

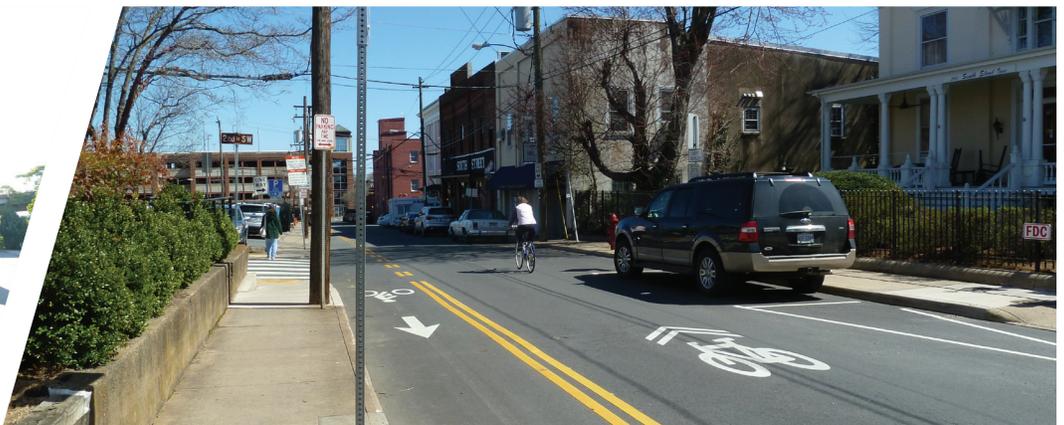
# CHARLOTTESVILLE

# STREETS



# THAT WORK

# DESIGN GUIDELINES



THIS PAGE INTENTIONALLY LEFT BLANK

# ACKNOWLEDGEMENTS

---

## Streets That Work / Code Audit Advisory Committee

Carl Schwarz	L.J. Lopez
Dan Rosensweig	Lucas Lyons
Eberhard Jehle	Rachel Lloyd
Elizabeth Waters	Tobey Bouch
Hugh Ewing	Warren Boeschstein

## City of Charlottesville Staff

Alexander Ikefuna	Juwhan Lee
Amanda Poncy	Kristel Riddervold
Barton Pfautz	Kylie Cempre
Brennen Duncan	Lance Stewart
Carrie Rainey	Malina Dana
Chris Gensic	Martin Silman
Christina Fisher	Mary Joy Scala
Claudia Elzey	Matt Alfele
Dan Frisbee	Missy Creasy
Dan Sweet	Pam Murray
Emily Pelliccia	Steve Upman
Heather Newmyer	Susan Elliott
Jason Ness	Trip Stakem
Jay Davis	William Sclafani
Jim Herndon	
John Jones	

## Streets That Work LIVE Volunteers

Andrew Mondschein	Kathy Galvin
Chip Boyles	Peter Ohlms
Chris Gist	Rachel Lloyd
Ed Furlow	Rebecca Fornaby
Elizabeth Van der Els	Robin Hanes
Genevieve Keller	Scott Paisley
Jake Fox	Shujing Zhang
Jeffrey Hajek	Stephen Bach
John Hermsmeier	Will Cockrell

## Toole Design Group

Jennifer Toole	Galen Omerso
Ken Ray	Sarah Saviskas
Wendy Phelps	Shailah Handy
Alia Anderson	John McCarthy
Eli Glazier	Siba El-Samra

THIS PAGE INTENTIONALLY LEFT BLANK

# CONTENTS

---

## Chapter 1

1.1 <i>Streets That Work</i> Process Overview .....	2
1.2 User Guide .....	5
1.3 Standards and Guidance .....	6
1.4 Previous Plans and Studies.....	7
1.5 Guiding Principles.....	7

## Chapter 2

2.1 Transportation .....	12
2.2 Utilities and Related Features .....	22
2.3 Green and Blue Stormwater Infrastructure .....	23

## Chapter 3

3.1 Street Network Overview.....	26
3.2 Street Typologies .....	29
3.3 Cross-Sections.....	32
3.4 Street Typologies At a Glance.....	66

## Chapter 4

4.1 Sidewalks.....	68
4.2 Roadways.....	81
4.3 Intersections .....	88

## Chapter 5

5.1 Department Responsibilities.....	98
5.2 Project Types.....	99
5.3 Development Review Process.....	100
5.4 Streets that Work Priority Projects.....	103
5.5 Pilot Project .....	111

# STREETS THAT WORK

## Executive Summary



*Streets That Work (STW) Guidelines* provide new guidance for street design to ensure that Charlottesville's streets meet the needs of all users: pedestrians, bicyclists, transit users, drivers, residents, workers, visitors and business owners. The *Guidelines* are intended to clearly communicate expectations regarding the design of the city's streets.

The *STW Guidelines* are one outcome from Charlottesville's adoption of a Complete Streets Resolution in 2014. The resolution directed the city to design and build streets that are designed to work for all users of all ages and abilities. Charlottesville's streets have evolved over many years of growth and development. Some areas of the city are easily experienced on foot or by bicycle, while other areas are oriented toward motor vehicles. The *Guidelines* recommend designs that balance the use of Charlottesville's streets so that walking, bicycling, transit and driving are all safe, appealing and convenient ways to travel through the city.

The *STW Guidelines* are not meant to be comprehensive — users should work with city staff to ensure all local, state and federal requirements are met. The *STW Guidelines* will be used to inform the city's policy and code audit that will formalize the recommendations in these Guidelines.



## How will the *STW Guidelines* be used?

The *STW Guidelines* recommend that any changes to the public right-of-way, whether proposed by a community member, developer, merchant association, city agency or others should conform to relevant guidelines and policies from the *STW Guidelines*. This means street improvement projects should be consistent with vision laid out in the *Guidelines* for the specific type of street. City-led projects that excavate in the public right-of-way shall include appropriate transit, pedestrian, bicycle and stormwater features to the maximum extent practicable.

## What do the *STW Guidelines* cover?

To better understand the challenges and opportunities present in designing streets in an established community like Charlottesville, the *STW Guidelines* cover the myriad functions served by the public right-of-way, assess the existing street network in the city, and assigns typologies to the major streets. The *STW Guidelines* provide design guidance for all elements of the public right-of-way, and include a prioritization scheme for advancing changes to the streetscape that will improve the safety and comfort of all users. The *Guidelines* include recommendations for street types, street elements, and implementation as summarized below.

### ▶ Street Types (Chapter 3.2)

The *STW Guidelines* identify a set of street types that form the framework for appropriate design features based on the context and dimensions of the street. The context for the street types is based on future land use in the Comprehensive Plan.

The six street types are presented in the table below. Local streets form the majority of the street network but are not assigned a typology due to the variations in context.

	Framework Streets						Local
	Mixed Use A	Mixed Use B	Downtown	Industrial	Neighborhood A	Neighborhood B	
<b>Percentage of Total Miles in City</b>	<3%	8%	2%	<2%	9%	7%	71%
<b>Number of Travel Lanes</b>	4 or more	2	2	2	2	2	2
<b>Sidewalks</b>	Both sides	Both sides	Both sides	Both sides	One or both sides	None or one side	Varies
<b>Dedicated Bicycle Facilities</b>	Yes	Yes	No	No	Yes	No	No
<b>Land Uses</b>	Commercial, Mixed Use	Mixed Use	Commercial, Mixed Use	Commercial, Industrial	Residential	Residential	Residential, Commercial, Mixed Use

## ► Street Elements (Chapter 4)

The recommendations in the *STW Guidelines* are organized into three sections: **SIDEWALK ELEMENTS**, or those between the curb and edge of the right-of-way; **ROADWAY ELEMENTS**, which are the elements between the curbs; and **INTERSECTIONS**, where users of all modes converge. Overall streetscape design is discussed in detail in Chapter 4, and the following provides a brief overview of some of the recommendations.

### *Sidewalk Elements*

In order to function for all users, sidewalks should allow sufficient clear width for through travel while providing amenities to serve passers-by. To that end, the *Guidelines* identify a set of sidewalk “zones” to organize elements on the sidewalk. Each zone should meet guidelines for width, use and appropriate elements.

The sidewalk zones are:

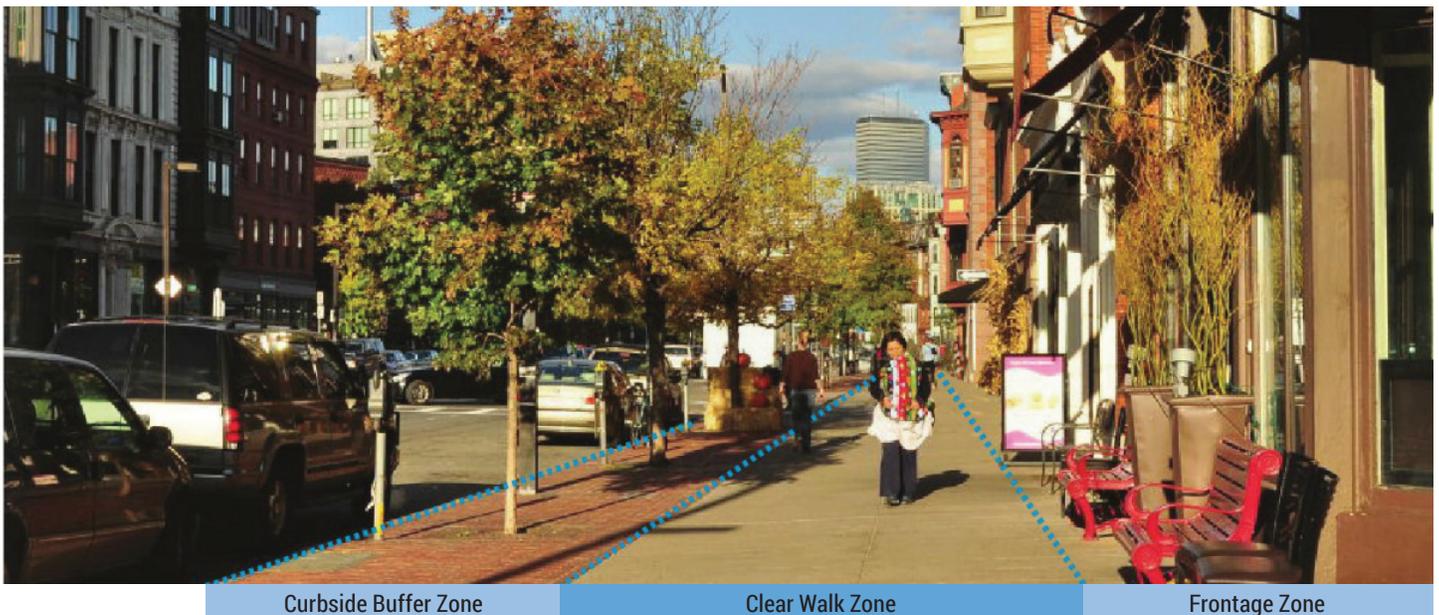
- **Frontage zone:** The area adjacent to the property line that transitions between the sidewalk and building uses.
- **Clear walk zone:** The portion of the sidewalk for pedestrian travel along the street.
- **Curbside buffer zone:** The portion of the sidewalk used for various streetscape amenities and functional elements, including plantings, street lights, furnishings, and surface utilities. It is also the area of the sidewalk used by people getting in and out of parked vehicles.

### **Sidewalk Width**

For most street types, the minimum recommended sidewalk width has been increased to 6 feet or greater. Where development projects create new streets or require streetscape improvements, sidewalks should meet or exceed the recommended sidewalk width.

### **Street Trees**

Throughout the *STW* planning process, the community has reiterated the desire to incorporate more street trees into the streetscape for the aesthetic, ecological, and psychological benefits they provide. These *Guidelines* recommend changes to the existing ordinance to focus on proper tree species selection, soil volume requirements, tree placement and maintenance.



Curbside Buffer Zone

Clear Walk Zone

Frontage Zone

### Green and Blue Stormwater Infrastructure

Green and blue stormwater infrastructure captures stormwater in the public right-of-way before it enters the city's stormwater system. Stormwater features may infiltrate, retain, detain, convey and/or treat stormwater, depending on the facility and the context. The basic recommendations from these guidelines is to incorporate green and blue stormwater elements into medians, streetscapes, and traffic calming strategies at every possible opportunity.

### Utilities

Utilities are functional elements of the streetscape that provide essential services throughout the city. They exist both above and below ground, and may act as a limiting factor in street design. Utilities should be efficiently located to minimize impacts to other existing and potential streetscape elements.

### Roadway Elements

The recommendations for roadways include lane widths, medians, parking and bicycle facilities.

#### Lane Widths

To facilitate travel speeds in line with community values, travel lanes in Charlottesville have a maximum recommended width of 11 feet (12 feet on Industrial streets). The combined width of a travel lane with adjacent on-street parking is 18 feet.

#### Medians and Islands

Medians and islands are traffic control devices that may also be landscaped to give a street a unique identity. Medians may also serve as pedestrian refuges at crosswalks. Medians should include landscaping if width allows, and be designed to visually slow traffic.

#### Bicycle Facilities

The bicycle facility recommendations are consistent with the 2015 Bicycle and Pedestrian Master Plan which focused on developing a low-stress network of connected bicycle facilities that provides access to popular destinations throughout the city.

#### Intersections

The guidance for intersection design enhances pedestrian safety and quality by focusing on the elements that contribute to an intersection that is easily understood and traversed by all users. Curb extensions, corner curb radii, and crosswalks are all important features of a safe intersection.

#### Curb Extensions (Bulb-outs)

Curb extensions, or bulb-outs, extend the sidewalk into the parking lane at intersections, making pedestrians more visible, shortening crossing distances, and slowing vehicle turn movements. They can also provide space for landscaping and other amenities.



Photo by Adam Coppola

### Corner Curb Radii

Curb radii define an intersection – curb radii should maximize pedestrian space and slow vehicle turns while accommodating necessary design vehicles. This section provides *Guidelines* for the design of curb radii, including appropriate design vehicles (the type of vehicle that should be able to make a given turn), and strategies for minimizing overly large turn radii.



### Crosswalks and Pedestrian Signals

Well-designed crossings are essential to creating a safe and usable pedestrian environment. Crosswalks and intersections can be enhanced by a number of features to make pedestrians visible to vehicles and create convenient pedestrian connections.



## ► Implementation (Chapter 5)

Arguably the most challenging part of street design and retrofit is implementation. Chapter 5 of *The STW Guidelines* provides detailed recommendations for developers, partner agencies and consultants that are involved in the design and construction of streets. The City of Charlottesville has the primary responsibility for guiding and permitting street design and maintaining the streets within city limits.

A set of priority corridors and intersections has been identified based on safety needs, planned projects and bicycle and pedestrian demand. These locations would all benefit from improvements based on the recommendations in the *STW Guidelines* to ensure safe and convenient travel for users of all modes and abilities.

The *STW Guidelines* are rooted in The City of Charlottesville established standards, but they provide flexibility for creativity. The city will be moving forward with a number of systematic pilot projects to test new approaches on a temporary basis.

# CHAPTER 1

---

## Introduction

# 1.1 Streets That Work Process Overview

Streets and sidewalks do far more than help people move through cities, integrated with essential utilities, they serve as gathering places, provide space for exercise and socializing, provide shelter for people waiting for the bus, and help convey and manage stormwater runoff. Recognizing the vast economic, social, recreational and ecological roles that streets play, the City of Charlottesville launched the **Streets That Work Initiative**: a comprehensive effort to rethink the way that existing and future streets are designed and function. The *Streets That Work Guidelines* are one of the components that form the overall vision for Charlottesville’s streets, as shown in Figure 1.

## The 4 Components of the Streets That Work Initiative

- Streets That Work Guidelines
- Bike/Ped Plan
- Green Infrastructure Plan
- Policy & Code Audit

This document presents the *Streets That Work Guidelines*, a central component of the broader *Streets That Work Initiative*. These Guidelines provide recommendations on all aspects of street design, with the goal of improving the transportation network for all users and transforming more city streets into vibrant and sustainable public spaces.



Figure 1: Components of the Streets That Work Planning Initiative

Together, the Guidelines and the other components of the *Streets That Work* Initiative will allow Charlottesville to create and maintain more thriving streets that are accessible for all users throughout the city. Streets are defined broadly in this process to include everything in between private property lines including sidewalks, planted buffers and street trees, street furniture and other amenities, pedestrian and bicycle facilities, on-street parking lanes, and vehicle travel lanes. However, this initiative recognizes the vital role that private interests play in creating inviting public spaces on the street edge and will inform the City Policy and Code Audit.



The Guidelines focus primarily on potential changes in the public right-of-way, including those that may be implemented by private developers during construction projects or the city as part of a retrofit project. A citywide Code Audit, which began as part of the broader *Streets That Work* Initiative, will be more specifically focused on the regulations that govern development on private property.

The *Streets That Work* Guidelines are consistent with, and build upon, existing engineering and environmental standards and requirements, including the:

- Virginia Department of Transportation’s Road Design Manual,
- Federal Highways Administration’s Manual on Uniform Traffic Control Devices (MUTCD),
- National Association of City Transportation Officials’ (NACTO) Urban Street Design Guide and,
- American Association of State Highway and Transportation Officials’ (AASHTO) Policy on Geometric Design of Highways and Streets (“Green Book”).
- Virginia Statewide Fire Prevention Code (2012)

## What are the *Streets That Work* Guidelines?

The Guidelines are a design resource for city departments, design professionals, private developers and city residents. The Guidelines articulate a vision for future streets by communicating the regulations and best practices that will make Charlottesville’s streets safer and more attractive for pedestrians, transit users, drivers, bicyclists, residents, workers and business owners.

The *Streets That Work* Guidelines are organized by chapter:

- 1 INTRODUCTION** outlines the purpose and need for the Streets That Work Guidelines and identifies the various audiences in the User Guide. Chapter 1 also includes an overview of the documents and principles informing the development of the Guidelines.
- 2 USES IN THE PUBLIC RIGHT-OF-WAY** provides an overview of the many functions within the public right-of-way, including transportation, utility provision and green and blue infrastructure systems.
- 3 STREET NETWORK AND TYPOLOGIES** assesses the city’s street network and presents six typologies for the city’s major streets.
- 4 STREET ELEMENTS** contains sections with design guidance for sidewalks, roadways and intersections.
- 5 IMPLEMENTATION** covers the application of the Guidelines, with a description of how street projects are realized and identifies priority corridors within the city.

Within that regulatory context, creative solutions that tailor designs to local conditions are encouraged. Therefore, the *Streets That Work* Guidelines remain flexible, and staff approval of individual street projects shall continue to be based on established engineering standards and professional judgment.

The *Streets That Work* Guidelines are intended to broaden the range of design options for streets in Charlottesville, recognizing that streets and sidewalks comprise approximately 12 percent of the city’s total area, and represent about 45 percent of the publicly owned land in the city. As such, streets and sidewalks are public spaces that present unique opportunities and must maximize the multifunctional public benefit they offer while retaining the existing public benefits of safe and maintainable utility infrastructure.

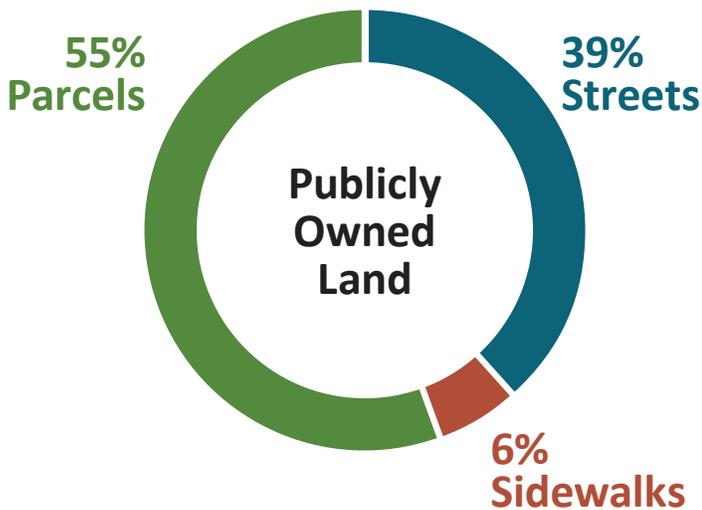


Figure 2: Publicly Owned Land in Charlottesville by Category.

## Why are the *Streets That Work* Guidelines and Code Audit needed?

Charlottesville’s streets have always served multiple functions. In the nineteenth and early twentieth centuries, streets allowed people and goods arriving by rail to reach local destinations. Over time, as motor vehicle ownership and use increased, street design came to focus primarily on motor vehicle movement, and the emerging discipline of traffic engineering worked to safely integrate cars and trucks into pre-existing urban forms. While it remains critical to accommodate motor vehicle movement through the city, the focus on cars has been at the expense of other modes of transportation, and has emphasized the ability of *vehicles* rather than *people* to access places.



Hydraulic Road prioritizes motor vehicle throughput.



Altamont Circle provides more of a balance between modes.

The *Streets That Work* Guidelines strive to balance vehicle mobility needs with the needs of other street users and utility infrastructure while prioritizing the myriad of community-serving functions that streets have traditionally provided. They will help Charlottesville become the city envisioned by the 2013 Comprehensive Plan and 2014 City of Charlottesville Strategic Plan, by supporting walkable development in designated mixed-use corridors where additional density is most appropriate. This pattern of development is consistent with the city’s investments in public transit and stated desire for citizens to have the choice to safely walk, bike, ride transit or drive to travel through the city.

## 1.2 User Guide

The *Streets That Work* Guidelines are a design resource for city departments, design professionals, private developers and their consultants. Though not intended as a primary audience, elected officials, neighborhood groups, advocates and interested residents may also benefit from using the Guidelines as a reference. This section provides a description of the role that each audience group plays in designing and executing street projects in Charlottesville, and discusses how they might use these Guidelines during the process. For all audiences, the Guidelines aim to strike a balance between specificity and flexibility – providing improved clarity about the design parameters that are appropriate in various contexts while leaving enough flexibility to make appropriate, site-specific decisions.

### City Staff

**Roles:** City staff have differing roles depending on the type of street project and the phase in the street’s life cycle. In some cases, staff may be responsible for all aspects of the design and execution of street projects. One example is when a new bike lane is striped as part of a street resurfacing. In cases where an outside party is designing a new street (or contributing elements of the streetscape), City staff serves as the approval body. The city is responsible for the long term maintenance of streets, such as regular sweeping and plowing, fixing potholes and restriping faded crosswalks. The city is also responsible for the management and maintenance of public utilities including gas, sewer and stormwater lines that exist in street corridors.

**Use of Guidelines:** When City staff is leading a street design project, the Guidelines will inform the elements and dimensions that may be appropriate for the context in which they are working. When the City approves plans developed by others, staff needs the ability to provide clear design parameters that have the support of the public and policy makers. These guidelines will assist staff as they make updates to enforceable citywide codes, such as the zoning code, and give staff the backup needed to exercise plan review authority.

The Guidelines can also support the City’s role in maintaining streets. These Guidelines provide parameters on the use of details like special paving materials, landscape installations, or street furniture, all of which have cost and labor implications that must be considered.

### Property Owners and Developers

**Roles:** Property owners and real estate developers in Charlottesville are a key part of the city’s economy. While the streets are public spaces and should serve the public good, they are the primary means of access to private property, and owners and developers have a vested interest in their design. Property owners and developers (as well as their design consultants) may contribute to aspects of the street design, for example by installing new sections of sidewalk or street trees along their property frontage. Although limited in Charlottesville, there may also be larger parcels or projects (such as residential neighborhoods or large mixed-use projects) where the owners and developers may be responsible for the construction of new streets or upgrades of existing streets.

**Use of Guidelines:** In concert with the city’s established standards, the guidelines show developers and their design consultants desired design elements including street dimensions, landscaping and the placement of other elements, including furniture, bus shelters, lights, etc. The Guidelines assist with the development review process by providing a clearly articulated set of expectations regarding street design.

### Public

**Roles:** The citizens of Charlottesville and the owners, employees and patrons of its businesses are the end users of the streets. As such, they have an interest in making their desires known to the professionals charged with designing city streets and have provided input on the vision, guiding principles and desired streetscape elements included in this plan through multiple open houses, outreach events and the submittal of written comments. When street projects are funded by public monies, the public will continue to be engaged in the decision making process through organized public meetings and other outreach methods.

**Use of Guidelines:** These guidelines are designed to be transparent and user-friendly. The visual nature of the Guidelines makes the document accessible to a wide audience, allowing everyone to develop common expectations for future street projects in the city.

## 1.3 Standards & Guidance

Streets in Charlottesville must meet a host of local, state and federal regulations. For example, development within the City of Charlottesville is subject to the Charlottesville City Code (1990, 2003).<sup>1</sup> The chapters governing Streets and Sidewalks (Chapter 28), Utilities (Chapter 31) and Zoning (Chapter 34) helped to inform these Guidelines.

Similarly, the City of Charlottesville Standards and Design Manual<sup>2</sup> (SADM) presents the minimum standards and design criteria, and identifies references for use in the planning, design and construction of new development and redevelopment in the City of Charlottesville. The SADM includes the materials and methods of construction for all improvements required in subdivisions, site development, redevelopment, public and private streets, and utilities.

This document provides details in addition to those covered in City Code and the SADM and will assist the City with its Code Audit and subsequent code updates to ensure City standards agree with the Guidelines.

Other codes, laws and manuals that should be consulted during a street design process are listed below, and described in more detail in Appendix A.

### State Standards and Guidelines

- Virginia Statewide Fire Code (2012)
- Virginia Department of Transportation - Road Design Manual
- Virginia Department of Transportation - Transportation Efficient Land Use and Design
- Virginia Department of Rail and Public Transportation Multimodal System Design Guidelines
- Virginia Stormwater Design Guide

### Federal Standards and National Guidelines

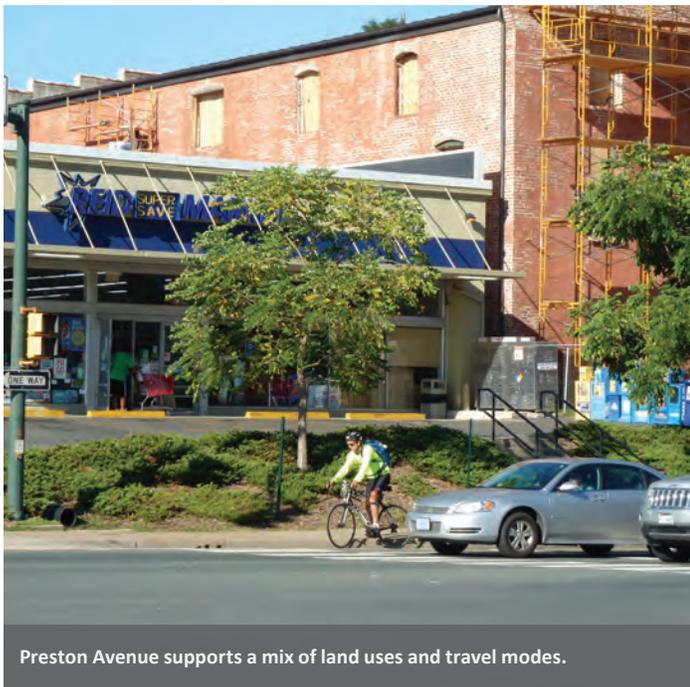
- Manual on Uniform Traffic Control Devices (MUTCD) - Federal Highway Administration (FHWA)
- Urban Street Design Guide - National Association of City Transportation Officials (NACTO)
- Policy on Geometric Design of Highways and Streets (“Green Book”) - American Association of State Highway and Transportation Officials (AASHTO)



Streets That Work Public Open House, September 2015.

1 [https://www.municode.com/library/va/charlottesville/codes/code\\_of\\_ordinances?nodeId=COCH1990](https://www.municode.com/library/va/charlottesville/codes/code_of_ordinances?nodeId=COCH1990)

2 <http://www.charlottesville.org/departments-and-services/departments-h-z/neighborhood-development-services/engineering/standards-and-design-manual>



## 1.4 Previous Plans and Studies

The *Streets That Work* Initiative was informed by several preceding planning studies and reports, which are listed below. Summaries of relevant recommendations from each document are included in Appendix A. These Guidelines build on these previous recommendations and serve as a central document for information about street design.

- Charlottesville Commercial Corridor Study (2000)
- Charlottesville Entrance Corridor Design Guidelines (2005)
- Charlottesville Downtown Parking Study, (2008)
- Charlottesville Transit Development Plan (2011)
- Charlottesville Comprehensive Plan (2013)
- Strategic Investment Area Plan (2013)
- West Main Street Action Plan (March 2015, Draft)
- Charlottesville Bicycle and Pedestrian Master Plan Update (Adopted September 2015)
- Charlottesville Downtown and University Corner Comprehensive Parking Analysis (2015)

## 1.5 Guiding Principles

### Complete Streets

These guidelines are grounded in *Complete Streets* principles, which attest that streets should be designed to work for all users and support essential utility infrastructure. On any given street this may include pedestrians, strollers, transit users, bicyclists, people with disabilities, and motor vehicle drivers of all ages and abilities. There is no exact recipe for a Complete Street. The needs of users and utility infrastructure will be different in different neighborhoods – so the designs should be different as well. Regardless, there are a common set of values that help define Complete Streets. These values, discussed below, form the governing philosophy behind the *Streets That Work* Guidelines.

### Mobility/Accessibility

The last half-century's focus on moving vehicle traffic has sought to maximize *mobility*, or the ability to move freely (i.e. quickly) between destinations. This guide recognizes the importance of mobility but provides an increased focus on *access*, or the ability to conveniently reach destinations. Improved access is achieved through the following actions:

- **Use a holistic approach to categorize streets.** Most departments of transportation sort streets into categories to help make decisions about design. The traditional approach sorts streets based on their function with regard to vehicular circulation. The Complete Streets approach uses a broader method based on surrounding land uses and multimodal transportation needs.
- **Prioritize and promote active transportation modes and transit where sensible.** Complete Streets include facilities for all users when possible. In addition to providing more transportation choices for more people, this approach can help address future traffic congestion by shifting trips to modes other than driving.
- **Accommodate brief, periodic uses such as deliveries and emergency vehicles, as well as special uses like events, without compromising everyday use.** Complete Streets should be flexible and allow for the unique circumstances that are a part of all dynamic cities. However, occasional events should not take priority to the detriment of other users.
- **Provide safe and essential utilities.** Complete Streets should integrate and balance multimodal transportation needs with safe and maintainable below ground utilities.

## Safety

Safety for all users must be a top priority—for bicyclists and pedestrians as well as motorists. Special attention must be paid to vulnerable street users, especially children, the elderly and persons with disabilities.

- **Consider the most vulnerable users first.** Charlottesville has one of the highest rates of walking and biking to work in Virginia—a rate much higher than the national average (see Chapter 4). Complete Streets emphasizes the comfort and safety of pedestrians above other modes.
- **Match speed to context.** Independent of the speed limit, the design of a street sends visual cues to motorists about how fast they should drive. The “design speed” is determined by characteristics like lane widths, roadside elements like street trees, and curbside elements like parking or bulb-outs. Complete Streets feature a design speed that is appropriate for the surrounding land uses and anticipated street users.

## Character/Livability

Streets occupy a significant share of the public space that makes up a city and should be used to the greatest extent possible to provide community and civic value. While buildings and architecture in Charlottesville contribute to its character, its streets are also a visible part of this legacy.

- **Enhance the character of existing neighborhoods.** Complete Streets within established neighborhoods could feature landscaping and sidewalks or be a shared street with low traffic volumes and no sidewalks, and all variations in between that speak to their unique character.
- **Foster economic opportunity.** There is a reason real estate professionals refer to “curb appeal.” Public investments in Complete Streets create value for owners of private property along those streets.
- **Encourage physical activity.** Prevention is the most effective health treatment and multiple studies have shown that people living in walkable and bicycle-friendly communities are more likely to be active on a regular basis.<sup>3</sup>

3 <http://www.peopleforbikes.org/statistics/category/facilities-statistics>

## Cost Effectiveness

In an environment of limited budgets and scarce transportation resources, street designers constantly seek opportunities to optimize value. Instead of reducing costs by removing design features seen as non-essential to the mobility of vehicles, Complete Streets designers take a different approach to control costs and ensure that delivered projects will provide an expansive and long lasting set of community benefits.

- **Assess the costs and benefits for the full life cycle of a project.** This includes understanding the substantial costs of relocating utilities and long-term maintenance costs of the project from the outset and designing the project to minimize these costs.
- **Utilize the expertise of the existing Development Review Team to review street projects in addition to private development.** Using a design review process that allows early street designs to be reviewed by multiple departments can identify conflicts and problem issues, especially if other departments will be helping with street and utility maintenance in the future.

## Charlottesville Streets That Work Guiding Principles

Using the Complete Streets principles described above, Charlottesville City staff gathered public feedback and worked with the *Streets That Work* Advisory Committee to develop the following Guiding Principles for the Initiative. These Guiding Principles are derived from the values expressed during the May charrette and complement the Community Values in the 2013 Comprehensive Plan<sup>4</sup> and City Council 2025 Vision Statements.<sup>5</sup> A full summary of the public engagement process can be found in Appendix B.

4 <http://www.charlottesville.org/departments-and-services/departments-h-z/neighborhood-development-services/comprehensive-plan/comprehensive-plan-2013>

5 <http://www.charlottesville.org/departments-and-services/departments-a-g/city-council/city-of-charlottesville-strategic-plan/alignment-with-council-vision-2025>

# In Charlottesville, streets will be:

## » HIGH QUALITY PUBLIC SPACES.

Charlottesville will emphasize innovative and thoughtfully-designed public spaces in public and private developments that reflect the diverse architectural and cultural heritage of surrounding neighborhoods. Streets will be visually attractive, appealing, and inviting.

## » VIBRANT PLACES OF COMMERCE.

Charlottesville's commercial streets will facilitate development that encourages economic vitality, social interaction, and visual interest the City.

## » SAFE AND ACCESSIBLE.

The safety, accessibility, and comfort of pedestrians, bicyclists, and transit users will be prioritized when planning and designing Charlottesville streets.

## » HEALTHY, GREEN AND SUSTAINABLE.

Charlottesville will promote health and long-term natural function of the built environment by utilizing sustainable and green design elements in all public and private developments.

## » CONNECTED AND CONVENIENT.

Charlottesville will be a multi-modal, connected community where an efficient and convenient transit system and well-designed bicycle and pedestrian network will link our overall transportation network so that users can easily travel throughout the city.

## » COLLABORATIVE.

Planning and designing the public realm, including public streets, will be a collaborative process to ensure decisions made about the city's public streets reflect the public's priorities.

## » POLICY DRIVEN.

City policies, codes and standards across departments will be revisited to ensure they advance these community goals in the public and private realm.

THIS PAGE INTENTIONALLY LEFT BLANK

# CHAPTER 2

---

## Uses in the Public Right of Way

Although the most obvious function of streets is to move people and goods from A to B, streets and the adjacent public right-of-way are also where main utility lines, including electric, cable, water, sewer, gas and storm are located. In conjunction with parks and open space, street trees and other plantings contribute to the city’s overall green infrastructure network. This chapter examines the transportation, utility and green infrastructure functions of streets and introduces basic design considerations for each. More detailed design guidance is available in the Street Elements chapter.

## 2.1 Transportation

According to the 2009-2013 American Community Survey 5-Year Estimates from the U.S. Census, the most common commute travel mode in Charlottesville is driving alone. The second most common commute travel mode is walking followed by carpooling and public transit. Although bicycling is the second least common commute travel mode, Charlottesville’s four percent bicycle mode share is more than double the national average.<sup>6</sup>

### Motor vehicles

For those with a driver’s license and access to a car, driving has several advantages including the ability to travel on demand in any type of weather and carry passengers and cargo. Cars have shaped the way streets and cities are built and are likely to continue to be the dominant mode of transportation for the near future. Vehicles, including freight and delivery trucks, are also an essential element of the city economy. However, in order to encourage the use of other travel modes and enhance safety for all users, cities and streets should not be designed exclusively for cars.

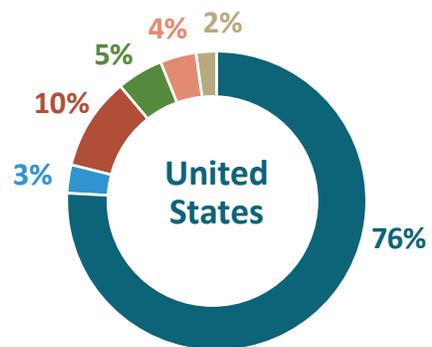
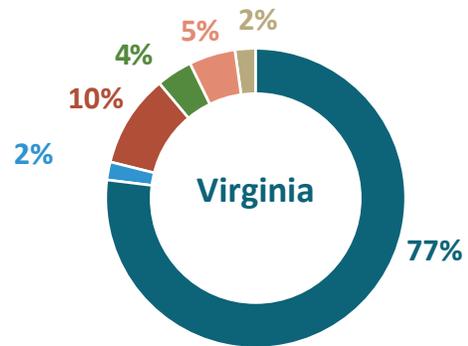
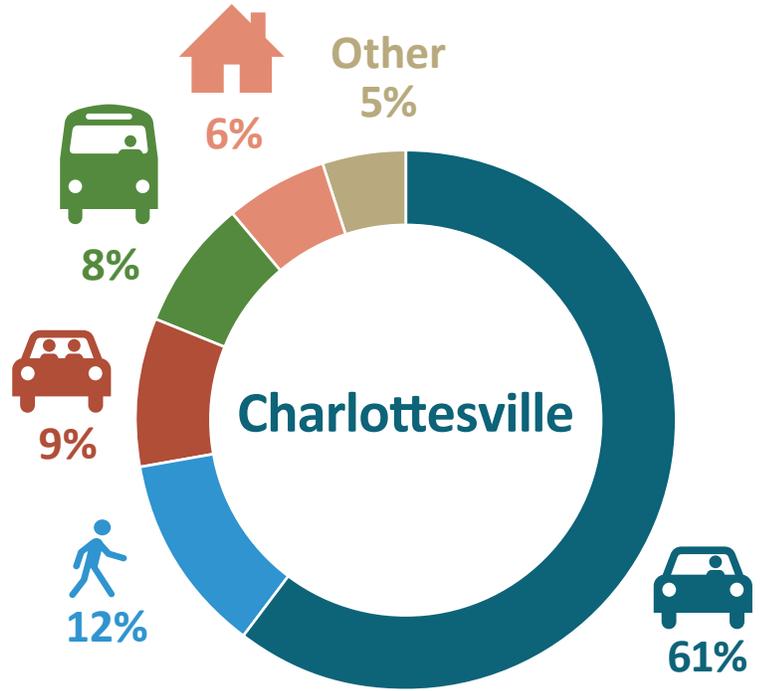


Figure 3: Comparison of travel modes in Charlottesville, Virginia and the United States; 2009-2013 American Community Survey 5-Year Estimates, U.S. Census.

6 U.S. Census Bureau, 2009-2013 American Community Survey 5-Year Estimates.

	2010	2011	2012	2013	2014 <sup>7</sup>	Average
All Collisions	799	772	771	755	727	764.8
All Injuries	380	345	351	336	346	351.6
All Fatalities	2	0	0	1	0	0.6

Table 1: Total Annual Collisions, All Modes

## Collision Data (All modes)

The table above contains data on all crashes in Charlottesville from 2011 to 2014 from the Virginia Department of Motor Vehicles. On average, there are two collisions and almost one injury per day.

## Motor Vehicle Considerations in Street Design

- Lanes must be wide enough to accommodate transit, emergency responders and large delivery vehicles.
  - CAT buses are 10.5' wide including the side mirrors.

– The Charlottesville Fire Department uses trucks that vary in length from 35' to 62', and are 8'3" wide.<sup>8</sup>

- Turning radii at intersections must also be wide enough to accommodate transit, emergency responders and large delivery vehicles; however, curb radii that are too wide allow vehicles to make high-speed turning movements and lengthen the crossing distance for pedestrians, increasing their exposure and risk of a collision.
  - More details on curb design and turning radii are available in Chapter 4 - Street Elements.
- For the comfort of all users, street designs should clearly distinguish between motor vehicle and pedestrian areas, and should provide separate space for bicycles where appropriate.



The painted buffer between the bike lane and travel lane on Elliot Avenue provides additional separation and visually narrows the travel lane without preventing large vehicles from making turns onto cross streets.

<sup>7</sup> Virginia Department of Motor Vehicles. <https://www.treds.virginia.gov/UI/Reports/Public/InteractiveReport.aspx?ReportPath=%2fInteractive+Crash+Reports%2fInteractive+Report>. Report accessed November 17, 2015.

<sup>8</sup> Charlottesville Fire Department, "Apparatus dimensions." Provided June 18, 2015.

	2010	2011	2012	2013	2014	Average
<b>Collisions involving pedestrians</b>	36	30	39	22	30	31.4
<b>Pedestrian Injuries<sup>2</sup></b>	37	30	43	22	34	33.2
<b>Pedestrian Fatalities<sup>3</sup></b>	0	0	0	1	0	0.2

Table 2: Total Annual Pedestrian Collisions

## Pedestrians

Charlottesville is recognized by the Walk Friendly Communities Program as a Gold-Level Walk Friendly Community.<sup>9</sup> The city has 175 miles of sidewalks, 20 miles of paved and soft surface trails and 825 marked crosswalks.<sup>10</sup> There are pedestrian signals and crosswalks at 57 of the city's 75 signalized intersections, and marked crosswalks at many other stop-controlled and mid-block locations. Charlottesville performed an assessment of its sidewalks, crosswalks and curb ramps in the summer of 2012 and used the findings to inform development of the 2013 ADA Transition Plan.

The ADA Transition Plan includes priority locations for the construction of new curb ramps where none currently exist as well as locations where reconstruction is required to make existing curb ramps and adjacent sidewalks meet ADA standards. Many of Charlottesville's sidewalks do not meet ADA standards for accessibility due to the placement of utility poles, steep driveway cross-slopes and uneven surfaces. The Transition Plan also addresses the need for additional accommodations at intersections including accessible push buttons, audible pedestrian signals and adequate crossing time.

Charlottesville's sidewalk network is most complete in the center of the city. Here, the streets are laid out in a traditional grid pattern and a mix of land uses makes walking from home to work and other destinations not only possible, but appealing. There are fewer sidewalks and mixed use areas in the neighborhoods further from the center of the city. Figure 4 shows streets with sidewalks in green, and streets without sidewalks in purple.

<sup>9</sup> Walk Friendly Communities is a national recognition program developed to encourage towns and cities across the U.S. to establish or recommit to a high priority for supporting safer walking environments. <http://www.walkfriendly.org/>

<sup>10</sup> City of Charlottesville GIS data, February 2015. Total sidewalk distance includes sidewalks on both sides of the street where applicable, and each marked crosswalk was counted individually.

The provision of sidewalks alone is not enough to create a truly walkable community. The width of the sidewalk, the presence of buffers like on-street parking and canopy trees, and the volume and speed of traffic all contribute to the quality of the walking environment.

### *Collision Data (Pedestrians)*

The table above contains data from the Virginia Department of Motor Vehicles regarding the number of pedestrian injuries and fatalities in Charlottesville from 2009 to 2013. On average, a pedestrian is injured once every twelve days.

### *Pedestrian Considerations in Street Design*

- As the most vulnerable road user, design features that increase pedestrian safety and comfort should be integral to all new and retrofit street designs.
- Wherever possible, a buffer should be provided between the pedestrian and motor vehicle throughway.
  - Potential buffers include bike lanes, parallel parking, trees, grass and/or street furniture such as benches and planters.
- Intersection alignment, signage and markings should maximize pedestrian visibility and minimize the crossing distance
  - Curb extensions can be used to shorten crossing distances and increase the visibility of the pedestrian.
  - At crossings on wide streets, a median refuge island should be provided that would allow the crossing to be made in two stages. Median refuge islands may not be applicable or feasible in all locations.

# Charlottesville Bicycle and Pedestrian Plan

## Connectivity of the On-Road Pedestrian Network

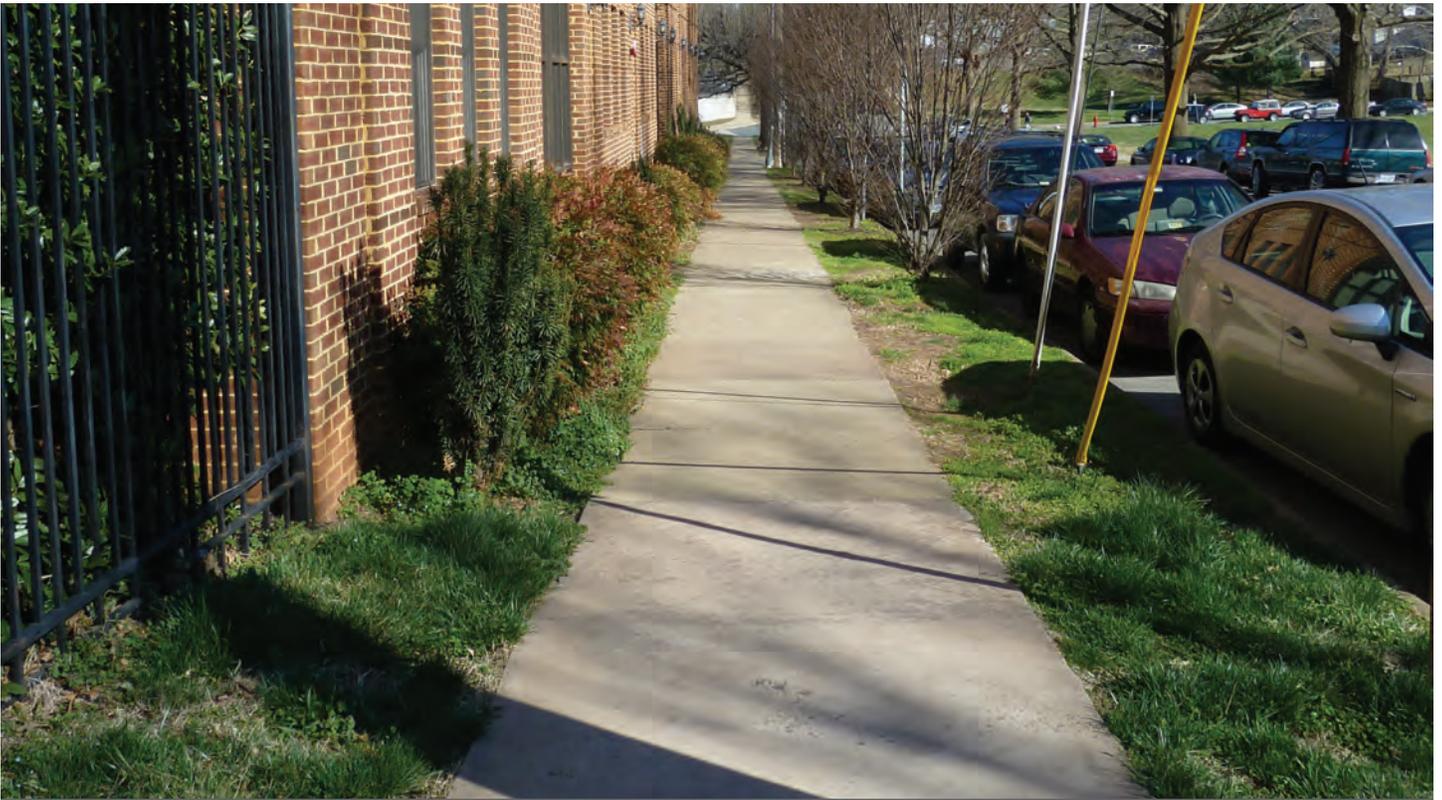
September 2014



- Hot Spot
- Pedestrian Network
- ⊠ Railroad Crossing
- ⊠ Areas that Lack Pedestrian Connectivity
- ⊠ Trail Crossing



Figure 4: Map showing connectivity of the on-road pedestrian network.



This sidewalk on the north side of Garrett Street has a planted buffer on both sides.



This median refuge island allows pedestrians to cross the wide intersection at Preston Avenue and Grady Avenue in two stages.

	2010	2011	2012	2013	2014	Average
<b>Collisions involving bicycles<sup>5</sup></b>	30	28	20	19	18	23
<b>Bicycle Injuries<sup>2</sup></b>	29	29	19	19	17	22.6
<b>Bicycle Fatalities<sup>3</sup></b>	1	0	0	0	0	0.2

Table 4: Total Annual Bicycle Collisions

## Bicyclists

In 2012, the League of American Bicyclists awarded Charlottesville a Silver-level Bicycle Friendly Community rating. Charlottesville was previously a Bronze-level Bicycle Friendly Community and the change in status reflects the city's commitment to bicycling through the provision of on-street bike facilities, a growing trail network, ongoing education programs for children and adults and more than double the national average of commuters traveling by bicycle. Charlottesville currently has 40 miles of bicycle facilities and is committed to more than double that by implementing the recommendations in the 2015 Bicycle and Pedestrian Master Plan Update, summarized in Table 3 and shown in Figure 5.

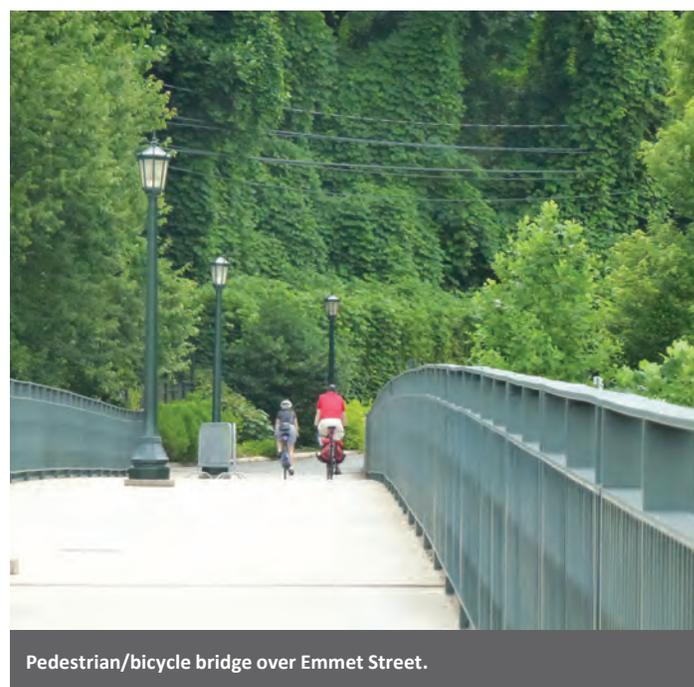
Type of Bicycle Facility	Existing Miles <sup>4</sup>	Recommended Miles
Signed Bicycle Routes	13.6	0.1
Shared Lane Markings	3.3	30.2
Wayfinding Sharrows	-	0.8
Bicycle Lanes	13.1	11.2
Climbing Bike Lanes	.5	14.7
Separated Bike Lanes	-	4.1
Contraflow Bicycle Lanes	0.4	0.7
One Way Except Bicycle	-	0.2
Shared Use Paths	9.6	2.5
<b>Total</b>	<b>40.5</b>	<b>64.5</b>

Table 3: Existing and Recommended Bicycle Facility Miles

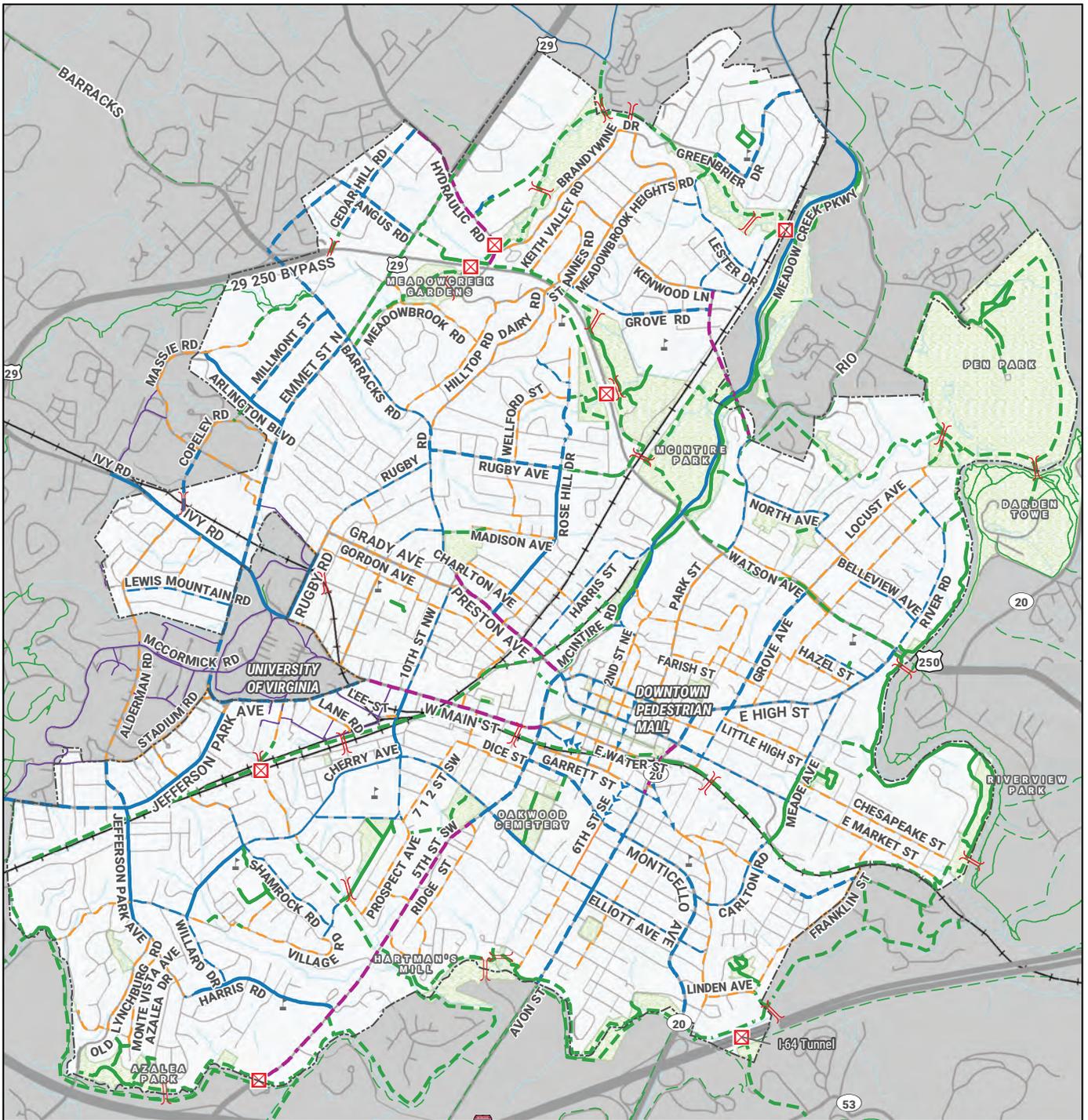
The recommendations contained in the 2015 Bicycle and Pedestrian Master Plan Update are designed to improve connectivity by filling in the existing gaps in the bicycle network, and emphasize the safety and comfort of bicyclists of all skill levels.

### Collision Data (Bicyclists)

The table above contains data from the Virginia Department of Motor Vehicles regarding the number of bicyclists involved in reported crashes and the resulting injuries and fatalities in Charlottesville from 2011 to 2014. On average, there is a collision involving a bicyclist every 16 days. Nearly all reported collisions resulted in injury.



Pedestrian/bicycle bridge over Emmet Street.



Bridges and Tunnels	Recommended Facilities	Existing Facilities	Albemarle County Greenways	Schools
Proposed Greenway Underpass Proposed Greenway Bridge	Shared Use Path Protected Bike Lane Bike Lane; Buffered Bike Lane Contraflow Bike Lane Climbing Lane Shared Roadway	Protected Bike Lane Bike Lane; Buffered Bike Lane Contra-Flow Bike Lane Climbing Lane Shared Roadway Shared Use Path	Existing Bike Lane Existing Multi-Use Path Proposed Multi-Use Path <b>UVA Bikeways</b> Existing Proposed	Schools Streams Rail Lines City Park City Limits

**Charlottesville, Virginia**

**Bicycle and Pedestrian Plan**  
Bikeway Facility Recommendations

0 0.5 1 Miles

Date: 5/3/2015

Figure 5: Bicycle facilities recommendation map from the 2015 Bicycle and Pedestrian Master Plan Update.

## *Bicycle Considerations in Street Design*

- Generally, the faster the vehicle speeds and higher the traffic volumes, the more separation should be provided between motor vehicle travel lanes and bicyclists.
  - Separation methods include wider bike lanes, painted buffers, bollards and concrete curbing.
- To every extent possible, bicycle facilities should continue up to and through intersections, rather than ending abruptly to accommodate motor vehicle turn lanes.
- In addition to on-street bike lanes, bicyclists also need secure and accessible parking at the end of their trip.
  - Bicycle parking can be provided on-street in a bike corral or in the furniture zone on the sidewalk, provided it does not impede the pedestrian thoroughway.



Bicycle facility markings continue through the intersection at 6th Street SE and Monticello Avenue.



Bicycle parking corral on 2nd Street SW.

# Transit

The City of Charlottesville and urban areas of Albemarle County are served by Charlottesville Area Transit (CAT). The bus system currently has twelve routes, including the popular Free Trolley that connects the University of Virginia and Health System to Downtown. In 2011, three routes accounted for 74 percent of daily ridership. They were the Free Trolley, and Routes 5 and 7 which serve Route 29 North including Barracks Road Shopping Center, Fashion Square Mall and Walmart.<sup>11</sup> As a whole, the system provided more than 2 million passenger trips last year.<sup>12</sup>

Within city limits, there is an average of 21.6 bus stops per square mile. When locating bus stops, CAT assesses the distance to the next stop, the proximity of nearby destinations and ADA accessibility.

Charlottesville is also served by JAUNT, Inc., a regional transit agency that provides fixed route commuter services and on-demand paratransit services for riders with disabilities. In 2014, JAUNT, Inc. provided 125,000 trips, and 70 to 80 percent of its ridership has a severe disability that makes using standard transit difficult. Similar to CAT buses, JAUNT vehicles need adequate travel lane widths, and clear space on the sidewalk to deploy wheelchair lifts.

In addition to CAT and JAUNT, Inc., the University of Virginia operates its own University Transit Service (UTS) with 6 different routes around the university campus and in nearby neighborhoods with significant student populations. UTS provides the highest frequency transit service of the three local systems, with headways of 10 minutes or less on major streets around the University.

## Transit Considerations in Street Design

- Where space permits, bus stops should have shelters that provide protection from the elements, seating and pedestrian scale lighting to ensure waiting users are visible at night.
- Bus stops need to be ADA accessible. Some existing bus stops lack sidewalks and curb ramps, while others do not provide the necessary 8-foot clearance to deploy the bus ramp.
- While providing a pull-out for a bus to occupy while loading and unloading allows traffic to pass around it, it can also make it difficult for the bus to merge back into traffic and block the view of pedestrians crossing the street in front of the bus.
- As buses pull to and from the curb, they are often required to cross the bike lane.
  - Colored pavement or other markings should be used to highlight these potential conflict areas.



Dashed striping and sharrow markings highlight bus merge area at an intersection.

<sup>11</sup> Virginia Department of Motor Vehicles. [http://www.dmv.virginia.gov/safety/crash\\_data/pedestrian/pdf/injury\\_juris.pdf](http://www.dmv.virginia.gov/safety/crash_data/pedestrian/pdf/injury_juris.pdf)

<sup>12</sup> Virginia Department of Motor Vehicles. [http://www.dmv.virginia.gov/safety/crash\\_data/pedestrian/pdf/fatality\\_juris.pdf](http://www.dmv.virginia.gov/safety/crash_data/pedestrian/pdf/fatality_juris.pdf)

## Fire Department and Emergency Response Vehicles

Roadway designs must consider the needs of emergency responders driving fire trucks and emergency response vehicles. The goal of the Charlottesville Fire Department and Charlottesville Albemarle Rescue Squad (CARS) is to minimize response times to save lives—seconds can make the difference between life or death. The Charlottesville Fire Department uses a 4 minute travel time benchmark from the Commission on Fire Accreditation International’s Self Assessment Manual to evaluate its performance. In 2015, fire department personnel arrived on the scene within 4 minutes at 77 percent of incidents. The department’s goal is to respond to 90 percent of incidents within 4 minutes of travel time.

The trend in urban development towards higher density presents a challenge for first responders in terms of maintaining desired performance benchmarks. The cumulative and complex effects of higher density development go beyond adequate street width for fire truck and ambulance access, and should be addressed collaboratively by multiple City departments during the design review process.

### *Fire Department and Emergency Response Considerations in Street Design*

- The Virginia Statewide Fire Code requires streets to be at least 20’ wide and have a clearance of 13’6” in height.
- As required by the Virginia Statewide Fire Code, street designs with traffic calming features must be approved by Fire Chief in order to minimize impacts to emergency response times.
  - Raised crosswalks and speed table designs should be reviewed by emergency services because in some applications, they create challenges for emergency response vehicles and alternative measures should be considered.



This bus stop has several nice features including seating, a shelter, trash and recycling receptacles and a shade tree. The stop does not have any visible lighting or an adequate landing pad for a wheelchair ramp.



First responders at the scene. Image credit: Charlottesville Fire Department

## 2.2 Utilities and Related Features

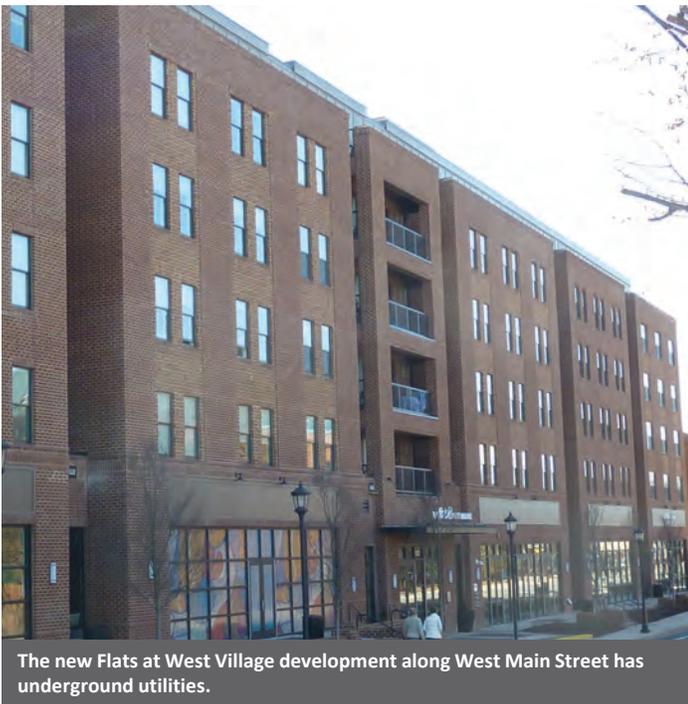
Utilities, including electric, cable, water, sewer, gas, and stormwater lines are located above and below ground within the city's rights-of-way. This infrastructure is critical to the health, safety and lives of all residents and the functionality of businesses in Charlottesville. When designing a street, consideration should be given to protection of these critical assets as well as allowing access for future maintenance. Relocating utilities to accommodate other elements in a street design is very challenging and extremely costly. More guidance on the location of utilities and related features can be found in Chapter 4 - Street Elements.

### *Utility Considerations in Street Design*

- Locations of permanent structures and trees shall be selected to accommodate existing utilities and access to above and underground utilities.

Aboveground access points like manholes, meter vaults and valve boxes shall be designed to accommodate traffic loadings and maintenance requirements in accordance with the requirements set forth in the Standards and Design Manual and other design guidelines.

- Common features along the sidewalk, including utility poles and parking meters/stations, should never be placed in the clear walk zone. (See page 71).



## 2.3 Green and Blue Stormwater Infrastructure

Trees, shrubs, grasses and other plantings play an important role in making streets comfortable, delightful, memorable, and sustainable. They can help define the character of a street or plaza, provide shade and cooling in strategic locations, reduce energy consumption in buildings, and absorb and cleanse stormwater. They absorb greenhouse gases and help filter airborne pollutants. When selected appropriately, plants can also clean soil contamination and contribute to native wildlife systems.

Maintaining landscape plantings on Charlottesville's streets is challenging. Sidewalk space is at a premium and the hard surfaces required to support concentrated activity can be hostile to street trees and other plantings. Soil compaction, water limitations, lack of space above or below ground, utility conflicts, temperature fluctuations, physical damage and litter all put stress on plants. These guidelines seek to balance the benefits of a healthy greenscape with the realities of limited space and the ongoing need for care and maintenance by a limited number of city staff. More guidance on the location and design of green infrastructure features can be found in the Street Elements chapter.

### *Green and Blue Stormwater Infrastructure Considerations in Street Design*

- Trees should not be planted in loading zones or within 10' of bus stop landing pads.
- Tree limbs should be pruned to maintain the clear walk zone, sight lines, maximize visibility of the street wall and provide access to utilities.
- Similar to street trees, green and blue stormwater infrastructure elements have environmental and aesthetic benefits. With careful design, elements can be modified to fit within physical constraints, integrated into medians or added to the curbside buffer or frontage zones of sidewalks.
- Drainage patterns and design elements that tie into existing pipes can present significant challenges when integrating green and blue infrastructure into street designs. For example, medians are usually at the crown of the roadway, with water draining away from them. One strategy to overcome some of these challenges is emphasizing the multiple benefits of these designs to take advantage of different funding sources.

### What is Green Infrastructure?

Green infrastructure is a strategically planned and managed network of wilderness, parks, conservation easements, greenways, trees and plantings that supports native species, maintains natural ecological processes, sustains air and water resources and contributes to the health and quality of life for the community.

In the right-of-way, green infrastructure refers to vegetated stormwater management practices.

Source: Charlottesville Comprehensive Plan.  
<http://www.charlottesville.org/home/showdocument?id=8180>

### What is Blue Infrastructure?

Blue infrastructure refers to the practice of diverting rainwater and snowmelt from the city's separate stormwater system into ponds, fields and other more natural settings.

In the right-of-way, blue infrastructure refers to non-vegetated stormwater management practices, like permeable pavement.

Source: Detroit Free Press. <http://www.freep.com/story/money/business/michigan/2015/05/16/detroit-infrastructure-water-sewerage-wetlands-environment/27243935/>

THIS PAGE INTENTIONALLY LEFT BLANK

# CHAPTER 3

---

## Street Network and Typologies



East High Street

The previous chapter looked at the multiple, essential functions that Charlottesville’s streets have, and introduced basic design considerations for each of these functions. This chapter examines the streets themselves, looking both at the network as a whole and at the characteristics of different street types used to determine the typologies in these guidelines.

## 3.1 Street Network Overview

With few exceptions, the street network in Charlottesville is built out and future road construction is limited to local streets providing residential access. Some arterial roads like Preston Avenue, 5<sup>th</sup> Street and Emmet Street have multiple travel lanes in each direction, but most streets within city limits have one lane in each direction, although the lanes are not always separated by pavement markings in residential neighborhoods. There are a few one-way streets around the downtown area and in the residential neighborhoods surrounding the West Main Street corridor.

## Mileage and Road Classifications

Charlottesville has 168.6 miles of roads within its boundaries.<sup>13</sup> These roads are assigned to one of several possible functional classifications within a hierarchy according to the character of motor vehicle service each roadway provides. Arterials and collectors carry the highest traffic volumes over longer distances, while local streets carry fewer vehicles shorter distances. Table 5 shows the miles of road within each classification in Charlottesville.

Road Classification (VDOT)	Miles
Interstate	0.4
Principal Arterial	15.5
Minor Arterial	13.1
Collector	16.7
Local	122.9
<b>Total</b>	<b>168.6</b>

Table 5: Miles of Charlottesville Roads by VDOT Classification

<sup>13</sup> City of Charlottesville, GIS data, April 2014.

## Posted Speed Limits

The posted speed limits in Charlottesville range from a minimum of 15 mph in some school zones to a maximum of 45 mph along 5<sup>th</sup> Street, portions of the 250 Bypass and Seminole Trail/29N. Most arterials have posted speed limits of 35 mph, while collectors and local streets have posted speed limits of 25 mph.

## Traffic Volumes

Charlottesville’s principal arterial roadways carry a disproportionate amount of the traffic in and through the city. Seventy-four percent of roads in Charlottesville have an average annual daily traffic (AADT) count below 1,000, which is relatively low.<sup>14</sup> The roads with the highest traffic volumes are shown in Table 6.

Road Name	Segment	Number of Through Travel Lanes	AADT VDOT, 2012	AADT VDOT 2014 <sup>8</sup>
29 N/Seminole Trail	250 Bypass to North City Limits	6	59,000	60,000
250 Bypass	Hydraulic Road to Dairy Road	4	42,000	37,000
29 N/Emmet Street	Barracks Road to 250 Bypass	4	31,000	29,000
Preston Avenue	Grady Avenue to Market Street	4	21,000	20,000
Ridge Street	Dice Street to Main Street	2	22,000	20,000
E High Street	Gillespie Avenue to 250 Bypass	2	19,000	18,000
5th Street	South City Limits to Cherry Avenue	4	18,000	17,000
Monticello Avenue	South City Limits to Meridian Avenue	2	15,000	14,000
Avon Street/9 <sup>th</sup> Street NE	Monticello Avenue to High Street	2-4	14,000	13,000
W Main Street	Jefferson Park Avenue to McIntire Road	2	13,000	12,000

Table 6: Average Annual Daily Traffic on Charlottesville’s Major Roads

*Note: One travel lane has a capacity of 10,000 vehicles per day.*

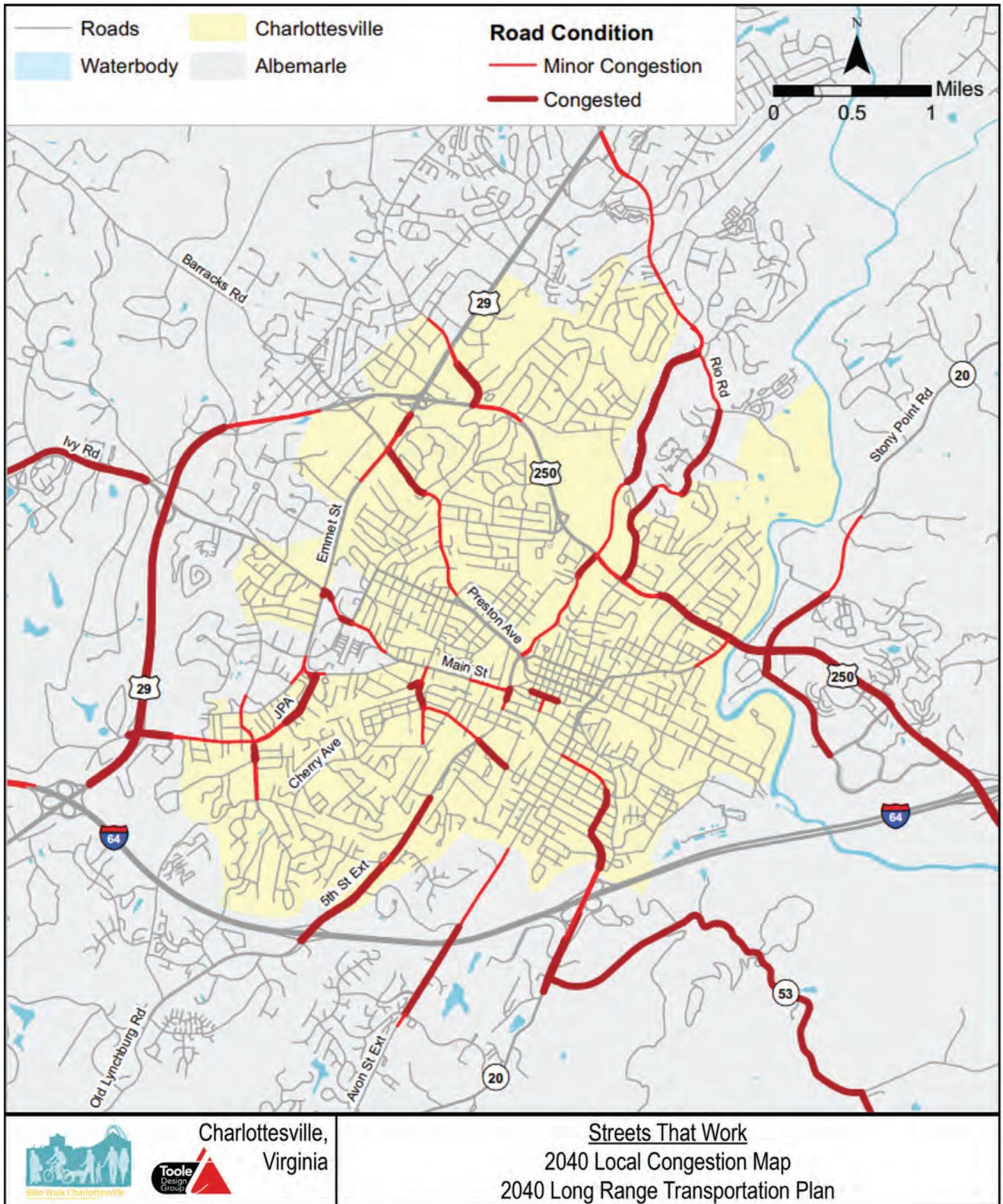
14 City of Charlottesville GIS data, April 2014.

15 Charlottesville Albemarle MPO Long Range Transportation Plan. <http://www.tjpc.org/LRTP/PDF/document/Chapter6.pdf>

## Projected Future Traffic

The 2040 Long Range Transportation Plan (LRTP) for the Thomas Jefferson Planning District which includes the City of Charlottesville and the surrounding counties of Albemarle, Greene, Fluvanna, Louisa and Nelson, assesses the future demand for travel throughout the region. The Travel Demand Model used to establish a baseline and make recommendations for the LRTP shows that several roads within and around Charlottesville will experience minor to severe congestion in the future as the regional population continues to grow. These roads are mapped in Figure 6.

Minor congestion refers to roads operating at 85 to 100 percent capacity, where drivers would likely experience delays at peak times. Congested roads are expected to carry more volume than they are designed to accommodate, and drivers will experience delays throughout the day.<sup>15</sup>



Map produced by the Thomas Jefferson Planning District Commission/Charlottesville-Albemarle MPO

Figure 6: 2040 Local Congestion Map.



West Main Street

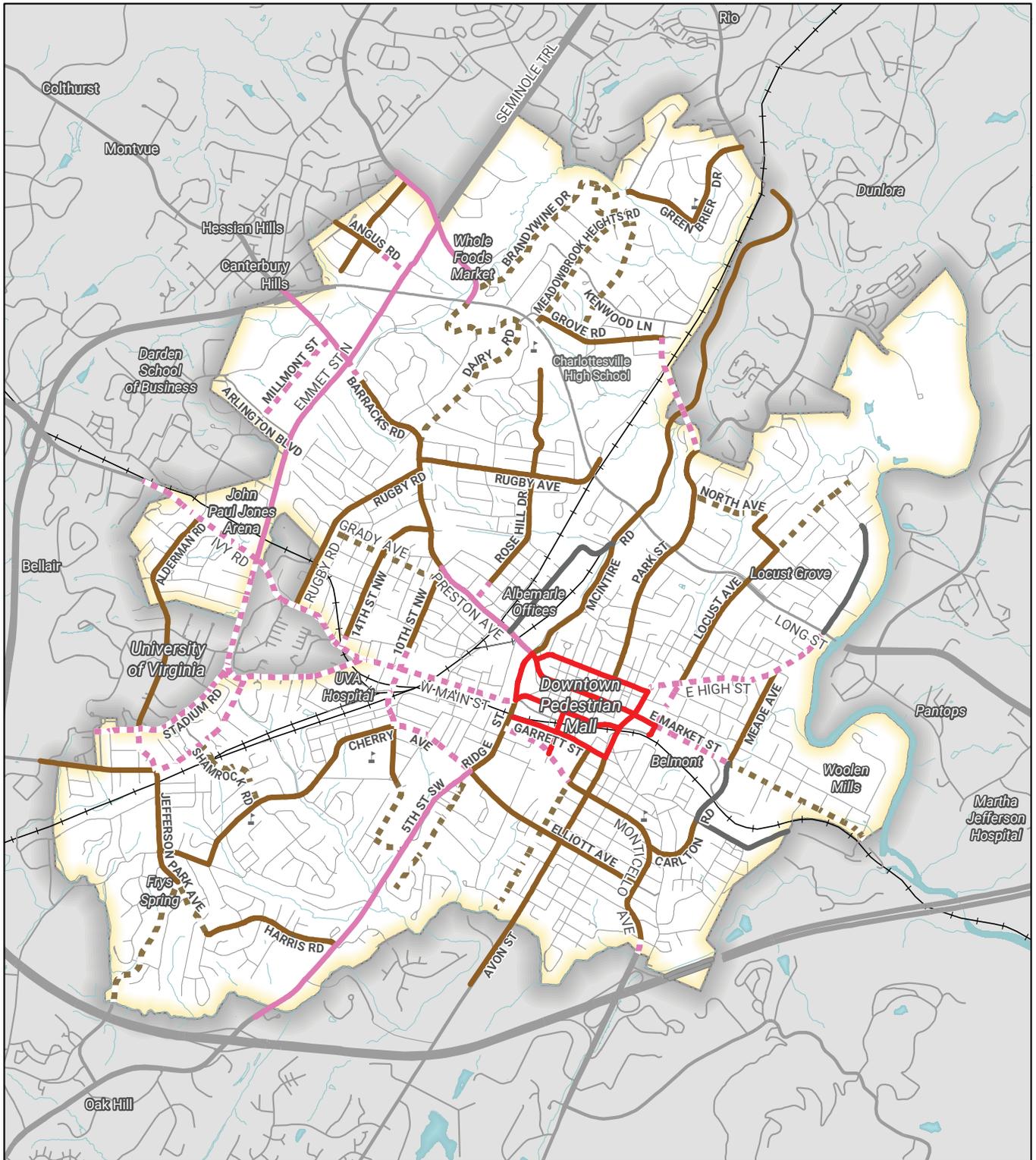
## 3.2 Street Typologies

Sorting streets into categories helps designers make preliminary decisions about the various elements of street design. These Guidelines present new categories, called *street typologies*, which are based on Complete Streets principles, not just motor vehicle level of service.

The first step in developing typologies for Charlottesville's streets was identifying the city's *framework* streets. *Framework* streets are the most direct routes through the

city that connect places, neighborhoods, and districts; they also serve as emergency vehicle routes. These streets form the basic structure of the street network, and their defining characteristics provide the basis for each of the street typologies.

While *framework* streets carry the majority of traffic volumes in the city, the majority of street miles in the city is comprised of (*non-framework*) local streets.



<p><b>Charlottesville, Virginia</b></p>  	<h2>Street Typology</h2> <hr/> <h3>Streets That Work</h3>	<p><b>Street Typology</b></p> <ul style="list-style-type: none"> <li><span style="color: red;">—</span> Downtown</li> <li><span style="color: grey;">—</span> Industrial</li> <li><span style="color: pink;">—</span> Mixed Use A</li> <li><span style="color: pink; border-bottom: 1px dashed pink;">—</span> Mixed Use B</li> <li><span style="color: brown;">—</span> Neighborhood A</li> <li><span style="color: brown; border-bottom: 1px dashed brown;">—</span> Neighborhood B</li> <li><span style="color: grey;">—</span> Local</li> </ul> <div style="text-align: right;">  <p>0 0.25 0.5 Miles</p> <p>Date: 5/20/2016</p> </div>
---	---	--

Figure 7: Charlottesville Street Typology Map

The defining characteristics of each *framework* street include adjacent land uses, design character (setback, height, location of parking, etc), the number of travel lanes, the presence of center turn lanes or medians, sidewalks and bicycle facilities, and on-street parking.

An overview of all seven street types and their existing, defining characteristics is provided in Table 7. Appendix C contains a comprehensive list of street segments for each typology, graphics of each street typology, tables showing recommended design parameters.

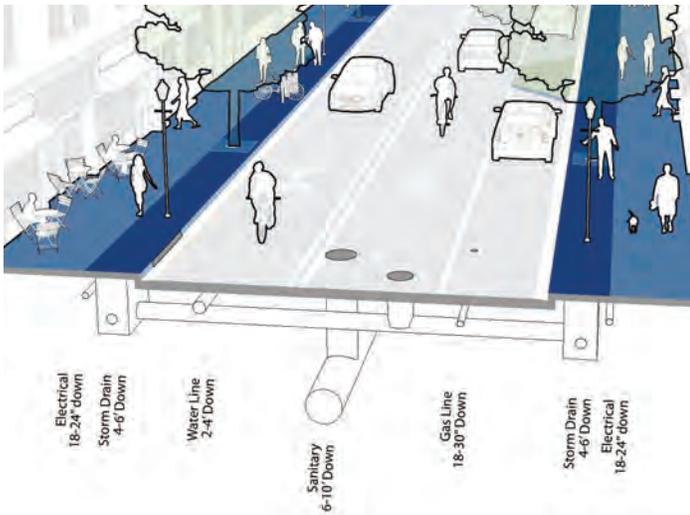
	Framework Streets						Local
	Mixed Use A	Mixed Use B	Downtown	Industrial	Neighborhood A	Neighborhood B	
<b>Miles</b>	4.4	12.7	3.4	2.4	14.7	11.5	119.5
<b>Percentage of Total Miles in City</b>	<3%	8%	2%	<2%	9%	7%	71%
<b>Number of Travel Lanes</b>	4 or more	2	2	2	2	2	2
<b>Sidewalks</b>	Both sides	Both sides	Both sides	Both sides	One or both sides	None or one side	Varies
<b>Median</b>	Yes	No	No	No	No	No	No
<b>Center Turn Lanes</b>	Yes	Sometimes	Sometimes	No	No	No	No
<b>Dedicated Bicycle Facilities</b>	Yes	Yes	Sometimes	No	Yes	No	No
<b>On-street Parking</b>	No	Sometimes	Yes	Sometimes	Sometimes	Sometimes	Sometimes
<b>Land Uses</b>	Commercial, Mixed Use	Mixed Use	Commercial, Mixed Use	Commercial, Industrial	Residential	Residential	Residential, Commercial, Mixed Use

Table 7: Charlottesville Street Typology Characteristics

## 3.3 Cross-Sections

The following section presents the proposed streetscape elements and dimensions for each street typology through text, graphics and tables. For each typology, there is a brief narrative that describes existing conditions and a list of representative streets in the City.

A generic *Existing* cross section is included to show the typical conditions along these streets within a right-of-way comparable to those found in Charlottesville.



Typical location of underground utilities.

Following the *Existing* cross section, two future scenarios are presented:

1. The *Retrofit* cross section shows one example of how the recommended street elements can be applied to the existing right-of-way. With most of the city built out, most street projects will be retrofit projects dealing with a constrained right-of-way.
2. The *Unconstrained* cross section reflects the amount of right-of-way required to include all of the desired street elements for a particular typology. These cross sections are provided to inform the vision for Charlottesville's streets although opportunities for implementation are quite rare.

Tables listing all of the desired street elements and parameters for their use is included at the end of each typology section.

**Note:** Many of the cross sections show trees located in the buffer zone between the sidewalk and roadway, and do not take into account conflicts with underground or overhead utilities. Consult the Utility section of Chapter 4 for required spacing around utility lines. Where plantings or furniture in the buffer zone is unattainable, a tradeoff should be made for another street element.

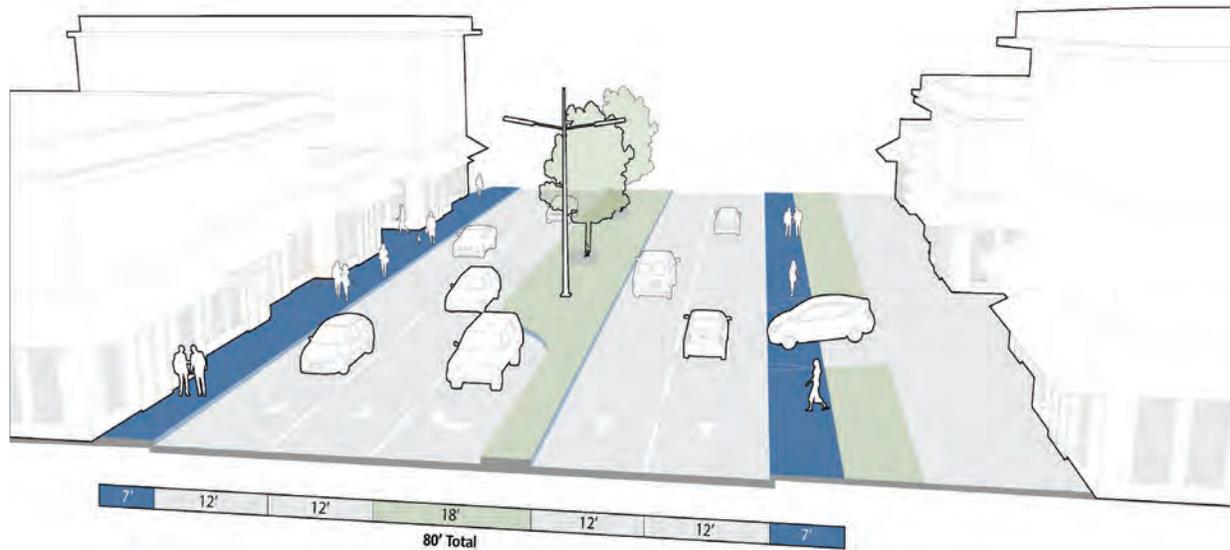


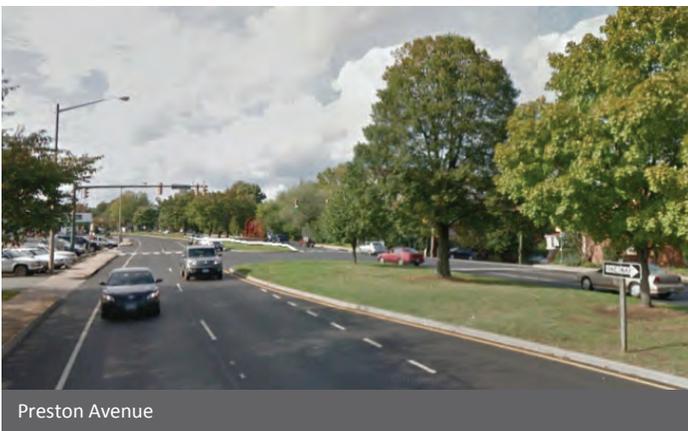
Roosevelt Brown Boulevard

## Mixed Use A

Existing Mixed Use A street segments in Charlottesville include segments of Emmet Street, 5<sup>th</sup> Street, Preston Avenue and Hydraulic Road. These segments are characterized by two vehicular travel lanes in either direction, a center median/turn lane, sidewalks without buffers and standard bicycle lanes. Currently, buildings along these streets are deeply set back from the edge of the road, often with parking between the curb and the structure.

### ► Existing





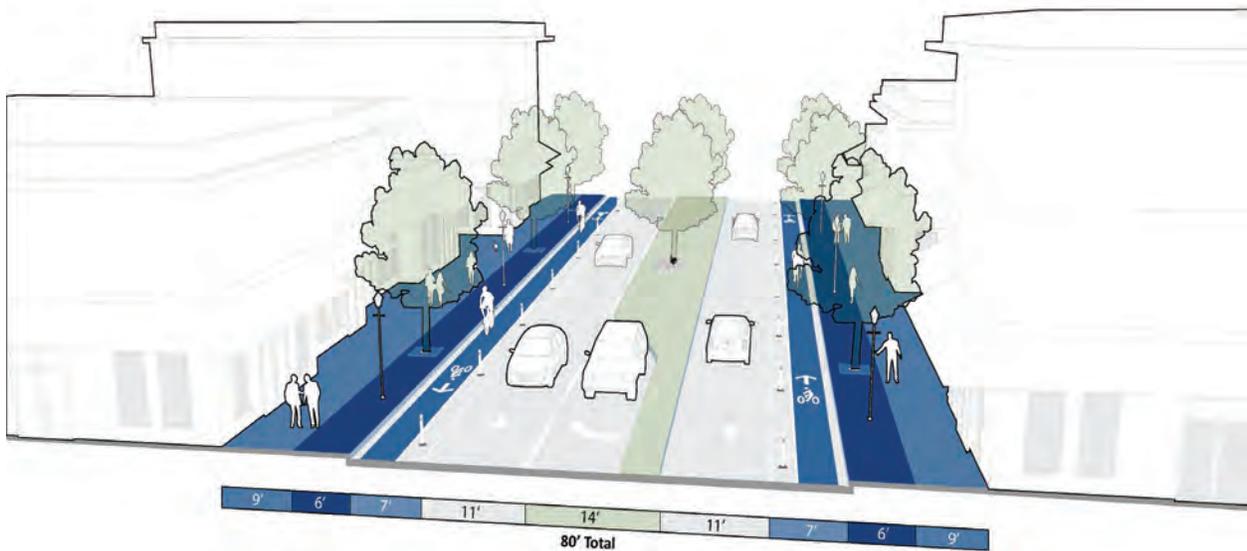
Street Segment	Posted Speed Limit (mph)	AADT	Heavy Vehicle Mix
Emmet St N Massie Rd to Hydraulic Rd	40	29,000	1%
Hydraulic Road Emmet St N to 250 Bypass	40	27,000	2%
Ridge-McIntire Road W Main St to Preston Ave	25	22,000	1%
Preston Avenue 10th St NW to Ridge-McIntire Rd	35	20,000	1%
5th St SW Cherry Ave to City Limits	45	17,000	2%
Ranges	25-45	17,000-29,000	1-2%

## ► Future

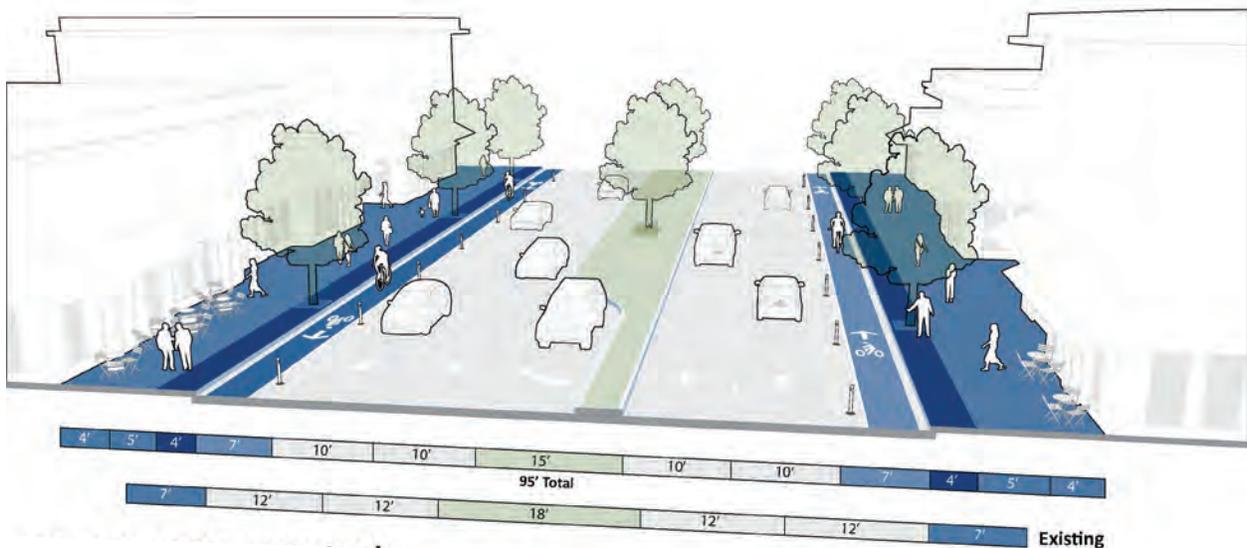
There are two potential Mixed Use A cross sections shown below. The first “Retrofit” cross section applies these Guidelines to the existing right-of-way. To do this, certain trade-offs are required. The retrofit cross section shows a single travel lane in each direction, buffered bike lanes, wider sidewalks with curbside buffer zones for trees and pedestrian scale lighting.

The second “Unconstrained” cross section shows two vehicular travel lanes in either direction, a center median/left turn lane and separated bike lanes. This scenario also has separated bike lanes, wider sidewalks with curbside buffer zones for trees and pedestrian scale lighting.

## ► Retrofit



## ► Unconstrained



## Table of Street Elements

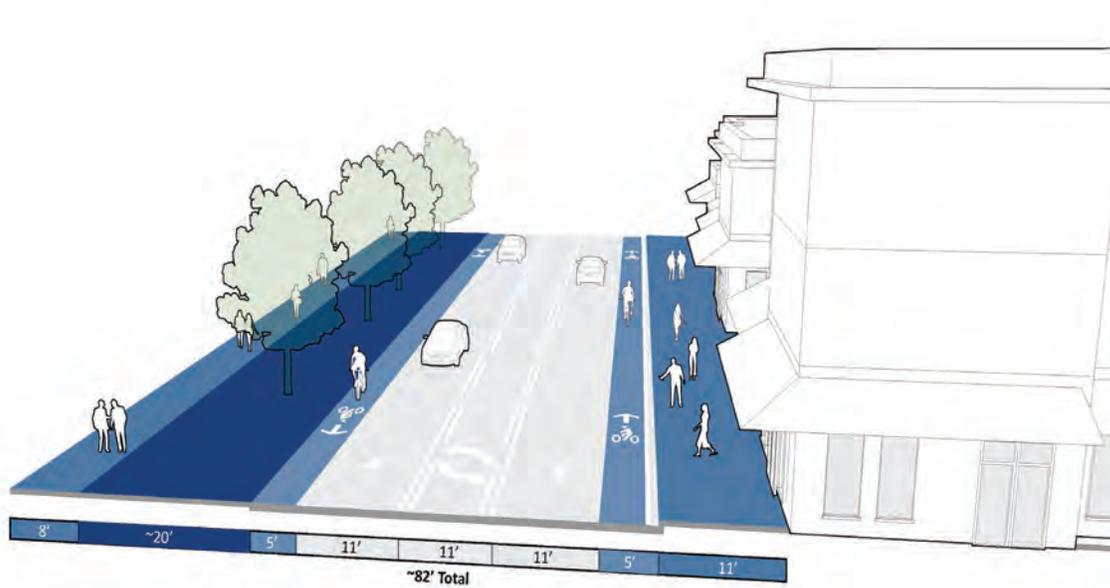
MIXED USE A STREET Major Design Elements	Recommended	Parameters
Right-of-way	n/a	60' - 100'
Sidewalks	Yes	> 7' clear walk zone
Curbside Buffer Zone (Highest Priority Street Element)	Yes	3' - 6' Width requirements: small trees = 4'; medium trees = 4' (6' preferred); large trees = 4' (6' preferred); smaller widths can be achieved if soil volume minimum met.
Street Trees	Yes	Locate in curbside buffer or in on-street parking zone Soil volume minimums: small trees = 250 ft <sup>3</sup> ; medium trees = 400 ft <sup>3</sup> ; large trees = 400 ft <sup>3</sup> (700 ft <sup>3</sup> preferred)
On-Street Parking*	Limited or None	8'
Diagonal On-Street Parking	No	Back-in parking only, 60°, 17' min. stall depth
Off-Street Parking Access	Limited	Driveways, service and loading preferred from alleys and side streets
Travel Lane Widths*	n/a	10-11', if transit 11' outer lane
Turn Lanes	Yes	10'
Design Speed	Slow	< 30 mph
Bicycle Facilities (High Priority Street Element)	Yes	5'-7' bike lanes, 7' separated bike lanes, turn boxes, 10' shared use paths Bicycle parking in Curbside Buffer Zone or on-street
Transit Stop Facilities	Yes	Shelters, benches, paved curbside waiting areas, litter receptacle
Traffic Calming	Yes	Roundabouts, medians
*Combined travel lane and on-street parking width 18' minimum (7' on-street parking, 11' travel lane OR 8' on-street parking, 10' travel lane)		
**Trees: small (10' – 30' mature height) ; medium (30' – 50' mature height); large (50' mature height)		
	Highest Priority Street Elements	High Priority Street Elements

MIXED USE A STREET Major Design Elements	Recommended	Parameters
Curbs	Yes	Vertical curb, or combination curb and gutter
Gutters	Yes	Combination curb and gutter
Pedestrian Lighting	Yes	16' Height Maximum; See Lighting Standards
Street Lighting	Yes	
Median	Yes	Recommended to facilitate safe pedestrian crossings on streets with 3 lanes of traffic (can alternate with center turn lane); traffic calming, and stormwater management
Curb Radii	n/a	20' - 30'
Build-To Line/Street Wall Set Back from Public ROW	n/a	5'-10'+; varies by zoning district
Green and Blue Stormwater Opportunities	Yes	See Stormwater Elements section in Chapter 4.
Sidewalk Pavement Material	n/a	Concrete, permeable pavement, permeable pavers
Parking Lane Material	n/a	Asphalt, permeable pavement, unit pavers
Roadway Material	n/a	Asphalt
Gutter Material	n/a	Asphalt, concrete
Curb Material	n/a	Concrete
Curbside Buffer Zone Material	n/a	Unit pavers, permeable pavement, lawn, groundcover, vegetated tree boxes
Utilities	n/a	Separation Requirements for Street Trees/Above Ground Infrastructure: 10' preferred, 5' minimum. Anything under 10', consult with Utilities Engineer to reach solution.
*Combined travel lane and on-street parking width 18' minimum (7' on-street parking, 11' travel lane OR 8' on-street parking, 10' travel lane)		
	Highest Priority Street Elements	High Priority Street Elements

## Mixed Use B

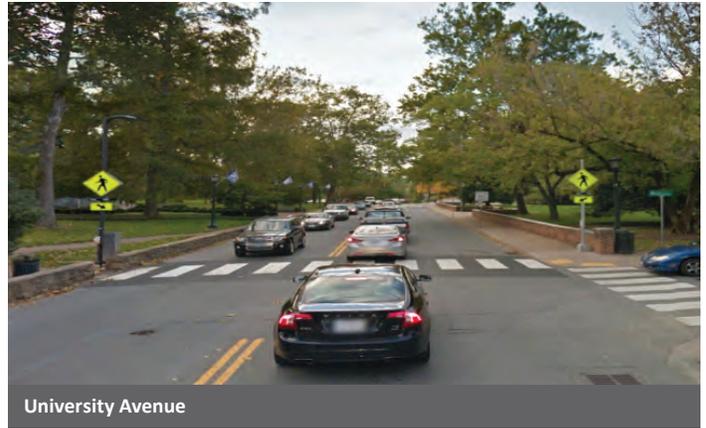
University Avenue and segments of Jefferson Park Avenue are two examples of existing Mixed Use B streets. They are characterized by one vehicular travel lane in each direction, intermittent center turn lanes, sidewalks and bicycle facilities. These streets also may have on-street parking. The adjacent land uses may be commercial, higher density residential or institutional. These streets should support high levels of walking, bicycling, and transit as they connect important destinations within the City and surrounding county. Future development that occurs along these streets will likely include a dense mix of uses.

### ► Existing





Emmet Street



University Avenue



Jefferson Park Avenue



Roosevelt Brown Boulevard

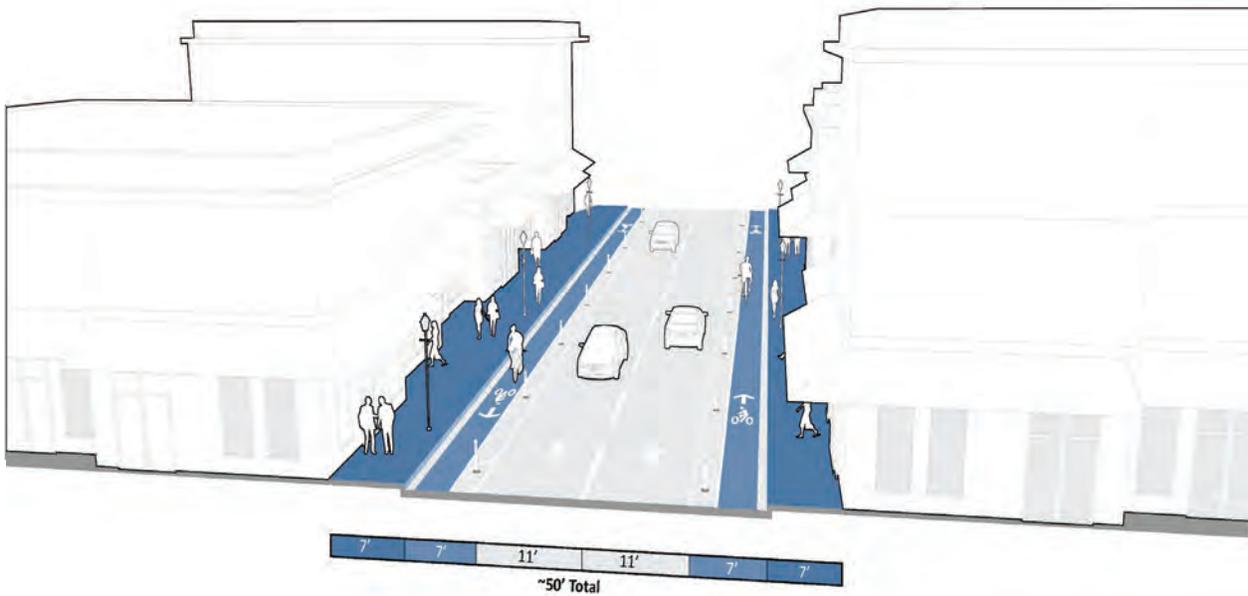
Street Segment	Posted Speed Limit (mph)	AADT	Heavy Vehicle Mix
Emmet St Jefferson Park Ave to Ivy Rd	25	14,000	3%
University Ave Emmet St N to Jefferson Park Ave	25	12,000	2%
Jefferson Park Ave Maury Ave to University Ave	25/35	12,000	5%
Roosevelt Brown Blvd Cherry Ave to W Main St	25	12,000	1%
Ranges	25-35	12,000-22,000	1%-5%

## ▶ Future

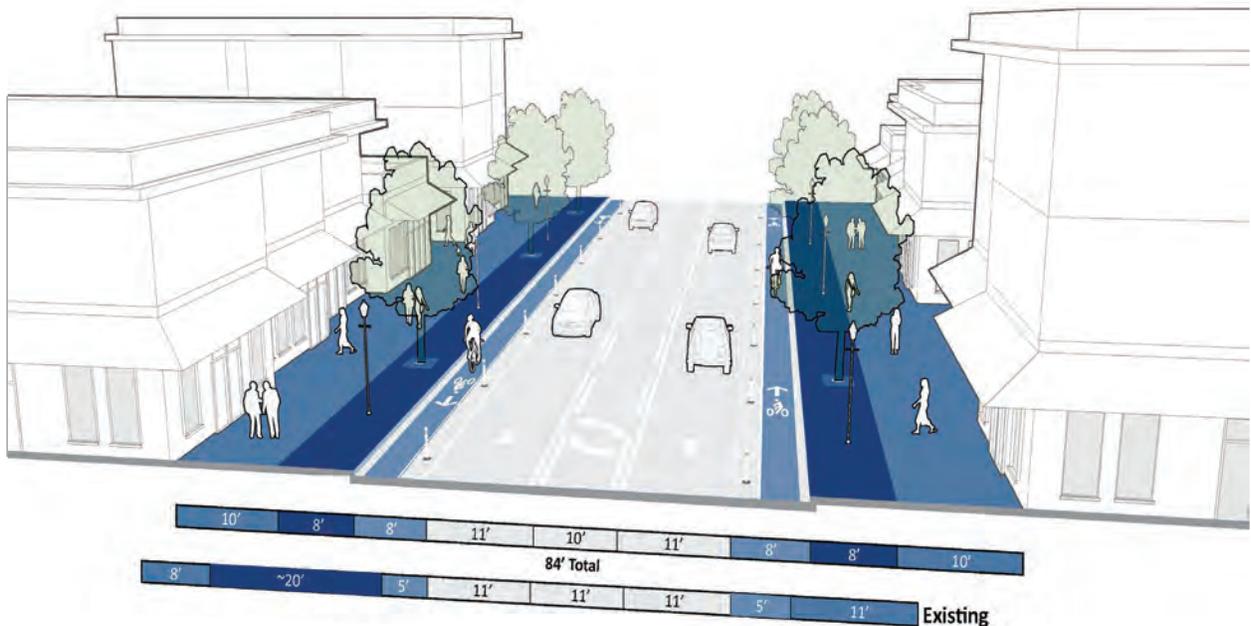
There are two potential Mixed Use B cross sections shown below. The first “Retrofit” cross section applies these Guidelines to the existing right-of-way. To do this, certain trade-offs are required. The retrofit cross section removes the center turn lane and shows buffered bike lanes in both directions. There are also wider sidewalks with pedestrian scale lighting on both sides of the street.

The second “Unconstrained ROW” cross section maintains the center turn lane configuration with the addition of bike lanes and on-street parking. Wide, 10’ sidewalks with 5’ curbside buffer zones with trees and pedestrian scale lighting are shown on both sides of the street.

## ▶ Retrofit



## ▶ Unconstrained



## Table of Street Elements

MIXED USE B STREET Major Design Elements	Recommended	Parameters
Right-of-way	n/a	50-80'
Sidewalks	Yes	> 7' clear walk zone
Curbside Buffer Zone (Highest Priority Street Element)	Yes	3' - 6' Width requirements: small trees = 4'; medium trees = 4' (6' preferred); large trees = 4' (6' preferred); smaller widths can be achieved if soil volume minimum met.
Street Trees	Yes	Locate in curbside buffer or in on-street parking zone Soil volume minimums: small trees = 250 ft <sup>3</sup> ; medium trees = 400 ft <sup>3</sup> ; large trees = 400 ft <sup>3</sup> (700 ft <sup>3</sup> preferred)
On-Street Parking*	Yes	7'-8'*
Diagonal On-Street Parking	No	Back-in parking only, 60°, 17' min. stall depth
Off-Street Parking Access	Limited	Driveways, service and loading preferred from alleys and side streets
Travel Lane Widths*	n/a	10-11', if transit 11' outer lane
Turn Lanes	Yes	10'
Design Speed	Slow	< 30 mph
Bicycle Facilities (High Priority Street Element)	Yes	5'-6' bike lanes, 7' separated bike lanes, turn boxes, 10' shared use paths Bicycle parking in Curbside Buffer Zone or on-street
Transit Stop Facilities	Yes	Shelters, benches, paved curbside waiting areas, litter receptacle
Traffic Calming	Yes	Roundabouts, corner curb extensions
*Combined travel lane and on-street parking width 18' minimum (7' on-street parking, 11' travel lane OR 8' on-street parking, 10' travel lane)		
**Trees: small (10' – 30' mature height) ; medium (30' – 50' mature height); large (50' mature height)		
	Highest Priority Street Elements	High Priority Street Elements

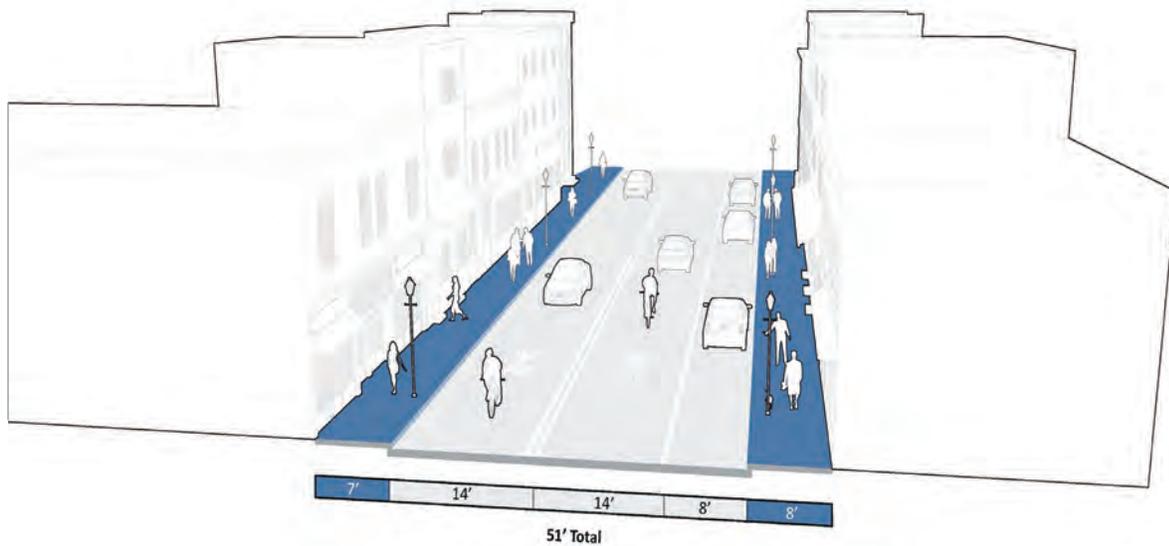
MIXED USE B STREET Major Design Elements	Recommended	Parameters
Curbs	Yes	Vertical curb, or combination curb and gutter
Gutters	Limited	Combination curb and gutter
Pedestrian Lighting	Yes	16' Height Maximum; See Lighting Standards
Street Lighting	Yes	
Median	Yes	Recommended to facilitate safe pedestrian crossings on streets with 3 lanes of traffic (can alternate with center turn lane); traffic calming, and stormwater management
Curb Radi	n/a	20' - 30'
Build-To Line/Street Wall Set Back from Public ROW	n/a	5' - 10'+; varies by zoning district
Green and Blue Stormwater Opportunities	Yes	See <i>Stormwater Elements</i> section in Chapter 4.
Sidewalk Pavement Material	n/a	Concrete, permeable pavement
Parking Lane Material	n/a	Asphalt, permeable pavement, unit pavers
Roadway Pavement Material	n/a	Asphalt
Gutter Material	n/a	Asphalt, concrete
Curb Material	n/a	Concrete
Curbside Buffer Zone Material	n/a	Unit pavers, permeable pavement, lawn, groundcover, vegetated tree boxes
Utilities	n/a	Separation Requirements for Street Trees/Above Ground Infrastructure: 10' preferred, 5' minimum. Anything under 10', consult with Utilities Engineer to reach solution.
*Combined travel lane and on-street parking width 18' minimum (7' on-street parking, 11' travel lane OR 8' on-street parking, 10' travel lane)		
	Highest Priority Street Elements	High Priority Street Elements

## Downtown

As the name implies, Downtown streets are the streets in the core of the city, surrounding the pedestrian mall. They generally have a single vehicular travel lane in both directions, intermittent center turn lanes, sidewalks and on-street parking. Street trees are planted in tree grates in more urban areas and in tree lawns where space allows. Downtown streets do not have dedicated bicycle facilities since traffic is generally moving more slowly and bicyclists can more easily share the travel lane with drivers, although climbing lanes are recommended on hilly streets. Buildings along Downtown streets generally have narrow setbacks, are both historic and modern in character with generally narrow setbacks. The buildings house government services, offices, retail, restaurants and residential units.

### ► Existing

---





9<sup>th</sup> Street NE



Market Street



E High Street



Water Street

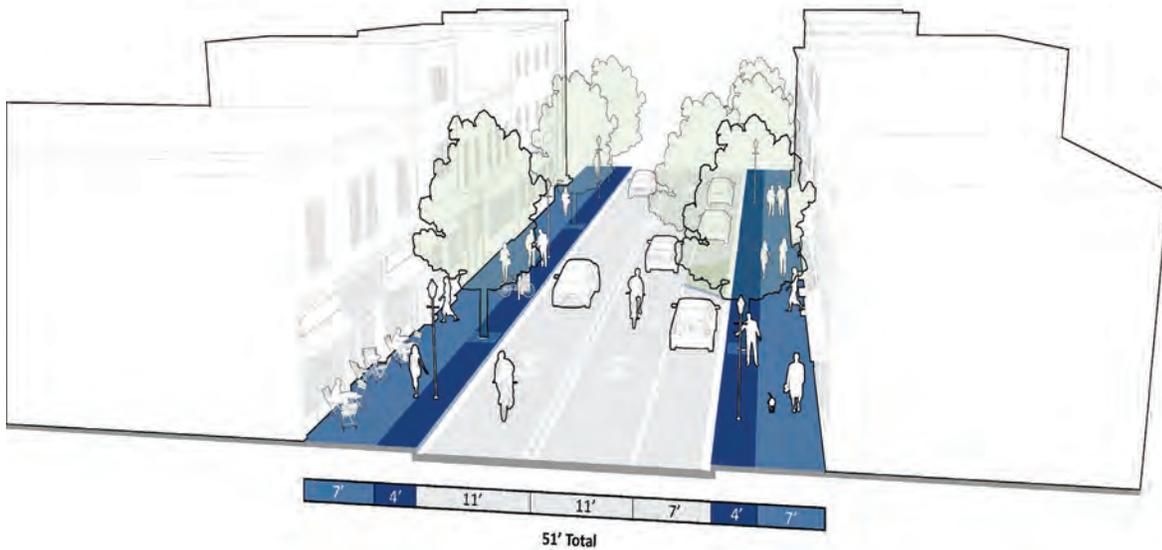
Street Segment	Posted Speed Limit (mph)	AADT	Heavy Vehicle Mix
9th St NE Market St to E High St	25	13,000	1%
Market St Ridge-McIntire Rd to 9th St NE	25	9,000	1%
E High St Preston Ave to 9th St NE	25	6,300	1%
Water St W Main St to 10th St SE	25	5,600	3%
<b>Ranges</b>	<b>25</b>	<b>5,600-13,000</b>	<b>1-3%</b>

## ▶ Future

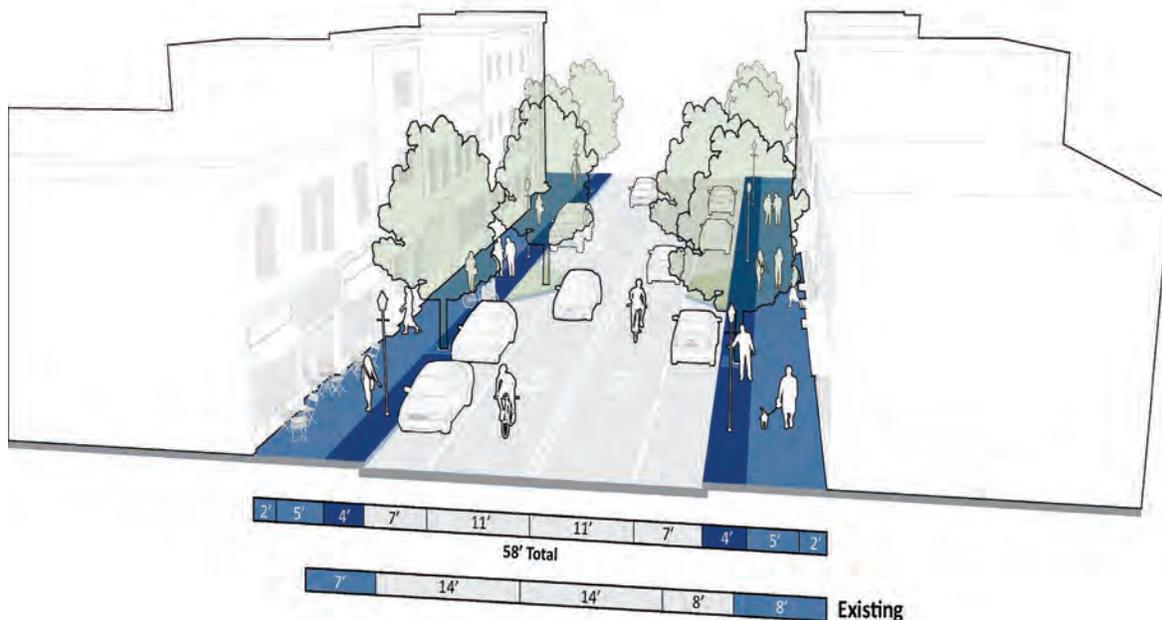
There are two potential Downtown street cross sections shown below. The first “retrofit” cross section applies these Guidelines to the existing right-of-way. To do this, certain trade-offs are required. The retrofit cross section keeps on-street parking on one side of the street and shared lane markings for bicycles, but narrows the travel lanes in favor of trees, pedestrian scale lighting and bicycle parking in the curbside buffers along the sidewalks on both sides.

The second “unconstrained” cross section is similar to the retrofit cross section but shows on-street parking on both sides of the street.

## ▶ Retrofit



## ▶ Unconstrained



## Table of Street Elements

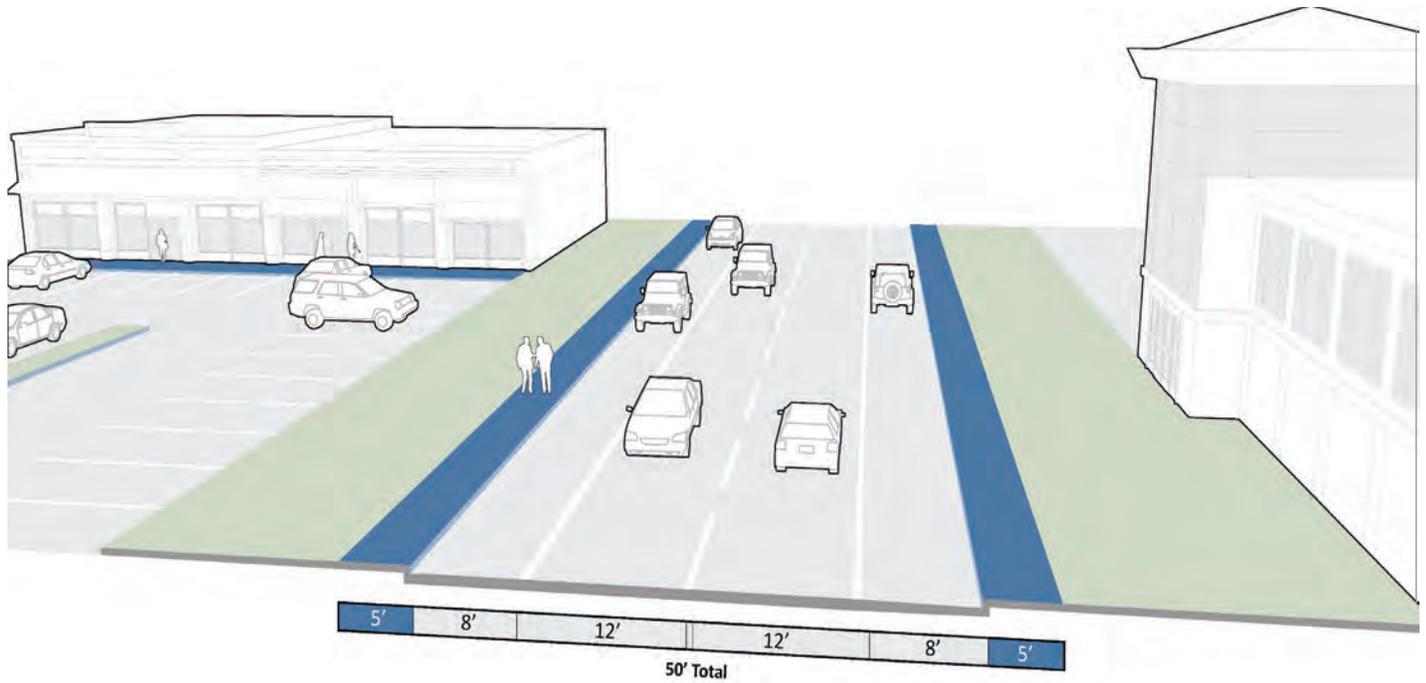
DOWNTOWN STREET Major Design Elements	Recommended	Parameters
Right-of-way	n/a	50' - 75'
Sidewalks	Yes	> 6' clear walk zone
Curbside Buffer Zone (Highest Priority Street Element)	Yes	3' - 6' Width requirements: small trees = 4'; medium trees = 4' (6' preferred); large trees = 4' (6' preferred); smaller widths can be achieved if soil volume minimum met.
Street Trees**	Yes	Locate in curbside buffer or in on-street parking zone Soil volume minimums: small trees = 250 ft <sup>3</sup> ; medium trees = 400 ft <sup>3</sup> ; large trees = 400 ft <sup>3</sup> (700 ft <sup>3</sup> preferred)
On-Street Parking* (High Priority Street Element)	Yes	7'-8' Loading zones need to be considered
Diagonal On-Street Parking	Limited	Back-in parking only, 60°, 17' min. stall depth
Off-Street Parking Access	Limited	Driveway, service and loading preferred from alleys and side streets
Travel Lane Widths*	n/a	10-11', if transit 11' outer lane
Turn Lanes	Limited	Only at major intersections and major destination access points
Design Speed	Slow	25 mph
Bicycle Facilities	Yes	Shared lane markings, climbing lanes, turn boxes, bike boxes
Transit Stop Facilities	Yes	Shelters, benches, paved waiting areas, litter receptacles, lighting
Traffic Calming	Yes	Corner extensions
*Combined travel lane and on-street parking width 18' minimum (7' on-street parking, 11' travel lane OR 8' on-street parking, 10' travel lane)		
**Trees: small (10' – 30' mature height) ; medium (30' – 50' mature height); large (50' mature height)		
	Highest Priority Street Elements	High Priority Street Elements

<b>DOWNTOWN STREET Major Design Elements</b>	<b>Recommended</b>	<b>Parameters</b>
<b>Curbs</b>	Yes	Vertical curb, or combination curb and gutter
<b>Gutters</b>	Limited	Combination curb and gutter
<b>Pedestrian Lighting</b>	Yes	16' height maximum, See Lighting Standards
<b>Street Lighting</b>	Yes	
<b>Median</b>	No	Recommended to facilitate safe pedestrian crossings on streets with 3 lanes of traffic; traffic calming, and stormwater management
<b>Curb Radii</b>	n/a	15' - 25' (See Street Elements chapter for information on effective radii)
<b>Build-To Line/Street Wall Set Back from Public ROW</b>	n/a	0'-5'; varies by zoning district
<b>Green and Blue Stormwater Opportunities</b>	Yes	See <i>Stormwater Elements</i> section in Chapter 4.
<b>Sidewalk Pavement Material</b>	n/a	Concrete, permeable pavement, unit pavers consistent w/ historic character
<b>Parking Lane Material</b>	n/a	Asphalt, permeable pavement, unit pavers
<b>Roadway Pavement Material</b>	n/a	Asphalt
<b>Gutter Material</b>	n/a	Concrete, and unit pavers
<b>Curb Material</b>	n/a	n/a
<b>Curbside Buffer Zone Material</b>	n/a	Unit pavers, permeable pavement, vegetated tree boxes
<b>Utilities</b>	n/a	Separation Requirements for Street Trees/Above Ground Infrastructure: 10' preferred, 5' minimum. Anything under 10', consult with Utilities Engineer to reach solution.
*Combined travel lane and on-street parking width 18' minimum (7' on-street parking, 11' travel lane OR 8' on-street parking, 10' travel lane)		
	Highest Priority Street Elements	High Priority Street Elements

# Industrial

Three existing industrial street segments in Charlottesville include Carlton Avenue, Market Street and River Road. These streets are characterized by one vehicular travel lane in each direction, sidewalks without buffers and some on-street parking. The streets provide access to commercial and industrial properties and must be able to accommodate larger truck traffic. Many of the buildings along these streets are significantly set back from the road.

## ▶ Existing





Carlton Avenue



Market Street



River Road

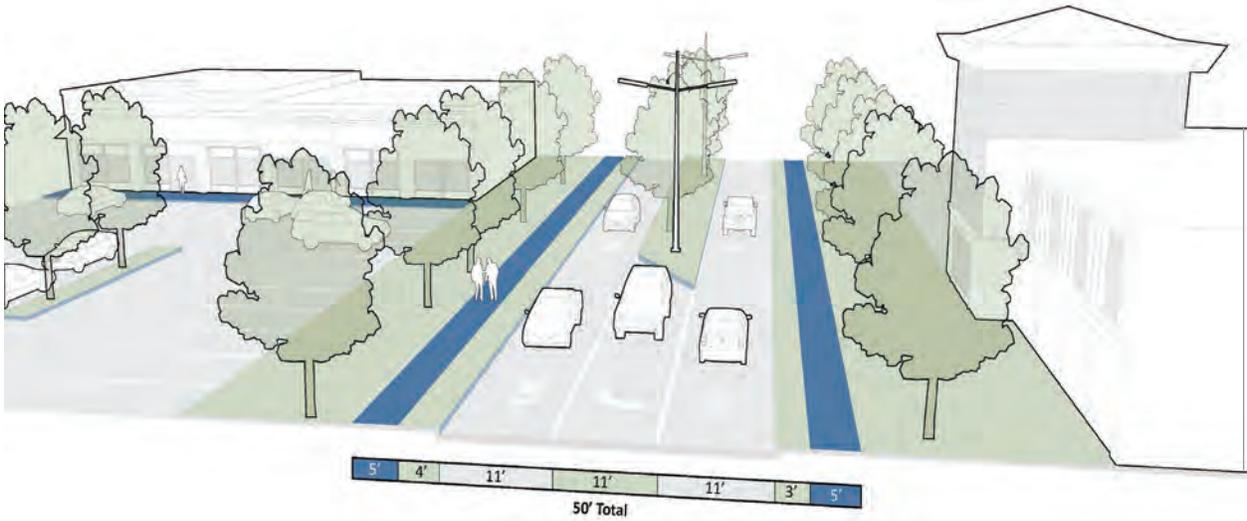
Street Segment	Posted Speed Limit (mph)	AADT	Heavy Vehicle Mix
Carlton Rd Carlton Ave to Meade Ave	25	7,200	4%
Market St 9 <sup>th</sup> St NE to Meade Ave	25	5,100	1%
River Rd Long St to Coleman St Ext	25	No data	No data
Ranges	25-35	5,100-7,200	1%-4%

## ▶ Future

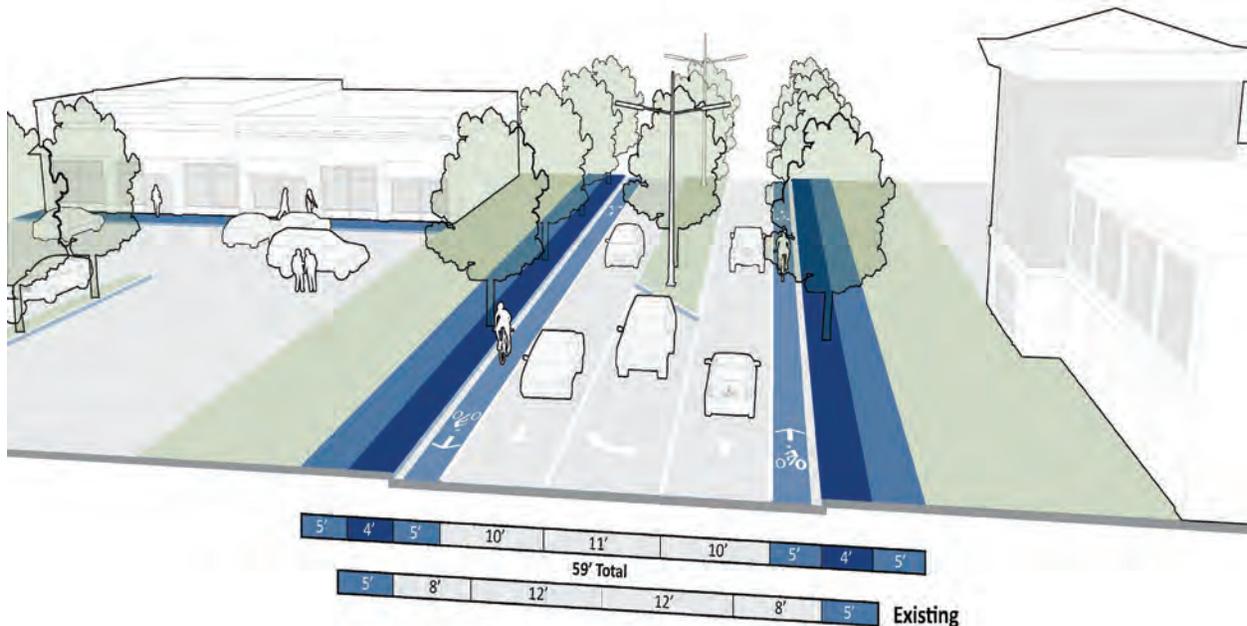
There are two potential Industrial street cross sections shown below. The first “retrofit” cross section applies these Guidelines to the existing right-of-way. To do this, certain trade-offs are required. The retrofit cross section replaces on-street parking with a center turn lane/median configuration to add more green elements to the streetscape. The sidewalks are also shifted back from the curb with a planted buffer between the travel lanes and the pedestrian walk zone.

The second “unconstrained” cross section also shows the center turn lane/median configuration, with the addition of bike lanes and a wider curbside buffer zone between the roadway and sidewalk. This wider buffer can accommodate small street trees.

## ▶ Retrofit



## ▶ Unconstrained



## Table of Street Elements

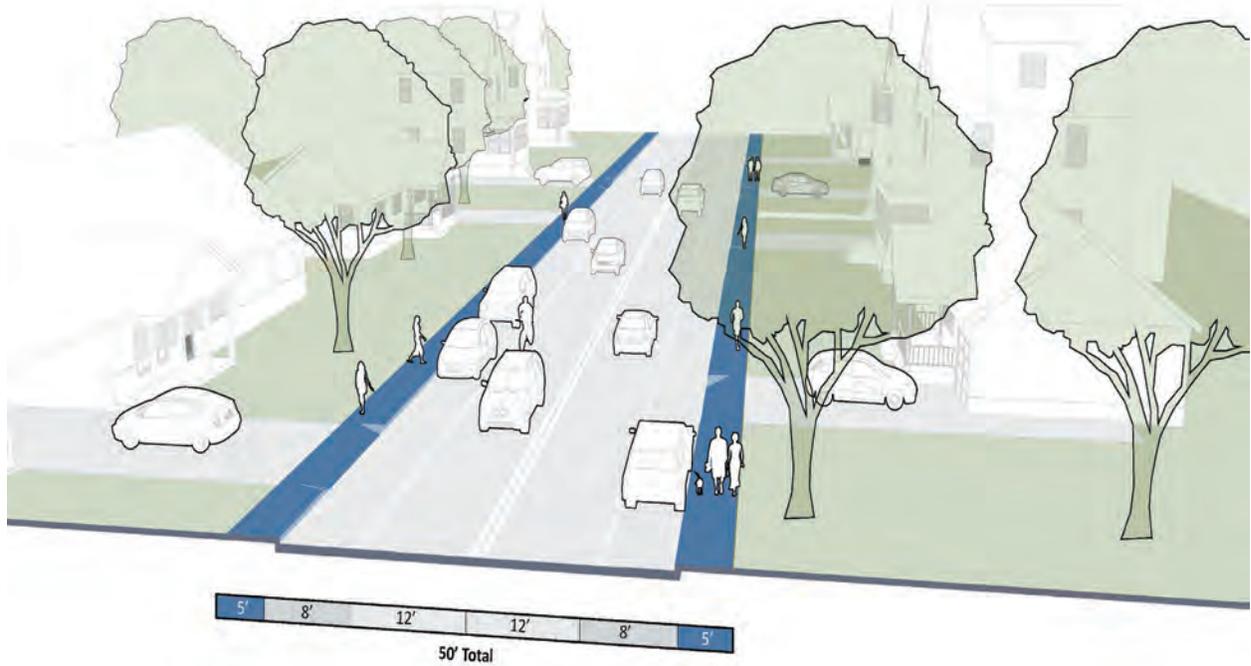
INDUSTRIAL STREET Major Design Elements	Recommended	Parameters
Right-of-way	n/a	40' - 60'
Sidewalks	Yes	5' - 6' clear walk zone
Curbside Buffer Zone (Highest Priority Street Element)	Yes	3' - 6' Width requirements: small trees = 4'; medium trees = 4' (6' preferred); large trees = 4' (6' preferred); smaller widths can be achieved if soil volume minimum met.
Street Trees**	Yes	Locate in curbside buffer or in on-street parking zone Soil volume minimums: small trees = 250 ft <sup>3</sup> ; medium trees = 400 ft <sup>3</sup> ; large trees = 400 ft <sup>3</sup> (700 ft <sup>3</sup> preferred)
On-Street Parking*	Limited	7'-8'
Diagonal On-Street Parking	No	
Off-Street Parking Access	Yes	Sidewalk level and ADA access to be maintained at all driveways
Travel Lane Widths* (High Priority Street Element)	n/a	11-12'
Turn Lanes	Yes	10'-11'
Design Speed	Slow	< 25mph
Bicycle Facilities	Limited	Shared Lane Markings, 5' bike lanes, 6' climbing bike lanes
Transit Stop Facilities	Yes	Benches, paved curbside waiting areas
Traffic Calming	Yes	Curb extensions (mid-block and corner) and only appropriate with on-street parking
Curbs	Where necessary	Vertical curb, or combination curb and gutter
*Combined travel lane and on-street parking width 18' minimum (7' on-street parking, 11' travel lane OR 8' on-street parking, 10' travel lane)		
**Trees: small (10' – 30' mature height); medium (30' – 50' mature height); large (50' mature height)		
	Highest Priority Street Elements	High Priority Street Elements

INDUSTRIAL STREET Major Design Elements	Recommended	Parameters
Gutters	Yes	Combination curb and gutter
Pedestrian Lighting	Yes	16' height maximum; See Lighting Standards
Street Lighting	Yes	
Median	Limited	Recommended to facilitate safe pedestrian crossings on streets with 3 lanes of traffic; traffic calming, and stormwater management
Curb Radi	n/a	20' - 30'
Build-To Line/Street Wall Set Back from Public ROW	n/a	10' - 60'; varies by zoning district
Green and Blue Stormwater Opportunities	Yes	See <i>Stormwater Elements</i> section in Chapter 4.
Sidewalk Pavement Material	n/a	Concrete, permeable pavement
Parking Lane Material	n/a	Asphalt, permeable pavement
Roadway Pavement Material	n/a	Asphalt
Gutter Material	n/a	Asphalt, concrete
Curb Material	n/a	Concrete
Curbside Buffer Zone Material	n/a	Unit pavers, permeable pavement, lawn, groundcover, vegetated tree boxes
Utilities	n/a	Separation Requirements for Street Trees/Above Ground Infrastructure: 10' preferred, 5' minimum. Anything under 10', consult with Utilities Engineer to reach solution.
*Combined travel lane and on-street parking width 18' minimum (7' on-street parking, 11' travel lane OR 8' on-street parking, 10' travel lane)		
	Highest Priority Street Elements	High Priority Street Elements

# Neighborhood A

Neighborhood A streets have one travel lane in each direction, sidewalks on at least one side, dedicated bicycle facilities and some on-street parking. Adjacent land uses are low and medium-density residential. Examples streets include Cherry Avenue from Roosevelt Brown Boulevard to Cleveland Avenue and Rugby Avenue from Barracks Road to McIntire Park.

## ► Existing





Rugby Avenue



Cherry Avenue



Monticello Avenue



Fontaine Avenue

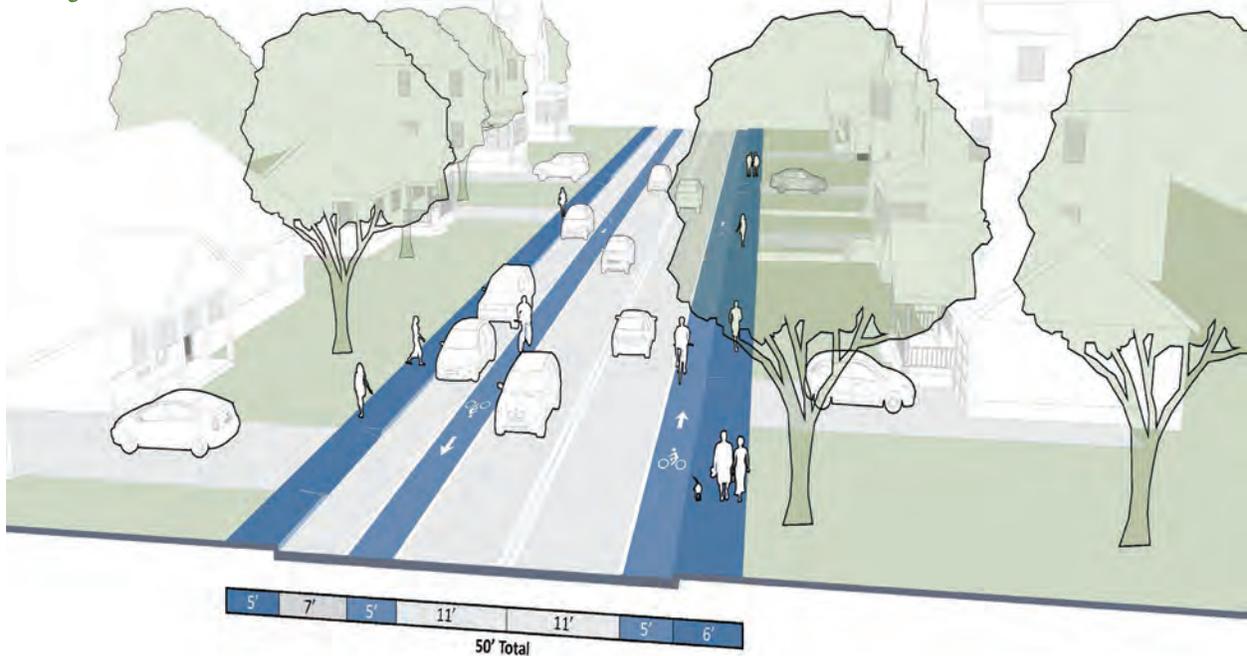
Street Segment	Posted Speed Limit (mph)	AADT	Heavy Vehicle Mix
Barracks Road Emmet St to Rugby Rd	25	15,000	1%
Monticello Avenue 6 <sup>th</sup> St SE to Quarry Rd	25-35	15,000	2%
Fontaine Avenue City limits to Maury Ave	35	11,000	2%
Rugby Avenue Barracks Rd to 250 Bypass	25	5,800	1%
Cherry Ave Cleveland Ave to Roosevelt Brown Blvd	35	5,600	1%
Ranges	25-35 mph	5,600-15,000	1-2%

## ▶ Future

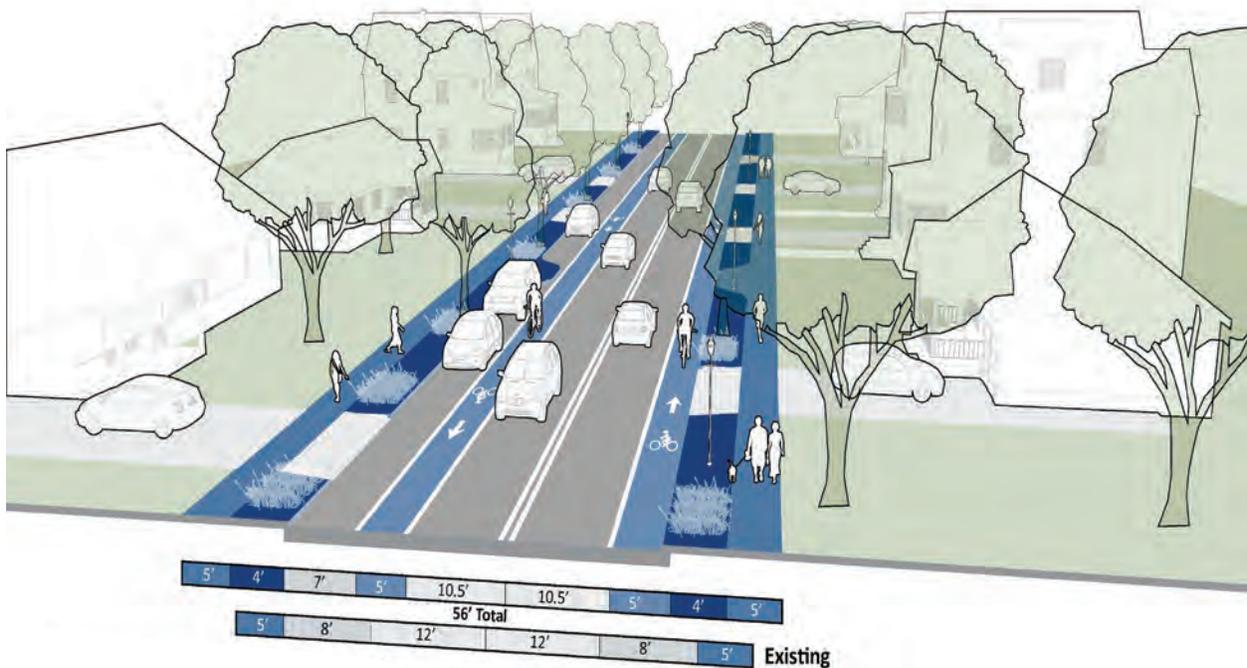
The proposed “Retrofit” Neighborhood A street maintains a single travel lane in each direction and consolidates on-street parking to one side of the street to provide space for dedicated bike lanes.

In the “Unconstrained” scenario, the roadway configuration is the same as the “Retrofit” scenario, and a wide buffer zone separates the sidewalk clear zone from the roadway. This area can accommodate plantings and medium trees, as well as pedestrian scale lighting and street furniture.

## ▶ Retrofit



## ▶ Unconstrained



## Table of Street Elements

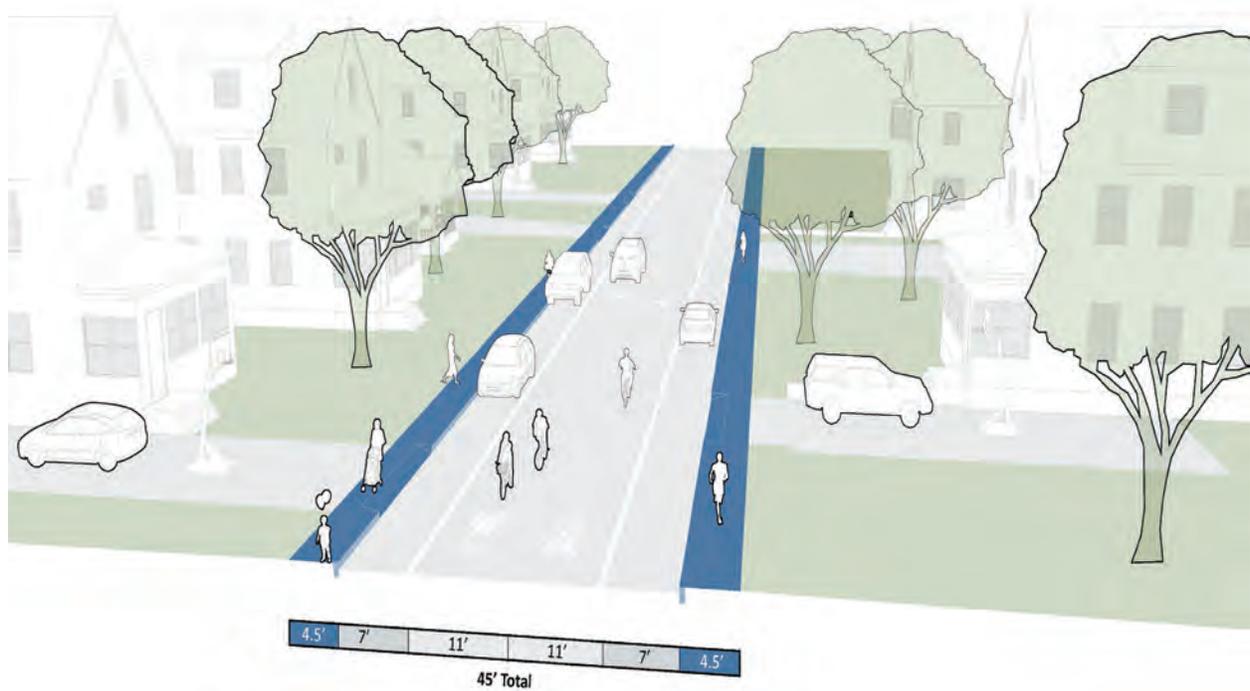
NEIGHBORHOOD A STREET Major Design Elements	Recommended	Parameters
Right-of-way	n/a	25' - 50'
Sidewalks (Highest Priority Street Element)	Yes	5'-6' clear walk zone
Curbside Buffer Zone	Yes	3' - 6' Width requirements: small trees = 4'; medium trees = 4' (6' preferred); large trees = 4' (6' preferred); smaller widths can be achieved if soil volume minimum met.
Street Trees**	Yes	Locate in curbside buffer or in on-street parking zone Soil volume minimums: small trees = 250 ft <sup>3</sup> ; medium trees = 400 ft <sup>3</sup> ; large trees = 400 ft <sup>3</sup> (700 ft <sup>3</sup> preferred)
On-Street Parking* (High Priority Street Element in areas without off-street parking)	Yes	7' - 8'*
Diagonal On-Street Parking	No	
Off-Street Parking Access	Yes	Sidewalk level and ADA access to be maintained at all driveways
Travel Lane Widths*	n/a	10-11', if transit 11' outer lane
Turn Lanes	No	
Design Speed	Slow	< 25mph
Bicycle Facilities (Highest Priority Street Element)	Yes	Bicycles May Use Full Lane signage, Shared Lane Markings, 5' Bike Lanes, 6' Climbing Bike Lanes
Transit Stop Facilities	Yes	Benches, paved curbside waiting areas
*Combined travel lane and on-street parking width 18' minimum (7' on-street parking, 11' travel lane OR 8' on-street parking, 10' travel lane)		
**Trees: small (10' – 30' mature height); medium (30' – 50' mature height); large (50' mature height)		
	Highest Priority Street Elements	High Priority Street Elements

NEIGHBORHOOD A STREET Major Design Elements	Recommended	Parameters
Traffic Calming	Yes	Curb extensions (mid-block and corner), speed tables, raised intersections, raised crossings, and mini traffic circles
Curbs	Limited	Vertical curb, or combination curb and gutter
Gutters	Yes	Valley gutter or combination curb and gutter
Pedestrian Lighting	Yes	16' Height Maximum; see Lighting Standards
Street Lighting	No	
Median	No	
Curb Radi	n/a	15' - 25'
Build-To Line/Street Wall Set Back from Public ROW	n/a	10' - 25'; varies by zoning district
Green and Blue Stormwater Opportunities	Yes	See <i>Stormwater Elements</i> section in Chapter 4.
Sidewalk Pavement Material	n/a	Concrete, permeable pavement, unit pavers
Parking Lane Material	n/a	Asphalt, permeable pavement, unit pavers
Roadway Pavement Material	n/a	Asphalt
Gutter Material	n/a	Asphalt, concrete, and unit pavers
Curb Material	n/a	Concrete
Curbside Buffer Zone Material	n/a	Lawn, groundcover, vegetated tree boxes
Utilities	n/a	Separation Requirements for Street Trees/Above Ground Infrastructure: 10' preferred, 5' minimum. Anything under 10', consult with Utilities Engineer to reach solution.
*Combined travel lane and on-street parking width 18' minimum (7' on-street parking, 11' travel lane OR 8' on-street parking, 10' travel lane)		
	Highest Priority Street Elements	High Priority Street Elements

# Neighborhood B

Existing Neighborhood B streets are different from Neighborhood A streets because they do not have dedicated bicycle facilities and they may not have sidewalks. Adjacent land uses are generally similar, although more Neighborhood B streets are found in the neighborhoods with the lower residential densities. Grady Avenue is an example of a Neighborhood B street.

## ► Existing .....





Park Street



Grady Avenue



Shamrock Road



Meadowbrook Heights Road

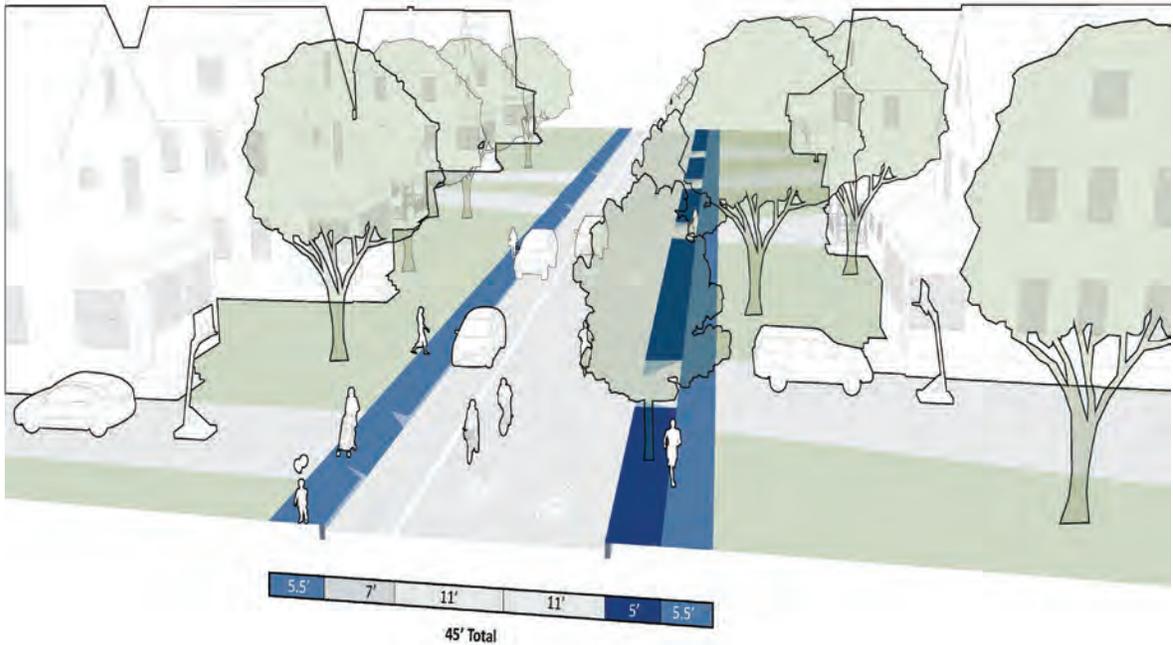
Street Segment	Posted Speed Limit (mph)	AADT	Heavy Vehicle Mix
Park St E High St to 250 Bypass	25	11,000	1%
Grady Ave Rugby Rd to Preston Ave	25	4,600	1%
Shamrock Road Cherry Ave to Jefferson Park Avenue	25	3,400	0%
Meadowbrook Heights Road Grove Rd to Yorktown Dr	25	1,200	1%
<b>Ranges</b>	<b>25</b>	<b>1,200-11,000</b>	<b>1%</b>

## ▶ Future

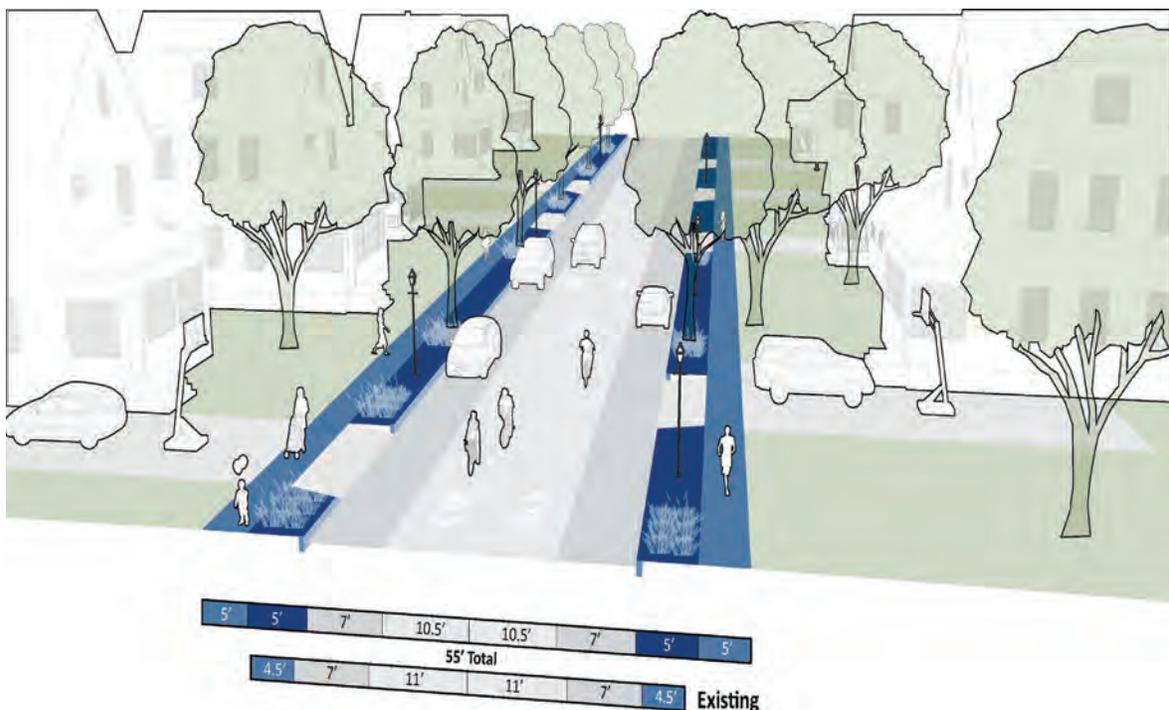
In the “retrofit” scenario, on-street parking has been consolidated on one side of the street, and a buffer zone has been provided between the roadway and sidewalk clear zone on the opposite side. This configuration provides a buffer between pedestrians and moving traffic on both sides of the street.

The “unconstrained” cross section shows on-street parking and sidewalk buffer zones on both sides of the street.

## ▶ Retrofit



## ▶ Unconstrained



## Table of Street Elements

NEIGHBORHOOD B STREET Major Design Elements	Recommended	Parameters
Right-of-way	n/a	25' - 50'
Sidewalks (Highest Priority Street Element)	Yes	5' – 6' clear walk zone
Curbside Buffer Zone	Yes	3' - 6' Width requirements: small trees = 4'; medium trees = 4' (6' preferred); large trees = 4' (6' preferred); smaller widths can be achieved if soil volume minimum met.
Street Trees	Yes	Locate in curbside buffer or in on-street parking zone Soil volume minimums: small trees = 250 ft <sup>3</sup> ; medium trees = 400 ft <sup>3</sup> ; large trees = 400 ft <sup>3</sup> (700 ft <sup>3</sup> preferred)
On-Street Parking (Highest Priority Street Element in areas without off-street parking)	Yes	7' - 8'
Diagonal On-Street Parking	No	
Off-Street Parking Access	Yes	Sidewalk level and ADA access to be maintained at all driveways
Travel Lane Widths (High Priority Street Element)	n/a	10-11', if transit 11' outer lane
Turn Lanes	No	
Design Speed	Slow	< 25mph
Bicycle Facilities	Yes	Bicycles May Use Full Lane signage, Shared Lane Markings, Climbing Lanes
Transit Stop Facilities	Yes	Benches, paved curbside waiting areas
Traffic Calming	Yes	Curb extensions (mid-block and corner), speed tables, raised intersections, raised crossings, and mini traffic circles
*Combined travel lane and on-street parking width 18' minimum (7' on-street parking, 11' travel lane OR 8' on-street parking, 10' travel lane)		
**Trees: small (10' – 30' mature height); medium (30' – 50' mature height); large (50' mature height)		
	Highest Priority Street Elements	High Priority Street Elements

NEIGHBORHOOD B STREET Major Design Elements	Recommended	Parameters
Curbs	Limited	Vertical curb, or combination curb and gutter
Gutters	Yes	Valley gutter or combination curb and gutter
Pedestrian Lighting	Yes	16' Height Maximum; see Lighting Standards
Street Lighting	No	
Median	No	
Curb Radi	n/a	15' - 25'
Build-To Line/Street Wall Set Back from Public ROW	n/a	10' - 25'; varies by zoning district
Green and Blue Stormwater Opportunities	Yes	See <i>Stormwater Elements</i> section in Chapter 4.
Sidewalk Pavement Material	n/a	Concrete, permeable pavement, unit pavers
Parking Lane Material	n/a	Asphalt, permeable pavement, unit pavers
Roadway Pavement Material	n/a	Asphalt
Gutter Material	n/a	Asphalt, concrete, and unit pavers
Curb Material	n/a	Concrete, granite
Curbside Buffer Zone Material	n/a	Lawn, groundcover, vegetated tree boxes
Utilities	n/a	Separation Requirements for Street Trees/Above Ground Infrastructure: 10' preferred, 5' minimum. Anything under 10', consult with Utilities Engineer to reach solution.
*Combined travel lane and on-street parking width 18' minimum (7' on-street parking, 11' travel lane OR 8' on-street parking, 10' travel lane)		
	Highest Priority Street Elements	High Priority Street Elements

# Local Streets

Local streets are found throughout the city, and provide immediate access to all types of land uses. Although local streets form the majority of the street network, there is no specific typology associated with them. This is due in part to the many variations in context and right-of-way width, as well as the community’s expressed desire to replicate as nearly as possible the feel of older local streets that do not meet current engineering and fire code standards. Applying a typology to local streets would require that certain minimums for lane widths be met, significantly altering the character of some local streets. However, the city should explore avenues in terms of code and policy changes to enable the feel of these streets to be replicated in retrofit projects and new construction.

Examples of local streets in residential contexts and their approximate right-of-way widths are shown below:



Azalea Drive south of Jefferson Park Avenue – 50’ with parking allowed on both sides and individual driveways; 4’-5’ sidewalks with obstructions both sides of the street.



Calhoun Street between Locust and St. Clair – 30’ with parking allowed on both sides. Some driveways and a 4’-5’ sidewalk on the north side of the street.



Westwood Road east of Rose Hill Drive - 48’ with parking allowed on both sides and driveways. 4’-5’ sidewalks with obstructions both sides of the street.



Monticello Road between Rialto and Levy – 35’ with parking on one side and one-way traffic. No driveways, and 4’-5’ sidewalks with obstructions on the both sides of the street.

Examples of local streets in mixed use contexts and their approximate right-of-way widths include:



E Jefferson Street between 1<sup>st</sup> Street N and 5<sup>th</sup> Street NE – 45' with parking and 4'-5' sidewalks with obstructions on both sides of the street.

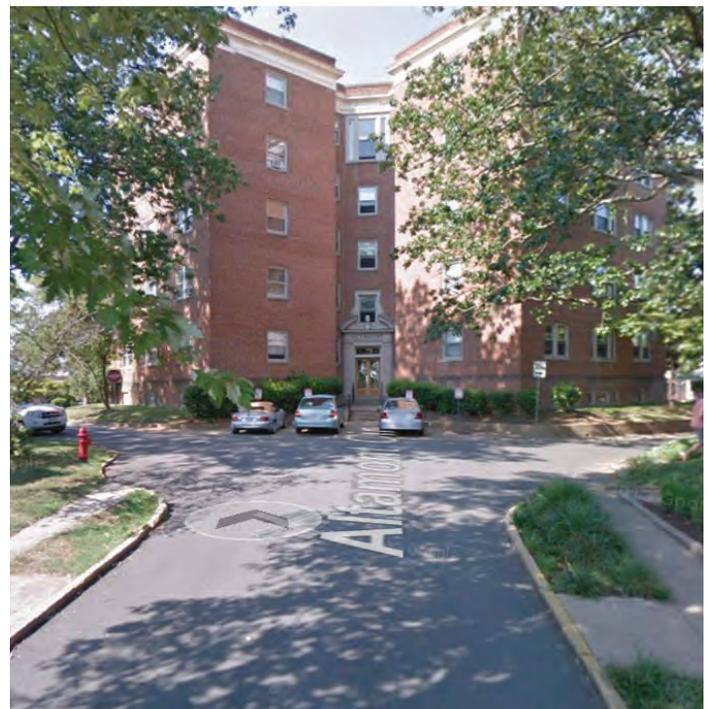


Monticello Road near intersection with Hinton Avenue – 40'-50' with parking on one side and 4'-5' sidewalks on both sides of the street. Planted sidewalk buffer on the north side of the street.

Whether a local street is located in a residential or mixed use context, the design considerations are the same.

## Design Considerations

- Local streets should be designed to provide safe and inviting places to walk and bike by keeping vehicular speeds low.
  - The dimensions of street elements on Local streets should not exceed the dimensions specified for Neighborhood B streets.
  - Traffic calming techniques like medians, chicanes, neighborhood traffic circles and curb extensions are all appropriate on Local streets.
- On narrow streets, on-street parking may create conditions that require drivers to yield to oncoming traffic. This type of street is considered a yield street.
  - Yield streets have standard curbs and sidewalks at the edge of the roadway.
  - Yield streets with parking on both sides function most effectively at widths of 24'-28' between the curbs and parking utilization rates of less than 60 percent.<sup>16</sup>
- In neighborhoods with driveways and off-street parking, space within the public right-of-way should be used for wider sidewalks and planted buffers.
- Elements like street furniture and paving materials can be used to enhance and define neighborhood character.



Altamont Circle was built before today's standards were enacted.

<sup>16</sup> NACTO Urban Street Design Guide. <http://nacto.org/publication/urban-street-design-guide/>



This shared street in Asheville, NC uses different paving materials to indicate where motor vehicles are expected to travel, while allowing pedestrians full use of the space.

## Shared Streets

One way Charlottesville may choose to replicate the feel of older streets is by allowing shared street designs in appropriate contexts. A shared street is a street with a single grade or surface that is shared by people using all modes of travel at low speeds. Shared streets work best where there are nearly equal volumes of pedestrians, bicyclists, and motorists. Street furniture, including bollards, benches, planters, and bicycle parking, can help define a shared space, subtly delineating the traveled way from the pedestrian-only space.

In Charlottesville, shared streets may be considered in residential or mixed use contexts where vehicle speeds (10-15mph) and traffic volumes are low to ensure safety. In commercial areas, shared streets maintain access for vehicles operating at low speeds and are designed to permit easy loading and unloading for trucks at designated hours. They are designed to implicitly slow traffic speeds using pedestrian volumes, design, and other cues to slow or divert traffic. In residential areas, shared streets can meet the desires of adjacent residents with space for children to play and residents to gather.

Shared streets require thoughtful design to maintain the low speeds and volumes<sup>17</sup>. Cities from Seattle, Washington;

Buffalo, New York; Chicago, IL to Cambridge, MA have successfully implemented shared streets in the U.S. To date, shared streets are not fully recognized by the Virginia Department of Transportation, and maintenance would be the full responsibility of the City. As a first step toward implementation, the City should consider the adoption of a specific definition of a shared street in city code.

### *Design considerations*

- The entrances to shared streets should be clearly designated through signage, narrowing of the roadway, and/or different paving materials to alert users to changes in operating procedures.
- The street design must meet current Americans with Disability Act (ADA) standards.
  - At intersections, designers should include detectable warning surfaces in order to alert pedestrians of potential vehicular conflicts.
- Access for fire trucks, sanitation vehicles and other service vehicles (school buses, street sweepers and snow plows) will be incorporated into shared street design.
- Alternate stormwater management systems must be considered, as curbless designs alter runoff flows.
  - One alternative is to grade the street towards plantings on the edge, or towards a gully in the center.

<sup>17</sup> See NACTO Urban Street Design Guide; <http://nacto.org/publication/urban-street-design-guide/streets/residential-shared-street/> and <http://nacto.org/publication/urban-street-design-guide/streets/commercial-shared-street/>

### 3.4 Street Typologies At a Glance

Street Typology		Mixed Use A	Mixed Use B	Downtown	Industrial	Neighborhood A	Neighborhood B
Right-of-way Design Speed Curb radii		60'-100' <30 mph 20'-30'	50'-80' <30 mph 20'-30'	50'-70' 25 mph 15'-20'	40'-60' <25 mph 20'-30'	25'-50' <25 mph 15'-25'	25'-50' <25 mph 15'-25'
Between the curbs	Travel lanes <sup>1</sup>	10-11' 11' curb lane along transit routes	10-11' 11' curb lane along transit routes	10-11' 11' curb lane along transit routes	11'-12'	10'-11'	10'-11'
	Turn Lanes	10' Center turn lane may be replaced by median between intersections	10'	10' Only at major intersections and major destination access points	10'-11' Center turn lane may be replaced by median between intersections	N/A	N/A
	Medians	Varies See below for minimum dimensions for street trees	Varies See below for minimum dimensions for street trees	N/A	Varies See below for minimum dimensions for street trees	N/A	N/A
	On-street parking <sup>1,2</sup>	8' Limited or none	7'-8' Loading zones should be considered	7'-8' Loading zones should be considered	7'-8' Limited or none	7'-8'	7'-8'
	Bicycle facilities	5'-7' bike lanes 7' separated bike lanes 10' shared use path	5'-6' bike lanes 7' separated bike lanes 10' shared use path	0' shared lane markings 6' climbing bike lanes	0' shared lane markings 5' bike lanes 6' climbing bike lanes	0' Bikes May Use Full Lane signs 0' shared lane markings	
Street edge	Clear Walk Zone	>7'	>7'	>6'	5'-6'	5'-6'	5'-6'
	Curbside Buffer Zone	3'-6'	3'-6'	3'-8'	4'-6'	0'-5'	0'-5'
	Street trees curbside buffer width requirement	4' for small, medium and large trees 6' preferred for medium and large trees	4' for small, medium and large trees 6' preferred for medium and large trees	4' for small, medium and large trees 6' preferred for medium and large trees	4' for small, medium and large trees 6' preferred for medium and large trees	4' for small, medium and large trees 6' preferred for medium and large trees	4' for small, medium and large trees 6' preferred for medium and large trees
	Transit features <sup>3</sup>	10' for shelter 4' for bench	4' for bench	4' for bench			
	Utilities - Overhead	1'-2' Locate in buffer zone					
	Utilities - Underground	5' minimum separation 10' separation preferred <10' consult with Utilities engineer	5' minimum separation 10' separation preferred <10' consult with Utilities engineer	5' minimum separation 10' separation preferred <10' consult with Utilities engineer	5' minimum separation 10' separation preferred <10' consult with Utilities engineer	5' minimum separation 10' separation preferred <10' consult with Utilities engineer	5' minimum separation 10' separation preferred <10' consult with Utilities engineer
	Building setbacks	5'-10'+ Varies by zoning district	5'-10'+ Varies by zoning district	0'-5' Varies by zoning district	10-60' Varies by zoning district	10'-25' Varies by zoning district	10'-25' Varies by zoning district

1. Combined travel lane and on-street parking width is 18' minimum (7' on-street parking, 11' travel lane OR 8' on-street parking, 10' travel lane)  
 2. On street parking should not be prioritized where driveways and off-street parking opportunities exist.  
 3. A 5' x 8' landing pad for wheelchair ramps is a required feature for new transit stops.

Highest Priority Street Elements	High Priority Street Elements
----------------------------------	-------------------------------

# CHAPTER 4

---

## Street Elements

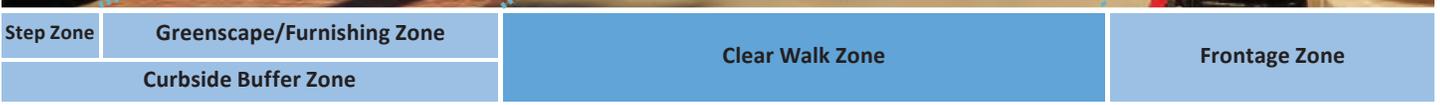
This chapter builds upon the recommendations for each street typology by providing additional information and guidance for the different elements that make a street “work” in all of its various capacities. The chapter is organized in three sections starting at the street edge with sidewalks, which encompass the area between the curb and the property line; followed by the roadway between the curbs; and concluding with intersections.

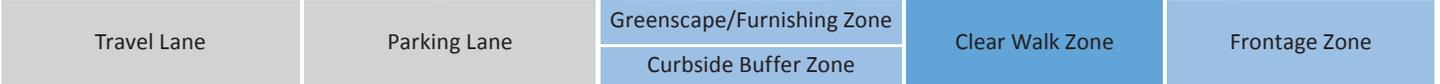
This chapter provides information and guidance in addition to the requirements in the Standards and Design Manual (SADM). Please refer to the SADM for additional guidance (available at <http://www.charlottesville.org/departments-and-services/departments-h-z/neighborhood-development-services/engineering/standards-and-design-manual>).

## 4.1 Sidewalks *(Between the curb and the property line)*

The width of the sidewalk contributes to the degree of comfort and enjoyment of walking along a street. Narrow sidewalks do not support lively pedestrian activity, and may inhibit accessibility for people in wheelchairs. They can also create dangerous conditions if foot traffic spills into the street.

The ideal sidewalk consists of four parts: 1) the frontage zone, 2) the clear walk zone, 3) the planting/furnishing zone, and 4) the step zone. Although the boundaries between the zones can sometimes overlap, each one serves a distinct purpose.





The **frontage zone (if used: 2' minimum, maximum varies)** is the area between the clear walk zone and the building frontages or lot lines. In locations where buildings are adjacent to the sidewalk, the frontage zone provides a space that buffers pedestrians from opening doors and structural elements. If space permits, the frontage zone can also be space for sidewalk cafés, store entrances, retail displays or landscaping. It is important that none of these elements infringe upon the clear walk zone.

The **clear walk zone (5' min, 6' preferred; >7' on Mixed Use A and Mixed Use B streets)** is the area of the sidewalk space that is specifically allocated for pedestrian travel. This space is the highest priority area in the sidewalk design. This zone must allow for unobstructed pedestrian movement regardless of ability, be free of any physical barriers, be well-lit and clear in all weather conditions. There may be opportunities to integrate blue stormwater infrastructure such as permeable pavers or porous pavement in this zone as long as the quality of the surface meets the standards presented in Section 205 of the City's Standards and Design Manual, as well as the Americans with Disabilities Act. The surface material should be durable and slip resistant with minimal gaps.

The curbside buffer zone is comprised of two parts:

1. The **greenscape/furnishing zone (if used: 4' for small, medium and large trees, 6' preferred for medium and large trees. Smaller widths can be achieved if soil volume minimums are met)** may include street trees or other plantings, street lights, signage, hydrants, benches, bicycle racks, public art, trash bins, parking meters, transit stops, green stormwater infrastructure, traffic signal poles, and utilities. If street trees are provided, minimum soil volumes must be met, and the minimum width should be 4' for a small, medium and large trees as defined in Charlottesville's Master Tree List. In addition to being home to objects that may otherwise obstruct pedestrian movement, this zone provides a buffer for pedestrians from the adjacent street. Placement of objects in the greenscape/furnishing zone should consider factors such as sight lines, potential damage from vehicles on the street and access to parked cars. Elements such as furniture, plantings and seating may not protrude into the clear walk zone. Ideally, planted elements should be designed to make use of stormwater runoff from the sidewalk and/or the street and to be resistant to damage from snow storage.
2. The **step zone (if used: 18" min, 2' preferred, 5' max)** is the area between the edge of the street and the front edge of the greenscape/furnishing zone. This zone provides a small area for people stepping out of parked cars or dismounting bicycles. This area may also be used for snow storage in order to keep both the roadway and the clear walk zone accessible. Since this zone is designed to be walked on, it should be constructed with a hard surface.

The widths of the clear walk zone and curbside buffer zone for each street typology are summarized in Table 8.

	Mixed Use A	Mixed Use B	Downtown	Industrial	Neighborhood A	Neighborhood B
<b>Clear Walk Zone</b>	>7'	>7'	>6'	5'-6'	5'-6'	5'-6'
<b>Curbside Buffer Zone</b>	3'-8'	3'-6'	3'-8'	4'-6'	0'-5'	0'-5'

Table 8: Sidewalk Zone Widths.

## Frontage Zone

Where space permits, the frontage zone can be space for sidewalk cafés, store entrances, retail displays or landscaping. The frontage zone may not always be within the public right-of-way, in which case it is subject to the City's Zoning Ordinance and maintained by private property owners.

### Cafés

Sidewalk cafés are encouraged on all street typologies where commercial activity occurs, including industrial areas.

- The preferred minimum width of a sidewalk café area is 6'.
- Cafés may not extend beyond the limits of the establishment into neighboring businesses.
- A minimum 4' clear path should be maintained to the front door of the dining establishment.
- Furniture should be durable, free-standing and matching.
  - Cafés on the Downtown Mall and in other areas subject to architectural review should follow the guidance in Chapter V of the Architectural Design Control Guidelines.<sup>18</sup>
- Awnings and/or umbrellas are desirable. Heat lamps, either free-standing or affixed to the underside of awnings, can extend outdoor dining into the colder months.

### Planters

- Planters and other furnishing elements must not protrude into the clear walk zone.

<sup>18</sup> <http://www.charlottesville.org/departments-and-services/departments-h-z/neighborhood-development-services/historic-preservation-and-design-review/board-of-architectural-review-bar/adg-guidelines>



Sidewalk café space on University Avenue.

## Building Frontages

The design, siting and orientation of buildings help define the pedestrian experience. The following provide guidance for designing buildings that support walkable environments:

- The design of building façades and entry points from the sidewalk contribute to the overall character of the street.
- Along active mixed-use and downtown streets, building frontages should be highly transparent allowing pedestrians to see into shops, restaurants and public spaces.
- On residential streets, building frontages should include windows overlooking the street with layers of landscaping, porches, patios, or semi-public space that provide an appropriate buffer. Setbacks will vary based on street typology and the scale of the buildings.
- The primary building face should be located on the most active street frontage with an attractive and welcoming facade that includes entry doors, windows, signs and other character-defining elements.
- A secondary building face along a mid-block passage or side street should also include openings overlooking the public space.
- Lighting should be integrated into the building design to indirectly illuminate the sidewalk at night. The light may filter through storefront windows or come from architectural lighting that highlights features the building itself.

## Building Heights and Setbacks

Buildings help define the street, so their form and design details merit careful consideration. The guidance below addresses building heights, the street wall and setbacks.

- A building’s design and scale should reflect the design and scale of the street where it is located. A small building will be overlooked along a large street, and a large building on a small street can make the street seem narrow and uninviting.
- Building design standards should support a healthy street environment for pedestrians: for example, designing buildings to take into account how they interact with strong winds to create wind tunnels or unnecessarily restrict flows of natural light and air.
- Buildings of 1 to 3 stories should be designed entirely at a pedestrian-oriented neighborhood scale, with features that can be appreciated by people walking or bicycling.
- Mid-height buildings of 4 to 6 stories should be designed at a pedestrian-oriented scale at the lower 1 to 3 floors and integrate awnings, windows, balconies and other features that provide opportunities for occupants to overlook the street from upper floors.
- Taller buildings (over 6 stories) should generally have a base of lower floors designed similarly to those of mid-height buildings, and may benefit by stepping back from the frontage above this level to provide a street character that is not overwhelming to the pedestrian.
- In most mixed-use districts and neighborhood centers, it is more important to provide a consistent “street wall” to define the street as an outdoor room than to provide varied setbacks and step backs to break up the mass.

Land use and site design on private property are governed by the city’s Zoning Ordinance<sup>19</sup>.

## Clear Walk Zone

The clear walk zone is the area of the sidewalk corridor that is specifically reserved for pedestrian travel. It should be well-lit and functional in all weather conditions. This zone must be free of any physical obstructions to allow for unfettered pedestrian movement.

<sup>19</sup> [https://www.municode.com/library/va/charlottesville/codes/code\\_of\\_ordinances?nodeId=CO\\_CH3420](https://www.municode.com/library/va/charlottesville/codes/code_of_ordinances?nodeId=CO_CH3420)

## ADA requirements

The clear walk zone must meet accessibility standards in the Federally Proposed Accessibility Guidelines for Pedestrian Facilities in the Public Right-of-Way (PROWAG).<sup>20</sup> The surface material should be smooth, stable, and slip resistant with minimal gaps, rough surfaces and vibration-causing features. The clear walk zone must have a 4' minimum clear width with a 2 percent maximum cross slope. For more information on curb ramps, and other essential elements of accessibility, please see section 4.3 Intersections.

## Driveways

The design of driveways should provide a continuous and level clear walk zone across the vehicular path and encourage vehicles to yield to pedestrians on the sidewalk. Driveways across public sidewalks are needed to link streets to off-street parking facilities and loading zones, however, driveways can create conflicts and require special treatments in order to maintain a safe and comfortable walking environment.



This residential driveway slopes up to provide a continuous and level Clear Walk Zone.

<sup>20</sup> <https://www.access-board.gov/guidelines-and-standards/streets-sidewalks/public-rights-of-way/proposed-rights-of-way-guidelines>

## Driveway Consolidation

Particularly on commercial streets, several driveways located close together create safety issues for drivers, pedestrians and bicyclists and can result in unnecessary delays for automobiles. While the city has largely discontinued these practices for new development, there are several areas where consolidation of driveways will be necessary as redevelopment occurs.

Preston Avenue and East High Street are both examples of streets with numerous conflict points due to the large number of businesses with individual parking lot entrances. The frequency and steep cross slopes of the driveways make walking along the street challenging (and sometimes unusable), particularly for pedestrians who are sight impaired, using a wheelchair or pushing strollers. Providing shared parking as businesses redevelop and moving vehicular entrances to side streets whenever possible will make the pedestrian environment more accessible and reduce the number of potential conflict points.



This diagram highlights the numerous driveway cuts on Preston Avenue.



A wide driveway crossing on Preston Avenue.

## Materials

The SADM specifies that sidewalks be constructed with hydraulic cement concrete or solid paving units.<sup>21</sup> Other example materials for sidewalk construction are listed below. The sidewalk materials used outside the public right-of-way or in areas not subject to city maintenance will be determined as part of the development review process.



Brick pavers are used for the sidewalks and roads in Court Square.

**Brick or combination of brick and concrete:** These materials may be used based on the context of the street, block frontage, and adjoining streets, with the intent of reinforcing their existing character. A combination of brick and concrete allows flexibility to keep brick as part of the streetscape, but use concrete within the clear walk zone.



Permeable paving and infiltration bed in Portland Oregon in the curbside buffer zone.

**Permeable pavers and porous pavement:** These materials may be used if determined applicable and appropriate based on the context of the street, grades, subsoils, drainage characteristics and groundwater conditions.

Permeable paving materials allow stormwater runoff to infiltrate through the sidewalk into the ground rather than running off into the street and storm drain system. This helps filter pollutants; reduce flooding and ponding; and contributes to improved water quality. Permeable paving materials include continuous solid expanses of porous materials and/or pavers specially installed to enable rainwater to run through gaps maintained between them.

Permeable pavement systems are typically underlain with an infiltration bed and subgrade soil and may be used in sidewalks, plazas, cafés, parking areas, alleys, and other areas without heavy vehicle traffic.

<sup>21</sup> <http://www.charlottesville.org/home/showdocument?id=10377>

## Curbside Buffer Zone

The curbside buffer zone is the area between the curb and the clear walk zone. This zone is where street trees, stormwater elements, street lights, signage, hydrants, benches, bicycle racks, public art, trash and recycling receptacles, parking meters, transit stops, signal and lighting control boxes, and utility hatch covers should be located. As such, this zone collects the objects that may obstruct pedestrian flow, and simultaneously provides a buffer for pedestrians from the adjacent roadway. This zone varies in character based upon which typology it is being used in. For example, in the Downtown typology, this zone is predominately hardscape with trees in tree wells and grates, whereas in a Neighborhood typology, a vegetative buffer with landscaping is more appropriate.

This zone should also be designed to accommodate snow storage in the winter to prevent snow from being stored in the clear walk zone. Green infrastructure elements should be designed to make use of stormwater runoff from the sidewalk and/or the street.

## Trees

Street trees have many benefits including visually narrowing the street, causing drivers to slow down and reducing the severity of collisions; capturing stormwater; creating habitat, filtering air pollutants, and providing shade in the summer that cools the hardscape and creates inviting places for people to walk, bike and gather. These types of places generate foot traffic for businesses and can create a sense of community in residential neighborhoods. Street trees may be planted on public or private property and can be planted in a variety of environments, such as: tree wells with tree grates in urban areas, in infiltration beds, in vegetative buffers and along sidewalks in regimented or natural spacings. Charlottesville's Zoning Ordinance governs the planting of street trees on private property, and contains the following provisions for streetscape trees:

- Currently, developments in zoning districts with maximum setbacks of less than 10' are not required to provide street trees.<sup>22</sup> Consider updating this code requirement during the code audit so that street trees are required regardless of the setback requirement.

- Streetscape trees shall be selected based on the soil volume criteria described later in this section and in Table 9. Currently, code requires street trees be large trees and allows the Director to approve a substitution of a medium tree.
- Streetscape trees shall be planted outside existing or proposed rights-of-way, but within 15' of the edge of such rights-of-way; however:
  1. Streetscape trees shall be planted within 5' of the edge of the right-of-way within an entrance corridor overlay district, and
  2. For certain parking lots adjacent to public rights of way (see City Code Section 34-873), streetscape trees shall be planted within ten 10' of the edge of the right-of-way.
  3. Streetscape trees may be planted in the city's existing or proposed rights of way with the approval of the director of neighborhood development services.
- Maintenance of required streetscape trees shall be the responsibility of the property owner for two years, after which the City takes over maintenance.

## Choosing the Right Trees

Choosing the right tree for the available habitat can help minimize conflicts with adjacent infrastructure. For example:

- Woody vegetation should adhere to the 10' preferred setback from all underground utilities (water, storm, sewer, and gas).
  - Where trees are strongly desired and the 10' preferred setback is unachievable, design elements like root barriers may be incorporated between 5'-10' of water, sewer, storm and gas utilities to protect both the root system and utility infrastructure. This must be approved by an Utilities Engineer.
- The City of Charlottesville's Master Tree List contains recommendations for tree species that are compatible with overhead wires.<sup>23</sup>
- Trees with deeper roots and small trunk flares should be used adjacent to pavements to prevent cracking and heaving.

<sup>22</sup> City of Charlottesville City Code, Sec. 34-870. [https://www.municode.com/library/va/charlottesville/codes/code\\_of\\_ordinances?nodeId=CO\\_CH34ZO\\_ARTVIIIIMREDE\\_DIV2LASC\\_S34-870STTR](https://www.municode.com/library/va/charlottesville/codes/code_of_ordinances?nodeId=CO_CH34ZO_ARTVIIIIMREDE_DIV2LASC_S34-870STTR)

<sup>23</sup> <http://www.charlottesville.org/departments-and-services/departments-h-z/neighborhood-development-services/development-ordinances>

## Soil Volumes

A tree's ability to grow is directly related to the volume of rooting soil available. With respect to large deciduous trees, soil volume is a significant limiting factor and a large deciduous species will not achieve its projected height and crown spread if adequate soil volume is not provided. The soil volume does not necessarily limit the type of tree, but the reality of what that tree can become.

Providing sufficient rooting soil in a dense, urban environment can be costly, but is worthwhile given the unique benefits that trees provide. Tree roots do not survive well in highly compacted soil because it lacks the void spaces needed for air and water to circulate. Roots in compacted soil will migrate toward the surface for air and water, causing sidewalks to crack and heave. Charlottesville's desire to have a vibrant urban tree canopy and healthy street tree program requires the language detailing soil volumes in these guidelines and in the City's Tree Packet to be incorporated into the Standards and Design Manual, Best Management Practices for Tree Preservation, Transplanting, Removal and Replacement and the City's Zoning Ordinance.

## Tree Placement

To achieve all of the urban design benefits listed above, street tree plantings should strive for a continuous row of trees along a street while respecting adjacent uses. Where this is not possible, incorporating individual trees where space allows is highly recommended over no trees at all.

- Trees should be offset from light poles by 15'.
- Trees should not be planted within 10' of driveways, loading zones and bus stop landing pads.
- Tree placement shall accommodate existing utility lines and access to above and underground utilities.
  - Woody vegetation should adhere to the 5 minimum, 10' preferred setback from all underground utilities (water, storm, sewer, and gas). Any adjustments to the 10' setback must be approved by a Utilities Engineer.

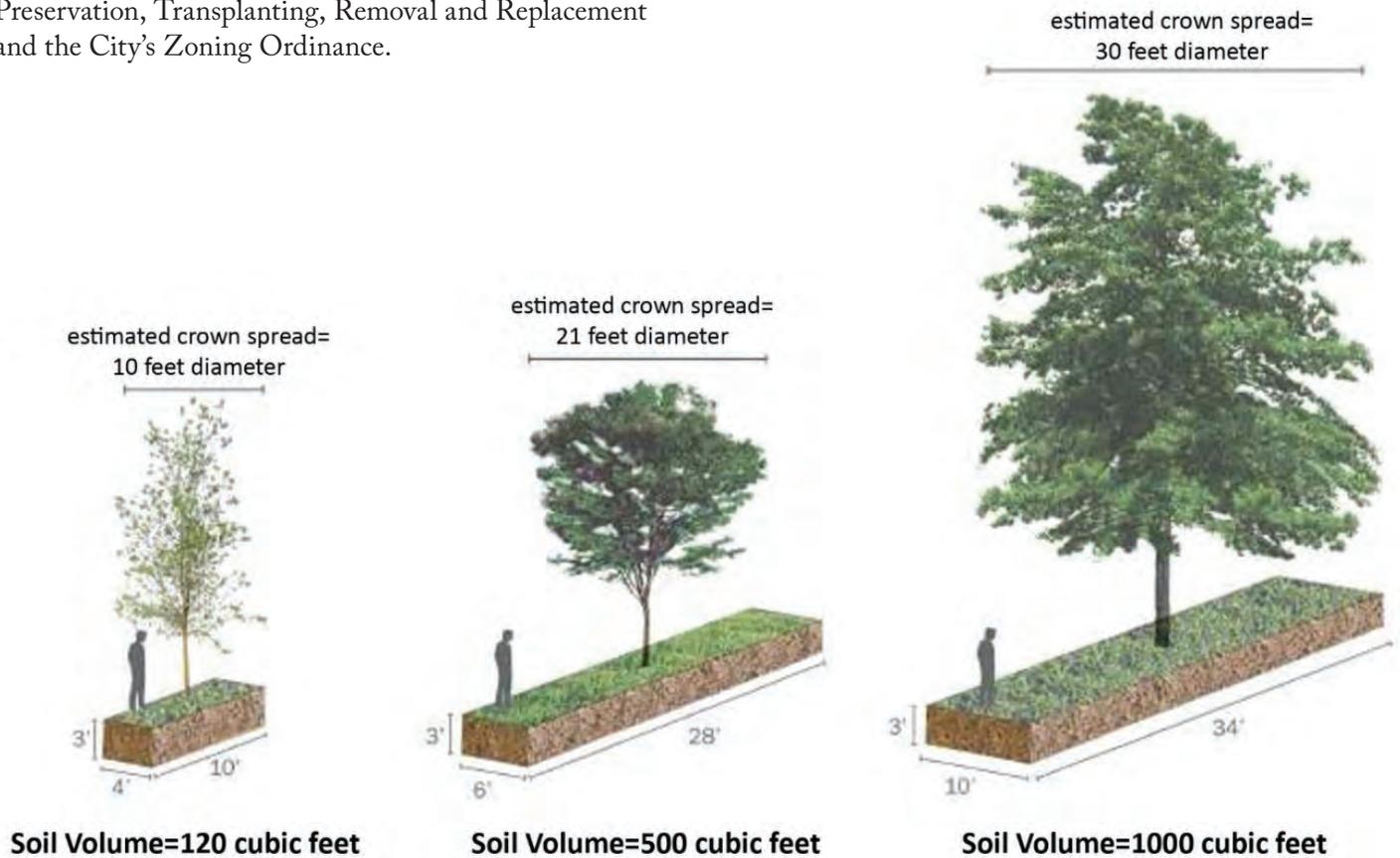


Figure 8: Illustration of how soil volumes affect tree size.

Table 9 summarizes the planting area width, spacing and soil volumes for trees in the public right-of-way.

	Small Deciduous or Ornamental Trees	Medium Deciduous Trees	Large Deciduous Trees
<b>Mature Height</b>	10'-30'	30'-50'	50'
<b>Planting Strip Width*</b>	4'	4' 6' preferred	4' 6' preferred
<b>Spacing between trees</b>	15' minimum 20' recommended	25' minimum 30' recommended	30' minimum 40' recommended
<b>Soil volume minimum</b>	250 ft <sup>3</sup> per tree	400 ft <sup>3</sup> per tree	400 ft <sup>3</sup> per tree; 900 ft <sup>3</sup> preferred per tree
*Narrower planting strips can be achieved if minimum soil volumes are met.			

Table 9: Street Tree Planting and Soil Area Standards

## Stormwater Elements

Similar to street trees, green and blue stormwater elements have environmental and aesthetic benefits. There may be opportunities to integrate green and blue stormwater infrastructure into medians, the curbside buffer zone, the clear walk zone and traffic calming strategies (curb extensions or chicanes).

With the opportunities inherent to implementing green and blue stormwater elements into the right-of-way come challenges and constraints. Important considerations include but are not limited to:

- Presence of existing underground utilities, especially the potential cost associated with reconfiguration of such utilities to accommodate the footprint of the stormwater element.
- Impacts on maneuverability and access required for emergency vehicle response.
- Impacts on snow and leaf removal activities.
- Ability to conduct routine and non-routine maintenance activities safely and effectively.
- Cost effectiveness of stormwater benefit provided given the challenges of smaller drainage areas and limited space to provide treatment within the right-of-way.

- Development right of adjacent properties that may be impacted by the presence of a stormwater element in the right-of-way.

While efforts to date to implement green and blue stormwater elements within the right-of-way have been challenging, the city is dedicated to continuing to explore opportunities to treat stormwater runoff in the right-of-way on a case-by-case basis. Two examples of green and blue stormwater elements that have been implemented in other communities are stormwater planters and linear bioretention. Other strategies to be considered include bioretention curb extension, grass channels, drop inlet tree boxes, structural tree trenches and permeable pavements.

Stormwater planters are designed to capture and absorb runoff from surrounding impervious areas including rooftops, sidewalks, plazas, parking lots and streets. They consist of structural walls and curbs which form the planter, underdrains and overflow drains connected to the storm drain system, a high draining soil mix above a gravel layer, mulch and plants.

Linear bioretention functions similarly to stormwater planters by receiving and filtering stormwater. Linear bioretention are built into the existing subgrade and may appear more like conventional landscaped areas when

compared to stormwater planters. Linear bioretention requires more space given their larger size (relative to typical stormwater planters) and are more likely to be constrained by existing below ground utilities. Benefits include the potential to treat slightly larger drainage areas and the ability to support more plantings. Charlottesville uses the following guiding documents and design standards when planning and implementing green design projects that have stormwater management and/or street trees as key components:

- Virginia Stormwater Best Management Practice Clearinghouse (Virginia Department of Environmental Quality)
- Chesapeake Bay Program Expert Panel Reports (Federal Chesapeake Bay Program)
- Chesapeake Bay Phase 5.3 Community Watershed Model, Best Management Practices for Nutrients and Sediment, Urban Practices (Federal Chesapeake Bay Program)
- Chapter 34: Zoning, Division 2. Landscaping and Screening (City of Charlottesville)
- City of Charlottesville Standards and Design Manual



This curb extension in Portland, Oregon is an example of linear bioretention that collects and filters stormwater from the street and sidewalk. It also prevents cars from parking too close to the corner and provides space for streetlights and other utilities.

## Utilities

Items like utility poles and parking meters/stations are a common feature in the sidewalk planting/furnishing zone of the sidewalk. The location of new utilities in new subdivisions in Charlottesville is governed by the regulations set forth in Chapters 29 and 31 of the City Code. Section 29-204 requires all new utilities in new subdivisions to be located underground “in a manner that will not preclude the installation of street trees or required landscaping.” On existing streets, utilities are located both underground and on overhead utility poles, and the required setbacks must be considered when designing a street.

- Locations of permanent structures and trees shall be selected to accommodate existence of and access to underground utilities.
- Utility poles and parking meters/stations should be located a minimum of 18” from the curb and should never be placed in the clear walk zone.
- Whenever possible, traffic control boxes should be located in unused space outside of the sidewalk zone; however, if they must be placed in the planting/furnishing zone, then a clear space should be provided on all sides so that people have space to open car doors and access vehicles parked along the street.
- Underground utility infrastructure has above-ground access points like manholes, meter vaults and valve boxes. These items shall be designed to accommodate traffic loadings and maintenance requirements in accordance with the requirements set forth in the Standards and Design Manual and other design guidelines.

	All Street Typologies
<b>Utilities - Overhead</b>	1'-2' Locate in Curbside Buffer Zone
<b>Utilities - Underground</b>	5' minimum separation 10' separation preferred <10' consult with Utilities engineer

Table 10: Utility Width and Setback Requirements

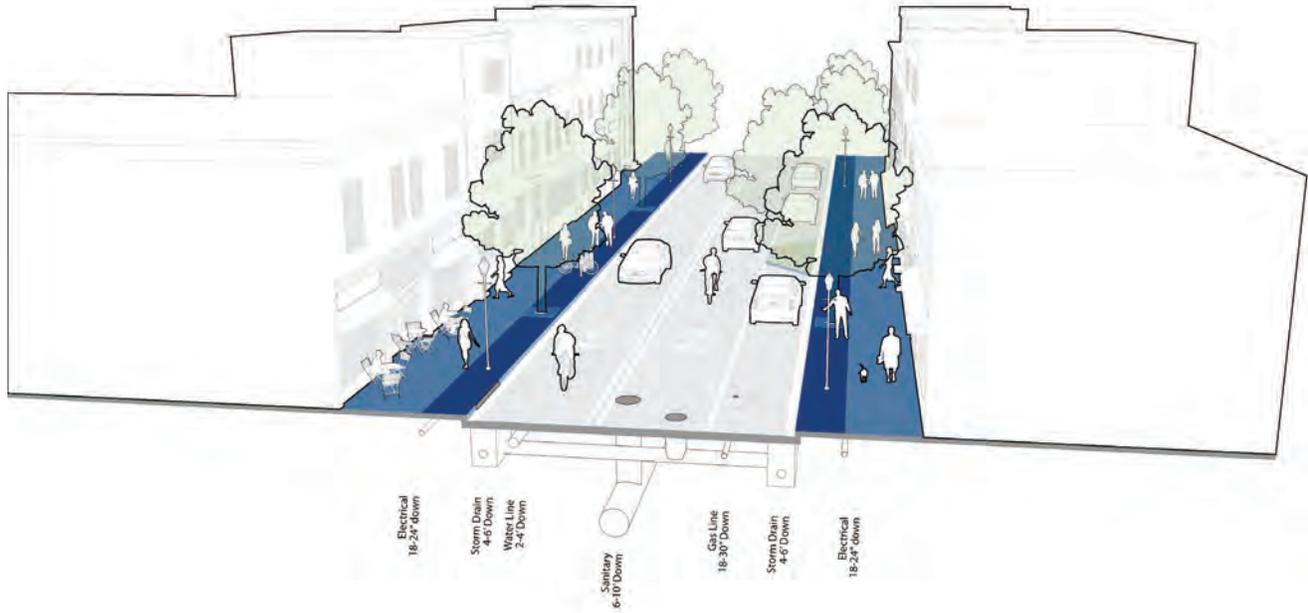


Figure 9: Utility Cross Section.

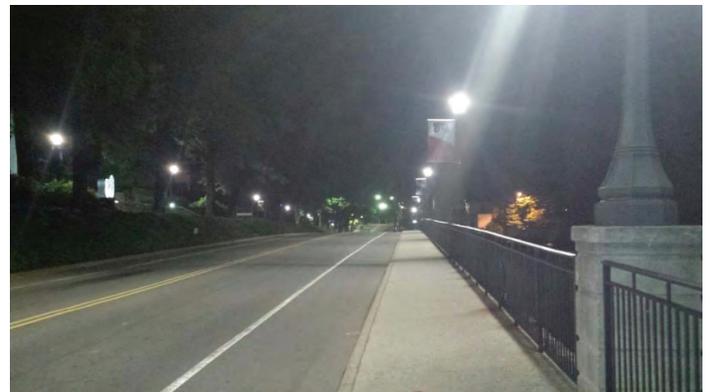
## Lighting

Appropriate street lighting facilitates safe movement of traffic and provides a sense of safety and security for pedestrians, but when used effectively, lighting can do much more. Good streetscape lighting lends character to a street, and by highlighting salient features, provide a sense of place and civic pride. Municipal street lighting should complement the context and land use of the Street Typology by fitting with the existing aesthetics and lighting levels and meet the City’s sustainability goals by being dark sky compliant and energy efficient.

- Lighting should reflect the character and urban design of the Street Typology to create a recognizable hierarchy of roads and spaces.
- Clear and consistent patterns should be used to reinforce the direction of travel and illuminate intersections.
- Pedestrian scale lighting (lower than 20’) should be used alone or in combination with roadway scale lighting in high-activity areas to encourage nighttime use and as a traffic calming device.
- Critical locations such as ramps, crosswalks, transit stops and seating areas that are used at night must be visible and lit.

## Street furniture

Well-designed street furniture makes the sidewalk more comfortable and convenient to use. Benches provide places to rest, catch up with neighbors or have lunch. Properly distributed trash receptacles help to keep the street clean. Appropriately located bicycle racks and shelters are essential to encouraging people to ride by making bicycle parking convenient and helps support bicycling as a viable mode of transportation. In addition to providing amenities, street furniture can also provide a buffer from the noise and commotion of vehicles on the street.



The pedestrian lighting on Rugby Road illuminates both the sidewalk and the street. Charlottesville Pedestrian Lighting Study, December 2015.

## Seating

Seating comes in a variety of temporary and permanent forms such as chairs, benches, seating walls, steps, monuments, planters, raised tree beds, etc. People enjoy watching others move about; therefore, the design and location of seating should respond to how the surrounding space is used. The best location for seating is a protected location away from typical pedestrian flows, beneath a street tree, outside the clear walk zone, with views of people walking by. The following ADA clear widths must be maintained when installing benches:

- 3' minimum on either side of the bench (except beside an ad panel of a bus shelter, where 6' clear width is required to open the panel door)

- 5' minimum from fire hydrants, > 1' minimum from any other amenity, utility or fixture
- 5' minimum, ideally 6' clear path to provide an additional 1' for people's legs, in front of the bench when located at the back of the sidewalk, facing the curb
- Where the back of the bench abuts a building, wall or other obstruction, a 1' minimum clear width should be provided for maintenance and trash removal
- 5' minimum clear path must be provided behind a bench when located at the front of the sidewalk facing the curb.

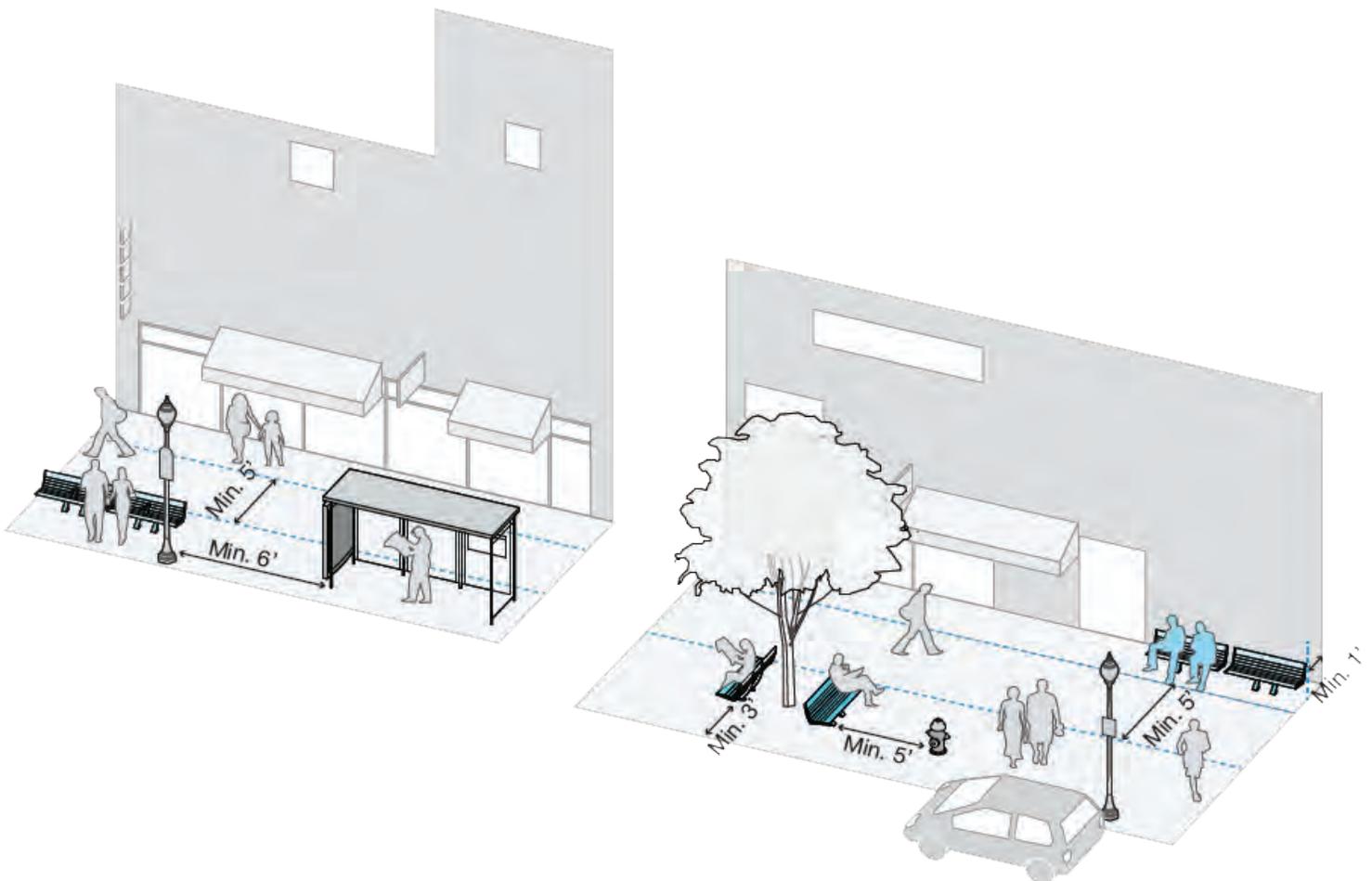


Figure 10: Bench placement. Graphic from Boston Complete Streets Guidelines.

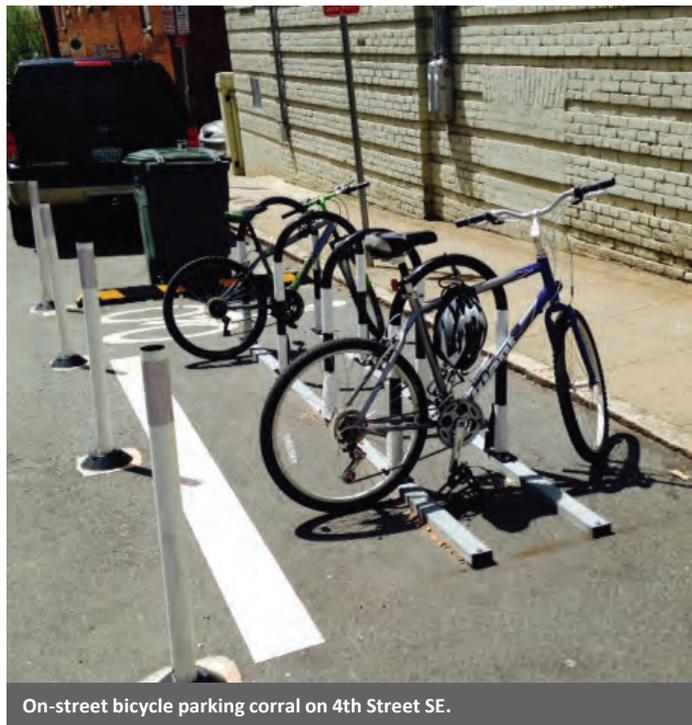
## *Bike parking*

Providing ample, well-designed bicycle parking is a key component of the city's strategy to increase bicycling.

Good bicycle parking designs maximize capacity, maintain an orderly appearance, and are secure and simple to use. Bicycle racks should be permanently affixed to a paved surface; movable bicycle racks are only appropriate for temporary use. A typical bicycle parking space is 2' by 6', and racks should be placed 3' apart to allow users to easily maneuver and lock and unlock their bike.

Bicycle rack designs must meet the following criteria:

- Support the frame of the bicycle at two points above the bicycle's center of gravity.
- Provide access for different bicycle frame sizes and styles.
- Allow easy locking of the frame and at least one but preferably both wheels.
- On-street bicycle parking should be considered where there are space constraints on the sidewalk. Eight to ten bicycles may be parked in one motor vehicle space.
- Off-street bicycle parking should be installed in an area highly visible to, and within 50' of the main entrance of the building it's intended to serve.



On-street bicycle parking corral on 4th Street SE.

## *Bus stops*

Sidewalks provide space for passengers to wait at bus stops and accommodate bus shelters and other transit stops. Shelters and other features improve operations, ridership and the value of transit to the community.

All transit stops should be fully ADA accessible for passengers. Transit stops may also be located on curb extensions and floating islands where on-street parking is present.

The area on the sidewalk where passengers load and unload at bus doors is called the landing zone (also known as the landing pad), which should be free from all obstructions including sign posts and bus stop amenities. The landing zone should be a minimum of 5' wide and 8' deep.

## 4.2 Roadways (*Between the curbs*)

The portion of a street between the curbs may consist of the following elements:

**Travel lanes (10' minimum, 11' preferred, 12' on Industrial Streets only)** for vehicles are discussed in detail below.

**Medians (6' minimum for pedestrian refuge, 8'-10' preferred)** are raised areas (delineated by curbs) and may have landscape in them. Medians may alternate with turn lanes at major intersections.

**Turn lanes (10' minimum)** are portions of the roadway designated specifically for left and right turns into streets or driveways.

**Bicycle facilities (0' for signed routes, 5' minimum for a bike lane)** indicate to bicyclists where they should ride and alert drivers to their presence.

**On-street parking (7' minimum, 8' preferred)** is also found within the curb-to-curb dimensions of the street. Although alignment of vehicles relative to curbs and travel lanes may vary, the most common configurations are parallel to the curb line or at an angle of less than 90 degrees from the curb line.

**Curbs and Gutters (6" vertical curb and, if used, 18" gutter pan)** define the width of the roadway and help with stormwater conveyance.

Designing a street with the minimum dimensions for each element compromises both safety and function. When combining multiple elements, minimum dimensions should not be used adjacent to each other. For example, **the combined travel lane and on-street parking width should be 18' minimum (7' on-street parking and a 11' travel lane OR 8' on-street parking lane and a 10' travel lane).**

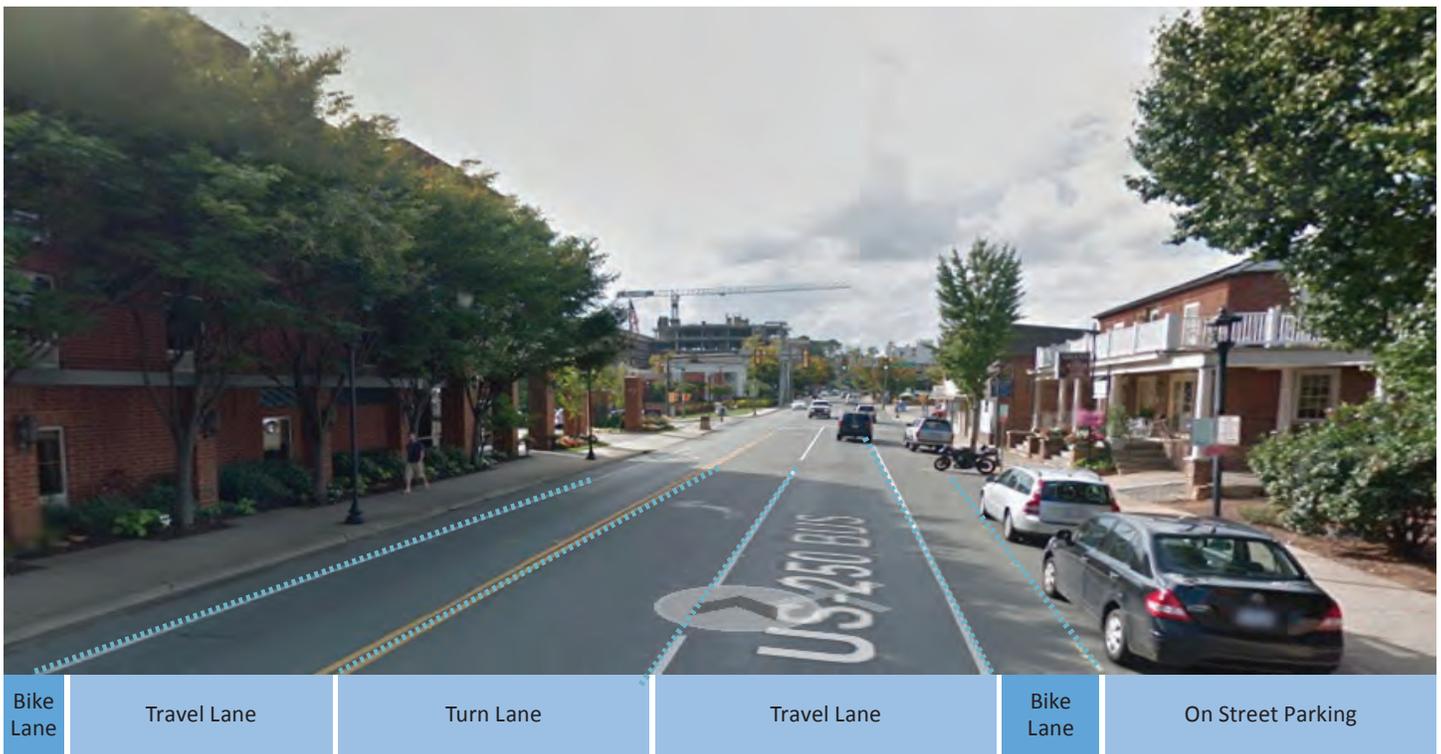


Figure 11: Roadway Elements.

# Travel Lanes

Lane width has many implications in street design from slowing traffic to increasing opportunities for active transportation. The width of travel lanes should be influenced by the physical dimensions of cars and trucks, desired speeds and type of road. Drivers are typically inclined to travel at higher speeds on roads with wider lanes. As speed and volumes increase, additional lane width is often considered desirable to accommodate the variations in lateral placement of the vehicle within a lane. Greater lane widths also help accommodate wider vehicles such as trucks, buses and recreational vehicles (RVs). Other design decisions, such as adding chicanes or curb extensions at intersections, work in conjunction with lane widths to influence driver speeds and the feel of the street.

In Charlottesville, the minimum travel lane width is 10', the typical condition is 11', and the maximum should be 12' on Industrial streets where heavy truck traffic is expected. Although each design decision will need to be based on local conditions, guidelines for each street type are shown in Table 11.

Narrower lane widths are most appropriate in urban areas as space is limited and streets tend to have higher levels of pedestrian activity. In this context, narrower lane widths encourage lower speeds, shorten pedestrian crossing distances and may enable the provision of on-street parking and transit stops. Residential streets do not typically require wide travel lanes, and the higher travel speeds that wide lanes tend to encourage are directly in conflict with the walkability, safety, and ambiance desired in residential areas.

In considering the use of narrower lanes, however, designers should recognize that narrow travel lanes reduce vehicle separation from other vehicles and from bicyclists. They can also create complications for buses, trucks and other large vehicles in forcing these vehicles to infringe on multiple lanes when turning. The cumulative relationship between the components of the street must be taken into account. Using minimum dimensions for multiple, adjacent elements should be avoided. In Charlottesville, adjacent parking lanes and vehicular travel lanes must be a minimum of 18'.

	Mixed Use A	Mixed Use B	Downtown	Industrial	Neighborhood A	Neighborhood B
Travel Lanes*	10-11'	10'-11'	10'-11'	11'-12'**	10'-11'	10'-11'
	11' curb lane along transit routes					

\* Combined travel lane and on-street parking width is 18' minimum (7' on-street parking, 11' travel lane OR 8' on-street parking, 10' travel lane)

\*\* 11' travel lane in residential infill areas within Industrial Typology to allow for wider sidewalks

Table 11: Lane Widths

# Medians

A median can be used to narrow the roadway, reduce motor vehicle speeds and improve pedestrian crossings. Medians also provide locations for utilities, opportunities to introduce green elements in the right-of-way and can be used to absorb stormwater and reduce the heat island effect.

- Medians with crosswalks and pedestrian refuges improve pedestrian safety and access by reducing crossing distances and enabling pedestrians to cross roadways in two stages. Islands with crossings should be designed with a stagger, or a “z” pattern, forcing pedestrians to face oncoming traffic before progressing through the second phase of the crossing. Center islands with crosswalks should meet all accessibility requirements:
  - 6’ in width minimum for pedestrian refuge island;
  - 8’ in width is preferred to provide adequate refuge for pedestrians with strollers or bicycles;
  - The sidewalk across the median should be 5’ wide.
- Medians can reduce the risk of head-on collisions by limiting left turn opportunities to desirable locations (e.g., signalized intersections).
- Medians should be carefully designed to ensure proper drainage and maximize the potential for on-site stormwater retention and infiltration.
- Sidewalks should not be reduced in width and bicycle lanes should not be eliminated in order to provide space or additional width for medians.
- Medians can be combined with mid-block pedestrian crossings to reduce crossing distances.
- Medians must meet the width and soil volume minimums outlined in the Sidewalks section to accommodate street trees.



The angled pedestrian walkway through the median orients pedestrians to see approaching vehicles.

# Bicycle Facilities

In addition to accommodating motor vehicles, the roadway should provide facilities for people traveling by bicycle. The 2015 Bicycle and Pedestrian Master Plan Update recommends expanding the network of on- and off- street bicycle facilities and contains design details for each type of facility. The most common facility types and required widths are summarized here.

	Mixed Use A	Mixed Use B	Downtown	Industrial	Neighborhood A	Neighborhood B
Bikes May Use Full Lane Signs					0'	0'
Shared Lane Markings			0'	0'	0'	0'
Bike Lanes	5'-7'	5'-6'	5'-6'	5'	5'	
Climbing Bike Lanes	6'	6'	6'	6'	6'	
Separated Bike Lanes	7'	7'				
Shared Use Path	10'	10'				
		= Not Applicable				

Table 12: Typical Dimensions of Bicycle Facilities



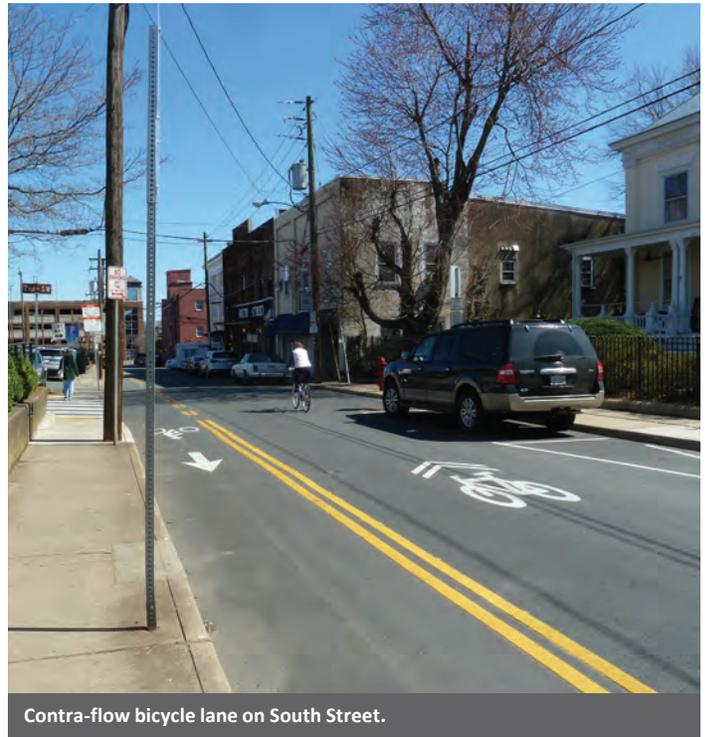
## Shared Roadway (0' additional width)

Shared Roadways are bicycle facilities that designate a vehicular travel lane as a shared space for people to drive and bicycle. This designation is demonstrated to all users through on-road pavement markings, known as “sharrows” or street signage indicating that people bicycling may use the full lane. These facilities do not provide any separation between people driving and bicycling and should not be used on streets where the traffic volume and speeds would be uncomfortable for bicyclists to ride with traffic. Therefore, they are best used on neighborhood streets and streets with posted speed limits of 25 mph or less. However, not all bicyclists will feel comfortable on this type of facility.

On narrow travel lanes adjacent to on-street parking, shared lane markings should be placed in a location that is outside of the door zone of parked vehicles. For detailed dimensions on placement of shared lane markings, see the latest edition of the MUTCD.



Bicycle lane on West Main Street.



Contra-flow bicycle lane on South Street.

### *Bicycle Lane (5-6' feet for typical bike lane)*

Bicycle lanes are one-way, on-road bike facilities that provide a dedicated space for people bicycling parallel to motor vehicle traffic. Bicycle lanes are often delineated with pavement marking stripes and, in some cases, may be fully colored for higher visibility, especially at intersections. Bicycle lanes (without a buffer or edge conditions like on-street parking, guardrails, and high curbing) require a minimum width of 5 feet. If more than 7 feet is provided for a bike lane, some form of physical separation should be provided so that drivers do not confuse the lane with a vehicle lane (see Separated Bicycle Lanes, below).

On one-way streets, a contra-flow lane can be provided. Contra-flow lanes enable only bicyclists to operate in a two directions on one-way streets. Contra-flow lanes are useful to reduce distances bicyclists must travel and can make bicycling safer by creating facilities to help other roadway users understand where to expect bicyclists. A double yellow line should be provided between the contra-flow lanes and the opposing travel lane. The double yellow line should be dashed if parking is provided on both sides of the street. Contra-flow lanes are less desirable on streets with frequent driveway or alley crossings on the side with the proposed contra-flow lane. Care should be taken at the termination of the contra-flow lane: it should be clear where bicyclists should go in the receiving roadway.



One-way separated bicycle lane.



Two-way separated bicycle lane.

## *Separated Bicycle Lanes (2-3' buffer plus 5-7' for a one-way configuration; 10'-12' for a two-way configuration)*

Separated bicycle lanes are on-road facilities that have separation from motor vehicle traffic. Vertical separation can provide visual separation or provide physical protection from motor vehicles using features such as curbs, planters or parked vehicles. Alternatively, vertical separation may be provided by designing the separated bike lane at the same elevation as the sidewalk. In all instances, the separation increases the perceived sense of safety and can make bicycle routes less stressful. These bicycle lanes can be one-directional on each side of the road or bi-directional on one side of the road.

Separated bike lanes are typically installed on streets with higher traffic volumes and/or speeds, with long blocks and therefore fewer intersections. Separated bike lanes

may be appropriate on any street type in Charlottesville, though may be less common on neighborhood streets unless they serve as a major connection to a trail or other facility. Intersection design for separated bike lanes is complex and requires careful attention to conflicts with turning vehicles. For more information, see the *Separated Bike Lane Planning and Design Guide* from the FHWA<sup>9</sup> and the *Separated Bike Lane Planning and Design Guide* by the Massachusetts Department of Transportation.<sup>10</sup>

In right-of-way constrained areas (at bus stops, bulbouts, intersections, etc), the minimum widths of the separated bicycle lanes can be reduced to 4' and 8' with staff approval.

# Parking

In addition to moving people around and through the city, streets in Charlottesville also provide essential loading zones and parking spaces for vehicles. Using the public right-of-way for loading and parking supports a variety of adjacent land uses and helps lower costs for developers when the number of required off-street parking spaces is reduced.

Parking demand is highest near Downtown and the University of Virginia campus and Medical Center. There is also high demand for on-street parking in residential neighborhoods and other areas without off-street parking.

Most private vehicles are 6' to 6.5' wide, and 7' parking lanes are appropriate on most street types as summarized in Table 13 below. Wider parking lanes are desirable in areas that receive frequent deliveries. Along streets with both on-street parking and bicycle lanes, the width of the parking lane should be minimized in favor of a wider bicycle lane.



	Mixed Use A	Mixed Use B	Downtown	Industrial	Neighborhood A	Neighborhood B
<b>Parking Lane Width</b>	8'	7'-8'	7'-8'	7'-8'	7'-8'*	7'-8'
<b>Applicability</b>	Limited or none	Loading zones should be considered	Loading zones should be considered	Limited or none	Only where driveways and off-street parking are not available	

\* Combined travel lane and on-street parking width is 18' minimum (7' on-street parking, 11' travel lane OR 8' on-street parking, 10' travel lane)

Table 13: On-street Parking Lane Widths

## 4.3 Intersections

Intersections are necessary elements of the street network but create potential conflicts between users, therefore, intersection design is critical to the safety and functionality of a street. The following guidelines should be used to create intersections that are safe, accessible, multimodal and balance the needs of all users.

### Basic Design

- Simple right-angle intersections are best for all users since many intersection problems are worsened at skewed and multi-legged intersections.
- Good intersection designs are compact.
- Free-flowing movements should be avoided.
- Signal timing should consider the safety and convenience of all users and should not hinder bicycle or foot traffic with overly long waits or insufficient crossing times.

### Intersection Geometry

Intersection geometry is a critical element of intersection design, regardless of the type of traffic control used. Geometry sets the basis for how all users traverse intersections and interact with each other. The principles of intersection geometry apply to both street intersections and limited access roadway on- and off-ramps.

#### *Skewed Intersections*

Skewed intersections are generally undesirable and introduce the following complications for all users:

- The travel distance across the intersection is greater, which increases exposure to conflicts and lengthens signal phases for pedestrians and vehicles.
- Skewed approaches require users to crane their necks to see other approaching users, making it less likely that some users will be seen.
- Obtuse angles encourage speeding by allowing vehicles to navigate the intersection without slowing down.

There are several strategies to alleviate some of the problems with skewed intersections, including:

- Every reasonable effort should be made to design or redesign the intersection closer to a right angle. Some right-of-way may have to be purchased, but this can be offset by the larger area no longer needed for the intersection, which can be sold back to adjoining property owners or repurposed for a pocket park, rain garden, greenery, etc.
- Pedestrian refuges should be provided if the crossing distance exceeds approximately 40’.
- General use travel lanes and bike lanes may be striped with dashes to guide bicyclists and motorists through a long undefined area.

#### *Multi-leg Intersections*

Multi-leg intersections (more than two approaching roadways) are generally undesirable and introduce the following complications for all users:

- Multiple conflict points are added as users arrive from several directions.
- Users may have difficulty assessing all approaches to identify all possible conflicts.
- At least one leg will be skewed.
- Users must cross more lanes of traffic and the total travel distance across the intersection is increased.

To alleviate the problems with multi-leg intersections:

- Every reasonable effort should be made to design the intersection so there are no more than four legs. This is accomplished by removing one or more legs from the major intersection and creating a minor intersection further up or downstream.
- As an alternative, one or more of the approach roads can be closed to motor vehicle traffic, while still allowing access for pedestrians and bicyclists.
- Roundabouts should be considered.
- Pedestrian refuges should be created if the crossing distance exceeds approximately 40’.
- General use travel lanes and bike lanes may be striped with dashes to guide bicyclists and motorists through a long undefined area.

	Mixed Use A	Mixed Use B	Downtown	Industrial	Neighborhood A	Neighborhood B
	10'	10'	10'	10'-11'	N/A	N/A
<b>Turn Lanes</b>	Center turn lane may be replaced by median between intersections		Only at major intersections and major destination access points	Center turn lane may be replaced by median between intersections		

Table 14: Turn Lane Widths

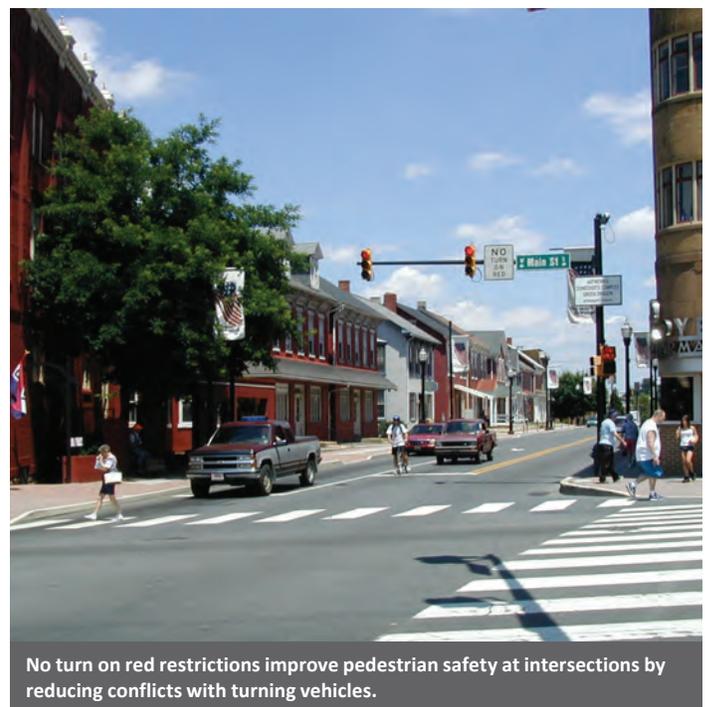
## Turn lanes

Where there are high volumes of turning vehicles, turn lanes allow through traffic to move smoothly and provide additional stacking space at intersections. Where they increase the width of the roadway, turn lanes make it more difficult for pedestrians and bicyclists to cross the street and increase the number of conflict points in an intersection.

- Channelized right turn lanes at intersections encourage faster motor vehicle turning speeds and should generally be avoided, however, in locations where a channelized right turn lane is necessary, it should be designed to encourage drivers to yield to pedestrians. The lane should approach the intersecting road with a “merge” condition (vehicles in the channelized right turn lane should be required to either yield or stop before turning right onto the receiving roadway).
- Two-way left turn lanes reduce the tendency for waiting motorists to ‘jump’ in front of oncoming vehicles in an adjacent through lane, and allow turning motorists to see all oncoming traffic.
- Center turn lanes do not need to be continuous along the length of a corridor. Turn lanes should be limited to essential intersections and replaced with medians to limit the number of turning movements. The benefits of medians are addressed in the Roadway section of these Guidelines.
- Intersections with dual turn lanes can be confusing for drivers and cyclists to navigate. Consider bike boxes and two-stage turn boxes to provide clearly designated spaces for bicyclists.

## Intersection Control

Intersection controls, such as signals and stop/yield signs, are one of the most important factors in intersection design. The goal of controlling intersections is to provide the safest, most efficient means to move people across an intersection, whether walking, riding a bicycle, taking the bus or driving. Specific attention should be given to vulnerable users, such as pedestrians and bicyclists, at intersections. Intersection controls range from uncontrolled intersections with no marked crosswalk, to complex signalized intersections with crosswalks striped on all legs, multiple phases, intervals and indications.



No turn on red restrictions improve pedestrian safety at intersections by reducing conflicts with turning vehicles.

# Prioritizing Pedestrians at Signalized Intersections

One tool that can improve the visibility and comfort of pedestrians at intersections is the use of a Leading Pedestrian Interval (LPI). An LPI is when pedestrians are given the WALK indication 3 to 7 seconds before conflicting motor vehicles traveling in the same direction are given a green light. LPIs give pedestrians a head start, increasing visibility for all modes. LPIs should be considered at intersections with high conflicts of pedestrians and turning vehicles, as determined by city staff.

Another tool that is used in areas with the highest pedestrian traffic is an exclusive pedestrian phase in the traffic signal (also known as a pedestrian scramble phase). An exclusive pedestrian phase is an additional phase in the signal cycle that is provided only for pedestrian movements while all pedestrian traffic is stopped. Exclusive pedestrian phases should generally be used at intersections where conflicting turning vehicles are equal to or greater than 250 vehicles per hour, where sight distances are restricted, at intersections with complex geometry, or near elderly housing, schools or similar destinations.

## *Signalized Intersections*

All signalized intersections should contain indications for motor vehicles and pedestrians, and signals for bicyclists where appropriate. By optimizing signal phasing and timings, multiple modes are able to safely move through the intersection with limited conflicts, low delay and more comfort.

Pedestrian signals at intersections communicate safe crossing times to pedestrians at signalized intersections, and should be provided for all crosswalks at all signalized intersections. Pedestrian signals have WALK, flashing DON'T WALK (sometimes replaced by a countdown timer) and steady DON'T WALK phases. The following should be kept in mind when programming pedestrian signals at intersections:

- Use shorter cycle lengths to minimize delay for people walking at intersections with high pedestrian volumes. A two minute cycle length may represent a small percentage of a 20 minute car trip, but is a significant proportion of a 10 minute walking trip.
- If used, pedestrian pushbuttons should be located near each end of the crosswalk per MUTCD guidelines. They should also be provided at a height that is consistent with the current Americans with Disabilities Act Guidelines.
- Provide sufficient signal time to cross the street. The MUTCD specifies a pedestrian walking speed of 3.5 feet per second. In locations with a high percentage of aging pedestrians, 3.0 feet per second may be more appropriate.

## *Stop-controlled Intersections*

Stop-controlled approaches are easiest for pedestrians to cross because motorists and bicyclists must stop and yield the right of way to pedestrians. Stop-controlled intersections also help reduce pedestrian wait times. However, the use of stop signs must balance safety with efficient traffic flow for all modes, including bicycles and transit vehicles. Stop sign installation requires specific warrants be met as determined by the MUTCD.

- Typically, marked crosswalks should be installed at each leg of all stop-controlled intersections, unless otherwise directed by the City Traffic Engineer.
- Stop signs should not be used for speed control.
- The use of stop signs should also be limited on streets with bikeways where feasible, as it requires significant energy to stop and start at signs resulting in lower levels of compliance.

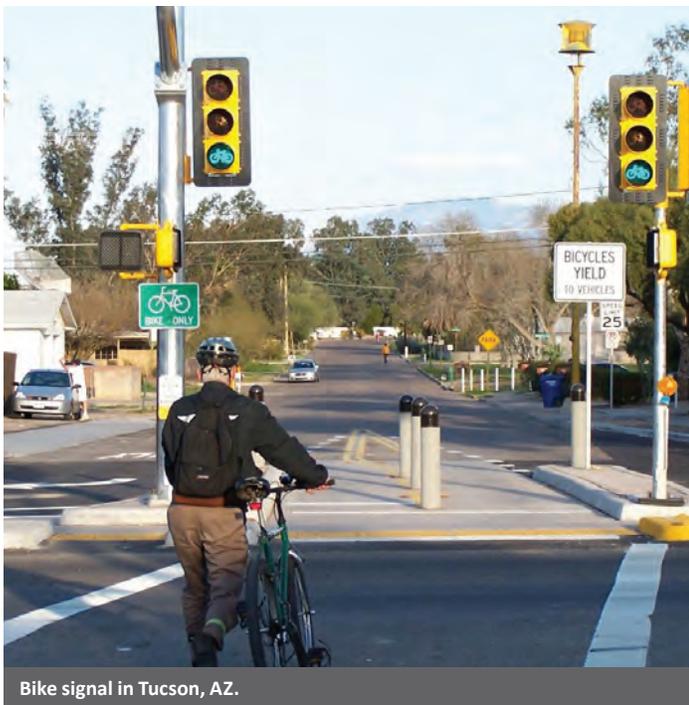
## Bicycle Features at Intersections

Designs for intersections with bicycle facilities should reduce conflict between bicyclists (and other vulnerable road users) and vehicles by heightening the level of visibility, denoting clear right-of-way and facilitating eye contact and awareness with other modes. Intersection treatments can improve both queuing and merging maneuvers for bicyclists, and are often accompanied by bicycle-specific signals.

The configuration of a safe intersection for bicyclists should include elements such as color, signage, medians, signal detection and pavement markings. Intersection design should take into consideration existing and anticipated bicyclist, pedestrian and motorist movements. In all cases, the degree of mixing or separation between bicyclists and other modes is intended to reduce the risk of crashes and increase bicyclist comfort. The level of treatment required for bicyclists at an intersection will depend on the bicycle facility type used, whether bicycle facilities are intersecting, and the adjacent street function and land use. For specific design guidance, reference the latest edition of the *NACTO Urban Bikeway Design Guide*<sup>24</sup>, the *AASHTO Guide for the Development of Bicycle Facilities*<sup>25</sup>, and the *Manual on Uniform Traffic Control Devices (MUTCD)*.<sup>26</sup>



Bike box at the intersection of University Avenue and Rugby Road.



Bike signal in Tucson, AZ.

24 <http://nacto.org/publication/urban-bikeway-design-guide/>

25 [https://bookstore.transportation.org/item\\_details.aspx?ID=1943](https://bookstore.transportation.org/item_details.aspx?ID=1943)

26 <http://mutcd.fhwa.dot.gov/>

	Mixed Use A	Mixed Use B	Downtown	Industrial	Neighborhood A	Neighborhood B
Effective Curb Radii	20'-30'	20'-20'	15'-20'	20'-30'	15'-25'	15'-25'

Table 15: Curb Radii

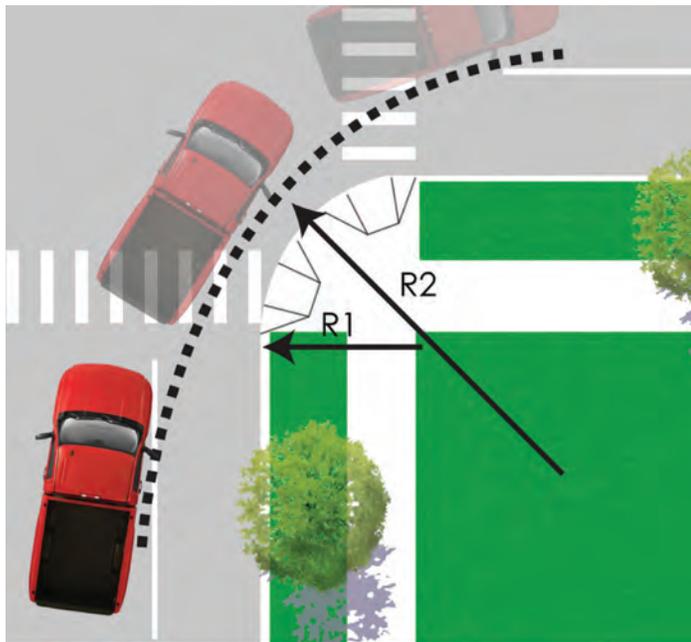


Figure 12: Physical (R1) and effective (R2) intersection curb radii.

## Corners and Curb radii

The *AASHTO Green Book* provides guidance on turn radii at corners for different types of vehicles (large trucks, school buses, etc). However, designing for the largest vehicle that *might* use an intersection can encourage drivers to make higher speed turns, lengthen crossing distances for pedestrians, and leave less space for sidewalks and other uses. Where large vehicles need to be accommodated, designers should consider the following factors to increase the effective curb radius without increasing the actual, physical curb radius:

- Cross-street lane width.** On streets with heavy bus or truck traffic, wider lanes may be needed to provide adequate turning space while maintaining a tight corner radius. However, on streets with moderate heavy vehicle traffic, designs that assume the turning vehicles will encroach into the opposite travel lane on the receiving street may be acceptable. Table 15 summarizes the curb radii appropriate for each street type.
- Placement of stop lines on non-divided cross-streets.** On cross-streets where traffic volumes do not create pressure to locate vehicle stop lines as close to the intersection as possible, moving the stop line back from the intersection can add cushion space for large vehicles to make right or left turns.
- On-street parking or near-side bus stops.** Multiple travel lanes, space used for buses, bike lanes and on street parking can help a large vehicle make a wider turn at an intersection, especially when coupled with the ability to bend outside of the immediate lane width on the street receiving the turn movement. The diagram in Figure 12 illustrates this concept. The curb radius (R1) allows shorter crossing distances for pedestrians, while, the effective radius (R2) defines the path that vehicles may follow from one travel lane to another. In this example, on-street parking allows vehicles to navigate a wider path without colliding with the corner curb. This is important with large trucks and other heavy vehicles as it can keep a smaller radius and give pedestrians a shorter crossing distance.



Perpendicular curb ramps.

## Curb ramps

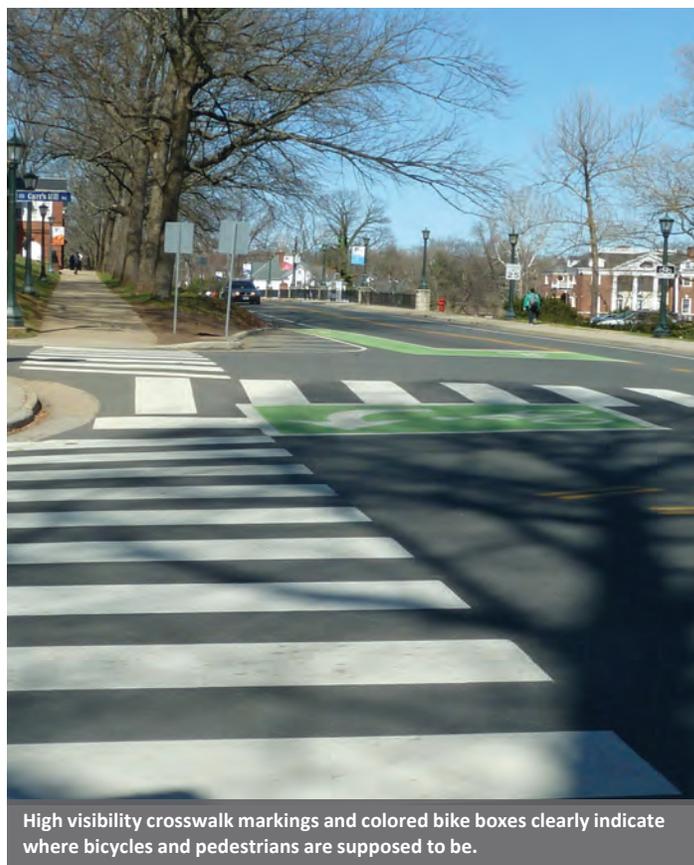
Curb ramps provide pedestrians a smooth transition from the sidewalk to the street. Appropriately designed curb ramps are critical for providing access across intersections and at midblock for people with mobility and visual impairments, as well as people pushing strollers, grocery carts, suitcases or children riding bicycles. Curb ramp design must meet the requirements of Title II of the Americans with Disabilities Act, which provides detailed standards regarding ramp slope, landing area size and other characteristics. In addition, curb ramps should adhere to the following guidelines:

- Curb ramps should be aligned with crosswalks. To achieve this, two perpendicular ramps are often preferable over a single diagonal ramp.
- Under ADA standards, curb ramps are required to have detectable warning strips that extend the full width of the ramp. These strips are designed to alert blind or low-vision pedestrians when they are entering a roadway.
- During winter, snow must be cleared from curb ramps to provide an accessible route.

## Crosswalks

As the most vulnerable road user, the safety of pedestrians should be the most important criterion in the design of crosswalks. Crosswalks indicate to pedestrians where they should cross the street and inform drivers where to expect pedestrians.

When streets are built or repaved, the City of Charlottesville upgrades curb ramps to ADA standards and installs high-visibility zebra style or ladder crosswalks. These guidelines recommend installing the high-visibility zebra style marking as the default because of their added safety benefit and their minimal installation and maintenance cost difference. The ladder crosswalk markings can still be used in lower pedestrian volume or specific character areas. In locations with significant pedestrian traffic and difficult sight lines, the city will also consider additional elements such as curb extensions, advanced warning signs or pedestrian activated rapid flashing beacons.



High visibility crosswalk markings and colored bike boxes clearly indicate where bicycles and pedestrians are supposed to be.

## Intersections

Marked crosswalks should be installed at each leg of all signal- and stop-controlled intersections unless otherwise directed by the City Traffic Engineer. When determining whether a crosswalk should be marked, the following should be considered:

- Traffic speeds and other crosswalks
- Traffic volumes
- Crossing Distances
- Crash History
- Distance from adjacent signalized intersections
- Need/demand for crossing
- Sight distance
- Street lighting
- Location of drainage inlets

## Mid-block/Uncontrolled Locations

Charlottesville currently follows the Virginia Department of Transportation’s “Guidelines for the Installation of Marked Crosswalks<sup>27</sup>,” and should continue to do so. Where marked crosswalks are more than 600’ apart, mid-block pedestrian crossings can be used to shorten the distance a pedestrian needs to walk.

- All mid-block marked crosswalks should be accompanied by advanced signage and pedestrian scale lighting to improve the visibility of pedestrians.
- Advance yield lines and signs should be placed 20’ to 50’ in advance of crosswalks on uncontrolled multilane approaches, and parking should be prohibited in the area between the yield line and the crosswalk.



Midblock crosswalk with rapid flashing beacon on Old Lynchburg Road.



Curb extension.

## Curb extensions

Curb extensions, also known as neckdowns, bulb-outs, or bus bulbs (when they occur at bus stops), are created by expanding the sidewalk at intersections or midblock crossings. Curb extensions are used to improve the safety and ease of walking along streets by shortening crossing distances and making pedestrians more visible to drivers. Bulb-outs may also provide additional space for pedestrians to queue before crossing the street or while waiting for a bus.

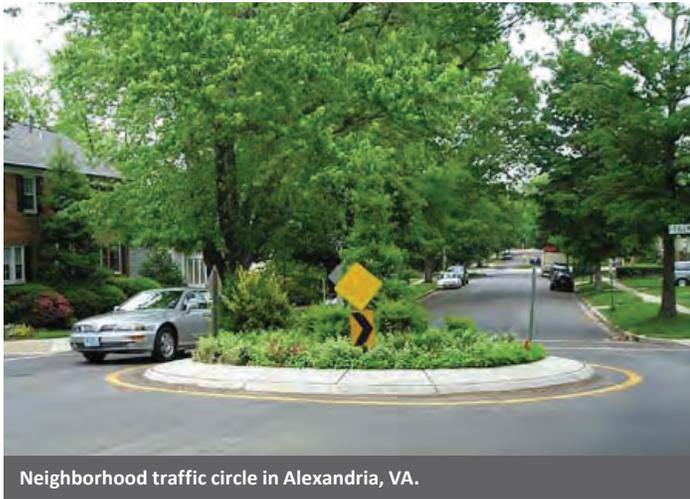
Curb extensions at intersections may extend into either one or multiple legs of the intersection, depending on the configuration of parking.

Curb extensions should adhere to the following guidelines:

- Curb extensions should be considered at corners or midblock only where parking is present or where motor vehicle traffic deflection is provided through other curbside uses such as bicycle share stations or parklets.
- Curb extensions should match the width of the crosswalk at a minimum, and designers may want to consider providing a 20’ long curb extension to restrict parking within 20’ of an intersection.
- When curb extensions conflict with turning movements, the width and/or length should be reduced rather than eliminating the extension wherever possible.
- Designers should be aware of the presence of a bike lane or a planned bike lane. Curb extensions should not create barriers or narrow lane widths for bicyclists, or force them to quickly merge with vehicle traffic.

<sup>27</sup> [http://www.virginiadot.org/business/resources/marked\\_20crosswalks\\_20final\\_20guidelines\\_2012-14-05.pdf](http://www.virginiadot.org/business/resources/marked_20crosswalks_20final_20guidelines_2012-14-05.pdf)

- Curb extensions may also impact underground utilities, curbside parking, delivery access, garbage removal, snow plows and street sweepers. These impacts should be evaluated when considering whether to install a bump out.
- Curb extension installation may require the relocation of existing storm catch basins which can increase costs substantially. Catch basins should be centered at least 5' from the beginning of the curb extension.
- Placing curb extensions at corners with fire hydrants can also help to ensure fire access is not blocked by parked cars.



Neighborhood traffic circle in Alexandria, VA.

## Neighborhood Traffic Circles

Neighborhood traffic circles, or small roundabouts, can reduce speeds and accidents in low-volume areas. They are also good for local streets because they can be used in lieu of STOP signs to move vehicles efficiently and moderate vehicular speeds through the intersection and thereby help to reduce emissions. When clear, traffic circles also allow bicyclists to proceed through in the intersection without losing momentum.

- Create a mountable curb for areas with large trucks or where emergency vehicles require access in constrained spaces.
- Traffic circles provide great opportunities to include green infrastructure or public art. They can be designed with greenscape elements that capture stormwater or elements that help create a sense of community.
  - Plant material must be maintained in order to not obstruct visibility.
  - A neighborhood partner could be identified for maintenance of any plantings or art.
- An interesting paver layout or other art work might be just as visually appealing without the maintenance needs of plants.
- Maintain circle visibility with paint and reflectors.
- Designs should consider the speed of the roadway and regulatory and/or warning signage should be provided to remind traffic to proceed counterclockwise around the circle.

THIS PAGE INTENTIONALLY LEFT BLANK

# CHAPTER 5

---

## Implementation

The previous chapters of the Guidelines dealt with the principles and elements of street design in Charlottesville, and this chapter covers the process of getting street projects implemented. Developers, partner agencies and consultants are involved in the design and construction of streets, but the City of Charlottesville has the primary responsibility for guiding and permitting street design, and maintaining the streets within city limits. This chapter describes the process for street design and construction, presents a list of priority corridors for improvements, and recommends using pilot projects to alter streets on a temporary basis before making permanent changes.

## 5.1 Department Responsibilities

This section outlines city departmental responsibilities relative to the planning, design, construction and management of the public right-of-way.

### Neighborhood Development Services

Building Permits and Inspections, Planning and Design, Engineering, Transportation and Traffic Engineering are all housed within Neighborhood Development Services. This department serves many functions related to the streets within the city, including:

- Processing permits for construction and temporary closures within the right-of-way,
- Managing comprehensive and small area planning processes,
- Installing traffic signs and conducting signal studies,
- Managing neighborhood traffic,
- Coordinating development review
- Creating pavement marking plans for repavings
- Coordinating neighborhood drainage projects, and
- Designing new roadways and sidewalks

## Parks and Recreation

The City Parks and Recreation Department is responsible for the planting, maintenance, and removal of trees and flowers on public properties including parks, schools, street right-of-ways and at public buildings such as City Hall.

## Public Works Department

Within Public Works, the Environmental Sustainability Division is dedicated to environmental compliance, public education, pollution prevention, and environmental stewardship opportunities. The Division, along with the Stormwater Utility staff, assist with the planning and design of green and blue infrastructure within the right-of-way and public communications to encourage proper use and understanding of the infrastructure design.

The Public Service Division is responsible for paving and maintaining streets and sidewalks, issuing curb cut permits, collecting refuse and recyclables, and the installation and maintenance of streetlights, traffic signals, and crossing signals.

The Public Service Division plows snow from the roadway, but property owners are required to remove snow from sidewalks in front of their property.

The Public Utilities Division is responsible for providing water, collecting wastewater, conveying stormwater and distributing natural gas. The Public Utilities Division is also responsible for utility line locating through Miss Utility, and meter reading in cooperation with the Utility Billing Office.

## 5.2 Project Types

Not all street projects are the same. Street projects in Charlottesville include the following types:

Scale of Project	Type of Project
<p style="text-align: center;">Large</p>  <p style="text-align: center;">Small</p>	Major Corridor Improvements
	CIP Projects
	Private Developments
	Retrofit Projects
	Maintenance
	Neighborhood Street Mural

Table 16: Common Street Project Types

**Major Corridor Improvements** are the largest, most complex and costly type of street project. These are often planned many years in advance and may rely on multiple funding sources from either the state or federal level.

**CIP Projects** have been identified in city planning processes and budgeted for in the city's the Capital Improvement Program (CIP). These projects may include ADA updates, new sidewalks, bicycle lanes or a combination of these elements. The CIP is updated on an annual basis with the process starting in August.<sup>28</sup>

**Private Developments** do not always affect changes in the right-of-way, but for large projects, developers may be required to perform a traffic study and make improvements in the right-of-way to mitigate any issues caused by increases in traffic. All new streets constructed to provide access to private development must meet the standards set forth in City Code and the SADM.

**Retrofit Projects** are generally smaller in scale and address a specific issue at an intersection or along a short section of street. These projects must be designed around significant constraints to keep costs manageable.

**Maintenance** projects are limited in their ability to significantly change the geometry of a street (i.e. the curb line), but Charlottesville proactively upgrades curb ramps and crosswalks and designs and adds bicycle facilities during scheduled repaving and restriping projects. Regular maintenance activities like sweeping and plowing do not change the street.

**Neighborhood Street Murals** are small scale art projects initiated by neighborhoods wishing to enliven the street. The application process and final design is managed by the City Traffic Engineer, and the mural is painted by community volunteers.

<sup>28</sup> F.Y. 2015 - 2019 Capital Improvement Program Development Timeline. <http://www.charlottesville.org/Home/ShowDocument?id=27962>

## 5.3 Development Review Process

The different types of street projects go through different review processes depending on the scale of the project and lead agent.

The City of Charlottesville has a Development Review Team in place to review site plans for private development. It is recommended that the Development Review Team also review plans for street projects to ensure the *Streets That Work* Guiding Principles are met to the furthest extent possible within budget and right-of-way constraints.

The following charts show the basic process for street projects. Private developers must follow all of the steps and meet the requirements of the City's Development Process<sup>29</sup>. These Guidelines should be used by developers when creating their design, to assist the Development Review Team review designs and by the public as a point of reference when public input is requested as part of the design process.

### The Development Review Team has representation from multiple city departments and disciplines:

- ADA Coordinator
- Bicycle and Pedestrian Coordinator
- Building Official
- Engineering
- Environmental Sustainability Office
- Fire Department /EMS
- Historic Preservation
- Neighborhood Planner
- Parks and Recreation/ Urban Forester
- Police
- Public Service
- Traffic Engineering
- Trails Planner
- Transit
- Urban Design
- Utilities
- Zoning

<sup>29</sup> <http://www.charlottesville.org/departments-and-services/departments-h-z/neighborhood-development-services/development-ordinances>

# Developer Initiated



Figure 13: Process for a Developer Initiated Street Project

## City-led CIP Projects

## City-led Retrofits

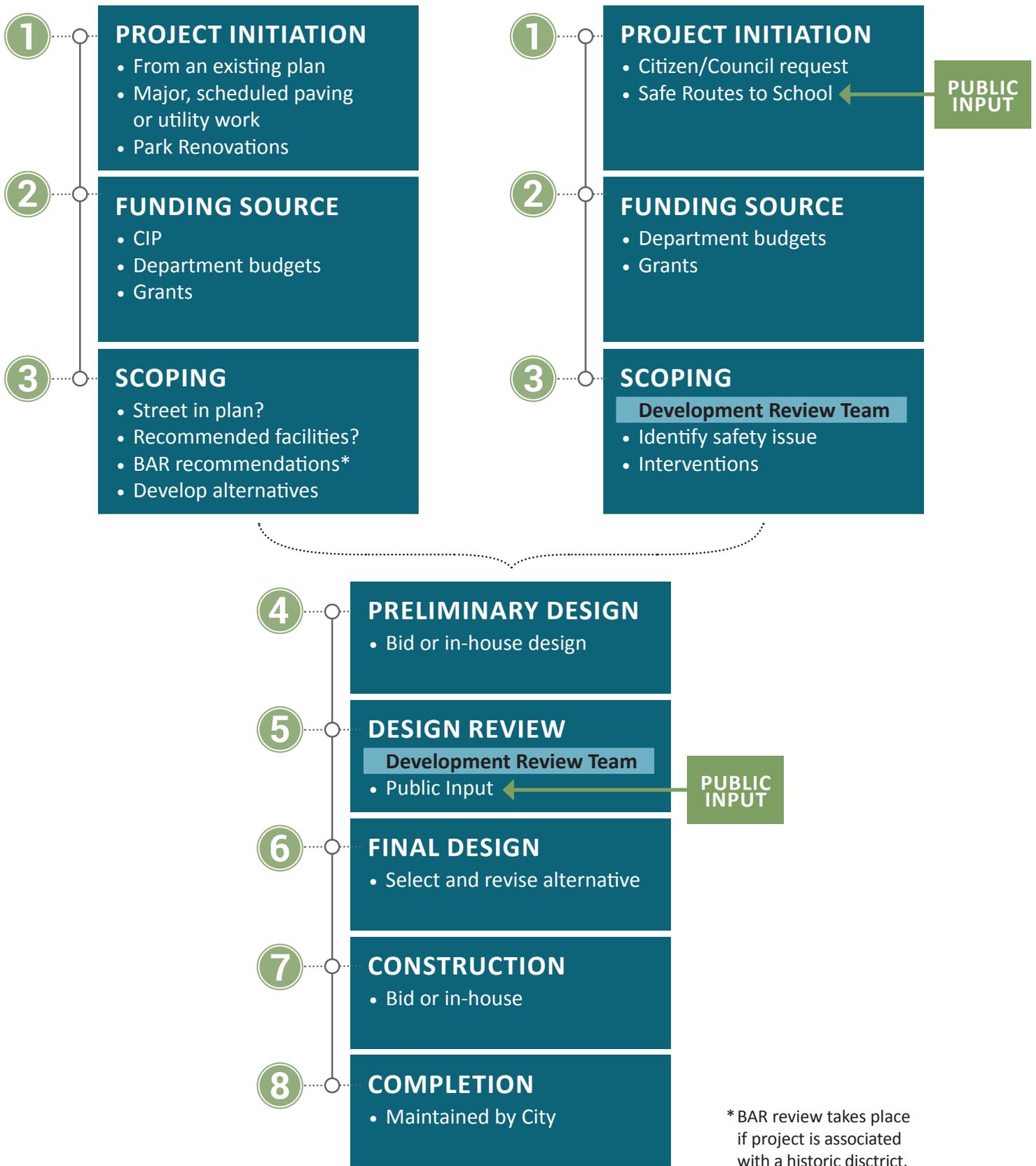


Figure 14: Process for a City-led Street Project

## 5.4 Streets that Work Priority Projects

The *Streets That Work* prioritization process used a standard set of criteria to compare all of the *framework* streets in Charlottesville. The process identified priority corridors and intersections where improvements based on the *Streets That Work* Guidelines would have a significant positive impact on the comfort and safety of all street users. An overview of the process and a subset of priority corridors and intersections are included in this chapter; the complete list of *framework* streets with priority scores can be found in Appendix D.

### Ranking Criteria

A total of eleven criteria were used in the prioritization process to identify priority intersections and corridors. The criteria were assigned the relative weights shown in Table 17. Safety data, both quantitative and qualitative, were given the highest weights. The quantitative data was in the form of crash data for all modes supplied by the Charlottesville Police Department, and the qualitative data on safety was gathered from public input received at neighborhood town hall meetings and during the *Streets That Work* planning process. More information on the public input process can be found in Appendix B.

Criteria related to bicyclist and pedestrian infrastructure, ADA accessibility and access to parks and schools received the second highest weights. The bicycle and pedestrian infrastructure data combined the bicycle facility and sidewalk recommendations in the 2015 Bicycle and Pedestrian Master Plan.<sup>30</sup> ADA accessibility data sets included the locations of curb ramps that do not meet ADA standards from the City’s ADA Transition Plan and intersections with inaccessible push buttons surveyed by the City in 2015.<sup>31</sup> The locations of schools and parks were provided by the City’s GIS staff. All of these factors were assigned ten points each.

The remaining five criteria were given five points each; they include the posted speed limit, roadway classification (as a proxy for traffic volumes), bicyclist/pedestrian demand, transit stops and locations of Capital Improvement Projects (CIP). Roads with higher posted speed limits and heavier traffic volumes based on roadway classification received

more points than roads with slower posted speed limits and local roadway classifications. The bicyclist and pedestrian demand analysis from the 2015 Bicycle and Pedestrian Master Plan was calculated using several inputs, including population and employment densities, proximity to shopping, schools, and parks as well as existing bicycle and pedestrian infrastructure and household car ownership.<sup>32</sup> Transit stop and CIP project locations were provided by the City’s GIS staff.

Criteria	Weight
Public Comments (Perceived safety)	20
Crash Data	15
Top 20 Planned Bicycle/Pedestrian Projects	10
ADA Accessibility (Curb ramps and accessible push buttons)	10
Schools	10
Parks	10
Posted speed limit	5
Roadway classification (Proxy for traffic volume)	5
Bicyclist/Pedestrian demand	5
Transit Stops	5
CIP	5
<b>Total</b>	<b>100</b>

Table 17: *Streets That Work* Priority Corridor Weighting Factors

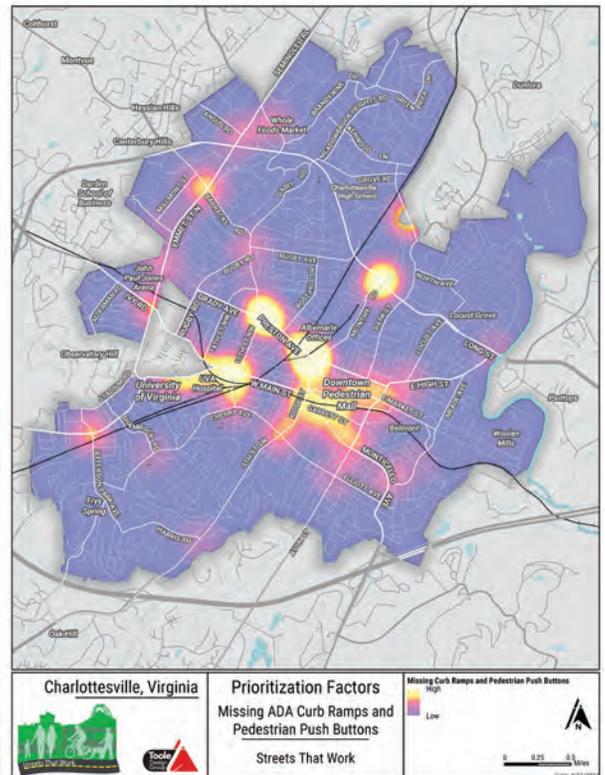
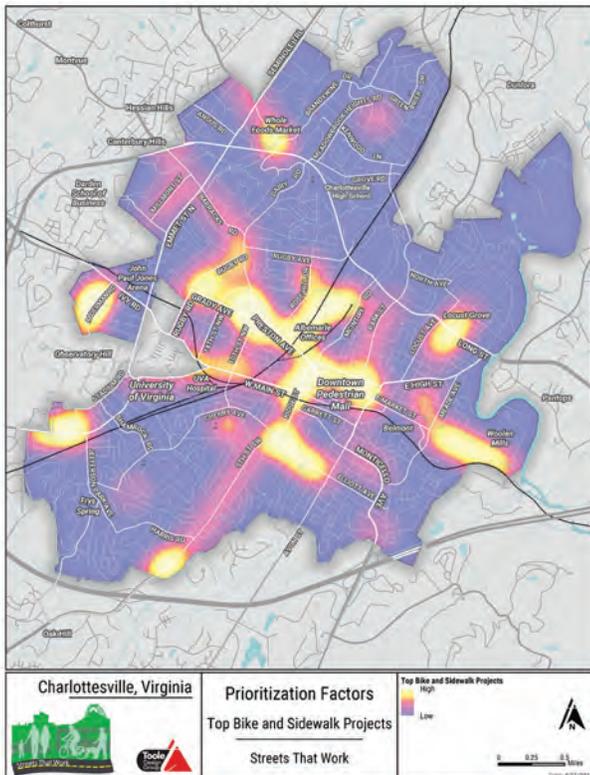
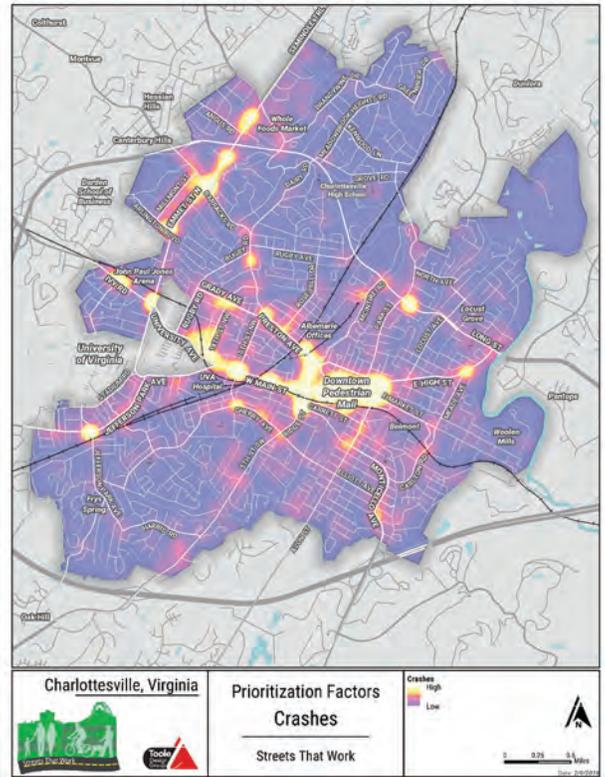
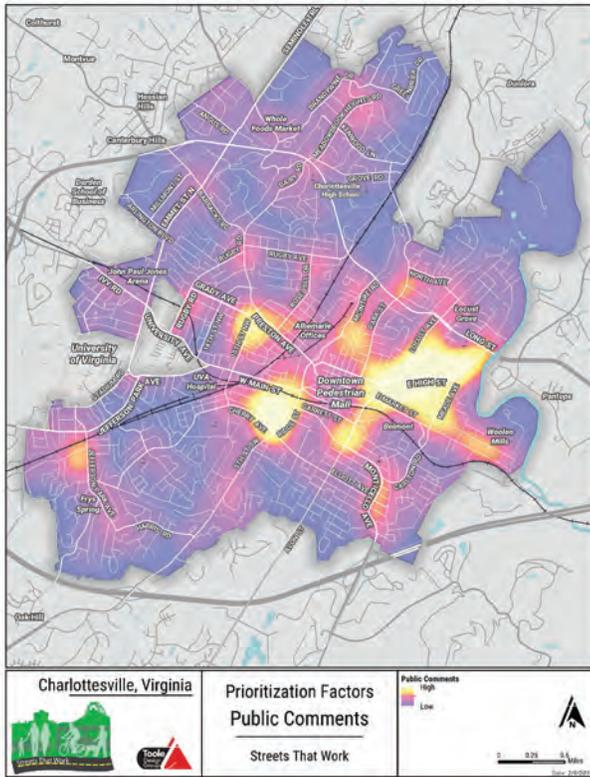
30 <http://www.charlottesville.org/departments-and-services/departments-h-z/neighborhood-development-services/transportation/bicycle-and-pedestrian/2014-bicycle-pedestrian-master-plan-update>

31 <http://www.charlottesville.org/home/showdocument?id=33416>

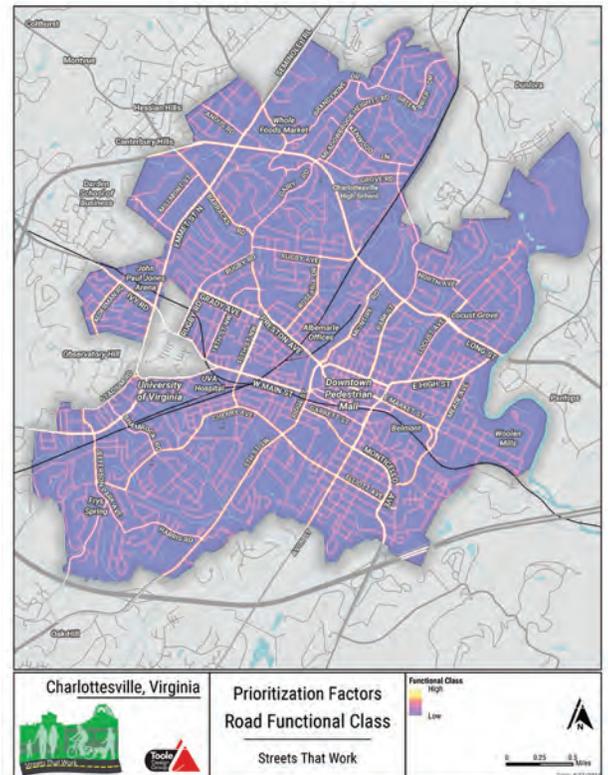
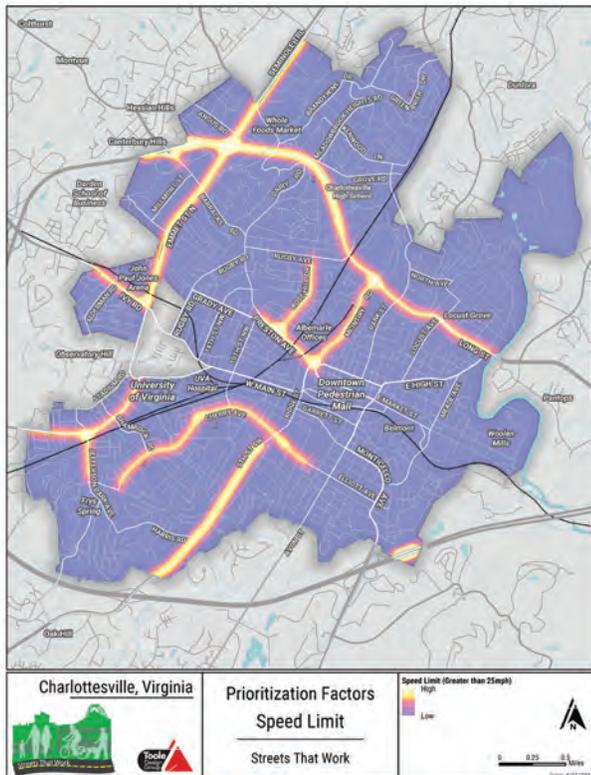
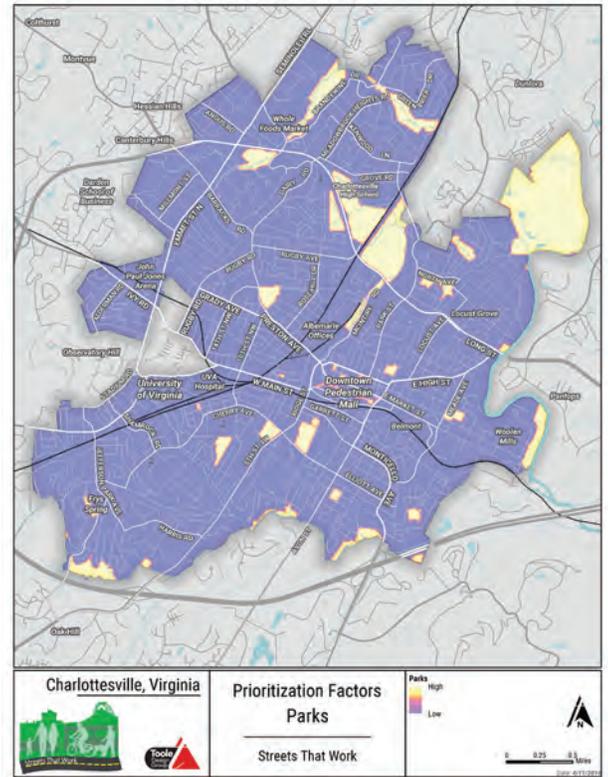
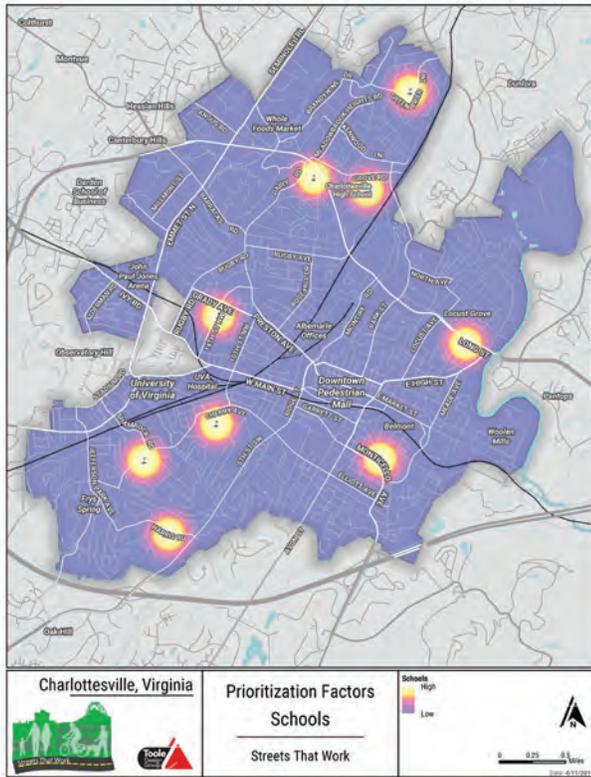
32 <http://www.charlottesville.org/departments-and-services/departments-h-z/neighborhood-development-services/transportation/bicycle-and-pedestrian/2014-bicycle-pedestrian-master-plan-update>

# Prioritization Process

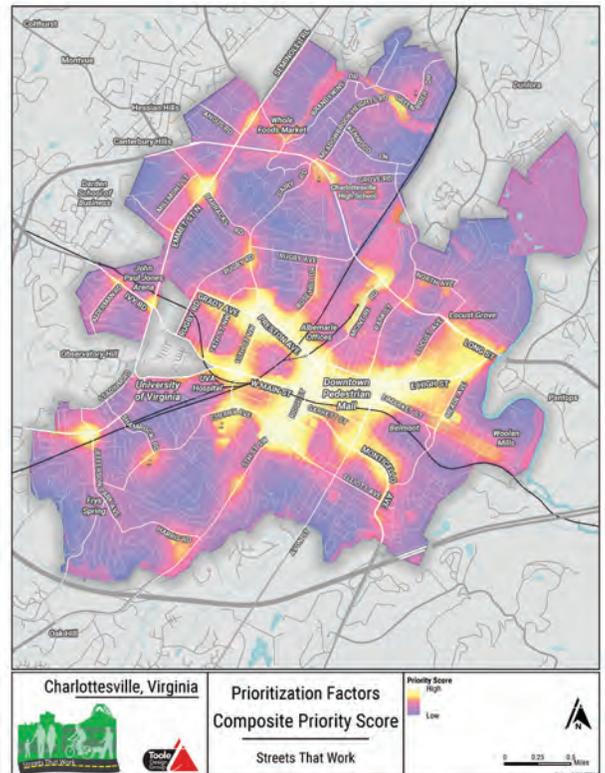
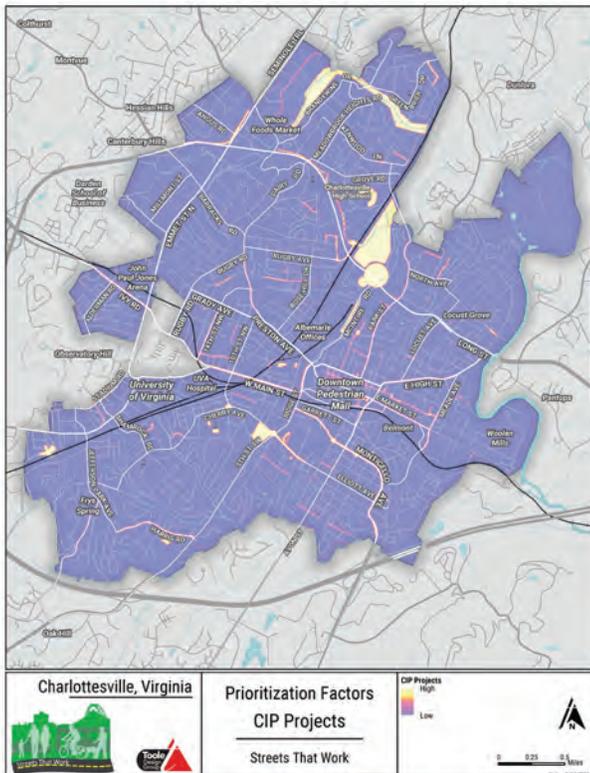
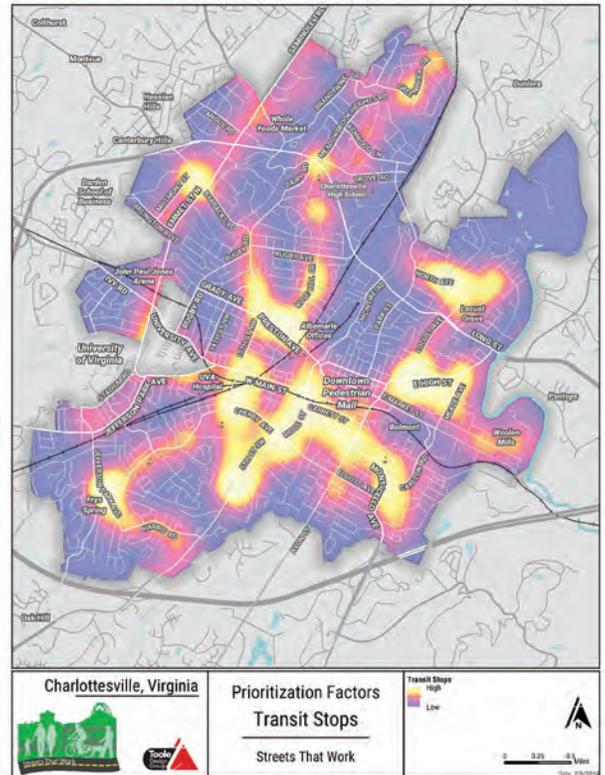
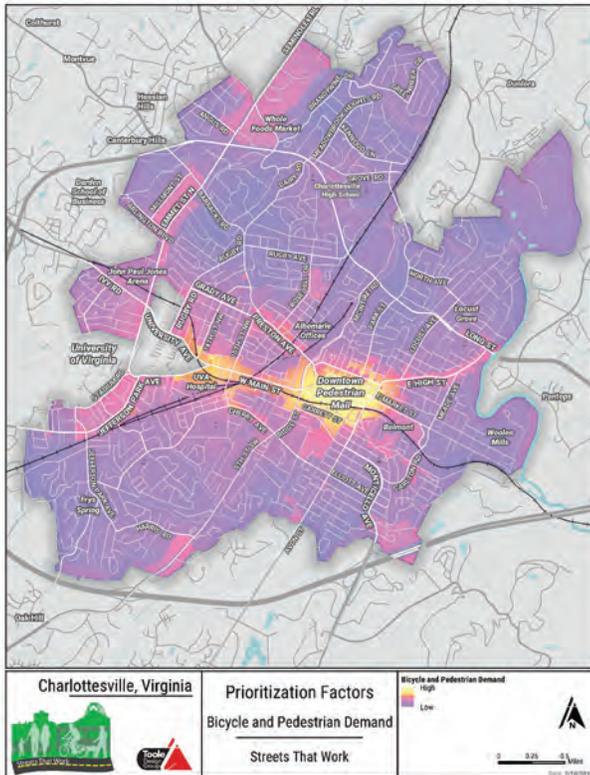
Data for each criterion was mapped separately using GIS software to create heat maps. The eleven heat maps were combined to create an overall heat map, and a composite score was calculated for each *framework* street and intersection based on the prevalence and assigned weight of each criteria.



# Prioritization Process (continued)

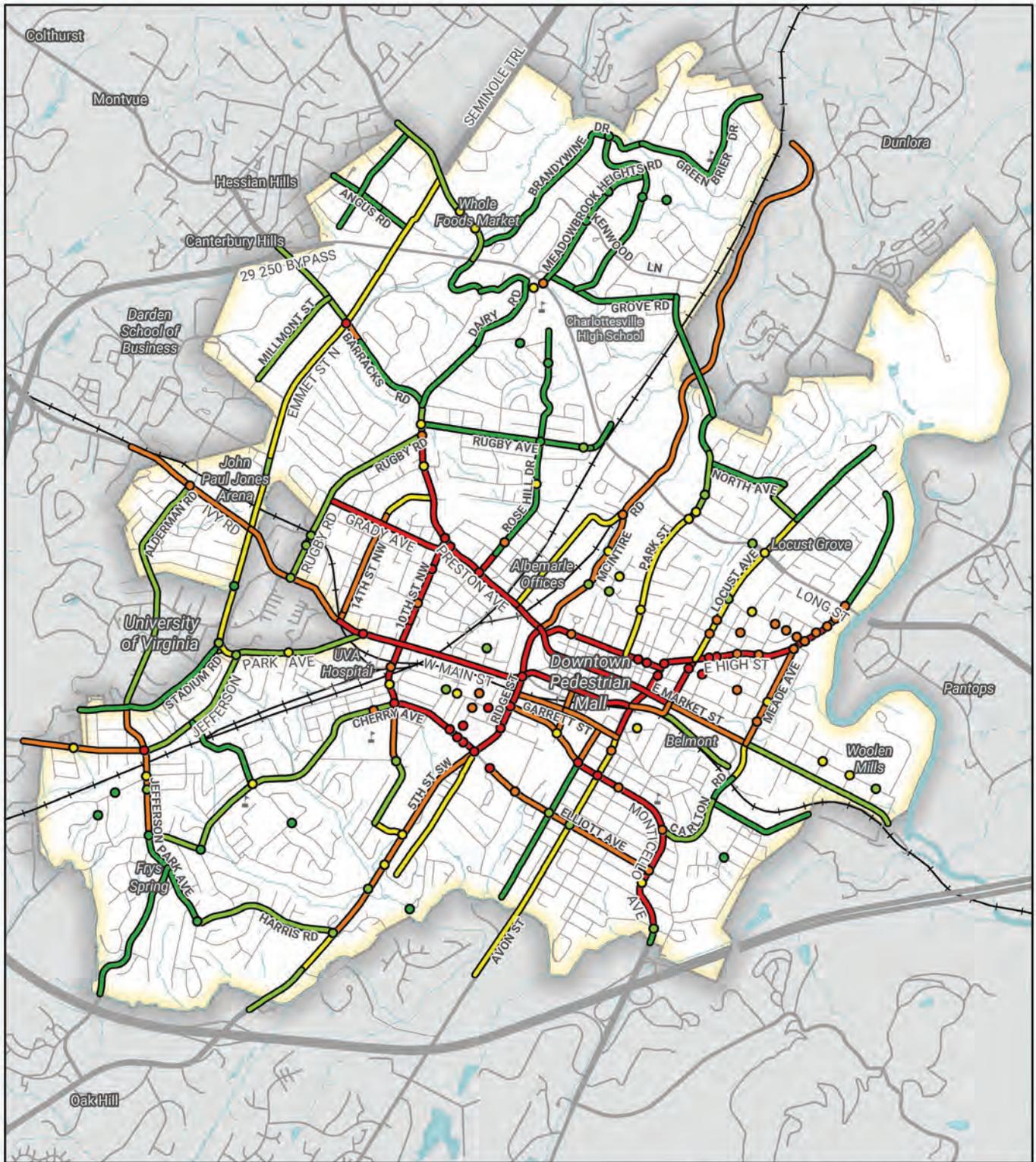


# Prioritization Process (continued)



Rank	Bicycle Facility Recommendations		Rank	Sidewalk Project Recommendations
	Location	Bicycle Facility Type		
1	Jefferson Park Ave at Emmet	Bicycle Lane	1	Barracks Rd
2	W Main St	Separated Bicycle Lanes	2	Preston Ave
3	University Ave	Shared Roadway	3	Alderman Rd
4	Ridge-McIntire Rd	Bicycle Lanes	4	Hydraulic Rd
5	E/W High St	Climbing Bicycle Lane	5	Rose Hill Dr
6	Grady Ave	Shared Roadway	6	Bunker Hill Dr
7	Jefferson Park Ave (W Main to Emmet)	Bicycle Lanes	7	St. Clair Ave
8	Preston Ave/Barracks Rd	Climbing Bicycle Lane	8	Albemarle St
9	Park St	Shared Roadway	9	9 <sup>th</sup> St NW
10	W Market St	Climbing Bicycle Lane	10	Commerce St

Table 18: Bicycle and Pedestrian Project Recommendations



**Charlottesville, Virginia**




## Priority Projects

---

### Streets That Work

Priority Intersections	Priority Corridors
<span style="color: green;">●</span> 0 - 29.99	<span style="border-bottom: 2px solid green; width: 20px; display: inline-block;"></span> 0 - 29.99
<span style="color: yellow;">●</span> 30 - 39.99	<span style="border-bottom: 2px solid yellow; width: 20px; display: inline-block;"></span> 30 - 39.99
<span style="color: orange;">●</span> 40 - 49.99	<span style="border-bottom: 2px solid orange; width: 20px; display: inline-block;"></span> 40 - 49.99
<span style="color: red;">●</span> 50 - 64.99	<span style="border-bottom: 2px solid red; width: 20px; display: inline-block;"></span> 50 - 64.99
<span style="color: darkred;">●</span> 65 - 100	<span style="border-bottom: 2px solid darkred; width: 20px; display: inline-block;"></span> 65 - 100

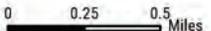

  

  
Date: 4/11/2016

Figure 15: Streets That Work Priority Projects

## Priority Corridors

Many of the priority corridors are found around the City’s downtown core, with its concentration of businesses, jobs, residences, and other amenities. Other areas of note include the mixed use corridors of Cherry Avenue, W Main Street, and Preston Avenue, as well as major neighborhood streets like Monticello Avenue. The full list of framework streets and their scores is available in Appendix D.

Rank	Street Name	Extent	Street Typology	Priority Score
1	Elliott Ave	Ridge St to Burnet St	Neighborhood A	100
2	9 <sup>th</sup> Street NE	E Market St to E High St	Downtown	99
3	Ridge McIntire Road	W Main St to Preston Ave	Mixed Use A	97
4	Preston Avenue	Harris St to McIntire Rd	Mixed Use A	93
5	Preston Avenue	10 <sup>th</sup> St NW to Harris St	Mixed Use A	92
6	W Main St	14 <sup>th</sup> St NW to Ridge McIntire Rd	Mixed Use B	91
7	E High St	Lexington Ave to 9 <sup>th</sup> St NE	Mixed Use B	91
8	10 <sup>th</sup> St NW	Wertland St to Preston Ave	Neighborhood A	90
9	Ridge Street	W Main St to Dice St	Mixed Use A	90
10	Lexington Avenue	E High St to Locust Ave	Mixed Use B	89

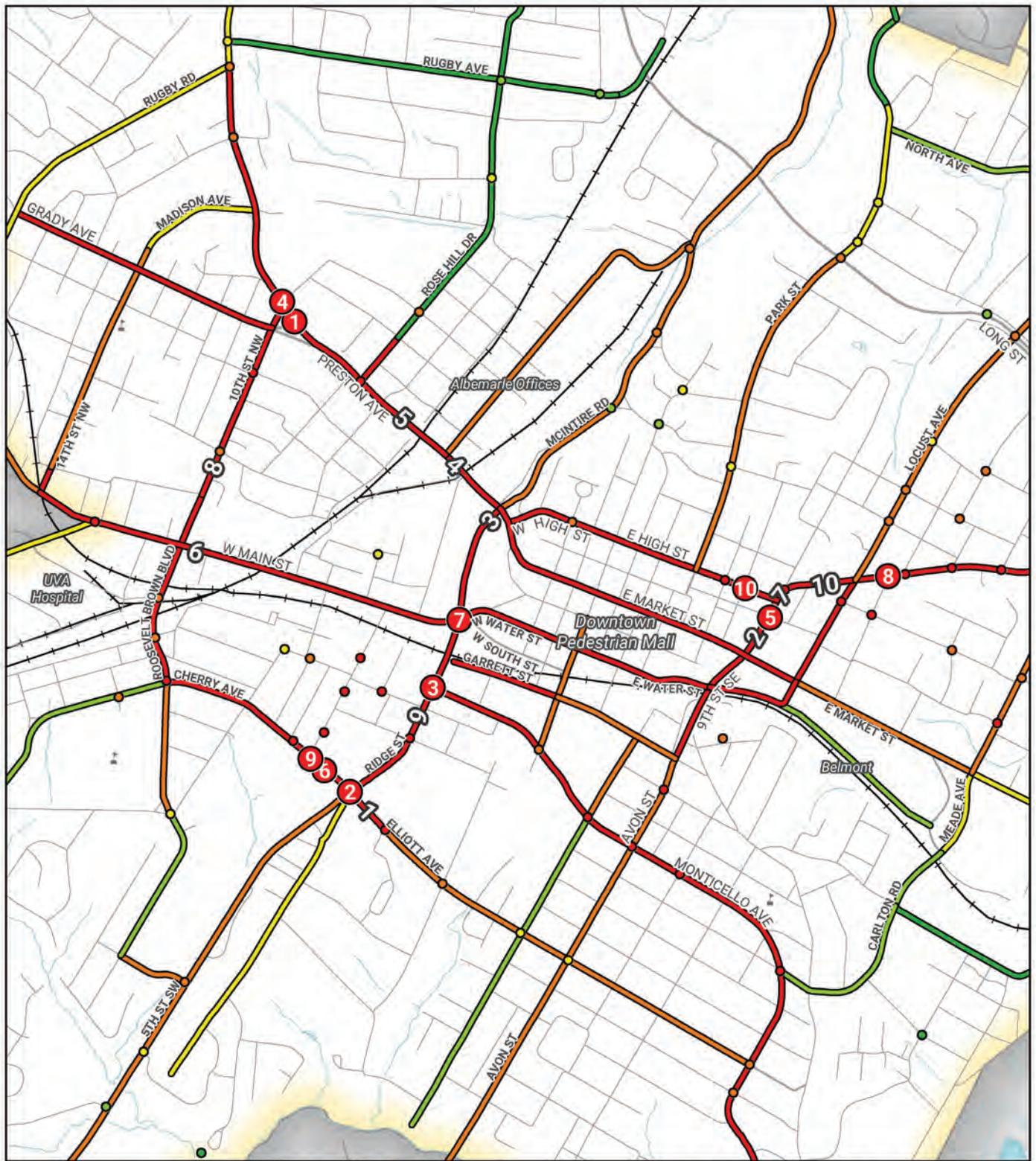
Table 19: Top 10 Streets That Work Priority Corridors

## Priority Intersections

The top priority intersections are all located along priority corridors within a mile of the City’s downtown core. Most of these intersections carry high volumes of traffic, have complex geometries and create barriers for bicyclists and pedestrians. The descriptions of the issues at each intersection are based on public input from neighborhood town hall meetings and the *Streets That Work* planning process.

Rank	Intersection	Issue	Priority Score
1	Grady Ave & Preston Ave	Intersection Problem	100
2	5th St SW & Elliott Ave	Intersection Problem	99
3	Ridge St & Monticello Ave	Intersection Problem	94
4	10th St NW & Preston Ave	Bicyclist/Pedestrian Hot Spot	93
5	E Jefferson St and 9th St NE	Bicyclist/Pedestrian Hot Spot	91
6	Cherry Ave (Mid-Block between 5th St SW and Ridge St)	Intersection Problem	89
7	Ridge St & W Main St	Bicyclist/Pedestrian Hot Spot	89
8	11th St NE & E High St	Bicyclist/Pedestrian Hot Spot	87
9	Cherry Ave & 5th St SW	Intersection Problem	84
10	E High St & 8th St NE	Bicyclist/Pedestrian Hot Spot	83

Table 20: Top 10 Streets That Work Priority Intersections



**Charlottesville, Virginia**




## Priority Projects

---

### Streets That Work

Priority Intersections	Priority Corridors
<span style="color: green;">●</span> 0 - 24.99	<span style="color: green;">—</span> 0 - 24.99
<span style="color: lightgreen;">●</span> 25 - 34.99	<span style="color: lightgreen;">—</span> 25 - 34.99
<span style="color: yellow;">●</span> 35 - 44.99	<span style="color: yellow;">—</span> 35 - 44.99
<span style="color: orange;">●</span> 50 - 59.99	<span style="color: orange;">—</span> 45 - 59.99
<span style="color: red;">●</span> 60 - 100	<span style="color: red;">—</span> 60 - 100



0 0.1 0.2 Miles

Date: 4/11/2016

Figure 16: Streets That Work Priority Projects - Detail

## 5.5 Pilot Project

While these Guidelines are grounded in the City's established standards, they also promote flexibility and creativity in street design. Meeting the City's stated goals for sustainability, connectivity and quality of life will require the innovative application of these Guidelines in every neighborhood. Pilot projects allow the City to test new approaches on a temporary basis, and introduce the general public to new concepts. Pilot projects are most effective when executed through a systematic process that encourages ample research, the use of high-quality materials and ensures the pilot is thoroughly evaluated.

- 1. Issue Identification:** The issue or issues to be resolved through the pilot project need to be clearly defined and supported by measurable evidence. Evidence may include data regarding safety, spatial or system gaps, and/or community feedback.
- 2. Best Practices Research:** The issue and potential solutions should be researched, and a preliminary plan for the pilot project developed. The plan should include the implementing department, a conceptual design, a list of materials, the pilot project timeframe and proposed evaluation strategy.
- 3. Risk Assessment:** A clear outline of the potential benefits of the proposed solution along with a list of possible concerns should be compiled as part of the plan. A wide variety of stakeholders and discipline professionals should be consulted for this assessment.
- 4. Testing and Measurement:** Any pilot solutions tested should include collection of before and after data, not only to test the effectiveness and safety of the solution, but to share the outcomes with other communities who face similar challenges. Data collection may include:
  - Bicycle and Pedestrian Counts
  - Traffic Counts
  - Speed Data
  - On-street parking utilization

## Streets That Work LIVE

On Saturday, April 16, 2016 the City of Charlottesville hosted a half-day demonstration event along 2<sup>nd</sup> Street SE between Water Street and Monticello Avenue south of the Downtown Mall. The event coincided with the Tom Tom Founder's Festival and was made possible through a collaboration between multiple City departments, the University of Virginia's School of Architecture, the Tom Tom Founder's Festival, the Thomas Jefferson Planning District Commission, Toole Design Group and the Charlottesville Tree Stewards. Volunteers from numerous organizations, including the STW Advisory Committee, Bicycle and Pedestrian Advisory Committee, Charlottesville Area Transit, Books on Bikes and the Clark Elementary School PTA, as well as small business owners, set up information tables and interacted with the public at the event.



Curb extension at 2nd Street SE and Garrett Street.



Curb extension at 2nd Street SE and Garrett Street.

## Issue Identification

The location for the demonstration project was chosen based on input from the STW Advisory Committee, Thomas Jefferson Planning District Commission and City staff. The initial focus for the demonstration project was the intersection of 2<sup>nd</sup> Street SE and Garrett Street. Located two blocks south of the Downtown Mall, this intersection handles steady volumes of vehicles, pedestrians and bicyclists.



Crosswalk at 2nd Street SE and Garrett Street, before.

The intersection is stop controlled in three directions, with one-way travel on the fourth leg away from the intersection. On-street parking is permitted on all legs. The crosswalks at the intersection are marked with faded parallel lines, and the corner curb ramps do not meet ADA standards. The combination of faded crosswalks and highly utilized on-street parking results in poor visibility for pedestrians.

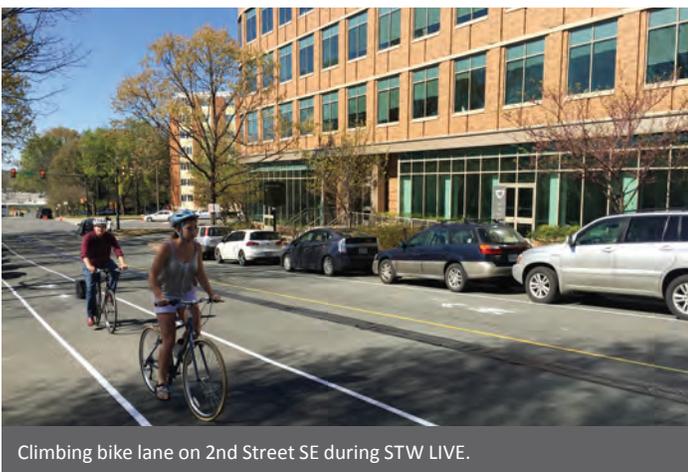


Crosswalk at 2nd Street SE and Garrett Street during STW LIVE.

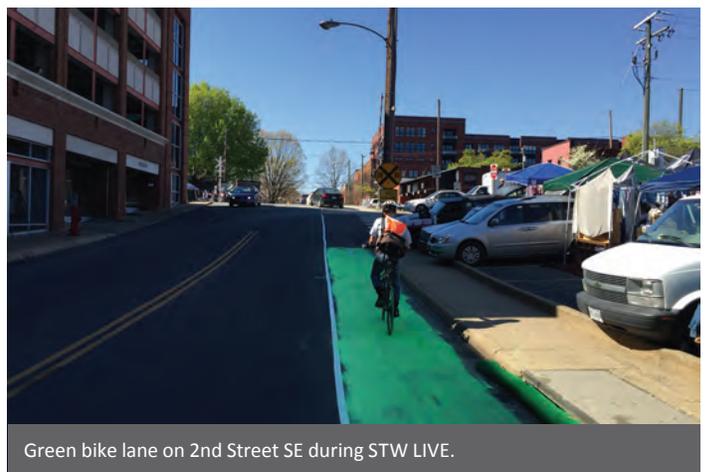
## Best Practices

A graduate capstone class in the Urban and Environmental Planning Department at the University of Virginia assessed the issues at the intersection of 2<sup>nd</sup> Street SE and Garrett Street and proposed temporary curb extensions and artistic crosswalk markings to make pedestrians more visible and calm traffic moving through the intersection.

Toole Design Group added to the intersection design with a climbing bike lane on 2<sup>nd</sup> Street SE from Monticello Avenue to Garrett Street and a green bike lane on 2<sup>nd</sup> Street SE from Water Street to South Street. Additional temporary installations included a picnic area, pop-up shops, curb extensions at the intersections of Monticello Avenue and 2<sup>nd</sup> Street SE and 6<sup>th</sup> Street SE, and a Story Walk from Monticello Avenue and 2<sup>nd</sup> Street SE to 6<sup>th</sup> Street SE and Garrett Street.



Climbing bike lane on 2nd Street SE during STW LIVE.



Green bike lane on 2nd Street SE during STW LIVE.

## Risk Assessment

To minimize disruption, maintain access and parking availability on a particularly busy Saturday, 2<sup>nd</sup> Street SE was only closed to traffic from 7:00 to 9:00 AM while the demonstration was installed. City staff had measured and identified the locations for the new markings the day before, which expedited the installation of the colored tape. During the closure, staff and volunteers installed bike lanes and crosswalk markings, which included covering and creating a new centerline on 2<sup>nd</sup> Street SE from Monticello Avenue to Garrett Street. The temporary centerline on the southern segment of 2<sup>nd</sup> Street SE maintained the on-street parking on both sides of the street.

One of the goals of the demonstration event was to educate the public about the different elements of street design and how small changes can have larger effects on how public space is experienced. Each demonstration installation was accompanied by educational signage, with topics ranging from bike lanes and curb extensions to the benefits of street trees and the locations of underground utilities.



One example of educational signage at the STW LIVE event.



Educational signage with space for feedback at the STW LIVE event.

## Testing and Measurement

Visitors at the demonstration event were asked to fill out surveys to provide feedback on their experience. Over 75 percent of respondents reported feeling more comfortable crossing the intersection of 2<sup>nd</sup> Street SE and Garrett Street during the demonstration project, and 98 percent of respondents reported that adding permanent bike lanes on 2<sup>nd</sup> Street SE would make them feel more comfortable riding there.

Anecdotally, the changes to the streetscape did change the way drivers, pedestrians and bicyclists travelled through the area. Several people in attendance expressed the desire to make some of the changes more permanent and replicate the event in other parts of the city.

# APPENDICES

---

# Appendix A. Supporting Documents

## Federal Standards and Guidelines

**Manual on Uniform Traffic Control Devices (MUTCD)** – Federal Highway Administration (FHWA)

“The Manual on Uniform Traffic Control Devices, or MUTCD defines the standards used by road managers nationwide to install and maintain traffic control devices on all public streets, highways, bikeways, and private roads open to public travel. The MUTCD, which has been administered by the FHWA since 1971, is a compilation of national standards for all traffic control devices, including road markings, highway signs, and traffic signals. It is updated periodically to accommodate the nation’s changing transportation needs and address new safety technologies, traffic control tools and traffic management techniques.”<sup>1</sup>

**Urban Street Design Guide** – National Association of City Transportation Officials (NACTO)

“A blueprint for designing 21st century streets, the Guide unveils the toolbox and the tactics cities use to make streets safer, more livable, and more economically vibrant. The Guide outlines both a clear vision for complete streets and a basic road map for how to bring them to fruition.”<sup>2</sup>

**Policy on Geometric Design of Highways and Streets (“Green Book”)** – American Association of State Highway and Transportation Officials (AASHTO)

“These guidelines are intended to provide operation efficiency, comfort, safety and convenience for the motorist. The design concepts provided herein were also developed with consideration for environmental quality. The effects of the various environmental impacts can and should be mitigated by thoughtful design processes. This principle, coupled with that of aesthetic consistency with the surrounding terrain and urban setting, is intended to produce highways that are safe and efficient for users, acceptable to non-users and in harmony with the environment.”<sup>3</sup>

1 <http://mutcd.fhwa.dot.gov/>

2 <http://nacto.org/publication/urban-street-design-guide/>

3 [http://nacto.org/docs/usdg/geometric\\_design\\_highways\\_and\\_streets\\_aashto.pdf](http://nacto.org/docs/usdg/geometric_design_highways_and_streets_aashto.pdf)

## State Standards

**Virginia Statewide Fire Code (2012)**

The Statewide Fire Code sets the standard minimum road widths and other design standards to ensure adequate emergency access.

- Section 503.2.1 states “fire apparatus access roads shall have an unobstructed width of not less than 20 feet exclusive of shoulders except for approved security gates in accordance with Section 503.6, and an unobstructed vertical clearance of not less than 13 feet 6 inches.” An exception to this standard allowing a narrower 18 foot width applies to roads “exclusively serving single family dwelling or townhouse developments which are fully sprinklered.” Streets exclusively serving fully sprinklered single family dwellings are not common in Charlottesville, so the 20 foot unobstructed width applies to nearly all city streets.
- Section 503.2.3 grants authority to the fire code official to increase the minimum widths required when they are “inadequate for fire or rescue operations.”
- The fire code official is also granted authority to set the required turning radii by Section 503.2.4. Turning radii in Charlottesville must accommodate the trucks currently in use by Fire Department which have wheelbases ranging from 15 feet to 30 feet.
- Section 503.4.1 states that traffic calming devices are prohibited unless approved by the fire code official. Traffic calming devices are defined as “street alignment, installation of barriers and other physical measures intended to reduce traffic and cut-through volumes and slow vehicle speeds.”<sup>4</sup>

4 Commonwealth of Virginia Statewide Fire Prevention Code, 2009. [http://ecodes.biz/ecodes\\_support/free\\_resources/Virginia2009/09Fire\\_Prevention/PDFs/Chapter%205\\_Fire%20Service%20Features.pdf](http://ecodes.biz/ecodes_support/free_resources/Virginia2009/09Fire_Prevention/PDFs/Chapter%205_Fire%20Service%20Features.pdf)

## Virginia Department of Transportation Road Design Manual<sup>5</sup>

“This manual has been prepared to promote uniformity in design procedures for all designers and technicians involved in the development of plans for Virginia’s highways. It is intended to serve as an informational and procedural guide and to be used in conjunction with specifications, standards, policy directives (State and Federal) and design policy manuals published by the American Association of State Highway and Transportation Officials (AASHTO).”<sup>6</sup>

## Local Codes and Standards

### Charlottesville City Code (1990, 2003)<sup>7</sup>

- Chapter 28 - Streets and Sidewalks
- Chapter 31 - Utilities
- Chapter 34 - Zoning

### Charlottesville Standards & Design Manual<sup>8</sup>

- Chapter 2 - New Public Street and Private Alley Construction
- Chapter 3 – Stormwater Management
- Chapter 5 – Traffic and Transportation
- Appendix E - Pavement Repair Details of Utility Installations
- Appendix H - Tree Planting and Preservation BMP Manual with Details

5 <http://www.virginiadot.org/business/locdes/rdmanual-index.asp>

6 [http://www.extranet.vdot.state.va.us/locdes/Electronic\\_Pubs/2005%20RDM/RoadDesignCoverVol.1.pdf](http://www.extranet.vdot.state.va.us/locdes/Electronic_Pubs/2005%20RDM/RoadDesignCoverVol.1.pdf)

7 [https://www.municode.com/library/va/charlottesville/codes/code\\_of\\_ordinances?nodeId=COCH1990](https://www.municode.com/library/va/charlottesville/codes/code_of_ordinances?nodeId=COCH1990)

8 <http://www.charlottesville.org/home/showdocument?id=10377>

## Local Planning Studies

### Charlottesville Commercial Corridor Study (2000)

This report provides comprehensive design recommendations for both the public and private realms along Charlottesville’s major corridors, and includes an economic analysis for each corridor. These commercial corridors connect important destinations and are the most direct and heavily travelled routes in Charlottesville. Most of the streets profiled in this plan correspond directly with the framework street classifications recommended in TDG’s December 2014 Technical Memorandum.

### Charlottesville Entrance Corridor Design Guidelines (2005)<sup>9</sup>

Private development along Charlottesville’s twelve entrance corridors is subject to the Entrance Corridor Design Guidelines. The Guidelines were created to “ensure through design review that corridor development is compatible with the City’s historic landmarks, buildings, and structures.” The Guidelines include chapters on buildings, site design and streetscape design with recommendations for setbacks, building materials, plantings, lighting, street furniture, signage, bicycle and pedestrian accommodations, and utility placement. The Entrance Corridor Design Guidelines do not include language about how these types of improvements are implemented in the public right-of-way.

### Charlottesville Transit Development Plan (2011)<sup>10</sup>

The Transit Development Plan reviews the history of transit service in Charlottesville, evaluated system performance and provided recommendations to improve routing, service, and bus stop features. Compared to peer transit systems, Charlottesville’s transit system performed better than average in multiple categories including ridership, service area, and vehicle utilization. Following the Transit Development Plan, transit services were consolidated and rerouted to improve overall system performance.

9 <http://www.charlottesville.org/Index.aspx?page=1748>

10 <http://www.charlottesville.org/index.aspx?page=2657>

### **Charlottesville Comprehensive Plan (2013)<sup>11</sup>**

Goals from multiple chapters of the Comprehensive Plan, including Economic Sustainability, Historic Preservation and Urban Design, Housing, Land Use, and Transportation speak to the desire for appealing, safe and efficient streets that serve the needs of all transportation modes and that are considered public amenities.

### **Strategic Investment Area Plan (2013)<sup>12</sup>**

The Strategic Investment Area (SIA) Plan contains cross sections for streets, both existing and proposed within the SIA, generally located to the south of the Downtown Mall. The sections emphasize multimodal travel, intersection improvements, green design and attractive pedestrian features including trees, café spaces and building faces that meet the sidewalk to create a sense of enclosure. To achieve these designs, the SIA Plan recommended changes to City Code including adopting a form based code with 10 to 15 foot building setbacks along primary streets and 5 to 10 foot setbacks along secondary and tertiary streets.

### **West Main Street Action Plan (March 2015, Draft)<sup>13</sup>**

The West Main Street Action Plan presented to City Council in March 2015 includes transportation, urban design and land use recommendations to improve the function and appeal of West Main Street from Downtown to the University of Virginia. Highlights of the plan include wider sidewalks, separated bike lanes, managed on-street parking, green design, wayfinding and zoning changes. One of the zoning changes proposed includes 10 foot setbacks for buildings and lowering the maximum building heights allowed through special use permits.

### **Charlottesville Bicycle and Pedestrian Master Plan Update (Adopted September 2015)<sup>14</sup>**

The Bicycle and Pedestrian Master Plan Update expands upon the bicycle and pedestrian network established in the 2003 Bicycle and Pedestrian Master Plan. The Plan Update focuses primarily on the on-street network and makes facility recommendations designed to appeal to users of all ages and abilities. The Plan Update also discusses prioritization and implementation based on Charlottesville's stated values, current funding levels and street paving schedule.

### **Charlottesville Parking Study (2015)**

The City recently completed a “Downtown and University Corner Comprehensive Parking Analysis” that examined parking supply and demand in two of Charlottesville's most popular destinations. The study's recommendations are grouped into three categories: optimize existing resources, offer viable and attractive commute and access alternatives, and maintain parking supply. To optimize existing resources, the study recommends adding meters to parking downtown, revisiting parking requirements and using a variety of available technologies to make finding and paying for parking easier. The study also recommends expanding transportation demand management programs to incentivize other modes of transportation and strategically adding to the existing supply of parking by partnering with developers and maintaining the existing “in lieu” parking payment option.

---

11 <http://www.charlottesville.org/index.aspx?page=3523>

12 <http://www.charlottesville.org/index.aspx?page=3409>

13 <http://gowestmain.com/pdf/2015-0323-Final-Council-Presentation.pdf>

14 <http://www.charlottesville.org/index.aspx?page=1309>

# Appendix B. Public Engagement



Beginning with the initial charrette in May 2014, the City of Charlottesville and TDG have worked consistently to engage the public in the Streets That Work Initiative through the following outreach and events. A full account of the public engagement process is available at [www.charlottesville.org/streetsthatwork](http://www.charlottesville.org/streetsthatwork).

## Neighborhood Meetings; November-December 2014

City staff met with residents in neighborhoods throughout the city and held an open meeting at City Hall during the months of November and December 2014. The feedback received at these meetings was used to create the following map of street design concerns and opportunities.

## Public Input Meeting; December 13, 2014

On December 13, 2014 the City hosted a Public Input meeting at Carver Recreation Center. Meeting participants worked together in small groups to provide feedback on the:

- first draft of the Guiding Principles for the Streets That Work/Code Audit initiative
- Town Hall Map of issues and opportunities (above), and
- which elements make for great streets.

Multiple groups expressed concerns about inadequate street lighting, the desire for more street trees, the need to protect the city's unique neighborhood character and the importance of filling in gaps in the city's bicycle and pedestrian networks.

# Town Hall Meetings / Neighborhood Design Day

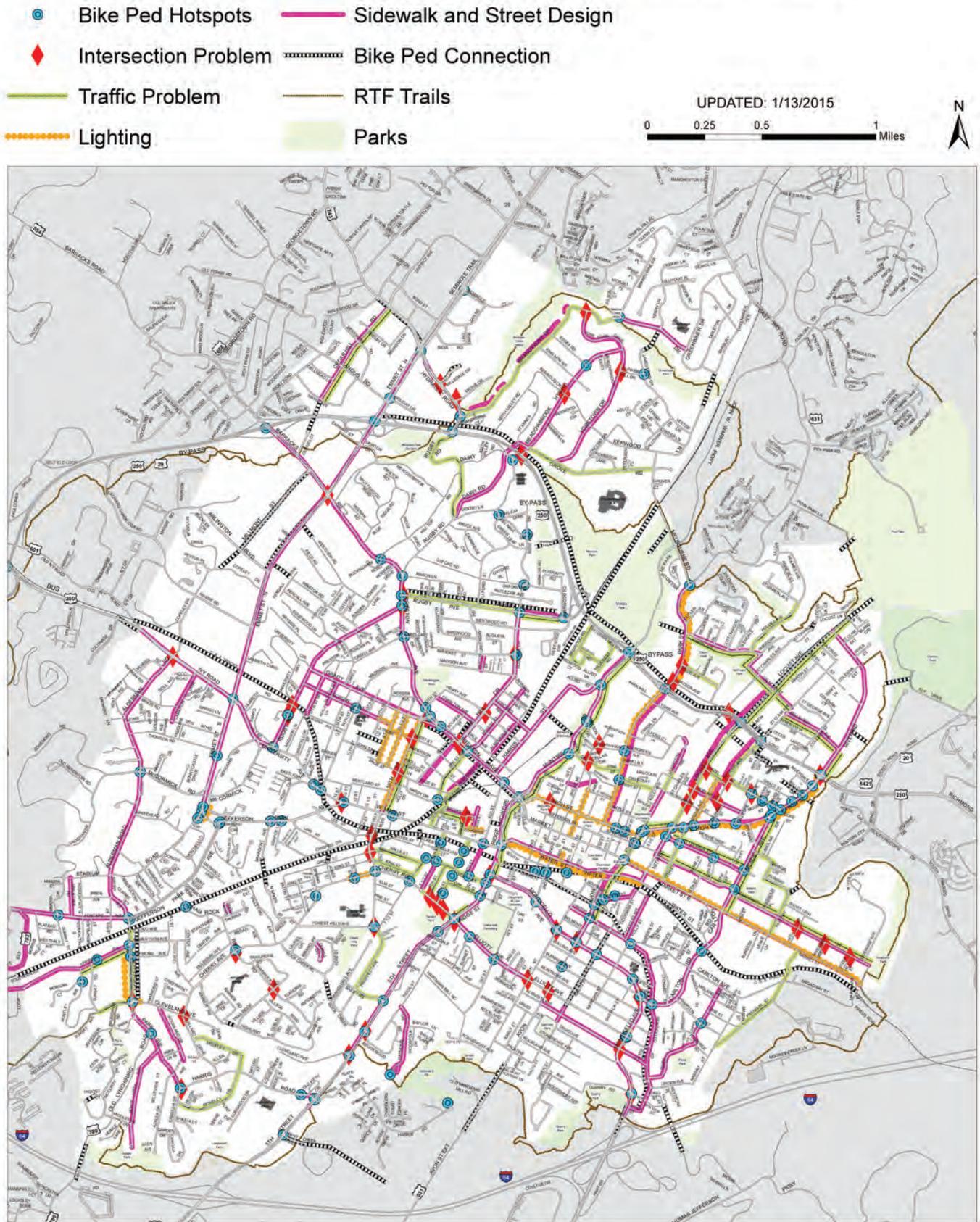


Figure 3: Map of map of public input received on street design concerns and opportunities.



## Summer 2015 Road Show

The City hosted a Streets That Work booth at the following local community events to introduce the public to the vision for the City's streets and promote the first public Open House in September 2015. Visitors at the booth received information on the planning process, and were given the chance to try fun games, prioritize street elements, and participate in activities such as creating a temporary street mural or demonstrating temporary pedestrian and bicycle improvements.

- African American Cultural Arts Festival | July 25, 2015
- Westhaven Community Day | August 1, 2015
- Back to School Bash | August 15, 2015

## Public Open House I; September 2015

On September 15, 2015, 40 people, including members of the public, fire department personnel, planners and engineers from Neighborhood Development Services, the City Sustainability Planner, members of the Streets that Work/Code Audit (STWCA) Advisory Committee, and TDG staff gathered at City Space for a Public Open House. TDG gave a short presentation on the goals of the Streets That Work Initiative and work to date. Public House attendees were asked to visit four stations and participate in a break-out group activity to provide input on the prioritization of streetscape elements for each street type in Charlottesville.

The stations included:

- Streetmix station. Using the online Streetmix program, visitors could design streets to allocate portions of the right-of-way to a variety of uses. The designs developed can be accessed via the following links:

<http://streetmix.net/kenallenray/9/downtown-street-40-ctc-60-row>

<http://streetmix.net/kenallenray/8/neighborhood-street-40-ctc-60-row>

<http://streetmix.net/kenallenray/7/mixed-use-street-60-ctc-100-row>

- Voting booth. Visitors had five votes each to drop into cups symbolizing different streetscape elements for a mixed-use corridor, including wider or narrower travel lanes, bus shelters, protected bike lanes, and canopy trees. The elements with the highest number of votes were concentrated on the street edge, and generally contributed to pedestrian comfort. There were no votes received for wider travel lanes, and higher speed limits received one vote. The votes were counted as follows:

Streetscape element	No. of votes
Canopy trees	32
Wider sidewalks	17
Pedestrian scale lighting	15
Separated bicycle facility	9
Narrow travel lanes	9
Slow speed limit	9
Bike lanes	8
Bus stops/shelters	6
Planted buffers	5
Wide auto travel lanes	0

Table 1 – Results of the Streetscape Prioritization Exercise

- Wheel of Fortune. Visitors were invited to play a trivia game testing their knowledge of Charlottesville bicycling, pedestrian, automobile, and transit safety and conditions.
- Charlottesville Green Infrastructure Map Tool. Kristel Riddervold, the City Environmental Sustainability Administrator, demonstrated a new tool showing the city’s green infrastructure and environmental resources, including stormwater management, bike and pedestrian trails, farmers’ markets, tree canopy, and etc. She solicited feedback to improve the tool prior to its launch on the City website.

For the small group break out activity, Open House attendees were divided into four to eight person groups, each with a facilitator from Neighborhood Development Services staff. The groups were each assigned a category of street (Mixed Use A, Mixed Use B, Downtown, Neighborhood A, and Neighborhood B) and tasked with choosing their top five elements from a list of street characteristics (including bike lanes, trees, narrower travel lanes, and etc.).

The results were as follows:

Priority	Mixed Use A	Mixed Use B	Downtown	Neighborhood A	Neighborhood A	Neighborhood B
1	Narrower travel lanes	Wider sidewalks (tie)	Wider sidewalks	Narrow travel lanes	Planted buffers	Shade trees
2	Wider sidewalks	Shade trees (tie)	Narrower travel lanes (cars)	Bike facilities	Shade trees	Lower speed limits
3	Bike facilities	Bike facilities	Lower speed limits	Trees	Lower speeds	Planted buffer (tie)
4	Trees	Bus shelters	Designated bike facilities	More on street parking	Designated bike facilities	Wider sidewalks (tie)
5	Bus shelters	Narrow travel lanes	Shade trees	Bus shelters	Narrow travel lanes	Narrow travel lanes

Table 2 – Priority Streetscape Elements by Street Type

The high priority elements for each street type chosen by the groups were concentrated on the street edge, and generally contributed to pedestrian comfort. Lower speed limits and narrow travel lanes are also high priority elements for many street types.

In summary, Open House attendees placed strong emphasis on shade trees and their multiple benefits; overhead utilities were an item of concern; and the conflict between traffic calming and fire department response abilities needed more discussion. It was also noted that the Mixed Use A and B street small groups had generated the same list of elements, although in a different order or priority.

---

As of **2/10/2016**, streets assigned to the Neighborhood A and Neighborhood B typologies are being vetted by City staff. The typologies are being reviewed to better address conditions on local streets, provide parameters for new subdivision streets, and descriptions in the Neighborhood A and Neighborhood B sections are subject to change.

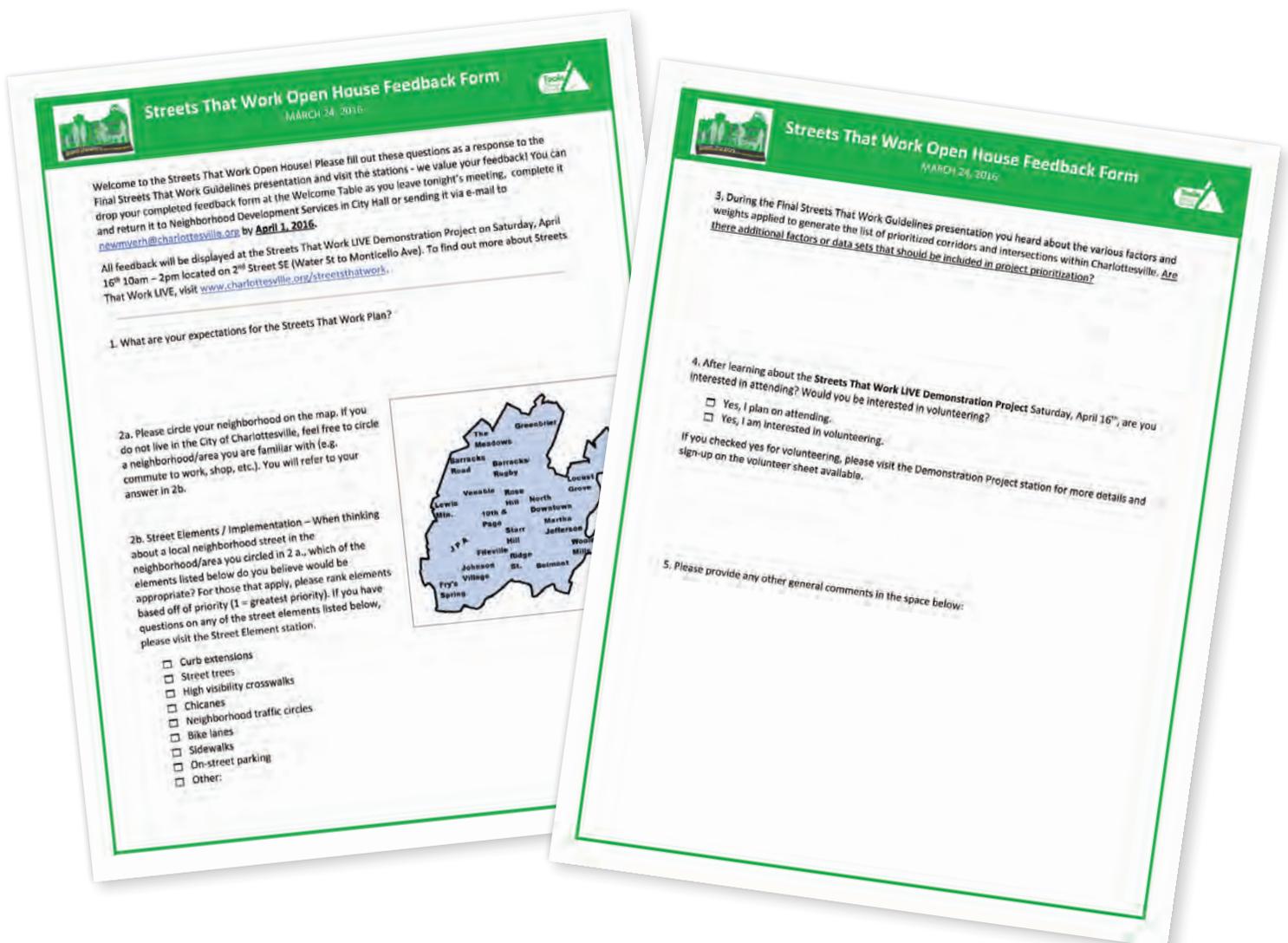
## Public Open House II; March 2016

On March 24, 2016, members of the public, fire department personnel, planners and engineers from Neighborhood Development Services, the City Sustainability Planner, members of the Streets that Work/Code Audit (STWCA) Advisory Committee, and TDG staff gathered at City Space for the second Public Open House. Attendees were asked to sign-in at the beginning of the meeting and pick up a feedback form to complete. A sample feedback form is included at the end of this section.

The meeting began with a presentation about the *STW Guidelines* which covered the planning process and highlighted the contents of the plan. Following the presentation, TDG and city staff answered questions from the audience about the timeframe for presentation to city council, street tree recommendations, speeding traffic on local streets and implementation.

Following the presentation, attendees were invited to learn more and provide comments on the different elements of the *Streets That Work Guidelines* by visiting a variety of stations set up around the room. The stations covered the following:

- **User Guide / Guiding Principles** – This station presented the Guiding Principles of the STW/CA process and explained how the Guidelines will be used by its three main audiences – city staff, property owners, developers and the general public.
- **Uses in the Public ROW** – IN addition to their transportation function, streets and the public right-of-way support utilities and green and blue infrastructure.
- **Street Typologies / Cross sections** – Typical existing, retrofit and unconstrained cross sections for each of the six street types in the city.
- **Street Elements** – Selected recommendations from the *STW Guidelines* for street elements along the side of streets, within the travel way and at intersections.
- **Prioritization** – GIS heat map exercise combining six data layers to identify priority corridors and intersections.
- **City Green Tool** – This interactive station showcased the CityGreen Tool, Charlottesville’s online database of sustainability features.
- **Fire Department** – Members of the Charlottesville Fire Department were on hand to present the capabilities of their equipment and answer questions about emergency response needs in street design.
- **Demonstration Project** – University of Virginia graduate students were on hand to promote and explain the demonstration project taking place in April 2016 along 2nd Street SE south of the Downtown Mall.



# Streets That Work LIVE; April 16, 2016

On Saturday, April 16, 2016 2nd Street SE south of Downtown was temporarily transformed by over ten different street demonstration projects, including a fluorescent green bike lane, colorfully patterned crosswalks, a climbing bike lane and narrowed travel lanes south of Garrett Street, bicycle and pedestrian wayfinding, and even a pop-up picnic area in front of the Glass Building. City Staff, Toole Design Group, TJPDC, University of

Virginia urban planning students, the Charlottesville Tree Stewards, and the Tom Tom Founders Festival were just a few of the partners involved. Each project was designed to show Streets that Work principles as they applied to a real Charlottesville context.

The demonstrations were accompanied by educational signage explaining the purpose and benefits of the



**Climbing Bike Lanes** are bike lanes on the uphill side of a long or steep hill, where bicyclists travel slowly. On the downhill side, bicyclists can keep up with vehicle traffic.



**Green Bike Lanes** are bike lanes that are painted green to increase visibility for bicyclists and to alert drivers to expect people on bikes.



**Curb Extensions** are sidewalk bump-outs at street crossings that reduce the crossing distance for pedestrians. They also reduce traffic speeds.



**Sharrows** are pavement markings that remind bicyclists and motorists that they share a lane, and show bicyclists where they should position themselves.



High Visibility Crosswalks increase the visibility of pedestrians crossing at the crosswalk and alert drivers that pedestrians may be present.



Street Trees make streets comfortable, walkable, and memorable. Trees provide shade, oxygen, and reduce the urban heat island effect.



A Parklet is a small park built in or near the street. Parklets may be installed on parking spaces, and provide spaces for people to sit, relax, and enjoy a beverage or meal.



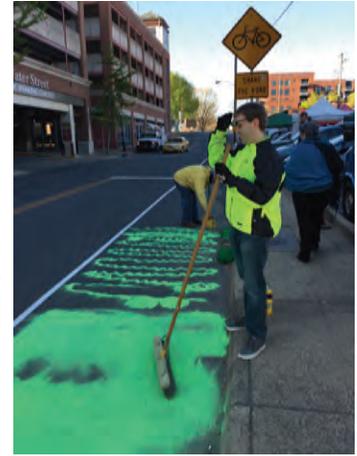
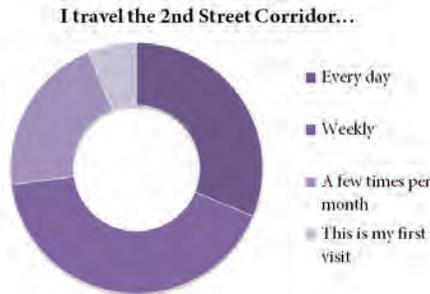
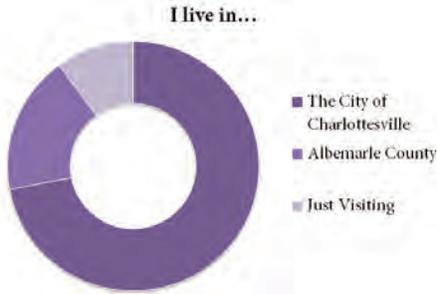
Pop-up Shops are temporary retail that “pops up” one day and disappears up to a month later. It can enliven a downtown by occupying vacant storefronts or selling goods on the street.

Hundreds of people visited the demonstration; a summary of the feedback they provided is included on the next pages.

# Streets that Work LIVE!

Hundreds of Visitors. Over 50 Detailed Surveys.

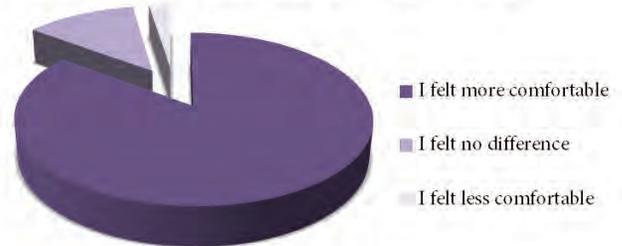
People who came to visit the Streets that Work demonstration on Saturday, April 16, 2016 had very different levels of experience with the study area...



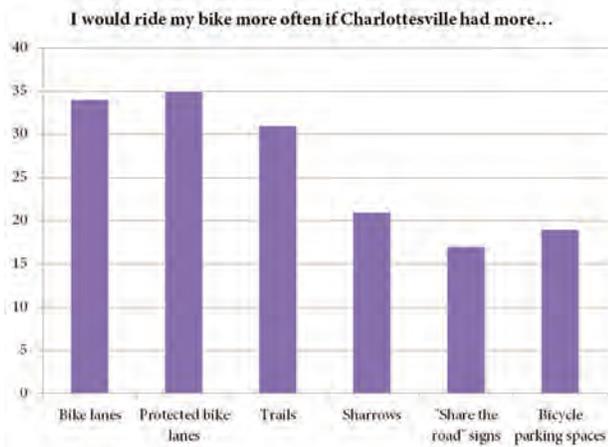
...But they agreed that the colorful new crosswalks and bike lanes made them feel safer.



**As a pedestrian, did you feel more or less comfortable crossing the street at the redesigned intersection?**



Bicyclists wanted to see protected lanes, sharrows, and trails all over the City. Pedestrians called out specific intersections where high-visibility crosswalks would be welcome....



**98%** Of respondents said that adding **permanent bike lanes** on 2<sup>nd</sup> Street would make them feel comfortable riding their bike there.

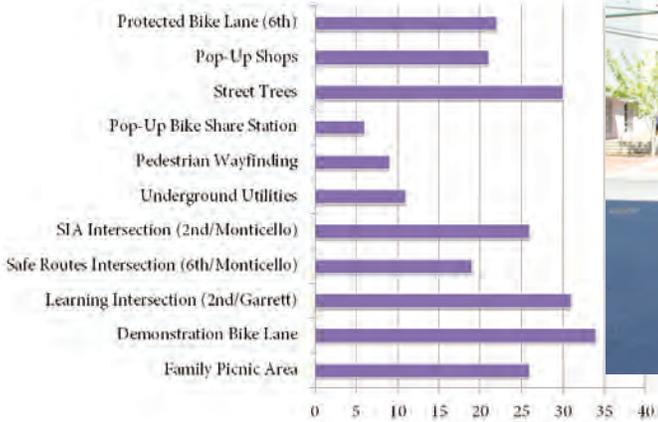
**84%** Of respondents said that adding **sharrows** on 2<sup>nd</sup> Street would make them feel comfortable riding their bike there.

Photo Credits: Jake Fox & Toole Design Group.

# One day. Over 10 Demonstrations.

Demonstration projects were not limited to the paving. Streets That Work volunteers came up with innovative ways to create bike & pedestrian wayfinding, the value of street trees, public plazas, active retail frontage, bike sharing, safe routes to school, and more...

Demonstrations visited



Visitors expressed a strong desire for more active streetscapes with outdoor seating, plazas, & plantings.



93%

Of respondents said city streetscapes would be improved by creating more **outdoor seating areas & public plazas.**

85%

Of respondents said city streetscapes would be improved by adding more **retail frontage.**

96%

Of respondents said they support strategies **encouraging sidewalk cafés and/or retail frontage** in our street design guidelines & zoning code.

Which design aspects are most important to improving Charlottesville's streets?

- |   |                            |    |                           |
|---|----------------------------|----|---------------------------|
| 1 | Bike Lanes                 | 8  | Active Retail Frontages   |
| 2 | More Street Trees          | 9  | Wider Sidewalks           |
| 3 | Safer Pedestrian Crossings | 10 | Better Wayfinding         |
| 4 | Traffic Calming            | 11 | Better Bus Stop Amenities |
| 5 | Bioretention               | 12 | Utilities Management      |
| 6 | Outdoor Seating            | 13 | Narrower Travel Lanes     |
| 7 | Street Lighting            | 14 | Wider Travel Lanes        |



Most important? Bike lanes, street trees, and safe crossings. Least important? Wide travel lanes.

Photo Credits: Jake Fox & Toole Design Group.

# Appendix C. Cross Sections and Typology Tables

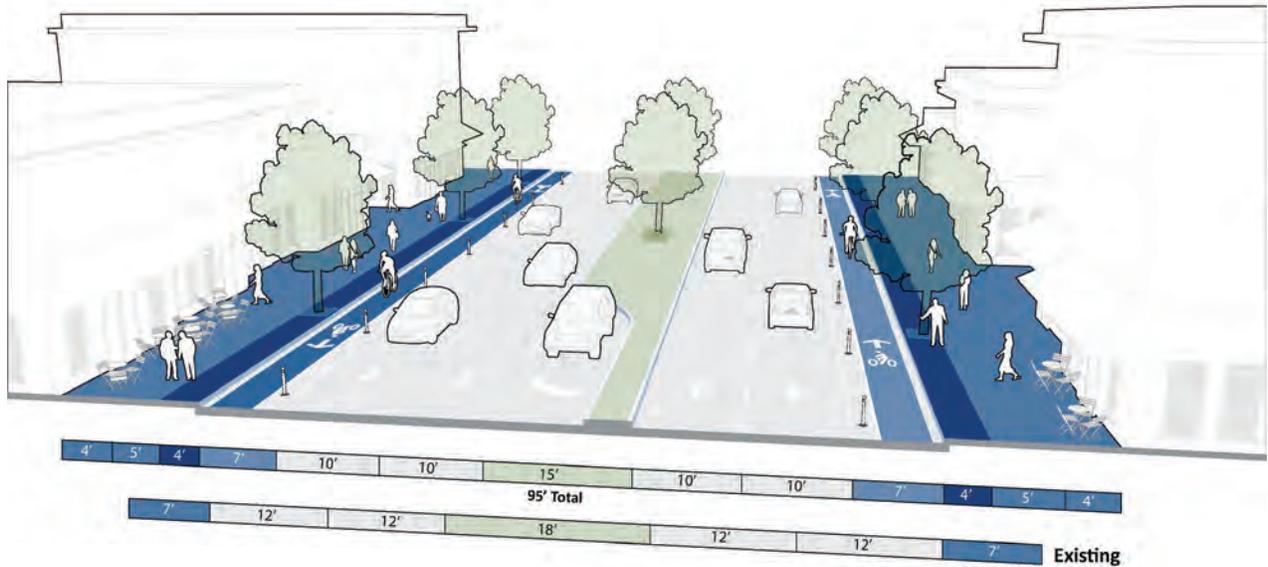
## Comprehensive Street Typology Table

Street Typology	Street Name	From	To
<b>Downtown</b>	2ND ST SE	Market Street	Garrett Street
	9TH ST NE/AVON	Garrett Street/Levy	E High Street
	E HIGH ST	W Market Street	9th Street NE
	E MARKET ST	Ridge/McIntire Road	10th Street NE
	E WATER ST	Ridge Street	9th Street/Avon
	GARRETT ST	2nd Street SE	9th Street/Avon
	RIDGE MCINTIRE RD	W Main Street	Preston Avenue
<b>Industrial</b>	CARLTON AVE	Carlton Road	Franklin Street
	CARLTON RD	Carlton Avenue	E Market Street
	HARRIS ST	Preston Avenue	McIntire Road
	RIVER RD	250 Bypass/Long Street	River Court
<b>Mixed Use A</b>	5TH ST SW	City Limits	Cherry/Elliott Avenue
	BARRACKS RD	City Limits	Emmet Street N
	EMMET ST N	Massie Road	Hydraulic Road
	HYDRAULIC RD	Emmet Street N	250 Bypass
	PRESTON AVE	10th Street NW	Ridge-McIntire Road
	RIDGE MCINTIRE RD	W Main Street	Preston Avenue

Street Typology	Street Name	From	To
Mixed Use B	10TH ST NE	E Market Street	E High Street
	10TH ST NW	W Main Street	Wertland Street
	14TH ST NW	University Avenue	Wertland Street
	ANGUS RD	Emmet Street N	N Berkshire Road
	BARRACKS RD	Emmet Street N	Meadowbrook Road
	CHERRY AVE	Roosevelt Brown Boulevard	Ridge Street
	E HIGH ST	9th Street NE	Long Street/250 Bypass
	E MARKET ST	10th Street NE	Meade Avenue
	EMMET ST N	University Avenue	Massie Road
	EMMET ST S	University Avenue	Jefferson Park Avenue
	IVY RD	City Limits	Emmet Street N
	JEFFERSON PARK AVE	Maury Avenue	University Avenue
	MAURY AVE	Jefferson Park Avenue	Stadium Road
	MELBOURNE RD	Park Street	Grove Road
	MILLMONT ST	Arlington Boulevard	Barracks Road
	MONTICELLO AVE	Ridge Street	6th Street SE
	ROOSEVELT BROWN BLVD	Cherry Avenue	W Main Street
	ROSE HILL DR	Preston Avenue	Charlton Avenue
	STADIUM RD	Mimosa Drive	Emmet Street S
	UNIVERSITY AVE	Emmet Street N	Jefferson Park Avenue
W MAIN ST	Jefferson Park Avenue	Ridge Street	

Street Typology	Street Name	From	To
Neighborhood A	10TH ST NW	Wertland Street	Preston Avenue
	14TH ST NW	Wertland Street	Grady Avenue
	5TH ST SW/RIDGE ST	Cherry Avenue	W Main Street
	9TH ST SW	Cherry Avenue	Prospect Avenue
	ALDERMAN RD	Stadium Road	Ivy Road
	ANGUS RD	N Berkshire Rd	City Limits
	AVON ST	Garrett Street	City Limits
	BARRACKS RD	Meadowbrook Road	Rugby Road
	CALHOUN ST	Locust Avenue	Sheridan Avenue
	CARLTON RD	Monticello Avenue	Carlton Avenue
	CEDAR HILL RD	Wayne Avenue	Hydraulic Road
	CHERRY AVE	Cleveland Avenue	Roosevelt Brown Boulevard
	CLEVELAND AVE	Jefferson Park Avenue	Willard Drive
	ELLIOTT AVE	Ridge Street	Monticello Avenue
	FONTAINE AVE	City Limits	Maury Avenue
	GREENBRIER DR	Brandywine Drive	Rio Road
	GROVE RD	Melbourne Road	Meadowbrook Heights Road
	HARRIS RD	Jefferson Park Avenue	5th Street SW
	JEFFERSON PARK AVE	Fontaine Avenue	Old Lynchburg Road
	LOCUST AVE	E High Street	North Avenue
	MADISON AVE	Grady Avenue	Preston Avenue
	MCINTIRE RD	Preston Avenue	City Limits
	MEADE AVE	E Market Street	E High Street
	MONTICELLO AVE	6th Street SE	Quarry Road
	PARK ST	E High Street	City Limit
	PRESTON AVE	10th Street NW	Rugby Road
	ROSE HILL DR	Charlton Avenue	End
	RUGBY AVE	Rugby Road	McIntire Park
RUGBY RD	University Avenue	Preston Avenue	
SHERIDAN AVE	Calhoun Street	North Avenue	

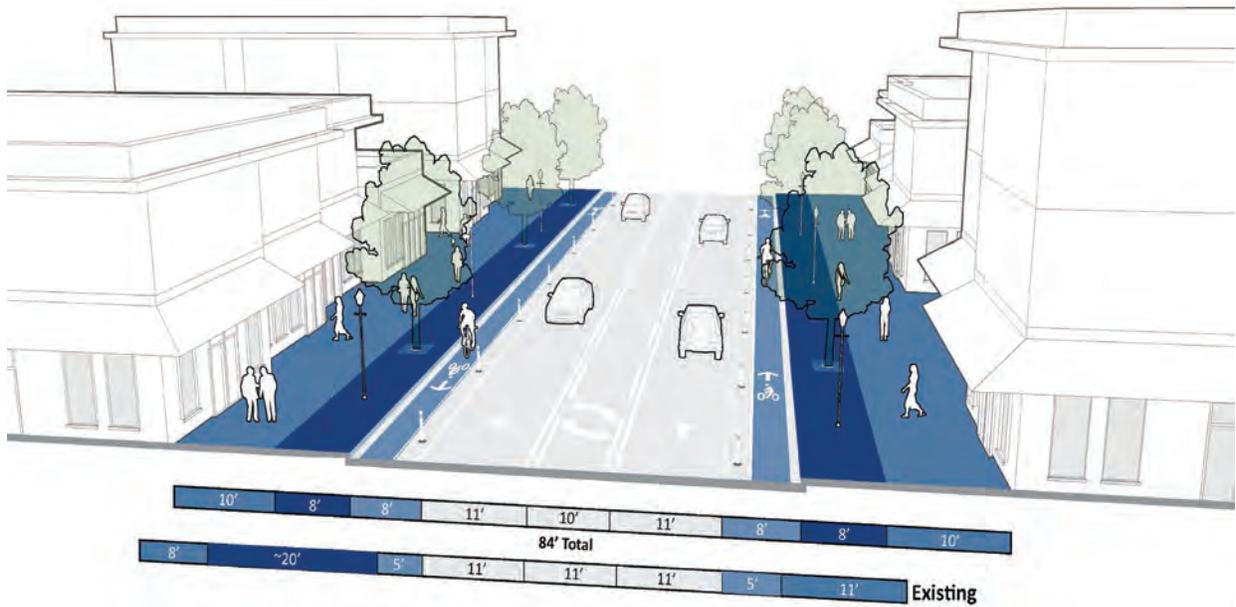
Street Typology	Street Name	From	To
Neighborhood B	6TH ST SE	Garrett Street	Monticello Avenue
	BRANDYWINE DR	Hydraulic Road	Greenbrier Drive
	DAIRY RD	Gentry Lane	Barracks Road
	E MARKET ST	Meade Avenue	Riverside Avenue
	GRADY AVE	Rugby Road	10th Street NW
	JEFFERSON PARK AVE	Old Lynchburg Road	Harris Road
	MEADOWBROOK HEIGHTS RD	Grove Road	Yorktown Drive
	NORTH AVE	Park Street	Sheridan Avenue
	OLD LYNCHBURG RD	Jefferson Park Avenue	City Limits
	PROSPECT AVE	9th Street SW	Bailey Avenue
	RIDGE ST	5th Street SW	Brookwood Drive
	RUGBY RD	Dairy Road	250 Bypass
	SHAMROCK RD	Jefferson Park Avenue	Cherry Avenue
	YORKTOWN DR	Grove Road	Brandywine Drive



## Mixed Use A

MIXED USE A STREET Major Design Elements	Recommended	Parameters
Right-of-way	n/a	60' - 100'
Sidewalks	Yes	> 7' clear walk zone
Curbside Buffer Zone (Highest Priority Street Element)	Yes	3' - 6' Width requirements: small trees = 4'; medium trees = 4' (6' preferred); large trees = 4' (6' preferred); smaller widths can be achieved if soil volume minimum met.
Street Trees**	Yes	Locate in curbside buffer or in on-street parking zone Soil volume minimums: small trees = 250 ft <sup>3</sup> ; medium trees = 400 ft <sup>3</sup> ; large trees = 400 ft <sup>3</sup> (700 ft <sup>3</sup> preferred)
On-Street Parking*	Limited or None	8'
Diagonal On-Street Parking	No	Back-in parking only, 60°, 17' min. stall depth
Off-Street Parking Access	Limited	Driveways, service and loading preferred from alleys and side streets
Travel Lane Widths*	n/a	10-11', if transit 11' outer lane
Turn Lanes	Yes	10'
*Combined travel lane and on-street parking width 18' minimum (7' on-street parking, 11' travel lane OR 8' on-street parking, 10' travel lane)		
**Trees: small (10' – 30' mature height) ; medium (30' – 50' mature height); large (50' mature height)		
	Highest Priority Street Elements	High Priority Street Elements

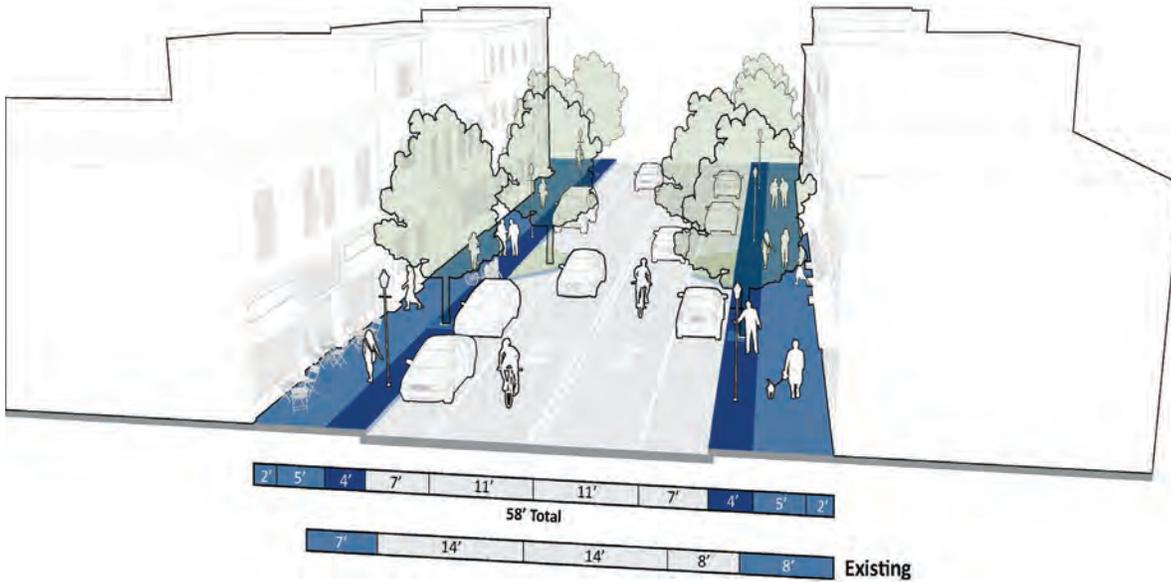
MIXED USE A STREET Major Design Elements	Recommended	Parameters
Design Speed	Slow	< 30 mph
Bicycle Facilities (High Priority Street Element)	Yes	5'-7' bike lanes, 7' separated bike lanes, turn boxes, 10' shared use paths Bicycle parking in Curbside Buffer Zone or on-street
Transit Stop Facilities	Yes	Shelters, benches, paved curbside waiting areas, litter receptacle
Traffic Calming	Yes	Roundabouts, medians
Curbs	Yes	Vertical curb, or combination curb and gutter
Gutters	Yes	Combination curb and gutter
Pedestrian Lighting	Yes	16' Height Maximum; See Lighting Standards
Street Lighting	Yes	
Median	Yes	Recommended to facilitate safe pedestrian crossings on streets with 3 lanes of traffic (can alternate with center turn lane); traffic calming, and stormwater management
Curb Radii	n/a	20' - 30'
Build-To Line/Street Wall Set Back from Public ROW	n/a	5'-10'+; varies by zoning district
Green and Blue Stormwater Opportunities	Yes	See Stormwater Elements section in Chapter 4.
Sidewalk Pavement Material	n/a	Concrete, permeable pavement, permeable pavers
Parking Lane Material	n/a	Asphalt, permeable pavement, unit pavers
Roadway Material	n/a	Asphalt
Gutter Material	n/a	Asphalt, concrete
Curb Material	n/a	Concrete
Curbside Buffer Zone Material	n/a	Unit pavers, permeable pavement, lawn, groundcover, vegetated tree boxes
Utilities	n/a	Separation Requirements for Street Trees/Above Ground Infrastructure: 10' preferred, 5' minimum. Anything under 10', consult with Utilities Engineer to reach solution.
*Combined travel lane and on-street parking width 18' minimum (7' on-street parking, 11' travel lane OR 8' on-street parking, 10' travel lane)		
**Trees: small (10' – 30' mature height) ; medium (30' – 50' mature height); large (50' mature height)		
	Highest Priority Street Elements	High Priority Street Elements



## Mixed Use B

MIXED USE B STREET Major Design Elements	Recommended	Parameters
Right-of-way	n/a	50-80'
Sidewalks	Yes	> 7' clear walk zone
Curbside Buffer Zone (Highest Priority Street Element)	Yes	3' - 6' Width requirements: small trees = 4'; medium trees = 4' (6' preferred); large trees = 4' (6' preferred); smaller widths can be achieved if soil volume minimum met.
Street Trees**	Yes	Locate in curbside buffer or in on-street parking zone Soil volume minimums: small trees = 250 ft <sup>3</sup> ; medium trees = 400 ft <sup>3</sup> ; large trees = 400 ft <sup>3</sup> (700 ft <sup>3</sup> preferred)
On-Street Parking*	Yes	7'-8'*
Diagonal On-Street Parking	No	Back-in parking only, 60°, 17' min. stall depth
Off-Street Parking Access	Limited	Driveways, service and loading preferred from alleys and side streets
Travel Lane Widths*	n/a	10-11', if transit 11' outer lane
Turn Lanes	Yes	10'
*Combined travel lane and on-street parking width 18' minimum (7' on-street parking, 11' travel lane OR 8' on-street parking, 10' travel lane)		
**Trees: small (10' – 30' mature height) ; medium (30' – 50' mature height); large (50' mature height)		
	Highest Priority Street Elements	High Priority Street Elements

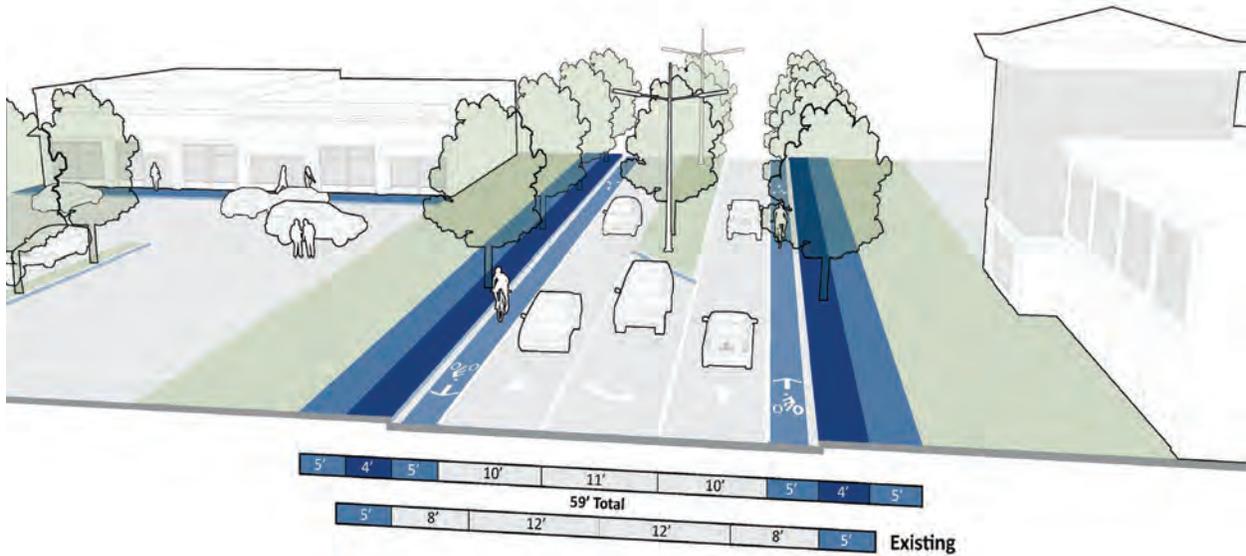
MIXED USE B STREET Major Design Elements	Recommended	Parameters
Design Speed	Slow	< 30 mph
Bicycle Facilities (High Priority Street Element)	Yes	5'-6' bike lanes, 7' separated bike lanes, turn boxes, 10' shared use paths Bicycle parking in Curbside Buffer Zone or on-street
Transit Stop Facilities	Yes	Shelters, benches, paved curbside waiting areas, litter receptacle
Traffic Calming	Yes	Roundabouts, corner curb extensions
Curbs	Yes	Vertical curb, or combination curb and gutter
Gutters	Limited	Combination curb and gutter
Pedestrian Lighting	Yes	16' Height Maximum; See Lighting Standards
Street Lighting	Yes	
Median	Yes	Recommended to facilitate safe pedestrian crossings on streets with 3 lanes of traffic (can alternate with center turn lane); traffic calming, and stormwater management
Curb Radi	n/a	20' - 30'
Build-To Line/Street Wall Set Back from Public ROW	n/a	5' - 10'+; varies by zoning district
Green and Blue Stormwater Opportunities	Yes	See <i>Stormwater Elements</i> section in Chapter 4.
Sidewalk Pavement Material	n/a	Concrete, permeable pavement
Parking Lane Material	n/a	Asphalt, permeable pavement, unit pavers
Roadway Pavement Material	n/a	Asphalt
Gutter Material	n/a	Asphalt, concrete
Curb Material	n/a	Concrete
Curbside Buffer Zone Material	n/a	Unit pavers, permeable pavement, lawn, groundcover, vegetated tree boxes
Utilities	n/a	Separation Requirements for Street Trees/Above Ground Infrastructure: 10' preferred, 5' minimum. Anything under 10', consult with Utilities Engineer to reach solution.
*Combined travel lane and on-street parking width 18' minimum (7' on-street parking, 11' travel lane OR 8' on-street parking, 10' travel lane)		
**Trees: small (10' – 30' mature height) ; medium (30' – 50' mature height); large (50' mature height)		
	Highest Priority Street Elements	High Priority Street Elements



## Downtown

DOWNTOWN STREET Major Design Elements	Recommended	Parameters
Right-of-way	n/a	50' - 75'
Sidewalks	Yes	> 6' clear walk zone
Curbside Buffer Zone (Highest Priority Street Element)	Yes	3' - 6' Width requirements: small trees = 4'; medium trees = 4' (6' preferred); large trees = 4' (6' preferred); smaller widths can be achieved if soil volume minimum met.
Street Trees**	Yes	Locate in curbside buffer or in on-street parking zone Soil volume minimums: small trees = 250 ft <sup>3</sup> ; medium trees = 400 ft <sup>3</sup> ; large trees = 400 ft <sup>3</sup> (700 ft <sup>3</sup> preferred)
On-Street Parking* (High Priority Street Element)	Yes	7'-8' Loading zones need to be considered
Diagonal On-Street Parking	Limited	Back-in parking only, 60°, 17' min. stall depth
Off-Street Parking Access	Limited	Driveway, service and loading preferred from alleys and side streets
Travel Lane Widths*	n/a	10-11', if transit 11' outer lane
Turn Lanes	Limited	Only at major intersections and major destination access points
*Combined travel lane and on-street parking width 18' minimum (7' on-street parking, 11' travel lane OR 8' on-street parking, 10' travel lane)		
**Trees: small (10' – 30' mature height) ; medium (30' – 50' mature height); large (50' mature height)		
Highest Priority Street Elements		High Priority Street Elements

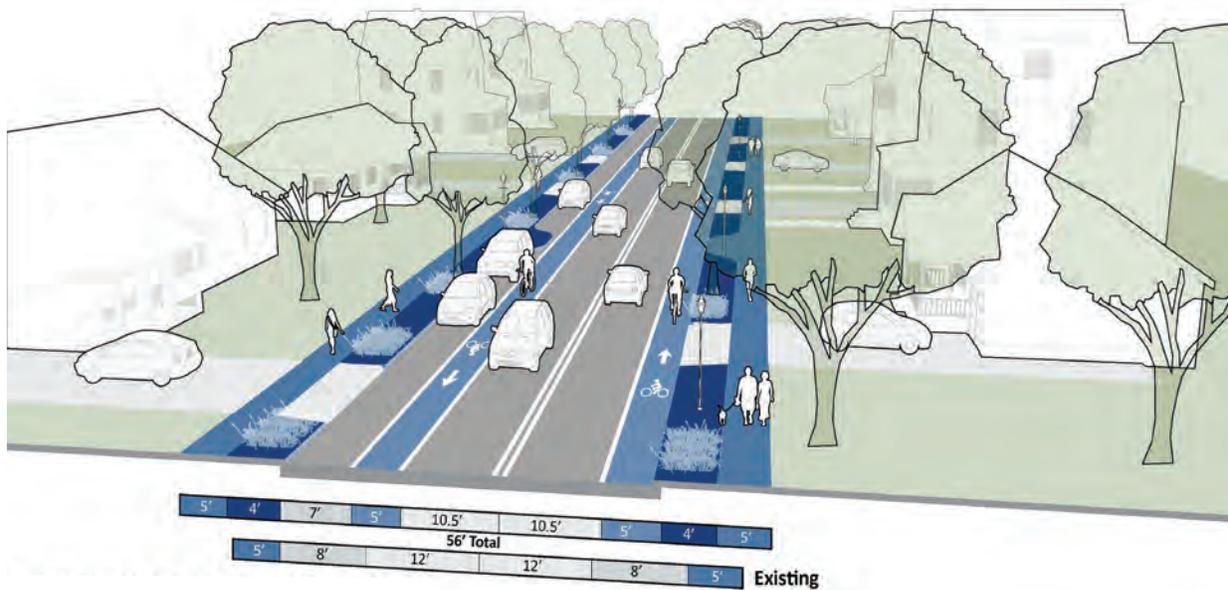
<b>DOWNTOWN STREET Major Design Elements</b>	<b>Recommended</b>	<b>Parameters</b>
<b>Design Speed</b>	Slow	25 mph
<b>Bicycle Facilities</b>	Yes	Shared lane markings, climbing lanes, turn boxes, bike boxes
<b>Transit Stop Facilities</b>	Yes	Shelters, benches, paved waiting areas, litter receptacles, lighting
<b>Traffic Calming</b>	Yes	Corner extensions
<b>Curbs</b>	Yes	Vertical curb, or combination curb and gutter
<b>Gutters</b>	Limited	Combination curb and gutter
<b>Pedestrian Lighting</b>	Yes	16' height maximum, See Lighting Standards
<b>Street Lighting</b>	Yes	
<b>Median</b>	No	Recommended to facilitate safe pedestrian crossings on streets with 3 lanes of traffic; traffic calming, and stormwater management
<b>Curb Radii</b>	n/a	15' - 25' (See Street Elements chapter for information on effective radii)
<b>Build-To Line/Street Wall Set Back from Public ROW</b>	n/a	0'-5'; varies by zoning district
<b>Green and Blue Stormwater Opportunities</b>	Yes	See <i>Stormwater Elements</i> section in Chapter 4.
<b>Sidewalk Pavement Material</b>	n/a	Concrete, permeable pavement, unit pavers consistent w/ historic character
<b>Parking Lane Material</b>	n/a	Asphalt, permeable pavement, unit pavers
<b>Roadway Pavement Material</b>	n/a	Asphalt
<b>Gutter Material</b>	n/a	Concrete, and unit pavers
<b>Curb Material</b>	n/a	n/a
<b>Curbside Buffer Zone Material</b>	n/a	Unit pavers, permeable pavement, vegetated tree boxes
<b>Utilities</b>	n/a	Separation Requirements for Street Trees/Above Ground Infrastructure: 10' preferred, 5' minimum. Anything under 10', consult with Utilities Engineer to reach solution.
*Combined travel lane and on-street parking width 18' minimum (7' on-street parking, 11' travel lane OR 8' on-street parking, 10' travel lane)		
**Trees: small (10' – 30' mature height) ; medium (30' – 50' mature height); large (50' mature height)		
	Highest Priority Street Elements	High Priority Street Elements



## Industrial

INDUSTRIAL STREET Major Design Elements	Recommended	Parameters
Right-of-way	n/a	40' - 60'
Sidewalks	Yes	5' - 6' clear walk zone
Curbside Buffer Zone (Highest Priority Street Element)	Yes	3' - 6' Width requirements: small trees = 4'; medium trees = 4' (6' preferred); large trees = 4' (6' preferred); smaller widths can be achieved if soil volume minimum met.
Street Trees**	Yes	Locate in curbside buffer or in on-street parking zone Soil volume minimums: small trees = 250 ft <sup>3</sup> ; medium trees = 400 ft <sup>3</sup> ; large trees = 400 ft <sup>3</sup> (700 ft <sup>3</sup> preferred)
On-Street Parking*	Limited	7'-8'
Diagonal On-Street Parking	No	
Off-Street Parking Access	Yes	Sidewalk level and ADA access to be maintained at all driveways
Travel Lane Widths* (High Priority Street Element)	n/a	11-12'
Turn Lanes	Yes	10'-11'
*Combined travel lane and on-street parking width 18' minimum (7' on-street parking, 11' travel lane OR 8' on-street parking, 10' travel lane)		
**Trees: small (10' – 30' mature height); medium (30' – 50' mature height); large (50' mature height)		
	Highest Priority Street Elements	High Priority Street Elements

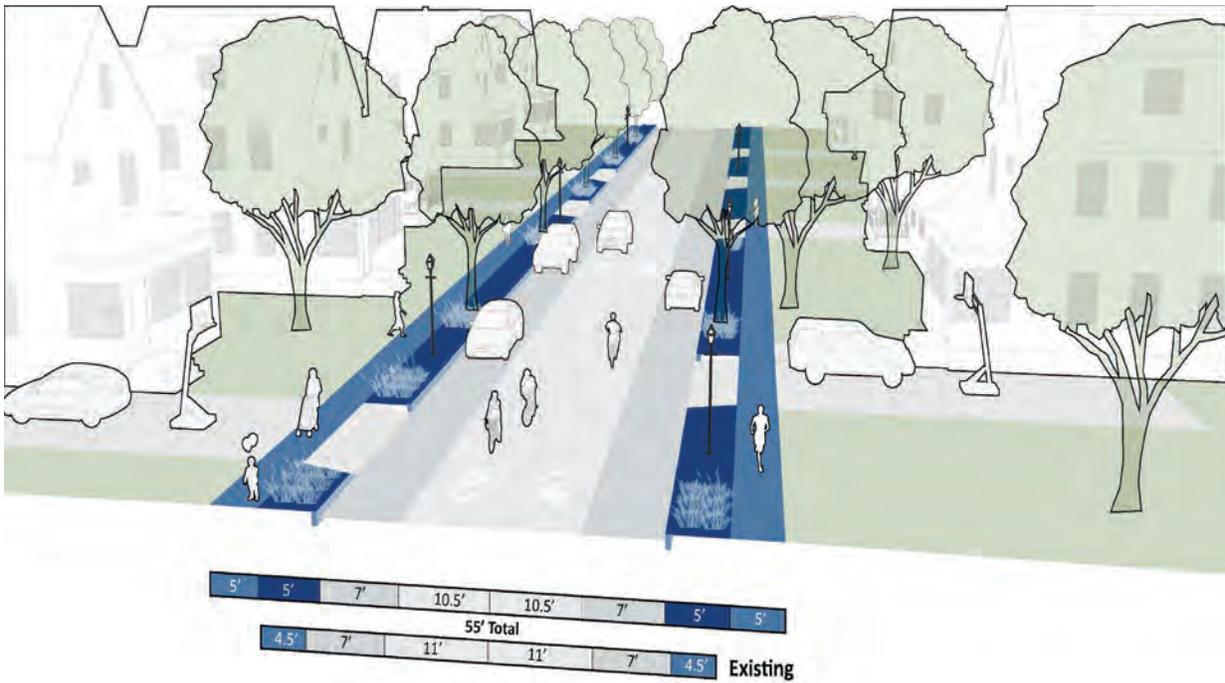
INDUSTRIAL STREET Major Design Elements	Recommended	Parameters
Design Speed	Slow	< 25mph
Bicycle Facilities	Limited	Shared Lane Markings, 5' bike lanes, 6' climbing bike lanes
Transit Stop Facilities	Yes	Benches, paved curbside waiting areas
Traffic Calming	Yes	Curb extensions (mid-block and corner) and only appropriate with on-street parking
Curbs	Where necessary	Vertical curb, or combination curb and gutter
Gutters	Yes	Combination curb and gutter
Pedestrian Lighting	Yes	16' height maximum; See Lighting Standards
Street Lighting	Yes	
Median	Limited	Recommended to facilitate safe pedestrian crossings on streets with 3 lanes of traffic; traffic calming, and stormwater management
Curb Radi	n/a	20' - 30'
Build-To Line/Street Wall Set Back from Public ROW	n/a	10' - 60'; varies by zoning district
Green and Blue Stormwater Opportunities	Yes	See <i>Stormwater Elements</i> section in Chapter 4.
Sidewalk Pavement Material	n/a	Concrete, permeable pavement
Parking Lane Material	n/a	Asphalt, permeable pavement
Roadway Pavement Material	n/a	Asphalt
Gutter Material	n/a	Asphalt, concrete
Curb Material	n/a	Concrete
Curbside Buffer Zone Material	n/a	Unit pavers, permeable pavement, lawn, groundcover, vegetated tree boxes
Utilities	n/a	Separation Requirements for Street Trees/Above Ground Infrastructure: 10' preferred, 5' minimum. Anything under 10', consult with Utilities Engineer to reach solution.
*Combined travel lane and on-street parking width 18' minimum (7' on-street parking, 11' travel lane OR 8' on-street parking, 10' travel lane)		
**Trees: small (10' – 30' mature height); medium (30' – 50' mature height); large (50' mature height)		
	Highest Priority Street Elements	High Priority Street Elements



## Neighborhood A

NEIGHBORHOOD A STREET Major Design Elements	Recommended	Parameters
Right-of-way	n/a	25' - 50'
Sidewalks (Highest Priority Street Element)	Yes	5'-6' clear walk zone
Curbside Buffer Zone	Yes	3' - 6' Width requirements: small trees = 4'; medium trees = 4' (6' preferred); large trees = 4' (6' preferred); smaller widths can be achieved if soil volume minimum met.
Street Trees**	Yes	Locate in curbside buffer or in on-street parking zone Soil volume minimums: small trees = 250 ft <sup>3</sup> ; medium trees = 400 ft <sup>3</sup> ; large trees = 400 ft <sup>3</sup> (700 ft <sup>3</sup> preferred)
On-Street Parking* (High Priority Street Element in areas without off-street parking)	Yes	7' - 8'*
Diagonal On-Street Parking	No	
Off-Street Parking Access	Yes	Sidewalk level and ADA access to be maintained at all driveways
Travel Lane Widths*	n/a	10-11', if transit 11' outer lane
*Combined travel lane and on-street parking width 18' minimum (7' on-street parking, 11' travel lane OR 8' on-street parking, 10' travel lane)		
**Trees: small (10' – 30' mature height); medium (30' – 50' mature height); large (50' mature height)		
	Highest Priority Street Elements	High Priority Street Elements

NEIGHBORHOOD A STREET Major Design Elements	Recommended	Parameters
Turn Lanes	No	
Design Speed	Slow	< 25mph
<b>Bicycle Facilities (Highest Priority Street Element)</b>	Yes	Bicycles May Use Full Lane signage, Shared Lane Markings, 5' Bike Lanes, 6' Climbing Bike Lanes
Transit Stop Facilities	Yes	Benches, paved curbside waiting areas
Traffic Calming	Yes	Curb extensions (mid-block and corner), speed tables, raised intersections, raised crossings, and mini traffic circles
Curbs	Limited	Vertical curb, or combination curb and gutter
Gutters	Yes	Valley gutter or combination curb and gutter
Pedestrian Lighting	Yes	16' Height Maximum; see Lighting Standards
Street Lighting	No	
Median	No	
Curb Radi	n/a	15' - 25'
Build-To Line/Street Wall Set Back from Public ROW	n/a	10' - 25'; varies by zoning district
Green and Blue Stormwater Opportunities	Yes	See <i>Stormwater Elements</i> section in Chapter 4.
Sidewalk Pavement Material	n/a	Concrete, permeable pavement, unit pavers
Parking Lane Material	n/a	Asphalt, permeable pavement, unit pavers
Roadway Pavement Material	n/a	Asphalt
Gutter Material	n/a	Asphalt, concrete, and unit pavers
Curb Material	n/a	Concrete
Curbside Buffer Zone Material	n/a	Lawn, groundcover, vegetated tree boxes
Utilities	n/a	Separation Requirements for Street Trees/Above Ground Infrastructure: 10' preferred, 5' minimum. Anything under 10', consult with Utilities Engineer to reach solution.
*Combined travel lane and on-street parking width 18' minimum (7' on-street parking, 11' travel lane OR 8' on-street parking, 10' travel lane)		
**Trees: small (10' – 30' mature height); medium (30' – 50' mature height); large (50' mature height)		
	Highest Priority Street Elements	High Priority Street Elements



## Neighborhood B

NEIGHBORHOOD B STREET Major Design Elements	Recommended	Parameters
Right-of-way	n/a	25' - 50'
Sidewalks (Highest Priority Street Element)	Yes	5' – 6' clear walk zone
Curbside Buffer Zone	Yes	3' - 6' Width requirements: small trees = 4'; medium trees = 4' (6' preferred); large trees = 4' (6' preferred); smaller widths can be achieved if soil volume minimum met.
Street Trees**	Yes	Locate in curbside buffer or in on-street parking zone Soil volume minimums: small trees = 250 ft <sup>3</sup> ; medium trees = 400 ft <sup>3</sup> ; large trees = 400 ft <sup>3</sup> (700 ft <sup>3</sup> preferred)
On-Street Parking (Highest Priority Street Element in areas without off-street parking)	Yes	7' - 8'
Diagonal On-Street Parking	No	
Off-Street Parking Access	Yes	Sidewalk level and ADA access to be maintained at all driveways
Travel Lane Widths (High Priority Street Element)	n/a	10-11', if transit 11' outer lane
*Combined travel lane and on-street parking width 18' minimum (7' on-street parking, 11' travel lane OR 8' on-street parking, 10' travel lane)		
**Trees: small (10' – 30' mature height); medium (30' – 50' mature height); large (50' mature height)		
	Highest Priority Street Elements	High Priority Street Elements

NEIGHBORHOOD B STREET Major Design Elements	Recommended	Parameters
Turn Lanes	No	
Design Speed	Slow	< 25mph
Bicycle Facilities	Yes	Bicycles May Use Full Lane signage, Shared Lane Markings, Climbing Lanes
Transit Stop Facilities	Yes	Benches, paved curbside waiting areas
Traffic Calming	Yes	Curb extensions (mid-block and corner), speed tables, raised intersections, raised crossings, and mini traffic circles
Curbs	Limited	Vertical curb, or combination curb and gutter
Gutters	Yes	Valley gutter or combination curb and gutter
Pedestrian Lighting	Yes	16' Height Maximum; see Lighting Standards
Street Lighting	No	
Median	No	
Curb Radi	n/a	15' - 25'
Build-To Line/Street Wall Set Back from Public ROW	n/a	10' - 25'; varies by zoning district
Green and Blue Stormwater Opportunities	Yes	See <i>Stormwater Elements</i> section in Chapter 4.
Sidewalk Pavement Material	n/a	Concrete, permeable pavement, unit pavers
Parking Lane Material	n/a	Asphalt, permeable pavement, unit pavers
Roadway Pavement Material	n/a	Asphalt
Gutter Material	n/a	Asphalt, concrete, and unit pavers
Curb Material	n/a	Concrete, granite
Curbside Buffer Zone Material	n/a	Lawn, groundcover, vegetated tree boxes
Utilities	n/a	Separation Requirements for Street Trees/Above Ground Infrastructure: 10' preferred, 5' minimum. Anything under 10', consult with Utilities Engineer to reach solution.
*Combined travel lane and on-street parking width 18' minimum (7' on-street parking, 11' travel lane OR 8' on-street parking, 10' travel lane)		
**Trees: small (10' – 30' mature height); medium (30' – 50' mature height); large (50' mature height)		
	Highest Priority Street Elements	High Priority Street Elements

# Appendix D. Streets That Work Priority Locations

## Priority Corridors

Rank	Street Name	Street Typology	Priority Score
1	Elliott Ave	Neighborhood A	100.0
2	9Th St Ne	Downtown	99.3
3	Ridge Mcintire Rd	Downtown	97.2
4	Preston Ave	Mixed Use A	93.2
5	Preston Ave	Mixed Use A	92.4
6	W Main St	Mixed Use B	90.6
7	E High St	Mixed Use B	90.6
8	10Th St Nw	Neighborhood A	90.5
9	Ridge St	Neighborhood A	90.2
10	Lexington Ave	Mixed Use B	88.9
11	9Th St Se/Avon St	Downtown	86.9
12	Market St	Downtown	85.9
13	Rose Hill Dr	Mixed Use B	79.6
14	10Th St Ne	Mixed Use B	79.5
15	10Th St Nw	Mixed Use B	78.6
16	Water St	Downtown	77.0
17	Cherry Ave	Mixed Use B	74.7
18	E High St	Mixed Use B	72.4
19	High St	Downtown	71.8
20	Grady Ave	Neighborhood B	69.0
21	Preston Ave	Neighborhood A	66.9
22	Monticello Ave	Neighborhood A	65.2
23	Roosevelt Brown Blvd	Mixed Use B	65.1
24	Garrett St	Downtown	62.7
25	E Water St	Downtown	62.2
26	14Th St Nw	Mixed Use B	61.2
27	Fontaine Ave	Neighborhood A	61.1
28	Monticello Ave	Mixed Use B	60.5
29	9Th St Sw	Neighborhood A	58.6
30	Meade Ave	Neighborhood A	58.0
31	Barracks Rd	Mixed Use B	57.7
32	Long St	Mixed Use B	57.3
33	6Th St Se	Neighborhood A	56.7
34	Elliott Ave	Neighborhood A	56.6
35	E Market St	Mixed Use B	55.1
36	2Nd St Se	Downtown	54.2

Rank	Street Name	Street Typology	Priority Score
37	Garrett St/Levy Ave	Downtown	53.7
38	Mcintire Rd/Meadowcreek Pkwy	Neighborhood A	53.1
39	Ivy Rd	Mixed Use B	53.0
40	Maury Ave	Mixed Use B	52.9
41	University Ave	Mixed Use B	52.3
42	14Th St Nw	Neighborhood A	52.2
43	Jefferson Park Ave	Neighborhood A	51.3
44	5Th St Sw	Mixed Use A	50.0
45	Locust Ave	Neighborhood A	48.2
46	Harris St	Industrial	47.5
47	Avon St	Neighborhood A	46.8
48	Bailey Rd	Neighborhood B	45.8
49	Park St	Neighborhood B	45.3
50	Meade Ave	Industrial	44.2
51	Ridge St	Neighborhood B	43.7
52	Emmet St N	Mixed Use A	43.5
53	5Th St Sw	Mixed Use A	43.0
54	Emmet St N	Mixed Use A	42.6
55	Emmet St S	Mixed Use B	40.6
56	Madison Ave	Neighborhood A	40.2
57	Jefferson Park Ave	Mixed Use B	40.0
58	Barracks Rd	Mixed Use A	39.9
59	Hydraulic Rd	Mixed Use A	39.4
60	Park St	Neighborhood A	39.3
61	5Th St Sw	Mixed Use A	38.9
62	E Market St	Neighborhood B	37.6
63	Rugby Rd	Neighborhood A	36.8
64	Alderman Rd	Neighborhood A	35.9
65	Millmont St	Mixed Use B	35.7
66	Harris Rd	Neighborhood A	35.2
67	Cherry Ave	Neighborhood A	34.7
68	Prospect Ave	Neighborhood B	34.6
69	Calhoun St	Neighborhood A	34.6
70	Carlton Rd	Neighborhood A	34.3
71	Stadium Rd	Mixed Use B	34.0

Rank	Street Name	Street Typology	Priority Score
72	Sheridan Ave	Neighborhood A	33.5
73	Stadium Rd	Mixed Use B	32.5
74	Emmet St N	Mixed Use A	32.1
75	Water St	Downtown	31.7
76	Cleveland Ave	Neighborhood A	30.0
77	Monticello Ave	Mixed Use B	29.2
78	Angus Rd	Mixed Use B	28.7
79	Barracks Rd	Neighborhood A	28.3
80	North Ave	Neighborhood B	27.7
81	Jefferson Park Ave	Neighborhood A	27.1
82	6Th St Se	Neighborhood B	26.7
83	Carlton Rd	Industrial	26.0
84	Jefferson Park Ave	Neighborhood B	25.4
85	Rugby Rd	Neighborhood B	25.0
86	Rugby Ave	Neighborhood A	25.0
87	Park St	Neighborhood B	24.0
88	Dairy Rd	Neighborhood B	23.1
89	Meadowbrook Heights Rd	Neighborhood B	23.0
90	Greenbrier Dr	Neighborhood A	22.1
91	Rose Hill Dr	Neighborhood A	22.0
92	Yorktown Dr	Neighborhood B	21.0
93	Ramp	Neighborhood A	19.7
94	Brandywine Dr	Neighborhood B	19.2
95	Stadium Rd	Mixed Use B	19.1
96	Grove Rd	Neighborhood A	18.2
97	Shamrock Rd	Neighborhood B	17.7
98	Rugby Rd	Neighborhood B	16.9
99	River Rd	Industrial	15.4
100	Old Lynchburg Rd	Neighborhood B	15.2
101	Locust Ave	Neighborhood B	14.3
102	Carlton Ave	Industrial	14.0
103	Angus Rd	Neighborhood A	13.7
104	Cedar Hill Rd	Neighborhood A	13.6
105	Melbourne Rd	Mixed Use B	11.0

## Priority Intersections

Intersection ID	Priority Score	Description of Issue
1	100.0	Intersection Problem
2	98.8	Intersection Problem
3	94.4	Intersection Problem
4	93.2	Bicycle/Pedestrian Hot Spot
5	91.4	Bicycle/Pedestrian Hot Spot
6	89.4	Intersection Problem
7	88.7	Bicycle/Pedestrian Hot Spot
8	87.0	Bicycle/Pedestrian Hot Spot
9	84.3	Intersection Problem
10	82.8	Bicycle/Pedestrian Hot Spot
11	82.5	Bicycle/Pedestrian Hot Spot
12	80.7	Bicycle/Pedestrian Hot Spot
13	80.2	Bicycle/Pedestrian Hot Spot
14	79.6	Intersection Problem
15	79.0	Bicycle/Pedestrian Hot Spot
16	78.2	Bicycle/Pedestrian Hot Spot
17	76.9	Intersection Problem
18	74.6	Intersection Problem
19	73.8	Bicycle/Pedestrian Hot Spot
20	72.7	Bicycle/Pedestrian Hot Spot
21	72.4	Bicycle/Pedestrian Hot Spot
22	71.8	Bicycle/Pedestrian Hot Spot
23	71.5	Bicycle/Pedestrian Hot Spot
24	70.8	Bicycle/Pedestrian Hot Spot
25	69.9	Intersection Problem
26	68.8	Intersection Problem
27	68.2	Intersection Problem
28	65.2	Intersection Problem
29	64.9	Intersection Problem
30	64.6	Bicycle/Pedestrian Hot Spot
31	64.2	Bicycle/Pedestrian Hot Spot
32	64.0	Bicycle/Pedestrian Hot Spot

Intersection ID	Priority Score	Description of Issue
33	63.6	Bicycle/Pedestrian Hot Spot
34	62.9	Bicycle/Pedestrian Hot Spot
35	62.6	Bicycle/Pedestrian Hot Spot
36	62.5	Bicycle/Pedestrian Hot Spot
37	62.2	Bicycle/Pedestrian Hot Spot
38	61.6	Bicycle/Pedestrian Hot Spot
39	60.7	Bicycle/Pedestrian Hot Spot
40	60.5	Bicycle/Pedestrian Hot Spot
41	59.3	Intersection Problem
42	58.7	Bicycle/Pedestrian Hot Spot
43	57.3	Bicycle/Pedestrian Hot Spot
44	56.8	Bicycle/Pedestrian Hot Spot
45	56.5	Intersection Problem
46	56.1	Bicycle/Pedestrian Hot Spot
47	55.6	Intersection Problem
48	55.4	Intersection Problem
49	54.7	Intersection Problem
50	54.6	Intersection Problem
51	54.5	Intersection Problem
52	54.0	Intersection Problem
53	54.0	Bicycle/Pedestrian Hot Spot
54	53.5	Bicycle/Pedestrian Hot Spot
55	52.6	Bicycle/Pedestrian Hot Spot
56	52.6	Bicycle/Pedestrian Hot Spot
57	52.4	Intersection Problem
58	52.4	Bicycle/Pedestrian Hot Spot
59	51.4	Bicycle/Pedestrian Hot Spot
60	50.5	Intersection Problem
61	50.2	Intersection Problem
62	49.6	Bicycle/Pedestrian Hot Spot
63	49.1	Bicycle/Pedestrian Hot Spot
64	48.9	Intersection Problem

Intersection ID	Priority Score	Description of Issue
65	48.3	Bicycle/Pedestrian Hot Spot
66	48.2	Bicycle/Pedestrian Hot Spot
67	47.7	Bicycle/Pedestrian Hot Spot
68	47.3	Intersection Problem
69	47.2	Bicycle/Pedestrian Hot Spot
70	46.7	Bicycle/Pedestrian Hot Spot
71	46.7	Intersection Problem
72	46.6	Intersection Problem
73	46.2	Bicycle/Pedestrian Hot Spot
74	45.8	Bicycle/Pedestrian Hot Spot
75	44.5	Intersection Problem
76	44.3	Intersection Problem
77	44.1	Bicycle/Pedestrian Hot Spot
78	43.0	Bicycle/Pedestrian Hot Spot
79	42.7	Intersection Problem
80	42.7	Bicycle/Pedestrian Hot Spot
81	41.8	Intersection Problem
82	41.8	Intersection Problem
83	41.7	Bicycle/Pedestrian Hot Spot
84	41.6	Intersection Problem
85	41.6	Bicycle/Pedestrian Hot Spot
86	40.8	Intersection Problem
87	40.5	Intersection Problem
88	40.0	Intersection Problem
89	39.8	Bicycle/Pedestrian Hot Spot
90	39.6	Intersection Problem
91	38.9	Intersection Problem
92	38.0	Bicycle/Pedestrian Hot Spot
93	37.5	Intersection Problem
94	37.4	Intersection Problem
95	37.2	Intersection Problem
96	37.2	Bicycle/Pedestrian Hot Spot

Intersection ID	Priority Score	Description of Issue
97	36.9	Intersection Problem
98	36.9	Bicycle/Pedestrian Hot Spot
99	36.2	Intersection Problem
100	35.5	Bicycle/Pedestrian Hot Spot
101	34.9	Bicycle/Pedestrian Hot Spot
102	34.5	Intersection Problem
103	33.9	Intersection Problem
104	32.7	Intersection Problem
105	32.7	Bicycle/Pedestrian Hot Spot
106	32.3	Intersection Problem
107	32.3	Bicycle/Pedestrian Hot Spot
108	32.2	Intersection Problem
109	32.0	Intersection Problem
110	30.4	Bicycle/Pedestrian Hot Spot
111	30.0	Bicycle/Pedestrian Hot Spot
112	29.6	Bicycle/Pedestrian Hot Spot
113	29.6	Intersection Problem
114	25.6	Intersection Problem
115	24.9	Bicycle/Pedestrian Hot Spot
116	23.4	Intersection Problem
117	22.7	Bicycle/Pedestrian Hot Spot
118	22.7	Bicycle/Pedestrian Hot Spot
119	20.7	Bicycle/Pedestrian Hot Spot
120	19.4	Bicycle/Pedestrian Hot Spot
121	19.2	Intersection Problem
122	18.9	Bicycle/Pedestrian Hot Spot
123	18.4	Bicycle/Pedestrian Hot Spot
124	17.3	Bicycle/Pedestrian Hot Spot
125	14.9	Intersection Problem
126	14.3	Bicycle/Pedestrian Hot Spot
127	8.4	Bicycle/Pedestrian Hot Spot
128	8.2	Intersection Problem