



Town of Richmond, Vermont **Bike, Walk, and Trails Plan**

Phase 1: North of Winooski River
May 2021

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Acronyms

AADT	Annual Average Daily Traffic
ADT	Average Daily Traffic
ADA	Americans with Disabilities Act
BLTS	Bicycle Level of Traffic Stress
CCRPC	Chittenden County Regional Planning Commission
MPH	Mile per Hour
SLM	Shared Lane Markings
SRTS	Safe Routes to School
TIP	Transportation Improvement Program
VMT	Vehicle Miles Traveled
VTrans	State of Vermont Agency of Transportation
VYCC	Vermont Youth Conservation Corps

Section 1

Introduction

1. Introduction



Background and Purpose

The Richmond Bike, Walk, and Trails Plan (the “Plan”) provides a vision, goals and priorities to improve walking and biking in Richmond. The Plan was developed to establish Town priorities to further local agencies’ efforts to enhance walking and biking for Richmond, Vermont’s 4,000 plus residents.

The Plan addresses both biking and walking as they share many commonalities in how they are planned for, funded, and constructed. The purpose of the Plan is to guide Chittenden County Regional Planning Commission (CCRPC) and the Town of Richmond to plan, fund, and deliver pedestrian and bicycle facilities and programs throughout the Town.

The Town of Richmond envisions its neighborhoods, village, parks, open spaces, and activity areas connected by a safe, comfortable, and convenient network of walking and bicycling facilities.

Walking and bicycling—often referred to together as “active transportation”—can complement the Town’s strategic goals related to affordability, economic opportunities, mobility and transportation options, roadway safety, and natural + working lands.¹ The Plan presents an integrated strategy for implementing infrastructure and supportive policies to encourage the growth of active transportation throughout Richmond. Continuous walking and bicycling facilities that are comfortable and accessible for people of all ages and abilities will help the Town achieve its strategic goals and provide many quality of life and economic benefits to Richmond.

The Richmond Walk, Bike and Trails Plan serves as a master plan for the Town of Richmond, to guide the reestablishment of a Complete Streets network that will include off-road connections and trails. The first phase of this planning effort, completed in June 2021 and currently represented in this document, focuses exclusively on areas on the north side of the Winooski River. The second phase to be completed will focus on areas to

the south of the river. The results of the two phases will ultimately be compiled into one comprehensive plan.

During the process of developing this Plan, two areas of key interest/themes emerged:

Complete Streets

A Complete Streets approach integrates people and place in the planning, design, construction, operation, and maintenance of our transportation networks. This helps to ensure streets put safety over speed, balance the needs of different modes, and support local land uses, economies, cultures, and natural environments.

National Complete Streets Coalition

1. Identifying opportunities to

achieve both near term improvements and the Town’s long-term vision by leveraging related projects, such as the Town’s Bridge Street Scoping Study and the Vermont Agency of Transportation’s (VTTrans) Route 2/Main Street repaving project.

2. Defining a vision for future investment in trails and roadway connections throughout Richmond that will inspire other communities to create connected on- and off-road networks to serve residents and visitors alike.

¹ Transportation Vision Connection, Richmond Town Plan, 2018. <http://www.richmondvt.gov/wp-content/uploads/2014/03/Richmond-Town-Plan-Draft.pdf>

Study Area

The focus of this plan is the area within the Town's boundaries north of the Winooski River (Figure 1).

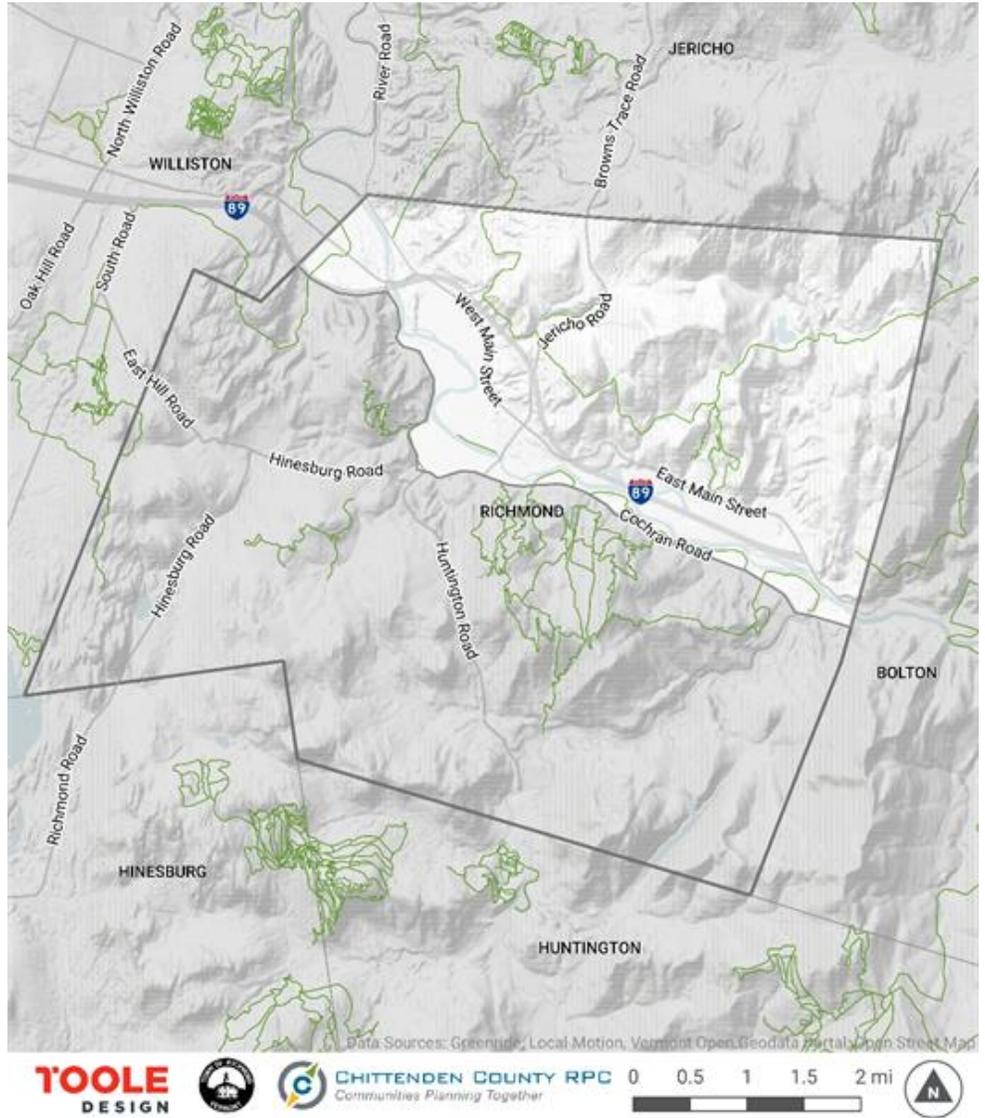


Figure 1. Study Area

Vision Statement

Richmond will be a place where all residents and visitors have safe and welcoming connections to where they need to and want to go, a place that is a healthy community with recreational and economic opportunities, and a place that is responsive to climate change.

The project vision statement, below, was developed through the community engagement process, with input from the project team, to guide the development of the Plan.

Safe and Welcoming

Richmond will make on-street and off-street walking and biking safe and welcoming to all residents, offering equitable access to

work, school, and play. Richmond will set a precedent for neighboring Chittenden County communities by acting as a testbed for the use of trails as transportation.

Connected

Richmond will be connected by foot and bike locally and regionally – among neighborhoods, between neighborhoods and the Village, and to neighboring towns.

Healthy

Richmond will build a healthy community, empower social connections, and responsibly increase market opportunities through sustainable recreation opportunities for residents and visitors.

Climate Adaptive

Richmond will reduce greenhouse gas emissions by providing more opportunities to walk and bike. Richmond will encourage people to choose active transportation by increasing its efficiency and convenience.

Why Walking and Bicycling?

A balanced transportation system that includes walking and bicycling is essential to Richmond's future, ensuring a continued quality of life for residents and visitors.



Economic Development

Walkable communities can attract new businesses and increase their overall economic activity. Businesses in walkable areas are easier for customers to access and the mixture of business types they attract multiply this effect.^{1 2 3}

Combining totals from bicycle-pedestrian infrastructure and program expenditures, bicycle-pedestrian event tourism, and bicycle-pedestrian-oriented businesses in Vermont resulted in a total 2009 economic contribution of \$82.7 million in output, and over 1,400 jobs with \$40.9 million in labor earnings (wages and salaries plus proprietor income).⁴ The state budget fiscal impact from bicycle and pedestrian activities in 2009 amounted to a net positive of \$1.6 million of tax and fee revenues for the State of Vermont.⁴

Home values in walkable neighborhoods are higher than those in less walkable neighborhoods and can have more than a \$30,000 premium.^{5 6 7}

Owning, operating, and maintaining a vehicle costs the average family \$8,500 per year, accounting for nearly all (94%) of their transportation costs.⁸ People who walk or bike can reduce their vehicle use and operating costs.⁹

Bicycle and pedestrian infrastructure, such as shared use paths, can boost property values nearby by providing a quality-of-life amenity.

Ensuring that Vermonters have safe and convenient facilities for walking and bicycling could save the state millions of dollars per year in health care, social services and transportation costs.⁴

Health and Environment



Health care costs represent a major factor in the Vermont economy and bicycling and walking can help reduce these costs.⁴ The health benefits related to regular physical activity can be far-reaching, including reduced risk of coronary heart disease, stroke, diabetes and other chronic diseases, as well as lower health care costs and improved quality of life for all age groups.⁴ Communities that are more walkable and bikeable can

see reductions in obesity, diabetes, high blood pressure, and heart disease rates.^{10 11 12 13}

The most common trips for bicyclists—those under five miles—produce the greatest environmental benefit since auto trips less than five miles in length are the least fuel efficient and produce the highest emissions per mile.⁴



Managing Transportation Demand and Expenditure

As Richmond grows over time, providing people with the option to walk or bike for daily trips rather than drive can limit congestion and vehicle miles traveled.

People on foot and on bike take up considerably less road space than the same number of people would use in single-occupancy vehicles.

Capital and lifecycle costs for pedestrian and bicycle infrastructure are lower than vehicle infrastructure while having a higher carrying capacity per square foot.

Traffic Safety



Communities designed to be more walkable and bikeable are safer for all road users. These communities experience fewer total, severe, and fatal crashes of all types because their infrastructure encourages slow vehicle speeds and more predictable behaviors.¹⁴

As more people walk, the safer walking is for everybody. When the number of people walking doubles, an individual's risk of being struck by a vehicle decreases by 34%.¹⁵

Streets with bikeways separated from car traffic are significantly safer for bicyclists, pedestrians, and drivers compared to streets without such infrastructure, and are effective in reducing severe injuries.^{16 17 18 19}



Recreation and Tourism

The qualities that make a place more walkable—such as connected sidewalks, places to linger, shopping, and a mix of uses and activities—are appealing to tourists and residents alike.

Safe, comfortable, and convenient shared use paths and bike lanes can attract recreational riders to a community, growing customer traffic to local businesses.^{20 21 22}

Communities across North America have found that money spent on bicycle tourism has a high return on investment. For example, in the Pikes Peak Area in Colorado, bicycling adds \$23 million per year and a return on investment up to 270%.²² Bicycle tourists on a popular route in Quebec spend \$214 per day, 6% more than other tourists, and two-thirds of those surveyed plan to return.²⁴ Walking and bicycling are two of the most popular recreational activities in Vermont – with 42 percent of Vermont adults walking for recreation, 34 percent hiking, and 23 percent bicycling.⁴

Design Users

A connected and accessible walking and bicycling network will allow users of all ages and abilities to enjoy all that Richmond has to offer. Both walking and biking infrastructure can be designed so everybody who lives in or visits Richmond can enjoy it safely and comfortably.

In order to appeal to the broadest possible array of users, pedestrian and bicycle networks should be designed to provide connectivity between origins and destinations along routes that are both objectively and perceivably safe and comfortable. No matter the skill level or trip purpose, all user groups will benefit from improved conditions for walking and bicycling.

Walking



The design and maintenance of walking infrastructure must comply with Title II of the Americans with Disabilities Act (ADA) of 1990 and Section 504 of the Rehabilitation Act of 1973, which established the legal right for people with disabilities to have access to transportation within the public right-of-way. As a best practice, communities should consider using the U.S. Access Board’s Public Rights-of-Way Accessibility Guidelines²⁶ when designing pedestrian infrastructure.

Accessible designs benefit all users, not just those with disabilities. For example, people with strollers also benefit from well-constructed and maintained sidewalks and curb ramps that are free of ruts, heaves, and other hazards.



Biking

According to national research, a substantial portion of the population is interested in riding a bicycle, but most choose not to because they feel unsafe riding in close proximity vehicle traffic, as shown in Figure 2. Therefore, road designs should focus on reducing bicyclists' exposure to vehicle traffic and speed.

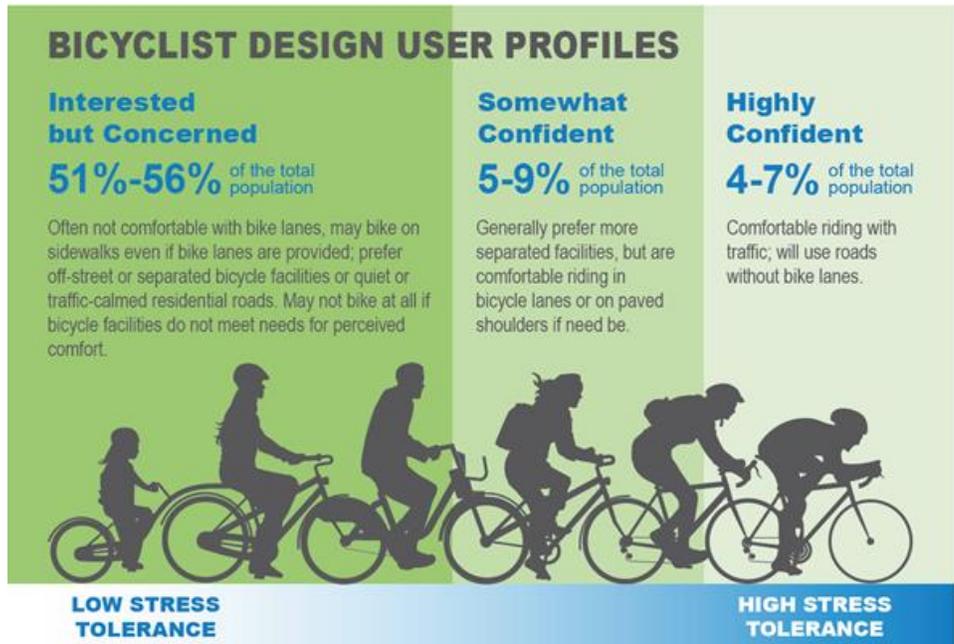


Figure 2. Bicyclist Types for Network Planning and Design

Source: Dill, Jennifer and McNeil, Nathan, Revisiting the Four Types of Cyclists: Findings from a National Survey, Transportation Research Record: Journal of the Transportation Research Board, January 12, 2016.

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Section 2

Planning Process

2. Planning Process



Figure 3. 2018 Richmond Town Plan

The Richmond Bike, Walk and Trails Plan represents the collective efforts of Town staff, Chittenden County Regional Planning Commission, the Town Transportation Committee, external stakeholders, and community members to define who Richmond is today, who the community wants to be in the future, and what it will take to get there. The graphic below summarizes each step in the planning process and describes the contents of this Plan.

Plan Process

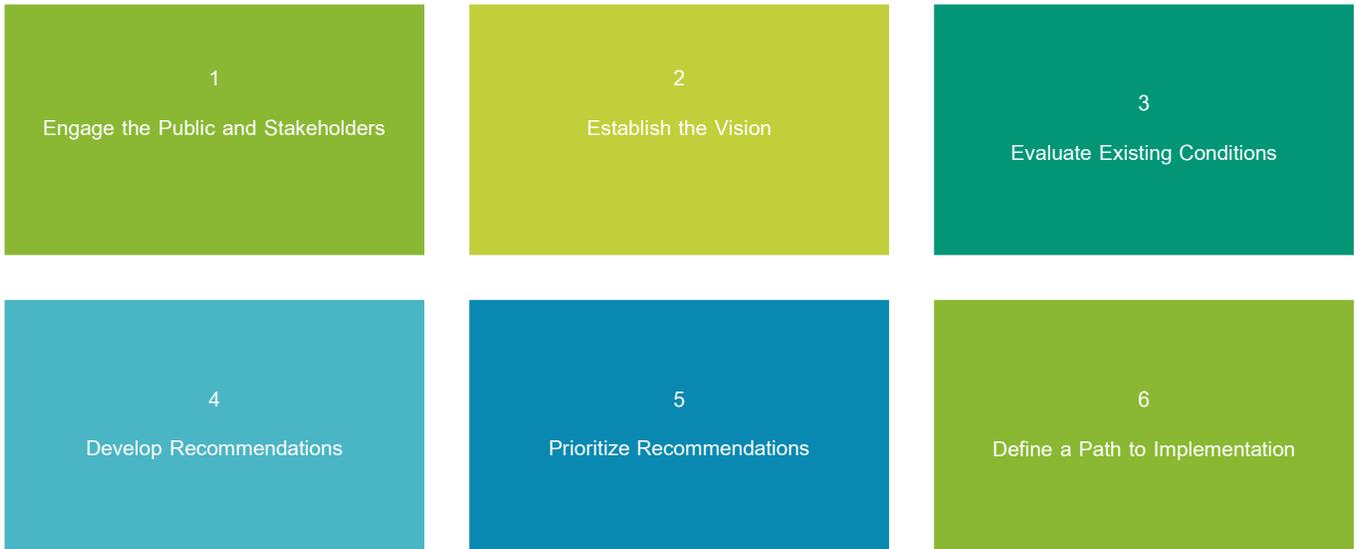


Figure 4. Plan Process

1. Engage the Public and Stakeholders

The Bike, Walk, and Trails Plan reflects the needs and desires of the people who live in, work in, do business in, visit, and take care of the Town of Richmond. Public and stakeholder engagement included a steering committee, two online open houses, and an interactive online map.

2. Establish the Vision

The desired future for active transportation in Richmond must align with what the community values. Active transportation can have positive impacts on the economy, quality of life, public health, and the environment. The Richmond Bike, Walk, and Trails plan sets the vision to act as waypoints toward a multimodal transportation system.

3. Evaluate Existing Conditions

Biking and walking in Richmond today and in the near-term can be characterized by how we travel, how we'd like to travel, and the state of the active transportation network. An evaluation of existing conditions provides the starting point from which to envision a desired future. This evaluation of biking and walking considers previous and ongoing planning, travel patterns, land use, crash trends, and demographic information.

4. Develop Recommendations

The Plan recommends infrastructure projects, programs, and policies to achieve the community's desired vision. These recommendations

represent a long-term vision for active transportation in Richmond. Town staff and partners should revisit and update these recommendations on a regular basis to adapt to and address changes in community needs and transportation conditions.

5. Prioritize Recommendations

Because resources are limited (time, funding, and space), the Plan scores and ranks project recommendations to communicate Richmond’s priorities for improving its transportation infrastructure. The prioritization process indicates what’s most important to reflect the Plan’s vision. Project prioritization serves as a tool to inform Plan implementation.

6. Define a Path to Implementation

The final step of the Plan’s process is defining which recommendations to implement in the short-term and which will require more time and resources to implement thus pushing them into the future. The Plan’s implementation strategy provides guidance for what should be done, when it should be done, and by whom.

Community and Stakeholder Engagement

The following section describes the Plan’s community and stakeholder engagement events and input



Richmond Transportation Committee: Project oversight was provided by Town Transportation Committee, which advises Town staff on issues related to driving, parking, walking, and bicycling in Richmond.

Project Advisory Committee: A project advisory committee was convened by the Town of Richmond, featuring members of the Trails Committee, the Transportation Committee, the Climate Action Committee, RiseVT, Local Motion, and the general public. The committee met three times and provided technical guidance throughout the project.

Project Advisory Committee	MEETING CONTENT
MEETING DATE	

November 12, 2020	Project introduction and visioning
February 10, 2021	Review of existing conditions, discussion of opportunities and constraints
May 24, 2021	Review and discussion of draft network recommendations



Online WikiMap: To gather feedback from the community, an interactive online map was launched for users to provide location-based feedback on destinations, favorite routes and locations that could use improvement. The WikiMap was open for comment from December 17, 2020 to January 22, 2021. Approximately 150 respondents provided comments. The public were asked to add comments/details about their input, which included:

- **Desired connections** (bike lane, sidewalk, shared use path, unpaved trail, winter trail)
- **Barriers** (walking, biking, cross-country skiing, snowmobiling, other) and why it's a barrier (high vehicle speeds, heavy traffic, narrow street, wide street, safety concern at intersection, steep slope, no dedicated bike lane or path, insufficient bike parking, long wait at intersection, conflicts with other bicyclists or pedestrians, streets/trail do not connect, highway/railroad/stream/river, no crosswalk, other)

Wikimap Respondents Demographics

- 90% white, 57% female

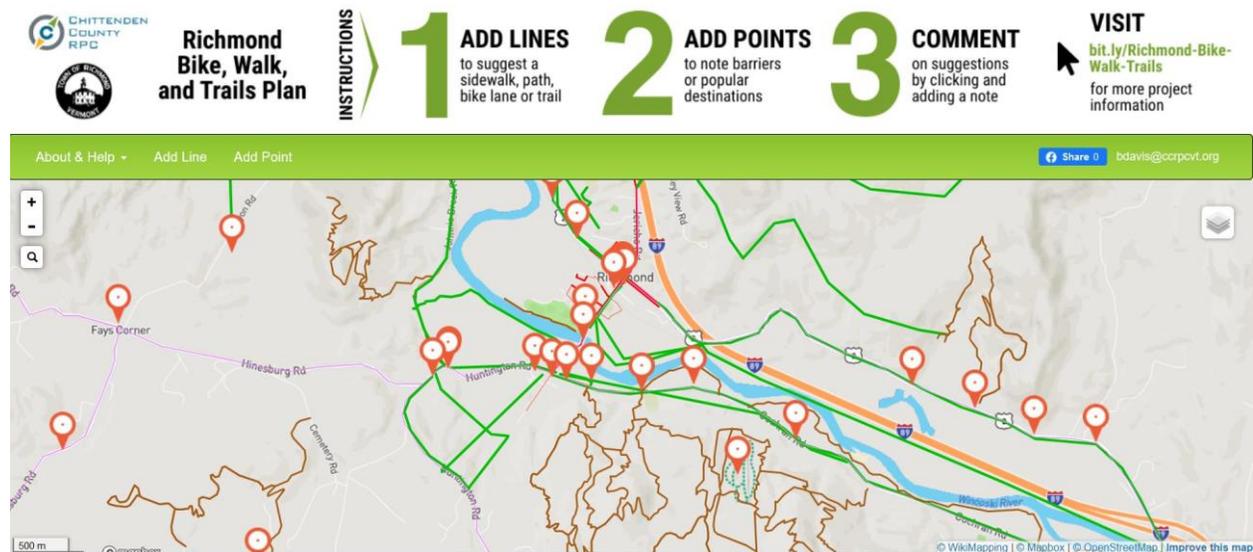


Figure 5. Screenshot of Wikimap

- Two-thirds live in Richmond
- One-third live AND work in Richmond



Wikimap Comment Summary:

- 69 destinations and/or barriers were identified
- 60 suggested connections (route and type, e.g., Bike Lane, Sidewalk, Paved Shared Use, Unpaved Trail, Winter Trail)
- Comments on barriers focused on approximately five areas:
 - The area around the Interstate 89 ramps
 - The Bridge Street/Route 2 intersections
 - Bridge Street bridge
 - The Bridge Street/Huntington Road/Cochran Road/Thompson Road intersection (outside this Plan’s project area)
 - Narrow roadways

Other comments included requests for lighting, bike parking, e-bike charging stations, car parking at trailheads, better roadway maintenance. A full summary of the comments can be found in the appendices.



Community Meetings: Two online community meetings were conducted: one at the beginning of the project, and one at the end, combined with the final PAC meeting.

COMMUNITY MEETING DATE	MEETING CONTENT
March 24, 2021	Review of the existing conditions, summary of public input to date, participant comments about desired connections and destination
May 24, 2021	Joint Project Advisory Committee/community meeting; review and discussion of the proposed draft network recommendations

Email Comments: Many community members and local organizations, including the Richmond Mountain Trails and Richmond Conservation Commission, provided comments via email throughout the project.



Community Input Themes

The following summarizes the major community input themes received via the WikiMap, Community and PAC meetings, and email comments:

- Strong interest for providing safe connections to the middle and elementary schools, Park and Ride, Andrews Community Forest, and the Village.
- Strong interest connecting residential neighborhoods.
- Strong support for providing improved walking and bicycling accommodations along Route 2/Main Street
- Strong interest in accessing daily destinations (e.g., schools, shopping, library) via walking and bicycling
- Support for more bicycle lanes, sidewalks, and trails throughout Richmond
- Increased safety and visibility for pedestrians and bicyclists along Bridge Street and through the Village

Section 3

Walking and Biking in Richmond

3. Walking and Biking in Richmond

This section covers a review of relevant plans and policies and an assessment of the existing conditions for walking and biking in Richmond.



Figure 6. Looking East on Main Street, 1930s

About Richmond

Located in the western foothills of the Green Mountains on the eastern edge of the Lake Champlain Valley, the Town of Richmond is bisected by the Winooski River. The two primary transportation facilities that connect Richmond to its neighbors, Main Street/US Route 2 and Interstate 89, are both located north of the river, following the level terrain. The New England Central Railway is also located north of the river. The historic town, organized in 1794, and currently home to approximately 4,000 residents, is a mix of agricultural and residential land. Aside from the relatively level area within the Village, much of Richmond is hilly.

Summary of Plan and Policy Review

The project team reviewed the following documents to provide an understanding of the planning framework.

Relevant Planning and Policy Documents

1. 2016 Town of Richmond Public Improvement Standards & Specifications
2. 2018 Richmond Town Plan
3. Village - School - Park & Ride Connections in Richmond, VT: Survey Report on Bike & Pedestrian Needs (Local Motion, 2019)
4. Transportation Implementation Plan (2020)
5. Richmond Trails Committee Minutes (2019-2020)
6. Road Safety Audit Review: Fays Corner (2004)
7. East Hill Road – Capacity & Transportation Improvement Plan (2006)
8. 2007 RSG report at Jericho Road (Safe Routes to School recommendations for Camel’s Hump Middle School)
9. Bridge Street Bicycle & Pedestrian Feasibility Study (2010)
10. Vermont Route 2 Bicycle and Pedestrian Scoping Report (2014)
11. Bridge Street Complete Streets Corridor Study – Scope of Work (2020)
12. Chittenden County, Vermont Active Transportation Plan (2017)
13. 2018 Chittenden County ECOS Plan: Supplement 5 – Metropolitan Transportation Plan
14. Chittenden County RPC 2018 Transportation Survey Report Bicycle and Pedestrian Program Annual Report (2016)
15. Vermont Agency of Transportation (VTrans) On-Road Bicycle Plan – Phase 1 Report (2016)
16. VTrans On-Road Bicycle Plan – Phase 2 Report (2018)

Findings

The following summary highlights key findings of relevant policy goals and plans related to and affecting walking, bicycling and trails conditions and environments. The findings also summarize the opportunities and issues, as well as desires of Richmond residents, regarding walking, biking, and trails. The full Plan and Policy Review memorandum can be found in the appendices.

Access to Safe Walking and Bicycling

Richmond has long had a goal of improving walkability and bikeability and residents expressed the desire for Richmond to be the most livable small town in Vermont, with safe biking and walking routes.¹ Richmond residents support safe, sustainable, and convenient mobility and transportation options, so that people can bike, walk, ride, and drive in Richmond and beyond.² Additionally, it is a Chittenden County goal to provide safe, accessible, and equitable mobility choices for businesses, residents and visitors.³ Increasing access to destinations that meet basic needs via a variety of mobility and transportation options is one of the best ways to accommodate shifting demographics.⁴ Finally, it is a statewide Vermont goal to improve the condition of state roads to enhance safety and better accommodate the needs of all bicyclists.⁵ The state has worked toward this goal by determining the demand for bicycling⁶, conducting a bicycle crash analysis, and conducting bicycle level of traffic stress analysis on state roads.⁷

Active transportation (walking and biking) is increasingly popular among many residents⁸ and has been identified as an important part of people's lives in Chittenden County for transportation, recreation, and health.⁹ While over 70% of Chittenden County residents feel safe when crossing streets on foot, 22% of residents would walk more often if more sidewalks were provided (and the lack of sidewalks is particularly an issue among suburban/rural residents).¹⁰ Additionally, over 50% of Chittenden County residents say that traveling by bicycle is a pleasant experience – residents also believe that more resources should be devoted to improving biking and walking facilities. Residents believe the region is not performing as well as it could with providing separated bike paths, improving the condition of bike paths, offering more bike racks, and general bicycling safety improvements – and an estimated 26% of Chittenden County residents would bike more often if bike paths were provided.¹¹ While there is a sidewalk system in the village area, there is no dedicated infrastructure to support safe walking or biking outside the Village and there are few sidewalks and no bike or shared use facilities for people

70%

Of Chittenden County residents feel safe when crossing streets on foot

22%

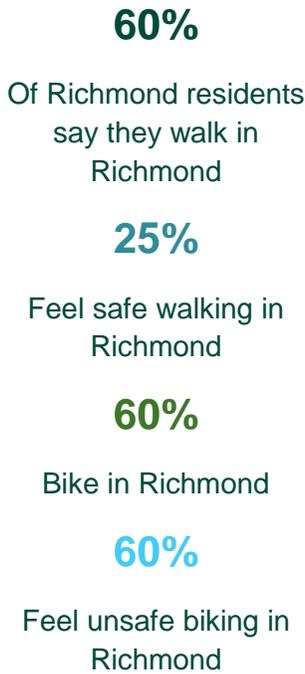
Would walk more if there were more sidewalks

50%

Say traveling on bike is a pleasant experience

26%

Would bike more if there were more bike paths



walking along important routes.¹² Richmond has a significant number of people who would love to walk and bike more frequently if the infrastructure existed.¹³ For instance, over 60% of respondents for the Village – School – Park & Ride Connections Survey (2019) indicated that they walk (between a few times a year to daily) along Jericho Road between the Village and schools; however, about one-quarter of respondents felt unsafe doing so.¹⁴ Similarly, over 60% of respondents indicated that they bike; however, nearly 60% of respondents felt unsafe biking.¹⁵

An analysis of bicycle-motor vehicle crashes in Vermont from 2006-2015 found that the number of crashes has not changed significantly from year to year over the 10 years, but that over 75% of crashes resulted in bodily injury to bicyclists.¹⁶ Most crashes occurred at intersections and collision hot spots were concentrated in Chittenden County.¹⁷ Anecdotally, bicyclists were thought to disobey traffic laws at higher rates than motorists. However, the analysis showed that bicyclists and motorists were cited for improper actions at roughly equal rates.

The top 3 bicyclist actions that contributed to crashes were:

- Improper crossing
- Unpredictable movements
- Failure to yield right of way

The top 3 improper motorist actions or contributing factors that contributed to crashes were:

- Failure to yield right of way
- Inattention
- Obstructed visibility

Route 2 within Richmond was found to have a lower level of crashes compared to other areas across the state, though there were still a number of crashes across the length of the corridor in Richmond.¹⁸ Route 2/Main Street within Richmond also scored a level of 3 and 4 for Bicycle Level of Traffic Stress (BLTS). BLTS 3 are roadways that are comfortable for experienced and confident bicyclists and BLTS 4 are roadways that are uncomfortable for most bicyclists (as opposed to BLTS 1, roadways that are welcoming to most bicyclists, or BLTS 2, roadways that are comfortable for most adult bicyclists).¹⁹ Based on an analysis including land use patterns, bicycle access to state roads, and current and potential bicycle use through a combination of stakeholder outreach and quantitative analysis – Route 2/Main Street within Richmond is considered a High Use/Priority corridor by the state.²⁰ This designation helps the

Vermont Agency of Transportation (VTrans) to prioritize funding for the corridor for construction and maintenance of on-road bicycle facilities.²¹

Route 2/Main Street has also been proposed as a network segment and identified as a high-feasibility and high-priority project in the Chittenden County Active Transportation Plan (ATP), and is already on the Chittenden County Transportation Improvement Plan (TIP).²² The Town of Richmond has long desired a better pedestrian and bicycle link between the Village and Park & Ride on Route 2/Main Street.²³ The needs for improvement are due to poor existing conditions for bicycle commuters (paved shoulders that are six inches or less, poor pavement conditions, an average annual daily traffic [AADT] volume of 8,500 vehicles, 40-50 mph posted speed) and the lack of safe and comfortable walking facilities.²⁴ Thus, a bicycle and pedestrian scoping study was conducted for Route 2/Main Street with a set of alternatives provided in 2014.²⁵

The Chittenden County ATP identified Route 2/Main Street, River Road/VT-117, and Bridge Street as high-feasibility and high-priority projects that should be part of an active transportation network.²⁶ Main Street and Cochran Road were also proposed to be part of the network.²⁷

Recreation and Economy

Richmond also has a considerable number of people who like to recreate²⁸ and residents expressed support for more social, cultural, and recreational offerings available to the public – including open space and recreation facilities and connections between them.²⁹ Recreation and tourism are crucial economic sectors in Vermont and its economy is driven by biking and other outdoor recreational activities.³⁰ Community members are interested in attracting new businesses that meet daily needs and cater to locals, support Richmond’s natural resources and working lands, and provide high-quality and sustainable jobs while creating new opportunities for recreation, culture, and social connections.³¹

Environment

It is a Chittenden County goal to provide sustainable mobility choices and reduce greenhouse gas emissions through active transportation.³² However, transportation options in Richmond are limited for anything other than motor vehicles, and some key commuter routes and locations (e.g., the Route 2/Main Street and Bridge Street intersection) cause congestion and choke points.³³ More robust investment in walking and biking (along with other measures) could reduce vehicle miles traveled (VMT), congestion, and the use of single-occupancy vehicles – and one strategy is to design Complete Streets.³⁴ Trail connectivity is also an important

factor in usage and travel efficiency, as well as in reducing vehicle traffic.³⁵ Additionally, local organizations (e.g., Local Motion) actively promote walking and bicycling and the infrastructure that supports sustainable transportation modes.³⁶

Bicycling Challenges

The top bicycling issues identified for Chittenden County include bicycling on bridges (due to lack of separation from vehicular traffic), bike lanes dropping at intersections, conflicts with turning vehicles (especially at commercial driveways), lack of bike detection at signalized intersections, and motorist compliance.³⁷ As Richmond itself does not have many on-street bikeways, these challenges indicate an overall lack of regard or priority for bicycles in planning. Additional issues include lighting, winter maintenance (snow clearance)³⁸, education and enforcement for all street users, universal design, integrating planning for different transportation modes, and maintenance of walking and bicycling facilities.³⁹

Notes

- ^[1] 2018 Richmond Town Plan. <http://www.richmondvt.gov/documents/2018-town-plan/>
- ^[2] Ibid
- ^[3] Chittenden County Regional Planning Commission (CCPRC) Regional Active Transportation Plan. 2017. <https://www.ccrpcvt.org/our-work/our-plans/regional-bikeped-plan/>
- ^[4] 2018 Richmond Town Plan. <http://www.richmondvt.gov/documents/2018-town-plan/>
- ^[5] State of Vermont Agency of Transportation (VTrans) On Road Bicycle Plan – Phase 2 Report. 2018. https://vtrans.vermont.gov/sites/aot/files/planning/bikeplan/Final_VoRB%20Phase%20II_180529.pdf
- ^[6] VTrans On Road Bicycle Plan – Phase 1 Report. 2016. <https://vtrans.vermont.gov/sites/aot/files/planning/bikeplan/VTrans%20On%20Road%20Bicycle%20Plan%20Phase%20I%20Report%20FULL.pdf>
- ^[7] VTrans On Road Bicycle Plan – Phase 2 Report. 2018. https://vtrans.vermont.gov/sites/aot/files/planning/bikeplan/Final_VoRB%20Phase%20II_180529.pdf
- ^[8] 2018 Richmond Town Plan. <http://www.richmondvt.gov/documents/2018-town-plan/>
- ^[9] CCRPC Regional Active Transportation Plan. 2017. <https://www.ccrpcvt.org/our-work/our-plans/regional-bikeped-plan/>^[10] Chittenden County Regional Planning Commission 2018 Transportation Survey Report. <https://www.ccrpcvt.org/wp-content/uploads/2018/11/2018-Transportation-Survey-Report.pdf>
- ^[11] Ibid
- ^[12] 2018 Richmond Town Plan. <http://www.richmondvt.gov/documents/2018-town-plan/>
- ^[13] Local Motion. Village – School – Park & Ride Connections in Richmond, VT: Survey Report on Bike & Pedestrian Needs. 2019. <http://www.richmondvt.gov/wp-content/uploads/2018/11/3c-Richmond-Survey-Report.pdf>
- ^[14] Ibid
- ^[15] Ibid
- ^[16] VTrans On Road Bicycle Plan – Phase 2 Report. 2018. https://vtrans.vermont.gov/sites/aot/files/planning/bikeplan/Final_VoRB%20Phase%20II_180529.pdf
- ^[17] Ibid
- ^[18] Ibid
- ^[19] Ibid
- ^[20] VTrans On Road Bicycle Plan – Phase 1 Report. 2016. <https://vtrans.vermont.gov/sites/aot/files/planning/bikeplan/VTrans%20On%20Road%20Bicycle%20Plan%20Phase%20I%20Report%20FULL.pdf>
- ^[21] Ibid
- ^[22] CCRPC Regional Active Transportation Plan. 2017. <https://www.ccrpcvt.org/our-work/our-plans/regional-bikeped-plan/>

- [23] CCRPC and Town of Richmond. Vermont Route 2 Bicycle and Pedestrian Scoping Report. 2014. https://studiesandreports.ccrpcvt.org/wp-content/uploads/2017/01/Richmond_Rt_2_Path_FINAL_ALL_DOCS_12-28-14.pdf
- [24] Ibid
- [25] Ibid
- [26] CCRPC Regional Active Transportation Plan. 2017. <https://www.ccrpcvt.org/our-work/our-plans/regional-bikeped-plan/>
- [27] Ibid
- [28] Local Motion. Village – School – Park & Ride Connections in Richmond, VT: Survey Report on Bike & Pedestrian Needs. 2019. <http://www.richmondvt.gov/wp-content/uploads/2018/11/3c-Richmond-Survey-Report.pdf>
- [29] 2018 Richmond Town Plan. <http://www.richmondvt.gov/documents/2018-town-plan/>
- [30] Ibid
- [31] Ibid
- [32] CCRPC Regional Active Transportation Plan. 2017. <https://www.ccrpcvt.org/our-work/our-plans/regional-bikeped-plan/>
- [33] 2018 Richmond Town Plan. <http://www.richmondvt.gov/documents/2018-town-plan/>
- [34] Ibid
- [35] Ibid
- [36] Ibid
- [37] CCRPC Regional Active Transportation Plan. 2017. <https://www.ccrpcvt.org/our-work/our-plans/regional-bikeped-plan/>
- [38] Ibid
- [39] Ibid

Travel Patterns and User Groups



Figure 7. Looking east on Main Street, 2000s

82%

Of Richmond residents commute out of town for work

88%

Travel to work in personal vehicles

0%

The Parking and Ride has inadequate capacity for parking demand

Community feedback suggests that although walking and biking are desired modes of travel in Richmond, there are quite a few significant barriers to making active transportation safe and comfortable for all ages and abilities. Improving the network of trails and walking and biking facilities would help improve resident and visitor access to the Town's key services and points of interest. See [Figure 8](#) for a map of the bicycle, pedestrian, and trail facilities in Richmond as well as key locations like schools, open spaces, concentrations of dining/retail, and town services that often serve as origin or destination points.

The largest neighboring employment centers are in Williston/South Burlington/Burlington, and Waterbury/Montpelier, so 82% of Richmond residents commute out of town for work. The Park and Ride in Richmond enables carpooling and access to an I-89 commuter bus, but 88% of commuters still travel in personal vehicles. The Park and Ride also has inadequate capacity for the parking demand. Options are currently limited for anything other than personal vehicles in Richmond.

There currently exists no transit options apart from a bus stop at the Park and Ride, and there is no weekend or evening bus service and no stop or access point in the Village. While a rail line runs through Richmond carrying freight and once-daily Amtrak passenger service, the nearest stops are in Essex Junction and Waterbury. Additionally, the Neighbor Rides service helps fill transportation gaps for seniors or people with

disabilities. However, there are no supplemental ride services for most residents.

Roadway Network

The project area’s transportation spine is made of primarily east-west roadways: Interstate 89, State Route 2/Main Street, and Vermont 117/River Road. Several other collectors and minor arterials provide north-side connectivity: Jericho Road, Bridge Street, and Governor Peck Road. With the exception of I-89, each of these roadways is narrow, curving and responds to the hilly topography.

Table 1. lists the primary roadways in Richmond, along with the managing jurisdiction, vehicle volumes, width, and posted speed limit.

Table 1. Richmond Roadways and Characteristics

STREET and JURISDICTION	AADT*	POSTED SPEED LIMIT (MPH)	RIGHT OF WAY WIDTH (FT)
Route 2/Main Street State Highway, Richmond	4,100 East, 8,300 West	50/40/30	49.5 (3 rods)
Jericho Road (major collector) Richmond	3,000	25/35/45	49.5 (3 rods)
Bridge Street (S0209) Richmond	5,705	25	49.5 (3 rods)
Southview Road Richmond	N/A - local		49.5 (3 rods)
Valley View Road Richmond	N/A – local		49.5 (3 rods)
River Road/ Vermont 117 State Highway	3,626	40/50	49.5 (3 rods)
Governor Peck Road (Minor Arterial) Richmond	2,500	35	49.5 (3 rods)
Snipe Ireland Road (gravel) Richmond	N/A - local		49.5 (3 rods)
Stage Road (gravel) Richmond	N/A - local		49.5 (3 rods)

*Annual Average Daily Traffic. Most recent counts from 2015-2020, location with highest count

SOURCES:

https://vtransmaps.vermont.gov/Maps/CountyTownSeries_2018/COUNTY_TOWN_CHITTENDEN_COUNTY_2018.pdf

<https://vtrans.public.ms2soft.com/tcds/tsearch.asp?loc=Vtrans&mod=>

[https://www.ccrpcvt.org/wp-](https://www.ccrpcvt.org/wp-content/uploads/2016/02/Jericho_Transportation_Study_FINAL_20150521.pdf)

[content/uploads/2016/02/Jericho_Transportation_Study_FINAL_20150521.pdf](https://www.ccrpcvt.org/wp-content/uploads/2016/02/Jericho_Transportation_Study_FINAL_20150521.pdf)

<https://vtrans.public.ms2soft.com/tcds/tsearch.asp?loc=Vtrans&mod=>

<http://www.richmondvt.gov/wp-content/uploads/2014/03/0-Richmond-Road-Map%C2%A0.pdf>

Bicycling

The study area lacks bicycle facilities, despite having popular routes for biking like Bridge Street and Route 2/Main Street. People riding their bikes also lack convenient places to park them in the Village area. Other barrier highlighted in community feedback is bridges across the across the Winooski River, as bicyclists must share the narrow lane with vehicles.

Walking

High-quality pedestrian infrastructure is critical to making it safe and comfortable for people to walk in Richmond. While the Village area has marked crosswalks at the majority of its intersections, these crossings are uncontrolled, creating potential conflicts between people driving and people walking. There are also significant sidewalk gaps along walking routes on Jericho Road and Bridge Street.

Off-street Trails

There are a number of trails within Phase 1 study area. However, not all are on publicly owned lands. Some are seasonal (i.e. snowmobile routes), and some are easements. Table 2 show the trails and their characteristics.

Table 2. Trails in the Study Area and their and Characteristics

TRAIL	DESCRIPTION
Old Jericho Road Trail – 0.7 mi.	Old road bed. Deep ravine, beautiful rocky brook, stands of hemlock, beech, and maple.
Volunteers Green Trail – 0.4 mi.	SURFACE: Packed dirt. Views of Winooski River, large cottonwood stands.
Warren & Ruth Beeken River Shore Trail – 3.0 mi.	Two short sections of this trail are along Cochran Rd itself.
	SURFACE: Packed dirt/single track. SUMMARY: Trail passes through the longest stretch of riparian forest on the Winooski.
VYCC Trails – 3.0 mi. Total	A system of three trails established on land conserved by the Vermont Youth Conservation Corps (VYCC) for non-motorized use (no bicycles). The terrain is forested, on a south-facing hillside. The climb from the Monitor Barn rises up about 300 feet to 600 feet elevation. Access to western trail section changes seasonally because of farming. SURFACE: Forest/soft surface
Snipe Ireland trail – 1 mi.	Conserved land (very sensitive habitat) land to Snipe Island Rd (Jericho). No motorized vehicles of any kind.
SOURCE: Richmond Trails Map	

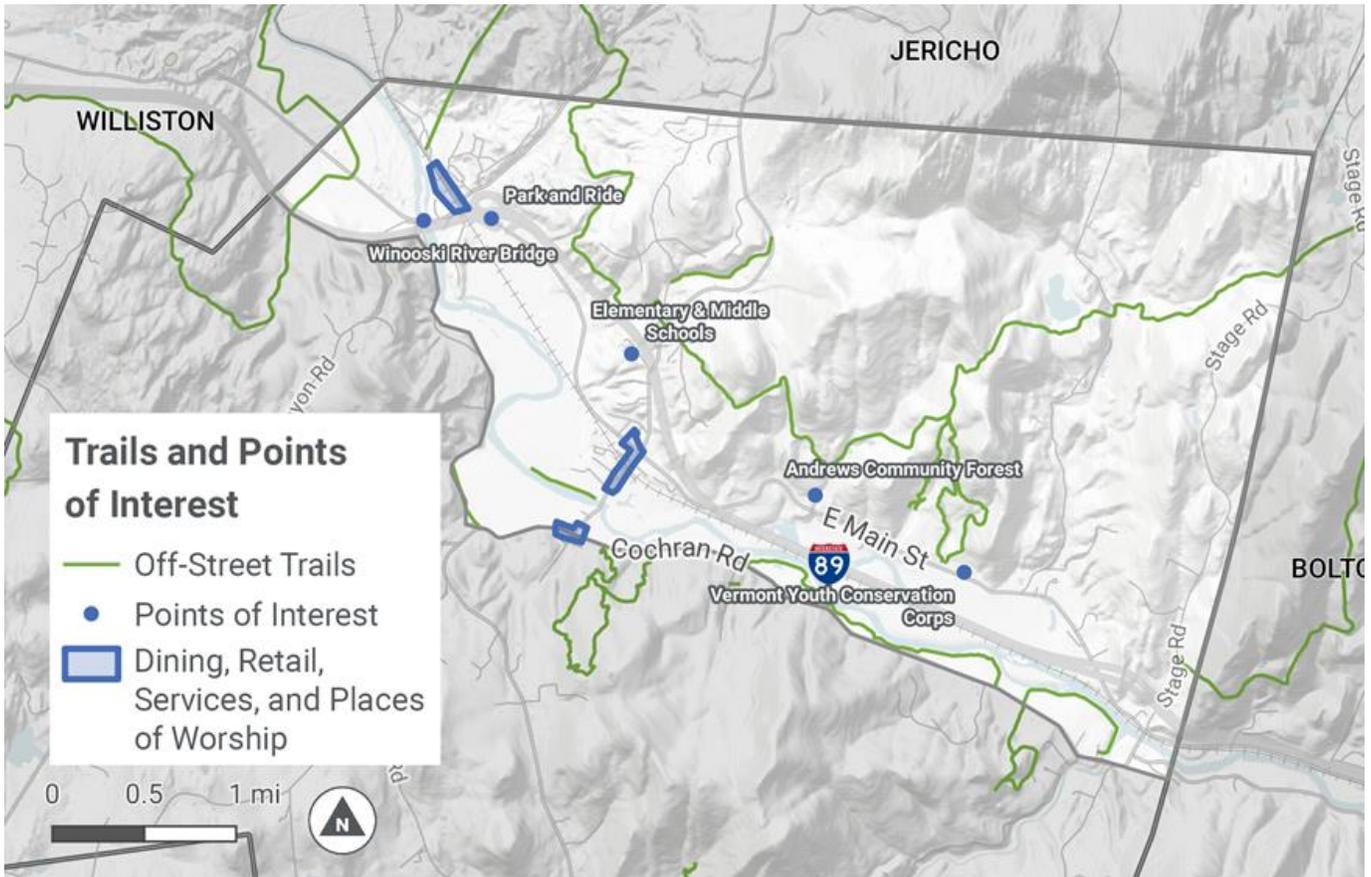


Figure 8. Trails and Point of Interest

Commuting Data

According to 2015-2019 American Community Survey 5-year estimates, the vast majority of workers in the study area and the wider Town commute by driving (see Table 3). Over 1/3 of Richmond’s commuters have commutes of over 30 minutes, indicating that they are traveling outside the town for work. The dependency on private vehicles is also reflected in vehicle availability, as almost every worker has access to one or more vehicles in their household (see Table 4). With improved biking and walking access to locations like the Park and Ride, current workers’ dependency on vehicles for commuting purposes could be reduced. Note that the American Community Survey data does not account for trips made for errands, leisure, or school, which could tend more multimodal than work trips.

Table 3. Means of Transportation to Work (Workers 16 years and over)

Driving (including carpooling)	Motorcycle	Transit	Biking	Walking
93.1% (2361)	0.0% (7)	0.0% (35)	0.0% (0)	0.0% (24)

Note: Does not include Worked from home or Other

Table 4. Motor Vehicles Available (Workers 16 years and over in households)

No vehicles	1	2	3	4	5 or more
1.0% (24)	11.0% (278)	51.3% (1301)	18.4% (468)	10.3% (261)	8.0% (204)

Multimodal Traffic Analysis

Roadway characteristics like travel lane width, posted speed limit, and traffic volumes have a direct impact on both the safety and comfort of people walking and bicycling. For this reason, the multimodal traffic analysis was conducted.

Vehicle Speeds

Speed limits vary throughout the study area (see [Figure 10](#)). Bridge St, which runs through the Village, is the only street within the area with a speed limit of 25 mph. Jericho Road and Main Street, which community feedback highlighted as popular biking routes, have speed limits varying between 25 and 50 mph. Wide turning radii on these streets can also enable high-speed driving, which can lead to a greater risks for collisions and a higher degree of crash severity if collisions do occur. VTrans’s Bicycle Level of Comfort Score ([Figure 9](#)) analysis corresponds with the speed limits – there very few VTrans corridors in the study area that score Level 1 or Level 2.

Heatmap bicycling data from Strava (not included) reflects public feedback and illustrates that the entire lengths of Jericho Road, Route 2/Main Street, Snipe Ireland Road, and Stage Road within the study area are all popular biking routes. Popular walking routes are more concentrated within Richmond Village (on Bridge Street), as well as a segment of Route 2/Main Street from Bridge Street west until there is no longer sidewalk infrastructure and the length of Jericho Road.

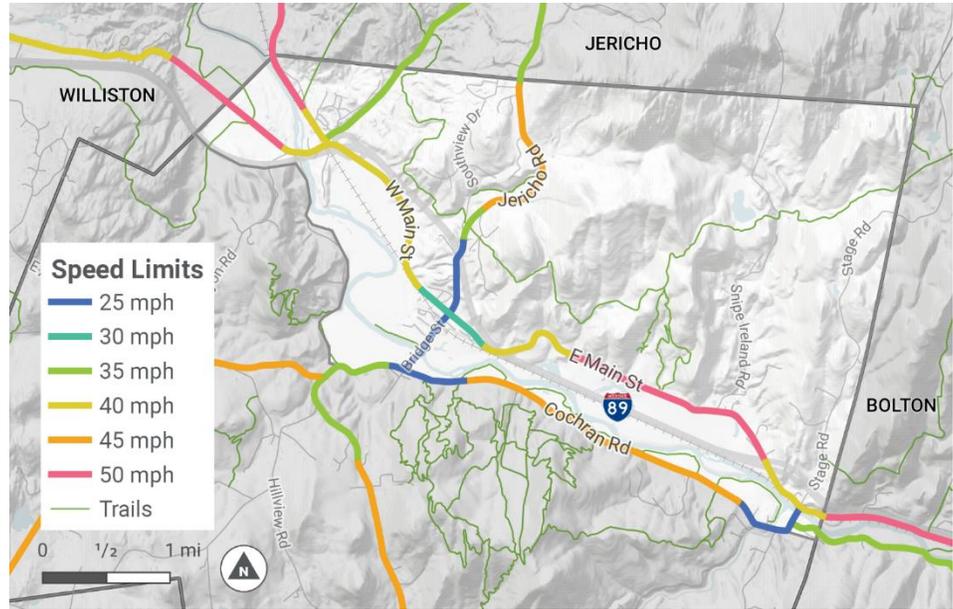


Figure 10. Map of Speed Limits

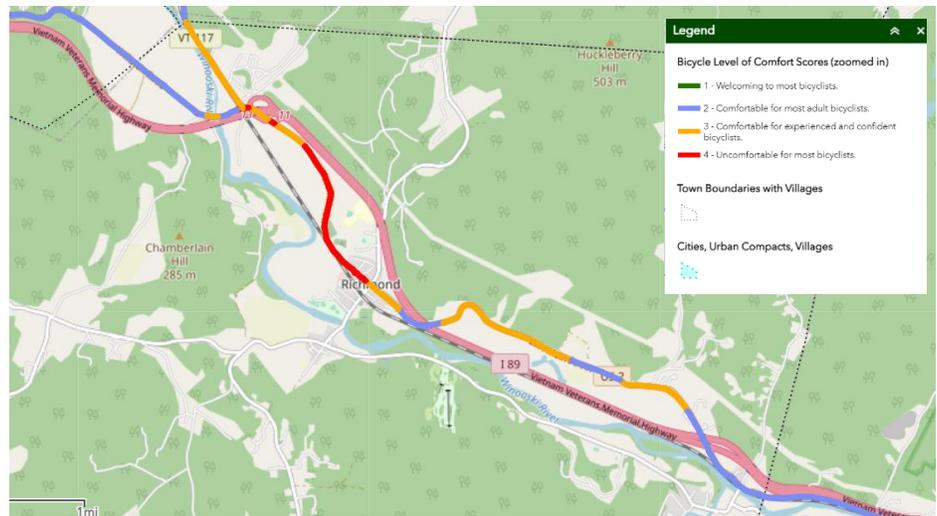


Figure 9. Bicycle Level of Comfort Score, VTrans On-Road Bicycling Plan

Collision Analysis

Data from 2014-2018 demonstrate that collisions in the study area are concentrated in two key areas (see Figure 12) – the intersection of Bridge Street and Route 2/Main Street, and the area near Richmond’s Park and Ride where Route 2/Main Street intersects with Interstate 89. Main Street and Jericho Road also have a number of collisions along their lengths within the study area (see Figure 11).

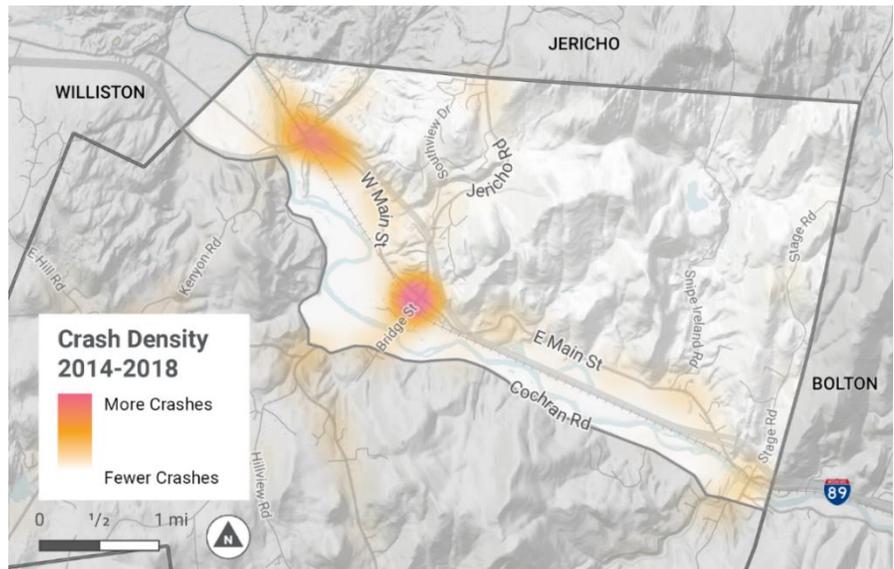


Figure 12. Map of Crash Density (2014-2018)

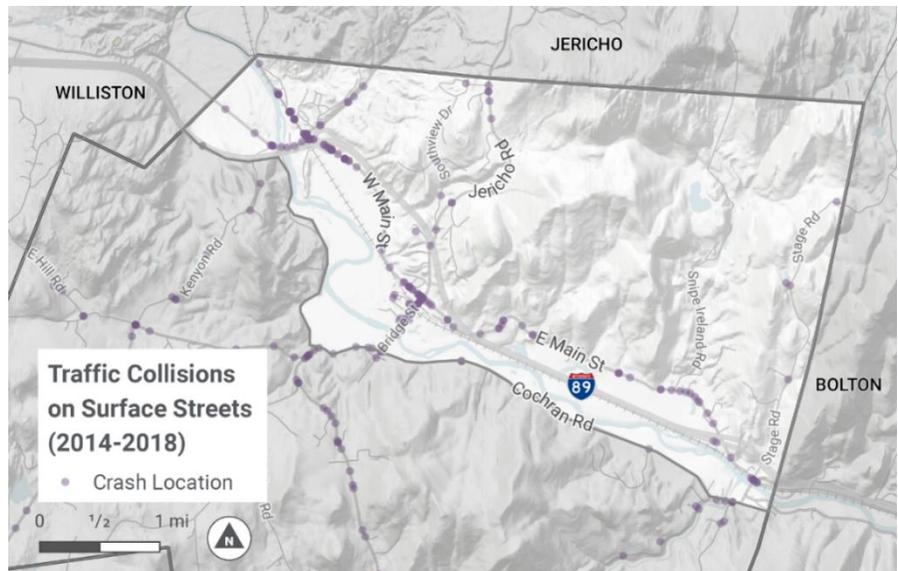


Figure 11. Map of Traffic Collisions on Surface Streets (2014-2018)

Land Use



Figure 13. Richmond farm scene

The Phase 1 study area is mainly residential and woodland, with commercial uses concentrated in the Village center and in the northwest. There are farms throughout the study area interspersed with woodland and residential uses. See [Figure 14](#) for a map of land use within the study area. In addition to current land use, the 2018 Town Plan reflects the Town's vision and goals for future land use, preparing for a future development. This future Richmond may have increased needs for active transportation to help alleviate congestion and reliance on single-occupancy vehicles. See [Table 5 Table 5. Future Land Use Areas](#) for a list of all future land use areas within the study area.

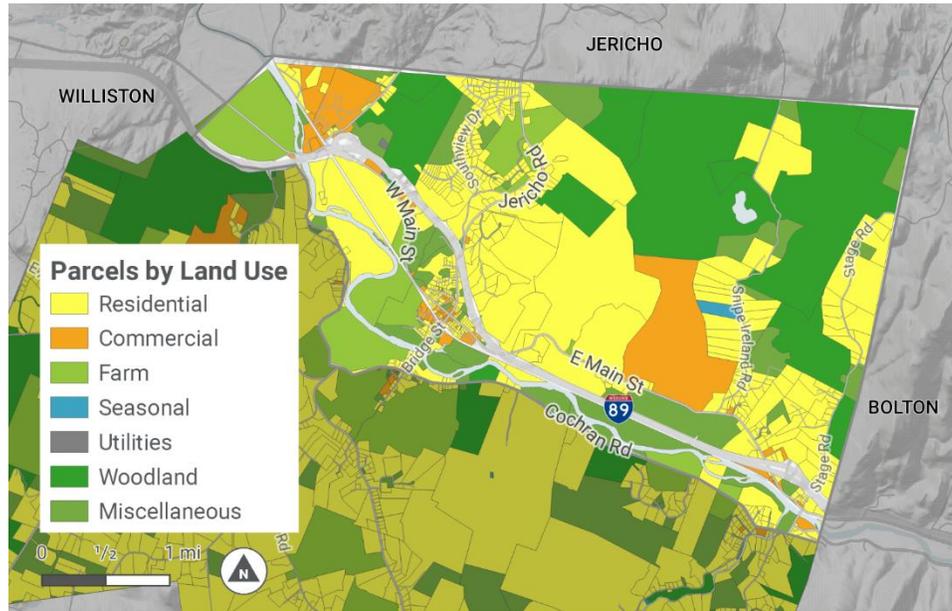


Figure 14. Map of Land Use

Table 5. Future Land Use Areas

LAND USE AREA	PURPOSE
Northwest Industrial-Commercial	Commercial and industrial uses that might not be suitable in the Village center area
Gateway	The attractive entrance to the historic Richmond Village, which includes commercial, light industrial, and residential uses
Villages	<u>Richmond Village</u> : Commercial and residential hub of the Town <u>Jonesville</u> : Secondary commercial and residential center
High Density Residential	<u>Riverview Commons Area</u> : Affordable housing in a densely settled neighborhood <u>North of Richmond Village Area</u> : Moderate to high density residential and accessory uses
Adaptive Agricultural-Residential	Commercial activities that diversify and support existing uses (i.e. event spaces, recreational activities, agricultural and forestry related uses)

Natural Resources and Historic Sites

It is important to note that much of the land within the study area is undeveloped, with a mix of wetlands and deciduous and mixed forest. A 2013 report found that Richmond has 21 different types of upland natural communities, which have a variety of diverse habitats for the Town’s wildlife. Four of these natural communities are within the study area (see Figure 15) – Research Forest, Huckleberry Hill, Huckleberry Hill South, Snipe Island Hemlock, and Resin Ridge.

Source: Science to Action: Four Town Natural Resources Inventory – Bolton, Huntington, Jericho, and Richmond (2013)

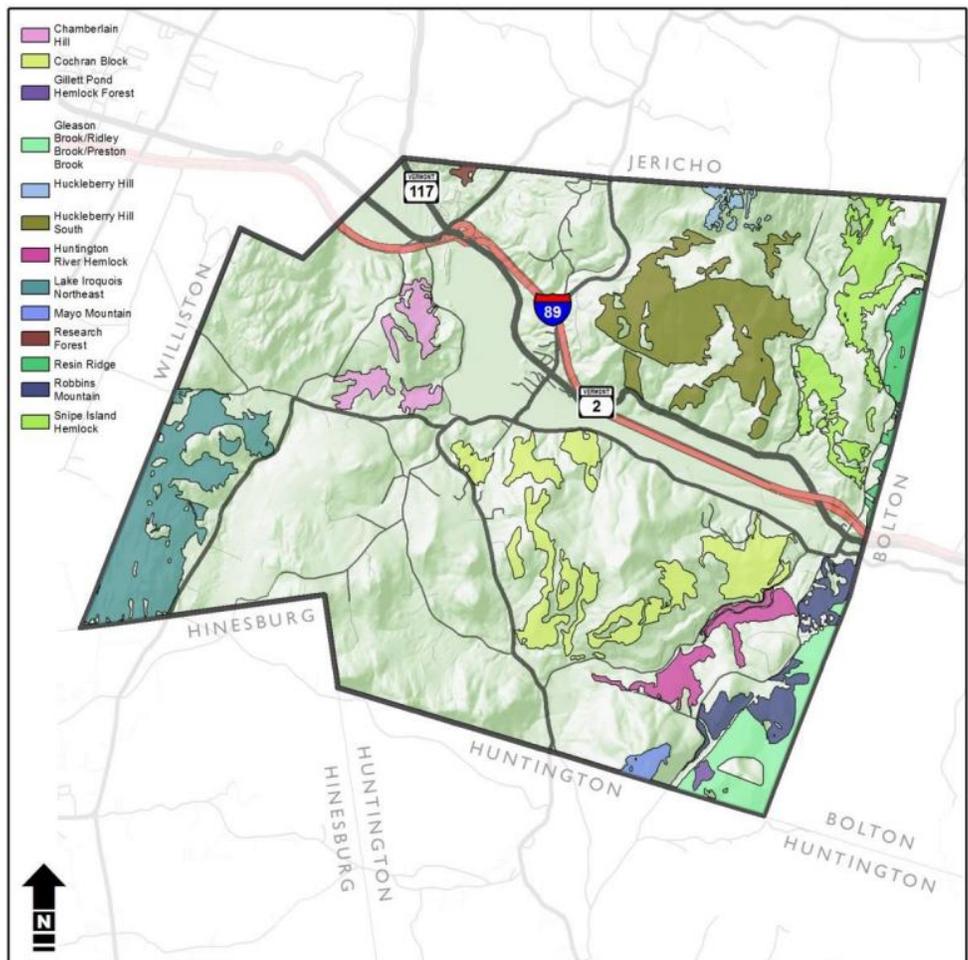


Figure 15. Map of Upland Natural Communities

Snipe Ireland Road and Stage Road are both Wildlife Travel Corridors, according to Natural Resource Data from a 2013 “Science to Action” project, which recommends isolating important travel corridors.

Recommendations should accommodate conservation of these corridors for wildlife.

In addition to an abundance of natural resources, more than 100 sites in Richmond are listed in the Vermont Register of Historic Places. Most of these were identified in a Historic Sites and Structures Survey conducted in 1976 by the state's Division for Historic Preservation. Within the study area, the survey designated North (West) Main Street and Bridge Street as historic districts, with 28 and 34 sites, respectively, meeting its historic significance criteria.

Within the study area are six sites that were also identified by the National Park Service's National Register of Historic Places:

- Gray Rocks (Andrews Farm)
- Richmond Congregational Church
- Richmond Underwear Company Building
- Round Church (also a National Historic Landmark)
- M.S. Whitcomb Farm (Venture Farm/Monitor Barn Farm)
- Winooski River Bridge (Checkered House Bridge)

Historic sites within the study area serve as social and sometimes recreational gathering places, providing opportunities for both education and tourism. However, potential trails or other pedestrian and bicyclist improvements that may negatively impact historic sites may not be fundable. Before pursuing funding for improvements, sites impacted by walking and biking improvements should be reviewed for potential negative impacts, including archaeological sensitivity as well as aesthetic impacts (for example, removing street trees to adjust road widths for a bicycle facility).

Constraints

Table 6 summarizes the primary constraints within the study area that may affect opportunities for implementing walking and bicycling.

Table 6. Study Area Constraints

CONSTRAINT	DESCRIPTION
Limited Public Right of Way	Existing roadways are narrow, thus limiting options for the addition of active transportation improvements, either as retrofits or new construction. Narrow roadways also create challenge for creating safe and comfortable bicycle facilities by limiting possibilities for separating bicycles and pedestrians from travel lanes.
Privately Owned Land	Implementation of some off-street trails may depend on the Town’s ability to acquire land that is currently privately owned or secure private landowner permission for public access.
Hilly Topography	The Town’s varied and steep topography creates challenges for new and existing multimodal routes – many existing roads are prone to erosion due to their steep grade.
Wildlife Travel Corridors, Conserved Areas and Natural Upland Communities	Recommendations should accommodate conservation of these areas for wildlife and other natural resources.
Historic Sites	Recommendations should investigate potential negative impacts to historic sites that may impact funding opportunities.
Special Flood Hazard Area	The 2018 Town Plan calls out the area around the Winooski River as a Special Flood Hazard Area, and recommendations must comply with any existing floodplain management regulations.
Seasonal and Maintenance Concerns	Snow removal, seasonal flooding, poor surface conditions, and lack of maintenance funds can diminish the usefulness of facilities like trails.

Section 4

Facility Toolkit

4. Facility Toolkit

This chapter provides information on biking and walking facilities that can be implemented throughout Richmond to encourage increased walking and bicycling. In practice, successful pedestrian and bicycle networks adhere to the following principles:

- Pedestrians and bicyclists are separated from vehicle traffic on major roads with higher vehicle speed and volume
- On local streets where vehicle speed and volume are low, pedestrians and bicyclists may comfortably mix with vehicle traffic
- Intersections and crossings are designed to safely accommodate pedestrians and bicyclists while minimizing delay

There are many more tools available than are shown here; the toolkit is limited to treatments that are recommended in the Plan.

Applicable Design Guidelines

VTrans Pedestrian and Bicycle Facility Planning and Design Manual

American Association of State Highway Transportation Officials (AASHTO) Guide for the Development of Bicycle Facilities

American Association of State Highway Transportation Officials (AASHTO) Guide for the Planning, Design, and Operation of Pedestrian Facilities

Federal Highway Administration (FHWA) Achieving Multimodal Networks

Federal Highway Administration (FHWA) Bikeway Selection Guide

Federal Highway Administration (FHWA) Small Town and Rural Multimodal Networks

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

NACTO Urban Bikeway Design Guide

Facilities for Busy Streets



The backbone of any transportation network are its arterials and busy streets that carry regional traffic. These facilities typically provide the most direct connections between destinations and often the shortest travel times. It is important to select the most appropriate facility type given the context of the corridor, pedestrian activity, and bicyclists' comfort levels, among other factors. A variety of on- and off-street bicycle facilities are available to suit the context of any busy street.

Sidewalks

Description

- Spaces designated for pedestrians located parallel to the roadway
- May be vertically separated by a curb or horizontally separated by a green buffer from the roadway
- Six-foot minimum width preferred: a consistent width of at least four feet if minimum not possible

Sidewalk with planter strip



Application

- Streets with any amount of pedestrian traffic
- Medium to high volume streets with traffic speeds of 25 mph or greater

Considerations

- Wider sidewalks preferred where pedestrian volumes are higher, such as commercial areas
- Buffer space between sidewalk and high-speed roads can increase pedestrian comfort and safety
- Signage, poles, and trees can effectively narrow sidewalk width and degrade sidewalk quality, making passage difficult for some users with limited mobility or with strollers or suitcases
- Ramp grades should be shallow enough for users with limited mobility to use safely and comfortably

Accessible curb ramp



Shared Use Path/Sidepath

Description

- Two-way path within a dedicated right-of-way or parallel to a road, designated for bicycles, pedestrians, and most other non-motorized uses
- Shared use paths are located in independent rights of way
- Sidepaths are located within a road right of way or parallel a road
- Provides low-stress bicycle and pedestrian connection
- Typical Dimensions: 10-14 feet wide depending on expected user volume plus 2-foot wide clearance on either side (8 feet in constrained conditions)

Shared use path (independent of street)



Application

- Often installed along active or abandoned rail corridors, parallel to roads, utility easements, or along streams, rivers, or other linear features
- Provides long-distance connections as well as short cuts between areas without bicycle or pedestrian infrastructure

Sidepath (alongside a street)



Considerations

- Right of way easement or acquisition may be required (especially for shared use paths)
- Separate maintenance program may be required
- Path should be Americans with Disabilities Act (ADA)-compliant

Bike Lane/Climbing Lane

Description

- An exclusive lane for bicyclists designated with pavement markings and signage
- Located adjacent to motor vehicle travel lanes and flows in the same direction as motor vehicle traffic
- A climbing lane is a facility that combines a bike lane in one direction and shared lane markings in the other direction



Application

- Medium to low volume streets with traffic speeds of 40 mph or less
- Climbing lanes are appropriate on narrow roadways that cannot accommodate a bike lane in both directions

Considerations

- Typical Dimensions: minimum 5 feet; 6-foot minimum preferred adjacent to parked vehicles; 4 feet acceptable adjacent to curb in low-speed environments
- Mixing zones may be required at intersections or bus stops
- Enforcement may be required to keep motorists from parking or stopping in bike lanes

- Separate pedestrian facilities must be present or provided

Bikeable Shoulder

Description

- A paved shoulder with a six-foot minimum width preferred; a consistent width of at least four feet if minimum not possible

Shoulder widened for biking



Application

- Collectors and arterials at least 30 feet wide
- Streets with wide travel lanes that are candidates for lane width reduction
- Streets with infrequently used on-street parking

Considerations

- Provides a designated space for bicyclists with minimal impact to parking
- Does not create an all ages, all abilities facility on roads with high speed, high volume traffic.

- May not facilitate through-intersection bicycle movement unless specifically designed to do so

Facilities for Low Volume Streets



Low volume streets provide an opportunity to add to a low-stress transportation system by taking advantage of the low vehicle speeds and volumes. Though people bicycling and even walking share travel lanes with people driving, local streets can provide a comfortable alternative to traveling on high-volume, high-speed streets. Various treatments may be employed to create this low-stress bicycling environment to appeal to pedestrians and bicyclists of all ages and abilities:

Neighborways and Traffic Calming

- Speed humps
- Neighborhood traffic circles

Pavement Markings and Signs

- Shared lane markings
- Wayfinding signs
- Advisory bike lanes/shoulders

Neighborway

Description

- A neighborway, also called a bike boulevard or neighborhood greenway, is a low-volume local roadway that prioritizes biking and walking
- A neighborway combines various traffic calming treatments along with signs and pavement markings to convey that the street is to be shared by neighbors traveling by all modes

Neighborway with speed hump, traffic circle



Application

- Designated low-volume local/neighborhood streets, to enhance access for people walking and biking, or to connect important destinations like schools, parks, and libraries
- Typically use vertical or horizontal traffic calming devices (see following pages), treatments on intersecting arterials to facilitate safe and comfortable crossing for bicyclist and walkers, along with pavement markings (shared lane markings) and wayfinding signs.
- Sometimes additional traffic control measure are employed to further reduce vehicle volumes

Neighborway signs and pavement markings



Considerations

- Treatments are context sensitive and should be employed with consideration of emergency vehicle, snow plows, and other important access needs

Traffic Calming: Vertical Deflection

Description

- A vertical deflection strategy to slow motor vehicle traffic
- Speed humps can also be designed to provide gaps for bicyclists to pass through without slowing



Application

- Speed humps: mid-block local streets

Considerations

- Speed humps: 6-inch rise and vehicle tapers for vehicle speeds of <20 mph to ensure a maximum speed differential between bicyclists and vehicles of <15 mph and better pedestrian visibility
- Clearly mark locations with pavement markings and signs
- Match gap spacing in speed cushions to emergency vehicle wheelbase to allow first responders to maintain travel speeds
- Incorporate design treatments that limit impacts and damage from snow plowing

Traffic Calming: Horizontal Deflection

Description

- Horizontal deflection strategies such as traffic circles, chicanes, or neckdowns force drivers to slow at intersections and yield to users approaching from the left

Neighborhood traffic circle



Application

- At intersections of residential streets with high design speeds where there is a history of crashes
- Along bicycle routes (residential streets that are signed or otherwise designated as bicycle routes)

Considerations

- Traffic circles should be sized according to street width and allow for the passage of emergency vehicles and snow plows. Street narrowing due to snow accumulation should be considered when determining the circle diameter
- Regulatory or warning signage should be provided to remind traffic to proceed counterclockwise around the circle
- Visibility can be enhanced with paint and reflectors

- Circles should be designed with mountable curbs to allow for emergency vehicle access.

Pavement Markings and Signs

Description

- Pavement markings reminds drivers to anticipate the presence of people bicycling
- Shared lane markings (SLMs) and wayfinding signs direct bicyclists along designated routes like neighborhood greenways
- Transverse pavement markings are painted bars, zig-zags or chevrons spaced to give drivers the sense that are speeding up, and thus makes them more aware of their speed and slow down

Shared lane markings



Wayfinding signage



Application

- Shared lane markings: local streets, but applicable on collectors and arterials to direct bicyclists through complex intersections or through constrained areas
- Wayfinding signs: local, collector and arterial streets

- Transverse pavement markings: at transition zones on busy streets (curves, congested areas) to bring awareness to change in roadway character



Considerations

- Place the centerline of SLMs a minimum 4 feet from curb where parking is prohibited, or 11 feet from curb where permitted
- Coordinate wayfinding signs with designated bike/walk routes. Provide distances and/or typical travel times to destinations on wayfinding signs

Photo: Best Practices in Traffic Operations and Safety: Phase II: Zig-zag Pavement Markings. VTRC.
http://www.virginiadot.org/vtrc/main/online_reports/p...

Advisory Shoulder or Advisory Bike Lane

Description

- Dedicated space for walking and/or biking marked with a continuous dashed line to permit motor vehicle encroachment
- One or both drivers must enter advisory bike lanes, provided that they are clear of pedestrians and bicyclists, to pass opposing motor vehicles
- Advisory shoulders are used on streets with no sidewalk
- Advisory bike lanes are used on streets with a sidewalk

Advisory bike lane (Hanover, NH)



Application

- Low-volume, low-speed streets where dedicated biking/walking infrastructure is infeasible
- Can be used to create safety zones with 20 mph limits

Considerations

- Streets with $\leq 3,000$ vehicles per day, ≤ 25 mph operating speeds, and a single lane in each direction
- Streets with adequate sight distance for safe passing
- Streets with infrequent heavy vehicle traffic
- Advisory shoulders designated for pedestrian travel must meet accessibility standards

Intersections and Crossings



Most pedestrian and bicycle crashes occur at intersections because of conflicts with turning motor vehicles. While pedestrians, bicycles, and motor vehicles must inevitably cross paths at intersections, design strategies can maximize all users' safety and comfort by minimizing exposure to conflicts, reducing speeds at conflict points, communicating right-of-way priority, and providing adequate sight distance. These strategies focus on the crossing location and intersection geometry:

Enhanced Crossings

- Crossing islands
- Curb extensions

- Raised crossings or intersections
- Rectangular Rapid Flashing Beacons (RRFB)

Geometric Modifications

- Truck aprons
- Slip lane removal

Crossing Island

Description

- Raised median or island that provides in-street refuge at a crossing (at-grade or raised crossing)

Midblock crossing island



Application

- Signalized, unsignalized, or complex intersections
- Medians, roundabout splitter islands, or right-turn “pork chop” islands

Considerations

- Opportunity for plantings, rain gardens, or other green infrastructure

Curb Extension

Description

- An extension of the sidewalk at crossings used primarily to reduce pedestrian crossing distances and provide greater visibility for pedestrians, but also to increase sight distance of bicyclists to approaching motorists

Curb extension aligned with parallel parking



Application

- Signalized, unsignalized, or complex intersections with on-street parking

Considerations

- May require parking reductions or utility modifications
- Curb extensions can force bicyclists to merge into general travel lanes
- Incorporate design treatments that limit impact and damage from snow plowing
- Quick-build treatments can be used to show “proof of concept” before investment in permanent materials

Quick-build curb extension



Raised Crossing

Description

- A crosswalk raised to sidewalk level, typically (but not always) at a midblock location
- Slows vehicles, improves visibility of pedestrians, and improves pedestrian accessibility

Raised crossing with pavement markings



Application

- Crosswalks or intersections where low vehicle speeds are desired
- Signalized, unsignalized, or complex intersections

Considerations

- May be paired with a beacon to encourage motorist yielding

Rectangular Rapid Flashing Beacon (RRFB)

Description

- A flashing beacon activated on demand order to warn and/or control motor vehicle traffic
- Yellow caution lights flash to warn drivers of crossing pedestrians when activated

RRFB on roadway with center median



Application

- Streets with traffic volumes sufficient to make unsignalized crossings difficult
- Neighborhood greenway crossings
- Mid-block shared use path crossings

Considerations

- Must meet Manual on Uniform Traffic Control Devices (MUTCD) traffic control device warrants
- Helps bicyclists and pedestrians
- Requires activation or detection

Truck Aprons

Description

- Modifications to curb lines or edges of pavement at an intersection, typically related to decreasing intersection width or turning radii at the intersection corners
- The design achieves an effective reduction in turning radius but allows larger vehicles to mount the device and make the turn with a larger turning maneuver

Truck apron creating a curb extension



Application

- Slip lanes, offset intersections, or any intersection with a wide turning radius that creates multiple or long crossings for pedestrians and bicyclists or that allow motorists to turn at high rates of speed
- Where intersection design exceeds traffic volume and vehicle types

Considerations

- Reclaim unused roadway space to transition into a separated bike lane at the intersection and/or to narrow pedestrian crossing distances
- Provides opportunity for plantings, rain gardens, pocket parks, or street furniture

Slip Lane Removal

Description

- Closure or “removal” of right turn slip lanes to reduce conflicts between turning vehicles and pedestrians/bicyclists

Slip lane repurposed for walking space



Application

- Freeway on/off-ramps, multi-lane arterials, to prioritize pedestrian movement over free right turns

Considerations

- Depending on context, provides opportunity for expanded walking/biking space, plantings, rain gardens, pocket parks, or street furniture
- Closures can be accomplished with quick build or permanent materials

Image source:
<https://usa.streetsblog.org/2018/07/13/cities-are-replacing-dangerous-slip-lanes-with-space-for-people/>

Section 5

Infrastructure

Recommendations

5. Infrastructure Recommendations

This section presents infrastructure recommendations to improve safety, comfort, and access for walking and bicycling and represent a starting point for growing an active transportation network throughout Richmond. These recommendations range from low-cost projects that can be implemented using pavement markings and signage to capital reconstruction projects. The projects have been evaluated for feasibility and informed by input from the Project Advisory Committee and community input. The implementation of each project will be subject to additional public outreach and may change in scope and nature during the project development process.

How These Recommendations Were Developed

To develop the recommendations found in this Plan, the project team considered various factors and inputs. The process began with identifying existing physical constraints, which included scenic roads, bridges, at-grade railroad crossings, wetlands, areas of critical environmental concern, roadway slope, and right-of-way. The project team also reviewed existing local and regional multimodal transportation plans to identify opportunities.

The need for biking and walking facilities and level of separation from motor vehicle traffic was determined by reviewing roadway traffic volumes and speed data and roadway functional classification. Recommendations for new crossings were determined based on the presence of non-motorized trip generating land uses, proximity to existing crosswalks, and presence of existing, planned, or proposed connecting facilities. Parcel maps were consulted to identify locations where short shared use path connections on public rights-of-way may be feasible.

Network Design Approach and Facility Types

Safe Routes to School

Many community members voiced concern about safety for school children and people walking and biking on roadways leading to the schools and expressed improvements to these roadways as a priority.

Recommendations for safe routes to school (SRTS) are intended to create family-friendly/all ages and ability facilities between residential neighborhoods and the elementary and middle schools.

Main Street Spine

Beside safe routes to school, one of the most prevalent community comments focused on the challenges for bicyclists and pedestrians along Route 2/Main Street. Main Street is the spine of the study area and the community – providing a connection from Williston to Bolton, as well as important destinations in-between (Park & Ride, the Village, Andrews Community Forest, and VYCC). Main Street needs to better prioritize biking and walking. The recommendations include proposals for improving conditions along Route 2/Main Street both in the short-term and long term through design and traffic management interventions as well as providing alternative routes.

Safe Travels through Neighborhoods

Roadways whose primary function is to provide neighborhood access should be safe and comfortable for neighbors walking, biking, and driving. Neighborways involve a set of low-cost, easy to implement design treatments that make it easier to walk and bike and message to drivers that they share the road with their neighbors.

Community Connections

To accommodate people walking and biking on rural collectors and arterials with constrained conditions, sidepaths are recommended as way to organize and consolidate non-motorized travel, work with existing surface drainage patterns and limited rights-of-way, and maintain the rural Village character of Richmond.

Off-Road Trails and Connectors

Off-road trails provide all ages and abilities routes to connect people to local destinations, supporting non-motorized travel, as well as providing recreational opportunities. Seasonal trails (i.e. ski trails) provide “bonus” recreational opportunities in areas that are otherwise off-limits in other seasons. In Richmond, trails are a critical part of the biking and walking network and should be enhanced with wayfinding signage, amenities, and winter maintenance (as appropriate).

Reducing speeds to shift toward a more walkable, livable Richmond

High speed streets harm the perceptions of safety and livability. Research has found a negative association of traffic speed with levels of social interaction and perceived friendliness of street environments. Streets with low speeds have more indicators of a better quality of life – more street activity, more signs of street care, etc. These social connections and indicators allow for people to develop stronger social networks which contributes to lower levels of mortality and better overall public health.²

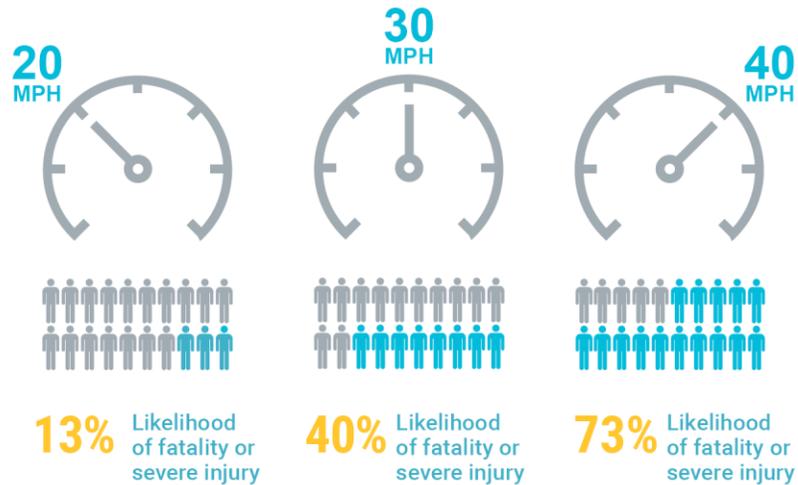
Reducing speeds is also necessary to lower injury and fatality rates in the transportation system as well as balance the needs of people walking, bicycling, and driving. Cyclists struck by vehicles travelling between 20-30 mph have a 92 percent higher probability of dying compared to those struck by vehicles travelling less than 20 mph. Those struck at 30-40 mph have three times the risk of dying, and those struck at 40-50 mph have a greater than 10-times the risk of dying compared to those injured by a vehicle going less than 20 mph.³ Pedestrian struck at 20 mph has a 13 percent risk of death, compared to 40 percent at 30 mph and 73 percent at 40 mph (see Figure 16). Pedestrians face injury rates above 90 percent and fatality rates around 75 percent when struck by vehicles travelling at 50 mph.⁴

Most approaches to setting speed limits are based on the 85th percentile speed (the speed at which 85 percent of traffic is traveling at or below).

² <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2845829/>

³ <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2845829/>

⁴ https://hria.org/wp-content/uploads/2017/01/TechReport_131209.pdf



Source: Tefft, Brian C. *Impact speed and a pedestrian's risk of severe injury or death. Accident Analysis & Prevention. 50. 2013*

Figure 16. Speed Fatality and Injury statistics

Intended to accommodate driver error and minimize the impact of crashes, this practice leads to designing wide roadways with large corner radii, which results in higher and unsafe speeds as well as a cycle of speed escalation. Rather than using the 85th percentile speed to set speed limits, consider street user mix and density, ability to segregate street users, land uses, and street activity. FHWA guidance for speed limits on streets with bicycle and pedestrian traffic:

- Preferred: up to 25 mph, 3,000 ADT
- Potential: up to 35 mph, 6,000 ADT

Along with the following segment-by-segment facility recommendations, a suite of speed reduction and traffic calming treatments are proposed to be implemented along the length of the entire corridor, with a focus on horizontal curves, narrow areas, and locations where there is more activity and/or crashes. These tools may include transverse rumble strips, pavement markings, signage, speed indicator signs active speed signs.

Vehicle speed reduction and increased awareness of the presence of bicycle and pedestrians must go hand in hand with the facility recommendations.

Network Recommendations



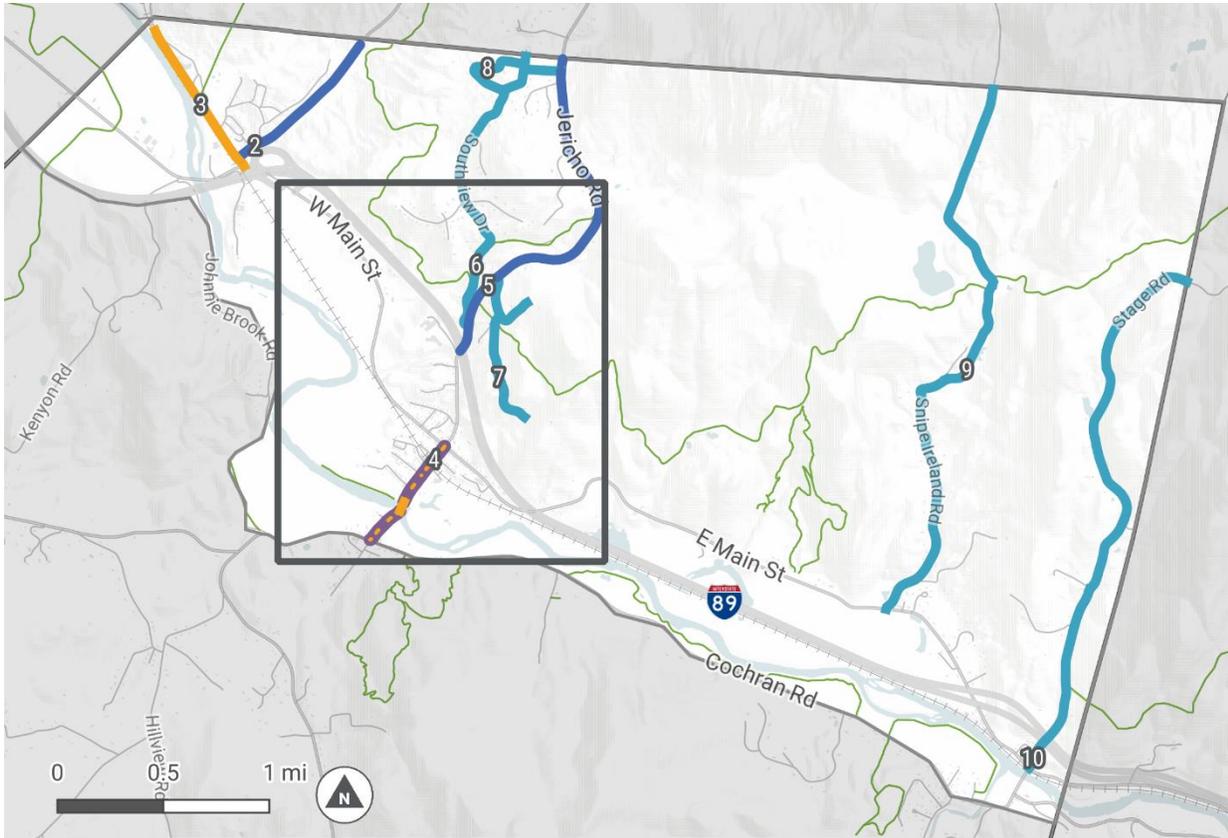
The short term and long-term facility network recommendations for on-street facilities are shown in [Figure 17](#) and [Figure 18](#) and described in

A Note on Historic Character

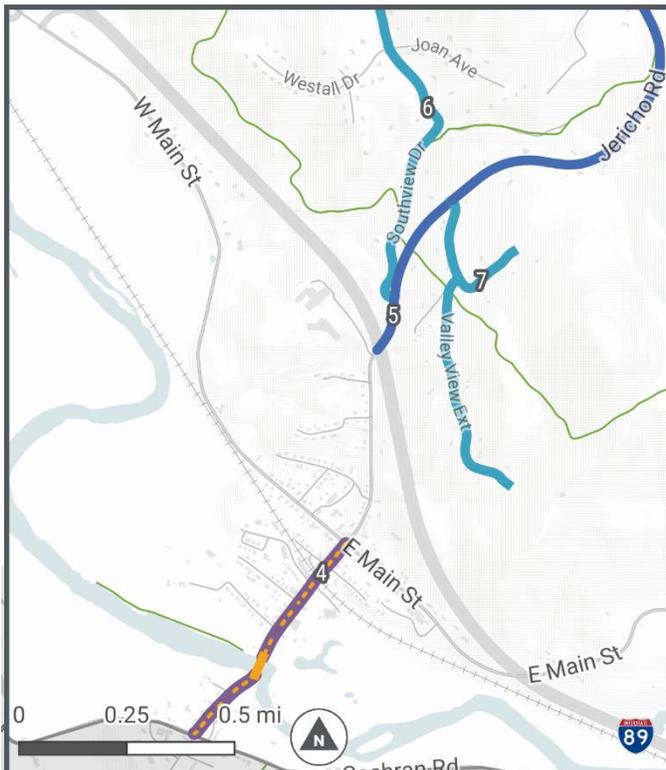
Residents and visitors alike value Richmond for its rural character and natural resources. The retention of these features is a key goal for the Town of Richmond and one that is supported by this Plan. Therefore, the Town is mindful of these considerations when implementing new transportation infrastructure.

The potential impact of pedestrian and bicycle facilities must be carefully weighed along with their benefits. First, it is useful to consider that improvements for walking and bicycling are significantly less impactful than roadway capacity expansion projects. By providing an alternative to driving, walking and bicycling facilities can help manage the demand for vehicle trips and reduce the need for future roadway expansion projects.

Second, facilities can be designed using a minimum of new pavement markings and signage to reduce visual clutter. Many examples can be found of pedestrian and bicycle facilities that successfully fit within the context of historic built environment and natural resources.



Village Inset



Short-Term Facility Recommendations

- Advisory Bike Lane
- Neighborway
- Shared Lane Markings
- Climbing Bike Lane and Painted Walkway
- Existing Trails

Figure 17. Short-Term Facility Recommendations



Table 7. On Street Recommendations

See Table 1 for roadway characteristics, including AADT, posted speed limit, and right-of-way width. More information about how short-term and long-term are defined can be found in Section 7. Prioritization and Implementation.

Map ID	SHORT-TERM FACILITY TYPE	LONG-TERM FACILITY TYPE	SPEED LIMIT: Exist > prop
2	<p>Governor Peck Highway (Richmond)</p> <p>Advisory bike lanes/shoulders + traffic calming measures:</p> <p>Install marked crosswalks, pedestrian crossing signs, and bicycle conflict markings at all crossings (River Road, Lower Cir, Summer St) to draw attention to pedestrians and bicyclists</p>	Sidepath on north side	35 mph → 30 mph
3	<p>River Road/ VT-117 (VTrans)</p> <p>Install “shared the road” signs and bike/ped warning signs at key activity areas, such as crossings</p>	<p>Alternative 1: Evaluate feasibility of two alternatives for a shared use path or sidepath:</p> <p>Alternative 1a: Widen for shared use path along railroad on west side. Install marked crossings at all intersections to provide connection between shared use path and destinations on east side. A sidewalk on the east side from the store down along the mobile home community would anchor the crossings from the west side to a safe walking facility on the east side.</p> <p>Alternative 1b: Widen for a sidepath on east side.</p>	45 mph (up to Rogers Lane) → 35 mph
4	<p>Bridge Street (Richmond)</p>		

Map ID	SHORT-TERM FACILITY TYPE	LONG-TERM FACILITY TYPE	SPEED LIMIT: Exist > prop
	<p>In coordination with Bridge Street study recommendations (2021):</p> <ul style="list-style-type: none"> • Install a painted sidewalk on east side • Install an uphill bike lane on the east side • Install shared lane markings on the west side • On bridge across Winooski River, install signage to draw attention to bicyclists • Remove or do not repaint centerline 	<p>In coordination with Bridge Street study recommendations (2021):</p> <ul style="list-style-type: none"> • Upgrade sidewalk on west side to be ADA-compliant • Install a new sidewalk on east side • Evaluate the feasibility of installing a beacon (RRFB) at key crosswalks without pedestrian signals • Extend recommended facilities from Bridge Street project southward. 	25 mph
5	Jericho Road		
	<p>Advisory walk and bike lanes/shoulders + traffic calming measures</p> <p>Install mirrors for blind turns</p>	<p>Reduce travel lanes to 10' and extend planned sidewalk on west side</p>	<p>35 mph (from School St to Valley View Rd)</p> <p>45 mph (north of Valley View Rd)</p> <p>→ 25 mph</p>
6	Southview Drive		
	Neighborway	Install a sidewalk on one side	25 mph > 20 mph
7	Valley View Road (unpaved)		
	<p>Neighborway</p> <p>Install signage to draw attention to pedestrians and bicyclists</p>	Same as short-term	25 mph > 20 mph
8	Hidden Pines Circle (Richmond)		
	<p>Neighborway</p> <p>Install shared lane markings and signage to draw attention to pedestrians and bicyclists</p>	Same as short-term	25 mph > 20 mph

Map ID	SHORT-TERM FACILITY TYPE	LONG-TERM FACILITY TYPE	SPEED LIMIT: Exist > prop
	Implement traffic calming measures as needed		
9	Snipe Ireland Road – unpaved (Richmond)		
	Neighborway Install signage to draw attention to pedestrians and bicyclists Install wayfinding signage directing to recreational trail opportunities in West Bolton	Same as short-term	25 mph > 20 mph
10	Stage Road – unpaved (Richmond)		
	Neighborway Install signage to draw attention to pedestrians and bicyclists Install wayfinding signage directing to recreational trail opportunities in West Bolton	Same as short-term	35 mph → 30 mph

Table 8. Intersection and Bridge Recommendations

INTERSECTION	RECOMMENDATIONS
River Road and W Route 2/Main Street	Tighten corner radii on both sides of River Rd Explore the Installation of protected bike intersection from Main St/Route 2 sidepath on south side to VT-117 facility
Governor Peck Road and River Road/VT-117	Install “don’t block the box / intersection” markings Install sufficient lighting for pedestrians and bicyclists Evaluate feasibility of installing a beacon (RRFB) at the intersection
Bridge Street crossings through Village	<ul style="list-style-type: none"> • Upgrade all crosswalks and pedestrian signals to be ADA-compliant • Ensure sufficient lighting at all crosswalks and install pedestrian-scale lighting if not • Install pedestrian refuge islands or curb extensions at key crossings, such as Railroad Street/Jolina Court • Upgrade railroad crossing – add gates for pedestrians
Bridge Street/ Main Street / Route 2	<ul style="list-style-type: none"> • Add curb extensions with truck aprons to tighten corner radii, create more landing area, and reduce crossing exposure at SE, NE, and NW • Shorten curb cuts at gas station on the corner
Bridge Street Bridge	<ul style="list-style-type: none"> • Explore feasibility of widening to accommodate biking and walking • Explore feasibility of creating a shared space, such as advisory shoulder
Western Winooski Bridge	<ul style="list-style-type: none"> • Widen or cantilever out to accommodate biking and walking • Explore feasibility of creating a shared space, such as advisory shoulders • Coordinate with current bridge project
Southview Drive	Implement traffic calming measures: <ul style="list-style-type: none"> • Tighten corner radii at all intersections with paint and posts • Install crosswalks at all intersections • Evaluate feasibility of roundabouts at key intersections

Table 9. Off-Road Recommendations

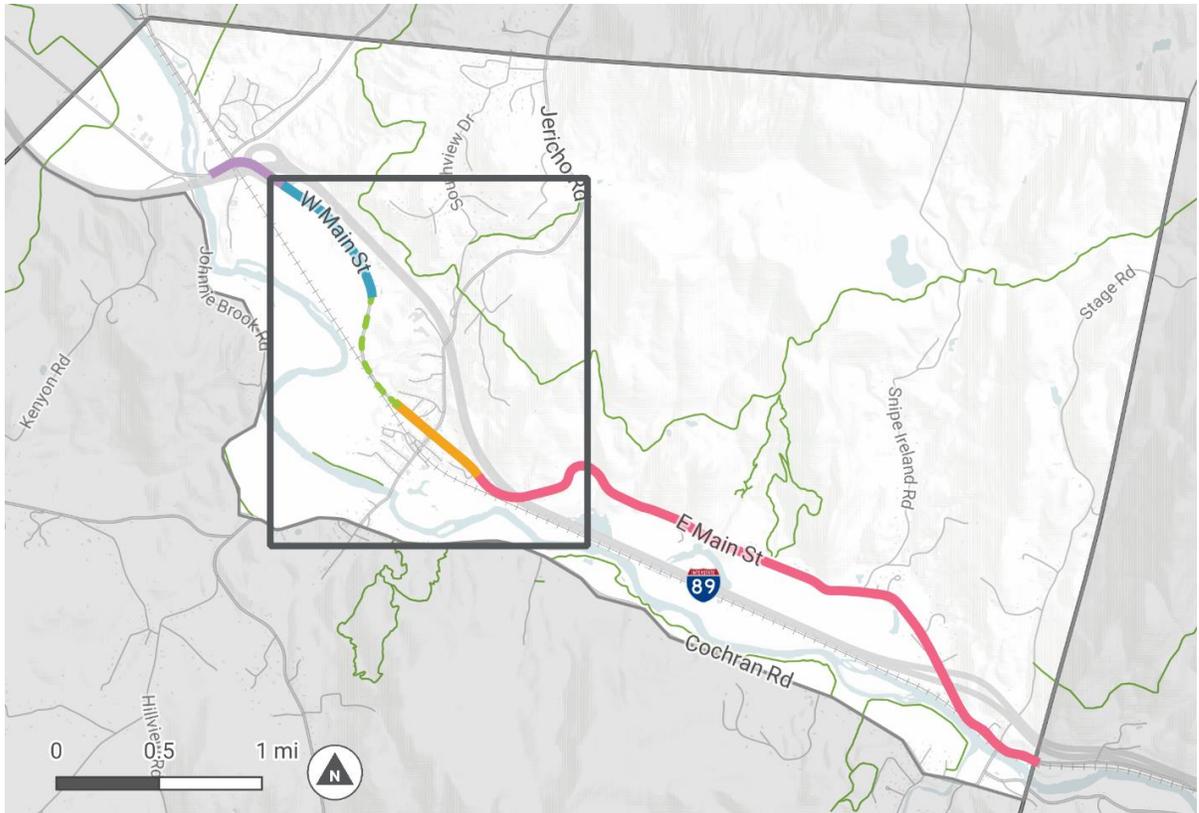
Map ID	LOCATION	RECOMMENDATIONS and NOTES
11	Johnnie Brook Trail (existing) (Richmond)	Outside of project area but noting for future plans Request to be accessible during winter
12	Sip of Sunshine Trail (existing) (Richmond)	Slated for expansion, connecting to Andrews Community Forest, in 2021 (confirm date)
13	Old Jericho Road Trail (Richmond)	Add wayfinding signage
14	Snipe Ireland Trail (existing) (Richmond)	Add wayfinding signage
15	Trail to connect Stage Road and Snipe Ireland Road	Look into feasibility of trail to connect the two roads. Note: Does not initially look feasible due to topography / change in elevation (500 feet). Would also require obtaining easements.
16	Warren & Ruth Beeken River Shore Trail (existing) (Richmond)	Close gaps along Cochran Rd
17	Volunteers Green Trail Extension (Richmond)	Lengthen trail for a recreational loop, following Winooski River northwest to Park & Ride Alternative 1a: Verburg Rd to W Main St > Park & Ride Alternative 1b: Verburg Rd > Park & Ride (following approximate path of I-89 offramp) Alternative 2: Follow river up to River View Cemetery > cross railroad to W Main St
18	West Village Connector Loop (Richmond, with easement from private land owners)	Obtain easements and formalize connections on western ends of Esplanade, Church St, Railroad St, and Borden St and mark public right-of-way for walking loops (connect the western end of Esplanade to W Main St)
19	Andrews Community Forest (Richmond)	Will be connected to VYCC Trails in the future and Sip of Sunshine Trail in 2021 Connect to Valley View Rd through a new trail

Route 2/Main Street Recommendations

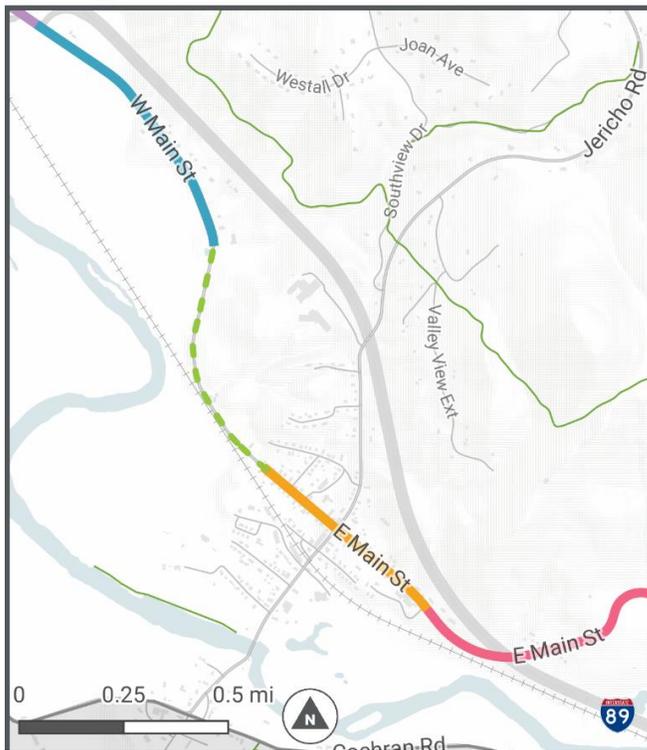
Route 2/Main Street has many challenging existing conditions, as noted previously. In addition to the narrow existing roadway and right of way, utility lines switch from one side of the road to the other several times, the river and floodplain create pinch points, roadside drainage and topography require guardrails, there are horizontal curves and land use constraints such as the railroad right of way, the cemetery, and residences close to the road. Additionally, because the character of the corridor changes along its length due to the various constraints, it is difficult to recommend a consistent facility type and location (as in a single side of the road). These constraints make the accommodation of bicycling and walking facilities challenging and expensive to construct. Both the 2014 study and the [Richmond - Bolton STP 2924\(1\), US2 Reclaim Project \(PIN 10C254\)](#) project currently under way indicate that wide shoulders would be the easiest way to accommodate bicycles and pedestrians.

However, in engagement with the project steering committee and the wider community, it is evident that the community feels that high quality walking and bicycling conditions along Route 2/Main Street are critical for the community's safety, mobility and livability, for everyone from school children and families, to commuter cyclists and casual bicyclists. For this reason, the recommendations center on all age and abilities facilities that will accommodate a wide range of users.

[Figure 19](#) and [Table 10](#), below, summarizes the recommendations. The roadway has been broken into segments that are consistent in character and constraints.



Village Inset



Route 2 Recommendations

- East Main St
- Village
- - - Detour
- West Main St
- I-89 Interchange
- Existing Trails

Figure 19. Route 2/Main Street Recommendations

Table 10. Route 2/Main Street Facility Recommendations

SEGMENT	SHORT-TERM FACILITY TYPE	LONG-TERM FACILITY TYPE
<p>East Main Street</p> <p>Town limits/ Cochran Road Bridge to Lemroy Ct</p> <p>Speed limit: 40 mph/50 mph > 35 mph</p>	<p>Bikeable Shoulders, 5 feet minimum</p>	<p>Sidepath, 8-10 feet wide as conditions allow, with 2 foot minimum separation (vegetated swale), wherever possible, south side if possible, from Stage Rd to approx. 3214 East Main St (0.3 mile)</p> <ul style="list-style-type: none"> • Segment is less populated but still an activity center, esp. near Jonesville • Where road narrows or other conflicts exist (stream crossings, bridges, etc.): transition to a widened shoulder on one side (5 feet minimum) with separation, along with signage and rumble strips, to just north of Hwy 89 overpasses • From 2950 E Main St to Lemroy Ct (2.6 miles), sidepath, 8-10 feet wide as conditions allow, with 2 foot separation (vegetated swale), south side of road, • At Hwy 89 overpass, transition to widened shoulders (narrow lane widths) • If facility needs to switch from one side to another (not ideal but may be necessary), crossing treatments will be needed. • Crosswalks and pedestrian refuge islands from shared use path on south side of roadway to YVCC and Andrews Community Forest.
<p>Main Street/Village Segment</p> <p>Lemroy Ct to 217 W Main Street (where sidewalks end)</p> <p>Paved width approx. 32 ft</p> <p>Speed limit 30 mph > 25 mph</p>	<p>Bikeable Shoulders, 5 feet minimum</p>	<ul style="list-style-type: none"> • Sidepath, 8-10 ft as conditions allow, with 2 foot minimum separation (vegetated swale) on north side of road (to avoid utility pole conflicts), replacing existing sidewalk, from Lemroy Ct to Jericho Rd (0.3 mile). Sidewalk and parking on south side to remain. • Rather than provide substandard walking and biking facilities on both sides of the road, we recommend creating a shared use path one side of the roadway. • West of Jericho Rd to 217 W Main St, narrow lanes and widen sidewalk on north side of road to create shared use path (0.2 mile)
SEGMENT	SHORT-TERM FACILITY TYPE	LONG-TERM FACILITY TYPE

<p>West Main Street (Part 1)</p> <p>217 W Main Street to past cemetery (1026-1034 W Main St)</p> <p>Speed limit: 30 mph > 25 mph</p>	<p>Bikeable Shoulders, 5 feet minimum</p>	<p>Ideally, a shared use path could be constructed along this segment on Route 2/Main Street, but with major constraints, we recommend providing alternative routes. See following table for details on detour options</p>
<p>WEST MAIN STREET (PART 2)</p> <p>Past cemetery to I-89 Interchange</p> <p>Speed limit: 40 mph > 35 mph</p>	<p>Bikeable Shoulders, 5 feet minimum</p>	<p>Sidepath, 8-10 ft wide as conditions allow, with 2 ft minimum separation (vegetated swale), wherever possible, north side of road (0.3 mile)</p> <ul style="list-style-type: none"> • This segment has fewer constraints. • South side of road was recommended in 2014 study. The north side would provide a direct connection to the Park and Ride, Route 2 detour options on the prior segment (217 W Main St to past cemetery), and easier connection to the schools as well as other areas that may be considered for further development on the north side.
<p>West Main Street @ Hwy 89 Interchange</p> <p>Speed limit: 40 mph > 35 mph</p>	<p>Bikeable Shoulders, 5 foot minimum.</p>	<p>Sidepath on south side, long-term solution.</p> <ul style="list-style-type: none"> • Short-term improvements include revisions to interchange to prioritize biking and walking. • This highway/Village interface should be redesigned to prioritize bicycles and pedestrians accessing the park and ride. • Reduce turn radii for on and off-ramps to VT-117 from US 2 to reduce speeds • Reduce travel lane widths to 10 feet to provide wide shoulders and reduce speeds • Close northbound slip lane onto I-89 North • Remove right turn lane from US 2 to VT-117 • Consider raised crossing at park and ride and across on/off-ramps • Add signs, pavement markings, and conflict markings • Ensure adequate lighting, add if deficient

Route 2/Main Street Detour Options Analysis

The following evaluation criteria were selected to evaluate the Route 2/Main Street detours (Table 11). Criteria are scored on a scale of 1-3,

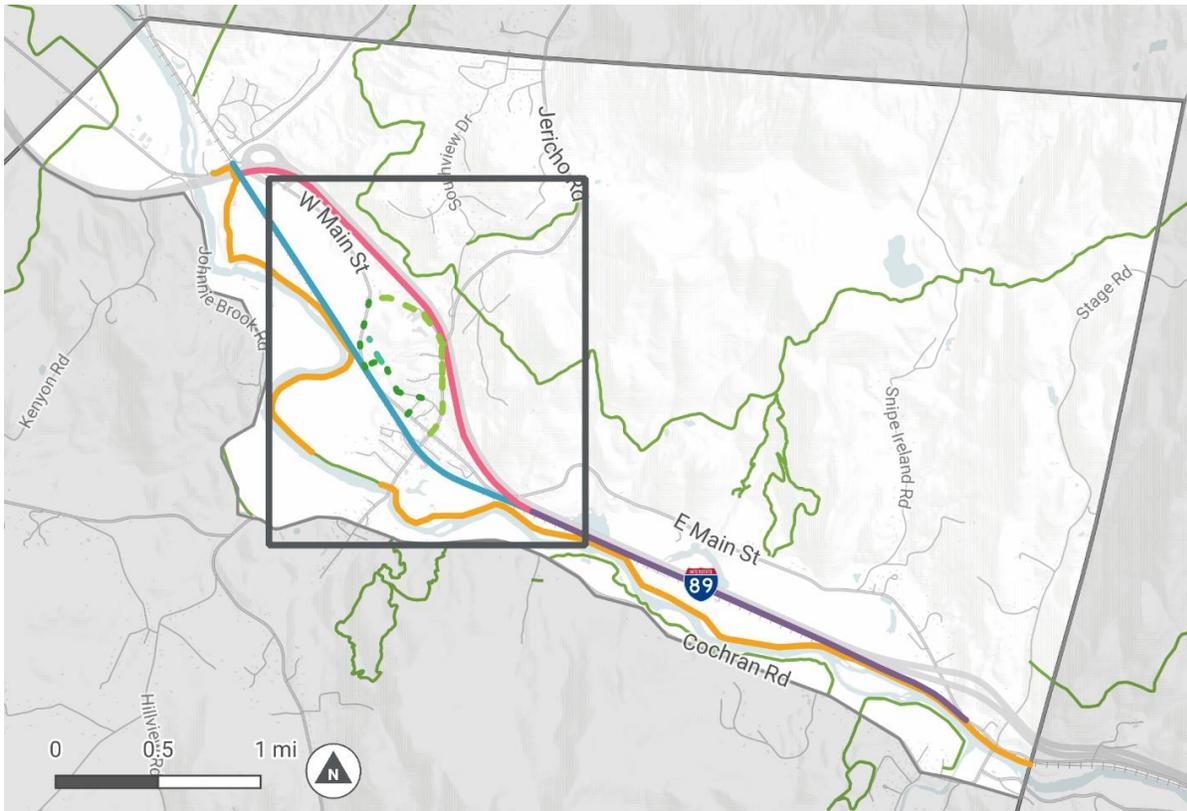
where 3 is the highest score and 1 is the lowest. The alternatives are scored relative to one another. The alternative with the highest overall score would best meet the community's needs.

- **Access and Connectivity:** does the alternative provide access to important destinations? A score of 3 would indicate that the alternative provides excellent access and connectivity compared to the other alternatives.
- **Directness:** does the alternative follow a direct route, or does it require out of direction travel or follow a circuitous route? A score of 3 would indicate that the alternative is very direct compared to the other alternatives.
- **Private Property Impacts:** would the alternative require right of way acquisition or easements? A score of 3 would indicate that the alternative has no private property impacts, or easement/acquisition needs compared to the other alternatives.
- **Topography:** does the alternative follow easy grades (under 5%)? A score of 3 would indicate that the alternative is level or has the least amount of elevation change compared to other alternatives.
- **Feasibility:** does the alternative require stream crossings, pose potential impacts to wetlands or other natural resources, or would it be challenging to construct for other reasons? A score of 3 would indicate that the alternative is the most constructable compared to the other alternatives.

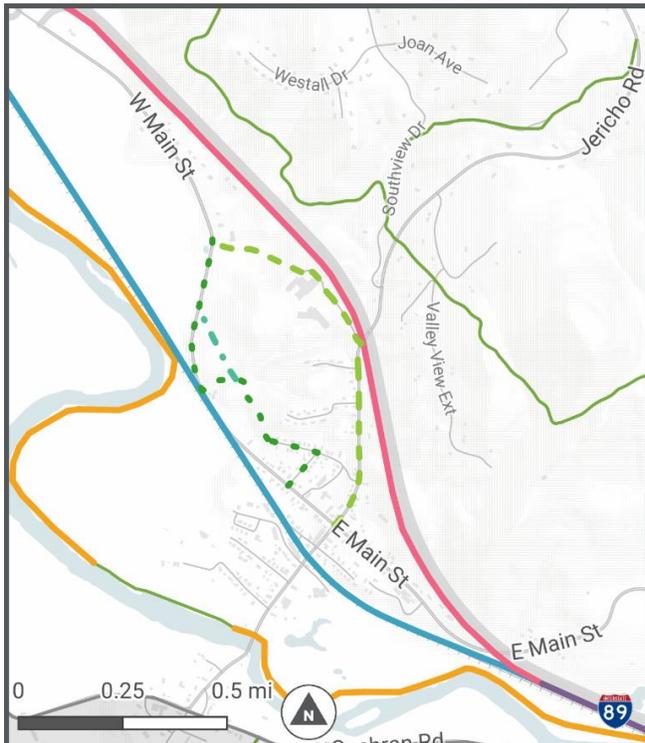
Discussions with the Cemetery Commission, New England Central Railway (NECR), as well as private landowners will be required to better understand property borders, willingness to provide easements, potential alignments, and overall feasibility of the potential routes.

Table 11. Route 2/Main Street Detour Options Analysis

POTENTIAL ROUTE	ACCESS/ CONNECTIVITY	DIRECTNESS	PROPERTY IMPACTS	TOPOGRAPHY	CONSTRUCT- ABILITY	TOTAL SCORE
A1. Baker- Tilden (Cross stream south of Riverview Cemetery)	2	2	2	2	3	11
A2. Jericho Road- School Road (Willis Hill Sledding and Outdoor Nature Lab/Richmond Land Trust)	1	1	3	1	2	8
A2. Cemetery (Path along north property line)	1	2	2	2	1	8
B. Highway 89 right of way	1	2	3	2	3	11
C. Winooski River	2	2	2	3	1	10
D. Railroad right of way	2	2	1	3	1	9



Village Inset



Route 2 Detour Options

- A1 Baker-Tilden
- A2 Jericho-School
- A3 Baker-Tilden-Cemetery
- B Highway 89 Right of Way
- C Winooski River
- D Railroad Right of Way
- A and D
- Existing Trails

Figure 20. Route 2/Main Street Detours

Section 6

Non-Infrastructure Recommendations

6. Non-Infrastructure Recommendations

Building on the infrastructure recommendations, this chapter presents ways to improve the walking and bicycling conditions in Richmond through education, encouragement, enforcement, and operations and regulatory enhancements. Like the previous infrastructure recommendations, these range from low-cost methods that consist of short-term outreach programs to higher-cost capital and long-range projects.

Table 12. Non-Infrastructure Recommendations

TYPE	PROJECT DESCRIPTION
Encouragement	Develop a biking and walking map. This can be an online map or printed map showing bike routes, distance between major destinations, sites of interest, and other amenities such as public restrooms and water fountains. Work with the local businesses to distribute the map.
Encouragement	Encourage businesses to install covered, secure, and well-lit bike parking for both customers and employees. The availability of bike parking is often a major factor in encouraging bicycling and can also be significant to attracting customers. Work with local businesses on implementation.
Encouragement	Hold a 2-mile challenge. Encourage or challenge residents and employees to bike or walk for trips under 2 miles.
Encouragement	Install a public bike maintenance station. Public maintenance stations allow bicyclists to fill tires with air and complete minor repairs. These stations offer convenience to bicyclists and increase the visibility of bicycling in the community. Potential priority locations include the Park and Ride, the Village, or Volunteer's Green.
Enforcement	Implement progressive ticketing program aimed at drivers and bicyclists and "bad driver" reporting program. Progressive ticketing programs employ warnings and education before ticketing as a means to educate road users about traffic laws, new facilities, and

	safe habits. “Bad driver” reporting program allows bicyclists or pedestrians to report unsafe vehicular driving to police without having to confront the driver.
Operations	Add a funding program in the Town budget for bicycle and pedestrian facilities. A dedicated funding program makes it easier to conduct small scale bicycle and pedestrian projects on a regular basis.
Operations	Require traffic management plans during construction to provide for pedestrian and bicycle travel. The Town should review traffic management plans for signs and detours that maintain pedestrian and bicyclist access around construction zones.
Operations	Review Town sidewalk and path snow removal policies and operations and update accordingly to define responsibilities and ensure sidewalks and paths are cleared within a specified time frame. A volunteer snow clearance program could recruit community groups, school groups, sports teams, or community service minded individuals to assist with snow clearance activities. These groups can supplement the Town’s snow clearance program, focus on routes to transit, or on off-street paths.
Operations	Incorporate pedestrian and bicycle facility condition inspection into regular maintenance assessments and replace or upgrade as needed. This should include inspection of sidewalks, shared use paths, curb ramps, crosswalks, pavement markings, and signage. Pavement markings generally require restriping every 3-5 years to maintain visibility. Pedestrian and bicycle markings should be incorporated into existing inspection programs. Data collected in GIS compatible formats can be cross-checked with the Bike, Walk, and Trails Plan.
Operations	Install side guards on Town owned heavy vehicles and require wheel guards on Town-contracted vehicles. Side guards prevent bicyclists from being pulled under the wheels of heavy vehicles in a crash. The Town should retrofit vehicles operated by the Town or under contract with the Town, such as waste removal, construction, or maintenance vehicles.
Operations	Implement a “SeeClickFix” or other mobile or online application to report issues to the Town. A mobile app allows citizens to report maintenance needs such as

	potholes, sidewalk cracks, missing curb ramps, snow clearance, bike parking requests, or other infrastructure issues that impact walking and biking. An app can help the Town track work orders and target maintenance to high-demand locations.
Operations	Create a bicycle parking program. The Town should create a bike parking request system and install new bike racks and bike parking corrals in areas of high demand.
Operations	Collect bicycle and pedestrian crash data annually. The Town should collect data bicycle and pedestrian crashes. Crash reports should be modified to include information specific to pedestrian and bicycle crashes (see recommendation regarding crash reports). Training may be required on new data collection procedures.
Operations	Review and update the Walk, Bike, Trail network map every five years. The plan will require updates as conditions change over time.
Operations	Collect and analyze bike and walk counts. Data collection can be supplied by volunteers. Participate in the data collection at key locations throughout Richmond to track walking and bicycling.
Regulatory	Review Town ordinances related to bicycle use, registration, and parking. Ordinances should encourage bicycling and protect bicyclists rather than discourage use.
Regulatory	Use the Walk, Bike, and Trails Plan for project and development review. Compare all proposed capital projects and development reviews to the infrastructure recommendations in the Plan for opportunities to implement recommendations. Include easements between parcels to create walking and bicycling connections and develop an off-road network.
Regulatory	Require restoration of all pedestrian and bicycle pavement markings after street utility repairs. Require implementation of short-term facilities recommendations for roads undergoing repaving. Include pavement markings as part of inspection list for utility repairs. Supply pavement marking plans with street opening permits.
Regulatory	Create a shared parking ordinance. Shared parking allowances would optimize parking supply in existing

	surface lots and improve the pedestrian environment by fostering more pedestrian friendly land-use and scale.
Regulatory	Work with the Climate Action Committee to establish and work towards a vehicle miles traveled (VMT) reduction target. Richmond can set a target VMT reduction percentage by a specific date. VMT may be measured by AADT.
Regulatory	Consider requiring developers to install shared use paths connecting to the bike/walk network.

Section 7

Prioritization and Implementation

7. Prioritization and Implementation

Opinions of Probable Cost

Opinions of probable cost ranges were developed by identifying major pay items and establishing rough quantities to determine a rough order of magnitude cost. Additional pay items have been assigned approximate lump sum prices based on a percentage of the anticipated construction cost. Planning-level cost opinions include a contingency to cover items that are undefined or are typically unknown early in the planning phase of a project. Cost opinions do not include easement and right-of-way acquisition; permitting, inspection, or construction management; engineering, surveying, geotechnical investigation, environmental documentation, special site remediation, escalation, or the cost for ongoing maintenance. The overall cost opinions are intended to be general and used only for planning purposes. There are no guarantees or warranties regarding the cost estimates herein. Construction costs will vary based on the ultimate project scope, actual site conditions and constraints, schedule, and economic conditions at the time of construction Project timeframe.

Table 13. Opinions of Probable Costs

ROADWAY	OPC
Main Street/US-2 (Short Term – Traffic Calming)	\$115,350
Main Street/US-2 (Long Term – Shared Use Path)	\$6,302,570
Governor Peck Highway (Short Term – Advisory Bike Lanes)	\$27,30
Governor Peck Highway (Long Term – Shared Use Path)	\$1,657,270
River Road/VT-117 (Short Term – Shared Lane Markings)	\$7,300
River Road/VT-117 (Long Term – Shared Use Path)	\$1,636,700
Bridge Street (Short Term – Climbing Lane, Painted Walkway)	\$289,800
Bridge Street (Long Term – Sidewalk)	\$1,269,430
Jericho Road (Short Term – Advisory Bike Lanes)	\$61,950
Jericho Road (Long Term – Sidewalk)	\$4,107,000
Southview Drive (Short Term – Neighborway)	\$66,600
Southview Drive (Long Term – Sidewalk)	\$2,842,600
Valley View Road (Short Term – Neighborway)	\$50,000
Valley View Road (Long Term – Advisory Bike Lanes)	\$31,500
Hidden Pines Circle Neighborway	\$45,520
Snipe Ireland Road Neighborway	\$152,660
Stage Road Neighborway	\$146,420
Sip of Sunshine Trail	\$213,700
Old Jericho Rd Trail Wayfinding	\$6,800
Snipe Ireland Trail Wayfinding	\$6,800
Stage - Snipe Ireland Connector	\$104,100
Warren & Ruth Beeken River Shore Trail	\$185,900
Volunteers Green Trail Extension	\$357,800
West Village Connector Loop Trail	\$50,850
Andrews Community Forest Trail	\$245,670

Prioritization Framework Phasing

Given limited resources, the Bike, Walk, and Trails Plan includes a prioritization framework that scores and ranks infrastructure projects according to criteria that fall under the Plan's vision framework: safe and welcoming, connected, healthy, and climate adaptive. Table 14 presents the criteria and Table 15 the project prioritization. The full scoring criteria can be found in the appendices.

Table 14. Project Prioritization Criteria

CATEGORY	MEASURE	DESCRIPTION	POINTS
Equity	Does the project help people in disadvantaged communities?	Connectivity to an area designated as a "disadvantaged community"	Direct connection to a disadvantaged community: 10 points Indirect connection: 5 points
Safety	Does the project address a high crash risk location?	Project is located along a high-crash node	Located at top-2 crash location: 10 points Other crash location: 5 points
Bicyclist/ Pedestrian Comfort	Does the project improve comfort for people walking and biking?	The extent to which the project improves bicyclist/pedestrian level of comfort	New path or trail: 10 points New sidewalk: 5 points New separated bike lane: 5 points New on-street bikeway: 2 points Traffic calming/advisory bike lane: 1 point
Connectivity	How many essential location types does the project connect to?	Points for connectivity to each of the following categories: <ul style="list-style-type: none"> • School • Park or open space • Neighboring municipality • Park & Ride • Commercial destination 	Direct connection: 2 points Indirect: 1 point
Feasibility	Is the project located along a roadway where right of way, topography, or other issues make implementation challenging and/or expensive?	Project has one of the following challenges: <ul style="list-style-type: none"> • Limited right-of-way or need for acquisitions/easements • Complicated environmental permitting • Constructability issues 	Subtract 5 points for each

High Priority Projects

Table 15 shows how all the projects scored (priority score) based on the criteria in Table 14 and how they rank (priority rank) according to those scores. Short-term is defined as within the next 5 years. Long-term is 5-15 years.

Table 15. Project Prioritization Ranking

PID*	PROJECT NAME	SHORT-TERM RECOMMEND-ATION	LONG-TERM RECOMMEND-ATION	PRIORITY SCORE	PRIORITY RANK
3	River Road/VT-117	Shared Lane Markings	SUP	33	1
2	Governor Peck Highway	Advisory Lane	SUP	32	2
1	Main Street/US-2	Bike Lanes	SUP	28	3
4	Bridge Street	Climbing Lane & Painted Walkway	Sidewalks	19	4
5	Jericho Road	Advisory Lane	Sidewalk & Climbing Lane	16	5
14	Snipe Ireland Trail	Trail	Trail Upgrades	14	6
11	Johnnie Brook Trail	Trail	Trail Upgrades	12	7
13	Old Jericho Road Trail	Trail	Trail Upgrades	12	8
12	Sip of Sunshine Trail	Trail	Trail	10	9
15	Stage - Snipe Ireland Connector	Trail	Trail	10	10
16	Warren & Ruth Beeken River Shore Trail	Trail	Trail	10	11
17	Volunteers Green Trail Extension	Trail	Trail	10	12
18	West Village Connector Loop	Trail	Trail	10	13
19	Andrews Community Forest	Trail	Trail	10	14
10	Stage Road	Neighborway		8	15
6	Southview Drive	Neighborway	Sidewalks	6	16
9	Snipe Ireland Road	Neighborway		4	17
7	Valley View Road	Neighborway	Advisory Lane	2	18
8	Hidden Pines Circle	Neighborway		1	19

*Project identification number

Implementation

The prioritization provides a roadmap for implementing the Bike, Walk, and Trails Plan's projects. The order of projects is based on the prioritization ranking described above. Prioritization scoring is only one of many tools to use in planning a strategy for execution. Scoring criteria can be limited and, for that reason, it is important to apply a human touch to how the Town intends to move forward with enhancing its transportation network. Some examples of considerations that are not captured in the prioritization scoring criteria are social and political factors, public perception or opinion related to need or impact, and the realities of project delivery. In other words, a lower scored project may need to be completed prior to a higher scored project in order to realize the ultimate objective of the higher scored project. Additionally, prioritization scoring lacks a consideration for funding constraints.

After this planning stage, the Town will work with the community, CCRPC, and other agencies to advance individual projects to the next phase. The Town could work with CCRPC or other to advance the top projects.

As this project is the first of a two-part project, this Plan provides information about funding sources, a recommended time frame for implementation, and some considerations moving forward. A full implementation plan should be developed during the second phase of the Walk, Bike, and Trails plan.

Any implementation plan must consider the political and social realities of the various projects and input received to date from members of the public, Town, and CCRPC that participated in the Plan development. It also brings into consideration funding constraints.

An implementation plan also considers funding partners that will play a role in specific project execution. These partners could include private development as well as VTrans, Federal Highways Administration, and Chittenden County.

As Route 2/Main Street is assessed for repaving as this plan nears completion, it makes sense for the Town to focus on this opportunity to establish a bold vision for Richmond Main Street, even if some VTrans policies will make some of the recommendations difficult. Most significant is the following, which requires 14 ft clear from the centerline on state highways to be clear of obstructions, including parallel parking. This makes many complete streets recommendations impossible in villages; and often prompts the discussion of the Town taking over the road from VTrans.

However, the Town of Richmond could elect to take over Route 2/Main Street through the Village; it would need to take on maintenance responsibility but could get funding from VTrans that mostly offsets the costs. This would allow the Town to have full control of the design, speeds limits, and parking.

Funding Sources

Local, state, and federal sources that the Town or CCRPC is eligible for are identified below to help fund the infrastructure recommendations. CCRPC also maintains a [Funding Opportunities database](#) of opportunities available to municipalities, non-profits, and businesses for planning and infrastructure-related projects. Funding for projects may consist of multiple external sources, as well as from the Town.

Local

Richmond Conservation Reserve Fund: The fund was created for the purpose of providing outdoor recreational opportunities (as well as preserving water quality, protecting wildlife, and conserving natural, agricultural, and historic resources). The fund may be used to establish and maintain hiking trails; permanently preserve public access to land valued for hiking, biking, and other types of affordable outdoor recreation; and maintain Richmond's rural character, historical heritage, beautiful scenery, and economic viability and quality of life.

CCRPC's Unified Planning Work Program (UPWP): The UPWP is a federally mandated document serving as the annual work plan for local and regional transportation planning projects. The document is updated annually and summarizes transportation and land use planning activities for CCRPC, member agencies, and other agencies conducting work in the Chittenden County region. There is an open solicitation for project requests from municipalities and the public on how public funds should be invested towards transportation and other planning programs in Chittenden County.

Last deadline: January 22, 2021

State

AARP Community Challenge Grant program: This program is part of AARP's nationwide Livable Communities initiative, which supports the efforts of cities, towns, and neighborhoods and rural areas to become great places to live for people of all ages. The program encourages delivering transportation and mobility options to increase connectivity, walkability, bikeability, wayfinding, and access to transportation options and roadway improvements. The program supports all community types, with nearly 40% of past projects benefitting rural communities. Projects should demonstrate an ability to garner additional funds or support from other funders, encourage replication or and overcome local policy barriers, and receive greater overall awareness and engagement. Grants range from several hundred dollars for small, short-term activities to several thousand or tens of thousands for larger projects.

Last deadline: April 14, 2021

Better Roads Program: This program provides towns with funding and technical assistance to implement cost-effective techniques that reduce erosion on roads while enhancing water quality. Grants are provided by the Agency of Transportation in partnership with the Agency of Natural Resources. Different categories of grants are available, including for the installation of grass- or stone-lined ditches, small culverts, rain gardens that treat road runoff, and catch basins or drop inlets. Projects range in cost from \$10k to \$75k and a 20% local match is required.

Last deadline: December 18, 2020

Bicycle and Pedestrian Program: The intent of the program is to improve access and safety for bicyclists and/or pedestrians through the planning, design, and construction of infrastructure projects. Funding is offered for the following facility types: bicycle lanes, shoulders, sidewalks, pedestrian crossings, pedestrian refuge islands, pedestrian signals, ADA improvements, and shared use paths. Both small-scale grants (for signs, pavement markings, crossing enhancements, on-road bike facilities) and federal aid grants (for scoping or feasibility studies and design/construction of projects) are available.

Last deadline: June 4, 2021

Electric Vehicle Charging Station Loan Program: This program is funded through the State Infrastructure Bank (SIB), operated by the Vermont Economic Development Authority with VTrans and the Federal Highway Administration. The financing is available for the purchase and/or installation of electric vehicle charging stations made available for use by

the general public. The loan amount is up to \$100,000, the interest rate is 1% fixed, and there is a 2% commitment fee.

Municipal Highway and Stormwater Mitigation Program: This program will fund any environmental mitigation activity, including pollution prevention and pollution abatement activities and mitigation to address stormwater management, control, and water pollution prevention or abatement related to highway construction or due to highway runoff. Potentially eligible projects include bank stabilization, culvert replacement or resizing, detention ponds, permeable pavers, subsurface detention systems, and bio retention systems – among others. This funding source may be applied to a project for Route 2/Main Street or I-89. A 20% local match is required.

Last deadline: October 9, 2020

Municipal Park and Ride Program: This program includes grants for the assessment and upgrade of existing state-owned facilities and the management of ancillary support activities. The [2014 Park-and-Ride Study](#) noted the need for the Richmond lot to be upgraded. There may be an opportunity to apply for funds for EV charging stations, electric bike charging stations, and secure bicycle parking.

Next deadline: August 5, 2021

Municipal Roads Grants-in-Aid Program: provides technical support and grant funding to municipalities to promote the use of erosion control and maintenance techniques that save money while ensuring best management practices are completed in accordance with the Vermont Department of Environmental Conservation's Municipal Roads General Permit (MRGP). Based on estimated hydrologically connected municipal road miles and as of May 2021, [Richmond has approximately 35 to 40 connected road miles and is eligible for \\$18,400 from VTrans](#), not including a required 20% local match. Construction must be completed by September 30, 2022.

Deadline for letter of intent to participate: June 25, 2021

Small Grants for Smart Growth: This program provides grants for community-based initiatives related to smart growth. Eligible transportation activities include hiring a designer to improve walking and biking amenities, organizing a diverse group of stakeholders to engage in a planning process, and convening landowners for discussions about connecting trail networks. Eligible public outreach and engagement activities include paying for food, childcare, and transportation costs to

help people attend public meetings; design charettes; printing and mailing costs for surveys and meetings announcements; translation services, and WiFi for project facilitation in underserved areas. Up to \$3,000 is available in a grant round and additional grants are available for \$500 to \$1,500.

Applications accepted on a rolling basis.

Transportation Alternatives Program (TAP): TAP provides funding for on- and off-road pedestrian and bicycle facilities; infrastructure projects improving non-driver access to public transportation and enhancing mobility, community improvement activities, and environmental mitigation; trails that serve a transportation purpose; and safe routes to school projects.

Last deadline: November 27, 2020

Vermont State Infrastructure Bank (SIB): SIB is operated by the Vermont Economic Development Authority with VTrans and the Federal Highway Administration. The bank offers loans to municipalities and private sector companies contracted with public authorities to assist in the construction and reconstruction of highways, roads and bridges, pedestrian facilities, and certain rail transit or public transit facilities. Interest rates are 1% fixed for loans to municipal-type borrowers and loan term may not exceed 30 years with repayment, commencing no later than five years after completion of project.

Federal

Infrastructure for Rebuilding America (INFRA) Grant Program: INFRA is a discretionary grant program to fund transportation projects of national and regional significance that result in good-paying jobs, improve safety, apply transformative technology, and explicitly address climate change and racial equity. Projects will be evaluated on whether they were planned as part of a comprehensive strategy to address climate change, or whether they support strategies to reduce greenhouse gas emissions such as deploying zero-emission-vehicle infrastructure or encouraging modal shift and a reduction in vehicle-miles-traveled. The USDOT seeks local sponsors who are significantly invested and is positioned to proceed rapidly to construction. Projects may be large (at least \$25 million) or small (at least \$5 million). The USDOT reserves at least 25% of funding for rural projects. Projects leveraging non-federal funding sources will be prioritized.

Last deadline: March 19, 2021

Rebuilding American Infrastructure with Sustainability and Equity

(RAISE): RAISE provides capital funding directly to any public entity, including municipalities and counties. Funding is intended to benefit communities large and small and the available funding will be distributed equally (50/50) in urban and rural areas. These discretionary grants, formerly known as BUILD and TIGER, offer up to \$25 million for each award.

Next deadline: July 12, 2021

Other Sources

PeopleForBikes Community Grant Program: The PFB Community Grant Program supports bicycle infrastructure projects and targeted advocacy initiatives that make it easier and safer for people of all ages and abilities to ride. Most grant funds are focused on bicycle infrastructure projects like bike paths, lanes, trails, and bridges; mountain bike facilities; bike parks and pump tracks; BMX facilities; and end-of-trip facilities like bike racks, bike parking, bike repair stations, and bike storage. Engineering and design work are funded. Grant requests up to \$10k may be made and total funding must be leveraged by at least 50%.

Next deadline: July 23, 2021