

**Hardwick-LVRT Connector Loop Proposal**  
**Local Motion**  
**December 7, 2022**

**Recommendations “At a Glance”**

Bike infrastructure improvements to provide a low stress route between the LVRT trailheads at Depot St. and the Memorial Park pause park, and the center of the Town of Hardwick are proposed in Figures 1 and 2. This design is predicated on the south-side consolidation of parking on Church Street, the re-purposing of two parallel parking spots for bike parking, and the removal of the car bridge parking lane (Figure 3).

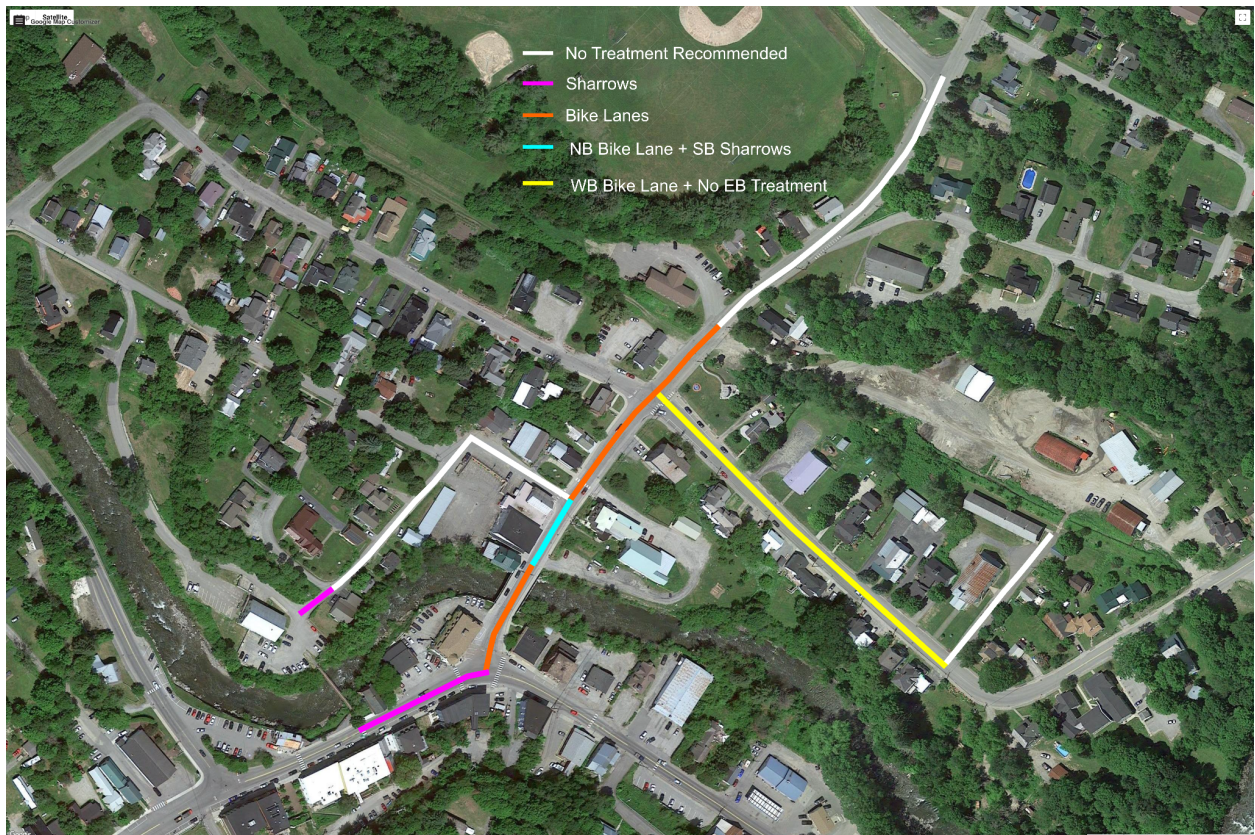


Figure 1: Connector Loop Design Recommendations

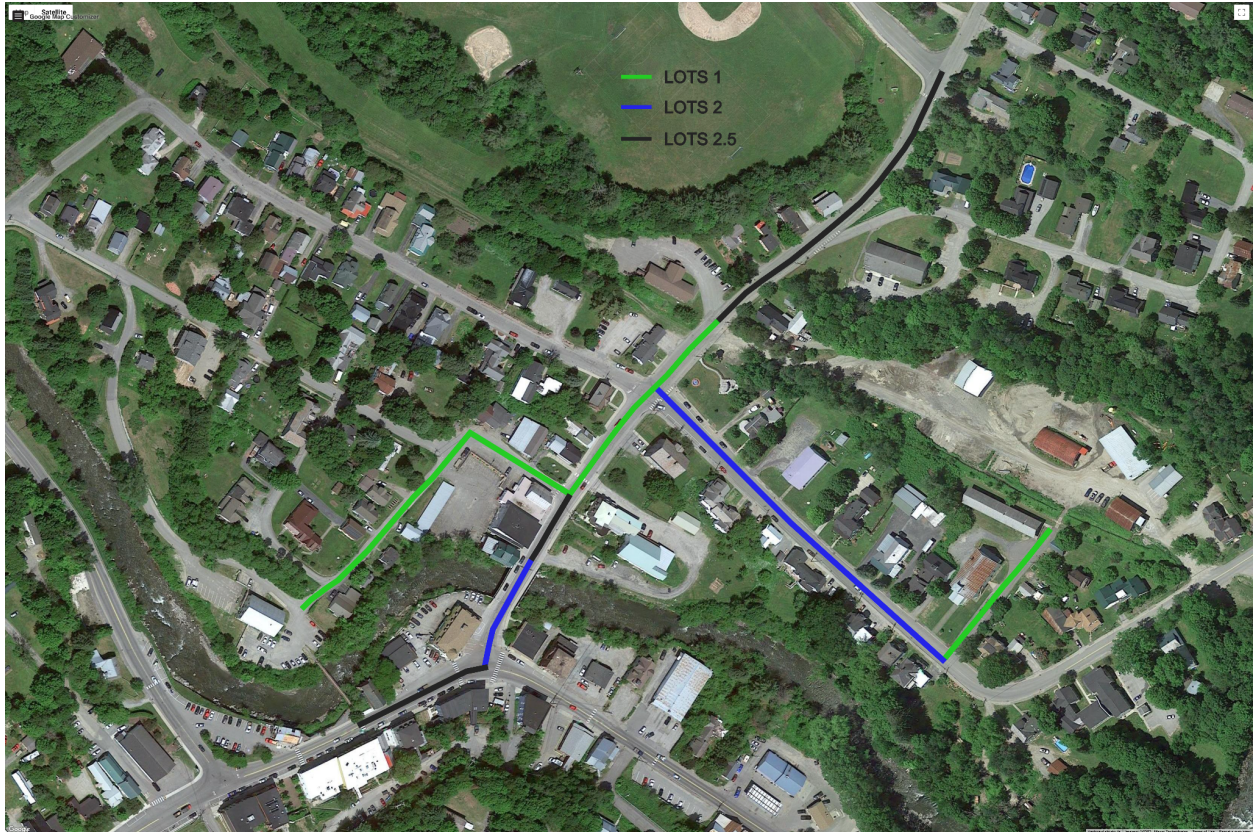


Figure 2 Expected Level of Traffic Stress for Bicyclists under the Recommended Design Scenario

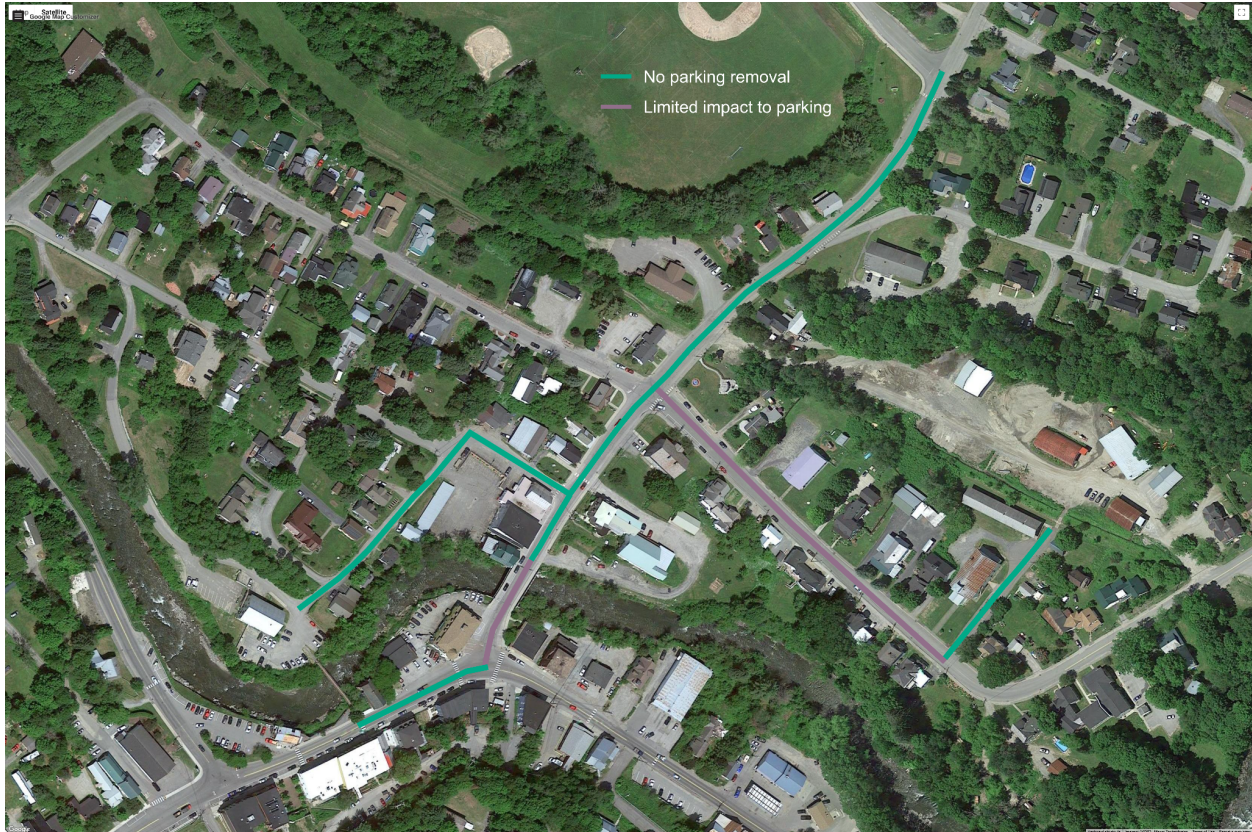


Figure 3 Impact to Parking under the Design Scenario

**Statement of Purpose and Need**

The Town of Hardwick is seeking assistance in providing safe bicycle connectivity between the Lamoille Valley Rail Trail (LVRT) and its town center. The segment of the LVRT which passes through Hardwick is anticipated to be complete by the end of Fall 2022. With the opening of this trail, the Town anticipates significant bike traffic originating from the Depot Street LVRT trailhead. A smaller trailhead at a new “pause park” will also be located at Memorial Park, at the northeast corner of N. Main Street and Church Street, approximately 520 feet north of the Main St. bridge.

Importantly, the Town is also in the process of replacing its popular and iconic swinging footbridge, which crosses the Lamoille River some 400’ west of the Main St. bridge. The Town is interested in providing bicycle access from the trailhead to the new bicycle/pedestrian bridge and park via a “go-around” route on Highland Ave./Brush St.

Lastly, as part of this project, the Town also seeks to improve bicycle connectivity to Hazen Union High School, located on N. Main St., approximately 660’ north of the trailhead.

This proposal aims to accomplish these three objectives to proactively provide for the safe movement of people biking in Hardwick.

## Project Area

The following figure depicts the proposed biking connector loop, which is to provide safe and comfortable access between the Hardwick business district, LVRT trailheads, new pedestrian bridge and park, and the high school. The entire loop is approximately 0.6 miles long.

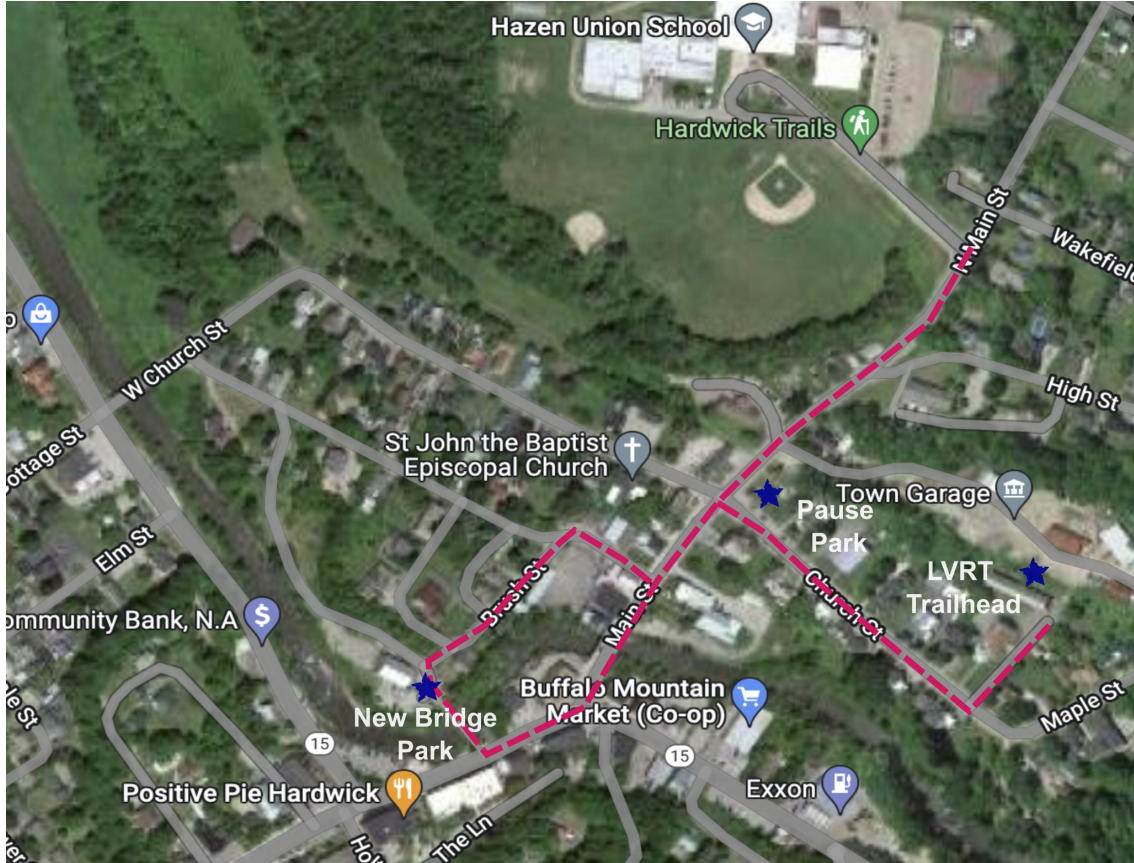


Figure 4: Hardwick-LVRT Bike Connector Loop

## Existing Conditions

The connector loop was divided into ten segments for analysis, and Google Maps was used to assess current street conditions. The figure below depicts street width data associated with each of these segments. The first number on the map represents the segment number. The second number, or range, is the available width (excludes parking). And the third number, or range, reflects the curb to curb width (includes parking).



Figure 5: Hardwick-LVRT Connector Loop - Street Widths

On November 3, 2022, Local Motion staff met with the following Town of Hardwick officials to observe actual conditions, take road width measurements and better understand the project's context. Staff met with the following individuals:

- David Upson, Town Manager
- Dave Gross, Chair Planning Commission
- Kristen Leahy, Zoning Administrator
- Tracy Martin, Economic Development Coordinator

Actual curb to curb widths measured during the site visit are presented below.

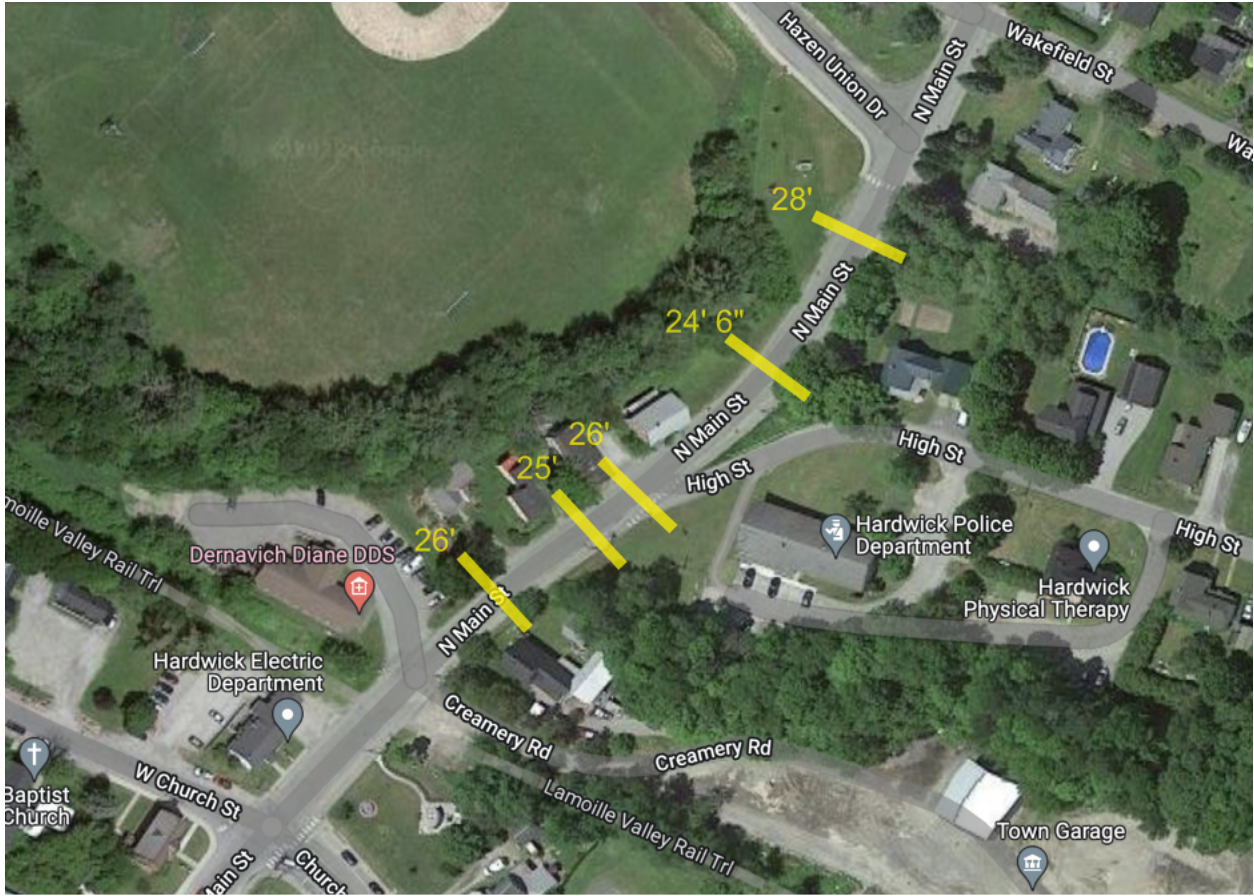


Figure 6: LVRT to High School

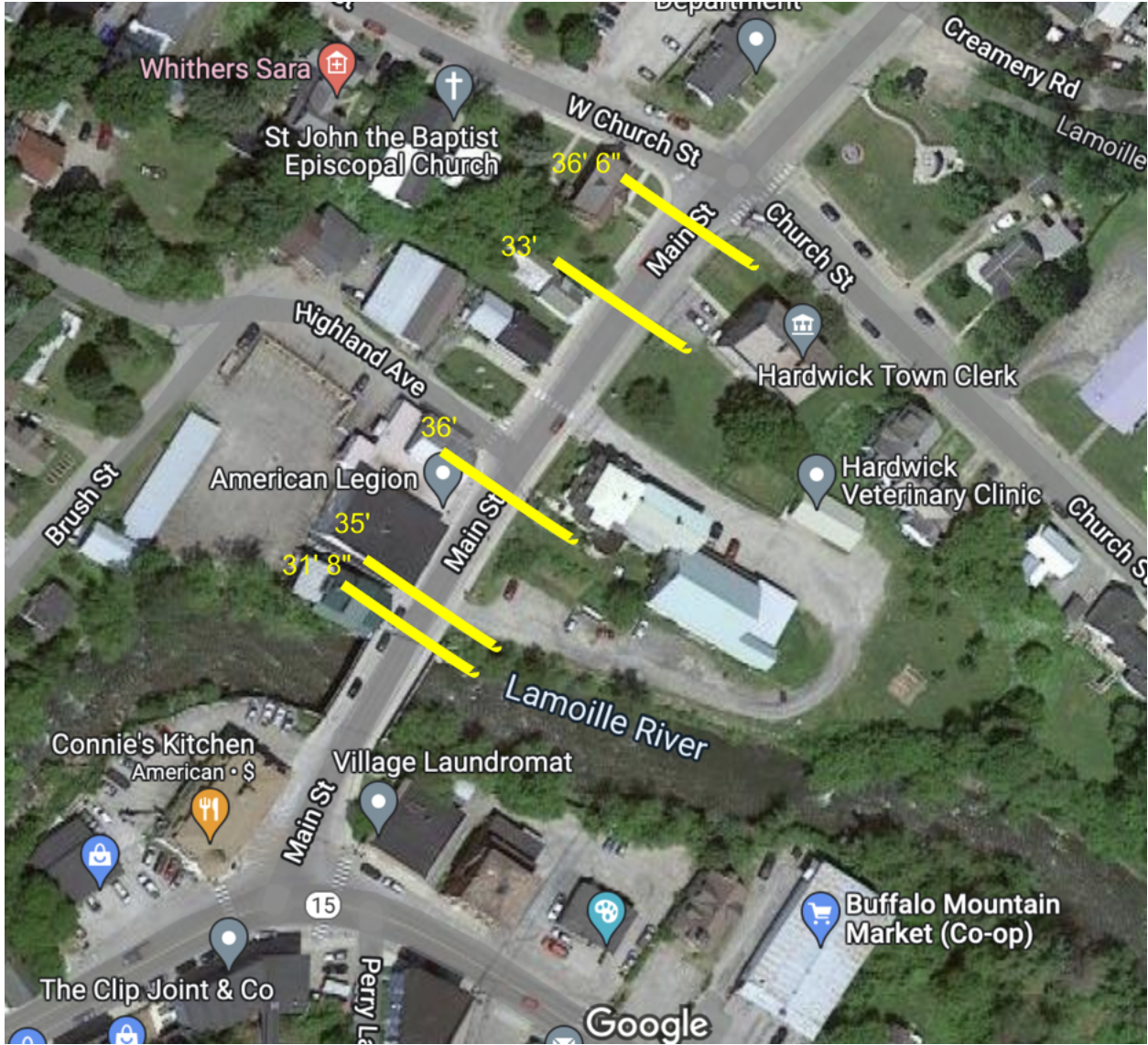


Figure 7: Main Street



Figure 8: Main Street Parking



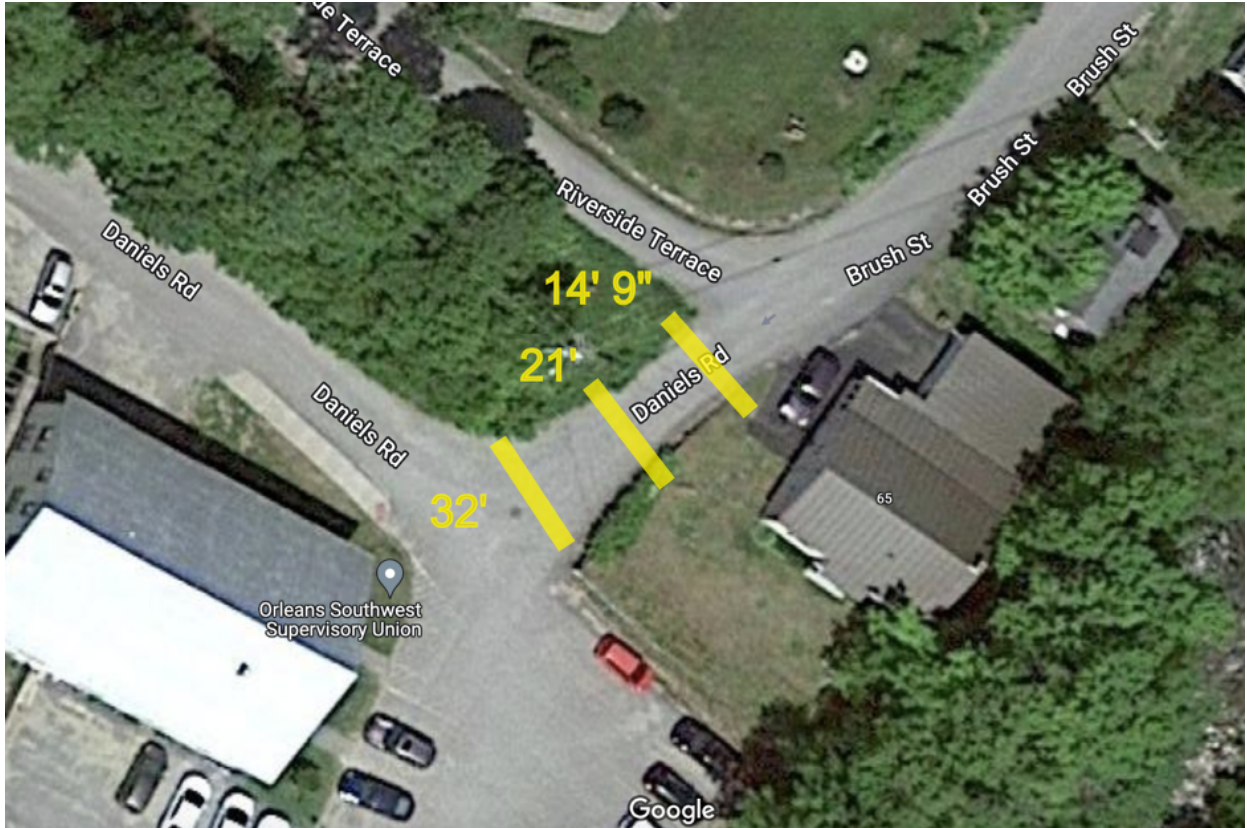


Figure 9: Daniels Road

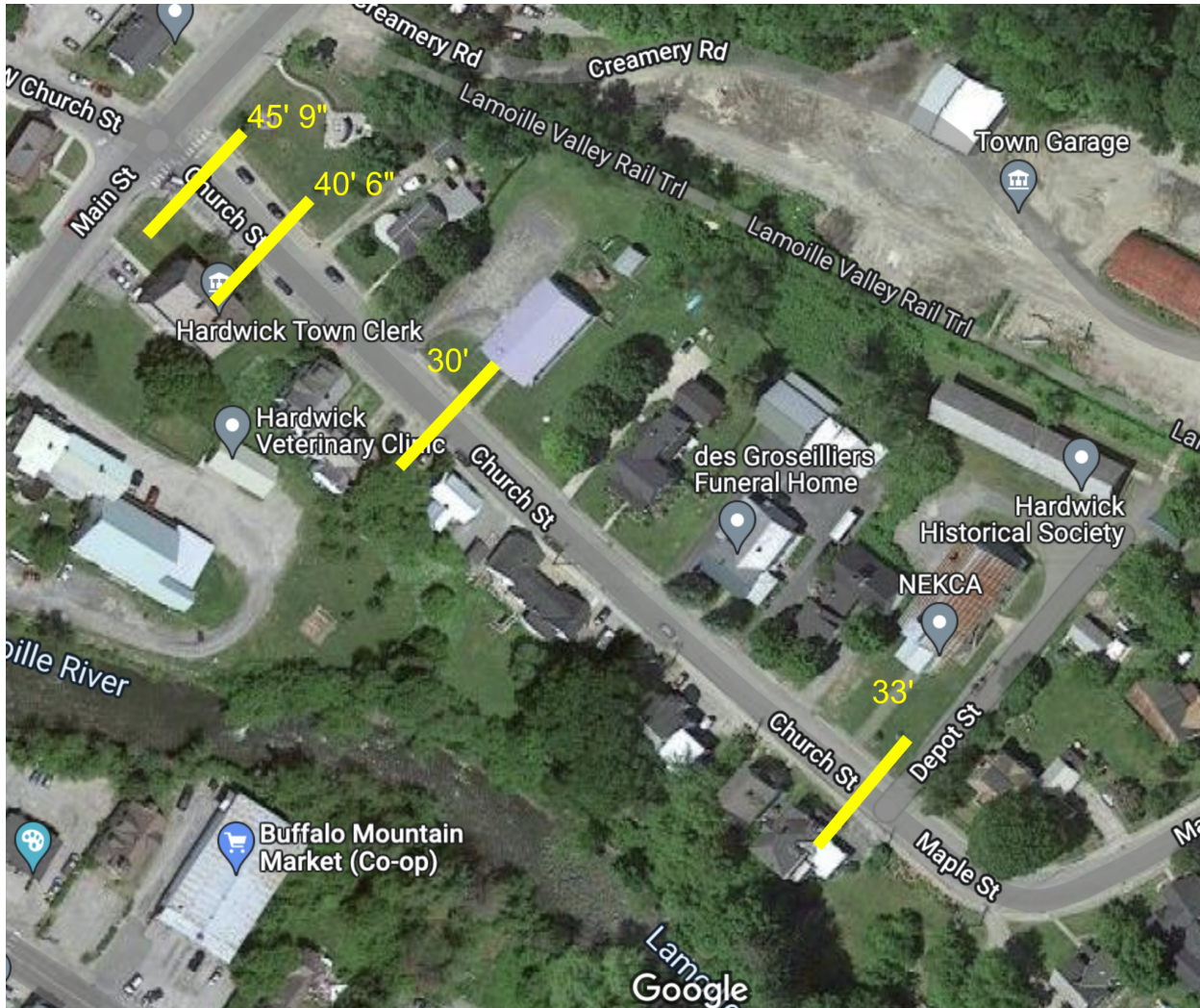


Figure 10: Church Street

**Recommendations**

In developing a conceptual design for the connector loop, we attempted to maximize the safety and comfort of people riding bikes, so as to create an inviting route for people holding a broad range of riding skill and confidence levels.

We balanced these goals with a desire to minimize the impact on parking, and the cost and difficulty of implementation and maintenance.

Our recommended design features bike lanes and sharrows, centerline removal, narrowing of the motor vehicle travelway, and wayfinding. Centerline removal when the travelway is relatively narrow can cause drivers to naturally slow down. As road widths were found to vary throughout segments, it is advisable that final designs maintain a 20' travelway for motor vehicles where possible, with additional width used to buffer adjacent bike lanes. Wayfinding signage to direct cyclists to places of interest along the low stress route, including the new pedestrian bridge and park, are an important part of the design recommendations. We strongly recommend that the

town ensures that the new park design provides a safe and separated route for people walking and biking that coordinates with proposed changes to Daniels Rd.

Recommended treatments for each segment are presented in Table 1 (with Segments 1, 2 and 7 being further divided into 1A/1B, 2A/2B and 7A/7B). Brief explanations of the rationales for segment designs follow with illustrative visualizations.

Table 1 Conceptual Design Segment Features

Seg. No.	Segment Name	Recommended Treatments	Level of Traffic Stress <sup>1</sup>
	ALL SEGMENTS	Wayfinding	
<a href="#">1A</a>	N. Main (High School to Creamery Rd.)	No short term recommendations. Consider centerline removal and the installation of fog lines.  Long term recommendation: Replace 5' sidewalk with a 10' shared-use path. Provide a 20' motor vehicle travelway with no centerline.	2.5
<a href="#">1B</a>	N. Main (Creamery Rd. to Church St.)	Add 8' (6/2) buffered bike lanes in both directions. Consider centerline removal.  Configuration: 8/11-12/11-12/8	1
<a href="#">2A</a>	Main (Church St. to Highland Ave.)	Remove centerline. Add variable 6' (5/1) - 7' (5/2) buffered bike lanes in both directions. (Explore relocation of west-side single handicapped parking space.)  Configuration: 6-7/20-22/7	1
<a href="#">2B</a>	Main (Highland Ave. to Car Bridge)	Remove centerline. Retain existing 8' parallel parking lane. Add (super) sharrows SB. Add 7' (5+2) buffered bike lane NB.  Configuration: 8/20/7	2.5

<sup>1</sup> Estimated using Montgomery County, MD Revised Level of Traffic Stress Method, Appendix D, Montgomery County Bicycle Master Plan

<a href="#">3</a>	Main (Across Car Bridge)	Remove centerline. Remove parallel parking. Add 5' bike lanes, both sides.  Configuration: 5/20/5	2
<a href="#">4</a>	Main (Car Bridge to Route 15)	Remove centerline. Replace (2) parallel parking spaces with a bike parking corral in front of Hardwick Inn. Retain angled parking. Extend 5' SB bike lane to new bike corral bike dismount area, north side of Hardwick Inn. Add min 5' NB bike lane to terminate at Route 15 intersection. Add mid-block crosswalk immediately south of car bridge. Add stop signs on Route 15 at the Main St. intersection to create a 3-way stop.  Configuration: 16/28+/5+	2
<a href="#">5</a>	Route 15 (Main to Pedestrian Bridge)	Add (super) sharrows, both lanes. Add stop signs on Route 15 at the Main St. intersection to create a 3-way stop. Improve crosswalk at the Pedestrian Bridge, including use of RRFB.  Option: Create intersection mural.	2.5
6	New Park	Ensure that the new park design provides a safe and separated route for people walking and biking from the park to Daniels Rd.	
<a href="#">7A</a>	Daniels (New Park to Brush St.)	Highlight the segment as shared use space, with the following characteristics: <ul style="list-style-type: none"> <li>● Retain one-way car travel (SW bound).</li> <li>● Permit two-way bike travel.</li> <li>● Add a stop sign NE end of Daniels Rd.</li> <li>● Add a "Keep Slow Cars are Guests" sign NE end of Daniels Rd.</li> <li>● Add "Except Bikes" plaque to existing "Do Not Enter" sign located at SW end of Daniels Rd.</li> <li>● Apply green-backed super sharrows on Daniels Rd.</li> </ul>	1
<a href="#">7B</a>	Brush (Daniels Rd. to Highland Ave.)	No additional treatment recommended.	1

<a href="#">108</a>	Highland  (Brush St. to Main)	No additional treatment recommended.	1
<a href="#">109</a>	Church  (Main St. to Depot St.)	Remove centerline. Consolidate parking on south side by removing north side parking. Convert N. Main/Church St. intersection to a 4-way stop. Add 5'+ traditional bike lane WB. No treatment EB.  Configuration: 8/20/5+	2
<a href="#">110</a>	Depot	No additional treatment recommended.	1

Segment 1A: N. Main (High School to Creamery Rd.)

No short term recommendation is made for Segment 1A due to unavailable space for bike facilities. Because of the relatively steep grade (between 5-6%), cyclists traveling north may be unsteady and slow, therefore sharrows, which explicitly invite cyclists to mix with motorized vehicles, are not recommended for this segment. A long-term solution is to replace the current asphalt sidewalk (which is in poor condition) with a shared use-path.

Consideration should also be given to allowing the centerline to fade away over time, in conjunction with the addition of fog lines, to induce slower speeds.

Segment 1B: N. Main (Creamery Rd. to Church St.)

The LVRT is located just south of Creamery Rd. and a pause park is planned at Memorial Park. To provide access from the pause park to the center of town, buffered bike lanes, along both sides of the road, are proposed beginning here. The curb to curb width of this segment slightly increases from north (38') to south (40'), which allows for the provision of generous buffered bike lanes (8').

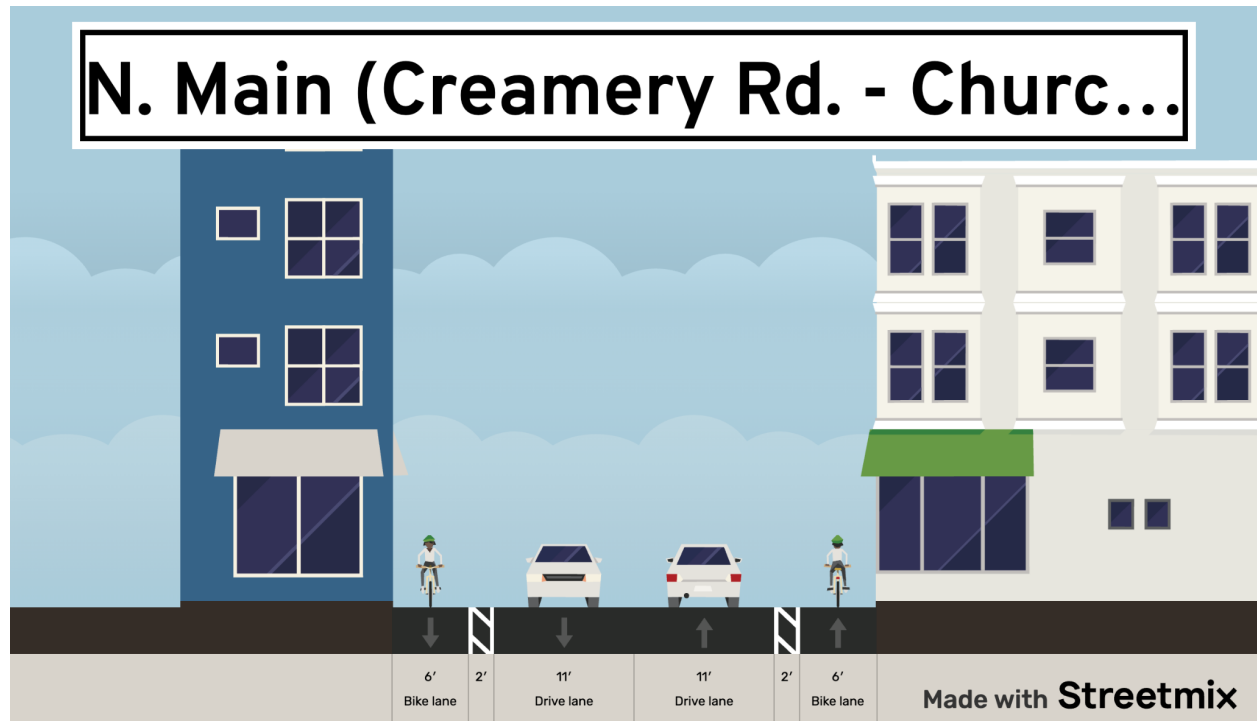


Figure 11: N. Main St. (Creamery Rd. - Church St.)

Segment 2A: Main St. (Church St. to Highland Ave)

Main south of Church St. remains wide enough to continue bike lanes from Segment 1B through to Segment 2B. Because the grade on Main St. between Church St. and Highland Ave. remains relatively steep at approximately 5%, we recommend maintaining the buffer for cyclists traveling uphill (northbound), who may be wavering and unstable, so that they are better separated from cars.

In addition, it is recommended that the centerline be removed from Church St. south to Route 15.

An unmarked single handicapped parking spot appears to be located on the west side of Main Street. Town officials should assess the current need for this space, and explore the possibility of removing or relocating it.



Figure 12: Segment 2A Main from Church St. to Highland Ave.

Segment 2B: Main (Highland Ave to Car Bridge)

Southbound sharrows in combination with a northbound buffered bike lane are recommended along this section of Main Street where retaining a parking lane is a community priority. Without removal of parking, there is insufficient space to add bi-directional bike lanes. The northbound buffered bike lane provides slower, uphill bicycle traffic with a separated space. It also achieves continuity in infrastructure type, which increases predictability for all users of the road.



Figure 13: Segment 2B: Main from Highland Ave. to Car Bridge



Source: NACTO Urban Bikeway Design Guide

Figure 14: Example of On Road Sharrow Markings

Segment 3: Main (Across Car Bridge)



The curb to curb width on the car bridge is 30'. With a 7-8' parking lane, there is currently inadequate space to provide two motor vehicle travel lanes plus any type of separated bike infrastructure. Thus, it is highly recommended that the town eliminate the parking lane and add bi-directional bike lanes across the bridge.

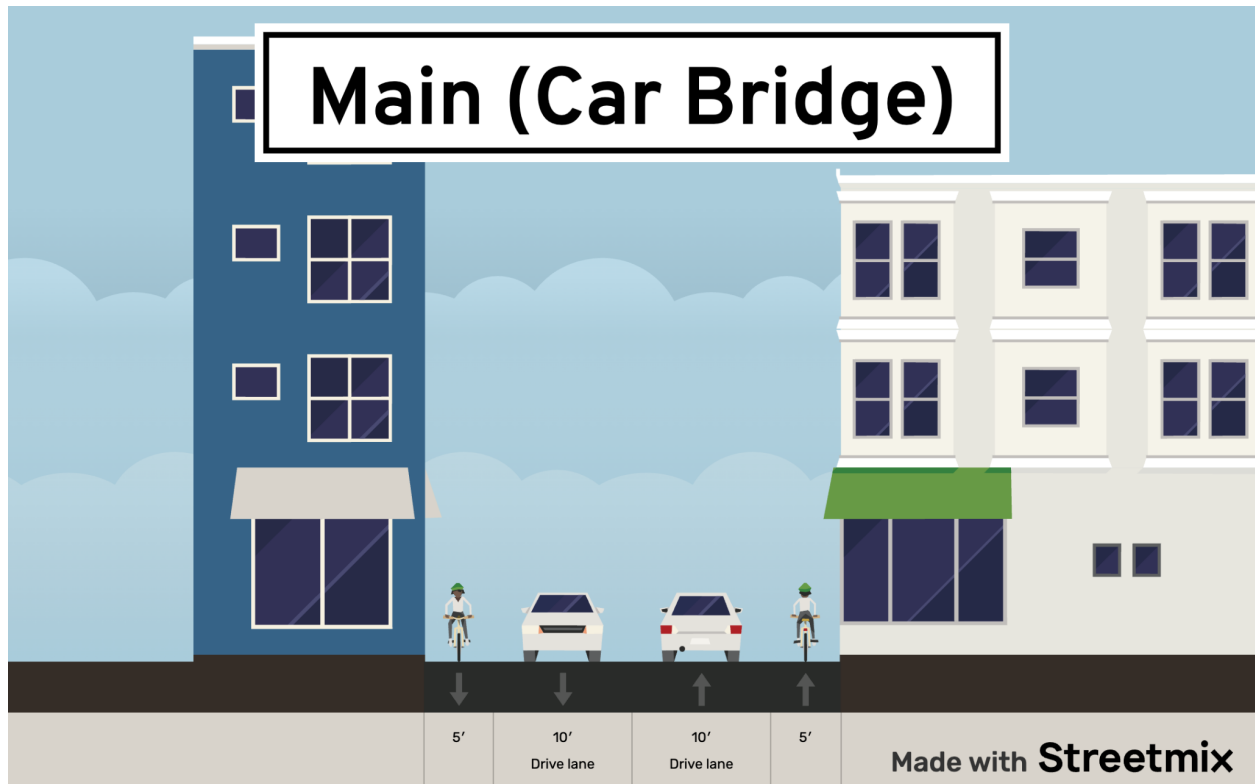


Figure 15: Segment 3 Main Car Bridge

#### Segment 4: Main (Car Bridge to Route 15)

The available curb (65') along the Hardwick Inn is currently used for both pull-in angle and parallel parking (3 marked and 2 unmarked spaces, respectively). Goals for this segment, which connects Main St. to the busiest and most stressful part of the connector loop (Route 15), are to limit the impact on parking, encourage cyclists to park their bikes and walk within the town center, and provide access to the northbound cycling infrastructure proposed in previous sections of this proposal.

The recommended design features a bike corral along the northern stretch of this curb space with a bike dismount area, providing a clear and visible location to invite riders to stop, park their bikes and explore Hardwick by foot. The bike lane from Segment 3 would be carried through to the bike dismount area. On the east side of the street, the bike lane would continue through to the intersection.

The proposed design also calls for the addition of stop signs on Route 15, changing the intersection from a 1-way stop to a 3-way stop. We recommend that a mid-block crosswalk be

constructed just south of the car bridge to facilitate the safe crossing of pedestrians and provide cyclist access to the northbound bike lane.

Placing a crosswalk in this location would satisfy the criteria outlined in VTrans' Guidelines for Pedestrian Crossing Treatments (2019), except for sight distance requirements. For posted speed limits of 25 mph, the required site distance is 155', which is unlikely to be met for motorists entering Main St. from westbound Route 15. VTrans, however, allows engineering judgment to be used to waive criteria when the context supports alternative safe designs. In this case, because speeds should be well below 25 mph as drivers turn onto Main St. from a stopped position, it is expected that the stopping site distance will be well within the motorist's sight distance from this direction (approximately 100').

The following figures depict the concept proposed for this segment and provide an example of a bike corral from which an appropriate design for this location could be modeled.



Figure 16: Segment 4 Main St. (Car Bridge to Rt 15)



Figure 15 Example Bike Corral

Longer term, we recommend that the Town of Hardwick install a crosswalk across Main St. at the Route 15 intersection. Making it easier and safer for pedestrians to move around the town's core business district will invite more desirable pedestrian activity in this area. This crossing is very long at almost 75', thus we also recommend the addition of bump outs to extend the curb in order to shorten the crossing distance and keep vehicle speeds low.

#### Segment 5: Route 15 (Main to Pedestrian Bridge)

As mentioned above, Route 15 is currently a challenging section to bike because of significant traffic volume and lack of biking infrastructure. Unfortunately, like Segment 3, there is limited available space for separated bike infrastructure. If the Main St./Route 15 intersection is converted to a 3-way stop, we recommend the placement of super (green-backed) sharrow along this segment ending at the pedestrian bridge crosswalk.

We also propose adding a rectangular rapid flashing beacon (RRFB) at the crosswalk located at the pedestrian bridge to help vulnerable users cross safely and provide cyclists with easier access to eastbound travel from the pedestrian bridge.

The following figure depicts a green-backed super sharrow.



Figure 17 Green-backed Super Sharrow

#### Segment 7A: Daniels Rd. (New Park to Brush St.)

This segment of the proposed bike connector route provides sole access to the pedestrian/bicycle bridge, and forthcoming bridge park for both cyclists and motorists. It is currently designated as a one way (SB) transportation facility. Although a very short segment (approx. 50'), Daniels Rd. presents a challenge to the shared use of motor vehicles and people riding bikes because of its narrow width, steep grade, poor sightlines, east-side retaining wall, and west-side topography.

People biking are extremely likely to use Daniels Rd. in both directions regardless of whether or not it is designated for one-way travel. Thus, a goal for improvements in this section is to create a high-visibility environment that alerts motorists that they will encounter people riding bikes on this short section of road by adding an "Except Bikes" plaque under the existing "Do Not Enter" sign located at the bottom of the road.

We also recommend maintaining Daniels Rd. as a one way (SW) route for car travel to avoid increasing the potential for bike-car conflicts that two-way travel would bring. In addition, we propose adding a stop sign at the top of Daniels Rd. to ensure that cars are traveling slowly. The addition of a new, non-regulatory sign "Keep Slow Cars are Guests" will alert drivers that this is a bicycle-preferred route. The primary feature to call attention to the shared-use nature of this street, however, would be the addition of bi-directional green-backed sharrows along the length of Daniels Rd. Together, these changes will highlight the potential presence of people on bikes, creating safer conditions for all.

It is important to note that this alternative would likely require annual application of the green-backed sharrow stencil.



Figure 18: Segment 7A Daniels Rd.

Segment 9: Church St. (N. Main to Depot St.)

Bike travel on Church St. is primarily expected to be east to west, from the main LVRT Trailhead off of Depot St. towards Main Street. Less bike traffic is expected to return along this route, as some cyclists may choose to access the trailhead via the pause park on N. Main Street. For this reason, it is recommended that parking along Church St. be consolidated to the south side and that a traditional bike lane be added for cyclists traveling west. While no facilities are proposed for cyclists traveling east, it is recommended that traffic entering the Church St./Main St. intersection be stop-controlled in all four directions, instead of current east-west travel only, to improve the safety for all users of the road.

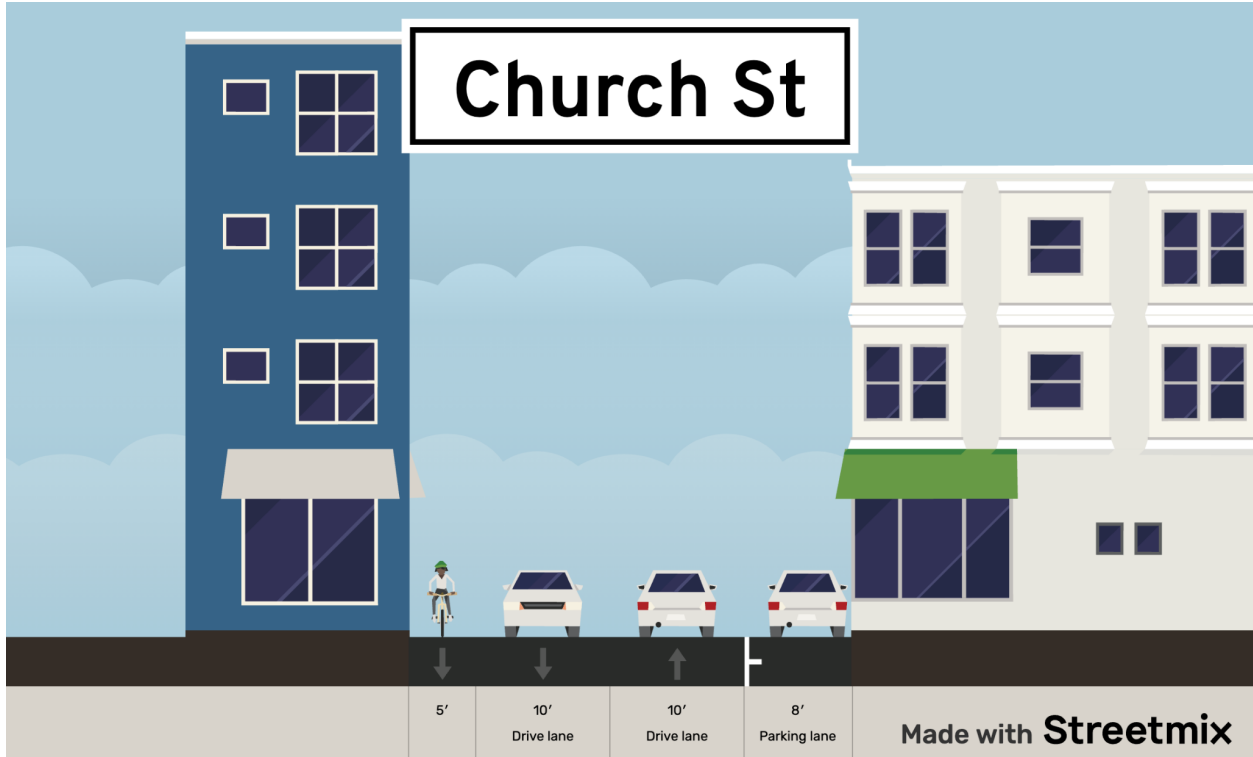


Figure 19: Segment 9 Church St.

Segments 7B, 8, 10

These segments are characterized by having very low motor vehicle speeds and traffic volume. Thus bicyclists are likely to be able to safely and comfortably ride in these areas without further treatment beyond the addition of wayfinding signage.

**Level of Traffic Stress Analysis**

Table 1 also provides an estimate of the level of traffic stress (LOTS) bicyclists can expect to encounter traveling in each segment of the connector loop. LOTS is an approach that quantifies the amount of discomfort that people feel when they bicycle close to traffic. A 4-scale measure is typically used to convey the extent to which riders are likely to use different types of biking accommodations. Figure 20 conceptually depicts the LOTS scale, with corresponding examples of infrastructure.



LTS 1

comfortable for all ages and abilities



LTS 2

comfortable for most adults



LTS 3

comfortable for confident bicyclists



LTS 4

uncomfortable for most

Source: [Alta Planning and Design, retrieved Oct 14, 2022](#)

Figure 20: Illustration of Levels of Traffic Stress for Bicyclists

As shown in Table 1, the proposed design generally yields a very low stress route, with almost all sections rated LOTS 1 or 2, and no segments rated LTS 3 or 4. Two segments, however, yielded an LOTS rating of 2.5 (2B and 5). These segments are characterized by the use of sharrows in combination with high traffic volume and/or adjacent parking.

In the case of the Route 15 segment, with bike parking facilities available at either end of this stretch, bicyclists will have the option of dismounting and parking or walking their bikes along this length to avoid the more stressful on road route.

The discomfort associated with the second LOTS 2.5 segment (Main St. between Highland Ave. and the car bridge) is expected to be lessened with the application of green-backed super sharrows and on street directional markings to improve motor vehicle and bicyclist understandings of where people on bikes are expected to be.