

# CITY OF BURLINGTON DEPARTMENT OF PUBLIC WORKS

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#### **MEMORANDUM**

To: Mayor Miro Weinberger

Burlington City Council Public Works Commission Chapin Spencer, Director

Re: Proposed Safety Enhancements for Section C6 of the Champlain Parkway

February 18, 2015

Fr:

This memo is a follow up on Champlain Parkway activities since the briefing I provided at the November 17, 2014 City Council meeting.

SUMMARY: Based on the community's input and the City's review of the Parkway's preliminary plans, we asked our consultant team to prepare the attached memorandum summarizing a number of proposed safety enhancements for the C6 section of the Champlain Parkway. We believe that these safety enhancements are feasible within the project's constraints, but we won't know for certain until further analysis is completed. VTrans and the City are working cooperatively to get this analysis done in the next several months.

BACKGROUND & DETAIL: In 2014, project consultant CHA provided the City with preliminary plans for section C6 (the portion of the project along Lakeside Ave and Pine St). For those not familiar with the project development process for federally-funded transportation projects, preliminary plan review is understood to be the last chance to make any substantive adjustments to a project's design.

Since 2007, the Champlain Parkway plans for the Pine Street corridor had been largely limited to a repaving project with bicycle and pedestrian improvements. Recognizing the transformation underway along Pine Street and the consistent vision from the public for a safe, vibrant, multi-modal corridor, the City asked VTrans and FHWA to consider safety enhancements along section C6 as part of the preliminary plan review. We were very appreciative when our project partners agreed to this exploration.

To make sure we didn't miss any design ideas, we reviewed past public input on the Champlain Parkway and sought additional public input on the future of Pine Street from AARP's Livable

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Communities workshop and initial PlanBTV South End public input. The City worked with PlanBTV South End consultants Goody Clancy and Dubois & King to draft a memo suggesting safety enhancements for the C6 section for VTrans and FHWA to consider.

The consultants were directed to review all of the design ideas for this corridor and package together the concepts that could feasibly be included in the Champlain Parkway project. To be considered feasible enhancements for the project, the items could not cause:

- an amendment to the project's permits that would be controversial
- an unreasonable escalation of the project's cost
- an unreasonable delay to the project's timeline

Please note that the ideas that can't feasibly be added into the Champlain Parkway project can be pursued as separate projects – as was done with the community's desire to better connect Pine St with Battery St when the Railyard Enterprise Project was launched in 2012 (more information at www.ccrpcvt.org).

The result of the consultant's work is compiled in the attached memo from Dubois & King. The consultant contract did not include the resources to fully analyze the potential impacts of these safety enhancements on the project's permits, cost and timeline. Therefore, further analysis must be completed to definitively determine that the proposed safety enhancements are feasible within the project's constraints.

The City's project team brought these proposed enhancements to VTrans and FHWA in January 2015. We are pleased to report that VTrans expressed conceptual support for our proposed enhancements, and authorized the preparation of scopes of work to complete the additional analysis necessary to determine each proposed enhancement's feasibility. VTrans and the City are working cooperatively to get this done. We seek to get the analysis of these proposed enhancements completed by May 2015. After this additional analysis is completed, VTrans will make a final decision on whether any of the safety enhancements can be incorporated into the project's plans.

The City's project team wants to thank our project partners for considering a number of the design concepts suggested by residents and South End stakeholders at this stage of project's development. We steadfastly believe that this collaboration, and its results, will deliver an even better project for Burlington's future.

I hope this update has been helpful. Feel free to contact me (cspencer@burlingtonvt.gov) to discuss any of this in further detail.

CC: Chris Cole, Deputy Secretary, VTrans
Wayne Davis, Project Manager, VTrans
Rob Sikora, Environment & Right-of-Way Program Manager, FHWA
Norman Baldwin P.E., Assistant Director, Burlington DPW
David Allerton P.E., Engineer, Burlington DPW



# **Design Memorandum**

To: Chapin Spencer, Burlington Department of Public Works

Cc: David Spillane, Goody Clancy

From: Lucy Gibson, P.E. Date: January 12, 2015

Re: Design Concepts for C-6 Section of the Champlain Parkway

This memorandum presents options for design enhancements for the Champlain Parkway/Pine Street corridor to improve safety, particularly for pedestrians and bicyclists. Pedestrian and bicycle activity has increased substantially with the recent revitalization and redevelopment along the Pine Street corridor.

The primary objective of the proposed design recommendations presented herein is to respond to the current and future pedestrian and bicycle activity on the Pine Street corridor by adding features to enhance the safety of all modes. The scope of these recommendations is section C6 of the Champlain Parkway, from the Parkway/Lakeside Avenue intersection in the South End to the Pine/Main Street intersection downtown.



# **Pedestrian and Bicycle Data**

Pedestrian counts are routinely included in the turning movement counts conducted by VTrans and CCRPC. Figure 1 shows that there has been a significant increase in pedestrians crossing at intersections along Pine Street. Pedestrian volumes at the Marble and Flynn Street intersections have more than doubled between 2005 and 2013. Bicycle data is not available, but field observations and regional trends suggest significant growth in bicycle volumes as well.

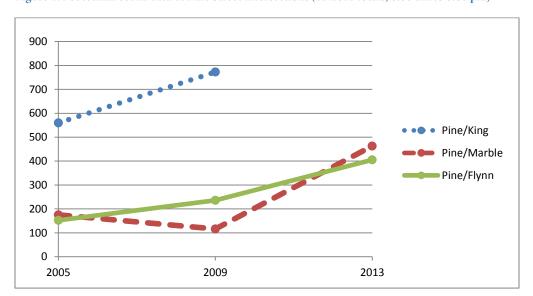


Figure 1: Pedestrian count data at Pine Street intersections (12 hour totals, 6:00 am to 6:00 pm)

Recent data from 2011 through 2014 (to present), obtained from the Burlington Police Department, indicates that in a period of less than 4 years, there were 18 crashes along the Pine Street corridor between Home Ave and Main Street that involved injuries to bicycles and pedestrians. The Burlington Police Department reports the location of each crash as the nearest intersection, which is summarized in the following table. It is noteworthy that there are more crashes involving cyclists than pedestrians, even though pedestrians outnumber bicyclists on the corridor.

Table 1: Locations of crashes involving bicycles or pedestrians along Pine Street corridor

Crashes involving:	Pedestrians	Bicycles	Total
Pine St / Flynn Ave	1	1	2
Pine St / Birchcliff Parkway		1	1
Pine St / Lakeside Ave	1	1	2
Pine St / Locust St	1	1	2
Pine St / Howard St	2	1	3
Pine St / Kilburn St	1	3	4
Pine St / Maple St	1	2	3
Pine St / King St	1		1
Total	8	10	18

The Champlain Parkway *Traffic and Safety Analysis* states that there were 3 crashes involving bicycles or pedestrians on the entire Pine Street corridor in the 5 year period from 2006 through 2010, compared to 18 crashes over the most recent 4 years. In recognition of increased pedestrian activity in this area, the City of Burlington, with support from VTrans, installed RRFB (rectangular rapidly flashing beacons) signs at several crosswalks in the project area in 2013.

# **Design Principles**

The following principles have guided the development of the proposed safety enhancements.

**Use Current Design Guidelines.** While the project design must comply with prevailing state and federal standards, several important sources of guidance that inform the design of multimodal urban streets are available, which do not conflict with prevailing standards, but rather provide more detail and focus. The following documents are references for the recommendations and concepts presented here.

- Designing Walkable Urban Thoroughfares (CNU-ITE)
- NACTO Urban Street Design Guide
- NACTO Bikeway Design Guide
- Pedestrian and Transit Oriented Design (Ewing, Bartholomew)

**Select and Reinforce Appropriate Design Speed.** The design speed and target speed should be set at 25 mph along Lakeside Avenue and Pine Street – consistent with the City's city-wide 25mph speed limit. The concept of a target speed is related to the design speed, but differs slightly in that efforts are made to prevent higher speed traffic. The following definition is provided by ITE (ITE-CNU 2010).

Target speed is the highest speed at which vehicles should operate on a thoroughfare in a specific context, consistent with the level of multimodal activity generated by adjacent land uses to provide both mobility for motor vehicles and a safe environment for pedestrians and bicyclists. The target speed is designed to become the posted speed limit. (p. 108)

Reducing vehicular travel speeds reduces the crash frequency and likelihood of injury or fatality in crashes involving bicycles or pedestrians. Speed management can best be accomplished through use of physical devices that encourage drivers to slow down, such as raised intersections, or narrowed sections created by curb extensions or raised medians. Techniques to reinforce a design speed at 25 mph include the following:

- Reduce travel lane widths to minimum recommended.
   (11 feet typical, 10 feet minimum)
- Provide streetscape elements to narrow visual appearance of street, and contribute to the driver's feeling of enclosure and friction. This includes street trees, pedestrian scaled lights (which have greater

Fatalities Based On Speed of Vehicle A pedestrian's chance of death if hit by a motor vehicle 90% 85% 80% 70% 60% 50% 45% 40% 30% 20% 10% 5% 20 mph 30 mph Killing Speed and Saving Lives, UK Department of Transportation

presence in driver's eye than taller street lights), bollards, curb extensions, and parallel parking.

 Incorporate physical measures to reduce speeds such as, raised and textured intersections or crosswalks, lateral shifts, or medians.

**Select Appropriate Design Vehicle**. The current design vehicle is a WB-62. Table 2 below provides vehicle classification data for Pine Street between Lakeside and Locust Streets, which shows that tractor-trailers comprise only 0.55% of all traffic, or about 70 per day. No data is available on the specific sizes of the tractor trailers, but it is likely that many of them are smaller than WB-62.

Table 2: VTrans Vehicle Classification Count (Station S6D541, 2013)

Vehicle Classification	Percent	# per day
1 Cycles motorcycle	0.85	107
2 PC passenger car	81.76	10302
3 2A-4T pickup truck/sports utility	12.42	1565
4 BUS full size school and transit busses	0.85	107
5 2A-6T 2 axle six tire, delivery type van or heavy duty pick up	2.86	360
6 3A-SU 3 axle single unit, short haul delivery truck, dump truck	0.17	21
7 4A-SU 4 axle single unit, short haul delivery truck, concrete truck	0.03	4
8 4A-ST < 5 axle tractor/single trailer, medium haul delivery	0.51	64
9 5A-ST 5 axle tractor/single trailer, "18 Wheeler"	0.12	15
10 6A-ST > 5 axle tractor/single trailer, tanker truck, logging truck	0.09	11
11 5-MT < 6 axle multi trailer truck	0.01	1
12 6A-MT 6 axle multi trailer truck	0.04	5
13 7A-MT > 6 axle multi trailer truck	0.29	37

Champlain Parkway traffic documentation indicates that the volume of trucks is not projected to increase after the project is complete.

For an urban walkable street, the design vehicle should be selected after an "evaluation of the trade-offs involved in selecting one design vehicle over another." (CNU-ITE, 2010). This guide recommends selecting a design vehicle which uses the facility frequently, and a control vehicle that must be occasionally accommodated. Passage of control vehicles needs to be physically possible, but may require crossing road centerlines or traversing curb zones. There are hundreds of pedestrians crossing at each major intersection on Pine Street every day, in contrast to the 70 +/- tractor trailers.

The project's design vehicle was increased to WB-62 at a project meeting in 2001 – and previously the project had a smaller design vehicle (thought to be WB-50). Considering the increased pedestrian activity on Pine Street and the continued transformation of formerly industrial properties to uses requiring fewer large vehicle deliveries, a re-evaluation of the project's design vehicle is recommended. Consider WB-62 as a control vehicle. A smaller design vehicle will allow for a more pedestrian-oriented design at intersections along the project corridor.

Pedestrian Oriented Design. The safest streets for pedestrians are where drivers expect pedestrians, which are places where pedestrians are frequent, and also places where the design of the street naturally alerts drivers to their presence, leading to safer and more engaged behavior by all street users. Designs that reduce travel speeds, increase eye contact, and guide all users to safely share the street are ideal. By contrast, conventional approaches to providing pedestrians facilities, which rely on signs and paint, are not always absorbed be drivers in a complex urban environment, where the economic activity might be a distraction. Given the complexity of the Pine Street corridor, a design where the street intuitively guides drivers to safely share the street are preferred than an approach where roadside signs provide instructions. Recommendations in this memo aim to design a corridor in such a way that proper behavior among all modes is self-enforcing.

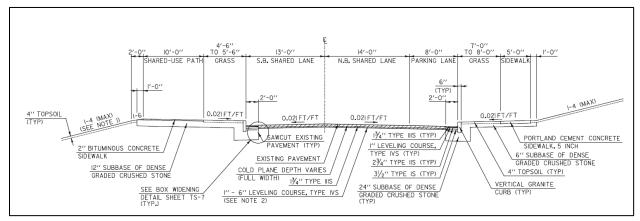
**Provide Multimodal Connections.** Pine Street is an important transit corridor, and all transit riders are pedestrians at either end of their trip, so pedestrian safety extends to transit users as well. Safe, comfortable transit stops to reinforce visibility of transit patrons are important. Bike racks should be available at each transit stop to ease intermodal connectivity and allow less confident riders to minimize the need ride on Pine St between points where they can access the shared use path.

# **Safety Enhancement Concepts**

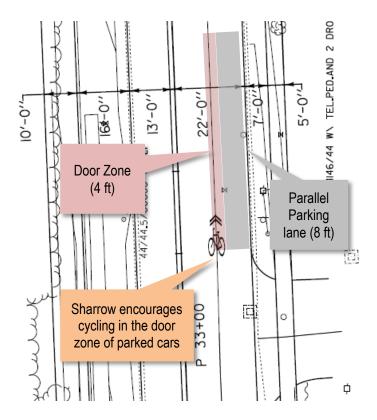
Improving pedestrian and bicycle safety along the Champlain Parkway, and more specifically along section C6 on Pine Street, is the primary goal of the proposed design concepts. At the same time, these recommendations seek to avoid utility impacts and minimize changes to the current footprint of the project. Attached to this memorandum are marked-up, annotated editions of the CHA plan sheets 1 through 13, which show recommended design enhancements. The following sections describe the design concepts in more detail.

#### Street Cross Section: Lakeside to Kilburn

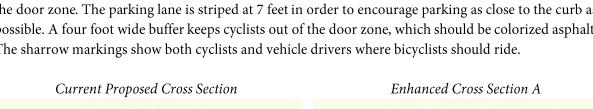
The proposed typical cross section of Section C6 is shown below.

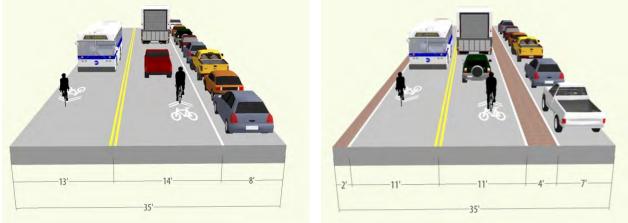


The safety of this treatment can be improved by introducing design elements that will encourage cyclists in the northbound shared lane to stay out of the door zone of the parallel parked cars.



The sketchup renderings below show the current and proposed alternative treatment for Pine Street, looking north. The street's center line is the same location, but the pavement treatment provides important cues to motorists and cyclists that will increase safety by actively directing bicyclists to avoid the door zone. The parking lane is striped at 7 feet in order to encourage parking as close to the curb as possible. A four foot wide buffer keeps cyclists out of the door zone, which should be colorized asphalt. The sharrow markings show both cyclists and vehicle drivers where bicyclists should ride.





This proposed treatment is in part inspired from a very successful streetscape project in Hamburg, NY (near Buffalo) along US Route 62 in the village center (shown in the photo below). The cross section has 10' travel lanes, 4' buffer lanes and 7' parking lanes. The buffer areas were constructed with colorized 20mm synthetic asphalt. The 7' parking lanes comply with state and federal guidelines. The presence of the colorized buffer gives the narrow parking lane more than sufficient space from the adjacent travel lane. Burlington DPW staff followed up with Paul Becker, the Village of Hamburg's project manager who managed construction of the project several years ago. In his email he stated that the roadway redesign has been "an unqualified success . . . Narrow 7' parking lanes, combined with the buffer lane, have worked very well. Winter conditions have not been a factor affecting the safe operation of the road configuration."



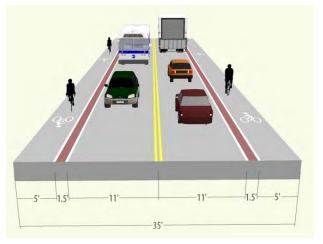
#### Kilburn to Maple

The shared use path ends at Kilburn St, so all cyclists will need to use the street. To enhance bicyclist safety in this section, it is proposed to remove the NB turn lane at Maple Street and the parallel parking so that buffered bike lanes can be provided in both directions. The figures below illustrate the current C6 cross section (left) and the proposed enhanced design (right).

## Current Proposed Cross Section



Enhanced Cross Section B



#### **Recommendations:**

- Apply Cross Section A to Pine Street between Lakeside and the shared use path terminus at the Kilburn/Pine intersection. Also use Cross Section A on Pine Street between Maple Street and Main Street.
- Between the Shared Use Path terminus and Maple Street, apply Cross Section B.
- Give consideration to use of colorized asphalt for the buffer, which will keep bicyclist out of the door zone, and also visually narrow the appearance of the road. For this reason, the narrow shoulder on the west side of Pine St should also be colorized.

#### **Shared Use Path Enhancements**

In order to enhance the safety of path users along this corridor, the following additions are recommended:

### **Driveway Treatments**

There are long segments of the shared use path without driveway crossings, but there are several existing commercial driveway crossings, as well as potential future crossings from new development. Enhancements that can improve the safety of these crossings include the following:

#### **Recommendation:**

- Explore narrowing the driveways to minimum widths and explore reducing the corner radii, which will slow down turning vehicles and provide greater opportunity to avoid conflicts with bicyclists.
- Install bold markings, reinforced by colored and textured pavement surfaces, as well as advisory signs at the crossings to convey to vehicles where they must yield to bicyclists.
- In locations where bicyclists should yield to vehicles, provide markings and yield signs to guide bicyclists.



Example of prominent shared use path crossing (left) and bicycle crossing marking used (right)

## Lighting

Because the shared use path is located behind the streetlights and because a substantial portion of the path traverses undeveloped land, lighting along the path alignment is poor.

#### **Recommendation:**

 Install pedestrian scaled lighting along the path, with particular emphasis on the crossing points, to allow safe use for pedestrians and bicycles in the evening, particularly during winter months when is often dark during morning and evening commuting hours.

#### **Crosswalk Enhancements**

As pedestrians are most vulnerable when crossing the street and being exposed to vehicles, there are a number of possible enhancements to crosswalks that could be incorporated into the C6 plans. Several examples below show techniques to emphasize the presence of pedestrians by narrowing the crossings with curb extensions, and/or raising the crossings so that they are more visible.

#### Recommendation:

• Install curb extensions at the intersections and mid-block crossings along the east side of Pine Street to provide opportunities for multimodal and streetscape enhancements, including transit shelters, bicycle racks, public art and bioretention.

Crossing zone with curb extensions



Curb extension at crosswalk



Textured intersection with raised crosswalk



Curb extension, crosswalk and bike racks



Curb extension with benches



# Raised Intersections / Speed Tables at Pedestrian-Rich Locations

At specific locations along high volume urban streets that have high levels of pedestrian activity, an effective approach to provide safety for all users is to install speed tables or raised intersections. This approach has been found to increase driver alertness to pedestrians, reduce speeds, and increase eye contact between drivers and other users. Raised intersections can also improve ADA accessibility with curbless street crossings. Design cues to alert motorists of the pedestrian-rich area along Pine Street between Howard and Marble are important – and speed tables are an effective tool. Additionally, a speed

table at the Pine/Kilburn intersection would help transition cyclists on the shared-use path to the road where the path ends. A 25mph design speed is recommended to be maintained through these areas. More information on raised intersections in the NACTO Streets Design Guide can be found here: http://nacto.org/usdg/raised-intersections/.

#### **Recommendations:**

- Install a long speed table from the southern side of the Pine/Howard intersection to the northern side of the Pine/Marble intersection with a curbless street occurring between these points. While the selection of an appropriate surface treatment should explore a range of options, the use of individual paving blocks is less likely to be successful in Vermont's climate, and options such as colored, textured concrete surfaces should be considered.
- If the above long speed table is not feasible, install two raised intersections one at the Pine/Howard intersection and one at the Pine/Marble intersection - each with a visible surface
- Install a raised intersection at the Pine / Kilburn intersection.

Raised intersection in Indianapolis, IN





Scored colored concrete, Buffalo, NY



Pedestrian Curb on Bell Street, Seattle





Credits: upper left: Yarger Engineering; upper right: NACTO, lower left: Lucy Gibson; lower right: Josh Feit

# **Transit Stops**

Safety enhancements to the transit stops will further create a safe multimodal corridor. Proposed enhancements below were developed in consultation with Chittenden County Transportation Authority.

#### **Recommendations:**

- Provide a pedestrian landing and an accessible connection to the sidewalk network at each transit stop. Some stops currently require transit riders to walk in the travel lanes.
- Provide shelters where supported by boarding data. This will allow riders wait at stop rather than
  darting toward bus from another sheltered location. The following locations are proposed for
  shelters:
  - Opposite Locust St (there is a shelter at the Locust St stop)
  - Howard St
  - Opposite Howard St
- Provide high visibility crosswalks near each stop, as many transit riders will need to cross Pine Street while accessing the stop or their final destination.
- Provide bicycle racks at or near transit stops, possibly on curb extensions, to ease multimodal connections and avoid tripping hazards caused by bicycles locked to other street features.

The attached plan sheets identify proposed locations of transit stops, design enhancements such as bus bulbs or landings, and other amenities such as shelters or bicycle racks. Several examples of bus bulbs are provided in the photos below.





# **Corner Truck Aprons**

Similar to truck apron at a roundabout, a corner truck apron provides a mountable surface for larger trucks making a right turn at an intersection, but reduces the effective turning radius for smaller vehicles. They are typically about 3 inches high, and deter cars from making a wider corner sweep, but allow trucks the room they need for the turns. Corner truck aprons can be used at intersections where wide radii are advisable due to the numbers of turning trucks, which could lead to higher cornering speeds for passenger cars. The corner aprons will encourage tighter turns and lower speeds for smaller vehicles.

#### **Recommendation:**

• If a smaller design vehicle and thus tighter curb radii are not achievable for this project, install corner truck aprons at the major project intersections with large radii.

The following photos are from an intersection in Bend, OR (left) and the Winooski Circulator (right)





# **Attachments**

Annotated plan sheets 1-13 extracted from Section C6 Preliminary Plans

