# Bike Routes and Boulevards – White Paper

**To:** Jim Olson, *City of Ashland*

**Cc:** Project Management Team

**From:** Adrian Witte and Drew Meisel, *Alta Planning + Design*

**Date:** February 1, 2011

**Re:** Task 7.1.J White Paper: "Bike Routes and Boulevards" - DRAFT

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## Direction to the Planning Commission and Transportation Commission

Five sets of white papers are being produced to present information on tools, opportunities, and potential strategies that could help Ashland become a nationwide leader as a green transportation community. Each white paper will present general information regarding a topic and then provide ideas on where and how that tool, strategy, and/or policy could be used within Ashland.

You will have the opportunity to review the content of each white paper and share your thoughts, concerns, questions, and ideas in a joint Planning Commission/Transportation Commission meeting. Based on discussions at the meeting, the material in the white paper will be: 1) Revised and incorporated into the alternatives analysis for the draft TSP; or 2) Eliminated from consideration and excluded from the alternatives analysis. The overall intent of the white paper series is to explore opportunities and discuss the many possibilities for Ashland.

## Introduction

The City of Ashland has been expanding its network of on- and off-street bikeways to encourage bicycling, increase safety, and improve connections to key destinations. The City's goal to better integrate active transportation on its existing roadways presents a number of opportunities, challenges, and constraints that need to be well considered. Not all bikeway facilities have the same "rate of return" in terms of the ridership increases, level of comfort, or level of safety that can be expected. Likewise, not all bikeway treatments are appropriate for all situations. This paper provides a bikeway typology that describes the different categories of bikeways (note: there are many variations within each of these categories). It also provides guidance such as the level of protection, benefits, drawbacks, application context, and design details for each facility type.

Suggested bike routes and boulevards are presented in an initial "Bike Network Plan" for discussion.

# Bikeway Typology

Bikeways can be classified in a number of ways; however, the level of protection afforded the bicyclist is typically the biggest distinction amongst facility types. A typical bikeway typology includes:

- **Bicycle Boulevards / Neighborhood Greenways:** low traffic volume streets treated with traffic calming, bicycle way-finding signage and markings, and improved pedestrian and bicycle crossing facilities at major streets. The low traffic volumes and speeds of local streets create a comfortable bicycling environment.
- **Shared Roadways:** used where physical constraints do not allow additional separation. Shared roadways generally include only signage to indicate the presence of bicycles to other road users, although sometimes they are enhanced with shared lane markings (also known as "sharrows"). Ideally these facilities would only be used where absolutely necessary and on lower traffic speed or volume streets.
- **Bike Lanes:** are marked laneways exclusively for bicycle travel. They are separated from vehicle travel lanes with longitudinal striping and include pavement stencils. These facilities are most appropriate where higher traffic volumes and speeds warrant greater separation. Shoulder bike lanes fall into this category.
- **Protected Bikeways:** these facilities provide additional separation that offers added protection to cyclists. There are numerous variations, but two distinct sub-categories include:
    - **Buffered Bike Lanes:** conventional bicycle lanes with additional buffer space separating it further from the motor vehicle travel lane or parking lane.
    - **Cycle tracks:** combine the user experience of a separated path with traditional on-street infrastructure. These facilities use vertical separation or horizontal separation in the form of medians, parked vehicles, or other separators to enhance the protection (and feeling of separation) from motor vehicle traffic.
- **Shared-Use Paths:** are used by a variety of non-motorized users, including pedestrians, cyclists, skaters, and runners. Shared use paths may be paved or unpaved, and are often wider than an average sidewalk (i.e. 8-feet minimum, typically 10 – 14 feet).

Each of these facility types is described in more detail below (with the exception of shared-use pathways, which will be addressed in a future white paper). It is noted also that there are numerous variations within each category.

## Bicycle Boulevards / Neighborhood Greenways

Bicycle Boulevards, also known as Neighborhood Greenways, provide a comfortable environment for bicycle riders of all ages and skill levels. Research indicates there is strong support for these facilities and that they are important in attracting new bicyclists – such as the "interested but concerned" rider group - who are typically less comfortable riding in more stressful traffic environments.

These facilities typically make use of the low traffic volumes and low traffic speeds characterized by local streets work best in well-connected street grids where riders can follow reasonably direct and logical routes and higher-order parallel streets can serve through vehicle traffic.

Streets with traffic volumes below 1,500 vehicles per day are preferred for Bicycle Boulevards; however streets with up to 3,000 - 4,000 vehicles per day may still be appropriate. Motor vehicle speeds of less than 25 miles per hour (mph) are desirable with a speed difference between motor vehicles and cyclists of no more than approximately 15 mph. Beyond these volumes and speeds, some form of separated facility such as a bike lane should be considered.

At their most basic level Bicycle Boulevards include merely signage. However, as conditions require, additional treatments such as pavement markings, enhanced crossing provisions, and traffic calming may be used. The *Fundamentals of Bicycle Boulevard Planning and Design* guidelines developed by Alta Planning + Design, Portland State University, and the Association of Pedestrian and Bicycle Professionals identify 5 levels of bicycle boulevard treatment that graduate in intensity as shown in **Figure 1** and described below.

Level 1 represents the least physically-intensive, and lowest cost treatment requiring only signage. Higher level treatments build on the previous level so Level 2 treatment would include signage appropriate for Level 1 with the addition of pavement markings and some low-level crossing treatments.

Level 3 builds further to include enhanced crossing treatments at busy intersections. This may include median separation of the crossing street to create a refuge area and allow two-stage crossing or could include half-signals to facilitate crossings on the minor street.

Level 4 introduces traffic calming such as chicanes, traffic circles, etc. to slow motor vehicle speeds. Level 5 introduces traffic diversion to reduce motor vehicle volumes.

It is noted that not all elements of a particular level will be appropriate for all streets with that designation – some flexibility must be considered within the design.

The impact of these treatments, particularly higher level treatments may need to be addressed through public consultation and in some cases a detailed engineering study.

Neighborhood Greenways (Bicycle Boulevards) will be identified as part of this Transportation System Plan update. It is proposed that the project team identify an appropriate application level for each route. This maintains some flexibility in the site-specific improvements the City makes in the implementation of the TSP. An example of a Bicycle Boulevard treatment is included in **Figure 2**.

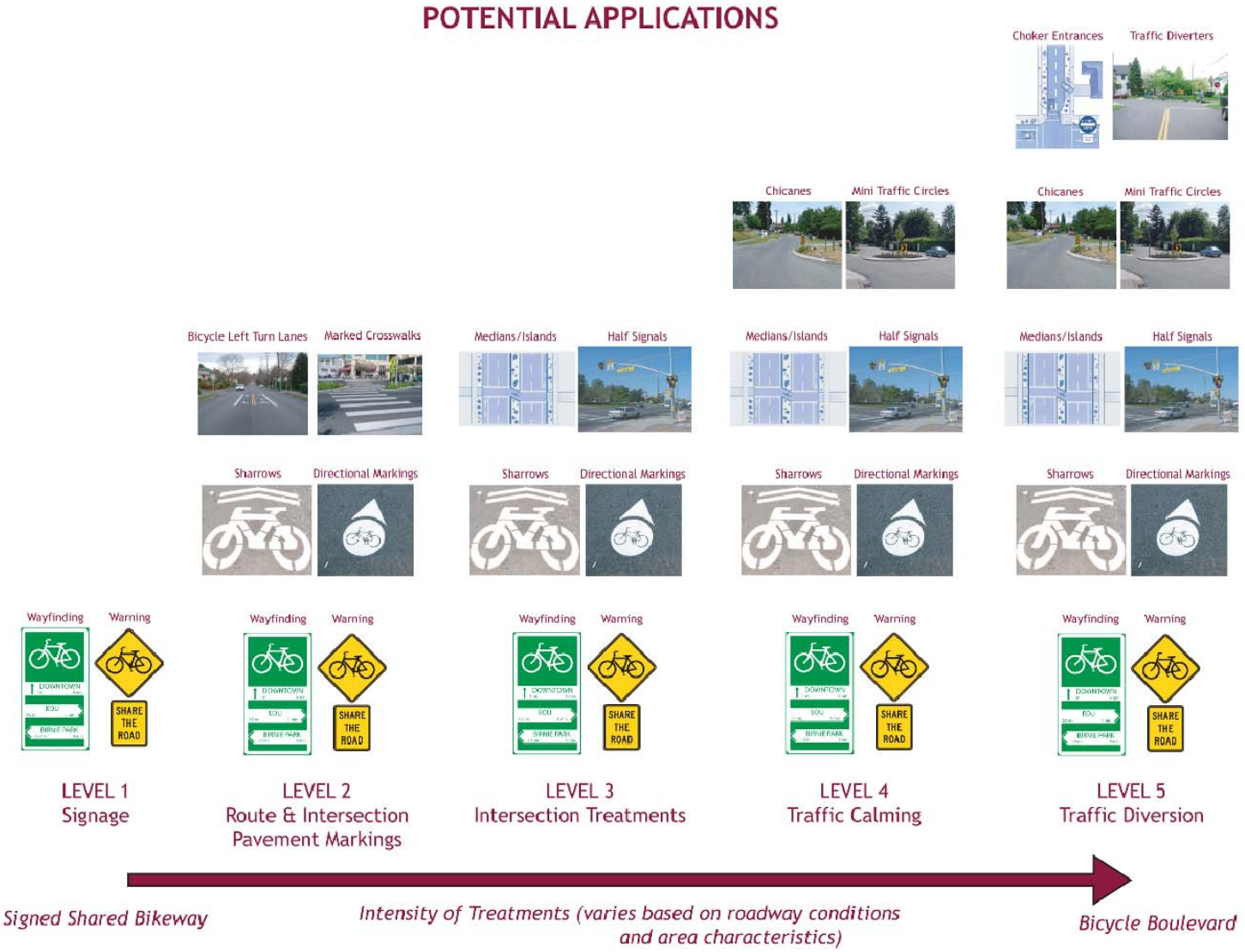



Figure 1: Bicycle Boulevard Treatment Levels.

**Benefits:**

- Low-stress bicycle environment through reduction of motor vehicle volumes and speeds.
- Easy and relatively cost-effective to implement.
- Can address multiple issues (e.g. traffic calming, green street development, etc.).

**Design Guidance:**

- Way-finding signs are placed at key locations leading to and along the route (Level 1).
- Warning signs advising motorists to "share the road" and "watch for bicyclists" may be installed (Level 1).
- Directional pavement markings delineate the bike route and alert riders to any change in direction – they also enhance recognition of the street as a bicycle boulevard to motorists (Level 2).
- The installation of stop control on cross streets provides a continuous bike route (stops have been found to be one of the biggest detractors of a bicycle route) and increases the interaction between motorists and other road users (Level 3).
- At unsignalized intersections with major streets, a bicycle crossing island can be provided to allow cyclists to cross one direction of traffic at a time when gaps allow (Level 3).
- Traffic calming can be used to reduce vehicle speeds (Level 4).
- Traffic diversion can be used to reduce vehicle volumes on the bicycle boulevard. These can be designed to be permeable for pedestrians and cyclists (Level 5).

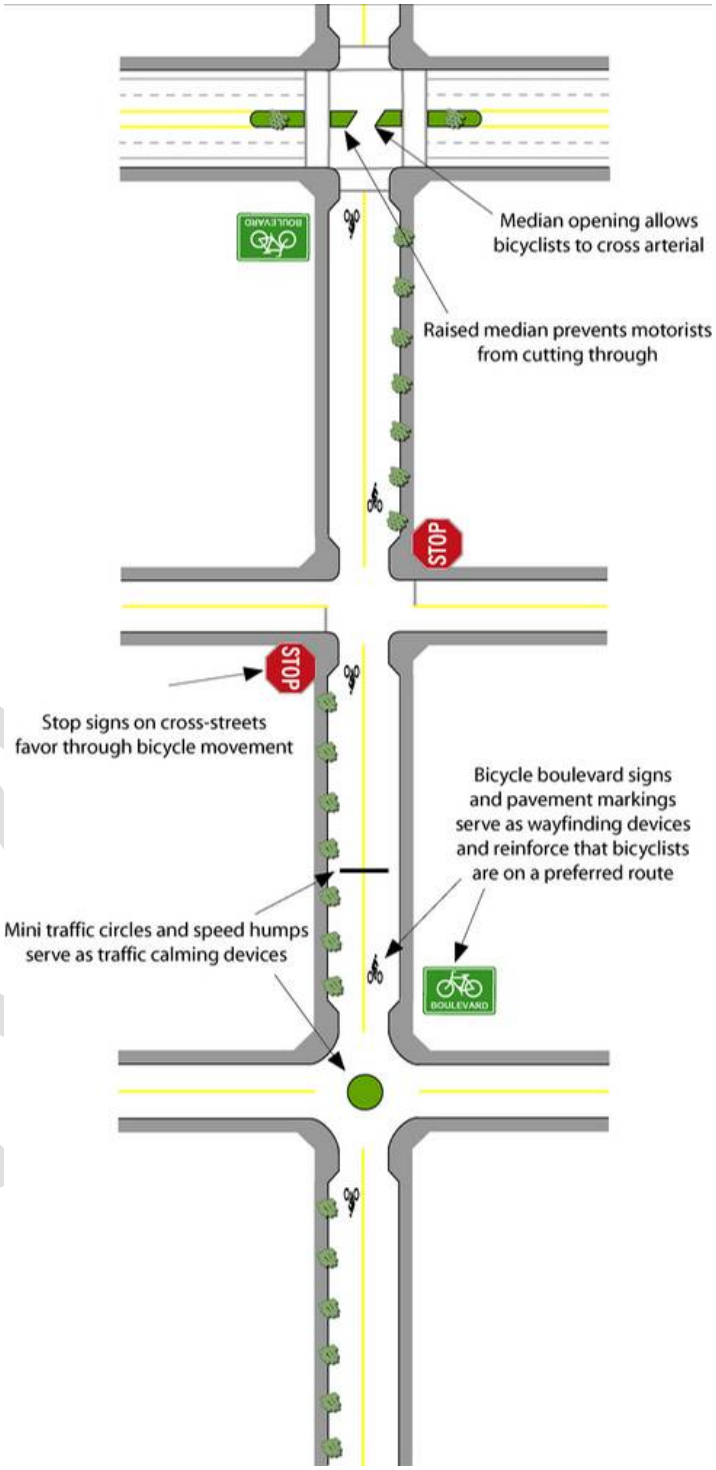
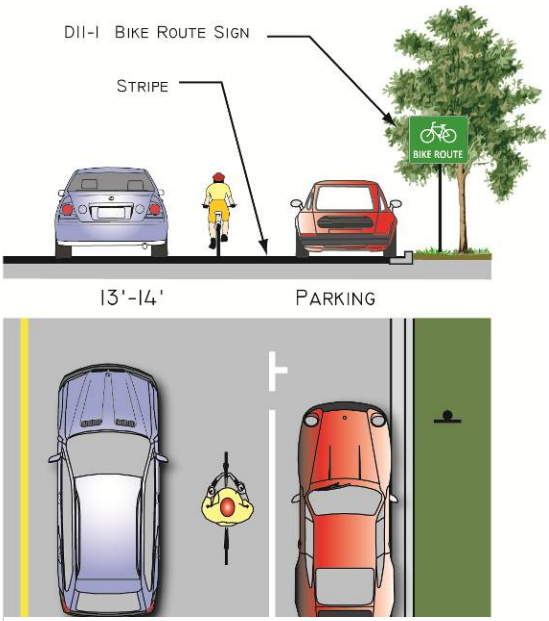



**Figure 2: Sample Bicycle Boulevard Treatment.**

## Shared Roadways

Shared roadways are generally provided on low traffic volume streets or where there are physical constraints that do not allow additional separation. They are typically designated with only signage, but shared lane markings (also known as "sharrows") can also be provided to aid cyclists in appropriately positioning themselves on the roadway and to more visibly alert drivers to the presence of a bike route along the roadway.




*Shared roadway recommended configuration.*

Shared roadways typically feature a centerline, no shoulders, and insufficient travel-way width to separate bicycles from motor vehicle and other traffic. Cyclists share a travel lane with automobiles or are provided a wide curbside lane that bicyclists share with parked vehicles.

This type of facility can be developed on rural roadways without curb and gutter or on urban streets, preferably where traffic volumes and speeds are low.

**Protection Level**: Low.

**Cycling Groups**: these facilities generally attract only those bicyclists comfortable in mixed traffic environments (i.e. "strong and fearless" and some of the "enthused and confident" cycling groups).

*This shared roadway in Los Angeles provides a wide outside lane adjacent to on-street parking.*

**Benefits**:

- Signage offers way-finding to cyclists and alerts motorists to the possibility of cyclists on the roadway.
- Easy and cost-effective to implement.

**Drawbacks**:

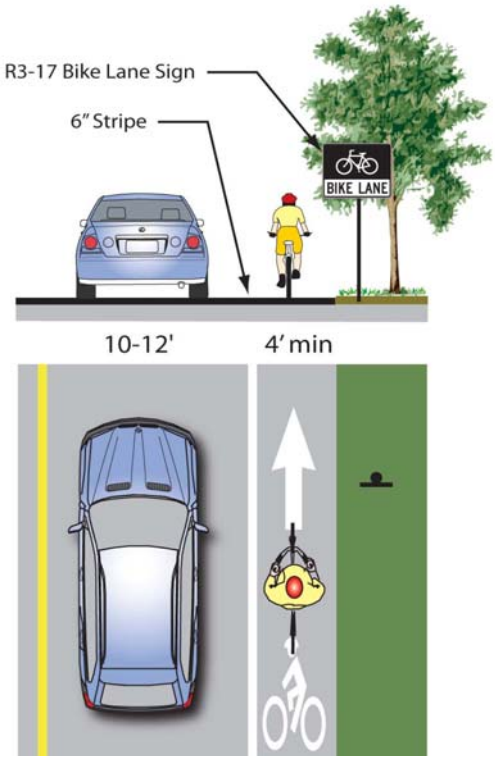
- Offers no separation from motor vehicle traffic. These facilities should only be used on streets with low traffic volumes and speeds or as a last resort where there is no physical space to separate bicyclists and motor vehicle traffic.

**Design Guidance**:

- Appropriate where lane widths are less than:
  - Shared with travel lane: 15 feet or less.
  - Shared with parking lane: 14 feet or less.
- If using shared lane markings - recommended placement varies depending on roadway conditions:
  - At least 11' from face of curb (or shoulder edge) on streets with on-street parking.
  - At least 4' from face of curb (or shoulder edge) on streets without on-street parking.
- Shared lane markings should not be used on roadways with a posted speed greater than 35 mph.

## Bike Lanes

Bicycle lanes designate a separate space for bicyclists adjacent motor vehicle travel lanes through the use of pavement markings and signage. Bicycle lanes are typically on the right side of the street, between the motor vehicle travel lane and the curb, road edge, or parking lane. Bike lanes can be on the left side on one-way streets.




*Conventional bike lane design.*

**Protection Level**: Medium,

**Cycling Groups**: adjacent traffic volumes, noise, and speeds can be off-putting to novice and less experienced cyclists. These facilities attract the "strong and fearless", "enthused and confident", and some of the "interested but concerned" cycling groups.

**Benefits**:

Although there are conflicting reports on the true safety benefits of providing bike lanes, many bicyclists, particularly less experienced riders, are more comfortable riding on a busy street if it has a striped and signed bike lane. Other benefits include:

- Encouraging proper riding behaviour by providing a protected on-street alternative to riding on the sidewalk.
- Creates a separation between bicyclists and automobiles and increases predictability of bicyclist and motorist positioning and interaction.
- Can improve person capacity of a street segment.
- Can often be incorporated into existing pavement widths and right-of-ways.

*Bike lane pavement markings in Portland, Oregon.*

**Drawbacks**:

- Expanding roadways to accommodate bicycle lanes can require additional right-of-way, increase construction and maintenance costs, and add to impervious surface.

**Design Guidance**:

- Bike lanes are appropriate on streets with:
  - Traffic volumes ≥ 3,000 vehicles per day.
  - Posted speed ≥ 25 mph.
- Minimum bike lane width: 6 feet.
- Bicycle lane word, symbol and/or arrow marking (MUTCD Figure 9C-3) must be used in association with longitudinal lane markings.

- A through bicycle lane shall not be positioned to the right of a right turn only lane or to the left of a left turn only lane.
- Gutter seams, drainage inlets and utility covers should be flush with the ground to prevent conflicts with bicycle tires.

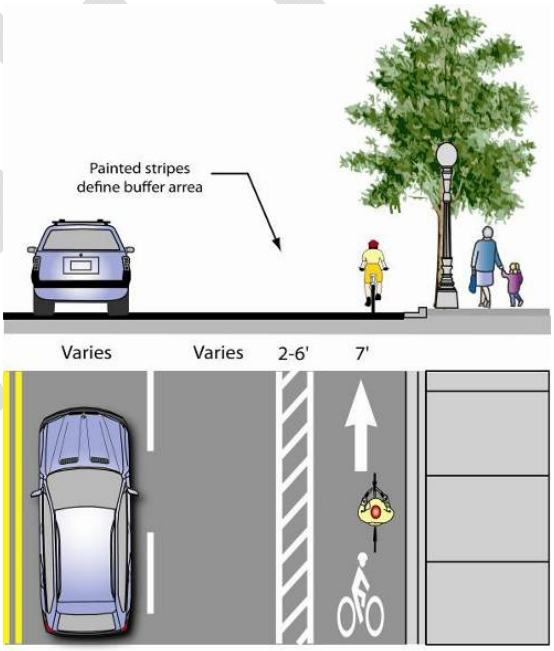
## Protected Bikeways

The level of protection that a bikeway provides can have a significant impact on attracting bicyclists, particularly novice and less confident bicyclists. These groups, that generally make up the "interested but concerned" cycling group display a strong preference for greater levels of separation from motor vehicle traffic and make route choice decisions based on this criteria. In general, as the level of protection increases, the more attractive a facility becomes to these bicyclists. It should be noted that in certain situations increased protection can impact convenience and are not always attractive to the "strong and fearless" and "enthused and confident" cycling groups who are comfortable riding in mixed traffic environments or standard bike lanes.

### Buffered Bike Lanes

Bike lanes on high-volume or high-speed roadways can still feel dangerous or uncomfortable for cyclists – whether perception or a real threat, the noise and proximity of quickly passing automobile traffic can deter continued cycling activities.

Buffered bike lanes are designed to increase the space provided between the bike lane and the travel or parking lane. This treatment is appropriate on streets that already have bike lanes with high automobile traffic volumes and speeds or a high proportion of truck or oversized vehicle traffic.




*Recommended buffered bike lane design.*

**Protection**: Medium – High.

**Cycling Groups**: the increased separation is attractive to "interested but concerned" and "enthused and confident" cyclists. So long as the buffer does not prevent cyclists maneuvering in and out of the buffered bike lane or passing another cyclist, these facilities may also be attractive to the "strong and fearless" group.

**Benefits:**

- Improves cyclist's perception of safety.
- Provides motorists greater shy distances from cyclists in the bike lane.
- Provides space for cyclists to pass one another without encroaching into the travel lane.

- Provides space for cyclists to avoid potential obstacles in the bike lanes, including drainage inlets, manholes, trash cans or debris.
- Parking side buffer provides cyclists with space to avoid the 'door zone' of parked cars.

**Drawbacks:**

- Requires additional roadway space.
- Requires additional maintenance for the buffer striping.
- Frequency of parking turnover should be considered prior to installing buffered bike lanes.


*Buffered bike lanes protect cyclists from fast-moving traffic.*

**Design Guidance:**

- Good application on:
  - Streets with high traffic volumes, traffic speeds, or high proportions of trucks or heavy vehicles.
  - On streets with excessive or extra road width.
- Buffer should be a minimum of 2' wide and typically up to 6' wide.
- Buffer markings should clearly distinguish it from the bike lane and relay for vehicles not to enter the area. Diagonal striping is commonly used.
- A solid white line is used to separate the buffer and the adjacent motor vehicle travel lane. Parking T's or a dashed line are acceptable between the buffer and a parking lane.

## Cycle Track

Cycle tracks are bike lanes that are physically separated from roadway traffic, parking, and sidewalks through horizontal and/or vertical separation measures.

Cycle tracks can be either one-way or two-way, on one or both sides of a street. Separation can include pavement markings or coloring, bollards, curbs/medians, barriers, or even using the vehicle parking lane.


*A cycle track separated with curb and bollards in Boulder, CO.*

**Protection**: High

**Cycling Groups**: physical separation is attractive to "interested but concerned" cyclists and some of the "strong and fearless". The restricted width of these facilities and the sometimes inconvenient connections at the start and end of these facilities can result in more experienced cyclists preferring to share the street with motor vehicles.

**Benefits:**

- Physical separation improves perceived and (as initial research suggests) real safety and comfort.
- Reduce risk of 'dooring' compared to a bike lane, and elimination of the risk of a doored bicyclist being run over by a motor vehicle.

- Cycle track cannot be used for double-parking, unlike a bike lane.
- Can be relatively low implementation cost by making use of existing pavement and drainage and using parking lane and low cost devices as a barrier.
- More attractive for bicyclists of all levels and ages.

**Drawbacks:**

- Potential parking or travel lane removal.
- Reduced sight distance at intersections needs to be treated, often resulting in a loss of parking near the intersection.
- Creating physical separation can be costly and require significant construction.
- Conflicts between right turning vehicles and bicyclists using the cycle track - impacts on operations and safety.


*A New York City cycle track makes use of an existing parking lane.*


*The City of San Francisco uses green paint and traffic delineators to demarcate the cycle track.*

**Design Guidance:**

- Preferred width of cycle track is 5' – 7'.
- Bicycle lane word, symbol and/or arrow marking (MUTCD Figure 9C-3) must be used.
- Use solid white line to separate vehicle travel and parking lanes and provide a buffer (preferably 3' wide). Use diagonal markings in the buffer.
- Sidewalk curb and furnishings should be used to prevent pedestrian use of the cycle zone.
- Colored pavement may be used to further define the bicycle space.

The bikeway continuum shown in **Figure 3** was developed by Alta Planning + Design to show the graduated increase in protection with different facility types. This figure is a guide that shows the primary separated facility types and as such, not every variation of protected facilities is included. Fact sheets that describe the intent, benefits, drawbacks, and design applications of each separated facility type are included below.

# Suggested Bike Plan

Based on the existing TSP and other reviewed plans, the TSP Update's Goals and Objectives, and field reconnaissance, the consultant has developed an initial Bike Plan illustrated in **Figure 4**. The intent of this recommendation is to facilitate discussion amongst the TC / PC as to whether these identified facility locations are reasonable or need to be adjusted.

The second step is to conduct a workshop with the TC / PC and the public to determine the specific near- and long-term level and type of treatment for each identified facility.

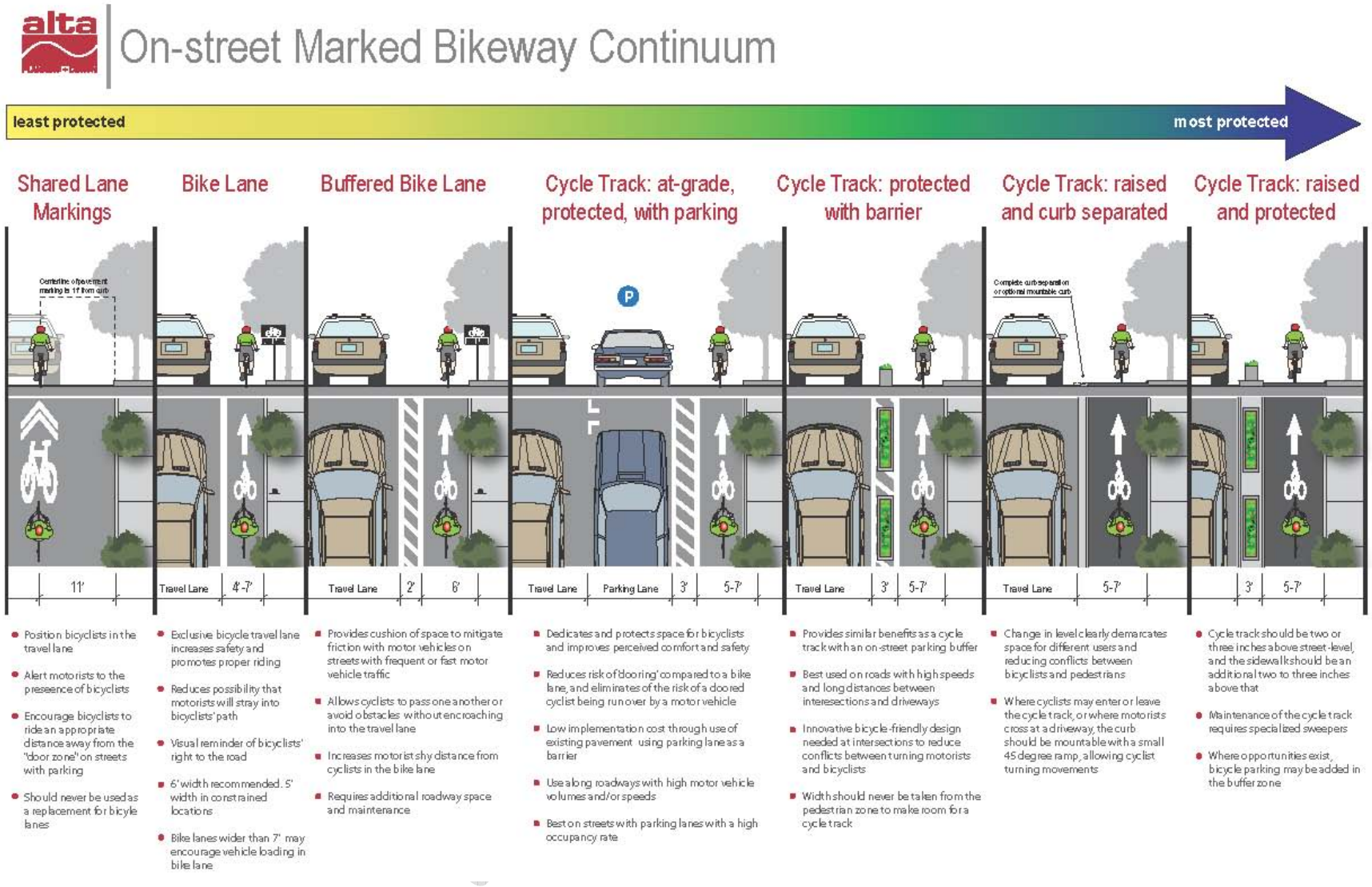
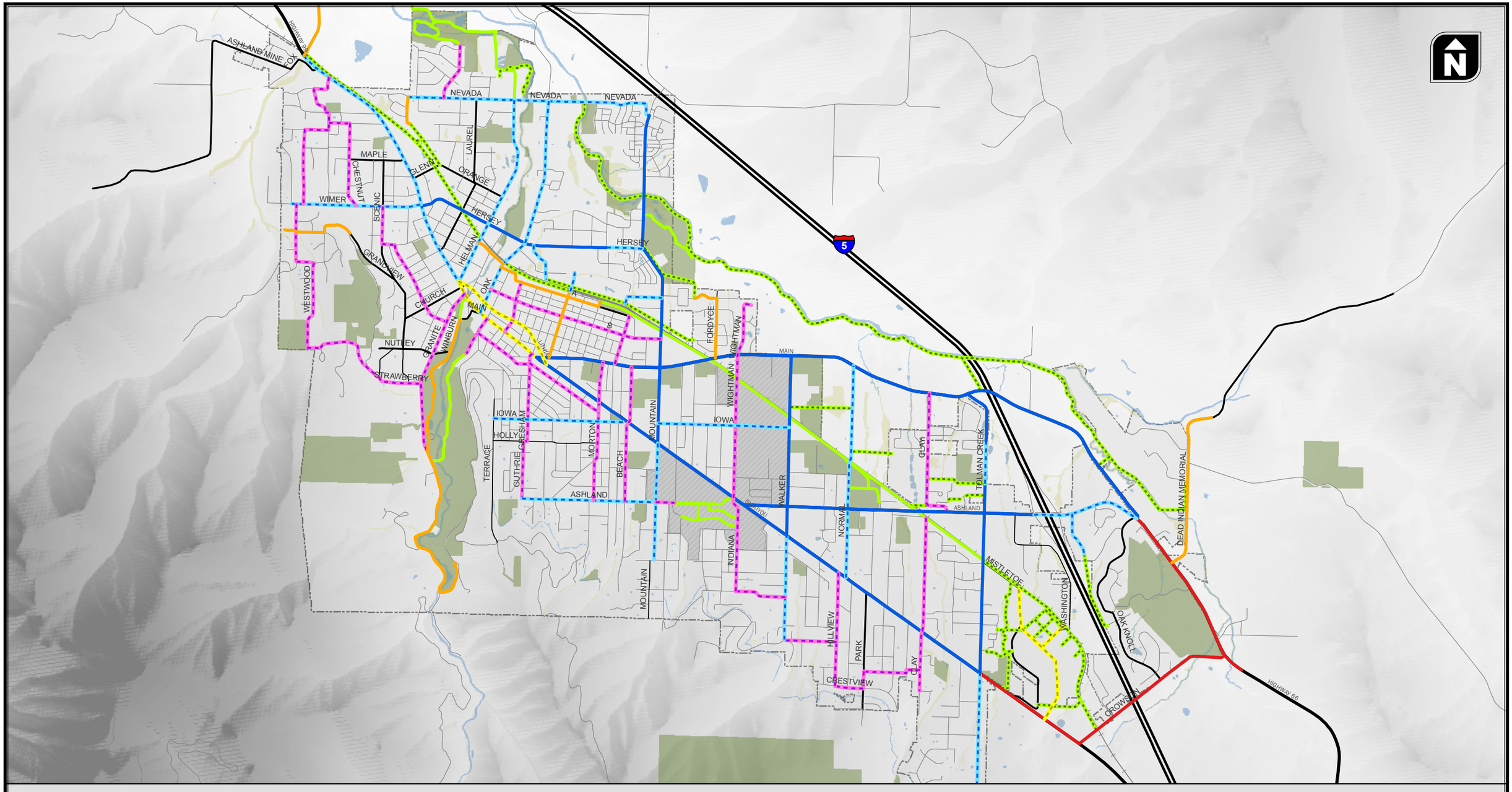



Figure 3: On-Street Marked Bikeway Continuum.




**On-Street Bikeways**
- Existing Bike Lane
- Existing Shared Roadway
- Existing Shoulder Lane
- Proposed Bike Lane
- Proposed Protected Bikeway
- Proposed Bicycle Boulevard

**Off-Street Trails**
- Existing Bike Path/Greenway
- Proposed Bike Path/Greenway

- Rivers
- Parks
- Wetlands
- City Limits

# DRAFT - Existing and Proposed Bikeway Network

CITY OF ASHLAND

Figure 4

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