ITHACA NEIGHBORHOOD GREENWAYS

STUDY AND PROPOSED PLAN

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Prepared for

ITHACA TOMPKINS COUNTY TRANSPORTATION COUNCIL (ITCTC)

Ithaca, NY

Fernando DeAragon

Executive Director

Prepared by

TOM KNIPE

Master of Regional Planning Candidate

Cornell University, Department of City and Regional Planning

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ACKNOWLEDGEMENTS

I have been privileged to work with visionary public servants, community members and advisors on this project, and I'd like to thank them for their professional, technical and personal support over the past 9 months. They allowed the project to grow from a seed of an idea into this proposed plan, and it will be their contributions and ongoing investment that will carry the project towards implementation.

Thanks to Tim Logue for his wisdom and friendship and to Kent Johnson for his thoughtful and detailed critiques of several drafts and for providing useful and timely information about the history of bicycle initiatives in Ithaca. Thanks to Lois Chaplin, Sue Powell, and Rick Manning for their ideas and enthusiasm for the concept as members of the steering committee. Thanks to Tom Mank for his mapping support.

Thanks to Mia Birk, Jennifer Dill and Joe Kurmaskie whose visits and presentations in November 2010 lit a fire for neighborhood greenways in Ithaca. Thank you to my fellow graduate planning students in the Department of City and Regional Planning at Cornell University who helped me organized the first Ithaca-Cornell Active Transportation Symposium, especially Zack Patton, Alyson Fletcher, Anna Brawley, Gabby Voeller, Ruslan Filipau, Greg Kelly and Lydia Morken, Thanks to the 400 people who attended the symposium, especially the 60 people who showed up at the Tompkins County Library on a Saturday morning in November, 2010 to learn about a vision for enhancing the bicycle and pedestrian infrastructure in their community.

Thanks to my professors and advisors who supported me on this project, especially Stephan Schmidt, Ann Forsyth and John Forester. Thank you to my family, and finally, thank you to Fernando DeAragon who embodies a rare combination of guts, vision and tact that make him a gem for those engaged in envisioning a more sustainable future for transportation in Tompkins County.

- Tom Knipe, March, 2011

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EXECUTIVE SUMMARY

This study and proposed plan were completed between June, 2010 and March, 2011 by the Ithaca Tompkins County Transportation Council (ITCTC) in close consultation with the City of Ithaca Office of the City Transportation Engineer. As the Metropolitan Planning Organization (MPO) for Tompkins County, the ITCTC is charged with promoting comprehensive inter-modal transportation planning and providing transportation-related information and analyses. This study supports the City of Ithaca's efforts to improve multi-modal transportation infrastructure. It offers a detailed draft plan for the development of a network of low-stress bicycle routes designed for casual cyclists to use safely and comfortably. The proposed network is designed with the intent to minimizing parking removal and preserve Ithaca's functional grid street pattern.

The goals of this proposed plan are to:

- Enhance **community and traffic safety** by incorporating bicycle and pedestrian safety features near common community destinations and resources in the City of Ithaca.
- Enhance **neighborhood livability**.
- Enhance bicycle and pedestrian safety and comfort in the City of Ithaca in order to increase **transportation choice**.
- **Minimize loss of parking** and right of way needed for bicycle improvements.
- Add value to related transportation and community planning efforts.

Ithaca is well-positioned to become an eminently bicycle-friendly city. In addition to improving safety, access and quality of life for City residents this would further enhance Ithaca's reputation as a regional leader in sustainability and as an attractive destination for visitors and businesses. Cycling currently accounts for a smaller share of trips than other modes of transportation. 2.3% of work trips are currently taken by bicycle according to the 2010 census, a slight increase from 1.8% in 2000. Increasing bicycling mode share may elicit many potential benefits. Neighborhood Greenways hold significant potential to achieve this by attracting people who do not currently use a bicycle for their transportation needs to replace some car trips with bicycle trips.

The *Ithaca Neighborhood Greenways Proposed Plan* supports existing plans and policies, including the Ithaca Bicycle Plan (1997), the Tompkins County 2020 Climate Action Plan, the Tompkins County 2030 Long-Range Transportation Plan, the Downtown Ithaca Alliance 2020 Strategic Plan, federal and state transportation policy, and recommendations developed by the Ithaca's City Transportation Engineer.

WHAT ARE BICYCLE BOULEVARDS / NEIGHBORHOOD GREENWAYS?

Bicycle boulevards / neighborhood greenways now animate over a dozen North American cities. In 2009, industry professionals and researchers - led by the Institute for Bicycle and Pedestrian Innovation (IBPI) at Portland State University and Alta Planning and Design - developed a comprehensive guide, the *Fundamentals of Bicycle Boulevard Planning & Design.* It is a primary source for this study. Bicycle

boulevards improve bicycle safety and circulation compared to other streets by creating (or in many cases already having) one or more of the following conditions:

- Low traffic volumes and speeds.
- Comfortable and safe intersections. Traffic control to help bicycles cross major streets.
- A distinctive 'look and feel' so that cyclists become aware of the existence of the bicycle boulevard, and motorists are alerted that the roadway is a priority route for bicyclists.
- Free-flow travel for bikes by assigning the right-of-way to the bicycle boulevard at intersections where feasible.
- Logical, direct, and continuous routes that are well marked and signed
- Access to desired destinations.
- Discouragement of non-local motor vehicle traffic where necessary.

Bicycle boulevards are "shared-use" facilities, meaning that car traffic and non-motorized traffic calmly share the street. They use a combination of straightforward design elements on existing neighborhood streets to give bicycles de-facto priority.

WHAT MAKES A BICYCLE BOULEVARD SPECIAL?

- They are ideal for cyclists of all ages and abilities.
- They are particularly attractive to children and other less traffic tolerant cyclists.
- They accommodate cyclists who are uncomfortable riding on busy roads, including roads with bike lanes.
- Cyclists tend to prefer bicycle boulevards to other types of infrastructure such as bicycle lanes (research by Portland State University professor Jennifer Dill, 2009).

In addition to providing excellent bicycle facilities that would form the spine of a comprehensive bicycle network in the City of Ithaca, bicycle boulevards hold the potential to serve the interests of a wide variety of community members, including families with children of all ages, school-aged children, seniors, transit users, women, motorists, pedestrians, business owners, homeowners and taxpayers. Beyond safety, access and livability, bicycle boulevards also hold the potential to serve broad community interests around the economy, public health, environment and fiscally responsible local government.

WHAT ARE THE SPECIFIC DESIGN ELEMENTS?

Bicycle boulevards employ five basic design elements. Examples of specific treatments within each category are in parentheses. More details including recommended treatments for each corridor appear in the narrative portion of this report and on the attached maps.

1. **Traffic calming** (speed tables, raised crosswalks, etc.)
2. **Signage and markings** (way-finding signage for cyclists, route identity signage, and pavement markings)
3. **Prioritization of travel**
4. **Intersection treatments** (signalization, curb extensions, bicycle-activation, colored "bike boxes")
5. **Traffic Reduction** (partial non-motorized only crossings)

HOW WERE STREETS SELECTED?

The ITCTC used the following criteria to select a potential network of streets for bicycle boulevards in the City of Ithaca. If this project moves forward to a formal planning and engineering phase, these may change in response to new information or different priorities identified in the public involvement process. One such change would be to place a greater emphasis on streets with the lowest possible traffic vs. continuity of the street corridor.

Criteria for the selection of streets:

- Already relatively low car traffic; less than 3,000 ADT (average daily traffic) is a requirement, less than 1,000 ADT is desirable where possible.
- Contiguous network without any gaps.
- Direct links or close proximity (within ¼ mile) to homes and popular destinations. Safe, comfortable access to neighborhoods, community facilities, parks, job and commercial centers, transit, social services and existing or planned bike and pedestrian infrastructure (including the Cayuga Waterfront Trail).
- Alignment with the Ithaca Bicycle Plan.
- Reasonably continuous street corridor, with as few jogs as possible.
- Not a high-volume transit or truck route.
- Existence or feasibility of traffic signals at major intersections.
- Not a high commercial traffic corridor if possible.
- Avoid steep hills.

WHY IS ITHACA WELL-SUITED FOR THIS TYPE OF INFRASTRUCTURE?

Ithaca is well-suited for bicycle boulevards for several reasons. First, existing traffic calming features (street trees, sidewalks, crosswalks, patterned street surfaces, raised intersections, curb extensions, mini-circles, and speed tables) can be expanded and complemented to support an integrated network of calmed streets across the flat areas of the city. Second, a 30-mile per hour speed limit is in place on all city streets and some areas already have lower speed limits or advisory speeds (10, 15 or 20 mph). Notably, state law would also allow the City to post 25 mph speed limits along specific corridors. Third, a dense, well-connected grid street pattern makes it easy for car traffic to use alternate corridors for through-travel. Fourth, crossing treatments at several key intersections along the proposed network (3rd & Hwy 13, Dey & Highway 13, Plain & Green, and Plain & Seneca) are planned and funded.

Finally, conditions in Ithaca support emphasizing bicycle boulevards as a primary strategy for bicycle infrastructure development. Efforts in Ithaca to implement a complete network of bicycle lanes – a strategy identified in the 1997 Ithaca Bicycle Plan - have been unsuccessful to date. Most City of Ithaca streets are too narrow to accommodate bicycle lanes without removing on-street parking on one side of the street. On-street parking would not be removed to implement this plan, except in limited circumstances.

WHY 'NEIGHBORHOOD GREENWAYS'?

Drawing inspiration from Portland, Oregon which recently renamed their bicycle boulevards to "neighborhood greenways", the steering committee for this study supports using the name *Ithaca*

Neighborhood Greenways to highlight the features of walkability, neighborhood livability, and green infrastructure. It's about more than just bikes. They also link the city's green spaces to each other and to the rest of the city. *Ithaca Neighborhood Greenways* implies a calm space where all modes safely co-exist, and offers an association to the region's sustainability values and goals.

WHAT ARE THE RECOMMENDED CORRIDORS?

- Plain St. and 3rd St. – map segments 1 and 6
- Tioga St. – map segment 2
- South Titus St. and South St. – map segment 3
- West State St. – map segment 4
- Cascadilla St. – map segment 5
- Franklin St., Lincoln St. and Fall St. – map segments 7 and 8

HOW MUCH WILL IT COST AND HOW WILL IT BE FUNDED?

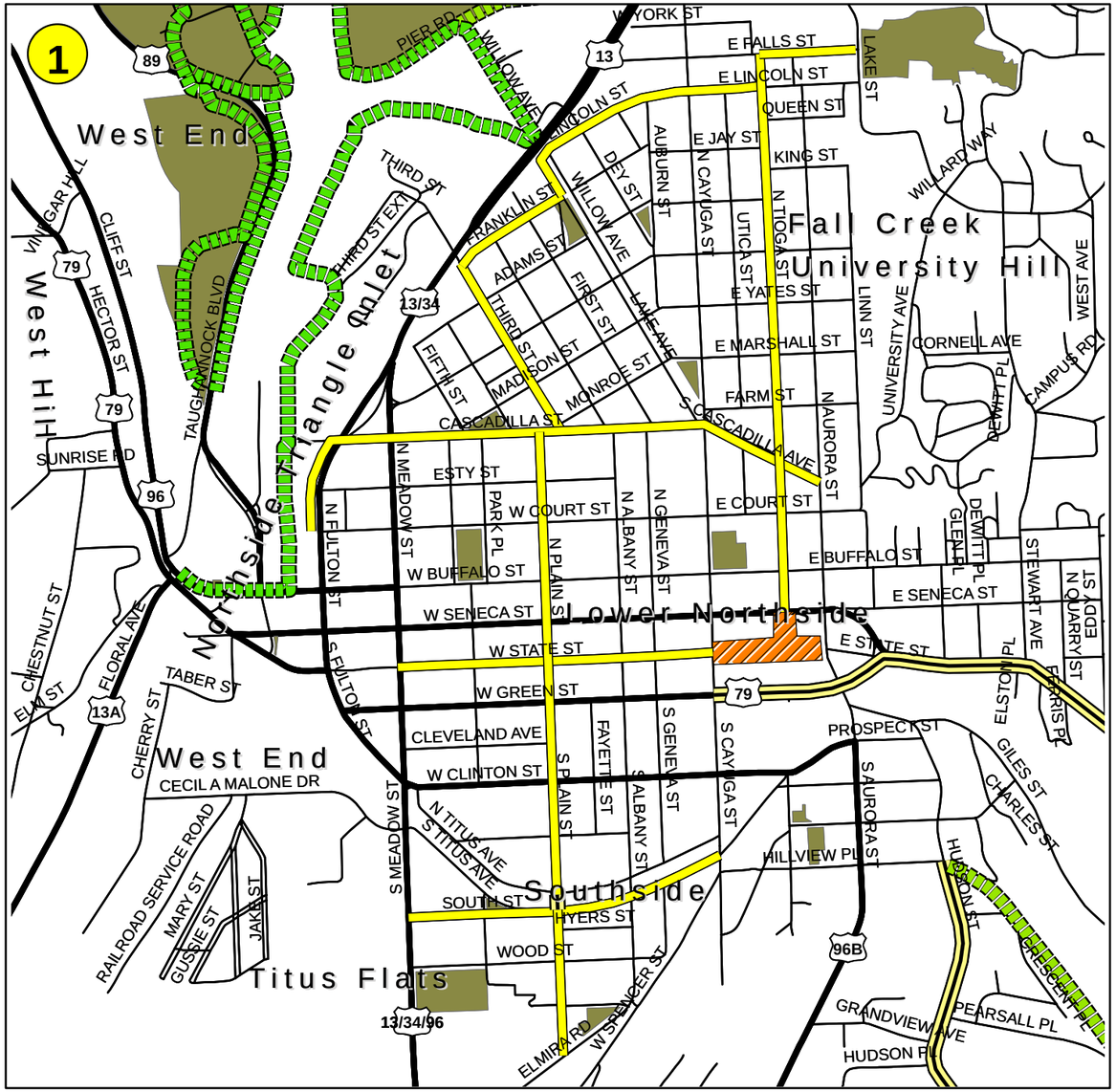
The ITCTC stands ready to provide continued to support to the City of Ithaca to identify and apply for funds. One likely non-local source is the TIP (Transportation Improvement Program). The TIP consists of federal transportation infrastructure dollars which are allotted by the New York State Department of Transportation to municipalities to according to regional transportation priorities identified by Metropolitan Planning Organizations (MPOs). ITCTC is the MPO for Ithaca and Tompkins County. Applications for the next round of TIP funding are expected in autumn, 2011.

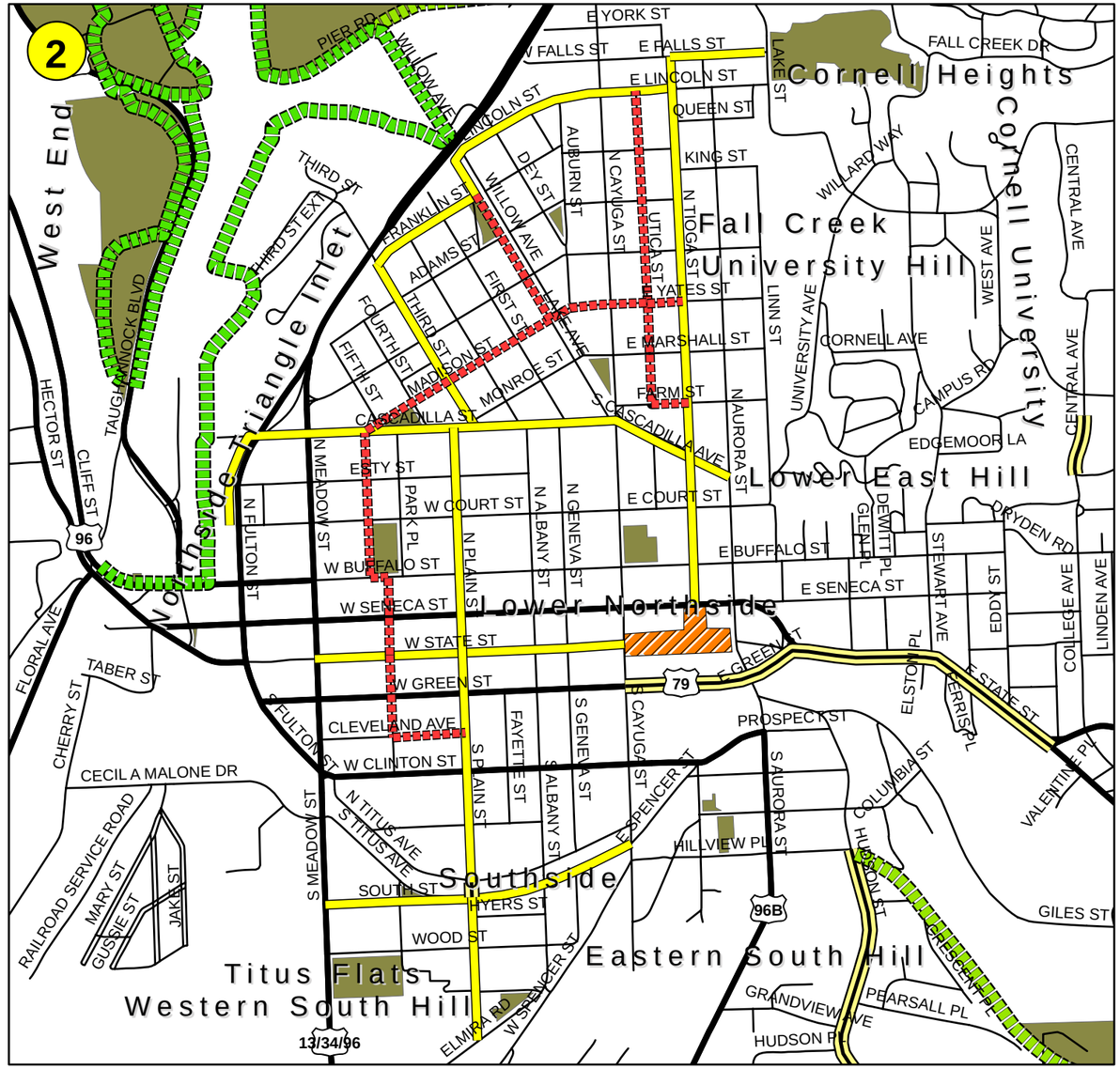
The cost estimates below are derived from a comprehensive list of proposed treatments (see Appendix A – Inventory of Proposed Treatments). Several factors influence the variability of the cost estimate including the quality of materials selected and the level of coordination with other physical improvements. This estimate does not include planning, engineering or maintenance costs or "soft measures" such as education.

		Low Estimate	High Estimate	Middle Estimate
TOTAL	**(Basic)**	**$283,625**	**$833,765**	**$558,695**
TOTAL	**(Plus)**	**$476,745**	**$1,271,765**	**$874,255**

OPTIONS

"Basic" and "plus" options were separated for cost-estimate purposes. The "basic" option entails the minimum physical improvements to create an *Ithaca Neighborhood Greenways* network. The "plus" option adds non-motorized only crossings, a new traffic signal, reducing the speed limit on neighborhood greenways to 25mph and several other enhanced treatments. Several phasing options are also described in the report. These options include the temporary trial installation of some treatments, piloting individual corridors, and a "basic" then "plus" sequence.





N

Legend

- Neighborhood Greenway
- Alternate Neighborhood Greenway
- Cayuga Waterfront Trail (Existing)
- Bike Lanes (Existing)
- Ithaca Commons
- Ithaca City Parks

Ithaca Neighborhood Greenways: Proposed Routes 1 and Proposed & Alternate Routes 2

Prepared by the Ithaca-Tompkins County Transportation Council - 8/11/10

0 1,500 3,000

Feet

Scale

Berkeley, CA - Streetfilms.org

Berkeley, CA - Streetfilms.org


Los Angeles, CA - Streetblog.org

Santa Rosa, CA - PressDemocrat

Boston, MA

Dave Parisi

Portland, OR – bikeportland.org

CHAPTER 1: INTRODUCTION AND BACKGROUND

The Ithaca Tompkins County Transportation Council (ITCTC) has initiated a study of the potential for a network of streets within the City of Ithaca to be developed as neighborhood greenways, or bicycle boulevards (as they are more commonly referred to in transportation planning literature). As the regional Metropolitan Planning Organization (MPO) for Tompkins County, ITCTC is charged with facilitating county-wide transportation planning and is responsible for working jointly and cooperatively with all transportation related agencies in Tompkins County to promote comprehensive intermodal transportation planning and provide transportation related information and analyses. This study supports the City of Ithaca's efforts to improve multi-modal transportation infrastructure. It offers a detailed draft plan for the development of a network of low-stress bicycle routes designed for casual cyclists to use safely and comfortably.

Four chapters summarize the study findings. The first chapter outlines the elements of the study process and summarizes the connection of the Ithaca Neighborhood Greenways concept to existing locally relevant plans and policies. Chapter Two provides a general overview of this type of transportation infrastructure including a definition and case for the use of the term "neighborhood greenway", its common elements and likely benefits, and a summary of who it is designed to serve. Chapter Three presents the meat of this report – a detailed description of recommended design treatments along six proposed Ithaca Neighborhood Greenway corridors. The final chapter offers a summary of costs, phasing options, and other implementation considerations. Several critical companions to this report are provided in the appendix, including a master list of proposed treatments with associated costs (Appendix A), and a copy of the *Bicycle Boulevard Planning and Design Guidebook* developed by Alta Planning and Design and Portland State University's Institute for Bicycle and Pedestrian Innovation (Appendix B).

The *Ithaca Neighborhood Greenways Study and Proposed Plan* addresses several main goals. Specifically, they are to:

- Enhance **community and traffic safety** by incorporating bicycle and pedestrian safety features near common community destinations and resources in the City of Ithaca.
- Enhance **neighborhood livability**.
- Enhance bicycle and pedestrian safety and comfort in the City of Ithaca in order to increase **transportation choice**.
- **Minimize loss of parking** and right of way needed for bicycle improvements.
- Add value to related transportation and community planning efforts.

STUDY PROCESS

Tom Knipe, Master of Regional Planning Student at Cornell University authored this study during a formal planning internship with the ITCTC from June to December 2010. The ITCTC coordinated closely with the City of Ithaca Office of the City Transportation Engineer. An ad-hoc steering committee provided additional support and consultation. Its members were:

- Fernando DeAragon, Executive Director, ITCTC
- Tom Mank, Planning Analyst, ITCTC
- Tim Logue, City of Ithaca Transportation Engineer
- Kent Johnson, City of Ithaca Jr. Transportation Engineer
- Rick Manning, independent planning consultant
- Lois Chaplin, Cornell Local Roads program

In addition to consultation with the steering committee, the author reviewed planning and design literature on bicycle boulevards, in particular the guidebook, *Fundamentals of Bicycle Boulevard Planning and Design.* The IBPI Guidebook (as it will be referred to in the rest of this document) is recognized as the definitive resource in the United States in bicycle boulevard design and planning. The author also reviewed relevant academic literature on bicycle and pedestrian infrastructure, along with local plans and policies having a direct bearing on this topic.

In June and July 2010, Tom Knipe recorded existing street conditions by riding a bicycle along all proposed and alternate neighborhood greenway corridors. He identified optimal routes and logged current obstacles and opportunities to achieve neighborhood greenway designation. In addition, ITCTC collected data performed GIS analysis and mapping on bicycle and pedestrian crash incidence, average annual daily traffic counts (AADT) on City of Ithaca streets, Census and American Community Survey information on age, population and means to work, etc.

The study author and ad-hoc steering committee participated in several formal and informal trainings and seminars on bicycle boulevards. First, the full committee took part in an August 2010 Association for Pedestrian and Bicycle Professionals (APBP) webinar on the topic of neighborhood greenways / bicycle boulevards presented by Mia Birk, CEO of Alta Planning & Design and Greg Raisman, Traffic Safety Specialist for the City of Portland, Oregon. Raisman, who leads the public outreach process associated with the expansion of neighborhood greenways in Portland, also made himself available for a follow up phone interview with the study author. Tom Knipe also participated in a bicycle boulevard breakout session at the September 2010 National Pro-Walk/Pro-Bike Conference in Chattanooga, Tennessee. Bicycle coordinators for the three American cities with the historically most highly developed bicycle boulevard systems - Roger Geller (City of Portland, OR), Tom Thivener (City of Tucson, AZ) and Eric Anderson (City of Berkeley, CA) – presented lessons learned.

Finally, on Saturday November 20th 2010, two nationally known experts in non-motorized transportation offered lectures on bicycle boulevards / neighborhood greenways at the Tompkins County Library in Ithaca as part of a three-day symposium organized by the

Organization of Cornell Planners and co-sponsored by the ITCTC. The symposium was entitled: *Moving Forward: An Active Transportation Symposium*. Sixty community members learned from Mia Birk and Jennifer Dill, the researcher behind a study demonstrating the efficacy of bicycle boulevards in Portland, Oregon. Following the presentations, attendees had the opportunity to provide feedback on a draft of this proposed plan. A detailed description of this feedback process and a response to attendee feedback is included as Appendix D. Videos of the lectures are available online at: http://www.cornell.edu/video/?videoid=1084

CONNECTION TO EXISTING PLANS AND POLICIES

The concept of enhanced bicycle and pedestrian infrastructure in the City of Ithaca through the development of a network of bicycle boulevards or neighborhood greenways draws considerable support from existing plans and policies. Several of these were reviewed in developing the *Ithaca Neighborhood Greenways Proposed Plan*, including the Ithaca Bicycle Plan, the Tompkins County 2020 Climate Action Plan, the Tompkins County 2030 Long-Range Transportation Plan, the Downtown Ithaca Alliance 2020 Strategic Plan, recommendations developed by the City of Ithaca Office of the City Engineer and federal transportation policy. A description of relevant findings follows.

CITY OF ITHACA BICYCLE PLAN

The Ithaca Bicycle Plan was adopted by the City of Ithaca Common Council in 1997. It was developed on behalf of the City of Ithaca Planning and Development Board by professional consultants and a thirteen-member client committee and was the result of extensive study and public involvement. The plan was partially driven by an opportunity to use $80,000 in federal ISTEA grant funding for bikeway improvements. The plan identified several benefits of improved bikeway facilities including: reduced traffic congestion, reduced traffic speed from traffic calming measures, less competition for automobile parking, reduced air pollution and noise associated with automobiles, health benefits for bikeway users, a safer pedestrian environment, and enhanced tourist amenity.

The 1997 Ithaca Bicycle Plan places primary emphasis on the installation of bicycle lanes on higher-traffic collector streets and arterials. Since adoption, a small portion of the on-street bicycle infrastructure called for in Phase One has been implemented (including bicycle lanes on East State Street, Hudson Street, and Thurston Avenue). Unresolved community and political disagreement over the removal of on-street parking to accommodate bicycle lanes was a significant factor preventing implementation of most of the proposed routes.

Despite difficulties in implementing bicycle lanes in Ithaca, the plan provides valuable background information, a toolbox with infrastructure options, policy recommendations and a summary of possible education and encouragement programs. As the City of Ithaca's formal bicycle plan, it offers a record of the public commitment to the provision of bicycle facilities. Notably, it also recommends the development of bicycle boulevards in the City of Ithaca as a long-term strategy.

TOMPKINS COUNTY 2020 CLIMATE ACTION PLAN

In order to track progress in meeting the County's greenhouse gas emissions reduction goal of 80% reduction by 2050, the Tompkins County Planning Department has developed a strategy to achieve the first 20% reduction in emissions by 2020. One of the new local measures called for in its July, 2010 report – *Interim Actions Toward Achieving the Community 2050 Greenhouse Gas Emissions Reduction Goal* – is a Transportation Demand Management (TDM) program. The first local TDM initiative on this list is the development of bicycle boulevard network in the City of Ithaca.

"Key TDM Initiative #1: Identify and promote one north-south and one east-west "bike boulevard" in the City of Ithaca to address safety concerns and promote more widespread bicycle use. "

- TOMPKINS COUNTY 2020 CLIMATE ACTION PLAN

TOMPKINS COUNTY 2030 LONG-RANGE TRANSPORTATION PLAN

An updated long-range transportation plan (LRTP) for the Ithaca metro region was adopted by the Ithaca-Tompkins County Transportation Council in December 2009. An Ithaca Neighborhood Greenways project demonstrates promise to help achieve several of the objectives established by the plan. Support for the related objectives would help achieve the goals of integration, connectivity, quality of life and environment identified by the LRTP.

INTEGRATION

Objective C: "Continue development of an integrated multi-modal transportation system, including public transit, bicycle and pedestrian facilities and networks, infrastructure and operations planning, construction and maintenance practices."

Objective K: "Promote benefits of walking and bicycling, including participation in promotional activities to encourage the increased use of walking and bicycling as modes of transportation."

CONNECTIVITY

Objective B: "Improve the existing and proposed road network to safely accommodate bicycling, pedestrian and transit uses."

QUALITY OF LIFE

Objective E: "Support efforts to address the special needs of the growing elderly population in Tompkins County."

Objective K: "Promote infrastructure designs that are sensitive to local environmental issues and preserve or enhance scenic beauty."

ENVIRONMENT

Objective C: "Support the development of a transportation system that is responsive to changes in energy availability. "

DOWNTOWN ITHACA ALLIANCE 2020 STRATEGIC PLAN

The core transportation-related strategies of the Downtown Ithaca Alliance's 2020 Strategic Plan (adopted August, 2010), along with several specific action items identified in the plan relate to the Ithaca Neighborhood Greenways concept. They are listed below:

Strategy 1.0: "Explore alternative transportation options for moving people into and out of downtown Ithaca."

Strategy 2.0: "Maintain and enhance existing transportation routes into and out of downtown."

Action 1.1: "Work to expand opportunities for bicycle commuting, including providing adequate public bike storage and shower facilities/opportunities."

Action 1.15: "To aid in pedestrian movement, there should be better highlighting and distinguishing of downtown cross walks."

Action 2.4: "Create better pedestrian routes from downtown into the adjacent neighborhoods, including widening sidewalks and creating bump out sidewalks at intersections to improve pedestrian safety, slow vehicles, and encourage more walking and biking."

Action 2.5: "Work with the City in ways to slow down vehicular traffic in downtown, to reduce the likelihood of accidents and to promote increased walking and biking."

CITY TRANSPORTATION ENGINEER RECOMMENDATIONS

The Office of the City Transportation Engineer for the City of Ithaca supports the concept of bicycle boulevards for Ithaca. Several internal memos since 2008 demonstrate that the Office of the City Traffic Engineer has given consideration to a possible bicycle boulevard network. One of these memos is a draft proposal for a pilot bicycle boulevard project along North Tioga St.

"A key element in the City's five-year Bicycle Network Improvement Plan is the development of bicycle boulevards on eight City-owned streets (N. Tioga St, Cascadilla Ave, Cascadilla St., Third St, Plain St., W. State St., S. Titus Ave. and South St.)"

- BICYCLE BOULEVARD NETWORK PROPOSAL, OFFICE OF THE CITY ENGINEER, CITY OF ITHACA (INTERNAL DRAFT MEMO, DECEMBER, 2008)

The City of Ithaca also has recent experience with the successful installation of shared lane markings or "sharrows" along Cayuga St, whereby "City staff gained a greater understanding of the design nuances associated with this marking and the public was exposed to this, now standard, marking." (City of Ithaca Shared Lane Markings Project Report #4). This is a valuable finding, as pavement markings generally are a key element of bicycle boulevard / neighborhood greenway design.

FEDERAL POLICY

Federal legislation officially recognizes bicycling and walking as modes of transportation. The 1998 Federal Transportation bill, Transportation Equity Act for the 21st Century (TEA-21), states that "bicyclists and pedestrians shall be given due consideration in the comprehensive transportation plans developed by each metropolitan planning organization." Three sections of the bill stipulate that transportation plans and programs must "provide for the development and integrated management and operation of transportation systems and facilities, including pedestrian walkways and bicycle transportation facilities" (SMTC, University Hill Study). The 2005 transportation bill, SAFETEA-LU (Safe, Accountable, Flexible, Efficient Transportation Equity Act – A Legacy for Users) provides a 30% increase in funding for bicycle-related projects (from $3 billion to $4 billion), and establishes the Non-motorized Transportation Pilot Project and Safe Routes to School program (SAFETEA-LU).

In addition, the goals of the *National Bicycling and Walking Study*, produced by the Federal Highway Administration, are to double the current percentage of total trips made by bicycling and walking while simultaneously reducing the number of bicyclists and pedestrians killed or injured in traffic crashes by ten percent. In order to meet these goals, "coordinated and committed effort must be put forth at every level of government" (SMTC, University Hill Study).

Finally, Ray LaHood's (US Secretary of Transportation's) recent policy statements manifest an increase in the Obama administration's support for walking and cycling.

"The DOT policy is to incorporate safe and convenient walking and bicycling facilities into transportation projects. Every transportation agency, including DOT, has the responsibility to improve conditions and opportunities for walking and bicycling and to integrate walking and bicycling into their transportation systems. Because of the numerous individual and community benefits that walking and bicycling provide — including health, safety, environmental, transportation, and quality of life — transportation agencies are encouraged to go beyond minimum standards to provide safe and convenient facilities for these modes"

- UNITED STATES DEPARTMENT OF TRANSPORTATION POLICY STATEMENT ON BICYCLE AND PEDESTRIAN ACCOMMODATION REGULATIONS AND RECOMMENDATIONS (MARCH, 2010)

CHAPTER 2: DEFINING NEIGHBORHOOD GREENWAYS

"A low traffic volume and low-traffic-speed street where bicycles, pedestrians and neighbors are given priority"

- CITY OF PORTLAND, OR - BICYCLE BOULEVARD DEFINITION

Neighborhood greenways share key characteristics with bicycle boulevards. A bicycle boulevard is a roadway that has been modified to enhance bicyclists' safety and convenience. It provides better conditions for bicycles while maintaining the neighborhood character, local motor vehicle access and necessary emergency vehicle access. Bicycle boulevards in some cities are intended to serve as the city's primary bikeways, or "bike arterials"; in other cities, they parallel other types of nearby facilities, such as bicycle lanes, and offer a lower-stress environment for cyclists. In the core area of the City of Ithaca, given an inherent paucity of space on city streets for separated facilities such as bicycle lanes, cycle tracks or bicycle paths, bicycle boulevards would serve as the backbone of the bikeway network, providing safe, direct, and convenient routes across the city.

On a bicycle boulevard, bicycle safety and circulation are improved compared to other streets by creating (or in many cases already having) one or more of the following conditions:

- Low traffic volumes and speeds.
- Discouragement of non-local motor vehicle traffic.
- Free-flow travel for bikes by assigning the right-of-way to the bicycle boulevard at intersections where feasible.
- Traffic control to help bicycles cross major streets (arterials).
- A distinctive 'look and feel' so that cyclists become aware of the existence of the bicycle boulevard and motorists are alerted that the roadway is a priority route for bicyclists.

The specific design of each bicycle boulevard differs, depending on the street characteristics, the desires of the surrounding residents and businesses, and available funds. Still, all bicycle boulevards include five basic elements. These will be described in detail in Chapter Three and are: 1) traffic calming, 2) signage & markings, 3) prioritization of travel, 4) intersection crossing treatments and 5) traffic reduction. No single element alone, such as traffic calming, makes a bicycle boulevard. Bicycle boulevards should be designed with extensive public input, including from neighbors, businesses, bicyclists, disabled citizens, and the City's emergency service providers (IBPI Guidebook, 2009). The location of fire stations and ambulance dispatch will affect the location of any traffic calming devices or other treatment along bicycle boulevards. The needs of all user groups must be taken into consideration as much as possible in the design phase (Birk and Raisman APBP webinar, 2010 and City of Berkeley, Bicycle Boulevard Design Guidelines).

A name is important. Bicycle boulevards have been implemented in over a dozen cities in the United States in the past decade and the term has become adopted into the transportation planning lexicon. *Neighborhood Greenway* is a new term developed by the City of Portland Oregon Bureau of Transportation (PBOT), which renamed its bicycle boulevards as neighborhood greenways in the spring of 2010. There were two reasons for the name change. First, PBOT felt that "bicycle boulevard" did not appropriately capture the full picture of neighborhood benefits of this type of infrastructure. They wanted the name to intrinsically include the benefits of walkability, place-making and community building (Raisman, quoted by BikePortland.org). Second, PBOT started working with the water and sewer bureau on integrating traffic calming and storm water management features through Portland's *Green Streets* program. *Green Streets* is a sewer and water bureau program to reduce runoff from streets by treating storm water onsite in infiltration beds built right into the city's streets. Partial funding for a proposed 300 mile expansion of the neighborhood greenway network in Portland came directly from integrating traffic calming features (required for neighborhood greenway expansion) into the *Green Streets* program. PBOT staff discuss neighborhood greenways in a StreetFilms.org video released in November, 2010 entitled: "Portland's Bicycle Boulevards become Neighborhood Greenways".

> *"People have started asking for bike boulevards in their neighborhood because they want safer, more bike and pedestrian friendly streets -- no matter what we call them." It's not just cyclists who benefit from this…its everyone."*

- KYLE CHISEK, PORTLAND BUREAU OF TRANSPORTATION, REFERRING TO THE NAME CHANGE (QUOTED BY MAUS, BIKEPORTLAND.ORG, 2010)

Consider how the name *Neighborhood Greenway* enhances the bicycle boulevard concept for Ithaca:

- The values of pedestrian amenity, neighborhood livability and community building are inherent in the name *Neighborhood Greenway.*
- *Neighborhood Greenways* call out opportunities for adding attractive green features and green infrastructure systems in neighborhoods through the incorporation of planters, swales for in-street storm water management, street trees and pocket parks.
- *Neighborhood Greenways* link several of the city's important green spaces to each other and to the rest of the city. These include the Cayuga Waterfront Trail, Stewart Park, Cass Park, Ithaca Falls, neighborhood parks and Ithaca's renowned creeks and gorges (Fall Creek, Cascadilla Creek, and Six Mile Creek).
- *Neighborhood Greenways* invite all city residents and visitors, not just people who currently identify themselves as cyclists, to engage in creating a community definition of the value of a linked network of traffic-calmed, non-motorized priority streets.
- Neighborhood Greenways invites the re-envisioning of public streets in neighborhoods as a place for people to play and be physically active.
- *Neighborhood Greenways* avoid the potential for an unnecessary dichotomy of "cars versus bikes" through the use of the potentially confusing term bicycle boulevard. They imply a calm

and inviting corridor for all modes and invite bicycles, pedestrians and motorists to safely and calmly co-exist along designated corridors.

- *Neighborhood Greenways* advance the green benefits of increased walking and cycling for transportation including clean air and CO2-emission reduction.

Neighborhood greenways should not be confused with traditional greenways, which focus primarily on linking to green spaces. The use of the term neighborhood greenway in this report refers to the shared-use bicycle infrastructure type more typically known in the transportation field as a bicycle boulevard.

INFRASTRUCTURE IMPROVEMENTS

Many of the proposed *Ithaca Neighborhood Greenways* already have some of the qualities described above for creating a bicycle boulevard. What infrastructure improvements would be required to create a network of bicycle boulevards in Ithaca? We can draw from five basic design elements: 1) traffic calming, 2) signage and markings, 3) prioritization of travel, 4) intersection/crossing treatments, and 5) traffic reduction. Again, Chapter Three will discuss these at length.

Ithaca is well-suited for these types of infrastructure improvements. First, Ithaca already has a number of traffic calming features including street trees, sidewalks, crosswalks, patterned street surfaces, raised intersections, curb extensions, mini-circles, and speed tables. These can be expanded and complemented to support an integrated network of calmed streets across the flat areas of the city. Second, a 30-mile per hour speed limit is in place on all city streets and some areas already have lower speed limits or advisory speeds (10, 15 or 20 mph). Notably, state law would also allow the City to post 25 mph speed limits along specific corridors. Third, a dense, well-connected grid street pattern makes it easy for car traffic to use alternate corridors for through-travel. If carefully planned and designed, the prioritization of travel for pedestrians and cyclists along bicycle boulevard corridors will be unlikely to negatively impact access for other vehicles. Fourth, crossing treatments at several key intersections along the proposed network (3rd & Hwy 13, Dey & Highway 13, Plain & Green, and Plain & Seneca) are planned and funded.

Finally, conditions in Ithaca support emphasizing bicycle boulevards as a primary strategy for bicycle infrastructure development. Efforts in Ithaca to implement a complete network of bicycle lanes – a strategy identified in the 1997 Ithaca Bicycle Plan - have been unsuccessful to date. The development of a bicycle boulevard / neighborhood greenway network does not preclude or replace the need for additional types of bicycle and pedestrian infrastructure such as bicycle lanes on higher-volume streets, additional off-street paths, bicycle parking, but most City of Ithaca streets were built 100+ year ago and are too narrow to accommodate bicycle lanes without removing on-street parking on one side of the street. On-street parking would not be removed to implement this plan, except in limited circumstances.

NEIGHBORHOOD GREENWAYS SERVE EVERYONE

Based on other US cities' experience with bicycle boulevard development, the *Ithaca Neighborhood Greenways Proposed Plan* holds the potential to attract a number of natural supportive constituencies, (including transportation advocates, public health advocates, and citizens and groups interested in encouraging sustainability and livability), as well as those who will express opposition. As Mia Birk reminded attendees of the November 20th Ithaca Neighborhood Greenways event at the Tompkins County Library, change is hard, and one needs to expect that there will be some community concern. As noted in the opening section of this report, the proposed network has been designed with the intent to mitigate negative community impacts by minimizing parking removal and preserving a functional grid street pattern.

The proposed physical improvements hold the potential to serve a broad spectrum of the public. 44% of City of Ithaca residents live within ¼ mile of the neighborhood greenway network proposed by this study (Census 2000, ITCTC GIS analysis). Since ¼ mile is considered an easy walking distance, the vast majority of city residents would have easy access to the network. Let us highlight the specific ways that different user groups are served:

- **Families with children of all ages.** 15% of people living within ¼ mile of a proposed Ithaca Neighborhood Greenway are children 17 or under (2000 Census).

- **School-aged children.** Three elementary schools (Fall Creek, Beverly J. Martin and Immaculate Conception) and two high schools (Ithaca High School and New Roots Public Charter School) are within ¼ mile of the proposed network. Boynton Middle School is a short distance beyond Ithaca High School along a separated off-street path.

- **People who are interested in using a bicycle more** for transportation, but do not currently ride due to safety concerns. A widely-accepted classification of four types of cyclists developed by Portland, Oregon bicycle coordinator Roger Geller demonstrates that 60% of the population does not currently regularly ride a bicycle for transportation, but would be interested in trying cycling if safety and comfort concerns can be addressed.

- **Seniors.** 13% of residents within ¼ mile of a proposed Ithaca Neighborhood Greenway are 65 or older (2000 Census, ITCTC). Safe bicycling and pedestrian facilities allow enhanced senior mobility, which is critical to supporting aging in place.

- **Transit users.** Most transit users walk or bike to access transit. In Ithaca, TCAT busses are equipped with bicycle racks, and over 30 bus lines pass through the study area. Providing better cycling and walking access to transit stops and better intermediate links via neighborhood greenways will enhance the transit user experience.

- **Women**. According to a recent GPS-based study of cyclist behavior and infrastructure choice, "women are less likely than men to try on-street bike lanes and more likely to go out of their way to use bike boulevards" (Dill, 2009). This study also showed that women diverted from the shortest routes more often to take advantage of bicycle boulevards or off-street paths. Behavioral research about relative levels of risk-avoidance points to the reasons for this difference between men and women (Scientific American, 2009).

- **Motorists.** Bicycle infrastructure expansions in other cities (Portland Traffic Safety Report, 2009 and NYC Pedestrian Study and Action Plan, 2009) have correlated directly with reductions in injuries and fatalities for all roadway users, including motorists and pedestrians. Also, more

people choosing bicycles for more trips (especially trips taken during peak travel periods like work commute and school commute trips) may translate to fewer cars, which may translate to less peak-hour congestion and less competition for parking

- **Pedestrians.** Over 40% of City of Ithaca residents walk to work. Neighborhood greenways would further enhance the City's excellent walking environment.

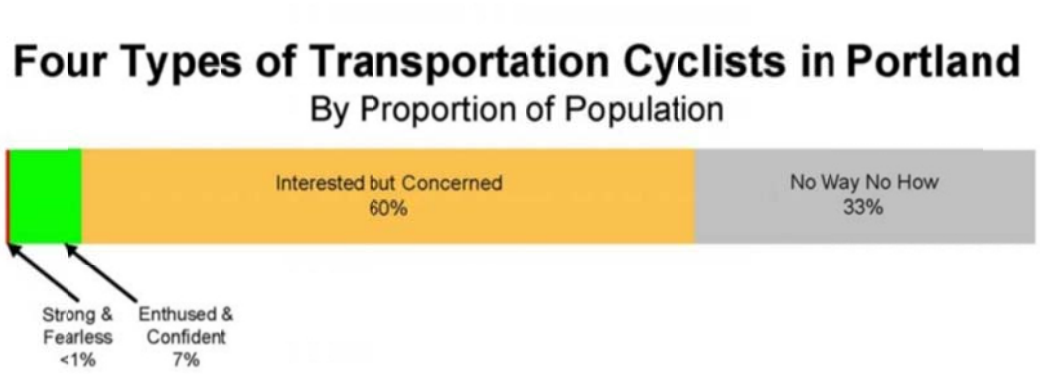
- **Business owners**. Increased accessibility to downtown Ithaca, the West State St. commercial corridor, and the southwest Ithaca retail area along with increased tourist amenity for the entire city may have a positive effect on retail sales.

- **Taxpayers.** Neighborhood greenways are a significantly more affordable to build per mile than separated facilities such as off-street bicycle paths or cycle tracks (in-street bicycle lanes separated from motor vehicle traffic by a buffer), but may provide a similar level of amenity.

DESIGN USERS

Who in particular is the target audience for Neighborhood Greenway design? In other words, who are the "design users"? Neighborhood Greenways create a bicycle and pedestrian priority environment on the street. Special consideration in neighborhood greenway design is given to children, seniors, and disabled people, all of whom have special traffic safety needs. For instance, children have 30% less peripheral vision than adults and poor judgment of oncoming speed and seniors and disabled people may have hearing limitations and slower movement (Birk & Raisman, 2010). Notably, these groups also often rely more on non-motorized transportation than other groups.

Neighborhood Greenways are also designed to serve non-confident, casual or "interested but concerned" cyclists. City transportation officials specializing in bicycle transportation have developed a typology of four basic types of cyclists (Geller, 2009). The four categories include: 1) a "strong and fearless" group who will ride no matter the conditions for cycling, 2) an "enthused and confident" group who will ride if given basic accommodations such as bicycle lanes, 3) an "interested but concerned" group for whom a perceived lack of safety is a significant barrier, and 4) a "no way – no how" group (Geller, 2009). The percent of the population fitting within any of the four groups may vary according to a community's demographic and other characteristics. 60% is commonly cited as the percent of people in the "interested by concerned" group. 33% are in the no-way-no-how group, 7% in the confident group, and less than 1% in the fearless group" (Geller, 2009). The "interested but concerned" people do not currently ride bicycles for transportation. By offering safe, comfortable, easily identifiable and contiguous bicycle routes, neighborhood greenways hold strong potential interested to serve "interested but concerned" cyclists.



- ROGER GELLER, 2009

To attract "interested but concerned" cyclists, bikeway design should reduce cyclist stress. In his 2008 study of on-road bicycle facilities for children and other non-confident cyclists (so-called "easy riders") Peter Furth identifies stress mechanisms for cyclists including overtaking traffic, parking turbulence and right turning traffic (Furth, 2008). He develops speed, volume, lane width and parking criteria to identify conditions that are unacceptable, and proposes several design ideas to reduce stress. Key ideas from the paper which may inform neighborhood greenway design in Ithaca include limiting the speed differential between cars and bikes to less than 15 miles per hour by reducing average car speed to less than 25 mph, using colored pavement in conflict areas and improved signalization.

> *"Easy rider facilities have to be safe both objectively and subjectively, protecting cyclists from both stress (perceived danger) and hazard (objective danger)"*

- FURTH, 2008, PG. 8

To increase bicycle mode share in the City of Ithaca, bikeway improvements would do well to focus on children, seniors, the disabled and non-confident or "interested but concerned" cyclists as the "design users" of neighborhood greenways. This infrastructure is also very useful and attractive to other users, such as more confident cyclists (Dill, 2009 and IBPI Guidebook, 2009).

POTENTIAL BENEFITS OF NEIGHBORHOOD GREENWAYS

This study identifies several categories of potential benefits of neighborhood greenways: safety, economy, fiscal responsibility, health, environment and livability. This section reviews evidence for these potential benefits, many of which rely on an increase over time in the percentage of trips being taken by bicycle vs. other modes. Replacing even a small portion of short trips that are currently made by car with bicycle or walking trips is likely to result in significant community benefits.

The City of Ithaca enjoys a very high percentage of people who walk to work – 41% (2010 Census). The bicycle mode share for trips to work is relatively low – approximately 2.3% (2010 Census). This represents an increase since 2000 census when the figure was 1.8% (2000 Census). National figures show work trips account for just 17% of all trips (NHTS, 2001), so the census figures may not accurately represent the total bicycle mode share. Still, these are the best estimates for Ithaca.

Nationally, 40% of all trips (by all modes) are less than two miles long (NPTS, 1995). In the City of Ithaca, this percentage may be much higher given the compact nature of the "downtown" area of the city. Two miles is an easy cycling distance. Indeed, one recent international walking and cycling literature review aimed at identifying potential government policies for increasing walking and cycling found that "based on findings from other successful cycling environments, there is a strong market for trips less than 2.5 kilometers" (Krizek and Forsyth, 2009). A person traveling at a leisurely biking pace of 12 miles per hour will take 10 minutes to travel two miles. In addition, evidence suggests that for these types of short trips, cycling is "time-competitive" with the automobile (Dill, 2009).

No study now comprehensively evaluates the impact specifically of neighborhood greenways / bicycle boulevards on bicycle or pedestrian mode share, but evidence points towards the effectiveness of bicycle boulevards at increasing cycling. First, as clearly stated in two recent comprehensive literature reviews, cities with more bicycle infrastructure in general have a higher bike mode share (Pucher, Dill and Handy, 2010; Krizek and Forsyth, 2009). Second, Jennifer Dill's 2008 GPS-based study of infrastructure and travel behavior in Portland, OR showed that "well-connected low-traffic streets, bicycle boulevards, and separate paths may be more effective than bicycle lanes on busy streets at getting more women and new adults bicycling" (Dill, 2008 pg. 3). Dill's findings also indicate that cyclists in general"use and value" bicycle boulevards.

In addition, a 2009 survey-based study of resident perceptions along a bicycle boulevard in Portland Oregon found that in general "living on a bicycle boulevard makes residents more likely to bike" (VanZerr, 2009, pg. 13).

> *"39 percent of the residents that did not self-select to move to the bicycle boulevard reported biking .52 days per week more on average. This finding indicates that designating bicycle boulevards in existing residential neighborhoods may have the ability to encourage some of the existing residents to bicycle more, as opposed to only those new residents that "self-select" to move into the community."*
>
> - MARIAH VANZERR, RESIDENT PERCEPTIONS OF BICYCLE BOULEVARDS: A PORTLAND, OREGON CASE STUDY, 2009

Another research project promises to shed further light on the specific impacts of bicycle boulevards on travel behavior. Dill with the Oregon Transportation Research and Education Consortium (OTREC) is launching an examination of impacts of new bicycle boulevard development on the levels of bicycling, physical activity, and health among the 'four types of cyclists' through a "longitudinal panel study of families living near bicycle boulevards" (OTREC).

ENHANCED SAFETY

The conditions that improve multi-modal transportation improve safety for everyone - speed reduction, less DUI, better compliance with traffic rules, and better organization of modes (Birk and Raisman, 2010). Evidence for this relationship is particularly strong in Portland, Oregon – where there is a significant inverse correlation between multi-modal transportation infrastructure investments and safety for all road users: cyclists, pedestrians and motorists.

Recent evidence from New York City demonstrates similar trends for cyclists. Bicycle infrastructure expansion there correlates with double digit percentage increases in cycling over the past several years. This in turn has correlated with the number of injuries to cyclists being cut almost in half between 1998 and 2009 (Steuteville, 2010).

Why have overall cycling injuries gone down as the rate of cycling has increased in New York and Portland? One explanation may come from a 'safety in numbers' effect, identified by Peter Jacobsen in a convincing 2003 study in the journal Injury Prevention. "Jacobsen found that when bicyclists (or pedestrians) become numerous, motorists adjust their behavior. They drive more carefully. Policies that increase the number of people walking or biking pay off in greater safety" (Steuteville, 2010).

> *"The safety benefits of bicycle boulevards are likely to be derived primarily from traffic calming and traffic reduction design features. Although the safety benefits specifically attributed to bicycle boulevards have yet to be studied, the safety benefits of traffic calming are well documented to reduce both the frequency and severity of collisions.*
>
> *The same conditions that make a street safe for cycling create safer conditions for all roadway users regardless of travel mode. Lower motor vehicle speeds translate into greater motorist reaction time, potentially allowing collisions to be avoided in the first place. A lower speed (between 16-31 mph) also means that if pedestrians or cyclists are involved in a collision with a motor vehicle, they less likely to be fatal[3].*
>
> *One study, conducted to determine if there are quantifiable collision reduction benefits of traffic calming, found that when several traffic calming treatments were employed as part of a single plan (similar to what may occur on a typical bicycle boulevard design), an average 65% reduction in collisions were reported."*

- IBPI GUIDEBOOK, PG 52

Traffic speed reduction is an important component of bicycle boulevards. Decreasing traffic speed enhances safety for all roadway users. In a Recent British Journal of Medicine article evaluating the impact of 20 mph zones in London, England (Grundy et al, 2009), 20 mph areas were associated with a 42% decrease in all crash activity, and a 46% decrease in serious injury & fatal crashes. Another finding is particularly notable. The biggest decrease in pedestrian crashes was for children under the age of 15. The study also showed a significant decrease in motor vehicle crashes.

The City of Berkeley's Bicycle Boulevard design guidelines (Berkeley Bicycle Boulevard design guidelines, Chapter 5) and the Institute for Transportation Engineer's guide to traffic calming by Reid Ewing both offer excellent review of how traffic calming reduces speeds.

OTHER POTENTIAL BENEFITS

ECONOMIC BENEFITS:

Ithaca Neighborhood Greenways hold the potential to support 'place marketing' and tourism initiatives for downtown Ithaca and Tompkins County. They enhance access to downtown businesses and retail centers along West State Street and in Southwest Ithaca, and they provide these areas with a

competitive advantage compared to retail centers outside the City of Ithaca which are not as accessible by bicycling and walking.

Ithaca Neighborhood Greenways support increased housing density in downtown Ithaca by supporting the viability of cycling and walking as primary modes of transportation. This is a primary development strategy promoted by the Downtown Ithaca Alliance (DIA). Together with transit, car sharing and ride sharing, increased cycling and walking may open opportunities for car-free housing strategies in the downtown area.

Several studies have found that urban greenways are likely to enhance property values, and at the very least they do not decrease property values (Lindsey et al, 2004). Neighborhood greenways may also hold the potential to mitigate costly traffic congestion as behavior changes over time. Also, as a 'non-invasive' strategy, *Ithaca Neighborhood Greenways* could achieve these gains without significant disruptions of current traffic realities and parking needs.

Recent evidence from a case study of the relative economic impact of several different stimulus-funded transportation investments in Baltimore Maryland also suggests that non-motorized transportation improvements provide more jobs than traditional roadway improvements (Garrett-Peltier, 2010). The researchers from the Political Economy Research Institute compared different types of transportation projects using an IMPLAN-based input-output model. US Secretary of Transportation Ray LaHood touted this study in a recent statement on his official blog.

> *"This week, a coalition of bicycling advocates introduced me to a new report showing that in Baltimore, MD, pedestrian and bicycle projects created nearly twice as many jobs per dollar spent than traditional road projects.*
>
> *That report was followed last week by a survey released by the Centers for Disease Control and Prevention indicating widespread public support--67 percent--in America's cities for street design activities that increase physical activity.*
>
> *"Putting the two studies together creates a powerful argument for continuing the Department of Transportation's support for bicycle and pedestrian infrastructure projects. Even as these investments increase mobility, they also generate economic growth. And, people are demanding them for their communities"*

- SECRETARY RAY LAHOOD, JANUARY 13, 2011 BLOG, "NEW DATA ADDS JOB CREATION TO THE MANY BENEFITS OF BICYCLE INFRASTRUCTURE"

The 2009 report by the League of American Cyclists entitled *The Economic Benefits of Bicycle Infrastructure Investments* provides additional details on the evidence of economic benefits of increased cycling/infrastructure.

FISCALLY SOUND INVESTMENT

Neighborhood greenways offer a high value for public dollars. In addition to supporting existing investments in transit, they cost much less than other separated bicycle facilities like cycle tracks and off-street paths. Of course, they also cost much less than auto-oriented infrastructure development. A basic cost-per-mile of comparison illustrates:

- $60 million for one mile of urban freeway (Birk and Raisman, 2010)

- $2.75 million for one mile of cycle track (Birk and Raisman, 2010). Cycle tracks are an in-street separated bicycle facility.
- $0.25 million for one mile of Ithaca Neighborhood Greenway.

HEALTH, ENVIRONMENT, LIVABILITY

Neighborhood greenways hold the potential to enhance community health by increasing access to walking and bicycling. If total combined walking and bicycling mode share can indeed be increased, what would be the health impacts for Ithaca residents? Although not dealing directly with the question of increasing bicycle mode share, a recent literature review of the health impacts of cycling reveals that "the combined evidence presented in studies (which have measured the effects of bicycling on physical activity, obesity rates, cardiovascular health, and morbidity) indicates that the health benefits of bicycling far exceed the health risks from traffic injuries, contradicting the widespread misperception that bicycling is a dangerous activity" (Pucher, Dill and Handy, 2010). This literature review also comments on an important reason for an increase in government interest in bicycling infrastructure investments: "perhaps due to the increasing evidence of the health benefits of bicycling, many government agencies and public health organizations have explicitly advocated more bicycling as a way to improve individual health as well as well as reduce air pollution, carbon emissions, congestion, noise, traffic dangers, and other harmful impacts of car use" (Pucher, Dill and Handy, 2010).

CHAPTER 3: A POTENTIAL NETWORK FOR ITHACA

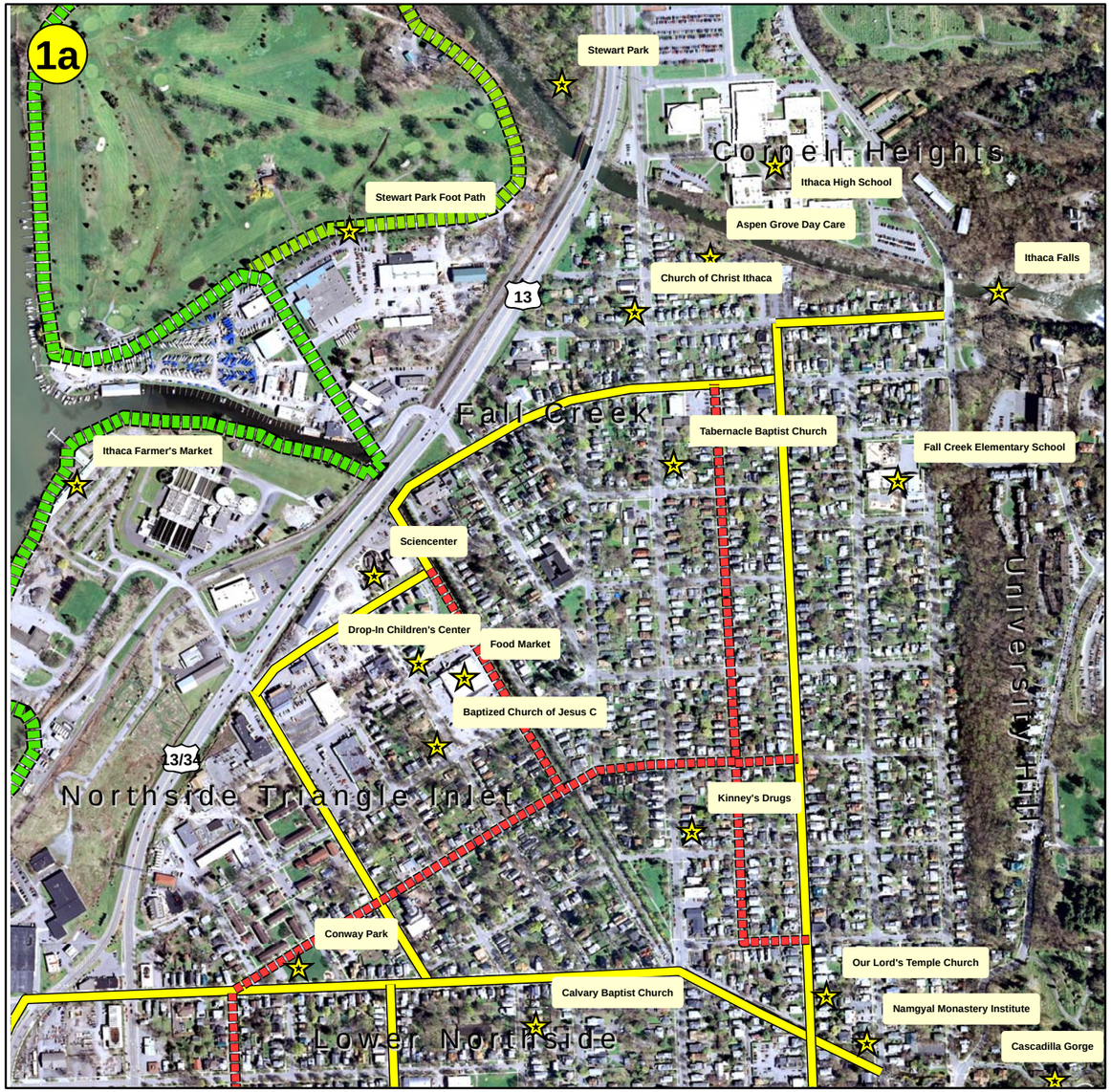
This chapter provides a toolbox of specific design treatments recommended for Ithaca and a detailed design concept for six recommended *Ithaca Neighborhood Greenway* corridors. This proposed plan is not a comprehensive bicycle plan for the City of Ithaca, the metropolitan region or Tompkins County. Other plans do and should address connections to other key destinations in the region. This network is narrowly focused on the flat downtown area in the City of Ithaca, which represents the vast majority of the land area within the City boundaries and the most densely populated residential areas, and includes many of the most common destinations.

We begin by discussing the criteria (and alternate criteria) for selecting streets to be included in the proposed network.

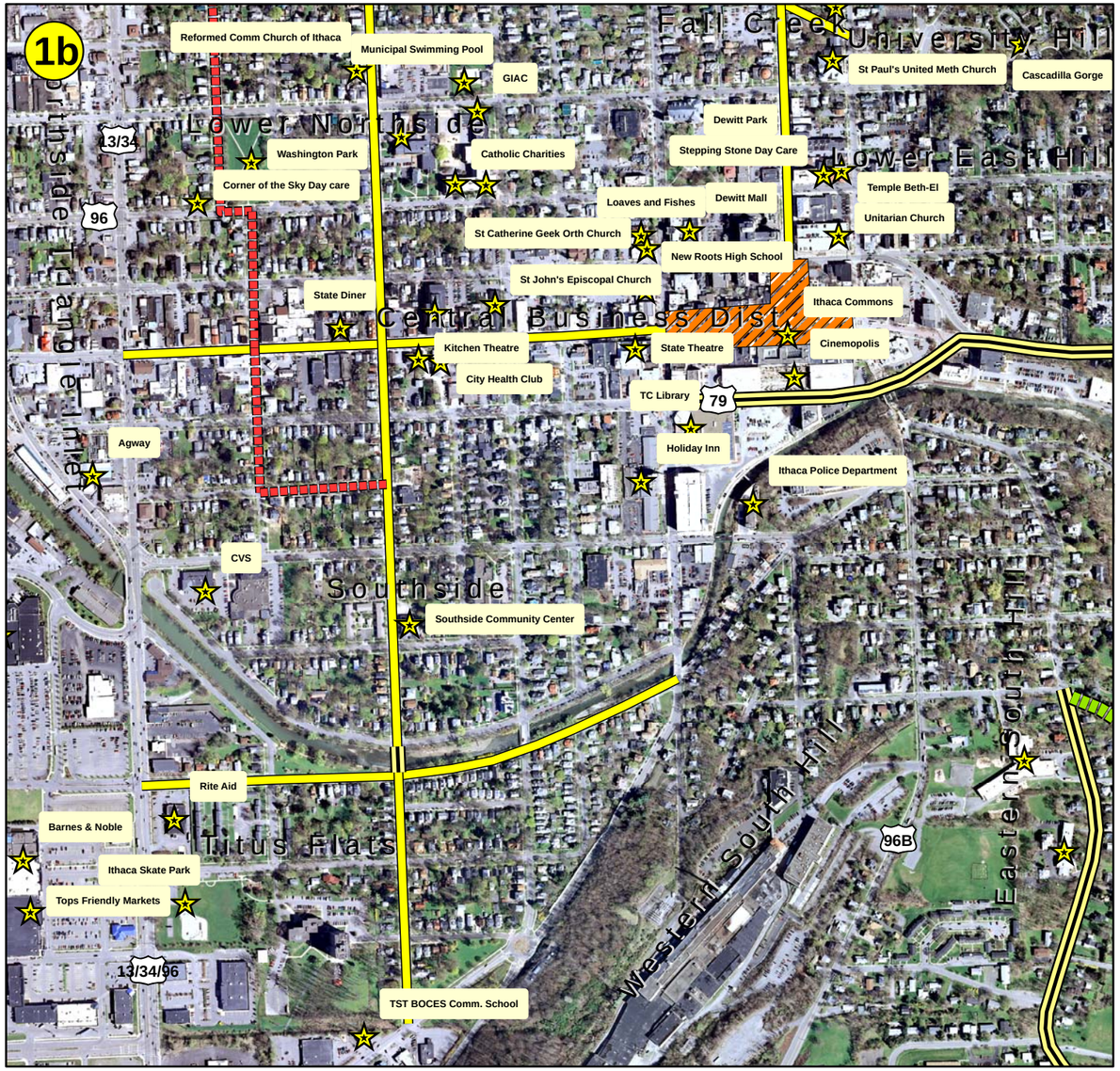
STREET SELECTION

The ITCTC identified the Ithaca Neighborhood Greenways network based on these criteria:

- Already relatively low car traffic (less than 3,000 average daily traffic is a requirement, less than 1,000 is most desirable where possible.
- Supports the development of a contiguous network without any gaps.
- Direct links or close proximity (less than ¼ mile) to the majority of residences and popular destinations in downtown Ithaca.
- Links to existing or planned infrastructure and fit with Ithaca Bicycle Plan and Bicycle Boulevard Network proposed by the City of Ithaca Office of the City Engineer.
- Links to planned extensions of the Cayuga Waterfront Trail.
- Reasonably continuous street corridor, with as few jogs as possible.
- Low-volume transit or truck route.
- Traffic signals at major intersections (or signals are feasible).
- Not a high commercial traffic corridor if possible.
- Flat or gentle hills.



Northside



Southside

N

Legend

- Bike Boulevard Destinations
- Neighborhood Greenway
- Alternate Neighborhood Greenway
- Cayuga Waterfront Trail (Existing)
- Bike Lanes (Existing)
- Ithaca Commons

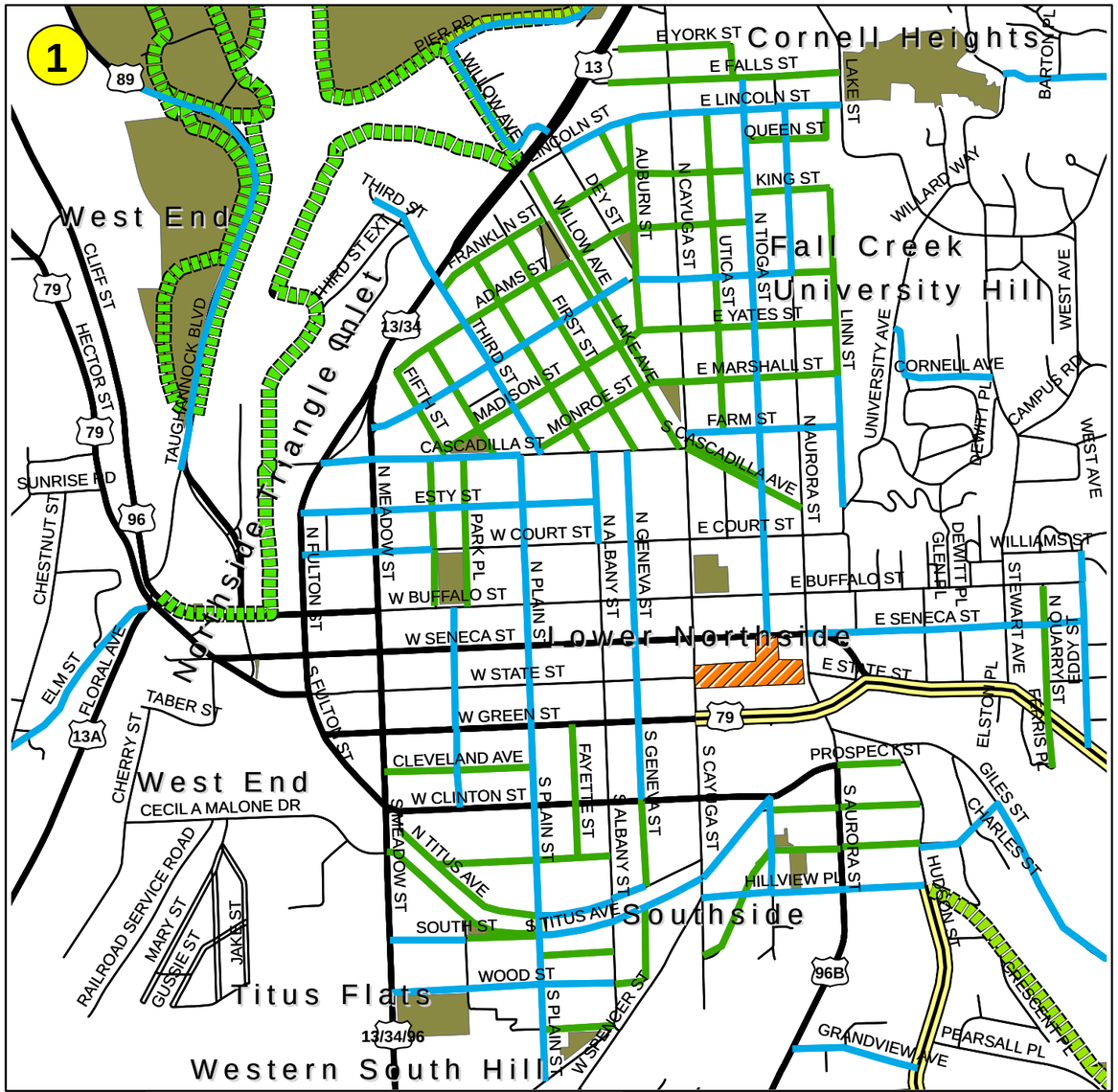
Ithaca Neighborhood Greenways: Destinations Within 1/4 Mile or Less of a Neighborhood Greenway

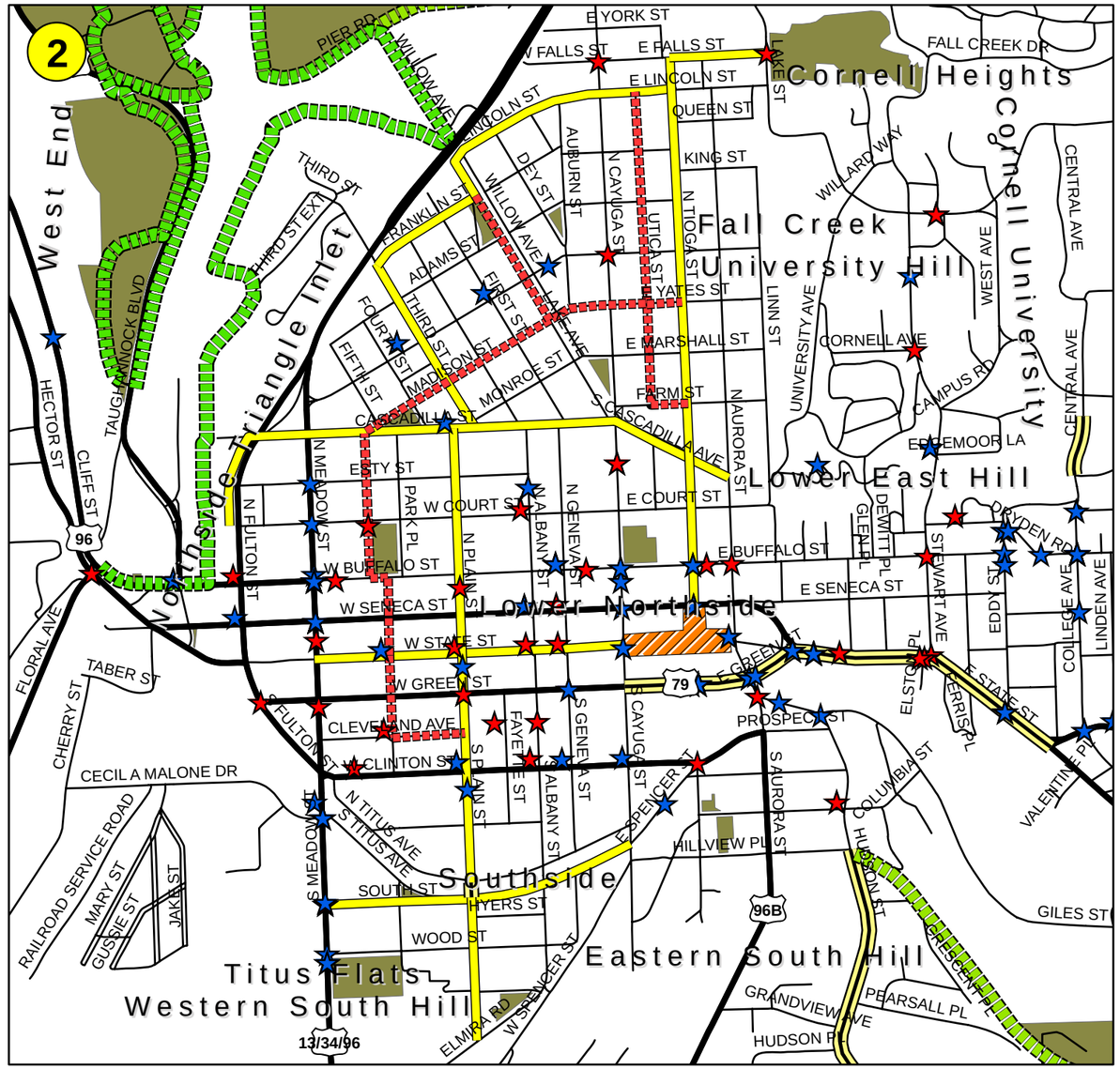
Prepared by the Ithaca-Tompkins County Transportation Council - 8/11/10

0 875 1,750

Feet

Scale





Legend

- Location of Pedestrian Crashes 2000-2008
- Location of Bicycle Crashes 2000-2008
- Alternate Neighborhood Greenway
- Neighborhood Greenway
- Ithaca Commons
- IthacaCityParks
- Bike Lanes (Existing)
- Cayuga Waterfront Trail (Existing)
- Streets with 1001-3000 AADT (Low Volume)
- Streets with <1000 AADT (Very Low Volume)

N

Ithaca Neighborhood Greenways: Streets with Low and Very Low Daily Traffic Volumes (1) and Location of Pedestrian and Bicycle Crashes 2000-2008 (2)

Prepared by the Ithaca-Tompkins County Transportation Council - 8/11/10

0 1,450 2,900

Feet

Scale

Alternate selection criteria:

This proposed plan recommends eight street segments to form six *Ithaca Neighborhood Greenway* corridors as shown in Figures 4-8 – *Plain-3rd, Tioga, Titus-South, West State, Cascadilla, and Franklin-Lincoln-Fall*. A full description of proposed treatments follows in this Chapter. The exact alignment of any neighborhood greenway corridor might be altered based on any of several factors.

First, the recommended corridors were selected by placing greater emphasis on the continuity of the street corridor than on the streets with the lowest possible traffic. Placing more emphasis on low-traffic street may alter the corridors (for example, Utica Street may be more desirable than Tioga Street for the primary Fall Creek corridor north of Farm Street). See Figure 1, *Proposed Routes and Proposed Alternate Routes*.

Second, this study recommends a strong public involvement process to include neighborhood design workshops where each neighborhood has an opportunity to suggest improvements on specific treatments. Corridor selection may also vary according to neighborhood preferences.

Third, this study did not evaluate average vehicle speed along potential corridors due to a lack of available data. At a minimum, baseline data on proposed corridors should be collected prior to implementation to assess the impact of treatments. If collected well enough in advance, speed data may also inform corridor selection and/or design decisions.

Finally, West State Street has slightly higher than optimum volumes of traffic (approximately 4,000 AADT), and it is also a commercial street with many driveways and metered curb parking. As stated in the criteria above, these are not necessarily desirable traits of a neighborhood greenway. Nevertheless, 1) it is the lowest traffic East-West corridor in the center of the City, 2) it is controlled by traffic signals at every intersection, 3) the existing patterned brick surface acts as a traffic calming feature, and 4) non-local (through-traveling) traffic can easily be diverted through signage and additional design elements to encourage use Green and Seneca Streets.

See Figure 1 for a map of proposed routes and proposed alternate routes. Figure 3 shows City of Ithaca streets with low (1,000 to 3,000 ADT) and very low (less than 1,000 ADT).

CITY OF ITHACA DESTINATIONS

The following is sample of destinations that are within ¼ mile of the proposed Ithaca Neighborhood Greenways network. Destinations which may be good candidates for inclusion in way-finding signs are in **bold.** Way-finding signs help neighborhood greenway users navigate to significant community destinations by displaying direction and travel time and distance. Final decisions about which destinations to show on way-finding signs would be made through a formal planning process.

Neighborhoods:

- **Fall Creek**
- **Northside**
- Lower Northside
- **Southside**

- Titus Flats
- Central Business District
- Western South Hill (if Spencer Rd.)

Educational resources:

- Cornell University (although not on the proposed network, portions of Cornell University are within ¼ mile of the network)
- **Ithaca High School**
- **Boynton Middle School**
- **Fall Creek Elementary School**
- **Beverly J. Martin Elementary School**
- Day care providers: GIAC, Children's Drop In Center, Aspen Grove Day Care, others.
- **Immaculate Conception School**
- **Tompkins County Public Library**

Parks:

- **Stewart Park**
- **Cass Park**
- Ithaca Children's Garden
- Dewitt Park, Conway Park, Washington Park
- Ithaca Skate Park
- **Ithaca Falls**

Employment centers:

- Downtown commercial offices and government offices
- Cornell University

Commercial centers:

- **Ithaca Commons**
- State Street
- Route 13 grocers and retailers (**Route 13 stores**)
- **Ithaca Farmers Market**

Community facilities:

- **GIAC (Greater Ithaca Activities Center)**
- Municipal Swimming Pool – Albany & Court
- Southside Community Center
- **Cayuga Waterfront Trail**
- **The Sciencenter**
- The Kitchen Theater
- State St. Theater
- Many places of worship

Transit:

- Bus routes accessible via the bike boulevard network:
    - Downtown routes: 10, 11, 15, 17, 68
    - Suburban routes: 13, 14, 30, 32, 51

    - Rural Commuter routes: 20, 21, 36, 40, 43, 52, 53, 67
- All TCAT buses have front bicycle racks with capacity for two bicycles.

Existing or planned bicycle facilities:

- Cayuga Street sharrows
- State Street and Hudson Street uphill bike lanes
- Future planned facilities: University Avenue to Cornell

Social services:

- Loaves and Fishes
- Department of Social Services
- Salvation Army and WIC program
- Catholic Charities

SUGGESTED TREATMENTS

The guidebook, Fundamentals of Bicycle Boulevard Planning and Design, is this report's primary source for specific details on treatment options, definitions and descriptions. It was published in July 2009 by the Institute for Bicycle and Pedestrian Innovation (IBPI) and Alta Planning and Design with input from national experts and a Portland, Oregon based steering committee. It is the most comprehensive and respected guide for bicycle boulevard planning and design in the United States. It should be viewed as a companion document to this study. For a comprehensive description of all recommended treatments, please refer to the IBPI guidebook (Appendix B).

As noted in the Infrastructure Improvements section of this report, neighborhood greenway design involves a combination of several core strategies. A partial list of recommended treatments which address each of the five key strategies of bicycle boulevard design is offered in the chart below. Descriptions follow. Appendix A, Master Treatment Inventory provides a comprehensive and detailed list of recommended treatments in Ithaca. See the IBPI Guide, Appendix B, for images of each treatment type.

Ithaca Neighborhood Greenways – list of proposed treatments by strategy

Markings and Signage	Identification Signs Way-finding Signs Warning Signs
Prioritize Bicycle Travel on Bicycle Boulevard	Pavement Markings Stop/Yield Signs
Intersection Treatment	Curb Extensions Bicycle Boxes/Advanced Stop Bar Bicycle Activated Signals Crossing at Off-Set Intersections

Traffic Calming	High-Visibility Raised Crosswalks Residential Speed Limit
Traffic Reduction	Partial Non-Motorized Only Crossings

Temporary or moveable options exist for a number of potential treatments. These include warning signs directed at vehicles approaching a Neighborhood Greenway crossing (mid-street upright caution signs on pedestals); speed humps (rubberized, moveable speed 'cushions' are an option), diversion (temporary planters may be used as bollards, etc.).

This proposed plan prioritizes maintaining existing on-street parking. It recommends parking removal only under conditions where it is necessary to provide a continuous, gap-less network and no other alternative is available which will create safe and comfortable conditions (for example, North Tioga St. between Court St. and Seneca St.).

INTERSECTION / CROSSING TREATMENTS

"Improvements along bicycle boulevards are of limited utility if cyclists cannot safely and comfortably cross major roadways. Intersection improvements on bicycle boulevards enhance cyclist safety by eliminating or raising awareness of potential areas of conflict between motorists and cyclists, and by reducing the delay cyclists experience at traditional intersections where no accommodations have been made for cyclists."

- IBPI BICYCLE BOULEVARD PLANNING AND DESIGN GUIDEBOOK

CURB EXTENSION

Also known as a bulb-out, a curb extension "extends the sidewalk or curb face into the parking lane at an intersection" (IBPI, 2009) in order to shorten the crossing distance / crosswalk for pedestrians and cyclists. Curb extensions also "visibly narrow the roadway" (IBPI, 2009). They are often used with an advance stop bar to identify the appropriate location in front of the crosswalk for cyclists to wait, and are suitable for the incorporation of green features such as landscaping or in-street storm water treatment.

Curb extensions are already planned for two key intersections along the proposed Neighborhood Greenway network: at Plain & Seneca, and at Plain & Green (funded separately by the TIP; likely date of installation is 2011). This study proposes the addition of a curb extension at Cayuga & Cascadilla. If employed, care in the design of a curb extension here must be taken to avoid obstructing cyclist travel along Cayuga.

BICYCLE BOX

Bicycle Boxes are an innovative design treatment to improve safety at relatively busy intersections where there is a strong potential for right turning vehicles to interact with cyclists traveling straight along a Neighborhood Greenway corridor (the so-called 'right hook' incident). They create two

stop bars at an intersection, “one directly behind the crosswalk for cyclists and another farther back for motorists” (IBPI). They allow cyclists to travel first through an intersection with a short green light (ensuring that they get across safely), and also allow cyclists turning left to position themselves properly.

A recent study of bike boxes in Portland (Dill, 2010) found that most motorists and cyclists understand and comply with the bike box markings. Notably, the markings also increased safety (fewer conflicts and more yielding behavior) and also increased perceptions of safety for both motorists and cyclists. (Dill, 2010)

This proposed plan recommends Bicycle Boxes at four intersections along the proposed network: South St. at Rt. 13, Cascadilla at Meadow (West bound), Tioga at Court (both directions), and Tioga at Buffalo (both directions).

ADVANCE STOP BAR

Advance Stop Bars are used in conjunction with curb extensions and bicycle boxes. In the case of curb extensions, advance stop bars delineate the appropriate area for cyclists to queue in front of the crosswalk.

BICYCLE DETECTION – BICYCLE ACTIVATED SIGNAL

These “assist bicyclists crossing signalized intersections by allowing cyclists to call a green signal phase through the use of a loop detectors (in the pavement) or push-button.” (IBPI)They “may reduce cyclist delay” and improve safety by discouraging “red-light running by cyclists” (IBPI).

Bicycle detectors are recommended at 4 intersections along the proposed network of Ithaca Neighborhood Greenways: at South St & Route 13, Plain & Green, Cascadilla & Meadow and Cascadilla & Fulton.

SIGNAL

A new bicycle and pedestrian activated signal is recommended in one location – at Plain & Seneca (see Figure 4).

BICYCLE BOULEVARD MARKINGS AND SIGNAGE

“The purpose to signage on bicycle boulevards is to identify routes to both bicyclists and motorists, provide destination and distance information, and warn users about changes in road conditions as needed.

In addition to serving these roles, signage also helps to “brand” the bicycle boulevard network, fostering familiarity among cyclists and motorists with traffic conditions that are to be expected on these facilities. Unlike other marketing efforts, distinctive signage has the advantage of passively advertising the bicycle boulevard 24 hours a day. “

- IBPI BICYCLE BOULEVARD PLANNING AND DESIGN GUIDEBOOK

Signs alone do not create a neighborhood greenway or bicycle boulevard, but they are important elements of a comprehensive system. The color of both identification and way-finding signs should be different than regulatory and warning road signs. Other communities have used green or purple signs; there appearance has been both non-customized and customized. A formal planning / design process should include a comprehensive evaluation of potential designs for both signs and pavement markings.

WAY-FINDING SIGNS

Way-finding signs "provide cyclists with direction, distance and/or estimated travel time to destinations" (IBPI, 2009). They also "passively market" the bicycle boulevard, and "inform motorists to expect cyclists". They hold the potential to offer a significant benefit to tourists and residents alike to navigate to common Ithaca destinations by bike and on foot. The average travel speed used to establish travel times for cyclists on way-finding signs is most commonly 10 mph.

Signs at appropriate locations should list the most prominent community amenities and destinations to be reached (see above for a list of suggestions).

Possible locations for way-finding signs along the proposed route include the following intersections (with # of signs at each proposed intersection). ITCTC selected these locations by identifying the most prominent neighborhood greenway entry points and intersections. In total, this study recommends a minimum of 32 or more way-finding signs.

- Tioga and Lincoln (4)
- Tioga and Cascadilla (3)
- Tioga and Seneca/Commons (2)
- Lincoln and Dey (3)
- 3rd and Lincoln (2)
- Cascadilla & 3rd/Plain (5)
- State & Plain (4)
- State & Cayuga (1)
- Titus & Plain (2)
- Cascadilla & Cayuga (2)
- Cascadilla Meadow (1)
- Cascadilla & Fulton (1)
- Fulton & Court (2)

IDENTIFICATION SIGNAGE

Identification signs offer similar benefits as way-finding signs, but mark the location of a neighborhood greenway to people entering or crossing the street, as opposed to traveling along it. Some cities with bicycle boulevards such as Portland and San Luis Obispo use stand-alone upright signs. Others such as Berkeley and Vancouver, BC actually incorporate the bicycle boulevard brand into the street

name signs. These should be posted at every intersection along the network. This plan recommends installing signs in 114 locations along the proposed *Ithaca Neighborhood Greenways* network.

PAVEMENT MARKINGS

Pavement markings are used to prioritize travel along neighborhood greenways. They "supplement way-finding and identification signage, encourage proper positioning by bicyclists while sharing the lane with motor vehicles, and act as a 'breadcrumb trail' for cyclists" (IBPI, pg. 23). Sizes and styles vary. Berkeley uses very large, highly visible 'bicycle boulevard' stencils that take up almost the entire lane (6 feet wide by 30 feet long). The advantage of this style is its high visibility and distinctiveness. Portland has used small 11" bicycle dots, but is currently moving away from these for their next round of bicycle boulevard development towards sharrows (shared lane markings). The advantage of sharrows for Ithaca would be two-fold: 1) the community already has experience with these markings on Cayuga St, and 2) the sharrow was recently added to the MUTCD (Manual on Uniform Traffic Control Devices) as an approved marking.

BICYCLE LANES

Bicycle lanes have their own unique set of design guidelines, and are generally a separate type of bicycle infrastructure from bicycle boulevards. In general, this plan does not prioritize bicycle lanes as a potential treatment, largely because the City would need to remove large amounts of on-street parking to accommodate the increased pavement surface needed for bicycle lanes. But the neighborhood greenway network should be both contiguous and comfortable and safe. In order to achieve this, this plan recommends that bicycle lanes be included in neighborhood greenway development in two cases: along busy commercial streets with heavy bus traffic, and as lead-ins to bicycle boxes. Specifically, this plan recommends bicycle lanes for Tioga between Court and Seneca, on Cascadilla between Meadow and Fulton, and on Franklin between 2nd and 3rd, and wherever bike boxes are recommended.

CALMING TREATMENTS

"Traffic calming is a set of design elements that reduce the speed and volume of motor vehicle traffic on roadways. Although frequently applied on many streets throughout communities, traffic has a natural relationship with bicycle boulevard development due to the operational conditions required. Traffic calming features are typically self-enforcing: the physical conditions of the roadway as opposed to regulatory devices influence drivers to reduce their speed in order to comfortably and safely drive the route.

When implementing traffic calming on bicycle boulevards, special consideration must be given to ensure designs to not create adversely affect cyclists, such as poorly designed speed humps that unnecessarily jar cyclists who pass over them or curb extensions that enhance rather than reduce areas of conflict between motor vehicles and cyclists."

- IBPI BICYCLE BOULEVARD PLANNING AND DESIGN GUIDEBOOK

This proposed plan prioritizes raised crosswalks over mid-block speed humps because they hold the potential to serve a dual purpose of slowing traffic along NG corridors and improving pedestrian safety and comfort at intersections. However, this does not preclude the appropriate use of mid-block speed humps, chicanes or other calming treatments in Ithaca. Planners, engineers and community members should refer to the IBPI guidebook during a formal planning phase for a complete set of possible treatments upon which to draw. In addition, this plan recommends the application of a 'residential speed limit' of 25 mph or less along neighborhood greenways (details follow on the next page).

HIGH VISIBILITY RAISED CROSSWALK

The goal of this treatment is to "reduce motor vehicle speeds and create a visibly prominent crossing location for bicyclists and pedestrians." (IBPI, pg. 30) These should be installed with "advance warning and advisory speed signage." (IBPI, pg. 30) The IBPI Guidebook also recommends using these at mid-block crossings, where the bicycle boulevard crosses a busy street. Given Ithaca's successful experience with raised intersections (along Buffalo St.) and raised crosswalks (Dey St.), this plan recommends the slightly different application of installing raised crosswalks across neighborhood greenways to slow vehicle speeds and improve pedestrian crossings at intersections. However, during the design phase, neighbors and planners may also wish to consider several other options in addition to raised crosswalks exclusively:

1. Install mid-block speed tables/humps AND raised crosswalks at intersections where the goal is to have more calming *along* neighborhood greenway corridors.

2. Use mid-block speed tables or and humps just before the crosswalk instead of raised crosswalks where the goal is to reduce the speed of travel *along* the neighborhood greenway corridors.

3. When the goal is to *slow and warn cross-traffic* at two-way controlled intersections, use high-visibility crosswalks parallel to the direction of neighborhood greenway through-travel in conjunction with a speed table to slow traffic in advance of a high-visibility crosswalk.

In Portland, Oregon raised crosswalks are commonly 22 ft. tables which are flat on top. Speed humps are 14 ft. wide.

RESIDENTIAL SPEED LIMIT

Lowering motor vehicle speeds on neighborhood greenways promises to create comfortable environments for cyclists and pedestrians. In addition, it may further limit cut-through traffic from traveling through residential neighborhoods (IBPI, 2009, pg. 39). This plan recommends creating a residential speed limit along NG corridors for use in conjunction with physical traffic calming improvements. A residential speed limit by itself will not necessarily achieve lowered speeds, and could create enforcement issues.

What is the ideal speed limit along neighborhood greenways and what are the regulatory limitations? Ithaca has a citywide speed limit of 30 miles per hour. According to current New York State

vehicular and traffic law, cities may establish a speed limit of “no less than 25 miles per hour” along designated individual streets that are not state highways. (NYSDMV Sec. 1643) One notable exception is in school zones, where a city may establish a limit of no lower than 15 mph. To lower the speed limit along neighborhood greenways to 20mph (a recommendation of the IBPI guidebook) would most likely require state legislation to authorize the use of regulatory speed limits below the standard. Several precedents for state law permit speed limits lower than 25 mph to be established by municipalities. For example, the Town of Hempstead, NY is permitted to established a 15 mph speed limit in the Point Lookout area (NYSDMV, Sec. 1643).

State law treats the use of advisory speed limits and warning signs in advance of calming treatments such as raised crosswalks, speed humps/tables and mini traffic circles differently than regulatory speed limits. The City may post such advisory speed signage at speeds lower than the lower limit of 25 mph designated by state law for street segments. The City of Ithaca currently employs advisory speed signage (yellow color) at numerous locations, including several locations along proposed NG corridors (e.g. Plain St. and the Six Mile Creek bridge and Plain St. at the Southside Community Center.)

CHICANE

This plan takes advantage of several opportunities to change the pattern of daytime on-street parking to break up long lines of sight and slow vehicles by creating a ‘chicane’ effect along two proposed NG corridors. Curbed islands in front of the on-street parking and (at the least) painted lane striping could help reinforce the weaving pattern. This innovative treatment takes advantage of one-side of the street parking situations on Cascadilla and Plain.

TRAFFIC REDUCTION TREATMENTS

PARTIAL “NON-MOTORIZED ONLY” CROSSING

Also called a partial diverter or partial street closure, this treatment allows pedestrians and cyclists to enter while limiting the entry of motor vehicles to an NG corridor. A partial non-motorized only crossing is less invasive than full street closure. Vehicles can exit the street; they are prohibited only from entering the corridor from that location. Landscaping or pocket park features can be incorporated.

This proposed plan recommends them on Tioga St. in two locations (on the north side of Court St. and the south side of Lincoln St.) and on Cascadilla St. on the east side of Meadow Street. The partial non-motorized only crossing at South and Fair St could also be improved through this project.

While desirable to create a calm bicycle and pedestrian priority environment, it may not be essential to install partial non-motorized crossings to achieve an effective NG network, and they may alter current traffic patterns. For this reason, they are listed as optional treatments. If installed in appropriate locations, with excellent design characteristics, they would serve to reduce cut-through traffic on NG corridors without significant disruption to overall traffic patterns. They can be temporarily installed. These temporary treatments could be made permanent, changed or removed after a trial period. Notably,

Berkeley and New York City have used this strategy to good effect using movable planters, paint and signage. In these cases, the treatments were popular and effective and became permanent.

RAISED CENTER MEDIAN

Like non-motorized only crossings, raised center medians serve to reduce motor vehicle cut-through, creating a more calm and inviting corridor for cyclists and pedestrians. If the median is wide enough, it also permits cyclists and pedestrians to cross busy streets one lane at a time. This plan recommends installing center medians on Clinton St. and Court St. where Plain St. crosses them. With partial non-motorized only crossings, this plan defines them as optional.

SUGGESTED TREATMENTS FOR ITHACA NEIGHBORHOOD GREENWAYS

This study recommends six corridors for the *Ithaca Neighborhood Greenways* network. Together, the proposed Ithaca Neighborhood Greenways are 4 and 1/2 miles long and comprise 5% of city streets. Detailed maps of treatments for each of the corridors are included at the end of this chapter of the report (Figures 4-8). Recommended alternatives to portions of these corridors are included in the overview map, but detailed treatment recommendations for the alternates are not included. For each corridor, this section of the plan provides the following:

1) A brief summary of existing conditions and issues including;
    a. Traffic volume for each of the proposed corridors are identified for each corridor using the following scale: Moderate (3000 – 5000 cars per day), Low (1000-3000 Cars per day), Very Low (under 1,000 cars per day).
    b. Existing or planned positive features including traffic calming or features which currently support a neighborhood greenway environment
    c. Existing challenges
    d. Parallel alternate car routes
    e. Alternate NG corridor(s)

2) A detailed table of recommended treatments

CORRIDORS:

- Plain and 3rd – map segments 1, 6
- Tioga – map segment 2
- Titus–South – map segment 3
- West State – map segment 4
- Cascadilla – map segment 5
- Franklin–Lincoln–Fall – map segments 7 and 8

PLAIN - 3RD

Plain St. is a primary North-South corridor. It links the Southside and Northside neighborhoods to the Ithaca Farmer's Market, Elmira Rd and the rest of the Ithaca Neighborhood Greenway network.

- Traffic volume: **Low**
- Features:
    a. Existing traffic calming features are in place at Center, Six Mile Creek Bridge, Southside Community Center, Buffalo and South.
    b. Several crossing improvements are planned at Hwy 13 & 3rd (2011), Green and Seneca (designed in 2011, built in 2012).
    c. This is identified as a planned bicycle boulevard corridor by the City of Ithaca Office of the City Engineer.
    d. Plain St. crosses many busy streets including Clinton, Green, Seneca, Court, and Buffalo.
    e. This is currently a common through street for cars.
- Parallel options for cars: Albany (Moderate to Very Heavy Traffic), Meadow/Fulton (Very Heavy Traffic).
- Alternate Corridors: Corn/Washington from Cleveland to Cascadilla (lower traffic, but issue with jog at Buffalo, lacks directness), Willow/Lake & Madison (very low traffic, but lack directness).

Plain - Third Neighborhood Greenway

Location	Issue / Condition	Possible Solution
Elmira Rd. to Wood	No parking 8am-6pm on East side of street for two blocks; long, straight line of sight and wide street encourage speeding	Change No Parking signs to other side of street between Park and Wood to interrupt line of sight and slow cars.
at Wood	4-way stop sign slows bicycle travel along proposed Bicycle Boulevard route.	Two options: 1) Convert to **Mini Traffic Circle** with four-way yield (or two-way stop on Wood); dual effect of calming traffic on BB and allowing for easy through-travel by bicycle. Must allow busses to navigate straight through. 2) Simply Remove Stop Signs along Plain to change to two-way stop along Wood. Option 1 would achieve the calming goal in addition to allowing easy bicycle through-travel, but would be more costly.
at Clinton	2-way stop along Plain, very busy intersection, limited visibility	Option 1) **Bicycle Advance Stop Bar**s in both directions to indicate that cyclists are permitted to stop closer to the intersection than cars. Full bicycle box not required in this location. With High Visibility Raised Crosswalks across Clinton and "Caution Bicycles" signs along Clinton in advance of intersection with Plain.
at Clinton	Potential access point to BB from Clinton. Through-travel along Plain by cars currently common.	Option 2) *Advanced Option (aggressive treatment and not required for overall implementation):* R**aised Center Median** in Clinton to prevent left turns onto Plain and also prevent through travel along Plain by cars (bicycles can travel through center median. As an alternative, consider Partial Diverter allowing through travel by bicycles but exit (South) only by cars on North side of Clinton.

Clinton to Elmira Rd.	TCAT route #15 runs once per hour in each direction. Route #68 runs 4 times per day in the mid-afternoon.	Ensure treatments allow through-travel by bus between Clinton & Elmira.
Titus to Center	Poor road surface condition	Resurface according to Streets & Facilities maintenance schedule.
at Green	Very busy one-way (Eastbound) street. Intersection is controlled by flashing red light along Plain, and along Green by a flashing yellow light with three-colored signal controlled by a button in the fire station at 10 W Green. Anecdotally, one firefighter told the researcher that the button is rarely used because either there is not much traffic or the 30 second timer is not enough time.	*Separate project (T.I.P. funded) will install curb bumpouts and high-visibility crosswalk* at this intersection to shorten crossing distance and improve line of sight. Install bicycle **Forward Stop Bars**. If feasible, install a **Bicycle Loop Detector** in the roadway along Plain to trigger red light along Green. Also, install Caution Bicycles sign in advance of intersection facing oncoming East-bound traffic along Green.
at Seneca	On this very busy street, the intersection is controlled only by two-way stop along Plain (no signal)	*Separate project (T.I.P. funded) will install curb bumpouts and high-visibility crosswalks at this intersection* to shorten crossing distance and improve line of sight. Option 1) Install bicycle **Forward Stop Bar**s and Caution Bicycles sign facing oncoming West-bound traffic along Seneca.
at Seneca		Option 2) *Advanced Option (potentially expensive and not required for overall implementation):* Install New HAWK Traffic Signal with Bicycle Loop Detector.
at State	Intersects bicycle boulevard	*Optional: Install Center Left Turn pavement markings at Plain and State.*
at Buffalo		Raised Crosswalk currently in place.
at Court	Access point to through travel along Plain.	*Advanced Option (desirable, but not required for overall implementation):* Install Raised Center Median Barrier in Court St. to prevent left turns onto Plain from Court and also prevent through travel along Plain by cars.
at Cascadilla	Intersection is offset; crosses Cascadilla Neighborhood Greenway	**Bicycle Center Left Turn** pavement markings at Plain and at 3rd. Requires removal of three on-street parking spots on South side of Cascadilla.
at Madison	Long straightaway encourages speeding.	Install **Raised Crosswalk**
at Hancock	four way stop	Convert to **Mini Traffic Circle**
Madison to Hancock	no parking both sides	
Hancock to Adams	no parking on the East side of the street, except for DMV road test queue M-F 8am-5pm. West side: no parking 8am-5pm.	
Adams to Lincoln	DMV cue line on East Side of street, too narrow for bike lanes	
at 13	Difficult crossing across major arterial; slated for crossing improvement in 2011.	In addition, consider installing bicycle box, lane leading into box, bicycle detector or push-button crossing signal for bikes.

TIOGA

Tioga St. links the Fall Creek neighborhood to the Ithaca Commons and the rest of the Ithaca Neighborhood Greenway network.

- Traffic volume: **Low to Moderate**
- Features:
    a. There are relatively few stop signs.
    b. There is on-street parking on both sides of the street, the full length.
    c. The pavement is in poor condition.
    d. Tioga St. from Lincoln to Tompkins is likely to be rebuilt in 2011, with other areas rebuilt by 2013. Cost of traffic calming features could be reduced by approximately 65% if coordinated with street rebuild.
    e. This is currently a common through street for cars.
    f. There is metered parking and commercial traffic from Seneca to Court.
    g. A long-straight line of sight encourages speeding.
    h. Provides an important connection to schools.
- Parallel options for cars: Aurora (ADT 4,214) & Cayuga (ADT 6,187).
- Alternate Corridors: Utica St (very low traffic, currently in common use by 'easy rider' cyclists, but would require a job of Tioga at Farm and turning lots of stop signs along Utica.), Yates to Willow/Lake.

Tioga Neighborhood Greenway

Location	Issue / Condition	Possible Solution
Cascadilla to Lincoln	Long, straight line of sight and wide street encourage speeding	Calm the street using **Raised Crosswalks** (across Tioga) at several locations (Farm, Marshall, Yates, King)
full length	Poor pavement condition	Repave - city maintenance schedule currently plans for re-paving in one or two block segments
Court to Lincoln	TCAT bus #36 stops at Court, Farm and Lincoln, but there are only four busses daily in each direction therefore very minor bus conflict.	Ensure bus can pass through treatments, or reroute
Court to Lincoln	This is a desirable alternate route to Cayuga or Aurora for cars.	*Advanced Option (desirable, but not required for overall implementation):* **Install Partial Diverters** at Court (or possibly Farm) at the South end and Lincoln at the North end to allow vehicles to exit the bicycle boulevard, but not enter. Requires North-bound TCAT bus #36 route to be diverted to Cayuga. Signage: "do not enter, **Except Bicycles**".
at Tompkins	4-way stop sign slows bicycle travel along proposed Bicycle Boulevard route.	Keep as-is. Conversion to Mini Traffic Circle with four-way yield was considered to allow easier through-travel by bicycles, but given the traffic volume at this intersection, and heavy pedestrian use, it was determined that a traffic circle may undermine pedestrian safety.
Lincoln to Farm	Free parking allowed on both sides of street - not fully occupied and off-street parking appears adequate.	Removal of one side of parking and installation of bike lanes is an option, but is not recommended due to anticipated opposition from homeowners. The recommended treatments are therefore calming and diversion measures (raised crosswalks and partial diverters)
Seneca to Court	TCAT bus #10, stops at Court (N. bound), buses every 8-10 minutes. Major bus conflict potential.	The bike lanes at bus conflict areas should be hashed (vs. a continuous solid line) to define the conflict area.

Seneca to Court	Heavy commercial traffic area, changes in nature at Farm from neighborhood street to commercial street, especially between Court and Seneca. On-street metered parallel parking on both sides of the street between Buffalo and Court. On-street metered parallel parking on West side of the street ONLY between Seneca and Buffalo. The East side of the street between Seneca and Buffalo has "no standing" for the South half of the block. The North half of the block (in front of the post office and Town Hall) currently has 10 minute parking. All businesses and public agencies along Tioga between Farm and Seneca have adequate off-street parking available.	Install **Bicycle Lanes** in both directions between Seneca and Court. Remove parking on one side of the street (East side requires the fewest meters (14) to be removed and does not disrupt parking in front of the courthouse). Between Seneca and Buffalo this allows 8 ft. for curb parking and twenty feet for the vehicle travel lanes, including center striping. Between Buffalo and Court, the combined width of the parking and bike lane will need to be reduced to 11.5 ft. (from 13ft). Further engineering work will need to be complete to confirm feasibility. The curb-to-curb width of Tioga Street between Seneca and Buffalo is 38 ft. The curb-to-curb width of Tioga Street between Buffalo and Court is 36 ft.
Seneca to Court	Bike Lane installation requires removal of metered on-street parking.	Estimated maximum revenue loss is $1,750 per year per meter ($6.75/day x 5 days/week, 52 weeks in a year). ($1/hour rate and 75% estimated occupancy 9am-6pm). 14 meters = $24,500 per year, although much of this will be offset by fuller occupancy in other metered areas and in the nearby City-managed garage.
Farm to Seneca	Yellow center line - may encourage motorists to pass cyclists with uncomfortably small distance between vehicle and cyclists	No passing bicycles zone, or bicycles allowed full lane signage (whatever is standard across all bicycle boulevards)
at Farm	Pedestrian curb bumpouts	Standard Bicycle Boulevard pavement markings showing bicycle travel lane.
at Cascadilla	Intersection with Cascadilla Bicycle Boulevard. Lots of existing pedestrian traffic.	Bicycle **Center Left Turn** pavement markings for cyclists in N. bound direction on Tioga to Turn to the left/West onto Cascadilla (segment South of the creek). **Install High Visibility Crosswalk / Crossbike**
at Court	Traffic light, difficult crossing, right hook potential	Install two **Colored Bicycle Boxes** along Tioga on each side of Court with colored bicycle lanes leading into the boxes.
at Buffalo	Traffic light, difficult crossing, right hook potential	Install two **Colored Bicycle Boxes** along Tioga on each side of Buffalo with colored bicycle lanes leading into the boxes.
at Seneca	Traffic light, south bound cars must turn right. Curb bumpout at Seneca on NW corner restricts cyclist through-travel on the right side of travel lane. Direction of pedestrian ramp on SW corner requires cyclists travelling through to the Commons to enter sidewalk from center of travel lane rather than from space to the right of the travel lane between the bumpout and parking.	**Improve Sidewalk Ramp** for cyclists to safety access sidewalk from street to facilitate ease of crossing. Bicycle Dismount signage.
at Ithaca Commons - Seneca	Pavement markings currently imply bicycles are not allowed.*	Change signage to **Bicycle Dismount Zone** signage to indicate that the Commons is a safe through-route for cyclists willing to dismount to connect to State St. Bicycle Boulevard and Home Dairy Alley.
At Commons	No bicycles pavement markings at entry to Commons, discourages bicycle through traffic, but this is the safest route to the library and State St. bicycle boulevard.	Bicycle Network Map to include Commons and Home Dairy Alley on BB network as Dismount Zone.

TITUS - SOUTH

The Titus-South Neighborhood Greenway corridor links the Titus Flats neighborhood and the Plain St. Neighborhood Greenway to the Southwest Ithaca retail area and South Cayuga St.

- Traffic volumes: **Very low**
- Features:
    a. It is already a quiet, traffic-calmed street with several existing calming treatments (partial diversion at S. Titus and Fair, no through traffic signage at entry from Cayuga, and a mid-block speed hump between Fair and Plain.
    b. On-street parking is allowed on one side of street Cayuga to Plain
    c. This is currently a common through-street for cars
    d. It is an important connection to Wegman's and big box retail stores.
- Parallel route options for cars: Clinton (ADT 8,000-9,000) and Elmira Rd/Spencer St. (ADT 6,400-10,000)
- Alternate Corridor: Wood St.

Titus-South Neighborhood Greenway

Location	Issue / Condition	Possible Solution
at Hwy 13 (east-bound)	Cyclists traveling straight through to Bicycle Boulevard from Wegman's parking lot area must navigate across a right turn lane. There are no markings to indicate the proper road position for cyclists.	Install a **Painted Bicycle Lane Through Conflict Area** for straight travel through this conflict area.
at Hwy 13 (west-bound)	Signalized intersection. Crosses high-traffic State Route 13 from neighborhood to grocery stores and big box retail stores.	Install **Bicycle Detector** in roadway (bicycle-activated-signal). Install colored **Bicycle Box** (may require removal of 1-2 on-street parking spaces on S. side of South at 13)
at Fair	Traffic calming device / partial diverter is in disrepair	Rehabilitate existing **Partial Diverter;** install **"Except Bicycles"** sign under "no through traffic sign.
Cayuga to Plain	Narrow roadway width requires queuing to pass. This is effectively a no-pass zone.	No treatment; already calmed

WEST STATE – MARTIN LUTHER KING

This is a primary East-West corridor linking the rest of the *Ithaca Neighborhood Greenway* network to State Street retail stores, the Ithaca Commons and the West End.

- Traffic volume: **Moderate**
- Features:
    a. There are many signalized intersections and lots of metered on-street parallel parking and commercial activity. But, it is the best East-West candidate in the central city.
    b. Current traffic speeds appear to be fairly low.
    c. Existing calming facilities include patterned brick surface Meadow to Cayuga.
    d. It is currently a common through street for cars.
- Parallel route options for cars: Green (ADT 8,000-9,000) and Seneca (ADT 6,400-10,000)
- Alternate Corridor: None

West State – Martin Luther King Neighborhood Greenway

Location	Issue / Condition	Possible Solution
at Meadow (East side)	Existing yellow cross hashing on State creates an opportunity to develop an enhanced "gateway" treatment into bicycle boulevard.	Install **Raised Median** in location of existing yellow cross hashing. Install Bicycle Boulevard identity signage in center median facing East Bound traffic coming onto State (also bicycle no passing zone signage if relevant).
at Plain	Intersects with Plain/3rd bicycle boulevard	Consider Center Bicycle Left Hand Turn markings.
at Ithaca Commons	Pavement markings imply bicycles are not allowed.*	Change signage to **Bicycle Dismount Zone** signage to indicate that the Commons is a safe through-route for cyclists willing to dismount to connect to State St. Bicycle Boulevard
full length	Parking removal for bike lanes is not an option. Lots of slow-moving commercial traffic and signals at every intersection.	No passing bicycles zone, or bicycles allowed full lane signage (whatever is standard across all bicycle boulevards)
all signalized intersections	Cars are likely to crowd cyclists while queuing at the lights at Geneva, Albany, Plain, Corn	Pavement markings at intersections should reinforce that bicycle are allowed/expected full lane. No raised crosswalks are needed (signals are potentially calming).

CASCADILLA

Links Tioga Neighborhood Greenway to 3rd/Plain Neighborhood Greenway, Cayuga Waterfront Trail/West End access via Fulton St. sidewalk, Purity Ice Cream.

- Traffic volume: Variable (**Very Low, Moderate, Low**)
- Features:
    a. There is a busy crossing at Cayuga, and busy signalized crossings at Meadow & Fulton.
    b. It is currently a common through-street for cars West of Cayuga.
    c. The one-way extremely low-traffic section East of Cayuga along the creek is a commonly used pedestrian and bicycle corridor.
    d. Daytime on-street parking is allowed on one side of street (South side).
    e. Creating a shared use bicycle and pedestrian path on the west side of Fulton St. between Court and Cascadilla would provide access to the Cayuga Waterfront Trail corridor.
- Parallel route options: Parallel route options for automobiles are Court (ADT 2,783) and Buffalo (ADT 7,032)
- Alternate Corridor: Madison/Yates

Cascadilla Neighborhood Greenway

Location	Issue / Condition	Possible Solution
Aurora to Tioga	"No Outlet" signage at Tioga	Add **"Except Bicycles" sign**
at Tioga	Heavily used cyclist and pedestrian crossing (across Tioga)	Install **Raised Crosswalk** (across Tioga)
Tioga to Cayuga	Currently marked for one-way travel in west-bound direction. "Do Not Enter" sign at potential east bound bicycle boulevard entry at Cayuga. ADT is extremely low.	Designate South side of creek as two-way bicycle boulevard. Add **"Except Bicycles" sign** to East-bound entry at Cayuga.
Tioga to Cayuga	"No Through Traffic" sign at west-bound entry at Tioga is on North side of creek only	Add a **"No Through Traffic" sign** at entry at Tioga to segment on South side of creek

at Tioga (East-bound)	No stop sign for East-bound (contraflow) bicycle traffic	Add **"Stop" sign** for bicycles - can be smaller size
at Cayuga	Busy crossing, intersection with designate bike route with sharrows (shared lane markings)	Add high visibility **Raised Crosswalk** in location of current crosswalk. Consider installing temporary "State Law - Stop for Pedestrians" sign on pedestal base.
at Cayuga (West-bound)	Poor visibility for cyclists crossing Cayuga in a west-bound direction requires cyclists to encroach into intersection to see North-bound car traffic on Cayuga.	Add small **Curb Extension** on East side of new raised/high-visibility sidewalk across Cayuga.
at Cayuga (East-bound)	Poor visibility for cyclists crossing Cayuga in an East-bound direction requires cyclists to encroach into intersection to see South-bound car traffic on Cayuga.	Add a **Forward Stop Bar** pavement marking for cyclists
Washington to Cayuga	No parking 9am - 6pm on North side of street, long straight line of sight for motorists encourages speeding	Change **"No Parking" signs** to create chicane effect using parked cars with alternating on-street parking. 1st to 2nd: South side No Parking (change from N. side); 3rd to Plain: no parking both sides (to create room for center bicycle left turn lanes), Plain to Park South Side No Parking (change from N. side). Ithaca Car Share car between Park & 4th would also need to be relocated to other side of street if this particular pattern is adopted.
at 1st	Long straight street, needs calming	Add **Raised Crosswalk**
at Plain / 3rd	Bicycle Boulevard off-set crossing/intersection, currently on-street parking is already not allowed between 3rd and Plain	Add **Center Left Turn** markings at turns from Cascadilla onto 3rd and onto Plain in the opposite direction. Remove three on-street parking spots between Cascadilla and Plain on South side of the street.
at Washington	Long straight street, needs calming.	Add **Raised Crosswalk.** This crosswalk is currently set at a diagonal…confirm that raised crosswalk can be installed on a diagonal. **I**nstallation of raised crosswalk at Park Pl may be more expensive because of sewer access (manhole cover) in crosswalk.
at Albany / 2nd	Four way stop at off-set intersection	Keep as-is
at 4th	Manhole cover is recessed several inches from street grade in bicycle lane of travel	Bring manhole cover to grade
at Meadow	Access point to neighborhoods off of main arterial. Currently allows Cascadilla as possible through-route to Cayuga.	*PLUS' Option (desirable, but not required for overall implementation):* **Partial Diverter** at Meadow to allow vehicles to exit bicycle boulevard West, but not to enter East-bound. Signage: "do not enter, except bicycles". Partial diverter should allow bicycle through-travel East-bound, e.g. Also requires re-marking arrows on pavement and changing signs on Meadow (state route) to indicate straight only at Cascadilla, no right turn.
at Meadow (West-bound)	Right hook potential (vehicles turning right into path of cyclist traveling straight). No markings to indicate proper lane position for cyclist/motorist.	1) Install **Bicycle Box** with **Colored Bicycle Lane** leading into it**.** Requires removal of two on-street parking spots on NE corner.. Corner business has ample off-street parking. 2) Install **Bicycle Detector** in pavement (both directions).

Meadow to Fulton	Vertical storm drain grates in bicycle travel lane in two locations. One is also several inches below level of asphalt.	Change orientation of storm grates. Make level with the street.
Meadow to Fulton	Busy street segment between two signalized intersections with parking on both sides. Bicycles currently forced to share lane with other vehicles. Parking on N. Side of street appears heavily used for Purity Ice Cream. South side of street parking is lightly used. Road width was not measured.	**Remove parking** on the South side of the street and install **Bike Lanes** in both directions.
at Fulton (West-South bound)	Bicycle Boulevard transitions from on-street route to off-street designated bikeway (currently a 5-ft wide concrete sidewalk)	For west-bound cyclists (transition from crossing Fulton on the street to the path on the West Side of Fulton-Southbound), 1) install **"Bicycles Use Sidewalk"** sign. 2) Install **Bicycle Detector** in pavement (on East side of Fulton only).
at Fulton (East-North bound)	Bicycle Boulevard transitions from off-street designated bikeway (currently a 5-ft wide concrete sidewalk) to on-street route.	Add on-pavement **Bicycle Boulevard Designation** markings indicating use of crosswalk by cyclists.
at Court street entrance to CWT	Rail crossing is uneven, wavy asphalt. "Driveway" is privately owned.	**Improve Rail Crossing**. Coordinate with CWT Committee, CSX. Coordinate public access with private driveway owner. May require an easement.
at Fulton and Court	Sidewalk ramp to Court exits	Widen/improve ramp to permit straight on entry/exit in both directions.
Fulton sidewalk - Cascadilla to Court	Sidewalk is 5ft wide, inadequate for two-way bicycle passing and shared pedestrian use. Right of way is owned by NY State.	Widen sidewalk to 8-12 ft.
Fulton sidewalk - Cascadilla to Court	City of Ithaca code (Ord. No. 06-11) prohibits cyclists from riding on sidewalk, "intended for the use of pedestrians".	Change designation to multi-use path and sign as designated bike route/shared use path.

FRANKLIN - LINCOLN - FALL

This corridor links the Tioga Neighborhood Greenway to the 3rd/Plain Neighborhood Greenway along the north edge of the City. It provides access to Ithaca Falls, the ScienCenter, and the Cayuga Waterfront Trail and Stewart Park via Dey and 3rd St..

- Traffic volume: **Very Low to Low**
- Features:
    a. Pedestrian bridge over Cascadilla Creek at Sciencenter provides a natural barrier to cars.
    b. Lincoln is currently a common through street for cars east of Dey St.
- Parallel route options: Parallel route options for automobiles are Falls (Cayuga to Lake, ADT) and Tompkins/Hancock (ADT 1,346/2,875)
- Alternate Corridor: None

Lincoln Neighborhood Greenway (Franklin-Lincoln-Fall)

Location	Issue / Condition	Possible Solution
at Lake and Franklin	Curb cut at start of ramp to the path is too high for safe navigation by cyclists (2-3 inches above street)	Improve **Sidewalk Ramp** / curb cut to permit a smooth entry / exit to the path from Lincoln
Third to Second	Wide right of way with wide entry (no curbs) to parking lot on South side, and city storage lot on North side. There is no on-street parking.	Improvements (curbs, crosswalks, clear driveways) are scheduled for this segment, in conjunction with the 3rd and Hwy 13 improvements. **Consider installation of 5ft wide Bike Lanes** in both directions if post-improvement road width allows.
creek foot bridge at Lincoln	Narrow bridge with wooden surface	Install **"Bicycles Yield to Pedestrians"** sign.
at Dey	Existing (old) bicycle route identity signage	Remove or re-use
at Tioga and Lincoln	Intersects Tioga Bicycle Boulevard, 2 way-stop along Lincoln	Keep as-is

ADDITIONAL CONSIDERATIONS FOR THE NETWORK

Since the completion of the study phase of this project (identification and study of the corridors above), several valuable ideas about the network were shared with the ITCTC. Many of these ideas came from community members who attended the November 20th, 2010 Ithaca Neighborhood Greenways open community event at the Tompkins County Library. A full list (verbatim) is attached as Appendix E. Ideas that fit best within the scope of a Neighborhood Greenways project are listed below in italics with comments from the study author.

- *"Network must go to IHS and Boynton. Please reconfigure the traffic flow to allow safe cycling to schools."*

  This would involve providing an extension of the proposed Tioga St. corridor north to York St., connecting to Cayuga St. A bicycle lane could then be installed on Cayuga between York and the start of the off-street path connecting IHS to Boynton. Alternatively, the sidewalk on the West side of Cayuga between York and the schools could be designated as a shared use facility and signed to direct cyclists onto the sidewalk. This is not ideal due to the potential conflict with pedestrians. Thinking more ambitiously, a new pedestrian bridge over Fall Creek beginning from the back of the parking lot by Fall Creek Pictures and/or improvements to the user path along the levee along Fall Creek could provide safe and comfortable access between the neighborhood greenway and the schools.

- *"Include LACS as a destination". "What is the link for West Hill, Hector and Cliff St. and all roads?"*

  The proposed network links to the Cayuga Waterfront Trail, which goes to the West of the Cayuga Inlet. Also, a decision was made by the ITCTC to focus this plan on the flat areas of the City. Connecting destinations west of Cayuga Inlet in the City of Ithaca to the CWT and the neighborhood greenway network should be addressed by future planning efforts.

- *"Advertise West Spencer as a safe route."*

  This route would assist people in safely and comfortably reaching Buttermilk Falls State Park by bicycle from the City of Ithaca. It should likely be included in a future master bicycle planning process that would enhance links to destinations outside of the core of the City of Ithaca.

- *"Easy connection to Cornell – dedicated bike paths to/from/on Cornell campus."*

  The lowest grade street between downtown Ithaca and Cornell is University Ave. Previous planning exercises have considered improvements to accommodate bicycles. This would be a key link in a comprehensive bicycle network, but it is not included in this proposed plan because it does not fit traffic volume and grade criteria for neighborhood greenway designation. Another street, Cascadilla Park Place, was considered but also not included. It is very calm, but also extremely steep. Currently, the best way for casual cyclists to climb the hill from downtown to Cornell is via a TCAT bus/bus bike rack.

- *"Elmira Rd. is wide and works, but you ride through parking lots (for a possible route of Plain St. to Elmira to Rt. 13). Mark roads for bikes.)"*

  Elmira Rd from Plain St. to Route 13 is a candidate for a "complete street" redesign; indeed the City has existing plans for to this, which would provide an excellent link between the neighborhood greenway on Plain St. Elmira Rd. and the big box stores on Route 13 in SW Ithaca.

- *"Designate S. Cayuga to Commons (Plain is too far)."*

  While S. Cayuga St. likely has too many cars per day to be considered a candidate for Neighborhood Greenway designation, one route that should be examined in more detail is connecting to the signalized pedestrian crosswalk at Cinemopolis on the south edge of The Ithaca Commons, through the esplanade along Six Mile Creek to the corner of Clinton St. and S. Cayuga St. It is one block south from there to the Neighborhood Greenway at S. Titus St., along S. Cayuga St.

- *"Geneva St. as N-S bike route with traffic assistance on Green & Seneca."*

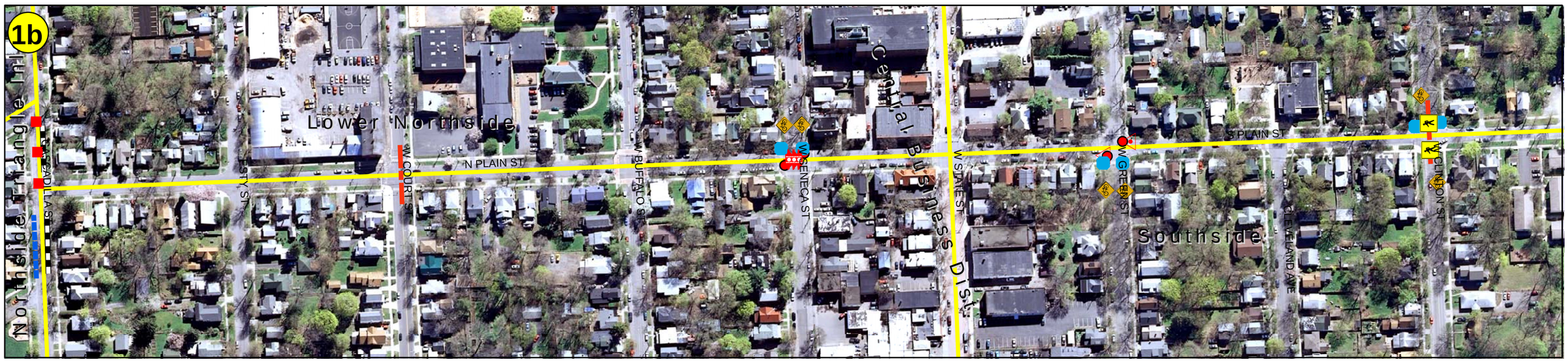
  This was considered as an alternate to Plain St.. The character of the streets is quite similar in terms of traffic volume and current crossing issues. But Geneva St. does not provide as direct of a connection because it does not cross Six Mile Creek. This this plan works to avoid jogs in order to create a highly predictable and intuitive system. Also, Plain St. is slated for crossing improvements at Green St. and Seneca St.

- *"Cayuga St. needs traffic calming."*

  Cayuga St. has over 6,000 cars per day. This plan prioritizes lower-traffic streets as the primary corridors for neighborhood greenways. Cayuga St. is also likely a common emergency responder route. For these reasons, traffic calming is not recommended on Cayuga St.

- *"Consider 2nd St. instead of 3rd St.?"*

2nd St. fits criteria for a Neighborhood Greenway to a certain degree. It has lower traffic than 3rd St. but it doesn't go straight through and does not benefit from an existing 4-way controlled intersection at Hancock St. (a busy crossing).



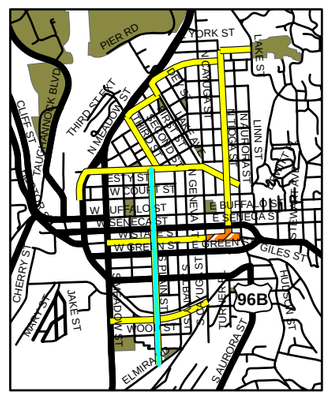
Legend

- Neighborhood Greenway
- Widen Sidewalk
- Raised Crosswalk
- Partial Diverter
- Mini Traffic Circle
- New Traffic Signal
- Improve Sidewalk Ramp
- Warning Sign
- Except Bike Sign
- Curb Extension
- Bicycles Use Sidewalk Sign
- Bicycle Detector
- Bicycle Center Left Turn Lane
- Bicycle Box
- Bicycle Advance Stop Bar
- Add Street Parking
- Remove Street Parking
- Raised Median Barrier
- Raised Median
- Bike Lane
- Bike Lanes (Existing)
- Cayuga Waterfront Trail (Existing)

N

Ithaca Neighborhood Greenways: Conceptual Network with Treatments

Segment 1 - Plain St



Prepared by the Ithaca-Tompkins County Transportation Council - 8/11/10

0 250 500

Feet

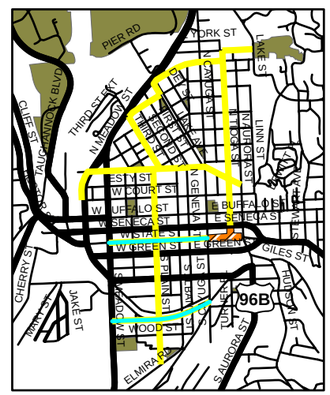
Scale

Legend

- Neighborhood Greenway
- Widen Sidewalk
- Raised Crosswalk
- Partial Diverter
- Mini Traffic Circle
- New Traffic Signal
- Improve Sidewalk Ramp
- Warning Sign
- Except Bike Sign
- Curb Extension
- Bicycles Use Sidewalk Sign
- Bicycle Detector
- Bicycle Center Left Turn Lane
- Bicycle Box
- Bicycle Advance Stop Bar
- Add Street Parking
- Remove Street Parking
- Raised Median Barrier
- Raised Median
- Bike Lane
- Bike Lanes (Existing)
- Cayuga Waterfront Trail (Existing)

N

Ithaca Neighborhood Greenways: Conceptual Network with Treatments Segment 3 - South St / S Titus St & Segment 4 - W State St



Prepared by the Ithaca-Tompkins County Transportation Council - 8/11/10

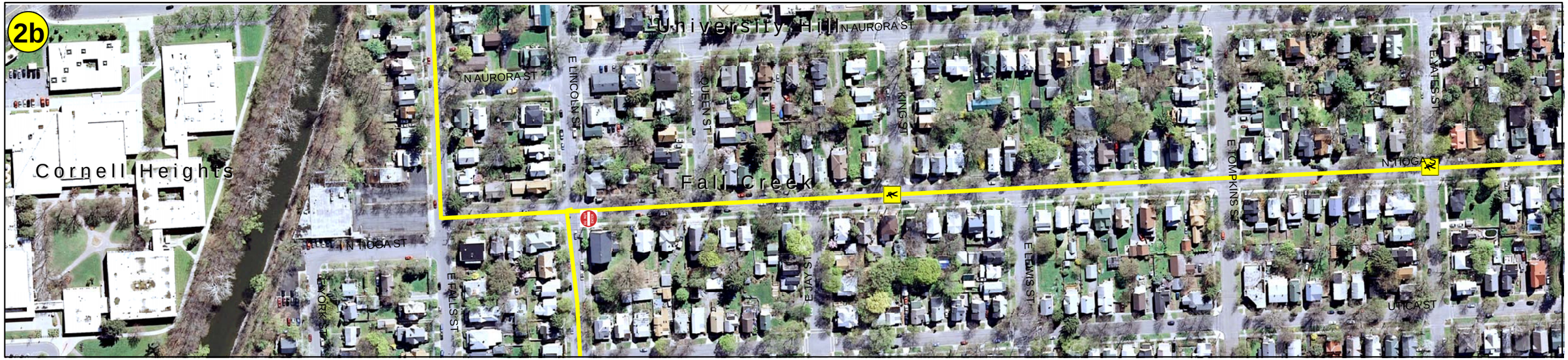
0 250 500

Feet

Scale

2a

2b



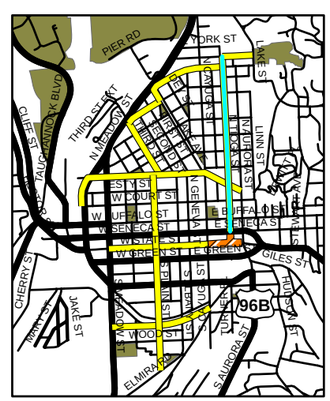
Legend

- Neighborhood Greenway
- Widen Sidewalk
- Raised Crosswalk
- Partial Diverter
- Mini Traffic Circle
- New Traffic Signal
- Improve Sidewalk Ramp
- Warning Sign
- Except Bike Sign
- Curb Extension
- Bicycles Use Sidewalk Sign
- Bicycle Detector
- Bicycle Center Left Turn Lane
- Bicycle Box
- Bicycle Advance Stop Bar
- Add Street Parking
- Remove Street Parking
- Raised Median Barrier
- Raised Median
- Bike Lane
- Bike Lanes (Existing)
- Cayuga Waterfront Trail (Existing)

N

Ithaca Neighborhood Greenways: Conceptual Network with Treatments

Segment 2 - Tioga St



Prepared by the Ithaca-Tompkins County Transportation Council - 8/11/10

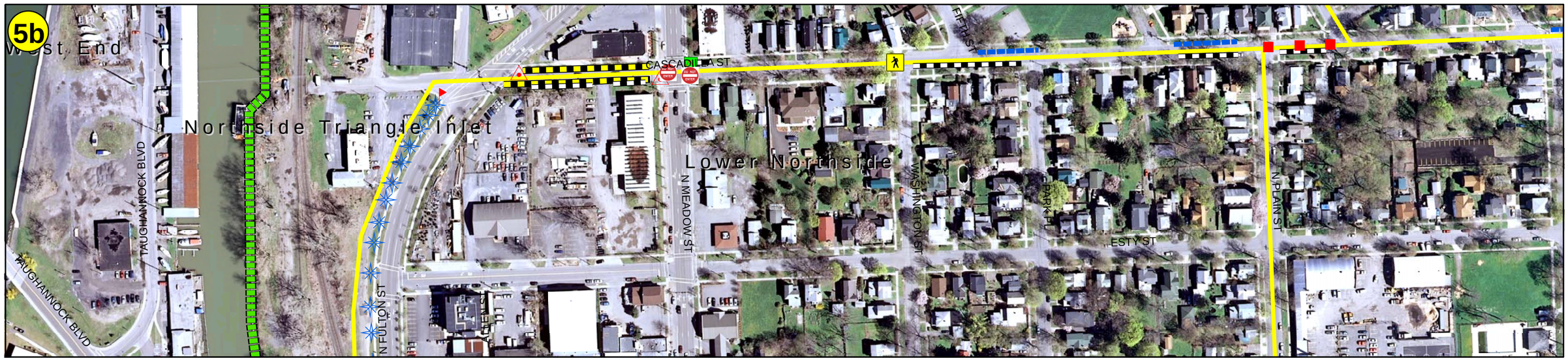
0 250 500

Feet

Scale

5a

5b



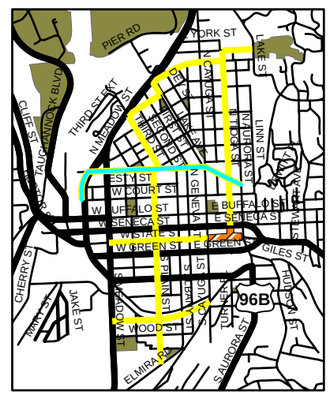
Legend

- Neighborhood Greenway
- Widen Sidewalk
- Raised Crosswalk
- Partial Diverter
- Mini Traffic Circle
- New Traffic Signal
- Improve Sidewalk Ramp
- Warning Sign
- Except Bike Sign
- Curb Extension
- Bicycles Use Sidewalk Sign
- Bicycle Detector
- Bicycle Center Left Turn Lane
- Bicycle Box
- Bicycle Advance Stop Bar
- Add Street Parking
- Remove Street Parking
- Raised Median Barrier
- Raised Median
- Bike Lane
- Bike Lanes (Existing)
- Cayuga Waterfront Trail (Existing)

N

Ithaca Neighborhood Greenways: Conceptual Network with Treatments

Segment 5 - Cascadilla St

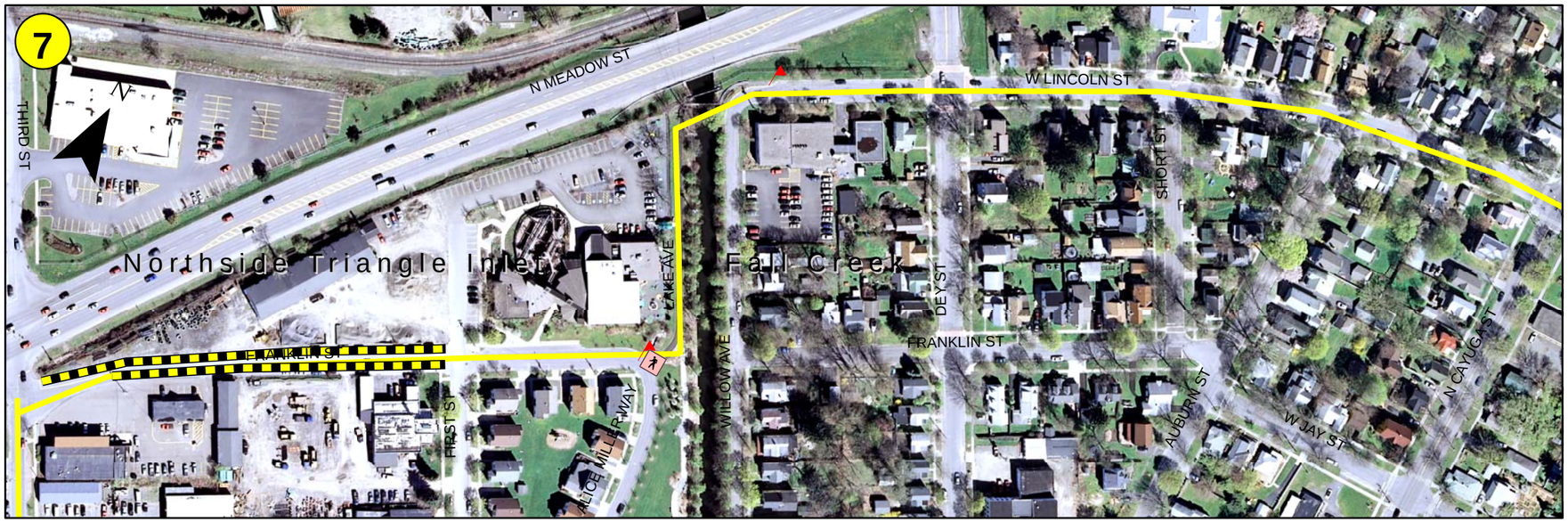


Prepared by the Ithaca-Tompkins County Transportation Council - 8/11/10

0 250 500

Feet

Scale



Ithaca Neighborhood Greenways: Conceptual Network with Treatments

Segment 6 - Third St, Segment 7 - Franklin St, Segment 8 - Lincoln/Fall St

0 250 500

Feet

Scale

Legend

- Neighborhood Greenway
- Widen Sidewalk
- Raised Crosswalk
- Partial Diverter
- Mini Traffic Circle
- New Traffic Signal
- Improve Sidewalk Ramp
- Warning Sign
- Except Bike Sign
- Curb Extension
- Bicycles Use Sidewalk Sign
- Bicycle Detector
- Bicycle Center Left Turn Lane
- Bicycle Box
- Bicycle Advance Stop Bar
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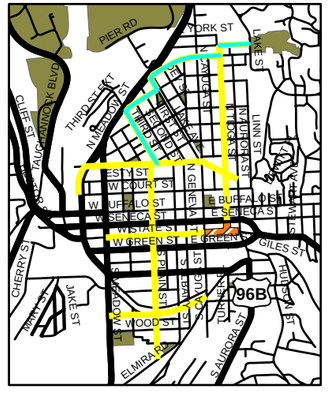
- Bike Lanes (Existing)
- Cayuga Waterfront Trail (Existing)



Prepared by the Ithaca-Tompkins County Transportation Council - 8/11/10

CHAPTER 4: IMPLEMENTATION

This section includes brief discussions costs, policy and funding considerations, phasing options, and planning process considerations.

COST SUMMARY

A detailed summary of the range of likely costs for each type of treatment is attached as Appendix A. Specific cost estimates are taken from two sources: 1) from the IBPI guide and 2) from previous City of Ithaca projects. Quantities for each treatment with corresponding locations are taken from the treatment recommendations proposed by this proposed plan. The actual project costs for an Ithaca Neighborhood Greenway network will vary depend on several factors. Reasonable middle range estimates of the cost of the initial installation are from $558,695 to $864, 255 depending on whether a *basic* or *plus* option is selected. As noted in the corridor descriptions above and in Appendix A, the *plus* option include several more extensive treatments such as partial non-motorized only crossings, raised center medians, a new traffic signal at Plain Street and Green Street, a wider path along Fulton Street.

		Low Estimate	High Estimate	Middle Estimate
TOTAL	**(Basic)**	**$283,625**	**$833,765**	**$558,695**
TOTAL	**(Plus)**	**$476,745**	**$1,271,765**	**$874,255**

DETERMINANTS OF VARIABLE COSTS

In addition to the decision about whether to pursue a “basic” or a “plus” option for physical treatments, several other factors will affect the final cost. These include the quality of materials selected, the level of coordination with other efforts, non-infrastructure costs and system maintenance costs. A discussion of each of these factors follows.

QUALITY OF MATERIALS

There are several choices to make during a planning and engineering phase about which materials and processes to use for various treatments. These include:

- **Pavement marking material**: paint or thermoplastic. The upfront cost of installing the markings in paint is much less, but paint requires more maintenance. For this reason, the City of Ithaca may wish to install the markings in thermoplastic.

- The City of Ithaca may also consider including the **purchase of stencils** for painted pavement markings in a funding proposal. Federal and state transportation funding for this type of project would not typically pay for ongoing maintenance costs, but the City may be able to make an argument to funders that the purchase of stencils should be included for use in the initial installation. The stencils could then be re-used.

- **Permanent vs. temporary treatments.** The City of Ithaca has used more temporary-style calming treatments with some success, such as the partial diverter at South St. and Fair St. The benefits of less permanent installations are that they can be cheaper and obviously can be tested for a "trial period", if needed. However, the maintenance costs may be greater over time and the physical appearance may deteriorate more rapidly as well.

- This study suggests alternating the side of the streets on which cars are permitted to park during the daytime on Plain St. and Cascadilla St. This is an affordable option, but if in testing this concept proves ineffective, the City may wish to install more substantial physical improvements such as curbed chicanes or additional speed humps or raised crosswalks.

COORDINATION WITH OTHER IMPROVEMENTS / EFFORTS

- **Planned rebuilding of Tioga St.** As noted in the description of the Tioga St. corridor in Chapter 3 of this study, Tioga St. is slated for a complete road rebuild during 2011 and 2012. Significant savings are likely to accrue from including the traffic calming and neighborhood greenway design elements in the re-build of Tioga if it is indeed selected as a Neighborhood Greenway corridor.

- **Community partnerships.** If the City engages in a substantial community outreach project and generates significant levels of community buy-in, community groups may choose to adopt and add value to aspects of the neighborhood greenways. See the Process Recommendations section of this report on page 51 for a list of possible partnerships.

NON-INFRASTRUCTURE COSTS

This study focuses on the use of physical infrastructure changes to develop a network of neighborhood greenways. Yet, the literature on encouraging bicycle transportation (Krizek & Forsyth 2009; Pucher, Dill, & Handy 2010) demonstrates that "substantial increases in bicycling requires an integrated package of many different, complementary interventions, including infrastructure provision and pro-bicycle programs, supportive land use planning, and restrictions on car use" (Pucher, Dill & Handy). A comprehensive treatment of non-infrastructure measures (also known as "soft measures" is outside the scope of this study. Thus, the cost estimate given above does not include several potentially important non-infrastructure-related costs. Briefly, these may include:

- **Education and encouragement**. These are essential to a successful neighborhood greenway program, and can take many forms. Ideas include bikeway maps/guides for community distribution, public outreach, events (organized rides, media events, bike to work, bike to school days, Cyclovias, etc.), print and outdoor media marketing, individualized marketing, Safe Routes to School, etc.

- **Evaluation.** A final project proposal should include funds for comprehensive, robust program evaluation, including pre-and post-implementation surveys and bicycle and pedestrian counts. There may be meaningful opportunities for researchers from local higher education institutions to support these evaluation efforts.

- **Engineering and planning**. This is likely to be about 10% additional on top of the physical improvements cost.

SYSTEM MAINTAINANCE

The City of Ithaca will need to perform some level of ongoing maintenance of the neighborhood greenway system. Much of this maintenance can likely be absorbed with little additional cost to the City, since this project mainly involves retrofitting existing pavement, not devoting new land area to transportation infrastructure. Still, further study is needed to estimate these costs. Considerations may include:

- **Pavement markings.** Paint will wear off, although given the selection of low-traffic corridors for the neighborhood greenway network, the rate at which markings will need to be repainted will be less (every 3-5 years?) than in locations experiencing high traffic volumes. East State St. for instance has high traffic volumes and the City must reapply paint here each year). Thermoplastic will last longer. The City of Ithaca may further mitigate costs by using the project application to purchase stencils.

- **Signs**. These are relatively maintenance free.

- **Traffic calming features**. The City's history with low maintenance requirements at existing calming features on Buffalo St. and Dey St. and several other locations suggests that these may also be relatively maintenance free.

- **Materials for treatments**. In selecting materials for traffic calming improvements (brick vs. concrete vs. asphalt), the City should take into account the relative maintenance cost associated with each type of material.

FUNDING

Several likely sources of funding are available for bicycle and pedestrian infrastructure planning and development. Appendix C of the IBPI Bicycle Boulevard Planning and Design Guidebook provides a comprehensive list of potential sources (IBPI, pg. 80) at Federal, State, and local levels. The City of Ithaca (Office of the City Engineer) and the Ithaca Tompkins County Transportation Council should work to target sources and apply for funding during the next phase of this project.

The two most promising Federal sources of funding for the *Ithaca Neighborhood Greenways* project deserve specific attention here. First, the next application for Federal funding is likely to be in the

Fall of 2011 with the update of the TIP - Transportation Improvement Program. If adequate local support for the concept is shown during the first half of 2011, the City may wish to include this project in their general application to the State for use of TIP funds. Second, the competitive Transportation Enhancement (TE) grant program may also be applicable to a neighborhood greenways project. However, the funding timeline for this source is less clear and since the typical TE project pays for improvements "outside the pavement", further research is required to identify whether this source would indeed be a good fit.

Several communities which have been successful at developing bicycle boulevards have invested local money. In Portland, Oregon a third of traffic fine revenues go to a community traffic safety fund, and this has been an important source of local funding for bicycle boulevard development (Raisman interview).

Incorporating meaningful partnerships with community organizations in Ithaca could also provide a significant source of financial support in the way of both reduced implementation and management costs. Several ideas:

- Work with schools and community organizations for funds and volunteer projects.
- Contract with students in the Cornell Department of City and Regional Planning and/or Landscape Architecture on volunteer design and/or planning projects.
- Work with Design Connect at Cornell University, a "multidisciplinary student outreach organization which collaborates with small communities across Upstate New York to create comprehensive and sustainable design solutions." http://designconnectcornell.com/
- Apply for grants from local community foundations. This may be an important source of added value funding for related encouragement and education initiatives.
- Develop a volunteer service or neighborhood organizations to provide maintenance of landscaping green features, planters, etc.

POLICIES

Several policy initiatives or changes can support the implementation of neighborhood greenways in Ithaca.

1. The City of Ithaca Code should likely be amended to allow cycling on "designated shared paths", such as the proposed connection along a widened sidewalk on the West side of Fulton Street between Cascadilla St. and Court St. The current City of Ithaca code restricts the use of sidewalks and footpaths by cyclists.

> *"No person shall ride, drive or operate a bicycle along any public sidewalk or footpath intended for the use of pedestrians. This provision shall not apply to children 10 years of age or under nor to anyone who, because of a disability, requires the use of a bicycle as a means of transportation or mobility. Any violation of the provisions of this section*

constitutes a civil offense punishable in accordance with Section 1-1 of the City of Ithaca Municipal Code"

- CURRENT CITY OF ITHACA CODE: [AMENDED 7-5-2006 BY ORD. NO. 06-11]

2. Current state law does not allow the City to set a speed limit on a given street corridor lower than 25 mph. This may be adequate to achieve the appropriate conditions along Neighborhood Greenway corridors, but a limit of 20 mph would provide substantial improvements in terms of cyclist and pedestrian safety and comfort along the designated corridors. City leaders, working with state legislators, may wish to petition for a legislative change allowing the speed limit to be set to 20 mph along bicycle boulevards/neighborhood greenways.

3. The Ithaca Commons is currently designated as a "Dismount Zone" for cyclists to support the values of pedestrian safety and comfort in Ithaca's downtown pedestrian center. The Commons is also an ideal corridor for cyclists wishing to avoid heavy one-way traffic on Cayuga, Seneca and Green Streets. For the latter reason, it is included in the Ithaca Neighborhood Greenway network as a pass-through area. Given the substantial benefits of having a contiguous bicycle boulevard network, and the importance of the Commons to that network, City of Ithaca policy makers and groups engaged in re-envisioning the future of the Commons may wish to consider a policy change around the use of bicycles in the Commons to provide balance to the goals of safety, comfort, utility and supporting a multi-modal transportation system.

Additional policy recommendations addressing common concerns and challenges include provisions for the following (IBPI guidebook, pg. 10)

- Maintaining property access
- Limiting impacts on traffic patterns.
- Providing emergency service access.
- Addressing transit route conflicts.
- Enforcement issues.

OPTIONS FOR PHASING

Several options for phased implementation appear below with recommendations.

OPTION A

Implement the entire network in two phases: Phase I, install signage and markings; Phase II, install physical improvements. Evidence suggests that effective neighborhood greenways require both signage and physical treatments. The result of a phased approach with signage and markings installed first might be public confusion due to the inadequacy of signage alone to alter the physical character (and user experience) of the street.

OPTION B

Pilot a segment with City funds (possibly on Tioga St.), then apply for funds for full project from a state or federal source such as the TIP. The advantage of this option would be two-fold. First, the City could try out the improvements in an area where they are most likely to show strong success, and be readily understood and valued by the community. This could generate grassroots demand and support for the broader network. Second, the City could apply lessons learned from the pilot segments to the entire network. The disadvantage of this approach is that there are certain benefits of Neighborhood Greenways that would only be generated by the development of a complete contiguous network. For instance, one would not expect to see City-wide increases in cycling, since one corridor alone addresses the issues of access and comfort for a limited set of people and trips. One would however, expect to see safety and livability improvements on the single corridor in question.

OPTION C

Implement the next work in two phases with Phase I: Install non-aggressive treatments first (the "Basic" program described in the master treatment inventory – Appendix A), then Phase II: partial diverters, median barriers (the "Plus" program described in Appendix A). A possible advantage of this approach is that it can be combined with the Pilot option (Option B).

OPTION D

A final option is to consider the use of temporary, "trial" installations of some treatments. Then, after a trial period of several months, based on community response, the City could decide to keep the temporary treatments in place, install more permanent treatments or remove them. The City has used this method in the past for traffic calming and channeling purposes, for example by using railroad ties and stone at the partial closure at South St. and Fair St. Several additional examples support how this might work for different types of treatments:

- For partial non-motorized only crossings, use movable planters and paint instead of concrete.
- For calming, use temporary rubberized speed cushions (see page 30 of Miami-Dade County Bicycle Boulevard Planning Study).
- For warning signage at crossings, use "Yield to Pedestrian" signs in crosswalk signs on rubber pedestals to enhance visibility of crossings.

PHASING RECOMMENDATIONS:

Phasing is not required, but may have certain advantages. If phasing is preferred, this study recommends Option C, or a combination of Option B and C. Option A is not recommended. Option D (trial installations) can be combined with any approach.

PROCESS RECOMMENDATIONS

The office of the City Transportation Engineer (with participation from the Board of Public Works, Common Council, the Ithaca Planning Department and the Mayor) should work closely with Ithaca's residential and business communities to ensure that the neighborhood greenway project addresses the needs of the community. A combination of displays, marketing, presentations, public meetings and public design charettes and workshops should be considered.

Studies note that "substantial increases in bicycling require an integrated package of many different, complementary interventions, including infrastructure provision and pro-bicycle programs, supportive land use planning, and restrictions on car use" (Pucher, Dill and Handy, pg. 2). The community will be well served if the City and other parties seek out opportunities to incorporate these complementary interventions. Also, planning and creative thinking about how to develop real on-the-ground partnerships with other community efforts hold potential to expand the appeal and impact of neighborhood greenways beyond the narrow realm of transportation planning. The following is a list of potential opportunities for connection with other community initiatives.

- Combine pocket parks and non-motorized only crossings.
- Incorporate creative neighborhood place-making, for example public art as a traffic calming mechanism at intersections (painted intersection).
- Combine green infrastructure and ecosystem enhancement with traffic calming measures.
- Partner with Safe Routes to School (SRTS). Local funding for the Safe Routes to School program may become available again upon passage of the federal transportation bill, possibly as early as 2011 or 2012. SRTS stakeholders including the City of Ithaca Office of the City Engineer, the Ithaca City School District and other school partners, the City of Ithaca Police Department and others should consider linking traffic safety improvements around schools and walking and cycling encouragement initiatives with *Ithaca Neighborhood Greenway* efforts.
- Partner with physical activity promotion efforts in Ithaca. One prominent partner might be the Health Planning Council and Creating Healthy Places, their three year grant to improve health through nutrition and physical activity promotion in the Northside and Southside neighborhoods.
- Partner with tourism promotion efforts, such as with the Tompkins County Chamber of Commerce and the Tompkins County Strategic Tourism Planning Board.
- Partner with the Cayuga Waterfront Trail Initiative.
- Partner with the Ithaca Commons and Downtown Ithaca Alliance.
- Partner with other trail/greenway initiatives, such as the Black Diamond Trail, and Six Mile Creek trail extension.
- Partner with the Way2Go transportation education program at Cornell Cooperative Extension of Tompkins County. The program may have the capacity to support the *Ithaca Neighborhood Greenways* initiative through in-kind marketing.

EVALUATION

A robust evaluation program will not only track project implementation and, but seek to understand impacts around the core goal areas of improved safety, increased bicycle mode share, resident and user perceptions, and enhanced livability. The following processes are recommended:

- Pre and post bicycle and pedestrian counts on proposed neighborhood greenway segments and other areas in the city to develop baseline data and establish trends.
- Pre and post implementation measurement of motor vehicle speed and volume along Neighborhood Greenway corridors.
- Survey of city residents, community perceptions
- Ongoing GIS analysis of crash locations and pedestrian and cyclist injuries.
- Opportunities for partnership with Cornell University Department of City and Regional Planning (or others) should be built in to develop original research design projects around neighborhood greenway implementation.

NEXT STEPS

SHORT TERM:

This study and proposed plan have evaluated the potential for a network of bicycle boulevards / neighborhood greenways in the City of Ithaca. It suggests that neighborhood greenways are a good fit for enhancing bicycle and pedestrian infrastructure in the City of Ithaca, and that such an investment holds the potential to pay significant dividends to quality of life and safety. A primary goal has been to provide the City of Ithaca with information to move forward with the next steps towards implementing a comprehensive neighborhood greenway strategy. The ITCTC is prepared to support the City's efforts by providing additional research, collaborative outreach and information on opportunities to fund such an initiative. Specifically, the following planning steps and research should be pursued:

- Develop a comprehensive strategy for marketing this study to decision-makers and stakeholders in the City of Ithaca. The ad-hoc steering committee for the *Ithaca Neighborhood Greenways Study and Proposed Plan* has just begun this process as of April, 2011. Strategies may include:
    - Meet with key decision-makers and share this study - City of Ithaca Engineer, the Board of Public Works, Mayor Carolyn Peterson, and Ithaca Common Council.
    - Meet with potential partners – several groups have expressed interest in being engaged early in the process of developing this project including the City of Ithaca Bicycle and Pedestrian Advisory Committee, the Way2Go program of Cornell Cooperative Extension. Other potential partners to consider including early in the process are the New

York Department of Transportation, Ithaca Health Planning Council and Human Services Coalition of Tompkins County, the Finger Lakes Cycling Club, emergency service providers, and the City of Ithaca Police Department.

- Decide whether to apply for funding for a neighborhood greenway project for Ithaca. Ideally, this should be completed prior to October, 2011 in order to take advantage of the next round of funding for the TIP.

- Community outreach process – once a determination has been made about the level of potential support for this concept amongst decision-makers and likely partners, there is a need to educate and collect feedback from a wide variety of additional community stakeholders. This could be done in advance of a formal master planning process, or as part of one, depending on the need. These may include the following (not a comprehensive list):

    - Neighborhood associations / groups
    - School-based groups: ICSD school board, PTAs
    - Downtown Ithaca Alliance
    - Southside Community Center
    - Chamber of Commerce and other business and tourism groups.
    - Media outlets: Ithaca Journal, Ithaca Times, etc.
    - Cornell University and Ithaca College

- Research funding mechanisms and develop a prioritized list of sources with application and funding timelines.

- Benefit / cost analysis – several tools are available for calculating the benefit / cost ratios of non-motorized transportation investments based on assumptions of reduced vehicle miles traveled (VMT). This is outside the scope of this study, but would be a useful addition.

- Explore the possibility of a city-funded pilot program on North Tioga St.

- Track the status of research on bicycle boulevards. Studies are currently underway which hold the potential to significantly enhance understanding of the effects/benefits of bicycle boulevard infrastructure.

- There is a need to examine the non-construction cost implications of pursuing a neighborhood greenway project in the City of Ithaca in more detail, for example for planning and engineering, inspection and maintenance. While the upfront capital investment is likely to be covered by money from outside the community (state / federal transportation dollars) the City is likely to incur additional costs after a certain period for maintenance. The amount will partially depend on the initial design of treatments such as pavement markings and traffic calming features. It will also depend on future decisions about the level of maintenance to pursue, and level of coordination with other maintenance programs. More research is required to provide a range of estimates.

LONG TERM:

Upon completion of short-term tasks, if the City of Ithaca determines that an *Ithaca Neighborhood Greenways* project should move forward, next steps include procurement, engineering and implementation and evaluation. A formal master planning process should include a comprehensive public involvement process and several decisions should be made in the course of this planning process including:

- To pilot or not to pilot
- Selection of phasing options
- Final selection of specific corridors and treatments.

STUDY SOURCES

LOCALLY RELEVANT POLICIES AND PLANS

Cayuga Waterfront Trail - http://www.cayugawaterfronttrail.com/

City of Ithaca Bike Plan (1997) - http://www.ci.ithaca.ny.us/index.asp?Type=B_BASIC&SEC={C3C56149-2E28-44A5-A337-5EA44C6E14C6}

City of Ithaca – Cayuga St. Sharrows report: http://bikeithaca.org/bpac/?page_id=42

Downtown Ithaca Alliance (DIA). (2010). *Downtown Ithaca 2020 Strategic Plan.* Retrieved from: http://www.downtownithaca.com/content/view/downtown-2020-strategic-plan.html

Ithaca Tompkins County 2030 Long-Range Transportation Plan – http://www.tompkins-co.org/itctc/lrp/index_2030final.htm

Tompkins County 2020 Energy Strategy, Interim Actions Toward Achieving the Community 2050 Greenhouse Gas Emissions Reduction Goal - http://www.tompkins-co.org/planning/energyclimate/documents/EnergyStrategy20207-20-10.pdf

United States Department of Transportation Policy Statement on Bicycle and Pedestrian Accommodation Regulations and Recommendations - http://www.fhwa.dot.gov/environment/bikeped/policy_accom.htm

NEIGHBORHOOD GREENWAYS / BICYCLE BOULEVARDS AND TREATMENTS

Austin, TX Bike Boulevard Traffic Impact Analysis: https://www.ci.austin.tx.us/publicworks/downloads/bikeblvdtrafficstudy.pdf

Austin, TX Bicycle Boulevard presentation: http://www.cityofaustin.org/publicworks/downloads/nueces_design_charette_presentation_1_13_10.pdf

Bicycle Boulevard Planning and Design Guidebook – IBPI, Alta Planning and Design and Portland State University. (2009). Retrieved online http://www.ibpi.usp.pdx.edu/guidebook.php

Bicycle Boulevard / Neighborhood Greenway Planning & Design Webinar slides Association of Pedestrian and Bicycle Professionals (APBP), August, 2010

Bicycle Transportation Alliance Bicycle Boulevard Project - http://www.bta4bikes.org/at_work/bikeboulevards.php

Bicycle Boulevard page on StreetsWIKI: http://streetswiki.wikispaces.com/Bicycle+Boulevard

Ciccarelli, John. (2009). article on Bike Boulevards in “Tech Transfer” newsletter. http://www.bicyclesolutions.com/pdfs/BicycleBoulevards.pdf

City of Berkeley Bicycle Boulevard Design Tools and Guidelines - http://www.ci.berkeley.ca.us/ContentDisplay.aspx?id=6652

FHWA Application, City of Columbus, OH, Request for Permission to Experiment with a Bicycle Box Intersection Treatment - http://www.atssa.com/galleries/default-file/6-26-09_Incoming-appl_ColumbusOH.pdf

Miami Dade County Bicycle Boulevard Planning Study: Model City/Brownsville - http://www.co.miami-dade.fl.us/mpo/docs/MPO_bicycle_boulevard_planning_final_20091221.pdf

Mariah VanZerr. Resident Perceptions of Bicycle Boulevards: A SE Salmon Street Case Study - http://www.ibpi.usp.pdx.edu/boulevardperceptions.php

Wikipedia Bicycle Boulevard definition: http://en.wikipedia.org/wiki/Bicycle_boulevard

University Hill Transportation Study, Syracuse Metropolitan Transportation Council (SMTC) - http://www.smtcmpo.org/bike-ped/finalrep.asp

University Hill Bicycle Network - Syracuse Metropolitan Transportation Council (SMTC)- http://www.smtcmpo.org/finalreps.asp?fy=2008&ShowAll=0

VIDEOS

Streetfilms.org: *Portland's Bicycle Boulevards become Neighborhood Greenways.* http://www.streetfilms.org/portlands-bike-boulevards-become-neighborhood-greenways/

Streetfilms.org: *Berkeley's Bicycle Boulevards.* Retrieved from: http://www.streetfilms.org/berkeley-bike-boulevards/

Streetfilms.org: *Portland's Bicycle Boulevards*. Retrieved from: http://www.streetfilms.org/portland-or-bicycle-boulevards/

Streetfilms:*Bicycle Boulevards for NYC.* http://www.streetfilms.org/bicycle-boulevards4nyc/

Birk, Mia and Dill, Jennifer. Bicycle boulevards / neighborhood greenways presentations at Moving Forward: Active Transportation Symposium. November 20th, 2010. Available online: http://www.cornell.edu/video/?videoid=1084

GENERAL BIKEWAY DESIGN GUIDELINES:

AASHTO Guide for the development of bicycle facilities: http://www.sccrtc.org/bikes/AASHTO_1999_BikeBook.pdf

Cities for Cycling, a bikeway design guideline project of the National Association of City Transportation Officials http://www.nacto.org/citiesforcycling.html

City of Tacoma, WA. Mobility Master Plan Bicycle and Pedestrian Design Guidelines. http://cms.cityoftacoma.org/Planning/MoMaP/MoMaPDesignGuidelines_PublicReviewDraft.pdf

Manual on Uniform Traffic Control Devices (MUTCD) Part 9: Traffic Control for Bicycle Facilities - http://mutcd.fhwa.dot.gov/pdfs/2009/pdf_index.htm

State of New York, NYS DMV. Vehicular and Traffic Law. 2006-2007 edition.

USDOT design guidance: http://www.fhwa.dot.gov/environment/bikeped/design.htm

ACADEMIC STUDIES, PUBLIC REPORTS, MEDIA

Dill, Jennifer. (2009). Understanding *and Measuring Bicycling Behavior: a Focus on Travel Time and Route Choice*. Oregon Transportation and Research Education Consortium. Retrieved from: http://www.ibpi.usp.pdx.edu/bikegps.php

Dill, Jennifer. (2010). *Evaluation of Bike Boxes at Signalized Intersections.* Oregon Transportation and Research Education Consortium. Retrieved from: http://www.ibpi.usp.pdx.edu/bikebox.php

Dumbaugh, Eric. Safe Streets, Livable Streets. Journal of the American Planning Association, Summer 2005, Vol. 71, No. 3 http://www.naturewithin.info/Roadside/TransSafety_JAPA.pdf

Ewing, Reid H. (1999). *Traffic calming: state of the practice*. Prepared for the U.S. Department of Transportation, Federal Highway Administration, Office of Safety Research and Development and Office of Human Environment; prepared by Institute of Transportation Engineers. Accessed: http://www.ite.org/traffic/tcstate.asp#tcsop

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Furth, Peter G. (2008). *On-Road Bicycle Facilities for Children and Other "Easy Riders": Stress Mechanisms and Design Criteria.* Presented at the Transportation Research Board Annual Meeting, Washington, January, 2008

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Geller, Roger. *Four Types of Cyclists*. Portland Bureau of Transportation. Retrieved from: http://www.portlandonline.com/transportation/index.cfm?a=158497&c=44671

Grundy, Chris et al. (2009). *Effect of 20 mph traffic speed zones on road injuries in London, 1986-2006: controlled interrupted time series analysis.* British Medical Journal. 339:doi:10.1136/bmj.b4469 (Published 10 December 2009)

Krizek, Kevin and Forsyth, Ann. (2009). *Walking and Cycling International Literature Review.* Accessed: http://www.walkinginfo.org/library/details.cfm?id=4414

LaHood, Ray. (2010). *United States Department of Transportation policy statement on bicycle and pedestrian accommodation, regulations and recommendations.* Accessed: http://www.dot.gov/affairs/2010/bicycle-ped.html

Lindsey et al. (2004). *Property Values, Recreation Values, and Urban Greenways*. Journal of Park and Recreation Administration, V22 (3) pp.69-90.

Maus, Jonathan. (2010). *For PBOT, neighborhood greenways is more than just a new name.* April 14, 2010 BikePortland.org post. Retrieved from: http://bikeportland.org/2010/04/12/pbot-bike-boulevards-now-known-as-neighborhood-greenways-31887

Maus, Jonathan. (2010). *PBOT: bike boulevards now known as 'neighborhood greenways'.* April 12, 2010 BikePortland.org post. Retrieved from: http://bikeportland.org/2010/04/14/for-pbot-neighborhood-greenways-is-more-than-just-a-new-name-31983

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National Personal Transportation Survey – NPTS (1995). Retrieved from: http://nhts.ornl.gov/1995/Doc/trends_report.pdf

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RESEARCH SUMMARIES PUBLISHED BY ADVOCACY ORGANIZATIONS:

National Safe Routes to School Partnership:
http://www.saferoutespartnership.org/mediacenter/research/231317

Rails to Trails Conservancy:
http://www.railstotrails.org/ourWork/advocacy/activeTransportation/campaignForActiveTransportation/index.html

Bikes Belong: http://www.bikesbelong.org/resources/stats-and-research/

The Alliance for Biking and Walking:
http://www.peoplepoweredmovement.org/site/index.php/members/members2/C285

REFER to IMAGES AND DESCRIPTIONS FROM IBPI GUIDEBOOK

Intersection Treatments	Locations	Quantity (Basic)	Quantity (PLUS)	Unit Cost Estimate (lower)	Unit Cost Estimate (upper)	Total Cost Estimate (lower)	Total Cost Estimate (upper)	Cost Source / Description	MUTCD Status	IBPI Guide Page
Curb Extensions / Bulbouts	Plain@Seneca (2, TIP)), Plain@Green (2, TIP), Cascadilla@Cayuga (1), Clinton@Plain (2)	3		$2,000	$20,000	$6,000	$60,000	IBPI Guide, per corner		page 38
Bicycle Box / Advanced Stop Bar	South@Route13, Cascadilla@Meadow, Tioga@Court, Tioga@Buffalo,	4		$5,000	$6,000	$20,000	$24,000	IBPI Guide	Type of advanced stop bar	page 26
Colored bicycle lane at intersection leading into bicycle box	South@Route13, Cascadilla@Meadow, Tioga@Court, Tioga@Buffalo,	4		0	0	$0	$0	part of bicycle box installation	No Parking Bike Lane signal for bike lane leading into box (Sign R7-9)	page 26
Advance stop bar (with no bike box)	Plain@Seneca (2), Plain@Green (2), Cascadilla@Cayuga	5		$175	$350	$875	$1,750	IBPI Guide		page 26
Mini Traffic Circle	Plain@Wood, 3rd@Hancock	2		$5,000	$12,000	$10,000	$24,000	IBPI Guide		page 34
Bicycle Detector (Bicycle-activated signal)	South@Route13 (2), Plain@Green (2), Cascadilla@Meadow (2), Cascadilla@Fulton (1)	7		$1,075	$2,075	$7,525	$14,525	IBPI Guide	2009 MUTCD, Sec. 9C.05 (page 810 & 814). Also, Sec9D.02, Signal Operations for Bicyclists, "signal timing and actuation shall be reviewed and adjusted to consider the needs of bicyclists"	page 27
Bicycle Center Left Turn Lane(s)	Cascadilla@3rd, Cascadilla@Plain, Tioga@Cascadilla	3		$175	$350	$525	$1,050	IBPI Guide		page 32
Painted Bicycle Lane Through Conflict Area	South@13/Wegmans	0	1	$2,500	$6,000	$0	$0	IBPI Guide	2009 MUTCD Sec. 9C.04, Figure 9C-4 for example, Sign R4-4	page36
				SUBTOTAL A	**(Basic)**	**$44,925**	**$125,325**			
				SUBTOTAL B	**(Plus)**	$47,425	$131,325			

Markings and Signage	Locations	Quantity (Basic)	Quantity (PLUS)	Unit Cost Estimate (lower)	Unit Cost Estimate (upper)	Total Cost Estimate (lower)	Total Cost Estimate (upper)	Cost Source / Description		
Wayfinding Signs - Bicycle Boulevard Destinations	Wayfinding Sign locations - SEE BELOW	34		$30	$300	$1,020	$10,200	IBPI Guide (low-end), City of Ithaca (high-end)	2009 MUTCD Section 9B.20. See Figure 9B06 for placement example.	page 20
Identification Signs - Bicycle Boulevard Designation signs	approximately two per crossing, plus select entry points	114		$30	$300	$3,420	$34,200	IBPI Guide (low-end), City of Ithaca (high-end)	2009 MUTCD, Section 9B.21covers Bicycle Route Signs, See Figure 9B-5 for placement example.	page 19
Pavement Markings - Bicycle Boulevard Designation	Just after each intersection and at 200 ft. intervals	350		$75	$400	$26,250	$140,000	IBPI Guide (low-end), City of Ithaca (high-end)	2009 MUTCD Section 9C.07 covers Shared Lane Markings. (Figure 9C-9 for example)	page 23
Warning signs (Caution Bicycles, Bumps, etc)	Clinton@Plain (2), Cayuga@Cascadilla (2), Green@Clinton (1), Seneca@Plain 1)	6		$30	$150	$180	$900	IBPI Guide (low-end), City of Ithaca (high-end)	2009 MUTCD Section 9B.18	page 21
No Through Traffic sign	Cascadilla(North)@Tioga, *others at diverters are incorporated into Partial Diverter/Center Median design)*	1		$30	$300	$30	$300	IBPI Guide (low-end), City of Ithaca (high-end)	2009 MUTCD Section 9B.14	
Bicycles Use Sidewalk / Shared Path signs	Fulton@Court, Fulton@Cascadilla, Lincoln@Willow, Franklin@AliceMillerWay	4		$30	$300	$120	$1,200	IBPI Guide (low-end), City of Ithaca (high-end)	2009 MUTCD Section 9B.12, Symbol R9-7	
Stop for Pedestrians temporary upright sign	Clinton@Plain, Cayuga@Cascadilla, Tioga@Cascadilla	3				$0	$0			
Bicycles Yield to Pedestrians Sign	Lincoln@Lake footbridge (2), Fulton@path (2)	4		$30	$150	$120	$600	plus installation, IBPI Guide	2009 MUTCD Section 9B.12, Symbol R9-7	
Bike Lanes	Cascadilla between Meadow & Fulton (540 ft), , Tioga between Seneca and Court (1,540 ft), *Franklin between 3rd & 2nd (600 ft)*	2,080	600	$4	$8	$8,320	$16,640	(in feet) IBPI Guide (low-end), author's estimate (high-end), may also require center restriping	2009 MUTCD Section 9C.04 covers Markings for Bicycle Lanes	
Except Bicycles signs (used in conjunction with "Do Not Enter" signs, Raised Center Medians, and Partial Diverters)	Cascadilla@Tioga, Cascadilla@Cayuga, If Diverters: Plain@Court (2), Plain@Clinton (2), Cascadilla@Meadow, Tioga@Court (2), Tioga@Lincoln (2)	2	9	$30	$300	$60	$600	IBPI Guide (low-end), City of Ithaca (high-end)		
No Right/Left Turn signs (Used for cross-traffic with Partial Diverters)	*If Diverters: Plain@Clinton (2), Plain@Court (2), Cascadilla@Meadow*	0	5	$30	$300	$0	$0	IBPI Guide (low-end), City of Ithaca (high-end)	OK	
New Pedestrian Hybrid (HAWK) Traffic Signal	Plain@Seneca (optional)	0	1	$100,000	$175,000	$100,000	$175,000	IBPI Guide		page 29
Residential Speed Limit Sign (20mph)	at all	0	130	$30	$300	$0	$0	IBPI Guide (low-end), City of Ithaca (high-end)	OK	page 39
No Passing Bicycles Zone signage	general application	0	130	$30	$300	$0	$0	IBPI Guide (low-end), City of Ithaca (high-end)	n/a	
				SUBTOTAL A	**(Basic)**	**$139,520**	**$379,640**			
				SUBTOTAL B	**(Plus)**	$250,140	$641,640			

Calming Treatments	Locations	Quantity (Basic)	Quantity (PLUS)	Unit Cost Estimate (lower)	Unit Cost Estimate (upper)	Total Cost Estimate (lower)	Total Cost Estimate (upper)	Cost Source / Description	
Speed Hump, Table or Cushion	none explicitely recommended; an optional treatment where additional calming is needed	0		$2,000	$15,000	$0	$0		page 35
High Visibility Raised Crosswalk	Cascadilla@Tioga, Cascadilla@Cayuga, Cascadilla@Washington, Cascadilla@1st, Tioga@Farm, Tioga@King, Tioga@Yates, Tioga@Marshall, 3rd@Madison, Plain@Clinton (2)	11		$2,000	$15,000	$22,000	$165,000		page 30
High-Visibility Crosswalk (non-raised)	Plain@Seneca (TIP), Plain@Green (TIP)	0		$2,000	$15,000	$0	$0		page 30
Change no parking signs to create alternating on-street parking pattern	Cascadilla between Washington and Cayuga, Plain between Elmira Rd and Wood,	20		$50	$100	$1,000	$2,000	installation cost only (estimate)	
Remove on-street parking spaces	Tioga between Court and Seneca (14), Cascadilla@Meadow (2), Cascadilla between Meadow and Fulton (5), Cascadilla beteen Third and Plain (3), South@13 (2)	6		$30	$300	$180	$1,800	sign/meter removal cost plus no parking sign installation; forgone parking revenue if metered.	
Raised Median	State@Meadow (currently painted, add concrete for gateway treatment)	1		$10,000	30,000	$10,000	$30,000	author's estimate	
				SUBTOTAL A	**(Basic)**	**$33,180**	**$198,800**		
				SUBTOTAL B	**(Plus)**	$33,180	$198,800		

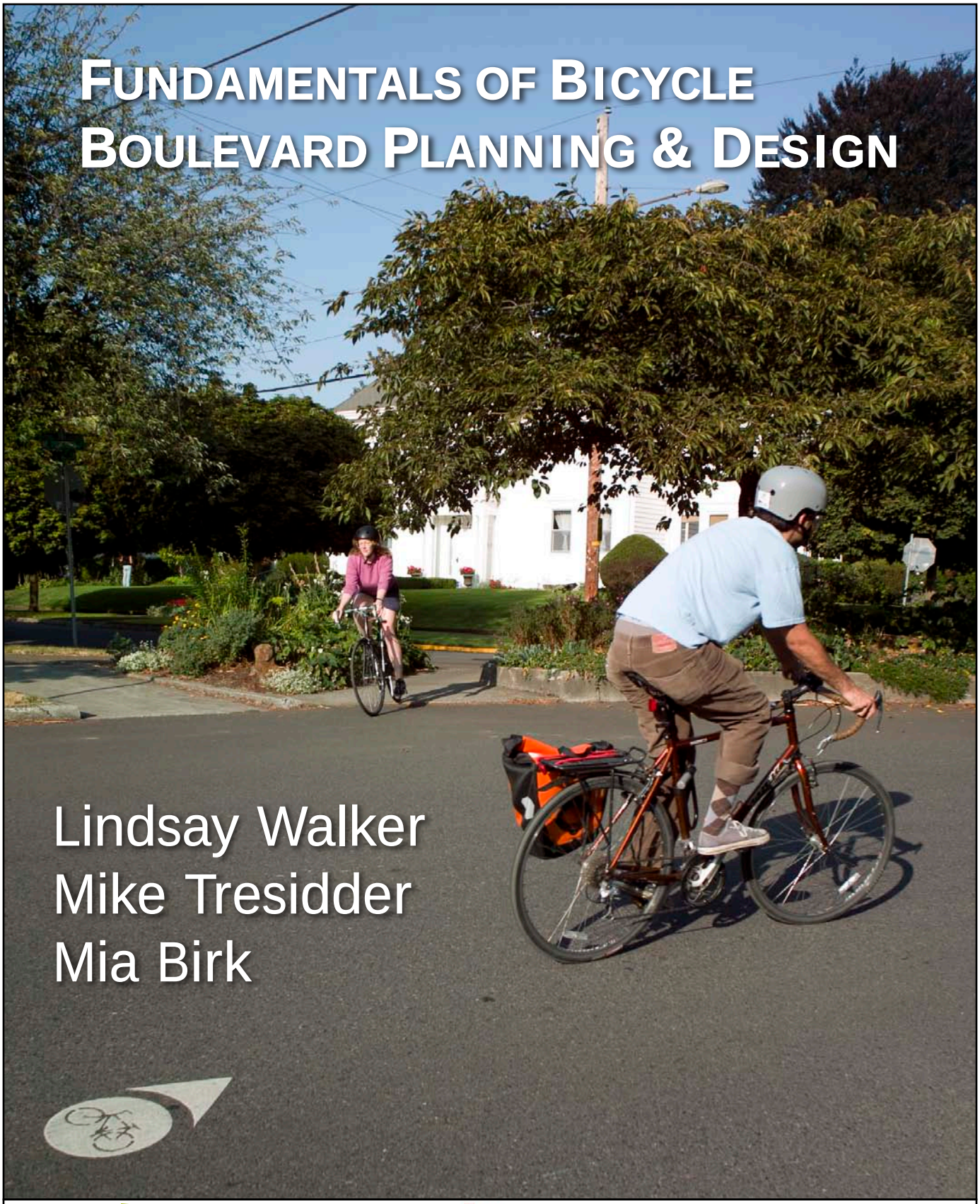
Traffic Reduction - OPTIONAL	Locations	Quantity (Basic)	Quantity (PLUS)	Unit Cost Estimate (lower)	Unit Cost Estimate (upper)	Total Cost Estimate (lower)	Total Cost Estimate (upper)	Cost Source / Description	
Partial Non-Motorized Only Crossings	South@Fair (re-hab existing), *Tioga@Court, Tioga@Lincoln, Cascadilla@Meadow*	*1*	3	*15,000*	*30,000*	*$15,000*	*$30,000*	*City of Ithaca*	*page 43, 44*
Raised Center Median	*Plain@Court, Plain@Clinton*	*0*	2	*15,000*	*30,000*	*$0*	*$0*	*author's estimate*	*page 43, 44*
				SUBTOTAL A	**(Basic)**	**$15,000**	**$30,000**		
				SUBTOTAL B	**(Plus)**	$90,000	$180,000		

Other Treatments	Locations	Quantity (Basic)	Quantity (PLUS)	Unit Cost Estimate (lower)	Unit Cost Estimate (upper)	Total Cost Estimate (lower)	Total Cost Estimate (upper)	Cost Source / Description
Widen sidewalk/shared use path	Fulton from Cascadilla to Court (700 ft long, widen by 3 or 5 ft)	2100	3500	$20	$20	$42,000	$70,000	Lynne Yost, City of Ithaca
Improve sidewalk ramp	Court@Fulton, Tioga@Seneca, Lincon@Lake	3		$3,000	$10,000	$9,000	$30,000	
Change orientation of storm grates	Cascadilla between Meadow & Fulton)	0	2			$0	$0	
Bring manhole cover to grade	Cascadilla at 4th	0	1			$0	$0	
Improve rail grade crossing	Court@Fulton (Cayuga Waterfront Trail access)	0	1	5,000	20,000	$0	$0	
				SUBTOTAL A	**(Basic)**	**$51,000**	**$100,000**	
				SUBTOTAL B	**(Plus)**	$56,000	$120,000	

Estimated Total Cost of Treatments

	Low	High	Middle
(Basic)	**$283,625**	**$833,765**	**$558,695**
(Plus)	**$476,745**	**$1,271,765**	**$874,255**

Fundamentals of Bicycle Boulevard Planning & Design



Lindsay Walker
Mike Tresidder
Mia Birk

ibpi
Initiative for Bicycle & Pedestrian Innovation

alta
PLANNING + DESIGN

Portland State
UNIVERSITY

Fundamentals of Bicycle Boulevard Planning & Design

Lindsay Walker, Alta Planning + Design, Initiative for Bicycle and Pedestrian Innovation Scholarship Recipient

Mike Tresidder, Senior Planner, Alta Planning + Design

Mia Birk, Principal, Alta Planning + Design; Adjunct Professor, Portland State University

Lynn Weigand, Director, Initiative for Bicycle and Pedestrian Innovation

Jennifer Dill, Center for Transportation Studies; Director, Oregon Transportation Research and Education Consortium

Initiative for Bicycle and Pedestrian Innovation
Center for Transportation Studies
Center for Urban Studies
Portland State University, Portland, Oregon

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Initiative for Bicycle and Pedestrian Innovation
Center for Transportation Studies, Portland State University
PO Box 751, Portland, OR 97207-0751
ibpi@pdx.edu
http://ibpi.usp.pdx.edu

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Portland-based Steering Committee

Robert Burchfield, City of Portland Bureau of Transportation, Oregon
Anthony Butzek, Metro, Portland, Oregon
Emily Gardner, Bicycle Transportation Alliance
Denver Igarta, City of Portland Bureau of Transportation, Oregon
Mark Lear, City of Portland Bureau of Transportation, Oregon
John Mermin, Metro, Portland, Oregon
Jamie Parks, Kittelson & Associates, Inc., Portland, Oregon
Greg Raisman, City of Portland Bureau of Transportation, Oregon

National Experts through the Association of Pedestrian & Bicycle Professionals

Eric Anderson, City of Berkeley, California
John Ciccarelli, Bicycle Solutions, San Francisco, California
Bill Schultheiss, Toole Design Group, LLC, Hayttsville, Maryland

Case Study & Other Context Providers

Jarrett Altman, Real Estate Professional, Portland, Oregon
Tom Bertulis, Institute for Transportation and Development Policy, New York, New York
Kevin Christian, City of San Luis Obispo, California
Richard Drdul, Community Transportation Planner, Vancouver, British Columbia
Peter Furth, Northeastern University, Boston, Massachusetts
Preston Johnson, New York City Department of Transportation, New York, New York
Morgan Kessler, City of Arcata, California
Heath Maddox, San Francisco Municipal Transportation Agency, San Francisco, California
David F Roth, City of Eugene, Oregon
David Ruelas, Portland State University Graduate Student, Portland
Raphael Ruis, City of Palo Alto, California
Jim Rutala, City of Ocean City, New Jersey
Lee Shoemaker, City of Eugene, Oregon
Tom Thivener, City of Tucson, Arizona
Rochelle Wheeler, Wheeler Pedestrian and Bicycle Planning, Oakland, California

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I. Introduction

Overview of this report

This report is intended to serve as a planning and conceptual design guide for planners, engineers, citizens, advocates, and decision makers who are considering bicycle boulevards in their community. Data for this guide was developed from literature review, case study interviews, and input from a panel of professional experts.

Section two of this guide contains information on bicycle boulevard planning, including considerations for route selection, public involvement, and funding. Section three provides information on design elements commonly used on bicycle boulevards including descriptions, design and implementation recommendations, images, and cost range estimates as available. Section four discusses marketing, maintenance, and safety considerations for bicycle boulevards. Finally, Section five presents individual case studies of bicycle boulevards from across the United States.

Additional resources, including a bicycle boulevard audit, can be found in the appendices.

What are Bicycle Boulevards?

Traffic engineers, planners, and bicycle activists often frame the development of their bikeway network around three types of bicycle facilities (Figure 1.1):

- Bicycle Path – a paved bicycle path physically separated from motor vehicle traffic (generally outside the road's right of way). It is often shared with pedestrians and other non-motorized users, and occasionally equestrians.
- Bicycle Lane – one-way on-street lanes that are signed and marked to designate the space occupied by cyclists on the roadway.
- Shared Roadway – A bike facility in which cyclists share the roadway with motor vehicles, cycling in a paved shoulder or a wide outside curb lane. It may or may not be signed as a preferred bicycle route.

Figure 1.1 Common types of bicycle facilities

Bicycle boulevards take the shared roadway bike facility to a new level, creating an attractive, convenient, and comfortable cycling environment that is welcoming to cyclists of all ages and skill levels (Figure 1.2). In essence, **bicycle boulevards are low-volume and low-speed streets that have been optimized for bicycle travel through treatments such as traffic calming and traffic reduction, signage and pavement markings, and intersection crossing treatments**. These treatments allow through movements for cyclists while discouraging similar through trips by non-local motorized traffic. Motor vehicle access to properties along the route is maintained.

Figure 1.2 A bicycle boulevard is attractive to cyclists and other non-motorized roadway users.

Bicycle boulevards are known by several different names. In Vancouver, British Columbia, bicycle boulevards are called Local Street Bikeways. In Minneapolis, Minnesota, they are known as Bike/Walk Streets. In other locations, bicycle priority streets. Further, there are bicycle routes that contain all the elements of a bicycle boulevard, but are not given a title.

There are also several European examples of roadway treatments similar to bicycle boulevards, such as the Fahrradstraße in Germany and the Fietstraten in the Netherlands. Literally translated as "bike streets," these roadways act as major cycling routes where motor vehicle traffic has been reduced or restricted and bicyclists have priority.

Although these low-volume, low-speed facilities vary greatly in their individual design elements, each shares the common theme of reducing the volume and speed of motor vehicle traffic (particularly non-local, cut-through traffic), and creating a comfortable space where bicyclists, and often pedestrians as well, have priority along the street. The primary characteristics of a bicycle boulevard are:

- low motor vehicle volumes
- low motor vehicle speeds
- logical, direct, and continuous routes that are well marked and signed
- provide convenient access to desired destinations
- minimal bicyclist delay
- comfortable and safe crossings for cyclists at intersections

Is there a street in the community that cyclists are naturally drawn to ride along? Are there fewer cars there and do they travel slower than on other streets? Do cyclists prefer this route because it has few stops and takes them directly to their destination?

If so, there may be potential for a new bicycle boulevard.

What makes a bicycle boulevard special?

Bicycle boulevards are attractive to cyclists and other non-motorized users

Bicycle boulevards are comfortable and attractive places to cycle. There are few motor vehicles and those on the road travel at low speeds reducing pressure on cyclists to hug the edge of the roadway. Intersections are designed to reduce the need for cyclists to stop frequently and are improved to allow convenient and safe crossings of major roadways. Clearly marked routes lead cyclists to the multiple destinations they need and want to go while clearly indicating to motorists that the street is intended for bicycle travel. Due to these conditions, bicycle boulevards attract cyclists of all ages and abilities. Research indicates that there is a strong preference by cyclists for bicycle boulevards, and suggests that they may be a key tool for attracting new cyclists who are typically less comfortable riding in traffic.[1] In addition, these low-speed and low-volume facilities are also pleasant places for pedestrians and other non-motorized users.

Bicycle boulevards are attractive to local agencies

Bicycle boulevards are attractive to local agencies for their ability to serve cyclists on existing road networks, including cyclists who may not feel comfortable riding on busy streets, even when bike lanes are provided. They may encourage people to consider cycling for one or more of their trips, which in turn may reduce local traffic congestion and help local agencies meet overall sustainability goals.

Bicycle boulevards also allow creation of bikeways along corridors where other bikeway treatments may not be feasible due to right of way or funding constraints. Although the cost of construction will vary depending on the specific traffic calming and intersection treatments implemented, bicycle boulevards can be relatively inexpensive compared to other bicycle facility improvements, particularly when the design builds upon existing traffic calming features.

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[1] Professor Jennifer Dill of Portland State University (Oregon) led a study researching how the built environment influences cycling behavior using Geographic Positioning Systems (GPSs). The study was funded by the Robert Wood Johnson Foundation Active Living Research program and the Oregon Transportation Research and Education Consortium (OTREC).

Preliminary analysis of the GPS data indicated that half of all cycling trips occurred on bicycle infrastructure (bike paths, bike lanes, bike routes, and bicycle boulevards) although bicycle infrastructure only accounts for 15% of the total roadway network available to cyclists in the Portland area. Notably, 10% of miles biked occurred on bicycle boulevards, a facility that accounts for less than 1% of the total bicycle infrastructure in the region.

Bicycle boulevards are attractive to property owners

Increasingly, proximity to bicycle facilities is being marketed as an amenity of a property. Real estate professionals in Portland, Oregon noted that a greater number of their clients are specifically looking for homes in close proximity to bicycle and transit facilities.

> *"I couldn't put a number to a higher sales price, but it [location of a property on a bicycle boulevard] is a definite plus. People are looking for more walkable/bikeable neighborhoods." – Jarrett Altman - Portland, OR Real Estate Professional*

Many homebuyers, particularly those with families, display preference for homes on streets that have low traffic volumes and speeds. Research finds that this preference for quiet neighborhood streets is the reason homes located on cul de sacs command a price premium.[2] Current residents also appreciate these conditions. Indeed, many communities have backlogged requests from citizens for traffic calming on residential streets. Bicycle boulevards that effectively incorporate traffic reduction and calming elements on residential streets may have similar impacts on housing values.

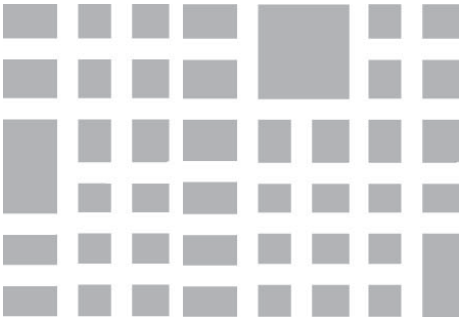
[2] An expanded discussion of these impacts is discussed in *Traffic Calming Benefits, Costs, and Equity Impacts* by Todd Littman of the Victoria Transportation Policy Institute.

II. Bicycle Boulevard Planning

Application in Different Contexts

Bicycle boulevards tend to work well in grid pattern road networks (Figure 2.1), which are often found in urban centers and in traditional neighborhoods. The logical and interconnected layout of these street networks are generally easy to navigate, tend to be continuous over long distances, and provide numerous route options to destinations. If one street is selected as the bicycle boulevard and treated to reduce through motor vehicle trips, several parallel streets remain available to motorists as alternates. In some locations, a large city block or park may reduce connectivity in the grid street system requiring cyclists to use higher speed streets. In these instances, identify opportunities to develop new non-motorized connections or design treatments that will increase cyclist comfort when traveling along the segments of higher speed roadway.

Figure 2.1 A traditional grid street system



Development of bicycle boulevards in suburban or rural settings can often be challenging due to a lack of alternate through roadways and the concentration of motor vehicle traffic on arterials. The "loop-and-lollipop" street patterns (Figure 2.2) commonly found in suburban housing developments may be reasonably good at keeping traffic speeds low and discouraging through traffic on residential streets, but these benefits often sacrifice connectivity. Trips that are relatively short "as the crow flies" become burdensome to walk or bike when a person must travel long distances just to get to the road that connects to their destination. In these systems, the through roads are generally the main streets with heavy, high-speed traffic with limited crossing opportunities, conditions that are intimidating for less traffic-tolerant cyclists.

Figure 2.2 "Loops and lollipops" in a typical suburban street

While this type of street pattern presents a challenge to bicycle boulevard creation in the suburban environment, there are often hidden opportunities. If right of way can be acquired (through purchase or easement), pathways can be constructed that connect dead-end streets. In a growing number of communities, such as Davis, California and Eugene, Oregon, cul-de-sacs are constructed and/or retrofitted to link up with nearby streets and trail systems. Communities have also begun to establish development policies that require greater street connectivity in order to reduce unnecessary out-of-direction travel. When a natural barrier, such as a waterway, creates discontinuity between two roadways, it may be possible to connect these streets by way of a bicycle and pedestrian bridge. Each of these strategies retains the benefit of motor vehicle reduction on roads, while creating continuous bikeways for non-motorized users.

Even without substantial connectivity improvements, opportunities for bicycle boulevard development within the "loop-and-lollipop" roadway pattern may exist, in some circumstances requiring little more than wayfinding improvements and careful attention to major intersections crossings to create a useful bicycle boulevard.

Bicycle boulevards work well to serve local trips, but they can also serve longer, regional trips as well. A single bicycle boulevard may be designed to span a long transportation corridor or to connect with a larger network of bicycle boulevards allowing cyclists to conveniently traverse great distances all on low-speed, low-volume streets. These regional bicycle boulevards or boulevard networks allow cyclists of all comfort and skill levels an opportunity to commute by bike, even if they work a great distance from their home. Due to the longer distances involved when traveling across a region, wayfinding and distance information on the connecting bicycle boulevards is essential.

Route Selection

Bicycle boulevard alignments are selected primarily based on the connectivity that can be provided to key destinations, the operational characteristics of the roadway corridor (or what may be achieved with the introduction of design elements), and how logical and direct the routing will ultimately be when completed. Other considerations, such as terrain, may also factor into routing decisions.

When possible, it is best that the alignment of the bicycle boulevard be selected within the scope of a comprehensive transportation plan for a corridor or neighborhood rather than focusing on a single street or corridor. This will help to avoid unintended problems (such as focusing excessive motor vehicle traffic onto nearby residential streets) and allow planners to assess the proposed bicycle boulevard within the context of the larger bicycle network.

Connectivity

A bike route to nowhere may provide a good workout, but it is not likely to likely to attract many cyclists beyond the recreational rider. To attract cyclists the route must first and foremost offer utility. Cyclists generally have the same destinations as motorists, and bicycle boulevards must provide access to the places cyclists need and want to go. Preferably, the bicycle boulevard will deliver the cyclist within a few blocks, if not directly to, the following destinations (Table 2.1).

Table 2.1 Connecting the bicycle boulevard to key destinations

Destination	Benefit
Neighborhoods	▪ Connected neighborhoods facilitate car-free play dates between children, as well as visits between adults.
Schools & Universities	▪ Schools and universities present natural populations of those who cannot or choose not to drive. ▪ A safe, low speed and low volume bicycle boulevard is appropriate for the skills of young cyclists and can provide an incentive for parents to let their children bike or walk to school. ▪ Improved conditions for bicycling to schools may reduce local congestion associated with dropping off and picking up children at school and may reduce excessive parking demand on university campuses.
Employment Centers	▪ Connections to employment centers such as office parks or downtown office buildings facilitate bicycle commute trips, potentially reducing peak hour congestion on arterials.
Commercial Centers	▪ Connections to commercial centers such as markets and retail establishments enable cyclists to complete errands such as grocery shopping or a trip to the post office as well as expanding commute options for employees. Links to theaters and restaurants increase transportation options for entertainment.
Recreational Facilities	▪ Cycling to recreational facilities such as gyms, parks, or sport fields is a great way to warm up and may reduce motor vehicle trips to these destinations.
Transit	▪ Bicycles can drastically expand the reach of a transit network, allowing transport up to five miles in less than 30 minutes at a leisurely pace. A viable bicycle boulevard connection may be the last barrier to mass transit use. ▪ Bicyclists must be able to either take their bicycle with them on their trip (i.e., bike-on-board) or leave their bicycle in a sheltered and secure location while they are away (i.e., bike-to-transit). Bicycle racks mounted on buses or inside trains, as well as short and long-term bicycle parking at transit stops, can enable bicycle-transit trips.
Bikeway Network	▪ A single bicycle boulevard cannot provide door-to-door passage to all destinations; however, it can provide connections to other facilities in the bikeway network. This assists cyclists traveling to destinations that may not be located directly on the bicycle boulevard. The bulk of the trip may occur on the bicycle boulevard, with shorter portions of the journey completed on a bike lane or path.

Operational Characteristics

Motor vehicle volumes on bicycle boulevards are usually less than 3000-4000 vehicles per day although volumes below 1500 vehicles per day are preferred. Roadways selected for bicycle boulevards ideally have maximum motor vehicle speeds of 25 mph and typically lack a centerline. In general, a speed differential between motor vehicles and cyclists of no more than approximately 15 mph is desirable. However, along segments of the route where these speed and volume conditions cannot be achieved, consider other measures that can increase cyclist comfort (such as providing a bicycle lane in areas with higher motor vehicle volume) or accept that a particular portion of the bicycle boulevard may be less attractive to less traffic tolerant cyclists.

An existing street that meets these operational characteristics may naturally stand out as a bicycle boulevard candidate and may only require the installation of design elements that maintain existing motor vehicle speeds and volumes. However, a street with higher motor vehicle speeds and volumes may also be retrofitted with traffic calming and traffic reduction design elements that intentionally lower the speed and volume of motor vehicles using the roadway. This second option may be preferable if doing it improves the bicycle boulevard connectivity to key destinations or provides a less circuitous route for cyclists. Communities are also likely to discover that the presence of cyclists along the completed boulevard combined with good traffic calming measures may further reduce motor vehicle speeds as motorists adapt to sharing the street with other roadway users and/or choose other routes.

Additional operational considerations include the frequency of intersections and motor vehicle turning movements along the route. Attention to these areas when planning the bicycle boulevard can highlight potential areas of potential areas of conflict between motorists and cyclists allowing them to be properly addressed or avoided entirely.

Direct Routes

Bicycle boulevards become "expressways" for bicyclists when they provide a direct route to popular destinations and design improvements to minimize bicyclist delay. While cyclists riding for recreation may favor a scenic route, cyclists commuting or running errands generally value an efficient and direct journey (perhaps even more so than motorists since cyclists have to propel themselves). For this reason bicycle boulevards frequently parallel nearby arterial roadways on which many destinations are frequently located. The availability of a parallel arterial roadway also encourages motorists to use arterials rather than cutting through local streets. This benefits both cyclists using the bicycle boulevard and the residents along local streets. However, considerations for terrain or the availability of a shortcut route may justify routing the boulevard away from parallel arterials.

Most cyclists are motorists as well. They are familiar with the main roadway networks and usually know which arterials will lead to a particular destination. Because the bicycle boulevard is located on a local street that may have little or no existing wayfinding, it will be less obvious than bike lanes on major roads. It must be clear to the cyclist that taking the bicycle boulevard route will lead them to their destination with a minimum of out-of-direction travel. Thus, a clear wayfinding system is essential, both on the bicycle boulevard and from arterial roadways.

Funding

Funding for bikeway planning, design and construction can come from a variety of sources, including federal, state, regional, and local programs. Additional funding opportunities include leveraging funds from Safe Routes To School programs, Green Streets/Stormwater Management projects, bond measures, systems development charges, local sales tax initiatives, and private funding.

Appendix C provides a summary of programs that fund bicycle and pedestrian projects.

Public Involvement & Outreach

Community Outreach

Community outreach and involvement is essential for successful public projects and bicycle boulevard development is no exception. Residents are naturally very interested in roadway changes proposed near their homes and eager to know how they may be affected by a project. Because bicycle boulevards are not yet a common bikeway type, it is likely to be a new concept that needs to be explained to community members. As such, the planning and construction of a bicycle boulevard (especially the first one in the community) will likely require an extensive amount of public outreach to communicate the purpose of bicycle boulevards, how they function, the benefits they may offer, and to build public strong support. Beyond education, public outreach early on in the planning process will allow residents opportunities to provide input on their goals for the project and allow planners to identify and address the concerns of those opposed to the project.

Local agency staff, working jointly with a local bicycle advisory committee, can provide residents with information about bicycle boulevards, and community members can identify desired cycling destinations and routes. A series of focused workshops on a particular bicycle boulevard route (or a segment of the route depending on length) can provide the opportunity to sketch out potential design elements of the bikeway and discuss how they will work together cohesively.

While public meetings and focused workshops are ideal forums for introducing bicycle boulevards, it is important to recognize that these types of meetings are often predominately attended by community members with a specific interest in bicycling. Make additional effort to engage community members who may not be naturally inclined to attend such a meeting, particularly residents and business owners located along or near any proposed routes. One method to gain interest from these not directly concerned with cycling is to frame the project in terms of the overall walkability and livability benefits extended to all residents in addition to the advantages that bicycle boulevard offer cyclists. Another method is to discuss traffic calming, a key characteristic of bicycle boulevards and a topic that many residents are already familiar with.

Meetings with neighborhood associations and direct mailings to residents are additional methods of getting in contact with key stakeholders and involving them in the project. Note that anyone potentially affected by the proposed bicycle boulevard, including residents who may not live directly on the bicycle boulevard, is a stakeholder and needs to be informed about opportunities to participate in the planning process.

Common Concerns & Challenges

Traffic Reduction and Traffic Calming Concerns

Traffic calming and traffic reduction design elements have been in use in several communities for many years. Concerns regarding traffic calming and reduction that occur on the bicycle boulevard are likely to be similar to concerns that are raised when these improvements are implemented anywhere else in the community. Most commonly, residents and officials will raise concerns about four potential issues related to traffic reduction and calming:

- Access to property;
- Impact on traffic patterns;
- Enforcement issues with motorcycles and mopeds; and
- Emergency response.

Planners need to be prepared to address these concerns and to respond to pressure to eliminate or modify traffic reduction and calming design elements in ways that reduce their effectiveness. Poorly designed traffic reduction and calming elements on so-called bicycle boulevards may backfire creating new traffic problems, such as attracting through motor-vehicle traffic to a bicycle boulevard with fewer stops. This reduces the comfort and safety of cyclists and negatively influences opinions regarding the utility of bicycle boulevards in general.

Access to Property

Bicycle boulevard designs commonly employ traffic reduction features that reduce the volume of motor vehicle traffic by partially or full restricting motor vehicle access to portions of the route. Such design elements make the single largest contribution to reduced motor vehicle volumes on bicycle boulevards, but are perhaps the most controversial and difficult element to implement due to concerns about resident access.

Residents must be assured that their access to their properties by motor vehicle will be maintained along sections of bicycle boulevards with traffic reduction elements. However, depending on the design, the route to access properties by car may change for some residents, potentially requiring slight out-of-direction travel to navigate around traffic restrictions. Local traffic patterns will adapt to motor vehicle restrictions over time and many residents come to appreciate the benefit of low-traffic streets as a tradeoff for any inconvenience in access. Traffic calming design elements such as speed humps prevent motor vehicles from speeding through neighborhoods, but generally have a negligible impact overall on the amount of time it takes for residents to access their property.

Trial installations of design elements can alleviate resident concerns regarding access and by allowing them to "try out" design features and allow any necessary modifications to be made before the city commits to a permanent installation.

Most design treatments used on bicycle boulevards do not impact on-street parking.

Impact on Traffic Patterns

When motor vehicle traffic is restricted or calmed on the bicycle boulevard it may induce an increase in motor vehicle traffic on adjacent streets. Local agencies must examine the impacts of traffic reduction elements both on the proposed bicycle boulevard and nearby streets, and include mitigation (e.g., additional traffic calming on adjacent streets) for any impact in their designs. Again, trial installations can allow residents to "try out" the design features and allow planners to evaluate and address impacts on traffic patterns.

Enforcement Issues with Motorcycles and Mopeds

Residents may be also be concerned that a bicycle boulevard will attract motorcyclists and moped riders who may not respect non-motorized only crossings. When Palo Alto, California implemented the first segment of the Bryant Street Bicycle Boulevard in the 1980's mopeds were popular. Bryant Street residents raised concerns early on that motorcyclists and mopeds would disregard the street closure elements intended to reduce motor vehicle volumes and use the bicycle boulevard for through travel. In practice, moped violations of street closures in Palo Alto were observed, however, they were overall very few. It seems that motorcyclists, like motorists, prefer to use the higher speed parallel facilities when they are available nearby.

Emergency Services Access

Reducing the volume and speed of traffic on a bicycle boulevard decreases the potential for and severity of collisions between motorists as well as other roadways users. However, traffic-calming elements can be a concern to fire and police personnel if the design substantially increases response times to properties along the bicycle boulevard. Without agency support for the design features, the development of a bicycle boulevard may be delayed or permanently deferred. Therefore, it is highly recommended that local agencies take steps early on in the bicycle boulevard planning process to engage emergency services and address their concerns:

- Actively develop relationships with fire and police services in the jurisdiction and involve them in the planning process for the proposed bicycle boulevard.
- The design elements acceptable to emergency services will vary among individual jurisdictions.
- Many jurisdictions have designated specific emergency response routes. Find out where these routes are located and avoid locating bicycle boulevards on these routes if necessary.
- Traffic reduction and calming design elements may be designed in such a way that allows a wide-chassis vehicle, such as a fire truck, to pass over, while preventing a similar movement of most passenger vehicles. However, these types of modifications may negate traffic calming and reduction benefits, as some passenger vehicles may also traverse these design elements. For this reason, it is generally preferable to identify emergency response streets where traffic calming and reduction improvements may be constructed rather than modifying these design elements for occasional emergency service access.
- Offer trial installations of street closures, medians, chicanes, or other design elements that may present an access concern to emergency services. This will assure them that the design will work with their equipment or allow time for design modifications.

A Bicycle Boulevard by Any Other Name?

The term bicycle boulevard, like the design concept, is still unfamiliar to many people. The "branding" of bicycle boulevards helps to ensure that planners, designers, and advocates are all talking about the same design concept, and the title lends itself to passive marketing of the bikeway network. However, to the general public the term can occasionally be confusing or off-putting.

Is this an improvement that only benefits bicyclists? Will my street become impassable due to the hordes of cyclists racing through my neighborhood? Will I be prohibited from driving to my own house? The answer to these questions is definitively no.

Nonetheless, depending on the sensitivity of the community or the unique design elements included in the proposed project, it may be preferable or more appropriate to call the bicycle boulevard by a different name. For example, BikeWalk Streets (as bicycle boulevards are called in Minneapolis, Minnesota) highlight street improvements that benefit both cyclists and pedestrians. Livable Streets and Neighborhood Greenway are other terms that suggest the benefits of the project extend beyond the bicycle route improvements to other road users such as pedestrians and residents. However, once a name has been decided, it is important to be consistent with its use throughout the community to avoid confusion and ensure that both drivers and cyclists understand what roadway conditions to expect on a modified street.

Bike Boulevards and Transit Routes Conflicts

Transit routes tend to be located on heavier traveled roadways in order to serve a greater number of passengers. Due to the high traffic volumes on these corridors, these roadways would generally not be good candidates for a bicycle boulevard treatment.

If the transit route is located along a lower volume roadway, there are still some conflicts that reduce compatibility with a bicycle boulevard. Bicycle boulevards are not intended to serve motor vehicle through trips. Transit provides through trips that would be disrupted by any bicycle boulevard traffic reduction and calming elements.

Furthermore, a bus sharing a bicycle boulevard (usually a local, two-lane street) plays a game of leap-frog with cyclists, overtaking them, then stopping to left off passengers at bus stops. As bicycle traffic increases on the bicycle boulevard, average bus speed will drop and bus-bike conflicts are likely to increase.

For these reasons, locating a bicycle boulevard along a transit route (or vice versa) is not generally recommended. However, depending on the frequency of transit service and the length that it travels on the bicycle boulevard, shared use of the route may present no problems.

Reduced Visibility of Cyclists and Cycling as a Transportation Mode and the Creation of a Hidden Bicycle Network

Cyclists riding on higher traffic streets in the bike lane or sharing the road can be seen by hundreds of motorists during their trip. Due to their location on low-volume local streets, cyclists using bicycle boulevards are not as visible. It is suggested that this lack of exposure can, in the long run, have both political and safety implications.

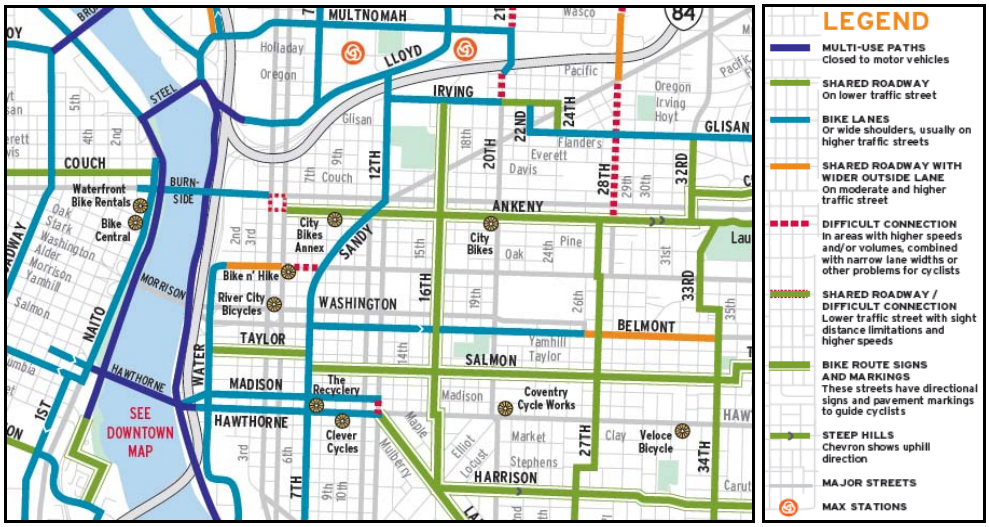
Some cyclists are concerned that reducing the number of cyclists visible to motorists on the roads will give the impression that fewer people are cycling. Citing the *Injury Prevention* study "Safety in Numbers: More Walkers and Bicyclists, Safer Walking and Biking," some have questioned whether this may ultimately lead to less caution among drivers and increased incidences of bicycle-vehicle collisions. These cyclists are also concerned that reduced exposure of cycling related to the "hidden" nature of the bicycle boulevard network also reduces cycling's presence as a transportation option and may diminish political support for investments in bicycle infrastructure and programs.

The bottom line is that bicycle boulevards provide a safe and more attractive option for confident, experienced cyclists as well as the large segment of the population who may never be willing to cycle on higher traffic roads served by bicycle lanes. Even if these less traffic-tolerant cyclists only ride on bicycle boulevards, it is ultimately an increase in cycling, and few things are better for political support, increased visibility, and safety than more cyclists on the road.

Will Bicycle Boulevards Eliminate the Need for Bicycle Lanes on Main Streets?

The establishment of a bicycle boulevard does not eliminate the need to properly accommodate bicyclists on nearby busy streets—typically with bicycle lanes, nor does the presence of bicycle lanes preclude the development of a parallel bicycle boulevard. When bicycle boulevards are located adjacent to streets with bicycle lanes (Figure 2.3), they increase the overall number of options available to facilitate bicycle transportation along a particular travel corridor. In circumstances where bicycle lanes will not fit or are not recommended on a main street, a parallel bike boulevard is a good alternative, and can work very well on its own, particularly if signs on the bicycle boulevard indicate and provide direction to key destinations located on the main street.

Figure 2.3 In Portland, Oregon, bicycle boulevards are located adjacent to streets both with and without bicycle lanes



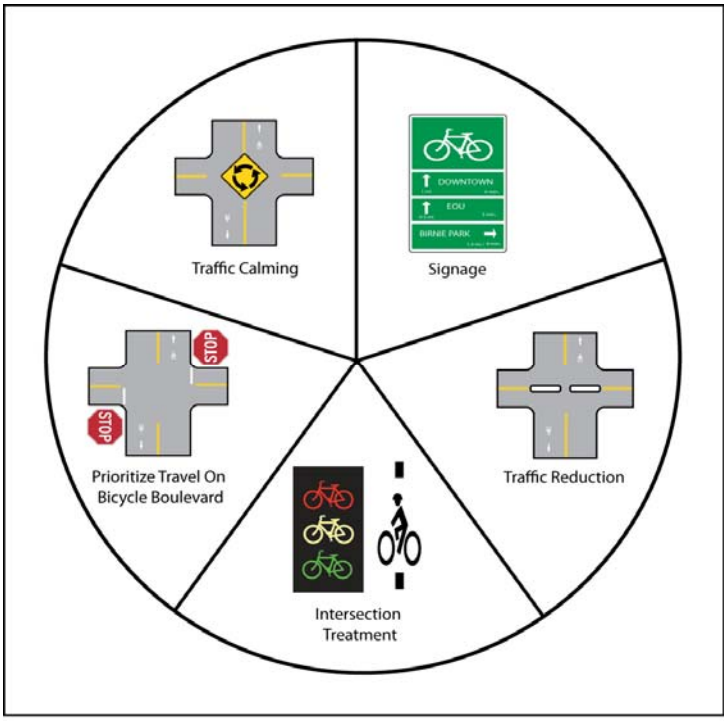
No single bikeway treatment is the solution in and of itself. Shared use paths and bicycle boulevards tend to attract novice and recreational riders, many of whom then become regular transportation cyclists. Bicycle lanes are critical for getting faster riders where they need to go, and for overcoming major barriers. Each treatment has its use. They must be employed *together* in order to create a

comprehensive, connected bikeway system that offers a full range of options for cyclists. Local agencies are encouraged conduct regular bicycle volume counts on bicycle boulevards, as well as other bikeways, to demonstrate use of the facility and to track usage trends.

III. Bicycle Boulevard Design Elements

The specific design elements needed to create a bicycle boulevard must be tailored to the unique conditions of each corridor. A variety of design options are available for use on a bicycle boulevard including traffic calming, signage and pavement markings, traffic reduction strategies, intersection treatments, and prioritization of cyclist travel (Figure 3.1).

Figure 3.1 Bikeway planners and engineers may pick and choose the appropriate mix of design elements needed for bicycle boulevard development along a particular corridor.



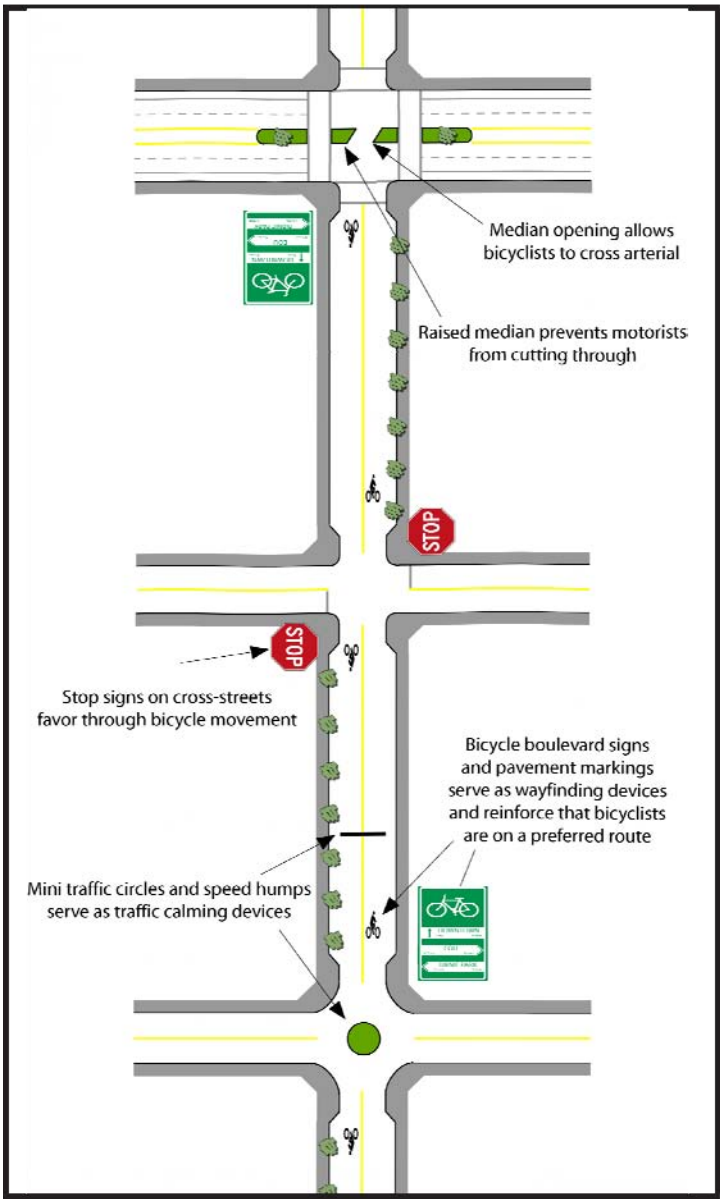
Mix and match design elements to:

- Reduce or maintain low motor vehicle volumes
- Reduce or maintain low motor vehicle speeds
- Create a logical, direct, and continuous route
- Create access to desired destinations
- Create comfortable and safe intersection crossings
- Reduce cyclist delay

All of these elements or a select few may be employed on a single corridor based upon how favorable existing conditions of the street or corridor are for bicycle travel. Bikeway planners and traffic engineers must employ good engineering judgment to select an appropriate combination of treatments that will work together to create the ideal conditions required for a bicycle boulevard (Figure 3.2).

Some local streets may already have traffic conditions optimal for a bicycle boulevard and will require little more than signage and pavement markings to create the new bikeway. Other streets, particularly roadways used frequently for through trips by motorists, will require features that reduce motor vehicle speeds and volumes and assist cyclists crossing busy intersections. The combined impact of theses elements is far greater than any single element alone.

Figure 3.2 Several design elements work together to create a bicycle boulevard



In the following section, descriptions of design elements commonly used on bicycle boulevards are presented along with recommendations and references for additional information (Table 3.1). When available, an estimated cost range for construction is provided. However, it should be noted that bicycle boulevard costs depend on a variety of factors and can vary significantly.

Design elements described in this document have been used effectively on bicycle boulevards and similar roadway designs in the United States and internationally. However, certain design elements may not yet be approved in local and national guidelines such as the Manual on Uniform Traffic Control Devices (MUTCD). This does not necessarily preclude the use of these design features. Local agencies may use these design features based on engineering judgment and the success of the design in other communities or can request permission for an experimental design.

Table 3.1 – Bicycle boulevard design elements

Signage	Identification Signs Wayfinding Signs Warning Signs
Prioritize Bicycle Travel on Bicycle Boulevard	Pavement Markings Stop/Yield Signs
Intersection Treatment	Bicycle Boxes/Advanced Stop Bar Bicycle Activated Signals Bicycle Activated Signals - Scramble Bicycle Activated Signals -Other Signals High Visibility Raised Crosswalk/Crossbike Crossing Islands Crossing at Off-Set Intersections
Traffic Calming	Traffic Circles Speed Tables Painted and Patterned Surfaces Chicanes Curb Extensions Residential Speed Limit Advisory Bicycle Lane Contraflow Bicycle Lane
Traffic Reduction	Non-Motorized Only Crossings Partial Non-Motorized Only Crossings

Signage

The purpose to signage on bicycle boulevards is to identify routes to both bicyclists and motorists, provide destination and distance information, and warn users about changes in road conditions as needed.

In addition to serving these roles, signage also helps to "brand" the bicycle boulevard network, fostering familiarity among cyclists and motorists with traffic conditions that are to be expected on these facilities. Unlike other marketing efforts, distinctive signage has the advantage of passively advertising the bicycle boulevard 24 hours a day.

Identification Signs

Signage

- Passively market the bicycle boulevard network.
- May employ distinctive symbols or colors.
- Signs alone do not create a bicycle boulevard. However, if traffic volumes and speeds are already low, intersections facilitate bicycle travel, and stop signs favor the boulevard, signage may be an enhancement that would help brand the street or corridor.

Design Recommendations

- Colors reserved by the Manual on Uniform Traffic Devices (MUTCD) for regulatory and warning road signs (red, yellow, orange, etc.) are not recommended. Colors commonly used for signage on bicycle boulevards include green (many jurisdictions) and purple (Berkeley and Emeryville California).
- Use retroreflective materials.
- Be aware of "sign clutter" that can diminish the effectiveness of signage overall. The use of modified street signs on bicycle boulevards, such as in Berkeley, California and Vancouver, British Columbia, is an effective way to provide identification of the route without introducing a new sign.

Cost Range

- $30 -150 per sign plus installation

References

- City of Berkeley Planning and Development Department. (2000). *Bicycle boulevard design tools and guidelines* (design guidelines). Berkeley, California: Retrieved from http://www.ci.berkeley.ca.us/ContentDisplay.aspx?id=6652

Berkeley, California

San Luis Obispo, California

Vancouver, British Columbia

Berkeley, California

Wayfinding Signs

Signage

- Provide cyclists with direction, distance and/or estimated travel times to destinations including commercial districts, transit hubs, schools and universities, and other bikeways.
- May only identify the direction the bicycle boulevard continues or alert cyclists to changes in the roadway.
- Inform motorists to expect cyclists and passively markets the bicycle boulevard network.
- Supplement bikeway identification signage and pavement markings.
- Install in advance of turns at a distance great enough to allow cyclists to recognize, prepare for, and safely execute a turn.
- Be aware of "sign clutter" that can diminish the effectiveness of signage overall.

Design Recommendations

- Employ distinctive symbols and/or colors to distinguish the bicycle boulevards from other roadway signs.
- Do not use colors commonly used for regulatory and warning road signs (red, yellow, orange) are not recommended. Colors commonly used for signage on bicycle boulevards are green (Portland, OR; MUTCD) and purple (Berkeley, CA).
- Use retroreflective materials.
- Sign size may vary, but lettering size should be no less than 2 inches height.
- Install ahead of or at the beginning of the bicycle boulevard and ahead of major intersections or connections with other bikeways.
- Ensure that signs are not obscured by vegetation through regular monitoring and maintenance.

Cost Range

- $30 -150 per sign plus installation

References

- United State Department of Transportation Federal Highway Administration. (2006). *BikeSafe: Bicycle countermeasure selection system*. Retrieved from http://www.bicyclinginfo.org/bikesafe/downloads.cfm
- City of Berkeley Planning and Development Department. (2000). *Bicycle boulevard design tools and guidelines* (design guidelines). Berkeley, California: Retrieved from http://www.ci.berkeley.ca.us/ContentDisplay.aspx?id=6652

Portland, Oregon

Emeryville, California

Vancouver, British Columbia

Berkeley, California

Warning Signs

Signage

- Alert motorists and cyclists of road condition changes including the end of the bicycle boulevard, upcoming traffic calming features, and traffic control devices.

Design Recommendations

- Ensure that signs are not obscured by vegetation through regular monitoring and maintenance.
- Be aware of sign clutter that reduces the effectiveness of signage overall.

Cost Range

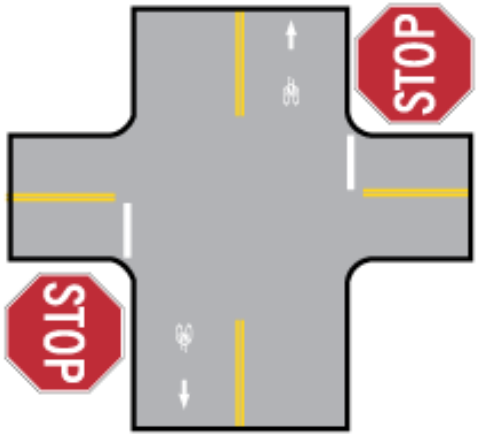
- $30 -150 per sign plus installation

References

- United State Department of Transportation Federal Highway Administration. (2006). *BikeSafe: Bicycle countermeasure selection system.* Retrieved from http://www.bicyclinginfo.org/bikesafe/downloads.cfm

Portland, Oregon

Prioritize Travel on Bicycle Boulevard



Design elements that prioritize travel on the bicycle boulevard are intended to raise awareness of the route as a bicycle priority thoroughfare and create conditions that reduce unnecessary delay for cyclists.

Pavement Markings

- Supplement wayfinding and identification signage, and serve as a reminder to cyclists and motorists that bicycle travel has priority.
- Encourage proper positioning by bicyclists while sharing the lane with motor vehicles.
- Frequent markings act as a "breadcrumb trail" for cyclists.

Design Recommendations

- Supplemental arrows may be used to indicate approaching turns.
- Install markings just after each intersection and in intervals of approximately 200 feet
- Install near high volume driveways or other conflict points to alert drivers.
- Sizes range from 12-24 inches in diameter in Portland, Oregon to 30 feet (length) by 6 feet (width) in Berkeley, California.
- Size and placement guidance for share the road markings or "sharrows" are provided in the California MUTCD.
- Apply markings with paint or thermoplastic. Thermoplastic tends be longer lasting.
- Increase the skid resistance and retroreflectivity by using glass beads.
- Do not use bicycle boulevard markings or shared lane markings within bicycle lanes.

Cost Range

- $75-150+ each, depending on size of marking and materials used.

References

- United State Department of Transportation Federal Highway Administration. (2006). *BikeSafe: Bicycle countermeasure selection system*. Retrieved from http://www.bicyclinginfo.org/bikesafe/downloads.cfm
- City of Berkeley Planning and Development Department. (2000). *Bicycle boulevard design tools and guidelines* (design guidelines). Berkeley, California: Retrieved from http://www.ci.berkeley.ca.us/ContentDisplay.aspx?id=6652
- State of California Department of Transportation (2006). Section 93.103(CA) Shared Roadway Bicycle Marking. *California Manual on Uniform Traffic Control Devices for Streets and Highways*. Retrieved from http://www.dot.ca.gov/hq/traffops/signtech/mutcdsupp/ca_mutcd.htm

Prioritize Travel On Bicycle Boulevard

Portland, Oregon

San Luis Obispo, California

Berkeley, California

San Francisco, California

Stop/Yield Signs

- Stop signs increase cycling time and energy expenditure due to frequent starting and stopping, leading to non-compliance by both cyclists and motorists alike, and/or use of other routes.
- Bicyclists should be able to travel continuously for the entire length of the bicycle boulevard with a minimum of stops.

Design Recommendations

- Do not install stop signs in the bicycle boulevard travel direction.
- Only install stop or yield signs to assign right of way to the bicycle boulevard and control cross traffic.
- If intersection control must be used in the bicycle boulevard travel direction, yield signs are preferred.
- Parking may need to be removed near the intersection for sight distance.
- After the intersection is modified, an increase in motor vehicle volume or speed along the route may occur. Mitigate through traffic calming.
- A traffic circle may be an alternative to stop and yield controlled intersections.

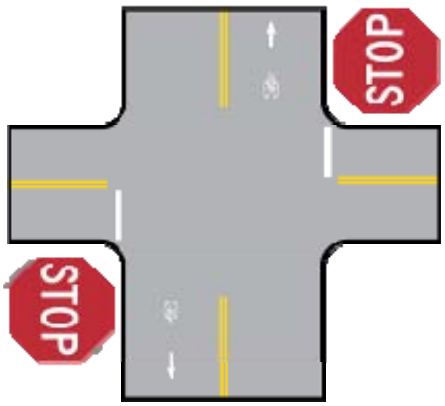
Cost Range

- Approximately $200 each

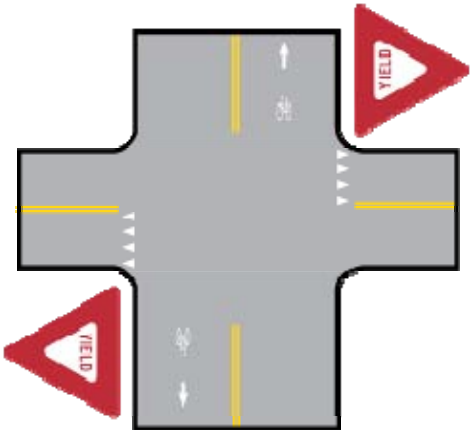
References

- American Association of State Highways and Transportation Officials (AASHTO). (1999). *Guide for the development of bicycle facilities*. Washington, D.C.

Prioritize Travel On Bicycle Boulevard



Stop Signs Assign the Right of Way to the Bikeway



Yield Signs Assign the Right of Way to the Bikeway

A Yield Controlled Crossing in Emeryville, California

Intersection Treatment

Improvements along bicycle boulevards are of limited utility if cyclists cannot safely *and* comfortably cross major roadways. Intersection improvements on bicycle boulevards enhance cyclist safety by eliminating or raising awareness of potential areas of conflict between motorists and cyclists, and by reducing the delay cyclists experience at traditional intersections where no accommodations have been made for cyclists.

Several innovative intersection crossing treatments for bicyclists were originally based on pedestrian crossing treatments. However, it is recommended that planners and engineers consider the unique characteristics of cyclists, such as cyclist positioning and crossing times, when applying these designs to bicycle boulevards.

The table *Selecting Intersection Treatments* is included in Appendix E to assist with identification of intersection crossing treatments based on motor vehicle traffic volume, posted motor vehicle speed limits, and the width of the roadway.

Planners and engineers are also strongly encouraged to reference the MUTCD for guidance on warrants for signals (MUTCD Chapters 4C, 4E, and 4F). When considering warrants, planners and engineers may use projected bicycle and motor vehicle volumes.

Bicycle Boxes/Advanced Stop Bar — Intersection Treatment

- Reduces right-turn ("right-hook") conflicts between bicyclists and motorists at intersections by increasing cyclist visibility to drivers and providing a space for cyclists to wait at signalized intersections.
- Cyclists pass through the intersection first during a green signal phase rather than queuing behind motor vehicles. This ensures they will get through the intersection during shorter green signal phases.
- Allows cyclists to position themselves properly to execute a left turn and increases their visibility to drivers traveling in the opposing direction.
- At a red light, cyclists queue inside the bike box. The bike box creates two stop bars: one located directly behind the crosswalk for cyclists and another farther back for motorists.
- During a green light, motorists continue through the intersection as usual but are alerted by the bike box and accompanying signage to watch for cyclists.
- A public education campaign is recommended to accompany installation.

Design Recommendations

- Use green color to delineate the bicycle box.
- The bike lane may lead through the intersection (excluding the crosswalk if marked). The leading bike lane as well as a portion of the bike lane approaching to the bike box may be colored.
- Design the bike box wide enough to encompass the entire outer lane and the adjacent bicycle lane if present.
- Do not allow the bike box to extend into the crosswalk.
- "Wait Here" or "Stop Here" may marked.
- Right turns on red must be prohibited, though an exception may be made for cyclists ("Except Bikes"). Bicycle boxes may not be compatible at intersections with high volume of right-turning vehicles.

Cost Range

- Approximately $5,000 – $6,000 per installation.

References

- City of Portland Bureau of Transportation. (2007). *Platinum bicycle master plan phase I: Existing conditions report* (Draft Report). Portland, Oregon: Retrieved from http://www.portlandonline.com/transportation/index.cfm?c=44674&a=159806
- City of London Transport for London. *Advanced stop lines (ASLS) background and research studies*. London, United Kingdom: Transport for London. Retrieved from http://www.tfl.gov.uk/assets/downloads/businessandpartners/asl.pdf

Bike Box Dimensions

Tucson, Arizona

Photo: Tom Thivener

Portland, Oregon

Bicycle Activated Signals – Bicycle Detection — Intersection Treatment

- Assists bicyclists crossing signalized intersections by allowing a cyclist to call a green signal phase through the use of loop detectors or push-button.
- May reduce cyclist delay and discourage red-light running by cyclists.
- Signal activation loops are buried in the roadway surface and do not require that cyclists dismount activate a signal. However, loop placement and sensitivity may require adjustment to prevent unintended activation by motor vehicles.
- Install bicycle detection during intersection upgrades.
- Signal detection devices using video and radar are also being employed by agencies.
- Bicycle signal heads and a separate bicycle signal phase may be considered at intersections with very high volumes of cyclists.

Design Recommendations

- Standard detection loops may be used, but must often be calibrated to detect cyclists.
- Detection loops can be marked with a bicycle detector symbol (MUTCD, Figure 9C-7) to indicate optimum cyclist position to activate the signal.
- Push-buttons must be installed at the edge of roadway so that a cyclist does not need to dismount to activate.
- Install additional activation loops or push-buttons for cyclists within left-turn pockets.
- Activation loops may be installed in advance of the intersection, allowing cyclists to call a green signal phase as they approach without needing to stop.

Cost Range

- Approximately $75 for pavement marking of loop only.
- $1,000-$2,000 for loop detector installation.

References

- American Association of State Highways and Transportation Officials (AASHTO). (1999). *Guide for the development of bicycle facilities*. Washington, D.C.
- United States Department of Transportation Federal Highway Administration (2007). *Manual on Uniform Traffic Control Devices*. Retrieved from: http://mutcd.fhwa.dot.gov/pdfs/2003r1r2/pdf_index.htm
- Metropolitan Transporation Commision (2009). Bicycle and pedestrian safety toolbos: Engineering. Retrieved from Metropolitan Transporation Commision website: http://www.mtc.ca.gov/planning/bicyclespedestrians/tools/bikeSignals/index.htm

Berkeley, Calfornia

Bicycle Detection Signage - Portland, Oregon

Bicycle Signal Head - Portland, Oregon

Bicycle Activated Signals – Scramble — Intersection Treatment

- Stops all motor vehicle movements at an intersection, creating an exclusive phase for bicyclists and pedestrians to cross the intersection in any direction, including diagonally.
- Eliminates two-stage crossings, reducing crossing time.
- May reduce unsafe and illegal crossings by cyclists.
- Use at intersections with high volumes of pedestrian and cyclist crossings from several approaches and/or a high rate of conflict between pedestrians and cyclists and turning motor vehicles.
- Well suited to facilitate crossings to and from pathways (the entrances of which may not be well aligned with the intersection) or other configurations which may otherwise require a two-phase crossing by cyclists.
- May result in additional delay for motorists.

Design Recommendations

- Use bicycle signal heads (and if applicable pedestrian signals) to indicate the scramble crossing phase.
- Signal is activated through push-button or marked loop detection.
- Use pavement markings and supplementary signage to indicate diagonal crossings are permitted.
- Right turns on red by motor vehicles must be prohibited.
- Conduct educational outreach on function of scramble signal.

Cost Range

- $10,000 - $100,000+. Significantly lower cost if existing signal is present.

References

- Metropolitan Transportation Commission (2009). *Bicycle and pedestrian safety toolbox: Engineering.* Retrieved from Metropolitan Transportation Commission website: http://www.mtc.ca.gov/planning/bicyclespedestrians/tools/bikeSignals/index.htm
- Wolfe, M., J. Fischer, et al. (2006). *Bike scramble signal at North Interstate and Oregon.* Portland State University: 10.

Portland, Oregon

Portland, Oregon

Bicycle Activated Signals – Other Signals

Intersection Treatment

- The pedestrian hybrid signal (also known as a HAWK signal – **H**igh-Intensity **A**ctivated Cross**w**al**k**) and TOUCAN (**T**w**O** Gro**U**ps **CAN** cross) signal facilitate pedestrian and cyclist crossings at unsignalized locations at marked crosswalks.
- Use on major crossings that lack adequate gaps in traffic for safe pedestrian and cyclist crossings.
- The pedestrian hybrid signal utilizes both red (two) and yellow (one) signal heads in the following sequence:
  1. Signal remains dark until activated by a pedestrian or cyclist via push-button or loop detector activation.
  2. Signal flashes yellow upon activation followed by steady yellow.
  3. Signal is steady red during pedestrian/bicycle crossing interval.
  4. Signal flashes alternating red during pedestrian/bicycle clearance interval.
  5. Signal returns to dark and motorized traffic may proceed.
- The TOUCAN restricts motor vehicle through movements on minor streets, allowing only right turns to/from the major street by motor vehicles.
- TOUCANs use a special bicycle signal head and lane for cyclists in the center roadway. Pedestrians receive a standard "WALK" indication and have a separated crosswalk.
- Motorists on the major street receive a green signal until the TOUCAN signal is activated for a bicycle/pedestrian crossing interval. Minor streets are controlled with stop signs.
- Both signals may require educational outreach to explain function. A pedestrian hybrid signal's unlit signal may confuse drivers, conveying a broken signal. In some states, drivers are required to treat an unlit signal like a four-way stop.
- The pedestrian hybrid signal may be used at locations that do not meet other signal warrants to facilitate pedestrian crossings.
- Note that the HAWK signal was initially designed for pedestrian crossings. Signal design and timing may need to be modified for use by cyclists.

HAWK Signal - Portland, Oregon

TOUCAN Signal - Tucson, Arizona

Photo: Tom Thivener

Cost Range

- Pedestrian Hybrid Signal $100-175,000
- TOUCAN $350-500,00

References

- United State Department of Transportation Federal Highway Administration. (2008). *Proposed amendments to the Manual on Uniform Traffic Control Devices*. Retrieved from http://mutcd.fhwa.dot.gov/resources/proposed_amend/index.htm
- City of Tucson Department of Transportation. (2009). *Pedestrian Traffic Signal Operation*. Retrieved from http://dot.tucsonaz.gov/traffic3/tspedestrian.php

High Visibility Raised Crosswalk/Crossbike

Traffic Calming/Intersection Treatment

- Reduce motor vehicle speeds and create a visibly prominent crossing location for bicyclists and pedestrians
- Can combine with a speed table (a long and broad, or flat-topped speed bump).
- The speed table portion of the raises the crosswalk 3-4 inches above the roadway, making bicyclists and pedestrians more visible to drivers.
- Installed at midblock crossings.

Design Recommendations

- Do not install on sharp turns or steep grades.
- Use retroreflective pavement markings and signage.
- Install advanced warning speed and advisory signage.
- Install "X-ING Ahead" pavement markings in addition to the crosswalk signage.
- Optional enhancements include curb extensions to shorten crossing distance (may eliminate some on-street parking), a refuge island to assist crossing roadways with higher traffic volumes and/or multiple lanes, and Yield signs and triangle "shark's tooth" pavement markings.
- The design may be modified to facilitate unimpeded crossing by wide-chassis vehicles such as fire trucks.
- Install high-contrast and tactile warning strips at the edge of the crosswalk to aid the visually impaired.
- Refer to local ordinances regarding whether bicyclists are required to dismount at crossing and sign appropriately.

Cost Range

- $2,000 - $15,000 dependent on extent of treatment, size of the road, and drainage issues.

References

- United State Department of Transportation Federal Highway Administration. (2006). *BikeSafe: Bicycle countermeasure selection system.* Retrieved from http://www.bicyclinginfo.org/bikesafe/downloads.cfm

Berkeley, California

Delta, British Columbia

Crossing Islands

Intersection Treatment

- Facilitate crossings of multiple lane and/or high-volume arterials by providing a space in the center of the roadway for bicyclists or pedestrians to wait for gaps in traffic.
- Use on wide roadways with multiple lanes of traffic or few gaps in traffic that allow single-stage crossings.
- Allows the bicyclist or pedestrian to cross while focusing on one direction of traffic at a time (two-stage crossing).
- Effective when located between signalized intersections, as the signals create gaps between platoons of motor vehicles.
- Large refuge areas allow groups of cyclists, cyclists with trailers, and/or pedestrians to cross simultaneously.
- Restricts left-turn movements and consequently reduce the number of potential conflict points between motor vehicles and bicyclists.
- Provides space for street trees and landscaping.

Design Recommendations

- The refuge area may be angled at an approximately 45 degrees to direct those crossing to face towards on-coming traffic. An 8 to 10 foot refuge area wide enough to accommodate a bicyclist with trailer is preferred.
- The refuge area may be enclosed on both sides of the cyclist, providing a waiting area separated from motor vehicle traffic by raised median.
- Cyclists may share the refuge area with pedestrians or another separated refuge area may be marked for cyclists only.
- Install reflectors at the refuge area to facilitate safe crossings at night.
- The roadway must be wide enough to accommodate the crossing island, on-street parking, two-directional travel, and bike lanes if used. This may require elimination of on-street parking and/or travel lanes, or narrowing of travel lanes.
- If landscaped, native or other low-maintenance plants are recommended to reduce maintenance.

Cost Range

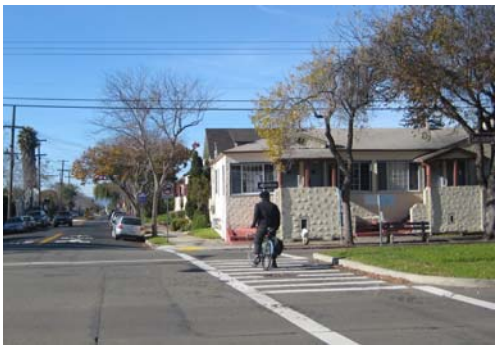
- $15,000 - $30, 000 per 100 feet.

References

- City of Portland Bureau of Transportation. (2007). *Platinum bicycle master plan phase I: Existing conditions report* (Draft Report). Portland, Oregon: Retrieved from http://www.portlandonline.com/transportation/index.cfm?c=44674&a=159806
- United State Department of Transportation Federal Highway Administration. (2006). *BikeSafe: Bicycle countermeasure selection system*. Retrieved from http://www.bicyclinginfo.org/bikesafe/downloads.cfm

Portland, Oregon

Portland, Oregon



Berkeley, California

Crosswalk and Median Refuge

Crossings at Off-Set Intersections — Intersection Treatment

- Off-set intersections are created when the "legs" of an intersection to do not line up directly across from one another.
- Three designs have been developed to help cyclists negotiate off set intersections:

Bicycle left-turn lane

Creates a designated space for two-way left turns using pavement markings.

Bicycle left-turn with raised median

Creates a single protected left-turn lane using a raised curb median.

Bicycle sidepath

Creates a two-way (or alternatively, two one-way sidepaths) separated path on one side of the roadway. Cyclists enter the sidepath from the right side of the roadway or bike lane and ride up to a signalized intersection. At the intersection, cyclists use the crosswalk or median refuge to continue along the bike route.

Design Recommendations

- Use retroreflective materials on both raised and painted left-turn lanes to increase cyclist visibility and facilitate bicycling at night.
- Deisgn both painted and raised median left-turn lanes to at least 6 feet in width and 8 feet in length so that bicyclists can be completely separated from the travel lanes.

Cost Range

- Bicycle left turn lane – Approximately $4/foot (centerline removal and new 4 inch striping), $75 per bicycle symbol.
- Bicycle left-turn with raised median – Approximately $15,000 - $30,000 depending on length of median.
- Bicycle Sidepath – Approximately $10/square foot.

References

- Hendrix, M. (2007). Responding to the challenges of bicycle crossings at offset intersections. Paper presented at the *3rd Urban Symposium - Uptown, Downtown, Or Small Town: Designing Urban Streets that Work (June 24-27, 2007),* Seattle, Washington.

Two Way Center Left Turn - Portland, Oregon

Median Left Turn Pocket - Portland, Oregon

Bicycle Side Path – Tucson, Arizona

Photo: Tom Thivener

Traffic Calming

Traffic calming is a set of design elements that reduce the speed and volume of motor vehicle traffic on roadways. Although frequently applied on many streets throughout communities, traffic has a natural relationship with bicycle boulevard development due to the operational conditions required. Traffic calming features are typically self-enforcing: the physical conditions of the roadway as opposed to regulatory devices influence drivers to reduce their speed in order to comfortably and safely drive the route.

When implementing traffic calming on bicycle boulevards, special consideration must be given to ensure designs to not create adversely affect cyclists, such as poorly designed speed humps that unnecessarily jar cyclists who pass over them or curb extensions that enhance rather than reduce areas of conflict between motor vehicles and cyclists.

Traffic Circles

Traffic Calming

- Raised circular islands located in the center of an intersection.
- Eliminates stop signs.
- Slight reduction in traffic speeds by requiring vehicles to maneuver around the center island circulating in a counter-clockwise direction.
- Reduces potential for and severity of traffic collisions at the intersection.
- Eliminates stop signs, potentially reducing cyclists delay.
- Provide opportunity for street beautification.
- Cooperative maintenance agreements with residents may be created for watering and maintaining landscaping.
- Less effective than speed bumps at reducing motor vehicle speed. Average motor vehicle speed reduction of 11 percent based on 85th percentile speed (Ewing, 1999).
- Larger motor vehicles such as fire trucks or school buses may be required to make a left-turn in front of the traffic circle in order to negotiate the turn.
- Visually impaired pedestrians are provided fewer audible cues to identify gaps in traffic as vehicles do not stop.

Design Recommendations

- Generally yield controlled though typically not signed as such.
- Install signage indicating counter-clockwise circulation the traffic circle in advance and/or on the traffic circle.
- Multiple traffic circles at several intersections along the route are more effective at reducing motor vehicle speed than a single traffic circle.
- If landscaped, consider the use of native and other low-maintenance plants. Public art may also be considered.
- Splitter islands may be used on the approach legs of wider intersections to further reduce the speed of motor vehicles entering the intersection. Splitter islands can also provide a refuge area for crossing pedestrians.

Cost Range

- $5,000-$12,000 for mini traffic circles depending on landscaping and road material.
- $45,000+ for landscaped roundabout at neighborhood intersections.

References

- State Department of Transportation Federal Highway Administration. (2006). *BikeSafe: Bicycle countermeasure selection system*. Retrieved from http://www.bicyclinginfo.org/bikesafe/downloads.cfm

Portland, Oregon

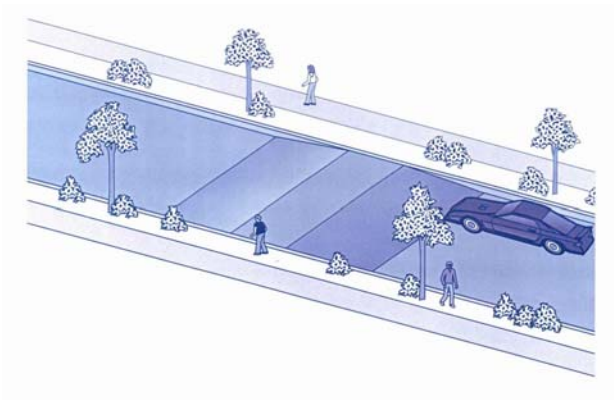
Berkeley, California

North Vancouver, British Columbia

Speed Tables

Traffic Calming

- Long and broad, flat-topped sections of raised roadway (3-4 inches high and 22 feet wide) that slow traffic by requiring motorists to reduce their speed.
- The shape of the speed table may be parabolic or trapezoidal.
- Motorist design speed varies depending on design. A 22 foot table has a motor vehicle design speed of 25 to 30 miles per hour.
- Typically installed in a series, spaced 300-500 feet apart.
- Motor vehicle speed and volume reduction is affected by the quantity and spacing of the speed tables along the street. If widely spaced, speeds between speed tables may not be reduced or even increased as motorists attempt to make up for lost time.
- Average motor vehicle speed reduction of 18 percent based on 85th percentile speed (Ewing, 1999).
- Gradual and longer speed tables are more comfortable for bicyclists to ride over without reducing their speed.
- Often combined with mid-block crossings, traffic circles, and other traffic calming design elements.



Speed Table

Design Recommendations

- Install advance signage and markings to warn motorists and bicyclists that they are approaching speed tables.
- Use retroreflective pavement markings and signage to increase visibility at night.
- Additional treatments (e.g., bollards) may need to be necessary to prevent motorists from driving around the speed hump if constructed on streets without curb.
- Do not use on sharp turns or steeped slopes.
- Carefully locate as to avoid conflict with underground utility access to boxes, vaults, and sewers.
- Do not construct at driveway locations.

Cost Range

- $2,000 - $15,000 dependent on extent of treatment, size of the road, and drainage issues.

References

- State Department of Transportation Federal Highway Administration. (2006). *BikeSafe: Bicycle countermeasure selection system*. Retrieved from http://www.bicyclinginfo.org/bikesafe/downloads.cfm
- United State Department of Transportation Federal Highway Administration. (2006). *University course on bicycle and pedestrian transportation* (University course No. FHWA-HRT-05-133). McLean, Virginia: Retrieved from http://www.tfhrc.gov/safety/pedbike/pubs/05085/pdf/combinedlo.pdf

Colored and Patterned Surfaces — Traffic Calming/Intersection Treatment

- Distinctive surface assists cyclists crossing conflict areas and provides traffic calming when used to visually narrow the traveled way.
- Employes tactile and visual signals to alert drivers to a change in the use of the roadway.
- Visually narrows the roadway.
- Delineates a pathway and assigns priority to cyclists, particularly within conflicts areas.
- Textured pavement creates an aesthetically pleasing surface and may be used at a "gateway" treatment.

Design Recommendations

- Stop bars and crosswalk markings are used in addition to color or pattern treatment at intersections and crosswalks to increase visibility, particularly at night.
- Use painted bike lanes in areas with potential motor vehicle and bicycle conflicts.
- Select textured materials carefully to prevent creating an uncomfortable riding surface for cyclists (e.g., cobblestone can create a jarring bicycle ride).
- Make painted surfaces slip resistant.

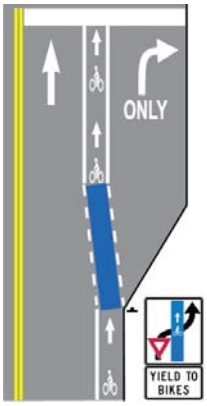
Cost Range

- Concrete Pavers – $15/per square foot
- Pattern Imprint – $100/per square foot
- Painted/Colored pavement – cost varies depending on material used

References

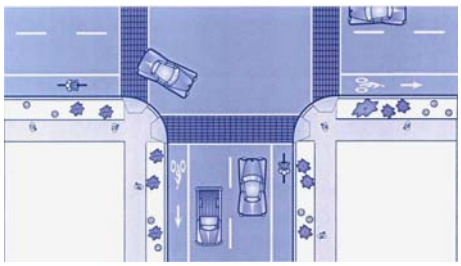
- State Department of Transportation Federal Highway Administration. (2006). *BikeSafe: Bicycle countermeasure selection system*. Retrieved from http://www.bicyclinginfo.org/bikesafe/downloads.cfm
- City of Berkeley Planning and Development Department. (2000). *Bicycle boulevard design tools and guidelines* (design guidelines). Berkeley, California: Retrieved from http://www.ci.berkeley.ca.us/ContentDisplay.aspx?id=6652

Portland, Oregon



Painted Bike Lane Through Conflict Area

Patterned Crosswalk at Mid-Block Crosswalk



Patterned Crosswalk at Intersection

Chicanes

Traffic Calming

- Raised curbs that create serpentine, horizontal shifting of the travel lanes along a roadway.
- The shifting lanes reduce speeds by eliminating long stretches of straight roadway where motorists can pick up speed and by forcing motor vehicles to shift laterally.

Design Recommendations

- Create a gradual shifting of the lanes.
- Barriers, such as a raised median may be installed to prevent motorists from avoiding the lateral shift by driving down the roadway centerline.
- Chicanes may be designed separated from the curb face to create a bicycle bypass and/or to allow water to continue draining along a gutter pan, but this may require maintenance to remove leaf matter and other debris build up.
- If landscaped, plant with low growing shrubs and/or trees with high canopies to preserve sight distance. Native plants may reduce maintenance requirements.
- Serpentine pavement markings may be used to "paint" chicanes on the roadway. Although the painted stripes may not achieve the same amount of horizontal diversion, they do visually narrow the roadway similar to raised chicanes.
- Installation may reduce on-street parking.
- Also can be achieved with on-street parking on alternating sides on the street.

Cost Range

- Landscaped chicanes: $10,000 (set of 3)

References

- State Department of Transportation Federal Highway Administration. (2006). *BikeSafe: Bicycle countermeasure selection system.* Retrieved from http://www.bicyclinginfo.org/bikesafe/downloads.cfm

Vancouver, British Columbia

Berkeley, California

Curb Extensions — Traffic Calming

- Curb extensions (also known as bulbouts) extend the sidewalk or curb face into the parking lane at an intersection. This visually narrows the roadway and reduces the width of the crosswalk, shortening bicyclist and pedestrian crossing distance.
- Install at intersection and mid-block crosswalks.
- Curb extensions can increase the amount of space available for pedestrian street furniture such as park benches, as well as bicycle parking. However, ensure that street furniture does not obstruct motorist view of pedestrians who may be entering the intersection.

Design Recommendations

- If bike lanes are not present, provide 12-14 feet of outside lane width at the curb extension.
- Curb extensions must not obstruct travel lanes or bicycle lanes when present.
- Consider the turning radius of larger vehicles, such as delivery vehicles and fire trucks when designing the curb extension. If frequently used by larger vehicles, modify the design to accommodate.
- If landscaped, plant with low growing shrubs to preserve sight distance and native plants to reduce maintenance.

Cost Range

- $2,000 - $20,000 per corner.

References

- State Department of Transportation Federal Highway Administration. (2006). *BikeSafe: Bicycle countermeasure selection system*. Retrieved from http://www.bicyclinginfo.org/bikesafe/downloads.cfm
- City of Portland Bureau of Transportation. (2007). *Platinum bicycle master plan phase I: Existing conditions report* (Draft Report). Portland, Oregon: Retrieved from http://www.portlandonline.com/transportation/index.cfm?c=44674&a=159806

Curb Extensions - Before and After

Landscaped Curb Extension

Residential Speed Limit

Traffic Calming

- Discourage motorists from traveling through residential neighborhoods by setting a residential speed limit of 20 mph.
- Signage alone may present enforcement issues. Combine with traffic calming as needed.
- May require legislation authorizing use of regulatory speed limits below standard. Some state traffic codes already include provisions for reduced speed limits in residential areas under certain conditions.
- Signs must be posted on all affected residential streets if standard speed limit for unsigned streets is higher than 20 mph.

Design Recommendations

- Generally implemented within a residential area on several streets rather than individual streets.
- May be combined with pavement markings and/or gateway treatments that indicate a reduced speed.

Cost Range

- $30 -150 per sign plus installation

References

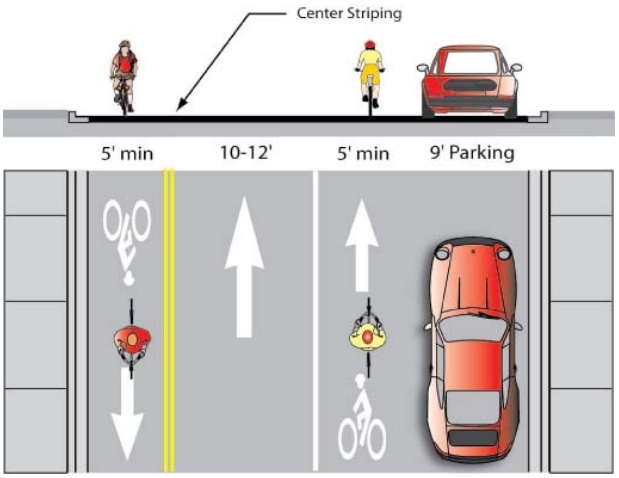
- City of Portland Bureau of Transportation. (2009). *Bikeway designs: Best Practices* (Draft Report). Portland, Oregon.

Residential Speed Limit Sign

Contraflow Lanes

Traffic Calming

- A designated bicycle facility that allows cyclists to travel against the flow of traffic on a one-way street.
- Provides direct access and improves cyclist connectivity, reducing cyclist travel time by eliminating out-of-direction detours and unauthorized wrong-way riding.
- Installed on left side of the street facing one-way traffic. The contraflow lane is generally separated from the motor vehicle lane with a double-yellow line.
- May require modifications to existing traffic signals to allow bicyclists to activate signal from "wrong" direction.
- Presents safety concerns due to cyclists traveling in a direction where motorists do not expect them. Engineers must carefully evaluate roadway conditions to determine whether a contraflow lane application is appropriate.
- In some cases, a contraflow may allow cyclists to avoid streets with high motor vehicle traffic speeds and volumes or create safer conditions at locations where cyclists frequently ride wrong-way.



Contraflow Lane with Parking

Design Recommendations

- Avoid use on streets with many driveways or streets that will intersect with the contraflow lane.
- Allow contraflow lane width of 5 feet or greater.
- Consider physical separation between the contraflow lane and motor vehicle travel lane.
- Consider painted bicycle lane to highlight presence of the contraflow lane to bicyclists and motorists.
- Post signage indicating cyclists may enter the one-way streets. Place signage on all streets intersecting the contraflow lane indicating that to motorists to expect two-way bicycle traffic.

Cost Range

- $5,000 - $50,000 per mile

References

- City of Portland Bureau of Transportation. (2009). *Bikeway designs: Best Practices* (Draft Report). Portland, Oregon.
- United State Department of Transportation Federal Highway Administration. (2006). *BikeSafe: Bicycle countermeasure selection system*. Retrieved from http://www.bicyclinginfo.org/bikesafe/downloads.cfm

Advisory Bicycle Lane

Traffic Calming

- Dashed white lines on both sides of a narrow roadway that delineate a space for cyclists.
- The travel lane is not wide enough to allow motorists to pass in both directions. Motorists may enter the bicycle advisory lane to pass when bicyclists are present, but must overtake vehicles with caution, yielding to oncoming traffic.
- Reduces motor vehicle speed due to friction created with oncoming vehicles and visual narrowing of the roadway..
- An option for streets too narrow for conventional bicycle lanes.
- May require special legislation for implementation.

Design Recommendations

- Advisory lane minimum width 4 feet.
- Two-way travel lane minimum width 13 feet.
- Use on local or neighborhood collector streets.
- Centerline of roadway is not marked.
- Consider maximum motor vehicle volume of 3000 vehicles per day and maximum motor vehicle speeds of 30-35 mph.
- Avoid use on streets with bends, inclines, or other sight restrictions.
- Consider use of painted bicycle lane to highlight bicycle lane and increase visual narrowing of the roadway.
- May require explanatory signage and public education.

Cost Range

- $5,000 per mile for lane marking.

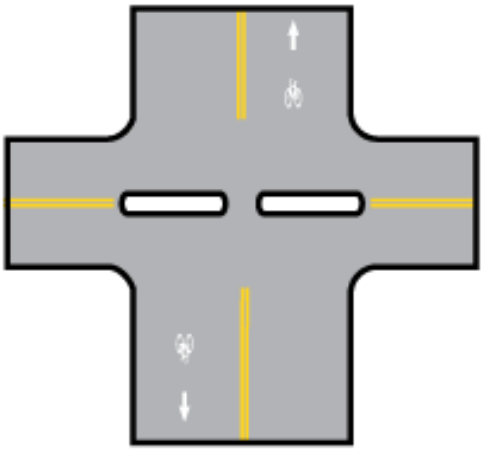
References

- City of Portland Bureau of Transportation. (2009). *Bikeway designs: Best Practices* (Draft Report). Portland, Oregon.
- CROW (2007). *Design manual for bicycle traffic.* Ede, The Netherlands: Dutch national information and technology platform for infrastructure, traffic, transport and public space.

Advisory Bicycle Lanes, Netherlands

Advisory Bicycle Lanes, Netherlands

Traffic Reduction



Traffic reduction design elements are effective tools to maintain existing low volumes or reduce the overall volume of motor vehicle through trips on the bicycle boulevard. While through trips by motor vehicles are eliminated or restricted in certain directions, continuous through travel by bicyclists and other non-motorized users is maintained and enhanced.

When implementing traffic reduction on bicycle boulevards, diversion of motor vehicle traffic off the bicycle boulevard and onto other local streets must be identified and addressed.

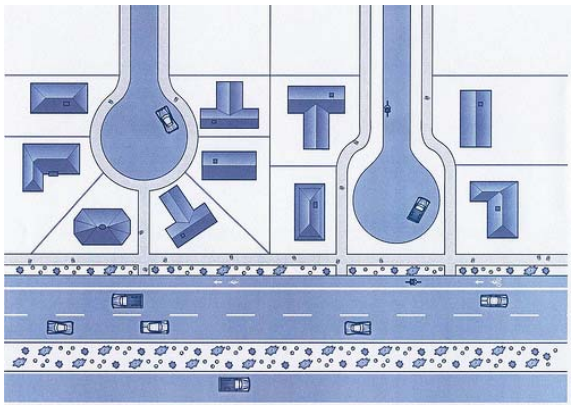
Non-Motorized Only Crossings

Traffic Reduction

- Increase bicycle and pedestrian connectivity by developing continuous non-motorized route connections not accessible to motor vehicles.
- Also referred to as a street closure or diverter.
- Typically placed on minor streets at an intersection with a major street to manage motor vehicle volumes on the minor street.
- Create a "dead-end" or cul-de-sac where a through street once existed, providing through access for non-motorized traffic. This may require purchase or donation of an easement.
- Construct a bicycle/pedestrian bridge across a water feature, a "dead end" roadway, park, or other physical barrier. Connect existing cul-de-sac streets to other streets using multi-use trails.
- Very effective at reducing motor vehicle traffic volumes along the roadway.
- Frequently landscaped, but can also be formed with raised curbs, medians, barrier placement, and signage.

Berkeley, California

San Luis Obispo, California



Cul de Sac Connects to Main Road

Design Recommendations

- Conduct a traffic analysis to assess potential motor vehicle traffic diversion onto nearby streets and consider additional traffic calming and reduction measures on nearby streets to mitigate any traffic impacts.
- Consider impacts to emergency vehicle or transit access or delay, and the overall affect on connectivity.
- Post signs permitting bicyclists to enter the closure.
- Design openings to a minimum of four feet in width.
- Bollards and other barriers intended to prevent motor vehicle access may be hazardous to cyclists. Use reflective materials on the barrier to increase visibility.
- If landscaped, consider the use of native or other low-maintenance plants. Stormwater management features may be integrated into the design.

Cost Range

- Costs will vary greatly depending on existing conditions and design of the connection.

References

- City of Portland Bureau of Transportation. (2007). *Platinum bicycle master plan phase I: Existing conditions report* (Draft Report). Portland, Oregon: Retrieved from http://www.portlandonline.com/transportation/index.cfm?c=44674&a=159806
- City of Berkeley Planning and Development Department. (2000). *Bicycle boulevard design tools and guidelines* (design guidelines). Berkeley, California: Retrieved from http://www.ci.berkeley.ca.us/ContentDisplay.aspx?id=6652

Partial Non-Motorized Only Crossings — Traffic Reduction

- Partial non-motorized crossings eliminate some motor vehicle movements at intersections, forcing motorists to turn off of and/or restricting turns onto the minor road.
- Also referred to as a partial closure, semi-diverter, or diagonal diverter.
- Partial non-motorized crossings include constructed barriers and signed restrictions that eliminate a motor vehicle turn movement.
- Diagonal diverters are barriers placed diagonally corner to corner across a four-way intersection. This design prevents through movements by motor vehicles but allows motorists to turn in one direction.
- Restrictions created through signage only may present enforcement issues.
- Frequently landscaped, but can also be formed with raised curbs, medians, barrier placement, and signage.

Berkeley, California

Vancouver, British Columbia

Portland, Oregon

Design Recommendations

- Conduct a traffic analysis to assess potential motor vehicle traffic diversion onto nearby streets and consider additional traffic calming and reduction measures on nearby streets to mitigate any traffic impacts.
- Consider impacts to emergency vehicle or transit access or delay, and the overall affect on connectivity.
- Post signs permitting bicyclists to enter the closure.
- The bicyclist's travel path may be marked or physically separated at the intersection to reduce potential conflicts with motor vehicles exiting the street.
- If landscaped, consider the use of native or other low-maintenance plants. Stormwater management features may be integrated into the design.

Cost Range

- Costs will vary greatly depending on existing conditions and design of the connection.

References

- City of Portland Bureau of Transportation. (2007). *Platinum bicycle master plan phase I: Existing conditions report* (Draft Report). Portland, Oregon: Retrieved from http://www.portlandonline.com/transportation/index.cfm?c=44674&a=159806
- City of Berkeley Planning and Development Department. (2000). *Bicycle boulevard design tools and guidelines* (design guidelines). Berkeley, California: Retrieved from http://www.ci.berkeley.ca.us/ContentDisplay.aspx?id=6652

Complementary Design and Programmatic Elements

Many design features and programs complement the development of a bicycle boulevard. These elements enhance the pedestrian and natural environment; multiplying the benefits of a bicycle boulevard. Moreover, some programs may help fund the planning or construction of a bicycle boulevard or individual bicycle boulevard design elements.

Safe Routes to School

Figure 3.3 School children in Portland, Oregon learn bicycling rules of the road through a Safe Routes To School Program

Safe Routes to School (SRTS) is a program that enables and encourages school children to walk and bike to school. Funding for SRTS is available at the Federal and State level (Federal funds are typically distributed by the States). The program provides funding for projects that make walking and biking to school safer and more appealing. A SRTS project typically contains an engineering, education, enforcement, or encouragement component (or a combination of the four) towards increasing active transportation options for children. Cooperation between school districts, public works, and law enforcement, is encouraged.

The low speed and low volume nature of bicycle boulevards make them an ideal bikeway for children bicycling to school. A bicycle boulevard is also a terrific classroom to teach school children the rules of the road (Figure 3.3).

An SRTS grant may also be used to help fund bicycle boulevard development if the route is within approximately 2 miles of a K-8 school.

For more information, visit the National Center for Safe Routes to School at: www.saferoutesinfo.org

Green Streets/Green Stormwater Treatments

Figure 3.4 A Green Streets project in Portland, Oregon sustainably manages stormwater, slows traffic, and creates a welcoming and pleasant environment for bicyclists and pedestrians

Green Streets reduce the impact of stormwater runoff through stormwater collection swales and pervious asphalt or concrete. These design features capture excess stormwater runoff, filter stormwater impurities, increase groundwater recharging, and reduce the load of excess stormwater on existing drainage systems.

Green Streets programs also beautify the streetscape through the use of wetland plants and enhance the bicycle and pedestrian environment through stormwater management features that provide a dual benefit of traffic calming.

Examples of Green Streets traffic calming include curb extensions, chicanes, and medians that are landscaped to collect and retain stormwater (Figure 3.4). Like Safe Routes to School programs, funding for Green Streets improvements may be leveraged for bicycle boulevard development.

For more information, visit the United State Environmental Protection Agency's website on Green Streets programs across the United States:
http://www.epa.gov/owow/podcasts/greenstreetsusa.html

Public Art

Figure 3.5 Public art in Ocean City, New Jersey and Portland, Oregon give distinction to bicycle boulevards



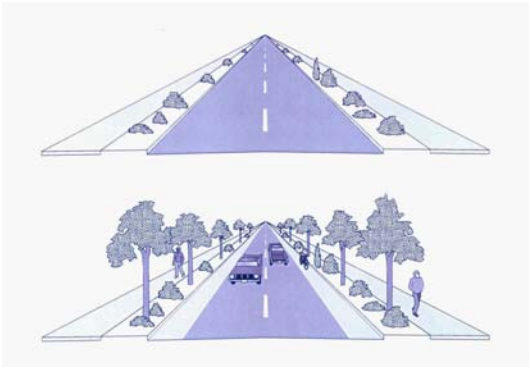
Public art defines the space along a bicycle boulevard, and is also a terrific way to increase public involvement (Figure 3.5). The art can even be functional, such as decorative bicycle parking. When public art is used for bicycle parking, form must meet function. The bicycle frame should be supported in two locations and the rack should accommodate a wide range of bicycle sizes.

Ideas for public art along bicycle boulevards include:

- Public competitions for artistic bicycle parking or intersection mural designs;
- Commissioned sculptures that identify the termini of a bicycle boulevard;
- Themed artwork or logos that identify a particular bicycle boulevard route.

Landscaping and Street Trees

Figure 3.6 Street trees



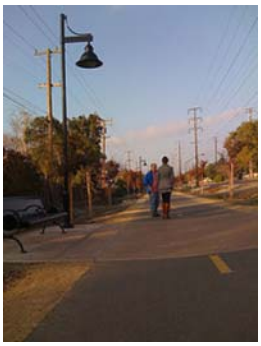
Corridors landscaped with street trees and planted medians beautify the streetscape and provide traffic calming benefits (Figure 3.6). Funding for landscaping can come through partnerships with parks and recreation and environmental services departments, as well as private funding sources.

Ideally, plants used for landscaping are native or low-maintenance. Cooperative agreements may be formed with nearby residents and business owners to provide for minor maintenance activities such as watering and pruning.

Pedestrian Amenities

Figure 3.7 Street furniture such as seating, drinking fountains and pedestrian-oriented lighting foster a comfortable environment for biking and walking in Portland, Oregon





The very design features that make bicycle boulevards wonderful places to cycle also make them terrific places to walk. These features can be further enhanced through the installation of pedestrian amenities such as park benches, water fountains, and pedestrian-oriented street lighting that create an inviting and comfortable pedestrian environment (Figure 3.7). The addition of pedestrian amenities advances the notion that the benefits of bicycle boulevards extend beyond bicyclists.

End of Trip Facilities

Figure 3.8 Adequate and safe parking in Berkeley, California and Portland, Oregon



Safe, secure and adequate parking is needed for cycling to be a viable transportation option (Figure 3.8). Comprehensive bicycle boulevard planning and construction will consider the need for parking at key destinations and work with appropriate business owners or local agency staff to create and maintain long and short-term bicycle parking facilities. Additional information on bicycle parking can be found at the Pedestrian and Bicycle Information Center website on Bicycle Parking: http://www.bicyclinginfo.org/engineering/parking.cfm

IV. Marketing, Maintenance & Safety

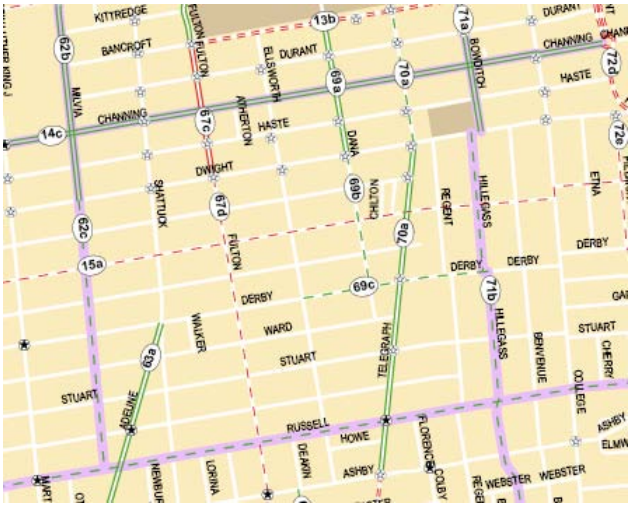
Marketing

Bicycle boulevard signage and pavement markings go a long way towards "advertising" the location of and destinations served by a bicycle boulevard 24 hours a day. However, it is not recommended that local agencies rely on signage alone to get the word out about bicycle boulevards in their communities. For the long-term success of the facility, including attracting new riders, communities are encouraged to actively market the location of bicycle boulevards and destinations they serve. Marketing of bicycle boulevards can be done in a variety of methods. Include funding for marketing activities in project cost estimates.

Bicycle Maps

Community bicycle maps are typically the first resource people turn to when looking for information on local bicycling and should be readily available in print and on the community website. Bicycle maps (Figure 4.1) generally highlight bike paths, lanes, or routes in different colors. Often, maps will differentiate bicycle boulevards by simply using another color, but this can also be accomplished by adding a unique pattern or outline to identify which of the shared roadway bike routes are also bicycle boulevards. To highlight the utility of bicycle routes, include symbols on maps for key destinations when possible.

Figure 4.1 The City of Berkeley bicycle map identifies bicycle boulevards as purple routes.



Community Rides

Get the word out about bicycle boulevards by holding community group rides that include bicycle boulevards. This allows community members to experience the difference of a bicycle boulevard and personally identify destinations served by the bicycle boulevard. Bicycle advocacy groups frequently hold such rides and prove to be an invaluable resource to communities with limited staff and resources.

Encouragement Programs

Several communities have developed programs that are focused on encouraging transportation alternatives to the single occupancy vehicle. These programs are an avenue to inform current and potential cyclists about what bicycle boulevards are and where they are located.

One such program, Portland SmartTrips (Figure 4.2), uses individualized marketing to inform residents of transportation options in their communities. Residents first receive a flyer in the mail that asks if they would like more information on bicycling, walking, and transit opportunities. Residents that opt-in may then select the type of additional information they would like to receive, including personalized walking, transit, and bicycle routes, bicycling safety information, calendars of free workshops and community events (some targeted specifically towards seniors or women), maps, as well as incentives like pedometer and coupon booklets.

Figure 4.2 Portland SmartTrips encourages bicycling, walking, and transit use

Celebrate New Bicycle Boulevards

When construction on a new bicycle boulevard is completed, the community can celebrate with a bicycle parade of school children—a wonderful way to tie into Safe Routes to School programs that encourage children and their parents to walk or bike to school (Figure 4.3)—or a press release. These types of activities raise awareness of the bicycle boulevard and are a fun way to recognize all the people who worked to make the new bikeway possible.

Figure 4.3 A parade of school children participating in a Safe Routes to School program can raise awareness about the bicycle boulevard

Maintenance

Pavement Quality & Maintenance

Smooth surfaces make for a pleasant bike ride. A street can have all the ideal characteristics of a bicycle boulevard, but miss on one important detail: pavement quality. Pavement in poor condition, including potholes, embedded objects such as abandoned railroad tracks, and debris, make for an uncomfortable and potentially dangerous journey. Inattention to pavement quality and debris can reduce the bicycle boulevard attractiveness and effectiveness.

Bicycle boulevards must be kept in good condition, with a smooth riding surface. Many cities have maintenance schedules for resurfacing and rehabilitating road surfaces. When possible and appropriate, prioritize these maintenance activities on the bicycle boulevards.

Pavement markings will wear over time and signage may be damaged or stolen. Incorporate funds for new markings and signs in maintenance budget. Signage programs that use consistent designs throughout the bicycle boulevard network keep expenses for sign replacement at a minimum.

Public-Private Partnerships

Landscaped design elements are often intentionally designed to be low-maintenance through the use of native plants, but may still occasionally require watering and/or sweeping, particularly as plants become established. Several communities with bicycle boulevards have partnered with local residents to help maintain these features.

Continued Evaluation

The contractors have been paid and bicyclists are riding down a brand new bicycle boulevard, but that is not that the end of this project. Continued evaluation of the bicycle boulevard, particularly a new bikeway or one where significant changes have occurred, is essential to the continued success of

the route. Project staff must regularly evaluate how the boulevard and adjacent streets are functioning and address any issues. Evaluation can include but is not limited to bicycle and motor vehicle counts and speed surveys, traffic collision analysis, and user surveys.

Common issues include:

- Several two-way stop signs were reoriented to assign right of way to the bicycle boulevard and reduce bicyclist delay. This change attracted through trips by motor vehicles from the nearby arterial.
- A street closure device is too low and passenger cars are ignoring the restriction.
- The loop detector on a bicycle-activated signal is no longer functioning and bicyclists can no longer call a green signal.

A bicycle boulevard audit worksheet has been included in the Appendix B of this report, and can be used to evaluate both streets with existing and proposed bicycle boulevards.

Safety

The safety benefits of bicycle boulevards are likely to be derived primarily from traffic calming and traffic reduction design features. Although the safety benefits specifically attributed to bicycle boulevards has yet to be studied, the safety benefits of traffic calming are well documented to reduce both the frequency and severity of collisions.

The same conditions that make a street safe for cycling create safer conditions for all roadway users regardless of travel mode. Lower motor vehicle speeds translate into greater motorist reaction time, potentially allowing collisions to be avoided in the first place. A lower speed (between 16-31 mph) also means that if pedestrians or cyclists are involved in a collision with a motor vehicle, they less likely to be fatal[3].

One study, conducted to determine if there are quantifiable collision reduction benefits of traffic calming, found that when several traffic calming treatments were employed as part of a single plan (similar to what may occur on a typical bicycle boulevard design), an average 65% reduction in collisions were reported[4].

[3] Sarkar, et al., 1997
[4] Zein, et al., 1997

V. Bicycle Boulevard Case Studies

Overview of Findings

- Milwaukie, Oregon
- Arcata, California
- St. Paul, Minnesota
- Santa Monica, California
- Syracuse, New York
- Pasadena, California

These are merely a handful of the bicycle boulevards that are currently being planned and constructed in communities across the United States. There are also many terrific examples of bicycle boulevards (and bicycle boulevard-like) designs across Europe. Countries like the Netherlands and Denmark have decades of experience in bicycle transportation planning. Many of the bikeway designs implemented in these countries have applicability on bicycle boulevards in the United States, and may be included in future versions of this guidebook.

In the following section, case studies of several bicycle boulevards present what has worked in the United States. These case studies represent a wide range of bicycle boulevards, from the stand-alone bicycle boulevard that relies primarily on signage and pavement markings, to robust bicycle boulevard networks where traffic is aggressively calmed through the use of multiple design elements.

Themes common across all case study interviews:

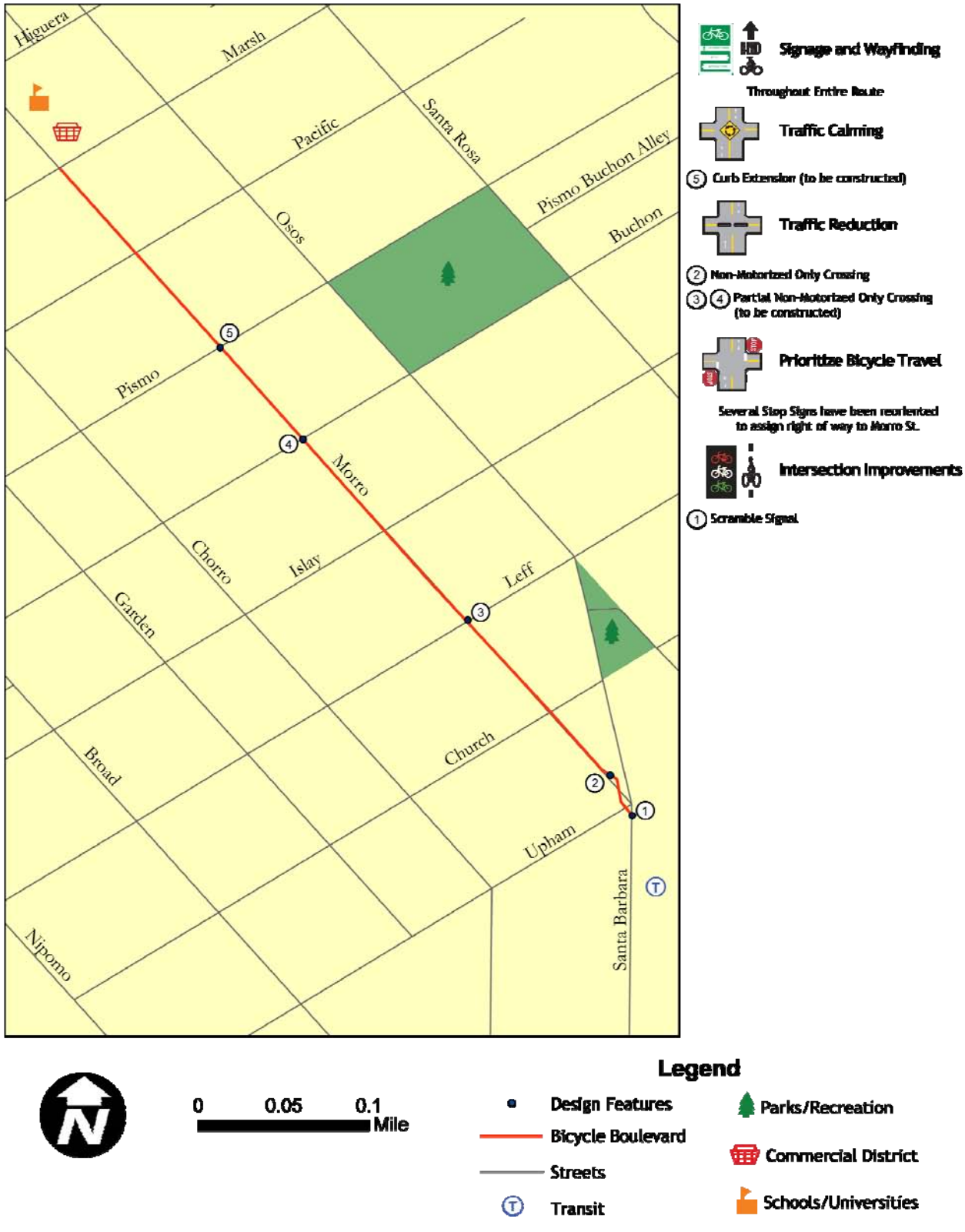
- Bicycle boulevards are described as well-loved in each community. Nearly all representatives indicated that they have plans for additional bicycle boulevards.
- Public involvement in the planning and design of the bicycle boulevard is key.
- Residents along proposed bicycle boulevards, as well as those on nearby streets, are frequently concerned about changes to traffic along their streets and access to their homes. Particularly in locations where no bicycle boulevard previously existed, the purpose and function of bicycle boulevards needs to be communicated to the public.
- Consult with local emergency services regarding traffic calming and reduction designs.
- Continually evaluate the performance of the bicycle boulevard as well as traffic impacts on nearby streets.
- Bicycle maps are the most common method of disseminating information about the bicycle boulevards. Organized community bicycle rides and other creative methods are also frequently mentioned.
- Use what is already available. Capitalize on existing features that reduce the speed and volume of motor vehicle traffic including non-motorized bridges and one-way streets, but remember that the boulevard still needs to connect to key destinations.
- Current bicycle and motor vehicle traffic data (before and after construction), as well as cost information on the planning, design, and construction of bicycle boulevards is often unavailable.

Case Study Summaries

Bill Roalman "Morro Street" Bicycle Boulevard – San Luis Obispo, California
Bryant Street "Ellen Fletcher" Bicycle Boulevard – Palo Alto, California
Channing Street Bicycle Boulevard – Berkeley, California
Haven Avenue "OC-1 Bikeway" – Ocean City, New Jersey
Lincoln-Harrison Bicycle Boulevard – Portland, Oregon
Monroe-Friendly Bicycle Boulevard – Eugene, Oregon
Third Street Bicycle Boulevard – Tucson, Arizona
40's Bikeway – Portland, Oregon

Google Earth tours are available for several of these bicycle boulevards. Download instructions and files at: http://bicycleboulevards.altaprojects.net/

Bill Roalman "Morro Street" Bicycle Boulevard – San Luis Obispo, California



Overview

- The Bill Roalman "Morro Street" bicycle boulevard is approximately 1/2 mile in length and runs along a primarily residential street in downtown San Luis Obispo (Figure 5.1).
- Morro Street was selected due to its proximity to Osos Street, a busy and narrow parallel arterial used by cyclists heading downtown.
- A bicycle boulevard was chosen specifically due to lack of room for bicycle lanes on either Osos Street or Morro Street.
- During a railroad station upgrade, Morro Street was closed at Santa Barbara Street by creating a landscaped cul-de-sac with pedestrian and bicycle access (Figure 5.2). A bicycle scramble signal was later installed at Santa Barbara to facilitate bicycle movements from Santa Barbara onto Morro (Figure 5.3).
- The City promotes the bikeway using advertisements on public access channels, public service announcements at local theaters, bike maps, and volunteer-led group bicycle tours.

Key Destinations

Transit – Amtrak	Other Bikeways –including a rail-trail
California Polytechnic University	Downtown San Luis Obispo

Lessons Learned & Advice

- Stop sign reorientation to favor the bicycle boulevard resulted in increased motor vehicle speeds and volumes along the route. In response, a project was recently approved to install partial-closures (cars forced into right turn; bikes can continue through) at two intersections, as well as a curb extension.
- In the future, the City would prefer to construct a complete design for a bicycle boulevard rather than phase improvements over time.
- Parking was removed near intersections to ensure adequate sight distance.
- Approval of traffic-calming design elements by emergency services agencies is essential.
- Continue evaluating operation after construction is completed and make design adjustments as needed.

Public Involvement

- Nearby residents were invited to neighborhood forums on the project.
- Neighborhood residents participated in a joint neighborhood-parks street tree planting activity to make the route an enticing place to bike and walk.
- The City Bicycle Advisory Committee acts as a sounding board for how the bikeway is functioning.

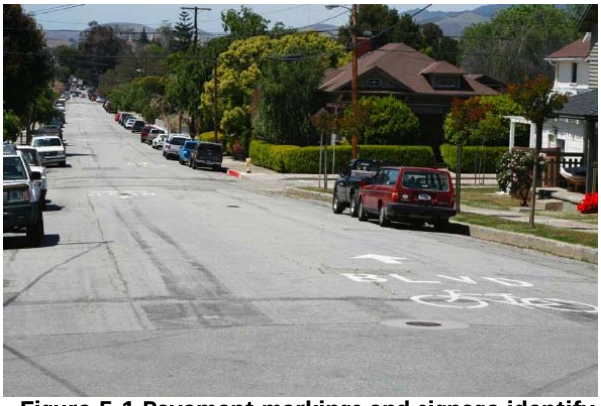


Figure 5.1 Pavement markings and signage identify the street as a bicycle boulevard.

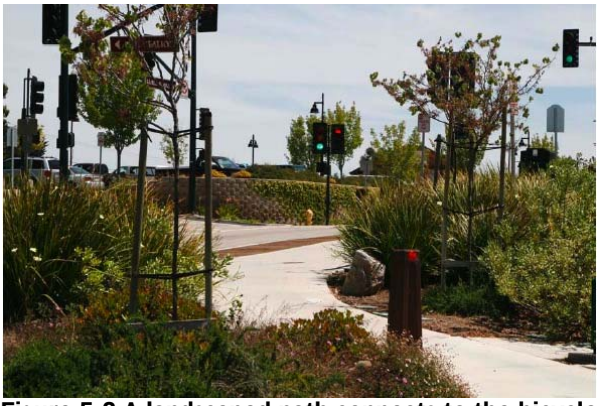


Figure 5.2 A landscaped path connects to the bicycle "scramble" signal.

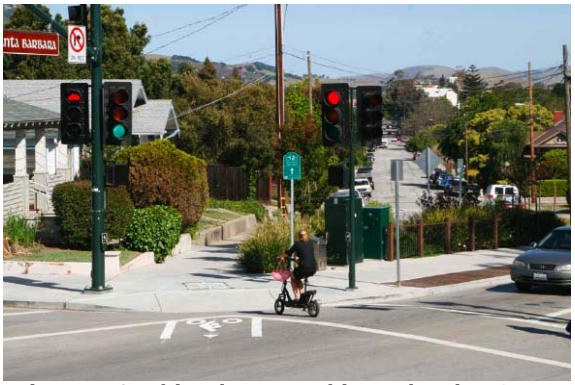


Figure 5.3 A bicycle "scramble"" signal at Santa Barbara Street connects the bicycle boulevard to the Amtrak station and a regional trail system.

Data

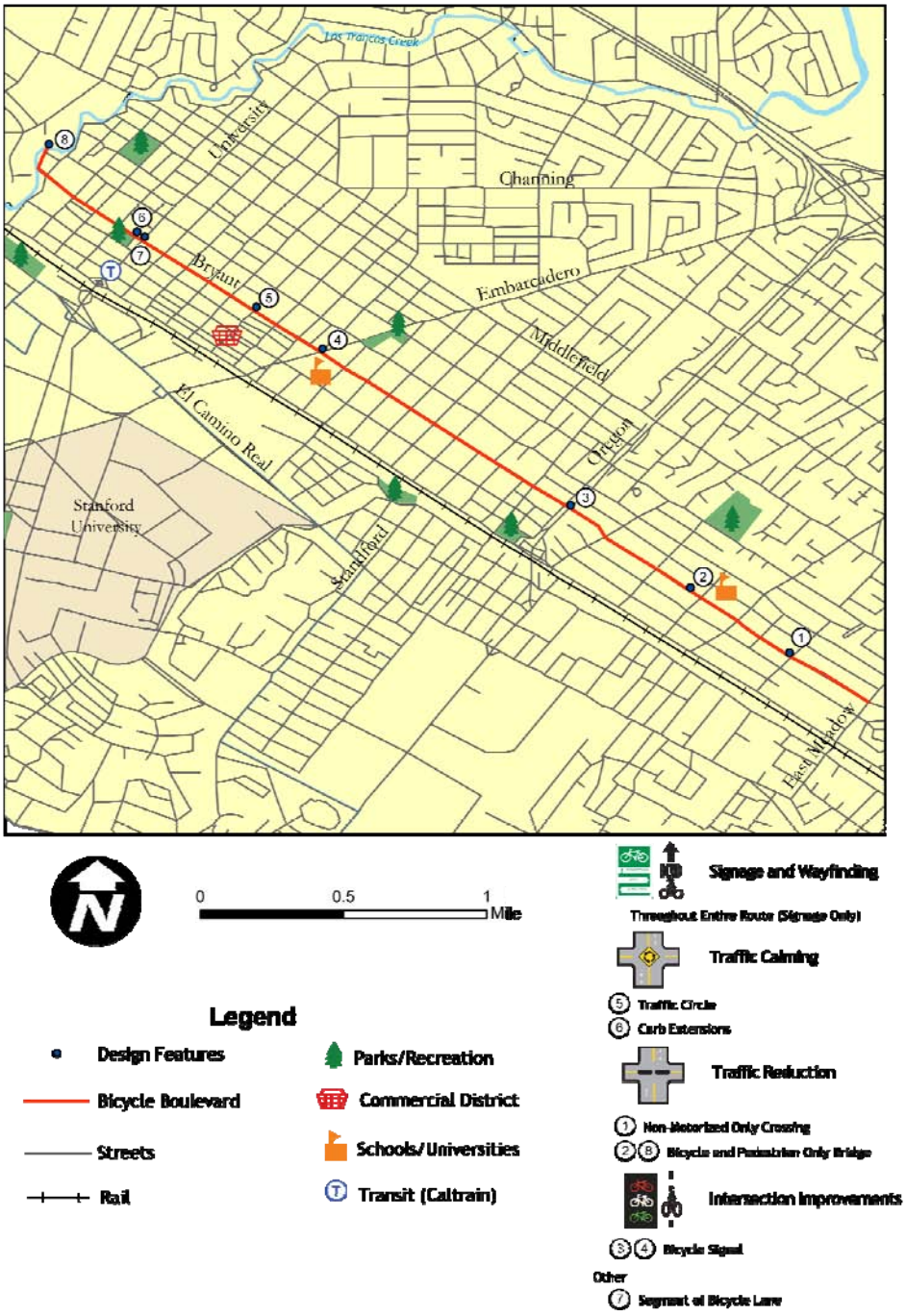
2007 Traffic Volumes: 345 (2-hour count)
2008 Bicycle Volumes: 75 (2-hour count)
Construction Cost::
Phase I & II (street closure, bicycle signal, signage, pavement markings): $370,000 (2003 dollars)
Phase III (slurry seal, curb extension, non-motorized only crossing): $361,711 (2008 estimate)
Speed Limit (assumed): 25 mph

Contact

Peggy Mandeville
Senior Transportation Planner
(805) 781-7590
pmandevi@slocity.or

City of San Luis Obispo
990 Palm Street
San Luis Obispo, CA
93401

Bryant Street "Ellen Fletcher" Bicycle Boulevard – Palo Alto, California



Overview

- The Bryant Street "Ellen Fletcher" bicycle boulevard is approximately 3.25 miles in length and runs along a primarily residential street in downtown Palo Alto.
- Connects the City of Palo Alto and the City of Menlo Park.
- Credited as the first bicycle boulevard in the United States.
- Implemented in two phases constructed 11 years apart due to the cost of a signal required to assist bicyclist and pedestrian crossings.
- The first segment (East Meadow Drive-Churchill Avenue) was constructed in 1981 and utilized an existing bicycle/pedestrian bridge (Figure 3.5). The second segment (Churchill Avenue-Northern City Limits) was constructed in 1992 and included a new signalized crossing.

Key Destinations

Intercity Transit (Caltrain)	Other Bikeways – including a rail-trail
Schools & Stanford University	Downtown Palo Alto
Libraries	Parks

Lessons Learned & Advice

- Remove unwarranted stop signs on the bicycle boulevard. Convert 4-way stop-controlled intersections to 2-way stops that assign right of way to the bicycle boulevard, or replace with traffic circles.
- Install traffic calming and/or non-motorized only crossings to maintain low motor vehicle speeds (Figure 5.4 and Figure 5.6).
- Use bicycle/pedestrian bridges or tunnels to create continuous through routes for non-motorized users that naturally restrict motor vehicles (Figure 5.5).
- Bicycle traffic on Bryant Street increased dramatically upon completion of the bicycle boulevard and attracted bicyclists from nearby parallel routes. Due to the success of the bicycle boulevard, there is currently a shortage of bicycle parking in downtown Palo Alto.

Public Involvement

- The City Transportation Division worked with the Bicycle Advisory Committee and held neighborhood outreach meetings.
- Any changes to traffic control or traffic calming along the bicycle boulevard must go through City Council where the public is encouraged to comment.
- In addition to a bicycle map, the City works with student groups from nearby Stanford University to "get the word out" about the route.
- Residents have requested the development of additional bicycle boulevards. Two new routes are currently being evaluated.

Figure 5.4 A non-motorized only crossing forces motor vehicles to turn at an intersection

Figure 5.5 A bicycle/pedestrian bridge creates a non-motorized only crossing at Matadero Creek

Figure 5.6 Bicycle activated signal

Photos: John Ciccarelli, Bicycle Solutions, www.bicyclesolutions.com

Data

Traffic Volumes: Not Available
1997 Bicycle Volumes: 385 (8-hour count)
Construction Cost:
Phase I (southern segment – bicycle bridge): $35,000(1983-84 dollars)
Phase II (traffic signal): $243,000 (1992 dollars)
Speed Limit (assumed): 25 mph

Contact

Raphael Ruis
Transportation Engineer
(650) 329-2305
rafael.ruis@cityofpaloalto.org

City of Palo Alto
250 Hamilton Avenue
Palo Alto, CA 94301

Channing Street Bicycle Boulevard – Berkeley, California

Legend

0 0.5 1 Mile

- Design Features
- Bicycle Boulevard
- Other Bicycle Boulevards
- Streets
- Parks/Recreation
- Commercial District
- Schools/Universities
- Transit

Signage and Wayfinding

Throughout Entire Route

Traffic Calming

(1) (9) (10) Traffic Circle
(3) Curb Extensions
(4) Colored/Patterned Pavement

Prioritize Bicycle Travel

(7) Stop Signs have been reoriented to assign right of way to Channing.

Traffic Reduction

(6) Partial Non-Motorized Only Crossing

Intersection Improvements

(5) Bicycle Signal
(8) (11) Medians

Other

(2) Segment of Bicycle Lane

Overview

- The Channing bicycle boulevard is approximately 2.5 miles in length and provides an east-west connector route in Berkeley, California.
- Includes sections of bicycle lane.
- Distinctive purple wayfinding and street signage is used on all bicycle boulevards (Figure 5.9).
- Large pavement markings (30'L x 6'W) (Figure 5.7) are installed approximately every 20 feet and at each intersection. The prominent markings reinforce the message to motorists that they are on a street prioritized for cyclists, act as a "breadcrumb trail" for cyclists, and contribute to a "sense of place."
- Most bicycle boulevards in Berkeley began as traffic calming installed during the 1960's to reduce cut-through traffic in neighborhoods. In the 1990's, the City formalized the network with the adoption of the City bike plan, building upon the existing traffic calming elements with signage, pavement markings, and new traffic calming features.
- Part of a well-connected network of bicycle boulevards.

Figure 5.7 Large pavement markings

Key Destinations

Schools & University of California Berkeley
Commercial District
Transit
Other Bicycle Routes
Downtown Berkeley
Bicycle/Pedestrian Bridge crossing Freeway

Figure 5.8 Landscaped non-motorized crossings allow cyclists through but restrict motorists

Lessons Learned & Advice

- Not all arterial crossings require signalization or other expensive improvements. A crossing located between two signals can create gaps between platoons of motor vehicles allowing bicyclists to safely cross. Wide medians can provide a refuge area when gaps are not sufficient in both directions.
- Schedule bicycle boulevard improvements in coordination with repaving and other major projects.
- Build upon existing traffic calming
- Plan bicycle boulevard network parallel to and within short distance of arterial and major collector streets.

Public Involvement

- Public input solicited through a series of public workshops to develop the conceptual design of the network.
- Several landscaped features are informally maintained by nearby residents (Figure 5.8).
- Marketed through a city bike map and individual bicycle tours. Passively marketed by way of signage and pavement markings.

Figure 5.9 Purple signs are used on bicycle boulevard streets

Data

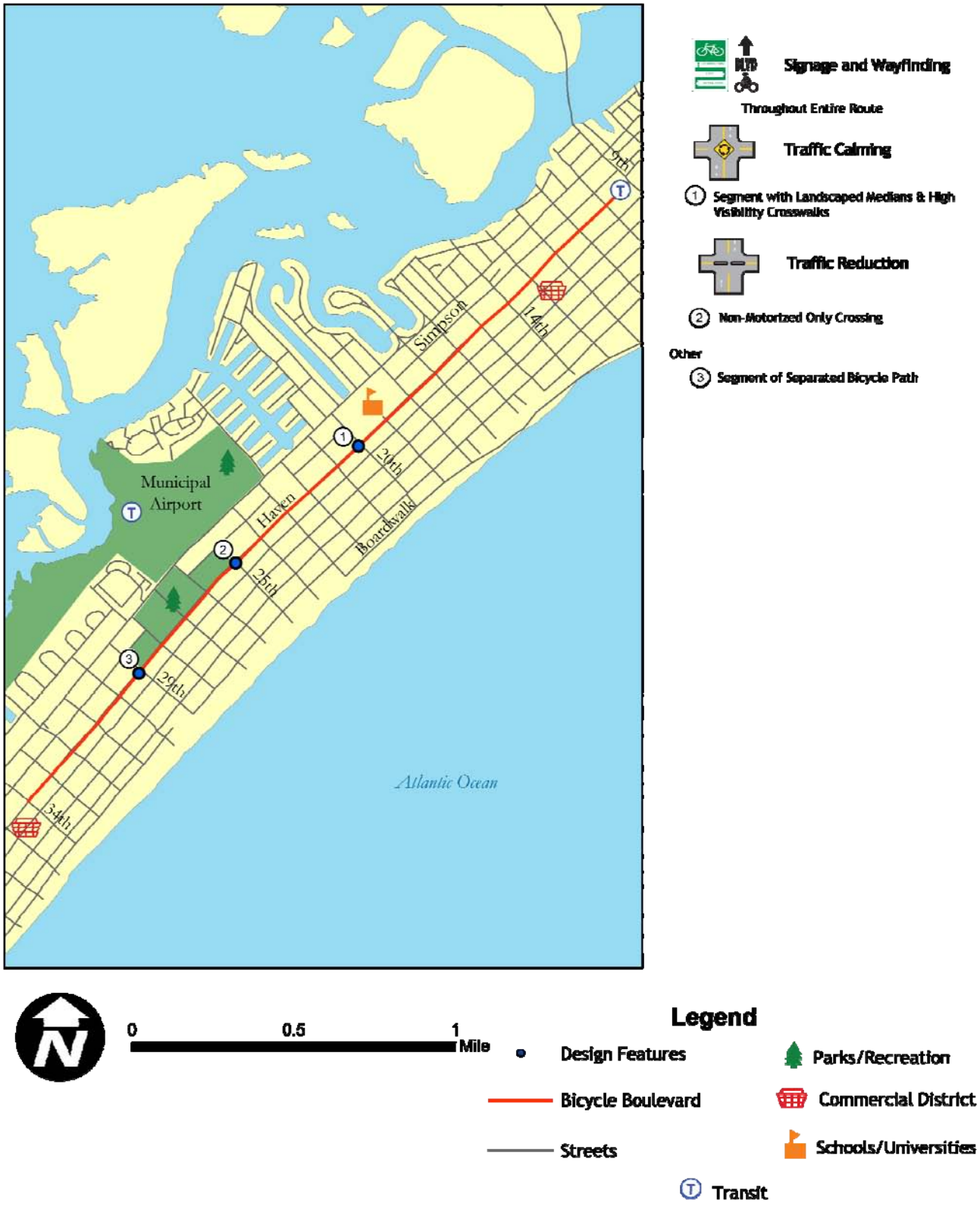
Traffic Volumes: 524 (2-hour A.M.) 789 (2-hour P.M)
Bicycle Volumes: 207 (2-hour A.M.) 257 (2-hour P.M)
Construction Cost: Not Available
Speed Limit (assumed): 25 mph

Contact

Eric Anderson
Bicycle Coordinator
(510) 981-7062
eanderson@ci.berkeley.ca.us

City of Berkeley
1947 Center St., Floor 3
Berkeley, CA 94704

Haven Avenue "OC-1 Bikeway" – Ocean City, New Jersey



Overview

- Located in the island city of Ocean City, New Jersey. At a length of approximately 2.7 miles, OC-1 connects State Routes 9 and 52, the primary gateways to the community.
- OC-1 provides a much-needed north/south bicycle route.
- Composed of bicycle boulevard, bicycle sidepath, and multi-use trail.
- Landscaped medians restrict through and left-turn movements by motorists. Curb extensions and refuge areas within the median facilitate pedestrian crossing (Figure 5.11).
- The stylized bicyclist used in a sculpture at 9th & Haven is used throughout on signage and pavement markings.
- Grid street layout offers parallel route alternatives for motorists. During summer, the OC-1 serves as parallel route to the popular beach boardwalk which is restricted to bicycles at noon due to large pedestrian volumes.
- OC-1 will be extended to the full length of Haven Avenue and east-/west connections to the route will be improved.

Key Destinations

Transit Center	Community Center
Beach & Wildlife Refuge	Recreational Facilities
Commercial Center	Schools

Lessons Learned & Advice

- Consider creative financing. OC-1 was funded mainly with private monies.
- Actively promote the bicycle boulevard with a ribbon-cutting ceremony, press releases, tourist brochures, and on the City website.
- Take advantage of existing traffic calming elements and multi-use trail connections.

Public Involvement

- Development of the OC-1 was an entirely community-driven project to create a bicycle-friendly community.
- Signage and the sculpture (Figure 5.10) were privately-funded. Pavement markings were installed by the City during regular road maintenance.
- This seaside "family resort" community has a year-round population of 15, 000 which swells to 130, 000 during the summer months. Tourists are strongly encouraged to cycle during their visit.
- Ties into a larger community goal of reducing the City's carbon-footprint.
- Select intersections will be painted with murals colored by school children.

5.10 Sculpture art and matching signage

Figure 5.11 Landscape medians restrict motorist movements

Figure 5.12 Posted speed is 15 mph

Data

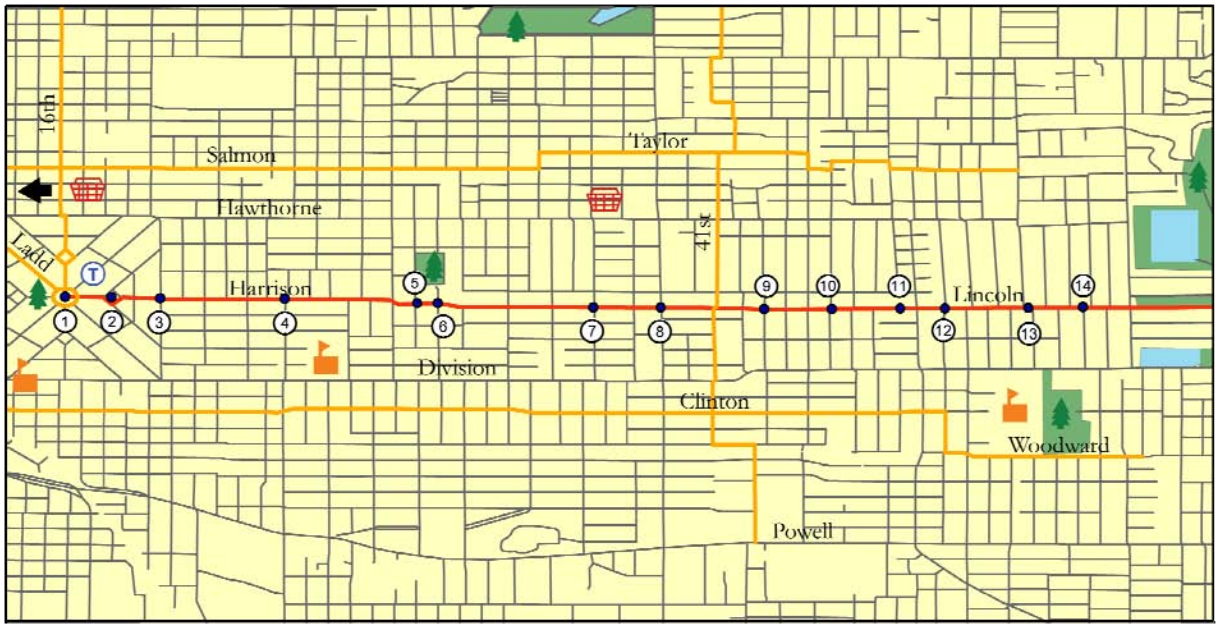
Traffic Volumes: N/A
Bicycle Volumes: N/A
Construction Cost: N/A
Speed Limit (posted): 15 mph (Figure 5.12)

Contact

Jim Rutala
Ocean City Business Administrator
(609) 525-9333
jrutala@ocnj.us

City of Ocean City
861 Ashbury Avenue,
City Hall Room 311
Ocean City, NJ 08226

Lincoln-Harrison Bicycle Boulevard – Portland, Oregon



0 0.5 1 Mile

Legend

- Design Features
- Bicycle Boulevard
- Other Bicycle Boulevards
- Streets
- Parks/Recreation
- Commercial District
- Schools/Universities
- Transit

Signage and Wayfinding
Throughout Entire Route

Traffic Calming

1 2 5 7 9 10 12 13 14 Traffic Circle
5 Speed Bumps Begin
11 Speed Bumps End

Traffic Reduction

3 4 Partial Non-Motorized Only Crossing

Intersection Improvements

8 Partial Non-Motorized Only Crossing with Bicycle Signal

Overview

- The Lincoln-Harrison bicycle boulevard is approximately 3 miles in length and provides an east-west connector route in central Portland, Oregon.
- The project was completed in phases:
- A bicycle route was initially identified in the 1970's.
- In the late 1980's, a traffic calming and reduction project was implemented to reduce motor vehicle traffic on neighborhood streets using traffic circles and non-motorized only crossings (Figure 5.13 and Figure 5.14).
- In the late 1990's, the route was further enhanced with the installation of 22-foot wide speed bumps that force motorists to slow but allow cyclists to cross comfortably with no reduction in speed (Figure 5.15).
- In 2005, wayfinding signage and pavement markings were developed and installed with a federal grant.
- Pavement markings 12-inch in diameter are used along the route for wayfinding purposes. In addition, other larger markings are planned to further enhance the visibility of the route.
- Between 1996-2008, bicycle volumes on this route have increased 755%.
- Part of a well-connected network of bicycle boulevards.

Key Destinations

Schools	Other Bikeways
Transit	Parks
Central Business District	Neighborhoods

Lessons Learned & Advice

- When implementing traffic calming and reduction on the bicycle boulevard, analyze and mitigate potential traffic impacts to nearby streets through additional traffic calming.
- Speed bumps are more effective at speed reduction than traffic circles.
- In order to maintain free-flow conditions for cyclists, recommends yield-controlled intersections rather than stop signs and/or two-way stop control that assigns right of way to the bicycle boulevard.
- To avoid conflicts with emergency vehicles, the City does not put bicycle boulevards on routes identified as primary emergency response routes.

Public Involvement

- The concept of bicycle boulevards can be difficult to convey to a public that is unfamiliar with their purpose and function. The success of the "universally-beloved" Lincoln-Harrison route familiarized the public with bicycle boulevards and contributed to public interest and support for later bicycle boulevards.
- Marketed through group rides and events, bicycle maps, and the SmartTrips and Safe Routes to School programs. Best advertisement is its key connections to destinations – there are clear reasons to use the route.

Figure 5.13 A signalized partial non-motorized crossing only allows motorists to exit the bikeway while cyclists may continue through.

Figure 5.14 Landscaped traffic circles eliminate the need for stop signs at several intersections

Figure 5.15 22-foot wide speed bumps slow motor vehicle traffic but not cyclists

Data

Traffic Volumes (2008): 1438 (24-hour count)
Bicycle Volumes (2008): 1900 (extrapolated total count)
Construction Cost: Not Available
Speed Limit (assumed): 25 mph

Contact

Roger Geller
Bicycle Planning Coordinator
(503) 823-7671
roger.geller@pdxtrans.org

City of Portland
Bureau of Transportation
1120 SW Fifth Avenue,
Suite 800
Portland, OR 97204

Monroe-Friendly Bicycle Boulevard – Eugene, Oregon

Overview

- The Monroe-Friendly bicycle boulevard is approximately 3 miles in length and runs along a residential street in Eugene, Oregon (Figure 5.16).
- Parallels Jefferson Street, a high traffic arterial two blocks east.
- Provides north-south cycling route and connects two popular multi-use trails: Ruth Bascom Riverbank Trail and Fern Ridge Path at Amazon Ridge.
- The Lane County fairgrounds bisect the bicycle boulevard and discourage its use as a through route by motorists. Pavement markings with arrows (Figure 5.18) guide cyclists east around the fairgrounds, however, cyclists may shortcut through the fairgrounds when they are open.
- Signage and pavement markings were modeled after those used in Portland, Oregon (Figure 5.17)
- Project included an intersection improvement that enhanced bicycle, pedestrian, and motor vehicle safety. The project included an intersection realignment to create a "T" intersection, sidewalk extension, landscaping, public art, and installation of bicycle-friendly drainage grates.
- One of several bicycle boulevards in the City's well-connected bikeway network.

Key Destinations

Schools & University of Oregon	Other Bikeways
Small Commercial Center	Parks
Downtown Eugene	Fairgrounds

Lessons Learned & Advice

- Consult with emergency services regarding proposed traffic calming devices.
- In response to cyclist feedback that the pavement markings were too small, the markings were enlarged to 18 inches in circumference.
- Pavement markings were installed towards the center of traffic lanes to reduce wear caused by motor vehicle traffic.

Public Involvement

- City staff met with adjacent property owners to discuss the project and design features. Residents were very supportive and particularly interested in features that would calm traffic.
- Landscaping and public art funded through a neighborhood matching grant incorporated bicycle art into intersection improvements at Monroe and 8th Streets.

Figure 5.16 Speed tables, wayfinding signage, pavement markings, and non-motorized only crossings work together to create the bicycle boulevard

Figure 5.17 Wayfinding signs are modeled after those used in Portland, Oregon

Figure 5.18 Pavement markings with arrows are used to guide cyclist through turns along the bikeway

Data

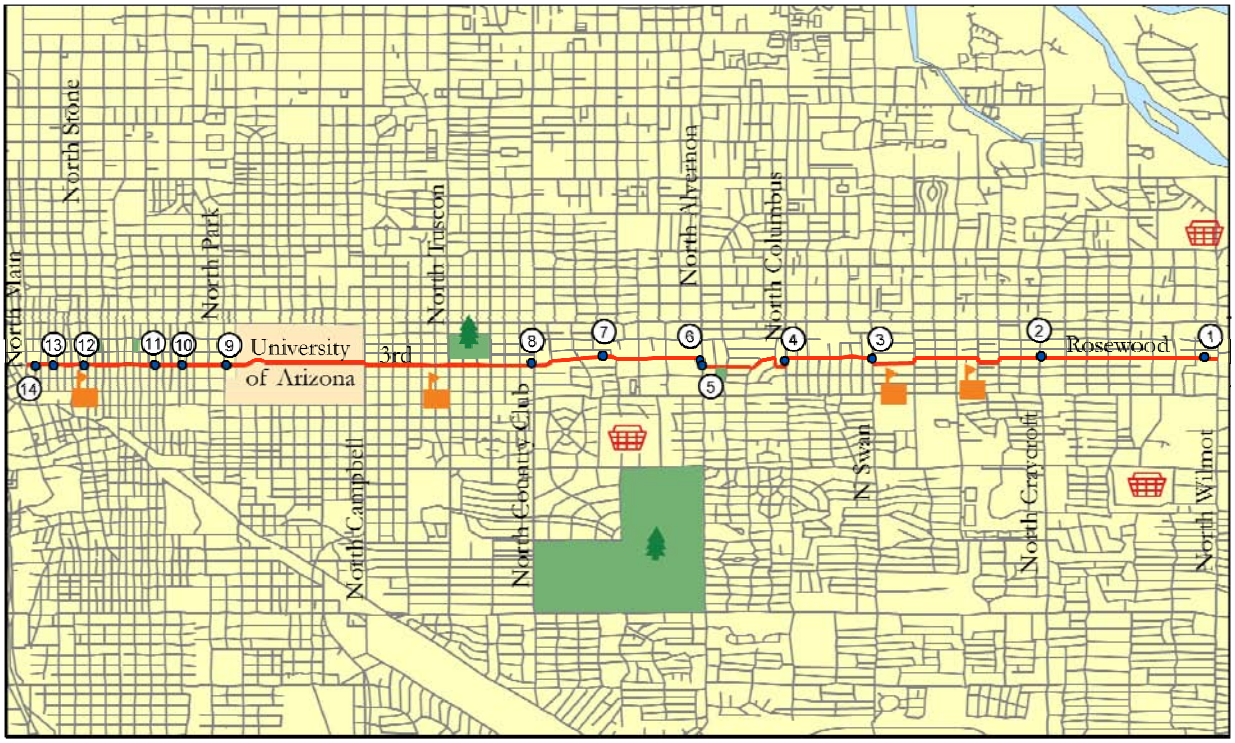
Traffic Volumes (2007): 2800
Bicycle Volumes (2008): 67 a.m., 127 p.m. (2-hour counts)
Construction Cost (2007 dollars): $440,000
Speed Limit (prima facie): 25 mph

Contact

Lee Shoemaker
Bicycle and Alternate Modes Coordinator
(541) 682-5471
lee.shoemaker@ci.eugene.or.us

City of Eugene
858 Pearl Street
Eugene, OR 97401

Third Street Bicycle Boulevard – Tucson, Arizona



0 0.5 1 Mile

Legend

- Design Features
- Bicycle Boulevard
- Streets
- Parks/Recreation
- Schools/Universities
- Commercial District

Signage and Wayfinding

Throughout Entire Route

Traffic Calming

(1) (7) (14) Speed Bumps (short sections)
(9) (10) (11) Speed Bumps (short sections)
(2) Traffic Circle

Intersection Improvements

(2) Median
(5) (8) (12) TOUCAN Signal

Other:

(3) (4) Segment of Bicycle Lane
(3) Bicycle Sidepath

Overview

- The Third Street bicycle boulevard is approximately 7 miles in length and provides an east-west connector route from midtown to downtown via the University of Arizona.
- East of the University the bicycle boulevard is located on a local street. West of the University the routes uses bicycle lanes on a collector roadway shared with a historic trolley car and planned modern streetcar tracks.
- Utilizes TOUCAN ("two groups can cross") signals at three major intersections (multi-lane, 20,000+ ADT)(Figure 5.20 and 5.21). TOUCAN signals have a designated lane, a bicycle push-button to activate the signal, and restrict through motor vehicle movement.
- A HAWK signal with a sidepath is being constructed in 2009 at the intersection of Swan and Third.
- The intersection at Alvernon Street and Third Street is offset (cyclists must briefly ride along and cross Alvernon Street in order to continue on Third Street). To facilitate this movement, a two-way bicycle sidepath has been constructed on the west side of Alvernon. The sidepath leads to a TOUCAN signal (Figure 5.19).
- Back-in diagonal parking is used in some areas. It provides motorists greater visibility when pulling out of the parking space.
- One of several existing and planned bicycle boulevards in Tucson.

Key Destinations

Schools & University of Arizona	Other Bikeways
Small Commercial Centers	Recreational Facilities & Parks
Midtown & Downtown Tucson	Neighborhoods

Public Involvement

- Providing a direct connection to the University of Arizona parallel to a major arterial, Third Street was already a preferred bicycle route before it evolved into a bicycle boulevard. Additional traffic calming (traffic circles, speed bumps, curb extensions), traffic reduction (right-turn only for motorists), and intersection signal improvements are planned.
- Motor vehicle restrictions were controversial.

Figure 5.19 A two-way bicycle side path and signalized crosswalk at East Third Street and North Alvernon Way.

Figure 5.20 TOUCAN signal heads at North Stone Avenue and East Third Street

Figure 5.21 A TOUCAN signal at North Country Club Road and East Third Street requires motorists to turn right while a bicycle signal head allows through movements by cyclists

Data

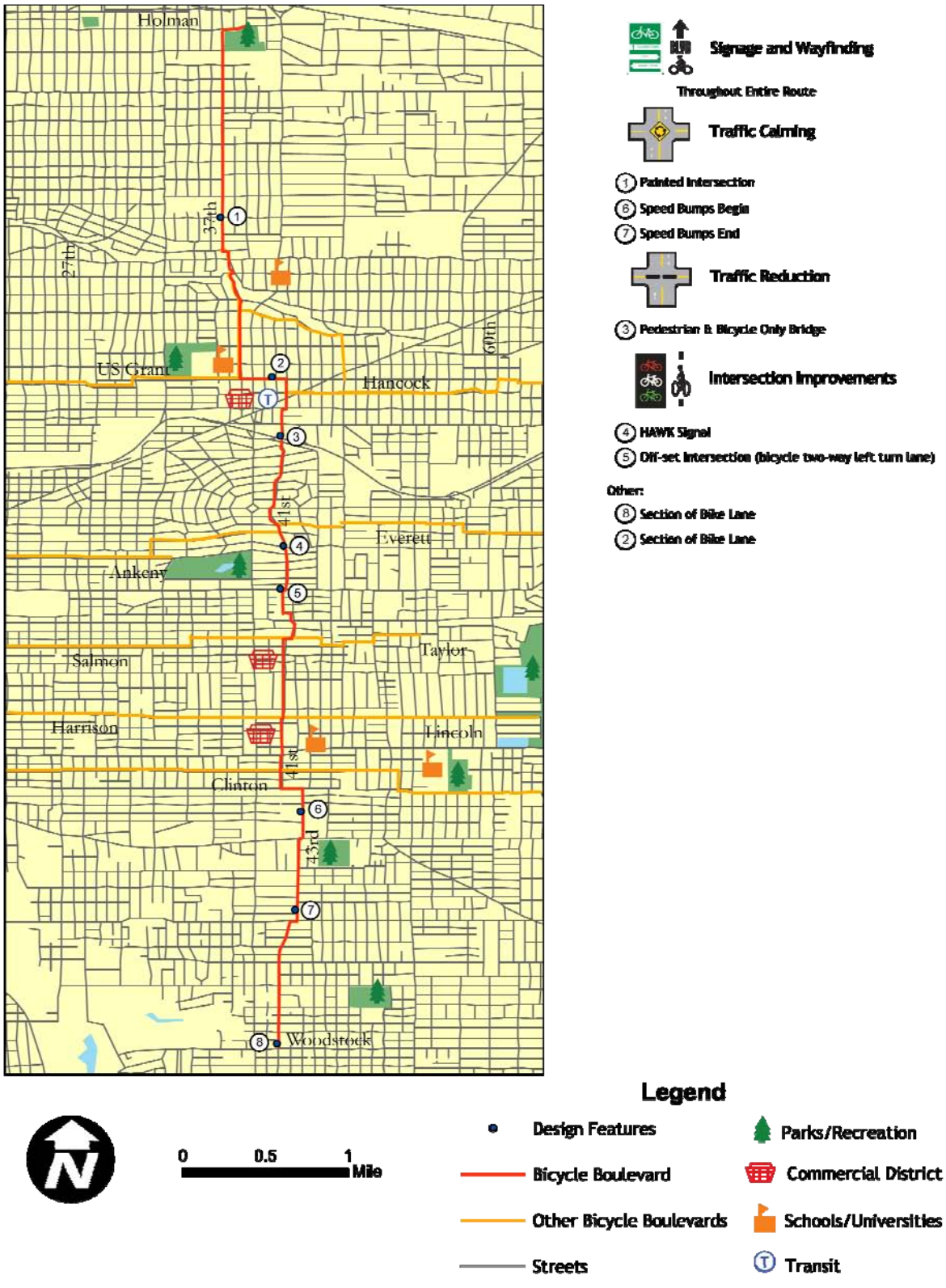
Traffic Volumes (2007): 2000
Bicycle Volumes (2008): 4000 (extrapolated total count)
Construction Cost: Not Available
Speed Limit (posted): 25 mph

Contact

Tom Thivener
Bicycle and Pedestrian Program Manager
(520) 837-6691
tom.thivener@tucsonaz.gov

City of Tucson
201 North Stone Avenue
6th Floor
Tucson, AZ 85726

40's Bikeway – Portland, Oregon



Overview

- The 40's bicycle boulevard is approximately 10 miles in length and provides a north-south connector route in central Portland, Oregon.
- Composed of a mixture of bicycle boulevard, bike lanes, and signed bike route. The route jogs along several parallel north-south streets, primarily on residential streets (Figure 5.22).
- Arterial crossings are enhanced with median refuges and curb extensions, and bicycle activated signals are marked.
- A HAWK signal was installed funded with an Oregon Department of Transportation grant (Figure 5.23).
- In addition to wayfinding signage, pavement markings with arrows indicated turns along the route.
- Parking was removed on one side of the street along a portion of the route to accommodate bike lanes. City policy states that parking not essential to served adjacent uses can be removed on city bikeways to proved bicycle lanes.
- Provides a direct connection to the Hollywood Transit Center, a major regional transit center.
- Part of a well-connected network of bicycle boulevards.

Key Destinations

Transit Center	Other Bikeways
Commercial Districts	Schools
Parks	Neighborhoods

Public Involvement

- Project involved extensive public outreach, including the creation of a project steering committee, multiple open-houses and public meetings (advertised through a variety of mediums), private presentations on request, and project newsletters delivered to residents along the proposed route.
- The Central Northeast Neighbors Association and City Repair painted and added landscaping to an intersection along the bicycle boulevard (Figure 4.24).

5.22 Cyclists traveling the boulevard

Figure 5.23 Cyclists crossing at a HAWK signal

Photo: Central Northeast Neighbors

Figure 5.24 A painted and landscaped intersection created by a neighborhood association has a traffic calming effect

Data

Traffic Volumes (2005-09): 976-5278 (24 hour count)
Bicycle Volumes (2006-07): 850-1000 (extrapolated total count)
Construction Cost: Approximately $200, 000 (not including HAWK signal)
Speed Limit (prima facie): 25 mph

Contact

Roger Geller
Bicycle Planning Coordinator
(503) 823-7671
roger.geller@pdxtrans.org

City of Portland
Bureau of Transportation
1120 SW Fifth Avenue,
Suite 800
Portland, OR 97204

VI. Appendix A - Literature Review Summary & References

References to bicycle boulevards primarily occur within the last decade, however earlier reference to this design treatment appears in the mid-to-late 1990's in both Oregon and California planning documents. Several key themes emerge from the literature review:

General Description & Overview of Bicycle Boulevards

As a relatively new design treatment, much of the existing documentation focuses on providing a general description or overview of bicycle boulevards and the intent of this bicycle treatment. A definition is often provided, along with a sampling of design elements commonly used and their intent.

Case Studies and Specific Bicycle Boulevard Project Documentation

In addition to describing the concept of bicycle boulevards, many documents also provide or make reference to specific case studies. Bicycle boulevards in both Palo Alto, CA and Berkeley, CA are frequently referenced.

Several local governments are currently planning for and designing bicycle boulevards in their communities, and there is an increasing amount of project documentation becoming available. Project documentation offers a glimpse of site-specific planning, design, and construction costs associated with implementation of a particular bicycle boulevard; however the information is at times transferable to other projects.

Descriptions of Bicycle Boulevard Design Elements

Within general descriptions and case studies of bicycle boulevards, individual design elements are discussed. However, some references go into greater detail of the these elements, providing information on the intent of the treatment, the typical or recommended application, design suggestions, illustrations (photos, drawings, and cross-sections), cost, and impact on motor vehicle traffic.

- Bicycle Transportation Alliance – Bicycle Boulevard Design Tools Matrix by "Goal"
- Berkeley, CA – Basic and Site Specific Design Guideline Strategies
- Bike/Walk Streets – Organizes Design Elements by Level of Treatment, Including Elements to Enhance the Pedestrian Environment

Transportation Plans and Policies in Support of Bicycle Boulevard Implementation

Relatively few communities have developed specific policies towards bicycle boulevards. Berkeley, CA and Napa, CA are exceptions.

What is missing from the existing literature? Very little empirical safety and traffic operations data is available for bicycle boulevards. There are many possible reasons for this omission. Traffic circulation patterns and historic collision histories are very site-specific, as are the design elements and level of treatment chosen for a particular bicycle boulevard. Due to the lack of consistency between sites, it can be difficult to generalize impacts from one design to the next.

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VII. Appendix B - Bicycle Boulevard Audit

The Bicycle Boulevard Audit can be used to assess a roadway for bicycle boulevard development or to assess the function of an existing bicycle boulevard. Before beginning the audit, we recommend that you obtain a map of the street surveyed so you can note destinations and parallel arterials near the bicycle boulevard, the location of existing and proposed design elements, as well as roadway maintenance needs. You may also want to bring a camera along during your audit to photograph these features/conditions.

Auditor: Date: Day of the Week: Time:

Overview

Bicycle Boulevard Street Name(s): _____

Route Begin Point _____
Route End Point _____

Length _____

Describe the land uses along the street (check all that apply):

- o Residential
- o Commercial – Retail
- o Commercial – Offices
- o Mixed of Commercial/Residential
- o Industrial
- o Institutional
- o Recreational
- o Other:

Destinations Served by the Bicycle Boulevard (On or Nearby)

- o Schools & Universities
- o Commercial Districts
- o Major Employment Centers
- o Recreational Centers/Facilities
- o Neighborhoods
- o Transit Facilities
- o Other Bicycle Routes
- o Other:

Bicycle Parking Facilities
Bicycle short-term (racks) and long-term (lockers) facilities that provide parking for cyclists at destinations along the route.

- o Exists - Location (or note on map):
  Describe:
- o Needed - Location (or note on map):
  Describe:

Motor Vehicle Parking

- o No Parking Allowed
- o Parallel Parking
- o Perpendicular Parking
- o Angled Parking
  - o Pull-in
  - o Back-in

Is there any transit service along the route?
Yes No Don't Know

If yes, what is the approximate frequency of service?
_____ Don't Know

Is the street on an Emergency Service Priority Route?
Yes No Don't Know
Intersections Requiring Stops by Cyclists
Number of Stops on Bicycle Boulevard

Number of Stops on Parallel Arterial Streets
Street Name #1 _____
Street Name #2 _____

Speed & Volume
The speed and volume of roadway users before and/or after bicycle boulevard improvements.

Bicycle Boulevard Speed & Volume

Motor-Vehicle Volume
Before: ADT _____ Or Light, Moderate, Heavy Unknown
After: ADT _____ Or Light, Moderate, Heavy Unknown

Bicycle Volume
Before: ADT _____ Or Light, Moderate, Heavy Unknown
After: ADT _____ Or Light, Moderate, Heavy Unknown

Motor Vehicle Speed
Posted or Prima Faciae Speed _____
Observed Speed (85% if available) _____
Before: MPH _____ Or OK, Too Fast Unknown
After: MPH _____ Or OK, Too Fast Unknown

Collision History on the Bicycle Boulevard (Include Time Period)
Before: Motor Vehicles_____ Bicycles_____ Pedestrians_____ Unknown
After: Motor Vehicles_____ Bicycles_____ Pedestrians_____
Unknown

Intersection Speed & Volume

Motor-Vehicle Volume
Before: ADT _____ Or Light, Moderate, Heavy Unknown
After: ADT _____ Or Light, Moderate, Heavy Unknown

Bicycle Volume
Before: ADT _____ Or Light, Moderate, Heavy Unknown
After: ADT _____ Or Light, Moderate, Heavy Unknown

Maintenance
Does the condition of the roadway provide a safe and comfortable cycling experience?

Pavement Quality
- Good Condition (Smooth riding surface, free of debris)
- Fair Condition (Rough spots in some locations, needs some maintenance but overall OK)
- Poor Condition (Degraded and crumbling, several potholes, collected debris, extensive maintenance required)

Note the location of maintenance issues on your map.

Drainage Grates
- None
- Bike Friendly
- Bicycle –Unfriendly (Bars parallel to riding direction, wheels could get stuck)

Bicycle Boulevard Design Elements

Signage
Signage that indicates to motorists and bicyclists that they are on a bicycle boulevard (Identification Signs) and may also indicate destinations on or near the bicycle boulevard (Wayfinding).

Wayfinding
- Exists - Location (or note on map):
- Needed - Location (or note on map):

Bicycle Boulevard Identification Signage
- Exists - Location (or note on map):
- Needed - Location (or note on map):

Roadway Markings
Roadways markings painted on the road that identify the street as a bicycle boulevard and/or indicate that bicycles and motor vehicles share the road.

- Exists - Location (or note on map):

  What does it look like (Sketch)?
  How large is it?
  How often does it repeat?

- Recommended - Location (or note on map):

Intersection Treatments
Bicycle intersection treatments that assist cyclists in crossing busy streets.

1. Stop Sign Orientation Favoring	2. HAWK Signals	3. High Visibility & Raised Crosswalks	4. Off-set Intersections Side Path Bicycle L-turn Lane L-turn Pocket in Median
5. Bike Boxes	6. Bicycle Detection Loops	7. Refuge Islands	8. Choker Entrance
9. Bicycle Signals	10. Scramble Signals	11. Elevated Crossings	12. Other:

Location(s) or note on map:

Traffic Calming
Roadway elements that reduce the speed of motor vehicles using the street(s).

1. Traffic Circles	2. Speed Bumps/Humps	3. High Visibility & Raised Crosswalks	4. Colored/Patterned Pavement
5. Landscaping & Street Trees	6. Medians	7. Chicanes	8. Pinch Points

9. Curb Extensions/Bulb outs
10. Stop Sign Orientation
11. Radar Feedback Signs
12. Other:

Location(s) or note on map:

Traffic Reduction

Roadway elements that discourage through traffic from using the roadway.

- Full Diversion
- Partial Diversion
- Non-Motorized Only Crossings & "Cul-de-Sac Connectors"

Location(s) or note on map:

Complementary Features

Design features and programs that enhance the environment and experience for pedestrians and cyclists.

Pedestrian Amenities

- Sidewalk
  - Condition (Good, Fair, Poor)
- Ramps at Intersections
  - Exists - Location (or note on map):
  - Needed - Location (or note on map):
- Street Furniture (Benches, trash receptacles)
  - Exists - Location (or note on map):
  - Needed - Location (or note on map):

Lighting

- No Lighting
- Auto-Oriented Lighting
  - Amount of Lighting:
  - OK Needs More
- Pedestrian-Oriented Lighting
  - Amount of Lighting:
  - OK Needs More

Public Art

- Exists - Location (or note on map):
- Recommended - Location (or note on map):
  Describe:

Landscaping

- No
- Yes
  - Well Maintained
  - Needs Maintenance

Safe Routes to School

Is there a primary or middle school (K-8) within 2 miles of the street?

Yes No Don't Know

Does the school have a Safe Routes to School program?

Yes No Don't Know

VIII. Appendix C - Funding Programs

Federal Highway Administration Programs	
Program/Primary Purpose	**Eligible Pedestrian and Bicycle Activities**
Metropolitan Planning (23 USC 104(f))	
Transportation planning in urbanized areas in accordance with 23 USC 134 and 49 USC 5303.	Bicycle and pedestrian planning as part of the metropolitan planning process.
Statewide Planning (23 USC 505)	
Statewide transportation planning in accordance with 23 USC 135 and 49 USC 5304.	Bicycle and pedestrian planning as part of the statewide planning process.
National Highway System (NHS) (23 USC 103)	
Improvements to rural and urban roads that are part of the NHS or that are NHS Intermodal connectors.	Construction of pedestrian walkways and bicycle transportation facilities on land adjacent to any highway on the NHS.
Surface Transportation Program (STP) (23 USC 133)	
Construction, reconstruction, rehabilitation, resurfacing, restoration, and operational improvements for highways and bridges including construction or reconstruction necessary to accommodate other transportation modes.	Construction of pedestrian walkways and bicycle transportation facilities; nonconstruction projects for safe bicycle use; modify public sidewalks to comply with the Americans with Disabilities Act. Projects do not have to be within the right-of-way of a Federal-aid highway.
Surface Transportation Program Transportation Enhancements Set-aside (TE) (23 USC 133(d)(2))	
12 specific activities included in the definition of Transportation Enhancement Activities in 23 USC 101(a)(35).	3 of the 12 eligible categories are pedestrian and bicycle facilities, safety and education for pedestrians and bicyclists, and rail-trails.
Interstate Maintenance (IM) (23 USC 119)	
Resurfacing, restoring, rehabilitating, and reconstructing most routes on the Interstate system.	No specific eligibility, but funds may be used to resurface, restore, rehabilitate, and reconstruct pedestrian and bicycle facilities over, under, or along Interstate routes.
Highway Bridge Replacement and Rehabilitation (HBRRP) (23 USC 144)	
Replace and rehabilitate deficient highway bridges and to seismically retrofit bridges located on any public road.	Pedestrian walkways and bicycle transportation facilities on highway bridges. If a highway bridge deck is replaced or rehabilitated, and bicycles are permitted at each end, then the bridge project must include safe bicycle accommodations (within reasonable cost). (23 USC 217(e))
Highway Safety Improvement Program (HSIP) (23 USC 148)	
To achieve a significant reduction in traffic fatalities and serious injuries on public roads. Improvements for pedestrian or bicyclist safety.	Construction and yellow-green signs at pedestrian-bicycle crossings and in school zones. Identification of and correction of hazardous locations, sections, and elements (including roadside obstacles, railway-highway crossing needs, and unmarked or poorly marked roads) that constitute a danger to bicyclists and pedestrians. Highway safety improvement projects on publicly owned bicycle or pedestrian pathways or trails.

Federal Highway Administration Programs	
Program/Primary Purpose	**Eligible Pedestrian and Bicycle Activities**
Highway Safety Improvement Program (HSIP) (23 USC 148)	
To achieve a significant reduction in traffic fatalities and serious injuries on public roads. Improvements for pedestrian or bicyclist safety.	Sign installation at pedestrian-bicycle crossings and in school zones. Identification of and correction of hazardous locations, sections, and elements (including roadside obstacles, railway-highway crossing needs, and unmarked or poorly marked roads) that constitute a danger to bicyclists and pedestrians. Highway safety improvement projects on publicly owned bicycle or pedestrian pathways or trails.
Congestion Mitigation and Air Quality Improvement Program (CMAQ) (23 USC 149)	
Funds projects in nonattainment and maintenance areas that reduce transportation related emissions.	Construction of pedestrian walkways and bicycle transportation facilities; nonconstruction projects for safe bicycle use. Projects do not have to be within the right-of-way of a Federal-aid highway, but must demonstrate an air quality benefit.
National Scenic Byways Program (NSBP) (23 USC 162) [Added 3/27/06]	
Eight specific activities for roads designated as National Scenic Byways, All-American Roads, State scenic byways, or Indian tribe scenic byways. The activities are described in 23 USC 162(c). This is a discretionary program; all projects are selected by the US Secretary of Transportation.	Construction along a scenic byway of a facility for pedestrians and bicyclists and improvements to a scenic byway that will enhance access to an area for the purpose of recreation. 23 USC 162(c)(4-5). Construction includes the development of the environmental documents, design, engineering, purchase of right-of-way, land, or property, as well as supervising, inspecting, and actual construction. [Note: Construction of the recreation facility is not eligible.]
Federal Lands Highways Program (FLHP) (23 USC 204)	
Coordinated program of public roads and transit facilities serving Federal and Indian lands. Funding is broken into 4 discrete sources: ▪ Indian Reservation Roads (IRR) ▪ Public Lands Highway - Discretionary & Forest Highways ▪ Refuge Roads ▪ Parkways & Park Roads	Construction of pedestrian walkways and bicycle transportation facilities.
Transportation, Community, and System Preservation Program (TCSP) (S-LU Sec. 1117, formerly TEA-21 Sec. 1221)	
Provides funding for a comprehensive program including planning grants, implementation grants, and research to investigate and address the relationships among transportation and community and system preservation plans and practices and examine private sector based initiatives	Pedestrian and bicycle projects meet several TCSP goals, are generally eligible for the TCSP program and are included in many TCSP projects.
Coordinated Border Infrastructure Program (S-LU Section 1303)	
To improve the safe movement of motor vehicles at or across the border between the United States and Canada and the border between the United States and Mexico.	Eligible as part of an overall project.

Federal Highway Administration Programs	
Program/Primary Purpose	**Eligible Pedestrian and Bicycle Activities**
Safe Routes to School (SRTS) (S-LU Sec. 1404)	
1. To enable and encourage children, including those with disabilities, to walk and bicycle to school; 2. To make bicycling and walking to school a safer and more appealing transportation alternative, thereby encouraging a healthy and active lifestyle from an early age; and 3. To facilitate the planning, development, and implementation of projects and activities that will improve safety and reduce traffic, fuel consumption, and air pollution in the vicinity of schools	Eligible Infrastructure Projects are planning, design, and construction of infrastructure-related projects that will substantially improve the ability of students to walk and bicycle to school, including ▪ sidewalk improvements, ▪ traffic calming and speed reduction improvements, ▪ pedestrian and bicycle crossing improvements, ▪ on-street bicycle facilities, ▪ off-street bicycle and pedestrian facilities, ▪ secure bicycle parking facilities, and ▪ traffic diversion improvements in the vicinity of schools. Eligible Non-infrastructure activities to encourage walking & bicycling to school, including: ▪ public awareness campaigns and outreach to press and community leaders, ▪ traffic education and enforcement in the vicinity of schools, ▪ student sessions on bicycle and pedestrian safety, health, and environment, and ▪ funding for training, volunteers, and managers of safe routes to school programs
Nonmotorized Transportation Pilot Program (NTPP) (S-LU Sec. 1807)	
To demonstrate the extent to which bicycling and walking can carry a significant part of the transportation load, and represent a major portion of the transportation solution, within 4 identified communities (Marin County, CA; Sheboygan County, WI; Columbia, MO; and Minneapolis-St Paul, MN).	Construction of nonmotorized transportation infrastructure facilities, including sidewalks, bicycle lanes, and pedestrian and bicycle trails, that connect directly with transit stations, schools, residences, businesses, recreation areas, and other community activity centers. Educational programs; promotion; network and project planning; data collection, analysis, evaluation, and reporting of results
Metropolitan Planning Program (MPP) (49 USC 5305(d))	
To carry out the metropolitan transportation planning process under 49 USC 5303.	Bicycle and pedestrian planning as part of the metropolitan planning process.
Statewide Planning & Research (SPR) (49 USC 5305(e)	
To carry out the provisions of 49 USC sections 5304, 5306, 5315, and 5322.	Bicycle and pedestrian planning as part of the statewide planning process.
Urbanized Area Formula Grants (49 USC 5307)	
Transit capital and planning assistance to urbanized areas with populations over 50,000 and operating assistance to areas with populations of 50,000 - 200,000.	Improve bicycle and pedestrian access to transit facilities and vehicles, including bike stations.

Source: Federal Highway Administration & Federal Transit Administration (http://www.fhwa.dot.gov/HEP/bkepedtble.htm)

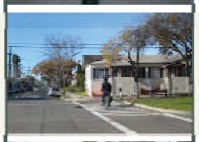
State Programs
State Transportation Improvement Program (STIP)
The Statewide Transportation Improvement Program (STIP) represents the four-year, fiscally-constrained and prioritized program of transportation projects, compiled from local and regional plans, along with the Washington Transportation Plan. The STIP contains Federally-funded projects plus state and local regionally-significant projects programmed for calendar years 2007 through 2010. These projects have been identified through planning process as the highest priority for the available funding to the State's transportation program.
Regional Transportation Improvement Program (RTIP)
Part of State Transportation Improvement Program (STIP), the main state program for transportation project funding. For "improving transportation within the region." The Regional Transportation Planning Agency must program funds.
State Bicycle Funding Programs
Several states have created programs to exclusively fund bicycle transportation projects. Examples include California's Bicycle Transportation Account, and Michigan and Oregon's Bicycle Bill's which allocate 1% of gas tax revenue to bicycle projects.
Special Interest License Plate Programs
Several bicycle advocacy groups generate revenue through the sale of special interest license plates. Drivers pay an additional fee to the State department of motor vehicles for the license plates which often bear the image of a cyclist and a slogan. A portion of the additional license fee is then allocated to bicycle and pedestrian educational programs and projects. Examples include "share the road" license plate program in Oregon, Texas, and Florida.
State Routes to Schools (SR2S)
Recent SAFETEA-LU legislation, which requires each state's Department of Transportation to designate a Safe Routes to Schools Coordinator, also contains a SR2S program. This state-level program is meant to improve the safety of walking and bicycling to school, and to encourage students to walk and bicycle to school through bicycle safety and traffic calming projects.
High Risk Rural Roads Programs
Authorized under SAFETEA-LU, the purpose of this program is to reduce the frequency and severity of collisions on rural roads by correcting or improving hazardous roadway locations or features. For a project to be eligible for HR3 funds, the project must be located on a roadway functionally classified as a rural major or minor collector, or a rural local road. There are 21 categories of projects eligible for funding under this program, including a category for projects that improve pedestrian or bicyclist safety.

Local Programs
Local Bond Measure
Local bond measures, or levies, are usually initiated by voter-approved general obligation bonds for specific projects. Bond measures are typically limited by time based on the debt load of the local government or the project under focus. Funding from bond measures can be used for right-of-way acquisition, engineering, design and construction of pedestrian and bicycle facilities.
Tax Increment Financing/Urban Renewal Funds
Tax Increment Financing (TIF) is a tool that uses future gains in taxes to finance current improvements that will create those gains. When a public project (e.g., sidewalk improvements) is constructed, surrounding property values generally increase and encourage surrounding development or redevelopment. The increased tax revenues are then dedicated to finance the debt created by the original public improvement project. Tax Increment Financing typically occurs within designated Urban Renewal Areas (URA) that meet certain economic criteria and approved by a local governing body. To be eligible for this financing, a project (or a portion of it) must be located within the URA.

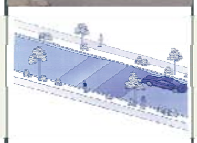
Local Programs
System Development Charges/Developer Impact Fees
System Development Charges (SDCs), also known as Developer Impact Fees, represent another potential local funding source. SDCs are typically tied to trip generation rates and traffic impacts produced by a proposed project. A developer may reduce the number of trips (and hence impacts and cost) by paying for on- or off-site pedestrian improvements encouraging residents to walk, bicycle, or use transit rather than drive. In-lieu parking fees may be used to help construct new or improved pedestrian facilities. Establishing a clear nexus or connection between the impact fee and the project's impacts is critical to avoiding a potential lawsuit.
Street User Fees
Local agencies may administer street user fees though residents' monthly water or other utility bills. The revenue generated by the fee could be used for operations and maintenance of the street system, with priorities established by the Public Works Department. Revenue from this fund could be used to maintain on-street bicycle and pedestrian facilities, including routine sweeping of bicycle lanes and other designated bicycle routes
Local Improvement Districts
Local Improvement Districts (LIDs) are most often used by cities to construct localized projects such as streets, sidewalks or bikeways. Through the LID process, the costs of local improvements are generally spread out among a group of property owners within a specified area (with the City providing a predetermined match). The cost can be allocated based on property frontage or other methods such as traffic trip generation.
Business Improvement Districts
Pedestrian improvements can often be included as part of larger efforts aimed at business improvement and retail district beautification. Business Improvement Districts collect levies on businesses in order to fund area-wide improvements that benefit businesses and improve access for customers. These districts may include provisions for pedestrian and bicycle improvements, such as wider sidewalks, landscaping, and ADA compliance.
Other Local Sources
Residents and other community members are excellent resources for garnering support and enthusiasm for a bicycle and pedestrian facility, and the local agency should work with volunteers to substantially reduce implementation and maintenance costs. Local schools, community groups, or a group of dedicated neighbors may use the project as a project for the year, possibly working with a local designer or engineer. Work parties can be formed to help clear the right-of-way for a new trail or maintain existing facilities where needed. A local construction company could donate or discount services. Other opportunities for implementation will appear over time, such as grants and private funds. The local agency should look to its residents for additional funding ideas to expedite completion of the bicycle and pedestrian system.

IX. Appendix D - Design Elements Comparison Chart

BICYCLE BOULEVARD DESIGN ELEMENTS

TOOLS	DESIGN ELEMENT	PHOTO	SPEED REDUCTION	LESS TRAFFIC	EMERGENCY DELAY	DESCRIPTION	WORKS WELL WITH:
SIGNAGE	**Identification**		**No**	**No**	**No**	**Identifies and passively markets streets that are bicycle boulevards.**	**Pavement Markings Wayfinding Signage**
	Wayfinding		No	No	No	Provides cyclists with direction, distance, and/or estimated travel times to desitinations.	Pavement Markings Wayfinding Signage
	Warning		**Maybe**	**No**	**No**	**Alert motorists and cyclists to changes in road conditions such as traffic calming and the presence of other road users.**	**Traffic Calming**
PRIORITIZE TRAVEL ON THE BICYCLE BOULEVARD	Pavement Markings		No	No	No	Supplements wayfinding and identification signage. Serves as a reminder to cyclists and motorists that bicycle travel has priority.	Wayfinding Signage Identification Signage
	Stop/Yield Signs		**No**	**Maybe**	**Yes**	**Requires car traffic to stop or yield. Oriented to assign right of way to the bicycle boulevard.**	**Traffic Calming**
INTERSECTION TREATMENT	Bicycle Box/ Advanced Stop Bar		No	No	No	Improves bicyclist visibility at intersections by providing a waiting space in front of motor vehicles. Reduces risk of right hook collisions.	Warning Signage
	Bicycle/Pedestrian Activated Signals		**No**	**No**	**No**	**Allows cyclists to call a green signal at traffic lights.**	**Pavement Markings**
	Crossings at Off-Set Intersections		No	No	No	Helps cyclists to negotiate intersections where the "legs" of the intersection are not aligned directly accross from one another.	Pavement Markings Bicycle Activated Signals
	High Visibility Raised Crosswalk		**Yes**	**Maybe**	**Yes**	**Reduces vehicle speeds and creates a visibly prominent crossing location for cyclists and pedestrians.**	**Warning Signage Pavement Markings**
	Crossing Islands		No	No	Maybe	Provides a space for cyclists and pedestrians to cross the road one direction at a time. May limit auto access.	Pavement Markings High Visibility Crosswalks Warning Signage
	Painted and Patterned Surfaces		**Maybe**	**No**	**No**	**Highlights potential conflict areas and may provide some traffic calming.**	**Warning Signage Traffic Calming**

BICYCLE BOULEVARD DESIGN ELEMENTS

TOOLS	DESIGN ELEMENT	PHOTO	SPEED REDUCTION	LESS TRAFFIC	EMERGENCY DELAY	DESCRIPTION	WORKS WELL WITH:
TRAFFIC CALMING	**Traffic Circles**		**Yes**	**Maybe**	**Yes**	**Reduces traffic speeds by requiring vehicles to maneuver around center island. Eliminates stop signs. Reduces conflict points at intersections due to elimination of left turns.**	**Warning Signage**
	Speed Tables		Yes	Maybe	Yes	Reduces vehicle speed. Long and broad shape does not jar cyclists or require cyclists to reduce speed.	Warning Signage
	Chicanes		**Maybe**	**Maybe**	**Maybe**	**Create a serpentine, horizontal shifting of the travel lanes along a roadway.**	**Warning Signage**
	Curb Extensions		Maybe	No	Maybe	Extend the sidewalk or curb face into the roadway, visually narrowing the roadway and reduces crossing width.	Medians Colored/Textured Pavement
	Residential Speed Limit		**Yes**	**No**	**No**	**Reduces motorist speed by instituting a 20 mph speed limit in residential area.**	**Traffic Calming**
	Contraflow Bicycle Lanes		Maybe	No	No	A designated bicycle facility that allows cyclist to travel against the flow of traffic on a one-way street.	Warning Signage Colored/Textured Pavement
	Advisory Bicycle Lane		**Yes**	**No**	**No**	**Dashed bicycle lanes on a narrow roadway that delineates space for cyclists. Travel lane is narrow and motorists must overtake with caution.**	**Warning Signage Colored/Textured Pavement**
TRAFFIC REDUCTION	Non-Motorized Only Crossings		No	Yes	Yes	Restricts motor-vehicle movements (creating dead end or forcing turns) while allowing through movements by cyclists.	Warning Signage
	Partial Non-Motorized Only Crossings		**No**	**Yes**	**Maybe**	**Restricts motor-vehicle movements requiring turns or limiting access directionally while allowing through movements by cyclists.**	**Warning Signage Pavement Markings**

X. Appendix E - Selecting Intersection Treatments

The following table is based on information contained in the 2002 U.S. Department of Transportation Federal Highway Administration Study *Safety Effects of Marked vs. Unmarked Crosswalks at Uncontrolled Intersections* (Report No. FHWA-HRT-04-100) and is based on pedestrian crossing time.

Roadway Type (Number of Travel Lanes and Median Type)	Motor Vehicle ADT ≤ 9,000			Motor Vehicle ADT > 9,000 to 12,000			Motor Vehicle ADT > 12,000 to 15,000			Motor Vehicle ADT > 15,000		
	Speed Limit **											
	30 mi/h	35 mi/h	40 mi/h	30 mi/h	35 mi/h	40 mi/h	30 mi/h	35 mi/h	40 mi/h	30 mi/h	35 mi/h	40 mi/h
2 Lanes	1	1	1/1+	1	1	1/1+	1	1	1+/3	1	1/1+	1+/3
3 Lanes	1	1	1/1+	1	1/1+	1/1+	1/1+	1/1+	1+/3	1/1+	1+/3	1+/3
Multi-Lane (4 or more lanes) with raised median ***	1	1	1/1+	1	1/1+	1+/3	1/1+	1/1+	1+/3	1+/3	1+/3	1+/3
Multi-Lane (4 or more lanes) without raised median	1	1/1+	1+/3	1/1+	1/1+	1+/3	1+/3	1+/3	1+/3	1+/3	1+/3	1+/3

*General Notes: Crosswalks should not be installed at locations that could present an increased risk to pedestrians, such as where there is poor sight distance, complex or confusing designs, a substantial volume of heavy trucks, or other dangers, without first providing adequate design features and/or traffic control devices. Adding crosswalks alone will not make crossings safer, nor will they necessarily result in more vehicles stopping for pedestrians. Whether or not marked crosswalks are installed, it is important to consider other pedestrian facility enhancements (e.g., raised median, traffic signal, roadway narrowing, enhanced overhead lighting, traffic-calming measures, curb extensions), as needed, to improve the safety of the crossing. These are general recommendations; good engineering judgment should be used in individual cases for deciding which treatment to use.

For each pathway-roadway crossing, an engineering study is needed to determine the proper location. For each engineering study, a site review may be sufficient at some locations, while a more in-depth study of pedestrian volume, vehicle speed, sight distance, vehicle mix, etc. may be needed at other sites.

** Where the speed limit exceeds 40 mi/h (64.4 km/h), marked crosswalks alone should not be used at unsignalized locations.

*** The raised median or crossing island must be at least 4 ft (1.2 m) wide and 6 ft (1.8 m) long to adequately serve as a refuge area for pedestrians in accordance with MUTCD and AASHTO guidelines. A two-way center turn lane is not considered a median.

1= Type 1 Crossings. Ladder-style crosswalks with appropriate signage should be used.

1/1+ = With the higher volumes and speeds, enhanced treatments should be used, including marked ladder style crosswalks, median refuge, flashing beacons, and/or in-pavement flashers. Ensure there are sufficient gaps through signal timing, as well as sight distance.

1+/3 = Carefully analyze signal warrants using a combination of Warrant 2 or 5 (depending on school presence) and EAU factoring. Make sure to project pathway usage based on future potential demand. Consider Pelican, Puffin, or Hawk signals in lieu of full signals. For those intersections not meeting warrants or where engineering judgment or cost recommends against signalization, implement Type 1 enhanced crosswalk markings with marked ladder style crosswalks, median refuge, flashing beacons, and/or in-pavement flashers. Ensure there are sufficient gaps through signal timing, as well as sight distance.

XI. Appendix F - Photo Credits

John Ciccarelli
Figure 5.6 Bicycle activated signal
Figure 5.5 A bicycle/pedestrian bridge creates a non-motorized only crossing at Matadero Creek
Figure 5.4 A non-motorized only crossing forces motor vehicles to turn at an intersection

Tom Thivener
Page 26 Bicycle Box – Tucson, Arizona
Page 29 TOUCAN Signal – Tucson, Arizona
Page 32 Bicycle Side Path – Tucson, Arizona

Greg Raisman
Page 41 Bicycle Advisory Lanes – Netherlands

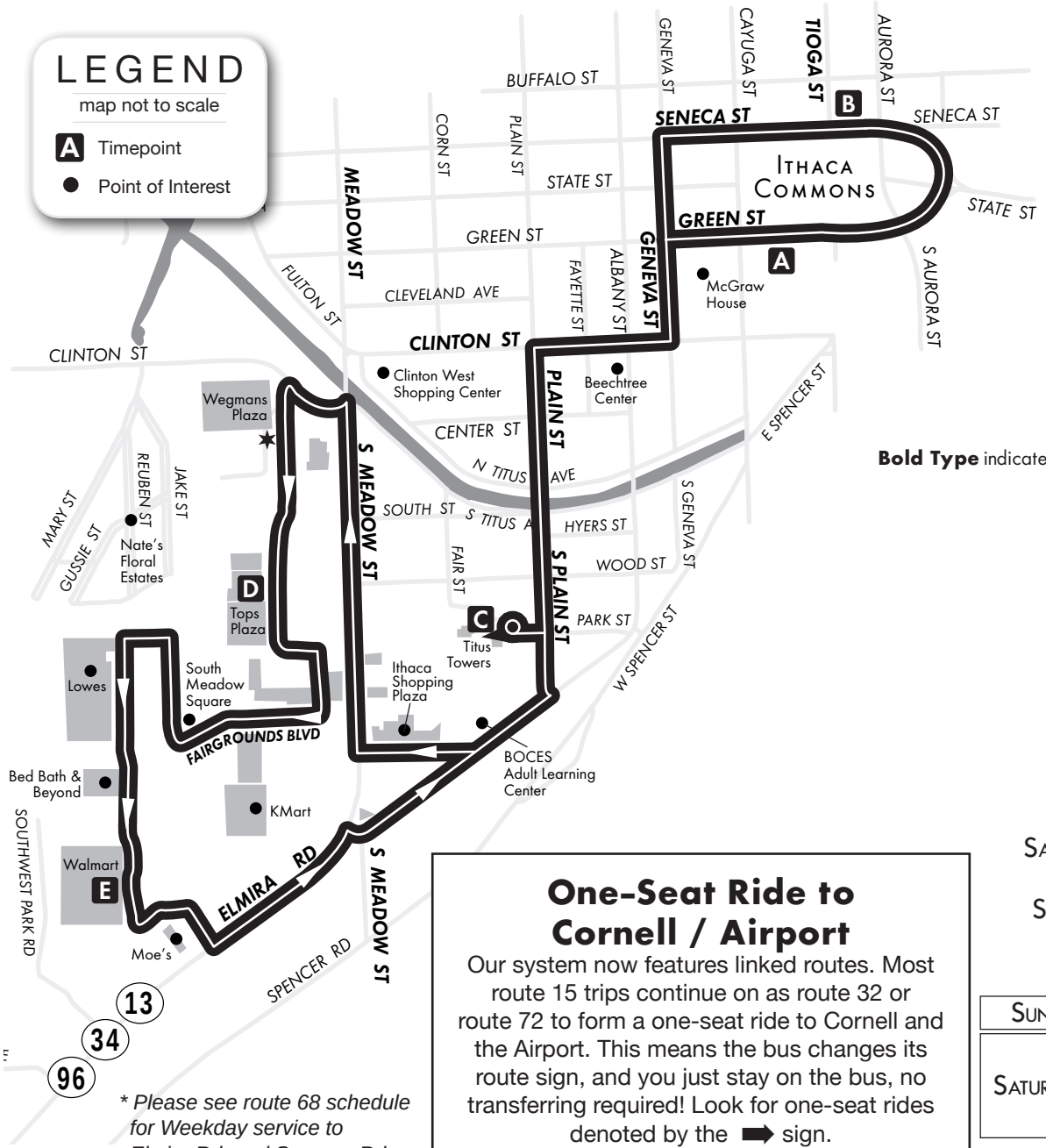
Central Northeast Neighbors
Figure 5.24 A painted and landscaped intersection created by a neighborhood association has a traffic calming effect

Alta Planning + Design
All other images

Route 15

Southside Shopper

Effective May 23, 2010



* *Please see route 68 schedule for Weekday service to Elmira Rd. and Spencer Rd.*

One-Seat Ride to Cornell / Airport

Our system now features linked routes. Most route 15 trips continue on as route 32 or route 72 to form a one-seat ride to Cornell and the Airport. This means the bus changes its route sign, and you just stay on the bus, no transferring required! Look for one-seat rides denoted by the ➡ sign.

Monday – Friday

Please read schedules from left to right.

LOOP

Green @ Commons A	Seneca @ Commons B	Titus Towers I C	Wegman's ✶	Top's D	Walmart E	Titus Towers I C	Green @ Commons A	One-Seat Ride to Cornell ➡	Continues as Route #
7:30 A	7:32 A	7:40 A	✶	7:53 A	7:58 A	8:03 A	8:10 A	➡	32
8:30 A	8:32 A	8:40 A	✶	8:53 A	8:58 A	9:03 A	9:10 A	➡	32
9:30 A	9:32 A	9:40 A	✶	9:53 A	9:58 A	10:03 A	10:10 A	➡	32
10:30 A	10:32 A	10:40 A	✶	10:53 A	10:58 A	11:03 A	11:10 A	➡	32
11:30 A	11:32 A	11:40 A	✶	11:53 A	11:58 A	**12:03 P**	**12:10 P**	➡	32
12:30 P	**12:32 P**	**12:40 P**	✶	**12:53 P**	**12:58 P**	**1:03 P**	**1:10 P**	➡	32
1:30 P	**1:32 P**	**1:40 P**	✶	**1:53 P**	**1:58 P**	**2:03 P**	**2:10 P**	➡	32
2:30 P	**2:32 P**	**2:40 P**	✶	**2:53 P**	**2:58 P**	**3:03 P**	**3:10 P**	➡	32
3:30 P	**3:32 P**	**3:40 P**	✶	**3:53 P**	**3:58 P**	**4:03 P**	**4:10 P**	➡	32
4:30 P	**4:32 P**	**4:40 P**	✶	**4:53 P**	**4:58 P**	**5:03 P**	**5:10 P**	➡	32
5:00 P	**5:02 P**	**5:10 P**	✶	**5:23 P**	**5:28 P**	**5:33 P**	**5:40 P**		20
5:30 P	**5:32 P**	**5:40 P**	✶	**5:53 P**	**5:58 P**	**6:03 P**	**6:10 P**	➡	32
6:00 P	**6:02 P**	**6:10 P**	✶	**6:23 P**	**6:28 P**	**6:33 P**	**6:40 P**		17
6:30 P	**6:32 P**	**6:40 P**	✶	**6:53 P**	**6:58 P**	**7:03 P**	**7:10 P**	➡	32
7:30 P	**7:32 P**	**7:40 P**	✶	**7:53 P**	**7:58 P**	**8:03 P**	**8:10 P**	➡	32
8:30 P	**8:32 P**	**8:40 P**	✶	**8:53 P**	**8:58 P**	**9:03 P**	**9:10 P**	➡	32

Bold Type indicates PM times.

✶ Service to Wegman's

Weekend

Please read schedules from left to right.

LOOP

	Green @ Commons A	Seneca @ Commons B	Titus Towers I C	Wegman's ✶	Top's D	Walmart E	Titus Towers I C	Green @ Commons A	One-Seat Ride to Cornell ➡	Continues as Route #
Saturday & Sunday	8:30 A	8:32 A	8:40 A	✶	8:53 A	8:58 A	9:03 A	9:10 A	➡	72
	9:30 A	9:32 A	9:40 A	✶	9:53 A	9:58 A	10:03 A	10:10 A	➡	72
	10:30 A	10:32 A	10:40 A	✶	10:53 A	10:58 A	11:03 A	11:10 A	➡	72
	11:30 A	11:32 A	11:40 A	✶	11:53 A	11:58 A	**12:03 P**	**12:10 P**	➡	72
	12:30 P	**12:32 P**	**12:40 P**	✶	**12:53 P**	**12:58 P**	**1:03 P**	**1:10 P**	➡	72
	1:30 P	**1:32 P**	**1:40 P**	✶	**1:53 P**	**1:58 P**	**2:03 P**	**2:10 P**	➡	72
	2:30 P	**2:32 P**	**2:40 P**	✶	**2:53 P**	**2:58 P**	**3:03 P**	**3:10 P**	➡	72
	3:30 P	**3:32 P**	**3:40 P**	✶	**3:53 P**	**3:58 P**	**4:03 P**	**4:10 P**	➡	72
	4:30 P	**4:32 P**	**4:40 P**	✶	**4:53 P**	**4:58 P**	**5:03 P**	**5:10 P**	➡	72
Sunday Only	**5:30 P**	**5:32 P**	**5:40 P**	✶	**5:53 P**	**5:58 P**	**6:03 P**	**6:10 P**		
Saturday Only	**5:30 P**	**5:32 P**	**5:40 P**	✶	**5:53 P**	**5:58 P**	**6:03 P**	**6:10 P**	➡	72
	6:30 P	**6:32 P**	**6:40 P**	✶	**6:53 P**	**6:58 P**	**7:03 P**	**7:10 P**	➡	72
	7:30 P	**7:32 P**	**7:40 P**	✶	**7:53 P**	**7:58 P**	**8:03 P**	**8:10 P**	➡	72
	8:30 P	**8:32 P**	**8:40 P**	✶	**8:53 P**	**8:58 P**	**9:03 P**	**9:10 P**	➡	72

✶ Service to Wegman's

For Your Convenience, various bus passes can be purchased at the following Outlets*

ONLINE
TCAT Store
(All passes available)
www.tcatbus.com/pages/buy

ITHACA
TCAT Main Office
(All passes available)
737 Willow Avenue
Phone: 277-RIDE

TCAT Green Street Station
131 East Green St., Ste. 3

Ithaca Town Hall
217 N. Tioga Street
607-273-1721

Tops – Ithaca
710 S. Meadow Street
607-275-8041

Wegman's
500 S. Meadow Street
607-277-5800

Transportation Council
121 E. Court Street
607-274-5570

Budget & Finance
125 E. Court Street
607-274-5542

Life Long Sr. Center
119 W. Court Street
607-273-1511

ITHACA COLLEGE
IC Bookstore
140 Phillips Hall
607-274-3210

CORNELL UNIVERSITY
Cornell Transportation
116 Maple Avenue
607-255-4600

Willard Straight Hall
607-255-0623

ETNA
Creekwood Apts
200 Lower Creek Rd.
607-347-4738

GROTON
Groton Village Clerk
607-898-3966

LANSING
Tops – Triphammer
2300 N Triphammer Rd.
607-266-8021

Shops at Ithaca Mall
40 Catherwood Drive
607-257-5337

DRYDEN
Dryden Village Office
80 South Street
607-844-8122

TC3 Book Store
9 North Street
607-844-6587

TRUMANSBURG
Kinney Drugs
2100 Trumansburg Rd
607-387-6661

NEWFIELD
Newfield Town Clerk
166 Main Street
607-564-9981

***Please Note:** Not all passes are available at all retail outlets. Please visit our website or call for details.

Useful Phone Numbers

Gadabout Trans. Services, Inc.	(607) 273-1878
Tioga County Public Transit	(607) 699-7433
Chemung County Transit	(607) 734-5211
Cortland Transit	(607) 758-3383
Greyhound Bus Lines	(607) 272-7930
Shortline Bus Lines	(607) 277-8800
Cornell Transportation	(607) 255-4600

Fares – Tompkins County

Exact Change, please. No Pennies

Cash fare, single ride:

Adult (ages 18-59)	$1.50
Youth (ages 6-17)	$.75

Children 5 and under ride free and must be accompanied by a responsible adult. Limit 3 children per adult

Senior Citizens (age 60+)	$0.75
Persons w/ Disabilities	$0.75

Youth Semester Pass

September – January •**OR**• February – June	$30
Summer Fun Pass	$50

Senior Citizens and Persons with Disabilities: If you have a Medicare, Senior Citizens Council Membership, ADA Paratransit Eligibility, or a Disability Eligibility card, you may show your card to the driver and pay half the cash fare. The Disability Eligibility Card is available to those persons receiving SSI, SSD, or Disabled Veteran's Benefits resulting from a service-connected disability.

Transfers: If more than one bus route is needed to get you to your destination, transfer slips are available at no additional cost. You should request a transfer from the Bus Operator when you pay the fare or use a transfer slip. Transfers are good for a continuous one way trip on the next available bus. They will not be accepted on any trip that will return the passenger to the area in which the transfer was originally issued, nor to re-board the same route.

Lost & Found: Located at TCAT Main Office, 737 Willow Ave. Office hours are 8am– 5pm, Monday to Friday. Please bring I.D.

Trips noted as continuing as another route: When a bus changes into a different route number (see schedule note), passengers already on board may continue to ride on the new route. There is no need to exit the bus or repay the fare.

277-RIDE (7433)
www.tcatbus.com

Get TCAT on your cell phone, point your browser to:
http://tcat.nextinsight.com/wml
ADA Paratransit Service: **273-1878 • TTY: 277-9766**

Printed 12/4/2009 1.5M Revised 5/23/2010

15 MONDAY – SUNDAY

Southside Shopper

ALSO SERVING:

Commons
McGraw House
Beechtree Care Center
Titus Towers
Ithaca Shopping Plaza
Wegman's
Tops
WalMart

Cornell / Airport – Most trips continue on ➡ as route 32 or 72

Effective May 23, 2010

TOMPKINS TCAT
CONSOLIDATED AREA TRANSIT, INC.

737 Willow Avenue • Ithaca, NY 14850

Route 68

Southwest Shopping
Effective January 1, 2010

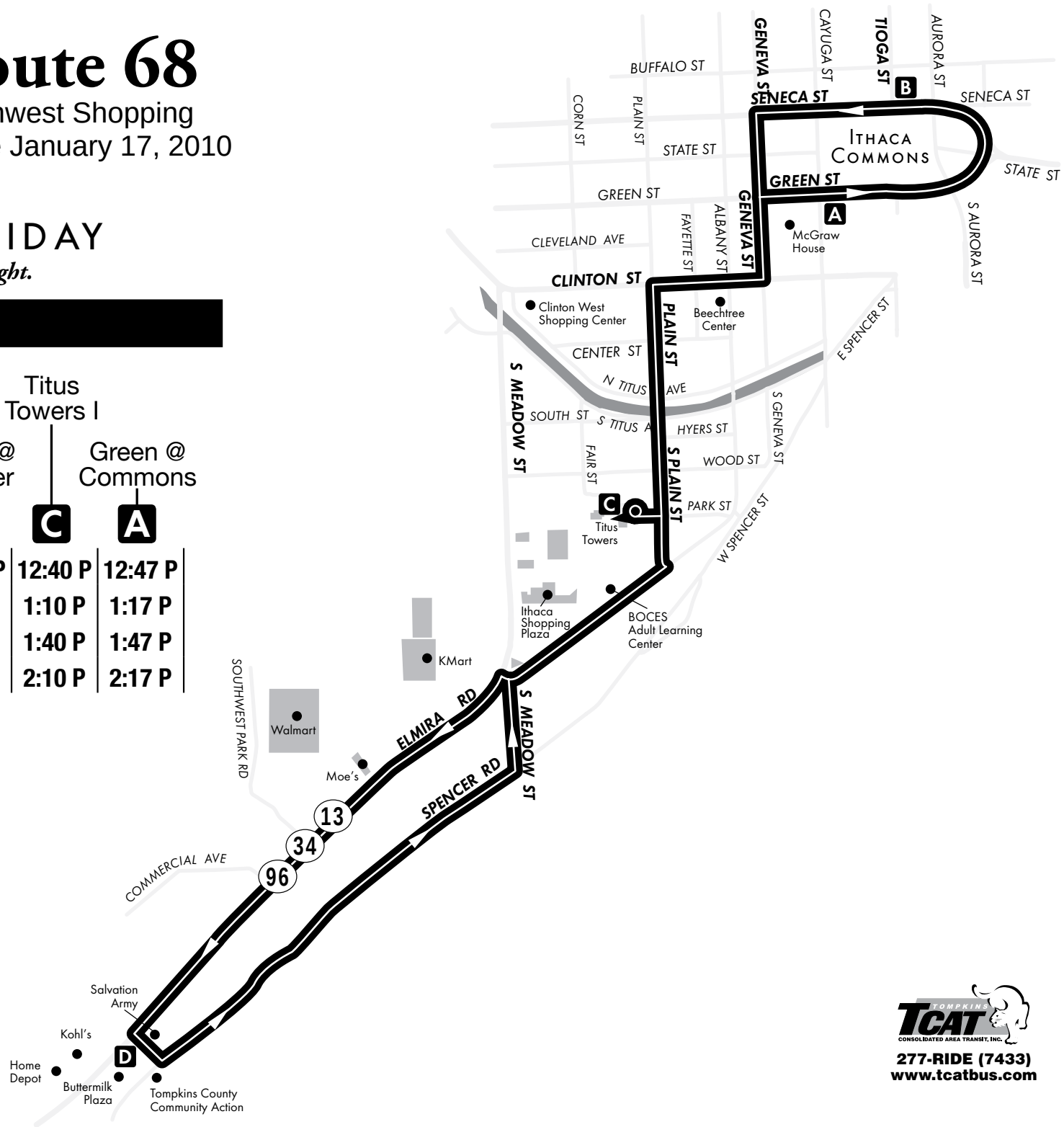
MONDAY – FRIDAY

Please read schedules from left to right.

LOOP

Green @ Commons	Seneca @ Commons	Titus Towers I	Elmira @ Spencer	Titus Towers I	Green @ Commons
A	B	C	D	C	A
12:20 P	12:22 P	12:30 P	12:35 P	12:40 P	12:47 P
12:50 P	12:52 P	1:00 P	1:05 P	1:10 P	1:17 P
1:20 P	1:22 P	1:30 P	1:35 P	1:40 P	1:47 P
1:50 P	1:52 P	2:00 P	2:05 P	2:10 P	2:17 P

Bold Type indicates PM times.



LEGEND

map not to scale

- A Timepoint
- ● Point of Interest

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www.tcatbus.com

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NEWFIELD
Newfield Town Clerk
166 Main Street
607-564-9981

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ADA Paratransit Service: **273-1878 • TTY: 277-9766**

Printed 12/4/2009 1.5M Revised 1/17/2010

68

MONDAY – FRIDAY

Southwest Shopping

ALSO SERVING:

Titus Towers
Salvation Army (SW)
Spencer Road
Beechtree Care Ctr.
McGraw House

Effective January 17, 2010

TOMPKINS TCAT
CONSOLIDATED AREA TRANSIT, INC.

737 Willow Avenue • Ithaca, NY 14850

MONDAY – FRIDAY

Please read schedules from left to right.

LOOP		
Seneca @ Commons	Sage Hall	Seneca @ Commons
A	B	A
07:30 A	07:41 A	07:52 A
07:42 A	07:53 A	08:04 A
07:54 A	08:05 A	08:16 A
08:00 A	08:11 A	08:22 A
08:06 A	08:17 A	08:28 A
08:12 A	08:23 A	08:34 A
08:18 A	08:29 A	08:40 A
08:24 A	08:35 A	08:46 A
08:30 A	08:41 A	08:52 A
08:36 A	08:47 A	08:58 A
08:42 A	08:53 A	09:04 A
08:48 A	08:59 A	09:10 A
08:54 A	09:05 A	09:16 A
09:00 A	09:11 A	09:22 A
09:06 A	09:17 A	09:28 A
09:12 A	09:23 A	09:34 A
09:18 A	09:29 A	09:40 A
09:24 A	09:35 A	09:46 A
09:30 A	09:41 A	09:52 A
09:36 A	09:47 A	09:58 A
09:42 A	09:53 A	10:04 A
09:48 A	09:59 A	10:10 A
09:54 A	10:05 A	10:16 A
10:00 A	10:11 A	10:22 A
10:06 A	10:17 A	10:28 A
10:12 A	10:23 A	10:34 A
10:18 A	10:29 A	10:40 A
10:24 A	10:35 A	10:46 A
10:30 A	10:41 A	10:52 A
10:36 A	10:47 A	10:58 A
10:42 A	10:53 A	11:04 A
10:48 A	10:59 A	11:10 A
10:54 A	11:05 A	11:16 A
11:06 A	11:17 A	11:28 A
11:18 A	11:29 A	11:40 A
11:30 A	11:41 A	11:52 A
11:42 A	11:53 A	**12:04 P**
11:54 A	**12:05 P**	**12:16 P**

LOOP		
Seneca @ Commons *(continued)*	Sage Hall *(continued)*	Seneca @ Commons *(continued)*
A	B	A
12:06 P	**12:17 P**	**12:28 P**
12:18 P	**12:29 P**	**12:40 P**
12:30 P	**12:41 P**	**12:52 P**
12:42 P	**12:53 P**	**01:04 P**
12:54 P	**01:05 P**	**01:16 P**
01:06 P	**01:17 P**	**01:28 P**
01:18 P	**01:29 P**	**01:40 P**
01:30 P	**01:41 P**	**01:52 P**
01:42 P	**01:53 P**	**02:04 P**
01:54 P	**02:05 P**	**02:16 P**
02:06 P	**02:17 P**	**02:28 P**
02:18 P	**02:29 P**	**02:40 P**
02:30 P	**02:41 P**	**02:52 P**
02:42 P	**02:53 P**	**03:04 P**
02:54 P	**03:05 P**	**03:16 P**
03:06 P	**03:17 P**	**03:28 P**
03:18 P	**03:29 P**	**03:40 P**
03:30 P	**03:41 P**	**03:52 P**
03:42 P	**03:53 P**	**04:04 P**
03:54 P	**04:05 P**	**04:16 P**
04:06 P	**04:17 P**	**04:28 P**
04:18 P	**04:29 P**	**04:40 P**
04:30 P	**04:41 P**	**04:52 P**
04:42 P	**04:53 P**	**05:04 P**
04:54 P	**05:05 P**	**05:16 P**
05:06 P	**05:17 P**	**05:28 P**
05:18 P	**05:29 P**	**05:40 P**
05:30 P	**05:41 P**	**05:52 P**
05:42 P	**05:53 P**	**06:04 P**
05:54 P	**06:05 P**	**06:16 P**
06:06 P	**06:17 P**	**06:28 P**
06:18 P	**06:29 P**	**06:40 P**
06:30 P	**06:41 P**	**06:52 P**
06:42 P	**06:53 P**	**07:04 P**
06:54 P	**07:05 P**	**07:16 P**
07:06 P	**07:17 P**	**07:28 P**

Bold Type indicates PM times.

Route 10

Cornell – Commons

Effective January 17, 2010

Designated Stops Only

TCAT TOMPKINS CONSOLIDATED AREA TRANSIT, INC.

277-RIDE (7433)

www.tcatbus.com

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Wegman's
500 S. Meadow Street
607-277-5800

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121 E. Court Street
607-274-5570

Budget & Finance
125 E. Court Street
607-274-5542

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119 W. Court Street
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CORNELL UNIVERSITY
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116 Maple Avenue
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Creekwood Apts
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9 North Street
607-844-6587

TRUMANSBURG
Kinney Drugs
2100 Trumansburg Rd
607-387-6661

NEWFIELD
Newfield Town Clerk
166 Main Street
607-564-9981

***Please Note:** Not all passes are available at all retail outlets. Please visit our website or call for details.

Useful Phone Numbers

Gadabout Trans. Services, Inc.	(607) 273-1878
Tioga County Public Transit	(607) 699-7433
Chemung County Transit	(607) 734-5211
Cortland Transit	(607) 758-3383
Greyhound Bus Lines	(607) 272-7930
Shortline Bus Lines	(607) 277-8800
Cornell Transportation	(607) 255-4600

Fares – Tompkins County

Exact Change, please. No Pennies

Cash fare, single ride:

Adult (ages 18-59)	$1.50
Youth (ages 6-17)	$.75

Children 5 and under ride free and must be accompanied by a responsible adult. Limit 3 children per adult

Senior Citizens (age 60+)	$0.75
Persons w/ Disabilities	$0.75

Youth Semester Pass

September – January •**OR**• February – June	$30
Summer Fun Pass	$50

Senior Citizens and Persons with Disabilities: If you have a Medicare, Senior Citizens Council Membership, ADA Paratransit Eligibility, or a Disability Eligibility card, you may show your card to the driver and pay half the cash fare. The Disability Eligibility Card is available to those persons receiving SSI, SSD, or Disabled Veteran's Benefits resulting from a service-connected disability.

Transfers: If more than one bus route is needed to get you to your destination, transfer slips are available at no additional cost. You should request a transfer from the Bus Operator when you pay the fare or use a transfer slip. Transfers are good for a continuous one way trip on the next available bus. They will not be accepted on any trip that will return the passenger to the area in which the transfer was originally issued, nor to re-board the same route.

Lost & Found: Located at TCAT Main Office, 737 Willow Ave. Office hours are 8am– 5pm, Monday to Friday. Please bring I.D.

Trips noted as continuing as another route: When a bus changes into a different route number (see schedule note), passengers already on board may continue to ride on the new route. There is no need to exit the bus or repay the fare.

277-RIDE (7433)
www.tcatbus.com

Get TCAT on your cell phone, point your browser to:
http://tcat.nextinsight.com/wml
ADA Paratransit Service: **273-1878 • TTY: 277-9766**

Printed 12/4/2009 1.5M Revised 1/17/2010

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MONDAY – FRIDAY

Cornell – Commons Shuttle

ALSO SERVING:

Risley Hall
Goldwyn Smith Hall
Sage Hall
Collegetown

Effective January 17, 2010

TOMPKINS TCAT
CONSOLIDATED AREA TRANSIT, INC.

737 Willow Avenue • Ithaca, NY 14850

Route 36

South Lansing

Effective January 17, 2010

LEGEND

map not to scale

- A — Timepoint
- ● — Point of Interest
- ▲ — Park / Recreation
- Ⓟ — Park & Ride
- Select Service Only. Please see schedule.

Bold Type indicates PM times.

★ indicates Friday service only.

F indicates flag stop. Passengers wanting to board will have to signal the bus driver

MONDAY – FRIDAY★

Please read schedules from left to right.

OUTBOUND

	Green @ Commons A	Vet School B	Sage Hall C	Lake St. @ Ithaca HS D	Lansing Town Hall E	Myers Point @ Rt. 34B F	Ludlowville G	Lansing Fire Company #3 H
	6:45 A	–	–	6:51 A	–	F	–	7:12 A
	7:20 A	–	–	7:26 A	–	F	–	7:47 A
FRIDAY ONLY ★	**3:35 P**	**3:41 P**	**3:47 P**	**3:51 P**	**4:02 P**	—	—	—
	4:35 P	**4:41 P**	**4:47 P**	**4:51 P**	**5:02 P**	**F**	**5:06 P**	**5:11 P**
	5:05 P	**5:11 P**	**5:17 P**	**5:21 P**	**5:32 P**	**F**	**5:36 P**	**5:41 P**

INBOUND

	Lansing Fire Company #3 H	Ludlowville G	Myers Point @ Rt. 34B F	Lansing Town Hall E	Statler Hall J	Boyce Thompson Inst. K	Seneca @ Commons L
	7:15 A	7:20 A	7:22 A	7:28 A	7:43 A	7:47 A	7:53 A
	7:50 A	7:55 A	7:57 A	8:03 A	8:18 A	8:22 A	8:28 A
	5:15 P	—	**F**	—	—	—	**5:43 P**
	5:45 P	—	**F**	—	—	—	**6:13 P**

TCAT TOMPKINS CONSOLIDATED AREA TRANSIT, INC.

277-RIDE (7433)

www.tcatbus.com

For Your Convenience, various bus passes can be purchased at the following Outlets*

ONLINE
TCAT Store
(All passes available)
www.tcatbus.com/pages/buy

ITHACA
TCAT Main Office
(All passes available)
737 Willow Avenue
Phone: 277-RIDE

TCAT Green Street Station
131 East Green St., Ste. 3

Ithaca Town Hall
217 N. Tioga Street
607-273-1721

Tops – Ithaca
710 S. Meadow Street
607-275-8041

Wegman's
500 S. Meadow Street
607-277-5800

Transportation Council
121 E. Court Street
607-274-5570

Budget & Finance
125 E. Court Street
607-274-5542

Life Long Sr. Center
119 W. Court Street
607-273-1511

ITHACA COLLEGE
IC Bookstore
140 Phillips Hall
607-274-3210

CORNELL UNIVERSITY
Cornell Transportation
116 Maple Avenue
607-255-4600

Willard Straight Hall
607-255-0623

ETNA
Creekwood Apts
200 Lower Creek Rd.
607-347-4738

GROTON
Groton Village Clerk
607-898-3966

LANSING
Tops – Triphammer
2300 N Triphammer Rd.
607-266-8021

Shops at Ithaca Mall
40 Catherwood Drive
607-257-5337

DRYDEN
Dryden Village Office
80 South Street
607-844-8122

TC3 Book Store
9 North Street
607-844-6587

TRUMANSBURG
Kinney Drugs
2100 Trumansburg Rd
607-387-6661

NEWFIELD
Newfield Town Clerk
166 Main Street
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ADA Paratransit Service: **273-1878 • TTY: 277-9766**

Printed 12/4/2009 1.5M Revised 1/17/2010

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MONDAY – FRIDAY

South Lansing

ALSO SERVING:

Lansing Fire Station #3 Ⓟ
Ludlowville
Lansing High School
Lansing Town Hall Ⓟ
Woodsedge Apartments
Cornell –Tower Road
Ithaca Commons
Ithaca High School
Boynton Middle School

Effective January 17, 2010

TOMPKINS TCAT
CONSOLIDATED AREA TRANSIT, INC.

737 Willow Avenue • Ithaca, NY 14850

Appendix D

ITHACA NEIGHBORHOOD GREENWAYS

Community Event - Saturday, Nov 20th, 10:00am-12:00pm
Part of Moving Forward: An Active Transportation Symposium, organized by Tom Knipe and the Organization of Cornell Planners

Tompkins County Library, Borg Warner Community Room
In Attendance: 60 people

Presenters:
Mia Birk, President of Alta Planning & Design
Jennifer Dill, Professor Portland State University

COMMUNITY FEEDBACK PROCESS:

Following presentations on bicycle boulevard planning and design and related research, attendees were given the opportunity to examine the preliminary conceptual plan for Ithaca Neighborhood Greenways and comment. There were four stations, with a facilitator and recorder for each station.

Facilitator Role (Tim, Tom, Fernando, Kent)
Stand in front of display items/comment pad, engage with community members, invite comments, and answer questions.

Recorder Role (Alyson, Lydia, Chrisophia, Gabby)
Write verbal comments on 2x3 index cards. We will have post its and markers for people to write comments directly, but we want to capture verbal comments as well.

1) Network: Which streets should form the network?
- Facilitator: Tim Logue
- Recorder: Alyson Fletcher
- Materials: Network Map, List of Network Criteria and alternate criteria, markers, post-its, easel pad with framing question.

2) Treatments: Which treatments should be used to calm traffic, reduce automobile traffic, facilitate safe and comfortable crossings, and mark the route?
- Facilitator: Tom Knipe
- Recorder: Lydia Morken
- Materials: Treatments Map, list of treatments, IBPI guidebook, markers, post-its, easel pad with framing question

3) Community Engagement and Partnerships: Outside of the transportation infrastructure changes, what other community projects, activities, or goals an be incorporated into Ithaca Neighborhood Greenways? Partnerships: Who should be engaged in this effort and what can they do?
- Facilitator: Fernando DeAragon
- Recorder: Chrisophia Somerfeldt

- Materials: markers, two easel pads (one for each framing question), index cards, two-three images of pocket parks and intersection repair.

4) Destinations: Which important destinations will be served by the network?
- Facilitator: Kent Johnson
- Recorder: Gabby Voeller

Materials: Destinations Map, list of destinations within ¼ mile, IBPI guidebook, markers, post-its, easel pad with framing question.

COMMUNITY FEEDBACK (COMMENTS RECORDED AT 11/20 MEETING)

Network: Which streets should form the network?

- Network must go to IHS and Boynton. Please reconfigure the traffic flow to allow safe cycling to schools!
- Repave Tioga St.
- Include LACS as a destination.
- Better crossings in West End.
- Add Auburn Street – natural route.
- Consider 2nd instead of 3rd?
- Consider not using bus routes.
- Dey St. connection to bike path (Cayuga Waterfront Trail)
- Advertise West Spencer as a safe route.
- Communicate entire system (which need to be changed, which are already used).
- Is the bridge by Home Depot useable?
- Make is safe into Big Box stores (have owners as partners and make it bike friendly).
- What is the link for West Hill, Hector and Cliff St. and all roads?
- 79E (State St.) bike lane is nice. Add one on University (incorporate into plan). Make it switch back.
- Accommodate slow uphill bike speed with wider lane.
- Work with Cornell to solve problem of getting cyclists up the hills and have facilities, etc.
- Bicycle route connection through Northside Liquor parking lot, then improve crossings to have safe routes for cyclists to Lowes, etc.
- Elmira Rd. is wide and works, but you ride through parking lots (Rte: Plain St. to Elmira to Rte 13. Mark roads for bikes.)
- Designate S. Cayuga to Commons (Plain is too far).
- Connection around Commons.
- Green St. Bike Lane. You have to cross traffic if you don't want to go uphill.
- Dangerous to get to Seneca.
- Commons as a bike-ped collector.
- Geneva St. as a N-S bike route with traffic assistance on Green & Seneca.
- Bike trails/ lanes on roads leaving the city (N. to Lansing, East to Cryden, etc.).

Treatments: Which treatments should be used to calm traffic, reduce automobile traffic, facilitate safe and comfortable crossings, and mark the route?

- Issue: accessing post office.

- Issue: Dealing with one-ways, especially State/79 splitting
- Idea: Wayfinding sign at Cascadilla/Cayuga (NW to Farmer's Market, S to Commons, N to Stewart Park, etc)
- Easy connection to Cornell – dedicated bike paths to/from/on Cornell campus.
- Idea: more speed humps and bulbouts
- Idea: Large planters or small medians with plantings near curb.
- Cayuga St. needs traffic calming
- Too many grates and manholes in bike lanes; debris on shoulders and in bike lanes.
- Sharrows not clear. Idea: signs around town to explain purpose and how to use. Symbol and concisely worded sign.
- Road conditions not suitable or safe. Too many potholes; bumpy & lumpy. Even when newly paved, not smooth. Quick fixes aren't done well. No good for bicyclists when pavement conditions are bad.

Community Engagement and Partnerships: Outside of the transportation infrastructure changes, what other community projects, activities, or goals should be incorporated into Ithaca Neighborhood Greenways?

- Monthly Ciclovia (neighborhood ride) with food and destinations ('ditto' – try with State to Farmer's Market).
- Block Parties
- Safe Routes to School (Elementary, Middle, High)
- Do we have a women-friendly bicycle shop which supports utilitarian cycling?
- What about a category for encouragement, community support, marketing, etc?

Partnerships: Who should be engaged in this effort and what can they do?

- Incorporate African American history trail (Alex Haley, underground railroad, etc)
- Must include leaders of color in planning from the BEGINNING.
- Include high schools and HS students
- DAC – Disability Advisory Council
- Churches, schools (partnerships)
- How do you engage drivers (like folks outside of the city who drive through the City)?
- IFD (Ithaca Fire Department)
- IPD (Ithaca Police Department)
- Health Planning Council (cyclovia)
- Ithaca Festival
- Bicycle Benefits
- Bike Share (Big Red Bikes)
- Farmer's Market
- RIBS (Recycle Ithaca's Bicycles)
- LACS
- Town of Ithaca
- Tompkins County

Destinations: Which important destinations will/should be served by the network?

- Need better connections to destinations uphill (IC, Cornell, hills around the city)
- Wegmans & Rt. 13 businesses
- OD pairs
- Missing from these maps: entrance routes to Staples, Kmart, Lowes area, e.g via Q. Plain St. to Elmira (lots of room for a bike lane here) – through wine store plaza to light if possible.
- Schools! (HIS, Boynton, LACS, BJM, GIAC)
- Skate Park
- What about places in the Town of Ithaca?
- Youth Bureau, Library, Stewart Park (Places kids go)
- Lake St. / Cayuga St. intersection
- West End intersection (Hangar Theatre & dog park)
- This looks good! Considerations: for traffic into city, across bridge from Cayuga Heights, Slaterville, etc.

			COMMUTING TO WORK - Workers 16 years and older																			
	Population		Total	Drive alone		Carpool		Bus		Walk		Bicycle		Taxi		Motorcycle		Other means		Work at home		Mean travel time
County	96,501	Census 2000	47,394	28,339	59.8%	5,779	12.2%	2,261	4.8%	7,951	16.8%	407	0.9%	25	0.1%	80	0.2%	127	0.3%	2,425	5.1%	17.8
County	100,583	2010 ACS	48,991	27,874	56.9%	5,853	11.9%	2,907	5.9%	8,022	16.4%	746	1.5%	58	0.1%	159	0.3%	274	0.6%	3,098	6.3%	17.8
	4.2%		*3.4%*	*-1.6%*		*1.3%*		*28.6%*		*0.9%*		*83.3%*		*132.0%*		*98.8%*		*115.7%*		*27.8%*		*0.0%*
Caroline	2,910	Census 2000	1,387	966	69.6%	184	13.3%	70	5.0%	23	1.7%	12	0.9%	0	0.0%	8	0.6%	0	0.0%	124	8.9%	17.8
Caroline	3,012	2010 ACS	1,632	1,138	69.7%	395	24.2%	0	0.0%	0	0.0%	14	0.9%	0	0.0%	0	0.0%	0	0.0%	85	5.2%	25.0
	3.5%		*17.7%*	*17.8%*		*114.7%*		*-100.0%*		*-100.0%*										*-31.5%*		*40.4%*
Danby	3,007	Census 2000	1,753	1,241	70.8%	411	23.4%	9	0.5%	22	1.3%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	70	4.0%	23.3
Danby	3,174	2010 ACS	1,689	1,230	72.8%	292	17.3%	0	0.0%	52	3.1%	0	0.0%	0	0.0%	46	2.7%	0	0.0%	69	4.1%	20.9
	5.6%		*-3.7%*	*-0.9%*		*-29.0%*		*-98.2%*		*136.4%*										*-1.4%*		*-10.3%*
Dryden	13,532	Census 2000	7,205	5,451	75.7%	1,005	13.9%	141	2.0%	204	2.8%	23	0.3%	0	0.0%	7	0.1%	19	0.3%	355	4.9%	19.0
Dryden	14,026	2010 ACS	6,878	5,224	76.0%	930	13.5%	94	1.4%	199	2.9%	59	0.9%	0	0.0%	25	0.4%	39	0.6%	308	4.5%	19.9
	3.7%		*-4.5%*	*-4.2%*		*-7.5%*		*-33.3%*		*-2.5%*										*-13.2%*		*4.7%*
Enfield	3,369	Census 2000	1,709	1,290	75.5%	255	14.9%	26	1.5%	30	1.8%	0	0.0%	6	0.4%	8	0.5%	0	0.0%	100	5.9%	22.8
Enfield	3,567	2010 ACS	1,652	1,101	66.6%	255	15.4%	47	2.8%	64	3.9%	12	0.7%	0	0.0%	15	0.9%	18	1.1%	140	8.5%	21.7
	5.9%		*-3.3%*	*-14.7%*		*0.0%*		*80.8%*		*113.3%*										*40.0%*		*-4.8%*
Groton	5,794	Census 2000	2,890	2,081	72.0%	476	16.5%	66	2.3%	64	2.2%	0	0.0%	0	0.0%	32	1.1%	0	0.0%	171	5.9%	23.2
Groton	5,853	2010 ACS	2,846	2,320	81.5%	258	9.1%	12	0.4%	35	1.2%	0	0.0%	0	0.0%	0	0.0%	59	2.1%	162	5.7%	22.5
	1.0%		*-1.5%*	*11.5%*		*-45.8%*		*-81.8%*		*-45.3%*										*-5.3%*		*-3.0%*
C.Ithaca	28,775	Census 2000	13,335	4,767	35.7%	1,074	8.1%	1,050	7.9%	5,493	41.2%	236	1.8%	7	0.1%	12	0.1%	45	0.3%	658	4.9%	14.3
C.Ithaca	29,821	2010 ACS	14,021	4,246	30.3%	1,301	9.3%	1,392	9.9%	5,804	41.4%	317	2.3%	0	0.0%	56	0.4%	15	0.1%	890	6.3%	14.5
	3.6%		*5.1%*	*-10.9%*		*21.1%*		*32.6%*		*5.7%*										*35.3%*		*1.4%*
Ithaca	18,710	Census 2000	8,768	4,757	54.3%	984	11.2%	532	6.1%	1,892	21.6%	116	1.3%	4	0.0%	4	0.0%	56	0.6%	427	4.9%	15.1
Ithaca	20,073	2010 ACS	9,712	4,765	49.1%	1,158	11.9%	869	8.9%	1,597	16.4%	306	3.2%	58	0.6%	6	0.1%	34	0.4%	919	9.5%	15.0
	7.3%		*10.8%*	*0.2%*		*17.7%*		*63.3%*		*-15.6%*										*115.2%*		*-0.7%*
Lansing	10,521	Census 2000	5,361	4,033	75.2%	749	14.0%	251	4.7%	66	1.2%	0	0.0%	8	0.1%	9	0.2%	0	0.0%	253	4.7%	17.8
Lansing	10,924	2010 ACS	5,637	4,318	76.6%	531	9.4%	241	4.3%	156	2.8%	19	0.3%	0	0.0%	0	0.0%	49	0.9%	323	5.7%	18.0
	3.8%		*5.1%*	*7.1%*		*-29.1%*		*-4.0%*		*136.4%*										*27.7%*		*1.1%*
Newfield	5,108	Census 2000	2,590	2,058	79.5%	322	12.4%	82	3.2%	34	1.3%	4	0.2%	0	0.0%	0	0.0%	0	0.0%	90	3.5%	22.0
Newfield	5,179	2010 ACS	2,298	1,829	79.6%	266	11.6%	69	3.0%	25	1.1%	10	0.4%	0	0.0%	0	0.0%	27	1.2%	72	3.1%	22.1
	1.4%		*-11.3%*	*-11.1%*		*-17.4%*		*-15.9%*		*-26.5%*										*-20.0%*		*0.5%*
Ulysses	4,775	Census 2000	2,396	1,695	70.7%	319	13.3%	59	2.5%	123	5.1%	16	0.7%	0	0.0%	0	0.0%	7	0.3%	177	7.4%	22.1
Ulysses	4,954	2010 ACS	2,626	1,703	64.9%	467	17.8%	183	7.0%	90	3.4%	9	0.3%	0	0.0%	11	0.4%	33	1.3%	130	5.0%	20.8
	3.7%		*9.6%*	*0.5%*		*46.4%*		*210.2%*		*-26.8%*										*-26.6%*		*-5.9%*
V.Dryden	1,832	Census 2000	960	742	77.3%	88	9.2%	43	4.5%	45	4.7%	2	0.2%	0	0.0%	0	0.0%	7	0.7%	33	3.4%	19.4
V.Dryden	1,633	2010 ACS	852	573	67.3%	187	21.9%	26	3.1%	34	4.0%	0	0.0%	0	0.0%	7	0.8%	0	0.0%	25	2.9%	19.3
	-10.9%		*-11.3%*	*-22.8%*		*112.5%*		*-39.5%*		*-24.4%*										*-24.2%*		*-0.5%*
V.Freeville	505	Census 2000	249	192	77.1%	25	10.0%	6	2.4%	8	3.2%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	18	7.2%	18.9
V.Freeville	532	2010 ACS	248	208	83.9%	14	5.6%	0	0.0%	8	3.2%	6	2.4%	0	0.0%	0	0.0%	0	0.0%	12	4.8%	18.3
	5.3%		*-0.4%*	*8.3%*		*-44.0%*		*-100.0%*		*0.0%*										*-33.3%*		*-3.2%*
V.Groton	2,470	Census 2000	1,131	828	73.2%	196	17.3%	24	2.1%	45	4.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	38	3.4%	23.8
V.Groton	2,310	2010 ACS	919	728	79.2%	130	14.1%	4	0.4%	27	2.9%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	30	3.3%	21.5
	-6.5%		*-18.7%*	*-12.1%*		*-33.7%*		*-83.3%*		*-40.0%*										*-21.1%*		*-9.7%*
V.Cay.Hgts	3,738	Census 2000	1,438	810	56.3%	154	10.7%	142	9.9%	173	12.0%	33	2.3%	0	0.0%	0	0.0%	15	1.0%	111	7.7%	16.9
V.Cay.Hgts	3,661	2010 ACS	1,742	870	49.9%	201	11.5%	84	4.8%	243	13.9%	105	6.0%	0	0.0%	0	0.0%	0	0.0%	239	13.7%	16.5
	-2.1%		*21.1%*	*7.4%*		*30.5%*		*-40.8%*		*40.5%*										*115.3%*		*-2.4%*
V. Lansing	3,417	Census 2000	1,569	1,009	64.3%	278	17.7%	195	12.4%	7	0.4%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	81	5.2%	15.6
V. Lansing	3,409	2010 ACS	1,762	1,060	60.2%	218	12.4%	241	13.7%	124	7.0%	19	1.1%	0	0.0%	0	0.0%	0	0.0%	100	5.7%	16.7
	-0.2%		*12.3%*	*5.1%*		*-21.6%*		*23.6%*		*1671.4%*										*23.5%*		*7.1%*
V.T-Burg	1,581	Census 2000	785	549	69.9%	72	9.2%	37	4.7%	70	8.9%	2	0.3%	0	0.0%	0	0.0%	0	0.0%	55	7.0%	21.9
V.T-Burg	1,821	2010 ACS	1,013	623	61.5%	154	15.2%	101	10.0%	53	5.2%	9	0.9%	0	0.0%	5	0.5%	15	1.5%	53	5.2%	22.2
	15.2%		*29.0%*	*13.5%*		*113.9%*		*173.0%*		*-24.3%*										*-3.6%*		*1.4%*