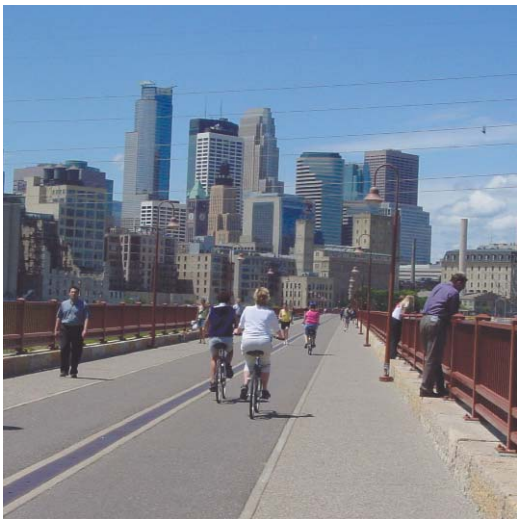
The Mn/DOT Bicycle Modal Plan

Safely accommodating bicycles...to help everyone move smarter, safer, and more efficiently



The Stone Arch Bridge into downtown Minneapolis was one of Minnesota's first Transportation Enhancement projects

Bike lanes on St. Paul's Summit Avenue reduced speeds, reduced accidents, and increased bicycle traffic

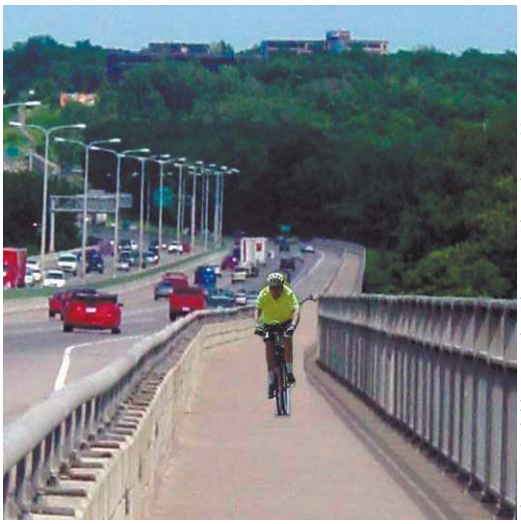


Photo: I-494 bridge over the Minnesota River, since 1981.

Safe accommodations on bridges are one of Mn/DOT's most important contribution to bicycle transportation in Minnesota.

Photo: Minnesota Office of Tourism

Scenic trails introduce Minnesotans to the transportation possibilities of the bicycle

Adopted 01/03/05

This document is available online at:
http://www.dot.state.mn.us/transit/bikeplan.html

Photo: Mark Fiers - TH 248, Rollingstone, MN

63% of Minnesota adults are bicyclists, nearly twice the national average[1]

Bicycling has become an important part of Minnesotans' lives. This activity when enabled as a convenient and attractive transportation option, has broad and cost-effective benefits.

The state legislature and Mn/DOT see important roles for walking, bicycling, and similar modes[2] in Minnesota's transportation systems. For some transportation needs, some of the time, they can be the best, and often preferred modes to use. Moreover, bicycling opportunities add to communities' quality of life and economic competitiveness.

We at Mn/DOT, as the state's leading transportation provider, are dedicated to doing our part to enable and encourage this mode on and across our facilities, and to encouraging our partners to continue their leadership in these areas as well.

[1] *Plan B, The Comprehensive State Bicycle Plan, Mn/DOT, 1992, p 7; Appendix B, p B1c.*

[2] *Including wheelchairs, inline skates, etc.*

This plan,
and all the good it is destined to engender,
is dedicated to Curt Eastlund,
Project Development Engineer, Brainerd

Curt was a particularly engaged member of
The Mn/DOT Bicycle Modal Plan Technical Steering
Committee who provided a tremendous amount of
guidance and advice to this landmark effort for bicycle
transportation. His tragic and untimely passing
in the fall of 2003 was mourned by all
in Mn/DOT who knew him.

At its November 2003 meeting,
the Technical Steering Committee
voted unanimously that this plan be
dedicated in Curt's honor and memory.

The Mn/DOT Bicycle Modal Plan

Safely accommodating bicycles...to help everyone move smarter, safer, and more efficiently

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While this modal plan addresses some needs for both pedestrians and bicycles, the majority of its recommendations and findings relate to Mn/DOT's roles in bicycle transportation.

Note: Underlined portions of text are live links in the on-line version of this document, which is available at http://www.dot.state.mn.us/transit/bikeplan.html.

SUMMARY OF FEDERAL AND STATE GUIDANCE REGARDING BICYCLE AND PEDESTRIAN ACCOMODATIONS

Federal Guidance

FHWA Nonmotorized Design Guidance, TEA-21, February 28, 2000

- *Bicycle and pedestrian ways shall be established in all new construction and reconstruction projects in urbanized areas (unless prohibited by law, excessive cost, or sparse population or other factors indicate absence of need).*

Federal Planning Requirements (TEA-21)

- *Support the economic vitality of the United States, and states and metropolitan areas especially by enabling global competitiveness, productivity, and efficiency.*
- *Increase the safety and security of the transportation system for motorized and non-motorized users.*
- *Increase the accessibility and mobility options available to people and freight.*
- *Protect and enhance the environment, promote energy conservation, and improve quality of life.*
- *Enhance the integration and connectivity of the transportation system, across and between modes throughout the state, for people and for freight.*
- *Emphasize the preservation of the existing transportation system.*

Environmental Justice (Presidential Executive Order 12898)

- *All projects using federal funds must identify and address the effects of all programs, policies, and activities on minority populations and low-income populations.*

State Statutes

Minnesota Statutes, Chapter 174, Minnesota Transportation Goals:

- *Promote and increase bicycling as an energy-efficient, non-polluting and healthful transportation alternative*
- *Provide safe transportation to users throughout the state*
- *Provide multimodal and intermodal transportation that enhances mobility, economic development, and provides access to all persons…*
- *Increase transit use in the urban areas by giving highest priority to the transportation modes with the greatest people moving capacity*
- *Ensure that the planning and implementation of all modes of transportation are consistent with the environment and energy goals of the state*

Minnesota Statutes, Chapter 116D, State Environmental Policy:

State government shall use all practicable means…

- *to assure safe, healthful, and aesthetic surroundings for all citizens;*
- *to maintain variety of individual choice;*
- *to encourage styles of living that minimize environmental degradation;*
- *to reduce the deleterious impact on air quality from operation of motor vehicles with internal combustion engines; and*
- *to minimize noise.*

To the fullest extent practicable the policies, rules, and public laws of the state shall be interpreted and administered in accordance with this chapter.

Minnesota Statutes, Chapter 160.264

When highway construction would otherwise destroy an existing bikeway or roadway used by bicycles, the road authority responsible shall replace the destroyed facility or access with one comparable.

Minnesota Statutes, Chapter 160.265

- *The commissioner shall establish a program for the development of bikeways primarily on existing road rights of way.*

The Mn/DOT Bicycle Modal Plan

Safely accommodating bicycles...to help everyone move smarter, safer, and more efficiently

Executive Summary

Overview

Minnesota has long been a leader in taking an active approach to designing transportation networks where a full range of transportation modes are accommodated. Roadway design generally considers bicyclists and pedestrians in the planning. Over the past decade, biking to work has increased in regional trade centers statewide by three percent.[1] However, more must be done to encourage and accommodate safe trips by bicycle.

While 73% of rural highways are rated good or fair for bicycles,[2] only 24% of urban arterials achieve that rating[3] and are the location of the majority of urban bicycle accidents. Bridges over freeways and elsewhere often become barriers in otherwise bike-serviceable networks of residential streets. US DOT data indicates that bicyclists are twelve times more likely, per mile traveled, to be killed than automobile occupants.[4] These are problems that Mn/DOT can play a role in solving.

The Mn/DOT Bicycle Modal Plan has been developed pursuant to the Minnesota Statewide Transportation Plan and is consistent with Mn/DOT's Mission to "…help Minnesotans travel safer, smarter and more efficiently". Covering the years 2005-2030, it prioritizes and guides investments in safe bicycle and pedestrian accommodations on Mn/DOT owned and influenced facilities. While it does not address retrofitting deficient infrastructure, it is designed to minimize the need for retrofitting in the future.

The Mn/DOT Bicycle Modal Plan provides a concise review of:

- State and Federal laws, policies and guidance related to bicycle transportation
- the role of the bicycle in Minnesota's transportation system, past and present
- recent trends, current bicycle mode share, and future growth potential
- safety, societal, and environmental challenges relevant to bicycling and walking.

It then outlines three key initiatives by which Mn/DOT can most appropriately implement state and federal laws, policies, and guidance over the next twenty-five years, 2005-2030:

E 38th St. in Minneapolis looking east over I-35W.

When approaching streets have parallel parking, continuing their width across bridges, with or without bike lane striping, works well…

Penn Ave. S in Minneapolis looking south over TH 62, the Crosstown.

…unless freeway entrance ramps necessitate additional travel or turn lanes, in which case additional width or re-striping is needed to accommodate bicycles.

Mn/DOT Policy and Action Plan

The first initiative clarifies policies under which accommodating bicycles and pedestrians are required[5] on Mn/DOT projects. These are expressed in the form of Mn/DOT bicycle vision and mission statements, along with targets for the relevant measures identified by this plan and the Minnesota Statewide Transportation Plan. The net effect is routine safe accommodation of bicycles and pedestrians on those elements of Mn/DOT projects where bikes are legal in and around urbanized areas, and accommodation elsewhere by design[6] or as needs dictate.

Minnesota Scenic Bikeway System Proposal

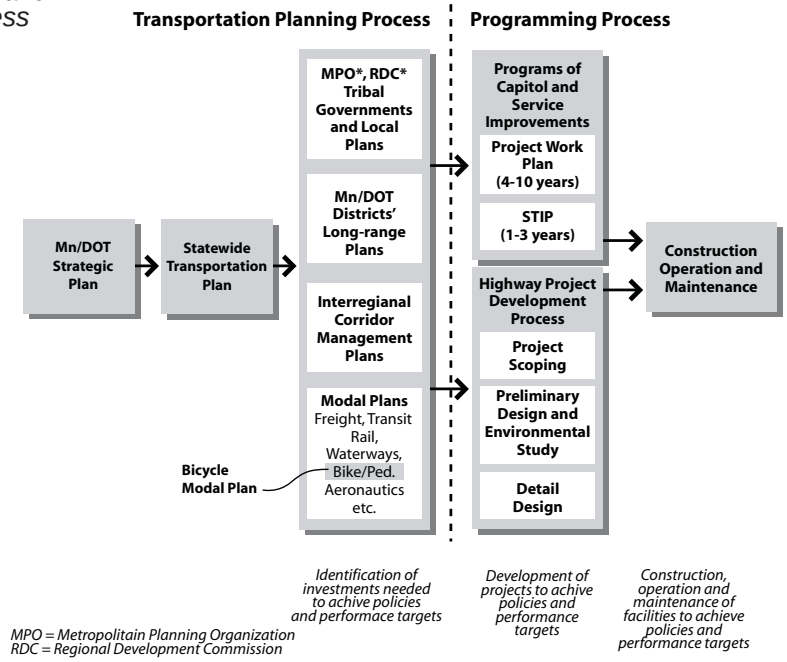
The second initiative is for Mn/DOT to partner in an inter-governmental effort to identify, develop, sign, map, and maintain a select system of statewide bike routes. These routes will utilize existing low traffic and shouldered roads that connect with off road trails. The purpose of these scenic bikeways is to *attract* bicyclists to the safest available routes.

Supplemental Design Guidance Recommendations

The third initiative is *supplemental design guidance* for bicycle and pedestrian facilities. This gives design engineers additional means by which to improve the facilities that contribute to the safety of bicyclists and pedestrians, even under conditions of limited right of way and other constraints. These additional treatments will be incorporated into the Department's design guidance as appropriate.

By implementing this Plan, a process is set in motion to incorporate design treatments into the Mn/DOT Road Design Manual and other planning and design documents. This will simplify and expedite the accommodation of bicycles and pedestrians on Mn/DOT projects.

Mn/DOT's Planning and Programming Process



[1] *Minnesota cities of 5000 or greater population showed average increases of 3% in bike commuting between the 1990 and 2000 census. The 3% applies primarily to the month of April, when the census is conducted. A check of precipitation records from April 1990 and April 2000 indicated both were very similar, with April 2000 having slightly more rain. Combined with the fact that April is a borderline month for heavy bicycle commuting, the 3% growth rate would appear to be fairly conservative. Sources: US Census, and High Density Precipitation Data, www.climate.umn.edu.*

[2] *Roadway ratings of bicycle suitability are the result of a formula based on speed, traffic volume, pavement width, and other factors, and are depicted on the Mn/DOT Bikeways Maps.*

[3] *Mn/DOT study using bikeway mapping criteria, Comprehensive State Bicycle Plan, Mn/DOT (1992), p 23*

[4] *J Pucher and LDijkstra, "Promoting Safe Walking and Cycling to Improve Public Health: Lessons from the Netherlands and Germany", American Journal of Public Health, September 2003, p 1509-1516.*

Based on an internal audit of a sample of current Mn/DOT construction projects, the fiscal impact of this Plan is estimated to be less than one percent of the annual highway program.

It is anticipated that through sound planning and guidance, fewer roadway users, including pedestrians and bicyclists, will be exposed to unnecessary hazards. Travel choices and convenience will be improved for all. The following are additional highlights of each chapter of the Modal Plan.

Chapter I: Introduction

Mn/DOT has a long history of bicycle program leadership in Minnesota. Starting with the first Bikeways Maps in the mid 1970's, Mn/DOT has provided guidance for bicycle transportation throughout the state. Other publications have included:

- Trunk Highway System Plan (1987)
- Plan B, The Comprehensive State Bicycle Plan, Mn/DOT (1992)
- Minnesota Bicycle Transportation Planning and Design Guidelines (1996)
- Mn/DOT Policy on Bikeway and Other Non-Motorized, Multi Use Trail Accommodation within Trunk Highway Right-of-Way (2004) 04-03-ES-01

The primary scope of this plan is to address bicycle needs on all infrastructure that Mn/DOT owns on which bicycle use is legal, including trunk highways (TH), and bridges related to trunk highways or over other barriers such as rivers. The secondary scope of this Plan is to suggest guidance for bicycle policy on infrastructure over which Mn/DOT has some influence, such as county state aid highways (CSAH's) and municipal state aid streets (MSA's). The Plan does not address retrofitting existing infrastructure, but is designed to minimize the need for future retrofitting.

This Modal Plan was developed with the oversight of a Technical Steering Committee,[7] which thoroughly discussed key initiatives, and operated on a consensus basis.

Chapter II: The Role of the Bicycle in Minnesota's Transportation System: Past, Present, Future

After the first heyday of bicycling in the late 1800's, bicycling began a renaissance in the 1970's. Partially in response to the Middle East oil crisis, key State legislation supported this revival of interest with new programs at Mn/DOT and the DNR. The 1991 federal transportation bill further encouraged these trends with greatly increased funding for bicycle facilities.

By 2000, the US Census indicated that 3.8% of workers in Minnesota communities of 5000 or greater population were walking or biking to work as their primary mode.[8] Minneapolis emerged as the number three bike commuting city nationwide, with 1.9-2.6% of commuters biking to work.

[5] *On all projects within Minnesota communities, barring exceptional circumstances, such as excessive cost, clear absence of need, or roads where bicycles and pedestrians are not permitted to operate. See Guidance, p 40, for additional detail.*

[6] *"By design" includes the proposed Minnesota Scenic Bikeway System. It may on occasion additionally include elements of local bikeway system plans that intersect with Mn/DOT facilities to the extent that those elements are consistent with this Modal Plan.*

[7] *See Appendix, page 107, for a listing of members.*

[8] *Walking accounts for 3.3% and biking accounts for 0.5% of trips to work in Minnesota communities of 5000 or greater population during the period the census is conducted. Forms are mailed out at the end of March or in the first week in April.*

[9] *Minnesota Center for Survey Research, U of M, 1989 Omnibus Survey.*

Congressman Jim Oberstar, Brainerd Mayor James Wallin and transit system Manager Tom Jay inaugurate the Brainerd & Crow Wing County Public Transit's bike racks, installed in 2004 on most buses in their system, a dial-a-ride system. This is the second county-level transit service to add bike racks, other than those in Duluth, the Twin Cities, and St Cloud. The first was the Paul Bunyan Transit System, in Bemidji.

Indicators of further growth potential include:

- ten percent of Minnesota adults bike to work or school at least once per year[9]
- 41 percent of all trips within communities are less than two miles in length[10]

Once adequate accommodations are in place to address safety problems, there are a number of issues that may yield further interest and growth potential for biking, either alone, or in combination with transit:

- dissatisfaction with the growth in traffic congestion
- physical inactivity being second only to smoking as a health risk for Americans, (1996 Surgeon General's Report)
- the need for alternative means of mobility for an aging population
- the Presidential Order on Environmental Justice, and
- the climate change threat.

Chapter III: State and Federal Law, Policy and Guidance

Mn/DOT has substantial authority and responsibility for accommodating and encouraging bicycling, pursuant to State legislation. Federal policy also supports and funds those directions. The overriding goal of the legislation is to provide for the consistent accommodation of bicycles on Minnesota roadway projects regardless of funding source. The legislation also seeks to preserve existing bikeway infrastructure by requiring the replacement and/or relocation of facilities displaced or destroyed by a roadway project.

The two major federal directions related to transportation, the Federal Planning Requirements and Environmental Justice, are consistent with the provision of bicycle and pedestrian facilities.

Chapter IV: Mn/DOT Policy and Action Plan for Bicycle Transportation

Pursuant to state and federal guidance, and in conjunction with the Minnesota Statewide Transportation Plan, Mn/DOT bicycle policy is defined by the following vision and mission:

Mn/DOT Vision for bicycle transportation:

Minnesota is a place where bicycling is a safe and attractive option in every community. Bicycling is accommodated for daily transportation and for experiencing the natural resources of the state.

Mn/DOT Mission for bicycle transportation:

Mn/DOT will safely and effectively accommodate and encourage bicycling on its projects in Minnesota communities, and in other areas where conditions warrant. Mn/DOT will exercise leadership with its partners to encourage similar results on their projects.

Mn/DOT's statewide transportation vision is to create a coordinated transportation network that meets the public's needs for safe, timely and

[10] *Pursuant to the 2001 National Household Travel Survey, per Pucher and J Renne, "Socioeconomics of Urban Travel: Evidence From the 2001 NHTS," Transportation Quarterly 57 (2003).*

predictable travel. Its mission is to help Minnesotans travel safer, smarter and more efficiently. The routine inclusion of bicycle facilities in developing Mn/DOT projects and programs enables the bicycle to be used for shorter trips within Minnesota communities, and to contribute to Mn/DOT's statewide transportation vision and mission.

Priorities:

To maximize the cost-effectiveness of future Mn/DOT investments in bicycle transportation, the following priorities should guide decision-making within the scope of this Plan:[11]

1. All project elements within 20 year urbanized areas on which bikes are legal
2. Projects within five miles of Regional Trade Centers, Levels 0-3
3. Minnesota Scenic Bikeway System
4. Other areas where needs exist

Low volume bicycle use in sparsely populated areas should generally be accommodated through cooperative use of available roadway and shoulder areas.

Performance measures and targets

Performance measures and targets are the means by which Mn/DOT achieves its missions. In support of the 2004 Bicycle Modal Plan mission, a series of performance measures and targets are defined to guide Mn/DOT's investment decision-making process as it relates to bicycle accommodations.

The measures and targets, detailed on the next page are divided into:

- Broad outcomes to which Mn/DOT contributes, such as increased user participation and reduced crash rates.[12]
- Mn/DOT output, such as the percentage of projects that are completed that include safe and effective accommodations, specific project types that are accomplished, and the participation of Mn/DOT districts and partners in accommodation projects.
- Mn/DOT process, such as planning, design, construction and maintenance manuals, state aid rules and staff training, and the effective collection of data related to bicycle infrastructure.

Fiscal Impact of the Plan

In order to estimate the cost to Mn/DOT of implementing this Plan, a sample set of eight current bonding accelerated projects was reviewed in detail to determine the gap between currently planned bicycle and pedestrian accommodations, and those that would result from following the Modal Plan. The sample projects are found in the Appendix. Across this sample of projects, the cost of the additional facilities recommended by the Modal Plan averaged less than 1% of project cost, with a range of

[11] See discussion of primary scope on page 3.

[12] While bicycle related data remains rudimentary, the US Census began to collect bicycle commuting data in 1990. Comparing the 1990 and 2000 data indicates that in Minnesota communities of 5000 or greater population bicycle commuting increased an average of 3% over that decade. Crash data is collected by the Department of Public Safety. When utilized with exposure data such as bicycle miles traveled, it allows comparison of crash rates with other modes. Bicycle miles traveled have been calculated for Minnesota between 1964 and 1989 (See Plan B, Appendix B, Mn/DOT, 1992). Expanding that data is planned to be accomplished per Additional Recommendation #18, page 104.

Measures and Targets

A. Broad Outcome Targets to Which Mn/DOT Contributes

1. By 2010, bicycle commute rates in Minnesota communities of 5000 or greater population will increase an average of 4% from 2000 levels.
2. Fatal and A Injury bicycle crash rates in 2010 will be reduced from 2000 rates, contributing to the Toward Zero Deaths program and US DOT goals.

B. Mn/DOT Output Targets

3. One free right turn traffic calming pilot project will be completed by 2006.
4. By 2008, new construction and reconstruction projects in 20 year urban areas, and pavement preservation projects where possible, will include safe and effective bicycle accommodations on those project elements where bicycles are legal, barring exceptional circumstances (*see Guidance*).
5. By 2008, all crossings of 20 year urban IRC improvement projects will include safe and effective bicycle accommodations, barring exceptional circumstances (*see Guidance*).
6. By 2007, partners will be identified, MN Scenic Bikeway route concepts and partner contributions will be defined, and target values for miles of tour routes to be identified, approved, signed and mapped will be established.
7. By 2008, each Mn/DOT district will participate in one or more special bicycle improvement projects per biennium (*See Guidance*).

C. Mn/DOT Process Targets

8. By 2006, all pertinent Mn/DOT design, planning, construction, and maintenance manuals and state aid rules will include effective bike guidance.
9. By 2006, a process for project reviews will be developed, evaluated, and institutionalized.
10. By 2006, a pilot program for innovative treatments will be developed and launched.
11. Beginning in 2006, 30% of Mn/DOT engineers, planners, and transportation specialists and consultants engaged in planning, design, contract management, or cooperative agreements will have completed a one-day bike/pedestrian design training session each year.
12. By 2011, comprehensive data will be up to date and managed on Mn/DOT infrastructure to do effective bicycle and pedestrian facility planning, and work will have been done with other partners to develop similar data for their on-road and trail bicycle and pedestrian systems and accommodations.

0%-5%. Accounting only for bicycle improvements would further reduce this range. In general, these sample snapshots found that the bulk of recommended accommodations were already a part of project documents. Missing accommodations included: adding extra shoulder width or warning signs when right turn lanes overlay shoulders; adding special pavement coloring and other treatments to free right turn conditions; adding second sidewalks to bridges in some cases, and adding 'change lanes to pass bicycles' signing where bike lanes weren't feasible.

Chapter V: Toward a Minnesota Scenic Bikeway System

Mn/DOT's policy for making bicycle-related shoulder investments has been largely defined by the 1987 Trunk Highway Bicycle System Plan, which focused on making safe bicycle connections between Minnesota communities and State parks.

This 2005 Plan proposes that interconnected cross-state routes be fully developed in order to capitalize on the superior biking experiences that are possible on many different types of highway and trail facilities. Partnerships between State agencies, county and city governments and non-governmental organizations will be established for the purpose of determining those roadways and trails safest and most attractive for bicycle touring.

Chapter VI: Supplemental Design Guidance

Supplemental design guidance has been developed to give design engineers additional means by which to improve the safety of bicyclists and pedestrians, even under conditions of limited right of way and other constraints. These additional treatments will be incorporated into Mn/DOT's design guidance as appropriate, some only after additional pilot testing. Sample treatments are listed below:

Sample Supplemental Treatments
(Numbers in parenthesis refer to treatment numbers)

- Well-signed Alternate Bicycle Route (02)
- Bike Lanes on Constrained Rights of Way (04,05)
- Wide curb lane (07)

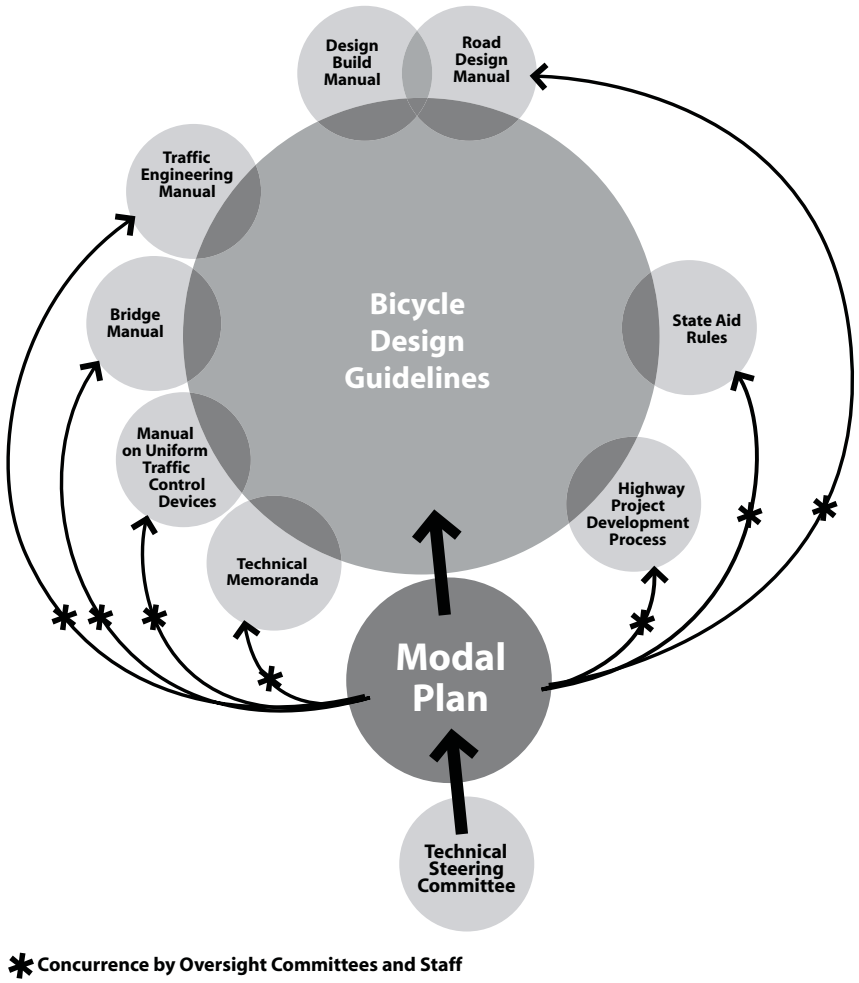
Chapter VII: Implementation

This chapter specifies the integration of bicycle design standards into Mn/DOT's Road Design and other primary manuals, training of Mn/DOT staff and consultants, and the provision of technical assistance by Mn/DOT's Bicycle Unit as the final support mechanism for the implementation of these policies and procedures. *Figure 1* shows the relationship among the various design plans and manuals.

This chapter also acknowledges the key roles and responsibilities of local, county and MPO authorities in planning bicycle transportation

networks, and the importance of exercising those responsibilities for Mn/DOT's bicycle infrastructure investments to be best planned and developed.

Figure 1: *Coordinating Mn/DOT Guidance for Safe Bike Accommodation: Relationships Diagram*



Chapter VIII: Additional Recommendations

The Bicycle Modal Plan represents the most recent initiative in continuing to develop high quality bicycle accommodations in Minnesota. There are still many improvements that can be made. For example, technology improvements in map-making mean that up-to-date, accurate maps can be produced virtually on demand.

Working together on the common goal of bike safety improves interagency cooperation. Various pilot projects such as bike/transit or the nationally recognized “safe routes to school” project create more public awareness of the benefits of bicycling. This chapter enumerates a number of such additional promising initiatives.

“Bicycle and pedestrian ways
shall be established in all
new construction and reconstruction projects
in urbanized areas...”

– *FHWA Nonmotorized Design Guidance*

MINNESOTA DEPARTMENT OF TRANSPORTATION

I. Introduction

Minnesota has long been a leader in taking an active approach to designing transportation networks where a full range of modes are accommodated. Roadway design generally considers bicyclists and pedestrians in the planning. However, more needs to be done to encourage and accommodate safe trips by bicycle.

In urban America, US DOT data indicate that bicyclists are 12 times more likely, per mile traveled, to be killed than automobile occupants.[1] While 73% of rural highways in Minnesota achieve ratings of good or fair for bicycles, only 24% of urban arterials achieve those ratings.[2] A recent study suggests that it is those substandard urban arterials without bike lanes that account for approximately two-thirds of urban bicycle accidents.[3] Bridges over freeways and rivers often become barriers in otherwise bike and pedestrian-friendly networks of residential streets. These are problems that Mn/DOT can play a role in solving.

Studies indicate safe infrastructure is the key to achieving bicycle mode shift.[4] Issues of traffic congestion, environmental protection, environmental justice, aging demographics, and health all underscore the wisdom of more fully capitalizing on this most economical and efficient of modes. Federal and state legislation and policy give us the authority and responsibility to do exactly that: to more fully capitalize on bicycle transportation.

Developed with the oversight of a Technical Steering Committee,[5] this Plan clarifies Mn/DOT's roles and outlines the steps needed to *simplify and expedite* the process of safely accommodating bicycles in Mn/DOT projects and programs. Incorporating the appropriate standards in Mn/DOT's primary road design and planning documents is the most important of those steps.

The primary scope of this Plan is to address bicycle needs on all infrastructure that Mn/DOT owns on which bicycle use is legal,[6] including trunk highways (TH), and bridges related to trunk highways or over other barriers such as rivers. The secondary scope of this plan is to suggest guidance for bicycle policy on infrastructure over which Mn/DOT has some influence, such as county state aid highways (CSAH's) and municipal state aid streets (MSA's). The Plan does not address retrofitting existing deficient infrastructure, but is designed to minimize the need for future retrofitting.

[1] *J Pucher and L Dijkstra, "Promoting Safe Walking and Cycling to Improve Public Health: Lessons from the Netherlands and Germany", American Journal of Public Health, September 2003, p 1509-1516.*

[2] *Mn/DOT study using Bikeway Mapping criteria, Comprehensive State Bicycle Plan, Mn/DOT (1992), p 23*

[3] *See "2004 Bicycle Accidents", City of Minneapolis Public Works Transportation, (August 2004), on file in the Mn/DOT Office of Transit.*

[4] *The Bicycle: Vehicle for a Small Planet, World Watch Paper 90 (1989), p 31; Bicycling Magazine/Harris Poll (1991).*

[5] *The Technical Steering Committee was made up of 13 Mn/DOT representatives and seven transportation partners' representatives. The committee roster appears in Appendix, page 107.*

76% of bike-legal urban arterials rate poor or unsatisfactory for bicycling.

By implementing this plan, Mn/DOT anticipates that fewer roadway users, including bicyclists, will be exposed to unnecessary hazards. Travel choices and convenience will be cost-effectively improved for all roadway users.

Plan Initiatives

The Mn/DOT Bicycle Modal Plan includes three key initiatives:

Mn/DOT Policy and Action Plan
The first initiative clarifies policy directives under which accommodating bicycles and pedestrians are required. These are expressed in the form of vision and mission statements along with targets for the relevant measures identified by the State Transportation Plan. Additional *measures, targets and guidance* that ensure the safe accommodation of bicycles on Mn/DOT projects are also included.

Minnesota Scenic Bikeways
The second initiative recommends an interagency process for identifying, maintaining, mapping, and signing a premiere system of Minnesota Scenic Bikeways that connect existing low traffic and shouldered roads and off road trails. The purpose of scenic bikeways is to attract bicyclists to the safest available statewide routes. Bicyclists will utilize some of the trunk highway paved shoulders identified by the 1987 Bicycle System Plan.

Supplemental Design Guidance
The third initiative outlines supplemental design guidance developed to give additional flexibility in improving the safety of bicycles even under conditions of limited right-of-way and other constraints.

In addition to the above, this Plan sets in motion a process to simplify the accommodation of bicycles by incorporating standard design treatments into Mn/DOT's Road Design Manual and other planning and design documents.

Statewide Planning Context

Mn/DOT's transportation planning/programming process begins with its *Strategic Plan*. The *Strategic Plan* sets the vision, mission, and directions for the Department. This is the high-level, broad statement of the agency's purpose and priorities that includes three overarching Strategic Directions:

- *Safeguard what exists*. This direction affirms Mn/DOT's commitment to preservation of the existing transportation system infrastructure and services.
- *Make the network operate better.* This direction affirms Mn/DOT's commitment to improvement of the transportation system.
- *Make Mn/DOT work better*. This direction affirms Mn/DOT's com mitment to continuous improvement of its processes and manage ment of its resources.

[6] *"Is legal" includes not only the legal status conveyed by state law for bicycles on most state roadways, but the "practicably legal" status that can be effectively created where necessary, for example by including a jersey barrier separated bike path as part of an otherwise limited access river bridge.*

The *Minnesota Statewide Transportation Plan*, adopted in August 2003, is a long-range plan that provides a policy framework and performance goals to ensure that the agency is making progress in achieving the directions of its *Strategic Plan*. The *Statewide Transportation Plan's* ten policies are aligned with the three strategic directions, resulting in policies that consider the entire network of transportation systems, including:

- system infrastructure and services,
- system management and operations,
- system preservation and expansion,
- the movement of people and freight, and
- the range of competitive and cost-effective travel choices.

Together, the *Strategic Plan* and the *Minnesota Statewide Transportation Plan* create the statewide planning context within which the *Mn/DOT Bicycle Modal Plan* is developed. (*see Figure 2 below*.)

While the *Minnesota Statewide Transportation Plan* encompasses major modal groups: highways and bridges, bus and rail transit, bicycles and pedestrians, freight, rail, waterways and aeronautics, it does not provide full-scale system level planning for each of these modes. Modal plans, such as this plan for bicycles, implement the Statewide Transportation Plan by developing additional performance goals/objectives and setting targets where necessary. Modal plans identify strategies and investments needed to reach those performance goals. Within fiscally constrained budgets, modal plans can help identify priorities for investments.

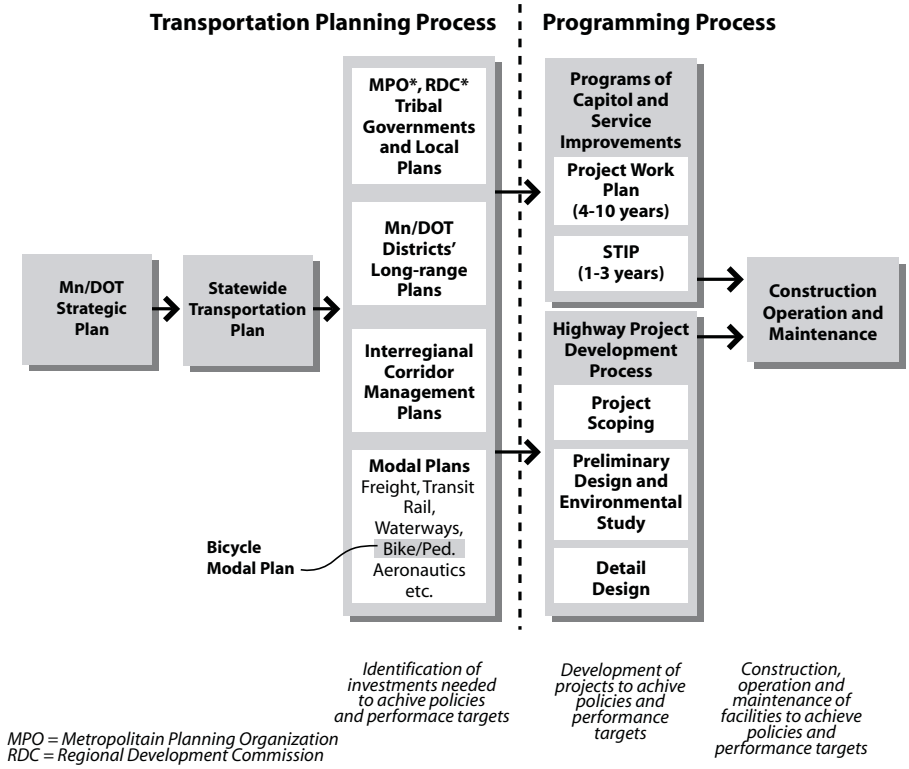


Figure 2: *Mn/DOT's Planning and Programming Process*

Rules of the Road

The rules of the road for bicycle users are contained in MS 169.222. They basically allow bicyclists all the rights and responsibilities of other vehicle operators, with a couple of unique provisions. One that is particularly key to this plan is that which allows a bicyclist to "claim a full lane" when there is insufficient space for a bike and motor vehicle to safely co-exist side by side in using the same lane. Bicycle driving instructors advocate this technique as the safest way to ride under those circumstances, and is widely practiced by advanced bicyclists for those reasons.

Because of this legal standing and practice, on roads where periodic obstruction of throughput would be detrimental, more reason exists to implement one of the design options which allocate exclusive or preferential space to bicyclists out of the path of motor vehicles.

Planning Process

A Technical Steering Committee oversaw the twenty month process of developing this plan over the course of ten regular committee meetings. The committee was made up of thirteen representatives from Mn/DOT plus Federal Highway Administration (FHWA), Metropolitan Planning Organizations (MPO), and Regional Development Commissions (RDC), city, county, University of Minnesota, and State Bicycle Advisory Committee representatives. The Planning & Urban Design Group at URS Corporation along with their subconsultant, Alta Planning+Design, were the consultants on the project.

All key elements of this modal plan were discussed in depth by the Technical Steering Committee, which operated on a consensus basis. In addition, Mn/DOT management provided regular oversight and direction. Special meetings were held with other internal groups to discuss key issues as they arose (*see Appendix II, Special Review Meetings*). Once the Bicycle Modal Plan has been implemented, bicycling will be thoroughly integrated into Mn/DOT's planning and design process.

Relationship to Other Mn/DOT Bike Guidance

In the interest of streamlining project development processes, the content of the Mn/DOT Bicycle Modal Plan will be integrated into other Mn/DOT guidance documents, as depicted in *Figure 1, page 8 and Figure 3*. In addition, as the Minnesota Scenic Bikeways program develops, it will be further documented in a separate plan as a successor to the 1987 Bikeway System Plan.

Implications for Mn/DOT

This Plan clarifies and operationalizes Mn/DOT's policy of routine safe bicycle accommodations in urban areas per FHWA guidance and MN statutes. It also increases design flexibility with which to provide safe accommodation, and simplifies and expedites project development processes through design manual upgrades. The result of these

changes will be more efficient and cost-effective use of transportation infrastructure through consistent bike lane and shoulder striping, and other practices.

Finally, Mn/DOT will partner with other road and trail authorities to select, map and sign the safest and best tour routes regardless of jurisdiction. These will be part of a new AASHTO initiative of national tour routes.

Next Steps

The plan development process resulted in increased awareness of opportunities for improving bicycle and pedestrian accommodation for many leaders within Mn/DOT. As a result, many actions are anticipated or already underway, including bicycle upgrades to the Mn/DOT Road Design Manual.

Key advances in improving the safety and utility of bicycle accommodation require formal adoption and implementation of the policy, measures, targets, and guidance found in this plan.

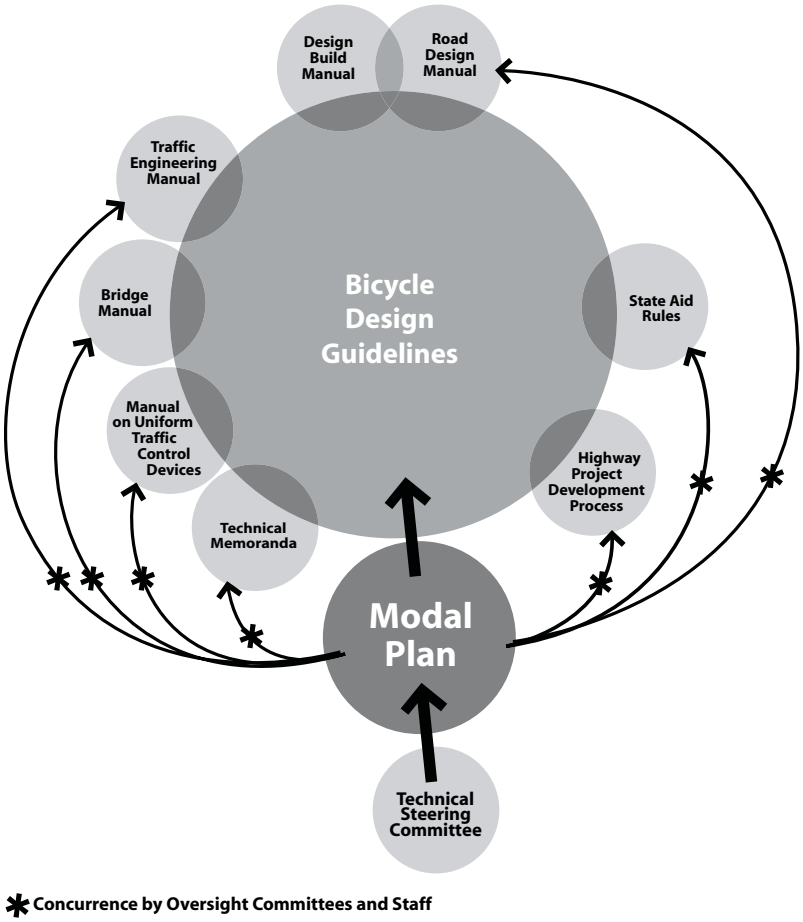


Figure 3: *Coordinating Mn/DOT Guidance for Safe Bike Accommodation: Relationships Diagram*

MINNESOTA DEPARTMENT OF TRANSPORTATION

II. The Role of the Bicycle in Minnesota's Transportation System: Past, Present, Future

History

Bicycling has long been recognized as a popular and efficient travel mode within Minnesota's overall transportation system. Bicyclists founded the national Good Roads movement that first lobbied for paved roads in the U.S. In St. Paul, farmers and bicyclists joined together at the first Minnesota Good Roads Convention in 1894. Two years later, the State's first bike path was installed around Lake Harriet in Minneapolis. By 1902, Minneapolis had 57 miles of mapped paths, and a reputation as a "wheelman's paradise".[2]

The national fascination with bicycles soon had competition, in the form of trolleys and automobiles. The competition was so stiff that, between 1910 and the 1960's, bicycles became largely relegated to the status of recreational vehicles and toys for children.

The 1970's saw a resurgence of interest in bicycling, marked locally by the 1967 re-opening of the bike path around Lake Harriet in Minneapolis,[3] spurred on by the Middle East oil embargo of 1973. Several pieces of landmark legislation were passed by the Minnesota Legislature that gave two State agencies new, proactive roles in developing Minnesota's bicycle infrastructure.

In the early 1970's the Department of Natural Resources (DNR) was charged with developing a system of State Trails, which have largely been built on abandoned railroad rights-of-way. DNR has also developed bicycle trails within many State parks.

In 1976, Mn/DOT began the execution of its new responsibilities by developing guidance for bicycle transportation statewide. This included standards and guidelines for determining the relative suitability of roadways for bicycling, and depicting that suitability for roads throughout the state on bikeways maps. These maps serve as an inventory of bicycle infrastructure as well as a navigation aid to bicyclists.

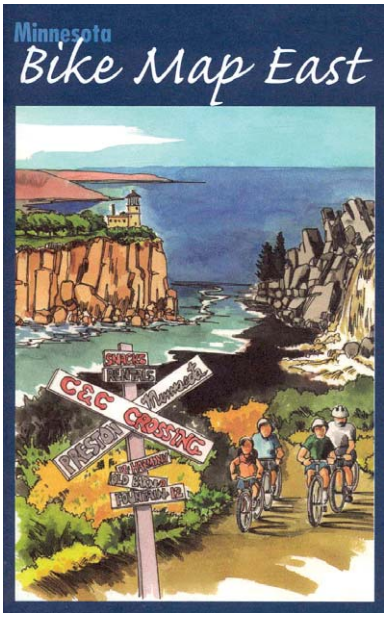
To date, three editions of the Minnesota Bikeways maps, and two editions of design guidelines have been developed, printed and made available to other units of government and to the public.

Bicycling is recognized as an important transportation choice in Minnesota. As early as 1989, sixty-three percent of Minnesota adults were bicyclists, nearly twice the national average…with nearly half of bicycle miles traveled being for transportation purposes.[1]

[1] *Plan B, The Comprehensive State Bicycle Plan, Mn/DOT, 1992, p 7; Appendix B, p B1c.*

[2] *Arey, Richard, Twin Cities Bicycling, Minnesota Outdoors Press (1995), p 9-12.*

[3] *Ibid, p 14.*



Current Mn/DOT Bicycle Guidance Publications

- Trunk Highway System Plan (1987) (to be supplanted by this plan)
- Plan B, The Comprehensive State Bicycle Plan, Mn/DOT (1992)
- Minnesota Bicycle Transportation Planning and Design Guidelines (1996)
- Mn/DOT Policy on Bikeway and Other Non-Motorized, Multi Use Trail Accommodation within Trunk Highway Right-of-Way (Re-issued, 2004), Technical Memorandum 04-03-ES-01

Mn/DOT's bicycle responsibilities were broadened by the 1984 legislature, which created a State Bicycle Advisory Committee[4] and the position of State bicycle coordinator to provide additional leadership in the development of bicycle transportation in Minnesota. Through a series of annual State conferences, the additional effort yielded the nation's first Comprehensive State Bicycle Plan. This effort also influenced the bicycle provisions of the landmark 1991 national transportation legislation, the Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA). Since ISTEA was passed, federal investments in bicycle facilities nationwide have increased from approximately $12 million per year to $540 million per year.

Locally, ISTEA-influenced bicycle improvements started quickly, with Minnesota's first application of “straight-through” bike lane striping (following AASHTO guidelines), on Summit Avenue in St. Paul in 1992. This was followed in 1994 with an extensive system of bicycle lanes in downtown Minneapolis.[5] A year later, Minneapolis adopted a five-year plan for bicycle highways, largely on abandoned railroad rights-of-way, and broke ground for the nation's first divided bicycle freeway.[6]

Since 1993, the Metropolitan Council (the Metropolitan Planning Organization (MPO) for the Twin Cities) and some Area Transportation Partnerships (ATPs) have awarded extra points in ranking for highway projects that include bike accommodations.

In 1999, Mn/DOT adopted a Technical Memorandum requiring the safe accommodation of bicycles in urban areas. In 1999 and 2000, the US DOT issued policy guidance that requires that bicycling and walking facilities be incorporated into all federally funded transportation projects unless “special circumstances” exist.

Spurred by the enhancements funding category of ISTEA and its successor legislation, bicycle projects have continued to be funded throughout Minnesota communities, from the Gitchi Gammi State Trail on the North Shore of Lake Superior, to bikeway development in Winona, to bike route signing in Duluth, with trail development from Blue Earth County to the Iron Range. The Twin Cities’ bicycle infrastructure is starting to look like an impressive *system* (*see Figure 4*).

[4] *The State Bicycle Advisory Committee is made up of State agency representatives plus citizen bicyclist representatives.*

[5] *Arey, p 17.*

[6] *The Cedar Lake Trail, connecting St. Louis Park with downtown Minneapolis.*

[7] *One example of a formal trail association is the Southeastern Minnesota Association of Regional Trails.*

[8] *Walking accounts for 3.3% and biking accounts for 0.5% of trips to work in Minnesota communities of 5000 or greater population during the period the census is conducted. Forms are mailed out at the end of March or in the first week in April.*

[9] *Minnesota cities of 5000 or greater population showed average increases in bicycling to work of 3% between 1990 and 2000. Minneapolis ranked third among large cities nationwide in bicycle commuting, after only Tucson and San Francisco. Source: Census Data cross-referenced with High Density Precipitation Data from www.climate.umn.edu; Mn/DOT.*

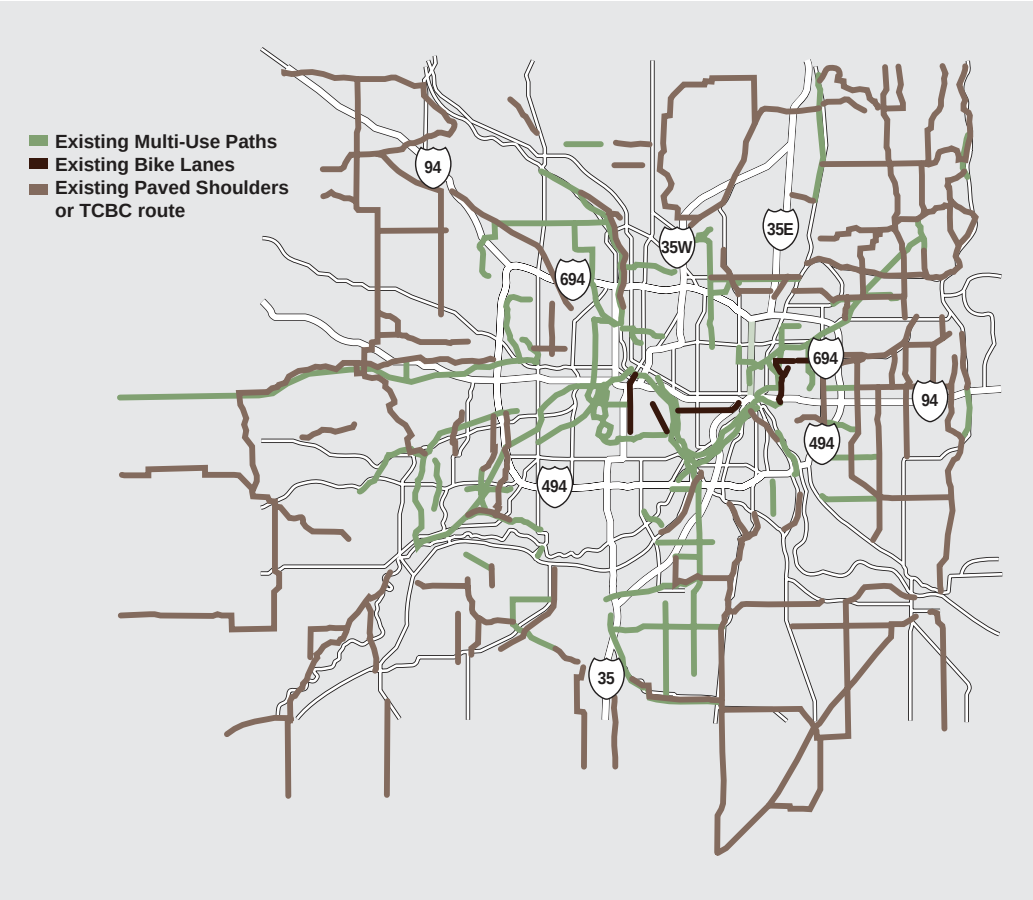


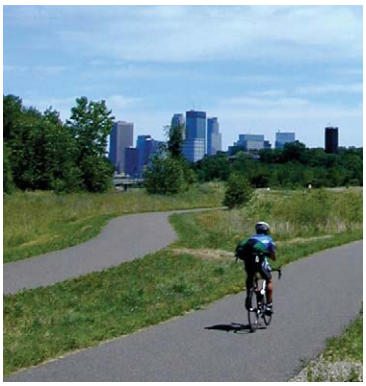
Figure 4: *Primary Twin Cities Bicycle Infrastructure 2002. (map). A landmark effort began mapping all bicycle infrastructure in the Twin Cities in 2001.*

As enthusiasm for trails and other bikeways has built, additional coordination has taken place between Mn/DOT and DNR, and formalized or de facto regional trails associations have developed.[7] This has led to the development of regional trails plans which have further enabled trail authorities to create new rights of way where necessary, desirable, or spectacular.

Results: Potential Realized Today

In addition to its popularity as a recreational activity, bicycling has become a significant mode of transportation for short trips, and a feeder mode to transit for longer trips. U.S. Census data for 2000 indicate that 3.8% of Minnesotans in communities of 5000 or greater biked or walked as their primary mode of transportation to work.[8] Moreover, the census shows a 3% increase in bicycling to work[9] in Minnesota in the last decade, during which bicycle infrastructure was significantly expanded.

Perhaps most tellingly, the census shows Minneapolis to be a national leader in bike commuting, with a 1.9%-2.6% mode share. This puts Minneapolis third in the nation in bike commuting, after only Tucson and San Francisco, and ahead of more popularly recognized “bike cities” such as Seattle, Washington, and Portland, Oregon.



The first three mile segment of the nation's first divided bicycle freeway connected St. Louis Park with downtown Minneapolis.

Metro/State

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CENSUS 2000

In Minneapolis, bike commuting thrives

Courtesy of Star Tribune; published Wednesday, September 25, 2002

The Cedar Lake Trail, which connects downtown Minneapolis with points south and west, is part of the extensive system of off-road bicycle paths luring city residents out of their cars. Minneapolis ranked third among the nation's big cities in the percentage of commuters who travel by bike.

Minnesota's significant successes in bike transportation to date have come in spite of our famous winter weather. While winter is predictably the "slowest" season for biking in Minnesota (only an estimated 0.2% of all biking takes place between November 1 and April 15)[10], both of the Twin Cities' major newspapers have declared that "…you see more people biking in Minneapolis in winter than you do any time of year in Los Angeles." Indeed, the Nordic countries have also proven that biking is not just a fair weather mode: some towns in Sweden plow their bike paths before their roadways.

Future Growth Potential

Worldwide, the average bicycle trip length is approximately two miles[11]. While recreational and fitness bicycling often exceeds that average in the US, the two-mile trip is within the average person's ability to use a bicycle for daily travel needs.

Nationwide, forty-one percent of all trips within communities are less than two miles[11] in length, and two thirds of trips are less than one mile in length. Eighty-nine percent of trips one to two miles in length are made by car.[12]

[10] *Plan B, Appendix B, p B-4, Mn/DOT (1992).*

[11] *Bicycle Transportation for Energy Conservation, USDOT (1980)*

[12] *Pursuant to the 2001 National Household Travel Survey, per Pucher and J Renne, "Socioeconomics of Urban Travel: Evidence From the 2001 NHTS," Transportation Quarterly 57 (2003).*

These large numbers of short trips are prime candidates for bicycle transportation—once such bicycle travel is safely enabled. The growth potential here dwarfs the significance of the slowly increasing commute distance in American cities.

US DOT has set a national target to double the number of bicycle trips throughout the U.S. One indication that this is possible in Minnesota, is the Mn/DOT Statewide Omnibus Survey completed in February of 2004.[13] It found that one in ten Minnesota adults had cycled to work or school at least once in the past year. A national survey done for Bicycling Magazine found that one in five Americans would commute by bicycle if safe space were available.[14]

Additional data from Mn/DOT's 2004 survey shed some light on other trips; for non-work-related trips one third of those surveyed had used bicycles while fifty percent walked.

Another estimate of the magnitude of growth potential in bicycle transportation comes from a landmark study of Twin Cities Metropolitan Area in 1973. Noting that the average door-to-door travel speed for auto trips is only 20 miles per hour, the study estimated that bikes would make eight percent of the daily metro area trips if a good bikeway system were built.[15]

Meeting the Primary Challenge: Safety

Though advances have been made, safety challenges need to be addressed for bicycles. A study using US DOT data indicates that per mile traveled, bicyclists in American cities are twelve times more likely to be killed than automobile occupants.[16] Of the 600 average annual traffic deaths in Minnesota, bicyclist fatalities have hovered around ten per year. Twenty-five percent of bicycle fatalities occur when an overtaking motorist strikes the bicyclist from behind.

Improving the safety of bicycle facilities within the roadway environment will encourage more people to safely use these beneficial modes of transportation, and can contribute to achieving Statewide Transportation Plan targets for reducing roadway fatalities.

A recent internal review of Mn/DOT construction projects indicated that most bike accommodations were already being included by Mn/DOT engineers. Relatively minor additions could often complete the job of accommodating bikes, for example, providing a colored bike lane through intersections with right turn lanes (*see Figure 5*), or widening a shoulder otherwise overlain by a right turn or bypass lane (*see Figure 6*).

[13] *Mn/DOT Statewide Omnibus Study 2003/2004, MarketLine Research, Inc.*

[14] *National Harris Poll conducted for Bicycling Magazine, 1991.*

[15] *Arey, p 15. That study outlined a proposal for an 1856 mile bikeway system in the Twin Cities.*

[16] *J Pucher and L Dijkstra, "Promoting Safe Walking and Cycling to Improve Public Health: Lessons from the Netherlands and Germany", American Journal of Public Health, September 2003, p 1509-1516.*

***Figure 5**: Blue Bike Lanes help to channelize bike traffic through complex intersections*

***Figure 6:** A small amount of extra asphalt adds a thoughtful measure of safety for cyclists using the shoulder*

The Broader Challenges

Meeting the safety challenges that exist for bicycle transportation will allow bicycle transportation to contribute to the solutions of even more intractable challenges for transportation and society at large. Five of these challenges are congestion, health and physical inactivity, an aging population, environmental justice, and climate change.

1. Congestion

Traffic congestion has consistently shown up on Twin Cities surveys as a high public concern. It is a quality of life issue that has the potential to undermine cities' economic viability and competitiveness. An annual national study indicates that the Twin Cities have the second highest rate of growth in congestion nationwide.[17]

[17] *Schrank, David, and Lomax, Tim, 2001 Urban Mobility Study, Texas Transportation Institute, Texas A&M University, http://mobility.tamu.edu/ums*

Yet experience in the U.S. indicates it is not possible to solve congestion with additional highway capacity. Strategically deployed transit shows promise.[18] Enabling bicycle access to express transit can increase the market for a given transit line while simultaneously providing a high degree of personal flexibility and mobility.

While there is a perception that people are in love with the automobile, and need its flexibility for commuting, a recent Mn/DOT study sheds new light on that subject. Completed in 2001, the study of solo commuters found that 84% go straight home from work two to five days per week. It also found that only 3% enjoy driving in rush hour traffic, while 16% appear to enjoy commuting by bus, and 48% "enjoy riding a bike on an off road bike trail through park-like areas".[19] These results may suggest that the bicycle, along with transit, may have a greater role in easing congestion than might otherwise have been thought.

A bicycle provides personal flexibility and mobility over the 'last mile' of trips made by transit

2. *Health and Physical Inactivity*

Sixty-four percent of adults in the U.S. are obese or overweight. Health care costs are soaring. The Center for Disease Control (CDC) has labeled obesity an epidemic and the nation's fastest rising public health issue, especially in children. Physical inactivity, a primary contributor to the obesity epidemic, has been cited as second only to smoking as a health risk for Americans.[20] CDC has pointed to the built environment and the transportation infrastructure as one of the causes of this epidemic.[21]

One of the first research studies to look at this link, between environment and obesity, found that amount of time spent driving had a greater correlation with obesity than did income, education, gender or ethnicity. It also found that people who lived within walking distance of shops (less than half a mile) were seven percent less likely to be obese than their counterparts who had to drive.[22]

Exploiting the growth potential of biking and walking may result in healthier people, cleaner air, and reduced health care costs.

3. *Aging Demographics*

Currently, more than one in five Americans age 65 and older do not drive, largely due to declining health.[23] Further, it is estimated that individuals still driving at age 70 will stop driving at some point, and spend on average 6-10 years "dependent on others to meet their transportation needs".[24]

The demographics of the United States will change dramatically during the next 25 years as baby boomers reach their 60's, 70's and beyond. The U.S. Census bureau projects that the number of Americans age 65 or older will swell from 35 million today to more than 62 million by 2025-nearly an 80% increase.[25]

Walking and bicycling (or in later years, tricycling) have the ability to add years of independence to our lives. Given the Surgeon General's

[18] *Curitiba, a city of one million in SE Brazil, has effectively solved congestion with what is thought to be the world's best bus system. With the highest car ownership rate in Brazil (one car for every three persons), it experienced a 30% decrease in car traffic over the same three decades as its population tripled: the buses are the most popular means of intracity travel.*

[19] *Multi-Modal Alternative Transportation Study, Mn/DOT, December 2001.*

[20] *Surgeon General's Report (1996)*

[21] *Health Factsheet, Surface Transportation Policy Project, www.transact.org/library/factsheets/health.htm*

[22] *Frank, Lawrence, research project utilizing a survey of 10,500 metro Atlanta residents, Georgia Tech, per Star Tribune, 5/31/04, p A8.*

[23] *Bailey, Linda, Aging Americans: Stranded Without Options, Surface Transportation Policy Project, www.transact.org.*

[24] *Foley, et al, Driving Life Expectancy of Persons Aged 70 Years and Older in the United States, in American Journal of Public Health, vol. 92, no. 8 pp. 1284-1289.*

[25] *Bailey, Linda, Aging Americans: Stranded Without Options, Surface Transportation Policy Project, www.transact.org.*

recommendation of 30 minutes of daily moderate exercise for better health, biking and walking have the ability to add significantly to the quality of life for older Minnesotans. Youth-fixated baby boomers in particular are expected to heed the "use it or lose it" call to action.

Also, as the population of Minnesota ages, consideration needs to be given to those seniors who continue to be active and who expect that trails and bikeways will be available both in urban and rural areas.

4. *Environmental and Social Justice*

The State of Minnesota has committed to making environmental and social justice part of its mission. Mn/DOT identifies and corrects programs, policies, and activities that have disproportionately high and adverse human, health, or environmental effects on minority and low-income populations.

The latest available statistics indicate that 17.6% of Minneapolis households do not own cars, many of these coming from low-income groups.[26] For those households that do own cars, transportation consumes 36 cents of every household dollar (double the American average).[27] Combining safe and attractive bicycling and walking facilities with effective transit systems could potentially alleviate some of these financial and mobility burdens for low-income populations. In addition, it can be noted that researchers suggest that bicycles are the most efficient form of transportation available.[28]

Creation of new and expansion of existing bicycling and walking facilities could spread the popularity of bicycling to new populations. As highway improvement projects are developed and implemented in Minnesota, safe and attractive bicycle and pedestrian accommodations should be incorporated into project designs. A long-range program for developing a more extensive system should also be a goal.

5. *Climate Change and Other Issues*

The growing scientific consensus around the reality of climate change makes diversifying Minnesota's transportation system with environmentally friendly modes prudent. The bicycle is one of those modes, and one that is easy and inexpensive to accommodate.

The US DOT states the climate change problem and its relationship to transportation as follows: "Transportation fuel use is a significant source of greenhouse gases. Furthermore, changes in climate could affect transportation systems. Transportation accounts for about a quarter of U.S. emissions, and is one of the fastest growing sectors. Most members of the scientific community now believe that buildup of these gases will cause changes in the earth's climate, including regional changes in temperature and precipitation, rising sea levels, and increasing severity of storms. We must provide transportation services while reducing the buildup of these emissions and preparing for the potential impacts of climate change."[29]

Other issues which stand to benefit from the strategic deployment of effective bicycle transportation infrastructure include reductions in oil

[26] *Travel Behavior Inventory (TBI), Metropolitan Council (2000), www.metrocouncil.org*

[27] *Housing Factsheet, Surface Transportation Policy Project, www.transact.org/library/fact-sheets/housing.htm*

[28] *Whitt and Wilson, Bicycling Science, MIT Press (1993).*

[29] *"Transportation: Part of the Problem, Part of the Solution", The US DOT Center for Climate Change & Environmental Forecasting, brochure, c 2001.*

consumption and reductions in air and water pollutants.

Summary

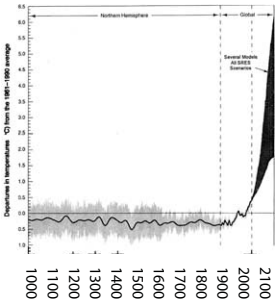
The many challenges enumerated make planning attractive, safe and useful bicycle accommodations extremely promising. There is the opportunity to appeal to numerous markets. Improving safety by making roads shared with drivers more amenable to bicyclists will have the cascade effect of making bicycling more attractive to commuters. Bicycle travel for people concerned about the environment and physical fitness is a market that is exploitable, particularly when roads and trails make the decision to use nonmotorized transportation appealing. As improved transit, advanced electric wheelchairs, low speed scooters and other similar conveyances are introduced to the transportation mix, more users for these expanding accommodations can be expected.

Exploiting the growth potential of biking will likely result in healthier people, cleaner air, reduced health care costs, reduced congestion, and more efficient use of road space and resources.

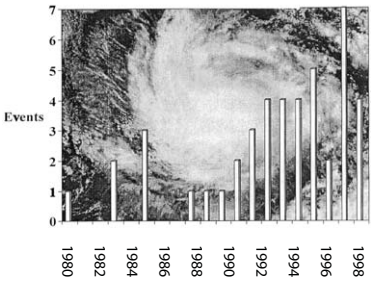
Communities can be more economically competitive to the extent that bicycle facilities are appropriately developed, in two ways: (1) that the communities' "overhead" in terms of personal operating costs for transportation can be reduced, and (2) that the greater quality of life rendered by bikeway and pedestrian development may attract those who can exercise choice in where to live, many of whom bring industry or other economic assets with them.

Minnesota is poised to continue as a leader in demonstrating the benefits and cost-effectiveness of bicycle and pedestrian transportation accommodations.

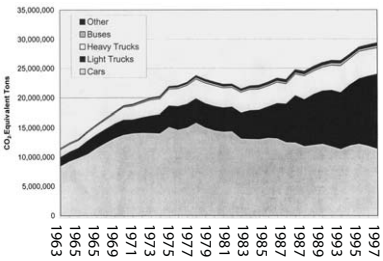
Variations of the Earth's Surface Temperature: 1000 to 2100



Number of Billion Dollar Weather Disasters



On Highway Emissions of Greenhouse Gases from Minnesota



[30] *Temperature chart source: IPCC WG I (Science) Summary for Policy-Makers, Third Assessment Report, 2001*

[31] *Weather chart source: NOAA/National Climate Data Center, 2000*

[32] *Emissions chart source: Mn/DOT*

SUMMARY OF FEDERAL AND STATE GUIDANCE REGARDING BICYCLE AND PEDESTRIAN ACCOMODATIONS

Federal Guidance

FHWA Nonmotorized Design Guidance, TEA-21, February 28, 2000

- *Bicycle and pedestrian ways shall be established in all new construction and reconstruction projects in urbanized areas (unless prohibited by law, excessive cost, or sparse population or other factors indicate absence of need).*

Federal Planning Requirements (TEA-21)

- *Support the economic vitality of the United States, and states and metropolitan areas especially by enabling global competitiveness, productivity, and efficiency.*
- *Increase the safety and security of the transportation system for motorized and non-motorized users.*
- *Increase the accessibility and mobility options available to people and freight.*
- *Protect and enhance the environment, promote energy conservation, and improve quality of life.*
- *Enhance the integration and connectivity of the transportation system, across and between modes throughout the state, for people and for freight.*
- *Emphasize the preservation of the existing transportation system.*

Environmental Justice (Presidential Executive Order 12898)

- *All projects using federal funds must identify and address the effects of all programs, policies, and activities on minority populations and low-income populations.*

State Statutes

Minnesota Statutes, Chapter 174, Minnesota Transportation Goals:

- *Promote and increase bicycling as an energy-efficient, non-polluting and healthful transportation alternative*
- *Provide safe transportation to users throughout the state*
- *Provide multimodal and intermodal transportation that enhances mobility, economic development, and provides access to all persons…*
- *Increase transit use in the urban areas by giving highest priority to the transportation modes with the greatest people moving capacity*
- *Ensure that the planning and implementation of all modes of transportation are consistent with the environment and energy goals of the state*

Minnesota Statutes, Chapter 116D, State Environmental Policy:

State government shall use all practicable means…

- *to assure safe, healthful, and aesthetic surroundings for all citizens;*
- *to maintain variety of individual choice;*
- *to encourage styles of living that minimize environmental degradation;*
- *to reduce the deleterious impact on air quality from operation of motor vehicles with internal combustion engines; and*
- *to minimize noise.*

To the fullest extent practicable the policies, rules, and public laws of the state shall be interpreted and administered in accordance with this chapter.

Minnesota Statutes, Chapter 160.264

When highway construction would otherwise destroy an existing bikeway or roadway used by bicycles, the road authority responsible shall replace the destroyed facility or access with one comparable.

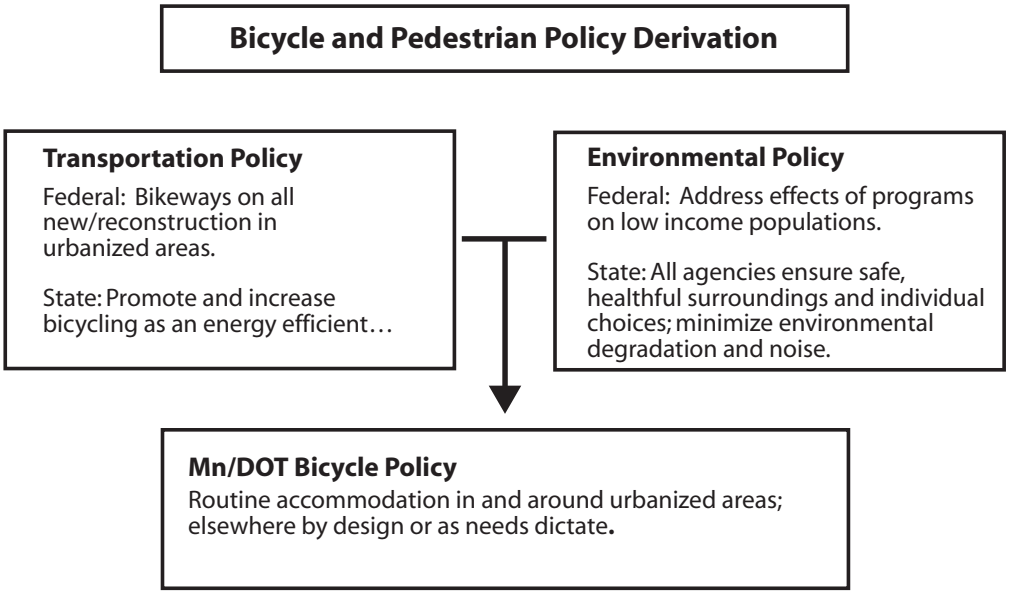
Minnesota Statutes, Chapter 160.265

- *The commissioner shall establish a program for the development of bikeways primarily on existing road rights of way.*

III. State and Federal Law, Policy, and Guidance

Introduction

Mn/DOT has substantial authority and responsibility for accommodating and encouraging bicycling, pursuant to State legislation. Federal policy also supports and funds those directions. Guidance comes from both transportation and environmental policy, as depicted below.



State Transportation Policy

State transportation policy is clear and direct when discussing bicycle accommodations. The statutes that enable the creation of the Department of Transportation, Minn. Statutes Chapter 174.01, Subd. 2, (14), specifically refers to bicycle transportation as part of the state's transportation system goals:

> "to promote and increase bicycling as an energy-efficient, nonpolluting, and healthful transportation alternative".

Additional state transportation statements from Minnesota Statutes Chapter 174 include the following, all of which may relate to bicycle and pedestrian planning, development, construction and safety:

- Provide safe transportation to users throughout the state
- Provide multimodal and intermodal transportation that enhances mobility, economic development, and provides access to all persons…
- Increase transit use in the urban areas by giving highest priority to the transportation modes with the greatest people moving capacity
- Ensure that the planning and implementation of all modes of trans portation are consistent with the environment and energy goals of the state.

Occasionally, State legislation is exceedingly explicit in setting policy, as in Minnesota Statutes Chapter 160.264 which further describes what must be done:

> "Whenever an existing bikeway, pedestrian way, or roadway used by bicycles or pedestrians or the sole access to such is destroyed by any new, reconstructed, or relocated federal, state, or local highway, the road authority responsible shall replace the destroyed facility or access with a comparable facility or access. Replacement is not required where it would be contrary to public safety or when sparsity of population…"
> http://www.revisor.leg.state.mn.us/stats/160/264.html

In addition to the legislation which outlines state policy regarding bicycle transportation, one piece of legislation defines a specific *program*, for the development and maintenance of bikeways, primarily on existing road rights-of-way. Further detail can be found in Minnesota Statutes Chapter 160.265 Bikeway Program.

State Environmental Policy

Minnesota Statutes Chapter 116D.02 Declaration of state environmental policy, is equally direct in describing the state's responsibility in promoting and maintaining an harmonious environment, including using "all practicable[1] means:

- to assure safe, healthful, and aesthetic surroundings for all citizens;
- to maintain variety of individual choice;
- to encourage styles of living that minimize environmental degradation;
- to reduce the deleterious impact on air quality from operation of motor vehicles with internal combustion engines; and
- to minimize noise.

To the fullest extent practicable the policies, rules, and public laws of the state shall be interpreted and administered in accordance with this chapter."

[1] *Practicable: possible to practice or perform*

Federal Transportation Policy

Mn/DOT also relies upon direction from the federal government in planning and developing transportation infrastructure.

Key among those directions is the FHWA Nonmotorized Design Guidance pursuant to the Transportation Equity Act for the 21st Century (TEA-21), February 28, 2000, which states,

> "Bicycle and pedestrian ways shall be established in all new construction and reconstruction projects in urbanized areas (unless prohibited by law, excessive cost, or sparse population or other factors indicate absence of need)".

The US DOT drafted the statement with input from public agencies, professional associations and advocacy groups. The adoption of the guidance is a way for public agencies to commit themselves to integrating bicycling and walking into the transportation mainstream.

Bicycle transportation accomodation can also help Minnesota to meet the following six Federal Planning Requirements promulgated by the FHWA pursuant to TEA-21:

- Support the economic vitality of the United States, and states and metropolitan areas especially by enabling global competitiveness, productivity, and efficiency.
- Increase the safety and security of the transportation system for motorized and nonmotorized users.
- Increase the accessibility and mobility options available to people and freight.
- Protect and enhance the environment, promote energy conservation, and improve quality of life.
- Enhance the integration and connectivity of the transportation system, across and between modes throughout the state,for people and for freight.
- Emphasize the preservation of the existing transportation system.

Federal Environmental Justice Policy

Federal regulations mandate the incorporation of environmental justice considerations into all Mn/DOT policies, programs, and activities. Presidential Executive Order 12898, issued in 1994, directs every Federal agency or agency using Federal funds to make environmental justice part of its mission by *identifying and addressing the effects of all programs, policies, and activities on minority populations and low-income populations.*

Transportation costs can be particular hardships for low-income populations. Safe and attractive bicycling facilities, in combination with effective transit service, can mitigate and potentially avoid these negative consequences. When transportation projects do affect these populations, full

and fair participation in the transportation decision-making process should be sought out.

Transportation Enhancements

In addition to broad policy mandates, there is one federal mandate that is explicitly funded, and that has been key to recent progress in bicycle infrastructure development. The Intermodal Surface Transportation Efficiency Act of 1991 provided for the “enhancement” category of projects that are funded with a percentage of the Surface Transportation Funds (STP). The STP funding included a minimum apportionment provision over the life of the act of 10% for enhancement activities.

Enhancement activities include twelve categories, including construction of pedestrian and bicycle facilities, and safety and education for bicyclists and pedestrians. There may be some overlap between the other categories that will have application to bicycle and pedestrian accommodations. The nature of a proposed enhancement project's relationship to surface transportation is very important for approval by FHWA as an enhancement project.

In Minnesota, the Area Transportation Partnerships (ATPs) are asked to program enhancement projects. To date, bicycle and pedestrian projects have represented the highest percentage of approved enhancement projects.

FHWA Final Guidance for Transportation Enhancement Activities provides further detailed information on enhancement projects.

Summary

Mn/DOT's most important priority, as articulated in the 2003 Strategic Plan, is to create a coordinated transportation network that meets needs for safe, timely and predictable travel. The mission is to enable Minnesotans to travel safer, smarter and more efficiently. The inclusion of bicycle and pedestrian facilities in the overall approach to developing projects and programs is an important means by which to implement those priorities and appropriately enables nonmotorized transportation for shorter trips within Minnesota communities.

The 2003-2023 Minnesota Statewide Transportation Plan reaffirms Mn/DOT's commitment to accommodate walking and bicycling for transportation purposes. It focuses those efforts on reducing crashes and roadway fatalities, on safe bicycle and pedestrian crossings of Interregional Corridors in regional trade centers, and on other measures and targets developed by this 2004 plan.

"Bicycle and pedestrian ways
shall be established in all
new construction and reconstruction projects
in urbanized areas..."

– FHWA Nonmotorized Design Guidance

MINNESOTA DEPARTMENT OF TRANSPORTATION

IV. Mn/DOT Policy and Action Plan for Bicycle Transportation

Vision and Mission Statement
Priorities
Performance Measures and Targets
Guidance
Fiscal Impact

Pursuant to state and federal guidance, and in conjunction with the Minnesota Statewide Transportation Plan, Mn/DOT bicycle policy is defined by the following vision and mission statements:

Mn/DOT Vision for bicycle transportation:

Minnesota is a place where bicycling is a safe and attractive option in every community. Bicycling is accommodated, both for daily transportation and for experiencing the natural resources of the state.

Mn/DOT Mission for bicycle transportation:

Mn/DOT will safely and effectively accommodate and encourage bicycling on its projects in Minnesota communities, plus in other areas where conditions warrant. Mn/DOT will exercise leadership with its partners[1] to encourage similar results on their projects.

Mn/DOT Transportation Vision and Mission:

Mn/DOT's statewide transportation vision is to create a coordinated transportation network that meets the public's needs for safe, timely and predictable travel. Its mission is "…to help Minnesotans to travel safer, smarter, and more efficiently". The routine inclusion of bicycle facilities in developing Mn/DOT projects and programs enables the bicycle to be used for shorter trips within Minnesota communities, and to contribute to Mn/DOT's statewide transportation vision and mission.

This routine inclusion of bicycle facilities also allows Mn/DOT to comply with its substantial authority and responsibility for accommodating and encouraging bicycling, pursuant to State legislation and federal policy.

[1] *Mn/DOT's partners traditionally include MPO's, RDC's, counties, cities, and townships. Additional partners include DNR and the Office of Tourism. Mn/DOT's relationships with its partners are often governed by cooperative agreements, municipal consent, and cost participation policies.*

Beginning with the 2003-2023 Minnesota Statewide Transportation Plan, the Minnesota Department of Transportation implemented a performance-based planning approach in its investment decision-making process. Mn/DOT will monitor, evaluate and consider performance-based transportation system needs when making investment decisions.

Priorities

To maximize the cost-effectiveness of future Mn/DOT investments in bicycle transportation, the following are the prioritized broad categories for safe bicycle accommodation as defined by this plan:

1. All project elements on which bikes are legal within 20 year urbanized areas
2. Projects within 5 miles of Level 3 or larger Regional Trade Centers
3. Minnesota Scenic Bikeways System
4. Other areas where needs exist[2]

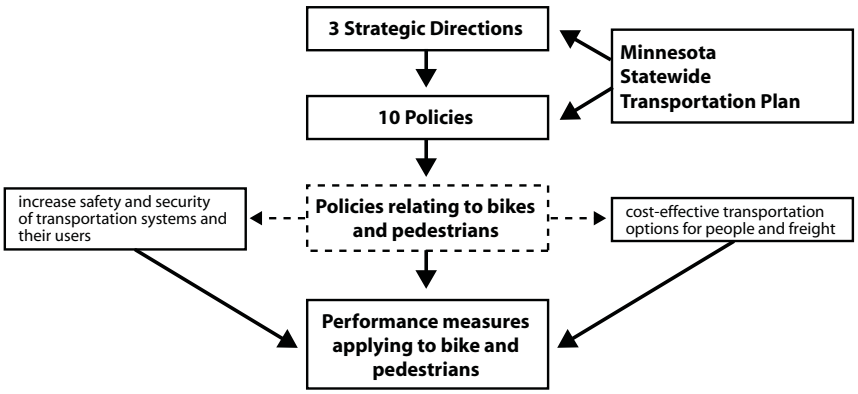
Low volume bicycle use in sparsely populated areas should generally be accommodated through cooperative use of available roadway and shoulder areas.

The intent of these priorities is that, if in any given budget year there is insufficient funding to accomplish all bicycle elements or projects that are desired and ready for construction, projects in lower priority categories would not be funded at the expense of those in higher priority categories.

Performance Measures and Targets

The Minnesota Statewide Transportation Plan provides a framework for Transportation Policies and Measures. Three strategic directions are central to the plan. These are safeguarding what exists, making the network operate better and making Mn/DOT work better. Ten overarching policies relate to these strategic directions. Measures provide a yardstick against which the units can chart their performance.

Performance measures have been developed for all of Mn/DOT's prod-



ucts and services in an effort to monitor and improve the effectiveness of service delivery. Measures can be roughly categorized into three levels of current usefulness. “Baseline” encompasses existing measures where targets are in existence and have been used. “Emerging” describes

[2] *The quintessential example of "other areas where needs exist" is evidenced by the existence of a well-worn pedestrian path in the grass along or near a highway.*

measures where a baseline exists but no targets have been used. “Developmental” measures are new categories; a baseline has not been established and targets have yet to be set. Measures are formulated to maximize alignment with Mn/DOT's strategic plan.

Much like the planning hierarchy discussed in Chapter I, there are multiple levels in the Bicycle Modal Plan that align with the Statewide Transportation Plan. Two Mn/DOT guiding policy statements have direct applicability to bicycle and pedestrian accommodations.

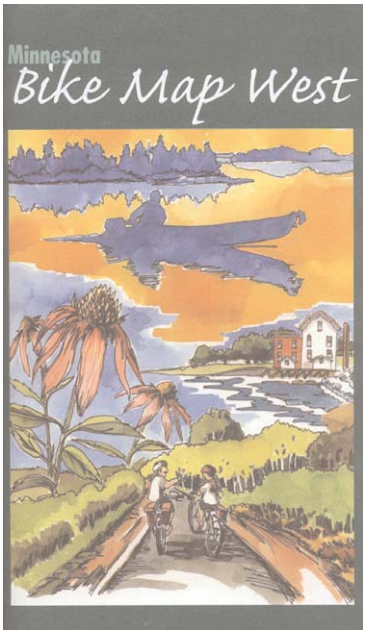
Policy 4, states that Mn/DOT will “provide cost-effective transportation options for people and freight.” Relevant desired outcomes include efficient, cost-effective, locally supported transit options available to transit dependent and transit choice customers. Developing accessible and safe bicycling accommodations provides additional options for the traveler. The following Policy 4 measure is one to which growth in bicycle transportation can contribute: 4.2T1: “Percent of peak period non-auto trips in RTCs”

Policy 7 states that Mn/DOT will “increase the safety and security of transportation systems and their users.” Relevant outcomes include reduction of crash rates, fatalities and personal injuries for transportation system users, as well as maintaining the security of travelers. Safe and effective bicycle facilities clearly are governed by this policy.

Keeping in mind the two overarching policy statements, a new mode specific measure for bicycle and pedestrian facilities was adopted by the Statewide Transportation Plan, within Policy 4.1P:

> Amount of facilities/services provided (pedestrian and bicycle facilities of interregional corridor crossings).
>
> “Percent of crossings of IRCs with appropriate bicycle and pedestrian accommodations.”

The Statewide Plan went on to state that the development of performance targets for bicycle and pedestrian accommodations are to be identified by the end of 2004. The following are those measures and targets to guide Mn/DOT investments in bicycle transportation. Reaching these targets ensures an appropriate and cost-effective means by which Mn/DOT can best carry out State statutes, Federal regulations, and the State Plan's policies relevant to bicycle transportation.



Outcome Targets

Outcome targets describe a desired state that can be evaluated and measured at a specified point in time. Mn/DOT cannot directly control the outcome, but can make significant contributions towards achieving the target. Where measures fall short, corrective action may be required. Corrective action may require a change in output or process activities. The outcome targets for bicycle accommodations are as follows:

By 2010, Mn/DOT and its partners will have developed adequate and appropriate bicycle facilities so that:

1. Bicycle commute rates in Minnesota communities of 5000 or greater population will increase an average of 4% from 2000 levels.[3]

2. Fatal and A Injury bicycle crash[4] rates are reduced from 2000 rates, contributing to the Toward Zero Deaths program and US DOT goals.

Output Targets

Output targets describe the way in which Mn/DOT incorporates bicycle and pedestrian accommodations into programs and projects. These measures describe the amount of work that will be done in order to reach the following targets. Note that some targets are urban-centered (U), others are rural (R), and others are a combination of both (B).

By 2006:

3. Mn/DOT will have completed a free right turn traffic calming pilot project as in the *Example 4*, page 56. (B)

By 2008 and each succeeding year:

4. All[5] new construction and reconstruction projects in 20 year urban areas, and pavement preservation projects where possible, will include safe and effective bicycle accommodations on those project elements where bicycles are legal, barring exceptional circumstances. (U)
5. All[5] crossings of 20 year urban interregional corridor (IRC) improvement projects will include safe and effective bicycle accommodations, barring exceptional circumstances. (U)
6. The Minnesota Scenic Bikeways System will be initiated by 2007:[6] (R)
   a. Partners', roles and contributions will be defined.
   b. Minnesota Scenic Bikeways System route concepts will be defined.
   c. Target values for miles of tour routes to be identified, signed, and mapped will be established.
7. Each district will participate in one or more special bicycle improvement projects per biennium.[7] (B)

Process Targets

Process targets describe how Mn/DOT performs its work and the way in which the process contributes to the achievement of the outcome and output targets.

By 2006, Mn/DOT will have institutionalized the following work processes:

8. Update and unify bike guidance, to be effective and integral, in:

[3] *While bicycle related data remains rudimentary, the US Census began to collect bicycle commuting data in 1990. Comparing the 1990 and 2000 data indicates that in Minnesota communities of 5000 or greater population bicycle commuting increased an average of 3% over that decade. Crash data is collected by the Department of Public Safety. When utilized with exposure data such as bicycle miles traveled, it allows comparison of crash rates with other modes. Bicycle miles traveled have been calculated for Minnesota between 1964 and 1989 (See Plan B, Appendix B, Mn/DOT, 1992). Expanding that data is planned to be accomplished per Additional Recommendation #18, page 104.See page 24, Mn/DOT Statewide Omnibus Study 2003/2004, for factors that would increase bicycling to work trips.*

[4] *Crash is as defined by the Minnesota Department of Public Safety, to be all reported crashes of bicyclists and/or pedestrians with motor vehicles. This is the only readily available data set in this area.*

[5] *"All" was deemed to be the appropriate target, despite its initially aggressive sound, for the following reason: If access, or bridges, or crossings are needed every X miles or Y feet for automobiles, they are likely needed at least that often for pedestrians and bicycles because of their much slower speeds.*

[6] *The Minnesota Scenic Bikeways System is described and defined in the Mn/DOT Bicycle Modal Plan, Chapter V.*

[7] *Special bicycle-pedestrian improvement projects may include capital improvements such as bike parking improvements, installation of pedestrian refuges, and completion of special segments of dedicated bike trails or bike lanes. Improvement projects may also include active participation in a regional trails group or coordination with bicycle enthusiasts, planning, or other participation in a cooperative bike-pedestrian planning project, improvement to bike-bus service connections, spring shoulder sweep program and sponsorship of community events that raise awareness of pedestrian and bicycle transportation options.*

- Minnesota Bicycle Transportation Planning and Design Guidelines (1996)
- Road Design Manual
- Design and Build Manuals
- Bridge Design Manual
- Highway Project Development Process
- Technical Memoranda
- State Aid Manual and Rules
- State Sign Manual

9. Develop, evaluate and institutionalize process for bike-pedestrian reviews of all relevant projects.

10. Pilot program for innovative treatments will be developed and launched.

The following benchmarks will exist:

11. Mn/DOT engineers, planners, and transportation specialists and consultants engaged in planning, design, contract management, or cooperative agreements will have completed a one-day bike/ pedestrian design training session offered in several locations in the state and using the best available expertise.

    By 2006, 30% will have completed.
    By 2007, 60% will have completed.
    By 2008, 90% will have completed.

The following baselines will be cooperatively established by Mn/DOT Districts and Central Office:

12. Infrastructure data and data systems will be sufficient to do effective bicycle and pedestrian facility planning. A common vocabulary will be used.

    By 2006, a comprehensive pilot shoulder, bike lane, and bike path inventory will be completed in one district.

    By 2007, comprehensive Mn/DOT data systems for TH, CSAH, and MSA's will be established.

    By 2009, other partners will have established comparable data systems and data.

    By 2011, Mn/DOT's comprehensive shoulder and other data will be up to date and managed in a joint effort between Mn/DOT Transportation Data and Analysis Office and Districts. Shoulder data would include type, width, condition, and rumble strip type. This data is used for mapping purposes, and as baseline data for both maintenance and improvements.

Photo: Mark Fiers

Guidance and Definitions for Achieving Select Targets

1. Urban area, urbanized area, "20 year urban areas", and "20 year urbanized areas" are defined to mean those portions of Regional Trade Centers of any size which will meet the density characteristics of Urban Areas or Urban Clusters as defined by the US Census Bureau *during the expected useful life* of a planned infrastructure improvement in that community. As of 2000, this density definition most essentially means those areas containing one or more block groups or census blocks developed to minimum densities of 1000 people per square mile.[8] This threshold density approximates that of areas of one acre single family lots.

   The future extent of urbanized areas may be inferred through interpolation or projection of the latest census projections available for subject areas.

   For Level 3 or larger Regional Trade Centers, "urban area" et al may also include, at a lower priority, the area five miles beyond that noted above.

   The intent of this definition and the policies, measures, and targets related to it is that bicycle infrastructure investments be made in areas where their use is reasonably practical and probable, now and in the future.

2. "Other areas where…use levels warrant…" is determined locally and includes recreational areas of the State that attract significant numbers of tourists, plus all projects that fall on Minnesota Scenic Bikeways.[9]

3. "Safe accommodations" generally means bike lanes, shoulders, or bike paths consistent with the Minnesota Bicycle Transportation Planning and Design Guidelines (1996). "Effective accommodations" is defined to mean that the facility is well used by the majority of people it could reasonably serve.

4. "Integral and effective bicycle guidance means that sufficient guidance is made a part of standard road design standards and guidance, and in plan, elevation, cross section, and profile formats, such that resulting facilities are well used by the majority of people they could reasonably serve.

5. Paved shoulders on rural segments of all trunk highways are encouraged wherever they can be justified for a variety of purposes. The highest priorities for bicycle shoulders are urban projects and Scenic Bikeways, as outlined by this plan, and expressed on page 36. In other areas with AADT higher than 1000, they may provide some bicycle value as well. Safety for all highway users, including bicyclists[10], requires that shoulders receive adequate maintenance commensurate with their intended or likely use by bicyclists. For example, those in urbanized areas should receive

[8] *http://www.census.gov/geo/www/tiger/glossry2.pdf page A-22.*

[9] *The Minnesota Scenic Bikeways System is described and defined in the Mn/DOT Bicycle Modal Plan, Chapter V.*

[10] *See page 24, Mn/DOT Statewide Omnibus Study 2003/2004, for factors that would increase bicycling to work trips.*

the highest level of maintenance, on the Minnesota Scenic Bikeways System should receive the next highest level of maintenance, and those on the Trunk Highway System Plan should receive the next highest level of maintenance.

6. Before the State turns back a road to a county or a county turns back a road to a municipality, a review of the safety and effectiveness of bicycle and pedestrian accommodations should be done, and improvements made where necessary, consistent with policy.

7. When a roadway is converted to a controlled access freeway and prohibits bicycles on it pursuant to MS 169.305, that eliminated bicycle access must be replaced by the road authority responsible with a comparable facility, pursuant to MS 160.264. Examples of comparable facilities include a bike path within the right of way of the controlled access freeway, or a well signed alternate route (Treatment 02) on a nearby parallel facility with conditions consistent with Mn/DOT bikeway design guidelines.

8. *Exceptional circumstances* which permit a plan to omit accommodations for bicycles is defined as the existence of one or more of the following conditions:[11]

   a. Where bicyclists are prohibited by law from using the roadway. (Note: In this instance greater effort to accommodate bicyclists elsewhere within the right of way or within the same transporta tion corridor is necessary.)[11]

   b. The cost of establishing bikeways or walkways would be *excessively disproportionate* to need or probable use. *Excessively disproportionate* is defined by the FHWA as exceeding twenty percent of the cost of the larger transportation project.[11,12]

   c. Where sparsity of population or other factors indicate an absence of need.[11]

   d. The existence or development of a duplicate facility serving the same user within a short distance. For example, a parallel facility such as a bicycle bridge exists within one-quarter mile of the proposed facility and already attracts the majority of bicycle traffic. Developing such a bicycle bridge that *would* attract the majority of bicycle use as part of the Mn/DOT project can be an alternative to full accommodations on the primary Mn/DOT facility.

9. Exceptions to The Mn/DOT Bicycle Modal Plan policy provisions must be approved by the Office of Technical Support and be documented with supporting data that indicates the basis for the decision.

[11] *Conditions a, b, and c, and Guidance point (7) are per "US DOT Policy Statement on Integrating Bicycling and Walking into Transportation Infrastructure", the most recent guidance transmitted by FHWA for use by State DOTs, February 28, 2000, pursuant to the requirements of Sec. 1202 of the Transportation Equity Act for the 21st Century (TEA-21): FHWA Nonmotorized Design Guidance.*

Fiscal Impact of the Plan

In order to estimate the cost to Mn/DOT of implementing this plan, a sample set of eight current bonding accelerated projects was reviewed in detail as part of Plan development to determine the gap between currently planned bicycle and pedestrian accommodations, and those that would result from following this Plan. The sample projects are found in the *Appendices, page 117*.

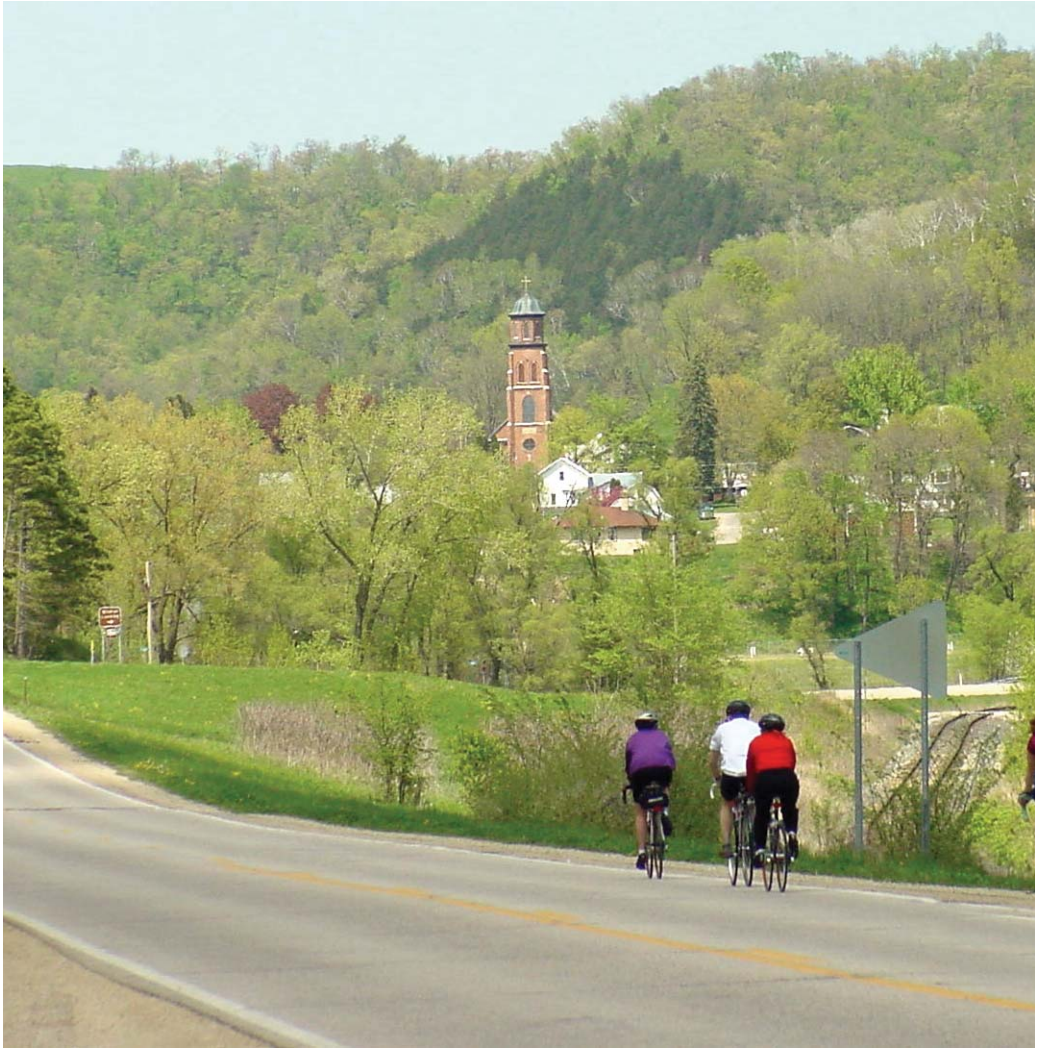
Across this sample of projects, the cost of the additional facilities recommended by the Modal Plan averaged below 1% of project cost with a range of 0%-5%.[12] Accounting only for bicycle improvements would futher reduce this range. In general, these sample snapshots found that the bulk of recommended accommodations were already a part of project documents.

The aesthetic and recreational qualities that initially draw many into bicycling can be incorporated into transportation facilities which can then also excel at serving recreational needs. Such dual-purpose assets can contribute unsurpassed quality of life advantages for the communities and regions of which they are a part.

[12] *The costs of additional facilities identified by this plan are estimated to average 0.17%-0.45%, and range from 0% to 5%, of total project cost. The total costs of all bike-ped facilities (the total of those additions specified by this plan plus those currently typically provided), average 1.54% of total project cost, and range from 0% to 14%. These costs are both well within the FHWA guideline that bike facilities should not exceed 20% of the total cost of the project.*

In addition, it should be noted that dedicated federal funds can often cover bike project expenditures (see Appendices, page 118).

Missing accommodations included: adding extra shoulder width or warning signs when right turn lanes overlay shoulders; adding special pavement coloring and other treatments in free right turn conditions; adding second sidewalks to bridges in some cases, and adding 'change lanes to pass bicycles' signing where bike lanes are not feasible.

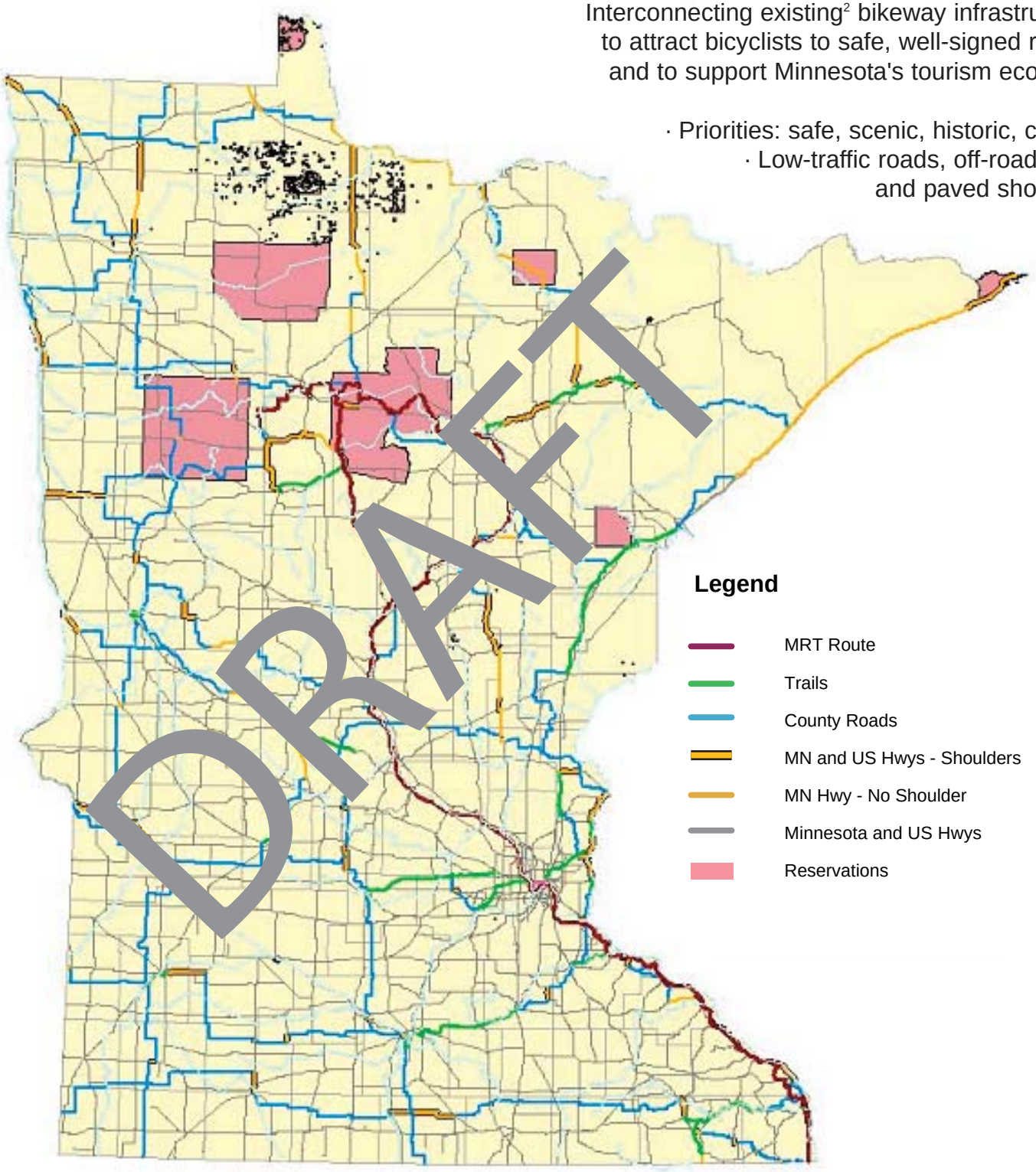


Recreational bicycling is a typical means by which people are introduced to the transportation capabilities of the bicycle.

A Concept for a Minnesota Scenic Bikeway System[1]

Interconnecting existing[2] bikeway infrastructure, to attract bicyclists to safe, well-signed routes, and to support Minnesota's tourism economy.

· Priorities: safe, scenic, historic, cultural
· Low-traffic roads, off-road trails, and paved shoulders



[1] *As a concept map this 10/19/03 draft is only illustrative of the concept of a scenic bikeways system for Minnesota. It does not reflect even preliminary interagency recommendations. This kind of system will require cooperative partnerships among local, county, and state units of government, road authorities, park and trail authorities, user groups, and businesses.*

[2] *In the example depicted by this conceptual map, it is estimated that 90% of the routes are already safely bikeable, with minor if any changes.*

V. Toward a Minnesota Scenic Bikeway System

Introduction

Minnesota leads the nation in miles of bicycle trails. There are approximately 1,300 miles of trail, of which 395 miles are paved State trails. Minnesota and Wisconsin together have built a substantial share of the nation's bike trails. Statewide, 73 percent of Minnesota's rural federal, state and local roadways rate good or fair for bicycling.[1]

Together, these resources represent substantial potential bicycle-touring infrastructure. Many of these trails and roadways traverse scenic areas of the State. To improve the safety and economic impact of bicycle touring in Minnesota in many areas, all that remains is to fill continuity gaps through improved signing, mapping, and minor improvements. Marketing can then capitalize on these substantial assets.

By developing a coordinated Scenic Bikeway System Minnesota will be well positioned for bike touring and other active vacation markets. A safe scenic bikeway system will more readily accommodate large group bike rides and local bike transportation needs, and will bring health and quality of life resources closer to more of Greater Minnesota.

Minnesota has a well-developed program for building off-road bicycle trails, especially rail-to-trail conversions. Trail projects are generally developed in phases that can take many years to complete. There are often gaps between destinations and trail segments. There are also many desirable touring areas that are not served by off-road trails.

While the federal and state trunk highway system typically functions best for inter-city and cross-state travel for motor vehicles, trails and lower volume and/or lower speed local roads are often the safest and most attractive systems for bicycle travel. On the other hand, the “legibility” due to the excellent signing of the trunk highway system across the State and nation makes those routes easier to follow. As a result, safety and tourism opportunities are sacrificed for want of relatively minor enhancements, such as route identification and signing.

Goal

The goal of the Minnesota Scenic Bikeways (MSB) project is to provide designated cycling routes that connect scenic, cultural, recreational and educational resources, tourism attractions and other popular destinations. By launching an intergovernmental cooperative effort to identify

A concept for coordinating the development of Minnesota's bicycle touring infrastructure into a first class transportation, tourism, and quality of life resource for the 21st century

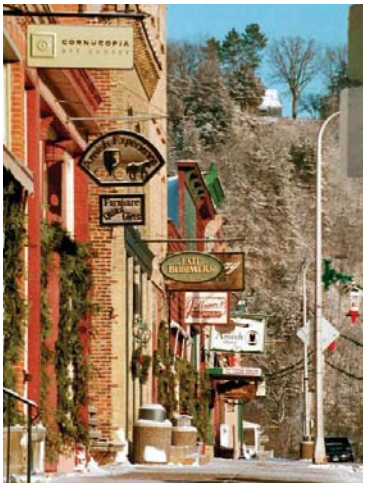


Photo: Marvin Eggert

Bicycling has brought an economic boom to places along the Root River Trail in southeastern Minnesota.

[1] *Plan B, Mn/DOT (1992), p 23*

Photo: Mark Fiers

and sign a primary bicycle network, bicyclist safety will be enhanced. Minnesota will be well positioned for bike touring and other active vacation markets. Ultimately, the system should link key resources statewide with a continuous network of off-road trails and signed on-road routes suitable for reasonably safe and efficient travel by bicycle. This system will become a part of the national bike route being developed by AASHTO.

History

Mn/DOT's history with safe bicycle accommodations in Greater Minnesota began in 1977 with a major initiative to assess the suitability for bicycling of all paved roads in the State. Improvements which would make deficient roadways suitable for bicycling were described.

Minnesota Statutes, Chapter 160.265 establishes a program for the "development of bikeways primarily on existing road rights-of-way." It requires coordination with other agencies, specifically the Metropolitan Council, the Department of Natural Resources, the Department of Trade and Economic Development (a.k.a. Department of Employment and Economic Development), the Minnesota Historical Society, and other local units of government. The Minnesota Office of Tourism, the Metropolitan Planning Organizations (MPOs) and Regional Development Commissions (RDCs) are also partners in developing the Scenic Bikeways System

In 1987 the Minnesota State [Trunk Highway] Bicycle Transportation System Plan was developed, (*see appendix*) giving Mn/DOT additional direction for bikeway investments. This plan identified 3750 miles of priority shoulder paving improvements for bicycling purposes on the trunk highway system. Although bicycling was not the only criterion for making these investments, by 2002 an estimated 88% (3285 miles) of those miles of shoulder had been paved. For a comparison of that system with the concept proposed here, see the map in the *Appendix, page 115*.

The 1987 System Plan has provided useful direction and one set of priority considerations in making shoulder investments on Minnesota's trunk highway system. The result provides a high level of bicycle mobility through rural areas of the State, which should be continued and maintained. However this system is limited to only the trunk highways of the State, which are not necessarily the best or most attractive routes available to bicyclists on tour. The Minnesota Scenic Bikeway System, in contrast, was conceived as a way to knit together the very best routes for touring bicyclists, regardless of jurisdiction, and to market them as statewide tourism resources. The level of interest that has developed among most units of government in Minnesota over the past 20 years should allow this more ambitious, but highly cost-effective, initiative to prove successful.

Over the past 30 years there have been several initiatives to identify specific bike tour routes in Minnesota. Bicycle organizations, bike clubs, individual entrepreneurs, and the American Automobile Association (AAA)

have all played a part in updating information. Mn/DOT has also identified bike tour routes on some editions of the Minnesota Bikeways Maps.

While many organizations and individuals can and have mapped bicycle tour routes over the past decades, only road authorities can take this next logical step in improving the safety of bicycle travel through Greater Minnesota.

Photo: Mark Fiers

Characteristics of Bicycle Touring

Bicycle touring is estimated to account for approximately 12% of all bicycle miles traveled annually in Minnesota[2]. Individuals and families can do touring as day trips. One popular touring activity is the weekend or week long organized group tour in which luggage is carried by support vehicles to each overnight stop. Loop tours are perhaps the most common, with daily mileage in the 50-80 mile range, Other tour forms include going out and back on the same trail, or one-way tours, using public transportation or a shuttle service to return home or to the starting point. Camping is common on the large group tours because of a lack of lodging capacity in smaller communities favored by bicyclists.

Minnesota hosts many high profile bike tours throughout the year. Some of the best known are:

- Ironman
- MS 150
- Red Ribbon Ride
- Stillwater Classic
- Headwaters 100
- Watermelon Ride
- Tour of Saints
- Great River Energy Bicycle Festival
- Habitat 500
- MS TRAM
- St. Paul Classic
- Gitchi Gami State Trail Lighthouse Ride
- Jesse James Bike Tour

Benefits of Accommodating Bicycle Tourists

For those communities that are attractive to bicycle tourists, there are special benefits. These may include having health and quality of life resources in the form of continuous trails or paved shoulders to area attractions. Increased tourism is beneficial to the local economy. Reduced motor vehicle congestion may also result to the extent that attractive bike accommodations are provided, and tourists substititute bike trips for car trips.

Bicyclists are unique among tourists in one particular respect. Limited cargo capacity means that supplies are purchased in the towns along the bicycle route.

[2] *Plan B, Mn/DOT (1992), Appendix B, p B-9.*

Characteristics of a Successful Scenic Bikeway System

Each route in the scenic bikeway system should connect places that have particularly scenic, historic, or cultural qualities. Quaint towns with interesting architecture, or famous landmarks such as the Mississippi River, can also be valuable features. Other attractions and a variety of services are also important.

The routes themselves should be designed and managed for bicyclist safety. Legible, well-marked and logistically convenient transitions should heighten the experience of the unique landscapes through which they pass. In order to maximize the value of the system as a whole, each tour route, or route segment should have an identity of its own. This approach adds value in part by giving potential repeat visitors additional reasons to return to see something new again next time.

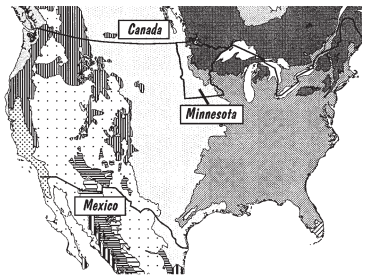
Minnesota is unique in having three distinctly different biomes, or ecological regions within its borders. Hence the Minnesota Scenic Bikeway System could easily encompass prairie, coniferous and hardwood forests. In this way, the Minnesota landscape provides an advantageous setting for accomplishing the scenic “diversity” objective.

Partnerships and Roles

Bicycle resources in Minnesota are currently managed by a number of different agencies and jurisdictions. While coordination and partnerships do exist, an organized approach to integrating the network will ensure continued success and improvement. The Minnesota Department of Natural Resources is responsible for the statewide trail system. Dedicated bike trails and bike routes within the State park system fall under DNR authority.

The Minnesota Department of Transportation is responsible for recommending, developing and mapping bicycle routes along State rights-of-way. Several Mn/DOT districts play leadership or key support roles with the DNR in the development of regional and district trail systems, both along Mn/DOT rights-of-way and elsewhere. For example, Mn/DOT District 4 has a policy of preparing highway right of way for planned trail corridors. This often takes the form of rough grading a shelf for future trails at the time of highway construction. Private-public partnerships , such as the Mississippi River Trail Inc. and the Southeastern Minneasota Association of Regional Trails, are key participants in the development of bicycle accommodations. These efforts are producing valuable routes in their own right, which would also become formal parts of the Minnesota Scenic Bikeway System, or provide key local and regional connections to it.

Mn/DOT will provide leadership in developing the Minnesota Scenic Bikeway System, carrying out its responsibilities as described in Minnesota Statutes, Chapter 160.265. Mn/DOT is prepared to provide organizational leadership, technical assistance, and cartography for this effort. Both Central Office and Districts will have leadership roles. Mn/DOT will work with other road and trail authorities to complete the installation of signs as required to make the system work optimally.



Minnnesota’s three ecological regions in boldface

- Hudson Bay
- **Northern Forests**
- Northwestern Forest Mountains
- Marine West Coast Forest
- **Eastern Temperate Forests**
- **Great Plains**
- North American Deserts
- Mediterranean California
- Southern Semi-Arid Highlands
- Temperate Sierra

Courtesy of Mn/DNR Trails and Waterways and the USDA Forest Service

The development of the Minnesota Scenic Bikeway System will require that all road and trail authorities in target areas of the state be full participating partners in developing and managing the system. The system would be developed, expanded, promoted and maintained as a cooperative project among state, county and local and governments, businesses, and customer groups. The system would include trails and low traffic and shouldered roads that are appealing to cyclists. Enhancing legibility and connectivity should prove successful in attracting bicyclists to the best and safest routes available.

As partners, other road and trail authorities' full participation includes such things as providing input into design and maintenance standards, participating in route selection and soliciting further community involvement critical to the success of the project. Each road and trail authority would be responsible for the maintenance of its facilities.

Steps Toward Implementation

Once The Mn/DOT Bicycle Modal Plan has been adopted, the following proposed steps take place:

1. Coordination and Participation

State agency partners including Mn/DOT, DNR and Tourism, representatives of RDCs, MPOs, and local road and trail authorities are consulted on the scenic bikeways concept. These agencies form an ongoing steering committee that provides long-term direction and momentum for the project.

The steering committee refines the overall concept, route selection process and implementation plan. The committee provides technical assistance for local route selection and coordinating committees. Engagement of local customers and agencies is particularly important in the initial stages of the project where knowledge of routes, destinations, and support services are critical. Full participation of all partners and citizen involvement is essential.

2. Finalize Destinations and Corridor Selection Criteria

Several criteria are suggested for selecting corridors for the interconnected network of cross-state bicycle routes. These criteria relate to opportunities, demand, route continuity and road suitability. The criteria and recommended routes are the basis for Mn/DOT and other agencies' initiatives as well as for review of applications made for funding local projects.

- **Destinations:** Identify destinations with attractive qualities. Qualities include scenic, cultural, educational and tourism attractions, and exceptional experiences of the State's diverse landforms and natural communities. Destinations should include half-day turn-around points at 20 to 35 mile intervals or loops that total 40 to 70 miles. Places where bicyclists are likely to stay (such as State parks, campgrounds, resort areas) should also be

Safety and scenery attract bicyclists

M1-8 M1-9

Bicycle Route Sign (M1-8) for identifying numbered state and local routes. US Bicycle Route Sign (M1-9) for US Bicycle Routes formally established by AASHTO.

considered. Shorter segments with interim destinations at 10 to 15 mile intervals should be developed as the system matures.

- **Connections:** Routes would show opportunities for networking through connection to other existing and proposed routes and looping opportunities. Interchange points between bikes and other modes of transportation such as train and bus stations, airports, and parking facilities are also identified. Connections to adjacent states' routes, such as the Mississippi River Trail, are clear.

- **Continuity, Transitions, Gaps and Barriers:** Treatments of gaps in the system are important. Project priorities should consider the opportunity to create segments with continuity of condition. That is, building longer continuous segments of off-road trail or on-road routes, and keeping changes in facility type to a minimum. Where changes are necessary, careful consideration of the transition is important. Safe entry and exit from off-road to on-road segments, warning of narrowing shoulders and narrow bridges and signing at changes in road affiliation should all be considered. Using signing and way finding techniques such as map signs showing route, hazards and distance of temporary segments minimizes difficulties in determining the proper route. Finally, solutions to barriers such as rivers, freeways and urban areas should receive priority.

- **Route suitability:** Identify off-road bicycle trails and other safe bikeways, scenic or unique low-traffic roads, and suitable paved shoulders. Review current road design, pavement conditions, existing and projected traffic volumes and the Mn/DOT roadway/bicycle design standards to identify suitable safe routes and needed infrastructure improvements.

3. Develop Signing System

The steering committee and lead agency will establish route naming, numbering and signing conventions for use by Mn/DOT and other agencies and local jurisdictions. Wayfinding is an essential part of a legible long-distance system, especially when routes are discontinuous or include a mixture of on-road and off-road segments. On-road segments of bicycle routes may change designation as they follow the best path between completed off-road segments and trip destinations. These transitions, turning from one road to another and moving from on to off-road, are confusing and should be clearly marked in the field and on route maps.

The Manual on Uniform Traffic Control Devices (MUTCD) and the American Association of State Highway Transportation Officials (AASHTO) Bicycle Technical Committee have adopted two route signs to be used on tour routes. Sign M1-8 is used to identify local and state routes. Sign M1-9 is used for AASHTO's network of formally established U.S. Bicycle Routes. Naming, numbering and signing conventions for the Minnesota Scenic Bikeway routes should be integrated with these standards.

4. Develop Minnesota Scenic Bikeway System Plan

- **Concept Plan:** Refine the corridor selection criteria. Prepare a tour route system concept plan that identifies appropriate travel corridors. Route naming and numbering and wayfinding signs should be integrated with existing tour route and roadway signing.

- **Design Standards:** Design and maintenance standards that define safe and sustainable practices should be adopted. Standards for different types of on and off road should be addressed. Include consideration of special warning and regulatory signs, especially for use on roadways with poor sight lines but scenic qualities.

- **Draft Route Selection:** Working with the Minnesota Scenic Bikeway System steering committee (see above) and local route selection committees, create a draft Minnesota Scenic Bikeway System Map for review. Recommend a network of routes to the State Bicycle Coordinator for corridor review.

- **Internal Mapping:** Map the proposed touring destinations and existing and programmed off-road trails. Identify gaps and barriers in the network. Evaluate potential on-road connector alignments for suitability and recommend alternatives. Identify planned Mn/DOT and local highway improvement projects that may incorporate needed trail improvements.

- **Route Testing:** Engage the bicycle touring community and local interests in regional route testing of the network. Evaluate for safety and aesthetic benefits, route continuity and identify needs for suitable transitions. Recommend route alignments for each segment.

- **Route Refinement:** Refer recommended segment alignments to the State Bicycle Coordinator for detailed analysis and coordination with local road authorities. Identify local advocates and partnerships for each trail segment including development, maintenance and operation.

5. Implementation

- **Administration:** Establish a system for tracking state and local planning, funding, improvements, and operations.

- **Funding:** Although many of the routes for the Minnesota Scenic Bikeway System are in place, some improvements to infrastructure will be required to establish and maintain the system. Review Mn/DOT's Surface Transportation Improvement Program (STIP) and 10-year plan to coordinate needed improvements with highway improvement projects. Establish parameters within STIP guidance to encourage funding of tour route improvements.

Small back roads make for great memories...and strengthened tourism economies.

Lack of maintenance can prompt unsafe behavior.

- **Mapping:** Mapping of the system should be completed, and periodically updated, to show complete facilities and anticipated new segments. Maps should include symbology that indicates existing off-road segments, destinations, services, on-road segments, gaps, hazards and challenges, planned improvements and attractions. The Minnesota Scenic Bikeway System (MSB) should also appear on the Official State Highway Map, either on the main map, or as an inset.

- **Technical Assistance:** Mn/DOT will provide technical assistance in the selection of design treatments for segments of the MSB System and in other planning matters related to bicycle and pedestrian accommodations.

- **Marketing and Promotion:** A State system provides opportunities for promoting local products and services, attractions and public facilities. Tourism activities can be developed for new visitors to the region. Local interests have a vested interest in ensuring successful and safe use, especially when they have participated in the selection, alignment, development and operation of the statewide and local routes.

Development: Establish a funding mechanism for the network to support lead agency-initiated and local trail projects eligible for state funding participation.

Pilot project: Prepare an illustrative analysis describing potential infrastructure improvements, signing, mapping, and marketing, and some estimated economic benefits to a sample county or community.

Priorities: Prioritize segment development including phasing of interim and final alignments. Identify funding sources most suitable for each segment and determine funding cycles and calendars for planning and development of each segment.

Maintenance and Operation: Maintenance and operation of Minnesota Scenic Bikeway System must be a shared venture between the partners. Develop cooperative agreements for maintenance and operation of bikeway segments including scheduled, periodic and emergency repairs, and enforcement. The Steering Committee should have continued oversight of these functions to ensure that the system consistently meets user expectations.

Road Construction: Monitor construction projects for notification of road closures and post detour information as needed.

Customer Feedback: Develop mechanisms for simple user feedback directly to road and trail authorities as necessary.

Biking's good in the metro region

BY RICK SHEFCHIK
Pioneer Press

We're lucky in the Twin Cities — the region has a chain of bike trails that will entice everyone from beginners to Greg LeMond types. Here are a few old favorites:

Gateway Trail from St. Paul to Pine Point Park north of Stillwater. A popular spot to pick up the trail is at the big parking lot just east of I-694 near Mills Fleet Farm in Oakdale.

Other intersections include County Road 12 east of Mahtomedi High School, and Minnesota 96 a mile west of Manning Trail. A quick getaway to the country with lots of fields, horses and small bodies of water along the way.

Bruce Vento Memorial Trail, a spur that connects the southern end of Lake Phalen in St. Paul to the Gateway Trail in Maplewood.

Trout Brook Trail, from Lake McCarrons on Rice Street in Roseville along an abandoned railroad line to Arlington Avenue and Jackson Street. Go east on Arlington for about a mile and you'll connect with the Gateway Trail.

Sunrise Prairie/Hardwood Creek Trail, from Hugo to North Branch. It runs alongside U.S. 61.

Big Rivers Trail, runs along the south side of the Mississippi River from Mendota Heights to Lilydale.

Southwest Regional LRT Trail between Hopkins and Victoria/Chanhassen, which splits at Hopkins. The northern extension skirts the south shore of Lake Minnetonka out to Victoria, while the southern extension goes nearly to Chaska.

Hopkins North Corridor to Cedar Lake Regional Trail, a spur from the Hopkins depot at the junction of U.S. 169 and Excelsior Boulevard, north through Hopkins and St. Louis Park, connecting to the Cedar Lake Trail.

Courtesy of St Paul Pioneer Press; published Sunday, June 6, 2004, p 14s

TRAVEL

Desktop Traveler / *Minneapolis*

THERE IS MORE TO MINNEAPOLIS than the brutal winters and the Mall of America. Snow or shine, residents of the Twin Cities tend to spend most of their time outdoors. One in six own a boat to cruise one of 600-plus lakes and every resident lives within six blocks of a park. The city, afterall, is the birthplace of Rollerblades. It flaunts 400 miles of connected jogging and biking trails, including the Grand Rounds National Scenic Byway, which encircles the city, and the Three Rivers' Park District's 4,900-acre Elm Creek Park Reserve that boasts 18 miles of horse trails. (No wonder Minneapolis boasts among the lowest TV viewership in the nation.) Here are some sites that will help set you out on the right trail this summer.

—Sheree R. Curry

Photo courtesy of Minnesota Office of Tourism

SITE	DESCRIPTION	EASE OF USE	COMMENT
Minneapolis Riverfront District www.minneapolis-riverfront.com	Site details what to do on the riverfront, a downtown hot spot overlooking St. Anthony Falls.	Chock full of historical tidbits. Lists eateries with great river views and tells where to hop on a trolley, picnic or bird watch.	The interactive map sports an illustrated view with pop-up trivia.
The Greater Minneapolis Convention & Visitors Association www.minneapolis.org	Official site of Minneapolis tourism.	Lets you book travel details, clip coupons, peruse year-long events calendar and check the weather.	"Quick Tips" let you know: First Sundays of the month are free at the Minnesota Museum of American Art.
Metropolitan Council's Regional Parks www.metrocouncil.org/parks/parks.htm	Provides maps and links to the area's 43 regional parks.	Click on the "Services" link, then "Transportation" for a downloadable bike-lanes map. To determine area travel by bus or light rail, try the Metro Transit Trip Planner.	Hilly Murphy-Hanrehan Park has challenging mountain-biking trails, Pig's Eye Island rookery is home to bald eagles and Lilydale-Harriet Island offers fossil hunting.
Minneapolis Park and Recreation Board www.minneapolisparks.org	Parks-and-recreation site gives info on rose gardens, golf courses, lakes and dog parks.	"Find a Park" and "Activity Finder" links let you sort by region, amenities, activities and even age level.	Rent a canoe for $10 an hour at Lake Calhoun and paddle two miles through the Chain of Lakes.
Minnesota Office of Tourism Twin Cities Metro Region www.exploreminnesota.com/destinations/region.cfm?oid=4646	City's official tourism site.	"Trip Planner" combines attractions you choose into a personal itinerary you can print, e-mail or update.	"Full Moon Walk" and guided wildflower and bird-watching strolls at Wirth Park discuss flower colors and habitats.

Courtesy of The Wall Street Journal; published Tuesday, July 6, 2004, p D4

Among the prizes upon completion of a Minnesota Scenic Bikeway System: the St. Paul Pioneer Press will have many more biking opportunities to report to the Twin Cities, and The Wall Street Journal will have many more to report to the nation and beyond!

MINNESOTA DEPARTMENT OF TRANSPORTATION

VI. Supplemental Design Guidance

Introduction
Examples
Catalogue of Treatments

Introduction

This section presents solutions for bicycle and pedestrian accommodation in places where space, traffic and other conditions require creative thinking to provide effective solutions. Wherever space and other factors permit, the standard bicycle facility cross-sections, crossings, and signalization found in the AASHTO Guide for the Development of Bicycle Facilities, and Mn/DOT, MUTCD, and other design manuals should be employed to provide predictable travel experiences consistent with the safe expectations of bicyclists and pedestrians. Some of those standard treatments are also presented in this section for context as well for enhancements to them or their application.

The treatments presented here will be incorporated into the department's design guidance as appropriate. It is anticipated that most treatments will become a part of a revised Mn/DOT bikeway design manual. The remainder will go through a pilot program to test various iterations of the designs, and to obtain more performance history before being considered by Mn/DOT or other authorities for broad scale use. Recommended standard treatments will also be included directly in Road Design Manual standard plates and other sections to simplify and expedite the project development process, with references to the bike design manual for additional options when necessary.

Where project constraints prevent an ideal treatment, alternative solutions are often possible and appropriate. The bike and pedestrian accommodation solutions presented in this section are currently in use across the United States. Each treatment description includes a reference to where it is used or cited in the transportation literature. A brief description and limitations of the treatment are included as well as an illustration or photograph. Note that these are site-specific solutions that require careful consideration of route continuity, transitions into and out of the special treatment area, and consideration of the entire transportation context. Finally, an initial (2004) construction cost estimate and, where applicable, a maintenance cost range are indicated.

Since there are alternative treatments that can be considered by the design engineer, documentation of the alternatives considered and the rationale for the one(s) chosen should be made a part of the Project Memo or Environmental Assessment.

Regardless of special circumstances, continuity of condition should be sought wherever possible. Bicyclists should not be forced to traverse repeated changes in the nature of the travel way. Users should not be expected to repeatedly enter and exit the roadway as they travel a specific route.

Where changes in continuity are necessary, thoughtful *transitions* should be provided to reduce unpredictable behavior and conflicts with other roadway users. Transitions may include signing and signalization, striping, well-positioned and proportioned channellization and ramps, as well as good visibility for all affected users of the roadway.

Some bicyclists may prefer to travel legally in regular traffic lanes unless bicycle-specific facilities are well designed and maintained, and appropriately used. Special care in providing bicycle facilities will help to attract users to the most safe and effective environments. All roadway design activities should ensure that the entire roadway environment is as safe as possible for all road users.

Design Strategies Matrix

A Design Strategies Matrix has been developed to summarize the suitability of each treatment for use in various roadway conditions and to supplement the individual treatment descriptions.

Examples

The following four examples provide illustrations of how select treatments and the design strategies matrix can be used. The decision matrix follows the examples.

Example 1
A high-volume four-lane trunk highway (19,000 AADT, with 11 foot inside lanes, 13 foot outside lanes, and 8 foot parking lanes) forms the main street of a mid-sized town. There is inadequate right of way to add standard bike lanes (Treatment 03); parking lanes must be retained.

> **Solution:** In partnership with local road authorities, Mn/DOT signs an Alternate Bike Route (Treatment 02). The alternate bike route is signed from the trunk highway, and on local streets parallel and one block away from the trunk highway. Local government ensures frequent stops are not required on the alternate route. Mn/DOT may install “Change Lanes to Pass Bicycles” signs (Treatment 09) on the main street portion of the trunk highway.
>
> **Discussion:** Mn/DOT's strategy is to (a) reduce bicycle traffic on the congested main street by effectively signing an attractive alternate through route, and optionally, (b) to remind drivers of the rules of the road when bicyclists are using the main street. To the extent that the alternate route is attractive and legible, the bicyclists likely to use Main Street are primarily those with destinations there. Their low numbers will not constitute an unreasonable obstacle to traffic flow and throughput.

Example 2

A high-volume two-lane trunk highway (12,000 AADT, with 14 foot travel lanes and 8 foot parking lanes) forms the main street of a small town. There is inadequate right of way to add standard bike lanes (Treatment 03); parking lanes must be retained.

Solution: As in Example 1, develop Alternate Bike Routes (Treatment 02), plus add "Share the Road" signs to the main street.

Discussion: Mn/DOT's strategy is to (a) reduce bicycle traffic on the congested main street, and (b) to remind motor vehicle drivers to welcome bicyclists who still need to use the trunk highway.

Example 3

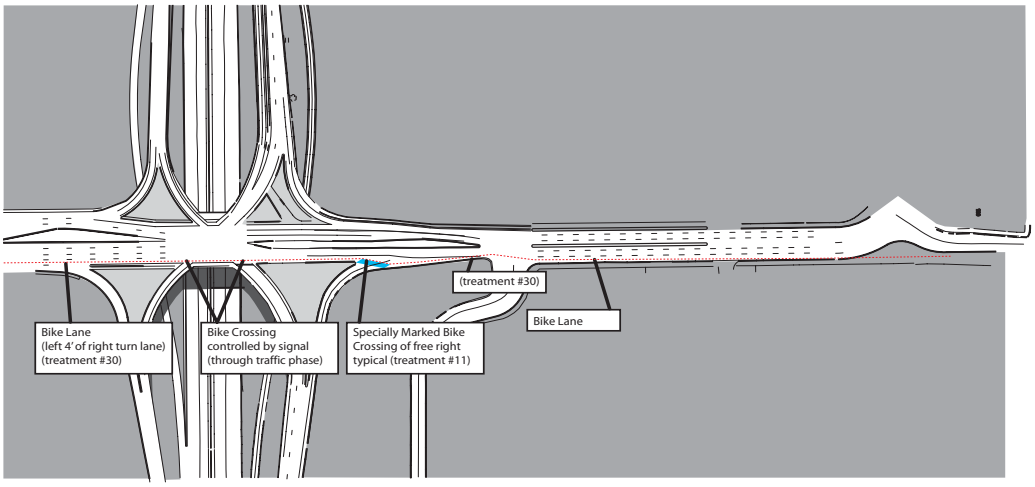


Figure 7: *Single Point Diamond Bike Lanes*

Single point diamond interchange bridges over freeways are typically designed with sidewalks for pedestrians and with some shoulder sections available to bicycle traffic. However those shoulder sections disappear at right turn lanes, creating confusing and potentially hazardous situations for both bicyclists and motorists. While bicyclists have the legal right to "take the whole lane" in those situations, this is not an optimum solution for handling bicycle traffic, since it impairs the throughput performance of the facility.

Solution: The design above, *Figure 7*, illustrates one compromise solution. It fits in minimum width bicycle lanes within the existing bridge dimensions by sharing or narrowing turning lanes (Treatment 28). It also uses color on bicycle lane sections in areas of motor vehicle turning movements (Treatment 11) to further alert all roadway users of the need to take particular precautions in those areas.

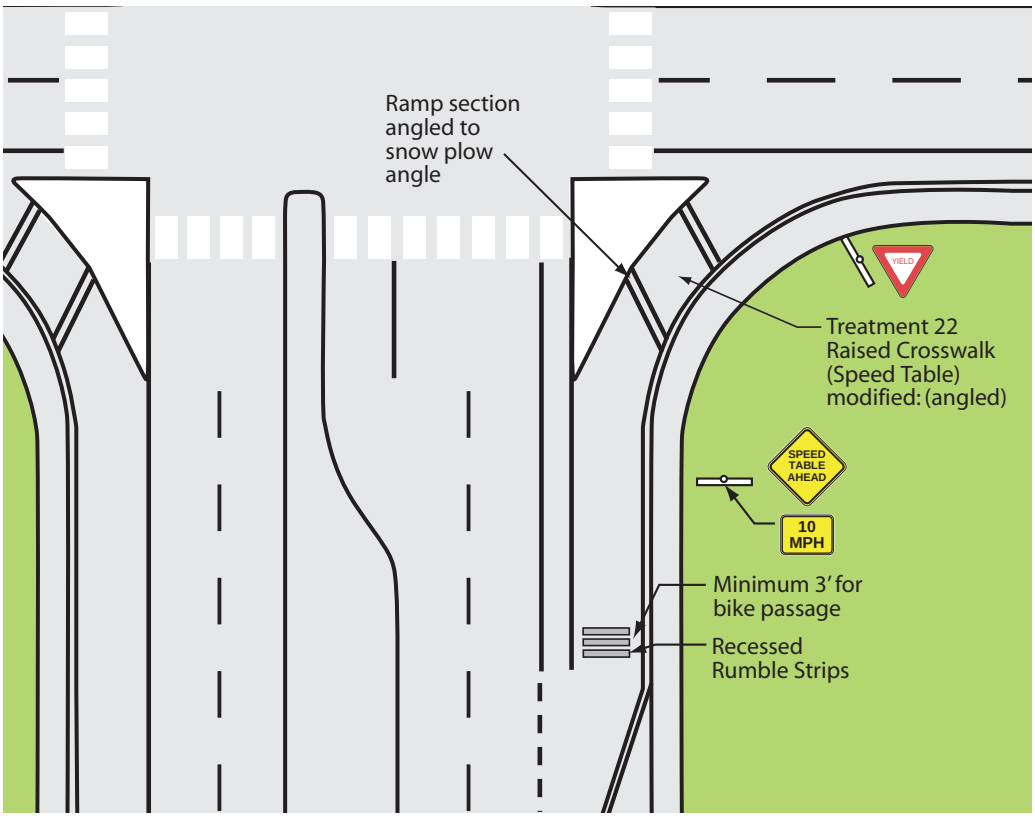
Discussion: This solution optimizes both motor vehicle throughput and safety for bicyclists at minimal cost. Adding width to the bridge to avoid design exceptions would be the other alternative solution that may achieve this performance level. However, the higher motor

vehicle speeds likely with standard width lanes may constitute an additional hazard for pedestrians and bicyclists.

Yet a third alternative solution in these kinds of areas could be building a separate parallel bike-ped bridge a reasonable distance away. For example, if there is a suitable locally supported parallel bike route (per Treatment 02) a block or so away, the case for building a separate bridge becomes stronger. This is an area that should receive considerable focus in local and regional bicycle plans.

Example 4

Figure 8: *Traffic Calming Free Right Turns*



Free right turns at intersections with "porkchop" islands constitute one of the most difficult, unattractive, and potentially hazardous conditions for pedestrian traffic movements. While pedestrian movements across the primary travel lanes of the intersection are typically protected, the only protection afforded the pedestrian when crossing the channelized right turn lane is the state law which requires that vehicles stop for pedestrians in crosswalks.

Solution: This design, *Figure 8,* illustrates a remedy to this pedestrian hazard. It combines, in the order encountered by motor vehicles, the following devices, (a) Speed Limit 10 MPH sign, and (b) a raised crosswalk/speed table (Treatment 22) at the point of crossing to the porkchop island. The raised crosswalk should be designed to allow a motor vehicle to comfortably cross it at a speed of approximately 10 miles per hour.

Discussion: This design retains the ability of right-turning vehicles to proceed without the need for stopping when pedestrians are not present. It retains relatively high throughput performance, while providing a safer and more appropriate pedestrian environment.

It should be noted that the long radius turns enabled by the use of porkchop islands were developed largely to allow multi-unit trucks and other large vehicles to negotiate turns without turning wide into oncoming travel lanes. The high speeds they enable other vehicles to maintain through intersections was an inadvertent consequence that has made intersections, already the most dangerous parts of roadways, potentially more dangerous, both for pedestrians and for motor vehicles.

This solution mitigates the negative consequences while retaining their performance advantages more safely. This solution is particularly suited for commercial and other areas with pedestrian activity. It should not be necessary in more rural settings where maintaining vehicular speed is of greater value.

Photo: Mark Fiers

Catalogue of Treatments

Design Strategies Matrix

Supplemental Facilities

Cross-Section Options

Signing & Pavement Marking

Crossing Treatments

Pedestrian Treatment

Scenic Bikeway System

Other Treatment Enhancements

Design Strategies Matrix

Design Strategies Matrix: Urban Area Bicycle Treatment Selection[1]

(Treatments 03-10 are numbered in descending order of anticipated preference, for use as available right-of-way (ROW) width decreases.)

AADT	< 5,000 AADT						5,000-10,000 AADT						>10,000 AADT				Limited Access Roadways
Posted Speed	<=30 MPH		31-40 MPH		>40 MPH		<=30 MPH		31-40 MPH		>40 MPH		<40 MPH		>40 MPH		
Vehicular Mix	trucks <10%	trucks >10%	trucks <10%	trucks >10%	trucks <10%	trucks >10%	trucks <10%	trucks >10%	trucks <10%	trucks >10%	trucks <10%	trucks >10%	trucks <10%	trucks >10%	trucks <10%	trucks >10%	
Functional Class	Collectors • • •

Design Strategies Matrix: Urban Area Bicycle Treatment Selection[1]

(Treatments 03-10 are numbered in descending order of anticipated preference, for use as available right-of-way (ROW) width decreases.)

AADT	< 5,000 AADT						5,000-10,000 AADT						>10,000 AADT				Limited Access Roadways
Posted Speed	<=30 MPH		31-40 MPH		>40 MPH		<=30 MPH		31-40 MPH		>40 MPH		<40 MPH		>40 MPH		
Vehicular Mix	trucks <10%	trucks >10%	trucks <10%	trucks >10%	trucks <10%	trucks >10%	trucks <10%	trucks >10%	trucks <10%	trucks >10%	trucks <10%	trucks >10%	trucks <10%	trucks >10%	trucks <10%	trucks >10%	
Functional Class	**Collectors** • • •

01. Bicycle Path/Shared Use Path

NOTE: Current Mn/DOT Standard

Bicycle Path refers to a facility intended for the exclusive use of human-powered, wheeled users. Parallel pedestrian facilities are necessary. Properly designed and located, bicycle paths can be highly useful as "bicycle freeways" in urban areas, especially where independent rights-of-way for such facilities exist or can feasibly be created. Providing this high level of mobility, exclusive bike paths complement surface streets, bike lanes, and other facilities that may serve more of an access function for bicyclists. The bike path should be well signed from primary parallel surface streets, with a system similar to that defined by Treatment 02. Bike paths—or in lower-use situations, shared use paths—may also provide a more appealing and safer environment for many users.

Where/when to use (quantitative guidance)

- In urban corridors with high travel demand
- Where there are fewer than 2 driveway/ intersection/road crossings per 1.6 km (1 mi) with a combined ADT of less than 500
- In areas of poor connectivity - to link neighborhoods to schools, parks, shopping and community centers

How to implement

- 3.0 m (10 ft) minimum width, 3.7 m (12 ft) minimum width in high use areas·
- Well-signed with destination and directional information
- Pathway overhead clearance of at least 3.0 (10 ft)
- Accessible to sweeping/snow removal machines and maintenance/emergency vehicles
- Provide safe crossings at intersections and mid-block crossings

Where already used

- Throughout the United States and Europe

Permitted in standards

☑ AASHTO/MUTCD

☑ MN Rd Des Manual

Cost Estimates

Initial capital cost:
$225,000 - $350,000/mi

Useful life:
20 years

Annualized capital cost:
$11,250 - $17,500/mi

Annual maintenance cost:
$2,300 - $6,000/mi

02. Well-Signed Alternate Bicycle Route

A lower-volume roadway that parallels a high-volume arterial can provide a pleasant alternative for “through” bicyclists, as well as a higher level of mobility and safety. While using this treatment does not remove the need to improve the safety of the primary route for those bicyclists who still need to use the arterial (especially if there are commercial or other public destinations along that arterial), it should decrease bicycle traffic on the arterial substantially. The success of this treatment is dependent on it having a high degree of convenience and legibility, or strong mental image in the minds of the bicyclists expected to use it.

Where/when to use (quantitative guidance)

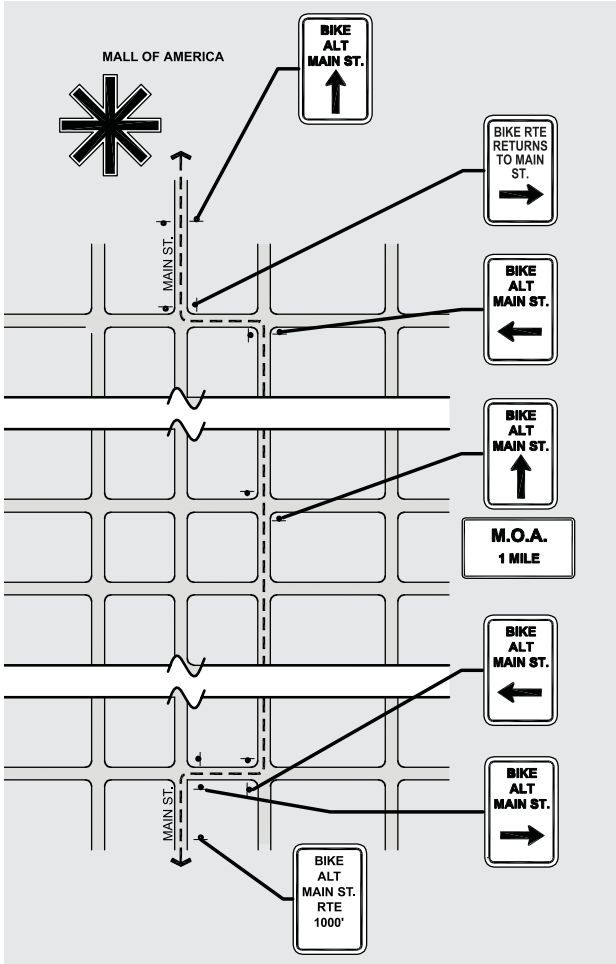
- Parallel lower-volume roadway is within .40 km (.25 miles) of high-volume arterial

If main arterial:

- has on-street parking and/or multiple driveways/turning conflict
- ADT >10,000
- Average vehicle speeds > 48 km/h (30 mph)
- does not have sufficient right-of-way for bicycle lanes

How to implement

- Directional and informational signs should be posted at every major intersection, intersections with other bicycle routes, confusing junctions, or every 300 m (1,000 ft)
- Traffic calming/bicycle priority should be installed on parallel route to divert through vehicle traffic
- Limit stop signs and signals on lower-volume roadway to the greatest extent possible, except where they are needed to cross busy streets



Where already used

- Throughout the United States
- Minneapolis (5th St SE parallel to University Avenue)

Permitted in standards

☑ AASHTO/MUTCD

Cost Estimates

Initial capital cost:
$400 per sign ($40/yr over 10 year life)

Maintenance:
Part of regular street maintenance

03. Standard Bicycle Lane or Shoulder (≥25')

NOTE: Current Mn/DOT Standard

A section of roadway designated by striping, signing and pavement markings for preferential bicycle use. Bicycle lanes shall be well marked.

Where/when to use (quantitative guidance)

- On urban arterial and major collector roadways
- Average vehicle speeds > 48 km/h (30 mph)
- ADT >10,000
- Vehicle mix includes a significant number of heavy trucks and/or buses

How to implement

- Reduce width of (or eliminate) travel, turning or parking lanes.
- Bike lanes should be 1.5 m (5 ft) wide from face of curb or guard rail to the bike lane stripe. There should be at least 1.2 m (4 ft) of rideable surface if the gutter pan joint is not smooth.
- Where space is available, wider bike lanes (e.g., 1.8 m [6 ft]) are preferred adjacent to parallel parking lanes to account for the door opening zone.
- In outlying areas without curbs and gutters, a minimum width of 1.2 m (4 ft) is recommended. A width of 1.5 m (5 ft) or greater is preferable where substantial truck traffic is present or where motor vehicle speeds exceed 80 km/h (50 mph) (Guide for the Development of Bicycle Facilities, AASHTO, 1999, page 23)

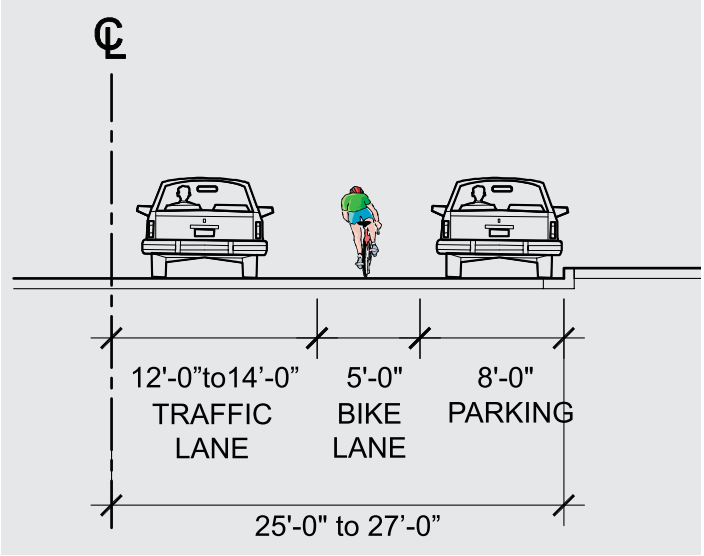
Where already used

- Throughout the United States
- Minneapolis (10th St S (US55) downtown)

Permitted in standards

☑ AASHTO/MUTCD

☑ MN Rd Des Manual



Cost Estimates

Initial capital cost:
$8,865/mi pavement markings (Epoxy, 4 yr life)

$7,625/mi signs

Annualized capital cost:
$2,900/mi

Maintenance:
Included in regular street maintenance

04. Bike Lanes on Constrained Rights-Of-Way with Parking - A (24'-0")

A constrained width roadway with parking where a portion is designated by striping, signing and pavement markings for preferential bicycle use. Bicycle lanes shall be well marked.

Where/when to use (quantitative guidance)

- Traffic lane plus parking lane = 7.1 m (23.5 ft) wide
- Traffic lane = 4.5 m (15 ft) wide
- Posted vehicle speeds = 48 km/h (30 mph)
- Not a mandatory treatment

How to implement

- Reduce width of travel and parking lanes

Where already used

- Cambridge, Massachusetts

Permitted in standards

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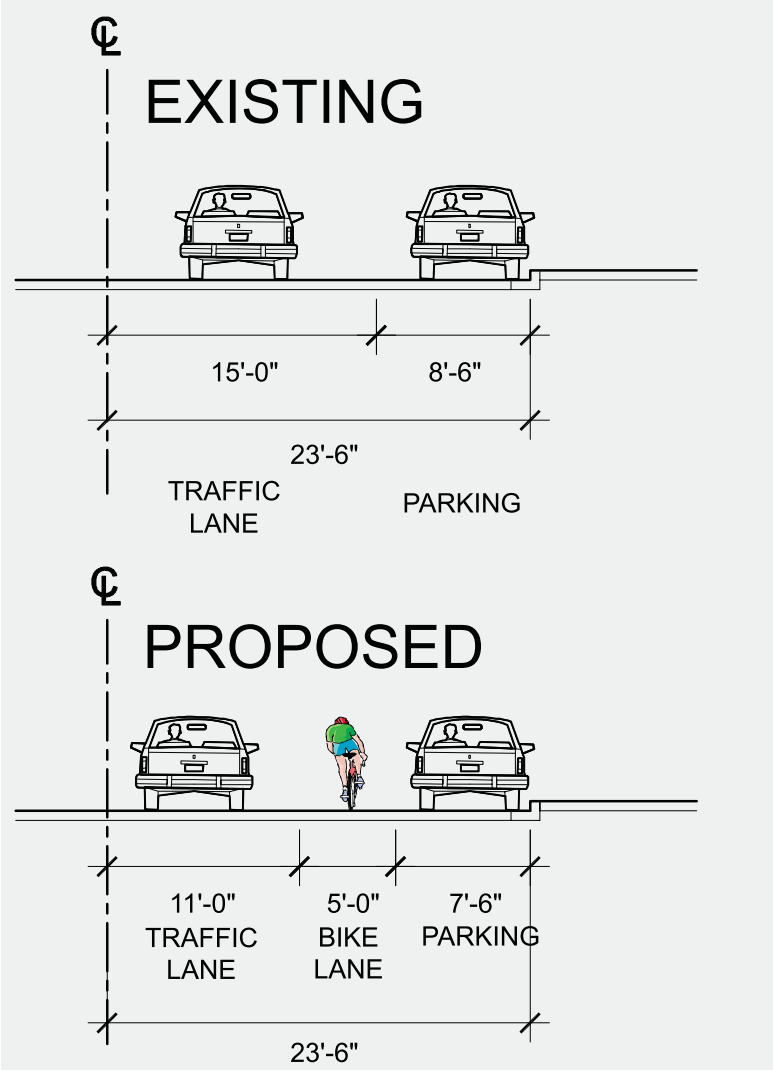

Cross-Section Options

Cost Estimates

Initial capital cost:
$8,865/mi pavement markings (Epoxy, 4yr life)

$7,625/mi signs

Annualized capital cost:
$2,900/mi

Maintenance:
Included in regular street maintenance

05. Bike Lanes on Constrained Rights-Of-Way with Parking - B (22')

A constrained width roadway with parking where a portion is designated by striping, signing and pavement markings for preferential bicycle use. Bicycle lanes shall be well marked.

Where/when to use (quantitative guidance)

- Traffic lane plus parking lane = 6.7 m (22 ft) wide
- Traffic lane = 4.3 m (14 ft) wide
- Posted vehicle speeds = 48 km/h (30 mph)
- Not a mandatory treatment

How to implement

- Reduce width of travel and parking lanes

  "In residential areas, a parallel parking lane from 2.1 to 2.4 m [7 to 8 ft] is acceptable" (A Policy on the Geometric Design of Highways and Streets, AASHTO, 2001, pages 437-8)

  "[Travel] lanes 3.0 m [10 ft] are acceptable on low-speed facilities… (A Policy on the Geometric Design of Highways and Streets, AASHTO, 2001, page 316)

Where already used

- Chicago, Illinois

Permitted in standards

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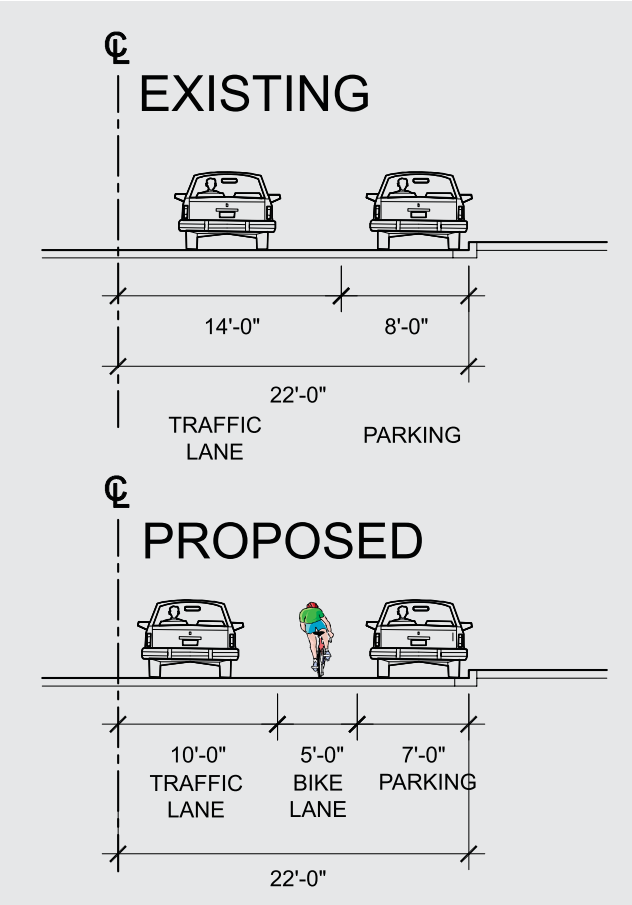


Cost Estimates

Initial capital cost:
$8,865/mi pavement markings (Epoxy, 4yr life)

$7,625/mi signs

Annualized capital cost:
$2,900/mi

Maintenance:
Included in regular street maintenance

06. Diagonally-Striped Lane (21') *Pilot Project Only*

76.2 mm (3 in) wide diagonal stripes are installed between the through-traffic lane and on-street parking to encourage motorists to drive near the centerline on wide curb lanes and park near the curb. May also experiment with dashed lane lines instead of diagonal stripes.

Where/when to use (quantitative guidance)

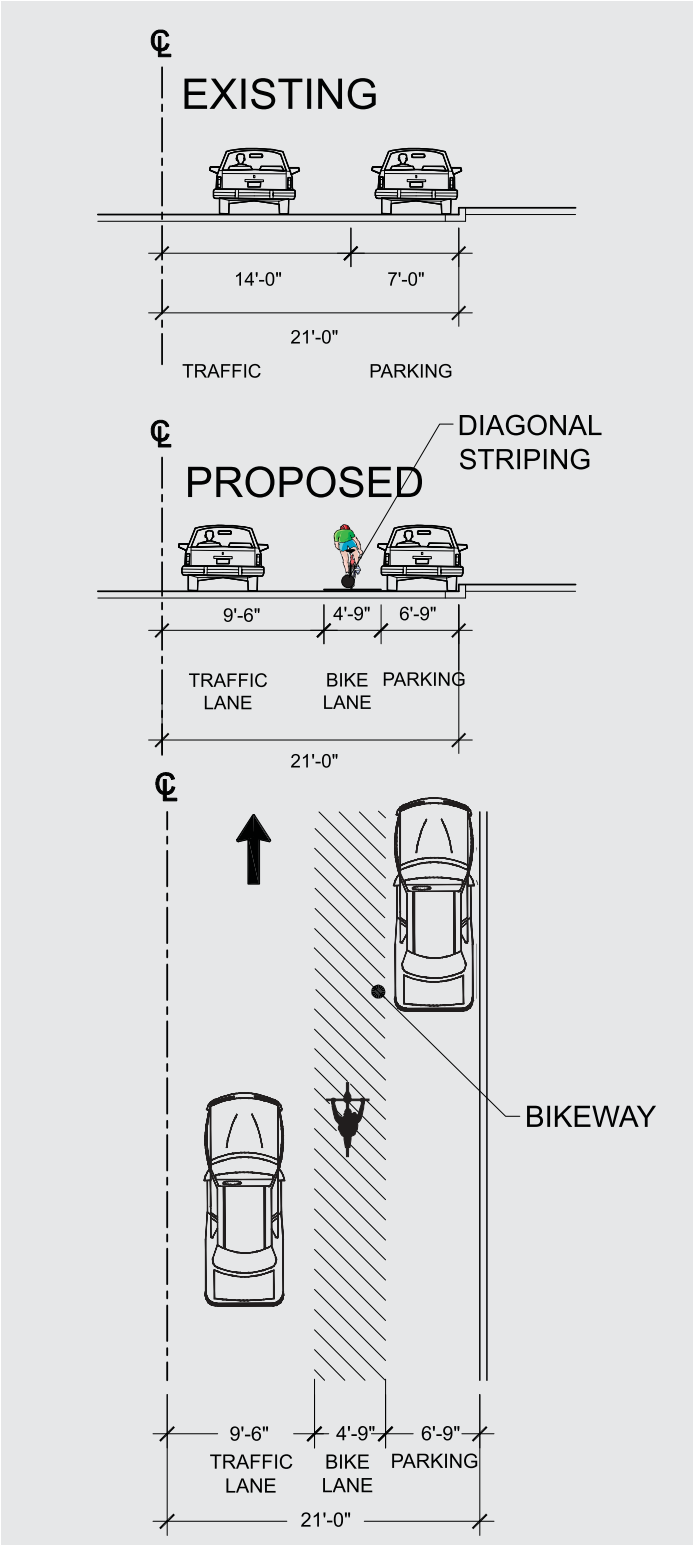
- On roads where motorists tend to encroach on the bike lane/shoulder area, particularly on curves in the road and/or where people tend to park far from the curb
- When a wide curb lane is not adequate as a bicycle facility but there is not enough room for a standard bicycle lane
- Posted vehicle speeds = 48 km/h (30 mph)
- ADT < 10,000
- Useful where space available varies (provides continuity through areas with difficult cross section)
- Not a mandatory treatment

How to implement

- Experimental; no standards

Where already used

- Minneapolis, MN (15th St W - Nicollet to Lyndale, experimental)



Cross-Section Options

Cost Estimates

Initial capital cost:
$17,500 -$42,000/mi pavement markings (Tape or Epoxy, 4-6 yr life)

$7,625/mi signs

Annualized capital cost:
$3,680-11,270/mi

Maintenance:
Included in regular street maintenance

07. Wide Curb Lane

A 4.2 m (14 ft) minimum outside travel lane can better accommodate bicyclists and motorists in the same lane. In most cases, the motorist will not need to change lanes to pass the bicyclist. Bicyclists have more maneuvering room at driveways and in places with limited sight distance.

Where/when to use (quantitative guidance)

- Vehicle speeds < 48 km/h (30 mph)
- ADT < 10,000
- In urban areas on major streets where experienced cyclists will likely be operating

How to implement

- Usable width is from edge stripe to lane stripe or from the longitudinal joint of the gutter pan to lane stripe
- Gutter pan should not be included as usable width. If there is no gutter pan, add 0.3 m (1 ft) minimum shy distance from face of curb
- 4.5 m (15 ft) of usable width is desirable on sections of roadway where bicyclists need more maneuvering room (e.g., steep grades, limited sight distance)
- If traffic speeds exceed 64 km/h (40 mph) and ADT exceeds 10,000, 4.5 - 4.8 m (15 - 16 ft) lanes are desirable
- Share the Road sign and pavement markings (Treatments 8 and 11) optional

Where already used

- Throughout the United States

Permitted in standards

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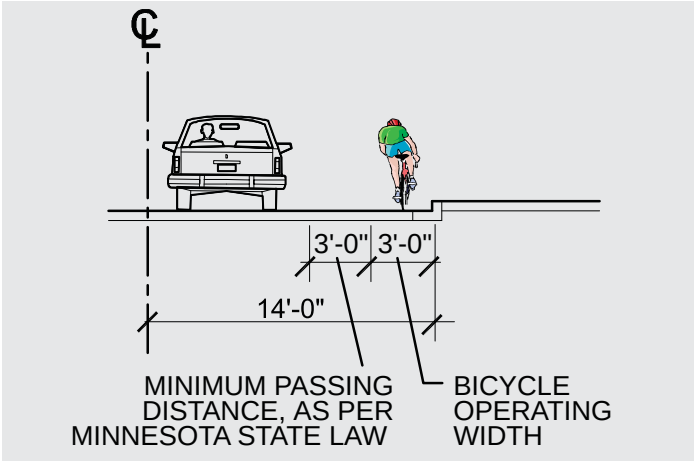


Cost Estimates

Initial capital cost:
Varies based on existing striping:

Obliterate lane marking $2,200/mi

Add lane marking $500/mi

Maintenance:
Included in regular street maintenance

08. Share the Road Signs *Pilot Project Only*

Bicyclists and motor vehicles share the same travel lane. Motorists will usually have to cross the centerline on a two-lane road to pass the bicyclist. Share the Road signage is used to encourage shared use and to reduce motor vehicle/bicyclist conflict on designated commuter and recreational bicycle routes and popular rural bicycling routes without dedicated bicycle facilities/shoulders. The signs illustrated warn drivers to watch for bicyclists traveling along the road.

Where/When to Use

- On urban streets with wide curb lanes of 14' or greater, but no bicycle lane
- In some rural road situations, such as where there is no paved shoulder and a large number of bicycles use the roadway

How to implement (quantitative guidance)

- Install signs approximately every 0.8 km (0.5 mi) on routes that are frequently used by bicyclists in urban areas
- Install every 1.6 km - 3.2 km (1 mi - 2 mi) on rural routes and/or on corners, hills, or other places with limited sight lines
- Avoid sign clutter
- Use in conjunction with traffic calming treatments, including speed limit reductions

Where already used

- Minnesota
- Other sign variations used throughout the United States

Cost Estimates

Initial capital cost

Initial cost $400 per sign ($40/yr over 10 year life)

Maintenance

Part of regular street maintenance

09. Change Lanes to Pass Bicycles Signing

Pilot Project Only

Bicyclists and motor vehicles share the same travel lane. Motorists will usually have to move into the adjacent travel lane to the left to pass the bicyclist. The sign CHANGE LANES TO PASS BICYCLES conveys this message to motorists overtaking bicycles. The optional sign Bicycles ALLOWED USE OF FULL LANE can be used to reinforce this message.

Where/When to Use (quantitative guidance)

- On urban streets with lanes too narrow (3.9 m [13 ft] or less) for bicycles and cars to safely pass within the lane
- In limited situations on rural roads without shoulders and with high bicycle volumes and low motor vehicle speeds and volumes (2,000 ADT or less)

How to implement

- Install signs approximately every 300 m (1,000 ft) on routes that are frequently used by bicyclists in urban areas
- Install every 1.6 km - 3.2 km (1 mi - 2 mi) on rural routes and/or on corners, hills, or other places with limited sight lines
- Avoid sign clutter
- Use in conjunction with traffic calming treatments, including speed limit reductions
- May be used in combination with pavement markings illustrated in Treatment 10

Where Already Used

- Variants of this concept used throughout the United States

Cost Estimates

Initial capital cost

Initial cost $400 per sign ($40/yr over 10 year life)

Maintenance:

Part of regular street maintenance

10. Shared Lane Arrow Pavement Marking
Pilot Project Only

Shared lane pavement markings are paint or thermoplastic markings on the roadway to help guide bicyclists out of the “door zone” from parked vehicles and to show motorists the bicyclist's travel path. The pavement markings, in conjunction with roadway signing, can reinforce that bicyclists belong on the road and will increase driver awareness of bicyclists.

Where/when to use (quantitative guidance)

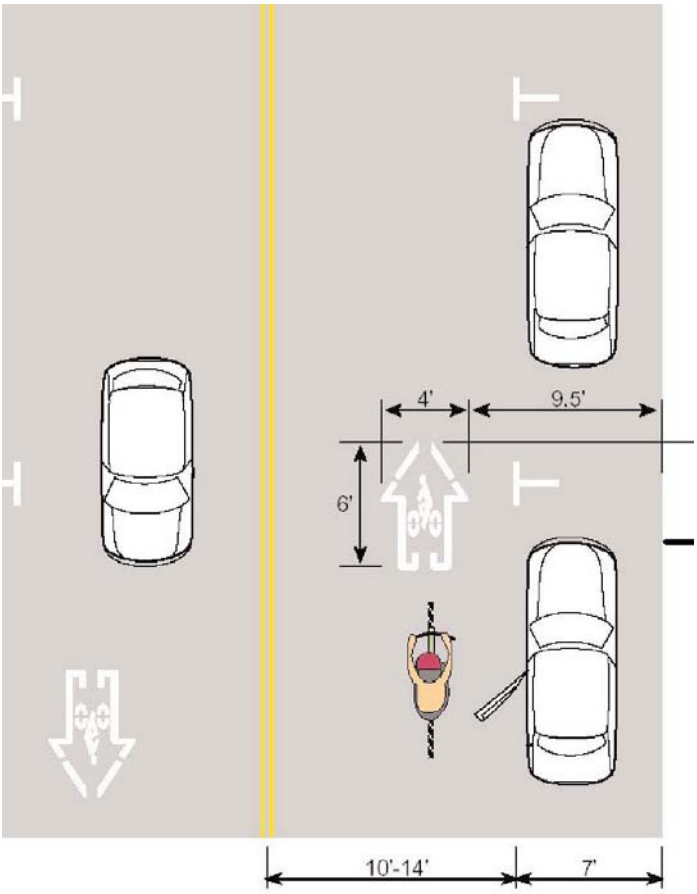
- On designated bicycle routes that are narrow shared-use roads where bicyclists tend to ride too close to parked vehicles or the curb
- Roadway speeds are low and parking turnover is high

How to implement

- Pavement markings should be installed with center 3.5 m (11.5 ft) from the face of the curb where parking is permitted
- For curb lanes with no room for parking or bicycle lanes, the pavement marking should be placed with the logo's centerline at least 0.9 m (3 ft) from the edge of the rideable surface
- Install logo every 30 - 60 m (100 - 200 ft)

Where already used

- Denver, CO
- San Francisco, CA



Cost Estimates

Initial capital cost
$35 - $55 per stencil

$400 per sign

Maintenance:
Part of regular street maintenance

Crossing Treatment

11. Colored Bicycle Lanes *Pilot Project Only*

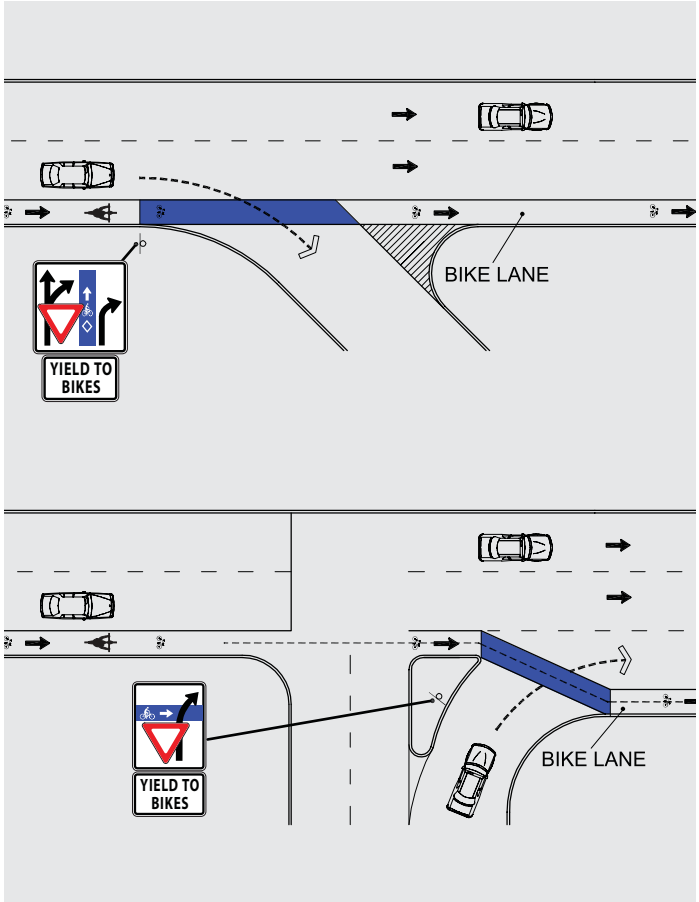
Colored bicycle lanes are used to increase visibility of bicyclists by explicitly defining the bicyclist's path of travel and to remind motorists that they are crossing a bicycle lane and a high-conflict zone. The color is obtained by using a dyed asphalt mix, thermoplastic treatment, or paint. Other colors can be achieved by using, for example, rose-colored trap rock in the seal coat for these high-conflict zones.

Where/when to use (quantitative guidance)

- At high-conflict locations where motorists are permitted or required to merge into or across the bicycle lane
- Conflict points at highway or bridge on/off ramps and busy intersections
- On commuter and/or high use bicycle routes

How to implement

- Identify high-conflict locations
- Pavement markings similar to standard bicycle lane but filled with color at the conflict point
- "Yield to Bikes" signs must accompany the treatment
- May be used in combination with bicycle pavement markings (see photos)



Where already used

- Portland, OR
- Cambridge, MA

Cost Estimates
(Based on Epoxy)

Initial capital cost:
Approximately $4,600/1500 sq ft installation. Includes signs and installation of pavement markings

Annualized capital cost:
$1,100/each

Replacement cycle:
Thermoplastic: 5-8 yrs

Dyed asphalt: 10 yrs

Epoxy: 3-5 yrs

Paint: twice a year

12. On-Ramp/Off-Ramp Crossing

The on-street bikeway exits with traffic and pulls away from the road to cross at a 90° (or close to 90°) angle. This treatment improves visibility, reduces crossing time, and provides additional comfort and safety for bicyclists. Another option for some such situations is to provide a tunnel under the exit ramp in place of the crosswalk.

Where/when to use (quantitative guidance)

- On high speed roadways with at speed access ramps, such as freeways, highways and expressways
- On high speed roadways that are designated bikeways and/or popular bicycling routes
- If no parallel alternative route is available

How to implement

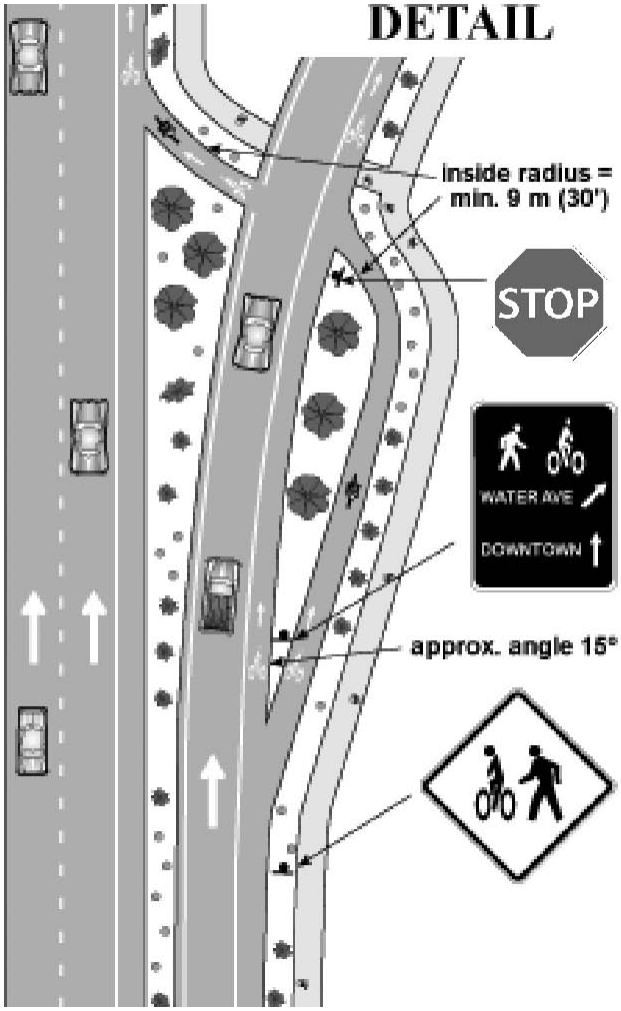
- Install traffic control devices (signs or signal) for bicyclists to either yield or stop before crossing the ramp
- Ensure adequate sight and stopping distances
- Install speed calming treatments (tight turning radius, rumble strips, speed reduction) to slow exiting motor vehicles
- Install directional, informational, and warning signs to guide the bicyclist to the crossing and/or their destination

Where already used

- Manchester, England

Permitted in standards

☑ AASHTO/MUTCD



Crossing Treatment

Cost Estimates

Variable

Crossing Treatment

13. Bicycle and Pedestrian Bridge

NOTE: Current Mn/DOT Standard

A shared use bridge structure allows bicyclists and pedestrians to cross over busy roadways, railways, or water bodies to reach popular destinations.

Where/when to use (quantitative guidance)

- At locations that would otherwise be difficult or impossible for bicycles and pedestrians to cross (over freeways, rivers/creeks, multiple railroad tracks, etc.)
- Connecting neighborhoods to local schools over high volume and high speed arterials/highways where signalized crossings are more than 135 m (450 ft) apart
- Use only when a safe and direct on-road alignment is not available
- Use only when bicyclists and pedestrians are not required to negotiate significant elevation changes
- Use when vehicular bridges do not offer continuity and directness of route

How to implement

- Full engineering and design analysis required
- Must meet ADA access requirements

Where already used

- Throughout the United States and elsewhere

Permitted in standards

☑ AASHTO/MUTCD

Cost Estimates

Initial capital cost:
(*at grade deck)*

$66.00 per sq ft

200 ft long x 12 ft wide br = $160,000

Add $80,000 if ramps needed for elevated bridge or use $100/sq ft overall

Useful life:
50 years

Annualized capital cost:
$1.32/sq ft

14. Bicycle and Pedestrian Tunnel

NOTE: Current Mn/DOT Standard

A shared use tunnel allows bicyclists and pedestrians to cross high volume/high speed roadways, railroads and/or freeway ramps.

Where/when to use (quantitative guidance)

- When a safe and direct on-street alignment is not available to cross a high volume/high speed roadway or railroad
- If the high volume/high speed roadway is elevated
- If an existing motor vehicle under-crossing is too narrow for a bicycle and pedestrian facility
- Use only when bicyclists and pedestrians are not required to negotiate significant elevation changes

How to implement

- Full engineering and design analysis required
- Must have adequate lighting and sight distance for safety
- Must have adequate overhead clearance of at least 3.1 m (10 ft)
- Tunnels 4.3 m (14 ft) wide allow for several users to pass one another safely. A 3.0 m x 6.0 m (10 ft x 20 ft) tunnel is ideal.
- May require drainage if the sag point is lower than the surrounding terrain
- Visibility into and through the tunnel and lighting enhance personal security concerns.

Where already used

- Throughout the United States and elsewhere

Permitted in standards

☑ AASHTO/MUTCD

Crossing Treatment

Cost Estimates

Initial capital cost:
$200.00 per sq ft

Useful life:
50 years

Annualized capital cost:
$4.00/sq ft

Crossing Treatment

15. Mixed-Use Path with Barrier

NOTE: Current Mn/DOT Standard

A 3.0 m (10 ft) minimum width shared use path separated from vehicular traffic by a barrier on bridges

Where/when to use (quantitative guidance)

- When an existing highway bridge is available to connect a shared use path across a feature such as a watercourse, railroad or roadway.

How to implement

- Remove or reconfigure vehicle travel lanes to include a 3.0 m (10 ft) shoulder and a 3 m (10-12 ft) shared use pathway

Where already used

- Minnesota

Permitted in standards

☑ AASHTO/MUTCD

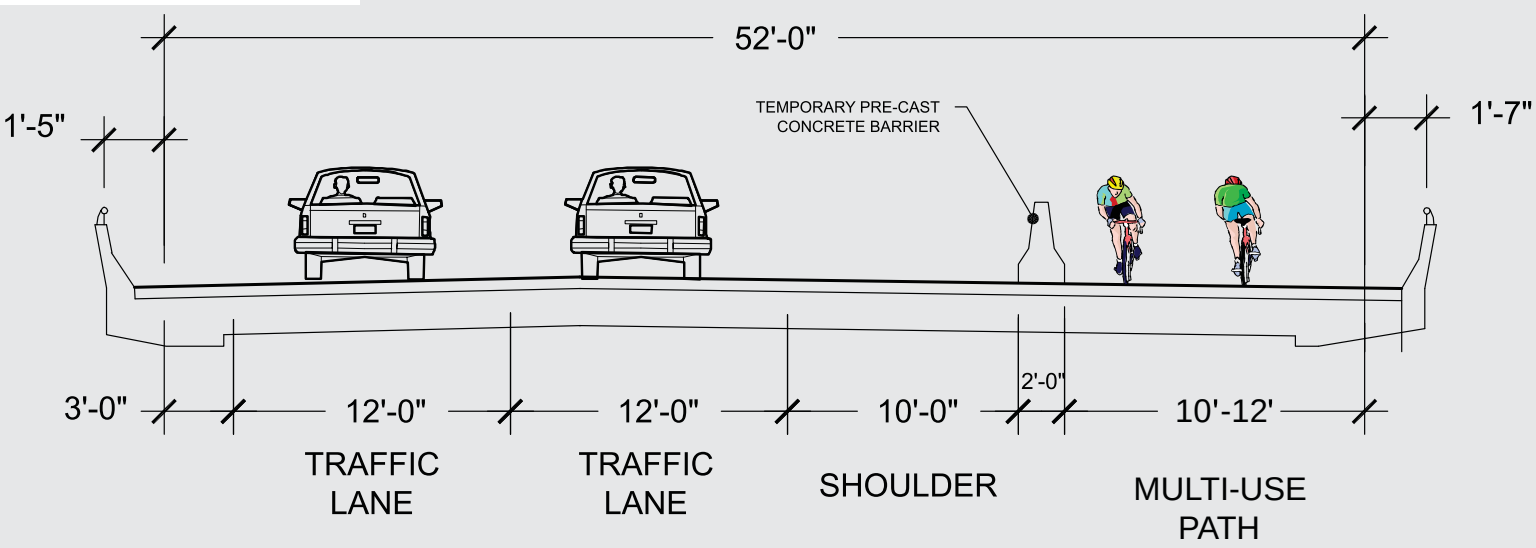
Cost Estimates
(for typical 500 ft bridge length)

Initial capital cost:
$30,000 (for typical 500 ft bridge striping and barrier)

Useful life:
10 years

Annualized capital cost:
$3,000

Maintenance:
Part of regular roadway maintenance



16. Raised Bike-Sidewalk on Bridge

NOTE: Current Mn/DOT Standard

In very rare cases the sidewalk on a bridge or in a tunnel is used by bicyclists and pedestrians. Generally these sidewalks are at least 3.7 m (12 ft) wide. In the illustrations, the rightmost travel lane is too narrow to accommodate a cyclist and motor vehicle operating side by side.

Where/when to use (quantitative guidance)

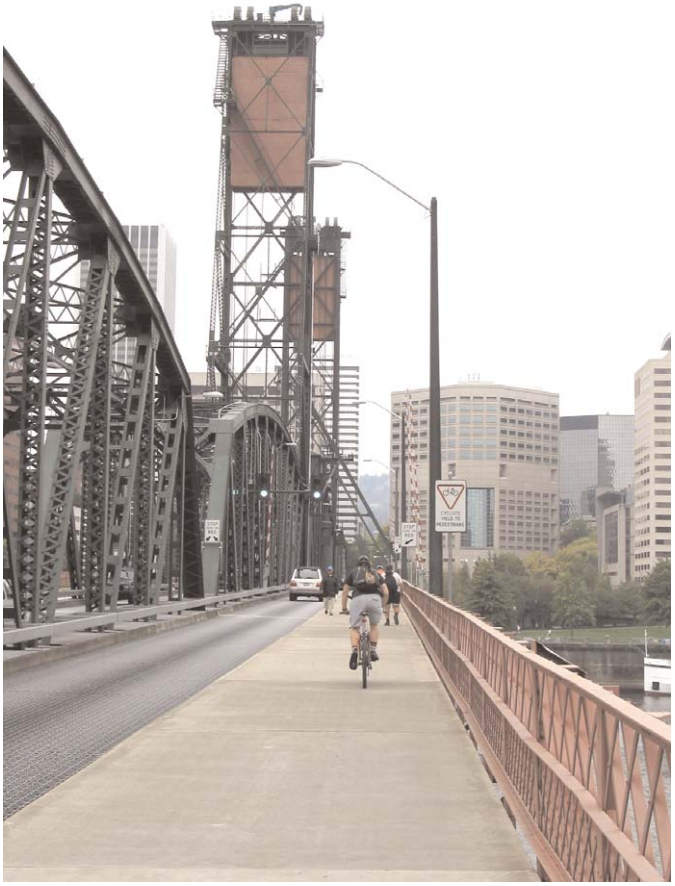
- On bridges with constrained right-of-way or narrow outside travel lanes, steel grating, or other unfriendly bicycle and pedestrian elements
- In tunnels with restricted lane width without shoulders
- Only applicable where speed limits are less than 40 mph

How to implement

- Existing sidewalk is used or modified including provision of adequate width, drainage, wheelchair ramps, and signage
- Approaches to the bridge must be accessible to bicyclists and pedestrians·
- Provide smooth transitions and match ramp width to path width

Where already used

- Throughout the United States



Crossing Treatment

Cost Estimates

Initial capital cost:
$90.00 per sq ft

Useful life:
30 years

Annualized capital cost:
$3.00/sq ft

Crossing Treatment

17. Jersey-Barrier Shoulder

The shoulder of a high volume/high speed roadway is partitioned with a concrete barrier to provide a comfortable bicycling space.

Where/when to use (quantitative guidance)

- On high speed, high volume roadways where separation is desirable
- In highway construction zones where vehicle travel lanes and shoulders have been shifted or eliminated
- If the roadway shoulder is wide enough to accommodate emergency/distressed vehicles and 1.8 m (6 ft) of one-way bicycle travel

How to implement

- Install concrete barriers on the shoulder allowing enough room for distressed vehicles on one side and at least 1.8 m (6 ft) of one-way bicycle travel on the other.
- Connections should be well signed, especially in construction/detour zones

Where already used

- Throughout the United States

Cost Estimates

Cost of barrier, end treatments, and extra shoulder width where necessary.

18. Bus/Van Shuttles

Scheduled or demand-response buses that are equipped to carry bicycles across or through a zone that is impassable except by vehicle.

Where/when to use (quantitative guidance)

- As many buses as is appropriate
- Can be especially useful in transporting bicyclists and pedestrians through an area with poor bicycle/pedestrian accommodation

How to implement

- Each transit vehicle can accommodate 2 or more bicycles
- Front racks or rear trailers

Where already used

- Throughout the United States

Crossing Treatment

Cost Estimates

Initial capital cost:
$560 per rack

Maintenance:
Minimal for scheduled service

19. Pedestrian Refuges at Uncontrolled or On-Demand Locations

Refuge islands allow pedestrians to cross fewer lanes at a time and to judge conflicts separately. They provide a refuge so slower pedestrians can wait for a signal or gap in traffic.

Where/when to use (quantitative guidance)

- On roadways with 4 or more lanes
- On wide 2 lane roads with >12,000 ADT and average vehicle speeds of 64.4 km/h (40 mph) or greater
- High volume roadways adjacent to schools and other pedestrian generators may require signalization
- May require additional right-of-way

How to implement

- Medians must be at least 1.2 m (4 ft) wide, but preferably 2.4 m (8 ft) or wider
- Plantings and decorative barriers can increase visibility of the treatment but should not block the view of pedestrians or diminish motorist sight lines
- Must provide enough room for several pedestrians or bicyclists to wait at once·
- At-grade cuts are preferable to ramps

Where already used

- Throughout the United States

Permitted in standards

☑ AASHTO/MUTCD

Cost Estimates

Initial capital cost:
$20,000 - $60,000/island depending on the dimensions and additional treatments (plantings, decorative border)

Maintenance:
Low/Moderate

20. Pork Chop Island (at Free Right Turn)

NOTE: Current Mn/DOT Standard

A triangular island is installed between a through lane and the right turn lane to create a shorter crossing distance, to improve visibility of right-turning vehicles, and to provide a refuge for pedestrians.

Where/when to use (quantitative guidance)

- On signalized crossings with heavy right turn traffic and larger-radius corners
- At skewed intersections

How to implement

- Islands must comply with ADA access requirements
- At-grade cuts are preferable to ramps; all elements must be plow-friendly
- Drainage issues must be avoided
- Signal poles must not impair access

Where already used

- Throughout the United States

Permitted in standards

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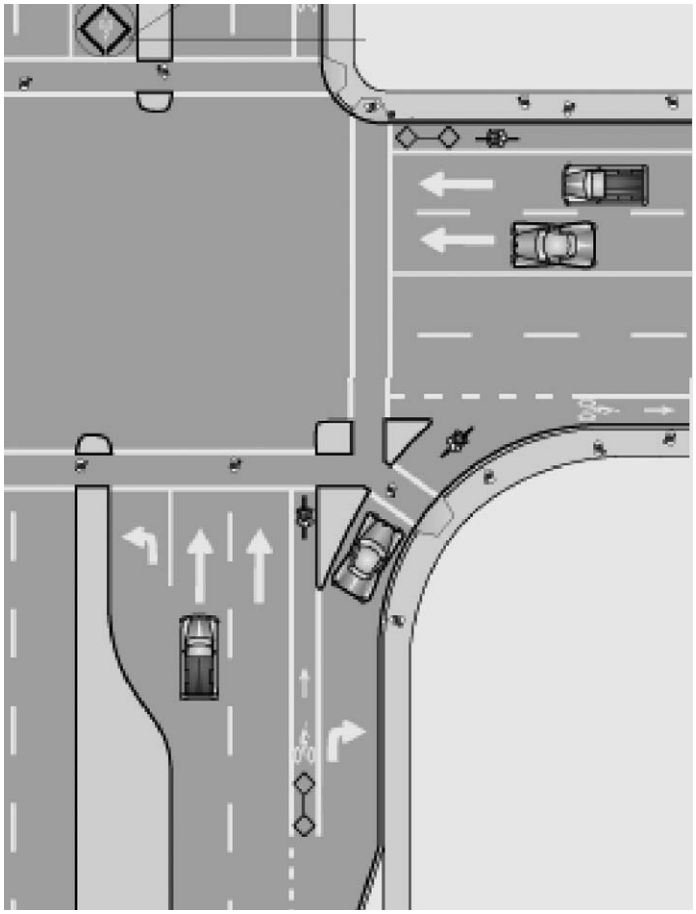


Cost Estimates

Initial capital cost:
$15,000 - $30,000/island

Maintenance:
Low/Moderate

21. Curb Extensions

The sidewalk extends across the parking lanes to the edge of the travel (or bicycle) lanes to narrow the distance of the road that a pedestrian has to cross. This treatment improves the visibility of pedestrians waiting to cross by bringing them close to the center of the driver's cone of vision and by allowing the pedestrian to see beyond the parked vehicles. Particular care needs to be taken to avoid infringing on bicycle operating space.

Where/when to use (quantitative guidance)

- At unsignalized intersections and mid-block crossings where pedestrian activity is high (e.g., downtowns, shopping centers, school crossings)
- Where there is a need to shorten the crossing distance of the roadway
- Where there is a need to improve the visibility of pedestrians

How to implement

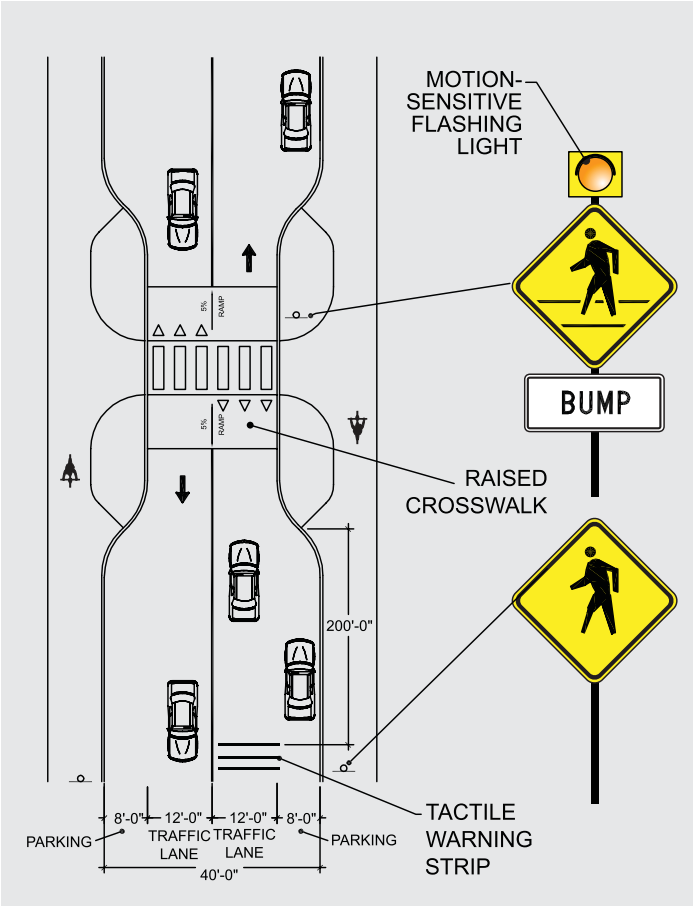
- Tactile treatments are needed to guide visually impaired persons to and through the crossings
- May require removing on-street parking space(s) at mid-block crossings

Where already used

- Throughout the United States

Permitted in standards

☑ AASHTO/MUTCD



Cost Estimates

Initial capital cost:
$5,000 - $25,000/extension, depending on the need to modify drainage and the use of decorative elements

Maintenance:
Low/Moderate

22. Raised Crosswalk (Speed Table) *Pilot Project Only*

Crosswalks are raised 150 mm (6 in) above the roadway pavement to an elevation that matches the adjacent sidewalk. This treatment includes a flat area on the top that constitutes the crosswalk. This flat area may be made of asphalt, patterned concrete, or pavers. The slope of the approach ramps can be varied to affect the speed at which they are crossed by motor vehicles.

Where/when to use (quantitative guidance)

- When there is a need to control traffic speeds and improve the visibility of crosswalks

How to implement

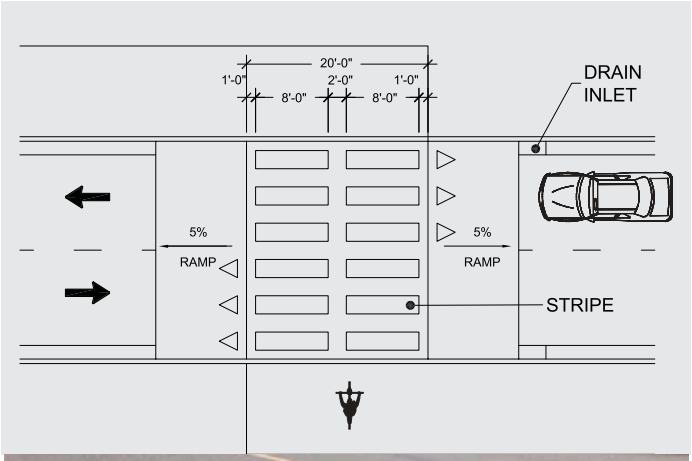
- 150 mm (6 in) high, flush with the sidewalk
- Tactile treatments are necessary for sight impaired pedestrians
- Skew ramps to snowplow angle

Where already used

- Throughout the United States and elsewhere

Permitted in standards

☑ AASHTO/MUTCD



Cost Estimates

Installation:
$5,000 - $20,000/crosswalk, depending on the width of the street, the drainage improvements affected, and the materials used for construction

Maintenance:
Part of regular street maintenance

23. Pedestrian Signals

NOTE: This treatment is an innovative site-specific treatment. A full engineering review should accompany any planning and/or decision making process for this treatment.

Pedestrian activated traffic signal at a marked multi-use path crossing or crosswalk.

Where/when to use (quantitative guidance)

- On mid-block crossings of high volume/high speed roadways, only where no other option is possible or feasible
- On roadways adjacent to schools or other high pedestrian activity areas where safety is paramount
- Anticipated use must be high enough for motorists to get used to stopping frequently for a red light (a light that is rarely activated may be ignored when in use)
- Night-time illumination of crosswalk is desirable

How to implement

- Signal needs to be timed with other local signals
- Signal may be accompanied by other traffic calming treatments (e.g., raised medians, curb extensions)
- Warning signs should be installed for motorists

Where already used

- Throughout the United States and elsewhere

Permitted in standards

☑ AASHTO/MUTCD

Cost Estimates

Installation:
$100,000 - $250,000/crossing, depending on the complexity of the crossing and the technologies used

Maintenance:
Part of regular street maintenance

24. Scenic Bikeway System Signing: Route Signs and Wayfinding

NOTE: Current Mn/DOT Standard

Special signs used to guide touring and recreational bicyclists through urban areas and along popular rural bicycling routes.

Where/when to use (quantitative guidance)

- On designated or popular bicycling routes
- To guide bicyclists through an urban area

How to implement

- Use signs sparingly, primarily at locations where cycle route turns and at junctions with other bicycle routes
- A consistent and recognizable logo, arrows and a destination should be on the sign to clearly direct bicyclists
- Bicycle route sign should be accompanied with destination and direction plaques

Where already used

- Throughout the United States and elsewhere

Permitted in standards

☑ AASHTO/MUTCD

☑ Mn/DOT

Mid-Block Stickers
Small inexpensive self-adhesive versions of basic route sign without route number. Can be plastered mid-block on existing poles, etc. Might also be used as an interim route signage between intersections until funding can be secured.

Scenic Bikeway System

Cost Estimates

Installation:
$400 per sign

Maintenance:
Low/Moderate

25. Cycle Track (One-Way) *Pilot Project Only*

NOTE: This treatment is an innovative site-specific treatment. A full engineering review should accompany any planning and/or decision making process for this treatment.

A cross between a bicycle lane and an off-street bicycle path that is separated from both motor vehicle traffic and the sidewalk by a curb or buffer.

Where/when to use (quantitative guidance)

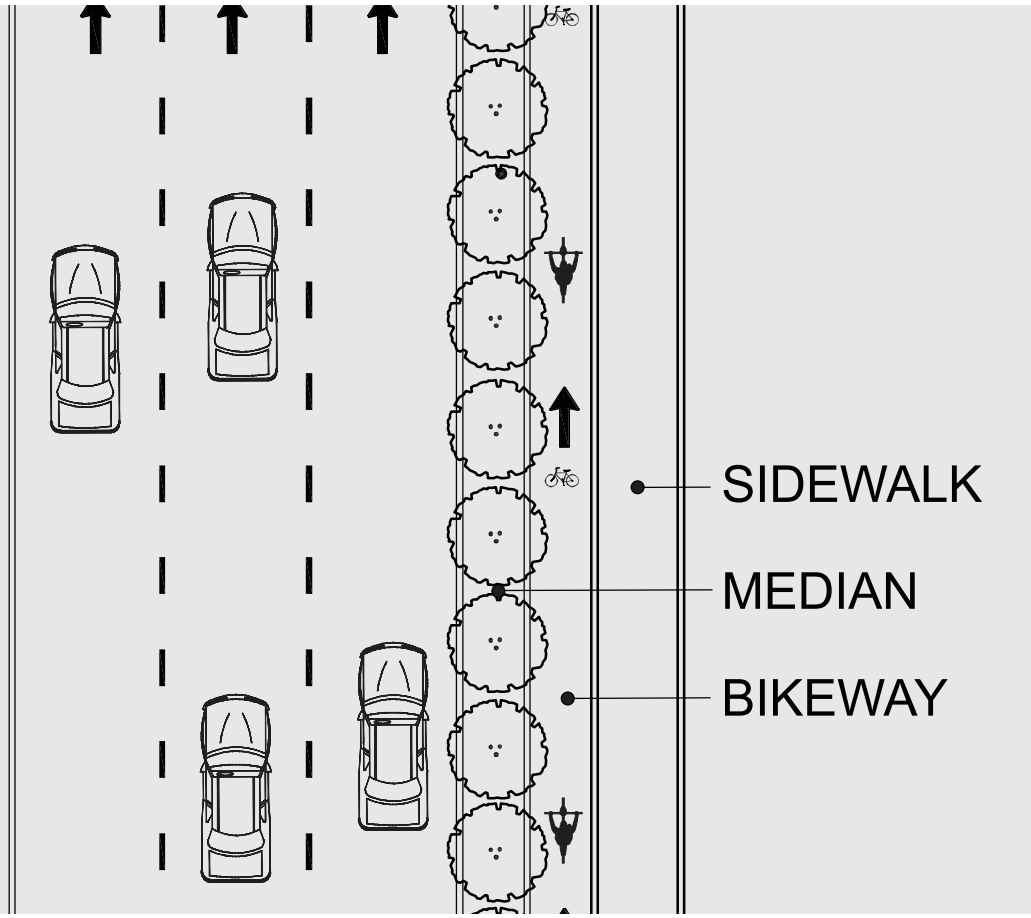
- Roadways with high ADT and/or high vehicle speeds·
- In business districts with high volumes of traffic
- On roadways with few major intersections and driveways

How to implement

- Minimum 1.5 m (5 ft) width of one-way cycle track plus shoulders
- Major intersections must have separate bicycle signal phases
- Cross traffic at minor intersections should be slowed or stopped prior to crossing the cycle track
- Mark with bicycle lane markings

Where already used

- Europe
- Madison, Wisconsin



Cost Estimates

Initial capital cost:
$225,000 - $350,000

Useful life:
20 years

Annualized capital cost:
$11,250 - $17,500

26. Diagonally Marked Door Zone (In Bicycle Lane)
Pilot Project Only

NOTE: This treatment is an innovative site-specific treatment. A full engineering review should accompany any planning and/or decision making process for this treatment.

Markings between the bicycle lane and the on-street parking lane to alert motorists of the presence of bicycles and to alert bicyclists to the "door zone". Also known as a "deterrent strip". Markings should be different than those shown to differentiate from Treatment 06.

Where/when to use (quantitative guidance)

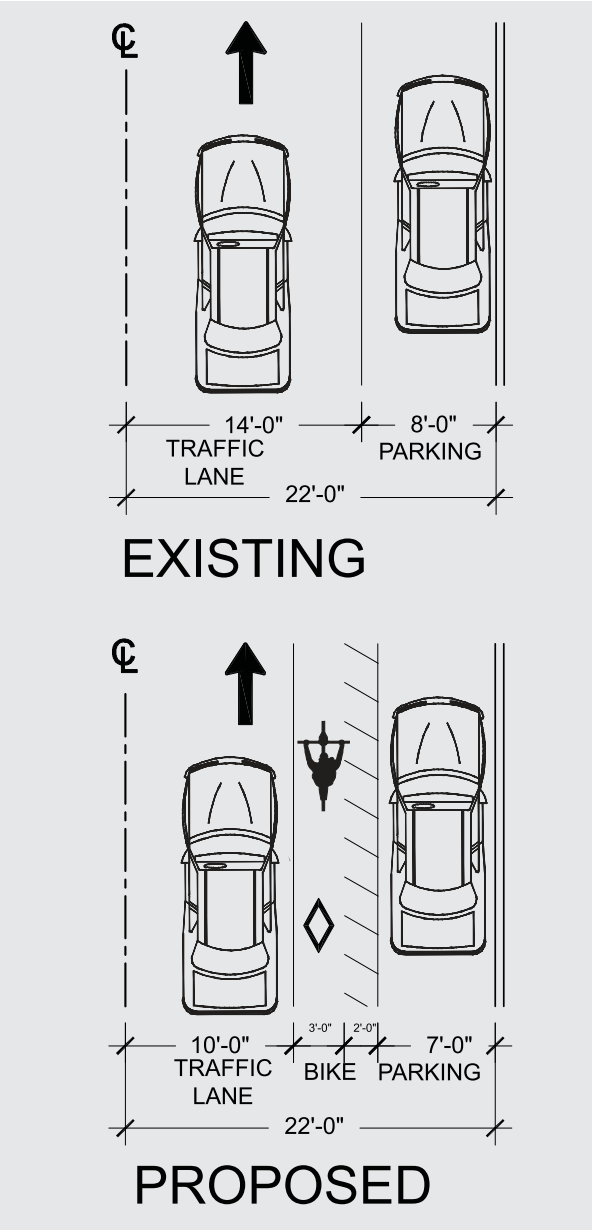
- Where there are high occurrences of bicycle/vehicle door conflict
- In areas with high on-street parking turnover
- Average vehicle speeds < 56 km/h (35 mph)
- ADT < 10,000, few trucks or buses

How to implement

- Reduce vehicle travel lane to 3.0 m (10 ft)
- Install 1.5 m (5 ft) bicycle lane
- Stripe the right 0.6 m (2 ft) of the bicycle lane
- Paint is preferable to thermoplastic treatments to reduce excessive vibrations for the bicyclist

Where already used

- Europe



Other Treatment Enhancements

Cost Estimates

Initial capital cost:
$5,000/mi

Maintenance:
Part of regular street maintenance

27. Through Bicycle Lane at Single Right-Turn

NOTE: This treatment is an innovative site specific treatment. A full engineering review should accompany any planning and/or decision making process for this treatment.

A bicycle lane is striped to delineate the safest route through single and dual right turn intersections. The bicycle lane is located to the left of the dedicated right-turn lane(s).

Where/when to use (quantitative guidance)

- Through high volume intersections with single or dual right-turn lanes

How to implement

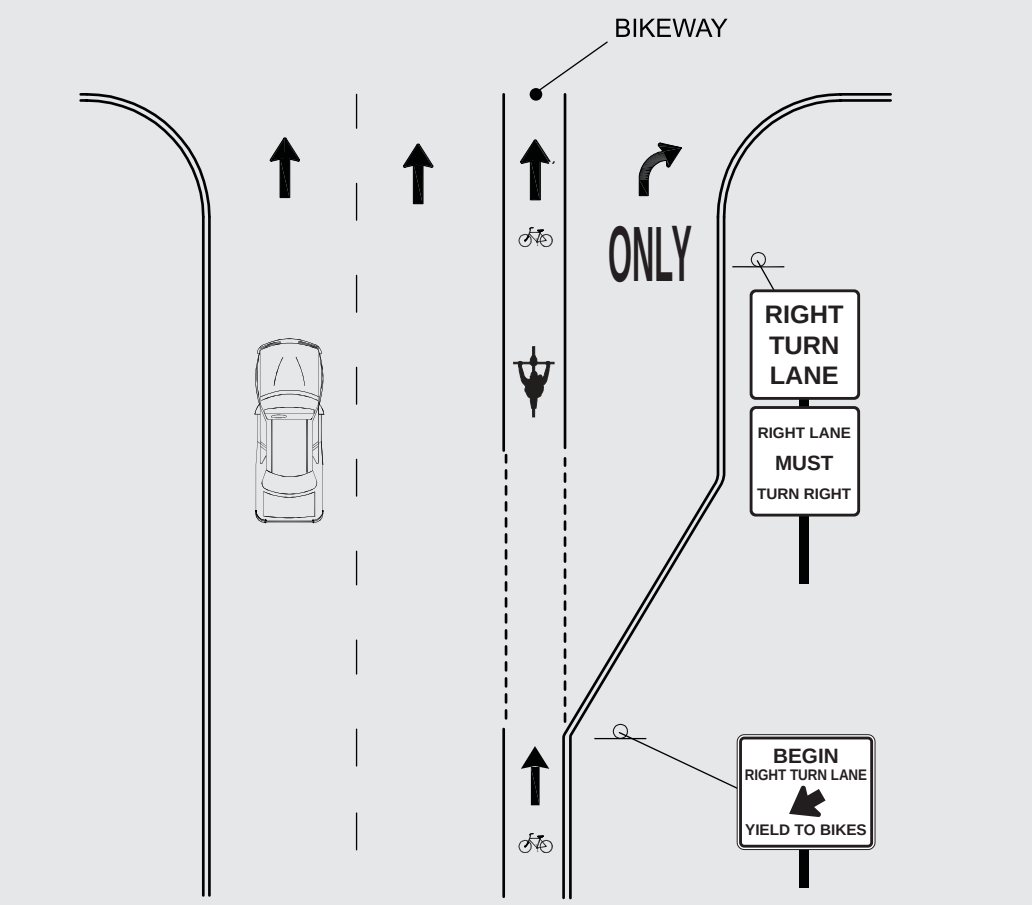
- Other traffic calming treatments should accompany the approach (e.g., colored bicycle lane and/or pavement markings)
- Install signs to direct bicyclists and alert motorists
- Bicycle lane should be a minimum of 1.2 m (4ft)
- A dashed line should be located at the motor vehicle entrance to the dedicated right-turn lane; length of dashed section dependent on speed and volumes.

Where already used

- Oregon
- Massachusetts

Permitted in standards

☑ AASHTO/MUTCD



Cost Estimates

Initial capital cost:
$25,000 - $35,000/ intersection

Maintenance:
Part of regular street maintenance

28. Combined Bicycle/Right-Turn Lane

NOTE: This treatment is an innovative site-specific treatment. A full engineering review should accompany any planning and/or decision making process for this treatment.

A standard-width bicycle lane is installed on the left side of the dedicated right-turn lane. A dashed stripe provides the bicycle portion and the right-turn portion of the lane.

Where/when to use (quantitative guidance)

- On roadways where there is not enough room to provide a standard-width bicycle lane and a standard-width dedicated right-turn lane
- Average vehicle speeds < 48 km/h (30 mph)

How to implement

- Install a sign to instruct motorists and bicyclists how to use the facility
- Stripe and sign bicycle lane pavement markings in the turn lane to position and guide bicyclists in the right-turn lane

Where already used

- Oregon

Cost Estimates

Initial capital cost:
$1,500 per intersection

Maintenance:
Part of regular street maintenance

29. Left-Side Bicycle Lane on a One-Way Street

NOTE: This treatment is an innovative site-specific treatment. A full engineering review should accompany any planning and/or decision making process for this treatment.

A standard-width bicycle lane is striped on the left side of a one-way street to reduce conflicts with parked cars, buses and right-turning vehicles.

Where/when to use (quantitative guidance)

- On one-way streets with high bus volumes in the right-most lane
- On streets with a high number of right-turns and/or vehicles merging from adjacent roadways
- No on-street parking on the left side of the roadway preferred

How to implement

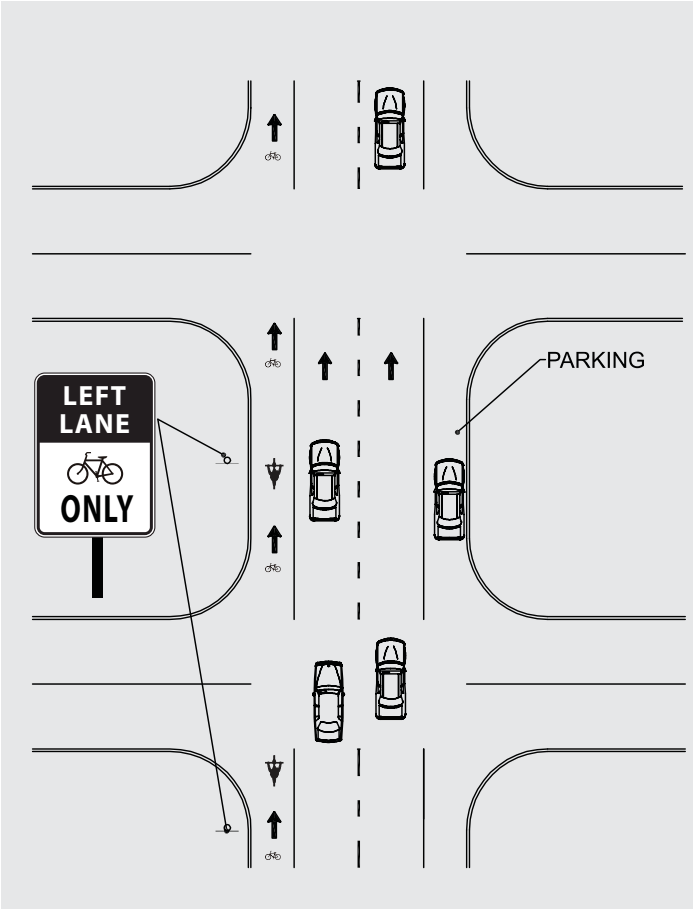
- Install standard-width bicycle lane on the left side of the street according to the same guidelines as regular right side bicycle lanes

Where already used

- Minneapolis (Park & Portland Avenues S.)
- Oregon
- California

Permitted in standards

☑ AASHTO/MUTCD



Cost Estimates

Initial capital cost:
$8,250/mile (signs and pavement markings one direction only)

Maintenance:
Part of regular street maintenance

30. Signed Shoulder

NOTE: Current Mn/DOT Standard

The existing shoulder of a roadway is explicitly signed as a bikeway.

Where/when to use (quantitative guidance)

- On designated bicycle routes and/or popular bicycling roadways
- ADT > 2,000·
- Average vehicle speeds > 56 km/h (35 mph)
- When there is inadequate sight distance (e.g. corners and hills)

How to implement

- Shoulder should be = 1.2 m (4 ft)
- Shoulder should be = 1.5 m (5 ft) from the face of the guardrail, curb or other roadside barriers
- Shoulder should be = 2.4 m (8 ft) if motor vehicle speeds exceed 80 km/h (50 mph) or if the percentage of trucks, buses and recreation vehicles is high
- Shoulders should be wider where higher volumes of bicyclists are expected

Where already used

- Throughout the United States

Permitted in standards

☑ AASHTO/MUTCD

Cost Estimates

Initial capital cost:
$400 per sign

Maintenance:
Part of regular roadway maintenance

31. Back in Angled Parking *Pilot Project Only*

NOTE: This treatment is an innovative site-specific treatment. A full engineering review should accompany any planning and/or decision making process for this treatment.

Back-in angled parking provides better visibility of on-coming bicyclists for motorists. Angled parking can make the street less desirable for pedestrians and wheelchair-users because of cars overhanging the sidewalk and making it narrower, and can affect visibility for residents and businesses. Note: Nose-in angle parking is not suitable for bicycle routes due to limited visibility for drivers backing out.

Where/when to use (quantitative guidance)

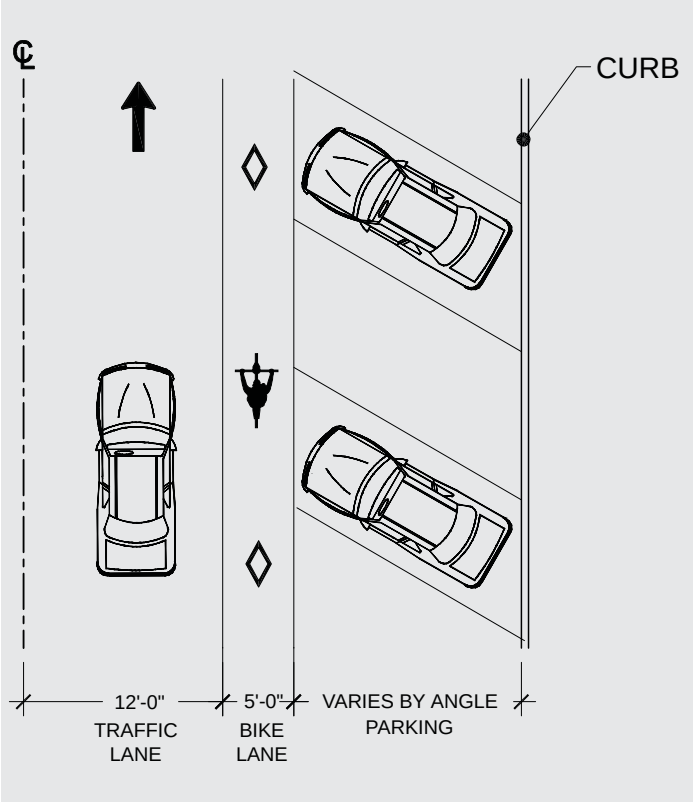
- Where angled, on-street parking exists and bicycle volumes are substantial
- Low volume/low speed roadway

How to implement

- Stripe 1.5 m (5 ft) bicycle lane
- Parking lane width depends on angle of parking

Where already used

- Washington



Cost Estimates

Initial capital cost:
Comparable to standard angled parking installation

Maintenance:
Part of regular street maintenance

32. Signal Progression for Bicyclists *Pilot Project Only*

NOTE: This treatment is an innovative site-specific treatment. A full engineering review should accompany any planning and/or decision making process for this treatment.

Signals in proximity to one another are retimed to accommodate a multiple of bicycle speeds (approximately 19 km/h [12 mph]). The reconfiguration is more efficient for bicyclists who may resist stopping due to the laws of physics.

Where/when to use (quantitative guidance)

- Business/shopping districts
- Central cities
- Designated bicycle routes desiring traffic calming (i.e., neighborhood collectors)

How to implement

- Reconfigure signal timing to accommodate travel speeds between 19 - 24 km/h (12 - 15 mph)

Where already used

- Oregon

Other Treatment Enhancements

Cost Estimates

Initial capital cost:
Minimal

Maintenance:
Part of regular signal maintenance

33. Rumble Strips

NOTE: Current Mn/DOT Standard

Continuous or intermittent rumble strips are intended to keep motorists from wandering out of the travel lanes, but are also used to guide motorists in poor driving conditions. Minnesota rumble strips standards vary from 300 - 400 mm (12 - 16 in) wide and are located 100 - 600 mm (4 - 24 in) from the fog line.

Where/when to use (quantitative guidance)

- Rumble strips are not recommended when roadway shoulder widths are 1.2 m (4 ft) or less

How to implement

- Install rumble strip within 150 mm (6 in) of the fog line
- Rumble strip width should not exceed 400 mm (16 in)
- Bikable shoulder width should be > 1.2 m (4 ft) and preferably 1.8 m (6 ft) or wider

Where already used

- Throughout the United States

Permitted in standards

☑ AASHTO/MUTCD

Cost Estimates

Initial capital cost:
Comparable to standard installation

Maintenance:
Part of regular street maintenance

VII. Operations and Maintenance

Operations and maintenance are particularly important considerations for facilities expected to be used by bicycles. The nature of the vehicle, from the lack of suspension, to tires that can be less than one inch wide and vulnerable to puncture, makes it particularly susceptible to pavement irregularities and debris.

Neglecting routine maintenance eventually may render bicycle facilities unridable, and such deteriorating facilities may become a liability to the operating authority. For these reasons, responsibilities for operation, maintenance, and policing of facilities should be established prior to construction. Mn/DOT generally does not provide routine maintenance of bicycle paths, but negotiates maintenance agreements with other agencies. Mn/DOT can and does however provide sweeping and snow plowing of shoulders in the course of whole road maintenance activities.

Maintenance is facilitated by standard width lanes and shoulders that can be cleared by snowplows or sweepers without the need for extra passes. Shoulders less than ten feet in width will often receive some "sweeping" action if there is sufficient high speed traffic. Special sweeping plans may be developed with maintenance engineers for roadways with special needs, such as those that become a part of the Minnesota Scenic Bikeway System.

The substantive guidance contained in the Mn/DOT Bicycle Transportation Design Manual on this subject should be referenced for additional detail.

MINNESOTA DEPARTMENT OF TRANSPORTATION

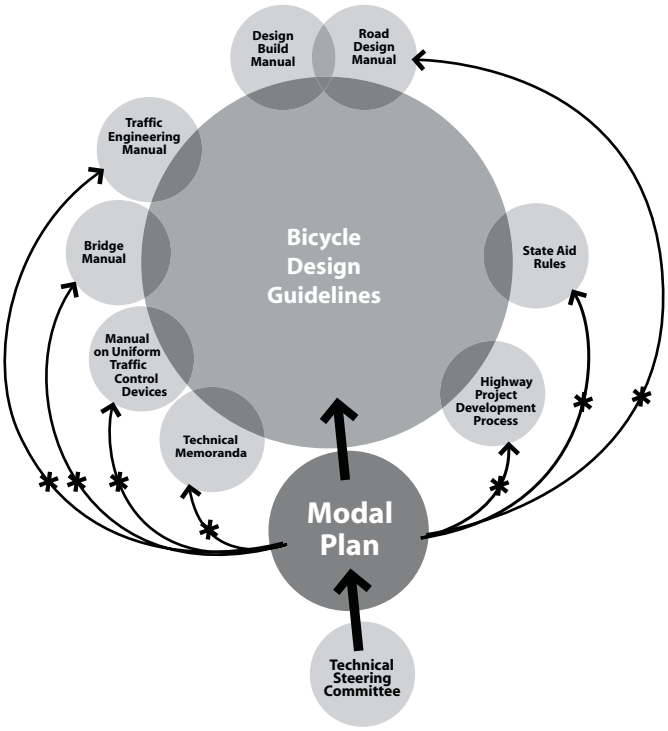
VIII. Implementation

This chapter outlines the process for moving forward from *The Mn/DOT Bicycle Modal Plan* to put the policies, practices, experience and skills of Mn/DOT in motion to achieve the mission of the plan, to: "…safely and effectively accommodate and encourage bicycling on its projects in Minnesota communities, plus in other areas where conditions warrant, and [to] exercise leadership with its partners to encourage similar results on their projects".

Effective implementation of the Modal Plan will require refinement, integration and deployment of policy and guidance; training of planning and design supervisors, staff and contractors; training of front line maintenance and construction personnel; and funding of pilot, periodic and on-going initiatives.

Integration With District Plans

Departmental policy is implemented through a series of processes, key among which are the Mn/DOT District Long-Range Plans and Project Work Plans. Both of these will need to carry forward the relevant policies, measures, and targets of The Mn/DOT Bicycle Modal Plan for Mn/DOT to be successful in implementing statutory and departmental policy. District Investment Guidance is included in the Appendix to further this process. Integration of this Guidance into Mn/DOT's STIP Guidance will further simplify and expedite the achievement of this departmental policy.



* Concurrence by Oversight Committees and Staff

Integration of Policy and Design Guidance

Department planning and design guidance is implemented primarily through a series of man-

uals that are periodically updated. The primary guidance for geometric design is captured in the *Roadway Design Manual*, and the *Bridge Design Manual*.

The *Minnesota Bicycle Transportation Planning and Design Guidance* (1996) (a.k.a. Bikeway Manual), provides more topical direction to designers. A primary conclusion of the *Bicycle Modal Plan* is that to improve safety Mn/DOT must simplify and expedite the planning and design of bicycle accommodations by integrating planning and design guidance into the department's main design manuals. Other state DOT's have been successful in this approach.

The Performance Measures and Targets section of *The Mn/DOT Bicycle Modal Plan* lays out the following schedule for this integration:

By 2006 all Mn/DOT design, planning, construction, and maintenance manuals and state aid rules will include effective bike and pedestrian guidance.

Some of these documents are currently in their major update cycle and their managers or authors are members of the Technical Steering Committee for the Bicycle Modal Plan. The revision recommendations for the *Road Design Manua*l are in the process of being incorporated as this plan goes to press.

State Aid Rules undergo periodic review and should include updated bicycle and pedestrian accommodation guidance in their next revisions.

This Plan is consistent with the current Mn/DOT Cost Participation Policy and does not propose any changes to it.

Training

The providers of transportation services are a key element of effective bicycle and pedestrian accommodation. From planning and funding decisions to design, construction, maintenance and enforcement, having Mn/DOT staff and our partners fully engaged in the process of providing a safe and attractive transportation opportunity is critical.

Training of supervisors, staff and contractors is an effective way to distribute information and make this staff aware of Mn/DOT's responsibilities and policies. The Bicycle Modal Plan sets the following target for training:

> *By 2006, 30% of Mn/DOT engineers, planners, and transportation specialists and consultants engaged in planning, design, contract management, or cooperative agreements will have completed a one-day bike/pedestrian design training session, with an additional 30% so trained in each subsequent year.*

A curriculum outline for this training is included in the Appendix.

Technical Assistance

The Mn/DOT Bicycle and Pedestrian Unit has historically provided technical assistance to Mn/DOT project managers and engineers as requested. To most cost-effectively ensure Mn/DOT's success in the implementation of this Modal Plan, the Bicycle and Pedestrian Unit will be formally included in the project review process. This will be done either by adding the unit to the list of other Mn/DOT functional units with signoff authority during the plan review process, or by adding bicycle and pedestrian review to those of the Geometrics and Traffic Engineering offices.

To further expedite this process, it is recommended that civil engineering expertise be added to the Bicycle and Pedestrian Unit.

Early in the process of Modal Plan implementation there may be significant call for hands-on technical assistance. In later stages, the majority of this function should be satisfied “upstream”, through training, and design and planning manual upgrades

Bicycle and Pedestrian Transportation Design Curriculum

Mn/DOT staff provides leadership in the planning, funding, design, construction and maintenance of transportation facilities across the state, including bicycle and pedestrian facilities. Providing safe and effective bicycle and pedestrian accommodations is intuitively logical but often challenging. While most Mn/DOT staff are familiar with policies and current practices for vehicular and pedestrian facilities, bicycle accommodations have only more recently begun to receive attention.

A training curriculum for developing a deeper understanding of Mn/DOT's goals, policies, and practices related to walking and bicycling as means of transportation is outlined in *Appendix II*. It is intended for Mn/DOT planning and design staff and consultants responsible for the development of the State's transportation system. Subsets of the training should be developed for supervisors and District Engineers, maintenance staff and transportation partners in State, county and local agencies. The training outline suggested here may be separated into independent bicycle and pedestrian resources.

The curriculum begins with the premise that a healthy transportation system is one that encourages and embraces transportation diversity and recognizes the importance of walking and bicycling. The goal of these courses is to help Mn/DOT staff gain knowledge and proficiency in the methods and models of planning and designing urban transportation systems with walking and bicycling in mind.

The courses cover planning, design, implementation, and maintenance of bikeways and walkways, as well as ancillary facilities such as bicycle parking. The role of education, enforcement, advocacy, and outreach in improving walking and bicycling conditions are also explained. The training includes examples from various cities, with a heavy emphasis on experience in Minnesota.

Reporting

A system for regular reporting on progress toward bicycle targets will be developed integral with that for other Mn/DOT targets. Regular reporting on measures and targets is a valuable way to retain departmental focus, to provide recognition, and to stimulate problem solving in areas that may not be progressing as planned.

Local and Regional/MPO Bicycle Plans

Local communities and Metropolitan Planning Organizations (MPOs) are perhaps the key entities for the development of safe and effective bikeway systems, in part due to the short length of many bicycle trips. Consistent with this position, MPOs are federally mandated to plan for bicycles and pedestrians. Mn/DOT also has a three-fold partnership interest in encouraging and supporting the development of these local and regional bicycle network plans.

First, Mn/DOT's statutory and leadership responsibility to promote and increase bicycling must, to be effective, be done in partnership with local and regional units of government that control the vast majority of bicycle transportation infrastructure. Second, to make maximum and most efficient use of bicycle and transit use as congestion and cost management tools also requires these same partnerships, for the same reasons.

And third, while Mn/DOT's primary and default commitment is to safely accommodate bicycle traffic on all urban infrastructure that it owns where bicycle use is legal, in some cases the precise nature of those investments can be best defined within the context of local and regional bicycle plans.

For example, if an adequate shared use path is planned or in existence, Mn/DOT project engineers may provide for a shared path cross-section on a bridge rather than the default of sidewalk(s) and shoulders/bike lanes.

A second example is that of a complex interchange between a city's minor arterial and an interstate freeway. If the city has decided to attract bicycle traffic away from the minor arterial to an alternate route (per Treatment 02), and has taken adequate steps to make that alternate route successful, the Mn/DOT project manager may consider contributing to a second, bike-ped bridge in lieu of investing in extensive accommodations on the primary bridge.

Several MPO's and local and county units of government have completed excellent bicycle plans which are in the process of being implemented. Mn/DOT should support their continued development and implementation throughout Minnesota's urban and urbanizing areas.

Cost Participation

Mn/DOT's policy is to determine what is necessary to safely accommodate bicycles on Mn/DOT projects, and to fully fund that accommodation. For additional clarity, an excerpt from the current cost participation policy is in the *Appendices, page 116*.

IX. Additional Recommendations

Several additional topics surfaced in the preparation of this Bicycle Modal Plan. Research and development on these topics will further the transportation goals of the State.

1. Legislative:
Review and analyze existing Minnesota bicycle legislation and make recommendations for housekeeping and policy revisions. Staff should do this in concert with the State Bicycle Advisory Committee (SBAC).

2. Bicycle Research:
Continue to develop a bicycle research program at the University of Minnesota. A study of statewide bicycle and pedestrian crash and injury data with comparisons to other jurisdictions will contribute to revised policies and priorities. Investigate this avenue also for assistance in tracking progress towards measures and targets.

3. State Bike Map updates:
The State Bike Map should be updated on a regular basis to keeping pace with a quickly changing transportation network. The State Highway Map should include some critical bicycle information.

4. State Bicycle Advisory Committee:
Review the purpose, mission, goals, structure and membership, bylaws and administration of the State Bicycle Advisory Committee and update where needed.

5. Advocacy groups:
Study how Mn/DOT and/or the SBAC can play a more meaningful role in coordinating, leadership and/or support of the more than 40 advocacy groups dedicated to bicycle and pedestrian transportation issues in Minnesota.

6. Safety:
Study the relationships Mn/DOT can develop with other agencies, private industry, non-governmental organizations (NGOs) and less formal groups to improve the delivery of bicycle and pedestrian safety programs. Encourge the development of an education and enforcement program to develop greater cyclist compliance with traffic laws.

7. Intradepartmental relationships:
Develop a means for regular formal and informal integration of bicycle and pedestrian staff input into policy, project development, performance

measurement, budgeting, training and professional development in departments, committees, subgroups and offices throughout Mn/DOT. (Central Office planning, District Engineers, Traffic, Security and Operations, MUTCD, design manuals and policies, maintenance, technical memos, policy updating cycles, enforcement, driver's education, etc.)

8. Roundabout Treatments:
Roundabouts are being rediscovered as traffic control devices, but little current research and development has been conducted related to pedestrian and bicycle safety and best practices. Review design criteria, design challenges and solutions that accommodate bicycles and pedestrians safely in the emerging use of modern roundabouts.

9. Single Point Diamond Interchange:
Develop an internal discussion of this design treatment and its impact on safe bicycle and pedestrian travel.

10. MPO/Regional Bike Plans:
Support and encourage the continued development of regional bikeway plans delineating primary bikeways through urbanized and exurban areas. These primary bikeways should connect neighborhoods to regional trailheads and activity centers. Encourage population densities and land use mixes that enable fast, safe, and pleasant bicycle travel to and between major traffic generators.

The State's metropolitan areas present prime opportunities for bikeway plans that identify and establish safe, effective alternate bike arterials (*see Treatment 02, page 63*) when extreme congestion and complexity on the primary artery makes bicycle travel unpleasant or unsafe.

Collaboratively develop criteria for regional bike plans for prioritizing funding, facilitating maintenance, and coordinating the overall system.

11. Infrastructure Tracking System:
The Bicycle Modal Plan includes recommendations for infrastructure investments. There is a presumption that bicycle facilities will be used effectively. However, Mn/DOT presently has neither the mechanisms to catalog the infrastructure investments nor to monitor the investments for effectiveness. Methods of gathering data on use, facility conditions, project performance, and facility demand must be developed, including the following:

- Bicycle counts and data gathering
- Good shoulder data
- Off-road facilities

12. School zones and safe routes to school:
Because of the impact of highway design on safe pedestrian and bicycle movement, Mn/DOT should become an advocate for a comprehensive approach to ensuring child safety in walking and biking to school. Safe and pleasant routes to schools are related to the following and other issues:

- Influencing school location/relocation decisions
- Responding to less than optimal school locations
- Relationship to inter-regional corridors and access management planning
- Long-range planning for grade separation and land use planning

13. Maintenance of facilities:
Preservation and maintenance of infrastructure is a top priority for Mn/DOT. Occasionally bicycle and pedestrian facilities are built and left with minimal maintenance and preservation until they are too rough to use. Mn/DOT, in it's partnerships with industry and local units of government should continue to negotiate and monitor agreements with appropriate entities for maintenance of infrastructure.

14. Bike Transit Pilot Project:
Research, evaluation, and demonstration of promising bicycle-transit integration schemes in Minnesota urban areas is warranted. Less than a decade ago only a handful of U.S. transit agencies allowed any kind of access to bicycles, and now 30,000 buses managed by more than 250 transit agencies in 45 states are equipped with bike racks to carry two bikes.

For urban transit systems to tap further into their bicycling markets in Minnesota, a request for proposals (RFP) for a market research study is proposed. That RFP would utilize an existing transit agency profile already employed to help identify those likely to convert to bike and ride services. The research would apply the model profile within target neighborhoods having densities of 7 dwelling units or more per acre and that either have or can develop highly attractive bike routes or paths to express transit stops.

15. Incentives:
Within the next few years, it may prove beneficial to develop internal incentives for individuals or groups of employees for exceptional performance in accommodating bicycles. This kind of incentive program is often useful in "jump starting" new policies or initiatives.

16. Safety Education:
While allocating space on and near main roadways is generally necessary for optimum development of bicycle transportation, civility among the various road users is also essential for bicyclist safety. Programs to nurture a welcoming attitude on the part of motorists, and responsible riding behavior on the part of bicyclists should be deployed on an ongoing basis by Mn/DOT and partner organizations.

17 Public-Private Partnerships:
Mn/DOT should enter into public-private partnerships when doing so can more cost-effectively carry out parts of its statutory duties and responsibilities.

18. Bicycle Traffic Counting:
Develop a methodology for bicycle traffic counting that can bring additional rigor to use data, and that can serve to expand existing data sources such as the U.S. Census and DNR's recreational counts.

19. Revenue Source:
Study the development of appropriate additional revenue streams to contribute to bicycle infrastructure development.

20. Functional Classification:
Develop, define, and fully define standards applicable to major bicycle arterials, minor bicycle arterials, and other classes of bikeways, to help guide planning and investments. Study the use of warrants and other criteria for triggering various strategies.

21. Administration:
Study the various roles and responsibilities for various agencies in developing, operating, and maintaining a mature bicycle transportation network.

22. Access Study:
Develop demonstration projects to model various effective approaches to developing safe and effective bikeway improvements leading to Mn/DOT bridge investments that are also legible and continuous with various bridge improvement types (sidepath vs bike lanes).

Appendices

Technical Steering Committee Roster
Technical Steering Committee Meetings
Special Review Meetings
Relative Speeds
Bicyclist Types
Scenic Bikeways/1987 Plan Comparison Map
Cost Participation Policy Excerpt
Fiscal Analysis Summary
Funding Sources Worksheet
Websites Cited
Bicycle & Pedestrian Training Curriculum
Language for District Plans
Glossary

MINNESOTA DEPARTMENT OF TRANSPORTATION

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*shared position

MINNESOTA DEPARTMENT OF TRANSPORTATION

Technical Steering Committee Meetings

The Mn/DOT Bicycle Modal Plan

Key infrastructure discussion areas:

- Mn/DOT urban bridges, and approaches;
- municipal state aid (MSA) streets and urban county state aid highways (CSAH);
- trunk highways (TH) through downtowns or other urbanized areas;
- cross-state routes.

Technical Steering Committee Meeting	Primary Focus/ Areas Introduced
1 **April 28, 2003** 10:00 – Noon	a. Introduction to Modal Plan; focus b. Relationship to other Mn/DOT processes c. Expanded design options: innovative treatments
2 **May 23** Noon – 2:00 Meeting # 1185	d. Integrating bike-ped accommodation within Mn/DOT e. Decision tree (under what conditions to do what—where "what" includes "good, better, best" options) f. Review and complete policy list
3 **June 6** Noon – 2 Meeting # 1202	g. Treatment applications and costs h. Use data report i. Performance measures j. Objectives and targets
4 **June19** 8:00 – 10:00 Meeting # 1203	k. Vision: Roles of Bike, Ped, Telework for MN l. Continue Decision Matrix discussion
5 **July 28** 12:00 – 2:00 Meeting #1446	m. Continue decision matrix/treatments discussions n. Introduce exceptions process o. Design manuals review and select revisions
August 8	p. Distribute products for review
6 **September 8** 10:30 – 12:30 Meeting #1623	q. Vision statement r. Measures and Targets s. Cost-effectiveness methodology
7 **September 30** 10:00 – 12:00 Meeting # 1624	t. Tour routes; selection process u. Finalize vision, targets, guidance v. Training program
8 **October 23** 1:00 – 3:00 Meeting # 1625	w. Finalize Decision Matrix and Treatments Catalogue x. Finalize tour routes recommendations y. Mission statement final z. Implementation discussion
9 **November 20** 8:00 - 10:00 Meeting # 1626	aa. Telework concepts bb. Finalize Measures and Targets\ cc. Bike-Transit Pilot Project Template dd. Long range recommendations
10 **July 21, 2004**	ee. Review, modify, and adopt final draft document, for recommendation to Mn/DOT

MPSchedA2Sum.pln 6/19/04

MINNESOTA DEPARTMENT OF TRANSPORTATION

Special Review Meetings

2003	
March 28	DE video conference: Process, key discussion areas
April 10	Doug Differt & Randy Halvorson, 1st briefing
April 14	Dick Bautch re: potential pilot projects
April 23	PCMG (Radisson South): process, key discussion areas
May 7	Doug Differt & Randy Halvorson, 2nd briefing
May 22	State Bicycle Advisory Committee briefing
July 31	Design Advisory Committee, review key plan elements
August 19	Metro Program Delivery Group briefing
August 22	State Bicycle Advisory Committee, review key plan elements
September 19	Metro planning, area managers: process, key discussion areas
September 22	Mn/DOT District Planning Directors briefing
September 22	Mike Weiss, State Sign Engineer discussion of potential signs
September 25	State Bicycle Advisory Committee update
September 29	Dave Redig, Rochester, re: maintenance implications
October 21	MPO Planning Directors briefing
October 22	Mn/DOT District Planning Directors discussion
October 30	Design Advisory Committee design update
November 5	Investment Mgt review (Abby McKenzie, Lynne Bly)
November 20	State Bicycle Advisory Committee update
December 3	Design Engineers briefing (St Cloud)
December 11	District Planning Directors video conference
December 16	Doug Differt & Randy Halvorson, 3rd briefing
2004	
March 16	Review fiscal impact study with Doug Differt, Randy Halvorson
July 23	District Planning Directors preview video conference
August 5	Management review
August 16	Program Management Division Staff Meeting
August 17	Metro Program Delivery Meeting
August 20	Internal Review begins: Draft to districts and division directors; posted on IHUB/WWW

September 1	Presentation to TAC at Metro's request
September 9, 23	Discussions with TAC Planning
September 24	Mn/DOT comments due
October 6	Initial TAC and DAC comments due
November	Internal and Met Council discussions
November 1	Management review
November 17	Final TAC Planning Committee meeting
December 1	Final TAC meeting
December 3	Glen Ellis consultation
December 7	TSC Subcommittee Meeting (plus) to review changes
December 8	Management briefing
December 9	Final State Bicycle Advisory Committee review
December 10	DE Video Conference briefing

2005

Jan 3	Presentation to Commissioner's Staff Meeting for approval

Relative Speeds

(mph)	Approximate top speeds, in miles per hour of various vehicles and other mobility devices
3	Walking
4-15	Electric wheelchairs
10-15	Inline skating (casual)
12-15	Segway
12-16	Average adult bicyclist
10-18	Electric scooters
up to 20	Electric bicycle
20	Law abiding driver, school zone
23	Inline skating (racing)
20-25	Bicyclists in pace line
30	Law abiding driver, MN city street
32	2004 Tour de France average speed in Prologue (3.8 mi, relatively flat)

Bicyclist Types

Bicyclists are divided into three groups by the FHWA:[1] Group A, Advanced Bicyclists; Group B, Basic Bicyclists, and Group C, pre-teen Children, whose roadway use is initially monitored by parents.

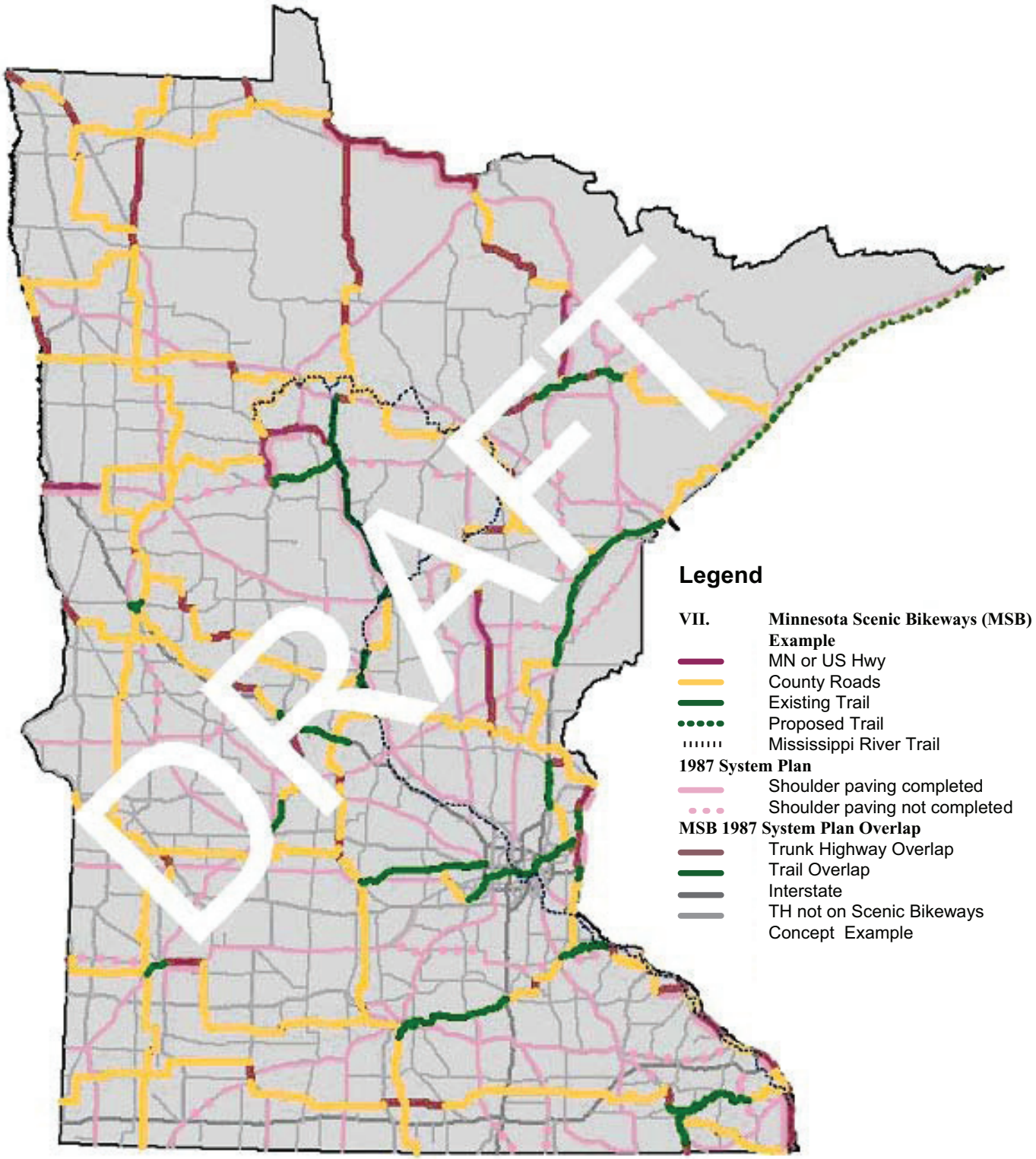
Group A bicyclists, though they can and will operate under most traffic conditions, are estimated by the Bicycle Federation of America (BFA) to constitute less than five percent of all bicyclists. Group B bicyclists represent the vast majority of bicyclists.[2] It is Group B bicyclists for whom striped bike lanes and other facilities are most critical and whose bike riding increases in response to the development of those facilities.[3]

[1] *Minnesota Bicycle Transportation Planning and Design Guidelines, Mn/DOT (1996).*

[2] *At least 63%, combining Plan B, Appendix B, p B-3, Mn/DOT (1992) with the BFA estimate.*

[3] *"Combined Bicycle Traffic over Four Main Portland Bicycle Bridges Juxtaposed with Bikeway Miles", on file in the Mn/DOT Office of Transit and Bikes.*

Comparison of a Minnesota Scenic Bikeways (MSB) Concept Plan with the 1987 Mn/DOT State TH Bicycle Transportation System Plan



Excerpt from Mn/DOT POLICY GUIDELINE, Highways (including Bikeways) 6.1.G-1 Policy and Procedures for Cooperative Construction Projects with Local Units of Government ["Cost Participation Policy"]

Date: August 7, 1985
Revised: June, 2001
Revised: April, 2004

Guidelines for Cooperative Construction Projects DS11.doc
(http://www.dot.state.mn.us/stateaid/forms/ds11_1.pdf):

Page 39 of 89 (Section I D3e 2ii; 6-41):

ii. Bikeways and Multi-use trails

When developing a trunk highway improvement project, Mn/DOT will determine what facilities are necessary to safely accommodate bicycles and other non-motorized transportation modes in accordance with Mn/DOT Technical Memorandum No.99-04-ES-01.

- Mn/DOT will be 100% responsible for costs of facilities which Mn/DOT determines are necessary to accommodate bicycle and other non-motorized transportation modes within the trunk highway right-of-way of a Mn/DOT-initiated project.
- Mn/DOT may initiate and be 100% responsible for costs associated with stand-alone bikeway and other nonmotorized transportation construction projects within trunk highway right-of-way.
- Mn/DOT participation in local, locally-initiated bikeway projects, or other bikeway or multi-use trail facilities not covered above, will be limited to the use of trunk highway right-of-way. Such use must be arranged with the appropriate Mn/DOT district and must be documented through
execution of a limited use permit.
- All other bikeway and multi-use trail construction will be 100% local responsibility.

Fiscal Analysis Summary

Safety, Livability, and Economic Growth for the 21st Century…Cost-effectively

The Modal Plan "Gap":

(Based on analysis of a sample of 8 of 17 Bonding Accelerated Projects)

Project Name	Total Const Cost Est (TCE)	Current Mn/DOT $ for B-P	% of TCE	Current Local $ for B-P	% of TCE	Infra MP Gap	% of TCE	Local $ MP Gap (all$DOT)	% of TCE	Total Est B-P Expend	% of TCE
								I+K		G+M	
371-N of Little Falls	26,900,000	270,000	1.0%		0.0%	$ -	0.0%	$ -	0.0%	$ 270,000	1.0%
I-94 fwy bridge, Montice	17,118,000	202,000	1.2%		0.0%	$ -	0.0%	$ -	0.0%	$ 202,000	1.2%
TH 10 thru DL	33,900,000	500,000	1.5%	143,000	0.4%	$ 16,400	0.0%	$ 159,400	0.5%	$ 659,400	1.9%
TH 14 W of Waseca	61,810,000	-	0.0%		0.0%	$ -	0.0%	$ -	0.0%	$ -	0.0%
212/147 Interchng	2,112,000	165,550	7.8%	-	0.0%	$ 51,000	2.4%	$ 51,000	2.4%	$ 216,550	10.3%
169 And Lk/PionTr	25,450,000	847,475	3.3%	-	0.0%	$ 40,000	0.2%	$ 40,000	0.2%	$ 887,475	3.5%
169/494 Interchng	67,200,000	123,000	0.2%	520,000	0.8%		0.0%	$ 520,000	0.8%	$ 643,000	1.0%
694 Edgerton,Labore	5,745,500	530,000	9.2%	-	0.0%	$ 300,000	5.2%	$ 300,000	5.2%	$ 830,000	14.4%
Sample Totals	240,235,500	2,638,025	1.10%	663,000	0.28%	$ 407,400	**0.17%**	$ 1,070,400	**0.45%**	$ 3,708,425	1.54%
03 Highway Program	$ 1,032,000,000	$ 11,332,388	1.10%	$ 2,848,105	0.28%	$ 1,750,103	0.17%	$ 4,598,208	0.45%	$ 15,930,596	1.54%
04 Highway Program	$ 982,000,000	$ 10,783,338	1.10%	$ 2,710,116	0.28%	$ 1,665,311	0.17%	$ 4,375,427	0.45%	$ 15,158,764	1.54%
05 Highway Program	$ 912,000,000	$ 10,014,668	1.10%	$ 2,516,930	0.28%	**$ 1,546,602**	0.17%	**$ 4,063,533**	0.45%	$ 14,078,201	1.54%

Bike, Ped Fatalities: 8.7% of total roadway fatalities
Bike, Ped Crashes: 2.7% of total roadway crashes

' Note: The majority of the 0.64% may be eligible for dedicated federal funds.*

Implications of the sample project analysis (with FY '05 HP dollar amounts):

'- Amount Mn/DOT currently spends on bike-ped: 0.72-1.10% ($10.0 M)
'- Amount contributed by local government for bike-ped: 0.28% ($2.5 M)
'- Additional amount Modal Plan would cost if locals keep paying for bike-ped (only): 0.17% ($1.5 M)
'- Additional amount Modal Plan would cost if bike-ped isn't (the only thing) cost-shared: 0.45% ($4.1 M)
'- Total amount we'd be spending on bike-ped accommodations if Modal Plan is adopted in current form: 1.54% ($14.1 M)
'- Est total amount of local funds contributed to highway program if average 5% cost share applied to whole projects: $45.6 M ('05)

Examples of "gap" remedies:

- Continuing shoulders thru RT lane sections
- Blue bike lanes across free right turns
- Warning signs when bike lanes not feasible
- 2nd sidewalk on bridges in some case

The case for fully funding basic bike-ped accommodations:

'- cost-effective way to address disproportionate fatalities (TZD)
'- streamline the process with local governments
'- reduce Mn/DOT's liability exposure (our legal responsibility)
'- req'd by Mn/DOT policy, per Tech Memo 99-04-ES-01
'- Mn/DOT leadership will leverage other local investments
'- Mn/DOT would only cover basic safe infrastructure
(locally desired enhancements still subject to local $)

Funding Sources Worksheet

BIKE/PED PROJECTS IN 2003 of 2003-2005 STIP*

showing the ariety of funding sources used, that total $37.6 million for FY 2003, or 3.6% of the $1.032 billion '03 Highway Program.

Restricted Funding Sources		*Fund Types*	*State Projects*		*Local Projects*				*STIPTotal BikePed*	*Non-Bike/ Ped Amts*	***Totals***	*Who selects projects*	*% of SBP$ controlled*
			Fed $	***State $***	*Fed $*	*StAidMtch*	*OthrMtch*	*%Mtch*					
	1	**SF**		**0**					**0**		**0**	Mn/DOT	0%
	2	STP			316,858		79,214	20%	396,072		396,072	ATP's	1%
Parts of TEA 21 Minimum Apportionments	3	STP (UG)			8,039,357		2,009,839	20%	10,049,196	-2,902,280	7,146,916	Met Cncl	19%
	4	STP (EN)	360,000	**240,000**	14,403,742		5,870,343	29%	20,874,085		20,874,085	ATP's	55%
	5	RT			3,263,712		2,436,348	43%	5,700,060	-862,000	4,838,060	DNR	13%
Other dedicated funds	6	FFM			10,000,000		2,500,000	20%	12,500,000	-11,750,000	750,000	FHWA	2%
	7	HPP		**66,000**	3,041,391		512,750	14%	3,620,141		3,620,141	Congress	10%
		Totals	360,000	**306,000**	39,065,059		13,408,495	26%	53,139,554		**37,625,274**		100%

* Fund types listed In order generally from greatest to least Mn/DOT control or discretion.

** Does not include bike-ped components integral to highway projects such as ped bridges over freeways, due to some internal accounting limitations. There are 5 projects in the '03 highway program coded as having some bike/ped components.

*** Also does not include shoulder paving, which is typically done for a variety of reasons. Shoulders are also subject to internal accounting limitations.

**** In very rare instances TH funds may be used as a local match for federal funds.

1 SF: State Funds. Mn/DOT selects projects. There are no stand-alone bike-ped projects in this year.

2 STP: Surface Transportation Project funds. ATP's select projects.

3 STP (UG): Urban Guarantee. Congress apportions directly to MPO's. Metro Council selects projects.

4 STP (EN): Enhancements funds, eligible only for limited purposes, including bike/ped, scenic, historic, and environmental projects. Congress apportions a minimum dollar amount; ATP's select projects.

5 RT: Recreational Trails. Congress apportions; DNR selects projects. Fed funds shown include $1.899 of Enhancements $$

6 FFM: Federal Fund Miscellaneous. Congress apportions. For example, with the Transportation and Community and System Preservation Program (TCSP) FHWA selects projects through a competitive application process.

7 HPP: High Priority Projects, formerly 'demonstration projects', selected by Congress. This year's include connections to the Paul Bunyan Trail in the Brainerd area, and a Midtown Greenway extension.

SBP$: State bicycle-pedestrian investments

Non-Bike/Ped Amounts Notes: $2.9M is for downtown skyways; $0.8M is for non-bike/ped snowmobile trails; $11.75M is the roadway portion of the Bassett Creek Parkway project.

:Bike$Sum03 5/13/03 SC-BH-MJ-JD-BW-DA

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Bicycle & Pedestrian Training Curriculum

NOTE: A one day training curriculum would be developed for broad delivery in Mn/DOT districts by selecting the highest priority topics from this three day curriculum. Incorporating something like the "Effective Cycling: Road 101" class[4] as an option is recommended.

Day One

Introduction

- The need for pedestrian & bicycle mobility nationwide and in Minnesota, including the worldwide, national, and local context.
- Bicyclist and pedestrian characteristics.
- Trends worldwide, nationwide and in Minnesota, including trends related to walking and bicycling activity, health/obesity, transportation mode share, air quality, demographics, and traveling to work and school.
- The role of Mn/DOT in providing safe and efficient bicycle and pedestrian accommodations; facility standards, guidelines, and design exceptions.

Policies, Standards, and Guidelines

- Federal documents: an overview of the AASHTO Guide for the Development of Bicycle Facilities, the Americans with Disabilities Act and its companion documents, the Manual on Uniform Traffic Control Devices, the U.S. DOT Rails-with-Trailstudy, other relevant documents.
- State and local policies: Mn/DOT Pedestrian and Bicycle guidance

Planning and Design Strategies

- Integrating bicycling and walking accommodations, opportunities and concerns into all transportation projects.
- Identifying problems and opportunities.
- Overview of types of studies and reports.
- Public and agency coordination.
- Case studies.
- Selecting a preferred alternative.
- The role of environmental regulations.

[4] *As sponsored by WisDOT, Bike Federation of WI, the Duluth-Superior MPO, and WE BIKE.*

Conducting Facility Audits

- Field review of projects from the viewpoint of pedestrians, persons with disabilities, and bicyclists.

Day Two

Analytical Tools and Methods

- Traffic & land-use models - how they do/don't account for bikes/pedestrians
- Bike/pedestrian demand projections - different types of projection
tools, including surveys, comparative analysis, latent demand. Utility of each, data requirements, accuracy, integration into traffic and other studies.
- Usage counts: methods and utility.
- Crash analysis - types, severity, time of day, location, etc… Overview of what we know and how we can improve safety through crash analysis.
- Level-of-service (or quality of facility) methodologies (e.g. Bicycle
Compatibility Index)
- Project prioritization approaches, including such criteria as cost,
feasibility, land uses served, barriers overcome, potential usage.
- Liability analysis and risk reduction strategies.
- Reviewing site conditions: checklist of what to observe and analyze.

Good Pedestrian Facility Design

- Pedestrian Network Development: basic principles, priorities
- Pedestrian user types
- Sidewalks
  - width,
  - design
  - buffers
  - type
  - surface treatments
  - ADA compliance in terms of width, slope, surface
- Intersections
  - Curb ramps: ADA compliance, type (parallel or diagonal), slope,
width, landing
  - Crosswalks: marked vs unmarked
  - Principles of good intersection design
  - Two-stage crossings
  - Signal phasing
  - Ramps
  - Interchanges: making pedestrian and bicycle friendly
  - Grade separation (over-crossings and under-crossings: when to
use, slope, ADA compliance, good and bad examples
  - Innovative treatments (pedestrian detection, countdown signals,

etc…)

- Traffic calming (also covered under "Bicycle Boulevards")
  - Slowing traffic: how it relates to pedestrian safety
  - Speed bumps, circles, intersection treatments, etc…
- Main streets
  - Good design helps business growth
  - Land use characteristics
  - Pedestrian design: narrow crossings, curb extensions, on-street parking, sidewalk design and buffers, etc…
  - Architectural features
- Development Codes
  - What they typically look like now
  - What the need to contain
  - Application
  - Enforcement

Day Three

Bikeway Network and Route Development

- Bikeway Network Development: basic principles, priorities
- Bicycle user types
- Existing bikeway network in Minnesota and in locales throughout Minnesota
- Bikeway facility selection based on roadway volume, width, traffic mix, speeds, user needs, land uses, etc…
- On- Street Bike Lanes & Shoulders
  - Design standards (lane width, line with, bike stencil markings, signs)
  - Ways to implement bike lanes on existing roadways and arterials
- Narrow travel or parking lanes
- Remove travel or parking lanes
- Widen roadway
- Cost, implications, examples of each.
  - Cost estimating
  - Route design review
  - Intersection design: simple, angled, complex, parallel, etc... Reducing conflicts, encouraging safe behavior.
  - Innovative designs treatments (colored bike lanes, bike boxes, striping, signal phasing)
- Shared lanes (a.k.a signed shared roadways)
  - Wide outside lanes (width, when to use)
  - Lower volume roadways/bicycle boulevards/bike routes
- When to use
- Traffic calming techniques
- Intersection design

- Integration with the network
- Shared lane markings
- Shared Use Paths (a.k.a. trails)
- Existing shared use paths in Minnesota
- Path user characteristics
- Types of paths (examples from Minnesota):
  - Rails to trails
    - Rails with trails
    - Waterside trails/environmental issues
    - Earthen trails
- Design principles and standards:
    - Slope, width, surface options
- Strategies for reducing user conflicts
- Economic impacts of trails
- Reducing safety concerns through principles of Trespassing Reduction through Environmental Design, working with Law enforcement
- Trail-roadway intersections: good design, reducing user conflicts
  - At-grade: marked, unmarked, signalized, diverting to existing signals
  - Grade separated (undercrossing and overcrossing)
- Trail-railroad intersection design
- ADA compliance

Integrating Walkways and Bikeways into Highway Design

- Developing internal procedures, checklists
- Retrofitting existing streets
- Data collection, analysis
- Intersection design
- Bridges
- Roundabouts
- Interchanges
- Cost estimating
- Highway re-design review

Construction Work Zones & Maintenance

- Work zone regulations and requirements; potential problems and challenges; and recommended work zone practices.
- Surface treatments, potholes, drainage
- Drainage grates
- Sweeping
- Vegetation control
- Path, sidewalk lighting

MINNESOTA DEPARTMENT OF TRANSPORTATION

District Investment Guidance

The following is guidance for District bicycle investments to ensure that they reflect Mn/DOT's priorities for bicycle transportation.

Bicycle Accommodation

Policy

It is Mn/DOT policy that safe bicycle accommodations shall be an integral part of all road project elements where bicycles are legal in Minnesota communities. Safe accommodations are defined by the bikeway and road design manuals.

This policy is pursuant to state and federal guidance, and in conjunction with the Minnesota Statewide Transportation Plan, Mn/DOT policy is further defined by the following vision and mission statements:

Mn/DOT Vision for bicycle transportation:

> *Minnesota is a place where bicycling is a safe and attractive option in every community. Bicycling is accommodated both for daily transportation and for experiencing the natural resources of the state.*

Mn/DOT Mission for bicycle transportation:

> *Mn/DOT will safely and effectively accommodate and encourage bicycling on its projects in Minnesota communities, plus in other areas where conditions warrant. Mn/DOT will exercise leadership with its partners to encourage similar results on their projects.*

Mn/DOT Transportation Vision and Mission:

> *Mn/DOT's statewide transportation vision is to create a coordinated transportation network that meets the public's needs for safe, timely and predictable travel. It's mission is "…to help Minnesotans to travel safer, smarter, and more efficiently". The routine inclusion of bicycle facilities in developing Mn/DOT projects and programs enables the bicycle to be used for shorter trips within MN communities, and to contribute to Mn/DOT's statewide transportation vision and mission.*

This routine inclusion of bicycle facilities also allows Mn/DOT to comply with its substantial authority and responsibility for accommodating and encouraging bicycling, pursuant to state legislation and federal policy.

Priorities

To maximize the cost-effectiveness of future Mn/DOT investments in bicycle transportation, the following are the prioritized broad categories for safe bicycle accommodation as defined by this plan:

1. All project elements where bikes are legal, on projects within Minnesota communities
2. Projects within 5 miles of Minnesota communities
3. Minnesota Scenic Bikeways System
4. Other areas where needs exist

Low volume bicycle use in sparsely populated areas should generally be accommodated thorugh cooperative us of available roadway and shoulder areas.

Bicycle Transportation Targets

Mn/DOT Targets for bicycle transportation of primary importance for District initiative include the following:

4. All new construction and reconstruction projects in urban areas, and pavement preservation projects where possible will include safe and effective bicycle accommodations on those project elements where bicycles are legal (2008-2030).

5. All crossings of urban interregional corridor (IRC) improvement projects will include safe and effective pedestrian and bicycle accommodations (2008-2030).

7. Each district will have developed one or more special bicycle improvement projects[5] (2008 and beyond).

12. Infrastructure data and data systems will be sufficient to do bicycle and pedestrian facility planning. A common vocabulary will be used.
    - Comprehensive pilot shoulder inventory completed (2006).
    - Comprehensive Mn/DOT data systems established (2007).
    - Other partners establish comparable data systems and data (2009).
    - Mn/DOT's comprehensive shoulder and other data up to date and managed (2011).

    Shoulder data would include type, width, condition, and rumble strip type. This data is used for mapping purposes, and as baseline data for both maintenance and improvements.

5 Special bicycle-pedestrian improvement projects may include capital improvements such as bike parking improvements, installation of pedestrian refuges, and completion of special segments of dedicated bike trails or bike lanes. Improvement projects may also include planning, and activities such as participation in a cooperative bike-pedestrian planning project, improvement to bike-bus service connections, spring clean sweep program and sponsorship of community events that raise awareness of pedestrian and bicycle transportation options.

Other Bicycle Initiatives

The Minnesota Scenic Bikeways System concept is currently being explored with other partners. As the definition of that system progresses, additional roles for Mn/DOT districts will emerge.

The 1987 Bicycle Transportation System Plan, estimated to be 88% complete statewide as of 2002, will be discontinued with the adoption of this plan.

Districts can also continue to play leadership or key support roles in the development of regional and local trail systems.

Glossary

1987 System Plan
The Mn/DOT [Trunk Highway] Bicycle Transportation System Plan, developed by the Mn/DOT Bicycle Planning Unit in 1987

20 Year Urban Area
Urban area, urbanized area, “20 year urban areas”, and “20 year urbanized areas” are defined to mean those portions of Regional Trade Centers of any size which will meet the density characteristics of Urban Areas or Urban Clusters as defined by the US Census Bureau *during the expected useful life* of a planned infrastructure improvement in that community. As of 2000, this density definition most essentially means those areas containing one or more block groups or census blocks developed to minimum densities of 1000 people per square mile[1]. This threshold density approximates that of areas of one acre single family lots.

The future extent of urbanized areas may be inferred through interpolation or projection of the latest census projections available for subject areas.

For Level 3 or larger Regional Trade Centers, “urban area” et al may also include, at a lower priority, the area five miles beyond that noted above.

The intent of this definition and the policies, measures, and targets related to it is that bicycle infrastructure investments be made in areas where their use is reasonably practical and probable, now and in the future.[1]

AAA
American Automobile Association

AADT
Annual Average Daily Traffic

AASHTO
American Association of State Highway and Transportation Officials, an organization whose primary membership comprises the heads of state transportation departments, based in Washington, DC.

ATP
Area Transportation Partnerships, organizations developed to join transportation decisionmakers at the Mn/DOT district level, primarily for the purpose of establishing project spending priorities.

Bicycle
Every device propelled solely by human power upon which any person my ride, having two tandem wheels except scooters and similar devices and including any device generally recognized as a bicycle though equipped with two front or rear wheels. *(MS Ch 169.01, Subd 51)*

[1] *http://www.census.gov/geo/www/tiger/glossry2.pdf, page A-22.*

Bicycle lane
A portion of a roadway or shoulder designed for the exclusive or preferential use by persons using bicycles. Bicycle lanes are to be distinguished from the portion of the roadway or shoulder used for motor vehicle traffic by physical barrier, striping, marking, or toher similar device.
(MS Ch 169.01, Subd 70)

Bicycle path
A bicycle facility designed for the exclusive or preferential use by persons using biycles and contructed or developed separately from the roadway or shoulder. *(MS Ch 169.01, Subd 69)*

Bicycle route
A roadway or shoulder signed to encourage bicycle use. (MS Ch 169.01 Subd 62)

Bicycle trail
A bicycle route or bicycle path developed by the commissioner of natural resources under section 85.016.

Bikeway
A bicycle lane, bicycle path, or bicycle route, regardless of whether it is designed for the exclusive use of bicycles or is to be shared with other transportation modes *(MS Ch 169.01, Subd 72)*

Bus
Every motor vehicle designed for carrying more than 15 passengers including the driver and used for the transportation of persons. *(MS 169.01, Subd 50)*

CDC
Center for Disease Control, the federal governmental organization based in Atlanta, Georgia.

Constitution Article XIV
That portion of the Minnesota Constitution which provides that the state and subdivisions shall construct and improve public highways; motor fuel and vehicle taxes shall be used solely for highway purposes. Motor vehicles may be taxed on a more onerous basis than other personal property.

Crosswalk
(1) that portion of a roadway ordinarily included with the prolongation or connection of the lateral lines of sidewalks at intersections; (2) any portion of a roadway distinctly indicated for pedestrian crossing by lines or other markings on the surface. (MS Ch 169.01, Subd 37)

CSAH
County State Aid Highways, county highways which comply with State Aid Rules to receive state funds from the Minnesota Highway User Distribution Fund

DNR
Minnesota Department of Natural Resources

Electric personal assistive mobility device
A self-balancing device with two nontandem wheels, designed to transport not more than one person, and operated by an electric propulsion system that limits the maximum speed of the device to

15 miles per hour. *(MS Ch 169.01 Subd 90)*

Electric-assisted bicycle
A motor vehicle with two or three wheels that: (1) has a saddle and fully operable pedals for human propulsion; (2) meets [federal requirements]…; has an electric motor that (i) has a power output of not more than 1,000 watts, (ii) is incapable of propelling the vehicle at a speed of more than 20 miles per hour; (iii) is incapable of further increasing the speed of the device when human power alone is used to propel the vehicle at a speed of more than 20 miles per hour, and (iv) disengages or ceases to function when the vehicle's brakes are applied. *(MS Ch 169.01, Subd 4b)*

FHWA
Federal Highway Administration, a part of USDOT

IRC
Inter-Regional Corridor, a designation applied by Mn/DOT to a primary subset of state trunk highways that receive the highest levels of traffic, that connect regional trade centers.

ISTEA
Intermodal Surface Transportation Efficiency Act of 1991, the first in a series of federal transportation funding acts which attempted to start leveling the playing field among all transportation modes.

Mn/DOT
Minnesota Department of Transportation

Motor vehicle
Every vehicle which is self propelled and every vehicle which is propelled by electric power obtained from overhead trolley wires. Motor vehicle does not include a vehicle moved soley by human power.

Motorized bicycle
A bicycle that is propelled by a motor of a piston displacement capacity of 50 cubic centimeters or less, and a maximum of two brake horsepower, which is capable of a maximum speed of not more than 30 miles per hour on a flat surface with not more than one percent grde in any direction when the motor is engaged. *(MS Ch 169.01, Subd 4a)*

MPO
Metropolitan Planning Organizations, recognized by federal transportation legislation as coordinating planning authorities for metropolitan areas of a certain size.

MRT
Mississippi River Trail, Inc, the organization promoting the development and marketing of an interstate bicycle route generally following the length of the Mississippi River.

MS Ch…, Subd
Minnesota Statutes, Chapter…, Subdivision…, referencing state laws

MSA
Municipal State Aid streets, those city streets which comply with State Aid Rules to receive state funds from the Minnesota Highway User Distribution Fund.

MSB
Minnesota Scenic Bikeways, a system of intergovernmental cross state routes proposed by the Mn/DOT Bicycle Modal Plan

MUTCD

The national Manual on Uniform Traffic Control Devices; the Minnesota version is referred to as the Minnesota MUTCD

Ped
Pedestrian

Plan B
Plan B, The Comprehensive State Bicycle Plan: Realizing the Bicycle Dividend, Mn/DOT (1992), the nation's first state comprehensive, inter-departmental state bicycle plan, developed under the aegis of the State Bicycle Advisory Committee.

RDC
Regional Development Commission, generally a multi county coordinating body of counties that are largely not urbanized.

RDM
Road Design Manual, Mn/DOT's official guidelines and standards for trunk highway construction.

Regional Trade Centers
Minnesota cities and other communities, ranked by size, from 0 (largest) to 7 (smallest)

Roadway
That portion of a highway improved, designed, or ordinarily used for vehicular travel, exclusive of the sidewalk or shoulder... *(MS Ch 169.01, Subd 31)*

SBAC
The Minnesota State Bicycle Advisory Committee

Segway
Commercial brand name of an electric personal assistive mobility device

Shoulder
That part of a highway which is contiguous to the regularly traveled portion of the highway and is on the same level as the highway. The shoulder may be pavement, gravel, or earth.
(MS Ch 169.01, Subd 73)

Sidewalk
That portion of a street between the curb lines, or the lateral lines of a roadway, and the adjacent property lines intended for the use of pedestrians.

STIP
State Transportation Improvement Program, the listing of all planned transportation investments using federal or state funds in the state of Minnesota for a given three year period, and the process used to arrive at that listing.

Street or highway
The entire width between boundary lines of any way or place when any part thereof is open to the use of the public, as a matter of right, for the purposes of vehicular traffic. *(MS Ch 169.01, Subd 29)*

TCBC
Twin Cities Bicycle Club, the largest bicycle touring club in Minnesota

TEA-21
Transportation Equity Act for the 21st Century, the third iteration of ISTEA

TH
Minnesota Trunk Highways, the state and federal "main highways"

Traffic
Pedestrians, ridden or herded animals, vehicles, streetcars, and other conveyances, either singly or together, while using any highway for purposes of travel. *(MS Ch 169.01, Subd 44)*

Transit
Any form of public transportation, generally scheduled buses and trains.

Urban Area
Urban area, urbanized area, “20 year urban areas”, and “20 year urbanized areas” are defined to mean those portions of Regional Trade Centers of any size which will meet the density characteristics of Urban Areas or Urban Clusters as defined by the US Census Bureau *during the expected useful life* of a planned infrastructure improvement in that community. As of 2000, this density definition most essentially means those areas containing one or more block groups or census blocks developed to minimum densities of 1000 people per square mile[1]. This threshold density approximates that of areas of one acre single family lots.

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US DOT
United States Department of Transportation

Vehicle
Every device in, upon, or by which any person or property is or may be transported or drawn upon a highway, excepting devices used exclusively upon stationary rails or tracks.

Wheelchair
For the purposes of this chapter, "wheelchair" is defined to include any manual or motorized wheelchair, scooter, tricycle, or similar device used by a disabled person as a substitute for walking. *(MS 169.01, Subd 24a)*

[1] *http://www.census.gov/geo/www/tiger/glossry2.pdf, page A-22.*

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This document is available online at:
http://www.dot.state.mn.us/transit/bikeplan.html