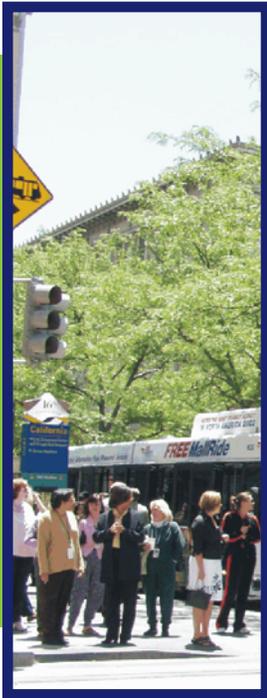


PEDESTRIAN AND BICYCLE ELEMENT OF THE 2035 METRO VISION REGIONAL TRANSPORTATION PLAN



Adopted November 15, 2006
Amended May 20, 2009

DRGO

DENVER REGIONAL COUNCIL OF GOVERNMENTS

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Denver Regional Council of Governments
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Disclaimer: The data in this report are compiled from multiple sources and are intended for informational purposes only. DRCOG assumes no responsibility or legal liability for the accuracy, completeness or usefulness of any information in this report.

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1. INTRODUCTION AND POLICIES

Bicycling and walking are important means of travel for thousands of people each day in the Denver region. Some people bicycle or walk by choice and others for economic or health reasons. The transportation benefits of providing bicycle and pedestrian facilities are to both enhance personal mobility options and to reduce the amount of motor vehicle travel (MVT). A decrease in motor vehicle travel will also reduce air pollution and fuel consumption. An important quality-of-life benefit is the improved health of the population due to increased physical activity.

Pedestrian or Walking

For the purposes of the document, the term “*pedestrian*” represents a person moving by foot, wheelchair or other forms of slow moving mobility assistance.

Likewise, if the term “*walking*” is used, it is meant to represent all types of pedestrian movement.

The region is fortunate to have a nice climate, over 1,100 miles of high-quality multi-use trails, an extensive sidewalk system along most neighborhood and major city streets and nearly 700 miles of designated on-street bicycle facilities. Even more facilities are envisioned by communities throughout the region to serve existing users, encourage new users, enhance safety, improve connections to transit services, and respond to expected growth and development in the region.

The *Pedestrian and Bicycle Element of the 2035 Metro Vision Regional Transportation Plan* provides a plan and guidance for providing quality facilities and encouraging pedestrian and bicycle travel in the planning area represented by the Denver Regional Council of Governments (DRCOG). It includes:

- Policies to be strongly considered by entities involved in the planning and design of facilities and in the approval of land developments;
- Information on factors that influence people to use these modes of travel. For example, valuable information was provided by the 1,500 respondents to DRCOG bicycling and pedestrian surveys in 2006;
- Travel characteristics such as average trip distance, purpose, and crashes with motor vehicles. This information will aid in the creation and analysis of project proposals;
- Local examples of facility design and land development practices that can enhance safety and comfort for pedestrians and bicyclists;
- Inventories of existing sidewalks, multi-use trails, and on-street bicycle facilities;
and

- Identification of additional bicycle and pedestrian facilities planned or envisioned for the area. Such facilities will offer safer and more convenient routes, complete gaps in the system, provide extensions, make key connections, or serve entirely new areas.

This document is an element of DRCOG’s *2035 Metro Vision Regional Transportation Plan (2035 MVRTP)* and reflects the principles outlined in the *Metro Vision 2035 Plan (Metro Vision 2035)*, the long-range growth and development plan for the Denver region. It updates the previous *Pedestrian and Bicycle Element of the 2030 Regional Transportation Plan*.

A. Metro Vision Goals and Policies

The Metro Vision 2035 Plan puts forth a vision and goals for the Denver region’s transportation system, as shown in Figure 1. The 2035 MVRTP goes further by outlining specific policies and strategies to meet the transportation goals set in Metro Vision. Several of these strategies address the role of pedestrian and bicycle travel in the regional transportation system. The 2035 MVRTP pedestrian and bicycle-related policies and action strategies are listed in Figure 2.

Figure 1. Metro Vision 2035 Plan Transportation Vision and Goals

Metro Vision 2035 Plan Transportation Vision and Goals
<p>Vision: A balanced multimodal transportation system will include rapid transit, a regional bus system, a regional roadway system, local streets, bicycle and pedestrian facilities and associated system and travel demand management services. This system will provide reliable mobility choices to all its users: residents and visitors of all ages, incomes and physical abilities, as well as businesses that provide services and produce or sell goods. Users will find the transportation system easy to access, safe and secure, and it will permit efficient state and nationwide connections for people and freight.</p> <p>Transportation Goals: Provide safe, environmentally sensitive and efficient mobility choices for people and goods; and integrate with and support the social, economic and physical land-use development of the region and state.</p>

Figure 2. 2035 Metro Vision RTP Pedestrian and Bicycle-Related Policies and Action Strategies

2035 Metro Vision Regional Transportation Plan
Pedestrian and Bicycle-Related Policies and Action Strategies

Policy #1 System Preservation. Assure the preservation and maintenance of existing facilities.

Policy #4 Rights-of-way Preservation. Reserve adequate rights-of-way in newly developing and redeveloping areas for pedestrian, bicycle, transit, and roadway facilities.

Policy #5 Denver Central Business District. Improve and maintain transportation access to downtown Denver.

Policy #6 Safety. Develop and maintain a safe transportation system for all of its users.

- *Emphasize projects on existing and future facilities that will reduce the likelihood or severity of crashes involving motor vehicles, trains, bicycles, and pedestrians; and*
- *Support legislation aimed at cost-effectively improving the safety of drivers, passengers, pedestrian, and bicyclists.*

Policy #9 Bicycle and Pedestrian. Provide bicycle and pedestrian access through and between developments, and provide links to transit facilities.

- *Require the provision of adequate sidewalks or pedestrian accommodations along all roadways and within private developments in the region's urbanized area and in densely developed rural communities.*
- *Develop regional off-street and on-street bicycle corridor facilities and encourage the provision of local facilities throughout the region.*

Policy #10 Interconnections. Improve interconnection of the transportation system within modes, between different modes, and between the metropolitan area and the rest of the state and nation.

- *Provide safe and convenient access for pedestrians and bicyclists to park-n-Ride lots, rapid transit stations and bus stops. Also provide bicycle parking and promote the capability of transit vehicles to carry bicycles.*

It is important that local governments, CDOT, RTD, private developers, and DRCOG implement the action strategies. This will ensure that the Denver region maintains its quality of life and status as one of the best bicycling and pedestrian areas in the country.

B. Outreach and Community Participation

The Pedestrian and Bicycle Element was prepared with valuable input from member governments of DRCOG, subject matter experts in the field, and the residents of the region.

Pedestrian and Bicycle Workgroups

Member governments, pedestrian and bicycle advocacy organizations, Americans with Disabilities Act (ADA) representatives, experts from the health field, local transportation management organizations, and other subject matter experts participated in a series of workgroup meetings held at DRCOG in 2006 and 2009. Workgroups provided input on regional policies, inventories of pedestrian and bicycle facilities, identification of major facility gaps, design considerations and land development principles, and offered guidance to the overall planning process.

2006 Pedestrian and Bicycling Questionnaires

Pedestrian and bicycling questionnaires were prepared (English and Spanish) and circulated to gather input from the public. Over 1,500 responses were received (see Chapter 2). DRCOG staff specifically distributed these questionnaires through the following channels:

- DRCOG Web site;
- Local government contacts (resulting in distribution by the City of Greenwood Village and City of Englewood posting the questionnaires on their Web sites);
- Bicycle and Pedestrian advocacy organizations;
- Posted in RTD transit stations (Market Street, Civic Center, Boulder, and Nine Mile);
- Distributed at breakfast stations during the 2006 Bike to Work Day (over 3,000 surveys distributed during this event);
- At regional fairs, markets, Denver's 16th Street Mall, Earth Day 2006, and other special events;
- Enclosed in several homeowners association mailings in Arvada; and
- Advertised in regional newspapers (including the Denver Post, Rocky Mountain News, and neighborhood newspapers).

Public Open Houses and Targeted Outreach

Two public open houses were held in April 2006 to inform the public and gather input. The open houses were held at the Civic Center Community Room in Englewood and the Boulder West Senior Center.

Outreach was also requested from the following local groups and DRCOG staff attended their meetings:

- the Denver Mayor's Bicycle Advisory Committee;

- the Colorado Front Range Trail Advisory Committee;
- the Area Agency on Aging Committee; and
- Bike Jeffco.

C. Pedestrian and Bicycle Policies

The following section contains pedestrian and bicycle policies on the topics covered by the Pedestrian and Bicycle Element. These topics include facility planning and design, land development principles, and education and encouragement activities. *Local governments, DRCOG, CDOT, RTD, and other agencies are strongly encouraged to adopt these policies as transportation and development projects and programs are implemented. Federal, State or local guidelines should be followed for all applicable policies.*

Facility Planning Policies

Pedestrian

1. In all urban and suburban areas, continuous sidewalks should be provided on both sides of all streets and roadways (except freeways), and where possible, detached from the roadway (preferred). Connections through developments and to the entrances of businesses, stores, schools, parks and other activity centers need to be established and maintained.
2. In rural areas, where pedestrian volumes tend to be low, paved shoulders should be provided along arterials with adequate width (in accordance with local, state and national guidelines) to buffer the pedestrian from the traveled roadway.
3. Local governments are encouraged to conduct a comprehensive review of pedestrian facilities and initiate efforts to provide any needed missing segments. In making such an analysis, local governments should also evaluate the degree to which barriers and intrusions exist and take the necessary steps to eliminate them.

Bicycle

4. The existing and planned street system should accommodate bicycles and motor vehicles to the maximum extent possible for safe bicycle travel.
5. Local governments are encouraged to identify specific bicycle transportation markets (i.e., home-to-school, home-to-shop, home-to-work), and provide bicycle facilities to serve these markets.
6. Where street improvement and drainage projects coincide with desired bikeways, provisions for bicycle and pedestrian travel should be explicitly addressed before the project proceeds and upheld throughout project development, construction, and operation.

Facility Design Policies

Pedestrian

7. New or reconstructed sidewalks detached from the curb along major regional and principal arterials should be a minimum unobstructed width of six feet. Planting or hard landscape strips between the curb and sidewalk should be no less than three feet wide.
8. New or reconstructed sidewalks attached to the curb along major regional and principal arterials should be a minimum unobstructed width of eight feet.
9. Sidewalks and multi-use trails should be built to accommodate the needs of all pedestrians and shall adhere to all Americans with Disabilities Act (ADA) design and accessibility guidelines.
10. Specific attention should be given to pedestrian needs in the design of intersections and traffic signalization.
11. "Right-turn-on-red" should be prohibited where high pedestrian volumes exist.
12. Roadway lighting should be provided at pedestrian crossings and other locations where conflicts could arise between drivers and pedestrians.
13. Property owners adjacent to sidewalks should meet local ordinance requirements to maintain and repair their sidewalks and promptly remove snow from walkways throughout the year.

Bicycle

14. In rural areas, paved shoulders of at least four feet in width should be provided along major regional and principal arterials, county highways, and state highways to accommodate bicycle and pedestrian travel.
15. In urban and suburban areas, as roadways and bridges on the regional roadway system are constructed, reconstructed, resurfaced, or re-striped, curb lanes should be widened to provide space for bicyclists.
16. Bicycle lanes designed to national standards are encouraged on collector and arterial roadways and along streets in areas where the construction of such a facility could improve the safety and/or connectivity of the regional bicycle system.
17. The use of "sharrow" pavement markings is encouraged where bicycles and vehicles share the traveled lane.
18. Bicycle parking facilities should be provided at major employment, retail, entertainment, commercial, and/or other activity centers in the region. Local governments should establish an off-street bicycle parking policy, which considers security, placement, quality of facilities, and provision of signs directing bicyclists to the parking facilities.
19. At actuated traffic signal locations, provision should be made to allow bicycles to be detected or to easily allow a bicyclist to activate a green signal.

Multi-use Trails

20. Multi-use facilities should have: (a) connections to the local street system and with residential, employment, commercial, recreational, and school sites; (b) explicit signage regarding proper use of the facilities; (c) a minimum width of ten feet to meet national standards; and (d) adequate lighting in underpasses and other dark areas.

Overall

21. In 1999, the Federal Highway Administration (FHWA) adopted the Policy Statement on Accommodating Bicyclists and Pedestrians in Transportation Projects (see document in Appendix A) as an approach to integrating bicycling and walking infrastructure investments into the transportation mainstream. FHWA's goal is that public agencies, professional associations, advocacy groups, and others (e.g. private entities) adopt this policy, sometimes referred to as "Complete Streets", to reflect the intent of current and future transportation legislation (such

Complete Streets

Bicycling and walking will be incorporated into all transportation projects unless exceptional circumstances exist. – FHWA

as SAFETEA-LU). FHWA's policy states, "*Bicycling and walking will be incorporated into all transportation projects unless exceptional circumstances exist.*"

22. Limited-access highways can create barriers to bicycle and pedestrian travel. Bicycling and walking should be accommodated near or adjacent to limited-access highways through the provision of facilities along parallel roadways or within the highway right-of-way.
23. Overpasses and underpasses to accommodate pedestrian and bicycle travel should be constructed to cross major obstacles such as freeways, rivers, or railways. As roadway overpasses and underpasses are constructed or reconstructed, accommodations should be made for pedestrians and bicyclists.
24. Pedestrian and bicycle connections should be explicitly addressed as communities plan for RTD FasTracks rapid transit stations as well as other transit services. In addition, bicycle access and short-term and long-term bicycle parking facilities should be provided at all park-n-Rides, carpool lots, rail and bus stations and other transit facilities as appropriate with the potential market.
25. No federal funding should be provided for any pedestrian or bicycle capital projects unless the recipient agrees to provide regular maintenance as outlined in a plan, ordinance, or agreement. Maintenance activities should include:
- Keeping the facility smooth and free of debris such as sand, gravel, leaves, and trash;
 - Repairing cracks and other damage;
 - Leveling grade differences between bridge decks and approaches;
 - Leveling manholes with the street surface;
 - Replacing drainage gates having longitudinal spacing with those having lateral spacing;

- Removing snow and ice;
- Clearing vegetation;
- Replacing faulty lighting; and
- Maintaining safe operating conditions during construction or other temporary events.

26. Traffic calming techniques should be considered where appropriate to improve safety for pedestrian and bicycle travel.

Land Development Policies

27. Local governments should require the provision of pedestrian and bicycle facilities in all new and redeveloped areas. Subdivision and planned unit development ordinances should require good pedestrian and bicycle access among residential areas, arterial and collector roads, transit stops, shopping facilities, schools, employment sites, and recreation facilities as well as through the development. Building and zoning ordinances should require bicycle parking at all major trip attractors.

28. Communities are encouraged to maintain existing pedestrian and bicycle linkages within development areas and provide new ones where appropriate and feasible. For example, cut-through sidewalks/trails at the end of cul-de-sacs or unpaved footpaths are viable components of the transportation system.

29. Local governments should consider pedestrian and bicycle facilities when designing, rebuilding, or restriping streets based on the context of the existing and planned land development and the function of the street using principles of context sensitive design solutions.

Education and Encouragement Policies

30. School districts are encouraged to develop a consistent and comprehensive bicyclist and pedestrian education program for children and parents. The program should provide basic principles for all users to safely operate on roadways and multi-use facilities. The program should include adequate on- and off-road training time and bicycle handling skills.

31. Bicycle clubs, bicycle shops, activist groups, community colleges, health clubs, and other organizations are encouraged to provide education programs on how to ride a bicycle safely. Instructors should be trained in the initial program years.

32. School districts and senior centers are encouraged to develop and provide classes regarding the pedestrian aspects of traffic signal operations.

33. Driver's license exams should continue to include questions on the legal rights and responsibilities of motorists, bicyclists, and pedestrians.

34. Driver education classes should explain how pedestrians and bicyclists use the road. This information should be incorporated into motorist's manuals and driver education programs.

35. The state is encouraged to develop and implement a law enforcement training program to educate police officers on the rights and responsibilities of motorists, pedestrians, and bicyclists on roadways and off-street multi-use trails.
36. The state should require motorists, bicyclists, and pedestrians to take and pass a pedestrian and/or bicyclist education course when they are involved in a significant number of violations. Motor vehicle defensive driving classes, frequently required for traffic violators, would be an ideal place to introduce awareness of all other modes.
37. Local governments should consider increasing police or special bicycle patrols of the off-street bicycle and pedestrian system.
38. Local governments, school districts, bicycle advocacy groups, and others should develop and disseminate maps to serve bicycling and pedestrian interests. Examples include bicycle route/facility maps, roadway bicycling suitability maps, and *Safe Routes to School* maps. The appropriate age and skill levels needed to use facilities should be identified on the various maps. These groups can also disseminate bicycle and pedestrian education materials.
39. Each local government should designate a bicycle and pedestrian coordinator. The functions of this position could include reviewing transportation projects and land development site plans for pedestrian and bicycle accommodations, implementing the pedestrian and bicycle components of local comprehensive plans, and organizing local pedestrian and bicycle workgroups and *Safe Routes to School* planning as needed.
40. Local governments are encouraged to conduct bicycle traffic counts to document the level of bicycling activity on specific routes.
41. Local governments are encouraged to provide bicycle-sharing programs, including kiosk stations, which allow for checking out and returning bicycles.

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2. FACTORS AFFECTING PEDESTRIAN AND BICYCLE TRANSPORTATION

Many factors influence bicycle and pedestrian travel, including the presence and maintenance of adequate facilities, land development patterns, and environmental elements such as climate and topography. These physical elements combined with other factors such as household income, health, personal safety, cost of fuel, and other personal considerations result in the current levels of bicycling and walking activity. In the spring and summer of 2006, DRCOG circulated questionnaires to gather input from the region's residents on what influences them to walk or bicycle. The following sections review the results of the 2006 pedestrian and bicycling questionnaires, and summarize local and national research on factors influencing pedestrian and bicycle travel.

A. Regional Perspectives: The 2006 DRCOG Pedestrian and Bicycling Questionnaires

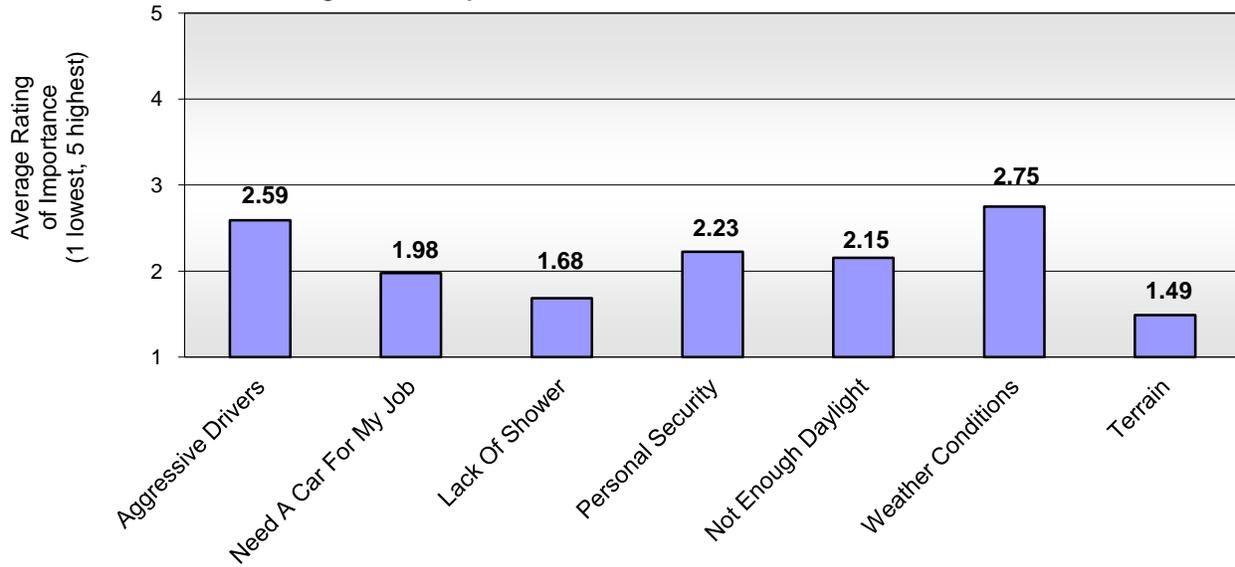
In the spring and summer of 2006, DRCOG distributed pedestrian and bicycling questionnaires to gather input on the factors that influence an individual's decision to walk or bicycle. The questionnaires were distributed through the DRCOG Web site, Bike to Work Day 2006 Web site, and many local government and advocacy organization Web sites. Hard copies were available at public open houses, 2006 Bike to Work Day breakfast stations, local conventions, RTD transit stations, bicycle advocacy group meetings, and many other channels. Over 1,500 responses were received (the questionnaires and results are provided in Appendix B). The following sections summarize results of the survey.

Personal and Environmental Factors

The most important personal factor for both pedestrian and bicycling respondents was inattentive or aggressive drivers (Figures 3 and 4). This factor remained the highest concern regardless of age, mobility impairment, or how often the person walked or bicycled. For pedestrians, other factors that were ranked high included personal security and the need for a car in their job. For bicyclists, other important factors included lack of a shower at their destination and bicycle theft. Environmental factors such as weather, terrain, and lack of daylight were also important issues for both pedestrians and bicyclists, but there is little that can be done to address these factors.

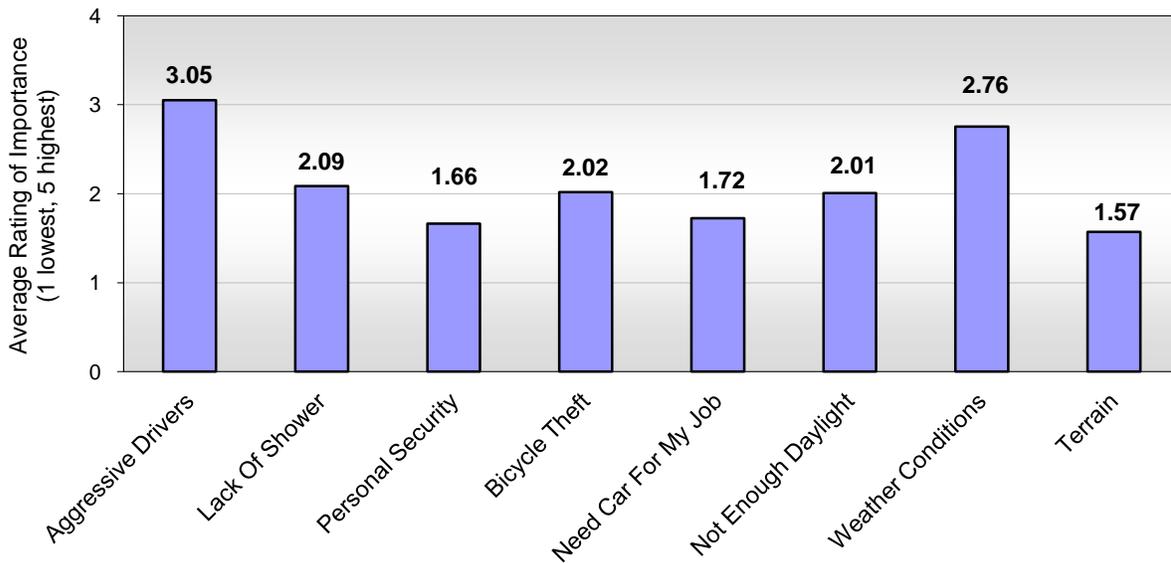
Aggressive driving is a problem many transportation system users face, but is particularly important to pedestrians and bicyclists since they are more vulnerable to serious injury in crashes with motor vehicles. While local governments and police departments continue to work toward reducing aggressive driving through education programs and traffic enforcement, motorists, pedestrians, and bicyclists must recognize the rights and responsibilities of all transportation system users. Promotional efforts like CDOT's Share the Road campaign, the annual Bike to Work Day, and local efforts at community fairs and gatherings can help raise the awareness of bicycling and walking as legitimate forms of transportation. In addition, concern about aggressive driving may also show there is a need to raise the level of attention given to this subject during driver education classes.

Figure 3. Major Personal and Environmental Factors, Pedestrian



Source: 2006 DRCOG Pedestrian Questionnaire. 413 Responses.

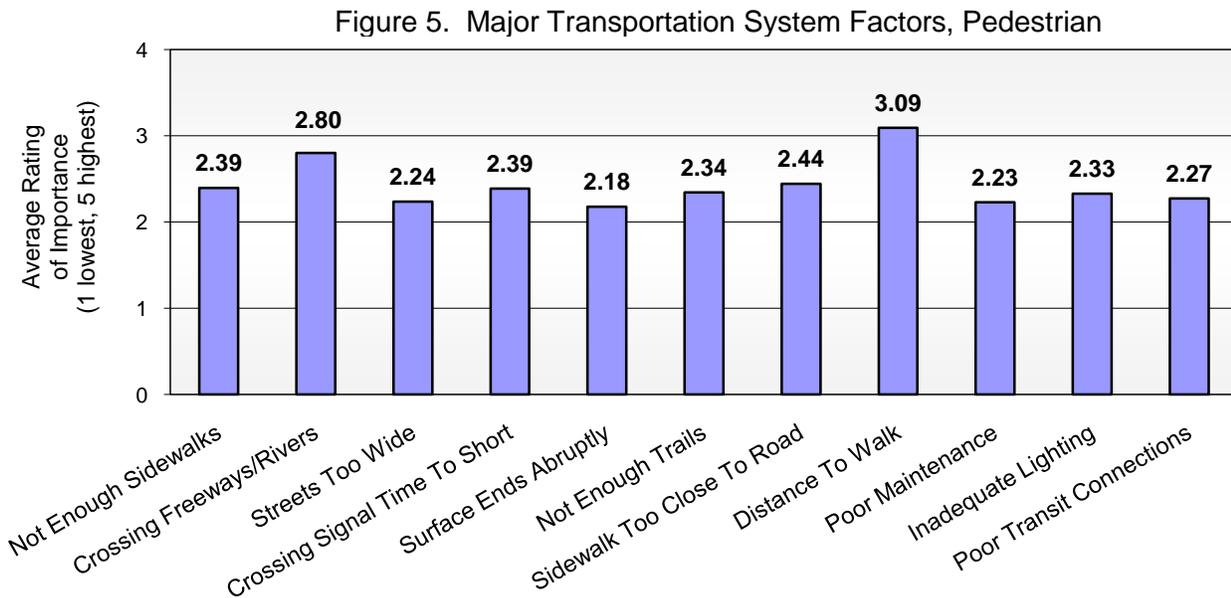
Figure 4. Major Personal and Environmental Factors, Bicycling



Source: DRCOG 2006 Bicycling Questionnaire. 1,253 Responses.

Transportation System Factors

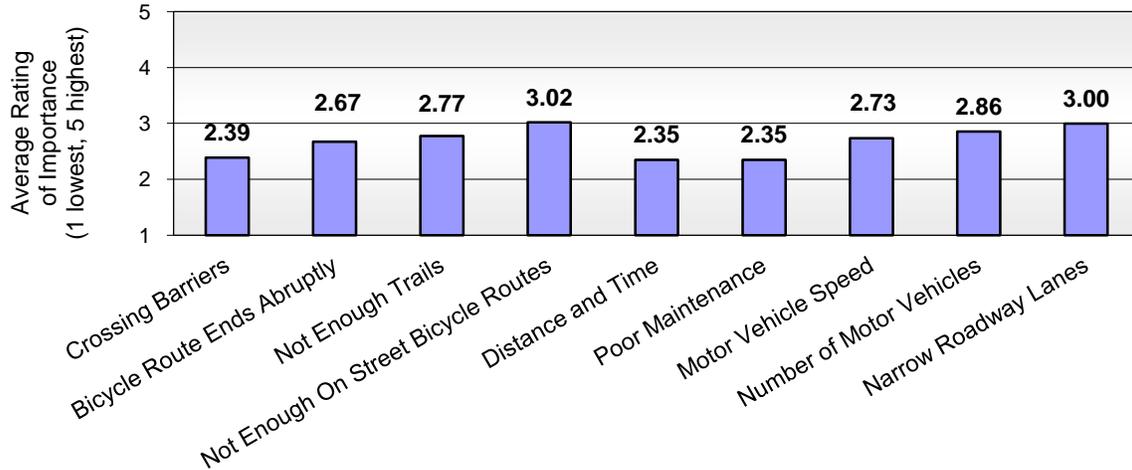
Respondents were asked to rank the most important transportation-related factors that influence how much they walk or ride a bicycle. The most important factors for pedestrians were the distance and/or time required to reach their destination and crossing major barriers such as freeways and rivers (Figure 5). For pedestrians aged 65 and over and for those with impairments (mobility, seeing, hearing, and/or cognitive impairments), the most significant transportation system factors were the signal crossing times provided to cross roadways; adequate lighting; and maintenance of facilities.



Source: 2006 DRCOG Pedestrian Questionnaire. 413 Responses.

For bicyclists, the most important factors were the provision of on-street bicycle routes and the lane width on roadways where bicycles and motor vehicles share the same travel lane (Figure 6). These factors were the most important to respondents regardless of how often they rode, their age, or any physical impairments. For those who ride infrequently, the lack of off-street multi-use trails was a slightly more important factor compared to the average for all respondents. In addition, bicyclists with impairments (mobility, seeing, hearing, and/or cognitive impairments) also considered crossing major barriers such as freeways and rivers an important factor.

Figure 6. Major Transportation System Factors, Bicycling



Source: DRCOG 2006 Bicycling Questionnaire. 1,253 Responses.

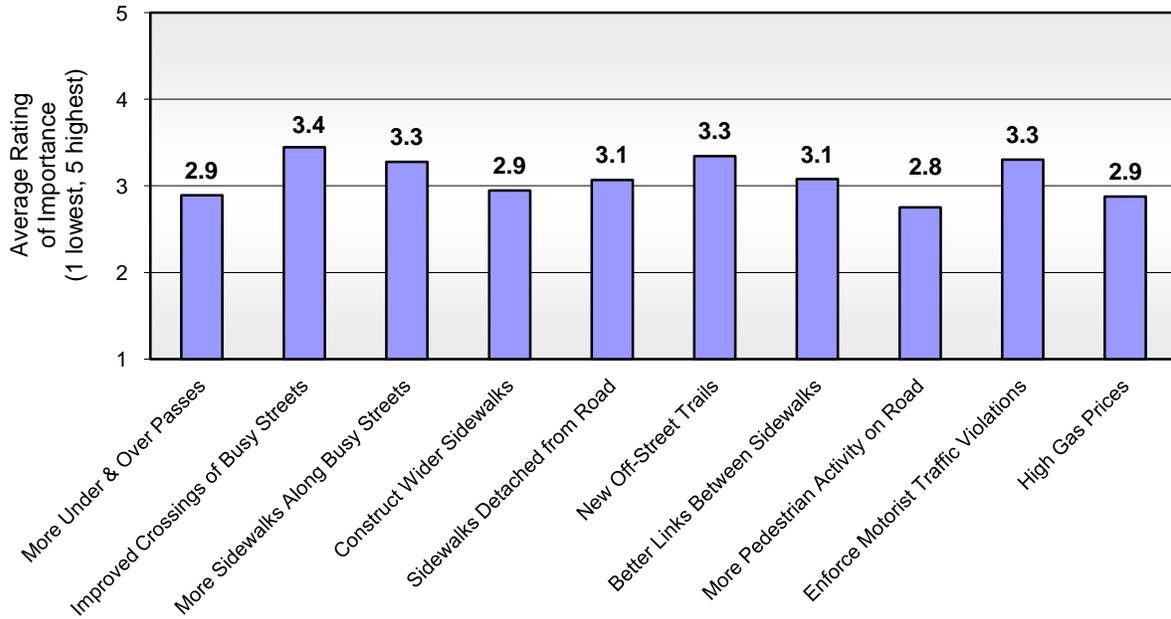
Encouragement Factors

Respondents were asked to rate the most important factors that would encourage them to walk or bicycle. As Figures 7 and 8 show, bicyclists and pedestrians alike generally thought infrastructure-related improvements would encourage more activity (such as building new off-street multi-use trails, constructing more sidewalks, widening lanes shared by motor vehicles and bicycles, striping bike lanes, and building bridges and underpasses).¹ There were no significant differences in the importance of these factors when tabulated by age or impairment. However, when tabulated by frequency of bicycling, those who bicycled once a week or more tended to favor striping on-street bike lanes and widening lanes shared by motor vehicles and bicycles.

Other highly ranked encouragement factors for both the pedestrian and bicycling questionnaires included enforcement of motor vehicle traffic violations and high gas prices. The importance of enforcement is not surprising given it was also a significant factor limiting walking and bicycling activity in previous questions. High gas prices, along with the other costs associated with owning a motor vehicle, will likely continue to influence walking and bicycling activity.

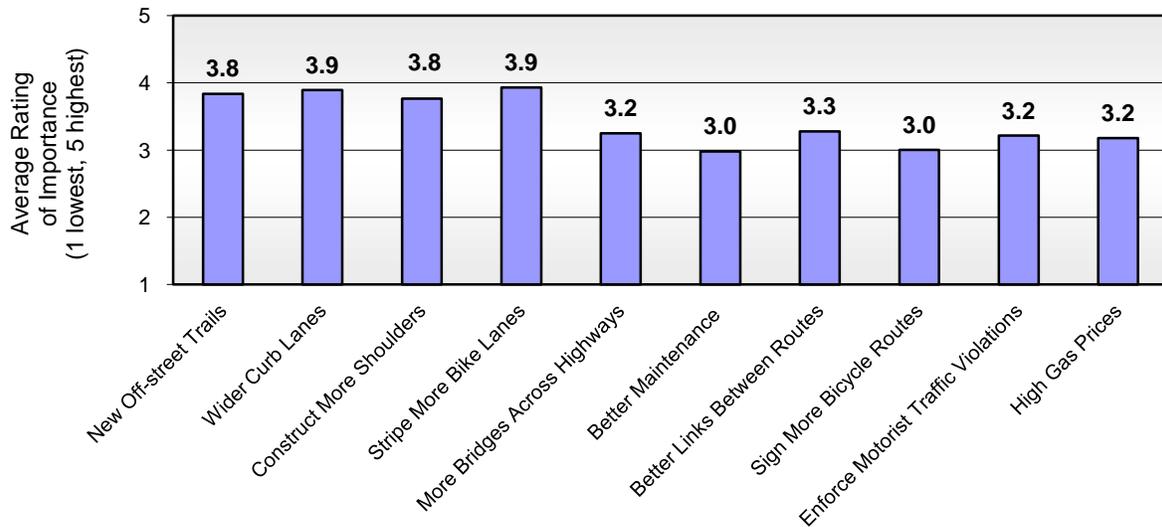
¹ These figures only display the highest ranked encouragement factors. A complete list of all the factors and their rankings is included in Appendix B.

Figure 7. Major Encouragement Factors, Pedestrian



Source: 2006 DRCOG Pedestrian Questionnaire. 413 Responses.

Figure 8. Major Encouragement Factors, Bicycling



Source: 2006 DRCOG Bicycling Questionnaire. 1,253 Responses.

Transit-related Information

Transit-related questions included how frequently the respondent rode the RTD transit system and, exclusive to the bicycling questionnaire, if they have ever taken a bicycle on an RTD bus or light rail train or parked their bicycle at an RTD facility.

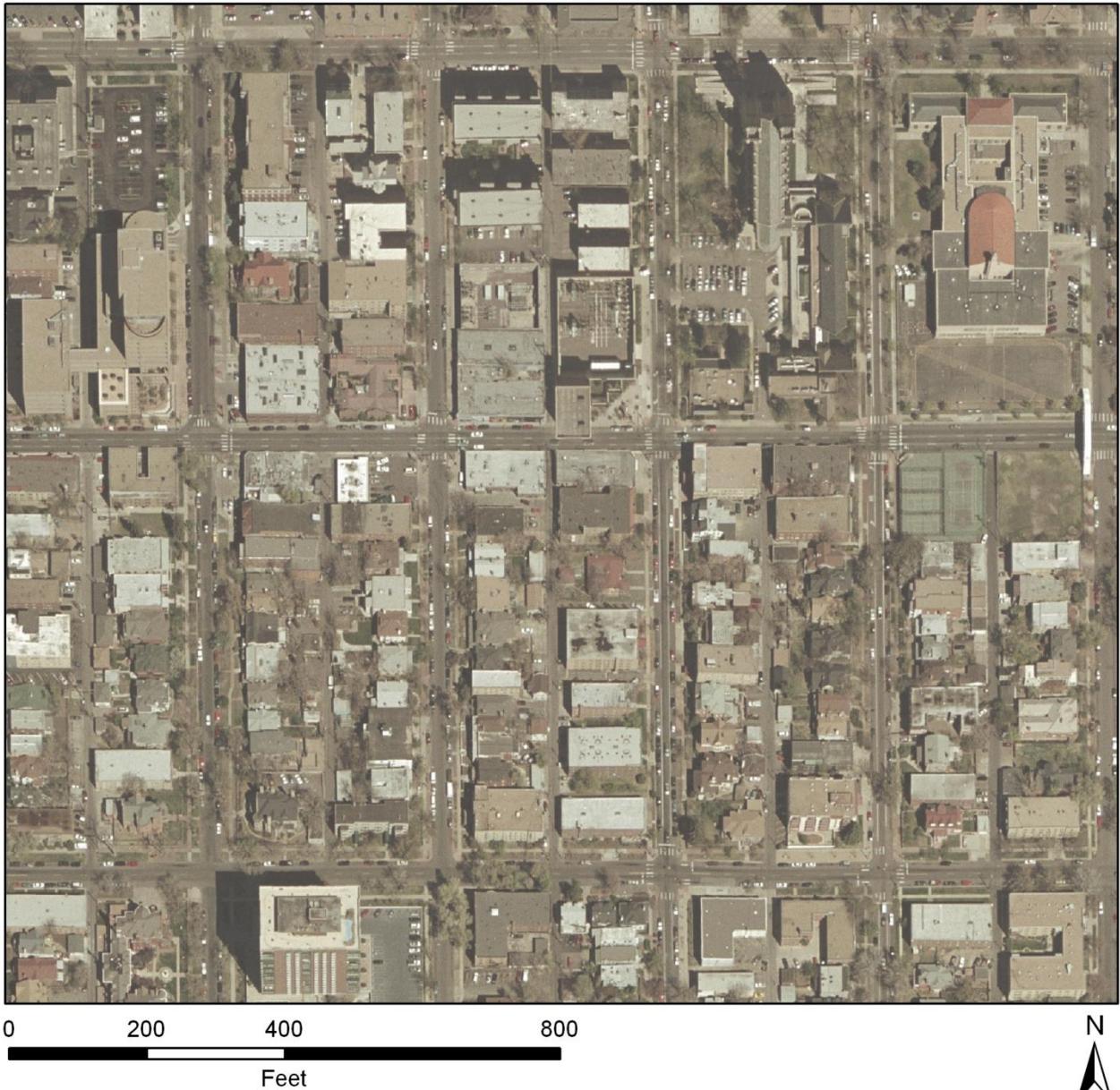
Overall, between 30 to 40 percent of the pedestrian and bicycling respondents used transit once per week or more. The most important encouragement factors for these frequent users of transit were similar to the factors from all respondents. For pedestrians who use transit frequently, improved crossings of busy streets and stronger enforcement of traffic violations by motorists were the most important factors that would encourage more pedestrian usage. For bicyclists, stronger enforcement of motor vehicle traffic violations and building on- and off-street bicycle facilities (multi-use trails, bike lanes, widening lanes shared with motor vehicles, and building bridges across highways, rivers, and other barriers) were the most important factors that would encourage more bicycle use of transit facilities. Specific questions regarding the importance of improved access to RTD bus stops and light rail stations were not highly ranked in comparison with other factors.

B. Land Development Factors

The frequency of bicycling and walking trips is strongly influenced by development patterns. Concentrated and more densely developed areas with mixed land-uses in the Denver region generally have the highest percentages of bicycle and pedestrian travel.² These areas also typically support pedestrian and bicycle connections by permitting shorter trips and providing links to other travel modes (e.g., transit). Many of these areas were developed before World War II with compact, grid street patterns (Exhibit 1).

² Source: 2000 Census Transportation Planning Package

Exhibit 1. Compact, grid street pattern (central portion of Denver)



In addition to the historic development in places such as central Denver, many new locations in the region also contain high-density development patterns or will in the future. Many of these locations are identified in the *Metro Vision 2035 Plan* as “urban centers,” or areas in the region that are designated as pedestrian-oriented locations offering a range of retail, business, civic, cultural, service, employment, and residential opportunities in a compact environment. Figure 9 displays the location of these centers. The most prominent example of an existing urban center is the Denver central business district (CBD), but other current examples include the Boulder CBD, the Englewood City Center, Glendale, and the Denver Tech Center.

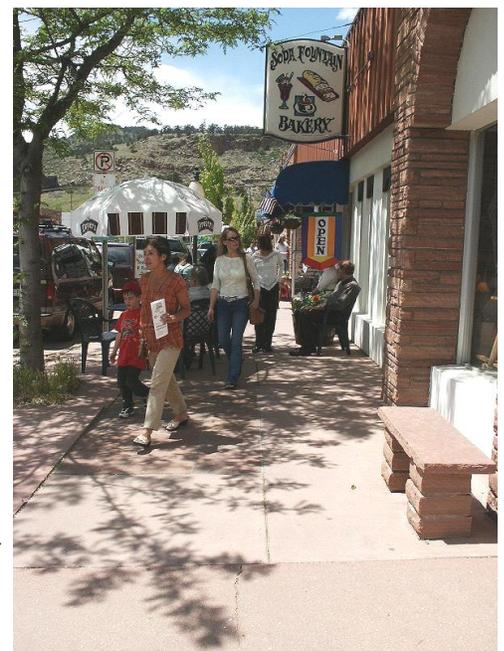
Many post-World War II developments contained single or segregated land-uses. They often had indirect pedestrian and bicycle access and a lack of sidewalks, multi-use trails, or other bicycle facilities. However, impediments in these types of areas can be overcome by integrating bicycle and pedestrian connectivity into site plans and developments (for example, the provision of cut-through sidewalks/trails in a cul-de-sac subdivision as displayed in Exhibit 2 can reduce the length of a trip to a bus stop or a retail area significantly). Chapter 6 contains more information and examples of how sites can be designed to enhance the bicycle and pedestrian transportation environment.



Exhibit 2. Multi-use trails linking dead-end cul-de-sacs

Rural areas present a special operating environment for pedestrians and bicyclists. Factors such as vehicle speed, the width of paved shoulders, and shoulder striping on rural roads or highways influence bicycle and pedestrian activity greatly. Rural town centers, like urban centers, can encourage a high amount of pedestrian and bicycle activity depending on the provision of adequate sidewalks and bicycle facilities (Exhibit 3).

Exhibit 3. Rural town centers such as downtown Lyons maintain a high level of pedestrian activity with the provision of well-designed sidewalks.



C. Environmental Factors

Generally, the DRCOG region has an exceptional climate and topographical setting for bicycling and walking. However, as noted previously, the respondents to the 2006 DRCOG Pedestrian and Bicycling Questionnaires stated climate was one of the largest deterrents to bicycling and walking, presumably due to low temperatures during the winter months.

Climate

The weather in the DRCOG region is generally good for either walking or bicycling from late March to early November. During this time, temperatures are typically moderate with little snowfall, though there is often the possibility of late-day summer thunderstorms. Even in the winter, there are many warm days conducive to bicycling and walking. An important deterrent for some people during the winter season are low temperatures and the decrease in daylight hours.

Topography

The greatest topographic constraint to walking and bicycling is found in the rural foothills and mountainous areas where non-recreation bicycling and walking trips are frequently limited to short trips within smaller mountain communities. The urban area of Denver is characterized as generally flat with moderate changes in elevation across rolling hills and ridges. Where significant changes in elevation occur in short distances, ADA-compliant ramps should be installed to the maximum extent feasible to accommodate both pedestrians and bicyclists. This is particularly important when building grade-separated pedestrian and bicycle structures that cross busy roadways, railways, or waterways.

D. Socio-Economic Factors

A key economic factor that influences bicycling and walking activity is income. Many people cannot afford to drive or take transit, leaving walking as the least expensive mode of travel. Bicycling can also be inexpensive, depending on the type of bicycle purchased.

Worker Earnings

Data available from the 2000 Census Transportation Planning Package (CTPP) shows that an individual who earns less than \$20,000 is more likely to walk or bicycle to work than any other earnings bracket (Table 1). They are also more likely to use public transit, which usually requires some walking. Individuals with higher earnings are most likely to drive alone.

Table 1
Means of Transportation to Work by
Worker Earnings in the Denver Region, 2000

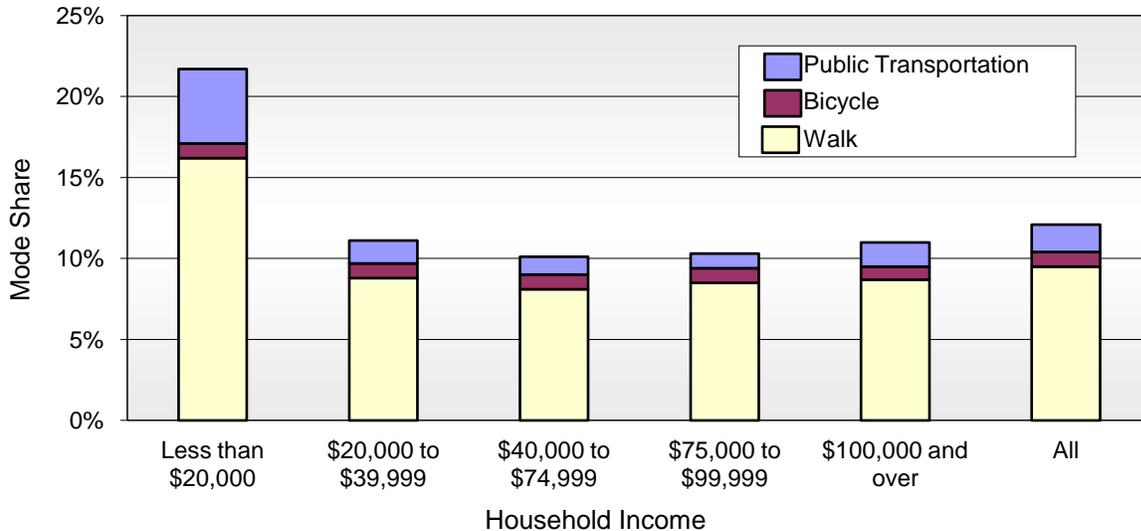
Annual Earnings	Drive Alone	Carpool	Transit	Bicycle or Walk	Other	Work at Home
0 - \$20,000*	65%	16%	6%	6%	1%	7%
\$20 - \$35,000	77%	12%	4%	2%	1%	3%
\$35 - \$50,000	82%	9%	4%	2%	1%	3%
\$50 - \$75,000	83%	8%	3%	2%	1%	4%
\$75,000 and over	82%	6%	2%	2%	1%	7%

Source: 2000 Census Transportation Planning Package (CTPP)
*Note - includes 'no earnings' as described in the CTPP

Household Income

National and statewide statistics on income level and travel mode choice also support the CTPP data for the Denver region. According to the 2001 National Household Transportation Survey (NHTS), walking and transit comprise a much greater share of the total trips made in lower-income households (Figure 10). The share of bicycling trips remains fairly consistent among all of the other income groups.

Figure 10. Modal Shares by Household Income, 2001



Source: Pucher, J. and Renne, J.L. (2003) "Socioeconomics of Urban Travel: Evidence from the 2001 NHTS" *Transportation Quarterly*, Vol. 57, No. 3., pp. 49-77.

Other Economic Factors

The cost of fuel and other vehicle-related costs also influence walking and bicycling as a means of transportation. In a 1997 nationwide survey, 45.6 percent of commuting

bicyclists indicated the cost of fuel influenced their choice to commute by bicycle and 34.0 percent indicated parking costs.³

For the communities in the DRCOG region, these economic factors suggest the importance of providing a comprehensive walking and bicycling transportation system in areas with low household income. They also suggest that as fuel prices and other costs associated with vehicle ownership continue to rise there will be increased demand for bicycle and pedestrian trips.

E. Congestion Factors

Traffic congestion increases vehicle travel time and is therefore an influential factor in making bicycling and walking trips. In some cases, a bicycle trip may be faster than driving due to congestion. The same 1997 survey found that 51.7 percent of bicycle commuters are influenced by congestion when they decide to use their bicycle to travel to work.⁴ Walking and bicycling trips combined with transit service can occasionally result in a total trip time less than driving depending on the destination.

F. Social and Workplace Factors

Social factors such as appearance and personal hygiene can influence pedestrian and bicycle travel in the region. Bicyclists surveyed by the 2006 DRCOG Bicycling Questionnaire ranked a lack of shower facilities at their workplace as one of the top limitations to bicycling to work. However, many employers are beginning to recognize the benefits of promoting physical activity in their workers through lower health care insurance claims and premiums. As a result, some workplaces partnered with nearby fitness centers to provide shower facilities for their employees, offer wellness incentive programs to promote physical activity, and purchase secure storage for bicycles. In addition, some Denver region workers also enjoy a business casual workplace where the clothing and equipment required to walk or bicycle is easily accepted by the workplace culture.

³ Moritz, W. (1997) "Survey of North American Bicycle Commuters: Design and Aggregate Results" *Transportation Research Record: Journal of the Transportation Research Board*, No. 1578, TRB, Washington, D.C., pp. 91-101.

⁴ Ibid. Footnote #9.

3. PEDESTRIAN AND BICYCLE TRAVEL DATA

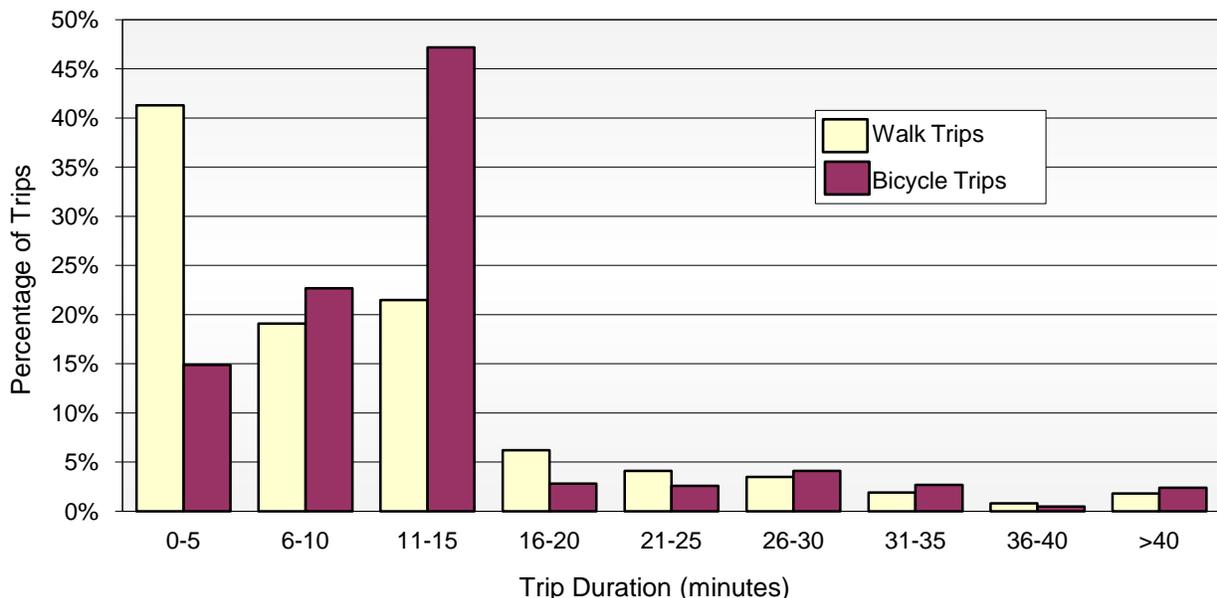
There are several sources of data available on pedestrian and bicycle travel, including (but not limited to) the U.S. Census, CDOT, DRCOG, and FHWA. This chapter summarizes regional pedestrian and bicycle travel data, including trip distance, purpose, duration, and motor vehicle crashes. Understanding the characteristics of these trips can help local governments and other sponsors develop projects and programs that will have the greatest impact on walking and bicycling activity.

A. Regional Walking and Bicycling Travel Data (1997 DRCOG Inventory)

The Travel Behavior Inventory (TBI) administered by DRCOG in 1997 obtained data on walk and bicycle trips in the region, including trip distance, trip duration, and trip purpose. The average distance of walk trips surveyed was 0.75 miles. The average distance of bicycle trips surveyed was 2.1 miles.

Figure 11 shows that the majority of both pedestrian and bicycle trips are less than 20 minutes in duration. This duration is consistent with the average length of walk and bicycle trips cited above. The statistics on trip length and duration underscore the importance of providing efficient and direct pedestrian and bicycle facilities through communities to connect residential areas with other land-uses and transit services. In addition, approximately **half of the region's motor vehicle trips are less than 3 miles**. There is potential to convert some of these vehicle trips to pedestrian, bicycle, and/or transit trips if well designed facilities are planned, constructed, and promoted in local communities (see Chapters 5 and 6 for more information on pedestrian and bicycle facility design and land-use development principles that can encourage these trips).

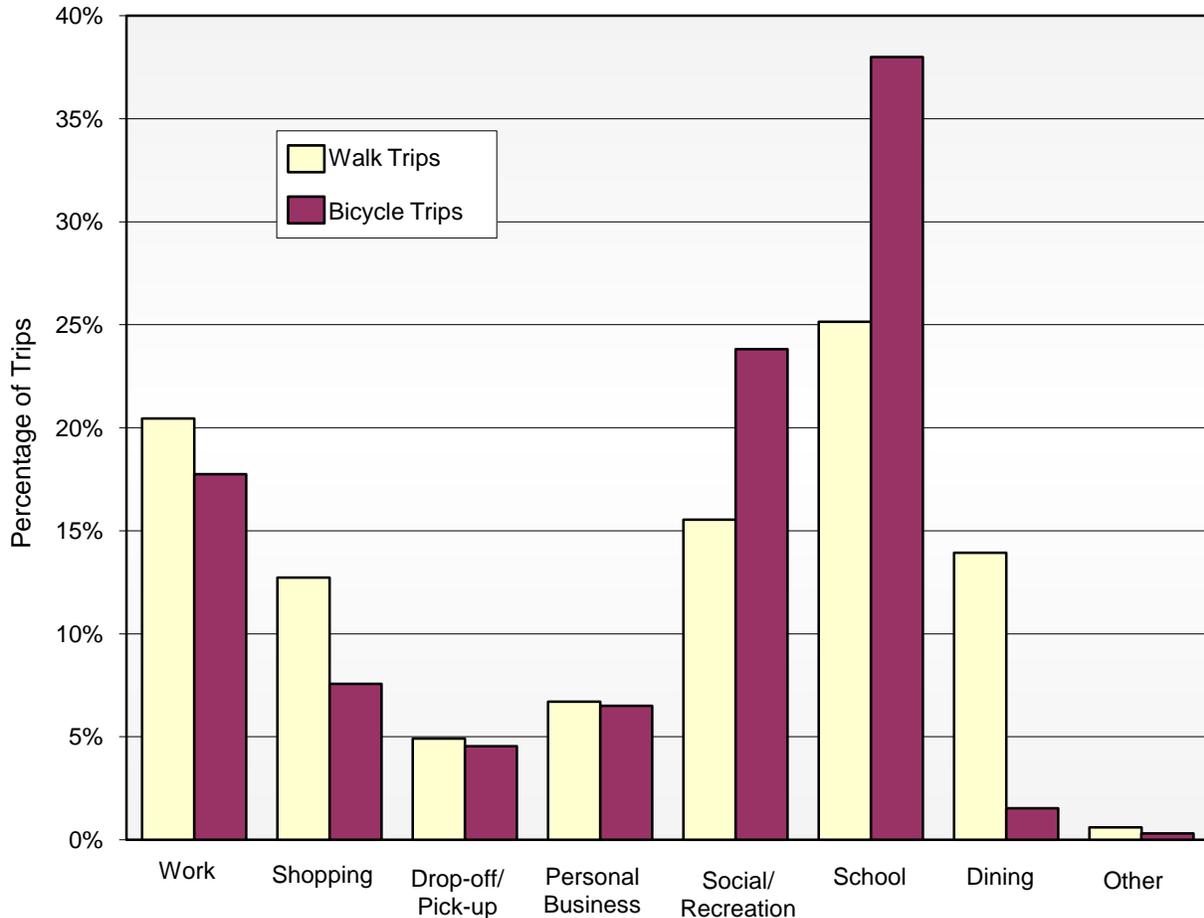
Figure 11. Duration (minutes) of Walk and Bicycle Trips, 1997



Source: 1997 Travel Behavior Inventory (TBI), DRCOG.

Figure 12 details the purpose of walk and bicycle trips obtained by the survey. Trips destined to work, school, and for recreation or social purposes were the three most frequent types of trips taken by pedestrians and bicyclists in the region. The significant number of trips to school (over 100,000 daily walk and bicycle trips) highlights the importance of providing pedestrian and bicycle facilities that link schools with residential areas and other land-uses. Chapter 7 contains information on the *Safe Routes to School* program currently administered by CDOT, which is dedicated, in part, to funding pedestrian and bicycle infrastructure improvements around schools.

Figure 12. Walk and Bicycle Trips by Purpose, 1997



Number of Daily Trips

Mode	Work	Shopping	Drop-off/ Pick-up	Personal Business	Social/ Recreation	School	Dining	Other
Walk	74,220	46,210	17,850	24,330	56,420	91,290	50,550	2,190
Bicycle	7,340	3,130	1,880	2,690	9,850	15,720	630	130

Source: 1997 Travel Behavior Inventory (TBI), DRCOG.

B. Walking and Bicycling to Work (2000 Census)

The 2000 Census Transportation Planning Package (CTPP) contains data on the means of transportation to work by all modes of travel. Table 2 presents the percentages of trips to work that were a walk or bicycle trip. Regionally, the average percentage of walk and bicycle trips to work, out of all work trips, was 3.1 percent. Figures 13 and 14 display the approximate home locations of these walk and bicycle trips. These figures show walk and bicycle trips are typically concentrated where population density is greatest, such as downtown Denver, Boulder, university and education campuses, and business centers.

Table 2
Trips to Work by Mode, 2000

County	Drive Alone	Carpool	Public Transit*	Bicycled	Walked	Other Means	Worked at Home	Total Work Trips
Adams	76.0%	14.5%	4.3%	0.2%	1.4%	0.7%	3.1%	178,580
Arapahoe	78.9%	10.9%	3.2%	0.2%	1.6%	0.7%	4.6%	260,152
Boulder	70.8%	10.4%	4.8%	2.8%	4.1%	0.7%	6.4%	159,749
Clear Creek	72.8%	13.4%	2.0%	0.0%	3.7%	0.6%	7.6%	5,550
Denver	68.4%	13.5%	8.3%	1.0%	4.4%	0.8%	3.7%	278,308
Douglas	81.0%	8.0%	1.5%	0.2%	0.8%	0.7%	7.9%	96,160
Gilpin	73.2%	15.7%	0.8%	0.1%	4.0%	1.0%	5.2%	2,992
Jefferson	79.6%	9.9%	3.3%	0.2%	1.3%	0.6%	5.1%	286,180
Regional Average	75.4%	11.5%	4.5%	0.7%	2.4%	0.7%	4.8%	100%
Regional Daily Trips Total	956,165	145,637	57,570	8,944	29,885	8,998	60,445	1,267,644

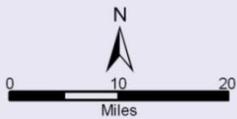
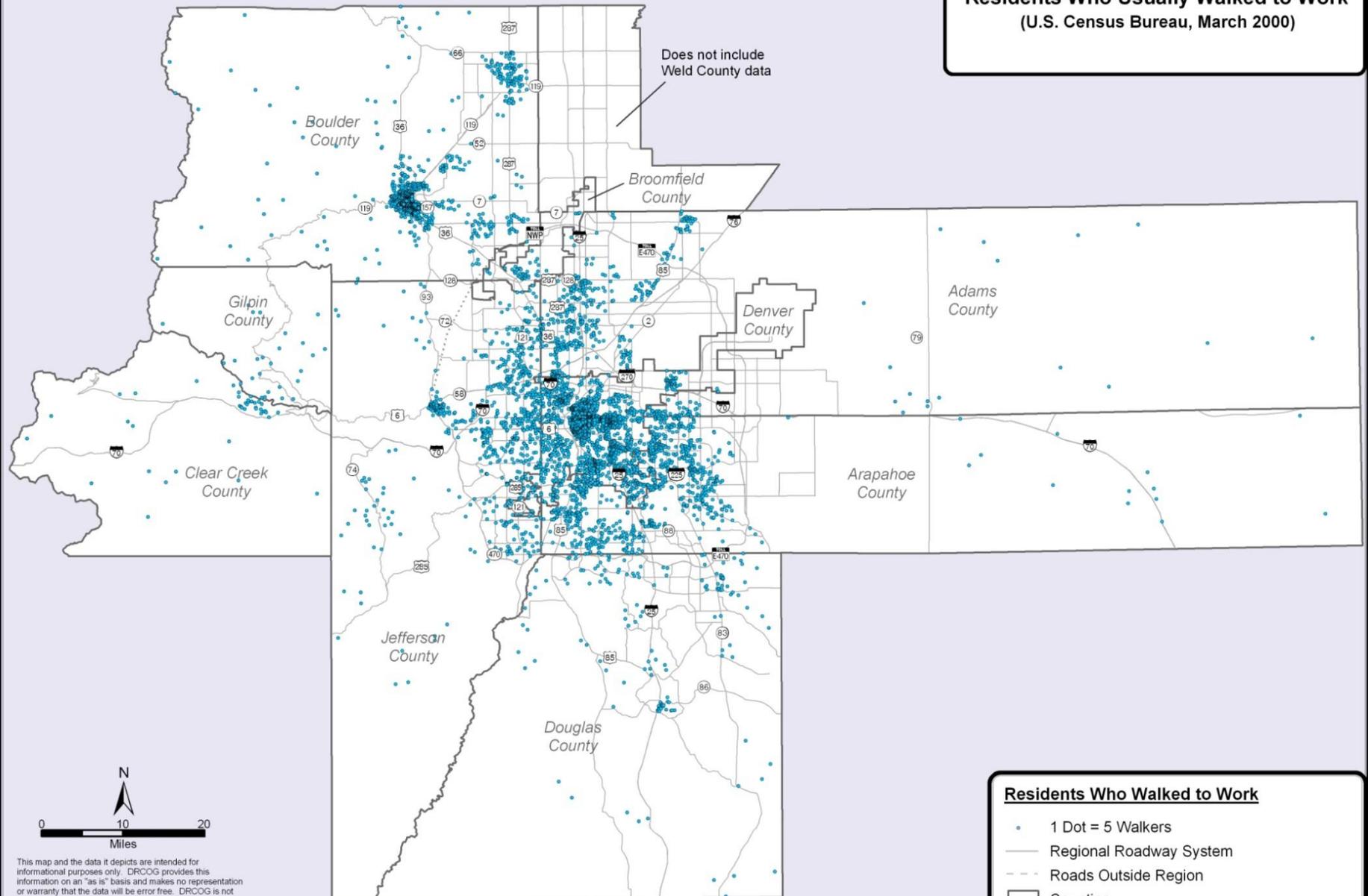
Source: 2000 Census Transportation Planning Package (CTPP)

*includes taxi service

Overall, Table 2 shows Denver and Boulder Counties experienced the highest combined percentages of walking and bicycling (5.4 percent and 6.9 percent, respectively). Table 2 also shows some of the rural counties in the DRCOG region (Clear Creek and Gilpin counties) experienced almost the same percentage of the population walking as did Boulder and Denver counties.

When reviewing the CTPP data, it should be noted that the survey might have undercounted the number of people walking or bicycling on a typical day in Denver. Specifically, the CTPP asked how respondents “usually” got to work during the survey week. If a respondent only bicycled two days that week and drove alone the remaining days, they would have been counted as a drive alone trip. In addition, the survey was conducted in March 2000 and inclement weather and/or low temperatures could have played a significant role in determining if people walked or bicycled to work. A study conducted by DRCOG estimated that four times as many people bicycle to work on warmer, good weather days in July as on cool days in March (*Monthly Variation in Bicyclists Along the Cherry Creek Trail in Glendale, Colorado*, January 2008).

Figure 13
Residents Who Usually Walked to Work
 (U.S. Census Bureau, March 2000)



This map and the data it depicts are intended for informational purposes only. DRCOG provides this information on an "as is" basis and makes no representation or warranty that the data will be error free. DRCOG is not responsible to any user for any costs or damages arising from inconsistencies in its data.
 Source: The 2000 Census Transportation Planning Package, DRCOG
 Projection: Colorado State Plane, NAD 83
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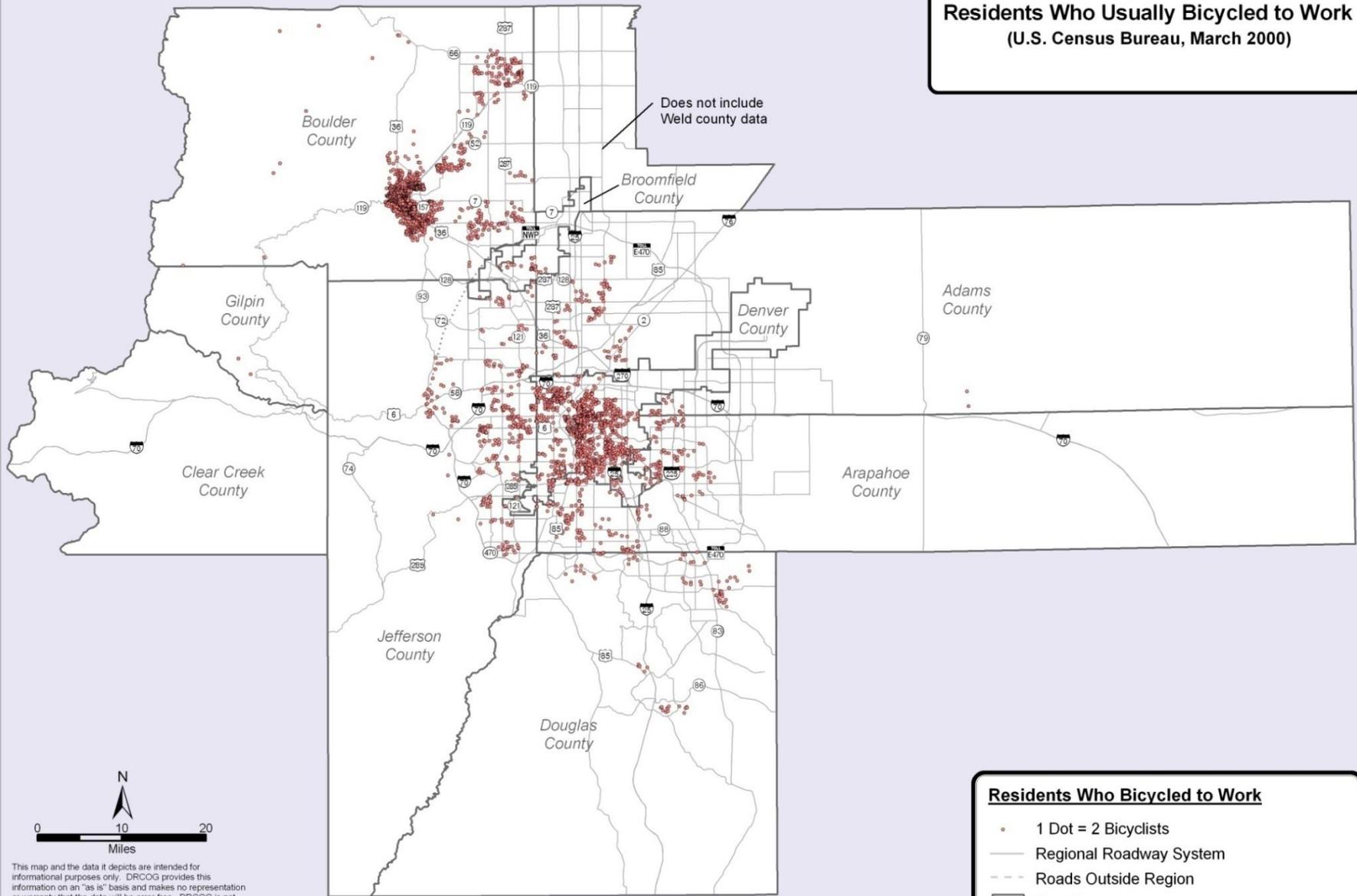
Residents Who Walked to Work

- 1 Dot = 5 Walkers
- Regional Roadway System
- - - Roads Outside Region
- Counties

*Note - Dots are randomly placed within the Transportation Analysis Zones (TAZs). Dots in large rural TAZs do not depict exact location. TAZ boundaries are not shown on this map. Data is not available for TAZs in Weld County portion of DRCOG.



Figure 14
Residents Who Usually Bicycled to Work
 (U.S. Census Bureau, March 2000)



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Source: The 2000 Census Transportation Planning Package, DRCOG
 Projection: Colorado State Plane, NAD 83
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Residents Who Bicycled to Work

- 1 Dot = 2 Bicyclists
- Regional Roadway System
- - - Roads Outside Region
- Counties

*Note - Dots are randomly placed within the Transportation Analysis Zones (TAZ's). Dots in large rural TAZ's do not depict exact location. TAZ boundaries are not shown on this map. Data is not available for TAZs in Weld County portion of DRCOG.



The 2000 CTPP also contains travel time data for trips to work by mode. On a regional basis, the average time of a walk trip to work was 12.8 minutes and the average bicycle commute was 18.5 minutes (Table 3). These travel times are significantly less than the time spent driving alone (24.8 minutes on average).

Table 3
Trips to Work by Travel Time, 2000

County	Mean Travel Time to Work (minutes)			
	All Modes	Drove Alone	Bicycled	Walked
Adams	27.6	26.1	24.7	12.8
Arapahoe	26.1	24.6	21.7	12.3
Boulder	22.4	21.5	15.6	12.0
Clear Creek	32.6	33.1	n/a *	10.2
Denver	24.5	22.8	20.3	14.1
Douglas	29.3	28.4	19.8	7.8
Gilpin	34.7	35.7	5.0	10.2
Jefferson	27.4	26.1	25.3	11.9
Regional Average	26.1	24.8	18.5	12.8

Source: 2000 Census Transportation Planning Package (CTPP)

* Note: Data not available.

C. Pedestrian and Bicycle Crashes

The Colorado Department of Transportation (CDOT) supplied data on 229,159 reported motor vehicle crashes in the DRCOG region for the years 2002 through 2004. The data included 2,994 crashes involving pedestrians and 2,440 crashes involving bicyclists including motorized bicycles. This data does not include unreported crashes. Data provided in this section can provide important information for local governments as they continue to plan their pedestrian and bicycle projects and systems. Pedestrian and bicycle safety is a key issue due to the higher likelihood of a serious injury or fatality resulting from a crash with a motor vehicle.

Crashes by County

Table 4 presents the number of pedestrian and bicycle-related crashes, injuries, and fatalities in the region from 2002 through 2004. The City and County of Denver has the highest total number of crashes. The average age of a pedestrian involved in a crash is 36, while the average age of a bicyclist is 32.

Table 4
 Number of Crashes, Fatalities, and Injuries
 Three-Year Total (2002-2004) for the DRCOG Region

County	Pedestrian			Bicycle		
	Total Crashes*	Fatalities	Injuries	Total Crashes*	Fatalities	Injuries
Adams	333	18	300	271	3	205
Arapahoe	575	20	508	419	1	341
Boulder	240	7	217	572	3	504
Broomfield	28	1	24	34	1	36
Clear Creek	6	0	10	2	0	4
Denver	1,340	66	1,151	757	7	559
Douglas	49	3	41	55	1	33
Gilpin	5	1	1	1	0	3
Jefferson	396	17	339	322	0	240
SW Weld	22	0	15	7	0	6
Regional Total	2,994	133	2,606	2,291	16	1,931

* Total Crashes represent the total number of incidents involving pedestrians or bicyclists. A single incident may result in property damage only or multiple pedestrian and/or bicyclist injuries and fatalities. In addition to these crashes, there were also 164 pedestrian and 31 bicycle reported hit-and-run crashes in the 2002 through 2004 data.

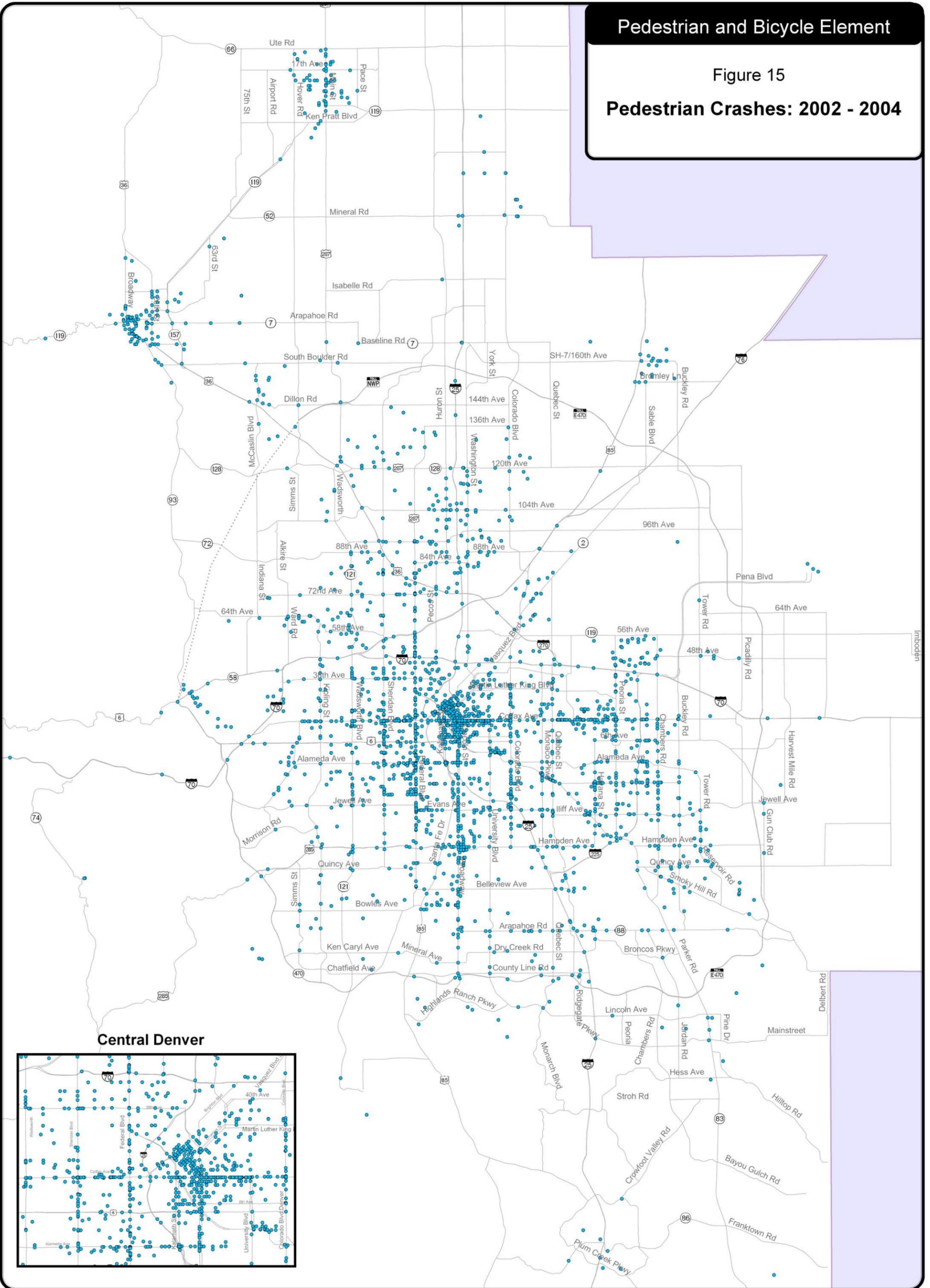
Source: CDOT Accident Data, Transportation Safety and Traffic Engineering Branch

Crashes by Location in Roadway

Figures 15 and 16 display the location of pedestrian and bicycle crashes that occurred in the Denver region from 2002 through 2004. Figure 15 shows that pedestrian crashes are concentrated on regional roadways such as Colfax Avenue, Federal Boulevard, and Colorado Boulevard. The bicycling crashes displayed in Figure 16 are more dispersed throughout the region than the pedestrian crashes and occur on local streets as well as the regional roadway system. The downtown areas of Denver and Boulder experienced a cluster of bicycle crashes, most likely due to density of the population and the relatively high bicycle usage in these cities.

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Figure 15
Pedestrian Crashes: 2002 - 2004



This map and the data it depicts are intended for informational purposes only. DRCOG provides this information on an "as is" basis and makes no representation or warranty that the data will be error free. DRCOG is not responsible to any user for any costs or damages arising from inconsistencies in its data. Data in the Weld County portion of DRCOG is state road data only.

Source: CDOT, DRCOG
Projection: Colorado State Plane, NAD 83
PJ 4/09



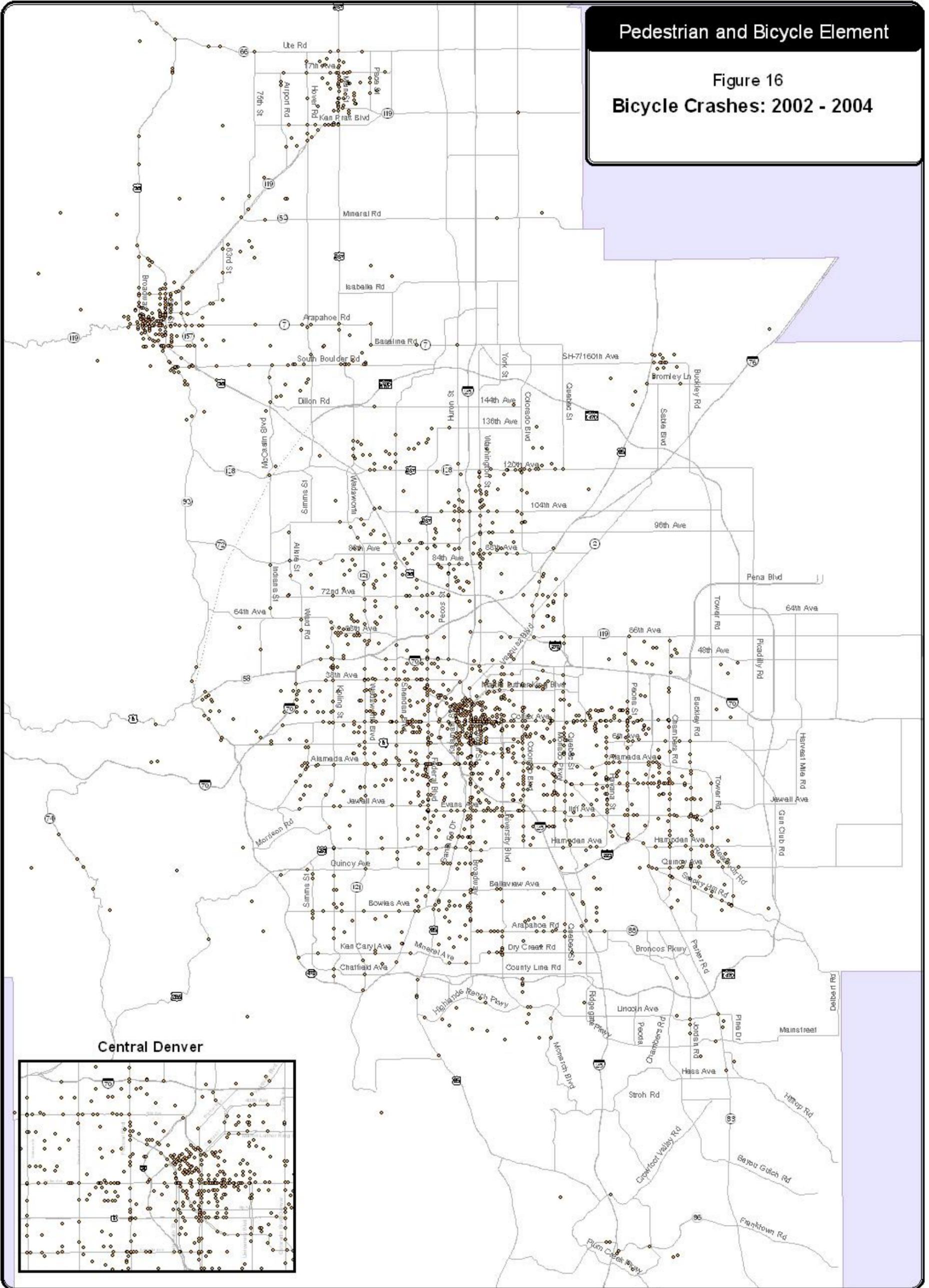
- Pedestrian Crashes
- Regional Roadway System
- - - Roads Outside Region



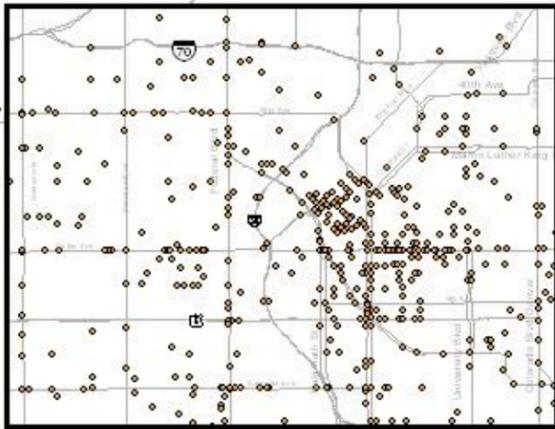
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Pedestrian and Bicycle Element

Figure 16
Bicycle Crashes: 2002 - 2004



Central Denver



- Bicycle Crashes
- Regional Roadway System
- - - Roads Outside Region

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Source: DRCOG
Projection: Colorado State Plane, NAD 83
PJ 409



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Tabulations of crashes by location within the roadway are presented in Table 5. Intersections are by far the most common location of crashes for both pedestrians and bicyclists. For bicyclists, the mid-block crash types are most likely sideswipe⁵ incidents.

Table 5
Crash Location in Roadway
 (2002-2004 Annual Average for the DRCOG Region)

Roadway Location	Annual Number of Crashes		Percentage of Crashes	
	Pedestrian	Bicycle	Pedestrian	Bicycle
Intersection related	550	525	51%	69%
Mid-block, urban roadway	383	90	36%	12%
At driveway access point	73	110	7%	15%
At highway interchange	25	11	2%	1%
Mid-street, rural roadway	32	16	3%	2%
In alley	9	9	1%	1%
Regional Total (average)	1,073	761	100%	100%

Source: CDOT Accident Data, Transportation Safety and Traffic Engineering Branch

Other Crash Characteristics

The data provided by CDOT also contains information on lighting conditions and pedestrian actions at the time of the crash.

The number of crashes by lighting condition (Table 6) shows that most crashes occur during daylight hours, which is also when most bicycling and walking occurs. Though a smaller number, the crashes occurring at night (dark) are disproportionately high considering that walking and bicycling activity is lower at night.

Table 6
Crashes by Lighting Condition
 (2002-2004 Annual Average for the DRCOG region)

Lighting Condition	Number of Crashes	
	Pedestrian	Bicycle
Daylight	636	645
Dark – lighted	258	76
Dark – unlighted	56	13
Dawn or Dusk	40	31

Source: CDOT Accident Data, Transportation Safety and Traffic Engineering Branch

For pedestrian crashes only, details on pedestrian action are also available for each crash. Table 7 presents what movement or action the pedestrian was engaged in at the

⁵ A “sideswipe” crash occurs when a pedestrian or bicyclist is struck by a passing motor vehicle.

moment of each crash, according to witnesses on the scene and the officer's opinion. These data show crossing or entering a street at an intersection is the most frequent type of pedestrian action involved in a crash. Entering or crossing the street mid-block is also a significant type of pedestrian movement that is involved in a crash. Note that the data represents the action only and does not imply fault of the pedestrian or driver.

Table 7
Crashes by Pedestrian Action
 (2002-2004 Annual Average for the DRCOG region)

Pedestrian Action	Number of Crashes	Percent
Cross /Enter at Intersection	301	25%
Cross/Enter NOT at Intersection	217	18%
Cross against Signal	279	24%
Standing in roadway	39	3%
Walking in roadway	36	3%
Playing in roadway	24	2%
Entering/exiting vehicle	21	2%
Lying in roadway	14	1%
Pushing/working on a vehicle	10	1%
Other	244	21%

Source: CDOT Accident Data, Transportation Safety and Traffic Engineering Branch

4. CURRENT AND PLANNED FACILITIES

Pedestrian and bicycle travel takes place over relatively short distances on an extensive system that must accommodate all types of users. Therefore, the principal planning and implementation focus is at the local level. It is of regional interest, however, to help encourage and fund adequate facilities to increase walking and bicycling, and thereby reduce single occupant motor vehicle travel, roadway demand, and air pollution.

This chapter serves two purposes. First, it displays the location and type of pedestrian and bicycle facilities that exist in the region today, including:

- Sidewalks along the non-freeway regional roadway system;
- Signed or marked bicycle facilities on roadways; and
- Off-street multi-use trails.

Second, in order to promote connectivity across the region and across jurisdictional boundaries, this chapter establishes a regional-level bicycle corridor system where emphasis is placed on the completion of key multi-use trails and on-street bicycle facilities.

A. Existing Facilities

Sidewalks

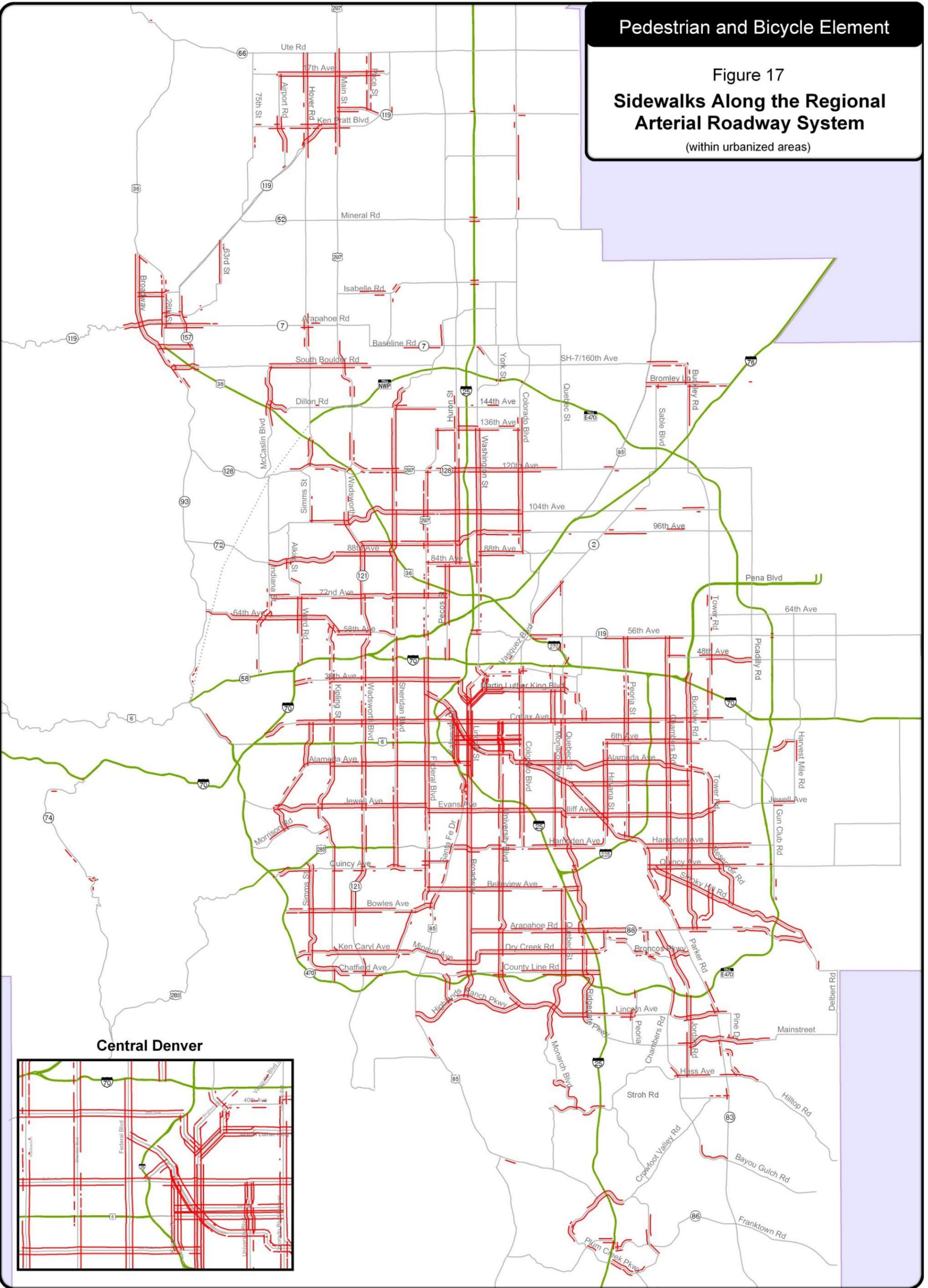
DRCOG staff inventoried the current supply of sidewalks on the regional arterial roadway system (non-freeway) using aerial photography and field observations. Figure 17 details where these sidewalks exist, with a focus on the urbanized area of the region. The inventory shows about 1,100 linear miles of sidewalks. There are approximately 660 centerline miles of arterial roadways with sidewalks on at least one side of the road (this represents about 70 percent of the miles of the regional arterial roadway system within the urbanized area). Local governments and others are encouraged to review this inventory and identify gaps in the sidewalk system and substandard facilities.

Multi-Use Trails

DRCOG staff also inventoried the locations of multi-use trail facilities built to accommodate pedestrians, bicyclists, and other users. Figure 18 displays the location of these trails, with an emphasis on major regional trails (such as the South Platte River Trail and Clear Creek Trail) that follow waterways, railroad and utility corridors, or other right-of-way outside of roadways. Occasionally communities also designate wide sidewalks as multi-use trails, which are also marked on Figure 18. Approximately 1,130 miles of multi-use facilities currently exist in the DRCOG region.

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Figure 17
Sidewalks Along the Regional Arterial Roadway System
 (within urbanized areas)



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Source: DRCOG
 Projection: Colorado State Plane, NAD 83
 PJ 3/09

0 5 10
 Miles

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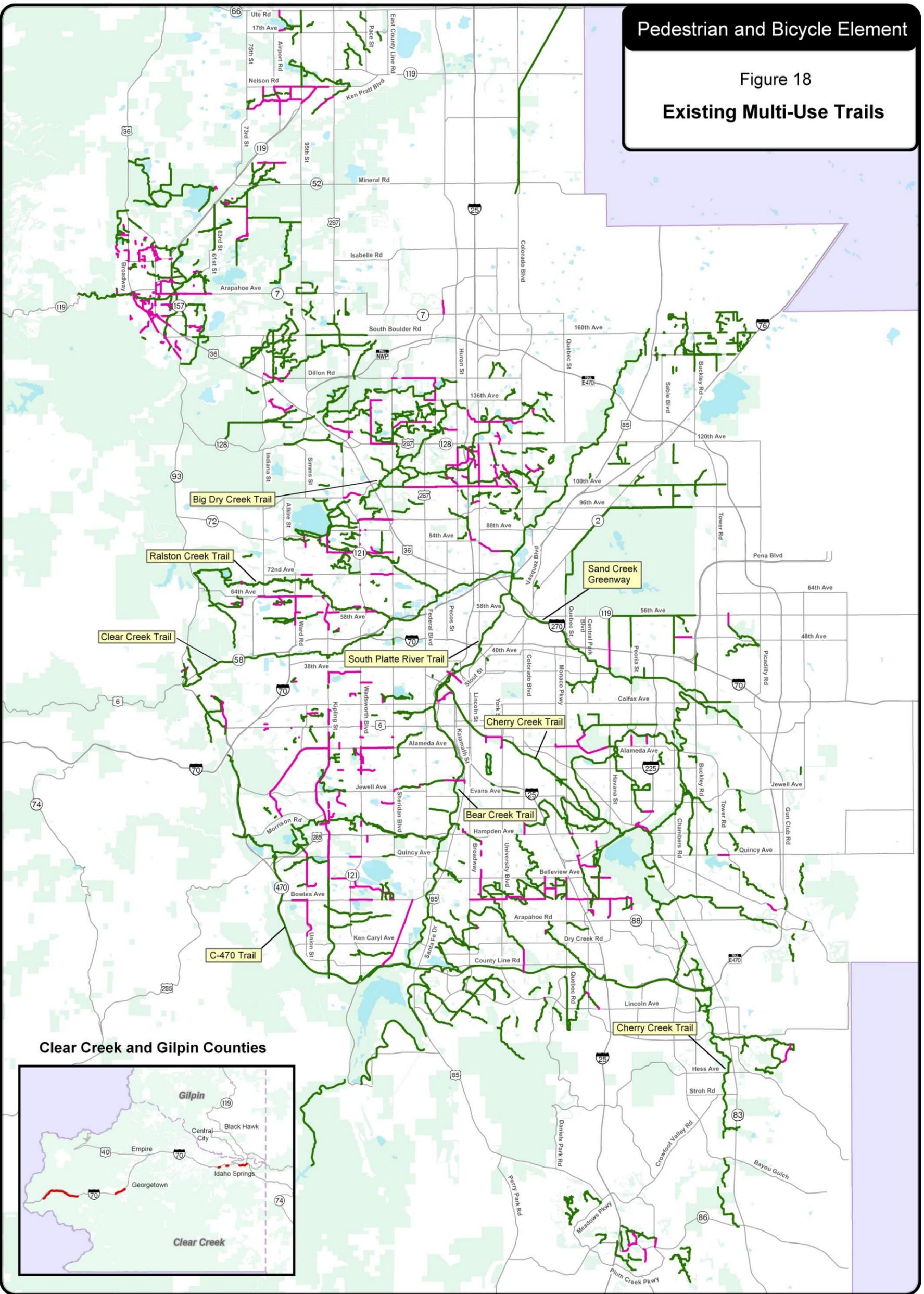
- Existing Sidewalks
- Regional Arterial Roadway System
- Freeways (sidewalks not included)
- Roads Outside Region



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Pedestrian and Bicycle Element

Figure 18
Existing Multi-Use Trails



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Source: DRCOG
Projection: Colorado State Plane, NAD 83
PJ 2/09

0 2.5 5
Miles

Clinton/Bikes & Ped/2009 Bicycle Ped Plan Update/Bike Ped Figures Update_2008-09/Fig18_Multi-Use_Trails_2002-2004_11x17_031009

Multi-Use Trails

- Off-street
- Sidewalk Along Street
- Regional Roadway System
- - - Roads Outside Region

- Lakes and Reservoirs
- Open Space and Parks



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On-street Bicycle Facilities

The largest facility resource for bicycling is the region's network of streets and roadways since bicyclists are permitted users (except on most freeways). Of these streets and roadways, approximately 677 miles contain bicycle accommodations such as bicycle routes signs, marked bicycle lanes, and other treatments. Appendix C contains maps detailing where these bicycle facilities exist in the region. Table 8 summarizes the mileage of each bicycle facility type (including multi-use trails).

Table 8
Miles of Bicycle Facilities in the Denver Region

Bicycle Facility Type	Miles
Roadways with Bicycle Lanes (centerline miles)	194
Roadways with Signed Shared Lanes (centerline miles)	483
Multi-Use Trail:	
Wide Sidewalk*	246
Off-Street Trail	890
Regional Total	1,813

* The multi-use trail category includes selected sidewalks (some communities permit bicycling on wide sidewalks, particularly as connections between other bicycle facilities and along busy major arterials).

B. Planned and Envisioned Facilities

Figure 19 displays a regional and community bicycle corridor system envisioned for 2035. As drawn in this figure, "corridors" do not always represent specific facilities but instead are a general guide for future planning efforts to identify regional connections that would be beneficial. Such improvements range from an overpass or underpass, paved shoulders, wide outside curb lanes, a bicycle lane, or a multi-use off-street trail parallel to a roadway or within another right-of-way.

The corridor system was defined by working with local agencies and bicycle organizations, conducting public open houses, and reviewing local plans. This system will be incorporated into the 2035 Metro Vision Regional Transportation Plan.

Projects that are within one-quarter mile of the corridors shown in Figure 19 may receive more emphasis for funding through the DRCOG Transportation Improvement Program (TIP) process than proposed facilities that are not within these corridors. See Chapter 7 for more information on project eligibility and scoring criteria for TIP funding.

Other Local Bicycle and Multi-Use Facilities

Hundreds of miles of additional bicycle facilities are planned by local governments or special districts (e.g. park and recreations districts), as identified in local comprehensive plans or transportation plans. Due to the very large number of ever-changing plans in the region, this document does not display or quantify all planned bicycle facilities.

Local facilities will primarily supplement and provide connections with the Regional Bicycle Corridor System displayed in Figure 19. Through the completion of the local facilities, access for bicyclists to parks, schools, residential neighborhoods, transit stations, and other commercial and business establishments will be improved. Local governments are encouraged to require private developers to help implement local bicycle plans by constructing facilities, preserving right-of-way, and providing on-site amenities such as bicycle racks or lockers. Facilities should be planned with consideration of the bicycle and multi-use trail policies listed in Chapter 1.

Key Bicycle Facility Missing Links

Key missing link locations in the current network of bicycle facilities are shown in the Appendix C Exhibits. These missing links were identified primarily by local government agencies as key locations where gaps between bicycle facilities exist or where physical barriers are significant enough to create uncomfortable connecting situations (e.g. major barriers refer to major roadways, rail lines, rivers, etc.). The identified locations are not all-inclusive. Projects that fill in the missing links will significantly help the connectivity of existing bicycle facilities and greatly improve access to transit stations, work places, and other important destinations.

Sidewalks

The primary method for planning and implementing sidewalks is through local rules and ordinances that require developers to construct sidewalks along new residential streets and within non-residential/mixed-use development sites. Local plans may also list specific locations for major pedestrian projects (such as under/overpasses or for new sidewalks along existing major roadways). Many locations of key gaps in the regional arterial sidewalk system are displayed in Figure 17. Further analysis of the key gaps should be conducted by local governments to identify specific sidewalk projects to include in plans or capital funding programs. Projects should be planned and constructed with consideration of the sidewalk policies listed in Chapter 1.

Key Multi-Use Trails

Several key multi-use trails, when completed, will provide the backbone for an integrated regional trail system. Other shorter off-street trails will provide important connections. These key trails, as commonly referenced and labeled on Figure 19, include:

- Bear Creek Trail (Evergreen to Englewood);
- Big Dry Creek Trail (Standley Lake to Fort Lupton);
- C-470 Trail (Golden to I-25);
- Cherry Creek Trail (downtown Denver to Franktown);
- Clear Creek Trail (Jefferson County Line to South Platte River Trail);
- Intercountry Non-motorized Corridor I-70 Mountain Trail (Loveland Ski Area to Jefferson County Line);

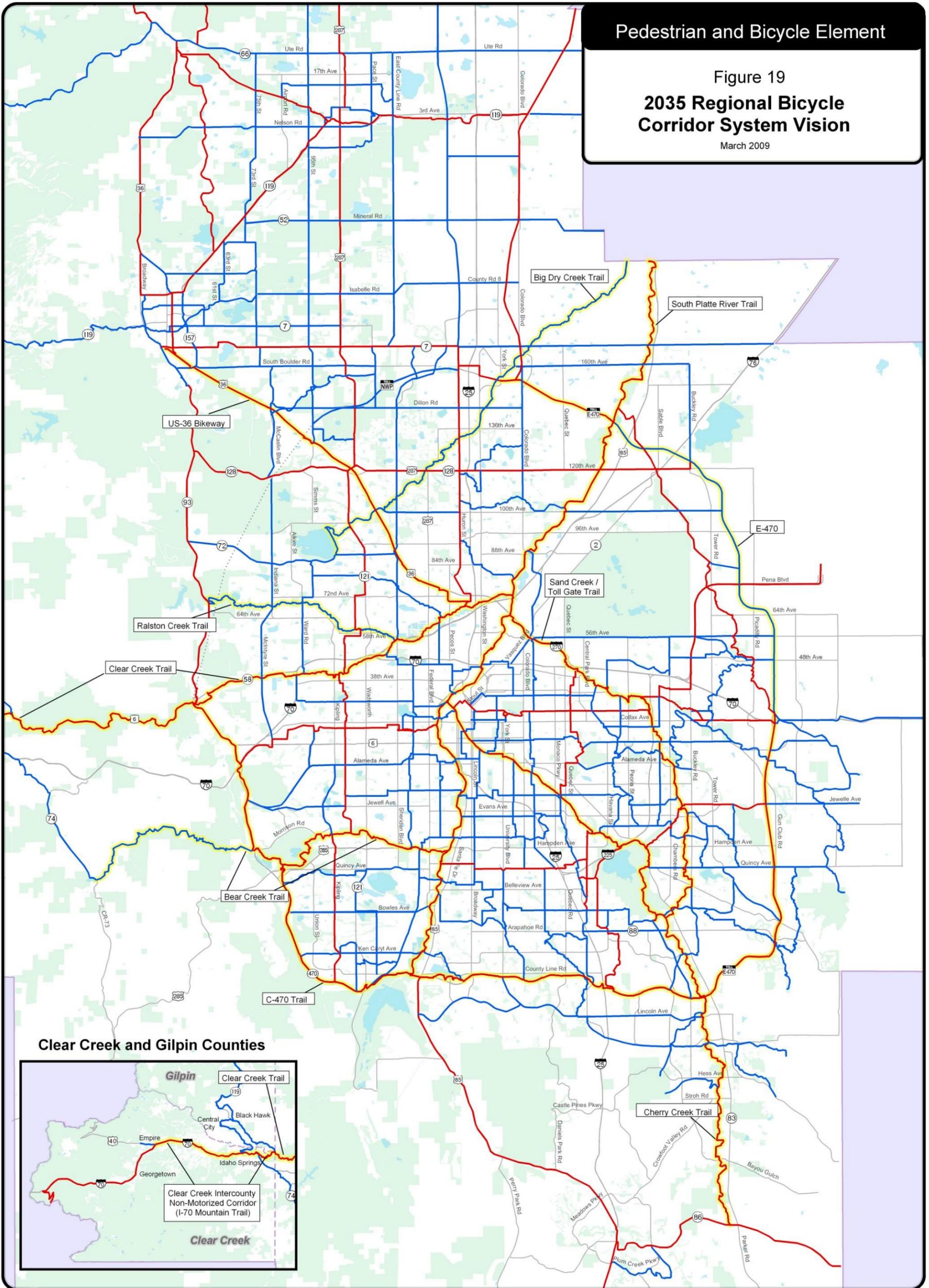
- E-470 Trail (Lone Tree to Thornton);
- Ralston Creek Trail (SH-93 to Clear Creek Trail);
- Sand Creek/Toll Gate Creek Trail (Commerce City to south Aurora);
- South Platte River Trail (Chatfield Reservoir to Fort Lupton); and
- US-36 Bikeway (Boulder to Clear Creek Trail).

A corresponding statewide-designated trail known as the Front Range Trail will follow several of the trails listed above.

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Pedestrian and Bicycle Element

Figure 19
**2035 Regional Bicycle
 Corridor System Vision**
 March 2009



Clear Creek and Gilpin Counties



This map and the data it depicts are intended for informational purposes only. DRCOG provides this information on an "as is" basis and makes no representation or warranty that the data will be error free. DRCOG is not responsible to any user for any costs or damages arising from inconsistencies in its data.

Source: DRCOG
 Projection: Colorado State Plane, NAD 83
 DAS 03/2009



- Regional Corridors
- Community Corridors
- Key Multi-use Trails
- Regional Roadway System
- - - Roads Outside Region
- Lakes and Reservoirs
- Open Space and Parks

Corridors Note: The specific facility representing a corridor may be directly on the route depicted or may be parallel within 1/4 mile. No more than one facility may represent the defined corridor.



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5. DESIGN CONSIDERATIONS

There are many aspects to designing pedestrian and bicycle facilities. These facilities must safely provide for a wide variety of users and mobility needs (from young children to individuals with disabilities to the elderly). This chapter summarizes many design aspects to consider when building and maintaining on-street bicycle facilities, off-street multi-use trails, and sidewalks. In addition, there are special considerations for pedestrians and bicyclists at intersections, traffic signals, overpasses and underpasses, and transit connections. Various resources for suggested facility designs are listed in Figure 20.

Figure 20. National Design Guidance Documents

National Design Guidance Documents

American Association of State Highway and Transportation Officials (AASHTO)
www.transportation.org/bookstore

- *AASHTO Guide for the Planning, Design and Operation of Pedestrian Facilities*, 2004
- *Guide for the Development of Bicycle Facilities*, 1999

United States Access Board
www.access-board.gov/ada-aba/

- *ADA Standards for Transportation Facilities 2006*
- *ADA Accessibility Guidelines for Buildings and Facilities*, 2005
- *Accessible Rights of Way: A Design Guide*, 1999
- *Accessible Pedestrian Signals*, 1998

Federal Highway Administration (FHWA)
www.fhwa.dot.gov

- *Accessible Public Rights-of-Way, Planning and Design*, 2007
- *Manual on Uniform Traffic Control Devices*, 2003 with Revisions
- *Designing Sidewalks and Trails for Access*, 1999
- *Implementing Pedestrian Improvements at the Local Level*, 1999

Institute of Transportation Engineers (ITE)
www.ite.org/ped.bike/publications.asp

- *Improving the Pedestrian Environment Through Innovative Transportation Design*, 2005
- *Context Sensitive Solutions in Designing Major Urban Thoroughfares for Walkable Communities: An ITE Proposed Recommended Practice*, 2005
- *Designing Sidewalks and Trails for Access*, 2001

A. General Design Considerations for Pedestrians

There is a wide spectrum of pedestrian users, from the grade-school-age child to healthy adults, to the elderly and persons with disabilities. The transportation system should accommodate the full range of users. All new or reconstructed pedestrian

infrastructure is required to comply with the Americans with Disabilities Act (ADA). Some general areas to consider when designing infrastructure for pedestrians include:

Age

A pedestrian's age plays a large role in how they navigate the pedestrian system. For example, children learning to walk to school independently are more likely to dart out or use poor judgment at busy intersections. Therefore, elements of design, as well as education, assistance (e.g., crossing guards), and law enforcement, are especially important to consider close to schools or other activity centers for children (museums, playgrounds, malls, etc.). Conversely, an elderly person may benefit from unique design considerations when crossing streets to get to, for example, a grocery store or medical facility.

Spatial Needs

According to the American Association of State Highway and Transportation Officials (AASHTO), two people walking side-by-side typically require about five feet of space. According to the ADA Accessibility Guidelines (ADAAG), those persons using wheelchairs require a minimum of five feet of space to comfortably pass one-another. In addition, a pedestrian's desired operating space often varies depending on the purpose of the trip. Pedestrians on a recreational or pleasure trip typically prefer a larger operating space than when waiting in line or walking in a downtown setting.

Mobility Impairments

Persons with ambulatory, hearing, vision, and/or cognitive impairments have unique mobility needs. Section H contains design considerations and ADA requirements that apply to those needs.

B. General Design Considerations for Bicyclists

Similar to pedestrians, the transportation system should accommodate a variety of bicyclists with varying experience and skill levels as these different rider types can greatly influence facility design. The following descriptions of bicyclist types are adapted from the FHWA document *Selecting Roadway Design Treatments to Accommodate Bicycles* (1992) and the AASHTO *Guide for the Development of Bicycle Facilities* (1999):

I. Advanced (Type A)

- Rider Characteristics: Experienced, physically strong riders who can operate under most traffic conditions. Able to ride in same manner as the driver of a motor vehicle and make appropriate decisions when necessary. Highly likely to use bicycle as a functional mode of transportation.

- General Preferences: On-street improvements such as widened curb lanes, bike lanes, and paved shoulders. Use of off-street trails typically depends on trip purpose and location of facilities in route to destination.

II. Basic (Type B)

- Rider Characteristics: Casual riders, often less confident than advanced riders to operate in shared lanes with heavy traffic.
- General Preferences: Residential streets with low traffic volume and speed. Also good candidates for bicycle lanes and off-street multi-use trails.

III. Child (Type C)

- Rider Characteristics: Inexperienced pre-teen whose bicycle use is initially monitored by parents.
- General Preferences: Sidewalks and residential streets with low vehicle speeds. Also favor multi-use trails or sidewalks that are well separated from collectors and arterials.

A key consideration for the design of any facility is the space required for bicyclists. Exhibit 4 demonstrates the operating space required for bicyclists according to AASHTO.

C. Design Considerations for On-Street Bicycle Facilities

There are several types of on-street facilities that can be designed to accommodate bicyclists. Many examples of these facilities exist in the region, including paved shoulders, wide curb lanes, and bike lanes. With the exception of bike lanes, bicyclists on these facilities are expected to share their travel lane with motor vehicles and other users. The following sections describe the dominant types of on-street bicycle facilities in the region and offer general design elements local governments should consider when building these facilities. The AASHTO *Guideline on the Development of Bicycle Facilities* (1999) and FHWA's *Selecting Roadway Design Treatments to Accommodate Bicycles* (1992), as well as other resources as noted, were used to develop these design considerations in consultation with local government staff.

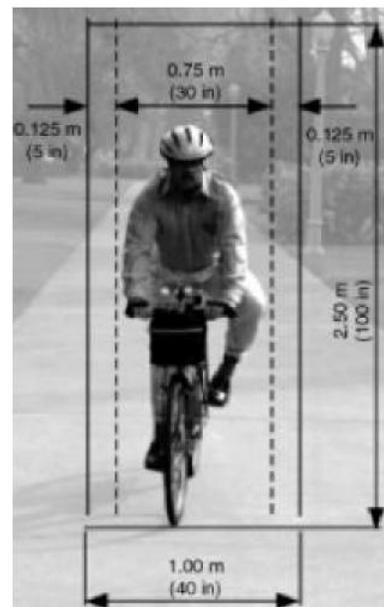


Exhibit 4. Bicyclist Operating Space (AASHTO)

Paved Shoulders

Paved shoulders offer an effective way to provide bicycle facilities along roadways in rural or less developed areas (Exhibit 5).



Exhibit 5. Paved shoulder along Jay Road, Boulder County

Advantages

- Provides an area for bicyclists out of the motor vehicle travel lane as well as breakdown space and safety enhancement for motor vehicles, and
- May extend travel lane pavement service life since edge deterioration can be reduced.

Concerns

- Motorist and bicyclist conflicts at intersections since shoulders are not perceived as travel lanes by motorists. In addition, shoulders are occasionally used as right turn lanes at intersections, which leave the bicyclist with little or no designated accommodation.
- On roadways currently with no shoulder provided, the cost of land acquisition for the shoulder could be significant and limited right-of-way may be available (particularly in mountain communities)

Minimum AASHTO Guideline Width

- Four foot minimum rideable area (six-foot minimum preferred where feasible).

Additional Recommendations/Accommodations (adapted from FHWA's Selecting Roadway Design Treatments to Accommodate Bicycles)

- Six to eight feet on roads with traffic volumes greater than 2,000 vehicles/day and a speed limit greater than 40 miles per hour (mph).
- Six feet on roads with traffic volumes greater than 10,000 vehicles/day.
- In some cases, the minimum four foot width can be technically infeasible and/or cost prohibitive. In those circumstances, *Share the Road* signage can be provided to alert motorists and bicyclists of decreasing shoulder widths (Exhibit 6). For more information on bicycle signage, see the Bicycle Signage section (Section E).



Exhibit 6. Share the Road sign used to warn users of constrained shoulder approaching a bridge on Colorado Highway 7 near Brighton

Rumble Strips

Rumble strips are installed predominately on rural paved roadways to alert drivers when their vehicles stray onto the shoulder or over the centerline of a roadway (Exhibit 7). CDOT's policy on rumble strips closely follows AASHTO's guidance in the *Guideline on the Development of Bicycle Facilities* (1999). The Guideline advises to maintain a five foot width on the shoulder beyond the rumble strip as a minimum for safe bicycling. Rumble strips should *not* be installed on shoulders less than six feet wide, especially where a guardrail is installed.



Exhibit 7. Rumble Strips with horizontal-cut showing spacing between series of cuts along a Colorado highway

Wide Curb Lane

A wide vehicle travel lane on the far right side of a roadway built to provide maneuvering room for bicyclists and other users (Exhibit 8).



Exhibit 8. Wide curb lane, Arvada

Advantages

- Can be beneficial to both motorists and bicyclists, as vehicles can comfortably pass a bicyclist without changing lanes or encroaching upon bicyclist operating space,

- Often a relatively low-cost method of providing and maintaining bicycling facilities if the only improvement required is re-striping vehicle lanes, and
- Generally, less pavement area and right-of-way is required for this type of facility than bike lanes.

Concerns

- Can encourage excessive speed by motorists (especially without striping or bike lanes),
- Possibility of increased motorist confusion over the proper path to use within the widened lane, and
- If on-street parking is permitted, conflicts with vehicle doors opening into bicyclist operating space.

Minimum AASHTO Guideline Width

- Fourteen-foot lane (not including width of gutter pan or curb)

Additional Considerations

- Fifteen-foot lane width on roads with traffic speeds greater than 30 mph, limited sight distance, frequent heavy truck traffic, or other factors impacting bicycling space,
- Can sometimes be implemented as part of repaving projects,
- Consider striping a bicycle lane on vehicle traveled lanes wider than 15 feet, and
- Wide lane accommodation is particularly important along freight corridors with high bicycling activity.

Other Road Marking Considerations

- *Treatments with Constrained Lane Width:* A single stripe along a roadway between the vehicle lane and bicyclist can help separate bicyclist operating space in areas with constrained width or on-street parking along streets with inadequate width for a bike lane (Exhibit 9).



Exhibit 9. A single stripe along the right side of vehicle travel lane can help define bicyclist-operating space

- *Sharrow* *pavement markings*: Sharrow lane markings are encouraged on bike routes along roadways classified as collector or higher in areas where there is need for bicycle connectivity, but not enough right-of-way to provide bike lanes. The “sharrow” marking consists of a symbol of a bicycle with two dart arrows above it. It is placed approximately three feet into the travel lane from the parking lane, adjacent right turn lane or curb (Exhibit 10). The symbol is designed to encourage all roadway users to share the road by showing the recommended position for bicyclists in the lane.



Exhibit 10. A “sharrow” pavement marking used along a roadway where bicycles and vehicles

Bicycle Lanes

On-street lanes striped for exclusive or preferential use by bicyclists. Lanes can be striped on each side of a two-way street, one side of a one-way street, or in special circumstances as a contra-flow lane separated from vehicle lanes with a median or barrier (Exhibit 11 and Exhibit 12). These lanes are designated with signs and pavement markings. This facility is typically applied in urban or suburban settings where a designated lane reserved for bicyclists will aid in a predictable and orderly flow for both motorist and bicycle traffic.



Exhibit 11. Striped bicycle lanes along Garrison Street, Lakewood



Exhibit 12. Contra flow lane, Boulder

Advantages

- Striping provides clearly defined areas for bicycle operation and separates bicyclists from the adjacent motor vehicle traffic,
- Motor vehicles are less likely to change lanes in order to pass bicyclist,
- Construction costs can be low (only street striping and signing) if street widening is not required, and
- Typically provides a more comfortable operating environment than wide curb lanes or paved shoulders for Class B (basic) bicyclists.

Concerns

- If improperly designed, bike lanes can create confusion between motorists and bicyclists at intersections,
- Construction costs can be high if street widening or acquisition of right-of-way is required,
- Tend to accumulate sand, gravel, and other debris from vehicle travel lanes, and
- Can provide a false sense of security for bicyclists.

Minimum AASHTO Guideline Width

- Roadway with no curb or gutter: four feet (five feet preferred)
- Roadway with curb or gutter: five feet (including the one to two-foot gutter pan) (Seven feet preferred.)
- Additional Recommendations: If motor vehicle parking is permitted, bike lanes should be a minimum of five feet wide (eight feet preferred) and placed between the parked area and the travel lane.

Intersections

- If there is a bus stop or high right-turn volume at an intersection, solid line striping should be replaced with dotted lines 50 to 200 feet before the intersection, depending on the size of the right-turn lane and/or bus stop (Exhibit 13). This is to alert both drivers and bicyclists of a busy intersection or bus stop ahead.



Exhibit 13. Dashed bike lane treatment at a large intersection, Boulder

- At non-signalized, low traffic volume intersections with a small number of right-turning motor vehicles, solid bicycle lane striping can continue all the way to the crosswalk on the near side of the intersection.

Signage Guidelines

Avoid use of the Preferential Lane Symbol (“diamond” shaped symbol) previously used to delineate bicycle lanes because the meaning of this symbol now refers to High Occupancy Vehicle (HOV) operating lanes. Exhibit 14 represents the currently adopted bicycle lane sign design from the MUTCD (2003).



Exhibit 14. Bike lane sign, Boulder

Bicycle Boulevards

Bicycle boulevards have been implemented on local streets that parallel busy arterial roadways. They are optimized for bicycle traffic by discouraging long distance motor vehicle travel on the street. In a typical grid-street situation, cars are prohibited from traveling more than two or three continuous blocks at a time. Structures are constructed at periodic intersections that force cars to turn, while allowing bicyclists to proceed straight through. Exhibit 15 shows how both bicycle and motor vehicle traffic can be routed through an intersection on a bicycle boulevard.



Exhibit 15. Intersection depicting the directing of traffic on a bicycle boulevard in Vancouver, Canada

Facilities Not Suitable for Bicycling

Unskilled bicyclists such as young children and recreational or casual adult bicyclists often use sidewalks as bicycle facilities. Sidewalks are primarily designed for pedestrians, and are generally not well suited for typical bicycle speeds. Municipal ordinances or local laws often prohibit bicycling on sidewalks. However, some local governments in the region permit bicycling on sidewalks. In addition, bicycling on sidewalks has a high potential to result in collisions with pedestrians as well as motor vehicles at street and driveway intersections. Because of this, AASHTO recommends against the use and designation of sidewalks as bicycle facilities.

Bicycling is prohibited on all urban freeways except where it is the only facility to use. For example, bicycling is allowed on the shoulders of Peña Boulevard to Denver International Airport (DIA), US-36 from Broomfield to Boulder, I-25 from Lincoln Avenue south to the northern boundary of Colorado Springs, and I-70 east of E-470.⁶

Busy or high-speed roadways that do not have paved shoulders or a wide curb lane are generally uncomfortable facilities on which to bicycle, especially for class B and C bicyclists. However, in some cases, these roads may offer the only viable route to reach popular destinations. In these instances, CDOT and local governments should install signage at key locations for motorists and bicyclists, such as Share the Road signs.

Motor Vehicle Parking

On-street parking can create conflict between motor vehicles and bicyclists using on-street facilities. Opening car doors, passengers exiting vehicles, and side rear-view mirrors are some examples of these potential conflicts. AASHTO recommends a minimum combined width of 12 feet to accommodate both on-street parking and bicycle operations.

D. Bicycle Parking

Secure and convenient bicycle parking facilities are significant concerns for individuals who use their bicycle as a means of transportation. Most bicyclists feel protecting their bicycle from theft and vandalism is paramount, and many feel protecting them from weather is very important. Thus, the degree to which available bicycle parking addresses these concerns influences the amount of travel by bicycle. Bicycle parking is typically accommodated with bicycle racks and bicycle lockers but may also be provided with storage sheds or bicycle parking rooms.

Short-term bicycle parking offers a convenient and readily accessible place to park bicycles for customers, delivery persons and other visitors. Short-term bicycle parking should be provided on the public access level, within 50 feet of the main entrance of a building and outside the building.

⁶ According to the 2004 CDOT Colorado Bicycling Map

Long-term bicycle parking offers a secure and weather protected place to park bicycles for employees, residents, and visitors who generally stay at the site for several hours. Long-term bicycle parking should be located on-site or in an area within 300 feet of an entrance; use covered racks or enclosed lockers; and be secure in a locked room, area enclosed by a fence with a locked gate, or within view of an attendant or security guard, monitored by a security camera, or visible from employee work areas.

Bicycle Racks

Racks are typically used for *short-term* parking, ranging from a few minutes to a few hours. The following items are important issues to consider when installing racks:

- The location of racks is encouraged in public spaces curbside or near the building's main entrance to provide a safe and secure space to bicyclists;
- Rack designs should be selected that can accommodate different types of bicycles while complementing most streetscape and architectural environments. They should provide bicycle parking without interfering with sidewalk or storefront space; and
- Spacing of racks should be allocated to accommodate different bicycles types and dimensions (such as recumbent, tandem, or other unique designs) while not encroaching on pedestrian space, particularly wheelchair operating space.

Bicycle Rack Design

A good bicycle rack design should:

- Allow the user to lock both the bicycle frame and wheels to the rack;
- Contain no sharp edges, seams or hardware to pose a hazard or become unsightly; and
- Be properly finished so as not to scratch or mar a bicycle frame.

Many cities establish bicycle rack design criteria. For example, the City and County of Denver has established the following criteria for any rack installed in the City:

- Support the bike frame at two locations (not just a wheel);
- Allow both the frame and at least one wheel to be locked to the rack (without requiring that the lock be placed near the bicycle chain);
- Allow the use of either a cable or U-type lock;
- Accommodate bicycles equipped with water bottle cages;
- Accommodate bicycles not equipped with kickstands; and
- Accommodate all types and sizes of bicycles, including various types and sizes of frames, wheel sizes, and tire widths.

"Inverted U" Rack

Many bicycle program specialists believe that the "inverted U" rack serves the majority of these design conditions where bicycle racks are needed (Exhibit 16). Exhibit 17 shows the suggested minimum spacing of the "inverted U" bicycle rack parking.



Exhibit 16. "Inverted U" rack, Boulder

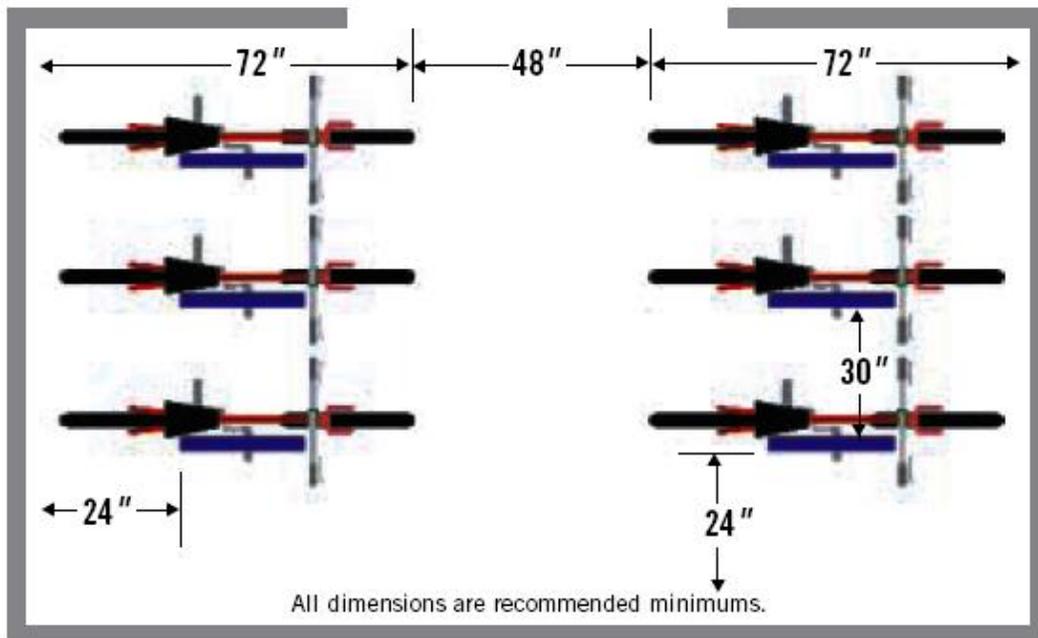


Exhibit 17. Recommended spacing dimensions for "Inverted U" bicycle rack parking (taken from DRCOG's A Guide to Bicycle Parking and the Association of Pedestrian and Bicycle Professionals' Bicycle Parking Guidelines)

Other Rack Types

Other types of racks have been installed in several communities, including “Cora” bicycle racks in Boulder to accommodate high demand for bicycle parking supply at various locations around the University of Colorado (Exhibit 18).



Exhibit 18. “Cora” bike rack example, Boulder

Bicycle Lockers

When a bicycle is parked most of the day or overnight, bicycle lockers can make parking more secure and weather resistant. Lockers are most useful at transit stations, downtown areas, office parks, college campuses, and other locations with high bicycling activity. Locating bicycle lockers (as well as bicycle racks) in motor vehicle parking structures (Exhibit 19) and lots warrants consideration. Exhibit 20 demonstrates a typical bicycle locker application at an RTD light rail station.



Exhibit 19. Bicycle lockers located in DRCOG parking garage



Exhibit 20. Bicycle lockers at RTD's Broadway and I-25 light rail station, Denver

Bicycle Parking Guidance

There are several helpful publications on bicycle parking, including DRCOG's *A Guide to Bicycle Parking* and the *Association of Pedestrian and Bicycle Professional's Bicycle Parking Guidelines* (Nov. 1997).

E. Bicycle Signage

Consistent application and maintenance of signage is important for both bicyclists and motorists. Bike Route signs indicate to bicyclists that a community has selected a preferred route for bicycle travel that may avoid busier or more congested roadways, direct the trip across major obstacles (like freeways and rivers), or connect discontinuous off-street trails. Share the Road signs indicate to both motorists and bicyclists that they will be sharing the road with each other, particularly in narrow stretches where the widths of paved shoulder or wide outside curb lanes are constrained.

Bicycle Route Signage

Several criteria should be considered before a roadway should be signed as a Bicycle Route. Adapted from AASHTO, these criteria are:

- Sign type, size and location should be selected in accordance with FHWA's *Manual of Uniform Traffic Control Devices (MUTCD, 2003)*;
- Route provides through and direct travel in corridors with high bicycle demand;
- Route connects discontinuous segments of bicycle facilities;
- Traffic control devices give greater priority to bicyclists on the route;
- Street parking has been removed or restricted in areas of critical width;

- A smooth, well maintained surface is provided (e.g., regular street sweeping, filled potholes, bicycle-safe drainage grates installed, etc);
- Wider curb lanes or shoulders are provided that meet or exceed the AASHTO minimum widths; and
- Route contains adequate lighting.

Exhibit 21 provides examples of the current MUTCD’s recommended signs to use indicating a bicycle route.



Exhibit 21. MUTCD Recommended Signs for Bicycle Routes

When route signs are installed, communities should consider adding destination information signs under the Bike Route signs (e.g., distance to major locations and directional arrows (Exhibit 22)).



Exhibit 22. Shared route signs (sharrow) with destination information, maps, and directional arrows, Denver

Share the Road Signage

As an example of design considerations for Share the Road signage, CDOT's policy considers the following aspects for State-maintained roadways:

- A relatively high number of bicyclists is expected on the roadway;
- The road narrows for a short distance and a motorist and bicyclist may unexpectedly find themselves in the same travel lane (such as at the end of a bike lane or a bridge approach); and/or
- There has been a significant history of bicycle crashes.

F. Pedestrian Facilities

There are typically two primary types of facilities built to accommodate pedestrians. These are sidewalks attached to the curb and sidewalks separated from the curb by a buffer (commonly called "detached sidewalks"). Both facilities have unique design considerations given their location and use. The following sections summarize these sidewalk types and offer design considerations adapted from the *AASHTO Guide for the Planning, Design, and Operation of Pedestrian Facilities (2004)* and input received from local government staff in the DRCOG region.

Attached Sidewalk

Attached sidewalks are connected to the curb or motor vehicle travel lane edge (Exhibit 23).



Exhibit 23. Attached sidewalk, Englewood

Advantages

- Typically, the least costly method to provide sidewalks along roadways compared to detached sidewalks (which may require land acquisition for the buffer between the roadway and sidewalk).
- Pedestrians may be more visible to drivers at intersections.

Concerns

- Snow is usually plowed from the travel lanes onto the initial few feet of any attached sidewalk.
- Parked vehicles against a curb may overhang and encroach on sidewalk space.
- ADA standards for curb cuts are frequently not compatible with driveway grades.
- No buffer is provided between moving vehicles and pedestrians.
- Utility poles, mailboxes, newspaper stands, temporary construction signs, and other objects must not be placed in locations that obstruct movement of pedestrians on sidewalk (Exhibit 24). Exhibit 25 shows adequate sidewalk width to accommodate amenities.



Exhibit 24. Narrow sidewalk containing sidewalk amenities that limits the movements of sidewalk users, Denver

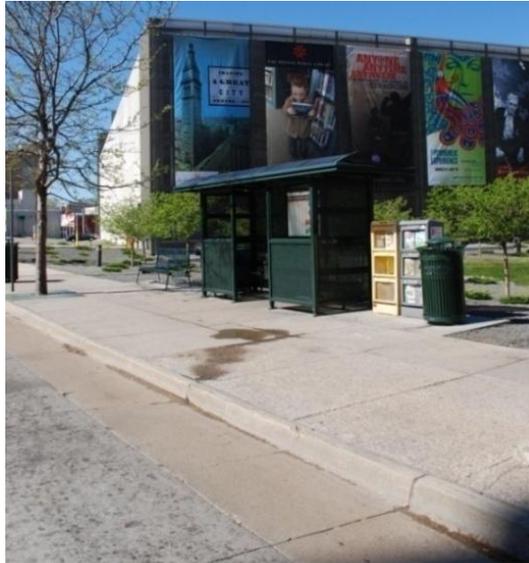


Exhibit 25. An example of a sidewalk wide enough to accommodate sidewalk amenities without obstructing pedestrian movement. 13th and Broadway, Denver

Minimum Width

- Minimum ADA Accessibility Guideline Width: Five feet unobstructed (enables wheelchairs to pass side by side). If an accessible route has less than six feet clear width, then parking/passing areas along the sidewalk at least five feet by five feet shall be located at reasonable intervals not to exceed 200 feet.

Detached Sidewalk

A type of sidewalk separated from vehicle travel lanes using a planting strip or other appropriate buffer treatment (Exhibit 26 and Exhibit 27).



Exhibit 26. Detached sidewalk application using tree grates and brick to create a buffer between the roadway and sidewalk, Englewood



Exhibit 27. Example of a detached sidewalk application in Greenwood Village

Advantages

- Provides pedestrians with a buffer from vehicle traffic.
- Provides space for snow storage during winter months.

Concerns

- Long-term maintenance requirements of planting strips/buffers.
- Must build access to street for transit locations, crosswalks, etc.

Minimum Widths

- Minimum pavement width: five feet unobstructed (ADA guidance, see previous Attached Sidewalk minimum width discussion).
- Minimum planting strip/buffer width: three feet (local/collector streets or other roadways with low speeds); six to eight feet (arterials and other major streets with high speeds).

G. Off-street Multi-use Trails

Also called shared-use paths, off-street multi-use facilities are physically separated from the road and are open to a variety of non-vehicular modes of travel, including walking, in-line skating, equestrian riding, strollers, wheelchairs, etc. They can be paved or unpaved and are typically located adjacent to roadways or along waterways, abandoned railroads, utility corridors, or through parks and open space (Exhibit 28). AASHTO guidance notes that, “Shared-use paths should not be used to preclude on-road bicycle facilities.”



Exhibit 28. The South Platte River Trail, an important north-south regional multi-use trail

Advantages

- Separates non-motorized travel modes from motor vehicles.
- Paved trails are open to a great variety of users, including bicyclists, walkers, in-line skating, wheelchair users, etc.

Concerns

- Significant differences in operating speeds between pedestrians, bicyclists, and other users can cause conflicts,
- Conflicts with motor vehicles arise where facilities access or cross roadways and driveways,
- Unique ADA considerations exist with unpaved trails. The ADA Accessibility Guidelines require stable, firm, slip-resistant surfaces on multi-use trails. The National Center on Accessibility has a number of recommendations for outdoor trail surface treatments (www.ncaonline.org), and
- Unpaved trails are not typically maintained during winter months (snow removal).

Minimum AASHTO Width

- AASHTO recommends a width of 10 feet for this type of facility. In some circumstances, that width may be increased depending on anticipated use. In rare circumstances, this width can be reduced to eight feet (provided there is good horizontal and vertical alignment) where bicycle and pedestrian traffic is low and unique restrictions make a wider trail technically infeasible.

Wayfinding and Warning Signage

As appropriate, wayfinding and warning signage is critical to promote proper use of these facilities. Wayfinding signage should include signs with directional arrows, maps, destinations, and distances. Warning signs can warn users of other modes (pedestrians, bicyclists, in-line skating, horses, wheelchairs, etc) and constraints like narrowing widths, sharp turns, restricted visibility, etc. (Exhibit 29 and Exhibit 30).



Exhibit 29. Signage indicating a multi-use trail crossing a large driveway, Boulder



Exhibit 30. Warning sign for motorists where multi-use trail crosses Ken Caryl Avenue, Littleton

Other Modes and Multiple User Considerations

Many communities are experiencing increased utilization of multi-use trails by other motorized and non-motorized modes of travel such as scooters, skateboards, roller blades, Segways[®], motorized wheelchairs, and electric-powered bicycles. Because these various modes operate at different speeds and have different operational space requirements, local governments have begun to regulate many aspects of their use. Examples include specifying right-of-way and yielding regulations, speed limits, and time of day prohibitions for different modes. Some communities, such as the City of Northglenn, have specified what users are or are not permitted on any sidewalk or multi-use trail by municipal ordinance. As technology advances in this area, local governments will need to continually assess the impact of these different modes and find the solution that best fits their community. In addition, local ordinances that prohibit by type of device without exception for user disabilities may not comply with the ADA.

H. American's With Disabilities Act (ADA) Considerations

The ADA requires all newly constructed and altered facilities (including sidewalks) to be readily accessible to persons with disabilities. Title II of the ADA covers all activities of State and local governments, regardless of the entity's size or receipt of federal funding. The Title requires that governments give people with disabilities an equal opportunity to benefit from all government programs, services, and activities (including transportation infrastructure).

Design Guidelines

Several ADA design guidelines for sidewalks and multi-use trails exist, including:

- ADA Standards for Transportation Facilities, U.S. Access Board, 2006
- ADA Accessibility Guidelines (ADAAG) for Building and Facilities, U.S. Access Board, September 2005,
- Revised Draft Guidelines to Public Right of Way, U.S. Access Board, 2005, and
- Designing Sidewalks and Trails for Access, Part II, FHWA, 2001.

Types of Pedestrian Infrastructure Affected by ADA Regulations

Examples of sidewalk-related infrastructure building requirements following ADA regulations include:

- Sidewalk Curb Ramps: Curb ramps provide continuous sidewalks for persons with mobility limitations and are required to be built with the appropriate slopes to accommodate elements such as wheelchair caster wheels (Exhibit 31).



Exhibit 31. ADA-compliant sidewalk curb ramp

- **Accessible Pedestrian Signals:** These signals are used to control pedestrian traffic movements at roadway intersections. There are unique ADA considerations when installing these signals including audible and vibro-tactile detection, clear floor space for push-button access, and design of the signal head (Exhibit 32). See Exhibit 36 for an ADA-compliant clear floor space and push-button location.



Exhibit 32. Pedestrian signal button and descriptive sign in words and graphics, Boulder

- Crosswalks: Crosswalks are typically defined as the portion of a roadway designated for pedestrians to use in crossing the street. The agency responsible for the roadway must ensure that all marked, unmarked, and mid-block crosswalks meet ADA standards for pedestrian safety and accessibility.
- Mid-street Islands: These islands can provide a refuge for persons with disabilities when they cross a busy roadway. The ADA requires they must either be constructed with crossings at street level or curb ramps provided with a four-foot flat section (Exhibit 33).



Exhibit 33. Crosswalk with pedestrian refuge, Boulder

- Driveway Crossings: When a driveway crosses a sidewalk, potential conflicts can arise for persons with disabilities regarding driveway width, cross slope, and grade.

I. Elderly Population Design Considerations

The provision of well-designed facilities, particularly pedestrian facilities, is a critical element of the transportation system for the elderly population. The most important design-related issues for respondents aged 65 and older in the 2006 DRCOG Pedestrian Questionnaire included facility lighting, narrow or poorly maintained sidewalks, and pedestrian signal timing at intersections. These design elements are not only important for the elderly population, but for all residents of the region. The following listed items should be considered for all pedestrian and bicycle projects, particularly in regards to elderly mobility. Some of these considerations are also listed in the previous ADA section.

- Lighting: Poor lighting can create a feeling of vulnerability and a risk to personal security. In addition, for those with vision impairments, poor lighting can create a potentially hazardous situation at locations such as intersections, along busy roadways, or transit stops.

- *Sidewalk width and surface conditions:* Narrow sidewalks are those that do not allow two individuals to walk side by side either unassisted or using walkers, wheelchairs, canes, or other forms of assistance. The sidewalk and multi-use trail widths, described in Section F and Section G are designed to accommodate mobility needs for the elderly population as well as all residents of the region. Cracked, broken, poorly maintained, and/or snow-covered sidewalk surfaces can create a risk of falling. Such a fall can be seriously debilitating for an elderly person.
- *Pedestrian Signal Timing:* Pedestrian signal timing was previously based upon an average pedestrian speed of four feet per second. Many elderly find the resulting time to cross intersections is too short, especially for those who are physically restricted to using walkers, canes, or other forms of assistance. As a result, many communities have started using three and one-half feet per second as the basis for signal timing. In addition, many of the design considerations related to crosswalks and pedestrian signals listed in Section H regarding the ADA can apply to the elderly population.
- *Signage:* Words on signs presented clearly and with large lettering should be incorporated. This is important for elderly users of the transportation system, regardless of the mode of travel (walking, bicycling, driving, using transit, etc).
- *Resting Areas:* Sidewalks and multi-use trails designed with areas for resting or recovering are beneficial to elderly as well as all users. Amenities such as benches, railings, and water fountains can make using these facilities more inviting for pedestrians and bicyclists alike.

J. Other Design Considerations

Intersections

A major design concern for both pedestrians and bicyclists is intersections with roadways, driveways, and other facilities used by motor vehicles. Intersection crossing distances for pedestrians and bicyclists has increased as streets have become wider. Design considerations for pedestrians and bicyclists at intersections include the following:

- *Large Curb Radii:* Intersections constructed with a larger turning radius along the curb to accommodate trucks result in increased crosswalk distances, which must be accounted for when traffic signal timing is implemented.
- *Center (Mid-street) Islands:* Center island treatments are often used at intersections or at mid-block crossings on wide arterial streets or streets with heavy traffic flow. Preferably, they are built with raised islands with hardscape/landscaping. Islands can provide a “refuge” for pedestrians (especially those who have difficulty crossing streets such as the elderly, persons with disabilities, or children) as well as an area for traffic signals and other roadway hardware.

- Mid-block Crossings: Mid-block crossings are typically used along roadway segments where a pedestrian or bicycle crossing is needed and there is a distance of 300 feet or more between intersections with crosswalks. Communities generally use a combination of center islands and striping to indicate these crossings, depending on items such as the width of the roadway and traffic volume and/or speed. Some unique applications to enhance the safety of these crossings have been used in the region, including the use of flashing beacons along Canyon Boulevard in Boulder (Exhibit 34).



Exhibit 34. Pedestrian-activated beacon integrated into pedestrian warning signs, Boulder

- Crosswalks: Crosswalks provide a defined space where pedestrians and bicycles can cross a roadway and alert motorists of their potential presence. Typically, they are delineated with white painted markings to provide a visual contrast between the roadway and crosswalk. Crosswalks made from materials of different textures other than the roadway, such as brick or stone, not only differentiate crosswalks from traveled portions of the street but also provide a tactile guide for persons with visual disabilities (Exhibit 35).



Exhibit 35. Crosswalk delineated by color and texture along 38th Avenue, Wheat Ridge

Traffic Signals

Traffic signals are an important element associated with pedestrian and bicycle roadway crossing safety. For both modes, the duration of the “walk” and the flashing “don’t walk” signal intervals are critical in addition to the locations of push buttons to activate these signals. For bicyclists, signal activation can be a problem at intersections where bicycle facilities cross major arterials or busy streets.

- **Duration of Crossing Interval:** The MUTCD (2003) recommends four-feet per second (3 mph) maximum pedestrian speed when determining the timing of signals at intersections with crosswalks. However, those with limited mobility are likely to travel slower than this rate and may not complete a roadway crossing before the signal changes. Where appropriate, a lower walking speed, such as 3.5 feet per second, could be reflected in signal phasing and timing plans to provide additional crossing time for pedestrians.
- **Location of Push-Buttons for Signal Activation:** The location of push-buttons should accommodate both pedestrians and bicyclists at intersections where an alternate bicycle-signal activation device has not been provided (Exhibit 36). In addition, ADA requirements apply to the location for the push buttons for persons with disabilities.



Exhibit 36. Example of push-button at pedestrian crossing. Exhibit also shows ADA required clear floor space.

- *Bicycle Signal Activation*: There is a need to improve signal activation devices for bicyclists at intersections and mid-block crossings. Section 9D.02 of the 2003 MUTCD states, “On bikeways, signal timing and activation shall be reviewed and adjusted to consider the needs of bicyclists.”

A popular device used for signal activation is an in-street detector, which electromagnetically detects the presence of metal. However, because bicycles contain less metal than automobiles, most in-street detectors will not detect a bicycle. Along bicycle corridors, the cities of Boulder and Lakewood have installed special detectors that can detect bicycles and painted bicycle symbols over the detectors to indicate their location to bicyclists (Exhibit 37).

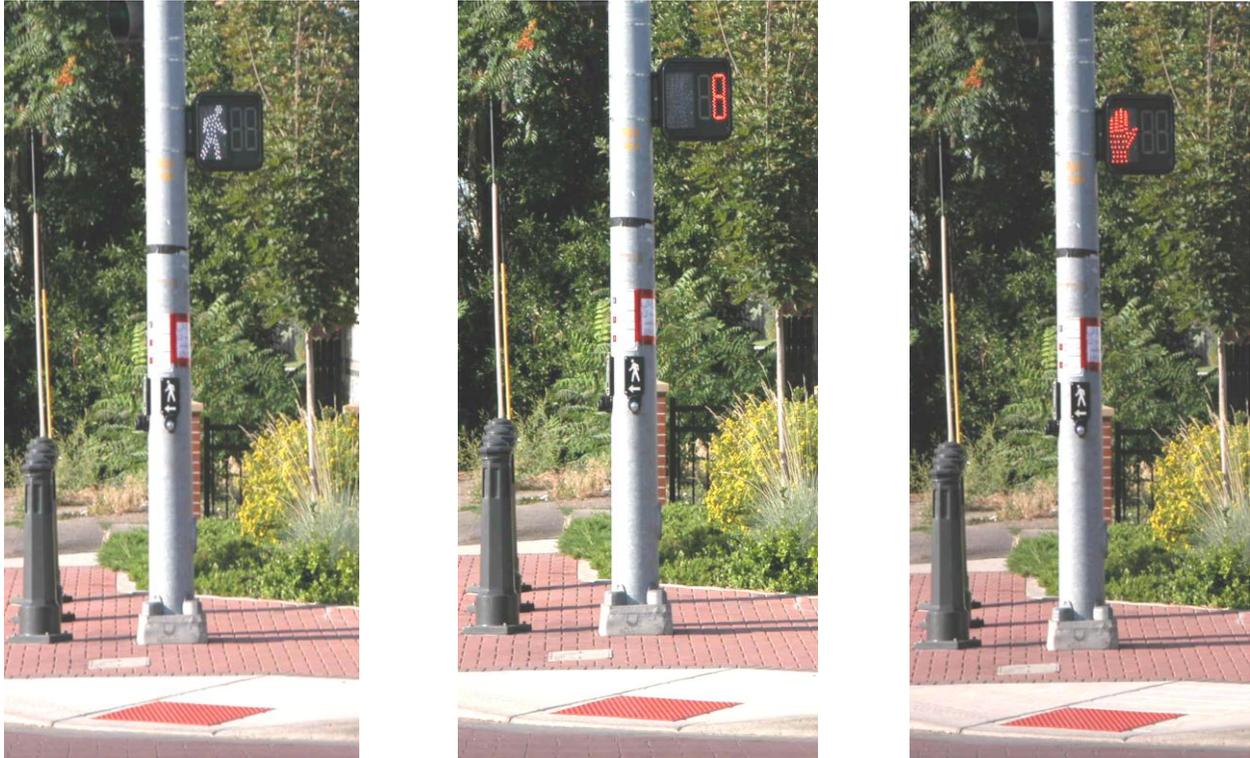


Exhibit 37. A detector loop located under the pavement marking at this intersection enables the metal from a bicycle to activate the traffic signal, Boulder

Motion detectors or cameras are also used to detect bicycles and pedestrians and activate traffic signals. These applications are typically cheaper than in-street detector loops but are still a relatively new technology. An important consideration is guiding the bicyclist or pedestrian to the right location (using pavement markings or signs) to be sensed by the motion detector or camera.

The MUTCD provides further guidance on bicycle signal activation design.

- Pedestrian Signal Designs: Several designs exist for pedestrian signals. The MUTCD (2003) contains two pedestrian signal types: countdown signals and signal heads (Exhibit 38). Countdown signals, a relatively new technology, provide information on how much time is left to cross an intersection safely. Many communities throughout the Denver region have installed these signals at key locations.



*Exhibit 38. Detail on countdown pedestrian signal operation.
 The walk signal phase starts with a white, non-flashing pedestrian symbol (inset A).
 For the clearance interval, the signal proceeds to a red, flashing hand with seconds counting down
 the remaining time (inset B) until the signal changes to a solid, non-flashing red hand (inset C)*

Overpasses & Underpasses

Crossing major barriers such as interstates, freeways, arterials with high speeds and volumes, rivers, railroads, and other obstacles is a significant impediment for many bicycle and pedestrian trips. As the region continues to build or reconstruct bridges and underpasses for the exclusive use of non-motorized modes, there are several design elements to consider such as lighting, width, slope, and access ramps (Exhibit 39 and Exhibit 40). In addition, as roadway bridges and underpasses are constructed or reconstructed, bicycle and pedestrian accommodations should be provided in accordance with FHWA’s Policy Statement on Accommodating Bicyclists and Pedestrians in Transportation Projects (found in Appendix A).



Exhibit 39. Pedestrian and bicycle overpass crossing Santa Fe Boulevard at the RTD Mineral Light Rail Station



Exhibit 40. Pedestrian and bicycle underpass underneath Broadway Street along the Boulder Creek Trail

K. Transit Connectivity

There are multiple design elements to consider when integrating pedestrian and bicycle modes of travel with transit services. These elements include bicycle accommodation on transit vehicles, bicycle parking at transit facilities, and pedestrian and bicycle facility connections between activity areas and transit facilities. RTD has been a leader in integrating pedestrians, bicycles, and transit and is committed to continue this effort with future FasTracks stations and corridors.

Bicycles on Buses

All RTD buses, except for the 16th Street Free MallRide, are equipped with front-mounted bicycle racks that can hold two bicycles. Additionally, bicycles can be stowed in baggage bins on over-the-road coach buses used on regional routes.

Based on data from RTD's most recent Bike-on-Bus Survey (Summer 2007), it is estimated that RTD serves about 690,000 weekday bicycle rack boardings per year. It is estimated that about 12,000 bicyclists are passed by each year due to racks already being full.

Bicycles on Rail

In October 2005, the RTD Board adopted a policy to allow bicycles on the trains at all times on a space-available basis. Exhibit 41 details how RTD's rail cars accommodate bicycles per boarding location; either at the front or back of each car excluding the front rail car of the train. Unless special circumstances arise, RTD expects to extend the current (2005) bicycle-on-train policy to future passenger-rail lines that are part of FasTracks.

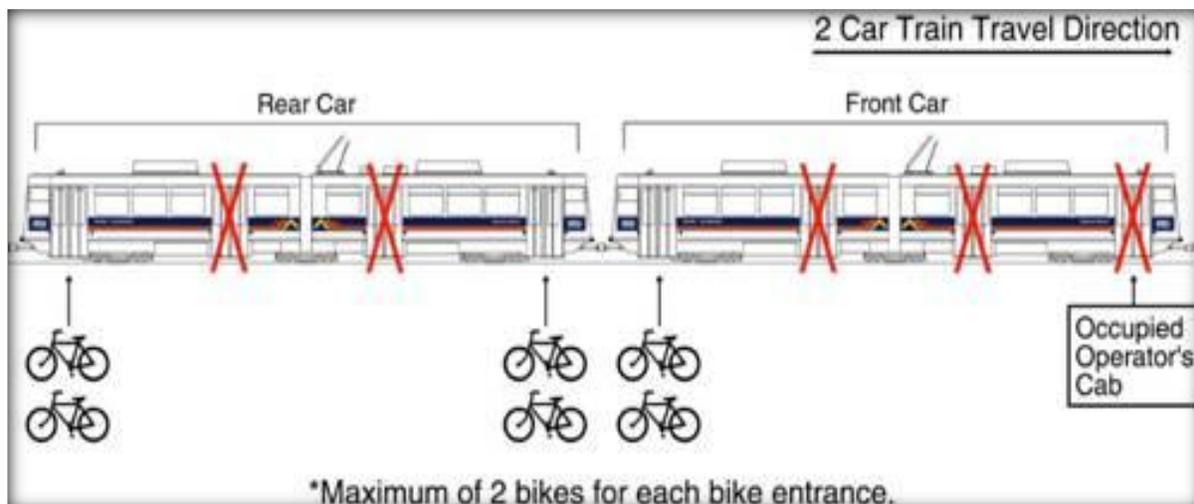


Exhibit 41. RTD bicycle boarding regulations on light rail services

Bicycle Parking at Transit Facilities

In an effort to encourage bicycle-to-transit connections, RTD offers nearly 600 racks and more than 500 lockers at transit facilities around the region. Table 9 presents bicycle rack and locker capacity at existing park-n-Rides, light rail stations, and other transit facilities.

Table 9
Supply of Bicycle Racks and Lockers at RTD Transit Facilities (November, 2006)

RTD Transit Facility	Rack Capacity	Number of Lockers	RTD Transit Facility	Rack Capacity	Number of Lockers
30th and Downing	10	8	Lincoln/Jordan	4	6
Airport Blvd/40th Ave	0	10	Littleton Downtown*	22	10
Alameda Station*	12	8	Longmont Depot	8	0
Alameda/Havana	4	0	Louisiana Station*	14	8
Arapahoe Station*	15	15	Market Street Station	4	5
Aspen Park	4	8	Mineral Station*	10	30
Belleview Station*	9	9	Montbello	2	0
Bergen Park	4	0	Mountain View	2	0
Boulder Transit Center	25	90	Nederland	6	6
Broadway	4	4	Nine Mile Station*	18	28
Broadway/27th	6	10	Niwot	4	0
Broomfield	20	6	Olde Town Arvada	4	8
C470/S.University Blvd	8	6	Olympic	8	8
Church of the Nazarene	6	4	Orchard Station*	1	0
Church Ranch	8	4	Oxford Station*	8	4
Civic Center Station	0	9	Paradise Hills	4	0
Cold Spring	6	12	Parker	4	6
Colorado Station*	5	11	Roosevelt Park	4	0
Commerce City	6	4	Southmoor Station*	13	11
County Line Station*	7	8	Stapleton	4	8
Dayton Station*	8	6	Superior/Louisville	8	16
Dry Creek Station*	0	0	Table Mesa	52	35
El Rancho	4	6	Tantra Dr (LDS Church)	12	8
Englewood Station*	20	32	Thornton	10	10
Evans Station*	12	8	Twin Forks	2	0
Evergreen	4	0	Union Station*	8	16
Flatirons/US 36	8	0	University Station*	11	8
Genesee Park	4	0	US 287 @ Niwot	8	0
Highlands Ranch Twin Ctr	16	12	US 85 & Bridge St	6	0
I-25/Broadway	18	30	Wadsworth/Hampden	8	8
Invesco Station*	0	4	Wagon Road	10	18
Ken Caryl	8	6	Ward Road	4	8
Lafayette	6	4	Westminster Center	28	18
Lincoln Station*	8	8	Yale Station*	4	4

Totals: **590** Bicycle Rack Capacity
 629 Number of Bicycle Lockers

* Light Rail Station

Pedestrian and Bicycle Connections

RTD is committed to helping communities provide pedestrian and bicycle connections in and around their transit stations. FasTracks will provide bicycle racks at all stations, bicycle lockers at major stations and park-n-Rides, and will accommodate bicycle access to rail stations and park-n-Rides from multi-use trails and bicycle routes. RTD has also committed to contributing up to one-half the cost of the proposed multi-use trail along the US 36 Corridor (commonly referenced as the Boulder-Denver Bikeway). Local governments and RTD should work together to ensure that adequate sidewalks provide access to bus stops and stations. Shelters and waiting space treatments should be considered where appropriate.

L. Facility Maintenance

Proper maintenance is a key requirement for both bicycle and pedestrian facilities. Major maintenance issues include debris, standing water, snow, poor surface conditions (e.g., potholes, large cracks, and rough pavement) and inadequate lighting. Specifically with on-street bicycle facilities, road surface treatments such as chip seal and shoulder rumble strips can create operating hazards for bicyclists depending on how the treatments are applied.

Debris, Snow, and Standing Water

Local governments should provided or enforce maintenance efforts to clear roadways and multi-use paved trails of snow and debris, particularly leaves, branches, trash, and sand applied during snowstorms. If the maintenance of sidewalks is the responsibility of adjacent property owners, ordinances and other rules outlining these responsibilities should be enforced (particularly regarding snow removal). In addition, facilities should be designed to drain water away from bicycle and/or pedestrian throughways. Particular maintenance attention needs to be given to bicycle lanes, which tend to accumulate debris “swept” into the bicycle facility from motor vehicle movement in adjacent lanes.

Poor Surface Conditions

Sunken manhole covers, potholes, and pavement cracks in roadways or paved pedestrian/bicycle facilities are examples of poor surface conditions that can affect a pedestrian or bicyclist. These conditions can create unsafe operating environments for users, especially bicycles, wheelchairs, and other wheel-based forms of transportation, and persons with visual impairments. Poor conditions can cause individuals to swerve into motor vehicle lanes to avoid an obstacle. Maintenance to improve these conditions also extends the life of the facility.

Inadequate Lighting

A lack of quality lighting can prevent pedestrians and bicyclists from seeing surface conditions or debris at night, which could lead to serious injury. For many individuals, insufficient lighting is also a significant personal safety concern, especially in underpasses.

Chip Seal

The typical use of chip seal (the application of pebble-sized stone to roadways using an oil-based adhesive) can extend the design life of a roadway but often creates a very rough and potentially hazardous surface for bicyclists. There are many alternative chip seal technologies available today (such as thin slurries of oil and sand) that can accommodate bicyclists. Generally, an aggregate larger than one-half inch makes bicycling control difficult.

Orientation of Storm Water Drainage Grates

Stormwater drainage grates are required to drain water from a roadway and if designed incorrectly, can be a serious hazard to bicyclists (drainage grates with large slots parallel to the roadway can trap the front wheel of a bicycle). In general, a honeycomb grate design with no greater than four inch spacing between grates can still efficiently drain water from the roadway without impacting the bicyclist (Exhibit 42).



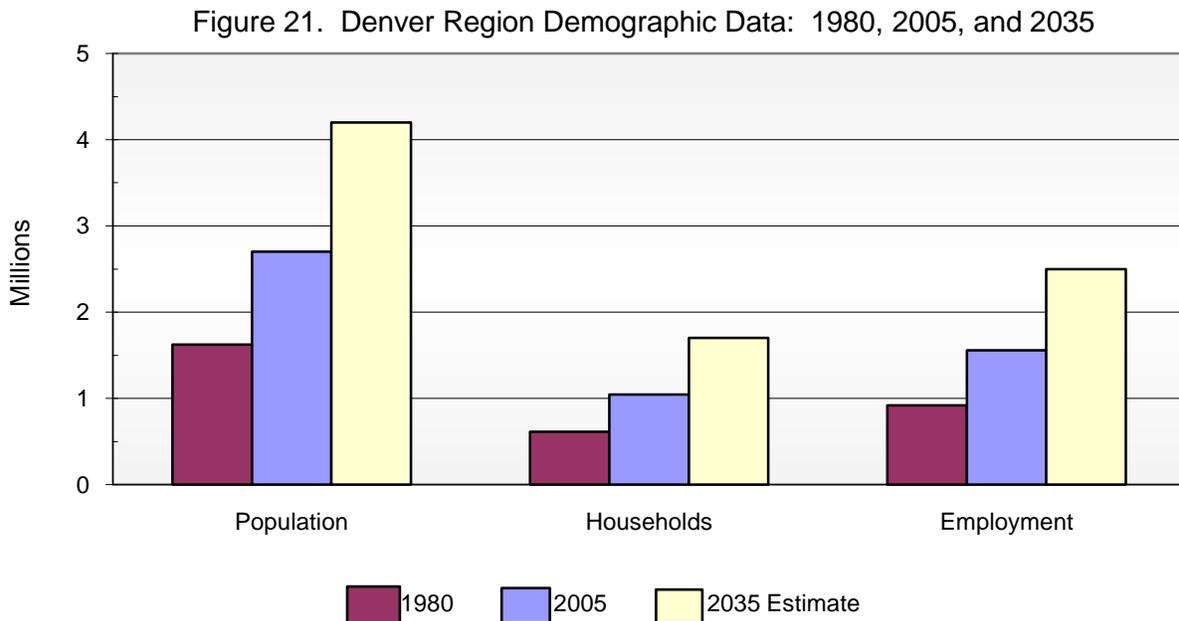
Exhibit 42. Well designed honeycomb-style stormwater drainage grate vs. a less desirable style of grate

Vegetation

Overgrown vegetation along or above sidewalks, multi-use trails, and roadways can impede upon a pedestrian or bicyclist's operating space and restrict sight distances. In general, local governments should inform property owners of their responsibilities to clear sidewalks of vegetation and enforce ordinances when necessary. Local governments or special districts should also maintain the vegetation along publicly owned multi-use trails, roadways, and other infrastructure used by pedestrians and bicyclists.

6. LAND DEVELOPMENT PRINCIPLES

The Denver region experienced very rapid growth in population and employment during the past 20 years. To accommodate this growth, significant amounts of land have been developed or redeveloped. From 1980 to 2005, the region's total population increased 40 percent (Figure 20). In areas where this population growth was greatest, some communities have doubled in size. The region is forecast to experience high growth rates through 2035, adding 1.5 million people to the Denver region.



Sources: U.S. Census Bureau and DRCOG estimates and projections

Within the context of such growth, it is important that local governments use the development review and land use-planning process as a tool in building more efficient pedestrian and bicycle friendly communities. Today, most local governments already use mixed-use ordinances, carefully control development density and vehicle parking, and require multi-use trails, sidewalks, and other non-motorized infrastructure as part of development review to ensure bicycle and pedestrian modes of travel are accommodated. The following sections describe these concepts and other land use controls and provide examples from communities in the region.

A. Mixed-Use Development

Many local planning agencies have incorporated mixed-use zoning ordinances and codes into their municipal or county ordinances. The concept of mixed-use zoning is to enable development that combines different land-use types (such as residential and commercial) into a pre-defined area. This variety of uses can allow shorter trips by individuals, thus decreasing the demand to drive a car. These areas vary in size (uses

can be mixed over an entire neighborhood, street corridor, or in just one parcel) and how they accommodate pedestrian and bicycle travel.

Many cities in the region have successful examples of mixed-use developments. Sites share retail, office, and residential uses in one building or parcel. The City of Boulder has been proactive in requiring mixed-use developments to accommodate pedestrian and bicycle modes as well as manage motor vehicle parking. Exhibit 43 illustrates a modern mixed-use building along 15th Street in Boulder that contains retail space on the ground level mixed with other uses on the second floor. Note the bicycle parking in front of the store, wide sidewalks with curb ramps, and multi-tiered parking structure adjoining the building (on the left side of the picture). All of these elements help to create a more efficient development that promotes pedestrian and bicycle travel, and naturally creates high foot-traffic for the retail establishment.



Exhibit 43. Mixed-use development along 15th Street, Boulder

Another example of mixed-use development is the Belmar redevelopment area in Lakewood, which was initially envisioned in their comprehensive plan as a City Center that would replace the mostly vacant Villa Italia shopping mall. This vision helped to facilitate a rezoning of the area into a Planned Unit Development (PUD), which enabled the most flexibility for mixed-use development. The City partnered with the business community, developers, and other interested parties to make Belmar more conducive to shorter trips by pedestrian and bicycle travel. The design of the buildings, shown in Exhibit 44, show careful attention to street-level facades, awnings, lighting, plantings, sidewalk width, and other amenities that can create a more comfortable walking environment.



Exhibit 44. A wide sidewalk and amenities such as pedestrian-focused lighting and plantings promotes a more comfortable walking environment in the Belmar redevelopment area, Lakewood

The benefits of mixed-use developments increase when used in conjunction with other strategies. Such strategies include permitting higher development density, managing motor vehicle parking, and connecting mixed-use areas with other developments using sidewalks, multi-use trails, or bike lanes.

B. Development Density

Generally, the higher the density of development, the less distance individuals may be required to travel. This in turn increases the attractiveness of making trips by walking or bicycling (as noted in Chapter 3, the average pedestrian trip is three-quarters of a mile and the average bicyclist trip is 2.1 miles according to the 1997 DRCOG Travel Behavior Inventory).

Today, the region has a wide range of lower- and higher-density developed areas. While many of these areas were developed in a historical context (i.e., pre- or post-World War II), some communities have recently begun encouraging new higher-density developments. Key locations include sites near transit stations, infill sites, and even previously undeveloped “greenfield” sites. The following sections highlight some concepts that communities can use to promote bicycling and pedestrian travel through development density.

Lower Density Development Examples

Brighton and Aurora offer examples of how regulations for new development can promote pedestrian and bicycle travel in low-density areas.

- City of Brighton, CO: During its development review process, the City of Brighton requires a site plan that includes details on development density, structure location, and where developers will provide right-of-way and construct trails as well

as provide sidewalks along arterials and collector roads. A park impact fee is charged based on development density to fund community and neighborhood parks, including trail construction through these parks. In addition, Brighton uses a Planned Unit Development Overlay Zoning District to provide flexibility in granting incentives such as density bonus up to 25 percent to developers that provide greenbelts, trails, open space and parklands (Exhibit 45).



*Exhibit 45. An aerial view of new development with sidewalks and trails in Brighton.
Note that sidewalks and trails are built before housing structures
due to a proactive development review process*

- **City of Aurora, CO:** In 2003, the City of Aurora adopted new regulations along the E-470 corridor that emphasize pedestrian and bicycle accommodations in new developments. The City controls development density by requiring four “neighborhoods” per square mile, each of which has boundaries clearly identifiable to its residents (such as a major street, dedicated park, landscaped area(s), or another significant feature). Continuous on and off-street pedestrian and bicycle circulation networks are required to be built through and between these neighborhood areas (Exhibit 46).

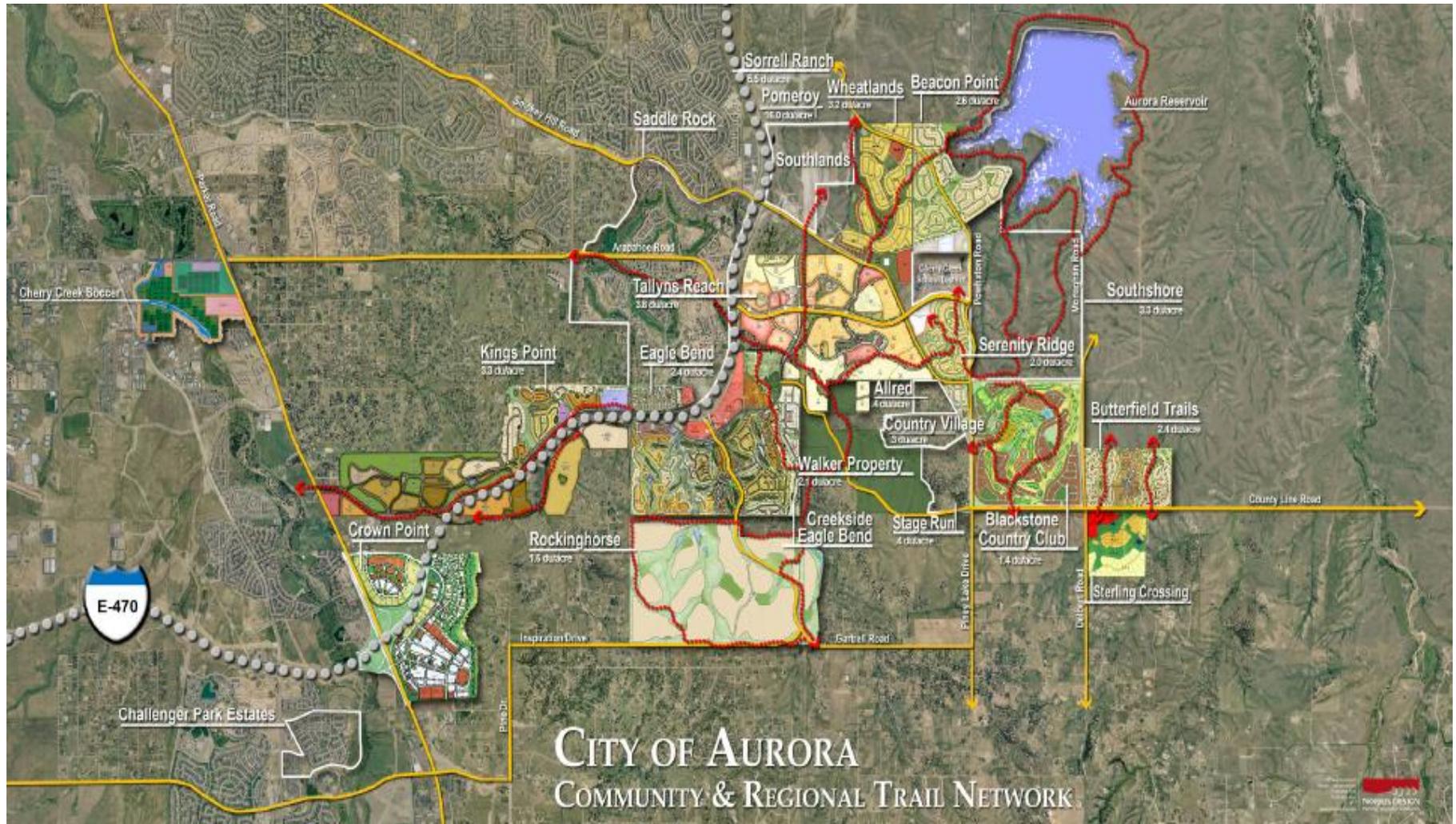


Exhibit 46. City of Aurora's Community and Regional Trail Network along E-470 planned developments

Off-street multi-use trails are denoted with red dotted lines.
 On-street bike lanes will be required on all 4-lane arterials and collector streets (these streets are highlighted in yellow)

In addition, Aurora regulations also require single-family residential areas to be contiguous to mixed-use and other types of development to, “avoid the creation of isolated pockets of residential use” (Aurora code, Section 146-919(C)(3)(b)).

Higher Density Development Examples

Some of the highest development density in the region is located in Central Denver. In particular, the area around Denver’s Union Station and the Central Platte Valley District contains a high-density mix of residential, commercial, entertainment, and other uses. These areas were rezoned by Denver in 2003 as either transit mixed-use or in a unique zone called the Platte River Valley Zone District. Both of these zoning districts promote diversified, high-density land uses with attention to local aesthetics, viewshed, open space, and transportation linkages. Each zoning type requires a subarea plan for each proposed development. In the transit mixed-use subarea plan, a particular emphasis is placed on pedestrian and bicycle connections to transit stations in the proposed development as well as to connecting zones.

In 2005, the City and County of Denver also developed Main Street zoning ordinances to enhance major commercial corridors throughout the city with particular attention to widening sidewalks and pedestrian connections to shopping, transit, and residential development. East Colfax Avenue, particularly between Logan and Marion Streets, was a key roadway rezoned with the highest-level of Main Street zoning density. This segment of Colfax has some of the highest pedestrian and transit use in the Denver region, but also has high concentrations of motor vehicle-related pedestrian and bicycle crashes (see Chapter 3, Figures 15 and 16). It was Denver’s hope that rezoning this corridor would enhance the commercial activity along Colfax as well as improve the safety for pedestrians and bicyclists in the future.

C. Motor Vehicle Parking

Consideration of pedestrian and bicycle accessibility in the design of motor vehicle parking lots is very important. Several communities use the land-development review process to ensure pedestrian and bicycle accommodations are included in parking lot designs, particularly for large retail stores.

Parking Lot Design

Placing motor vehicle parking facilities in back of commercial developments can reduce the walking distance to store fronts from the street. Typically, this allows storefronts to be located closer to the sidewalk, thus allowing pedestrians to access the development more easily. This concept is true for retail areas in city centers as well as larger commercial developments in suburban and rural areas.

The City of Lakewood outlines pedestrian accommodation through commercial parking areas in their 2005 Design Manual, which illustrates examples of development styles for residential, commercial and office properties. The Design Manual enables the development review process to ensure that pedestrian design elements are incorporated into all site development proposals. The City is planning to use this manual with

development projects at West Corridor light rail stations, at Saint Anthony’s Hospital, near the Federal Center at Union Street, and within the Belmar redevelopment.

In many situations, large office or retail areas have large parking lots between the building entrance and the roadway sidewalk. Several communities, such as the City of Aurora and the City of Boulder, have successfully accommodated pedestrian travel by requiring sidewalks to be built through the spine of the parking lot to help pedestrians avoid vehicles backing out of parking spaces (Exhibit 47).



Exhibit 47. Boulder Target parking lot designed with wide sidewalks for pedestrian and bicycle accommodation

D. Pedestrian and Bicycle Connections

Pedestrian and bicycle-oriented connections through and between developments are most efficiently planned during the development review process. It is common today for many local governments to require pedestrian and bicycle connections to be built in new developments, particularly in suburban planned unit development (PUD) areas. When these connections are built during the initial construction process in new developments, the cost and approval process is significantly less than trying to construct them after the development is established.

The City of Brighton requires multi-use trails in all new residential developments, including cul-de-sac cut-through paths as well as continuous connections to adjacent residential areas, parks, schools, and other land uses. The city and developers have been creative in finding off-street space for these trails, including use of utility right-of-ways, ditches, and other corridors that can exclusively serve bicyclists and pedestrians with minimal right-of-way acquisition costs (Exhibit 48).



Exhibit 48. New trail in Brighton constructed within an existing gas line right-of-way

The City and County of Denver has also historically integrated pedestrian and bicycle accommodations through development review, some of which is visible in the southern area of the city near Yosemite Street and Hampden Avenue (Exhibit 49)

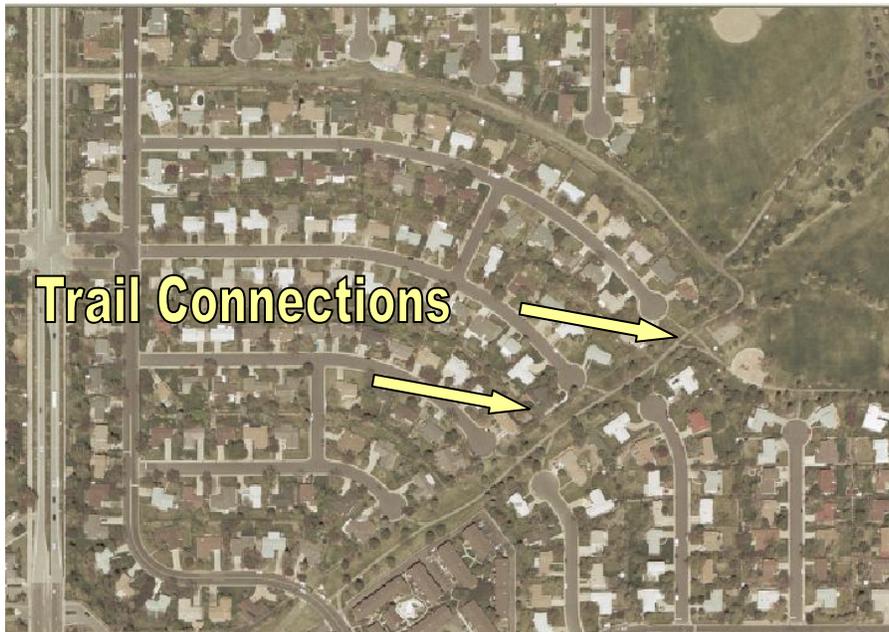


Exhibit 49. Trail connections to cul-de-sac streets in southern Denver. These connections serve local pedestrians and bicyclists, linking them with regional off-street trails

E. Local Community Site Planning Examples

The many principles discussed in this chapter should be used to create a more comfortable and safer environment for pedestrians and bicyclists, as well as all other users (motorists, transit users, etc). Every community and development is unique in how these principles are adapted to fit their particular projects. This section details several examples where these principles are being used in areas such as new highway corridors, infill and redevelopment sites, and at future rail transit stations.

City of Boulder: Travel Demand Management Planning Efforts

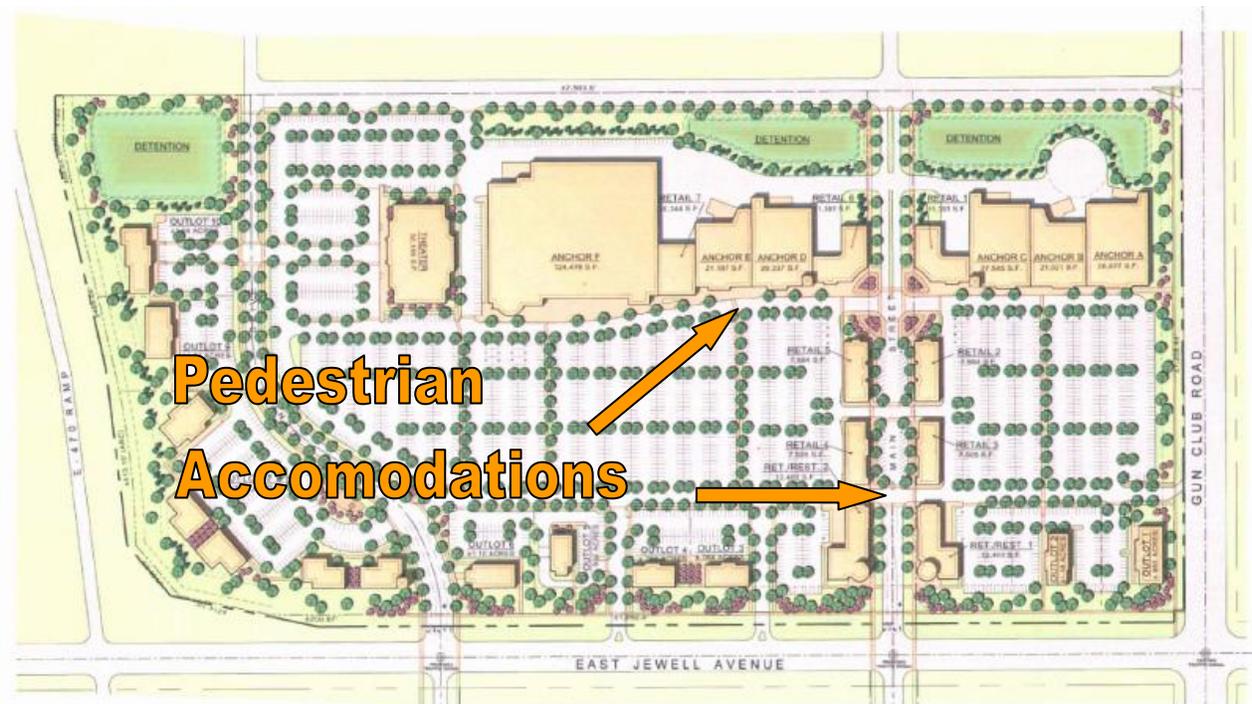
During the City of Boulder's development review process, applicants are required to submit a site-specific Travel Demand Management (TDM) Plan that outlines what actions will be taken to promote or enhance alternative modes of travel at their site. An important component of this plan is a description of how the new site will accommodate pedestrian and bicycle modes of travel. In a collaborative process with city staff and the applicant, each development proposal is reviewed to define the best or most appropriate TDM strategies. Recent strategies with a pedestrian and bicycle focus have included:

- Sidewalk and/or trail facilities: Each plan is reviewed to ensure that pedestrians and bicyclists will be able to conveniently access the site, especially through parking lots.
- Bicycle parking: Plans frequently provide racks, lockers, and even sheltered parking if sufficient demand exists.
- Personal care facilities: Showers, lockers, and changing room facilities are typically included depending on projected use.
- Promotional programs: A wide variety of programs have been developed to encourage alternative modes of travel, including:
 - Bicycle fleet pools: A program where employees sign-out and use company-owned bicycles during the day. In 2006, 20 companies participated.
 - EcoPass Transit Passes: Employees who pledge to commute by alternative modes are given transit passes for use on any RTD service.

From 2001 through 2006, 26 projects in Boulder have included TDM plans. The City is hoping to amplify the use of this program even further, especially at the future site of the Boulder Transit Village. A TDM Toolkit document that explains different strategies is distributed by GO Boulder transportation planning staff.

City of Aurora: E-470 Regional Activity Centers

The City of Aurora has developed regulations for large retail development proposals along the E-470 corridor (identified as Regional Activity Centers in Aurora’s municipal code). These regulations focus attention on development density, parking layout, and pedestrian and bicycle-oriented connections. One example (Exhibit 50) is a proposed development at East Jewell Avenue and Gun Club Road. In this concept drawing, the developer proposes to develop a “Main Street” which will be built to encourage walking with wide sidewalks, minimized parking, and planting strips. Bicyclists will also be accommodated. Tree-lined sidewalks will be provided through larger parking areas to connect retail areas and adjoining roadways to connect retail areas and adjoining roadways.



*Exhibit 50. Proposed Regional Activity Center, City of Aurora
Note pedestrian accommodations along the new “Main Street”
and through surface parking lots*

City and County of Broomfield: Arista Project

The Arista project in the City and County of Broomfield is an example of a development effort with an emphasis on future FasTracks transit connectivity and other alternative modes of travel. With both a commuter rail station and bus rapid transit (BRT) station planned within one-half mile of this site, it is important that the development accommodate pedestrian and bicycle travel. Broomfield and the developers of Arista worked together to include wide sidewalks, on-street bike lanes, and off-street multi-use trails to connect to future transit stations along US-36 and other major roadways (Exhibit 51).

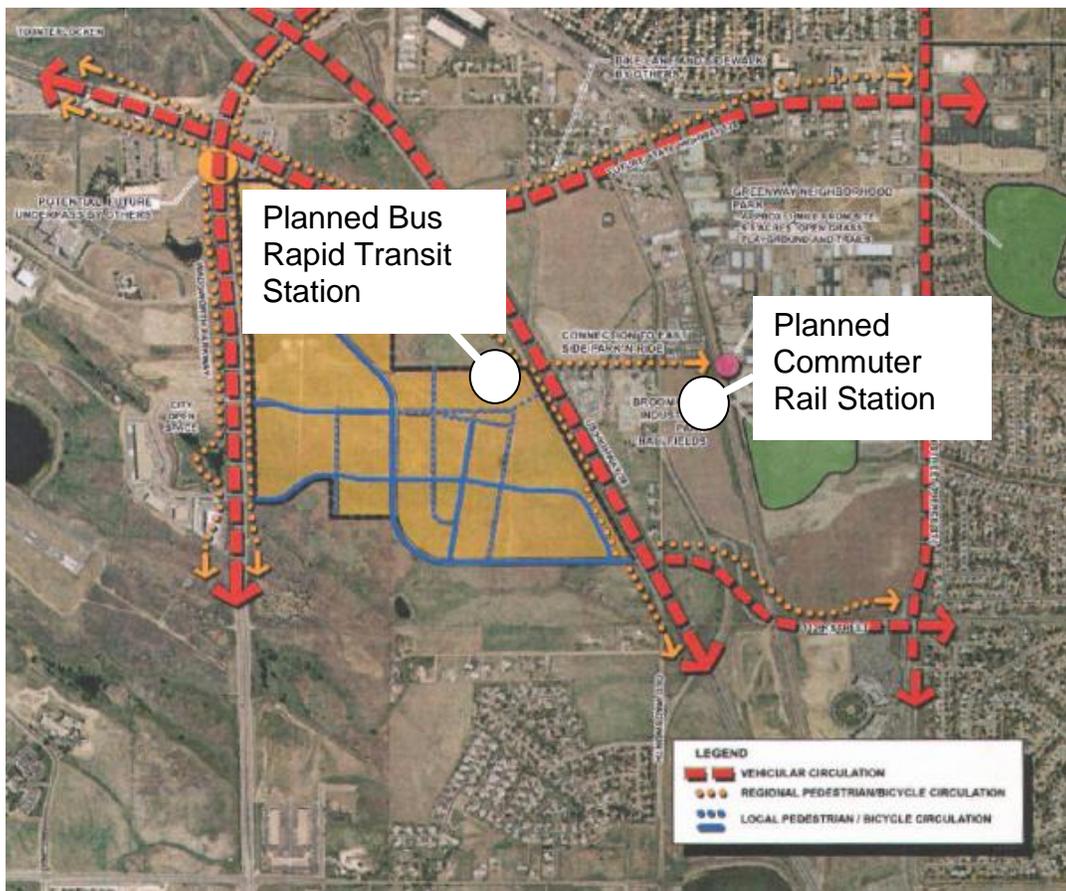


Exhibit 51. Broomfield's Arista Development

In addition, the development will contain a mixed-use retail and residential area with a pedestrian-focused center containing enhanced crosswalks (textured and colored concrete) and 12 to 18 foot wide sidewalks with plantings, street furniture, and other amenities.

Parking will be accommodated for this area in a multi-level structure behind sidewalk-level retail (Exhibit 52). The purpose of this design is twofold: it will serve pedestrians connecting to rapid transit from the Broomfield Event Center and it will create a market for vibrant retail activity.

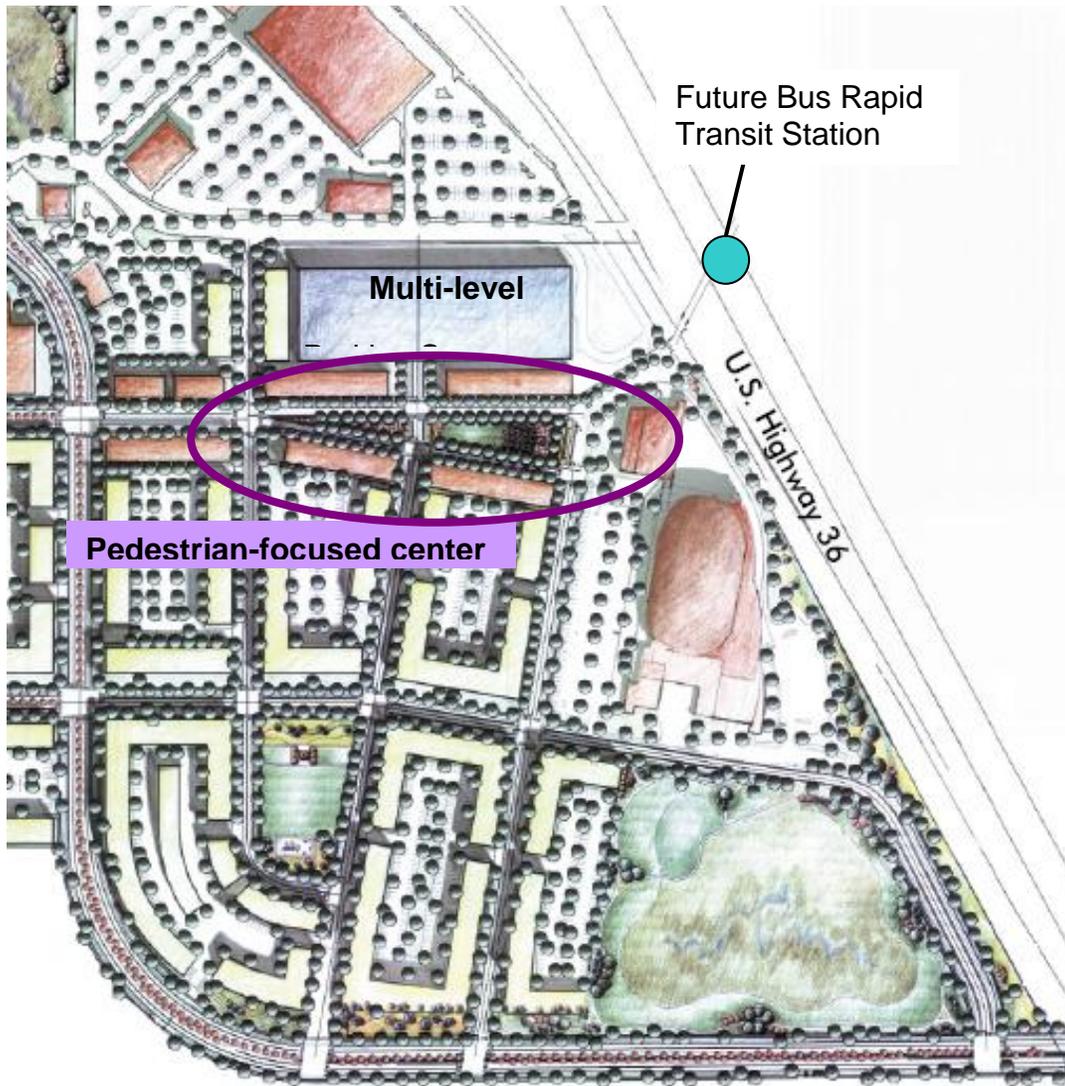


Exhibit 52. Broomfield's Arista Development Parking Structure

City of Greenwood Village: Landmark Project

The City of Greenwood Village redeveloped an older, single-use office-building complex near I-25 and Orchard Road into a mixed-use development called Landmark (Exhibit 53). The *Greenwood Village Comprehensive Plan* helped facilitate this redevelopment since it was identified in the plan as a Corridor Planning Area. The plan sets a vision for Corridor Planning Areas to provide a variety of land uses and activities, including office, commercial, entertainment, civic, and recreational uses as well as promote pedestrian and bicycle travel. The plan also contains specific policies regarding pedestrian and bicycle facilities and connectivity, accommodation through parking areas, and linking non-motorized modes with transit.

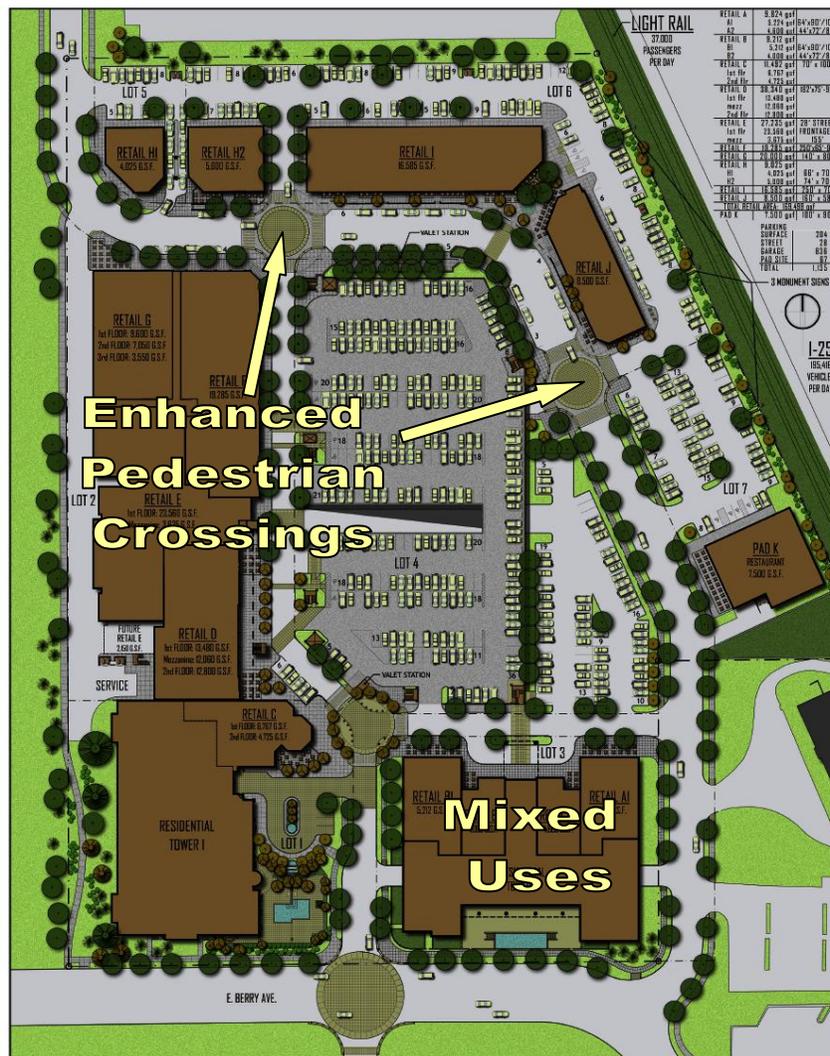


Exhibit 53. Landmark Development Plan in Greenwood Village

Englewood: Civic Center Transit Oriented Development

Transit-oriented development (TOD) is intended to create a pedestrian and bicycle-friendly environment within close proximity to transit services through utilizing the land development principles discussed above (encouraging mixed-use development, increasing density, managing parking, and building non-motorized connections through development). TOD has quickly become a major planning focus for many local governments as they prepare for future rail corridors and stations scheduled for completion through the RTD FasTracks program (see the Arista, Broomfield example Exhibit 51).

The City of Englewood was one of the first communities to consciously build a TOD in the Denver area (Exhibits 54-56), RTD proposed the Englewood light rail station, which compelled the city to plan for redeveloping the area into a mixed-use, walkable city center. From a financial perspective, the Englewood TOD has been a successful location for business and residential real estate, however it took a large initial public investment to prepare the area and provide the base infrastructure (over \$18.5 million spent by the City of Englewood). The TOD is a mix of multi-family housing, government offices, big-box stores (e.g., Wal-Mart), and smaller-scale retail.



Exhibit 54. Englewood light rail station with pedestrian and bicycle bridge (white) connecting city offices and other mixed-use development



Exhibit 55. Transit-oriented development at the Englewood light rail station. City offices are located left of fountain and mixed-use residential and retail development to the right. Light rail station is located top center.



Exhibit 56. Demand has been so high at the Englewood light rail station RTD now provides two tiers of bicycle lockers

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7. NEEDS AND FUNDING

This chapter presents a general identification of pedestrian and bicycle facility needs, and funding sources throughout the region. It identifies an estimated level of funding needed for desired pedestrian and bicycle facilities as well as a constrained scenario based upon a level of funding reasonably expected through 2035.

In addition, this chapter contains a discussion regarding the federal sources of funding programmed through DRCOG for pedestrian and bicycle facilities and contains general policies to be considered in the Transportation Improvement Program (TIP) project evaluation and selection process.

A. Fiscally Constrained Pedestrian and Bicycle Element

The *2035 Metro Vision Regional Transportation Plan (2035 MVRTP)* includes an estimate of the total cost to maintain and expand the pedestrian and bicycle system. It also defines the expected revenues that will be available for improvements (Table 10). These values are rough estimates and are difficult to quantify. In addition, there are many “hidden” expenditures for which the precise costs are not quantified, such as pedestrian signal push-buttons, pedestrian signal heads, and sidewalk maintenance (e.g., repairing cracks).

Table 10
2035 Region-wide Costs and Revenues for Pedestrian and Bicycle Facilities

System Category	Estimated Total Cost (millions)	Fiscally Constrained Revenue Estimate (millions)
Preservation and Maintenance (off-street)	\$35	\$35
New Pedestrian/Bicycle Facilities (including expansion and upgrades)	\$1,000	\$690

Source: Adapted from Table 6 (page 106) of the *2035 Metro Vision Regional Transportation Plan*

Approximately \$700 million is expected to be available for new pedestrian and bicycle facilities between now and 2035. An estimated additional \$300 million would be needed to fully build out the envisioned pedestrian and bicycle system throughout the region.

B. Funding Sources

Funds to construct, maintain, and promote the use of bicycle and pedestrian facilities are available from many sources. This section details some of the specific funding sources made available at the federal level as well as programs specific to the State of Colorado and local governments in the region. In addition to these agency sources, private funds are increasingly supporting development of pedestrian and bicycle projects.

The 2005 transportation legislation SAFETEA-LU (the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users) contains many federal funding programs that can be used to plan and construct pedestrian and bicycle facilities as well as reconstruct, maintain, and promote their use. In addition to the programs described below, nearly all federal transportation programs can be used for pedestrian and bicycle projects exclusively or as part of a larger roadway or transit project (for example, construction of pedestrian or bicycle transportation facilities on land adjacent to any highway on the National Highway System). The legislation allocates funding through the year 2009. These programs are administered at both the regional and state level.

DRCOG Selected Programs

As the federally designated Metropolitan Planning Organization (MPO) for the Denver region, DRCOG is responsible for preparing the TIP document, which programs federal funds for the next four to six years. DRCOG selects the projects for funding in three federal programs. All three funding sources can be used for pedestrian and bicycle improvements (STP-Metro, STP-Enhancement, and CMAQ). The most frequent funding program used for pedestrian and bicycle projects is STP-Enhancement, but DRCOG has funded pedestrian and bicycle projects with STP-Metro and CMAQ funds as well. DRCOG typically requests application submittals for TIP funding about 9 months before the start of the fiscal year (state) of the new TIP.

- *STP-Enhancement*: The purpose of the STP-Enhancement program is to strengthen the cultural, aesthetic, and environmental aspects of the nation's intermodal transportation system. Pedestrian and bicycle-related activities eligible for funding include construction of facilities, safety and educational projects, and the preservation of abandoned railway corridors (including the conversion and use thereof for pedestrian and bicycle trails) (SAFETEA-LU Section 1122).
- *Congestion Mitigation/Air Quality (CMAQ)*: The CMAQ program provides funding for projects and programs in air quality nonattainment and maintenance areas for ozone, carbon monoxide (CO), and particulate matter (PM₁₀ and PM_{2.5}) that reduce transportation-related emissions. The Denver area is an air quality maintenance area for carbon monoxide and PM₁₀, and a non-attainment area for ozone. Because pedestrian and bicycle travel can reduce congestion and benefit air quality by reducing transportation-related emissions, this funding source has been used in the Denver region for both construction projects and promotional activities (such as maps, brochures, and public service announcements, etc.). Promotional activities are typically part of a broader Travel Demand Management (TDM) program.
- *STP-Metro*: The purpose of the STP-Metro program is to provide flexible funding that may be used for projects on the DRCOG-designated Regional Roadway System, transit capital projects, public bus terminals and facilities, and bicycle and pedestrian projects. DRCOG has typically used most STP-Metro funds for road projects.

State and Federal Administered Programs

- *Safe Routes to School*: A new program created by the SAFETEA-LU legislation is Safe Routes to School. This program provides funding to enable and encourage primary and secondary school-aged children to bicycle and walk to school. Funding is available for both infrastructure and educational projects. Projects are allocated and administered in Colorado by CDOT. Local governments, schools and other eligible organizations in the DRCOG region received approximately \$537,000 in infrastructure improvements and approximately \$278,000 in education program funding in the 2008-2009 allocation process (the funding cycle is expected annually through 2009).
- *Highway Safety Improvement Program* (HSIP): The Highway Safety Improvement Program (SAFETEA-LU Section 1401) Federal-aid program has the goal of reducing traffic fatalities and serious injuries on all public roads. To help program HSIP funds, states must prepare a Strategic Highway Safety Plan (SHSP) that describes the safety concerns in the state CDOT adopted a complying document in 2006 known as the Strategic Plan for Improving Roadway Safety (SPIRS). The SPIRS identifies needed safety improvements in the transportation system, including pedestrian and bicycle travel on any public roadway or trail, especially highway and railroad crossings. For FY 2009, the State of Colorado was apportioned \$16.5 million in HSIP funds.
- *Recreational Trails Program*: The Recreational Trails Program provides funds to the states to develop and maintain recreational trail and trail-related facilities for both non-motorized and motorized recreational trail uses (SAFETEA-LU Section 1109). In Colorado, these funds are administered by Colorado State Parks and are available to acquire land and construct, maintain, and rehabilitate trails and trail facilities for a variety of users (including pedestrians, bicyclists, in-line skating, equestrian use, cross-country skiing, snowmobiling, off-road motorcycling, all-terrain vehicle riding, four-wheel driving, or other off-road motorized vehicles). The emphasis on this program is on trails for recreational trips and not necessarily transportation-function trips (although there may be overlaps in some cases). In FY 2009, the State of Colorado was apportioned \$1.7 million in Recreation Trails Program funds.
- *Federal Lands Highway Program*: The Federal Lands Highway Program provides transportation funding for planning, research, engineering, and construction activities on highways, roads, parkways, and transit facilities that provide access to or are within public lands, national parks, and Indian Reservations.
- *National Scenic Byways Program*: The National Scenic Byways Program recognizes roads having outstanding scenic, historic, cultural, natural, recreational, and archaeological qualities and provides for designation of these roads as National Scenic Byways, All-American Roads, or America's Byways. Pedestrian and bicycle-related projects include planning, construction, promotion, and other improvements along byway corridors.

CDOT administers the Scenic Byways Program in Colorado. Projects are limited to \$100,000 per byway, so little if any construction is ever funded directly by the Byways program. However, funding for feasibility studies and planning projects with a pedestrian and bicycle focus (for example, a feasibility study to build a multi-use trail within the right-of-way of a byway) have been funded in the past. There are no feasibility studies or planning projects funded by the byways program in the Denver region at this time.

- Transportation, Community, and System Preservation (TCSP): The Transportation, Community, and System Preservation (TCSP) program is intended to address the relationships among transportation, community, and system preservation plans and practices and identify private sector-based initiatives to improve those relationships. Eligible uses of funds include projects that improve the efficiency of the transportation system, reduce impacts on the natural environment and the need for future investments in infrastructure, and provide access to jobs, services, and centers of trade. Many pedestrian and bicycle projects in the Denver region would be eligible under this criteria. Examples of projects funded in the past include approximately \$250,000 to complete pedestrian and bicycle planning at the proposed SH-121/ Grandview Avenue Railroad Grade Separation Project in Arvada and three capital projects in Denver (between \$200,000 and \$400,000 each) for pedestrian and bicycle bridges/overpasses and intermodal connectivity at Denver Union Station.
- Federal Transit Administration (FTA): Pedestrian and bicycle projects that improve access to transit facilities are eligible for funding under several capital improvement programs administered by FTA. Improving access includes construction of pedestrian and bicycle facilities that connect to transit stations, installation of bicycle parking (racks and lockers) at transit stations, and installing equipment to transport bicycles on transit vehicles. The specific sections of SAFETEA-LU that contain these pedestrian and bicycle provisions are Sections 5307 (Urbanized Area Formula Grants), Section 5309 (Capital Investment Grants and Loans), and Section 5311 (Formula Grants for Other Than Urban Areas).

In addition to these sections, the Job Access and Reverse Commute (JARC) program provides funding for local programs that offer job access and commute services to low income individuals who may live in the city core and work in suburban locations. Portions of this program's funding can be spent on pedestrian and bicycle improvements to access transit but no such projects have been funded in the Denver region at this time.

- Great Outdoors Colorado (GOCO): The GOCO program was established by a state constitutional amendment (Article XXVII) approved by Colorado voters in 1992. The GOCO amendment dedicates a portion of state lottery proceeds to projects that preserve, protect, and enhance Colorado's wildlife, parks, rivers, trails, and open spaces. Since GOCO's establishment, it has awarded approximately \$650 million for over 3,000 projects throughout the state. While many of the GOCO trail projects are intended for recreational use in open space areas, several projects have filled in critical links of the region's off-street multi-use trail network which are also used for transportation trips. An example is

Westminster's Big Dry Creek Trail, in which GOCO funds were used to fill in missing links.

Locally Administered Programs

There are several local efforts that contribute significant resources to pedestrian and bicycle projects. Municipalities and counties in the Denver region have made significant contributions to the construction and maintenance of sidewalks, multi-use trails, and on-street bicycle facilities. Most local governments require or strongly encourage private developers to fund sidewalks and/or multi-use trails. However, the long-term success of these projects often depends greatly on the partnerships involved. Many bicycle advocacy organizations in the region (including BikeDenver, Bicycle Aurora, Bike Jeffco, Bicycle Douglas County, etc.) organize volunteers to promote bicycling as a mode of transportation and also coordinate trail maintenance activities.

On a case-by-case basis, RTD also helps fund local pedestrian and bicycle connections to transit facilities and services. As part of the FasTracks program, RTD will continue to construct pedestrian and bicycle connections, grade-separated structures to cross interstates or other obstacles, and bicycle parking facilities. RTD has also committed to contributing up to half the cost of the proposed multi-use trail along the US 36 corridor (commonly referenced as the Boulder-Denver Bikeway).

A unique practice in some cities nationwide is to take the revenue generated from on-street parking and reinvest it back into the local streets where it was earned (as opposed to the city's general fund). Much of this revenue is spent on enhancements to pedestrian and bicycling infrastructure on those streets (such as wider sidewalks, bicycle parking, ADA-compliant curb ramps, streetscape redesign, lighting, benches, and other pedestrian amenities). As an example, the City of Pasadena, California implemented a performance-based parking management program that has generated \$80,000 per block in Old Pasadena, which is now a vibrant commercial area. Investments from parking revenue included pedestrian signage, sidewalk repair and widening, lighting, and benches.

C. Transportation Improvement Program (TIP) funding

The Transportation Improvement Program (TIP) identifies federally funded surface transportation projects to be implemented in the Denver region over a three to six year period. The TIP process is conducted every two years and fully programs three years worth of funding for transportation projects. More details about the TIP process and funding of pedestrian and bicycle projects are discussed previously, in the TIP document, and in the TIP Policy document.⁷

As the Metropolitan Planning Organization (MPO) for the Denver region, DRCOG prepares the TIP in coordination with CDOT, RTD, and local governments. The

⁷ At this time, the most current TIP is the 2008 – 2013 TIP, which is accessible at www.drcog.org. Also on this site is the most current *Policy on Preparation*, adopted June 20, 2007 and amended December 19, 2007 by the DRCOG Board of Directors.

geographic area covered by the TIP includes all of Broomfield, Denver, Jefferson, and Douglas counties, and portions of Adams, Arapahoe, Boulder, and Weld counties. Areas within the DRCOG region but outside of the TIP area (e.g., Clear Creek and Gilpin counties) are covered by the State TIP (STIP), which is administered by CDOT.

TIP Policy Document

Early in each DRCOG TIP cycle, policies are crafted to guide:

- What types of pedestrian and bicycle projects will be eligible,
- How they will be evaluated for selection, and
- How pedestrian and bicycle elements will be considered within roadway, transit or multi-modal projects.

During the policy development process, representatives from local governments and partner agencies may participate in workgroups and/or workshops examining eligibility and evaluation criteria.

DRCOG staff then prepares a draft policy document, possibly in conjunction with a formally established ad hoc committee. The policy document then goes through the DRCOG committee recommendation process and finally to the DRCOG Board of Directors for approval.

Eligible Pedestrian and Bicycle Projects

Based upon input received from residents, pedestrian and bicycle workgroups, and other stakeholders, the following policies have been developed on the types of projects, in order of priority, that should be eligible for TIP funding in the future. It should be noted that proposed projects must be on facilities identified in an adopted local plan.

1. *New construction*: The construction of new facilities is essential to complete the pedestrian and bicycle system as identified in this document or in locally adopted plans. New construction is defined as a project that will result in a new facility where pedestrian or bicycle infrastructure did not exist previously. Examples include construction of new sidewalks or multi-use trails, widening roads to provide bike lanes, and paving shoulders. Grade separations are also eligible for TIP funding through this category as long as they connect users with a local sidewalk, trail, or bicycle facility.
2. *Upgrades to Existing Facilities*: There are some facilities in the region that were not constructed to current desired standards. They may not meet ADA requirements and/or AASHTO design guidelines for width, slope, curve radii, etc. An upgrade is defined as a safety or operational enhancement of an existing facility. Sponsors seeking funding in this category will be expected to provide usage statistics, safety-related data, and other information as to why this facility requires the improvements. Example projects include widening existing facilities (such as multi-use trails, bike lanes, or sidewalks), slope adjustments, and lighting improvements. Projects that primarily reconstruct a facility are not defined as upgrades.

3. Reconstruction of Existing Facilities: Some facilities in the region require extensive repair due to pavement surface deterioration. A reconstruction project is defined as one where a travelway facility is entirely replaced due to pavement surface deterioration. *To be eligible the project must not have been previously funded as a DRCOG TIP project.* Project sponsors will be expected to provide photographs, inventories, and other relevant data detailing the extent of the surface deterioration, in addition to usage statistics.

Evaluation Criteria

A specific point-based scoring system will be developed for each TIP cycle. The following criteria topics should be considered when evaluating pedestrian and bicycle projects.

For All Bicycle Facility Projects

- Regional Bicycle Corridor System: The scoring system should consider awarding additional points to projects that represent a designated Regional Corridor or Community Corridor as shown on Figure 19.

New Construction

- Safety: Existing safety problems should be evaluated using data on the number of injury and fatal accidents in the area of the proposed new facility. In addition, if the improvement is planned along a roadway (such as a bike lane or paved shoulder), the roadway speed limit should be considered in the evaluation. Facility lighting should also be included as a safety-related criterion for new projects.
- Connectivity: The scoring system should consider how effectively projects will close gaps between two existing pedestrian/bicycle sections; provide access and connectivity to population and employment centers, parks and schools; eliminate barriers; and/or provide direct access to transit services.
- Usage: Priority should be given to projects that are near or connecting existing population and employment centers, parks or schools. If available, the new DRCOG travel model should be used for predictions of bicycle and pedestrian trip-ends by geographic areas. The typical distance is 0.5 mile for pedestrian projects and 1.5 miles for bicycle projects.

Upgrades to Existing Facilities

- Safety: How the improvement will address safety should be a criteria. Data on documented injury accidents should be provided as well as narrative on how the upgrade project will *improve* the current situation. If no injury accidents have occurred on the facility, information such as adjacent roadway speed, motor vehicle lane width, and signalization should be provided. However, these projects will not receive as much emphasis as projects along facilities where injuries have occurred and are documented.

- Operational Characteristics: The project sponsor should report the facility's current physical and operational characteristics (relative to ADA standards for facility width, slope, visibility, lighting, etc.) and describe how these characteristics do not meet standards.
- Usage: The project sponsor should provide observed usage statistics.

Reconstruction of Existing Facilities

- Extent of Deterioration: Project sponsors are expected to document the extent of the facility's deterioration with photographs, inventories, and other quantitative data. If safety is a concern, background information should be provided.
- Usage: The project sponsor should provide observed usage statistics and identify the existing connectivity.

Pedestrian/Bicycling Considerations for Roadway Projects

- Safety-based criteria should consider how the project would reduce or prevent crashes involving pedestrians and bicyclists.
- Criteria should consider the pedestrian and bicycling activity level along the roadway and the associated project impact on pedestrian and bicycling activity.
- Complete Street concepts (Appendix A) should be reflected in the scoring system.

8. EDUCATION, ENCOURAGEMENT AND FUTURE EFFORTS

While the provision of physical facilities in the Denver region can encourage bicycling and walking as modes of transportation, some people are not aware of the facilities or how to use them properly. Others may not feel comfortable, adequately skilled, or safe when making a walking or bicycling trip. To help address these concerns, this chapter offers recommendations for educational and encouragement efforts to promote walking and bicycling as modes of travel. In addition, this chapter outlines the projects and activities DRCOG may lead or participate in the future.

A. Bicycle and Pedestrian Education

Educational programs should be provided to motorists, bicyclists, and pedestrians in coordination with the provision of facilities and the enforcement of traffic laws. Educational programs can assist in providing a better understanding of the various modes and how motorists, bicyclists, and pedestrians share facilities in a safe manner. The major issues to be addressed by motorist, bicycle, and pedestrian education programs are as follows:

- Effective skills for bicycling in and walking along streets and roadways.
- Effective skills for navigating through complex urban intersections as a bicyclist or pedestrian.
- The rights and responsibilities of all roadway, multi-use trail, and sidewalk users.
- Traffic laws and how they relate to pedestrian and bicycle movements.

Transportation and public works departments at the local level are encouraged to partner with local schools, recreation departments, senior centers, law enforcement agencies, churches, and other community groups to provide education opportunities.

Child and School-Age Education Programs

Providing education programs for children may increase their skill levels, thus encouraging them as they become adults to bicycle or walk as a means of transportation. Many local governments in the region have developed education programs in partnership with local schools that encourage or promote walking and bicycling to school. Existing programs include:

- *Boulder Valley School District's (BVSD) "Safe Routes to School" Program*: This program is a partnership between the school district, Bicycle Colorado, and GO Boulder. The Crest View Elementary School has also been very successful in encouraging children to bicycle to school with the help of Frieker, Inc, a non-profit organization that tracks daily bicycle trip data online and coordinates incentives, parties, and other encouragement activities based on how many miles children bicycle.
- *Cycle Safety Circus*: Held in Denver every June at major event locations (in 2006 it was held at the Pepsi Center in downtown Denver), the Circus entertains and

educates children on bicycling safety, including proper helmet use and how to ride a bicycle effectively.

- Local police bicycle rodeos: Many local police departments, in coordination with school districts and communities, periodically hold bicycle rodeos to teach children bicycle safety, rules of the road, and how to share the road with motor vehicles.

In addition to these local efforts, the League of American Bicyclists and the National Highway Traffic Safety Administration have many materials and programs (e.g., Effective Cycling) available to help communities develop walking and bicycling education materials.

Safe Routes to School

The *Safe Routes to School* program was created through the federal SAFETEA-LU legislation in 2005. This program provides funding to states to enable and encourage primary and secondary school-aged children to bicycle and walk to school. Funding is available for both infrastructure and educational projects and is administered in Colorado by CDOT (see Chapter 7 for more information). The *Safe Routes to School* program recognizes the importance of partnerships and requires applicants to demonstrate how their proposed educational program will be implemented in the community using multiple agencies, talents, and resources.

Adult Education Programs

Comprehensive bicycle education programs for adults should continue to be developed and implemented. Programs such as these provide the basic principles for courteously and safely sharing roadways and multi-use trails, map reading, and route development skills. Some government entities already engage in educational efforts in their area.

- The City of Boulder (GO Boulder) publishes a pamphlet on how pedestrians, bicyclists, and motorists can share roadways and multi-use trails courteously.
- CDOT publishes the *Colorado Bicycling Manual* that details the rules of the road for bicyclists as well as helpful information on many aspects of bicycling (equipment, parking, etc).
- The back panel of the Denver Bike Map has information with regards to sharing the road.

In addition to these programs, education programs could also be used for motorists, pedestrians, and bicyclists when they are involved in traffic violations. Defensive driving classes, frequently required for traffic violators, would be an ideal place to introduce awareness of pedestrians and bicyclists. A major component of this program would include instruction that a bicycle is a vehicle and that bicyclists are vehicle drivers with certain rights and responsibilities. In addition, this program could also review pedestrian rights and responsibilities, particularly at intersections and crosswalks.

B. Encouragement and Awareness

Programs to encourage walking and bicycling can greatly change travel habits. Publicity campaigns, signs and maps, and changes in policies regarding parking and employer/employee incentives are some of the ways this can occur. These efforts along with ongoing awareness programs could encourage more people to walk or bicycle for commuting or other utilitarian trips.

Both the public and private sector can participate in these programs. Local governments could offer incentives or recognition to employers that encourage the use of alternative modes of travel. In turn, employers could offer incentives or recognition to employees who use alternative modes of transportation for daily commuting. Police departments could also help by giving notices of improper behavior to motorists, bicyclists, and pedestrians as part of an awareness campaign. Promotional programs could focus on the following:

- Advertising the benefits of bicycling and walking as alternative forms of transportation;
- Promoting the combined use of walking, bicycling, and public transit as a way of getting to and from various destinations since transit can extend the effective range of walk and bicycle trips;
- Encouraging private corporations to promote walking and bicycling as modes of travel by offering incentives for participation, perhaps by giving recognition to employers that promote alternative modes; and
- Promoting alternative modes of transportation through efforts such as the Guaranteed Ride Home program and the annual Bike to Work Day (BTWD) effort.

These promotional efforts have clearly been shown to encourage more bicycling and walking activity. For example, surveys indicated that approximately 40 percent of the participants in BTWD increased the number of days they bicycle to work because of the event. In addition, the largest motivator for people to participate in BTWD was company participation and word-of-mouth communication about the event. This underscores the need for partnerships and local involvement in walking and bicycling encouragement efforts.

Support should also continue for DRCOG's RideArrangers program and transportation management organizations/associations (TMO/TMA), such as:

- Boulder East Community Transportation Options;
- Downtown Denver Partnership;
- Fitzsimons TMO;
- GoBoulder;
- Stapleton Area TMA;
- Southeast Business Partnership (South I-25 Urban Corridor);

- Transportation Solutions (Cherry Creek/Colorado Blvd. area); and
- 36 Commuting Solutions.

These entities conduct many important activities that encourage walking and bicycling.

Health Community Participation

Organizations in the health community, such as the Thriving Communities Program through insurance provider Kaiser Permanente, also promote walking and bicycling as part of active living. Through the Thriving Communities Program, eleven community projects in the Denver region received a total of \$200,000 to develop and implement programs, policies, and environmental changes to promote healthy eating and active living. The recipients included Denver Public Health, the Tri-County Health Department, the Cross Community Coalition, and Foothills Park and Recreation. In all these organizations, the Thriving Communities funding was oriented towards neighborhoods and local communities with little or no active living education and encouragement programs.

Advocacy Group Participation

Local advocacy groups are also very involved in promoting walking and bicycling as means of transportation. These groups are typically engaged at a local or grassroots level and advocate for the provision of pedestrian and bicycle infrastructure as well as educate and raise awareness about alternative modes of transportation. DRCOG will continue to work with these groups as they develop educational and promotional efforts. A sample of some of the groups active in the Denver region today include:

- Bicycle Aurora
- Bicycle Colorado
- Bicycle Douglas County
- Bicycle Longmont
- BikeDenver
- Bike Jeffco
- Boulder Bicycle Commuters
- Build the Bikeway Coalition
- Colorado Walks
- Derailleur Bicycle Collective

Bicycle-Sharing Program

Denver has initiated a bicycle-sharing program that allows municipal employees to check out bicycles for business or recreational use. Bicycle kiosk stations are located in a three- to four-mile radius of downtown Denver and integrated with the existing

multimodal transportation system. This employee program will be expanded citywide (see Exhibit 57).

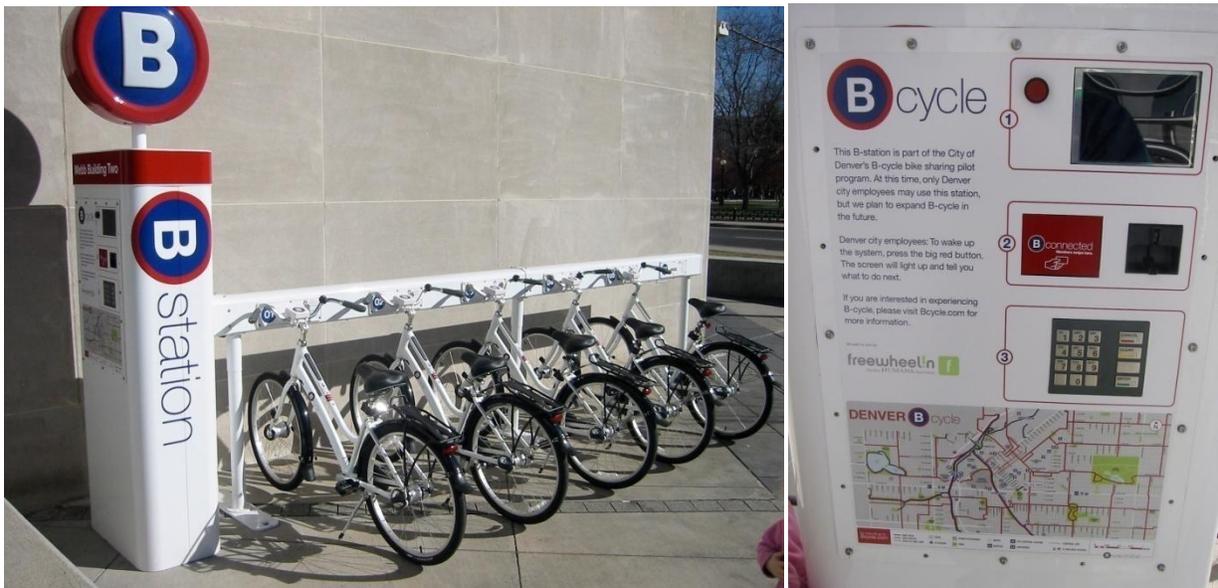


Exhibit 57. One of Denver's Bicycle-Sharing Program bicycle kiosk stations located in front of the Wellington E. Webb Municipal Office Building, Denver

C. Future Regional Products and Activities

DRCOG will continue to encourage pedestrian and bicycle travel as alternative modes of transportation. Future products and activities could include (but are not limited to):

Future Products

- Create and distribute a bicycling map that highlights the regional bicycling routes and multi-use trails throughout the DRCOG area.
 - Update this map and the underlying inventory of bicycle facilities on a regular basis.
 - Develop online applications for viewing and distributing this information.
- Maintain a bicycle and pedestrian planning page through the DRCOG Web site with news, maps, events, and information with regional significance.
- Develop and publish informational brochures on particular pedestrian and bicycle topics, including revisions to the existing DRCOG pamphlets and brochures.

Future Activities

- DRCOG will facilitate regional forums, ad hoc committees, or workgroups as issues pertaining to pedestrian and bicycle transportation arise.

- As necessary, DRCOG will participate in regional efforts that aid in implementing the specific projects and policies of the Pedestrian and Bicycle Element.
- Continue to refine and evaluate the Transportation Improvement Program (TIP) funding process as it pertains to pedestrian and bicycle projects.
- Continue to participate in multi-community pedestrian and bicycle planning efforts (current examples include BikeLinks36 and the Colorado Front Range Trail).
- Participate in multi-community transit connectivity planning activities (as invited or requested by RTD and communities along FasTracks corridors).
- Review Environmental Impact Statements/Assessments (EIS/EA) and other NEPA planning efforts for attention to pedestrian and bicycle modes of travel.
- Further work with communities towards implementing the design considerations and land development principles summarized in Chapters 5 and 6.
- Continue the annual Bike to Work Day and other promotional efforts.
- Update bicycle and pedestrian travel data.
- Incorporate future amendments to the Pedestrian and Bicycle Element into the Metro Vision Regional Transportation Plan.

APPENDIX A

**FHWA POLICY STATEMENT ON ACCOMODATION OF BICYCLES AND
PEDESTRIANS IN TRANSPORTATION PROJECTS**

Accommodating Bicycle and Pedestrian Travel: A Recommended Approach (1999)
A US DOT Policy Statement
Integrating Bicycling and Walking into Transportation Infrastructure

Purpose

Accommodating Bicycle and Pedestrian Travel: A Recommended Approach is a policy statement adopted by the United States Department of Transportation. USDOT hopes that public agencies, professional associations, advocacy groups, and others adopt this approach as a way of committing themselves to integrating bicycling and walking into the transportation mainstream.

The Design Guidance incorporates three key principles:

- a. a policy statement that **bicycling and walking facilities will be incorporated into all transportation projects** unless exceptional circumstances exist;
- b. an approach to achieving this policy that has already worked in State and local agencies; and
- c. a series of action items that a public agency, professional association, or advocacy group can take to achieve the overriding goal of improving conditions for bicycling and walking.

The Policy Statement was drafted by the U.S. Department of Transportation in response to Section 1202 (b) of the Transportation Equity Act for the 21st Century (TEA-21) with the input and assistance of public agencies, professional associations and advocacy groups.

Introduction

Bicycling and walking issues have grown in significance throughout the 1990s. As the new millennium dawns public agencies and public interest groups alike are striving to define the most appropriate way in which to accommodate the two modes within the overall transportation system so that those who walk or ride bicycles can safely, conveniently, and comfortably access every destination within a community.

Public support and advocacy for improved conditions for bicycling and walking has created a widespread acceptance that more should be done to enhance the safety, comfort, and convenience of the nonmotorized traveler. Public opinion surveys throughout the 1990s have demonstrated strong support for increased planning, funding and implementation of shared use paths, sidewalks and on-street facilities.

At the same time, public agencies have become considerably better equipped to respond to this demand. Research and practical experience in designing facilities for bicyclists and pedestrians has generated numerous national, State and local design manuals and resources. An increasing number of professional planners and engineers are familiar with this material and are applying this knowledge in towns and cities across the country.

The 1990 Americans with Disabilities Act, building on an earlier law requiring curb ramps in new, altered, and existing sidewalks, added impetus to improving conditions for sidewalk users. People with disabilities rely on the pedestrian and transit infrastructure, and the links between them, for access and mobility.

Congress and many State legislatures have made it considerably easier in recent years to fund nonmotorized projects and programs (for example, the Intermodal Surface Transportation Efficiency Act and the Transportation Equity Act for the 21st Century), and a number of laws and regulations now mandate certain planning activities and design standards to guarantee the inclusion of bicyclists and pedestrians.

Despite these many advances, injury and fatality numbers for bicyclists and pedestrians remain stubbornly high, levels of bicycling and walking remain frustratingly low, and most communities continue to grow in ways that make travel by means other than the private automobile quite challenging. Failure to provide an accessible pedestrian network for people with disabilities often requires the provision of costly paratransit service. Ongoing investment in the Nation's transportation infrastructure is still more likely to overlook rather than integrate bicyclists and pedestrians.

In response to demands from user groups that every transportation project include a bicycle and pedestrian element, Congress asked the Federal Highway Administration (FHWA) to study various approaches to accommodating the two modes. The Transportation Equity Act for the 21st Century (TEA-21) instructs the Secretary to work with professional groups such as AASHTO, ITE, and other interested parties to recommend policies and standards that might achieve the overall goal of fully integrating bicyclists and pedestrians into the transportation system.

SEC. 1202
**BICYCLE TRANSPORTATION AND
PEDESTRIAN WALKWAYS**

(b) Design Guidance

- (1) **In general.** In implementing section 217(g) of title 23, United States Code, the Secretary, in cooperation with the American Association of State Highway and Transportation Officials, the Institute of Transportation Engineers, and other interested organizations, shall develop guidance on the various approaches to accommodating bicycles and pedestrian travel.
- (2) **Issues to be addressed.** The guidance shall address issues such as the level and nature of the demand, volume, and speed of motor vehicle traffic, safety, terrain, cost, and sight distance.
- (3) **Recommendations.** The guidance shall include recommendations on amending and updating the policies of the American Association of State Highway and Transportation Officials relating to highway and street design standards to accommodate bicyclists and pedestrians.
- (4) **Time period for development.** The guidance shall be developed within 18 months after the date of enactment of this Act.

TEA-21 also says that, "Bicycle transportation facilities and pedestrian walkways shall be considered, where appropriate, in conjunction with all new construction and reconstruction of transportation projects, except where bicycle and pedestrian use are not permitted." (Section 1202)

In August 1998, FHWA convened a Task Force comprising representatives from FHWA, AASHTO, ITE, bicycle and pedestrian user groups, State and local agencies, the U.S. Access Board and representatives of disability organizations to seek advice on how to proceed with developing this guidance. The Task Force reviewed existing and proposed information on the planning and technical design of facilities for bicyclists and pedestrians and concluded that these made creation of another design manual unnecessary. For example, AASHTO published a bicycle design manual in 1999 and is working on a pedestrian facility manual.

The area where information and guidance was most lacking was in determining when to include designated or special facilities for bicyclists and pedestrians in transportation projects. There can also be uncertainty about the type of facility to provide, and the design elements that are required to ensure accessibility.

For example, when a new suburban arterial road is planned and designed, what facilities for bicyclists and pedestrians should be provided? The task force felt that once the decision to provide a particular facility was made, the specific information on designing that facility is generally available. However, the decision on whether to provide sidewalks on neither, one or both sides of the road, or a shoulder, striped bike lane, wide outside lane or separate trail for bicyclists is usually made with little guidance or help.

After a second meeting with the Task Force in January 1999, FHWA agreed to develop a **Policy Statement on Accommodating Bicyclists and Pedestrians in Transportation Projects** to guide State and local agencies in answering these questions. Task Force members recommended against trying to create specific warrants for different facilities (warrants leave little room for engineering judgment and have often been used to avoid providing facilities for bicycling and walking). Instead, the purpose of the Policy Statement is to provide a recommended approach to the accommodation of bicyclists and pedestrians that can be adopted by State and local agencies (as well as professional societies and associations, advocacy groups, and Federal agencies) as a commitment to developing a transportation infrastructure that is safe, convenient, accessible, and attractive to motorized AND nonmotorized users alike. The Policy Statement has four elements:

- a. an acknowledgment of the issues associated with balancing the competing interests of motorized and nonmotorized users;
- b. a recommended policy approach to accommodating bicyclists and pedestrians (including people with disabilities) that can be adopted by an agency or organizations as a statement of policy to be implemented or a target to be reached in the future;

- c. a list of recommended actions that can be taken to implement the solutions and approaches described above; and
- d. further information and resources on the planning, design, operation, and maintenance of facilities for bicyclists and pedestrians.

The Challenge: Balancing Competing Interests

For most of the second half of the 20th Century, the transportation, traffic engineering and highway professions in the United States were synonymous. They shared a singular purpose: building a transportation system that promoted the safety, convenience and comfort of motor vehicles. The post-war boom in car and home ownership, the growth of suburban America, the challenge of completing the Interstate System, and the continued availability of cheap gasoline all fueled the development of a transportation infrastructure focused almost exclusively on the private motor car and commercial truck.

Initially, there were few constraints on the traffic engineer and highway designer. Starting at the centerline, highways were developed according to the number of motor vehicle travel lanes that were needed well into the future, as well as providing space for breakdowns. Beyond that, facilities for bicyclists and pedestrians, environmental mitigation, accessibility, community preservation, and aesthetics were at best an afterthought, often simply overlooked, and, at worst, rejected as unnecessary, costly, and regressive. Many States passed laws preventing the use of State gas tax funds on anything other than motor vehicle lanes and facilities. The resulting highway environment discourages bicycling and walking and has made the two modes more dangerous. Further, the ability of pedestrians with disabilities to travel independently and safely has been compromised, especially for those with vision impairments.

Over time, the task of designing and building highways has become more complex and challenging. Traffic engineers now have to integrate accessibility, utilities, landscaping, community preservation, wetland mitigation, historic preservation, and a host of other concerns into their plans and designs - and yet they often have less space and resources within which to operate and traffic volumes continue to grow.

The additional "burden" of having to find space for pedestrians and bicyclists was rejected as impossible in many communities because of space and funding constraints and a perceived lack of demand. There was also anxiety about encouraging an activity that many felt to be dangerous and fraught with liability issues. Designers continued to design from the centerline out and often simply ran out of space before bike lanes, paved shoulders, sidewalks and other "amenities" could be included.

By contrast, bicycle and pedestrian user groups argue the roadway designer should design highways from the right-of-way limits in, rather than the centerline out. They advocate beginning the design of a highway with the sidewalk and/or trail, including a buffer before the paved shoulder or bike lane, and then allocating the remaining space for motor vehicles. Through this approach, walking and bicycling are positively encouraged, made safer, and included as a critical element in every transportation

project rather than as an afterthought in a handful of unconnected and arbitrary locations within a community.

Retrofitting the built environment often provides even more challenges than building new roads and communities: space is at a premium and there is a perception that providing better conditions for bicyclists and pedestrians will necessarily take away space or convenience from motor vehicles.

During the 1990s, Congress spearheaded a movement towards a transportation system that favors people and goods over motor vehicles with passage of the Intermodal Surface Transportation Efficiency Act (1991) and the Transportation Equity Act for the 21st Century (1998). The call for more walkable, liveable, and accessible communities, has seen bicycling and walking emerge as an "indicator species" for the health and well-being of a community. People want to live and work in places where they can safely and conveniently walk and/or bicycle and not always have to deal with worsening traffic congestion, road rage and the fight for a parking space. Vice President Gore launched a Livability Initiative in 1999 with the ironic statement that "a gallon of gas can be used up just driving to get a gallon of milk."

The challenge for transportation planners, highway engineers and bicycle and pedestrian user groups, therefore, is to balance their competing interest in a limited amount of right-of-way, and to develop a transportation infrastructure that provides access for all, a real choice of modes, and safety in equal measure for each mode of travel.

This task is made more challenging by the widely divergent character of our nation's highways and byways. Traffic speeds and volumes, topography, land use, the mix of road users, and many other factors mean that a four-lane highway in rural North Carolina cannot be designed in the same way as a four-lane highway in New York City, a dirt road in Utah or an Interstate highway in Southern California. In addition, many different agencies are responsible for the development, management, and operation of the transportation system.

In a recent memorandum transmitting Program Guidance on bicycle and pedestrian issues to FHWA Division Offices, the Federal Highway Administrator wrote that "We expect every transportation agency to make accommodation for bicycling and walking a routine part of their planning, design, construction, operations and maintenance activities." The Program Guidance itself makes a number of clear statements of intent:

- Congress clearly intends for bicyclists and pedestrians to have safe, convenient access to the transportation system and sees every transportation improvement as an opportunity to enhance the safety and convenience of the two modes.
- "Due consideration" of bicycle and pedestrian needs should include, at a minimum, a presumption that bicyclists and pedestrians will be accommodated in the design of new and improved transportation facilities.
- To varying extents, bicyclists and pedestrians will be present on all highways and transportation facilities where they are permitted and it is clearly the intent of

TEA-21 that all new and improved transportation facilities be planned, designed and constructed with this fact in mind.

- The decision not to accommodate [bicyclists and pedestrians] should be the exception rather than the rule. There must be exceptional circumstances for denying bicycle and pedestrian access either by prohibition or by designing highways that are incompatible with safe, convenient walking and bicycling.

The Program Guidance defers a suggested definition of what constitutes "exceptional circumstances" until this Policy Statement is completed. However, it does offer interim guidance that includes controlled access highways and projects where the cost of accommodating bicyclists and pedestrians is high in relation to the overall project costs and likely level of use by nonmotorized travelers.

Providing access for people with disabilities is a civil rights mandate that is not subject to limitation by project costs, levels of use, or "exceptional circumstances". While the Americans with Disabilities Act doesn't require pedestrian facilities in the absence of a pedestrian route, it does require that pedestrian facilities, when newly constructed or altered, be accessible.

Policy Statement

1. Bicycle and pedestrian ways shall be established in new construction and reconstruction projects in all urbanized areas unless one or more of three conditions are met:

- bicyclists and pedestrians are prohibited by law from using the roadway. In this instance, a greater effort may be necessary to accommodate bicyclists and pedestrians elsewhere within the right of way or within the same transportation corridor.
- the cost of establishing bikeways or walkways would be excessively disproportionate to the need or probable use. Excessively disproportionate is defined as exceeding twenty percent of the cost of the larger transportation project.
- where sparsity of population or other factors indicate an absence of need. For example, the Portland Pedestrian Guide requires "all construction of new public streets" to include sidewalk improvements on both sides, unless the street is a cul-de-sac with four or fewer dwellings or the street has severe topographic or natural resource constraints.

2. In rural areas, paved shoulders should be included in all new construction and reconstruction projects on roadways used by more than 1,000 vehicles per day, as in States such as Wisconsin. Paved shoulders have safety and operational advantages for all road users in addition to providing a place for bicyclists and pedestrians to operate.

Rumble strips are not recommended where shoulders are used by bicyclists unless there is a minimum clear path of four feet in which a bicycle may safely operate.

3. Sidewalks, shared use paths, street crossings (including over- and undercrossings), pedestrian signals, signs, street furniture, transit stops and facilities, and all connecting pathways shall be designed, constructed, operated and maintained so that all pedestrians, including people with disabilities, can travel safely and independently.

4. The design and development of the transportation infrastructure shall improve conditions for bicycling and walking through the following additional steps:

- planning projects for the long-term. Transportation facilities are long-term investments that remain in place for many years. The design and construction of new facilities that meet the criteria in item 1) above should anticipate likely future demand for bicycling and walking facilities and not preclude the provision of future improvements. For example, a bridge that is likely to remain in place for 50 years, might be built with sufficient width for safe bicycle and pedestrian use in anticipation that facilities will be available at either end of the bridge even if that is not currently the case
- addressing the need for bicyclists and pedestrians to cross corridors as well as travel along them. Even where bicyclists and pedestrians may not commonly use a particular travel corridor that is being improved or constructed, they will likely need to be able to cross that corridor safely and conveniently. Therefore, the design of intersections and interchanges shall accommodate bicyclists and pedestrians in a manner that is safe, accessible and convenient.
- getting exceptions approved at a senior level. Exceptions for the non-inclusion of bikeways and walkways shall be approved by a senior manager and be documented with supporting data that indicates the basis for the decision.
- designing facilities to the best currently available standards and guidelines. The design of facilities for bicyclists and pedestrians should follow design guidelines and standards that are commonly used, such as the AASHTO *Guide for the Development of Bicycle Facilities*, AASHTO's *A Policy on Geometric Design of Highways and Streets*, and the ITE Recommended Practice "*Design and Safety of Pedestrian Facilities*".

Policy Approach

"Rewrite the Manuals" Approach

Manuals that are commonly used by highway designers covering roadway geometrics, roadside safety, and bridges should incorporate design information that integrates safe and convenient facilities for bicyclists and pedestrians -- including people with disabilities - into all new highway construction and reconstruction projects.

In addition to incorporating detailed design information - such as the installation of safe and accessible crossing facilities for pedestrians, or intersections that are safe and convenient for bicyclists - these manuals should also be amended to provide flexibility to the highway designer to develop facilities that are in keeping with transportation needs, accessibility, community values, and aesthetics. For example, the Portland Pedestrian Design Guide (June 1998) applies to every project that is designed and built in the city, but the Guide also notes that:

- "Site conditions and circumstances often make applying a specific solution difficult. The Pedestrian Design Guide should reduce the need for ad hoc decision by providing a published set of guidelines that are applicable to most situations. Throughout the guidelines, however, care has been taken to provide flexibility to the designer so she or he can tailor the standards to unique circumstances. Even when the specific guideline cannot be met, the designer should attempt to find the solution that best meets the pedestrian design principles described [on the previous page]"

In the interim, these manuals may be supplemented by stand-alone bicycle and pedestrian facility manuals that provide detailed design information addressing on-street bicycle facilities, fully accessible sidewalks, crosswalks, and shared use paths, and other improvements.

Examples: Florida DOT has integrated bicycle and pedestrian facility design information into its standard highway design manuals and New Jersey DOT is in the process of doing so. Many States and localities have developed their own bicycle and pedestrian facility design manuals, some of which are listed in the final section of this document.

Applying Engineering Judgment to Roadway Design

In rewriting manuals and developing standards for the accommodation of bicyclists and pedestrians, there is a temptation to adopt "typical sections" that are applied to roadways without regard to travel speeds, lane widths, vehicle mix, adjacent land uses, traffic volumes and other critical factors. This approach can lead to inadequate provision on major roads (e.g. a four foot bike lane or four foot sidewalk on a six lane high-speed urban arterial) and the over-design of local and neighborhood streets (e.g. striping bike lanes on low volume residential roads) , and leaves little room for engineering judgment.

After adopting the policy that bicyclists and pedestrians (including people with disabilities) will be fully integrated into the transportation system, State and local governments should encourage engineering judgment in the application of the range of available treatments.

For example:

- Collector and arterial streets shall typically have a minimum of a four foot wide striped bicycle lane, however wider lanes are often necessary in locations with parking, curb and gutter, heavier and/or faster traffic.
- Collector and arterial streets shall typically have a minimum of a five foot sidewalk on both sides of the street, however wider sidewalks and landscaped buffers are necessary in locations with higher pedestrian or traffic volumes, and/or higher vehicle speeds. At intersections, sidewalks may need to be wider to accommodate accessible curb ramps.
- Rural arterials shall typically have a minimum of a four foot paved shoulder, however wider shoulders (or marked bike lanes) and accessible sidewalks and crosswalks are necessary within rural communities and where traffic volumes and speeds increase.

This approach also allows the highway engineer to achieve the performance goal of providing safe, convenient, and comfortable travel for bicyclists and pedestrians by other means. For example, if it would be inappropriate to add width to an existing roadway to stripe a bike lane or widen a sidewalk, traffic calming measures can be employed to reduce motor vehicle speeds to levels more compatible with bicycling and walking.

Actions

The United States Department of Transportation encourages States, local governments, professional associations, other government agencies and community organizations to adopt this Policy Statement as an indication of their commitment to accommodating bicyclists and pedestrians as an integral element of the transportation system. By so doing, the organization or agency should explicitly adopt one, all, or a combination of the various approaches described above AND should be committed to taking some or all of the actions listed below as appropriate for their situation.

- a. Define the exceptional circumstances in which facilities for bicyclists and pedestrians will NOT be required in all transportation projects.
- b. Adopt new manuals, or amend existing manuals, covering the geometric design of streets, the development of roadside safety facilities, and design of bridges and their approaches so that they comprehensively address the development of bicycle and pedestrian facilities as an integral element of the design of all new and reconstructed roadways.
- c. Adopt stand-alone bicycle and pedestrian facility design manuals as an interim step towards the adoption of new typical sections or manuals covering the design of streets and highways.
- d. Initiate an intensive re-tooling and re-education of transportation planners and engineers to make them conversant with the new information required to accommodate bicyclists and pedestrians. Training should be made available for, if not required of, agency traffic engineers and consultants who perform work in this field.

Conclusion

There is no question that conditions for bicycling and walking need to be improved in every community in the United States; it is no longer acceptable that 6,000 bicyclists and pedestrians are killed in traffic every year, that people with disabilities cannot travel without encountering barriers, and that two desirable and efficient modes of travel have been made difficult and uncomfortable.

Every transportation agency has the responsibility and the opportunity to make a difference to the bicycle-friendliness and walkability of our communities. The design information to accommodate bicyclists and pedestrians is available, as is the funding. The United States Department of Transportation is committed to doing all it can to improve conditions for bicycling and walking and to make them safer ways to travel.

Further Information and Resources

General Design Resources

A Policy on Geometric Design of Highways and Streets, 1994 (The Green Book). American Association of State Highway and Transportation Officials (AASHTO), P.O. Box 96716, Washington, DC, 20090-6716, Phone: (888) 227-4860.

Highway Capacity Manual, Special Report 209, 1994. Transportation Research Board, Box 289, Washington, DC 20055, Phone: (202) 334-3214. Next Edition: FHWA Research Program project has identified changes to HCM related to bicycle and pedestrian design.

Manual on Uniform Traffic Control Devices, 1988. Federal Highway Administration (FHWA), Superintendent of Documents. P.O. Box 371954, Pittsburgh, PA 15250-7954. Next Edition: 2000, will incorporate changes to Part IX that will soon be subject of Notice of Proposed Rulemaking.

Flexibility in Highway Design, 1997. FHWA. HEP 30, 400 Seventh Street SW, Washington, DC 20590.

Pedestrian Facility Design Resources

Design and Safety of Pedestrian Facilities, A Recommended Practice, 1998. Institute of Transportation Engineers, 525 School Street, S.W, Suite 410, Washington, DC 20024-2729, Phone: (202) 554-8050.

Pedestrian Compatible Roadways-Planning and Design Guidelines, 1995. Bicycle / Pedestrian Transportation Master Plan, Bicycle and Pedestrian Advocate, New Jersey Department of Transportation, 1035 Parkway Avenue, Trenton, NJ 08625, Phone: (609) 530-4578.

Improving Pedestrian Access to Transit: An Advocacy Handbook, 1998. Federal Transit Administration / WalkBoston. NTIS, 5285 Port Royal Road, Springfield, VA 22161.

Planning and Implementing Pedestrian Facilities in Suburban and Developing Rural Areas, Report No. 294A, Transportation Research Board, Box 289, Washington, DC 20055, Phone: (202) 334-3214.

Pedestrian Facilities Guidebook, 1997. Washington State Department of Transportation, Bicycle and Pedestrian Program, P.O. Box 47393, Olympia, WA 98504.

Portland Pedestrian Design Guide, 1998. Portland Pedestrian Program, 1120 SW Fifth Ave, Room 802; Portland, OR 97210. (503) 823-7004.

* *Implementing Pedestrian Improvements at the Local Level*, 1999. FHWA, HSR 20, 6300 Georgetown Pike, McLean, VA .

* *AASHTO Guide to the Development of Pedestrian Facilities*, 2000. AASHTO. (currently under discussion)

Bicycle Facility Design Resources

Guide for the Development of Bicycle Facilities, 1999., American Association of State Highway and Transportation Officials (AASHTO), P.O. Box 96716, Washington, DC, 20090-6716, Phone: (888) 227-4860.

Implementing Bicycle Improvements at the Local Level, (1998), FHWA, HSR 20, 6300 Georgetown Pike, McLean, VA .

Bicycle Facility Design Standards, 1998. City of Philadelphia Streets Department, 1401 JFK Boulevard, Philadelphia, PA 19103.

Selecting Roadway Design Treatments to Accommodate Bicyclists, 1993. FHWA, R&T Report Center, 9701 Philadelphia Ct, Unit Q; Lanham, MD 20706. (301) 577-1421 (fax only)

North Carolina Bicycle Facilities Planning and Design Guidelines, 1994. North Carolina DOT, P.O. Box 25201, Raleigh, NC 27611. (919) 733-2804.

Bicycle Facility Planning, 1995. Pinsof & Musser. American Planning Association, Planning Advisory Service Report # 459. American Planning Association, 122 S. Michigan Ave, Suite 1600; Chicago, IL 60603.

Florida Bicycle Facilities Planning and Design Manual, 1994. Florida DOT, Pedestrian and Bicycle Safety Office, 605 Suwannee Street, Tallahassee, FL 32399.

Evaluation of Shared-use Facilities for Bicycles and Motor Vehicles, 1996. Florida DOT, Pedestrian and Bicycle Safety Office, 605 Suwannee Street, Tallahassee, FL 32399.

Bicycle and Pedestrian Design Resources

Oregon Bicycle and Pedestrian Plan, 1995. Oregon Department of Transportation, Bicycle and Pedestrian Program, Room 210, Transportation Building, Salem, OR 97310, Phone: (503) 986-3555

Improving Conditions for Bicyclists and Pedestrians, A Best Practices Report, 1998. FHWA, HEP 10, 400 Seventh Street SW, Washington, DC 20590.

Traffic Calming Design Resources

Traffic Calming: State of the Practice. 1999. Institute of Transportation Engineers, 525 School Street, SW, Suite 410; Washington, DC 20024.

Florida Department of Transportation's Roundabout Guide. Florida Department of Transportation, 605 Suwannee St., MS-82, Tallahassee, FL 32399-0450.

National Bicycling and Walking Study. Case Study # 19, Traffic Calming and Auto-Restricted Zones and other Traffic Management Techniques-Their Effects on Bicycling and Pedestrians, Federal Highway Administration (FHWA).

Traffic Calming (1995), American Planning Association, 122 South Michigan Avenue, Chicago, IL 60603

Traditional Neighborhood Development Street Design Guidelines, 1997. Proposed Recommended Practice, Institute of Transportation Engineers, 525 School Street, SW, Suite 410; Washington, DC 20024.

Making Streets that Work, City of Seattle, 600 Fourth Ave., 12th Floor, Seattle, WA 98104-1873, Phone: (206) 684-4000, Fax: (206) 684-5360.

Traffic Control Manual for In-Street Work, 1994. Seattle Engineering Department, City of Seattle, 600 4th Avenue, Seattle, WA 98104-6967, Phone: (206) 684-5108.

ADA-related Design Resources

Accessible Pedestrian Signals, 1998. U.S. Access Board 1331 F Street NW, Suite 1000; Washington, DC 20004. (800) 872-2253.

Accessible Rights of Way: A Design Manual, 1999. U.S. Access Board, 1331 F Street NW, Suite 1000; Washington, DC 20004. (800) 872-2253.

Designing Sidewalks and Trails for Access, Part One. 1999. FHWA, HEPH-30, 400 Seventh Street SW, Washington, DC 20590.

ADA Accessibility Guidelines for Buildings and Facilities, 1998 (ADAAG). U.S. Access Board, 1331 F Street NW, Suite 1000; Washington, DC 20004. (800) 872-2253.

Uniform Federal Accessibility Standards, 1984 (UFAS), available from the U.S. Access Board, 1331 F Street NW, Suite 1000; Washington, DC 20004. (800) 872-2253

Universal Access to Outdoor Recreation: A Design Guide, 1993. PLAE, Inc, MIG Communications, 1802 Fifth Street, Berkeley, CA 94710. (510) 845-0953.

Recommended Street Design Guidelines for People Who Are Blind or Visually Impaired. American Council of the Blind, 1155 15th Street NW, Suite 720; Washington, DC 20005. (202) 467-5081.

Trail Design Resources

Trails for the 21st Century, 1993. Rails to Trails Conservancy, 1100 17th Street NW, 10th Floor, Washington DC 20036. (202) 331-9696.

Greenways: A Guide to Planning, Design, and Development, 1993. The Conservation Fund. Island Press, 1718 Connecticut Ave NW, Suite 300; Washington, DC 20009.

Trail Intersection Design Guidelines, 1996. Florida Department of Transportation, 605 Suwannee St., MS-82, Tallahassee, FL 32399-0450.

* Indicates publication not yet available

APPENDIX B
PEDESTRIAN AND BICYCLING QUESTIONNAIRES



Pedestrian Questionnaire



What are your thoughts on pedestrian issues in the Denver region?

The Denver Regional Council of Governments (DRCOG) is updating its Pedestrian and Bicycle Element of the Regional Transportation Plan. This Plan will set regional policies, inventory existing pedestrian facilities, and set guidelines for future improvements of sidewalks, paths, and pedestrian amenities. Please let us know your views by completing the questionnaire below.

1. In good weather conditions, about how often do you walk, wheelchair, etc to **places like work, school, the store, or the bus?**

<u>176</u> Daily	<u>48</u> Rarely
<u>132</u> Weekly	<u>16</u> Never
<u>41</u> Monthly	

2. In good weather conditions, about how often do you walk, wheelchair, etc to **for fun, recreation, or exercise?**

<u>198</u> Daily	<u>15</u> Rarely
<u>169</u> Weekly	<u>4</u> Never
<u>27</u> Monthly	

3. What do you **use the most?** (CHECK MAXIMUM OF TWO)

<u>362</u> Sidewalks
<u>39</u> Worn footpaths along side of road
<u>46</u> Roadways (in street or on shoulder)
<u>173</u> Off-street trails (e.g., shared with bicyclists and other users)
<u>82</u> Walk through parks, fields, etc
___ Other: _____

4. What **personal and environmental factors limit** you from walking, wheelchairs, etc more often? RATE EACH OF THE FOLLOWING FACTORS FROM 1 TO 5 (1 = not a factor, 5 = very important):

<u>1.4</u> Physical (health)	<u>2.2</u> Concerned about personal security (personal assault, crime)
<u>1.2</u> Don't enjoy physical activity	<u>2.2</u> Not enough daylight
<u>1.3</u> Concerned about personal appearance	<u>2.8</u> Weather conditions
<u>2.6</u> Inattentive or aggressive drivers	<u>1.5</u> Terrain (steep hills)
<u>2.0</u> Need a car for my job	___ Other: _____
<u>1.7</u> Lack of shower/dressing facilities at destinations	

5. What **transportation system factors limit** you from walking, wheelchairs, etc more often? RATE EACH OF THE FOLLOWING FACTORS FROM 1 TO 5 (1 = not a factor, 5 = very important):

<u>2.4</u> Not enough sidewalks	<u>1.2</u> Sidewalks/pathways too difficult for wheelchairs
<u>2.8</u> Crossing major barriers (freeways, rivers, etc)	<u>3.1</u> Distance/Time to walk to destinations
<u>2.2</u> Streets are too wide to cross	<u>2.2</u> Poor maintenance of sidewalks or routes across
<u>2.4</u> Signal does not provide enough time get across	

- 2.2 Surface ends abruptly (not continuous) (pavement cracks, gravel, etc)
- 2.3 Not enough off-street trails 2.3 Inadequate lighting
- 2.4 No separation between sidewalk and roadway 2.3 Poor transit connections
- 1.2 Lack of useable wheelchair ramps _____ Other:_____

6. What would **encourage** you to walk, wheelchair, etc more often?
 RATE EACH OF THE FOLLOWING FACTORS FROM 1 TO 5 (1 = not a factor, 5 = very important):

- 2.9 More underpasses/overpasses 2.6 Better maintenance of the sidewalk system
- 3.5 Improved crossings of busy streets 2.6 Slow down traffic
- 3.3 More sidewalks along busy streets 2.0 Provide more showers & lockers at work, etc
- 3.0 Construct wider sidewalks 2.5 More attractive views along sidewalks (storefronts, etc)
- 3.1 Separate sidewalks from the road 2.8 More pedestrian activity on sidewalks (safety)
- 3.3 New off-street trails 2.4 Education on pedestrian and motor vehicle safety
- 3.1 Better links to or between sidewalks/paths 3.3 Stronger enforcement of traffic violations by motorists
- 2.6 Better access to RTD *bus* stops/stations 2.2 Stronger enforcement of traffic violations by pedestrians
- 2.5 Better access to RTD *light rail* stations 2.9 High gas prices
- 1.6 Improve access for persons with disabilities _____ Other:_____

7. **Transit:**

How often do you use the RTD Transit System? (CHECK ONE)

- 104 Daily
- 71 Weekly
- 81 Monthly
- 112 Yearly or less
- 34 Never

Optional:

What is your home ZIP code? _____ What is your age? 42 (ave) Gender? M 40% F 60%

Do you consider yourself to be: 343 White (Caucasian) 6 Black (African-American)
16 Hispanic 8 Asian/Pacific Islander 4 American Indian 6 Other

Do you have an impairment in: 6 mobility 8 seeing 5 hearing 0 cognitive?

Would you like to make any other comments regarding pedestrian issues in the Denver region?

Thank You!

This questionnaire can be returned to us in any of the following ways:

- ✓ Fold, tape, and mail the postage-paid questionnaire back to our office;
- ✓ Fax the questionnaire to our office at 303-480-6790;
- ✓ Drop off the questionnaire at DRCOG offices; or

Complete the questionnaire online at www.drcog.org/bikeped



Fold here and seal with tape



Bicycling Questionnaire



What are your thoughts on bicycling in the Denver region?

The Denver Regional Council of Governments (DRCOG) is updating its Pedestrian and Bicycle Element of the Regional Transportation Plan. This Plan will set regional policies, inventory existing bicycle facilities, and set guidelines for future bicycling improvements. Please let us know your views by completing the questionnaire below.

1. In good weather conditions, about how often do you ride a bicycle to get **to a place like work, school, the store, etc?**

- | | |
|----------------------------------|-------------------------------------|
| <u>875</u> Once per week or more | <u>173</u> Few times a year or less |
| <u>140</u> Once per month | <u>59</u> Never |

2. In good weather conditions, about how often do you ride a bicycle **for fun, recreation, or exercise?**

- | | |
|----------------------------------|------------------------------------|
| <u>971</u> Once per week or more | <u>95</u> Few times a year or less |
| <u>161</u> Once per month | <u>20</u> Never |

3. What do you **use the most?** (CHECK MAXIMUM OF TWO)

- 676 Roads
- 566 Bike Lanes (striped lane dedicated to bicycles on roadways)
- 724 Off-street trails (e.g., bike paths shared with pedestrians and other users)
- 166 Sidewalks
- 12 Do not ride/Other: _____

4. What **personal and environmental factors limit** you from bicycling more often?

RATE EACH OF THE FOLLOWING FACTORS FROM 1 TO 5 (1 = not a factor, 5 = very important):

- | | |
|---|--|
| <u>1.5</u> Physical (health) | <u>1.7</u> Concerned about personal security (personal assault, crime) |
| <u>1.4</u> My bicycle needs repairs | <u>2.0</u> Concerned about bicycle theft |
| <u>1.0</u> Don't know how to ride a bicycle | <u>1.7</u> Need a car for my job |
| <u>1.1</u> Don't own/have access to a bicycle | <u>2.0</u> Not enough daylight |
| <u>1.1</u> Don't enjoy physical activity | <u>2.8</u> Weather conditions |
| <u>1.4</u> Concerned about personal appearance | <u>1.6</u> Terrain (steep hills) |
| <u>3.1</u> Inattentive or aggressive drivers | ___ Other: _____ |
| <u>2.1</u> Lack of shower/dressing facilities at destinations | |

5. What **transportation system factors limit** you from bicycling more often?

RATE EACH OF THE FOLLOWING FACTORS FROM 1 TO 5 (1 = not a factor, 5 = very important):

- | | |
|---|--|
| <u>2.4</u> Crossing barriers (freeways, rivers, etc) | <u>2.1</u> Lack of secure bike storage/parking |
| <u>2.7</u> Route/lane/path ends abruptly (not continuous) | <u>1.7</u> Bicycle rack on RTD bus is full |
| <u>2.8</u> Not enough off-street multiuse paths | <u>1.7</u> Poor transit connections |
| <u>3.0</u> Not enough on-street bicycle routes/lanes | <u>2.7</u> Speed of motor vehicles |

- | | |
|---|-------------------------------------|
| <u>2.5</u> No good bicycle routes to my destinations | <u>2.9</u> Number of motor vehicles |
| <u>2.4</u> Distance/Time to ride bicycle to destinations | <u>3.0</u> Narrow roadway lanes |
| <u>2.4</u> Poor maintenance of roads or bicycle paths (gravel, potholes, etc) | ____ Other: _____ |

6. What **encourages** you to bicycle more often?

RATE EACH OF THE FOLLOWING FACTORS FROM 1 TO 5 (1 = not a factor, 5 = very important):

- | | |
|--|--|
| <u>3.8</u> New off-street multi-use paths | <u>3.0</u> Sign more Bicycle Routes |
| <u>3.9</u> Wider curb lanes on roadways | <u>2.8</u> Slow down traffic |
| <u>3.7</u> Construct more roadway shoulders | <u>2.6</u> Provide showers & lockers at work, etc |
| <u>3.9</u> Stripe more Bike Lanes | <u>2.5</u> More bicycle racks at destination |
| <u>3.3</u> More bridges across highways and rivers | <u>2.4</u> More bicycle lockers at destination |
| <u>2.2</u> Better access to RTD <i>bus</i> stops/stations | <u>1.8</u> Education on bicycle safety and how to ride a bicycle effectively |
| <u>2.2</u> Better access to RTD <i>light rail</i> stations | <u>3.2</u> Stronger enforcement of traffic violations by motorists |
| <u>3.0</u> Better maintenance of the bicycle system | <u>2.5</u> Stronger enforcement of traffic violations by bicyclists |
| <u>3.3</u> Better links to or between Routes/lanes/trails | <u>3.2</u> High gas prices |
| <u>2.8</u> Better maps | ____ Other: _____ |

7. **Transit:**

- A. How often do you use the RTD Transit System? (CHECK ONE)
- | |
|---------------------------|
| <u>191</u> Daily |
| <u>171</u> Weekly |
| <u>272</u> Monthly |
| <u>371</u> Yearly or less |
| <u>220</u> Never |
- B. Have you ever traveled with your bicycle on an RTD bus or light rail train?
- | |
|--|
| <u>473</u> Yes |
| <u>736</u> No |
| <u>16</u> Didn't know I could do this! |
- C. Have you ever parked your bicycle at an RTD bus station, light rail station, or park-n-ride? (CHECK ALL THAT APPLY)
- | |
|--------------------------------|
| <u>193</u> Yes (bicycle rack) |
| <u>21</u> Yes (bicycle locker) |
| <u>979</u> No |

Optional:

What is your home ZIP code? _____	What is your age? <u>41 (ave)</u>	Gender? M <u>63%</u> F <u>37%</u>
--------------------------------------	--------------------------------------	--------------------------------------

Do you consider yourself to be: **1,032** White (Caucasian) **9** Black (African-American)
40 Hispanic **15** Asian/Pacific Islander **9** American Indian **27** Other

Do you have an impairment in: **9** mobility **23** seeing **13** hearing **2** cognitive?

Would you like to make any other comments regarding bicycling issues in the Denver region? _____

Thank You!

This questionnaire can be returned to us in any of the following ways:

- ✓ Fold, tape, and mail the postage-paid questionnaire back to our office;
- ✓ Fax the questionnaire to our office at 303-480-6790;
- ✓ Drop off the questionnaire at DRCOG offices; or
- ✓ Complete the questionnaire online at www.drcog.org/bikeped

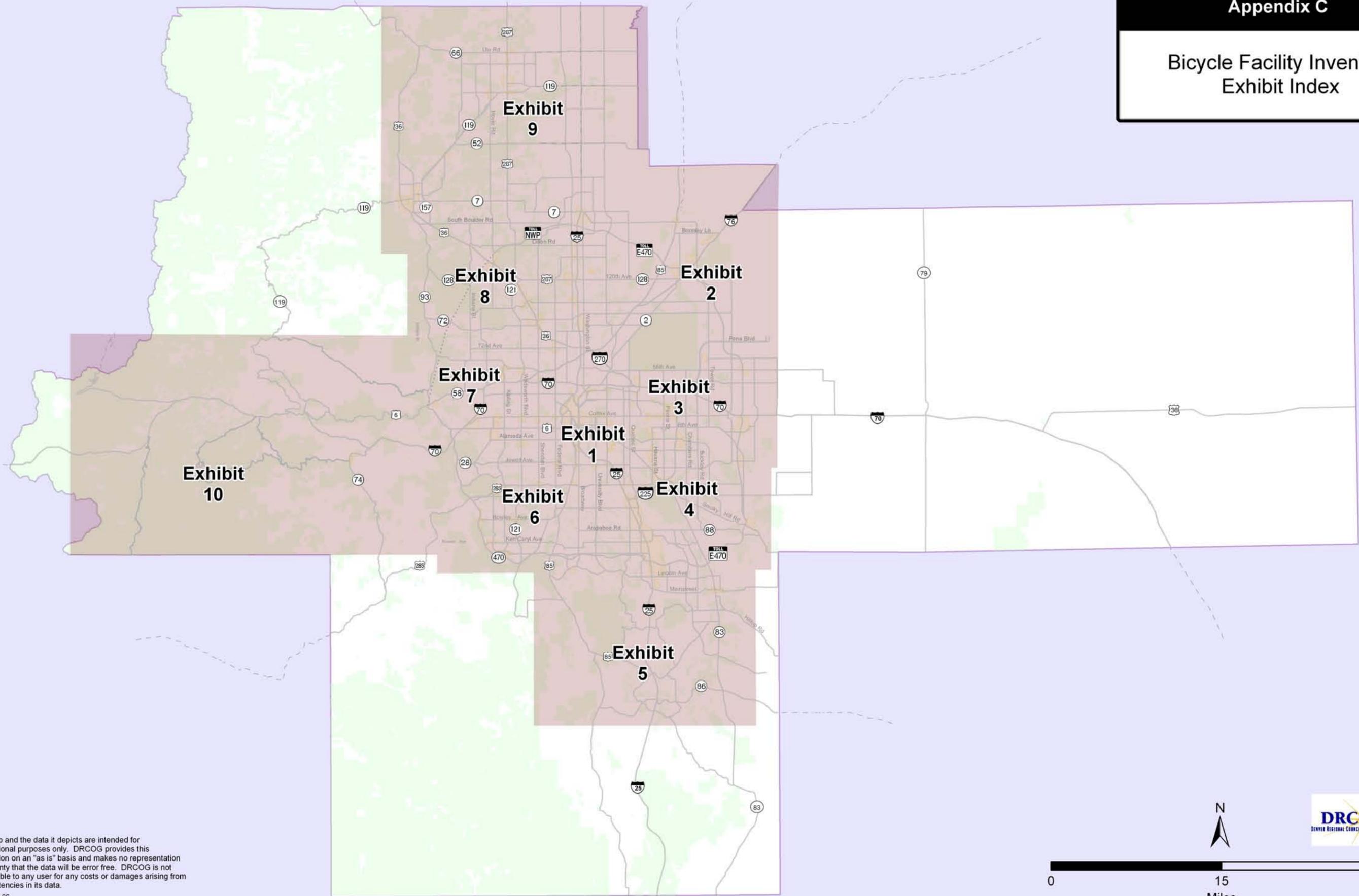


7/25/06, WRO

Fold here and seal with tape

APPENDIX C
BICYCLE FACILITY INVENTORY

Bicycle Facility Inventory
Exhibit Index



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MN 10-31-06
DS 04-21-09

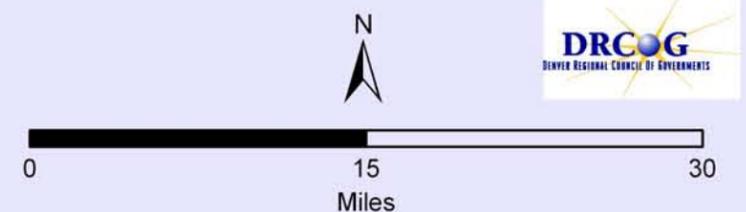
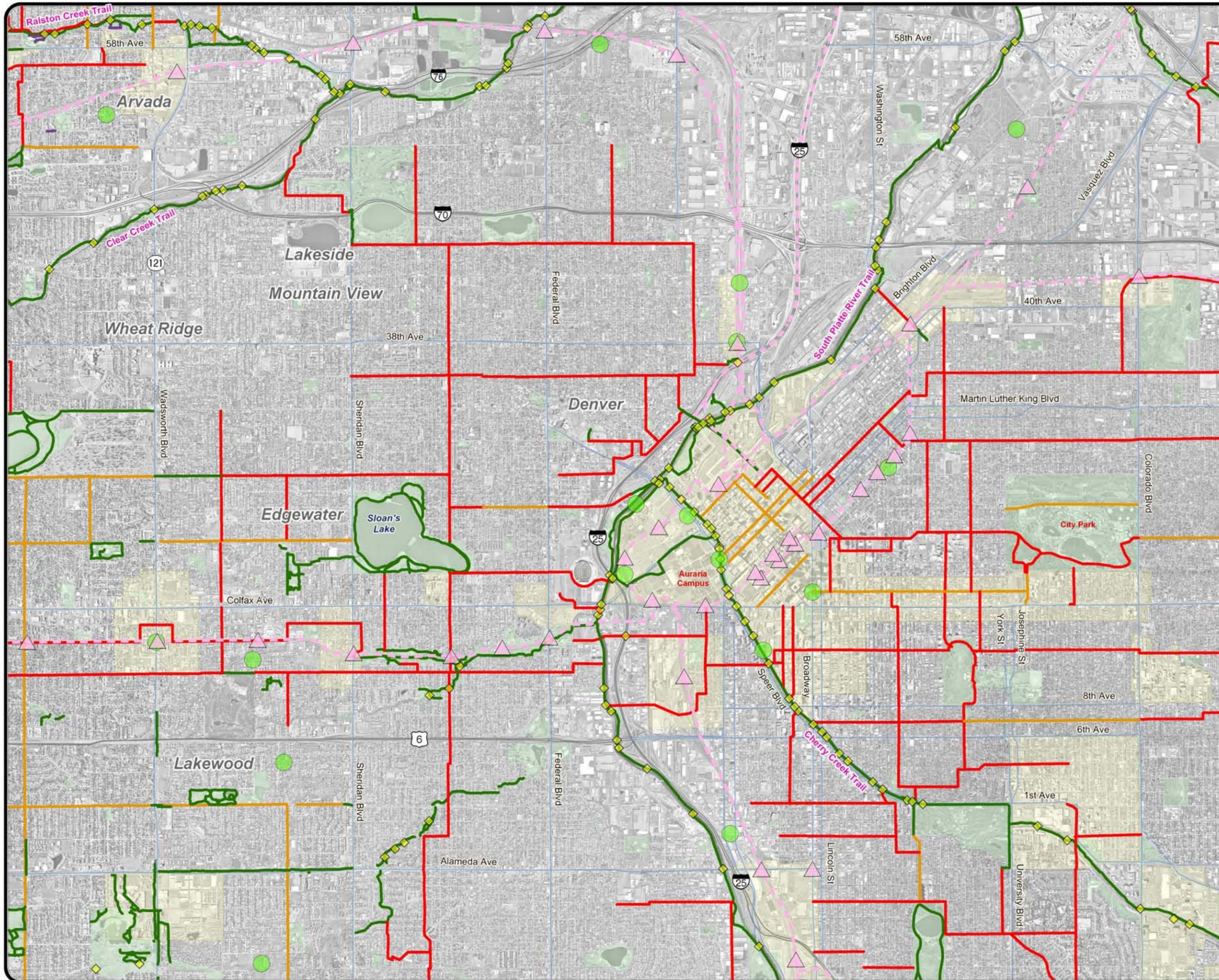
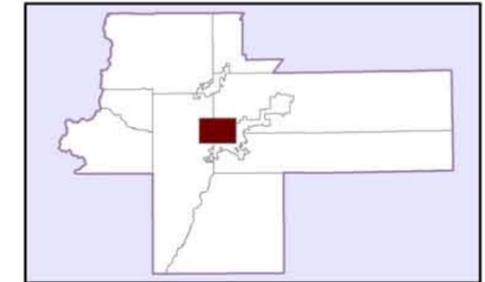


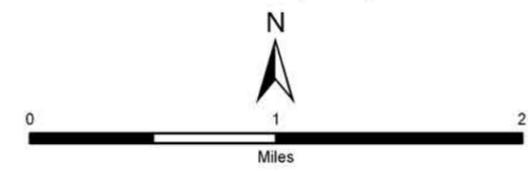
Exhibit 1
Central Metro Area



- Existing Bicycle Facilities**
- On-Street Bike Lanes
 - On-Street Signed Bicycle Route
 - Off-Street Multi-Use Trail
 - Neighborhood Trails
 - Bicycle/Pedestrian over/underpass
 - Possible Missing Link Locations

- Transit System (existing + planned)**
- Rapid Transit Corridor
 - Transit Stations (including all park-n-Ride Lots)

- Land Use & Infrastructure**
- Freeway
 - Major Regional/Principal Arterial
 - Urban Center
 - Parks and Open Space (2004)

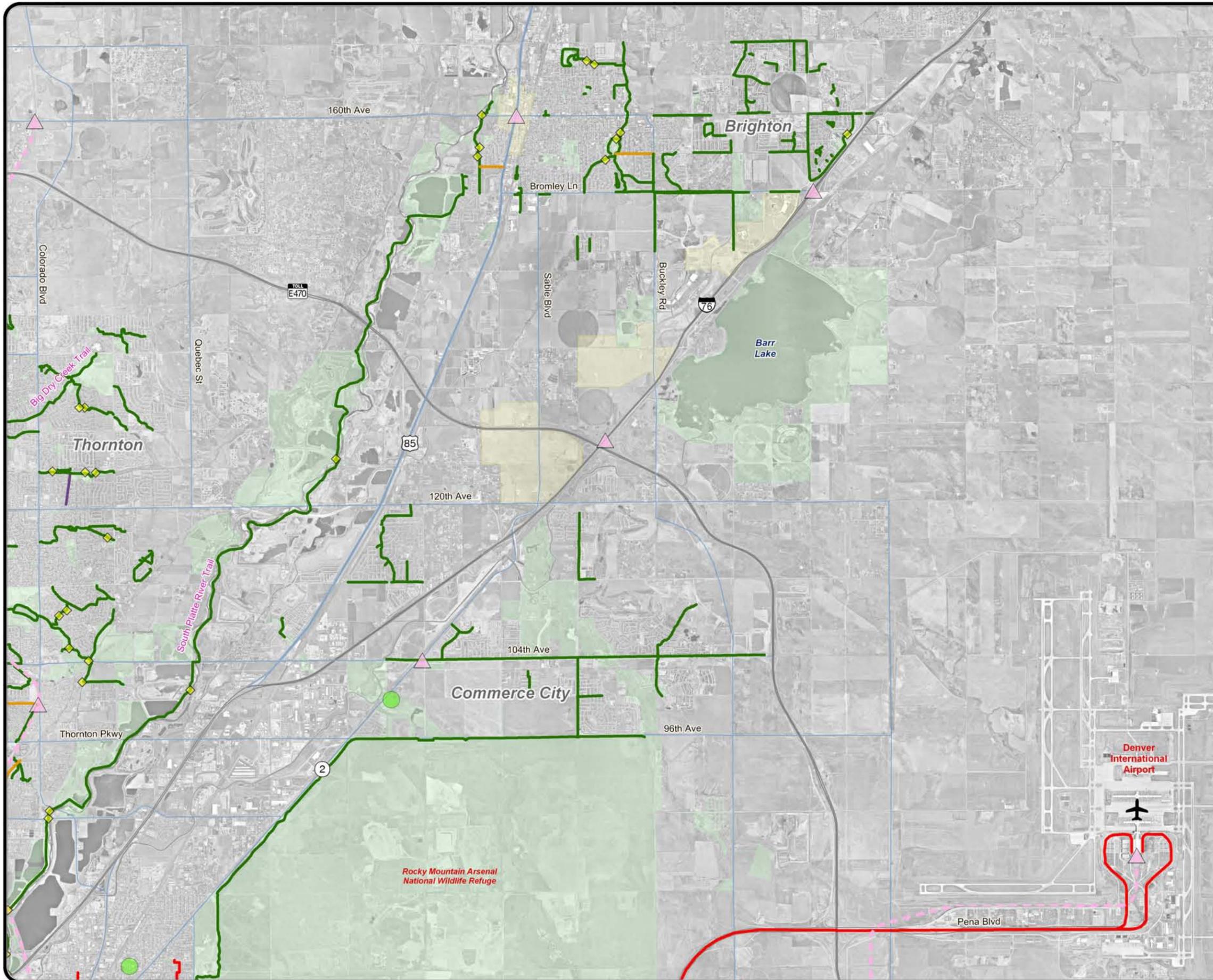
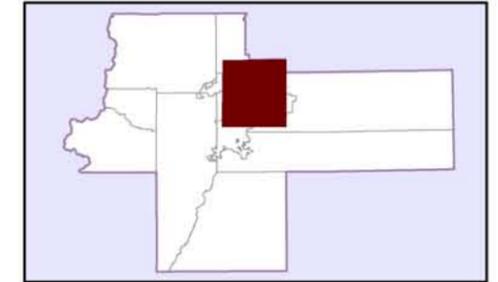


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PJ 3/16/09
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Exhibit 2
Northeast Metro Area



Existing Bicycle Facilities

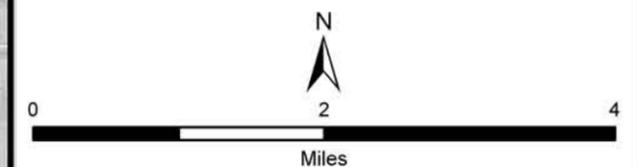
-  On-Street Bike Lanes
-  On-Street Signed Bicycle Route
-  Off-Street Multi-Use Trail
-  Neighborhood Trails
-  Bicycle/Pedestrian over/underpass
-  Possible Missing Link Locations

Transit System (existing + planned)

-  Rapid Transit Corridor
-  Transit Stations (including all park-n-Ride Lots)

Land Use & Infrastructure

-  Freeway
-  Major Regional/Principal Arterial
-  Urban Center
-  Parks and Open Space (2004)

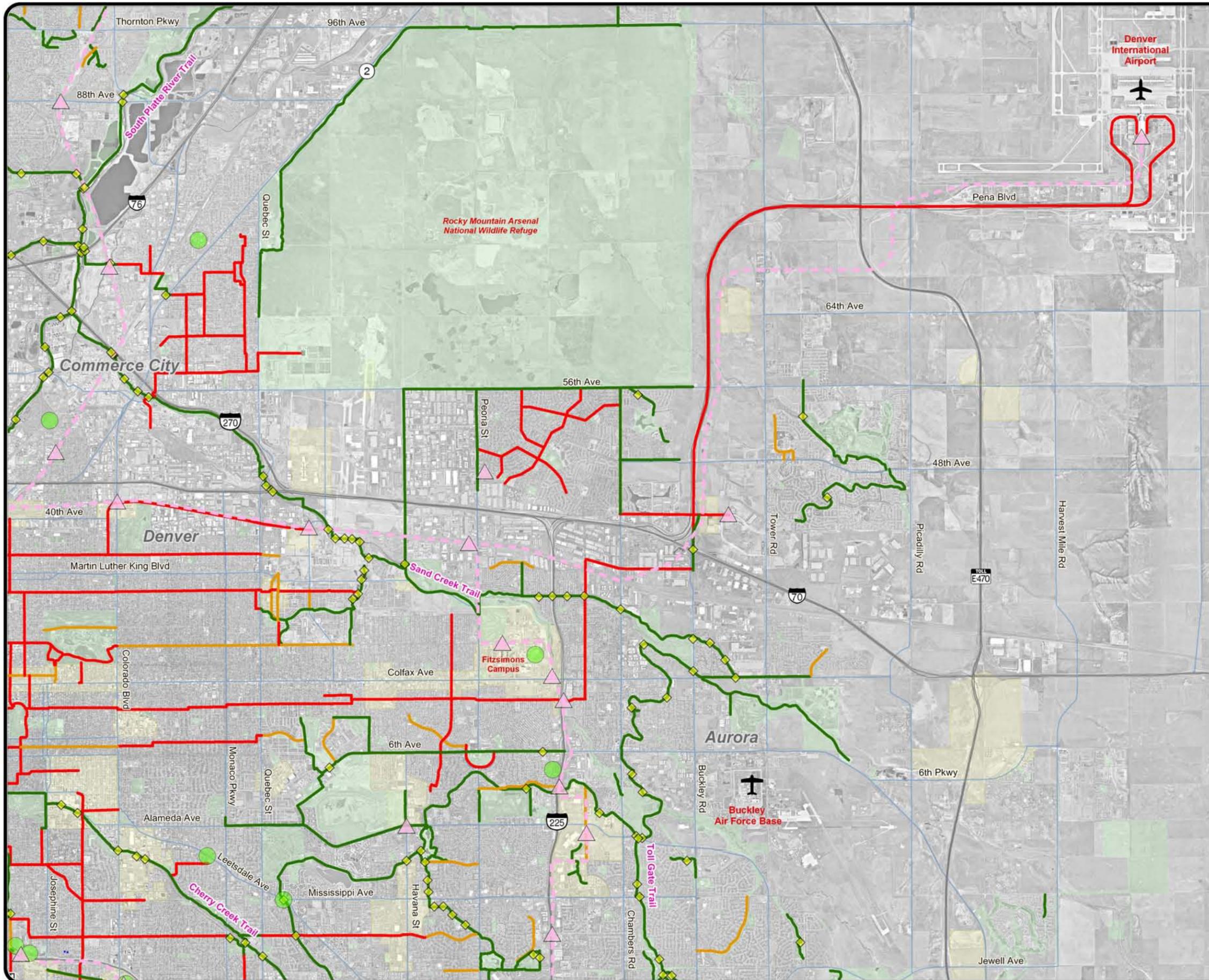


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RJ 31809
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Exhibit 3
East Metro Area



Existing Bicycle Facilities

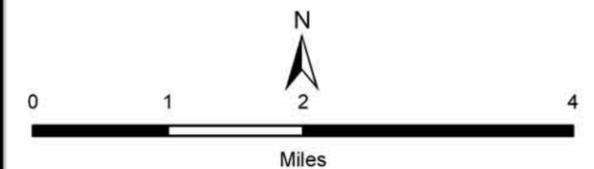
- On-Street Bike Lanes
- On-Street Signed Bicycle Route
- Off-Street Multi-Use Trail
- Neighborhood Trails
- ◆ Bicycle/Pedestrian over/underpass
- Possible Missing Link Locations

Transit System (existing + planned)

- - - Rapid Transit Corridor
- ▲ Transit Stations (including all park-n-Ride Lots)

Land Use & Infrastructure

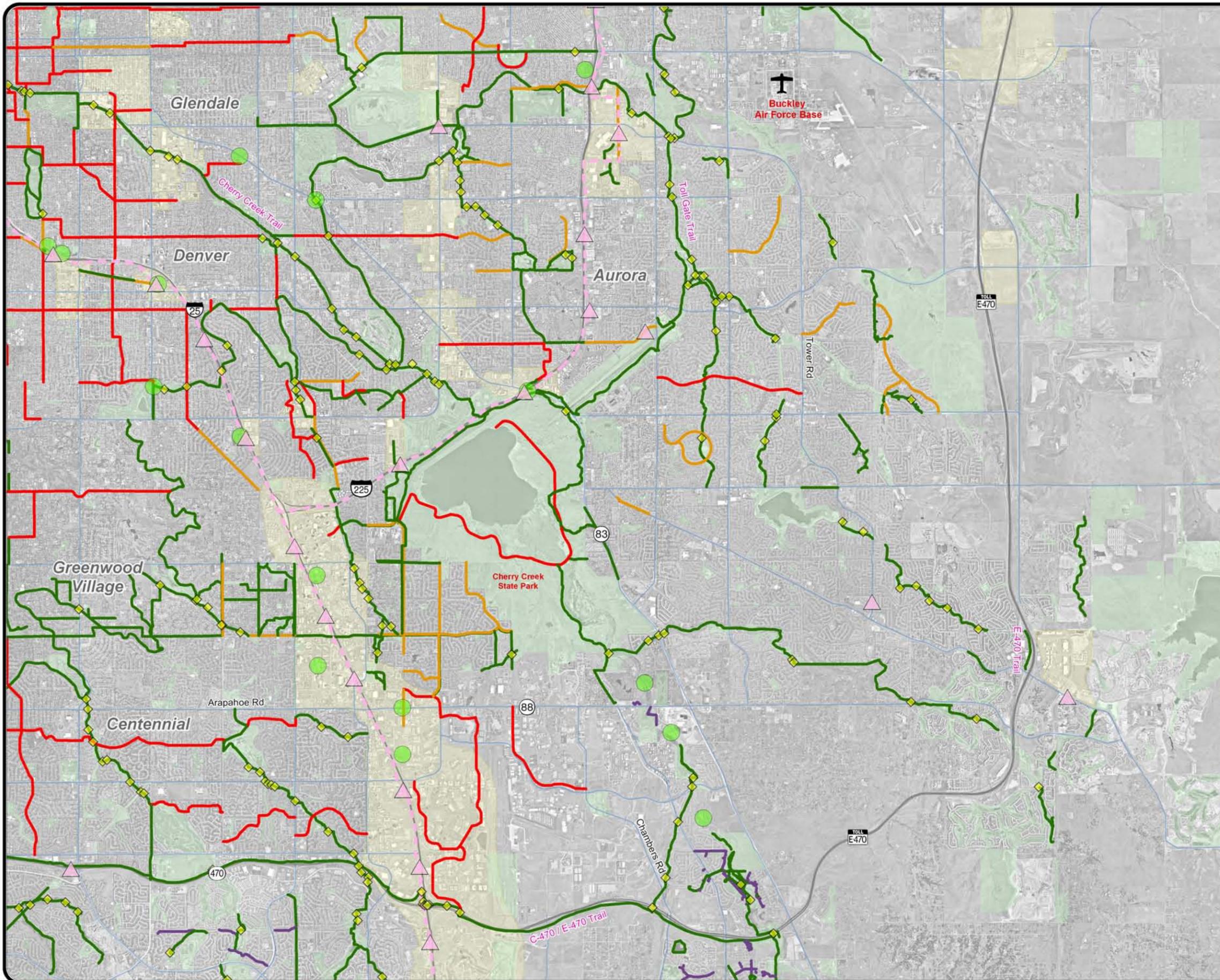
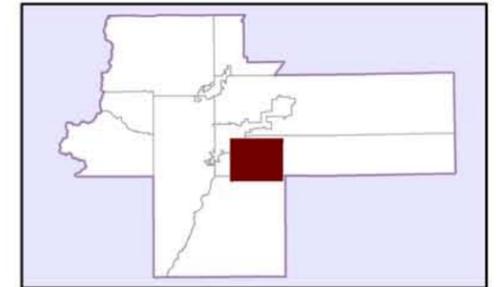
- Freeway
- Major Regional/Principal Arterial
- Urban Center
- Parks and Open Space (2004)



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Exhibit 4
Southeast Metro Area



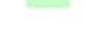
Existing Bicycle Facilities

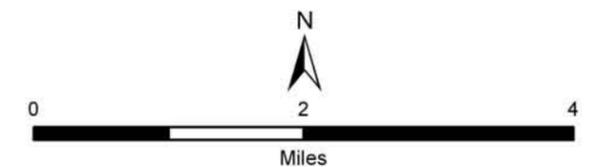
-  On-Street Bike Lanes
-  On-Street Signed Bicycle Route
-  Off-Street Multi-Use Trail
-  Neighborhood Trails
-  Bicycle/Pedestrian over/underpass
-  Possible Missing Link Locations

Transit System (existing + planned)

-  Rapid Transit Corridor
-  Transit Stations (including all park-n-Ride Lots)

Land Use & Infrastructure

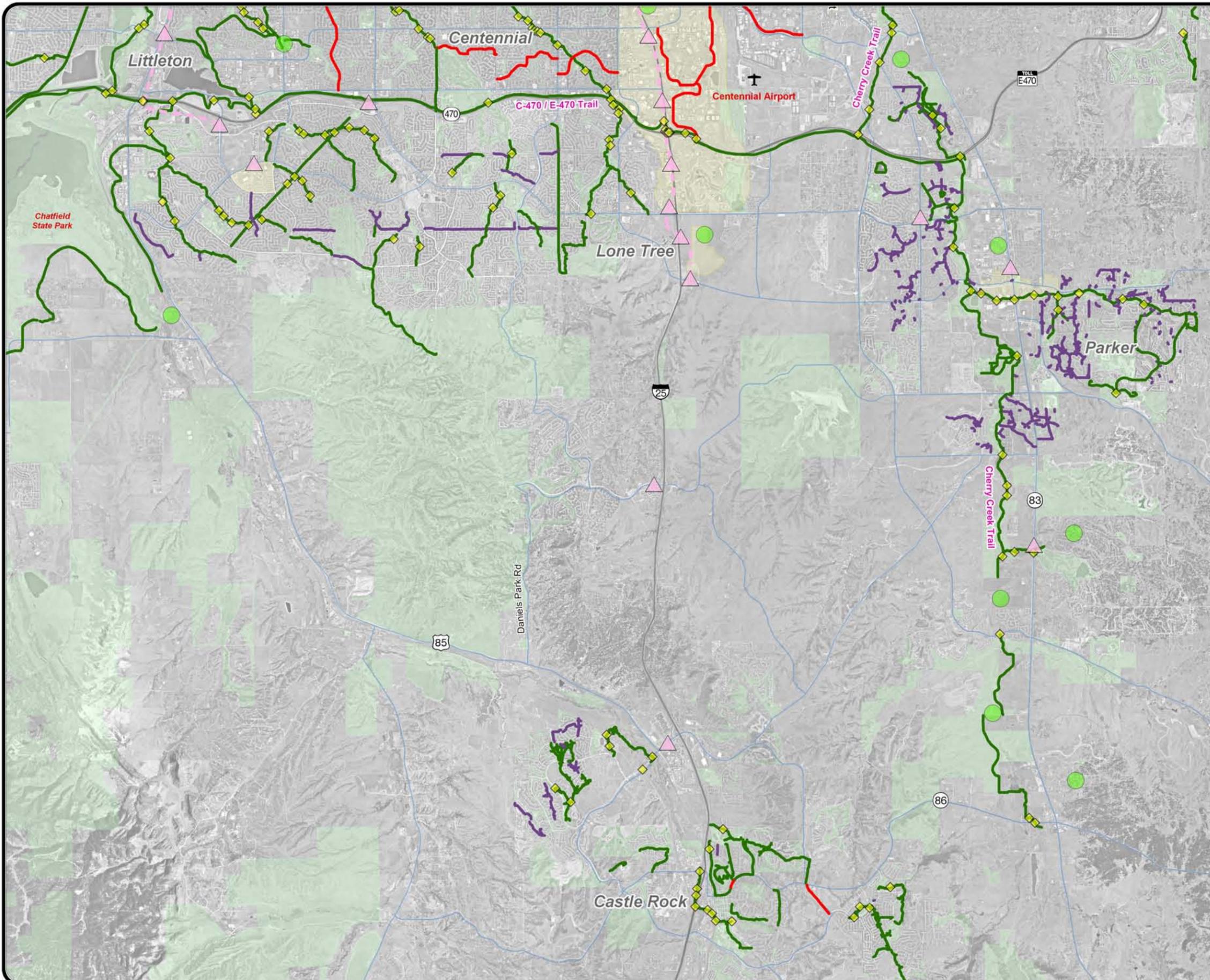
-  Freeway
-  Major Regional/Principal Arterial
-  Urban Center
-  Parks and Open Space (2004)



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Exhibit 5
Northern Douglas County Area



Existing Bicycle Facilities

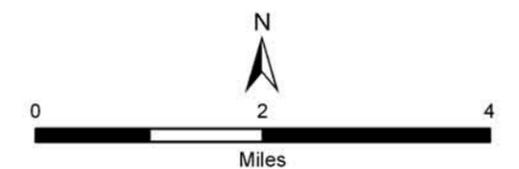
-  On-Street Bike Lanes
-  On-Street Signed Bicycle Route
-  Off-Street Multi-Use Trail
-  Neighborhood Trails
-  Bicycle/Pedestrian over/underpass
-  Possible Missing Link Locations

Transit System (existing + planned)

-  Rapid Transit Corridor
-  Transit Stations (including all park-n-Ride Lots)

Land Use & Infrastructure

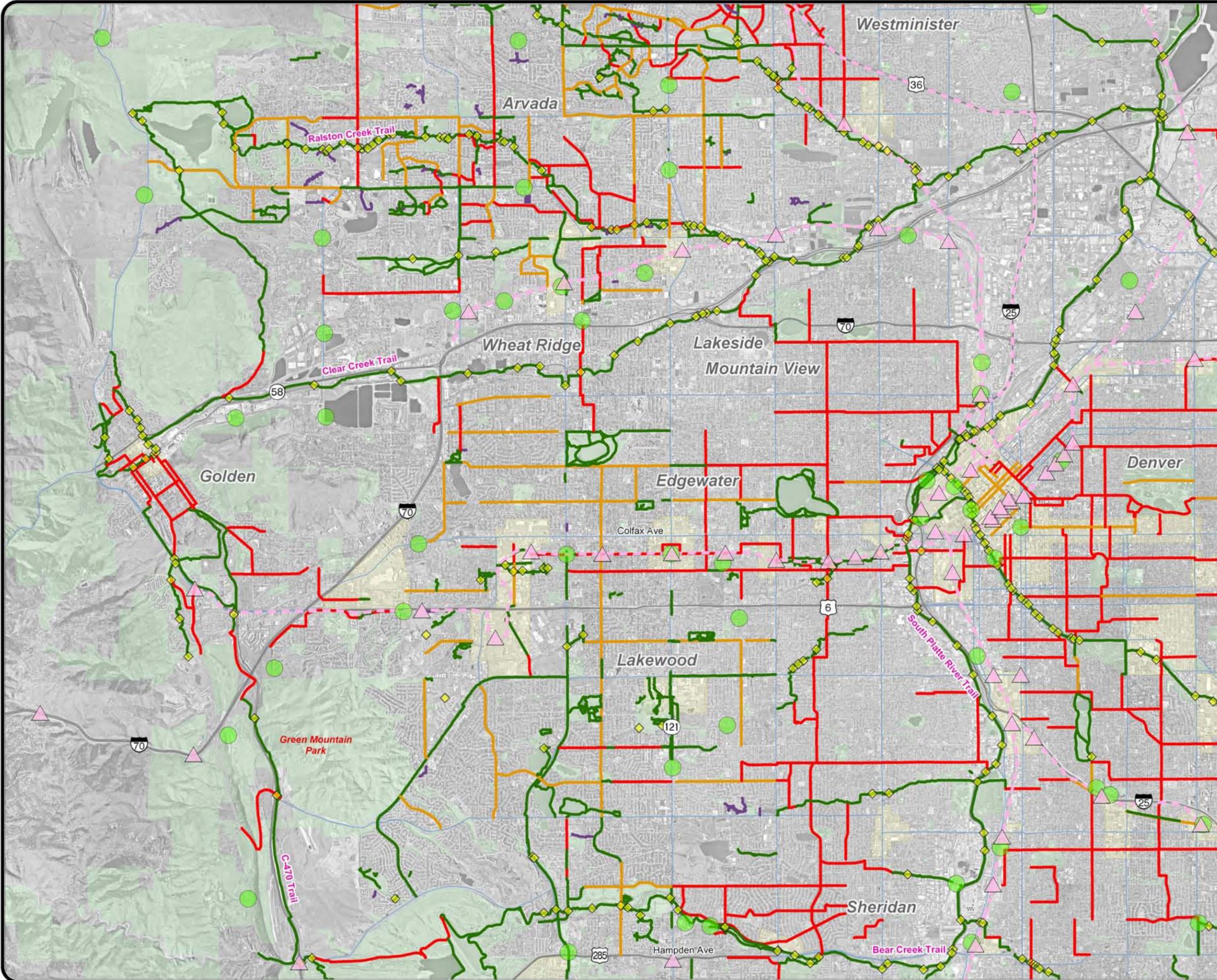
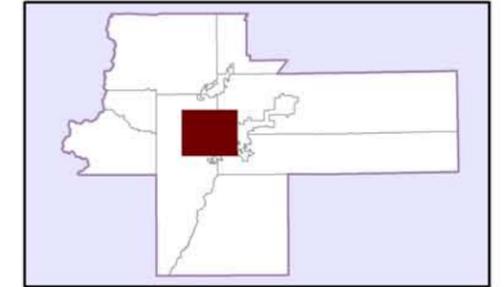
-  Freeway
-  Major Regional/Principal Arterial
-  Urban Center
-  Parks and Open Space (2004)



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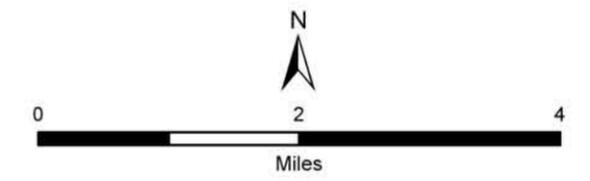
Exhibit 7
West Metro Area



- Existing Bicycle Facilities**
- On-Street Bike Lanes
 - On-Street Signed Bicycle Route
 - Off-Street Multi-Use Trail
 - Neighborhood Trails
 - ◆ Bicycle/Pedestrian over/underpass
 - Possible Missing Link Locations

- Transit System (existing + planned)**
- - - Rapid Transit Corridor
 - ▲ Transit Stations (including all park-n-Ride Lots)

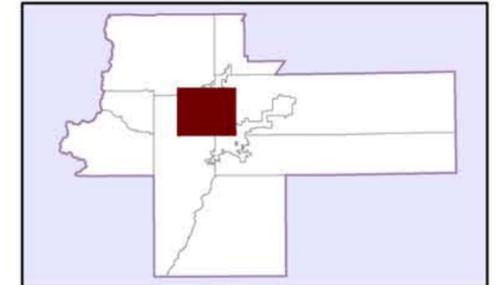
- Land Use & Infrastructure**
- Freeway
 - Major Regional/Principal Arterial
 - Urban Center
 - Parks and Open Space (2004)



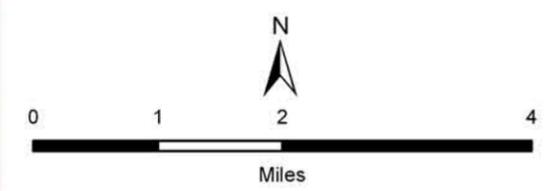
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DRCOG
 DENVER REGIONAL COUNCIL OF GOVERNMENTS

Exhibit 8 Northwest Metro Area



- Existing Bicycle Facilities**
 - On-Street Bike Lanes
 - On-Street Signed Bicycle Route
 - Off-Street Multi-Use Trail
 - Neighborhood Trails
 - Bicycle/Pedestrian over/underpass
 - Possible Missing Link Locations
- Transit System (existing + planned)**
 - Rapid Transit Corridor
 - Transit Stations (including all park-n-Ride Lots)
- Land Use & Infrastructure**
 - Freeway
 - Major Regional/Principal Arterial
 - Urban Center
 - Parks and Open Space (2004)



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PJ 3/15/09
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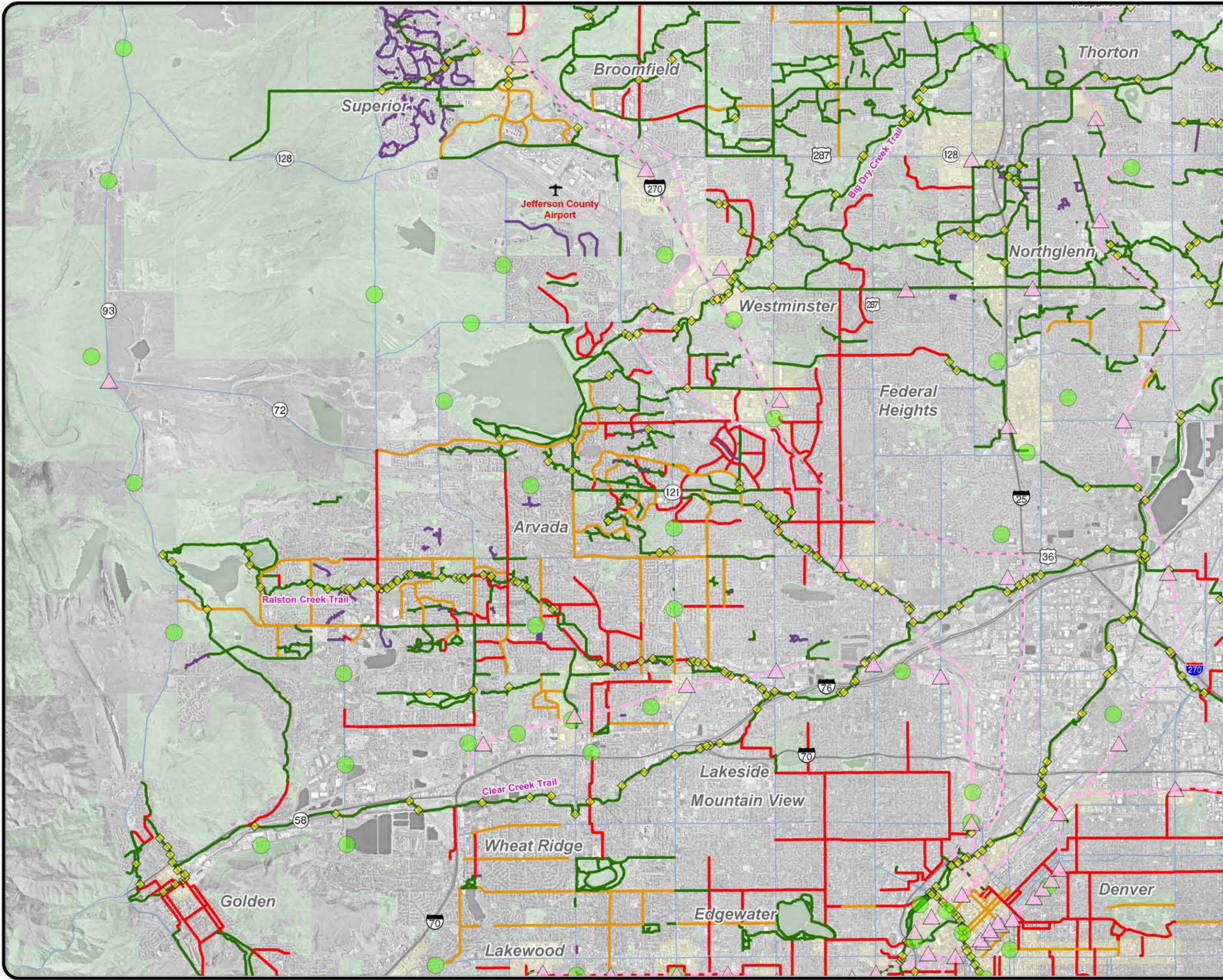
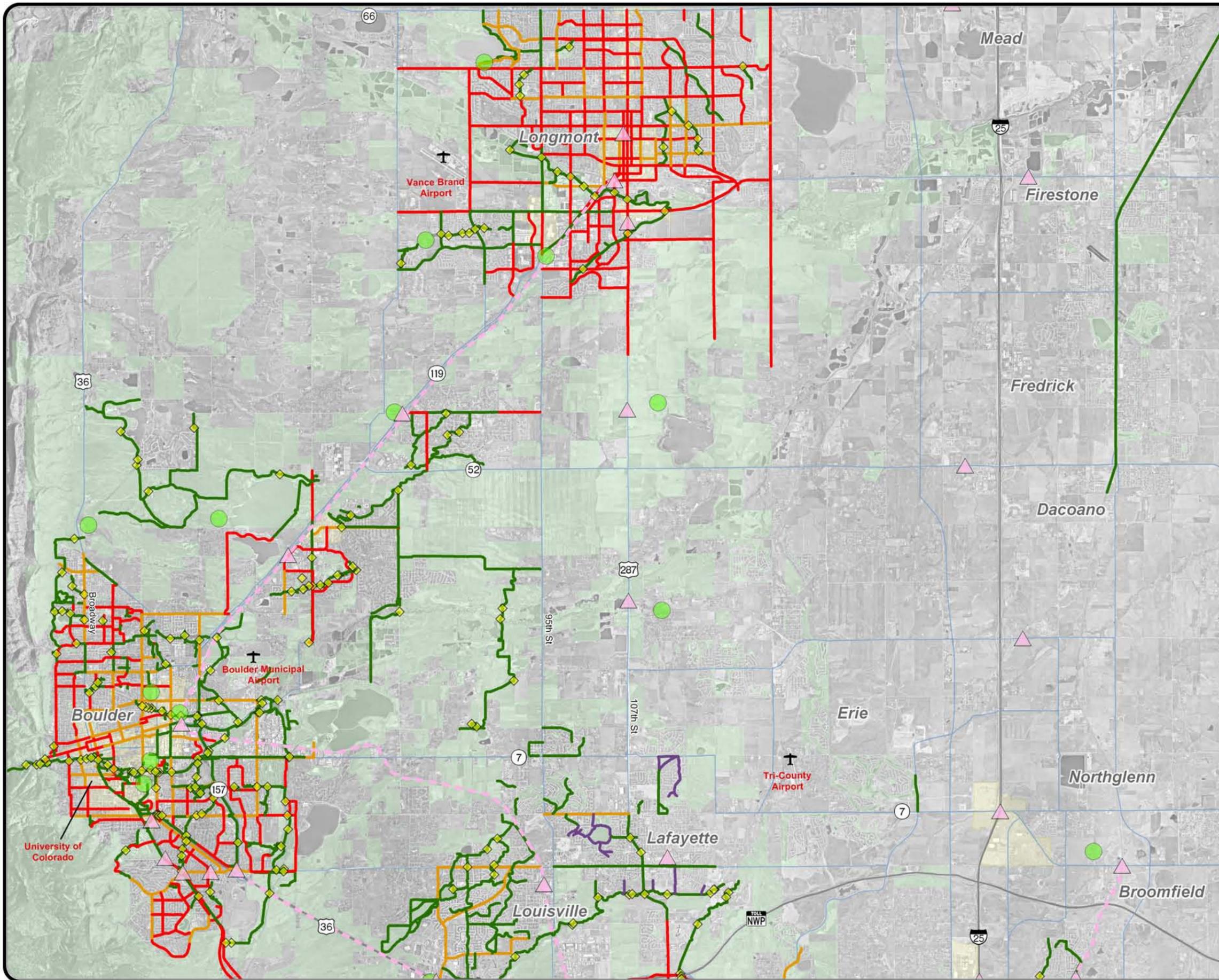
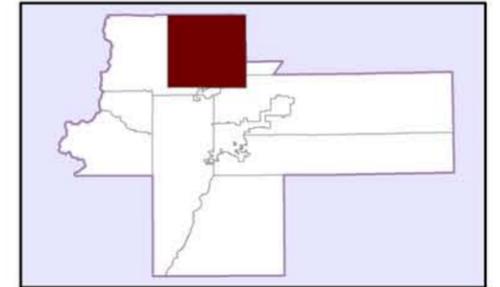


Exhibit 9
Boulder County Area



Existing Bicycle Facilities

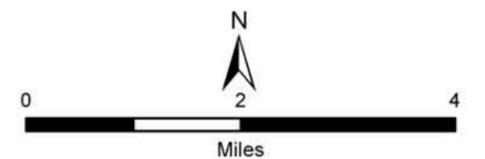
-  On-Street Bike Lanes
-  On-Street Signed Bicycle Route
-  Off-Street Multi-Use Trail
-  Neighborhood Trails
-  Bicycle/Pedestrian over/underpass
-  Possible Missing Link Locations

Transit System (existing + planned)

-  Rapid Transit Corridor
-  Transit Stations (including all park-n-Ride Lots)

Land Use & Infrastructure

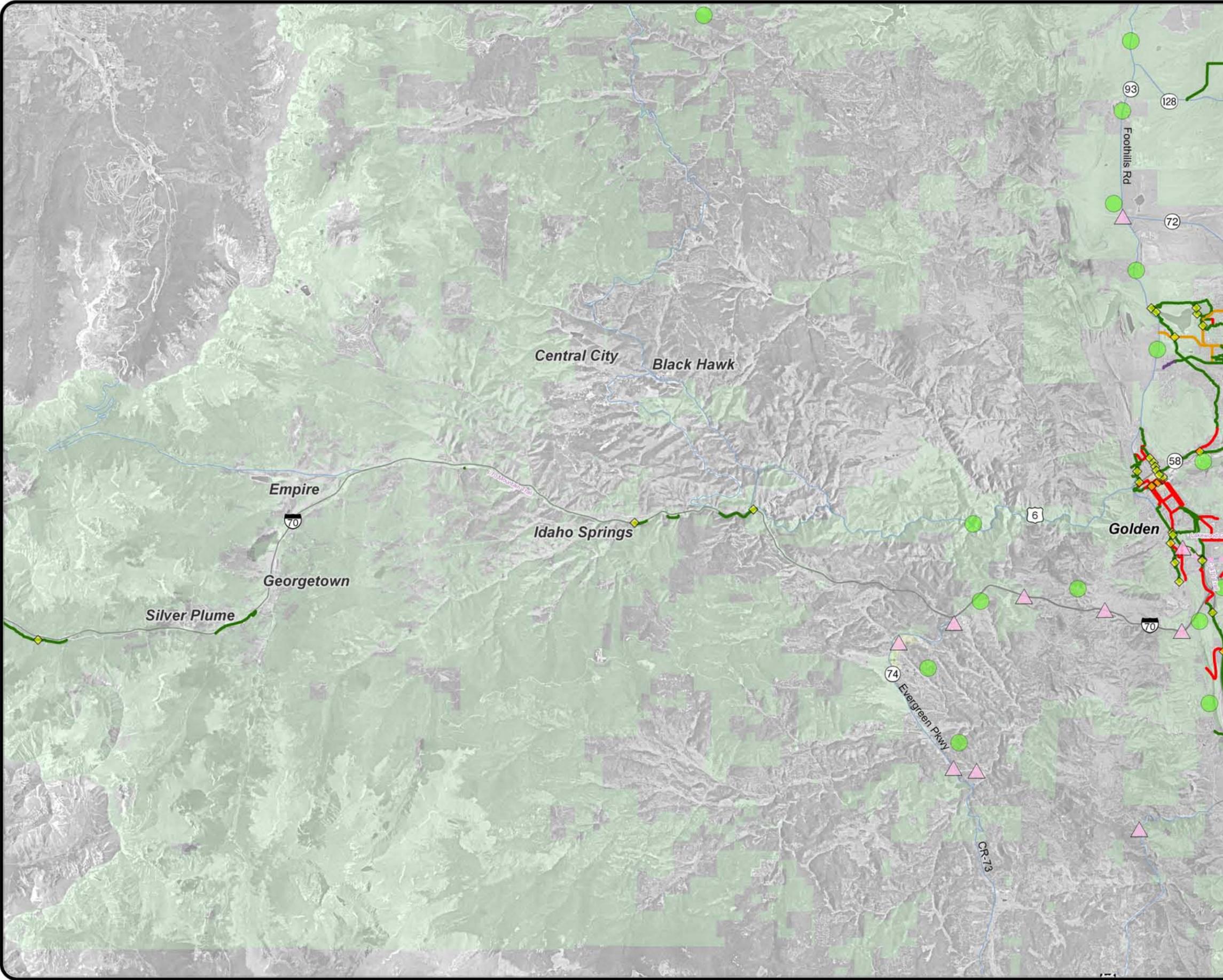
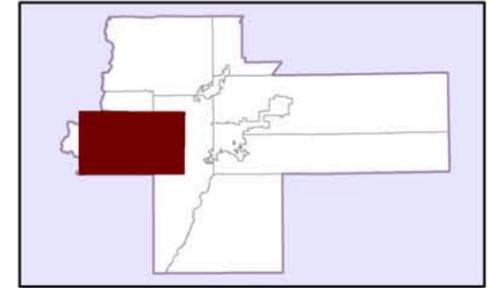
-  Freeway
-  Major Regional/Principal Arterial
-  Urban Center
-  Parks and Open Space (2004)



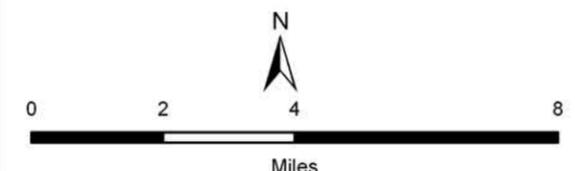
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Exhibit 10
Clear Creek County Area



- Existing Bicycle Facilities**
- On-Street Bike Lanes
 - On-Street Signed Bicycle Route
 - Off-Street Multi-Use Trail
 - Neighborhood Trails
 - ◆ Bicycle/Pedestrian over/underpass
 - Possible Missing Link Locations
- Transit System (existing + planned)**
- - - Rapid Transit Corridor
 - ▲ Transit Stations (including all park-n-Ride Lots)
- Land Use & Infrastructure**
- Freeway
 - Major Regional/Principal Arterial
 - Urban Center
 - Parks and Open Space (2004)



APPENDIX D
LIST OF ACRONYMS

LIST OF ACRONYMS

AASHTO	American Association of State Highway and Transportation Officials
ADA	Americans with Disabilities Act
ADAAG	Americans with Disabilities Act Accessibility Guidelines
BRT	Bus Rapid Transit
BTWD	Bike To Work Day
CDOT	Colorado Department of Transportation
CTPP	Census Transportation Planning Package
DIA	Denver International Airport
DRCOG	Denver Regional Council of Governments
EIS/EA	Environmental Impact Statement/Environmental Assessment
FHWA	Federal Highway Administration
FTA	Federal Transit Administration
MPO	Metropolitan Planning Organization
MUTCD	Manual of Uniform Traffic Control Devices
MVRTP	Metro Vision Regional Transportation Plan
NHTS	National Household Transportation Survey
PUD	Planned Unit Development
RTD	Regional Transportation District
SAFETEA-LU	Safe, Accountable, Flexible, Efficient Transportation Equity Act - A Legacy for Users
STIP	State Transportation Improvement Program
TBI	Travel Behavior Inventory
TDM	Travel Demand Management
TIP	Transportation Improvement Program
TOD	Transit-oriented Development

APPENDIX E
ADOPTING RESOLUTION

DENVER REGIONAL COUNCIL OF GOVERNMENTS

STATE OF COLORADO

BOARD OF DIRECTORS

RESOLUTION NO. 8, 2009

A RESOLUTION TO ADOPT THE AMENDED PEDESTRIAN AND BICYCLE ELEMENT OF THE 2035 METRO VISION REGIONAL TRANSPORTATION PLAN

WHEREAS, the Denver Regional Council of Governments, as the Metropolitan Planning Organization, is responsible for carrying out and maintaining the continuing comprehensive transportation planning process designed to prepare and adopt regional transportation plans and programs; and

WHEREAS, the urban transportation planning process in the Denver region is carried out through cooperative agreement between the Denver Regional Council of Governments, the Regional Transportation District, and the Colorado Department of Transportation; and

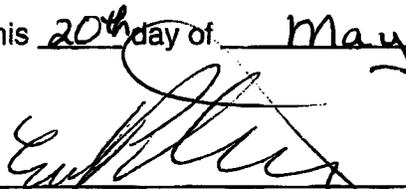
WHEREAS, THE *2035 Metro Vision Regional Transportation Plan* contains limited information regarding pedestrian and bicycle travel, and therefore, references the Pedestrian and Bicycle Element; and

WHEREAS, the document *Pedestrian and Bicycle Element of the 2035 Metro Vision Regional Transportation Plan* was prepared to incorporate broad Board adopted Metro Vision transportation policies and refine specific pedestrian and bicycle policies; and

WHEREAS, the Regional Transportation Committee has recommended adoption of the document.

NOW, THEREFORE, BE IT RESOLVED that the Denver Regional Council of Governments hereby adopts the amended *Pedestrian and Bicycle Element of the 2035 Metro Vision Regional Transportation Plan* document as the pedestrian and bicycle plan for the Denver region. This plan supercedes all previous pedestrian and bicycle plans adopted by the Board of Directors.

RESOLVED, PASSED AND ADOPTED this 20th day of May, 2009 at Denver, Colorado.



Ed Peterson, Chair
Board of Directors
Denver Regional Council of Governments

ATTEST:



Jennifer Schaufele, Executive Director



DRCOG
DENVER REGIONAL COUNCIL OF GOVERNMENTS

Denver Regional Council of Governments
1290 Broadway, Suite 700
Denver, CO 80203-5606

www.drcog.org - 303-455-1000