Salt Lake County
Bicycle Best
Practice

October 12, 2012
Bicycles

Purpose Statement

Bicycling has increased in popularity over the last decade as Americans realize its health, transportation, and financial benefits. Between 2010 and 2011, Salt Lake City recorded a 27 percent increase in bicycling averaged over 12 locations. Cities across the United States and within Utah are realizing that attracting (or retaining) a young, active, and educated workforce requires “quality of life” investments that allow residents to walk and bicycle safely in their communities.

Much of the recent growth in bicycling can be attributed to successful implementation of new bikeways and non-infrastructure programs. Continuing this trend in areas already exhibiting success and expanding it to areas in need of better bicycling conditions will require a systematic, multi-pronged approach. This section explores national best practices in the following six categories and discusses how they might be applied across Salt Lake County to enhance residents’ quality of life.

- Bicycle Benefits
- Bikeway Design
- Implementation
- Education & Promotion
- Data Management
- User-Friendly Mapping

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Related Best Practices:
Best Practices

Core Concepts:

1. Share anticipated economic benefits of bikeways with decision makers and the general public at key points (such as when Capital Improvement Project lists are being evaluated) and through various communication channels (such as media releases, public involvement materials, and on project websites).

2. Look for opportunities to provide bicycle facilities as part of planned roadway construction and maintenance projects.

3. Bicyclists have varying levels of comfort. Multiple facility types may be required in certain cases to provide a comfortable experience for different types of people.

4. Bicycle facilities should be designed to maximize comfort and convenience for non-expert riders. They may vary depending on roadway functional classification, traffic speed, volume, and other factors.

5. When possible and appropriate, minimum dimensions and level of accommodation should be exceeded.

6. Bicycle facility master plans should be created to direct the implementation of specific bikeway types within specific corridors.

7. Start projects with the “presumption of inclusion” that all modes and users should be considered in the public right-of-way, while allowing for clear exceptions to the inclusion rule.

8. Create education and promotion campaigns that address known behavior problems, safety issues, and community needs.

9. Develop a common understanding for how Salt Lake County and partner jurisdictions can efficiently and collaboratively maintain information about existing and planned bikeway assets.

10. Develop near- and long-term applications that utilize bikeway data to enhance the user experience and aid facility planning and maintenance.

11. Deliver useful and relevant information about cycling routes through a variety of methods.
Key Questions:

Why should we invest in bikeways?

What individuals, groups, and communities will benefit from investing in bikeways, and what types of benefits will be realized?

How can we estimate and communicate the value of bikeway investment benefits during decision-making and public involvement processes?

What bikeway facility design standards should we use?

What factors should influence the type of bikeway to provide?

What different types of bicyclists exist, and which bikeways are most appropriate for them?

What options do we have for retrofitting bikeways on existing roadways?

What wayfinding signage standards should we use?

What are next steps for implementing the adopted Salt Lake County Complete Streets policy and ordinance?

What should the role of SLCBAC be?

What should the role of a County Bicycle Coordinator be, and who should this person report to?

What current behavioral problems (e.g. disregard for traffic control, riding at night without lights, etc.) could be addressed through educational programs? Which of those problems are a high priority for change?

Which educational programs are most likely to change the most problematic driver actions that cause bicycle-related injury and death?

Which educational programs are most likely to change the most problematic cyclist actions that cause bicycle-related injury and death?

What promotional goals are a priority for Salt Lake County?

How should bikeway asset data be maintained and updated?

What short- and long-term software applications will provide the greatest value for agency staff and the public?

How can we best use mapping to communicate information about existing bikeways and supporting facilities?

What types of easily maintained technology can we utilize to provide information to the widest audience?
Discussion: Bicycle Benefits

Health Cost Benefits

Bicycling is associated with numerous proven health benefits, including healthy weight, lower stress, and increased exercise. Better health translates into economic savings through reduced health care costs. Although the risks of bicycling garner much of the media attention, the benefits outweigh those risks. The following list of findings and supporting documentation provide more detail on bicycling’s health cost benefits.

Finding: Bicycling promotes physical activity, physical health, healthy weight, and lower stress levels.


- A recent Harvard university study found that bicycling, even for as little as five minutes each day, can stave off weight gain for middle aged women. Source: “Bicycle Riding, Walking, and Weight Gain in Premenopausal Women” (http://archinte.ama-assn.org/cgi/reprint/170/12/1050).


- Active commuting to work is easier to sustain over the long-term than gym-based exercise programs. Source: “Randomised controlled trials of physical activity promotion in free living populations: a review” (http://www.ncbi.nlm.nih.gov/pubmed/7499985).

- A recent analysis of the health savings resulting from the bicycle infrastructure in Portland (OR) demonstrated that if the city builds out only the infrastructure it currently plans, by 2030, Portland will have saved $800 million – partly in fuel costs but primarily in health care and the value of reduced mortality. Source: “Costs and Benefits of Bicycling Investments in Portland, Oregon” (http://journals.humankinetics.com/AfcStyle/DocumentDownload.cfm?DType=DocumentItem&Document=08%5Fgotschi%5FJPAH%5F2010).
One Canadian study found that commuters who travel by bicycle are more satisfied with their commute than commuters using any other mode. Source: “Like commuting? Workers’ perceptions of their daily commute” (http://www.statcan.gc.ca/pub/11-008-x/2006004/pdf/9516-eng.pdf).

A study in Copenhagen concluded that people who commuted to work by bike had 40 percent lower risk of dying over the course of the study period than those who didn’t. Source: “All-Cause Mortality Associated With Physical Activity During Leisure Time, Work, Sports, and Cycling to Work” (http://archinte.ama-assn.org/cgi/content/abstract/160/11/1621).

An international literature review found numerous studies demonstrating that bike commuters miss less work due to illness each year than non-bike commuters. Source: “Physical activity, absenteeism and productivity: an Evidence Review” (http://www.tfl.gov.uk/assets/downloads/businessandpartners/Physical-activity-absenteeism-and-productivity-evidence-review.pdf).

Finding: Building bikeways results in more bicycling.

In Charleston (SC), research found that the construction of a bicycle and pedestrian path on the Wonder’s Way Bridge resulted in increased activity levels. Sixty-seven percent of surveyed path users said that their physical activity had increased since the path opened, with even greater activity increases for African-American bridge users. Source: “Wonder’s Way Bike Pedestrian Pathway on the Arthur Ravenel, Jr. Bridge: A Successful Model for Facilitating Active Living in Lowcountry South Carolina” (http://media.charleston.net/2009/pdf/crbpathstudy_032609.pdf).

The results of a study of 33 large U.S. cities (excluding New York City, which is considered an outlier in much transportation research because of its size and high use of public transportation) showed that each additional mile of bicycle lane per square mile is correlated with an approximate one-percent increase in the share of bike-to-work trips. Source: “Bicycle Commuting and Facilities in Major U.S. Cities: If you build them they will come – another look” (http://www.des.ucdavis.edu/faculty/handy/ESP178/Dill_bike_facilities.pdf).
A 2009 study by researcher Jennifer Dill used GPS technology to collect information on bicycling behavior from 166 regular Portland (OR) riders. It found that a “disproportionate share of the bicycling occurred on streets with bicycle lanes, separate paths, or bicycle boulevards,” indicating that bicycle-specific infrastructure investments were attracting new riders. Dr. Dill also concluded that 1) well-connected low-traffic streets, bicycle boulevards, and separate paths may be more effective than bicycle lanes on busy streets at getting more women and inexperienced adults bicycling, 2) adding bike lanes to more arterials might reduce travel times and distances, particularly for experienced bicyclists, and 3) for many short trips (3 miles or less), the bicycle was time-competitive with the automobile. Source: “BikeGPS: Understanding and Measuring Bicycling Behavior”. (http://www.ibpi.usp.pdx.edu/bikegps.php).

Finding: People who bicycle regularly are more physically active, which leads to lower health care costs.

- One study looked at variations in health care costs between employees of different weight categories and employees with different levels of habitual physical activity. Physically active employees incurred approximately $250 less in health care costs annually compared to sedentary employees. Among obese employees, the difference in health care costs between physically active and sedentary employees was greater ($450/employee). Source: “Relationship of body mass index and physical activity to health care costs among employees” (http://www.ncbi.nlm.nih.gov/pubmed/15167389).

- A 2009 Dutch study found that cycle commuters provide their employers with an economic advantage by requiring fewer sick days each year and enjoying better overall health. Researchers estimate that every 1% increase in the number of employees that cycle to work saves employers €27M ($36M) per year. Source: “Regelmatig fietsen naar het werk leidt tot lager ziekteverzuim / Regular Bicycling to Work Leads to Fewer Sick Days” (http://www.tno.nl/downloads/KvL-L.09-01.971Nm_laag%20DEF.pdf).
Finding: The health benefits of bicycling outweigh the risks.

- One study, in Spain, of users of a bike sharing system showed that the health benefits of using public bicycle share systems (defined as deaths avoided because of increased physical activity) far outweigh the mortality risks (related to traffic crashes and air pollution). Source: “The health risks and benefits of cycling in urban environments compared with car use: health impact assessment study” (http://www.bmj.com/content/343/bmj.d4521).

- A study of cycling and health published in 1992 by the British Medical Association found that, despite the hostile environment in which most current cyclists ride, the significant health and longevity benefits of cycling outweigh the risk of crash injury or death. Source: “Cycling: Towards Health and Safety” (not available online).

- A study from the Netherlands examined benefits of increased cycling (in the form of physical activity) and related risks (in the form of exposure to air pollution and crash risk). The authors concluded that individuals who shift from driving to bicycling gain 3-14 months of decreased mortality while confronting much lower risks related to air pollution (0.8-40 days lost) and traffic crashes (5-9 days lost), resulting in a strong net benefit to individuals. Source: “Do the Health Benefits of Cycling Outweigh the Risks?” (http://ehp03.niehs.nih.gov/article/info:doi/10.1289/ehp.0901747).

- According to a 1996 study funded by the Australian Department of Transport, regular cycling reduces over four times as many heart attack fatalities as it increases in crash fatalities. Source: “Pedaling Health – Health Benefits of a Modal Transport Shift” (http://safety.fhwa.dot.gov/ped_bike/docs/cyhealth.pdf).

Transportation Safety Benefits

Studies show that when more people ride bicycles, the crash risk for cyclists is reduced. Perhaps more importantly, cyclists are not the only people who benefit. Studies also show that bike-friendly areas can be safer for drivers as well. The following list of findings and supporting documentation provide more detail on the transportation savings benefits of cycling.
Finding: More people bicycling results in lower crash risk for bicycling.

- A study examining crash data and walking/bicycling rates from five U.S. and international data sets found that walking/bicycling crash risk decreases as walking/bicycling rates increase. This has been called the “Safety In Numbers” principle. Source: “Safety in numbers: more walkers and bicyclists, safer walking and bicycling” (http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1731007/pdf/v009p00205.pdf).

- In New York City, a study of bike lanes found that installation of bicycle lanes did not lead to an increase in crashes, despite the probable increase in the number of bicyclists. The most likely explanations for the lack of increase in crashes are reduced vehicular speeds and fewer conflicts between vehicles and bicyclists after installation of these lanes. Source: “Evaluating the Safety Effects of Bicycle Lanes in New York City” (http://www2.cambridgema.gov/cdd/et/bike/bike_safety.html#15).

- One study found that for every doubling of the number of cyclists, the number of fatalities only increases by 25%, thus reducing the overall risk of cycling by 37%. Source: “An expert judgment model applied to estimating the safety effect of a bicycle facility” (http://www.ncbi.nlm.nih.gov/pubmed/10868762).

Finding: Streets with bike lanes are safer for all users.


- Installing bike lanes and traffic calming (e.g. road diets and speed humps) results in fewer injuries and fatalities for all road users. Source: “The Built Environment and Traffic Safety: A Review of Empirical Evidence” (http://jpl.sagepub.com/content/23/4/347.abstract).

- A nationwide survey of League of American Bicyclists members determined that streets with bike lanes have a significantly lower crash rate than either major or minor streets without any bicycle

**Finding:** Installing bicycle facilities increases cyclist predictability, reduces wrong-way riding and sidewalk riding, and increases traffic control compliance.

- In Cambridge (MA), sidewalk bicycling was cut in half after the installation of bicycle lanes on Massachusetts Avenue in Central Square. Source: unpublished data reported by the City of Cambridge on their Community Development web page (http://www2.cambridgema.gov/cdd/et/bike/bike_safety.html#15).

- One study found that users of bike lanes were much less likely to ride against traffic (in the street as well as on the sidewalk) than users of wide outside lanes (i.e. shared roadways). Source: “A Comparative Analysis of Bicycle Lanes Versus Wide Curb Lanes: Final Report” (http://www.fhwa.dot.gov/publications/research/safety/pedbike/99034/99034.pdf).

**Transportation Cost Savings Benefits**

Bikeways are an economical community transportation investment in relation to other modes. Also, people who bicycle more and drive less save money on household transportation. The following list of findings and supporting documentation provide more detail on the transportation savings benefits of cycling.

**Finding:** Building bikeways is a relatively low-cost transportation investment.

- The entire bikeway network of Portland (OR) was built for less than the cost of constructing one mile of urban freeway. Complete details about how this figure was calculated can be found here: http://www.politifact.com/oregon/statements/2011/mar/19/sam-adams/portland-mayor-sam-adams-says-portlands-spent-its-/.  

**Finding:** People who bicycle or walk more, and drive less, spend less on family transportation costs and spend more supporting local businesses.

- As a result of policies to encourage bicycling and maintain urban density, Portland (OR) residents drive less and consequently spend
less on transportation, leaving more money to spend on things they value. Compared to the distance and time spent commuting to work in the median American city, Portlanders travel 2.9 billion fewer miles and spend 100 million fewer hours, saving $2.6 billion a year. Much of that savings is spent at local businesses. Source: “Portland’s Green Dividend” (http://www.ceosforcities.org/files/PGD%20FINAL.pdf).

Business/Economic/Job Creation Benefits

Bicycles are associated with numerous business and economic benefits. The bicycle industry creates jobs and construction of bikeways has been shown to create more jobs per dollar spent than other types of transportation infrastructure. Many areas in Utah have also demonstrated the tourism benefits of bicycling. The following list of findings and supporting documentation provide more detail on the positive economic impacts of cycling.

**Finding: Bicycle investments contribute to business revenues and job creation.**

- In Colorado, a 1998 study of the economic benefits of bicycling to the state concluded that economic benefits of bicycling were significant. In the manufacturing sector, annual revenue was $763 million and 513 jobs were created (with an annual payroll of $18 million). In the retail sector, Colorado residents spend $200 million on bicycles, bicycle maintenance, and bicycle-related products, generating 700 FTE jobs (with an annual payroll of $16 million). In the tourism sector, the total revenue from cycling tourists at resorts is between $141 million and $193 million, while bicycle tours, racing, and charity rides generate annual revenue of $640,000, $2 million, and $3.4 million, respectively. Half of all summer visitors at Colorado ski resorts spend time bicycling; of those 699,000 people, 70 percent are from out of state and 40 percent said they would have altered their vacation destination if bicycling were not available. Source: “Economic Impact of Bicycling in Colorado” (http://atfiles.org/files/pdf/CObikeEcon.pdf).

- In Maine, a study of the economic impacts of bicycle tourism estimated that over 2 million bicycle tourists visited in 1999, and that they spent $36.3 million. Source: Bicycle Tourism In Maine:

- A 2000 study estimated the total annual economic value of mountain bicycling in Moab (UT) is $1.33 million, and that the average consumer spending per person per trip was $585. Source: “Estimating the Recreation Demand and Economic Value of Mountain Biking in Moab, Utah: An Application of Count Data Models” (http://www.mendeley.com/research/estimating-recreation-demand-economic-value-mountain-biking-moab-utah-application-count-data-models/).

- Another study of the economic value of public lands in Grand County (UT) determined that travel and tourism-related industries (including mountain bicycling) supported 1,486 private wage and salary jobs, or 44 percent of total, in the county in 2009. National parks in Grand County created $53.5 million in total labor income in 2009. The study further reports that in fiscal year 2007, the economic impact of non-local Bureau of Land Management (BLM) visitor spending was $177 million in local output and more than $64 million in labor income for Grand County. The economic impact of spending by non-local visitors to BLM lands supported 2,447 jobs in the county in fiscal year 2007. Source: “The Economic Value of Public Lands in Grand County, Utah” (http://headwaterseconomics.org/land/reports/economic-grand-county/).

- In Wisconsin, the bicycling industry (consisting of manufacturing, distribution, retail, and other services) contributes $556 million and 3,418 jobs to the Wisconsin economy. Source: “The Economic Impact of Bicycling in Wisconsin” (http://www.dot.wisconsin.gov/business/econdev/docs/impact-bicycling.pdf).

- A 2003 study commissioned by the North Carolina Department of Transportation calculated that public investments in off-road paths and wide paved shoulders had cost a total of $6.7 million and generated $60 million in annual benefits for the region (with 1,400 annual associated jobs). The authors also found that bicycling opportunities were a primary reason many tourists chose to come to the region. Source: “Pathways to Prosperity: The Economic Impact of Investments in Bicycle Facilities” (http://atfiles.org/files/pdf/NCbikeinvest.pdf).
The 2008 value of the bicycle-related economic sector in Portland (OR) was found to be nearly $90 million. Nearly 60 percent of that revenue came from retail, rental, and repair, with the remaining contribution coming from manufacturing and distribution, bicycle events, and professional services. Source: “The Value of the Bicycle-Related Industry in Portland” ([link](http://www.altaplanning.com/App_Content/files/fp_docs/2008%20Portland%20Bicycle-Related%20Economy%20Report.pdf)).

After bike lanes were added to Valencia Street in San Francisco (CA), two-thirds of merchants surveyed said that the lanes had a positive overall impact on their business. Source: “Economic Effects of Traffic Calming on Urban Small Businesses” ([link](http://www.bikewalk.org/2004conference/sessions/28_Business_calm/TrafficCalming_summary.pdf)).

**Finding:** Public investments in walking and bicycling infrastructure create more jobs per dollar than road construction projects.

- A study of 11 cities in the U.S. found that, for each $1 million invested in infrastructure projects, roadway projects create 7.8 jobs, pedestrian projects create 9.6 jobs, and cycling projects create 11.4 jobs. Source: “Pedestrian and Bicycle Infrastructure: A National Study of Employment Impacts” ([link](http://www.peri.umass.edu/236/hash/64a34bab6a183a2fc06fde212875a3ad/publication/467/)).

**Finding:** Shifting trips from driving to bicycling results in cost savings for both society and the individual.

- Researcher Todd Litman looked at the benefits of congestion reduction, roadway cost savings, vehicle cost savings, parking cost savings, air pollution reduction, energy conservation, and traffic safety improvements. Litman estimated that replacing a car trip with a bike trip saves individuals and society $2.73 per mile. A typical two-mile bike trip would save $5.46. Source: “Quantifying the Benefits of Nonmotorized Transportation for Achieving Mobility Management Objectives” ([link](http://www.vtpi.org/nmt-tdm.pdf)).

**Finding:** Bikeways and shared-use paths increase the property value of adjacent homes.

- An Omaha (NE) study concluded that 81% of residents who live near trails feel that the trail would have a neutral or positive effect
on their home sale price, and over 63% of those who bought homes after the nearby trail was constructed reported that the trail was a positive influence in their decision to purchase their home. Source: “Omaha Recreational Trails: Their Effect on Property Values and Public Safety” (http://atfiles.org/files/pdf/omahastudy.pdf).

- A Washington State study concluded that properties near the Burke-Gilman trail are significantly easier to sell than other properties, though the effect was diminished for properties immediately adjacent to the trail itself. Source: “Evaluation Of The Burke-Gilman Trail’s Effect on Property Values and Crime” (http://www.brucefreemanrailtrail.org/pdf/Burke-Gilman.pdf).

- A Delaware study developed a model based on actual home sales prices and determined that proximity to a bike path increases home values by $8,800. Source: “Property Value/Desirability Effects of Bike Paths Adjacent to Residential Areas” (http://128.175.63.72/projects/DOCUMENTS/bikepathfinal.pdf).

- An Ohio study found that proximity to the Little Miami Scenic Trail increased property values at a rate of $7.05 per foot of proximity. Source: “The Impact of the Little Miami Scenic Trail on Single Family Residential Property Values” (http://etd.ohiolink.edu/view.cgi/KARADENIZ%20DUYGU.pdf?acc_num=ucin1211479716).

- A study of home values in Surrey (BC) found that single-family property that bordered a greenway or a trail proved to have 1% to 20% greater value than those that did not. Source: “Greenway Proximity Study”, not available online – statistic cited here: (http://www.bikewalk.org/2004conference/sessions/2_Business/Business_Case_for_Active_Transportation.pdf).

- Developers of a housing development in Apex (NC) raised sales prices for the 40 lots adjacent to the regional greenway by $5,000; those homes were still the first to sell. Source: “Prime Location on the Trail”, not available online – statistic cited here: (http://www.bikewalk.org/2004conference/sessions/2_Business/Business_Case_for_Active_Transportation.pdf).

- One Portland State University (OR) student research paper found that homes located on a bicycle boulevard are worth $5,757 more than homes that are not. Source: “Valuing Bike Boulevards in Portland through Hedonic Regression” (available upon request).
Discussion: Bikeway Design

Bicyclist Characteristics

The purpose of this section is to provide facility designers with an understanding of how bicyclists operate and how their bicycles influence that operation. Bicyclists are much more affected by poor facility design, construction activities, and maintenance issues than motor vehicle drivers. They also lack protection from the elements and roadway hazards provided by an automobile’s physical design and safety features. By understanding the unique characteristics and needs of bicyclists, designers can provide high-quality facilities and minimize risk to the people who use them.

Bicycle as a Design Vehicle

Like motor vehicles, bicyclists and their bicycles come in a variety of sizes and configurations. Variations occur in the types of vehicle (such as a conventional bicycle, recumbent bicycle, or a tricycle) and behavioral characteristics (such as the comfort level of the bicyclist). Bikeway designs should consider reasonably expected bicycle types and utilize the appropriate dimensions.

The figure in the upper left shows the operating space and physical dimensions of a normal adult bicyclist, which are the basis for typical facility design. Bicyclists require clear space to operate within a facility, which is why the minimum operating width is greater than the physical dimensions. Bicyclists prefer five feet or more operating width, although four feet is minimally acceptable.

Many other commonly used pedal-driven cycles and accessories should be considered during bikeway design. The most common types include tandem bicycles, recumbent bicycles, and trailer accessories. The figure in the lower left provides typical dimensions for these bicycle types.
Design Speed Expectations

The expected speed that different types of bicyclists maintain under various conditions also influences bikeway design, particularly for shared use paths.

Bicyclist skill level also leads to dramatic variance of expected speeds and behavior. Several bicyclist classification systems are currently used within the bicycle planning and engineering professions. These classifications are helpful in understanding the characteristics and infrastructure preferences of different bicyclists.

It should be noted that these classifications may change in type or proportion over time as infrastructure and culture evolve. Education and experience help less confident bicyclists more comfortably and safely share the roadway with vehicular traffic. Bicycle infrastructure should be planned and designed to accommodate as many user types as possible. This may require multiple facility types within a community or along parallel routes to provide a comfortable experience for the greatest number of people.

Types of Bicyclists

It is important to consider bicyclists of all skill levels when creating a bikeways or bicycle programs. Bicyclist skill level greatly influences expected speeds and behavior, both in separated bikeways and on shared roadways.

The most conventional framework classifies cyclists as...
Advanced, Basic, or Child. A more detailed understanding of the U.S. population as a whole is illustrated in the figure below left, which was developed by planners in Portland, OR and is supported by data collected nationally since 2005. This classification system provides the following categories to address varying attitudes towards bicycling in the U.S.

Strong and Fearless (1% of population)

This segment of the population will typically ride anywhere regardless of roadway conditions or weather. These people ride faster than other user types, prefer direct routes, and typically choose roadway connections -- even if shared with vehicles -- over separate bicycle facilities such as shared-use paths.

Enthused and Confident (7% of population)

This user group encompasses the “intermediate” bicyclists who are fairly comfortable riding on all types of bikeways but usually choose low traffic streets or shared-use paths when available. These bicyclists may deviate from a more direct route in favor of a preferred facility type. This group includes all kinds of bicyclists including commuters, recreationalists, racers, and utilitarian bicyclists.

Interested but Concerned (approximately 60% of population)

This user type makes up the bulk of the cycling population and represents people who typically only ride a bicycle on low traffic streets or shared-use paths under favorable conditions and weather. These people perceive significant barriers to cycling, specifically traffic and other safety issues. However, they may become “Enthused & Confident” with encouragement, education, and experience.

No Way, No How (approximately 32% of population)

People in this category do not ride bicycles and perceive severe safety issues with riding in traffic. Some of them may eventually give cycling a second look, and may progress to the user types above. A significant portion of these people will not ride a bicycle under any circumstances.

Bikeway Types

The following sections describe bikeway types by their operational characteristics, degree of separation from motor vehicle traffic, and maintenance needs. For guidance on facility width and other design considerations, see the Design Standards section.

Historically, bikeways have been described as Class I, Class II, or Class III. A discussion of this former system and how it relates to the separation-based definitions given here can be found in the User-Friendly Mapping chapter of this best practice document.

Shared Roadways

On this type of bikeway, bicyclists and cars operate within the same travel lane, either side by side or in single file depending on the roadway configuration, outside lane width, and presence (or absence) of shoulder space. The most basic type of bikeway is a signed shared roadway. This facility provides continuity to other bikeway types (usually bike lanes) or is used to designate preferred routes through high-demand corridors where higher level bikeways (e.g. bike lane or cycle track) do not exist. Shared Lane Markings may be used to give further indication to drivers and bicyclists that they are sharing roadway space and to encourage bicyclists to properly position themselves laterally.

Other treatments including directional signage, traffic diverters, chicanes, chokers, and other traffic calming devices may be used to reduce vehicle speeds or volumes. Such treatments often are associated with a special subset of shared roadways called a Bicycle Boulevard. Shared roadways require the least amount of maintenance – usually just occasional sign replacement and paint refreshment.

Bike Lanes

This bikeway type uses signage and striping to allocate roadway space to bicyclists. Bike lanes encourage predictable movements by bicyclists and motorists. Care must be taken to properly design bike lanes to meet or exceed minimum standards. Substandard bike lanes are often worse than no bikeway at all, and may give less experienced bicyclists a false sense of security. Buffered Bike Lanes are a step up from typical bike lanes. They provide a painted buffer between the bike lane and either the travel lane or parked cars (or both). Bike lanes require frequent sweeping because debris tends to accumulate there. They also require snow removal during the winter.
**Cycle Tracks**

This bikeway type combines the user experience of a separated path with the on-street infrastructure of bike lanes. They may be level with the travel lane and separated from traffic by parked cars, planters, or curbing. They may also be raised slightly above the level of the adjacent travel lane or colored to enhance visibility. Cycle tracks are more difficult to maintain than other bikeways because traditional snowplows and sweepers don’t fit within the space. Specialized maintenance equipment may be required.

**Shared Use Paths**

These two-way paths are typically located in rights-of-way separate from roadways, or adjacent to high-speed roads with very few roadway crossings of the path. They are preferred by less experienced cyclists because of their separation from traffic. More experienced cyclists may avoid them if pedestrians and slower cyclists are present. Snow removal and sweeping of these paths may also require specialized equipment.

**Bikeway Continuum**

The continuum shown below illustrates the varying degrees of separation and protection from motor vehicle traffic exhibited by each on-street bikeway type. People with less bicycling experience will generally prefer the types further to the right. Although not shown in the continuum (because they are an off-street bikeway type), shared-use pathways have the highest degree of separation of any bikeway type.
Design Standards

National Association of City Transportation Officials (NACTO)

NACTO is comprised of the transportation departments of many major and mid-sized US cities. NACTO members collaborated to create a shared best practice called the Urban Bikeway Design Guide, published in 2011. This is an alternative to other available design guides and contains more guidance on innovative bikeway designs than any other source. Guidelines found in the Urban Bikeway Design Guide are considered to supersede those found in the AASHTO guide (described below), although they are mostly in agreement. It may be viewed or downloaded for free at: http://nacto.org

American Association of State Highway and Transportation Officials (AASHTO)

AASHTO is a nonprofit, nonpartisan body representing state transportation departments. AASHTO’s Guide for the Development of Bicycle Facilities is a widely used bikeway planning and design tool. It is used by UDOT as the agency’s official bikeway design guidebook. This guidebook was last published in 1999 and does not contain guidance on advancements occurring within the last 13 years. A revision has been in process since 2010 but has not yet been published. The 1999 version is available for purchase at: http://transportation.org

Manual on Uniform Traffic Control Devices (MUTCD)

The MUTCD defines the standards used by road managers nationwide to install and maintain traffic control devices on all public streets, highways, and bikeways. The MUTCD was last published by the Federal Highway Administration (FHWA) in 2009. It’s main contributions to bikeway design are provision of signage and striping standards. The MUTCD is available for free download at: http://mutcd.fhwa.dot.gov
Bikeway Selection

This section presents a method for selecting particular bikeway types for given contexts. There are no absolute rules for determining the most appropriate type of bicycle facility for a particular location. Roadway speeds, volumes, right-of-way width, presence of parking, adjacent land uses, and expected bicycle user types are all critical elements of this decision. Studies find that the most significant factors influencing bicycle use are motor vehicle traffic volumes and speeds. Additionally, most bicyclists prefer facilities separated from motor vehicle traffic or located on local roads with low motor vehicle traffic speeds and volumes.

Because off-street pathways have a physical separation from the roadway, they are perceived as safe and attractive routes for bicyclists who prefer to avoid motor vehicle traffic. Conformance with standard bikeway designs allows users to anticipate whether they would feel comfortable riding on a particular bikeway and plan their trips accordingly. A process consisting of the following three steps can help determine the appropriate bikeway type to provide:

- **Identify Design User**
- **Consider Traffic Speed and Volume**
- **Select a Bikeway Type**

**Step 1: Identify Design User**

One of the most important factors to consider during bikeway design is the type of person the facility is meant to attract. User preferences vary by bicyclist skill level, trip purpose, and individual characteristics. As the level
of separation increases, a facility becomes more attractive to a wider range of bicycle users, thereby making bicycling a more viable and preferred transportation mode.

During the planning phase of a particular bikeway, the expected user group should be determined based on factors such as land use (e.g. proximity to schools, parks, and commercial areas) and connections to transit. The table on the previous page uses a color spectrum to show the applicability of various bikeway types to the different population groups defined previously in this best practice.

**Step 2: Consider Traffic Speed and Volume**

Bicyclists' comfort levels decrease proportionally with increases in motor vehicle volumes and widening gaps between the speed of bicycles and the speed of adjacent traffic. As a result, both traffic volume and traffic speed are important considerations when choosing an appropriate bikeway type for a given location. In general, as both volume and speed increase, so does the need for greater separation of the bikeway from traffic in order to appeal to a wider cross-section of people. Wider bikeways also help to mitigate the effects of volume and speed, albeit to a lesser extent than increasing facility separation.

The tables on page 24 use color spectra to graphically depict the appropriateness of different bikeway types for various traffic volumes and speeds. These tables may be used to get a general idea about whether a particular bikeway type will be a good solution for a given combination of volume and speed. Shared use paths are not included in this table because they are usually placed in rights-of-way separate from roadways, which makes the volume and speed of traffic less of a factor than for on-street bikeways.

The figure on page 25 combines both speed and volume into a single graphic. To use this figure to help identify an appropriate treatment for the roadway in question, identify the Average Annual Daily Traffic (AADT) on the left side and the posted speed limit on the bottom. The point represented by the combination of these values will fall within categories 1, 2, or 3. Within each category, the available bikeway types are ranked in order of the level of protection (with “A” being the most protection and “D” being the least) that they afford to people riding bicycles. The highest-ranked bikeway type for the combination of volume and speed chosen is the preferred selection.
**Step 3: Select A Bikeway Type**

This step begins with a determination of whether the preferred bikeway type resulting from Step 2 can be accommodated within the right-of-way and the available budget. If it can, the bikeway selection process is over. If a determination is made that it cannot be accommodated within the right-of-way and budgetary constraints, then the process is repeated for the next highest ranked bikeway type in the identified category (1, 2, or 3) until a type is found that does satisfy those constraints. Options for retrofitting bikeways on existing roads are presented in later sections.

### APPROPRIATE BIKEWAYS FOR GIVEN SPEED CONTEXTS

<table>
<thead>
<tr>
<th>Context</th>
<th>≤ 20 MPH</th>
<th>20-25 MPH</th>
<th>30-35 MPH</th>
<th>40-45 MPH</th>
<th>&gt;45 MPH</th>
<th>ADDITIONAL NOTES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Marked Shared Roadway</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Consider strategies to reduce motor vehicle speeds to preferred levels; for higher volume roads, only use this treatment if speeds are lower than 30 MPH</td>
</tr>
<tr>
<td>Bike Lane</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>For roads with speed &gt; 45 mph, maximize the bike lane width and consider buffered bike lanes</td>
</tr>
<tr>
<td>Buffered Bike Lane</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Protection strategies should be enhanced as speed and volume increase</td>
</tr>
<tr>
<td>Street-Level Cycle Track</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Protection strategies should be enhanced as speed and volume increase</td>
</tr>
<tr>
<td>Raised Cycle Track</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### APPROPRIATE BIKEWAYS FOR GIVEN VOLUME CONTEXTS

<table>
<thead>
<tr>
<th>Context</th>
<th>&lt;1,000 AADT*</th>
<th>1,001 to 3,000 AADT</th>
<th>3,001 to 5,000 AADT</th>
<th>5,001 to 10,000 AADT</th>
<th>10,001-25,000 AADT</th>
<th>&gt;25,000 AADT</th>
<th>ADDITIONAL NOTES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Marked Shared Roadway</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>Consider strategies to reduce motor vehicle speeds to preferred levels</td>
</tr>
<tr>
<td>Bike Lane</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>For increased user comfort at high volume levels, consider a facility offering increased separation</td>
</tr>
<tr>
<td>Buffered Bike Lane</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Street-Level Cycle Track</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Raised Cycle Track</td>
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<td></td>
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<td></td>
<td></td>
</tr>
</tbody>
</table>

* AADT - Average Annual Daily Traffic

**Marked shared roadways may also be used in categories 2 and 3 as long as the speed limit does not exceed 35 mph; however, engineering judgement, should be used in these situations.
Retrofitting Existing Streets to Add Bikeways

This section presents the various ways in which bikeways may be retrofitted to existing streets. Different methods may be used to reallocate space from parking or travel lanes to bikeways, or create new space by widening. Shared lane markings (which are discussed in detail in the MUTCD) are not mentioned here because they are generally not used in situations where space has been made available for higher-level facilities like bike lanes or cycle tracks. Likewise, shared-use paths are not mentioned because they are typically used in non-roadway rights-of-way. The following retrofit methods are presented here:

- Roadway Widening
- Lane Narrowing
- Lane Reconfiguration
- Parking Reduction

The table below shows ranges for the amount of space that needs to be reallocated to implement given bikeway types through these retrofit methods. The values include both sides of the road. Ranges are given to reflect variation between minimum and desired values. This section of the best practice is intended merely to show typical ways of retrofitting roads to accommodate bicyclists. It does not supplant the detailed guidance contained in the design standard documents shown on page 21.

<table>
<thead>
<tr>
<th>ROADWAY SPACE REALLOCATION</th>
<th>TOTAL WIDTH THAT MUST BE GAINED THROUGH MODIFICATIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>APPLICABLE TREATMENTS</td>
<td></td>
</tr>
<tr>
<td>Shoulder Bikeway</td>
<td>6-12’</td>
</tr>
<tr>
<td>Conventional Bike Lane</td>
<td>8-12’</td>
</tr>
<tr>
<td>Buffered Bike Lane</td>
<td>16’-18’</td>
</tr>
<tr>
<td>Cycle Track</td>
<td>14’-20’</td>
</tr>
</tbody>
</table>

More information about the four retrofit methods listed above is given on the following pages. Each section is couched in the assumption that space is being reallocated for a conventional bike lane. However, the retrofit methods can be used in the same manner to create space for buffered bike lanes and cycle tracks (although more reallocated space would be needed for them).
**Roadway Widening**

Bike lanes can be accommodated on streets with excess right-of-way by adding new shoulders or widening existing shoulders. Although roadway widening incurs higher expenses compared with re-stripping projects, bike lanes can be added to streets currently lacking curbs, gutters, and sidewalks without the high costs of major infrastructure reconstruction.

**Guidance**

- Consult the NACTO and AASHTO guides for recommendations about bikeway width for roads with and without curb and gutter.
**Lane Narrowing**

Lane narrowing utilizes roadway space that exceeds minimum standards to provide the needed space for bike lanes. Many roadway lanes are wider than the minimum standards prescribed in local and national roadway design standards. Most standards allow for the use of 11-foot and sometimes 10-foot wide travel lanes to create space for bike lanes, although truck volumes need to be considered as one of the factors when contemplating lane narrowing. The 2010 *Highway Capacity Manual* states that there is no operational difference between 10-foot and 12-foot travel lanes. A flowchart on the next page provides a template for deciding how to balance bikeway and travel lane widths.

**Guidance**

Vehicle lane width:

- **Before:** 10-15 feet
- **After:** 10-11 feet

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AASHTO supports reduced width lanes in *A Policy on Geometric Design of Highways and Streets*: “On interrupted-flow operation conditions at low speeds (45 mph or less), narrow lane widths are normally adequate and have some advantages.”
BEGIN WITH GOAL OF 6' WIDE BIKE LANE

CAN OTHER LANE WIDTH STDS. BE MET W/ 6' BLs?

IMPLEMENT STD. TRAVEL LANE WIDTH AND 6' BIKE LANES

WILL 11' LANE WIDTH(S) ALLOW FOR 6' BLs?

IMPLEMENT 11' TRAVEL LANES AND 6' BIKE LANES

DOES THE ROAD HAVE SIGNIF. TRUCK VOLUME?

IMPLEMENT 10' TRAVEL LANES AND 6' BIKE LANES

CAN 11' TRAVL. LANES & MIN. 4' BLs COEXIST?*

USE 11' TRAVEL LANES AND MAKE THE BLs AS WIDE AS POSSIBLE

BLs NOT IMPLEMENTABLE THROUGH LANE NARROWING
**Lane Reconfiguration**

The removal of a single travel lane will generally provide sufficient space for bike lanes on both sides of a street. Streets with excess vehicle capacity provide opportunities for bike lane retrofit projects. Although the figure below shows a situation where a center turn lane is being added along with a lane reduction, space for bike lanes may also be gained where an existing center turn lane is removed.

**Guidance**

Vehicle lane width:

- Width depends on project. No narrowing may be needed if a lane is removed.
**Parking Reduction**

Bike lanes can replace one or more on-street parking lanes on streets where excess parking exists or the importance of bike lanes outweighs parking needs. Eliminating or reducing on-street parking also improves sight distance for bicyclists in bike lanes and for motorists on approaching side streets and driveways.

**Guidance**

Vehicle lane width:

- Parking lane width depends on project. No travel lane narrowing may be required depending on the width of the parking lanes.

---

Removing or reducing on-street parking to install bike lanes requires comprehensive outreach to the affected businesses and residents. Prior to reallocating on-street parking for other uses, a parking study should be performed to gauge demand and to evaluate impacts to all users, including people with disabilities.
Bikeway Signing

The ability to navigate is informed by landmarks, natural features, and other visual cues. Bikeway signage should indicate:

- Direction of travel
- Location of destinations
- Travel time/distance to those destinations

Signage can serve both wayfinding and safety purposes, including:

- Helping to familiarize users with the bicycle network
- Helping users identify the best routes to destinations
- Helping to address misperceptions about time and distance
- Helping overcome a “barrier to entry” for people who are not frequent bicyclists (e.g. “interested but concerned” bicyclists)

Bicycle wayfinding signage plans identify:

- Sign locations
- Sign type – what information should be included and design features
- Key destinations highlighted for bicyclists
- Approximate distance to each destination
- Approximate travel time based on 10 mph average speed

Bicycle wayfinding signs also visually cue motorists that they are driving along a bikeway and should use caution. Signs are typically placed at key locations leading to and along bikeways, including intersections of multiple routes. Too many road signs tend to clutter the right-of-way, and it is recommended that these signs be posted at a level most visible to bicyclists rather than per vehicle signage standards. The AASHTO guide and MUTCD, which are described on page 21, contain guidance about lateral and vertical sign placement considerations.
Wayfinding Sign Types

A bicycle wayfinding system consists of comprehensive signing and/or pavement markings to guide bicyclists to their destinations along preferred bikeways. The three general types of bicycle wayfinding signs are:

Confirmation Signs

- Indicate to bicyclists that they are on a designated bikeway and also make motorists aware of the bikeway.
- May include destinations, distance, and time, but do not include arrows.
- Placed every ¼ to ½ mile on off-street facilities and every 2 to 3 blocks along on-street bicycle facilities, unless another type of sign is used (e.g. within 150 ft of a turn or decision sign).
- Should be placed soon after turns to confirm destination(s).
- Pavement markings can also act as confirmation that a bicyclist is on a preferred route.

Turn Signs

- Indicate where a bikeway turns from one street onto another.
- Pavement markings may be used to supplement the signs; destinations, arrows, and distances may be used.
- Should be placed on the near side of intersections where a bicyclist will need to turn to get to the indicated destination.
- Pavement markings can also indicate the need to turn.

It can be useful to classify a list of destinations for inclusion on the signs based on their relative importance to users. A particular destination’s ranking in the hierarchy can be used to determine the physical distance from which the locations are signed.

Primary destinations may be included on signage up to five miles away. Secondary destinations may be included on signage up to two miles away. Tertiary destinations may be included on signage up to one mile away.
Decision Signs

- Mark the junction of two or more bikeways, and inform bicyclists of the designated bikeways available to access key destinations.
- Must include destinations and arrows. Inclusion of distance and travel time is recommended, but not required.
- Should be placed on the near side of intersections in advance of a junction with another bikeway.
- May be used along a route to indicate a nearby destination.

Bicycles on Narrow Canyon Roads

Salt Lake County’s many canyons are popular destinations for recreational bicyclists seeking exercise or scenic opportunities, despite canyon roads being difficult for motorists and bicyclists to comfortably share. Roads are generally narrow and widening may be difficult, costly, or undesirable for environmental or aesthetic reasons. Motorists complain that bicyclists do not ride single file, while bicyclists describe instances of cars passing too closely or being otherwise harassed.

The following best practices – which include both infrastructure and non-infrastructure solutions – can help to address this issue:

- Where possible, widen the roadway and/or shoulder in the uphill direction to give drivers the ability to more safely pass bicyclists. Additional space is less needed in the downhill direction where bicycle and car speeds will be closer to one another.
- In canyons with higher speeds (e.g. the Cottonwood Canyons), user-activated flashing warning signs can be installed at the canyon entrances to alert motorists of bicyclists on the road ahead. This treatment is less applicable for Emigration Canyon, where cyclists are ubiquitous and the flashers would remain on for long stretches of time.
- Work with bicycle clubs and teams to adopt a “Single File is Safer” ethic. An example of an existing program can be found at: http://www.cbcef.org/single-file-is-safer.html.
- Install signs to highlight the expectation of bicyclists using the road (e.g. “Share the Road”) or to encourage specific behavior (e.g. minimum passing distance or instructions to ride single file). Signs are less effective than the other best practices mentioned above.
Discussion: Implementation

Salt Lake County is evaluating existing organizational practices and procedures in an effort to understand how best to support a comprehensive implementable plan for increasing bicycling countywide. Because the County has jurisdiction over only unincorporated areas and bicyclists routinely cross jurisdictional boundaries, cooperative planning is necessary for improving bicycling activity, not only within Salt Lake County’s own boundaries, but between cities. Independent municipalities within Salt Lake County include:

- Alta
- Bluffdale
- Cottonwood Heights
- Draper
- Herriman
- Holladay
- Midvale
- Murray
- Riverton
- Sandy
- Salt Lake City
- South Jordan
- South Salt Lake
- Taylorsville
- West Jordan
- West Valley City

The following areas fall within the direct jurisdiction of Salt Lake County:

- Copperton Township
- Millcreek Township
- Emigration Township
- Kearns Township
- Magna Township
- White City Township
- Big Cottonwood Canyon
- Little Cottonwood Canyon
- Parley’s Canyon
- Granite
- Sandy Hills
- Willow Canyon
- Willow Creek
- Southwest

The County and many other cities are in the process of actively creating a comprehensive plan for improving bicycle activity. Coordination between these planning efforts is needed because of the intertwining of road networks and municipal boundaries.
Current Practices: Inter-Jurisdictional Cooperation & Implementation

Establishing better inter-jurisdictional cooperation can be as simple as identifying processes that already work across multiple entities (whether bicycle related or not) and then building on that with best practices from the profession. To that end, a detailed questionnaire was distributed to stakeholders from the Salt Lake County Bicycle Advisory Committee (SLCBAC), County, township and municipal staff, and County Planning Commissioners.

One goal of the questionnaire was to discover other projects or plans that have been implemented across jurisdictional boundaries. Successful models can be assessed to determine how their organization, reporting structure, policies, and communication practices foster coordinated planning efforts. The following sections are informed by the completed questionnaires.

Existing Inter-Jurisdictional Practices in Salt Lake County

The County Cooperative Plan (CCP) was created in 2008 to focus on county-wide issues such as economic competitiveness, resource management, land use planning, and environmental issues that, like bicyclists, do not stop at their jurisdictional boundaries. The CCP unites the six townships, 16 cities, and other areas of unincorporated Salt Lake County to identify, understand, and solve county-wide issues together. The CCP also brings other counties, organizations, and State agencies to the table to help solve shared problems or concerns in a cooperative manner. In 2009, the group focused on transportation issues and developed a cooperative plan bicycle route map.

The CCP framework is an example of a successful cooperative effort that works because of the regular meetings, inter-jurisdictional participation, and the development and provision of tools to aid local jurisdictions and unite land use planning while still maintaining local autonomy. CCP participants learn from one another and discuss collaborative ways to solve issues. This group will be a key component in sustainable planning and development efforts in the future. Lessons learned from the work of this group are that good communication and cooperation are paramount for the level of coordination anticipated for cooperative implementation of bicycling infrastructure in Salt Lake County.

Another effort described as successfully integrating jurisdictions within the County is the work done to build shared use paths. Shared use paths have been completed within both the County and city jurisdictions. It appears that regular communication by parks staff members with engineering and planning staff is integral to the success of these projects, as well as funding availability through the Open Space Trust Fund and other State and Federal sources.

**Current Bicycle Coordination and Implementation Practices**

The survey identified the importance of strong leadership and staff tasked specifically with the implementation of bicycle projects and programs. There is a general perception that much of Salt Lake City’s bicycle implementation success stems from earmarking full-time employees and interns to bicycle-related efforts. A similar strategy would benefit Salt Lake County.

The survey also found a sense that a regional bikeway authority of some kind is needed to coordinate planning and funding amongst the many different jurisdictions and agencies involved in transportation planning and decision making.

**Communication Between Jurisdictions**

Establishment of a staff position within the County government to focus specifically on bicycle issues has been identified as a key component for improving communication and implementing facilities, programs, and policies. A structure that fosters interagency communication can provide expertise and project support to cities and townships that do not have the time or resources required to advance bicycling in their communities. Coordination, collaboration, and regular meetings are seen as a benefit, particularly if they provide an opportunity to:

- Learn about upcoming street projects.
- Brainstorm creative solutions to site-specific issues.
- Explore funding opportunities.
- Foster region-wide connectivity.

**Promoting Voluntary Change Among Autonomous Municipalities**

Some communities in Salt Lake County are heavily involved with bicycle planning, programming, and capital improvement activities, while others have historically not been very involved in these activities. The County
has an opportunity to be a positive role model by implementing bicycle infrastructure in unincorporated areas, providing assistance to individual cities, and bringing cities together to coordinate regional efforts. Currently, SLCBAC advises County staff and the Mayor on bicycling issues.

**Coordination With UDOT**

The Utah Department of Transportation (UDOT) is an important partner in countywide bicycle connectivity efforts because they control many regional roads that provide access to important educational, commercial, and residential destinations. Other agencies and citizen advocates often lack understanding about the political structure and the processes necessary to work with UDOT. A strong relationship between County staff and the UDOT Bicycle and Pedestrian Coordinator will be crucial to bikeway implementation efforts. The following actions would help to foster better coordination with UDOT:

- Have County staff (particularly a County Bicycle Coordinator if such a position is established) forge a strong relationship with the UDOT Bicycle and Pedestrian Coordinator, and leverage that relationship to educate city staff.
- Have County staff assist individual cities with creating bicycle plans so that they have something in place with which to work with UDOT.
- Work with the UDOT Bicycle and Pedestrian Coordinator to identify the proper UDOT representative to sit on County steering committees or attend activities for individual projects (as well as sit on UDOT advisory bodies and committees, where appropriate).
- Also team with the UDOT Bicycle and Pedestrian Coordinator to identify a UDOT representative to serve as a liaison to SLCBAC.

**Samples of Inter-Jurisdictional Implementation**

The following existing plans and projects from within the County and communities nationwide were reviewed for the purpose of describing successful inter-jurisdictional implementation processes:

1) Utah Bicycle and Pedestrian Master Plan Design Guide
   a. Salt Lake County Complete Streets Policy
   b. Park City Transportation Summit
   c. Maintaining Public Interest
2) Mountainland Association of Governments
3) Carolina Thread Trail (NC)
4) South Bay Bicycle Master Plan (CA)
5) Roanoke Valley Area Metropolitan Planning Organization (VA)
6) Santa Clara County Valley Transit Authority (CA)

Utah Bicycle and Pedestrian Master Plan Design Guide

While the Utah Bicycle and Pedestrian Master Plan Design Guide\(^4\) does not provide much information about inter-jurisdictional cooperation, it does provide local agencies instruction on how to prepare planning documents within the context of adjacent jurisdictions. It provides resources to planners to help demystify the many layers of governance and their relationship to bicycling. For example, the Regional Transportation Plan for Wasatch Front Regional Council (Davis, Weber, and Salt Lake Counties) will show non-motorized facilities, including those which inform the State Transportation Improvement Program (STIP). However, many projects that are funded locally do not appear on the STIP and will most likely be located in county, city, or small area plans. The Guide points out that by obtaining relevant plans from adjacent communities, an agency can better ensure complete pedestrian and bicycle systems between different jurisdictions. The guide also provides an overview of good practices in Utah including the Salt Lake County Complete Streets Policy, the Park City Transportation Summit, and tips for keeping the momentum going after a plan is adopted.

Salt Lake County Complete Streets Policy

Salt Lake County codified its Complete Streets Policy into Ordinance 14.12.030 in April 2010. The Ordinance required the Public Works Department to adopt a complete streets policy “for use by county departments, developers, and others in the overall layout and design of streets and adjacent developments.” The review and consideration of complete streets components for design, construction, and approving building or zoning applications includes:

- Lower speed limits.
- Traffic signal progression at a lower speed.
- Street construction and design with pedestrian and bicycle friendly features.

Street connectivity.

Context-sensitive construction and reconstruction.

**Park City Transportation Summit**

Park City developed a unique strategy for selecting and prioritizing projects for funding through its local Capital Improvement Programs (CIPs). Every two years, Park City and Summit County staff members and elected officials gather for a day-long Transportation Summit to discuss local transportation issues. Summit participants receive briefings on recent and planned transportation projects from City representatives as well as UDOT. Following the briefings, participants work in small groups to identify upcoming transportation needs and potential projects to be funded. Each small group presents its list to the other Summit participants. After the small group presentations, all participants have the opportunity to rank their highest-priority projects from all of the lists. Participants also indicate whether projects should be undertaken in a one-year, three-year, or five-year horizon. Following the Transportation Summit, Park City and Summit County staff members incorporate the high priority projects from the Summit into local Capital Improvement Plans for funding, and begin the process of implementation. This model could easily be applied to an inter-jurisdictional committee of stakeholders in Salt Lake County.

**Maintaining Public Interest**

Implementation tasks can benefit from the same excitement and enthusiasm generated by the public involvement component often associated with planning processes. Continued interest and involvement from the public is essential for creating support for projects in the event that they come up against political or practical barriers. Key methods for maintaining the public's interest are:

- Establishing an ongoing role for the advisory committee if one was created to help develop the plan. Salt Lake City, Salt Lake County, Provo, Park City, and Ogden each has an established bicycle advisory committee that meets regularly.

- Showcasing progress on bicycle projects and continuing discussion on bicycle and pedestrian issues by using electronic media and local communication channels that are updated regularly.
• Partnering with public health, law enforcement, and schools to implement encouragement, education, and enforcement activities.

**Mountainland Association of Governments**

The Mountainland Association of Governments (MAG) was chosen as an example of a regional organization that has been supporting progress in bicycling in Summit, Wasatch and Utah Counties. MAG serves the following functions:

- A funding source.
- A forum for discussing funding priorities.
- A clearinghouse for project concepts and designs.
- A resource for project development and assistance in securing UDOT and FHWA approval.
- Staff support to represent local interests to regional, State, and Federal agencies on behalf of local elected officials.

MAG indicates that what makes their process work in terms of the relationships among and between partner agencies is the common source of funds and a forum for identifying funding priorities. Additionally, the development and upkeep of personal relationships, including an understanding that MAG is looking out for the needs of partner agencies, is essential. There is a perception that the building and maintenance of trust among the partners works better with staff resources, such as exist at MAG where there is a full time coordinator in a dedicated Bicycle and Pedestrian Program, who is guided by the Unified Work Program and the Metropolitan Transportation Plan. Although MAG bylaws specify the voting status of associated agencies, there is nothing specific about bicycle implementation in the bylaws.

**Carolina Thread Trail (NC)**

The Carolina Thread Trail is a regional trail network that will reach 15 counties in North Carolina. It is identified as a best practice in implementation due to its success in weaving communities together. The Thread is one outcome of a 2005 leadership retreat held by the Foundation for the Carolinas for the purpose of determining the region’s environmental needs and concerns. A concern for open space preservation launched the
Thread two years later as a project focused on preserving natural corridors and connecting people to nature by providing a regional trail backbone. The Catawba Lands Conservancy, a nonprofit land conservation agency with regional purview, provides the leadership and funding for the project. Counties become eligible for funding of planning, implementation and land acquisition if they have adopted master plans that show corridors on the regional network. Fourteen counties have pursued letters of support to commence the planning process from each community within their jurisdiction. Although the planning efforts include on- and off-street planning, there is a trend revealing that counties have an easier time coming together over trails and green space than they do over traditional on-road connections. The success of the multi-county planning efforts for the Thread Trail is attributed to:

- Relatively easy to access funding.
- Consensus that local support is essential to move forward.
- Cooperation among nonprofit leaders, regional business leaders, and the North Carolina Department of Transportation.
- Board representation that includes local elected officials.
- County autonomy in applying for funding and deciding the pace of implementation based on interest and energy.

**South Bay Bicycle Master Plan (CA)**

Renew Environments for Nutrition, Exercise and Wellness in Los Angeles County (RENEW-LAC) received Federal funding through the Communities Putting Prevention to Work Program. One product of the grant was the South Bay Bicycle Master Plan, developed through a multi-city master planning process, with a goal of improved and increased connectivity across the cities of El Segundo, Gardena, Hermosa Beach, Lawndale, Manhattan Beach, Redondo Beach, and Torrance. The project was led by the Los Angeles County Bicycle Coalition and the South Bay Bicycle Coalition, which came together to improve the safety and convenience of bicycling in the South Bay Region of Los Angeles County. In anticipation of the planning work, the seven cities adopted supportive resolutions and dedicated in-kind staff time to assist with plan review and data gathering. Although this effort did not include unincorporated county areas, it is relevant to the Salt Lake County initiative because of the multi-jurisdictional cooperation and the
leadership provided by LA County to develop a plan that focuses on cross-city consistency and connectivity.

The final plan reflects the multi-city planning process whereby the cities share common documented goals, objectives, and policies focused on evaluation and planning, engineering, education, enforcement, encouragement, and equity. Individual city chapters provide for a discussion of a city’s existing conditions, needs analysis, and proposed facility improvements. Inter-jurisdictional connectivity is one criterion used to develop each city’s project priorities. Design guidance and a regional wayfinding and signage plan ties the individual city facilities together. Each jurisdiction adopted the common plan in 2011 and will be individually responsible for implementation within its own boundaries.

With respect to implementation, the Plan recommends the following accountability mechanisms to ensure its success:

- Designation of Mobility Coordinators within each city (or assistance to the Regional Planning Organization to establish a regional position) to coordinate, and oversee implementation, and provide regular updates to the city councils.

- Establishment of a regional bicycle advisory committee comprised of community members and council liaisons from each city that will meet regularly to monitor progress of bikeway implementation for each city.

**Roanoke Valley Area Metropolitan Planning Organization (VA)**

The Regional Roanoke Valley Area Bikeways Plan was adopted in 2005\(^5\). Subsequently, jurisdictions within the study area were encouraged to recognize or adopt the plan as a guiding document in developing a regional bicycling network for the purpose of promoting and facilitating bicycle use. Local governments are primarily responsible for implementation of the bicycle projects. The plan includes recommendations for bikeways, signage, and non-infrastructure programs to facilitate cross-jurisdictional consistency. The plan recognizes that the local implementation of regional best practices can be more successful if other stakeholders encourage and facilitate their implementation.

Stakeholders included local departments, area schools, employers, employees.

\(^5\) [http://www.rvarc.org/bike/bikefinal.pdf](http://www.rvarc.org/bike/bikefinal.pdf)
bicycle advocates, economic development agency representatives, and others. The Bicycle Plan Advisory Committee meets to provide guidance and assist in implementing the plan recommendations. The Committee includes representatives from the State DOT, bicycle and trail advocacy organizations, city and county staff, and members from planning and transportation departments. The MPO also provides links to local, state, and regional planning resources.

**Santa Clara County Valley Transit Authority (CA)**

Santa Clara’s Bicycle Program provides facilities, services, and programs to improve bicycle infrastructure and bicycling conditions throughout Santa Clara County, CA. Valley Transit Authority (VTA) is the countywide planning agency for bicycle projects. They plan and fund projects of regional or countywide significance. The policy document that provides the framework for the program is the Countywide Bicycle Plan, while their Bicycle Technical Guidelines offer facility design best practices. The County Plan identifies routes of countywide or intercity significance and complements member agencies’ bicycle plans, which focus on improvements at a local level. Projects of regional countywide significance, as identified through the planning effort, are eligible for Bicycle Expenditure Program funding through the VTA, with the provision of a 20% minimum local match. Money for this program comes local voter-approved sales tax, Congestion Management Program funds, federal grants, state planning grants, and other sources.

Incorporated cities provided input into the Plan, through their Bicycle and Pedestrian Advisory Committees (BPACs). Additionally, a separate VTA BPAC provided guidance. Still ongoing, the VTA BPAC has 16 members (one for each city and the county, plus a nonvoting member from the Silicon Valley Bicycle Coalition). The BPAC advises the Board on funding and planning issues, serves as the bicycle advisory committee for Santa Clara County review, and provides comments to Congestion Management Program staff regarding plans and designs for an effective countywide bikeway system. The VTA BPAC also updates the Countywide Bicycle Plan, Countywide Bicycle Map, Countywide Bicycle Expenditure Plan, and coordinates bicycle-related issues affecting the transit system.

This VTA BPAC coordinates with BPACs from other agencies on multi-

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jurisdictional bicycle and pedestrian issues. It also coordinates work and meets as needed with the County’s Trails Committee, makes recommendations to the VTA Board of Directors regarding the Countywide annual priority list of bicycle and pedestrian projects for funding, and serves as the countywide bicycle and pedestrian advisory committee for the County.7

**Recommended Roles and Responsibilities**

The following sections present recommendations for the various County bodies involved in bicycle-related issues.

**Bicycle Coordinator**

The creation of a Bicycle Coordinator position would greatly enhance the County’s ability to monitor bicycle-related policies, programs, and projects. The Coordinator would oversee implementation of bike facilities, programs, grant applications, and data collection as well as provide regular updates to – and solicit recommendations from – SLCBAC.

The current location in the Mayor’s office provides the advantage of access across multiple departments. However, in the interest of getting things done, the position would be best housed in the Public Works Department where the Planning and Engineering Departments are located and where projects are prioritized and implemented. It is recommended that the Bicycle Coordinator position be located directly under the Public Works umbrella rather than within either Planning or Engineering to allow the person to work equally with both departments.

Although the Bicycle Coordinator does not need to be an Engineer, an understanding of engineering processes or experience with municipal public works, whether obtained through an engineering background or through other means, is preferable. Proposed roles and responsibilities for the County Bicycle Coordinator position include:

- Manage updates of a County bicycle master plan, and provide technical support to cities as they develop their own bicycle master plans.
- Manage countywide GIS bicycle database updates.

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7. [http://www.vta.org/inside/boards/governing_board.html#bpac](http://www.vta.org/inside/boards/governing_board.html#bpac)
- Serve as the primary link between SLCBAC and the various governmental bodies (including the CCP) that are working on bicycle-related projects and programs.

- Find out about upcoming road improvement, utility, and other projects that impact bikeway development and solicit feedback from SLCBAC to review plans, concept designs, and other materials related to those projects.

- Track city and county benefits of plan implementation and trends in bicycle commuting through the use of census data, travel surveys, and volunteer-led bicycle counts.

- Develop and update design guidelines for use throughout the county.

- Evaluate and prioritize potential projects for regional funding.

- Regularly monitor bicycle safety and seek a continuous reduction in bicycle-related collisions.

- Coordinate bicycle improvement funding applications among all involved cities to increase probability of receiving grant funding.

- Develop grant applications for bicycle projects.

- Implement bicycle encouragement programs.

- Disperse best practices knowledge to municipalities; for example, training them on low-cost ways of implementing bikeways, such as the “chasing the pavers” method of incorporating striping changes at the same time as resurfacing projects.

- Ensure that bicycle master plan programs and projects are implemented in an equitable manner, both geographically and socioeconomically.

- Develop an annual report to SLCBAC and the County Council that will include a summary of grant applications, awards, and an overview of implementation progress.

As individual cities grow their own bicycle program capacities, they too should create bicycle coordinator positions. The County Bicycle Coordinator can offer suggestions and assistance to cities that are contemplating hiring such a person.
**County and Township Planning Commissions**

It is not customary for a bicycle advisory committee to advise a planning commission on an ongoing basis because the day-to-day functions of those commissions are typically centered on very specific land use, policy, and ordinance concerns. However, the Planning Commissions also help to develop General Plans and Transportation Plans, which can be very important for future bicycling improvements. The County and Township Planning Commissions can play an integral role in effecting policy-level change under the recommendations of the County Bicycle Coordinator, other staff, and SLCBAC without being directly advised by the SLCBAC. Rather than having SLCBAC advise the Planning Commissions directly, it is recommended that the County Bicycle Coordinator serve as the primary link to the Commissions and solicit input from SLCBAC at the appropriate times.

**Municipal Planning Commissions**

Municipal Planning Commissions focus on land use, policy, and ordinance concerns specific to individual autonomous cities within the County. It is not practical or advisable for a regional advisory body like SLCBAC or for County staff to try coordinating with these bodies, at least for the foreseeable future. However, for communities in Salt Lake County that do not have a bicycle advisory committee, SLCBAC could be a resource upon request by the municipality.

**SLCBAC**

*Representation*

Until each municipality has its own Bicycle Advisory Committee (and perhaps even after), Salt Lake County should build on SLCBAC’s successes and focus on increasing that body’s effectiveness. Residents of each municipality and township should have the opportunity for representation on the committee, as well as technical staff, advocates, and policymakers. Representative membership will increase opportunities for communication and collaboration around bicycling issues. Furthermore, with different levels of government within the county looking at the same vision, the changes can be implemented collaboratively with the opportunity to learn from each other through better coordination.
SLCBAC should be composed of between 11 and 15 appointed people with representation from residents and agency staff, some of which would be voting members while others would serve in an ex-officio capacity. A committee smaller than 11 people may not be representative enough, while a number larger than 15 may prove unwieldy, especially at first. The following minimum composition is recommended, with other “at large” voting members appointed to fill the remaining seats.

- One resident from a county township or other non-incorporated, non-township location.
- Three residents from incorporated cities, including at least one who lives west of I-15 since those communities are traditionally under-represented on bicycling matters.
- Two members from city staff.
- Four ex-officio representatives – one each from the County Mayor’s office, Wasatch Front Regional Council, UDOT (from either the Central or Region 2 offices), and the Utah Transit Authority.

The existing structure (Chair, Co-Chair, Secretary, Treasurer) can be maintained in this new body. The County Bicycle Coordinator should coordinate the process of soliciting candidates for SLCBAC appointments and provide recommendations, with the ultimate appointment coming from the County Mayor. Once a newly-constituted SLCBAC is running, the group may take over the role of recommending other candidates for appointment.

Advisory Roles

SLCBAC should be reconstituted as an official County advisory body. Optimal advisory roles for SLCBAC include the following:

- Submit formal recommendations for improving bicycling conditions on the County roadway and shared use paths systems to the County Bicycle Coordinator. This should include coordination with the Parks and Recreation and/or Planning Departments.
- Make formal recommendations for improvements to existing inter-jurisdictional facilities to the County Bicycle Coordinator so that the Coordinator can work with the appropriate municipalities and County townships to implement those recommendations.
- Guide the development and review of a County bicycle master plan.
Review and comment on changes to the general plan, zoning ordinance, municipal code, and other policy documents relating to bicycling.

Review public and private projects that impact bicycle facilities to ensure adequate consideration of bicyclist needs.

Review and comment on the design of capital improvements to bicycle facilities (e.g. bikeways, bike parking facilities, intersection projects, traffic signals, street maintenance).

Provide a liaison between the County and community groups on issues related to bicycling.

Propose, review, and prioritize bicycle transportation projects for funding.

Review and approve grant applications.

Receive and review annual reports on bicycle project implementation.

It is worth noting that these advisory roles are predicated upon the hiring of a County Bicycle Coordinator. Reconstituting SLCBAC in this manner likely will not be feasible without that staff person in place.

Advisory Chain of Command

Assuming the committee takes on the roles and responsibilities described above, SLCBAC should report to the Public Works Department (via the County Bicycle Coordinator) on most matters, while also providing advice to the County Council and Mayor on matters of policy or document adoption.

Alternatively, SLCBAC could continue its existing structure of advising the Mayor’s office. However, there are three distinct advantages to changing SLCBAC’s primary reporting body to be the Public Works Department:

- Communication and reporting will be streamlined if a County Bicycle Coordinator is hired and also housed within the Public Works Department, as recommended in this document.

- Mayors and Councilmembers often rely on staff recommendations to make decisions, which means that direct coordination with the Parks and Recreation, Engineering, and Planning Departments is crucial.
• Provision of an ex-officio Mayor’s representative allows for consistent communication with the Mayor’s office, while allowing the primary reporting channel to be directed where it’s most needed.

SLCBAC’s budget should be limited to that which supports monthly or quarterly meetings.

**Cooperative County Plan (CCP)**

The CCP process is currently the best mechanism for disseminating information and resources among Salt Lake County and its municipal bodies. It has a proven track record of bringing people from the various agencies into collaborative discussions. It is tempting to organize SLCBAC as a subset of the CCP to leverage existing information sharing channels. However, this would complicate the reporting and advisory structure because the CCP addresses numerous regional planning challenges and would likely not have the capacity to house and coordinate the activities of an advisory body focused specifically on just a small subset of those issues.

Furthermore, removing SLCBAC from a direct reporting relationship to the County Bicycle Coordinator – and by extension the County Public Works Department – would run counter to the goal of working as closely as possible with the areas of County staff where the “rubber meets the road”.

This does not, however, mean that there should not be an important coordination function between SLCBAC and the CCP. There will likely be frequent opportunities and reasons for SLCBAC to attend CCP meetings, solicit that body’s input, and offer updates on bicycle-related efforts. Logical points of coordination include:

• Dissemination of information such as revised best practices, announcements about technical training opportunities, upcoming bicycle events, and bikeway funding changes.

• Discussion of changes in countywide data management practices.

• Solicitation of new members for SLCBAC.

• Presentation of SLCBAC recommendations about inter-jurisdictional bikeway development.

• Requests for pooled funding (or other non-monetary resources) for the purpose of accomplishing goals that benefit multiple communities.
Complete Streets Guidance

The Salt Lake County Council adopted a Complete Streets Ordinance and Policy in April 2010. The purpose of this section is to give guidance and resources for implementing the existing ordinance and policy. Much of the information in this section is taken from Complete Streets Policy Analysis 2010\(^6\) (hereafter referred to as Policy Analysis), which was published by the National Complete Streets Coalition.

What Is a Complete Streets Policy?

According to Policy Analysis, Complete Streets policies:

“...formalize a community’s intent to plan, design, and maintain streets so they are safe for all users of all ages and abilities. Policies direct transportation planners and engineers to consistently design and construct the right-of-way to accommodate all anticipated users, including pedestrians, bicyclists, public transportation users, motorists, and freight vehicles.

“Complete streets can be achieved through a variety of policies: ordinances and resolutions; rewrites of design manuals; inclusion in comprehensive plans; internal policies developed by transportation agencies; executive orders from elected officials, such as Mayors or Governors; and policies developed by stakeholders from the community and agency staff that are formally adopted by an elected board of officials.”

Implementation of Existing County Policy and Ordinance

Adopting a Complete Streets ordinance or policy is only the first step. The more difficult – but ultimately productive – task is converting the paper vision into actual practice. The following excerpt from Policy Analysis reinforces this concept and lists four key steps for Salt Lake County to take now in order to move from a visionary stage to an implementation stage:

“Taking a complete streets policy from paper into practice is not easy, but providing some momentum with specific implementation steps can help. The [following] four key steps [will aid] successful implementation of a policy:

- Restructure or revise related procedures, plans, regulations, and other processes to accommodate all users on every project.

develop new design policies and guides or revise existing to reflect the current state of best practices in transportation design. Communities may also elect to adopt national or state-level recognized design guidance.

- offer workshops and other training opportunities to planners and engineers so that everyone working on the transportation network understands the importance of the complete streets vision and how they can implement in their everyday work.

- develop and institute better ways to measure performance and collect data on how well the streets are serving all users.”

other implementation guidance can be found in the following sources:

- california department of transportation’s complete streets implementation action plan9. this document provides an example of how another agency has developed a detailed action plan to integrate complete streets principles into its manuals, guidelines, staff training, policies, and project selection processes.

- american planning association’s complete streets: best policy and implementation practices. this report contains a wealth of real-world implementation examples in a variety of complete streets practice areas from cities across the us.

to summarize the importance of transitioning policy to implementation, policy analysis further says:

“...adoption of a policy with strong language is only the first step – the policies must lead to changes inside of transportation agencies that then lead to project-level changes as transportation projects are designed for the safe use of bicyclists, transit users, and pedestrians of all ages and abilities.

“we know from our research and experience that full implementation requires agencies to undertake additional training of staff, as well as creation of new project development processes, design standards, and performance measures. policies that look good on paper are of little value if they do not lead to change in practice and in projects on the ground.”

Exceptions to the Inclusion Rule

In order for Complete Streets policies to work, they must include a clear process for accommodating exceptions to the inclusion rule. Policy Analysis states the following regarding this principle:

“Making a policy work in the real world requires developing a process to handle exceptions to providing for all modes in each project. There must be a balance achieved when specifying these in policy language so that the needed flexibility for legitimate exceptions does not also create large loopholes. The strongest policies set out clear responsibility and a clear process for granting exceptions.

“...the following exceptions are appropriate with limited potential to weaken the policy. They follow the Federal Highway Administration’s guidance on accommodating bicycle and pedestrian travel and identified best practices frequently used in existing Complete Streets policies.

- Accommodation is not necessary on corridors where specific users are prohibited, such as interstate freeways or pedestrian malls.
- Cost of accommodation is excessively disproportionate to the need or probable use. We do not recommend attaching a percentage to define ‘excessive’ as the context for many projects will require different portions of the overall project budget to be spent on the modes and users expected; additionally, in many instances the costs may be difficult to quantify. A 20% cap may be appropriate in unusual circumstances, such as where natural features (e.g. steep hillsides, shorelines) make it very costly or impossible to accommodate all modes. A 20% figure should always be used in an advisory rather than absolute sense.
- A documented absence of current and future need.

“Many communities have included other exceptions that the Coalition, in consultation with transportation planning and engineering experts, also feels are unlikely to create loopholes:

- Transit accommodations are not required where there is no existing or planned transit service.
• Routine maintenance of the transportation network that does not change the roadway geometry or operations, such as mowing, sweeping, and spot repair.

• Where a reasonable and equivalent project along the same corridor is already programmed to provide facilities exempted from the project at hand.

“We believe the primary objective of Complete Streets is to provide safe accommodation for all users of the transportation network. Additional exceptions begin to weaken this goal and may create loopholes too large to achieve the Complete Streets vision. Engineers and project managers are talented and creative problem solvers and should be able to address project-level barriers in ways that still achieve an environment supportive of all users.

“In addition to defining exceptions through good policy language, there must be a clear process for granting them. We recommend a senior-level department head, publicly accountable committee, or a board of elected officials be charged with approving exceptions. Doing so ensures that as a policy moves into implementation, its intent is carried out and no exceptions are abused.”

Collaboration Versus Enforcement

Complete Streets policies are sometimes born from a sense that historically the so-called “alternative” modes have not been accommodated well in roadway planning and design. In these cases, champions of the Complete Streets concept often want to very strictly limit (if not eliminate entirely) potential loopholes to the inclusion of bicyclists, pedestrians, and transit users. However, Policy Analysis cautions against this rigid approach:

“The desire to ‘force’ transportation engineers to behave differently has led some to advocate focusing on passing laws with binding, airtight language requiring accommodation. The palpable sense of frustration among some advocates is understandable; this seemingly simple concept has proven difficult to instill over several decades of advocacy.

“Yet, in the realm of street design, engineers are the licensed professionals charged with safe and efficient operation of the transportation system. It is extremely difficult, and perhaps inappropriate, for elected officials to tread into the territory of prescriptive
street design. Engineers are inherently problem solvers, and the best way to change their focus is to work with them to change the definition of the problem.

“In our systems approach to Complete Streets, the redefinition of the problem is the purview of decision-makers, while the final approval of the designs to achieve the desired outcomes lies with the traffic engineers. We have found that a cooperative approach with street designers and traffic engineers is critical to effective policy implementation. Cultivating positive relationships and strategic partnerships inside the profession is a proven success...

“...Based on this experience, we believe that the most effective Complete Streets laws or policies primarily engage decision makers in an appropriate role of setting a new standard of intent and defining desired outcomes, rather than attempting to force specific changes through an enforcement mechanism.”

**Project Prioritization Guidance**

The desire for bikeway improvements seemingly always outweighs available funding, as is the case with transportation funding in general, thus making it important to prioritize investments. The first step in determining bikeway project priority is deciding upon the factors that should be considered in making the priority determination. The second step is assigning weights to those factors.

Salt Lake County will ultimately need to decide upon factors and weighting that are appropriate to their local context. However, the following factors and weights from a similar process done in Scarborough, ME are presented below to show how another community has addressed prioritization:

- Improves safety (3)
- Provides Safe Routes to School (3)
- Provides access to destinations (2)
- “Completes” the street (2)
- Impact on traffic safety and circulation (2)
- Increases regional/local connectivity (2)
Another idea for Salt Lake County to strongly consider is tying the factors back to the Complete Streets ordinance and policy. This would allow the prioritization process to reflect the vision set forth in those documents while at the same time providing an easy way to evaluate how well those documents are being implemented.
Discussion: Goals and Priorities for Education and Promotion Efforts

The following education and promotion goals were identified by Salt Lake County as high priorities for the region.

Goal 1: Teach children bicycling skills and laws.

Goal 2: Educate the general public about bicycling – rights and responsibilities of cyclists, expected driver behavior in bikeways and near bicyclists, and benefits of bicycling.

Goal 3: Educate professional drivers (transit operators, school bus drivers, commercial drivers, etc.) about bicycling.

Goal 4: Educate current and potential bicycle riders about rights and responsibilities, bicycling routes, and expected behavior.

Goal 5: Educate policymakers and decision makers about the experience of bicycling and the needs of cyclists.

Goal 6: Encourage businesses to provide bicycle parking and incentives for employees who ride a bike to work.

A series of education and promotion programs that serve these goals are described on the following pages. The table below summarizes the goals addressed by each program.

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The table above indicates which goals are addressed by each program.
Bicycling Website

Description: A County bicycling website should be created to give residents a one-stop information portal. This should include links to all bike maps (online versions and instructions about how to get a hard copy), information about committees and community groups working on bicycling, an event calendar, information about laws and ordinances about bicycling, and relevant agency contacts and phone numbers.

Target audience: general public

Goals addressed:

Goal 2: Educate the general public about bicycling – rights and responsibilities of cyclists, expected driver behavior in bikeways and near bicyclists, and benefits of bicycling.

Goal 4: Educate current and potential bicycle riders about rights and responsibilities, bicycling routes, and expected behavior.

Sample program: http://www.bikelongbeach.org

Integrate Bicycling into Driver’s Ed

Description: Improving driver awareness of bicyclists helps to make a safer and more comfortable road environment for bicycling. Outreach through Drivers Ed classes is a good way to reach beginning drivers. One possible teaching tool is a video (perhaps produced together with high school students) about laws and safe driving and bicycling.

Target audience: teenagers preparing to get their driver’s licenses

Goals addressed:

Goal 1: Teach children bicycling skills and laws.

Goal 2: Educate the general public about bicycling – rights and responsibilities of cyclists, expected driver behavior in bikeways and near bicyclists, and benefits of bicycling.

Diversion Program

*Description:* The goal of a diversion class is to provide education to precisely the road users who need it most, as evidenced by their breaking a traffic law. A diversion class can be aimed at motorists and bicyclists. In lieu of a citation and/or fine, individuals can take a one-time, free or inexpensive class instead. In Marin County (CA), interested citizens can take the class even if they did not receive a ticket. This program is a good way to educate road users about bicycle rights and responsibilities, and can also increase public acceptance of enforcement actions.

*Target audience:* drivers and bicyclists

*Goals addressed:*

- Goal 2: Educate the general public about bicycling – rights and responsibilities of cyclists, expected driver behavior in bikeways and near bicyclists, and benefits of bicycling.
- Goal 4: Educate current and potential bicycle riders about rights and responsibilities, bicycling routes, and expected behavior.

*Sample program:* [http://www.legacyhealth.org/srsc](http://www.legacyhealth.org/srsc)

Implement a Safe Routes to School Program

*Description:* Helping children walk and bicycle to school is good for children’s health and can reduce congestion, traffic dangers and air pollution caused by parents driving children to school. Robust Safe Routes to School programs address all of the “Five Es” (Engineering, Education, Encouragement, Enforcement, and Evaluation).

Salt Lake County could take a leadership role in setting up a countywide Safe Routes to School (SRTS) Task Force and work with local municipalities and townships, school districts, and the UDOT SRTS Coordinator to support SRTS Programs. The Task Force could help school districts and communities establish SRTS programs at individual schools.

The exact SRTS program offerings will depend on the local priorities, interests, and resources, as determined by the Task Force, local municipalities, townships, and interested local volunteers, but may include:
• Making/updating and distributing the Student Neighborhood Access Program (SNAP) map showing preferred walking and biking routes as required by Utah State Law.

• Organizing an event for International Walk to School Day in the fall.

• Applying for grants (through UDOT’s SRTS program, local community foundations, health granting organizations, or others) to expand SRTS work.

• Establishing Walking School Bus programs.

**Target audience:** school children and parents

**Goals addressed:**

Goal 1: Teach children bicycling skills and laws.

Goal 2: Educate the general public about bicycling – rights and responsibilities of cyclists, expected driver behavior in bikeways and near bicyclists, and benefits of bicycling.


**Offer Bike to Work Week Events**

**Description:** Bicycling to work is a great way to get exercise, save money, reduce pollution, and have fun. Cities and towns across the country participate in Bike to Work Week, Month or Day. The League of American Bicyclists (LAB) hosts a website for commuters and event organizers. The website contains information on nationwide and local events, an organizing handbook, and tips for commuters.

**Common Bike to Work elements include:**

• Commute 101 workshops in advance of Bike to Work Day.

• Guided commutes or group rides to increase comfort and familiarity with bicycling routes.

• “Energizer Stations” to reward commuters with treats and incentives.
Workplace/team bicycling challenges for most miles, highest percentage of days, etc.

Celebrity events (e.g. mayor bikes to work with news team, bike/bus/car race).

Post-work celebration.

Bike-to-school events.

Target audience: current and potential cyclists

Goals addressed:

Goal 2: Educate the general public about bicycling – rights and responsibilities of cyclists, expected driver behavior in bikeways and near bicyclists, and benefits of bicycling.

Goal 4: Educate current and potential bicycle riders about rights and responsibilities, bicycling routes, and expected behavior.


Recognize Bike-Friendly Businesses

Description: A bike-friendly business program trains, supports, and recognizes businesses that encourage bicycling by their employees and visitors. A program may include:

- A bike-friendly business audit program.
- An annual bike-friendly business certification program.
- Public recognition of bike-friendly businesses.
- Staff time and/or financial support for building facilities and creating incentives.
- Incentive programs that offer cash, treats, credit at a bike shop, or in-kind items to bicyclists.
- Assistance with bike parking and/or setting up employee benefits programs.
- Discounts for customers who arrive by bicycle.

A Bike-Friendly Business program can be run by a local community group, organized by a government agency, or the existing national program developed by the League of American Bicyclists can be promoted locally.
Open Streets events offer a safe and welcoming cycling environment for residents of all ages and abilities.

There are several examples of successful programs from around the United States. In New York City, for example, Transportation Alternatives (a nonprofit group) runs a Bike Friendly Business program that recruits business owners (either nominated by community members or self-identified) to participate in their program at no cost. Businesses are profiled on the Bike-Friendly Business web page and interactive map, and business owners can offer incentives to bicyclists as an additional way to increase business traffic.

In Boulder, a partnership between the City and a community organization (Community Cycles) invites businesses to complete a questionnaire about their bicycle programs and facilities, and on the basis of the resulting scores, publishes a list of ranked Bike-Friendly Businesses. A similar program, Mayor Menino’s Bike-Friendly Business Awards, publishes an annual list in Boston and gives winners stickers to display with pride in shop windows. In Denver, meanwhile, bicycle-friendly businesses are recognized on the Bikedenver.org web page on the basis of community nominations.

Salt Lake County has an existing ordinance requiring the provision of bicycle parking at all new commercial facilities. Businesses should be educated about this ordinance in order to make sure that it is being followed and businesses are providing adequate bicycle parking.

**Target audience:** business owners

**Goals addressed:**

Goal 6: Encourage businesses to provide bicycle parking and incentives for employees who ride a bike to work.


**Organize an Open Streets Event**

**Description:** Open Streets events have many names: Sunday Parkways, Ciclovias, Summer Streets, Saturday Streets. They are periodic street closures that create a temporary park open to the public for walking, bicycling, dancing, roller skating, and other non-motorized activities.
Open Street Events have been very successful internationally and are rapidly becoming popular in the U.S. Open Streets events promote health by creating a safe and attractive space for physical activity and social contact, and are cost-effective compared to the cost of building new parks for the same purpose. These can be weekly events or one-time events, and are generally very popular and well-attended.

**Target audience:** general public

**Goals addressed:**

- Goal 2: Educate the general public about bicycling – rights and responsibilities of cyclists, expected driver behavior in bikeways and near bicyclists, and benefits of bicycling.
- Goal 4: Educate current and potential bicycle riders about rights and responsibilities, bicycling routes, and expected behavior.
- Goal 5: Expose policymakers and decision makers to the experience of bicycling and the needs of cyclists.

**Guide:** [http://openstreetsproject.org/](http://openstreetsproject.org/)

**Offer Bike Rodeos**

*Description:* Bike Rodeos are drop-in events aimed at teaching children basic skills and safety rules. A safety course is set up to teach various skills and training on rules of the road is provided. They are often organized by Police or Fire Departments and can include free or low-cost helmet distribution and/or bike safety checks. Bike Rodeos can stand alone or be part of other events like Family Day or Safe Routes to School programs.

**Target audience:** children

**Goals addressed:**

- Goal 1: Teach children bicycling skills and laws.

**Guide:** [http://www.bike.cornell.edu/pdfs/Bike_Rodeo_404.2.pdf](http://www.bike.cornell.edu/pdfs/Bike_Rodeo_404.2.pdf)

**Teach Bicycle Skills Courses for Adults and Youth**

*Description:* Most cyclists do not receive any training on safe cycling practices, the rules of the road, and bicycle handling skills. Cycling skills courses can address this education gap. The most common program is the League of American Bicyclists courses (including Road I, Road II, and Commuting), taught by League Certified Instructors. Courses cover bicycle safety checks, fixing a flat, on-bike skills, crash avoidance techniques, and traffic negotiation.
A separate course should be taught to youth and be aimed at their developmental stage. Typical school-based bicycle education programs educate students about the rules of the road, proper use of bicycle equipment, biking skills, street crossing skills, and the benefits of cycling. Education programs can be part of a Safe Routes to School program.

These types of education programs are usually sponsored by a joint city/school district committee that includes appointed parents, teachers, student representatives, administrators, police, bicyclists, and engineering department staff.

Target audience: current and potential bicyclists; children

Goals addressed:

Goal 1: Teach children bicycling skills and laws.

Goal 4: Educate current and potential bicycle riders about rights and responsibilities, bicycling routes, and expected behavior.

National program: http://www.bikeleague.org/programs/education/

Host an Annual Policymakers Ride

Description: Organizing a bicycle ride for elected officials, agency staff, and community leaders is an excellent way to create a shared understanding of bicycling needs and opportunities, and create formal and informal relationships that can help with future bikeway implementation.

Target audience: elected officials and agency staff

Goals addressed:

Goal 5: Expose policymakers and decision makers to the experience of bicycling and the needs of cyclists.

Sample program: http://bikeportland.org/2007/07/24/policymakers-connect-on-bi-state-ride-4535

Develop a Professional Driver Education Program

Description: Professional drivers often operate large vehicles. They have a vested interest in avoiding crashes and following the rules of the road. It is possible to take advantage of existing professional driver education, training, and licensing programs to communicate about bicycling and bikeways. Brochures should be developed for professional drivers explaining a) laws and statutes about bicycling on roadways, and b) types of bikeways and expected driver and cyclist behavior in each.
The brochures should be distributed to professional drivers through the appropriate licensing organization. In addition, workshops can be developed covering the same material and offered at no cost to agencies and organizations that supervise professional drivers.

**Target audience:** Professional drivers

**Goals addressed:**

Goal 3: Reach out to professional drivers (transit operators, school bus drivers, commercial drivers, etc.) about bicycling.

**Sample program:** [http://www.sfbike.org/?drivertraining](http://www.sfbike.org/?drivertraining)

**Develop a Bicycling Ambassador Program**

**Description:** Bicycling ambassador programs train paid outreach staff to provide information about bicycling to the public. Ambassadors be trained on local bicycle facilities, bicycling resources available to the public, any planning processes or other ways that residents can request improvements, bicycle safety statistics, bicycle laws, and successful outreach techniques. Some programs use Ambassadors as roving staff at events and/or on facilities (e.g. on a busy shared use path). Other programs provide Ambassadors at public events by request. Some Ambassadors specialize in youth outreach. Ambassadors should wear a distinctive jacket/shirt/button that lets the public know that they can be approached with questions and comments.

Chicago has a robust bicycle ambassador program called Mayor Daley’s Bicycling Ambassadors. Their mission is to increase bicycle use while decreasing the number of bicycling related injuries. This goal is accomplished through educating Chicagoans on the benefits of bicycling and bicycle safety. In 2004 the program expanded to include teenage Junior Ambassadors who teach peer-to-peer bicycle safety education to Chicago children. The major campaigns of Mayor Daley’s Bicycling Ambassadors include bicycle safety education, motorist education, shopping by bike, commuting to work by bike, and bikes on transit (including bus rack demonstrations).

**Target audience:** current and potential cyclists

**Goals addressed:**

Goal 4: Educate current and potential bicycle riders about rights and responsibilities, bicycling routes, and expected behavior.

**Sample program:** [http://www.bicyclingambassadors.org](http://www.bicyclingambassadors.org)
Discussion: Data Management and Storage Protocols

Planning a continuous county bikeway network is similar to environmental planning in the sense that cyclists are creatures with little regard for administrative boundaries. It is easier to implement a multi-jurisdictional bikeway network derived from a common consensus because transitions between different jurisdictions are more likely to be seamless for the user, thereby making the overall system easier to navigate by bicycle. In order to accomplish that vision, however, all member municipalities must agree to common design principles and data storage protocols while collaborating on network implementation.

Data Collection and Consistency

Many of Salt Lake County’s jurisdictions have bikeway networks that include existing and proposed facilities. Additional links will be added to these networks over the coming years as new facilities are constructed and existing streets are retrofitted with bikeway facilities. Developing a standardized mapping update process can help minimize the following problems commonly encountered when developing integrated datasets:

- Variations in data format and delivery methods. Some communities only maintain paper maps or digital copies of their bikeway network within a plan document while other jurisdictions maintain a digital repository of bikeway data represented by vector-based features.

- Variations in data attributes that are collected. If digital data are collected, the datasets may track the same type of information (e.g. bikeways) but may not include the same information about these facilities (e.g. the width of bike lanes). It is useful to know the location of bikeways, but the inclusion of similar attributes allows more robust and detailed analysis.

- Variations in the definitions of data attributes that are collected. For example, some municipalities classify shared-use paths as such only if they are paved, while others may not share this requirement. This variation in the definition of the data attributes can create challenges when the data is used for some applications (e.g. a region-wide route planner).

These challenges affect many MPOs and county governments across the country. Interviews with data managers and a survey of Salt Lake County’s
member jurisdictions show that this is a challenge for Salt Lake County, too. Research with jurisdictional data managers revealed the following commonalities:

- Regional data managers typically maintain both regional bikeway networks and data received from local municipalities. Several locations did not differentiate between regional and local networks, but expressed interest in identifying a “regional” network to emphasize the importance of inter-jurisdictional connections and to highlight these key corridors as funding priorities.

- Data updates tend to occur irregularly, generally in conjunction with plan updates every three to four years. Three of four agencies indicated the desire to update data more frequently as the data can be used for multiple applications (e.g. multi-modal trip planners and demand modeling).

- Ad hoc updates result in varying levels of detail and accuracy within the region or study area.

- At a minimum, most datasets include name and facility types. Additional facility quality information is desirable but is more challenging to collect for a variety of reasons (e.g. limited staff capacity, the relative level of effort, and access to technology).

- There is an increasing trend of tying data to the roadway or transportation network through a unique identifier and paying increased attention to the spatial data attributes (facility information such as roadway name and bicycle facility type) and topological correctness (line segments used to represent bikeway networks are digitally connected so continuous travel along the “facility” is possible). The addition of a unique identifier allows the data to be used in a multi-modal transportation network. Spatial data attributes and topological correctness are also necessary for the data to be used in routing applications.

- Data managers in most agencies reported a call for updated bikeways facility information typically resulted in marked-up hard copy maps. The resulting staff effort to integrate hard-copy map data into existing digital repositions was time consuming and introduced inaccuracy related to digitizing error.

The following sections provide recommendations based on best practices interviews and survey results.
Countywide Datasets

Currently, the county maintains the following datasets for public use:

- 2002 Annexation
- Cemeteries
- City Council Districts
- County Libraries
- Fire Stations
- Golf Courses
- Hospitals
- Jordan River
- Lakes
- Major Streets
- Parks
- Schools
- Streams
- Zip Codes

Other datasets, such as parcels and FEMA floodplain data are maintained by the county, but unavailable for free download. However, they can be obtained for project-specific work or inquiry. It is recommended that the county also maintain a bikeway layer for public use and download. The county would maintain responsibility for the planning of bikeways and maintenance of the dataset within unincorporated portions of the county, while partner jurisdictions would be responsible for the development and maintenance of the dataset within their administrative boundaries. Based on the selected update method discussed in the next section, county staff may be responsible for harmonizing municipal bikeway datasets with the countywide bikeway network.

Data Update Protocol and Timeframe

Data Update Protocol

A systemic and simple update method is integral to the success of data sharing. Survey results indicate that the ability to update bikeway network data online is highly desirable and while this functionality is currently available, the complexity of editing features while maintaining topological validity can be a significant barrier to implementation. Regardless of the scenario selected, it will be necessary to develop a preliminary base dataset before moving forward. The following steps can be used to develop this bikeway network dataset:
1. Determine which dataset will be used as the base for the on-street bikeway network. If the county or MPO maintains a roadway network used for routing emergency vehicles, it is an ideal framework and should be utilized\textsuperscript{10}. Another potential data source is NAVTEQ\textsuperscript{11}. The network should include a unique identifier for each network link that does not change.

2. Determine how geometry for shared use paths will be developed and incorporated with the roadway network. Linear features representing trails should be snapped to the roadway network to ensure a topologically correct data set.

3. Achieve agreement between member jurisdictions on a schema for maintenance of bikeway data. Additional details are discussed in the Metadata Standard section located on page 72.

4. Encourage member jurisdictions to develop and attribute the roadway and trail links that fall under their jurisdiction and provide the digital data to the county.

5. Have the county compile and validate the bikeway network dataset.

Based on this information and an analysis of existing software, the following options are recommended. The County will need to select one of the recommendations.

\textit{Scenario 1 – Web Based Update}

A web updated based scenario could be implemented using the county’s current installation of ESRI’s ArcServer, which supports web based editing of existing network features. Interviews with other data managers suggest that while most jurisdictions are interested in development of these systems, the current applications are still cumbersome and best used for editing attributes of existing features (e.g. existing roadway or trail links). In the current systems, adding new linear features while maintaining topological correctness is complicated and can lead to increased editing time and reduced feature accuracy.

\textsuperscript{10} The US Office of Emergency Management typically subsidizes maintenance of network data for this purpose, and building upon this data source may reduce data development and maintenance costs.

\textsuperscript{11} Additional information is available at http://www.navteq.com/. 

October 12, 2012
Scenario 2 – Unique Feature Based Update

In this scenario, feature information would be updated and joined to a centralized bikeway network based on unique ID’s of a roadway network. Each partner jurisdiction would be responsible for submitting a geodatabase containing a unique identifier and agreed-upon relevant feature attributes described in the Metadata Standard section located on page 72. The county would then be responsible for updating and validating the bikeway network dataset. While this system does not allow partner jurisdictions to update their data via the web, it may provide greater data accuracy while allowing the county to monitor advances in web editing functionality.

Responsible Parties

A successful data sharing process is dependent on a partnership between the county and member jurisdictions. Roles and responsibilities are outlined below.

County Bikeway Data Manager

The county should designate a primary contact person (which could be the Bicycle Coordinator described in the Implementation section of this best practice) to coordinate development and ongoing maintenance of the bikeway network dataset. If this person is not housed within Information Services (IS), a process should be developed to ensure a method for clear and consistent communication with IS regarding the development and maintenance of the countywide bikeway network. The duties of this position should include:

- Setting and maintaining a schedule for regular bikeway network updates.
- Maintaining a database of jurisdictional contacts.
- Regular communication with jurisdictional representatives about scheduled updates and modifications to the update process or metadata requirements.
- Communication about new uses of data (e.g. development of new online tools).
• Working with jurisdictional staff to ensure that sufficient resources are dedicated to maintenance of the jurisdictional and county bikeway data infrastructure.

• Including data management goals and objectives in future transportation and comprehensive plan updates.

• Increasing the efficiency of data collection and application development (e.g. distributing bikeway data through UDOT’s uPLAN data portal).

• Working with member municipalities to ensure each jurisdiction has the capacity to update data internally or to develop a maintenance agreement with the county or other local jurisdiction.

Partner Jurisdictions

Each jurisdiction should designate a point of contact to manage bikeway network updates. Due to the variety of government structures in Salt Lake County, this representative may be in Community Development (or another planning department), GIS, Public Works, or IS. Regardless of department, this person should undertake the following responsibilities:

• Ensure that jurisdictional bikeway data are provided to the County Bikeway Data Manager by the deadline requested.

• Develop data or work with staff developing data for both on- and off-street facilities to ensure accuracy of defining attributes and physical location.

• Include data management goals and objectives in future transportation and comprehensive plan updates.

• Inform the County Bikeway Data Manager of changes to the appointed jurisdictional bikeway contact.

• Work with county staff to ensure sufficient resources are dedicated to maintenance of the jurisdictional and county bikeway data infrastructure.

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12. Slight variations exist in departmental naming schemas across jurisdictions in Salt Lake County.
**Update Timeframe**

The Bikeway Data Manager should request updates from each municipality annually in October, with a submission deadline in November (to correspond with the end of the typical construction season). This would allow for compilation and redistribution of the data to the municipalities the following January. More frequent updates would create an unnecessary burden for staff and would be of limited use. Less frequent updates may result in out-of-date bikeway information and loss of continuity as departments are reorganized or staff turns over. All partner jurisdictions are responsible for providing their data to the County Bikeway Data Manager in the specified digital format on or before the designated deadline. Data provided by jurisdictions that do not adhere to the deadline may not be included in the update.

**Existing Versus Planned Facilities**

Achieving the goal of getting municipalities located within Salt Lake County to use a common data standard will require effort and follow through. For this reason, the County should initially focus on obtaining data about existing bikeways only. Only after this process is working well should the County attempt to aggregate planned bikeway data.

**Data Format**

Data should be provided to the county as a geodatabase with Federal Geographic Data Committee (FGDC)-compliant metadata following the approved county standard (discussed in the Metadata Standard section located below.).

**Data Availability**

Bikeway data should be available for public download on the county website. This may require a policy change in jurisdictions where data is not currently available.

**Metadata Standard**

Metadata, or “data about data”, provide documentation of spatial data, describing content, quality, condition, and other characteristics of a data set. Well-written metadata files benefit the data creators as well as data seekers and users. Proper documentation allows data to be used appropriately and can make it available for others to use as well. A sample standard is included in the Resources section at the end of the Bicycles
best practice. Well-documented metadata will be compliant with FGDC standards and include the following information:\(^{13}\):

- Dataset objective or abstract
- Datum, project, and domain
- Data format
- Data standards
- Naming conventions
- Field definitions
- Standard attribute fields, their definition, and possible values

**Standard Attributes**

The recommended list of bikeway network attributes includes features currently tracked by partner jurisdictions in Salt Lake County and new attributes that can make the data useful to a variety of users. These features, at a minimum, should be tracked:

- Roadway or shared-use path name
- Bikeway facility type
- Bikeway width
- Surface (paved/unpaved)
- Year of completion
- Responsible jurisdiction

Other attributes that would be useful, but which would require more effort to populate and maintain include:

- Roadway cross-section information (e.g. number and width of lanes, presence of on-street parking)
- If on-street parking is permitted, designation of the parking type (e.g. parallel, angled, back-in angled) and width

\(^{13}\) ESRI provides a metadata template that conforms to the FGDC standard that can be accessed through ArcCatalog. Additional information on the FGDC is available at [http://www.fgdc.gov/](http://www.fgdc.gov/).
Data Use, Tools, and Applications

Successful multi-jurisdictional datasets should be updated with regularity, but should also meet the needs of known user groups for display and analysis. Failure to meet these needs in the short- and long-term can result in these groups maintaining their own datasets. In order to consolidate the data in one place and meet these user requirements, the county and member jurisdictions should consider desirable data uses and prioritize those that will bring the greatest short- and long-term benefit. These strategies below have been prioritized based on survey feedback and relative ease of implementation.

Near-Term Strategies

On-line Update of Bikeway Assets

Though currently not in widespread use, web based network editing is a highly desirable feature that is rapidly becoming more feasible. This feature can be enabled with Salt Lake County’s current ArcServer application, but may be cumbersome and complex when used to add new network data. Other open source development companies such as Dotted Eyes are making this technology part of their open source solutions, but are still limited in terms of adding and validating new features.14 This technology could be used to edit information about existing features in the bikeway network and could be used to augment a regular update process.

Multimodal Trip Planner

Many jurisdictions have a bicycle route planner or multi-modal route planner. These systems are becoming increasingly easy to implement and can be provided through ESRI, Google, or other open source solutions. Partnering with transit providers such as the Utah Transit Authority can result in a more robust route finder. Noteworthy examples are compared on page 80.

Distribution of Bikeway Data to uPLAN, AGRC, Google Maps, or Open Street Map (OSM)

Wide dissemination of bikeway network data has become increasingly easy in the last several years. Providing bikeway data free of charge to the Google Map and Open Street Map (OSM) communities provides benefits

14. [http://www.dottedeyes.com](http://www.dottedeyes.com)
including crowd-sourced applications such as the popular One Bus Away that provides real-time transit information\textsuperscript{15}.

The bikeway data should be made available to the public as part of Utah’s State Geographic Information Database (SGID), which is hosted and maintained by the Utah Automated Georgraphic Reference Center (AGRC). This strategy takes advantage of the State’s existing distribution framework and data maintenance structure. It also makes it possible in the future for other counties to send the AGRC their bikeway data so that a multi-county or statewide database can be created.

AGRC also hosts UDOT’s uPlan mapping platform. Including the bikeway data as part of uPlan would make the data available to the broader public. Salt Lake County could also choose to develop their own web mapping service through AGRC, which contracts basic web mapping and hosting services for minimal cost. Finally, the County and member municipalities may choose to establish a web mapping service using their own internal resources, Google Maps, or OSM. Building and maintaining a new map may incur a greater investment in staff resources than utilizing the existing AGRC infrastructure.

\textbf{Longer-Term Strategies}

A variety of other tools can be implemented as longer-term services including:

- Integration of the improved cycling network into regional transportation demand modeling.
  - \textit{Example: Portland Metro} \url{http://www.oregonmetro.gov/index.cfm/go/by.web/id/31704/print/true}

- Crowd sourcing maintenance needs
  - \textit{Example: Open 311} \url{http://open311.org/}

- Bike crash (and near miss locations) reporting.
  - \textit{Example: San Francisco} \url{http://www.baycitizen.org/data/bike-accidents/report/}

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\textsuperscript{15} Instructions for uploading bikeway data to Open Street Map can be found here: \url{http://wiki.openstreetmap.org/wiki/Main_Page}.
- Tracking facility use via automated and manual counts.
- Develop traffic hazard index.
Discussion: User-Friendly Mapping

The measure of an effective map is how well it conveys information to users. The best-designed maps will begin with a motive or goal as well as an understanding of the audience and where the map will be used. Design of the map will consider data availability and resources (time and equipment) available for development as well as maintenance and accessibility of the map to the intended user group.

In Salt Lake County, the intent of developing an integrated user map is to provide cyclists with information about current roadway and bikeway conditions, connections to other transportation modes, and locations of potential destinations. The County map should be easy to maintain and accessible through a variety of portals (the Internet and mobile user devices) to ensure the widest distribution.

Map Contents

An online user map can contain information about a variety of geographic features that impact the cycling experience. Though the features that are represented can vary based on the map’s purpose, most existing online maps include information about the following primary features:

- Major/minor contour
- Roadway classification (highway, arterial, and local)
- Administrative boundaries (city/county)
- Transit route/transit stop
- Bike facility types
- Parks
- Rivers/ponds/lakes
- Bicycle/pedestrian bridge
- School
- Trailhead

Mountain biking trails are intentionally not included in the bikeway types described in this document. It is recommended that the County first focus on urban bikeways and later include mountain biking trails when staff resources allow.
Color Palette and Symbology

A good user map will be easy to read and intuitive to navigate. Basic symbology for the primary features recommended on previous page are shown in the figure on the next page. Colors are chosen for contrast, visibility, and inherent associations (e.g. red means stop, green means go).

Features that are attractions or barriers (parks, water) are complementary colors for familial grouping. Natural features are in the same saturation value range - easily visible but not obtrusive or dominant. Administrative boundaries are thick lines for ease of identification, but a subtle coloration complementary to roadways so they are not overly dominant.

Background color for jurisdictions can be white for best contrast, or an optional uniform tan color for a softer appearance that reduces glare. Highways and interstates are wide lines, but use of white on top of black makes them visible without overwhelming the map, as would happen with a wide, dark line. Arterials, which are widely-recognized for wayfinding, are moderately dark and moderate width. Local streets are thinner and lighter grey to keep the map from being overly busy. Transit, which can include rail, is a wide dashed line in a brown hue that is visible, dark, but not overly dominant.

The most dominant and visible features are the bicycle facilities. The colors are vivid and bright, and follow a spectrum of caution (yellow) to suitable (green and blue) to unusual (purple for off-street). Labels, whether for streets, parks, schools, or other facilities, should always be black for best legibility.

Portland, Oregon’s citywide “Portland by Bicycle” map is a very popular map, often cited as an example of best practices in map design. It is found at: http://www.portlandonline.com/transportation/index.cfm?c=39402&a=322407.

The Des Moines Bicycle Collective’s Regional Trails Map also follows these principles for both the print and online versions, which are found at: http://www.dsmbikecollective.org/mapcentral.

The following subsections describe the recommended specifications for bikeway mapping GIS symbology.
General

- Parks: Solid green fill, no border; RGB value 195/220/165
- River/Ponds/Lakes: Solid blue fill, no border; RGB value 160/220/235
- Administrative Boundaries: 3 pt. grey/green border; RGB value 206/220/211. Optional fill of tan color; RGB value 248/243/223
- Bike/Ped Bridge: beveled shape with white or background color fill to mask underlying linework; 1 pt. black line
- School: ESRI character, “Default Marker” font
- Trailhead: ESRI character, “US Forestry 1” font
- Major contours: 1 pt. line, round dots with a gap of 1 pt. between dots; RGB value 200/200/200
- Minor contours: 0.5 pt. line, round dots with a gap of 1 pt. between dots; RGB value 180/180/180

Roadways

- Interstate or Highway: 2 pt. white line on top of 3.5 pt black line
- Arterial: 2.5 pt. solid grey line; RGB value 150/150/150
- Local: 2 pt. solid grey line; RGB value 200/200/200

Transit

- Route: 4 pt. line, 1 pt. dash and 2 pt. gap; RGB value 130/100/30
- Stop: ESRI character, “Default Marker” font

Bicycle Facility Types

- Bike Boulevard: 3 pt. solid green line, RGB value 193/216/47
- Signed Shared Roadway: 3 pt. solid yellow line, RGB value 255/210/75
- Marked Shared Roadway: 2.5 pt. yellow/4 pt. white/5 pt. black line (yellow is same RGB value as above; under it is a white line, and under that is a black line to give a “halo” effect to the yellow line; see diagram)
- Bike Lane: 3 pt. solid green line, RGB value 66/133/76
- Buffered Bike Lanes: 2.5 pt. green/4 pt. white / 5 pt. black line (green is same RGB value as above; under it is a white line, and under that is a black line to give a “halo” effect to the green line; see diagram)
• Uphill Bike Lane/Downhill Shared Lane: 2 pt. dark green line adjacent to 2 pt. yellow line (same RGB values as above); black chevron indicates uphill direction
• Cycle Track: 3 pt. solid blue line, RGB value 0/159/218
• Shared Use Path: 3 pt. solid purple line, RGB value 102/45/145

**Relationship to Traditional Bikeway Classification**

Bikeways have traditionally been categorized by the following terminology:

- **Class I** – off-street shared use paths
- **Class II** – on-street striped bike lanes
- **Class III** – streets designated as bike routes by signage only

Significant changes in bikeway best practices from 2000 to 2012 have greatly blurred the lines between the three traditional classes, making that classification system obsolete. For example, cycle tracks combine the separation of a Class I facility with the on-street nature of Class II facilities. Likewise, bicycle boulevards and marked shared roadways do not fit cleanly into any of the classifications, and buffered bike lanes may be viewed as an enhanced Class II bikeway.

As advancements in the field of bikeway planning and design continue to develop, it is likely that the traditional system will lose even more of its...
original value. For this reason, Salt Lake County should depart from usage of this terminology and instead utilize the terminology and symbology presented herein.

Desirable User Features

A good user interface will provide more than just a map of bicycle routes across Salt Lake County. The summary of existing bicycle route finders displayed in the table below shows that some applications allow users to find transit stations, customize a route to avoid hills and busy roads, as well as log, share, and comment on recent rides.

Software Solutions and Handheld Applications

Numerous software solutions exist which can be used to successfully manage GIS data and deploy that data to the Internet. Currently, Salt Lake County utilizes ESRI’s ArcServer to provide data sharing services. Proprietary services, such as ESRI, provide consistent comprehensive functionality and software support and may be simpler to implement, but are more costly to maintain than open source solutions. The use of proprietary versus open source software is a decision that has to be constantly evaluated in any software project.

Proprietary Software Solutions

Proprietary solutions, in this case ESRI, have the benefit of a single company backing the product, providing support (for fees) and continuing upgrades. They also usually guarantee their product to work based on what it can offer. These products always cost much more money than open source solutions through licensing, upgrades, and support fees.

ESRI software is widely used across the US despite its high cost. It provides good tools for editing GIS data in the form of their desktop applications and solid web support. Recent ESRI advancements include the ability to create streaming map services that can be accessed by desktop and mobile devices utilizing ArcGIS online.\(^{16}\)

In summary, proprietary solutions can be a great decision if the budget can allow for it, the product functionality satisfies the requirements, and the solution is appropriately scoped. Also, the client purchasing the software needs to be comfortable with the End User License Agreement (EULA) that the company provides for their software. They have to acknowledge that they are paying for a product that another company owns and has the

exclusive rights to modify, which is usually not the case with open source.

**Open Source**

Open source software has come a long way for many technology sectors in recent years, especially in the GIS and web mapping worlds. Open source projects provide a synergistic benefit – everyone gets to use code that others have improved for their own projects. The biggest benefit of open source software is zero licensing cost. However, costs are still involved in building and maintaining the system. In addition to licensing savings, open source software products can be easier to maintain with the right hired personnel that know the technology well. Also, knowledgeable staff can easily make incremental upgrades to the system as it changes over time.

One company of note, called Development Seed, is based in Washington, D.C. They do web mapping projects for international development uses and have a very impressive set of GIS and web mapping tools with open source code for all to use. They have a toolset known as MapBox that provides functionality similar to ESRI. However, features would need to be evaluated to see if they would provide the functionality the County needs.

In summary, open source software deserves serious consideration for cost reasons, the ability to decide how the software should work, and the benefit of a community of users around the world that are using and improving the software, resulting in a quality product. Open source solutions are usually a bit more technically complex because of the types of integration required to make the system function as a whole. Proprietary systems are usually (but not always) easier to implement due to the fact that these companies commit resources into installer programs and sometimes even offer their own staff to assist in implementing their product for you, although such services may cost additional money. Most modern-day web development firms utilize open source technology for the work they do, so the County will not have a hard time finding appropriate talent to maintain an open source product, especially if the products are widely used around the world (and thus more mature and stable).

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**Integrated vs. Piecemeal Systems**

Another noteworthy question is whether web mapping will be served from a single integration application or through smaller piecemeal web mapping services. An open source example of integrated services is Virtual Charlotte, which provides planning data for a multi-county area with support from multiple developers. A proprietary example of integrated services is UDOT’s uPLAN system, running on ESRI’s ArcServer, which was originally built to support the long-range transportation planning process and now acts as a decision support and cost-benefit analysis tool for several government agencies.

A number of free open source applications can easily be embedded into an existing website on a piecemeal basis. These systems can be used to create ad hoc or single purpose maps (e.g. to display bicycle crash locations). They are easily embedded within a website and do not require a high level of technical proficiency, but provide limited functionality. Commonly used sites include:

- **Geocommons:** [http://geocommons.com/](http://geocommons.com/)
  - Provides a wide range of functionality and has public datasets available for use. Menus and map legends are easy to read.

- **Batch Geo:** [http://www.batchgeo.com/](http://www.batchgeo.com/)
  - Good service for online geocoding of GIS information, but has limited functionality.

- **ZEEmaps:** [http://www.zeemaps.com/](http://www.zeemaps.com/)
  - Wiki maps for crowd-sourcing. Free service has ads, but is easy to use.

**Handheld Applications**

Handheld applications for mobile devices can enhance the depth and breadth of the user experience. Well designed applications can augment more traditional data sources such as printed system maps, update quickly and at low cost to provide the newest information, and collect data from users to enhance the bicycle planning process. The county or other users may develop applications if the data are made available to the public.

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Functionally good applications are stable and reliable, consistent with the platform (Android or iPhone), load quickly, and provide ad-free service.

Examples of useful applications include:

Route recording and workout:
- MapMyRide: http://www.mapmyride.com/
- Move! Bike Computer

Route Finding:
- City of Calgary Bikeways and Pathways: http://www.calgary.ca/CS/CSC/Pages/Mobile-Apps.aspx

Bicycle Rental (Bike Share):
Resources

Objective

The objective is to provide standards for GIS data being submitted to the Bicycle Best Practices Plan. Specifically, this standard is for agencies responding to directives where it is required that data is to be delivered to the custodian of BBP geodatabase.

Datum, Projection and Domain Extent

- All data must be submitted in NAD_1983_StatePlane_Utah_Central_FIPS_4302_Feet
- Geographic Coordinate System: GCS North American 1983
- Map Projection: Lambert Conformal Conic (Spheroid GRS_1980)
- The domain extent of the data frame in Feature Class Properties should be as follows:

Data Format

Two acceptable formats are available for data submissions:

- ESRI feature classes within a file geodatabase
  - Two or more feature classes must be formatted within a feature dataset.
  - Shapefiles are not allowed.
- Autodesk AutoCAD DWG format that meets MMCD standards
  - This option is for engineering data only.
Data Standards

Feature Classes

- All feature class names must be mixed case and have a maximum length of 32 characters (emergencyPlanning).
- All feature datasets must have unique names.
- File geodatabases and other GIS related files should include a date of creation/revision. See date guidelines listed below.

Attribute Fields

- Attribute fields may not be named using a reserved word. See Appendix A, SQL Reserved Words.
- Names must be less than 20 characters.
- Names cannot contain spaces or symbols.
- Names should be in mixed “camel” case (e.g. pathType).

Relationships

Database and linked annotation should use an “rl” prefix so that they indicate they contain a relationship as well; they will be grouped together. The full syntax should be “rl” , [the source feature class], “Has”, [the destination feature class]. For example, an annotation class named wiPathAnno2010 which has a linked relationship to wiPathMain should read “rlwiPathMainHaswiPathAnno2010”.

Standard Attribute Fields

When applicable, these fields should be included in each bike route feature class:

- OID (Object ID)^20
- shape^20
- shape_length^20
- city (string) 20 character field identifying the city in which the feature lies.
- comm (string) 20 character field identifying the SLCo community council with decision-making authority over the feature.

^20. Default attributes automatically assign to features by ArcGIS
- **township** (string) 20 character field identifying the unincorporated SLCo township in which the feature lies.

- **source** (string) 20 character field identifying the original source of the data.

- **editor** (string) 20 character field identifying the most recent editor of the data.

- **editDate** (date) Date field identifying the day of the most recent edit. (mm-dd-yyyy)

- **permUse** (string) 30 character field identifying the permitted uses of the trail. As this will be a searchable field, it is critical that similar uses are always entered identically for ease in selection. Only enter these standard singular field values in camel case. (Example: `offHighwayVehicle`)
  - pedestrian
  - equestrian
  - bicycle
  - `offHighwayVehicle`
  - `winterUse`
  - `snowmobile`

- **type** (string) 50 character field identifying the bikeway type as defined in the SLCo Bicycle Best Practices, pp. 19-20.
  - sharedRoadways (marked & signed)
  - bikeLanes (standard & buffered)
  - `cycleTracks` (street-level & raised)
  - sharedUsePaths (marked & signed)

- **jurisdiction** (string) 20 character field identifying the entity responsible for the upkeep of the segment. (City, County, Municipal, State, University, Unknown)

- **existing** (1 short integer)
  - 0 = FALSE: proposed / planned trail
  - 1 = TRUE: existing trail

- **notes** (string) 250 character field displaying any questions, comments or concerns about the segment.

- **name** (string) 50 character field identifying the trail name of the segment.
• **bikLanWdth** (integer) 2 character field identifying the bike lane width in feet.

• **connGap** (string) 1 character field identifying a binary relationship (Y/N). A record with a “Y” designation is a non-bikeway segment added to complete / connect a bicycle route.

• **class** (integer) 1 character field identifying the Traditional Bikeway Classification types as defined on page 82

• **roadName** (string) 35 character field identifying the name of the street the segment is on.

• **roadSpeed** (integer) 2 character field identifying the road speed limit in miles per hour.

• **roadComm** (string) 1 character field identifying a binary relationship (Y/N). A record with a “Y” designation indicates a road with heavy commercial traffic.

• **vehLnNum** (integer) 1 character field identifying the number of lanes on the road.

• **vehLnWdth** (integer) 2 character field identifying the lane width in feet.

• **vehLnDir** (string) 10 character field identifying lane direction. (One way, Two way)

• **vehLnType** (string) 25 character field identifying the type of vehicular road. (Highway, Residential, Arterial.)

• **maintainer** (string) 35 character field identifying the agency responsible for maintaining the bike route segment.

• **installYr** (integer) 4 character field identifying the year of bike route installation.

• **installOrg** (string) 35 character field identifying the organization that installed the bike route segment.

• **roadAADT** (integer) 4 character field identifying the measured annual average daily traffic of the road.

• **surfType** (string) 25 character field identifying the material that makes up the surface of the bikeway. (concrete, asphalt, gravel, wood)
**Metadata**

Please use the standard metadata format for GIS data as provided by ArcGIS. This information can be supplied in ArcCatalog. Ensure that each field is completely filled for easy reference.

**Summary**
There is no summary for this item.

**Description**
There is no description for this item.

**Credits**
There are no credits for this item.

**Access and use limitations**
There are no access and use limitations for this item.


Appendix A - SQL 2005 Reserved Words

Microsoft SQL Server uses reserved keywords for defining, manipulating and accessing databases. Reserved keywords are part of the grammar of the Transcript-SQL language that is used to parse and understand statements and batches. The following table lists SQL Server and ODBC reserved keywords that may not be used in any GIS data created for the Bicycle Best Practices.

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