

# CHAPTER 4

## Trail Design and Construction Standards



*Core Trail at Riverwalk in Edwards*

### Introduction

This chapter includes recommended standards for design and construction of the Regional Core Trail and connecting Spur Trails that are separated from roadway and offer a transportation option and recreation opportunity. These trails are intended for use by the public. Also addressed in this section are standards for unpaved trails, private trails, sidewalks, and safely sharing roadways with non-motorized uses.

### Fundamentals of Trail Design

These standards are based primarily on the 1999 guidelines from the American Association of State Highway and Transportation Officials (AASHTO) for the development of bicycle facilities, particularly their recommendations regarding shared use paths and shared Roadways. Several other studies and standards resources were consulted in the formulation of this chapter as well (see References, Appendix C).

In addition to following the detailed design recommendations, implementation of this plan should reflect several basic design philosophies. In developing the route for the Core Trail, these philosophies were considered:

1. **CONSIDER THE POTENTIAL USER RANGE OF ABILITIES** and carrying capacity when designing a trail segment. Trail width, slope, surface and accessibility determine the type of trail user (e.g. road bike vs. mountain bike) and overall carrying capacity (e.g. 6' trail vs. 10' trail). The Core Trail project, for example, is being designed with a certain user in mind – a family on a bike ride with children either in a burley or on their own bikes. That image helps define the level of safety, grade, design speed, and overall quality of experience.
2. **LOCATE TRAILS IN THE MOST EFFICIENT, DIRECT TRAVEL ROUTE WHERE POSSIBLE** except where the purpose of the trail has been determined to be primarily scenic and recreational.
3. **DESIGN TO AVOID OR MITIGATE ENVIRONMENTAL IMPACTS** by not encroaching upon wetlands or riparian corridors, critical habitat areas, and erosive landforms. Follow natural contours to minimize cut and fill activities. Meander around fragile or established features. Make every effort to preserve existing vegetation. If environmental impacts are unavoidable, mitigate with proven successful methods. Where possible, utilize areas of existing disturbance such as utility line easements, abandoned rail corridors or ditches.

4. **MINIMIZE OR MITIGATE IMPACTS OF TRAIL UPON ADJACENT LANDOWNERS.** Some trail sections may be in close proximity to residential, commercial, industrial or agricultural development. These conflicts must be identified as part of the analysis for each trail segment. Mitigation measures shall be identified and may include but are not limited to realignment, fencing, berming, and screening. This aspect of the trails segment analysis and design is very important to the community success of the system. The “good neighbor” policy is particularly important during the construction period.
5. **MAXIMIZE SCENIC VIEWS.** Site the alignment to view scenic features while actively using the trail and at rest stops.
6. **CONSIDER SAFETY IN ALL LEVELS OF SITING AND DESIGN.** Safety is the primary focus of the following recommended design standards.
7. **DESIGN FOR EASE OF USE AND NAVIGATION.** Keep construction (uniform surface type and width) and accessories (signs, striping, lighting, striping, trailheads) consistent throughout the system to promote an image of reliability and ease of use.
8. **DESIGN FOR EASE OF MAINTENANCE.** If possible, avoid constructing trail sections through areas of poor drainage, unstable soils, rock or snow slide areas, through shaded icy spots, immediately adjacent to winter sanded roadways, vehicular use areas or snow storage sites, or in areas of mature vegetation that is prone to deadfall, debris or surface roots. Consider vandalism susceptibility and prevention when selecting materials and accessories (lighting, bollards, furniture, etc.).
9. **DESIGN AS A FOUR-SEASON TRAIL,** if possible, in the most heavily populated areas. This will require prior commitment to winter maintenance by the managing agency and mitigatable wildlife issues.

## Design Standards For Trails

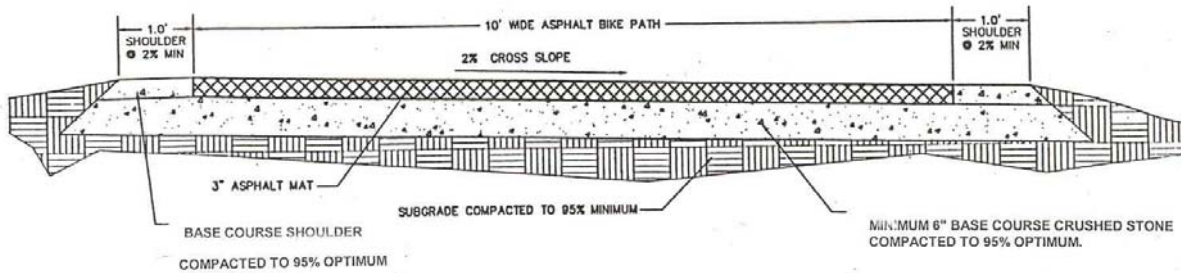
In certain cases, deviation from these recommended standards should be allowed by the managing jurisdiction where safety or user experience are not compromised, and the rationale for the deviation is defensible. For example, narrowing the core trail to less than the recommended width in areas where there are exceptional property or environmental impacts may be allowable if minimized to the greatest extent possible.

For more specific guidance or for items not addressed in the following standards, consult the most current American Association of State Highway and Transportation Officials and Colorado Department of Transportation guidelines.

### Trail Width:

- 10 feet wide for the majority of the Core Trail System for medium levels of use by a variety of user types, with 1 to 2 foot clear areas, graded for drainage, on each side of the trail.
- 8 feet wide for Spur Trail sections connecting to the Core Trail, or on other public trails where traffic is expected to be moderate, even on typical peak days during peak hours, and there are safe opportunities to pass. Provide 1 to 2 foot clear areas, graded for drainage on each side of the trail.

## TYPICAL TRAIL CROSS SECTION



- 12 feet wide for trail sections with expected heavy use by a variety of user types (pedestrians, bicycles, occasional maintenance vehicles, cycling two abreast, roller skaters), with 1 to 2 foot clear areas graded for drainage on each side of the trail.
- For any width of trail listed above, where demand exists and budget allows, a 3 to 5 foot soft surface trail is recommended for separate jogging use, either immediately adjacent to the trail or separation.

### Adjacent Slopes:

- Adjacent uphill slopes, 3:1 preferred, 1:5:1 maximum
- Adjacent downhill slopes, 3:1 preferred, 2:1 maximum. Railing, fence or dense landscape barrier required for greater than 2:1 slopes.

### Surfacing:

- A minimum of 3 inches Bituminous Asphalt over 6 inches of compacted CDOT Class 6 aggregate base course (ABC) over a compacted subgrade. A soils report is advisable to determine appropriate pavement and submaterial thickness.
- Concrete trails are encouraged when feasible and constructed with 4 inches of reinforced 3,000 psi concrete over 6 inches of compacted CDOT Class 6 ABC. In areas prone to erosion or flood, concrete may be required.
- Transitions between different surfacing types (e.g. new asphalt to existing asphalt, asphalt to concrete, asphalt to base course) should be flush with no more than a 1/4" differential.

### Compaction:

- All asphalt, base course (including shoulders) and subgrade material to be compacted to 95% of maximum density obtained at optimal moisture content as determined by AASHTO T180-57, Method A, Testing. Subgrade and base course must be dry and free of frost when asphalt is

placed. Shoulders may require additional treatment to retain compaction and methods include adding lime or sakrete to base course in areas where shoulders are exceptionally prone to erosion.

### **Design Speed:**

- 20 mph for the paved trail specified above/15 mph for unpaved paths

*Bicyclists can travel faster than 20 mph but it is inappropriate to do so in a mixed-use setting. Meanders may be used to encourage reduced bicycle speed. Raised surface methods, such as speed bumps and upright barriers, such as bollards, should not be used to reduce speeds as they create more of a hazard than a deterrent. (See Barriers section below).*

### **Sight Distance:**

- All alignments should incorporate safe sight distance in compliance with the AASHTO design guidelines, especially at narrow sections, intersections, curves and shall give special attention to wet, shaded, unpaved or otherwise hazardous sections.

### **Minimum Curve Radius:**

- The recommended minimum curve radius for a 20 mph design speed is 36 feet, based on a 15 degree lean angle.
- When substandard radius curves must be used on shared use trails because of right-of-way, topographical or other considerations, standard curve warning signs and supplemental pavement markings should be installed. It is advisable to widen the trail in order to increase the lateral space available to bicyclists as they lean to the inside of the turn.

### **Cross Slope:**

- 2 - 3% maximum cross slope, may be increased to up to 5% on curves but overall disabled access should be evaluated as part of the design decision.

### **Grade:**

- 2% to 3% slope preferred, 1% acceptable but drainage should be considered.
- Grades on shared use trails should be kept to a minimum; especially on long inclines. Grades should be kept to 5% or less as much as possible. On shared use paths, where terrain dictates, designers may need to exceed the 5% grade recommended for bicycles on some short section.

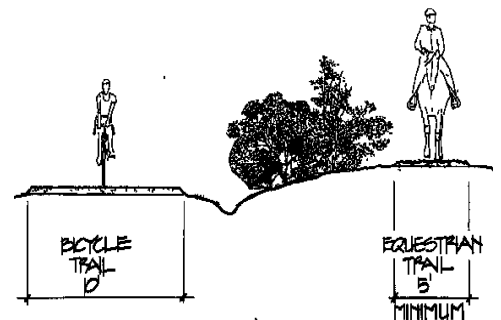
### **Accessibility:**

- The summarized American with Disabilities Act trail guidelines adopted in 2000, are as follows and should be accommodated. This list also includes AASHTO standards for the category of 5% to 8.33% which are not specifically addressed by the ADA standards.

- 5% grade or less for any distance
  - 5-6% for up to 800 feet (per AASHTO)
  - 7% for up to 400 feet (per AASHTO)
  - Up to 8.33% grade for 200 feet maximum. Resting intervals no more than 200 apart.
  - Up to 10% for 30 feet maximum. Resting intervals at 30 feet.
  - Up to 12.5% maximum. Resting intervals at 10 feet.
  - No more than 30% of the trail may exceed a running slope of 8.33%
  - Passing Space: provided at least every 1000 feet where trail width is less than 5 feet.
  - Signs shall provided indicating the length of the accessible trail segment. Good signing at trail access points that identify situations that could be difficult to negotiate will help users determine for themselves whether to use the trail.
- ADA guidelines recognize that in some cases it may be difficult to meet the recommended standards. It is understood that it may be very difficult to build fully accessible trails but every effort should be made in design and construction to accommodate disabled access.
  - Excessive grades may be mitigated by widening the trail, signing to alert trail users to grades and allowable speeds, providing longer sight distance and wider clearance, installing railings, or incorporating short switchbacks where possible.

### Equestrian Trails/Bridle Paths:

- Bridle paths separated from paved shared use paths are recommended because of potential conflicts between horses, bicycles, dogs, in-line skaters and pedestrians
- Recommended width is 5 to 8 foot, graded to drain properly. Surfacing should be soil, fine gravel, crusher fines or wood chips.
- Recommended separation between a paved shared-use trail and a bridle path is 10 feet or greater.

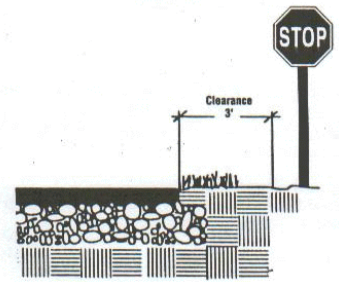


### Standard Trail Easement Width:

- 20 foot minimum for off-road, paved trail
- 30 foot minimum for combination paved, off-road trail and unpaved, equestrian trail
- It may be acceptable to request less than 20 feet, depending on the location.
- Abandonment of any easement required for a portion of the trail system may be requested by the property owner or initiated by the local government if it is determined that the easement and trail segment are no longer necessary as part of the trails system.

### Clearance:

- Lateral: 1 foot to 2 foot graded clear area with a maximum 6:1 slope should be maintained adjacent to both sides of the trail. 3 feet or more is desirable to provide clearance from trees, poles, retaining walls, fences, railings, guardrails or other lateral obstructions.
- Where the trail is adjacent to ditches or slopes down steeper than 3:1, a wider separation should be considered. A 5 foot separation from the edge of pavement to top of slope is desirable. Depending on height of embankment, and condition at bottom, a physical barrier such as a railing, fence or dense shrubbery may need to be installed.
- Vertical : 10 feet or higher is optimum, 12 feet minimum for equestrians for passing under structures or vegetation.
- For existing structures (i.e. bridges, underpasses) with substandard clearances, hazard signs and dismount signs should be posted where necessary.



### Railings/Fences:

- 54 inches (4.5 feet) minimum height recommended when the trail users include bicyclists. 42 inches is the minimum railing height for railings on pedestrian-only trails.
- Smooth surfaces recommended including sanded and painted steel or wood or vinyl coated chain link.
- An attractive yet safe railing and fence design should be selected for the Core Trail and used consistently throughout.
- Railing or fence should extend 4 to 8 feet beyond the edge of the drop-off or hazard area.
- Railing ends should be flanged or flared to prevent users from colliding with the exposed end of the railing. The flanged end also helps to visually tie the railing to the site (also see Bridge section below).

### Separation from Adjacent Roadway:

- 10 foot minimum, wider separation strongly recommended. 5 foot minimum from parking lot and trail separation.
- In extreme cases of less than a 10 foot separation, a barrier a maximum of 42 inches high such as guardrail or shrubs may be required. Attention must be paid to sight distance during design and placement. Other structures designed to withstand vehicular impact may also be used, upon review and approval.

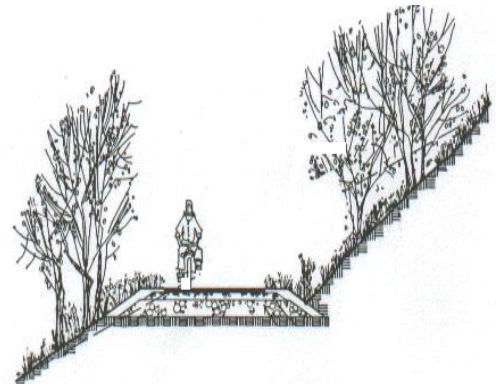
### Trail and Road or Driveway Intersections:

- Crossings should be 90 degrees and feature a flat approach.

- Trail users should come to a complete stop at appropriately signed intersections. Signs will include Stop Ahead, Stop and for minor driveways (i.e. single family residences), Yield.
- Establish exceptionally clear sight lines to and from roadway for safe crossing. Remove or mitigate visual obstructions.
- For crossings of high traffic roadways, consult AASHTO for detailed guidelines. Traffic control devices such as timed or user-activated signals may be necessary at certain crossings.
- Where possible, trail crossings should be placed at existing stop-signed or signalized road intersections.
- Commercial or industrial driveways that are paved as part of the trail should be evaluated to determine need for thicker pavement to withstand higher loading, a wider path section to prevent edge raveling and curve radius to prevent scattering of road shoulder gravel across the path by motor vehicles.
- Overpass or underpass structures, while the optimum method of crossing high volume roadways, are often cost prohibitive. If an overpass or underpass becomes a real option, consult AASHTO and CDOT standards (see section on Underpasses/Tunnels below).

#### Drainage:

- Sloping in one direction at an optimum of 2% (5% on curves) is preferred over crowning to provide drainage and simplify construction and maintenance (see section on Cross Slope above).
- Hillside trails may require drainage swales on the uphill side to intercept downhill drainage. Swales should be located outside of the shoulder area. An exception to this recommended guideline is when the area available to construct the trail is very constrained and the trail must be narrowed for a distance. The uphill shoulder could be deleted and the uphill disturbed area revegetated to the edge of asphalt. The revegetation will control some drainage and debris coming from the uphill side prior to sheet flowing across the path.
- Design should include retention of natural groundcover or revegetation to aid in drainage retention.
- Catch basins and cross culverts may be necessary. Culvert openings should be protected and hidden if possible. Stone facings are recommended but flared end sections shall be used at minimum. Clearance between the edge of the culvert and the trail surface should be 3 feet so as not to create a hazard.
- When box culverts are used as part of the trail system, drainage must be considered in design or retrofitting.





### **Erosion Control:**

- Erosion control regulations and best management practices adopted by the pertinent jurisdiction shall be adhered to during the trail construction.

### **Barriers to Motor Vehicles:**

- Shared use trails may occasionally need some form of physical barrier at highway intersections to prevent unauthorized motor vehicles on the trail. Because barriers are sometimes a hazard, they should only be used where encroachment by vehicles is a chronic problem, enforcement is difficult and they can be clearly seen by trail users.
- Common barrier types include bollards, boulders, low landscaping, plastic breakaway posts or fencing and should be at least 3 feet tall. Barrier selected should be vandal resistant and able to be moved.
- Bollards should be of the removable, lockable variety to permit authorized vehicles.
- All barriers other than landscaping should be reflectorized for visibility and painted a bright color for daytime visibility. Striping an envelope around the barrier is recommended.
- Barriers should be spaced to allow wheelchairs and bicycles with trailers to pass through.

### **Utility Structures:**

- Utility structures such as valve boxes, manhole frames, lids and grates, sanitary sewer clean outs and storm drain inlets shall be located outside of the trail corridor. If they cannot be removed, they shall be flush with pavement, non-skid and bicycle safe. All other utility structures should conform to the lateral clearance standards noted above.

### **Bridges:**

- New bridges should be 2 to 4 feet wider than approaching path and a minimum of 12 feet for shared pedestrian/bicycle bridges.
- The top horizontal rail should be a minimum of 54 inches high (4.5 feet). Rub (hand) railings mounted below should be a minimum of 42 inches high (3.5) and of a smooth material such as sanded, stained wood or steel.
- Bridge railings should extend a minimum of 5 feet beyond end of bridge and flare out away from the bridge and match the approach grades. Longer approach rails between 12 to 15 feet are recommended when the connecting path is on an incline.
- New bridges should be built for weight loads associated with maintenance vehicles, a minimum of 10,000 pounds with the weight limit posted. 12,500 pounds is preferred.





- Decking shall be of a high friction type and laid perpendicular to the direction of travel. Joints should be bicycle safe. Drainage off of the bridge must be considered in the bridge design.
- Bridges shall be designed in accordance with local flood regulations and other pertinent state and federal regulations. Clearance for rafting and other watercraft should be considered in the site design.
- Highway bridges undergoing renovation or reconstruction should be designed to accommodate bike traffic if a bike lane or route leads bikes to that bridge.

### **Underpasses or Tunnels:**

- Minimum width should be 10 feet with 12 feet or more desirable.
- Minimum overhead clearance should be 10 feet or more if vehicles will use the structure, 8 feet is sufficient if no vehicles likely.
- Walls should be coated with epoxy paint for easy graffiti removal.
- Include gutters on one or both sides for drainage.
- Where possible, vandal resistant lighting should be mounted on the walls.
- Signs shall be mounted in the approach zones to warn of hazards.
- All of the above should be considered in retrofitting existing underpasses (e.g. box culverts) but if minimum width and height will remain substandard, reflectors and black and yellow hazard symbols and signs should be posted.



### **At-Grade Railroad Crossings:**

- Crossings are typically subject to specific standards per railroad policy and state regulations. Signs, signalization, widths and type of crossing will typically be specified in the railroad's conditions of approval.
- In making a proposal for a crossing, design the trail crossing at a right angle to the railroad tracks and with a flat approach (0.5% to 2%) to the crossing.

## Lighting:

- Lighting of the entire Core Trail system is not proposed. However, lighting of certain sections that will service commuting traffic or are areas of potential hazard or conflict (tunnels, road intersections) should be considered. Placement should be considerate of adjacent land uses.
- Light standards should be at a scale appropriate for pedestrian uses (e.g. 12' high posts with lights shielded to shine downward upon the path), meet minimum clearances and be vandal proof if possible. Maintenance responsibility for the lights must be established prior to installation.
- Style of lighting fixtures should remain consistent throughout the system.

## Signs:

- The Core Trail system is proposed to pass through several jurisdictions and consistency of sign type and design becomes an important issues in order to promote reliability and continuity particularly since one goal of the system is to link existing and proposed trail systems together.
- Construction plans for each trail segment should include specifications for location and type of signs necessary for the specific trail. There are generally three types of sign types: Safety (Caution or Regulatory), Etiquette, and Information.
- 18" x 18", 24" x 24" or 12" x 18" are the standard sizes for trail safety signs, per the MUTCD.



### *Regarding the Core Trail Sign Plan:*

- The current Manual of Uniform Traffic Control Devices (MUTCD) should be followed as closely as possible for standard sizes, colors, and shapes but custom signs are sometimes necessary to address a specific trail situation.
- Trailhead signs should be coordinated for similar design and content along the trail with the pertinent jurisdictions.
- A Core Trail symbol should be affixed to select signs at various intervals along the Core Trail route to promote the identity and continuity of the trail system e.g. 4" x 4" rounded edge square with name of trail - The Eagle Valley Trail - inscribed.
- Post mile markers approximately every two miles in rural areas and every mile in developed areas. However, sign clutter should be avoided and the mile marking program should not commence until several long sections (3+ miles) have been established.

- Signs to community centers should be installed at select locations along the Core Trail including mileage.
- Locations where the trails ends temporarily, informational signs should be installed to direct users to the safest route through the gap in the system
- Signs should be installed in a consistent manner along the trail according to the following specification for free standing poles. Low profile monument signs may be appropriate in certain locations such as for trailhead signs or at activity center entry points. Signs will be placed to avoid conflicts with vegetation growth.
- Each trail segment should be evaluated for appropriate signs, such as the following commonly used caution or regulatory signs: Slow, Hill Ahead, Curve symbols, Posted Speed, No Motor Vehicles, Railroad/Road Crossing, Trail Narrows, Narrow Bridge, Bridge and Trail May be Icy, Rough Pavement, Low Clearance, Trail Ends Ahead, Trail Ends, Stop, Yield, Signs advising motor vehicles of trail (Watch for Pedestrians or Trail Crossing).
- Common information and etiquette signs are: Bikes Yield to Peds, etc., Keep to the Right, Name of Trail, Bridge, River or Creek, Share the Trail, Directional Signs to Towns, Activity Centers, City Limits, Please No Trespassing, Trailhead Signs.
- Off-road paved trails that end and become either shared road trails or unpaved trails should include a Trail Ends warning sign. Depending on the particular location, a directional sign may also be warranted to direct users to the next section of trail.

### **Sign Installation:**

- Core Trail sign installation should remain consistent with the following installation specifications:
  - Signs should be mounted on 4" by 4" treated posts that are either pretreated or coated with sealant prior to installation.
  - Post will be six feet measured from ground level.
  - Post should be buried at least 2 to 3 feet in the ground.
  - Top of backfill should be ramped slightly away from post for drainage.
  - Mix dry cement into backfill before filling in the hole and tamp.
  - Top of sign shall be flush with top of post.
  - Sign will affixed with lag bolts, vandalism proof variety recommended.

### **Trail Accessories:**

- See Appendix B for styles selected for the Core Trail System. Place furniture to meet the recommended clearance of 3' feet or farther from the trail.
  - Bicycle racks - at trailheads and access points. Developers shall be encouraged to provide bicycle racks where applicable.
  - Furniture - Benches and picnic tables should be made of durable material, in a style that reflects the natural setting and is consistent throughout the system. Benches should be placed at rest areas and at trailheads along the trail.

- Trash containers - located in rest areas and at trailheads, made of a durable material and consistent in style throughout the system. Consider containers that encourage recycling where feasible.
- Restrooms - locate facilities or direct trail to public restroom facilities at 10 mile intervals. Design should be easily maintained, environmentally sound and reflect the natural surroundings (e.g. no blue plastic “porto-potties”).
- Drinking Water - facilities or access to potable water every 10 miles. Where restrooms with a water and sewer system are proposed a spigot, handpump or post type is acceptable.
- Pet Waste “Stations” - dispenser for bags to pick up pet waste so not left on trail or in shoulders.

### Trailhead or Rest Area Design:

- Trailhead sites should be selected based on access, least impacts on adjacent neighborhood, ease of maintenance and no environmental impacts. Parking lots, restrooms, signs, etc. should be sited so as not to obstruct scenic views. Construction materials should blend in with the adjacent surroundings.
- Rest areas along the trail should be located in areas of likely need, such as at the end of an incline or at a shady spot after an exposed stretch, but they should also be considerate of the view opportunities.
- Trailhead accommodations will vary but the following items should be considered:
  - trailhead sign
  - parking
  - bike racks
  - trash receptacles
  - benches
  - picnic tables
  - landscaping
  - restrooms
  - drinking fountains

- Trailhead Signs should include pertinent usable or interesting information such as a trail map with distance information, Trail Rules, Contact Information, Flora and Fauna information, Trail Contact Information (e.g. for comments or reporting maintenance or enforcement issues), special considerations i.e. handicapped accessibility, hazards or interpretation, rest room or rest area locations. This photo is of a trailhead sign in Edwards.



- Construction plans for each trail segment shall address landscaping. Prominent existing vegetation shall be indicated on the plan in relation to the trail location and protected in the field for preservation. Areas of landscaping for mitigation or general beautification (e.g. around rest areas

or restrooms) shall also be identified on the plans with emphasis on native, low maintenance species. Supplemental irrigation to aid in plant establishment and first year survival must be specified on the plans.

- All areas disturbed during construction shall be revegetated with an appropriate groundcover seed mix (see Appendix C for sample mixes). Steep areas may require additional stabilization (fiber matting, etc.) during plant establishment.

#### **Pavement Striping:**

- In areas where traffic is steady or high at peak hours, a center stripe is recommended.
- Center striping is also recommended on curved or straight inclines to manage flow of uphill and downhill traffic.
- Crosswalks should be painted at all road and major driveway intersections.

#### **Maintenance and Emergency Access:**

- If new trails are designed with proper clearances, bridge weight loads and trail width, trail maintenance should be efficient and relatively uncomplicated. However, special attention should be paid to maintenance vehicle access points and turnarounds and turning radius for vehicles through trail curves.
- Emergency Access points should be identified during planning for construction of each segment, if not within 100 feet of a roadway.

#### **Standard Specifications and General Notes for Trail Construction Plans:**

- Available from the ECO Trails Program for inclusion in construction plan set. Use of similar construction techniques and management practices is encouraged among jurisdictions cooperating in the trail building program outlined by this plan.

#### **As-built Construction Drawings:**

- Shall be required at the discretion of the particular jurisdictions. As-builts should at a minimum include the surveyed final path location described by centerline or edges, culverts with inverts and sign location and type.

#### **Private Trails:**

- Designers of trails which are contained within a new or existing development and are for the exclusive use of its residents or owners are encouraged to use these standards for design.

#### **Unpaved Trails:**

- These standards are for trails not built adjacent to a paved trail but built as independent hiking, biking or equestrian trails in the frontcountry or backcountry.

- Desired minimum width is 3 feet. Overhead clearance for bike use is 8 feet. Maximum sustained grades should not exceed 10%, for stretches of less than 150 feet, grades should not exceed 15%.
- Include structures necessary to prevent erosion of surface material, such as concrete pans at cross drainage locations and water bars or short paved sections on slopes.
- Accessibility to these types of trails should be evaluated per current ADA standards and designed accordingly.

### Shared Roadways:

- For the purposes of this plan, shared roadways refers to essentially all roads in all jurisdictions in Eagle County except those where non-motorized users such as pedestrians and bicyclists are expressly prohibited.
- Non-motorized users are typically not in the vehicle travel lanes but on the edges of the road platform in the shoulder, or on bike lanes or a bike route. These terms are often used interchangeably, but are defined as follows by the Colorado Department of Transportation Bikeway Design Guidelines:

**Bike Lane:** “A portion of a roadway which has been designated by striping, signing and pavement markings for the preferential or exclusive use by bicyclists”. Bikes lanes should be incorporated where possible into new street design or retrofit of existing streets. The minimum width of any bike lanes should be 5 feet excluding the gutter pan. Additional widths are desirable when substantial truck traffic, parallel parking, speeds over 55 mph or curves are present. Bike lanes should travel in one direction with traffic. Two way bike lanes on same side of roadway are not recommended. Consult current AASHTO or local road standards for bike lane specifications.

**Bike Route:** “A roadway distinguished by (bicycle-related) signs only, which provides continuity to other bicycle facilities, or is designated as the proposed (bicycle) route through high demand corridors”. Each jurisdiction is encouraged to incorporate bike routes into their comprehensive streets plan. Establishing bike routes, that are fairly direct, with relatively few stop signs or intersections and well signed, can reduce hazards to bicyclists on other shared routes. Signs and symbols painted on the road surface will also improve vehicle awareness of alternative modes of transportation. Shoulders often function as a de-facto bike lane or bike route and should be inspected for hazards prior to establishing a route (manholes, sewer inlets, blind driveways, etc.). Bike routes should travel in one direction with traffic. Incorporating bike routes into a streets system is typically easier than a bike lanes system because it utilizes existing pavement. Consult current AASHTO or local road standards for bike route specifications.



**Shoulder:** “That portion of a roadway exclusive of the travel lane designated and ordinarily used for vehicle travel. It is that portion of the roadway to the outside of the white line. Colorado Bicycle Law 42-4-106.5-(5) states “...where a paved shoulder suitable for bicycle riding is present, persons operating bicycles shall ride on the paved shoulders.” A paved shoulder is a de facto bikeway when present, but is different from a Bike Lane in that it is not signed nor meant exclusively for the use of bicycles”. Shoulders should be provided and maintained on roads where is anticipated that cyclists will ride, pedestrians may walk and no off road facilities are available. A minimum of four feet of shoulder width is recommended, 6

feet or greater is preferred. If rumble strips are present, that area should be not be included in the above widths. If funding or right-of-way is limited, shoulder widening should occur first on uphill sections of roadway. Consult AASHTO or local road standards for additional specifications.

See comment regarding two-way shoulder traffic below in *Retrofit of Existing Facilities*.

### **Sidewalks:**

- Sidewalks are typically intended for pedestrians, built in conjunction with a roadway and generally six feet wide or less. Bicyclists are typically not legally permitted on sidewalks. Sidewalks are not considered safe for higher speed use because of width, pedestrian conflicts, copious intersections, poor sight distance and inconsistent maintenance levels.
- Sidewalk design standards are not addressed in this plan. Sidewalks are encouraged throughout the developed areas of Eagle County as conduits to and from neighborhoods, community centers and other activity areas. Direct sidewalk connections to the Core Trail and Spur Trail system are also encouraged. Consult the pertinent Town or County improvement standards for sidewalk requirements.
- The requirement for a sidewalk system (generally 6' wide or less) or a separated trail system (8' wide or greater) or a combination of both shall be the decision of the individual jurisdiction.

### **Retrofitting Existing Facilities:**

- Non-compliance with the recommended standards listed here does not imply that an existing trail facility is unsafe. It may be very serviceable for the level of use or compared to other trail systems. These standards are primarily a guideline for new trail development. Retrofitting of trail segments and structures throughout the entire system is encouraged over time. Retrofitting will most often apply to these items: curb ramps, clearance to obstructions or marking as unavoidable hazards, signs, intersections, edge drop offs, vehicular bridges without bicycle or pedestrian facilities.
- Road shoulders that have been designed, widened or striped and signed to accommodate two-way non-motorized traffic should be modified for improved safety. Separation between the roadway and the two-way shoulder by a barrier or grade change (i.e. adding curb and gutter and elevating the platform) is recommended.

### **Wildlife Protection:**

Trails improperly located or designed can have negative impacts upon resident wildlife including the initial impacts of construction disturbance, trampling of habitat, fragmentation of habitat and introducing humans into areas previously not accessible. The Colorado Division of Wildlife recommends the following design and management principles for the regional trail system to help reduce impacts on wildlife. The intent is to cause no significant impacts on our local wildlife population and if impacts are not mitigatable, the route should not be pursued:

- Try to locate trails in already disturbed areas
- Disturb as narrow an area as possible when constructing the trail
- Consider screening trails with vegetation in known habitat areas



- Try to curb opportunities to create casual spurs off of the main trail, particularly along stream banks
- Be particularly sensitive to wildlife routes to local water sources and avoid crossing those routes
- Include interpretive displays along the trail about respecting wildlife and habitat
- Trails traveling through winter range should be closed during the critical survival period of December 1 to April 30. If a trail is adjacent to a major roadway, closure may not be necessary
- Dogs should be restricted or not allowed in sensitive habitat areas
- Railing and fences should be constructed to not impede wildlife movement
- Riparian corridors and wetlands should be protected during and after construction, with no negative impacts to these prime habitats
- Bear proof trash cans should be installed if trash cans are included trailhead or trail rest area facilities