

## SECTION 15: TRAILS

### 1. SCOPE:

- a. This article establishes the minimum requirements for the design of Multi-Use Paths within Payson City. Multi-use paths are required where so indicated on the Payson City Active Transportation Plan, the Payson City Transportation Master Plan, as well as all other Payson area-specific plans.

### 2. DEFINITIONS:

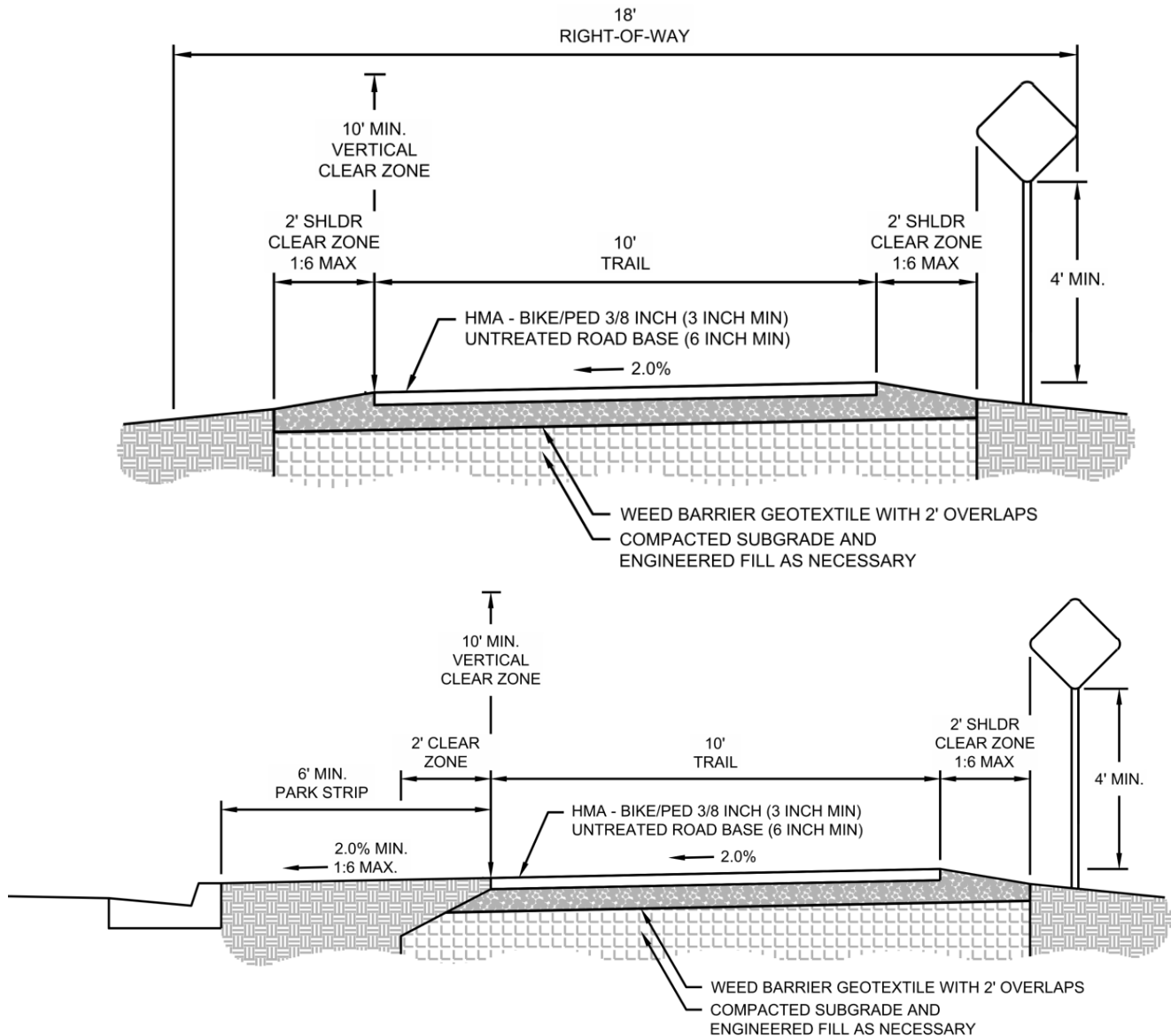
- a. Trails and Separated Shared-use Paths: The terms shared use paths, multiple-use paths, and trails are interchangeable within Payson City. A trail or shared use path refers to a City owned right-of-way (or permanent easement) that allows non-motorized travel with, or without access to the adjacent properties.
- b. Bicycle Lanes: Refers to on-street lanes, a minimum of four (4) feet wide, designated by paint or barriers, dedicated for the use of people on bicycles.
- c. Sidewalks: Indicates a hard-surfaced path adjacent to a street, a minimum of five (5) feet wide, dedicated for the use of people walking.
- d. Neighborhood Pathways: Refers to short links between neighborhoods, adjacent businesses, parks, and other points of interest. In cul-de-sacs, strategically placed paths (between two lots) are encouraged to link bicyclists and pedestrians to local destinations without requiring long, indirect routes that tend to inhibit walking or bike riding.
- e. Non-standard or Temporary Pathways: Indicates the use of existing improvements such as sidewalks or roadway shoulders for trail routes and will only be considered for use after all other options have been exhausted. Such solutions are temporary expedients.

### 3. DESIGN AND CONSTRUCTION STANDARDS

- a. These standards are based on recommendations of the American Association of State Highway and Transportation Officials (AASHTO), as set forth in the AASHTO Guide for the Development of Bicycle Facilities, 1999; and the Manual on Uniform Traffic Control Devices, 2009 Edition (MUTCD 2009), and other sources. Should any of these design standards come into conflict with published national standards, follow those in the current AASHTO Guide and MUTCD.
- b. Separation of Facilities
  - i. When two-way shared-use paths are located adjacent to a roadway, wide separation between the two facilities demonstrates to both the bicyclist and the motorist that the path functions as an independent facility. Safety and comfort of the trail user are both critical considerations. A trail located next to high-speed traffic diminishes safety and creates discomfort for the patron and reduces trail use.
  - ii. A minimum horizontal separation of six (6) feet between the trail edge of pavement and roadway edge of pavement is required. Ideally, this buffer area will be lined with shade trees or other vertical and native and/or drought-tolerant landscaping that acts as a barrier. Where the trail runs parallel to a high-speed facility (greater than or equal to 40 mph), wider separation is recommended.
  - iii. When horizontal separation is not possible, a suitable physical barrier is required. Such barriers serve both to prevent path users from making unwanted movements between the path and the highway shoulder and to reinforce the concept that the path is an independent facility. Where used, the minimum barrier height is forty-two (42) inches, to prevent bicyclists from toppling over it. A barrier between a shared-use path and adjacent roadway must not impair sight distances at

intersections, and not be a hazard to trail users or errant motorists.

- iv. Do not locate trails along roadsides where sidewalks are typically provided. Typically, sidewalks are not good candidates for use as trails since they tend to be too narrow to accommodate multiple services and are also frequently interrupted. Where good trail design is not possible due to frequent interruptions or lack of suitable separation from roadways, a combination of bicycle lanes and sidewalks may be more appropriate.
- c. Trail Widths
- i. *Right-of-Way* - A minimum right-of-way width of eighteen (18) feet, deeded to the City, to accommodate the trail, shoulders, and signage is required. The trail right-of-way is meant to always provide public access along the trail. If extenuating circumstances prohibit the right-of-way to be deeded to the City, then an irrevocable permanent easement must be granted to maintain public access in perpetuity. Neighborhood trail connectors follow the same cross section, widths, and standards outlined in this document, even if part of a private development connection to the trail system.
  - ii. *Paved Shared-Use Trails* - Minimum useable surface width is ten (10) feet for two-way, shared-use trails. Constrictions to eight (8) feet will be considered in certain situations, such as restricted physical space between a roadway and building or vertical drop-off. All such constrictions are not permitted to exceed one hundred (100) feet in length and must have smooth transitions. Install appropriate signage to warn users of changes in trail width.
  - iii. *Natural surface paths* – The minimum width of a natural surface path in backcountry or rural settings is two (2) feet where only pedestrian use is anticipated. A minimum width of four (4) feet is recommended where multiple uses are anticipated, or where the path is adjacent to a paved urban trail. Where path usage levels are anticipated to be similar to paved trails, the minimum width is ten (10) feet.
  - iv. *Neighborhood Pathways* – Short connecting paths of five hundred (500) feet or less, minimum six (6) feet in width.
  - v. *Shoulders and clear zones* – A minimum two (2) foot wide horizontal clear zone, from which all lateral obstructions such as trees, signs, fences, etc., are to be removed is required on either side of the path. Within this clear zone, a two (2) foot wide graded area on either side of the trail with a cross-slope no greater than a 1V:6H must be provided. A vertical clear zone of ten (10) feet is also required, free of obstructions such as tree limbs, overhangs, etc. The horizontal and vertical clear zones together create a trail envelope free of obstructions and other hazards.



#### 4. TRAIL SURFACES:

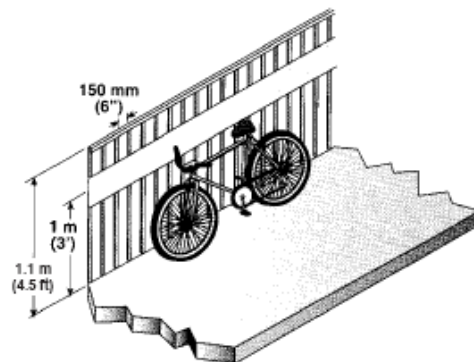
- a. Asphalt surfacing is preferred for trails in the city. If circumstances dictate that a concrete trail would be preferable, then it must be approved by the Development Services Director or designee.
- b. Design Loads – While loads will be substantially less than highway loads, trails must be designed to sustain, without damage, occasional wheel loads from emergency and maintenance vehicles.
- c. Subgrade Identification – Trail projects are required to identify the existing subgrades along the proposed trail route prior to construction. A geotechnical report completed by a licensed professional geotechnical engineer must be completed for all trail projects to analyze soil conditions and recommend a pavement design unless waived by the City Engineer or designee. Naturally occurring clay soils, peat, and high silt content sandy soils have been identified as having typically insufficient strength for proper pavement construction at minimum thickness.

- d. **Asphalt Surface Trail** – The minimum section of asphalt surface trails is three (3) inches bituminous surface course of PG 64-34, DM-1/2, 50 blow (APWA 32.12.05) on top of six (6) inches of three-quarter (3/4) inch minus untreated road base. Compact subgrade soil to a minimum of ninety-five (95) percent maximum density at optimum moisture (AASHTO T 99 standard). Base course must be compacted to ninety-five (95) percent of maximum density at optimum moisture as determined by the AASHTO T180 or ASTM D 1557 or as determined by a licensed, professional geotechnical engineer and approved by the City Engineer or designee.
- i. **General Specifications for Asphalt Work**
- Ensure that asphalt paving machines and handwork are able to form the smooth curves, width changes, surface pitch, and superelevation required.
  - Ensure that both the subgrade and the base are dry and free of frost and ice when asphalt work is done.
  - Scarify the surface of the subgrade to a minimum depth of six (6) inches, adjust the moisture condition as needed, then compact the soil.
  - Apply a root inhibitor or lay geotextile beneath the asphalt to prevent roots from heaving the surface.
  - Extend base course a minimum of two (2) feet beyond the paved surface width. Compact the shoulder and slope it away from the asphalt at a maximum 1V:6H slope.
  - Ensure that the finished asphalt surface is smooth and free of obvious imperfections. Where asphalt meets concrete or other hard surfaces, the joint must be smooth and even across both surfaces. Asphalt joints are to be butt rather than taper.
  - Feather the edge of pavement with base course or native soil to avoid any sharp drops from the trail edge.
- e. **Concrete Surface Trail** – The minimum section of Concrete Surface Trails is four (4) inch slab thickness on four (4) inch base course, with transverse saw-cut joints every ten (10) feet and a medium transverse broom finish. Finished surface must be flush with ground surface.
- i. **General Specifications for Concrete Work**
- Cross-slope, superelevation, grade and weed barrier geotextile fabric requirements for concrete trails are the same as for asphalt trails.
- ii. **Materials**
- **Concrete** – 4000 psi at twenty-eight (28) days, six (6) percent plus or minus one (1) percent entrained air. Utilize both coarse and fine aggregate with maximum coarse aggregate size of one and one-half (1-1/2) inch, conforming to the Standard Specification for Concrete Aggregate, ASTM C33. Air entraining agents must conform to ASTM C260.
  - **Cement** – Follow the standard specification for Portland Cement, ASTM C150, Type I or II, or ASTM 175 for Air-Entraining Portland Cement, Type IA or IIA.
  - **Water** – Use only water that is clean and free from injurious amounts of oil, acids, alkali, salt, or organic substances harmful to concrete.
  - **Curing Compounds** – Liquid membrane curing compounds must conform to ASTM C309.
  - **Preformed Filler** – Expansion joint material must be non-extruding preformed joint filler conforming to ASTM D1751.
  - **Joint Sealer** – Joint sealer must conform to ASTM D3405.

- f. Natural Surface Trail – Design trails using natural surfacing materials to provide facilities for as many users as possible. Compacted dirt, crushed stone and crusher fines are acceptable in appropriate aggregates and size.
  - i. Remove all large rocks, roots, stumps, and any other obstacles to users. Scarify all organic material within the path envelope unless the trail is planned specifically for single-track mountain bike use.
  - ii. The minimum compacted depth of crushed stone paths is four (4) inches of crushed stone; limestone, sandstone, or crushed rock, with an aggregate mix and passing a screen of no more than three-fourths (3/4) inch. No rounded aggregate is permitted. Path surfaces of only untreated base course aggregate are discouraged due to the typical inclusion of soils in base course materials that render them prone to rutting and displacement in wet conditions.

## 5. STRUCTURES:

- a. All overpasses, underpasses, and bridges must have a minimum clear width the same as that of the approach trail, plus the minimum two (2) foot wide horizontal clear zone. Align bridge or underpass approaches along the path to allow clear sight lines across or through the entire structure, and to avoid forcing trail users to make abrupt turns, climbs, or descents to access the structure.
- b. Widths and clearances – The clear width of the bridge surface must be equal to or greater than the approach path. A preferred width of fourteen (14) feet provides an additional clear width of two (2) feet on each side of a ten (10) foot traveled portion of a bridge that is to be used by both cyclists and pedestrians. A vertical clearance of ten (10) feet must be maintained.
- c. Design loads – When a bridge is wide enough to permit access by emergency vehicles, the design live load of the bridge must accommodate such vehicles.
- d. Railings – Railings installed on both sides of a multi-use path structure must be a minimum of forty-two (42) inches high. Additional height tends to obstruct the view of path users and should be avoided if appropriate. Attach smooth ten (10) inch wide horizontal rub rails to the inside of the railings at a handlebar height of three (3) feet above the bridge deck surface. The maximum width of openings in the handrail is six (6) inches to prevent young children from falling through the handrail.



i. Railing with "rub-rail"

*Adapted from Oregon Bicycle and Pedestrian Plan (1995)*

- e. Bridge entrances – Extend the handrails as described above at each entrance to the bridge a minimum of eight (8) feet beyond the end of the bridge and splayed outward at fifteen (15) degree angles to the pathway.
- f. Decking – If decking that does not provide a smooth and continuous surface is to be used (such as wood decking) it must be laid at no less than forty-five (45) degrees to the direction of travel along the

bridge to prevent gaps that may develop in the decking from trapping bicycle wheels. Where possible, install decking at ninety (90) degrees to the direction of travel. On all bridge decks, bicycle-safe expansion joints are required. Avoid decking materials that become slippery when wet. All screws or bolts must be countersunk flush with the deck surface.

- g. All structures, including underpasses, are required to maintain the minimum clear zone or envelope throughout.

#### 6. DRAINAGE:

- a. Design trails with a continuous cross slope of two (2) percent to provide for proper drainage and to be accessible to wheelchairs where wheelchair use is possible. Crowned surfaces are not usually wheelchair friendly.
- b. Ditches, swales, interceptor swales, and/or closed drain systems must properly drain water away from the trail surface and clear zones. Locate open drainage features outside the trail envelope.
- c. Drainage grates must be located outside of the trail envelope. However, if placement inside the envelope is necessary, only utilize grates of bicycle safe design and emplaced flush with the trail pavement surface.

#### 7. DESIGN SPEED:

- a. The design speed of paved trails is twenty-five (25) miles per hour to safely accommodate bicycle use; higher design speeds for multi-use paths are discouraged. Use fifteen (15) miles per hour for the design speed of unpaved trails.

#### 8. MINIMUM CURVE RADII FOR PAVED TRAILS:

| Design Speed | Minimum Radius |
|--------------|----------------|
| 12mph        | 36 feet        |
| 20mph        | 100 feet       |
| 25mph        | 156 feet       |
| 30mph        | 225 feet       |

- a. Where reduced curve radii must be used because of limited right-of-way, topographical, or other considerations, standard curve warning signs and supplemental pavement markings are required as per the latest edition of the MUTCD. Wider pavement can also be used to offset the effects of reduced curve radii.
- b. Superelevation – Superelevation or pavement banking on curves may be required. Refer to the latest edition of the *AASHTO Guide for the Development of Bicycle Facilities* for design recommendations.

#### 9. GRADES:

| Grade | Maximum Length |
|-------|----------------|
| 6%    | 800 feet       |
| 7%    | 400 feet       |
| 8%    | 300 feet       |
| 9%    | 200 feet       |
| 10%   | 100 feet       |

- a. Typically, grades on trails are to be kept to a minimum, under five (5) percent, to best serve all non-motorized users. Only use steeper grades over short distances.
- b. Grades are not permitted to exceed ten (10) percent on straight sections, or five (5) percent on curves. Where a path must curve on a grade, provide longer than normal sight lines and a transition zone at

both top and bottom of the grade.

- c. The maximum grade is three (3) percent with crushed stone or other unpaved surfaces for bicycle handling, drainage, and erosion reasons. If this is not feasible, appropriate drainage and erosion mitigation measures are to be utilized. Refer to International Mountain Bicycling Association's publication *Building Better Trails* for design guidelines.
- d. Signs warning of steep grades must be provided at the top of sections with grades higher than five (5) percent, or where users cannot see the bottom of the grade.



W7-5  
18"x18"

#### 10. SIGHT DISTANCE:

- a. Maintain adequate sight distances for the higher speed users, usually considered to be bicyclists. Use the guidelines provided in the latest edition of the *AASHTO Guide for the Development of Bicycle Facilities*.

#### 11. TRAIL-ROADWAY INTERSECTIONS:

- a. Long sections of trail without road crossings or driveways are most desirable. A minimum 1320 feet (1/4 mile) is required between such interruptions.
- b. Intersections between trails and roadways must be carefully designed to maintain the safety of users and motorists. Refer to the latest edition of the *AASHTO Guide for the Development of Bicycle Facilities* for design recommendations.
- c. Controlling motorized vehicle access may be required at trail/roadway intersections. Install the MUTCD standard sign R5-3 at all such intersections.

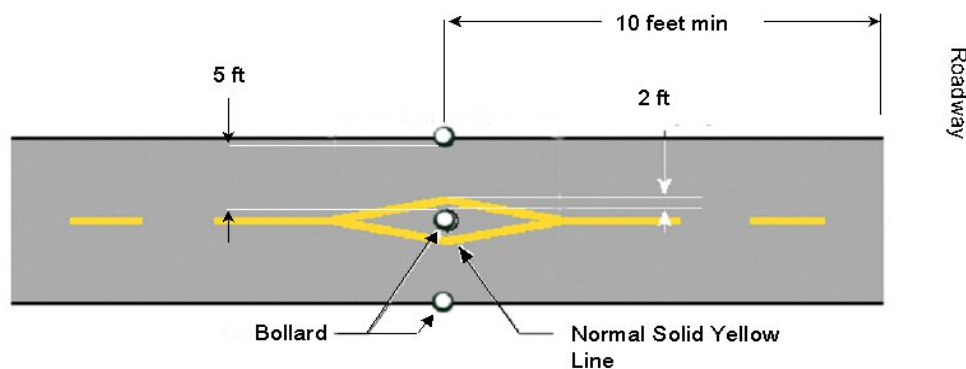


R5-3

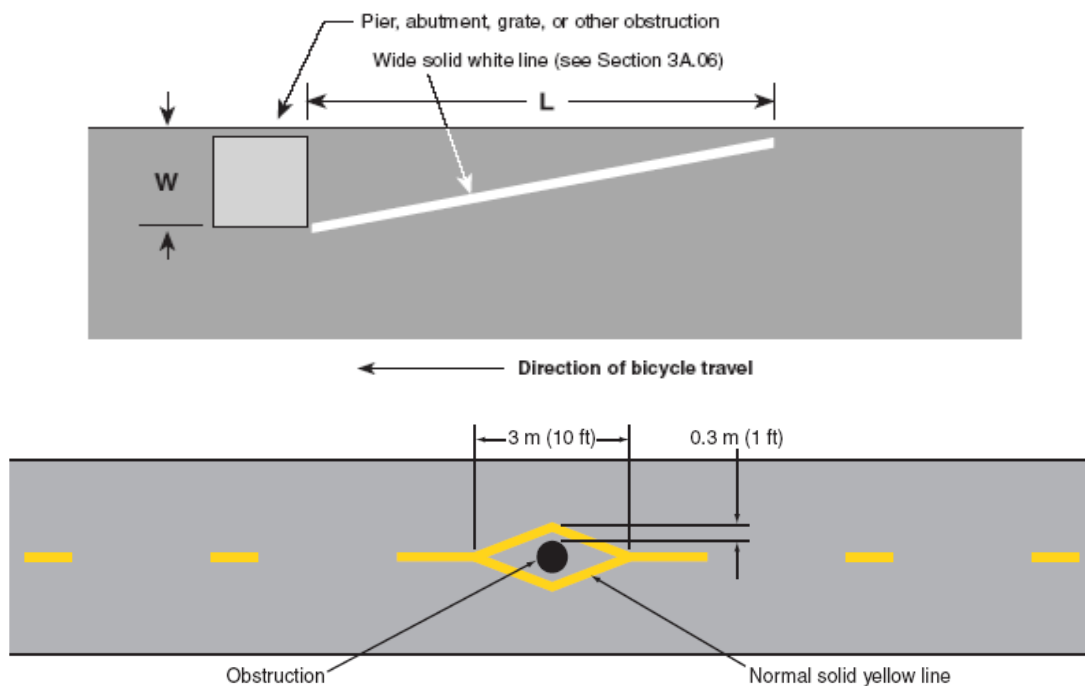
- d. Install lockable, removable bollards if more aggressive measures are needed. Posts or bollards are to be set back beyond the clear zone on the crossing roadway or be of a breakaway design. The post must be permanently retro-reflectorized for nighttime visibility and painted a bright color for improved daytime visibility. Striping an envelope around any post within the travel way of a paved trail is recommended. Refer to the latest edition of the *MUTCD, Traffic Controls for Bicycle Facilities*.
  - i. Bollard Design – Three and one-half (3½) inch diameter galvanized steel, rounded top, painted

traffic yellow with retro-reflectorized obstruction marking. Install the bollard so the top is between three (3) and four (4) feet above paved surface.

- ii. **Bollard Placement and Pavement Markings** – Place an appropriate number of bollards across the trail to inhibit motorized access. Placement must keep “travel lanes” on the trail unobstructed and not force users to detour out of the normal line of travel. Install bollards with five (5) feet of separation to allow trail user access while not allowing automobiles.
- iii. Where the desire for ATV use of the trail can be reasonably anticipated, reduce the separation between bollards to a maximum of forty-eight (48) inches to discourage such vehicular access. Utilize appropriate obstruction marking and signing as needed when bollards intrude into the pathway surface.



**Figure 9C-8. Example of Obstruction Pavement Marking**





## 12. SIGNAGE AND PAVEMENT MARKINGS:

- a. All appropriate and necessary signage and pavement markings are to be provided according to the latest edition of the MUTCD, *Traffic Controls for Bicycle Facilities*.
- b. Follow MUTCD regulations for all sign placements. Place signs no closer than two (2) feet from the trail edge of pavement, and no farther than six (6) feet. Install signs so the bottom edges are between four (4) and five (5) feet vertically from the trail surface. These requirements facilitate access by users while maintaining the envelope. Scale down signs for trails to recommended sizes.
- c. Striping of bicycle lanes on the roadway in tandem with sidewalks for pedestrians can be provided to link two sections of separated pathway or to extend a route where needed. Proper signage must also be provided. Multiple or frequent transitions from trail to bike lanes/sidewalks are not recommended due to safety and usability problems. Refer to the latest edition of the *AASHTO Guide for Developing Bicycle Facilities*.
- d. Sample Signage



## 13. ACCESSIBILITY:

- a. Title II and Title III of The Americans with Disabilities Act (ADA) of 1990 require all new construction and alterations to be accessible to all Americans, including those with disabilities. The US Access Board publishes *ADA Accessibility Guidelines (ADAAG)* that must lawfully be applied to new construction in both the private and public sectors. While these guidelines do not yet specifically address trails, the following provisions can and should be applied:
  - i. Accessible Routes (ADAAG 4.3)
  - ii. Parking (ADAAG 4.6) - will usually apply to trailheads
  - iii. Curb Ramps (ADAAG 4.7)
  - iv. Ramps (ADAAG 4.8)