

APPENDIX D.
MULTI-USE
PATH TOOLBOX



TOWN OF GILBERT

MULTI-USE PATH TOOLBOX

Prepared for:

Town of Gilbert
90 E Civic Center Drive
Gilbert, AZ 85296



Prepared by:

Kittelson & Associates, Inc
40 N Central Avenue, Suite 1920
Phoenix, AZ 85004



CONTENTS

1. INTRODUCTION	1
Planning Context	1
Report Organization	1
Who Should Use This Guide?	1
2. PRINCIPLES & GUIDANCE.....	3
Guiding Principles for Planning Multi-Use Paths and Active Transportation Networks	3
Technical References for Facility Planning & Design	4
3. PLANNING & IMPLEMENTING	5
Multi-Use Paths from Inception to Operation.....	6
Right of Way & Permitting.....	9
Roosevelt Water Conservation District	9
Salt River Project	11
Union Pacific Railroad.....	12
Flood Control District of Maricopa County.....	13
4. TOOLBOX.....	15
How to Use the Toolbox.....	15
Multi-Use Path Typologies	15
Multi-Use Path Treatments & Components.....	25

1. INTRODUCTION

In order for multi-use paths to be useful to every person, regardless of age, ability, or familiarity with the Town and transportation network, it is important path design follows consistent guidelines which prioritize safety, comfort, and ease of navigation. This toolbox is intended to provide an overview of the types of paths in the Town and the treatments to be considered for each when designing facilities which are safe and comfortable for users of all ages and abilities.

Planning Context

The Multi-Use Path Toolbox is one component of a set of plans which lay the groundwork for the transportation network in Gilbert. It expands on the work started in the Town of Gilbert Transportation Master Plan and is intended to be used in conjunction when designing and implementing facilities outlined in the Multi-Use Path Action Plan.

Master Plan



Identifies and defines the Town's transportation vision and ultimate network of facilities and treatments for all modes.

Multi-Use Path Action Plan



Identifies implementable projects and programs which will connect, enhance, and complete the existing multi-use path network.

Multi-Use Path Toolbox



Identifies the range of multi-use path facility types, treatments which can be applied to them, and the planning process to follow in the selection and design of the treatments.

Report Organization

1. INTRODUCTION

introduces the plan, context, and intended use

2. PRINCIPLES & GUIDANCE

discusses general planning and design guidance for multi-use paths and active transportation networks

3. PLANNING & IMPLEMENTING

defines the planning and implementation process for multi-use paths, including checklists

4. TOOLBOX

discusses potential facilities and treatments for multi-use paths and how to select them

Who Should Use This Guide?

This guide is intended to be used as a handbook to guide the design and implementation of multi-use paths in the Town of Gilbert. As discussed in the Multi-Use Path Action Plan, multi-use paths can be built by the Town, but a secondary network of paths is owned and managed by community groups and homeowners' associations (HOAs). The following discusses who might use this guide and how they may use it:

Town of Gilbert Staff

Town staff may use this guide when scoping projects and throughout the planning, design, and implementation process. It is intended to be helpful in identifying process and treatments as well as appropriate stakeholders and coordination as follows:

Identify appropriate partners for coordination	Navigate project implementation process and key players	Identify design options for new or existing multi-use paths	Review detailed design guidance
Section 2	Section 3	Section 4	Section 4

Engineers, Planners, & Designers

Engineers, planners, and designers can use this guide when hired by a government agency or property owners. It can help them navigate the planning process and develop designs which will be approvable by the Town of Gilbert as follows:

Understand multi-use path design goals and key resources	Navigate project implementation process and key players	Identify multi-use path typologies for public and private projects	Review detailed design guidance
Section 2	Section 3	Section 4	Section 4

HOAs & Property Owners

HOAs and property owners can use this guide in two ways: to understand the process for developing path projects which tie into the primary path network and to understand who to contact regarding existing or proposed paths as follows:

Understand multi-use path design goals and key resources	Navigate project implementation process	Understand who to contact regarding path projects	Learn about path design options and guidance
Section 2	Section 3	Section 3	Section 4

2. PRINCIPLES & GUIDANCE

Guiding Principles for Planning Multi-Use Paths and Active Transportation Networks

The multi-use path network in Gilbert is interconnected with and part of a larger active transportation network. The Town's vision is to develop an active transportation network that works for every person and that makes walking, biking, and using other non-vehicular modes a viable and attractive choice for residents and visitors. In order to do this, the following principles should be followed

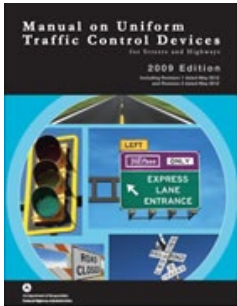
- + The network should be direct and continuous
- + Projects should be designed for users of all ages, abilities, and identities
- + Consistency should be provided in facility design to create a predictable and seamless user experience
- + Convenient access to destinations should be prioritized
- + The multi-use path network is one component of the overall active transportation network, and connections between facility types should be seamless
- + Projects should be designed to local, state, and federal best practices
- + Connections into the multi-use path network from residential communities should be encouraged, and the Town should work with communities to plan these in accordance with this document
- + Safety and comfort of multi-use path users should be prioritized in crossings over streets, railroads, canals, and other barriers



Image Source: trailink.com

Technical References for Facility Planning & Design

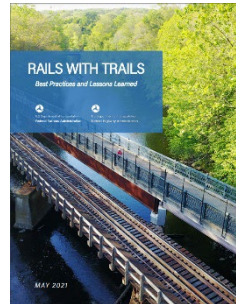
Multi-use paths and other active transportation facilities should be developed using design best practices, engineering judgement, and local, state, and federal best practices. Additionally, best practices in planning and design for these modes are rapidly evolving. The documents listed below provide a start to but not a comprehensive list of the national guidance which led to the development of the solutions toolbox in this guide and should be referenced as they evolve to keep up with the newest guidance. Resources include the Federal Highway Administration (FHWA), the American Association of State Highway and Transportation Officials (AASHTO), and the National Association of City Transportation Officials (NACTO).



Manual on Uniform Traffic Control Devices (FHWA)

National standards for the installation and maintenance of traffic control devices on all public streets, highways, and bikeways

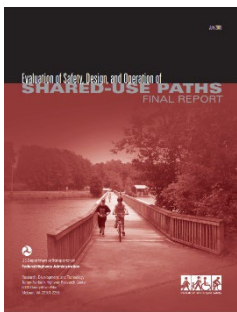
<https://mutcd.fhwa.dot.gov/>



Rails With Trails (FHWA)

Discusses best practices and lessons learned, including design and working with railroad owners

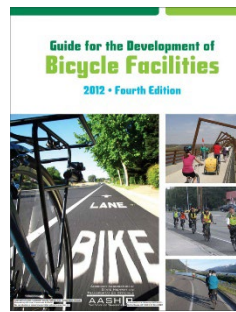
https://www.fhwa.dot.gov/environment/erecreational_trails/publications/rwt2021/



Evaluation of Safety, Design, and Operation of Shared-Use Paths (FHWA)

Focuses on a methodology to analyze comfort of shared-use paths

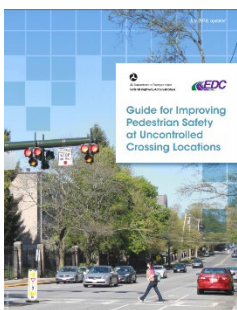
<https://www.fhwa.dot.gov/publications/research/safety/pedbike/05137/05137.pdf>



Guide for the Development of Bicycle Facilities (AASHTO)

Considers all bikeway facilities, including a chapter dedicated to shared-use paths

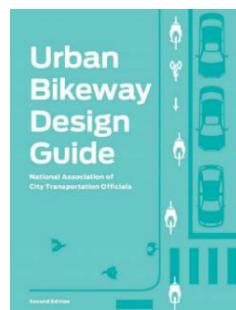
<https://nidotlocalaidrc.com/perch/resources/aashto-gbf-4-2012-bicycle.pdf>



Guide for Improving Pedestrian Safety at Uncontrolled Crossing Locations (FHWA)

Best practices guidance for countermeasures at uncontrolled crossing locations

https://safety.fhwa.dot.gov/ped_bike/step/docs/STEP_Guide_for_Improving_Ped_Safety_at_Unsig_Loc_3-2018_07_17-508compliant.pdf



Urban Bikeway Design Guide (NACTO)

Comprehensive best practices guidance for all ages and abilities bikeway design

<https://nacto.org/publication/urban-bikeway-design-guide/>



Separated Bike Lane Planning and Design Guide (FHWA)

Recommendations for planning and design of separated bike lanes, which are applicable to street-adjacent multi-use paths with a bikeway component

https://www.fhwa.dot.gov/environment/bicycle_pedestrian/publications/separated_bikelane_pdg/separatedbikelane_pdg.pdf



Don't Give Up at the Intersection (NACTO)

Focuses on intersection treatments to create safe and comfortable nonmotorized crossings

https://nacto.org/wp-content/uploads/2019/05/NACTO_Dont-Give-Up-at-the-Intersection.pdf

PAGE INTENTIONALLY LEFT BLANK

3. PLANNING & IMPLEMENTING

Multi-Use Paths from Inception to Operation

The planning, design, implementation, operation, and maintenance for multi-use paths requires collaboration and coordination between many people. That said, the majority of the projects will follow a similar framework, as described below and with specific checklists of actions to consider in this section:



1. Identify a Project, Needs, & Goals

Projects may be selected from the Multi-Use Path Action Plan or initiated by a private developer, HOA, or landowner. Based on the context, use the multi-use path typologies in this Toolbox to establish design standards. This phase should include visioning explain why the project is being initiated and the goals it aims to achieve.



2. Determine the Context and Design Needs

Key stakeholders should be involved, including agency and public stakeholders as well as right-of-way owners. Working with these groups, define potential strategies from the Multi-Use Path Toolbox to be considered and determine project constraints, funding, design needs, and permitting needs.



3. Develop Proposed Design

Develop potential design alternatives. Utilizing stakeholder input, analyze alternatives to select and design a final design concept that is agreed upon by planners, engineers, elected officials, maintenance staff, and any other key stakeholders.



4. Approvals & Construction

Ensure all right-of-way and internal Town approvals have been granted. During construction, address any problems that arise and allow for creative design solutions to arise in the field.



5. Open, Track, & Maintain*

Congratulations, your project has been built and is open to the public! Remember, your project doesn't stop here – ongoing maintenance preserves the town's investment and supports the travel of all users.

*No checklist for this step



1. Identify a Project, Needs, & Goals

Utilizing the Multi-Use Path typologies in Chapter 4, select the appropriate typology based on the context. This will become the starting point for design decisions.

STEP 1. CHECKLIST OF ACTIONS

The following are recommended actions to complete during step 1:

- Use the classification map in the toolbox to determine the context and select the correct typology. In the event there are two options, advance both to step 2.
- Define the current or future users. Consider all ages, abilities, and identities as well as all potential travel modes.
- Define the following initial elements to define the reason for project initiation:
 - Purpose
 - Need
 - Goals



2. Determine the Context and Design Needs

It is important that solutions selected meet the goals and needs for the project. Developing these solutions requires a data informed approach, considering data analysis and input from various stakeholders and agencies. Building off the results of Step 1, the next step is to analyze needs and work with partners to identify the proper solutions. Results of this step can identify spot treatments or corridor projects for infrastructure, wayfinding, or amenities.

STEP 2. CHECKLIST OF ACTIONS

The following are recommended actions to complete during step 2:

- Using the Right of Way (ROW) ownership map in this chapter, identify and engage appropriate agency partners. Initial ideas for potential options can be vetted by ROW owners before moving into final design for the greatest chance of successful permitting.
- Identify other appropriate stakeholders, which may include other Town departments, other agency partners, community groups, HOAs, landowners, elected officials, residents, or other groups as appropriate.
- Conduct site assessments and gather observational data. Invite stakeholders to join.
- For all projects: collect and analyze data for, current allocation of space, utilities, vegetation, amenities, lighting, etc. Ask stakeholders to verify data conclusions.
- For street crossing projects: collect and analyze data for speeds, volumes, number of lanes, and crash history. Ask stakeholders to verify data conclusions – are there other safety issues?
- Summarize data analysis conclusions to finalize issues, needs, and opportunities.
- Based on conclusions from data analysis and stakeholder involvement, select the treatments from Chapter 4 which may be appropriate to move forward.
- Identify potential funding mechanisms.



3. Develop Proposed Design

Step 3 is an iterative process that weighs trade-offs and choices to develop and vet alternatives, resulting in one preferred alternative for which final design is completed. The level of effort and amount of iteration depends on the scale, scope, and nature of each project. For example, path design or intersection crossings may include multiple options or alignments, while wayfinding should follow established guidance. When designing paths and treatments, the Town should consult the toolbox elements in Chapter 4 as well as the national best practice guidance noted in Chapter 2 and any applicable state or local sources.

STEP 3. CHECKLIST OF ACTIONS

The following are recommended actions to complete during step 3:

- Develop preliminary design alternatives based on the street typology and priority street elements and needs. Difficult trade-offs may need to be made due to limited physical space available.
- Undergo a thorough feasibility review for the potential solutions to account for Right-of-Way impacts, environmental constraints, design considerations, and detailed cost development.
- In cooperation with multiple departments (including Street Transportation, Engineering, Transit, and Planning and Development) review and evaluate each design alternative and document the pros/cons of each option and weigh trade-offs and design choices between the alternatives.
- Conduct internal and external stakeholder consultation for feedback on the evaluation of options including life cycle maintenance costs. Refinements to the street design should result from a thoughtful and collaborative discussion of trade-offs between competing uses on the street and within the available right of way.
- Review and apply additional resources including specific design guidelines, construction standards, and best practices.
- Select a preferred alternative based on the input received and constraints identified.
- Finalize the preferred street design, including cross-sections and streetscape details.



4. Approvals & Construction

Step 4 includes ensuring the Town has all needed approvals and then construction.

STEP 4. CHECKLIST OF ACTIONS

The following are recommended actions to complete during step 4:

- Finalize and document internal and external agreements and approvals for encroachments, operations, and maintenance responsibilities and agreements.
- Secure funding and program improvement in the Capital Improvement Plan.
- Although construction is the responsibility of the Department of Public works, remain flexible to help resolve issues during construction if and when they arise.

Right of Way & Permitting

There are many different agencies which own and operate the land on which multi-use paths may be built. It is important to identify right of way (ROW) and land ownership prior to beginning the design process on any project. In many cases, projects require easements and permits from ROW and landowners so that the Town can legally construct the project and, post construction, maintain it. The key ROW owners in the areas multi-use paths are generally built in Town of Gilbert include:

- + **Roosevelt Water Conservation District (RWCD):** owns and operates canals and irrigation facilities in the Town.
- + **Salt River Project (SRP):** provides water and power to the area and owns and operates powerline corridors and irrigation facilities.
- + **Union Pacific Railroad (UPRR):** owns and operates the commercial rail lines in Gilbert.
- + **Flood Control District of Maricopa County (FCD):** owns and operates canals in Gilbert.

Figure 1 displays the proposed primary Multi-Use Path network based on who owns the right-of-way. The remainder of this section describes the permitting process for each of the above-mentioned agencies.

In many cases, projects may also encroach on private land. Easements may also be required in these cases and the Town's legal department should be consulted when these issues arise.

Roosevelt Water Conservation District

RWCD directs all plan review through the Water Operations and Engineering Supervisor. The process is as follows:

- 1 Submit Plans to RWCD**

These should be submitted to the Water Operations and Engineering Supervisor. At the time this report was written, this is Tabitha Langland (t.langlan@rwcd.net). The submittal must include an initial \$4,000 retainer.
- 2 Design Plan Review**

This is an iterative process and should be started early in the design phase to avoid rework. RWCD utilizes a consultant (EPS) who must approve the plans before RWCD will approve. Once all changes have been made and RWCD agrees with the proposed design, UPRR will formally approve the plans.
- 3 Approval Letter**

Hard copies may be requested and may include additional conditions. The plan review process will be closed out and a refund issued if available.
- 4 Permit Issuance to General Contractor**

RWCD Construction Inspector will complete this step.
- 5 Pre-Construction Meeting**

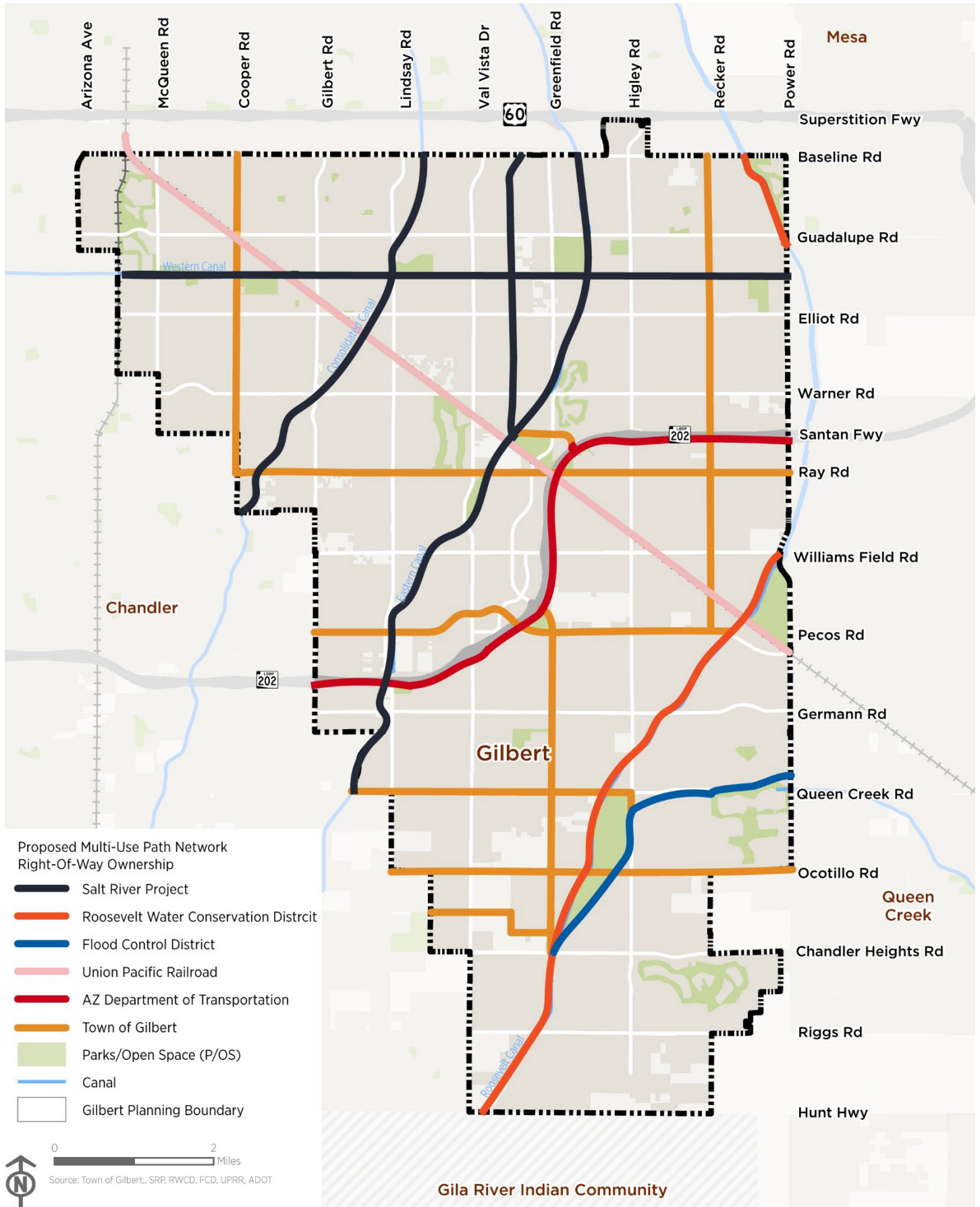
RWCD will specify construction requirements.
- 6 Construction and Inspection**

RWCD inspectors visit site and provide approvals for specified activities. Any design changes require RWCD approval.



The most updated process instructions and requirements can be found on RWCD's website, here: <https://www.rwcd.net/developers>

Figure 1: Proposed Multi-Use Path Network Right-of-Way Ownership



Salt River Project

SRP's directs all plan review through the Canal Multiple Use Construction Consultant. SRP's website does not include a specific process to conduct plan reviews. The Town should coordinate all plan review activities with SRP's Canal Multiple Use Construction Consultant. At the time this report was written, this is Bryanna McHenry (bryanna.mchenry@srpnet.com).

Union Pacific Railroad

UPRR's policy is to not permit any new public or private parallel, at-grade crossings in the railroad's ROW. New at-grade trail crossings are also not permitted unless they are designed as part of a roadway crossing equipped with active warning devices. Grade separated trail crossings are permissible with permits. UPRR recommends coordination begin as early in the project process as possible, and provides the following process diagram:

1 **Submit Inquiry to UP Contact Center**

Through website; they will perform an initial concept evaluation to determine next steps. If they agree to move forward, a formal Reimbursement Agreement (RA) will be set up.

2 **Onsite Field Diagnostic Meeting**

The goals are to determine field conditions and formulate guidance and recommendations for changes to the crossing. This will include a team of UPRR individuals. State and regulatory agency employees may also join this meeting if they have jurisdiction.

3 **Design Plan Review**

This is an iterative process with submittals at 30%, 60%, and 90%. Once all changes have been made and UPRR agrees with the proposed design, UPRR will formally approve the plans.

4 **Approval**

Only valid for 2-years; if it expires before the project construction has started, UPRR may start the process again. May include additional conditions.

5 **Map & Legal Descriptions**

They may require review; UPRR Real Estate will draft an agreement and easement and execute the agreement.

6 **General Contractor Submits a Right of Entry Permit Application**

UPRR must approve the contractor's application.

7 **Pre-Construction Meeting**

UPRR will specify construction requirements.

8 **Construction and Inspection**

There are applicable submittals during construction. Railroad flagging will be required during construction; this must be requested after the Right of Entry agreement is approved.



The most updated process instructions and requirements can be found on UPRR's website, here:

https://www.up.com/real_estate/roadxing/industry/index.htm



For all public projects, UPRR requires the following of the public projects manual:

https://www.up.com/cs/groups/public/@uprr/@corprel/documents/up_pdf_nativedocs/pdf_up_public_projects_manual.pdf



For all crossings, UPRR provides design guidance which must be followed:

<https://www.up.com/customers/ind-dev/operations/specs/index.htm>

PAGE INTENTIONALLY LEFT BLANK

Flood Control District of Maricopa County

FCD offers both ROW permits and floodplain use permits, however, the Town of Gilbert has responsibility for Floodplains within Town limits and so ROW permits are the focus of this section. A ROW permit must be obtained prior to any development or access requested on property FCD owns or has easements over and/or on structures FCD maintains. The process is as follows:

1 **Contact District ROW Specialist**

Updated contact information can be found at their website, below.

2 **Concept Plan Review**

This preliminary review is not required but recommended. It requires an online application, and a user guide, including specifications for file size and naming conventions, can be found on the FCD website.

3 **Design Plan Review**

This is likely an iterative process – *Start Early!*

4 **Approval Letter**

May include additional conditions.

5 **Map & Legal Description Approval**

Must be submitted in an 8.5x11" recordable format and may be an iterative process.

6 **FCD Posts Public Notice and Conducts an Appraisal**

This is at the cost of the applicant.

7 **Permit Issuance to General Contractor**

Requires a Work Plan & Emergency Action Plan.

8 **Pre-Construction Meeting**

FCD will specify construction requirements.

9 **Construction and Inspection**

FCD inspectors visit site and provide approvals for specified activities. Any design changes require FCD approval.



Checklists, process updates, fee schedule, and other guiding documents can be found at:

<https://www.maricopa.gov/5657/Permits#row>

4. TOOLBOX

How to Use the Toolbox

This toolbox is intended to be used as a resource for planning and designing any type of multi-use path project in the Town. To use the toolbox to arrive at a project design, there are two major steps:

- STEP 1 Define Multi-Use Path Typology**
 In this step, use the typologies in this chapter to define path type. This will guide the path-wide design and ultimate treatments.
- STEP 2 Identify & Apply Appropriate Treatments & Components**
 The treatments sections are focused on identifying and providing guidance for specific path elements. They are focused on crossings, amenities, and signage and wayfinding. Not every treatment will be appropriate for every project.

Multi-Use Path Typologies

The Town of Gilbert has an ambitious plan to complete its multi-use path network and build new connections. To support these efforts, this Toolbox establishes new multi-use path typologies that consider land use, context, potential users, anticipated activity, and target trip purposes. The typology is intended to inform planning decisions when altering existing streets and paths or building new ones. There are 8 typologies in total, including variations, as indicated in Figure 2.

Typology Toolbox

Each of the typologies has its own sheet which describes the typology and provides baseline information; lays out a process for allocating the right of way; provides details on the dimensions; and shows an example cross section.

1 Multi-Use Path Typologies
Multi-Use Path 1.0 (MUP 1.0)

2 Summary
 These paths run alongside or near existing transportation corridors in high density areas. With frequent use, it may be appropriate to separate bikes and pedestrians for user comfort. MUP 1.0 is intended to be used for new construction next to an existing sidewalk.

3 MUP 1.0 Path Adjacent to Existing Sidewalk

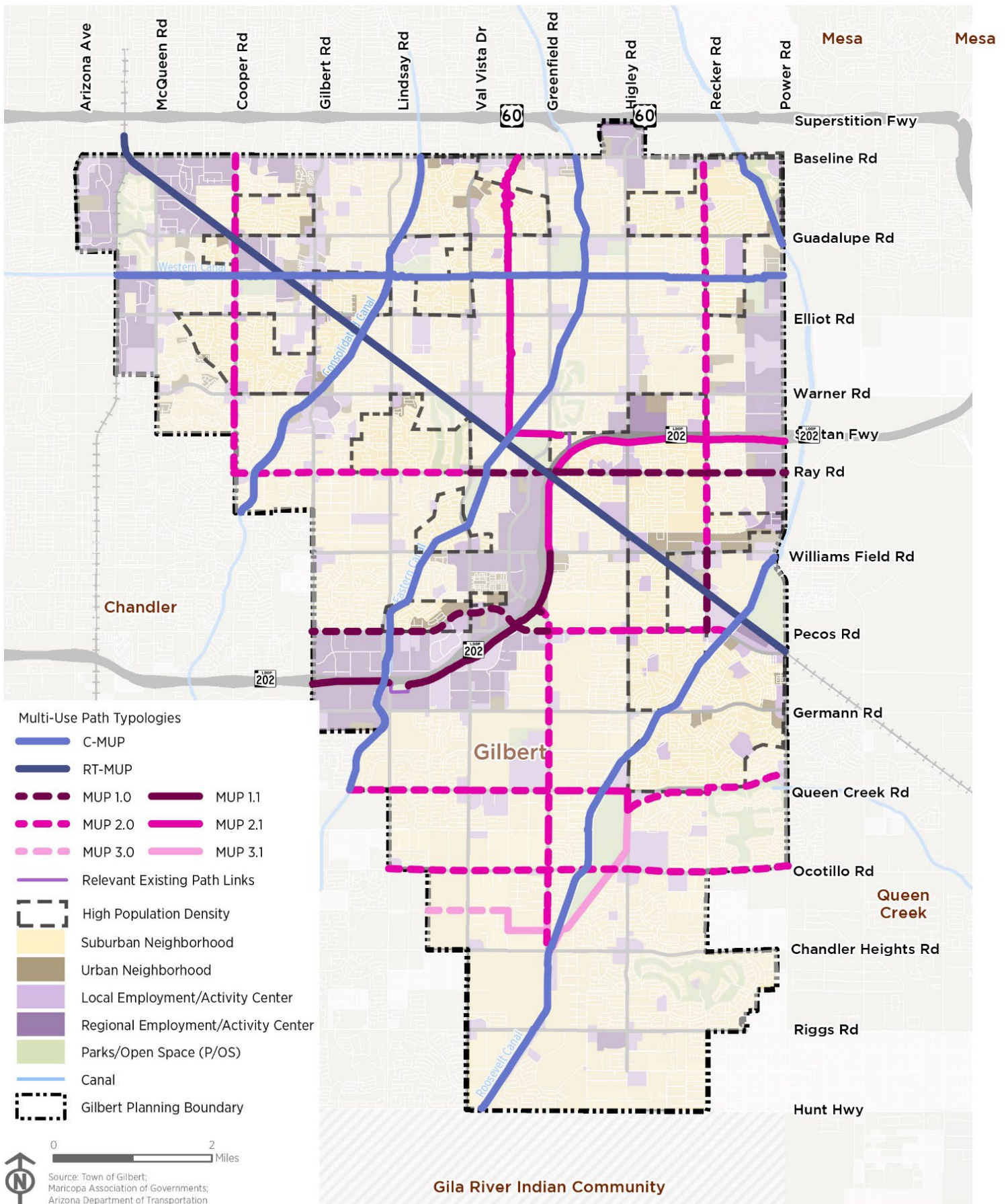
4 At a Glance

Right of Way 24-34 Feet	Urban Land Use	Many Amenities & Crossings	High Multimodal Use	Trips Daily Needs
----------------------------	-------------------	-------------------------------	------------------------	----------------------

5 MUP 1.0 Path Element Details

Element	Description	Range (min)	Treatments
Vertical Clearance	Clearance above the path which should be kept clear to accommodate path users	8.5'	N/A
Mobility Zone	Area intended for path user travel.	19'-24'	Varies
Existing	Existing sidewalk and buffer, if applicable.	5'-8'	Concrete
Hard Surface	Hard surface path provides accessible walking space and a usable path for most bike riders.	10'-12'	Concrete Asphalt
Shoulder	Shoulder / clear zone on either side of traveled way.	2'	Match Surface
Landscape Zone	Space for path wayfinding and amenities such as lighting, benches, and shade structures.	5'-10'	Landscape Amenities

Figure 2 Multi Use Path Typologies

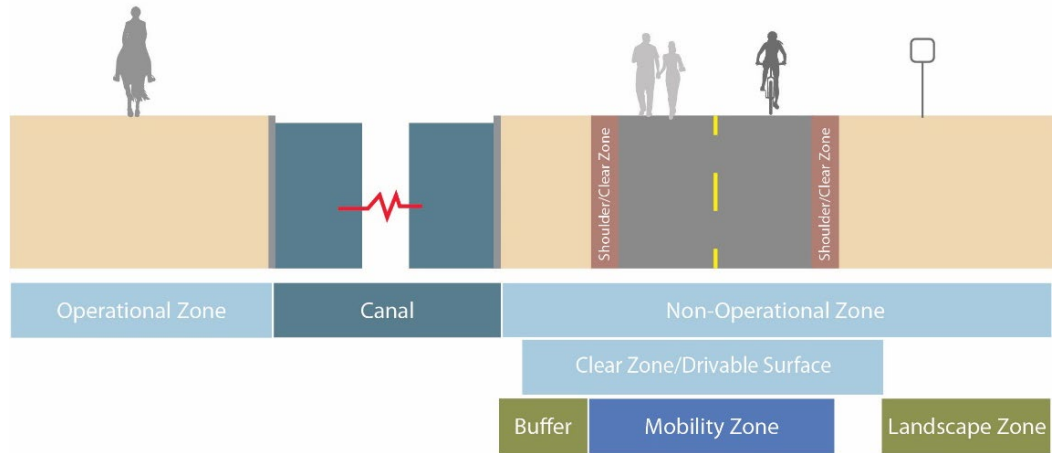


Multi-Use Path Typologies

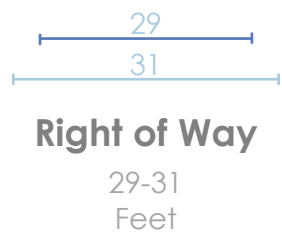
Canal Multi-Use Path (C-MUP)

Summary

These paths run along canals and provide long distance connections for all modes. Generally, the path will run along one side of the canal and preserve space for utility company access on the opposite side.



At a Glance



Design decisions on canal multi-use paths must adhere to SRP requirements:

- + No improvements in Operational Zone
- + Clear sight lines at intersections
- + Pavement markings in place of signage
- + Equestrians may be accommodated in the Operational zone or via a soft surface path
- + Signs posted on existing posts

C-MUP Path Element Details

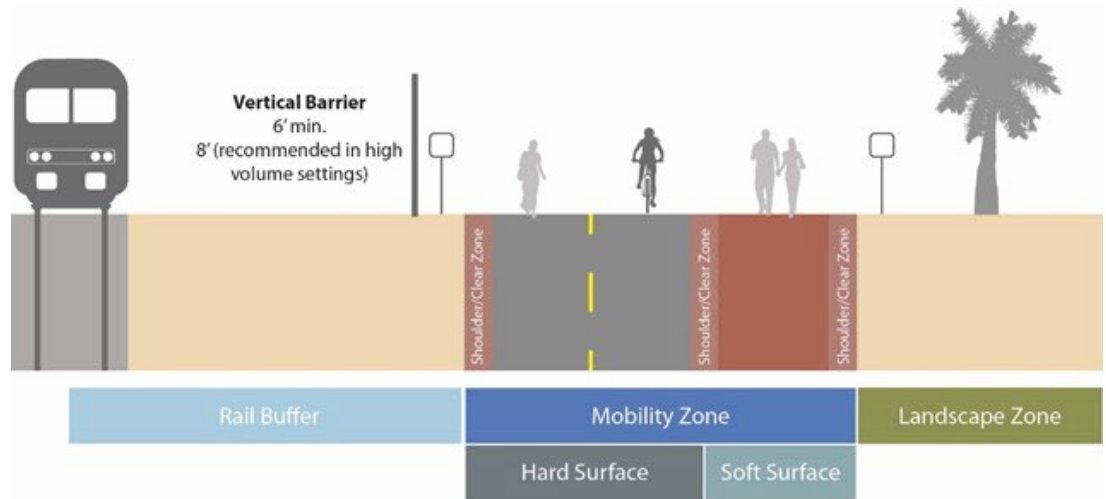
Element	Description	Range (min)	Treatments
Operational Zone	General drivable surface utilized for maintenance and access to features by ROW owner.	Varies	Concrete Asphalt Natural
Non-Operational Zone	Canal side where multi-use path elements are permissible.	Varies	Varies
<div style="display: flex; align-items: center;"> <div style="width: 20px; height: 20px; background-color: #4a7c9c; margin-right: 5px;"></div> <div style="text-align: center;"> <p>Clear Zone / Drivable Surface</p> </div> </div>	Clear path for maintenance vehicle.	20'	Concrete Asphalt Natural
<div style="display: flex; align-items: center;"> <div style="width: 20px; height: 20px; background-color: #4a7c9c; margin-right: 5px;"></div> <div style="text-align: center;"> <p>Buffer</p> </div> </div>	Lateral buffer between path users and edge of canal; vertical barriers are prohibited.	5'	Natural
<div style="display: flex; align-items: center;"> <div style="width: 20px; height: 20px; background-color: #4a7c9c; margin-right: 5px;"></div> <div style="text-align: center;"> <p>Mobility Zone</p> </div> </div>	Area intended for path user travel.	10'-12'	Concrete Asphalt
<div style="display: flex; align-items: center;"> <div style="width: 20px; height: 20px; background-color: #4a7c9c; margin-right: 5px;"></div> <div style="text-align: center;"> <p>Shoulder</p> </div> </div>	Shoulder / clear zone on either side of traveled way.	2'	Match Surface
<div style="display: flex; align-items: center;"> <div style="width: 20px; height: 20px; background-color: #4a7c9c; margin-right: 5px;"></div> <div style="text-align: center;"> <p>Landscape Zone</p> </div> </div>	Space for path wayfinding and amenities such as lighting, benches, and shade structures.	10'	Landscape Amenities

Multi-Use Path Typologies

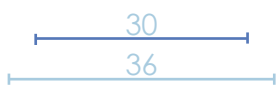
Rail with Trail Multi-Use Path (RT-MUP)

Summary

These paths run along rail lines and provide long distance connections for all modes. These paths must be built outside of rail ROW and separate path users from the rail line.



At a Glance



Right of Way

30-36
Feet

Rail with Trail paths provide a multi-use alignment adjacent to an active railway. UPRR does not allow paths within their ROW, and therefore additional ROW may be required for implementation. Other considerations include:

- + The need for a safety plan
- + Community preference for barrier type
- + Train frequency (up to 15/day)
- + Crossings require special attention type

RT-MUP Path Element Details

Element	Description	Range (min)	Treatments	
Rail Buffer	A 6-8' tall vertical barrier is required separating path users from the rail line. A setback is also desired.	25'	Vegetation Fence	
Mobility Zone	Area intended for path user travel.	20-26'	Varies	
	Hard Surface	Hard surface path provides accessible walking space and a usable path for most bike riders.	10'-12'	Concrete Asphalt
	Soft Surface	Soft surface path provides space for runners, equestrians, and others who prefer not to use the hard surface.	4'-8'	Decomposed granite Stabilized aggregate Natural
Shoulder	Shoulder / clear zone on either side of traveled way.	2'	Match Surface	
Landscape Zone	Space for path wayfinding and amenities such as lighting, benches, and shade structures.	10'	Landscape Amenities	

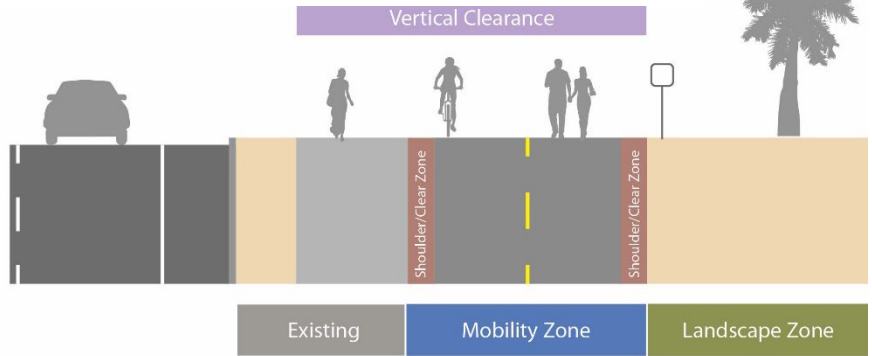
Multi-Use Path Typologies

Multi-Use Path 1.0 (MUP 1.0)

Summary

These paths run alongside or near existing transportation corridors in high density areas. With frequent use, it may be appropriate to separate bikes and pedestrians for user comfort. MUP 1.0 is intended to be used for new construction next to an existing sidewalk.

MUP 1.0 Path Adjacent to Existing Sidewalk



At a Glance

<p>Right of Way 24-34 Feet</p>	<p>Urban Land Use</p>	<p>Many Amenities & Crossings</p>	<p>High Multimodal Use</p>	<p>Trips Daily Needs</p>
---	----------------------------------	--	---------------------------------------	-------------------------------------

MUP 1.0 Path Element Details

Element	Description	Range (min)	Treatments	
Vertical Clearance	Clearance above the path which should be kept clear to accommodate path users	8.5'	N/A	
Mobility Zone	Area intended for path user travel.	19'-24'	Varies	
	Existing	Existing sidewalk and buffer, if applicable.	5'-8'	Concrete
	Hard Surface	Hard surface path provides accessible walking space and a usable path for most bike riders.	10'-12'	Concrete Asphalt
Shoulder	Shoulder / clear zone on either side of traveled way.	2'	Match Surface	
Landscape Zone	Space for path wayfinding and amenities such as lighting, benches, and shade structures.	5'-10'	Landscape Amenities	

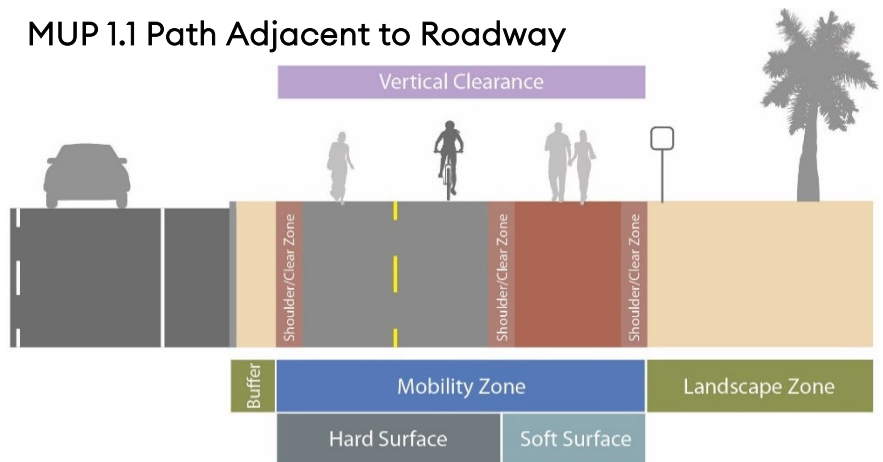
Multi-Use Path Typologies

Multi-Use Path 1.1 (MUP 1.1)

Summary

A variation of MUP 1.0, these paths run alongside or near existing transportation corridors in high density areas. With frequent use, it may be appropriate to separate bikes and pedestrians for user comfort. MUP 1.1 applies in areas where a new path is being built or reconstructed.

MUP 1.1 Path Adjacent to Roadway



At a Glance

<p>Right of Way 30-40 Feet</p>	<p>Urban Land Use</p>	<p>Many Amenities & Crossings</p>	<p>High Multimodal Use</p>	<p>Trips Daily Needs</p>
---	----------------------------------	--	---------------------------------------	-------------------------------------

MUP 1.1 Path Element Details

Element	Description	Range (min)	Treatments	
Vertical Clearance	Clearance above the path which should be kept clear to accommodate path users	8.5'	N/A	
Buffer	Space between path users and street; may be landscaped.	5' (preferred)	Landscape Natural	
Mobility Zone	Area intended for path user travel.	20'-25'	Varies	
	Hard Surface	Hard surface path provides accessible walking space and a usable path for most bike riders.	10'-12'	Concrete Asphalt
	Soft Surface	Soft surface path provides space for runners, equestrians, and others who prefer not to use the hard surface.	4'-8'	Decomposed granite Stabilized aggregate Natural
Shoulder	Shoulder / clear zone on either side of traveled way.	2'	Match Surface	
Landscape Zone	Space for path wayfinding and amenities such as lighting, benches, and shade structures.	5'-10'	Landscape Amenities	

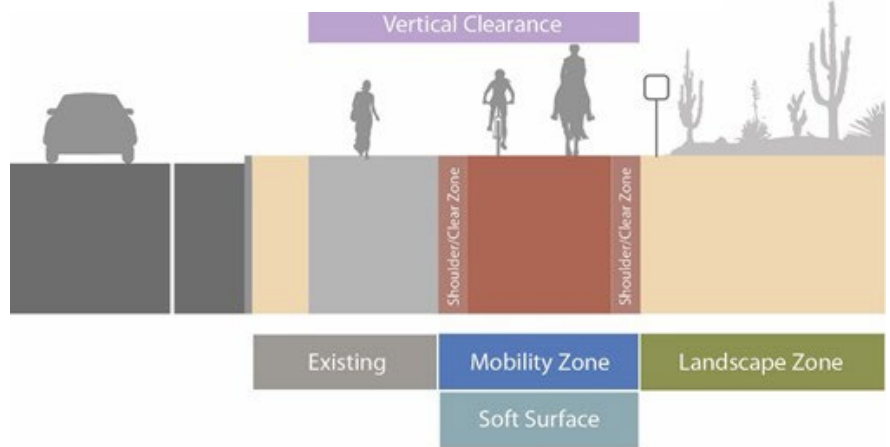
Multi-Use Path Typologies

Multi-Use Path 2.0 (MUP 2.0)

Summary

These paths run alongside or near existing transportation corridors in suburban areas. Where equestrian use is anticipated, a parallel soft surface path should be prioritized. MUP 2.0 is intended to be used for new construction next to an existing sidewalk.

MUP 2.0 Path Adjacent to Existing



At a Glance



Right of Way

22-32 Feet



Suburban

Land Use



Some

Amenities & Crossings



Moderate

Multimodal Use



Trips

Commute & Recreation

MUP 2.0 Path Element Details

Element	Description	Range (min)	Treatments	
Vertical Clearance	Clearance above the path which should be kept clear to accommodate path users	10'	N/A	
Mobility Zone	Area intended for path user travel.	17'-22'	Varies	
	Existing	Existing sidewalk and buffer, if applicable.	5'-8'	Concrete
	Soft Surface	Soft surface path provides space for runners, equestrians, and others who prefer not to use the hard surface.	8'-10'	Decomposed granite Stabilized aggregate Natural
	Shoulder	Shoulder / clear zone on either side of traveled way.	2'	Match Surface
Landscape Zone	Space for path wayfinding and amenities such as lighting, benches, and shade structures.	5'-10'	Landscape Amenities	

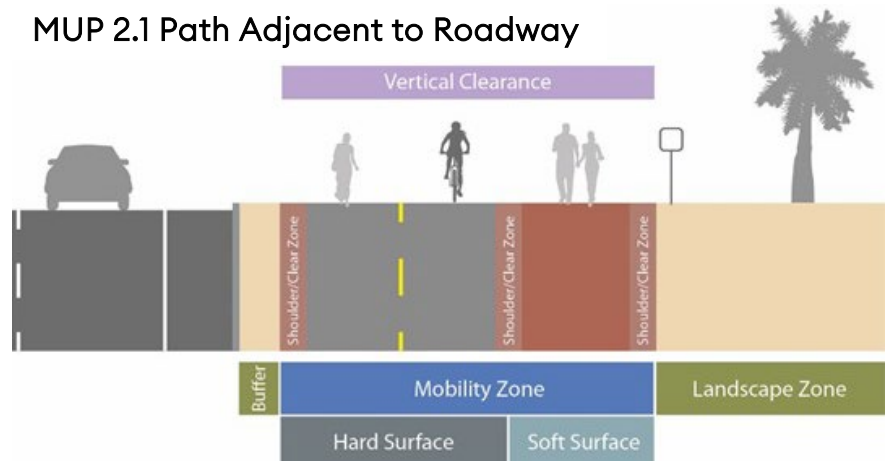
Multi-Use Path Typologies

Multi-Use Path 2.1 (MUP 2.1)

Summary

A variation of MUP 2.0, these paths run alongside or near existing transportation corridors in suburban areas. Where equestrian use is anticipated, a parallel soft surface path should be prioritized. MUP 2.1 applies in areas where a new path is being built or reconstructed.

MUP 2.1 Path Adjacent to Roadway



At a Glance

<p>Right of Way 32-41 Feet</p>	<p>Suburban Land Use</p>	<p>Some Amenities & Crossings</p>	<p>Moderate Multimodal Use</p>	<p>Trips Commute & Recreation</p>
---	-------------------------------------	--	---	--

MUP 2.1 Path Element Details

Element	Description	Range (min)	Treatments	
Vertical Clearance	Clearance above the path which should be kept clear to accommodate path users	10'	N/A	
Buffer	Space between path users and street; may be landscaped.	5' (preferred)	Landscape Natural	
Mobility Zone	Area intended for path user travel.	22'-26'	Varies	
	Hard Surface	Hard surface path provides accessible walking space and a usable path for most bike riders.	8'-10'	Concrete Asphalt
	Soft Surface	Soft surface path provides space for runners, equestrians, and others who prefer not to use the hard surface.	8'-10'	Decomposed granite Stabilized aggregate Natural
Shoulder	Shoulder / clear zone on either side of traveled way.	2'	Match Surface	
Landscape Zone	Space for path wayfinding and amenities such as lighting, benches, and shade structures.	5'-10'	Landscape Amenities	

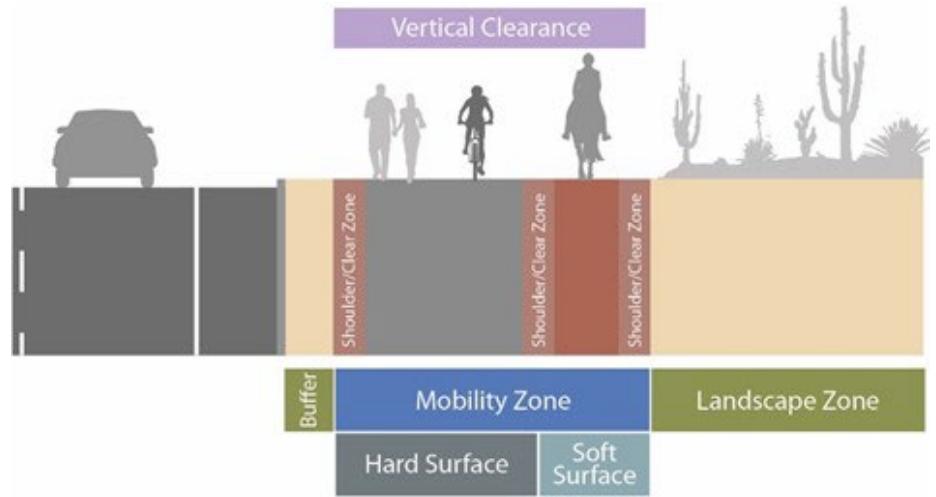
Multi-Use Path Typologies

Multi-Use Path 3.0 (MUP 3.0)

Summary

These paths run alongside or near existing transportation corridors in rural areas. Emphasis is placed on matching the surrounding context and a soft surface is required to meet equestrian needs. MUP 3.0 is intended to be used for new construction next to an existing sidewalk.

MUP 3.0 Path Adjacent to Roadway



At a Glance



Right of Way

28-39 Feet



Rural

Land Use



Fewer

Amenities & Crossings



Lower

Multimodal Use



Trips

Mostly Recreation

MUP 3.0 Path Element Details

Element	Description	Range (min)	Treatments	
Vertical Clearance	Clearance above the path which should be kept clear to accommodate path users	12'	N/A	
Buffer	Space between path users and street; may be landscaped.	5'	Landscape Natural	
Mobility Zone	Area intended for path user travel.	18'-24'	Varies	
	Hard Surface	Hard surface path provides accessible walking space and a usable path for most bike riders.	8'-10'	Concrete Asphalt
	Soft Surface	Soft surface path provides space for runners, equestrians, and others who prefer not to use the hard surface.	4'-8'	Decomposed granite Stabilized aggregate Natural
Shoulder	Shoulder / clear zone on either side of traveled way.	2'	Match Surface	
Landscape Zone	Space for path wayfinding and amenities such as lighting, benches, and shade structures.	5'-10'	Landscape Amenities	

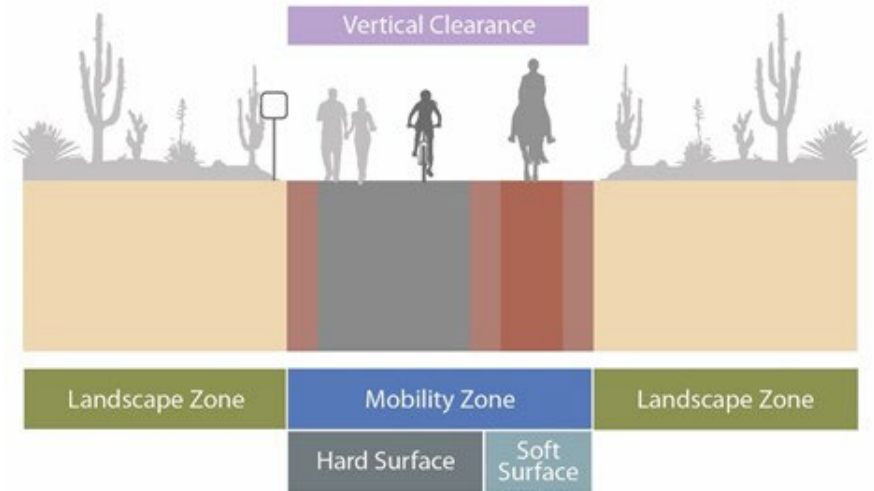
Multi-Use Path Typologies

Multi-Use Path 3.1 (MUP 3.1)

Summary

A variation of MUP 3.0, these paths run alongside or near existing transportation corridors in rural areas. Emphasis is placed on matching the surrounding context and a soft surface is required to meet equestrian needs. MUP 3.1 applies in areas where a new path is being built or reconstructed.

MUP 3.1 New Off-Street Path



At a Glance

<p>Right of Way 23-34 Feet</p>	<p>Rural Land Use</p>	<p>Fewer Amenities & Crossings</p>	<p>Lower Multimodal Use</p>	<p>Trips Mostly Recreation</p>
---	----------------------------------	---	--	---

MUP 3.1 Path Element Details

Element	Description	Range (min)	Treatments	
Vertical Clearance	Clearance above the path which should be kept clear to accommodate path users	12'	N/A	
Mobility Zone	Area intended for path user travel.	18'-24'	Varies	
	Hard Surface	Hard surface path provides accessible walking space and a usable path for most bike riders.	8'-10'	Concrete Asphalt
	Soft Surface	Soft surface path provides space for runners, equestrians, and others who prefer not to use the hard surface.	4'-8'	Decomposed granite Stabilized aggregate Natural
Shoulder	Shoulder / clear zone on either side of traveled way.	2'	Match Surface	
Landscape Zone	Space for path wayfinding and amenities such as lighting, benches, and shade structures.	5'-10'	Landscape Amenities	

Multi-Use Path Treatments & Components

The treatments selected for a multi-use path can have a significant impact on the comfort and desirability for users of multi-use paths. The design of multi-use paths considers the interaction of many different roadway users, design elements, and intended uses. This chapter provides an overview of the variety of tools to consider when designing paths to be welcoming for people of all ages, abilities, and identities.

The list of treatments in this toolbox includes nationally recommended design elements that provide context and user appropriate paths, safer crossings, high quality amenities, and clear wayfinding for all path users. These treatments were selected based on an analysis of existing conditions and the information gained through the public outreach process. In the outreach phase, there was a clear desire for more comfortable paths that connect people to the places they want to go. People indicated a willingness to use paths more frequently as long as those paths met their needs.

51% of respondents who walk would walk more if there were facilities to make walking more comfortable (shade, benches, etc.)

How To Use the Treatments & Components Toolbox

The toolbox is intended to provide strategies and components which can be applied to every trail project. It includes general guidance and introductory level discussion on each component but should be used in conjunction with the technical reference documents mentioned in Section 2. Principles & Guidance for formal design guidance. The toolbox contains the following categories:

Path Design & Surface Materials

Contains information on general path design guidance, potential path users and needs, and surface materials.

Crossings

Contains information on crossing treatments, including applied guidance for signalized and unsignalized crossings

Signage & Wayfinding

References and provides key points from the Town of Gilbert's *2016 Trail and Wayfinding Signage Master Plan*

Access Points, Support Facilities, & Amenities

Provides guidance on the variety of facilities and treatments which can be applied to access points and to increase comfort and usability of multi-use paths

Multi-Use Path Treatments & Components

Path Design & Surface Materials

Introduction & Guidance

Multi-use paths can be designed in a variety of ways and places. Generally careful consideration should be paid to potential users and the purpose of the trip. While many of the paths in Gilbert are intended to support both utilitarian and recreational trips, each has a slightly different context and need. Regardless, the following design principles are relevant to all multi-use paths:

Design for Accessibility

All path design should follow the design guidelines set forth by the most recent Federal ADA Regulations and Standards. At the time of this report adoption, these are the 2010 ADA Standards for Accessible Design.



https://www.ada.gov/2010ADASTandards_index.htm

Recognize the Intended User when defining Surface Type

Potential path users have varying needs when it comes to path design. For example, certain users can only operate on certain types of path surfaces. Some examples of these materials are listed below and discussed in more detail in the remainder of this section.

Hard Surfaces

- + Asphalt
- + Concrete
- + Resin-Based Stabilized Material

Soft Surfaces

- + Stabilized aggregate
- + Natural Earth

Recognize User Volume when Separating or Combining Uses

As usage increases, it is important to consider separation of uses. In areas with higher usage and with a variety of users, it may make sense to separate bicycle and pedestrian traffic, and equestrian traffic should generally be provided a separate path when possible.

Ensure Paths Meet User Needs

Multi-use paths are not like sidewalks. Because they combine a variety of users, it is important to provide paths in as straight an alignment as possible, as opposed to a meandering alignment which might be appropriate for a trail or sidewalk. This is especially important for bicycle riders, who may not have the ability to follow a meandering path.

Multi-Use Path Treatments & Components

Path Design & Surface Materials

Hard Surfaces

Hard surface paths are the most versatile when it comes to accessibility. They also require less maintenance and can withstand frequent use. They are more expensive than soft-surface trails and require considerations for things like drainage and potential environmental impact.

Users Accommodated

Wheelchair User



Walker



Stroller



Runner



Bicyclist



Mountain Biker



Roller Skater



Equestrian



Surface Types

Asphalt

- + Works well in urban areas and for people using wheeled devices
- + Requires regular, minor maintenance like crack patching
- + Last longer with heavy use
- + Potential environmental contamination during install



Image Source: trailink.com

Concrete

- + Longest lasting hard-surface material
- + One of the most expensive materials
- + Holds up well in flooding and climate swings
- + Unyielding surface can be uncomfortable for some users



Image Source: AZMAG.gov

Resin-Based Stabilized Material

- + Utilizes resin to bind homogenous soil particles
- + As hard as asphalt but does not absorb as much heat
- + Finished surface color blends in with natural environment
- + More expensive than asphalt
- + Requires drainage
- + New product; longevity unclear

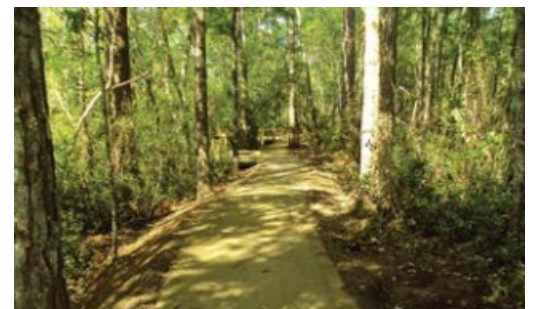


Image Source: USDA









Multi-Use Path Treatments & Components

Path Design & Surface Materials

Soft Surfaces

Hard surface paths are the most versatile when it comes to accessibility. They also require less maintenance and can withstand frequent use. They are more expensive than soft-surface trails and require considerations for things like drainage and potential environmental impact.

Users Accommodated

Wheelchair User	Walker	Stroller	Runner	Bicyclist	Mountain Biker	Roller Skater	Equestrian
X/✓	✓	X/✓	✓	X/✓	✓	X	✓
							

Surface Types

Stabilized Aggregate

- + Includes decomposed granite and crushed stone
- + Lower cost to install
- + Allows for natural filtration of water
- + Requires stabilization or can wash out
- + Maintains natural look and feel
- + Can be ADA accessible but may not be as comfortable as hard surface

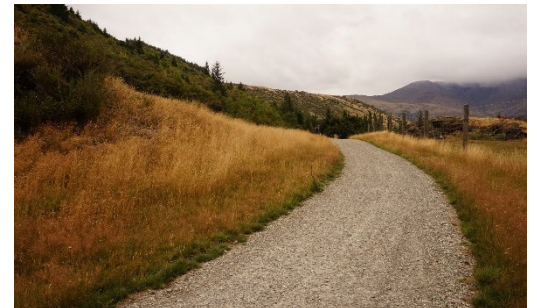


Image Source: organic-lock.com

Natural Earth

- + Cheapest surface material for installation
- + Can wash out and requires maintenance due to drainage issues
- + May not be ADA accessible, especially if not properly maintained



Image Source: tripadvisor.com

Multi-Use Path Treatments & Components

Crossings

Introduction & Guidance

Crossings are one of the most critical components of a multi-use path. They are the locations which provide entrances to paths but also introduce potential conflicts with other modes and so can act as barriers or seams, depending on the design. Goals for multi-use path crossings are shown on this page. The remainder of this section discusses crossing treatments and potential applications at different intersection types.

- GOAL 1 Provide Adequate Sight Distance and Visibility**
Provide clear visibility between users so they can see and react to potential conflicts.
- GOAL 2 Communicate Right-Of-Way Priority**
Use design to communicate right-of-way and user priority at conflict points.
- GOAL 3 Minimize Exposure at Conflict Points**
Reduce the potential for conflicts through separation of movements and creating clear paths for each user.
- GOAL 4 Reduce Speeds at Conflict Points**
Slow down roadway and path users to increase reaction times and reduce the risk and severity of conflict.
- GOAL 5 Maximize Accessibility of Users of All Ages and Abilities** Create paths which are easily navigated by users of all ages and abilities. All designs must comply with ADA design requirements at a minimum and be designed in accordance with Public Right-of-Way Accessibility Guidelines (PROWAG).

Multi-Use Path Treatments & Components

Crossings

Treatments, Components, & Applicability

This section describes the variety of potential treatments, their benefits, constraints, typical applications, and design considerations. An overview of the treatments is provided below. The information on potential location types is intended as a guide for common applications but does not preclude the use of any option. Engineering judgement should be applied based on the context, data, and public input to select appropriate options.

Category	Treatment	Potential Location Types			Mid-Block	Goal(s) Addressed
		Arterial	Local	Intersection		
General Crossing Treatments	High Visibility Crosswalk	✓	✓	✓	✓	1, 2, 3, 5
	Raised Crossing		✓	✓	✓	1, 2, 3, 4, 5
	Pedestrian Refuge Island	✓	✓	✓	✓	1, 3, 5
Accessibility Treatments	Curb Ramps With Tactile Warning Panels	✓	✓	✓	✓	5
	Accessible Pedestrian Signals	✓	✓	✓	✓	5
Traffic Control	Rectangular Rapid Flashing Beacon		✓		✓	2, 3, 4, 5
	Pedestrian Hybrid Beacon	✓			✓	2, 3, 4, 5
Signal Phasing	Exclusive Pedestrian Phase	✓	✓	✓		2, 3, 4, 5
	Leading Pedestrian Interval	✓	✓	✓		2, 3, 4, 5
Signage and Striping	Advanced Warning Signing	✓	✓		✓	1, 2, 4
	Centerlines On Paths	✓	✓	✓	✓	1, 2, 4, 5
Geometry Treatments	Curb Extensions	✓	✓	✓	✓	1, 3, 4, 5
	Tighten Intersection Geometry	✓	✓	✓	✓	1, 3, 4, 5
	Sight Distance Improvements	✓	✓	✓	✓	1
	Grade Separation	✓		✓	✓	2, 3, 5
	Vertical/Horizontal Deflection		✓		✓	4
	Path Approach Geometry	✓	✓	✓	✓	1, 3, 5
	Bend-Out	✓		✓		1, 2, 3, 4
	Protected Intersections	✓		✓		1, 2, 3, 4, 5

Multi-Use Path Treatments & Components

Crossings

General Crossing Treatments

Crossing treatments which shorten crossing distances and highlight the crossings to other users.

High Visibility Crosswalk

Use patterns which are reflective and visible to drivers from far away.

Benefits

- + Alerts drivers to crossing & designates crossing for path users
- + Drivers required to stop for people in crosswalk

Typical Applications

- + Applied at intersections or mid-block in conjunction with other treatments

Constraints

- + More effective when combined with other traffic control

Design Considerations

- + Striping can vary
- + Paint or thermoplastic
- + Should match path width



Source: Maricopa Association of Governments

Raised Crossing

Bring the crossing to sidewalk level requiring drivers to slow and increasing visibility for all users.

Benefits

- + Increases visibility and provides clear right-of-way priority
- + Slows down drivers

Typical Applications

- + Generally applied mid-block or on side streets
- + Should not be used on transit routes.

Constraints

- + Can be difficult to navigate for large trucks
- + Relatively expensive

Design Considerations

- + At sidewalk height and at least as wide as path
- + Provide detectable warnings prior to street crossings
- + Drainage should be considered



Source: NYC DOT

Pedestrian Refuge Island

Provides a protected area in the middle of a crosswalk for people to stop when crossing the street.

Benefits

- + Reduces exposure for people crossing the street
- + Allows crossings to be done in two phases

Typical Applications

- + Multi-lane streets, especially where children and seniors are expected users
- + Can be signalized or unsignalized

Benefits

- + Reduces exposure for people crossing the street
- + Allows crossings to be done in two phases

Typical Applications

- + Multi-lane streets, especially where children and seniors are expected users
- + Signalized or unsignalized



Source: FHWA

Multi-Use Path Treatments & Components

Crossings

Accessibility Treatments

These treatments are intended to make paths safe and comfortable for all users.

Curb Ramps with Tactile Warning Panels

Transition users from the sidewalk level to street level.

Benefits

- + Smooth transition for anyone using a wheeled device
- + Tactile panels assist users with visual impairments

Typical Applications

- + Required at all crossings

Constraints

- + N/A, although important to consider requirements for landings and potential ROW needs

Design Considerations

- + Reflect current ADA design standards



Source: Maricopa Association of Governments

Accessible Pedestrian Signals

Audible signals which help to communicate walk and wait times.

Benefits

- + Provide audible or verbal tones to users with visual impairments to help navigate intersections

Typical Applications

- + Can be applied at any crossing

Constraints

- + Noise levels can be disruptive in residential areas

Design Considerations

- + Consider noise levels
- + Recommended to utilize PROWAG standards



Source: Maricopa Association of Governments

Multi-Use Path Treatments & Components

Crossings

Traffic Control

Traffic control can be applied mid-block or at intersections to better define intended movements.

Rectangular Rapid Flashing Beacon

Include flashing signs to alert drivers to people crossing.

Benefits

- + Strobing lights are highly visible and at driver eye level
- + Proven to increase driver yielding

Typical Applications

- + Mid-block crossings with high demand and moderate to high traffic volumes

Constraints

- + Must be activated by path users
- + Lower compliance than at traffic signals

Design Considerations

- + Push button should be accessible to all users
- + If street is wider than 2-lanes, a refuge island may be desired



Source: ADOT

Pedestrian Hybrid Beacon (HAWK Signal)

Pedestrian activated signal which remains unlit when not in use.

Benefits

- + Near driver 100% yielding behavior
- + Improves safety for all users and reduces crashes

Typical Applications

- + Mid-block crossings with high demand and high traffic volumes, especially on roads with multiple lanes

Constraints

- + Must be activated by path users
- + Relatively expensive

Design Considerations

- + Push button should be accessible to all users



Source: Maricopa Association of Governments

Multi-Use Path Treatments & Components

Crossings

Signal Phasing

Signal phasing can be used to fully separate or prioritize movements.

Exclusive Pedestrian Phase

Provides a dedicated phase for non-motorized users.

Benefits

- + Fully separates non-motorized users from drivers
- + Allows people to cross in all directions at the same time

Typical Applications

- + Signalized intersections where crossing distances are short or where there are significant volumes of nonmotorized users

Constraints

- + Can create delay for all users which can impact compliance for all users

Design Considerations

- + Requires a pedestrian signal face
- + Should be combined with “No Right Turn on Red”



Source: NACTO

Leading Pedestrian Interval (LPI)

Provides a 3-7 second head start before vehicle phase.

Benefits

- + Give non-motorized users a head start to reduce conflicts with turning vehicles
- + Increases visibility

Typical Applications

- + Signalized intersections where right-turning vehicles frequently conflict with nonmotorized users

Constraints

- + Reduces green time for vehicle movements & can add delay

Design Considerations

- + Requires a pedestrian signal face
- + Minimum 3-7 second head start



Source: PedBikeInfo.org

Multi-Use Path Treatments & Components

Crossings

Signage and Striping

These treatments can help communicate right-of-way and road user roles and responsibilities.

Advanced Warning Signage

Signs alerting travelers to upcoming mid-block crossings.

Benefits

- + Alerts drivers and path users to crossings

Typical Applications

- + Applied at mid-block crossings in conjunction with other treatments

Constraints

- + More effective when combined with other traffic control

Design Considerations

- + Signs should reflect MUTCD standards
- + Placement depends on motor vehicle speeds and other criteria



Source: MUTCD

Naming Conventions at Street Crossings:

Signage on street approaching path: Should always identify the path name

Signage on path approaching street: Should always identify the street name

Centerlines on Paths

Can be used to indicate user priority and separate path users.

Benefits

- + Can provide clear separation between path users when appropriate, reducing conflicts

Typical Applications

- + Consider applying at all intersections and crossings
- + Optional along entire path but recommended where high usage is present or anticipated
- + Consider applying on sharp turns or where there is low visibility

Constraints

- + May require maintenance

Design Considerations

- + Can be paint (cheaper) or thermoplastic (longer lasting)



Source: National Park Service

Multi-Use Path Treatments & Components

Crossings

Geometry Treatments

Physical changes to streets and intersections can improve safety and usability for everyone.

Curb Extensions

Extend curb or sidewalk into the street to narrow crossing distances.

Benefits

- + Narrows crossing distances, reducing exposure
- + Slows turning vehicles
- + Increases visibility for all users
- + Can provide space for landscape

Typical Applications

- + Mid-block or intersection nonmotorized crossings

Constraints

- + Turning radius for large vehicles must be considered
- + Drainage, space, and design other challenges

Design Considerations

- + Consider potential impacts to bike lanes and parking in design



Source: Maricopa Association of Governments

Tighten Intersection Geometry

Reconstruct street corners to reduce curb radius.

Benefits

- + Slows turning vehicles
- + Reduces crossing distances for nonmotorized users

Typical Applications

- + All intersections and street types

Constraints

- + Turning radius for large vehicles must be considered

Design Considerations

- + Important to consider vehicle types when defining radius
- + Consider on-street parking, bike lanes, and other impacts on “effective curb radius”



Source: Maricopa Association of Governments

Sight Distance Improvements

Clearing elements which impede visibility at crossings and intersections.

Benefits

- + Improves visibility, allowing drivers more time to react to motorized and nonmotorized cross-traffic

Typical Applications

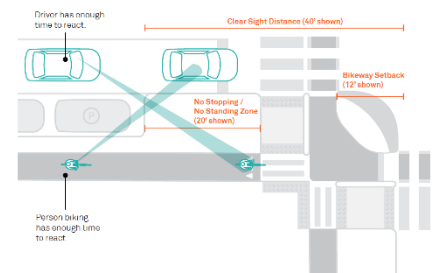
- + All intersections and street types

Constraints

- + Can have high costs
- + May conflict with placemaking goals

Design Considerations

- + Ensure signals and signs are not obstructed
- + Consider other contextual needs, such as a desire for street trees and vegetation



Source: NACTO

Multi-Use Path Treatments & Components

Crossings

Geometry Treatments (Continued)

Grade Separation

Path crosses over or under a road, rail line, canal, or other barrier.

Benefits

- + Physical separation between path users and a barrier, completely removing potential conflicts

Typical Applications

- + At limited access highways, railroads, canals, and very large or high-volume roads

Constraints

- + Expensive
- + Can require out of direction travel
- + Significant space requirements

Design Considerations

- + Lighting is important for undercrossing
- + Minimize slope and out of direction travel



Source: Town of Gilbert

Vertical/Horizontal Deflection

Vertical (speed bumps/humps) and horizontal (chicanes) treatments intended to slow down vehicular traffic.

Benefits

- + Slows vehicle speeds
- + Easily navigated by bicyclists

Typical Applications

- + Mid-block on minor streets where traffic calming is desired
- + Vertical deflection works well with curb extensions

Constraints

- + Emergency and transit vehicles may be required to slow down
- + Vertical deflection can be noisy

Design Considerations

- + Drainage should be accommodated
- + May need advanced signing



Source: PedBikeSafe.org

Path Approach Geometry

Crossings should be at right angles and have one consolidated crossing point.

Benefits

- + Improves visibility and accessibility for all users

Typical Applications

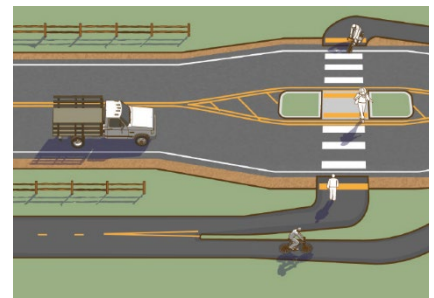
- + All intersections and street types

Constraints

- + May require space to adjust path to right angle

Design Considerations

- + Consider user needs when consolidating hard and soft surface paths



Source: Rural Design Guide

Multi-Use Path Treatments & Components

Crossings

Geometry Treatments (Continued)

Bend-Out

Sets the crossing further from the street to increase visibility and provide more yield space for turning vehicles.

Benefits

- + Increases visibility for all users
- + Bend-outs provide additional yielding space for turning drivers
- + Provides a greater sense of comfort

Typical Applications

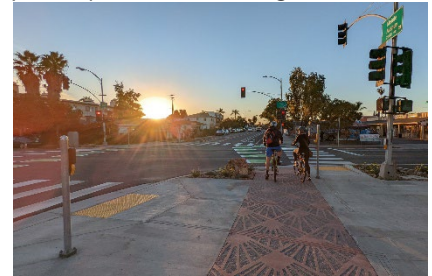
- + Should only be used in conjunction with signalized intersections

Constraints

- + Can be difficult to implement in limited right-of-way

Design Considerations

- + Requires enough space for a vehicle to yield in front of the crossing (6-16.5')



Source: SANDAG

Protected Intersections

Physically separates bicyclists from motor vehicles and pedestrians at an intersection.

Benefits

- + Slows vehicle speeds
- + Easily navigated by bicyclists
- + Shortens crossings distances and improved visibility for all users
- + Provides yielding space for turning drivers

Typical Applications

- + At signalized intersections, especially where there is high biking volume or demand for turning movements on cross streets

Constraints

- + Can require additional space
- + Can add additional signal delay if bike signals are used
- + Can be expensive

Design Considerations

- + Bikeways can be at street or sidewalk level
- + Bike signals can increase separation but also increase delay
- + Consider ADA requirements and accessibility for all users
- + Requires enough space for a vehicle to yield in front of the crossing (6-16.5')



Source: Kittelson & Associates, Inc.

Multi-Use Path Treatments & Components

Crossings

Pulling it Together: Mid-Block Crossings

Overview

The appropriate traffic control and treatments for a midblock multi-use path street crossing are primarily dependent on the volume and speed of vehicles. The following table summarizes FHWA’s guidance for improving pedestrian safety at uncontrolled crossings and should be referenced to select appropriate treatments.

Roadway Configuration	Posted Speed Limit and AADT								
	Vehicle AADT <9,000			Vehicle AADT 9,000–15,000			Vehicle AADT >15,000		
	≤30 mph	35 mph	≥40 mph	≤30 mph	35 mph	≥40 mph	≤30 mph	35 mph	≥40 mph
2 lanes (1 lane in each direction)	① 2 4 5 6	● 5 6 7 9	○ 5 6 7 9	① 4 5 6	● 5 6 7 9	○ 5 6 7 9	① 4 5 6	● 5 6 7 9	○ 5 6 7 9
3 lanes with raised median (1 lane in each direction)	① 2 3 4 5	● 3 5 7 9	○ 3 5 7 9	① 3 4 5	● 3 5 7 9	○ 3 5 7 9	① 3 4 5	● 3 5 7 9	○ 3 5 7 9
3 lanes w/o raised median (1 lane in each direction with a two-way left-turn lane)	① 2 3 4 5 6 7 9	● 3 5 6 7 9	○ 3 5 6 7 9	① 3 4 5 6 7 9	● 3 5 6 7 9	○ 3 5 6 7 9	① 3 4 5 6 7 9	● 3 5 6 7 9	○ 3 5 6 7 9
4+ lanes with raised median (2 or more lanes in each direction)	① 3 5 7 8 9	● 3 5 7 8 9	○ 3 5 7 8 9	① 3 5 7 8 9	● 3 5 7 8 9	○ 3 5 7 8 9	① 3 5 7 8 9	● 3 5 7 8 9	○ 3 5 7 8 9
4+ lanes w/o raised median (2 or more lanes in each direction)	① 3 5 6 7 8 9	● 3 5 6 7 8 9	○ 3 5 6 7 8 9	① 3 5 6 7 8 9	● 3 5 6 7 8 9	○ 3 5 6 7 8 9	① 3 5 6 7 8 9	● 3 5 6 7 8 9	○ 3 5 6 7 8 9

Given the set of conditions in a cell,

- # Signifies that the countermeasure is a candidate treatment at a marked uncontrolled crossing location.
- Signifies that the countermeasure should always be considered, but not mandated or required, based upon engineering judgment at a marked uncontrolled crossing location.
- Signifies that crosswalk visibility enhancements should always occur in conjunction with other identified countermeasures.*

The absence of a number signifies that the countermeasure is generally not an appropriate treatment, but exceptions may be considered following engineering judgment.

- 1 High-visibility crosswalk markings, parking restrictions on crosswalk approach, adequate nighttime lighting levels, and crossing warning signs
- 2 Raised crosswalk
- 3 Advance Yield Here To (Stop Here For) Pedestrians sign and yield (stop) line
- 4 In-Street Pedestrian Crossing sign
- 5 Curb extension
- 6 Pedestrian refuge island
- 7 Rectangular Rapid-Flashing Beacon (RRFB)**
- 8 Road Diet
- 9 Pedestrian Hybrid Beacon (PHB)**

*Refer to Chapter 4, 'Using Table 1 and Table 2 to Select Countermeasures,' for more information about using multiple countermeasures.

**It should be noted that the PHB and RRFB are not both installed at the same crossing location.

This table was developed using information from: Zegeer, C.V., J.R. Stewart, H.H. Huang, P.A. Lagerwey, J. Feaganes, and B.J. Campbell. (2005). Safety effects of marked versus unmarked crosswalks at uncontrolled locations: Final report and recommended guidelines. FHWA, No. FHWA-HRT-04-100, Washington, D.C.; FHWA, Manual on Uniform Traffic Control Devices, 2009 Edition (revised 2012). Chapter 4F, Pedestrian Hybrid Beacons. FHWA, Washington, D.C.; FHWA, Crash Modification Factors (CMF) Clearinghouse. <http://www.cmfclearinghouse.org/>; FHWA, Pedestrian Safety Guide and Countermeasure Selection System (PEDSAFE). <http://www.pedbikesafe.org/PEDSAFE/>; Zegeer, C., R. Srinivasan, B. Lan, D. Carter, S. Smith, C. Sundstrom, N.J. Thirsk, J. Zegeer, C. Lyon, E. Ferguson, and R. Van Houten. (2017). NCHRP Report 841: Development of Crash Modification Factors for Uncontrolled Pedestrian Crossing Treatments. Transportation Research Board, Washington, D.C.; Thomas, Thirsk, and Zegeer. (2016). NCHRP Synthesis 498: Application of Pedestrian Crossing Treatments for Streets and Highways. Transportation Research Board, Washington, D.C.; and personal interviews with selected pedestrian safety practitioners.

Source: FHWA Guide for Improving Pedestrian Safety at Uncontrolled Crossing Locations, Table 1

Multi-Use Path Treatments & Components

Crossings

Desired Design Elements

The following elements are desired at mid-block crossings in Gilbert:

Local & Collector Streets

- + High visibility crosswalk
- + Raised crossing for local street crossings
- + Rectangular Rapid Flashing Beacon (RRFB) for collector street crossings
- + Advanced warning signing for approaching drivers and path users

Minor or Major Arterials

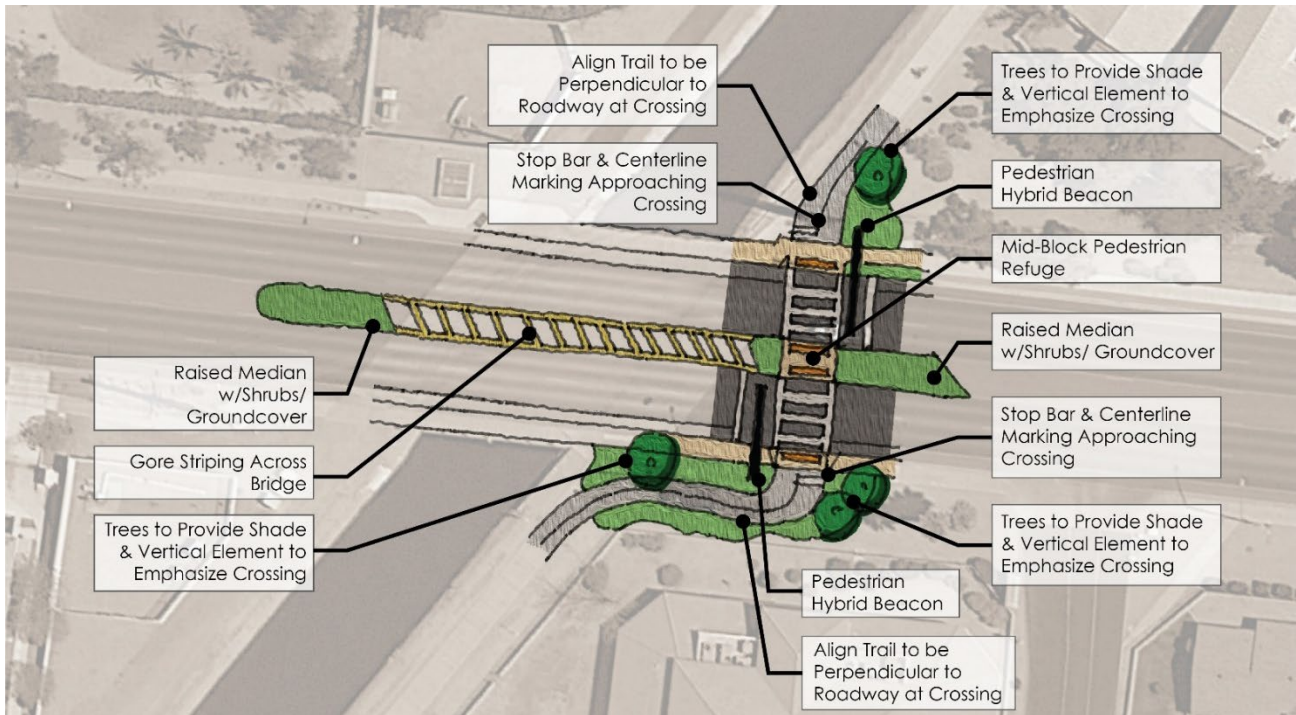
- + High visibility crosswalk
- + Curb ramps with tactile warning panels.
- + Pedestrian Hybrid Beacon
- + Pedestrian refuge island
- + Advanced warning signing for approaching drivers and path users
- + Path centerline and wayfinding if path curves
- + Accessible Pedestrian Signals

Applying the Guidance

To contextualize this, the guidance and solutions discussed in the toolbox have been applied at the midblock crossing of Heritage Trail at Guadalupe Road. The *Safety Improvements for Trail Crossings* report recommends the following geometric and signal improvements at this location:

- + Install PHB with all related pavement markings, signs, and beacons
- + Construct a raised median east of the future crosswalk

Building on these recommendations, the sketch below illustrates how a path crossing could be adjusted to adhere to the guidance in this toolbox.



Multi-Use Path Treatments & Components

Crossings

Pulling it Together: Intersection Crossings

Overview

Where multi-use paths approach intersections, they should generally be redirected to use the intersection crossing as opposed to crossing mid-block near the intersection. Most multi-use path crossings in Gilbert occur at minor and major arterials due to the Town’s street grid layout. There are few local or collector street crossings for off-street multi-use paths, such as those following canal corridors. The following table summarizes contextual guidance for intersection control at path crossings based on street type.

	Side Street or Major Driveway	Local or Collector	Minor or Major Arterial
Local or Collector	Unsignalized	Unsignalized	Unsignalized/Signalized
Minor or Major Arterial	Unsignalized	Unsignalized/Signalized	Signalized

Desired Design Elements

The following elements are desired at intersection crossings in Gilbert:

Unsignalized Crossing

- + High visibility crosswalks
- + Curb ramps with tactile warning panels
- + Recessed crossing providing enough space for one vehicle to queue
- + Raised crossing for local street or driveway crossings
- + Tighten intersection geometry where feasible
- + Advanced warning signing for approaching drivers and path users

Signalized Crossings

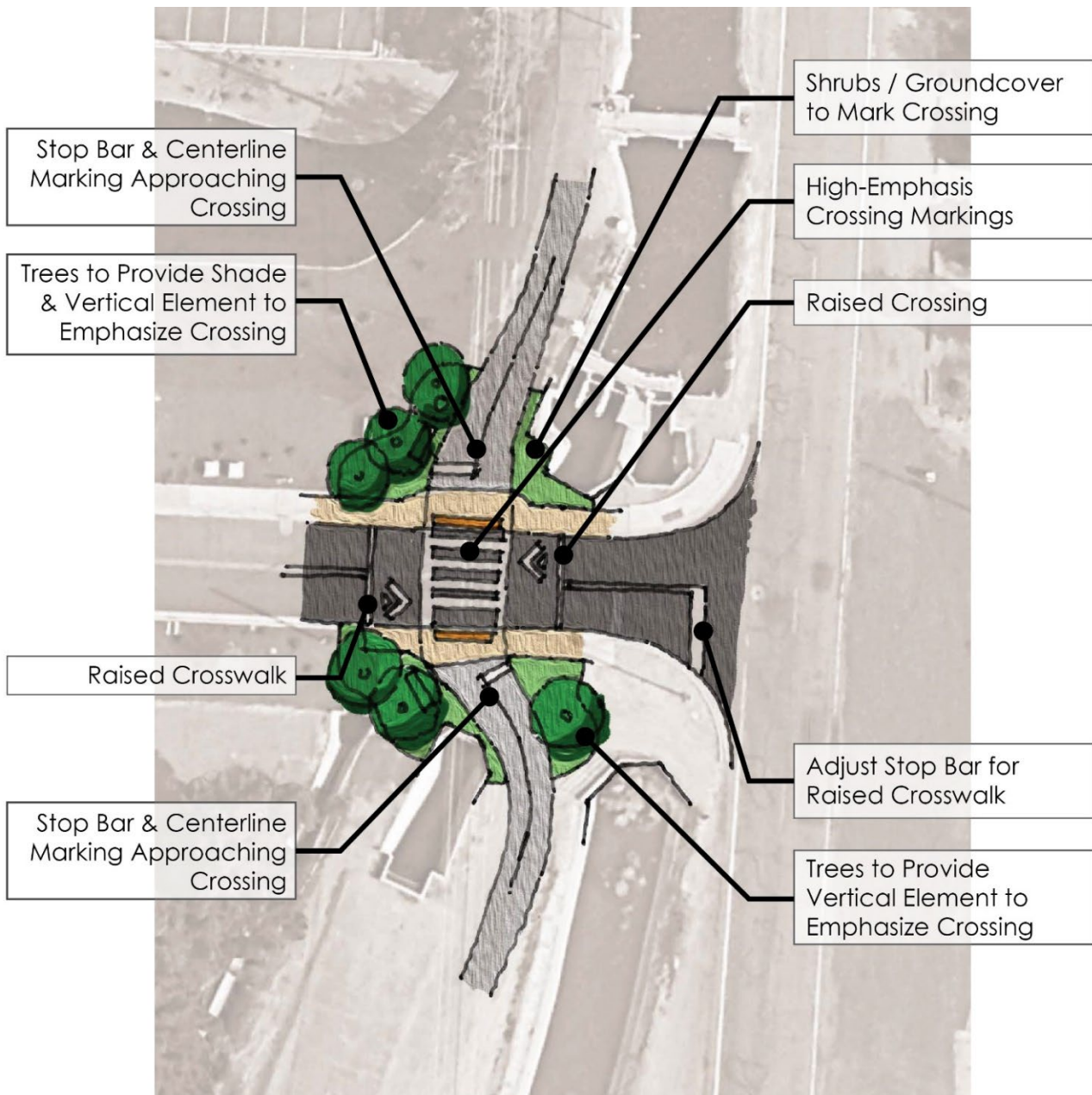
- + High visibility crosswalks
- + Curb ramps with tactile warning panels
- + Exclusive pedestrian phase or LPI and protected intersection elements
- + Pedestrian refuge island
- + Path centerline and wayfinding if path curves
- + Tighten intersection geometry where feasible
- + Accessible Pedestrian Signals (APS)

Multi-Use Path Treatments & Components

Crossings

Applying the Guidance – Unsignalized Crossings

The following sketch shows what a recessed crossing and raised crosswalk at a local side street could look like. Utilizing the guidelines in this toolbox, the crossing has been drawn to maximize user comfort when crossing the side street, improving visibility for all users and clearly prioritizing path users when crossing the street.

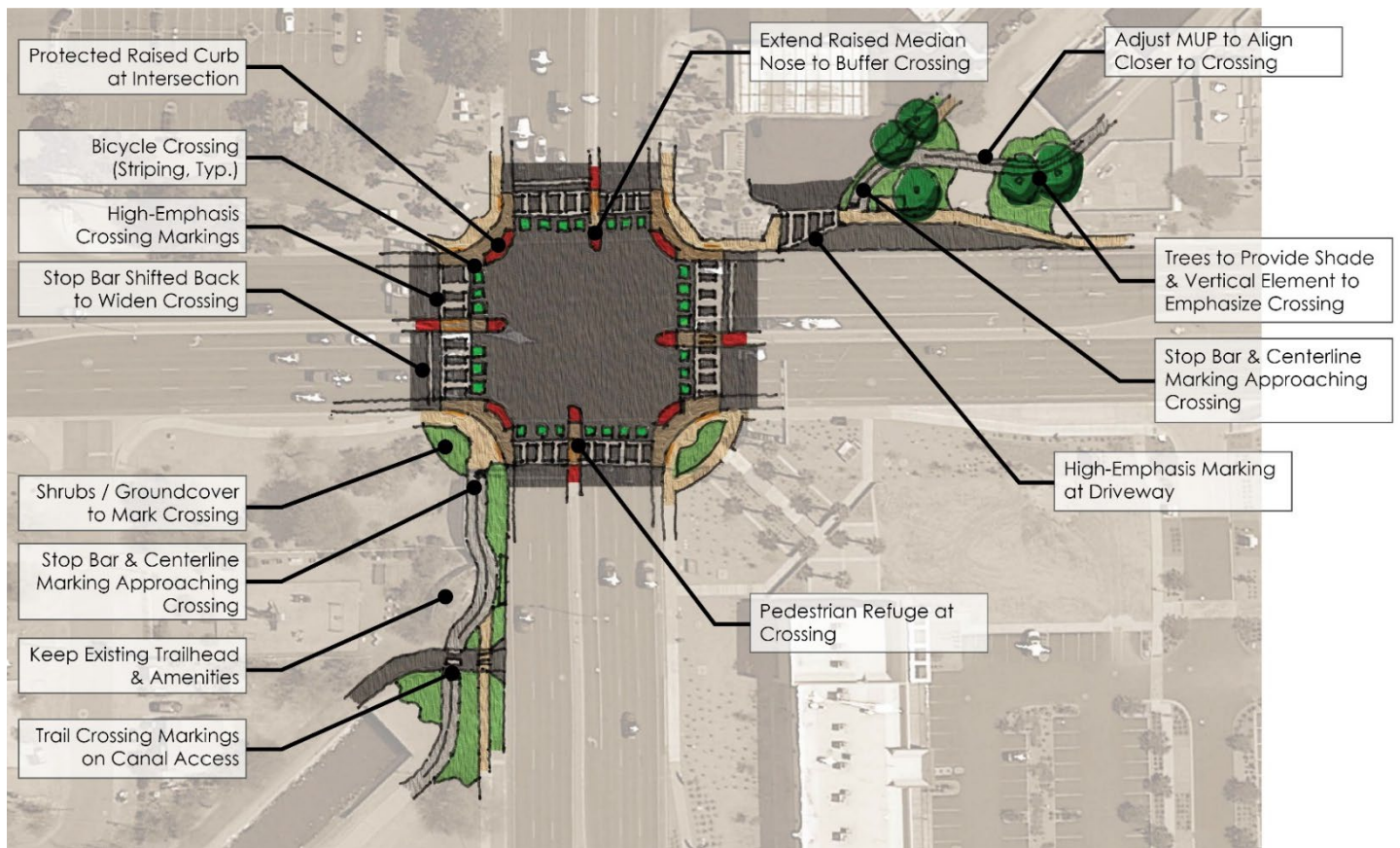


Multi-Use Path Treatments & Components

Crossings

Applying the Guidance – Signalized Crossings at Major Arterial Intersections

Intersections of two major arterials are some of the most complex locations to meet the needs of all users. There are multiple conflict points which must be addressed and potentially large volumes of traffic. One way to address conflicts is to separate users to the maximum extent possible via a protected intersection design. The following sketch shows what a protected intersection at two major arterials could look like.

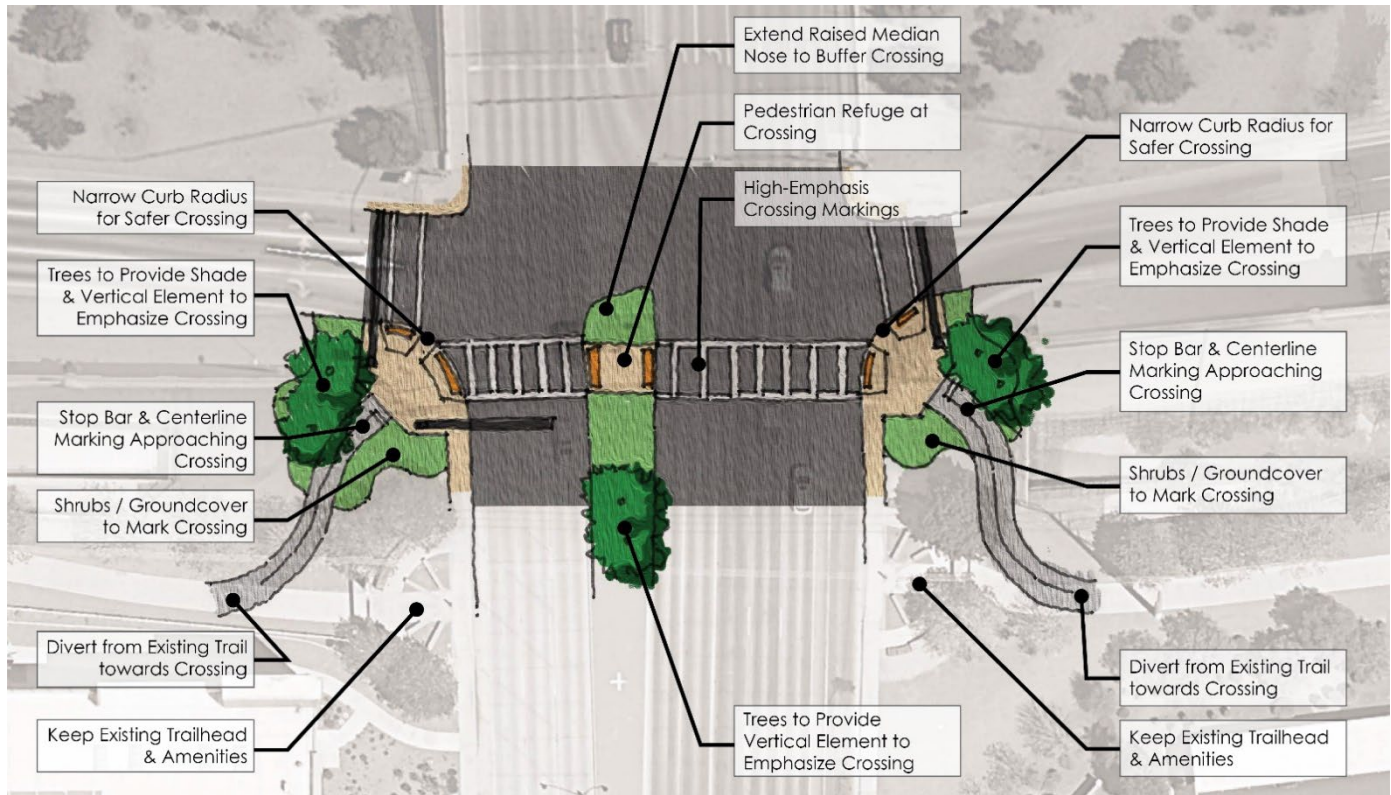


Multi-Use Path Treatments & Components

Crossings

Applying the Guidance – Signalized Crossings at Minor Streets

Intersections of side or local streets at major arterials present challenges in prioritizing path users in crossing the major arterial. The guidelines in the toolbox provide many ways to address conflicts and prioritization. The sketch below shows how the toolbox could be applied to a path crossing at the intersection of a minor street with a major arterial.



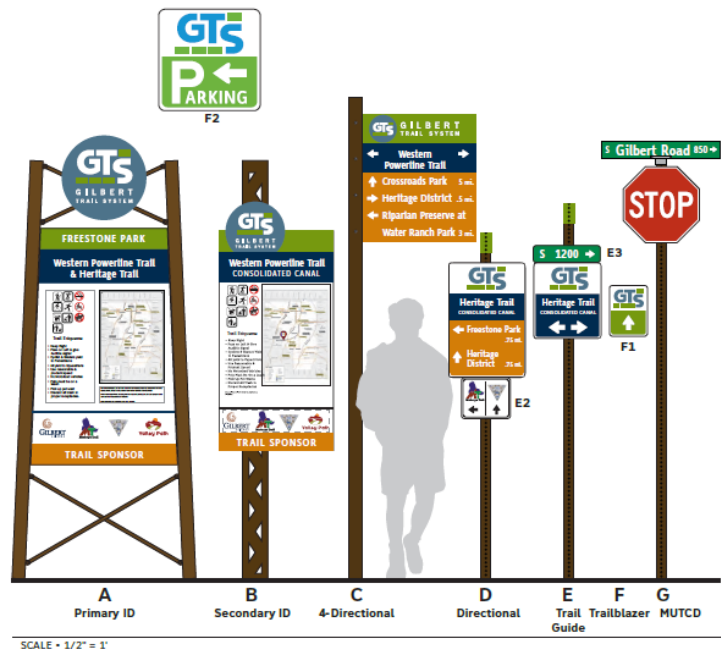
Multi-Use Path Treatments & Components

Signage & Wayfinding

Introduction & Guidance

Signs serve multiple functions on multi-use paths: communicating traffic control, instructing users on path policies or etiquette, and providing wayfinding, branding, and orientation. Traffic control consists of both regulatory and advisory signs, which are regulated by the MUTCD and which provides national standards and guidance on the appropriate application of signs.

Wayfinding is a specific type of signage which helps to guide users and inform them about location, directions, and other necessary information. Wayfinding signs can be used to reinforce systemwide design themes or can seek to match the environment of the multi-use path.



The 2016 *Gilbert Trail System Wayfinding and Signage Master Plan* provides comprehensive guidance on the different types of signs and their application. This section provides a quick reference for key types of wayfinding for consideration in the planning stages of a multi-use path project. The wayfinding plan is currently being updated, and this section should be updated to address changes. The updated wayfinding plan should reflect the naming conventions included in this document.

Wayfinding Element	Description	Application(s)
Primary Path Trailhead	Identifies park entrances and multi-use trailheads, provides general information, and orients users within the Town and system	<ul style="list-style-type: none"> + Formal multi-use path entrances and parking locations + Major staging areas and entry points to multi-use path network
Secondary Path Trailhead	Secondary introduction to the path system; provides guidance for individual trails	<ul style="list-style-type: none"> + Path entrances or exits the boundaries of Town of Gilbert
Kiosks & Interpretive Signs	Provide information on paths, history, and points of interest; can also include interactive elements like auditory interventions	<ul style="list-style-type: none"> + At trailheads + At points of interest along paths
Major Directional Signage	Provides identification of upcoming path crossings and direction to destinations	<ul style="list-style-type: none"> + Major junctions where one path crosses another
Secondary Directional Signage	Confirms the path a user is on and directs to destinations or points of interest that may be located off the path	<ul style="list-style-type: none"> + Periodically along multi-use paths (approx. every ¼ to ½ mile) + Occasionally at minor junctions
Trailblazers	Confirm to users that they are on or entering the Multi-Use Path Network. They are not intended to provide or suggest any regulatory information	<ul style="list-style-type: none"> + Network junctions with minor paths + At roadway crossings + At Multi-Use Path Network end points

Multi-Use Path Treatments & Components

Access Points, Support Facilities, & Amenities

Introduction & Guidance

Access points serve as entrances into the path system while support facilities and amenities provide important comfort and accessibility functions. While path design is critical for usability, these added features can add to the experience and increase usage.

Facility/Amenity	Description	Placement
Major Trailheads	Access points and full service stops along the path, including more than 5 parking spaces	+ Approx. every 4 miles
Minor Trailhead	Access points and rest stops; may include parking	+ Approx. every 2 miles
Gateways	Wayfinding and Branding of the Trail	+ At entrances to town parks + At major intersections + At major trailheads
Benches	Pause/Rest along Trail	+ Approx. 6 per mile (every 800')
Drinking Fountain	Potable water for people, pets, and a water hook-up for service needs	+ All major and minor trailheads
Bike Parking	Defined parking area for four or more bikes	+ All major and minor trailheads
Hitching Posts	Posts for hitching horses	+ All major and minor trailheads
Restrooms	Located strategically along system due to high maintenance needs; should be coordinated with service access / parking	+ All major trailheads
Bike Repair Station	Multi-tool bike stands as a trail amenity/ user service provided	+ All major trailheads + All minor trailheads
Litter/Recycling / Pet Waste	Placed at all points of entry to the system. Not intended for placement along trails.	+ All trailheads + All gateways + At bench locations where feasible
Shelters/Ramadas	Shade structures, gathering places, and locations for events	+ Parks + Major Trailheads
Bollards	To keep vehicular traffic off Trail Use sparingly	+ Only where justification of need is provided for interface
Electrical Service	Security lighting For events and maintenance	+ All areas with high night usage + At all district parks + Where streets and trails intersect + Underpasses and where additional security is needed + All lighting shall meet Town of Gilbert Lighting Standards
Special Consideration Amenities & Opportunities	Consider opportunities for water access, skateboarding, nature trails, interpretive and branding methods like signage, art (always credit the artist!) or environmental graphics	+ Where appropriate or needed