STREET DESIGN GUIDELINES

Endorsed by City Council
December 2014

NOTES & INSTRUCTIONS

DOCUMENT INFORMATION

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Wichita's Policy Manual for Multi-Modal Transportation

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ACKNOWLEDGMENTS

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RESOLUTION NO. 14-341

A RESOLUTION ENDORSING THE WICHITA MULTI-MODAL POLICY AND STREET DESIGN GUIDELINES

WHEREAS, the transportation system of Wichita is an extraordinary public asset integral to the City's economic health and community fabric; and

WHEREAS, the City of Wichita works to make the best use of its public streets and paths to move people and goods; and

WHEREAS, the City of Wichita has an opportunity to improve health and to provide a variety of viable transportation options including bicycling, walking, and taking transit; and

WHEREAS, multiple citizen surveys and community plans have shown a desire for improvements related to walking, bicycling, and taking transit in Wichita; and

WHEREAS, the City of Wichita recognizes the importance of creating streets that enable safe travel by a variety of different travel modes, including walking, bicycling, driving, moving freight, and taking transit; and

WHEREAS, the City of Wichita recognizes the importance of creating streets that enable safe travel by people of all ages and abilities, including children, youth, families, older adults, and individuals with disabilities; and

WHEREAS, the Multi-Modal Accommodation Policy helps to implement the Wichita Bicycle Master Plan, and the Wichita Pedestrian Master Plan through consideration of multiple modes of transportation as part of improvement and maintenance projects in street rights-of-way and paths; and

WHEREAS, the document Street Design Guidelines; Wichita's Policy Manual for Multi-Modal Transportation provides design guidance based on current City practices, helps provide greater predictability for multi-modal design of Wichita streets, and combines guidance from multiple sources into one document.

NOW, THEREFORE BE IT RESOLVED BY THE GOVERNING BODY OF THE CITY OF WICHITA, KANSAS:

Section 1. The City Council of the City of Wichita endorses the Multi-Modal Accommodation Policy contained within the document Street Design Guidelines; Wichita's Policy Manual for Multi-Modal Transportation.

Section 2. The City of Wichita will consider multiple modes of transportation and the context for improvements and maintenance projects of street rights-of-way and public access easements.

Section 3. The City of Wichita should form a Multi-Modal Committee to be involved in the review of project and activity plans to ensure consistency with the Multi-Modal Accommodation Policy.

Section 4. The City of Wichita will consider Street Design Guidelines; Wichita's Policy Manual for Multi-Modal Transportation as guidance in future planning and designing of public streets and public access easements.

ADOPTED by the governing body of the City of Wichita, Kansas, this 2nd day of December, 2014.

CITY OF WICHITA, KANSAS

Carl Brewer, Mayor

ATTEST:

Karen Sublett, MMC

Karen Sublett, City Clerk
(SEAL)

Approved as to Form:

Sharon Dickgrafe

Sharon Dickgrafe, Interim Director of Law and City Attorney

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CHAPTERS

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MULTI-MODAL ACCOMMODATION POLICY

VISION & PURPOSE

Transportation is a critical aspect of our everyday lives. We must move ourselves and our goods within, around, and through the community to accomplish our daily routines. The degree to which we are able to make these movements is a direct determinant of our individual and collective levels of health, safety, and economic vitality. The quality of life Wichita enjoys is inextricably linked to the effectiveness of our transportation system.

Given the central role travel plays in our lives, our transportation system must consider more than just the roadways we drive on. Rather, the street must strike the appropriate balance between vehicles, people, and places. Our transportation system must consist of adequate facilities for every mode of travel that meet every user's needs in a manner appropriate to the setting in which it exists.

The residents of Wichita have expressed the desire for transportation facilities that allow safe and efficient travel by all modes including:

- Walking
- Mobility devices, such as wheelchairs
- Bicycles
- Personal vehicles
- Transit vehicles
- Emergency vehicles
- Commercial and freight vehicles

The Multi-Modal Accommodation Policy has been developed with the vision of enhancing the overall safety and effectiveness of Wichita's transportation system. Every street shall be designed such that there are no unreasonable barriers to traveling by any given mode.

From a purely functional standpoint, only the roadway itself is required to provide for the basic needs of all travel modes. One might walk, use a wheelchair, ride a bicycle or drive a car on the surface of a roadway. Yet, because of the differences in speed and size between these modes, it is impractical for roadways alone to adequately serve all modes in all situations.

Some streets may contain multiple facilities, each dedicated to a single mode. Other streets may contain one or more facilities that are shared between travel modes. Over time, Wichita's transportation system will continue to integrate functional networks for each mode of travel into a complete system.

All users of all ages and abilities deserve to travel safely and efficiently. Travel is a people-centric activity. It is not done for the sake of the vehicle or for the sake of the place. It is done for the sake of the person. People need to go places. Each transportation facility must be properly designed to account for the amount and range of potential users, along with the travel decisions they make. The transportation system as a whole must connect people with places, no matter which mode of transportation they choose.

The most effective transportation systems are context-sensitive. The various modes and their users must interact with each other and the surrounding environment. Where the various travel modes intersect, functional connections must be provided to allow users to transition between different modes. Connections between the system and destinations must also consider the locations and land uses being served. The design of each transportation facility will provide for the needs of all potential users in a manner that is sensitive to the context of the facility's surroundings.

The purposes of this Policy are to:

- Provide a framework for achieving a well integrated multi-modal transportation system
- Direct the City to routinely consider, and to the extent practical, accommodate all modes and all users with a focus on improving the safety and effectiveness of the City's transportation system.

The City will routinely plan, design, construct, operate, and maintain streets and street rights-of-way to provide safe and efficient access for all users based upon current and future need. This Policy standardizes the routine accommodation of all modes of travel and provides for consistency in the consideration of travel needs.

APPLICABILITY

Bicycling, walking, taking transit, and driving are all viable means of transportation and deserve proper facilities on which to travel. Accommodations for automobiles, freight vehicles, emergency vehicles, transit vehicles, bicycles, and pedestrians shall be considered during planning, programming, right-of-way acquisition, design, construction, reconstruction, repair, operations, and maintenance activities to create a well connected and integrated transportation system for all modes of travel.

This Policy shall apply to all public and private development in street rights-of-way and public access easements. However, this Policy shall not be used to require improvements beyond those required by zoning and subdivision approval. Projects and activities occurring within street rights-of-way can enhance accommodations for multiple modes of travel. The City shall assess the need for designated facilities for all modes of travel in all projects and activities, new and retrofit, occurring within public right-of-way and public access easements. Additionally, the City shall keep existing multi-modal accommodations operational to the greatest possible degree during construction, and/or include safe and convenient detours as part of traffic control plans.

There will likely be a varying degree of assessment based on project scope. City-wide, area, and corridor plans as well as professional judgment should provide the basis for assessing needs for each mode. The assessment process will require coordination between City departments, developers, land owners along corridors, and other agencies responsible for transportation infrastructure or infrastructure in the public street right-of-way. Coordination with other jurisdictions may also be needed to facilitate system connectivity and route continuity where facilities cross jurisdictional boundaries.

The City understands that designated facilities will not be provided for all modes on every roadway. This is not feasible, practical or necessary. This Policy provides for flexibility in approach to accommodation.

Multi-modal facilities will not be provided when:

1. A specific mode is prohibited, such as pedestrians on a highway;
2. Costs or impacts are excessively disproportionate to current and/or future need or likely use;
3. Site-specific conditions, safety concerns, or engineering considerations make accommodations infeasible; or
4. Maintenance activities do not offer practical opportunities for providing accommodations.

A multi-modal committee shall be established by the City and consist of high-level engineering, street maintenance, planning, and transit staff and be responsible for administration of this Policy. The committee has flexibility in determining how they will carry out their responsibilities, which are listed below.

- Overall Policy implementation and evaluation;
- Making accommodation decisions on multi-modal projects;
- Ascertaining the project need and anticipated level of use under the guidance of approved/endorsed planning documents and exercising sound professional judgment;
- Reviewing cost-effectiveness including making project-level decisions to determine whether to develop isolated facilities, to reserve space for future facilities, or to do neither; and
- Gathering and evaluating measurable data and reporting performance to City management and elected officials, including developing targets and benchmarks for measures;
- Documenting all policy and project decisions, including projects reviewed and final committee decisions/recommendations.

The City shall apply this Policy during the street design process using the Street Design Guidelines and other adopted guidance documents. The City should periodically update the Guidelines as appropriate.

For non-design projects or programs, the Multi-Modal Committee should be involved in the review of project and activity plans to ensure consistency with this Policy.

The Committee will incorporate a context-sensitive approach in application of the Policy to be guided by established City goals and community values. Consideration will be given to existing and likely future adjacent land uses and intensities, natural and man-made physical features, and economic activity along the street or corridor as well as the people that use or will likely use the street or corridor. City-wide, area, corridor, and other plans should be considered for context-sensitivity.

IMPLEMENTATION

To ensure effective implementation of this Policy, the City shall:

- Make the consideration of all modal transportation networks a routine part of everyday operations. Every project or activity within street right-of-way or access easements will be viewed as an opportunity to improve the multi-modal transportation system.
- Develop and/or revise plans, codes, laws, procedures, rules, regulations, guidelines, and programs to integrate policy principles, as appropriate.
- Evaluate the budget needs of multi-modal accommodations during project and program development and develop budgets to accommodate multi-modal needs.
- Coordinate land use planning with the street design process to ensure the compatibility of streets and development at the corridor level.
- Carry out implementation cooperatively with all relevant departments, jurisdictions, private developers, regional, state and federal agencies.
- Utilize the Multi-Modal Committee to monitor progress and evaluate Policy implementation.

The Multi-Modal Committee shall be responsible for gathering data and reporting on performance measures. The reporting shall occur annually to City management and elected officials. Reporting should also include a summary of exceptions allowed, a description of multi-modal projects recently completed, and an assessment of benefits and impacts.

At a minimum, performance measures should include:

- Linear miles of on-street bikeways marked or signed.
- Linear miles of off-street bikeways or shared use facilities.
- Linear miles of sidewalk installed.
- Number of intersections improved for transit, bicyclists, and pedestrians.
- Number of other dedicated facilities installed for transit, bicyclists, and pedestrians.

POLICY GUIDANCE

While the Multi-Modal Committee is provided flexibility in carrying out its responsibilities, the following guidance is provided. Refer to **Appendix A** for additional information on maintenance considerations and decision-making processes.

MAINTENANCE PROJECTS

It is ***not*** the intent of this Policy for the Multi-Modal Committee to:

- Review every type of street maintenance project or review time-sensitive emergency repairs.
- Significantly impact allocated maintenance funding.
- Interfere with established operations and maintenance functions or the authority of City staff tasked with those responsibilities.
- Make decisions that lead to the inefficient utilization of maintenance labor or resources.

The main intent of this Policy regarding the Multi-Modal Committee's review of maintenance projects is to foster coordination between City staff in identifying opportunities for on-street multi-modal improvements and accommodations. Improving coordination should lead to:

- Identification of duplicative maintenance and capital street projects.
- Reduction in the need to pursue one-dimensional multi-modal facility retrofit projects.
- More efficient utilization of maintenance and capital funding over time.

Generally, routine preventative maintenance projects, such as crack sealing, are not good candidates for Committee review. These types of projects leave the structural street elements intact and require little, if any, engineering design. Furthermore, they are normally conducted by in-house staff according to established budgetary parameters.

Multi-Modal Committee review of maintenance projects should occur in the process where indicated in **Figure 2**. Committee review is only appropriate for fairly substantial planned maintenance projects that involve the reconstruction of street structural components, such as pavement rehabilitation (milling and overlay, etc.). These types of projects tend to be more expensive, require some degree of engineering design, and are normally constructed by outside contractors.

The Multi-Modal Committee review should focus on identifying significant maintenance projects on street segments where multi-modal capital projects are planned. In addition, combining the budgets and scopes of separate projects into a single project with a single budget should reduce overall project costs. Any savings realized could then be used toward funding other multi-modal projects, which will help expedite full Policy implementation.

ISOLATED & FUTURE FACILITIES

The process of developing functional networks for each mode will be incremental, with projects constructed individually over time. Certain street or intersection projects will present challenges for integrating multi-modal accommodations and providing network connectivity.

City codes and policies sufficiently address the provision of pedestrian accommodations. Therefore, this section provides guidance primarily for the development of on-street bicycle lanes and transit facilities in locations that are isolated from the existing modal systems or where current demand is limited.

In determining the appropriate level of accommodation. There are four main approach options.

1. **No Accommodation** - Do not accommodate the bicycle or transit facility as part of the project under review. This approach would defer the improvements to a later date when the location can be retrofitted to meet new demand or connect to adjacent modal facilities developed during the interim period.

2. **Minimal Accommodation** - Design the multi-modal facility as part of the reviewed project, but provide minimal accommodation when the project is constructed. This approach would allow accommodations to be designed within the context of the other street improvements and sufficient right-of-way would be acquired, but accommodations would be constructed as a future phase. However, utilities and appurtenances between the curbs and right-of-way lines would be constructed to avoid relocation when the multi-modal accommodations are constructed at a later date.

3. **Moderate Accommodation** - Design the multi-modal facility as part of the reviewed project and reserve sufficient space within the constructed improvements for future multi-modal integration. For example, curb placement would account for sufficient space to provide a future bike lane, but the space would be absorbed into the travel lanes until the bicycle lanes, pavement markings, and signage are added in the future. To accommodate transit, curb placement would account for extra outside lane width. Additionally, the concrete pad for a bus stop could be constructed, but signage, benches, and shelters placed when needed in the future. Alternatively, some combination of the accommodations might be constructed if there exists varying circumstances between bicycle and transit accommodations.

4. **Full Accommodation** - Design and construct the multi-modal accommodations as part of the reviewed project.

Accommodation Considerations

The preeminent consideration the Multi-Modal Committee must take into account when determining the proper approach for a given project is the degree of consistency with the Multi-Modal Accommodation Policy and overall transportation goals.

Several additional considerations must also be weighed. **Figure 1** to the right provides a suggested model for weighing the considerations described below.

Funding & Costs

The primary cost consideration is whether or not sufficient funding has been allocated to the project under review to construct the multi-modal accommodations. If so, the remaining considerations must be factored into the review.

There may be cases when sufficient funding is available, but full accommodation may not be recommended at the time of review for other reasons. There may be other cases when insufficient funding has been allocated, but some level of accommodation is desired. Considerations include:

- May the portion of project funding allocated to the multi-modal component be deferred to complete the accommodations at a later date?
- If so, will the costs of deferring improvements become excessive after inflation?
- Are there other accommodations the funding could be used to construct with other projects under review?
- Can funding be made available from other projects or sources to pursue the desired level of accommodation?

Space Availability

Space availability is not a concern when the City has been able to acquire its standard right-of-way width for the project under review. However, there are circumstances that may limit the acquisition of the full standard right-of-way. Examples include locations where previous development has constrained space availability or where the costs of utility relocation have been deemed disproportionally high.

In cases where there is insufficient space available for the preferred accommodations, the Committee should weigh the following:

- Can adequate funding be provided to purchase sufficient right-of-way for the multi-modal accommodations?
- If funding can be made available for right-of-way acquisition, does the benefit outweigh the cost?
- Can acceptable alternate configurations for the multi-modal accommodations fit within the available space?
- Will deferring the improvements to a later time inhibit the ability to provide full multi-modal accommodations for the project location in the future?

Maintenance Capacity

Each new facility and multi-modal accommodation added to the City's inventory must be maintained. The City's capacity to maintain modal accommodations must be considered along with the other factors discussed. The key concerns are:

- Are the costs and resources necessary to maintain the full degree of multi-modal accommodations disproportionate to anticipated benefits?
- Does the City have the capacity to adequately maintain the accommodations if they are constructed as isolated improvements or in advance of demand?
- Have the accommodations been identified as a community priority?
- If deferred, will sufficient maintenance capacity be available when full accommodations are eventually constructed?

Safety & Individual Functionality

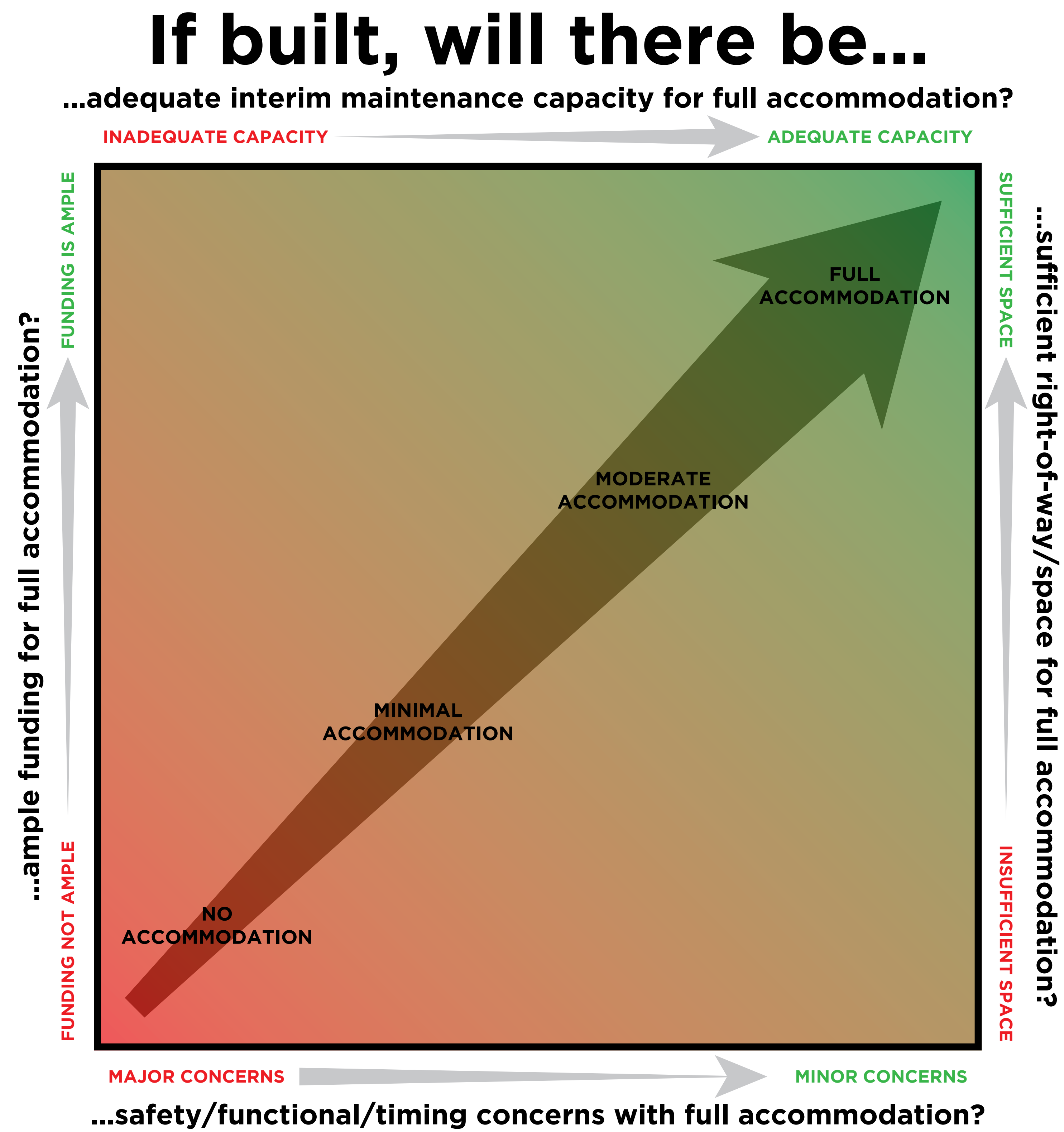
In cases where full accommodation would result in an isolated facility, the safety and individual utility of the improvements must be evaluated. The main factors to consider are:

- Do the accommodations address an existing safety deficiency?
- Would the lack of connectivity result in unsafe conditions for those using the isolated facility?
- Can users safely navigate between the isolated facility and the existing modal network?
- If constructed, would the accommodation be fully functional as an individual facility until connections are provided to the modal network?
- If not, is there another configuration option or phasing alternative for providing a functional connection during the interim period?

Timing

The final consideration in determining the appropriate accommodation approach is timing. Primarily, how long would the facility be isolated until it is connected to the rest of the modal network?

Figure 1: Accommodation Approach Selection Model



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IMPORTANCE OF THE COMMITTEE

The most critical means of implementing the Multi-Modal Accommodation Policy is through the establishment of a Multi-Modal Committee and integrating the Committee into the process of transportation decision-making. This section explains when and why the Multi-Modal Committee should be involved in the review of a project. Committee involvement at these specific points is best understood within the context of the facility's lifecycle.

THE ASSET LIFECYCLE

As illustrated in **Figure 2**, the lifecycle of a transportation asset or facility can be depicted as a cyclical process. This process begins when some need is recognized and a project is programmed in the Capital Improvement Program. The process ends when the facility is removed from the inventory or decommissioned. In between these two points, the life of a facility is measured in a series of overlapping and recurring life segments, phases and activities.

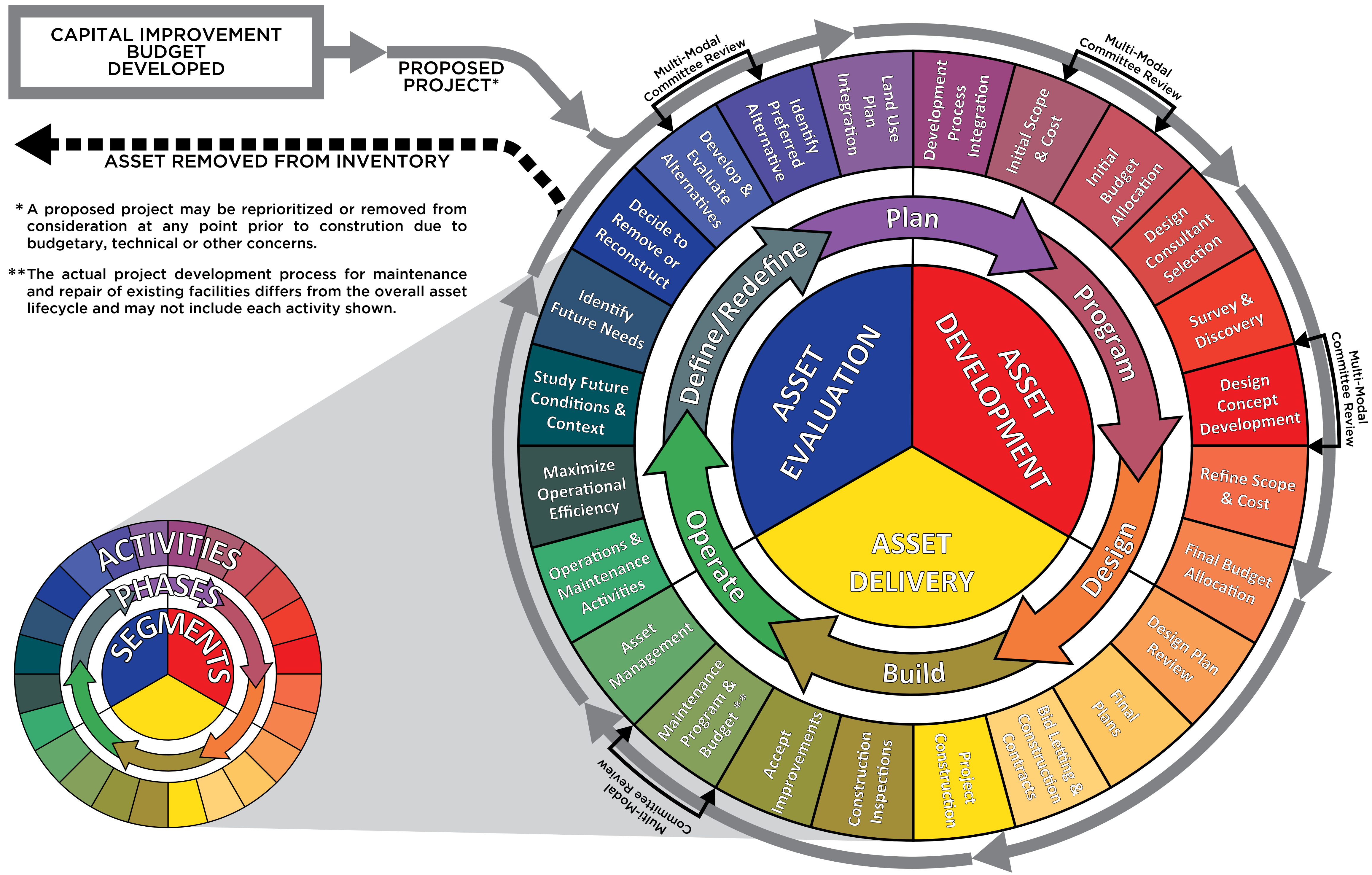
The lifecycle can be broken into 24 activities, each of which is described in this section. Relative to these Guidelines, each activity is a discreet action that occurs/recurs at approximately the same point through each round of the cycle. The activities can be broken into two different groupings called segments and phases.

Lifecycle segments describe the main purpose or goal behind conducting each activity in that segment. The segments include:

- Asset Development – Activities that prepare the way for a facility to meet identified needs.
- Asset Delivery – Activities that are carried out to provide a facility itself or provide the benefits of that facility toward meeting identified needs.
- Asset Evaluation – Activities that identify a facility's need or measure its performance at meeting an identified need.

The lifecycle phases are more specific in nature than the segments and help describe the objective of each activity. Phases are not coincidental to the segments,

Figure 2: Asset Lifecycle Diagram



but overlap at three points. The six distinct phases are:

1. Define/Redefine – The phase in which needs are identified and a facility is initially defined to meet identified needs or redefined to meet changing needs. This phase is in the Asset Evaluation segment.

2. Plan – The phase in which desired project elements are initially conceived and aligned with the City's overarching goals for community development. This phase is split between the Asset Evaluation and Development segments.

3. Program – The phase in which the project is aligned with the City's resources for implementation. This phase is in the Asset Development segment.

4. Design – The phase in which the project's construction plans and specifications are developed. This phase is split between Asset Development and Delivery segments.

5. Build – The phase in which the project is constructed. This phase is in the Asset Delivery segment.

6. Operate – The phase in which the project meets identified needs. This phase is split between the Asset Delivery and Define/Redefine segments.

BEGINNING POINT

Capital Improvement Budget Developed

The comprehensive plan, a neighborhood plan, an engineering study, a development proposal or citizen input first identifies the need or desire for a capital project. The project is included in Capital Improvement Program when it has been prioritized against other capital projects. The lifecycle of an asset begins at this point as a proposed project. The overall capital budget is allocated to individual proposed projects according to planning-level cost estimates.

PHASE 1: DEFINE/REDEFINE

Develop & Evaluate Alternatives

Generally, more than one design option may meet identified needs. Several possible alternatives are evaluated and compared. The assessment should include initial costs, benefits, maintenance considerations, community preferences and other factors. The existing, planned, and future land use context should also be considered in the evaluation. The evaluation may take place as part of a project specific study or a less detailed assessment.

PHASE 2: PLAN

Identify Preferred Alternative

At the conclusion of the evaluation of alternatives, a preferred alternative is selected for further development. It represents the most desirable solution to meeting the identified needs, based upon the evaluation. The Multi-Modal Committee should be involved in reviewing alternatives to ensure consistency with the City's Multi-Modal Accommodation Policy. Also, capital and maintenance projects should be reviewed to identify those where access to existing multi-modal accommodations need to be maintained during project construction.

Land Use Plan Integration

Just as existing and future land uses influence the selection of a preferred alternative, the preferred alternative may influence the way adjacent land can be developed. This should be considered when updating land use plans, implementing land use policy and acquiring right-of-way to keep development from encroaching into the project location.

Development Process Integration

The project and land use plans are considered during the development approval process after being established as official policy. Appropriate measures for mitigating future development's impacts to the planned facility are identified. For example, the dedication of auxiliary turn lanes or access easements can be required as conditions of development approval. The measures identified in this step can be implemented when new development occurs, as appropriate.

Initial Scope & Cost

Based on the preferred alternative, the initial design scope of work and associated budget is set.

PHASE 3: PROGRAM

Initial Budget Allocation

The project's initial budget is allocated as a capital expenditure. The Multi-Modal Committee should be involved in scoping and budgeting activities to ensure adequate funding is provided to meet the City's multi-modal project goals.

Design Consultant Selection

The project's design consultant is selected using the City's established selection process. The Request for Proposals/Qualifications assumes the project's initial scope, which was determined previously.

Survey & Discovery

After contract negotiations and approval, the selected design consultant begins the first phases of project design. The survey and discovery activities will help to determine if any deviations from scope are justified by site-specific conditions.

Design Concept Development

The project consultant develops the design concept upon which final designs and construction documents will be based. This generally includes investigating several concept options intended to meet project objectives. Stakeholder/community involvement activities are conducted to provide opportunity for public feedback. The Multi-Modal Committee should be involved in this phase so the final concept provides the City's desired level of multi-modal accommodation.

PHASE 4: DESIGN

Refine Scope & Cost

After a design concept has been approved, the scope of improvements is refined accordingly. The project consultant then provides an itemized construction cost estimate. The City then determines if the project will continue as planned, be reprioritized/rescheduled, or be removed from consideration.

Final Budget Allocation

The final project budget is established, based upon final scope and costs provided after concept development. The City may choose to have the selected consultant proceed with final designs or select a different consultant to complete the design phases. The final project budget includes final design, construction, and other costs like right-of-way acquisition and utility relocation.

Design Plan Review

City staff reviews design drawings at various points during their development. A revised construction cost estimate is provided with each set of review plans. This helps to ensure consistency with the approved concept design and City standards/specifications. Plan mark-ups and comments are provided by City staff as appropriate.

Final Plans

Final plans and construction cost estimates are developed that address mark-ups and comments provided during the review conducted by City staff. Traffic control plans are reviewed to ensure access to existing multi-modal facilities is maintained throughout construction as determined feasible. This step includes preparation of all construction documents necessary to bid the project.

PHASE 5: BUILD

Bid Letting & Construction Contract

The project bidding process is conducted and a contractor is selected to construct the project. The lowest qualified bidder is generally awarded the contract.

Project Construction

Construction activities may proceed when a contract has been executed between the City and the contractor. At this point, the City issues a notice to proceed.

Construction Inspection

The City inspects constructed improvements at various points during construction and upon project completion. During construction, temporary access provided to existing multi-modal facilities is inspected to ensure consistency with traffic control plans. Inspection helps ensure the quality of construction and full delivery of all contracted services/improvements. Inspectors may require reconstruction of some improvements deemed of poor quality or inconsistent with City codes, standards and specifications.

Accept Improvements

After all contracted improvements and services have been completed according to plans and passed final inspection, the improvements are accepted and enter into the inventory of facilities. Facility operations may then proceed.

PHASE 6: OPERATE

Maintenance Program & Budget

When a facility enters the inventory and periodically throughout its useful life, it is critical to program, schedule and budget for required maintenance and repair. The Multi-Modal Committee should be involved in the development of significant repair and maintenance projects, as described on page 2. This will help ensure the city's multi-modal goals are implemented in a coordinated and cost-effective fashion.

Asset Management

Asset management is an administrative function that includes monitoring the facility's condition and operations. Monitoring condition helps to maximize maintenance budget and facilitate scheduling of maintenance activities. Performance is monitored by gathering and analyzing data to determine how well a facility is meeting identified needs. Asset management helps protect public investment in a facility by extending its useful life and improving the efficiency of maintenance activities.

Operations & Maintenance

In this stage, City staff carries out activities that allows the public to use the facility for its intended purpose(s). Such activities include traffic signal operations and traffic enforcement. Certain maintenance activities are preventative/routine in nature. For example, sealing cracks can prevent substantial damage to pavement and periodic reapplication of pavement markings preserves traffic operations. Also, occasional facility repairs like pavement patching are needed.

Maximize Operational Efficiency

When operational deficiencies are identified, operational changes are made to restore a facility's effectiveness at meeting needs. Operational deficiencies are often related to changes in the operating environment. For example, new development might increase the traffic volume and congestion at a particular intersection. A change in traffic signal timing/phasing might be an effective way to restore operational efficiency.

PHASE 1: DEFINE/REDEFINE

Study Future Conditions & Context

Anticipated conditions (i.e. safety, congestion, capacity) sometimes indicate the need for a new or upgraded facility. In the case of an existing facility, it may become increasingly difficult for the facility to continue meeting identified needs. A study may be conducted to determine the traffic conditions and land use context that can be anticipated in future years.

Identify Future Needs

When future mobility, safety, and anticipated land uses have been studied and quantified, community needs and desires can be identified for a particular location. Needs may be related to safety, changing public expectations, degrading facility condition, undesirable system performance, demographic changes or evolving land uses/development patterns.

Decide to Remove or Reconstruct

This activity is applicable only to existing facilities. After future conditions are studied and needs have been identified, a facility's ability to meet community needs must be assessed and a decision made as to the facility's viability. The facility may have remaining useful life and the ability to meet anticipated needs after rehabilitation. In some cases, the facility may require modifications in addition to rehabilitation. However, when rehabilitation/reconstruction becomes infeasible, the facility may need to be removed from the system and perhaps replaced altogether.

ENDING POINT

Asset Removed From Inventory

The ending point of the transportation facility lifecycle comes when the asset is removed from the City's system inventory. Under most circumstances, transportation facilities are not removed from the inventory once constructed, but continue evolving through the lifecycle to meet changing conditions. However, occasionally assets are removed from the City's inventory when they are no longer required to meet community needs.

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DEFINITION & PURPOSE

The term routine accommodation refers to the practice of planning, designing, constructing, operating, and maintaining streets to provide safe and efficient access for all users of all modes of transportation. It also infers that this practice is part of the normal programming and design processes.

Proactive implementation of routine accommodation helps to reduce costs associated with transportation infrastructure and improve the efficiency of City resources. Designing streets to the appropriate degree of accommodation avoids the need for future retrofit projects, which tend to be more expensive and less effective in the long run.

As stated in the Multi-Modal Accommodation Policy, it is the City's intent to practice routine accommodation. The Street Design Guidelines outline the process and principles whereby routine accommodation will be integrated into the City's transportation decision-making and street design processes.

MODAL ACCOMMODATION

The key to successful implementation of routine accommodation is striking the correct balance of modal accommodations for a street in order to achieve the City's multi-modal goals. It is neither practical, feasible nor necessary for every street to provide ***separate dedicated facilities*** for each mode of transportation. Rather, the appropriate mix of accommodations for any given street is based on meeting community needs for ***functional, safe, and efficient networks*** for all users of each mode of transportation. The networks are integrated into the overall transportation system. Individual modal networks are provided for pedestrians (including mobility devices), bicyclists, and motor vehicles (including cars, trucks, motorcycles, buses, emergency vehicles and commercial vehicles).

ACCOMMODATION SCENARIOS

The City's network-based approach means that each street may accommodate the different transportation modes to varying degrees. There are five general scenarios for achieving the appropriate degree of accommodation for an individual street design project.

SCENARIO 1

Scenario 1 provides shared accommodations for all modes of transportation. All users share the travel lane of a street. Generally, this scenario is applicable only to local streets and collector streets with space constraints or barriers. Scenario 1 is appropriate for streets with:

- Low bicycle/pedestrian demand
- Low traffic volume and travel speed
- Predominantly residential land uses
- Low to moderate development intensity

SCENARIO 2

Scenario 2 provides a shared use sidepath for the use of bicycles and pedestrians, but accommodates motor vehicles in the travel lane. This scenario may be applicable to streets of any functional classification where the following conditions exist:

- Low to moderate bicycle/pedestrian demand
- Moderate to high traffic volume
- Moderate travel speed
- Low to moderate intensity residential development
- Low intensity commercial corridors
- Moderate to high intensity commercial corridors where access spacing is sufficient to minimize operational conflicts

SCENARIO 3

Scenario 3 provides a sidewalk for the use of pedestrians with bicycles and motor vehicles sharing the travel lane. This scenario is appropriate for streets of any functional classification where the following conditions exist:

- Moderate to high pedestrian demand
- Low to moderate bicycle demand
- Low to moderate traffic volume and travel speed
- Moderate development intensity
- Commercial or mixed-use corridors in close proximity to residential neighborhoods

SCENARIO 4

Scenario 4 provides a sidewalk for pedestrian use and partially shared accommodations for bicycles and motor vehicles. Streets with roadside ditches provide a paved shoulder while streets with curb and gutter have shared lane markings (sharrows) in the outside travel lane. This scenario is applicable to bicycle boulevards, collectors and arterials where space constraints or barriers are not ideal for a bike lane. It also may be preferred to have partially shared accommodations for bicyclists and motor vehicles. Scenario 4 is appropriate under the following conditions:

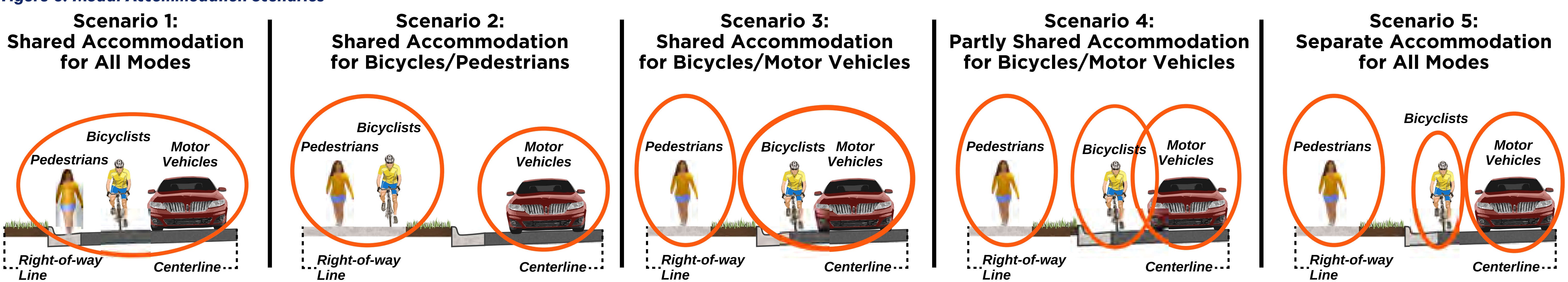
- Moderate to high bicycle/pedestrian demand
- Low to moderate to traffic volume and travel speed
- Moderate to high development intensity
- Any land use type

SCENARIO 5

Scenario 5 provides dedicated accommodations for all modes within the street right-of-way. A sidewalk is provided for pedestrians and the travel lane is for the use of motor vehicles. Bicycles are accommodated with a bike lane. This scenario is appropriate for collector or arterial streets with:

- Moderate to high bicycle/pedestrian demand
- Moderate to high traffic volume
- Moderate travel speed
- Moderate to high development intensity
- Any land use type

Figure 3: Modal Accommodation Scenarios



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INTRODUCTION

The continuing development of an integrated transportation system that balances the needs of all users and modes in the design of streets is a priority for Wichita. This will not lead to designated facilities on all streets, as it is not feasible or necessary in all circumstances. Rather, every street should be designed to safely accommodate all modes so that there are no unreasonable barriers to traveling by any given mode. The street design process should balance the need to accommodate individual modes of travel in a safe, efficient, and cost effective manner.

Street design should first and foremost consider the safety of all street users. Design should also consider the context of the surrounding area and the street function. Available right-of-way, existing curb locations, and drainage features often limit street design and space available for accommodating users and street activity.

This chapter first identifies a process for designing streets through the use of a decision tree. The design of a street should take a comprehensive look at the context and function of the street. The decision tree guides the design of a street by identifying the appropriate context of the surrounding development and land use as well as the function of the street in accommodating all modes of travel.

The context and street function options identified in the decision tree are defined in this chapter. The differences in development intensity, primary land use, street classification, and drainage type are explained to aid in selecting the appropriate options in the decision tree. The street functions are explained within the framework of street functional zones. Each zone is explained and guidance is provided for proper space allocation for each zone based on the function of the zone. The space allocation for each zone also takes into account the context and street function. Space allocation matrices are also provided to show preferred and constrained widths for each zone.

The preferred space allocation is generally under the ideal circumstances. However, each street design should be based on the individual needs for the specific street or segment. The constrained widths identified may not be able to be achieved in certain instances. The guidance provided in this document is simply guidance. To the degree appropriate, this guidance should be followed. However, flexibility in design is needed and should be accommodated as individual circumstances will influence design.

The space allocation matrices and guidance in this section are based on information gathered from a variety of sources. The City of Wichita reviewed source information and selected the recommended space allocation desired. Designers should consult appropriate sources to ensure proper design. See **Appendix C** for a list of referenced source documents.

DECISION TREE

Determining the proper accommodations for each mode of travel and all street-level activity is the first step in designing a street. Plans, engineering studies, and other efforts to identify needs and desires for a particular street should precede the use of the decision tree. Once the needs and desires are identified, the decision tree can then be used to start the design process.

The decision tree is a tool that should be used in the initial stages of design. It will aid in determining proper space allocation and design of a street cross-section that appropriately accommodates all modes and street-level activities in a context-sensitive manner.

The space dedicated for individual components of a street cross-section, such as sidewalks and on-street parking are dependent upon many variables. The decision tree presents a set of options for each variable. Once the options are selected, the corresponding space allocation matrix is used to identify preferred and constrained space allocation for individual components of the street cross-section.

HOW TO USE THE DECISION TREE

Step 1

Once a project location has been defined and a general idea of the accommodations to be included have been defined, the first step is to determine if the street is a two-way or one-way street. There are two decision trees; one for two-way streets and one for one-way streets. **Figure 4** is the two-way street configuration decision tree and **Figure 5** is the one-way street configuration decision tree.

Step 2

The next step of the decision tree defines the context of the street. The decision tree offers options to select the appropriate development intensity, primary land use, street classification, and drainage characteristics. Definitions of each option are provided later in this chapter. The options selected will guide how the street is designed to complement the context. Consideration should be given to existing, approved, planned, and future context.

Step 3

The final step of the decision tree defines the elements and accommodations to be included within the street right-of-way. The decision tree guides the selection of appropriate accommodations for pedestrians, transit users and vehicles, bicyclists, and motor vehicles as well as other elements of design including on-street parking, raised medians, or left turn lanes. Each accommodation fits within a specific functional zone of the street. Consideration should be given to existing, approved, planned, and future modal accommodations.

Each street is comprised of functional zones. Each zone has a different function and is designed for that specific function. Working through the decision tree will guide the design and space allocation for each functional zone based on characteristics of the street.

Once an option is selected for each variable in the decision tree, identify the proper space allocation. There are four space allocation matrices identified later in this chapter; Urban, General Urban, Suburban Curb & Gutter, and Suburban Open Ditch. Refer to the appropriate matrix based on the selected development intensity and drainage option. Each matrix identifies the preferred and constrained widths for each component of the street right-of-way.

There is additional design guidance provided later in this chapter in the Street Functional Zones section that complements the matrices. These sections provide additional guidance and include guidance for special circumstances.

There are also examples provided in **Appendix B** showing the layout of a few typical street cross-sections. These examples were selected to show common street cross-sections for Wichita. They show a plan view and a cross-section view as well as the corresponding options selected from the decision tree. They also show preferred and constrained dimensions.

There will be certain instances where, even under the constrained situation, space within the existing right-of-way will not allow the provision of the space identified for the constrained widths for each zone. In these instances, the Multi-Modal Committee and City Engineer will need to make a determination on how to proceed. Certain zones may need to be removed or reduced beyond the constrained widths identified in the matrices. However, required standards and design criteria must still be met.

WHEN TO USE THE DECISION TREE

When defining an initial scope for a street project, the City may use the decision tree to identify how specific modes of travel and activities will be accommodated within the street. The proper space allocation matrix can be referenced to see if there is sufficient right-of-way to accommodate the desired design elements.

For new streets, the decision tree and appropriate matrix can aid in determining the amount of right-of-way needed to properly accommodate the desired design elements.

When retrofitting streets where right-of-way is constrained or there is not a desire to move existing curbs and drainage features, the decision tree and appropriate matrix can aid in determining if there is sufficient space for all desired accommodations.

Later in the street design process when developing a design concept, the decision tree can be used to reassess the initial scope and refine accommodations. As issues emerge, the decision tree and corresponding matrix can also aid in reassessing and refining design.

Figure 4: Two-Way Street Configuration Decision Tree

Section	Category	Options	Considerations
CONTEXT CHARACTERISTICS	DEVELOPMENT INTENSITY:	Suburban; General Urban; Urban Core	**CONSIDERATIONS:** Existing, approved, planned, and future context characteristics; building setbacks; building orientation; block length; building height, building width; vehicle speed; off-street parking availability and on-street parking need; ROW limitations; curb to curb limitations; historic structures or districts; conservation or preservations elements; topography; design council review; plazas; streetside activities such as sidewalk patios; landscaping; utilities; existing street trees or other landscaping
CONTEXT CHARACTERISTICS	PRIMARY LAND USE:	Residential; Mixed-use / local business; Regional business; Industrial	
CONTEXT CHARACTERISTICS	STREET CLASSIFICATION:	Arterial; Collector; Local	
CONTEXT CHARACTERISTICS	DRAINAGE:	Curb & gutter; Open ditches	
SIDE 1 STREET FUNCTION	OFF-STREET BIKE/PED FACILITIES:	None; Sidewalk; Side path	Pedestrian demand; bike demand; presence of on-street bike facilities
SIDE 1 STREET FUNCTION	TRANSIT LEVEL OF AMENITY:	0; 1; 2; 3; 4	Transit presence; transit demand
SIDE 1 STREET FUNCTION	ON-STREET PARKING TYPE:	None; Parallel; Angled (45°); Angled (60°); Perpendicular (90°)	Transit presence; parking demand; loading/unloading zones; on-street bike facility type
SIDE 1 STREET FUNCTION	ON-STREET BIKE FACILITIES:	Travel lanes only; Shared lane markings; Bike boulevard; Bike lane; Buffered bike lane; Paved shoulder	Bike Master Plan; type, turnover, and duration for on-street parking; gutter pan; utility access and drainage covers
SIDE 1 STREET FUNCTION	TRAVEL LANES:	1 lane; 2 or more lanes	Traffic demand; vehicle type mix; pedestrian crossing demand
	CENTER LANE/MEDIAN:	None; Raised median*; Continuous left turn lane *may include left turn lanes at intersections	Turning demand; spacing of access points; pedestrian crossings including mid-block crossings
SIDE 2 STREET FUNCTION	TRAVEL LANES:	1 lane; 2 or more lanes	Traffic demand; vehicle type mix; pedestrian crossing demand
SIDE 2 STREET FUNCTION	ON-STREET BIKE FACILITIES:	Travel lanes only; Shared lane markings; Bike boulevard; Bike lane; Buffered bike lane; Paved shoulder	Bike Master Plan; type, turnover, and duration for on-street parking; gutter pan; utility access and drainage covers
SIDE 2 STREET FUNCTION	ON-STREET PARKING TYPE:	None; Parallel; Angled (45°); Angled (60°); Perpendicular (90°)	Transit presence; parking demand; loading/unloading zones; on-street bike facility type
SIDE 2 STREET FUNCTION	TRANSIT LEVEL OF AMENITY:	0; 1; 2; 3; 4	Transit presence; transit demand
SIDE 2 STREET FUNCTION	OFF-STREET BIKE/PED FACILITIES:	None; Sidewalk; Side path	Pedestrian demand; bike demand; presence of on-street bike facilities

Figure 5: One-Way Street Configuration Decision Tree

Section	Element	Options	Considerations
CONTEXT CHARACTERISTICS	DEVELOPMENT INTENSITY:	Suburban; General Urban; Urban Core	**CONSIDERATIONS:** Existing, approved, planned, and future context characteristics; building setbacks; building orientation; block length; building height, building width; vehicle speed; off-street parking availability and on-street parking need; ROW limitations; curb to curb limitations; historic structures or districts; conservation or preservations elements; topography; design council review; plazas; streetside activities such as sidewalk patios; landscaping; utilities; existing street trees or other landscaping
	PRIMARY LAND USE:	Residential; Mixed-use / local business; Regional business; Industrial	
	STREET CLASSIFICATION:	Arterial; Collector; Local	
	DRAINAGE:	Curb & gutter; Open ditches	
STREET FUNCTION	OFF-STREET BIKE/PED FACILITIES:	None; Sidewalk; Side path	Pedestrian demand; bike demand; presence of on-street bike facilities
	TRANSIT LEVEL OF AMENITY:	0; 1; 2; 3; 4	Transit presence; transit demand
	ON-STREET PARKING TYPE:	None; Parallel; Angled (45⁰); Angled (60⁰); Perpendicular (90⁰)	Transit presence; parking demand; loading/unloading zones; on-street bike facility type
	ON-STREET BIKE FACILITIES:	Travel lanes only; Shared lane markings; Bike boulevard; Bike lane; Buffered bike lane; Paved shoulder	Bike Master Plan; type, turnover, and duration for on-street parking; gutter pan; utility access and drainage covers
	TRAVEL LANES:	1 lane; 2 or more lanes	Traffic demand; vehicle type mix; pedestrian crossing demand
	ON-STREET BIKE FACILITIES:	Travel lanes only; Bike lane; Buffered bike lane	Bike Master Plan; type, turnover, and duration for on-street parking; gutter pan; utility access and drainage covers
	ON-STREET PARKING TYPE:	None; Parallel; Angled (45⁰); Angled (60⁰); Perpendicular (90⁰)	Transit presence; parking demand; loading/unloading zones; on-street bike facility type
	OFF-STREET BIKE/PED FACILITIES:	None; Sidewalk; Side path	Pedestrian demand; bike demand; presence of on-street bike facilities

CONTEXT & FUNCTION

Conventional street design has focused on safe and efficient vehicular travel and providing access to adjacent land development. Typical street design parameters include existing and projected traffic volumes, design vehicle, and street classification. An increasingly important consideration in street design is the context.

Context refers to the physical environment within and surrounding the street as well as human interactions with the street. The development intensity and primary land use are major considerations when developing context-sensitive street designs.

Included in the human interactions is how the street functions to move people. The street functional classification defines how people use the street to travel and access adjacent developments. Classification is a major consideration when determining how to accommodate travel appropriately along a street.

The final consideration for context is the type of drainage to be used. Although not explicitly an element of surrounding context, drainage type is a secondary element of street design influenced by the context. Most urban streets use curb and gutter along with underground storm sewers to manage stormwater runoff. In some suburban settings, it is best to use open drainage ditches to manage stormwater. In either circumstance, the drainage type has a major influence on the street design.

Historically, development intensity and primary land use have not been considered to the extent currently desired. By explicitly considering these elements of context in the design of all streets, they will better complement the adjacent land uses and enhance safety and functionality of the street for all users.

In the street design process, determining all elements of the context should occur early in the process. Consideration should be given to the existing, approved, planned, and future context.

DEVELOPMENT INTENSITY

The development intensity describes the current and anticipated future land development characteristics such as physical form along a corridor and areas surrounding the corridor. The development intensity is generally highest in the urban core and gradually diminishes as you move outward into the general urban and suburban areas.

Development intensity influences the design and space allocation for different street elements due to the unique characteristics of activity along and surrounding the street. Higher intensity developments often include more pedestrian and transit activity where lower intensity developments are often more automobile-oriented.

Figure 6 identifies the general locations of the urban core, general urban, and suburban areas. This map is meant as a starting point in determining development intensity. Determining the appropriate development intensity should occur on a case-by-case basis to accurately assess existing conditions as well as consider approved, planned, and future development intensity.

URBAN CORE

The urban core generally includes downtown Wichita and corridors extending from downtown that have a high intensity of development. The characteristics of the urban core generally include the following:

- Grid street pattern with sidewalks on both sides of street
- Short blocks
- Taller buildings
- Smaller or no setbacks from the right-of-way
- Smaller or no setbacks between adjacent buildings
- Building entryways directly adjacent to and facing sidewalks along street
- Parking provided on-street, shared between properties, or behind/beside buildings
- High degree of neighborhood and smaller-scale commercial and entertainment activity
- High degree of pedestrian and transit activity
- Main commercial, retail, and leisure center

Streets in the urban core should be designed to create a walkable and transit-friendly environment focusing on the safety of all street users. They should have a high degree of amenities that promote walking, bicycling, and transit while safely accommodating vehicular travel and parking needs.

GENERAL URBAN

The general urban area generally includes areas outside of downtown Wichita developed prior to the 1960s. The characteristics of the general urban area typically include the following:

- Primarily grid street pattern
- Short to medium blocks
- Small to medium setbacks from the right-of-way
- Small to moderate setbacks between buildings
- Building entryways mixed between facing street and facing parking
- Parking provided primarily on-street or in front/beside buildings
- Neighborhood commercial activity
- Moderate degree of pedestrian and transit activity

Depending upon the corridor, different modes of travel will have priority in the general urban area. Streets in this area should be designed to accommodate all travel modes to the degree needed to support current and expected use. They should promote walking and biking, especially at the neighborhood level and provide quality access to transit.

SUBURBAN

The suburban area generally includes areas outside of the general urban area. The characteristics of the suburban area typically include the following:

- Primarily single family residences
- Large blocks
- Scattered large-scale commercial development
- Large setbacks from the right-of-way
- Large setbacks between buildings
- Building entryways oriented to parking lot
- Large parking lots in front of buildings
- Regional commercial activity
- Low degree of pedestrian and transit activity
- Automobile-oriented development
- Hierarchical street pattern with extensive use of cul-de-sacs and loop streets

Streets in the suburban area should be designed to accommodate all travel modes while understanding the primary means of travel will likely be via automobile. However, pedestrian and bicycle travel should be encouraged especially at the neighborhood level and provisions for longer bicycle trips should be included. Developing these connections is key in order to deal with the larger blocks. It is also important to accommodate transit based upon transit need and achieving transit goals.

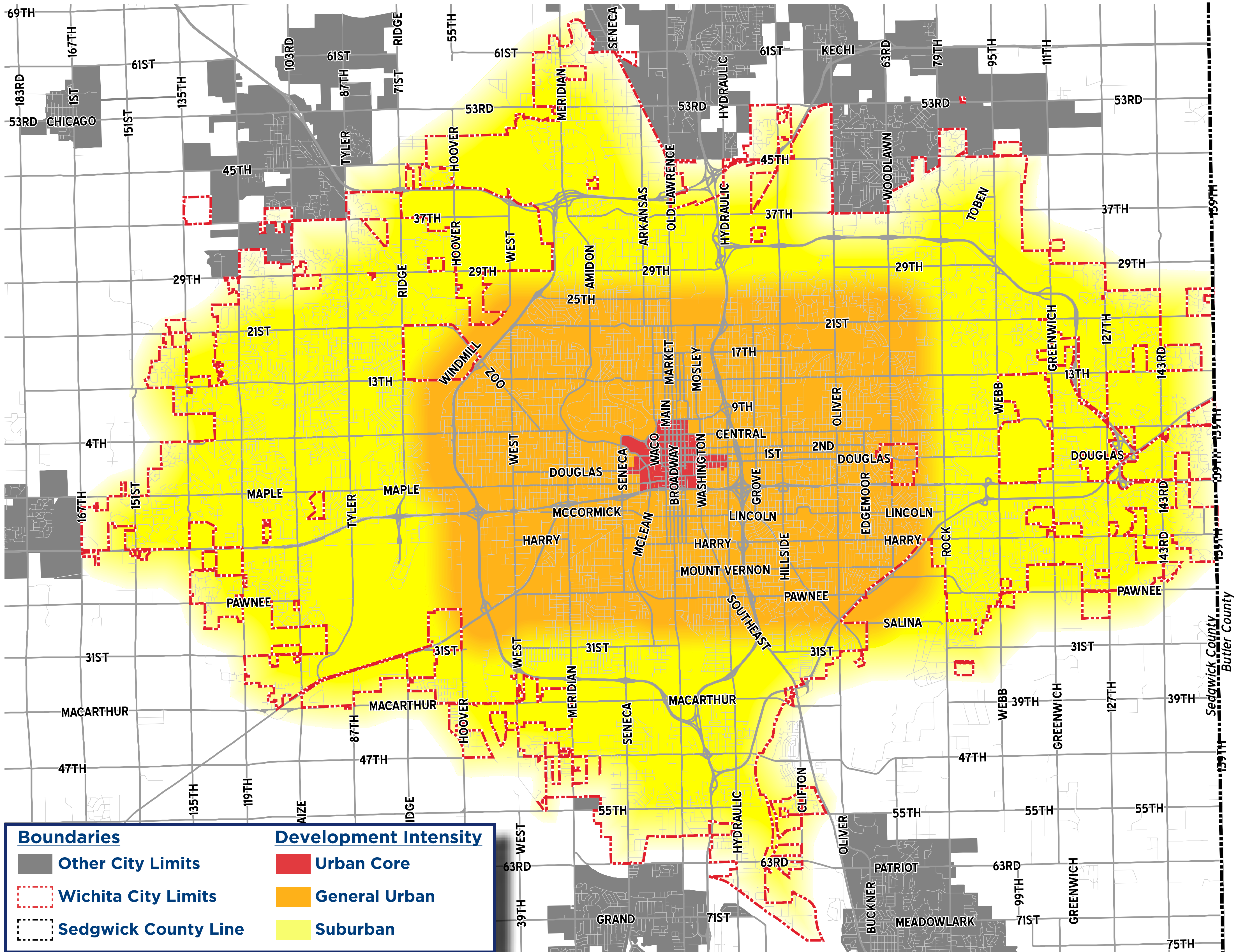
PRIMARY LAND USE

In addition to development intensity, land use has a major influence on how we use our streets and how the streets interact with the adjacent developments. Corridors or street segments often include multiple types of adjacent land uses.

Street design should be based on how the street interacts with the land uses while accounting for the development intensity. The primary, or most common land use should be a main consideration. The options identified as the primary land use include residential, mixed-use / local business, regional business, and industrial. Consideration should be given to the existing, approved, planned, and future primary land use.

Figures 7, 8, and **9** show examples of each primary land use within each of the three development intensity areas.

Figure 6: General Development Intensity Guide



RESIDENTIAL

Residential land uses are dominated by houses, duplexes, apartments, condominiums, mobile homes, and other types or residences. Residential uses include low-, medium-, and high-density and a street could include a mixture of densities. When residential land uses are the primary use, they often include commercial or entertainment areas which are typically located at major intersections.

Compared to streets along commercial or mixed-use land uses, residential streets have a lower degree of pedestrian and transit activity. This normally constitutes less space being provided for these activities, but is dependent upon mobility needs and demand.

MIXED-USE/LOCAL BUSINESS

Mixed-use and local business, although different in development type, often interact similarly with the street and its users. Mixed-use is simply a mix of local business and residential land uses. This type of land use typically has higher business and residential density in close proximity to one another.

Local business land uses are primarily smaller-scale commercial developments that often cluster together. They normally occur in the urban core or general urban area along arterials or collectors. Mixed-use/ local business uses do not typically occur in suburban areas. Although local businesses are common in suburban areas, they are typically clustered together in mall-type developments which form more of a regional business development.

Mixed-use/local business land uses have the following characteristics:

- Mix of higher-density residential and smaller-scale commercial
- Vertical integration of commercial and residential uses within the same building or horizontal integration with minimal spacing between uses
- Smaller-scale strip malls
- Smaller parking lots which are often not shared with other businesses

- Restaurants and entertainment venue
- Often integrated and well connected to surrounding neighborhood
- Draws trips from a relatively close proximity

Mixed-use/local business uses create an environment that increases the demand for walkable corridors due to the close proximity of residences to businesses.

REGIONAL BUSINESS

Regional business land uses include large-scale or regional business centers that attract trips from large distances, as well as local business centers in a suburban context. Regional business land uses have the following characteristics:

- Larger scale business development
- Larger front and side setbacks
- Large parking lots typically between the buildings and the road, which are often shared between businesses
- Regional malls and larger-scale strip malls
- Often separated from surrounding neighborhood
- Draws trips from around the region creating longer travel distances

INDUSTRIAL

Industrial land uses are dominated by light to heavy industrial development. Industrial land uses have the following characteristics:

- High amount of truck traffic generation and attraction
- Manufacturing
- Larger scale buildings

Figure 7: Urban Core Examples

Figure 8: General Urban Examples

Figure 9: Suburban Examples

STREET CLASSIFICATION

Wichita's network of streets work together to allow us to safely and efficiently travel to our destinations. There is a hierarchy of street classifications, which describe the street's function in term of access and mobility for vehicular travel. Arterial are the highest street classification, followed by collectors and then locals. The classification of a particular street plays a major role in determining the proper space allocation for different street elements.

The traditional means of classifying streets into arterials, collectors, and locals does not provide for the consideration of the variations in the vehicular function based on the development intensity and land use along the street. Although traditional classification methods separate urban from rural, they do not provide sufficient detail in the differences that come along with different development intensities and primary land uses. This section includes descriptions about how the function of a certain street classification varies based on development intensity.

The determination of the appropriate street classification for a street design should be based on an approved street classification map. However, consideration should be given to potential changes in street function that may occur due to the project itself or land development changes.

ARTERIAL

Arterials provide the highest degree of mobility and the lowest degree of access to adjacent properties of all the street classifications. They provide the highest level of service for vehicular travel at the greatest speed for the longest uninterrupted distance. In the context of this document, arterials will focus on arterials not considered freeways or highways. In Wichita, the arterials include heavily traveled mile-line roads such as Rock Road, Maize Road, and Central Avenue. Characteristics of arterials generally include the following:

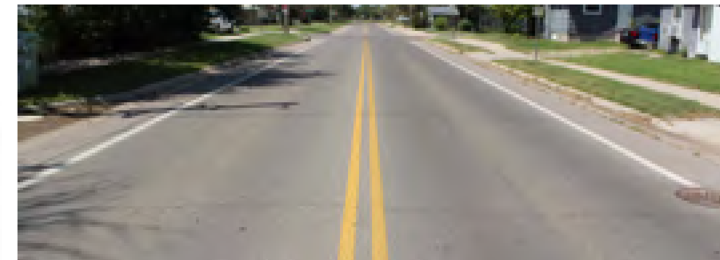
- Carry longer trips
- Carry a major portion of trips into, out of, and through Wichita
- Carry a high number of vehicles per day
- Operate at higher speeds
- Common transit corridors
- Serve major centers of activity
- Focus on major traffic movements rather than access to adjacent properties

Arterials in suburban, general urban, and the urban core areas may function differently. Although they all provide the highest degree of mobility within the corresponding area, the character of arterials differ based upon development intensity. The major differences are the varying degrees of access provided to development as well as the vehicular travel speed. Urban core arterials typically require much more direct property access due to development intensity and have slower posted speed limits. They also typically have on-street parking. Suburban arterials typically have higher posted speeds, do not provide on-street parking, and require less access because of lower development intensity. General urban arterials typically fall in the middle on posted speed and property access provided.

COLLECTOR

Collectors provide less mobility than arterials, but they provide more access to adjacent land developments. They channelize trips from the local street network onto arterials for longer trips. They carry fewer vehicles than arterials and for shorter distances. They provide a link from local streets to arterials and vice versa. Characteristics of collectors include the following:

- Carry moderate to short trips
- Carry a moderate number of vehicles per day
- Operate at lower speeds
- Provide a moderate degree of land access
- Provide circulation within neighborhoods and subareas
- Occasionally carry transit



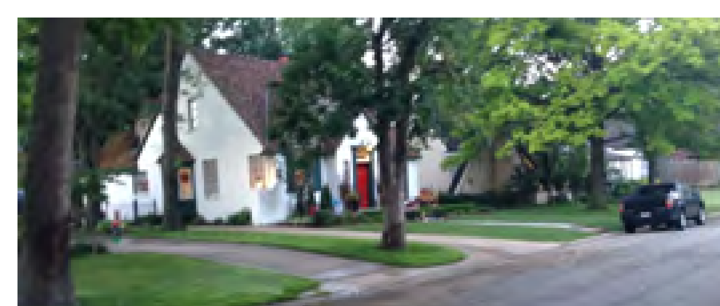
Collectors in different development intensities function slightly differently. Collectors in the urban core strike a balance between mobility and land access. Suburban collectors typically connect residential local streets to the arterial network and are primarily surrounded by residential uses.

LOCAL

Local streets focus on providing direct access to developments. Their primary purpose is to provide access to adjacent land use and typically do not provide a high degree of mobility. They typically discourage through traffic and carry very short trips. Characteristics of local streets include the following:

- Carry very short trips
- Carry a low number of vehicle per day
- Operate at low speeds
- Provide a high degree of land access
- Rarely carry transit

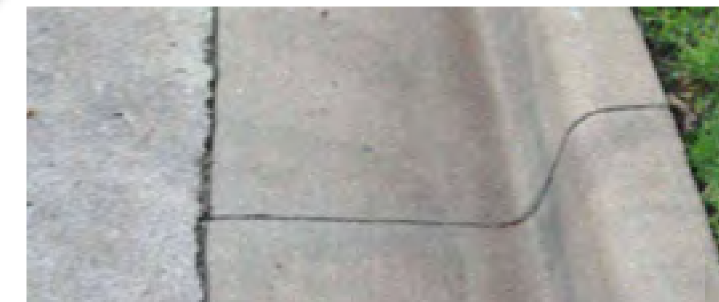
Local streets do not function differently between development intensities. The primary function is to provide direct land access and therefore, carry minimal traffic.



DRAINAGE

CURB & GUTTER

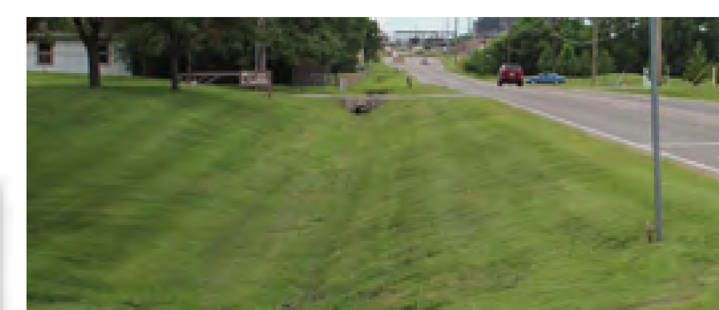
Curb and gutter drainage is typical in an urban setting and is often found in suburban areas. It includes curbs and gutter pans to channel stormwater runoff on the street to drain inlets along the curb to a culvert underground. The presence of curb and gutter impacts the space allocations of parking, bicycle lanes, and outside travel lanes.



OPEN DITCHES

Open ditches collect, store, and transfer stormwater runoff along the sides of streets. Most often open ditch streets are found in rural or suburban areas.

Open ditches affect many elements of design. The design requires the use of a shoulder, which can be used for accommodating bicyclists. Normally, much or all of the space between the shoulder and the property line is used for the open ditch, leaving little or no room for amenities or accommodations outside the paved portion of the street.



STREET FUNCTIONAL ZONES

The street right-of-way is divided up into several street functional zones. Each functional zone is designed to accommodate specific activities, uses, and modes of travel. There are two major functional zones; the sidewalk zone and the travel zone. These are segmented into lesser zones that comprise these two major functional zones.

Figure 10 at the bottom of the page shows an example cross-section with the street functional zones. There may be circumstances, such as the inclusion of cycle tracks, that would cause locations of the zones to vary. But in general, it shows the typical location for each zone. This figure is a hybrid selection to illustrate the range of street functional zones and is not a typical cross-section.

SIDEWALK ZONE

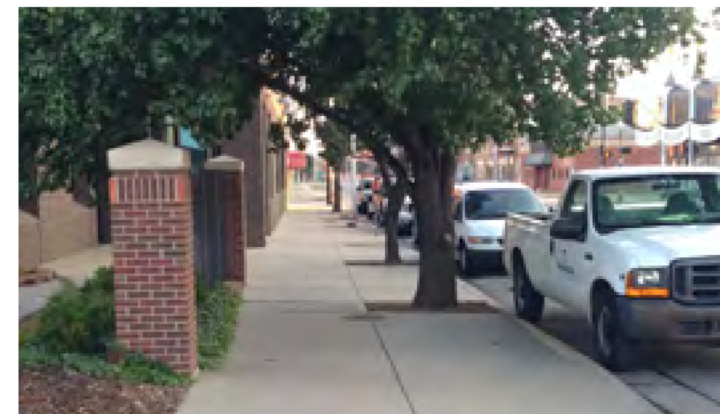
The first major functional zone is the sidewalk zone, which is the portion of the street that accommodates non-vehicular activity. It extends from the property line to the inside edge of the gutter or shoulder and is comprised of the frontage zone, pedestrian zone, amenity zone, and curb zone. However, not all of these zones must be present in each sidewalk zone.

The space allocated to the sidewalk zone should be based on the function of the individual zones that comprise the sidewalk zone as well as the space needed to buffer elements and users of the sidewalk zone from the travel zone. Pedestrians also desire a buffer from vertical elements as they tend to shy away from these elements, effectively narrowing the pedestrian area. The shy area on both sides of the pedestrian zone should be a consideration in the design of the sidewalk zone.

The functions of each individual zone typically vary by context as well as the adjacent building ground floor use. Wide sidewalk zones are typical in areas with high pedestrian and transit use as well as ground floor building activity. Narrower sidewalk zones are typical where pedestrian and transit use is minimal and there is little to no interaction of the ground floor building activity and the sidewalk zone.

The sidewalk zone must be at least 8 feet wide to accommodate transit stops. The Americans with Disabilities Act (ADA) requires a 5 foot long (parallel to curb) by 8 foot wide (perpendicular to curb) pad for a landing area. This pad can extend through the entire sidewalk zone, which may be necessary in constrained situations.

In street cross-sections using open drainage ditches, the sidewalk zone includes open ditches and may or may not include all or any of the other zones comprising the sidewalk zone. The space allocation for the sidewalk zone in an open ditch section should be evaluated on a case by case basis, as it is heavily dependent upon drainage requirements.



TRAVEL ZONE

The second major functional zone is the travel zone, which is the portion of the street that accommodates vehicular activity. It extends from the inside edge of the gutter or shoulder to the inside edge of the gutter or shoulder on the other side of the street. The travel zone is comprised of the parking lane, bicycle lane, travel lane(s), and median/left turn lane(s). However, not all of these zones/lanes must be present in each travel zone.

The space allocated to the travel zone should be based on the function of the individual zones that comprise the travel zone. The functions typically vary based on demand for on-street bicycle travel, on-street parking, and all types of vehicle travel such as automobiles and transit vehicles. They also vary based on context, adjacent land use, and street classification.

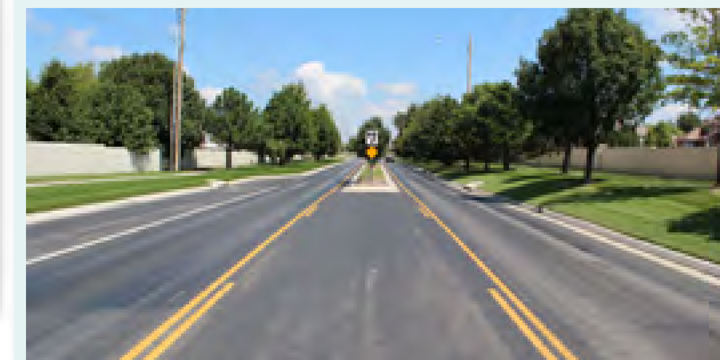
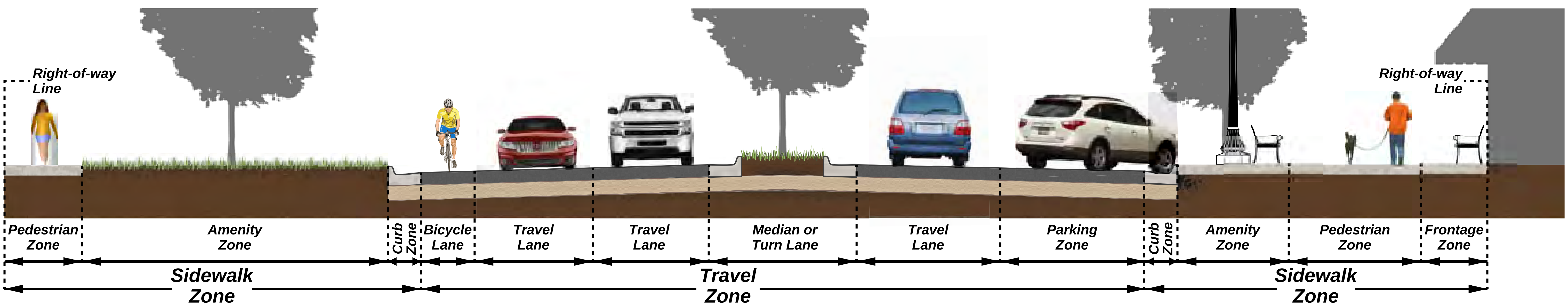


Figure 10: Street Functional Zones



FRONTAGE ZONE DESIGN

The frontage zone is the area within the sidewalk zone between the property line and the pedestrian zone, as shown in **Figure 11**. It serves as a buffer between pedestrians on the sidewalk and adjacent buildings or other vertical elements on the property line such as fences or landscaping. This zone is often integral when there is no front building setback where the building face is located on the property line. Pedestrians shy away from vertical elements so the frontage zone provides for this 'shy' distance, which is typically around 1.5 feet. It also provides space for swinging doors on buildings, window shoppers, street cafes, private street furniture, private signage, and merchandise displays.

The frontage zone also provides a pedestrian shy area in situations where other vertical elements are present on the edge of the property line, such as fences, shrubs, or retaining walls.

Typical amenity zone elements such as benches and trash cans, can be placed in the frontage zone. Where no amenity zone exists, placement of typical amenity zone elements such as benches, light poles, and trash cans may be placed in the frontage zone. However, caution must be taken to make sure there are no issues with incompatible elements being placed next to the property line such as street trees right next to the building face.

DESIGN GUIDELINES

The frontage zone is not recommended in all situations. If included, the frontage zone is recommended to be 1 to 8 feet wide. The variation is based on the building setback, building orientation, desire for space for sidewalk cafes, and presence of adjacent sidepath.

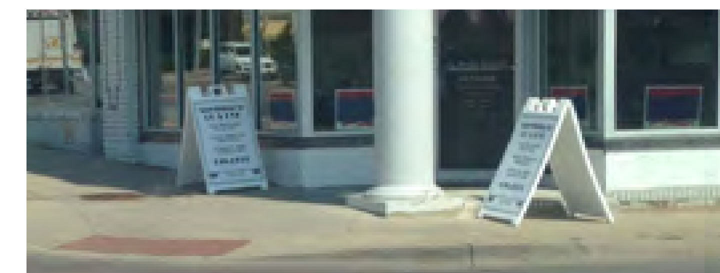
Where there is no building setback, which is common in the urban core area, the frontage zone should be at least 1 foot wide in residential areas and 2 feet in all with all other land uses to provide for a shy zone for pedestrians. It is preferred to provide 2.5 to 3 feet for the frontage zone when there is no setback, depending upon street classification. Providing this space is important when the building entrances are directly adjacent to the sidewalk zone to allow space for pedestrians when building doors open. The space also allows for the placement of private signs and other elements and activities outside of the pedestrian zone. To the extent practical, vertical elements in the frontage zone should not be placed where they will obstruct pedestrian zone use. Although not necessary in all situations, this zone is often paved when there is no building setback.

In instances where a sidewalk cafes may be expected directly adjacent to the building face or property line, the frontage zone should be a minimum of 6 feet wide and preferrably 8 feet wide. However, sidewalk cafes can be placed in the amenity zone. The location of a sidewalk cafe within the overall sidewalk zone should be considered.

Where there is a setback and a sidewalk will be included, it is recommended that the sidewalk be installed adjacent to the property line. In these instances, property owners might assume that their property extends to the outside edge of the sidewalk. This would likely lead to private fences or other vertical elements such as shrubs or retaining walls being placed in the frontage zone directly adjacent to the sidewalk. This would effectively negate the purpose of providing a shy area for sidewalk users. To account for the shy area not being included in the frontage zone, it is preferred that the sidewalk be at least 6 feet where adjacent to side or rear yards.

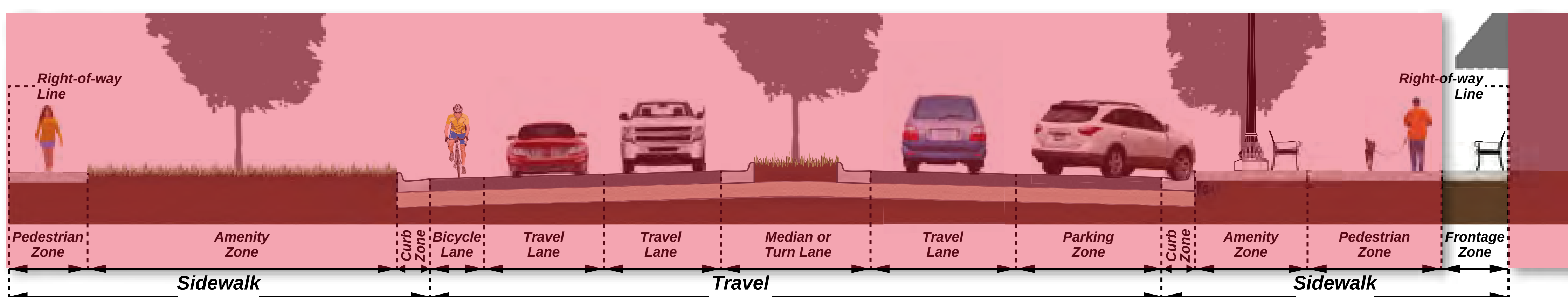
Where there is a sidepath provided in the pedestrian zone, it is preferred that 2 feet of clear area be provided on either side of the sidepath. The frontage zone, where adjacent to a sidepath, is recommended to be 2 feet wide and clear of all obstructions. A wider frontage zone should be considered in areas that are likely to have vertical obstructions in order to achieve a 2 foot clear area.

There is the potential for circumstances to warrant placing elements in the frontage zone that are typically placed in the amenity zone. The frontage zone should be sized appropriately to accommodate these elements as well as the other elements previously identified such as the shy area for pedestrians and clear area for sidepaths.



The matrices on pages 31-34 show the preferred and constrained widths for the frontage zone. They also identify the variations in the widths if there is no setback, if there will be sidewalk cafes, if there is a setback, and if there is a sidepath. For additional guidance on the frontage zone, refer to Chapter 7 of the Pedestrian Master Plan.

Figure 11: Frontage Zone



PEDESTRIAN ZONE DESIGN

The pedestrian zone is the area within the sidewalk zone between the frontage zone and the amenity zone, as shown in **Figure 12**. This zone typically is developed as a sidewalk and functions as a space for pedestrians to travel. It can also be a place for bicyclists to travel when it is developed as a sidepath.

It is imperative that this zone remain clear of obstructions to allow for pedestrian and/or bicycle movement. Therefore, the space allocated to the pedestrian zone refers to the area to remain clear of obstructions. Not only does this clear area include the horizontal space, but it also includes the vertical clearance required for pedestrian and/or bicycle travel.

In order to properly function, space may be needed in addition to the clear space. Pedestrians and bicyclists tend to shy away from vertical obstructions that are adjacent to the sidewalk or sidepath, such as building walls, fences, trees, and light poles. A shy area on either side of the pedestrian zone should be accommodated.

DESIGN GUIDELINES

The pedestrian zone must meet requirements set forth by the Americans with Disabilities Act (ADA). In general, these requirements call for at least 5 feet of clear area for pedestrian movement. Under constrained circumstances, 5 feet for the pedestrian zone is acceptable. However, it is preferred that the pedestrian zone be at least 6 feet wide along arterials and within the urban core. This will provide extra space for pedestrians and have a built-in shy area for the possibility of fences or other vertical obstructions being placed on the property line when no frontage zone is provided. To the extent practical, vertical elements in the amenity zone and frontage zone should not be placed where they will obstruct pedestrian zone use.

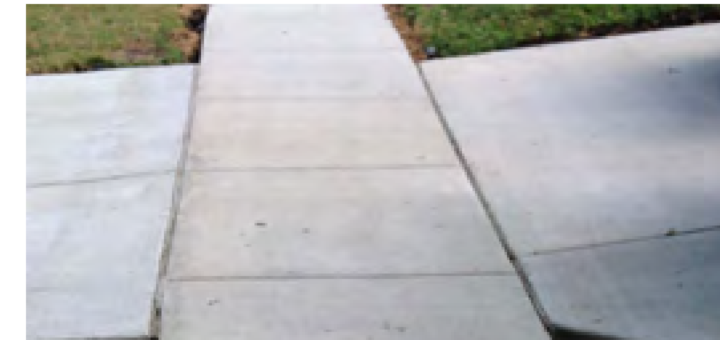
Where there is or will likely be a high degree of pedestrian activity, sidewalks should be wider. This would typically occur in the urban core area as well as areas that have mixed-use or local business land uses. Wider sidewalks should also be considered on arterials and collectors where pedestrian volumes are likely to be greater.

The pedestrian zone should also be wider when a sidepath is provided to accommodate off-street bicycle travel. The constrained width of the sidepath is 10 feet and the preferred width is 12 feet in all situations. When a sidepath is provided, it is recommended that there is 2 feet on either side of the sidepath that is clear of all vertical obstructions.

Where the pedestrian zone is directly adjacent to the curb, such as when an amenity zone is not provided, the width of the pedestrian zone should be 2 feet wider. This provides a buffer between pedestrians and an adjacent vehicular travel lane. If on-street parking is adjacent to the curb, it provides a buffer for vehicle doors or overhanging vehicles.

The minimum vertical clearance for the pedestrian zone is 80 inches above the surface. Where a sidepath is provided and bicycle travel will be accommodated in the pedestrian zone, the minimum vertical clearance is 100 inches and the preferred clearance is 120 inches.

Where the pedestrian zone crosses driveways, the appearance should be maintained through the driveway to communicate to the operators of vehicles that they are crossing a pedestrian path. To the extent practical, driveway crossings should also maintain the elevation of the sidewalk and driveway aprons should not extend into the pedestrian zone.



Very high volume driveways, especially those for regional commercial uses, often exhibit the operational characteristics of a street. Such driveways are frequently designed as full intersections and may sometimes even be signalized. Where this is the case, the pedestrian crossings should be designed as crosswalks, just as if it were a full intersection.

The matrices on pages 31-34 show the preferred and constrained widths for the pedestrian zone. They show the differing widths for sidewalks and sidepaths. The widths shown on the matrices reference the area for the pedestrian zone to remain clear of any obstructions, but does not include the shy area on either side. However, as mentioned earlier, there can be a built-in shy area for sidewalks greater than 5 feet wide. For additional guidance on the pedestrian zone, refer to Chapter 7 of the Pedestrian Master Plan. For additional guidance on pedestrian zones in downtown, refer to the Downtown Wichita Streetscape Design Guidelines. For additional guidance on sidepaths, refer to Appendix G the Bicycle Master Plan.

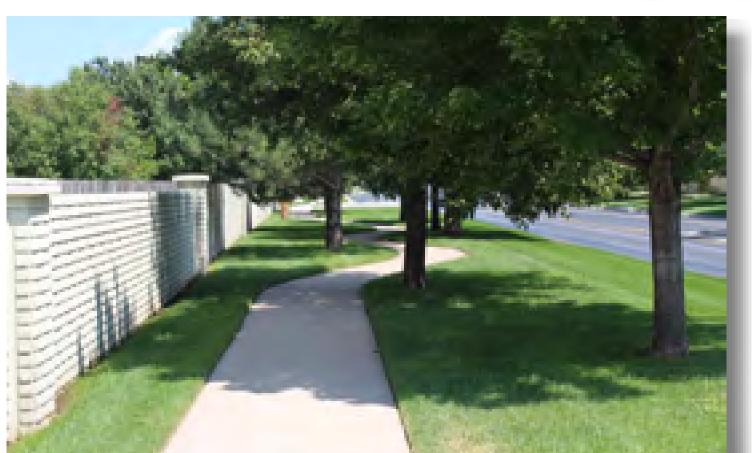
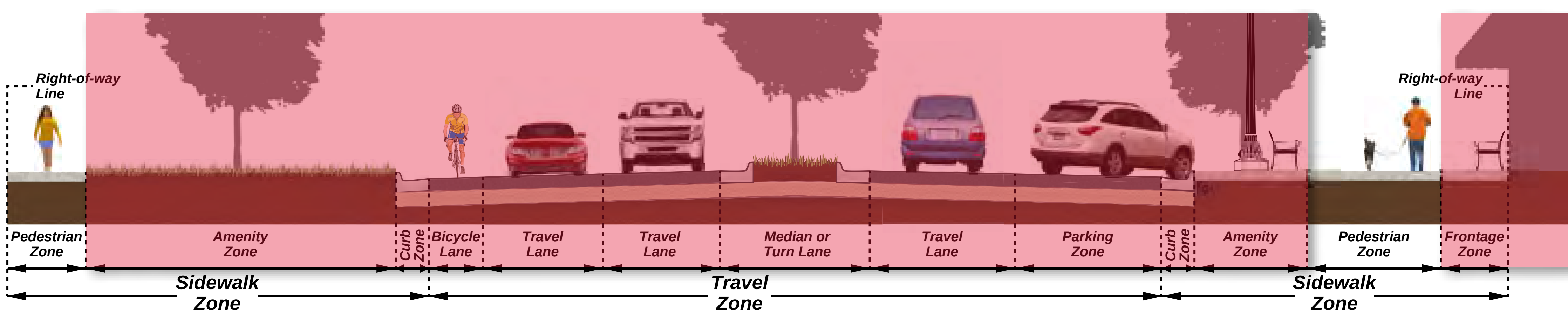


Figure 12: Pedestrian Zone



AMENITY ZONE DESIGN

The amenity zone is the area within the sidewalk zone between the pedestrian zone and the curb zone or shoulders, as shown in **Figure 13**. It functions as a buffer between the travel zone and the pedestrian zone as well as place for streetside amenities.

In this section, we refer to three different areas, each of which impact the space needed for the amenity zone as well as the placement of objects within the amenity zone. The ***operational offset*** is the space needed to separate moving vehicles from fixed objects in the sidewalk zone, which improves safety in case of crashes. The ***parking offset*** refers to the space needed between on-street parking and fixed objects (and pedestrians) in the sidewalk zone. The ***shy area*** refers to the space needed between the pedestrian zone and vertical objects in the amenity zone.

The amenity zone provides space for amenities and other objects. Some examples of amenities or other objects to be placed in the amenity zone include street trees, planting strips, street furniture, utility poles, underground utilities, signal poles, signal and electrical cabinets, trash receptacles, signs, fire hydrants, and bicycle racks. Not only can the amenity zone house permanent elements, it can also include temporary elements such as retail kiosks, stands, or other business activities as well as snow from plowing streets. It can also be the place for swales and other stormwater management elements. The amenity zone provides the space of all of these elements to allow the pedestrian zone to remain free of obstacles.

Amenities such as benches and shade trees provide critical elements to make a street more pedestrian friendly and encourage the use of sidewalks. It is also important to provide space for the amenity zone along streets that carry transit routes as it provides space for transit stops, boarding areas, shelters and passenger queuing areas.

The amenity zone may be extended in specific locations through the creation of curb extensions, which can accommodate additional amenities, shorten the distance for pedestrian crossings, or be used for transit boarding areas. Curb extensions should only be included where on-street parking is provided. The curb extensions would not be included in the typical space allocation for the amenity zone since they are placed at specific locations and not along an entire block or corridor.

In open ditch sections, the amenity zone is the place for the open ditches for stormwater drainage management.

DESIGN GUIDELINES

The space allocated to the amenity zone should vary based on the intended function. The functions could include any or all of the following: operational offset, parking offset, shy area, and/or a place for amenities.

The amenity zone should be designed to include the operational offset when the travel lanes are directly adjacent to the curb zone or shoulder. The operational offset, which is measured from the curb face (includes the curb itself), should be a minimum of 1.5 feet. All fixed objects should be placed at least 1.5 feet from the face of the curb. It is recommended that all rigid elements be kept at least 4 feet from the face of the curb. Consideration should be given to the design speed of the street when determining the width of the operational offset. The offset increases for open ditch cross-sections where curbs are not present. This offset varies based on design speed, traffic volumes, and slope of the ditch and is measured from the outside edge of the outside travel lane.

If on-street parking is provided, it is not necessary that the amenity zone serve as the operational offset. In this case, the amenity zone should provide for the parking offset as well as the shy area and space for amenities.

The parking offset, which is measured from the face of the curb to any fixed object or the pedestrian zone, is dependent upon the on-street parking type. For parallel parking, the parking offset should be at least 1.5 feet wide. For angled parking, 1.5 to 2.5 feet of parking offset should be provided for overhanging vehicles.

The amenity zone should be at least wide enough to create the desired parking offset between the face of the curb and pedestrians. The amenity zone should be wider if any vertical elements will be placed within the amenity zone in order to maintain the parking offset while keeping the vertical elements from intruding into the pedestrian zone.

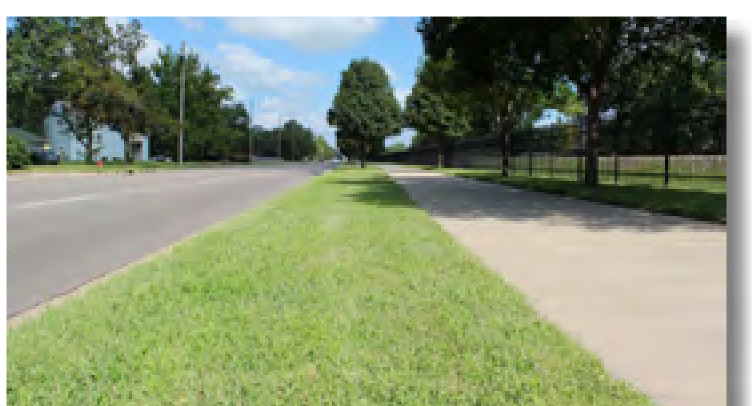
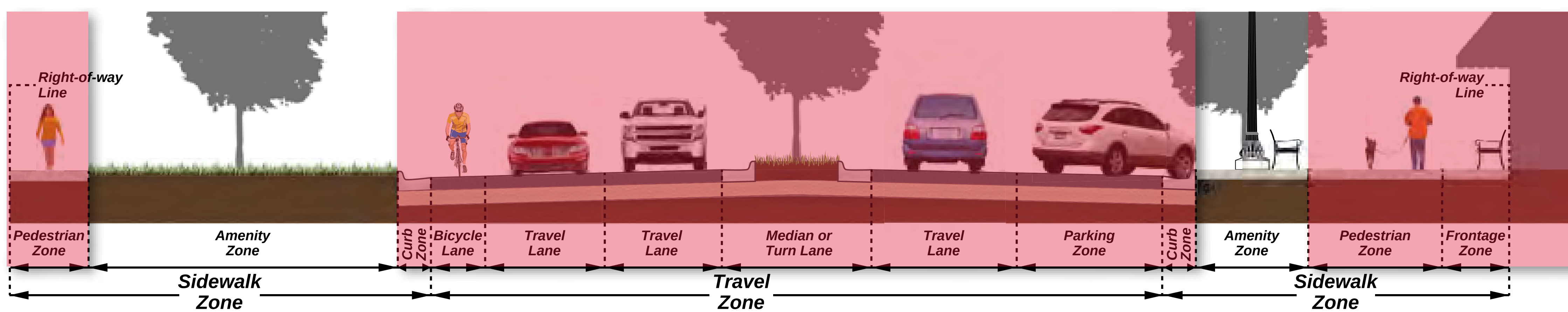


Figure 13: Amenity Zone



The amenity zone should also be wide enough to accommodate a shy area of 1 foot between the pedestrian zone and any vertical objects in the amenity zone. To the extent practical, vertical elements in the amenity zone should not be placed where they will obstruct pedestrian zone use.

Where there is a sidepath along a street, the minimum recommended distance between the sidepath and the face of the curb (curb & gutter sections) or the outside edge of the shoulder (open ditch sections) is 5 feet and the preferred distance is 6 feet, except at intersections. This separation is to show that the sidepath and the vehicle travel lanes function independently.

The amenity zone is the typical place to accommodate transit stop features and space for riders waiting to board a bus. Consideration should be given to the type of features to be provided at the bus stops, ADA requirements, and pedestrian circulation within the stop. As previously mentioned, the bus stops can be accommodated through the creation of a curb extension as long as there is an on-street parking lane. Refer to **Chapter 6** for design guidance for transit stops and spacing recommendations.

The width of the amenity zone should be wide enough to accommodate desired streetside amenities. Amenities such as street trees and benches help create a pedestrian friendly environment. Therefore, the amenities provided should be based on the development intensity, primary land use, and street classification. A wider amenity zone should be considered in the urban core, mixed-use/local business land uses, regional commercial land uses, and along arterials to provide for a higher degree of amenities.

Streets with ground-floor commercial activity directly adjacent to the property line should provide a wider amenity zone as well. In these situations, it may be desirable to include sidewalk cafes in the amenity zone. The amenity zone should be at least 8 feet wide to accommodate sidewalk cafes.

The amenity zone can be paved, have tree wells, and/or be landscaped with grass or vegetation. If the amenity zone includes grass or vegetation, it should be at least 2 feet wide to allow for maintenance activities. If trees are planted in tree wells, the amenity zone should be wide enough to accommodate a properly sized tree well for the type of tree planted. If trees are planted in a grassy strip, the amenity zone should be wide enough to provide space for root growth without disturbing the structural integrity of paved or other features.

The placement of amenities within the zone should not interfere with line of site requirement. It is important to allow vehicle operators to see other moving vehicles as well as other street users at critical locations such as at intersections and driveways.

In some instances, there may not be sufficient space in the amenity zone to include all desired amenities. In these instances, amenities can be placed in the frontage zone.

The matrices on pages 31-34 show the preferred and constrained widths for the amenity zone. They show the differing widths for the amenity zone based on development intensity. The widths identified in the matrices may not always work when accommodating transit stops. Refer to **Chapter 6** for additional transit stop design guidance. For additional guidance on the amenity zone, refer to Chapter 7 of the Pedestrian Master Plan. For additional guidance on the amenity zone in downtown, refer to the Downtown Wichita Streetscape Design Guidelines.

CURB ZONE DESIGN

The curb zone is the area within the sidewalk zone between the amenity zone and the travel zone, as shown in **Figure 14**. This zone includes the curb and gutter in most cross sections. If the street does not have curb and gutter, such as a section that has open ditches, the curb zone is not present.

Streets with curb and gutter are prevalent in urban and suburban developments. They are often preferred over open ditch sections because they reduce the amount of space needed for drainage, therefore reducing the amount right-of-way needed for a street.

The curb and gutter establishes the grade of streets and direct stormwater runoff. They also support and delineate the edge of the pavement. The curb is the section between the back of curb and the curb face. It provides a vertical separation between the motor vehicles in the parking or travel lanes and the sidewalk zone activities and users. The gutters, or gutter pans, are the portion from the curb face to the longitudinal joint, also known as the high edge.

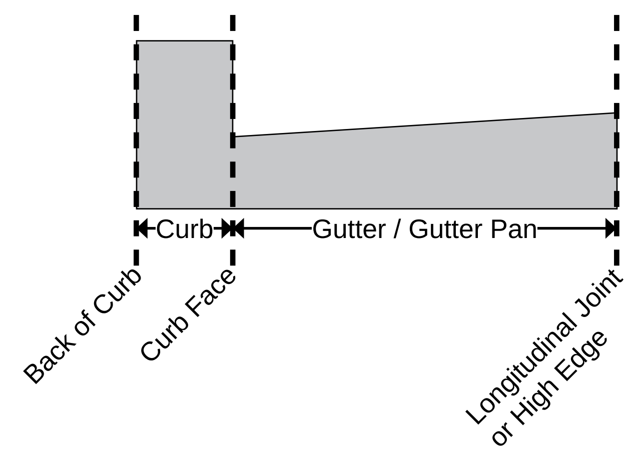
As mentioned in the Amenity Zone Design section, there is an operational offset recommended for streets where there are travel lanes directly adjacent to the curb zone. The width of the curb (not including the gutter pan) is included in the operational offset.

DESIGN GUIDELINES

In the urban core area, the curb and gutter is preferred to be 3 feet wide with 1 foot for the curb and 2 feet for the gutter pan. In the constrained situation, the curb can be reduced to 6 inches. However, consideration should be given to the operational offset and parking offset mentioned in the Amenity Zone section.

In general urban and suburban, the preferred and constrained width of the curb and gutter is 2 feet 6 inches with 6 inches for the curb and 2 feet for the gutter pan. In all development intensity areas, the curb is typically constructed 6 inches tall.

Figure 15: Curb Cross-Section



The gutter pan is expected to be used to as space for parking when on-street parking is provided. The curb, as mentioned earlier, provides some of the space needed as a parking offset for opening car doors for parallel parking and vehicle overhangs for angled parking.

Vehicular travel lanes can adjacent to the curb zone. In this situation, the gutter pan is not included in the travel lane. Bicycle lanes can also be directly adjacent to the curb zone. The gutter pan and the seam at the high edge where the gutter pan meets the pavement is not ideal for bicycle travel. The path for bicycle travel should be assumed to be outside of the gutter pan. However, elements within the curb zone such as drainage grates and utility covers should be flush with the surface and oriented to safely accommodate bicycle travel.

The curb and gutters used to construct a raised median are different than those used within the curb zone outside the travel zone. For more information about the curb and gutter dimensions for a median, refer to the Median/Turn Lane(s) section.

The matrices on pages 31-34 show the preferred and constrained widths for the curb zone. They show the differing widths for the curb and gutter based on development intensity. For additional guidance on the curb zone, refer to Chapter 7 of the Pedestrian Master Plan.

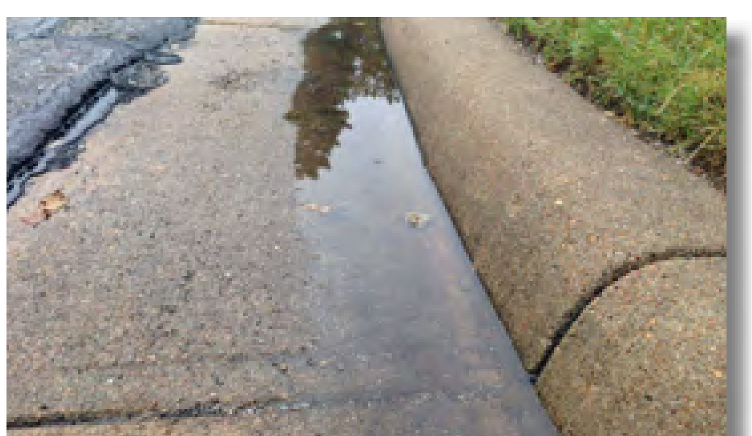
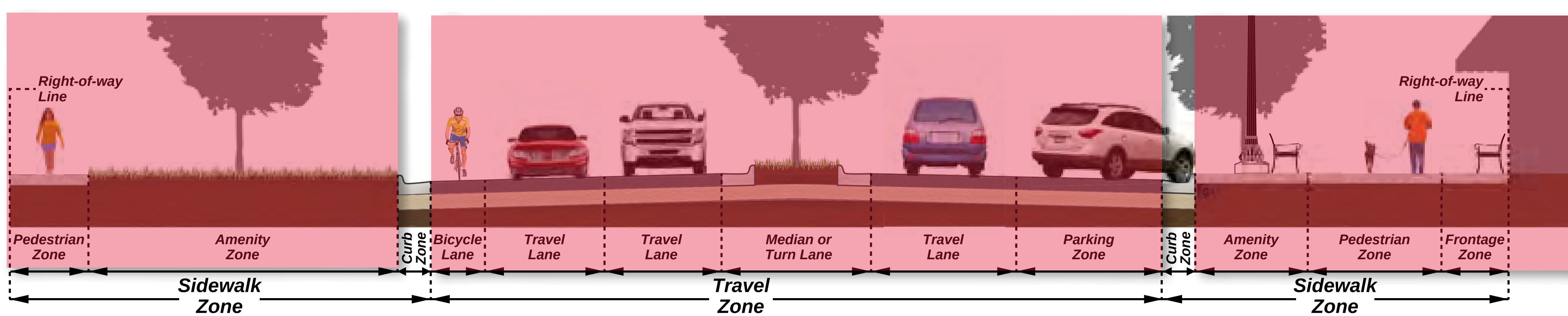


Figure 14: Curb Zone



PARKING ZONE DESIGN

The parking zone is a place to accommodate on-street parking and is located between the curb zone and the travel lane (or bicycle lane, if provided). **Figure 16** illustrates the location of the parking zone.

The inclusion of the parking zone is dependent upon parking demand. On-street parking in the urban core and general urban areas is often deemed necessary to meet at least some of the parking demands due to the intensity of land uses. Higher speed and higher volume streets often do not include on-street parking due to the potential conflicts with vehicle doors and vehicles entering and exiting on-street parking stalls. Development along higher speed streets typically include on-site parking to meet demand. Arterials in the general urban and suburban areas may include on-street parking, depending upon the parking demand, off-street parking availability. Collectors and local streets typically provide space for on-street parking.

The type of on-street parking is also dependent upon demand as well as other street and context characteristics. Angled parking is often provided where parking is in high demand, such as the urban core area or where there is a high intensity of commercial activity. However, streets with a high priority for the through movement of vehicles typically do not have angled parking. Traditional front-in angled parking is also not typically used when adjacent to a bicycle lane due to visibility and safety concerns. Parallel parking is often provided where on-street parking is needed but it is not deemed appropriate to provide angled parking.

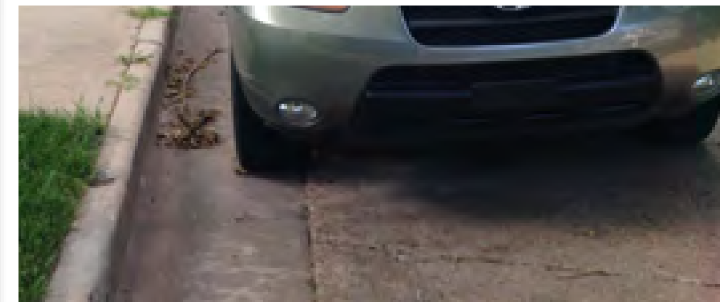
The space allocated to the parking zone depends upon the parking type provided. Parallel parking is common in constrained situations where more space is desired for other street features. Angled parking typically accommodates more vehicles along a street but more space within the right-of-way is needed. Typical parking stall angles include 45 degree, 60 degree, or 90 degree.

The parking type affects the outside travel lane width, the bicycle lane width, as well as the buffer area between the face of the curb and vertical objects or pedestrians in the sidewalk zone..

In some cases, the curb is constructed into the parking zone to create a curb extension. This feature shortens pedestrian crossings and can provide more space for the sidewalk zone. In these locations, parking is not provided in the segment where the curb is extended.

DESIGN GUIDELINES

Dimensions for the parking zone are measured from the high edge of the curb section (lateral seam between the gutter pan and the pavement). It is expected that vehicles will use the 2 foot wide gutter pan within the curb zone as part of the space for parking.



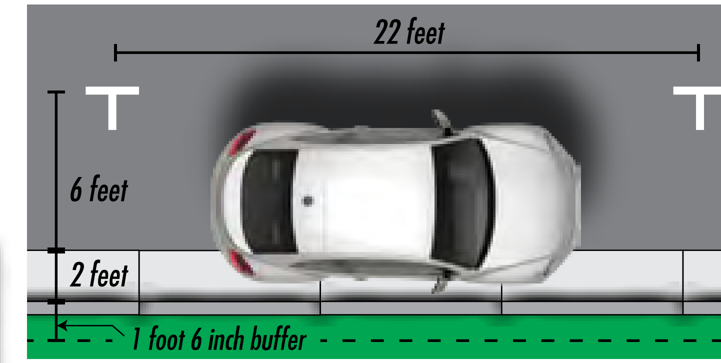
The parking zone for parallel parking is preferred to be 6 feet and 5 feet in constrained situations except in industrial areas. In industrial areas, the preferred width is 7 feet and the constrained width is 6 feet to provide more space for larger vehicles.

At least a 1.5 foot wide buffer should be provided between the face of the curb and vertical objects in the sidewalk zone as well as pedestrians traveling within the pedestrian zone when parallel parking is provided. **Figure 17** shows the preferred parallel parking layout for non-industrial streets.

The width of the parking zone should be greater when angled parking is provided. For 45 degree angled parking, the preferred width is 16 feet and the constrained width is 14 feet. **Figure 18** shows the preferred layout for 45 degree angled parking. For 60 degree angled parking, the preferred width is 17 feet and the constrained width is 15 feet. **Figure 19** shows the preferred layout for 60 degree angled parking. For 90 degree (perpendicular) parking, the preferred width is 18 feet and the constrained width is 16 feet. **Figure 20** shows the preferred layout for 90 degree angled parking. Stall width should be 9 feet wide in areas with high parking turnover. They can be narrower in areas with low parking turnover.

Where angled parking is used, there should be sufficient space for vehicles to safely maneuver into and out of the parking stall. This space can be completely within the outside travel lane or be provided in multiple lanes adjacent to the angled parking lane.

Figure 17: Parallel Parking



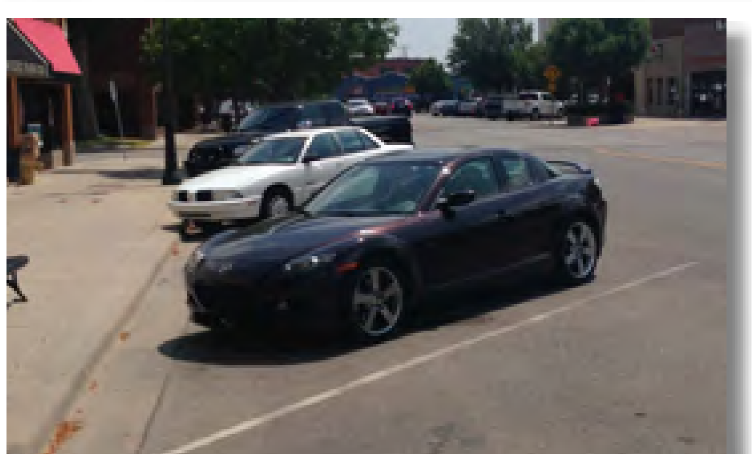


Figure 16: Parking Zone

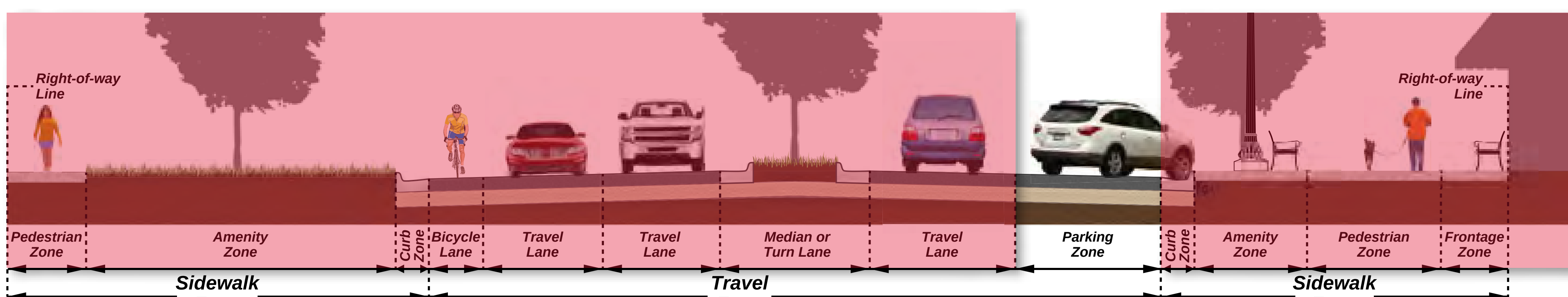


Figure 18: 45º Angled Parking (front-in)

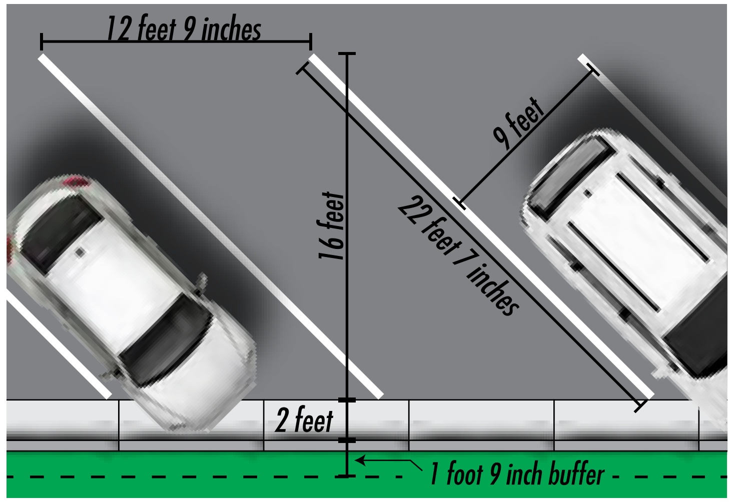


Figure 19: 60º Angled Parking (front-in)

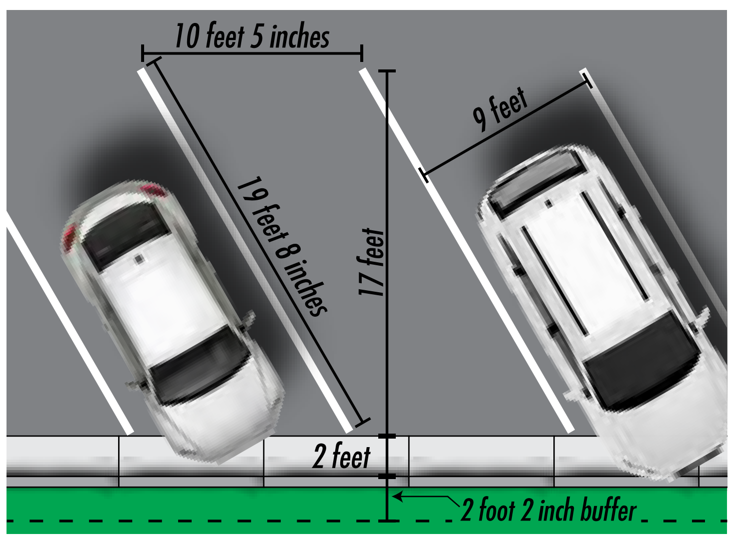
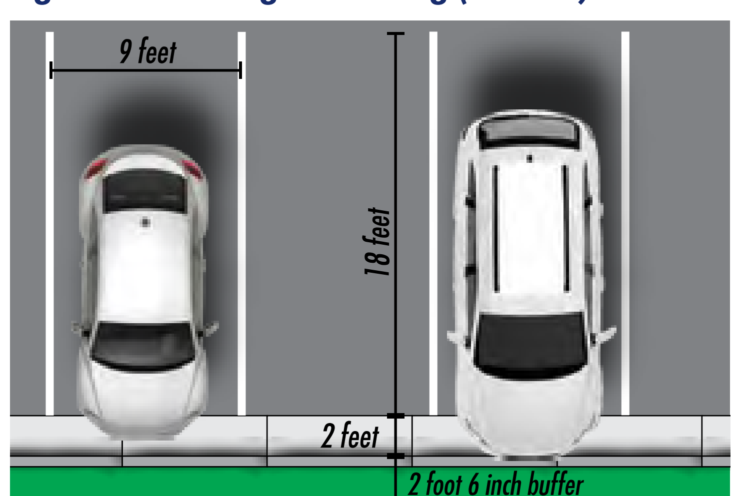


Figure 20: 90º Angled Parking (front-in)



The presence of bicycle lanes adjacent to on-street parking affects the space for the parking zone. When parallel parking is adjacent to a bicycle lane, consideration should be given to providing a delineation between the parking zone and bicycle lane. This delineation can include a striped lane line or parking space 'Ts'. When space is constrained, the parking zone should be narrowed rather than using a narrow bicycle lane in most situations.

Bicycle lanes are not recommended to be used adjacent to traditional front-in angled parking. However, bicycle lanes can be considered when using back-in angled parking, due to the increased visibility this configuration allows.

On-street parking can be removed at specific locations when a curb extension is desired to create additional space for the sidewalk zone. This is a common treatment at intersections to reduce pedestrian crossing distance and improve pedestrian visibility. The curb extension should not extend into adjacent travel or bicycle lanes. Curb extension should be 6 inches less in width than adjacent parking stalls. Where bike lanes are present, curb extensions should be one foot less in width than adjacent parking stalls.

On-street parking must restricted at bus stop locations. The length of a no-parking zone for a bus stop depends upon the stop location. Shorter no-parking zones can be achieved at bus stops by creating a curb extension.

The matrices on pages 31-34 show the preferred and constrained widths for the parking zone. They show the differing widths based on the on-street parking type. The dimensions in the matrices do not include the gutter pan, which is assumed to be included in the actual parking space. For additional guidance on the parking zone in downtown, refer to the Downtown Wichita Streetscape Design Guidelines.

BICYCLE LANE DESIGN

Bicycle lanes are the portion of a street designed specifically for bicycle travel. Bicycle lanes are typically placed between the outside travel lane and the curb or shoulder (or parking lane if on-street parking is provided), as shown in **Figure 21**.

Bicycle lanes are typically used on arterials or collectors where motor vehicle volumes and speeds are greater and separation from vehicle traffic is desired. Where greater separation from vehicular traffic is desired, a buffer can be placed between the bicycle lane and the adjacent travel lane. Buffers can also be placed between the bicycle lane and an adjacent on-street parking lane to provide space for swinging vehicle doors.

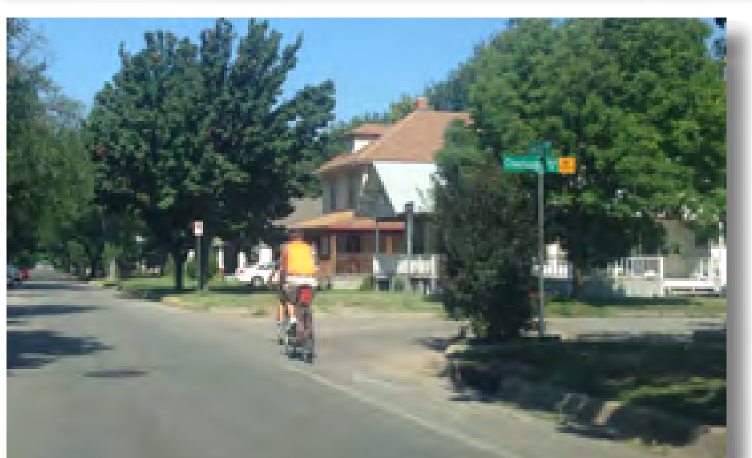
In general, bicycle lanes should be provided on both sides of the street on two-way streets or on both streets of one-way couplets. If unable to provide bicycle lanes in both directions on two-way streets due to space constraints, a shared-lane with markings should be considered on the side of the street without a bicycle lane. On one-way streets, there is also the option of providing a contra-flow bicycle lane or a two-way cycle track.

If a bicycle lane is provided along a street with on-street parallel parking, the bicycle lane should be located between the outside travel lane and the parking lane. However, one-way protected cycle tracks or two-way cycle tracks can be provided between the curb and on-street parking lanes. This changes the location of the bicycle lane within the street cross-section.

Bicycle lanes are not recommended with front-in angled parking. Bicycle lanes can be considered with adjacent back-in angled parking.

The pavement within bicycle lanes should be smooth. Utility covers, gutter seams, and drainage inlets should be flush with the surface and oriented to safely accommodate bicycle use. When placed adjacent to the curb zone, the seam between the gutter pan and the pavement should be smooth with no or minimal vertical off-set.

The space allocated to the bicycle lane is dependent upon the type of bicycle lane, use of the adjacent zones, bicycle demand, vehicle volumes, and vehicle speeds. In general, a bicyclist's preferred operating width is 5 feet.



DESIGN GUIDELINES

Conventional Bicycle Lanes

Bicycle lanes include a 6 to 8 inch wide white lane line separating motor vehicle traffic from the bicycle lane. They also include pavement markings to designate the bicycle lane for use by bicyclists.

Where a bicycle lane is located adjacent to the curb, the minimum width is 4 feet from the longitudinal joint (between the gutter pan and the pavement) to the center of the inside bicycle lane line. This provides 4 feet of usable operational bike lane width. Where a bike lane is located adjacent to a curb, parking should be prohibited.

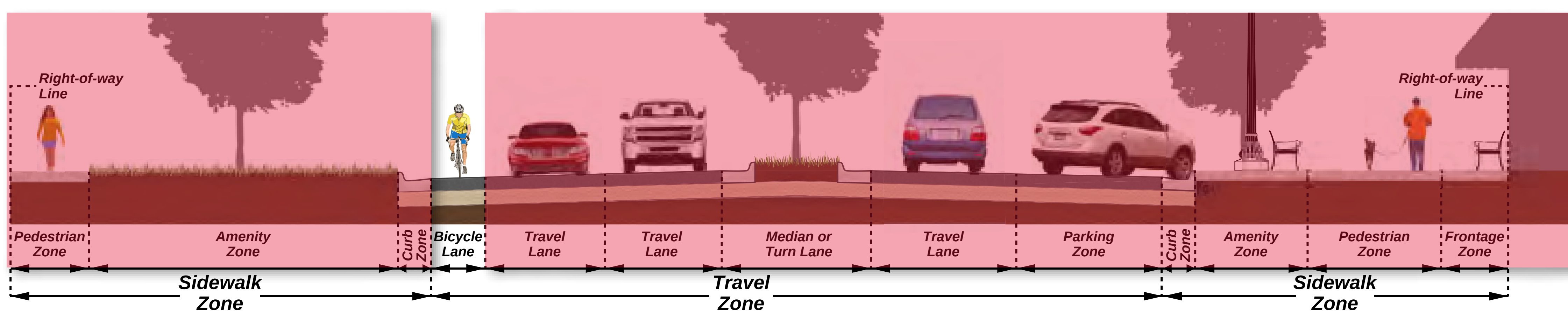
Wider bicycle lanes along the curb should be considered in locations where bicycle use is expected to be high to provide the opportunity for bicyclists to ride side-by-side or pass another cyclists while remaining within the bicycle lane. In areas where there is substantial truck traffic and travel speeds are higher (typically arterials), a wider bicycle lane and/or buffer should be considered. It is also desirable to provide an extra 2 feet of space when the bicycle lane is adjacent to a guardrail or other physical barrier to provide a shy area.

A wide gutter pan used as a bicycle lane can aid in accommodating a bicycle lane on extremely constrained streets. A 4 to 5 foot wide gutter pan can be striped and marked as a bicycle lane. This treatment provides the space needed for bicycle operations without the longitudinal joint within the bicycle lane.

Where the bicycle lane is adjacent to a parallel parking lane, it is preferred to include a 4 inch white lane line or parking Ts to delineate the outside edge of the bicycle lane and the inside edge of the parking lane. Where adjacent to on-street parking, the preferred width of the bicycle lane is 6 feet and the constrained width is 5 feet (measured from inside bicycle lane line to parking lane line). Where the adjacent parking lane is narrow (7 feet wide) and has high turnover, a wider (6-7 feet) bicycle lane and/or buffer should be considered to allow for more room to maneuver around opening vehicle doors.

Bicycle lanes can be accommodated in open ditch sections where there is no curb and gutter by providing extra pavement outside the travel lanes. Rather than including a paved shoulder, the extra pavement would be designed and designated for bicycle travel. These bicycle lanes follow the guidance for a conventional bicycle lane. Parking should be expressly prohibited in these bicycle lanes.

Figure 21: Bicycle Lane



Buffered Bicycle Lanes

Buffered bicycle lanes should follow the same design guidance for the conventional bicycle lanes. In a buffered bicycle lane, there is added space between the bicycle lane and the adjacent travel lane and/or between the bicycle lane and the adjacent parking lane.

The buffer width should be based on the desired separation and be at least 1.5 feet wide and preferably 2 feet wide. The buffer should consist of an additional solid white lane line parallel to the bicycle lane line. When a buffer is used between the parking lane and bicycle lane, 2 solid lines or a solid line and parking Ts are both acceptable. Crosshatching is preferred in all bicycle buffer areas. If the buffer is 3 feet wide or more, crosshatching or chevron markings are required between the bicycle lane line and the buffer line.

Other Bicycle Facility Options

The following four bicycle facility type options that are not specifically recommended by the Bicycle Master Plan. However, these facility types may be appropriate in some situations.

Contra-Flow Bicycle Lanes

Contra-flow bicycle lanes provide for bicycle travel against the flow of normal vehicular traffic. Contra-flow bicycle lanes are only used on one-way streets and provide for bicycle travel in the opposing direction. Streets with contra-flow bicycle lanes should have a bicycle lane or shared lane markings on the other side of the street (motor vehicle traffic flow direction).

Contra-flow bicycle lane design should follow the conventional bicycle lane guidance. They should also include appropriate signage to indicate bicycle-only travel in the contra-flow direction as well as appropriate intersection traffic controls.

Where contra-flow bicycle lanes are used without on-street parallel parking, a solid double yellow lane line between contra-flow bicycle lane and motor vehicle traffic in the opposing direction travel lane is to be used. In addition these lines, a buffered bicycle lane design can be used to increase separation.

If on-street parking is provided on the side of the street with the contra-flow bicycle lane, consider a wider bicycle lane and a buffer strip between the bicycle lane and parking lane.

Source: senditcourier on Instagram.com (http://instagram.com/p/qufjetw3gM/)

Left-Side Bicycle Lanes

Another option available on one-way streets is a left-side bicycle lane. This configuration provides for bicycle travel in the same direction as motor vehicle travel. However, rather than the typical placement on the right side of the street, it is on the left side. The left side placement may be desirable when there is high parking turnover or when parking is provided only on the right side of the street. It may also be desirable when there are high right turn motor vehicle volumes or a high volume of left turning bicyclists.

Left-side bicycle lane design should follow the conventional bicycle lane guidance. They should also include appropriate signage and pavement markings to communicate proper usage and direction of travel. These lanes can also be buffered and would follow the design guidance for buffered bicycle lanes.

Left-side bicycle lanes can also be used on streets with a center median. The bicycle lane would be placed between the far inside travel lane and the median. This design would be beneficial over a right-side bicycle lane when there are frequent bus stops or truck loading zones on right side of the street.

Source: City of Laurel, Maryland - Walk and Bike Laurel blog (walklaurel.blogspot.com)

One-Way Protected Cycle Tracks

One-way protected cycle tracks are similar to a buffered bicycle lane but provide a physical barrier between the travel lane and the bicycle travel space. The barrier can be a parking lane, raised median, other physical barrier, or a combination of parking and a physical barrier. One-way protected cycle tracks may be preferred on streets with multiple travel lanes, high vehicular speeds and volumes, and high parking turnover.

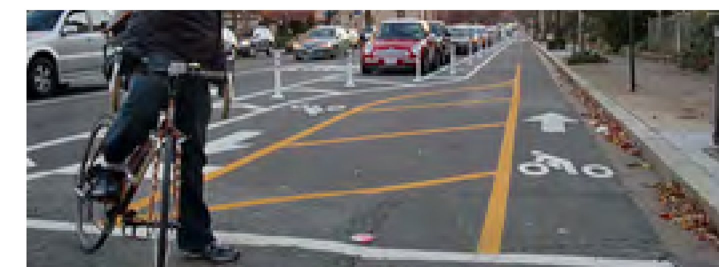
The cycle track should be marked as a bicycle lane and be 5 to 7 feet wide, measured from the face of the curb. When parking lanes are used as the barrier and pavement markings are used to separate the parking lane and cycle track, a 3 foot wide buffer using solid white lane lines and crosshatching should be used. The buffer between parking and the cycle tracks, no matter the treatment type, should be at least 3 feet wide to allow for a buffer for opening doors. The desired minimum width of the parking lane and buffer is 11 feet.

Source: BeyondDC (http://urbanplacesandspaces.blogspot.com/2009/09/best-practices-in-bicycling.html)

Two-Way Cycle Tracks

Two-way cycle tracks are similar to one-way protected cycle tracks but they provide bicycle travel in both directions and are marked as such. This treatment should be considered under similar circumstances when considering a contra-flow bicycle lane.

The two-way cycle track should include proper pavement markings and signage. The preferred width of the bicycle travel area is 12 feet and 8 feet in constrained situations. A dashed yellow centerline should be provided to separate directional travel in the track. The minimum desired width of the buffer between the tracks and adjacent travel lane or parking lane is 3 feet. This buffer can be raised, striped (and include crosshatch), and include other vertical buffer elements.



Source: Cbus Cycle Chick (https://cbuscyclechic.wordpress.com/category/cycle-tracks/)

The matrices on pages 31-34 show the preferred and constrained widths for the conventional bicycle lane and additional space for a buffered bicycle lane. The matrices only show these options because they are the typical on-street bicycle facility type recommended by the Bicycle Master Plan that are dedicated to bicycle -only travel. The matrices also do not show the extended gutter pan option. Design guidance for the other on-street bicycle facility options is limited to the text of this section. The matrices show the differing widths of the bicycle lane based on the provision of parking adjacent to the bicycle lane as well as additional space needed for buffers. The dimensions in the matrices do not include the gutter pan. For additional guidance on bicycle lanes, refer to Appendix G of the Bicycle Master Plan.

TRAVEL LANE DESIGN

Travel lanes are provided for the through movement of vehicular travel. They do not include left or right turn lanes. Travel lanes carry many different types of vehicles, from bicycles and automobiles to semi-trucks and emergency vehicles. There can be just one travel lane or many travel lanes and they can be provided in either one direction (one-way street) or two directions (two-way street).

Travel lanes can be adjacent to many different zones or lanes. They can be adjacent to a curb zone, parking zone, bike lane, travel lane in the same direction, travel lane in the opposing direction, or the median/left turn lane. They can also be adjacent to a right turn lane. **Figure 22** shows two options for the number and placement of the travel lanes.

All travel lanes are considered shared lanes unless specific modes are restricted from use, such as bicycle use on freeways. This idea influences the space allocation for the lanes as well as other design and operating specifications that will allow all users to safely and efficiently use the travel lanes.

There are two types of travel lanes; outside travel lanes and general travel lanes. On two-way streets, there are two outside lanes. They are located closest to the curb or shoulder on each side of the street, which is the right lane in each direction. On one-way streets, there is only one outside lane. It is located closest to the right curb or shoulder.

Travel lane widths often differ by their placement within the street cross-section. The outside lanes are often wider than the general lanes to accommodate uses that typically use this lane, such as bicyclists and transit vehicles. Lane widths also vary due to other factors such as vehicle speeds, street classification, adjacent land use, presence of buses and heavy trucks, adjacent parking provided, adjacent parking type, transit routes, or when marked as a shared lane.

On major streets with higher motor vehicle volumes and higher speeds, bike lanes or paved shoulders are the preferred means of accommodating bicyclists.

The number of lanes provided is mainly a function of vehicular demand and available space for travel lanes. Streets with high vehicular demands, such as along arterials, typically have more travel lanes. Local streets typically carry fewer motor vehicles and require fewer travel lanes.

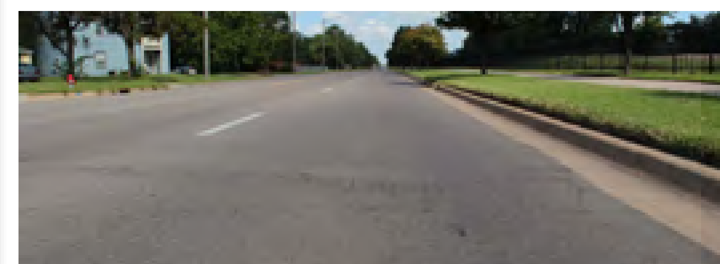
DESIGN GUIDELINES

In general, travel lane widths are recommended to be 11 feet wide for arterials and collectors and 10 feet wide for local streets. However, there are variables that should be considered when determining the width of individual travel lanes.

Outside Travel Lanes

For two-way streets, there are two outside travel lanes. They are closest to the curb or shoulder on each side of the street, which is the right-hand lane in each direction. For one-way streets, the outside travel lane is located closest to the right curb or shoulder. They may be directly adjacent to the curb or shoulder, on-street parking, or a bike lane.

In this section, the outside lane widths for curb and gutter sections are measured from the longitudinal joint between the gutter pan and the pavement to the travel lane line.



Outside travel lanes that are adjacent to the curb do not have conflicts with on-street parking. The lane widths of outside lanes adjacent to the curb should vary based on street classification and adjacent land use. Arterials should generally provide more lane width than collectors or local streets. Streets with adjacent industrial land uses should include extra lane width to accommodate higher heavy truck volumes. Residential streets can often have narrower lanes than commercial streets.

Outside travel lanes may need to be wider where they are adjacent to on-street parallel parking. An extra foot of lane width should be considered in non-residential areas, especially when parking turnover is high. This provides more room for vehicle doors swinging open.

Outside travel lanes adjacent to on-street angled parking are recommended to be at least 12 feet wide. This lane width may not always provide the needed maneuvering space when vehicles are entering or exiting angled parking stalls. On lower speed and lower volume streets, vehicles will often be able to safely maneuver into and out of stalls by encroaching into other lanes beyond the adjacent outside travel lane. Consideration should be given to the character and operations of the street when determining outside lane width adjacent to angled parking.

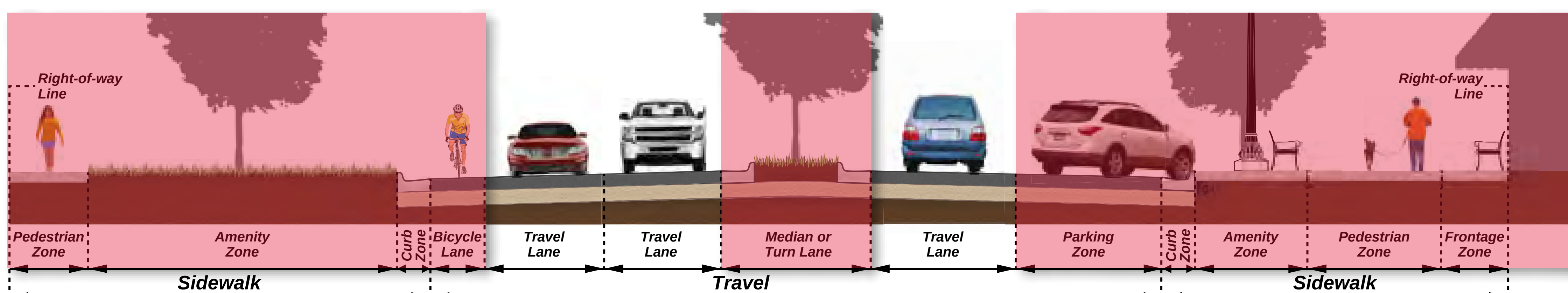


Figure 22: Travel Lanes

Beyond the typical motor vehicles, the outside travel lane is often the lane that carries transit vehicles. Streets that currently or will likely have future transit service are recommended to have outside lane widths at 12 feet wide and 11 feet in constrained situations. However, if on-street parking is provided, the outside travel lane should be wide enough to accommodate the recommended or constrained width based on the parking type.

Streets with open ditches are treated differently than those with curb and gutter. Outside lane widths on open ditch sections are measured from the inside travel lane line to the outside travel lane line. An extra 1 foot of pavement should be provided outside of the outside lane line. A paved or unpaved should can be provided beyond the extra one foot of pavement.

Outside travel lanes may also include shared lane markings to remind motor vehicle drivers and bicyclists that the travel lane should be shared. This designation does not necessarily need to change the lane widths. However, when using a wide outside lane to accommodate bicycle and motor vehicle travel, at least 14 foot wide outside lanes will provide sufficient space for motorists to pass bicyclists without encroaching into the adjacent travel lane. The placement of the shared lane marking will vary based upon the characteristics of the travel lane and roadway.

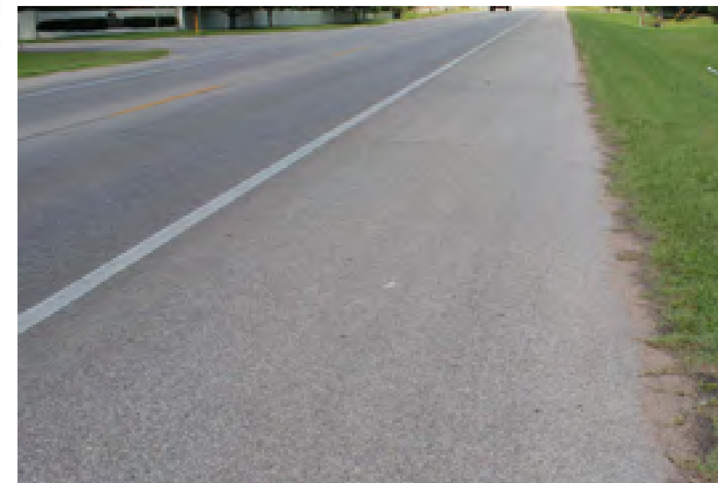
General Travel Lanes

The general travel lanes include all other travel lanes not considered outside travel lanes or turning lanes. On streets with only one travel lane in each direction, there are no other travel lanes beyond the outside travel lanes. Streets with multiple lanes in each direction have general travel lanes. These are the travel lanes located to the left of the outside travel lane.

Similar to the outside travel lane, general travel lanes should vary in width based on street classification and adjacent land use. Unlike the outside travel lane, the general travel lane widths should not be impacted by on-street parking.

Shoulders

Shoulders are located within the travel zone and only occur in open ditch sections. They are generally located to the right of the travel lane. They provide safety for motorists that may leave the travel lane and space for stopped vehicles. Whether paved or unpaved, the shoulder provides generally the same benefit.



Paved or unpaved shoulders vary in width based upon street classification. In general, shoulders should be a minimum of 3 feet wide for all street classifications. The shoulder should be paved and wider if it is being designed to accommodate bicycle travel. See the Bicycle Lane Design section for proper design of a bicycle lane.

The matrices on pages 31-34 show the preferred and constrained widths for the outside travel lane and general travel lane. The Suburban Open Ditch Matrix on page 34 shows the preferred and constrained widths for shoulders. For additional guidance on travel lane widths for downtown, refer to the Downtown Wichita Streetscape Design Guidelines.

MEDIAN/LEFT TURN LANE(S) DESIGN

A raised median or a continuous two-way left turn lane are optional features in the travel zone. Either of the two options separate opposing vehicular traffic lanes. An example of a median is shown in **Figure 23**.

Raised medians provide separation between two-way traffic and often include pavement, grass, shrubs, trees, or other type of landscaping between the curbs. Raised medians often narrow or terminate at the approach to an intersection where left-turn lanes are provided. Medians serve as a means of managing access and improving the safety of the street. They can also serve as a crossing island for pedestrians or bicyclists crossing a street. Strategically placed median islands may also be used as traffic calming devices to discourage improper center turn lane usage.

Continuous two-way left turn lanes provide space for vehicles to exit the travel lane when approaching a left turn. They have been used to improve vehicular traffic flow by providing a space for turning vehicles outside of the through travel lanes. Continuous two-way left turn lanes are common in areas with a high number of access points along the street with a high number of left turning vehicles.

Although specific to intersections, one-way left turn lanes can be accommodated in the median/left turn lane(s) area. This configuration is encouraged where sufficient access controls to adjacent properties are provided. The width of these lanes should be the same as continuous two-way left turn lanes.

DESIGN GUIDELINES

Continuous Two-Way Left Turn Lanes

Continuous two-way left turn lanes are recommended to be 12 feet in width and 11 feet in constrained situations. In industrial areas with heavy truck traffic, these lanes are recommended to be 14 feet wide or 12 feet wide in constrained situations. The wider turn lane will better accommodate heavy truck traffic expected in industrial areas.

Medians

The space allocated for the median should be the same as that for the continuous left turn lane. This allows for the inclusion of a left turn lane at intersections by discontinuing the median without requiring additional space. The total width of the median, which includes two curb and gutter treatments and a raised center element, should be 11 to 12 feet wide or 12 to 14 feet wide on industrial streets.

The curb and gutter for the median is different than that used in the curb zone. The curb and gutter should be 1 foot 9 inches wide. The curb should be 6 inches wide and 8 inches tall. The gutter pan should be 15 inches wide.

The median between the two curbs should be 8 feet 6 inches wide when 12 foot wide turn lanes are desired at intersections or 7 feet 6 inches when 11 foot wide turn lanes are desired at intersections. The median can be paved or landscaped and can often include trees. The recommended and constrained width will provide sufficient area for queuing pedestrians and bicyclists within the median if mid-block crossings are provided.

Wider medians may be desired where turn lanes will be provided at intersections and the median will be narrowed rather than removed. However, additional right-of-way is often available at intersections where a turn lane would be provided so it may not be cost-effective to create a wider median along the entire street. Medians should be wider on industrial streets where turn lanes are also wider.

If turn lanes will not be provided except at major intersections, the median may be narrower while still providing the desired separation of opposing vehicle traffic.

The matrices on pages 31-34 show the preferred and constrained widths for the median and center turn lane. For additional guidance on median widths for downtown, refer to the Downtown Wichita Streetscape Design Guidelines.

Figure 23: Median/Left Turn Lane

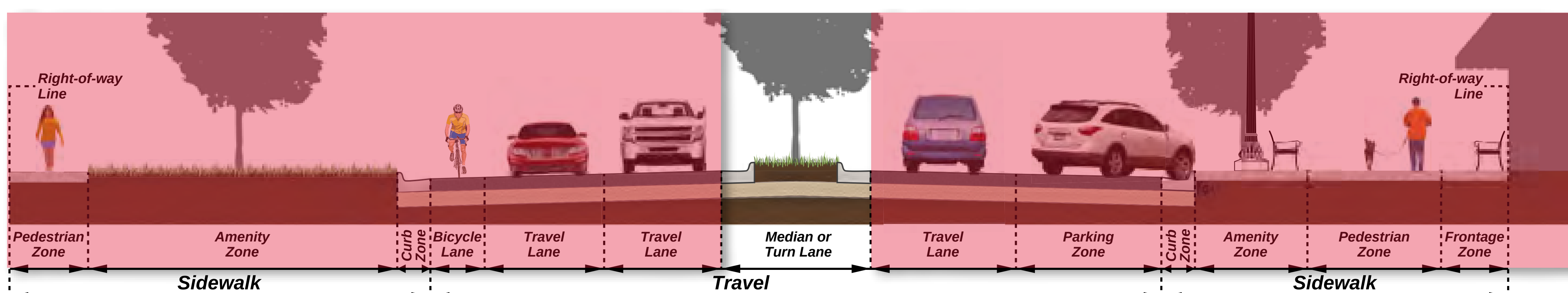


Table 1: Urban Core Matrix

Decision Tree Elements / Sidewalk zone

Primary land use	Street classification	Drainage	Preferred or Constrained	Frontage zone	w/ no setback	w/ sidewalk café	w/ setback	w/ sidepath	Pedestrian zone	Sidewalk	Sidepath	Amenity zone*	w/ amenities	w/ sidewalk café	Curb zone	Curb	Gutter pan
Residential	Arterial	Curb	Preferred	**0'-3'**	3'	-	0'	2'	**6'-12'**	6'	12'	**7'**	7'	-	**3'**	1'	2'
Residential	Arterial	Curb	Constrained	**0'-2'**	1'	-	0'	2'	**5'-10'**	5'	10'	**5'**	5'	-	**2'6"**	6"	2'
Residential	Collector	Curb	Preferred	**0'-3'**	3'	-	0'	2'	**6'-12'**	6'	12'	**7'**	7'	-	**3'**	1'	2'
Residential	Collector	Curb	Constrained	**0'-2'**	1'	-	0'	2'	**5'-10'**	5'	10'	**5'**	5'	-	**2'6"**	6"	2'
Residential	Local	Curb	Preferred	**0'-2'6"**	2'6"	-	0'	2'	**6'-12'**	6'	12'	**7'**	7'	-	**3'**	1'	2'
Residential	Local	Curb	Constrained	**0'-2'**	1'	-	0'	2'	**5'-10'**	5'	10'	**5'**	5'	-	**2'6"**	6"	2'
Mixed-use / local business	Arterial	Curb	Preferred	**0'-8'**	3'	8'	0'	2'	**10'-12'**	10'	12'	**8'**	8'	8'	**3'**	1'	2'
Mixed-use / local business	Arterial	Curb	Constrained	**0'-6'**	2'	6'	0'	2'	**5'-10'**	5'	10'	**5'**	5'	-	**2'6"**	6"	2'
Mixed-use / local business	Collector	Curb	Preferred	**0'-8'**	3'	8'	0'	2'	**8'-12'**	8'	12'	**8'**	8'	8'	**3'**	1'	2'
Mixed-use / local business	Collector	Curb	Constrained	**0'-6'**	2'	6'	0'	2'	**5'-10'**	5'	10'	**5'**	5'	-	**2'6"**	6"	2'
Mixed-use / local business	Local	Curb	Preferred	**0'-8'**	2'6"	8'	0'	2'	**6'-12'**	6'	12'	**8'**	8'	8'	**3'**	1'	2'
Mixed-use / local business	Local	Curb	Constrained	**0'-6'**	2'	6'	0'	2'	**5'-10'**	5'	10'	**5'**	5'	-	**2'6"**	6"	2'
Regional business	Arterial	Curb	Preferred	**0'-8'**	3'	8'	0'	2'	**10'-12'**	10'	12'	**7'-8'**	7'	8'	**3'**	1'	2'
Regional business	Arterial	Curb	Constrained	**0'-6'**	2'	6'	0'	2'	**5'-10'**	5'	10'	**5'**	5'	-	**2'6"**	6"	2'
Regional business	Collector	Curb	Preferred	**0'-8'**	3'	8'	0'	2'	**8'-12'**	8'	12'	**7'-8'**	7'	8'	**3'**	1'	2'
Regional business	Collector	Curb	Constrained	**0'-6'**	2'	6'	0'	2'	**5'-10'**	5'	10'	**5'**	5'	-	**2'6"**	6"	2'
Regional business	Local	Curb	Preferred	**0'-8'**	2'6"	8'	0'	2'	**6'-12'**	6'	12'	**7'-8'**	7'	8'	**3'**	1'	2'
Regional business	Local	Curb	Constrained	**0'-6'**	2'	6'	0'	2'	**5'-10'**	5'	10'	**5'**	5'	-	**2'6"**	6"	2'
Industrial	Arterial	Curb	Preferred	**0'-3'**	3'	-	0'	2'	**6'-12'**	6'	12'	**7'**	7'	-	**3'**	1'	2'
Industrial	Arterial	Curb	Constrained	**0'-2'**	2'	-	0'	2'	**5'-10'**	5'	10'	**5'**	5'	-	**2'6"**	6"	2'
Industrial	Collector	Curb	Preferred	**0'-3'**	3'	-	0'	2'	**6'-12'**	6'	12'	**7'**	7'	-	**3'**	1'	2'
Industrial	Collector	Curb	Constrained	**0'-2'**	2'	-	0'	2'	**5'-10'**	5'	10'	**5'**	5'	-	**2'6"**	6"	2'
Industrial	Local	Curb	Preferred	**0'-2'6"**	2'6"	-	0'	2'	**6'-12'**	6'	12'	**7'**	7'	-	**3'**	1'	2'
Industrial	Local	Curb	Constrained	**0'-2'**	2'	-	0'	2'	**5'-10'**	5'	10'	**5'**	5'	-	**2'6"**	6"	2'

Travel zone

Primary land use	Street classification	Drainage	Preferred or Constrained	Parking Zone**	Parallel**	45 degree**	60 degree**	90 degree**	Bike lane (+ buffer)	w/o parking**	w/ parking	w/ single buffer	w/ double buffer	Outside travel lane	Marked shared lane**	w/o parking**	w/ parallel parking	w/ angled parking	w/ transit service***	General travel lanes
Residential	Arterial	Curb	Preferred	**6'-18'**	6'	16'	17'	18'	**4'-10'**	4'	6'	+2'	+4'	**11'-13'**	13'	11'	11'	12'	12'	**11'**
Residential	Arterial	Curb	Constrained	**5'-16'**	5'	14'	15'	16'	**3'-8'**	3'	5'	+1'6"	+3'	**10'-11'**	10'	10'	10'	11'	11'	**10'**
Residential	Collector	Curb	Preferred	**6'-18'**	6'	16'	17'	18'	**4'-10'**	4'	6'	+2'	+4'	**10'-12'**	10'	10'	10'	12'	12'	**10'**
Residential	Collector	Curb	Constrained	**5'-16'**	5'	14'	15'	16'	**3'-8'**	3'	5'	+1'6"	+3'	**9'-11'**	9'	9'	9'	11'	11'	**9'**
Residential	Local	Curb	Preferred	**6'-18'**	5'	16'	17'	18'	**-**	-	-	-	-	**10'-12'**	10'	10'	10'	12'	12'	**10'**
Residential	Local	Curb	Constrained	**5'-16'**	5'	14'	15'	16'	**-**	-	-	-	-	**9'-11'**	9'	9'	9'	11'	11'	**9'**
Mixed-use / local business	Arterial	Curb	Preferred	**6'-18'**	6'	16'	17'	18'	**4'-11'**	4'	7'	+2'	+4'	**11'-13'**	13'	11'	12'	12'	12'	**11'**
Mixed-use / local business	Arterial	Curb	Constrained	**5'-16'**	5'	14'	15'	16'	**3'-9'**	3'	6'	+1'6"	+3'	**10'-11'**	10'	10'	11'	11'	11'	**10'**
Mixed-use / local business	Collector	Curb	Preferred	**6'-18'**	6'	16'	17'	18'	**4'-10'**	4'	6'	+2'	+4'	**11'-12'**	11'	11'	12'	12'	12'	**11'**
Mixed-use / local business	Collector	Curb	Constrained	**5'-16'**	5'	14'	15'	16'	**3'-8'**	3'	5'	+1'6"	+3'	**10'-11'**	10'	10'	11'	11'	11'	**9'**
Mixed-use / local business	Local	Curb	Preferred	**6'-18'**	6'	16'	17'	18'	**-**	-	-	-	-	**10'-12'**	10'	10'	11'	12'	12'	**10'**
Mixed-use / local business	Local	Curb	Constrained	**5'-16'**	5'	14'	15'	16'	**-**	-	-	-	-	**9'-11'**	9'	9'	10'	11'	11'	**9'**
Regional business	Arterial	Curb	Preferred	**6'-18'**	6'	16'	17'	18'	**4'-11'**	4'	7'	+2'	+4'	**11'-13'**	13'	11'	12'	12'	12'	**11'**
Regional business	Arterial	Curb	Constrained	**5'-16'**	5'	14'	15'	16'	**3'-9'**	3'	6'	+1'6"	+3'	**10'-11'**	10'	10'	11'	11'	11'	**10'**
Regional business	Collector	Curb	Preferred	**6'-18'**	6'	16'	17'	18'	**4'-10'**	4'	6'	+2'	+4'	**11'-12'**	11'	11'	12'	12'	12'	**11'**
Regional business	Collector	Curb	Constrained	**5'-16'**	5'	14'	15'	16'	**3'-8'**	3'	5'	+1'6"	+3'	**10'-11'**	10'	10'	11'	11'	11'	**9'**
Regional business	Local	Curb	Preferred	**6'-18'**	6'	16'	17'	18'	**-**	-	-	-	-	**10'-12'**	10'	10'	11'	12'	12'	**10'**
Regional business	Local	Curb	Constrained	**5'-16'**	5'	14'	15'	16'	**-**	-	-	-	-	**9'-11'**	9'	9'	10'	11'	11'	**9'**
Industrial	Arterial	Curb	Preferred	**7'-18'**	7'	16'	17'	18'	**5'-11'**	5'	7'	+2'	+4'	**14'-15'**	14'	14'	15'	15'	14'	**13'**
Industrial	Arterial	Curb	Constrained	**6'-16'**	6'	14'	15'	16'	**3'-9'**	3'	6'	+1'6"	+3'	**12'-13'**	13'	12'	13'	13'	12'	**12'**
Industrial	Collector	Curb	Preferred	**7'-18'**	7'	16'	17'	18'	**4'-10'**	4'	6'	+2'	+4'	**14'-15'**	14'	14'	15'	15'	14'	**13'**
Industrial	Collector	Curb	Constrained	**6'-16'**	6'	14'	15'	16'	**3'-8'**	3'	5'	+1'6"	+3'	**12'-13'**	13'	12'	13'	13'	12'	**12'**
Industrial	Local	Curb	Preferred	**7'-18'**	7'	16'	17'	18'	**-**	-	-	-	-	**13'-14'**	13'	13'	14'	14'	13'	**13'**
Industrial	Local	Curb	Constrained	**6'-16'**	6'	14'	15'	16'	**-**	-	-	-	-	**12'**	12'	12'	12'	12'	12'	**12'**

Center / median zone

Primary land use	Street classification	Drainage	Preferred or Constrained	Median	curb and gutter (x2)	back curb to back curb	Turn lane
Residential	Arterial	Curb	Preferred	**12'**	1'9" each	8'6"	**12'**
Residential	Arterial	Curb	Constrained	**11'**	1'9" each	7'6"	**11'**
Residential	Collector	Curb	Preferred	**12'**	1'9" each	8'6"	**12'**
Residential	Collector	Curb	Constrained	**11'**	1'9" each	7'6"	**11'**
Residential	Local	Curb	Preferred	**-**	-	-	**12'**
Residential	Local	Curb	Constrained	**-**	-	-	**11'**
Mixed-use / local business	Arterial	Curb	Preferred	**12'**	1'9" each	8'6"	**12'**
Mixed-use / local business	Arterial	Curb	Constrained	**11'**	1'9" each	7'6"	**11'**
Mixed-use / local business	Collector	Curb	Preferred	**12'**	1'9" each	8'6"	**12'**
Mixed-use / local business	Collector	Curb	Constrained	**11'**	1'9" each	7'6"	**11'**
Mixed-use / local business	Local	Curb	Preferred	**-**	-	-	**12'**
Mixed-use / local business	Local	Curb	Constrained	**-**	-	-	**11'**
Regional business	Arterial	Curb	Preferred	**12'**	1'9" each	8'6"	**12'**
Regional business	Arterial	Curb	Constrained	**11'**	1'9" each	7'6"	**11'**
Regional business	Collector	Curb	Preferred	**12'**	1'9" each	8'6"	**12'**
Regional business	Collector	Curb	Constrained	**11'**	1'9" each	7'6"	**11'**
Regional business	Local	Curb	Preferred	**-**	-	-	**12'**
Regional business	Local	Curb	Constrained	**-**	-	-	**11'**
Industrial	Arterial	Curb	Preferred	**14'**	1'9" each	10'6"	**14'**
Industrial	Arterial	Curb	Constrained	**12'**	1'9" each	8'6"	**12'**
Industrial	Collector	Curb	Preferred	**-**	-	-	**-**
Industrial	Collector	Curb	Constrained	**-**	-	-	**-**
Industrial	Local	Curb	Preferred	**-**	-	-	**-**
Industrial	Local	Curb	Constrained	**-**	-	-	**-**

- = not typical; * = additional space may be needed for transit stop accommodation; ** = does not include 2 foot wide gutter pan; *** = lane width without parking (provide extra space for parking type, if provided)

The matrix shows recommended and constrained widths for different zones under varying circumstances (if the zone is included). In some cases, the zone may be completely removed. The constrained width shows the width in constrained circumstances if the zone is included.

When using the matrix, select the highest number for that zone based on the accommodations identified (eg. Frontage zone that has zero setback and a sidepath, the preferred width is 3 feet).

This matrix is intended to be a guide for typical sections. For unique situations or for additional guidance, refer the to section in Chapter 4 specific to the zone in question.

Table 2: General Urban Matrix

Decision Tree Elements				Sidewalk zone														Travel zone																	Center / median zone			
Primary land use	Street classification	Drainage	Preferred or Constrained	**Frontage zone**	w/ no setback	w/ sidewalk café	w/ setback	w/ sidepath	**Pedestrian zone**	Sidewalk	Sidepath	**Amenity zone***	w/ amenities	w/ sidewalk café	**Curb zone**	Curb	Gutter pan	**Parking Zone****	Parallel**	45 degree**	60 degree**	90 degree**	**Bike lane (+ buffer)**	w/o parking**	w/ parking	*w/ single buffer*	*w double buffer*	**Outside travel lane**	Marked shared lane**	w/o parking**	w/ parallel parking	w/ angled parking	w/ transit service***	**General travel lanes**	**Median**	curb and gutter (x2)	back curb to back curb	**Turn lane**
Residential	Arterial	Curb	Preferred	**0'-3'**	3'	-	0'	2'	**6'-12'**	6'	12'	**8'**	8'	-	**2'6"**	6"	2'	**6'-18'**	6'	16'	17'	18'	**4'-10'**	4'	6'	*+2'*	*+4'*	**11'-13'**	13'	11'	11'	12'	12'	**11'**	**12'**	1'9" each	8'6"	**12'**
			Constrained	**0'-2'**	1'	-	0'	2'	**5'-10'**	5'	10'	**5'**	5'	-	**2'6"**	6"	2'	**5'-16'**	5'	14'	15'	16'	**3'-8'**	3'	5'	*+1'6"*	*+3'*	**10'-11'**	10'	10'	10'	11'	11'	**10'**	**11'**	1'9" each	7'6"	**11'**
	Collector	Curb	Preferred	**0'-3'**	3'	-	0'	2'	**6'-12'**	5'	12'	**8'**	8'	-	**2'6"**	6"	2'	**6'-18'**	6'	16'	17'	18'	**4'-10'**	4'	6'	*+2'*	*+4'*	**10'-12'**	10'	10'	10'	12'	12'	**10'**	**12'**	1'9" each	8'6"	**12'**
			Constrained	**0'-2'**	1'	-	0'	2'	**5'-10'**	5'	10'	**5'**	5'	-	**2'6"**	6"	2'	**5'-16'**	5'	14'	15'	16'	**3'-8'**	3'	5'	*+1'6"*	*+3'*	**9'-11'**	9'	9'	9'	11'	11'	**9'**	**11'**	1'9" each	7'6"	**11'**
	Local	Curb	Preferred	**0'-2'6"**	2'6"	-	0'	2'	**6'-12'**	5'	12'	**8'**	8'	-	**2'6"**	6"	2'	**6'-18'**	5'	16'	17'	18'	**-**	-	-	-	-	**10'-12'**	10'	10'	10'	12'	12'	**10'**	**-**	-	-	**12'**
			Constrained	**0'-2'**	1'	-	0'	2'	**5'-10'**	5'	10'	**5'**	5'	-	**2'6"**	6"	2'	**5'-16'**	5'	14'	15'	16'	**-**	-	-	-	-	**9'-11'**	9'	9'	9'	11'	11'	**9'**	**-**	-	-	**11'**
Mixed-use / local business	Arterial	Curb	Preferred	**0'-8'**	3'	8'	0'	2'	**8'-12'**	8'	12'	**7'-8'**	7'	8'	**2'6"**	6"	2'	**6'-18'**	6'	16'	17'	18'	**4'-11'**	4'	7'	*+2'*	*+4'*	**11'-13'**	13'	11'	12'	12'	12'	**11'**	**12'**	1'9" each	8'6"	**12'**
			Constrained	**0'-6'**	2'	6'	0'	2'	**5'-10'**	5'	10'	**5'**	5'	-	**2'6"**	6"	2'	**5'-16'**	5'	14'	15'	16'	**3'-9'**	3'	6'	*+1'6"*	*+3'*	**10'-11'**	10'	10'	11'	11'	11'	**10'**	**11'**	1'9" each	7'6"	**11'**
	Collector	Curb	Preferred	**0'-8'**	3'	8'	0'	2'	**6'-12'**	6'	12'	**7'-8'**	7'	8'	**2'6"**	6"	2'	**6'-18'**	6'	16'	17'	18'	**4'-10'**	4'	6'	*+2'*	*+4'*	**11'-12'**	11'	11'	12'	12'	12'	**11'**	**12'**	1'9" each	8'6"	**12'**
			Constrained	**0'-6'**	2'	6'	0'	2'	**5'-10'**	5'	10'	**5'**	5'	-	**2'6"**	6"	2'	**5'-16'**	5'	14'	15'	16'	**3'-8'**	3'	5'	*+1'6"*	*+3'*	**10'-11'**	10'	10'	11'	11'	11'	**9'**	**11'**	1'9" each	7'6"	**11'**
	Local	Curb	Preferred	**0'-8'**	2'6"	8'	0'	2'	**6'-12'**	6'	12'	**7'-8'**	7'	8'	**2'6"**	6"	2'	**6'-18'**	6'	16'	17'	18'	**-**	-	-	-	-	**10'-12'**	10'	10'	11'	12'	12'	**10'**	**-**	-	-	**12'**
			Constrained	**0'-6'**	2'	6'	0'	2'	**5'-10'**	5'	10'	**5'**	5'	-	**2'6"**	6"	2'	**5'-16'**	5'	14'	15'	16'	**-**	-	-	-	-	**9'-11'**	9'	9'	10'	11'	11'	**9'**	**-**	-	-	**11'**
Regional business	Arterial	Curb	Preferred	**0'-8'**	3'	8'	0'	2'	**8'-12'**	8'	12'	**7'-8'**	7'	8'	**2'6"**	6"	2'	**6'-18'**	6'	16'	17'	18'	**4'-11'**	4'	7'	*+2'*	*+4'*	**11'-13'**	13'	11'	12'	12'	12'	**11'**	**12'**	1'9" each	8'6"	**12'**
			Constrained	**0'-6'**	2'	6'	0'	2'	**5'-10'**	5'	10'	**5'**	5'	-	**2'6"**	6"	2'	**5'-16'**	5'	14'	15'	16'	**3'-9'**	3'	6'	*+1'6"*	*+3'*	**10'-11'**	10'	10'	11'	11'	11'	**10'**	**11'**	1'9" each	7'6"	**11'**
	Collector	Curb	Preferred	**0'-8'**	3'	8'	0'	2'	**6'-12'**	6'	12'	**7'-8'**	7'	8'	**2'6"**	6"	2'	**6'-18'**	6'	16'	17'	18'	**4'-10'**	4'	6'	*+2'*	*+4'*	**11'-12'**	11'	11'	12'	12'	12'	**11'**	**12'**	1'9" each	8'6"	**12'**
			Constrained	**0'-6'**	2'	6'	0'	2'	**5'-10'**	5'	10'	**5'**	5'	-	**2'6"**	6"	2'	**5'-16'**	5'	14'	15'	16'	**3'-8'**	3'	5'	*+1'6"*	*+3'*	**10'-11'**	10'	10'	11'	11'	11'	**9'**	**11'**	1'9" each	7'6"	**11'**
	Local	Curb	Preferred	**0'-8'**	2'6"	8'	0'	2'	**6'-12'**	6'	12'	**7'-8'**	7'	8'	**2'6"**	6"	2'	**6'-18'**	6'	16'	17'	18'	**-**	-	-	-	-	**10'-12'**	10'	10'	11'	12'	12'	**10'**	**-**	-	-	**12'**
			Constrained	**0'-6'**	2'	6'	0'	2'	**5'-10'**	5'	10'	**5'**	5'	-	**2'6"**	6"	2'	**5'-16'**	5'	14'	15'	16'	**-**	-	-	-	-	**9'-11'**	9'	9'	10'	11'	11'	**9'**	**-**	-	-	**11'**
Industrial	Arterial	Curb	Preferred	**0'-3'**	3'	-	0'	2'	**6'-12'**	6'	12'	**7'**	7'	-	**2'6"**	6"	2'	**7'-18'**	7'	16'	17'	18'	**5'-11'**	5'	7'	*+2'*	*+4'*	**14'-15'**	14'	14'	15'	15'	14'	**13'**	**14'**	1'9" each	10'6"	**14'**
			Constrained	**0'-2'**	2'	-	0'	2'	**5'-10'**	5'	10'	**5'**	5'	-	**2'6"**	6"	2'	**6'-16'**	6'	14'	15'	16'	**3'-9'**	3'	6'	*+1'6"*	*+3'*	**12'-13'**	13'	12'	13'	13'	12'	**12'**	**12'**	1'9" each	8'6"	**12'**
	Collector	Curb	Preferred	**0'-3'**	3'	-	0'	2'	**6'-12'**	5'	12'	**7'**	7'	-	**2'6"**	6"	2'	**7'-18'**	7'	16'	17'	18'	**4'-10'**	4'	6'	*+2'*	*+4'*	**14'-15'**	14'	14'	15'	15'	14'	**13'**	**-**	-	-	**-**
			Constrained	**0'-2'**	2'	-	0'	2'	**5'-10'**	5'	10'	**5'**	5'	-	**2'6"**	6"	2'	**6'-16'**	6'	14'	15'	16'	**3'-8'**	3'	5'	*+1'6"*	*+3'*	**12'-13'**	13'	12'	13'	13'	12'	**12'**	**-**	-	-	**-**
	Local	Curb	Preferred	**0'-2'6"**	2'6"	-	0'	2'	**6'-12'**	5'	12'	**7'**	7'	-	**2'6"**	6"	2'	**7'-18'**	7'	16'	17'	18'	**-**	-	-	-	-	**13'-14'**	13'	13'	14'	14'	13'	**13'**	**-**	-	-	**-**
			Constrained	**0'-2'**	2'	-	0'	2'	**5'-10'**	5'	10'	**5'**	5'	-	**2'6"**	6"	2'	**6'-16'**	6'	14'	15'	16'	**-**	-	-	-	-	**12'**	12'	12'	12'	12'	12'	**12'**	**-**	-	-	**-**

*- = not typical; * = additional space may be needed for transit stop accommodation; ** = does not include 2 foot wide gutter pan; *** = lane width without parking (provide extra space for parking type, if provided)*

The matrix shows recommended and constrained widths for different zones under varying circumstances (if the zone is included). In some cases, the zone may be completely removed. The constrained width shows the width in constrained circumstances if the zone is included.

When using the matrix, select the highest number for that zone based on the accommodations identified (eg. Frontage zone that has zero setback and a sidepath, the preferred width is 3 feet).

This matrix is intended to be a guide for typical sections. For unique situations or for additional guidance, refer the to section in Chapter 4 specific to the zone in question.

Table 3: Suburban Curb & Gutter Matrix

Decision Tree Elements / Sidewalk zone

Primary land use	Street classification	Drainage	Preferred or Constrained	Frontage zone	w/ no setback	w/ sidewalk café	w/ setback	w/ sidepath	Pedestrian zone	Sidewalk	Sidepath	Amenity zone*	w/ amenities	w/ sidewalk café	Curb zone	Curb	Gutter pan
Residential	Arterial	Curb	Preferred	0'-3'	3'	-	0'	2'	6'-12'	6'	12'	8'	8'	-	2'6"	6"	2'
Residential	Arterial	Curb	Constrained	0'-2'	1'	-	0'	2'	5'-10'	5'	10'	5'	5'	-	2'6"	6"	2'
Residential	Collector	Curb	Preferred	0'-3'	3'	-	0'	2'	6'-12'	5'	12'	8'	8'	-	2'6"	6"	2'
Residential	Collector	Curb	Constrained	0'-2'	1'	-	0'	2'	5'-10'	5'	10'	5'	5'	-	2'6"	6"	2'
Residential	Local	Curb	Preferred	0'-2'6"	2'6"	-	0'	2'	6'-12'	5'	12'	8'	8'	-	2'6"	6"	2'
Residential	Local	Curb	Constrained	0'-2'	1'	-	0'	2'	5'-10'	5'	10'	5'	5'	-	2'6"	6"	2'
Mixed-use / local business	Arterial	Curb	Preferred	0'-8'	3'	8'	0'	2'	6'-12'	6'	12'	8'	8'	8'	2'6"	6"	2'
Mixed-use / local business	Arterial	Curb	Constrained	0'-6'	2'	6'	0'	2'	5'-10'	5'	10'	5'	5'	-	2'6"	6"	2'
Mixed-use / local business	Collector	Curb	Preferred	0'-8'	3'	8'	0'	2'	6'-12'	6'	12'	8'	8'	8'	2'6"	6"	2'
Mixed-use / local business	Collector	Curb	Constrained	0'-6'	2'	6'	0'	2'	5'-10'	5'	10'	5'	5'	-	2'6"	6"	2'
Mixed-use / local business	Local	Curb	Preferred	0'-8'	2'6"	8'	0'	2'	6'-12'	6'	12'	8'	8'	8'	2'6"	6"	2'
Mixed-use / local business	Local	Curb	Constrained	0'-6'	2'	6'	0'	2'	5'-10'	5'	10'	5'	5'	-	2'6"	6"	2'
Regional business	Arterial	Curb	Preferred	0'-8'	3'	8'	0'	2'	6'-12'	6'	12'	8'	8'	8'	2'6"	6"	2'
Regional business	Arterial	Curb	Constrained	0'-6'	2'	6'	0'	2'	5'-10'	5'	10'	5'	5'	-	2'6"	6"	2'
Regional business	Collector	Curb	Preferred	0'-8'	3'	8'	0'	2'	6'-12'	6'	12'	8'	8'	8'	2'6"	6"	2'
Regional business	Collector	Curb	Constrained	0'-6'	2'	6'	0'	2'	5'-10'	5'	10'	5'	5'	-	2'6"	6"	2'
Regional business	Local	Curb	Preferred	0'-8'	2'6"	8'	0'	2'	6'-12'	6'	12'	8'	8'	8'	2'6"	6"	2'
Regional business	Local	Curb	Constrained	0'-6'	2'	6'	0'	2'	5'-10'	5'	10'	5'	5'	-	2'6"	6"	2'
Industrial	Arterial	Curb	Preferred	0'-3'	3'	-	0'	2'	6'-12'	6'	12'	8'	8'	-	2'6"	6"	2'
Industrial	Arterial	Curb	Constrained	0'-2'	2'	-	0'	2'	5'-10'	5'	10'	5'	5'	-	2'6"	6"	2'
Industrial	Collector	Curb	Preferred	0'-3'	3'	-	0'	2'	6'-12'	5'	12'	8'	8'	-	2'6"	6"	2'
Industrial	Collector	Curb	Constrained	0'-2'	2'	-	0'	2'	5'-10'	5'	10'	5'	5'	-	2'6"	6"	2'
Industrial	Local	Curb	Preferred	0'-2'6"	2'6"	-	0'	2'	6'-12'	5'	12'	8'	8'	-	2'6"	6"	2'
Industrial	Local	Curb	Constrained	0'-2'	2'	-	0'	2'	5'-10'	5'	10'	5'	5'	-	2'6"	6"	2'

Travel zone

Primary land use	Street classification	Drainage	Preferred or Constrained	Parking Zone**	Parallel**	45 degree**	60 degree**	90 degree**	Bike lane (+ buffer)	w/o parking**	w/ parking	w/ single buffer	w/ double buffer	Outside travel lane	Marked shared lane**	w/o parking**	w/ parallel parking	w/ angled parking	w/ transit service***	General travel lanes
Residential	Arterial	Curb	Preferred	6'-18'	6'	16'	17'	18'	4'-10'	4'	6'	+2'	+4'	11'-12'	-	11'	-	-	12'	11'
Residential	Arterial	Curb	Constrained	5'-16'	5'	14'	15'	16'	3'-8'	3'	5'	+1'6"	+3'	10'-11'	-	10'	-	-	11'	10'
Residential	Collector	Curb	Preferred	6'-18'	6'	16'	17'	18'	4'-10'	4'	6'	+2'	+4'	10'-12'	10'	10'	10'	12'	12'	10'
Residential	Collector	Curb	Constrained	5'-16'	5'	14'	15'	16'	3'-8'	3'	5'	+1'6"	+3'	9'-11'	9'	9'	9'	11'	11'	9'
Residential	Local	Curb	Preferred	6'-18'	5'	16'	17'	18'	-	-	-	-	-	10'-12'	10'	10'	10'	12'	12'	10'
Residential	Local	Curb	Constrained	5'-16'	5'	14'	15'	16'	-	-	-	-	-	9'-11'	9'	9'	9'	11'	11'	9'
Mixed-use / local business	Arterial	Curb	Preferred	6'-18'	6'	16'	17'	18'	4'-11'	4'	7'	+2'	+4'	11'-12'	-	11'	-	-	12'	11'
Mixed-use / local business	Arterial	Curb	Constrained	5'-16'	5'	14'	15'	16'	3'-9'	3'	6'	+1'6"	+3'	10'-11'	-	10'	-	-	11'	10'
Mixed-use / local business	Collector	Curb	Preferred	6'-18'	6'	16'	17'	18'	4'-10'	4'	6'	+2'	+4'	11'-12'	11'	11'	12'	12'	12'	11'
Mixed-use / local business	Collector	Curb	Constrained	5'-16'	5'	14'	15'	16'	3'-8'	3'	5'	+1'6"	+3'	10'-11'	10'	10'	11'	11'	11'	9'
Mixed-use / local business	Local	Curb	Preferred	6'-18'	6'	16'	17'	18'	-	-	-	-	-	10'-12'	10'	10'	11'	12'	12'	10'
Mixed-use / local business	Local	Curb	Constrained	5'-16'	5'	14'	15'	16'	-	-	-	-	-	9'-11'	9'	9'	10'	11'	11'	9'
Regional business	Arterial	Curb	Preferred	6'-18'	6'	16'	17'	18'	4'-11'	4'	7'	+2'	+4'	11'-12'	-	11'	-	-	12'	11'
Regional business	Arterial	Curb	Constrained	5'-16'	5'	14'	15'	16'	3'-9'	3'	6'	+1'6"	+3'	10'-11'	-	10'	-	-	11'	10'
Regional business	Collector	Curb	Preferred	6'-18'	6'	16'	17'	18'	4'-10'	4'	6'	+2'	+4'	11'-12'	11'	11'	12'	12'	12'	11'
Regional business	Collector	Curb	Constrained	5'-16'	5'	14'	15'	16'	3'-8'	3'	5'	+1'6"	+3'	10'-11'	10'	10'	11'	11'	11'	9'
Regional business	Local	Curb	Preferred	6'-18'	6'	16'	17'	18'	-	-	-	-	-	10'-12'	10'	10'	11'	12'	12'	10'
Regional business	Local	Curb	Constrained	5'-16'	5'	14'	15'	16'	-	-	-	-	-	9'-11'	9'	9'	10'	11'	11'	9'
Industrial	Arterial	Curb	Preferred	7'-18'	7'	16'	17'	18'	5'-11'	5'	7'	+2'	+4'	14'	-	14'	-	-	14'	13'
Industrial	Arterial	Curb	Constrained	6'-16'	6'	14'	15'	16'	3'-9'	3'	6'	+1'6"	+3'	12'	-	12'	-	-	12'	12'
Industrial	Collector	Curb	Preferred	7'-18'	7'	16'	17'	18'	4'-10'	4'	6'	+2'	+4'	14'-24'	14'	14'	15'	14'	14'	13'
Industrial	Collector	Curb	Constrained	6'-16'	6'	14'	15'	16'	3'-8'	3'	5'	+1'6"	+3'	12'-13'	13'	12'	13'	13'	12'	12'
Industrial	Local	Curb	Preferred	7'-18'	7'	16'	17'	18'	-	-	-	-	-	13'-14'	13'	13'	14'	14'	13'	13'
Industrial	Local	Curb	Constrained	6'-16'	6'	14'	15'	16'	-	-	-	-	-	12'	12'	12'	12'	12'	12'	12'

Center / median zone

Primary land use	Street classification	Drainage	Preferred or Constrained	Median	curb and gutter (x2)	back curb to back curb	Turn lane
Residential	Arterial	Curb	Preferred	12'	1'9" each	8'6"	12'
Residential	Arterial	Curb	Constrained	11'	1'9" each	7'6"	11'
Residential	Collector	Curb	Preferred	12'	1'9" each	8'6"	12'
Residential	Collector	Curb	Constrained	11'	1'9" each	7'6"	11'
Residential	Local	Curb	Preferred	-	-	-	12'
Residential	Local	Curb	Constrained	-	-	-	11'
Mixed-use / local business	Arterial	Curb	Preferred	12'	1'9" each	8'6"	12'
Mixed-use / local business	Arterial	Curb	Constrained	11'	1'9" each	7'6"	11'
Mixed-use / local business	Collector	Curb	Preferred	12'	1'9" each	8'6"	12'
Mixed-use / local business	Collector	Curb	Constrained	11'	1'9" each	7'6"	11'
Mixed-use / local business	Local	Curb	Preferred	-	-	-	12'
Mixed-use / local business	Local	Curb	Constrained	-	-	-	11'
Regional business	Arterial	Curb	Preferred	12'	1'9" each	8'6"	12'
Regional business	Arterial	Curb	Constrained	11'	1'9" each	7'6"	11'
Regional business	Collector	Curb	Preferred	12'	1'9" each	8'6"	12'
Regional business	Collector	Curb	Constrained	11'	1'9" each	7'6"	11'
Regional business	Local	Curb	Preferred	-	-	-	12'
Regional business	Local	Curb	Constrained	-	-	-	11'
Industrial	Arterial	Curb	Preferred	14'	1'9" each	10'6"	14'
Industrial	Arterial	Curb	Constrained	12'	1'9" each	8'6"	12'
Industrial	Collector	Curb	Preferred	-	-	-	-
Industrial	Collector	Curb	Constrained	-	-	-	-
Industrial	Local	Curb	Preferred	-	-	-	-
Industrial	Local	Curb	Constrained	-	-	-	-

*- = not typical; * = additional space may be needed for transit stop accommodation; ** = does not include 2 foot wide gutter pan; *** = lane width without parking (provide extra space for parking type, if provided)*

The matrix shows recommended and constrained widths for different zones under varying circumstances (if the zone is included). In some cases, the zone may be completely removed. The constrained width shows the width in constrained circumstances if the zone is included.

When using the matrix, select the highest number for that zone based on the accommodations identified (eg. Frontage zone that has zero setback and a sidepath, the preferred width is 3 feet).

This matrix is intended to be a guide for typical sections. For unique situations or for additional guidance, refer the to section in Chapter 4 specific to the zone in question.

Table 4: Suburban Open Ditch Matrix

Decision Tree Elements				Sidewalk zone									Travel zone									Center / median zone			
Primary land use	Street classification	Drainage	Preferred or Constrained	**Frontage zone**	w/ no setback	w/ sidewalk café	w/ setback	w/ sidepath	**Pedestrian zone**	Sidewalk	Sidepath	**Amenity zone***	**Shoulder**	Paved or unpaved	Paved for bike use	**Outside travel lane****	Marked shared lane	w/o parallel parking	w/ parallel parking	w/ transit service	**General travel lanes**	**Median**	curb and gutter (x2)	back curb to back curb	**Turn lane**
Residential	Arterial	Ditch	Preferred	**0'-3'**	3'	-	0'	2'	**6'-12'**	6'	12'	*	**3'-5'**	3'	5'	**12'**	-	12'	-	12'	**11'**	**12'**	1'9" each	8'6"	**12'**
			Constrained	**0'-2'**	1'	-	0'	2'	**5'-10'**	5'	10'	*	**2'-4'**	2'	4'	**11'**	-	11'	-	11'	**10'**	**11'**	1'9" each	7'6"	**11'**
	Collector	Ditch	Preferred	**0'-3'**	3'	-	0'	2'	**6'-12'**	5'	12'	*	**3'-5'**	3'	5'	**12'-13'**	13'	12'	13'	12'	**10'**	**12'**	1'9" each	8'6"	**12'**
			Constrained	**0'-2'**	1'	-	0'	2'	**5'-10'**	5'	10'	*	**2'-4'**	2'	4'	**11'-12'**	12'	11'	12'	11'	**9'**	**11'**	1'9" each	7'6"	**11'**
	Local	Ditch	Preferred	**0'-2'6"**	2'6"	-	0'	2'	**6'-12'**	5'	12'	*	**3'**	3'	-	**11'-12'**	12'	11'	12'	12'	**10'**	**-**	-	-	**12'**
			Constrained	**0'-2'**	1'	-	0'	2'	**5'-10'**	5'	10'	*	**2'**	2'	-	**10'-11'**	11'	10'	11'	11'	**9'**	**-**	-	-	**11'**
Mixed-use / local business	Arterial	Ditch	Preferred	**0'-8'**	3'	8'	0'	2'	**6'-12'**	6'	12'	*	**3'-5'**	3'	5'	**12'**	-	12'	-	12'	**11'**	**12'**	1'9" each	8'6"	**12'**
			Constrained	**0'-6'**	2'	6'	0'	2'	**5'-10'**	5'	10'	*	**2'-4'**	2'	4'	**11'**	-	11'	-	11'	**10'**	**11'**	1'9" each	7'6"	**11'**
	Collector	Ditch	Preferred	**0'-8'**	3'	8'	0'	2'	**6'-12'**	6'	12'	*	**3'-5'**	3'	5'	**12'-13'**	13'	12'	13'	12'	**11'**	**12'**	1'9" each	8'6"	**12'**
			Constrained	**0'-6'**	2'	6'	0'	2'	**5'-10'**	5'	10'	*	**2'-4'**	2'	4'	**11'-12'**	12'	11'	12'	11'	**9'**	**11'**	1'9" each	7'6"	**11'**
	Local	Ditch	Preferred	**0'-8'**	2'6"	8'	0'	2'	**6'-12'**	6'	12'	*	**3'**	3'	-	**12'**	12'	12'	12'	12'	**10'**	**-**	-	-	**12'**
			Constrained	**0'-6'**	2'	6'	0'	2'	**5'-10'**	5'	10'	*	**2'**	2'	-	**11'**	11'	11'	11'	11'	**9'**	**-**	-	-	**11'**
Regional business	Arterial	Ditch	Preferred	**0'-8'**	3'	8'	0'	2'	**6'-12'**	6'	12'	*	**3'-5'**	3'	5'	**12'**	-	12'	-	12'	**11'**	**12'**	1'9" each	8'6"	**12'**
			Constrained	**0'-6'**	2'	6'	0'	2'	**5'-10'**	5'	10'	*	**2'-4'**	2'	4'	**11'**	-	11'	-	11'	**10'**	**11'**	1'9" each	7'6"	**11'**
	Collector	Ditch	Preferred	**0'-8'**	3'	8'	0'	2'	**6'-12'**	6'	12'	*	**3'-5'**	3'	5'	**12'-13'**	13'	12'	13'	12'	**11'**	**12'**	1'9" each	8'6"	**12'**
			Constrained	**0'-6'**	2'	6'	0'	2'	**5'-10'**	5'	10'	*	**2'-4'**	2'	4'	**11'-12'**	12'	11'	12'	11'	**9'**	**11'**	1'9" each	7'6"	**11'**
	Local	Ditch	Preferred	**0'-8'**	2'6"	8'	0'	2'	**6'-12'**	6'	12'	*	**3'**	3'	-	**12'**	12'	12'	12'	12'	**10'**	**-**	-	-	**12'**
			Constrained	**0'-6'**	2'	6'	0'	2'	**5'-10'**	5'	10'	*	**2'**	2'	-	**11'**	11'	11'	11'	11'	**9'**	**-**	-	-	**11'**
Industrial	Arterial	Ditch	Preferred	**0'-3'**	3'	-	0'	2'	**6'-12'**	6'	12'	*	**3'-7'**	3'	6'	**14'**	-	14'	-	14'	**13'**	**14'**	1'9" each	10'6"	**14'**
			Constrained	**0'-2'**	2'	-	0'	2'	**5'-10'**	5'	10'	*	**2'-5'**	2'	5'	**12'**	-	12'	-	12'	**12'**	**12'**	1'9" each	8'6"	**12'**
	Collector	Ditch	Preferred	**0'-3'**	3'	-	0'	2'	**6'-12'**	5'	12'	*	**3'-5'**	3'	5'	**14'**	14'	14'	14'	14'	**13'**	**-**	-	-	**-**
			Constrained	**0'-2'**	2'	-	0'	2'	**5'-10'**	5'	10'	*	**2'-4'**	2'	4'	**12'-13'**	13'	12'	13'	12'	**12'**	**-**	-	-	**-**
	Local	Ditch	Preferred	**0'-2'6"**	2'6"	-	0'	2'	**6'-12'**	5'	12'	*	**3'**	3'	-	**13'**	13'	13'	13'	13'	**13'**	**-**	-	-	**-**
			Constrained	**0'-2'**	2'	-	0'	2'	**5'-10'**	5'	10'	*	**2'**	2'	-	**12'**	12'	12'	12'	12'	**12'**	**-**	-	-	**-**

- = not typical; * = dependent upon drainage requirements; ** = an additional 1 foot of pavement is required outside of the outside lane line

The matrix shows recommended and constrained widths for different zones under varying circumstances (if the zone is included). In some cases, the zone may be completely removed. The constrained width shows the width in constrained circumstances if the zone is included.

When using the matrix, select the highest number for that zone based on the accommodations identified (eg. Frontage zone that has zero setback and a sidepath, the preferred width is 3 feet).

This matrix is intended to be a guide for typical sections. For unique situations or for additional guidance, refer the to section in Chapter 4 specific to the zone in question.

INTRODUCTION

CHAPTER CONTENT & ORGANIZATION

This chapter identifies options for designing intersections based on the desired or existing configuration. Intersection treatments for motor vehicles are designed according to engineering considerations and the Pedestrian Master Plan contains detailed design guidance. This chapter presents general intersection design guidance with an emphasis on intersection design for bicycles.

This chapter covers the various types of intersections including mid-block crossings, driveways, and several types of street intersections including uncontrolled, stop controlled, and signalized. Preferred options for intersection treatments are identified for each type of intersection. The advantages, disadvantages, typical applications, and design guidance are also provided along with example configuration illustrations.

Although not all intersection options are covered in this chapter, the options presented represent the majority of the intersection configurations that Wichita will encounter when implementing the recommendations from the Bicycle Master Plan. For options and design treatments beyond those identified in this chapter, consult the Manual on Uniform Traffic Control Devices (MUTCD), American Association of State Highway and Transportation Officials (AASHTO) guides, National Association of City Transportation Officials (NACTO) guides, and Chapter 10 of the Institute of Transportation Engineers (ITE) Designing Walkable Urban Thoroughfares.

GENERAL DESIGN CONSIDERATIONS

Intersections are a place where conflict points exist. There are through movements, left turn movements, and right turn movements. A conflict point exists where a movement crosses, diverges from, or merges with another movement. For the transportation network to operate safely and efficiently, these conflict points need to be managed.

Proper intersection design allows all users to be confident and feel safe when crossing through intersections. This requires a delicate balance of the needs of each mode and all users including the elderly and mobility challenged.

There are many considerations when initially designing or redesigning an intersection. The following is a list of some of the major considerations:

- How will the intersection safely accommodate all users?
- How will it meet the projected use for each mode?
- How efficiently will it operate?
- How will it balance the demands for each mode?
- How will it provide for predictable and intuitive movements?
- How will it provide a high degree of visibility for all users?
- How will it complement the context of the surrounding development?

Intersections are the main points where pedestrians cross streets. Pedestrians often feel vulnerable crossing through intersections. Reducing the crossing distance and providing other enhancements can improve pedestrian confidence when crossing through intersections and even promote pedestrian travel.

Transit stops are frequently located at or very near intersections. Consideration should be given to the location of bus stops along existing and future transit routes. Along with transit, pedestrian crossings in close proximity to transit stops should be provided. Also, bicycle lane lines should be dotted (2 foot line and 4 foot gap) at bus stops and at bus pullouts For more information on transit stop design, refer to **Chapter 6**.

Bicyclists travel through intersections on both on-street and off-street facilities. Dedicated bicycle facilities should provide intuitive movements so all users know where to expect bicyclists to operate. Pavement markings and signage can help bicyclists navigate confusing or potentially hazardous intersections. Often times, there will be a “mixing zone” on the approach to an intersection, which is an area where bicyclists and cars can cross through the same space. The design guidance in this chapter identifies options for accommodating bicyclists at different types of intersections.

Motor vehicles (cars, trucks, motorcycles, large trucks, buses, emergency vehicles, etc.) will benefit from proper intersection design. This chapter does not expressly identify design guidance for accommodating motor vehicles. However, it provides guidance to allow for intersections to operate safely for all users, including motorists.

Specifically beneficial to motorists, consideration should be given to an intersection within the context of a corridor rather than an isolated point. Signal timing and synchronization can also benefit motorists by reducing delay at signalized intersections along a corridor. Improvements or modifications to other intersections along a corridor can also reduce conflicts at a problematic intersection by promoting an alternate route for vehilces.

AMERICANS WITH DISABILITIES ACT

Intersection treatment are required to follow the Americans with Disabilities Act (ADA). The United States Access Board has proposed guidelines for the design, construction, and alteration of facilities. This guidance covers sidewalks, street crossings, and other street elements. These Street Design Guidelines promote accessibility for all people no matter age or ability and are consistent with the proposed guidelines. It is assumed that all intersection designs will provide ADA accommodations. Therefore, limited ADA design guidance is provided by this document.

ACCESS MANAGEMENT

The City of Wichita’s access management guide outlines the preferred access management practices along major arterials. This policy encourages more motor vehicle travel along major streets and fewer through trips on minor local streets. It provides guidance and requirements for access management to improve the safety of intersections.

All major street approaches are required to include raised center medians at least 300 feet long and at least 4 feet wide. These medians are intended to reduce vehicular conflicts within an intersection area.

Property access points on arterial streets are also required to be setback from the intersection to improve safety and operations at intersections. A 200 foot setback is required for the first right-in/right-out driveway from an intersection. A 400 foot setback is required for first full-turning movement driveway. These measurements are to be from the point where street right-of-ways intersect.

Access points are required to be properly spaced. There must be at least:

- 400 feet between full-turning movement drives on the same side of the street
- 200 feet between right-in/right-out drives
- 200 feet minimum offset for drives not lined up on opposite sides of arterials and not having conflicting left turns
- 400 feet between drives on opposite sides

Where right-in/right-out drives are provided, a median to divert unintended vehicular movements should be considered. Also, the design of the right-in/right-out drive should properly channel traffic into the intended position and discourage use as a full-turning drive.

MID-BLOCK CROSSINGS

Mid-block crossings occur where a crosswalk is provided for pedestrians and bicyclists that is at least 100 feet away from a stop controlled or yield controlled cross street. Mid-block crossings can include a variety of treatments from simple pavement markings and signs to traffic signals with pedestrian signals.

GENERAL GUIDANCE

The design and crossing treatments for mid-block crossings should be based upon many factors. The number of lanes to be crossed, presence of median, average daily vehicular traffic, and speed limit should factor into the crossing treatment. Other considerations include site distances, pedestrian volumes, vehicle mix, lighting, et cetera.

Many bicycle boulevard identified in the Bicycle Master Plan intersect arterials near existing mid-block pedestrian crossing signals. Some may necessitate new mid-block crossing signals, depending on motor vehicle speeds, volumes, and gaps for crossings. It is important to provide a proper design to allow for bicyclists to travel between the bicycle boulevard and the crossing. Design guidance for this concept is provided in the stop controlled intersections section.

DESIGN GUIDANCE

Design guidance for mid-block crossings is provided in Appendix G of the Bicycle Master Plan. Guidance on mid-block crossing treatments are provided in Chapter 7 of the Pedestrian Master Plan (see guidance on Crosswalks, Crossing Island, Mid-Block Crossing, Rectangular Rapid Flash Beacons, Illumination at Pedestrian Crossings, and Curb Extensions).

DRIVEWAYS

A driveway is a vehicular access point between a street and adjacent property. These access points can be signalized but are most often uncontrolled. At uncontrolled driveways, the entering/exiting vehicle must yield the right-of-way to all users in the street or on the sidewalk or sidepath.

GENERAL GUIDANCE

Bicyclists and pedestrians will often travel across a driveway on the intersecting street. Signalized driveways should be treated like other signalized intersections. The design guidance for these intersections is presented later in this chapter in the signalized intersections section. Uncontrolled driveways should be treated differently than signalized driveways. The guidance in this section covers uncontrolled driveway intersections.

On-street bicycle facilities are often preferred over off-street facilities where there will be many uncontrolled driveway crossings. However, sidepaths may be the better option due to other circumstances like high motor vehicle speeds and volumes along the street.

DESIGN GUIDANCE

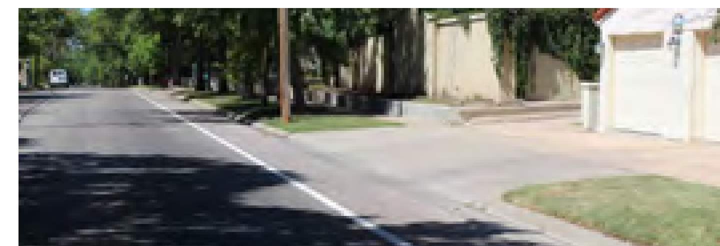
Sidewalks/Sidepaths

Sidewalks and sidepaths within the driveway should continue at the same grade as ingress and egress and must not exceed a 2 percent cross slope. These intersections should not look like typical street intersections with curb ramps down to and up from the driveway. The driveway apron between the sidewalk or sidepath should bring the driveway to the same grade as the sidewalk or sidepath.

The driveway apron should be completely within the amenity zone. Where the sidewalk or sidepath on either side of the driveway is directly adjacent to the curb, consider moving it back from the curb to be completely outside of the driveway apron. For additional guidance on driveway design, refer to the Pedestrian Master Plan and Bicycle Master Plan.

Bicycle Lanes

Conventional and buffered bicycle lanes at minor uncontrolled driveways should continue the solid bicycle lane lines. For buffered bicycle lanes, consider discontinuing any crosshatching in the buffer area. At major driveways, the bicycle lane lines should be terminated and dotted lane lines can be used.



The need for bicycle lane pavement markings (bicycle lane word and/or symbol and arrow markings, MUTCD 9C-3) indicating the bicycle lane should be considered after each driveway. They are not needed for each minor driveway, such as those to residences. These markings are more desirable when the driveway has a higher volume of traffic, such as uncontrolled driveways to major businesses.

Bicycle Boulevards (Shared Lane Markings)

Bicycle boulevards at uncontrolled driveways should continue with the typical design. Similar to bicycle lane pavement markings, consideration should be given to the need for placement of shared lane markings after major driveways.

Right-In/Right-Out

Where right-in/right-out driveways are used, consider the need for a center median to reinforce proper use of the driveway. Also, the driveway should be designed to channelize and deflect traffic into and out of the property to encourage proper use of the right-in/right-out concept.

UNCONTROLLED INTERSECTIONS

An uncontrolled intersection is a street intersection where no traffic signals or signs are used to indicate the right-of-way. Uncontrolled intersections also include those with yield signs.

GENERAL GUIDANCE

The guidance provided in this section covers intersections between two streets. See the previous section for guidance on uncontrolled driveway intersections.

Bicycle lanes are not anticipated to be provided along streets with uncontrolled intersections of two streets because most bicycle lanes are recommended to be placed on arterial or major collector streets. If they do, the bicycle lane lines should be discontinued through the intersection.

Streets with bicycle lanes may intersect other streets at a roundabout, which is considered an uncontrolled intersection. Also, bicycle boulevards may cross through uncontrolled street intersections. Design guidance for bicycle lanes at roundabouts as well as bicycle boulevards at uncontrolled intersections are provided in this section.

It may be desirable to provide marked crosswalks when sidewalks or sidepaths cross uncontrolled street intersections to enhance the visibility of the crossing. Additional crossing enhancements at these locations may also be desired due to motor vehicle speeds, volumes, and the number of lanes to cross. See Chapter 7 of the Pedestrian Master Plan for more information on crosswalks and additional treatments for uncontrolled intersections.

DESIGN GUIDANCE

Bicycle Lanes at Roundabouts

There are two options for designing bicycle lanes at roundabouts. The first option is to drop the bicycle lane prior to entering the roundabout. The bicyclist can travel through the intersection in the general travel lanes. The bicycle lane should be dotted for 50 to 200 feet prior to termination. The dotted line should terminate at least 50 feet from the crosswalk ramp.

The second option provides a ramp to the sidewalk or sidepath to allow the bicyclist to use the roundabout like a pedestrian. For this option, the bicycle lane should be dotted for 50 to 200 feet prior to termination. The dotted line should terminate at the ramp, which should be placed at least 50 feet from the crosswalk ramp.

These options are shown in **Figure 24** below and further described on page 4-64 of the AASHTO *Guide for the Development of Bicycle Facilities* (2012, 4th Edition).

Bicycle Boulevards (Shared Lane Markings)

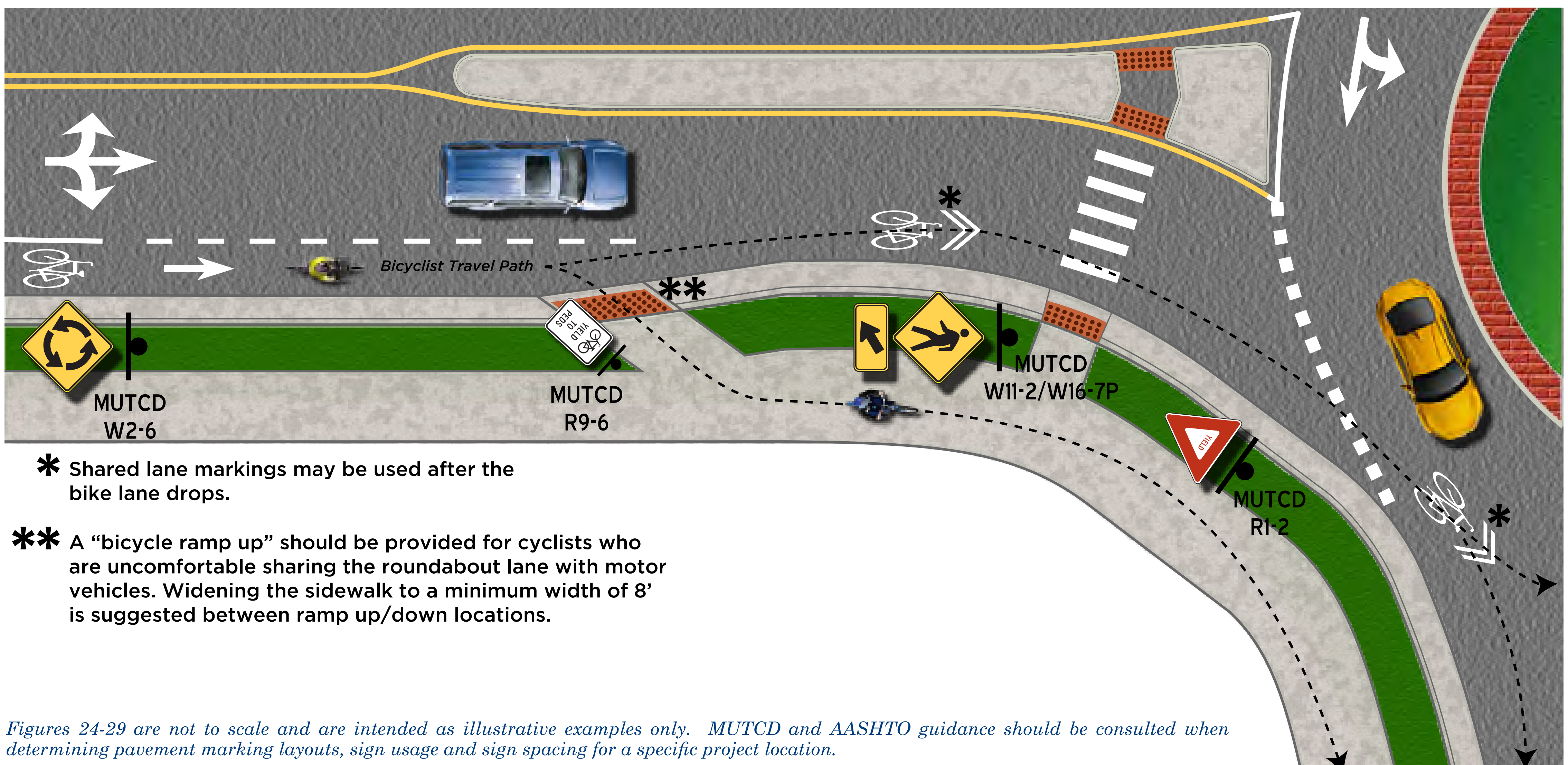
Bicycle boulevards may pass through uncontrolled intersections since they typically occur along low volume local or collector streets and often intersect with other low volume streets. These uncontrolled intersections may be configured like a typical intersection or a roundabout.

At typical intersections, such as 4-way intersections or T intersections, shared lane pavement markings should be provided after the intersection to enhance the visibility and guidance for bicycle use. To provide additional bicycle priority on the bicycle boulevard, stop or yield signs may be desirable on the cross street.

Bicycle boulevards may include mini roundabouts to decrease vehicular speeds and enhance the safety for bicyclists. These roundabouts should be sized to accommodate emergency vehicles. Shared lane pavement markings should be provided after the roundabout along the bicycle boulevard.

Additional guidance on bicycle boulevards is provided in Appendix G of the Bicycle Master Plan and for mini roundabouts (mini traffic circles) in Chapter 7 of the Pedestrian Master Plan.

Figure 24: Roundabout Treatment Options



Figures 24-29 are not to scale and are intended as illustrative examples only. MUTCD and AASHTO guidance should be consulted when determining pavement marking layouts, sign usage and sign spacing for a specific project location.

STOP CONTROLLED INTERSECTIONS

A stop controlled intersection is a street intersection where one or more of the approaches are stop controlled with signage to assign right-of-way to opposing traffic. These intersections use stop sign(s) to stop at least one direction of travel.

GENERAL GUIDANCE

Designing stop controlled intersections depends upon whether it is all-way stop controlled or just one or two directions are stop controlled. This section provides guidance for both situations.

DESIGN GUIDANCE

Sidewalks/Sidepaths

Where sidewalks or sidepaths cross at a stop controlled intersection, a marked crosswalk should be considered across the stop controlled street(s), especially in areas where pedestrian/bicyclist crossing volumes are high. Additional crossing enhancements may be desired, especially if the street being crossed is not stop controlled. Additional guidance on crosswalks at stop controlled intersections is available in Chapter 7 of the Pedestrian Master Plan.

Bicycle Lane on All-Way Stop

All-way stop intersections may include bicycle lanes. One option on the approach is to terminate the bicycle lane line and provide a shared lane marking. Another option is to use dotted bicycle lane lines 50 to 200 feet prior to the intersection and keep the dotted line against the curb since right turn lanes are not typically provided at all-way stops. The bicycle lane lines can also remain solid up to the intersection.

The bicycle lane lines should be completely discontinued through the intersection. Solid bicycle lane lines and bicycle lane pavement markings should be provided on the far side of the intersection if the bicycle lane is present on the far side. However, pavement markings may not be needed on the far side of all minor intersections.

Bicycle Lanes on Uncontrolled Movement

Bicycle lanes along arterials or major collectors will often cross through stop controlled intersections with the traffic on the arterial having the right-of-way. In this situation, the bicycle lane lines may remain solid. They can also be dotted for 50 to 200 feet on the approach if right turns are permitted. If right turns are prohibited, the lines should remain solid. The same guidance pertains to left side bicycle lanes on one way streets with left turn lanes.

If there is a right turn lane, the bicycle should follow the guidance for signalized intersections with a right turn lane. Refer to the sections on right turns and **Figure 25**.

The bicycle lane lines should be discontinued through the intersection. An optional dotted line can be provided through the intersection. Dotted lines should only be considered when extra guidance is needed for proper bicyclist positioning through an intersection.

On the far side of the intersection, bicycle lane lines should continue (if bicycle lane is present). Bicycle lane pavement markings should also be placed after the intersection, depending upon the need to express the bicycle lane use for bicyclists. They may not be needed at all minor intersections.

Bicycle Boulevards (Shared Lane Markings)

Bicycle boulevards should generally have the right-of-way at minor intersections. Consideration should be given to having the lanes along the bicycle boulevard uncontrolled and having the cross streets stop controlled. Another option is the inclusion of a mini roundabout. See the subsection on bicycle boulevards (shared lane markings) under the uncontrolled intersections section.

Regardless of whether or not bicycle boulevards have the right-of-way at stop controlled intersections, they should follow the typical design throughout the corridor. They should also have a shared lane marking on the far side of the intersection.

Bicycle boulevards are typically stop controlled when they intersect arterial streets and the arterial streets are not stop controlled. This typically does not provide for a safe crossing through the arterial, especially when traffic speeds and volumes are high along the arterial. Mid-block crossings or nearby intersection crosswalks may be utilized for safe crossings. Where bicyclists are encouraged to use a mid-block crossing or nearby crossing, the bicycle boulevard can transition into a sidepath prior to the intersection via a ramp similar to that illustrated in **Figure 26**. The transition can also be provided at the intersection, as illustrated on page G-21 in Appendix G of the Bicycle Master Plan. The sidepath should be a minimum of 8 feet wide (10 to 12 feet preferred) and connect to the crossing.

Where signalized crossings or other crossings are not in close proximity to the bicycle boulevard and arterial crossing, a new mid-block crossing in close proximity may be needed. Another option is to signalize the intersection. For additional guidance for bicycle boulevards and crossing arterial streets, refer to Appendix G of the Bicycle Master Plan.

SIGNALIZED INTERSECTIONS

A signal-controlled intersection is a street intersection where a traffic signal controller, either mechanical or electric, assigns right-of-way and indicates which traffic is allowed to proceed at any particular time. These are typically located where arterial streets intersect. They also occur where arterials intersect with higher volume collectors or entrances to major business developments.

This section provides some guidance for designing intersections to accommodate all modes, with additional detail for accommodating bicycle facilities at signalized intersections.

GENERAL GUIDANCE

The process of designing signalized intersections is complex. The design should consider context, street function, intersection geometry, and the volume of motor vehicles, bicyclists, and pedestrians. The design should create a balance for modes while enhancing the safety and predictability of movements at an intersection.

The following are some general design considerations for signalized intersections:

- Minimize unused space, such as excess pavement
- Eliminate unnecessary travel lanes
- Align lanes through an intersection
- Traffic signal coordination
- Restrict turns where they create safety conflicts or pose operational issues

Bicycle movements should be clearly defined on the approach to the intersection. If bicycle lane lines need to be dropped, a mixing zone should be defined so bicyclists and motorists know where their movements may conflict.

Pedestrian access and safety is a major consideration at signalized intersections. These intersections, like most others, should be compact to allow shorter pedestrian crossings while still accommodating motor vehicle and bicycle needs. Signalized intersections should have marked crosswalks on all legs of the intersection except where pedestrians are prohibited or where pedestrian facilities are not present or likely be provided. The crossings should be accompanied by pedestrian crossing controls and countdown signals. Additional guidance is found in Chapter 7 of the Pedestrian Master Plan.

DESIGN GUIDANCE

Bicycle Through Movement

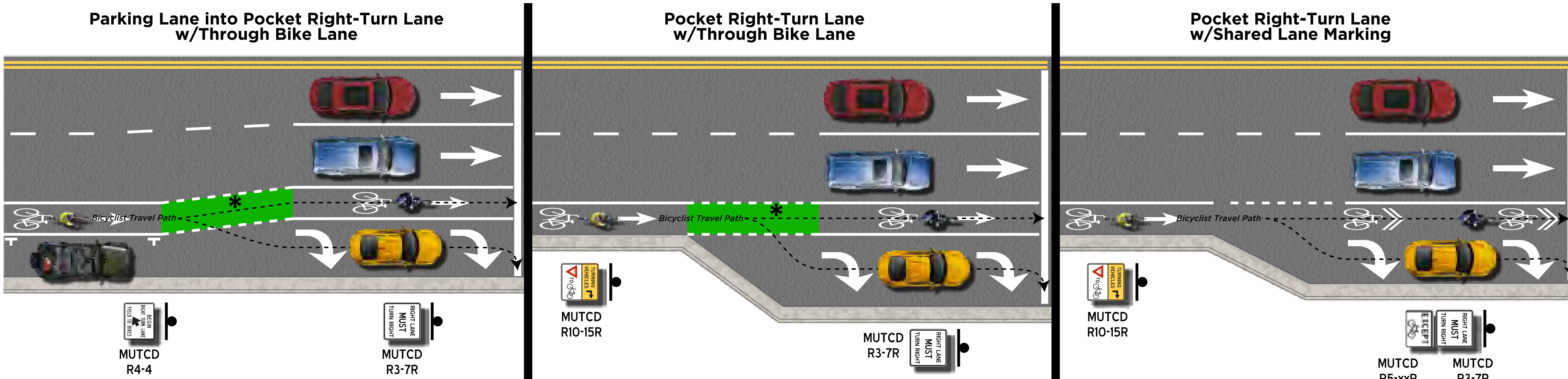
There are many options to provide for the through movement for bicyclists on the approach to an intersection. They are dependent upon the presence of right turn lanes if the bicycle lane is on the right side of the street. If they are on the left side of the street, they are dependent upon the presence of left turn lanes.

Bicycle lanes can be dotted or dotted and colored to guide bicyclists through the intersection. This treatment may be desired where extra guidance is needed for bicyclists to travel through the intersection, such as at large intersections, skewed intersections, or intersections with long and undefined areas. Where the bicycle lane continues on the far side of the intersection, solid bicycle lane lines should be provided after the intersection as well as a bicycle lane pavement marking.

If no right turn lane is present for a right side bicycle lane (or no left turn lane is present for a left side bicycle lane), the bicycle lane can remain solid or be dotted for 50 to 200 feet in advance of the intersection. Although less desirable, the bicycle lane can also be completely dropped. If dropped, shared lane markings are encouraged.

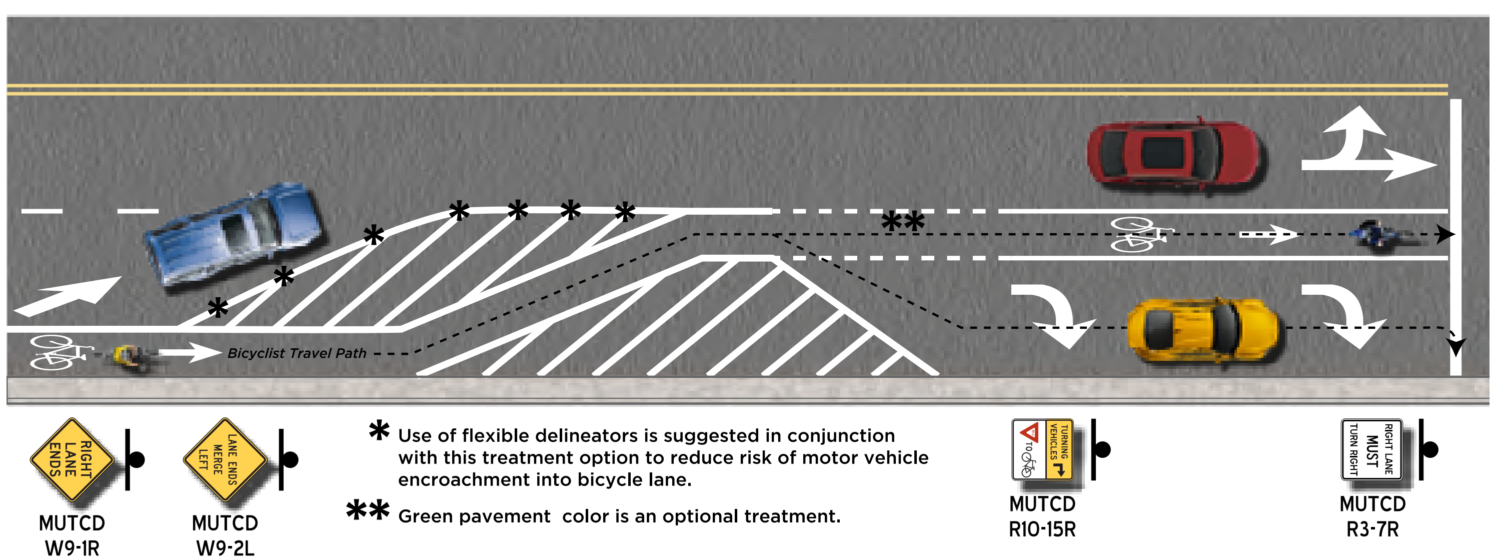
In certain circumstances, it may be desirable to provide a forward stop bar for bicylists. This allows bicyclists to stop ahead of motor vehicles at intersections in a highly visible position. This

Figure 25: Bicycle Lane with Right Turn Lane



✱ Use of green pavement color is optional.

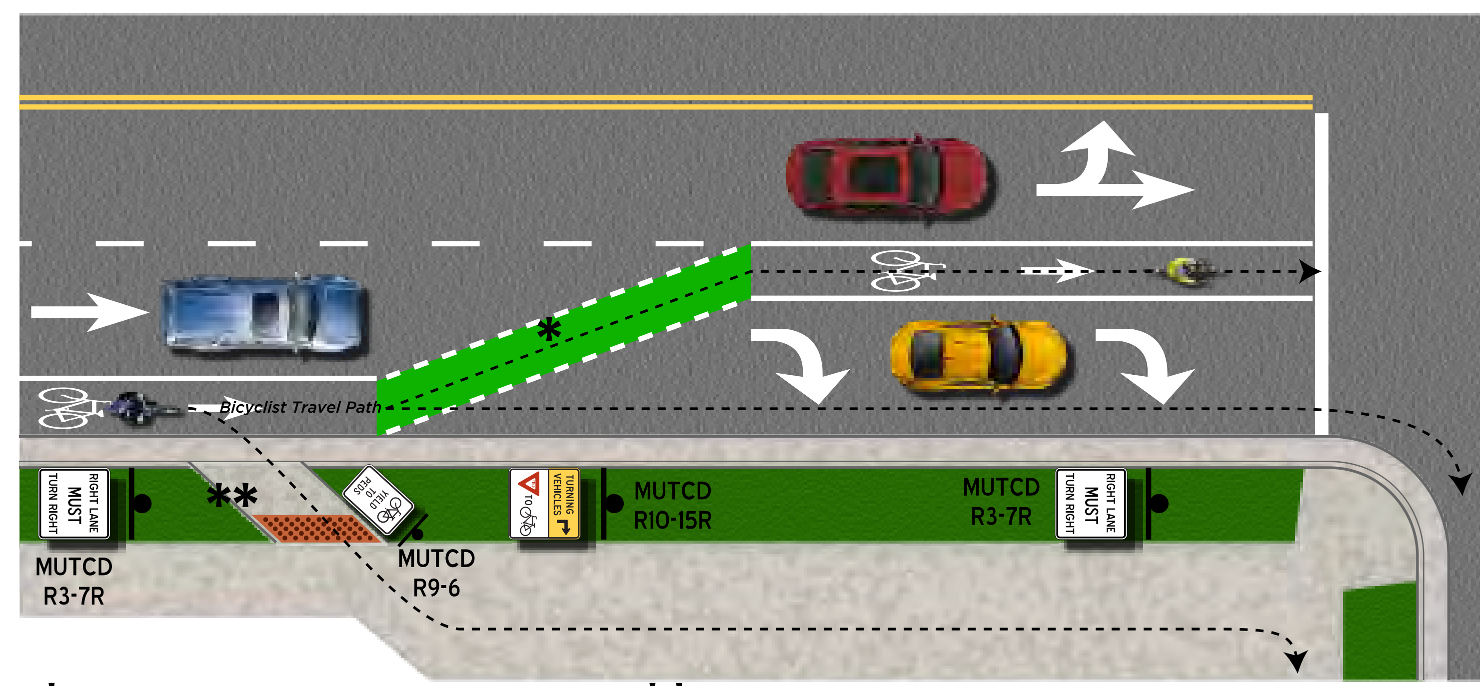
Figure 26: Advanced Travel Lane Drop



✱ Use of flexible delineators is suggested in conjunction with this treatment option to reduce risk of motor vehicle encroachment into bicycle lane.

✱✱ Green pavement color is an optional treatment.

Figure 27: Travel Lane Drop



✱ Green pavement with dashed outlines is an optional treatment for this situation.

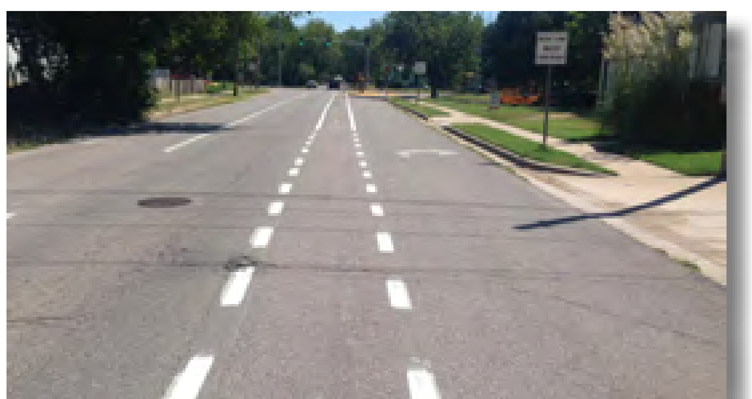
✱✱ Optional "bicycle ramp up" may be provided for right-turning cyclists who are uncomfortable sharing the turn lane with motor vehicles. If used, widening the sidewalk to a minimum width of 8' is suggested.

treatment should be considered where right turning vehicle volumes are moderate to low and there is a desire to make bicyclists highly visible when queing at an intersection. The stop bar for bicyclists can be placed on the far side of the crosswalk in a protected area. This treatment is typically accompanied by curb extenstions on the cross street to provide extra space for bicycles to queue.

Motor Vehicle Right Turns

Right turn pockets are created by a curb cut or where parking is restricted at an intersection approach to create a right turn lane. There are multiple options to accommodate bicyclists at these intersections from a bicycle lane.

Where a right turn lane is provided with a bicycle lane, the bicycle lane lines should be dotted 50 to 200 feet prior to the intersection to show where motorists are likely or encouraged to merge into or across bicycle lane. The bicycle lane can be provided between the travel and the turn lane and it is optional to include green colored pavement with the dotted lines.



Another option is to use pavement markings to designate the right turn lane as shared lane. This shared lane may be desirable where space is constrained. The width of the shared right turn lane should be a maximum of 13 feet wide. The options for bicycle lanes with a right turn lane are shown in **Figure 25**. The traffic signs shown in the illustration should be used to enhance guidance.

To the extent practical, the bicycle lane should remain at the same width at the approach. The minimum width of the bicycle lane when provided between the travel lane and turn lane is 4 feet, but is preferred to be 5 to 6 feet wide.

Travel lanes can also drop prior to providing a right turn lane. If sufficient space is available on the approach to the intersection, it is preferred to use the advanced lane drop option, shown in **Figure 26**. The lane drop option in **Figure 27** is another option if a travel lane drops into a turn lane. The dotted bicycle lane lines provide highly visible pavement markings to show to bicyclists and motorists where bicyclists are expected to operate. Additional guidance on bicycle lanes at intersections is provided in Appendix G of the Bicycle Master Plan.

Bicycle Boulevards (Shared Lane Markings)

Bicycle boulevards at signalized intersections will typically occur where bicycle boulevards intersect arterial streets. The shared lane marking should be provided at the intersection approach on the outside through lane. They should also be provided at the far side of the intersection. Medians on the arterial with a refuge area can enhance bicycle crossings at bicycle boulevards when crossing arterial street.

Left Turns

There are three options for accommodating left turning bicylists at signalized intersections from a right side bicycle lane. These include a two-stage turn queue box, bicycle box, and simply expecting bicyclists to use the left turn lane or inside lane to make a left turn. The last option is not the ideal situation, but

Figure 28: Two-Stage Turn Queue Box

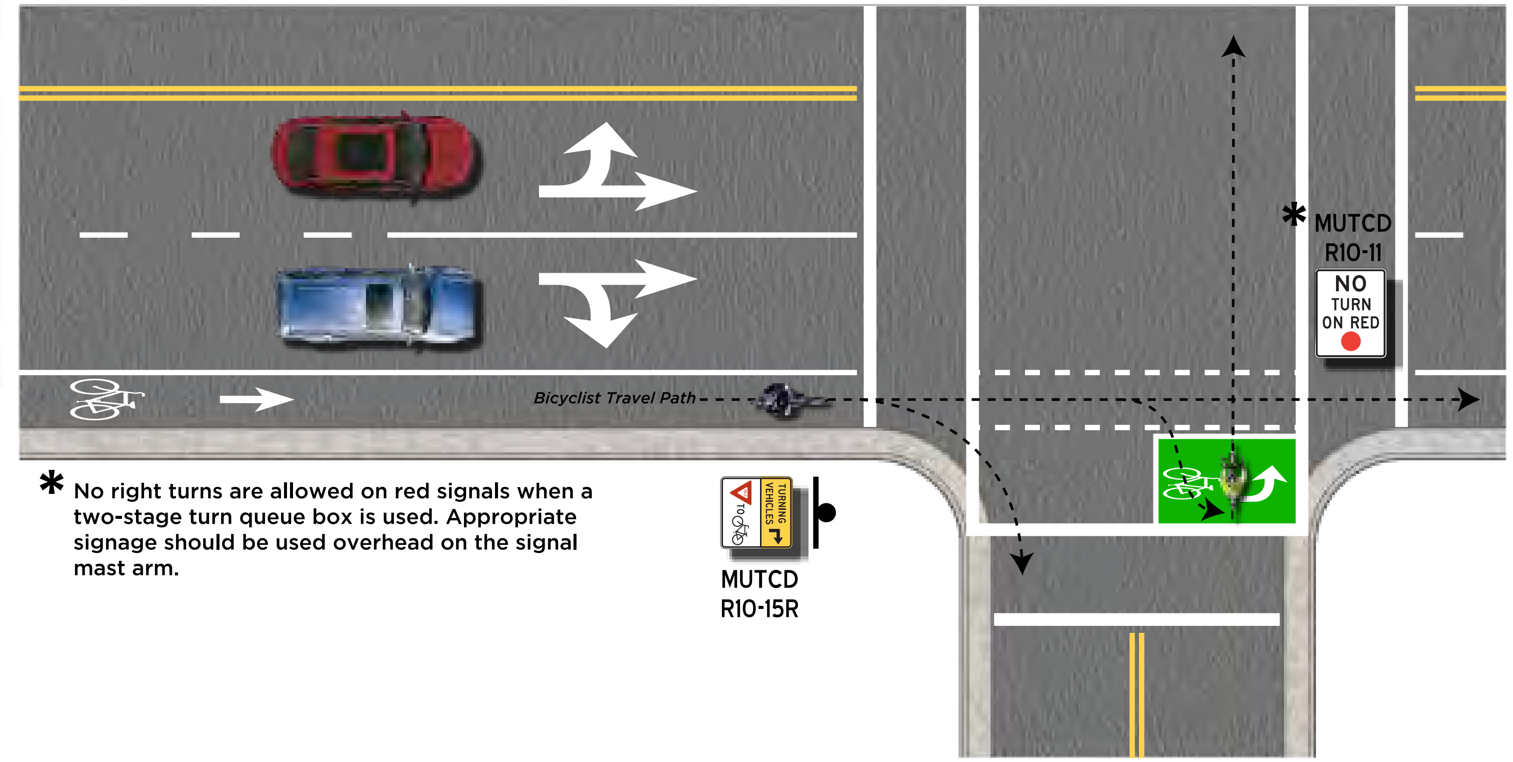
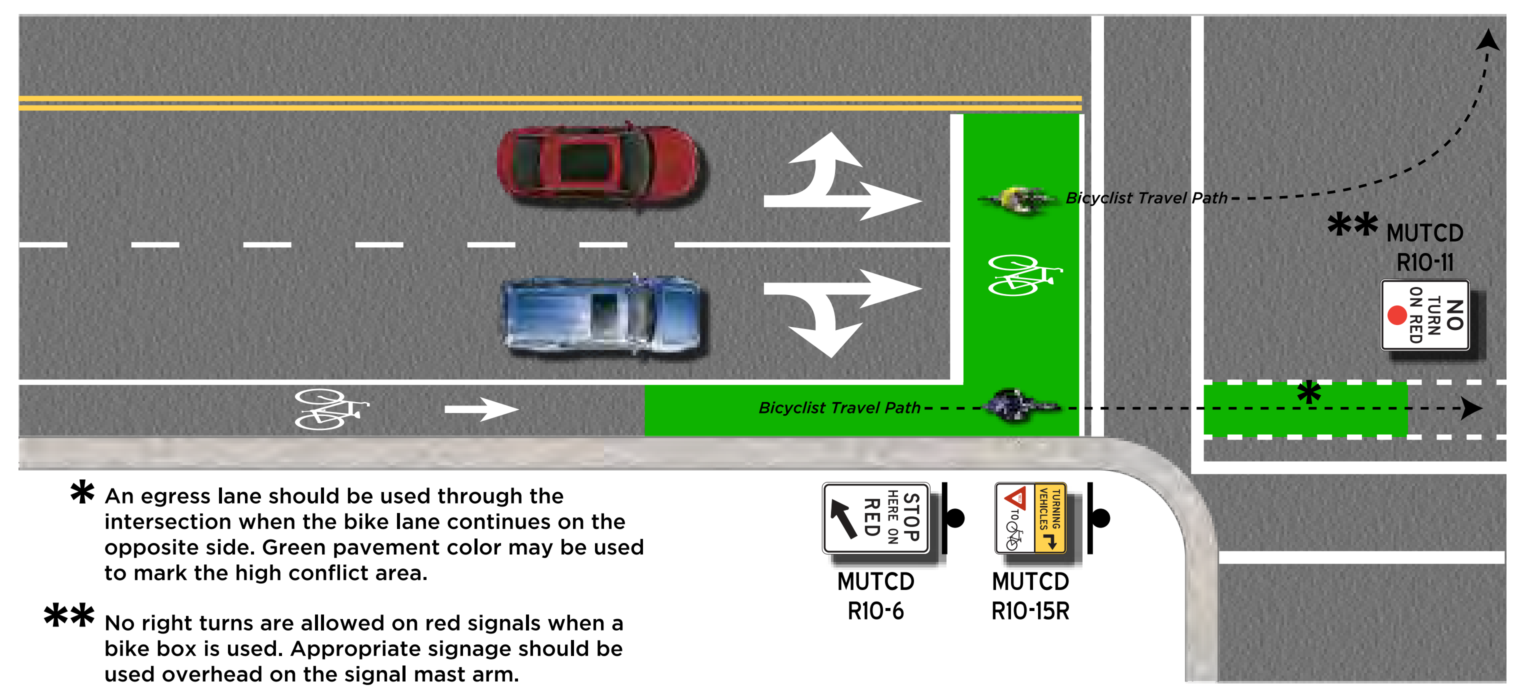


Figure 29: Bicycle Box



may be preferred when the other two options are not feasible. Bicyclists will have to be confident riding with motor vehicle traffic to use this option.

Two-Stage Turn Queue Boxes

A two-stage turn queue box is one option to accommodate bicyclists making left turns from a right side bicycle facility or right turns from a left side facility. They provide a place to queue after moving into the intersection on a green phase. Bicyclists enter into the intersection, enter the box, properly orient themselves, and then continue on the cross street once the green phase is provided for the cross street. This treatment is illustrated in **Figure 28**.

Two-stage turn queue boxes enhance bicyclist safety and comfort by providing a dedicated area for bicyclists when making a two-stage turn. They also reduce turning movement conflicts between motor vehicles and bicyclists and separate bicyclists making a turn and those passing through the intersection. However, they typically increase delay for bicyclists by having them make two-stage turns.

Two-stage turn queue boxes should be considered at signalized intersections on multi-lane streets with high motor vehicle volumes and/or speeds. They should also be considered with cycle tracks and where a significant volume of bicyclists make a left turn from a right side bicycle facility.

These boxes must include pavement markings to indicate proper direction and positioning and should include colored pavement as a background. They are highly recommended be placed in a protected area within the parking lane or between the pedestrian crossing and the bicycle lane. If there is not space, the box can be placed behind the pedestrian crossing or the pedestrian crossing can be moved. They should be wide enough to store bicyclists safely. Dashed bicycle lane lines should also be provided through the intersection to define the proper positioning for bicyclists making the through movement.

Where queue boxes are used, right turns for motor vehicles must be restricted on the red phase on the cross street to prevent vehicles from encroaching into the queue box.

Bicycle Boxes

A bicycle box is one option to accommodate bicyclists making a left turn from a right side on-street bicycle facility or a right turn from a left side bicycle facility. They can also help transition a bicyclists when bicycle facilities switch from one side of the street to the other. Bicycle boxes provide a designated area ahead of traffic lanes at a signalized intersection. They provide bicyclists with a safe area to get ahead of traffic queued at an intersection in a highly visible area. This configuration is illustrated in **Figure 29**.

Bicycle boxes enhance the visibility of bicyclists and reduce delay for bicyclists at traffic signals. They allow for bicyclists to properly position themselves when making a left turn or when a right-side bicycle lane transitions to a left-side bicycle lane after an intersection. Bicycle boxes improve safety and operational issues caused by right turning motor vehicles and through moving bicyclists at the start of the green phase by placing bicyclists ahead of stopped vehicles. They also reduce vehicle encroachment into crosswalks.

Bicycle boxes should be considered at signalized intersections with a high volume of motor vehicles and bicyclists. They are appropriate where there is a high volume of left turning bicyclists and/or a high volume of right turning vehicles. They are also appropriate where a bicycle route makes a left turn or where a bicycle facility moves from the right side of the street at the approach to an intersection to the left side of the street at the opposite side of the intersection.

Bicycle boxes should be 10 to 16 feet deep (measured parallel to the travel lanes) and must include pavement markings illustrating its use for bicyclists. These boxes should also included colored pavement as a background. Stop bars must be used to show where motor vehicles are to stop prior to the bicycle box. It is recommended to include a sign expressing where vehicles are expected to stop prior to the bicycle box and a sign where bicyclists are expected to stop. On the approach, the intersection must also prohibit right turns on the red phase.

Bicycle lane lines should be used to define the space for bicyclists on the approach to the intersection. This ingress lane can include 25 to 50 feet of colored pavement from. A dashed egress lane should be provided through the intersection where there is a bicycle facility or lane on the far side of the intersection to communicate the potential conflict area during a green phase. A sign indicating that right turning motor vehicles should yield to bicyclists going through the intersection should also be considered.

AT-GRADE RAIL CROSSINGS

Streets and paths that cross railroad tracks at skewed angles can cause safety issues and steering difficulties for bicyclists. Rough crossings can also reduce riding comfort for bicyclists.

GENERAL GUIDANCE

The ideal situation is to allow bicyclists to cross railroad tracks at a 90 degree angle. Crossing at a right angle reduces steering difficulties and decreases the possibility of the bicycle tires to get stuck in the flangeway opening between the rails and the pavement.

The depth and width of the flangeway opening can also be a safety and comfort issue. It is desirable to provide a shallow and narrow opening. It is also desirable to provide a smooth crossing to increase bicyclists' comfort.

DESIGN GUIDANCE

Shared use paths and bicycle lanes (or paved shoulders that are designed for bicycle travel) should cross railroad tracks between 60 to 90 degrees.

On extremely skewed intersections of the railroad tracks and bicycle facilities (30 degrees or less), may not be possible to get 90 degrees so 60 may be practical. It may be desirable to include a W10-1 or W10-12 warning sign at these locations where the angle is near 60 degrees.

It is preferred to use concrete for the crossing surface, but is not required. The flangeway opening can include rubber fillers when the rail line has occasional low-speed rail traffic.

Additional guidance and illustrations are available in the AASHTO *Guidelines for the Development of Bicycle Facilities* (2012, 4th Edition) starting on page 4-38.

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INTRODUCTION

Transit is an integral part of Wichita's multi-modal transportation system. The design guidance provided for streets and intersections in the Street Design Guidelines identifies appropriate accommodations for transit vehicles and transit riders. **Chapter 4** identifies space allocations for transit vehicles within the outside travel lane. It also identifies space in the sidewalk zone for transit stops.

This chapter expands upon the guidance in **Chapter 4** by providing additional design considerations and guidance for bus stops. It covers the spacing of bus stops, their general location, and specific placement. The spacing of bus stops along a route should be based on transit service goals in specific areas or along a corridor. The general location of bus stops should serve the most potential users. The exact placement should provide for safe and efficient access to major destinations as well as other factors identified within this chapter.

There are multiple options for the type of bus stop to be installed, such as curb extension stops and bus bays. Choosing the appropriate type should be based on considerations of traffic operations for transit vehicles as well as other motor vehicles. The type of stop has a major influence on the design of streets and the space allocation for each individual street functional zone.

There are different amenities that can be provided at a bus stop, and not all bus stops should have the same amenities. This chapter describes four different levels of amenity and identifies the criteria for selecting the proper level for each stop. Design guidance is also provided for each level of amenity.

Similar to the other design guidance provided in **Chapter 4**, transit design should consider more than existing conditions. Approved, planned, and future conditions along the corridor or street should also be considered. This will help integrate transit into the function of the street and complement its context.

The recommendations in this chapter are based on the *Transit Cooperative Research Program (TCRP) Report 19: Guidelines for the Location and Design of Bus Stops* produced by the Transportation Research Board. Some have been modified to achieve the goals of Wichita Transit.

SPACING OF BUS STOPS

The spacing between bus stops along a bus route is a major decision that affects the access to transit and in-vehicle travel time. Spacing affects how far people must walk to get to a bus stop or to their destination from a bus stop. It also affects how much time people spend on the bus traveling to their destination. Spacing along a route should be based upon transit service goals along the corridor or within an area.

Less spacing between the stops provides a higher degree of access. Transit users do not have to travel as far to reach a stop and there is likely to be a stop closer to their destination. However, less spacing increases the number of stops, which increases in-vehicle travel time. Greater spacing provides less access and improves in-vehicle travel time. Ideally, a balance should be reached based on the considerations identified in this section.

In general, spacing should vary based upon the context; the surrounding development intensity as well as the land use. These characteristics greatly impact potential transit ridership.

In high-density areas typical of the urban core where ridership is likely to be higher and trip origins and destinations are more dense, the spacing between bus stops should be the smallest (300-1,000 feet). In high-density areas, it is often desirable to provide a high degree of transit access, which should lead to less spacing between stops.

Transit access in suburban areas is typically less of a priority than in higher-density areas. Low-density areas where ridership is likely to be lower and destinations more scattered, spacing should be greater (600-2,500 feet).

Medium-density areas, such as those of general urban areas where ridership is likely to be moderate, the spacing will be somewhere between the suburban and urban core spacing (500-1,200 feet).

Beyond the general guidelines presented above, the spacing should really focus on meeting transit service goals for a specific area or corridor. The spacing guidelines are just a starting point and should be treated as a high-level guide. They provide a general idea of the number of stops needed along a corridor. Determining the locations and specific placement of bus stops is a more detailed process and may cause spacing to vary from the guidelines presented above.

GENERAL LOCATION OF BUS STOPS

Bus stops should be located to provide safe and efficient access for existing and potential riders. Locating bus stops generally provides a block or two in which a bus stop should be located. The general location should provide the opportunity to serve the most potential riders.

The focus should be on locating bus stops where they will facilitate the highest ridership potential, which is typically where job and population density are the highest. These high density areas include job and population clusters as well as individual land developments that would foster high transit use. These areas with high ridership potential are major origins (beginning of trip) or destinations (end of trip) for transit trips. The following is a list of some major origins and destinations:

- Grocery store
- Shopping center
- School, university, and college
- Medical center
- Large office building
- Large manufacturing plant or industrial use
- Cluster of commercial or industrial developments
- Large apartment complex or cluster of high-density residential uses
- Civic building
- Regional park
- Zoo
- Airport

Locating bus stops near major origins and destinations is a great starting point. However, bus stops are needed in other locations as well that do not directly serve a major origin or destination. Access to transit via bus stops along routes is needed where potential riders may exist. Locating these stops should start by using the spacing guidelines. Next, assess the transit demand by looking at surrounding land use and development. Locating these stops near smaller-scale businesses or apartment complexes is likely to best serve the needs of transit users.

Not only is it important to provide stops based on ridership potential, consideration should be given to the trip between the origin/destination and the bus stop. Quality access via safe and efficient pedestrian and bicycle facilities should be available or be able to be developed. This includes safe and viable street crossings.

Beyond consideration of the existing conditions, it is also important to consider the future. Approved, planned, and future developments as well as the future street function should be considered when locating bus stops.

SPECIFIC PLACEMENT OF BUS STOPS

When the general location of a bus stop is chosen, the next step is to determine the exact placement of the stop. Bus stops can be located at intersections or at mid-block locations.

Major factors in determining the placement of bus stops include the following:

- Specific locations of major origins and destinations
- Street and intersection design and operations
- On-street bicycle facilities
- On-street parking
- Bus routing
- Pedestrian and bicycle access
- Available space as well as obstacles within the sidewalk zone
- Transit stop amenities (shelters, benches, etc.)
- Access to nearby routes and stops
- Sufficient space for buses
- Impacts on surrounding land uses and neighborhood
- Proximity of pedestrian crossing locations
- Driveway locations
- Traffic control devices

Stops should be placed to minimize conflicts that interfere with motor vehicle, bicycle, bus, and pedestrian movement while still providing high quality transit service. A balance of travel modes is needed based on the mobility needs and goals along a corridor.

The majority of bus stops are placed in very close proximity to intersections on either the near-side (prior to crossing through the intersection) or the far-side (after crossing through the intersection), as shown in **Figure 30**. Less common are mid-block stops that are located between intersections. Each placement has distinct advantages and disadvantages. The individual characteristics of each location as well as pedestrian, bicycle, transit, and vehicular safety and operations should be factored prior to determining the placement.

Considerations for Placement

Wichita Transit generally prefers bus stops at intersections on the near-side. However, there will be situations where far-side bus stops or even mid-block bus stops will be the preferred placement.

Often times, potential bus stop placements have different characteristics. Consideration should be given to the amount of available space for appropriate bus stop amenities at these locations. Another important consideration is the specific location of origins and destinations in close proximity to the stop location. Bus stops should be placed close to these developments. Also important is the availability of safe and efficient access between the potential bus stop location and adjacent origins and destinations. If quality access does not exist, the potential and likelihood for its development should be assessed.

Traffic operations should be a primary consideration when placing a bus stop. Each placement has unique operational characteristics, which should be considered when determining proper placement.

Another important consideration for placement is bus routing and stop locations for each route. When routes intersect or travel along the same street, bus stops can be shared. In these instances, bus stop consolidation can save money by reducing the number of stops as well as provide enhanced service by allowing riders to stay at one stop when transferring.

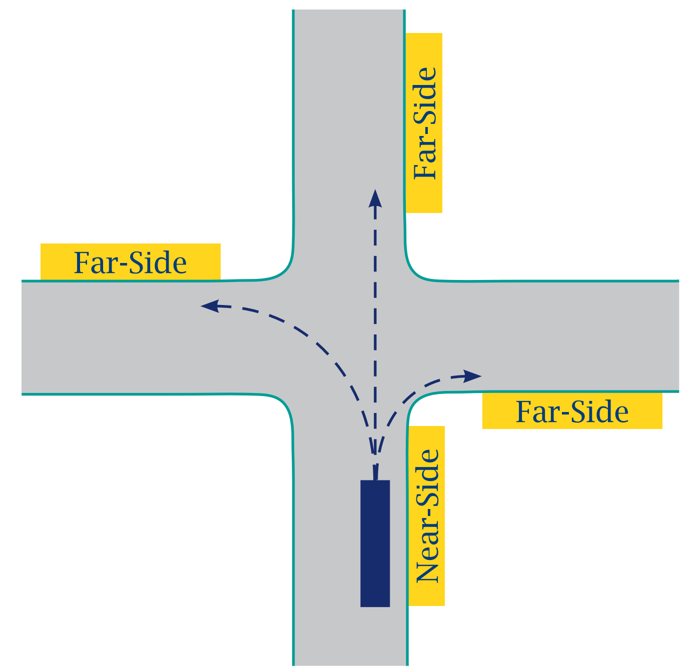
Consideration should be given to how pedestrians will cross the street when accessing or leaving a bus stop. Safe pedestrian crossings should be in close proximity to a bus stop. Also important is the consideration of street lighting to provide riders with needed light.

The placement of bus stops should avoid driveways to the extent possible. Also, stopped buses should not be in critical site lines for those leaving a site. Bus stops should also be visible by the bus driver, other drivers, and bus riders.

Although not a specific consideration, coordination with developers and neighborhood groups can improve the safety and function of a bus stop. When desired, bus stops can even be provided within the development.

The operational characteristics at a bus stop vary based on the combination of type and specific placement. A placement should not be determined independently from the type. They should be considered together to properly identify the combination of placement and type that will work best in each situation.

Figure 30: Intersection Bus Stop Placement Options



NEAR-SIDE BUS STOPS

Near-side bus stops are located at or in close proximity to an intersection and are placed prior to the bus crossing through the intersection.

There are accepted advantages to near-side bus stops, which include the following:

- Minimizes interferences when traffic is heavy on the far side of the intersection
- Allows passengers to access buses closest to crosswalk
- Results in the width of the intersection being available for the driver to pull away from curb
- Eliminates the potential of double stopping
- Allows passengers to board and alight (deboard) while the bus is stopped at a red light
- Provides driver with the opportunity to look for oncoming traffic, including other buses with potential passengers

There are also accepted disadvantages to near-side bus stops, which include the following:

- Increases conflicts with right-turning vehicles
- May result in stopped buses obscuring curbside traffic control devices and crossing pedestrians
- May cause sight distance to be obscured for cross vehicles stopped to the right of the bus
- May block the through lane during peak period with queuing buses
- Increases sight distance problems for crossing pedestrians

Near-side bus stops are generally preferred in the following situations:

- When major origins or destinations are located on the near-side
- When pedestrian access and safety are greater on the near-side
- When space is constrained on the far-side
- When vehicular traffic is greater on the far-side

FAR-SIDE BUS STOPS

Far-side bus stops are located at or in close proximity to an intersection and are placed after the bus crosses through the intersection. This could be after the bus passes through the intersection going straight, turning left, or turning right.

There are accepted advantages to far-side bus stops, which include the following:

- Minimizes conflicts between right turning vehicles and buses
- Provides additional right turn capacity by making curb lane available for traffic
- Minimizes sight distance problems on approaches to intersection
- Encourages pedestrians to cross behind the bus
- Creates shorter deceleration distances for buses since the bus can use the intersection to decelerate
- Results in bus drivers being able to take advantage of the gaps in traffic flow that are created at signalized intersections

There are also accepted disadvantages to far-side bus stops, which include the following:

- May result in the intersections being blocked during peak periods by stopping buses
- May obscure sight distance for crossing vehicles
- May increase sight distance problems for crossing pedestrians
- Can cause a bus to stop far side after stopping for a red light, which interferes with both bus operations and all other traffic
- May increase number of rear-end accidents since drivers do not expect buses to stop again after stopping at a red light
- Could result in traffic queued into intersection when a bus is stopped in travel lane

Far-side bus stops are generally preferred in the following situations:

- When major origins or destinations are located on the far-side
- When pedestrian access and safety is greater on the far-side
- When there is a right-turn lane on the near-side with moderate to high traffic volumes using the turn lane
- When the route makes a left turn
- When there are multi-phase traffic signals or dual turn lanes
- When vehicular traffic is heavier on the near-side

MID-BLOCK BUS STOPS

Intersection bus stops are not always the most desirable. In certain instances, mid-block bus stops may be preferred. Mid-block bus stops are those between street intersections; not at or in close proximity to intersections.

There are accepted advantages to mid-block bus stops, which include the following:

- Minimizes sight distance problems for vehicles and pedestrians
- May result in passenger waiting areas experiencing less pedestrian congestion

There are also accepted disadvantages to mid-block bus stops, which include the following:

- Requires additional distance for no-parking restrictions
- Encourages patrons to cross street at mid-block (jaywalking)
- Increases walking distance for patrons crossing at intersections

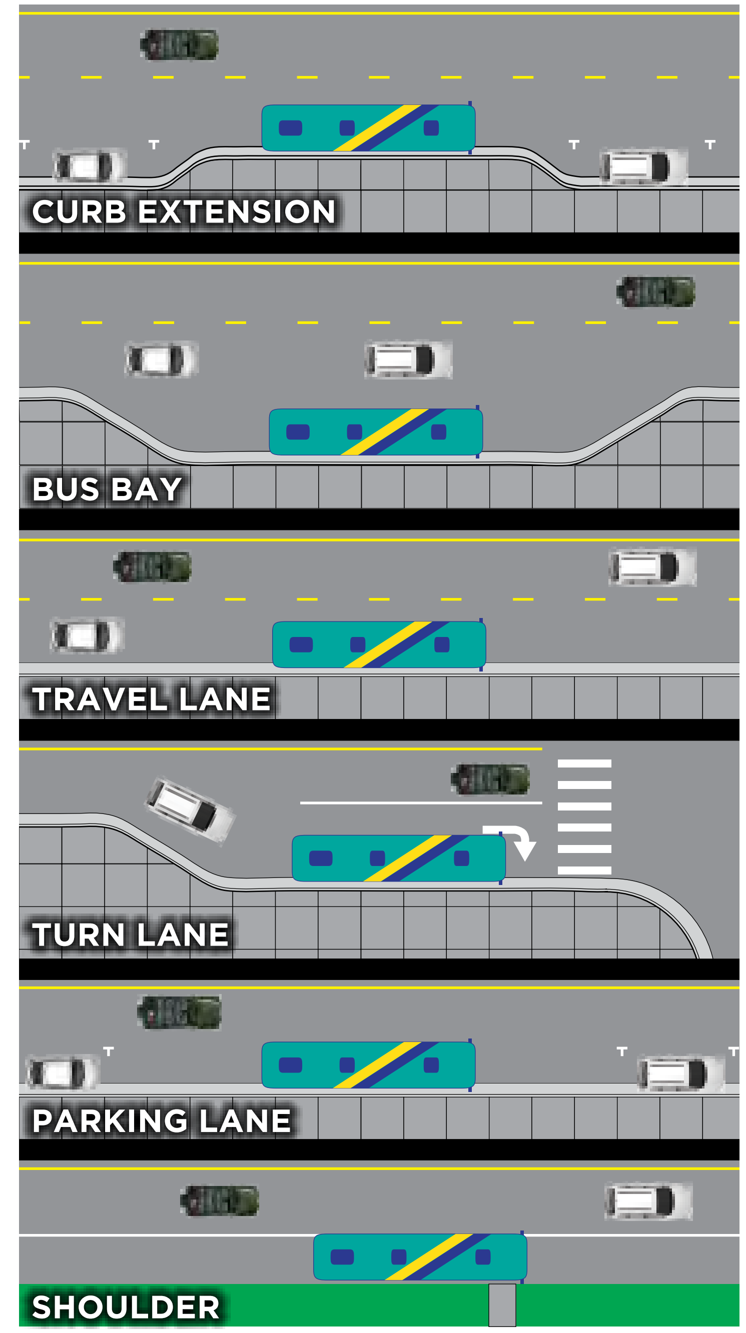
Mid-block bus stops are generally not preferred. However, they may be desirable in locations with mid-block pedestrian crossings. They may also be desirable where major origins or destinations are not located near intersections, such as on long blocks.

TYPE OF BUS STOP

There are three main type of bus stops that are identified in this section; curb extension, bus bay, and curb-side. There are also subtypes for curbside stops (travel lane, turn lane, parking lane, and shoulder). **Figure 31** shows examples of each. Each type has unique benefits, constraints, appropriate applications, and design recommendations. The design recommendations provided are based on a typical 40 foot bus, since this is the typical bus size used by Wichita Transit. The design is also influenced by the level of amenities provided at the bus stop, which are discussed later in this chapter.

The presence of on-street bicycle facilities should be one of the considerations when selecting the type of bus stop. Both bicyclists and buses typically operate on the right side of the road, which often causes conflicts. Pavement markings should clearly communicate to both bicyclists and bus drivers the expected operational movements of each. Bicyclists should know where to ride, bus drivers should know where to drive, and each should know where to expect the other.

Figure 31: Bus Stop Types



CURB EXTENSIONS

A curb extension is where the sidewalk zone protrudes into the parking lane and provides extra space for streetside amenities. In the instance of a curb extension bus stop, the extra space provides room for a bus stop. Curb extensions can be placed on near-side, far-side, or mid-block bus stops. They effectively keep the bus within the outside travel lane when stopped for boardings and alightings.

By keeping the bus within the travel lane, curb extensions reduce bus delay because buses do not have to maneuver back into the travel lane. Curb extensions reduce crossing distance for pedestrians and provide additional space for transit amenities and pedestrian circulation. They also allow for more on-street parking than curb-side bus stops.

Although curb extensions reduce delay for buses, they can increase delay for other vehicles using the outside lane because the bus is stopped in the lane. This can be a major concern on high volume streets and streets with only one lane in the specific direction.

Curb extensions should only be used along streets with on-street parking. They are most appropriate on streets with a high transit service priority, high pedestrian activity, low vehicle volumes, and/or low vehicle speeds. They are also beneficial when the sidewalk zone is constrained and sufficient space is not available for bus stops.

The length of the curb extension, measured parallel to the curb, must be long enough to include the required 5 foot landing pad to allow access for boarding and alighting. However, a 40 foot long bus stop is recommended to allow both front and rear doors of the bus to be accessed from the curb extension.

The width (perpendicular to the curb) of the curb extension should be less than the parking lane width. The curb extension will likely accommodate most bus stop features. However, typical parking lane width is 6 feet wide. The landing pad is required to be 8 feet wide, which can extend into the remaining sidewalk zone.

When used for intersection stops, curb extensions should provide an adequate turning radius. No matter the placement, they should include taper(s) to allow easy access to and from adjacent on-street parking stalls.

BUS BAY

A bus bay is basically the opposite of a curb extension. In a bus bay, the curb cuts into the sidewalk zone. This creates a bay for the bus to pull out of the travel lane to allow passengers to board and alight.

Bus bays provide space for the bus to completely depart from the travel lane when stopped for boardings and alightings. This allows traffic to flow past the stopped bus without being delayed. It also reduces the likelihood of rear-end collisions by providing more effective vehicular flow in the travel lane.

Bus bays may cause bus delay when attempting to re-enter the travel lane. This is especially true when traffic volumes are high. They also remove a portion of the sidewalk zone which reduces the amount of space for amenities and/or pedestrian travel.

Bus bays are most appropriate where vehicle speeds are greater, buses queue for a longer period of time, and/or where multiple buses serve the same stop at the same time. There should also be sufficient sidewalk zone space after a bus bay is installed.

The bay should be a minimum of 12 feet wide. The bay should completely contain a 50 foot long bus stop area as well as needed length for bus maneuvering when entering and exiting the bay. The total length of the bay should vary based upon the number of buses that will queue within the bay at one time as well as the operational characteristics of the adjacent street. Also, parking should be restricted within the bus bay.

CURB-SIDE

A curb-side stop is where the bus stops in a travel lane, turn lane, shoulder, or parking lane.

Travel Lane Bus Stop

In a travel lane stop, the bus stops in the outside travel lane to allow for boardings and alightings. There is no on-street parking allowed and the outside travel lane is adjacent to the curb. This requires no maneuvering out of and into the travel lane.

This type of stop has no potential for the bus to be delayed when re-entering the traffic flow since it is already in the travel lane. Travel lane bus stops require minimal design and can be easily installed and/or relocated. Unlike bus bays, they do not require additional space to be removed from the sidewalk zone.

Travel lane bus stops often cause delay for vehicles in the outside travel lane, especially if there is only one travel lane in that certain direction. They also pose greater safety concerns for rear-end collisions with buses.

This stop type may not be appropriate on high volume or high speed streets where a stopped bus will cause major operational issues for other vehicular traffic. They may also cause issues when there is a high volume of boarding and alightings where the bus is queued at the stop for a relatively long period.

The space for travel lane bus stops is the same weather they are near-side, far-side, or mid-block. The bus stop area should be at least 30 to 40 feet long.

Turn Lane Bus Stop

Turn lane bus stops are only located on the near-side in a right-turn lane. They operate differently than travel lane bus stops since the bus stops in a turn lane rather than a through lane. If the bus route continues directly through the intersection, the bus will have to reenter the through travel lane, which is not desirable. However, if the bus route turns right, the bus will already be in the proper location to make a right turn.

Similar to a travel lane stop, turn lane stops are easy to install and/or relocate. Other advantages as well as any disadvantages are dependent upon the routing of the bus through the intersection. If the bus is traveling directly through the intersection, a turn lane stop functions similar to a bus bay. If the bus route makes a right turn, it will function similar to a travel lane stop.

Turn lane bus stops are not appropriate if the bus route makes a left turn through the intersection. They may not appropriate if there is a high number of right-turning vehicles at the intersection as the stopped bus will delay the turning vehicles. With a high volume of right-turning vehicles, a far-side bus stop is likely more appropriate.

Turn lane bus stops should include a 240 foot right-turn lane to allow enough space for the bus to enter the turn lane and stop for boardings and alightings. However, this amount of space may not always be available. Under constrained circumstances, a shorter lane can be used. At a minimum, the turn lane bus stop should start at least 5 feet from the crosswalk or end of the curb return radius (which ever is greater). It should have a 40 foot long bus stop and 60 feet for maneuvering and deceleration prior to the bus stop. The turn lane should also be 12 feet wide.

Parking Lane Bus Stop

In a parking lane stop, the bus pulls out of the travel lane into a parking lane (which has parking restricted at the bus stop) to allow for boardings and alightings. This stop type also includes parking restrictions beyond the actual bus stop to allow for bus maneuvering, acceleration,and/or deceleration.

This type of stop has the same operational advantages and disadvantages for buses and other vehicles as the bus bay option since the bus pulls out of the travel lane to allow for boarding and alightings. However, they are cheaper to install because curb does not have to be moved. They also do not decrease the sidewalk zone space. They do, however, require the removal of on-street parking.

Parking lane bus stops can only be used when a parking lane is present along the street. They are most appropriate where vehicle speeds are greater, buses queue for a longer period of time, there is sufficient sidewalk space, and/or where multiple buses serve the same stop at the same time.

The space for the bus stop should be at least 5 feet along the curb to meet ADA requirements. However, 40 feet is recommended to allow for both front and rear doors to be accessed.

No parking restrictions should allow for bus maneuvering, acceleration, and deceleration. At near-side parking lane stops, the bus stop should be at least 5 feet from the crosswalk or end of the curb return radius, which ever is further from the intersection. From that point, the bus stop should be 40 feet with an extra 60 feet of no parking restrictions to allow for bus deceleration.

At far-side parking lane bus stops, the bus stop should be at least 5 feet from the crosswalk or end of the curb return radius, which ever is further from the intersection. From that point, the bus stop should be 40 feet with an extra 50 feet of no parking restrictions to allow for bus acceleration.

At mid-block parking lane bus stops, the bus stop should include 40 feet for the bus stop. It should include at least 60 feet of no parking restrictions to allow for deceleration and 50 feet for acceleration.

Shoulder Bus Stop

Shoulder bus stops are located on open ditch street sections along the shoulder of the street. The bus pulls out of the travel lane onto a paved shoulder to allow for boardings and alightings. If a bus stop is located on an open ditch section, a shoulder bus stop is the only option (unless an area is created outside of the shoulder for a bus, similar to a bus bay).

Shoulder bus stops have the same bus and other vehicle operational advantages and disadvantages as the parking lane bus stops. Consideration needs to be given to the presence of bicycle facilities on the paved shoulder.

There should be 40 feet of space allocated to the bus stop and a sufficient length of parking restriction on the shoulder to allow for maneuvering, acceleration, and deceleration. A 5 foot by 8 foot landing pad should be provided at the bus stop adjacent to the paved shoulder with proper access to sidewalks in the sidewalk zone. Careful consideration should be made to connect the landing pad to an adjacent sidewalk to provide an accessible pedestrian connection, as this will likely cross through the open drainage ditch.

BUS STOP LEVEL OF AMENITY

The level of amenity provided at a bus stop is a key design consideration. There are four defined levels, which are based on the features provided at a bus stop. They are described from Level 4 to Level 0. The levels correspond to the options identified in the decision trees located in **Chapter 4**. Level 4 has the highest degree of amenities and Level 1 has the lowest degree. Level 0 is considered not to be on a transit route and have no bus stops.

The major considerations for determining the Level of Amenity at a bus stop are average daily ridership (number of boardings and alightings at a stop), peak hour frequency of bus service (number of buses stopping per day at a stop), the number of routes serving the bus stop, and/or the adjacent land use and destinations.

LEVEL 4

Level of Amenity 4 bus stops provide the highest degree of features at a bus stop. It includes a bus shelter with dynamic message boards or similar to provide real-time information to riders about next bus arrival time and similar type of information. The bus shelter often includes an integrated trash receptacle. They can include additional seating outside of the shelter, separate trash receptacle, and/or bicycle racks.

Level 4 bus stops should be placed at locations with very high ridership, such as at transit hubs or along highly transit-oriented streets. They should be considered under the following circumstances:

- Average daily ridership is 20 or more;
- Frequency of bus service is 30 minutes or less;
- Number of routes serving the stop is 2 or more;
- In locations in close proximity to major trip origins and destinations;
- At a transit station, substation, or park-and-ride station; and/or
- In locations where transit ridership is being heavily promoted.

Level 4 bus stops require sufficient space to accommodate bus shelters. Bus shelter design guidance, as well as guidance on other bus stop amenities, is provided later in this chapter. There may be instances where Level 4 stops include non-standard bus shelters. The design of the stop should accommodate the shelter, no matter the design. They also require a source of electric power. This power source can be hard-wired or some other, such as solar. Dependent upon ridership at the stop, additional seating may be provided with benches.

LEVEL 3

Level of Amenity 3 bus stops provide a high degree of features. These stops include a bus shelter, but do not include real-time informational signs as with Level 4 bus stops. The bus shelter typically includes an integrated trash receptacle. They can include additional seating outside of the shelter, separate trash receptacle, and/or bicycle racks. Bus schedules should also be included in bus shelters.

Level 3 bus stops should be placed at locations with high ridership. They should be considered in the following circumstances:

- Average daily ridership is 20 or more;
- Frequency of bus service is 30 minutes or less;
- Number of routes serving the stop is 2 or more;
- In locations with high commercial and/or residential density;
- In locations in close proximity to major trip origins and destinations;
- In locations with a high number of physically challenged or elderly riders; and/or
- In locations where transit ridership is being heavily promoted.

Similar to Level 4 bus stops, Level 3 bus stops require sufficient space to accommodate bus shelters and other desired amenities. Bus shelter design guidance, as well as guidance on other bus stop amenities, is provided later in this chapter.

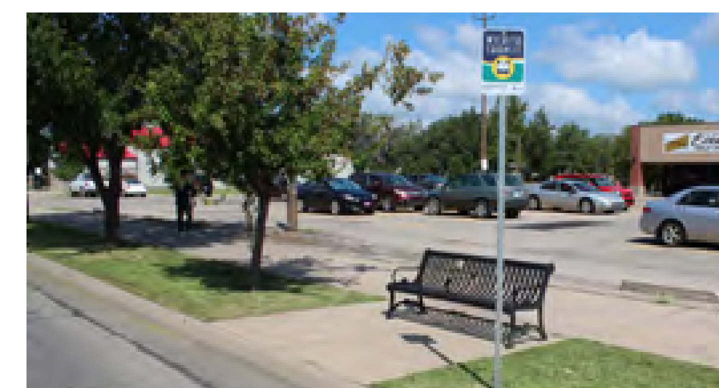
LEVEL 2

Level of Amenity 2 bus stops provide a moderate degree of features. These stops include a bus stop sign and at least one bench. They may also include trash receptacles and/or bicycle racks.

Level 2 bus stops should be placed at locations with moderate to low ridership. They should be considered in the following circumstances:

- Average daily ridership is 10 or more;
- Frequency of bus service is 60 minutes or less;
- In locations with moderate commercial and/or residential density;
- In locations with a moderate number of physically challenged or elderly riders; and/or
- In locations where transit ridership is being promoted.

Level 2 bus stops require sufficient space to accommodate at least one bench. Bench design guidance, as well as guidance on other bus stop amenities, is provided later in this chapter.



LEVEL 1

Level of Amenity 1 bus stops generally provide only a bus stop sign with no other amenities. Wichita Transit's goal is to have at least a sign at all pick-up and drop-off sites. In the interim, there will be 'stops' that do not include a sign or any other amenities. Level 1 stops should be placed at locations with very low ridership. In general, they are only served by one route and riders will not make transfers. Level 1 bus stops should be located at all stops that are not identified as Level 2 or higher.

BUS STOP DESIGN

All bus stops should include at least a 5 foot (parallel to curb) by 8 foot (perpendicular to curb) paved landing area adjacent to the curb where patrons will board and alight. In general, at least a 3 foot wide unobstructed space should be provided around objects at a bus stop where pedestrian access is expected. This access should be provided to all amenities at bus stops, including the shelter, bench, and trash receptacle.

There should also be pedestrian access to and from bus stops. When bus stops are not directly adjacent to, or integrated into the sidewalk, a paved surface should provided to connect the sidewalk to the bus stop. The minimum width of the access should be 4 feet wide, but it is desirable to be 5 feet. If narrower than 5 feet, special considerations must be made to allow for those in wheelchairs to pass one another.

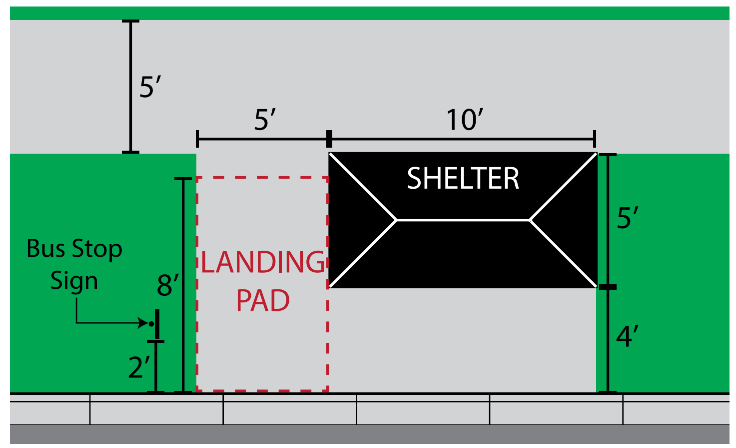
The ideal placement of a bus stop is in the amenity zone between the sidewalk and the curb. However, there will be instances where space is constrained and there is insufficient space within the amenity zone. When this occurs, the bus stop can encroach into the other sidewalk zones (pedestrian zone and frontage zone). However, pedestrian access must be maintained through the pedestrian zone along the sidewalk.

BUS SHELTER DESIGN

Standard bus shelters are 5 feet by 10 feet and 7 feet by 14 feet and have paved pads of 9 feet by 15 feet and 10 feet by 20 feet, respectively. This pad can be placed anywhere in the sidewalk zone, but it is preferred to place the pad within the amenity zone. Where the bus shelter pad is not adjacent to the curb, there should be pedestrian access to the landing pad.

Where the bus shelter is placed in the pedestrian zone, at least 4 feet (5 feet preferred) of pedestrian access along the sidewalk should be maintained. Pedestrian access to the shelter pad should be provided when it is not directly connected to the sidewalk. There should also be 2 feet of clearance from the overhead canopy to the face of the curb and 1 foot of clearance between the shelter and any building wall. **Figure 32** shows the standard layout for a bus stop with a 5 foot by 10 foot bus shelter.

Figure 32: Standard Bus Stop with Shelter



Additional paved surface should be provided, as needed, to accommodate other amenities such as bicycle parking. Additional surface may also be needed if the landing pad cannot be accommodated within the shelter pad.

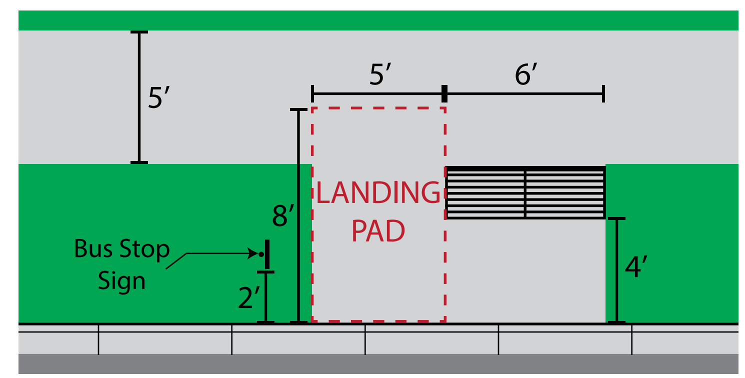
Another important design and placement consideration for the bus shelter is sight distance at intersections and driveways. A bus shelter should not block sight distance. This may require placement of the shelter further away from the street.

BENCH DESIGN

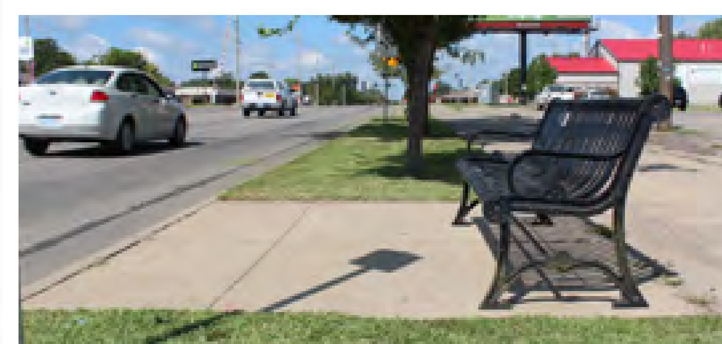
The standard size of a transit bench is 6 feet long and the paved pad is 11 feet by 6 feet. The ideal placement of the bench pad is in the amenity zone. However, it can be placed anywhere within the sidewalk zone. Where the bench pad is not adjacent to the curb, there should be pedestrian access to the landing pad.

The bench should be placed at least 3 feet from the back of the curb, but greater spacing may be needed with higher speed traffic along the street. At least 3 feet of clearance should be provided on the side of the bench to allow for pedestrian circulation. **Figure 33** shows the standard layout for a bus stop with a bench.

Figure 33: Standard Bus Stop with Bench

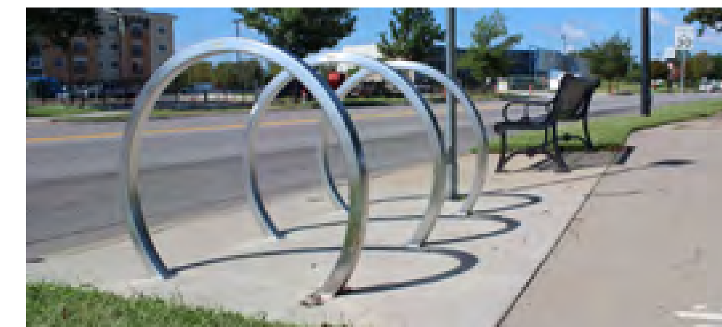


Additional paved surface should be provided, as needed, to accommodate other amenities such as bicycle parking.



BICYCLE RACKS

Bicycle racks should be provided at transit stops that have a high likelihood of use by bicyclists. These would typically be along bicycle routes or where bus routes intersect with bicycle routes. Bicycle racks should be considered at stops along streets with on-street bicycle facilities or sidepaths. Bicycle racks should also be considered at bus stops within 1/4 of a mile of an intersection of a bus route and an off-street bicycle path. If multiple stops are within 1/4 of a mile, priority placement of the bicycle racks should be at the closest bus stop to the intersection.



Bicycle racks at bus stops in the urban core should also be a consideration as well as other areas that have high bicycle use. Consideration should be made to the presence of other bicycle parking provided in proximity to transit stops. If sufficient bicycle parking is available near a bus stop, it may not be necessary or desirable to provide additional bicycle parking at the bus stop.

Wichita Transit typically uses a loop-style bicycle rack, with each loop providing 2 bicycle parking spaces. The number of bicycle parking spaces provided should depend upon the expected use. Where bus stops are close to bicycle routes or in areas with a high amount of bicycle use, at least 4 bicycle parking spaces should be provided. In areas with lower bicycle parking needs, 2 bicycle parking spaces may be sufficient.

Bicycle racks should be placed far enough away from the curb so parked bicycles are out of the operational offset. The spacing between bicycle racks should be 28 inches. At least 14 inches should be provided between a bicycle rack and any other vertical feature, such as a bench.

OPERATIONAL IMPLEMENTATION

CONTEXT

Implementation of the multi-modal (routine) accommodation component of the Street Design Guidelines will be particularly challenging for the City's maintenance operations. Unlike the traditional processes associated with new infrastructure projects, the timeline and requisite procedures for maintenance projects do not afford opportunities for site-specific budget approval. Because associated funds are designated specifically for infrastructure maintenance, the proposed multi-modal accommodation policy will, in effect, require that non-maintenance projects be prioritized over those (maintenance) projects for which the funding was intended. Because shortfalls in street and other infrastructure maintenance funding are already recognized, it is imperative that City leaders be made specifically aware of any reprioritization and/or alternative use of those funds. **Figure 34** on the bottom right illustrates the process anticipated for the review of multi-modal accommodations for maintentance projects.

NEW INFRASTRUCTURE

In the case of the City's contract maintenance program, limited opportunity for City Council notification does exist. While the program is already prepared on an extremely tight timeframe, such that the following year's program may be proposed for approval in the fall/winter of the preceding year, the Public Works & Utilities Department will strive to incorporate requirements of the multi-modal accommodation policy in its preparation, within those same time constraints. In accordance with the policy, beginning in 2015 the department will meet with the Multi-Modal Committee each fall upon draft completion of the subsequent year's contract maintenance program. Following Committee review and identification of all feasible and practical accommodations, the program will be revised as necessary to fund those accommodations, with (from a street maintenance aspect) lower priority projects being eliminated from the program. As some accommodations may be associated with lower priority infrastructure maintenance locations, the process will be iterative. The City Council will be informed of any such eliminated projects at the time of final program proposal.

Due to the reactive nature of the City's internal maintenance operations, similar opportunities to provide City leaders advance notification of a reprioritization, or alternate use of designated funding, largely do not exist. As any diversion of resources toward the accommodation of new infrastructure will, necessarily, detract from the department's already strained ability to maintain existing infrastructure, routine in-house maintenance activities do not offer practical opportunities for providing accommodations. Therefore, such operations are not ordinarily subject to the multi-modal accommodation policy, or multi-modal committee review. However, whenever the department does identify a potential accommodation coincident with a rare opportunity for advanced consideration and review, the prospective accommodation will be brought to committee and, if appropriate, a related funding measure will be presented for City Council consideration.

ONGOING MAINTENANCE

At least as important as the addition of new multi-modal accommodations, are the resulting, perpetual maintenance requirements of those same accommodations. As new infrastructure – whether as seemingly innocuous as a shared bike lane marking, or as extensive as a 2-lane to 5-lane widened corridor – is added to the system, one of two things must necessarily occur: maintenance funding must either go up, or service levels must go down. Because certain existing infrastructure, like bike paths and parking lots, presently have no designated funding and must already compete for funds designated and needed for streets, it's impossible to quantify, or even qualify, the impact of additional maintenance requirements. Suffice it to say, what is now lacking will only become more so.

Because mechanisms do not presently exist to facilitate staff's unilateral prioritization of nonspecifically funded maintenance above street maintenance, the diversion of designated street maintenance funds to competing infrastructure needs has historically been limited. The situation is further complicated by the fact that both stakeholder engagement, as well as expected levels of service tend to be generally higher for non-street infrastructure. Consequently, when services are diverted in order to satisfy customer requests, the proportional impact is typically much greater than 1:1.

Thus, it is imperative that intended levels of service and, more importantly, requisite funding, be clearly defined and approved, coincident with the approval of any accommodation. To do otherwise is to surely only invite new opportunities for service delivery to fail, while simultaneously hastening failure in existing service areas already overextended. As such, all proposed accommodations and associated project proposals will include a line item delineating the estimated annual cost of ongoing outsourced maintenance, defining the specific level of service priced, and indicating that, upon approval, an equivalent amount of Street Maintenance Division funding will thenceforth be diverted away from street maintenance in order to fund the service. A second line item of the project proposal will advise City leaders of the aggregate maintenance cost associated with all such previously approved accommodations.

As associated costs accrue to suitable size, the feasibility of further outsourcing expanded services will be assessed. City leaders will also be afforded opportunities to consider whether accrued expenses should continue to detract from existing street maintenance operations, or if alternative funding sources need be identified.

Figure 34: Maintenance Project Review Process

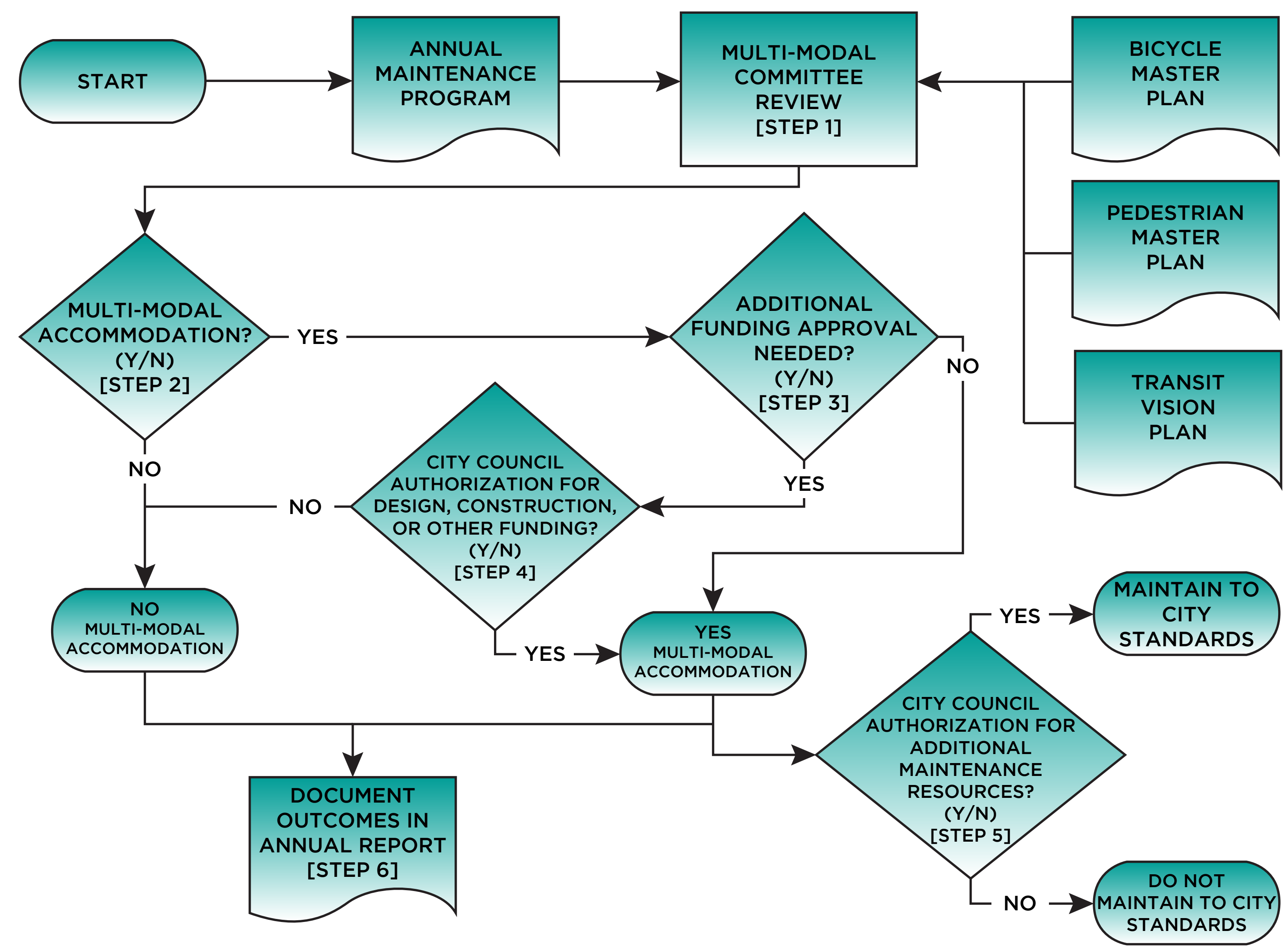


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Figure 35: Urban Core Example #1

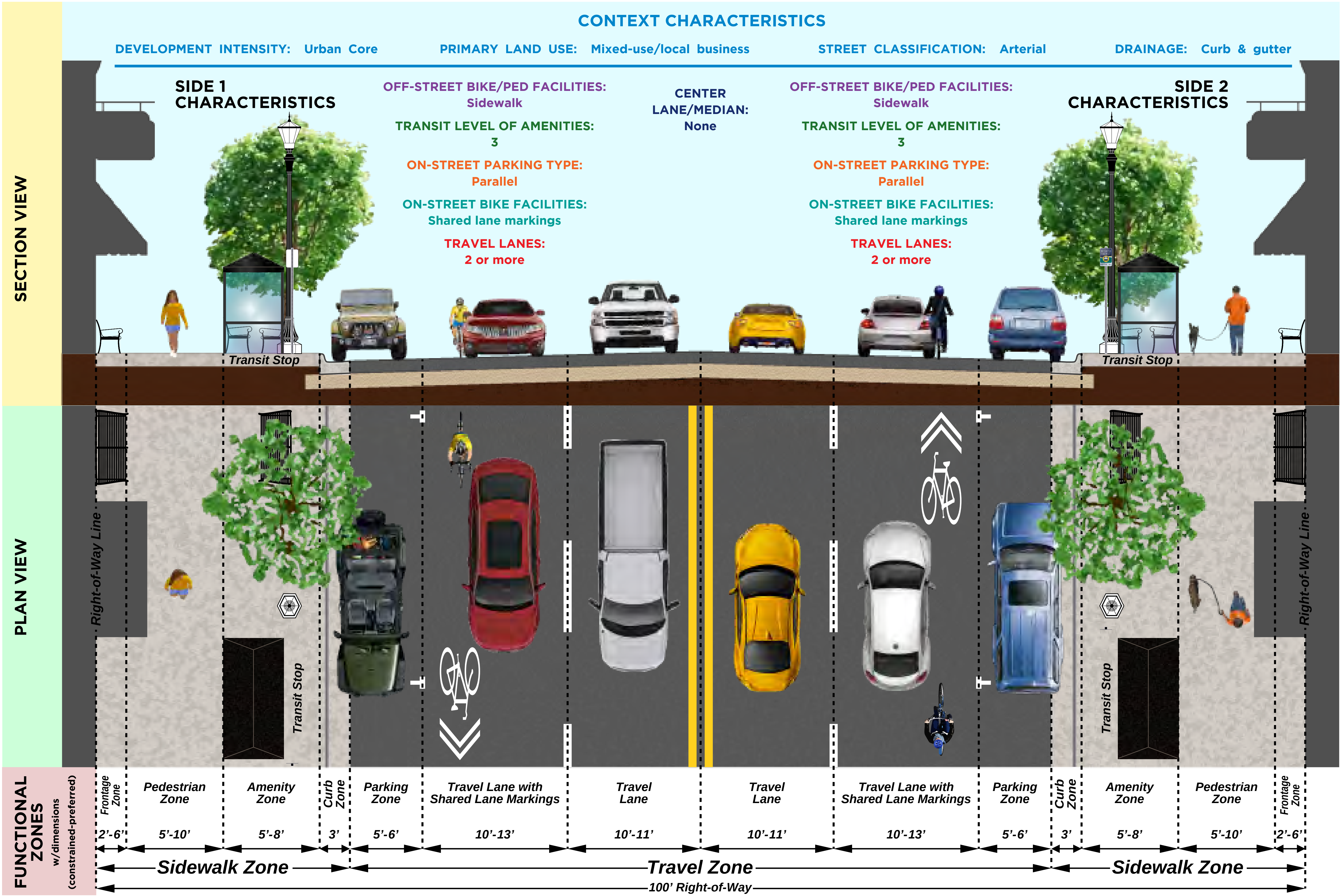


Figure 36: Urban Core Example #2

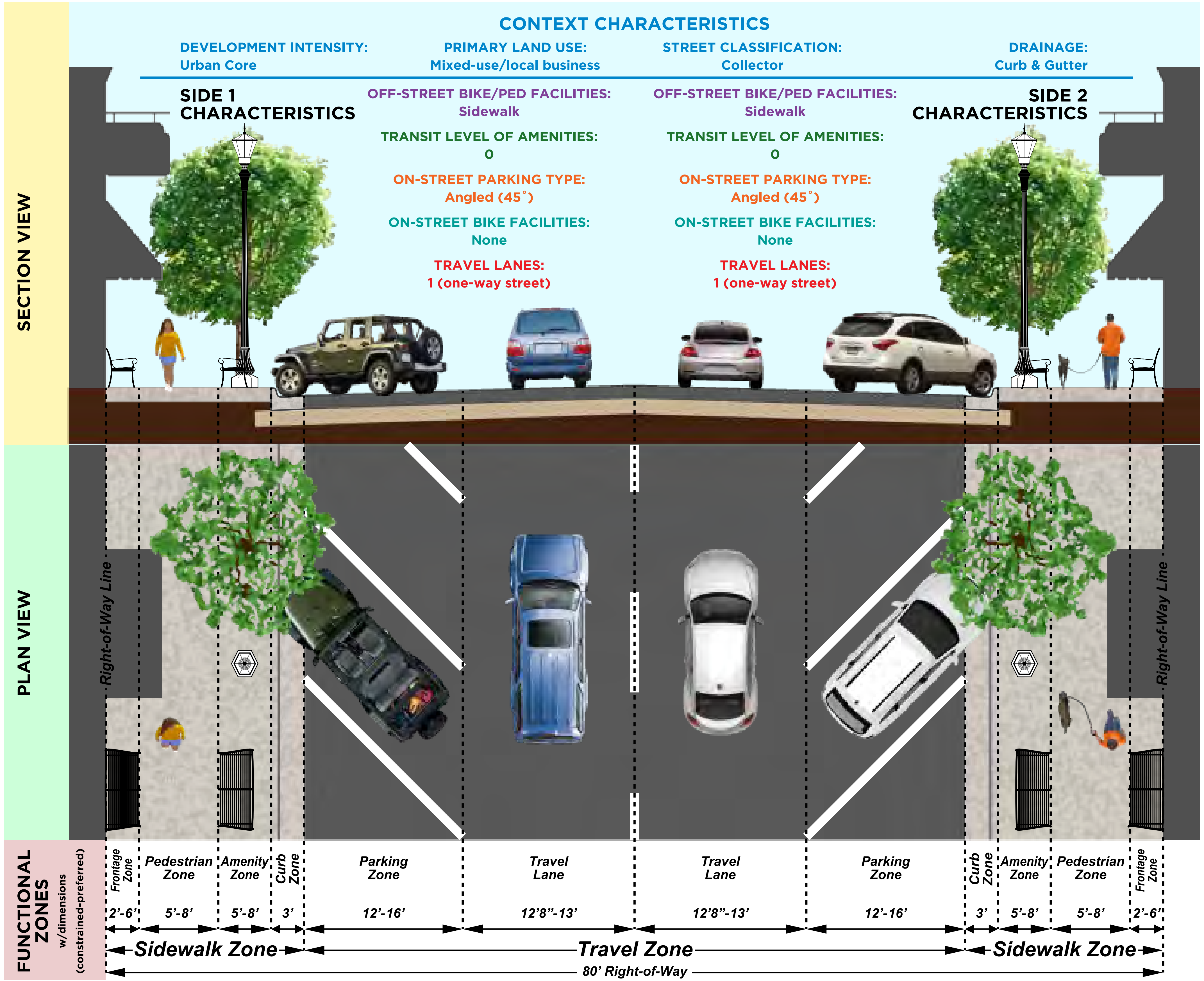


Figure 37: General Urban Example #1

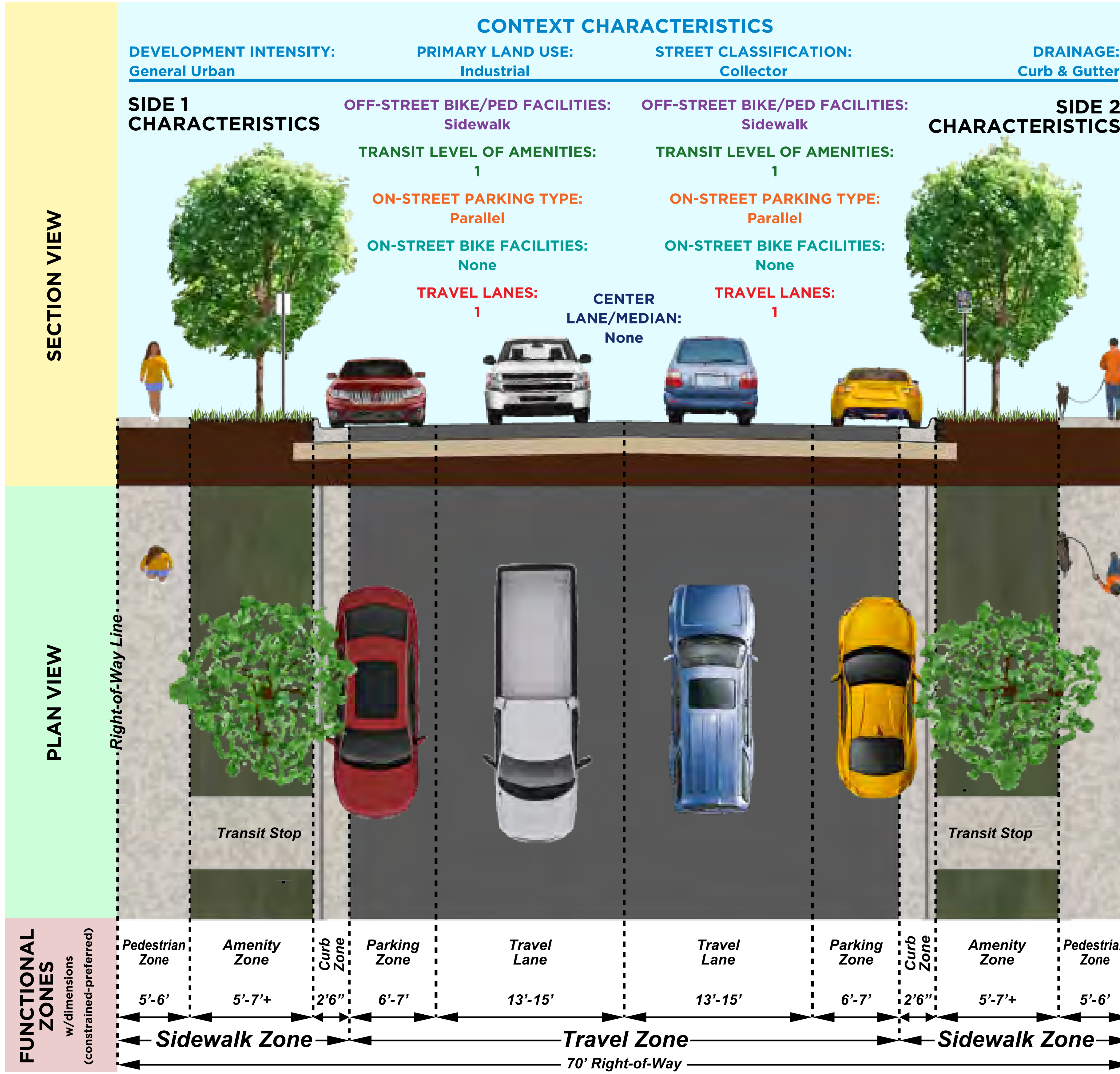


Figure 38: General Urban Example #2

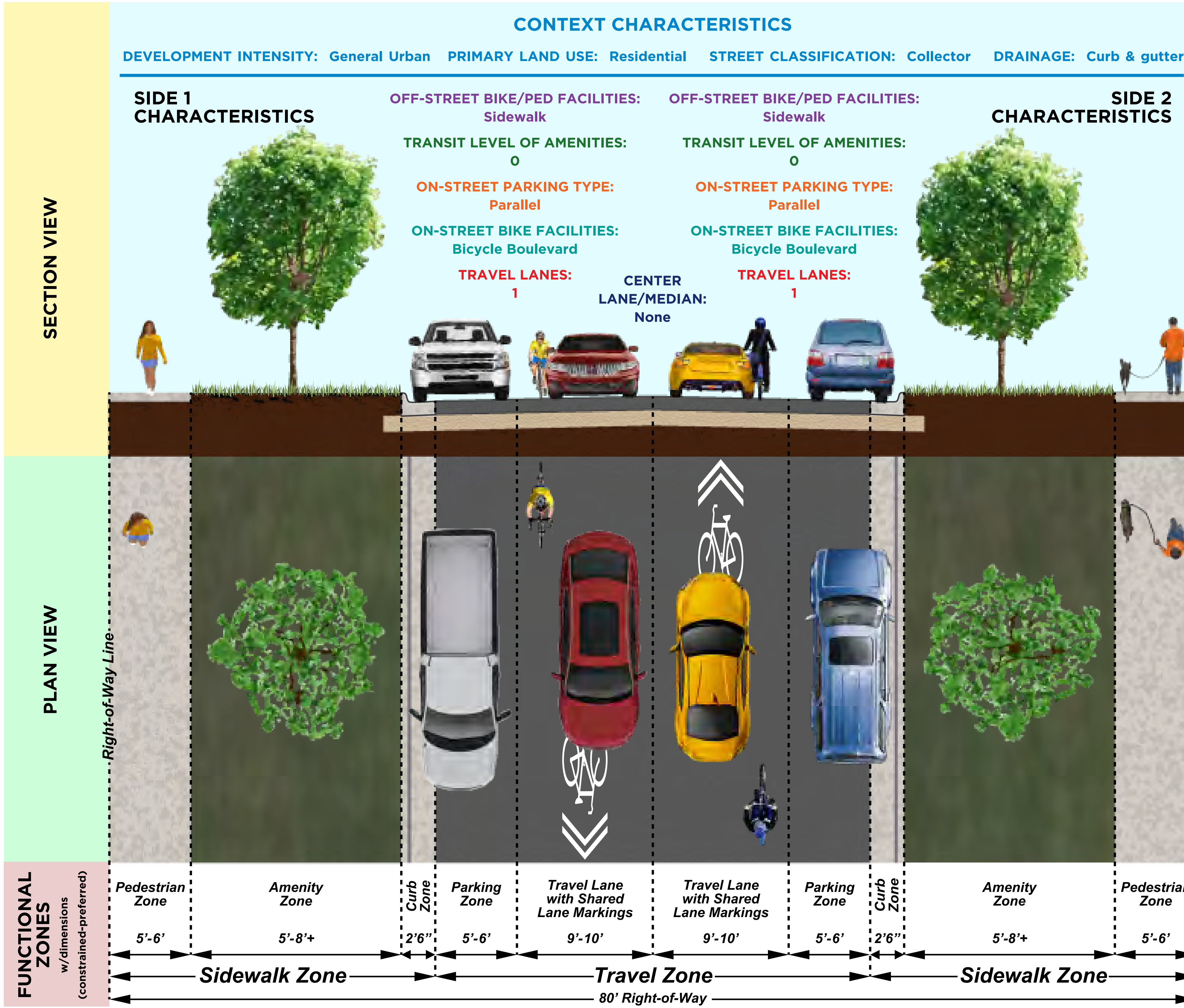


Figure 39: General Urban Example #3

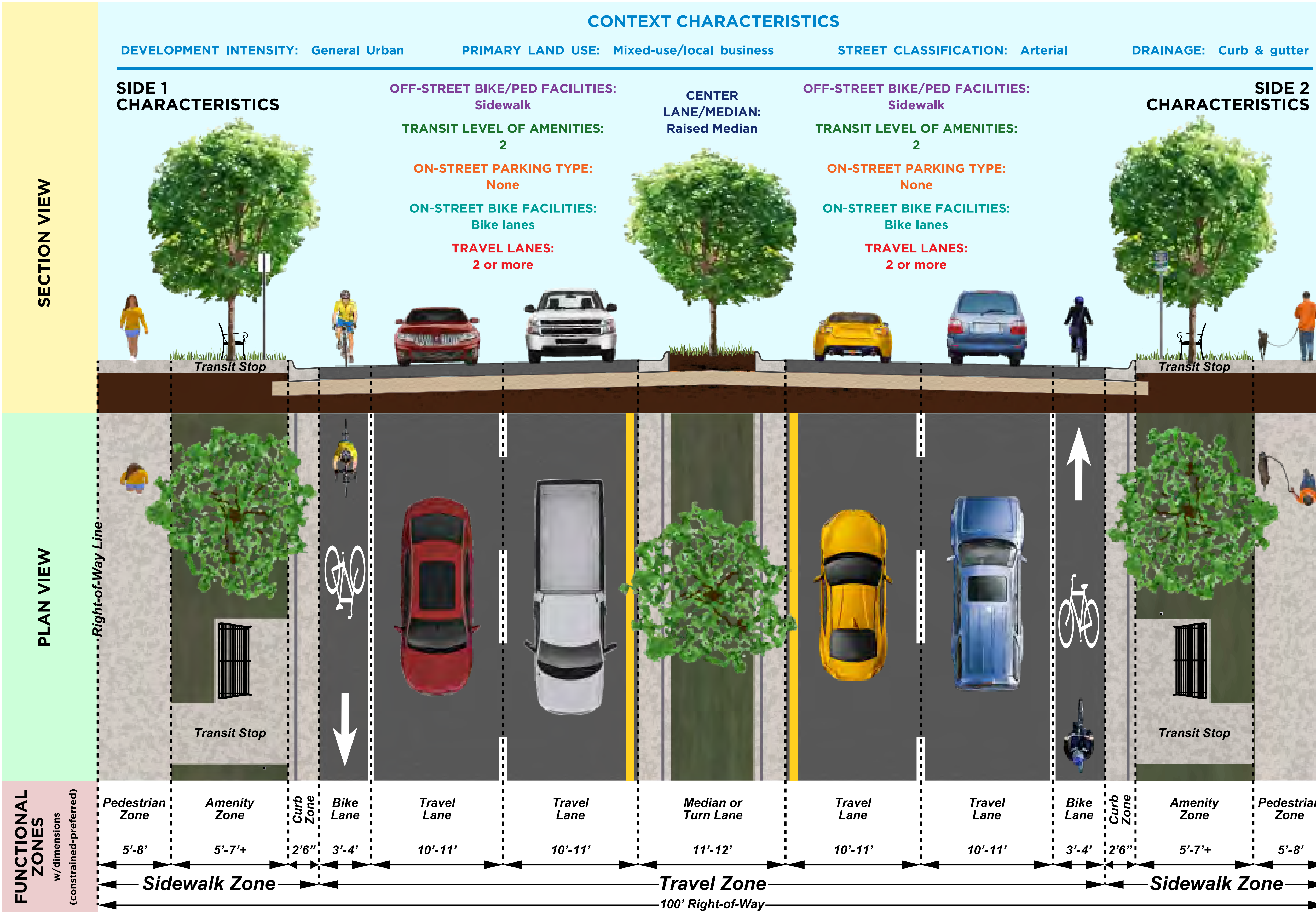


Figure 40: Suburban Example #1

CONTEXT CHARACTERISTICS

DEVELOPMENT INTENSITY: Suburban | **PRIMARY LAND USE:** Residential | **STREET CLASSIFICATION:** Arterial | **DRAINAGE:** Open ditches

SIDE 1 CHARACTERISTICS		CENTER LANE/MEDIAN:		SIDE 2 CHARACTERISTICS
	OFF-STREET BIKE/PED FACILITIES: Sidewalk	Continuous center left-turn lane	OFF-STREET BIKE/PED FACILITIES: Sidewalk	
	TRANSIT LEVEL OF AMENITIES: 0		TRANSIT LEVEL OF AMENITIES: 0	
	ON-STREET PARKING TYPE: None		ON-STREET PARKING TYPE: None	
	ON-STREET BIKE FACILITIES: Paved shoulder		ON-STREET BIKE FACILITIES: Paved shoulder	
	TRAVEL LANES: 1		TRAVEL LANES: 1	

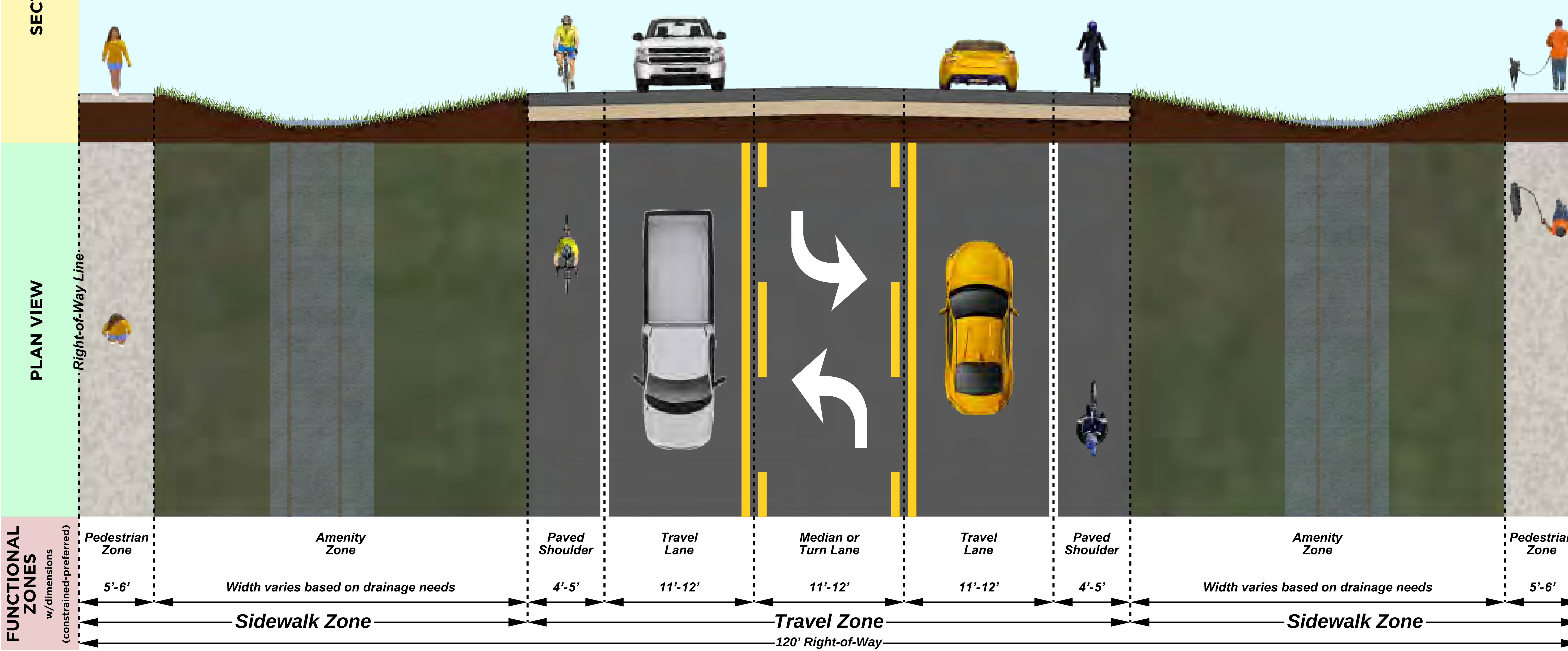


Figure 41: Suburban Example #2

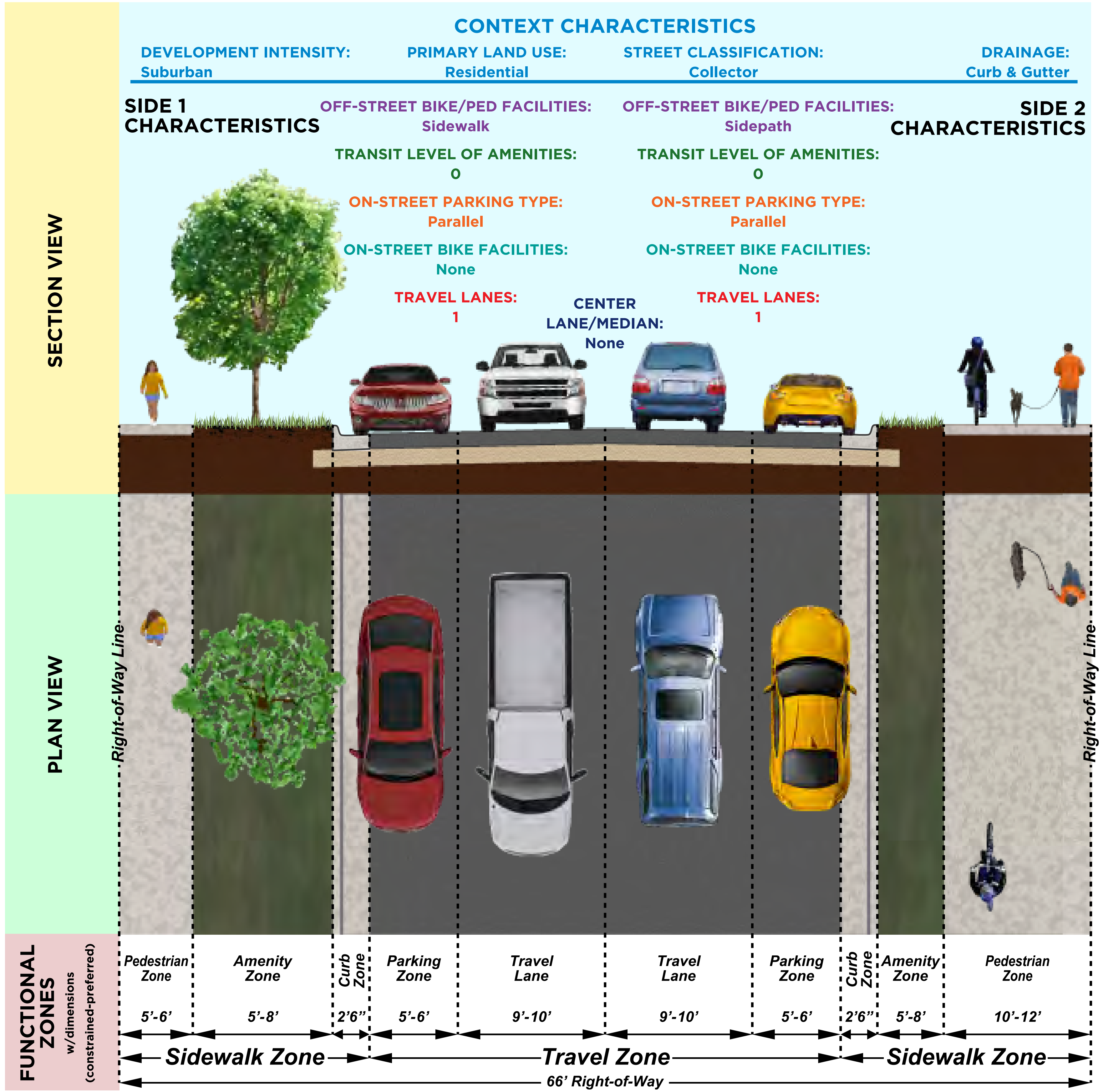
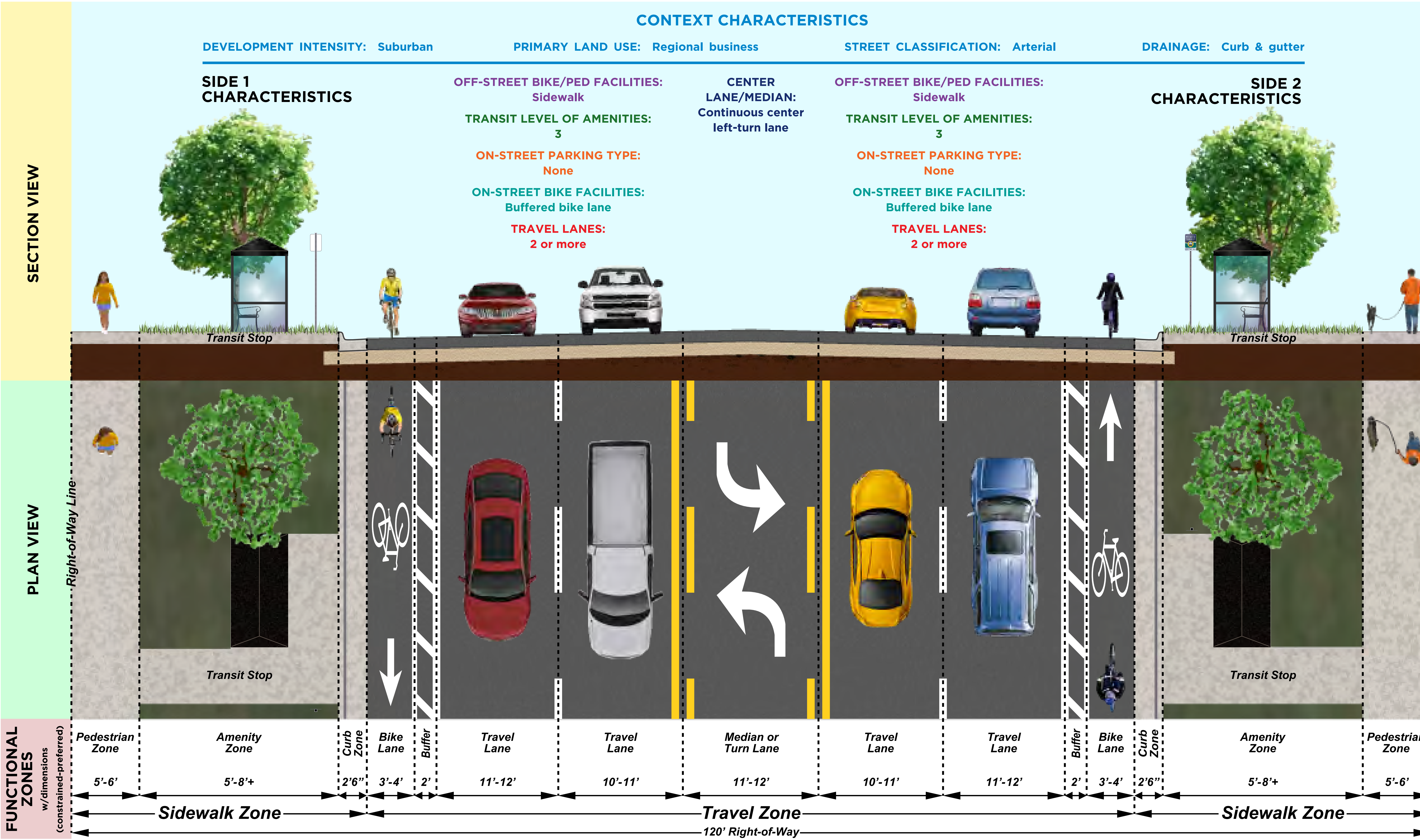


Figure 42: Suburban Example #3



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