CITY OF SANTA FE STREET DESIGN GUIDE

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Chapter 1. Introduction and Purpose

In 2022, the City of Santa Fe adopted a Complete Streets Resolution in response to increased public demand for multimodal facilities; the desire to improve quality of life for residents and visitors; the need to address roadway safety hazards; respond to climate change; and to encourage economic development. The Resolution (2022-46) directed the City of Santa Fe to update its transportation design criteria to ensure that all public infrastructure projects implement Complete Streets best practices.

The **Public Infrastructure Design Guide: Streets** (herein referred to as “Street Design Guide”) was prepared as a joint effort between the City of Santa Fe and the Santa Fe Metropolitan Planning Organization (Santa Fe MPO) to develop a set of updated guidelines in conformance with national standards. This Street Design Guide was developed by analyzing existing standards and guidelines from local, state, and federal levels and comparing them to transportation planning best practices from National Association of City Transportation Officials (NACTO), Public Right-of-Way Accessibility Guidelines (PROWAG), American Association of State Highway and Transportation Officials (AASHTO), and Complete Streets. These frameworks have been synthesized and adapted to suit the unique characteristics and needs of Santa Fe, including strategies for constrained right-of-way that are frequently encountered throughout the City.

The Street Design Guide serves as a strategic resource during the conceptual planning phase of new or reconstructed streets, corridors, or networks. The Guide will assist public and private transportation professionals and City staff in applying a consistent, safe, and multimodal approach to street design in Santa Fe. While it is not a technical design manual, it is designed to guide transportation professionals and designers toward achieving technically sound outcomes by referencing and aligning with established planning and engineering design standards. Users are expected to apply their professional expertise in conjunction with these standards to develop designs that meet both conceptual goals and technical requirements.

1.1. Complete Streets Movement & Santa Fe

Complete Streets is an approach to planning, designing, and building streets that equally prioritize all modes of transportation while prioritizing safety. Bicyclists, motorists, pedestrians, and transit riders of all ages and abilities are considered when designing a Complete Street. This approach also emphasizes the needs of those who have been historically disenfranchised and subject to systemic underinvestment, or those whose needs have not been met through traditional transportation planning and design, such as people with disabilities and people who do not have access to personal vehicles. There is not one singular design prescription for Complete Streets as each one responds to its community context and is therefore unique.

A Complete Street may include bike lanes, sidewalks, accessible public transportation stops, median islands, safe and frequent crosswalks, roundabouts, and curb extensions. The context and needs of users vary between suburban, urban, and rural contexts, which are particularly important considerations in Santa Fe.

This Streets Design Guide considers Complete Streets best practices and applies it to the unique context of Santa Fe. Because of Santa Fe's historically narrow rights-of-way, a context-sensitive approach was developed to assist designers in prioritizing street elements and modal users in constrained scenarios. Additionally, drainage is not typically included in Complete Streets guides but is incorporated in this guide. The following factors are considered to ensure a comprehensive street design:

- community context
- right-of-way
- mode-specific plans (bike, transit, trails, etc.)
- complete streets best practices
- safety and speed management techniques
- preferred street elements
- context-sensitive priority modes

This guide draws from existing efforts in the City of Santa Fe to improve the City's streets. The vision, therefore, of the Streets Design Guide is to assist the City in achieving the stated goals and objectives of the following documents: the City of Santa Fe Complete Streets Resolution (#2022-46); City of Santa Fe Multimodal Transition Plan (MMTP) (adopted by Resolution #2022-65); the City of Santa Fe Stormwater Management Strategic Plan; the Santa Fe MPO 2040 Metropolitan Transportation Plan (MTP); and relevant multi-modal plans adopted by the City of Santa Fe or the Santa Fe MPO Transportation Policy Board.

Vision for Santa Fe's Complete Streets

Safety
A safe and secure transportation system for motorized and non-motorized users

Equitable Multimodal Mobility and Accessibility
An accessible, connected, and integrated transportation system for all users, where all community members can achieve an active life without a private car

Environmental Stewardship
A transportation system that protects and enhances the natural, cultural, and built environment and mitigates climate change

Congestion Relief and System Operations
An efficient and reliable transportation system poised to leverage emerging technologies

Economic and Community Vitality
A transportation system that supports economic and community vitality

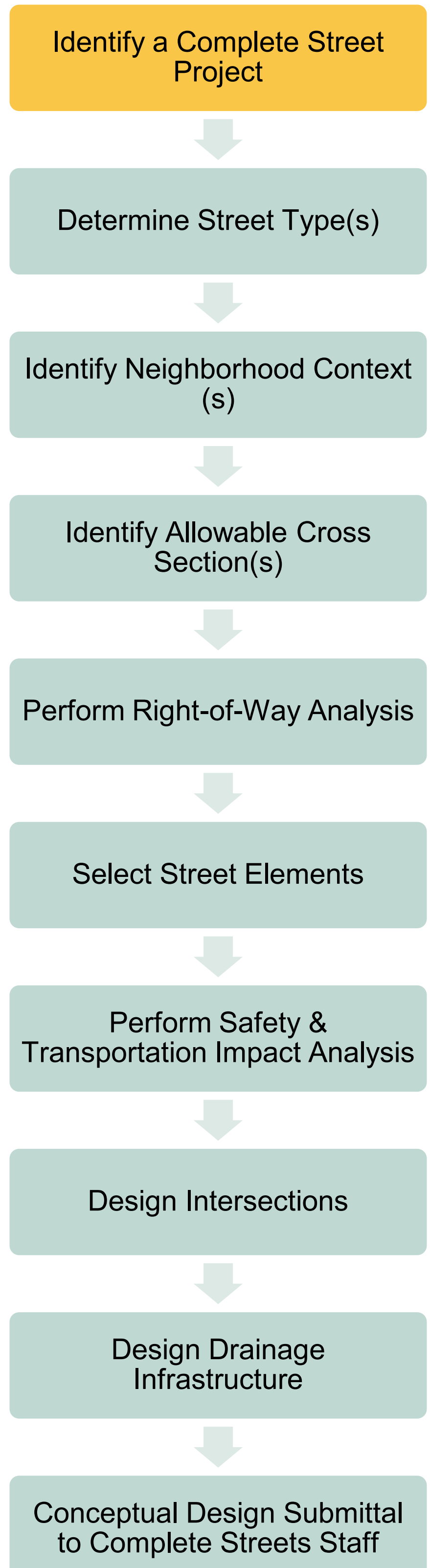
Public Health
A transportation system that supports healthy lifestyles

1.2. Design Process & Elements

This Streets Design Guide is intended to be used by designers in the conceptual stages of a new street design or a street retrofit to create a context-sensitive solution.

This Streets Design Guide establishes a step-by-step process for conceptual street design. It merges the need for context sensitivity with the understanding of each street's unique purpose in the overall transportation network. By creating a process to identify priority street design features when there may not be enough room to accommodate all modes of travel is a vital part of street design in Santa Fe. To accomplish this, street design decisions will be based on the following considerations:

1) **Street Type** is based on street functional classification and indicates the role the street plays in the broader network.
2) **Neighborhood Context** is derived from urban planning principles and nomenclature used to describe places and neighborhoods which help designers understand the local use of a street.
3) **Right-of-Way**, both existing and acquirable, determines the limitations of street design by defining the available width of the street.
4) **Mode-Specific Plans and Design Considerations**, such as the Multimodal Transition Plan and Bicycle Master Plan, are used to identify additional infrastructure that should be implemented in the street's design.
5) **Number of Lanes**, either existing or planned, ensures that adequate capacity is accounted for by vehicles, while balancing the need for other modes on streets.
6) **Street Elements** are conditions, objects, and infrastructure that may occur or be designed in within the street.
7) **Safety and Transportation Impact Analyses** are required for reconstruction projects.
8) **Intersection Considerations** ensure that adjacent land uses, level of service, and traffic engineering do not negatively impact new street design or existing street redesign while sacrificing street safety for vulnerable users.
9) **Drainage** factors and strategies, including Green Stormwater Infrastructure (GSI), provide guidance on how to manage street drainage in ways that help protect both roadway users and water quality in our watershed.



This manual provides methods for developing appropriate cross sections and prioritizing relevant street elements, both in new developments and on existing roadways with constrained right-of-way. As there may not always be enough space to include all of the optimal design features in reconstruction projects, this Guide assists in prioritizing modes and street elements to advance the goals of the Street Design Guide.

1.3. Reference Standards

National design guidelines and standards informed the creation of this Streets Design Guide. These documents, a full list of which can be found in Appendix A, can be used to provide further details on the planning and design of roadways and multi-modal infrastructure.

To achieve innovative, multi-modal design, the following guidelines should take precedence in the order they are listed below:

1. NACTO Urban Street Design Guide (Current Edition)
2. Manual on Uniform Traffic Control Devices (MUTCD) (Current Edition)
3. AASHTO Policy on Geometric Design of Highways and Streets (AASHTO Green Book) (Current Edition)

If a newer edition of these documents is released subsequent to release of the Streets Design Guide, the more recent edition should be used. If newer guidance directly conflicts with information in the Streets Design Guide, design decisions are subject to approval by the City Traffic Engineer, Complete Streets Staff, or applicable Director. As always, engineering judgement should be used to ensure that guidelines are applied in a context-sensitive manner. Where conflicts between the Streets Design Guide and reference materials exist, the Streets Design Guide should be treated as the preferred, though safety should always be the guiding decision for street design.

1.4. Relationship to Other Plans

Existing adopted City and MPO plans and strategies already in place for bicycles, pedestrians, drainage, and transit shall be incorporated into the design process. See **Chapter 2: Contextual Street Design Framework** for a list of other modal plans that should be consulted when designing streets in Santa Fe. Design standards adopted by ordinance may supersede the criteria of the Streets Design Guide, subject to final approval by the City of Santa Fe Complete Streets staff.

Chapter 2. Contextual Street Design Framework

Streets are often seen first as corridors for moving people and goods. But they are more than that: streets are also home to utilities, landscaping, and stormwater infrastructure, and much of a city's public space.

This Street Design Guide holistically considers all possible elements of a street, prioritizing people's safety while balancing efficient travel and public infrastructure. Street context and needs are different across neighborhoods and may even change along segments of the same street. As a result, each street will look and operate differently, even when using a Complete Streets approach.

Streets are not static, but dynamic public spaces that change over time based on community values, needs and desires.

"Streets are often the most vital yet underutilized public spaces in cities. In addition to providing space for travel, streets play a big role in the public life of cities and communities and should be designed as public spaces as well as channels for movement."

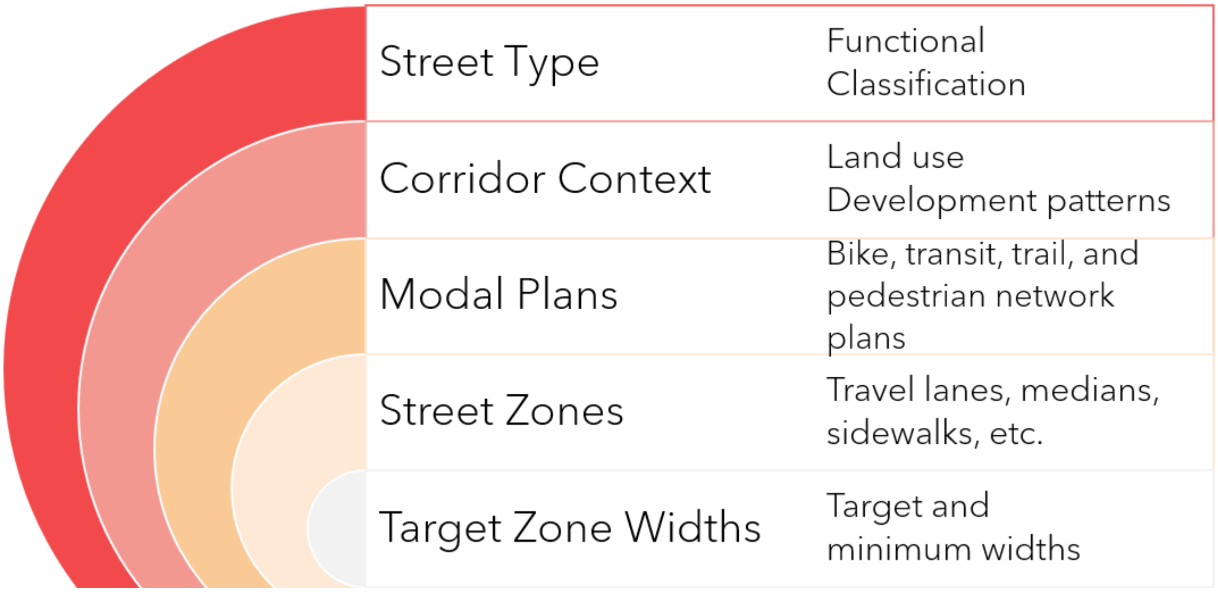
– NACTO Principles for Urban Street Design

T**he needs of pedestrians, cyclists, cars, transit, utilities, stormwater, and the land uses surrounding a street will inform how a street should be designed or retrofitted.** To provide a context-sensitive approach to designing our streets, this chapter outlines:

1. **Santa Fe Street Types:** Standard street typologies based on functional classification and local context.
2. **Corridor Context:** Common land use and historic development patterns in Santa Fe that constrain space along streets in Santa Fe.
3. **Mode Specific Plans:** Local and regional modal plans that will inform the presence and type of multimodal facilities.
4. **Street Zones:** Common elements of a street broken down by the zone they typically occupy.
5. **Zone Widths by Street Type:** Tables outlining target, minimum, and maximum widths for each zone of a street, based on Street Type.
6. **Zone Prioritization:** Tables for prioritizing zones and modes based on the context of the specific street being planned or designed.

Modern municipal design standards increasingly recognize the importance of livability, safety, and multimodal access as core design principles. The implementation of context-sensitive street design, traffic-calming measures, and Complete Streets principles can enhance safety, accessibility, and the overall quality of life in Santa Fe. By integrating these guidelines into street retrofitting and future development, the city can foster a transportation network that supports all users while improving community connectivity and economic vitality.

Figure 1: Contextual Street Design Framework



2.1. Community Context

Santa Fe has witnessed many iterations of growth, with much of its core development dating prior to the popularization of the automobile in the American West. Santa Fe's historical development boasts beginnings as a Pueblo settlement. It was re-established as a Spanish colonial outpost in the 1600s and continued to grow under both Spanish and Mexican governance between the 1600s and 1800s. It boomed again following the arrival of the railroad in the 1860s, at which point Santa Fe was under the control of the United States.

Figure 2: An Image of Historic Santa Fe

Because of this pre-automobile development, much of Santa Fe was developed with narrow roads that constrain the typical right-of-way necessary for travel today, especially in the historic core of Santa Fe. Some streets today remain unpaved dirt or gravel roads, which exhibit a rural character. However, as zoning regulations and engineering standards became the prevailing framework for urban development, the built environment in Santa Fe underwent significant transformation. Streets in other parts of Santa Fe, developed post-automobile popularization, are decidedly more car-oriented and surrounding land uses are less mixed-use, with limited emphasis on multimodal users. The expansion of suburban communities and the construction of high-capacity streets has resulted in a transportation network that currently prioritizes vehicular flow over multimodal accessibility and safety.

The prioritization of personal vehicles over diverse transportation modes presents ongoing challenges in achieving a balanced and equitable urban mobility system. The land use context and original roadway design of particular corridors and historic considerations will inform the retrofit of streets, which should seek to achieve a more equitable approach, accommodating a variety of modal users.

2.2. Santa Fe Street Types

Functional street classification systems group streets based on the needs for vehicle mobility versus property access. The system can be used to develop a city's roadway network to support varying speeds, volumes, and types of traffic. The functional classification system is the basis for most local, state, and national roadway design guides and manuals. However, functional classifications are limited because they primarily consider the mobility and capacity of motor vehicles. The traditional classifications by themselves are not sufficient when designing a street and should not be the governing measure for design assumptions and intended operations. Therefore, a new methodology has been developed for this report: the Santa Fe Street Type.

A Santa Fe Street Type is a localized definition of roadway typology with the goal of designing and retrofitting streets that prioritize safety for all users. Types are informed by standard roadway functional classifications and by typical local street composition.

The type of street indicates the intended function of the street in the transportation network and gives options on how to achieve that functionality within different rights-of-way. This approach offers a balance between functional classification, adjacent land uses, and the trade-offs resulting from competing needs of all transportation modes. Each type is intended to reflect community values first and foremost, with technical assumptions and standards in support of those values.

Each street type is defined by a combination of factors, including desired speeds, access, modes served, and trip length. Street types are broken into six types (Type 0, I, II, III, IV, V). Types are organized in a hierarchy based on the streets' function in their Zones. The Street Types shown provide a description and visual of how the different types are intended to function. The streets range from block uses (Types 0 - I), to city uses (Types II - III), and up to regional uses (Types IV - Type V).

A street may change in Type as the roadway travels through the city. Additionally, the purpose of a street can change when it passes through activity centers and special districts, resulting in corresponding changes in street design as described in the next section: **Corridor Context**.

Table 1: Street Types by Functional Classification, Lanes, Mode, Purpose, and Typical Characteristics

Type	Functional Classification	Typical Lanes	Purpose & Modes Served	Characteristics in Santa Fe
Type 0	*N/A* (Alleys & Private Roads)	1	**Purpose:** Local and private access **Primary Modes:** Pedestrians, Passenger Vehicles	Occasionally unpaved Residential or commercial Utility access Refuse storage/pickup Sometimes privately maintained
Type I	Local Roads	1 – 2	**Purpose:** Local access **Primary Modes:** Pedestrian, Cyclist, Passenger Vehicles, Local Deliveries	Narrow right-of-way Slow speeds Frequent intervals Frequent curb cuts Supportive of multi-modal travel Mail and parcel delivery Residential
Type II	Minor & Major Collectors	2-3	**Purpose:** Connect local travel to the arterial network and/or commercial destinations **Primary Modes:** Pedestrian, Cyclist, Passenger Vehicles, Some Transit, Local Deliveries	Slow to moderate speeds Frequent intervals Supportive of multi-modal travel Residential and low-intensity commercial
Type III	Minor Arterials	3 – 6	**Purpose:** Connect travelers to destinations within the city **Primary Modes:** All	Moderate speeds Moderate intervals (intersection spacing) Frequent curb cuts Typically surrounded by commercial or dense multi-family uses
Type IV	Major Arterials	5 – 8	**Purpose:** Accommodate longer-distance travel within, into, and out of the city **Primary Modes:** Passenger Vehicles, Commercial Vehicles, Transit	High speeds Some access control Some curb cuts for major commercial access Sometimes surrounded by commercial uses, sometimes traveling through or around rural or lower-density settings
Type V	Freeways & Interstates	4 - 8	**Purpose:** Long-distance regional and interstate travel in, out, and through the region **Primary Modes:** Passenger Vehicles, Commercial Vehicles	High speeds Access-controlled Pedestrians and cyclists prohibited on interstates *Design guidance not developed in this document.*

2.3. Corridor Context

The following descriptions of Corridor Contexts provide additional context to be considered when planning roadway design or retrofits in certain areas of Santa Fe.

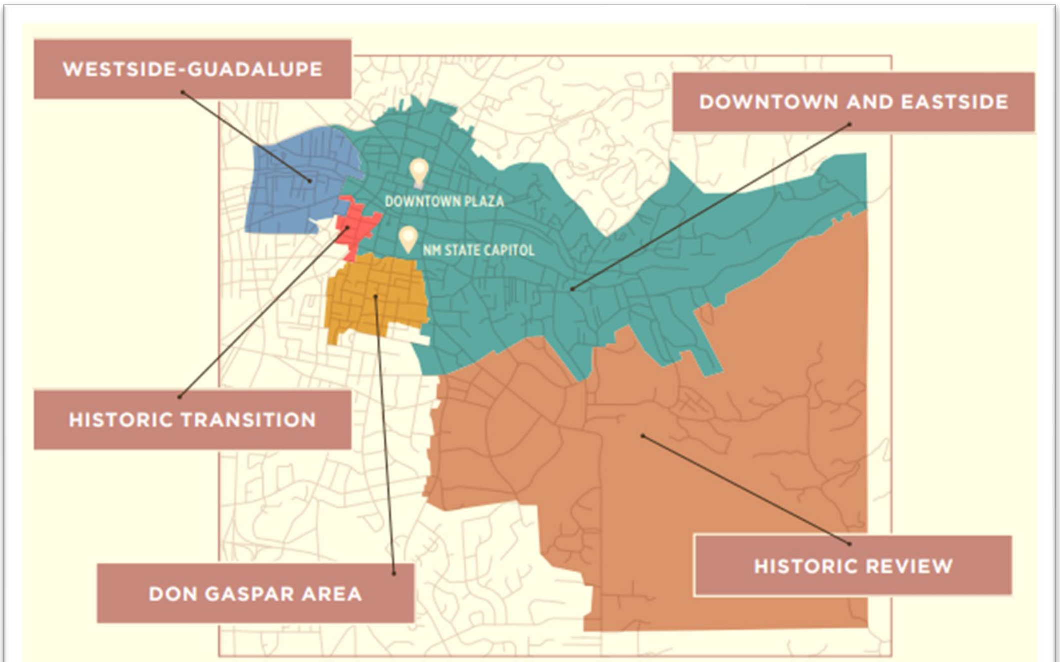
2.3.1 Historic Districts

Santa Fe's **Historic Districts** are characterized by narrow streets and mixed uses, where commercial and residential uses are sometimes directly adjacent to each other. Existing residential streets are typically "yield" streets, with parking on one or both sides. Due to constrained right-of-way, most streets in the historic districts enjoy slow design speeds of 20 to25 mph and are some of the safest streets in the network. The presence, width, and quality of sidewalks are inconsistent and may not meet modern ADA standards.

Redesigns of historic streets, as necessary or in coordination with redevelopment, will involve careful consideration of tradeoffs, likely forfeiting vehicle and parking lanes for stormwater facilities and ADA-compliant sidewalks. Considerations for historic character, business needs, and connectivity should be made when selecting sidewalk treatments and installing utilities, landscaping, or street furniture. Coordination with the Historic Preservation Division is recommended when redesigning streets in Historic Districts.

To determine whether a project passes through a **Historic District**, visit the City's interactive mapping system and view the "Historic Districts" layer under Public Viewer > Overlay Districts.

Figure 3: Santa Fe Historic Districts



ABOVE » Map of Santa Fe's Five Historic Districts

2.3.2 Neighborhood Centers and Community Commercial

Neighborhood Centers boast small-scale commercial uses such as retail and restaurants close to residential neighborhoods. These buildings are often built to the sidewalk edge and offer pedestrian-scale designs. These are more likely to occur on Type II streets, but may occasionally occur on Type III streets, or sometimes along Type I streets in historic districts. Examples of existing Neighborhood Centers include:

- Lena Street
- Rail Yards
- Siler/Rufina District
- Hickox St
- Canyon Road
- Rodeo Plaza

Neighborhood Centers are not as common in southwest and southeast Santa Fe, but future growth plans aim to accommodate more neighborhood- and multimodal-oriented development and redevelopment.

Community Commercial areas are usually near residential neighborhoods and are typically on Type II or Type III streets. Unlike Neighborhood Centers, Community Commercial uses are more likely to be oriented to vehicular access with buildings set back from the roadway and street-fronting parking lots. In their current configuration, street design may be less friendly for multi-modal access.

Regardless of current design, these destinations are desirable for pedestrians and cyclists. The street should support pedestrians, cyclists, on-street parking, and active street life through slower travel speeds and comfortable multi-modal facilities.

To determine whether a project passes through a Neighborhood Center or Community Commercial area, visit the City's interactive mapping system and view the "Future Land Use" layer under Public Viewer > Overlay Districts.

2.3.3 Industrial

Industrial streets provide access to manufacturing plants, warehouses, and other industrial land uses. They see a high share of freight traffic while general traffic volumes and speeds remain low. Multimodal uses tend to be infrequent or pass-throughs on the way to other destinations. Due to high volumes of freight traffic, wider lanes should be considered.

Accommodating truck traffic, including providing adequate turning radii at intersections, is a primary design consideration for these streets. While pedestrian use may be minimal, sidewalks and accessible accommodation should still be provided. Industrial Street designs should discourage trucks cutting through residential streets in surrounding neighborhoods.

2.3.4 School Zones

School Zones are short corridors close to schools, especially around the entrances, exits, pick-up and drop-off areas. Streets in school zones should include prioritized safety measures by incorporating traffic calming such as reduced speed limits, speed humps, raised crosswalks, and high-visibility crosswalks to ensure the protection of children, whether as pedestrians or cyclists. Adequate signage and flashing beacons can alert drivers to the presence of a school zone, reinforcing the need for slower speeds and heightened awareness. Wide sidewalks, pedestrian refuge islands, and protected crossings should be integrated to create a safer walking environment for students. Well-designed drop-off and pick-up zones should minimize traffic congestion and conflicts between vehicles, cyclists, and pedestrians; considerations should be made for children and parents arriving on bicycles or scooters. Integrating bike facilities including bike lanes and intersection treatments and improving connectivity to surrounding neighborhoods encourages safe and sustainable transportation options for students and families.

Additional accessibility considerations for students who are hard of hearing, deaf, or blind should be made around schools specializing in education for those populations.

Projects should consult with the *Safe Routes to School Action Plan* and any updates, as appropriate.

2.3.5 Rural-Urban Interface

Typical in east and northern Santa Fe, rural areas are characterized by low density, single family residential development with less than 3 dwelling units per acre. Streets in these areas may be unpaved or paved with no curb and gutter. Because of this, stormwater conveyance and infrastructure are different than an urban roadway. Instead of traditional curb and gutter, there may be open swales or ditches or other drainage and green stormwater infrastructure (GSI) along the streets. Additionally, multimodal users are more likely to be local recreational users on neighborhood walks or bike rides comfortable on low-volume unpaved streets.

Unpaved streets are no longer preferred. Design considerations should consider how to continue reinforcing the rural characteristics of these neighborhoods.

2.3.6 Stormwater Sensitive Areas

As identified in the City of Santa Fe's *Stormwater Management Strategic Plan* (2017), the City is faced with several stormwater management challenges. Santa Fe, like other cities, provides certain services to residents, including the management of stormwater using the public rights-of-way and storm sewer infrastructure. Without proper management, runoff from storms can cause erosion of the arroyos, acequias, and the Santa Fe River, as well as carry pollution into the river that can impact ecological biodiversity. Furthermore, uncontrolled stormwater can damage private property as well as public assets and infrastructure. With the use of proper management techniques, however, stormwater can be a resource for Santa Fe residents instead of a source of damage and pollution. Stormwater runoff from Santa Fe is regulated through the U.S. Environmental Protection Agency (USEPA) Municipal Separate Storm Sewer (MS4) permit, which requires control of the pollutants in the runoff.

Runoff from buildings, parking lots, rooftops, and streets enters arroyos and the Santa Fe River via overland flow, streets, and the storm sewer systems. The volume and velocity of this stormwater can cause erosion, and pollutants carried by the runoff can pollute waterways. In addition, research shows that climate change will result in warmer temperatures and prolonged droughts in the Santa Fe region in the future, as well as heavier rain events. These storm events may result in more flooding and erosion of the arroyo systems and discharge of pollutants to the Santa Fe River if stormwater is not adequately managed on private and public properties. The City's storm sewer infrastructure is facing increased pressure from increasing storm intensity and the creation of new impervious surfaces. As the City of Santa Fe continues to grow, every new development brings additional impervious surfaces that generate more stormwater runoff that the City must manage and increases the potential to cause additional damage to waterways.

Special considerations should be made in stormwater sensitive areas, including the integration of Green Stormwater Infrastructure (GSI), the use of pervious surfaces, or the widening of gutter pans to accommodate larger flows.

2.4. Mode-Specific Plans

The City of Santa Fe and the Santa Fe Metropolitan Planning Organization have developed several mode-specific plans to guide the implementation of transportation alternatives such as sidewalks, bike lanes, and transit. Before designing a street, practitioners should consult these plans to understand where and how these specific modal elements should be integrated.

2.4.1 Multimodal Transition Plan (2022, inclusive of any updates)

The goal of the transition plan is to actively support and encourage transportation investments that increase transit, walking, and bicycling while improving safety for all street users.

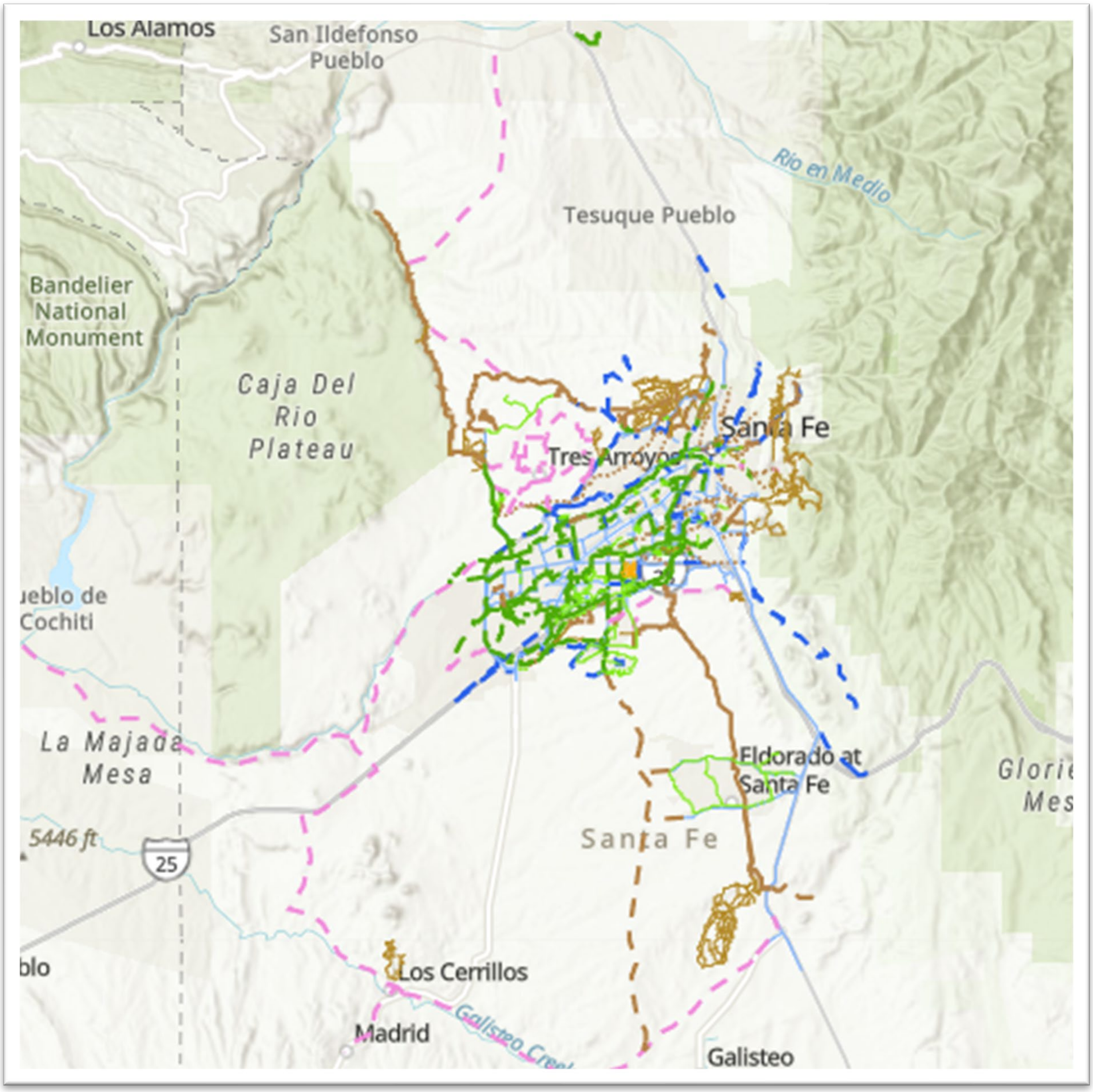
Access the plan: Multi-modal transition plan | Santa Fe Metropolitan Planning Organization

2.4.2 Santa Fe Metropolitan Bicycle Master Plan (2019, inclusive of any updates)

The goal of the Santa Fe Metropolitan Bicycle Master Plan is to create a comprehensive bicycle network for cyclists of all ages and abilities. The plan emphasizes protected bike lanes, addressing equity, and access concerns. It proposes a long-range bike network and design toolkit for facilities that serve all cyclists.

A snapshot of the Interactive Bicycle Master Plan is below. Access the interactive map here: ArcGIS - Interactive Bicycle Master Plan

Figure 4: Interactive Bicycle Master Plan

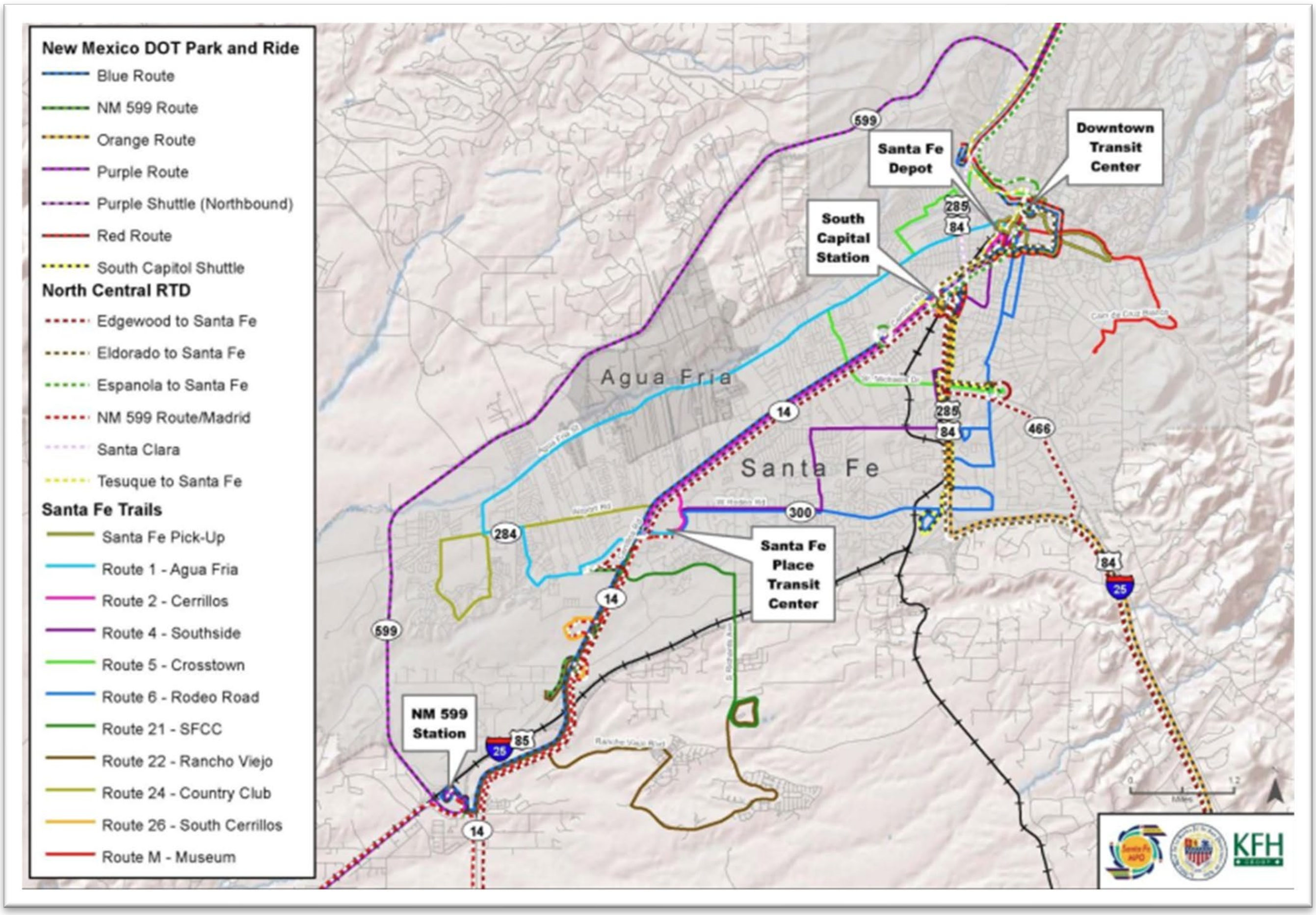


2.4.3 Santa Fe Metropolitan Public Transit Master Plan (2015, *inclusive of any updates*)

The Santa Fe Metropolitan Public Transit Master Plan was adopted in 2015 and focuses on standardizing service, technology, fare medium, and communication across the four different transit providers located in Sante Fe.

Access plan: [Public Transit Plan | Santa Fe Metropolitan Planning Organization]

Figure 5: Santa Fe Metropolitan Public Transit Master Plan

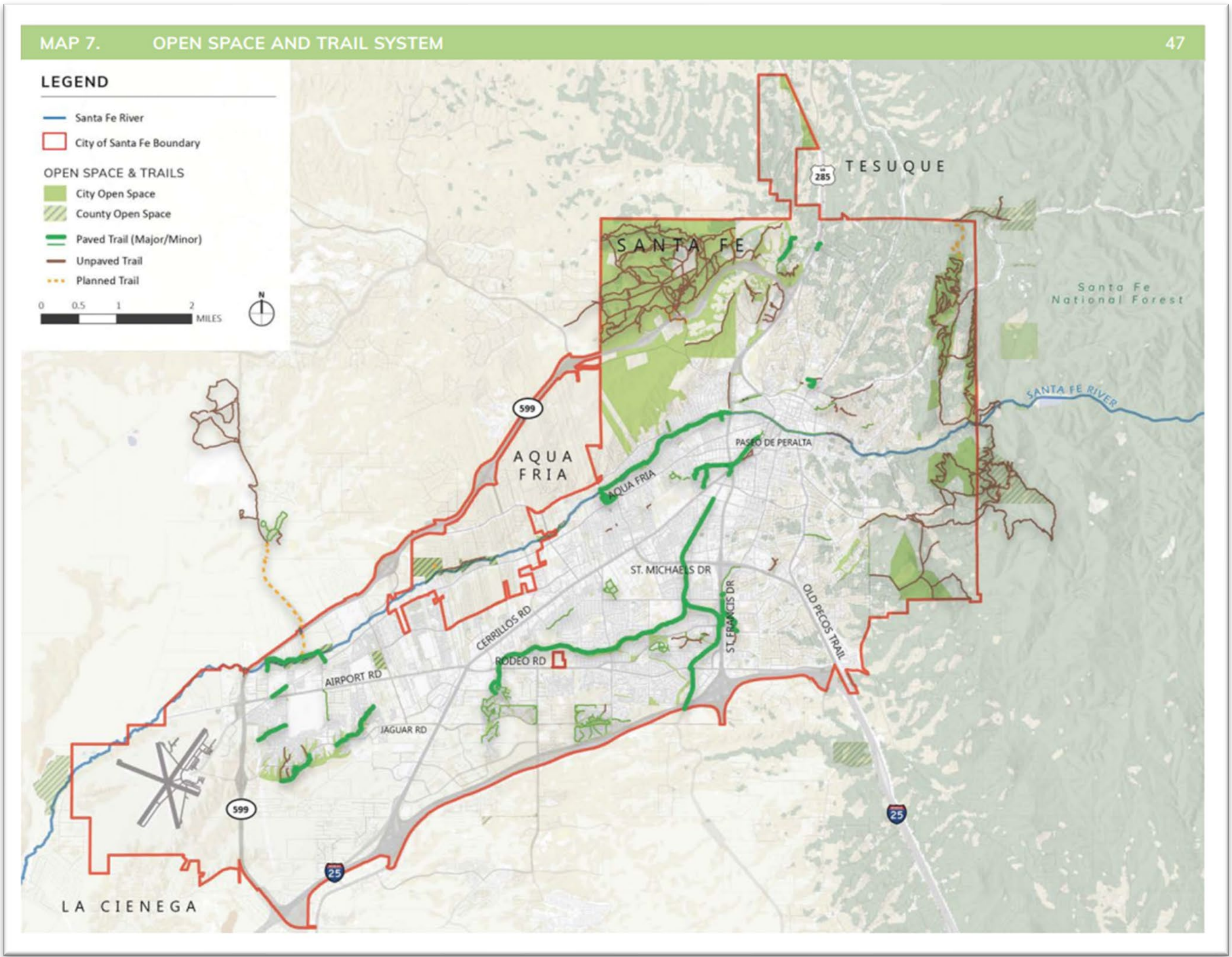


2.4.4 Santa Fe Parks, Open Space, Trails, & Recreation Master Plan (2017, inclusive of updates)

This plan addresses expanded accessibility, improving infrastructure, closing network gaps, and continued long term maintenance efforts.

Access plans: Parks, Open Space, Trails & Recreation Master Plan

Figure 6: Parks, Open Space, Trails & Recreation Master Plan



2.4.5 Local Road Safety Plan (2022, inclusive of updates)

The Santa Fe Metropolitan Planning Organization's Local Road Safety Plan was developed to improve road safety and reduce traffic-related fatalities and serious injuries by 50% before 2027. It focuses on key conditions such as roadway departure, distracted and impaired driving, speeding, and safety for pedestrians, cyclists, and drivers of all ages. It also follows the Safe System Approach, emphasizing proactive, data-driven safety strategies and partnership.

Figure 7 – FHWA Safe System Approach

An analysis of serious and fatal road-related injuries helped to identify a “high injury network.” Projects on the High Injury Network should take particular care to design interventions that improve safety for all roadway users, and follow any recommendations outlined in the Plan for that particular roadway segment.

Access plan: [Santa Fe MPO Local Road Safety Plan]

Figure 8: Santa Fe MPO Local Road Safety Plan

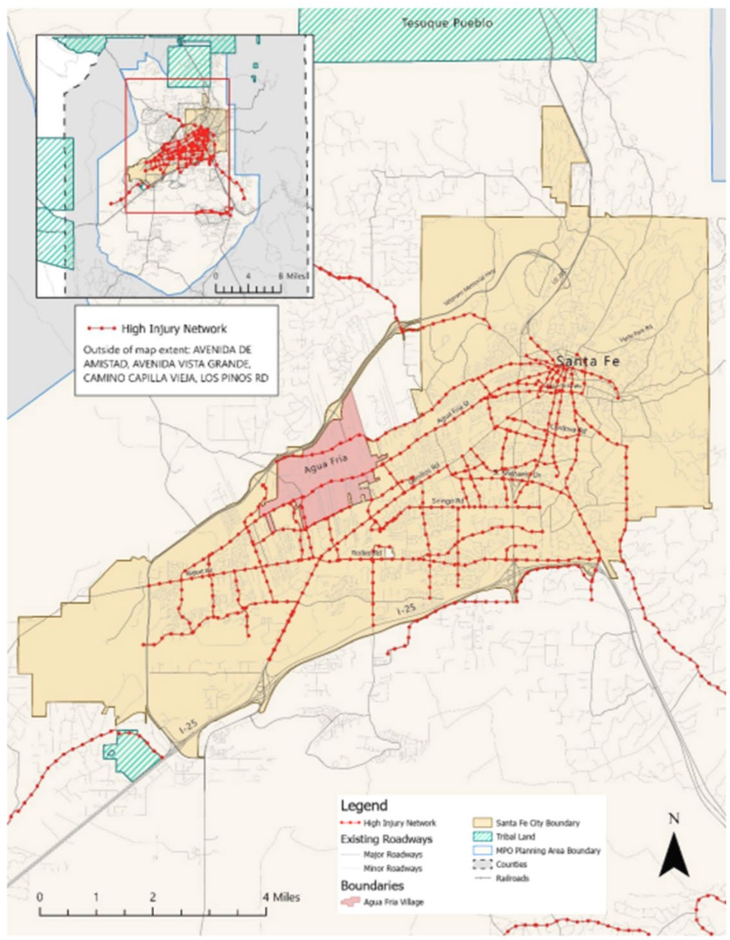


Figure 16. Graphic. Santa Fe Metropolitan region High Injury Network (HIN) (Source: NMDOT, 2021).

2.4.6 Safe Routes to School Action Plan (2023, inclusive of updates)

The Santa Fe Safe Routes to School (SFSRTS) Action Plan for 2024-2027 provides a framework of objectives and activities to increase safe walking and bicycling to and from school in and around Santa Fe NM for the next four years and beyond.

Appendix 4 of the SFSRTS identifies households within walking distance of assigned schools. Projects within walking distance (0.5 miles) of a school location should design for the presence of students.

Access the [Santa Fe Safe Routes to School Action Plan].

2.5. Street Zones

The elements that comprise a street are typically separated, with some exceptions. These elements can be referred to as *street zones.* The graphic below illustrates all possible street zones considered in this document; however, it is important to note that not every zone will exist on every street.

2.5.1 Pedestrian Zone

The pedestrian zone often bookends the very edges of a whole street, usually between the edge of a private lot and the start of a Flexible Zone or a Curb & Gutter Zone. This zone ensures that pedestrians have a safe place and adequate room to walk, whether making their entire journey on foot or closing the distance between their parked vehicle and destination.

Pedestrian Zones may sometimes be used by businesses, with appropriate permits, for patio seating. In some instances, the Pedestrian Zones and Bike Zones may be combined into a shared use/multiuse path. See **Chapter 4: Elements of the Street** and **Chapter 6: Intersections** for considerations on how and when this is appropriate.

The Pedestrian Zone may be interrupted by driveways, curb cuts, and roadway intersections. For a discussion on intersection treatments for pedestrian safety, see **Chapter 6: Intersections**.

2.5.2 Flexible Zone

The Flexible Zone, sometimes known as the landscaping zone or the parkway, is the section of street between the Pedestrian Zone and the Curb & Stormwater Zone (though sometimes may be located on the outside edges of the right-of-way, between private property and the Pedestrian Zone).

Uses will vary across street types and available right-of-way, and will also fluctuate along a single street. The Flexible Zone may include:

- Irrigated landscaping and green stormwater infrastructure (GSI) such as bioswales and tree trenches.
- Public spaces such as benches, trash cans, and parklets.
- Bus stop infrastructure.
- Lighting, fire hydrants, and utility poles.
- Bicycle and micromobility parking.
- Placemaking elements, such as art, signage, and pedestrian scale lighting.

2.5.3 Curb and Stormwater Zone

The Curb & Stormwater Zone collects and conveys stormwater from Vehicular Zone travel lanes into inlets and storm drain systems and/or into green stormwater infrastructure in the Flexible Zones or Median Zones. A curb and gutter combination forms a triangular channel that carries runoff to drainage facilities and keeps driving lanes free from flooding. On existing streets, the Bicycle Zone may sometimes share space with the Curb & Stormwater Zone. On new streets, or streets with adequate right-of-way, these zones should be separated where feasible. Drainage flow paths and systems may not always allow for this separation.

2.5.4 Bicycle Zone

The Bicycle Zone refers to any portion of the street a cyclist is designated to occupy. Bicycle facilities will vary based on the Street Type and Corridor Context. Cyclists should be separated from the Vehicular Zone with a protective physical barrier if possible. Bicycles may share space with the Vehicular Zone on streets where cars are infrequent and slow-moving, such as a Bike Boulevard. Sometimes, the Bicycle Zone may share space with the Pedestrian Zone on a shared multiuse path.

2.5.5 Parking & Loading Zone

The Parking & Loading Zone provides dedicated spaces for a variety of uses. This can include transit vehicles loading and unloading passengers, parked cars, and loading and unloading zones for temporarily stopped vehicles.

2.5.6 Vehicular Zone

The Vehicular Zone is the dedicated space for motorized vehicle movement. Vehicular Zones vary in number of travel lanes, anticipated traffic volume, direction (one-way or two-way), and stop control based on Street Type (see **Santa Fe Street Types** section), Corridor Context (see **Corridor Context** section), Traffic Impact Analysis (see **Transportation Impact Analysis** section) and available right-of-way (see **Chapter 3 - Right-of-Way**).

2.5.7 Median Zone

Some streets provide medians, center turning lanes, or physical barriers to separate travel lanes moving in opposite directions. Center turn lanes can be incorporated as part of a median and interspersed with median islands. At intersections or mid-block crossings, medians can also serve as pedestrian or bicycle refuges, whether as raised features or through physical barriers, pavement markings, and signage that distinguishes a zone specifically dedicated to pedestrian or cyclist safety.

2.6. Zone Widths by Street Type

The following Zone Widths were developed for each Street Type based on the purposes and modes served by the Street Zones described above. As all roads are context-sensitive, the Street Design Guide does not provide a “preferred cross section” for each Street Type. This allows designers to adapt street design to the context and needs of that street.

The following Zone Width tables provide four alternative width scenarios:

- **Target**: Should be met in all new street designs and followed in all street redesign cases where ROW permits.
- **Maximum**: Can be followed where ROW allows. Maximums primarily provide additional space for non-vehicular Zones and make additional allowances for wider Vehicular Zones in industrial areas.

- **Minimum**: Can be utilized on existing streets with narrow right-of-way, where target widths might not be met in all Zones.
- **Historically constrained**: These widths should only be applied for existing streets with extremely limited ROW and where additional ROW acquisition is not feasible.

Each *Zone Width by Street Type* table is paired with a *Prioritization of Zone Width in Limited ROW* table to guide designers in prioritizing available ROW to each Zone. Designers are encouraged to utilize creativity and professional judgement when designing in limited ROW.

In projects working with limited right-of-way, designers should follow these steps:

1. Determine the Street Type.
2. Determine the Community and Corridor Contexts.
3. Determine whether bike lanes should be included.
4. Perform a Right-of-Way Analysis (**Chapter 3: Right-of-Way**).
    a. If the Right-of Way Analysis determines that available right-of-way does not support achieving the Target Width for all zones on that Street Type, proceed to the next step.
5. Consult the *Prioritization of Zone Width in Limited ROW* table for the appropriate Street Type, Community Context, and Corridor Context.
    a. High Priority Zones should aim to achieve the Target Width, even in limited ROW scenarios.
    b. Low Priority Zones may be reduced to the Minimum Width to make adequate room which will allow higher priority zones to achieve the Target Width.
    c. If more room is needed, optional zones (such as Median or Parking Zones) may be eliminated, utilizing the designer's judgement and in consultation with Complete Streets staff.
    d. If right-of-way is still too constrained to accommodate all Zones, and the project is located in a Historic District, then Low- and Medium-Priority Zones may be reduced to Historically Constrained minimum widths. If lower priority zones have already been reduced to the Minimum or Historically Constrained widths and the project is still outside the bounds of the available ROW, High Priority Zones can be reduced to the Minimum.

Additional details on widths and measurements within specific zones and general features are as follows:

- **Pedestrian Zone**: some projects may need to increase the size of the pedestrian zone, depending on the Level of Stress recommendations that result from the Transportation Impact Analysis (**Chapter 5**).
- **Bike Zone**: to determine whether the project is on the Bike Network, refer to the Santa Fe Bike Master Plan Network. If a bike lane is identified on the network, the Bike Zone widths should be determined based on the level of traffic stress analysis provided in the Transportation Impact

Analysis (**Chapter 5**) and the Santa Fe Bike Master Plan 2025 Amendment: Designing for Safer Cycling.

- **Curb and Gutter**: the Curb should always be 6” wide, and the Gutter should be at least 1’6” wide.
    - On streets where parking exists, parking can share space with the gutter. In those instances, Parking Zone widths can be measured from the edge of the curb to the edge of the parking lane.
    - On streets where parking does *not* exist, the Gutter should stand alone. The Vehicular Zone should *not* share space with the Gutter, and the width of the Vehicular Zone should be measured from the edge of the Gutter to the inside lane.
- **Median and Center Turn Lane Widths**: In some cases, the Median Zone may fluctuate in size along a corridor, depending on right-of-way and other physical constraints.

Minimum and Historically Constrained widths are conducive with guidance in the Public Right-of-Way Accessibility Guidelines (PROWAG), the Manual on Uniform Traffic Control Devices (MUTCD) (2024), and the AASHTO Policy on Geometric Design of Highways and Streets 7th Edition (2018).

2.6.1 Type I Streets

Type I (Local Roads)	Target	Maximum	Minimum	Historically Constrained	Notes
Pedestrian Zone	6'	10'	5'	4' *	*Must construct passing section every 200 feet, or per PROWAG
Flexible Zone	6'	8'	3'	0	
Curb & Stormwater	2'	2'6"	1'6"	1'6"	
Bicycle Zone	N/A	N/A	N/A	N/A	Cyclists share the road on local streets.
Parking Zone	7'	8'	7'	0	Gutter pan is included in parking width.
Vehicular Zone: Total Travel Lane Width* (both directions)**	16'	18'	15' (Yield Roadway)	15' (Yield Roadway)	*Shared streets may propose alternative configurations to accommodate pedestrians, parking, and vehicular travel lanes. **For one-way, one-lane configurations, 12' travel lane minimum required.
Median Zone	N/A	N/A	N/A	N/A	
Unless otherwise noted, all widths listed refer to a single side of the street and should be replicated on both sides.					

Prioritization of Zone Width in Limited ROW Street Type I (Local)	Pedestrian Zone	Flexible Zone	Curb & Gutter Zone	Bicycle Zone	Parking & Loading Zone	Vehicular Zone	Median Zone
Historic Districts	H	M	H	P	L	L	N/A
Neighborhood Centers/ Commercial Centers	H	H	H	P	M	L	N/A
Industrial	M	L	H	P	L	H	N/A
School Zones	H	H	H	H / P	L	L	N/A
All others	H	M	H	P	L	M	N/A

H = High Priority | M = Medium Priority | L = Low Priority | P = Plan Specific | N/A = Not Applicable

All zones should be included unless otherwise specified. High priority multimodal elements take precedence over vehicular capacity (total lanes or lane width). Shared streets acceptable on Type I Roadways.

2.6.2 Type II Streets

Type II (Collectors)	Target	Maximum	Minimum	Historically Constrained	Notes
Pedestrian Zone	6'	10'	5'	5'	
Flexible Zone	6'	8'	4'	0	
Curb & Stormwater	2'	2'6"	1'6"	1'6"	
Bicycle Zone*	*	*	5'*	*	*Refer to Bicycle Master Plan Network and 2025 Amendment: Designing for Safer Cycling
Shared Use Path*	12'	14'	8' **	8' **	*If utilized, replaces both the Pedestrian and Bicycle zones. ** 8' only acceptable if used on both sides of the road and if cyclists are provided one-way directional travel on either side of the street.
Parking Zone*	8'	8'	8'	7'	*Parking on Type II roadways optional. Gutter pan is included in parking width.
Vehicular Zone (Lane Widths)	9'6"	10'	9'6"	9'	11' travel lanes in industrial areas only.
Median Zone*	Flexible	11'	6'	0	*6' required to provide a mid-block crossings with a center refuge island, but not required length of corridor. Consult **Chapter 5**, Transportation Impact Analysis, for Left Turn Lane warrants.
Unless otherwise noted, all widths listed refer to a single side of the street and should be replicated on both sides.					

Prioritization of Zone Width in Limited ROW Street Type II (Collectors)	Pedestrian Zone	Flexible Zone	Curb & Gutter Zone	Bicycle Zone	Parking & Loading Zone	Vehicular Zone	Median Zone
Historic Districts	H	M	H	P	L	L	L
Neighborhood Centers/ Commercial Centers	H	M	H	H / P	M	L	L
Industrial	M	L	H	P	L	H	M
School Zones	H	H	H	H / P	L	L	M
All others	H	M	H	P	L	M	M

H = High Priority | M = Medium Priority | L = Low Priority | P = Plan Specific | N/A = Not Applicable

All zones should be included unless otherwise specified. High priority multimodal elements take precedence over vehicular capacity (total lanes or lane width).

2.6.3 Type III Streets

Type III (Minor Arterials)	Target	Maximum	Minimum	Historically Constrained	Notes
Pedestrian Zone	6'	10'	5'	5'	
Flexible Zone	6'	8'	4'	0	
Curb & Stormwater	2'	2'6"	1'6"	1'6"	
Bicycle Zone*	*	*	5'*	*	*Refer to Bicycle Master Plan Network and 2025 Amendment: Designing for Safer Cycling
Shared Use Path*	12'	14'	9' **	9' **	*If utilized, replaces Pedestrian and Bicycle zones. ** 9' only acceptable if cyclists are provided directional travel on either side of the street.
Parking*	8'	8'	8'	8'	*Parking on Type III roadways not recommended on streets over 35mph.
Vehicular Zone	10'	10'	10'	9'6"	*11' travel lanes in industrial areas only
Median Zone*	Flexible	13'	6'	0	*6' required to provide a mid-block crossings with a center refuge island, but not required length of corridor. Consult **Chapter 5**, Transportation Impact Analysis, for Left Turn Lane warrants.

Unless otherwise noted, all widths listed refer to a single side of the street and should be replicated on both sides.

Prioritization of Zone Width in Limited ROW Street Type III (Minor Arterials)	Pedestrian Zone	Flexible Zone	Curb & Gutter Zone	Bicycle Zone	Parking & Loading Zone	Vehicular Zone	Median Zone
Historic Districts	H	M	H	P	L	L	L
Neighborhood Centers/ Commercial Centers	H	M	H	H / P	L	H	M
Industrial	M	L	H	P	L	H	M
School Zones	H	H	H	H / P	L	L	H
All others	H	M	H	P	L	M	H

H = High Priority | M = Medium Priority | L = Low Priority | P = Plan Specific | N/A = Not Applicable

All zones should be included unless otherwise specified. High priority multimodal elements take precedence over vehicular capacity (total lanes or lane width).

2.6.4 Type IV Streets

Type IV (Major Arterials)	Target	Maximum	Minimum	Historically Constrained	Notes
Pedestrian Zone	*	10'	*	5'	*Shared use path preferred on Type IV roads.
Flexible Zone	6'	8'	6'	4'	
Curb & Stormwater	2'	2'6"	1'6"	1'6"	
Bicycle Zone*	*	*	*	*	*Shared use path preferred on Type IV roads. Refer to Bicycle Master Plan 2025 Amendment: Designing for Safer Cycling
Shared Use Path*	12'	14'	10'	9' **	*If utilized, replaces Pedestrian and Bicycle zones. ** 9' only acceptable if cyclists are provided directional travel on either side of the street.
Parking	N/A	N/A	N/A	N/A	*No parking on Type IV roadways.
Vehicular Zone	10'	10'6"	10'	10'	
Median Zone	13'	14'	6'	0	
Unless otherwise noted, all widths listed refer to a single side of the street and should be replicated on both sides.					

Prioritization of Zone Width in Limited ROW Street Type IV (Major Arterials)	Pedestrian Zone	Flexible Zone	Curb & Gutter Zone	Bicycle Zone	Parking & Loading Zone	Vehicular Zone	Median Zone
Historic Districts	H	M	H	P	N/A	M	M
Neighborhood Centers/ Commercial Centers	H	M	H	H / P	N/A	H	H
Industrial	M	M	H	P	N/A	H	H
School Zones	H	H	H	H / P	N/A	M	H
All others	H	M	H	P	N/A	H	H

H = High Priority | M = Medium Priority | L = Low Priority | P = Plan Specific | N/A = Not Applicable

All zones should be included unless otherwise specified. High priority multimodal elements take precedence over vehicular capacity (total lanes or lane width).

2.7. Conclusion

This chapter has provided the initial context required to begin planning or designing a street in Santa Fe: Street Type, Corridor Context, and Modal Plans to follow, and Target Widths. It has also provided a guiding framework for prioritizing Zone elements based on these .

The next chapters will detail right-of-way considerations and detailed design elements for each Street Zone.

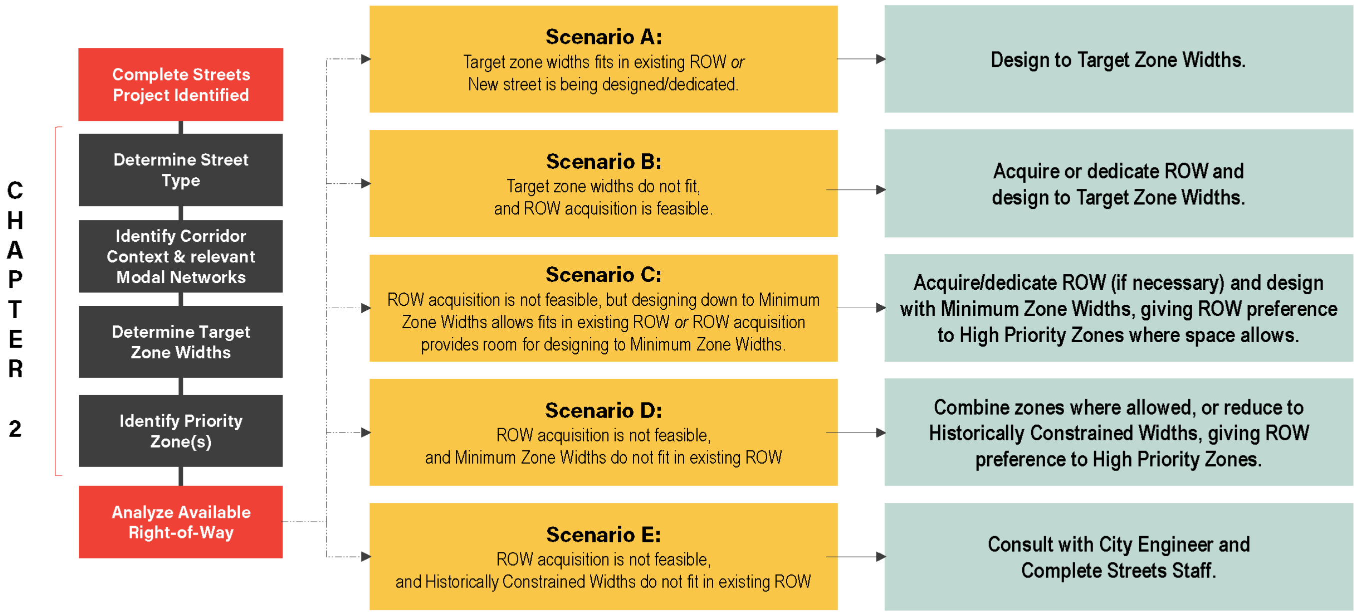
Chapter 3. Right-of-Way

While transportation elements like streets and sidewalks are the most visible uses of right-of-way, above- and below-ground utilities are equally important and often complicate roadway design and reconstruction. Right-of-way availability and constraints are significant factors in street design.

3.1. Right-of-Way Analysis

The following analysis is most applicable to the redesign of existing streets. Cross sections for new streets should aim to follow the Target Widths.

Figure 9: Right-of-Way Analysis Flow Chart



Before advancing to design-specific street elements for each zone, a right-of-way analysis must be completed to determine the workable street area. Before performing a right-of-way analysis, the project must first identify the Street Type(s), Corridor Context, Target Zone Widths, and Prioritized Zones based on the workflow in **Chapter 2: Contextual Street Design Framework**. Design speed is determined in **Chapter 4: Elements of the Street**.

At this level, a desktop right-of-way analysis is sufficient. If right-of-way acquisition is required, a field survey is recommended. To determine how much right-of-way is needed at intersections, see **Chapter 6: Intersections**.

3.1.1 Scenario A: New Construction or Sufficient Right-of-Way

In this scenario, there is sufficient right-of-way to accommodate all relevant Zones in the Target Zone Width based on the identified Street Type. Alternatively, the project is a new roadway and can dedicate or acquire the required right-of-way for the Target Zone Width. The project may advance to the next step.

3.1.2 Scenario B: Acquire or Dedicate Right-of-Way

In this scenario, there is not sufficient right-of-way to accommodate all Target Zone Widths. However, right-of-way acquisition is feasible through acquisition, dedication, or easements. This scenario may occur in places where building setbacks are sufficient to accommodate street widening.

The project team should endeavor to acquire sufficient right-of-way to accommodate the Target Zone Width throughout the whole project area whenever feasible. In a larger corridor project, there may be some instances where right-of-way acquisition is feasible in some stretches of the corridor and not others. The project team should aim to make right-of-way along the corridor as consistent as possible, but fluctuations in certain areas may be acceptable. Specifically, fluctuations in the presence or width of the Flexible Zone, Parking, and Loading Zone, and Median Zone can be accommodated through creative design solutions following the Prioritized Zones relevant to that Street Type and Corridor Context.

3.1.3 Scenario C: Constrained Right-of-Way

In this scenario, there is not sufficient existing right-of-way to accommodate the Target Zone Widths. Additionally, right-of-way acquisition is not feasible, or acquisition does not provide enough space for all relevant Zones in the Target Zone Width for the majority of the project. This situation may be common in established corridors and within areas of the city primarily developed before 1970.

The project team may design Zones down to the Minimum Zone Widths. Where space allows, design Prioritized Zones up to the Target Zone Width. Consider, when appropriate, the use of shared streets, shared use paths, and other multimodal alternatives to combine Zones and reduce total roadway width needs. See **Chapter 4: Elements of the Street** for additional guidance on combined Zones.

3.1.4 Scenario D: Historically Constrained Right-of-Way

In this scenario, there is not sufficient existing right-of-way to accommodate either the Target or Minimum Zone Widths. Additionally, right-of-way acquisition is not feasible, or acquisition does not provide enough space for all relevant Zones in the Target or Minimum Zone Width for the majority of the project. This situation will be most common in Historic areas.

The project team may design Zones down to the Historically Constrained Zone Widths. Where space allows, design Target Zones up to the Target or Minimum Zone Widths. Consider, when appropriate, the use of shared streets, shared use paths, and other multimodal alternatives to combine Zones and reduce total roadway width needs. See **Chapter 4** for additional guidance on combined Zones.

3.1.5 Scenario E: Insufficient Right-of-Way

In this scenario, there is not sufficient existing right-of-way to accommodate any of the Zone Widths set forth in **Chapter 2: Contextual Street Design Framework**. Additionally, right-of-way acquisition is not feasible. This scenario may occur in Type I streets in the city's historic neighborhoods.

The project team should sketch up an alternative cross section which prioritizes safety and adequately balances multi-modal movements, then consult with the Complete Streets Staff and City Engineer (or their designee) to receive approval to advance.

Chapter 4. Elements of the Street

This chapter outlines typical elements found in the designated Zones of a street and provides general design guidance on their installation. It also provides prioritization tables to aid in selecting appropriate and context-sensitive treatments when designing a complete street where the safety of all users is the number one priority.

When moving into design, practitioners should consult AASHTO guidelines for horizontal and vertical alignment of new streets, while following preferred and maximum widths identified in this Design Guide.

4.1. Pedestrian Zone

The Pedestrian Zone refers to the right-of-way occupied by people on foot or using assisted mobility devices such as wheelchairs, seated scooters, and white canes. These wide variety of users are collectively referred to as "pedestrians" throughout this document for simplicity. All elements of the Pedestrian Zone must comply with Public Right-of-Way Accessibility Guidelines from the U.S. Access Board (PROWAG).

"A decision to walk can be influence by the comfort, convenience, and visual interest of the route, as well as the presence of other potential destinations along the route. Since pedestrians travel more slowly than motor vehicles, they are more likely to prefer greater detail in their environment; and because they are not protected within a vehicle, their immediate physical environment may have a profound effect on their level of comfort. Elements such as shading along the route, separation by space or barrier from vehicle traffic, attractive buildings nearby, visually appealing landscape, and the ability of benches and areas to rest typically increase their level of comfort." – AASHTO Guide for the Planning, Design, and Operation of Pedestrian Facilities, 2nd Edition, 2021

The following subsections provide guidance on elements that are typically in a Pedestrian Zone. Not all elements need to be included in every street design; practitioners should use best judgement and work to respond to the contextual needs of a particular street or corridor.

4.1.1 Paving

Sidewalk surface materials should be selected to be slip-resistant, easy to maintain, and meet accessible criteria as required by ADA Standards. Typically, sidewalks in Santa Fe are constructed of concrete or brick for their durability and longevity. Other surfacing options include unit pavers (concrete, asphalt, stone), asphalt, or pervious materials such as pervious concrete, unit pavers with pervious joints, and compacted crusher fines paving. Where possible, recycled materials or materials with recycled content should be used.

Pavement materials and patterns can be designed to enhance visual interest or create a corridor-level identity (placemaking). These higher design elements may be more appropriate on Type II and Type III Streets and along sidewalks in Mainstreet, Neighborhood Center, and Community Commercial areas. Historic areas may have additional requirements.

For details on alternative pavements that promote street drainage, refer to **Chapter 7, Alternative Pavements**.

4.1.2 Driveways and Curb Cuts

Curb cuts, such as ramped sidewalks and depressed curbs, are an integral part of pedestrian facilities. Detectable warning surfaces should be used at all curb cuts with a stop or yield sign, and should be considered on commercial curb cuts with a high volume of traffic.

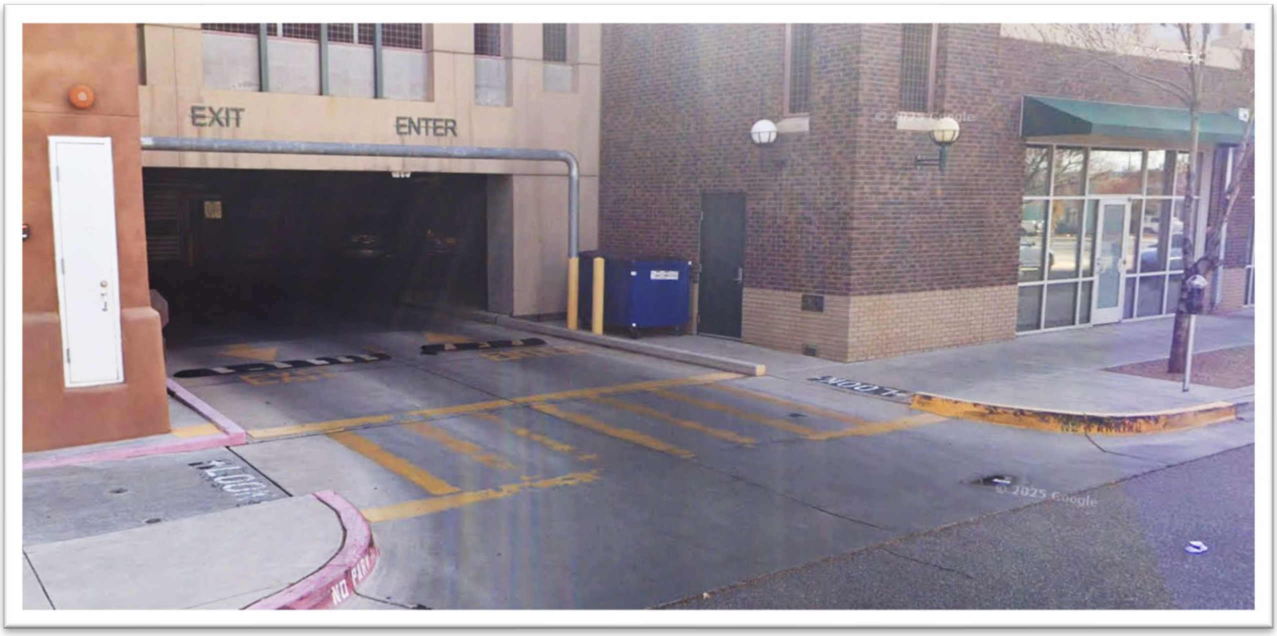
Designing driveways and associated curb cuts with pedestrian safety in mind is crucial for accessibility and reducing conflicts between pedestrians and vehicles.

Continuous & Level Sidewalks. Sidewalks should maintain grade continuity over driveways (rather than dipping the sidewalk to match the driveway slope). Though a 1.5% cross-slope is preferred, the maximum cross-slope is 2% to comply with PROWAG requirements. If maintaining grade continuity is not feasible or practicable, consult with the Director of Complete Streets or designee.

Signage and Visual and Material Cues. Use contrasting materials, textures, or colors to differentiate the sidewalk from the driveway to alert drivers of pedestrian priority. Utilize "Yield to Pedestrian" signage for drivers. Clearly mark pedestrian paths where sidewalks transition across long driveways or curb cuts, especially in areas where high volumes of traffic are anticipated.

Clear Sightlines and Minimal Driveway Widths. Minimize driveway widths to reduce pedestrian crossing distances. Where possible, maximize sight distance and ensure no obstruction is blocking driver and pedestrian views of each other (i.e., signage, landscaping, and parked vehicles). If existing buildings or structures block adequate line-of-sight, take additional measures to alert both pedestrians and drivers to one another's potential presence.

Figure 10: Example of speed bumps, visual cues, and signage markings at the entrance and exit of a parking garage with limited sight distance in Albuquerque, NM.



4.1.3 ADA Considerations

Pedestrians with disabilities often rely on transit as a primary transportation mode and need accessible, properly-designed pedestrian facilities that comply with PROWAG. Sidewalk surface materials should be easy to maintain, slip-resistant, and meet the criteria set by the ADA Standards as well as local requirements. Curb ramps should meet these requirements and include tactile warning strips and unobstructed connections to pedestrian travel paths. They should be installed at all marked and unmarked crosswalks.

Rural-Urban Interface Considerations

Rural areas often lack designated walkways or sidewalks. In some cases, the shoulders along roads are used by pedestrians, although they are not formally recognized as pedestrian facilities and often do not meet ADA standards. In rural areas, pedestrian space should still be intentionally allocated along roads where possible. Minimum shoulder width standards should still be met along rural roads and highways in areas pedestrians use. No Parking signs should be included as well.

4.2. Flexible Zone

Flexible Zone is so named in this Guide because it is likely to serve multiple purposes along a corridor, and even sometimes multiple uses as it travels along a single block. By nature, this zone is flexible in its design guidance. It can be home to landscaping, Green Stormwater Infrastructure (GSI), bus stop furniture, light poles, and other elements useful and necessary in a street.

The Flexible Zone can be on the outside of the street ROW (directly adjacent to private property) in Type I and some Type II Streets, where speeds are expected to be 30mph or less *and* volumes during peak hours are expected to be low.

4.2.1 Alternative Pavements

In some instances, it will be appropriate to pave the Flexible Zone. For details on alternative pavements, refer to **Chapter 7, Alternative Pavements**.

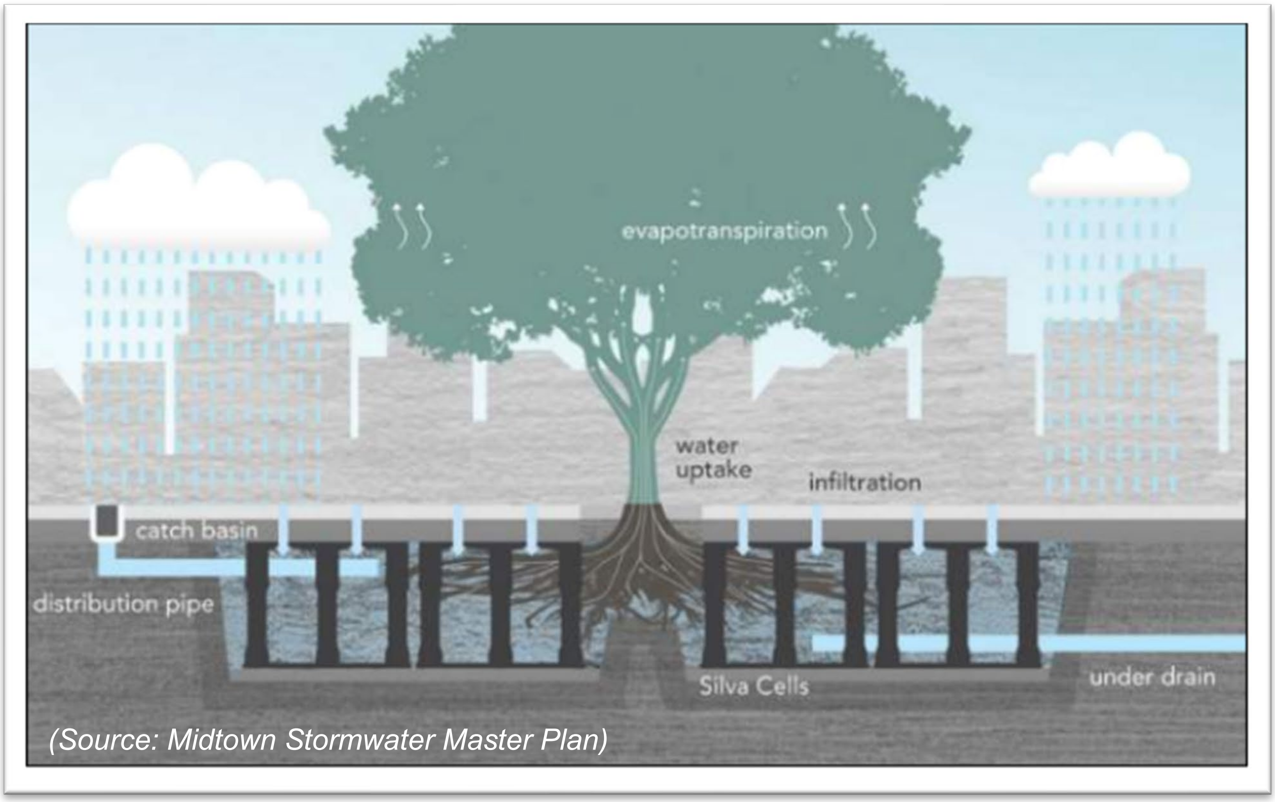
4.2.2 Landscaping

Landscaping in the Flexible Zone enhances the street environment. Plants mitigate the urban heat island effect, create a more comfortable microclimate, help manage street runoff, and provide locations for bird and wildlife habitat. Street trees can serve as a barrier between pedestrians and traffic on high volume streets and provide a more comfortable, shaded walking environment. Street trees also visually narrow the field of vision for motorists, encouraging them to move more slowly.

Landscape improvements in the flexible zone can soften the edge of the sidewalk and make the walking environment more enjoyable. Thoughtful plant selection – including drought tolerant and native plants – can beautify the streetscape and help establish or reinforce a local character.

In some instances, it may be appropriate to incorporate paving as a part of the landscaping. For details on alternative pavements that can support water capture for plants (such as permeable pavement and suspended pavement), refer to **Chapter 7, Alternative Pavements.**

Figure 11: Suspended Pavement Cell System Overview, Deeproot



Consult the City of Santa Fe Recommended Plants for Santa Fe list (Appendix B) for guidance on acceptable plantings. The Santa Fe Master Gardeners provide an illustrated guide and additional details and best practices for many of the plants provided in City's accepted planting palette (Appendix C).

Additional considerations:

- Practitioners should select street trees whose roots will have a limited impact on the sidewalk integrity. Trees should be planted in Landscaping Strips of 8' or wider.
- A widely accepted guideline for urban forestry diversification is the **"10-20-30 rule"**, which suggests:
  - No more than 10% of any one species
  - No more than 20% of any one genus
  - No more than 30% of any one family

  Species-level diversity helps avoid mass loss if a disease like Dutch elm disease or emerald ash borer strikes. Genus and family-level diversity helps protect against broader vulnerabilities, such as climate shifts or newly emerging pests.
- Cacti and other thorny plants should be planted with caution and care. Practitioners should model full growth size to ensure that cacti will not grow within 6 inches of the edge of the

sidewalk zone. Additionally, cacti or other bushes should not block access for passengers exiting vehicles on streets with parking.

- In constrained spaces, suspended pavement systems can increase soil volume and support long-term tree health by improving water and root access; see **Chapter 7: Street Drainage** for additional information. Trees should not be used where the planting width is less than 6 feet, and 8 feet is preferred. Tree planting in street medians is discouraged due maintenance and irrigation challenges. Trees should instead be located within the public right-of-way, where width allows, and grouped to provide shade and ecological benefit.

If planting landscaping in the Flexible Zone, then that flexible zone, including GSI elements, should be irrigated. Irrigation and maintenance of landscaping are the responsibility of the property owner(s) contiguous to the landscaping, as outlined in §14-9-2(H) of the City of Santa Fe Municipal Code of Ordinances.

4.2.3 Green Stormwater Infrastructure (GSI)

There are many different GSI practices that are well aligned for use along streets within the City of Santa Fe; see **Chapter 7: Street Drainage** for additional information. GSI practices serve both as drainage solutions and as sustainable, attractive landscaping elements, providing multiple benefits to natural and human environments. Most importantly, GSI functions to recharge the aquifer, reduce pollutants in receiving waters, reduce the burden of potable water sources for irrigation, and provide an opportunity to infiltrate street runoff.

Similar to a landscaping strip, **vegetated GSI practices should be irrigated. Irrigation and maintenance of landscaping, including GSI practices, is the responsibility of the property owner(s) contiguous to the landscaping, as outlined in §14-9-2(H) of the City of Santa Fe Municipal Code of Ordinances.**

4.2.4 Furniture

Streetscape furnishings within the Flexible Zone can improve the street environment by offering places to rest and socialize. Each streetscape project should include a palette and placement plan for furnishings that reflects the identity and character of the surrounding district and maximizes use of the space. Furnishings should be concentrated in where pedestrians will most benefit, such as near transit stops, shaded locations, and at building entrances or collection spots. Furnishings should be selected for quality, maintenance, and durability.

Figure 12 - Example of sidewalk furniture in the Flexible Zone[1]

[1] https://nacto.org/publication/urban-street-design-guide/street-design-elements/sidewalks/sidewalk-design/

4.2.5 Bus Stops

Transit users are often pedestrians during their "first and last mile" trips to and from their destinations. Providing facilities that enhance and promote walking in and around transit stops encourages transit use. Locating bus stops near pedestrian crossings can help increase pedestrian safety, especially for people with disabilities. Covered bus stops should be prioritized for protection from elements (sun and rain).

Figure 13: Covered Bus Stop

School bus stops should also be considered. Students who live outside of walking distance to schools are served by school bus transportation from remote school bus stops. These stops can change location from year to year. Pedestrian connections should be present for the safety of the students.

4.2.6 Trash Receptacles

Public trash receptacles are particularly useful in areas anticipated to handle a high volume of pedestrians, such as Neighborhood Centers or near transit stops. The inclusion of trash receptacles in a street design should be determined in coordination with the City.

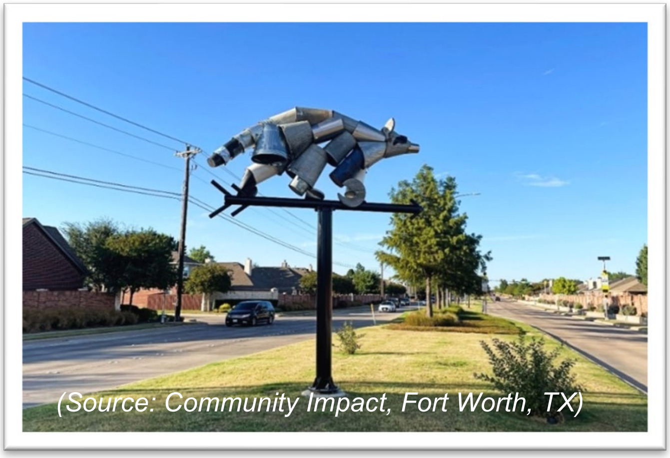
Designers should consult with City of Santa Fe City Facility Management Division when installing trash receptacles.

4.2.7 Public Art

Public Art can be integrated within the streetscape to assist with wayfinding and add character.

Designers should consult with City of Santa Fe Arts & Culture Division if there is a desire to install art along a public street. The placement of art should be in coordination with the Complete Streets staff.

Figure 14: Metal Sculpture in Median



(Source: Community Impact, Fort Worth, TX)

4.2.8 Sidewalk Dining

Sidewalk dining may occupy, with appropriate permits, part of the Sidewalk or Flexible Zone. Their presence contributes to a vibrant and lively walkable district. Sidewalk dining usually incorporates greenery, seating, and even bike racks to accommodate the unmet demand for public space on busy neighborhood retail streets or commercial areas.

As with **Parklets**, sidewalk dining should include physical separation from adjacent vehicle traffic. Umbrellas, chairs, and tables may be used to accomplish this. The placement of sidewalk furnishings -- and a plan for their after-hours storage -- may be coordinated with adjacent business owners to ensure ample pedestrian access and a clear zone for pedestrian movement.

Figure 15: Sidewalk Dining in Chicago, IL

4.2.9 Bicycle Parking

On-street bicycle parking racks provide secure parking for cyclists at their destinations and should be prioritized on streets with bicycle facilities serving commercial areas, such as in Neighborhood Centers and Community Commercial districts. Neighborhood character should be considered when selecting styles and colors of racks. Racks with two points of contact are favorable, such as the “inverted U” and “staple”. Racks that only have one point of contact, such as the “wave,” “hanging triangle,” and “wheel bender” are substandard and **not** recommended. For more details on acceptable bike parking, see Appendix D, Essentials of Bike Parking.

4.2.10 Bollards and Planter Barriers

Bollards are simple yet highly effective structures, protecting pedestrians from potential crashes during vehicle street departures. They should be set at least 2' behind a vertical curb. They can also prevent unauthorized vehicle access. Bollards may be most useful on streets with a high volume or high speeds of traffic with limited right of way, where the separation between pedestrians is minimal. Streets and corridors on the High Injury Network that have high rates of street departures should particularly consider the use of extra protective barriers between the Pedestrian Zone and the street.

Figure 16: Planter Barrier in the Flexible Zone.

(Source: NACTO Global Street Design Guide, 2017)

Bollards come in many shapes and sizes, and should be designed with neighborhood character in mind.

4.2.11 Lighting

Functional lighting is a key part of safety in the streetscape. Poor lighting along major pedestrian routes and intersections can reduce pedestrian visibility and increase the risk of collisions. Crosswalks and their approaches should be well lit, with consistent levels of lighting. Overhead lighting placed directly over crosswalks may provide better pedestrian visibility than lighting placed directly over the intersection. Pedestrian-scale lighting is recommended in Neighborhood Centers and Community Commercial.

For specifications on lighting, see Appendix E (Santa Fe Lighting Standards).

4.2.12 Wayfinding

Wayfinding signage is used by pedestrians to navigate nearby destinations such as transit, retail centers, restaurants, and coffee shops, as well as events such as public meetings, sales, and weather conditions.

Wayfinding should be prioritized within two miles of the downtown Santa Fe historic district; within a mile of museums and cultural centers; and within a mile of major transportation facilities (such as the Rail Runner and off-street trails). Refer to MUTCD design guidelines on standard sign guidance.

Figure 17: Wayfinding Signage, MUTCD

4.3. Bicycle Zone

The Bicycle Zone encompasses the bicycle travel area and protective elements, including buffers for the bicycle lanes. Cyclists need special considerations because of their vulnerability to vehicular traffic and the potential for severe or fatal accidents. By incorporating bicycle facilities, cyclists can have a safer experience. In New Mexico, bicycles are legally recognized as vehicles under state law, though they are allowed to treat stop and lights as “yield” control. Section 66-3-702 of the New Mexico Statutes Annotated (NMSA 1978) grants every person riding a bicycle upon a street all the rights and duties applicable to the driver of a vehicle, except where specific bicycle-specific regulations apply. This legal status underscores the importance of designing streets that accommodate all users, including cyclists. In some cases, cyclists may elect to use designated bike facilities, but some instances cyclists may need to utilize a vehicular lane to transition to another street or destination.

4.3.1 Facility Types

The Bicycle Zone includes a variety of facilities, such as shared use paths and lanes, separated and buffered bicycle lanes, paved shoulders, and bicycle boulevards. These elements form bikeways and bikeway networks so that people of all abilities and ages can be accommodated. Land use context, presence of heavy vehicles, driveway frequency, traffic volumes, and traffic speeds are factors that influence the selection of bicycle facility type.

Bicycle Routes and Bicycle Boulevards

Bicycle Routes and Bicycle Boulevards utilize local or neighborhood streets where bicyclists share the road with drivers. Bicycle boulevards provide enhanced comfort and connectivity over bicycle routes by reducing vehicle traffic and minimizing stops or detours for bicyclists. Typically, they are applied on narrow streets to ensure low vehicle speeds, allowing bicyclists to ride with the flow of traffic. Barriers such as diverters, speed humps, and mini-roundabouts can aid in traffic calming along bike boulevards and minimizing vehicular through-traffic.

Bicycle Lane

Bicycle lanes are dedicated on-street spaces for cyclists, typically striped next to motor vehicle lanes. Conventional bike lanes are marked with a lane stripe, bike lane stencils, and signage. Bike Lanes should be no greater than 6’ in width, as drivers can mistake bicycle lanes for parking lanes or turning lanes, and no less than 5’.

Buffered Bicycle Lane

Buffered bicycle lanes are enhanced versions of standard striped bicycle lanes, providing additional separation between bicyclists and vehicle traffic using a striped buffer zone. Buffered bicycle lanes are the minimum standard for streets with speed limits greater than 25 MPH. Striped buffers for buffered bicycle lanes should be 1.5 to 3 feet wide. Unless the facility has physical barriers, the combined width of the buffered bicycle lane (striping and bicycle lane width) should be no greater than 6’6” in width (5’ bike lane and 1’6” buffer), as drivers can mistake bicycle lanes for parking lanes or turning lanes.

Protected/Separated Bikeway

Protected bicycle lanes build upon buffered bicycle lanes by including additional vertical structures in the buffer zone or a vertical grade separation for vehicles and bicyclists. Protected bicycle lanes appeal to bicyclists of all ages and abilities. The vertical separation that protects bicyclists can be comprised of bollards, curbs, planters, flexible posts, or other structures. Buffer zones for protected bicycle lanes should be ideally three (3) feet wide to allow for the installation of protective structures. Protected bicycle lanes require additional consideration and countermeasures where there are frequent curb cuts or driveways.

Refer to the Bicycle Master Plan 2025 Amendment: Designing for Safer Cycling for additional guidance on designing protected and safe facilities.

Urban Trails or Multi-use Trails

Multi-use paths or shared use paths allow people to walk, run, skate, or ride on a trail physically separated from motorized vehicle traffic and often apart from the street network or street grid. Paved trails accommodate all trail users for transportation and recreation and are a high-comfort bicycle facility.

Bicycle Facility Types by Street Type

The table below identifies appropriate bicycle facilities by street type.

Table 2: Bicycle Facility Types by Street Type

Bicycle Facilities by Street Type*	Shared Lane	Bicycle Lane	Buffered Lane	Protected Bikeway
Street Type I	✓	~	~	✕
Street Type II	~	~	✓	~
Street Type III	✕	✕	~	✓
Street Type IV	✕	✕	✕	✓

✓ = Preferred ~ = Acceptable in Some Contexts ✕ = Not Appropriate

**Urban Trails are not included in this list as they are considered a part of an off-street trail network.*

4.3.2 Physical Protective Barriers for Bike Facilities

Vertical elements can be installed quickly using a variety of materials and budgets.

Delineator Posts

Flexible delineator posts are one of the most popular types of protective separation elements due to their visibility, low cost, and ease of installation. Their aesthetic quality and durability can present difficulties; agencies may prefer a more permanent style should budgets and design allow.

Figure 18: Delineator Posts

Concrete Wall and Jersey Barriers

Concrete wall barriers provide the highest level of crash protection among the separation types listed in this guide. They require little maintenance and are less expensive than other treatments. This barrier is not as aesthetically pleasing as other types and may require service vehicle solutions and additional drainage. Crash cushions should be installed where the barrier ends are exposed.

Figure 19: Concrete Barrier

Bollards

Bollards provide a strong vertical element to the buffer space. They can be rigid or flexible, and can be high in cost depending on placement frequency. Rigid bollards are not appropriate on higher speed streets due to the risk posed to drivers and bicyclists in the event of a high-speed crash with a fixed object.

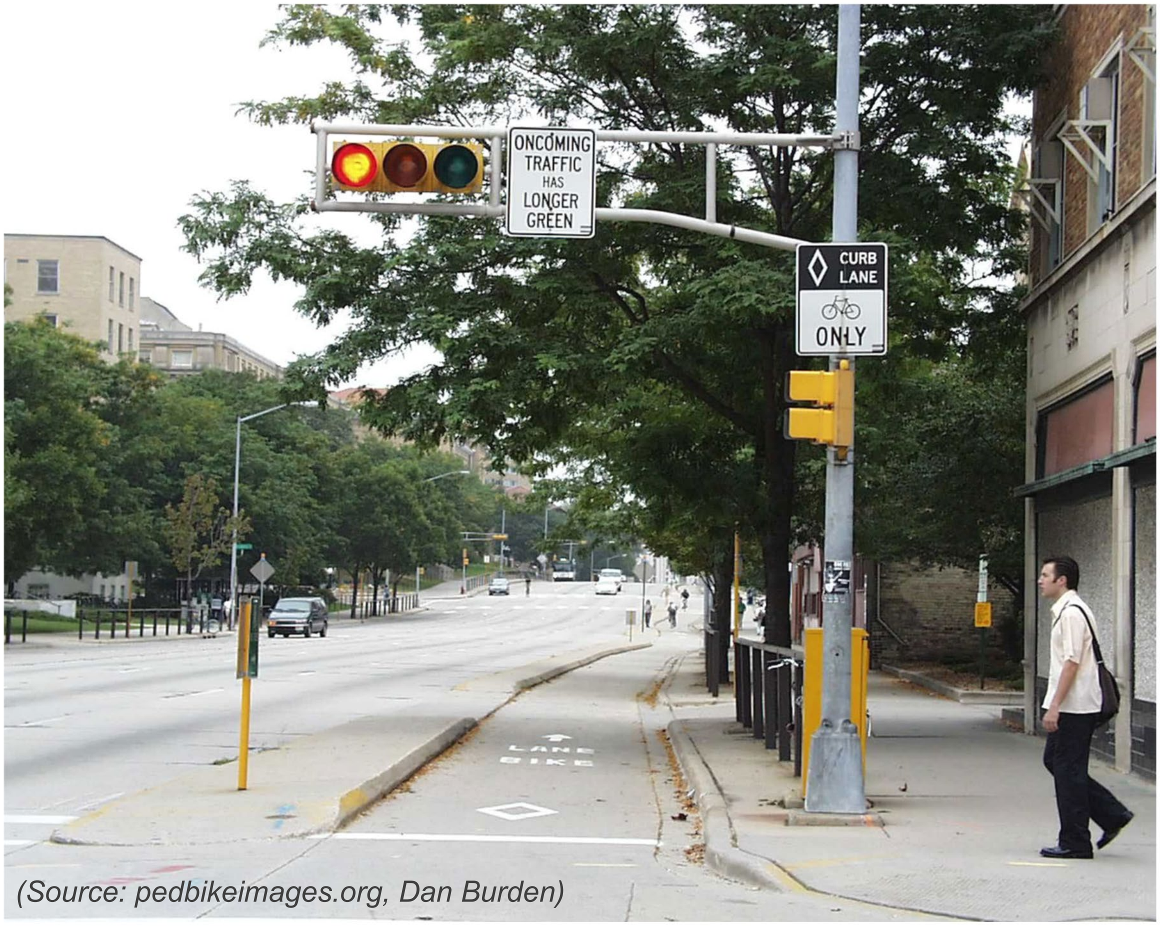
Figure 20: Bollards

(Source: pedbikeimages.org, Dan Burden)

Raised Median

Raised medians offer an attractive and low-maintenance buffer element. They are typically 6 inches tall and can either be precast or cast in place. They can be designed with drainage gaps and may include planting strips. Where appropriate, mountable curbs can be used.

Figure 21: Raised Median



(Source: pedbikeimages.org, Dan Burden)

Raised Lane

Raised lanes are typically 3 to 6 inches high and can be designed at either an intermediate level between the street and sidewalk or flush with the sidewalk. A 3-inch (intermediate) mountable curb can permit access for street sweeping equipment. If at sidewalk level, the raised bike lane should be designed so that it is visually separate from the pedestrian portion of the facility. Markings, buffers, and different pavement types can be used to delineate the separate intended spaces for pedestrians and bicyclists.

Figure 22: Raised Bike Lane

(Source: pedbikeimages.org, Brandon Whyte)

Figure 23: Planters

(Source: pedbikeimages.org, Brandon Whyte)

Planters

Planters add an attractive element to the streetscape and are quick to install. However, this treatment can be more expensive than others and may require more upkeep. Planters may not be appropriate on higher speed streets.

Low Profile Barriers

Low profile barriers, such as parking stops, rubber curbs, and lane separators, are inexpensive buffers that offer multiple benefits. These types of barriers are durable, can provide almost continuous separation, and provide a good solution when minimal buffer width is available. It is important to note that minimum widths will not provide the same protection and comfort due to bicyclists' proximity to traffic and the barriers' low height. Armadillos (low-barrier rounded rubber stops at intervals) allow ambulance, fire, and police vehicles to drive over it if necessary.

Figure 24: Rubber Barriers on a Two-Way Cycle Track

(Source: Julia Diara)

Combination of Barriers

Combining barriers can maximize safety benefits at lower overall costs. For example, delineator posts can be alternated with parking stops or lane separators to provide vertical and horizontal elements. At the start of a block, rigid barriers or planters can be used with bollards to highlight the presence of a separated bike line.

Figure 25: Combination of Treatments

(Source: pedbikeimages.org, Adam Coppola)

4.3.3 Striping

Striping patterns for bicycle facilities have different applications. Boldy marked striping is a key part of providing safe intersections and street crossings. Painting the full width of a bike lane green can provide drivers with visual cues to expect cyclists, especially as lanes approach intersections. Detailed standards on bike lane striping can be found in the Manual of Uniform Traffic Control Devices (MUTCD).

Cross Bike Markings at Curb Cuts

When bicycle facilities cross curb cuts where cars frequently make turns (such as parking lot entrances to grocery stores), providing visual markings can alert drivers to the presence of cyclists. This is a low-cost but high impact addition to improving cyclist safety. Additional options for markings include styles such as:

- Bicycle lanes may be continued through a driveway using solid or dotted longitudinal lines
- The bicycle symbol, sharrow marking, pavement word markings, or a combination thereof may be used in bicycle lane extensions through driveways
- Green-colored pavement (see Section 3H.06) may be used as a background to enhance the conspicuity of the bicycle symbol at driveways

Figure 26: Cross Bike Markings

4.3.4 Pavement Marking

Colored pavement can be used in limited locations as a spot treatment, such as a bike box or conflict areas at intersections or within bikeways as an overlay or embedded into the pavement. “Conflict areas” include all intersections, right turn bays, and merging lanes.

Overlay

An overlay is a colored material placed on the top of the pavement. Paint, sometimes mixed with sand for skid resistance or retro reflective glass beads for reflectivity, is the most common method for marking road surfaces. Inexpensive, paint is considered a non-durable pavement marking and is easily worn down by the elements. especially in snowy climates and with heavy traffic.

Thermoplastic is a type of durable plastic pavement marking made from polymer resins that become liquid when heated and hard when cooled. Thermoplastic can be pre-formed into specific shapes such as bicycle lane symbols, tiles, arrows, and shared lane markings. It is easier to apply than Methyl Methacrylate (MMA) and usually lasts longer than epoxy.

Durable Liquid Pavement Markings (DLPM) include MMA and epoxy. MMA are 2-part liquids composed of an activator and resin. Epoxies are adhesive waterborne acrylics that are applied with a spray or as paint. Both coatings can be skid resistant, adhere to asphalt or concrete, and retro reflective. MMA can be installed at any temperature, dries quickly, and is durable. Epoxies are sensitive to temperature and moisture, and dry slower than MMA; they are less expensive than MMA as well. The City of Santa Fe may have additional requirements for materials. Local standards should be verified before overlays are placed.

Embedded

Colored asphalt is made of the same material as standard asphalt but contains a colored pigment. This asphalt can be installed in a thin layer on top of conventional asphalt to reduce the cost of repaving and dying new, colored asphalt. Red and green are popular choices.

4.3.5 Wayfinding

Like pedestrian wayfinding, bikeway wayfinding can help people navigate to nearby destinations. In addition, bike facility wayfinding can help cyclists navigate the bike network through directional signage and route maps. Ongoing planning for wayfinding programs are being conducted by the City of Santa Fe; designers are encouraged to utilize the recommendations that ultimately result from the ongoing work.

4.3.6 Micromobility and Electric-Assisted Mobility Device Considerations

Emerging trends in micromobility include electric scooters and electric bicycles.

Scooters should share bike lanes with cyclists where appropriate and safe. Electric scooters may be used on low-density areas with wide sidewalks but should be prohibited on sidewalks in high-density commercial areas with heavy pedestrian traffic, and where bike lanes are provided.

Electric bicycles (e-bikes) may allow cyclists to travel at higher speeds than non-motorized bicycles, especially up hills. Physically protected or separated bike lanes up steep hills should consider widening the cyclist travel lane to allow for e-bikes to safely pass non-electric cyclists.

4.4. Combining Zones: Multimodal Alternatives

In constrained and hyper-constrained, designers may consider combining Pedestrian and Bicycle Zones into a shared use path on one side of the street.

4.4.1 Shared Use Paths

Shared use paths, sometimes known as multi-use trails, urban trails, or multi-use paths, are designed to be jointly used by bicyclists, pedestrians, and other active transportation users. When available right-of-way is constrained and both pedestrians and cyclists must be accommodated, shared use paths may provide an acceptable alternative. This facility allows two-way traffic on a single side of the street and is efficient in constrained spaces.

There are key considerations when determining whether shared use paths can replace separate pedestrian and cycling facilities. They may be most appropriate when:

- There are infrequent street intersections or crossings (common along rivers, linear parks, utility corridors, rail corridors).

- There is at least 14’ of right-of-way available for the facility (10’ for the path and two 2’ shoulders). 16’ is preferred with 12’ for the path and two 2’ shoulders.

Because shared use paths combine several user types and two-way directions, they carry a higher risk of conflicts between bicyclists and pedestrians. Conflicts can stem from 1) high volumes of users, 2) path users traveling at different speeds, 3) path users overtaking other users, 4) sharp curves with inadequate sight lines, 5) vertical objects near the path, and 6) surface defects that narrow the usable width.

Shared use paths should be developed using the AASHTO Guide for the Development of Bicycle Facilities. Design elements to consider include:

- Centerline striping to delineate directional movement.
- User yield signage to encourage safety.
- The use of bollards at intersections to physically delineate the space from accidental vehicle entry.
- Physical vertical barriers near hazardous conditions, such as near a waterway, railway, or within two feet of a street with vehicles traveling in opposing directions.
- Widening pathways at intersection approaches to reduce conflicts.
- Setting back intermittent and continuous vertical objects 2’ – 3’ from the path (shy distance).
- Shoulders of at least 2’ on each side.
- Ample lighting.
- Landscaping and/or parking lanes between the shared-use path and vehicle lanes.
- Frequent crossings for path users to access the opposite side of the street

If multi-use paths are the preferred alternative for a street’s cross section **on both sides of the street**, it should be signed so that bicycles use the multi-use path in the same direction as adjacent vehicle traffic. The path should be visually separated into a pedestrian zone and a bike zone, utilizing visual or material cues to separate cyclists from pedestrians.

Figure 27: Shared Use Path

Figure 28: Cyclist on a Shared Use Path

4.4.2 Shared Streets

Narrow residential streets in the older parts of Santa Fe often have sidewalks that are narrow, deteriorating, or nonexistent. By necessity, these streets may operate as shared spaces where children play, people walk or cycle, and vehicles drive. Narrow commercial streets that are popular with tourists in Historic Downtown also function as de facto shared streets. Designating these streets as “Shared Streets” may improve pedestrian safety in these highly trafficked areas.

Figure 29: Shared Street

Depending on volume and a street's role in the traffic network, these streets have the potential to be redesigned to become shared streets. When designing a shared street, key considerations from NACTO include:

NACTO Shared Streets Best Practices

- Textured or pervious pavements flush with the curb reinforce the pedestrian-priority nature of the street. Special pavements, especially unit pavers, may be subject to additional maintenance costs and should be selected based on regional climate and long-term durability. Selection of snowplow-compatible materials is recommended for colder climates. Drainage channels should be provided either at the center of the street or along the flush curb, depending on underground utilities and other existing conditions.
- Street furniture, including bollards, benches, planters, and bicycle parking, can help define a shared space, subtly delineating the traveled way from the pedestrian-only space.
- A shared street sign should be used at the entrance to a shared street. In some cases, a modified YIELD TO PEDESTRIANS sign (MUTCD 2B-2) may be added to reinforce the conversion in early stages.
- Shared streets generally permit motorists and bicyclists to operate in a 2-way fashion. Narrower shared streets may be made 1-way for motorists, though 2-way bicycle traffic should still be permitted. Certain restrictions and regulations may apply to vehicles on a shared street. Designers should strive to make these behaviors implicit through the design details of the street itself.
- Provide tactile warning strips at the entrance to all shared spaces. Warning strips should alert drivers and pedestrians.
- On wider shared streets, staggered blocks of landscaping, head-in parking, back-in angled parking, or perpendicular parking can be used to create a chicane effect.[3] In some cases, parking may be permitted directly adjacent to properties in a residential environment. Bollards, paving materials, and street furniture help to define parking spaces and to delineate private from public space.

Figure 30: Shared Street Signage in Santa Monica, CA

4.5. Curb and Drainage Zone

4.5.1 Drop Inlets

Drop inlets can be classified as off- or on-street structures. On-street inlets are typically located alongside or on the shoulder of a street or highway, and are designed to collect runoff from the road surface. The three basic designs of drop inlets are curb opening inlets, slotted drain inlets, and grated inlets. Since they are installed flush with the pavement, they do not pose a significant safety problem to motorists. However, they should be sized and selected to accommodate street runoff, be capable of supporting vehicle wheel loads, and be bicycle and pedestrian friendly.

Grate types

Grates that are compatible with bicycles should be used.

Location

Grate inlets should not be placed in traffic lanes because of the adverse effect on drivers who veer away from them, potentially causing accidents. Cyclists should be provided room to move around grate inlets as well, who may get caught in the grates or swerve to avoid them.

Should warping of the gutter be necessary for curb-opening inlets or cub cuts, it should be limited to the portion within 2' to 3' feet of the curb to minimize adverse driving effects. Catch basins or inlets with an open grate should be located within the gutter line and be spaced so that any ponding of water on the pavement does not exceed the tolerable spread limits, see **Chapter 7: Street Drainage** for additional details.

4.5.2 Curbs

Curbs should follow NMDOT standards drawings to a maximum of 6" height. See Appendix F for details. See **Chapter 7: Street Drainage**, for additional details.

4.6. Parking and Loading Zone

4.6.1 On-Street Parking

On-street parking can be considered a street-zone buffer between pedestrians and moving vehicular traffic. On-street parking can be beneficial for pedestrians because it provides a buffer between the sidewalk and street, and typically reduces vehicle speeds. Parking should be set back from pedestrian crossings and intersections so that parked cars do not impact the visibility of pedestrians to motorists. When on-street parking or bike lanes are present, the "effective" curb radii, rather than the actual, should be used to create a more compact intersection that encourages slower speeds.

The type of on-street parking selected should be based on consideration of the specific function and width of the street, traffic volume, adjacent land-use, as well as anticipated and existing traffic operations. Three types of on-street parking—parallel, back-in angled, and perpendicular—are examined below.

Parallel Parking

When used in residential areas, a parallel parking lane on either one of both sides of the street should be at least 7 ft. wide. When used in industrial and commercial areas, the parking lane width should be at least 8 feet wide; they are usually provided on both sides of the street, where right-of-way allows.

Back-in Angled

Back-in/head-out angled parking provides a way to increase total parking spaces available on a street, and improves visibility for the driver to see other vehicular and bicycle traffic when exiting the parking space. It can be easier to maneuver into these spaces than those created by parallel parking. Consideration should be made so that vehicles with long rear overhangs to don't interfere with parking meters, light poles, accessibility, and other street furniture. Head-in angled parking is not suggested for use within this Guide as it limits the driver's visibility of pedestrians and cyclists.

Parking Meters

Parking meters facilitate payment for on-street parking spaces. All types of on-street parking can use parking meters. Metered parking encourages the turnover of parking in high-demand locations so that desirable on-street spaces are more likely to be used by business patrons, instead of employees or other longer-term visitors. Parking meters come in a variety of styles, such as single-spaced meters, double-headed meters, or multi-space pay stations (which can also be used in parking garages and other pay-by-space lots).

Parking meters should be present in high-demand parking areas, such as Neighborhood Centers and Community Commercial. They should be located at least 18 inches from the curb and out of the Pedestrian Zone. Single-space meters should be placed at the head of the parking space, and double-headed meters should be located between spaces. Double-headed meters should be used when possible as they decrease clutter within the Parking, Loading, and Transit and adjoining Zones.

Multi-space pay stations should be placed every 8-10 parking spaces with clear signage directing users to the station and any relevant information about parking. The signage should be placed carefully so as not to counteract the decluttering benefits of installing pay stations. Multi-space pay stations are also favorable when there is high competition for spaces.

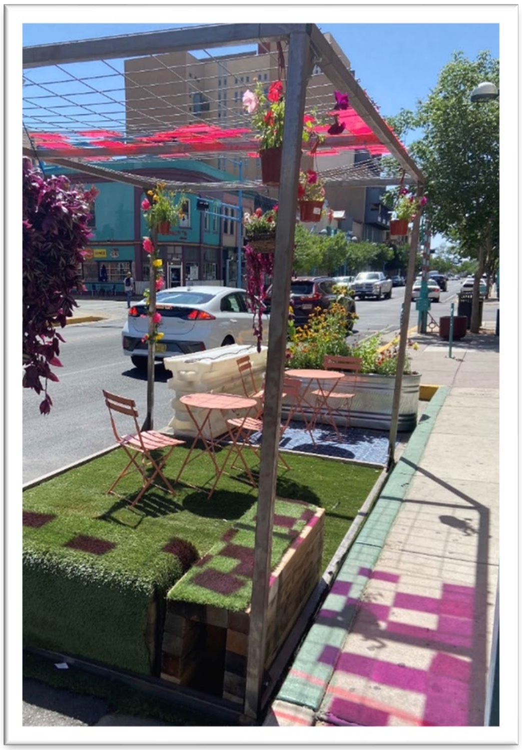
Parking meters should have multiple payment options such as debit or credit, cash, and mobile app. On-street parking spots are typically the highest demand spots in a district. Therefore, they should be priced equal to or greater than the rates for surface lots or parking garages to encourage shorter-term parking and higher turnover of vehicles.

4.6.2 Permeable Pavers & Gravel Parking Spots

Gravel is a low-cost material that allows water runoff to drain through the gravel and into the ground below. A gravel parking space does not require extensive groundwork such as concrete or asphalt. Gravel parking can be installed quickly and has low maintenance requirements. See **Chapter 7: Street Drainage** for GSI practices using alternative pavements.

4.6.3 Parklets

Figure 31: Temporary Parklet in Downtown Albuquerque



Parklets function within this Zone by occupying on-street parking spaces to provide public seating. These curbside platforms convert parking into vibrant community spaces, often through partnerships between the city and local businesses, neighborhood associations, or residents. Parklets are typically located where congested or narrow sidewalks prevent the installation of traditional sidewalk cafes and benches, or where local residents or property owners see a need to expand the current seating capacity and public space on the street.

To ensuring visibility and safety for moving traffic and parking cars, parklets should be buffered by using a parking block at least 2 feet from the parklet itself (on all sides the parklet is exposed to vehicular traffic). Vertical elements should be present so that they are visible to traffic. Parklets should be a minimum width of 6 feet and take one or more parallel parking spaces or 3-4 angled parking spaces. The number of parking spaces taken can vary based on site context, but sightlines and accessibility should always be considered.

Temporary parklets may be considered during special events.

As a part of a revitalization project on the Saint Michael’s Drive Corridor in 2012, the City of Santa Fe adopted code to allow for parklets.

4.7. Vehicular Zone

The following section describes considerations and design guidance for the Vehicular Zone.

4.7.1 Alternative Pavements & Sloping

For details on alternative pavements, refer to **Chapter 7, Alternative Pavements**. For details on street right-of-way sloping for drainage, refer to **Chapter 7, Alternative Pavements**.

4.7.2 Street Striping

Hot Thermoplastic is the preferred street striping material for longitudinal striping on new or rehabilitated pavement. Hi-Build Retroreflectorized Painted Markings may be used for older pavements or maintenance. Hot Thermoplastic is preferred for symbols, arrows, and words. Designers can also consider newer technologies that may be developed after this document is published.

- Yellow stripes should be used between two opposing directions of travel.
- White stripes should be used for edge lines and between lanes in the same direction.

- All bike and pedestrian symbols, arrows and the word ONLY should be white.

Striping is not desirable on local / residential roads except at intersections with other types of roads to designate lanes. Striping on local roads has been shown to increase vehicle speeds by providing a clear path for the driver to navigate.

Bicycle Lane Markings

- Bicycle lanes should be marked with a minimum 6” solid white stripe. Bicycle lanes may be continued through a driveway using solid lines if there is no stop sign or dotted longitudinal lines where the driveway has a stop sign. Bicycle symbols can be used where bike lanes start.

- Raised pavement markers should not be used on bicycle lanes as they can cause a bicyclist to lose balance and fall.

- Green paint may be used at key locations such as trail crossings, or where parking in the bike lanes is a particular problem. Green paint shall not be used in the same location as shared-lane markings. Green paint can only be used in the bike lane or in a bicycle box. See the current edition of the MUTCD for specific examples.

Crosswalks

See **Chapter 6: Intersections** for crosswalk details.

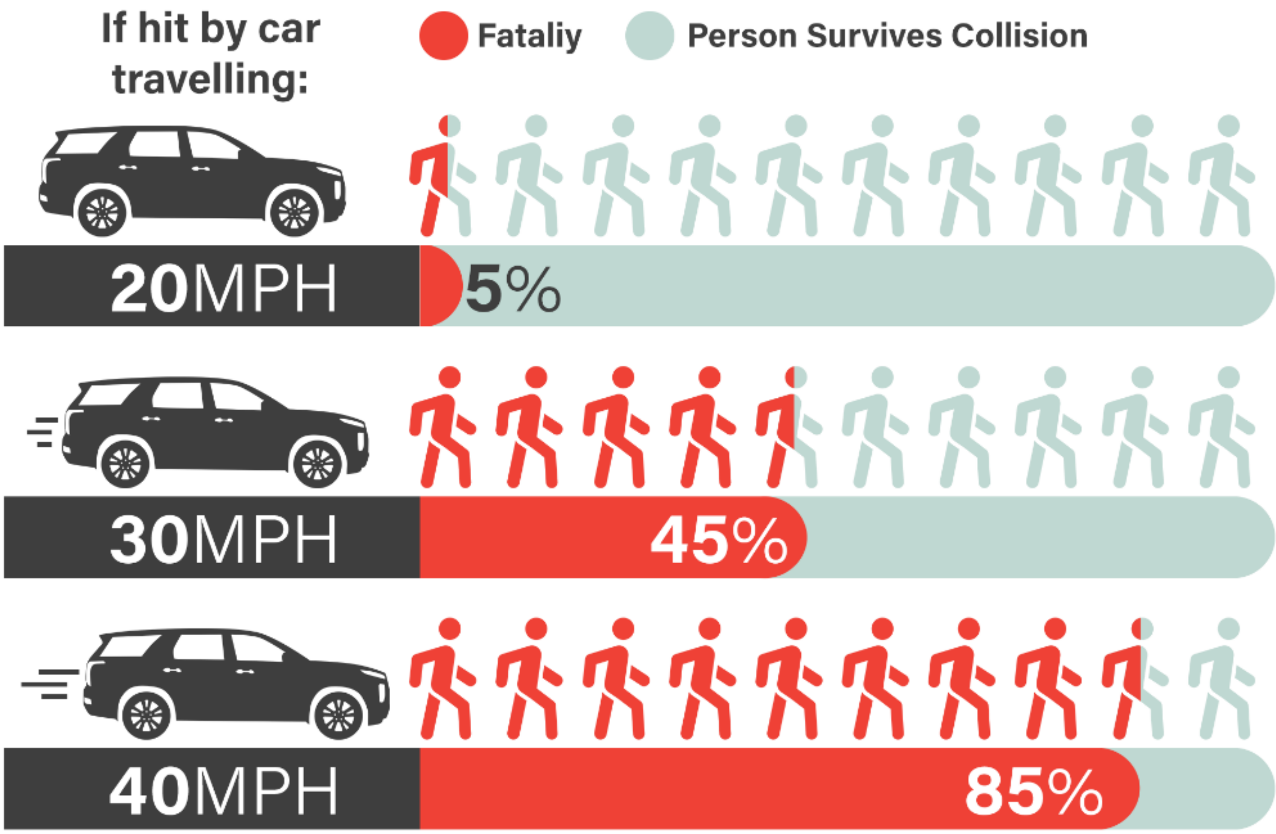
4.7.3 Target and Design Speed

Speed limits are only part of what frame expectations typical speeds; design elements such as street width, or the presence (or lack) of vertical elements also contribute to the speeds drivers feel comfortable traveling at. When a target speed limit and design speed are considered simultaneously, streets can create a safe, reasonable, and consistent speed to protect pedestrians, bicyclists, and drivers.

The three types of speed limits—statutory, posted, and “special conditions” speed limits—are applicable in the Street Design Guide.

When identifying an appropriate speed for a street, designers should consider the safety of pedestrians and other vulnerable road users.

Figure 32: Pedestrian Fatality Likelihood Based on Speed of Vehicle



National Traffic Safety Board (2017) Reducing Speeding-Related Crashes Involving Passenger Vehicles. Available from: https://www.ntsb.gov/safety/safery-studies/Documents/SS1701.pdf

Statutory & Default Speed Limits

Statutory speed limits are established by State legislatures for specific road types. The State of New Mexico has the following speed limits:

- 15 mph on all highways when passing a school with children present and when there is a school zone
- 30 mph in a business or residential district
- 55 mph on county roads without posted speed limits

The statutory speed limit is capped at 75 mph for the state of New Mexico.

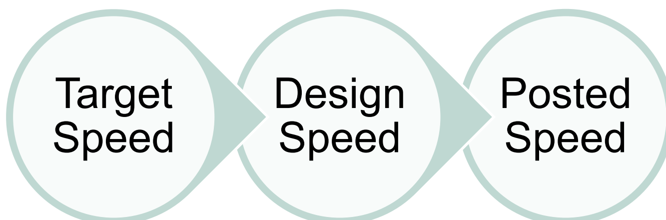
Municipalities and counties may reduce (but not exceed) speed limits by local legislation. Within the City of Santa Fe, the default speed limit on city-owned streets is 25 mph, where that is presumed to be the speed limit where no other speed limit is posted.

Target Speed Method

All Complete Streets projects should use a Target Speed method, which is different from traditional speed limit setting methodology (which uses the 85th percentile of operating speed).

Target speeds are used in conjunction with functional classifications (in this instance, Street Type) to aid in establishing ranges of appropriate street speeds for vehicles in relation to street context. A target speed is the highest desired operating speed given the land-use context, vehicular mobility, and multimodal activity of the area.

To implement Target Speeds, designers should first decide an appropriate speed limit based on corridor context; then, design the street to encourage that speed.



The Target Speed will ultimately become the Posted Speed.

The speed of traffic impacts the comfort and safety of all road users. Target speeds should consider the context and safety of each user group.

Maximum Target Speed by Street Type

The following table shows the *maximum* target speed based on Street Type and Corridor Context. Designers may use lower target speeds at their discretion based on the context of the street.

Table 3: Maximum Target Speed by Street Type

Maximum Target Speed by Street Type	Historic Districts	Neighborhood Center / Community Commercial	All Others
Type I	20 mph	20 mph	20 mph
Type II	25 mph	25 mph	30 mph
Type III	30 mph	30 mph	35 mph
Type IV	35 mph	35 mph	40 mph

Posted Speed Limit

Posted speed limits, also known as regulatory speed limits, are sign-posted along roads. A posted speed limit could be the same as the statutory speeds, or it can be established by a state transportation agency, county, or city and void statutory or default speed limits. **The posted speed limit should be the same as the Target Speed and Design Speed except in School Zones** and should not be higher than the Maximum Target Speed identified above.

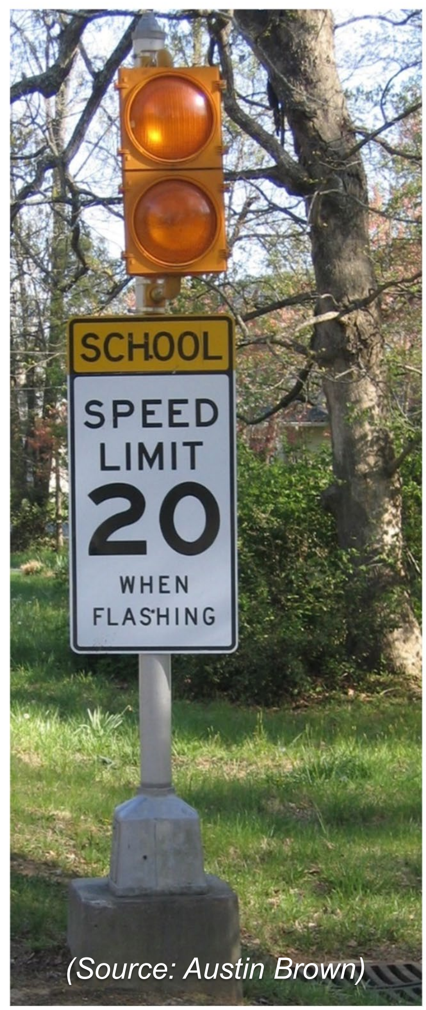
Advisory & Variable Speed Limits

Variable speed limits are displayed on customizable message signs (CMS) at locations where street conditions regularly require a reduction in speed greater than 10 mph below the posted speed limit. School zone and work zone speed limits are included in this category. Advisory speeds are non-regulatory speeds posted for an isolated section or small portion of a street to inform drivers of safe driving speeds. They are determined using an engineering speed study and in accordance with the *Manual on Uniform traffic Control Devices* (MUTCD).

Speed Limits in School Zones

School Zones may utilize variable speed limits that lower the speed temporarily during times when students are likely to be present. Through school zones, Complete Streets projects should design for maximum pedestrian and bicyclist comfort, utilize traffic calming interventions, and install appropriate signage along the corridor. Pairing variable School Speed Limit signage along with a radar alerting drivers to their current speed may help encourage drivers to go slow during school hours.

Figure 33: Variable School Zone Speed Limit Sign



(Source: Austin Brown)

4.7.4 Traffic Calming Interventions

To aid in slowing traffic to target speeds, there are several Vehicular Zone interventions that can be implemented.

When streets are designed with wide lanes and wide line of sight, drivers tend to feel more comfortable speeding. Street design decisions that can impact the speed of travel on streets can include:

- Lane widths
- Curb radii
- Signal progression
- Intersection design (including roundabouts, speed tables, median barriers, stop signs, etc)
- Speed bumps and cushions (see section below on speed bumps that accommodate emergency vehicles)
- Line of sight, which can be affected by:
  - Tree canopy
  - Land use and building location
  - Presence of bicycle facilities
  - Staggered physical barriers, such as chicanes, lateral shifts, and bulb-outs
  - On-street parking
  - Curves or bends in the street
- Stopping distance

This subsection describes speed humps and speed tables. For details on other roadside interventions that can aid in slowing traffic such as those listed above, see subsections on the Flexible Zone, Bicycle Zone, and Parking Zone. Additionally, GSI practices are conducive to traffic calming, as they often provide vertical visual elements that naturally slow drivers. Medians, traffic circles, chicanes, and curb extensions (also referred to as bump-outs or bulb-outs) can be great opportunities to include GSI practices.

Table 4: Traffic Calming Interventions

	Type I	Type II	Type III	Type IV
Speed Humps	✓	~	✕	✕
Speed Cushions	✓	~	✕	✕
Speed Tables	~	✓	~	✕
Pinchpoints	~	✓	✓	✕
Median Islands	✓	✓	✓	✓
Lateral Shifts	✓	✓	~	~
Chicanes	✓	~	✕	✕
On-Street Parking	✓	✓	~	✕

✓ = Preferred ~ = Acceptable in Some Contexts ✕ = Not Appropriate

For details on when and how to implement traffic calming measures, review the City of Santa Fe Traffic Calming Program (Appendix G).

For information on how to use intersection design, such as roundabouts or traffic circles, to slow traffic, see **Chapter 6: Intersections**.

Speed Humps and Speed Cushions

In North America, speed humps are the most common traffic calming device. They are affordable, effective, and easy to build. There are four common profiles of speed humps: circular, sinusoidal, flat-topped, and parabolic. The parabolic profile, specifically the Watts 12 ft. profile hump between 3 and 4 inches high, is the most widely used speed control measure within the United States. The City of Santa Fe's preferred speed bump is a parabolic speed hump that is 14' wide and 3" high.

Any type of speed hump should have the required dimensions to produce enough driver discomfort to reduce speed to the appropriate level without sacrificing safety to street users. A speed hump should be large enough so that it causes a vertical deflection in the body and suspension of a vehicle passing over it. There should also be a small drainage culvert so that street runoff can drain. Reflective paving is recommended directly before the speed hump. Emergency, cyclists, and transit vehicles should be considered as well.

Speed Tables

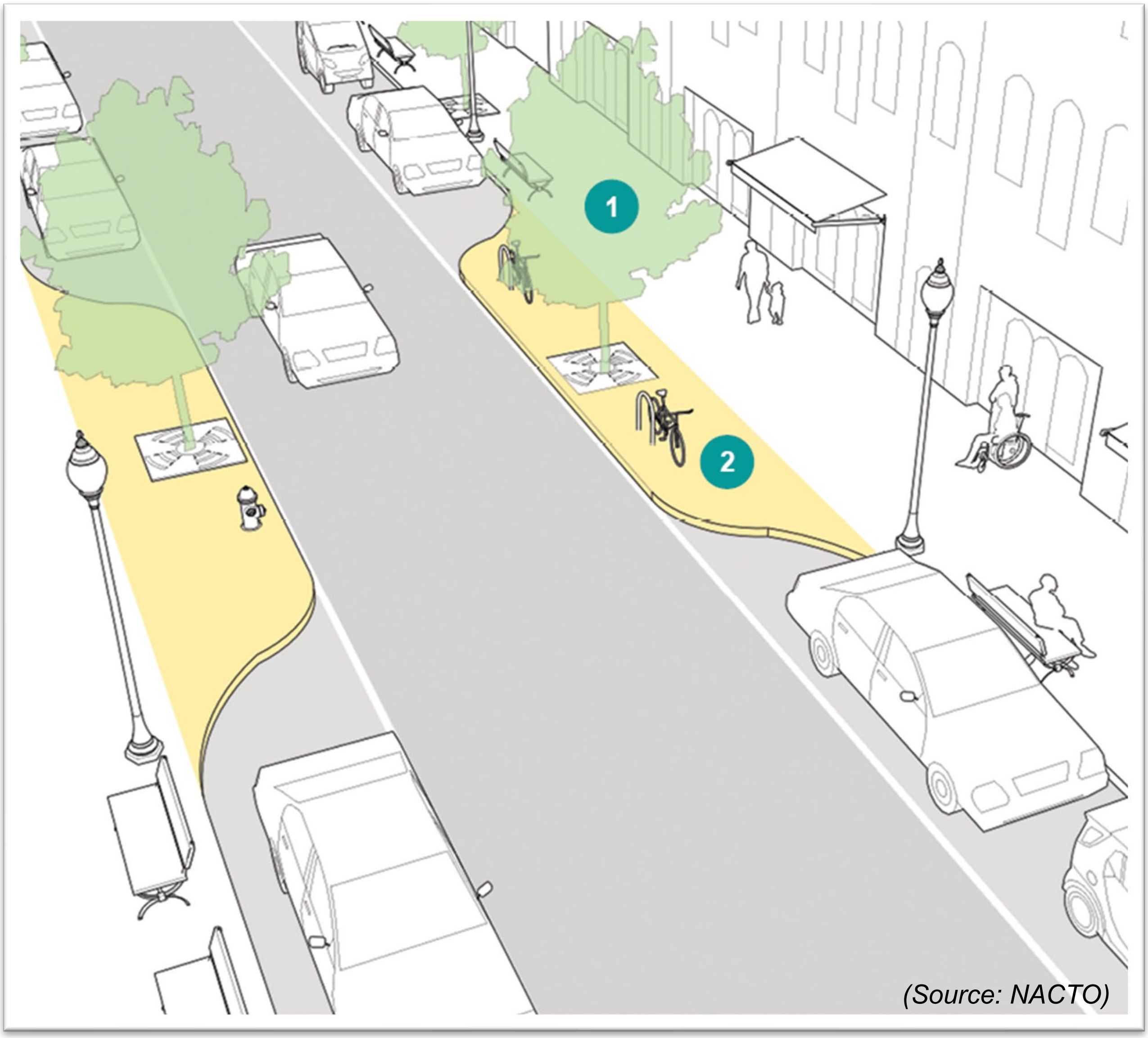
Speed tables are similar to speed humps but have an extended flat top. They are generally used on collector streets because the higher design speed allows for easier access by emergency and transit vehicles. Some speed tables are enhanced with textured surfaces or brickwork for increased effectiveness and aesthetics. The standard size of speed table used in the United States is 3 to 4" high with a 10' table top, with 6' long ramps on either side of the table. These 22' (in total) tables are long enough for the wheelbase of an entire vehicle to be flat on the table top, minimizing risk of a vehicle bottoming out and providing a smoother transition between the road and the table. The ramp and table length can vary from region to region based on laws and design needs. There should also be a small drainage culvert so that street runoff can drain. The City of Santa Fe's preferred size for speed tables is 3" high with 7' long ramps on either side of the table.

The table's design allows a higher design speed of 25 to 30 mph. Additionally, speed tables can serve a dual purpose as a raised crosswalk.

Pinchpoints

Chokers or pinchpoints are physical extensions of the Pedestrian or Flexible Zone into the Vehicular Zone that slow down vehicles. They can including landscaping, GSI, sidewalk dining, or a gateway for pedestrian mid-block crossings (see Median Zone for more on mid-block multimodal crossings).

Figure 34: Pinchpoint from the Flexible Zone



Median Islands, Lateral Shifts, and Chicanes

These countermeasures aim to calm traffic by creating a shift in the travel pattern on the street.

Median Islands

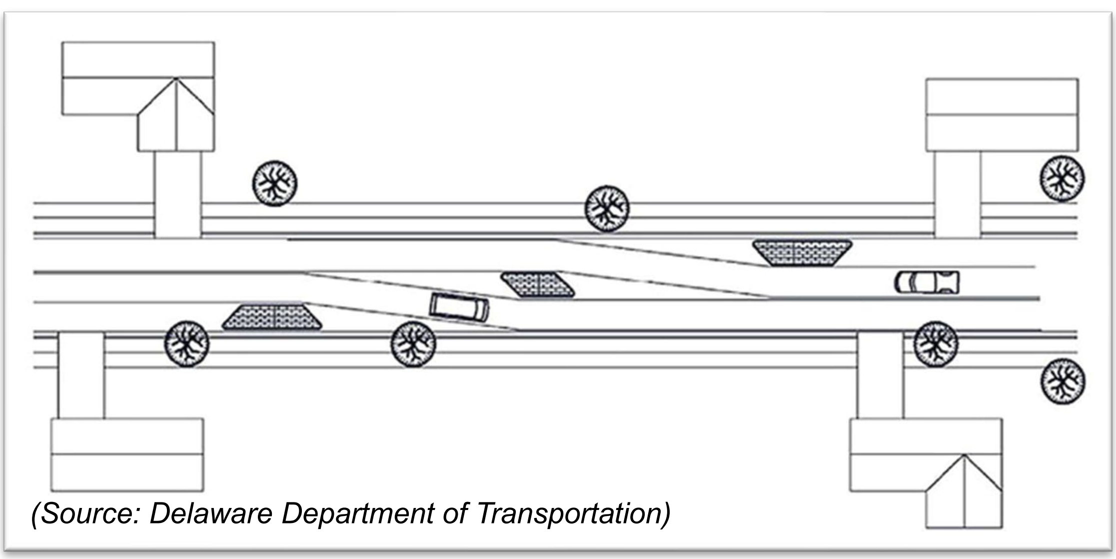
Median islands split the street, narrowing actual or perceived width of travel lanes and encouraging cars to slow. This intervention can be paired with a reduced speed limit. Figure X shows an example of a median island on a road with bicycle lanes.

Figure 35: Median Island on a Two-Lane Road with Bicycle Lanes

Lateral Shifts

Lateral Shifts utilize median islands to slow traffic; but rather than returning the vehicle to the original path, it shifts the location of both lanes of traffic.

Figure 36: Lateral Shift Schematic

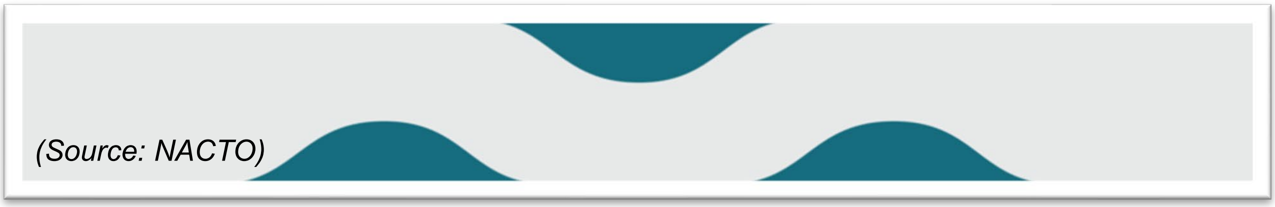


(Source: Delaware Department of Transportation)

Chicanes

A chicane utilizes a series of alternating lane shifts (as opposed to the singular shift created by a Lateral Shift).

Figure 37: Chicane



4.7.5 Turn Lanes

Turn lanes, especially dedicated right-turn lanes and right-turn slip lanes, along roads help facilitate fast motor vehicle travel but can be dangerous to pedestrians. **This section specifically discusses non-intersection turning movements.** For details on intersection turning movements, see **Chapter 6: Intersections**.

In areas with frequent large vehicles turns or high right-turn volumes, and where pedestrian activity is expected to remain low, a channelized right-turn lane may be permissible. The turning angle should be tightened to increase pedestrian visibility and slow approach speeds. In areas with more pedestrians, a raised pedestrian crossing or signalized right-turn lanes should be considered.

4.7.6 Yield Streets

Yield streets are shared, slow-speed, bidirectional streets designed to accommodate bicyclists, pedestrians, and motor vehicle traffic within the same unmarked travel area. Yield streets help to maintain aesthetic preferences and serve local travel needs; they are a common form of low-volume local rural roads. They are designed with narrow street dimensions to aid in community livability and prioritize local access. In rural areas with a disconnected street network, local streets are sometimes the only emergency access route, so yield street design and implementation should consider the requirements of emergency vehicles and responders.

One important characteristic of yield streets is that no pavement markings or striping is necessary to implement a yield street. Pedestrian warning and two-way traffic signs should be used to warn road users of the street's conditions. At the uncontrolled crossings of local streets, no special treatment is necessary. Parking prohibitions should be considered 20-50 feet before intersections. This is helpful for accommodating large vehicle turning movements. Adequate stopping sight distance should be provided at uncontrolled intersections and around curves as well.

Yield streets are appropriate for Type 0 and Type 1 Streets, especially in historically-constrained scenarios.

4.7.7 One-Way Configuration

One-way roads and streets should be examined through the lens of the area's context. A one-way street system often forces drivers to take out-of-direction routes to their destinations, which increases the number of intersections a vehicle must travel through and the volume of turning movements.

One-way configurations are only appropriate on existing Type I and Type II Streets where available right-of-way limits the ability to provide all necessary infrastructure (such as sidewalks, curb and gutter, and on-street parking). This may be more common in Historic Districts. For one-way configurations, designers should consult with the City Engineer and Complete Streets staff.

4.7.8 Commercial Alleys

Commercial alleys can play an integral role in a downtown street network. Enhancing alleys in commercial areas to include pedestrian amenities can provide additional connectivity while serving as a playful placemaking tool.

Intersections between alleys and sidewalks (traveling perpendicular) can potentially obstruct visibility for passing pedestrians and potential vehicles, as streets are narrow and buildings may be built up to the edge of the right-of-way, leading to a narrow field of vision. The intersection should be raised to the sidewalk level and rumble strips should be added to mitigate visibility issues. Warning signs should be added to warn pedestrians of potential traffic. Since bicyclists may use commercial alleys, similar signage and regulations for cyclists should apply as well.

Figure 38: Commercial Alley, NACTO

If vehicles are permitted, alleys should be maintained so that trucks and other freight vehicles can access them easily. Street furniture should be designed to minimize conflict with trucks and freight vehicles.

4.8. Median Zone

4.8.1 Center Turn Lanes

For detailed information about turning lanes at intersections, see **Chapter 6: Intersections.**

4.8.2 Center Medians

Medians are curbed areas that separate two directions of traffic on a street. Medians should break at regular intervals and at cross-streets to allow for opposing traffic to cross and for left-hand turns.

Medians may help slow speeds -especially when planted with shrubs, grasses or low landscaping. Medians can provide opportunities for GSI (see **Chapter 7: Street Drainage**) where street runoff can be collected, allowing for pollutants to settle and promoting infiltration. Additionally, medians present an opportunity to incorporate public art, sculptural elements, or distinctive paving materials that reflect local character. These design features can transform medians into visually engaging spaces that reinforce neighborhood identity while also improving pedestrian safety by providing mid-block crossing refuges, eliminating the need to cross both directions of traffic at once.

Medians can also help improve safety by separating traffic moving in opposing directions. **For more details on median refuge islands, see Chapter 6: Intersections.**

4.8.3 Multimodal Crossings

Mid-block crossings allow pedestrians to reach their destinations across the street without crossing at intersections. These are typically installed in locations with a high pedestrian volume, long distances between intersections (greater than 300 feet), and destinations on both sides of the street.

On a street with four or more lanes where average daily traffic is greater than 15,000 or where speeds are 40 miles per hour or greater, mid-block crossings should be designed with care and enhanced safety considerations for pedestrians, as risk of severe injury and death are increased at 40mph or greater.

Figure 39: Mid-block Median Crossing in Los Angeles

Utilizing the FHWA *Guide for Improving Pedestrian Safety at Uncontrolled Crossing Locations* (Appendix H) will assist designers in selecting appropriate treatments for mid-block crossings.

Refuge Island

Refuge islands are protected spaces located in the center of the street to assist with pedestrian and bicycle crossings. Crossings are facilitated by allowing users to navigate only one lane direction of traffic at a time. In areas with multi-lane streets or higher volumes, increased levels of treatment such as hybrid beacons, active warning signs, and bicycle signals may be desired. Median islands should be a minimum of 6' wide to accommodate bicycles.

Figure 40: Median Island with Pedestrian Refuge and Offset Crosswalk

(Source: Scott Batson)

HAWK Beacon or Pedestrian Hybrid Beacon (PHB)

High intensity activated crosswalk (HAWK) beacons assist in pedestrian and cyclist crossings by stopping vehicular traffic on demand. They are particularly effective for high-traffic roads either as mid-block crossings (connecting trails or providing a crossing in a popular commercial area), or at intersections where a vehicular traffic signal is not warranted. HAWK infrastructure can lead to a 69% reduction in pedestrian-involved crashes, including a 15% reduction in crashes resulting in severe injuries.[2]

A HAWK beacon should only be installed at a marked crosswalk. The need for a beacon should be considered after a study that considers major street volumes, speeds, width, and gaps in conjunction with pedestrian volumes, walking speeds, and delay. (MUTCD 11 Edition)

[2] "Safety Effectiveness of the HAWK Pedestrian Crossing Treatment," Office of Research and Technology, FHWA, USDOT (2010)

HAWK crossings provide drivers with multiple cues to emphasize the potential presence of a pedestrian:

- Unique beacon configuration (two red lenses above a single yellow lens)
- High visibility crosswalk markings
- A stop bar approximately 50’ from the crosswalk
- 8” solid lane lines between through-travel lanes
- Signs that can be illuminated and read “CROSSWALK”
- School warning signs

When the HAWK is activated, it begins with a yellow beacon to warn motorists to prepare to stop. This is followed by a double red signal that informs drivers to stop completely. Simultaneously, an illuminated walk sign for pedestrians notifies them that it is safe to cross. After the walk phase ends, the signal transitions to a flashing hand pedestrian countdown and the beacon displays alternating flashing red lights to drivers. This indicates to drivers that they can proceed after coming to a full stop and verifying there are no longer pedestrians in the crosswalk. This stop-and-go operation is useful if a pedestrian walks faster than the presumed walking speed. Each driver is legally required to come to a full stop after each vehicle during the alternating flashing red phase. The ability to balance the safety of pedestrians with driver delays is a valuable part of the HAWK treatment.

Figure 41: HAWK Beacon and Crossing

HAWK crossings are appropriate along:

- Type II, III, and sometimes IV Streets
- On streets with speed limits of 45mph or less
- Along streets with volumes of high traffic
- In commercial areas where high volumes of pedestrian traffic are expected
- Along streets where pedestrian-involved crashes are at a higher rate

Where possible, HAWK crossings should include a center refuge island, especially on higher-speed streets. This can also allow for a phased crossing approach, where traffic in one direction is stopped first while the pedestrian crosses to the center refuge island; then pedestrians are required to push another button to stop and then cross the other direction of traffic. This can help reduce driver delays.

Refer to the Manual on Uniform Traffic Control Devices for guidance on installing HAWKs.

RRFB

To enhance pedestrian visibility and increase driver awareness at uncontrolled, marked crosswalks, Rectangular Rapid Flashing Beacon (RRFB) can be installed in combination with a pedestrian warning sign. These small rectangular lights can reduce pedestrian crashes up to 47% and increase motorist yielding rates up to 98%, depending on speed limit, crossing distance, time of day, and number of lanes.[3] **HAWK crossings are generally preferred over RRFBs, but RRFBs may be more appropriate for streets where lower or slower volumes of traffic are anticipated but where pedestrian crossings are expected to be frequent.**

RRFBs flash in alternating, high frequency when activated to alert drivers to the presence of pedestrians at the crossing. They are installed on both sides of a crosswalk above the diagonal downward arrow plaque point at the crossing and below the pedestrian crossing sign or above the street mounted on poles. The flashing pattern is activated with passive (video or infrared) pedestrian detection or by pushbuttons, and should be unlit when not activated.

RRFBs are not appropriate for every street. The use of RRFBs should be limited to locations with significant pedestrian safety issues as over-use of these treatments may diminish their effectiveness. RRFBs should be used with other signage for pedestrians, trails, or school crossing warnings. They should not be used for crosswalks across approaches controlled by yield signs, stop signs, pedestrian hybrid beacons, or traffic control signals, except for the egress or approach from a roundabout.

[3] "Proven Safety Countermeasures, Rectangular Rapid Flashing Beacons." Office of Proven Safety Countermeasures, FHWA, USDOT (2021)

Figure 42: RRFB Crossing

RRFBs are not appropriate for every street. RRFBs can be used:

- Where HAWK crossings are not appropriate.
- On Type II and Type III streets.
- On streets with speed limits at or under 35 miles per hour.
- On streets with 4 travel lanes (including a center turn lane) or fewer.
- In school zones.

Refer to the manual on Uniform Traffic Control Devices for guidance on installing RRFBs.

4.8.4 Depressed Median

Depressed medians can allow drainage to occur in two directions. Rainfall runoff, melting ice and snow, and other factors drain out of the travel lanes both off the shoulder and into the median. Drainage inlets within the median should be designed either with culvert ends provided with traversable safety grates or the top of the inlet flush with the ground. Landscaping and GSI can also be included in depressed medians. See **Chapter 7: Street Drainage** for more details on Green Stormwater Infrastructure.

Chapter 5. Safety & Transportation Analyses

5.1. Safety Analysis for Street Redesign Projects

In the conceptual design stage, designers should identify roadway safety concerns and existing crash trends along the corridor. For new street projects, safety should be the primary consideration guiding design.

In 2022, the Santa Fe Metropolitan Planning Organization (MPO) adopted a Local Road Safety Plan, which included an analysis to identify corridors and intersections with the highest rate of crashes within the Santa Fe Metropolitan Planning Area. The Plan identified several safety emphasis areas, which can be addressed in a street redesign project:

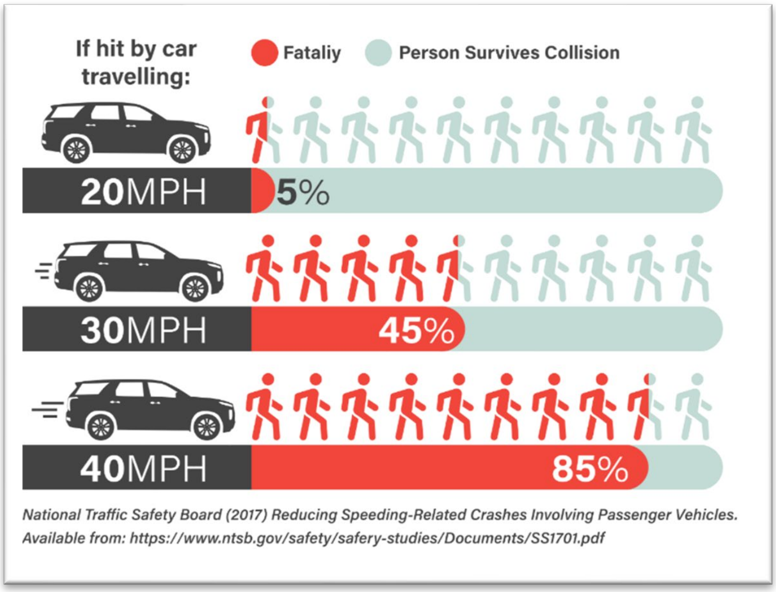
- **Roadway Departures.** Speed and nighttime driving were major contributing factors to serious injuries and fatalities from vehicles leaving the roadway.
- **Speeding.** Higher speeds lead to higher risks of serious injuries or fatalities. Roads designed with wide lines of sight and high speed limits can encourage speeding. Speed-related crashes are more likely to occur at mid-block locations than at intersections.
- **Intersections.** Intersections create natural points of conflict due to the various types of maneuvers (turning and crossing) and a higher variety of user types (vehicles, pedestrians, and cyclists). Bicyclists and pedestrians are particularly vulnerable at intersections.
- **Pedestrians.** Pedestrians are the most vulnerable road user. Four-lane streets with a center median or turn lane and a posted speed limit at or above 35mph have a higher risk for pedestrian injury and fatality.
- **Cyclists.** Crashes involving bicyclists occur primarily on principal arterials.

Street redesign projects should refer to the High Injury Network and identify whether the project area includes a High Injury corridor or intersection. **Identifying the project on the High Injury map should be included in the conceptual design submission package to the Complete Streets staff**. Designers of projects that include a High Injury corridor or intersection should consult with the Santa Fe MPO. In addition, Complete Streets staff may flag projects in areas with frequent constituent complaints or safety-related requests, and subsequently request a Safety Analysis be performed.

The MPO maintains a comprehensive repository of crash data, analytical tools, and regional safety studies that are essential for identifying historical trends, evaluating potential safety risks, and informing evidence-based design decisions. Additional resources on historic crash data can be found on the Santa Fe MPO website and its safety data hub.

While the Santa Fe MPO provides regional crash data and safety analysis tools, these resources may not always offer the necessary level of detail, timeliness, or geographic specificity for a given project. In such cases, the project team is responsible for conducting additional due diligence to ensure a comprehensive understanding of existing safety conditions. This may include, but is not limited to, road safety audits, field observations, coordination with local law enforcement and emergency services, review of hospital or incident reports, community engagement, or commissioning targeted safety studies. The objective is to exhaust all relevant and available sources of information to inform a safe and context-sensitive street design.

Figure 43: Fatality Rate by Vehicle Speed



5.1.1 Implementing Proven Safety Countermeasures and Traffic Calming

Different types of crashes call for different types of interventions. Once crash factors along the corridor are identified – through MPO data analysis or other safety investigations – designers may consider applying appropriate FHWA Proven Safety Countermeasures (see graphic below) to reduce the risk of crashes. Traffic calming measures from **Chapters 4** and **6** should also be considered. Designers should be careful that solutions improve vehicular safety without degrading pedestrian or bicyclist safety (or vice versa). Selection of appropriate safety treatments should be done in coordination with the Santa Fe MPO and City of Santa Fe Complete Streets Staff.

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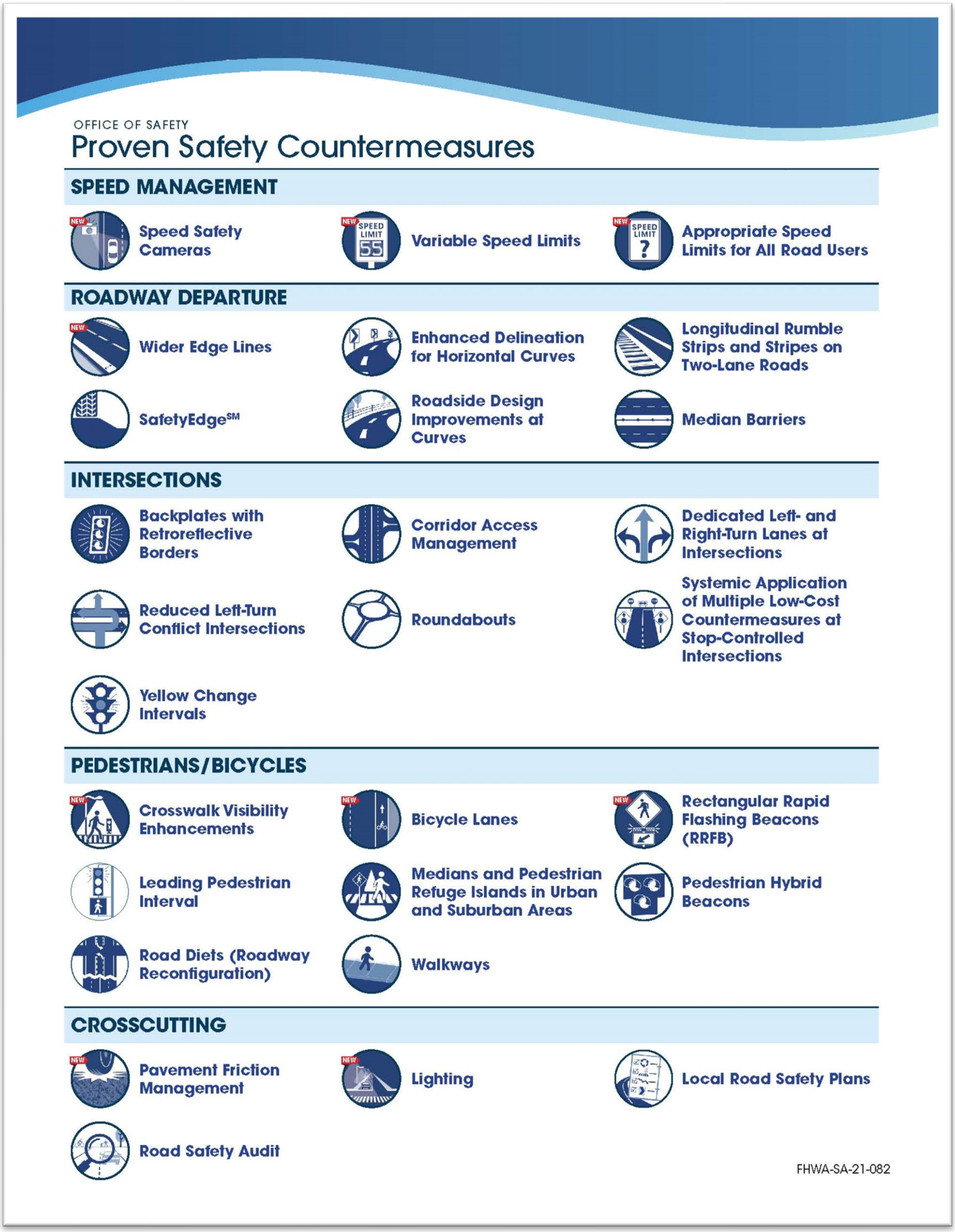
Figure 44: Proven Safety Countermeasures



5.2. Transportation Impact Analysis

The City of Santa Fe's Transportation Impact Analysis (TIA) methodology guides developers in evaluating the potential effects of proposed development or redevelopment projects for all modes of transportation. A TIA may be required to assess how a project may impact the surrounding transportation network.

The TIA identifies existing and projected traffic volumes and conditions, site-generated traffic, and their combined impacts on the existing and planned roadway and trail systems. The TIA provides an opportunity for the City and the developer to share information and jointly address transportation and traffic -related objectives. This collaboration helps ensure development needs are balanced with the functional integrity of the surrounding streets, bike networks, trails, and public transit services. The need for a TIA should be assessed as early as possible in the development process when there is greatest flexibility for mitigating traffic and transportation-related user problems.

The results of the Transportation Impact Analysis help the City of Santa Fe determine any necessary upgrades for adjacent streets to support the trips anticipated to be taken to the development site.

See **Appendix I, City of Santa Fe Transportation Impact Analysis**, to determine whether a TIA is required and for instructions on how to prepare a TIA for submission to the City of Santa Fe.

Chapter 6. Intersections

Intersections play an important role in vehicular, commercial, and multi-modal travel. As such, they are a vital consideration when implementing Complete Streets design standards. Adjacent land uses should inform intersection design and modal priorities, especially where different Street Types and context-sensitive street designs intersect. These locations often present the most potential for conflicts, both among street users and during design decision-making.

A corridor's vehicular level of service can be influenced by the capacity of its intersections. Adding right or left-turn lanes may improve vehicular levels of service but can worsen bicycle and pedestrian levels of service and safety.

Intersections must balance traffic and land use considerations. There are six principles for intersection design that are explored through the guidelines within this chapter, including:

- **Meet User Needs:** Intersection design should balance the efficient movement of motor vehicles with the efficient and safe movement of non-motorized users. Pedestrians are the most vulnerable roadway users, and cyclists and pedestrians are susceptible to greater injuries in the event of an accident with a motor vehicle.
- **Accessibility:** Universal accessibility principles and ADA guidelines should be considered when designing curbs, curb cuts, signal timing and other geometric design principles.
- **Clutter Reduction:** Intersection elements such as light and sign poles, hydrants, and utility covers should be placed to maximize functionality and maintain accessibility. Utilities should be accessible to allow maintenance without obstructing pedestrian crossings.
- **Ease of Maintenance:** Materials used should be sustainable, long-lasting, and require minimal maintenance.
- **Reclaim Space:** Wide intersections are not always necessary for the efficient movement of motor vehicles. Underutilized intersection space can be reallocated for transit users, pedestrians, cyclists, and green space.

6.1. Intersection Spacing

Properly spacing roadway intersections is essential for balancing traffic flow, safety, and accessibility. Street Type and Corridor Context should guide decisions about appropriate spacing between intersections.

Type I and II Streets benefit from frequent intersections to support connectivity, ensuring easy access for residents, businesses, and emergency services. This layout promotes walkability and cyclist mobility, fostering vibrant communities where short trips can be made without relying on major roads. Streets along Neighborhood Centers and Community Commercial areas should also provide frequent intersection spacing to promote walkability and business access.

In contrast, an excessive number of intersections on Type IV roads can lead to congestion, increased crash risks, and reduced efficiency for longer-distance travel. Type IV roads are designed for higher-speed, long-distance travel, and benefit from longer intersection spacing to maintain free-flowing traffic and reduce delays.

While wider spacing might benefit regional mobility, overly long gaps between intersections can hinder pedestrian and cyclist movement, creating barriers to access. Strategic planning—such as incorporating pedestrian crossings, multi-use paths, and signalized bike-friendly intersections—can mitigate these challenges. By aligning intersection spacing with road function, designers can create a network that optimally serves all users, balancing efficiency with accessibility.

The chart below provides recommended maximum intersection spacing for new subdivisions. For existing roadways, these guidelines should be consulted when considering whether to close access points.

Table 5: Maximum Intersection Spacing

Maximum Intersection Spacing	
Type I	800 ft
Type II	1,000 ft
Type III	1,320 ft
Type IV	1,600 ft

Non-Vehicular Access Points

Some developments may include dedicated pedestrian access points – such as at trails or sidewalks – around the development. This may be convenient on cul-de-sacs where pedestrians must travel unreasonably far out of direction to exit the subdivision. Such facilities should follow all PROWAG design requirements. Pedestrian-only access should feel open or be well lit to discourage loitering.

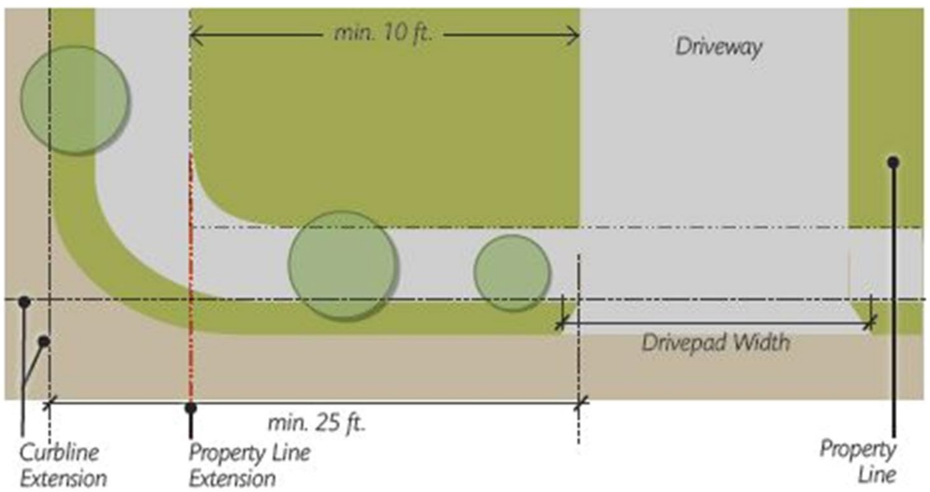
Figure 45 - Pedestrian Cul-de-Sac Access Example

6.2. Driveways near Intersections

Driveways should be set back from intersections to provide more visibility for pedestrians and to provide adequate sight distance for vehicles turning out of cross streets.

Driveways on Type I Residential streets should be located a minimum of 25' from the curbline extension of the cross street as shown in the Figure below.

Figure 46: Residential Driveway Distance from Intersection



(Source: City of Albuquerque DPM)

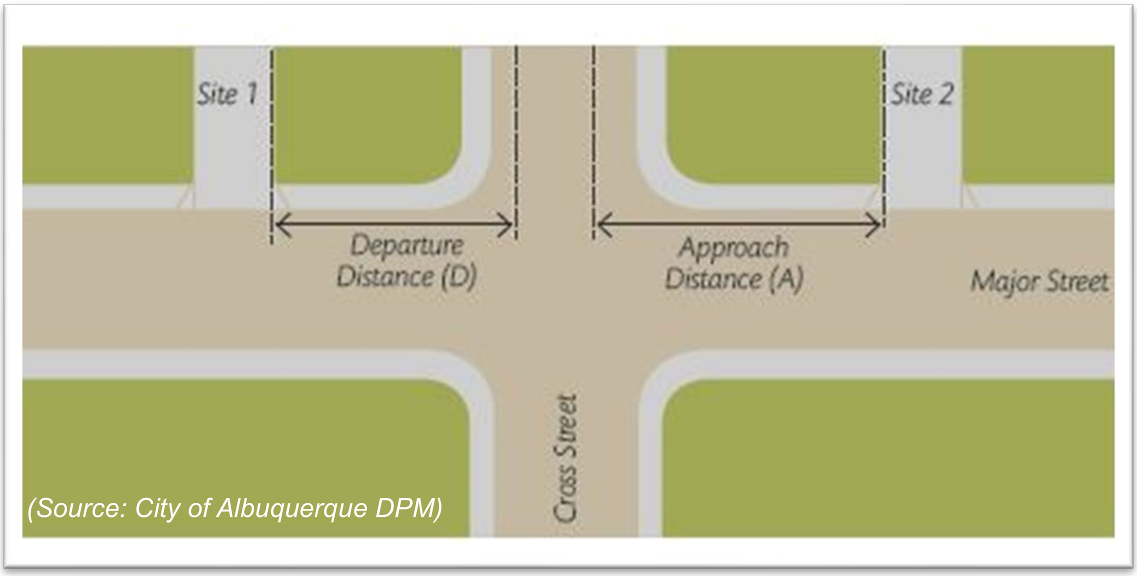
Multi-family, mixed-use, and non-residential driveways should be located as shown in the following table and figure. All dimensions are from the curb face to the edge of driveway.

Turning restrictions may be imposed for driveways that are too close to signalized intersections with turn lanes, or where existing driveways or roadway characteristics may increase crash potential or at locations with a history of high crash rates. The restriction may be for left-turn movements in or out of the driveway or right-turns in or out. See Table 6, Minimum Distance Between Commercial Site Access and Intersection.

Table 6: Minimum Distance Between Commercial Site Access and Intersection

Intersection Distance Table by Cross Street Type	Type IV + Type III		Type II		Type I	
	A	D	A	D	A	D
Type IV	300 ft	200 ft	200 ft	150 ft	150 ft	100 ft
Type III	200 ft	150 ft	150 ft	100 ft	100ft	100 ft
Type II	150 ft	150 ft	100 ft	100 ft	75 ft	75 ft
Type I	75 ft	75 ft	50 ft	50 ft	25 ft	25 ft

Figure 47: Driveway Distance from Intersection, Approach and Departure



6.3. Types of intersections

Uncontrolled intersections are typically local roads with low traffic volumes. Drivers enter the intersection on a first come, first served basis.

Stop controlled intersections can be stop controlled as a two-way or an all-way stop.

Signalized intersections are controlled by a traffic signal. A traffic signal needs study shall be conducted per the current edition of the Manual on Uniform Traffic Control Devices (MUTCD) to determine if a new traffic signal should be installed.

Roundabouts are circular intersections with a center island and counterclockwise vehicle movement. They use splitter islands to deflect entering vehicles and manage vehicle speed. Roundabouts should be considered at stop-controlled intersections with a level of service of E or F, as determined by a Traffic Impact Study, or where a traffic signal is warranted. Multilane, mini or turbo roundabouts can be used.

The types of intersections most appropriate for each street type are shown in the following table:

Table 7: Types of intersections

Type of Intersection by Street Type	Uncontrolled	Stop / Yield Controlled	Signalized	Roundabouts
Street Type I	✓	✓	X	~
Street Type II	X	✓	X	✓
Street Type III	X	✓	✓	✓
Street Type IV	X	X	✓	~

✓ Acceptable ~ Acceptable in some context **X** Not Appropriate

6.4. Design Elements

6.4.1 Design Vehicle / Control Vehicle

The ***Design Vehicle*** is the largest vehicle that regularly uses the intersection and is used to determine the proper turning radius for an intersection. For example, if the intersection is on a transit route, the intersection should be designed so that buses can make a right turn without encroaching into oncoming lanes.

The Design Vehicle should be accommodated without encroachment into the opposing travel lanes from collector streets, arterial streets, and local streets with designated roadway striping. For local streets with minimal traffic volumes and no roadway striping, the design vehicle is permitted to go across the centerline of the street to make a turn.

If the intersection is on a designated freight corridor, industrial street, or a bus route, the Design Vehicle should be the largest vehicle that regularly uses the street. For all other street designations, the Design Vehicle should **not** be selected based on the largest vehicle that may occasionally use the intersection. Instead, it should represent the least maneuverable vehicle that accounts for at least 3% of turning movements. Utilize vehicle classification counts to obtain accurate information for these roadway design purposes.

The ***Control Vehicle*** is the least maneuverable vehicle that may possibly use the intersection. The control vehicle may swing wide to make turns and encroach on bike lanes and oncoming lanes on the side street.

6.4.2 Curb Radii

Curb radius designs should consider multiple factors based on the specific needs and constraints of the intersection. Such factors could include:

- Right-of-way considerations and limitations from adjacent land uses
- Freight generators, nearby emergency centers and fire stations with larger design vehicle requirements
- School locations which may include frequent bus travel
- Number of travel lanes and lane widths
- Intersection skew
- Effective placement of curb ramps, crosswalks, and pedestrian pushbutton locations
- Presence of a multi-use path and protection of its safe, effective use
- Necessary drainage inlet locations or other stormwater design considerations

Designers should avoid intersection corner radius designs that would result in vehicles driving over the sidewalk or intersection curb ramps. Instead, provide sufficient curb lengths around the corner for channelization of vehicular traffic as necessary without compromising pedestrian infrastructure.

Narrower streets with curbside travel lanes may require larger corner radii because the effective turning radius closely mirrors the actual corner radius. Due to their age and construction before typical roadway standards have been developed, narrower roads are common in Santa Fe. Intersection and roadway design should always adhere to the local Fire Code to accommodate emergency vehicles.

Intersection medians can be designed with mountable truck aprons to accommodate larger commercial vehicles while maintaining shorter crossing distances for pedestrians and bicyclists. Otherwise, the design should not allow encroachment of the Control Vehicle into the center raised median area.

Figure 48: Mountable Curb Median Example

A standard curb radii of 25 feet is recommended. Radii below 25 feet can be considered on Type I and II streets, in consultation with the Fire Marshall. In general, **any curb radii larger than 30 feet should seek approval from Complete Streets Staff.**

On higher speed streets – particularly with speed limits 40 mph and above – the risk of rear-end crashes for right-turning vehicle is high, especially where there is no dedicated right turn lane. Larger curb radii may be appropriate at intersections with high right turn volumes are high, especially on higher-speed streets. However, designers should consider how to protect the most vulnerable users while balancing the needs of all travel modes.

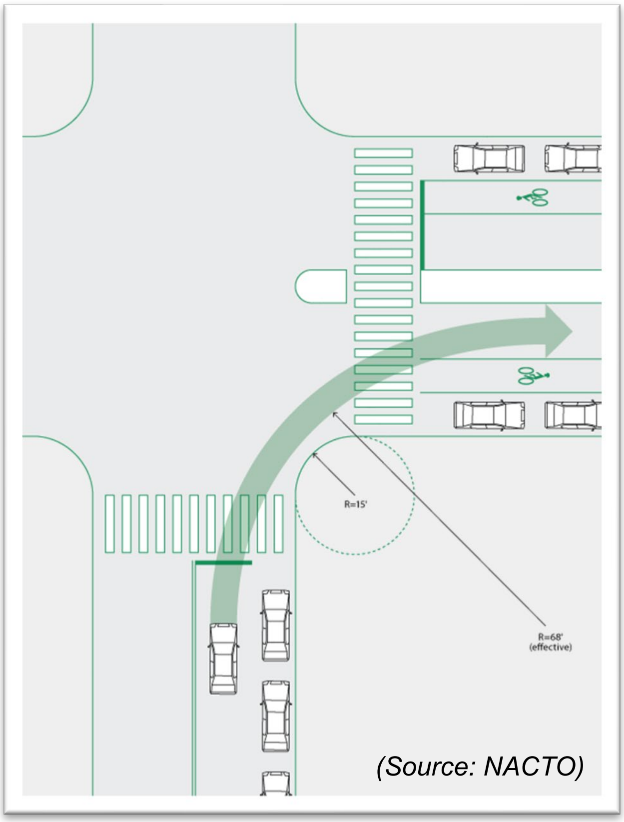
Effective Curb Radius

The effective radius for Design Vehicles will be larger than the curb radius if there are shoulders, bicycle lanes, or on-street parking because the turning movement will need to avoid these designated areas. The effective radius should be used to determine the ability of Design Vehicles to negotiate a turn. Note the diagram below as an example.

At any intersection where the receiving street has more than one lane in the vehicle’s direction of travel, calculation of the effective radius should assume that large vehicles can use all receiving lanes to make the turn at a lower speed. A large corner radius should **not** be used to facilitate a truck turning from a right turn lane into the outside lane on a multi-lane street.

In all cases, the smallest feasible curb radius should be used. Project teams are encouraged to use turn simulation software to determine this smallest feasible radius. Resultant turning template designs should be submitted to the City of Santa Fe as a part of the Preliminary Street Design Checklist, along with roadway construction plans, for review prior to design approval on both Capital Improvements Projects and Development Projects.

Figure 49: Effective Curb Radius Illustration



Parking is not allowed within 25 feet of an intersection so that the Effective Curb Radius can be used.

6.4.3 Turn lanes

Rear-end crashes can be severe on lanes that serve multiple turning movements. Research has found that crash rates increase with greater speed differentials in the traffic stream increases. Providing separate, dedicated turn lanes can reduce the speed differential in the main travel lanes, thereby reducing the frequency and severity of rear-end collisions. However, the addition of turn lanes may have the effect of increasing roadway width and vehicle speeds where higher speeds translate into higher kinetic energy, making collisions more severe as well as increasing crossing distances for pedestrians. The City of Santa Fe Local Road Safety Plan identifies the need to “manage impacts to keep kinetic energy at tolerable levels should a crash occur” in accordance with the FHWA’s Safe Systems Approach.

Left-turn lanes can potentially increase intersection capacity where left turns would otherwise share the use of a through lane. Shared use of a through lane dramatically reduces capacity, especially when opposing traffic is heavy.

Research has indicated that providing dedicated turn lanes becomes increasingly important on higher speed roadways, where turning vehicles create greater speed differentials.

Turn Lane Warrant, Dimensions, and Locations

To determine whether an intersection warrants a turn lane, consult the lane guidance in **Appendix I (Transportation Impact Analysis)**.

A separate turn lane consists of a taper plus a full-width auxiliary lane. The design of turn lanes should consider the speed at which drivers enter the lane, the deceleration required to safely make the turn, and the required vehicular storage length for waiting vehicles. Other special considerations include the volume of trucks that will use the turn lane and the steepness of an ascending or descending grade. Further instructions on determining turn lane location is included in Appendix I (Transportation Impact Analysis). Required turn lane length elements are outlined in Table 8.

Table 8: Turn Lane Length Requirements

Posted speed limit	Left turn deceleration lane	Right turn deceleration lane
<40mph (See Note 1.)	Taper + storage	Taper + storage
≥40mph (See Note 2.)	Decel. Length	Decel. Length

Note 1*: Storage length should be provided from operational analyses. Storage length should be calculated as the 95th percentile queue length rounded up to the nearest 25 feet with a 50-foot minimum length.*
When operational analyses are not applicable (e.g., for turning movements that are uncontrolled), utilize the deceleration distance for the auxiliary lane length. Using guidance from the latest AASHTO Green Book for "Deceleration Lanes", accept a moderate amount of deceleration within the through lanes and utilize the taper length as part of the deceleration within the through lanes. Deceleration rates greater than 6.5 ft/s2 may be used where practical. A minimum bay length of 50 feet shall be provided.

Note 2*: Deceleration length should be calculated based on the distance required to brake from the posted speed of the roadway to a stop and includes the appropriate taper based upon the posted speed. Utilize recommended deceleration distances for "Lane Change and Deceleration Distance" provided by the latest AASHTO Green Book.*

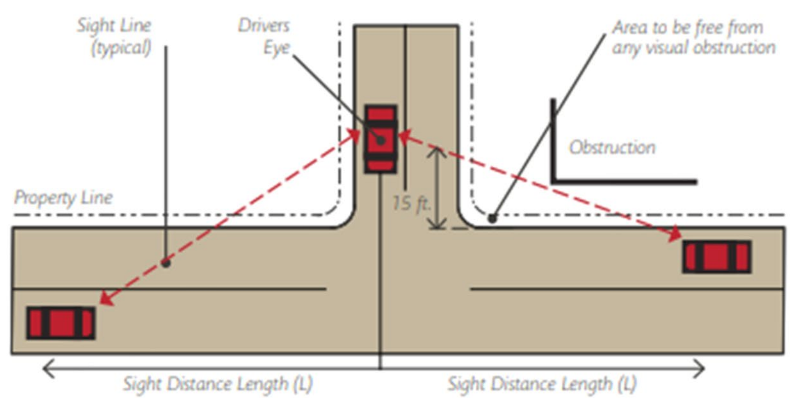
Turning restrictions may be imposed for driveways that are too close to signalized intersections with turn lanes, or where existing driveways or roadway characteristics may increase crash potential or at locations with a history of high crash rates. The restriction may be for left-turn movements in or out of the driveway or right-turns in or out. See Table 9, Minimum Distance Between Commercial Site Access and Intersection.

6.4.4 Intersection Sight Distance

At any intersection where the minor street is stop controlled and the major street is uncontrolled, a clear sight triangle shall be provided. The sight distance triangle runs from a point on the minor street's pavement edge which is 15 feet back from the major street, as shown in Figure 6.6 below.

Sight Distance Length (L) along the major street's edge of pavement varies based on the stopping sight distance at a given speed on the major street. More distance is needed for a left turn from the minor street since the vehicle must travel a greater distance to reach the travel lane on the major street. Table 9 summarizes the required sight distance by vehicle speed.

Figure 50: Intersection Sight Distance Criteria



(Source: City of Albuquerque DPM)

Table 9: Minimum Intersection Sight Distance

Speed Limit (MPH)	Minimum Intersection Sight Distance					
	2 Lane Undivided		3 Lane Undivided or 2 lane divided w/ Median		4 Lane Undivided	
	Left Turn	Right Turn	Left Turn	Right Turn	Left Turn	Right Turn
20	230 ft	200 ft	240 ft	200 ft	250 ft	200 ft
25	280 ft	240 ft	300 ft	240 ft	320 ft	240 ft
30	340 ft	290 ft	360 ft	290 ft	380 ft	290 ft
35	390 ft	340 ft	420 ft	340 ft	440 ft	340 ft
40	450 ft	390 ft	480 ft	390 ft	500 ft	390 ft

No Parking Distance

Clear lines of sight can be supported by no-parking zones leading up to an intersection. Table 10 provides general guidance on no-parking distances in the approach to the intersection:

Table 10: "No Parking" Distance from Intersection Approach

Intersection Type	Distance
Type I	20 ft
Type II	25 ft
Type III	30 ft
Type IV	N/A

6.4.5 Pedestrian & Cyclist Considerations

Curb Ramps

Intersection curb ramps must comply with federal Public Right-of-Way Accessibility Guidelines (PROWAG) so that intersections are readily accessible and usable by pedestrians with disabilities or limited mobility.

Existing physical constraints such as underlying terrain, underground structures, adjacent developed facilities, drainage, and the presence of a significant natural or historic feature, may make full compliance technically infeasible. In these cases, alterations should be constructed to meet PROWAG to the maximum extent feasible.

Where crosswalks are provided, curb ramps should be perpendicular to direction of travel to the maximum extent feasible.

Detectable warning surfaces must be provided on all curb ramps at crosswalks and named streets. Detectable warning surfaces can be provided at driveways with heavy use.

Signalized Intersection Considerations for Pedestrians

Designers should consider the latest signal equipment for push buttons and pedestrian signals to improve mobility for all users. Signal timing for vehicles and pedestrians must be balanced to meet the needs of all users. Pedestrian signal timing is based on the time for a pedestrian to cross at a speed of 3.5 feet per second (MUTCD). If there is a known presence of slower pedestrians, such as older adults, children, and people with mobility issues, a crossing speed of 2.5 feet per second is recommended (ITE, Design and Safety of Pedestrian Facilities manual). Research demonstrates that after waiting 30 seconds, pedestrians begin to look for gaps in traffic to cross streets, which can be unsafe. A pedestrian activated signal can be helpful in these situations.

A leading pedestrian interval (LPI) allows pedestrians a head start into an intersection before vehicles can begin turning. Typically, the WALK signal is activated 5 seconds before turning vehicles are given a green signal. LPIs are often used with “No Right-turn on Red” signals.

Intersections where pedestrians must wait for left turning vehicles to clear the crosswalk can be a source of pedestrian-vehicle conflicts. A lagging left turn is a signal timing method where the left-turn arrow is given after vehicles traveling straight have passed through the intersection. If pedestrians can cross the intersection at the beginning of a signal cycle, conflicts between vehicles turning left and pedestrians are reduced.

Crosswalk Lighting

Overhead road lighting installed at crosswalks typically provides greater visibility distance than headlamps on vehicles alone. The effectiveness of the lighting in increasing visibility distance, by increasing luminance contrast, is a function of several variables such as the location and orientation of the luminaire, the color of the light source, and the intensity of the emitted light. Lighting should be installed at all striped crosswalks at intersections without full intersection lighting. Lights should be centered on the crosswalk as much as possible to create the greatest contract between the crosswalk and the surrounding area.

Center Refuge Islands

Refuge islands are protected spaces located in the center of the street to assist with pedestrian and bicycle crossings. Crossings are facilitated by allowing users to navigate only one direction of traffic at a time. The minimum center island width is 6 feet to accommodate bicycles. In areas with multi-lane streets or higher volumes, increased levels of treatment such as hybrid beacons, active warning signs, and bicycle signals may be desired. Large vehicle turning radii must be considered when designing refuge islands.

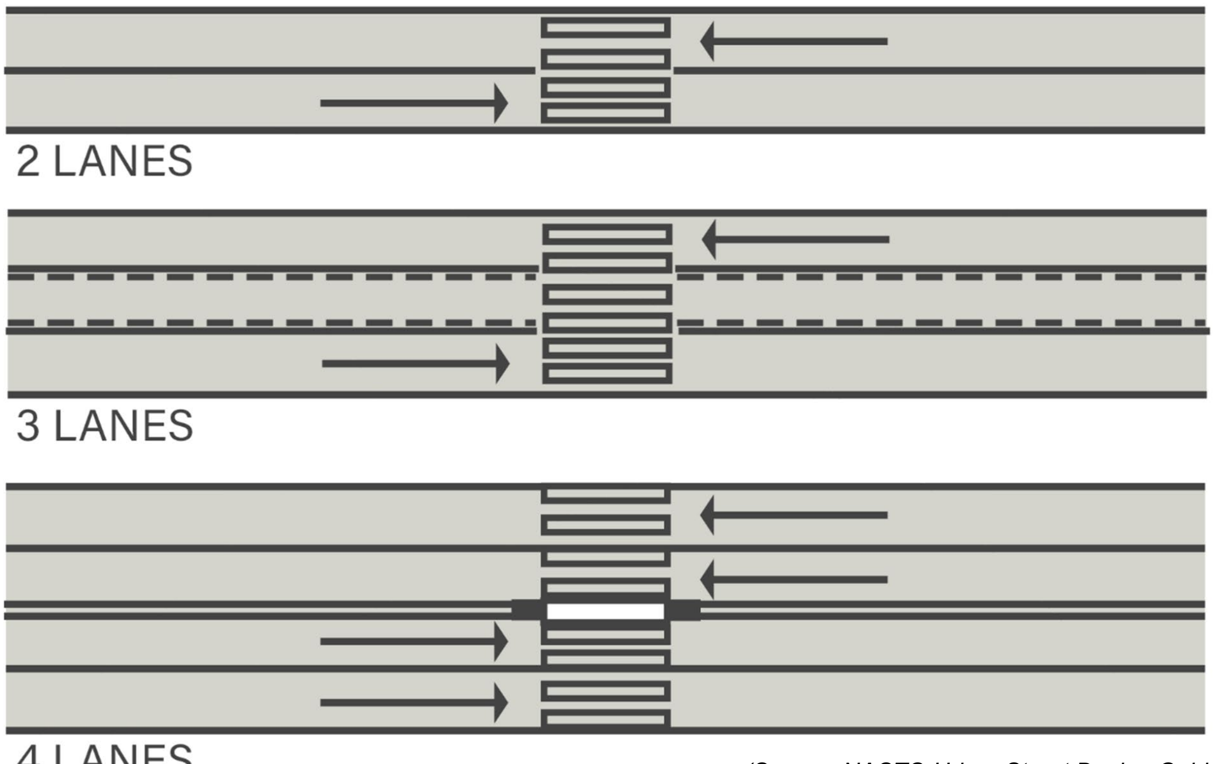
Figure 51: Bicycle Refuge Island

Ideal locations for refuge islands include:

- Wide streets where children, older adults, and people with limited mobility cross regularly
- Wide, two-way streets with 4 or more lanes with high traffic volumes, large pedestrian volumes, and high travel speeds
- Side and local streets where traffic volumes and flows create insufficient cross times
- Near bus stops

A pedestrian safety island reduces the exposure time experienced by a pedestrian in the intersection. While safety islands may be used on both wide and narrow streets, they are generally applied at locations where speeds and volumes make crossings prohibitive, or where three or more lanes of traffic make pedestrians feel exposed or unsafe in the intersection.

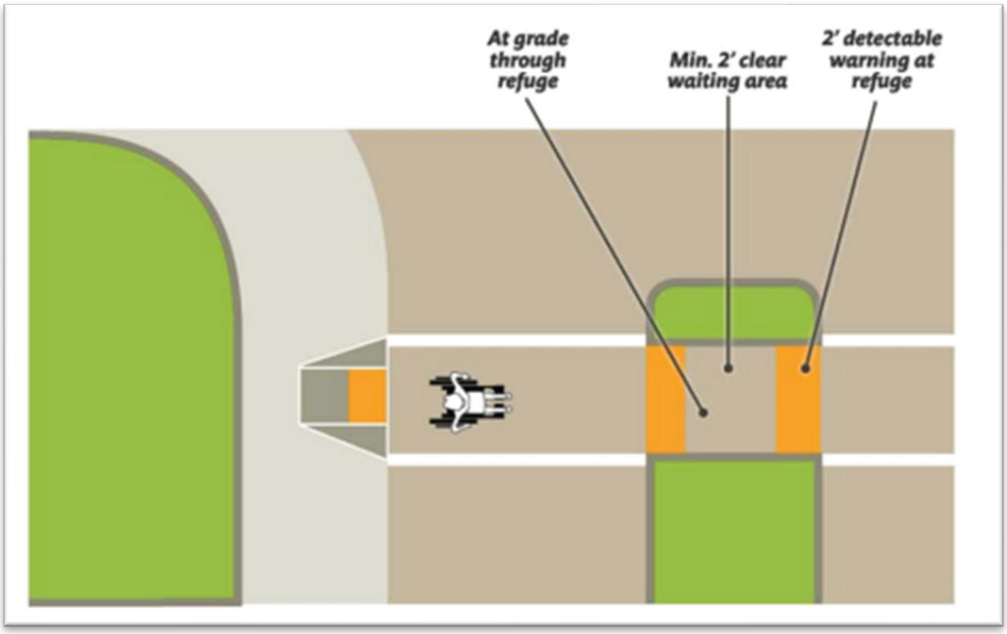
Figure 52: NACTO Guidance on Installing Center Refuge Islands



(Source: NACTO Urban Street Design Guide)

As the number of travel lanes increases, pedestrians feel more exposed and less safe entering the intersection. For unsignalized crossings, higher speeds and volumes may necessitate the use of a median at narrower cross sections.

Figure 53: At-grade Refuge Island Accessible Distance



Bike Signal Detection / Push Buttons

New traffic signals should include bicycle detection. If the signal is older and cannot automatically detect bicycles, push buttons can be used. Push buttons are a mechanical, low-cost, user-activated solution that can be used by both pedestrians and bicyclists when placed appropriately for either user. They are not suitable in certain situations, such as when a bike lane is not adjacent to the curb. Cyclists should be able to reach push buttons without having to dismount.

6.4.6 Striping

The preferred type of roadway striping for longitudinal lines is Hot Thermoplastic for new or rehabilitated pavement. Hi-Build Retroreflectorized Painted Markings may be used for older pavements or maintenance. Hot Thermoplastic is preferred for symbols, arrows, and words. Designers can also consider newer technologies that may be developed after this document is published.

Bicycle Lane Markings

- Extend markings through intersections.
- Right turn bays should be constructed between the curb and the bike lane. Shared lane marking as shown in the Figure below may be used if there is not enough right-of-way to accommodate a separate bicycle lane.

Figure 54: Share Lane Markings

(Source: NACTO Urban Bikeway Design Guide)

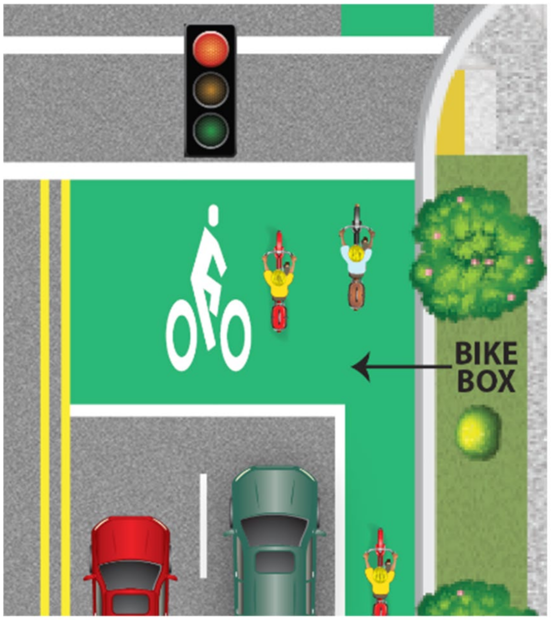
- Green paint may be used at key locations such as trail crossings or where parking in bike lanes is a particular problem. A bicycle box may be used in an intersection on heavily traveled bicycle routes as shown in Figure 6.11 below.
- Minimum width of white stripe between bike lanes and vehicle travel lanes is 9 inches per City of Santa Fe Multimodal Transition Plan

Crosswalks

Marked crosswalks shall be provided at all signalized and roundabout intersections. Crosswalks shall be installed at the direction of the City at stop controlled and uncontrolled intersections. For a discussion of mid-block crossings, see **Chapter 4: Elements of the Street**.

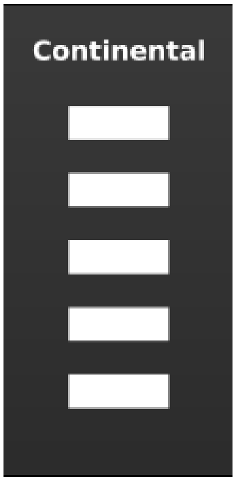
If the City determines that one leg of an intersection should not have a crosswalk, the pedestrian path should

Figure 55: Painted Bicycle Box in Intersection



(Source Oregon DOT)

be separated from the curb, crosswalk to crosswalk with landscaping or other nonprepared surface a minimum of 24 inches wide.



The preferred type of crosswalk marking is Continental (Longitudinal Bar) for high visibility. Bars should be placed outside of the wheel paths for a longer life. Other crosswalk types may be used at the direction of the City.

6.4.7 Neighborhood Traffic Management

Neighborhood Traffic Management is used to reduce the speed and volume of traffic to acceptable levels to improve neighborhood safety and livability. Traffic management is done using physical devices that alter driver behavior and improve conditions for non-motorized street users. Traffic calming measures can reduce the volume of traffic by discouraging cut through traffic.

The use and placement of devices must consider emergency response access and potential impact to vehicles and operations. Refer to the City of Santa Fe Traffic Calming Program (Appendix G) for additional guidance on where and how to install traffic calming devices.

Curb Extensions

Curb Extensions or Bulb Outs should be considered for Type I, Type II and Type III roadways with high pedestrian activity. Curb Extensions can also be used on Type III roadways with on-street parking to provide greater pedestrian visibility and shorten crossing distances.

They also provide space for street furniture, landscaping, and art. Curb Extensions may be implemented in downtown areas, commercial areas with heavy pedestrian use, and residential neighborhood areas. An example Curb Extension is shown in the photograph below.

The advantages of the curb extension are:

- Pedestrian visibility
- Vehicular speed reduction by breaking up drivers' line-of-sight
- Space for pedestrian and streetscape amenities

The disadvantages are:

- May create drainage issues where curb and gutter exist
- May create an obstruction for bicyclists

Figure 56: Curb Extension at Signalized Intersection

The curb extension should be constructed of barrier curb and gutter. A minimum lane width of 10 feet should be maintained (except where 9'6" is allowed). Care must be taken not to obstruct access by Control Vehicle.

Neighborhood Entry Island

A Neighborhood Entry Island is a raised island in the center of a two-way street that identifies the entrance to a neighborhood. The island narrows each direction of travel and interrupts sight distance along the center of the roadway. The island should have a minimum width of 5 feet and a minimum length of 12 feet. It should be constructed of 6 inch barrier curb and gutter. Care must be taken not to obstruct access by Control Vehicles. These measures can be applied to Type I and II streets.

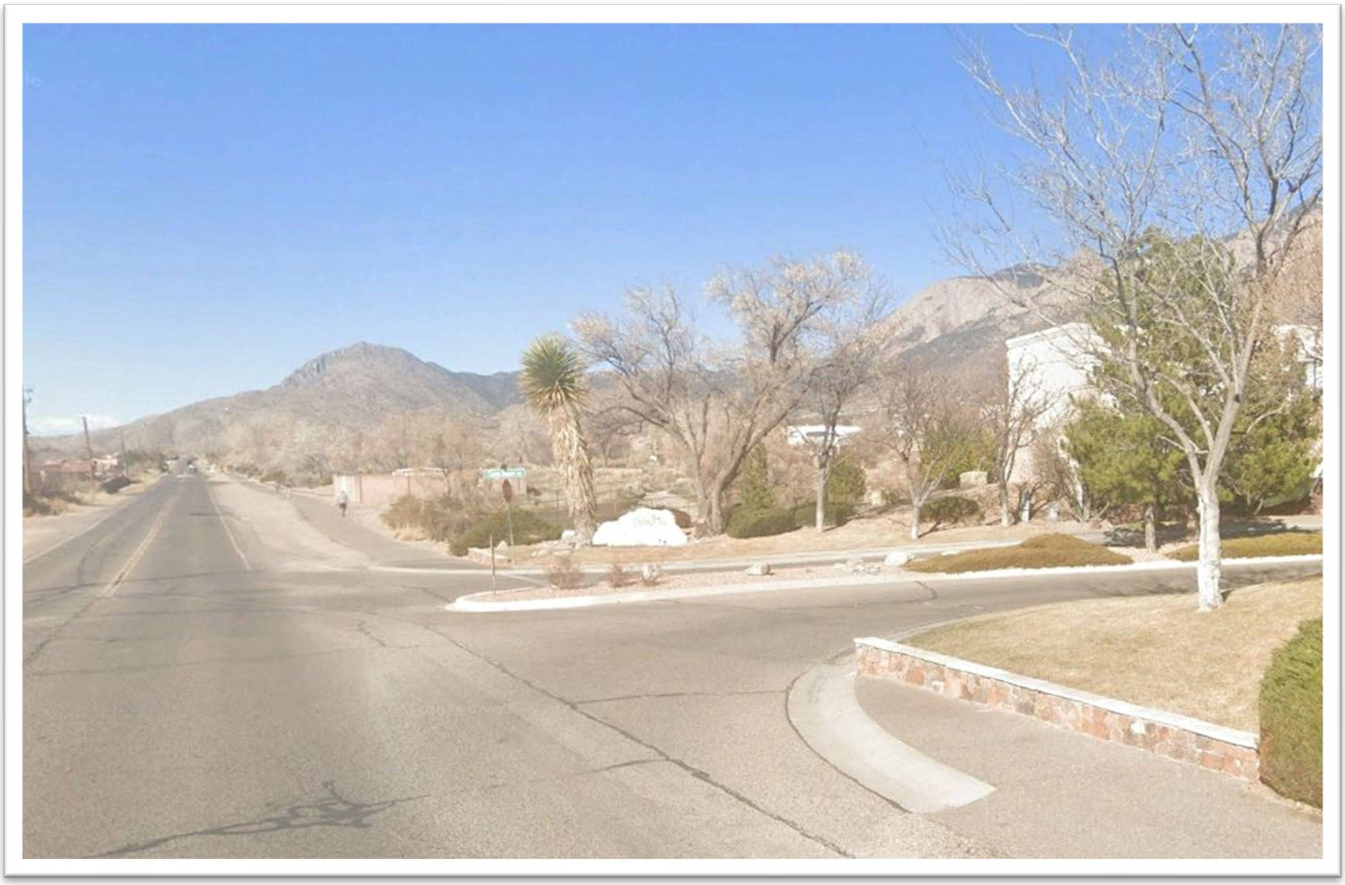
The advantages of the island are:

- Notifies motorists of a change in roadway character
- Helps slow traffic
- Opportunity for landscaping and/or monumentation
- May discourage cut-through traffic
- Can enhance neighborhood identity
- Can include a pedestrian refuge if 6 feet wide

The disadvantages are:

- Need for maintenance and possibly irrigation
- May necessitate removal of parking

Figure 57: Neighborhood Entry Island



Raised Crosswalk or Speed Table

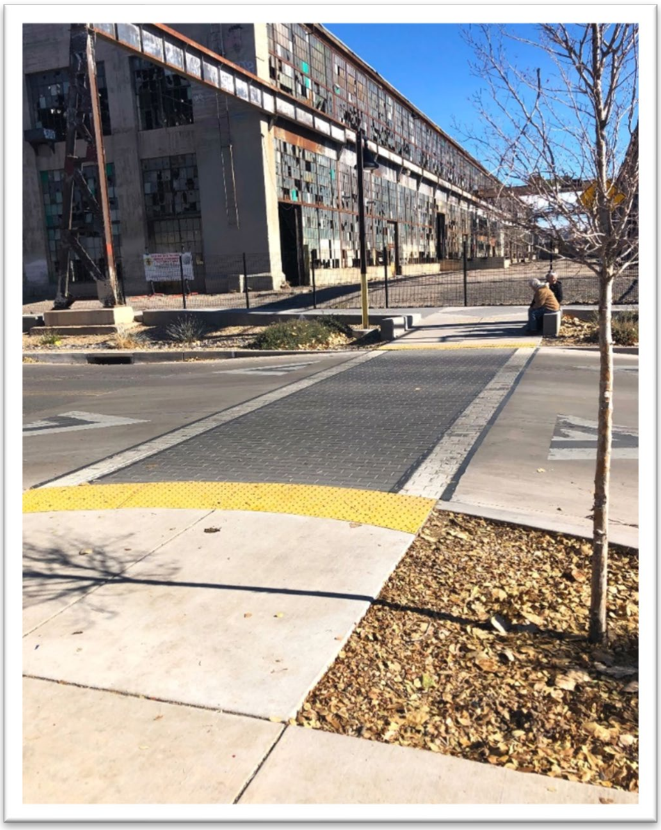
Raised crosswalks are flat topped pedestrian crossings that should be used on local streets where speeding is a problem and at locations where a significant pedestrian pattern is identified. They can be used at mid-block locations such as a trail crossing. They should not be used on emergency response routes without approval from the Fire Chief. The advantages are:

- Slows traffic
- Increases pedestrian visibility in the crosswalk
- Requires minimum maintenance other than pavement markings

The disadvantages are:

- Need for maintenance and possibly irrigation
- May necessitate removal of parking

Figure 58 - Raised Crosswalk in Albuquerque



Traffic Circle

Traffic circles are raised circular medians in an intersection with counterclockwise traffic flow. The intersections are typically controlled by Yield signs on all approaches or stop signs on the minor approach. They can be used on streets where speed control is desired and at intersections where improved side-street access is desired. They should not be used at intersections with heavy left turn movements. Traffic circles can be used on Type I and II streets.

A traffic circle should have a minimum circular Vehicular Zone width of 16 feet. The intersection return radii should have a minimum radius of 10 feet. The traffic circle should be constructed of barrier curb and gutter; however, the Control Vehicle may require mountable curb and gutter. They are more effective with aesthetics or landscaping treatments or other elements that break up the driver's line of sight.

The advantages of traffic circles are:

- Provides increased access to street from side street
- Slows traffic as it drives around circle
- Breaks up sight-lines on straight streets
- Opportunity for landscaping in intersection

The disadvantages are:

- May impede emergency response
- May impede left turns by large vehicles
- On streets with bicycle facilities, bikes must merge with traffic around circle

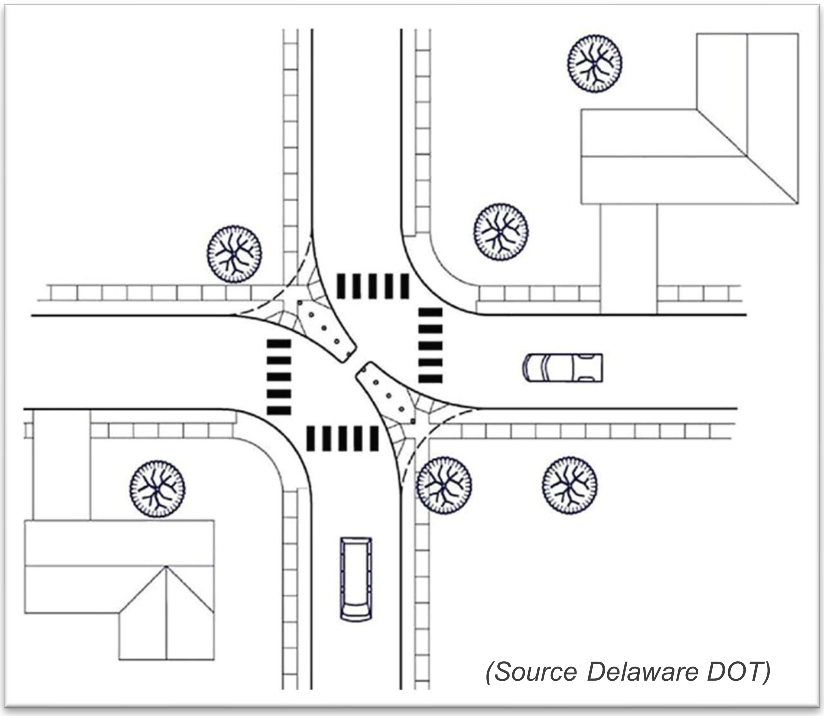
Figure 59: Traffic Circle


(Source Google Street View)

Other Devices

Devices such as diverters and islands that restrict movements should only be used with careful consideration of traffic patterns in the entire neighborhood. Vehicular traffic may divert to another neighborhood street causing issues in that area. Review the City of Santa Fe’s Traffic Calming Program and consult with Complete Streets Staff before planning for these devices.

Figure 60: Diagonal Diverter Schematic



Temporary Infrastructure

In cases where the curb radius of a given intersection results in an unsafe crossing distance but funding is not yet available to reconstruct the curb, the City may delineate the appropriate curb radius using interim treatments – with materials such as epoxied gravel, planters, and bollards – with approval by Complete Streets Staff. However, this should only be a temporary option until funding becomes available for a more permanent solution.

6.4.8 Freight, Emergency Vehicles, Transit

Freight operators frequently have difficulty navigating turns, narrow lanes, and circular travel paths on multi-modal streets. In areas where pedestrians and bicycles traverse driver blind spots, there is a high risk of dangerous collisions. In a commercial area, it is critical that trucks drivers have access to loading docks and loading zones to make deliveries.

Emergency service providers face the same difficulties, as well as the very real danger of colliding with other vehicles / bicycles/ and pedestrians while traveling at high speeds to an incident location. This risk must be weighed against the potential loss of life from slower response times.

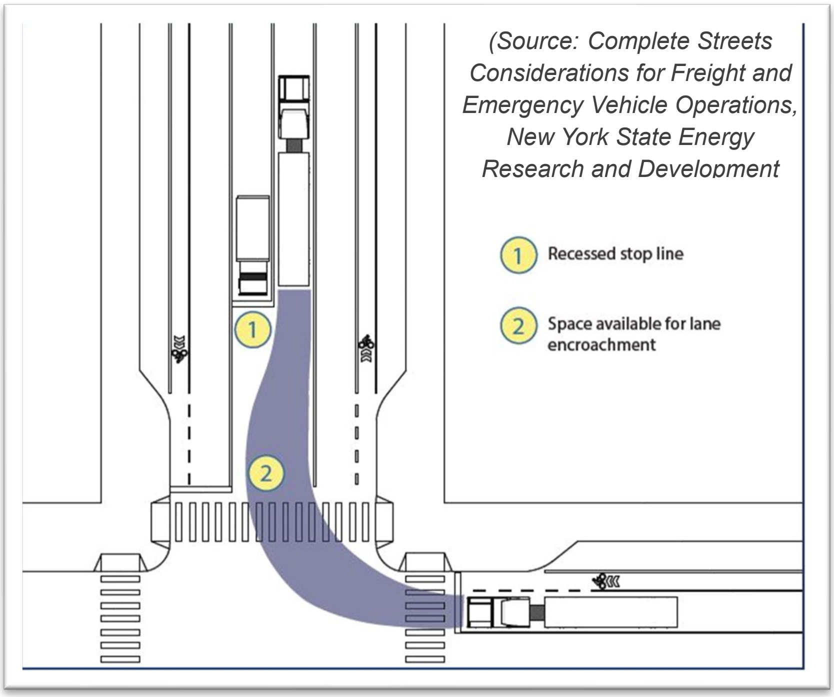
Transit vehicles and school buses can also have the same difficulties, in addition to the need for access to pickup and drop-off locations.

These vehicles should be considered Control Vehicles with priority use of all street space, including bus and bicycle lanes. Intersections with Type I and Type II streets should be designed so that a fire truck can navigate curves without encroaching on the sidewalk or curb ramps. Intersections with Type III and IV streets should be designed to accommodate fire trucks.

The following are suggested strategies for providing adequate space to accommodate safe large vehicle turns:

- Parking restrictions near the intersection to provide additional space for large vehicle turns.
- Recessed stop line, a stop line set back from an intersection to provide additional space for a large vehicle to encroach into an adjacent lane to navigate a turn. Additional pavements markings or signage may be required to inform drivers where they are expected to stop. The distance for the recessed stop line is location-specific and should be determined based on the Control Vehicle.
- Vehicle size restrictions.
- Leading signal phases for non-motorized travelers.

Figure 61 - Recessed Stop Line



Chapter 7. Street Drainage

This chapter describes drainage considerations to reduce pollution and minimize runoff impacts. Street drainage design should address both runoff quantity and quality. These guidelines are intended to be used in conjunction with the City's regulatory authority under Chapter 14 of the Santa Fe Land Development Code.

The street drainage guidance applies to most design circumstances; however, this guidance is not a substitute for good engineering judgment, and imagination and ingenuity are encouraged. Situations will arise in which these criteria are not appropriate. Public Works staff may require more stringent criteria or allow relaxation of best practices advanced in this Street Design Guide based on their judgment, knowledge, and sound engineering and design practices.

The purpose of street drainage design, according to the Santa Fe Code of Ordinances, is to protect, maintain, and enhance the health, safety, and general welfare of Santa Fe's residents and natural environment. Drainage design for streets should consider the following principles and guidelines:

- protect life and property from the dangers of flooding, which includes preserving, as best possible, existing drainage paths and floodplains
- respect, protect, maintain, and restore natural drainageways, wetlands, bosques, floodplains, steep slopes, riparian vegetation, and wildlife habitat areas
- minimize erosion and sedimentation
- control the adverse impacts associated with accelerated runoff on natural drainage ways and all structures due to increased development and impervious surfaces
- protect the scenic character of Santa Fe from the visual blight of indiscriminate cuts and fills and vegetation removal resulting from extensive grading and utility scars
- treat stormwater runoff as a valuable natural resource in Santa Fe, a community that is prone to drought, by encouraging water collection and infiltration
- provide aesthetically pleasing solutions to stormwater management and erosion control measures by integrating measures into the overall landscape and street design, including the use of GSI practices
- prevent street runoff from entering or damaging acequias or other irrigation facilities
- consider and provide for maintenance access operations for stormwater management measures
- promote improved water quality through compliance with the Environmental Protection Agency (EPA) National Pollutant Discharge Elimination System (NPDES) MS4 permit and Construction General Permit (CGP)

The following sections serve as a guide for what designers should consider during conceptual design and preliminary engineering for street projects in Santa Fe. Drainage design should also follow the general standards set forth in the Santa Fe Code of Ordinances.

7.1. Hydrology Methodology

Hydrologic analysis is the study of how water moves across and through the land, including rainfall, runoff, infiltration, and drainage patterns. It helps engineers and designers understand how much water will flow over a surface during storms and how that water will behave.

For a street, hydrologic analysis is essential to design proper drainage systems that prevent flooding, erosion, and water damage. It ensures that stormwater is safely collected and directed away from roads, buildings, and other infrastructure, keeping the area safe and functional during heavy rain events.

Understanding the hydrology for a project is one of the first steps in drainage design. The hydrology results will be used for street hydraulic analysis and design. The following methods can be used for hydrologic analyses:

Rational Formula Method – This method is appropriate for smaller watersheds of 160 acres or less and where only a peak runoff rate is needed; however, it is **not** to be used for runoff volume computations. Section 403 of the New Mexico Department of Transportation (NMDOT) Drainage Design Manual, July 2018, describes the use of the Rational Formula Method.

Natural Resource Conservation Service (NRCS) Simplified Peak Discharge Method – This method is based on the Soil Conservation Service (SCS) February 1985 document titled Peak Rates of Discharge for Small Watersheds, Chapter 2, Engineering Field Manual for Conservation Practices, and can be used in watersheds with areas up to 10 square miles. Section 404 of the NMDOT Drainage Design Manual describes the NRCS Simplified Peak Discharge Method.

NRCS (SCS) Unit Hydrograph Method within U.S. Army Corps of Engineers "HEC-HMS (Hydrologic Modeling System)" – The HEC-HMS program is a very robust modeling tool and is applicable, but perhaps not most appropriate, for all applications. Section 405 of the NMDOT Drainage Design Manual describes the use of the NRCS Unit Hydrograph Method within HEC-HMS.

7.2. Design Storm

Streets should be designed to carry the peak runoff during a 100-year, 24-hour storm event. The principal 100-year, 24-hour design storm event is defined by the NOAA Atlas 14 Volume 1 Version 5, and subsequent updates. This is typically in the range of 3 to 3.3 inches of rain in 24 hours in Santa Fe as of this document's publication. Analysis of additional storm events may be needed to address water quality, stream stability, sediment transport, floodplain, or stormwater volume management.

The runoff from the street should not exceed the downstream capacity of the receiving water (see Off Street Flows and Downstream Capacity for more information).

7.3. Water Quality

Drainage boundaries often extend across many jurisdictions and regional cooperation may be needed to approve facilities—including streets—with potential multi-jurisdictional and regional impacts. The City of Santa Fe, Santa Fe County, and NMDOT District 5 are all permittees on MS4 permit NMR040000-2007, which establishes cooperation between agencies to achieve the following:

- best manage the discharge of runoff into arroyos and the Santa Fe River
- maximize efficient use of drainage facilities
- minimize impact on downstream water quality and storm drainage facilities

As part of the MS4 permit, the City of Santa Fe ("City") requires post-construction stormwater controls for runoff that promote infiltration, evapotranspiration, and/or beneficial reuse (consistent with New Mexico water law) for the stormwater quality design volume (SWQV). This MS4 Permit requirement aligns with the City's support of GSI, Low Impact Development (LID) approaches, and sustainable practices for all projects. To achieve compliance with the MS4 permit, street design projects should include the evaluation and implementation of GSI practices within the project's right-of-way (ROW). The **Green Stormwater Infrastructure (GSI)** subsection in this chapter provides additional details on options and implementation of GSI practices within street projects.

7.3.1 Stormwater Quality Design Volume

Stormwater Quality Design Volume (SWQV) refers to the volume of stormwater from any given storm that should be managed on-site to remove the majority of stormwater pollutants on an average annual basis before leaving the site. The MS4 Permit requires that the SWQV be managed within the street project's ROW. GSI practices to manage the SWQV per MS4 are required for street projects with land disturbances equal to or greater than one (1) acre, including projects which disturb less than one (1) acre but are part of a larger common plan of development.

There are two main components that factor into the calculation of the SWQV for a project: 1) rainfall depth values and 2) areas of the project to which the rainfall (or runoff) depth is applied. The SWQV is the rainfall depth multiplied by the applicable area of the project.

For the rainfall depth component for impervious areas of a project, the City will use the rainfall depths defined for the 80th and 90th percentile storm events provided in the Estimating Predevelopment Hydrology in Urbanized Areas in New Mexico, EPA Publication Number 832-R-15-009.

This reference is consistent with requirements in both the 2015 EPA Draft Statewide MS4 Permit and the 2024 EPA Strawman MS4 Permit. The design storm rainfall depth parameter varies for new streets and street redesign projects (referred to as redevelopment in MS4 Permit terms). The design storm rainfall depth for Santa Fe is 0.68-inches for new development and 0.50-inches for redevelopment. The MS4 Permit definitions for new development and redevelopment, as they relate to the stormwater quality design standard, are shown in Table 11.

Table 11: Context Definitions for SWQV for Street Projects

Context	Definitions
New Streets (New Development)	Proposed street project in an area with little or no existing impervious cover. This can include an undeveloped property or a property that had previously been developed, but improvements and impervious cover have been mostly or completely removed so that project constraint issues related to existing infrastructure no longer exist.
Street Redesign Projects (Redevelopment)	Proposed street projects that alter the footprint of an existing street or related impervious areas. Street redesign projects have constraints typically not found in new street projects.
Pervious Areas Likely to Exhibit Higher Runoff	Runoff from these areas, though pervious, will be higher than runoff from pervious native soil conditions and will likely contribute runoff that needs to be treated as part of the SWQV. Pervious areas likely to exhibit higher runoff refers to the following areas: Soil compacted by human activity with minimal vegetation, including unpaved shoulders, drive pads, and walkways. Irrigated lawns and areas within the street ROW with slopes greater than 10%, 10:1 (horizontal to vertical). Disturbed pervious areas in the street ROW with slopes at 20%, 5:1 (horizontal to vertical), or greater.
Impervious Areas	Impervious areas in the street ROW include pavement, sidewalks, and drive pads. If located in the project ROW, these areas also include detention and retention basins, even if these areas are seasonally dry. Alternative pavements which offer permeability and infiltration do not need to be accounted for as impervious areas for this calculation.

The second step is to determine the applicable area for SWQV calculation. This includes all impervious areas within the street project, as well as pervious areas that will have higher runoff as compared to native soil conditions. Although runoff from pervious areas is expected to be lower than runoff from impervious areas, some pervious areas likely to exhibit higher runoff still need to be included in the SWQV. Therefore, the rainfall depth component for these pervious areas is 15% less than that applied to impervious areas. The definition for impervious areas and pervious areas likely to exhibit higher runoff, related to the SWQV calculation, are defined in Table 12 as related to street projects.

The equation for SWQV (cubic feet, ft^3) is:

$$SWQV = a[R_{HR} * Area_{HR} + R_I * Area_I]$$

Table 12 provides descriptions of the SWQV equation coefficients and variables.

Table 12: SWQV Equation Coefficients and Variables

Coefficient/Variable	Description	Quantity
a	Factor to convert rainfall depth from inches to feet	*1/12* (feet/inches)
R_{HR}	Rainfall depth for pervious areas likely to exhibit higher runoff. This factor is different for new development and redevelopment.	New Streets: $R_{HR} = 0.58\ inches$ Street Redesign Projects: $R_{HR} = 0.43\ inches$
$Area_{HR}$	Surface area of the project that is pervious but likely to exhibit higher runoff. For redevelopment projects, this will pertain to the redeveloped portion of the street project.	Total area of the street project that is pervious but likely to exhibit higher runoff (sq. ft.) based on the conceptual design.
R_I	Rainfall depth. This factor is the 90th percentile storm depth for new streets and the 80th percentile storm depth for street redesign projects.	New Streets: $R_I = 0.68\ inches$ Street Redesign Projects: $R_I = 0.50\ inches$
$Area_I$	Surface area of the project that is impervious. For street redesign projects, this will pertain to any new areas (added lanes, sidewalks, etc.) of the street project.	Total impervious area (sq. ft.) of the street project based on conceptual design.

As an alternative, at the discretion of the City Engineer and Complete Streets Staff, a project-specific 90th or 80th percentile storm event discharge volume may be calculated using methodology specified in Estimating Predevelopment Hydrology in Urbanized Areas in New Mexico, EPA Publication Number 832-R-15-009.

7.4. Off-Site Flows and Downstream Capacity

Downstream capacity and off-site flows are the most important elements of a successful street drainage project. The designer is expected to research adjacent projects, as-built storm drain construction plans, and related Drainage Master Plans to correctly identify downstream capacity for the project area. The designer is also expected to perform a site visit, review topography, and review adjacent drainage studies and stormwater management plans to accurately identify off-site flows reaching the project area.

The street project drainage report and plans should identify the off-site drainage basins that contribute flow to the project area and quantify the off-site 100-year, 24-hour flows that enter the street project area. As stated in the Design Storm subsection above, analysis of additional storm events may be necessary to address water quality, arroyo stability, sediment transport, or stormwater volume management, at the City's discretion.

Streets should be designed to accept off-site flows and convey them through the project to at least one drainage outfall. The drainage outfall(s) should consider capacity, project-related erosion and sedimentation, as well as downstream water quality. The downstream capacity of the outfall location(s) should be evaluated and documented. Additional channel and arroyo analysis may be requested by the City's Parks and Open Space Division, River and Watershed or Complete Streets Staff. Refer to NMDOT Drainage Design Manual for additional analysis and design guidance on sediment transport, as needed. Site discharge should be limited to proven capacity of downstream infrastructure. If the only reasonable outfall(s) for a proposed street project is a historic flow path through adjacent private property, the historic flow characteristics and path should be maintained.

7.5. Floodplain Considerations

The designer is expected to research whether the project is located within a Federal Emergency Management Agency (FEMA) floodplain and within a Special Flood Hazard Area (SFHA). There are restrictions on water surface elevation changes within a FEMA SFHA. The designer is responsible for recognizing and accommodating these SFHA restrictions and for coordinating with the local floodplain administrator.

The designer should determine with the local floodplain administrator and FEMA if a Conditional Letter of Map Revision (CLOMR) and a Letter of Map Revision (LOMR) are needed. A CLOMR is a letter from FEMA commenting on whether a proposed project or hydrology change, if constructed as proposed, would meet minimum National Flood Insurance Program (NFIP) standards. A LOMR is a letter from FEMA officially revising the current NFIP map to show changes to floodplains, regulatory floodways, or flood elevations. For more information on the above-mentioned letters of map change, refer to FEMA's Flood Map Service Center webpage.

7.6. Street Hydraulics

Street networks, in addition to their primary function of safely moving people and vehicles, also function to convey stormwater runoff. Street hydraulic design should balance these functions. The general goals of street hydraulic design are the following:

1. To ensure that the safety and convenience of the public are preserved.
2. To prevent runoff, once collected by the street system, from leaving the street ROW except at specially designated locations.
3. To provide an efficient means of transporting runoff.

For street sections with a median, the street cross-section slope may be changed to drain the street toward the median rather than to the outside edges of the street. This allows the use of GSI in a depressed median.

7.6.1 Street Capacity and Spread

The hydraulic capacity of the street section should be evaluated on every street project, including street redesign projects.

The curb and gutter combination form a triangular channel that can convey runoff within the street without interruption of the traffic. The hydraulic capacity of the street section depends on the curb height, slope of the street, and cross-slope of the street section. The design flow runoff spreads within the street section to include not only the gutter width, but also adjacent parking lanes or shoulders, and portions of the traveled lane surface. Where no specific street capacity or spread standards have been adopted or identified, the design should follow the current edition of the NMDOT Drainage Design Manual.

Curbs should follow the NMDOT standards drawings to a maximum of 6” height (Appendix F).

A valley gutter may be appropriate in a variety of applications, including on streets or alleys with an inverted crown. The longitudinal slope for valley gutters should be 0.6% or steeper, up to a 1% slope. Water blocks may be necessary at driveways to ensure the street flow remains in the street and does not divert to lower elevations along the street.

7.6.2 Inlets

Inlets are drainage structures that collect street surface water through grate or curb openings and convey it to storm drains or culverts. Inlet capacity governs both the rate of water removal from the gutter and the amount of water that can enter the storm drainage system. Inlets should be built to meet the street flow and spread criteria; Sections 206 and 504.3 of the NMDOT Drainage Design Manual provides additional information on how to perform these calculations. Inlet grates may become blocked by sediment and trash, so curb openings—or combination inlets with both grate and curb openings—may function better in urban conditions. The inlet analysis should include assumed clogging factors, typically 25 – 50%; refer to NMDOT Drainage Design Manual.

Inlets at a low point in a street profile are referred to as sag or sump inlets and should be limited to Type I local roads and only in those situations where terrain or grading considerations warrant their use. Design of inlets at a sag will assume a 50% clogging factor. Inlet grates in sag will require a minimum of one flanking inlet (an inlet near to and upstream of the sag inlet). When specifying a sag inlet, the designer should ensure that surrounding properties are protected from the occurrence of inlet and lateral clogging by demonstrating that an emergency overflow solution exists for the design storm peak flow rate.

When designing inlets to capture stormwater from the street, determine the capacity of the lateral (pipe connecting inlet to main line) pipe and the capacity of connector (inlet to inlet) pipes. The minimum diameter of connector and lateral pipes is 18 inches.

Grate inlets and depressions of curb-opening inlets should be located outside the through lanes to minimize the shifting or swerving of vehicles attempting to avoid them. Inlet grates should safely accommodate bicycle and pedestrian traffic.

7.6.3 Intersections

Intersections and other significant changes in street cross section or slope require special consideration when the flow depth/street slope conditions result in supercritical flow– characterized by shallow, fast-moving water. If street flow is likely to cross into the subcritical flow range, identify the height and length of hydraulic jump in the drainage report. Subcritical flow in a street refers to a type of water flow that is slow and deep, typically occurring when the slope of the street is flatter and the water moves under the influence of gravity but without much velocity. Supercritical flow in streets is shallower and faster-moving water, usually on steeper slopes.

Nuisance flows should not be conveyed across Type II – IV streets on the surface by valley gutters or other means. Provisions for storm drainage inlets should be included at all intersections of major streets. Transitional pavement surface approaches to intersections can be designed to contain nuisance flows within gutter lines. Where valley gutters are appropriate, they should be designed to suitably accommodate flows across intersections, parallel to the primary traffic-carrying street.

Manholes for linear storm drains should not be located within intersections. However, storm drain manholes may be appropriate at intersections where two trunk lines converge.

7.6.4 Conveyance Systems

Conveyance systems are drainage facilities, both natural and artificial, that collect, contain, and convey stormwater runoff. Natural conveyance systems include arroyo drainage courses, rivers, and wetlands. Artificial conveyance systems include gutters, pipes, culverts, inlets, manholes, constructed wetlands, ditches, channels, and swales. The installation of artificial conveyance systems in areas where natural drainage systems exist should not eliminate or override any code requirements that protect natural systems.

Storm Drain

Storm drain systems are typical street drainage enclosed system conveyances. These systems should be designed as flowing full and, whenever possible, under pressure.

The designer should select the appropriate pipe type based on hydraulic requirements, geometry constraints, soil corrosion, economy, constructability, and maintenance. The City prefers that reinforced concrete pipe (RCP) be used. Other pipe types will be considered, at the discretion of the Complete Streets Staff, including polymer-coated Ultra Flo pipe, which is spiral rib corrugated metal pipe (CMP) with a smooth interior that is an alternative to RCP, or other protective polymer-coated CMP pipe types. Use of uncoated CMP is not acceptable.

Pressure flow should be calculated using a modelling program that can illustrate the Hydraulic Grade Line (HGL) and energy grade line (EGL) as well as account for major losses (i.e. friction within the pipe) and minor losses (i.e. junctions, exits, bends, manholes, expansion and contraction, and appurtenances). If the proposed storm drain is designed for pressure conditions, the HGL for the design storm should not be higher than the ground or street surface. Storm drain truck and laterals should be a minimum of 24-inch in diameter, designed to meet a 2 ft/s minimum velocity to ensure self-cleansing, and have a 0.3% minimum pipe slope.

Manholes and junctions are used in storm drain systems to provide a hydraulically efficient transition at alignment changes and to provide access for storm drain maintenance. Manholes are generally made of pre-cast or cast-in-place reinforced concrete and should be a minimum of 4 feet in diameter. Manholes should be specifically located at intermediate points along long pipe sections, where pipe sizes change, where multiple pipes must junction, and where an abrupt change in grade occurs.

Storm drain manholes should be spaced at intervals of approximately 450 feet. Where the proposed storm drain pipe is less than 30 inches in diameter and the horizontal alignment has numerous bends or angle points, the manhole spacing should be reduced to approximately 300 feet. The spacing requirements apply regardless of design velocities.

The designer should provide diagrams, including all invert elevations, showing how the chosen manhole size can accommodate the storm drain pipe sizes and laterals. Storm drain outfalls should be designed to dissipate energy and minimize erosion. Refer to the culvert section for additional information on energy dissipation at outfalls.

Open Channels

When a street crosses over open channels, including natural arroyos, designers may select from culverts or bridges. The conceptual design of the street crossing will need to consider the nature, function, and stability of the arroyo. Culvert and bridge crossings should be sized to adequately carry the arroyo design storm flow rate (100-year, 24-hour) while protecting against adverse impacts to upstream and downstream reaches that may result from installing the new crossing. Crossing structures should conform to the arroyo shape so that they disturb the flow as little as possible. It may be necessary to build maintenance access roads and ramps along with the street crossing. Additional considerations include channel and arroyo analysis and sediment transport; refer to NMDOT Drainage Design Manual for guidance.

All projects should minimize erosion and degradation of arroyo channels and improve the condition of the channels, in accordance with Santa Fe Code of Ordinance. All street designs with an arroyo crossing should be coordinated with the City's Parks and Open Space Division, River and Watershed team.

Culverts

Culverts are often used in street designs for drainage conveyance. They can be used to allow existing arroyo flow to pass safely under a street (refer to the **Open Channel**s section above), at turnouts or driveways to allow access across adjacent street or median ditches, or to drain street ditches or swales into an adjacent drainage feature.

The City recommends the FHWA Hydraulic Design of Highway Culverts for culvert design. For street culverts, the ratio of headwater depth to culvert rise should not exceed 1.5 and the headwater should be limited to edge of shoulder.

Energy dissipation, stilling basin structures, or flow spreaders are required to minimize scour damage caused by high exit velocities and turbulence at culvert outlets. Rock protection at culvert outlets is appropriate where moderate outlet conditions exist; however, there are situations where rock basins are impractical, and a reinforced concrete outlet structure may be more suitable. All outlet structures must be designed to match the receiving arroyo or drainage facility conditions.

7.7. Green Stormwater Infrastructure (GSI)

Green Stormwater Infrastructure practices mimic natural processes to manage street drainage, promote infiltration and evapotranspiration, and protect water quality. GSI leverages plants, soils, and nature itself to manage runoff and create healthier urban environments. Low Impact Development (LID) is a broader term that includes employing GSI practices. LID is an approach to land development (or redevelopment) that works with nature to manage runoff as close to its source as possible. Infiltrating rainwater using GSI practices provide numerous water-related benefits beyond preventing erosion, such as water quality treatment, aquifer recharge, and slowing peak discharge.

Since the 1990s, the City has mandated onsite stormwater detention for private development to mitigate offsite erosion. However, evolving research highlighted the advantages of infiltrating rainwater into multifunctioning landscapes so, in 2016, the City adopted Resolution No. 2016-25 supporting the use of infiltration through GSI practices on public and private land. This resolution spurred a planning process culminating in the Governing Body's 2019 approval of the City of Santa Fe Stormwater Management Strategic Plan. Resolution No. 2016-25 and the Stormwater Management Strategic Plan are included in Appendices J and K, respectively. This plan effectively transitioned the City's stormwater management policy from detention to infiltration-based practices.

Today, the City's general philosophy for stormwater management is to treat rainfall runoff as a resource. Combining GSI and gray infrastructure systems can improve water quality and infiltration, while minimizing runoff and flooding. GSI practices can reduce the size of or need for costly gray drainage infrastructure - such as pipes, storage facilities, and treatment systems - by utilizing plants and soils to soak up and store the runoff, thereby decreasing reliance on gray infrastructure. GSI systems offer multiple environmental, aesthetic, and social benefits that traditional conveyance methods do not provide. However, centralized (gray) drainage infrastructure can provide a backstop for the system when unprecedented storm events occur. Pairing the development of GSI with gray infrastructure provides redundancy and creates a more resilient system.

GSI supports complete street designs by:

- ✓ Encouraging walking and biking by providing shade and traffic calming
- ✓ Cleaning urban pollutants from the air and water
- ✓ Reducing the urban heat island effect
- ✓ Providing wildlife habitat and migration corridors
- ✓ Improving residents' overall sense of well-being
- ✓ Improving health outcomes for the community
- ✓ Increasing property values

These benefits align directly with goals in existing plans including the *Sustainable Santa Fe 25-Year Plan,* 2018; the City of Santa Fe Parks, Open Space, Trails & Recreation Master Plan, 2017; and the City of Santa Fe Land Use & Urban Design Plan.

Designing stormwater systems that also support pedestrian and cyclist safety is a vital step in creating a resilient, multifunctional public realm. GSI practices, such as bioretention basins, curb extensions, and alternative pavement, not only manage and treat stormwater at its source, but when thoughtfully designed, can narrow roadways, reduce vehicle speeds, and increase visibility at crossings. This dual-purpose approach enhances safety for all road users. By co-locating GSI with traffic calming measures, the City can support a network of streets that are not only environmentally sustainable but also safer, healthier, and more livable for all.

Enhancing Traffic Calming Features with GSI

Traffic calming zones are often conducive to GSI practices because they may be modified as low points where street runoff can be collected. By using curb openings with sediment traps and lowering the grade, street runoff can enter the traffic calming GSI areas, settle out pollutants, and promote infiltration. Some of these zones include:

- Medians
- Traffic circles
- Chicanes
- Curb extensions (i.e., bump-outs or bulb-outs)

7.7.1 GSI Practices

This section highlights several GSI practices that are well-suited for implementation along streets within Santa Fe. Table 13 identifies the associated benefits that GSI practice provides. GSI should be included on every new street drainage project unless it is well documented that GSI is not the best drainage management approach.

Table 13: GSI Practices and Associated Benefits

GSI Practices for Street Drainage	Benefits		
	Promote Infiltration	*Reduce Erosion Promote Sediment Capture*	*Improve Water Quality*
Bioretention Basin	✓		✓
Alternative Pavements	✓		✓
Infiltration Trench	✓		✓
Soil Sponge	✓		✓
Check Dam	✓	✓	✓
Rock Rundowns		✓	✓
Permeable Stilling Basin	✓	✓	✓

The following resources provide further guidance for GSI practices:

- City of Santa Fe Stormwater Management Strategic Plan (City of Santa Fe)
- Incorporating Green Infrastructure into Roadway Projects in Santa Fe (City of Santa Fe; EPA)
- Bernalillo County GSI LID Standards (Bernalillo County)
- Bernalillo County GSI LID Strategies for Desert Communities (Bernalillo County)
- NMDOT National Pollutant Discharge Elimination System Manual Appendix A – Best Management Practices (BMPs) (NMDOT)

Bioretention Basin

Bioretention basins are depressed areas that are designed to capture, slow, and infiltrate runoff. Bioretention basins improve water quality by allowing pollutants to settle out and promoting infiltration. Bioretention basins utilize a variety of native plants, including grasses and flowers, which improve aesthetics, promote infiltration, and provide a habitat for various types of wildlife. These basins provide versatile, attractive features that can be installed in almost any unpaved space. They are also referred to as rain gardens, infiltration basins, and stormwater harvesting basins. A bioswale is a specific type of bioretention basin that is used for conveyance of runoff. Figures 1 through 4 show various graphics and images of bioretention basins, including potential locations and applications in street drainage design.

Figure 62: Bioretention Basin Diagram

Figure 63: Bioretention Basin Constructed Along 2nd Street Trail


(Source: Bernalillo County)

Figure 64: Bioretention Basin, also known as a Rain Garden, along West Alameda in Santa Fe


(Source: Santa Fe Watershed Association)

Figure 65: Bioretention Basin, also known as a Rain Garden, in Santa Fe. Note Rock Sediment Trap at Curb Opening

Alternative Pavements

Street projects often result in increased impervious surfaces, such as pavement or concrete, which can negatively impact water quality and increase runoff volume. Taking measures to reduce the amount of pavement and increase water infiltration is important to protect and restore the natural hydrological conditions and therefore reduce the stress on downstream waters. Impervious reduction can be achieved through various methods such as narrowing the width of streets; reducing the number of driveways, parking spaces, and other impervious areas; creating a road diet; or using alternative pavements that increase infiltration.

Underground Utilities

Existing and proposed underground utilities can cause challenges during GSI design. A utility investigation is recommended prior to design of GSI practices, including alternative pavements.

Two different applications of alternative pavement are described in this section: permeable pavement and suspended pavement. The designer should obtain geotechnical data showing infiltration rates for the project area to ensure that the selected alternative pavements will infiltrate as designed.

Permeable Pavement

Permeable pavements are paved surfaces that let water soak into the ground, including pervious concrete, porous asphalt, and permeable interlocking pavers (Figures 5 and 6). Maintenance is important for permeable pavement; regular vacuuming is required to prevent sediment from clogging pavement pores.

Figure 66: Permeable Pavement Rendering

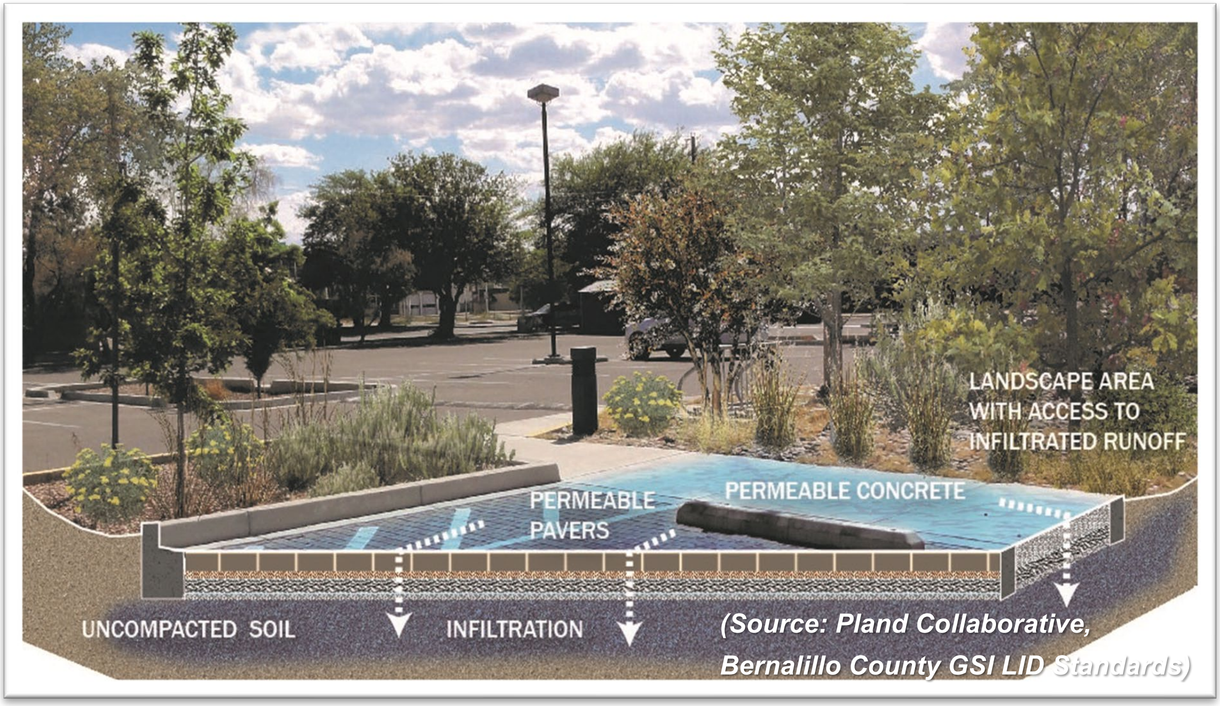


Figure 67: Permeable Pavers at Bachechi Open Space in Albuquerque

Suspended Pavement

Suspended pavement is a general term for any technology that supports the weight of paving and creates a subsurface void space that is filled with lightly compacted, high-quality soil for tree and plant root growth (Figure 7). In addition to aiding urban tree growth, the suspended pavement system provides the following benefits:

- promotes infiltration for drainage management
- assists with maintaining pre-development hydrology
- minimizes non-point source pollution
- alleviates flooding
- functions to recharge watersheds

Suspended pavement systems are often applied in constrained spaces. Planting trees in narrow roadway medians and areas adjacent to the street and sidewalk are discouraged if less than 6-feet width is provided, due to space constraints for tree growth and irrigation challenges. Use of suspended pavement could allow trees to be incorporated into more narrow areas along streets; see Figure 8 for an example. When incorporating trees, consult The City of Santa Fe Municipal Tree Board (Appendix B) for tree selection options.

Figure 68: Suspended Pavement Cell System Overview, Deeproot

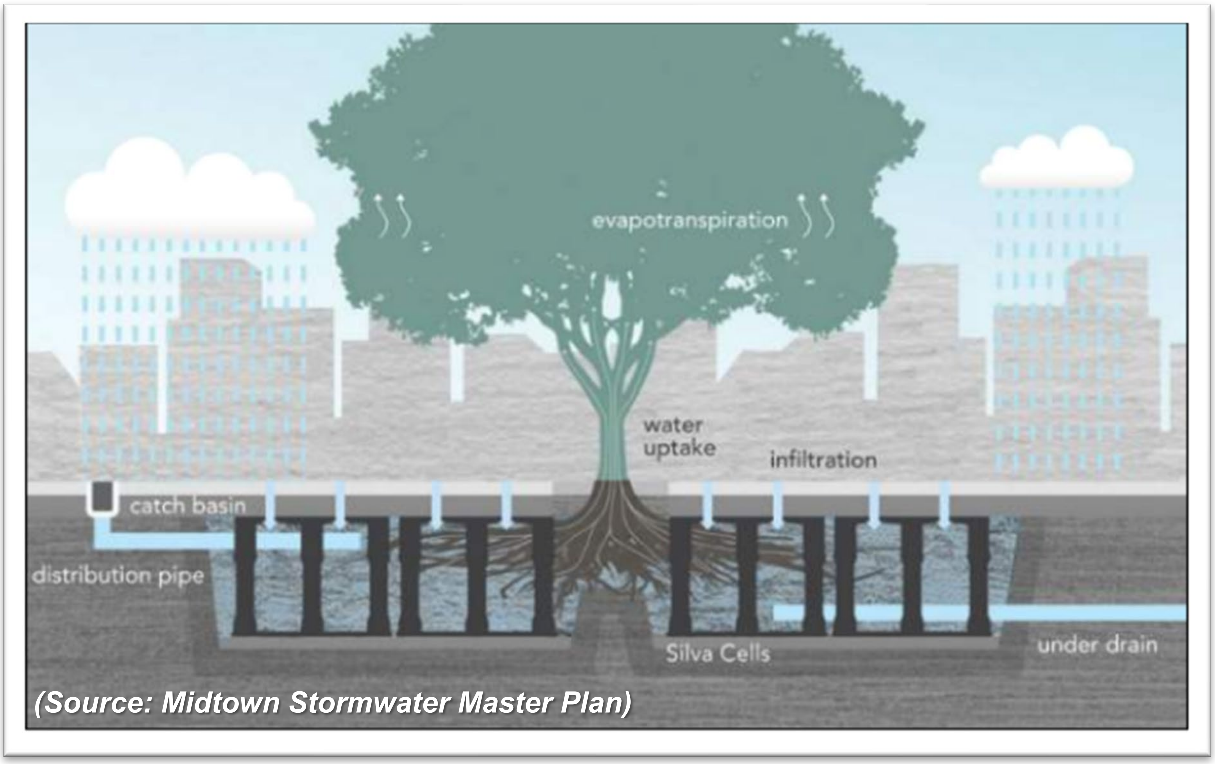


Figure 69: Narrow Streetscape Planters Using Suspended Pavement Can Facilitate Successful Inclusion of Trees

Infiltration Trench

An infiltration trench is a linear excavated area that is lined with filter fabric and filled with rock to create additional space for runoff to collect and infiltrate into adjacent permeable soils. Figure 9 shows an example of an infiltration trench in a commercial parking lot, but this method can also be applied in street settings. Vegetation should not be incorporated into the trench, but planting vegetation alongside the trench is encouraged. This practice is a good solution where soils have low infiltration rates or where there is limited width for GSI.

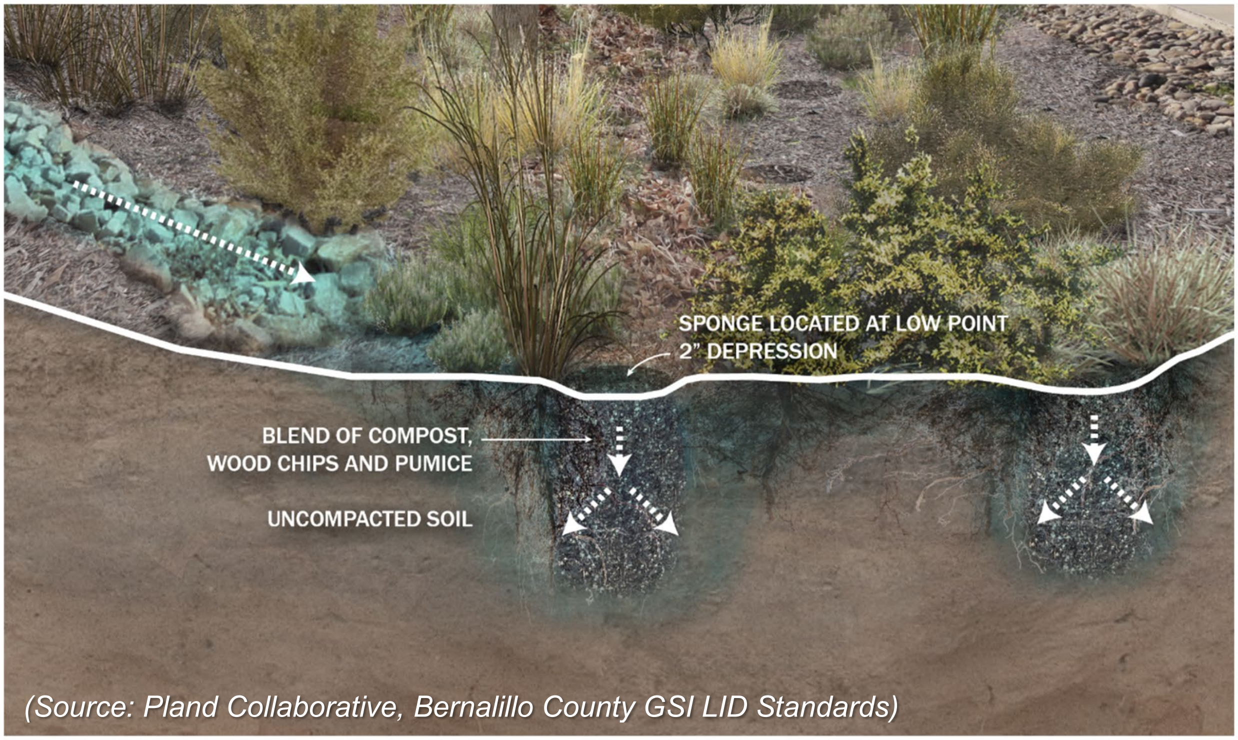
Figure 70: Infiltration trench in a commercial parking lot in Albuquerque, NM. This method can also be used along streets.

(Source: Pland Collaborative)

Soil Sponge

Soil sponges can be important components of successful GSI practices because they improve infiltration. A soil sponge is an excavated hole filled with a mix of pumice, compost, and wood chips. In addition to improving infiltration, soil sponges absorb and store runoff and inoculate the surrounding soil with beneficial microorganisms, helping to support plant health. Figure 10 shows a section view graphic of a soil sponge. When incorporated into GSI, soil sponges are almost imperceivable. They can be included in new or existing GSI practices wherever infiltration is a concern.

Figure 71: Soil Sponge Graphic



Check Dam

Check dams are important components of successful GSI practices where conveyance of runoff occurs. A check dam is a shallow, typically permeable, control placed perpendicular to the flow of water within a drainage feature. They help slow flows, allowing more time for infiltration and settling out of sediment and debris. They are typically used in series within a bioretention basin that provides conveyance functions on a steep slope. The material for check dams can be stacked rocks, small boulders, or logs, as shown in Figure 72 and Figure 73.

Figure 72: Check Dams Made with Rock

Figure 73: Check Dams Made from Wood

Rock Rundowns

Rock rundowns can be used to manage and convey runoff from a street or other adjacent property. They are typically placed to stop erosion at the edge of a small drop-off and covered with a single layer of angular rocks or riprap (Figure 74). Rock rundowns are typically integrated with larger bioretention basins. They may also be used at the end of an outfall to prevent erosion into a waterbody.

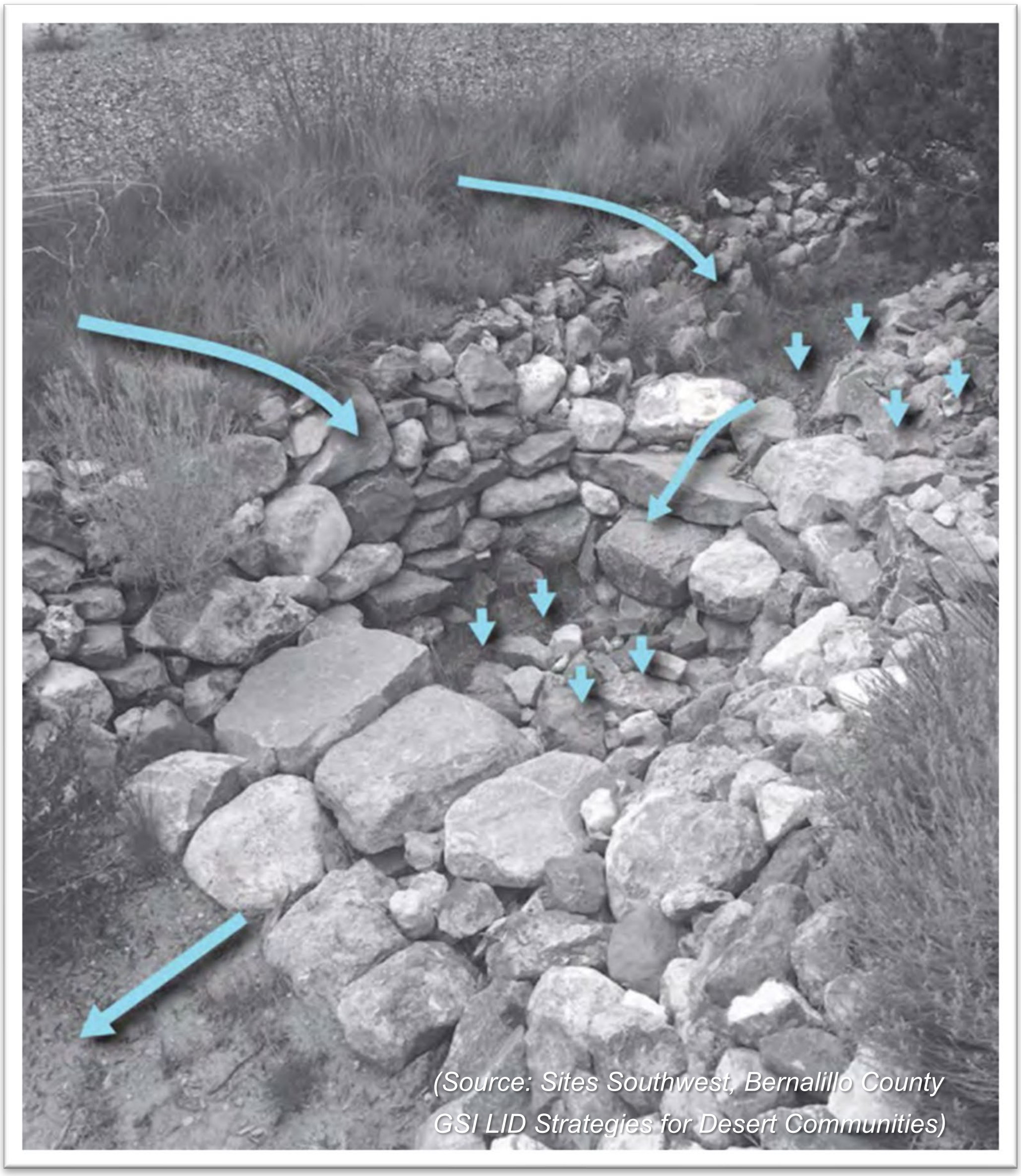
Figure 74: Rock Rundown


(Source: Quivira Coalition and Watershed Artisans)

Permeable Stilling Basin

A permeable stilling basin, or stacked stone erosion control basin, is an erosion control intervention composed of rock-lined step falls and basins that provide erosion control (Figure 14). It could also be used, similar to a rock rundown, to manage and convey runoff from a street for other adjacent property. Permeable stilling basins stabilize actively eroding headcuts by dissipating the energy of falling water at the headcut pour-over and the bed of the channel. The structure converts the single cascade of an eroding headcut into a series of smaller step falls. They also serve to maintain soil moisture, encouraging the establishment of protective vegetation.

Figure 75: Permeable Stilling Basin. Blue Arrows Show Direction of Flow.



7.7.2 GSI General Considerations for Conceptual Design & Construction

This section discusses general considerations for GSI selection and conceptual design. GSI practices should be integrated into street drainage designs to infiltrate and retain runoff as well as to improve the pedestrian experience through shading and traffic calming. GSI practices are often used together; for example, check dams and soil sponges may be included in the design of a bioretention basin. Conceptual design considerations include location selection, soils considerations, and plant selection.

Street drainage design should include GSI practices and may require larger stormwater retention and detention basins, including subsurface systems. Detention or retention facilities in a street must be designed to evacuate within 24 hours of a storm event. Evacuation time refers to the amount of time it takes for the stormwater to infiltrate or drain completely.

GSI Location Selection

The following should be considered when selecting locations for GSI:

- ✓ Consider the drainage area reaching the GSI practice. Some GSI practices are more applicable for smaller drainage areas. A series of GSI practices can be implemented in the street ROW to treat larger drainage areas and higher runoff rates.
- ✓ Visibility and clear zones requirements for streets should be accounted for during the design of GSI.
- ✓ GSI applications on steep slopes should be carefully considered and designed. Incorporate check dams or permeable stilling basins into GSI designs where steep slopes are not avoidable.
- ✓ Evaluate if the GSI location has shallow bedrock or high groundwater, both of which will impact infiltration. Maintain a separation distance of 2-3 feet between the GSI practice and the groundwater table.
- ✓ Locate underground utilities and consider how these utilities will impact the GSI practice design and locations.

GSI Soil Considerations

Soils may impact the effectiveness of GSI. The following can help designers determine the efficacy of GSI depending on existing soil types or soil selection:

- ✓ Soils in bioretention basins should have infiltration rates greater than 0.5 inches per hour. Soil percolation tests should be performed to confirm infiltration rates. If infiltration rates are low, consider amending soils, adding one or multiple soil sponges, adding an underdrain, or installing a minimum 12-inch sand layer.
- ✓ Alternative pavement practices also must consider soil infiltration rates and install an overflow mechanism, if needed, for larger storm events.
- ✓ Carefully consider GSI locations that have adjacent highly erodible soils, as the sediment laden runoff from these areas will clog the infiltration capacity of the GSI practice. Sediment traps will become even more critical in these locations.
- ✓ For GSI practices with vegetated plantings, soils should be suitable to sustain the selected plantings. In general, soils for trees will require more moisture holding capacity than soils that support herbaceous plants or xeriscape.

GSI Plant Selection

Plant selection and location should be considered during conceptual design, as plants are crucial to successful GSI practices. Regionally adapted plants should be selected based on temperature tolerance, soil types, and water needs. Most vegetation requires supplemental irrigation during its establishment period but once established should be able to function only on stormwater flows. The City of Santa Fe Municipal Tree Board provides a list of plants that can be expected to grow acceptably in the Santa Fe area given proper siting and care; see **Appendix B** and utilize the **Santa Fe Master Gardener A Guide to Native Plants for the Santa Fe Landscape (Appendix C)** for additional visual and maintenance guidance to assist with GSI plant selection.

GSI Construction Considerations

It is important to maintain soil permeability for infiltration and to limit compaction during construction. Best practices to protect soil conditions during construction should be followed, including:

- ✓ Add notes on construction plans to protect the GSI areas, landscaped areas, and remaining undeveloped areas from construction equipment that could compact soils and reduce soil permeability.
- ✓ Tracked vehicles (versus wheeled vehicles) should be used whenever practicable to minimize compaction of subsoils.
- ✓ Reserve existing topsoil and reuse it to maintain a healthy growth medium for plant establishment.
- ✓ Erosion and sediment control measures should be placed at the toe of slopes, adjacent to alternative pavement areas, to prevent sediment from washing into areas at all times during and after construction.
- ✓ Remove excess sediment that results from construction activities. Accumulated sediment limits infiltration and is a primary reason GSI fails to operate as designed.
- ✓ Break up, or scarify, the soil after construction to reduce compaction and to promote infiltration.
- ✓ Complete impervious area construction and stabilize pervious areas before runoff is allowed to enter infiltration areas.

7.8. Street Right-of-Way Grading

The slopes within the street ROW should be carefully designed to prevent erosion and minimize maintenance needs. All slopes should be protected from erosion, especially when subjected to upland flows. Whenever possible, design slopes at 4:1 (horizontal to vertical) or gentler to reduce erosion. Use of steeper slopes will require consultation with and approval from the Complete Streets Staff.

If slopes steeper than 4:1 are used, include a one (1)-foot level buffer adjacent to sidewalks. If 3:1 slopes are used, utilize enhanced soil stabilization practices to minimize erosion and sediment runoff onto adjacent sidewalks and streets. For slopes greater than 3 feet high, the maximum slope should not exceed 3:1 unless they are stabilized from slope failure through City-approved means. Steeper slopes may be acceptable subject to geotechnical recommendations and City concurrence.

7.9. Street Drainage Maintenance

All street drainage facilities—whether green or gray—require maintenance to keep them functioning as designed. Maintenance keeps components working as designed and helps avoid expensive repairs. All maintenance of street drainage facilities are the responsibility of the City, unless the City has an agreement or ordinance in place for others to perform the maintenance. The construction contractor should provide the City with a shapefile or CAD file for all constructed GSI locations, which will assist with ensuring long-term GSI maintenance. Santa Fe Code of Ordinance Section 21-1.2 – Weeds and Other Vegetation requires that property owners maintain not only their own property but also the adjacent public right-of-way, including sidewalks and the strip between the sidewalk and the street. In short, property owners are responsible for maintenance between the back of curb to the property. This includes controlling the growth of weeds or uncultivated vegetation.

Maintenance inspections should be conducted on the drainage facilities in accordance with the following schedule:

- On or about March 15th
- On or about September 15th and
- After each large storm event of 1-inch or greater (0.25-inches for GSI practices).

Inspections are especially important after large storm events greater than 0.25-inches of rainfall, but at a minimum, drainage facilities should be inspected at least twice per year. The City should maintain a file of the inspections and remedial action conducted on the drainage facilities.

Maintenance should include, but is not limited to, the following:

- Inspect structural integrity of drainage facilities.

Maintenance – Sediment Trap

To ensure the success of GSI practices, practitioners must prevent sediment clogging to ensure infiltration is not impacted. Therefore, every design of GSI must include capturing and managing sediment. Sediment traps function by briefly pooling incoming runoff, which reduces flow velocity and allows coarser sediments to settle out before reaching the main GSI practice. Concrete sediment traps are preferred to facilitate cleaning out the accumulated sediment with a shovel. Other materials, such as cobbles, will be considered for sediment traps, as well as the use of grasses and vegetation adjacent to the sediment trap for secondary polishing of runoff.

Photo and Caption Source: Aaron Kauffman, Southwest Urban Hydrology

Slow: Velocity of water is reduced to prevent erosion at inlet; **Pool**: Temporary stilling of water allows for suspended material to settle; **Drop**: Sediment (dirt, cigarettes, plastic bottles, cinders, etc.) falls to bottom of trap while the upper pool layer of water pours into basin where infiltration is desired.

- Flush all culverts, inlets, and drainage pipes to remove sediment, trash, and vegetation that prevents or hinders the flow of stormwater in the street drainage system.
- Inspect for accumulated sediment and erosion in all swales, ditches, drainage basins, outfalls, and street ROW.
    - Remove sediment that is greater than 6-inches in depth, trash, and debris from GSI, sediment traps, ditches, and detention or retention basins.
    - If necessary, repair erosion issues and repair erosion control measures.
- Remove invasive species and prune vegetation to ensure sight distances are clear, and sign visibility and unobstructed pedestrian zones are maintained. Pruning in GSI practices should only be for safety and visibility. The New Mexico Department of Transportation's GSI Maintenance Manual and the New Mexico Department of Transportation's GSI Maintenance Field Guide provide further details regarding effective maintenance of GSI adjacent to streets.
- Replace any dead plants.

Signs should be posted within or adjacent to the GSI practices to clarify maintenance practices and to ensure that no equipment that might compact the soils within the feature is used. A template for this signage will be provided by Public Works staff during the review process (at or before 30% design review). The signs should include educational information for the public regarding the function and benefits of GSI practice. Native plantings may look less manicured than other landscaped areas, which may concern members of the public; educational information can help educate the public about GSI practices and native plantings.

Appendices

Table of Appendices