LONG RANGE TRANSPORTATION SYSTEM GUIDE

2015

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CONNECTIVITY STRATEGIES

Chapter 4.4: Describes the importance of connectivity and complete networks and outlines ways to ensure connectivity in new developments.

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CONCEPTUAL DESIGN MATRICES

Chapter 5: Matrices outline right-of-way specifications for roadways based on future functional classification and character area.

ROADWAY DESIGN ELEMENTS

Chapter 5: Describes basic roadway design considerations, such as lane widths, pedestrian or streetside infrastructure, bicycle infrastructure, and intersection design.

STREETSIDE DESIGN ELEMENTS

Chapter 6: Describes additional pedestrian streetside design elements that should be considered for new and existing streets.

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COMPLETE STREETS CHECKLIST

Chapter 7: Provides a checklist to review roadway projects in terms of their regional and local contexts.

COMPARING ALTERNATIVES

Chapter 7: Examples show how existing roadway redesigns may be compared to fulfill Complete Streets planning goals.

PERFORMANCE MEASURES

Chapter 8: Provides a list of methods to evaluate performance, including multi-modal level of service indicators, connectivity measures, safety measures, and ways to evaluate land use integration and support.

Chapter 1

INTRODUCTION

Chapter 1

Introduction

The Mid-Region Metropolitan Planning Organization has developed the Long Range Transportation System Guide (LRTS Guide) to respond to the growing need for transportation networks to become more efficient at addressing congestion, providing multi-modal options for all users, supporting economic development, and improving public health. One of the key findings of the *2035 Metropolitan Transportation Plan* was that the strategy of adding roadway capacity was not sufficient to address congestion across the Albuquerque Metropolitan Planning Area (AMPA). The good news is there are promising alternative strategies that not only address congestion but also have economic and health benefits. These strategies involve creating "Complete Streets" and relating land use and transportation planning to improve conditions for all users.

The *2040 Metropolitan Transportation Plan*'s Preferred Scenario involves careful examination of how land use affects travel demand. The Preferred Scenario results in reductions in future travel demand through different types of growth that are publically acceptable throughout the region. The LRTS Guide provides recommendations on a second aspect of relating land use to transportation by providing conceptual roadway designs and networks that support adjacent land uses.

The LRTS Guide builds upon previous planning efforts. In 1965 the Long Range Major Street Plan laid out a gridded connected network of long range major route improvements. This map eventually became the Long Rang Roadway System and part of the Future Albuquerque Area Bikeways and Streets (FAABS) document. Now the LRTS Guide replaces the FAABS document and several of the prior elements have transitioned over. The FAABS document included a series of system maps: Long Range Roadway System, Long Range Bikeway System and the Long Range High Capacity Transit System. These system maps are now in the LRTS guide. They show where future roadways, bikeways, and transit lines are planned. It also provides a means to assess connectivity needs and ensure complete, efficient networks.

For future roadways, the LRTS guide builds upon the past right-of-way guidance from the FAABS document, but now incorporates multi-modal accommodations based on national best practices. The intent of this guidance for future roadways is to find the minimum right-of-way needed for good multi-modal accommodation. For current roadways, the LRTS guide provides methods to evaluate existing roadways for improved multi-modal accommodations, safety, and land use integration.

Finally, the LRTS Guide is part of the long range transportation planning process. It is incorporated into the *2040 Metropolitan Transportation Plan* and is developed to support the goals of the MTP. It will remain a part of the MTP and will be updated according to federal transportation planning processes.

1.1 GUIDING PRINCIPLES

The LRTS guide has five main guiding principles:

1. TRANSPORTATION AND LAND USE INTEGRATION

Integrating land use and transportation involves understanding how different land uses affect travel demand and providing roadway and network designs that are appropriate for the surrounding context.

Previously, right-of-way guidance was based only on how the roadway was anticipated to function in the future. The LRTS guide uses both the land use context and the roadway type to provide guidance on conceptual roadway design and right-of-way needs. The goal is to ensure that roadways support adjacent land uses as well as efficient regional travel. The LRTS Guide intends to avoid mistakes made in the past where incompatible land uses and roadway types were paired together. For example, locations with a high number of pedestrian crashes may indicate that adjacent land uses are generating the need for people to walk, while the roadway is primarily designed to support high speed automobile traffic.

Much of the AMPA's development occurred after WWII when development patterns favored automobile travel and the separation of land uses. This has led to roadways that primarily support automobile traffic (85 percent of all trips in the AMPA are completed in a passenger vehicle)[1]. However, there are many factors that support mitigating this trend. Of all the trips made by passenger vehicle, 11 percent are under a mile[1]. These short auto trips suggest that the area's roadways do not encourage walking or bicycling even though destinations are close.

Providing roadways that support the surrounding land uses not only reduces the number of short auto trips, but also allows for new investment and the incubation of quality public spaces.

2. COMPLETE STREETS

Complete Streets is a movement that stresses the need to accommodate all users of the roadway: pedestrians, bicyclists, transit users, and motorists. People of all ages and abilities are able to move safely along and across Complete Streets regardless of travel mode. The practice is not limited to design, but involves planning, programming, operating and maintaining transportation systems. Complete Streets also involve relating to the surrounding land use by finding the appropriate means of accommodation for the setting. A "complete" rural street will look and feel different than a "complete" urban one.

There are not enough resources to rebuild all roadways as Complete Streets. However, there are many opportunities to provide multi-modal accommodations that lead to a transportation network that works better for more people. These considerations vary for new roads and existing roads. For this reason, the LRTS Guide recommends recognizing Complete Streets opportunities at a variety of levels and provides Complete Streets considerations and processes to capitalize on these opportunities.

[1] Mid-Region Travel Survey, 2014

FIGURE 1.1: COMPLETE STREETS SUPPORT ALL USERS OF ALL ABILITIES

3. CONNECTIVITY

It can be a challenge for a single roadway to accommodate freight movement, high volume, and high speed traffic along with pedestrian and bicyclist needs. An important means of addressing multiple needs simultaneously is through creating "complete networks." This means designing complete, layered transportation networks that allow people to reach desired destinations – although not always on the same roadway. Creating better connected networks for all modes of travel reduces the potential conflict between different users. Providing low-stress routes for pedestrians and bicyclists improves accessibility by allowing people who are concerned about safety from traffic to reach destinations. In addition, improving connectivity improves efficiency by making trips more direct and reduces congestion by providing multiple routes to destinations.

4. SUPPORT THE PRICIPLES OF THE 2040 PREFERRED SCENARIO

The LRTS Guide is intended to support the Preferred Scenario in the *2040 Metropolitan Transportation Plan*. The Preferred Scenario minimizes travel demand through more compact and mixed land uses, provides more jobs west of the Rio Grande, and looks to alternative modes (particularly transit) to provide more travel options. The development of the Preferred Scenario also involves responding to public concerns to develop a transportation system that not only addresses congestion, but also supports economic development and creates places where people want to be. Creating transportation systems that are context appropriate and meets the needs of all users is an important part of supporting the principles of the Preferred Scenario.

5. SUPPORT OTHER PLANS AND POLICIES

Much of the motivation behind this guide is a convergence of efforts. The LRTS Guide builds upon the comprehensive plans of the municipalities in the region. The centers and corridors concept from City of Albuquerque/Bernalillo County Comprehensive Plan provides a framework for LRTS system maps and activity centers. The City of Rio Rancho's Comprehensive Plan explicitly calls for a Complete Streets Policy and the Village of Los Lunas Comprehensive Plan sets the vision for the village "to become less auto-dependent through the provision of more diverse travel options and land use patterns that support walkability, livability, and sustainability." Throughout the region more plans are including Complete Streets principles. The LRTS Guide supports putting these concepts into practice and provides guidance for location-specific plans.

In response to the 2035 MTP, the Metropolitan Transportation Board issued a resolution re-

questing regional guidance on accommodation of all modes and integrating land use and transportation. Many aspects of this guide come from locally adopted plans, policies and development processes. In addition, the process provided in this manual will help guide Mid-Region Metropolitan Planning Organization (MRMPO) comments for development review.

1.2 ADOPTION & IMPLEMENTATION

The LRTS Guide is part of the Metropolitan Transportation Plan and will be updated to support subsequent MTPs. The principles, processes and systems in the LRTS Guide will be updated with the Metropolitan Transportation Plan and with close coordination with member agencies to ensure that it takes into account local agency efforts and adopted plans while also addressing regional transportation needs.

The Long Range Roadway System is referenced in City of Albuquerque's Development Process Manual and Bernalillo County's Streets Standards. By adopting the 2040 Metropolitan Transportation Plan, member governments are supporting the intent of the LRTS Guide. Member governments are encouraged to adopt the processes provided in this guide and provide feedback that will improve future iterations.

Implementation of the LRTS Guide will occur in a variety of ways from new roadway construction in newly developed areas, to projects on roadways with constrained rights-of-way. New roadways offer the most flexibility in rights-of-way requirements, but it is also essential to ensure adequate connectivity during this development phase. Projects on roadways with fully developed land uses offer the least flexibility, but depending on the land use and roadway type, can represent the highest need for multimodal accommodation in the near-term.

Finally, the update of the City of Albuquerque /Bernalillo County Comprehensive Plan and the accompanying update of the zoning and development ordinances provide a good opportunity to integrate the LRTS Guide into these efforts.

Chapter 2

USING THIS DOCUMENT

Chapter 2

Using This Document

The LRTS Guide provides a Complete Streets planning process for systematically incorporating land use and multi-modal considerations at a variety of opportunities. This chapter contains the steps recommended to ensure that a variety of considerations are taken into account when planning and designing roadways and transportation networks. Guidance is also provided on the collection and evaluation of roadway and network measures to better understand different users and their needs, as well as the various benefits and tradeoffs involved with different roadway and network configurations.

The Complete Streets planning process outlined here involves six main steps that move from broad geographic considerations to specific segments. The steps are listed below:

1. Identify considerations and implementation opportunities for the plan or project. (this chapter)
2. Identify the land use character area from the Preferred Scenario. (Chapter 3)
3. Identify the roadway's regional role and opportunities to improve network connectivity. (Chapter 4)
4. Assess right-of-way needs and develop conceptual designs. (Chapter 5, 6)
5. Evaluate alternatives. (Chapter 7)
6. Collect and analyze performance measures. (Chapter 8)

2.1 IMPLEMENTATION OPPORTUNITIES

The LRTS Guide may be applied to a wide range of plans, studies and projects. Developing a master plan for an area with no infrastructure to resurfacing an existing roadway all provide opportunities to support surrounding land use and accommodate different transportation modes. However, the most appropriate type of implementation varies with each opportunity. For example, preserving network connectivity and right-of-way is critical in master plans for undeveloped areas, but evaluating a wide range of detailed roadway designs might not be as important. For roadway resurfacing maintenance, pursuing additional right-of-way is not appropriate, but evaluating the land use, the roadway type and if excess

lane width could improve shoulders or bicycle lanes is very important.

Table 2.1 categorizes different implementation opportunities broadly by geographic shape and if a project involves an existing or future roadway. These categories have similar implementation types that are included in Table 2.1 as well.

Figure 2.1 shows the recommended Long Range Transportation Guide planning process.

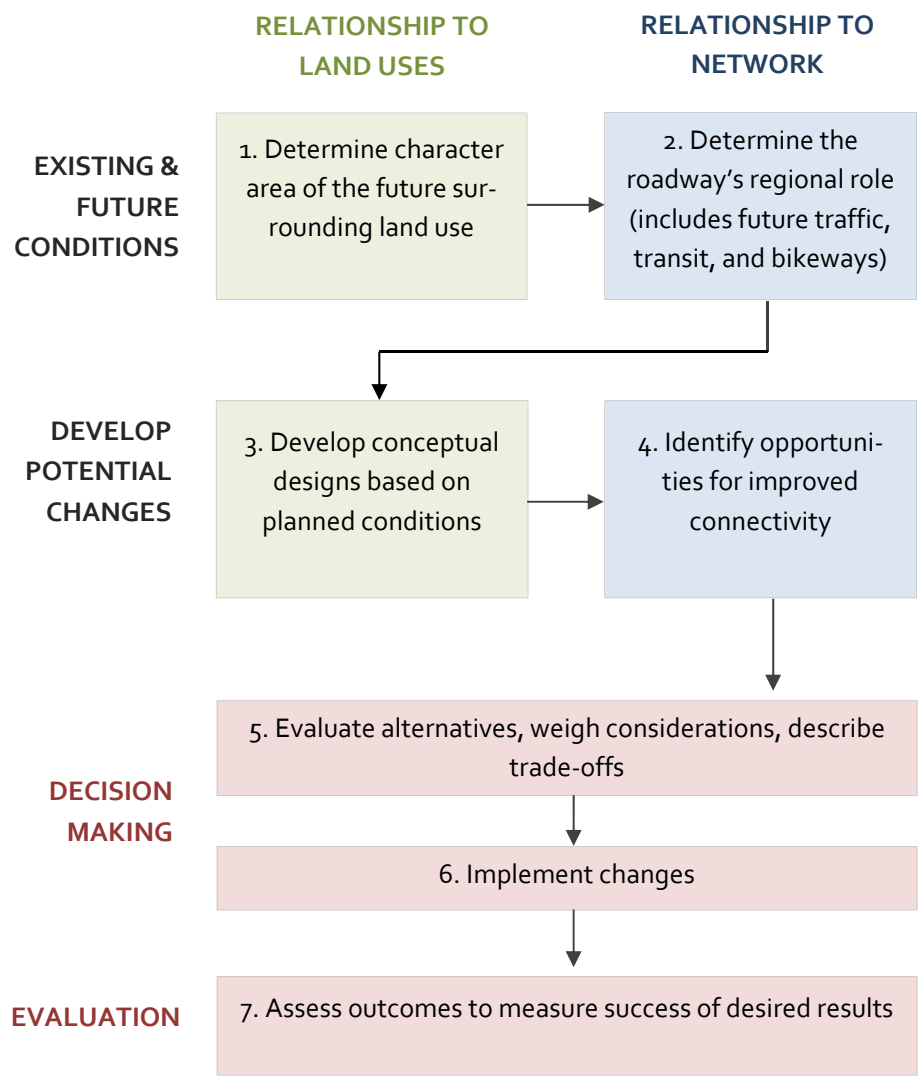


FIGURE 2.1: LRTS GUIDE PLANNING PROCESS

TABLE 2.1: IMPLEMENTATION OPPORTUNITIES & TYPES

IMPLEMENTATION OPPORTUNITY	IMPLEMENTATION TYPE
Sector Plans, Area Plans, Master Plans, Facility Plans These plans address large areas and provide a blueprint for roadways, trails and other facilities. Nearly all of these plans include future land use designations.	**1. Identify & coordinate with planned land use (Ch 3).** • *What are the future land use designations from local plans?* **2. Identify and preserve roadway and trail network connectivity (Ch 4 & 7).** • *Is there sufficient access to planned land uses?* • *Could a denser network of narrower roads be used instead of a sparse network of wider roads?* • *Does the layout of the roadway and trail network support future land use designations?* • *Does the network allow for pedestrians and bicyclists to take alternative roadways?* • *Does the network meet recommended connectivity measures and are there opportunities for improved connectivity?* **3. Develop conceptual roadway designs (Ch 5 & 6).** • *Does the conceptual design and network work together to accommodate all roadway users (although not necessarily on the same road)?*
Corridor Plans, Engineering & Feasibility Studies These efforts tend to focus on a segment of roadway and sometimes include a limited area that includes paralleling roadways.	**1. Identify & coordinate with planned land use (Ch 3).** • *What are the future land use designations from local plans?* **2. Identify and preserve connectivity through easements and parallel routes (Ch 4).** • *Is there sufficient access to planned land uses?* • *Can parallel routes improve access to adjacent land use and better accommodate pedestrians and bicyclists?* • *Are there any easements or other opportunities to improve pedestrian and bicyclist access and mobility?* **3. Develop conceptual roadway designs (Ch 5 & 6).** • *Does the conceptual roadway design and parallel roadways work together to accommodate all roadway users (although not necessarily on the same road)?* **4. Identify corridor issues and considerations (Ch 7 & 8).** • *How is the roadway currently performing?* • *Are there additional opportunities to address issues?*
New Roadway Construction New roadways are typically built in phases. Each phase should provide multi-modal options and support the land use developing around it.	**1. Identify & coordinate with planned land use (Ch 3).** • *What are the future land use designations from and local plans?* **2. Identify and preserve roadway and trail network connectivity (Ch 4).** • *Is there sufficient access to planned land uses?* • *Are approved access points being built along with the development of homes and businesses?* **3. Develop conceptual roadway design (Ch 5 & 6)** • *Does the design allow for all roadway users to be accommodated through each phase of the roadway being built?* **4. Identify corridor issues and considerations (Ch 7 & 8).** • *What are the long-term and short-term goals of the roadway?* • *Are there additional opportunities to address issues?* • *What are the performance measures to evaluate changes to the roadway?*

Roadway Redevelopment & Reconstruction These efforts involve changing an existing roadway or intersection. Typically, a corridor or feasibility study precedes these projects. Given that these roadways are already in use, this is also an opportunity to test out design alternatives with temporary features.	**1. Identify & coordinate with planned land use (Ch 3).** • *What are the future land use designations from local plans?* **2. Identify and preserve roadway and trail network connectivity (Ch 4).** • *Does this roadway provide an important connection between or within activity centers?* • *Are there any small opportunities to improve access to adjacent land use?* **3. Develop conceptual roadway design (Ch 5 & 6)** • *Which modes are prioritized based on the character area and roadway type?* • *Are there opportunities to improve accommodation for prioritized modes?* **4. Identify corridor issues and considerations (Ch 7 & 8).** • *How is the roadway currently performing?* • *Are there additional opportunities to address issues?* • *What are the performance measures to evaluate changes to the roadway?*
Roadway Resurfacing Maintenance Although these projects are limited and should not become full reconstruction projects, they provide unique opportunities to capitalize on small improvements that can make large impacts at much lower costs than a reconstruction project.	**1. Identify & coordinate with planned land use (Ch 3).** • *What are the future land use designations from local plans?* **2. Identify and preserve roadway and trail network connectivity (Ch 4).** • *Does this roadway provide an important connection between or within activity centers?* • *Are there any small opportunities to improve access to adjacent land use?* **3. Develop conceptual roadway design (Ch 5 & 6)** • *Which modes are prioritized based on the character area and roadway type?* • *Are there opportunities to improve accommodation for pedestrians and bicyclists by reducing driving lane widths?* • *Are shoulders being improved along with the rest of the roadway?* • *Are there missing sidewalks that can be filled in?* **4. Identify corridor issues and considerations (Ch 7 & 8)** • *How is the roadway currently performing?*

Chapter 3

CHARACTER AREAS

Chapter 3

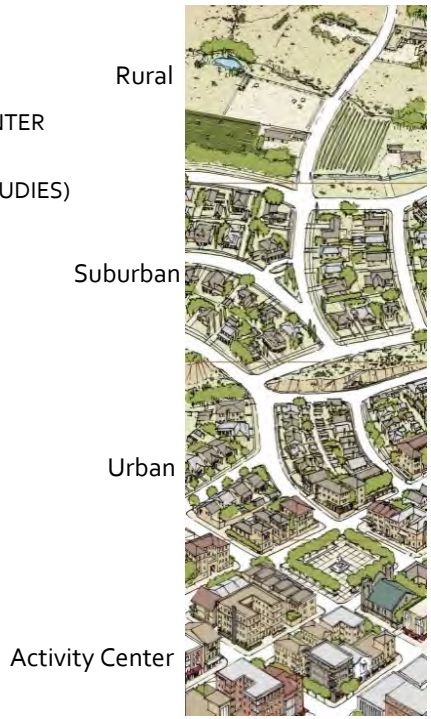
Character Areas

Determining the character area is the first step of the LRTS process. The scenario planning effort has shown the significant effect land use patterns have when addressing transportation challenges of the future. Additionally, the design and operation of the roadway contributes as much to the context as the buildings in the area. For this reason, it is important to have a clear idea of the intended future character surrounding the roadway and then balance transportation demand with the critical need for the roadway to support the adjacent land use. This chapter describes four character areas and ways to determine each character area. Roadway network connectivity and conceptual design elements in chapters 4, 5 and 6 are based on these character areas.

3.1 LAND USE CONTEXT

Determining the surrounding character area presents a variety of challenges. Making a detailed assessment of the land use surrounding a roadway is new for many transportation professionals. Adding to the challenge is that this assessment needs to be for the *future* character area, not the current surroundings since the lifecycle of the roadway is often much longer than the surrounding environment. This requires examining locally adopted plans and zoning ordinances. The LRTS Guide provides a character area map that gives an overall idea of character areas. However, in practice, character areas are relatively small and it is impossible to determine them all at a regional level. This is why local plans and the local community vision need to be used when making this determination. This can be difficult since local governments have a wide range of land use designations. In order to help this process the LRTS Guide simplifies character areas into five categories: (1) activity centers, (2) urban, (3) suburban, (4) rural, and (5) rural main streets. Overall, this classification follows a transect-based model, moving from a continuum of rural to urban character areas, with increasing densities and intensity of uses (Figure 3.1). Rural main streets are overlaid on top of this transect model to indicate those places with higher pedestrian and/or commercial activity within town and village centers.

FIGURE 3.1: TRANSECT EXAMPLE
(SOURCE: CENTER FOR APPLIED TRANSECT STUDIES)



The LRTS Character Area map (pg. 19) provides a broad view of character areas in the region and a starting point for determining character area. This map was developed based on the final conceptual Preferred Scenario. Two of the main principles of this scenario are to provide more jobs west of the river and to promote activity centers that provide denser, mixed-use, walkable areas that can be connected by transit. The Preferred Scenario was created using stakeholder input and it provides a goal for the region, but it is not based on current zoning ordinances. In practice, adopted ordinances and plans should be used in order to assess character area. It is impossible at the regional level to come up with an exact model of the variety of contexts a long roadway will pass through.

However, there are measures that can help determine character area (see Table 3.1). Below are descriptions of these measures. Although all of these measures are correlated, it is best to try to determine at least two of them before making assigning a character area.

LAND USE MIX

Land use is a common criterion for characterizing development. Common land uses includes: (1) single family residential, (2) multi-family residential, (3) commercial retail, (4) commercial services, (5) public/institutional, and (6) parks/open space. An area where one can live, work, shop, go to school and have places to congregated is a typical activity center. That is why an activity center should include nearly all the land uses listed above. These land uses were tested out on block groups to understand how well these geographies scored. Table 3.1 provides general rules on how to measure this mixture. This table also provides land use mix scores based on an entropy formula using the six land use categories listed above. If geography dedicated one-sixth of its total area to each land use, the score would be 1. In practice, this does not happen and many block groups include all six uses, but do not have scores better than 0.30. The land use formula is:

$$land\ use\ mix\ score = -\frac{1}{\ln(6)}\sum_{i=1}^{6} p_i \ln(p_i)$$

Where p_i is the proportion that land use i contributes to the overall geography.

NET RESIDENTIAL DENSITY

Net residential density is another way to help characterize development. This is the number of dwelling units per residentially zoned acre. Caution must be used in areas with manufactured homes or group quarters where the land may not be zoned residential, but the Census data includes the number of dwelling units.

The net residential density for activity centers is 12 dwelling units per acre. This is a minimum density needed to support transit[2].

ACTIVITY DENSITY

Activity density is a measure of combined residential and commercial activity. It supplements the net residential density with employment activity.

[2] Public Transit and Land Use Policy, 1977

Activity Density =

$$\frac{Population_i + Employment_i * X}{Acres_i}$$

For $Data\ Analysis\ Subzone\ i$, where

$$X = \frac{AMPA\ Population}{AMPA\ Employment}$$

The beneficial part of the activity density measure is that MRMPO provides these measures for the 2040 forecast. Caution must be used in a few instances where the acreage of the data analysis subzone (DASZ) overshadows the population and employment that take place within the zone. For example, Kirtland Air Force Base in Albuquerque and Merillat in Los Lunas have significant concentrated activity, but the DASZ encompasses much more area.

FIGURE 3.2: REGIONAL ACTIVITY CENTER – UPTOWN

URBAN AND RURAL DESIGNATIONS

The term *rural* in this document refers to *rural character areas* within the federally designated Albuquerque Metropolitan Planning Area (AMPA). Rural character areas have low residential densities and they are interspersed with agriculture and rangeland. Two examples of rural character areas in the AMPA are the Village of Corrales and the Village of Tijeras.

Metropolitan planning organizations update federally-designated *rural* and *urban* boundaries based on decennial census populations. These designations then guide federal funding processes. This document addresses the Albuquerque Metropolitan Planning Area (AMPA) which is federally classified as *urban*. This document does not address the federally designated *rural* areas in Torrance and Sandoval Counties which fall under the Rural Transportation Planning Organization.

3.2 ACTIVITY CENTERS

Activity centers exist in both urban and suburban contexts, although their form and surrounding land uses may vary. Activity centers prioritize pedestrian accessibility and are targeted for higher intensities of mixed-use development and enhanced transit connections. In addition, activity centers promote a "park once" approach where people driving to these locations can park once and walk to a variety of destinations.

The 2040 MTP has identified four types of activity centers. However, pedestrian priority activity centers identified in the Albuquerque/Bernalillo Comprehensive Plan and other local plans should also be taken into consideration.

REGIONAL ACTIVITY CENTERS

People across the region travel to regional activity centers to access jobs, education, and other services. These centers include transit connections and the potential to support mixed-use development.

REINVESTMENT CENTERS

Reinvestment centers are currently targeted for redevelopment. They often have connections to transit and some mixed-use elements. In some cases, these areas were major destination hubs in the past.

OPPORTUNITY CENTERS

Opportunity centers have been identified by local communities as areas that have room for additional development and that have the potential to become mixed-use destinations. Nearly all of these locations involve addressing transportation issues by incubating local mixed-use centers with high levels of employment so that nearby residents do not need to travel across the river or traverse other barriers for daily needs.

EMPLOYMENT CENTERS

Unlike the other types of activity centers, employment centers consist of a single large employer or business center with no plans for housing and they are not targeted future land use changes. These locations not addressed in the LRTS guide, but they are identified in the Preferred Scenario.

DOWNTOWN ALBUQUERQUE

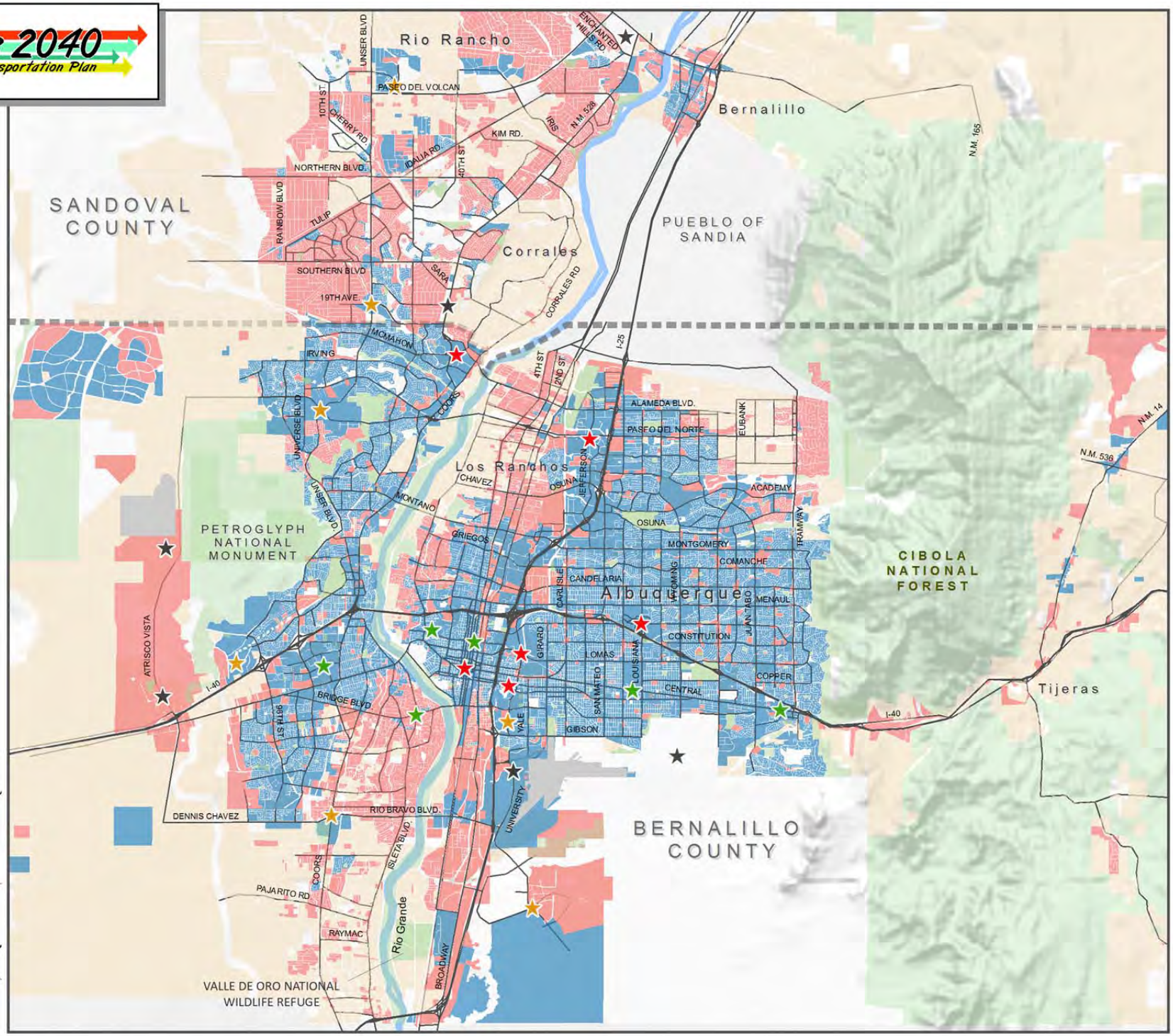
Downtown Albuquerque is a unique area in many ways, because it functions as the urban core for the region and remains the region's most dense job center. It is both a regional activity center and reinvestment center. Increased investment in Downtown's pedestrian amenities, bicycle infrastructure, and civic spaces could catalyze further private investment and redevelopment of Downtown's vacant and/or under-utilized infrastructure.

In March 2015, The Downtown Walkability Analysis was adopted by City of Albuquerque a policy for prioritizing multi-modal improvements in Downtown Albuquerque. This study was completed in fall of 2014 by Jeff Speck, the author of *Walkable City: How Downtown Can Save America One Step at a Time.* The Downtown Walkability Analysis is the recommended resource for improvements to streets in Downtown Albuquerque.

Futures 2040
Metropolitan Transportation Plan

Map 3.1: Long Range Transportation Systems (LRTS) Character Areas

- Regional Center
- Opportunity Center
- Reinvestment Center
- Employment Center
- Open Space
- Rural
- Suburban
- Urban
- County Boundaries
- Airports



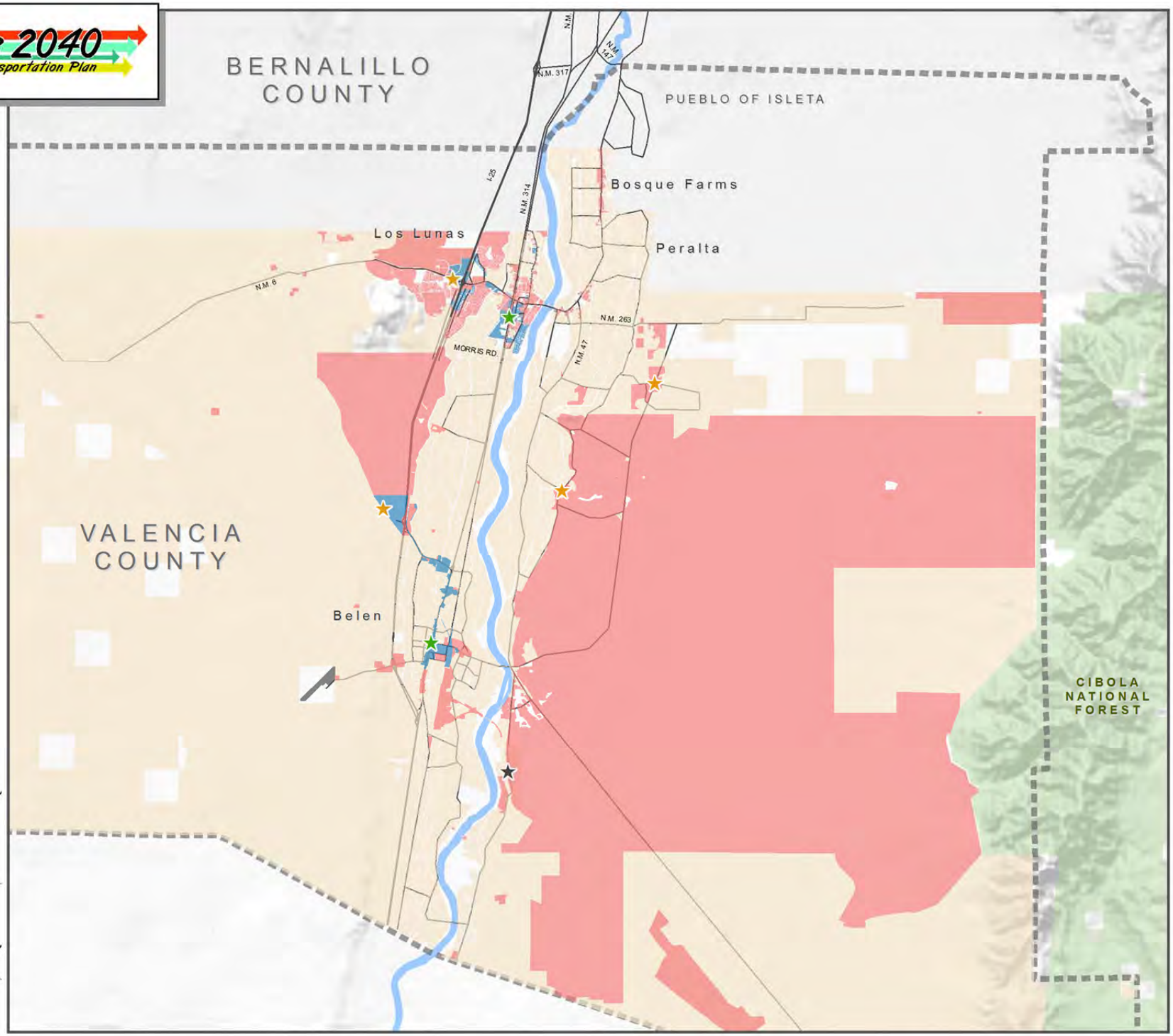
MILES 0 0.5 1 2 3 4

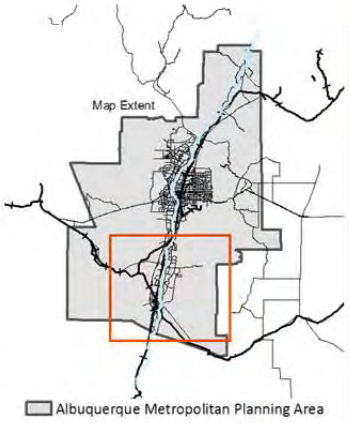
NORTH

Futures 2040
Metropolitan Transportation Plan

Map 3.2: Long Range Transportation Systems (LRTS) Character Areas, Valencia County

- Regional Center
- Opportunity Center
- Reinvestment Center
- Employment Center
- Rural
- Suburban
- Urban
- County Boundaries
- Airports





MILES 0 0.5 1 2 3 4

NORTH

TABLE 3.1: CHARACTER AREAS

ACTIVITY CENTERS

Activity centers are designated in the 2040 MTP and the Albuquerque/Bernalillo County Comprehensive Plan. These areas exist in both urban and suburban areas but generally are planned to have a higher intensity of use than general urban or suburban areas. This includes increased pedestrian traffic, retail activity, or core job centers. The priority for activity centers is accessibility for all modes, with an increased emphasis on pedestrian comfort.

Land Use Mix: Activity Centers often have all of the following land uses: Multi-family, retail, services, parks (includes plazas), public buildings (includes schools), and often nearby single family units. (LU mix score > 0.22)
Planned Net Residential Density: > 12 dwelling units per acre
Future Activity Density Score: ≥ 25

Examples: Uptown (shown), Downtown Albuquerque, UNM area, Nob Hill, Cottonwood, and Journal Center

GENERAL URBAN

Urban areas are generally do not have as high of residential and employment densities as activity centers, but they have a fairly high number of different land uses within short distances.

Land Use Mix: Urban areas often have at least four of the following land uses: single family, multi-family, retail, services, parks, and public/institutional buildings such as schools.
(LU mix score > 0.16)
Planned Net Residential Density: ≥ 8 dwelling units per acre
Future Activity Density Score: ≥ 12

Examples: an Mateo & Lomas area (shown), Wyoming Blvd & Montgomery Blvd

GENERAL SUBURBAN

Suburban areas primarily contain single family residential land use with scattered commercial that support these residences. Future suburban areas should provide for pedestrian and bicycle access to commercial areas, schools, parks and transit.

Land Use Mix: The predominant single family land uses in suburban areas often include two or three of the following other land uses: multi-family, retail, services, parks, and public/institutional buildings such as schools. (LU mix score > 0.10)
Planned Net Residential Density: < 8 dwelling units per acre
Future Activity Density Score: < 12

Examples: Coors Blvd, Southern Blvd, Unser Blvd, Harper Rd

RURAL

The primary characteristic of rural areas is very low residential densities. Often rural areas develop into suburban areas. If an area is determined to be rural in the future there should be evidence that measures are in place to preserve low residential density.

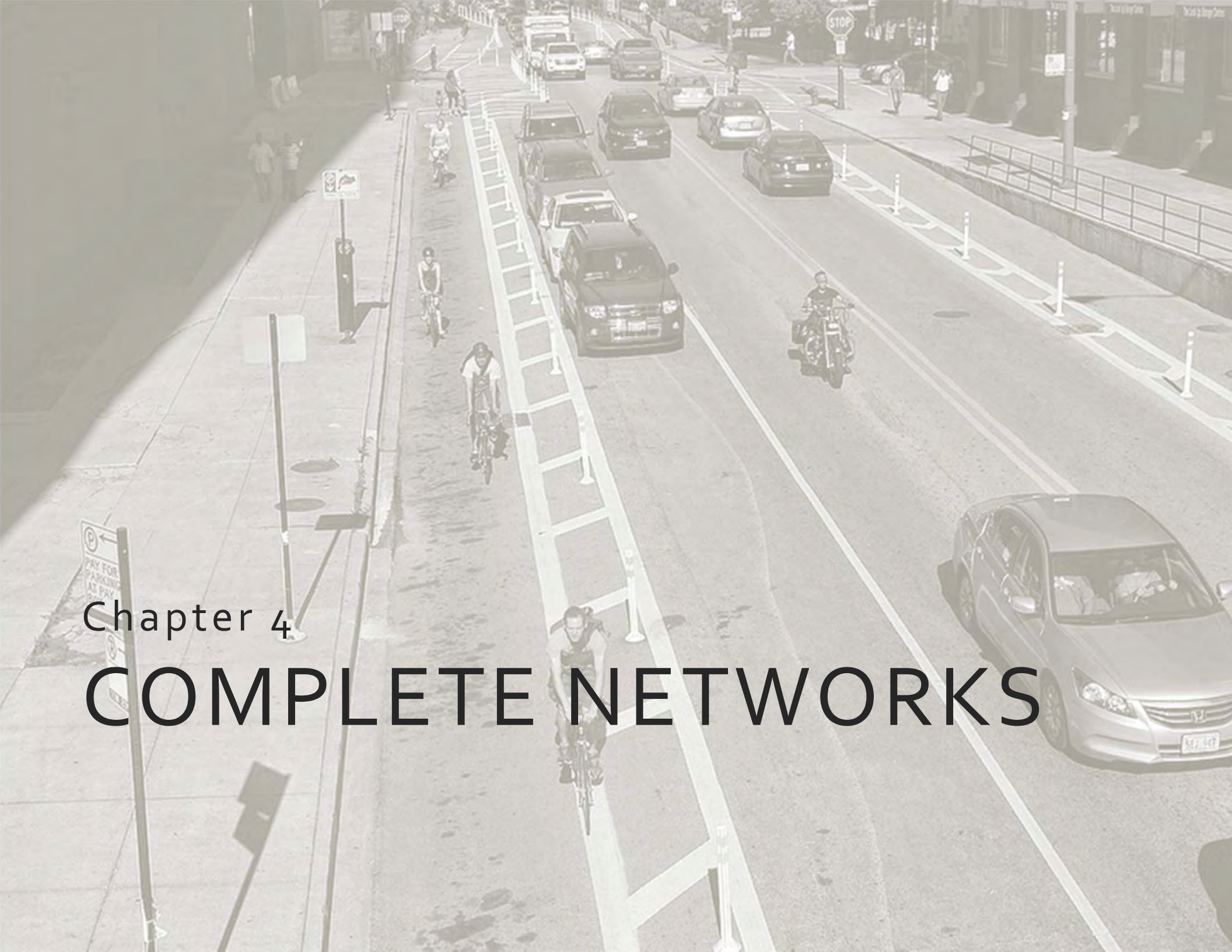
Land Use Mix: Rural areas have very low residential densities and often include agricultural land, and/or open space. (LU mix score < 0.10)
Planned Net Residential Density: ≤ 3 dwelling units per acre
Future Activity Density Score: < 7

Examples: Isleta Blvd (shown), Rio Grande Blvd

RURAL MAIN STREETS

Main streets, like downtown streets, are places that traditionally support retail businesses and pedestrian activity. They often function as the heart of historic towns, or as the "living room" of a neighborhood where people come to shop, eat, and congregate. For this reason, special care needs to be taken to preserve pedestrian comfort and safety. (Also see *Special Streets* in section 5.7.)

Examples: NM 313 in Bernalillo (shown), Corrales Rd, 4th St at Guadalupe Plaza in Los Ranchos, NM 333 in Tijeras



Chapter 4

COMPLETE NETWORKS

Chapter 4

Complete Networks

Roadways play many roles from carrying freight long distances to inviting pedestrians to patronize sidewalk cafes. It is not possible for a single roadway to play all of these roles well at the same time. However, a well-connected system of roadways can meet these diverse challenges by assigning different responsibilities to different routes. No other factor affects a transportation system's overall efficiency more than roadway network connectivity. Roadway connectivity allows for more route options which disperses congestion and can help avoid major issues when a roadway is closed for construction, incidents, or events. The redundancy of routes is preferable for pedestrian and cyclists because they can directly reach their destinations while avoiding conflicts on major roads. In addition, regularly spaced roadways offer better opportunities for signal synchronization, increasing efficiency and travel times. Finally, the smaller blocks structure allows for development flexibility where land uses can evolve and adapt over time.

Unfortunately, roadways are now planned as fragmented systems with a focus on channeling traffic onto a few arterials. Typically, new developments create disconnected roadway layouts that are site-based and address the interests of a single landowner without taking into consideration the negative regional consequences of a disconnected roadway network. Such a network fails to capitalize on opportunities for local roads, collectors, and minor arterials to make meaningful connections.

The *2035 Metropolitan Transportation Plan* took the first step in seeing how a lack of connectivity can negatively affect future transportation. The *2040 Metropolitan Transportation Plan* takes the next step by recommending ways to address and improve network connectivity through the LRTS Guide. The intent is to provide guidance for creating complete networks that offer alternative low-speed, low-volume routes that help serve communities and the region.

4.1 NETWORK DESIGN

Ensuring high levels of connectivity through careful network planning has numerous benefits including:

- Offers direct routes, which decreases travel time and vehicle miles traveled (VMT).
- Improves air quality and health outcomes by reducing VMT and congestion.
- Reduces congestion by allowing surrounding roadways to absorb excess traffic from other routes.
- Encourages more walking and bicycling by creating shorter, more direct routes.
- Provides more direct access to businesses and residences.[3]

LAYERED NETWORKS

A gridded network of connected roadways is the best way of achieving high levels of connectivity and addressing the variety of needs of the regional transportation system.[4] Although large areas of the region have missed the opportunity to have a gridded roadway network, there are still many ways to improve connectivity and network efficiency. It is still possible to create layered networks for pedestrians, transit, bicyclists, drivers, and freight at a regional scale.

The Long Range System maps (pg.28-36) provide the designated layers for these different modes. Each map identifies current and future planned connections that will allow travel by different modes between major destinations. The maps communicate to the wide variety of stakeholders where proposed network connections are recommended. This helps ensure that important network links (and gaps) are not overlooked as opportunities to improve the roadway arise.

FIGURE 4.1: COMPARISON OF A 15 MINUTE WALK FROM A BUS STOP IN WITH A TRADITIONAL, GRIDDED NETWORK (LEFT) AND A CONVENTIONAL NETWORK (RIGHT)

The Long Range System maps provide a foundation for layered network connectivity; however, smaller opportunities for connections also exist. section 4.5 provides a variety of strategies to improve connectivity. Often these smaller connections are very effective for people traveling by foot or bicycle.

Finally, the region still has opportunities with new, larger developments to establish and preserve a gridded transportation system. These areas are included in the system maps to ensure that important connections are preserved from one development to the next.

[3] ITE. Planning Urban Roadway Systems; Ewing, Pedestrian- and Transit-Oriented Design, 59-60
[4] Ewing, 59

4.2 LONG RANGE ROADWAY SYSTEM

The Long Range Roadway System (LRRS) (pg. 28-29) provides future recommended roadways and their regional role. This system should be viewed as an aspirational network. That is, the map provides a basic, minimal future network that demonstrates how the region's transportation network is envisioned to function, with some roadways closer to their desired functionality than others. This network includes roadways that are not expected to be constructed within the timeframe of the 2040 MTP. These roadways are included in the Long Range Roadway System in order to help identify future need. Roadways beyond the scope of the 2040 MTP also provide a means to identify important regional connections. As new areas develop, additional connectivity needs will have to be assessed further (see section 4.5 for strategies to improve connectivity).

FUNCTIONAL CLASSIFICATION

This leads to an important distinction between LRRS and current functional classification. Just like the name implies, current functional classification is based on how the roadway currently functions. In addition, current functional classification determines eligibility for federal funding.

In contrast, the LRRS roadway typed build upon and move beyond functional classification by considering the character of the roadway and the role it plays in the regional system. The classifications used in the LRRS were developed with the needs of all users in mind and the types of trips the roadway serves. For example, the LRRS differentiates principal arterials into two groups (regional and community) to differentiate the types of trips these roadways accommodate. These designations can help determine the steps necessary to preserve and improve the transportation system.

REGIONAL PRINCIPAL ARTERIAL

Trips on regional principal arterials are primarily for traveling longer distances across the region. Regional principal arterials prioritize passenger vehicles and freight. In general, there are not many destinations along regional principal arterials. These roadways should have high levels of access management and many are currently included in the region's access management policy. Regional principal arterials tend to have higher speeds and more lanes. If there is a parallel regional and community principal arterial and a person wants to drive to a destination beyond the communities these arterials serve, then they most likely would take the regional principal arterial. For these reasons, regional principal arterials should only be planned along the edges of activity centers and not through them. Unfortunately, there are some developed activity centers that are bisected by regional principal arterials. In these cases, modal priorities along these roads need to be balanced.

COMMUNITY PRINCIPAL ARTERIAL

Although these roadways are given the functional classification of principal arterial, these corridors include many destinations with direct access from the arterial. Travel on community principal arterials tends to be over relatively short distances and to destinations with access directly on that arterial. Community principal arterials tend to have lower speeds and fewer lanes than regional principal arterials.

Community principal arterials do not prioritize one mode over another; instead they strive to achieve a balance through several strategies that can include slowing down motorized traffic or improving walking and bicycling facilities. Higher levels of congestion on community principal arterials is acceptable compared to regional principal arterials since community principal arterials bring people *to* areas and regional principal arterial take people *through*.

MINOR ARTERIAL

Minor arterials provide the connectivity of principal arterials, but they prioritize slower moving traffic, including bicyclists and pedestrians, to allow these modes additional options to reach destinations without needing to be on a principal arterial.

MAJOR COLLECTOR

Major collectors provide additional connectivity between destinations on arterials and neighborhoods. They prioritize bicyclists and pedestrians. Bicyclists should be able to use collectors for long segments of their trips while motorists primarily use them for short segments of their trips.

MINOR COLLECTOR

Minor collectors provide additional connectivity between destinations on arterials and neighborhoods.

4.3 LONG RANGE CONCEPTUAL TRANSIT SYSTEM

The Long Range Conceptual Transit System map (pg. 30) shows future planned transit corridors along with the existing bus and commuter rail service and rail stations.

As with the Long Range Roadway System, the Long Range Conceptual Transit System is design to support the principles of the 2040 Preferred Scenario. Specifically, the network seeks to connect activity centers and support future mixed-use corridors. Expanded transit would also provide increased river crossing options.

For more transit-related information, see section 5.5 Transit.

4.4 LONG RANGE BIKEWAY SYSTEM

The Long Range Bikeway System (LRBS) (pg. 31-36) includes both existing and future existing bikeways and trails. Proposed facilities include projects beyond the 2040 timeframe. The LRBS also identifies long distance routes that provide means for bicyclists to travel across and between jurisdictions in the region as well as other special alignments.

For descriptions of different bikeways, see section 5.6 Bikeway and Trail Infrastructure.

Table 4.1: Existing and Anticipated Miles of Bikeways and Trails

Facility Type	2004	2010	2014	Proposed 2040 Project Miles*	Total Proposed Full Build-Out
Paved Trail	145.20	206.20	274.80	97.34	695.02
Bicycle Lane	130.80	218.60	261.20	124.72	749.66
Route	124.50	156.30	415.1**	1.72	568.07
Bicycle Boulevard	0.00	6.20	6.16	0.00	21.92
Total	400.50	587.30	957.22	223.78	2,034.67

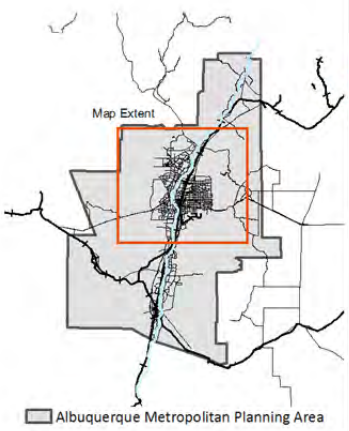
* Only includes 2040 MTP projects.

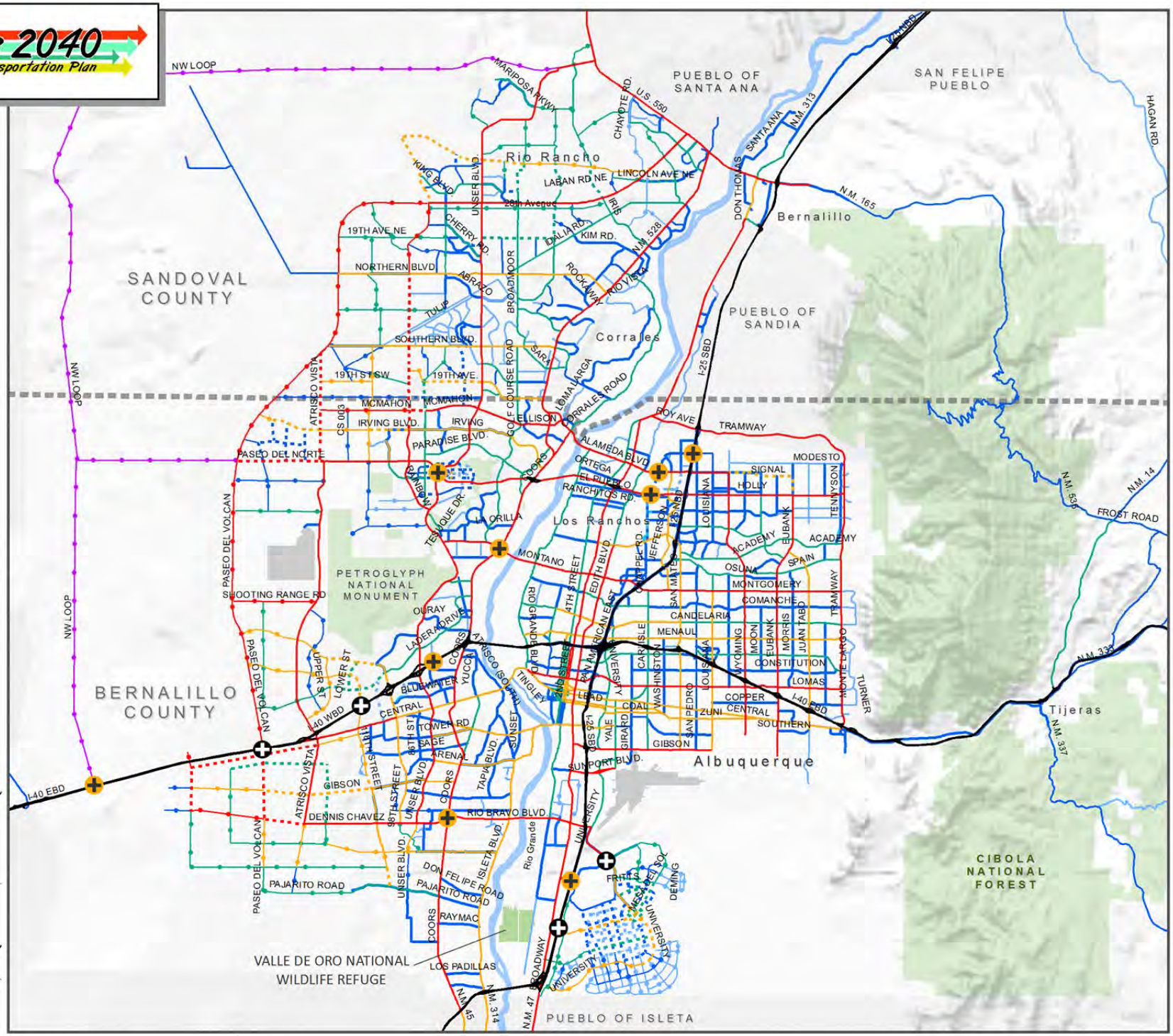
** Includes additional miles in Valencia County that were all not included on 2035 LRBS.

Futures 2040
Metropolitan Transportation Plan

Map 4.1: Long Range Transportation Systems (LRTS) Long Range Roadway System

- Intch./Crossing
- Intch./Crossing Post 2040
- Interstates
- Regional Principal Arterial
- Community Principal Arterial
- Minor Arterial
- Major Collector
- Minor Collector
- Proposed Regional P. Arterial
- Proposed Community P. Arterial
- Proposed Minor Arterial
- Proposed Major Collector
- Proposed Minor Collector
- Prop. Regional P. Arterial Post 2040
- Prop. Community P. Arterial Post 2040
- Proposed Minor Arterial Post 2040
- Proposed Major Collector Post 2040
- Proposed Minor Collector Post 2040
- Classification TBD Post 2040
- County Boundaries
- Airports





MILES
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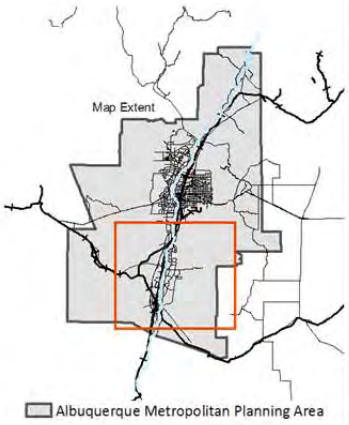
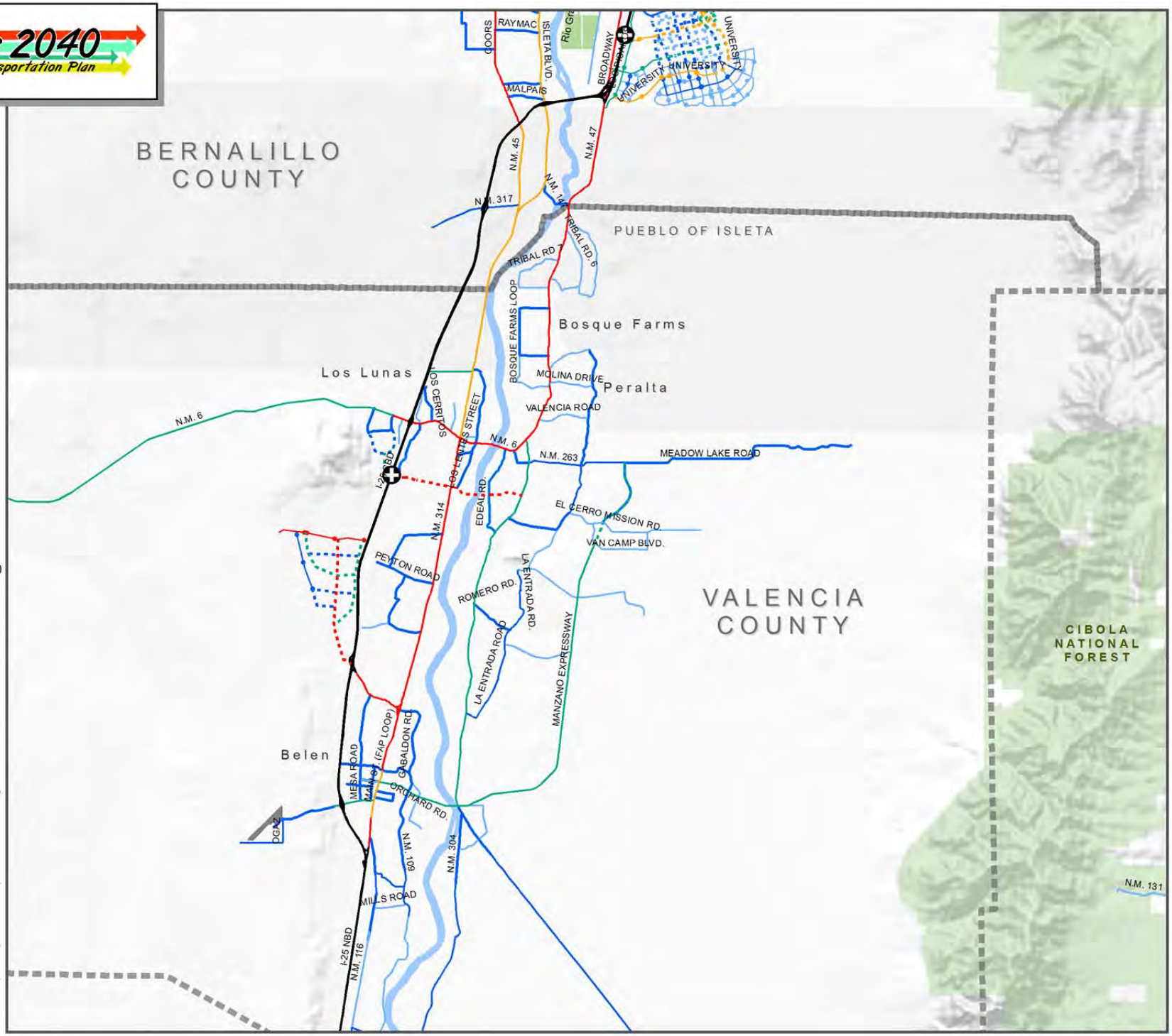
Futures 2040
Metropolitan Transportation Plan

Map 4.2: Long Range Transportation Systems (LRTS) Long Range Roadway System, Valencia County

- Intch./Crossing
- Intch./Crossing Post 2040
- Interstates
- Regional Principal Arterial
- Community Principal Arterial
- Minor Arterial
- Major Collector
- Minor Collector
- Proposed Regional P. Arterial
- Proposed Community P. Arterial
- Proposed Minor Arterial
- Proposed Major Collector
- Proposed Minor Collector
- Prop. Regional P. Arterial Post 2040
- Prop. Community P. Arterial Post 2040
- Proposed Minor Arterial Post 2040
- Proposed Major Collector Post 2040
- Proposed Minor Collector Post 2040
- Classification TBD Post 2040
- County Boundaries
- Airports





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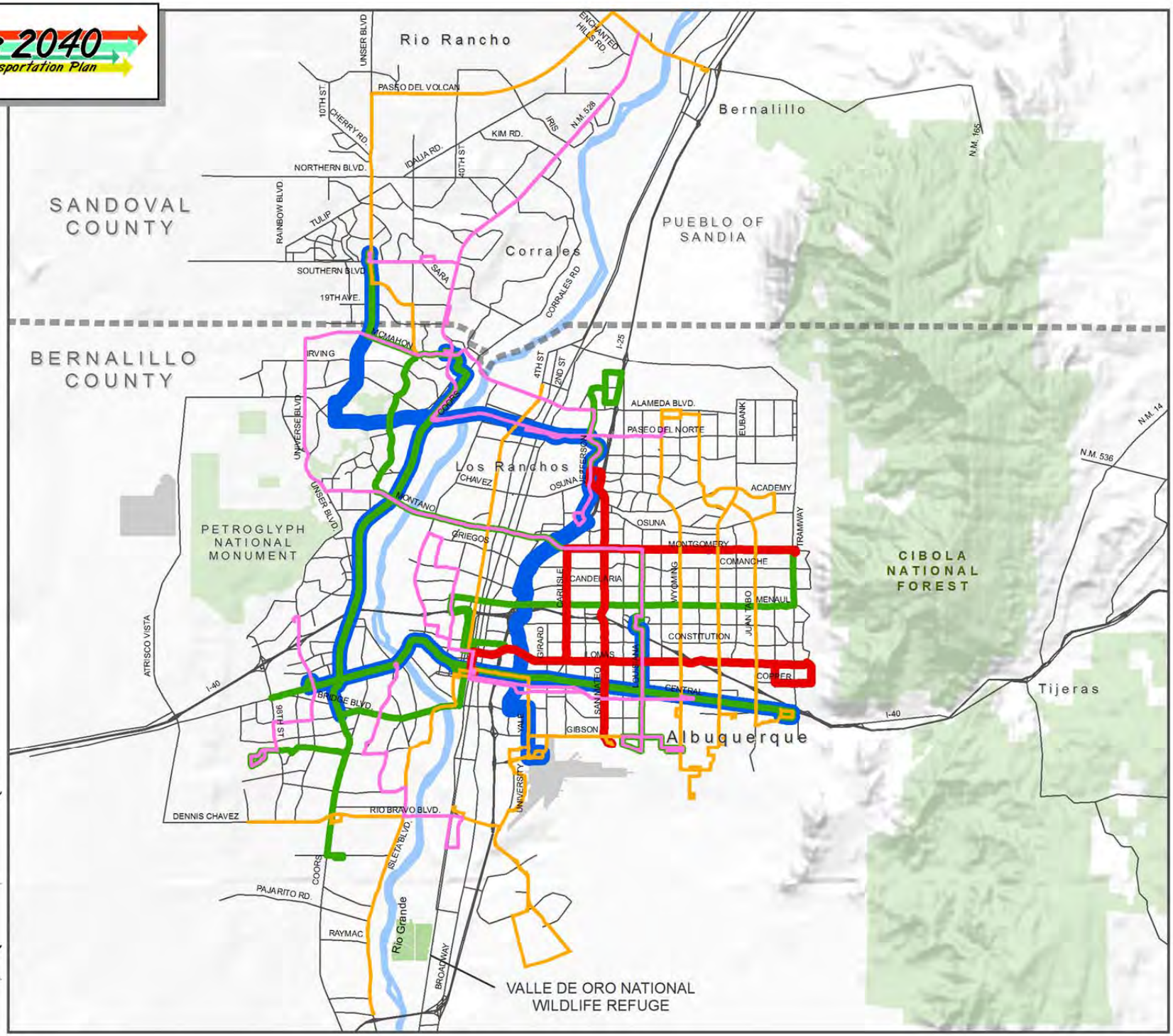
Futures 2040
Metropolitan Transportation Plan

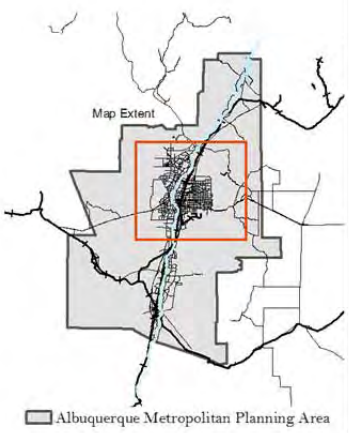
Map 4.3: Long Range Transportation Systems (LRTS) Conceptual Transit System

- BRT (8-15 min)
- Rapid Ride (15 min)
- Primary (15 min)
- Secondary (25 min)
- Tertiary (30-40 min)

Base Map

- County Boundaries
- Airports





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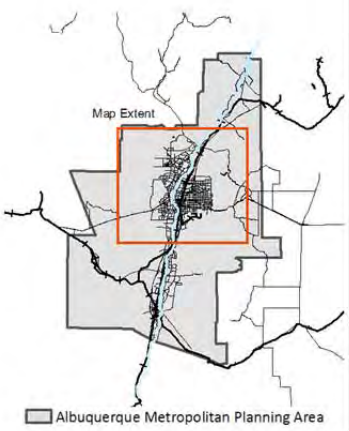
Futures 2040
Metropolitan Transportation Plan

Map 4.4: Long Range Transportation Systems (LRTS) Existing Bikeways

- Paved Trail
- Bicycle Lane
- Bicycle Boulevard
- Bicycle Route
- County Boundaries
- Airports



PUEBLO OF SANTA ANA
SAN FELIPE PUEBLO
Rio Rancho
Bernalillo
SANDOVAL COUNTY
PUEBLO OF SANDIA
Corrales
Los Ranchos
PETROGLYPH NATIONAL MONUMENT
BERNALILLO COUNTY
Albuquerque
Tijeras
CIBOLA NATIONAL FOREST
PUEBLO OF ISLETA
Rio Grande

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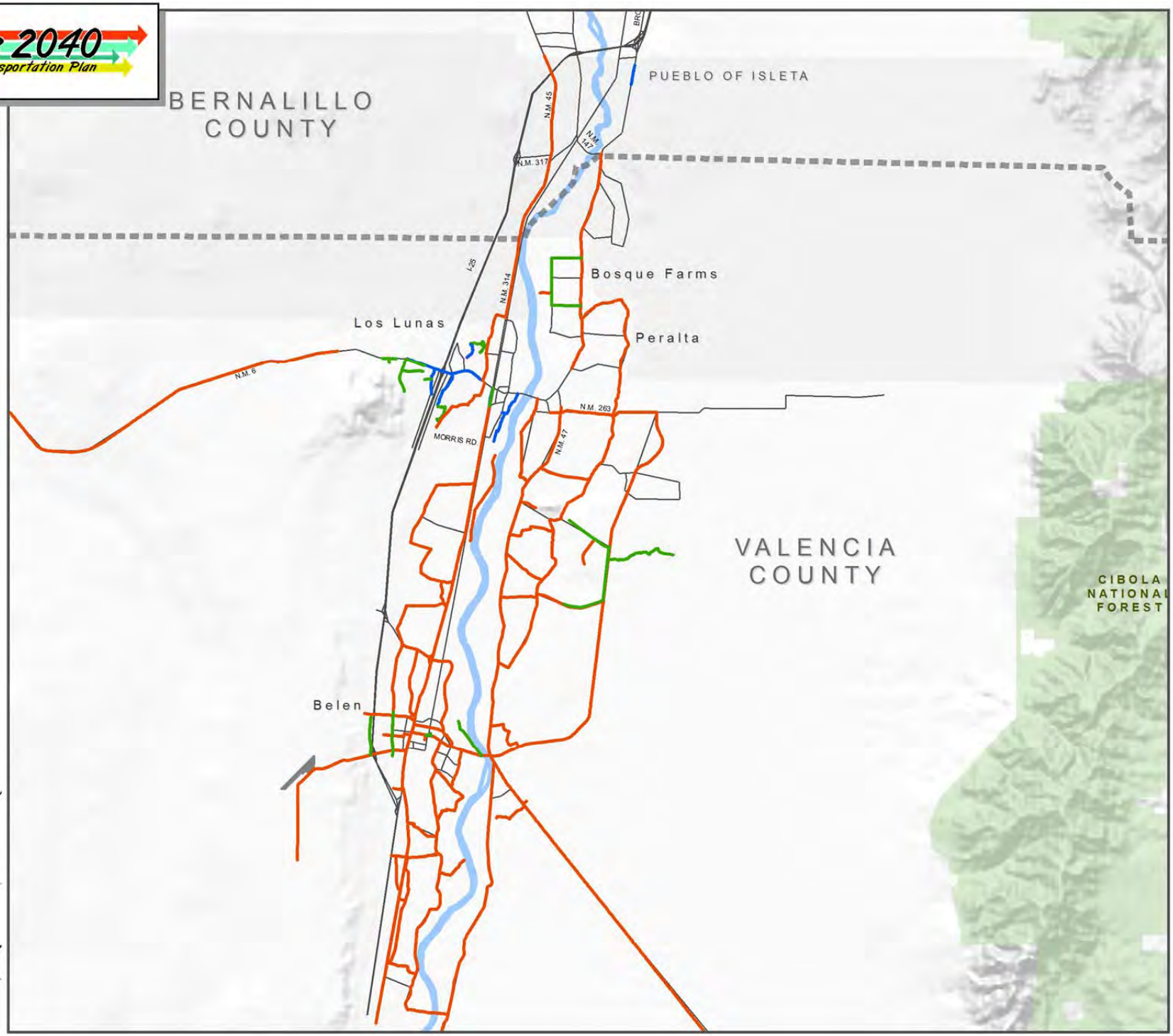
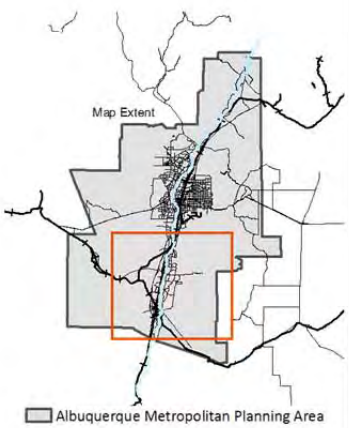
Futures 2040
Metropolitan Transportation Plan

Map 4.5: Long Range Transportation Systems (LRTS) Existing Bikeways, Valencia County

- Paved Trail
- Bicycle Lane
- Bicycle Boulevard
- Bicycle Route
- County Boundaries
- Airports





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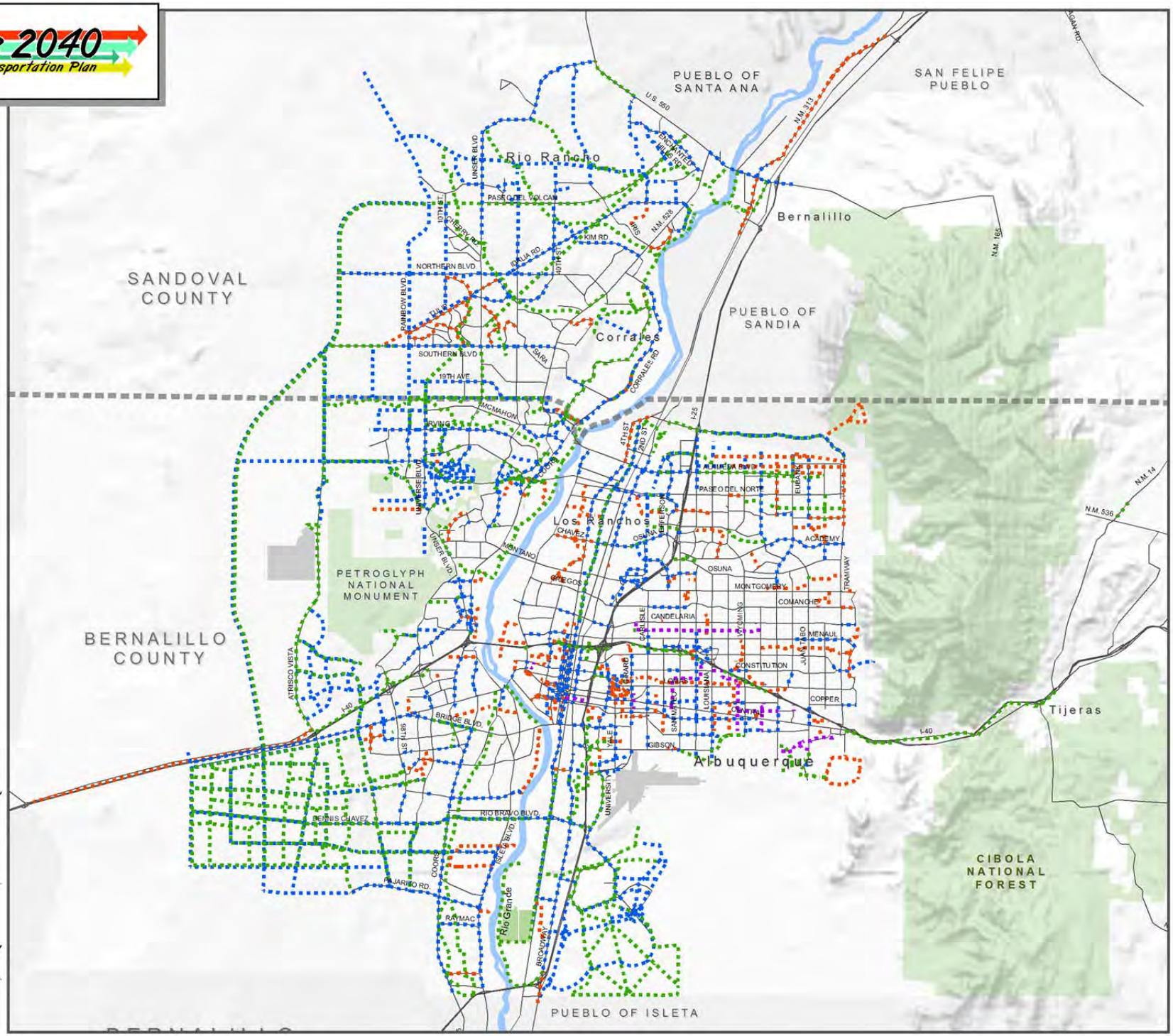
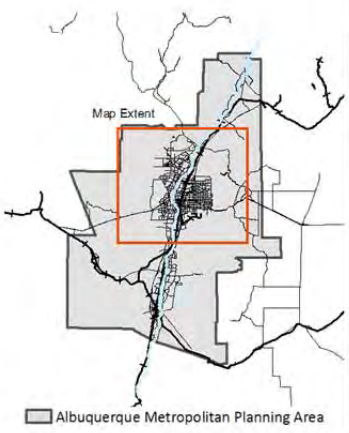
Futures 2040
Metropolitan Transportation Plan

Map 4.6: Long Range Transportation Systems (LRTS) Proposed Bikeway Network

- Paved Trail
- Bicycle Lane
- Bicycle Boulevard
- Bicycle Route
- County Boundaries
- Airports





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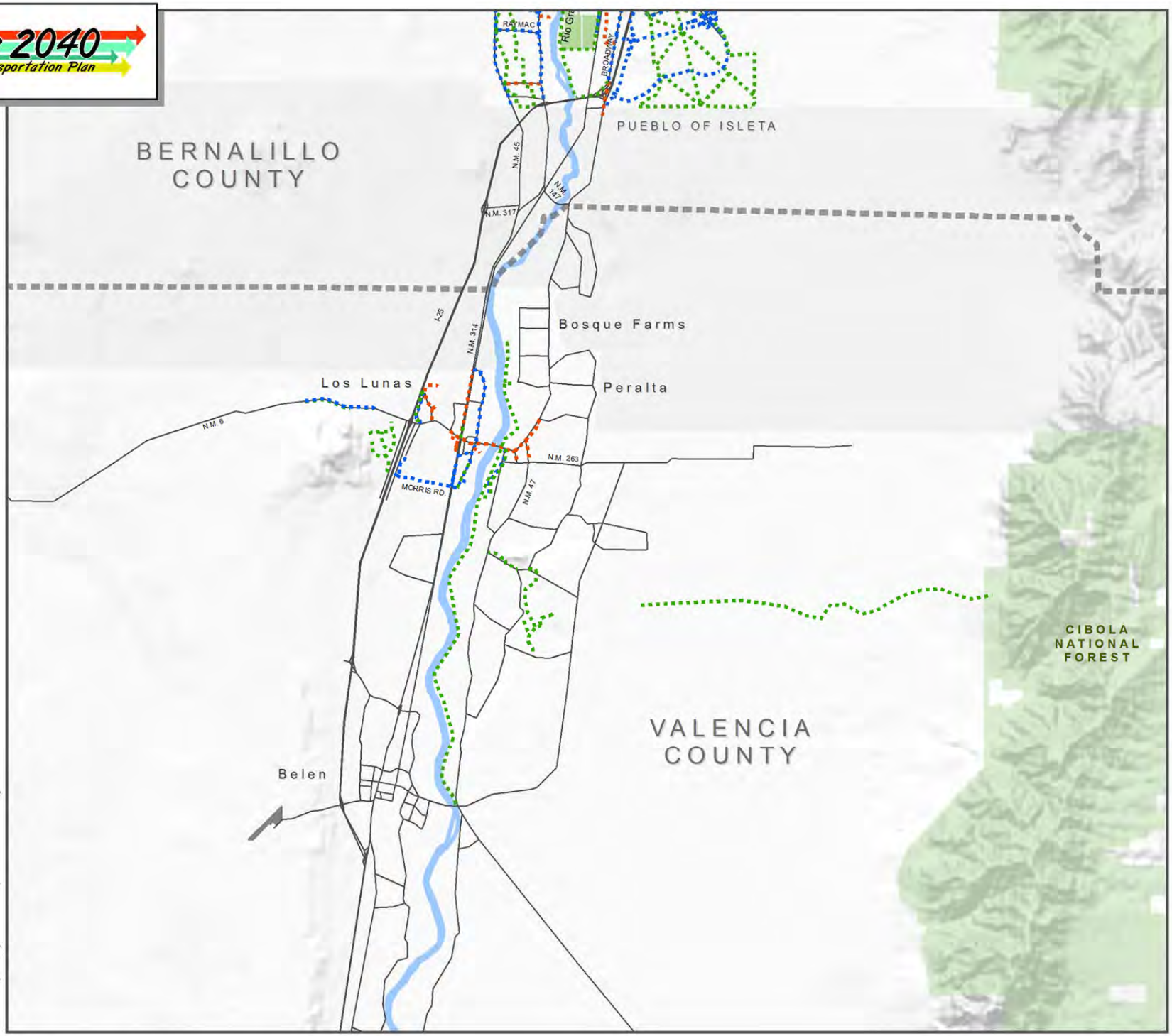
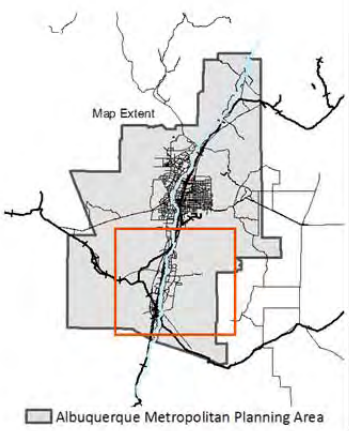
Futures 2040
Metropolitan Transportation Plan

Map 4.7: Long Range Transportation Systems (LRTS) Proposed Bikeway Network, Valencia County

- Paved Trail
- Bicycle Lane
- Bicycle Boulevard
- Bicycle Route
- County Boundaries
- Airports





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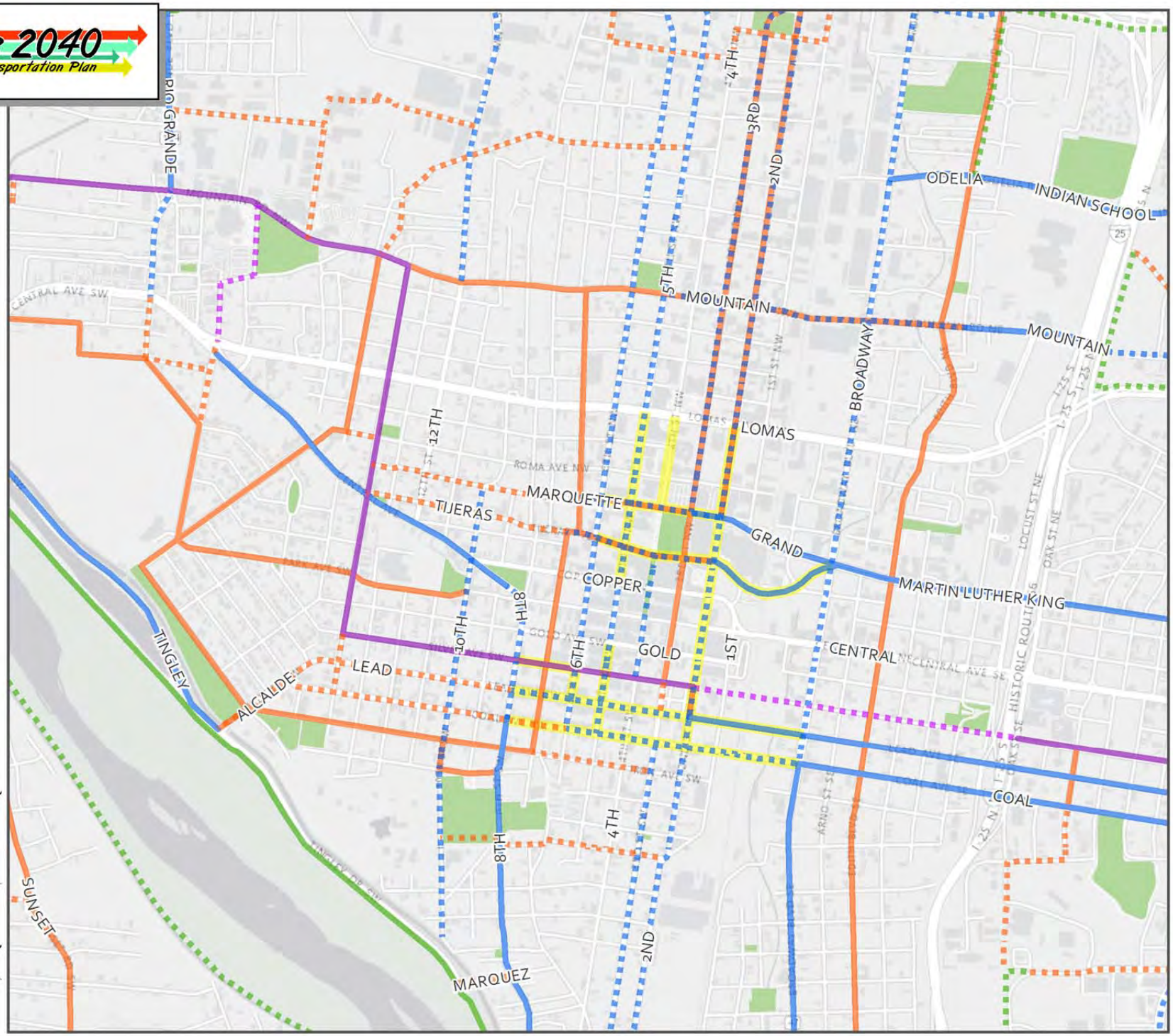
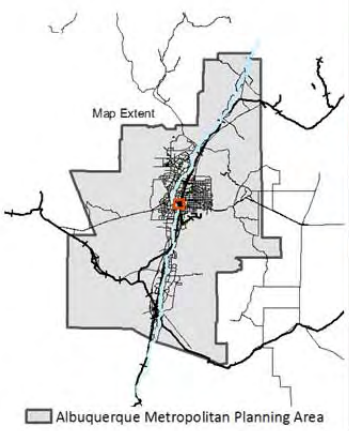
Futures 2040
Metropolitan Transportation Plan

Map 4.8: Long Range Transportation Systems (LRTS) Existing and Proposed Bikeway Network, Downtown Albuquerque

- Proposed, Bicycle Boulevard
- Proposed, Bicycle Lane
- Proposed, Bicycle Route
- Proposed, Paved Trail
- Existing, Bicycle Boulevard
- Existing, Bicycle Lane
- Existing, Bicycle Route
- Existing, Paved Trail
- Cycle Track Study Area
- Parks





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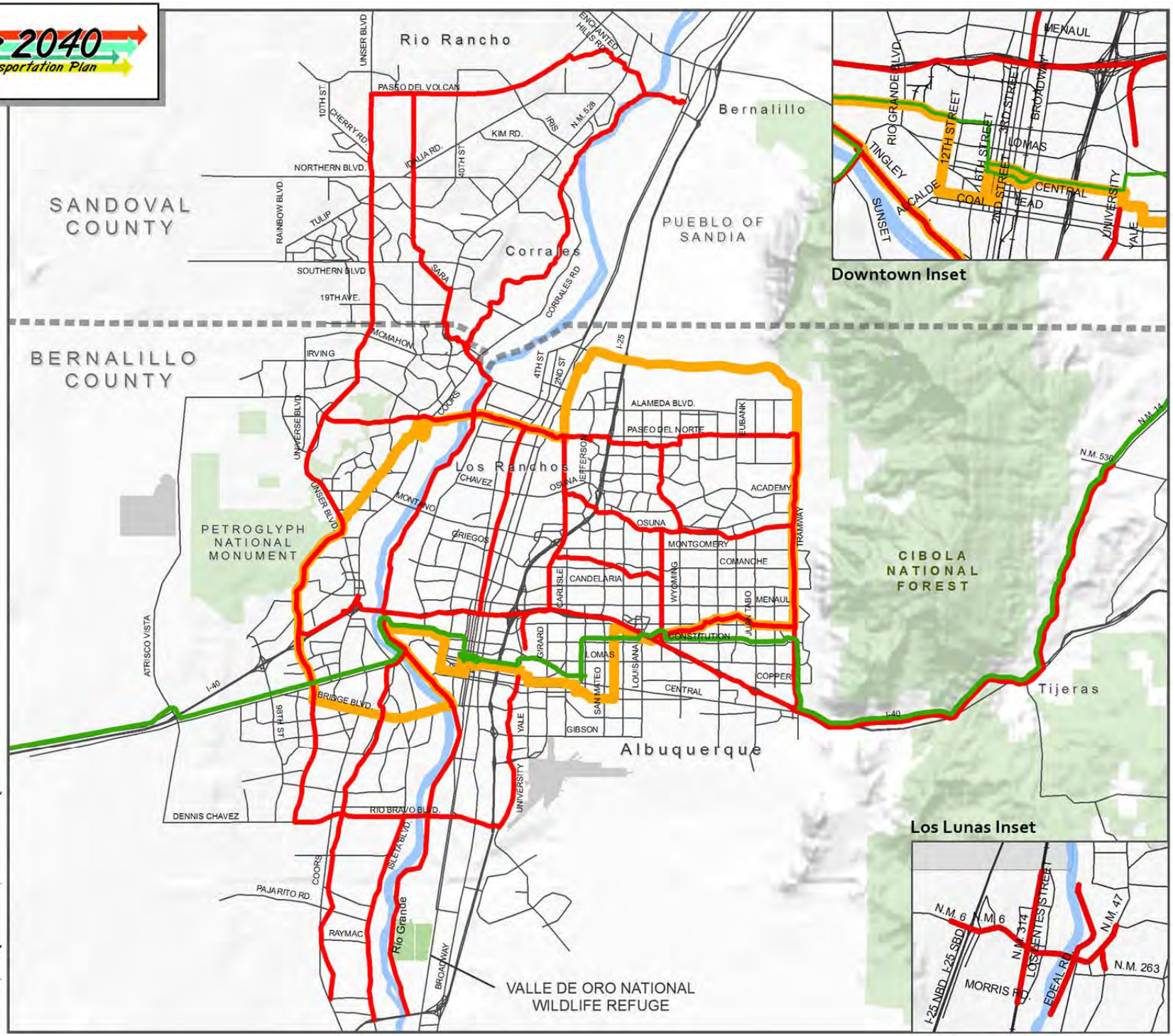
Metropolitan Transportation Plan

Map 4.9: Long Range Transportation Systems (LRTS) Special Alignments

- U.S. Bicycle Route 66
- Long Distance Routes
- 50 Mile Activity Loop

Base Map

- County Boundaries
- Airports



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4.5 CONNECTIVITY STRATEGIES

Although past development practices have not provided adequate connectivity to address future transportation demand, there are a number of ways to improve connectivity in developing and existing areas.

1. CONSULT LONG RANGE SYSTEM MAPS

Consult the Long Range System maps for future planned roadways, bikeways, and transit corridors and their recommended connections.

2. PROVIDE ADEQUATE ROADWAY CONNECTIVITY

The Long Range Roadway System provides basic minimal connections. As new areas develop, additional connectivity needs to be assessed based on the planned land use and anticipated residential densities. Often rural areas to develop into suburban areas and in some cases suburban areas develop into urban. In areas with this potential, roadway connections within the area and to surrounding areas need to be preserved and developed in conjunction with land use development.

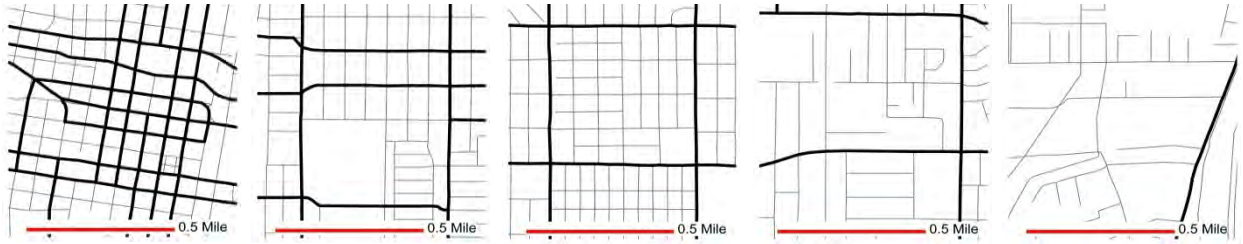
The following recommendations are based on two ITE documents: *Designing Urban Thoroughfares* and *Planning Urban Roadway Systems* and analysis of future travel demand. Descriptions of the connectivity measures are in section 8.3

Recommended Connectivity:

1. **Activity Centers:** Arterial and collector spacing less than a half-mile apart with a maximum 400' block length with over 90 four-leg intersections per square mile. Albuquerque's urban core is unique in the region. Figure 4.2 shows downtown Albuquerque in comparison to other networks. (Figure 4.2 example urban core: downtown Albuquerque, activity center: UNM area.)
2. **Urban:** Arterial and collector spacing at a half-mile apart with a maximum 600' block length and over 50 four-leg intersections per square mile. (Figure 4.2 example: NE Albuquerque)
3. **Suburban:** Arterial and collector spacing at approximately a mile apart, (but preferably less than a mile apart) with a maximum 800' block length and over 10 four-leg intersections per square mile. (Figure 4.2 example NE Albuquerque)
4. **Rural:** Arterial and collector spacing is often more than a mile apart with approximately 10 or less four-leg intersections per square mile. (Figure 4.2 example: S. Valley)

For all character areas: Dead-end streets and cul-de-sacs not allowed unless connections are physically infeasible.

FIGURE 4.2: CONNECTIVITY STANDARDS FOR DIFFERENT CHARACTER AREAS



URBAN CORE
Approx. 200 Four-leg intersections per square mile; closely spaced arterials & collectors.

ACTIVITY CENTER
Approx. 100 Four-leg intersections per square mile; arterials & collectors spaces less than 0.5 mile.

URBAN
Approx. 80 Four-leg intersections per square mile; arterials & collectors spaces at approx. 0.5 mile.

SUBURBAN
Approx. 40 Four-leg intersections per square mile; arterials & collector spaced at approx. 1 mile.

RURAL
Approx. 10 Four-leg intersections per square mile; arterials & collectors spaced more than 1 mile apart.

3. SUPPORT OVERALL NETWORK

New developments should show how all their proposed roadways and trail systems will make a contribution to the transportation system as a whole by providing routes that allow people to travel not only within the proposed development but also through it to adjacent developments. This involves balancing neighborhood and regional needs. In many cases, local road networks are planned to only serve the people who live on them, however neighborhood streets can provide excellent pedestrian and bicycle routes due to slower speeds and low traffic volumes.

Providing more ways for people to travel through the neighborhood allows for the traffic burden to be shared and allows for pedestrian and bicyclist connectivity. Providing this additional connectivity also requires improved traffic calming measures. However, traffic calming measures have great aesthetic potential making the neighborhood a more attractive place to live.

Local examples: The Cabezon neighborhood in Rio Rancho took advantage of every existing connection and preserved three connections with the neighborhood to the north of it.

5. ASSESS EASEMENTS

Assess drainage and utility easements as possible trails or local roads.

Local example: This image shows easements in dotted yellow along west Central Ave in the vicinity of Unser Blvd and Coors Blvd. This is an activity center targeted for reinvestment. The easements represent additional routes that can connect homes to the SW Transit Center and to shopping. These easements should be preserved and developed into trails or local roadways.

6. ENSURE ACCESS

Connect approved roadways between arterials to neighborhoods before land is developed to preserve future connectivity.

Local Example: This dead end street was originally intended to access Unser Blvd. However the connection was not made early in the development and neighbors now oppose the access. As the lot to the north develops into retail new access requests need to be made instead of capitalizing on a single access point that could serve both the neighborhood and the new development.

6. NEIGHBORHOOD ACCESS

Provide access to multi-purpose trails or sidewalks along arterials with bus rapid transit or priority transit that border neighborhoods but are inaccessible due to walls or drainage. These breaks in the wall connect pedestrians and bicyclists to trails and transit that otherwise is infeasible.

Local Example: This break in the wall allows the neighborhood access to a trail that makes regional connections along Unser Blvd in Rio Rancho.

Chapter 5

ROADWAY DESIGN GUIDELINES

Chapter 5

Roadway Design Guidelines

The following conceptual design recommendations for new roadways build upon character area, the roadway's regional role, and if the roadway is part of the Long Range Transit or Bikeway Systems. Once the surrounding context and the roadway's role in the network has been identified the next step is to determine the conceptual design. These recommendations provide basic guidance on right-of-way (ROW) set-aside width and a means for modal prioritization. The intent is to provide the minimum right-of-way width that also ensures good multi-modal accommodation in order to avoid costly retrofits later on. Expressways and interstates are not included in this guidance.

The following design recommendations are flexible and were developed to be context sensitive. They have been created to provide a wider range of options to member agencies. As such, these design guidelines provide a range of options depending on transportation and land use context. Each roadway context includes basic roadway specifications such as the number of lanes, driving lane width, sidewalk widths, and bicycling infrastructure.

These design guidelines draw on the best practices recommended by leading design guides, including:

- Institute of Transportation Engineers (ITE)'s Designing Walkable Urban Thoroughfares
- AASHTO's Guide for the Development of Bicycle Facilities 4th Edition
- Pennsylvania DOT's Smart Transportation Handbook
- NACTO's Urban Street Design Guide and Urban Bicycle Design Guide

Further design guidance can be found in each of these guides (please refer to the Appendix for a complete list). Wherever possible, the recommendations are grounded in the latest research of best practices, but adapted to the Albuquerque Metropolitan Planning Region's unique context.

5.1 RIGHT OF WAY PRESERVATION FOR FUTURE ROADWAYS

The LRTS Guide provides a range of right-of-way (ROW) as well as recommended (ROW) for individual elements that may be included in the roadway. The minimum ROW standards ensure adequate space is set aside for pedestrians, bicyclists, transit, and motorists. The maximum ROW is provided for roadways where additional ROW may be warranted for elements that require significant space such as transit lanes or adjacent trails, although in most cases this maximum ROW is not required to accommodate all users.

TABLE 5.1: Right-of-Way Ranges

Regional Principal Arterial	106'-156'
Community Principal Arterial	96'-130'
Minor Arterial	82'-124'
Major Collector	62'-100'
Minor Collector	48'-84'

Right-of-way flexibility helps to manage the trade-offs between smaller and larger right-of-ways. Smaller rights-of-way have the advantage of allowing for more developable land, lowering maintenance and construction costs, and creating shorter pedestrian crossing distances. However, wider rights-of-way provide more flexibility for multi-modal accommodation and allow for medians, which improve roadway safety and improve mid-block crossings for pedestrians.

NUMBER OF LANES

A critical consideration when developing future roadways is the number of lanes needed for anticipated travel demand. There are two key recommendations.

1. The conceptual design matrices (section 5.7) provide the maximum number of lanes based on roadway type and character area. If the maximum number of lanes is not sufficient to meet projected demand, creating additional, connected, parallel routes is recommended instead of adding more lanes beyond the recommended maximum. Expressways and interstates are not included in this guidance.
2. The Trend Scenario provides the official travel demand forecast and it should be used to determine future needs. However, it is worthwhile to look at the differences between the Trend and Preferred Scenario travel demand. A major issue with using the Trend Scenario travel demand is induced demand. Building roadways now to accommodate traffic 20 years in the future encourages more trips making capacity improvements less effective. Taking induced demand into consideration as well as the character area and the demand from the Preferred Scenario is recommended when planning for future travel demand needs.

REDUCING RIGHT OF WAY REQUIREMENTS

In some cases, there may be opportunities to *reduce* the minimum ROW set aside. The following are options can be used to reduce the overall amount of ROW dedication for new roadways. These options can also be used to deal with constrained ROW on an existing roadway.

1. **Ensure connectivity:** Roadways do not have to be as wide if they are part of a complete network that disperses traffic along many different routes. Creating a network with multiple parallel roads means roads can be narrower, carry less traffic individually, and support additional modes, while maintaining overall network efficiency and capacity (see s*ection 4.5 Connectivity Strategies* for appropriate levels of connectivity).
2. **Fewer lanes:** Reducing the number of lanes along a roadway may be acceptable given projected or actual traffic volumes. Future roadways, especially those embedded in well-connected networks, do not have to include as many lanes to support the same overall traffic volume.

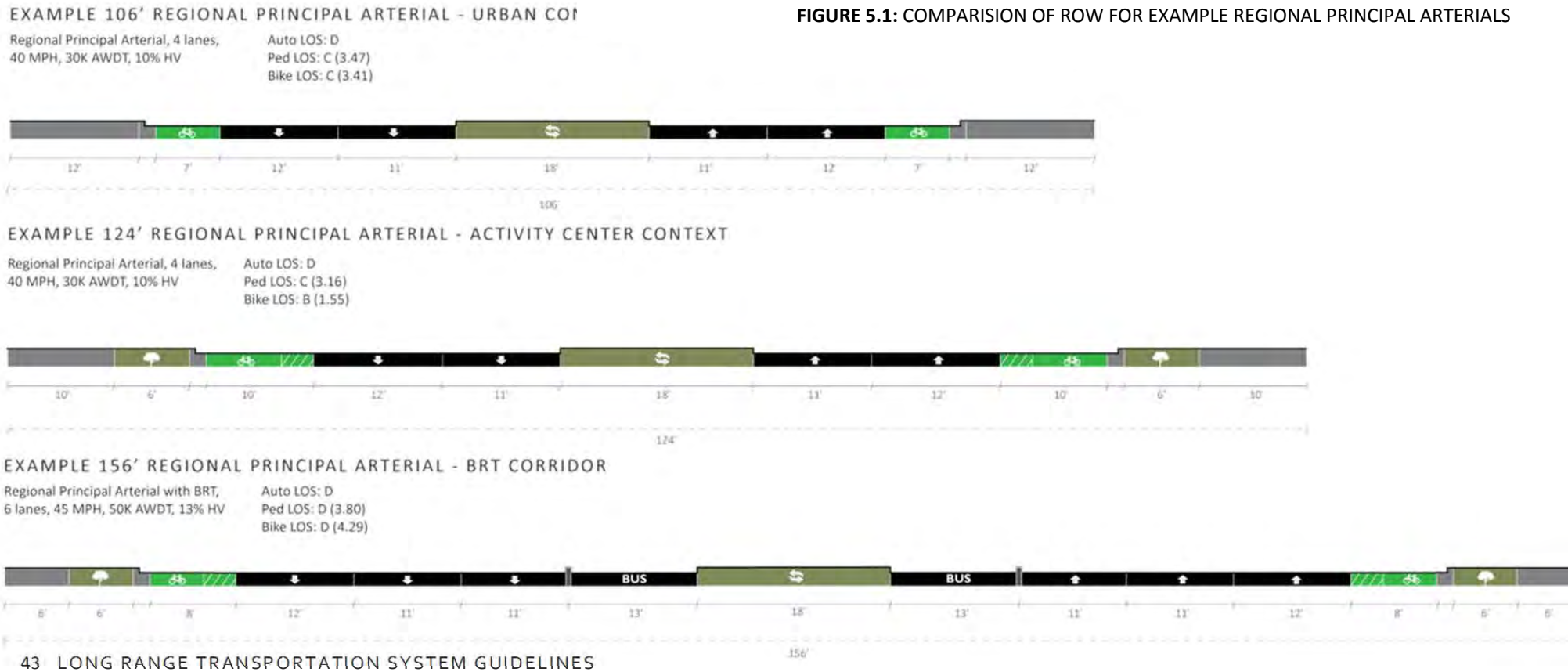
3. **Narrower lane widths:** Reducing the width of travel lanes can also reduce the ROW requirements. Generally, lane widths of 10 to 11 feet are recommended along urban roadways.
4. **Provide parallel bikeways:** Bicycling infrastructure does not need to be included along every roadway if there are parallel routes close by. Providing a bicycle route on a lower volume roadway may be a better option than trying to accommodate bicyclists on a principal arterial.

EXCEPTIONS & AMENDMENTS

In some cases, exceptions to the standard right-of-way requirements or changes to the system maps may be acceptable if there are existing constraints or additional considerations. Circumstances where exceptions may be necessary include:

- Environmental considerations
- Disproportionate costs
- ROW constraints on existing roadways
- Explicit preclusion of a certain use along the roadway, such as non-motorized travel
- Additional street design goals as listed in relevant sector plans.

FIGURE 5.1: COMPARISION OF ROW FOR EXAMPLE REGIONAL PRINCIPAL ARTERIALS



5.2 TRAVELED WAY DESIGN ELEMENTS

Traveled way is the section of the roadway between curbs.

LANE WIDTH

A standard lane width of 10 to 11 feet is recommended along all urban areas with speeds 35 MPH or lower. In urban areas, lane widths of 10 to 11 feet provide the same levels of service as wider lanes,[5] while maintaining or improving the overall safety of wider lanes.[6] Narrower lanes also reduce impervious surface coverage; require less construction material; have lower maintenance expenses; and reduce crossing distances for pedestrians.[7] Using narrower lanes also provides extra room for other roadway users. For example, reducing the lane widths from 12 to 11 feet on a six lane road creates room for a 3 foot bike lane buffer on each side of the road, increasing bicycle level of service significantly.

[5] Potts, I.B., Harwood, D.W., & Richard, K.R. (2007). Relationship of lane width to safety for urban and suburban arterials. *Geometric design and the effects on traffic operations 2007*, 63-82. Washington, DC: Transportation Research Board

[6] NACTO Urban Street Design Guide 34; Harwood, D.W. (1990). *Effective utilization of street width on urban arterials* (NCHRP Report 330). Washington, DC: Transportation Research Board

[7] NACTO, 34

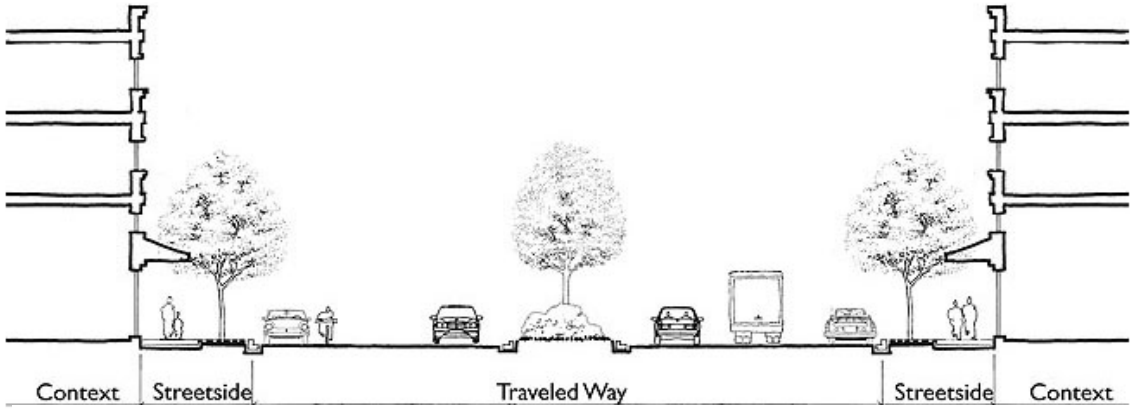


FIGURE 5.2: ELEMENTS OF THE TRAVELED WAY

Lane widths of 12 feet may be appropriate on roadways with speeds higher than 35 MPH higher, with higher percentages of heavy vehicles (including buses) and in rural contexts.[8] On slow collectors (30 mph and below), in constrained environments where there is not enough space for dedicated bicycle lanes, wider outside lanes improve bicycle level of service. Transit requires a minimum of 11 foot lane widths with 12 feet preferred.

Table 5.2 Lane Width

10'-11' for speeds 35 MPH or lower
11'-12' for speeds above 35 MPH, higher percentages of heavy vehicles and transit

[8] Highway Safety Manual 2010, 10-24: Lane widths under 12' result in crash modification factors greater than 1.00

DESIGN SPEEDS

Roadway design, target, and posted speeds should be set together with the context of the area clearly in mind. Generally, speeds 35 MPH or below are appropriate in urban areas.[9] In areas with higher levels of pedestrian or bicycle activity, even lower speeds are appropriate (30 MPH or lower).

This is because higher design speeds require more "forgiving" roadway design features: wider lanes, larger turning radii, clear zones, channelized turn lanes, and larger intersection spacing. This in turn reduces the comfort and safety of the street for other users, and lowers multimodal level of service scores. In addition, high-

[9] ITE Designing Walkable Urban Thoroughfares, 108

er speeds are associated with more severe crashes, including more fatalities.[10]

Given these considerations, posted speed should be consistent with the targeted design speed, using proactive design strategies including traffic calming, narrower lanes, street trees, and shorter signal lengths.

MEDIANS

Medians have many benefits: they facilitate left turns, create pedestrian refuge areas, create an attractive landscape buffer, allow for the installation of street infrastructure (such as lighting), and can increase roadway safety.[11].

TABLE 5.3: Recommended Median Widths for Roadways 35 mph or less[12]

Median Type	Recommended Width
Access control	6'
Pedestrian refuge	8'
Street Trees and Lighting	10'
Single left turn lane:	
Collector median	14'
Arterial median	16-18'
Dual left turn lane:	22'
Dedicated transit lanes:	22-24'

[10] NACTO Urban Street Design Guide 140; ITE Designing Walkable Urban Thoroughfares 111
[11] Highway Safety Manual,
[12] ITE 141

FIGURE 5.3: ANGLED PARKING IN UPTOWN

ON-STREET PARKING

On-street parking supplements the parking demand of nearby businesses and residences. It also increases the comfort of pedestrians by providing an additional buffer between the sidewalk and traffic. Parked cars not only create a physical shield between pedestrians and the roadway, but also effectively slow traffic, which can enhance a street's walkability.[13]

However, there are trade-offs with on-street parking. They introduce a visual obstruction for pedestrians and vehicles crossing the roadway and they reduce the capacity of the adjacent lane. On-street parking introduces an additional hazard for bicyclists, due to drivers opening their doors into occupied bike lanes ("dooring") or due to motorists entering and exiting parking spaces.

The preferred width of parallel on-street parking is 8 feet wide. A minimum of 13 feet is needed to include both a parallel parking lane and an adjacent bicycle lane. Shared lane markings and buffered bicycle lanes (with the buffer

[13] ITE Designing Walkable Urban Thoroughfares, 109

between parked cars and the bicycle lane) are strategies to reduce the risk of "dooring."[14]

Angled parking should be considered on wide streets with low speeds and volumes and in activity areas. Back angle parking is recommended for all angled parking and particularly for roadways that also include a bike route or lane.

TABLE 5.3: Minimum Dimensions for Angled Parking[15]

Angle	Stall Length	Minimum Width of Adjacent Lane
45˚	17' 8"	12' 8"
50˚	18' 3'	13' 3"
55˚	18' 8"	13' 8"
60˚	19' 0"	14' 6"

FIGURE 5.4: PEDESTRIAN CROSSING AT CENTRAL AVENUE AND 8TH STREET ROUNDABOUT

5.3 SAFE INTERSECTIONS

Visibility and predictability are key considerations at intersections: all users should have a clear view of each other so they can safely negotiate the intersection without conflict. Often, designing safe intersections is a challenge because intersections introduce many conflict points between users: motorists are turning, pedestrians of all abilities are crossing the street, buses are unloading passengers, and bicyclists are attempting to negotiate a safe crossing. Intersections are also often places where otherwise good street design breaks down: bike lanes end to make way for right turn lanes, crosswalks are not provided at logical crossing points, generous curb radii promote high turning speeds, and crossing signals do not allow adequate time for slower pedestrians to cross safely.

Because intersections introduce many conflict points, the safety of the most vulnerable users – pedestrians and bicyclists – should be prioritized. Many times this means providing shorter crossing distances for pedestrians, slowing traffic speeds, and enhancing bicycle and pedestrian visibility.

INTERSECTION CROSSWALKS

Highly visible marked crosswalks are essential elements of safe crossings and should be provided at all approaches of signalized intersections. Unmarked crosswalks may be appropriate at unsignalized intersections with lower speeds, unless located near large pedestrian generators such schools, high volume transit stops and commercial areas. See section 6.3 for more information about mid-block crossings.

[14] NACTO Urban Bikeway Design Guide 9, 133
[15] ITE Designing Walkable Urban Thoroughfares 147

CURB DESIGN

Curb design at intersections is important because it demarcates the transition zone between pedestrians and motorists. Turning movements are one of the top causes of pedestrian crashes at intersections.[16] Often this can be attributed to higher turning speeds and reduced visibility. Large curb radii (curb returns) can exacerbate this problem by promoting higher speed turns and by increasing pedestrian crossing distances. Smaller curb radii can be used to slow vehicles making right turns. Additionally, channelized right turn lanes reduce driver visibility and introduce additional conflict points. This creates an unsafe environment for pedestrians and increases intersection crossing times.

CURB EXTENSIONS

One way to slow traffic at intersections is to use curb extensions (also known as bulb outs) to extend the line of the curb into the street. This slows traffic and makes crossing distances shorter.[17] Curb extensions also provide a larger waiting area for pedestrians, reduce curb radii, and provide room for more accessible, perpendicular curb ramps.

Curb extensions can be considered at intersections of streets with on-street parking, as well as at midblock crossings. Bus bulbs outs can be used at bus stops to define the location of the stop as well as provide a space for transit shelters.

FIGURE 5.5: EXAMPLE OF A LANDSCAPED CURB EXTENSION IN NOB HILL

SIGNALS AND SIGNAL TIMING

Modifications to signal timing can be used to better accommodate pedestrians, transit vehicles or bicyclists. For example, walk signal times can be changed to allow slower walkers, including the elderly, to cross the street in one cycle. Planning for these users requires calculating walk times based on an average pedestrian speed of 3.0 – 3.5 MPH. Waiting times can also be reduced in high volume pedestrian areas.

ROUNDABOUTS

Modern roundabouts have been shown to reduce the number of crashes and crash severity at intersections as compared to signal controlled intersections.[18] This is achieved by reducing the number of conflict points at intersections, while keeping traffic flowing, which can also increase overall intersection capacity.

However, roundabouts can make it harder for pedestrians to cross the intersection, by increasing walking distance and requiring drivers to yield to pedestrians. Blind pedestrians, who rely on sound, often cannot determine if a motorist is yielding in a roundabout crossing.

[16] Ewing, Pedestrian- and Transit-Oriented Design 43
[17] ITE Designing Walkable Urban Thoroughfares 195
[18] ITE Designing Walkable Urban Thoroughfares 190

5.4 TRAFFIC CALMING

Efforts should be made to slow traffic on streets with pedestrian or bicycle activity. This includes minor arterials and collectors. This is important because higher speeds are associated with more severe crashes, as well as higher likelihoods of pedestrian and bicyclist fatalities. There are several active measures to reduce speed, some of which are outlined in Figure 5.6.[19]

5.5 TRANSIT

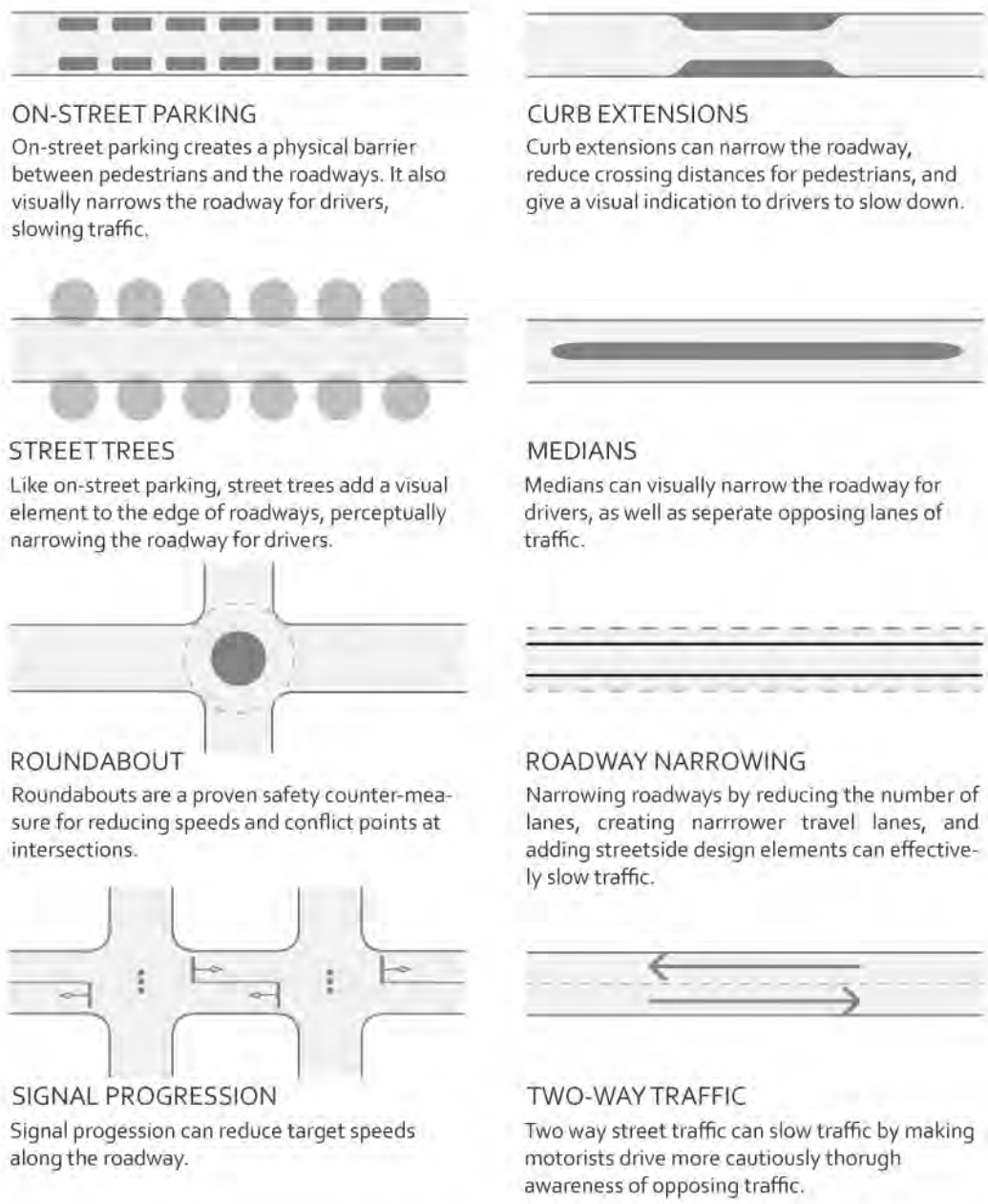
Transit users are pedestrians before they board and when they arrive at their destination, meaning the provision of minimum levels of streetside pedestrian facilities between transit stops and nearby destinations are critical to support higher transit levels of service.

TRANSIT LANES

Dedicated transit lanes can be considered along major transit routes where congestion may increase headways and reduce transit level of service. Generally, dedicated bus lanes should be 12 feet wide and no less than 11'.

BUS RAPID TRANSIT

FIGURE 5.6: EXAMPLE TRAFFIC CALMING MEASURES. ADOPTED FROM NACTO URBAN STREET DESIGN GUIDE AND ITE DESIGNING WALKABLE URBAN THOROUGHFARES



[19] AASHTO Guide for the Planning, Design, and Operation of Pedestrian Facilities, 40-41

FIGURE 5.7: EXAMPLE OF BUS FACILITIES IN DOWNTOWN ALBUQUERQUE

Bus Rapid Transit generally requires dedicated lanes, at grade boarding platforms, signal prioritization, and off-board fare collection. In addition, most routes require median transit platforms, which unlike traditional bus stops, require significant space. The recommended added width for transit platforms is 10 feet for each side platform and 30 feet for center platforms.[20]

Although transit in general does not require dedicated transit lanes, dedicated space at intersections for queue jumps may be recommended as well as additional dedicated space at bus stops.

[20] Bicycle Commuting and Facilities in Major U.S. Cities TRB 2003

TRANSIT STOPS

Transit users are pedestrians before they board and after they arrive at their destination, meaning that the provision of pedestrian facilities between transit stops and nearby destinations is critical to support higher transit levels of service. This includes providing, at minimum, a place to sit. Higher levels of service can be achieved by providing comfortable bus shelters, service information, real-time service updates and improved pedestrian level of service.

5.6 BICYCLE & TRAIL INFRASTRUCTURE

Providing safe and well-connected bicycling infrastructure is crucial to encouraging more bicycling. There is a direct correlation between the amount of bicycling infrastructure that is built and the number of people who choose to bike.[21] However, constructing bicycling infrastructure that is safe and accessible to bicyclists of all abilities is often challenging, especially within a constrained right-of-way. In addition, design standards for bicycling infrastructure are rapidly evolving as cities experiment with different configurations to learn what works best.

[21] Alliance for Biking & Walking. (2014). Bicycling and Walking in the United States 2014 Benchmark Report.

AASHTO's *Guide for the Development of Bicycling Facilities 4th Edition* and NACTO's *Urban Bicycling Design Guide* provide excellent guidance on current best practices that expand on the considerations below.

BICYCLE LANES

Bicycle lanes provide an exclusive travel lane for bicyclists to use within the roadway. They are generally included on community principle arterials, minor arterials, and major collections with higher traffic volumes or higher speeds. Bicycle lanes create benefits for both bicyclists and motorists: they provide lateral separation between cyclists and traffic, which increases bicyclist comfort and safety; they enable bicyclists to travel at comfortable speeds without worrying about traffic; and they provide more predictability to both users with regard to positioning and interaction.

AASHTO's *Guide for the Development of Bicycle Facilities* provides a recommended width of 5 feet for bicycle lanes. The LRTS Guide recommends 5 feet (not inclusive of the gutter pan) on roadways with posted speeds of 30 mph or less. On roadways with higher speeds wider lanes are recommended. For roadways with posted speeds of 35 mph, bike lanes 6 feet wide are recommended. In urban areas with curb and gutter, bicycle lanes 7 feet wide with a 3 foot striped buffer are recommended. In addition, on streets with on-street parking, wider lanes may be appropriate to protect bicyclists from accidental "dooring."

FIGURE 5.8: BICYCLE LANE AND PEDESTRIAN CROSSING

BARRIER PROTECTED BICYCLE LANES (CYCLE TRACKS)

In the case of regional principal arterials and community principal arterials, as well as in areas of higher bicycle traffic, protected bicycle lanes (or cycle tracks) may be appropriate. Protected bicycle lanes increase the lateral separation between motorists and bicyclists by including a buffer/barrier area between the outside of the bicycle lane and the outside auto lane. This area is usually 3 feet, and may include buffered striping, plastic divider bollards, or other physical barriers. Protected bike lanes can also be considered in areas with on-street parking where the bicycle lane is between the parked cars and the curb.

Currently, there are no barrier protected bicycle lanes (cycle tracks) in the region; however, there are areas in downtown Albuquerque where this type of facility is being studied (please see Long Range Bikeway System).

FIGURE 5.9: MULTI-USE PATH ALONG PASEO DEL NORTE

BICYCLE BOULEVARDS & SHARED LANE MARKING (SHARROWS)

On streets with low traffic volumes (<3,000 ADWT) and with posted speeds 25 MPH or less, sharrows may be used to indicate the presence of bicyclists.[22] Sharrows are on-street markings that indicate a shared lane between motorists and bicycles. They remind both users to expect the presence of bicyclists, without having to add an exclusive bike lane (which is not always feasible in a constrained right-of-way).

Sharrows can be coupled with bicycle boulevards to create connecting, parallel routes for bicycle traffic away from higher volume roadways. Bicycle boulevards are streets that are designated to prioritize bicycle traffic. They utilize lower traffic speeds, traffic calming, unique signage, and pavement markings. Bicycle boulevards running parallel to major streets can increase the accessibility for riders who are less comfortable riding on these major roadways. They also provide a secondary option to create connected routes between primary bicycling routes and the full bicycling network.

[22] NACTO Urban Bikeway Design Guide, 136

MULTI-USE PATHS

The region's multi-use paths are very popular and several new trails are planned along regional principal arterials. However, there are many considerations and trade-offs in the development of trails alongside roadways. Trails along roadways involve significant safety considerations[23] and they require a substantial amount of right-of-way. In an effort to explore alternatives that provide facilities that are comfortable and attractive, while investigating options that require less space, trails may be substituted with cycle tracks and sidewalks with buffers in areas where this configuration is vetted as a reasonable alternative.

BIKEWAY INTERSECTION MARKINGS & SIGNAL DETECTION

Like crosswalks, bicycle intersection markings indicate to motorists the intended path (and implied presence) of cyclists. They also guide cyclists through intersections with additional conflict points or high levels of activity. This helps increase safety, especially where there is the potential conflict for cyclists and motorists making right hand turns.[24] One example of a newer practice is to install bike boxes at intersections with high volumes of traffic. These

[23] AASHTO Guide for the Development of Bicycle Facilities, 5-8

[24] NACTO Urban Bikeway Design Guide, 50

allow bicyclists to queue at the front of the intersection, between the crosswalk and cars, which increases their visibility to motorists. They can also facilitate safer left turns by bicyclists.[25]

Often bikeways are on roadways that do not have signal priority or that require a motor vehicle to be detected in order to for the signal to change. Bicycle detection at signalized intersections provides a means to address cyclists reasons for running red lights. Also bicyclist detection can be used to improve the intersection's safety by providing adequate time for the bicyclist to cross the intersection.

FIGURE 5.10: DOWNTOWN ALBUQUERQUE

5.7 SPECIAL STREETS

Depending on the land use context of the street, the roadway may also function as a special street – for example, as a multi-way boulevard in a commercial area. These special streets involve unique design considerations that involve more detailed considerations to support existing land uses and users. A few of the special streets referenced in this guide include:

1. **Downtown Streets** often handle higher pedestrian volumes, many turning movements, business deliveries, and higher density developments. For these reasons, special care must be taken to ensure that downtown streets support a safe and attractive environment that accommodates pedestrians and bicyclists while supporting surrounding land uses. Often this means keeping speeds low, installing traffic calming features such as curb extensions, and providing a robust network of bicycle infrastructure. Specific considerations include creating wider sidewalks, installing street trees, converting one-way streets to two way streets, adding on-street parking, and creating attractive, clearly visible transit amenities.
2. **Multi-way Boulevards** are a design option for wider, principal and minor arterial roadways to support more walkable, bicycle-friendly streets. The often support slower traffic, mixed land uses, and an attractive, pedestrian-oriented public realm. Multi-way boulevards include a central median and a central traveled way bordered by landscape buffers that separate the main thoroughfare from parallel access roads. Access roads often include on-street parking, bikeways, and pedestrian ameni-

[25] NACTO Urban Bikeway Design Guide, 50

FIGURE 5.11: RURAL MAINSTREET – LAS VEGAS, NM

ties. Street trees and other landscape design features are key elements of traditional multi-way boulevards.

3. **One-way street couplets** such as Lead and Coal can function together as a unified corridor for regional travel. These streets, working in concert, can carry a high volume of traffic (from all modes) within a narrower overall right of way. Such a configuration can allow for better accommodation of all modes without having to squeeze amenities for all modes within a single constrained right-of-way.
4. **Transit Corridors** are designed to accommodate high capacity transit services such as Bus Rapid Transit (BRT) along existing arterial streets. They often have dedicated travel lanes for buses, median transit stations, special signal timing, and expanded pedestrian amenities. Given the high number of riders on these lines, special care must be taken to facilitate safe crossings for pedestrians. Because dedicated bus lanes add to the right of way requirements of these streets, these streets can become quite wide making it challenging to balance the needs of all modes. However, new transit corridors have the opportunity to catalyze economic development along a corridor by offering expanded mode choices, connecting key job centers, increasing pedestrian traffic, and raising land values.

5.8 ROADWAY SPECIFICATIONS

The following street typology matrices provide conceptual design recommendations for new roadways based on functional classification and character area. These matrices provide basic guidance on right-of-way (ROW) set-aside widths for new streets within the Albuquerque Metropolitan Planning Area. Additional right-of-way may be required for special purposes such as intersection widening, drainage, slopes, and landscaping. However, the required right-of-way width may be reduced for a street in a fully or substantially developed area when a different right-of-way has been platted or otherwise publicly acquired for the street.

REGIONAL PRINCIPAL ARTERIAL

Regional principal arterials prioritize motor vehicle, transit, and freight movement. They are intended to support longer, regional trips. Generally, they carry a higher volume of traffic (15,000 – 50,000 AWDT), have higher speeds, and have larger right-of-way requirements. For these reasons, regional principal arterials should only be planned along the periphery of activity centers. In the cases where a regional principal arterial bisects an activity center, the roadway should slow down and be designed and operated like a community principal arterial.

DESIGN CONSIDERATIONS

1. These roads may carry high capacity transit (such as BRT) traveling longer distances. Dedicated transit lanes may be provided in these cases.
2. Given their higher speeds and volumes, bikeways should not be included on these roadways if there are existing parallel routes within 1,000 feet.
3. These streets may be designed as multi-way boulevards if traveling through areas with increased pedestrian traffic.

BICYCLE INFRASTRUCTURE

Option 1: Given that regional principal arterials carry high volumes of fast traffic, it is recommended to plan bikeways on parallel roadways within 1,000' of a regional principal arterial, preferably on either side of the arterial

Option 2: Adjacent multi-use path and bicycle lanes and bicycle lane with striped buffer for roadways with higher speeds

Option 3: Bicycle lane with striped buffer for roadways with high speeds

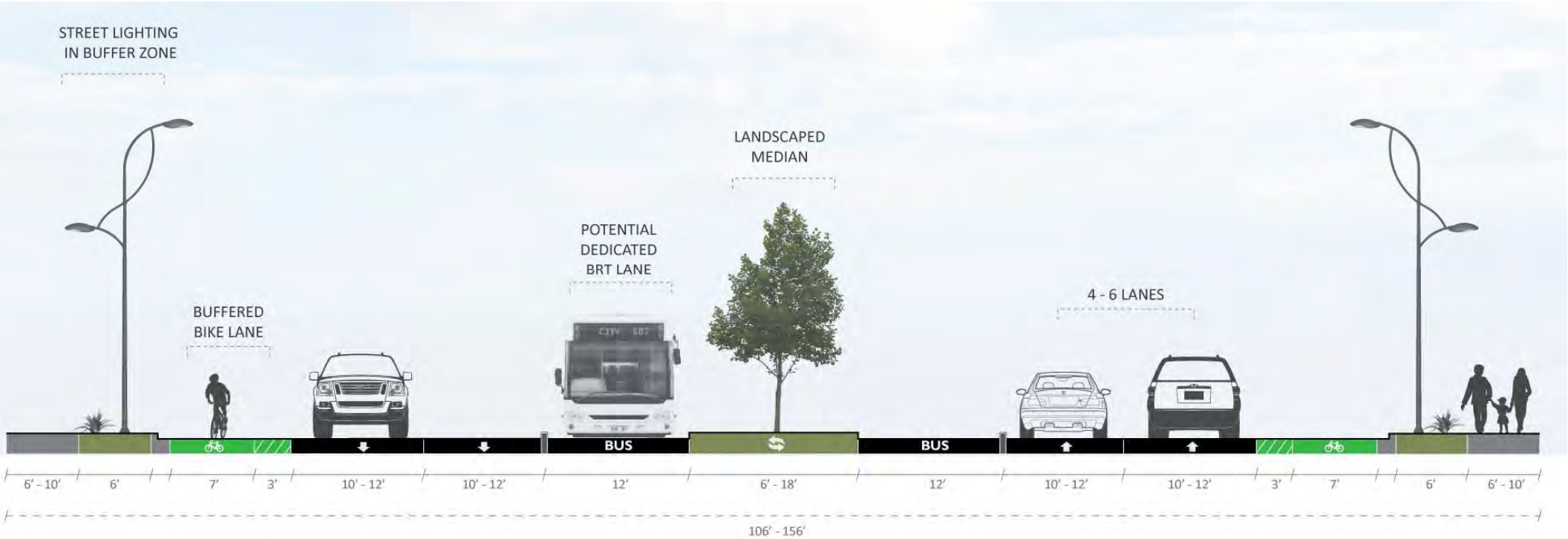


TABLE 5.4: REGIONAL PRINCIPAL ARTERIAL

ROW RANGE: 106'-156'

Character Area	ACTIVITY CENTER	URBAN	SUBURBAN	RURAL	MAIN STREET
Examples	Unser at Rio Rancho City Center	Coors & Montaño	Unser & Montaño	Sen. Dennis Chavez	N/A
STREETSIDE MINIMUMS (ONE SIDE)					
Landscape buffer	6'	6'	6'	8'-14' paved shoulder (both sides) and/or an 8-10' multi-use trail with a 5' buffer	*See Community Principal Arterial Main Street*
Clear Sidewalk width	10'	6'	6'		
Building Shy Zone (ingress/egress)*	2'	2'	2'		
Streetside Width (for one side only)	18'	14'	14'		
BIKEWAYS (ONE SIDE)					
Multi-Use Path	*See Long Range Bikeway System*			8'-14' paved shoulder (both sides) and/or an 8'-10' multi-use trail with a 5' buffer from the roadway	*See Community Principal Arterial Main Street*
Multi-Use Path Outside Buffer	5'	5'	5'		
Multi-Use Path Inside Buffer	3'	3'	3'		
Paved Multi-Use Path Width	10'-14'	10'-14'	10'-14'		
Barrier Protected Bicycle Lane (Cycle Track)	*See NACTO Urban Bikeway Design Guide for Cycle Tracks. Barrier protected cycle tracks may be considered in lieu of a multi-purpose trail as long as the roadway has sidewalks that meet the streetside minimums above.*				
Bicycle Lane (widths do not include gutter pan)	Posted Speed 30 mph or lower: 5' bicycle lane Posted Speed 35 mph: 6' bicycle lane Posted Speed >40 mph: 7' bicycle lane with 3' striped buffer				
TRANSIT					
Dedicated Bus Lane	*See Long Range Transit System: Include 24' for bus rapid transit routes.*				N/A
ROADWAY					
Maximum Number of Through Lanes	2-6	4-6	4-6	4-6	*See Community Principal Arterial Main Street*
Desired Operating Speed	30-35 MPH	30-35 MPH	40-55 MPH	35-55 MPH	
Lane Width	10'-11'	10'-12'	10'-12'	11'-12'	
Outside Lane Width (heavy vehicles)	12'	12'	12'	12'	
Parallel Parking	-	-	-	-	
Median/Center Turn Lane	6'-18'	6'-18'	6'-18'	6'-18'	

*Include 2' if buildings, walls, or other vertical structures are planned adjacent to public ROW. *Please see Building Shy Zone in Section 6.1.*

COMMUNITY PRINCIPAL ARTERIAL

Community principal arterials do not prioritize one mode over another; instead they strive to achieve a balance through several strategies. Although these roadways are given the functional classification of principal arterial, these corridors include many destinations with direct access from the arterial. Travel on community principal arterials tends to be over relatively short distances and to destinations with access directly on that arterial. Community principal arterials tend to have lower volumes (10,000 – 30,000 AWDT), lower speeds, and fewer lanes than regional principal arterials. Design options for community principal arterials include multi-way boulevards, or one-way couplets like Lead/Coal Ave.

DESIGN CONSIDERATIONS

1. These streets may be multi-way boulevards if traveling through areas with increased pedestrian traffic.
2. These routes may carry high capacity transit (BRT) traveling longer distances. Dedicated transit lanes may be provided in these cases.
3. On-street parking may be considered in activity centers or urban areas with commercial activity.
4. Depending on volume, fewer lanes may be necessary on these streets. Narrower lanes can be considered in activity areas with high pedestrian volumes.

BICYCLE INFRASTRUCTURE

Option 1: Barrier protected bicycle lane/cycle track in activity centers

Option 2: Bicycle lane with striped buffer for roadways with high speeds

Option 3: Use a gridded network and plan bikeway on parallel roadways within 1,000' of community principal arterial

Option 4: Adjacent multi-use path and bicycle lane with striped buffer for roadways with higher speeds

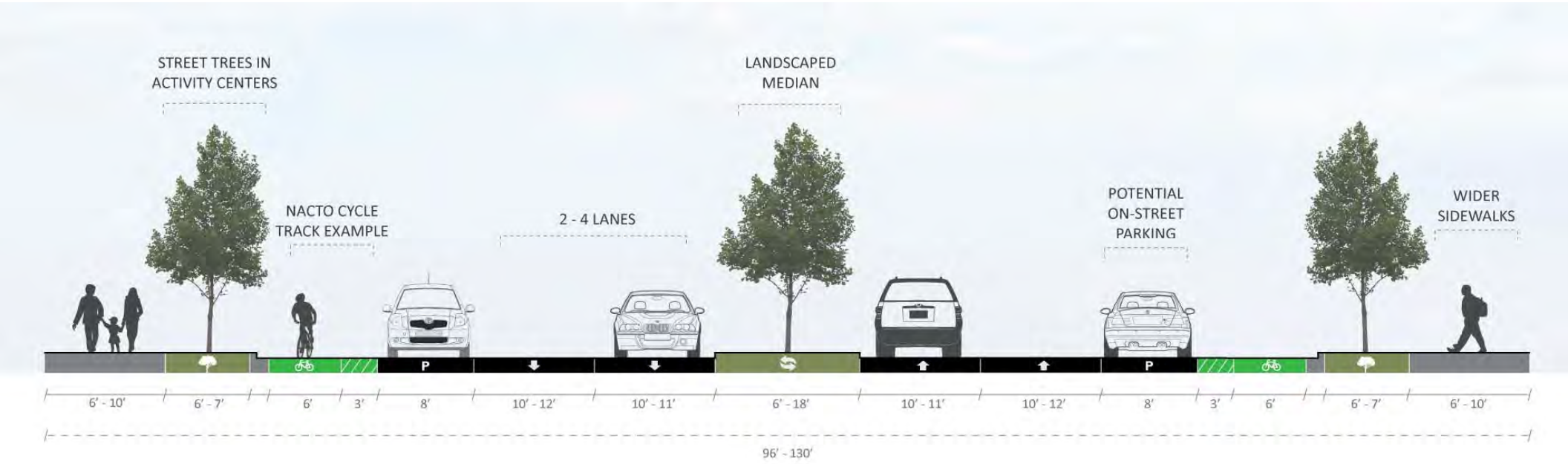


TABLE 5.5: COMMUNITY PRINCIPAL ARTERIAL — ROW RANGE: 96'-130'

Character Area	ACTIVITY CENTER	URBAN	SUBURBAN	RURAL	MAIN STREET
Examples	Central Ave	Osuna & Jefferson	Southern Blvd	Isleta Blvd	4th St at Guadalupe Plaza
STREETSIDE MINIMUMS (ONE SIDE)					
Landscape buffer	7' (tree well)	6'	6'	8'-14' paved shoulder (both sides) and/or an 8-10' multi-use trail with a 5' buffer	6' (tree well)
Clear Sidewalk width	10'	10'	6'		6'
Building Shy Zone (ingress/egress)*	2'	2'	2'		-
Streetside Width (for one side only)	19'	18'	14'		12'
BIKEWAYS (ONE SIDE)					
Multi-Use Path	*See Long Range Bikeway System*			8'-14' paved shoulder (both sides) and/or an 8'-10' multi-use trail with a 5' buffer from the roadway	Consider a barrier protected bicycle lane/cycle track. Otherwise use a minimum 5' shoulder or bike lane.
Multi-Use Path Outside Buffer	N/A	5'	5'		
Multi-Use Path Inside Buffer	N/A	3'	3'		
Paved Multi-Use Path Width	N/A	10'-14'	10'-14'		
Barrier Protected Bicycle Lane (Cycle Track)	*See NACTO Urban Bikeway Design Guide for Cycle Tracks. Barrier protected cycle tracks may be considered in lieu of a multi-purpose trail as long as the roadway has sidewalks that meet the streetside minimums above.*				
Bicycle Lane (widths do not include gutter pan)	Posted Speed 30 mph or lower: 5' bicycle lane (min 13' for combined parallel parking and bike lane.) Posted Speed 35 mph: 6' bicycle lane Posted Speed >40 mph: 7' bicycle lane with 3' striped buffer				
TRANSIT					
Dedicated Bus Lane	*See Long Range Transit System: Include 24' for bus rapid transit routes.*				
ROADWAY					
Maximum Number of Through Lanes	2-4	2-4	4	2-4	2-4
Desired Operating Speed	25-30 MPH	30-35 MPH	35-40 MPH	30-40 MPH	25-30 MPH
Lane Width	10'-11'	10'-11'	10'-12'	10'-12'	10'-11'
Outside Lane Width (heavy vehicles)	12'	12'	12'	12'	12'
Parallel Parking	7'-8'	7'-8'	-	-	7'-8'
Median/Center Turn Lane	6'-18'	6'-18'	6'-18'	6'-18'	6'-18'

*Include 2' if buildings, walls, or other vertical structures are planned adjacent to public ROW. *Please see Building Shy Zone in Section 6.1.*

MINOR ARTERIAL

Minor Arterials provide the connectivity of principal arterials, but they prioritize slower moving traffic, bicyclists and pedestrians in order to give these modes other options to reach destinations without needing to be on a principal arterial. They generally have fewer lanes, lower speeds, and lower volumes (6,000 – 20,000 AWDT) than principal arterials. Given their lower speeds and volume, additional design elements may be worth considering on these streets, including on-street parking, bicycle lanes, expanded sidewalks, and landscape improvements.

DESIGN CONSIDERATIONS

1. On-street parking may be considered in activity centers or urban areas with commercial activity.
2. Depending on volume, fewer lanes may be necessary on these streets. Narrower lanes can be considered in activity centers with high pedestrian volumes.
3. Two through lanes with a central left turn lane may be desirable on these streets.
4. These streets provide opportunities to implement green infrastructure.

BICYCLE INFRASTRUCTURE

Option 1: Bicycle lane

Option 2: Barrier protected bicycle lane/cycle track in activity centers and/or high traffic areas

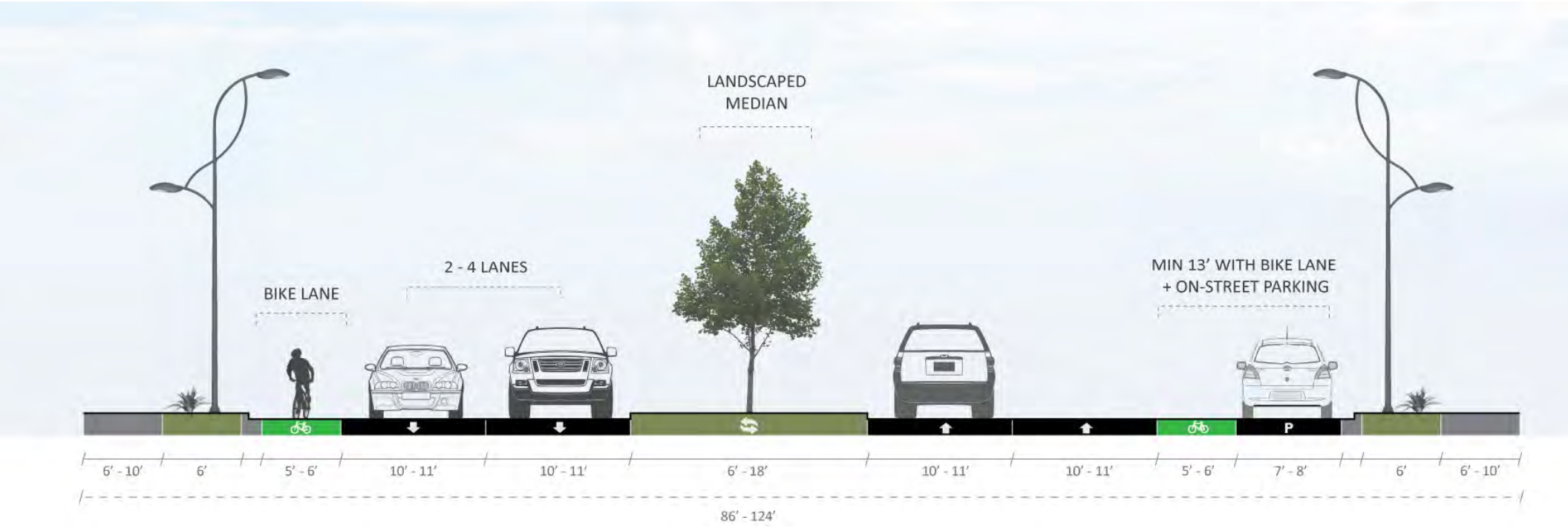


TABLE 5.6: MINOR ARTERIAL

ROW RANGE: 86'-124'

Character Area	ACTIVITY CENTER	URBAN	SUBURBAN	RURAL	MAIN STREET
Examples	Seven Bar Loop in Cottonwood	Candelaria	Harper or Sage	Rio Grande Blvd	Corrales Rd in village Center
STREETSIDE MINIMUMS (ONE SIDE)					
Landscape buffer	6' (tree well)	6'	5'	4' paved shoulder (both sides) and/or 5' buffer with 8' multi-use path (one side)	6' (tree well)
Clear Sidewalk width	10'	6'	6'		6'
Building Shy Zone (ingress/egress)*	2'	-	-		-
Streetside Width (for one side only)	18'	12'	11'		12'
BIKEWAYS (ONE SIDE)					
Multi-Use Path	*See Long Range Bikeway System*			4' paved shoulder (both sides) and/or 5' buffer with 8' multi-use path (one side)	4' shoulder
Multi-Use Path Outside Buffer	N/A	5'	5'		
Multi-Use Path Inside Buffer	N/A	3'	3'		
Paved Multi-Use Path Width	N/A	10'-12'	10'-12'		
Barrier Protected Bicycle Lane (Cycle Track)	*Consider in areas of high bicycle activity.*				
Bicycle Lane (widths do not include gutter pan)	Posted Speed 30 mph or lower: 5' bicycle lane (min 13' for combined parallel parking and bike lane.) Posted Speed 35 mph: 6' bicycle lane				
TRANSIT					
Dedicated Bus Lane	*See Long Range Transit System: Include 24' for bus rapid transit routes.*				
ROADWAY					
Maximum Number of Through Lanes	2-4	2-4	2-4	2-4	2
Desired Operating Speed	25-30 MPH	30-35 MPH	30-40 MPH	35-40 MPH	25-30 MPH
Lane Width	10'-11'	10'-11'	10'-11'	10'-11'	10'-11'
Outside Lane Width (heavy vehicles)	12' if on the Long Range Transit System as a current or future bus route.				
Parallel Parking	7'-8'	7'-8'	-	-	7'-8'
Median/Center Turn Lane	6'-14'	6'-14'	6'-18'	6'-18'	6'-18'

*Include 2' if buildings, walls, or other vertical structures are planned adjacent to public ROW. *Please see Building Shy Zone in Section 6.1.*

MAJOR COLLECTOR

Major Collectors provide additional needed connectivity between destinations on arterials and neighborhoods. They usually have 2 to 4 lanes, low traffic volumes (3,000 – 12,000 AWDT), and prioritize bicyclists and pedestrians. Bicyclists should be able to use collectors for long segments of their trips and motorists will generally use them for short segments of their trips. As with minor arterials, additional design considerations include adding on-street parking, bicycle lanes, expanded sidewalks, and landscape improvements (e.g., green infrastructure).

DESIGN CONSIDERATIONS

1. On-street parking may be considered in activity centers or urban areas with commercial activity.
2. Depending on volume, fewer lanes may be necessary on these streets. Narrower lanes can be considered in activity centers or locations with high pedestrian volumes.
3. Two through lanes with a central left turn lane may be desirable on these streets.
4. These streets provide opportunities to implement green infrastructure.

BICYCLE INFRASTRUCTURE

Option 1: Bicycle lane

Option 2: Sharrow/Shared Lane

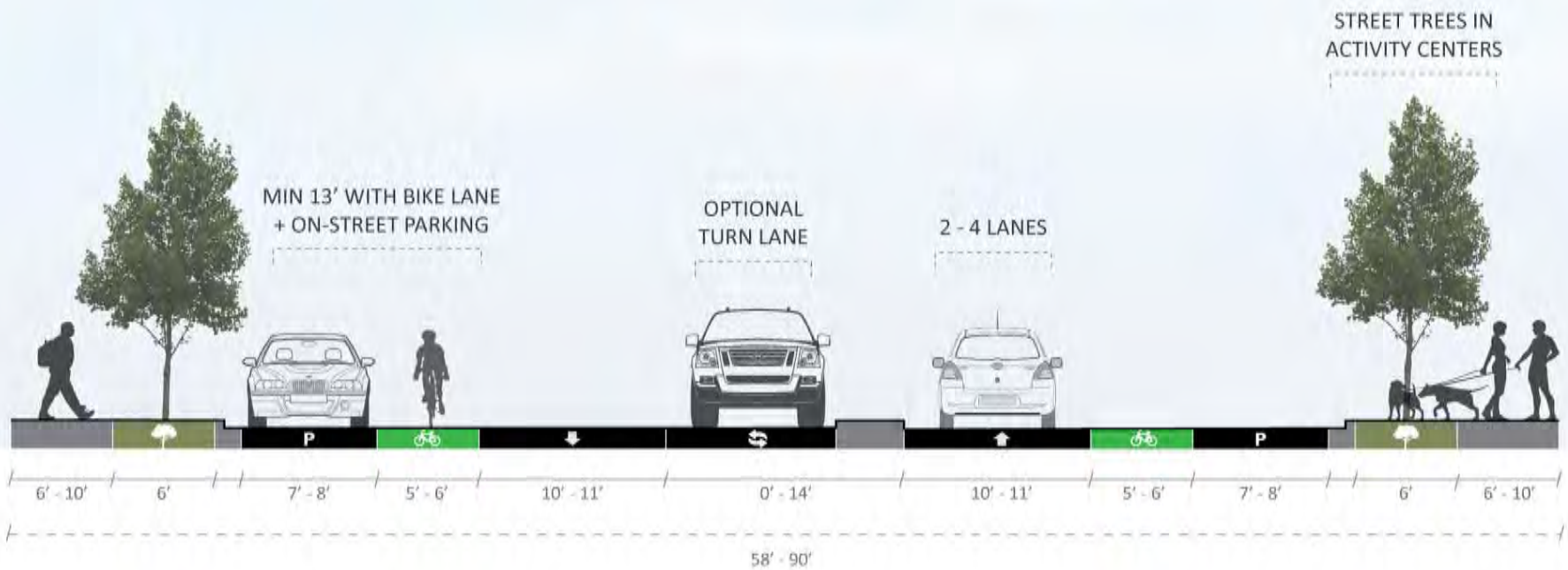


TABLE 5.7: MAJOR COLLECTOR

ROW RANGE: 58'-90'

Character Area	ACTIVITY CENTER	URBAN	SUBURBAN	RURAL	MAIN STREET
Examples	Seven Bar Loop in Cottonwood	Comanche	Meadowlark	Frost Rd	NM 333 in Tijeras
STREETSIDE MINIMUMS (ONE SIDE)					
Landscape buffer	6' (tree well)	6'	5'	4' paved shoulder (both sides) and/or 5' buffer with 8' multi-use path (one side)	6' (tree well)
Clear Sidewalk width	9'	6'	6'		6'
Building Shy Zone (ingress/egress)*	2'	-	-		-
Streetside Width (for one side only)	17'	12'	11'		12'
BIKEWAYS (ONE SIDE)					
Multi-Use Path	*See Long Range Bikeway System*			4' paved shoulder (both sides) and/or 5' buffer with 8' multi-use path (one side)	4' shoulder
Multi-Use Path Outside Buffer	N/A	N/A	5'		
Multi-Use Path Inside Buffer	N/A	N/A	3'		
Paved Multi-Use Path Width	N/A	N/A	10'-12'		
Shared Lane Marking (See NACTO Urban Bikeway Design Guide)	Appropriate for streets with posted speeds of 25 mph or lower and AWDT less than 3,000.				
Bicycle Lane (widths do not include gutter pan)	Posted Speed 30 mph or lower: 5' bicycle lane (min 13' for combined parallel parking and bike lane.) Posted Speed 35 mph: 6' bicycle lane				
ROADWAY					
Maximum Number of Through Lanes	2	2-4	2-4	2-4	2
Desired Operating Speed	25-30 MPH	25-35 MPH	30-35 MPH	35-40 MPH	25-30 MPH
Lane Width	10-11'	10'-11'	10'-11'	10'-11'	10'-11'
Outside Lane Width (heavy vehicles)	12' if on the Long Range Transit System as a current or future bus route.				
Parallel Parking	7'-8'	7'-8'	7'-8'	-	7'-8'
Median/Center Turn Lane	0'-14'	0'-14'	0'-14'	0'-14'	0'-14'

*Include 2' if buildings, walls, or other vertical structures are planned adjacent to public ROW. *Please see Building Shy Zone in Section 6.1*

MINOR COLLECTOR

Minor collectors provide additional connectivity between destinations on arterials and neighborhoods. They typically have low traffic volumes (under 6,000 AWDT), and prioritized access to residential areas and local businesses. In most cases, due to low speeds and low traffic volumes, bicyclists should be able to share the road comfortably using shared lane markings (sharrows); however, the streetside environment is similar to major collectors.

DESIGN CONSIDERATIONS

1. On-street parking may be considered in activity centers or urban areas with commercial activity.
2. These streets provide opportunities to implement green infrastructure.

BICYCLE INFRASTRUCTURE

Option 1: Sharrow/Shared Lane

Option 2: Bicycle lane

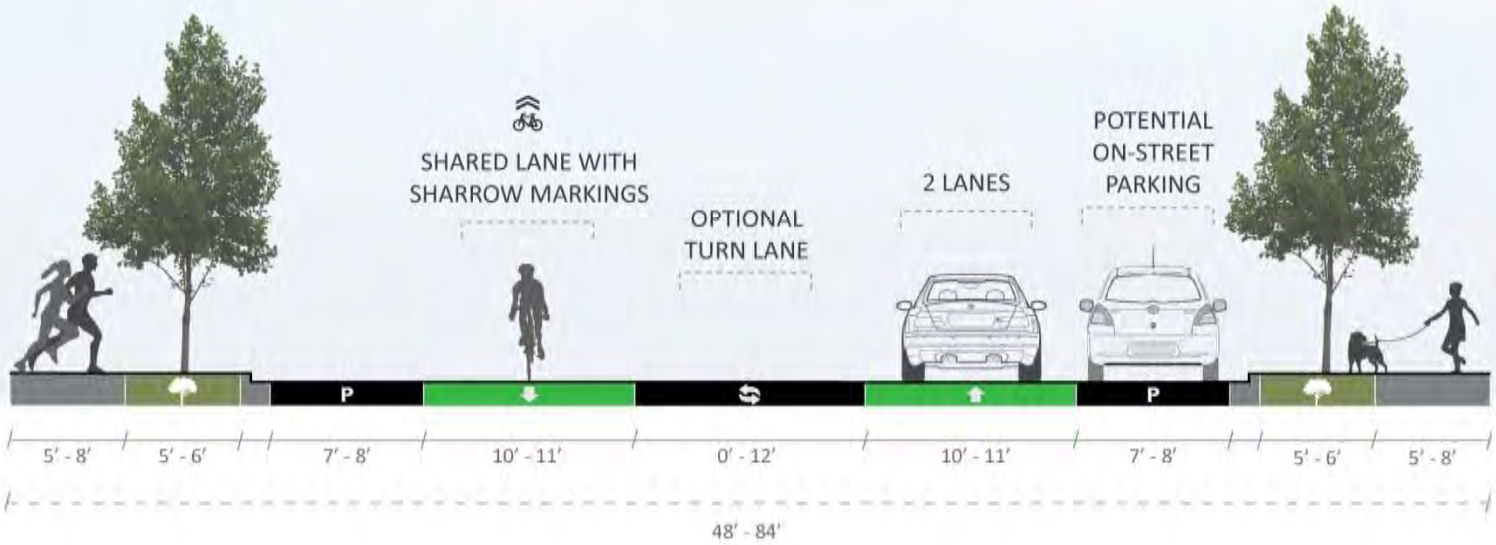


TABLE 5.8: MINOR COLLECTOR

ROW RANGE: 48'-84'

Character Area	ACTIVITY CENTER	URBAN	SUBURBAN	RURAL	MAIN STREET
Examples	Western end of Lead/Coal	Tingley Rd, Cutler Ave	Western Hills	Todos Juntos Rd, Jarales Rd	N/A
STREETSIDE MINIMUMS (ONE SIDE)					
Landscape buffer	6'	6'	5'	4' paved shoulder (both sides)	N/A
Clear Sidewalk width	8’	6'	5'		
Building Shy Zone (ingress/egress)*	2’	-	-		
Streetside Width (for one side only)	16’	12'	10'		
BIKEWAYS (ONE SIDE)					
Multi-Use Path	N/A			4' paved shoulder (both sides)	N/A
Multi-Use Path Outside Buffer	N/A				
Multi-Use Path Inside Buffer	N/A				
Paved Multi-Use Path Width	N/A				
Shared Lane Marking (See NACTO Urban Bikeway Design Guide)	Appropriate for streets with posted speeds of 25 mph or lower and AWDT less than 3,000.				
Bicycle Lane (widths do not include gutter pan)	Posted Speed 30 mph or lower: 5' bicycle lane (min 13’ for combined parallel parking and bike lane.)				
ROADWAY					
Maximum Number of Through Lanes	2	2	2	2	N/A
Desired Operating Speed	18-25 MPH	18-30 MPH	18-30 MPH	20-35 MPH	
Lane Width	10-11’	10’-11’	10’-11’	10’-11’	
Outside Lane Width (heavy vehicles)	12' if on the Long Range Transit System as a current or future bus route.				
Parallel Parking	7’-8’	7’-8’	7’-8’	-	
Center Turn Lane	0’-12’	0’-12’	0’-12’	0’-12’	

*Include 2’ if buildings, walls, or other vertical structures are planned adjacent to public ROW. *Please see Building Shy Zone in Section 6.1*

Chapter 6

STREETSIDE DESIGN ELEMENTS

Chapter 6

Streetside Design Elements

The *streetside* of a roadway refers to the pedestrian section of the roadway extending from the edge of private property to the face of the curb. This area not only provides for pedestrian travel, access to adjacent properties, and locations for transit amenities; the streetside also has significant economic and environmental potential. In many areas, the streetside offers the opportunity to become public spaces that bring added value to the street and support adjacent business. The streetside also provides a means to help manage and clean stormwater which helps address the growing environmental need to reuse water and provide a mechanism to clean stormwater before releasing it to the river.

The following section describes elements of the streetside, additional considerations for making walking safe, comfortable and interesting as well as how the streetside can create 'Green Streets' and aid in stormwater management.

6.1 SIDEWALKS AND BUFFERS

For urban and suburban character areas there are three basic elements for streetside guidance; the landscaped buffer, clear sidewalk width, and the building shy zone. The landscaped buffer provides both a separation from the roadway and a place for bus stops, signage, utilities and lighting. The pedestrian clear sidewalk width is sometimes referred to as the pedestrian throughway. All urban and suburban roadways should include these two elements in order to provide adequate pedestrian accommodation.

SIDEWALKS

Sidewalks are an essential component to providing pedestrian access to businesses, residences, and public spaces. Sidewalks are part of active transportation networks and should be included in all urban and suburban roads.

The City of Albuquerque's Development Process Manual requires 6 foot sidewalk widths. This is a comfortable width for two people to walk side by side and converse. Larger sidewalk widths should be included in areas of higher pedestrian traffic, such as activity centers, retail streets, active transit stops, and near schools. Creating an even walking surface is also important to facilitate comfortable pedestrian travel. For example, mul-

FIGURE 6.1: BUFFERED, LANDSCAPED SIDEWALK ALONG COAL AVE WITH WIDE CLEAR ZONES FOR WALKING

tiple curb cuts along a street that cut into the sidewalk can be consolidated to reduce the number of conflict points between entering and exiting vehicles and pedestrians while also creating a more even walking surface.

SIDEWALK BUFFERS

Buffers along sidewalks can be provided to increase pedestrian comfort by increasing the lateral separation between pedestrians and fast moving cars. These buffers can be landscaped and include street trees, green infrastructure, street infrastructure such as lighting or utility poles, and transit stops. They also provide space for driveway pads while allowing the sidewalk to remain level.

Although sidewalks are not necessary along most rural roads, a wide shoulder can be provided for bicyclists and pedestrians. In rural areas with increased activity, sidewalks can be considered, or right-of-way set aside for future sidewalks if development progresses.

BUILDING SHY ZONES

The building shy zone refers to area where buildings or walls adjoin the pedestrian clear sidewalk zone. The conceptual design matrices include two additional feet to the streetside width as a countermeasure to reduce conflicts from people exiting buildings and address the effect of people shying away from walls or other vertical structures which effectively reduces the clear sidewalk area. Activity centers and urban areas are most likely to have buildings that abut sidewalks. Walls alongside sidewalks is very common in the region. If buildings and walls are setback or if the clear sidewalk area abuts flat landscaping such as a lawn then the extra two feet of width is not necessary.

6.2 PEDESTRIAN AMENITIES

Well-designed pedestrian amenities are crucial to creating walkable places. Pedestrian amenities include more than providing ample sidewalks and buffers. In general, pedestrians need safe, comfortable, interesting, and well-connected places to walk.[26] Often, this means focusing on design details that engage all the senses. Although often considered as non-essential, these elements

[26] Walkable City, 2012

FIGURE 6.2: STREET LIGHTING AND STREET TREES IN DOWNTOWN ALBUQUERQUE

should be seen as crucial parts of the public right-of-way as they can lead to increased pedestrian activity. For this reason, elements including street trees, landscaping, and street furniture are just as important as providing enough sidewalk space.

STREET TREES

Street trees are a worthy addition to most roadways, especially those with high levels of pedestrian activity. The benefits of street trees are numerous. They provide shade, safety for pedestrians, privacy, enhanced aesthetics, improved air quality, increased stormwater runoff capture, and reduced urban heat island effect. They have also been shown to increase property values of adjacent properties.[27] In addition, a row of street trees, planted together, can form a beautiful, continuous canopy that visually frames the street.

STREET FURNITURE, LIGHTING & INFRASTRUCTURE

Including ample spaces for people to stop, sit, wait, and rest should be provided along streets with higher levels of pedestrian activity. Street furniture can encourage increased activity and interaction along the street, while increasing the comfort level of pedestrians. This in turn can encourage more walking.[28] Walkway lighting adds to safety and visibility at night.

ACTIVE PUBLIC SPACES

People are attracted to places with other people. Providing public spaces along the streets can bring vibrancy to otherwise lifeless streets by encouraging people to stop and interact. In contrast, "dead spaces" such as parking lots, vacant lots, and blank facades discourage public use, and lead to inactive, less interesting streets. Creating active public spaces can involve building small plazas or pocket parks, creating sitting areas, improving transit amenities, and installing public art.

[27] Ewing, Pedestrian- and Transit-Oriented Design, 65
[28] ITE Designing Walkable Urban Thoroughfares, 126

FIGURE 6.3: THE STREET AS ACTIVE PUBLIC SPACE

6.3 SAFE CROSSINGS

Midblock crossings are effective in areas with long block lengths, areas with a high level of pedestrian activity, and in places where many pedestrians currently cross due to efficiency.[29] Mid-block crossings are generally not necessary where block lengths are short or in areas with little pedestrian activity. Like intersection crossings, midblock crossings should emphasize slower speeds, visibility, and safety.

There is ample guidance on selected locations for mid-block crossings, which must be done with care. On some roadways, only marking a crosswalk is insufficient.[30] However, there are additional elements that have been found to be effec-

[29] NACTO Urban Streets Design Guide, 115
[30] Federal Highway Administration, Safety Effects of Marked Versus Unmarked Crosswalks at Uncontrolled Locations, 2005

FIGURE 6.4: PEDESTRIAN BEACON AND CURB EXTENSION IN BERNALILLO, NM

tive at improving pedestrian safety when used in conjunction with a marked crosswalk.

PEDESTRIAN CROSSING ISLANDS

Pedestrian crossing islands (refuges) can be considered for multi-lane arterials and collectors with medians.[31] These islands can allow pedestrians to cross the street in two stages and only worry about one direction of traffic at a time. Refuges have been shown to reduce pedestrian crashes on multi-lane arterials.[32]

Median design can also calm traffic and facilitate slower, safer streets. For example, medians can be extended into the intersection beyond the crosswalk to protect pedestrians and slow drivers making left turns. In addition, medians with trees further helps to calm traffic and provide opportunities to capture increased storm water runoff.

PEDESTRIAN HYBRID BEACONS

Pedestrian beacons and signals can increase the visibility of a crossing. These beacons have been shown to decrease the number of crashes at mid-block crossings and can be considered on faster roadways.[33]

6.4 GREEN STREETS

Green streets incorporate green infrastructure or low-impact development (LID) practices into their design and functioning. They are designed to integrate natural systems with the built environment by utilizing ecosystem services to manage and mitigate the effects of stormwater runoff, water pollution, air pollution, and the urban heat island effect.

The quantified benefits of green infrastructure have led many cities to see green infrastructure as a worthy investment. They (1) clean and reduce the amount of storm water runoff; (2) shade and beautify streets; (3) increase property values; (4) create wildlife habitats; and (5) use passive irrigation to water native vegetation and street trees, limiting the amount of additional watering necessary.[34] Although originally developed for climates in the Northwest and Northeast, green infrastructure practices have begun to be implemented in

[31] Federal Highway Administration Proven Safety Countermeasures http://safety.fhwa.dot.gov/provencountermeasures/

[32] Ewing, Pedestrian- and Transit-Oriented Design, 42

[33] Federal Highway Administration Proven Safety Countermeasures.

[34] MacAdam, James. (2010). Green Infrastructure for Southwestern Neighborhoods.

the Southwest. Tucson, for example, has a green streets policy that requires the City of Tucson Department of Transportation to integrate green infrastructure in every roadway development and redevelopment project.

One objection to implementing green infrastructure projects is additional costs for engineering, installation, and maintenance. However, studies have shown that in many cases, green infrastructure systems are competitive if not cheaper than conventional design practices.[35] In addition, green infrastructure supplements existing storm water infrastructure, which can reduce the need for costly expansion projects, resulting in smaller pipes, smaller processing facilities, and lower maintenance costs.

FIGURE 6.5: CURB CUT AND RAIN BASIN AFTER RAIN EVENT IN TUCSON, AZ

SOFT INFRASTRUCTURE

Green streets emphasize the benefits of "soft" infrastructure systems that utilize natural ecosystem services to manage stormwater runoff. This includes reducing impervious surface coverage and maximizing the coverage of landscaped areas to capture, slow, filter, and infiltrate runoff. Specific strategies include constructing narrower roadways, creating wider landscape buffers with native vegetation and groundcover, planting more street trees, and using pervious pavement where appropriate.

Most green infrastructure supplements existing stormwater systems. Systems are often designed to handle rainfall events up to a specific threshold – additional overflow water enters the existing stormwater system normally. They are usually designed like traditional "hard" infrastructure systems to manage specific rainfall events. Additional performance criteria can also be used to ensure that adequate drainage and infiltration occur, even after heavy rainfall.

CURB CUT DESIGN

Green street infrastructure can often be integrated with existing traffic calming devices and landscape buffers. Usually curb design alternatives can be used to channel stormwater into bioretention basins, infiltration planters, rain gardens, stormwater bump outs, and street trees (see Figure 6.5).[36]

[35] Environmental Planning Agency (EPA). (2014). The Economic Benefits of Green Infrastructure: A Case Study of Lancaster, PA http://water.epa.gov/polwaste/green/upload/2008_01_02_NPS_lid_costs07uments_reducingstormwatercosts-2.pdf

[36] MacAdam, James. (2010). Green Infrastructure for Southwestern Neighborhoods

Chapter 7

EVALUATING ALTERNATIVES

Chapter 7

Evaluating Alternatives

Picking transportation projects that will lead to the most benefit (for investment dollars spent) means thinking strategically about where and how improvements are implemented. For example, constructing new pedestrian amenities such as expanded sidewalks and improved street furniture, will not necessarily lead to more pedestrian activity. In other words, vibrant street life will not develop spontaneously in areas that lack good urban form which involve many factors including residential density, commercial activity and the relationship of the roadways to the surrounding buildings. Nor will a new bus rapid transit route necessarily be successful in areas that do not have the requisite density or potential to benefit from increased transit investment.

The good news is that projects from around the country have shown that street retrofits can lead to significant improvements.[37] Sometimes these projects are controversial because they involve a change in the status quo that can affect travel patterns. Many people may have a hard time envisioning a new configuration for the street, especially if they believe it will increase their travel times or contribute to congestion. Choosing designs that balance the needs of established roadway users is paramount to ensuring street retrofits are successful. However, retrofit projects can also create additional transportation options. They may also be linked to general planning goals to make an area more walkable, for example, or they may be tied to specific objectives such as reducing the number of crashes along an existing corridor.

7.1 CONSTRAINED RIGHTS OF WAY

In some cases, retrofit projects have inherent tradeoffs. For example, redesigning an existing roadway to accommodate all modes within a constrained ROW can be challenging, given established surrounding land uses, existing travel patterns, and current zoning. Allocating space for new users along such roadways can mean reducing space for others. Sometimes this can lead to an overall improvement in

[37] *Rethinking Streets*, University of Oregon

FIGURE 7.1: EXAMPLE OF A WALKING AUDIT AND SAFETY DEMONSTRATION

roadway performance, while maintaining vehicle throughput.[38] Determining trade-offs requires prioritizing the needs of various users, and evaluating the most important performance objectives and measures of success.

Using clear, evidence-based recommendations to accomodate users is the first step to ensure that reconstruction projects fulfill Complete Streets goals. These goals can be measured using various evaluation tools such as multi-modal level of service metrics, crash statistics, traffic models, and connectivity measures. Other evaluation tools (such as walking audits) can be used to determine how well the street currently meets the needs of users with different abilities. Analyses may find that some roads include too many lanes, could have lower posted speeds, or do not support existing or future land uses. (Details on these performance measures are outlined in Chapter 8.)

[38] ITE, Planning Urban Roadway Systems, 38

7.2 COMPLETE STREETS CHECKLIST

To help facilitate an improved transportation planning process, MRMPO has developed the *Complete Streets Checklist* to provide a baseline analysis of existing conditions, constraints, and opportunities along existing roadways (see Appendix). This checklist (1) establishes a baseline inventory of existing conditions along the roadway such as traffic counts and existing cross-sections; (2) identifies possible Complete Streets considerations and priorities; (3) identifies possible constraints; and (4) points to possible design opportunities. The collected data are then used as inputs for a multi-modal level of service metric that provides a comparison between roadway designs. The goal is that the checklist can be used to generate clear conceptual design priorities that can lead to the best overall multi-modal configuration.[39] The checklist includes the following sections, and utilizes the performance measures outlined in Chapter 8.

BASIC PROJECT INFORMATION

The checklist includes basic project information, such as project name, location, responsible agency, goals, and development phases.

[39] The checklist is not a prioritization process, but a way to evaluate alternative design options.

EXISTING CONDITIONS

This section includes existing conditions, such as character area, transportation context, future travel demand projections, the roadway's role and existing levels of service. The checklist includes a section where existing cross section elements and traffic counts can be recorded. These elements can be used to calculate multi-modal level of service (MMLOS), and compare conceptual designs. The intent is to collect a baseline inventory of existing data and identify the roadway's regional context.

PRIORITY CONSIDERATIONS

To help facilitate roadway projects[40] that will provide the most benefits, this section outlines various priority areas that may be important to consider. Each priority consideration addresses one component of Complete Streets. By selecting initial considerations to explore further, MRMPO and member agencies can begin to identify issues along the roadway such as pedestrian safety, walkability and congestion.

It also provides a way to understand existing constraints that limit the ability of a project to address identified needs. A few constraints may include: (1) constrained right-of-way; (2) conflicting plans and policies; (3) balancing user needs; (4) preservation of existing infrastructure; (5) environmental considerations.

1. **Expanded Choices and Community Involvement:** Would a reconfigured street have the opportunity to expand mode choices available to residents? Would the addition of bike lanes, or transit service be beneficial to the neighborhood? Would the project improve accessibly to jobs, especially for low income residents? Who will be involved in the design process and whose interests should be considered? What are some ways to increase involvement in the design process?
2. **Land Use Integration:** Does the street support a diverse range of land uses, activities, and users? Does the street run through an existing activity center? If so, does the street support the activity center's users? Would a reconfigured roadway potentially catalyze increased business investment along the street? Is community involvement a priority?
3. **Congestion and Efficiency:** Is addressing congestion a priority? Is the efficiency of the roadway a concern?
4. **Community Health:** Is improving community health outcomes a priority? Does the design encourage active transportation options? Does the project address environmental justice issues in the community, for example, gaps in the neighborhood's sidewalk, transit, or bicycle networks?
5. **Parking:** Is expanded on-street parking a priority?
6. **Walkability:** Does the street encourage and enable walkability? Can pedestrian needs be better accommodated with expanded sidewalks, safer crossings, landscape buffers, street trees, traffic calming, or other amenities?
7. **Bicycling:** Does the street enable safe bicycling? Are there gaps in the current bicycling infrastructure, such as impassible intersections or other barriers that could be fixed?
8. **Transit:** Does the street support high quality transit? For example, are comfortable transit shelters provided within walking distance of pedestrian catchment areas?
9. **Traffic Calming:** Is traffic safety an issue? How many crashes occur along the street? Are crashes attributable to design features of the street such as high speeds, low visibility or lack of traffic calming features?
10. **Green Streets:** How well does the street handle stormwater runoff and water quality? Are there ways to incorporate green infrastructure within the roadway?
11. **Connectivity:** Does the street's configuration support the goals of creating complete networks? Does the corridor link activity centers efficiently? Does the current configuration introduce barriers to travel for

[40] Roadway projects may include TIP projects, projects outlined in the MTP, or roadway projects and plans developed by member agencies.

certain users? Would the project expand connections between anchor institutions or job centers?

12. **Freight:** Is facilitating freight travel a priority for the roadway?

COMPLETE STREETS OPPORTUNITIES

After gathering information on existing conditions, and understanding the project's priority considerations, the checklist provides a list of conceptual design ideas that are linked to specific considerations. For example, if traffic calming has been identified as a priority along the roadway, several strategies are listed that may help achieve this goal. Selecting initial strategies to explore allows MRMPO and member agencies to identify possible design alternatives, which in turn can guide the planning process as it evolves.

A few sample retrofit strategies for existing streets include:

- **Narrow Travel Lanes:** restriping travel lanes from 12 feet to 10 feet can free up additional space for bike lanes, or expanded pedestrian amenities. Medians can also be reduced to add more space to the pedestrian sidewalks and surrounding area.
- **Lane Reduction:** Reducing the number of travel lanes ("road diets") involve reassigning space for traffic calming, expanded mode choices, and potentially better land use integration. Reducing the number of lanes on arterials from 6 to 4 lanes (4 to 3 lanes, with central turn lane on collectors) can free space to add protected bike lanes, on-street parking, and wider sidewalks. Road diets from 4-3 lanes can be considered on roadways with maximum volumes of 15,000 to 20,000 AWDT, as well as streets with safety concerns.[41]
- **Sidewalk and landscaping easements:** Private land owners can provide easements with the incentive that local government will install and, in some cases, maintain landscaping. This can expand the ROW space for streetside pedestrian amenities.

7.3 COMPARING DESIGNS

There are inherent tradeoffs with different roadway design choices. Often, these have direct effects on specific roadway users that should be balanced with the goals for the overall street network. For example, attempting to expand sidewalks, add generous bike lanes, and maintain the same number of travel lanes (or widths) along a constrained right-of-way may lead to a design that lowers the level of service for all users, instead of enhancing user options.

Therefore, before settling on a final conceptual roadway design, alternatives should be evaluated to see how well each meets specific performance goals. One way to review alternatives is to develop a comparison matrix to review the strengths and weaknesses of different roadway design alternatives. This can include an appraisal of expected performance outcomes for various modes, or can be tied to projected performance measures such as multi-modal level of service (MMLOS).

To work through these tradeoffs and demonstrate how performance measures can be used, a few example comparisons are shown using Bridge Blvd, Zuni Rd and San Pedro Dr as examples. These comparisons utilize the *Complete Streets Checklist* to provide a baseline inventory of existing conditions. The collected data are then used as inputs for a multi-modal level of service metric that provides quantitative comparison between roadway designs.[42] These indicators are tied to specific physical design elements such as roadway width, traffic volume, traffic speed, sidewalk width, presence

[41] Peak hour volumes should also be considered. (Proven Safety Countermeasures, "Road Diet", Federal Highway Administration, Office of Safety, FHWA-SA-12-013, 2012.)

[42] A simplified model, developed by *Sprinkle Consulting*, has been used to produce the MMLOS scores for these comparisons.

of bicycle infrastructure, and the presence of on-street parking.

A more qualitative set of measures is also provided to show the relative merits of different roadway designs. These measures compare the merits of different design configurations using positive (+) and negative (-) valuations for each configuration's relative strengths or weaknesses. The goal is to provide a framework that allows the best design option to be chosen in a constrained right-of-way.

The following section illustrates the previously described methodology for comparing alternatives by comparing 3-5 alternative conceptual designs including the existing design for three roadways that have been identified for multi-modal improvements.

BRIDGE BLVD CORRIDOR PLAN

Bridge Boulevard is a community principal arterial handling approximately 26,000 AWDT between Isleta Blvd and Goff Blvd. This roadway was recently the subject of a corridor plan that proposed three different roadway alternatives. The main street conceptual design alternative was chosen and is evaluated. Overall, the project has the opportunity to expand mode choices, better integrate land uses, and calm traffic – all while taking into account future travel demand.

1. **Existing:** *4 travel lanes, 11-12 ft median, 5-6 ft sidewalks, 5-6 ft shoulder.* The existing configuration of Bridge features narrow sidewalks, wide travel lanes, and faster traffic. Although this roadway is classified as a community principal arterial, which should accommodate all modes, the current design mainly facilitates automobile traffic.
2. **Mainstreet Concept:** *4 travel lanes, 14 ft landscaped median, 6-12 ft sidewalks, 5 ft bike lane, 8' on street parking (one side).* This conceptual design from the recently updated Bridge Corridor Plan seeks to expand the sidewalks along Bridge, and create a wider landscaped median. The design retains the existing 5 foot bike lanes and travel lanes, but may also include on-street parking. This option promotes traffic calming, walkability, and access to businesses. It also requires less ROW than the other options presented in the Bridge Corridor Plan
3. **Buffered Bike Lanes:** *4 travel lanes, 12 ft landscaped median, 6 ft sidewalks with 6 ft landscape buffer, 8 ft buffered bike lanes, no parking.* This conceptual design focuses on bicycle traffic by creating 8 foot buffered bike lanes on both sides of the street. These lanes would increase bicycle level of service (BLOS) significantly, and could be narrowed in constrained rights-of-way. Like the mainstreet design, this configuration adds a landscaped median, and provides a 6 foot landscaped buffer between the sidewalk and street. This option requires approximately the same amount of right of way as the mainstreet option.
4. **Two-way Cycle Track:** *4 travel lanes, 12 ft landscaped median, 6 ft sidewalks with 6 ft landscape buffer, 13 ft two way cycle track (one side), 7' on street parking (one side).* This option seeks to increase bicyclists' comfort, safety, and BLOS by including a two-way cycle track along one side of the roadway. This cycle track could be coupled with on-street parking to buffer bicyclists from traffic and give them their own exclusive travel path. This option requires the most right-of-way, and may be the hardest to implement in Bridge's constrained right-of-way.

ZUNI ROAD RECONSTRUCTION

Zuni Road, a community principal arterial with an average 19,000 AWDT, is currently being evaluated for potential reconstruction that would reduce the number of travel lanes and increase multi-modal travel options. This project has the opportunity to increase safety, create new connections, and improve multi-modal level of service indicators. Although some segments of the road have ample right-of-way, some segments are constrained. The segment between Washington St and San Mateo Blvd is considered below.

1. **Existing:** *6 travel lanes, 18 foot median, 5 foot sidewalks.* The current configuration does not include bike lanes and has minimal sidewalks.
2. **Alternative 1:** *4 travel lanes, 6 ft bike lane, 10 ft sidewalk, 18 ft median, speed reduction to 30 mph.* This option improves multi-modal options by adding bike lanes and expanding sidewalks.
3. **Alternative 2:** *4 travel lanes, 9 ft buffered bike lane, 10 ft sidewalk, street trees, speed reduction to 30 mph.* This option adds a buffered bike lane to increase the bicycle LOS. Improved landscaped buffers with street trees would also be used to reduce storm water runoff.

SAN PEDRO ROAD DIET

San Pedro, a minor arterial with 15,000 AWDT, is being evaluated as a candidate for a road diet. In this scenario, the roadway will be reduced from four through lanes to two lanes and a center turn lane from Lomas to just south of I-40. This roadway reconstruction project creates opportunities to improve traffic flows (by including a central turn lane), expand mode choices, include on-street parking, and introduce traffic calming measures.

1. **Existing:** *4 travel lanes, no median, 6 ft sidewalks.* This configuration does not provide multi-modal options.
2. **Alternative 1:** *2 travel lanes, central turn lane and median, on-street parking, lower speeds.* This option adds on-street parking, which will help with traffic calming and improve access to businesses. It may also improve traffic flow with the introduction of a dedicated left turn lane.
3. **Alternative 2:** *2 travel lanes, no median, on-street parking, bike lane.* This configuration adds a bicycle lane and parking to the street. Although this option provides the most multi-modal options, it also introduces potential conflicts between users. Not including a dedicated left turn lane may affect traffic flow.
4. **Alternative 3:** *2 travel lanes, central turn lane and median, bike lane.* This option prioritizes biking over on-street parking. It may also improve traffic flow with the introduction of a dedicated left turn lane.
5. **Alternative 4:** *2 travel lanes, no median, on street parking, and sidewalk buffers with green infrastructure.* Adds expanded sidewalk buffers with green infrastructure to increase storm water runoff capture. Provides the best pedestrian improvements, but not including a dedicated left turn lane may affect traffic flow.

FIGURE 7.2: BRIDGE BLVD CONCEPTUAL DESIGN COMPARISION

BRIDGE BLVD (Isleta to Goff) - 26,000 AWDT - 35 MPH

	ROW Width	AutoLOS	Transit LOS	Bicycle LOS	Pedestrian LOS	Walkability Index	Traffic Calming	Mode Choices	Parking	Land Use Integration	Green Streets	Cost	Strengths/ Weaknessess
Existing	78'	D	E	C (3.37)	C (3.47)	Minimal	-	-	-	-	-	+	1/10
Mainstreet	100'	D	C	C (3.06)	C (2.80)	Basic	+	+	+	+	-	-	7/4
Bike Lanes	100'	D	C	B (1.93)	C (3.11)	Basic	+	+	-	+	-	-	7/4
Cycle Track	104'	D	C	**A**	**C (2.53)**	Basic	+	+	+	+	-	-	**8/3**

EXISTING

MAINSTREET CONCEPT

BUFFERED BIKE LANES

TWO WAY CYCLE TRACK CONCEPT

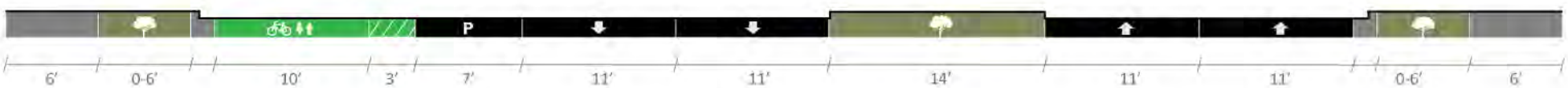


FIGURE 7.3: ZUNI ROAD CONCEPTUAL DESIGN COMPARISION

ZUNI ROAD (Washington to San Mateo) - 19,000 AWDT - 35 MPH

	ROW Width	AutoLOS	Transit LOS	Bicycle LOS	Pedestrian LOS	Walkability Index	Traffic Calming	Mode Choices	Parking	Land Use Integration	Green Streets	Cost	Strengths/ Weaknessess
Existing	~100'	C	E	3.79 D	2.98 C	Minimal	-	-	-	-	-	+	2/9
Alternative 1	~100'	C	C	1.93 B	2.68 C	Basic	+	+	-	+	-	+	**9/2**
Alternative 2	~100'	C	C	**0.37 A**	**2.32 C**	Basic	+	+	-	+	+	-	**9/2**

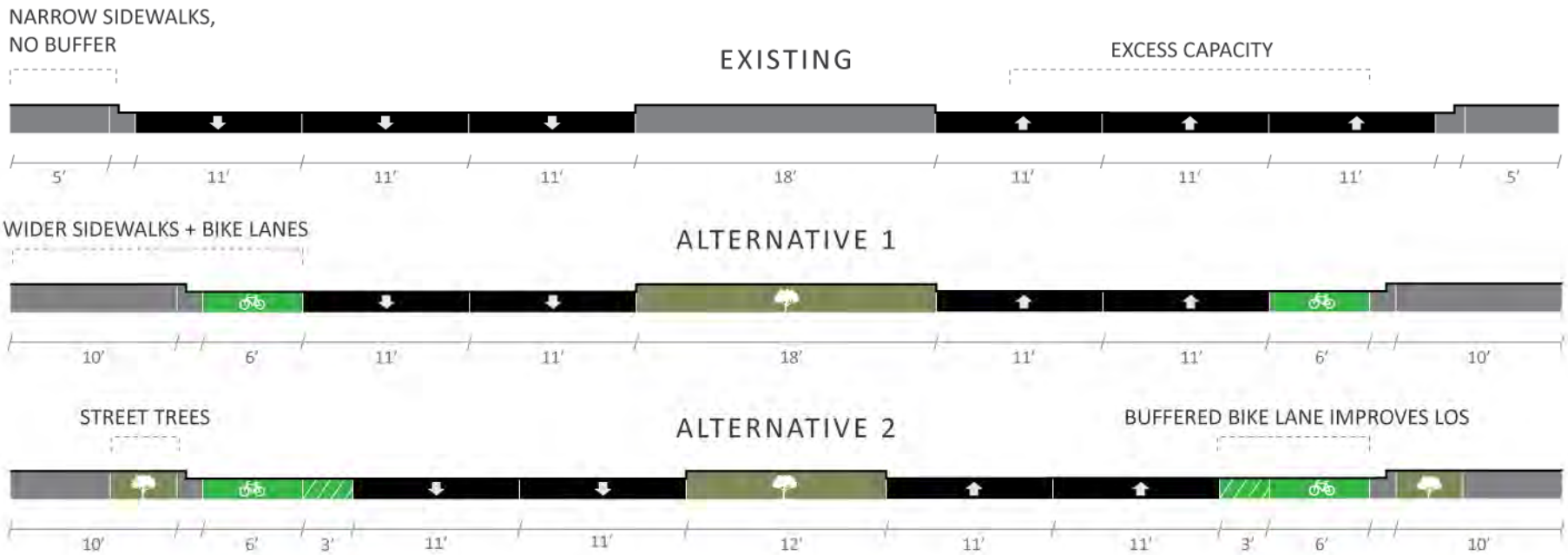


FIGURE 7.4: SAN PEDRO CONCEPTUAL DESIGN COMPARISION

SAN PEDRO (Marble to Haines) - 15,000 AWDT - 35 MPH

	ROW Width	Transit LOS	Auto LOS	Bicycle LOS	Pedestrian LOS	Walkability Index	Traffic Calming	Mode Choices	Parking	Land Use Integration	Green Streets	Cost	Strengths/ Weaknessess
Existing	61'	N/A	C	3.80 D	2.99 C	Basic	-	-	-	-	-	+	3/7
Alternative 1	61'	N/A	D	3.88 D	2.99 C	Moderate	+	-	+	+	+	+	7/3
Alternative 2	61'	N/A	D	3.06 C	2.87 C	Moderate	+	+	+	+	-	+	**8/2**
Alternative 3	61'	N/A	D	**2.22 B**	3.44 C	Moderate	+	+	-	+	+	+	**8/2**
Alternative 4	61'	N/A	D	3.88 D	**2.68 C**	Moderate	+	-	+	+	+	-	6/4

Chapter 8

PERFORMANCE MEASURES

Chapter 8

Performance Measures

Evaluating projects, before and after they are completed, is a crucial step in ensuring that roadways meet the needs of all users. Specific quantifiable performance measures can be used to provide insight into how well the design meets its original objectives. These performance measures can include multi-modal level of service, transit performance, safety, and connectivity. Using performance measures to evaluate innovative projects before and after can also provide evidence to support future projects.

INPUTS, OUTPUTS AND OUTCOMES

Increasingly, evaluation methodologies are focusing on *inputs, outputs, and outcomes*, which correspond to different stages in a transportation planning context.

Inputs refer to quantifiable investment, which can include money spent, policies passed, and number of community participants. *Outputs* refer to the direct, tangible results of these inputs, including miles of new roads built, miles of new bike routes, and new trees planted. *Outcomes* refer to how the roadway functions after it is built or reconstructed. This includes operating levels of service, changes in traffic volume, number of bicyclists, and number of crashes. An *inputs, outputs and outcomes* approach can be applied to evaluate specific projects, or it can be used to track the progress of larger scale planning objectives.

MONITORING PERFORMANCE

MRMPO collects data and performs analysis on a wide range of transportation projects. Specifically, the MPO evaluates overall system performance primarily as it relates to congestion and crash statistics. MRMPO has also developed tools to better model future land use scenarios, which can assist in making better future development decisions. As part of these efforts, the LRTS document is designed to complement the 2040 MTP by providing specific, measurable objectives that can be evaluated periodically to ensure the goals of this document and the 2040 MTP are being met.

The following are a set of performance methodologies that can be used to ensure that these guidelines promote multi-modal travel options, connectivity, walkable places, and complete networks. The intent is that these performance measures can be used to help inform decisions by MRMPO's member agencies, especially those agencies responsible for roadway and network

design. They provide a clear set of methodologies that can be used to evaluate connectivity, multi-modal level of service, walkability, safety, and successful land use integration.

Many of these measures use an inputs, outputs, and outcomes-based approach that requires before and after data collection, as well as specific analytical tools (see table 8.1). MRMPO can provide the analytical tools and data to evaluate each of these measures as they change over time. Member agencies can use these tools to compare specific design configurations, or to ensure their ideas support the principles of the 2040 Preferred Scenario. Although such data collection, analysis, and ongoing evaluation can involve a long process, the benefits of evaluation for creating successful projects cannot be overstated.

TABLE 8.1: EVALUATION METHODOLOGY APPROACHES

	CONCEPT/DEFINITION	OBJECTIVE	PLANNING PHASES	EXAMPLE MEASURES
INPUTS	Inputs refer to quantifiable investments, which can include money spent, policies passed, and/or number of community participants. As a measure, they refer to data/goals that are used to inform the project process.	To ensure the strategic projects are picked that are resource efficient, context sensitive, and consistent with other plans and goals.	During project selection, comparison, inventory, and prioritization.	• Investment Dollars • High Activity Areas • Plan Consistency • Projected Land Uses • Character Areas
OUTPUTS	Outputs refer to the direct, tangible results of these inputs, including miles of new roads built, miles of new bike routes, and/or new trees planted. As a measure, refers to the expected, quantitative outcomes of the project, using projected and actual performance measures.	To model expected performance before projects are built to ensure they meet goals and objectives. Also, to help evaluate alternatives.	During project comparison, evaluation and design. Can also be used to evaluate projects after they are complete.	• Amount of New Construction • Levels of Service • Walkability Index • Intersection Density • Average Block Length • Directness Index
OUTCOMES	Outcomes refer to how the roadway functions after it is built or reconstructed. This includes operating levels of service, changes in traffic volume, number of bicyclists, and/or number of crashes.	To compare expected performance (from inputs, and built outputs) to actual results. To measure performance over time.	After projects are complete. Some models can project expected outcomes.	• Crash Rates • Congestion • Trips Generated by Mode • Increased Investment • New Development

8.1 MULTI-MODAL LEVEL OF SERVICE (MMLOS) INDICATORS

Several multi-modal level of service (MMLOS) models have been developed in the past decade to evaluate how well roadways accommodate all user groups. These include various models that seek to measure the level of comfort and safety of pedestrians, bicyclists and transit users in addition to motorists. Often these tools require additional planning studies and data collection that focus on pedestrian, bicyclist, and transit specific features of the roadway to calculate a MMLOS score. As with motor vehicle LOS, scores are based on an A to F scoring range.

Updated MMLOS models are included in the *Highway Capacity Manual (HCM),* the *Transit Capacity and Quality of Service Manual*, and Florida DOT's *Quality/Level of Service Handbook*. A report produced by the Transportation Research Board entitled *National Cooperative Highway Research Program Report 616: Multi-Modal Level of Service Analysis for Urban Streets,* synthesizes these different models and shows how they may be applied to urban roadways.

Various studies have shown that users' perceptions of LOS vary greatly depending on user group and context (e.g., elderly pedestrians vs. recreational users). However, regression models from survey data have produced models that have been shown to accurately predict user's perceptions of comfort and safety.[43]

BICYCLE LEVEL OF SERVICE

Quantitative Output – Bicycle LOS Score

There are several methodologies to calculate bicycle level of service. Most of these measure variables such as presence of a bike lane, bike lane width, traffic speed and volume, presence of on-street parking, number of conflict points, and pavement condition. These measurements can be used to calculate BLOS for bicycle infrastructure along streets, as well as along multi-purpose paths. As can be expected, wider bike lanes are correlated with higher levels of service, although the presence of higher vehicle speeds (or heavier vehicles) may lower this score. Overall, bicycle level of service scores can be used to ensure bicycling facilities are adequate to fit the context of the street (e.g., by showing wider bike lanes should be used on streets with higher traffic volumes or on-street parking).

TRANSIT LEVEL OF SERVICE

Quantitative Output – Transit LOS Score

On-time transit performance is a key factor in transit level of service measures. This includes the frequency, reliability, service hours, and passenger loads of specific routes. In addition, current transit LOS models seek to not only measure the transit service quality, but also the quality of the environment these services operate in. These models take into consideration bus stop amenities, distance between stops, and stop security.

PEDESTRIAN LEVEL OF SERVICE

Quantitative Output – Pedestrian LOS Score

Various models have been developed to calculate pedestrian level of service based on studies of stated pedestrian preferences and actual behavior. These models often take into consideration basic design features such as sidewalk width, traffic speed and volume, pedestrian volume, presence of obstructions, and number of conflict points (e.g., driveways). Unlike vehicle level of service measures, pedestrian level of service is not necessarily dependent on volume or capacity considerations such as spacing between pedestrians, pedestrian walking speed, or delay at intersections. Other physical design elements are just as important and can lead to higher or lower pedestrian LOS scores. Like bicycle LOS, pedestrian LOS metrics allow pedestrian facilities to be sized correctly to the context of the street (e.g., including a landscape buffer along streets with more traffic or higher speeds).

[43] Transportation Research Board. (2008). Multi-modal Level of Service Analysis for Urban Streets. National Cooperative Higher Research Program Report 616. Washington, DC

8.2 WALKABILITY MEASURES

Walkability has been championed as a key to creating vibrant streets and neighborhoods. Scoring systems to measure walkability have been developed that expand on pedestrian level of service indicators to include additional considerations that are important to creating pedestrian friendly environments. Unlike pedestrian LOS indicators, walkability methodologies seek to address more subjective measures of pedestrian comfort, safety, interest, and destination choice. These methodologies acknowledge that pedestrians have a complex range of needs that vary among individuals. However, there are a few key indicators that have been shown to be important to most users and can be compiled to evaluate the walkability of an area.

WALKABILITY INDICES

Semi-Quantitative Output, Outcome – Walkability Index Score

Hall Planning and Engineering's *Walkability Index* measures 10 factors that can be compared using a semi-quantitative score sheet system that scores street segments on a 0-100 point system. These measures include:

1. Traffic Speed
2. Street Width
3. Presence of On-Street Parking
4. Sidewalk Width
5. Intersection Spacing Distance
6. Pedestrian Amenities
7. Building to Height Ratio
8. Land Use Mix
9. Façade Design
10. Transit and Bicycle Features

The strength of this system is that it relates basic, objective physical design features to actual pedestrian perceptions of comfort, safety, and interest. It also synthesizes existing variables that are traditionally inventoried in transportation projects to produce a score that can be used to compare different roadway segments. More walkable segments score above 50 points on this score sheet. For example, Central Ave, as it runs through Nob Hill (with its many pedestrian friendly features), scores approximately 75 points whereas Lomas from 14th Street to I-25 scores approximately 30 points.

PEDESTRIAN COMPOSITE INDEX

Quantitative Input – Pedestrian Composite Index Score

MRCOG uses the Pedestrian Composite Index (PCI) to rank areas of higher or lower pedestrian activity. This methodology evaluates an area's pedestrian generators such as schools, transit and restaurants compared against an area's pedestrian deterrents such as roadway speed, number of lanes and pedestrian crashes. As an analysis tool, it quantifies which streets have the most potential to generate pedestrian traffic, as well as those that deter pedestrian activity. These two numbers can then be compared to produce an index that reveals which areas could benefit the most from pedestrian improvements.[44]

8.3 CONNECTIVITY

Street connectivity is a crucial measure of network performance and has broad implications on how well individual streets function within the larger transportation network. As outlined in chapter 4: Complete Networks, there are numerous benefits to well-connected networks. They ensure efficiency, reduce congestion, reduce vehicle miles traveled, create direct routes for multiple users, encourage walking and bicycling, and provide more direct access to businesses.

There are several methodologies to measure the connectivity of different development patterns. Most of these methodologies compare physical features of the existing network, including block length, number of intersections, and route directness. These measures can provide replicable standards to compare connectivity between different development patterns. In addition, the benefits of connectivity can be measured individually as positive outcomes of well-connected networks.

[44] Please see PCI section in the 2040 MTP for more details.

INTERSECTION DENSITY

Quantitative Output – Four-leg Intersections per Square Mile

Four-leg intersection density describes the number of intersections with four adjoining streets per unit area (usually square miles). This is a useful measure of how well connected a road network is because it excludes dead end streets (e.g. cul-de-sacs) and t-intersections and indirectly measures average block length. Higher scores (greater than 100 intersections/square mile) generally indicate more favorable for creating walkable places.[45] For example, gridded networks generally have higher scores than traditional single-family subdivision layouts, but this also dependent on average block length and access points from major roadways to local developments.

Intersection density can be calculated by counting the number of true intersections in a given area, and dividing this by the area size, which is usually converted to square miles.

AVERAGE BLOCK LENGTH

Quantitative Output – Average Block Length

Average block length is an additional measure of connectivity that is especially relevant for pedestrians. In general, pedestrians value shorter block lengths, as they allow for pedestrians to pick more direct routes, and offer more opportunities to the cross the street. In urban areas, block lengths of 200 feet to 400 feet are ideal for promoting pedestrian-scaled environments.[46]

Average block length can be calculated by adding the block lengths of each block in a specified area, divided by the number of blocks.

DIRECT ROUTES AND TRIP DISTANCE

Quantitative Output, Outcome – Directness Index

Direct routes to destinations allow for shorter travel distances, which is extremely important for pedestrians who are only willing to walk short distances to reach their destinations. On average, studies have found that most people are only willing to walk between ¼ to ½ mile to reach a destination (such as a transit stop)[47]. If the distance is longer, they will not take the trip or choose an alternative mode. For this reason, having a network that offers direct routes, coupled with shorter block lengths, is essential to increase the walkability of an area. It is also an essential consideration when planning transit stops, which should be within walking distances of residences and businesses.

Although trip distance may appear to be short and direct on a map, actual trip distance may be much longer if streets do not connect and no direct route is available. This can increase on-the-ground trip distance significantly, and make walking inconvenient or simply too long for most pedestrians.

Route directness can be measured using a "directness" ratio that compares actual, on the ground travel distance divided by direct line travel distance. For walkability, a ratio of 1.5 or less is ideal.[48]

8.4 SAFETY

Evaluating crash statistics along existing roadways is important to understand where, why, and how crashes along different roadway segments occur. These statistics can reveal areas with higher overall crash rates, which can then be attributed to specific design features of the street that contribute to lower user safety. Such calculations

[45] Planning for Street Connectivity, 2003

[46] Ewing, Pedestrian- and Transit-Oriented Design, 28-30

[47] Mid-Region Travel Survey, 2014

[48] MRMPO uses the TRAM modeling tool to compare the travel times of various modes based on the network design. This tool can reveal the relative efficiency of a roadway network to support multiple users. For example, the TRAM model can be used to find the areas that can be reached in five minutes from the Alvarado Transportation Center by walking, bicycling, driving, or taking the bus. This allows for quantifying the number of people who can access certain services, how many services fall within a certain transportation shed, or how much ground a person can cover in a given time using various modes. TRAM analysis can be done at a regional, neighborhood, site-specific scale. In addition to mapping accessible areas for various modes at different time increments, TRAM can be used to contrast current and proposed road networks to identify alignments that provide the most access to users for different modes.

are especially important for improving intersection safety, where the majority of crashes occur.

NUMBER OF CRASHES AND CRASH RATES

Quantitative Outcome – Number of Crashes and Crash Rate

One method to evaluate intersection safety is to compare the number of crashes at each intersection to the volume of cars passing through the intersection in a given time period. Comparing these two factors generates a crash rate, showing the relative likelihood of a crash happening at a given intersection. This can be used to measure the relative safety of an intersection for motorists, pedestrians, and bicyclists by comparing reported crashes from all users.

In Bernalillo County, some of the intersections with the most pedestrian crashes also have a high crash rate, including San Mateo and Central, and Central and Louisiana. Other intersections of note include several downtown Albuquerque, including Gold and 2nd, Marquette and 5th, Central and 6th, Gold and 5th, and Gold and 6th. The high crash rates at these intersections point to a need to understand potential design or operating issues that have contributed to lower user safety. Such analysis can also point to "crash hotspots" where the likelihood of crashes happening is much higher.

PEDESTRIAN INTERSECTION SAFETY INDEX

Quantitative Output – Ped ISI Score

Another way to measure intersection safety for pedestrians is using the Federal Highway Administration's *Pedestrian Intersection Safety Index* (Ped ISI). This methodology uses six basic roadway attributes to determine an intersection's safety: 1) Whether the intersection is signalized or not; 2) whether the intersection includes a stop sign; 3) number of lanes; 4) 85th percentile speed; 5) average daily traffic (ADT); and 6) whether the intersection is surrounded by commercial land uses. The factors produce a score from 1-6, with higher numbers indicating less safe intersections based on a combination of these factors. For example, San Mateo, with 6 lanes, a posted speed limit of 40 and 30,000 ADT, scores a 3.6 (less safe), while Ridgecrest, with two lanes, a 25 MPH speed limit, and 2,200 ADT, scores a 1.73 (more safe).

8.5 LAND USE INTEGRATION AND SUPPORT

By supporting the users and activities of their adjacent land uses, roadways can help foster positive feedbacks that lead to a stronger integration between these land uses and the transportation network. The region has examples where the land use and roadways work together to support economic development and valuable public places (such as Nob Hill), however, the way these effects are measured is new and still developing. This section recommends three measures to begin the process of better understanding land use and transportation integration. The *Multi-Modal Approach to Economic Development in the Metropolitan Area Transportation Process* by the Federal Highway Administration provided ideas for these measures.

HIGH ACTIVITY AREAS

Quantitative Input – Activity Density Score

Roadway projects can look to catalyze investment in areas with high existing or potential future activity (i.e., higher densities and trip generation potential). MRMPO's Project Prioritization Process includes a simple methodology to calculate activity levels by comparing population density and employment density to a unit area.[49] The formula for activity density is:

$$\text{Activity Density} = \frac{\text{DASZ Population} + \left(\text{Employment} * \frac{\text{AMPA Population}}{\text{AMPA Employment}}\right)}{\text{DASZ Acreage}}$$

This formula can be used to measure both current activity and projected activity in terms of population and job density by Data Area Subzone

[49] Please see MRMPO's *Project Prioritization Process Guidelines for Large Urban Areas* (September 2014), page 69

(DASZ). In this way, activity density can provide a means to understand which areas are likely to see increased use and benefit the most from infrastructure investment. It can also be used to compare actual development over time.

INCREASED TRANSIT RIDERSHIP, PEDESTRIAN ACTIVITY, AND BICYCLE ACTIVITY

Quantitative Outcome – Trip Counts by Mode

Creating targeted transportation investment in high activity areas can help expand mode choices for all users, which allows people the opportunity to change their transportation behaviors. These modal shifts can be seen with an increasing percentage of trips being taken by pedestrians, bicyclists and transit riders in response to these expanded options. Such changes can be measured by counting the number of pedestrians, bicyclists, transit users, and motorists before and after projects are constructed. Trip generation models can also be used to project the expected number of motorists or transit users that will result from a project, although methods for calculating increased pedestrians and bicyclists are still being developed.

INCREASED INVESTMENT & BUSINESS SALES

Quantitative Outcome(s) – Change in Investment/Sales Dollars

In addition to increased trips and user activity, roadway projects can be evaluated as to how they stimulate increased investment along a corridor. Some ways to measure increased investment include:

1. **Increased Business Sales:** Local businesses may see increased sales along streets that redeveloped to support additional modes. For example, studies have shown that the addition of bike lanes and/or on street parking can lead to increased retail activity and sales.
2. **New Development Projects:** investment in roadway projects may spur new development along a corridor by increasing investment potential and market attractiveness. For example, new Bus Rapid Transit routes have been shown to increase investment along corridors, especially those that connect major job centers. New development can be seen in decreased vacancy rates, increased building permits, and new businesses along the street.
3. **Increased Property Values:** Roadways may increase property values of adjacent properties. For example, walkability improvements, including the installation of street trees, better lighting, and wider sidewalks, have been shown to increase property values along these streets as compared to streets without these improvements.[50]

[50] Ewing, Pedestrian- and Transit-Oriented Design, 65

Appendix

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COMPLETE STREETS CHECKLIST

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COMPLETE STREETS CHECKLIST

To help facilitate an improved transportation planning process, MRMPO has developed the Complete Streets Checklist to provide a baseline analysis of existing conditions, constraints, and opportunities along existing roadways. The goal is that the checklist can be used to generate clear conceptual design priorities that can lead to the best overall multimodal configuration.

PROJECT NAME _____ RESPONSIBLE AGENCY(S) _____

LOCATION _____ CHARACTER AREA _____

ROADWAY CLASSIFICATION _____ POSTED SPEED _____

DEVELOPMENT PHASE

- ☐ Sector Plan, Area Plans, and Master Plans
- ☐ Corridor Plans & Studies
- ☐ Engineering & Feasibility Studies
- ☐ New Road Construction
- ☐ Redevelopment and Reconstruction Projects
- ☐ Roadway Resurfacing Maintenance

PROJECT MODE PRIORITIES

- ☐ Transit
- ☐ Bicyclists
- ☐ Pedestrians
- ☐ Freight
- ☐ Motor Vehicles

PROJECT DESCRIPTION

CROSS SECTION ELEMENTS

ELEMENT	DESCRIPTION	WIDTH
THROUGH DRIVE LANES		
MEDIAN		
PARKING		
BICYCLE INFRASTRUCTURE		
SIDEWALK BUFFERS		
SIDEWALKS		
SHOULDERS		
TOTAL		

1

EXISTING CONDITIONS

		CURRENT	2040 PROJECTION
LAND USE	PRIMARY LAND USES		
	LAND USE MIX		
	DU/ACRE		
	ACTIVITY DENSITY		
	PED COMPOSITE INDEX		

		COUNT	2040 PROJECTION	MODE SHARE %
TRAFFIC	AWDT			
	PEDESTRIANS			
	BICYCLISTS			
	FREIGHT			

		EXISTING	FUTURE	DESCRIPTION/CONDITION
NETWORKS	TRANSIT ROUTE			
	FREIGHT ROUTE			
	SIDEWALKS			
	BICYCLE ROUTE			

		WEEKDAY	WEEKEND	RIDERSHIP
TRANSIT	FREQUENCY			
	HOURS OF OPERATION			

		CRASHES (LAST 5 YEARS)	FATAL	RATE
CRASHES	AUTO			
	BICYCLES			
	PEDESTRIAN			

		SCORE		SCORE
PERFORMANCE	AUTO LOS		TRAVEL DELAY	
	TRANSIT LOS		BICYCLE LOS	
	PEDESTRIAN LOS		WALKABILITY INDEX	

ADDITIONAL EXISTING CONDITIONS

2

PRIORITY CONSIDERATIONS

PRIORITY	CONSIDERATION	YES/NO
EXPANDED CHOICES & INVOLVEMENT	Is there an opportunity to expand mode choices along the roadway?	
	Is community involvement a priority?	
	Are there existing plans that should be consulted?	
LAND USE INTEGRATION	Is economic development along the street a priority?	
	Does the street support a diverse range of land uses, activities, and users?	
	Does the street support the realization of the 2040 preferred scenario?	
CONGESTION & EFFICIENCY	Is addressing existing or future congestion a priority?	
	Is the efficiency of the roadway a concern?	
	Are roadway pavement conditions a concern?	
COMMUNITY HEALTH	Is improving community health outcomes a priority?	
	Does the design encourage active transportation options?	
	Are there gaps in the neighborhood's sidewalk, transit, or bicycle networks?	
	Does the project improve accessibly to jobs, especially for low income residents?	
PARKING	Is expanded parking a priority?	
	Is on-street parking a possibility?	
WALKABILITY	Are the area's sidewalks ADA Compliant?	
	Are crosswalks provided?	
	Are additional pedestrian amenities a priority?	
BICYCLING	Does the street enable safe bicycling?	
	Are there gaps in the current bicycling infrastructure, such as impassible intersections or other barriers?	
	Is bicycle safety a concern?	
TRANSIT	Is expanded transit service a priority?	
	Are improved transit amenities a priority?	
TRAFFIC CALMING	Is traffic calming a priority?	
	Are crash rates higher than other areas?	
	Is intersection crossing safety a concern?	
GREEN STREETS	How well does the street handle storm water runoff and water quality?	
	Are there ways to incorporate green infrastructure within the roadway?	
CONNECTIVITY	Does the street's configuration support the goals of creating complete networks?	
	Would the project expand connections between anchor institutions or job centers?	
	Does the current configuration introduce barriers to travel for certain users?	
FREIGHT	Is freight movement a priority along this roadway?	
	Is this a major freight route?	

COMPLETE STREETS GAPS

ADDITIONAL CONSTRAINTS

3

IMPLEMENTATION OPPORTUNITIES

PRIORITY	POTENTIAL STRATEGIES		FEASIBILITY
LAND USE INTEGRATION & DEVELOPMENT	☐ Walkability Improvements ☐ Façade Upgrades ☐ Infill Strategies	☐ Zoning Changes ☐ Establish BID, Main Street District, etc. ☐ Maintenance Plan	
CONGESTION & EFFICIENCY	☐ Lane Restriping ☐ Roundabouts ☐ Access Management	☐ Travel Demand Management ☐ ITS Solutions ☐ Signals and Signal Timing ☐ Additional Lanes	
COMMUNITY HEALTH	☐ Trail Connections ☐ Bike infrastructure improvements	☐ Fill in Sidewalks ☐ Active Public Spaces	
PARKING	☐ On-street Parking	☐ Public Parking	
WALKABILITY & URBAN DESIGN	☐ Wider Sidewalks ☐ Expanded Landscape Buffers ☐ Street Trees ☐ Improved Crosswalks ☐ Reduce Curb Cuts	☐ Street Furniture ☐ Active Public/Open Spaces ☐ Improved Street Lighting ☐ Public Art ☐ Unique Paving Materials	
BICYCLING	☐ Bike Lanes ☐ Buffered Bike Lanes (Cycle Tracks) ☐ Multi-use paths	☐ Bicycle Boulevards ☐ Intersection Markings ☐ Parallel Bike Route	
TRANSIT	☐ Bus Rapid Transit ☐ Expanded Service	☐ Improved Transit Stop Amenities	
TRAFFIC CALMING	☐ Lower Design/Posted Speed ☐ Narrower Lanes ☐ Lane Reduction ☐ Median Improvements	☐ Roundabouts ☐ Signals and Signal Timing ☐ Pedestrian Beacons ☐ Improved Signage and Lighting ☐ Shoulder Changes	
GREEN STREETS	☐ Street Trees ☐ Pervious Surfaces ☐ Bioretention Basins	☐ Infiltration Planters ☐ Rain Gardens ☐ Median Design	
CONNECTIVITY	☐ Denser, grid like network ☐ Side Street Improvements ☐ Parallel Routes ☐ Improved Trail Connections	☐ Limit cul-de-sacs and Dead Ends ☐ Use shorter block lengths ☐ Pedestrian Connections to Adjacent Land Uses	
FREIGHT	☐ Truck Route Signage	☐ Designated Truck Route	

ADDITIONAL OPPORTUNITIES

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