CPBS
Center for Pedestrian and Bicyclist Safety

A Tier-1 University Transportation Center

NMDOT Pedestrian Safety on Arterials

July 2024

A Report From the
Center for Pedestrian and Bicyclist Safety

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University of New Mexico

About the Center for Pedestrian and Bicyclist Safety (CPBS)

The Center for Pedestrian and Bicyclist Safety (CPBS) is a consortium of universities committed to eliminating pedestrian and bicyclist fatalities and injuries through cutting-edge research, workforce development, technology transfer, and education. Consortium members include: The University of New Mexico; San Diego State University; The University of California Berkeley; The University of Tennessee Knoxville; and The University of Wisconsin Milwaukee. More information can be found at: https://pedbikesafety.org

Disclaimer

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16. Abstract

New Mexico's pedestrian fatality rate has been in the top ten for the United States (US) for 27 of the last 28 years. New Mexico Department of Transportation (NMDOT) roadways were host to 26.7% of the pedestrian crashes and 38.3% of the pedestrian fatal and serious injury (KA) crashes that occurred in New Mexico between 2015 and 2019. We identify an NMDOT Safety Priority profile consisting of NMDOT roads in urban areas with five lanes, signed at 35 mph, carrying about 10,000 or fewer vehicles per day, and with available roadway width (from outside of sidewalk to outside of sidewalk) of between 88-96 feet. Reconfigurations of similar roadways from across the country primarily consisted of reductions to three lanes (i.e., one travel lane in each direction with a two-way left-turn lane (TWLTL)), the addition of pedestrian amenities such as curb extensions or pedestrian refuges, and the installation of bicycle lanes. Based on the successful roadway reconfigurations that we identified and other past research, we made design recommendations that fundamentally shift the configuration of NMDOT roadways in urban areas by reducing the number of travel lanes and adding pedestrian and bicycle facilities. Reducing the number of lanes should reduce motor vehicle speeds, reduce turning conflicts, reduce crossing distance and complexity for pedestrians, and provide safe dedicated space for both pedestrians and bicyclists. Fundamentally rethinking the lane configuration will be a more economical method of improving traffic safety outcomes than spot-treatments such as adding traffic-controlled crossings along still fundamentally unsafe roadway corridors. Such reconfigurations may also help to build a sense of place and generate investment in the downtown areas through which they pass.

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SI* (MODERN METRIC) CONVERSION FACTORS

APPROXIMATE CONVERSIONS TO SI UNITS

Symbol	When You Know	Multiply By	To Find	Symbol
		LENGTH		
in	inches	25.4	millimeters	mm
ft	feet	0.305	meters	m
yd	yards	0.914	meters	m
mi	miles	1.61	kilometers	km
		AREA		
in^2	square inches	645.2	square millimeters	mm^2
ft^2	square feet	0.093	square meters	m^2
yd^2	square yard	0.836	square meters	m^2
ac	acres	0.405	hectares	ha
mi^2	square miles	2.59	square kilometers	km^2
		VOLUME		
fl oz	fluid ounces	29.57	milliliters	mL
gal	gallons	3.785	liters	L
ft^3	cubic feet	0.028	cubic meters	m^3
yd^3	cubic yards	0.765	cubic meters	m^3
		NOTE: volumes greater than 1000 L shall be shown in m^3		
		MASS		
oz	ounces	28.35	grams	g
lb	pounds	0.454	kilograms	kg
T	short tons (2000 lb)	0.907	megagrams (or "metric ton")	Mg (or "t")
		TEMPERATURE (exact degrees)		
^oF	Fahrenheit	5 (F-32)/9 or (F-32)/1.8	Celsius	^oC
		ILLUMINATION		
fc	foot-candles	10.76	lux	lx
fl	foot-Lamberts	3.426	candela/m^2	cd/m^2
		FORCE and PRESSURE or STRESS		
lbf	poundforce	4.45	newtons	N
lbf/in^2	poundforce per square inch	6.89	kilopascals	kPa

APPROXIMATE CONVERSIONS FROM SI UNITS

Symbol	When You Know	Multiply By	To Find	Symbol
		LENGTH		
mm	millimeters	0.039	inches	in
m	meters	3.28	feet	ft
m	meters	1.09	yards	yd
km	kilometers	0.621	miles	mi
		AREA		
mm^2	square millimeters	0.0016	square inches	in^2
m^2	square meters	10.764	square feet	ft^2
m^2	square meters	1.195	square yards	yd^2
ha	hectares	2.47	acres	ac
km^2	square kilometers	0.386	square miles	mi^2
		VOLUME		
mL	milliliters	0.034	fluid ounces	fl oz
L	liters	0.264	gallons	gal
m^3	cubic meters	35.314	cubic feet	ft^3
m^3	cubic meters	1.307	cubic yards	yd^3
		MASS		
g	grams	0.035	ounces	oz
kg	kilograms	2.202	pounds	lb
Mg (or "t")	megagrams (or "metric ton")	1.103	short tons (2000 lb)	T
		TEMPERATURE (exact degrees)		
^oC	Celsius	1.8C+32	Fahrenheit	^oF
		ILLUMINATION		
lx	lux	0.0929	foot-candles	fc
cd/m^2	candela/m^2	0.2919	foot-Lamberts	fl
		FORCE and PRESSURE or STRESS		
N	newtons	0.225	poundforce	lbf
kPa	kilopascals	0.145	poundforce per square inch	lbf/in^2

NMDOT Pedestrian Safety on Arterials

A Center for Pedestrian and Bicyclist Safety Research Report

July 2024

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Acronyms, Abbreviations, and Symbols

AADT	Annual Average Daily Traffic
ADA	Americans with Disabilities Act
ADT	Average Daily Traffic
CMF	Crash Modification Factor
CTDOT	Connecticut Department of Transportation
DOT	Department of Transportation
FHWA	Federal Highway Administration
KA	Fatal and Serious (Injuries)
MnDOT	Minnesota Department of Transportation
mph	Miles Per Hour
MPO	Metropolitan Planning Organization
NACTO	National Association of City Transportation Officials
NJDOT	New Jersey Department of Transportation
NMDOT	New Mexico Department of Transportation
PBOT	Portland Bureau of Transportation
PHB	Pedestrian Hybrid Beacon
RIRO	Right-In Right-Out
RRFB	Rectangular Rapid Flashing Beacon
SHSP	Strategic Highway Safety Plan
TWLTL	Two-Way Left-Turn Lane
US	United States
vpd	Vehicles Per Day
VRU	Vulnerable Road User
WSDOT	Washington State Department of Transportation

Abstract

New Mexico's pedestrian fatality rate has been in the top ten for the United States (US) for 27 of the last 28 years. New Mexico Department of Transportation (NMDOT) roadways were host to 26.7% of the pedestrian crashes and 38.3% of the pedestrian fatal and serious injury (KA) crashes that occurred in New Mexico between 2015 and 2019. We identify an NMDOT Safety Priority profile consisting of NMDOT roads in urban areas with five lanes, signed at 35 mph, carrying about 10,000 or fewer vehicles per day, and with available roadway width (from outside of sidewalk to outside of sidewalk) of between 88-96 feet. Reconfigurations of similar roadways from across the country primarily consisted of reductions to three lanes (i.e., one travel lane in each direction with a two-way left-turn lane (TWLTL)), the addition of pedestrian amenities such as curb extensions or pedestrian refuges, and the installation of bicycle lanes. Based on the successful roadway reconfigurations that we identified and other past research, we made design recommendations that fundamentally shift the configuration of NMDOT roadways in urban areas by reducing the number of travel lanes and adding pedestrian and bicycle facilities. Reducing the number of lanes should reduce motor vehicle speeds, reduce turning conflicts, reduce crossing distance and complexity for pedestrians, and provide safe dedicated space for both pedestrians and bicyclists. Fundamentally rethinking the lane configuration will be a more economical method of improving traffic safety outcomes than spot-treatments such as adding traffic-controlled crossings along still fundamentally unsafe roadway corridors. Such reconfigurations may also help to build a sense of place and generate investment in the downtown areas through which they pass.

Executive Summary

New Mexico's pedestrian fatality rate has been in the top ten for the United States (US) for 27 of the last 28 years. New Mexico Department of Transportation (NMDOT) roadways were host to 26.7% of the pedestrian crashes and 38.3% of the pedestrian fatal and serious injury (KA) crashes that occurred in New Mexico between 2015 and 2019. The purpose of this project was to identify specific NMDOT safety-priority corridors based on pedestrian crash histories, create an NMDOT Safety Profile based on the design profiles for five of those NMDOT safety-priority corridors, examine how other state and local DOTs have redesigned similar roadways, and then provide design recommendations for the NMDOT Safety Profile.

Although roadways with the NMDOT Safety Profile make up less than 5% of NMDOT's lane miles, 42.4% of pedestrian crashes and 33.9% of pedestrian KA crashes on NMDOT roads occurred on the Safety Profile roadways. That Safety Priority profile consisted of NMDOT roads in urban areas with five lanes, signed at 35 mph, carrying about 10,000 or fewer vehicles per day, and with available roadway width (from outside of sidewalk to outside of sidewalk) of between 88-96 feet.

Reconfigurations of similar roadways from across the country primarily consisted of reductions to three lanes (i.e., one travel lane in each direction with a two-way left-turn lane (TWLTL)), the addition of pedestrian amenities such as curb extensions or pedestrian refuges, and the installation of bicycle lanes. Reconfigurations were reported to have been successful with improved safety outcomes and public approval all while maintaining stable motor vehicle traffic operations.

Based on the successful roadway reconfigurations that we identified and other past research, we made design recommendations that fundamentally shift the configuration of NMDOT roadways in urban areas by reducing the number of travel lanes and adding pedestrian and bicycle facilities. Reducing the number of lanes should reduce motor vehicle speeds, reduce turning conflicts, reduce crossing distance and complexity for pedestrians, and provide safe dedicated space for both pedestrians and bicyclists. Fundamentally rethinking the lane configuration will be a more economical method of improving traffic safety outcomes than spot-treatments such as adding traffic-controlled crossings along still fundamentally unsafe roadway corridors.

Based on the case studies profiled and crash modification factors that were determined by past research, such reconfigurations should not only improve traffic safety while continuing to provide adequate level of service for the traffic volumes expected on these roadways, but such reconfigurations may help to build a sense of place and generate investment in the downtown areas through which they pass.

1. Introduction

New Mexico had the highest pedestrian fatality rate (per capita) in the United States every year between 2016 and 2021. Over the last 28 years in terms of pedestrian fatality rates, New Mexico has been in the top five for 24 of those 28 years and has been in the top ten for 27 of those 28 years. New Mexico Department of Transportation (NMDOT) roadways were host to 26.7% of the pedestrian crashes and 38.3% of the pedestrian fatal and serious injury (KA) crashes that occurred in New Mexico between 2015 and 2019.

The purpose of this project was to identify specific NMDOT safety-priority corridors based on pedestrian crash histories (Section 3). We then provide design profiles for five of those NMDOT safety-priority corridors (Section 3.1) and use those case studies to create an NMDOT Safety Profile (Section 3.2). We then examine how other state and local DOTs redesigned similar roadways (Section 4). We finally make design recommendations for the NMDOT Safety Profile (Section 5) based on the other examples we identified and other past research.

Findings provide a specific design vision for NMDOT roadways that many times constitute the Main Street through a rural New Mexico community. Improving these NMDOT Safety Profile roadways will improve pedestrian safety (and traffic safety in general) on NMDOT roadways and do much to improve traffic safety in New Mexico.

2. Literature Review

The goal of this literature review is to compile roadway design guidance from federal, state, and local transportation agencies that are focused on pedestrian safety. The research team reviewed design guidance including standard design manuals, complete street policies, traffic calming guidance, and other similar roadway design guidance.

2.1. State Design Guidance

The research team's search of the design literature began with the *New Mexico Department of Transportation (NMDOT) Design Manual* (*NMDOT, 2016*). We first specifically referred to Section 1200 (Pedestrian Facilities). The guidance gives a description of sidewalk design considerations and some Americans with Disabilities Act (ADA) criteria. However, guidance regarding provision of pedestrian crossings – which is a critically important topic given the high number of pedestrians that are struck attempting to cross NMDOT roadways at midblock locations – was lacking in context and detail. For example, the guidance regarding spacing of pedestrian crossing facilities simply states: "Consider shortening the crossing distance" (*NMDOT, 2016*). In another part of Section 1200 of the *NMDOT Design Manual* that discusses the provision of midblock pedestrian crossings, there is again a lack of specificity for how often pedestrian crossings should be provided:

> "A midblock crossing may be appropriate on roadways with pedestrian crossing traffic caused by nearby pedestrian generators, (see Section 1200.10.2 for

> crosswalk criteria for marked crosswalk recommendations at unsignalized intersections). The District Traffic Engineer should be consulted for approval of midblock crossings." (*NMDOT, 2016*)

The research team was not able to find any design guidance that was specific to different land use contexts. The only mention of land use context in pedestrian design guidance that the research could identify in Section 1200 of the *NMDOT Design Manual* reported that: "Maintenance agreements provide jurisdictional authority for decisions to mark crosswalks based on a population threshold of 25,000 and should be consulted prior to making a decision to mark a crosswalk" (*NMDOT, 2016*). Section 1200 of the *NMDOT Design Manual* also states: "Transit stops shall be connected to the sidewalk, curb ramps, street crossings, and PCPs by PARs" (*NMDOT, 2016*). However, no specifics about how often those street crossings should be provided.

The research team was not able to identify any design guidance regarding lane configurations and their relationship with pedestrian safety in Section 1200 of the *NMDOT Design Manual*. However, the *NMDOT Design Manual* contains Section 1250 which details road diets and expresses NMDOT's commitment to using road diets:

> "In 2015 an Every Day Counts Initiative for Road Diets was initiated by FHWA [Federal Highway Administration]-Headquarters, FHWA-New Mexico Division Office, and NMDOT with committee members drawn from Planning, Maintenance, Construction, and Design. Their charge was to develop a policy and begin the process of institutionalizing Road Diets as a design tool at NMDOT." (*NMDOT, 2016*)

Section 1250 the *NMDOT Design Manual* identifies several benefits to road diets including improving safety, economic development impacts on Main Streets, and increased pedestrian and bicyclist capacity (*NMDOT, 2016*). Road diet conversions to three-lane configurations are specifically mentioned for their benefits in terms of safety, even if those safety benefits come with a cost in terms of degraded traffic operations:

> "For example, if a roadway presents a significant safety issue at four lanes and has high traffic volumes, but the right-of-way is constrained, NMDOT may choose to implement a three-lane Road Diet in order to reduce crashes even thought it might increase travel times, thus presenting a trade-off between safety and operations." (*NMDOT, 2016*)

As seen in the above quote, motor vehicle traffic operations are a primary barrier to pursuing road diet conversions. High-level guidelines for roadways that may be road diet candidates in terms of daily traffic volumes are provided in Section 1250 of the *NMDOT Design Manual*:

> "For four-lane roadways with less than 10,000 AADT [Annual Average Daily Traffic], Road Diets [reducing to a three-lane configuration] should have virtually

> no impact on the roadway's operations, as the roadway has excessive capacity. For roadways with more than 10,000 AADT, an in-depth operations analysis is needed to assess the impact of a Road Diet on the operations of the candidate road, as well as the potential overflow facilities." (*NMDOT, 2016*)

Note that for the NMDOT safety-priority corridors detailed below in Section 2.3, three of the five corridors are below the 10,000 AADT threshold specified in the *NMDOT Design Manual*, and the other two corridors carry just slightly over 10,000 vehicles per day. Although NMDOT has recognized the possibility of road diets, implementation at the time of this report has been limited.

Other NMDOT reports that mention pedestrian safety and provide some general design guidance include the *New Mexico 2021 Strategic Highway Safety Plan* (SHSP) and the *NMDOT Vulnerable Road User Safety Assessment* (*NMDOT, 2022; NMDOT, 2023*). The *NM SHSP* identifies pedestrian involvement as a High-Priority Safety Emphasis Area and its Appendix B identifies the following design-oriented Safety Strategies to address the problem:

> "Explicitly include the safety of all road users in the design of transportation projects, including maintenance projects and plans. Use national best practices and bicycle, pedestrian, and equestrian (BPE) recommendations as a guide."
>
> "Implement street lighting and other measures to improve conspicuity and visibility of pedestrians."
>
> "Provide Americans with Disabilities Act (ADA)-compliant sidewalks/ walkways/trails, crosswalks, and curb ramps at locations with identified needs."
>
> "Install traffic calming for road sections and intersections, such as road diets." (*NMDOT, 2022*)

Similarly, the *NMDOT Vulnerable Road User Safety Assessment* identifies specific roadways on which to focus for vulnerable road user safety and provides some general design guidance:

> "Of the vulnerable road user [VRU] crashes on all public roadways in New Mexico, 84% of all injury-causing VRU-involved crashes and 91% of fatal vulnerable road user crashes occurred on roads classified as major collectors or higher, or at intersections with these roads, despite accounting for only 20% of centerline miles in the state." (*NMDOT, 2023*)

The *NMDOT Vulnerable Road User Safety Assessment* identified "UC Major" corridors as corridors in urban areas with over 7,000 AADT or four or more lanes (*NMDOT, 2023*). Suggested countermeasures to improve safety on these UC Major corridors include road diets, corridor access management, buffered or separated bike lanes, and enhanced midblock crossing treatments such as median refuge islands, raised crosswalks, rectangular rapid flashing beacons (RRFBs), and pedestrian hybrid beacons (PHBs). Many standard pedestrian safety treatments are mentioned, but there is no specific design vision provided for these corridors.

Other state DOTs mention Complete Streets, but the research team was not able to find any guidance that provides a specific design vision. For instance, while New Jersey Department of Transportation (NJDOT) has a *Complete Streets Design Guide*, the guide largely consists of descriptions of individual treatments without providing an overall street design profile that utilizes those treatments (*NJDOT, 2017*). The research team was able to find several examples of other DOTs discussing the possibility of integrating Complete Streets into their guidance, although many of these examples did not have final guidance available at the time of the writing of this report. For example, the Washington State Legislature passed Senate Bill 5974 in 2022, in which Section 418 states that transportation projects starting design on or after July 1, 2022, and which have a project cost of $500,000 or more must incorporate complete streets concepts, although exact design details or profiles are again lacking:

> "In order to improve the safety, mobility and accessibility of state highways, it is the intent of the Legislature that the department must incorporate the principles of complete streets with facilities that provide street access with all users in mind, including pedestrians, bicyclists and public transportation users." (*Washington State Legislature, 2022*)

One interesting perspective from a state DOT came from Connecticut DOT's (CTDOT) *Complete Streets Controlling Design and Justification Process* (*CTDOT, 2023*). Although there was a lack of guidance on pedestrian crossing spacing, this resource identified rural town centers as a land use context that warrants pedestrian facilities, which could apply to our own work in New Mexico and is worth further exploration in other states' guidance:

> "Rural Town Center applies to rural areas located within developed communities. Rural town centers generally have low development densities with diverse land uses, on-street parking, sidewalks in some locations, and small building setbacks. Rural town centers may include residential neighborhoods, schools, industrial facilities, and commercial main street business districts, each of which present differing design challenges and differing levels of pedestrian and bicycle activities." (*CTDOT, 2023*)

Many states have traffic calming guides, but these treatments typically do not apply to state highways. We therefore do not expand upon those treatments. Also, many of the traffic calming treatments that the research team was able to identify were like the treatments detailed in the Complete Streets guides mentioned above.

2.2. Federal Design Guidance

Federal guidance applicable to the problem at hand includes the *FHWA's Road Diet Informational Guide* (*FHWA, 2014*). FHWA notes that road diets can improve both general traffic safety and pedestrian safety. While FHWA primarily focused on traditional road diets which involve 4-lane to 3-lane reductions, the report notes that jurisdictions have used road diets that consisted of 5-lane to 3-lane reductions. Importantly, FHWA specifies that road diets have been successful on roadways that experienced up to 23,000 vehicles per day (vpd) in Kentucky, 24,000 vpd in Oakland, CA, and 25,000 vpd in Seattle, WA. Although in-depth engineering studies are necessary, FHWA indicates that road diets are likely feasible on roads well within the vehicle volumes seen on many NMDOT roads in rural communities:

> "The FHWA advises that roadways with ADT [average daily traffic] of 20,000 vpd or less may be good candidates for a Road Diet and should be evaluated for feasibility." (*FHWA, 2014*)

Another piece of federal design guidance that has some pertinence to improving pedestrian safety on NMDOT roadways is *FHWA's Small Town and Rural Multimodal Networks* (*FHWA, 2016*). This FHWA guide recognizes that many rural communities are built around state or county highways, which present unique issues to be addressed:

> "Many small and rural communities are located on State and county roadways that were built to design standards that favor high-speed motorized traffic, resulting in a system that makes walking and bicycling less safe and uncomfortable. These roadways can be retrofitted and redesigned over time to provide a transportation network that better serves the safety, health, and economic interests of the community." (*FHWA, 2016*)

Along with detailing standard pedestrian and bicycle treatments, a key recommendation from *FHWA's Small Town and Rural Multimodal Networks* in the Multimodal Main Streets section provides specific design recommendations for converting five lane arterial Main Streets through small communities to three lane configurations (**Figure 1**) (*FHWA, 2016*). However, there is no mention of pedestrian crossing spacing distances.

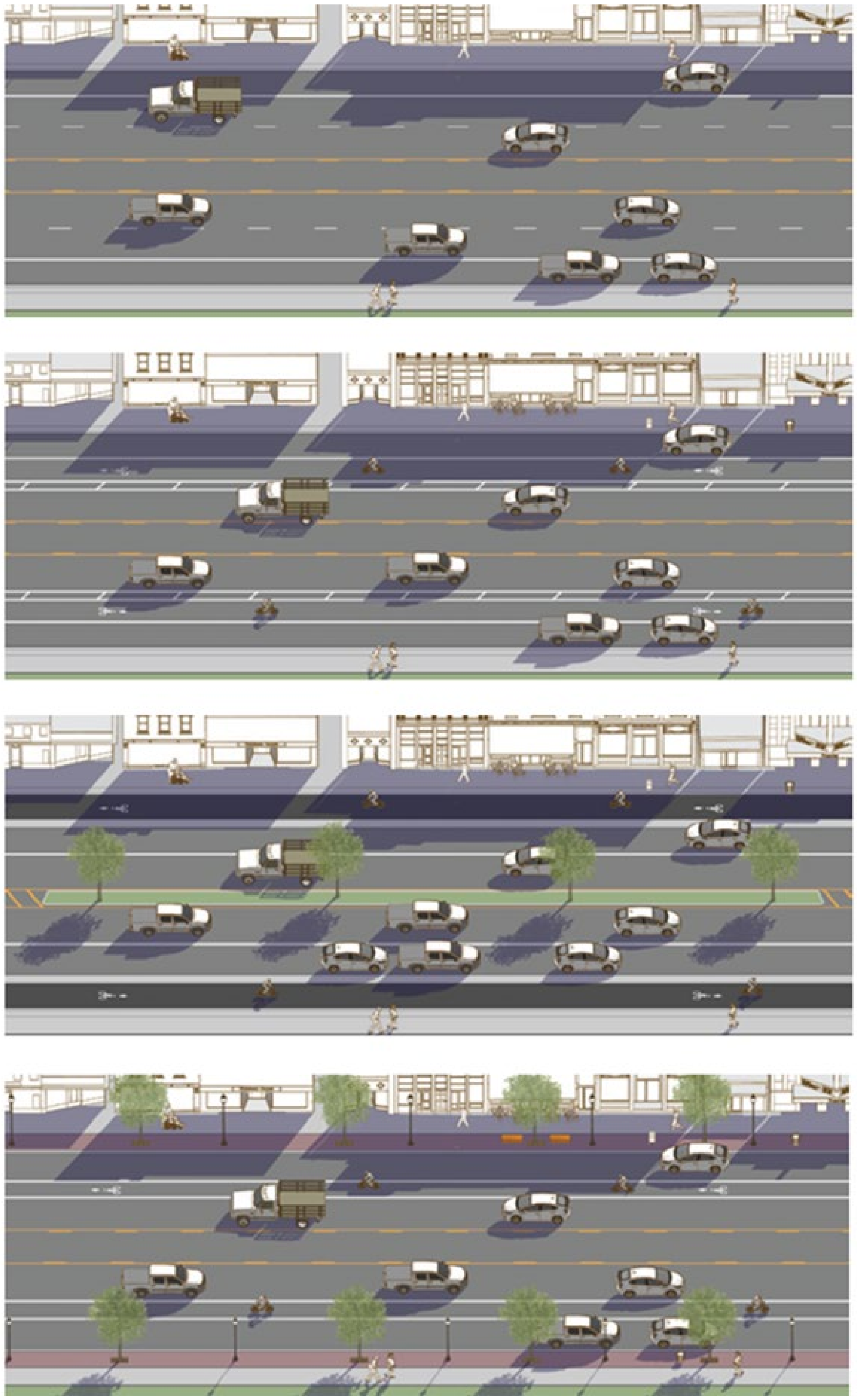

Figure 1. Example of five-lane Main Street (top picture) conversions to Road Diet with Bike Lanes (2nd from top); Median and Separated Bike Lanes (3rd); Streetscape Expansion with Bike Lanes (bottom). (source: *FHWA's Small Town & Rural Multimodal Networks*)

2.3. Local Design Guidance

The Portland Bureau of Transportation (PBOT) from Portland, OR published the *PedPDX: Portland's Citywide Pedestrian Plan* which notes that:

> "While research on exactly how far a person walking will travel out of direction to access a marked or enhanced pedestrian crossing is scant, it is a general rule of thumb that people walking will typically take the shortest route from point A to point B. Increasing the number of marked and enhanced crossing opportunities increases the number of options for people walking to cross the street." (*PBOT, 2019*)

Accordingly, *PedPDX: Portland's Citywide Pedestrian Plan* specifies that marked pedestrian crossings (enhanced or not) should be provided every 530 feet within pedestrian districts and within 100 feet of all transit stops (**Figure 2**) (*PBOT, 2019*). Outside pedestrian districts, marked pedestrian crossings are recommended every 800 feet. The average distance between pedestrian crossings on the NMDOT roadways identified in Section 3.1 is 1,722 feet.

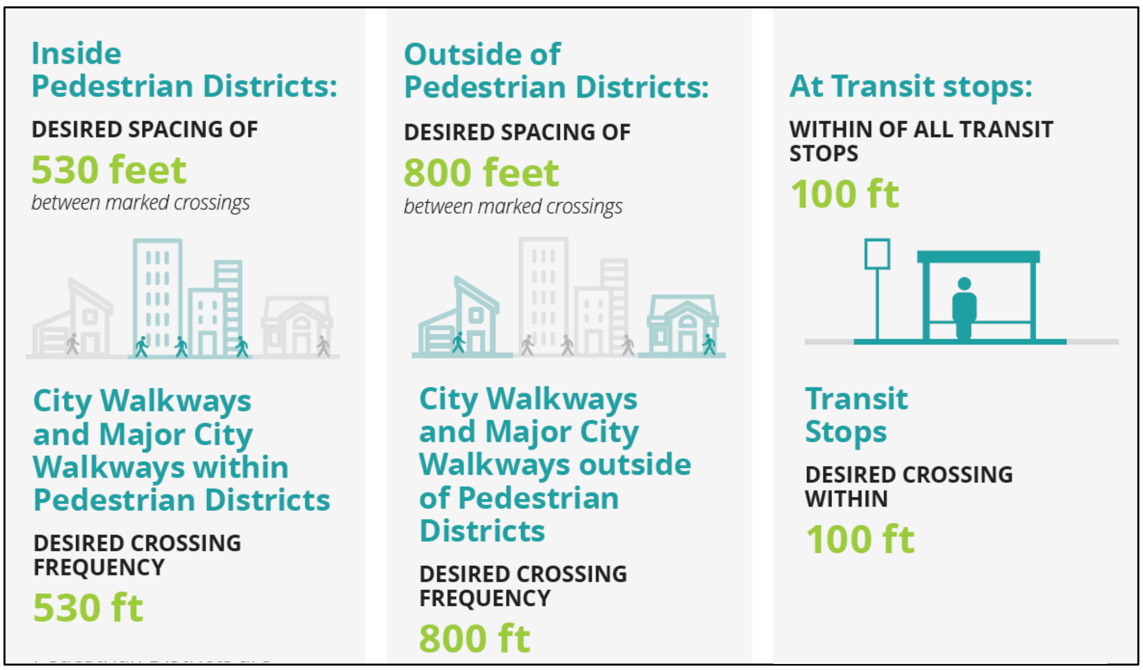

Figure 2. Marked pedestrian crossing spacing guidelines from *PedPDX: Portland's Citywide Pedestrian Plan*.

The *Tucson Street Design Guide 2020* was prepared by the City of Tucson, AZ, to provide guidance on incorporating Complete Streets design approach in all transportation projects across the city (*City of Tucson, 2021*). Although this is another design guide on the city level, it does provide design guidelines that may translate to some NMDOT roadways. One specific design guideline that pertains to pedestrian safety specifies the amount of right-of-way that should be dedicated to pedestrians and bicyclists:

> "Roadways that currently devote less than 25 percent of the right-of-way to the combined pedestrian realm and bicycle/parking zone, for example, are going to largely serve motor vehicles and transit, while roadways that devote 50 percent or more of the right-of-way to the outside zones are going to provide a more balanced environment that supports active modes as well as other public activities." (*City of Tucson, 2021*)

As seen in the NMDOT roadways identified in Section 3.1, most of the NMDOT safety-priority corridors currently dedicate about 15% of their right-of-way to pedestrians or bicyclists. The *Tucson Street Design Guide 2020* also notes that five-lane configurations (with AADT up to 20,000) can likely be converted into three-lane roadways by eliminating one travel lane in each direction and using the space for enhanced bicycle lanes or on-street parking (*City of Tucson, 2021*). The guide provides a corridor-level design vision for neighborhood commercial districts, which might correlate with NMDOT roadways that form the Main Street for a rural community (**Figure 3**).

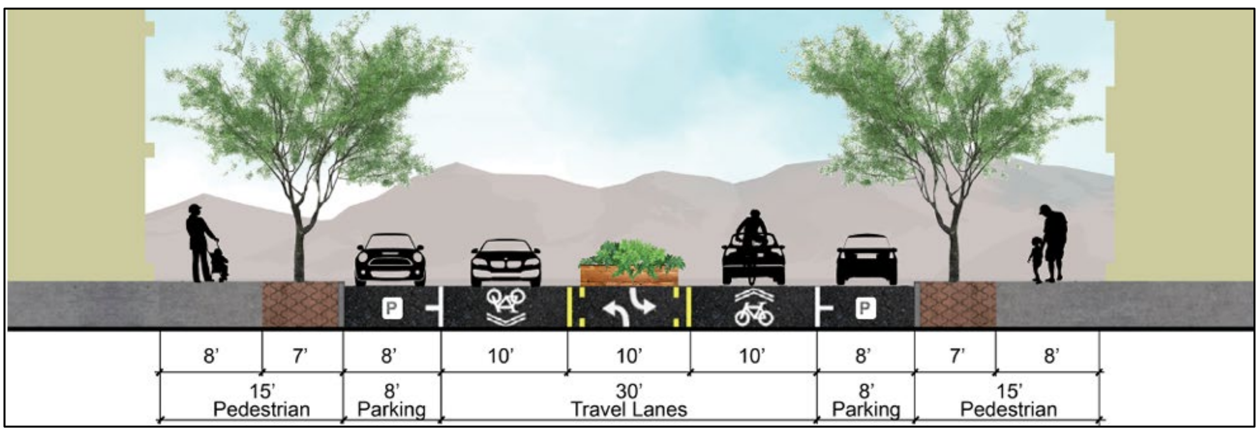

Figure 3. Corridor-level design vision for neighborhood commercial districts (source: *Tucson Street Design Guide 2020*)

The *Tucson Street Design Guide 2020* notes that pedestrian crossings should be regularly provided, but they specify relatively long distances (**Figure 4**) compared to the Portland guidance noted before (*City of Tucson, 2021*). Since it is unclear whether such long distances between pedestrian crossings are safe, this NMDOT report recommends using Portland's guidance as opposed to Tucson's guidance for crossing spacing.

> "Regular, safe crossing opportunities must be provided for bicyclists and pedestrians. Where there are long distances between traffic controls, pedestrians and bicyclists will look to cross the road at uncontrolled locations. In urban areas,

where there is more pedestrian or bicycle activity, enhanced pedestrian crossings should be provided at frequent intervals. In suburban contexts, crossings can be less frequent but should still be located at regular intervals near generators of bicycle and pedestrian traffic." (*City of Tucson, 2021*)

CONTEXT	ENHANCED CROSSING FREQUENCY
Downtown / University / Neighborhood Commercial Street	Every block
Urban Connector / Thoroughfare	1/8 mile - 1/4 mile
Suburban Connector / Thoroughfare	1/4 mile - 1/2 mile

Figure 4. Pedestrian crossing spacing guidelines from *Tucson Street Design Guide 2020*.

3. Identification of NMDOT Safety-Priority Corridors

Between 2015-2019, there were 2,906 pedestrian crashes and 817 pedestrian KA crashes reported across New Mexico in the NMDOT crash dataset. 776 (26.7%) of the pedestrian crashes and 313 (38.3%) of the pedestrian KA crashes occurred within 50 feet of an NMDOT road (**Figure 5**). At the same time, NMDOT has 29,781 (19.8%) lane miles of roadway out of a total of 150,747 lane miles of roadway across the state (*FHWA, 2021*). The 19.8% of roadway lane miles in New Mexico that are owned/operated by NMDOT are slightly overrepresented since they experience 26.7% of pedestrian crashes and 38.3% of KA pedestrian crashes in the state (**Figure 5**).

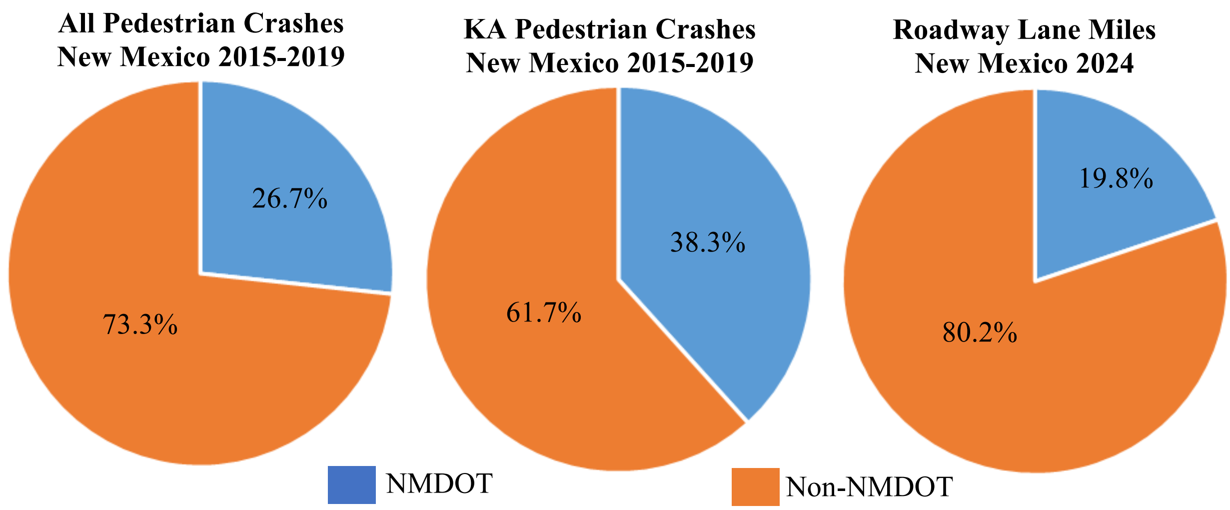

Figure 5. The distribution of pedestrian crashes relative to NMDOT roadways.

With 29,781 lane miles of NMDOT roadway, prioritizing locations to improve safety sounds like a daunting task (the equatorial circumference of Earth is 24,901 miles). However, while 2,564 (88.2%) pedestrian crashes and 631 (77.2%) KA pedestrian crashes in New Mexico between 2015-2019 occurred in urban areas, only 2,596 lane miles (8.7%) of NMDOT roads are in urban areas (**Figure 6**). By focusing on urban areas, we can feasibly address a vast majority of New Mexico's pedestrian safety issues (77.2%-88.2%) while only focusing on a small portion (8.7%) of NMDOT roads.

All Pedestrian Crashes
New Mexico 2015-2019
KA Pedestrian Crashes
New Mexico 2015-2019
NMDOT Roadway Lane Miles
New Mexico 2024

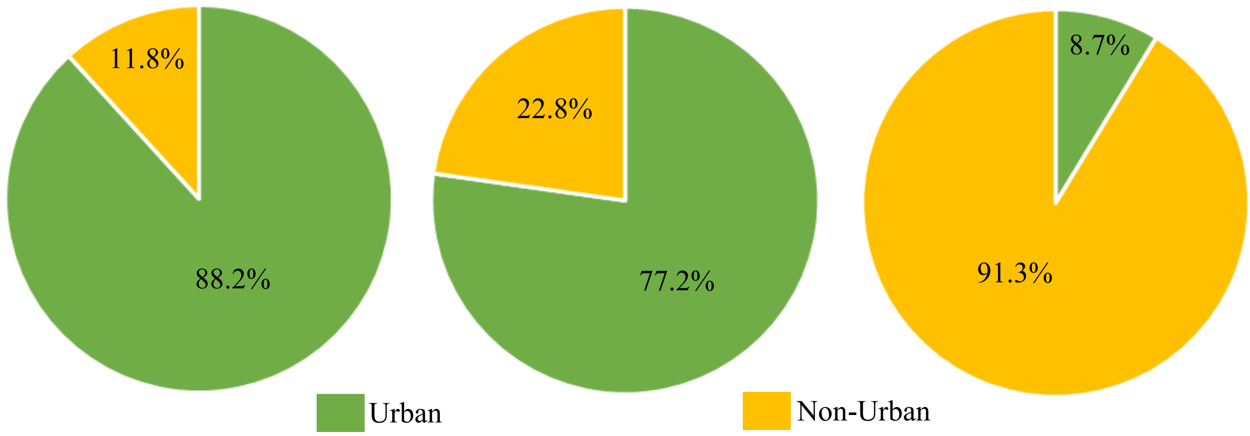

Figure 6. Pedestrian crashes on urban versus non-urban NMDOT roadways.

Knowing that we wanted to focus on NMDOT roads in urban areas, we next queried any NMDOT road segments that were within 0.25 miles of a developed place (per US Census Bureau), had 1.0 or more pedestrians struck per mile between 2015-2019, had more than 10% of households without access to an automobile, and had a length greater than 0.1 miles. This query identified NMDOT roadways in urban areas with extant pedestrian safety issues and with equity reasons to believe there would be higher than normal pedestrian exposure or latent demand (**Figure 7**). This query allowed us to further focus on specific NMDOT roadway types in urban areas for which design reconsiderations could help improve pedestrian safety.

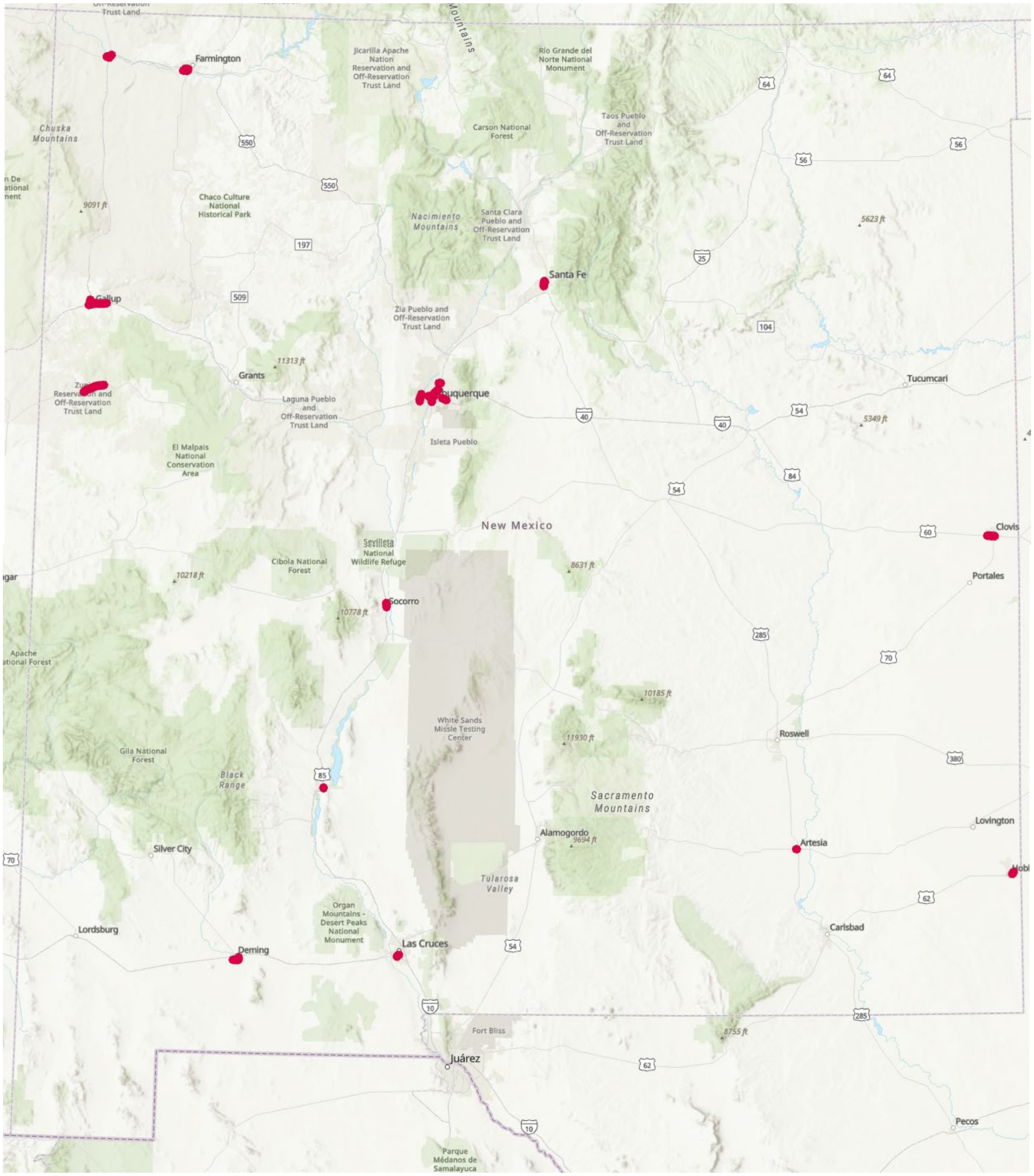

Figure 7. Map of NMDOT safety-priority corridors (highlighted in red).

The safety-priority corridors were well-distributed across New Mexico (**Figure 7**) and were located in urban areas as large as Albuquerque (population of 562,599 in 2021) and as small as Truth or Consequences (population 6,062 in 2021). The next step was to identify commonalities between the designs of these roadways so we could make design recommendations. Ideally, all the safety-priority roadways would have similar designs so a single strategy would address as many pedestrian safety issues as possible.

3.1. Cross Section Profiles of NMDOT Safety-Priority Corridors

To identify design commonalities on our safety-priority roadways, we next chose five NMDOT safety-priority roadways to profile. We selected roadways from communities of all sizes across New Mexico and in consultation with the NMDOT advisory team. We did not profile any safety-priority roadways in Albuquerque because those road segments are unique relative to other New Mexico communities. The research team noted the design characteristics of the safety-priority roadways including lane configuration, speed limit, width, and distance between traffic-controlled pedestrian crossings. The design team also noted the ADT on the safety-priority roadways and the surrounding land use contexts. The roadway characteristics in the table were pulled from the NMDOT HSIP Non-Interstate Network Screening Map (*NMDOT, 2024a*) and the vehicle volumes were from the NMDOT Transportation Data Management System (*NMDOT, 2024b*).

3.1.1. US-82 (W Main Street) in Artesia, NM (32.8422, -104.4048)

This segment of US-82 (W Main Street) is located in Artesia, New Mexico, between 12th Street and 7th Street (**Figure 8**). Artesia is a town with a population of 12,458 in southeastern New Mexico. Artesia's downtown is anchored to US-82 and US-285 which run east/west and north/south through the town, respectively. The land use along the corridor is mixed consisting of mostly commercial and some residential, all of which is relatively low-density development. Relatively low-density residential developments are located beyond the immediate corridor itself to both the north and south.

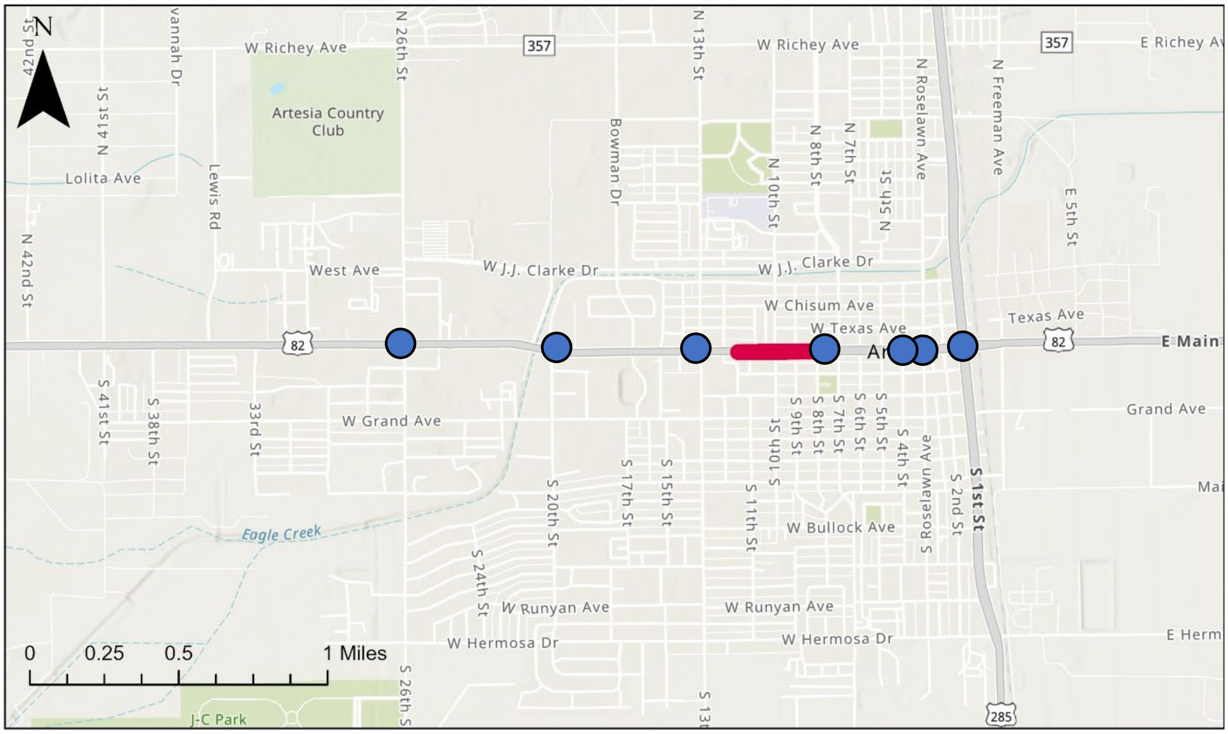

Figure 8. Map of safety-priority corridor in Artesia, NM (highlighted in red). Traffic-controlled pedestrian crossings represented with blue circles.

This segment of US-82 (W Main Street) has a functional classification designation of minor arterial (**Table 1**). The roadway consists of a 5-lane configuration with two travel lanes in each direction and a center two-way left-turn lane (**Figures 9 & 10**). The total width of the roadway from the outside of sidewalk to the outside of sidewalk is 96 feet. The roadway carried an average of 4,026 vehicles per day total (inclusive of both directions of travel) in 2022 and is signed at 35 mph. There are crossings for pedestrians where traffic is controlled by traffic signals every 1,764 feet on average across the entire corridor. These are primarily concentrated on the east end of the corridor. Traffic-controlled pedestrian crossings are provided on the west end of the corridor approximately every 2,600 feet.

Table 1. Characteristics of US-82 (W Main Street) in Artesia, NM

Functional Classification	Minor Arterial
ADT (2022)	4,026
Lanes	5
Speed Limit	35 mph
Width	96’
Distance between Traffic-Controlled Crossings	1,764’

Figure 9. Photo of US-82 / W Main Street in Artesia, NM.

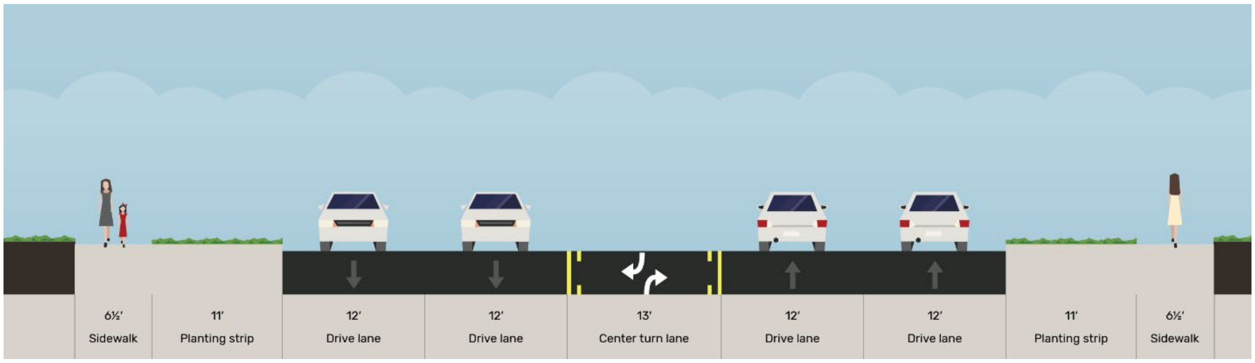

Figure 10. Cross section diagram of US-82 / W Main Street in Artesia, NM.

3.1.2. US-64 Business (W Broadway Avenue) in Farmington, NM (36.7281, -108.2106)

This segment of US-64 Business (W Broadway Avenue) is located in Farmington, New Mexico, between Main Street and Vine Avenue (**Figure 11**). Farmington is a town with a population of 46,422 in northwestern New Mexico. Farmington's downtown Main Street runs parallel to US-64 just 275 feet to the north. The land use along the corridor is mixed consisting of mostly commercial and some residential, all of which is relatively low-density development. Relatively low-density residential developments are located beyond the immediate corridor itself to both the north and south, along with amenities such as schools and parks.

Figure 11. Map of safety-priority corridor in Farmington, NM (highlighted in red). Traffic-controlled pedestrian crossings represented with blue circles.

This segment of US-64 Business (W Broadway Avenue) has a functional classification designation of principal arterial (**Table 2**). The roadway consists of a 5-lane configuration with two travel lanes in each direction and a center two-way left-turn lane (**Figures 12 & 13**). The total width of the roadway from the outside of sidewalk to the outside of sidewalk is 90 feet. The roadway carried an average of 10,827 vehicles per day total (inclusive of both directions of travel) in 2022 and is signed at 35 mph. There are crossings for pedestrians where traffic is controlled by traffic signals every 1,094 feet on average across the entire corridor and these are relatively evenly-distributed along the entire corridor.

Table 2. Characteristics of US-64 Business (W Broadway Avenue) in Farmington, NM

Functional Classification	Principal Arterial
ADT (2022)	10,827
Lanes	5 (+2 parking)
Speed Limit	35 mph
Width	90’
Distance between Traffic-Controlled Crossings	1,094’

Figure 12. Photo of US-64 Business / W Broadway Avenue in Farmington, NM.

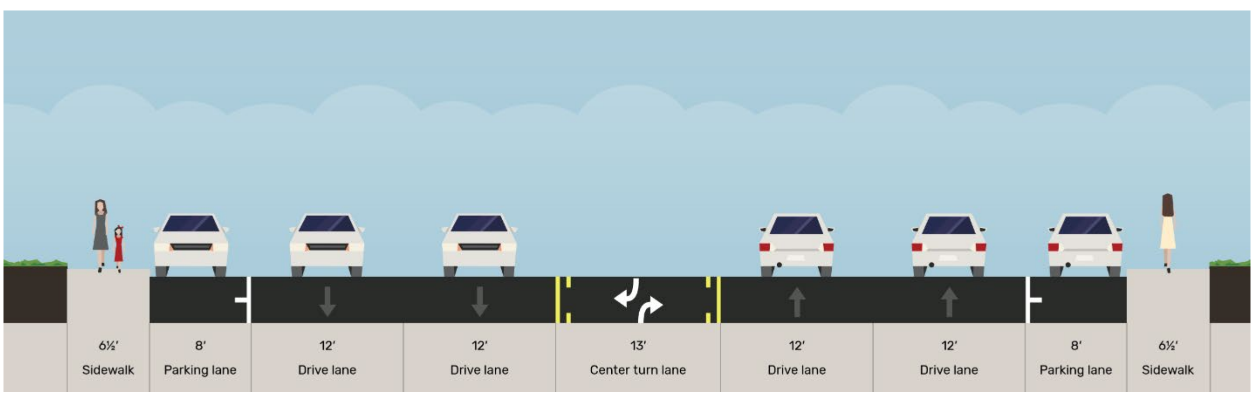

Figure 13. Cross section diagram of US-64 Business / W Broadway Avenue in Farmington, NM.

3.1.3. I-40 Business (Highway 66) in Gallup, NM (35.5308, -108.7332)

This segment of I-40 Business (Highway 66) is located in Gallup, New Mexico, between Ellison Street and Mollica Drive (**Figure 14**). Gallup is a town with a population of 21,495 in western New Mexico. Gallup's historic downtown is anchored to I-40 Business which runs east/west through the town. The corridor is historic Route 66 and parallels a railroad and I-40, which are approximately 250 feet and 750 feet to the north, respectively. The land use along the corridor is relatively high-density commercial. Medium-density residential developments are located beyond the immediate corridor itself to the south, along with amenities such as schools and parks.

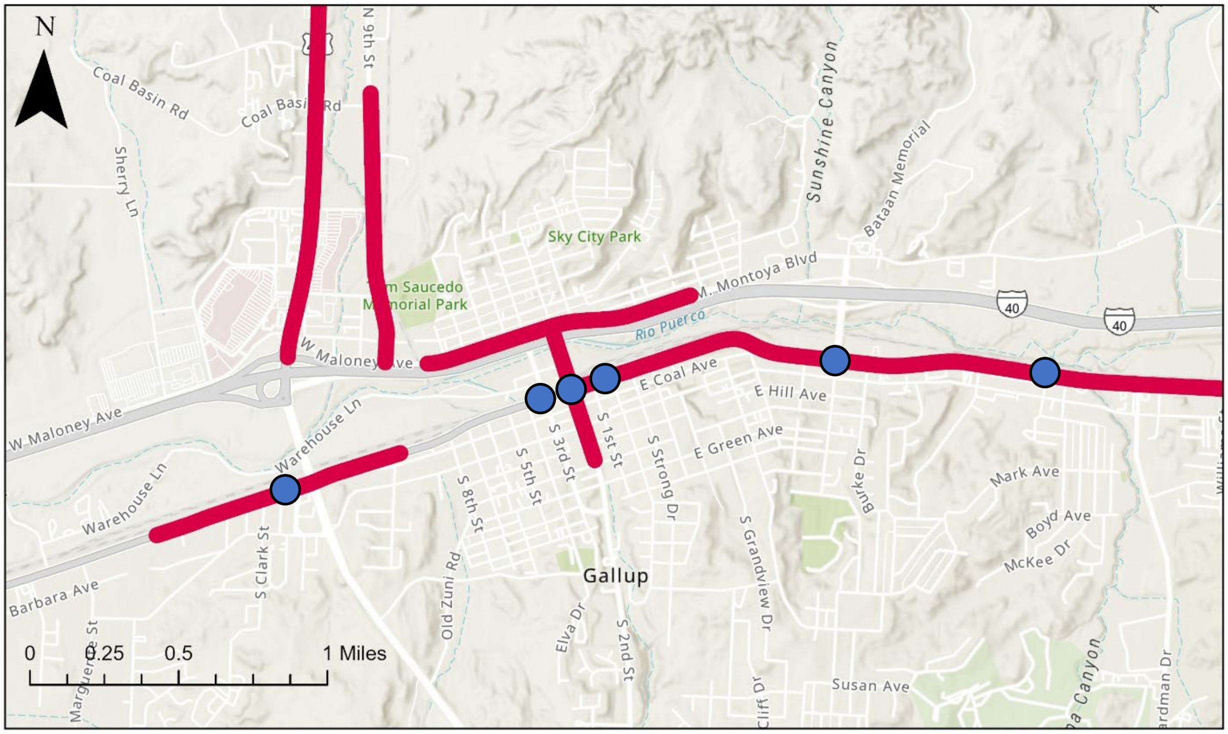

Figure 14. Map of safety-priority corridor in Gallup, NM (highlighted in red). Traffic-controlled pedestrian crossings represented with blue circles.

This segment of I-40 Business (Highway 66) has a functional classification designation of principal arterial (Table 3). The roadway consists of a 5-lane configuration with two travel lanes in each direction and a center two-way left-turn lane (**Figures 15 & 16**). The total width of the roadway from the outside of sidewalk to outside of sidewalk is 80 feet. The roadway carried an average of 12,888 vehicles per day (inclusive of both directions of travel) in 2023 and is signed at 35 mph. There are crossings for pedestrians where traffic is controlled by traffic signals every 2,305 feet on average across the entire corridor. These are primarily concentrated near the downtown core. Traffic-controlled pedestrian crossings are provided less often on the far west and east ends of the corridor with spacings of over three-quarters of a mile between crossings.

Table 3. Characteristics of I-40 Business (Highway 66) in Gallup, NM

Functional Classification	Principal Arterial
ADT (2023)	12,888
Lanes	5
Speed Limit	35 mph
Width	80’
Distance between Traffic-Controlled Crossings	2,305’

Figure 15. Photo of I-40 Business / Highway 66 in Gallup, NM.

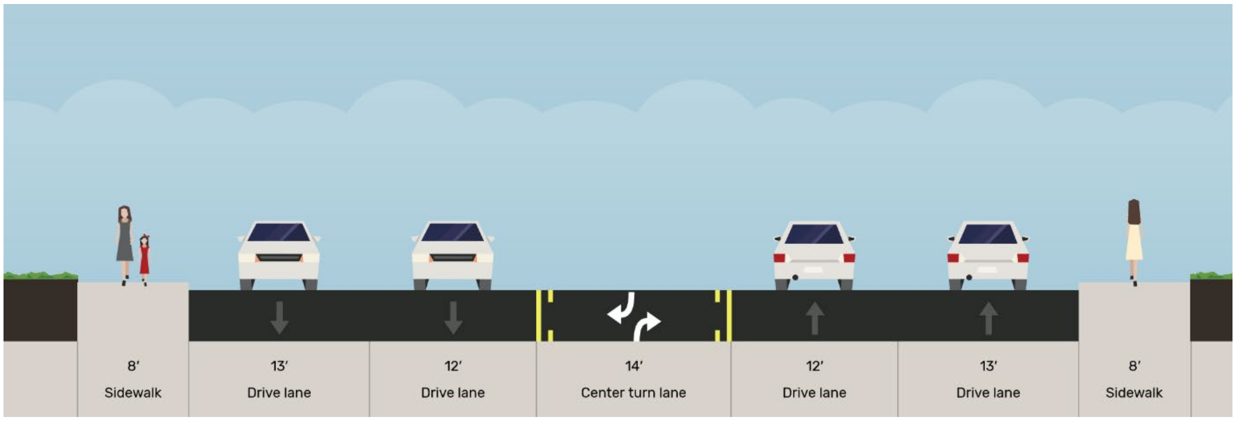

Figure 16. Cross section diagram of I-40 Business / Highway 66 in Gallup, NM.

3.1.4. US-60 (California Street) in Socorro, NM (34.0635, -106.8923)

This segment of US-60 (California Street) is located in Socorro, New Mexico, between the I-25 interchange and Spring Street (**Figure 17**). Socorro is a town with a population of 8,414 in central New Mexico. Socorro's downtown is anchored to US-60 which runs north/south through the town. The land use along the corridor is mostly low-density commercial. Relatively low-density residential developments are located beyond the immediate corridor itself to both the east and west, along with amenities such as schools and parks.

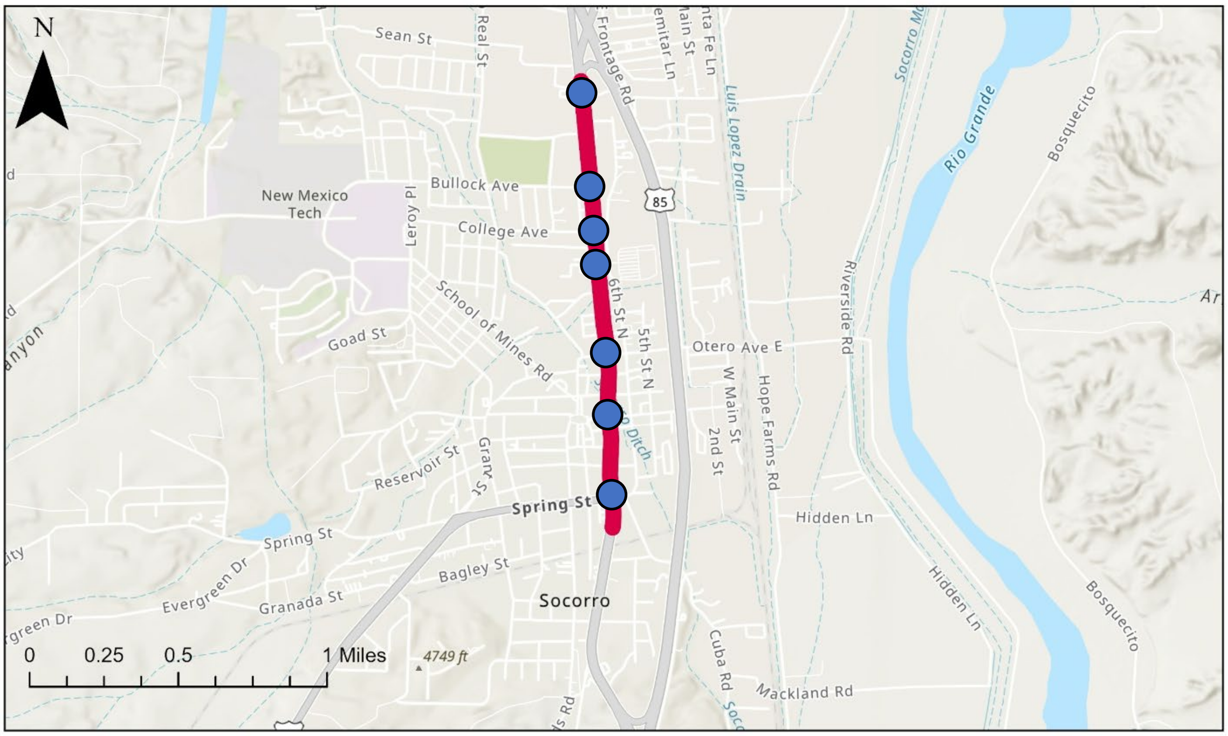

Figure 17. Map of safety-priority corridor in Socorro, NM (highlighted in red). Traffic-controlled pedestrian crossings represented with blue circles.

This segment of US-60 (California Street) has a functional classification designation of principal arterial (Table 4). The roadway consists of a 5-lane configuration with two travel lanes in each direction and a center two-way left-turn lane (**Figures 18 & 19**). The total width of the roadway from the outside of sidewalk to the outside of sidewalk is 96 feet. The roadway carried an average of 9,085 vehicles per day total (inclusive of both directions of travel) in 2022 and is signed at 35 mph. There are crossings for pedestrians where traffic is controlled by traffic signals every 1,335 feet on average across the entire corridor. These are relatively evenly-distributed across the corridor.

Table 4. Characteristics of US-60 (California Street) in Socorro, NM

Functional Classification	Principal Arterial
ADT (2022)	9,085
Lanes	5
Speed Limit	35 mph
Width	96’
Distance between Traffic-Controlled Crossings	1,335’

Figure 18. Photo of US-60 / California Street in Socorro, NM.

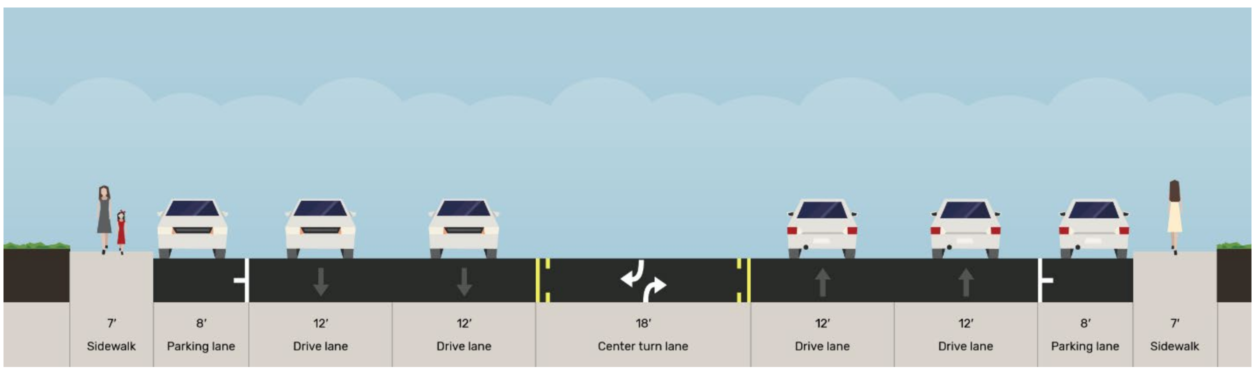

Figure 19. Cross section diagram of US-60 / California Street in Socorro, NM.

3.1.5. I-25 Business (Date Street) in Truth or Consequences, NM (33.1322, -107.2504)

This segment of I-25 Business (Date Street) is located in Truth or Consequences, New Mexico, between Smith Avenue and Foch Street (**Figure 20**). Truth or Consequences is a town with a population of 6,062 in south-central New Mexico. Truth or Consequences' downtown is anchored to I-25 Business which runs north/south through the town. The land use along the corridor is mostly low-density commercial. Relatively low-density residential developments are located beyond the immediate corridor itself to both the east and west, along with amenities such as schools and parks.

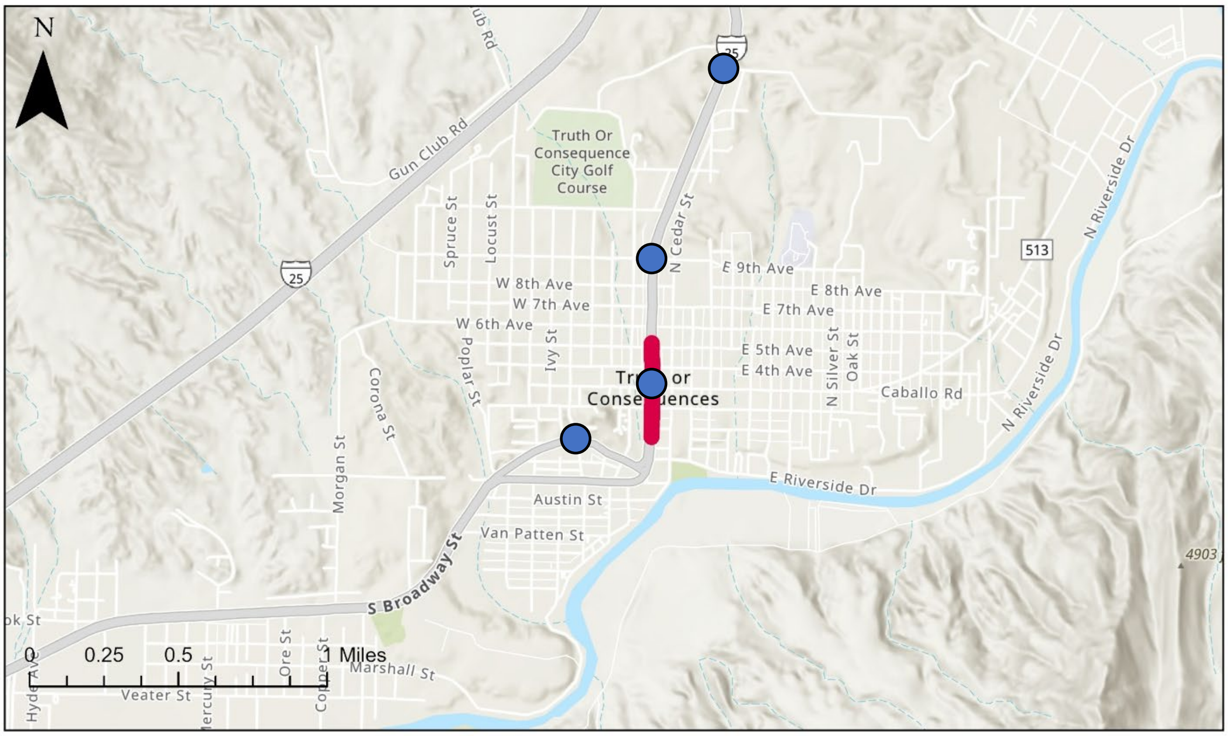

Figure 20. Map of safety-priority corridor in Truth or Consequences, NM (highlighted in red). Traffic-controlled pedestrian crossings represented with blue circles.

This segment of I-25 Business (Date Street) has a functional classification designation of principal arterial (Table 5). The roadway consists of a 5-lane configuration with two travel lanes in each direction and a center two-way left-turn lane (**Figures 21 & 22**). The total width of the roadway from the outside of sidewalk to the outside of sidewalk is 88 feet. The roadway carried an average of 8,083 vehicles per day total (inclusive of both directions of travel) in 2022 and is signed at 35 mph. There are crossings for pedestrians where traffic is controlled by traffic signals every 2,112 feet on average across the entire corridor. These are primarily concentrated on the southern end of the corridor with a gap of 3,500 feet between crossings on the northern end. Note that the crossing on the northern end of the corridor is a roundabout.

Table 5. Characteristics of I-25 Business (Date Street) in Truth or Consequences, NM

Functional Classification	Principal Arterial
ADT (2022)	8,083
Lanes	5
Speed Limit	35 mph
Width	88’
Distance between Traffic-Controlled Crossings	2,112’

Figure 21. Photo of I-25 Business / Date Street in Truth or Consequences, NM.

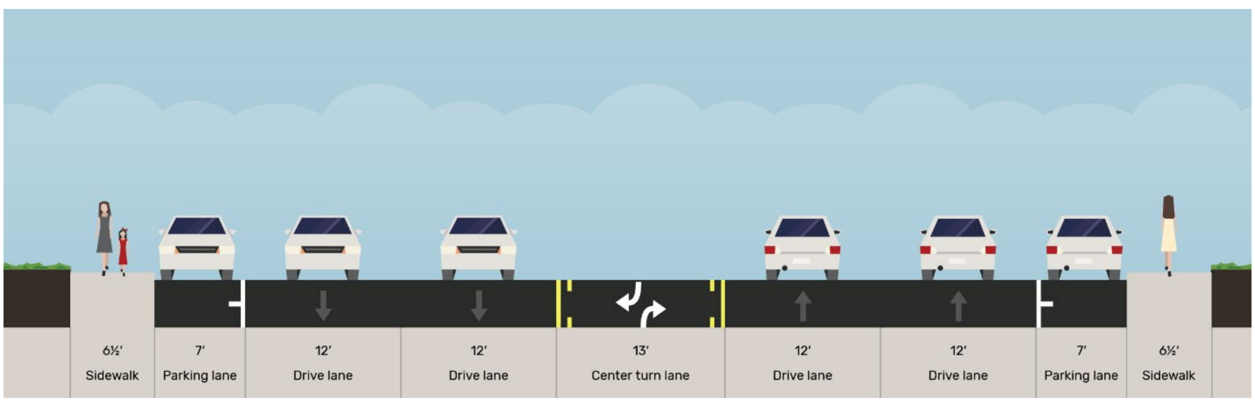

Figure 22. Cross section diagram of I-25 Business / Date Street in Truth or Consequences, NM.

3.2. Summary of NMDOT Safety-Priority Corridor Cross Section Profiles

After profiling several of the NMDOT safety-priority corridors that we identified, we were fortunate to identify key patterns within the roadway designs. All the identified NMDOT safety-priority corridors had five-lane configurations with two travel lanes in each direction and a center two-way left-turn lane. Despite the five-lane configurations, the ADTs were relatively low, ranging from 4,026 to 12,888 vehicles per day. All the roadway widths (from outside of sidewalk to outside of sidewalk) were between 80 and 96 feet and all the profiled corridors had posted speed limits of 35 mph. Average distance between traffic-controlled pedestrian crossings along the corridors were between 0.21 miles to 0.44 miles.

Now that our safety analysis has led to the identification of a specific roadway design profile, how many crashes in New Mexico occur on this type of roadway profile? Five-lane NMDOT roads in urban areas make up 1,465.4 lane miles across New Mexico (1.0% of the total lane miles across the state). But 329 of the 2,906 (11.3%) pedestrian crashes occur within 50 feet of these roads and 106 of the 817 (13.0%) pedestrian KA crashes occur within 50 feet of these roads. If we remove pedestrian crashes that are occurred in the Albuquerque metro area from that analysis, 222 of the 1,277 (17.4%) pedestrian crashes and 66 of the 398 (16.6%) pedestrian KA crashes occur within 50 feet of NMDOT roads of the type we have profiled.

Specifically examining NMDOT roads, 42.4% of pedestrian crashes and 33.9% of pedestrian KA crashes that occur on NMDOT roads occur on our five-lane urban road type, despite the fact that the road type only makes up 4.9% of all NMDOT lane miles (**Figure 23**).

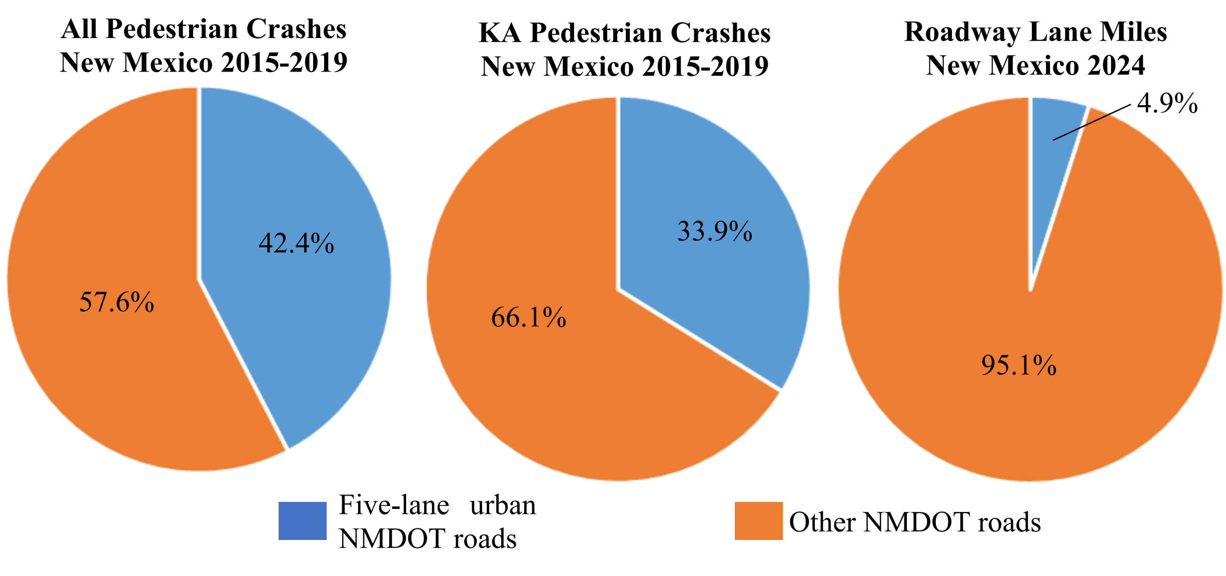

Figure 23. Distribution of pedestrian crashes relative to NMDOT roads and urban five-lane configurations.

4. Example of Other DOTs' Road Redesigns Addressing the Safety-Priority Profile

We now profile four examples of road redesigns that addressed safety issues on roadways that had profiles similar to the safety-priority profile we identified above. We specifically sought rural examples of roads owned by other state DOTs. We also profile an example of a road owned by the city of Charlotte, North Carolina, that had similar characteristics to our NMDOT priority roads. All the roadway redesigns profiled below have roadway widths and vehicle volumes similar to the NMDOT profiles detailed above.

4.1 Highway 65 (South Broadway) in Albert Lea, MN (43.6430, -93.3687)

Albert Lea is a city of about 18,500 residents in south central Minnesota. A road diet was implemented by Minnesota Department of Transportation (MnDOT) in 2015 on Minnesota Highway 65 (South Broadway) between Main Street and 7th Street on the south end of Albert Lea's downtown (**Figure 24**) (*MnDOT, 2024a*).

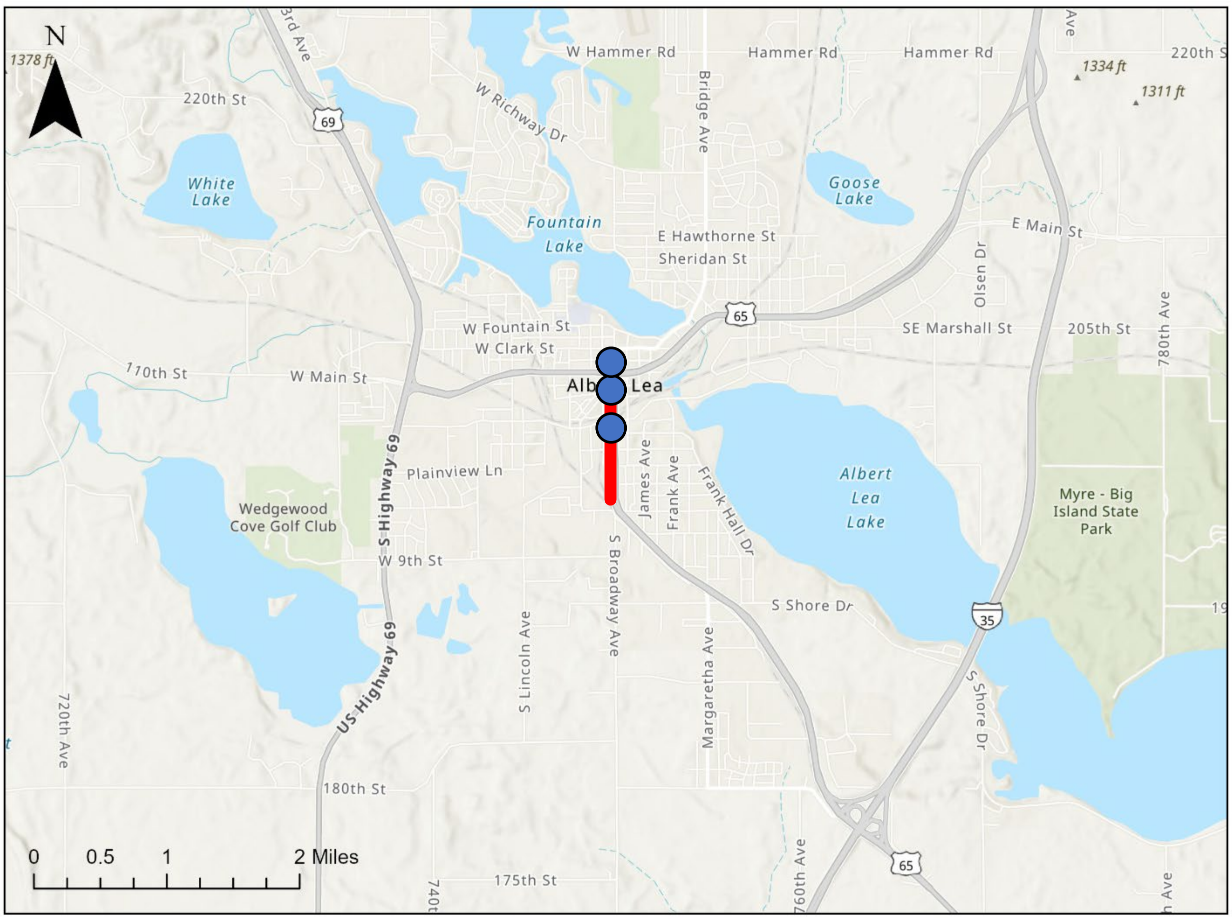

Figure 24. Map of non-New Mexico roadway redesign case study in Albert Lea, MN (highlighted in red). Traffic-controlled pedestrian crossings represented with blue circles.

Albert Lea adopted a complete streets policy in 2009 and initiated a major downtown revitalization in 2013 (*MnDOT, 2024a*). The Highway 65 road diet was part of this overall revisioning of the city. Because there was regular maintenance on the road scheduled by MnDOT, the city asked whether they could complete a road diet instead of simply maintaining the road in its current configuration. Citizens expressed that they were concerned that the road redesign would cause confusion, increase vehicle wait times, and cause safety issues as traffic might back up across a railroad crossing.

The road redesign was a traditional road diet that had a four-lane configuration (two travel lanes in each direction) converted to a three-lane configuration with bike lanes on each side of the street (**Table 6** and **Figures 25 and 26**). The road carried between 5,000 and 7,000 vehicles per day both before and after the realignment and the total road width (from outside of sidewalk to outside of sidewalk) was 98 feet, which are both similar to the NMDOT roadways profiled above (*MnDOT, 2024a*). In addition to lane reconfiguration, the project also saw replacement of sidewalks and traffic signals, new decorative lighting, trees, and curb bump-outs for pedestrians at key intersections.

Table 6. Characteristics of Highway 65 (South Broadway) in Albert Lea, MN

	Before	**After**
Functional Classification	Minor Arterial	Minor Arterial
ADT (2013, 2022)	7,000	5,420
Lanes	4	3
Speed Limit	30 mph	30 mph
Width	98’	98’
Distance between Traffic-Controlled Crossings	1,333’	1,333’

Figure 25. Photo of Highway 65 / South Broadway in Albert Lea, MN before (top) and after (bottom) road redesign.

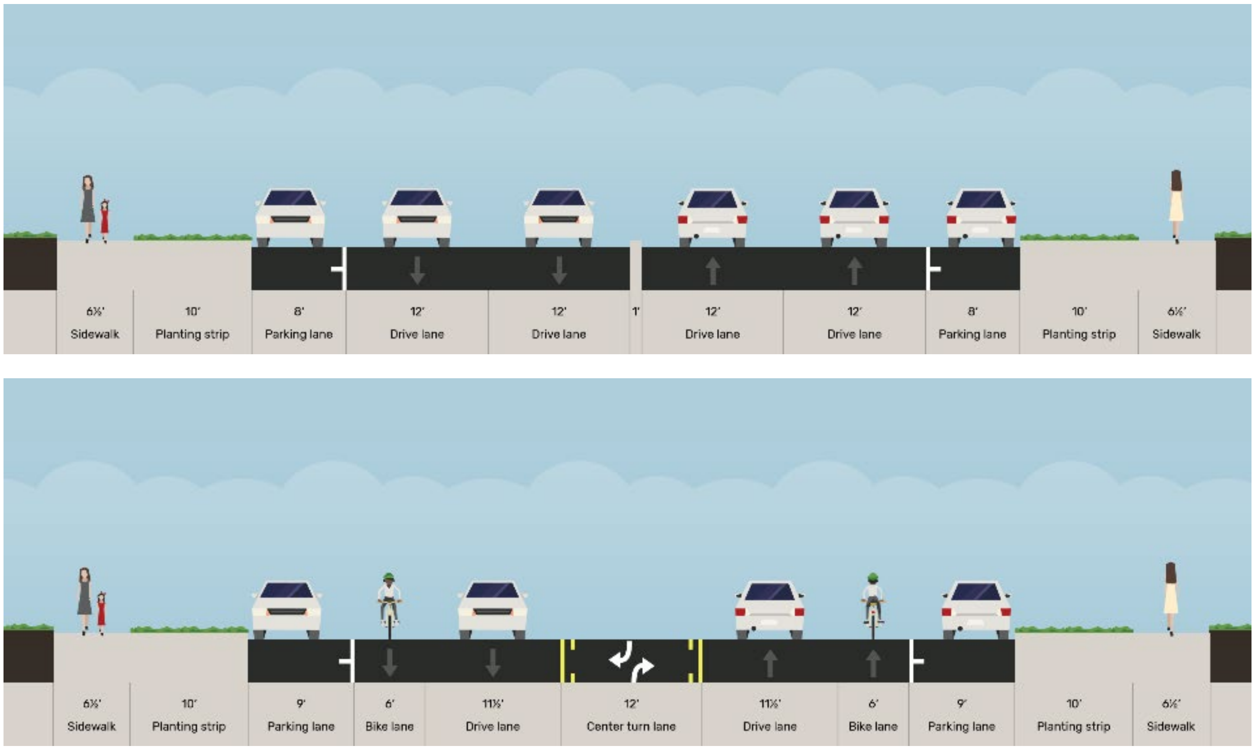

Figure 26. Cross section diagram of Highway 65 / South Broadway in Albert Lea, MN before (top) and after (bottom) road redesign.

Crashes occurred most often on the original four-lane configuration when vehicles were switching lanes to avoid turning vehicles (*MnDOT, 2024a*). Vehicle speeds decreased after the redesign with the average speed being just below the signed 30 mph speed limit after the redesign. Crashes also decreased in the four years after the reconstruction. Albert Lea anticipates collecting several more years of crash data to substantiate any safety trends.

The city reported that biking and walking activity increased across the community by nearly 40% in the years after the redesign and pedestrian volumes doubled in the downtown area between 2013 and 2018 (*MnDOT, 2024a*). More than a dozen businesses relocated to Albert Lea since the redesign of Highway 65 and the other associated work and over $2 million has been invested in Albert Lea's downtown since the projects. The road redesign was credited as a major part of the revitalization of downtown Albert Lea.

4.2. Highway 78 (Lake Avenue) in Battle Lake, MN (46.2837, -95.7141)

Battle Lake, Minnesota, is a small community of approximately 1,000 residents in central Minnesota. Highway 78 functions as Battle Lake's main corridor through their downtown district (**Figure 27**). The section of Highway 78 between Front Street and Summit Street was redesigned and reconstructed in 2014 (*MnDOT, 2024b*).

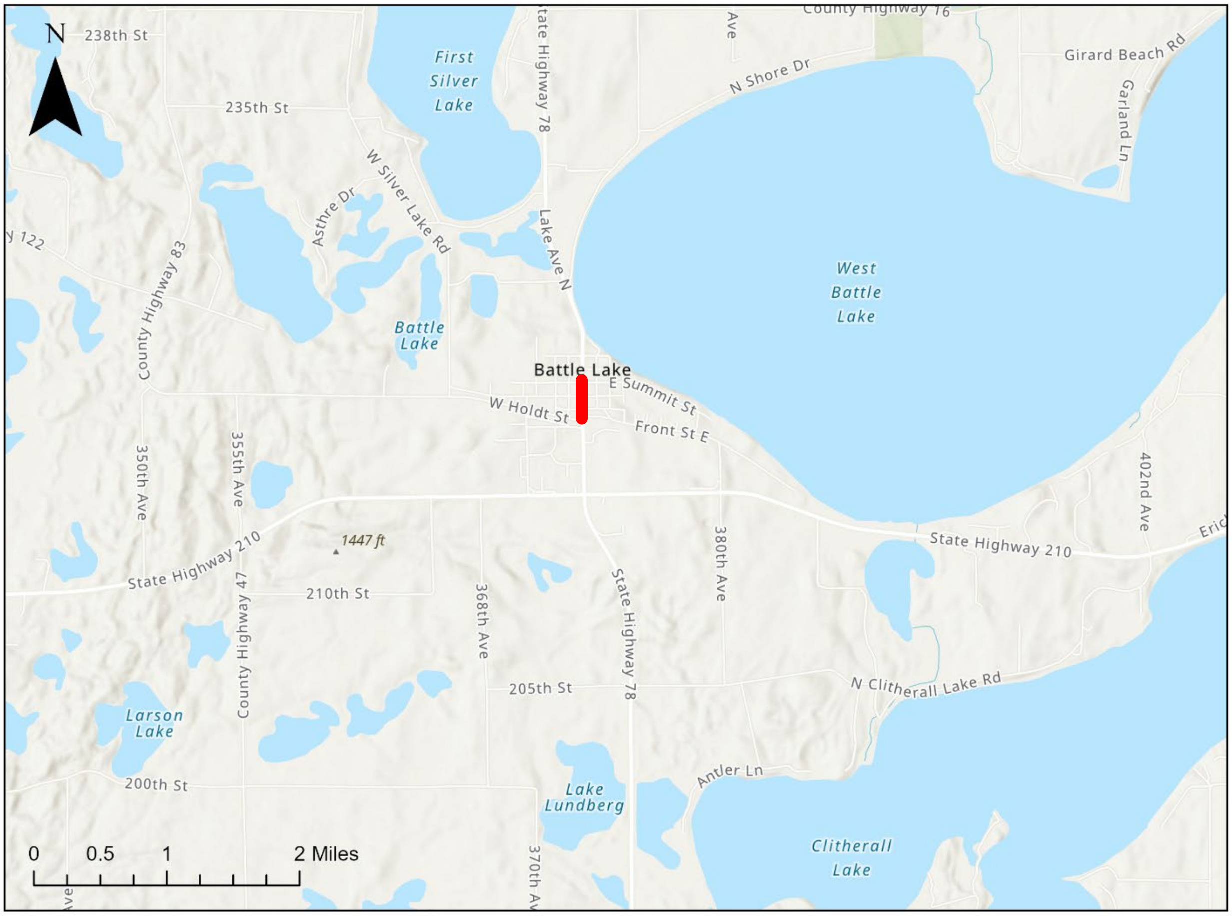

Figure 27. Map of non-New Mexico roadway redesign case study in Battle Lake, MN (highlighted in red). Traffic-controlled pedestrian crossings represented with blue circles.

The redesign was completed at a time when there was going to be regular MnDOT maintenance in terms of a mill and overlay (*MnDOT, 2024b*). The city approached MnDOT to ask whether the road could be redesigned instead of simply maintained in its current design. The project consisted of several funding sources with MnDOT paying for 80% of the project and the city paying for 20% of the project. The state Housing and Redevelopment Authority also contributed to the project to improve local storefronts.

The redesign of Highway 78 included the implementation of a road diet (traditional four-lane to three-lane conversion), the integration of complete streets principles, and design updates to account for the Americans with Disabilities Act (ADA) (**Table 7** and **Figures 28 and 29**) (*MnDOT, 2024b*). The renovation also included curb extensions and curb ramps to improve pedestrian safety, although there are no controlled pedestrian crossings along the corridor. The project also added bike racks, benches, and planter boxes.

Table 7. Characteristics of Highway 78 (Lake Avenue) in Battle Lake, MN

	Before	**After**
Functional Classification	Minor Arterial	Minor Arterial
ADT (2013, 2021)	3,250	4,250
Lanes	4	3
Speed Limit	30 mph	30 mph
Width	94’	94’
Distance between Traffic-Controlled Crossings	n/a	n/a

Figure 28. Photos of Highway 78 / Lake Avenue in Battle Lake, MN before (top) and after (bottom) road redesign.

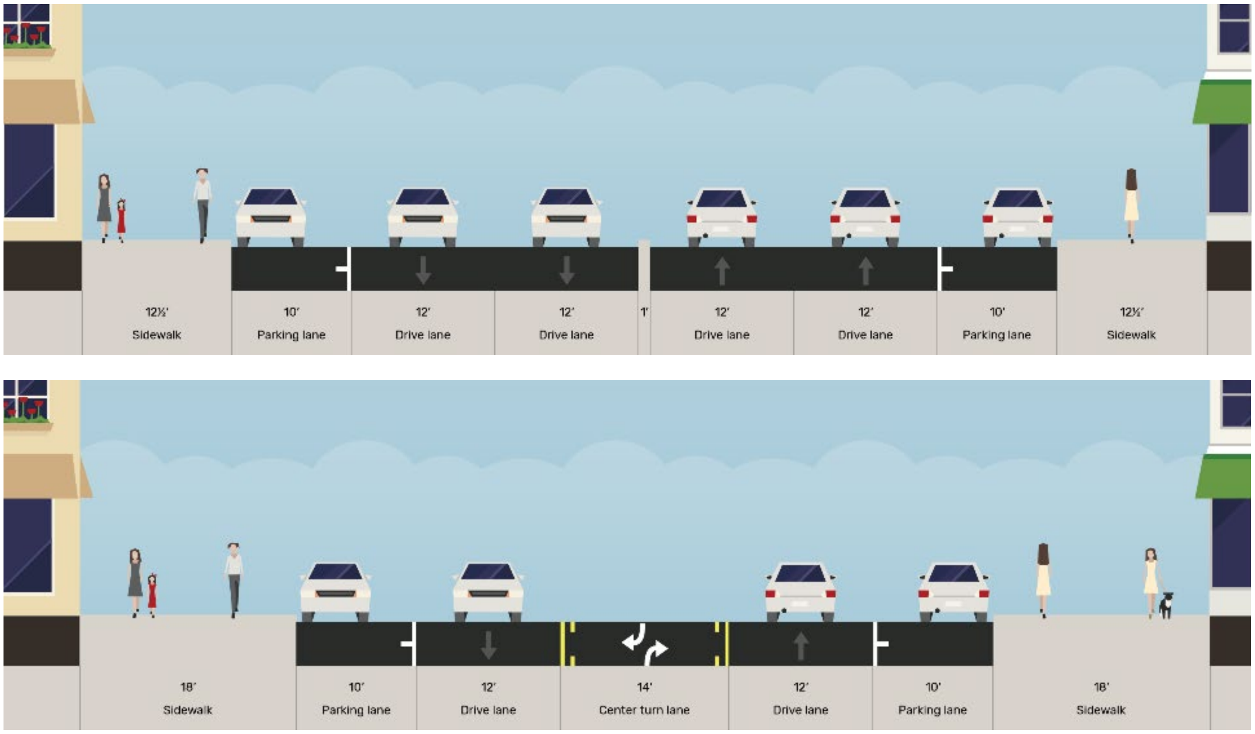

Figure 29. Cross section diagram of Highway 78 / Lake Avenue in Battle Lake, MN before (top) and after (bottom) road redesign.

Battle Lake reported that crashes decreased in the four years after the reconstruction (*MnDOT, 2024b*). The city anticipates collecting several more years of crash data in order to substantiate any traffic safety trends. While only anecdotal, the Battle Creek police chief reported greatly improved visibility for pedestrians.

In addition to the street renovation, a 12-mile Glendalough Trail was also constructed from Battle Lake to the local state park (*MnDOT, 2024b*). The city credits the street renovation and other related investments with new business investment, increased tourism, and the burgeoning of a strong arts community. Battle Creek experienced 21 new business openings since the street renovation.

4.3. East Boulevard in Charlotte, NC (35.2084, -80.8532)

The roads above in Sections 4.1. and 4.2. are examples of classic road diets consisting of 4-lane to 3-lane conversions. This current example of East Boulevard in Charlotte, NC is an example of a 5-lane to 3-lane conversion like that which would be required to reconfigure our safety-focus profiles in New Mexico.

Charlotte, NC is a large city with a population of about 880,000, presenting a significantly different context than the smaller New Mexico communities profiled above. Even so, the road design and land use along the corridor are similar to the New Mexico examples. East Boulevard runs through a historic low-density residential neighborhood to the south of downtown Charlotte and anchors higher-density offices, retail, restaurants, multifamily housing, and a bus route (**Figure 30**). A neighborhood plan completed in 2002 called for the corridor to become a "Main Street" with lowered speeds and enhanced walking and biking infrastructure (*Project for Public Spaces, 2024*).

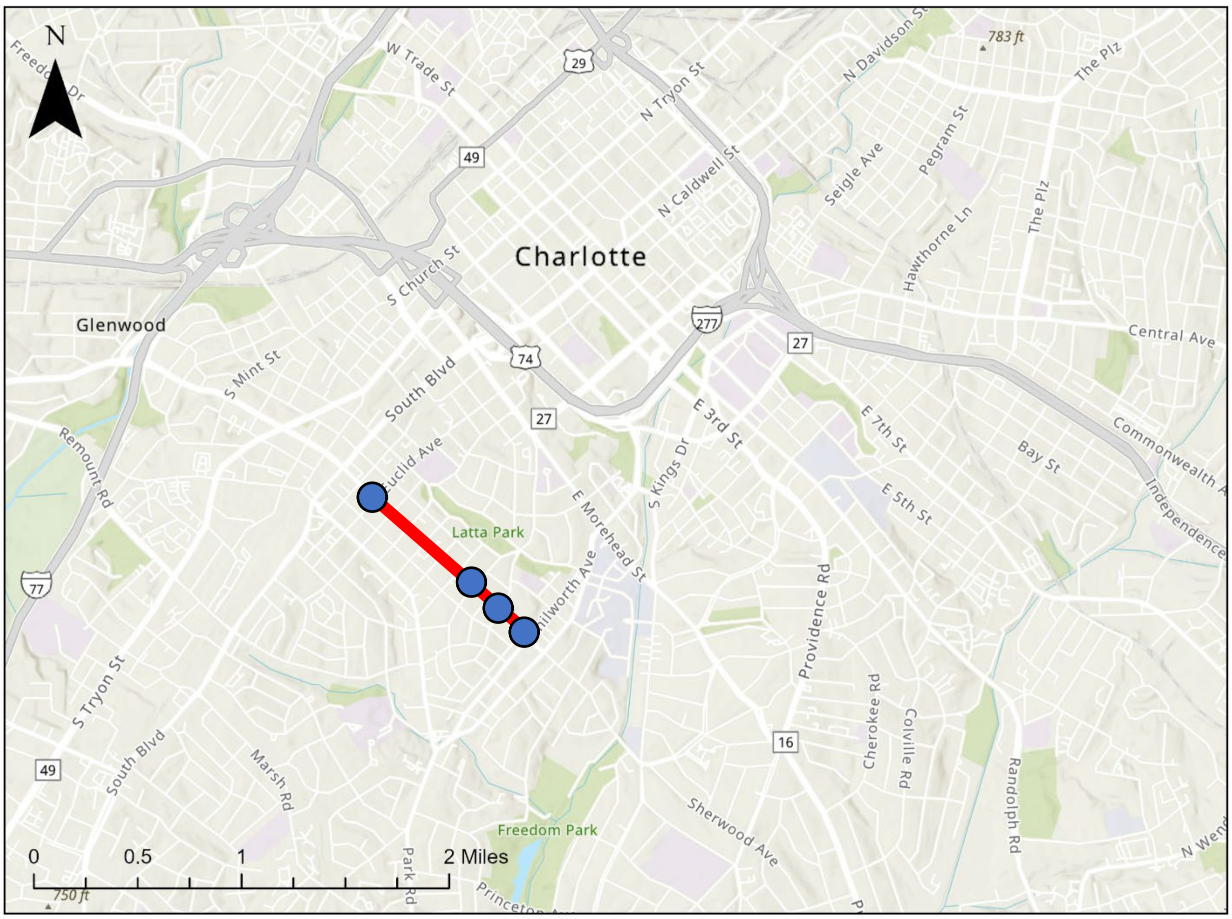

Figure 30. Map of non-New Mexico roadway redesign case study in Charlotte, NC (highlighted in red). Traffic-controlled pedestrian crossings represented with blue circles.

The 5-lane to 3-lane conversion from Euclid Avenue to Kenilworth Avenue (0.7 miles) took place in 2010 (**Table 8** and **Figures 31 and 32**) (*Project for Public Spaces, 2024*). With the reduction in motor vehicle lanes, bike lanes were added on both sides of the street. There were also curb extensions and 17 pedestrian refuge islands installed throughout the corridor (**Figure 33**). Although there were no new traffic-controlled pedestrian crossings added, the pedestrian refuge islands and curb extensions made the corridor significantly easier for pedestrians to cross. The project decreased the distance that pedestrians needed to cross the street from 70 feet across the five lanes of traffic to just 17-28 feet between curb and refuge islands. More tree canopy and landscaping were also integrated throughout the corridor. Although there is a traffic-controlled crossing every 1,078 feet along the corridor, if you count the median refuges and curb extension crossing locations, there is now a pedestrian crossing provided every 539 feet along the corridor.

Table 8. Characteristics of East Boulevard in Charlotte, NC

	Before	**After**
Functional Classification	Major Collector	Major Collector
ADT (2013, 2021)	18,600	19,700
Lanes	5	3
Speed Limit	35 mph	35 mph
Width	100’	100’
Distance between Traffic-Controlled Crossings	1,078’	1,078’

Figure 31. Photos of East Boulevard in Charlotte, NC before (top) and after (bottom) road redesign.

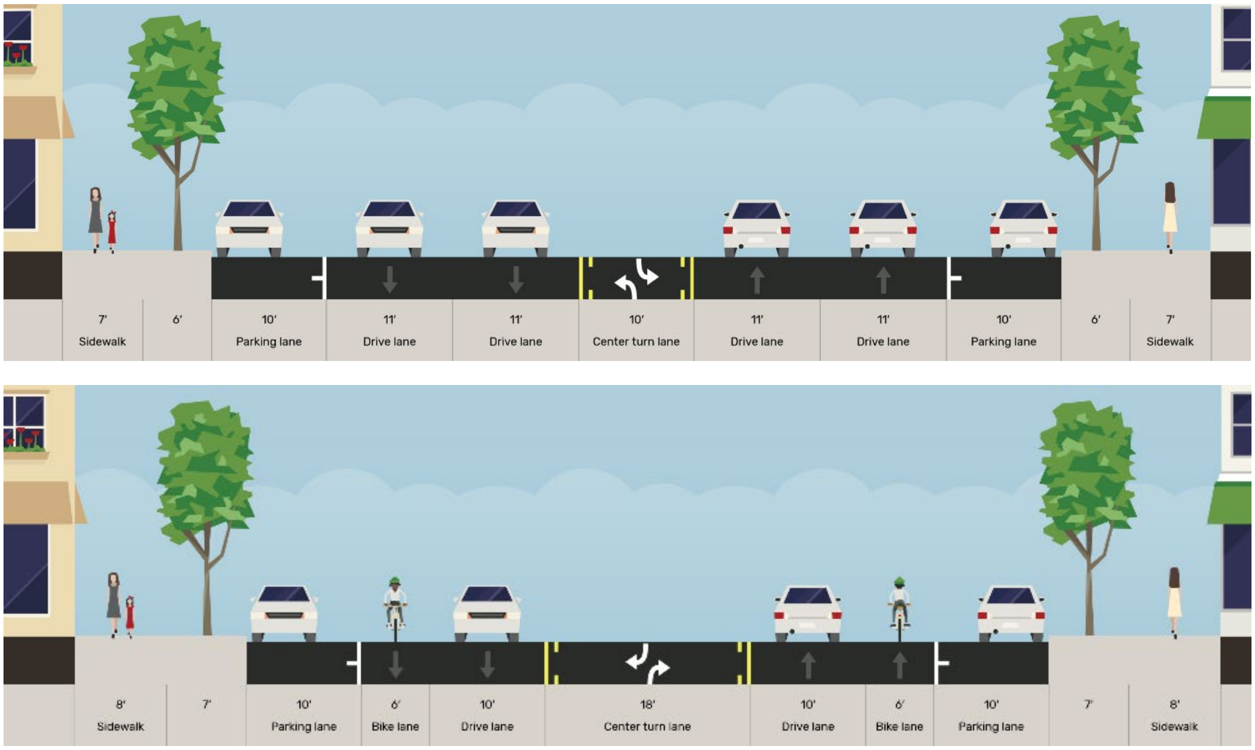

Figure 32. Cross section diagram of East Boulevard in Charlotte, NC before (top) and after (bottom) road redesign.

Figure 33. Pedestrian crossing on East Boulevard in Charlotte, NC after road redesign (Photo: *City of Charlotte*).

According to the National Association of City Transportation Officials (NACTO), traffic throughput was not significantly impacted as a result of the project (*NACTO, 2017*). In fact, even though there was a reduction in the number of motor vehicle lanes, there was a slight increase in vehicle volumes (**Table 8** and **Figure 34**) after the implementation of the project. Traffic volumes of around 20,000 vehicles per day are significantly more than any of our New Mexico examples. Travel times for the corridor remained constant after the project but 85th percentile speeds dropped from approximately 50 mph to 42 mph and there was a significant reduction in excessive speeding (**Figure 35**) (*NACTO, 2017*).

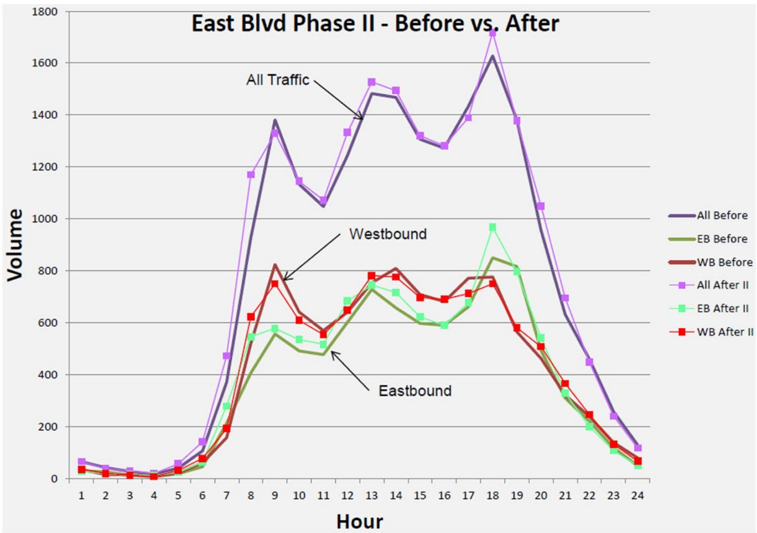

Figure 34. Traffic Volume Measurements on East Boulevard in Charlotte, NC before and after road redesign (*NACTO, 2017*).

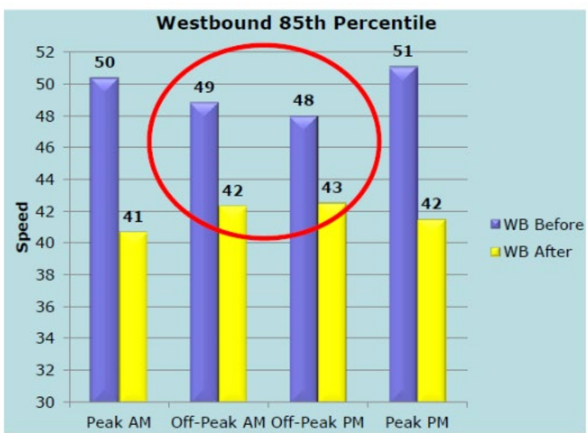

Figure 35. 85th percentile speeds for East Boulevard road redesign (*NACTO, 2017*).

A crash analysis for East Boulevard showed generally similar crash counts in the before and after periods (*NACTO, 2017*). An increase in pedestrian and bicyclist crashes was attributed to higher levels of walking and biking in the after period, although there was not enough data to perform a proper crash analysis accounting for exposure.

4.4. US-75 (Main Avenue) in Sioux Center, IA (43.0843, -96.1757)

Iowa DOT has well-established program of using road diets on their roadways when they pass through developed areas (*Iowa DOT, 2024*). One example of such a road diet is in Sioux Center, IA, a city of about 8,300 residents as of 2021 in northwestern Iowa near the South Dakota and Minnesota borders. Sioux Center is a community that serves residents from a wide rural area, similar to many of the New Mexico communities profiled above (**Figure 36**). US-75 runs north/south through the middle of Sioux Center and functions as a typical rural Main Street, anchoring regional shopping and other amenities that are utilized by surrounding residents from a wide surrounding area (**Figure 37**).

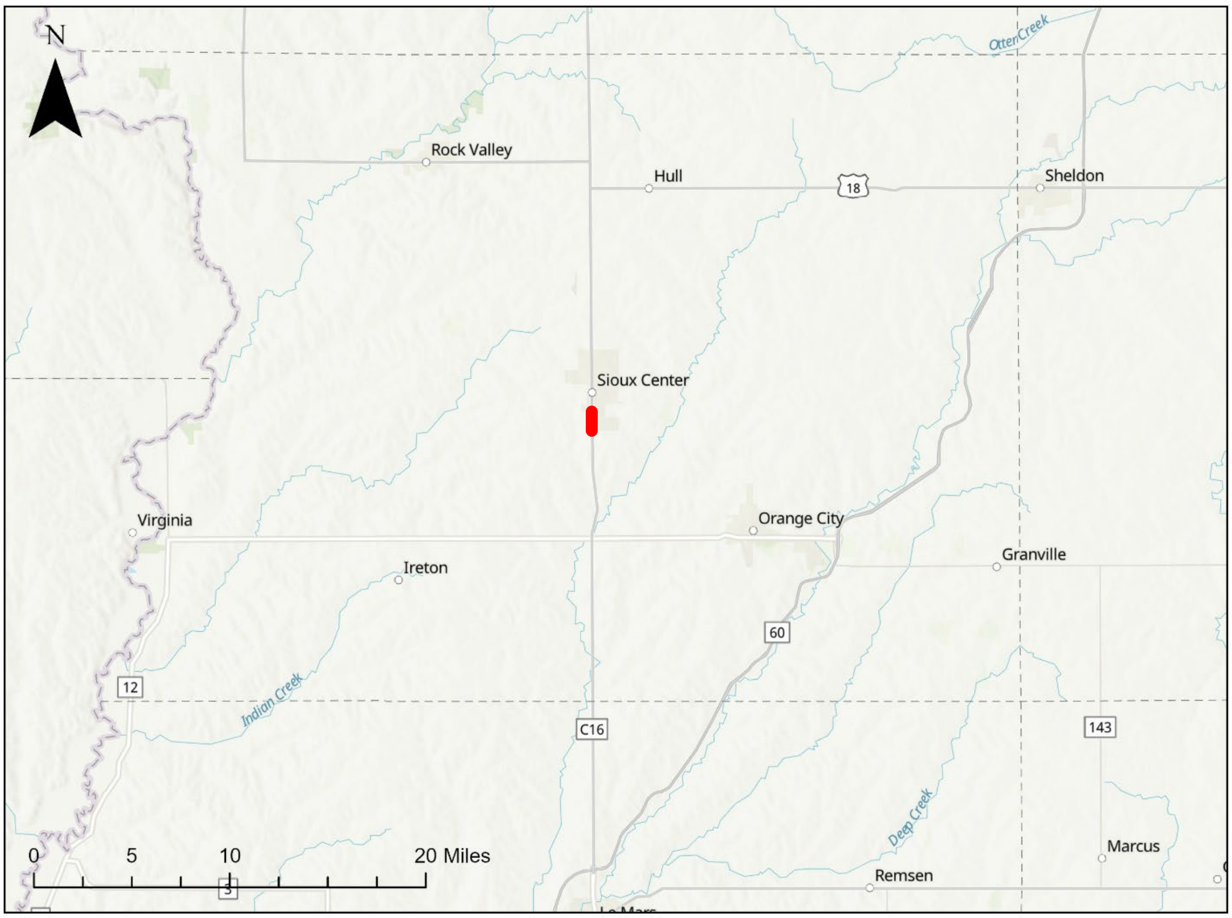

Figure 36. Map of non-New Mexico roadway redesign case study in Sioux Center, IA on regional level (highlighted in red). Traffic-controlled pedestrian crossings represented with blue circles.

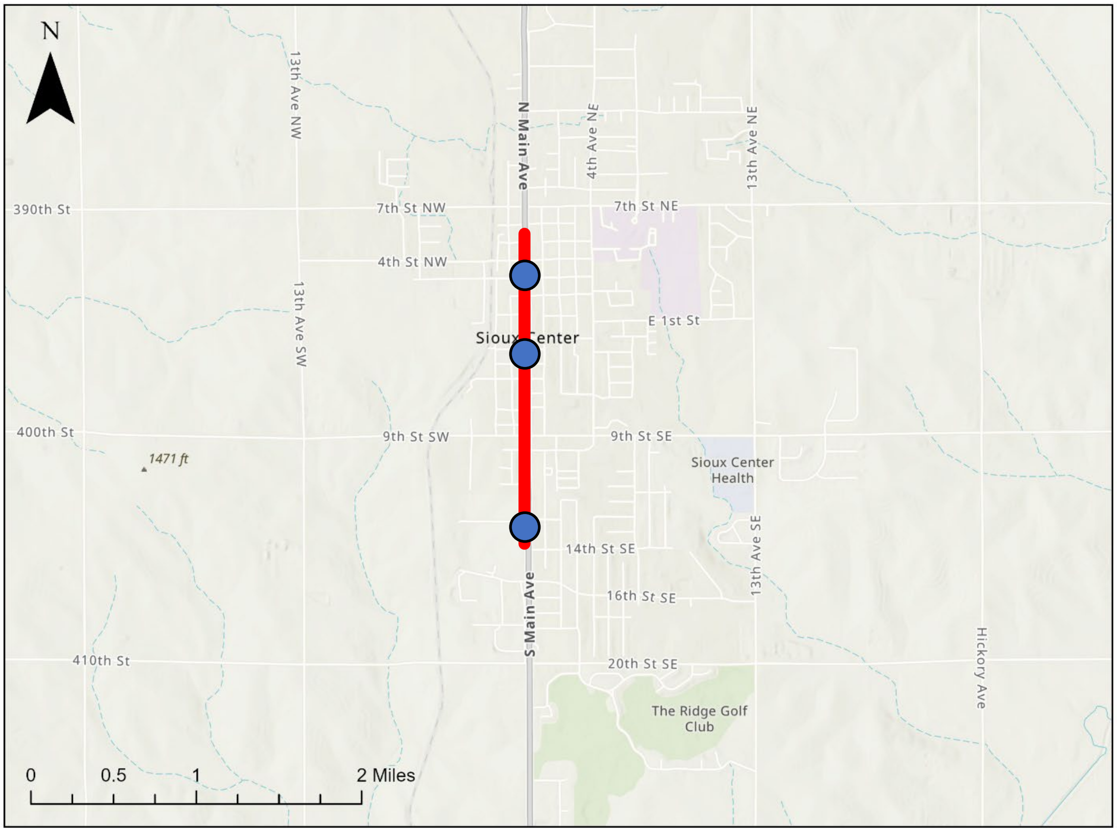

Figure 37. Map of non-New Mexico roadway redesign case study in Sioux Center, IA on local level (highlighted in red). Traffic-controlled pedestrian crossings represented with blue circles.

Sioux Center had concerns with excessive speeding and motorists reported that turning movements across the highway were difficult (*Iowa DOT, 2024*). There were also concerns for pedestrian safety in the commercial corridor. The four-lane to three-lane road diet was completed in 1999 and stretch from 10th Street SE/SW to 9th Street NE/NW (**Table 9** and **Figures 38-40**). The approximately 11,000 motor vehicles that use the corridor daily is on the upper end of the range for our NMDOT examples and the traffic consists of about 9% trucks.

Table 9. Characteristics of US-75 (Main Avenue) in Sioux Center, IA

	Before	**After**
Functional Classification	Principal Arterial	Principal Arterial
ADT (1998, 2019)	11,000	11,150
Lanes	4	3
Speed Limit	25 mph	30 mph
Width	94’	94’
Distance between Traffic-Controlled Crossings	Data not available	2,165’

Figure 38. Photos of US-75 / Main Avenue in Sioux Center, IA before (top) and after (bottom) road redesign (*Iowa DOT, 2024*).

Figure 39. Photos of US-75 / Main Avenue in Sioux Center, IA before (top) and after (bottom) road redesign (*Iowa DOT, 2024*).

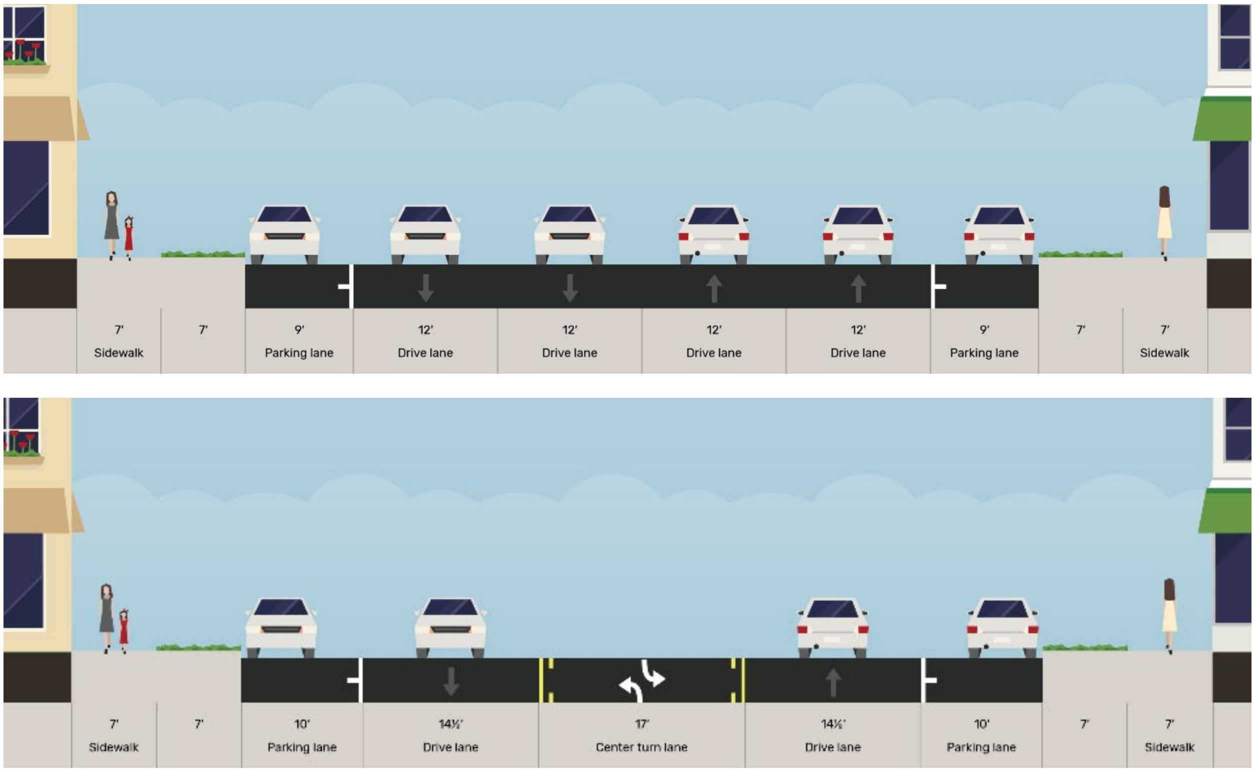

Figure 40. Cross section diagram of US-75 / Main Avenue in Sioux Center, IA before (top) and after (bottom) road redesign.

After the US-75 road diet, average travel speeds through the corridor decreased 25% from 28 mph to 21 mph and the proportion of vehicles travelling more than 5 mph over the speed limit decreased from 43% to 13% (*Iowa DOT, 2024*). Crashes decreased 57% from thirty in the seven months before the project to thirteen in the seven months after the project. Injury crashes decreased from ten in the seven months before the project to zero in the seven months after the project.

Public opinion from 930 respondents (about 15% of the population of the town at that point) showed that while only 18% supported the conversion before, support rose to 45% after the conversion (*Iowa DOT, 2024*). Ardith Lein, the executive director of the Sioux Center Chamber of Commerce, reported that:

"The Chamber of Commerce Executive Board, as well as almost all business owners, prefer the three-lane highway to the previous four-lane highway. It has slowed traffic down through the central business district, which has improved the shopping environment. Pedestrian crossings of US-75 are much safer; there have been fewer accidents and the emergency vehicles like having the center lane available to drive in." (*Iowa DOT, 2024*)

Paul Adkins, the chief of police for Sioux Center, was originally opposed to the conversion but he turned out to be a key proponent of the conversion (*Iowa DOT, 2024*). In the ultimate display of support for the project, the three-lane configuration is still in place as of 2021, twenty-two years after initial implementation.

5. Design Recommendations

Now that we have identified our safety-priority profile for NMDOT roads and we have examined what other states and cities have done with similar roadways, we now present design recommendations to improve the safety of the NMDOT Safety Profile roadways. We first detail general cross section recommendations, then provide recommendations for the provision of pedestrian crossings, and finally provide additional design considerations such as street furniture and gateway treatments.

While we attempt to provide crash modification factors (CMFs) from FHWA's Crash Modification Factors Clearinghouse for the design recommendations made below, there are two important caveats. First, CMFs are context-specific, so while we attempt to select the most appropriate CMFs, they may not resonate perfectly with NMDOT roadways. For example, many CMFs have been generated for road diets consisting of four-lane to three-lane conversions, but there are few for five-lane to three-lane reductions. Second, there may be latent pedestrian and/or bicyclist demand present on the NMDOT roadways which may impact safety outcomes (*Ferenchak & Marshall, 2019b; Ferenchak & Marshall, 2019c; Ferenchak & Marshall, 2020a*). In other words, if improvements are made on NMDOT roadways that lead to increased pedestrian and bicyclist activity, that increase in exposure may lead to increases in crashes, which can obscure safety analyses if exposure is not accurately considered.

5.1. Cross Section

All the proposed cross sections found below assume that there is 90 feet of right-of-way available from the outside of sidewalk to the outside of sidewalk. At least 90 feet of right-of-way was available for four of our five NMDOT roadways profiled. The proposed cross sections are applicable to the NMDOT Safety Profile roadways on the corridor level, although full engineering studies will be required to make sure the designs work within the context of each individual roadway. For instance, the final design for roadways requiring more business access driveways may differ from those requiring on-street parking.

The key recommendation is that the NMDOT Safety Profile roadways should be redesigned with a road diet to reduce the number of travel lanes to three, including two through lanes and one two-way left-turn lane (TWLTL). According to Section 1250 of the NMDOT Design Manual, roadways with more than 10,000 AADT require an in-depth operations analysis to assess the impact of a road diet (*NMDOT, 2016*). The NMDOT Safety Profile roadways that we profiled above carry between 4,026 and 12,888 vpd, with three of the five profiled roadways carrying less than 10,000 vpd and a fourth carrying less than 10% over that threshold. The FHWA's Road Diet Informational Guide cites several successful road diets that carried over 20,000 vpd (*FHWA, 2014*).

To derive a CMF for road diets, we averaged seven CMFs that explored changes in crashes for all road users and all severities (*Abdel-Aty et al., 2014; Harkey et al., 2008; Lim & Fontaine, 2022; Pawlovich et al., 2006; Persaud et al., 2010; Sun & Rahman, 2019; Zhou et al., 2022*). These seven road diet CMFs ranged between 0.53 – 0.75 and resulted in an overall average CMF of 0.64 (**Table 10**). We averaged three CMFs that explored changes in injury crashes relative to road diets for all road users (*Abdel-Aty et al., 2014; Lim & Fontaine, 2022; Zhou et al., 2022*). These road diet injury CMFs ranged between 0.36 – 0.63 and resulted in an overall average CMF of 0.54 (**Table 10**). Interestingly, similar crash reductions were found on Central Avenue in Albuquerque, NM, after the installation of the ART system, which functions somewhat like a road diet (*Bia & Ferenchak, 2022*). We utilized data in a report by Zegeer et al. to calculate a CMF of 0.36 for all pedestrian crashes, which compares roadways with five or more lanes and marked crossings to roadways with two lanes and marked crossings (*Zegeer et al., 2005*).

Table 10. Crash Modification Factors (CMFs) for Design Recommendations (*note: CMFs are multiplied by the historical number of crashes, so any CMF below 1.0 represents a crash reduction; 1. CMFs are all users are for 4-lane to 3-lane road diet conversions and for pedestrians are for 5 or more lanes to two lanes; 2. CMFs are for standard, buffered, and protected bike lanes)*

Countermeasure	CMF	User Type	Crash Severity	Area Type
Cross Section Treatments				
Road Diet[1]	0.64	All	All	Urban/Suburban
	0.54		K, A, B, C	Urban/Suburban
	0.36	Pedestrian	All	Urban/Suburban
Install Bike Lane[2]	0.60	All	All	Urban
	0.86		K, A, B, C	Urban
	0.42	Bicyclist	All	Urban
	0.47		K, A, B, C	Urban
Install Street Trees	0.57	All	All	Urban/Suburban
	0.44		K, A, B, C	Urban/Suburban
Pedestrian Treatments				
Raised Crosswalk	0.67	All	A, B, C	Urban/Suburban
	0.55	Pedestrian	A, B, C	Urban/Suburban
Crosswalk (high-visibility)	0.60	Pedestrian	All	Urban
Crosswalk (standard)	0.82	Pedestrian	All	Urban
Raised Median Refuge (w/ marked crosswalk)	0.54	Pedestrian	All	Urban/Suburban
Raised Median Refuge (w/ unmarked crosswalk)	0.61	Pedestrian	All	Urban/Suburban
RRFB	0.58	Pedestrian	All	All
PHB	0.82	All	All	Urban/Suburban
	0.43	Pedestrian	All	Urban/Suburban
Other Recommended Treatments				
Driveway Reduction	0.72	All	K, A, B, C	Urban/Suburban
Convert full movement to RIRO	0.55	All	All	Urban/Suburban
	0.20		K, A, B, C	Urban/Suburban
Improve Lighting	0.75	All	All	All
	0.59		K, A, B, C	All
	0.30	Pedestrian	A, B, C	Rural
	0.40	Bicyclist	A, B, C	Rural
Gateway Treatments	0.78	All	All	Urban/Suburban

The preferred road diet cross section includes protected bike lanes on both sides of the roadway (**Figure 41**). These bike lanes were included in the recommended design because most of the NMDOT roadways profiled above are included as proposed facilities on the bike network in NMDOT's New Mexico Prioritized Statewide Bicycle Network Plan, with several being listed as the highest Tier 1 priority (*NMDOT, 2018*). Since there is right-of-way width available, we recommend providing some form of protection for the bike lanes. This development of the NMDOT bicycle network aligns with recent research identifying the importance of providing complete VRU networks (*Sanchez Rodriguez & Ferenchak, 2023*).

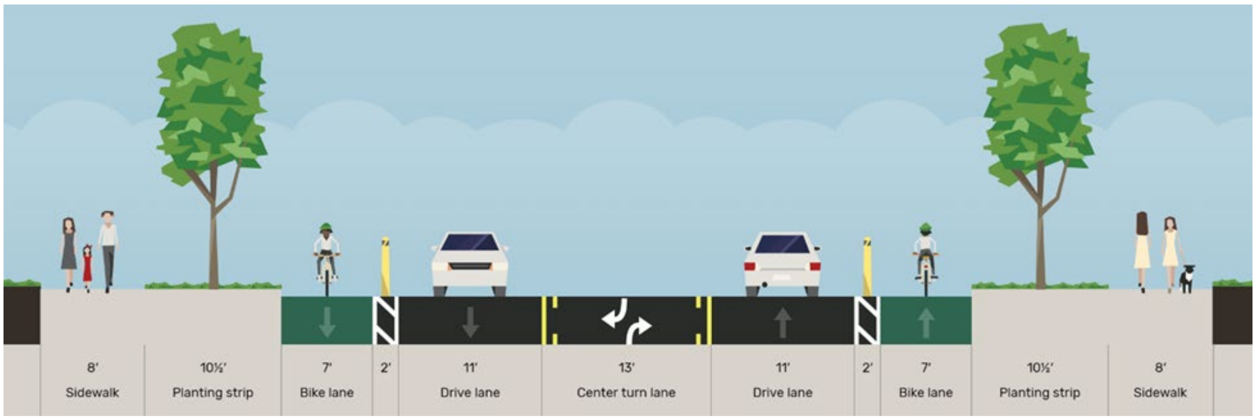

Figure 41. Cross section diagram of design recommendations with bike lanes and no on-street parking (assuming 90' from outside of sidewalk to outside of sidewalk).

Past research has found that not only do protected bike lanes provide safe space for bicyclists, but protected bike lanes have also been shown to improve traffic safety for all road users, likely because the bike lanes act as traffic calming (Marshall & Ferenchak, 2019). Similarly, cities that have seen the most success with their Vision Zero efforts have been those that have taken multimodal approaches to road safety, as opposed to simply attempting to make driving itself safer (*Ferenchak, 2023*). The roadway redesign examples above from Albert Lea, MN, and Charlotte, NC, both feature road diet reconfigurations that included bike lanes.

To derive a CMF for bike lanes, we averaged two CMFs that explored changes in crashes for all road users and all severities (*Abdel-Aty et al., 2014; Avelar et al., 2021*). These two road diet CMFs ranged between 0.51 – 0.68 and resulted in an overall average CMF of 0.60 (**Table 10**). We averaged two CMFs that explored changes in injury crashes for all road users that ranged between 0.73 – 0.98 and resulted in an overall average CMF of 0.86 (*Abdel-Aty et al., 2014; Avelar et al., 2021*). We found one CMF that explored changes in crashes for bicyclists that was 0.42 (*Abdel-Aty et al., 2014*). We averaged three CMFs that explored changes in injury crashes for bicyclists that ranged between 0.36 – 0.65 and resulted in an overall average CMF of 0.47 (*Abdel-Aty et al., 2014; Nosal & Miranda-Moreno, 2012; Rodegerdts et al., 2004*). Past research has found that other bicyclist treatments that do not provide protected and segregated space for bicyclists, such as shared lane markings, are not as effective at improving safety and are not appropriate for users of all ages and abilities (*Ferenchak & Marshall, 2019a; Ferenchak & Marshall, 2020b; Ferenchak & Marshall, 2020c; Harris et al., 2013*).

Many of the NMDOT roadways profiled above have businesses that need driveway access for their off-street parking. Protected bike lanes are still feasible in such situations, although there will need to be breaks in the bike lane protection to account for the driveways along the corridor (**Figure 42**).

Figure 42. Example of a protected bike lane that provides driveway access.

The preferred cross section also includes a tree lawn that provides separation for the sidewalk (**Figure 41**). Not only can such separation enhance pedestrian safety (both real and perceived), but the tree lawn can also help to beautify the corridor. Many of the non-New Mexico examples profiled above noted that their street redesigns helped to revitalize their downtown areas. Given that many of the NMDOT Safety Profile roadways constitute Main Streets through rural New Mexico communities, such revitalization should be seen as a significant possible asset of these design recommendations.

While most of the NMDOT Safety Profile roadways have off-street parking accessed by driveways, some may need to accommodate on-street parking. The preferred method of providing on-street parking while also providing bicyclists with protected bike lanes is to protect the bike lane with the on-street parking (**Figure 43**). Note that a buffer should be provided between the on-street parking and the bike lane in this configuration (**Figure 44**). It is also possible to have an unprotected standard bike lane on the inside with on-street parking on the outside of the roadway (see the Charlotte, NC, example above). While the on-street parking takes up some additional right-of-way width in this example, there is still room for sidewalk separation with a tree lawn.

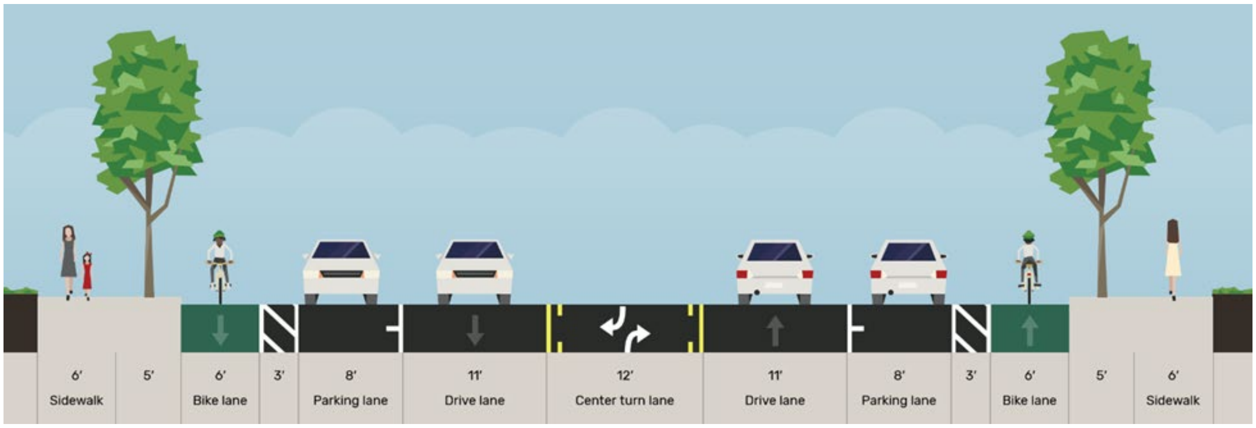

Figure 43. Cross section diagram of design recommendations with bike lanes and on-street parking (assuming 90' from outside of sidewalk to outside of sidewalk).

Figure 44. Example of a bike lane protected by on-street parking.

If a bike lane is not possible or is not preferred, then the additional right-of-way space is recommended to be provided to the pedestrians and the sidewalk separation (**Figure 45**). In this cross-section example, the vehicle through lanes are 11 feet wide with a 14-foot TWLTL. The generous space for sidewalk and tree lawn can also be utilized for street furniture, public art, or other amenities that can aid in revitalization of the commercial corridor. The same basic cross section can also be used with on-street parking included (**Figure 46**). We averaged two CMFs that explored changes in crashes for all road users relative to the presence of street trees (assuming the street trees are on the roadside and provide approximately 50% street coverage) that ranged between 0.43 – 0.71 and resulted in an overall average CMF of 0.57 (*Marshall et al., 2018; Mok et al., 2006*) (**Table 10**). We found a single street tree CMF of 0.44 for injury crashes for all road users (*Marshall et al., 2018*).

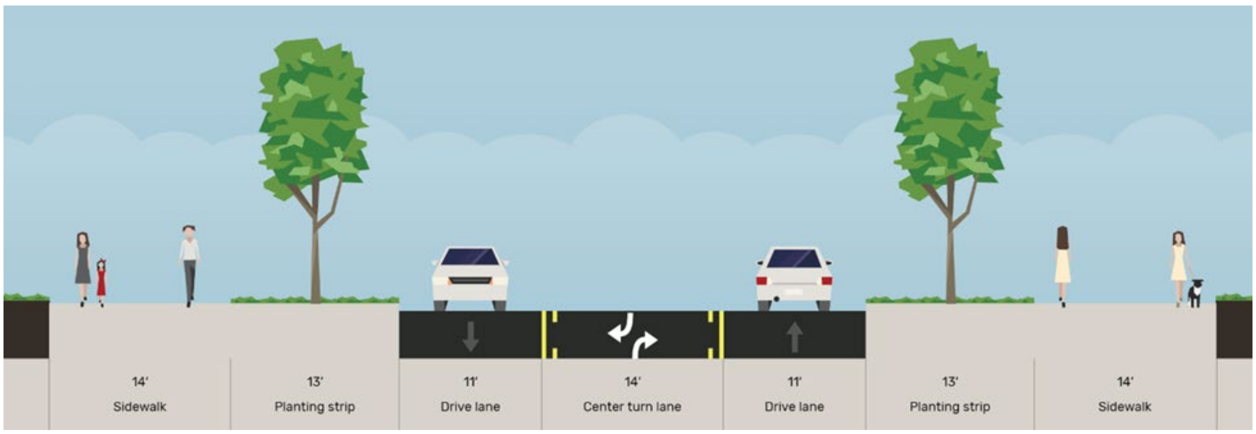

Figure 45. Cross section diagram of design recommendations with no bike lanes or on-street parking (assuming 90' from outside of sidewalk to outside of sidewalk).

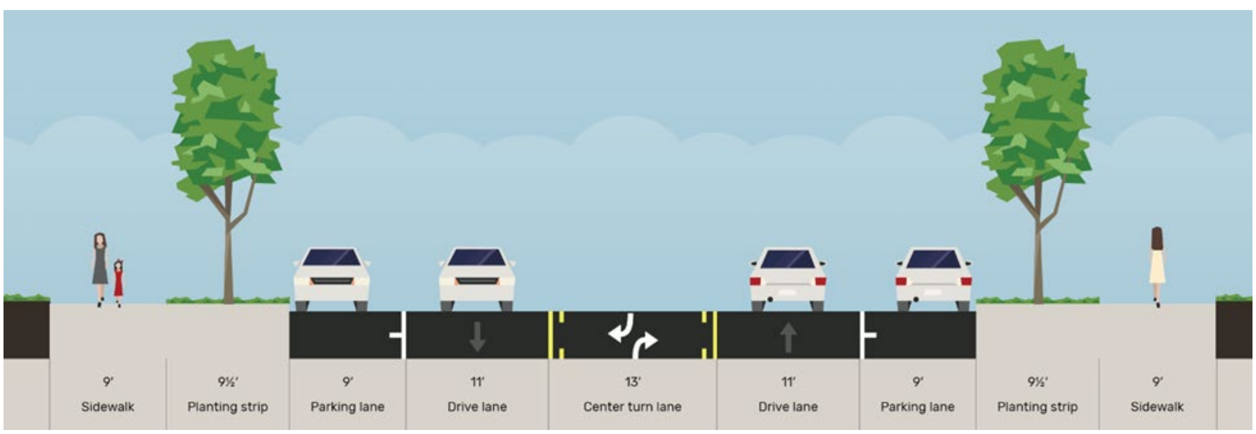

Figure 46. Cross section diagram of design recommendations with on-street parking and no bike lanes (assuming 90' from outside of sidewalk to outside of sidewalk).

The recommendations above are general corridor-level recommendations and engineering studies are needed to ensure that the cross sections will work for particular corridors. It should also be noted that when reconsidering the design of a corridor, the future of the corridor might be considered as much as the existing conditions. For instance, while high driveway density might make it troublesome to include bike lanes, it might be suggested that access management be utilized to reduce the number of driveways, since past research determined a CMF of 0.72 for driveway reductions (*Elvik et al., 2009*). Similarly, turning restrictions might be employed to further improve safety. For instance, Le et al. found that right-in right-out (RIRO) intersections experienced significantly fewer crashes compared to full-movement three-legged intersections, with CMFs of 0.55 and 0.20 for total crashes and fatal and injury crashes, respectively (*Le et al., 2018*).

5.2. Pedestrian Crossings

When considering treatments to improve pedestrian safety, we focus on pedestrian crossings because most of the NMDOT Safety Priority corridors already have sidewalks and crossings have historically been the primary issue (*Ferenchak & Abadi, 2021; Ferenchak et al., 2024*). A substantial benefit of the cross-section recommendations above is that once the width of the travel way is reduced, pedestrian crossings become significantly easier and expensive pedestrian crossing treatments may not even be required (see Figure 26 above). The estimated CMF for pedestrian crashes of a road diet that sees a roadway reduced from five or more lanes to two lanes is 0.36 (**Table 10**).

Although the road diet alone should impart significant pedestrian safety benefits, other treatments may complement the road diet. Installing a raised median pedestrian refuge in the TWLTL has a CMF of 0.54 if a marked crosswalk is included and a CMF of 0.61 if there is an unmarked crosswalk (*Zegeer et al., 2002*) (**Table 10**). Raised pedestrian crosswalks have a CMF of 0.55 for pedestrian injury crashes and 0.67 for all user injury crashes (*Elvik et al., 2009*). If a raised crosswalk is not feasible given the prevailing vehicle volumes and speeds, simply providing a high-visibility crosswalk has a CMF of 0.60 and a standard crosswalk has a CMF of 0.82 for pedestrian crashes (*Chen et al., 2012; Kadeha et al., 2022*).

If a road diet is implemented and a crossing treatment is preferred, it likely can simply be a rectangular rapid flashing beacon (RRFB) (#7 in **Figure 47**) (*Blackburn et al., 2018*). An RRFB is suitable on three-lane roadways if vehicle volumes are less than 15,000 and the posted speed limit is less than 40 mph (which satisfies all our New Mexico case studies). RRFBs can be used on roadways with three lanes even if the AADTs are above 15,000 if there is a raised median present. We identified two CMFs for RRFBs ranging between 0.53 – 0.64 for an overall average of 0.58 for pedestrian crashes (*Monsere et al., 2016; Zegeer et al., 2017*) (**Table 10**).

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

Given the set of conditions in a cell,

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

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

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

Figure 47. Application of pedestrian crash countermeasures by roadway feature (source: *Blackburn et al., 2018*).

The last pedestrian crossing option to consider is the pedestrian hybrid beacon (PHB). These treatments are more complicated and expensive than the simpler crossings necessitated by a road diet or RRFBs, which would limit how many could be utilized along a corridor. Therefore, we would recommend the road diet option with simpler crossing treatments instead of installing PHBs on the existing cross section configuration. PHBs can be used on roadways even with high volumes and speeds (#9 in **Figure 47**) (*Blackburn et al., 2018*). Past research has deduced PHB CMFs of 0.43 for pedestrian crashes and 0.82 for all road user crashes (*Zegeer et al., 2017*) (**Table 10**).

If a road diet is not implemented and large crossing widths require enhanced crossing treatments such as RRFBs, PHBs, or standard traffic signals, the logical next question is: how often should those crossing treatments be provided along our NMDOT Safety Priority corridors? Academic research is relatively lacking in terms of specifying pedestrian crossing facility spacing guidance. While past research has reported that pedestrians identify trip distance as the most important factor for their decision whether or not to walk and safety was identified as the second most important factor, the researchers did not identify any specific thresholds for distances (*Weinstein Agrawal et* *al., 2008*). Past research has demonstrated that pedestrian crossing facilities have gravity that can attract pedestrians to them and can make pedestrians more likely to cross at those facility locations, but exact distance thresholds for how far pedestrians were willing to travel to use a crossing facility were again lacking (*Cantillo et al., 2015; Havard & Willis, 2012*).

This question of pedestrian crossing spacing is an important one because of the cost of the pedestrian crossing facilities. The average cost of an RRFB is $22,500 and the average cost of a PHB is $57,680 according to FHWA (*FHWA, 2018a; FHWA, 2018b*). According to the Washington State Department of Transportation (WSDOT), traffic signals have been estimated to cost upwards of $250,000, with additional ongoing maintenance and retiming costs (*WSDOT, 2024*). For the sake of an example, if a PHB would be provided every 800 feet (per the Portland guidance for outside pedestrian zones) for the entire corridor length of 11,525 feet (for the Gallup example corridor), that would require 15 PHBs for a total estimated investment of $865,000. This would not include ongoing maintenance for those crossing treatments and would still not guarantee safety between the crossing facilities. In this way, as suggested above, implementing a road diet redesign of the cross section and therefore reducing the crossing distance and treatment complexity will lower the ongoing cost of countermeasures in the long term and more thoroughly ensure pedestrian safety.

5.3. Other Design Recommendations

Adequate street lighting should be ensured throughout the NMDOT Safety Priority corridors. Many pedestrian crashes occur at night and past research has identified that both pedestrian crash severity and frequency have been increasing at night, while only severity has been increasing during daylight (*Ferenchak et al., 2022*). We averaged the three CMFs that we found relating the presence of streetlighting to changes in crashes for all road users that ranged between 0.63 – 0.92 and resulted in an overall average CMF of 0.75 (*Abdel-Aty et al., 2014; Choi et al., 2015; Li et al., 2021*) (**Table 10**). We averaged the two CMFs that we found relating the presence of streetlighting to changes in injury crashes for all road users that ranged between 0.53 – 0.65 and resulted in an overall average CMF of 0.59 (*Abdel-Aty et al., 2014; Wanvik, 2009*). We found two additional CMFs relating the presence of streetlighting to changes in pedestrian and bicyclist injury crashes in rural areas, with a pedestrian CMF of 0.30 and a bicyclist CMF of 0.40 (*Wanvik, 2009*). These streetlighting CMFs are general guidelines as some represented the installation of lighting, some represented increases in illumination, and others represented increases in the uniformity of the illumination.

Another design recommendation to communicate the change in context when transitioning from rural area to developed/urbanized area is to include a gateway treatment. Gateway treatments can include gateway monuments (i.e., structural signs on the roadside that communicate the name of a location to motorists), pinch points, and/or other traffic calming treatments. We averaged the two CMFs that we found relating the presence of gateway treatments to changes in crashes for all road users that ranged between 0.74 – 0.83 and resulted in an overall average CMF of 0.78 (*Makwasha & Turner, 2013; Ye et al., 2011*) (**Table 10**).

Street furniture should also be considered if road redesigns are undertaken, although we were not able to find any research evidence that street furniture would have a direct impact on traffic safety. As many of the non-New Mexico roadway redesign examples focused on revitalizing their Main Streets and the economic and business benefits thereof, including amenities such as street furniture may help to realize a holistic revitalization of the downtown areas through which the NMDOT Safety Priority roadways pass through.

5.4. New Mexico Examples

The research team sought to identify examples of successful road reconfigurations within New Mexico of roads that resembled the safety-priority profile identified above. We were able to identify one example of a New Mexico roadway located in an urbanized downtown area that was converted from four to two lanes. Although this road was not an NMDOT road and it was not a five-lane to three-lane conversion, it was relatively similar in design and context and we therefore profile it below.

5.4.1 Main Street in Farmington, NM (36.7290, -108.2080)

The example reconfiguration is Main Street in Farmington, NM, between Miller Avenue and Schwartz Avenue (**Figure 48**). Farmington is a town with a population of 46,422 residents in northwestern New Mexico. Interestingly, the safety-priority corridor identified in Section 3.1.2 (Farmington's US-64 Business or W Broadway Avenue) runs parallel to Main Street just 275 feet to the south. Main Street is a city-owned road. The land use along the corridor is mixed consisting of mostly commercial and some residential, all of which is relatively high-density development. Relatively low-density residential developments are located beyond the immediate corridor itself to both the north and south, along with amenities such as schools and parks.

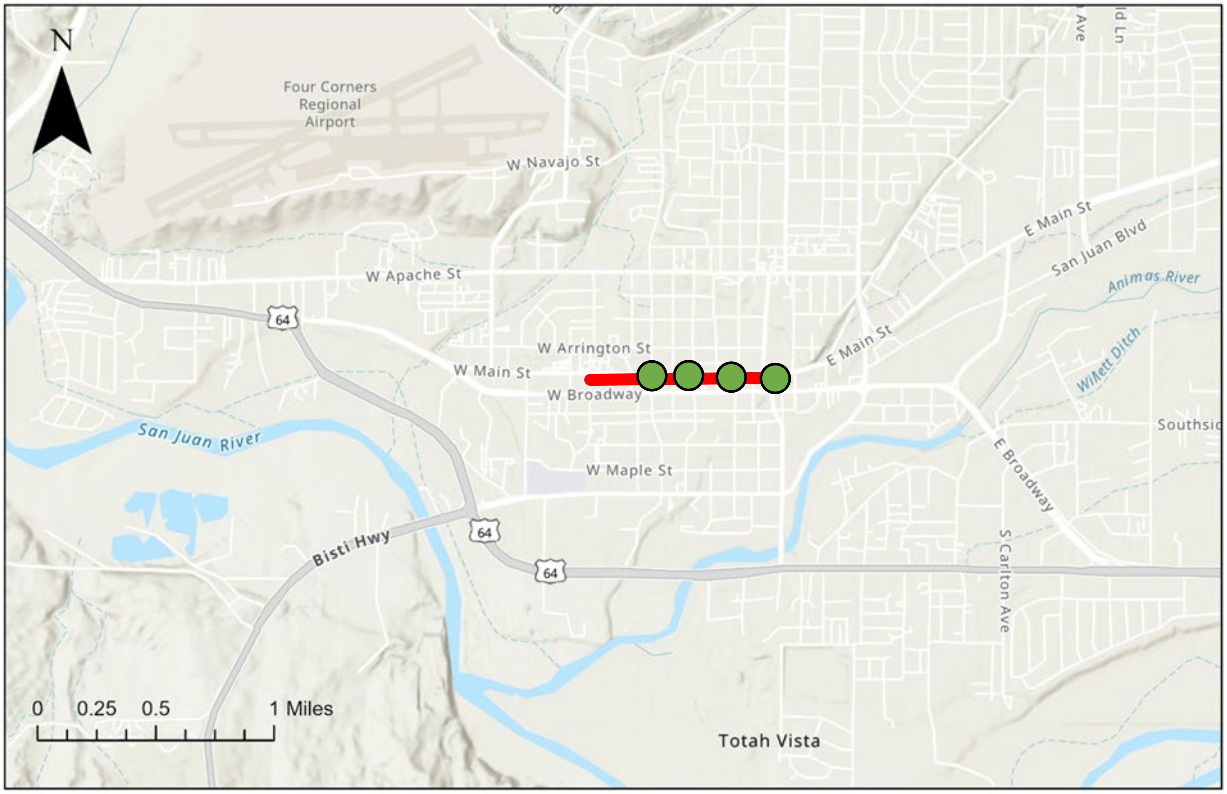

Figure 48. Map of New Mexico roadway redesign case study in Farmington, NM (highlighted in red). Roundabouts represented with green circles.

Main Street's conversion was completed in July 2020. This segment of Main Street had a functional classification designation of principal arterial before reconfiguration and retained that designation after (**Table 11**). The total width of the roadway from the outside of sidewalk to the outside of sidewalk is 84 feet and the road carried about 10,000 vehicles and was signed at 25 mph both before and after reconstruction.

The roadway saw a reduction of general motor vehicle travel lanes from four lanes to two lanes with the additional space converted to wider sidewalks and buffers between the travel lanes and on-street parking (**Figures 49-51**). There were also many curb extensions added along the corridor. The signalized intersections along the corridor were converted to roundabouts. No additional traffic-controlled pedestrian crossings were added to the corridor during the reconfiguration.

The reconfiguration was too recent to perform a crash analysis with the data that is currently available. Peter Koeppel, the Officer of the Farmington Metropolitan Planning Organization (MPO), provided the following anecdote:

“Vehicle volumes along Main Street are surprisingly high. People like the fact that there are no signals, just roundabouts, which are efficient (though not everyone understands what yield signs mean). Vehicle speeds are low and it's a pleasant place to walk.”

Table 11. Characteristics of Main Street in Farmington, NM.

	Before	**After**
Functional Classification	Principal Arterial	Principal Arterial
ADT (2018, 2021)	10,158	10,422
Lanes	4	2
Speed Limit	25 mph	25 mph
Width	84’	84’
Distance between Traffic-Controlled Crossings	811’	811’

Figure 49. Photos of midblock segment of Main Street in Farmington, NM before (top) and after (bottom) road redesign.

Figure 50. Photos of intersection on Main Street in Farmington, NM before (top) and after (bottom) road redesign.

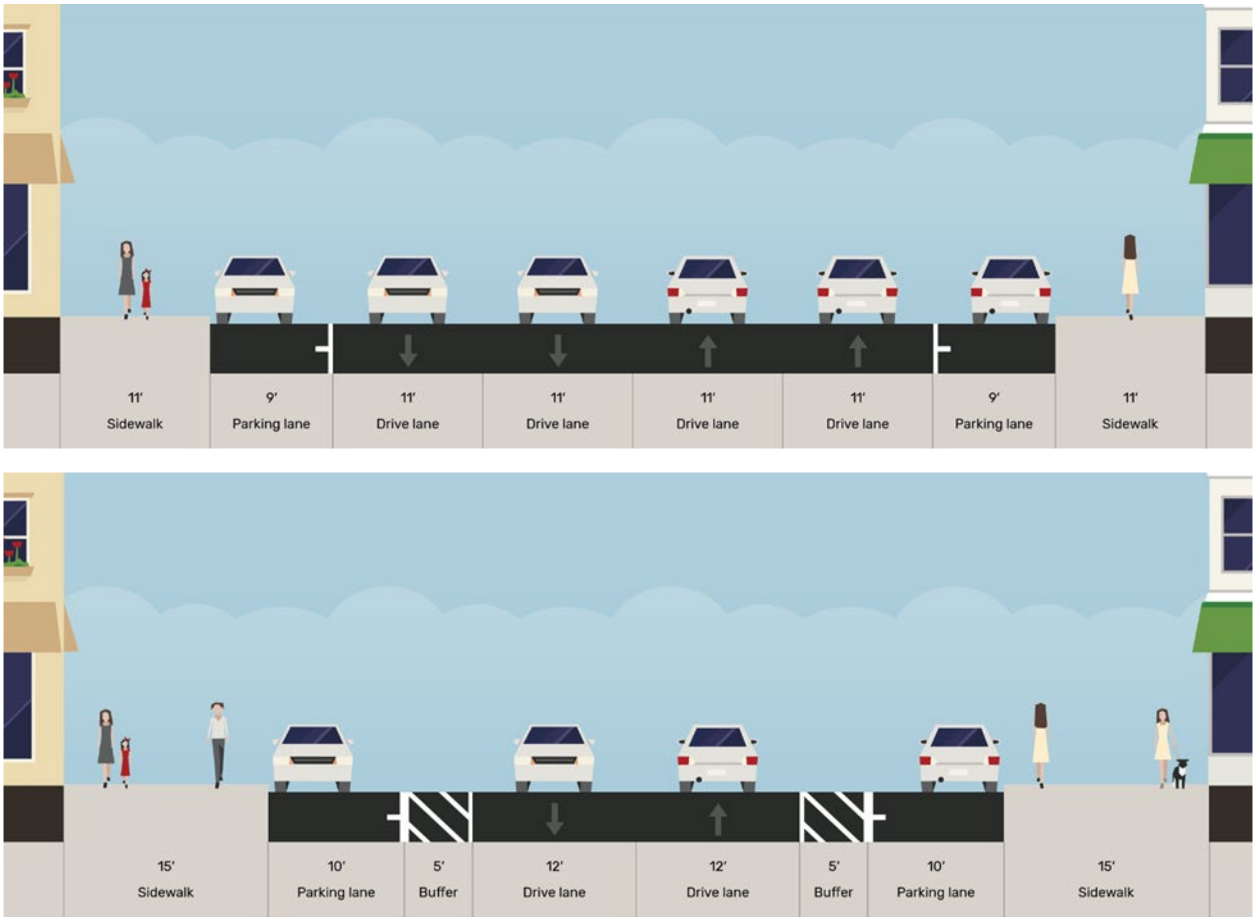

Figure 51. Cross section diagram of Main Street in Farmington, NM before (top) and after (bottom) road redesign.

6. Conclusions and Recommendations

Although pedestrian safety in New Mexico is a pressing issue, the conclusions from this report are hopeful. Many of the pedestrian safety issues in New Mexico are located on relatively few roads. When considering NMDOT roads in particular, we identified a safety-priority roadway design profile: NMDOT roads in urban areas with five lanes, signed at 35 mph, carrying about 10,000 or fewer vehicles per day, and with available roadway width (from outside of sidewalk to outside of sidewalk) of between 88-96 feet. Although roadways with this safety-priority profile make up less than 5% of NMDOT's lane miles, they account for 42.4% of pedestrian crashes and 33.9% of pedestrian KA crashes on NMDOT roads.

What can we do with these roadways that fit the safety-priority profile? While not yet the status quo across the country, we were able to identify several examples of roadways with similar profiles that had successful reconfigurations. Those reconfigurations primarily consisted of reductions to three lanes (one travel lane in each direction with a TWLT lane), the addition of pedestrian amenities such as curb extensions or pedestrian refuges, and the installation of bicycle lanes. Reconfigurations were reported to have been successful with improved safety outcomes and public approval all while maintaining stable motor vehicle traffic operations. We also identified a reconfiguration of Main Street in Farmington, NM, that experienced a similar roadway reconfiguration.

Based on the successful roadway reconfigurations that we identified, we made design recommendations in Section 2.5 for roadways that match the NMDOT safety-priority profile. In summary, to solve the pedestrian safety issues present on NMDOT roadways, the most effective approach is to fundamentally rethink road configurations for NMDOT roadways in urban areas by reducing the number of travel lanes and adding pedestrian and bicycle facilities. Reducing the number of lanes should reduce motor vehicle speeds, reduce turning conflicts, reduce crossing distance and complexity for pedestrians, and provide safe dedicated space for both pedestrians and bicyclists. Fundamentally rethinking the lane configuration will be a more economical method of improving traffic safety outcomes than spot-treatments such as adding traffic-controlled crossings along still fundamentally unsafe roadway corridors.

Based on the case studies profiled, such reconfigurations should not only improve traffic safety while continuing to provide adequate level of service for the traffic volumes expected on these roadways, but such reconfigurations may help to build a sense of place and generate investment in the downtown areas through which they pass.

7. References

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