Bohannan Huston

MaxGreen Transportation Engineers

SILVER AVENUE BIKE BOULEVARD REVIEW

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December 2019

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- Northwest Representative: Jim Fordice
- Unincorporated East of the Rio Grande Representative: Vacant
- At-Large Representative: Irene Entila
- Southwest Representative: Dan Majewski
- At-Large Representative: Ed Gerety
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TABLE OF CONTENTS

LIST OF FIGURES

INTRODUCTION

Project Background

Bicycle boulevards – neighborhood streets where improvements have been made to calm vehicle traffic and appeal to less confident bicyclists – are an emerging bikeway facility type that complements on-street bike lanes and ensures that bicyclists of all abilities can access major destinations. Though bicyclists must travel with the flow of vehicles along bicycle boulevards, traffic volumes and speeds are typically low and design techniques ensure greater motorist awareness. Over the last decade, the City of Albuquerque has introduced a series of bicycle boulevards that now connect Old Town, Downtown, the University of New Mexico (UNM), Nob Hill, the Fair Heights neighborhood, and Uptown.

Silver Ave lies parallel to several major streets – including Central Ave, Lead Ave, and Coal Ave – and provides a low-stress alternative that nevertheless connects to a series of major destinations. Since the Silver Ave Bike Blvd was first designed and built there have been a number of improvements to the bicycle boulevards, as well as land use changes and investments in the area between UNM and Downtown. Some of these investments include the reconstruction of Central Ave associated with Albuquerque Rapid Transit, improvements to Lead Ave and Coal Ave, and new residential and commercial development. The Silver Ave Bike Blvd Review seeks to augment the growing bicycle network and complement these recent investments through improvements to the existing Silver Ave Bike Blvd by providing a low-stress, low-traffic option for riders of all ages.

Purpose and Need of Study

The purpose of this study is to evaluate conditions and provide recommendations for the portion of the Silver Avenue Bike Blvd that runs from Yale Blvd west to the Paseo del Bosque Trail and connects major destinations such as Old Town, Downtown, and UNM. In particular, the study considers how to best provide a safe and comfortable alternative to the bikeways on Lead Ave and Coal Ave; though these roadways feature wide bike lanes, they are principal arterials with high speeds and high traffic volumes that are unappealing to many bicyclists.

Improvements are recommended that address barriers along the study area, including I-25 and the Downtown railroad crossings, and better enable short and medium-distance trips between major destinations exclusively on calm neighborhood streets. The study applies techniques that have been developed along other bicycle boulevard segments, including Silver Ave to the east of Yale Blvd, and provide recommendations and design concepts to address the issues identified for the corridor. Final engineering design, including the precise locations of signage and pavement markings, will take place in a later phase.

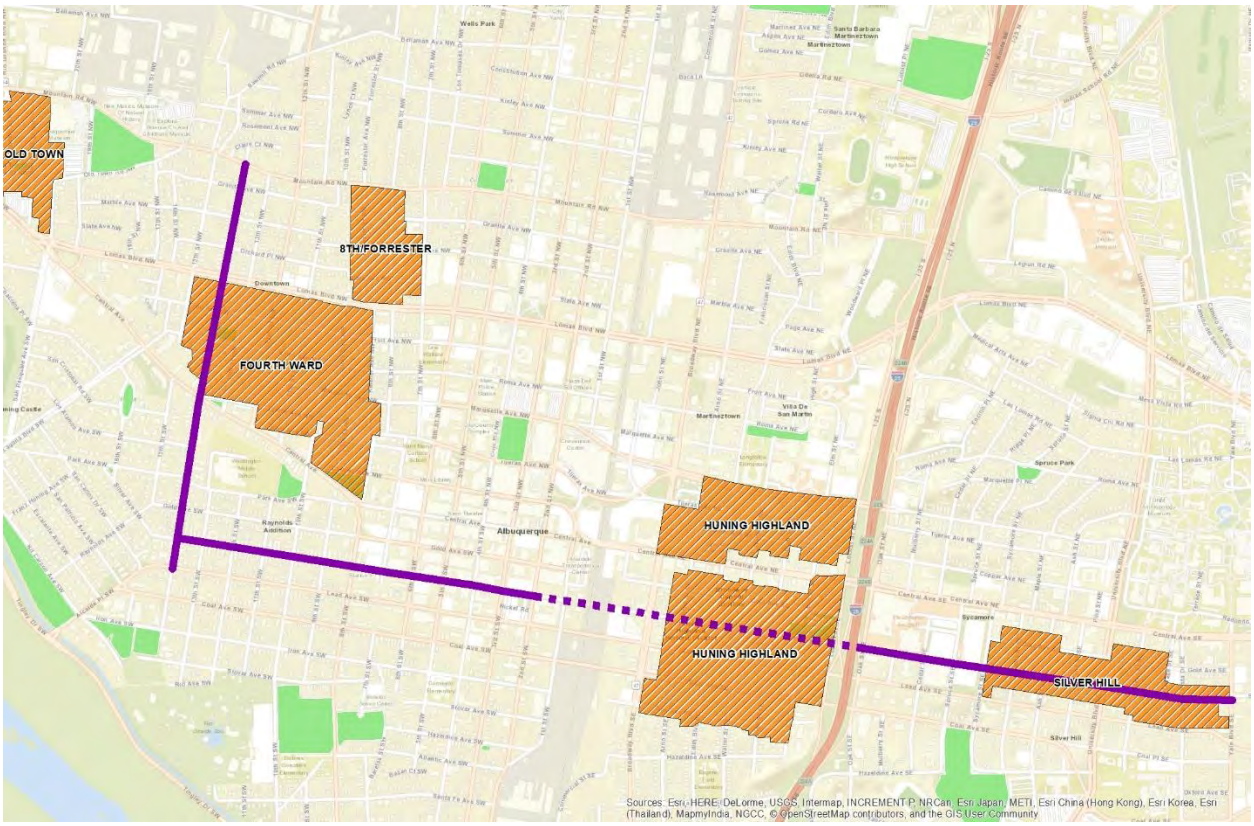
A major focus of the study is to identify improvements that help Silver Ave appeal to bicyclists from ages 8 to 80 who may not feel comfortable utilizing on-street bike lanes. The majority of bicyclists in the US can be described as “interested but concerned,” meaning they will consider bicycling as an option but generally prefer to avoid traveling alongside high speed and/or high-volume motor vehicle travel. There is a growing appeal for networks of bicycle boulevards among less confident riders, including students and families, who prefer the lower speed settings of neighborhood roads. Where the Silver Ave Bike Blvd intersects with major roads, the study offers design options and recommendations to minimize safety concerns to provide the highest level of user comfort as possible.

Study Area

This study evaluates portions of the Silver Ave Bike Blvd for improvements from Yale Blvd to 14th St and the 14th St Bike Blvd from Silver Ave to Mountain Rd. The study also includes a qualitative evaluation of the suitability of Mountain Road as a bicycle boulevard. The study area presents two significant challenges in terms of connectivity: I-25 and the Downtown railroad tracks. Navigating these barriers is explored in detail in the Recommendations section.

The study area spans a length of five miles between the UNM area, Downtown, and Old Town and includes parts of the City's designated 50-mile bike loop. The majority of the study area has already been designated as a bicycle boulevard and features basic signage and pavement markings. The portion of Silver Ave between Broadway Blvd and I-25 has been identified as a bicycle boulevard in the Long Range Bicycle System, though no signage or pavement markings have been applied to this area. The Silver Ave Bicycle Boulevard also passes through several of the City's five historic neighborhoods, including Silver Hill, Huning Highland, and the Fourth Ward.

Figure 1: Silver Ave Bicycle Boulevard Review Study Area



Bicycle Boulevards in Albuquerque

Bicycle boulevards were originally designed and implemented in 2009 following the passage of the Bicycle Boulevard Resolution (F/SR 07-268), which called for the creation of bikeways that serve all levels of bicyclists. Albuquerque's use of bicycle boulevards became recognized as an innovative technique for shared use roadways and has been highlighted in the NACTO *Urban Bikeway Design Guide*.

Bicycle boulevards are intended to utilize local (i.e. neighborhood) streets to provide routes with low vehicle traffic and infrequent stops and detours for bicyclists. The initial bicycle boulevard system ran from the Paseo del Bosque Trail connection on Mountain Rd to San Mateo Blvd, connecting Old Town, Downtown, UNM, Nob Hill, and the Highland area. In practice, the bicycle boulevards featured purple street signs, 18 MPH speed limit signs, and pavement stencils. Over time, the City recognized that additional improvements would be beneficial to ensure low motor vehicle travel speeds and a high level of comfort for bicyclists.

The portion of the Silver Ave Bike Blvd from Yale Blvd to Nob Hill was studied beginning in 2015, resulting in the identification of deficiencies and the design and construction of improvements that have made that portion of the Silver Avenue Bike Blvd easier and safer to use. The improvements include mini-roundabouts at Cornell Dr and Princeton Dr, a protected median at Girard Blvd that also closed Silver Ave to through traffic, and a bi-directional protected lane on Carlisle Blvd in front of the Presbyterian Church. The Fair Heights Bike Blvd was subsequently improved from Nob Hill to Uptown featuring similar techniques.

Characteristics of Bicycle Boulevards

While experienced bicyclists seek direct routes on major roadways, casual, concerned, and low-speed recreational bicyclists often favor quieter streets and bike trails. Through bicycle boulevards, the City of Albuquerque utilizes infrastructure improvements and various traffic calming devices designed to control motor vehicle speeds to provide routes that are attractive to bicyclists of all ages and abilities. Bicycle boulevards are generally multiple miles in length to allow for continuous trips and access to major destinations.

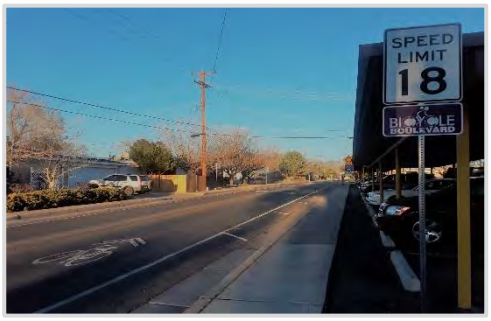
The following street elements characterize bicycle boulevards in the City of Albuquerque. These definitions are adapted from the 2009 resolution creating bicycle boulevards, the Bikeways & Trails Facilities Plan, and from the set of techniques that have been applied to the Silver Ave and Fair Heights Bicycle Boulevards. The principal design manual for bicycle boulevards is the National Association of City Transportation Officials (NACTO) *Urban Bikeway Design Guide*.

Shared-Use Facility

Bicycle boulevards are roadways in which bicyclist's share the pavement with motor vehicles, but the facility is optimized in favor of the bicycle. While many roadways have bicyclists ride alongside of traffic in dedicated bike lanes, bicycle boulevards are typically narrow and designed to ensure low vehicle speeds, allowing bicyclists to ride with the flow of traffic.

Local/Neighborhood Streets

Bicycle boulevards transform a residential or local street that typically feature low speeds, limited through traffic, and on-street parking into a formalized bike route that accommodates motor traffic but gives priority to bicyclists. The designation of a neighborhood street as a bicycle boulevard is accompanied by the introduction of additional street elements to calm traffic and encourage bicycling. Bicycle boulevards are typically located parallel to major streets to offer a low stress alternative.



Low Speeds

Bicycle boulevards feature posted speed limits of 18 MPH, which is lower than the typical neighborhood or local street speed limit of 25 MPH. The non-typical speed limit is intended to call attention to the increased presence of bicyclists. A lower design speed (i.e. safe operating level for motorists) and target speed (i.e. intended speed of motorists) are the result of traffic calming measures and allow bicyclists to more comfortably ride with the flow of traffic.

Low Traffic Volumes

Low levels of vehicle traffic are intended to make bicycle boulevards appealing to bicyclists of all experience levels. The low vehicle volumes enable cars to pass safely using the full street width, with no need for the separation provided by a bike lane stripe. The use of "sharrows" to indicate a shared-use facility, a common characteristic of bicycle boulevards, is most appropriate when traffic volumes are below 3,000 vehicles per day. In practice, most bicycle boulevards in the City of Albuquerque have traffic volumes below 1,000 vehicles per day.

Signage and Pavement Markings

The City of Albuquerque has developed a series of street signs and pavement markings to provide identification of the facility as a bicycle boulevard and to ease the "barrier to entry" for inexperienced and "interested but concerned" bicyclists. The purple color and logo of these signs are unique to bicycle boulevards, thereby providing a sense of branding, and alert motorists to the unique character and operations of the facility. Pavement markings on bicycle boulevards include "sharrows" and bicycle stencils and are generally applied every block.

Wayfinding

Wayfinding signs for bicycle boulevards provide directions and distances to key destinations, while pavement markings provide additional guidance when the bicycle boulevard turns or changes direction along its route. Wayfinding signs utilizes a purple color and bicycle logo to reinforce the route as a bicycle boulevard.

Traffic Calming and Barriers to Through Traffic

Design techniques may be used to slow down vehicle traffic and discourage vehicle through trips via stop sign placement and the use of barriers. Other traffic calming measures found on bicycle boulevards include diverters, speed humps, and mini-roundabouts, as well as the removal of center striping and the delineation of on-street parking in order to narrow the shared space of the roadway and encourage lower speeds. Stop signs may be used in combination with mini-roundabouts, an alternative means of traffic control that discourages high speed through travel while enabling bicyclists to move continuously through the intersection. The distance between stop signs or traffic signals is generally between 0.25 and 0.5 miles.

Bicyclist Accommodation at Busy Intersections

Where bicycle boulevards cross or intersect with major roads, design techniques are applied to increase motorist awareness and provide protection for bicyclists. Intersection treatments include median refuges that allow pedestrians and bicyclists to cross one direction of traffic at a time, barriers or cycle tracks, and the use of HAWK signals. Intersection barriers can also limit motor vehicle through traffic.

Public/Stakeholder Outreach

Public and stakeholder outreach was conducted in two phases, with each phase including presentations to the Greater Albuquerque Bicycling Advisory Group (GABAC) and at a public meeting. The Project Team also coordinated with New Mexico Department of Transportation (NMDOT) and various City of Albuquerque departments on the potential options and recommendations contained in this study. Information on the project and public meeting materials were posted on a project page on the City website. The first phase presented the project scope and initial findings from a site visit by the project team and solicited input on areas of concern along the corridor. The second phase presented recommendations and design concepts along the study area. A summary of public and stakeholder outreach is included in Appendix A.

EXISTING CONDITIONS

Study Area Segments

The study area for the Silver Ave Bicycle Boulevard Review spans a length of five miles between the UNM area, Downtown, and Old Town. For analysis and design purposes, the corridor has been divided into several segments. This section describes the conditions and general roadway features along the length of each segment. In several cases, the transitions or boundaries between these segments merit some form of design intervention.

Yale Blvd to I-25

The easternmost segment of the study area spans just over 0.8 miles and traverses the historic tree-lined Silver Hill neighborhood and the residential areas to the east of Presbyterian Hospital and I-25. Along Silver Ave between Buena Vista Dr and Mulberry St, the street is divided by a wide landscaped median with 17'-18' one-way travelways with on-street parallel parking. Between Yale Blvd and Buena Vista Dr, Silver Ave is an undivided two-way street with 32' from curb-to-curb, including parallel on-street parking. Although on-street parking is allowed throughout this segment of Silver Ave, spaces are not delineated.

Barriers located at Yale Blvd, University Blvd, and Sycamore St allow pedestrians and bicyclists to pass through on Silver Ave but prevent vehicle through traffic. The result is a low-speed and low-volume roadway that affords a comfortable ride for bicyclists traveling in mixed-flow traffic.

I-25 to Railroad Crossing

To the west of I-25 lies an isolated 0.4-mile stretch of Silver Ave through the Huning Highland Neighborhood. Due to the major barriers at both ends of this segment – Silver Ave terminates just west of Broadway Blvd in a gated parking lot and dead-ends on the east at Locust St – there is minimal through traffic.

In this segment, Silver Ave is an approximately 32'-wide local street with delineated on-street parallel parking (a stripe parallel to the curb marks the width of the parking area but the individual spaces are not marked). Though not currently an improved bicycle boulevard, this segment of Silver Ave is included in the Long Range Bikeway System and the Bikeways & Trails Facilities Plan as a future bicycle boulevard.

Downtown: 2nd St to 8th St

The bicycle boulevard designation and signage resume on 2nd St in Downtown (Silver Ave between 1st St and 2nd St is not part of the designated bicycle boulevard). The 0.4-mile that spans between 2nd St and 8th St is among the east-west streets within the Downtown grid, represented by short block lengths and high levels of pedestrian activity. Silver Ave through Downtown is classified as a local road with a 40' curb-to-curb cross-section, and is the only portion of the study area with striped center lines. Metered on-street parallel parking is provided on both sides of the street to serve nearby restaurants and offices. Several traffic signals along this segment have been replaced recently with stop control as a result of recommendations from the Downtown Stop Sign Evaluation.

At present, all-way stop signs are located at 2nd, 4th, 5th, 6th, and 8th Streets, with a traffic signal at 3rd St, forcing bicyclists to stop at nearly every block along the way. Two-way stop control is provided on 7th St.

West Downtown

The westernmost portion of the study area traverses Downtown neighborhoods along Silver Ave from 8th St to 14th St and 14th St from Silver Ave to Mountain Rd. West of 8th St, Silver Ave again assumes a residential character, though the area is also home to legal offices and other small businesses. This segment of Silver Ave features a 32'-wide street section with heavily used on-street parallel parking.

The bicycle boulevard in this area follows 14th St north of Silver Ave for 0.85 miles to Mountain Rd. Fourteenth St north of Central Ave is the narrowest stretch of the study area with a width of 26'. A full traffic signal and pedestrian crossing are located at 14th St and Central Ave, though improved signal detection for bicyclists is needed. A designated bicycle/pedestrian crossing, and median refuge were installed in fall 2018 at 14th St and Lomas Blvd.

Mountain Rd

Mountain Rd is designated as a bicycle boulevard for the 1.5-mile stretch between 14th St and the access to the Paseo del Bosque Trail. East of Rio Grande Blvd, Mountain Rd is classified as a collector road and supports through traffic between I-25 and Old Town, with average daily traffic volumes of approximately 7,000 vehicles. Mountain Rd also serves as a primary vehicle access route to the museum district. West of Rio Grande Blvd, Mountain Rd is a local road serving residential areas and the Reginald F. Chavez Elementary School.

Note: The suitability of Mountain Rd as a bicycle boulevard is considered in this study through a qualitative analysis. The corridor was not evaluated for design recommendations at this time.

Traffic and Bicycle Counts

Traffic Counts

Data Collection

Traffic volume and speed data were collected using pneumatic tubes to verify the suitability of portions of the study area as bicycle boulevards and to evaluate the need for additional traffic calming features or design interventions. Traffic counts were collected on August 21st and 22nd, 2018 at three locations along the study area:

- 14th St – Between Central Ave & Park Ave
- Iron Ave – West of Broadcast Plaza
- Silver Ave – Between 5th St and 6th St

Based on site visit observations, Silver Ave through Downtown appears to have the highest traffic volumes of any stretch of the study area. Data was collected on Iron Ave as this roadway is under consideration as a connection from the Silver Ave Bike Blvd at 14th St to the Paseo del Bosque trail at Alcalde Pl and Kit Carson Park. Fourteenth St near Park Ave was selected for data collection due

to its location midway between Silver Ave and Central Ave and its unusual geometry as a five-point intersection. Fourteenth St also features a wide cross section that may encourage higher speeds. Figure 2 below shows a summary of the data collected.

Figure 2: Vehicle Counts and Speeds (collected August 21-22, 2018)

Street & Location		14th St *Between Central Ave & Park Ave*	Iron Ave *West of Broadcast Plaza*	Silver Ave *Between 5th St and 6th St*
Volume	*AM Peak Hour*	237	162	179
	PM Peak Hour	228	161	176
	24-hour	2,259	1,368	1,624
Speed	*Average*	16.9 MPH	21.9 MPH	16.9 MPH
	85th Percentile	24.4 MPH	29.0 MPH	24.3 MPH

Analysis

Based on the observed traffic volumes (all three sites carry less than 3,000 vehicles per day) and vehicle speeds (average speeds are less than 25 MPH), all three locations meet the criteria established in the City of Albuquerque's *Development* Process *Manual* (DPM) regarding the appropriateness of a bicycle boulevard. Additionally, each of the locations meet the guidance from NACTO for the application of sharrows and for bicyclists to be able to travel safely in mixed flow traffic.

Based on the observed conditions and the neighborhood character of the street, Iron Ave between 14th St and Alcalde Pl would be a suitable location for a bicycle boulevard. Though the 85th percentile speed is relatively high (per NACTO, the 85th percentile speed should not exceed 25 MPH), it is likely that the designation of Iron Ave as a bicycle boulevard and the application of signage and pavement markings would have a modest traffic calming effect.

Bicycle Counts

Data Collection

Bicycle counts data were collected concurrent to the traffic counts data along 14th St, Iron Ave, and Silver Ave through Downtown. Data collection efforts utilized cameras that recorded travel behavior at the intersections and capture movement in all directions. Bicycle counts data are summarized for the 12-hour period from 6 AM to 6 PM in Figure 3.

Three additional counts at the intersection of Silver Ave with Edith Blvd (August 16th), Cedar St (August 23), and Buena Vista Dr (September 6th) were collected by the Mid-Region Council of Governments (MRCOG) using video cameras, though data is provided for three two-hour peak periods (7-9 AM, 11 AM – 1 PM, and 4-6 PM). To allow for comparison with the 12-hour data collected specifically for this study, an adjustment factor of 50 percent is applied to the MRCOG data. (The adjustment factor is based on the approximately 2/3-share of trips taken during the three peak periods along 14th St, Iron Ave, and Silver Ave).

Figure 3: Bicycle Counts along Study Area

Street	Location	12-Hour Bike Count
14th St	South of Iron Ave	9
14th St	North of Iron Ave	20
Iron Ave	West of 14th St	32
Iron Ave	East of 14th St	33
14th St	South of Park Ave	28
14th St	North of Park Ave	29
Park Ave	14th St	41
Park Ave	14th St	42
Silver Ave	West of 5th St	109
Silver Ave	East of 5th St	96
5th St	South of Silver Ave	56
5th St	North of Silver Ave	57
Silver Ave	*Edith Blvd*	*5*
Edith Blvd	*Silver Ave*	*33*
Silver Ave	*Cedar St*	*26*
Cedar St	*Silver Ave*	*0*
Silver Ave	*Buena Vista Dr*	*119*
Buena Vista Dr	*Silver Ave*	*104*

Note: Italics indicate data collected by MRCOG with an adjustment factor applied

Analysis

The Silver Ave Bike Blvd is a generally well-utilized bikeway facility, with the highest number of bicycle trips were observed at Silver Ave and Buena Vista Dr near UNM and along Silver Ave through Downtown Albuquerque. A higher number of trips were observed along Park Ave than along the 14th St Bicycle Boulevard, indicating Park Ave may be utilized as an east-west alternative to the Silver Ave Bicycle Boulevard through west Downtown. The high number of trips on Park Ave reinforces the potential benefits of traffic management at the intersection with 14th St.

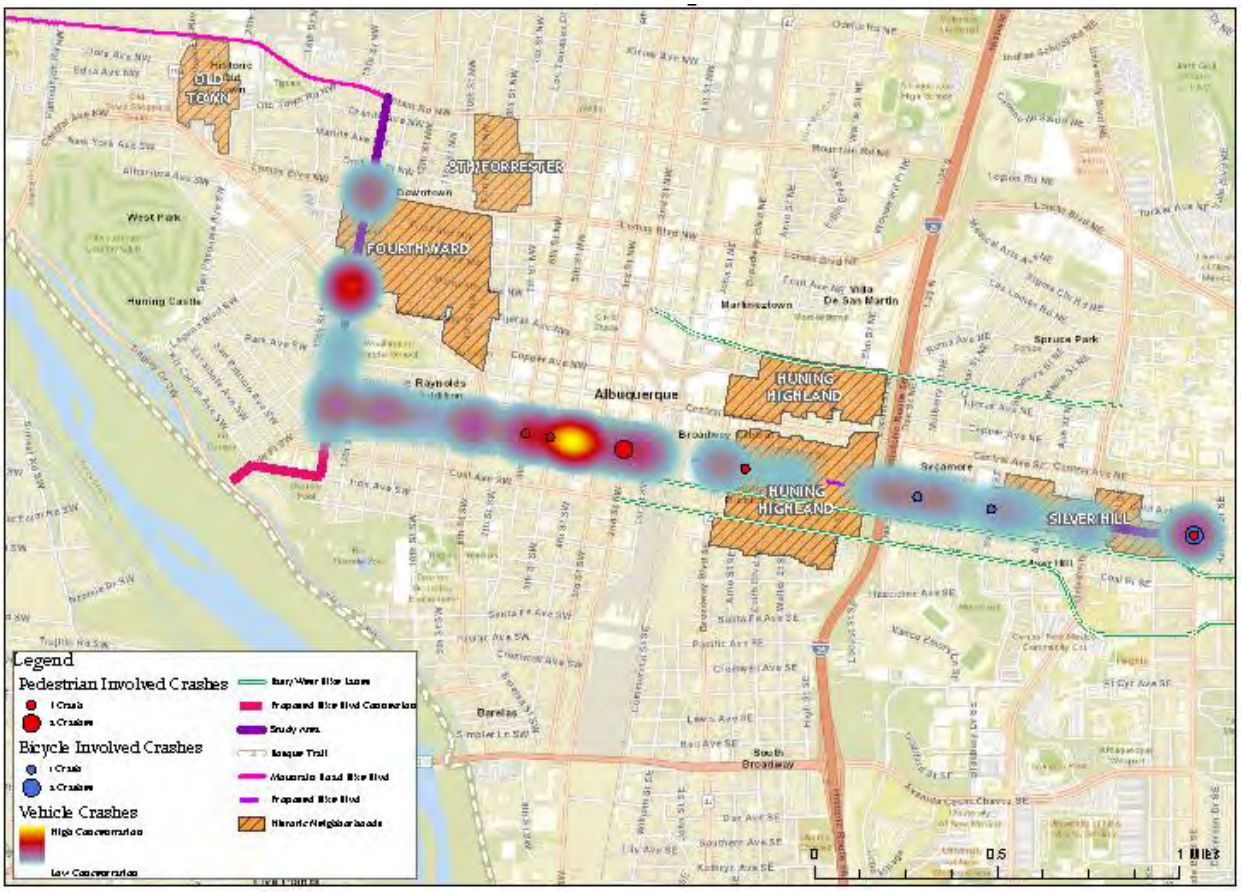
Iron Ave, an undesignated local road and potential connection to the Paseo del Bosque Trail from Silver Ave in west Downtown, experienced a higher number of bicycle trips than the nearby 14th St Bicycle Boulevard segment.

Crash Data

Crash data were provided by MRCOG for the years 2011 to 2015. A total of 170 crashes occurred along the Silver Ave Bicycle Boulevard and 14th St Bicycle Boulevard over the five-year data span. Of those crashes, six involved pedestrians and four involved bicyclists. Of the 170 crashes involving motor vehicles only, 19 crashes were single-vehicle crashes, while the remainder involved multiple vehicles. About 35 percent of the crashes in the study area involved alcohol.

Among the bicyclist-involved crashes, two took place at Yale Blvd and Silver Ave, with other crashes reported at the intersections of Silver Ave with Sycamore St and Mulberry St. The one fatality in the five-year span along the study area involved a pedestrian at 2nd St and Silver Ave.

Figure 4: Crashes along Study Area, 2011-2015



Overall, the highest numbers of crashes are concentrated in the Downtown portion of the study area, including multiple pedestrian-involved crashes. Other locations with high numbers of crashes include the intersections of Central Ave and 14th St and Yale Blvd and Silver Ave. Both intersections have been improved since the crash data was collected, including a raised median and pedestrian/bicycle refuge at Silver Ave and Yale Blvd, and an updated crosswalk and intersection geometry at 14th St and Central Ave as part of the Albuquerque Rapid Transit construction.

Figure 5: Locations with High Numbers of Crashes along Silver Ave and 14th St

Location	Total Number of Crashes	Crashes with Injuries
Silver Ave and 4th St	18	5
Central Ave and 14th St	14	5
Silver Ave and Yale Blvd	12	3
Silver Ave and 6th St	10	3
Silver Ave and 2nd St	8	6
Silver Ave and 1st St	7	1
Lomas and 14th St	6	4
Silver Ave and 8th St	6	0
Silver Ave and 5th St	6	2
Silver Ave and 14th St	5	0
Silver Ave and 3rd St	5	2
Silver Ave and Broadway Blvd	5	1
Silver Ave and 12th St	4	1
Silver Ave and Mulberry St	4	1
Silver Ave and Cedar St	4	0
Silver Ave and Oak St	3	1
Silver Ave and 11th St	2	0
Silver Ave and 10th St	2	0
Silver Ave and 9th St	2	1
Silver Ave and Arno St	2	1
Silver Ave and Walter St	2	0

Crashes occurred at rates above the regional average at nearly all the intersections of Lead Ave and Coal Ave with I-25 frontage roads and the intersections on either side of the railroad crossings. Because Silver Ave does not extend through I-25 or across the Downtown railroad tracks, bicyclists often use Lead Ave or Coal Ave to traverse these features. Figure 6 shows the total number of crashes between 2011 and 2015 and the crash rates compared to the regional average at these key intersections. Multiple bicyclist-involved crashes occurred at Lead Ave and 2nd St, Lead Ave and Broadway Blvd, and Coal Ave and Locust St.

Figure 6: Crashes at Key Intersections along Lead Ave and Coal Ave

Location	Total Number of Crashes	Crashes with Injuries	Crash Rate versus Regional Average	Crashes involving Bicyclists / Pedestrians
Lead Ave and 2nd	31	14	1.21	3 / 1
Coal Ave and 2nd	25	9	1.24	1 / 3
Lead Ave and Broadway Blvd	51	28	1.20	3 / 0
Coal Ave and Broadway Blvd	27	7	0.67	0 / 0
Lead Ave and Locust St	35	12	1.16	0 / 1
Coal Ave and Locust St	32	6	1.19	2 / 0
Lead Ave and Oak St	37	11	1.22	1 / 0
Coal Ave and Oak St	48	20	1.61	1 / 0

Relevant Plans and Studies

Bicycle Boulevard Resolution

In 2009, the City of Albuquerque passed a resolution calling for the conversion of a small network of local streets to bicycle boulevards. Through the use of design interventions such as removing barriers and detours to through-cycling, removing stop signs from the boulevard and instead stopping traffic approaching from intersecting streets, bicycle boulevards transform residential streets into "bike expressways" that also accommodate local motor traffic at low volumes. In particular, the City of Albuquerque's resolution seeks to provide accommodations for all levels of bicyclists, especially "casual cyclists [who] favor quieter streets." The initial bicycle boulevard network included Mountain Rd from the Paseo del Bosque Trail to 14th St, 14th St from Mountain Rd to Silver Ave, and Silver Ave from 14th St to the Nob Hill area.

Bikeways & Trails Facilities Plan

In 2015, the City of Albuquerque consolidated the various documents related to active transportation infrastructure into the *Bikeways & Trails Facility Plan*. The primary goals of the Bikeways & Trails Facility Plan include the following:

- Ensure a well-connected, enjoyable, and comfortable non-motorized transportation and recreation system throughout the metropolitan area
- Guide future investment in the bikeways and trails system, including facility improvements, new facilities, maintenance, and education/outreach programs

In addition to these two main goals, the plan identifies secondary goals of increasing public awareness and education of bikeways and trails, increasing usage of bikeways and trails, and leveraging the bikeway and trail network as a part of economic development in Albuquerque.

To support these goals, the *Bikeways & Trails Facilities Plan* outlines current programs and bikeway conditions, defines bikeway infrastructure types, and identifies desired improvements. Among the Plan's specific recommendations, Silver Ave from Broadway Blvd to I-25 is proposed for

improvements as a bicycle boulevard. A connection between Silver Ave in Downtown and the Bosque Trail access at Kit Carson Park is also identified as a proposed bike route.

Definition of Bicycle Boulevards – Bikeways & Trails Facilities Plan

"a bike route that is designed to prioritize the through movement of bicycles while maintaining local access for motor vehicle travel. This bikeway type is often used on neighborhood streets with good connectivity. Traffic calming devices are used to control motor vehicle speeds and discourage vehicle through trips. These devices may include diverters, speed humps, traffic circles, or pocket parks which allow through access by bicycles…. Bicycle boulevards should limit bicycle stops to one per quarter-mile or preferably one per half-mile spacing."

Long Range Bikeway System

The Long Range Bikeway System (LRBS), maintained by MRCOG and updated every five years as part of the metropolitan transportation plan development process, contains the network of current and proposed bicycle facilities in the Albuquerque metropolitan area. (The LRBS is being updated at the time of this study.) The development of the LRBS involves the participation of City of Albuquerque staff.

All portions of Silver Ave and 14th St that are currently designated as a bicycle boulevard are indicated on the LRBS network map. Silver Ave from Broadway Blvd to I-25 is designated as a future bicycle boulevard.

City of Albuquerque Development Process Manual

The *Development Process Manual* (DPM) governs the land development process for the City of Albuquerque and provides design standards for transportation and utilities infrastructure, as well as landscaping and site design requirements. Where documents such as the *Bikeways & Trails Facilities Plan* provide guidance on desired infrastructure locations and types, the DPM provides specific standards related to the dimensions and application of bikeway facilities. The DPM also incorporates and expands upon guidance related to bicycle boulevards contained in the *Bikeways & Trails Facility Plan*. Per the DPM, bicycle boulevards are most appropriate on low-volume streets (below 3,000 vehicles per day) and low-speed roadways (posted speed of 25 MPH or below). The DPM indicates that bicycle boulevards provide lower-stress alternative routes and may be applied on streets that are parallel to roadways with bicycle lanes. Bicycle boulevards should be part of a route that is at least two miles long.

Near South Valley Multi-modal Study

The objective of the *Near South Valley Multimodal Study* is to identify roadway, pedestrian, bicycle, and transit needs and improvements in the current transportation system for the study area and develops a list of recommendations for future multimodal transportation needs. Study area boundaries are the Rio Grande to the west, I-25 on the east, Salida Sandia (the southern border of the Valle de Oro National Wildlife Refuge) on the south, and Lead Ave on the north. Though most of the analysis relates to locations to the south of the Silver Ave Blvd study area, relevant recommendations include bike lanes on Broadway Blvd between Lead Ave and Coal Ave. Such an

improvement could provide an additional on-street option for bicyclists using the bicycle boulevard.

South I-25 Corridor Study

In the *South I-25 Corridor Study*, NMDOT evaluates potential highway improvement projects for the stretch of I-25 between NM 47/Broadway Blvd and I-40. Completed in October 2016, the study considers current and future needs through the year 2040. Recommendations include replacements to aging infrastructure, including the reconstruction of major interchanges, and operational improvements. The document does identify bikeway facilities in the South I-25 study area, but there is no discussion of improved facilities or a new crossing in the vicinity of Silver Ave-Lead Ave-Coal Ave or as part of improvements to the interchange.

Downtown 2025 Sector Development Plan

The *Downtown 2025 Sector Development Plan* is a policy and implementation plan for Downtown Albuquerque created jointly by the City of Albuquerque and the Downtown Action Team. The plan was first adopted in 2000 and amended most recently in 2014, though regulations were rescinded with the adoption of the Integrated Development Ordinance. However, the policies remain in place as a Metropolitan Redevelopment Area Plan and as an Appendix to the Comprehensive Plan.

The Plan seeks to answer three fundamental questions regarding development in Downtown:

- What should Downtown Albuquerque look like in 10 years?
- What commitments will the community make to ensure Downtown investment?
- How should people get to Downtown and move around Downtown?

In response to these questions, the *Downtown 2025 Sector Development Plan* provides goals, commitments, policies, and implementation actions for land use, transportation, and urban design that the City and community expect to realize over time. The general vision for Downtown Albuquerque is a return to "its former prominence as the community's premier gathering place and as the center of Albuquerque's Historic District."

From a transportation perspective and of note for Silver Ave, the plan calls for the following actions:

- Modifying Downtown streets and sidewalks to serve the needs of pedestrians, transit, bicyclists, and cars, with the focus on serving pedestrians first
- Developing, managing, and operating parking as an essential civic infrastructure, and reducing overall parking ratios over time
- Changing downtown to make it more understandable to infrequent users, and providing easy access to other parts of the Historic District

Several action items are outlined to achieve these goals, including providing bicycle racks and other bicycle-friendly facilities throughout Downtown, removal of parking requirements for new development in favor of on-street parking, and adding informational and directional wayfinding signage. In doing so, the plan seeks to "make Downtown a 'pedestrian-first,' 'park-once' place with excellent pedestrian, transit and bicycle facilities."

Downtown Neighborhood Area Traffic Study

The *Downtown Neighborhood Area Traffic Study*, completed in July 2014, encompasses the bicycle boulevards that run along 14th St from Central Ave to Mountain Rd, as well as Mountain Rd itself. Though most of the recommendations from this study have to do with neighborhood streets that are not bicycle boulevards, the study recommends making improvements to the 14th St Bike Blvd crossing at Lomas Blvd, which recently occurred as part of a separate project. One proposal from the study involves reconfiguring the stop signs along 14th St so that bicyclists on the bicycle boulevard would have the right-of-way.

Downtown Walkability Analysis

In the *Downtown Walkability Analysis*, Jeff Speck demonstrates how modest planning and design interventions can positively influence the livability and vitality of Downtown Albuquerque. The document explores Speck's four components of walkability, describing how most people will only make the choice to walk if such a trip is "simultaneously useful, safe, comfortable, and interesting." These criteria are used as the basis for a series of recommendations, including improved signalization, restriping roadways and reallocating space to non-motorists, and the identification of locations where infrastructure investments are likely to have the greatest impact on people's choice to walk.

Based on the principle that providing bicycle infrastructure also improves conditions for pedestrians and that the same factors that encourage walking also encourage bicycling, the *Downtown Walkability Analysis* makes recommendations for bikeway infrastructure improvements. Rather than call for bike lanes on every street, the analysis calls for lanes to be inserted only where right-of-way currently exists and where roadway space can easily be reallocated from general purpose lanes to other uses. Specifically, the analysis calls for bike lanes on the following streets:

- North-south routes:
  - 2nd St
  - 4th St
  - 6th St
- East-west routes:
  - Central Ave
  - Marquette Ave/Tijeras Ave one-way pair
  - Lead Ave/Coal Ave one-way pair

The *Downtown Walkability Analysis* includes an examination of Silver Ave, including recommendations for the removal of traffic signals where Silver Ave meets 3rd, 4th, 5th, 6th, and 8th Streets. Speck asserts that Silver Ave needs minimal restriping to serve its current function as a bicycle boulevard.

Downtown Signals-to-Stop Signs Conversion Evaluation

One of the recommendations from the City's 2014 *Downtown Walkability Analysis* is to replace the traffic signals at several intersections in downtown Albuquerque with stop sign control. The *Downtown Signals-to-Stop Signs Conversion Evaluation*, completed in August 2017, considered 13 Downtown intersections to determine whether traffic signals are warranted, whether multi-way stop control criteria are met, and whether partial stop control might be the appropriate treatment.

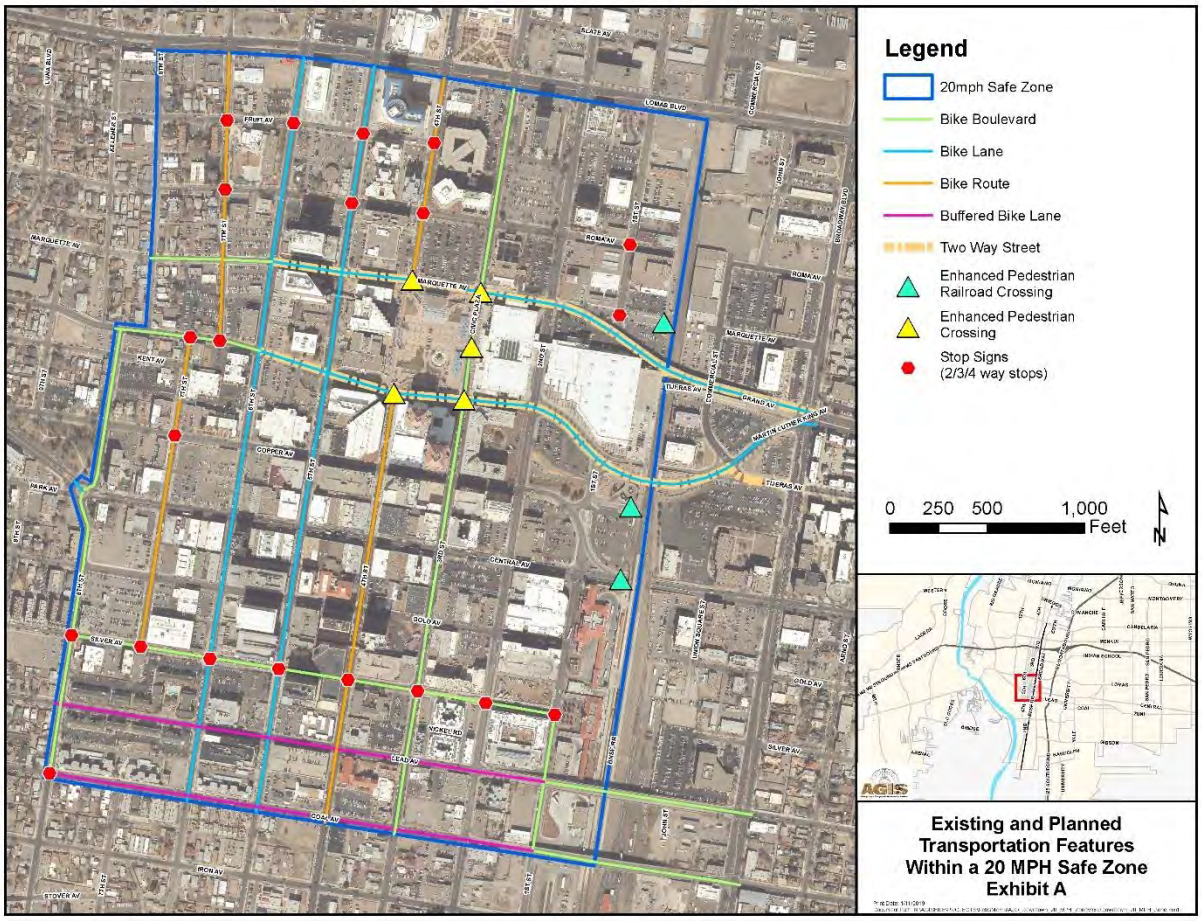
The Silver Ave intersections between 2nd St and 8th St were part of this study, which found that none of the intersections warrant signalization. All-way stop control is recommended at the 2nd St intersection because of increased east-west pedestrian activity to the recently-opened grocery store located along Silver Ave. Stop signs are recommended for placement on the north-south streets only at 4th St, 5th St, and 6th St. The 7th St intersection was not signalized prior to the study, and the study recommends keeping the stop signs on the 7th St (i.e. north-south) approaches only. Finally, the recommendation at 8th St is to place stop signs on the Silver Ave (i.e. east-west) approaches only. Construction was occurring during the study near the Silver Ave/3rd St intersection, so that location was not analyzed. Consequently, it remains signalized today even though it most likely does not meet signal warrants.

A site visit conducted soon after the signals-to-stop signs study was complete revealed that all-way stops were implemented at several of the intersections along Silver Ave, though that was not the recommendation from the study. Implementing the recommendations of the study would enhance the functionality of Silver Ave's use as a bicycle boulevard through Downtown by limiting the times bicyclists would need to come to a complete stop. If there is concern that this spacing of stop signs allows motorists to gain too much speed along Silver Ave, stop signs could be added to the east-west approaches at the Silver Ave/5th St intersection.

Downtown Safe Zone

In March 2019, City Council approved a Downtown Safe Zone that lowers the speed limit within the Downtown core – comprised of the area between Coal Ave, Lomas Blvd (though Lomas Blvd itself is excluded), 8th St, and Broadway Blvd – to 20 MPH on all roads. The Downtown Safe Zone has implications for both signage and stop sign alignment along Silver Ave. Specifically, the Downtown Safe Zone map (see Figure 7) indicates stop signs would be placed on all intersections along Silver Ave from 2nd St through 8th St, though the alignment and configuration are not specified. The map also calls for the inclusion of buffered bike lanes along Lead Ave and Coal Ave through Downtown.

Figure 7: Downtown Safe Zone



Ongoing Studies

Lead Ave/Coal Ave Traffic Study

The City of Albuquerque is evaluating alternative alignments along Lead Ave and Coal Ave between 3rd St and 5th St to determine the impacts of alternative lane configurations. To complement the potential reconfiguration, the City of Albuquerque is considering buffered bike lanes along Lead Ave and Coal Ave from 2nd St to 8th St.

South Broadway Traffic Study

The *South Broadway Traffic Study* is evaluating existing conditions along Broadway Blvd between Coal Ave and Gibson Blvd to determine if opportunities exist to introduce traffic calming measures and add on-street bike lanes along Broadway Blvd to improve north-south bicycle connections into Downtown. Multiple design options have been proposed, each with 6' on-street bike lanes. The study area has been extended to include the segment between Lead Ave and Mountain Rd, including the intersection with Silver Ave.

RECOMMENDED IMPROVEMENTS

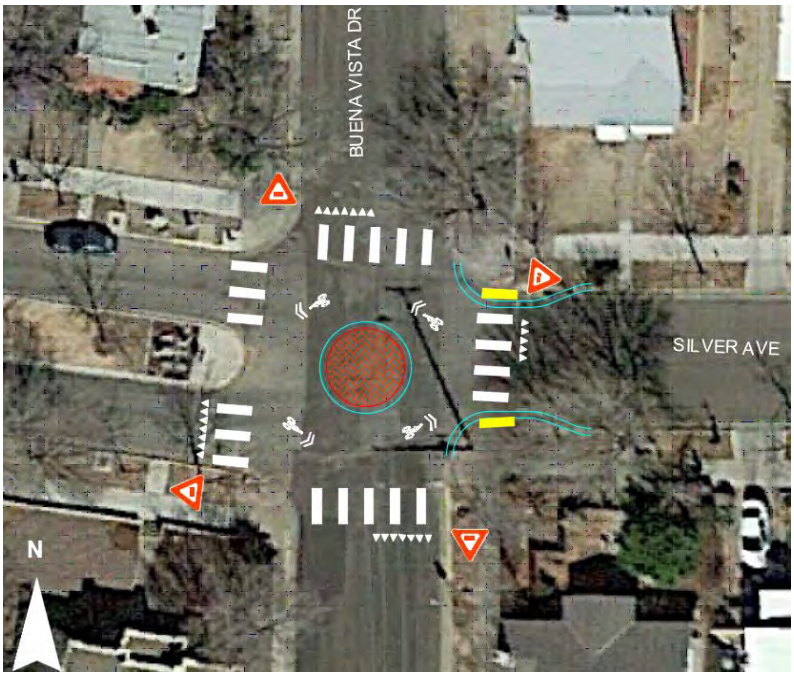
Recommendations for improvements throughout the study area are described in the sections below, starting from the east side of the corridor at Yale Blvd, where the existing "improved" section of the Silver Ave Bike Blvd ends, and ending at the west side of the corridor at the intersection of Mountain Rd and 14th St. The improvements proposed here could be undertaken all at once or in phases.

Yale Blvd to I-25

Silver Ave/Buena Vista Dr Intersection

The Silver Ave/Buena Vista Dr intersection is an important crossroads for two bikeways, but because it is controlled with stop signs on all approaches, bicyclists must legally come to a full stop on every approach, regardless of whether there is another vehicle present. Farther east on the Silver Ave Bike Blvd, former all-way stop intersections at Cornell Dr and Princeton Dr were converted into mini-roundabout intersections, where all four approaches must yield to traffic in the intersection. These types of improvements make the intersection more visible to oncoming motorists and allow bicyclists on the bicycle boulevard to continue through the intersection without coming to a full stop if there are no conflicting vehicles or pedestrians present. This same concept could be implemented at Silver Ave/Buena Vista Dr, as shown in Figure 8. The proposed design also includes enlarged curbs along Silver Ave to encourage traffic calming and channel traffic into the mini-roundabout.

Figure 8: Mini-Roundabout Concept at Silver Ave/Buena Vista Dr



Buena Vista Dr provides bicycle connectivity to the Central New Mexico Community College (CNM) to the south and UNM to the north. Providing additional wayfinding signs on all approaches to the Silver Ave/Buena Vista Dr intersection would benefit bicyclists on both streets. An example of a typical wayfinding sign for a bicycle boulevard is shown in Figure 9.

Buena Vista Dr is currently designated by the City as a bicycle route, and staff from CNM have requested that Buena Vista Dr be converted into a bicycle boulevard. MRCOG indicated that Buena Vista Dr will be shown as a "proposed bicycle boulevard" in the next version of the Long Range Bicycle System map. It should be noted that a roundabout at Buena Vista Dr would be conducive to both north-south and east-west bicycle boulevards.

Figure 9: Example of Wayfinding Sign

Delineate On-Street Parking along Silver Ave

Striped, or delineated, on-street parking has the effect of narrowing the roadway space and reducing travel speeds. Such markings are utilized along the Silver Ave Bike Blvd to the east of Yale Blvd and may offer similar benefits through the study area. In addition to traffic calming, the consistent use of delineated on-street parking further establishes the local streets on which bicycle boulevards have been applied as unique streetscapes. This technique is most appropriate on two-way local streets without raised medians. See Figure 10 for an example of the potential application on delineated on-street parking spaces on Silver Ave to the west of Buena Vista St.

Figure 10: Recommended Signage and Pavement Markings, Silver Ave west of Yale Blvd

Stop Sign Alignment at Silver Ave/Spruce St

The orientation of the stop signs at Spruce St should be revised to require the north-south travel *only* along Spruce St to stop at Silver Ave and to allow for improved flow along Silver Ave.. At present, bicyclists must stop at three consecutive intersections (Cedar St, Spruce St, and Sycamore St). Since through vehicle travel is blocked at Sycamore St and I-25, the potential for high traffic volumes through this intersection is minimal.

Interstate 25 Crossing

Silver Ave is part of the east-west grid system of roadways that was divided with the construction of Interstate 25 (I-25) decades ago. Several options were considered for getting bicyclists on the Silver Ave Bike Blvd from one side of I-25 to the other. A basic assumption of the design options is that more confident and higher speed bicyclists that do not wish to interact with pedestrians and slower speed bicyclists will utilize the on-street bike lanes along Lead Ave and Coal Ave.

Current Travel along Lead Ave and Coal Ave

Currently, a **westbound** bicyclist on the Silver Ave Bike Blvd is notified with a sign that the bicycle boulevard ends at the approach to Mulberry St. A BIKE ROUTE sign and left arrow plaque directs the bicyclist onto southbound Mulberry St, where the bicyclist can then use the westbound on-street bike lane on Lead Ave to cross under I-25. Once a bicyclist on the Lead Ave bike lane crosses the railroad tracks and enters Downtown, a BIKE ROUTE sign and right arrow plaque directs the bicyclist northbound to ride with vehicle traffic on 2nd St, but there is no indication that this is the way to continue on the Silver Ave Bike Blvd.

An **eastbound** bicyclist on the Silver Ave Bike Blvd is shown its last purple BICYCLE BOULEVARD wayfinding sign between 3rd St and 2nd St, indicating the direction and distance to Downtown and the Transit Center. A BIKE ROUTE sign and right arrow plaque directs the bicyclist onto southbound 2nd St, where the bicyclist can ride with vehicle traffic for two blocks and then turn onto eastbound Coal Ave to use the on-street bike lane to cross over the railroad tracks and under I-25. There are no signs on eastbound Coal Ave to direct bicyclists back onto the Silver Ave Bike Blvd east of I-25.

I-25 Crossing Option 1: Use Lead Ave and Coal Ave with Low-Cost Treatments

I-25 Crossing Option 1 would keep the existing routes in place for the bicycle boulevard connection but would provide additional signage to guide bicyclists to the continuation of the bicycle boulevard on either side of the interstate. The routes would comprise the following sets of streets:

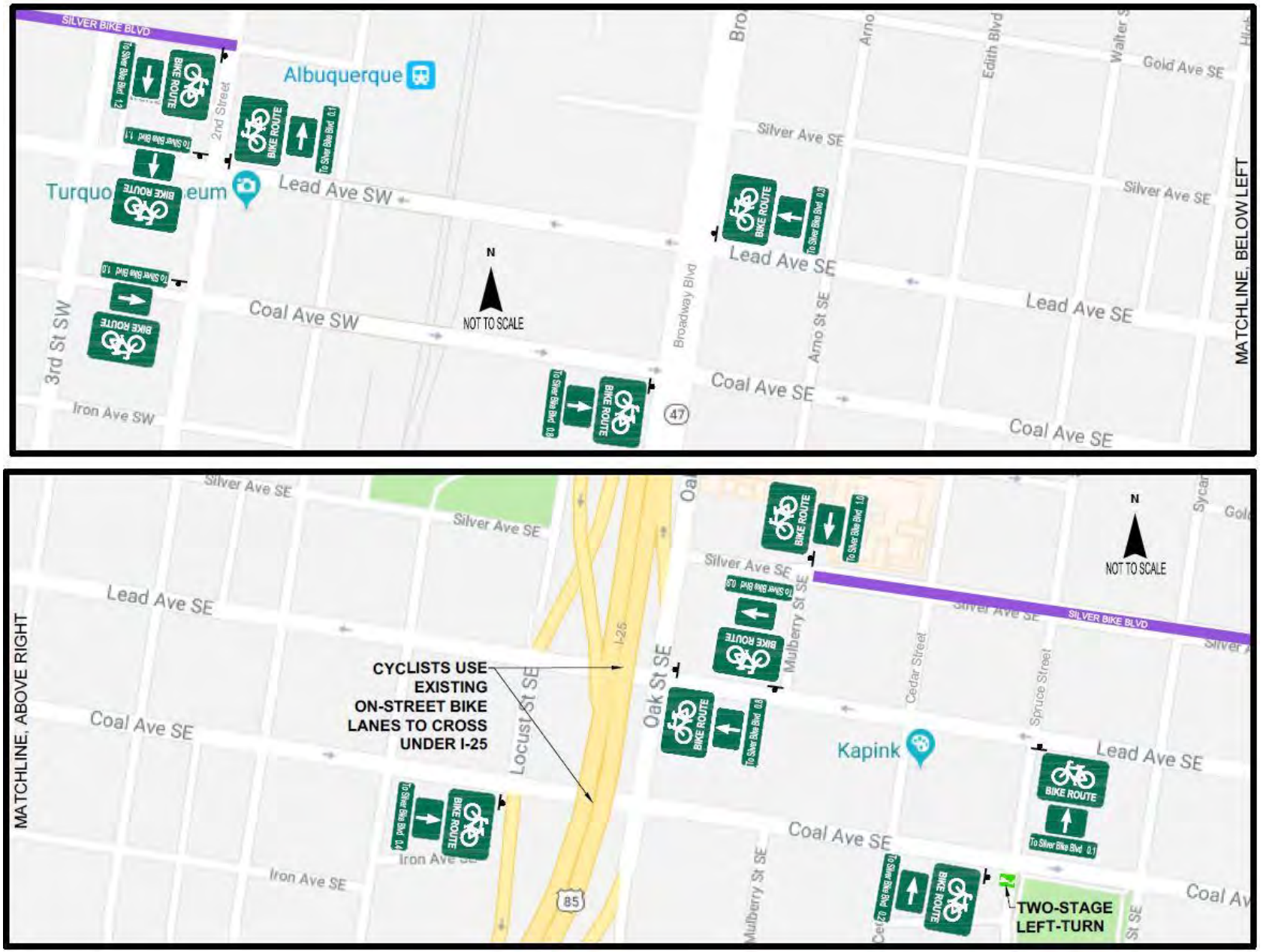
- **Westbound**: Silver Ave - Mulberry St - Lead Ave – 2nd St - Silver Ave
- **Eastbound**: Silver Ave – 2nd St – Coal Ave – Spruce St – Silver Ave

Figure 11 shows a concept of the low-cost treatments that would use the existing Lead Ave and Coal Ave bike lanes under I-25 as on-street connectors between the two disconnected portions of the Silver Ave Bike Blvd. The treatments consist of signage with distances to the continuation of the Silver Ave Bike Blvd and a two-stage left-turn box at the intersection of Coal Ave and Spruce St. The two-stage left-turn box would remove the need for bicyclists on the Coal Ave bike lane on the far-right side of the street to weave across two lanes of eastbound traffic to make the left-turn movement. Bicyclists could stay to the right of traffic, stop and wait in the two-stage left-turn box,

and cross Coal Ave with northbound Spruce St traffic at the signal. However, bicyclists would still have to cross two lanes of free-flowing westbound Lead Ave traffic one block to the north before reaching Silver Ave, as there is no traffic signal at that intersection.

Under Option 1, bicyclists are not actively encouraged to utilize Silver Ave between Broadway Blvd and I-25 in either direction. Additional signage and pavement markings along this stretch of Silver Ave would be unnecessary.

Figure 11: Option 1 for Crossing I-25



I-25 Crossing Option 2: Use Lead Ave and Coal Ave with Connection Along Oak St

This option is similar to I-25 Crossing Option 1 in that bicyclists would use the existing bike lanes on Lead Ave and Coal Ave to cross under I-25. However, rather than using Mulberry St and Spruce St as the connections to Silver Ave, this option would make improvements through a multi-use path along Oak St as the north-south connection. Bicyclists would not be actively encouraged to utilize Silver Ave between Broadway Blvd and I-25.

Rather than turning southbound onto Mulberry St as in Option 1, a **westbound** bicyclist on Silver Ave would ride all the way to Oak St and then access a multi-use path along the east side of Oak St. The path would carry riders south to the northeast corner of the Lead Ave/Oak St intersection. One hospital driveway and one gated alley driveway (both low volume) would be crossed by the path. Upon reaching Lead Ave, bicyclists would use the westbound on-street bike lane to cross under I-25. The same signage shown in Option 1 farther west would be used to indicate to bicyclists how to get back onto the Silver Ave Bike Blvd in Downtown.

This option could be enhanced through a multi-use path along the south side of Silver Ave to the east of Oak St. This second path would remove the conflict between northbound drivers turning right from Oak St onto Silver Ave and bicyclists accessing or departing the path at that intersection. After crossing under I-25, an **eastbound** bicyclist would take refuge at sidewalk level at the southeast corner of the Coal Ave/Oak St intersection. The bicyclist would cross Coal Ave at the signal with the northbound Oak St traffic, and then use a new multi-use path to ride northbound along the east side of Oak St to Lead Ave. There are no driveways to cross in this segment of Oak St. The bicyclist would cross the Lead Ave/Oak St intersection at the signal with northbound Oak St traffic and would use the multi-use path along the east side of Oak St to reach Silver Ave.

In addition to the bike route signage, treatments are recommended at the Oak St intersections with Lead Ave and Coal Ave. The treatments involve signage indicating a right-turning vehicle might conflict with a through-moving bicyclist in a path to the vehicle's right. Figure 12 shows a sign (a variation on standard sign R10-15, TURNING VEHICLES YIELD TO [Peds]) that should be considered. The multi-use path crossing should be also delineated with pavement markings. Figure 13 shows a concept drawing of this option.

Figure 12: Sign to Supplement Right Turn across Bicycle Path

Though Option 2 replaces sidewalk space with multi-use paths along Oak St, there are not likely to be conflicts among bicyclists and pedestrians. The typical bicyclists using the path would be individuals who prefer traveling at slower speeds along Silver Ave instead of Lead Ave and Coal Ave, or bicyclists who intend to access destinations near Central Ave, including Presbyterian Hospital.

Figure 13: Option 2 for Crossing I-25

I-25 Crossing Option 3: Multi-use Paths along Lead Ave and Oak St

As a way of keeping bicyclists off busy streets, I-25 Crossing Option 3 would create multi-use paths at sidewalk-level along the east side of Oak St from Silver Ave to Lead Ave, along the north side of Lead Ave underneath I-25, and as an extension of Locust St north of Lead Ave. The paths would replace the existing sidewalk sections, and pedestrians and bicyclists would share the paths along Lead Ave and Oak St. A street view depiction of this concept is shown in Figure 14 and an aerial view of this concept is shown in Figure 17. Modifications under the I-25 bridge along Lead Ave would require coordination with NMDOT, while utility relocation may be required along Oak St. Existing sidewalks that would be converted into multi-use paths can be seen in Figure 15 and Figure 16. A concreate surface is preferred under the interstate, while asphalt may be used for other segments of the path.

For **westbound** bicyclists, bicyclists would continue on the Silver Ave Bike Blvd past Mulberry St. Between Mulberry St and Oak St, bicyclists would be directed onto a multi-use path along the south side of Silver Ave, which would curve to the south and follow Oak St along its east side. Bicyclists would then take refuge at the northeast corner of Lead Ave and Oak St and cross Oak St with westbound traffic on Lead Ave. Rather than using the on-street bike lane, bicyclists would continue on another multi-use path at sidewalk-level along the north side of Lead Ave under I-25 before crossing the southbound I-25 off-ramp at the signal with westbound Lead Ave traffic.

Figure 14: Concept Street View of I-25 Crossing Option 3 - Multi-use Path under I-25

At this point the options would vary depending on whether the Silver Ave Bike Blvd has been designated and improved between I-25 and Broadway Blvd (discussed in later sections). If improvements have not been made, bicyclists would continue westbound on Lead Ave in the on-street bike lane. However, if improvements have been made, at the northwest corner of the Lead Ave/I-25 southbound ramps intersection, bicyclists would use a new multi-use path to travel northbound to Locust St. One block further north, Locust St intersects Silver Ave and the bicyclist would be back on the westbound Silver Ave Bike Blvd.

I-25 Crossing Option 3 only benefits **eastbound** bicyclists on the Silver Ave Bike Blvd if the bicycle boulevard is designated and improved between I-25 and Broadway Blvd because eastbound bicyclists will need to be at the northwest corner of the Lead Ave/southbound I-25 off-ramps intersection to use the new multi-use path under I-25. If Silver Ave is improved as a bicycle boulevard west of the interstate, eastbound bicyclists would turn south on Locust St and then use the multi-use path to reach the northwest corner of Lead Ave/southbound I-25 off-ramps. Bicyclists would cross the southbound I-25 ramp traffic concurrent with the westbound Lead Ave traffic. Though a crosswalk and signal exist for eastbound pedestrians, a bicycle signal could be added at the northeast corner of this intersection as there is no eastbound motor vehicle traffic on Lead Ave. The bicyclist would cross under I-25 on the Lead Ave multi-use path to reach the northwest corner of Lead Ave and Oak St and would cross Oak St concurrent with the westbound Lead Ave traffic – a bicycle signal would also be needed for this movement – and then turn north on the multi-use path along Oak St before reaching Silver Ave one block to the north.

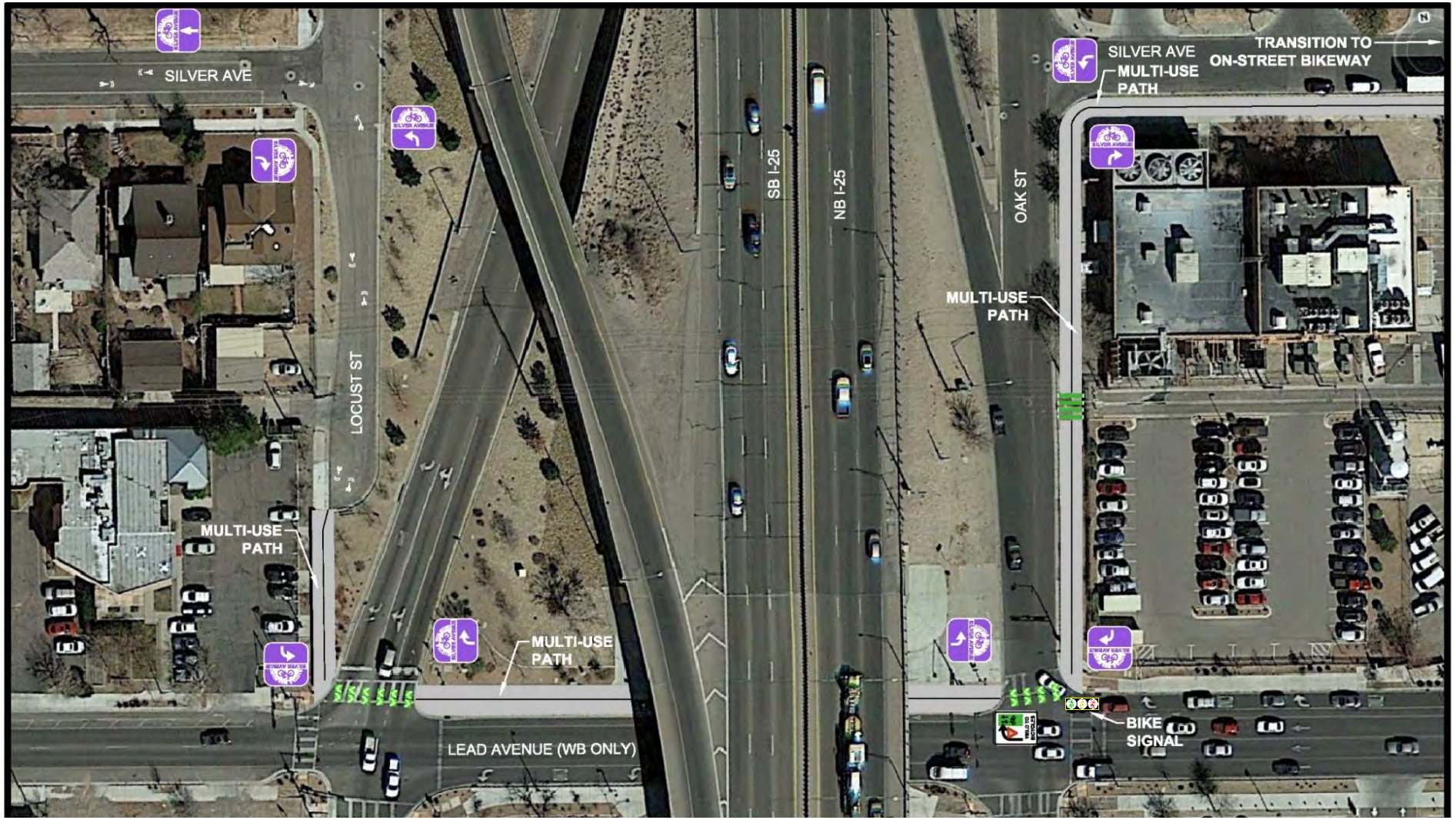
Along with the bicycle signal heads for the eastbound bicycle movements at Lead Ave/I-25 southbound ramps and Lead Ave/Oak St, additional directional signs and pavement markings would be recommended, as shown in Figure 17. These treatments to address motorist awareness are critical; though Option 3 utilizes existing pedestrian crossings, two-way bicycle travel would be introduced in a place where such travel patterns do not currently exist. A more detailed visualization of the northwest corner of the intersection of Lead Ave and Locust St, including a variety of safety countermeasures, can be found in Appendix B.

Another potential concern is that sharing space along the multi-use paths may create conflicts among pedestrians and bicyclists, including among bicyclists traveling at different speeds. The experience of other bicycle boulevards in Albuquerque indicates that confident and high-speed bicyclists will avoid Silver Ave altogether. The multi-use path would be of similar width to popular trails in the Albuquerque area, including the Paseo del Bosque Trail, which provides ample space for navigating conflicts. The short lengths of the path segments also ensure that bicyclist speeds remain low.

Figure 15: Existing Sidewalk along Oak St

Figure 16: Existing Locust St and Lead Ave Connection

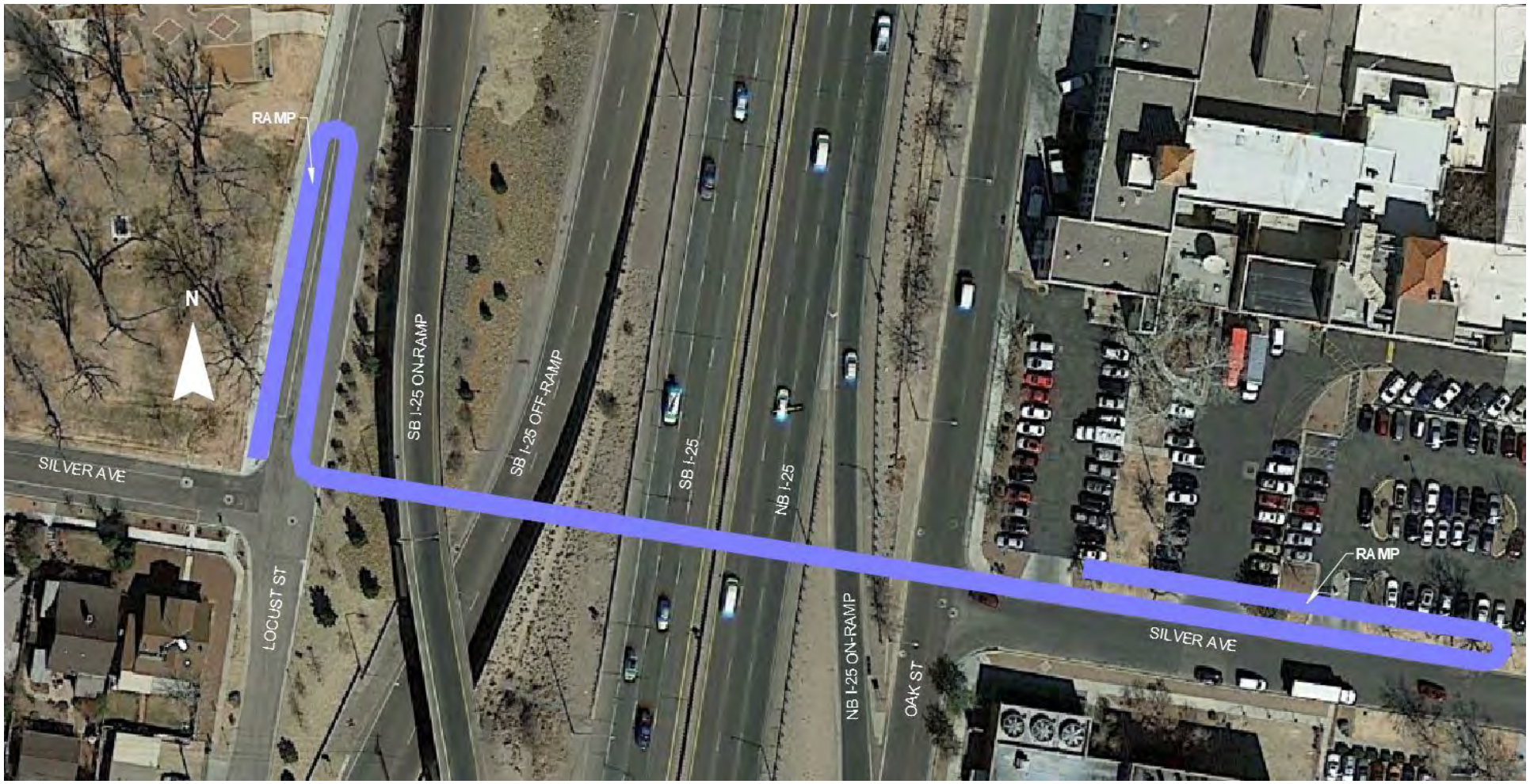
Figure 17: Concept Plan View of I-25 Crossing Option 3 - Multi-use Path Connection under I-25



I-25 Crossing Option 4: Pedestrian-Bicyclist Overpass across I-25

The most direct route for bicyclists would be to ride over I-25 on a new pedestrian-bicyclist bridge following the Silver Ave alignment between the area south Presbyterian Hospital and Highland Park. A bridge with a similar function was constructed for the Bear Canyon Arroyo trail crossing over I-25 between Jefferson St and Osuna Rd in 2012. Such a bridge would be expensive – the Bear Canyon Arroyo overpass cost about $4 million while the Gail Ryba pedestrian-bicyclist bridge over the Rio Grande cost approximately $5 million – and would take several years to implement (or longer if federal funding is utilized). Additionally, the elevations on Silver Ave are substantially higher on the east side of I-25 than on the west, and to make the ramps accessible they would need to be several hundred feet long on each side. Figure 18 shows a concept drawing of the bridge and ramps for I-25 Crossing Option 4. Right-of-way acquisition would likely be required for this option, and design options may have negative impacts to Highland Park.

Figure 18: Concept Plan View of I-25 Crossing Option 4 - Pedestrian-Bicyclist Overpass across I-25



Evaluation of I-25 Crossing Options

The evaluation matrix below depicts the extent to which each option meets the purpose and need of the Silver Ave Bike Blvd Review, as identified in the Introduction.

Figure 19: I-25 Crossing Options Evaluation Matrix

Criteria	Option 1	Option 2	Option 3	Option 4
1. User Comfort Level				
2. Connectivity to Silver Ave				
3. Safety (based on conflict points)				
4. Cost				
5. Feasibility				

Favorable / High Benefit

Neutral / Moderate Benefit

Unfavorable / Negative Impact

User Comfort Level refers to the appeal of the option for less confident bicyclists. Options 1 and 2, which rely heavily on existing on-street bike lanes along Lead Ave and Coal Ave to cross I-25, do not have much potential to attract additional users. However, these options provide additional motorist awareness that may provide some benefits to existing users. Options 3 and 4 are noteworthy in that they provide off-street or grade-separated facilities that are likely to appeal to bicyclists who prefer to travel on less busy streets.

Connectivity to Silver Ave refers to the directness of the option and the ability for users to easily access Silver Ave both east and west of I-25. Options 1 and 2 require extensive use of Lead Ave and Coal Ave and require bicyclists to cross major streets repeatedly to access the bicycle boulevard. Opportunities for eastbound bicyclists to access Silver Ave east of Broadway Blvd are particularly limited. Option 2 provides easier access between Lead Ave and Coal Ave to Silver Ave to the east of I-25 than Option 1. Options 3 and 4 provide direct access to Silver Ave with minimal travel out of direction.

Safety is based on the number of intersections and conflict points that need to be navigated by users. Options 1 and 2 are both rated particularly low because of the need to cross Lead Ave and Coal Ave repeatedly to access Silver Ave. Option 3 requires crossings at the I-25 off and on-ramps, two intersections with high levels of traffic volume and turning movements. The features associated with Option 3 would provide improvements for existing pedestrians and bicyclists at the intersection. The bridge featured in Option 4 would allow users to avoid any conflict points.

Costs reflect the magnitude of financial investment required to implement each option. Option 1 is the lowest cost since it requires no new infrastructure. Options 2 and 3 require modest investments through the construction of multi-use paths where existing sidewalks are located. Option 4 would require a substantial cost that is orders of magnitude greater than the other options.

Feasibility refers to the ease of implementation of each option. The most feasible of the alternatives is Option 1, which requires the installation of additional signage only. Options 2 and 3 require the use of existing right-of-way and sidewalk and landscaping space to install multi-use paths and are thus highly feasible from a technical standpoint. Additional features required for Options 2 and 3 include signage, pavement markings, and signal crossing equipment. Option 4

would require a lengthy environmental review process and right-of-way acquisition. The option also presents design challenges; to ensure ADA-compliant slopes would require long bridge approaches and spiral or switchback ramps.

I-25 Crossing Recommendation: Option 3 (Multi-Use Paths)

Based on the overall feasibility and modest cost, as well as the high level of connectivity to Silver Ave, this study recommends Option 3 for implementation. Under this option, user comfort would be improved significantly beyond existing conditions, though this option alone does not address all safety concerns along Silver Ave. The multi-use path is complementary to the existing bikeway along Lead Ave and accommodates a different set of users. Additional signing, pavement markings, and curb extensions would also benefit existing bicyclists along Lead Ave. Further coordination with NMDOT is required on use of NMDOT right-of-way for the multi-use path and installation of bike traffic signals, among other considerations.

Lead Ave/Oak St Intersection

The sections above discussing the I-25 crossing options mention a series of recommended treatments at the Lead Ave/Oak St intersection, Additional improvements at this intersection could involve the following depending on the option selected.

Westbound Right-Turning Traffic on Lead Ave onto Oak St

Bike Lane Signage and Markings

The westbound vehicle right-turn movement from Lead Ave onto northbound Oak St, which is also the I-25 northbound frontage road, is relatively high volume and high speed. Prior to reaching the Oak St intersection, vehicles cross the westbound bike lane at Mulberry St. This area of conflict could be made more conspicuous with the BEGIN RIGHT TURN LANE YIELD TO BIKES sign (see Figure 20) to indicate where westbound traffic on Lead Ave making a right turn onto northbound Oak St crosses the westbound on-street bike lane. Additionally, the area of conflict could be marked with green pavement markings such as those shown in Figure 21. The City should use its standard option used at similar locations around the city.

Figure 20: Sign for Right-Turn Across Bike Lane

Intersection Signage and Pavement Markings

Once drivers reach the Lead Ave/Oak St intersection itself, westbound drivers turning right will have already crossed the westbound bike lane and may think that they have no additional conflicts on their right, given the relatively low volume of pedestrians using the crosswalk across the north portion of the intersection. To address this concern, some variation of the R10-15 sign (TURNING VEHICLES YIELD TO [Pedestrians or Bicycles]) and refreshed crosswalk pavement markings should be added. Green pavement marking should be used if either I-25 Crossing Options 2 or 3 is selected, which put bicycle traffic from the multi-use path across the north portion of the intersection.

Figure 21: Typical Pavement Marking for Bike Lane through Right-Turn Vehicle Lane (source: NACTO)

Intersection Corner Improvements

For I-25 Crossing Options 2 and 3, which involve multi-use paths at sidewalk level, the Lead Ave/Oak St intersection corners should be reconstructed to provide additional space for bicyclists and pedestrians to wait for the green signal. Curb ramps should also be widened to match the width of the path at the intersection corners. A bicycle signal could also be added at the northeast corner of the intersection for eastbound bicycle traffic, as there is no eastbound vehicle traffic on Lead Ave. Alternatively, bicyclists could use the existing pedestrian signal and cross with the "Walking Person" indication.

Lead Ave/I-25 Southbound Off-Ramps Intersection

Additional treatments at the Lead Ave/I-25 southbound ramps intersection would be part of I-25 Crossing Option 3, in which both westbound and eastbound bicyclists cross the north portion of the Lead Ave/I-25 southbound ramps intersection. Like the improvements at Lead Ave/Oak St, the northeast and northwest corners of this intersection would need to be extended and the curb ramps widened to accommodate the wider two-way path. Additionally, a bicycle signal (see Figure 22) could be added at the northeast corner of the intersection for eastbound bicycle traffic, as there is no eastbound vehicle traffic on Lead Ave. Alternatively, bicyclists could use the existing pedestrian signal and cross with the "Walking Person" indication.

Figure 22: Bicycle Traffic Signal

The new multi-use path along the extension of Locust St would need to intersect Locust St with a ramp for bicyclists. Pedestrians that use the existing sidewalk along the west side of Locust St could also use this path to reach Lead Ave.

Note: NMDOT is seeking clarification on whether an access review is required for improvements to Locust St. Access would be improved through a widened path to the intersection along the existing sidewalk and the installation of a curb ramp.

I-25 to Broadway Blvd

The stretch of Silver Ave from Locust St (I-25) to Broadway Blvd should be improved as a bicycle boulevard. Minimal changes are required to this area, with primary improvements consisting of signage and pavement markings. No revisions to the existing stop sign alignment are required. On-street parking is already delineated, though individual spaces could be striped to clarify the purpose of the pavement markings.

Figure 23: Silver Ave through Huning Highland, West of I-25

Railroad Crossing Options

As with I-25, the presence of the railroad on the east edge of Downtown presents an obstacle for continuous travel along the Silver Ave Bike Blvd. Silver Ave currently terminates at Broadway Blvd and 1st St, though bicyclists may cross the railroad tracks using the on-street bike lanes on Lead Ave (westbound) and Coal Ave (eastbound). Potential improvements over the railroad tracks are also shaped by the fact that at present there are no signage or pavement markings along Silver Ave between Broadway Blvd and I-25 (the designated bicycle boulevard resumes at Mulberry St to the east of I-25), though the area has been identified as a bicycle boulevard in the Long Range Bikeway System. The options below would enhance access to the portion of Silver Ave to the east of Broadway Blvd.

Railroad Crossing Option 1: Barrier-Separated Bike Lanes on Lead Ave and Coal Ave Bridges

The existing on-street bike lane on Lead Ave over the railroad tracks is separated with striping only; a pedestrian walking area is separated from both vehicle traffic and the existing bike lane on the north side of the bridge with a concrete wall barrier. Railroad Crossing Option 1 would continue to route **westbound** bicyclists over the Lead Ave bridge, but would provide a one-way barrier-separated bike lane using a raised curb and flex posts (see Figure 24 for one example of this type of barrier). Once westbound bicyclists cross the railroad tracks and reach the 2nd St intersection, they would be directed one block to the north to continue on the Silver Ave Bike Blvd.

Figure 24: Curb and Flex Post Barrier

Under Railroad Crossing Option 1, **eastbound** bicyclists on the Silver Ave Bike Blvd would be directed to the existing bike lane over the railroad tracks on Coal Ave. Wayfinding signs and pavement markings would direct bicyclists from Silver Ave to the signalized intersection of Coal Ave and 3rd St. At this location a two-stage left-turn box could be used to assist bicyclists making the left-turn from 3rd St onto eastbound Coal Ave. Once the eastbound bicyclists cross the railroad tracks, they can either continue on Coal Ave or turn north to access Silver Ave on Broadway Blvd or Arno St. Because bicyclists will be on the far right side of the eastbound driving lanes, a two-stage left-turn box is also recommended, along with signs indicating access to the bicycle boulevard to the north. Figure 25: Railroad Crossing Option 1 depicts Option 1 for crossing the railroad tracks and accessing Silver Ave east of Downtown.

Note: The City of Albuquerque is currently undergoing a study of the Broadway Blvd cross section in this area, which may result in a recommendation for on-street bike facilities on Broadway Blvd. This would provide an important connection for eastbound bicyclists wishing to continue on the Silver Ave Bike Blvd. Further improvements would also be required at the Lead Ave/Broadway Blvd intersection and are described later in this document.

Figure 25: Railroad Crossing Option 1

Railroad Crossing Option 2: Two-Way Cycle Track on Lead Ave Bridge with Improved Connections at 2nd St and Broadway Blvd

Two-Way Cycle Track

Under Railroad Crossing Option 2, both westbound and eastbound bicyclists would cross on the Lead Ave bridge utilizing a **two-way cycle track**. Specifically, the existing concrete barrier on the Lead Ave bridge would be removed and reconfigured to create the cycle track on the north side of the street; driving lanes would be separated from bicyclists using a raised curb and flex posts (see Figure 26) or a similar vertical barrier. This option would provide a direct connection for eastbound bicyclists as it would not require them to cross both Lead Ave and Coal Ave on 2nd St to access the bike lanes on the south side of Coal Ave to cross the railroad tracks. See Figure 28 for a concept drawing of Option 2. The cycle track would replace the existing bike lane along Lead Ave, though the sidewalk would be retained. See the section on **Broadway Blvd/Lead Ave Connection to Silver Ave** for additional details on improvements east of the railroad tracks.

Figure 26: Example of Two-way Cycle Track

Source: https://bikefriendlyoc.org/2011/03/24/updates-from-day-3-at-velo-city-conference-in-seville-spain/

Improvements to Lead Ave/2nd St Intersection

The existing outside vehicle lane at the westbound Lead Ave/2nd St approach flares out slightly, implying a right-turn lane. For options 1 and 2, the new delineated bike lane curb should narrow that vehicle lane to indicate that the outside lane is a shared through/right-turn lane. To warn motorists turning right onto northbound 2nd St that a cyclist may also be turning right into a shared lane, the cyclist path could be marked on the pavement as is shown in Figure 25. The R10-15 variation (Right Turn) YIELD TO BICYCLES sign could also be posted. Because Lead Ave becomes a two-way street just west of 2nd St, a complementary (Left Turn) YIELD TO BICYCLES sign could be posted for eastbound traffic making a left turn.

2nd Street: Lead Ave to Silver Ave

The short block between Silver Ave and Lead Ave provides an important connection between the Downtown Silver Ave Bike Blvd and the proposed cycle track along Lead Ave over the railroad

tracks. At present, 2nd St features sharrows and basic signing. However, improvements are appropriate to improve the comfort level for users of the bicycle boulevard.

In the southbound direction, the dedicated right-turn lane would be replaced with a 5' bike lane. Additional on-street parking spaces would be added along 2nd St (there are five existing spaces), while travel lanes could be narrowed to help manage speed along the roadway segment. A bike turn box and additional pavement markings at the intersection should be introduced to guide bicyclists to the cycle track and to alert motorists of the potential bicycle turning movements. Figure 27 depicts the proposed improvements.

Additional traffic analysis may be required to ensure that the loss of a right turn lane from 2nd St to Lead Ave westbound would not have significant impacts on traffic flows, including back-ups into the Silver Ave intersection. See Appendix C Appendix C: Evaluation of Traffic Operations at Lead Ave/Broadway Blvd and Lead Ave/2nd Sfor analysis related to traffic operations at the intersection of Lead Ave and 2nd St.

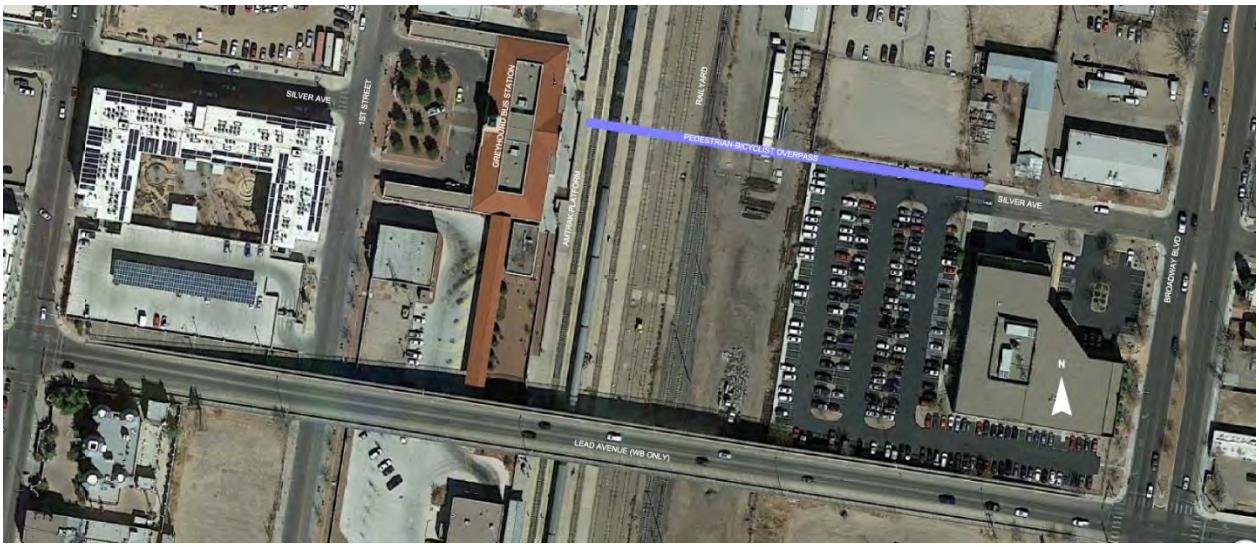
Figure 27: 2nd St Connection: Lead Ave to Silver Ave

Figure 28: Railroad Crossing, Option 2

Railroad Crossing Option 3: Pedestrian-Bicyclist Overpass across the Railroad

The most direct route for bicyclists would be to ride over the railroad tracks on a new pedestrian-bicyclist overpass following the Silver Ave alignment. The overpass would need to span the 300-foot wide railyard and the gated parking lot (another 200 feet) to the east and would need to negotiate the existing transit facilities to provide for connections to Silver Ave. Similar to an overpass over I-25, such a bridge would cost several million dollars and would take several years to implement. (An at-grade crossing was considered for this project but was determined to not be feasible at this time.) Figure 29 shows a concept drawing of an overpass across the railroad tracks.

Figure 29: Railroad Crossing Option 3 – Pedestrian-Bicyclist Overpass



Railroad Crossing Recommendation: Option 2

This study recommends the two-way cycle track over as the preferred option the railroad tracks. The option provides the most direct connection along the Silver Ave Bike Blvd between Downtown Albuquerque and the Huning Highland neighborhood and provides the greatest the benefit for eastbound bicyclists since it eliminates the need to cross Lead Ave and Coal Ave multiple times to utilize the Silver Ave Bike Blvd. The option would also integrate easily with proposed bikeway improvements on Broadway Blvd and Lead Ave through Downtown.

Broadway Blvd/Lead Ave Connection to Silver Ave

Assuming the Silver Ave Bike Blvd between Broadway Blvd and I-25 is designated and improved, additional treatments should be introduced to facilitate access to the bicycle boulevard to the east of the railroad tracks.

If Railroad Crossing Option 2 is pursued, a connection is required to and from the Lead Ave/Broadway Blvd intersection where bicyclists can be routed via Lead Ave and Arno St (Option A) or via Broadway Blvd to Silver Ave (Option B). These options are described below. Note that the stretch of Broadway Blvd from Lead Ave to Silver Ave is being evaluated as part of a separate study. The options discussed here may need to be revisited upon completion of the South Broadway Traffic Study.

Option A – Route Bicyclists on Lead Ave and Arno St

Westbound bicyclists on Silver Ave approaching the railroad tracks would turn left to ride southbound on Arno St, where, once reaching Lead Ave, they would enter a two-way barrier-separated cycle track (an extension of the two-way cycle track in Railroad Crossing Option 2). Two low-volume driveways would be crossed by this cycle track (see Figure 30). When bicyclists get to Broadway Blvd, they would cross at the signal with the westbound Lead Ave traffic and proceed over the railroad tracks. The westbound approach of Lead Ave at Broadway Blvd currently has two through lanes and an exclusive right-turn lane. This approach should be reconfigured so that right-turning vehicles share the outside lane with through vehicles.

Eastbound bicyclists on the Lead Ave cycle track over the railroad tracks would stop at the Broadway Blvd approach and cross with the signal concurrent to the westbound Lead Ave traffic. A bicycle signal would be needed for this movement as there is no eastbound motor vehicle traffic at this intersection. Additionally, pavement markings and signage should be used to alert vehicles that two-way bicycle traffic crosses the north portion of the intersection. Bicyclists would proceed eastward on the cycle track against the flow of motor vehicle traffic for one block. Once reaching Arno St, they would turn left and ride one block to the north on Arno St until reaching the Silver Ave Bike Blvd.

Option B – Route Bicyclists to Silver Ave on Broadway Blvd

Westbound bicyclists on Silver Ave would use the same route as in Option 1, turning left to ride southbound on Arno St and then turning right onto Lead Ave. Under this option, the cycle track on Lead Ave between Arno St and Broadway Blvd would be one-way barrier-separated. Bicyclists would reach Broadway Blvd and would cross with the westbound vehicle through movement on Lead Ave. See Figure 31 for additional information.

Eastbound bicyclists would use the traffic signal at Broadway Blvd (a bicycle signal would be needed) and cross with the concurrent westbound motor vehicle traffic on Lead Ave before turning left to ride in a bike lane on Broadway Blvd for one block. At Silver Ave, bicyclists would turn right to continue on the bicycle boulevard.

Notes about Lead Ave and Broadway Blvd Intersection

The City of Albuquerque is considering eliminating the dedicated left turn lane for vehicles traveling westbound on Lead Ave and turning southbound onto Broadway Blvd. Drivers wishing to turn left could still make the movement from the outside lane, which currently serves through-moving traffic only. The proposed change is in response to safety concerns after multiple incidents in which vehicles making the turning movement collided with street lights or, in one case, the adjacent building.

At the time of this study's completion, a number of scenarios for the intersection are being considered, including design options that could affect the pavement space available for the recommendations proposed for the Silver Ave Bike Blvd. As this study also recommends the elimination of the dedicated right turn lane from Lead Ave onto Broadway Blvd northbound, coordination will be required to ensure the objectives of the various studies - as well as impacts to traffic operations - are considered.

See Appendix C Appendix C: Evaluation of Traffic Operations at Lead Ave/Broadway Blvd and Lead Ave/2nd Sfor analysis related to traffic operations at the intersection of Lead Ave and Broadway Blvd.

Figure 30: Option A for Lead Ave-to-Silver Ave Connection at Broadway Blvd

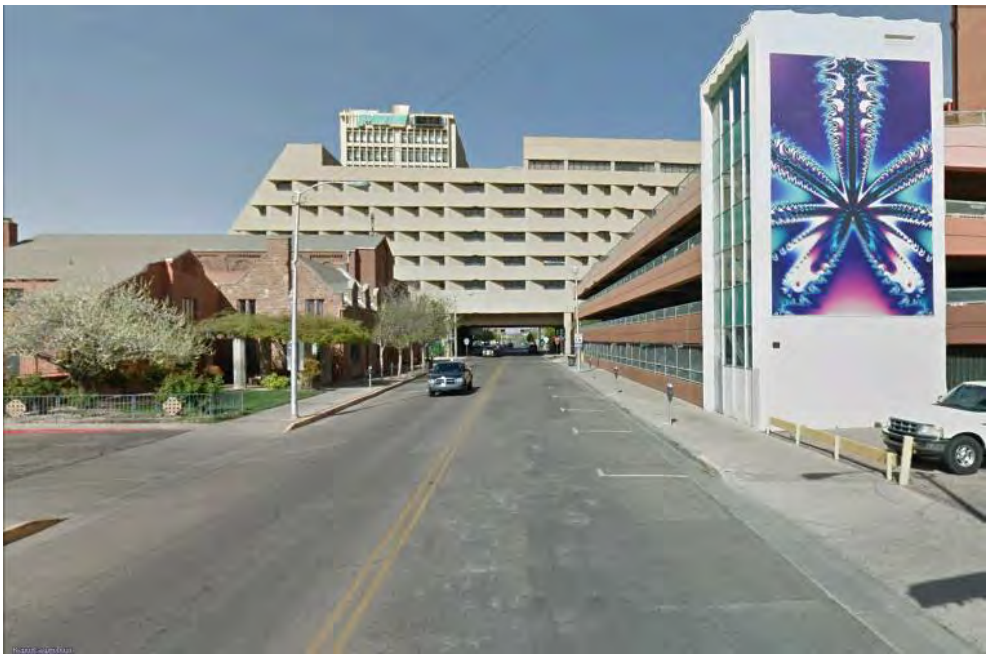
Figure 31: Option B for Lead Ave-to-Silver Ave Connection at Broadway Blvd

Downtown Silver Ave

The proposed bikeway improvements along Lead Ave and Coal Ave and the designation of a Downtown Safe Zone could enhance the attractiveness of alternative routes for bicycling through Downtown and reduce the need or benefits related to a bicycle boulevard through Downtown. However, this study recommends that the Silver Ave Bike Blvd through Downtown be retained and improved for several reasons. The benefits include an additional east-west route option and general increase in awareness of bicyclists. The Silver Ave Bike Blvd through Downtown is also critical for connectivity of the overall bicycle boulevard system.

The relatively high numbers of total crashes along Silver Ave reflect that the Silver Ave would benefit from further traffic calming measures and efforts to raise awareness among motorists of the presence of high numbers of bicyclists and pedestrians. Additional signage, pavement markings, and traffic calming measures could reduce motor vehicle speeds and improve safety for all users (at present there are limited pavement markings and signage applied between 2nd St and 8th St.).

Figure 32: Downtown Silver Ave, Existing Conditions



In addition to basic bicycle boulevard techniques of signage and pavement markings, recommendations for revised stop sign alignment and on-street parking are discussed below.

Stop Sign Alignment

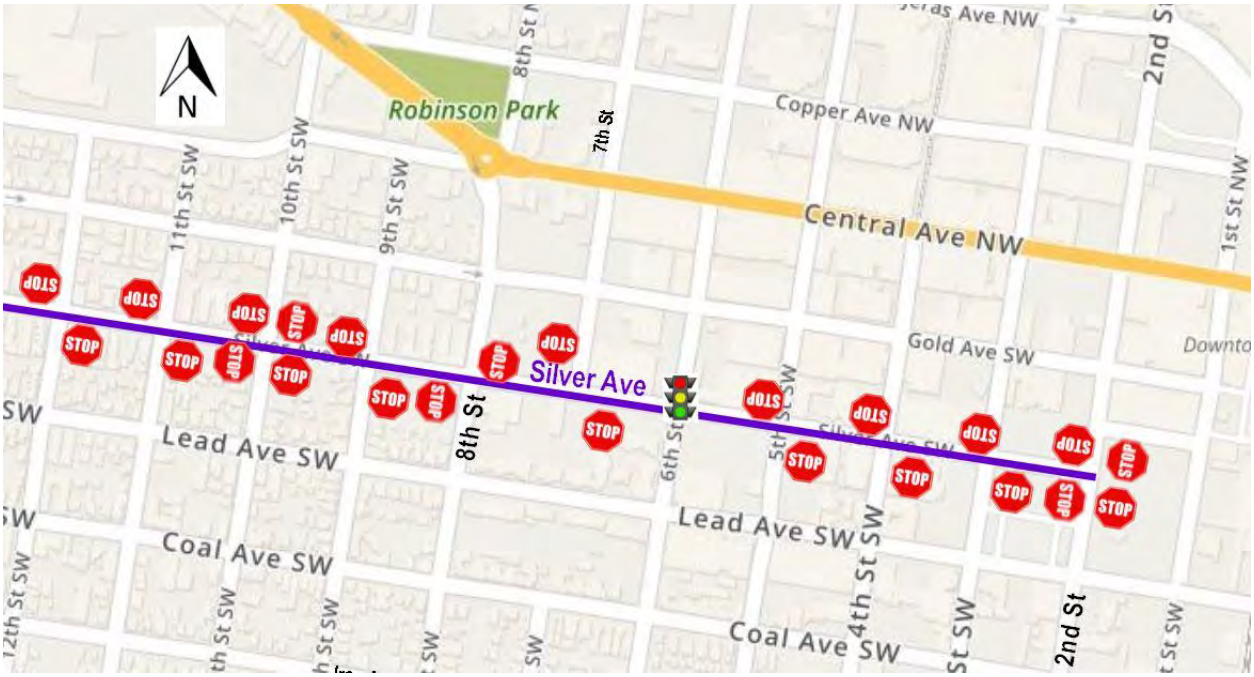
As discussed in the Existing Conditions section, changes have been proposed to the stop sign alignment along Silver Ave through Downtown in a number of studies; however, those proposed changes are sometimes in conflict. The recommendations proposed here are generally consistent with the Downtown Signals-to-Stop Signs Conversion Evaluation completed in 2016. One noteworthy change is that, due to a request from the ADA community, the traffic lights on 6th St and Silver Ave have been reinstalled. The proposed traffic control is shown in Figure 33 and consists of the following:

- All-way stop at Silver Ave/2nd St

- Traffic signal at Silver Ave/6th St
- Stop control on Silver Ave only at 8th St
- Stop control on the numbered streets only at Silver Ave and 3rd St, 4th St, 5th St, 7th St, 9th St, and 10th St

With this arrangement, bicyclists would only have to stop along Silver at 2nd St, 6th St, and 8th St, resulting in a free-flow distance of 0.15-0.3 miles at a time (the recommended range of stops for a bicycle boulevard is 0.25 to 0.5 miles). A four-way stop *could* be installed at 4th St if there are concerns that stop spacing would lead to higher speeds between 2nd St and 6th St.

Figure 33: Proposed Stop Sign Aligning, Downtown Silver Ave



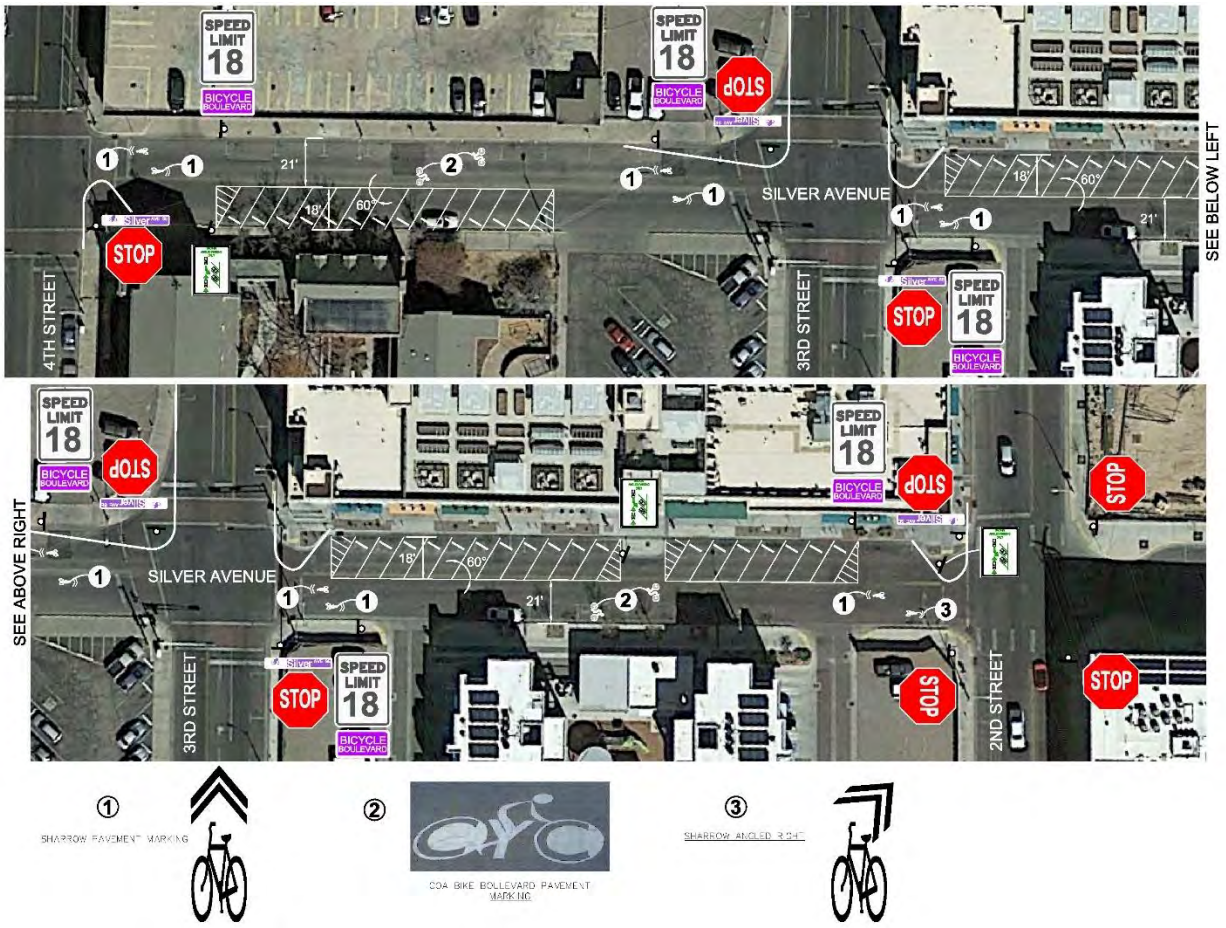
On-Street Parking

Back-in angle parking is the preferred parking method – where space allows – in the recently updated City of Albuquerque *Development Process Manual*. Back-in angle parking offers safety benefits for bicyclists and motorists through improved visibility and can increase the total number of available parking spaces, depending on the width of the street.

Silver Ave between 2nd St and 4th St is an appropriate location for on-street parking as the approximately 40' curb-to-curb cross-section provides ample space for back-in angle design (spaces require 18' perpendicular to the curb using a 60°). Figure 34 depicts the installation of back-in angle parking on Silver Ave, along with enhanced signage and pavement markings.

Note that the on-street parking depicted in Figure 34 is provided on alternating sides of Silver Ave to allow drivers moving in both directions an opportunity to park. The actual placement of on-street parking on the north or south side of the street should be determined during final design.

Figure 34: Recommended Improvements for Silver Ave from 2nd St to 4th St



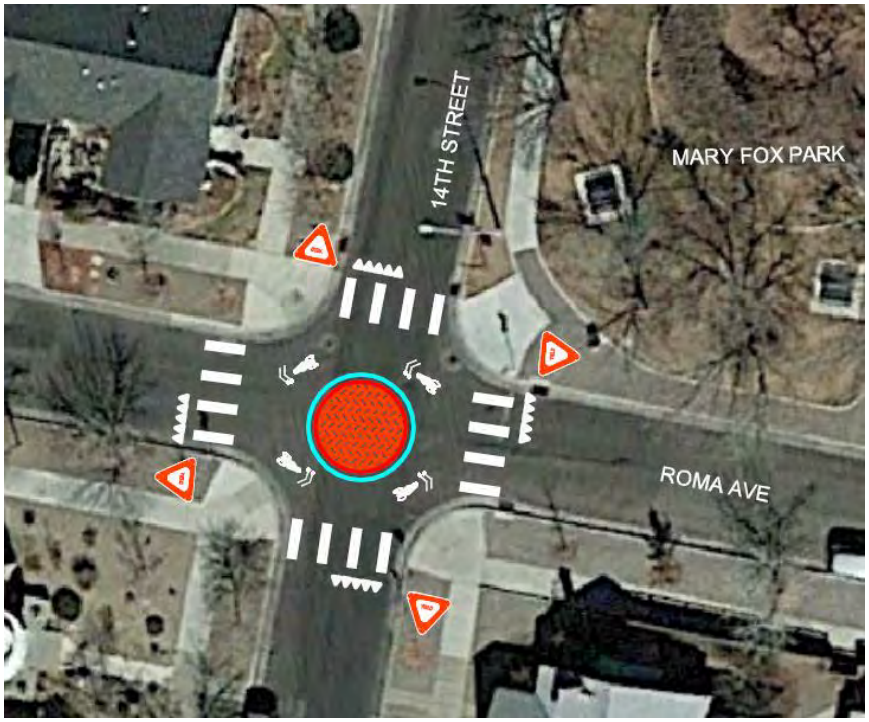
Mini-Roundabouts

The intersection of **Park Ave and 14th St** two blocks north of Silver Ave and two blocks south of Central Ave is currently an all-way stop with a pork chop island at the southeast corner for channelizing northbound-to-eastbound right turns. Based on the potential traffic calming benefits and the uncertainty caused by the unusual design, the intersection is a logical location for a mini-roundabout (see Figure 35). Further analysis may be required to ensure all crossings are ADA-compliant.

Figure 35: Mini-Roundabout Concept at Park Ave and 14th St

To minimize the number of times a bicyclist on the bicycle boulevard must stop along the four-block stretch of 14th St between Central Ave and Lomas Blvd on this stretch, the all-way stop at **Roma Ave/14th St** could be replaced with a mini-roundabout, as shown in Figure 36.

Figure 36: Mini-Roundabout Concept at Roma Ave and 14th St

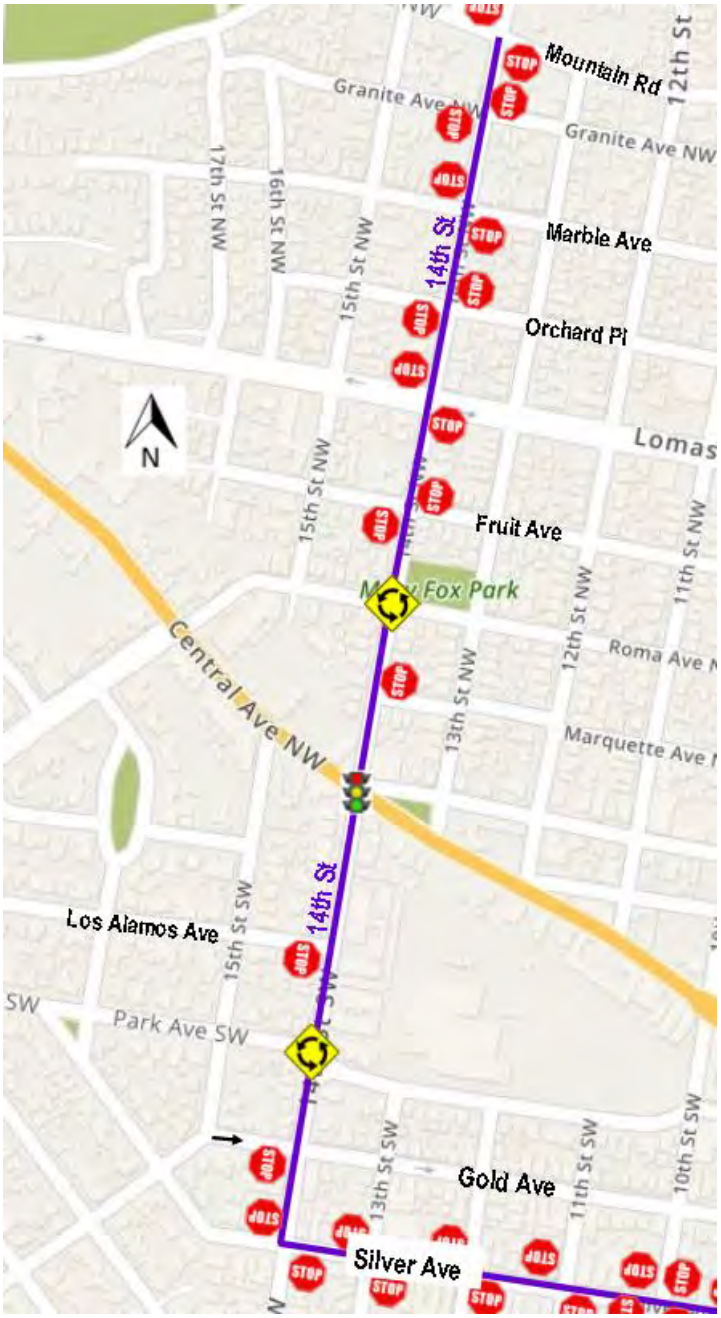


Stop Sign Alignment at 14th St and Fruit Ave

The stop signs at the Fruit Ave/14th St intersection could also be switched to stop traffic on Fruit Ave rather than on 14th St. Fruit Ave is controlled with stop signs at 15th St one block west, but to the east the next stop sign on Fruit is at 12th St. Re-aligning the stop signs would create a maximum stop (or mini-roundabout) spacing of two blocks on both Fruit Ave and on 14th St.

Figure 37 shows the recommended traffic control along the 14th St Bike Blvd between Central Ave and Mountain Rd, including the recommended mini-roundabouts at Park Ave and Roma Ave.

Figure 37: Recommended Traffic Control on 14th St Bike Blvd



14th St: Lomas Blvd to Mountain Rd

The stretch of the bicycle boulevard between Lomas Blvd and Mountain Rd also consists of four blocks. Currently the center intersection (Marble Ave) is controlled with stop signs on the 14th St approaches only. This spacing of stops signs is considered short for a bicycle boulevard (recommended stop sign spacing is 0.25 to 0.5 miles, and the two-block spacing is just over 0.1 miles), but it is understood that this neighborhood has long had speeding problems and that switching the stop signs at Marble Ave/14th St could have the unintended effect of increasing vehicle speeds on 14th St. Accordingly, no changes are recommended for traffic control in this segment of the 14th St Bike Blvd.

Signage and Pavement Markings

In addition to the physical improvements and other enhancements described above, the study area would benefit from the consistent use of signage and pavement markings, including bicycle stencils and sharrows. Though most of the study area is designated as a bicycle boulevard and features purple street signs, pavement markings and signage such as the 18 MPH speed limit signs are infrequent. By contrast, frequent pavement markings and signage were installed on recently-improved portions of the Silver Ave and Fair Heights Bike Blvd to improve motorist awareness and further recognize those streets as bike-friendly.

Figure 38. Bicycle Boulevard Signage and Pavement Markings

Purple Street Signs	*Sharrows*	*Bicycle Stencils*
		
Speed Limit Signs	*Regulatory Signage*	*Wayfinding*
		

To further enhance the overall branding of the Silver Ave Bike Blvd, signage and pavement markings contained in Figure 38 should be applied consistently along the study area. Specifically, bicycle stencils and sharrows should be utilized at the beginning and ending of each block with frequent speed limit and "Bicyclist May Use Full Lane" signs. See Figure 34 for the typical application of signage and pavement markings for each block.

Other Recommended Improvements

Wayfinding

Wayfinding signs should be installed at regular intervals along the study area and at major cross streets and decision points to highlight nearby destinations, mileage, and for directional guidance along the bicycle boulevard. Locations where wayfinding signs would be particularly beneficial include the following:

Figure 39: Wayfinding Signage for Silver Ave/ 14th St Intersection

- **14th St and Silver Ave** – Signage should indicate that the bicycle boulevard continues north from Silver Ave on 14th St (for westbound bicyclists) toward Old Town. Signage could also indicate that the Bosque Trail may be accessed by traveling south on 14th St from Silver Ave.
- **Walter St** – Signage should indicate access to the Edo ART station to the north of Silver Ave.
- **Buena Vista St** – Signage should indicate access to UNM to the north and CNM to the south.
- **I-25 Crossing** – Signage depends on the selected option.
- **Railroad Crossing** – Signage depends on the selected option.
- **Historic Neighborhoods** – The Silver Ave Bike Blvd passes through several of the City's historic neighborhoods, including Silver Hill, Huning Highland, and the Fourth Ward. There is an opportunity to provide an additional level of place-making through signage that indicates bicyclists are entering one of these historic districts.

Note on Major Intersection Crossings

Major intersections at University Blvd and Lomas Blvd present obstacles for bicyclists traveling along the bicycle boulevards as both roadways are principal arterials with multiple lanes of traffic (University Blvd features three lanes in each direction while Lomas Blvd features two lanes in each direction plus on-street parking. Both intersections feature raised medians and designated bicycle crossings to provide refuge and reduce the crossing distance. Signage indicating bicyclists may be present is also utilized to increase vehicular awareness.

The intersections were not evaluated as part of this study. However, the effectiveness of each of these crossings should be reviewed in the near future (the Lomas Blvd crossing was recently installed while the University Blvd crossing would be evaluated as part of further transit studies along the corridor). Identified issues at the University Blvd crossing include lack of detectable warning surfaces and refuge cut outs that do no align with the sidewalks along Silver Ave and are too narrow to accommodate bicyclists and pedestrians simultaneously.

Paseo del Bosque Trail Access

Access to the Paseo del Bosque Trail from Downtown could be enhanced by a connection from 14th St and Silver Ave to the access point along Alcalde Pl (Kit Carson Park). This study recommends that a new bicycle boulevard segment be created that extends south along 14th St from Silver Ave to Iron Ave and along Iron Ave from 14th St to Alcalde Pl (see Figure 40). Both Iron Ave and the proposed segment of 14th St to the south of Silver Ave are low-volume neighborhood streets that meet the general criteria for bicycle boulevards, and both streets already experience a moderate number of bicyclists. The total distance of this bicycle boulevard segment is 0.4 miles.

Basic improvements to these streets should include typical characteristics including signage and pavement markings. Iron Ave features a wide cross-section and relatively high vehicle speeds that would be appropriate for traffic calming. Improvements are also warranted at the intersection of Alcalde Pl and Tingley Dr to facilitate direct access to the Bosque Trail. Part of the challenge stems from the fact that access is provided from the crosswalk on the south side of Alcalde Pl and Tingley Dr, and bicyclists using the roadway cannot directly access the trail due to a raised median. Options to improve access include a trail or widened sidewalk along the south side of Alcalde Pl and a bicycle cut through in the median on Tingley Dr.

Figure 40: Recommended Connection from Silver Ave and 14th St to Bosque Trail

Summary of Recommendations

Figure 41 below provides a summary of the recommendations developed as part of the Silver Ave Bike Blvd Review. These recommendations are organized from east-to-west and are described in greater detail earlier in this section. Each of these recommendations are generally low-cost and easy to implement and could be part of a phased implementation or addressed through a concerted Silver Ave Bike Blvd improvement effort.

Figure 41: Summary of Recommendations

Location	Improvements	Feasibility / Ease of Implementation	Cost
Study Area			
Each block	Signing and pavement markings (i.e. sharrows and bicycle stencils)	High	$
Entrances to neighborhoods; major decision points along the corridor	Wayfinding	High	$
Yale Blvd to I-25			
Yale Blvd to Buena Vista Dr	Delineate on-street parking	High	$
Silver Ave and Buena Vista Dr	Mini-roundabout	Medium	$$$$
University Blvd and Lomas Blvd	Review overall effectiveness of crossing at time of future improvements to University Blvd	High	$
Silver Ave and Spruce St	Update stop sign orientation	High	$
I-25 Option Crossing (Option 3)			
Silver Ave from Mulberry St to Oak St	Multi-use path	Medium	$$$
Oak St from Silver Ave to Lead Ave	Multi-use path	Medium	$$$
Lead Ave from Oak St to Locust St	Multi-use path	Medium	$$$
Locust St north of Lead Ave	Multi-use path and ADA accessible ramp	High	$$-$$$*
Lead Ave and Oak St Intersection	Larger curb extensions and widened curb ramps	Medium	$$
	Bike traffic signal	Medium	$$
	Intersection signing and green pavement markings	High	$
I-25 to Broadway Blvd			
Each block	Implement full bicycle boulevard	High	$
Railroad Crossing (Option 2)			
Lead Ave bridge from Broadway Blvd to 2nd St	Two-way cycle track with raised curb and flex posts	Medium	$$$$

Location	Improvements	Feasibility / Ease of Implementation	Cost
	Bike traffic signals	Medium	$$
Lead Ave to Silver Ave Connection at Broadway Blvd Option 1			
Broadway Blvd and Lead Ave Option 1	Two-way barrier separated cycle track along Lead Ave to Arno St	High	$$
	Bicycle signal	Medium	$$
Broadway Blvd and Lead Ave Option 2	One-way barrier separated cycle track along Lead Ave to Arno St (WB); bike lane along Broadway Blvd from Lead Ave to Silver Ave (EB)	High	$$
	Bike traffic signal	Medium	$
2nd St Connection - Lead Ave to Silver Ave			
2nd St Corridor	Install bike lane, on-street parking	High	$
2nd St/Lead Ave Intersection	Bike turn box, pavement markings, bicycle traffic signal	High	$$
Silver Ave Bike Blvd through Downtown			
2nd St to 4th St	Back-in angle on-street parking	High	$
2nd St to 8th St	Update stop sign orientation	High	$
West Downtown Neighborhoods			
14th St and Fruit Ave	Stop sign re-alignment	High	$
14th St and Roma Ave	Mini-roundabout	Medium	$$$$
14th St and Park Ave	Mini-roundabout	Medium	$$$$
Bosque Trail Access			
14th St from Silver Ave to Iron Ave	New bicycle boulevard segment	High	$
Iron Ave	Traffic calming	High	$-$$*
Iron Ave from 14th St to Alcalde Pl	New bicycle boulevard segment	High	$
Alcalde Pl and Tingley Dr	Trail or widened sidewalk and bicycle cut through in median along Tingley Dr	Medium	$$
Alcalde Pl and Iron Ave	Mini-roundabout	Medium	$$$$

*Indicates the total depends on the elements included in the final design.

Legend

$	$0-10,000
$$	$10,000-20,000
$$$	$20,000-50,000
$$$$	$50,000-100,000

SUITABILITY OF MOUNTAIN RD AS A BICYCLE BOULEVARD

The purpose of this memorandum is to assess whether Mountain Rd in its current configuration meets the definition and criteria for a bicycle boulevard in the City of Albuquerque. The characteristics of a bicycle boulevard have evolved since they were initially designated and installed in 2009, with several miles of bicycle boulevards redesigned using an emerging toolkit of best practices. This analysis is based on observations related to design speed, traffic volume, street width, and other design features, and a comparison of characteristics of Mountain Rd to other bicycle boulevards in the City of Albuquerque, including the techniques proposed along Silver Ave to the west of Yale Blvd.

General Conditions along Mountain Rd

The Mountain Rd Bike Blvd should be considered in two parts: east and west of Rio Grande Blvd. **East of Rio Grande Blvd**, Mountain Rd is classified as a collector road and supports through traffic between I-25 and Old Town. Mountain Rd also serves as a primary vehicle access route to the museum district. MRCOG traffic counts data indicates about 7,700 vehicles per day at the time of the most recent counts (April 2017) between 19th St and 14th St on Mountain Rd. The design speed between Rio Grande Blvd and 19th St is substantially higher than the posted 18 MPH speed limit (likely 30-35 MPH), and the width of the road combined with center striping encourages higher speed travel. From a user standpoint, the connection to Old Town is not clearly demarcated and wayfinding could be improved. From 14th St to Edith Blvd, Mountain Rd is a designated "bicycle route" and provides an important east-west connection.

The primary issue for this portion of the corridor as a bicycle boulevard is that Mountain Rd is not a neighborhood street. Rather, speeds and volumes exceed the thresholds generally associated with shared use facilities; NACTO indicates that shared lane markings or sharrows are "not a preferred treatment" on "streets with posted 35 mph speeds or faster and motor vehicle volumes higher than 3,000 (vehicles per day).

West of Rio Grande Blvd, Mountain Rd is classified as a local road and serves primarily residential areas and access to Reginald Chavez Elementary School. This portion of the corridor is generally narrower than segments to the east of Rio Grande Blvd, and offers traffic calming features associated with the school, including speed humps and flashing beacons. Overall, Mountain Rd to the west of Rio Grande Blvd meets the general criteria for a bicycle boulevard, though basic design features such as regular signing and pavement markings are limited.

Site Visit Observations

BHI and MaxGreen evaluated Mountain Rd as part of a site visit on July 30, 2018. In addition to the qualitative description of conditions described above, the Project Team evaluated conditions from a user perspective. Observations include:

- Crossing Rio Grande Blvd in its current configuration is challenging and uncomfortable
- A bicyclist was observed on the sidewalk at 14th St and Mountain Rd rather than traveling with the flow of traffic as intended

- A semi-truck was observed along Mountain Rd east of Rio Grande Blvd, indicating the types of conflicts for bicyclists
- Wayfinding and signing indicating the entrance to Old Town or other destinations is limited

Figure 42: Current Conditions along Mountain Rd, East of Rio Grande Blvd

Recommendations

Overall, Mountain Rd in its current condition does not meet the criteria of a bicycle boulevard or include the features exhibited on other bicycle boulevards that have been subject to design improvements. However, Mountain Rd plays an important role in east-west connectivity through the north Downtown and Old Town areas and should remain a bicycle route. The bicycle boulevard along Mountain Rd to the east of Rio Grande Blvd should be either decommissioned and re-rerouted, or subject to significant design interventions to reduce speed and improve bicyclist comfort levels.

If the bicycle boulevard is to be re-routed, Marble Ave from 14th St to 19th St provides a comfortable alternative through residential neighborhoods for bicycle travel between the 14th St Bike Blvd and Old Town. A future study could evaluate potential alternative alignments through Old Town, opportunities to utilize connections through residential areas, and options for crossing Rio Grande Blvd.

The Mountain Rd Bike Blvd between Rio Grande Blvd and the Bosque Trail access should be preserved as a bicycle boulevard and improved through additional pavement markings and signing. Preservation and enhancement of this facility would improve bicycle connections to Old Town and Downtown for individuals traveling from the Bosque Trail and other points to the north and west. Providing multiple bicycle boulevard connections (Silver Ave and Mountain Rd) to the Bosque Trail would also enable greater recreational travel within the greater Downtown area.

APPENDIX A: PUBLIC & STAKEHODLER OUTREACH

The first phase of public and stakeholder outreach focused on the project scope and information gathering and featured presentations to the Greater Albuquerque Bicycling Advisory Committee (GABAC) on August 13, 2018 and a public meeting on August 30, 2018. A second phase of outreach was conducted in early 2019, including presentations to GABAC on January 16 and a public meeting on February 5. The second phase featured design concepts along the Silver Ave Bike Blvd. This memo describes the discussion and feedback received during both phases of public and stakeholder outreach. The presentations given at the public meetings are included in this document.

Phase 1: GABAC Meeting Summary – August 13, 2018

The Silver Ave Bike Blvd Review was a discussion item on the August 2018 GABAC meeting agenda. The Project Team provided a presentation on the scope of the study and initial findings from a site visit, and solicited input from GABAC on the following discussion items.

Discussion Items

Railroad Crossing and Broadway Blvd

Alternatives for crossing the railroad tracks are currently limited, and discussion focused on the best places to access Lead Ave from Silver Ave. The Project Team proposed Arno St in the presentation, but was asked to consider the suitability of a cycle track or on-street improvements along Broadway Blvd as an alternative to Arno St.

Oak St Crossing

Attendees raised concerns about making the intersection safer at Oak St. Specific concerns included whether riders will have enough time to move through the intersection at Oak St without having to worry about cars, and whether vehicles turning off of Lead Ave and Coal Ave onto Oak St will stop for bicyclists.

The right turn heading north onto Oak St from westbound Lead Ave raises safety concerns for pedestrians and bicyclists who cross Oak St at the signalized intersection. This turning movement would be problematic for users of a cycle-track along Lead Ave. Coordination with NMDOT is also required regarding any possible improvements at the I-25 underpass.

Connections Between Silver Ave and Lead/Coal Aves

Attendees requested an exploration of using Edith Blvd instead of Arno St as a means of connecting north-south between Lead and Coal Aves and Silver Ave. Utilizing Edith Blvd could allow more time for bicyclists to reach the left turn lane on Lead Ave before crossing Broadway Blvd. One attendee raised concerns that there is too much routing on and off of Silver Ave; however, if the Silver Ave Bike Blvd is to be utilized it is hard to avoid the crossings at I-25 and the railroad tracks.

Intended Users of Bicycle Boulevards – Silver Ave versus Lead/Coal Aves

Discussion took place regarding the intended users of the Silver Ave Bike Blvd and whether it makes sense to provide alternatives to Lead and Coal Aves, or whether bicyclists should be encouraged to utilize existing bike lanes on Lead and Coal Aves. Proponents of using Lead Ave and Coal Ave exclusively expressed a desire to ride with the flow of traffic and felt unsafe having to cross these two streets. Others in attendance recognized that many bicyclists would not feel comfortable on Lead and Coal Aves and would prefer alternate routes. Most attendees agreed that it is important to provide alternatives for less confident bicyclists, regardless of their individual preferences.

On-street Parking

A consensus was reached with a preference to mark each individual space, as some drivers think non-delineated parking spaces are actually a turn lane.

Mountain Rd Bike Blvd

The Mountain Rd Bike Blvd is unlike other corridors evaluated in this study; traffic is much heavier and conditions lead to higher vehicle speeds. If Mountain Rd is to be utilized as a bicycle facility in the future (whether as a bicycle boulevard or through bike lanes), further study is necessary to determine needed improvements. If Mountain Rd is not utilized as a bicycle boulevard in the future, the study would need to identify which other streets would be used in place of Mountain Rd.

Considerations for Downtown Silver Ave

Due to the high transit activity on 2nd St and the greater north-south traffic, 3rd St was the preferred option for linking the Silver Ave Bike Blvd to Lead and Coal Aves.

There are a number of other studies taking place at the same time, and coordination within the city will be needed. Of particular interest are the Downtown Safe Zone proposal and the possibility of parking-protected bike lanes on Lead and Coal Aves from 2nd St to 8th St.

Phase 1: Public Meeting Summary – August 30, 2018

The Project Team conducted a public meet at the City of Albuquerque Special Collections Library. Similar to the GABAC meeting, the event featured a presentation on the scope of the study and initial findings, and provided attendees an opportunity to provide input and general comments and concerns. The comments and questions received during the course of the public meeting are summarized below. Additional comments were submitted in writing by meeting attendees, while electronic comments were accepted from August 30 through September 17. A brief summary of key issues raised by members of the public are provided at the end of this document.

Discussion Items

I-25 Crossing

The Project Team reinforced the benefits of providing bicycling options for people who would not feel comfortable riding on Lead Ave and Coal Ave. Three initial options were presented in the meeting for crossing I-25:

- Use of Lead Ave and Coal Ave
- Use of the existing street network to access Silver Ave via Locust St and Cedar St, combined with Lead Ave and Coal Ave
- An off-street two-way cycle track at the I-25 underpass along Lead Ave and Oak St.

Improvements to Locust St were proposed as part of any option. Attendees provided comments and critiques regarding the I-25 underpass and potential improvements to Lead Ave at Oak St/Frontage Rd. The improvements proposed below are needed currently, as identified by both attendees and the Project Team site visit, and would provide benefits for the proposed cycle track:

- Drivers making right turns through the bike lane along Lead Ave to get on Oak St and I-25 cause safety concerns. Added barriers and street paint were proposed as design features to slow down the speed of turning movements and to prevent drivers from turning into bicycle lanes along Lead Ave.
- Push-button activated, bike-only signalization could be added to the intersections of Lead Ave and Oak St and Lead Ave and the I-25 off-ramp to give bicyclists the opportunity to cross these intersections without having to worry about traffic.
- Based on concerns with the speed of cars exiting I-25 onto Lead Ave, multiple attendees expressed a desire to pursue speed reduction strategies, including techniques such as colored paint and rumble strips.

The Project Team indicated that coordination with the New Mexico Department of Transportation for will be necessary for interventions on NMDOT facilities, but improvements at Lead Ave and Oak St are critical for the safety of existing bicyclists and pedestrians along Lead Ave, as well as future users of the Silver Ave Bike Blvd who may use the crosswalk.

Desire to Avoid Crossing Lead Ave/Coal Ave

An attendee expressed frustration with the length of time it takes to cross Lead Ave and Coal Ave from Silver Ave at non-signalized intersections. This issue could be addressed through improved connections along Silver Ave, such as bridges or on-street cycle tracks, or additional signalized intersections.

Bicycle/Pedestrian Bridges

Multiple attendees called for dedicated cycle bridges to cross both I-25 and the railroad tracks, expressing frustration with the lack of bike infrastructure in the area. These interventions would eliminate the need to cross both Lead and Coal Aves from Silver Ave. The Project Team indicated that bridges can be evaluated further though cost and right-of-way would be concerns.

Multiple attendees inquired to the possibility of using Central Ave to cross I-25 and the railroad tracks rather than Lead and Coal Aves, with one attendee saying that they already use Central in favor of Lead and Coal Aves. The Project Team indicated that Central Ave had not been a focus to this point due to the fact that access to Silver Ave can be challenging at the I-25 area.

Downtown Area

A Downtown resident asked whether the Silver Ave Bike Blvd Review would incorporate the Jeff Speck Walkability Study commissioned by the City of Albuquerque. Specifically, concerns were raised about how bicyclists would affect the increased amounts of traffic that might come as a result of new development Downtown, as well as how bicyclists would interact with increased amounts of

pedestrians. The Project Team responded that the Silver Ave Bike Blvd Review will seek to complement the City's Walkability Study, including where Silver Ave is mentioned specifically. As bicycle boulevards are mixed-use facilities where bicyclists share the road with cars, there would be minimal interaction between bicyclists and pedestrians walking on the sidewalk.

Railroad Crossing

The primary option presented for navigating the railroad crossing is the use of Lead Ave and Coal Ave with access via 3rd St and Arno St (east of Broadway Blvd). Attendees presented additional ideas for bicycle infrastructure at the railroad crossing, including an at-grade crossing across the railroad tracks at Silver Ave and a bi-directional cycle track along Lead Ave, with the possible addition of more jersey walls to improve bicyclist safety. The cycle track would function in a similar manner to the proposed cycle track at the I-25 underpass.

Maintenance

Attendees raised concerns with the amounts of trash and debris that end up in the bike lanes on Lead Ave and Coal Ave as a result of heavy rain and asked that this be taken into account in the design of this project. The problem is exacerbated at underpasses where safety and cleanliness were cited as issues. The Project Team indicated that maintaining bicycle facilities in good working order is important for providing meaningful travel options. Factors such as drainage and debris flow can be accounted for once the project reaches the final design phase.

General Safety

Multiple attendees expressed a desire for increased driver awareness and education of how to safely interact with bicyclists.

Mountain Rd

The presentation mentioned the fact that the study included evaluation of Mountain Rd as a bicycle boulevard. An attendee asserted that the street is a bicycle boulevard in name only and called for added bike infrastructure and traffic calming measures if it is to continue acting as a bicycle boulevard. The Project Team responded that, in many ways, Mountain Blvd does not have the same characteristics as other bicycle boulevards in the City of Albuquerque. A decision will be necessary on whether to continue utilizing Mountain Rd as a bicycle boulevard, and what improvements may be needed to make it more accommodating to bicyclists, or whether another street may be more appropriate to take its place.

Phase 2: GABAC Meeting Summary – January 14, 2019

The Silver Ave Bike Blvd Review was a discussion item on the January 2019 GABAC meeting agenda. The Project Team provided a presentation on the scope of the study of the project, observations of existing conditions within the study area, design challenges, general recommendations, and design concepts for the railroad and I-25 crossings. The presentation served as a preview of the material that was be shared at the public meeting scheduled for February 5. Although a full review by City departments and stakeholder agencies were not completed at the

time of the meeting, the presentation provided an opportunity to solicit input from GABAC and identify any critical issues among the recommendations.

General Items

The following items were presented but did not generate questions or comments.

14th Street Traffic Calming

The Project Team presented design intervention options for traffic control along the 14th St Bike Blvd. Traffic calming every 2-3 blocks such as mini roundabouts at Park Ave and Roma Ave, barriers that make it more difficult for through motor traffic, and reviewing stop sign alignment would all aid in making 14th St more bike friendly.

Bosque Trail Connection

Proposal to utilize existing neighborhood road networks and extend bicycle boulevard south on 14th and west along Iron Ave- making an explicit connection to the Bosque Trail.

Downtown Silver Ave

The downtown stretch Silver Ave (between 2nd and 4th) is important as a bicycle boulevard for its connectivity to other bicycle boulevards, the Project Team proposed to maintain and enhance this area. Ideas to improve this area include the use of traffic calming techniques and raising motorist awareness of bicyclists through signage and pavement markings. Back-in angle parking would be beneficial for downtown Silver Ave as it raises visibility of bicyclists without a loss of available parking.

Buena Vista Dr & Silver Ave

The Project Team proposed this intersection for a mini-roundabout to manage traffic but allow for continuous four-way travel. Buena Vista Dr is being considered as a bicycle boulevard; design interventions in this area would coincide with the Long Range Bikeway System Map.

Mountain Rd as a Bicycle Boulevard

The Project Team looked at how well Mountain Rd today meets the characteristics of a bicycle boulevard and shared a preliminary evaluation. West of Rio Grande, Mountain Rd is a low volume neighborhood street; east of the Rio Grande Blvd, Mountain Rd is a higher volume collector road.

Preliminary recommendations include decommissioning Mountain Rd as a bicycle boulevard east of the Rio Grande and using Marble Ave as an alternative east-west route from 14th St to 19th St. The Project Team indicated that an additional study would be needed to identify specific design improvements, including the preferred crossing of Rio Grande Blvd.

Discussion Items

Railroad Crossing

Three options presented include:

- Utilize Lead Ave and Coal Ave with connections along 2nd St and Broadway Blvd to Silver Ave.

- Barrier separated two-way cycle-track along the north side of Lead Ave with a connection to Silver Ave along Broadway Blvd or Arno St. These solutions would eliminate the need for crossing Lead Ave and Coal Ave and improve the access to Silver Ave.
- Bicycle-pedestrian bridge over the Downtown railroad tracks.

Attendees noted that the railroad tracks are not under the jurisdiction of the City Albuquerque, which might add possible issues if a bridge were to be pursued.

Concerns were raised about bicyclists riding eastbound on Lead Ave approaching Broadway Blvd. Conflicts could arise as bicyclists begin to cross but motorists may not be looking in the direction of oncoming bicyclists. Project team members clarified a bicycle signal is included among the recommendations for bicyclists crossing Broadway Blvd in the eastbound direction.

One attendee asked about the suitability of using 2nd St as a connection between Silver Ave and Lead Ave. The Project Team indicated that 2nd St is a logical connection since bicyclists could utilize the crosswalk at 2nd St and immediately access the cycle track heading eastbound.

The Project Team explained that design options with bike lanes for Broadway Blvd are also being considered, and that the final option for accessing Silver Ave depends on the selected alternative for Broadway Blvd.

I-25 Crossing

Four options were presented for crossing I-25.

- Option 1: Improved signing is provided with on-street connections.
- Option 2: Transform the sidewalks along Oak St into a raised multi-use path to connect Lead Ave and Coal Ave to Silver Ave.
- Option 3: A series of multi-use paths under I-25 overpass, along Oak St, as well as a connection from Locust St as well.
- Option 4: Pedestrian-bicycle bridge over I-25 to connect Silver Ave.

The Project Team explained that Option 1 requires bicyclists to travel longer distances to access Silver Ave and to cross major roads multiple times. One attendee liked this option because it utilizes unsignalized crossing rather than having to wait for green lights, meaning he can just cross the streets whenever he wants to with no added stress.

Concerns were raised about the hazardous crossing of Oak St to get to the multi-use path (Option 3). It was pointed out by Project Team that only one accident occurred involving a pedestrian and that the proposed crossing location is an existing crosswalk. The Chair of GABAC remarked that because this is a busy crossing, speeds are lower which in turn makes the area safer for pedestrians. Benefits also include avoiding multiple crossings of Lead Ave and Coal Ave.

Another attendee said that the path of least resistance is bypassing all of the Lead Ave and Coal Ave crossings, and that the paths would function as guideways and protect less confident bicyclists from possible bad decisions. Additional discussion focused on the use of shared space by bicyclists and pedestrians, with no major concerns raised.

The Project Team indicated that Option 4 may not be viable due to the cost and the extremely long ramp required due to elevation changes. Discussion occurred over the long-term prospects of incorporating bicycle and pedestrian facilities during the reconstruction of the I-25 interchange. However, no such facilities are included in NMDOT's long-term plans.

Phase 2: Public Meeting Summary – February 5, 2019

The Project Team conducted a public meeting at the City of Albuquerque Special Collections Library. As with the initial public meeting, the event featured display boards and a presentation on the scope of the study and the proposed options for Silver Ave. Attendees were given the opportunity to provide input and general comments before, during, and after the presentation. The comments and questions received during the course of the public meeting are summarized below. Additional comments were submitted in writing by meeting attendees, while electronic comments were accepted from February 5 through February 22. A brief summary of key issues raised by members of the public are provided at the end of this document.

Discussion Items

The presentation covered the purpose and need of the study, discussion of the benefits of Silver Ave as a bicycle boulevard and the intended users of the facility, as well as proposed recommendations. The recommendations were presented along the corridor from west to east, with emphasis and additional discussion on the railroad and I-25 crossings.

Downtown Improvements

Recommendations for the Downtown area include back-in angle parking to promote safety and traffic calming and the application of bicycle boulevard signing and pavement markings. Attendees raised questions about the potential transition to back-in angle parking downtown, and doubts were raised regarding the safety for motorists and bicyclists as compared to parallel parking. The Project Team explained that the safety benefits of back-in angle parking versus parallel parking have been demonstrated.

Railroad Crossing

The Project Team presented the three options for the railroad crossing, with the majority of comments and discussion focused on Option 2. Generally, attendees voices support for Options 2 and 3, but had concerns about the visibility of the potential bike facilities for bicyclists and potential conflicts with motorists.

- One attendee asked whether bicyclists would share the road with vehicles on 2nd St between Lead Ave and Silver Ave, and whether bicyclists would be given bike signals at the intersections of Lead Ave with 2nd St and Broadway Blvd. (A shared travel lane on 2nd St and bicycle signals are among the recommendations.)
- One attendee raised the question of the possibility of extending the Lead Ave two-way cycle track presented in Option 2 all the way from 2nd St to I-25. The Project Team explained that the effectiveness of the cycle track would be compromised by the access points and driveways along Lead Ave. This suggestion may also be redundant, as the existing bike lanes already provide the option for traveling along the entirety of Lead and Coal Ave.
- One attendee asked whether vehicle lanes could be removed from Lead Ave to improve conditions for bicyclists. The travel lanes along Lead Ave and Coal Ave are not under consideration as part of this study.

- A suggestion was provided to have bicyclists to go from Lead Ave to Silver Ave using Edith Blvd, as opposed to Broadway Blvd or Arno St, as Edith Blvd connects to Central Ave where a signalized intersection exists.

I-25 Crossing

The Project Team presented the four options for the I-25 crossing as well as the evaluation matrix. Discussion focused almost exclusively on Options 3 and 4, with no attendees expressing a preference for Options 1 or 2.

Many attendees expressed an interest in a bicycle-pedestrian bridge over I-25. The Project Team indicated that while a bridge was the subject of many comments, the cost and timeframe for implementation make the option infeasible.

Multiple attendees expressed interest and support for Option 3, though attendees raised operational concerns and questions. Specifically, a concern was raised that transitioning off and on Lead Ave could be confusing for bicyclists. Fearing for the safety of bicyclists, a question was also posed of whether dedicated bike signals would be put in place to help bicyclists cross the I-25 off- and on-ramp.

One attendee raised concerns that Option 3 would not actually attract the 8 to 80 bicyclists meant to be served by this project. The attendee also stated their belief that a bridge would be the only option that would attract new bicyclists, as well as improving the walkability and bikeability of the area, and connecting the neighborhoods separated by I-25.

A concern was raised that widening Locust street to accommodate for bicyclists might lead to vehicles using the cycle track to drive onto Lead Ave. The Project Team explained that that concern can be addressed through bollards or other devices that block vehicle through travel.

Concerns were raised about who owns and maintains the area described in I-25 Crossing Option 3, and whether coordination with different stakeholders would make this option challenging.

Miscellaneous Concerns

One attendee asked whether stormwater management would be a consideration when adding mini-roundabouts.

One attendee doubted the ability of the city have to maintain future signs and striping, as current facilities have degraded and are hard to see.

Mountain Rd

The Project Team asserted that the corridor in its current configuration does not meet the characteristics of a bicycle boulevard. The Project Team clarified that even if Mountain Rd is de-commissioned as a bicycle boulevard it would not be eliminated as a bicycle route.

One attendee raised concern for the abandonment of Mountain Rd as a bicycle boulevard and encouraged the City to tie in the Sawmill District to the bicycle boulevard system.

Summary of Public Comments

Public comments and input were received for the Silver Ave Bike Blvd Review in the form of written comments collected at the two public meetings, as well as electronic comments submitted over a several week period following each public event. In total, 51 comments were provided, with 26 of these received through email, and 25 received through written comments at the meetings. Commenters included neighborhood residents, local bicyclists, and public officials. Of these comments, various themes and patterns emerged.

- Various comments indicated support for the concept of bicycle boulevards in general, while other commenters indicated a positive opinion of the Silver Ave Bike Blvd through the UNM and Nob Hill areas.
- A desire for general bicycle infrastructure improvements was a recurring theme among the comments. Of the comments received, 47% (24) included some type of request for infrastructure improvements, with specific requests including additional striping, signage, pavement repairs, signals, barriers, bike boxes, and various other improvements along (and outside) the project area. Areas discussed by multiple commenters include:
  - Mountain Rd – Requests for reduced traffic speeds and improvements to the intersection with Rio Grande Blvd.
  - Lead Ave – Requests for speed control through electric speed notification signs, reducing number of vehicle lanes, and physical barriers to bicyclists.
  - A general increased usage of signing, striping, and green paint to indicate the presence of bikes was identified by multiple commenters.
- 31% (16) of all comments expressed concerns with the safety of the proposed design alternatives.
  - I-25 area: Crossing the on and off-ramps along Lead Ave was the most-identified safety issue. Multiple commenters indicated current issues along Lead Ave, with some suggesting that the on and off-ramps could still be unsafe even with the proposed improvements.
  - Railroad crossing: The speed and proximity of vehicle traffic on Lead Ave and navigating the Broadway Blvd intersection were identified by several commenters as posing a significant risk to bicyclists. Several commenters suggested physical barriers to bicyclists on Lead Ave, as with the proposed cycle track option.
  - A general distrust of drivers was expressed by many respondents.
  - Various comments reflected a view of Lead Ave as a stressful corridor for bicyclists.
- 27% (14) voiced support for a bridge to cross I-25 and the railroad tracks (as well as two comments supporting a tunnel), making grade-separated crossings the most-requested alternative of the proposed design alternatives.
- A smaller number of commenters provided feedback on the multi-use path option for navigating the I-25 crossing (Option 3). Multiple comments indicated the use of Option 3 as a second choice if the bridge crossing were not pursued, while two comments indicated that

a bridge crossing would be an inefficient use of public funds and that Option 3 would be a more appropriate public investment.

- 16% (8) of the received comments voiced support for a two-way cycle track along Lead Ave to cross the railroad tracks.
- Two comments were received in support of back-in angle parking downtown, with one in opposition.
- Multiple commenters indicated that modifications are required along Mountain Rd to ensure the safety of bicyclists, and that the corridor is not functioning as a bicycle boulevard today. Other comments indicated a desire to keep some form of bicycle infrastructure along Mountain Rd.
- Multiple comments indicated support for creating a connection from 14th St and Silver Ave to the Bosque Trail along Alcalde Pl. One request included intersection improvements at Alcalde Pl and Iron Ave and an improved connection for bicyclists to the Bosque Trail.
- Various requests were made related to the maintenance of bicycle infrastructure.
- Various comments were received that fall outside of the scope of the study. These included such suggestions as making other streets into bicycle boulevards, implementing stormwater management, improving ADA compliance, and increasing driver awareness of bicyclists.

APPENDIX B: LEAD AVE/LOCUST ST CROSSING DESIGN CONCEPTS

Background

This appendix provides visualizations of potential improvements along the I-25 southbound off-ramp and the intersection of Locust St and Lead Ave. These concepts were developed in coordination with NMDOT to address existing conflicts and safety concerns. The concepts are not intended as a final design for the intersection. Rather, the concepts depict the elements that could be applied to enhance safety and increase the visibility of bicyclists utilizing the I-25 crossing along the Silver Ave Bike Blvd.

The design concepts respond to specific concerns at the intersection including the speed of motor vehicles making the turn from the southbound frontage road onto Lead Ave westbound and the potential lack of motorist awareness toward bicyclists and pedestrians crossing the Locust St/Lead Ave intersection. Of particular concern is the fact that Lead Ave is a one-way roadway and motorist attention is draw to the vehicles approaching from the east. As a result, motorists are less likely to be aware of bicyclists and pedestrians crossing from the west side of the intersection.

Aerial and street view design concepts are provided below. Proposed improvements are shown in yellow to highlight the distinction from the existing roadway conditions.

Concept Elements

Lane Alignment / Striping

The current alignment features a particularly wide outside lane approaching the intersection with Lead Ave. The design concept includes striping to narrow the outside lane along the frontage road and manage traffic before the intersection. The lane alignment is brought closer to 90 degrees and the gore between the center and outside lanes is removed. When combined with the curb extension (described below), the effect is to force motorists into a slower turning movement when traveling onto westbound Lead Ave.

Curb Extension

The curb at the northwest corner of Lead Ave and Locust St is extended and reconstructed with a tighter curb return radius. The effect is to reduce the speed of motorists completing a turn from the off-ramp/frontage road to westbound Lead Ave and to reduce the crossing distance for bicyclists and pedestrians crossing the street along the proposed path of the Silver Ave Bike Blvd.

Multi-use Trail

A multi-use trail could be installed parallel to the I-25 off-ramp to bring bicyclists to the intersection. The trail would follow the existing topography and be above the grade of the roadway, enhancing the visibility of bicyclists and increasing the awareness of motorists to the fact that they

are approaching an intersection where non-motorized users may be present. The concept depicts a crossing and ramp at the intersection of Silver Ave and Locust St, though the precise alignment of the trail warrants further analysis. Additional features that may be worth consideration include a railing on the east side of the trail and signage along the southbound off-ramp to indicate a bicycle and pedestrian crossing location.

Landscaping

The current landscaping along the west side of the I-25 off ramp reduces the visibility of bicyclists and pedestrians who may be present at the intersection with Lead Ave. The introduction of the multi-use trail would therefore warrant the removal of some landscaping features. The design concept depicts the replacement of street trees with ground cover and other shrubs that would not block the line of sight from motorists.

Other Considerations

Additional analysis may be conducted to determine the length of the deceleration lane and whether the dual right turn is warranted or if the center travel lane approaching the Lead Ave intersection could be converted to a through lane.

Aerial View of Lead Ave/Locust St/I-25 Off-Ramp – Existing Conditions

Aerial View of Lead Ave/Locust St/I-25 Off-Ramp – Proposed Concept

Street View of Lead Ave/Locust St/I-25 Off-Ramp – Existing Conditions

Street View of Lead Ave/Locust St/I-25 Off-Ramp – Proposed Concept

APPENDIX C: EVALUATION OF TRAFFIC OPERATIONS AT LEAD AVE/BROADWAY BLVD AND LEAD AVE/2ND ST

Purpose

The purpose of this analysis is to examine the impacts of the installation of traffic signals at Walter St on the operations of Lead Ave/Broadway Blvd and Coal Ave/Broadway Blvd and to produce conceptual designs for the intersections of Lead and 2nd St and Lead Ave and Broadway Blvd, including lane potential reconfigurations. The analysis also considers the impacts of an additional bike-only phase as part of the signal timing plan for the intersections of Lead Ave/Broadway Blvd and Lead Ave/2nd St. The conceptual design integrates the recommendations from the Broadway Blvd Traffic Calming Study and the Silver Ave Bike Blvd Review.

Methodology

The Project Team performed a traffic simulation for the four intersections of Lead Ave and Coal Ave with Broadway Blvd and Walter St for the existing AM and PM peak hours to assess the impacts of the installation of traffic signals at the Walter Street intersections. The following considerations were incorporated into the traffic simulation:

- Installation of traffic signals at the intersections of Walter St/Lead Ave and Walter St/Coal Ave.
- Modifications recommended as part of the Broadway Blvd Traffic Calming Study (from the ongoing Parametrix study)
- Recommended improvements from the Silver Ave Bike Blvd Review (concluded in 2019)
- Elimination of the dedicated left turn from Lead Ave westbound to Broadway Blvd southbound to address safety concerns

Data Collection

Figures 1 and 2 show the vehicle turning movement counts for the AM and PM peak hours at the intersections of Lead Ave/2nd Street (counted on Wednesday, August 21, 2019) and Lead Ave/Broadway Blvd and Coal Ave/Broadway Blvd (both counted on Tuesday, November 14, 2017). Volumes shown for the Lead Ave/Walter Street and Coal Ave/Walter Street intersections were based on the counts at Lead Ave/Broadway Blvd and Coal Ave/Broadway Blvd and an estimated number of turning vehicle movements (one every two minutes) and through movements on Walter Street (one every five minutes). Count data is provided in Tables 1 and 2.

Existing Intersection Geometry and Signal Phasing

The existing geometry and signal phasing at the study intersections is the following:

Lead Ave/2nd Street

- Northbound: One lane shared by left-turn and through movements
- Southbound: One through lane and one right-turn lane
- Eastbound: One left-turn lane and one right-turn lane
- Westbound: One left-turn lane, one through lane and one lane shared by through movements and right turns

All four legs have striped crosswalks with pedestrian signals. The intersection is pretimed with a 60 second cycle length in both the AM and PM peak hours. There is no actuation (no ped push buttons, vehicle loops, or cameras) at the intersection. All of the left- and right-turns are permitted only, and the cycle has two phases: 1) northbound and southbound vehicles and pedestrians; 2) eastbound and westbound vehicles and pedestrians.

Lead Ave/Broadway Blvd

- Northbound: One left-turn lane and two through lanes
- Southbound: Two through lanes and one right-turn lane
- Westbound: One left-turn lane, two through lanes, a westbound bike lane, and one right-turn lane

All four legs have striped crosswalks with pedestrian signals. The intersection is pretimed with a 110 second cycle length in the AM peak hour and 120 second cycle length in the PM peak hour. Only the northbound left-turn movement has detection (loops) so that the northbound left-turn arrow is only present when there is a vehicle waiting to make this turn. There is no other actuation (no ped push buttons, vehicle loops, or cameras) at the intersection. The southbound right-turn and westbound left- and right-turns are permitted only. The cycle serves the following movements: 1) northbound left-turn vehicles (protected, if actuated); 2) northbound and southbound vehicles (including permitted turns) and pedestrians; 3) westbound vehicles and eastbound and westbound pedestrians.

Lead Ave/Walter Street

- Northbound: One lane shared by left-turn and through movements
- Southbound: One lane shared by through movements and right turns
- Westbound: One lane shared by left-turn and through movements, one lane shared by through movements and right turns, and one westbound bicycle lane separated from the adjacent through lane by a painted buffer.

The intersection is stop-controlled on the northbound and southbound approaches. There are curb ramps at all four corners of the intersection, but no striped crosswalks.

Coal Ave/Walter Street

- Northbound: One lane shared by through movements and right turns
- Southbound: One lane shared by left-turn and through movements

- Eastbound: One lane shared by left-turn and through movements, one lane shared by through movements and right turns, and one eastbound bicycle lane separated from the adjacent through lane by a painted buffer

The intersection is currently stop-controlled on the northbound and southbound approaches. There are curb ramps at all four corners of the intersection, but no striped crosswalks. Buildings are located directly on the right-of-way lines at both the southwest and southeast corners of the intersection.

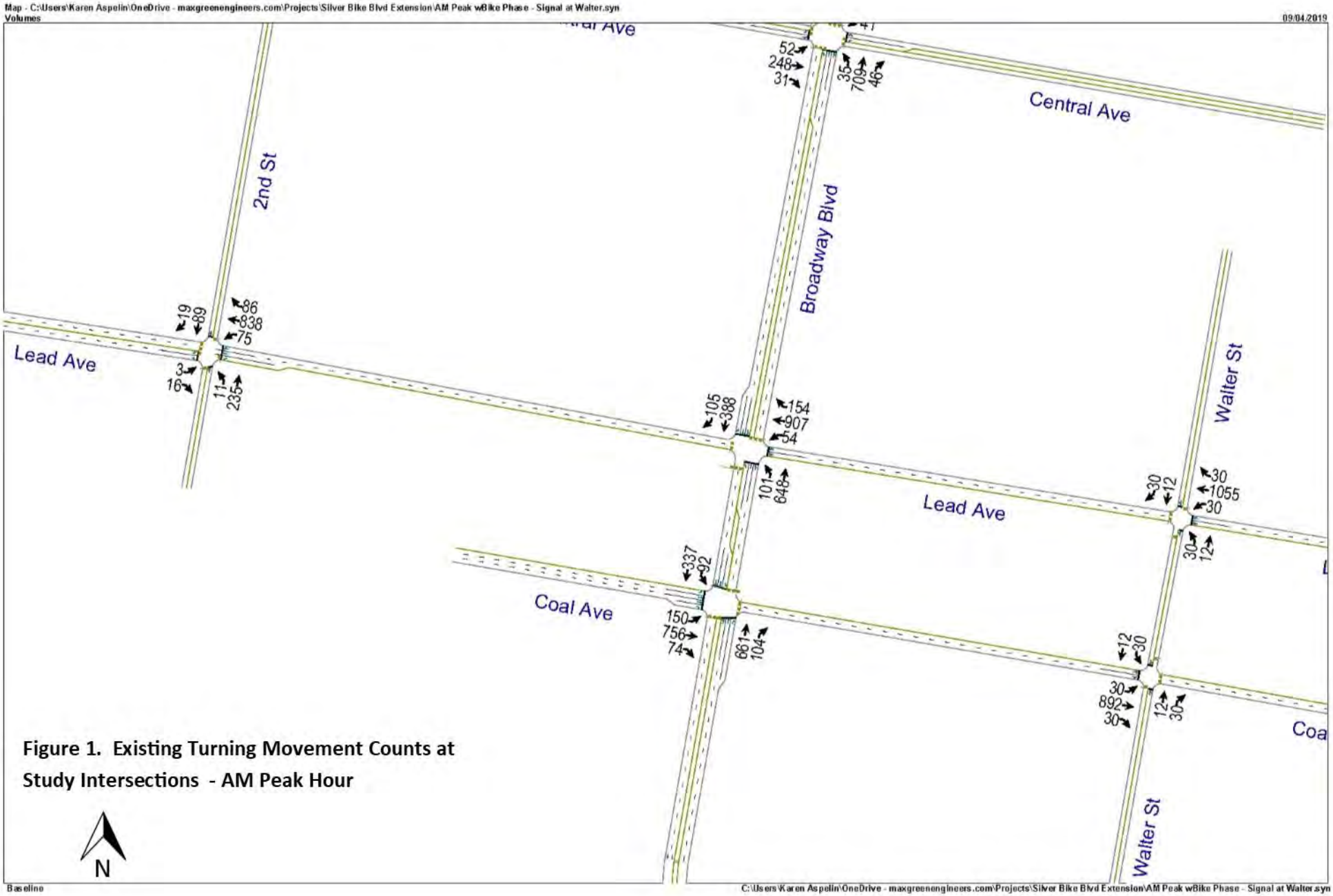


Figure 1. Existing Turning Movement Counts at Study Intersections - AM Peak Hour

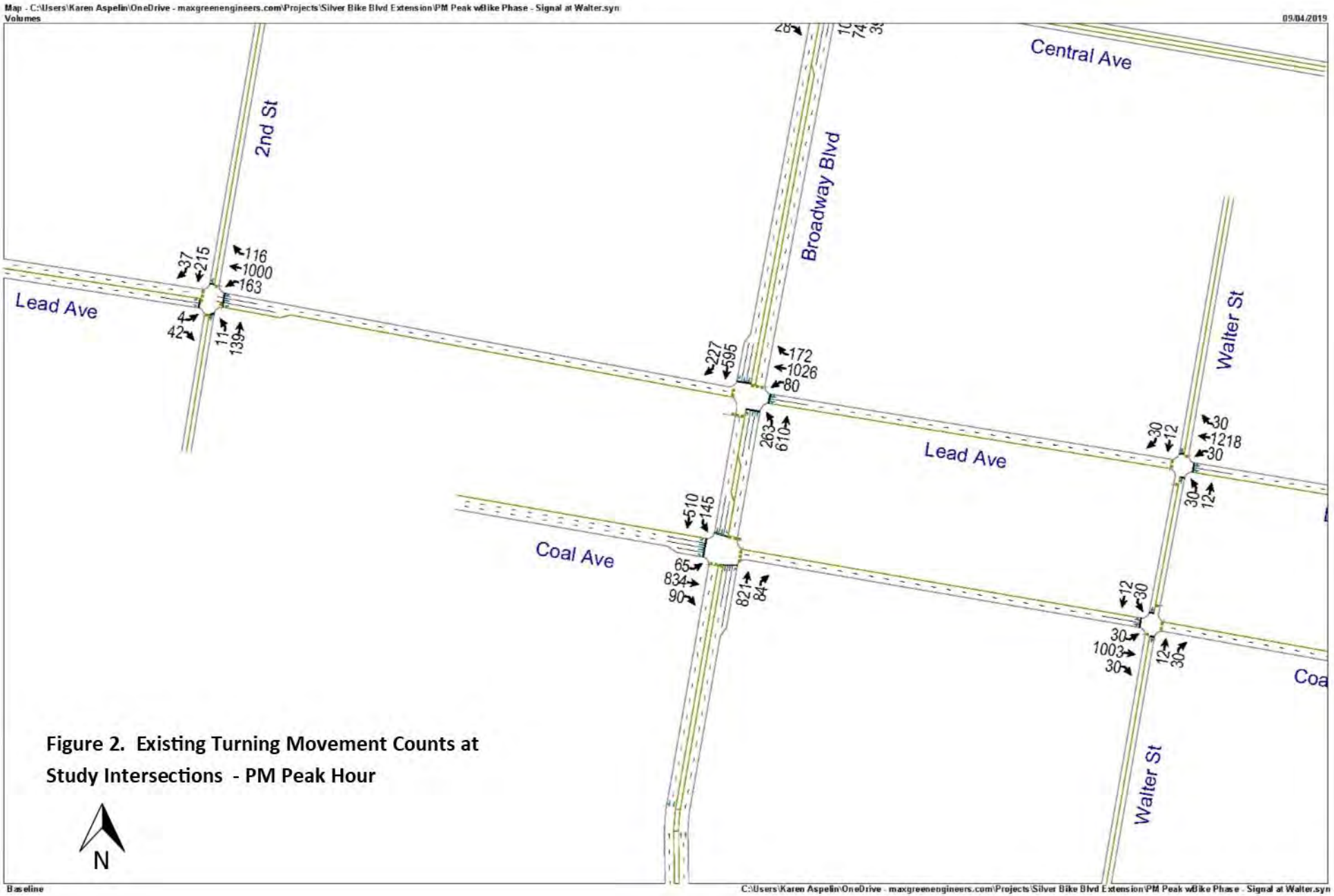


Figure 2. Existing Turning Movement Counts at Study Intersections - PM Peak Hour

Modifications Studied

Under study at these intersections are modifications that would do the following:

Modification 1

This modification would signalize the Lead Ave/Walter Street intersection and Coal Ave/Walter Street intersection. The lane geometry would not change but signalization at each intersection would involve a two-phase cycle serving: 1) northbound and southbound vehicles and pedestrians; 2) eastbound or westbound vehicles and pedestrians. This modification could be made with or without the implementation of any of the others.

Modification 2

This modification would change the lane geometry at the Lead Ave/Broadway Blvd intersection to eliminate the exclusive left-turn lane westbound. This would place moving traffic farther away from the sidewalk and existing building at the southeast corner of that intersection. The new westbound lane geometry would be one lane shared by left-turn and through movements, one through lane, a westbound bike lane, and one right-turn lane. No changes would be made to the signal phasing at the intersection.

Modification 3

This modification would include Modification 2 and would also involve the addition of a leading protected bicycle interval to the signal cycles at Lead Ave/2nd Street and Lead Ave/Broadway Blvd to accommodate a two-way cycle track over the Lead Ave railroad bridge. This concept is shown in Figure 3.

The only changes to the lane geometry at Lead Ave/2nd Street would be to combine the two southbound vehicle lanes into a single right-turn/through lane to allow space for a marked bike box for eastbound bicyclists at the northwest corner of the intersection. While the required lanes for westbound traffic would not change, the lanes would all need to be shifted south to allow space for the two-way cycle track on the north side of the street.

The proposed phasing for the bike signal at **Lead Ave/2nd Street** is shown in Figure 4 and is summarized as follows:

- Phase 1 - A short (assumed 10-second) leading protected bicycle interval would be provided either every cycle (if no way of actuation is provided) or preferably only when actuated (if bicycle detection is installed). This shows the “green bike” to the eastbound bicyclist at the northwest quadrant of the intersection. All other movements are shown a red indication or “Upraised Hand” during this interval, and southbound and westbound right turns are posted prohibited on red.
- Phase 2 – all eastbound and westbound vehicle movements are permitted with a green ball. Bicyclists continue to see the “green bike” and eastbound-westbound pedestrians have the “Walking Person.” Turning vehicles must yield to bikes and peds.
- Phase 4 – all northbound and southbound movements are permitted with a green ball. Northbound and southbound pedestrians have the “Walking Person” indication. Bicyclists waiting at the northwest quadrant to travel eastbound see a “red bike.”

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7500 Jefferson Street, NE Albuquerque, NM 87109
MaxGreen Transportation Engineers

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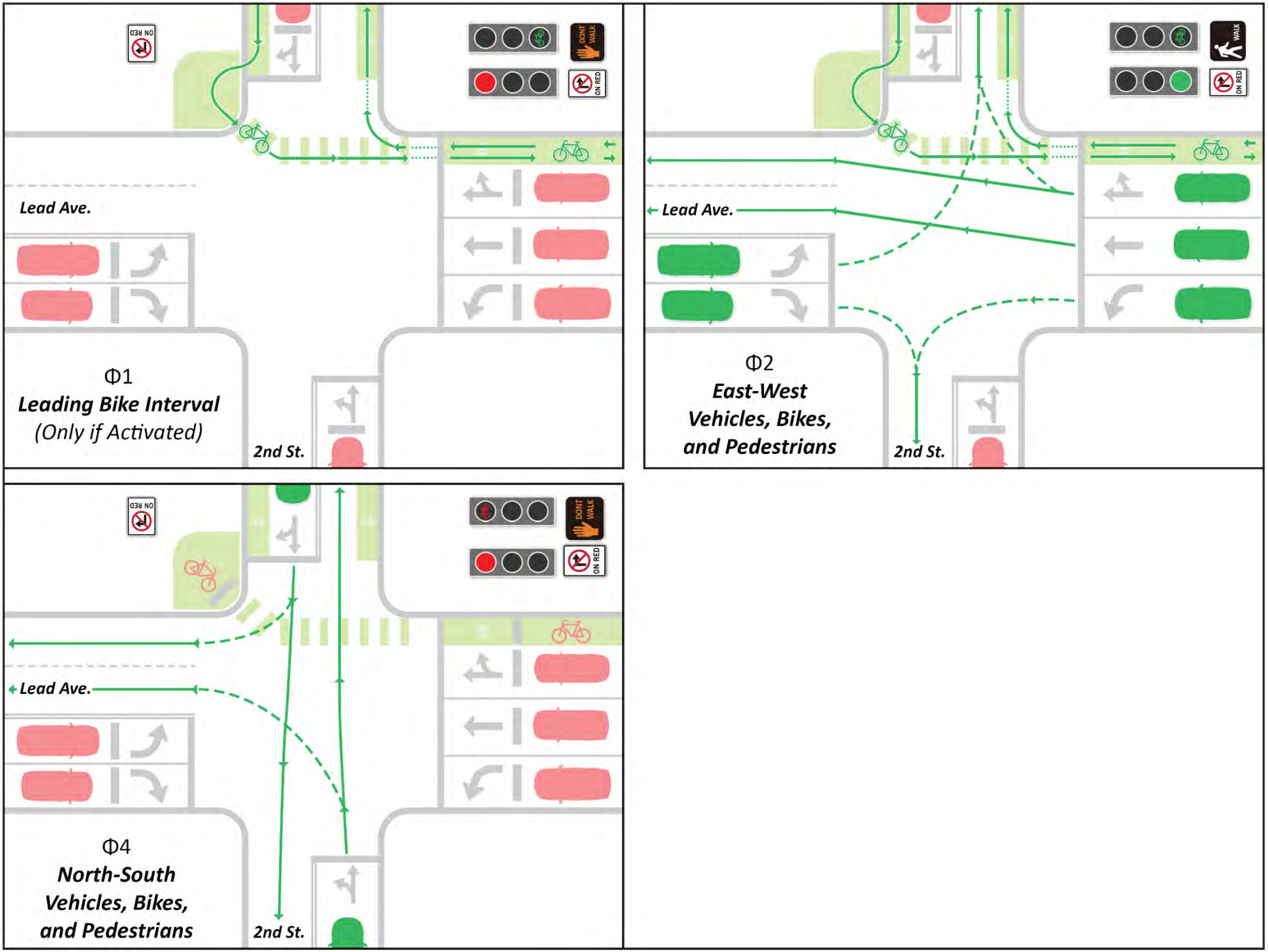

Figure 4. Proposed Phasing for Bike Signal at Lead Avenue/2nd Street

Under Modification 3, additional changes would be required to the lane geometry at Lead Ave/Broadway Blvd. The new lane geometry westbound would be a shared left-turn and through lane, a shared right-turn and through lane, and a two-way cycle track at the eastbound and westbound approaches.

The proposed phasing for the bike signal at **Lead Ave/Broadway Blvd** is shown in Figure 5 and is summarized as follows:

- Phase 1 - A short (assumed 10-second) leading protected bicycle interval would be provided either every cycle (if no way of actuation is provided) or preferably only when actuated (if bicycle detection is installed). Figure 5 shows the "green bike" to the eastbound and westbound bicyclists at the northeast and northwest quadrants of the intersection. All other movements are shown a red indication or "Upraised Hand" during this interval, and southbound and westbound right turns are posted prohibited on red.
- Phase 2 – all westbound vehicle movements are permitted with a green ball. Eastbound and westbound bicyclists crossing the north leg continue to see the "green bike" and eastbound-westbound pedestrians have the "Walking Person," so vehicle turning movements must yield to bikes and peds.
- Phase 7 – if detected by the existing loops, the northbound left-turn movement sees the green left-turn arrow. This phase can overlap with the northbound through-vehicle green ball and "Walking Person" shown across the intersection's east leg. The bike signals at the northwest and northeast corners show a "red bike."
- Phase 4 – all northbound and southbound movements are permitted with a green ball. All northbound and southbound pedestrians have the "Walking Person" indication. The bike signals at the northwest and northeast corners show a "red bike."

Modification 4

Modification 4 incorporates a road diet on Broadway Blvd at its intersection with Lead Ave. This alternative being considered as part of another City study that evaluates a much larger segment of Broadway Blvd.

Modification 5

Modification 5 incorporates both the road diet of Broadway Blvd at its intersection with Lead Ave and the two-way cycle track across the Lead Ave railroad bridge. The road diet allows bike lanes on Broadway Blvd, which in turn allows the eastbound Silver Bike Blvd route to use Broadway Blvd between Lead Ave and Silver Ave rather than Arno Street. This concept is shown in Figure 6 and also includes the changes in lane configuration at the westbound approach of the Lead Ave/Broadway Blvd intersection which are part of Modification 2.

With Modification 5, the proposed phasing for the bike signal at Lead Ave/Broadway Blvd is the same as what was shown for Modification 3 (in Figure 5).

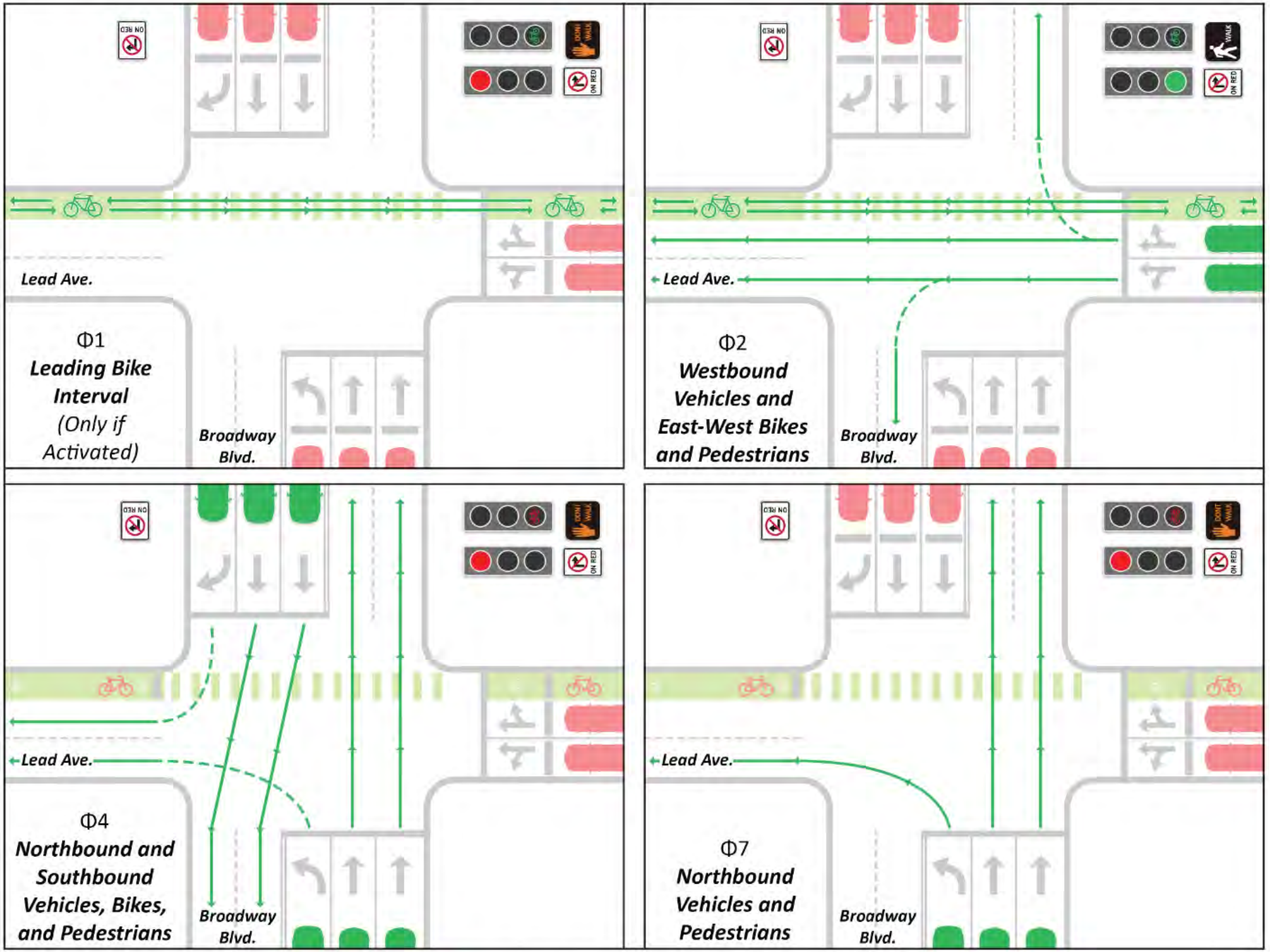

Figure 5. Proposed Phasing for Bike Signal at Lead Avenue/Broadway Boulevard

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MATCHLINE BOTTOM RIGHT, PREVIOUS SHEET

MATCHLINE BELOW LEFT

MATCHLINE ABOVE RIGHT

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Evaluation of Options

Capacity Analysis

Delays and levels of service (LOS) for the above modifications were evaluated at each of the study intersections in the AM and PM peak hours using the existing traffic counts, the existing signal timing plans provided by the City, and methodologies from the 2010 *Highway Capacity Manual* (HCM). Signalized intersection LOS is defined in terms of the control delay for each movement. LOS criteria for signalized intersections are as follows:

Control Delay (sec/veh)	LOS
0 – 10	A
>10 – 20	B
>20 – 35	C
>35 – 55	D
>55 – 80	E
>80	F

While the Synchro 10 software can simulate a pedestrian- (or bicycle-) only phase, the HCM does not have the capability to analyze a leading protected bicycle interval. To simulate this addition to the cycle, the interval was coded as a protected-only Phase 5 (westbound left-turn) with a 10-second recall at each intersection with a bike signal. The results using this assumption would yield a higher delay estimate than would be expected if bike detection is installed. With detection, the interval would be skipped during cycles when no bicyclist is present, decreasing delay for other vehicles at the intersection. Note that the 10-second addition to the cycle length would take the intersections out of coordination with their adjacent intersections when actuated. Tables 1 and 2 show the delays and levels of service estimated for each movement.

The upstream filter factor for a movement considers the volume-to-capacity ratio at the upstream intersection (in this case, the Coal Ave/Broadway Blvd and Central Ave/Broadway Blvd intersections). If these intersections are congested – and in the scenario with a road diet on Broadway Blvd they are both congested – the filter factor accounts for the fact that vehicles are "metered" by those upstream intersections into the subject intersection. This may result in what appears to be less delay in the road diet option than in the scenario where Broadway Blvd has four lanes. The new signal at Lead Ave/Walter Street has some filtering effect on arrivals at Lead Ave/Broadway Blvd, but because the intersection is below capacity the effect is small.

Table 1. AM Peak Hour Delay (sec/veh) and Level of Service

Intersection	Eastbound			Westbound			Northbound			Southbound		
Option	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lead Ave/2nd Street												
Existing conditions	19/B	n/a	9/A	10/B	17/B		14/B		n/a	n/a	12/B	11/B
Mod 3 (bike signal)	29/C	n/a	8/A	15/B	27/C		20/B		n/a	n/a	17/B	
Lead Ave/Broadway Blvd												
Existing conditions	n/a			28/C	48/D	30/C	11/B	26/C	n/a	n/a	14/B	13/B
Mod 2 (WB lane mods)	n/a			72/E		30/C	11/B	26/C	n/a	n/a	14/B	14/B
Mod 3 (WB mods+bike signal)	n/a			F[2]			13/B	14/B	n/a	n/a	18/B	17/B
Mod 4 (Broadway road diet)	n/a			28/C	48/D	30/C	11/B	17/B[1]	n/a	n/a	16/B	13/B
Mod 5 (road diet+bike signal)	n/a			F[2]			14/B	22/C	n/a	n/a	20/C	17/B
Lead Ave/Walter Street												
Existing conditions	n/a			A (free-flow)			22/C		n/a	n/a	19/C	
Mod 1 (signalization)	n/a			8/A			37/D		n/a	n/a	37/D	
Coal Ave/Walter Street												
Existing conditions	A (free-flow)			n/a			n/a	16/C		19/C		n/a
Mod 1 (signalization)	24/C			n/a			n/a	35/C		35/D		n/a

[1]See explanation in text about upstream filter factor effect on results shown for road diet scenarios

[2]Movement is over-capacity; by definition, level of service is F

Table 2. PM Peak Hour Delay (sec/veh) and Level of Service

Intersection Option	Eastbound			Westbound			Northbound			Southbound		
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lead Ave/2nd Street												
Existing conditions	24/C	n/a	10/A	20/B	30/C		14/B		n/a	n/a	14/B	11/B
Mod 3 (bike signal)	31/C	n/a	8/A	17/B	38/D		19/B		n/a	n/a	21/C	
Lead Ave/Broadway Blvd												
Existing conditions	n/a			29/C	63/E	31/C	15/B	12/B	n/a	n/a	21/C	21/C
Mod 2 (WB lane mods)	n/a			F[2]		31/C	15/B	12/B	n/a	n/a	21/C	21/C
Mod 3 (WB mods+bike signal)	n/a			F[2]			19/B	15/B	n/a	n/a	25/C	25/C
Mod 4 (Broadway road diet)	n/a			29/C	63/E	31/C	20/C	1/A[1]	n/a	n/a	27/C	21/C
Mod 5 (road diet+bike signal)	n/a			F[2]			31/C	21/C	n/a	n/a	34/C	25/C
Lead Ave/Walter Street												
Existing conditions	n/a			A (free-flow)			27/D		n/a	n/a	22/C	
Mod 1 (signalization)	n/a			3/A			57/E		n/a	n/a	56/E	
Coal Ave/Walter Street												
Existing conditions	A (free-flow)			n/a			n/a	18/C		21/C		n/a
Mod 1 (signalization)	17/B			n/a			n/a	56/E		57/E		n/a

[1]See explanation in text about upstream filter factor effect on results shown for road diet scenarios

[2]Movement is over-capacity; by definition, level of service is F

Conclusions/Recommendations

Lead Ave/2nd Street Intersection

It will be critical to the good operation of this intersection to have a way to passively detect a bicyclist waiting at the northwest corner for the bike signal. This could be accomplished with thermal imaging or radar detection. While the leading bike interval could be placed on recall (if no detection is installed), displaying the green bike-only interval every cycle with no bicyclists present will lead to driver frustration and disregard for the new installation.

Lead Ave/Broadway Blvd Intersection

It appears that the removal of two lanes from the westbound approach at the Lead Ave/Broadway Blvd intersection puts the intersection over-capacity. Since both through lanes are proposed as shared lanes with turning movements that must yield to pedestrians and bicyclists, westbound through-capacity on Lead Ave is substantially decreased over existing conditions.

The congestion expected to result from a road diet on Broadway Blvd is being addressed as part of a separate City project and may or may not be determined to be acceptable. The removal of lanes on the westbound Lead Ave approach to this intersection and the addition of a bike-only interval would further exacerbate vehicle congestion, at least during the peak traffic hours. At the time of this writing, however, the final design for Broadway Blvd has not been determined.

Given the complexity and range of issues identified at this intersection, further design efforts should be pursued that consider all four legs of intersection. The final design for Lead Ave may consider only closing one of the two turn lanes. Such as design could incorporate other safety countermeasures to protect pedestrians and buildings on the south side of Lead Ave, such as rumble strips and safety railings This design effort may also consider the driver confusion related to parking lane on south side of Lead Ave, as well as countermeasures to address the significant property damage reported related to vehicles turning from Lead to Broadway and hitting buildings.

While the proposed design for the intersection has a LOS F, potential modifications to the final design will need to consider safety for bicyclists and pedestrians, crashes involving impacts with built structures, signal timing, integration with design on Broadway Blvd. For the same reasons stated above for the Lead Ave/2nd Street intersection, it will be crucial to provide bicycle detection if the bike signal is implemented.

Lead Ave/Walter Street Intersection

The new signal at Lead Ave/Walter Street may have some filtering effect on arrivals at Lead Ave/Broadway Blvd, but because the intersection is below capacity the effect would be small. Much of the effect that this new signal would have on the downstream intersection at Broadway Ave will be dependent on what type of detection is installed and how the signal is programmed.

Coal Ave/Walter Street Intersection

Structures are located at both the southwest and southeast corners of the Coal Ave/Walter Street intersection. Finding space to place the required traffic signal equipment may be challenging.

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