

NM599 RE-PRIORITIZATION PLAN • FINAL REPORT • CNS100490



FOR



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Administration**

SUBMITTED BY:



WITH:

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NM 599 Re-Prioritization Plan

Final Report

CN S100490

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Executive Summary

NM 599 (Veterans Memorial Highway) serves as a route for regional traffic whose destination is not Santa Fe and provides local access for north Santa Fe to connecting facilities including I-25 to the south and US 285/US 84/St. Francis Drive to the north. The facility still serves as a Waste Isolation Pilot Project (WIPP) route transporting low-level nuclear waste from various sites to the Waste Isolation Pilot Project facility just east of Carlsbad, NM. NM 599 provides access to several local land uses including the following:

- Santa Fe Municipal Airport
- Various residential developments north and south of NM 599
- Various recreational land uses along the corridor including several hiking and biking trails

The NM 599 is also intended to provide congestion relief for both St. Francis Drive and Cerrillos Road.

A. Purpose & Need

The need for this re-prioritization study is similar to that of the original study; namely, the NM 599 relief route was constructed to ultimately be an access-controlled freeway facility with interchange access. The NM 599 facility currently has a mix of freeway and arterial characteristics with both interchanges and at-grade intersections. This mixture of facility types leads to increased risk for crashes, large variances in operating speeds, and mixed driver perceptions on how to negotiate the facility. This is especially true for drivers who are using the facility as a bypass, as these drivers may not be as familiar with the facility as local drivers. Since regional model traffic demand projections are much less aggressive than they were ten years ago when the original study was conducted, capacity and connectivity needs are much less urgent than what was shown in the original prioritization study. Therefore, the main needs for this corridor are to improve safety and ultimately usher this corridor toward its final limited-access configuration. To do this, this project will take the following approach:

1. Assessment of existing traffic operations and safety.
2. Projection of 2040 traffic demands under “No-Build” conditions based on the latest Santa Fe Metropolitan Planning Organization (SFMPO) regional model inputs, projected road network, and economic development.
3. Assessment of traffic operations under 2040 “No-Build” conditions.
4. Safety assessment of the 2040 “No-Build” condition applying 2010 Highway Safety Manual (HSM) methodology by applying the Interactive Highway Safety Design Model (IHSDM) software to predict future crash rates.

5. Development and assessment of potential interim design alternatives at each at-grade intersection location that could be implemented in the short- to mid-term to reduce predicted crashes.
6. Review and refinement, if needed, of the proposed alternatives in the original prioritization study.
7. Assessment of potential interim and ultimate design alternatives for traffic operations and predicted safety.
8. Building of a matrix to update the 2010 priority plan for the corridor.
9. Providing updated interchange priority rankings.

B. Evaluation of Alternatives

A detailed design alternative analysis for each potential interchange location identified in the original study was completed for this study. Alternative design analyses for this re-prioritization study includes a review of potential impacts of the ultimate interchange configuration as well as potential interim projects that could be put in place prior to the ultimate design. These assessment areas include the following:

1. Traffic Operations – A review of level of service and traffic capacity based on principals of the Highway Capacity Manual.
2. Safety – A comparison of predicted crashes and crash rates between alternatives using the 2010 HSM predictive method and the IHSDM software.
3. Connectivity – A review of access, available routes, and presence of out of way pathing.
4. Constructability – A review of design and construction challenges including construction phasing, grading challenges and impact on traffic operations during construction.
5. Right-of-Way – A review of the need, if any, for additional right-of-way. It should be noted that the right-of-way necessary to construct interchanges has already been purchased at most locations.
6. Construction Cost – Planning-level construction cost estimates of the build alternatives.
7. Interim Alternatives – Identification of interim construction projects that could provide safety improvements until funding for the ultimate configuration can be secured.

Most preferred alternatives from the original 2010 Priority Study were carried forward into this Re-prioritization Study with some refinements at certain locations.

C. Project Re-Prioritization

Based on the alternatives analysis contained herein, the priority of interchange projects along NM 599, and the estimated construction cost of each, is as follows:

- | | |
|---------------------------|--------------|
| 1. Via Veteranos (CR 70) | \$7,650,000 |
| 2. Camino de Los Montoyas | \$10,220,000 |
| 3. Airport Road | \$11,640,000 |



4. West Frontage Road	\$6,430,000
5. Ephraim Road	\$8,000,000
6. Caja Del Rio	\$8,130,000

If private funding is proposed for one of the above locations and is needed due to adjacent development, construction of that interchange could be made a higher priority.

D. Interim Project Options

Interim alternatives were reviewed and assessed at all locations to provide more short-term safety benefits. Two options combining several of these interim alternatives have been described within this report with both providing significant crash reductions in the interim before full interchanges can be constructed. While both options will provide crash reduction benefit, one option, which includes limiting left-turns from Via Veteranos and Camino de Los Montoyas, provided the greater crash reduction to construction cost ratio.



1.0 Introduction

NM 599 (Veterans Memorial Highway) serves as a route for regional traffic whose destination is not Santa Fe and provides local access for north Santa Fe to connecting facilities including I-25 to the south and US 285/US 84/St. Francis Drive to the north. The facility still serves as a Waste Isolation Pilot Project (WIPP) route transporting low-level nuclear waste from various sites to the Waste Isolation Pilot Project facility just east of Carlsbad, NM. A vicinity map is provided in Figure 1 and depicts the study corridor and surrounding area. NM 599 provides access to several local land uses including the following:

- Santa Fe Municipal Airport
- Various residential developments north and south of NM 599
- Various recreational land uses along the corridor including several hiking and biking trails

NM 599 is also intended to provide congestion relief for both St. Francis Drive and Cerrillos Road.

A. Past Studies

Phase A Study

Due to past safety concerns and changing regional traffic demands, the New Mexico Department of Transportation (NMDOT) commissioned a study of the NM 599 corridor per procedures in the NMDOT Location Study Procedures Manual. A Phase A study was completed in September 2009 and the result of that study was the identification of viable design alternatives to achieve the purpose and needs of the NM 599 corridor. The executive summary of the NM 599 Phase A study is provided in **Appendix A**.

Prioritization Study

Upon completion of the 2009 Phase A study, a prioritization study was commissioned to conduct a detailed analysis of each viable alternative identified in the Phase A study, to identify a preferred alternative for each existing at-grade intersection along the corridor, and to prioritize each alternative considering capacity, safety, connectivity, environmental impact, and right-of-way needs. The executive summary of the original prioritization study, which was completed in spring of 2010, is provided in **Appendix A**.

B. Current Study

The NMDOT wanted to re-study and re-prioritize preferred improvements along the corridor due to the following:

- There has been a significant reduction in projected traffic demand and development growth in the Santa Fe Metropolitan Planning Organization (SFMPPO) regional model compared to what was projected in the original 2010 study.
- Since the last study there have been several significant crashes, including two fatal crashes occurring at the Via Veteranos intersection.
- Since the 2010 study there have been significant advances in the assessment of safety. Specifically, the 2010 Highway Safety Manual has been published providing a predictive method to determine expected numbers of crashes based on traffic demands and lane geometry. Additionally, the impact of a particular road improvement on predicted crashes for a given facility can be determined through the use of crash modification/crash reduction factors.
- Some improvements have been made along the corridor since the original study including the construction of a new interchange at Jaguar Road and Meadows Road (County Road 62).

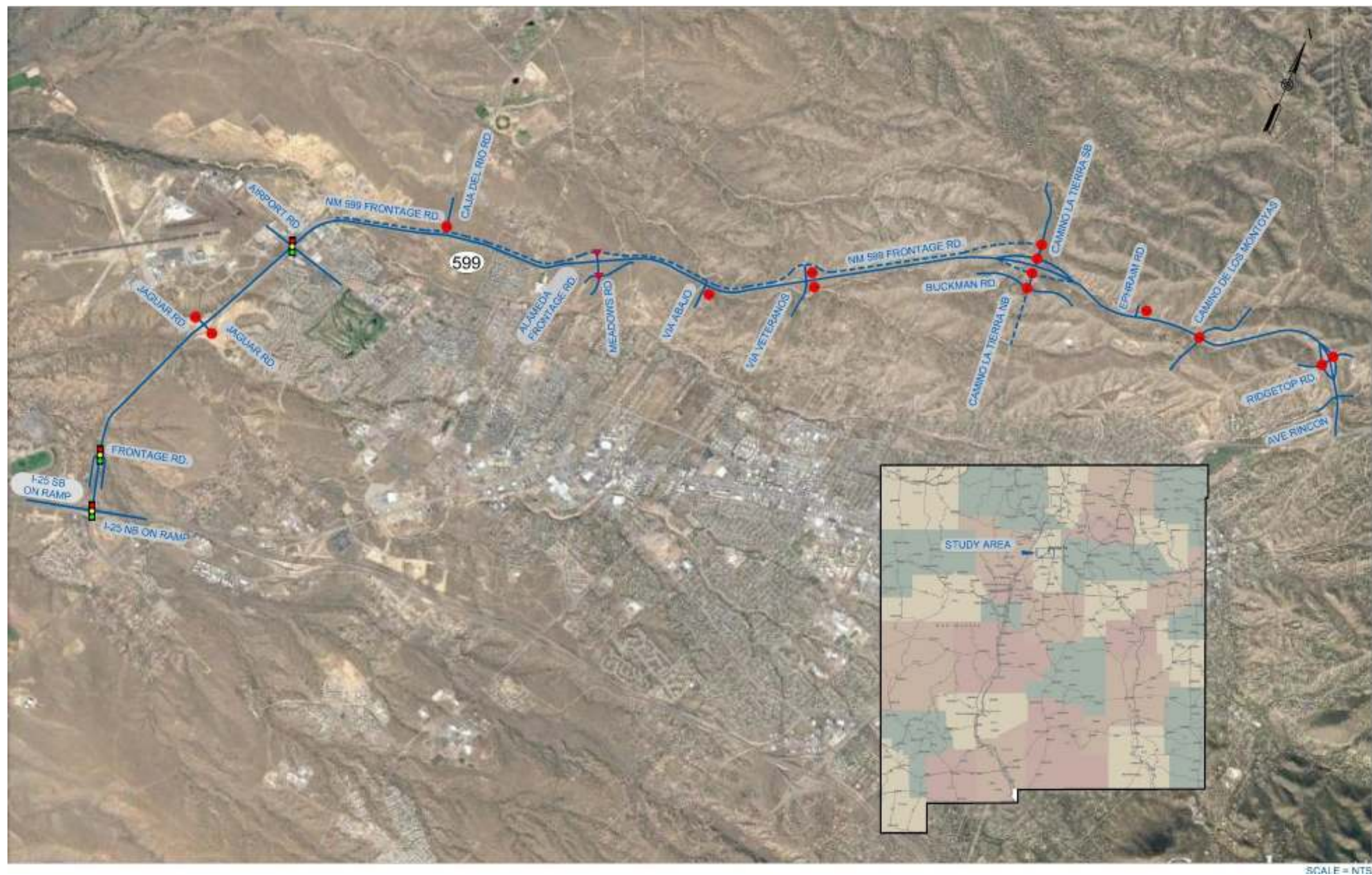


Figure 1 Project Area

2.0 Purpose and Need

A. Project Need

The need for this re-prioritization study is similar to that of the original study; namely, the NM 599 relief route was constructed to ultimately be an access-controlled freeway facility with interchange access. As shown in Figure 2, the NM 599 facility currently has a mix of freeway and arterial characteristics with both interchanges and at-grade intersections. This mixture of facility types leads to increased risk for crashes, large variances in operating speeds, and mixed driver perceptions on how to negotiate the facility. This is especially true for drivers who are using the facility as a bypass, as these drivers may not be as familiar with the facility as local drivers. Since regional model traffic demand projections are much less aggressive than they were ten years ago when the original study was conducted, capacity and connectivity needs are much less urgent than what was shown in the original prioritization study. Therefore, the main needs for this corridor are to improve safety and ultimately usher this corridor toward its final limited-access configuration. To do this, this project will take the following approach:

1. Assessment of existing traffic operations and safety.
2. Projection of 2040 traffic demands under “No-Build” conditions based on the latest SFMPO regional model inputs, projected road network, and economic development.
3. Assessment of traffic operations under 2040 “No-Build” conditions.
4. Safety assessment of the 2040 “No-Build” condition applying 2010 Highway Safety Manual (HSM) methodology by applying the Interactive Highway Safety Design Model (IHSDM) software to predict future crash rates.
5. Development and assessment of potential interim design alternatives at each at-grade intersection location that could be implemented in the short- to mid-term to reduce predicted crashes.
6. Review and refinement, if needed, of the proposed alternatives in the original prioritization study.
7. Assessment of potential interim and ultimate design alternatives for traffic operations and predicted safety.
8. Building of a matrix to update the 2010 priority plan for the corridor.
9. Providing updated interchange priority rankings.

B. Statement of Purpose and Need

The purpose of this study is to update the original prioritization plan based on the latest traffic demands, updated road conditions, and the 2010 HCM methodology of crash prediction. The goals of this project are not only to update which at-grade intersections are priority for construction of the ultimate design alternative, but also provide some

interim design options that may also achieve crash reduction along the corridor in the short-term until funding, which has been relatively constrained in recent years, can be available to implement the ultimate corridor configuration. These goals could be achieved by restricting minor street movements, providing dilemma zone protection, implementing peak hour protected-only left-turns at signalized intersections, and eliminating at-grade intersections altogether.

3.0 Stakeholder Participation

The NM 599 facility is one which impacts many stakeholders across several agencies and their citizens. These include the NMDOT, the City of Santa Fe, Santa Fe Municipal Airport, Santa Fe County, Santa Fe Parks and Recreation, SFMPO, and the Department of Energy (WIPP). Therefore, it was important to get input and feedback into this re-prioritization process. With that in mind, a stakeholder meeting and an interchange workshop were planned and facilitated during the course of this study.

A. Stakeholder Meeting

A stakeholder meeting was held September 6, 2017, to present the stakeholders with the purpose and need of the project, existing conditions of the NM 599 corridor, the approach to the safety analysis, and the project schedule. At the end of the presentation portion of the meeting, a group discussion was encouraged to discuss the needs and wants for the corridor from the stakeholders’ perspectives. In summary, one of the greatest concerns from the City of Santa Fe, Santa Fe County, NMDOT and SFMPO was the recent fatalities that have occurred at the Via Veteranos stop-controlled at-grade intersection. Detailed stakeholder meeting notes are provided in **Appendix B** documenting feedback, questions, and concerns for the corridor.

B. Interchange Workshop

On October 11, 2017, an interchange workshop was held with a representative from each of the NM 599 stakeholders who attended the September 6 stakeholder meeting. The goal of the workshop was the following for each current at-grade intersection or planned interchange location:

1. Present both interim and ultimate design alternatives.
2. Provide capacity analysis and predicted crash rate data.
3. Present constructability and design challenges of each alternative.
4. Provide a planning-level cost estimate for each alternative.
5. Facilitate a roundtable discussion from each of the stakeholder attendees.
6. Summarize potential combinations of interim design alternatives.

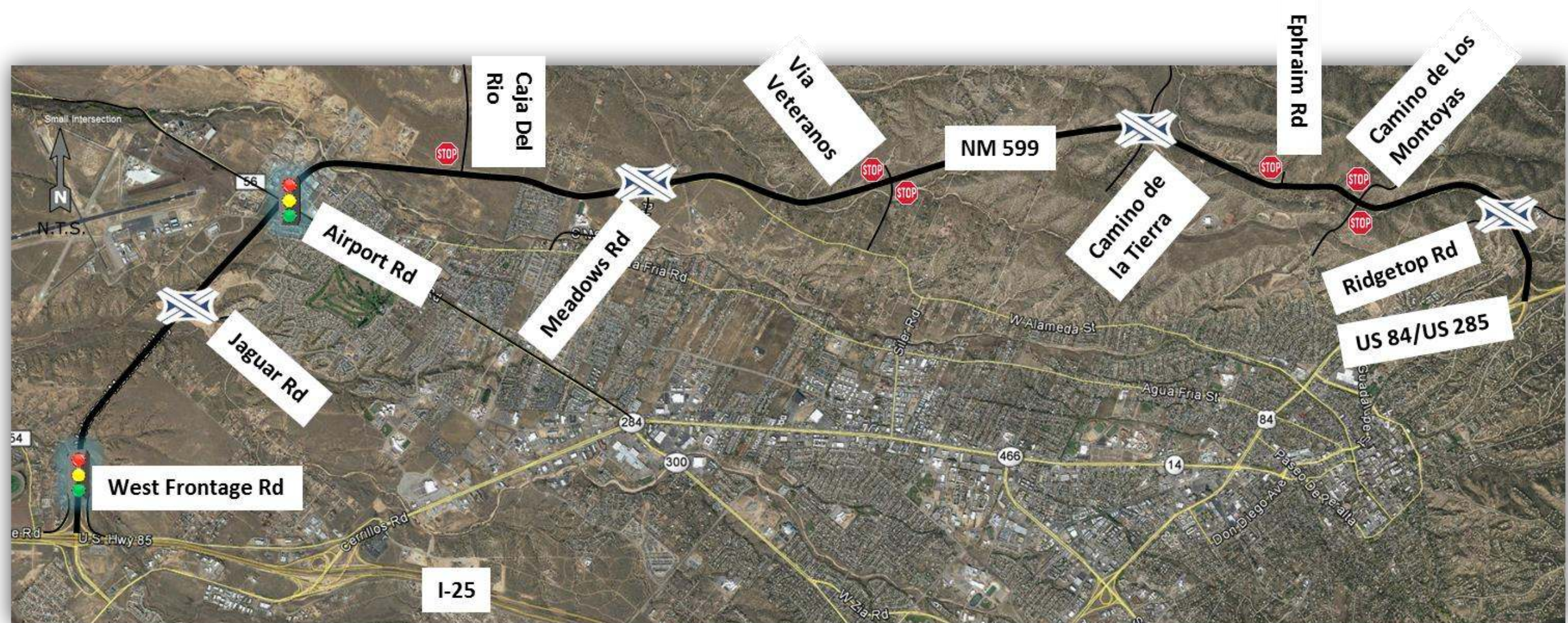


Figure 2 Current Interchange and At-Grade Intersection Locations along NM 599

More detailed meeting notes documenting questions, comments, and feedback are provided in **Appendix B**.

5. Existing Conditions

A. Overall Corridor Conditions

Currently, NM 599 is a four-lane divided highway with two 12-foot through lanes in each direction, an approximately 40-foot non-raised median, outside shoulders varying from six to 14 feet, and four-foot inside shoulders. As shown in Figure 3, there are existing interchanges at the following locations:

- Jaguar Road (constructed in 2015 and opened to traffic in November 2017)
- Meadows Road (County Road 62, constructed in 2013)
- Camino La Tierra (existed in original 2010 study)
- Ridgetop Road (existed in original 2010 study)

As noted, both Jaguar Road and Meadows Road interchanges have been constructed since the original 2010 study. The Jaguar Road interchange has only recently been built and opened to traffic, in November 2017. The Meadows Road interchange incorporates roundabout control at both ramp terminals. The Jaguar Road interchange was privately funded by the adjacent developer and the Meadows Road interchange was publicly funded under CN 5100390 as well as federal sources.

The NM 599 facility still has at-grade intersections at the following locations:

- West Frontage Road (currently signal control)
- Airport Road (currently signal control)
- Via Veteranos (currently two-way stop control on the Via Veteranos approaches)
- Ephraim Road (currently stop control with right-in/right-out access)
- Camino De Los Montoyas (currently two-way stop control on the Camino De Los Montoyas approaches)

There are segments of two-lane, two-way, undivided frontage roads located north and south of NM 599. The North Frontage Road runs from just north of the Santa Fe River bed to the Camino La Tierra interchange. Alameda Street serves as a frontage road on the south side of NM 599 running from the Meadows Road interchange but separating from the NM 599 facility approximately halfway between the Meadows Road interchange and the Via Veteranos intersection. Buckman Road also serves as a frontage road on the south side of NM 599 running from just west of the Camino La Tierra interchange to the Camino De Los Montoyas interchange.

Speed limits along the NM 599 study corridor vary from 45 MPH to 65 MPH with speed limits graphically depicted in Figure 3.

B. Future Developments and Projects

Currently, there are some projects in development that could be constructed within the next couple of years. These projects include the following known at the time of this report:

Jaguar Road Interchange

This facility was constructed by a private developer as part of off-site improvement requirements for the Village Plaza development. The Village Plaza development is expected to bring over 250,000 square feet of commercial retail and mixed-use development to southwest Santa Fe. The interchange has been opened as of late November 2017. This interchange will not only provide access to NM 599 for the proposed Village Plaza development, but also the Tierra Contenta neighborhood and SWAN Park. It also provides a new access point to the Santa Fe Municipal Airport.

Via Veteranos Reconstruction

Due to crash fatalities occurring at the Via Veteranos at-grade intersection within the past two years, the NMDOT is in the process of redesigning the Via Veteranos intersection to eliminate left-turn and through movements from both of the Via Veteranos approaches. Only right-in/left-in/right-out turn movements would be allowed once construction of this project is completed. The goal of this project is to eliminate the highest crash-risk movements, the minor street left-turn and through movements which have led to the recent crash fatalities. This project is currently at the 60% design phase. The proposed plans per the 30% design are shown on page 52. Although this project is in the process of design, currently there is no construction funding and therefore it is unknown when construction of this improvement will start.

Plaza la Tierra Development

The developer of Las Campanas master plan community is planning to subdivide 304 acres at the northeast and northwest quadrants of the La Tierra interchange into a residential and commercial center. Plaza La Tierra is currently being presented as a development with 250 residential units and 20,000 square feet of commercial space on both sides of Camino La Tierra north of NM 599.

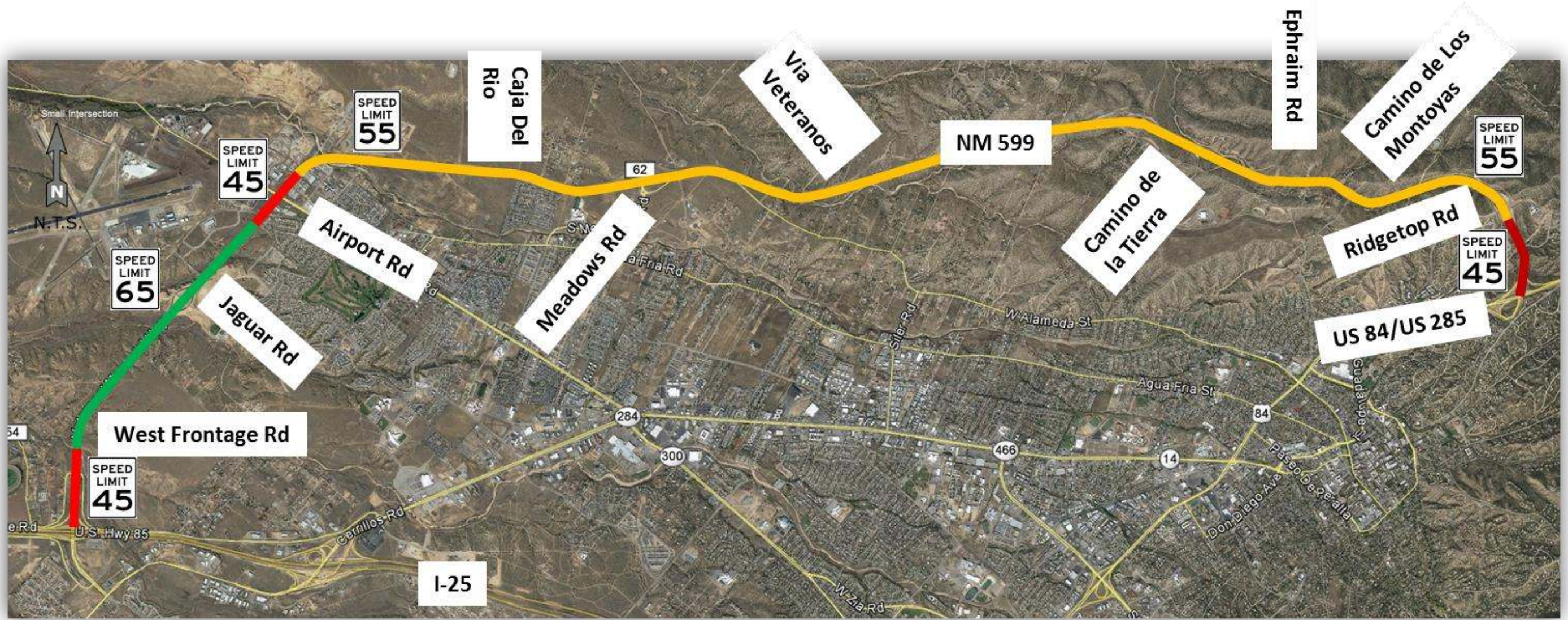


Figure 3 Current Posted Speed Limits along NM 599

interchange north of NM 599. However, this development will require a change in zoning which will be either approved or rejected in early 2018. Therefore, at this time it is unknown when this development will be constructed.

US 285 Ramp Project

The NMDOT is in the process of redesigning the eastbound-to-southbound on-ramp from NM 599 to US 285. Improvements include the lengthening of this on-ramp and have recently completed 60% design. Final plan production was expected to be completed at the end of 2017 with construction following some time in 2018; however the schedule is in the process of changing.

The Legacy of Santa Fe Retirement Center

A retirement center has recently been constructed north of NM 599 at the intersection of Avenida Aldea and Camino Botanica, approximately midway between the Via Veteranos intersection with NM 599 and the Camino La Tierra interchange. The project includes 84 retirement living units offering a mix of limited assistance, traditional assistance, and memory care. The facility also will house a restaurant, a movie theater, a general store, a gym, and a library.

The Place at Caja Del Rio

Another retirement complex is being planned to break ground this spring near the NM 599 corridor along Caja del Rio Road. The Place at Caja del Rio has been given full development approval by the Santa Fe County Commission and is expected to be completed in several phases over the next five years. The first phase will open in 2021 and will have 180 units for independent living, 200 for assisted living, 120 skilled nursing beds, and 80 units for memory care.

C. Traffic Analysis of Existing Conditions

Data Collection

Data collection for this project included the following:

- 1. NMDOT provided 24-hour counts at all ramps
- 2. NMDOT provided 24-hour counts along NM 599
- 3. The consultant team collected 12-hour turning movement counts at the study intersections
- 4. The consultant team collected spot speed data at five locations along NM 599
- 5. NMDOT provided data for the years 2013 through 2015 for crashes occurring within the project area

Twenty-Four Hour Data Collection

NMDOT completed all 24-hour ramp counts between April and July of 2017. AM and PM peak hour ramp volumes for all existing interchanges including the directional ramps between NM 599 and US 285 and all on- and off-ramps at I-25, Meadows Drive, Camino La Tierra and Ridgetop Road are provide in **Appendix C**. Twenty-four hour average daily traffic volumes (ADTs) collected in 2015 were also provided by the NMDOT via their permanent and temporary count stations.

Daily traffic volumes on NM 599 range from 10,000 vehicles per day (vpd) between Meadows Road and Via Veteranos to 16,000 vpd between Ridgetop Road and US 285. Side street ADTs range from 1,124 vpd on Meadows Road up to 17,160 vpd at Airport Drive. It should be mentioned that overall traffic demands along NM 599 have remained relatively steady since 2010, fluctuating between a slight increase and decrease. This is reflected in Table 1, which presents data from the SFMPO website collected from NMDOT and SFMPO permanent count stations within the Santa Fe metropolitan area.

Table 1 Historical ADTs (2010 to 2015, in vehicles per day) on NM 599 and Major Corridors in Santa Fe

Location	2010	2011	2012	2013	2014	2015
NM 599 (North of I-25 & South of Airport)	11,342	11,037	11,407	11,568	11,766	11,281
Cerrillos Road (North of Alta Vista)	32,489	28,903	30,819	31,760	32,053	32,149
St. Francis Dr. (Between Alta Vista and Cordova)	41,833	42,162	40,415	41,085	41,939	39,353
St. Francis Dr. (Between Zia Rd. and Siringo Rd.)	45,784	45,212	43,507	43,714	43,799	44,703

As shown, traffic demands throughout the Santa Fe region have not grown significantly since 2010 and in some cases, demands appear to have reduced slightly.

Turning Movement Counts

Lee Engineering counted 12-hour turning movement volumes at the study intersections during the timeframe of February 28 to April 13, 2017. Each intersection was counted from 6:00 AM to 6:00 PM on a Tuesday, Wednesday, or Thursday. Raw data sheets can be found in **Appendix C**, and AM and PM peak hour turning movement counts at all study intersection are shown in Figure 4, Figure 5, and Figure 6. The heaviest turning movement volumes occurred at the NM 599/West Frontage Road and NM 599/Airport Road intersections; lighter turn movement volumes were counted at the study intersections east of Airport Road.



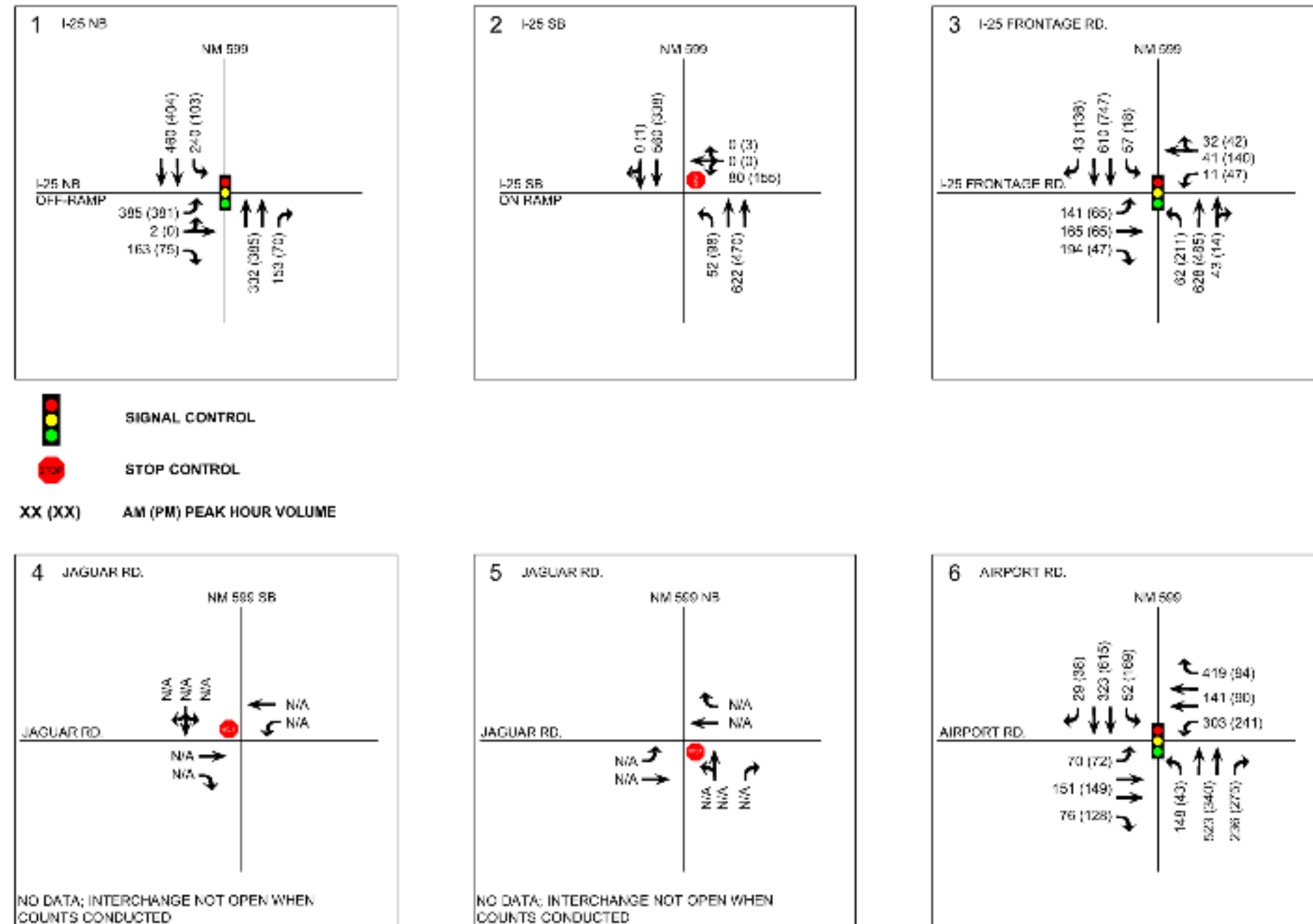
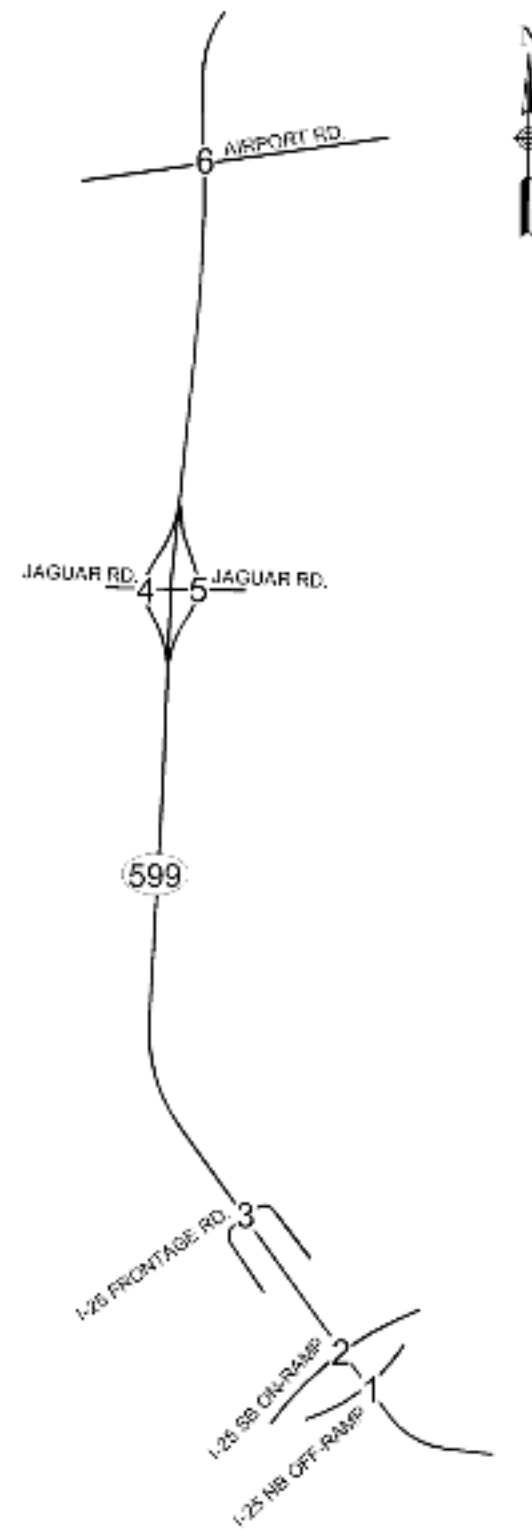


Figure 4 2017 AM and PM Peak Hour Turning Movement Counts (I-25 to Airport Road)

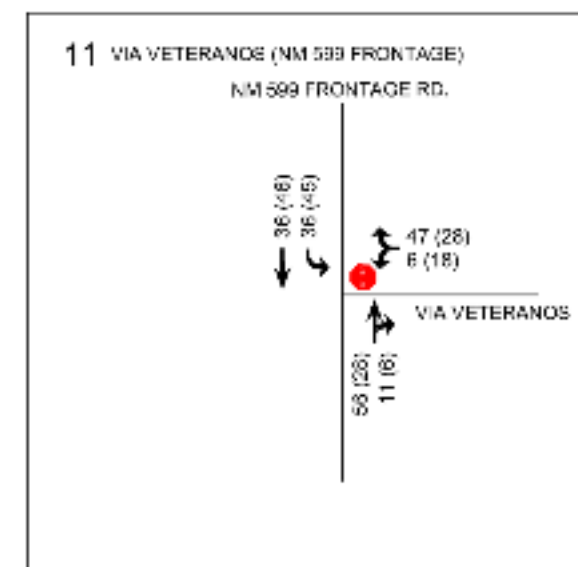
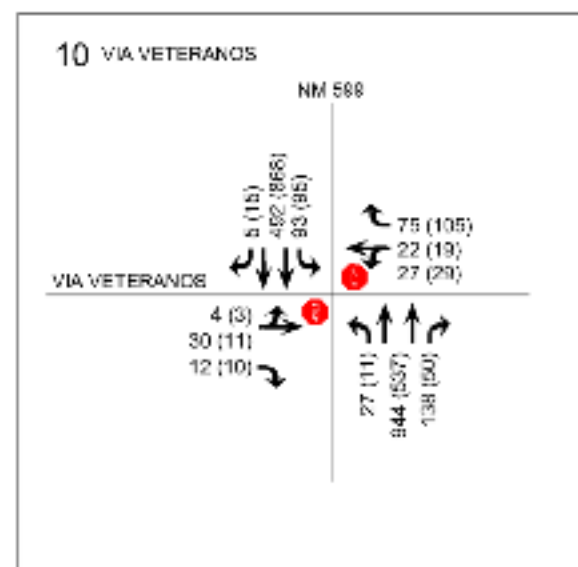
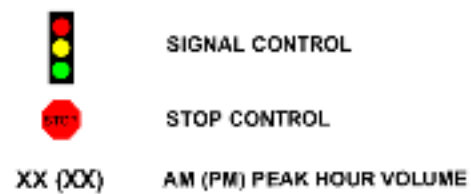
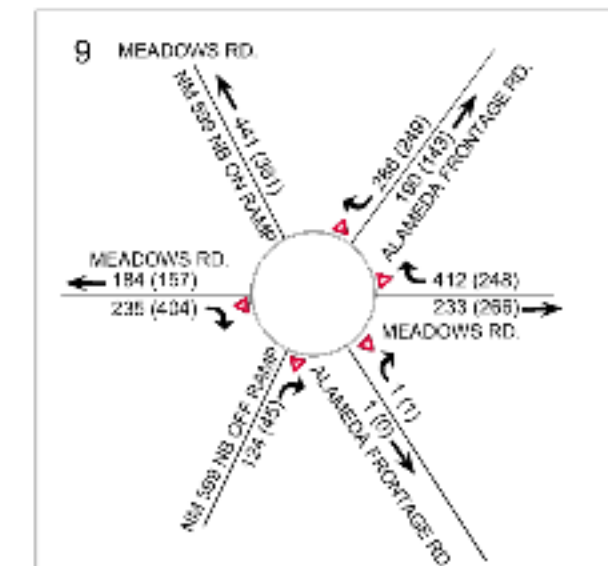
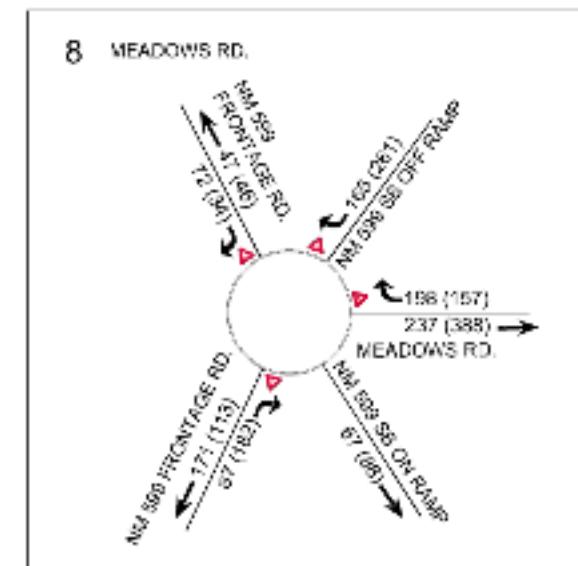
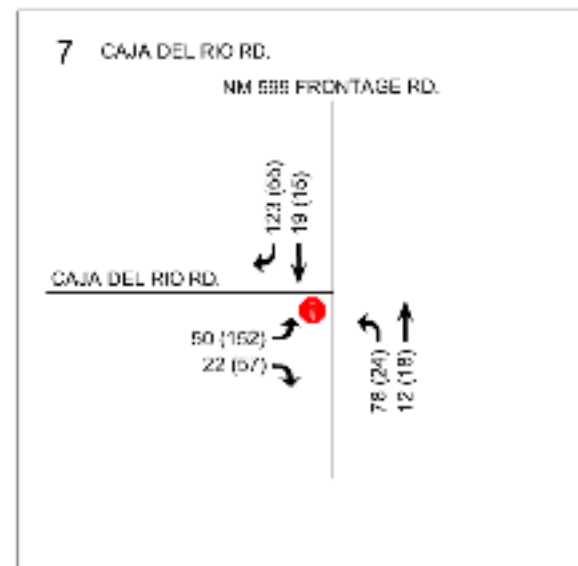
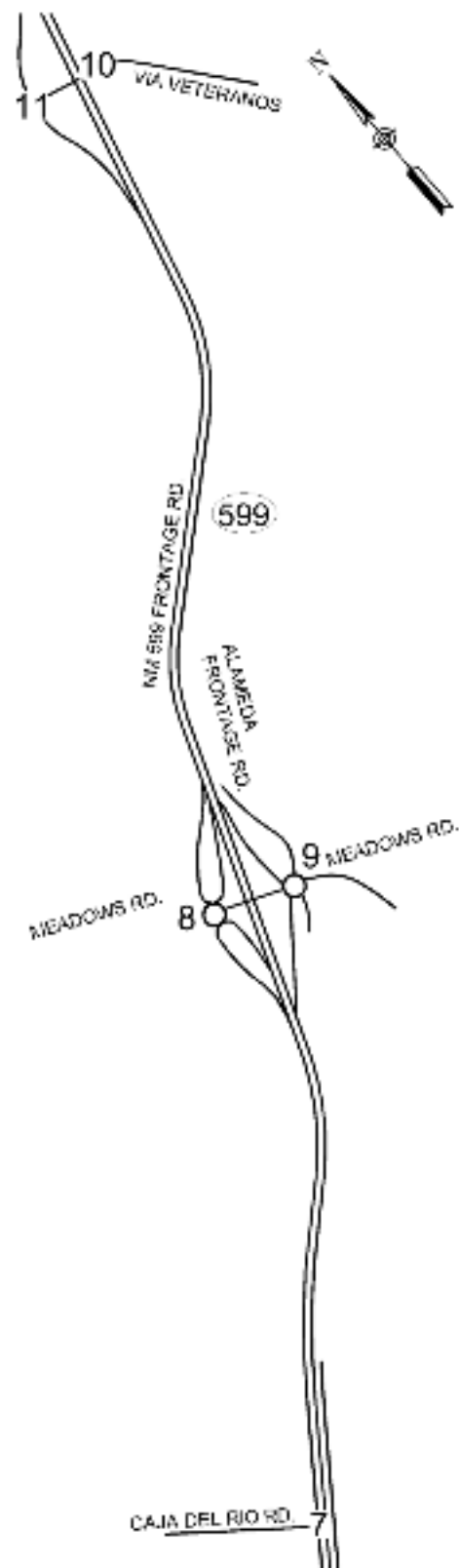


Figure 5 2017 AM and PM Peak Hour Turning Movement Counts (Caja Del Rio to Via Veteranos)

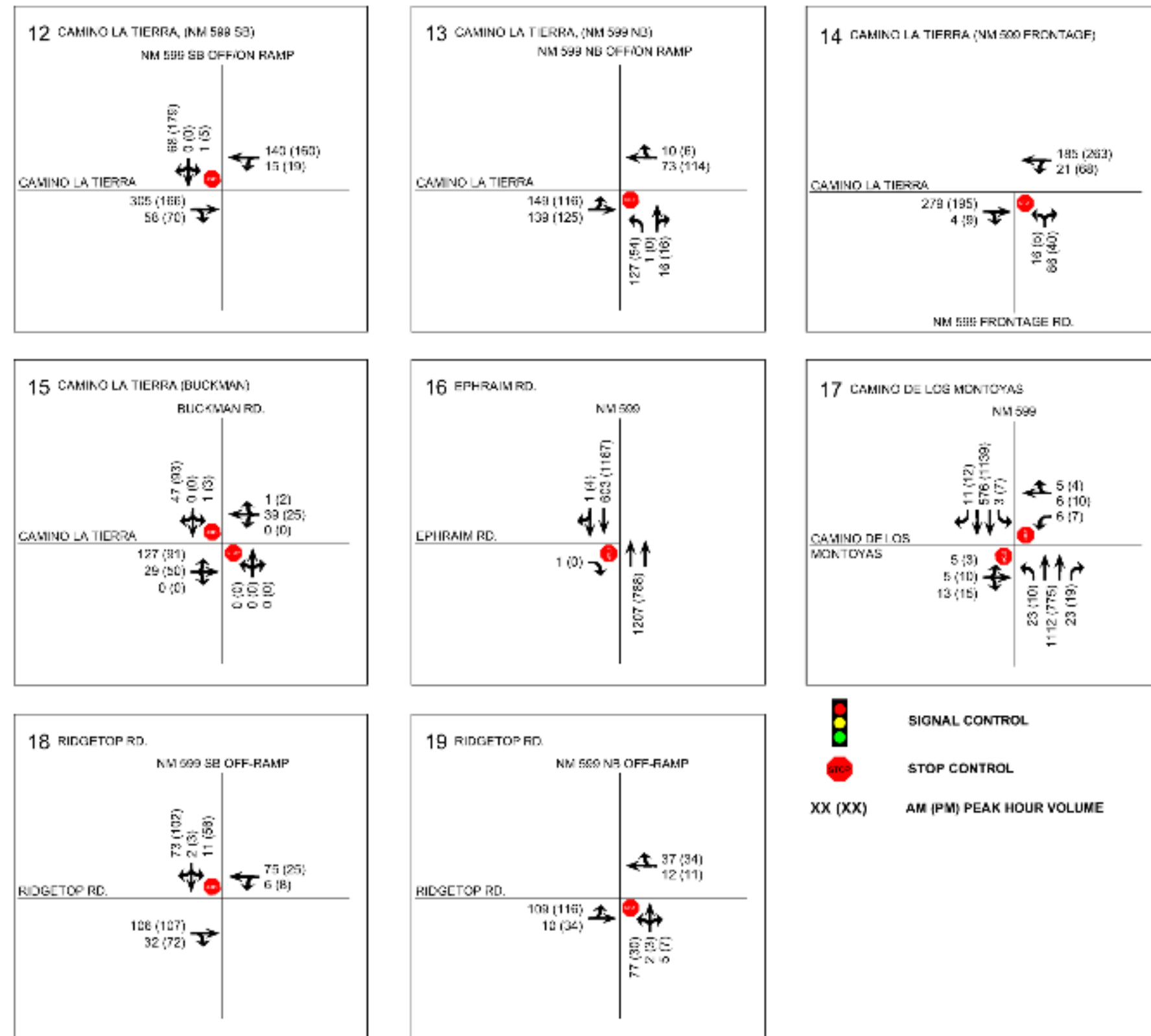
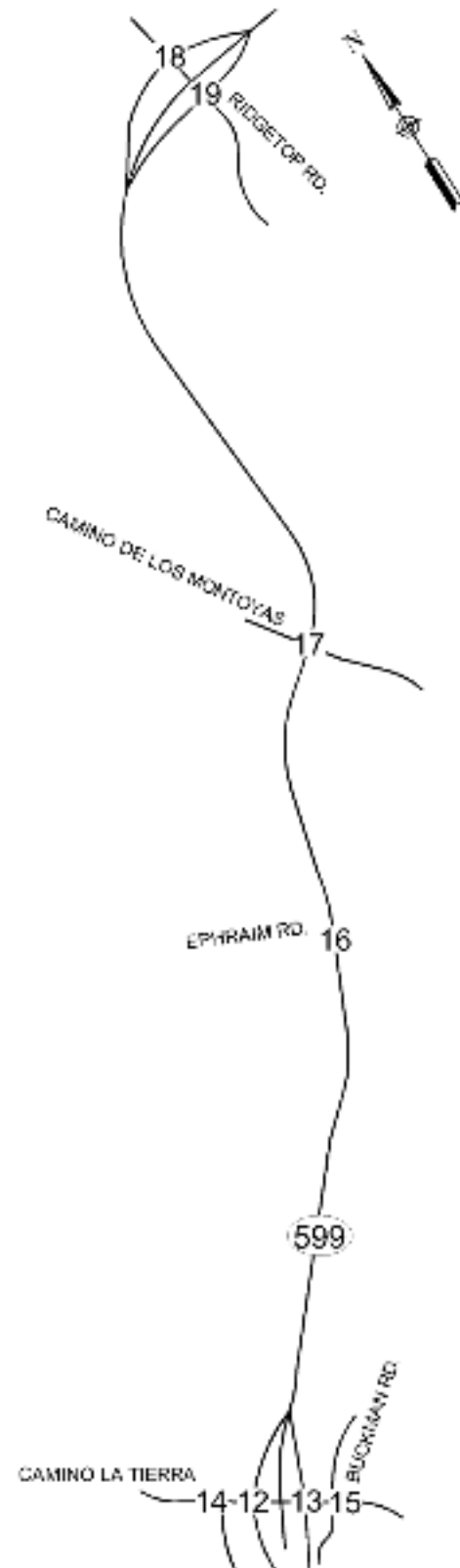


Figure 6 2017 AM and PM Peak Hour Turning Movement Counts (Camino La Tierra to Ridge Top)

Speed Data

Speed data were collected along NM 599 in April 2017 at the following locations:

- 1. North of the I-25 Frontage Road intersection
- 2. Just east of Caja Del Rio
- 3. At the Via Veteranos intersection
- 4. At the Camino de Los Montoyas intersection
- 5. Between the on- and off-ramps at the Ridgetop Road interchange

A map indicating speed study locations is shown in Figure 7. A total of 100 samples per direction was collected at each of these locations, with raw data provided in **Appendix C**.

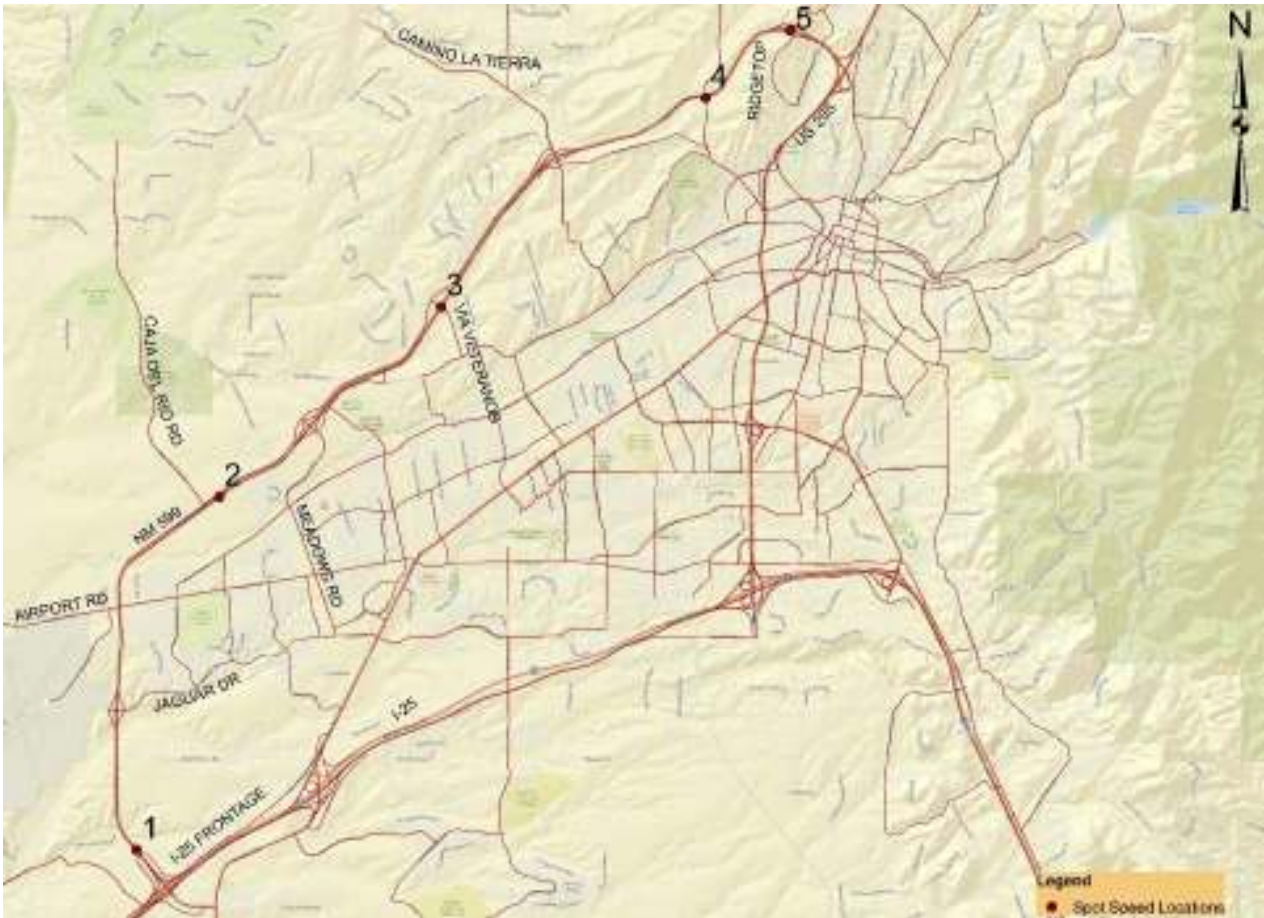


Figure 7 Speed Data Collection Locations

Resulting average and 85th percentile speeds per direction at each location are shown in Figure 8.

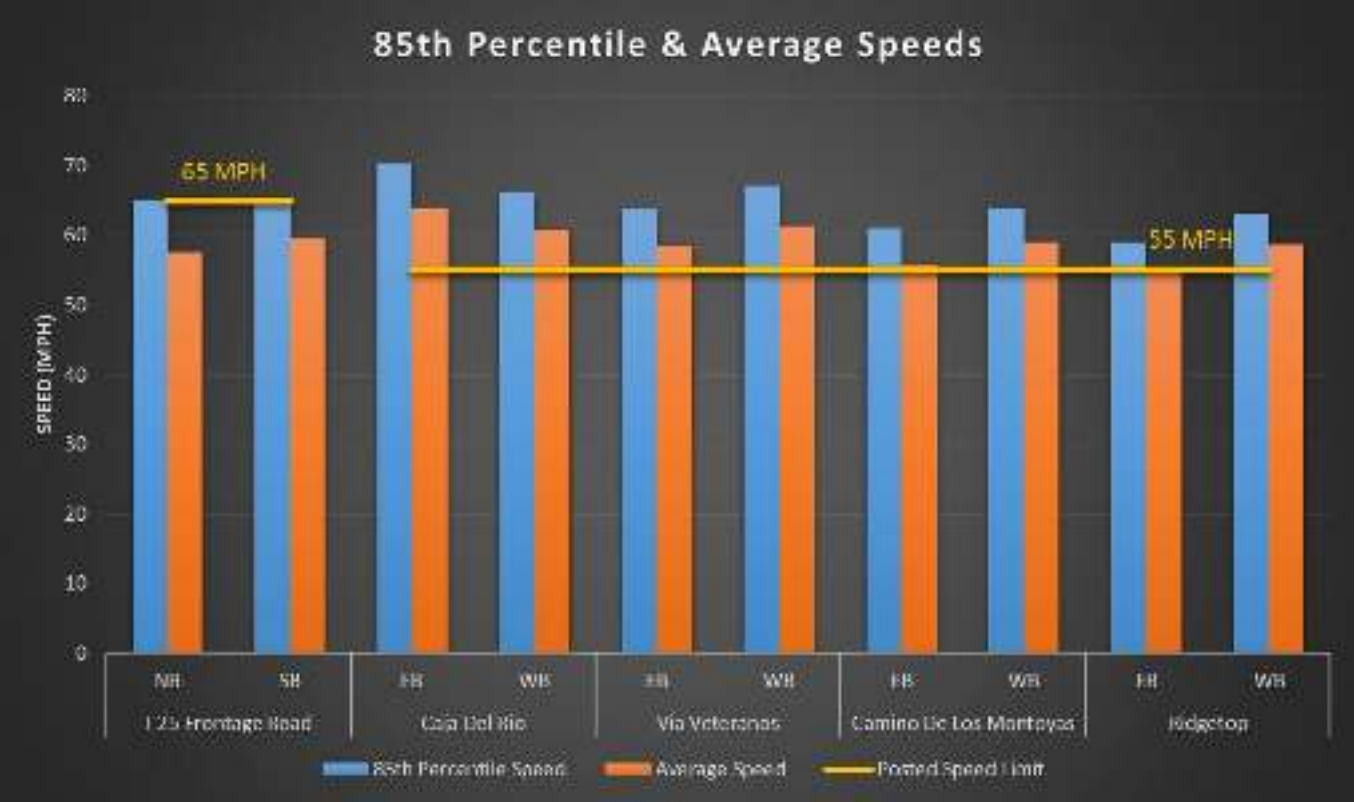


Figure 8 Observed 85th Percentile and Average Speeds

As shown, 85th percentile and average observed speeds ranged from 55 to 60 MPH near Ridgetop Road and up to 65 to 70 MPH near the Caja Del Rio data collection site. Generally, posted speed limits are exceeded throughout the corridor except near the I-25 Frontage Road where the higher posted speed limit puts more drivers in compliance. The additional speed metrics of standard deviation and pace are shown in Table 2. Standard deviation provides a measure of the variability of the recorded spot speeds, while the pace is the 10 MPH speed range containing the largest percentage of recorded spot speeds.

Table 2 Speed Metrics along NM 599

Data Collection Location	Direction of Travel	Posted Speed Limit	Average Speed	85th Percentile Speed	Standard Deviation	10 MPH Pace
North of I-25 Frontage Road	NB	65 MPH	58 MPH	65 MPH	6.2 MPH	51 to 61 MPH
	SB		60 MPH	65 MPH	5.3 MPH	55 to 65 MPH
East of Caja Del Rio	EB	55 MPH	64 MPH	70 MPH	6.1 MPH	57 to 67 MPH
	WB		61 MPH	66 MPH	5.5 MPH	53 to 63 MPH
Near Via Veteranos	EB		58 MPH	64 MPH	5.3 MPH	52 to 62 MPH
	WB		61 MPH	67 MPH	6.9 MPH	54 to 64 MPH
Near Camino de Los Montoyas	EB		56 MPH	61 MPH	5.9 MPH	48 to 58 MPH
	WB		59 MPH	64 MPH	4.7 MPH	55 to 65 MPH
Ridgetop Road Interchange	EB		54 MPH	59 MPH	4.8 MPH	48 to 58 MPH
	WB		59 MPH	63 MPH	5.0 MPH	53 to 63 MPH

As shown, standard deviations range from 4.7 MPH to 6.9 MPH on either side of the average speed which highlights the safety challenges of this particular corridor. Much of the speed variance is directly impacted by the fact that the road alternates between an arterial style roadway with at-grade intersections and slower speeds to a freeway facility with interchanges and higher speeds. In general, when speed variances increase on a facility, the risk for crashes, especially rear-end type crashes, tends to increase. Variance in speeds was greatest at Via Veteranos. The 10 MPH pace ranged from 48 to 58 MPH eastbound at Camino de Los Montoyas up to 57 to 67 MPH eastbound at Caja del Rio. The posted speed limit is 55 MPH at both locations.

Crash Data

The latest three-year crash data available at the time of the preparation of this study was provided by the NMDOT. It includes all available information on crashes in the study area occurring from the years 2013 to 2015. Raw crash data provided by the NMDOT is provided in **Appendix C** and a more detailed discussion of crashes is provided in the Safety Analysis section of this report.

Traffic Forecasts

NM599 Travel Model Forecasts

The NM 599 2040 forecast volumes were developed with the use of the SFMPO Travel Demand Model. This model runs in the PTV Vision VISUM 16.01-13 software with a base year of 2015 and an updated forecast year of 2040.

Model Area

The SFMPO model includes all the MPO boundaries and beyond within in Santa Fe County. The model area is shown in Figure 9.

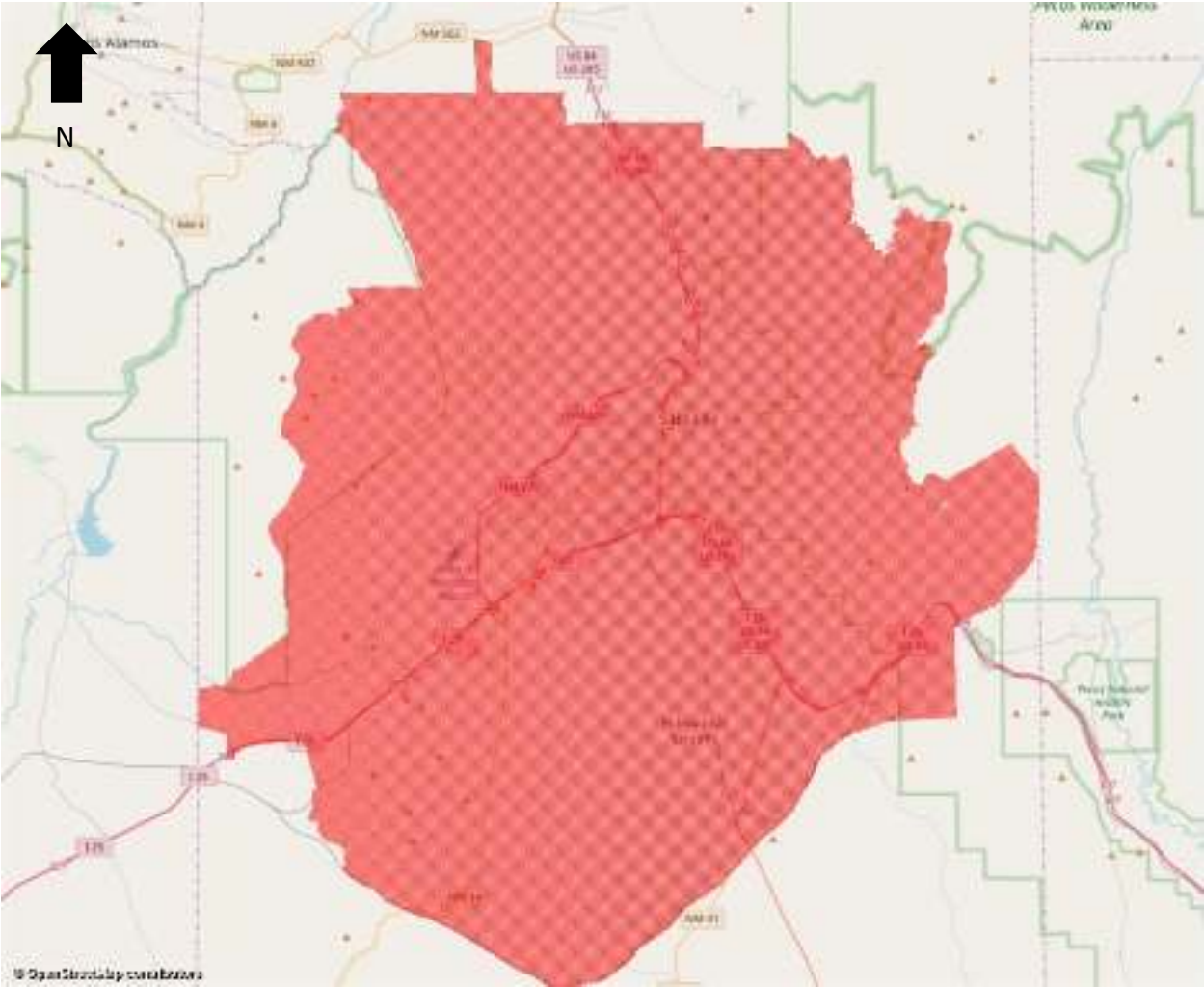


Figure 9 Santa Fe MPO Model Area

Model Network

The model network includes all roadways classified as a collector and above with some local and access roads added for model operation. Potential future roads, where known, and roads proposed for the NM 599 study are included in the model and designated as “future.” Base year links with link types are shown in Figure 10.

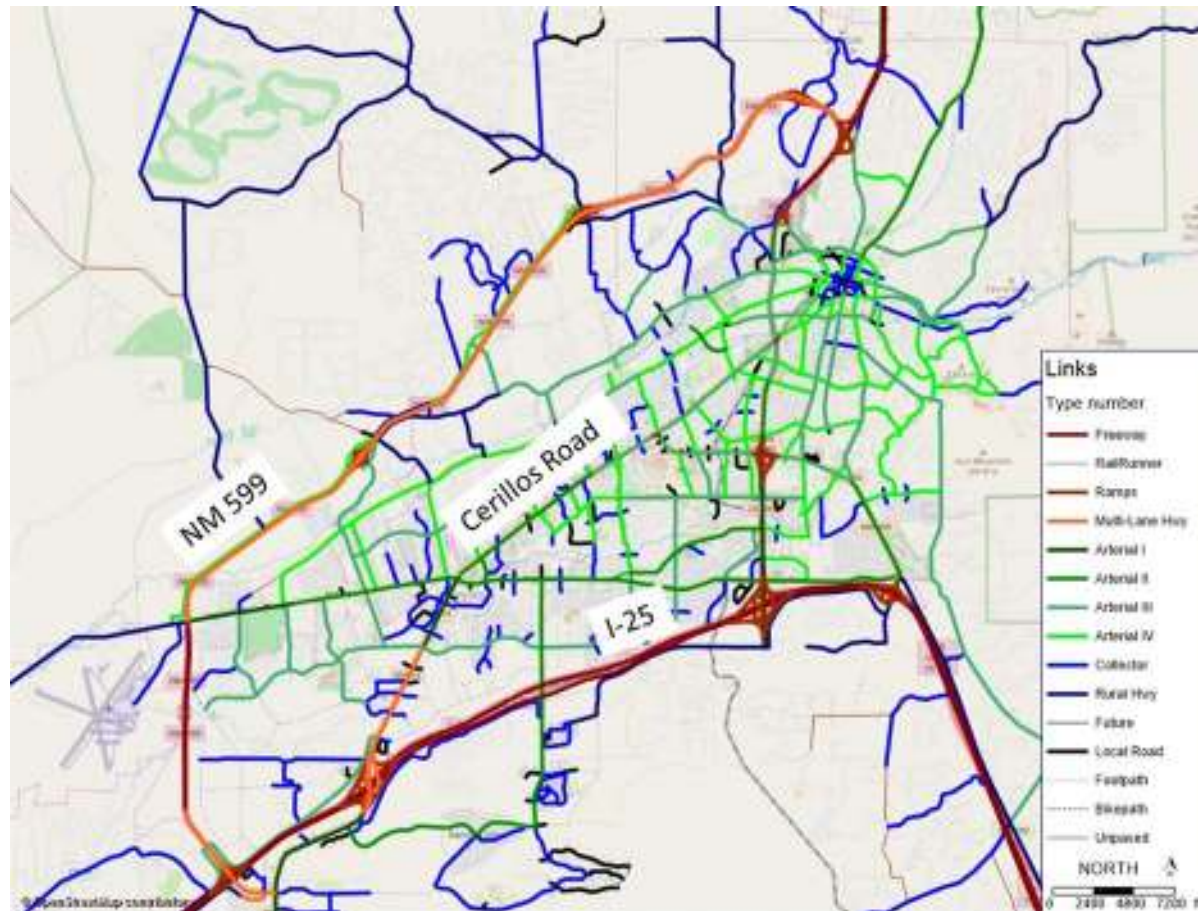


Figure 10 Base Year (2015) Link Types (NTS)

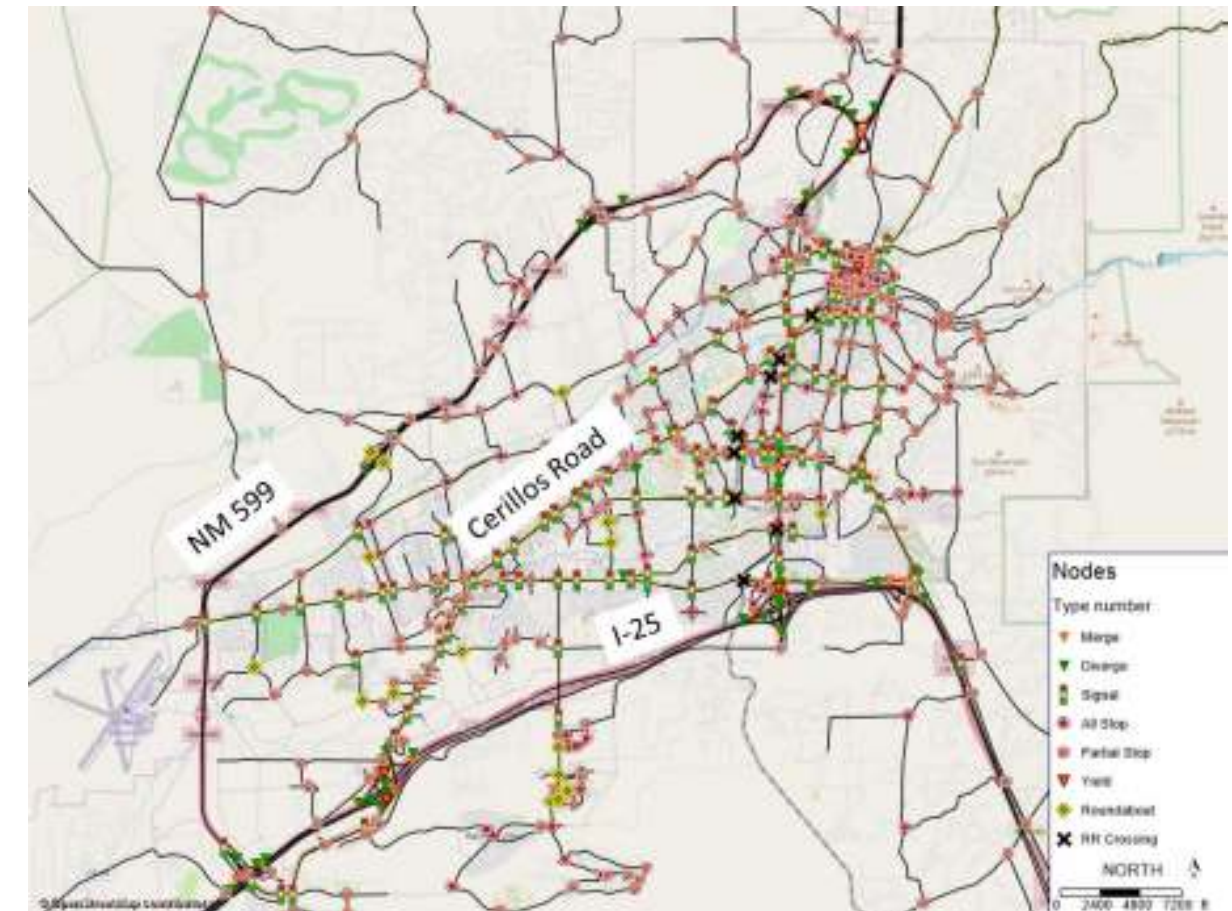


Figure 11 Node Type Showing Intersection Control (NTS)

All links were coded with type, number of lanes, and posted speed limit. Capacities are computed based upon link types and number of lanes per direction.

Node types were assigned based upon intersection control as shown in Figure 11. Intersections with partial stop-control were coded with the TModelSpecial attribute on links to designate the leg that is stopped.

Trip Generation, Distribution, and Mode Choice

The SFMPO model consists of 315 internal zones, five Railrunner commuter rail stations, and five external zones.

Base year and use data were collected for all internal zones using City of Santa Fe, Santa Fe County, and Longitudinal Employer-Household Dynamics (LEHD) data from the US Census Bureau. This included a number of housing units, whether single family or multi-family by zone, employees by classification, number of hotel rooms, number of students by school type (primary, secondary, technical, and college), and park-and-ride spaces.

Daily person-trips are generated by trip purposes for Home Based Work (HBW), Home Based School (HBS), Home Based College (HBC), Home Based Other (HBO), Non-Home Based (NHB), and Truck. Home Based Work trips were stratified into the three income levels used by the Census-based LEHD data.

Trip distribution used the gravity model for each trip purpose. Home Based Work and Home Based School trips are distributed using the AM assignment skim travel time matrix. Home Based College, Home Based Other, and Non-Home Based trips were distributed with the Midday assignment skim travel time matrix. Truck trips were distributed

with the Midday truck assignment skim travel time matrix. All distributions used feedback loops to account for changes in travel time due to changes in travel demand and congestion.

Integral to the trip distribution feedback steps is mode choice to develop the trips to be assigned to the transit system. The mode choice function was calibrated to reflect the number of observed bus transit trips. Person-trips were then converted to vehicle-trips with factors for vehicle occupancy by trip purpose.

Through trips for the base year and the 2040 forecast year were derived from the New Mexico State Travel Demand Model (NMSTDM). The NMSTDM was updated to include SFMPO model data to properly reflect the growth expected in the SFMPO area for external and through trips.

Trip Assignment

Trip assignments were conducted for the AM, Midday (MD), and PM peak hours after developing peak hour matrices based upon peaking and directional factors from *NHCRP Report 716, Travel Demand Forecasting: Parameters and Techniques*. These were adjusted during model calibration to reflect observed peak hour traffic counts.

Peak hour traffic assignments also used Multi-Point Assignment (MPA) percentages for zone centroid connectors. This applies a weight to each connector developed by reviewing zone land use as access locations. The benefit to the model is that traffic assignments behave as if there were a zone for each connector and can more accurately reflect reality. Traffic assignments for the AM and PM peak hours were compared with traffic counts.

The Coefficient of Determination or R² is a tool to measure the overall model accuracy. The R² or “goodness of fit” statistic shows how well the regression line represents the assignment data. In statistics, R² is a number that indicates the proportion of the variance in the dependent variable that is predictable from the independent variable. For travel models, the industry has typically sought to achieve an R² of 0.88 or higher. A value of 1.00 is perfect, but even if traffic counts were compared against themselves, the daily variation would not yield a Coefficient of Determination (R²) of 1.00.

Another measure of the model's ability to assign traffic volumes is the percent Root Mean Square Error (RMSE). The RMSE measures the deviation between the assigned traffic volumes and the counted traffic volumes; the calculation is shown below:

$$\% \text{ RMSE} = 100 \times \frac{\sqrt{\frac{\sum(\text{Assignment Errors})^2}{\text{Number of Links}}}}{\text{Average Count}}$$

The percent RMSE indicates a degree of deviation between the assigned and counted traffic volumes. Currently, there are no national standards for model verifications of RMSE. NCHRP 365 includes the recommendation that %RMSE be below 35.

The figures below show link ground counts on the X-axis and assigned volumes on the Y-axis. On the “goal” line, the assignment volume is equal to the ground count. The linear “regression” line shows the best straight line estimate of the assignment volume for any count. The “allowable” curves show the maximum allowable errors according to the graph from the Travel Model Validation and Reasonableness Checking Manual.

Figure 12 shows a comparison with all AM counts and for 365 count locations shows a %RMSE of 30 and R² of 0.91, both of which are better than the recommended standards.

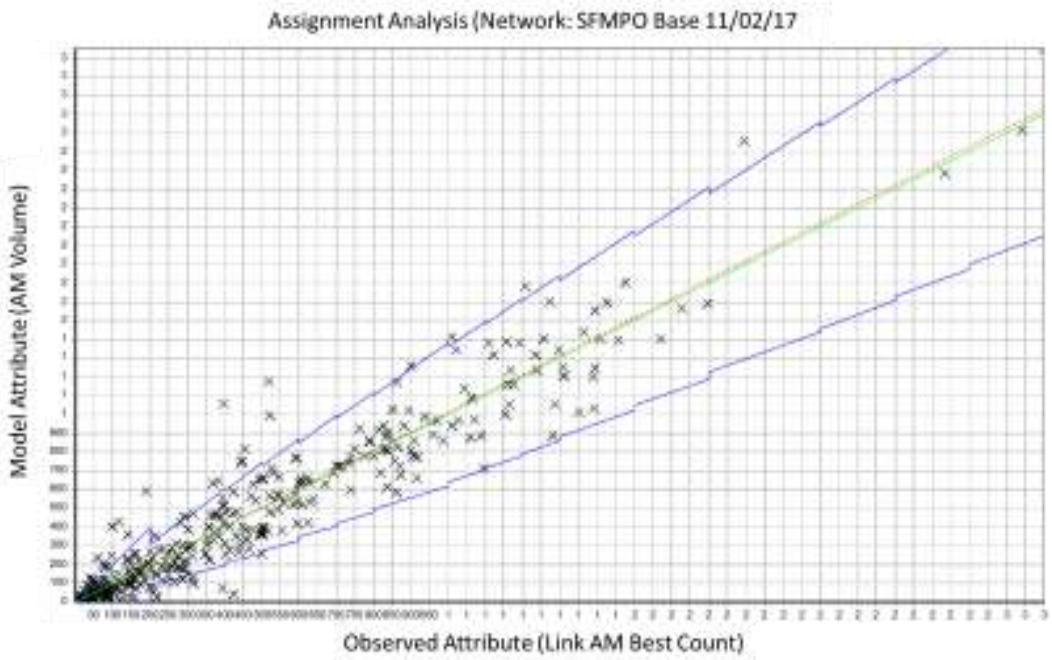


Figure 12 Base AM Peak Hour Forecast Validation with Count Stations

Figure 13 shows a comparison with the peak hour AM counts collected for the NM 599 study and reflect more current conditions. This includes 118 counts and it should be noted that the statistics are even better for these newer count locations in the NM 599 corridor with a %RMSE of 26 and R² of 0.95.



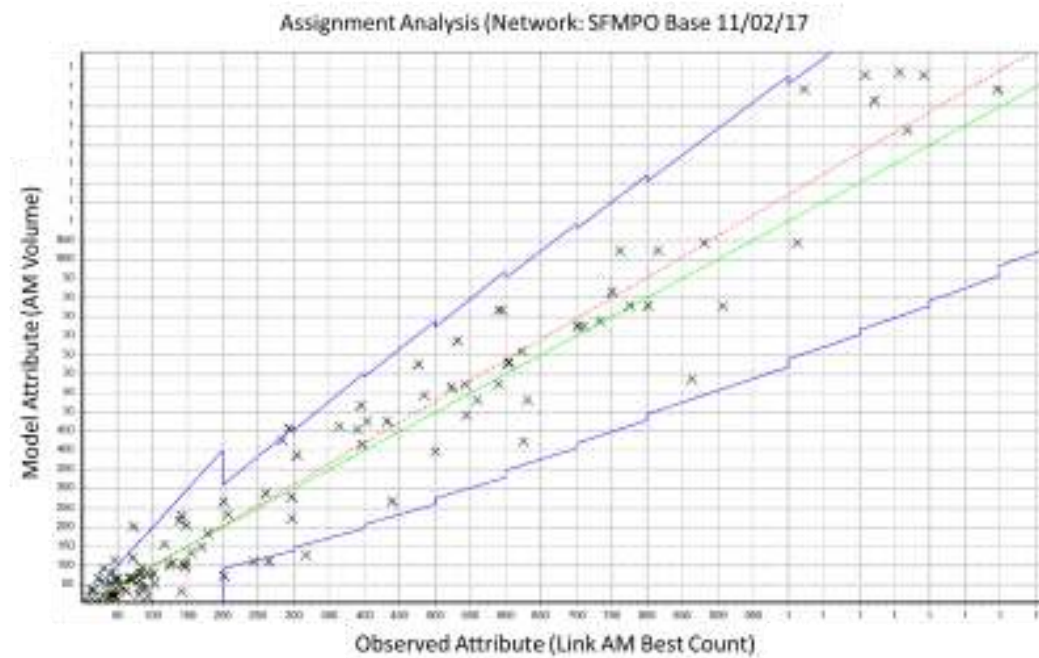


Figure 13 Base AM Peak Hour Forecast Validation with Study Counts

PM count locations were similarly compared. Figure 14 shows a comparison with 698 count locations with a %RMSE of 31 and R^2 of 0.90. Again, these are better than recommended standards.

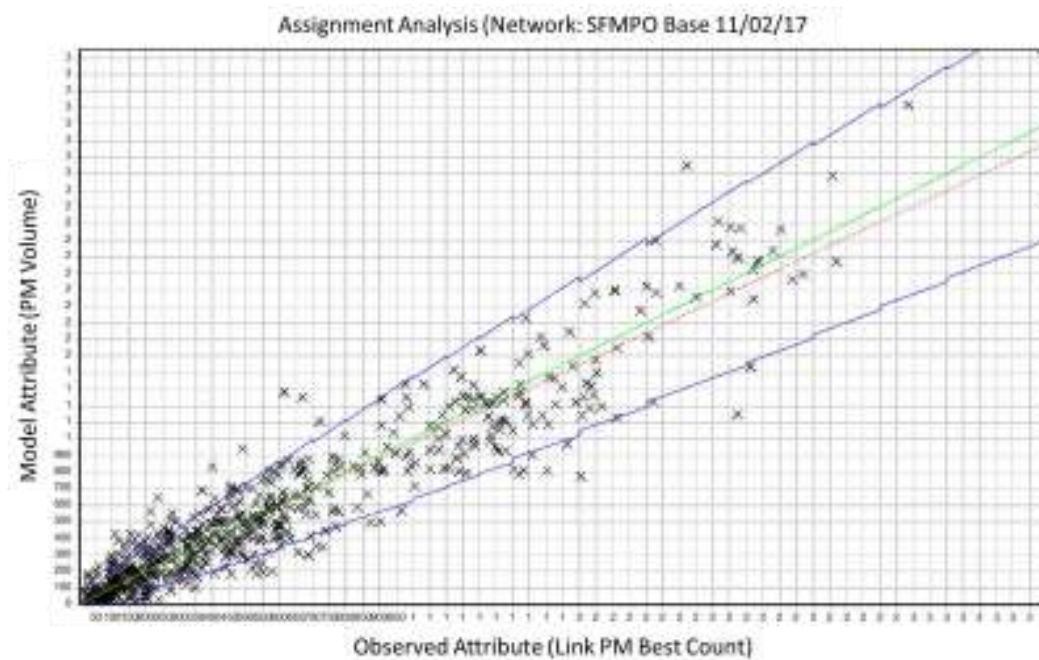


Figure 14 Base PM Peak Hour Forecast Validation with Count Stations

Figure 15 shows a comparison with the peak hour PM counts collected for the NM 599 study and reflect more current conditions. This includes 117 counts and it should be noted that the statistics are even better for these newer count locations in the NM 599 corridor with a %RMSE of 29 and R^2 of 0.92.

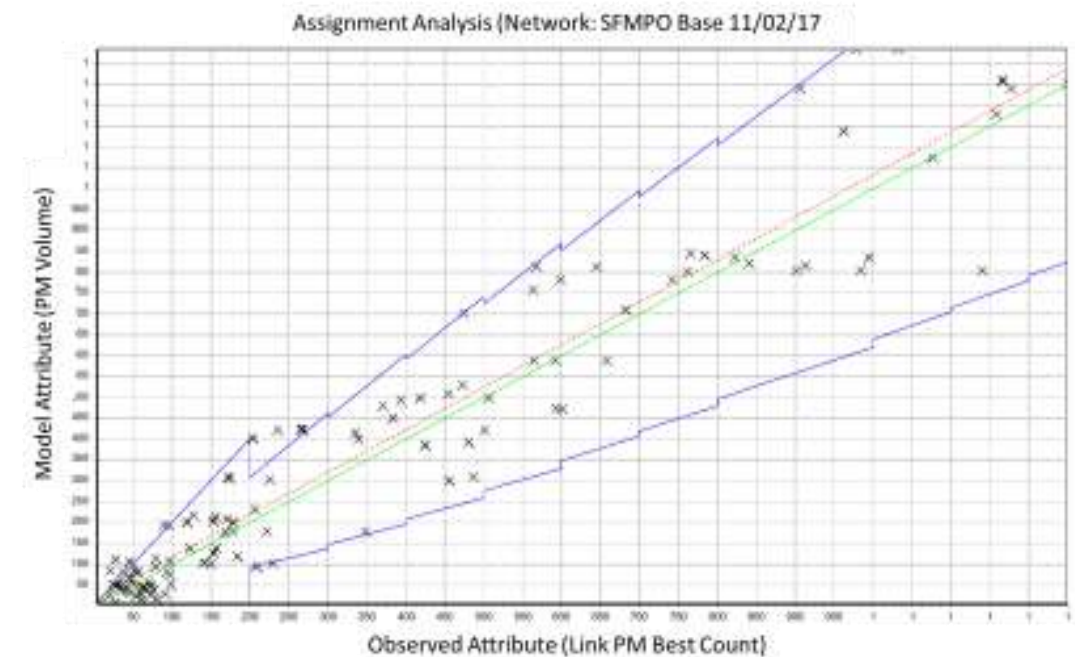


Figure 15 Base PM Peak Hour Forecast Validation with Study Counts

The model is calibrated sufficiently to be used for future condition and alternative forecasts. Not only are the %RMSE and R^2 sufficiently within standards, but the regression line slopes and percentages within allowable standards reflect an acceptable model.

The NM 599 counts were used in the validation of the update of the SFMPO model. The model used for the NM 599 study is the updated SFMPO model delivered to the MPO in December 2017.

Future Forecasts

Santa Fe MPO has provided forecast land use for 2040 as well as assumed projects for the No-Build condition. The No-Build projects include completion of the I-25/Cerrillos Rd. and NM 599/Jaguar interchanges as well as planned infrastructure improvements in the Las Soleras and Jaguar Road areas. No additional improvements to NM 599 connections were included in the No-Build alternative.

All forecast alternatives were tested individually with the same set of 2040 land use and external growth projections. Due to different connections in the alternatives, the NM 599 corridor attracts different levels of traffic.

Volumes for all alternatives were supplied for further analysis by other members of the study team. The 2040 “No-Build” data is depicted in model snapshots found in **Appendix C**.

The Fratar/Furness method was used to take 2040 directional demands from the model and calculate turning movement demands at intersections. Calculation sheets are provided in **Appendix C** and 2040 “No-Build” demands are shown in Figure 16, Figure 17, and Figure 18 on pages 17, 18 and 19.

Capacity Analysis

Based on 24-hour counts provided by NMDOT and turning movement counts collected by the consultant team, operation capacity analysis was done for existing conditions including current traffic demands, traffic control, and lane geometry. Analyses were conducted based on methodologies in the Highway Capacity Manual and address signalized control, two-way stop control, on- and off-ramp, and freeway section capacity. Systemwide capacity analysis results are summarized in Figure 19, Figure 20, and Figure 21 on pages 20, 21, and 22.

As indicated, the entire corridor is currently operating well under capacity with most Levels of Service (LOS) ranging from A to C except for the following movements:

- The minor street left-turn from the southbound I-25 off-ramp is at LOS F. However, this movement is a very low demand movement and is operating under capacity. This is can happen on minor stop control approaches to high speed arterials due to the fact that available gaps on the arterial approaches occur less frequently and cause enough delay at the minor approach to be LOS F, but the approach volume usually very low and therefore is below capacity. Usually queuing is not an issue under these conditions.
- The left-turns from the stop-controlled approaches on Via Veteranos are currently operating at a LOS of F for both AM and PM peak hours and over capacity.
- The north to west and south to east left-turns from the stop-controlled approaches on Camino De Los Montoyas are currently operating at a LOS F for AM and PM peak periods; again, these movements are operating below capacity.

Capacity analysis was also conducted for a “No-Build” condition which assumed forecasted 2040 traffic demands with current traffic control and lane geometry. Systemwide “No-Build” capacity analysis results are summarized in Figure 22, Figure 23, and Figure 24 on pages 23, 24, and 25.

Under 2040 “No-Build” conditions, the entire corridor is expected to continue to operate under-capacity at acceptable LOS ranging from A to D except at the following locations:

- The north to west and south to east left-turns from the stop-controlled approaches on Via Veteranos are expected to operate at a LOS F for both AM and PM peak hours; unlike current conditions, these approaches are expected to be over-capacity.
- The north to west and south to east left-turns from the stop-controlled approaches on Camino De Los Montoyas are expected to operate at a LOS F for the AM and PM peak periods; again, unlike current conditions, these approaches are expected to be over-capacity.

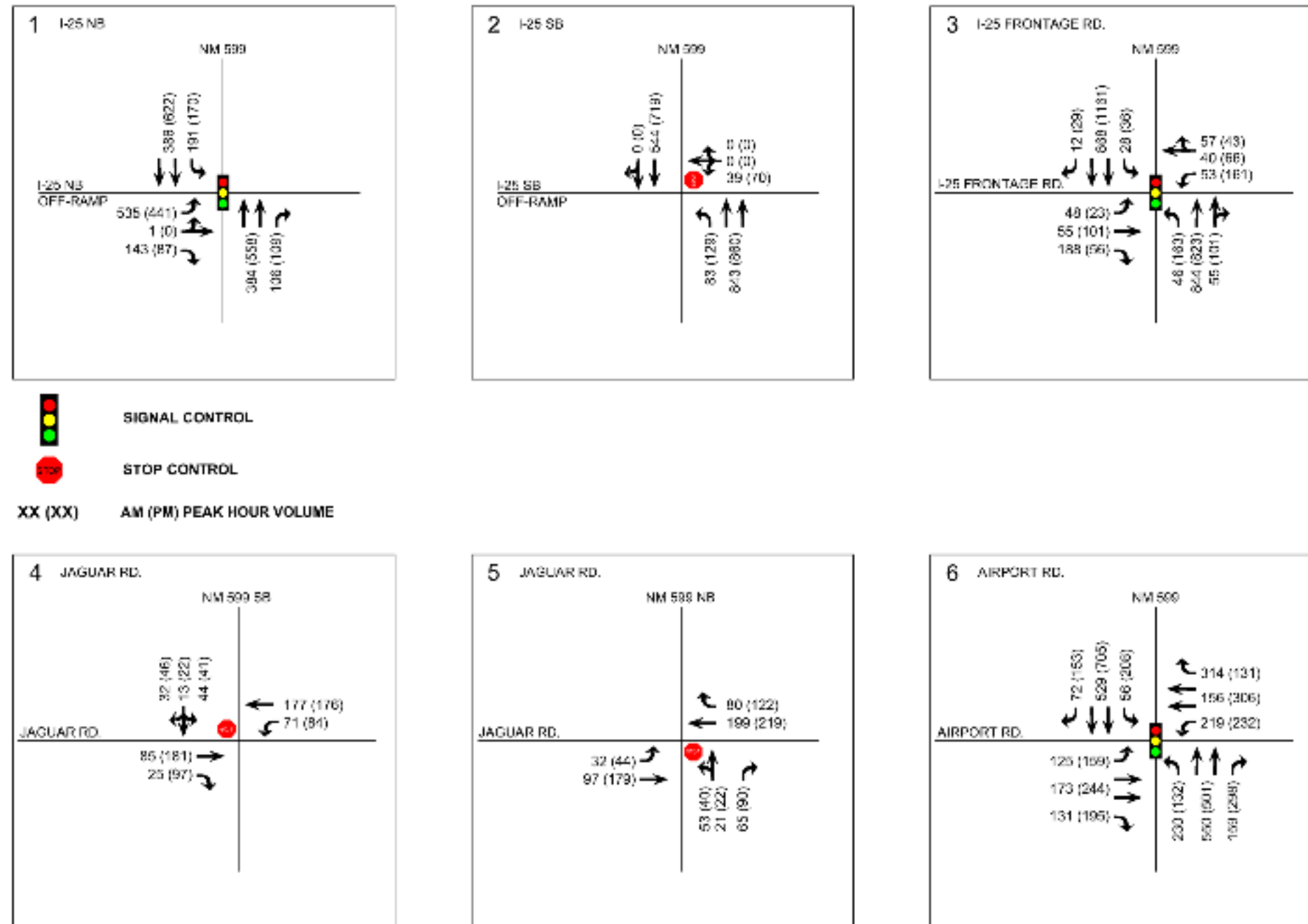
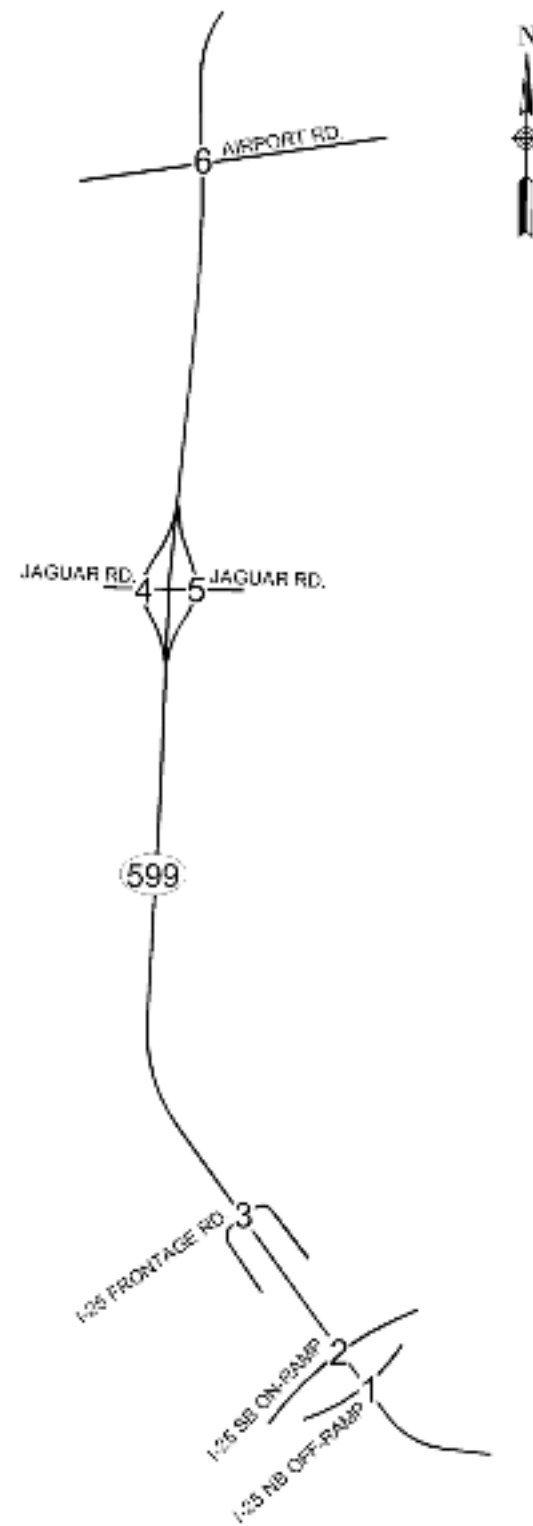


Figure 16 2040 "No-Build" Turning Demands (I-25 to Airport Road)

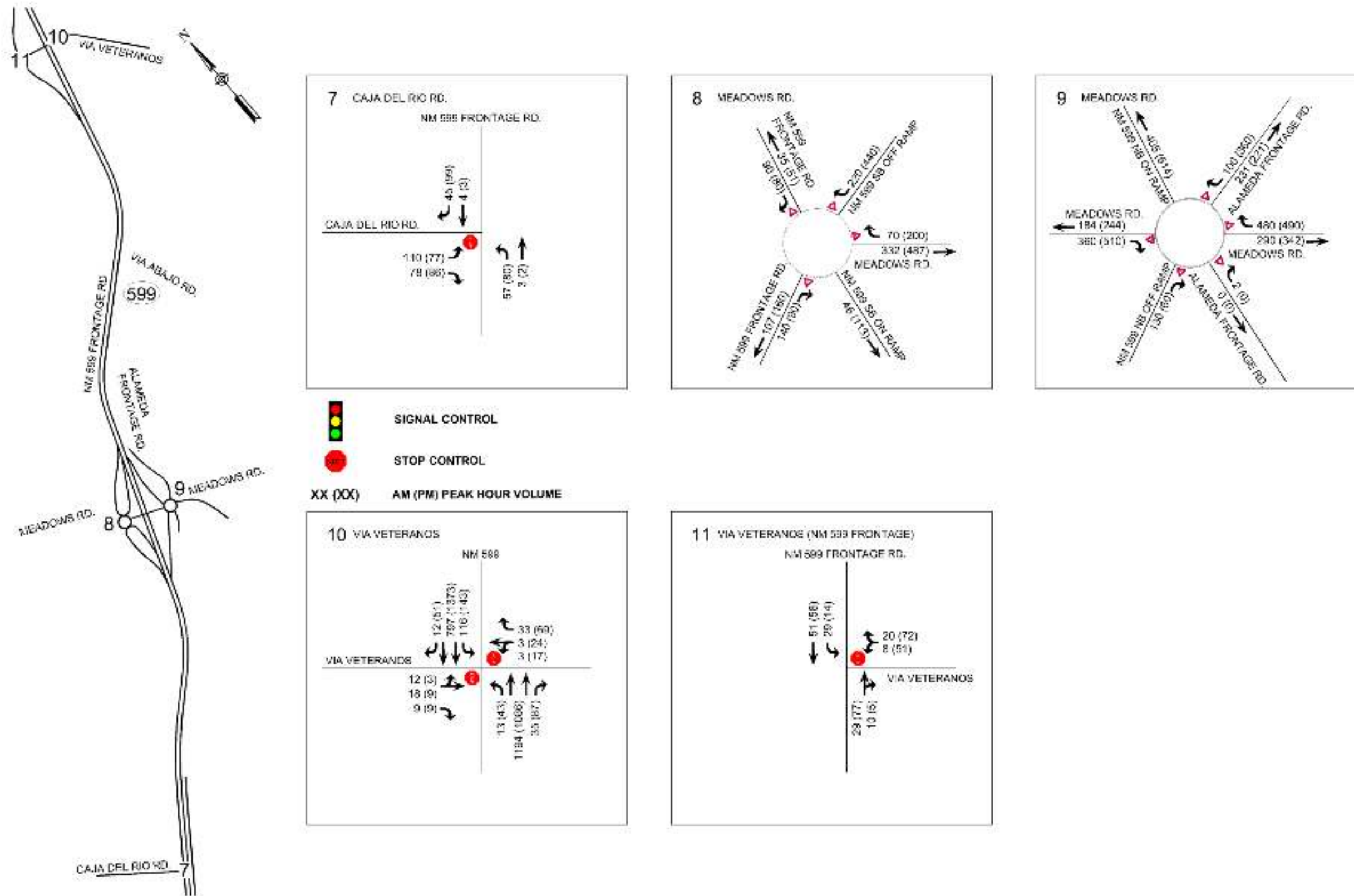


Figure 17 2040 "No-Build" Turning Demands (Airport Road to Via Veteranos)

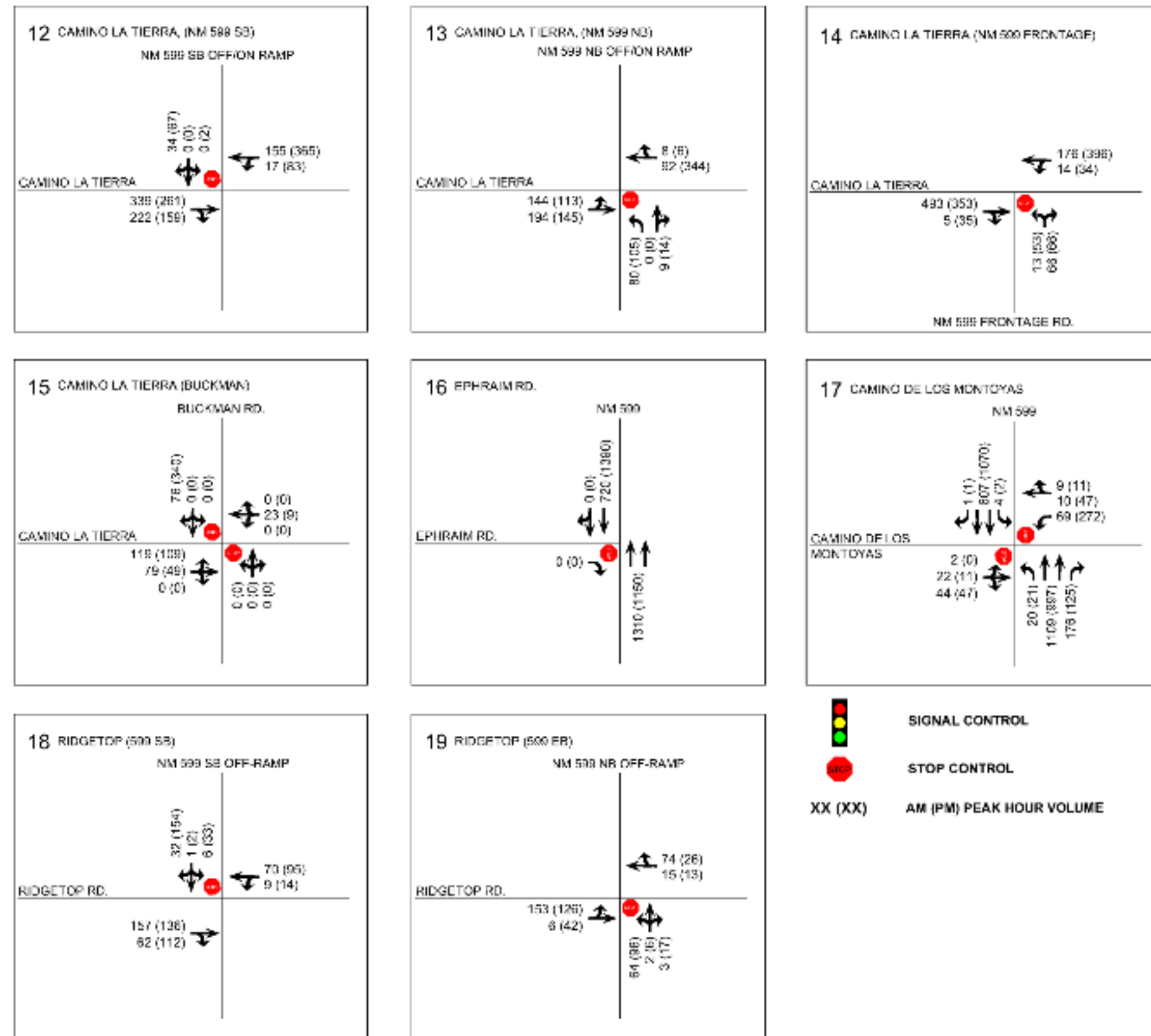
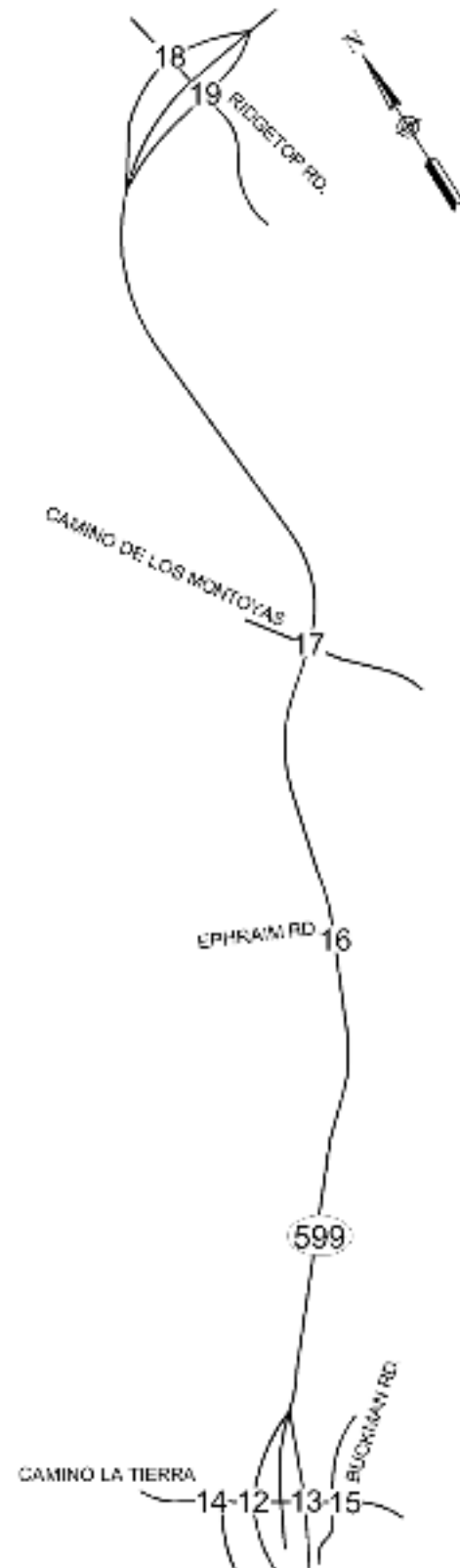
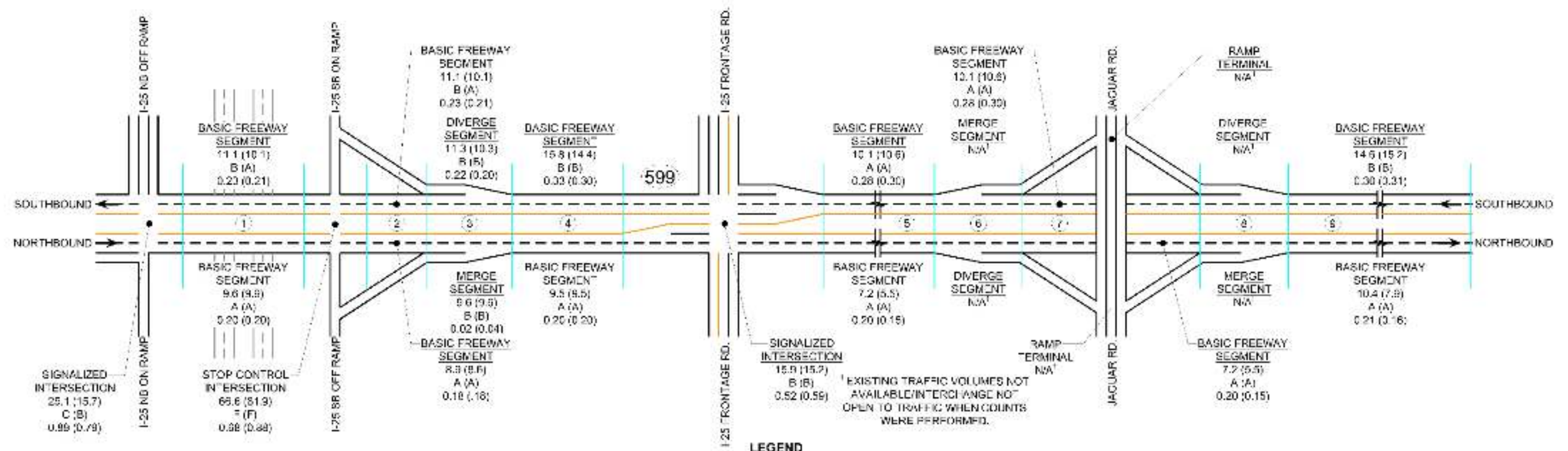
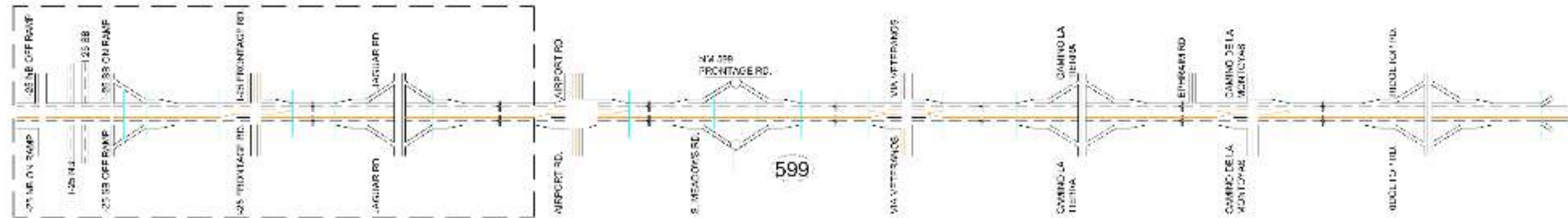


Figure 18 2040 "No-Build" Turning Movement Demands (Camino La Tierra to Ridgetop)



LEGEND

INTERSECTION / RAMP TERMINALS	BASIC MERGE & DIVERGE SEGMENTS
XX (XX) AM DELAY (PM DELAY)	XX (XX) AM DENSITY (PM DENSITY)*
XX (XX) AM LOS (PM LOS)	XX (XX) AM LOS (PM LOS)
XX (XX) AM V/C* (PM V/C)*	XX (XX) AM V/C* (PM V/C)*

* WORST CASE MOVEMENT V/C REPORTED FOR STOP CONTROLLED INTERSECTIONS.

* DENSITY = PASSENGER CAR / MILE / LANE

V/C is volume to capacity

Delay = Average seconds/vehicle

Figure 19 Existing Capacity Analysis Results (I-25 to Jaguar Rd)

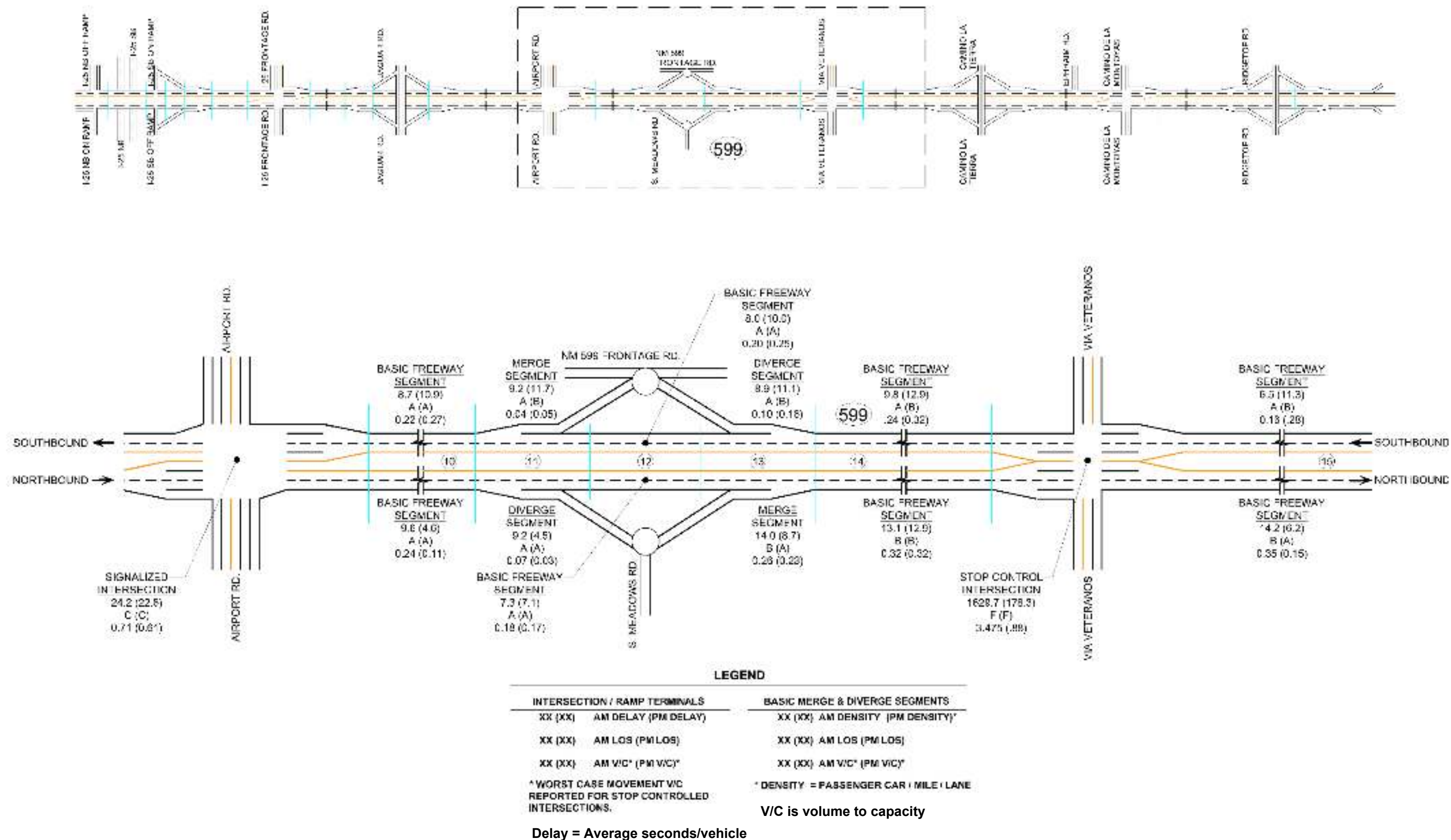


Figure 20 Existing Capacity Analysis Results (Airport Rd to Via Veteranos)

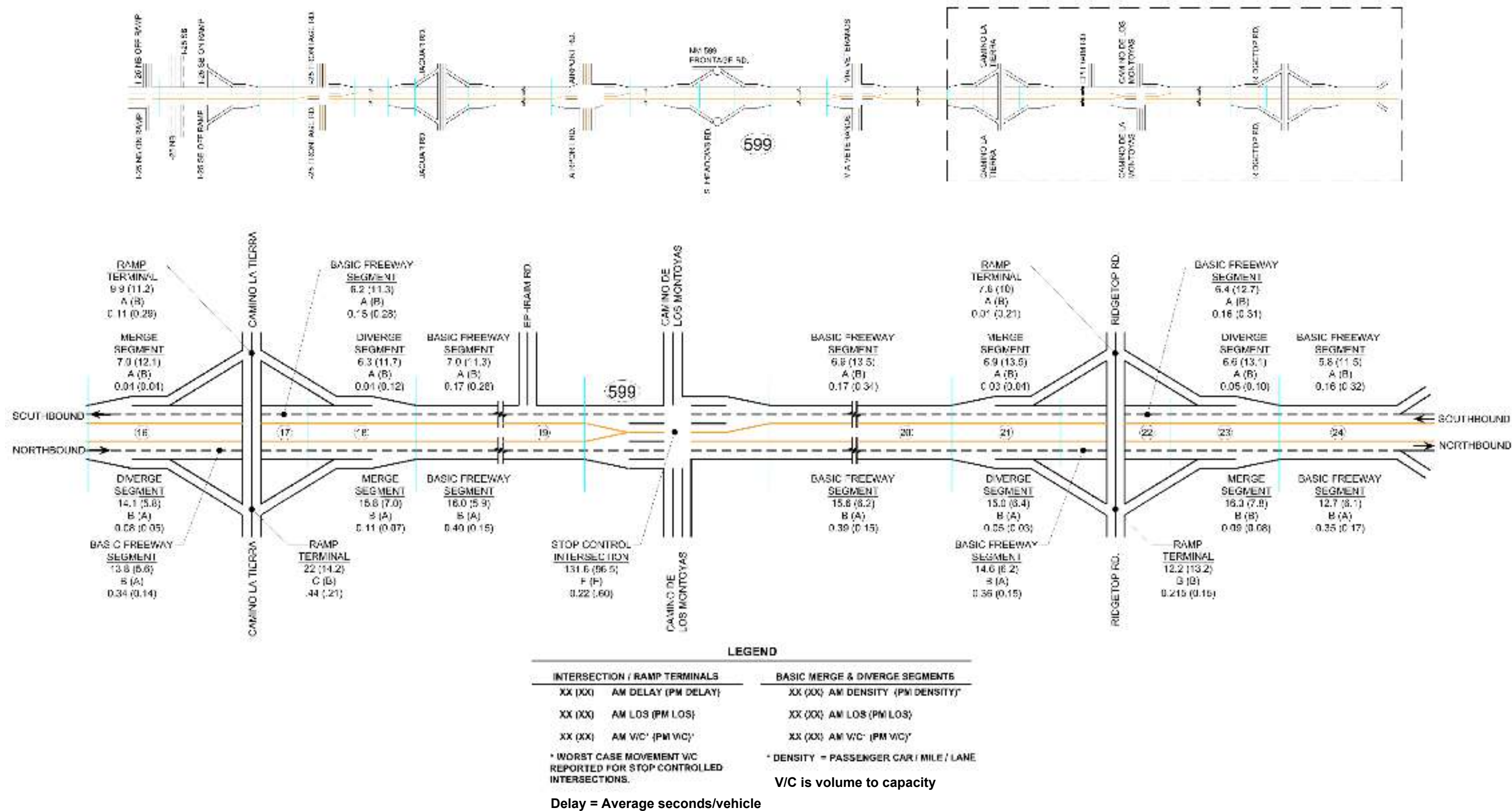
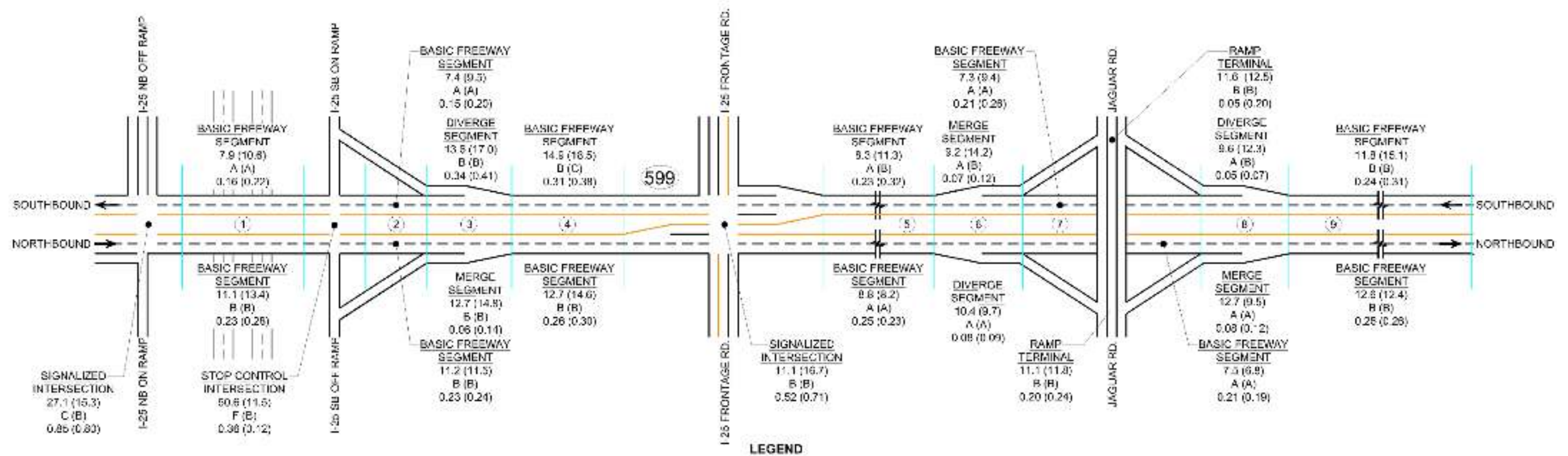
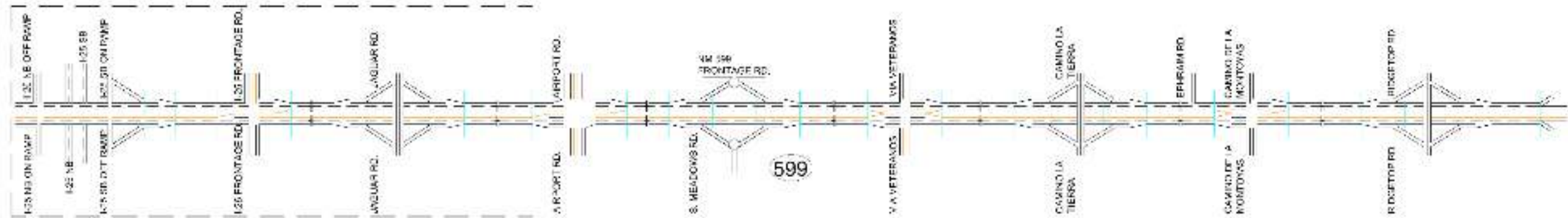


Figure 21 Existing Traffic Operations Analysis Results (Camino La Tierra to US 285)



LEGEND

INTERSECTION / RAMP TERMINALS	BASIC MERGE & DIVERGE SEGMENTS
XX (XX) AM DELAY (PM DELAY)	XX (XX) AM DENSITY (PM DENSITY)*
XX (XX) AM LOS (PM LOS)	XX (XX) AM LOS (PM LOS)
XX (XX) AM V/C* (PM V/C)*	XX (XX) AM V/C* (PM V/C)*

* WORST CASE MOVEMENT V/C REPORTED FOR STOP CONTROLLED INTERSECTIONS.

* DENSITY = PASSENGER CAR / MILE / LANE

V/C is volume to capacity

Delay = Average seconds/vehicle

Figure 22 2040 No-Build Traffic Operations Results (I-25 to Jaguar Road)

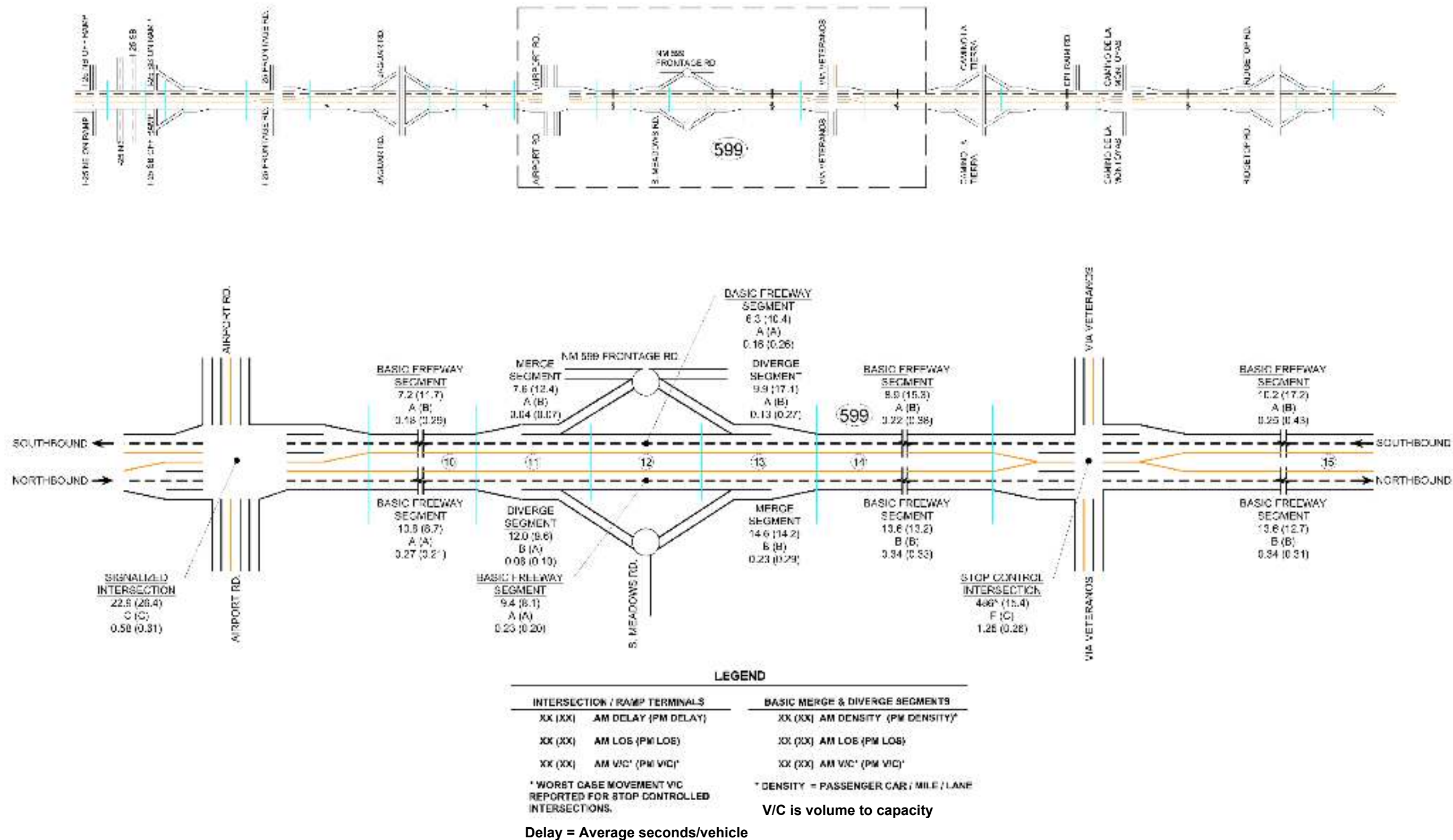


Figure 23 2040 Traffic Operations Analysis Results (Airport Road to Via Veteranos)

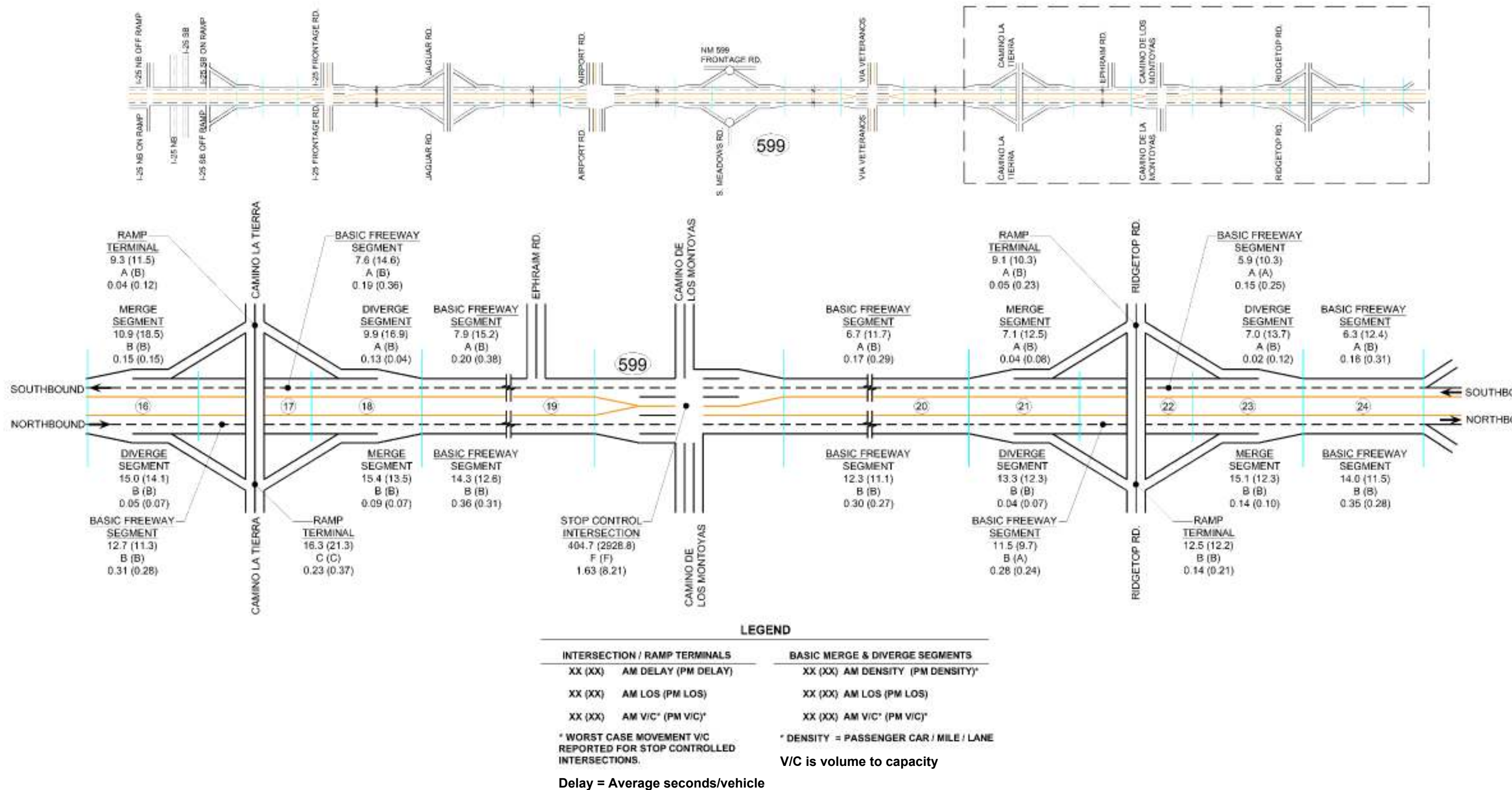


Figure 24 2040 No-Build (Camino La Tierra to US 285)

Safety Analysis

A comprehensive safety analysis was conducted based on the NMDOT-provided data. The safety analysis discussed in these next sections includes the following:

- 1. Summary of all crashes along the NM 599 corridor
- 2. Summary of all crashes occurring at at-grade intersections
- 3. Detailed description of fatal crashes along the NM 599 corridor
- 4. Discussion of Predictive Crash Methodology
- 5. Interactive Highway Safety Design Model Analyses for “No-Build” conditions

Overall Crash Summary

Crash data provided by the NMDOT was processed, summarized, and categorized to show crashes by location, year, crash type, time of day, crash severity, and crash cause. An overall summary table is provided in **Appendix D**.

Crashes by severity and location along the corridor are indicated in Figure 25, Figure 26, Figure 27, Figure 28 and Figure 29.

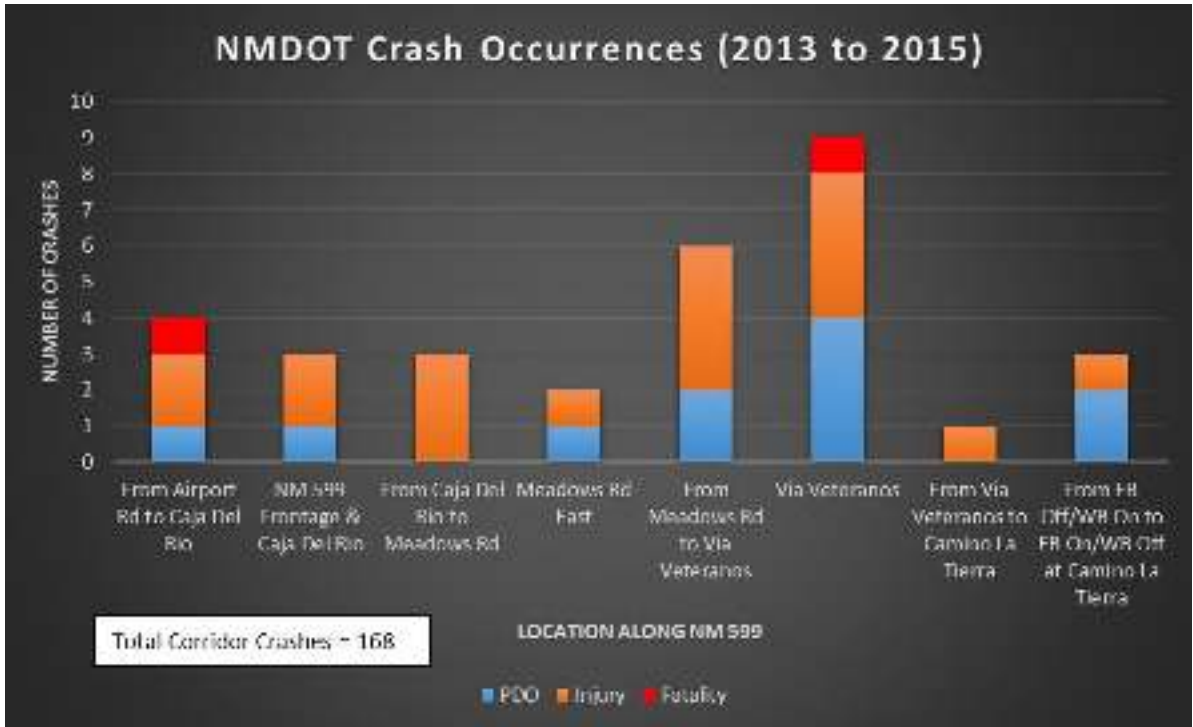


Figure 26 Crashes on NM 599 by Location and Severity (Between Airport Road and Camino La Tierra Interchange)

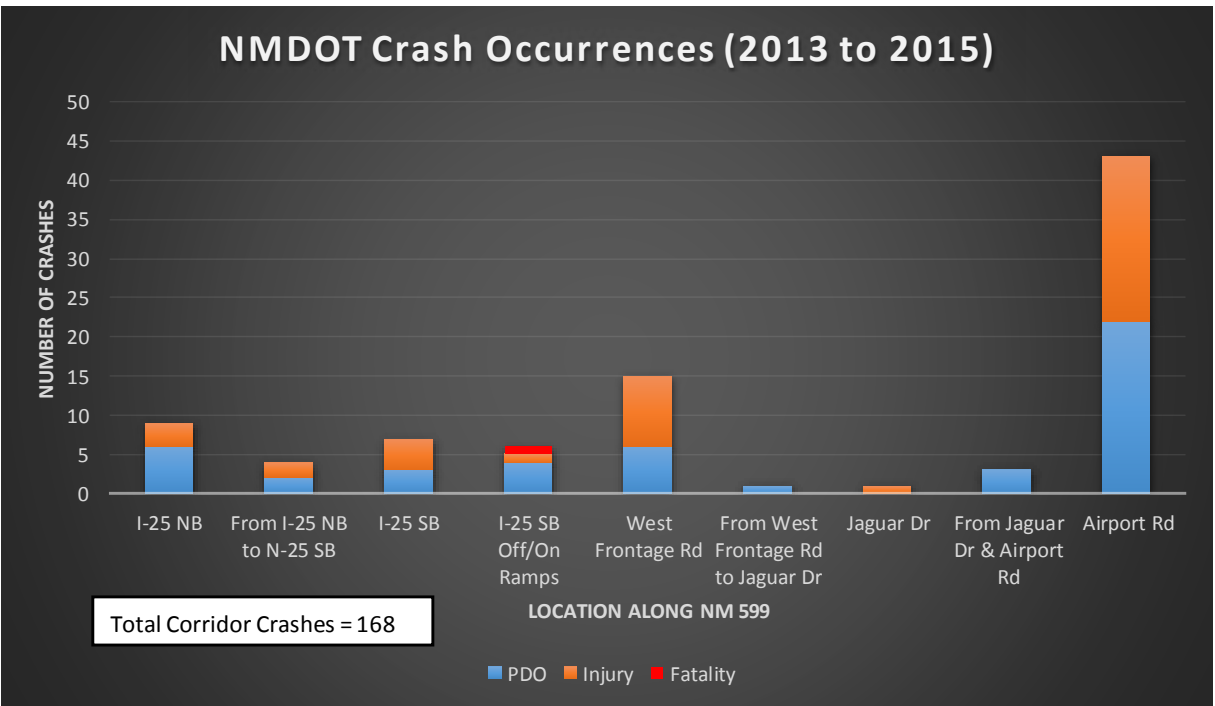


Figure 25 NM 599 Corridor Crashes by Location and Severity (I-25 Interchange to Airport Road)

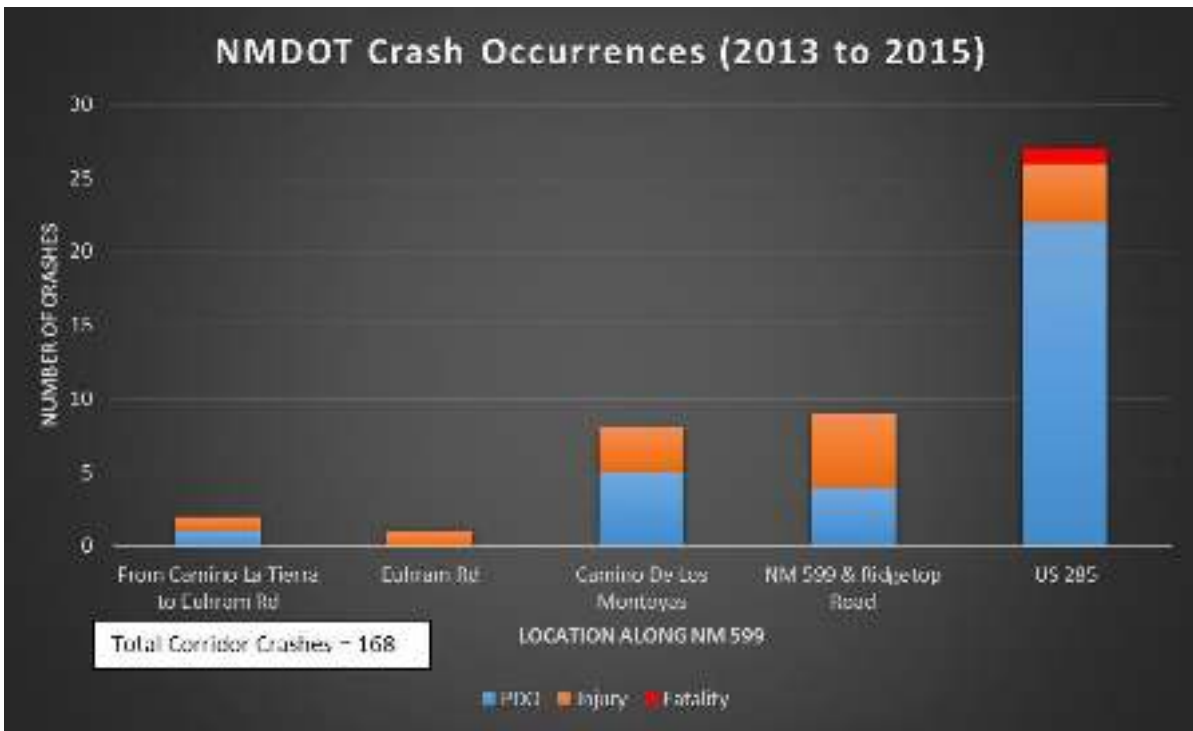


Figure 27 Crashes on NM 599 by Location and Severity (Between Camino La Tierra and US 285)

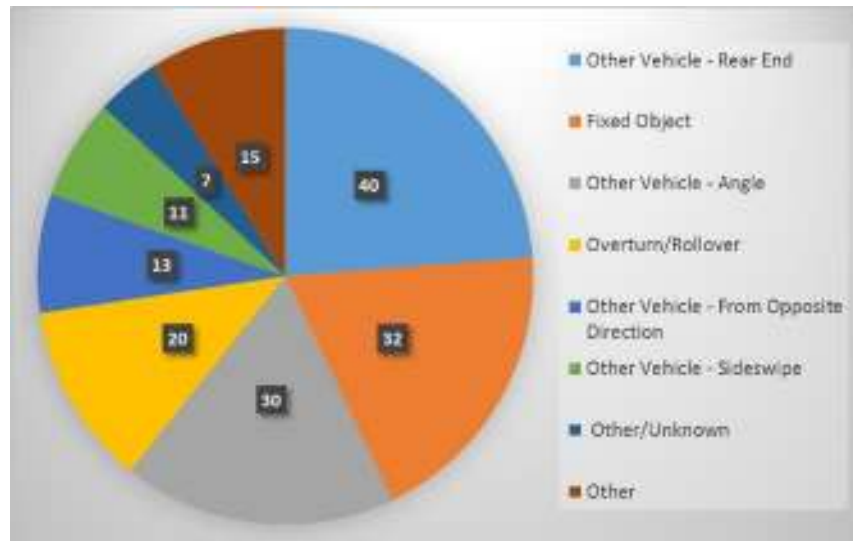


Figure 28 Overall NM 599 Crashes by Type

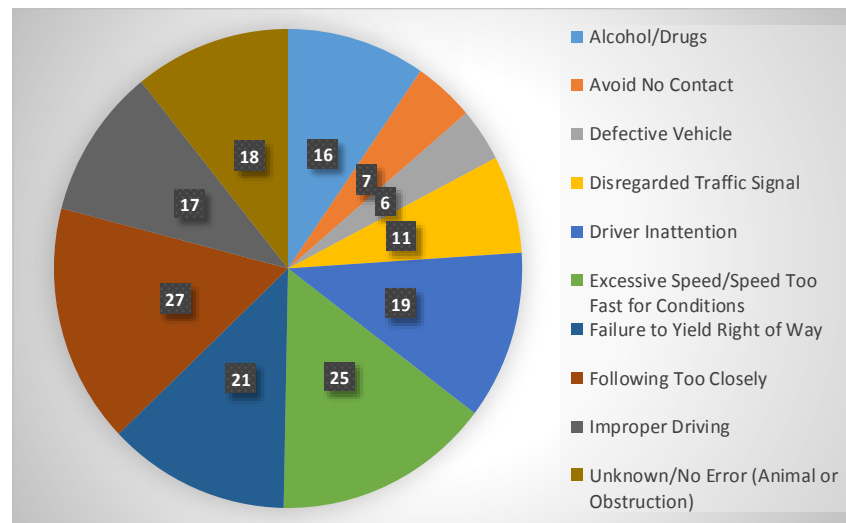


Figure 29 Overall NM 599 Crashes by Cause

Based on the crash summary and the previous five figures, the following observations are made:

1. A total of 168 crashes occurred from 2013 to 2015 with crashes increasing from 45 in 2013 to 68 in 2015.
2. The most common crash type within the study area was rear-end crashes, with nearly one in four crashes categorized as rear-end. The next most common crash type was a single vehicle crash with a fixed object totaling 19% of all crashes with angle crashes following closely at 18%.
3. It should be noted that single vehicle crashes (combined fixed object and rollover crashes) account for 31% of all crashes. Generally, most single vehicles crashes occurred in the northeast portion of NM 599 where

horizontal and vertical curvature varies the most. Figure 30 indicates the location of all single-vehicle crashes along NM 599. These include fixed object and run off the road crashes.



Figure 30 Single Vehicle Crash Locations on NM 599 (2013-2015)

4. Near 75% of all crashes occurred during daylight time periods and a small portion during dawn/dusk periods.
5. Nearly half (46%) of all crashes were either an injury or fatality crash.
6. There were four fatal crashes occurring during the three-year study period and one fatal crash that has occurred since 2015. A more detailed discussion of all fatal crashes occurring within the study area since 2013 is provided in a later section of this report.
7. The most common crash causes include “following too closely” (16%), “excessive speed/driving too fast for conditions” (15%), “failure to yield right-of-way” (13%), and “driver inattention” (12%).
8. Finally, locations with the greatest frequency of crashes were the Airport Road intersection (43 crashes or 26% of the total number), the US 285 directional interchange, (27 crashes or 16%), and the I-25 Frontage Road intersection (15 crashes or 9%).

Crash Summary at At-Grade Intersections

The purpose of this study is to reassess the priorities for grade-separating the existing at-grade intersections along the NM 599 corridor. Therefore, the following sections focus on the crash summaries at the at-grade intersection of NM 599 with the I-25 Frontage Road, Airport Road, Via Veteranos and Camino De Los Montoyas.

I-25 Frontage Road

Currently, the NM 599/I-25 Frontage Road intersection is signalized with protected-permitted left-turn phasing on all approaches and exclusive right-turn lanes on the northbound, southbound, and westbound approaches. From 2013 to 2015 a total of 15 crashes were reported; they occurred mostly during daytime hours and involved injuries, as opposed to property damage only.

The types of crashes at the I-25 Frontage Road intersection are summarized in Figure 31.

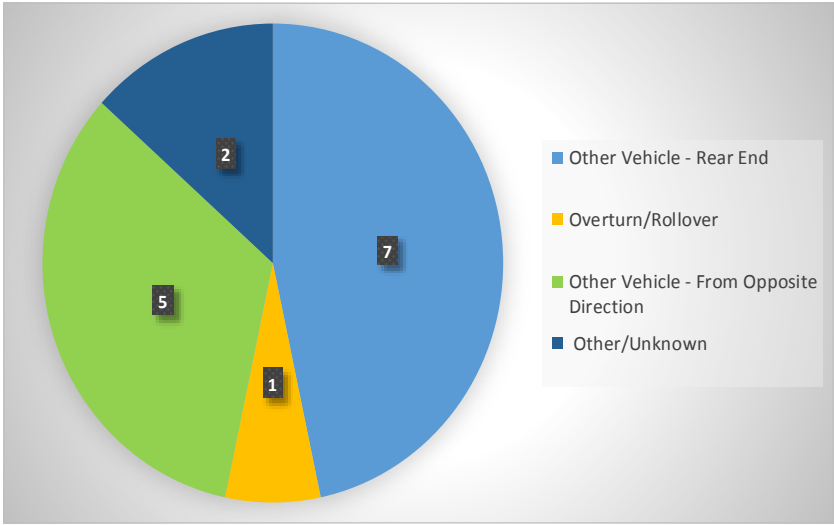


Figure 31 Crashes by Type at the I-25 Frontage Road Intersection (2013-2015)

Crashes described as “rear end” and “from opposite direction” account for 80% of all crashes that occurred at the I-25 Frontage Road from 2013 to 2015. Rear end crashes can be common at signalized intersections, but could also be exacerbated by the inconsistency of speed limits and the alternating arterial/freeway character of the NM 599 corridor, which may lead to greater speed variance among road users. The data does not make apparent whether crashes categorized as “from opposite direction” are head-on crashes or if they are angle crashes between a left-turning and oncoming vehicle. It is likely that most of these are the latter as this intersection has permitted phasing for left-turns, which increases the risk of this type of angle crash.

Causes of the crashes at the I-25 Frontage Road intersection are summarized in Figure 32.

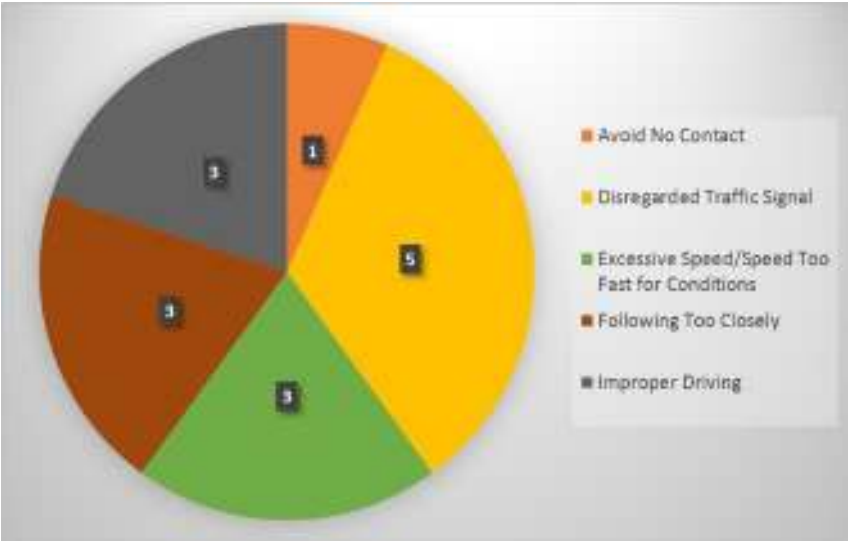


Figure 32 Crashes by Cause at the I-25 Frontage Road Intersection (2013-2015)

As shown, the most common crash cause at the I-25 Frontage Road intersection was “disregarded traffic signal.” This further supports the likelihood that the crashes identified as “opposite direction” are angle crashes, which tend to occur when a red or yellow indication has been disregarded. The second most common cause was identified as “following too closely.” This may further exemplify the wide variance in operating speeds between users on NM 599.

Airport Road

Currently, the NM 599/Airport Road intersection is signalized with protected-permitted left-turn phasing on all approaches and exclusive right-turn lanes on the northbound and southbound approaches. From 2013 to 2015 there 43 crashes were reported, making this the top crash location in the corridor. These crashes occurred mostly during daytime hours and were split evenly between injury crashes and property damage only crashes. While no fatalities occurred at the intersection, there was a fatal crash just east of the intersection, which is discussed in the next section.

The types of crashes at the Airport Road intersection are summarized in Figure 33.

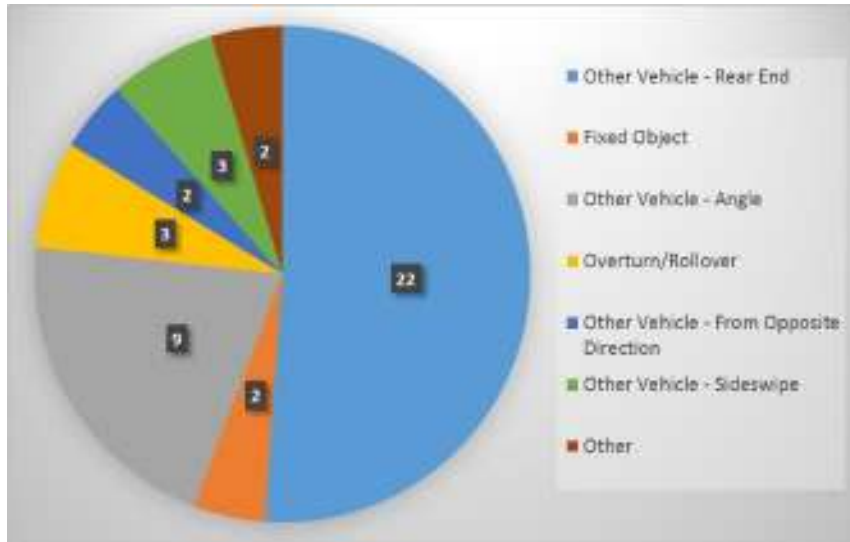


Figure 33 Crashes by Type at the Airport Road Intersection (2013-2015)

As shown, the dominant crash type at the Airport Road intersection is rear-ended crashes at just over half of all crashes. The next most common type are angle crashes at 21% of all crashes. Again, while rear-end crashes are not uncommon at signalized intersections, it is likely that extreme speed variation and the variation between surface arterial and freeway characteristics contribute to the risk for rear-end crashes. Additionally, high operating speeds tend to increase the disregard for yellow or red signal indications as well as increasing the impact of the dilemma zone. The dilemma zone at a signalized intersection is the point at which an approaching vehicle can neither pass through the signal without running the red light nor brake quickly enough to stop safely at the stop bar.

Causes of crashes at the Airport Road intersection are summarized in Figure 34.

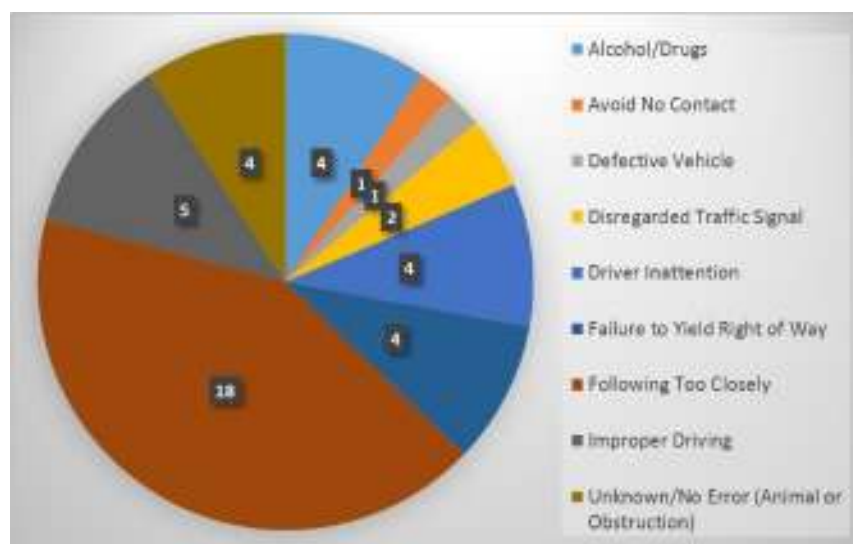


Figure 34 Crashes by Cause at the Airport Road Intersection (2013-2015)

As a further indication of the potential adverse effects of facilities with inconsistent speed limits and alternating characteristics between surface arterials and freeways, “following too closely” was by far the dominant cause for crashes at the Airport Road intersection, accounting for 42% of all crashes.

Via Veteranos

Currently, the Via Veteranos intersection operates as a two-way stop control intersection with approaches on Via Veteranos operating under stop control and the NM 599 approaches operating uncontrolled. All approaches include exclusive left-turn and exclusive right-turn lanes. From 2013 to 2015 eight crashes were reported; they occurred mostly during daytime hours and usually resulted in an injury or fatality. One fatality occurred during the 2013 to 2015 timeframe. More recently, another fatal crash occurred in December of 2016. Both fatalities were the result of angle crashes between a minor street left-turning vehicle and a through vehicle on NM 599. These fatal crashes are discussed further in the next section.

Crash types at the Via Veteranos intersection are summarized in Figure 35.

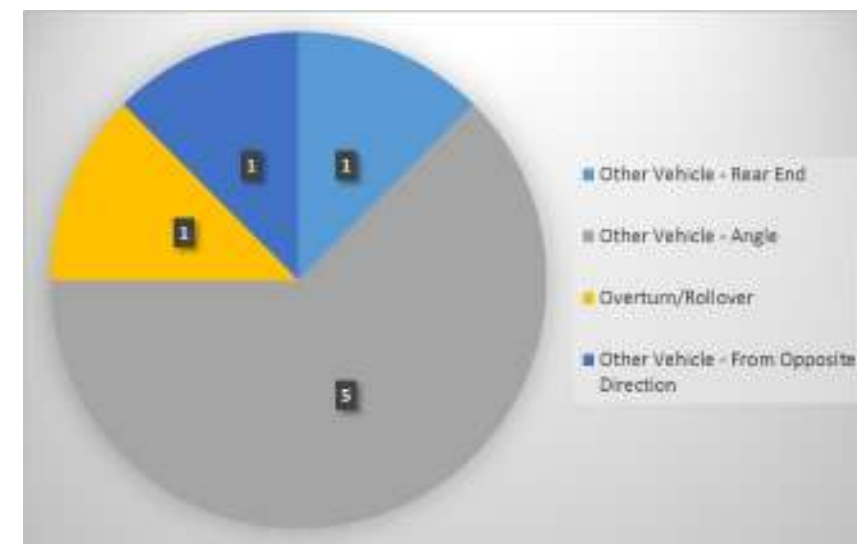


Figure 35 Crashes by Type at Via Veteranos Intersection (2013-2015)

The causes of crashes at the Via Veteranos intersection are summarized in Figure 36.

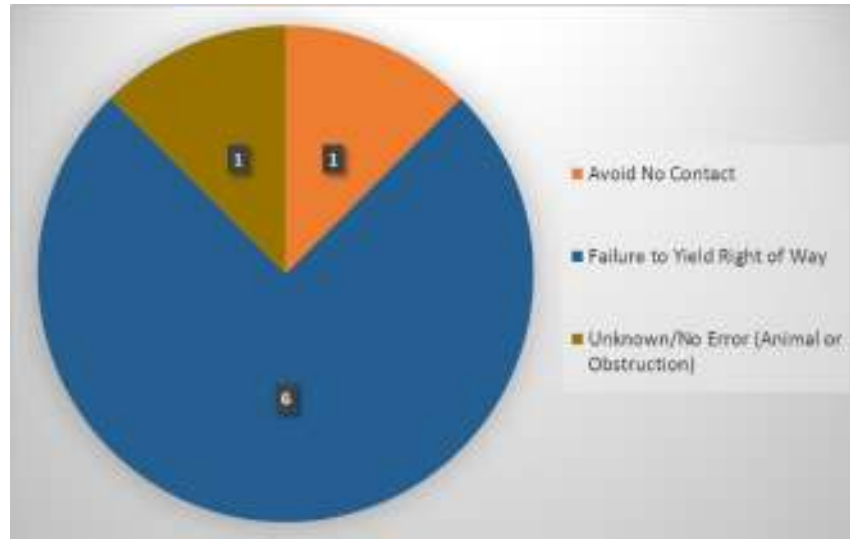


Figure 36 Crashes by Cause at Via Veteranos Intersection (2013-2015)

Three-quarters of the crashes were caused by “failure to yield right of way,” which suggests the current difficulty for turning and crossing vehicles from Via Veteranos to complete their maneuvers safely due to conflicting high speed traffic on NM 599 and large delays experienced at left-turn and crossing movements from Via Veteranos.

Camino de Los Montoyas

Currently, the NM 599/Camino de Los Montoyas intersection operates as a two-way stop control intersection with approaches on Camino de Los Montoyas operating under stop control and the NM 599 approaches operating uncontrolled. All approaches include an exclusive left-turn lane and the northbound, eastbound, and westbound approaches each have an exclusive right-turn lane. From 2013 to 2015 eight crashes were reported, occurring mostly during daytime hours and with most crashes categorized as property damage only. While no fatal crashes have occurred at this intersection, this intersection has similar angle crash risks to Via Veteranos for turning and through vehicles from the stop-controlled Camino de Los Montoyas approaches.

Crash types at the Camino de Los Montoyas intersection are summarized in Figure 37.

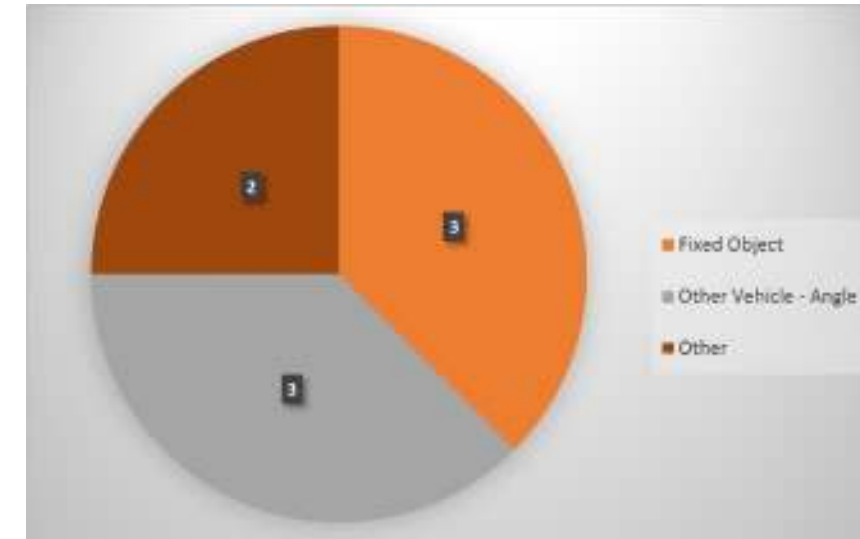


Figure 37 Crashes by Type at the Camino de Los Montoyas Intersection (2013-2015)

Crash causes at the Camino de Los Montoyas intersection are summarized in Figure 38.

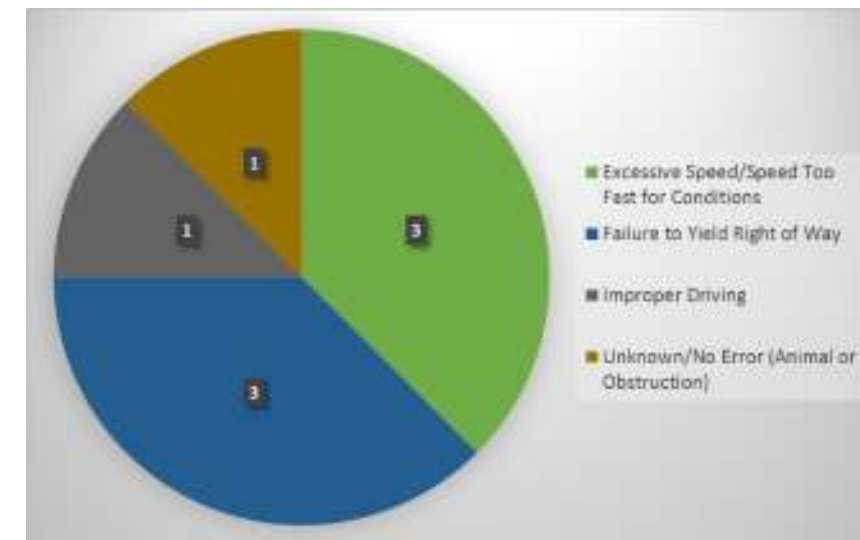


Figure 38 Crashes by Cause at the Camino de Los Montoyas Intersection (2013-2015)

“Failure to yield right-of-way” and “speed too fast for conditions” shared the top most common cause of crashes at the Camino de Los Montoyas intersection with each accounting for 37.5% of all crashes at this location. Similar to Via Veteranos, the “failure to yield right of way” crashes likely indicate the difficulty for minor street left and through movements. As previously mentioned, the NM 599 alignment in the vicinity of the Camino de Los Montoyas intersection includes much more frequent horizontal and vertical curvature, which may explain the frequent “speed too fast for conditions.”

Fatal Crashes on NM 599 (2011-2016)

Four fatal crashes were reported in the provided data from 2013 to 2015 and one additional fatal crash occurred in 2016. The following section presents crash details for each fatal crash that has occurred on NM 599 since 2013.

Fatal Angle Crash on December 20, 2014 at Via Veteranos

A fatal crash occurred on this date at the Via Veteranos intersection. The crash was an angle crash and involved a left-turning vehicle from Via Veteranos onto NM 599 and a through vehicle on NM 599. The incident occurred during the daytime hours and the identified cause of the crash was a failure to yield.

Fatal Motorcycle Crash on July 15, 2015 at I-25 Southbound Off-Ramp

A fatal angle crash involving a motorcycle occurred on this date at the southbound I-25 off-ramp around 7 PM. The identified cause of the crash was a failure to yield, with one of the vehicles approaching on the southbound off-ramp and the other vehicle on a NM 599 approach.

Fatal Pedestrian Crash on October 28, 2015 Just North of Airport Road

Two pedestrians were struck on NM 599 just north of Airport Road late at night on this date. The report indicates that both pedestrians were intoxicated and in a physical confrontation within the NM 599 right-of-way when they were struck.

Fatal Single Vehicle Crash on December 24, 2015 at US 285/US 84

A single vehicle overturned on this date resulting in a fatal crash. The vehicle was traveling east to north on a tight turn on the directional ramp at the time of the crash and improper driving was identified as the primary cause of the overturn.

Fatal Angle Crash on December 8, 2016 at Via Veteranos

A second angle crash fatality occurred at Via Veteranos in a very similar manner to the fatal crash occurring at this location in 2014, which involved a left-turning vehicle from Via Veteranos colliding with a vehicle on NM 599. Like the other crash, this crash occurred during the daytime and failure to yield was the primary cause leading to this incident.

Interactive Highway Safety Design Model (IHSDM)

To better assess design alternatives and incorporate the latest safety analysis methodology found in the 2010 Highway Safety Manual, the IHSDM model was applied. The IHSDM software published by the FHWA requires the following input to calculate predicted crash rates:

- 1. Daily Traffic Demands

- 2. Roadway Geometry
 - a. Number of Lanes
 - b. Horizontal Curvature
 - c. Shoulder Widths
 - d. Median Widths
 - e. Crash Barriers
 - f. Speed Limits
- 3. Traffic Control
- 4. Roadway Classification

Based on NMDOT-provided “as-built” drawings an IHSDM model reflecting existing conditions was developed which included the NM 599 alignment from I-25 to US 285, all current at-grade intersections, existing interchanges (including the Jaguar Road interchange), all interchange ramps and ramp terminals, and current frontage roads along NM 599. It should be noted that while the provided “as-built” drawings covered the majority of the study corridor, there were some areas in which there were no as-built drawings available. For these areas, horizontal alignment and stationing were developed with AUTOCAD and aerial maps.

The IHSDM software automatically subdivided the corridor into eight sub-sections due to the alternating nature of surface arterial and freeway characteristics throughout the study length. Therefore, NM 599 predicted crashes are reported by segment in both total crashes and in terms of the crash rate per million vehicle miles traveled. Furthermore, the IHSDM reports predicted crashes and crash rates (per million entering vehicles) for at-grade and ramp terminal intersections.

Once the existing model had been established, “No-Build” forecasted traffic demands were input into the model and the crash prediction module was then run to predict total crashes between 2016 and 2040 if no improvements were constructed. Resulting predicted crashes are summarized in Table 3.



Table 3 Predicted Crashes in NM 599 Segments under "No-Build" Conditions

Section of NM 599	Observed 2013-2015	Predicted 2016-2040 "No Build"			
	Crash Rate per MVMT	Crash Rate per MVMT	Average Crahes Per Year		
			Fatal & Injury	PDO	Total
I-25 to 1 Mile N. of I-25 Frontage Road	0.95	0.92	4	8	12
1 Mile N. of I-25 Frontage Road to 1/2 Mile N. of Jaguar	0.99	1.05	3	4	7
1/2 Mile N. of Jaguar to 1/2 Mile N. of Airport	1.95	1.91	8	13	22
1/2 Mile N. of Airport to 1/4 Mile S. of Via Veteranos	1.03	1.21	8	10	18
1/4 Mile S. of Via Veteranos to 1/4 Mile N. of Via Veteranos	1.24	1.34	1	2	3
1/4 Mile N. of Via Veteranos to 1/4 Mile W. of Los Montoyos	0.91	0.97	9	11	20
1/4 Mile W. of Los Montoyos to 1/4 Mile E. of Los Monoyos	2.22	2.01	3	3	6
1/4 Mile E. of Los Montoyos to US 285	1.26	1.27	5	7	12
Total NM 599	1.32	1.34	40	60	100

MVMT = Million Vehicle Miles Traveled

Based on the above summary, the following observations are noted:

Generally, crash rates are expected to increase from just north of Airport Road to just north of the Via Veteranos intersection. This could be due to the presence of several sections of horizontal curvature as well as the increased risk for crashes at the minor stop control approaches to Via Veteranos due to the projected overcapacity operation of the minor street left-turn movements. Crash rates for the remainder of the corridor are expected to hold steady or decrease slightly. The fact that crash rates are expected to mostly hold steady is indicative of the fact that the corridor and its facilities, including most at-grade intersections and interchanges, are expected not to change geometrically or from a traffic control standpoint and are expected to still operate under capacity. With no further construction along the NM 599 corridor, IHSDM predicts that on average there will be 40 fatal/injury crashes and 60 property damage crashes per year between 2016 and 2040 due to traffic demand growth in the area.

As part of the total crashes predicted in Table 3, the IHSDM also predicts crashes for all the current at-grade intersection locations, which are summarized in Table 4.

Table 4 Predicted Crashes at At-Grade Intersections under "No-Build"

Intersection with NM 599	Observed 2013-2015	Predicted 2016-2040 "No Build"			
	Crash Rate per MEV	Crash Rate per MEV	Average Crashes Per Year		
			Fatal & Injury	PDO	Total
I-25 Frontage Road	0.44	0.36	1.1	2.33	3.43
Airport Road	0.91	1.1	5.38	8.58	13.96
Via Veteranos	0.56	0.6	2.34	2.59	4.93
Camino de Los Montoyos	0.41	0.43	1.74	1.96	3.7

MEV = Million Entering Vehicles

As shown, crash rates at the at-grade intersections are expected to remain relatively unchanged with slight increases at the Airport Road, Via Veteranos, and Camino de Los Montoyas intersections and a slight decrease at the I-25 Frontage Road intersection. Again, much of the reason crash rates remain relatively unchanged is due to the fact

that the overall intersections are expected to operate under capacity. The movements that are expected to be failing, such as the minor street left-turn movements from Via Veteranos and Camino de Los Montoyas, are not expected to grow as quickly relative to the main line movements along NM 599, therefore not significantly increasing the crash rates.

6.0 Alternatives Analysis

A detailed design alternative analysis for each potential interchange location identified in the original study was completed for this study. Alternative design analyses for this reprioritization study includes a review of potential impacts of the ultimate interchange configuration as well as potential interim projects that could be put in place prior to the ultimate design. These assessment areas include the following:

- 1. Traffic Operations – A review of the level-of-service and traffic capacity based on principals of the Highway Capacity Manual.
- 2. Safety – A comparison of predicted crashes and crash rates between alternatives using the 2010 HSM predictive method and the IHSDM software.
- 3. Connectivity – A review of access, available routes, and presence of out of way pathing.
- 4. Construction Impacts – A review of design and construction challenges including construction phasing, utility challenges and impact on traffic operations during construction.
- 5. Right-of-Way – A review of the need, if any, for additional right-of-way. It should be noted that right-of-way necessary to construct interchanges at most locations has been already purchased.
- 6. Construction Cost – Planning-level construction cost estimate of the build alternatives.
- 7. Interim Alternatives – Identification of interim construction projects that could provide safety improvements until funding for the ultimate configuration can be secured.

A. No-Build Alternative

The “No-Build” Alternative assumes that all traffic control, lane geometry, and road infrastructure remains unchanged for those conditions currently in place during the production of this report aside from the opening of the recently constructed Jaguar Road interchange, which was assumed to be operational in the “No-Build” Alternative. Although it was shown that the “No-Build” Alternative would generally operate at acceptable LOS and below capacity under forecasted 2040 demands, the “No-Build” Alternative does not satisfy the primary project goals and needs. Specifically, this alternative does not satisfy the ultimate goal to convert the NM 599 facility to a limited access freeway. Furthermore, safety risks associated with the mixture of at-grade intersections and interchanges will increase as traffic demands increase. Therefore, it is concluded that the “No-Build” Alternative is not a viable one to satisfy the purpose and need of this facility.

B. I-25 Frontage Road

Ultimate Configuration

The original prioritization plan recommended an overpass combined with jug-handle access roads connecting the West I-25 Frontage Road to NM 599 via two at-grade T-intersections on the I-25 Frontage Road and two right-

in/right-out only intersections on NM 599. This ultimate alternative was proposed to achieve the overall goal of converting NM 599 to a limited-access freeway from I-25 to US 285 by eliminating the left-turn and through movements to/from NM 599. The study team reviewed this alternative and concluded that this alternative as shown in the original prioritization study would still be preferred with little modification. The original concept from the 2010 Prioritization Study is shown in Figure 39.

Traffic Operations

Traffic operational analysis for existing conditions, the 2040 “No-Build” Alternative, and the proposed overpass with 2040 traffic volumes are summarized in Table 5.

Table 5 Traffic Operations Comparison for I-25 Frontage Road Grade Separation (2040 Demands)

Scenario	Facility	Intersection				Worst-Case Movement			
		AM		PM		AM		PM	
		v/c	LOS	v/c	LOS	v/c	LOS	v/c	LOS
"No Build"	I-25 Frontage Road Signal	0.52	B	0.71	B	0.21	C	0.57	C
I-25 Frontage Road Grade Separation	North I-25 Frontage Road T-Intersection	NA				0.26	C	0.22	B
	South I-25 Frontage Road T-Intersection					0.18	B	0.31	B
	Southbound Right-In/Right-Out Intersection					0.34	B	0.17	B
	Northbound Right-In/Right-Out Intersection					0.29	B	0.16	B

The I-25 Frontage Road intersection is expected to operate at acceptable Levels of Service (LOS) under both the “No-Build” Alternative and the overpass option with forecasted 2040 traffic demands.

Safety

Generally, safety at this location will moderately increase due to the elimination of all left-turn movements to/from the I-25 Frontage Road and through movements across NM 599 as left-turn movements, especially permitted left-turn movements, have a greater risk for crash occurrences and a greater severity of crashes than other movements, particularly on high-speed facilities. The IHSDM predictive model was run for both “No-Build” and overpass options to predict the expected number of crashes from 2025 to 2040. The year 2025 was chosen as potentially a reasonable time frame by which an overpass could be constructed. Table 6 summarizes the comparison between both options and the expected number of crashes that could be avoided by implementing the overpass.

Table 6 Predicted Crash Reduction of I-25 Frontage Road Grade Separation

Scenario	Predicted Crashes 2025-2040		
	Fatal/Injury	PDO	Total
"No Build"	51.07	116.8	167.87
I-25 Frontage Rd Grade Separation	48.53	108.48	157.01
Crash Difference	-3	-8	-11



As shown, it is expected that three fatal/injury crashes and eight property damage only crashes might be avoided between 2025 and 2040 if the overpass option was constructed. The IHSDM software predicts crash rates at the I-25 Frontage Road Crossing would relatively be maintained from 0.34 per million entering vehicles (MEV) to 0.35 per MEV.

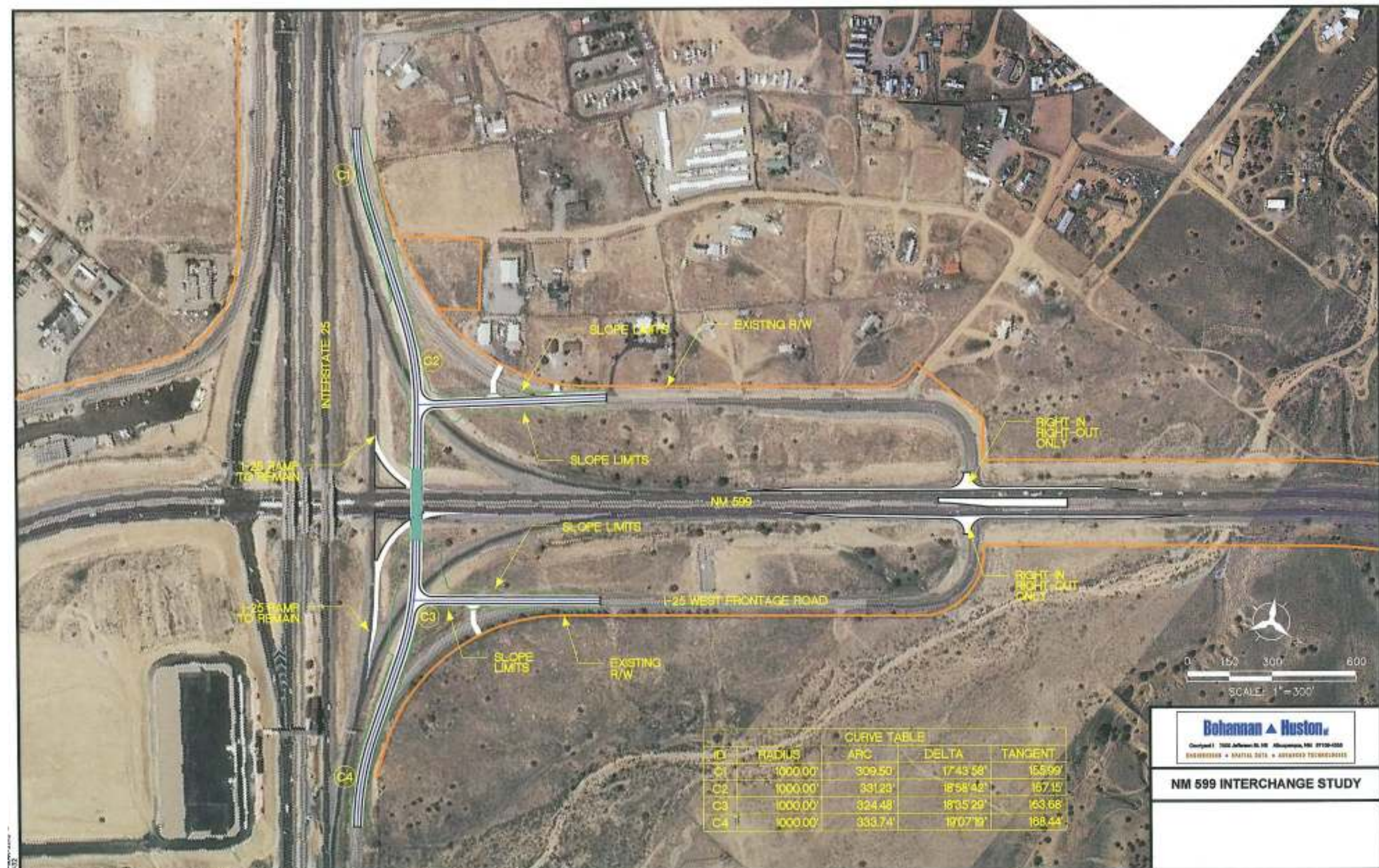


Figure 39 Overpass Concept at I-25 Frontage Road (Exhibit from 2010 Prioritization Study: BHI)

Connectivity

While the overpass build alternative still provides full access to the I-25 Frontage Road and NM 599, some routing would not be intuitive. For example, heading east or west on the I-25 Frontage Road, you must use the western T-intersection to head south on NM 599 and the eastern T-intersection to head north on NM 599.

Right-of-Way

The overpass alternative would not require additional right-of-way to construct.

Construction Impacts

Utilities – Utilities are expected to include water, natural gas, overhead electric. Minimal utility impacts are anticipated.

Environmental- No significant impacts expected. Either an Environmental Assessment or Categorical Exclusion required for NEPA.

Construction Traffic – One-lane closures anticipated for work on NM 599 as well as lane shifts for bridge construction. Flagman control needed for the frontage road.

Construction Cost

The estimated cost of the overpass alternative is **\$6,430,000**. A detailed breakdown of this cost estimate is provided in **Appendix F**.

Safety Benefit vs. Construction Cost

The predicted safety benefit in terms of a number of crashes reduced was converted to cost savings. Based on the NHTSA-published “*The Economic and Societal Impact of Motor Vehicle Crashes, 2015 (Revised)*”, fatal/injury crash costs were estimated at \$3,257,390 per incident and property damage only crashes were estimated at \$7,449 per incident in 2017 dollars. It should be noted that the fatal/injury cost is an average between MAIS categories 0 to 5 and fatal crash cost estimates per the NHTSA publication referenced. A predicted crash savings/construction cost ratio was calculated and summarized in Table 7.

Table 7 Predicted Crash Savings/Construction Cost Ratio for I-25 Frontage Road Grade Separation

	Savings/Costs		
	Fatal/Injury	PDO	Total
I-25 Frontage Grade Separation Predicted Crash Savings	-\$8,273,771	-\$61,977.14	-\$8,335,748
I-25 Frontage Grade Separation Construction Cost			\$6,430,000
Safety Benefit/Construction Cost Ratio			1.30

Interim Alternatives

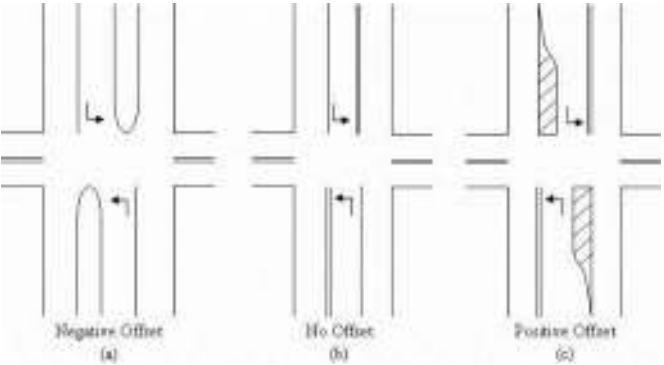
No geometric interim alternative was identified for the I-25 Frontage Road that would provide a safety benefit and still accommodate similar connectivity and access that is present at this location today. However, there are some opportunities that could improve safety in the short term. These include the following:

- 1. Installation of Advanced Dilemma Zone Protection** – As shown, the most common crash types in this area were rear end and angle crashes. Inherent to signal safety is, especially on high speed approaches, what is called the “dilemma zone.” The “dilemma zone” at signalized intersection is defined, per the FHWA, as “The area in which it may be difficult for a driver to decide whether to stop or proceed through the intersection at the onset of the yellow signal indication. It is also referred to as the ‘option zone’ or the ‘zone of indecision’.” With greater operating speeds this dilemma zone becomes larger and much more difficult to accommodate with a set yellow and red clearance time due to the fact that higher speed approaches tend to have much greater variances in speeds and therefore one clearance interval will not reduce this dilemma zone for all approach speeds. If advanced speed detection is installed on an approach, the clearance time can then be varied depending on the measured approach speed in order to minimize this dilemma zone and subsequently reduce angle and rear end crash risks.
- 2. Installation of Flashing Yellow Arrow Indications** – The installation of flashing yellow arrows not only has been shown to improve the safety of permitted left-turn phasing but will also allow the signal operator to modify protected and permitted left-turn phasing by the time of day. For example, a left-turn movement could be set to operate as protected-only during peak hours when angle crash risks might be greater due to increased conflicting traffic demands. During off-peak periods, when conflicting traffic demands are much less, protected-permitted operations could be resumed. This reduces the risk of non-compliance of the



protected left-turn arrow during low traffic demand when opposing traffic gaps are readily available because vehicles will be provided a permitted phase with the flashing arrow indication.

3. **Improvement of Opposing Left-Turn Offset** – Opposing left-turn offset is the net lateral position difference between opposing left-turns, which can have a significant impact on permitted left-turn sight distance



(AASHTO Green Book refers to this as Case F Site Distance). Figure 40 depicts examples of negative offset, no offset, and positive offset. As shown, negative offset and no offset will adversely limit opposing left-turn sight distance, while positive offset tends to increase available sight distance. On high-speed facilities, this left-turn offset is more crucial due

Figure 40 Opposing Left-Turn Offset Conditions Source: FHWA Safety Evaluation of Offset Improvements for Left-Turn Lanes

to the fact that the required sight distance increases with greater oncoming speeds. A review of the current geometry at the existing I-25 Frontage Road

indicates that opposing left-turn lanes on the NM 599 approaches are negatively offset and limit sight distance. Modification of the existing medians could be undertaken to reduce this negative offset and provide additional much-needed sight distance to aid permitted left-turn drivers in choosing a safe gap in oncoming traffic. These modifications would reduce the risk of angle crashes.

Traffic Operations

None of the described interim alternatives would have a significant impact on intersection movement delay and capacity, although implementing protected-only left-turn phasing during peak hours would increase delays and queues. It is not expected that delays would be significant enough to degrade LOS to unacceptable levels.

Safety

All three interim alternatives would reduce the predicted number of crashes at this intersection. Per the Crash Modification Factors Clearinghouse website, which compiles the latest researched crash modification factors for specific mitigation treatments, the installation of advanced detection is expected to reduce all fatal/injury crash types by 39%. Altering left-turn protected and permitted phasing and providing a zero or positive left-turn offset is predicted to reduce angle crashes by 2% and 42% respectively. The combined anticipated crash savings is summarized in Table 8.

Table 8 Predicted Crash Reduction of I-25 Frontage Road Signal and Left-Turn Modifications

Scenario	Predicted Crashes 2020-2040		
	Fatal/Injury	PDO	Total
"No Build"	63.78	145.72	209.5
Left-Turn Phasing and Median Modification	58.35	139.05	197.4
Crash Difference	-5	-7	-12

As shown, the combined implementation of all three interim options is expected to reduce predicted crashes by approximately five for fatal/injury crashes and seven property damage only crashes for a total potential savings of 12 crashes from 2020 to 2040. It should be noted that unlike the interchange configuration, it was assumed that the interim option could be constructed earlier and therefore crash savings was based on a 2020 implementation year.

Connectivity

Connectivity and access would not be impacted by any of the potential interim projects.

Right-of-Way

All interim projects would not require additional right-of-way to construct.

Construction Impacts

Utilities – As very little excavation will be required, utility impacts will be minimal.

Environmental- No significant impacts expected however; it is likely a revision to the Environmental Assessment would be required.

Construction Traffic – One-lane closures would likely be needed for median work.

Construction Cost

The estimated cost of all three interim alternatives is **\$300,000**. A detailed breakdown of this cost estimate is provided in **Appendix F**.

Safety Benefit vs. Construction Cost

Assuming a construction date of 2020, all safety benefit and construction costs were converted to 2017dollars and a ratio was calculated and summarized in Table 9.

Table 9 Predicted Crash Savings/Construction Cost Ratio for West Frontage Road Interim Option

	Savings/Costs		
	Fatal/Injury	PDO	Total
Left-Turn Phasing and Median Modification Predicted Crash Savings	-\$17,687,629	-\$49,686.00	-\$17,737,315
Left-Turn Phasing and Median Modification Construction Cost			\$300,000
Safety Benefit/Construction Cost Ratio			59.12

C. Airport Road

Ultimate Configuration

The original prioritization plan recommended replacement of the existing at-grade signalized intersection with a traditional tight diamond interchange with a proposed bridge structure on NM 599 taking it over Airport Road. The study team reviewed this alternative and concluded that this alternative as shown in the original prioritization study would still be preferred with some potential modifications. Modifications may include bringing Airport Road over NM 599, and the reduction of Airport Road at the intersection to one lane in each direction. The original concept from the 2010 Prioritization Study is shown in Figure 41.

Traffic Operations

Traffic operational analysis for the “No-Build” Alternative, and an interchange option with Airport Road reduced to one through lane in each direction are summarized in Table 10.

Table 10 Traffic Operation Comparison for Interchange at Airport Road (2040 Demands)

Scenario	Facility	Intersection				Worst-Case Movement			
		AM		PM		AM		PM	
		v/c	LOS	v/c	LOS	v/c	LOS	v/c	LOS
"No Build"	Airport Road Signal	0.58	C	0.61	C	0.5	D	0.55	D
Airport Road Interchange	West Ramp Terminal Intersection	0.71	B	0.83	B	0.71	D	0.83	D
	East Ramp Terminal Intersection	0.83	B	0.89	B	0.83	D	0.89	D
	Southbound Off-Ramp	NA				0.19	A	0.29	B
	Southbound On-Ramp					0.27	B	0.32	B
	Northbound Off-Ramp					0.3	B	0.26	B
	Northbound On-Ramp					0.3	B	0.19	A

As shown the Airport Road intersection is expected to operate at acceptable LOS and below capacity under both the “No-Build” Alternative and interchange option under 2040 forecasted demands.

Safety

The replacement of the current at-grade signalized intersection with the proposed interchange configuration may significantly reduce crashes at this location. The IHSDM predictive model was run for both “No-Build” and interchange options to predict expected crash occurrences from 2025 to 2040. Again, 2025 is the earliest an interchange was assumed to be constructed. Table 11 summarizes the expected crash savings by implementing the overpass.

Table 11 Predicted Crash Reduction of Airport Road Interchange

Scenario	Predicted Crashes 2025-2040		
	Fatal/Injury	PDO	Total
"No Build"	111.12	184.38	295.5
Airport Road Interchange	102.24	129.4	231.64
Crash Difference	-9	-55	-64

As shown, a total reduction of nine fatal/injury crashes and 55 property damage only crashes would be expected between 2025 and 2040 if the interchange were constructed. The current crash rate at the Airport Road intersection of 1.16 per MEV may be reduced to ramp terminal intersection rates of 0.79 per MEV for the southbound ramps and 1.04 per MEV for the northbound ramps. This reduction is attributed to the fact that the ramp terminal intersections will have slower approach speeds and smaller turning movement demands than a single signalized at-grade intersection.

Connectivity

Connectivity will be enhanced for this location with the addition of on- and off-ramps for vehicles exiting and entering the NM 599 facility. All routes that are feasible under today’s single at-grade intersection will be maintained with the proposed interchange facility.

Right-of-Way

Per the original prioritization study, right-of-way has already been obtained to accommodate an interchange at the Airport Road intersection and no additional right-of-way would be required.

Construction Impacts

Utilities – Utilities are expected to include water, natural gas, overhead electric, sanitary sewer, and fiber optic cable. Utility impacts are anticipated.

Environmental- No significant impacts expected; however a Categorical Exclusion would likely be required for NEPA. There is a potential for noise and visual impacts.

Construction Traffic – Alternate two-way traffic on existing NB/SB lanes with crossovers will likely be required for work on NM 599. Lane closures and shifts for bridge construction and Airport Road work.

Construction Cost

The estimated cost of the overpass alternative is **\$11,640,000**. A detailed breakdown of this cost estimate is provided in **Appendix F**.



Safety Benefit vs. Construction Cost

Assuming a construction date of 2025 all safety benefit, costs and a benefit/cost ratio were calculated and summarized in Table 12 in 2017 dollars.

Table 12 Predicted Crash Savings/Construction Cost Ratio for Airport Road Interchange

	Savings/Costs		
	Fatal/Injury	PDO	Total
Airport Road Interchange Predicted Crash Savings	-\$28,925,625	-\$409,555.70	-\$29,335,181
Airport Road Interchange Construction Cost			\$11,640,000
Safety Benefit/Construction Cost Ratio			2.52



Figure 41 Interchange Alternative at Airport Road (Exhibit from 2010 Prioritization Study: BHI)

Interim Opportunities

No geometric interim alternative was identified for the Airport Road intersection that would provide a safety benefit and still accommodate similar connectivity and access that is present at this location today. Similar to the I-25 Frontage Road location, the same interim opportunities could improve safety in the short term. These include the following:

- 1. **Installation of Advanced Dilemma Zone Protection** – This installation would work identically to what was described at the I-25 Frontage Road location.
- 2. **Installation of Flashing Yellow Arrow Indications** – This installation would work identically to what was described at the I-25 Frontage Road location.
- 3. **Improvement of Opposing Left-Turn Offset** – This installation works identically to what was described at the I-25 Frontage Road location. It should be noted that the current opposing left-turn offset on NM 599 at Airport Road is even more negative than what is currently present at the I-25 Frontage Road, which means that opposing left-turn sight distance is even more restricted at this location and would benefit that much more from this median treatment.

Traffic Operations

None of the described interim alternatives would have a significant impact on intersection movement delay and capacity, although implementing protected-only left-turn phasing during peak hours would increase delays and queues. It is not expected that delays would be significant enough to degrade LOS to unacceptable levels.

Safety

Expected crash reductions for all three alternatives are identical to those reported for the interim options at the I-25 Frontage Road intersection. Predicted crash reductions if all three alternatives were implemented are summarized in Table 13.

Table 13 Predicted Crash Reduction of Airport Road Signal and Left-Turn Modifications

Scenario	Predicted Crashes 2020-2040		
	Fatal/Injury	PDO	Total
"No Build"	138.7	230.13	368.83
Airport Road Signal and Left-Turn Modifications	109.89	205.55	315.44
Crash Difference	-29	-25	-53

The combinations of the installation of all three interim options is expected to reduce predicted fatal/injury crashes by 29 and 24 property damage only crashes for a total potential savings of 53 crashes from 2020 to 2040.

Connectivity

Connectivity and access would not be impacted by any of the potential interim projects.

Right-of-Way

All interim projects would not require additional right-of-way to construct.

Construction Impacts

Utilities – As very little excavation will be required, utility impacts will be minimal.

Environmental- No significant impacts expected; however it is likely an Environmental Assessment or Categorical Exclusion would be required.

Construction Traffic – One-lane closures would likely be needed for median work.

Construction Cost

The estimated cost of the interim alternatives Airport Road signal and left-turn modifications alternative is **\$300,000**. A detailed breakdown of this cost estimate is provided in **Appendix F**.

Safety Benefit vs. Construction Cost

Assuming a construction date of 2020 all safety benefit and construction costs were converted to 2017 dollars and a ratio was calculated and summarized in Table 14.

Table 14 Predicted Crash Savings/Construction Cost Ratio for Airport Road Interim Alternative

	Savings/Costs		
	Fatal/Injury	PDO	Total
Airport Road Signal and Left-Turn Modifications Predicted Crash Savings	-\$93,845,412	-\$183,100.75	-\$94,028,513
Airport Road Signal and Left-Turn Modifications Construction Cost			\$300,000
Safety Benefit/Construction Cost Ratio			313.43



D. Caja del Rio

Ultimate Configuration

Per the original Prioritization Study, an interchange at Caja del Rio was not planned for during the original design of the NM 599 relief route. However, it was identified as an allowable access point in the original environmental document. Currently, Caja del Rio connects the north NM 599 Frontage Road to the Las Campanas residential community as well as the Santa Fe Landfill, Animal Shelter, the Municipal Recreation Center, Marty Sanchez Links, New Mexico Department of Game and Fish, and various residences in between. Caja del Rio currently does not connect to any road network south of NM 599 nor does it cross NM 599. As will be discussed, there is currently no right-of-way acquired for this interchange and the need for construction of this facility will depend greatly on adjacent development.

Traffic Operations

There is no existing Caja del Rio intersection. Furthermore, the 2040 forecasts do not show significant growth or development within the Caja del Rio area to trigger the need for the Caja del Rio interchange. Therefore, no existing or future conditions traffic operation analysis was calculated.

Safety

With no existing intersection between Caja del Rio and NM 599, no safety improvements with the construction of a Caja del Rio interchange is anticipated.

Connectivity

Connectivity and access would be enhanced for this location over existing conditions with the addition of on- and off-ramps for vehicles exiting and entering the NM 599 facility. Furthermore, Caja del Rio would likely be connected to the road network on the south side of NM 599.

Right-of-Way

As mentioned, there currently is no right-of-way dedicated for a Caja del Rio interchange. Per the 2010 Prioritization Study, it was estimated that 31 acres of right-of-way would be required and the adjacent land is currently owned by the State Land Office.

Construction Impacts

Utilities – Utilities are expected to include water and natural gas. Utility impacts are anticipated.

Environmental- No significant impacts expected. Environmental Assessment or Categorical Exclusion will be required for NEPA. There may be a potential for noise and visual impacts.

Construction Traffic – One-lane closures on NM 599 to tie in ramps. Detour NM 599 traffic to ramps for construction of the overpass. Flagman control used to tie in frontage road and Caja del Rio.

Construction Cost

The estimated cost of an interchange at Caja del Rio is **\$8,130,000**. A detailed breakdown of this cost estimate is provided in **Appendix F**.

Safety Benefit vs. Construction Cost

With no safety benefit associated with a new interchange for Caja Del Rio, there is no benefit/cost ratio for its construction.

Interim Opportunities

Routes between west NM 599 and Caja del Rio are currently limited as the North Frontage Road is not a paved route across the Santa Fe River. Therefore, motorists on Caja del Rio wanting to head west on NM 599 must initially head east to access NM 599 via the Meadows Road interchange. This route is slightly inconvenient and adds approximately two miles to the trip to head west on NM 599. Furthermore, drivers are currently crossing the Santa Fe riverbed illegally, which presents a safety issue with the risk for high water crossings during rain events and subsequently injury to motorists. To mitigate this condition, in the interim the North Frontage Road could be continued from its current terminus just east of the Santa Fe River by constructing a bridge running parallel to NM 599 to connect the North Frontage Road to Paseo de River. This concept was also proposed in the 2010 Prioritization Study, which proposed a reconstruction of Paseo de River in addition to the Santa Fe River bridge construction. This interim concept is shown in Figure 42 Santa Fe River Crossing Alternative. As shown, improvements for this study are assumed to include only the Santa Fe River Bridge and enough additional pavement to connect both the North Frontage Road and Paseo de River to the bridge structure.



Figure 42 Santa Fe River Crossing Alternative

Traffic Operations

Traffic operational analysis for the “No-Build” Alternative and the Santa Fe River Bridge alternative are summarized in Table 15.

Table 15 Traffic Operation Comparison for Santa Fe River Crossing (2040 Demands)

Scenario	Facility	Intersection				Worst-Case Movement			
		AM		PM		AM		PM	
		v/c	LOS	v/c	LOS	v/c	LOS	v/c	LOS
"No Build"	Caja del Rio/North Frontage Road	NA				0.07	B	0.18	A
	Airport Road Signal	0.58	C	0.61	C	0.3	C	0.55	D
Santa Fe Bridge Connection	Caja del Rio/North Frontage Road	NA				0.24	B	0.22	B
	Airport Road Signal	0.59	C	0.71	B	0.18	C	0.57	C

As shown the Caja del Rio/North Frontage Road and the Airport Road/NM 599 intersections are expected to operate at acceptable LOS under 2040 forecasted demands for both the “No-Build” and Santa Fe River Bridge alternatives. It should be noted that movements at both the Colony Drive/ Paseo de River and Colony Drive/Airport Road intersection would also be impacted. The degree of impact is not known as turning movement volumes were not collected at these locations. If this project were to be constructed, study of these two intersections would be recommended.

Safety

It is not expected that this option will significantly impact crashes along NM 599 and the increase in diverted demand to the Airport Road intersection is not significant enough to increase crash rates at that intersection. Therefore, no net safety benefit or detriment is expected, although the formal connection across the Santa Fe River would eliminate the illegal river bed crossings.

Connectivity

As mentioned, connectivity would be enhanced by providing traffic from/to Caja del Rio a shorter route for destinations on west NM 599 via the proposed connection to the NM 599/Airport Road intersection via Paseo de River and Colony Drive. This would potentially reduce trip length for Caja del Rio drivers by two miles.

Right-of-Way

Per the 2010 Prioritization Study, approximately two acres of right-of-way would need to be obtained in order to construct the river bridge.

Construction Impacts

Utilities – Utilities are expected to include water, natural gas, overhead & underground electric, sanitary sewer, and fiber optic cable. Utility impacts are anticipated.

Environmental- No significant impacts expected. Environmental Assessment or Categorical Exclusion will be required for NEPA. An individual 404 permit may be required for this location.

Construction Traffic – No impacts on traffic for bridge construction. Flagman control will be required for connections to the frontage road. There are no impacts on NM 599 traffic anticipated.

Construction Cost

The estimated cost of an interchange at Caja del Rio is **\$2,310,000**. A detailed breakdown of this cost estimate is provided in **Appendix F**.

E. Via Veteranos (CR 70)

Ultimate Configuration

A full interchange is ultimately proposed for the Via Veteranos intersection with stop control ramp terminals, single-lane ramps, and a single lane in each direction on Via Veteranos. Generally, there are no recommended changes to this concept aside from some changes in ramp alignments and opportunities to reduce the size of the bridge. A full interchange concept for Via Veteranos is depicted in Figure 43.

Traffic Operations

Traffic operational analysis for the “No-Build” Alternative and the proposed interchange alternative are summarized in Table 16.

Table 16 Traffic Operations Comparison of Via Veteranos Interchange (2040 Demands)

Scenario	Facility	Worst-Case Movement			
		AM		PM	
		v/c	LOS	v/c	LOS
"No Build"	Via Veteranos (Stop Control)	2.26	F	0.51	C
Via Veteranos Interchange	North Ramp Terminal (Stop Control)	0.2	B	0.32	B
	South Ramp Terminal (Stop Control)	0.07	A	0.19	B
	Westbound Off-Ramp	0.28	B	0.43	B
	Westbound On-Ramp	0.27	B	0.4	B
	Eastbound Off-Ramp	0.41	B	0.29	B
	Eastbound On-Ramp	0.38	B	0.29	B

As shown, minor street left-turns from Via Veteranos under a “No-Build” Alternative are expected to operate over capacity as well as at LOS F under forecasted 2040 demands. An interchange, including all ramps and ramp terminals, would improve operations to an acceptable LOS of B or better under forecasted 2040 demands.

Safety

The replacement of the current at-grade two-way stop controlled intersection with the proposed interchange configuration may significantly reduce crashes at this location. As discussed in the existing conditions sections of this report, this interchange has had two recent traffic fatalities associated with the minor street left-turn movement. The proposed interchange would significantly reduce the number of crashes that are predicted to occur at this intersection under a “No-Build” Alternative. The IHSDM predictive model was run for both “No-Build” and interchange options to predict expected crash occurrences from 2025 to 2040. Table 17 summarizes the comparison between both options and the expected crash savings by implementing the full interchange.

Table 17 Predicted Crash Reduction of Via Veteranos Interchange

Scenario	Predicted Crashes 2025-2040		
	Fatal/Injury	PDO	Total
"No Build"	50.58	63.35	113.93
Via Veteranos Interchange	14.29	28.91	43.2
Crash Difference	-36	-34	-71

As shown, a total reduction of 36 fatal/injury crashes and 34 property damage only crashes would be expected between 2025 and 2040 if the overpass option was constructed. Crash rates at the Via Veteranos intersection were observed to be 0.59 per million entering vehicles (MEV) which would be reduced with ramp terminal intersection rates of 0.24 per MEV for the westbound ramps and 0.32 per MEV for the eastbound ramps. This reduction is attributed to the fact that the ramp terminal intersections will have slower approach speeds and that a minor street left-turn lane will be eliminated.

Connectivity

Connectivity will be enhanced for this location with the addition of on and off-ramps for vehicles exiting and entering the NM 599 facility. All routes that are feasible under today’s single at-grade intersection will be maintained under the proposed interchange facility.

Right-of-Way

Per the original prioritization study, the right-of-way has already been obtained to accommodate an interchange at the Via Veteranos intersection and no additional right-of-way would be required.

Construction Impacts

Utilities – Utilities are expected to include underground electric for existing street lighting on Via Veteranos. Utility impacts are anticipated.

Environmental- No significant impacts expected; However an Environmental Assessment or a Categorical Exclusion will be required for NEPA. Possible noise and visual impacts. An individual 404 permit may be required for this location.

Construction Traffic – One-lane closures on NM 599 for ramp tie-ins and lane shifts on NM 599 for bridge constructions. Detour Via Veteranos traffic to the Meadows Road interchange.

Construction Cost

The estimated cost of the overpass alternative is **\$7,650,000**. A detailed breakdown of this cost estimate is provided in **Appendix F**.



Safety Benefit vs. Construction Cost

Assuming a construction date of 2025 all safety benefit and construction costs were converted to 2017 dollars and a ratio was calculated and summarized in Table 18.

Table 18 Predicted Crash Savings/Construction Cost Ratio for Via Veteranos Interchange

	Savings/Costs		
	Fatal/Injury	PDO	Total
Via Veteranos Interchange Predicted Crash Savings	-\$118,210,691	-\$256,549.62	-\$118,467,241
Via Veteranos Interchange Construction Cost			\$7,650,000
Safety Benefit/Construction Cost Ratio			15.49



Figure 43. Updated Full Interchange Concept at Via Veteranos (CR 70)

Interim Opportunities

With concerns surrounding the two recent traffic fatalities occurring at the Via Veteranos intersection, there are some opportunities to implement interim treatments in an effort to mitigate crash risk, especially for minor street left-turn and through movements from Via Veteranos. The interim projects which would reduce predicted crashes at Via Veteranos include:

- 1. **Right-In/Right-Out/Left-In Alternative** - In an effort to provide interim mitigation, the NMDOT is currently in the process of designing and eventually constructing a project which would eliminate minor street left-turn and through movements. Right turns from Via Veteranos and right-turn and left-turn movements to Via Veteranos would still be allowed with this alternative. This alternative is currently 60% designed with a final design expected to be completed by late 2017 or early 2018. Currently, construction funding has not yet been allotted for this alternative; therefore, it is unknown when construction of this alternative will be completed. Figure 44 shows the 30% design layout indicating proposed improvements.
- 2. Another approach would be to construct interim projects that would essentially be phased toward the final interchange configuration.
 - a. **Grade Separation Alternative** – One option would be to construct a bridge carrying Via Veteranos over NM 599 essentially eliminating the at-grade intersection. No ramps would be constructed to connect Via Veteranos to NM 599. The Grade Separation Alternative is shown in Figure 45.
 - b. **Low-Speed Ramps Alternative** – Another option would be to construct low-speed ramps in addition to a Via Veteranos bridge over NM 599. The low-speed ramps would utilize the existing right-turn lanes on the east and west legs of the current intersection as deceleration lanes for relatively short low-speed ramps which would connect on either side of NM 599. On-ramps would also be provided with acceleration lanes provided using existing shoulder widths. Figure 46 depicts the Low-Speed Ramps Alternative.

Traffic Operations

Traffic operational analysis for the “No-Build” Alternative, and the proposed grade separated alternative are summarized in

Table 21. It should be noted that impacts both South Meadows and Camino La Tierra are presented due to the potential for rerouted trips from the eliminated direct access to/from Via Veteranos. Also, the low-speed ramp alternative was not reported as it is expected to operate similarly to the full interchange option reported in the previous section.

Table 19 Traffic Operations Comparison of Interim Alternatives at Via Veteranos

Scenario	Facility	Worst-Case Movement			
		AM		PM	
		v/c	LOS	v/c	LOS
"No Build"	Via Veteranos (Stop Control)	1.25	F	0.26	C
Via Veteranos Grade Separation	Via Veteranos/North Frontage Rd (Stop Control)	0.032	A	0.15	A
	North Meadows Ramp Terminal (Roundabout)	0.325	A	0.399	A
	South Meadows Ramp Terminal (Roundabout)	0.767	D	0.433	B
	Camino La Tierra/North Frontage Rd (Stop Control)	0.185	B	0.497	C
	North Camino La Tierra Ramp Terminal	0.379	C	0.787	D
	South Camino La Tierra Ramp Terminal	0.233	C	0.659	C
	Camino La Tierra/Buckman (Stop Control)	0.081	A	0.345	B

The interim alternative is expected to mitigate the failing minor street left-turn movements from Via Veteranos under a “No-Build” Alternative, operating at a LOS D or better. It should be mentioned that only the overpass with no ramps option was analyzed as this option restricts the most turn movements at Via Veteranos and reroutes more traffic than the Right-In/Right-Out/Left-In Alternative. Since operations appears acceptable for the Grade Separation Alternative, the Right-In/Right-Out/Left-In Alternative should also operate acceptably as it restricts fewer turn movements.

Safety

All interim options are intended to increase safety at the intersection and reduce predicted crash occurrences to varying degrees. It was assumed that the Right-In/Right-Out/Left-In alternative could be constructed earlier than the other two. Therefore, crash savings calculation was based on 2020 to 2040 for the Right-In/Right-Out/Left-In alternative and the Overpass and Low-Speed Ramps alternatives were based on 2025 to 2040. Table 20 summarizes the reduced number of predicted crashes based on IHSDM calculations.



Table 20 Predicted Crash Reductions of Via Veteranos Interim Alternatives

Scenario	Predicted Crashes 2020-2040		
	Fatal/Injury	PDO	Total
"No Build" 2020-2040	60.39	75.75	136.14
"No Build" 2025-2040	50.58	63.35	113.93
Right-In/Right-Out/Left-In	38.65	48.48	87.13
Crash Difference	-22	-27	-49
Via Veteranos Overpass	6.96	15.64	22.60
Crash Difference	-44	-48	-91
Low Speed Ramps	14.25	28.91	43.16
Crash Difference	-44	-34	-78

As shown, all alternatives are expected to reduce predicted crashes significantly, with the Grade Separation Alternative option expected to reduce crashes by the most followed by the Low-Speed Ramps option and finally the Right-In/Right-Out/Left-In alternative.

Connectivity

Right-In/Right-Out/Left-In Alternative – This interim alternative proposes to eliminate direct left-turns from Via Veteranos approaches as well as through movements crossing NM 599. It should be noted that the existing frontage roads on both the north and south side allow for these movements to access or cross NM 599 at either the Meadows Road interchange approximately two miles southwest of Via Veteranos or the Camino La Tierra interchange approximately two miles to the northeast. With access opportunities on either side, left-turn demands will not necessarily need to travel out of their way whether their desired routes are north or south on NM 599. Through demands may feel slightly inconvenienced depending on their ultimate trip destination. It should be noted however, that Via Abajo, located approximately one mile to the south, provides an underpass that allows vehicles to cross NM 599 without conflicting with high speed traffic. All turns from NM 599 to Via Veteranos will still be allowed as will right-turns from Via Veteranos to NM 599.

Grade Separation Alternative – This alternative will prohibit direct access between Via Veteranos and NM 599, and drivers on Via Veteranos will only be allowed to cross NM 599 via a grade separation. Motorists on Via Veteranos would be required to use either the Meadows Road interchange to the southwest or the Camino La Tierra interchange to the northeast to access NM 599. Again, due to the adjacent interchanges on either side of Via Veteranos turn movements will not need to route too far out of the way to be perceived as an inconvenience to drivers.

Low-Speed Ramps Alternative – This alternative will not restrict any movements that are allowed today at the at-grade intersection except now they will all occur at two ramp terminal intersections similar to the ultimate interchange alternative.

Right-of-Way

All interim options would be constructed within existing right-of-way.

Construction Impacts

Utilities – Utilities are expected to include underground electric for existing street lighting on Via Veteranos. Utility impacts for the Right-In/Right-Out/Left-In alternative are expected to be minimal. The Grade Separation and Low-Speed Ramps options will have utility impacts.

Environmental- No significant impacts expected for any of the alternatives; However an Environmental Assessment or a Categorical Exclusion will be required for NEPA. There may be noise and visual impact. An individual 404 permit may be required for the Grade Separation and Low-Speed Ramps alternatives at this location.

Construction Traffic – Minimal traffic impacts are expected for the Right-in/Right-Out/Left-In option. Lane shifts on NM 599 for bridge constructions will be required for both the Grade Separated and Low-Speed Ramps alternatives. One-lane closures on NM 599 will be required for the low-speed ramps. Detour Via Veteranos traffic to the Meadows Road interchange for all alternatives.

Construction Cost

Estimated interim construction costs are **\$500,000** for the Right-In/Right-Out/Left-In Alternative, **\$3,870,000** for the Via Veteranos Overpass Alternative, and **\$4,630,000** for the Low Speed Ramps Alternative. A detailed breakdown of these cost estimates is provided in **Appendix F**.

Safety Benefit vs. Construction Cost

Assuming the construction year of 2020 for Right-In/Right-Out/Left-In and 2025 for Overpass and Low-Speed Ramps, safety benefit, construction costs, and benefit/cost ratios were calculated in 2017 dollars and summarized in Table 21.



Table 21 Predicted Crash Savings/Construction Cost ratio for Via Veteranos Interim Alternatives

	Savings/Costs		
	Fatal/Injury	PDO	Total
Right-In/Right-Out/Left-In Predicted Crash Savings	-\$70,816,966.45	-\$203,139.03	-\$71,020,105
Right-In/Right-Out/Left-In Construction Cost			\$500,000
Safety Benefit/Construction Cost Ratio			142.04
Via Veteranos Overpass Predicted Crash Savings	-\$142,087,361.62	-\$355,400.19	-\$142,442,762
Via Veteranos Overpass Construction Cost			\$3,870,000
Safety Benefit/Construction Cost Ratio			36.81
Low Speed Ramps Predicted Crash Savings	-\$118,210,691.27	-\$256,549.62	-\$118,467,241
Low-Speed Ramps Construction Cost			\$4,630,000
Safety Benefit/Construction Cost Ratio			25.59

While all interim alternatives are expected to provide significant benefit-cost ratios, the Overpass Alternative is expected to offer the greatest benefit for the cost.

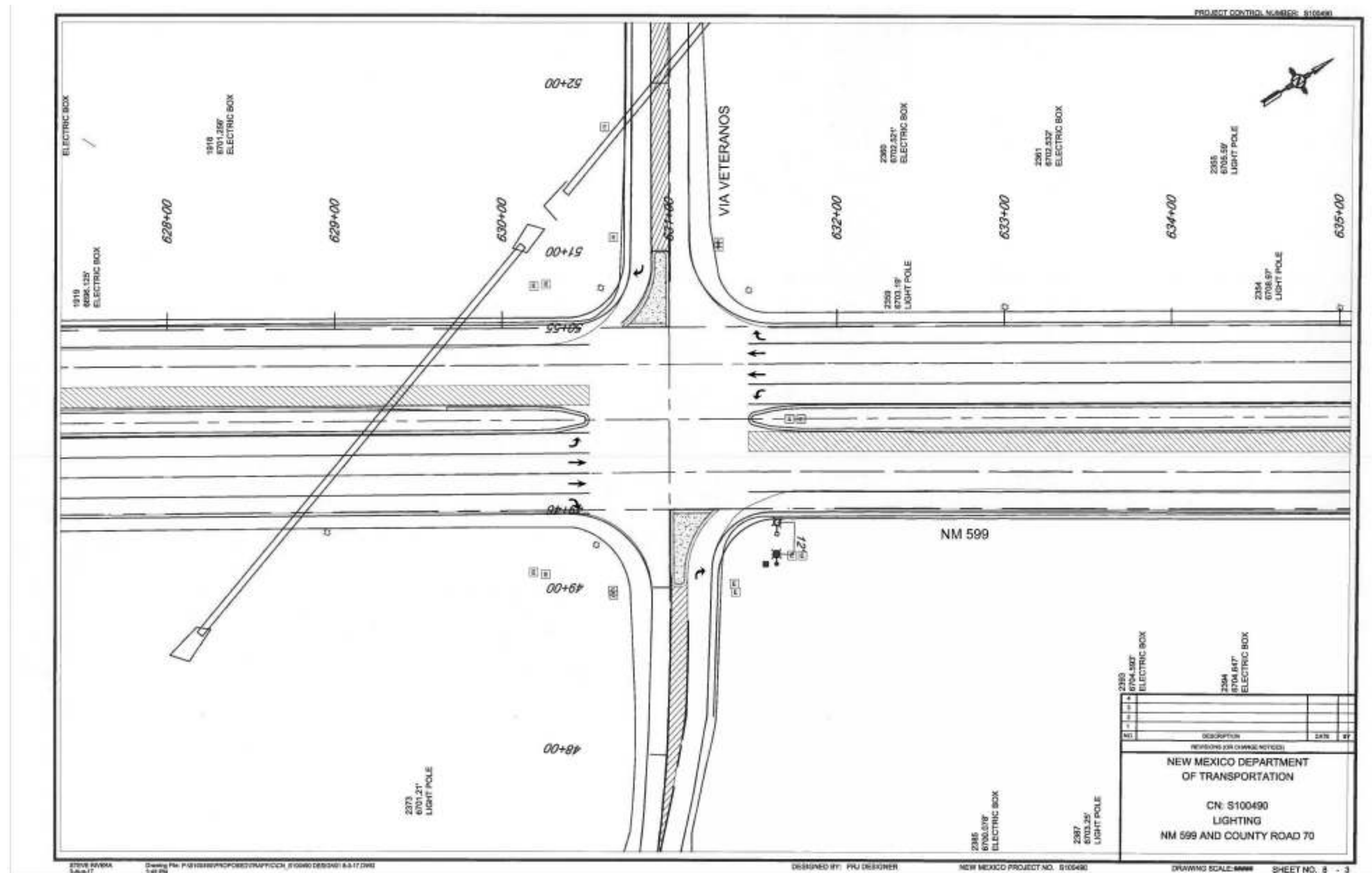


Figure 44 Right-In/Right-Out/Left-In 30% Design



Figure 45 Grade Separated Alternative



Figure 46 Low-Speed Ramps Alternative

F. Ephraim Road

Ultimate Configuration

An interchange at Ephraim Road was identified in the 2010 Prioritization Study due to the fact that an interchange at this location was planned as part of the original NM 599 project. An interchange at Ephraim Road was originally considered to accommodate several residential developments that were being planned for the north side of NM 599. However, aside from two existing properties with private residences, this land has since become the property of the City of Santa Fe Open Space. The interchange concept from the 2010 Priority Study is shown in Figure 47 Ephraim Interchange Concept (Exhibit from 2010 Prioritization Study: BHI). Currently, there is only an at-grade right-in/right-out access at Ephraim Road providing access to six private parcels and a mountain bike park north of NM 599.

Traffic Operations

With so little traffic using the current access and with no development anticipated or included in the 2040 regional model at Ephraim Road, the capacity analysis was not calculated. Based on existing and forecasted demands, the existing facility and a future interchange would be assumed to operate at LOS A.

Safety

With such low traffic volumes, there have not been any crashes nor are crashes predicted to occur at Ephraim Road. Therefore, there are no predicted crash reductions associated with the interchange.

Connectivity

With very little current or anticipated adjacent development, an interchange would add very little additional connectivity or access benefit aside from providing more comprehensive access to/from NM 599 for the existing private residences and the mountain bike park north of NM 599.

Right-of-Way

An interchange at Ephraim Road would be accommodated by existing right-of-way.

Construction Impacts

Utilities – There are no anticipated utility impacts.

Environmental- No significant impacts expected for any of the alternatives; however an Environmental Assessment or Categorical Exclusion will be required for NEPA. Possible noise and visual impacts.

Construction Traffic – Much of the construction for this interchange can be completed with minimal impact on existing traffic. Lane shifts will be required on NM 599 for the construction of the bridge and lane closures for ramp tie-ins. Access will need to be maintained for the adjacent six properties on the north side of NM 599 during construction.

Construction Cost

Per the 2010 Priority Study, the estimated cost is **\$8,000,000**.

Safety Benefit vs. Construction Cost

With no anticipated safety benefit, no safety benefit-cost ratio was calculated.

At this time, the need for an interchange at this location is not foreseen nor would it be cost-effective, based on current and anticipated commercial/residential development and the expected lack of benefits to capacity or safety.

Interim Opportunities

One of the goals for NM 599 is to convert this corridor to a limited-access freeway facility as originally planned. In keeping with that plan, it is desirable to ultimately eliminate the at-grade right-in/right-out intersection at Ephraim Road, but access must still be maintained for the six private parcels north of NM 599. This may be accomplished by extending the north frontage road along NM 599 from its current terminus at the Camino La Tierra interchange to the Camino de Los Montoyas at-grade intersection. This interim alternative is explored in greater detail in the Camino de Los Montoyas alternative analysis discussion, as it is also considered to be an interim alternative for that location.

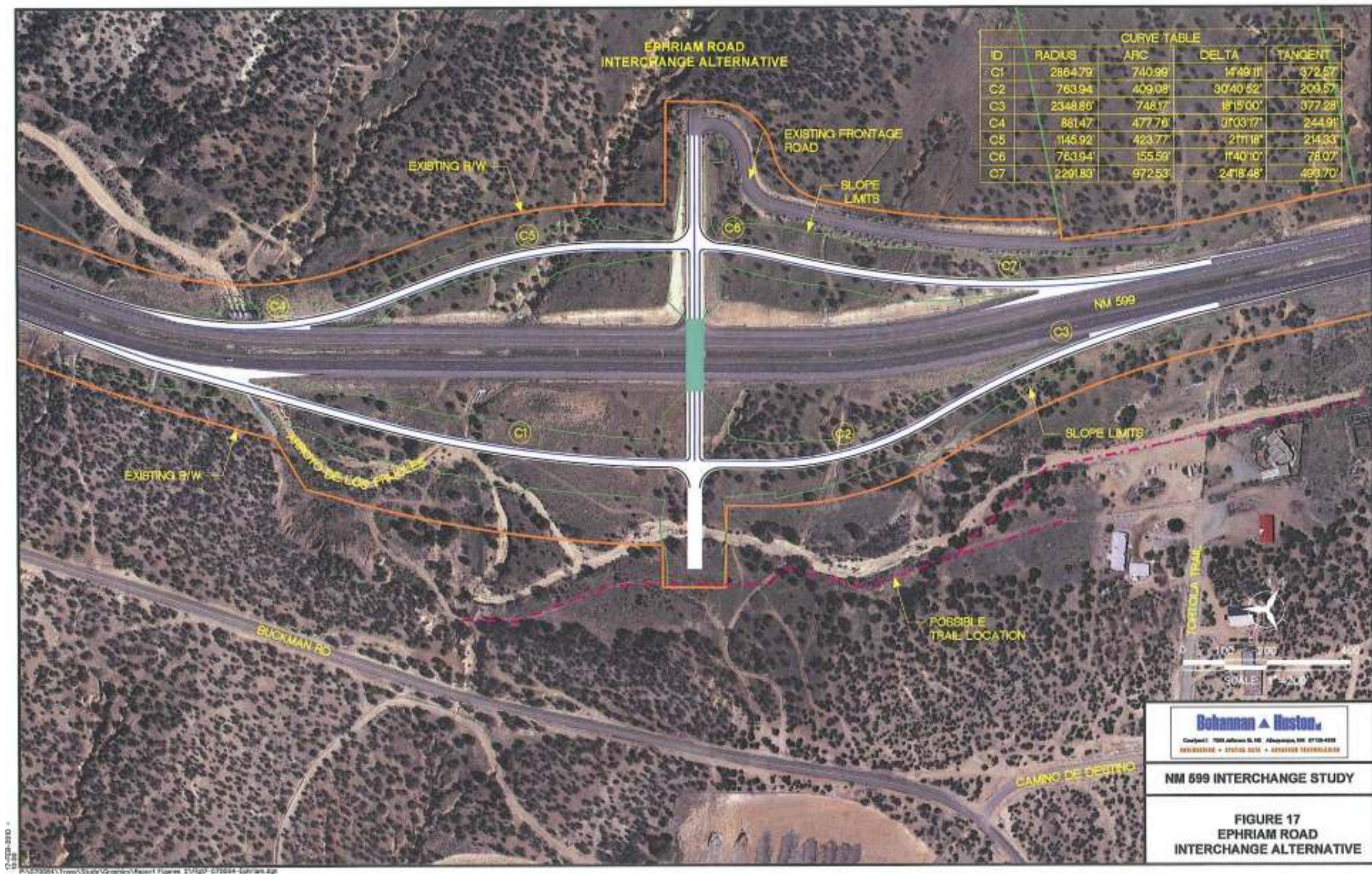


Figure 47 Ephraim Interchange Concept (Exhibit from 2010 Prioritization Study: BHI)

G. Camino de Los Montoyas

Ultimate Configuration

Similar to Via Veteranos, a full interchange is ultimately proposed for the Camino de Los Montoyas intersection with stop control ramp terminals, single-lane ramps, and a single lane in each direction on Camino de Los Montoyas. Per the 2010 Prioritization Study, right-of-way has been already been purchased for construction of an interchange approximately 1,000 feet east of the current Camino de Los Montoyas alignment. Furthermore, the original study reviewed three alternatives including a full interchange just east of the Camino de Los Montoyas alignment with connecting roadways back to Camino de Los Montoyas on either side of NM 599. Another two alternatives proposed an overpass at the current Camino de Los Montoyas alignment with frontage road/access road connections to either a full interchange at Ephraim Road or a full interchange just east of the current Camino de Los Montoyas alignment. The preferred alternative, per the 2010 study, was a full interchange just east of the Camino de Los Montoyas alignment with access road connections to Camino de Los Montoyas on either side of NM 599. That preferred interchange alternative is depicted as Figure 48 Camino de Los Montoyas Interchange Concept from 2010 Priority Study. If an interim construction approach is taken with the Camino de Los Montoyas access, particularly if an overpass with Frontage Road expansion is opted for at the Camino de Los Montoyas alignment, the alternative with an overpass at Camino de Los Montoyas and a full interchange to the east would be able to integrate interim construction into the final interchange alternative.

Traffic Operations

Traffic operational analysis for the “No-Build” Alternative and the proposed interchange alternative are summarized in Table 22.

Table 22 Traffic Operations Comparison for Camino de Los Montoyas Interchange (2040 Demands)

Scenario	Facility	Worst-Case Movement			
		AM		PM	
		v/c	LOS	v/c	LOS
"No Build"	Camino de Los Montoyos (Stop Control)	1.63	F	8.2	F
Camino de Los Montoyos Interchange	North Ramp Terminal (Stop Control)	0.01	A	0.19	A
	South Ramp Terminal (Stop Control)	0.21	A	0.16	A
	Westbound Off-Ramp	0.22	A	0.36	B
	Westbound On-Ramp	0.24	A	0.39	B
	Eastbound Off-Ramp	0.36	B	0.27	B
	Eastbound On-Ramp	0.34	B	0.25	A

Much like the Via Veteranos intersection, the minor street left-turns from Camino de Los Montoyas are currently operating at an unacceptable LOS of F and are expected to continue to operate at LOS F with greater delays under a 2040 “No-Build” Alternative. An interchange, including all ramps and ramp terminals, would improve operations to an acceptable LOS of B or better under forecasted 2040 demands.

Safety

The replacement of the current at-grade signalized intersection with the proposed interchange configuration may significantly reduce crashes at this location. Unlike the Via Veteranos intersection, there were no fatal crashes at Camino de Los Montoyas since 2013. However, minor street and through movement crash risks are similar to those that are present at Via Veteranos due to similar existing traffic control and intersection geometry. The proposed interchange would significantly reduce the number of crashes that are predicted to occur at this intersection under a “No-Build” Alternative. The IHSDM predictive model was run for both “No-Build” and interchange options to predict expected crash occurrences from 2025 to 2040. Table 23 summarizes the comparison between both options and the expected crash savings by implementing the full interchange.

Table 23 Predicted Crash Reduction of a Camino de Los Montoyas Interchange

Scenario	Predicted Crashes 2025-2040		
	Fatal/Injury	PDO	Total
"No Build"	36.26	47.59	83.85
Camino de Los Montoyos Interchange	12.06	24.13	36.19
Crash Difference	-24	-23	-48

As shown, a total reduction of 24 fatal/injury crashes and 23 property damage only crashes would be expected between 2025 and 2040 if the overpass option were constructed. Crash rates at the Camino de Los Montoyas intersection were observed to be 0.42 per million entering vehicles (MEV) which would be reduced to ramp terminal intersection rates of 0.27 per MEV for the westbound ramps and 0.26 per MEV for the eastbound ramps. This reduction is attributed to the fact that the ramp terminal intersections will have slower approach speeds and a minor street left-turn lane will be eliminated.

Connectivity

Connectivity will be enhanced for this location with the addition of on- and off-ramps for vehicles exiting and entering the NM 599 facility. All routes that are feasible under today’s single at-grade intersection will be maintained under the proposed interchange facility provided access/frontage road connections are provided from the proposed interchange to the current Camino de Los Montoyas alignment.



Right-of-Way

If the preferred alternative from the 2010 Prioritization Study is constructed, an additional seven acres of right-of-way would be required to connect the proposed interchange to the Camino de Los Montoyas alignment. If the overpass plus interchange east of Camino de Los Montoyas option is constructed no additional right-of-way would be required.

Construction Impacts

Utilities – Utilities are expected to include existing water with no impacts expected.

Environmental- No significant impacts expected; however an Environmental Assessment or a Categorical Exclusion will be required for NEPA. Possible impacts to noise and visual resources. An individual 404 permit may be required for an interchange at this location.

Construction Traffic – Lane shifts on NM 599 for bridge construction and one-lane closures on NM 599 will be required for the ramp tie-ins. Flagmen control at Camino de Los Montoyas for frontage road tie-ins.

Construction Cost

The estimated cost of the overpass alternative is **\$10,650,000**. A detailed breakdown of this cost estimate is provided in **Appendix F**.

Safety Benefit vs. Construction Cost

Assuming the construction year 2025, safety benefits, construction costs and a benefit/cost ratio were calculated in 2017 dollars and summarized in Table 24.

Table 24 Predicted Crash Savings/Construction Cost Ratio for Camino de Los Montoyas Interchange

	Savings/Costs		
	Fatal/Injury	PDO	Total
Camino de Los Montoyas Interchange Predicted Crash Savings	-\$78,828,843	-\$174,757.67	-\$79,003,601
Camino de Los Montoyas Interchange Construction Cost			\$10,220,000
Safety Benefit/Construction Cost Ratio			7.73



Figure 48 Camino de Los Montoyas Interchange Concept from 2010 Priority Study

Interim Opportunities

Similar to Via Veteranos, there are opportunities to implement interim treatments in an effort to mitigate crash risk, especially for minor street left-turn and through movements from Camino de Los Montoyas. The interim alternatives which would reduce predicted crash incidences at Camino de Los Montoyas include:

- 1. **Right-In/Right-Out/Left-In Alternative** – The same mitigation currently being designed by the NMDOT for Via Veteranos could also be applied at Camino de Los Montoyas. Left-turn and through movements from Camino de Los Montoyas would be eliminated from the current at-grade intersection. Right-turns from all approaches and left-turn from NM 599 would still be allowed. The proposed configuration would look similar to the 30% design prepared by the NMDOT for the Via Veteranos intersection and shown in Figure 44.
- 2. **Grade Separation and Frontage Road Alternative** – Another option would be to construct a bridge carrying Camino de Los Montoyas over NM 599 without providing direct access between the two roads. This would eliminate the current at-grade intersection. To provide a connection to Ephraim Road and Camino La Tierra, the existing North Frontage Road, which currently terminates on the west side of the Camino la Tierra interchange, could be extended eastward eventually connecting to Ephraim Road and Camino de Los Montoyas. This extension would not only provide a mitigating interim alternative for Camino de Los Montoyas but would also provide an alternative access for the six private parcels at Ephraim Road, which currently only have right-in/right-out access to NM 599 today. A concept of this interim alternative is shown in Figure 49. An additional option for Alternative 2 Grade Separation and Frontage Road Alternative would involve extending the north frontage road further east from Camino de Los Montoyas to the Ridgetop Road interchange. This option would provide further connectivity and access to traffic demands from Camino de Los Montoyas wanting to head east on NM 599. This alternative is depicted in Figure 51.

Traffic Operations

Traffic operational analysis for the “No-Build” Alternative, and the grade separated interim alternative are summarized in Table 25. It should be noted that impacts at Camino La Tierra are presented due to the potential for rerouted trips from the eliminated direct NM 599 access to/from Camino de Los Montoyas. No impacts were calculated for the additional Frontage Road Alternative as there is not much traffic accessing to the northeast on NM 599 to/from

Table 25 Traffic Operations Analysis Comparison for Interim Alternatives at Camino de Los Montoyas

Scenario	Facility	Worst-Case Movement			
		AM		PM	
		v/c	LOS	v/c	LOS
"No Build"	Camino de Los Montoyos (Stop Control)	1.63	F	8.2	F
Camino de Los Montoyos Grade Separation	Camino de Los Montoyos/N. Frontage Rd (Stop Control)	0.217	A	0.202	B
	Camino La Tierra/N. Frontage Rd (Stop Control)	0.672	C	0.173	A
	North Camino La Tierra Ramp Terminal	0.304	A	0.145	B
	South Camino La Tierra Ramp Terminal	0.64	D	0.55	B

As shown, the grade separated alternative is expected to mitigate the failing minor street left-turn movements from Camino de Los Montoyas under a “No-Build” Alternative all operating at LOS CD or better. It should be noted that no LOS was calculated for Alternative 3 (Additional Frontage Road Alternative) as this alternative would have minimal impact on capacity calculations at both Camino de Los Montoyas and Ridgetop Road. Since the Grade separated option is expected to operate at an acceptable LOS, the less restrictive, Right-In/Right-Out/Left-In Alternative is also expected to operate acceptably.

Safety

All interim options are intended to increase safety at the intersection and reduce predicted crash occurrences to varying degrees. Table 26 summarizes the reduced number of predicted crashes based on IHSDM calculations.

Table 26 Predicted Crash Reduction of Interim Alternatives at Camino de Los Montoyas

Scenario	Predicted Crashes 2020-2040		
	Fatal/Injury	PDO	Total
"No Build" 2020-2040	44.58	58.77	103.35
"No Build" 2025-2040	36.26	47.59	83.85
Right-In/Right-Out/Left-In	28.53	52.31	80.84
Crash Difference	-16	-6	-23
Camino de Los Montoyas Grade Separaton & Frontage	6.79	14.78	21.57
Crash Difference	-29	-33	-62

As shown, the grade separated alternative is expected to reduce predicted crashes, with the Grade Separation and Frontage Road Alternative expected to reduce crashes more than the Right-In/Right-Out/Left-In alternative. The safety impact of the additional frontage road connection to Ridgetop Road would have minimal impact on crash reduction, therefore it was not analyzed.



Connectivity

Right-In/Right-Out/Left-In Alternative – Just like this option at Via Veteranos, this interim alternative would eliminate direct left-turns from the Camino de Los Montoyas approaches as well as through movements crossing NM 599. Unlike current conditions at Via Veteranos, there is less Frontage Road infrastructure to provide convenient alternative routes for left-turn and through demands. For northbound to westbound left-turn demands, which are projected to be the greatest turning demand at this intersection, motorists can use Buckman Road south of NM 599 to eventually access the Camino la Tierra interchange with very little out of path routing. Southbound to eastbound and southbound through demands are currently and forecasted to be relatively low compared to other movements at this intersection. Furthermore, the southbound left-turn movement is likely a backtracking movement, which may explain the lower demand as it is more likely that vehicles coming from the north with an eastern destination would more likely use Tano Road to ultimately gain access to US 285 north or south. Through movements coming from the south or north could use either Camino la Tierra or US 285 instead of Camino de Los Montoyas as well.

Grade Separation and Frontage Road Alternative – This alternative will accommodate only the through movement at the Via Veteranos intersection. All other turn demands to or from Camino de Los Montoyas would be required to use either the Camino la Tierra interchange to the southwest or the Ridgetop Road interchange to the northeast (if the additional frontage road is built to the east). Again, due to the adjacent interchanges on either side of Camino de Los Montoyas, turn movements will not need to route to far out of the way to be perceived as an inconvenience to drivers provide the frontage road is constructed from Camino de La Tierra to Ridgetop Road. Out of way routing would arise if one or all sections of the north frontage road is not constructed.

Right-of-Way

All interim alternatives, including all frontage road options, can be constructed within existing right-of-way.

Construction Impacts

Utilities – Utilities are expected to include underground electric for existing street lighting and water. Utility impacts for all interim alternatives are expected to be minimal.

Environmental- No significant impacts expected for any of the alternatives; however an Environmental Assessment or a Categorical Exclusion will be required for NEPA in all alternatives.

Construction Traffic – Minimal traffic impacts are expected for the Right-in/Right-Out/Left-In option. Lane shifts on NM 599 for the overpass will be required for the Grade Separation and Frontage Road alternative. One-lane closures on NM 599 may be required for the frontage road construction. Flagmen control will be required for all frontage road tie-ins at Camino La Tierra, Ephraim Road, Camino de Los Montoyas, and Ridgetop Road.

Construction Cost

Estimated interim construction costs are \$2,000,000 for the Right-In/Right-Out/Left-In Alternative, \$4,940,000 for the Camino de Los Montoyas Overpass Alternative, and an additional \$3,000,000 if the North Frontage Road were extended to Ridgetop Road. A detailed breakdown of these cost estimates is provided in **Appendix F**.

Safety Benefit vs. Construction Cost

Assuming the construction year of 2020 for Right-In/Right-Out/Left-In and 2025 for the Grade Separation and Frontage Road Alternative, safety benefit, construction costs, and benefit/cost ratios were calculated in 2017 dollars and summarized in Table 27.

Table 27 Predicted Crash Savings/Construction Cost Ratios for Camino de Los Montoyas Interim Alternatives

	Savings/Costs		
	Fatal/Injury	PDO	Total
Right-In/Right-Out/Left-In Predicted Crash Savings	-\$52,277,204	-\$48,156.69	-\$52,325,361
Right-In/Right-Out/Left-In Construction Cost			\$500,000
Safety Benefit/Construction Cost Ratio			104.65
Camino de Los Montoyas Overpass Predicted Crash Savings	-\$95,995,290	-\$244,407.46	-\$96,239,697
Camino de Los Montoyas Overpass Cost			\$4,940,000
Safety Benefit/Construction Cost Ratio			19.48

While both interim alternatives are expected to provide significant benefit-cost ratios, the Right-In/Right-Out/Left-In Alternative is expected to offer the greatest benefit for the cost. It should be noted that the third alternative would add more accessibility to either interim alternative, it does not offer any significant reduction in the number of predicted crashes.



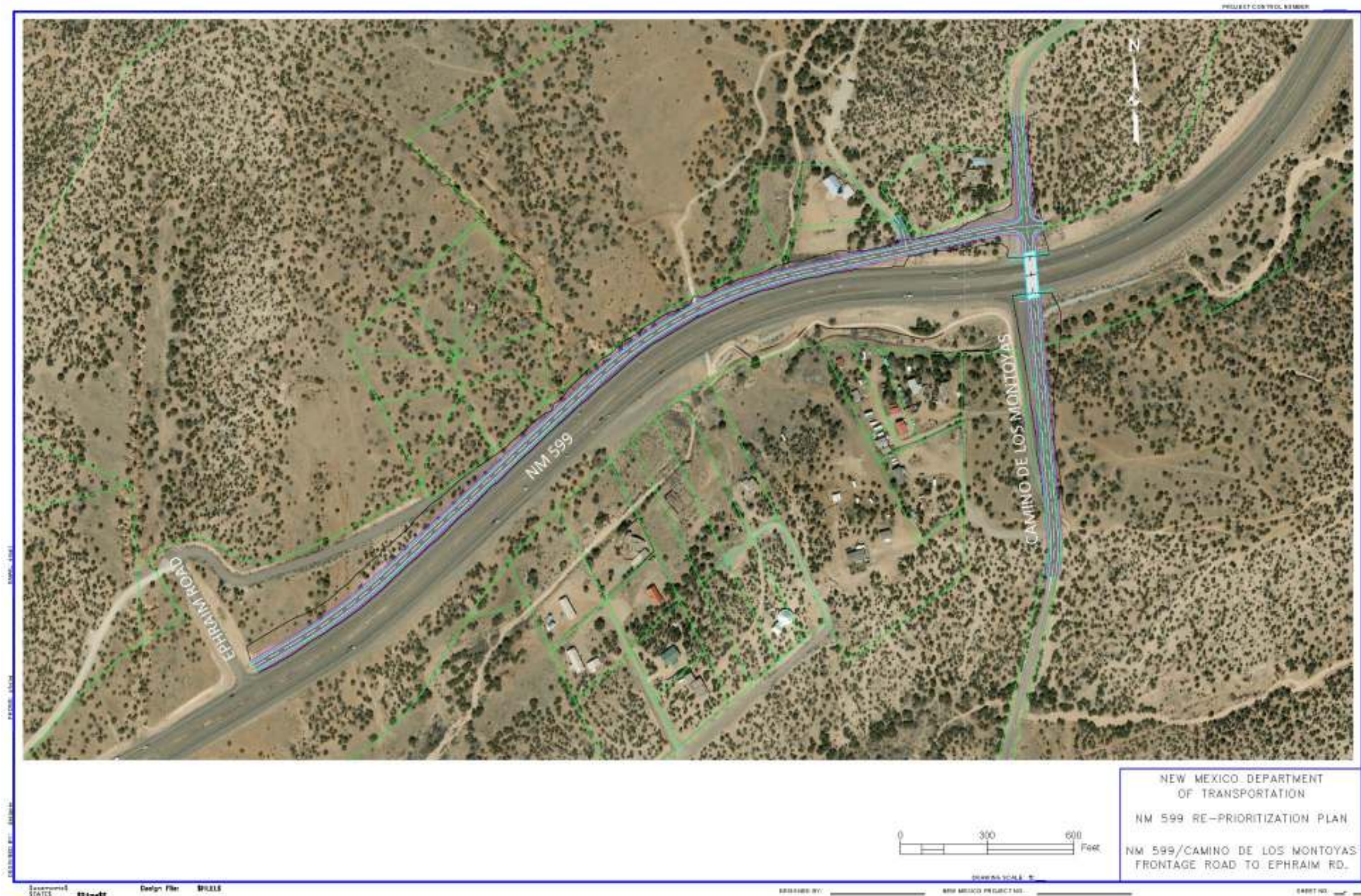


Figure 49 Grade Separation and Frontage Road Extension Alternative (Camino de Los Montoyas to Ephraim Rd)

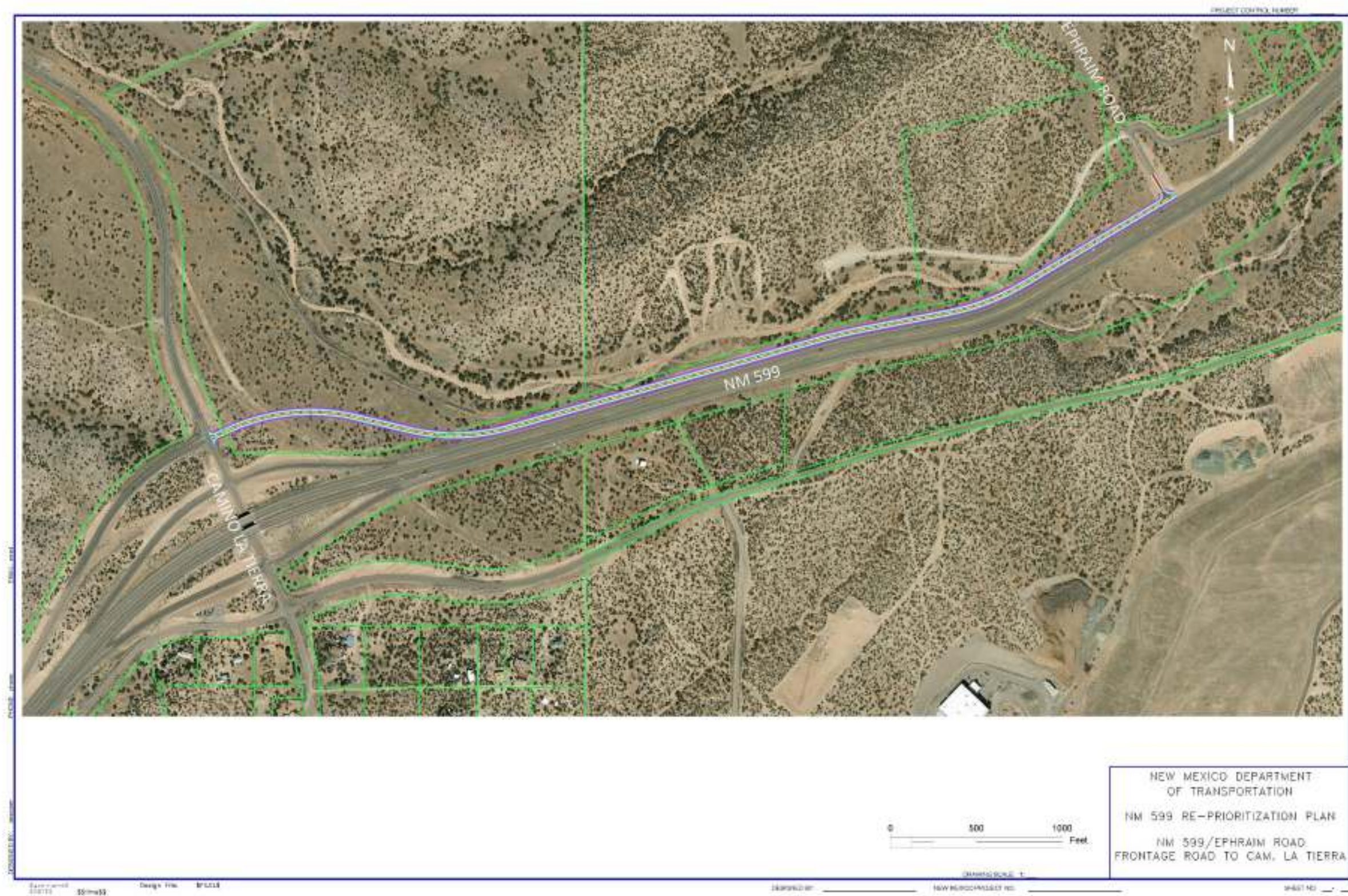


Figure 50 Grade Separation and Frontage Road Extension Alternative (Ephraim Rd to Camino la Tierra)

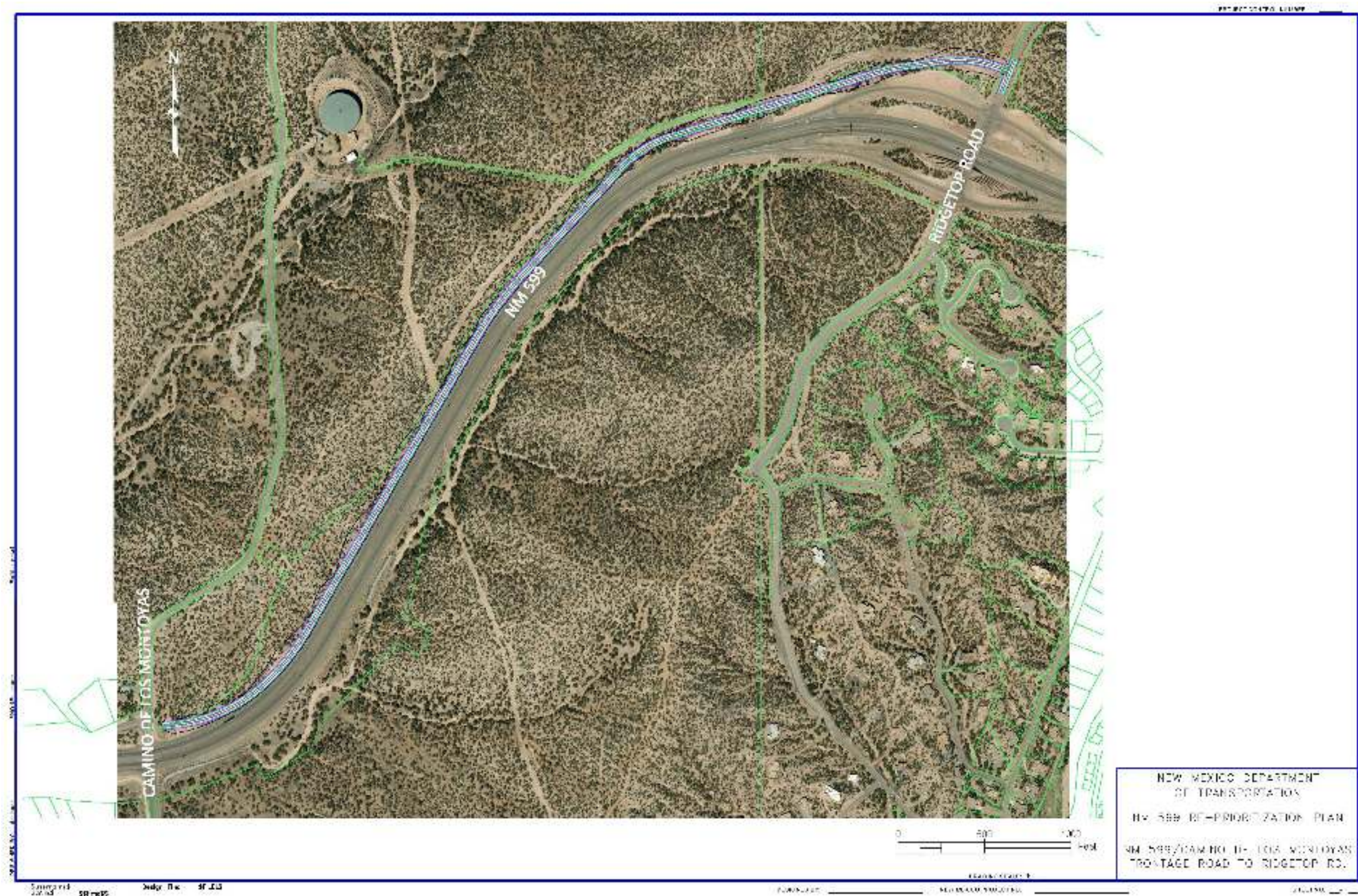


Figure 51 Frontage Extension Option from Camino de Los Montoyas to Ridgetop

7.0 Priority Matrix

A priority matrix was created to assist in the reprioritization of new interchanges along NM 599 based on discussion presented in the Alternatives Analysis Section and on the following focus areas:

- 1. Traffic Operations
- 2. Safety Benefit (Predicted Crash Reduction)
- 3. Connectivity
- 4. Right-of-Way
- 5. Construction Impacts
- 6. Cost
- 7. Safety Benefit/Construction Cost Ratio

The above focus areas were then weighed and scored for a full interchange alternative at each study location. The resulting decision matrix is provided in Table 28. As indicated, each focus area was weighed differently with Safety Benefit/Construction Cost Ratio weighed the heaviest at 25%. Safety Benefit, Construction Cost, and Right-of-Way were next at 15% each, and the remaining focus areas were weighed at 10% each. The resulting interchange priority is as follows:

- | | |
|---------------------------|--------------|
| 1. Via Veteranos (CR 70) | \$7,650,000 |
| 2. Camino de Los Montoyas | \$10,220,000 |
| 3. Airport Road | \$11,640,000 |
| 4. West Frontage Road | \$6,430,000 |
| 5. Ephraim Road | \$8,000,000 |
| 6. Caja Del Rio | \$8,130,000 |

Table 28 NM 599 Priority Matrix

Focus Area	I-25 Frontage Road		Airport Road		Caja Del Rio		Via Veteranos (CR 70)		Ephraim Road		Camino de Los Montoyas	
	Score	Comments	Score	Comments	Score	Comments	Score	Comments	Score	Comments	Score	Comments
Traffic Operations (10 Possible)	6	Traffic Operations will slightly improve over "No-Build".	6	Traffic Operations will slightly improve over "No-Build".	6	Traffic Operations will slightly improve over "No-Build"	8	Traffic Operations will improve failing minor street left-turn movements to acceptable operating levels.	6	Traffic Operations will slightly improve over "No-Build"	8	Traffic Operations will improve failing minor street left-turn movements to acceptable operating levels.
Safety Benefit (Crash Reduction) (15 Possible)	3	Predicted crashes from 2025 to 2040 will be reduced slightly.	8	Crashes will be more significantly reduced with this alternative. Some of the potential crash savings are offset by predicted crash rates for the new ramp terminal intersections.	0	There are little to no crashes now or under "No-Build" and this option would provide little if any crash reduction.	8	Crashes will be most significantly reduced with this alternative compared to the other locations.	0	Little, if any, crash reduction expected due to very low demands.	6	More modest crash reductions than Airport or Via Veteranos but significantly more than West Frontage Road.
Connectivity (10 Possible)	6	This option will maintain connectivity with slightly out of way routing compared to the current intersection.	10	This alternative will maintain connectivity with the added convenience of on-off ramps.	6	While connectivity would be improved over today's conditions; there are few adjacent developments to connect to.	10	This alternative will maintain connectivity with the added convenience of on-off ramps.	4	While connectivity would be improved over today's conditions; there are few adjacent developments to connect to.	10	This alternative will maintain connectivity with the added convenience of on-off ramps.
Right-of-Way (15 Possible)	15	No new Right-of-Way Required.	15	No new Right-of-Way Required.	3	Approximately 31 Acres of new Right-of-Way is required.	15	No new Right-of-Way Required.	15	No new Right-of-Way Required.	9	Approximately 7 acres of new Right-of-Way required.
Construction Impacts (10 Possible)	8	Minimal utility and environmental impacts.	4	Utility and environmental impacts anticipated	4	Utility and environmental impacts anticipated	4	Utility and environmental impacts anticipated	8	Minimal utility and environmental impacts.	6	Minimal utility impacts with some environmental impacts.
Construction Cost (15 Possible)	12	\$6,430,000	3	\$11,640,000	6	\$8,130,000	9	\$7,650,000	9	\$8,000,000	6	\$10,220,000
Safety Benefit/Construction Cost Ratio (25 Possible)	5	Crash reduction benefit to cost ratio is 1.30	10	Crash reduction benefit to cost ratio is 2.52	0	NA	20	Crash reduction benefit to cost ratio is 15.49	0	NA	15	Crash reduction benefit to cost ratio is 7.73
Total	55		56		25		74		42		60	

8.0 Interim Opportunities

Based on construction cost estimates from this study and the previous 2010 Prioritization Study, it is estimated that construction of interchanges at all study intersections will cost a total of **\$52,070,000** and construction costs at the current major at-grade intersections (I-25 Frontage Road, Airport Road, Via Veteranos [CR 70], and Camino de Los Montoyas) will total **\$35,940,000**. With currently limited budgets, the construction of full interchanges for the entire NM 599 corridor is a long way off. Therefore, as previously outlined there are opportunities for interim or phased projects that work toward the ultimate goal of a limited-access freeway and provide potential safety benefits (predicted crash reductions) in the shorter term. Furthermore, a combination of interim options could be packaged together into one corridor-wide project with the expressed goal of reducing predicted crashes and transitioning NM 599 from a mix of surface arterial and freeway elements to a more consistent limited access facility. Two potential interim packages are summarized in Table 29. It should be noted that the cost for the overpass at Camino de Los Montoyas does assume frontage road extension east of Camino de Los Montoyas.

As shown, both options can provide significant crash saving. Although Option 1 provides less predicted crash reduction, it is the less expensive option with lower construction impacts and could be constructed in the shorter term. Option 2 provides the greater predicted crash reductions (in some cases as much as the full interchange counterpart) and include facilities that could be considered phased construction for the ultimate interchange (bridge overpasses at Via Veteranos (CR 70) and Camino de Los Montoyas). However, Option 2 is significantly more costly and construction would be longer term than Option 1. Additionally, Option 1 offers a slightly higher safety benefit-to-construction cost ratio than Option 2.

Table 29 Interim Alternatives Comparison for NM 599

	West Frontage	Airport Road	Caja del Rio	Via Veteranos	Ephraim Road	Camino de Los Montoyas		
	Signal and Median Mods	Signal and Median Mods	Santa Fe Bridge Connection	Right-In/ Right-Out/ Left-In	Frontage Road Extension	Right-In/ Right-Out/ Left-In	Total	Savings/ Cost Ratio
Option 1								
Crash Savings	\$17,737,314	\$94,028,513	NA	\$71,020,105	NA	\$52,325,360	\$235,111,294	30.98
Construction Cost	\$300,000	\$300,000	\$2,310,000	\$500,000	\$3,680,000	\$500,000	\$8,590,000	
	Signal and Median Mods	Signal and Median Mods	Santa Fe Bridge Connection	Grade Separation	Frontage Road Extension	Grade Separation	Total	Savings/ Cost Ratio
Option 2								
Crash Savings	\$17,737,314	\$94,028,513	NA	\$142,442,761	NA	\$96,239,697	\$350,448,287	23.84
Construction Cost	\$300,000	\$300,000	\$2,310,000	\$3,870,000	\$3,680,000	\$3,610,000	\$14,700,000	

