Phase 1B Alternatives Analysis Final Report

NORTH I-25 FREEWAY OPERATIONS STUDY

Comanche Road Interchange to Tramway Road Interchange

NMDOT Project: TPA-TPU-025-4(122)228, CN D3018

Submitted to:

New Mexico DEPARTMENT OF TRANSPORTATION

Submitted by:

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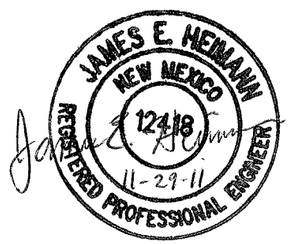

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PROJECT CD

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EXECUTIVE SUMMARY

Introduction

The New Mexico Department of Transportation (NMDOT) conducted this study to document existing deficiencies and future conditions within the North I-25 corridor in Albuquerque, New Mexico, and to identify improvement strategies to address design-year transportation needs. This document compiles and summarizes the Phase 1B detailed evaluation of alternatives completed for the North I-25 Freeway Operations Study (Project No. TPA-TPU-025-4(122)228, CN D3018). A map illustrating the project vicinity and the study area is provided as Figure ES-1.

The North I-25 corridor includes the mainline freeway, the frontage road system, and the arterial cross-street intersections within and in close proximity to I-25 from north of I-40 to Tramway Road. Recommendations are provided for I-25 and its interchanges at Comanche Road, Montgomery Boulevard/Montaño Road, Jefferson Street, San Mateo Boulevard/Osuna Road, San Antonio Drive/Ellison Street, and Alameda Boulevard. The improvements identified for I-25 in the Paseo del Norte Interchange Study Draft Environmental Impact Statement (DEIS) were refined based on the findings of this study and the proposed modifications are reflected in the recommendations herein. The Tramway Road/Roy Road interchange was recently improved and further improvements were not identified by this study.

The transportation improvement needs of the North I-25 corridor are addressed by this study, the *North I-25 Freeway Operations Study*, and the *I-25/Paseo del Norte Interchange Study*. The recommendations provided herein address the entire North I-25 corridor. However, while the improvements identified for I-25 in the I-25/Paseo del Norte Interchange Study were reevaluated, the Paseo del Norte interchange itself was not. As such, the results of this study provide information to plan and program improvements for the North I-25 corridor with the exception of the Paseo del Norte interchange.

Purpose and Need

The purpose of the North I-25 Freeway Operations Study is to identify strategies to improve the efficiency of the freeway mainline and associated ramp, frontage road and interchange systems, and to update and prepare the North I-25 corridor for continued growth of the Albuquerque metropolitan area.

The need for improvements to the North I-25 corridor is based on (1) travel demand and congestion, (2) physical deficiencies, and (3) safety issues. Because the transportation system within the Albuquerque region has developed and evolved around the use of I-25 as a central thoroughfare, few practical approaches are available to substantially reduce the traffic demand within and through the project area. While some mainline widening is needed, buildings located adjacent to the freeway/frontage roads may limit the feasibility of widening more than one lane in each travel direction. For this reason, improvements in the corridor also focus on solutions that optimize the capacity of the existing facility to achieve a reasonable level of service (i.e., LOS D should not be expected during peak periods).

Public Involvement

Because the primary objective of the North I-25 Freeway Operations Study is to identify improvements for planning and programming purposes, the NMDOT will not conduct a public information meeting at the conclusion of Phase 1B. Public information meetings and public hearings, as applicable, will be scheduled when specific projects are programmed for environmental documentation, preliminary and final design, and construction.

In lieu of a public meeting at this time, the following activities will be used to inform stakeholders of the project results:

- An Executive Summary will be e-mailed to all persons and organizations included in the project contact list. All contacts will also be notified of the availability of the Phase 1B report on the project web site.
- The NMDOT will contact the owners of property and/or businesses expected to be impacted by the proposed improvements to inform them of the status and anticipated schedule of potential improvements.

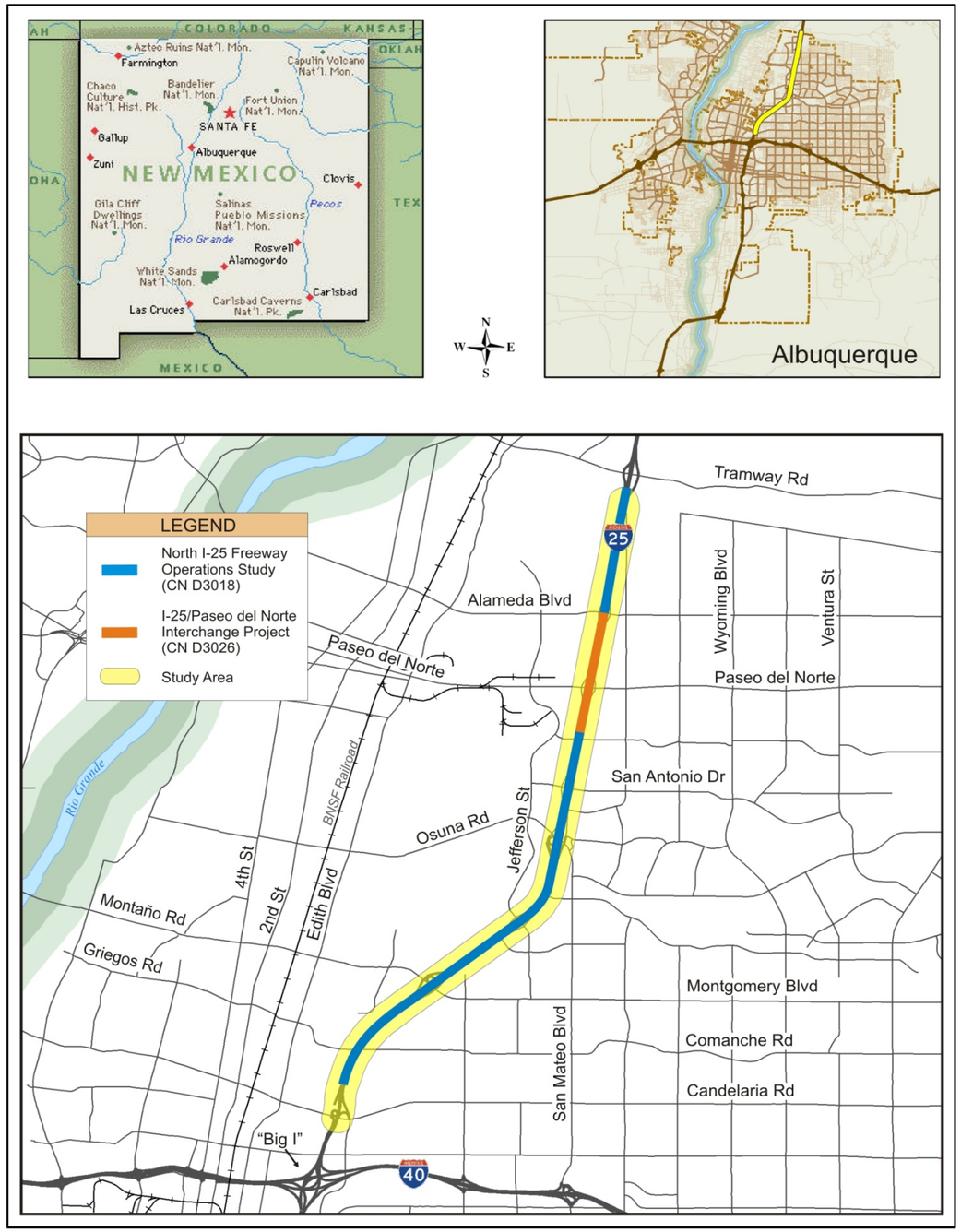


Figure ES-1, Vicinity and Study Area Map

- Presentations will be made to NMDOT executive staff, the MRCOG Technical Coordinating Committee (TCC) and Metropolitan Transportation Board (MTB), and City of Albuquerque executive staff.

A project website for the North I-25 corridor was developed to provide project information for the North I-25 Freeway Operations Study (www.northI25.com).

Alternatives

The North I-25 corridor is a developed corridor with established features that were incorporated into the proposed improvement alternatives. The development of improvement alternatives focused on ways to improve upon the existing highway facilities in the I-25 corridor. The design-year for this study was 2030, which was based on the currently adopted Metropolitan Transportation Plan for the Albuquerque metropolitan area.

Strategies to manage travel along the corridor and provide and maintain smooth traffic flow on the mainline freeway are considered as the highest priority. Secondarily, accommodating access to and from the North I-25 corridor both to the mainline freeway and the frontage road system must also be included in the management of the facility. Geometric improvements are part of the solution including modifications to the freeway mainline, interchange configurations, and ramp roadways.

In addition to the No-Build (e.g., Do-Nothing) Alternative, three corridor-wide build alternatives were developed and evaluated. The following objectives were applied in the development of alternatives:

- Recognize the importance of regional mobility on the mainline I-25 freeway and the function the frontage road system can provide for local access and circulation.
- Address deficiencies identified in the existing conditions analysis – operational, geometric, safety.
- Provide lane balance and lane continuity on mainline I-25.
- Provide sufficient spacing of decision points between ramps, existing and proposed.
- Consistent with driver expectation.
- Allow for future enhancements beyond the 20-year design period such as ramp metering or express lanes.

No-Build Alternative

The No-Build Alternative assumes that the number of lanes and ramp configurations within the study area are maintained in their existing configuration. No major changes to interchanges, the mainline freeway or the frontage roads within the North I-25 corridor are made. However, the NMDOT may implement interim improvements to extend the life of the existing facilities. The No-Build Alternative does not alter access nor requires additional right-of-way. Improvements are limited to maintenance projects for pavement, bridge structures, drainage structures, pavement markings, traffic signals, signing, and other basic roadway elements. Grade separation structures crossing I-25 for bicycle and pedestrian travel that are independent of other interchange improvements are also included. Improvements to the I-25/Paseo del Norte interchange are not included in the No-Build Alternative.

Build Alternatives

Three build alternatives were developed for the entire North I-25 corridor from north of I-40 to Tramway Road. These alternatives are simply referred to as *Build Alternative 1*, *Build Alternative 2*, and *Build Alternative 3*. Each of the build alternatives provides four basic lanes in both travel directions from north of I-40 to Paseo del Norte along with auxiliary lanes to supplement on and off-ramp operations as appropriate. Each of the build alternatives also incorporates the I-25/Paseo del Norte Interchange Study improvements. For the purposes of this study, Alternative 16 for the I-25/Paseo del Norte Interchange is shown because it is considered the locally preferred alternative by the NMDOT. The primary differences between the alternatives involve the ramp and interchange layouts rather than the mainline freeway. Specifically, the differences involve (1) ramp spacing and sequence, (2) ramp design to accommodate ramp metering, and (3) techniques to reduce conflicts.

Build Alternative 1 and Build Alternative 2 accommodate ramp metering, Build Alternative 3 does not. Ramp metering is proposed for the on-ramps between I-40 and Paseo del Norte to facilitate future traffic management of the North I-25 corridor. The implementation and design of the ramp metering system will require further refinement and evaluation to determine the best solution specific to the North I-25 corridor.

Modal Alternatives as part of the Build Alternatives

Modal alternatives include strategies that increase the person-carrying capacity of a highway corridor. This is typically accomplished through a shift from automobile use to transit, rail, carpools, bicycles, or walking. While many types of modal alternatives exist, their applicability to the North I-25 corridor is dependent on several factors including: local policies, connectivity to adjoining systems or facilities, and their ability to substantially contribute to the resolution of the transportation problems found within the project area. Because one of the primary needs of the North I-25 Freeway Operations Study is to provide continuity in design of the freeway system, which requires improvements in highway capacity, modal alternatives alone are not expected to satisfy the purpose and need of this project. They can, however, enhance the transportation system within and proximate to the North I-25 corridor and were included in the development of the improvement alternatives.

Note that the MRCOG is building higher transit mode use into the 2035 MTP. The MRCOG Metropolitan Transportation Board (MTB) has assigned targets to increase transit's share of Albuquerque's peak hour river crossings to 10% in 2020 and 20% in 2035.

Transportation Systems Management as part of the Build Alternatives

Transportation Systems Management (TSM) consists of minor improvements to existing streets to eliminate points of congestion that contribute to overall poor system performance. Typically, TSM strategies focus on improvements to the overall system including and parallel to the route under investigation. The objective of TSM strategies is to provide a series of relatively minor improvements to improve overall traffic flow and to balance traffic flows. Common TSM strategies include the elimination of bottlenecks at intersections and along short segments of roadways. This may be accomplished by the addition of auxiliary lanes at intersections (e.g., right- and left-turn lanes), changes to traffic signal systems to optimize intersection capacity, the addition of auxiliary lanes between freeway ramps to improve merging problems, and the use of technologies to provide real-time monitoring of major roadways to detect congestion and convey timely information to motorists. These types of improvements were incorporated in the Phase 1B alternatives development process.

Design Year Traffic Performance Expectations

Based on the design-year 2030 traffic forecasts and traffic analyses completed for this study, some congestion is projected under design-year conditions. However, this finding does not understate the need for improvements in the North I-25 corridor. Congestion is projected to be widespread and will affect most of the major roadways within the metropolitan area. Moreover, the feasibility of major improvements to the arterial street system in the area east of the Rio Grande will be limited. For this reason, the Albuquerque region will need to get the most out of its transportation system to meet future traffic demand. In some cases, capacity improvements can be made but in others, the existing capacity will need to be managed. High-capacity corridors like I-25, which passes through the middle of the region, will continue to be highly utilized so investments into the I-25 Corridor will provide value to the region and should be programmed even if full mitigation of congestion cannot be achieved. Furthermore, managing congested traffic conditions would be difficult with the existing configuration of I-25.

Recommendations

The NMDOT desire for this study was to identify one recommended alternative for the corridor as a complete system. The following recommendations are made based on the Phase 1B engineering and environmental evaluations of the proposed improvement alternatives.

- The No-Build alternative will be advanced to Phase 1C, Environmental Documentation and Processing. It is a viable alternative and will serve as the baseline to compare the impacts and benefits of the proposed build alternative.
- The Recommended Build Alternative incorporates selected features of all three build alternatives evaluated and is illustrated schematically in Figure ES-2. Typical sections along I-25 are shown in Figure ES-3, and the conceptual design layout is attached at the end of this summary.

Interstate 25

The Recommended Build Alternative provides four basic lanes from north of I-40 to Paseo del Norte in both travel directions. In addition, 12 to 14-foot shoulders and auxiliary lanes to supplement on and off-ramp operations are provided, as appropriate. The bottleneck in the northbound direction at Comanche Road is eliminated, and the appropriate number of lanes is provided southbound exiting the I-25/Paseo del Norte interchange. Lane balance and lane continuity is provided in both travel directions.

The reduction of conflicts along the study corridor was accomplished through the use of braided ramp pairs and by removing ramps to eliminate weave sections along the mainline freeway. Collector-distributor (CD) roads were incorporated at the San Mateo/Osuna and San Antonio/Ellison interchanges as well. The proposed mainline improvements also include ITS applications to facilitate management of the corridor including ramp metering at selected on-ramps (see Figure ES-2). While much of the system is expected to be installed by other projects and the specific elements of the ITS system are not defined by this study, costs for an ITS system are included in the project cost estimate.

Several modifications to the improvements included in the I-25/Paseo del Norte Interchange DEIS are recommended which will need to be addressed in future environmental documents and the Interstate Access Change Request (IACR) for the interchange. These modifications are listed below:

- Northbound I-25
  - The Jefferson Street on-ramp is eliminated.
  - Ramp metering is recommended for the San Mateo Boulevard/Osuna Road on-ramp.
  - The off-ramp north of San Antonio Drive to the northbound frontage road, which would have provided local access to Paseo del Norte and other local streets, is eliminated. The recommendation is to combine this access with the San Antonio Drive off-ramp. A CD road is provided over San Antonio Drive to intersect the frontage road at the approximate location of the slip ramp proposed in the DEIS.
  - A two-lane ramp diverge is proposed at the Alameda Boulevard off-ramp.
- Southbound I-25
  - The Alameda Boulevard off-ramp is moved further north which requires widening and access modifications to the southbound frontage road.
  - The San Antonio Drive on-ramp is eliminated.
  - A two-lane off-ramp is proposed to provide access to San Mateo Boulevard/Osuna Road as well as access to Jefferson Street via a CD road over San Mateo Boulevard. A slip ramp diverges from the two-lane ramp roadway to the southbound frontage road to provide access to San Mateo Boulevard and Osuna Road. The two-lane ramp roadway continues south with one lane dropping to a loop ramp to southbound San Mateo Boulevard and the other continuing to the frontage road south of San Mateo Boulevard/Osuna Road to provide access to Jefferson Street. The CD road is braided with the San Mateo Boulevard/Osuna Road on-ramp.
  - The San Mateo Boulevard/Osuna Road Interchange is reconstructed *(may be considered a separate project similar to the reconstruction of the Alameda Boulevard interchange)*.
    - A lane is added to southbound San Mateo Boulevard starting at the loop ramp and ending at Academy Road.
    - An advance u-turn is provided on the north side serving the south-to-north movement.
  - Ramp metering is recommended for the San Mateo Boulevard/Osuna Road on-ramp.
  - The direct off-ramp to Jefferson Street is relocated as described above.

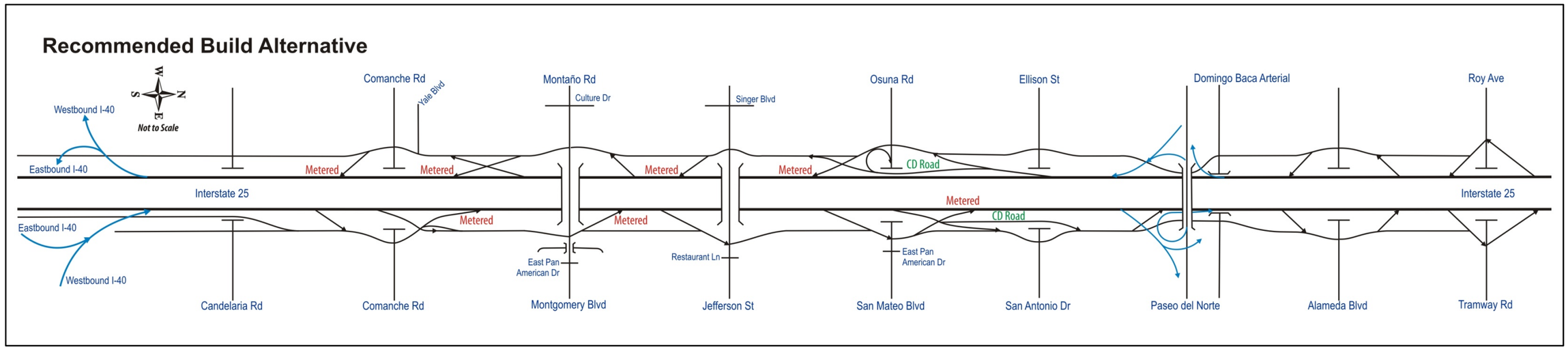


Figure ES-2, Ramp Layout Schematic for the Recommended Build Alternative

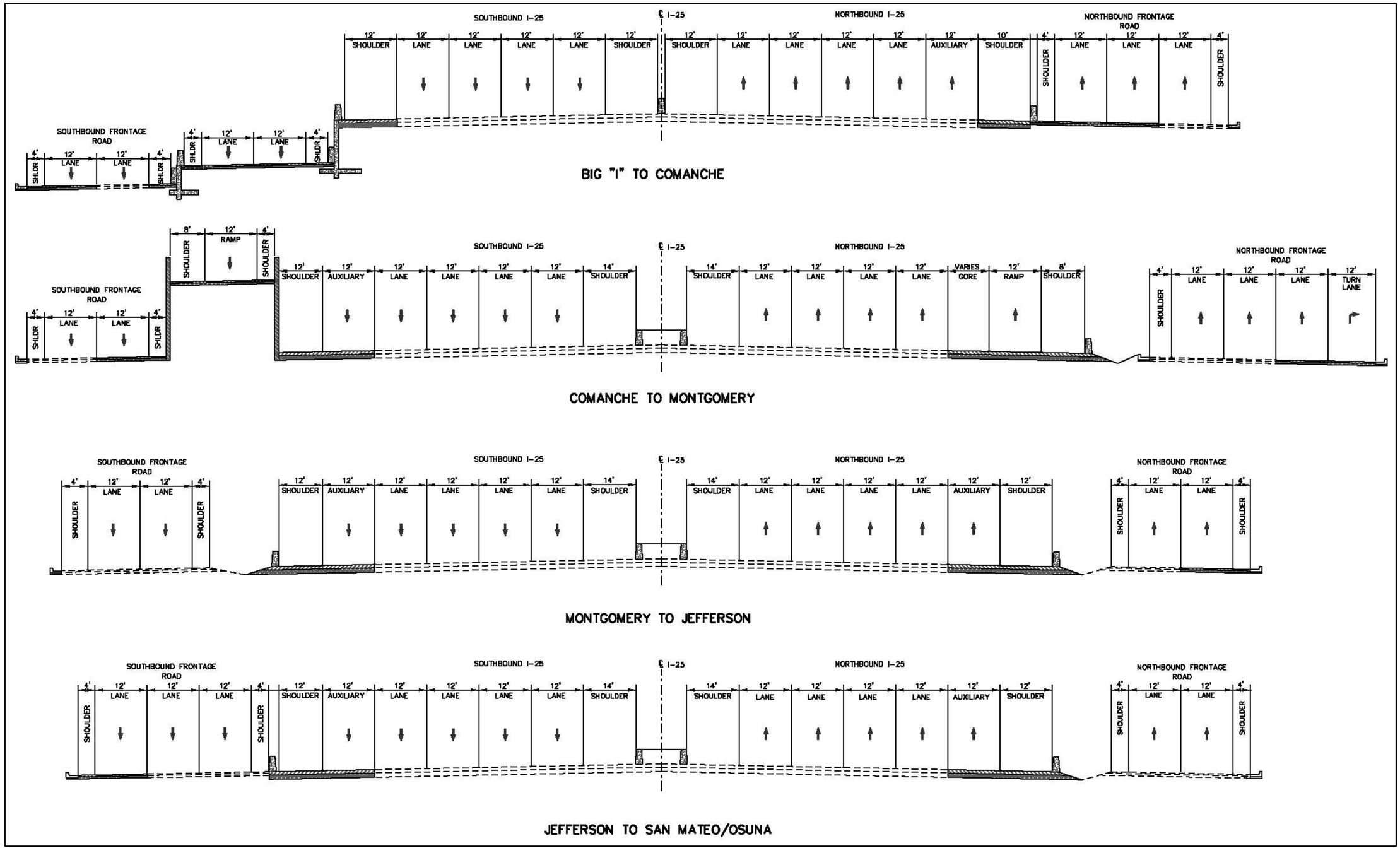


Figure ES-3, Recommended Build Alternative Typical Sections along North I-25

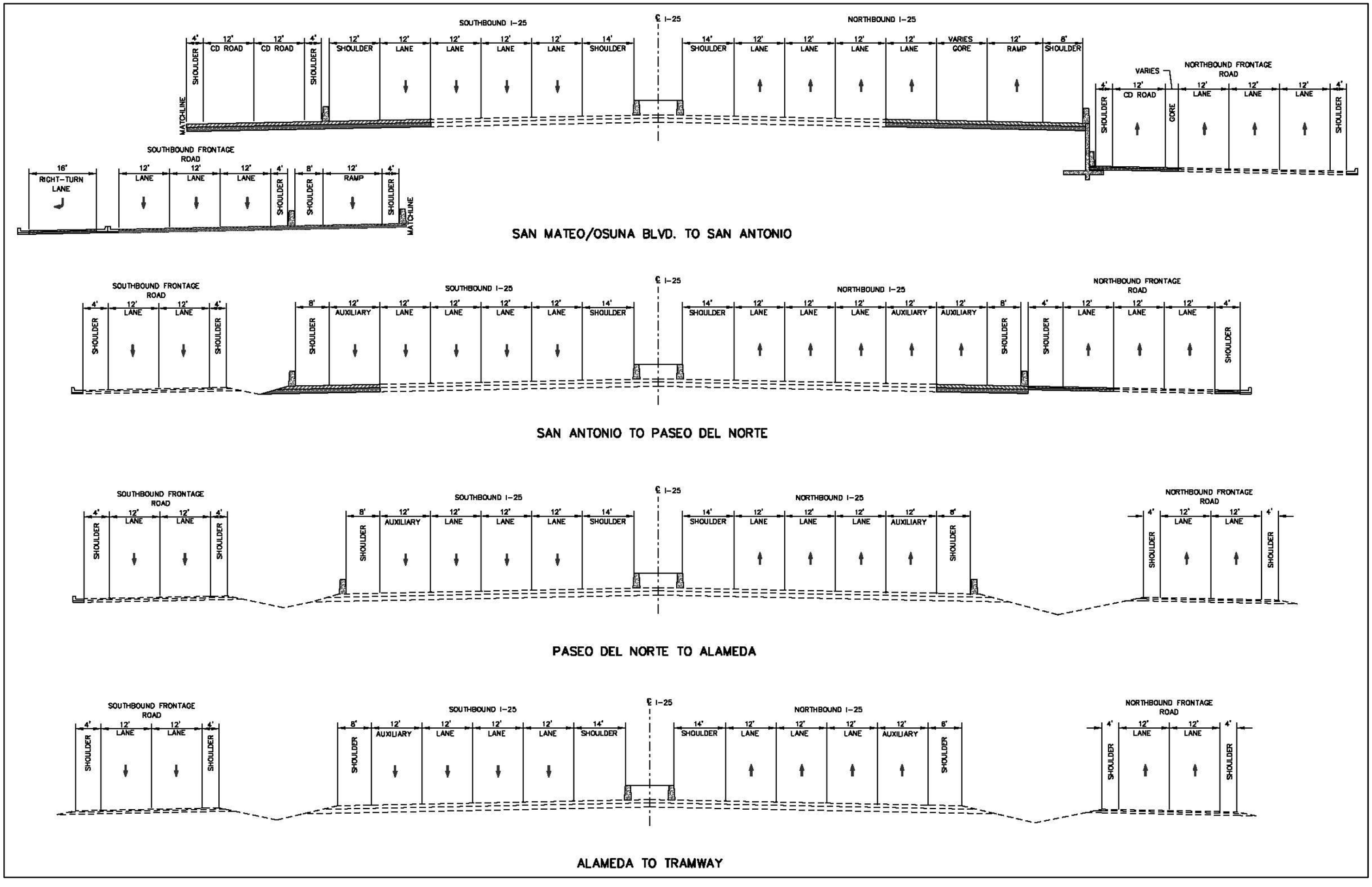


Figure ES-3 (continued), Recommended Build Alternative Typical Sections along North I-25

Interchanges

The following summarizes the key modifications recommended for the interchanges along North I-25. Refer to the attached plan view layouts for more information. Improvements to the intersection lane configurations are included at each interchange.

1. Comanche Road Interchange: Reconstructed, full access retained, compressed diamond layout, on-ramps metered, advance u-turns on both sides, access management on west side.
   - Local service road from Aztec Road eliminates access to the northbound frontage road between Aztec Road and Comanche Road.
2. Montgomery Boulevard/Montaño Road Interchange: Reconstructed, full access retained, compressed diamond layout, on-ramps metered, advance u-turns on both sides, access management on east side.
   - Grade-separated local service road which maintains full access to and from Pan American East Drive.
   - Loop ramp eliminated.
3. Jefferson Street Interchange: Widen existing bridge structure, access reduced, compressed diamond layout, on-ramp metered, advance u-turns on both sides, access management on east side.
   - Northbound on-ramp eliminated.
   - Southbound off-ramp relocated north; combined with San Mateo/Osuna off-ramp continuing grade-separated over the arterial via a CD road and braided with San Mateo/Osuna on-ramp.
   - Realignment of Restaurant Lane and access easement extensions associated with Monroe Street connection to Jefferson Street.
4. San Mateo Boulevard/Osuna Road Interchange: Reconstructed, full access added, compressed diamond layout, on-ramps metered, advance u-turn on north side, access management on west side.
   - Traffic signal control at Pan American East Drive to remain.
   - Fourth lane added to southbound San Mateo Boulevard from the proposed loop ramp.
5. San Antonio Drive/Ellison Street Interchange: Existing bridge and layout, access reduced, access management on east side.
   - Northbound off-ramp braided with new San Mateo Boulevard on-ramp.
   - Northbound on-ramp relocated north, braided with the Paseo del Norte directional off-ramp.
   - Southbound off-ramp eliminated.
   - Southbound on-ramp eliminated.
6. Alameda Boulevard Interchange: Reconstructed, full access retained, compressed diamond layout, advance u-turns on both sides, access management on both sides.

Ramp Metering

Ramp metering is recommended for the North I-25 corridor from Comanche Road to Paseo del Norte. A ramp metering evaluation and study should be conducted to refine the approach for implementation and subsequent operation (e.g., fixed time, metered-at-demand, traffic responsive). Responsible agencies will need to consider if resources (e.g., staff, funding, equipment) can be made available to support ramp metering programs and if these systems can be effectively maintained. In addition to these resources, staff must also consider how they intend to enforce ramp meter compliance, and should investigate if law enforcement is committed to the ramp meter program.

Multi-Modal Elements

Alternative transportation modes are accommodated in the Recommended Build Alternative as follows:

- **Pedestrians**: Sidewalks are provided for pedestrians along both sides of each crossing arterial street through the I-25 interchanges. Typical sidewalk widths are a minimum of six to eight feet.
- **Bicycles**: On-street bicycle lanes are incorporated into the interchanges identified for reconstruction. Bicycle trail improvements are shown connecting both sides of Montgomery Boulevard to the North Diversion Channel trail. The grade-separated structure at the Bear Arroyo crossing of I-25 was incorporated into the conceptual design (City of Albuquerque project). A grade-separated structure is also included as part of the Paseo del Norte interchange improvements.
- **Transit**: The costs associated with the I-25 bridges over San Mateo Boulevard/Osuna Road were increased to accommodate future bus rapid transit (BRT). Providing improvements to I-25 will improve the reliability of travel within the corridor which would make it available for use by ABQ Ride transit routes (using general purpose travel lanes).
- **Managed Lanes**: Full shoulder widths are provided along both sides of mainline I-25 in both travel directions. Future managed lanes could be added to the North I-25 corridor if the shoulder width is utilized and design exceptions are obtained for the reduced shoulder widths.

In addition, the Rail Runner commuter rail, which is parallel to the North I-25 corridor, provides service from Belen to Santa Fe.

Estimated Cost and Right-of-Way

The estimated project cost estimate for the Recommended Build Alternative is summarized in Table ES-1. Costs are estimated in today's (2009) dollars and are intended to be all inclusive at the conceptual level, including New Mexico gross receipts tax. The costs increased substantially over the previous costs shown because nearly all the interchanges include new bridge structures and improvements to the Alameda Boulevard interchange are added.

Table ES-1, Conceptual Project Cost Estimate for Recommended Build Alternative

Description	Cost
Roadway	$37,000,000
Bridges	$46,000,000
Drainage	$12,000,000
Signing & Striping	$3,000,000
Lighting	$2,000,000
Signalization/Ramp Metering/ITS	$3,000,000
Baseline Cost	**$103,000,000**
Construction Engineering and Utilities	$41,000,000
Subtotal	**$144,000,000**
Contingency (30%)	$44,000,000
Engineering Design (8%)	$12,000,000
Right-of-Way / Access Easements	$11,000,000
Construction Management (12%)	$18,000,000
New Mexico Gross Receipts Tax (7%)	$10,000,000
Total Estimated Cost	**$239,000,000**

Notes: 1. Costs are based on current unit bid prices (2009).
2. Contingency percentages are based on a phased implementation of project.

Right-of-way impacts include impacts to two businesses, approximately seven acres of property acquisition, excluding the additional right-of-way needed for the Paseo del Norte interchange, and less than two acres of access easements. With a few exceptions, many of the impacts involve slivers of frontage property both along the frontage

roads and at intersections. Based on existing land use and/or size of impact, the noteworthy impacts occur at the following locations:

- New local service road for properties abutting the northbound frontage road, south of Comanche Road
- Northbound Montaño Road off-ramp braid, north of Comanche Road
- Access easements at Jefferson Street Interchange area, east of Jefferson Street
- Property on both sides of I-25 for braided ramps/CD roads, south of San Antonio Drive/Ellison Street

Phasing and Implementation Plan

The proposed improvements will require a substantial capital investment and are expected to be implemented in phases over time. There are multiple approaches that could be utilized to phase and prioritize the identified improvements. One possible phasing and implementation plan is summarized below.

Study Phase

Two Federal policies for transportation improvement projects must be addressed as part of the project development process to obtain approval for final design, right-of-way acquisition, and construction. These involve the National Environmental Policy Act (NEPA) and the Interstate Access Change Request (IACR) policy.

The NEPA requirements should be completed through preparation of an environmental assessment (EA/FONSI) or an environmental impact statement (DEIS/FEIS/ROD), including a public hearing. While the improvements are expected to be implemented in phases, it is recommended that the NEPA environmental documentation be completed for the entire length of project. An EA/FONSI is anticipated based on the expected impacts. The EA should request approval for right-of-way acquisition and final design activities. To authorize construction, environmental reevaluations would be completed specific to the phase to be constructed.

Similarly, the IACR should consider the entire study corridor as a system. A draft version of the IACR should be prepared to identify and confirm the type and extent of proposed improvements required for the study corridor. The draft IACR may be conditionally approved by FHWA prior to the completion of NEPA requirements. Final approval of the IACR is contingent on approval of the NEPA and planning processes. The IACR analyses should be comprehensive involving specific evaluations by phase as well as for the entire system at full build out.

Construction Phasing Approach

A potential construction phasing approach was developed based on a cost per phase ranging from $15 to $30 million to facilitate programming the identified improvements. The costs reflect complete projects including design, right-of-way acquisition and construction based on 2009 dollars. Eleven (11) phases were identified and are shown in Figure ES-4, including cost estimates for each phase. The phasing approach shown in Figure ES-4 is not prioritized and does not address the I-25/Paseo del Norte interchange improvements. The frontage road projects could be further divided as needed based on available funding amounts. The interchange bridge and street improvement projects should be implemented as a complete project, although median access modifications adjacent to the interchanges could be implemented at any time.

Ramp Metering

Implementation of ramp metering in the North I-25 corridor will require substantial modifications to accommodate queuing, acceleration requirements, and to balance the location of on and off-ramps in the corridor. The benefits of ramp metering could be realized today if used to simply break up vehicle platoons to smooth the flow of traffic onto the freeway. Therefore, once the on-ramp roadways are reconstructed to accommodate ramp metering, ramp metering operations should be utilized. A ramp metering evaluation and study should be conducted to refine the approach for implementation and subsequent operation (e.g., fixed time, metered-at-demand, traffic responsive).

Implementation Priorities

The construction phasing approach was based on building from the outside in. The frontage roads would be reconstructed, including access modifications and utility work, to make room for the ramp roadway modifications, braided ramps and mainline freeway widening. Improvements to the arterial interchange crossings could be constructed before or after the frontage road projects. Temporary transitions will be needed between the phases which may modify how access is provided to and from the mainline freeway.

The suggested approach to defining the implementation priorities is to determine where the first project should be constructed. There are critical operational and safety concerns at both the I-40/I-25 interchange and at the I-25/Paseo del Norte interchange that could be used as a basis for establishing where the initial project should occur. Improvements could begin at the south end focusing on northbound I-25 to improve operations within and north of the I-40/I-25 interchange to address queue back-ups onto mainline I-40 associated with the east-to-north and west-to-north ramps. Alternatively, they could begin at the north end to focus on improving operations at the I-25/Paseo del Norte interchange.

Other key factors influencing the location of the initial project include, but are not limited to, the amount and source of available funding, the relief provided by the interim project that will be constructed soon to extend the fourth freeway lane on northbound I-25 from Comanche Road through the Montgomery Boulevard interchange, and political priorities and influences. From an engineering perspective, there are no structural deficiencies that require immediate correction.

Suggested priority listings are provided below. In either scenario, advance right-of-way acquisition should occur as soon as practical for those identified properties that are currently undeveloped.

Priority Listing with Initial Project at South End to Address Issues at the I-40/I-25 Interchange

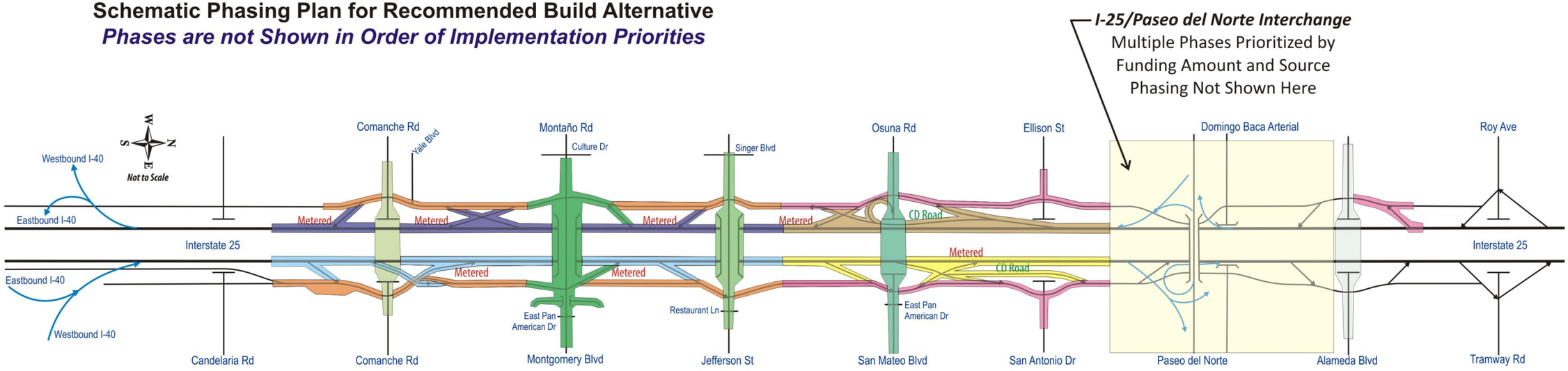
1. Northbound and Southbound Frontage Roads, South Segments
2. Montgomery/Montaño Interchange and Street
3. Northbound Comanche/Montgomery Braid and Mainline
4. Southbound Montaño/Comanche Braid and Mainline
5. Northbound and Southbound Frontage Roads, North Segments
6. Northbound San Mateo/San Antonio Braid, CD Road, and Mainline
7. Southbound CD Road, Osuna/Jefferson Braid, and Mainline
8. Jefferson Bridge and Street
9. San Mateo/Osuna I-25 Bridge and Street
10. Comanche I-25 Bridge and Street
11. Alameda I-25 Bridge and Street

Priority Listing with Initial Project at North End to Address Issues at the I-25/Paseo del Norte Interchange

1. Northbound and Southbound Frontage Roads, North Segments
2. Northbound San Mateo/San Antonio Braid, CD Road, and Mainline
3. Southbound CD Road, Osuna/Jefferson Braid, and Mainline
4. Northbound and Southbound Frontage Roads, South Segments
5. Montgomery/Montaño Interchange and Street
6. Northbound Comanche/Montgomery Braid and Mainline
7. Southbound Montaño/Comanche Braid and Mainline
8. Jefferson Bridge and Street
9. San Mateo/Osuna I-25 Bridge and Street
10. Comanche I-25 Bridge and Street
11. Alameda I-25 Bridge and Street

Schematic Phasing Plan for Recommended Build Alternative

Phases are not Shown in Order of Implementation Priorities



Northbound and Southbound Frontage Roads, South Segments
Estimated Cost $26,340,000

Northbound and Southbound Frontage Roads, North Segments
Estimated Cost $21,120,000

Northbound Comanche/Montgomery Braid and Mainline
Estimated Cost $17,360,000

Northbound San Mateo/San Antonio Braid, CD Road, and Mainline
Estimated Cost $19,650,000

Southbound Montaño/Comanche Braid and Mainline
Estimated Cost $18,640,000

Southbound CD Road, Osuna/Jefferson Braid, and Mainline
Estimated Cost $20,880,000

Comanche I-25 Bridge and Street
Estimated Cost $22,760,000

Montgomery/Montaño Interchange and Street
Estimated Cost $29,760,000

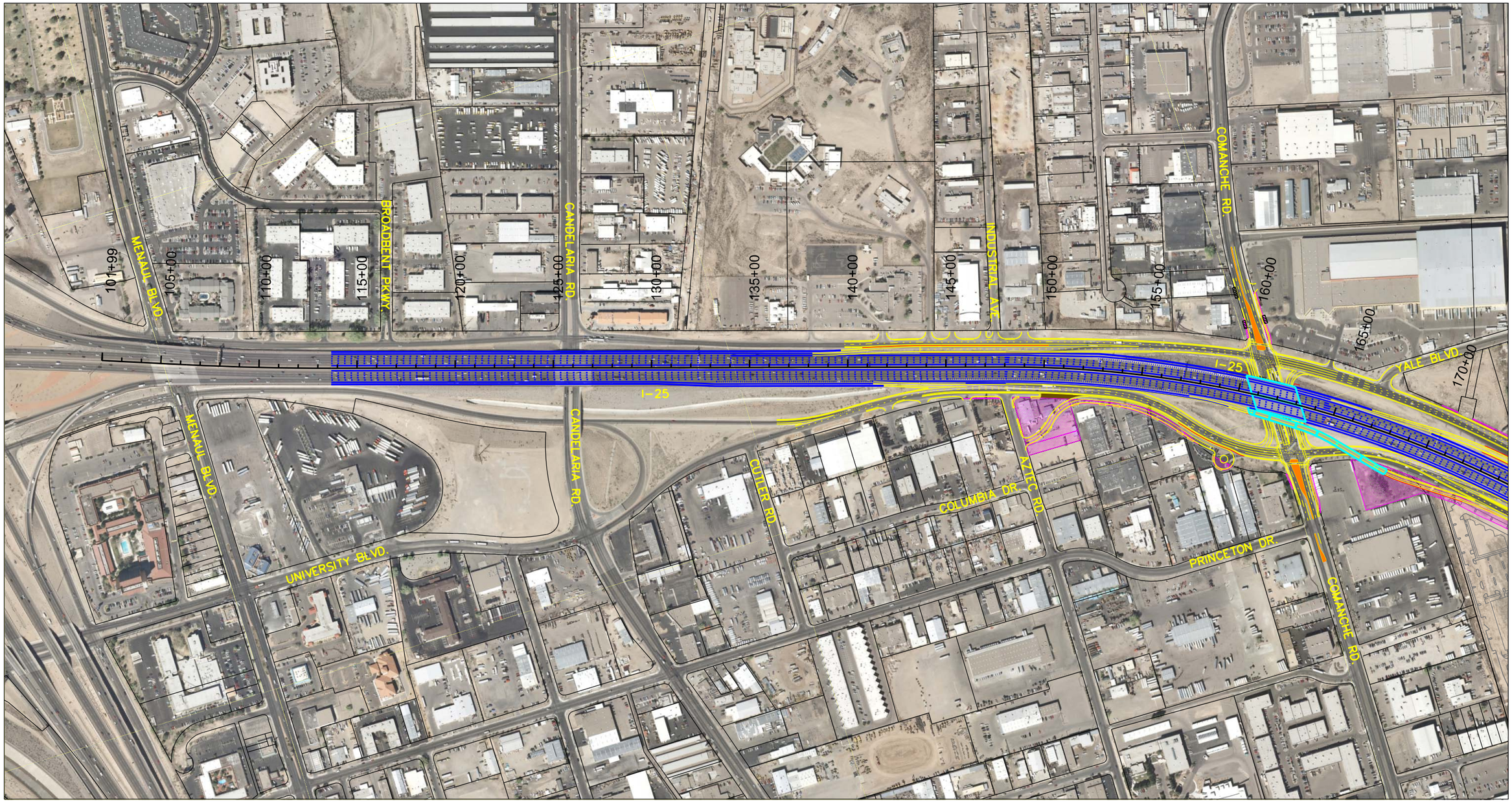
Jefferson Bridge and Street
Estimated Cost $18,800,000

San Mateo/Osuna I-25 Bridge and Street
Estimated Cost $26,920,000

Alameda I-25 Bridge and Street
Estimated Cost $16,890,000

Figure ES-4, Suggested Phasing Plan and Estimated Costs per Phase, Not in Prioritized Order

ATTACHMENT
CONCEPTUAL PLAN LAYOUTS FOR THE RECOMMENDED BUILD ALTERNATIVE



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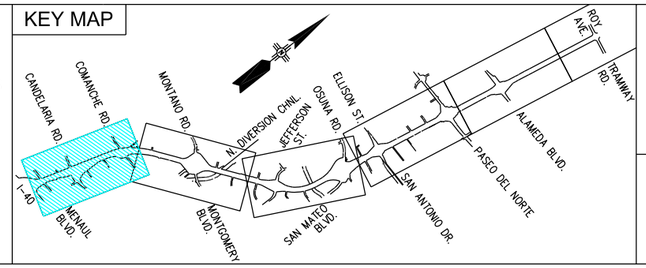
CONCEPTUAL
NOT FOR CONSTRUCTION

DESIGNED BY: JWC	DRAWN BY: JWC	DATE: 04/08/11

LEGEND

- I-25
- FRONTAGE ROADS/RAMPS
- PARCEL LINES
- RIGHT OF WAY
- ACCESS EASEMENTS
- RETAINING WALLS
- NEW BRIDGES

KEY MAP

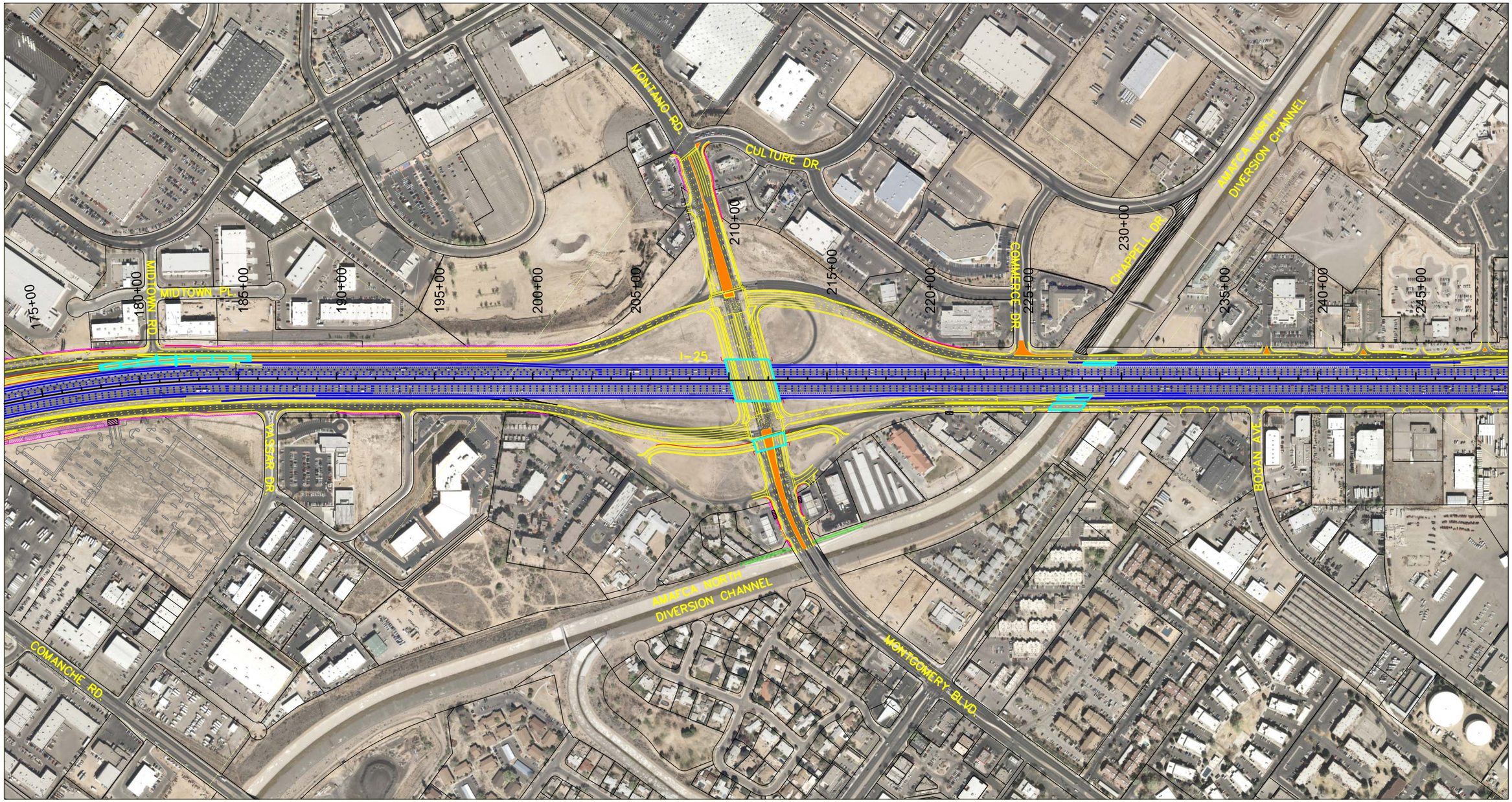


NORTH I-25
FREEWAY OPERATIONS STUDY
PHASE IB ALTERNATIVES ANALYSIS

INTERSTATE 25
INTERSTATE 40 TO TRAMWAY ROAD
PLAN LAYOUT
RECOMMENDED BUILD ALTERNATIVE

NEW MEXICO PROJECT NO. CN D3018

SHEET NO. 1



PB 125 YEARS

New Mexico DEPARTMENT OF TRANSPORTATION

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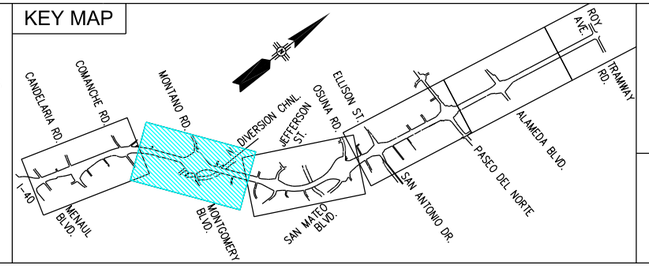
CONCEPTUAL
NOT FOR CONSTRUCTION

DESIGNED BY: JWC	DRAWN BY: JWC	DATE: 04/08/11

LEGEND

- I-25
- FRONTAGE ROADS/RAMPS
- PARCEL LINES
- RIGHT OF WAY
- ACCESS EASEMENTS
- RETAINING WALLS
- NEW BRIDGES

KEY MAP

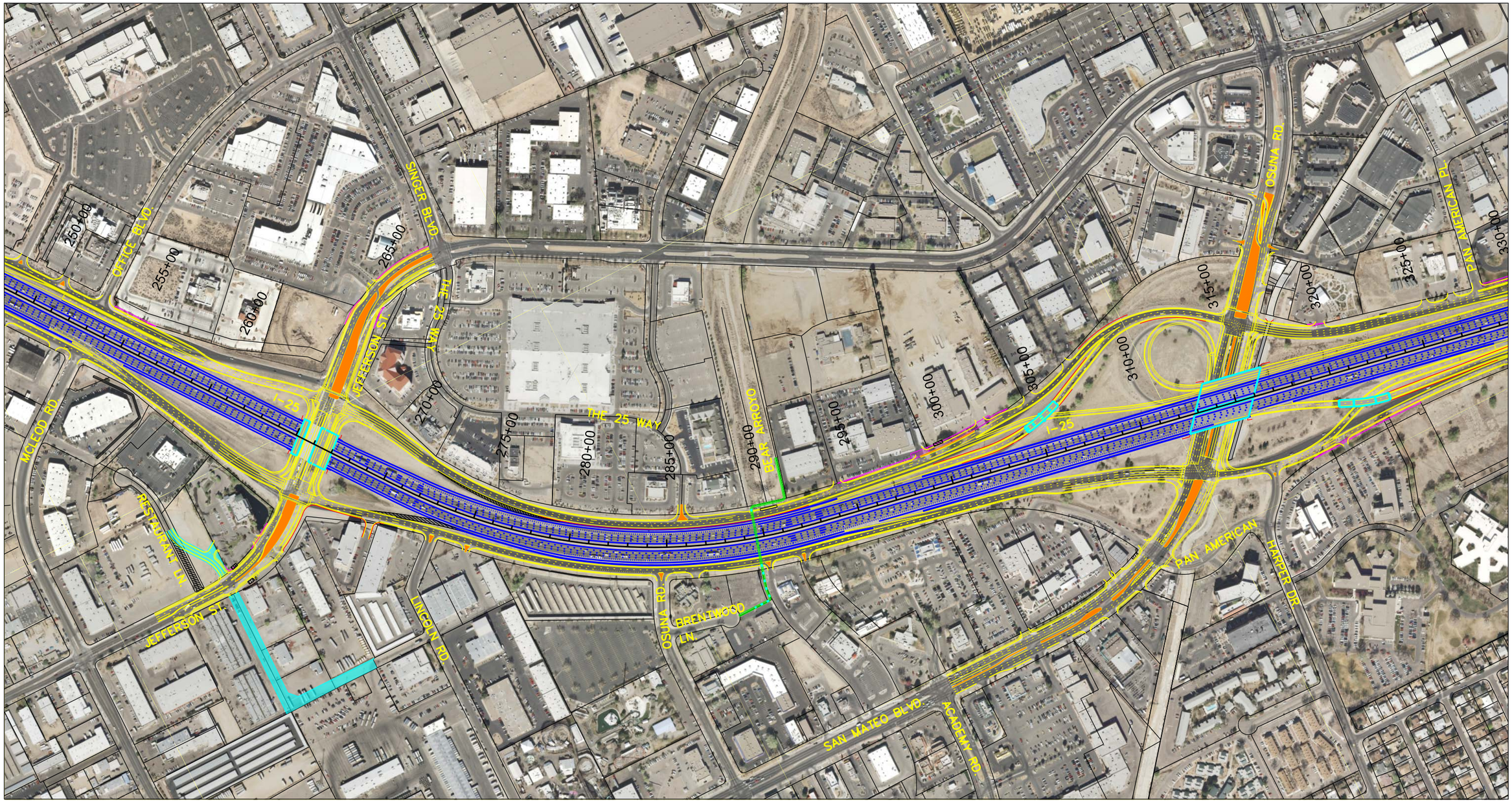


NORTH I-25
FREEWAY OPERATIONS STUDY
PHASE IB ALTERNATIVES ANALYSIS

INTERSTATE 25
INTERSTATE 40 TO TRAMWAY ROAD
PLAN LAYOUT
RECOMMENDED BUILD ALTERNATIVE

NEW MEXICO PROJECT NO. CN D3018

SHEET NO. 2



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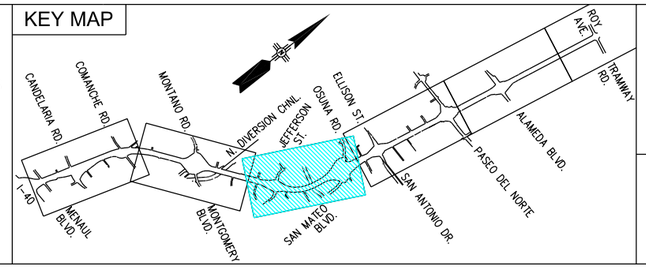

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FREEWAY OPERATIONS STUDY
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INTERSTATE 25
INTERSTATE 40 TO TRAMWAY ROAD
PLAN LAYOUT
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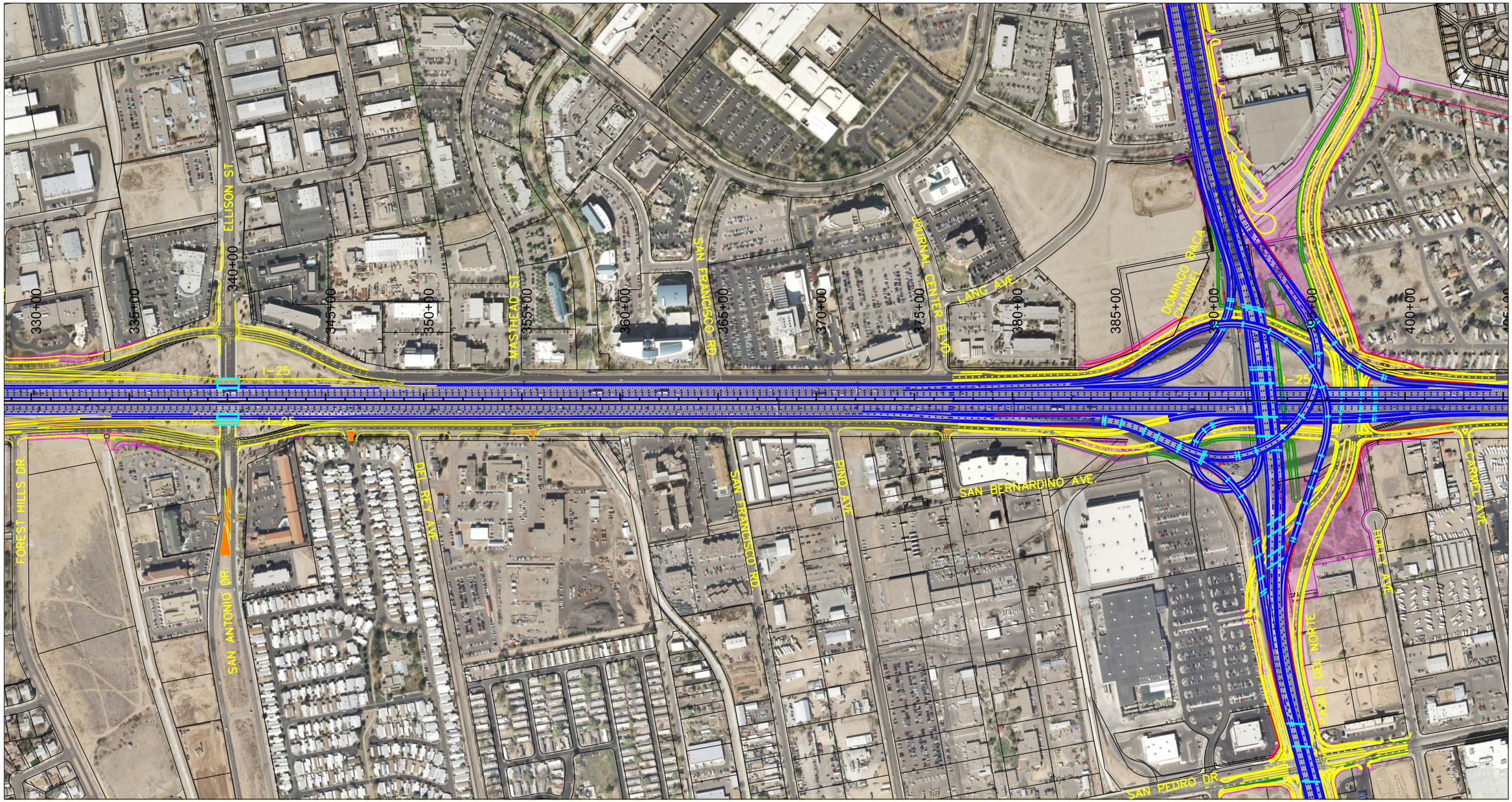

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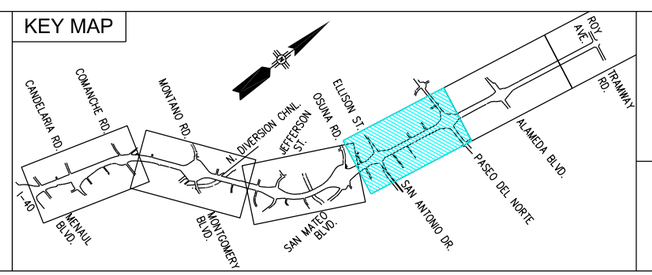

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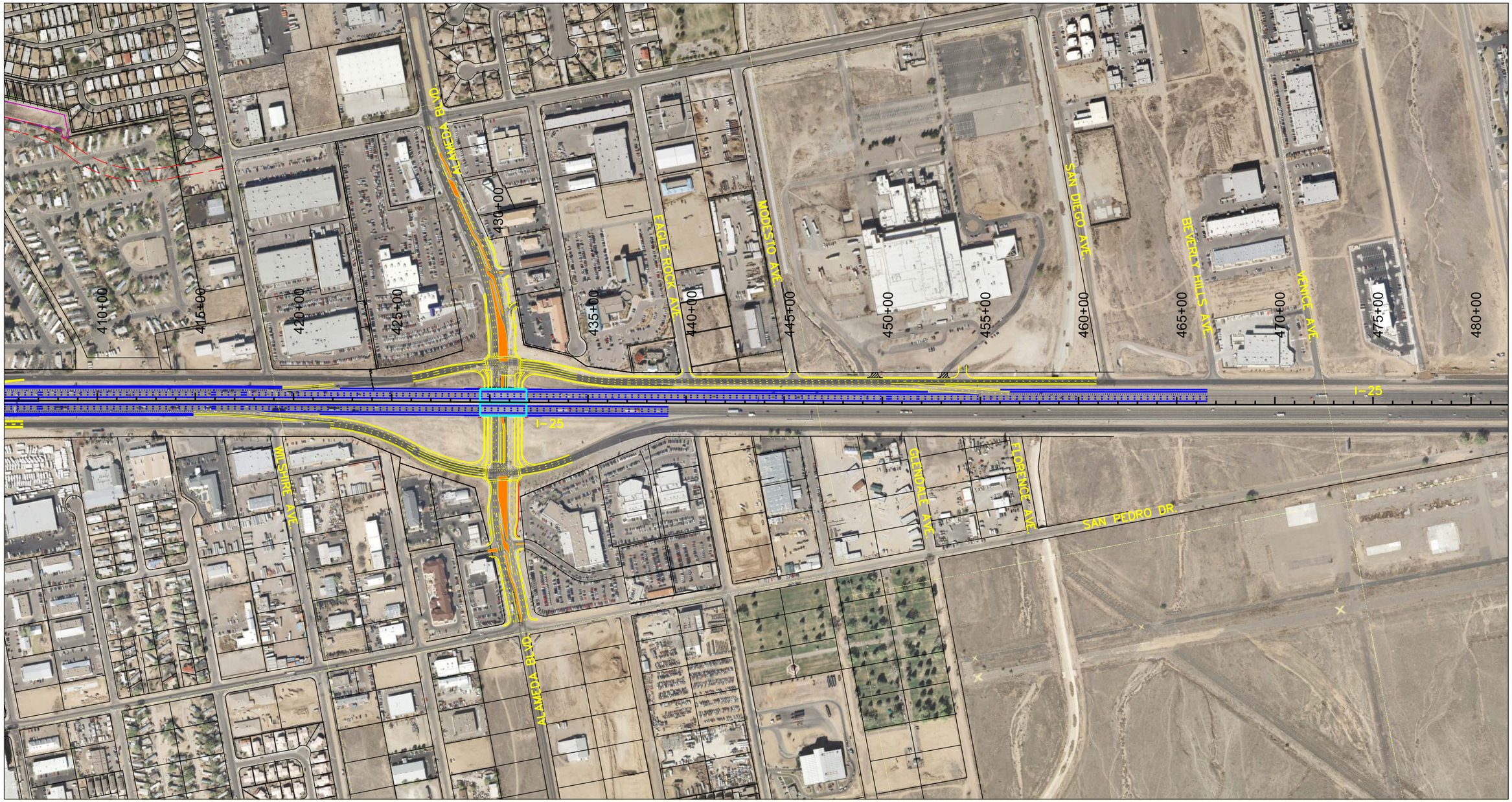

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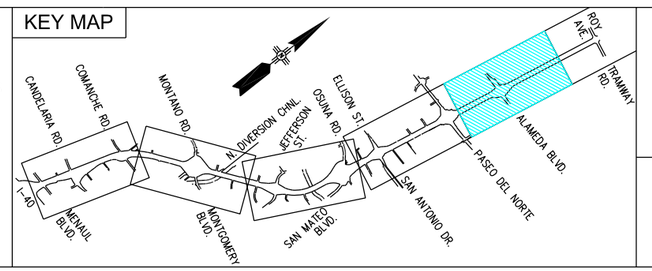

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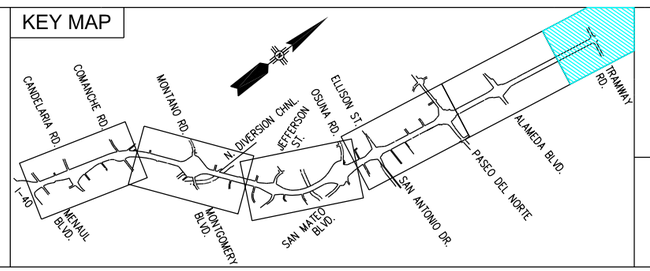

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CHAPTER 1 INTRODUCTION AND PURPOSE AND NEED

Introduction

The New Mexico Department of Transportation (NMDOT) conducted this study to document existing deficiencies and future conditions within the North I-25 corridor in Albuquerque, New Mexico, and to identify improvement strategies to address design-year transportation needs. This document compiles and summarizes the Phase 1B detailed evaluation of alternatives completed for the *North I-25 Freeway Operations Study* (Project No. TPA-TPU-025-4(122)228, CN D3018). A map illustrating the project vicinity and the study area is provided as Figure 1-1.

The overall North I-25 study area includes the transportation system from the Comanche Road Interchange to the Tramway Road Interchange including the mainline freeway, the frontage road system, and the arterial cross-street intersections within and in close proximity to I-25. Eight interchanges exist in the North I-25 corridor at Comanche Road, Montgomery Boulevard/Montaño Road, Jefferson Street, San Mateo Boulevard/Osuna Road, San Antonio Drive/Ellison Street, Paseo del Norte, Alameda Boulevard, and Tramway Road/Roy Road.

The North I-25 Freeway Operations Study is focused on the Comanche Road, Montgomery Boulevard/Montaño Road, Jefferson Street, San Mateo Boulevard/Osuna Road, and San Antonio Drive/Ellison Street interchanges and the mainline freeway segments connecting these interchanges. The I-25/Paseo del Norte Interchange Study (CN D3026) evaluated the San Mateo Boulevard/Osuna Road, San Antonio Drive/Ellison Street, Paseo del Norte, and Alameda Boulevard interchanges. The modifications to I-25 identified in the I-25/Paseo del Norte Interchange Study were reevaluated with the exception of the Paseo del Norte interchange itself. The Tramway Road/Roy Road interchange was recently improved and only basic analysis was performed in this study.

The results of this study will provide information to plan and program improvements identified for the North I-25 corridor with reasonable accuracy based on the best information available today. In addition, this document provides information to help manage future development activities within and adjacent to the North I-25 corridor.

Background

Interstate 25 (I-25) is a major north-south thoroughfare through the middle of Albuquerque serving multiple transportation markets including intercity, regional, intrastate, and interstate travel. According to the map of the *2009 Traffic Flows for the Greater Albuquerque Area* prepared by the Mid Region Council of Governments (MRCOG), average weekday traffic volumes range from 76,600 vehicles per day near the Tramway Road Interchange and to 180,800 vehicles per day near the Montgomery Boulevard Interchange. These high daily traffic volumes are indicative of a heavily traveled urban freeway. While originally developed as part of the National Highway System for strategic national defense purposes, the Albuquerque metropolitan area has evolved and is reliant on I-25 for all types of trip purposes in addition to its function as an interstate highway.

The corridor currently experiences recurring congestion during the morning and evening peak periods, and congestion is expected to worsen with continued growth of the metropolitan area. The transportation deficiencies and improvement needs of the North I-25 corridor were addressed by two studies as indicated in Figure 1-1; the North I-25 Freeway Operations Study and the I-25/Paseo del Norte Interchange Study.

The North I-25 Freeway Operations Study was included in the 2006-2011 Transportation Improvement Plan (TIP) for the Albuquerque Metropolitan Planning Area (AMPA). Funding for the study was allocated in 2007. The scope of the project includes Phase 1A and Phase 1B of the NMDOT *Location Study Procedures*.

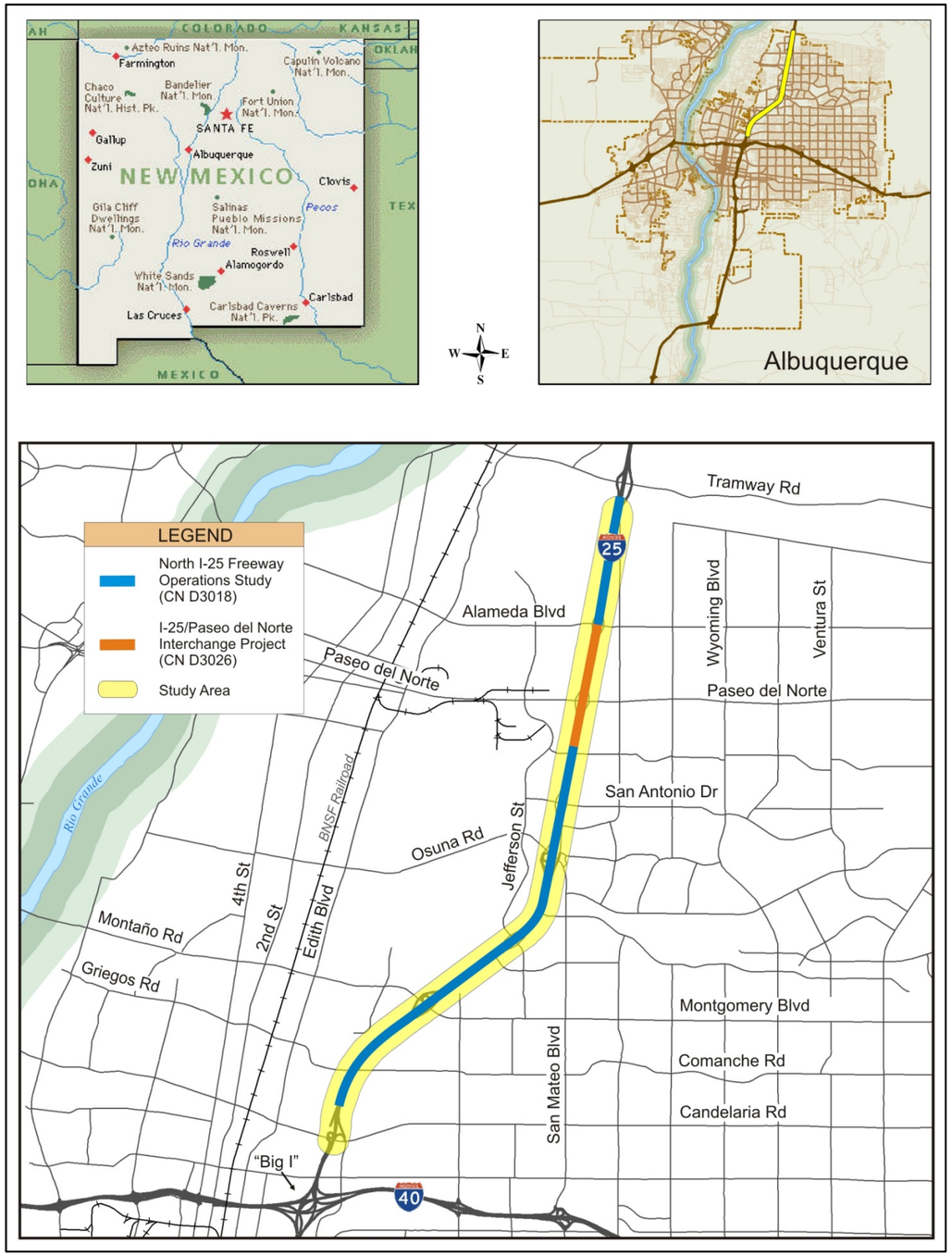


Figure 1-1, Vicinity and Study Area Map

Study Methodology and Assumptions

An overview of the primary aspects of the study methodology and assumptions is provided below.

Design References

The freeway geometric design improvements, the configuration of access to I-25, and the arterial street design were reviewed and improved based on several design references which primarily included:

- A Policy on Geometric Design of Highways and Streets, 2004 AASHTO (Green Book)
- Freeway and Interchange Geometric Design Handbook, 2005 ITE
- A Policy on Design Standards Interstate System, January 2005, AASHTO
- Ramp Management and Control Handbook, January 2006 FHWA
- Manual on Uniform Traffic Control Devices (MUTCD), 2009 FHWA
- State Access Management Manual, September 2001 NMDOT
- Access Management Manual, 2003 TRB
- Roadway Design Manual, October 2006 TxDOT
- Development Process Manual (DPM), City of Albuquerque

The design team for this project discussed design options pertinent to the study area and guided the development of the proposed improvements for the North I-25 corridor. In addition, documents addressing ramp metering were reviewed from several states including California, Arizona, Nevada, and Texas.

Traffic Projections

The travel demand assessment for Phase 1B was conducted based on the MRCOG EMME/2 travel demand models developed for the 2030 Metropolitan Transportation Plan (2030 MTP). Phase 1B focuses on the AM and PM peak hours of the 2030 model year. The travel demand assessment was performed by Planning Technologies, LLC and Parsons Brinckerhoff (PB) in cooperation with MRCOG. The base models developed in Phase 1A for the North I-25 corridor were modified to reflect the roadway and interchange improvements advanced for detailed evaluation. The No Build Alternative and three Build Alternatives were specifically modeled for this study. The MTP is currently being updated to represent a planning horizon of 2035. The updated Plan is expected to be complete by mid- to late 2011. As individual projects are advanced within the North I-25 Corridor, traffic forecasts will be updated to represent the MTP in place at that time.

Traffic Operations

The operational performance of the North I-25 transportation network was assessed using two analysis tools. Synchro was used to evaluate signalized intersection operations of the frontage road intersections with arterial cross streets and for closely-spaced signalized intersections adjacent to the I-25 corridor. The Highway Capacity Software (HCS+) was used to evaluate the freeway system including basic freeway segments, ramp junctions and weave sections. It should be noted that the assessment of operational performance was not at the level required for an Interstate Access Change Request. Due to the congestion expected in this corridor, micro-simulation analysis will be required when projects move forward to improve the North I-25 system. Micro-simulation analyses of 2030 No Build Alternative conditions (AM and PM peak periods) for the entire North I-25 corridor were developed using VISSIM as part of the I-25/Paseo del Norte Interchange Study, however the build alternatives have not been simulated.

Access Management

Access management along the mainline freeway was based on balancing the competing needs in the corridor with the space available per the AASHTO Green Book and the ITE *Freeway and Interchange Geometric Design Handbook*. Access conditions along the frontage roads at ramp junction areas were reviewed considering guidance in the TxDOT *Roadway Design Manual*. Access considerations within the interchange influence areas were based on a combination of state and national guidelines and policies.

Technical Project Team

A technical Project Team was created to assist with the development and progress of this project. Project Team meetings were attended by representatives from the NMDOT (District and General Office staff), Federal Highway Administration (FHWA) Division office, MRCOG, and the City of Albuquerque.

Purpose and Need

This section provides the intended purpose and objectives for improvements to the North I-25 corridor and summarizes factors that justify why improvements are needed. As such, the foundation for the purpose and need is established in this report. However, some of the information will require updates when environmental clearance is sought for improvement projects such as the travel demand forecasts, infrastructure condition status, and crash/safety analysis.

Purpose Statement

The purpose of the *North I-25 Freeway Operations Study* is to identify strategies to improve the efficiency of the freeway mainline and associated ramp, frontage road and interchange systems, and to update and prepare the North I-25 corridor for continued growth of the Albuquerque metropolitan area.

When last updated in the early 1990s, the existing design of I-25 was adequate to provide efficient traffic flow for its design year of 2010. However, growth within the metropolitan area and at the major employment and activity centers accessed by the I-25 corridor, together with improvements to the I-40/I-25 (Big I) interchange, has resulted in travel demand that exceeds the available capacity and has rendered the configuration of access to and from the mainline freeway inadequate. While the existing configuration of ramps was reasonably able to accommodate traffic into the 21st century, the facility has become outdated creating the need for additional capacity and the reconfiguration of access to preserve the safe and efficient function of the interstate. Significant population growth within the metropolitan area and employment growth within the North I-25 corridor are projected to continue for the foreseeable future. The accompanying traffic growth will cause congestion to worsen.

The need for improvements to the North I-25 corridor is based on (1) travel demand and congestion, (2) physical deficiencies, and (3) safety issues. The primary aspects of the study area and features of the existing North I-25 facilities that affect I-25 and its efficiency include:

- Travel Demand and Congestion
  - Metropolitan area growth and associated growth in travel demand
  - Insufficient number of lanes on the freeway mainline
  - Congestion at ramp/frontage road intersections with the cross streets including the need for better access management and capacity along the cross streets within the interchange areas and frontage road improvements
- Physical Deficiencies
  - Insufficient ramp spacing for current and forecast demand (closely-spaced interchanges)
  - Substandard horizontal or vertical design elements
- Safety Issues
  - Primarily attributed to increased travel demand and congestion and physical deficiencies rather than specific safety deficiencies

Because the transportation system within the Albuquerque region has developed and evolved around the use of I-25 as a central thoroughfare, few practical approaches are available to substantially reduce the traffic demand within and through the project area. While some mainline widening is needed, buildings located adjacent to the freeway/frontage roads may limit the feasibility of widening more than one lane in each travel direction. For this reason, improvements in the corridor will also focus on solutions that optimize the capacity of the existing facility to achieve a reasonable

level of service. Strategies to manage travel along the corridor and provide and maintain smooth traffic flow on the mainline freeway will be considered as the highest priority. Secondarily, accommodating access to and from the North I-25 corridor both to the mainline freeway and the frontage road system must also be included in the management of the facility. Geometric improvements will be part of the solution including modifications to the freeway mainline, interchange configurations, and ramp roadways. A discussion of the factors that contribute to the corridor deficiencies are discussed below.

Discussion of Need

The following summarizes key information for each condition or deficiency identified above that demonstrates the need for improvements to the North I-25 corridor.

Travel Demand and Congestion

Metropolitan Area Growth and Associated Travel Demand

Substantial regional growth is expected within the Albuquerque metropolitan region. According to the 2030 MTP for the MRCOG Region, an approximate 41% growth in population and 39% growth in employment are expected between 2004 and 2030. These values are expected to increase for the 2035 MTP.

Specific to the North I-25 corridor, considerable employment growth is expected while population growth is expected to be minimal. Figure 1-2 and Figure 1-3 illustrate the forecast growth from year 2006 to year 2030 by traffic analysis zone (TAZ) per the MRCOG socio-economic projections prepared for the 2030 MTP. The growth in employment and population would translate into increase travel demand that will need to be accommodated.

Interstate 25 is a heavily used commuter route with high demand on both a peak-hour and daily basis. The high travel demand is due to multiple trip purposes for which the I-25 corridor is used including regional through trips, local through trips, and regional and local trips destined to or generated by development within the study corridor. Interstate 25 passes through the center of the Albuquerque metropolitan area and is the primary route used for intra-city travel, as well as inter-city travel between the eight municipalities within the metropolitan region. The metro area encompasses an overall north-south distance of almost 50 miles between the City of Belen and Town of Bernalillo. Traffic that originates within this area or that is traveling to locations served by I-25 accounts for the vast majority of traffic within the I-25 corridor. According to the MRCOG *2009 Traffic Flows for the Greater Albuquerque Area*, the daily volume of traffic on I-25 north of Comanche Road was 180,800 vehicles in 2009. In comparison, the traffic volume on I-25 south of Los Lunas was about 21,200 vehicles or 11.7% of the volume north of Comanche Road. The daily volume on I-25 north of US 550 is about 21% of the volume north of Comanche. These comparisons demonstrate that the vast majority of trips using I-25 are internal to the metro area.

For the North I-25 corridor, a comparison of daily traffic flows for key locations in the study area is provided in Table 1-1. As shown in the table, substantial growth in travel demand is expected in the North I-25 corridor.

Table 1-1, Comparison of Existing and Forecast Daily Two-Way Traffic Flows

Year	North of I-40	Growth (%)	Montgomery to Jefferson	Growth (%)	South of Paseo del Norte	Growth (%)	North of Tramway	Growth (%)
2009 Daily Traffic [1]	172,700	-	164,500	-	129,100	-	69,300	-
2030 No Build Alternative [2]	223,600	29%	197,300	20%	174,200	35%	107,300	55%
2030 Improved Scenario [2]	246,000	42%	233,600	42%	196,000	52%	107,300	55%

1. *Source is the MRCOG 2009 Traffic Flows Map.*
2. *Source is the MRCOG 2030 EMME/2 Travel Demand Model.*

Insufficient Number of Freeway Lanes

The North I-25 freeway is in need of additional mainline lanes to provide additional capacity and to improve lane continuity at key areas. The analysis of the No Build alternative under 2030 traffic forecast conditions indicates that congestion is expected throughout the corridor from north of I-40 to south of Paseo del Norte. The congestion is demonstrated in the traffic performance charts of Figure 1-4, which show average speed profiles during the peak hours based on VISSIM micro-simulation results. The mainline freeway is deficient in one or both travel directions during the peak travel periods. The capacity deficiencies include the basic freeway, weave segments, and most of the ramp junctions in the North I-25 corridor.

A key location where lane continuity is not provided is in the northbound travel direction north of I-40. Improvements constructed as part of the I-40/I-25 interchange reconstruction ended approximately at Comanche Road transitioning into the existing freeway lanes within and north of the Comanche interchange. As such, only three mainline lanes are provided creating a bottleneck point which causes congestion upstream to the I-40/I-25 system interchange. Additional improvements are needed to fully accommodate the I-40/I-25 interchange improvements to eliminate the bottleneck that now exists, to provide four basic lanes on the freeway mainline, and to extend the five lanes exiting the system interchange as far north as is possible. Auxiliary lanes would supplement the four basic lanes as required at ramp junctions. It should be noted that NMDOT District 3 is making interim improvements to eliminate the bottleneck. However, this will require a shoulder width design exception to implement the desired improvements through the Montgomery interchange due to the insufficient width under the bridge structure. As such, permanent improvements will still be needed to provide standard lane and shoulder widths.

A similar situation would occur in the southbound direction if the I-25/Paseo del Norte interchange is improved as currently planned. The planned improvements are substantial and will require improvements south of the Paseo del Norte project to provide the necessary basic number of lanes on the freeway. Five lanes will exit the interchange southbound making four basic lanes on the mainline freeway necessary to the I-25/I-40 interchange. One of the five lanes can be dropped at an off-ramp, and auxiliary lanes would supplement the four basic lanes as required at ramp junctions.

Intersection Deficiencies

Intersection capacity deficiencies at ramp terminals are prevalent along the North I-25 corridor whether indicated by poor levels of service or by high volume-to-capacity ratios for movements. For existing conditions, 12 of 16 interchange intersections indicate a capacity deficiency, and all 16 have at least one movement projected to be over capacity in the year 2030. While there is a need to improve the intersections, because of the high demand using the North I-25 corridor and the major arterials crossing I-25, capacity deficiencies may remain at several intersections even with geometric improvements and added turn lanes. Some level of capacity deficiencies should be expected because of space limitations (i.e., improvements will be retrofitted considering existing development) and due to fiscal constraints which realistically make multi-level interchanges not viable at more than one location (e.g., Paseo del Norte). With continued congestion, the need for access management improvements in the interchange areas becomes greater.

Within the vicinity of interchanges, access along the arterial cross streets must be managed to facilitate safe and efficient operations on the approaches and departures to the frontage road/ramp terminal signalized intersections. A higher level of access management is needed on the arterial cross streets than is currently provided at most of the interchanges in the North I-25 corridor to satisfy the desired level of access control specified in NMDOT and FHWA policy documents. Per the *State Access Management Manual*, access should be controlled within 300 feet of interchange ramp terminals. Access management improvements are needed at the following locations based on existing conditions:

- Comanche Interchange: west side
- Montgomery/Montaño Interchange: east side
- Jefferson Interchange: east side
- San Mateo/Osuna Interchange: both sides
- San Antonio/Ellison Interchange: both sides
- Alameda Interchange: west side

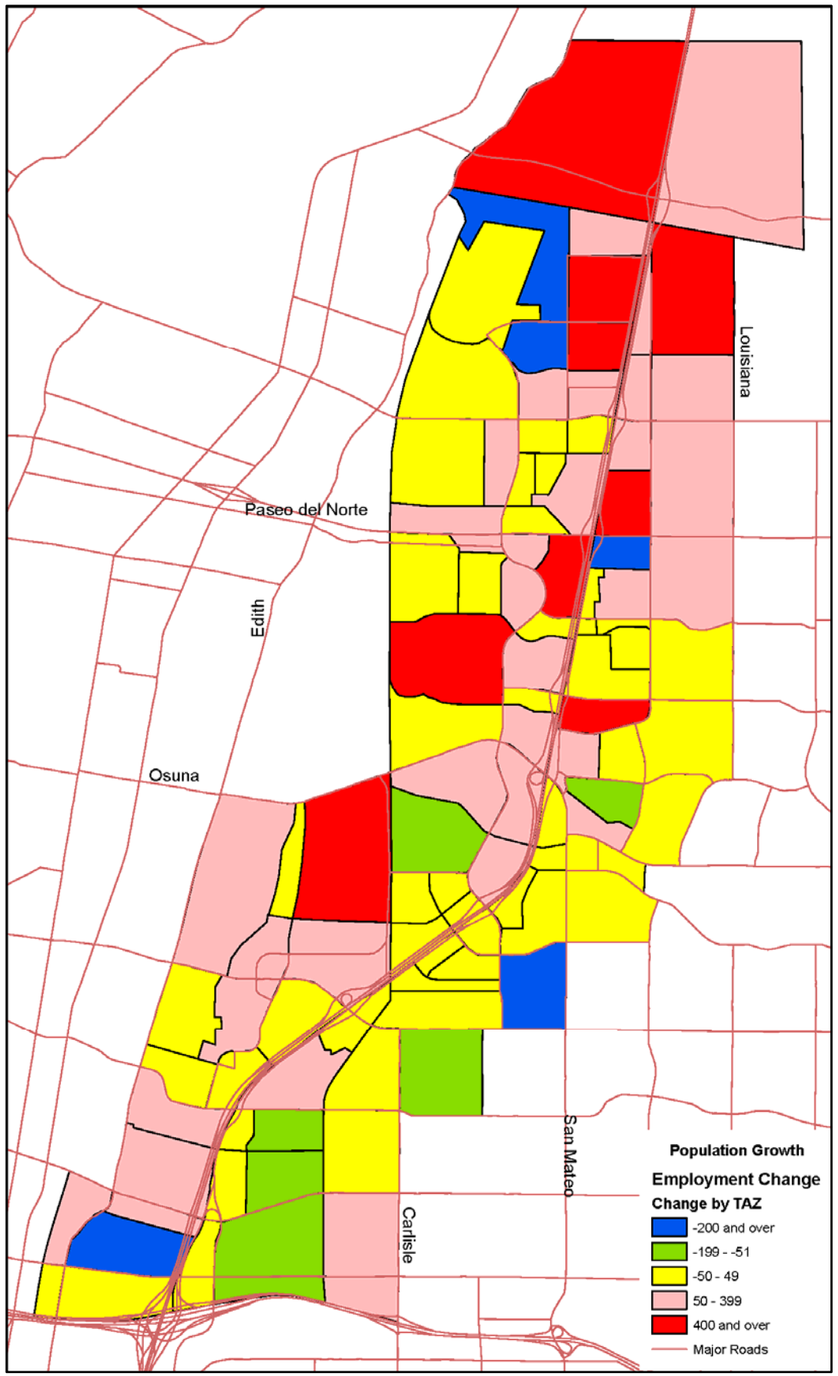


Figure 1-2, Employment Change – 2006 to 2030

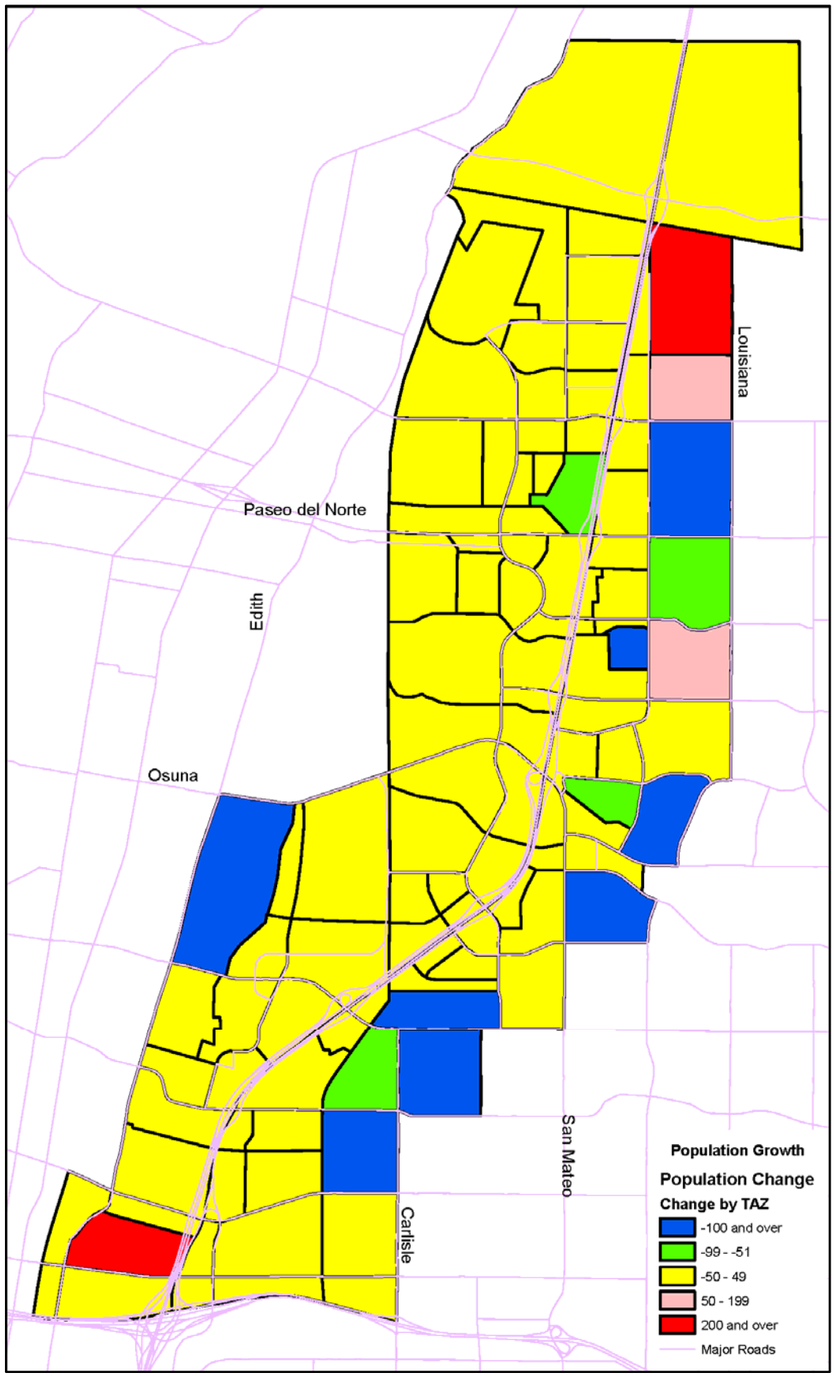
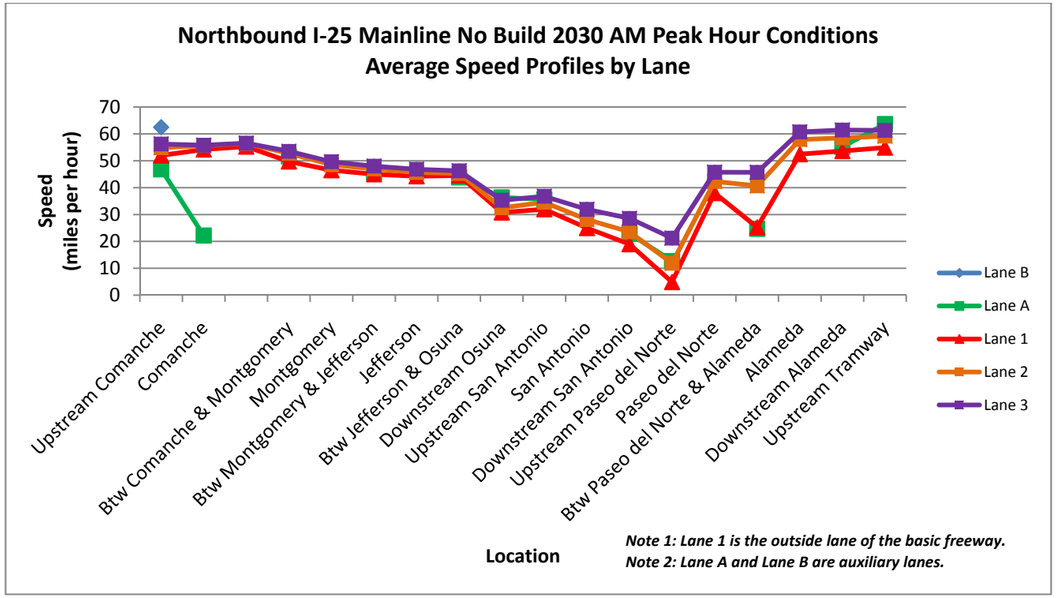
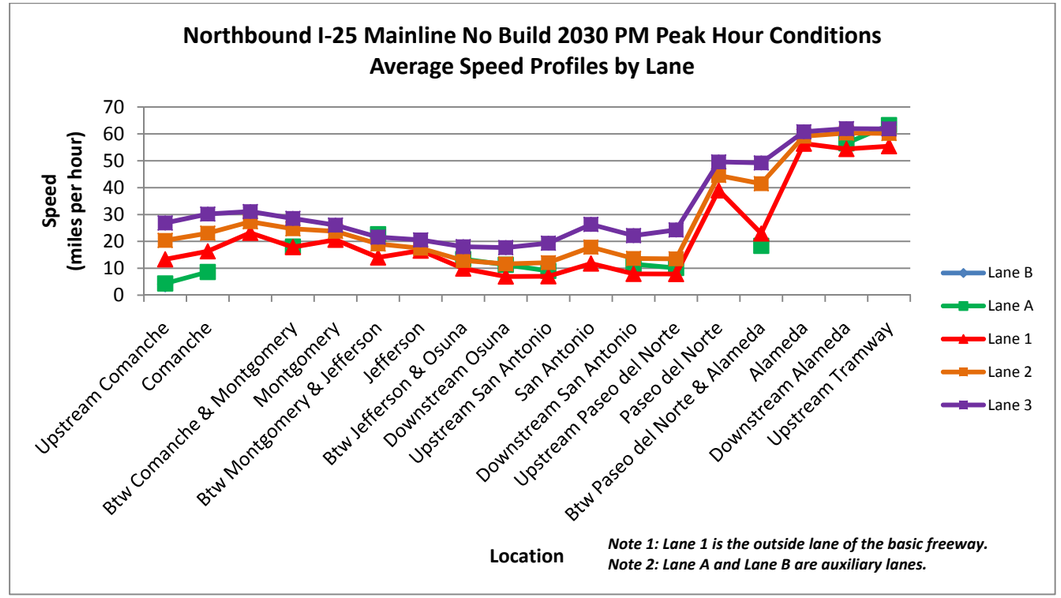
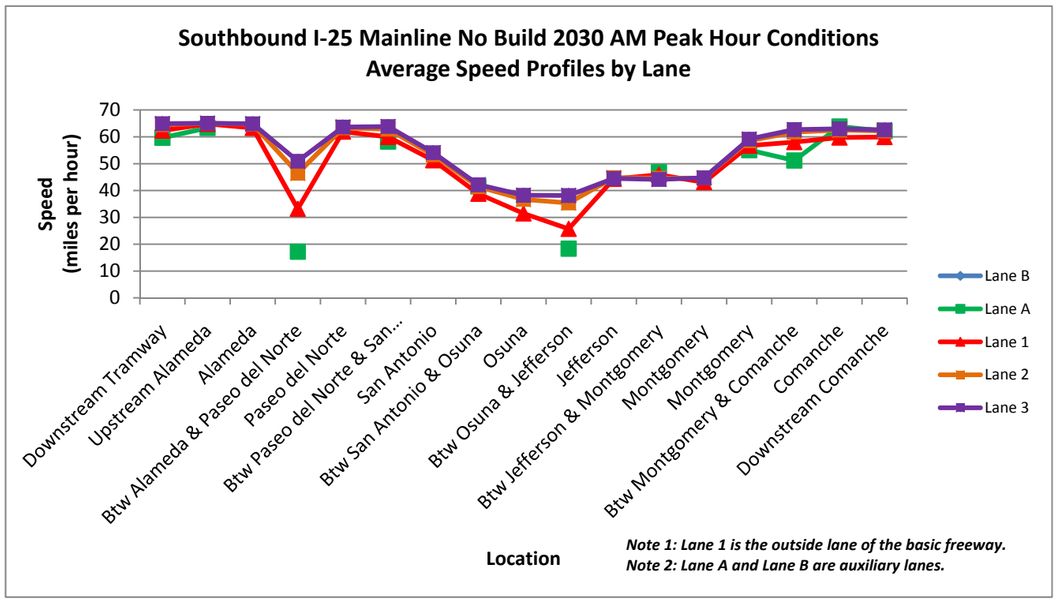


Figure 1-3, Population Change – 2006 to 2030







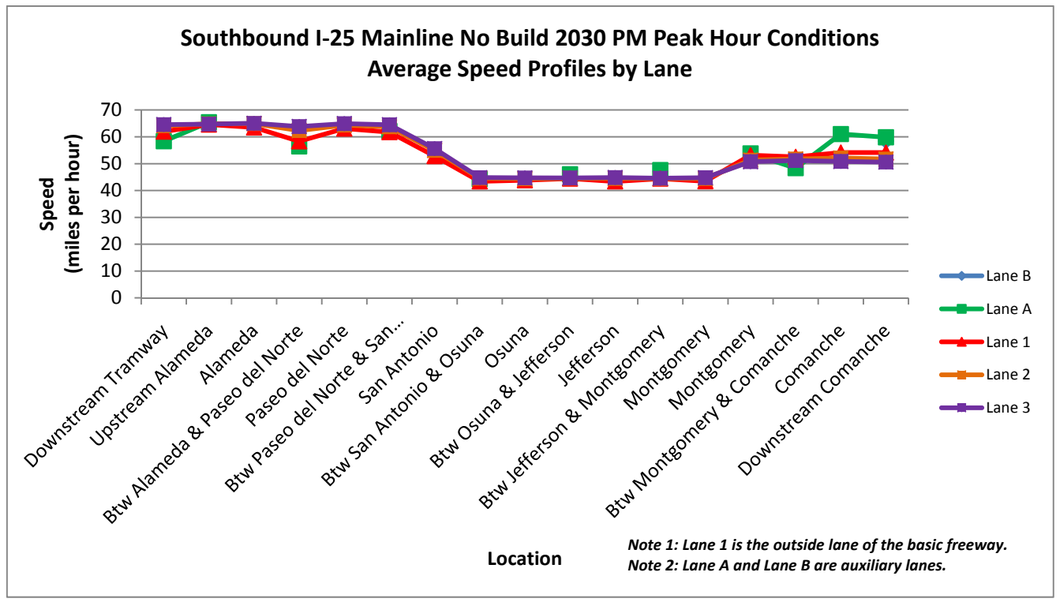


Figure 1-4, Year 2030 No Build Conditions Traffic Performance Charts – AM and PM Peak Hour Average Speed Profiles

Sound access management principles will be applied in the development of alternatives at each interchange. However, similar to the expectation that there will be intersection capacity deficiencies after improvement, retrofitting access modifications in a built environment may also result in access design variances in the improved condition.

Physical Deficiencies

Interchange Spacing and Access Management

From Comanche Road to Tramway Road, eight partial or full traffic interchanges exist within a distance of approximately six miles (see Table 1-2). This interchange density is high as the desired minimum spacing of interchanges should be one mile in urban areas according to the Federal Highway Administration (FHWA) *A Policy on Design Standards Interstate System*, January 2005. The close spacing of ramp junctions combined with the high traffic volume traveling on the freeway mainline and on the ramps has a significant effect on the efficiency and safety of traffic operations. Closely spaced ramps result in insufficient distance to merge, diverge, and/or to weave which can create pseudo-bottleneck points along the freeway (e.g., southbound between the San Antonio on-ramp and the San Mateo Loop off-ramp). Modifications to the access configuration are needed which generally involves ramp geometric improvements, braiding ramps, ramp metering, and/or the elimination of access.

Table 1-2, Existing Crossroad to Crossroad Spacing along North I-25

Cross Street	Centerline Spacing (feet)	Centerline Spacing (miles)	Existing Type	I-25 Alignment
Menaul Boulevard	-	-	Grade Separation	Straight
Candelaria Road	2025	0.38	Grade Separation	Straight
Comanche Road	3580	0.68	Service Interchange	Straight
Montgomery Boulevard/Montaño Road	4920	0.93	Service Interchange	Curvilinear
Jefferson Street	5440	1.03	Service Interchange	Straight
San Mateo Boulevard/Osuna Road	4820	0.91	Service Interchange	Curvilinear
San Antonio Drive/Ellison Street	2630	0.50	Service Interchange	Straight
Paseo del Norte	5175	0.98	Service Interchange	Straight
Alameda Boulevard	3850	0.73	Service Interchange	Straight
Tramway/Roy Road	7150	1.35	Service Interchange	Straight

Note: Shaded values do not satisfy the minimum one-mile spacing requirement for urban freeways.

Critical locations of closely spaced ramps along the North I-25 corridor include:

- Northbound, Comanche On-ramp to Montgomery Off-ramp
- Northbound, Jefferson On-ramp to San Mateo Off-ramp
- Northbound, San Antonio On-ramp to Paseo del Norte Off-ramp
- Northbound, Paseo del Norte On-ramp to Alameda Off-ramp

- Southbound, Alameda On-ramp to Paseo del Norte Off-ramp
- Southbound, San Antonio On-ramp to San Mateo Loop Off-ramp
- Southbound, San Mateo/Osuna On-ramp to Jefferson Off-ramp
- Southbound, Montgomery On-Ramp to Comanche Off-ramp

Substandard Design Elements

A review of the horizontal and vertical alignment characteristics of the I-25 mainline freeway and frontage roads was performed based on as-built plans to identify if the appropriate design standards are satisfied. Several geometric deficiencies were identified. Based on a 70 mph design speed and AASHTO superelevation rates, the horizontal curve at Comanche is deficient for superelevation in both directions. This curve has a 2% rate while the minimum should be 3.4% for 70 mph. The vertical alignment at Comanche also has a deficient K-value in the sag curve in the northbound direction. The existing K-value is 173 while the minimum AASHTO value is 181. One other notable characteristic discovered through the geometric design review is the profile grades near San Mateo Boulevard to San Antonio Drive are flat at less than 0.3%. Drainage issues result when sufficient slope is not provided to allow water to flow off the travel lanes properly.

On the frontage roads, the only notable design aspect involves the Jefferson Street interchange. This interchange was designed with angle points at the intersections which, together with adverse cross slope, result in design speeds of 30 to 35 mph for the frontage road through movements. The desirable design speed on the frontage roads is 50 mph.

Existing bridge structures are generally in good condition, but a few deficiencies are noted. Based on current standards, both of the I-25 bridges over Comanche are functionally obsolete due to insufficient under-clearance, and the bridge railings on the Montgomery overpass are substandard. The spacing of bridge piers at the Montgomery Boulevard overpass also limit widening of the mainline interstate. If widening is needed for capacity or lane continuity reasons, this bridge will need to be reconstructed.

Safety Issues

Safe travel is an essential objective of all transportation improvement projects. As urban areas outgrow their infrastructure and travel demand exceeds available capacity, oftentimes increased crash occurrence results from the congested conditions. This is true for the North I-25 corridor as the causal factors of crashes are thought to primarily be the result of the congestion resulting from travel demand outgrowing the current physical characteristics of the facility. This is demonstrated by the crash history which suggests that approximately 80% of the crashes reported along the North I-25 mainline freeway were rear-end or sideswipe crashes, and the associated crash severity (i.e., percentage of injury and fatal crashes) was 29% over the length of the study corridor, which is considered low for a high-speed facility.

It is important to clarify that the safety aspect of the need for improvements is not based on an existing facility with substandard design features. Rather, the safety need based on crash experience in the study corridor is predicated on the increases in travel demand and congestion which have outgrown the existing facility.

Crash data for the project segment of I-25 indicates that several locations within the study corridor have a higher than average crash rate when compared to freeway and intersection crashes throughout Albuquerque. This includes a few segments of the mainline freeway and the intersections of the northbound frontage road with each of the crossing arterial streets as listed below:

- Northbound I-25 High Crash Segments
  - Milepost 227.3 to 227.6, Comanche off-ramp vicinity
  - Milepost 228.1 to 228.5, Montgomery off-ramp vicinity
  - Milepost 230.6 to 231.0, San Antonio off-ramp vicinity
  - Milepost 231.6 to 232.0, Paseo del Norte off-ramp vicinity

- Southbound I-25 High Crash Segments
  - Milepost 231.5 to 232.0, Paseo del North on-ramp vicinity
  - Milepost 230.5 to 231.0, San Antonio on-ramp, San Mateo off-ramp vicinity
  - Milepost 229.6 to 230.1, Jefferson off-ramp vicinity

- High Crash Intersections within the Study Area
  - Comanche Road/Northbound Frontage Road
  - Montgomery Boulevard/Northbound Frontage Road
  - Jefferson Street/Northbound Frontage Road
  - San Mateo Boulevard/Northbound Frontage Road
  - San Antonio Drive/Northbound Frontage Road
  - Paseo del Norte/Northbound Frontage Road

Refer to the crash analysis section in Chapter 2 of the Phase 1A report for more details, which can be found on the project CD included in this report. The crash data analysis will need to be updated when environmental clearance is sought for improvement projects in the North I-25 corridor.

Public Involvement

A Public Involvement Plan (PIP) was prepared at the onset of this study. It should be noted that the public involvement process described in the PIP was modified in Phase 1B to be aligned with the intent of the NMDOT to use this study as a planning and programming document. The following summarizes activities conducted for this study.

Phase 1A Public Information Meeting

A public information meeting was held October 21, 2008 at the NMDOT District 3 auditorium, 7500 Pan American NE, Albuquerque from 4:00 PM to 7:00 PM; an open house format was used. This meeting was an opportunity to provide initial project information to the public by use of information boards along with the availability of project staff for one-on-one discussions.

The meeting was advertised in the Albuquerque Journal Thursday, October 2 and Sunday, October 12, 2008. Flyers announcing the meeting were mailed to 194 businesses and organizations. The local news media was notified and mention of the meeting was included in some of the traffic reports. In addition, there were portable message boards located along I-25 for several days prior to the meeting. Despite these efforts, turn-out for this meeting was light; 20 persons signed the sign-in sheet. The attendees were generally appreciative of the information provided and seemed to feel that the level of information was sufficient for this stage of the project.

In discussions with the meeting attendees, no major points of controversy were identified for the project. Instead, there was a general sense that improvements needed to be made. Attendees were encouraged to provide written feedback on either a comment form or a flip chart; six persons made comments on the available forms.

Phase 1B Stakeholder Involvement

Because the primary objective of the North I-25 Freeway Operations Study is to identify improvements for planning and programming purposes, the NMDOT will not conduct a public information meeting at the conclusion of Phase 1B. Public information meetings and public hearings, as applicable, will be scheduled when specific projects are programmed for environmental documentation, preliminary and final design, and construction.

In lieu of a public meeting at this time, the following activities will be used to inform stakeholders of the project results:

- An Executive Summary will be e-mailed to all persons and organizations included in the project contact list. All contacts will also be notified of the availability of the Phase 1B report on the project web site.
- The NMDOT will contact the owners of property and/or businesses expected to be impacted by the proposed improvements to inform them of the status and anticipated schedule of potential improvements.
- Presentations will be made to NMDOT executive staff, the MRCOG Technical Coordinating Committee (TCC) and Metropolitan Transportation Board (MTB), and City of Albuquerque executive staff.

A project website for the North I-25 corridor was developed to provide project information for the North I-25 Freeway Operations Study (www.northI25.com). The websites include a comment form that can be submitted to the NMDOT. The study results will be made available to the public via this website.

CHAPTER 2 ALTERNATIVES IDENTIFICATION AND DEVELOPMENT

Introduction

The North I-25 Freeway Operations Study is concerned with mainline I-25, its interchanges and the parallel frontage road system. The development of improvement alternatives focuses on ways to improve upon the existing highway facilities in the I-25 corridor from north of I-40 to Tramway Road with particular emphasis on the facilities from the Comanche Road Interchange to the San Mateo Boulevard/Osuna Road Interchange. The design-year for this study is 2030 which was based on the currently adopted Metropolitan Transportation Plan for the Albuquerque metropolitan area.

The purpose of improvements to the North I-25 corridor is to improve the efficiency of travel along I-25 for today and well into the future. The need for improvements is to provide continuity in design of the freeway system and to improve the management of access within the corridor both along the mainline freeway as well as along the frontage road system and cross streets within the interchange influence areas. The following objectives were applied in the development of alternatives:

- Recognize the importance of regional mobility on the mainline I-25 freeway and the function the frontage road system can provide for local access and circulation.
- Address deficiencies identified in the existing conditions analysis – operational, geometric, safety.
- Provide lane balance and lane continuity on mainline I-25.
- Provide sufficient spacing of decision points between ramps, existing and proposed.
- Satisfy driver expectation.
- Allow for future enhancements beyond the 20-year design period such as ramp metering or express lanes.

Alternatives Considered but Eliminated

The process used to develop the improvement alternatives during Phase 1B involved the preparation of white papers for each interchange area which enabled the project team to focus on specific issues prior to developing system-wide concepts for the entire North I-25 corridor. These white papers are included on the attached project CD. The following summarizes key issues regarding alternatives development and alternatives considered but eliminated.

Comanche Interchange Area

Several improvement options were conceptually designed at the onset of Phase 1B for the ramps and frontage roads within the Comanche Road interchange area. The improvement concepts were organized by four specific locations within the Comanche Road interchange area:

- I-25/Comanche Interchange
- I-25 Northbound Ramps, I-40 Junction to Montgomery
- I-25 Southbound Comanche On-Ramp
- Northbound Frontage Road Access Options, South of Comanche

The southbound Comanche off-ramp was addressed with the Montgomery interchange improvements because of its relationship to the Montgomery southbound on-ramp(s).

I-25/Comanche Interchange

Concepts developed for this location focus on the I-25 bridge structure and the alignment of the frontage roads through their intersection with Comanche Road. Two primary alternatives exist for the I-25/Comanche interchange including retaining the existing I-25 bridge structure or rebuilding the bridge structure and adding advance U-turns. An option to realign the southbound frontage road through the signalized intersection with Comanche Road was also developed with the goals of improving the skew angle at the intersection thereby reducing the setback of the westbound approach and increasing the queue storage under the bridge.

Both of the interchange bridge structure alternatives were advanced. However, the realignment of the southbound frontage road was dropped from further consideration. As illustrated in Figure 2-1, the frontage road realignment would not substantially improve the situation considering the costs and impacts of the concept, and the existing layout is reasonably drivable.

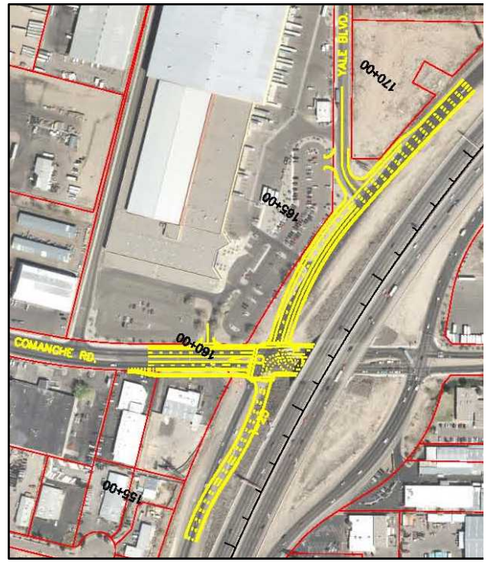


Figure 2-1, Eliminated Southbound Frontage Road Realignment Alternative

I-25 Northbound Ramps, I-40 Junction to Montgomery

Alternatives for this location focus on mainline I-25 from the I-40 northbound on-ramps junction to Montgomery Boulevard specifically the location and design of the Comanche off-ramp, Comanche on-ramp, and Montgomery off-ramp. The number of lanes provided on mainline I-25, the location of the ramp gores along the northbound frontage road, and the layout of a metered on-ramp/frontage road junction were also of interest.

Several layouts were developed for this location which can be found in the “Comanche Interchange Area” white paper on the DVD included in this report. The following alternatives were dropped from further consideration:

- One-Lane Comanche Off-Ramp, Four Mainline Lanes to Montgomery Off-Ramp
  - Eliminated because the fifth mainline lane drops at the Comanche off-ramp. Five mainline lanes are needed to the Montgomery off-ramp.
- Two-Lane Comanche Off-Ramp, Four Mainline Lanes to Montgomery Off-Ramp
  - Eliminated because the fifth mainline lane drops at the Comanche off-ramp. Five mainline lanes are needed to the Montgomery off-ramp.
- One-Lane Comanche Off-Ramp, Move Braid Further North, Fifth Lane Drops at Montgomery Off-Ramp
  - Eliminated because of the property and access impacts associated with moving the braid further north (see Figure 2-2).
- Two-Lane Comanche Off-Ramp, Move Braid Further North, Fifth Lane Drops at Montgomery Off-Ramp
  - Eliminated because of the property and access impacts associated with moving the braid further north (see Figure 2-2).
- Two-Lane Comanche Off-Ramp, Shift Comanche Off-Ramp Gore South, Five Mainline Lanes to Montgomery Off-Ramp
  - Eliminated because the Comanche off-ramp gore was not moved far enough south resulting in insufficient spacing between successive off-ramps. The Comanche off-ramp gore needs to be moved further south to improve mainline ramp spacing and to improve frontage road operations.

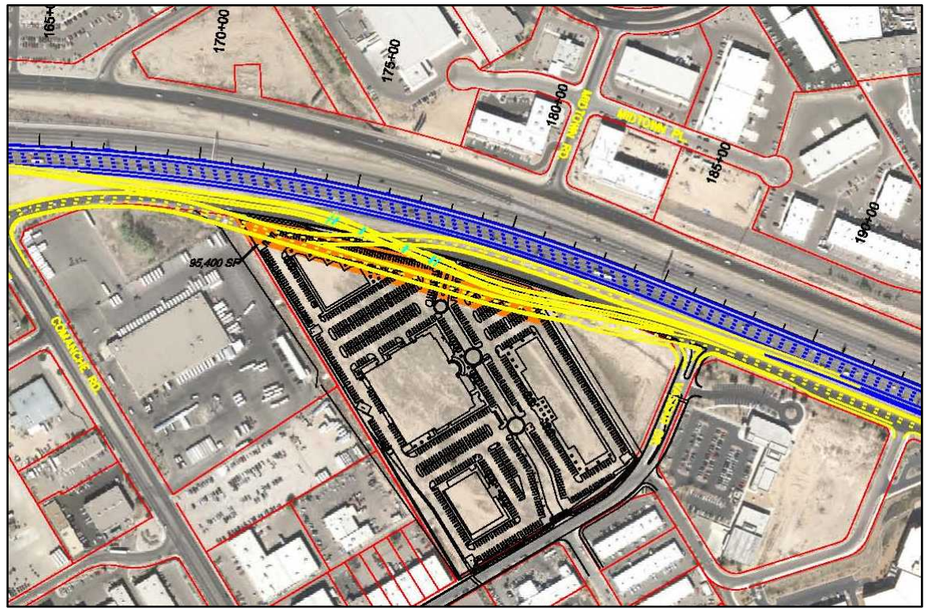


Figure 2-2, Eliminated Northern Location of the Comanche On-Ramp/Montgomery Off-Ramp Braid

Ramp metering is being considered for the North I-25 corridor. Two options were considered for the layout of the on-ramp/frontage road junction as follows:

- Metered Comanche On-Ramp, One-Lane Exit to On-Ramp (No Option Lane, see Figure 2-3)
  - The two-lane ramp for ramp meter storage is developed after the lane drop on the frontage road
  - Effectively only allows ramp access from the inside left-turn lane on Comanche Road for the east-to-north movement, or the left-most through lane on the frontage road

- Metered Comanche On-Ramp, Two-Lane Exit with Option Lane to On-Ramp
  - The two-lane ramp for ramp meter storage begins with the lane drop and option lane on the frontage road
  - Allows access to the on-ramp from two lanes thereby reducing lane-change conflicts and facilitating better lane utilization on the signalized intersection approaches

The preferred layout is to provide an option lane therefore the one-lane exit to on-ramp layout shown in Figure 2-3 was eliminated.

I-25 Southbound Comanche On-Ramp

Two alternatives were considered for the Comanche southbound on-ramp which included no change to the existing ramp and modifying the ramp to accommodate ramp metering. Both alternatives were recommended for inclusion in the Phase 1B alternatives evaluation.

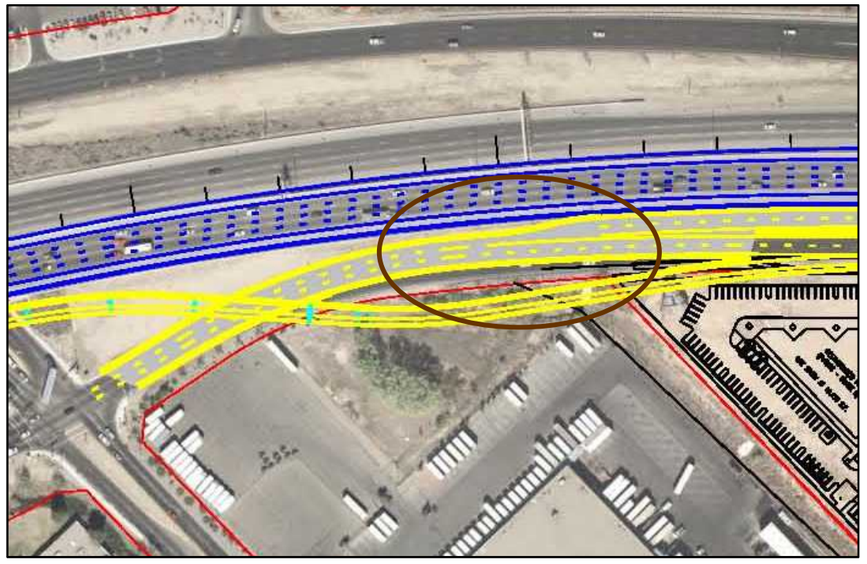


Figure 2-3, Eliminated On-Ramp/Frontage Road Junction for Ramp Metering

Northbound Frontage Road Access Options, South of Comanche

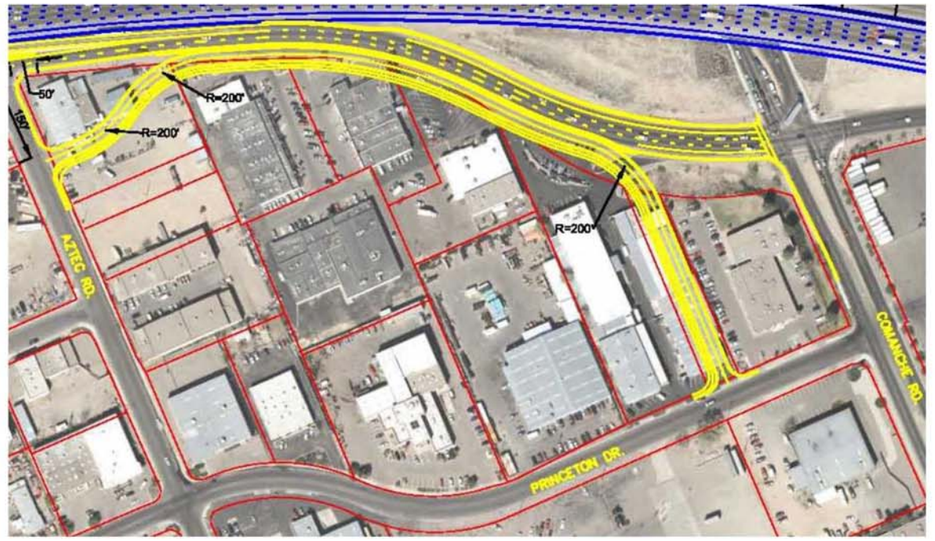
This location focused on the northbound frontage road between Aztec Road and Comanche Road where a channelized access road is provided for properties abutting the frontage road. The existing facilities were constructed by the Big I project. At that time, the decision was made to maintain the access along the northbound frontage road and to fit the improvements within the available space. With this project, investigations are being made into improvement options associated with the access to the northbound frontage road, which include maintaining the access and eliminating the access by providing a local road separated from the frontage road.

A meeting was held on May 12, 2010 with the Development Services at the City of Albuquerque to discuss the issues associated with a new local street. The key design parameters identified and used to review alternatives included:

- Industrial Street roadway type.
- Posted speed of 20 mph; verify sight distance requirements.
- Minimum right-of-way of 40 feet. This includes 30 feet of pavement and 5-foot setbacks on each side. The setbacks must be consistent with the zoning code requirements for M-1, Light Manufacturing Zone. A setback of 11 feet is required from the junction of a driveway or alley.
- Standard 8-inch barrier curb.
- Minimum radii will allow large trucks to drive the street without encroaching on the curb; although, large vehicles may leave their lane to complete a turn.
- Sidewalks are not required.
- An emergency vehicle turn-around is required (50-foot radius). The City standard design may be modified if proper use can be demonstrated.
- Access easements are possible.

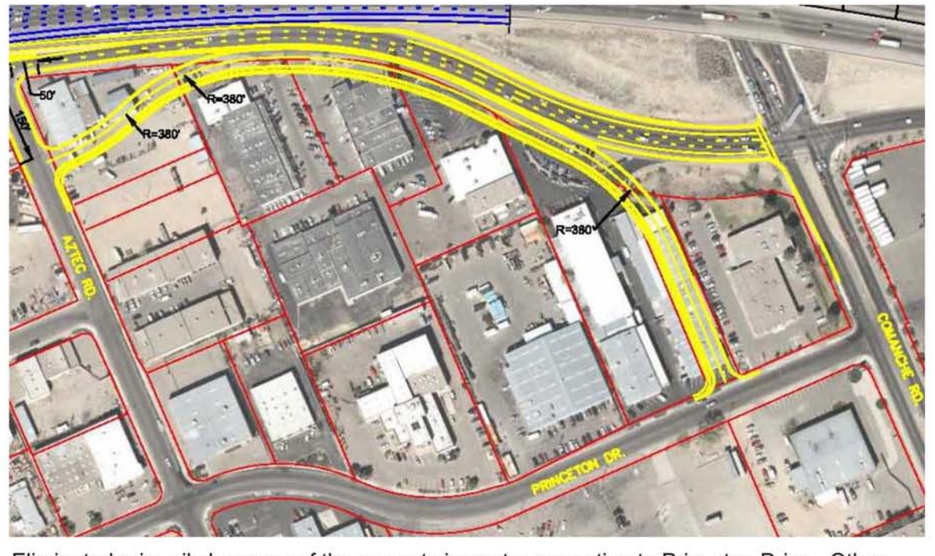
The alternatives considered and eliminated for the northbound frontage road access conditions are summarized in Figure 2-4.

Eliminated because the Comanche off-ramp needs to be moved further south, which will require access control to be extended further south.



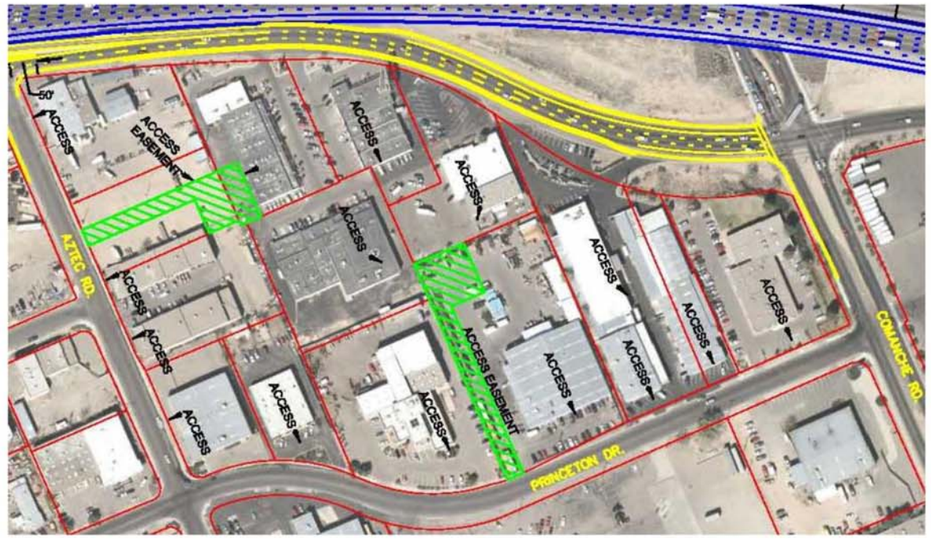
Eliminated primarily because of the property impacts connecting to Princeton Drive. Other solutions exist to avoid taking the long building and still provide reasonable access.

Eliminated primarily because of the property impacts connecting to Princeton Drive, and the 60-foot radii north of Aztec Road are insufficient. Other solutions exist to avoid taking the long building and still provide reasonable access.

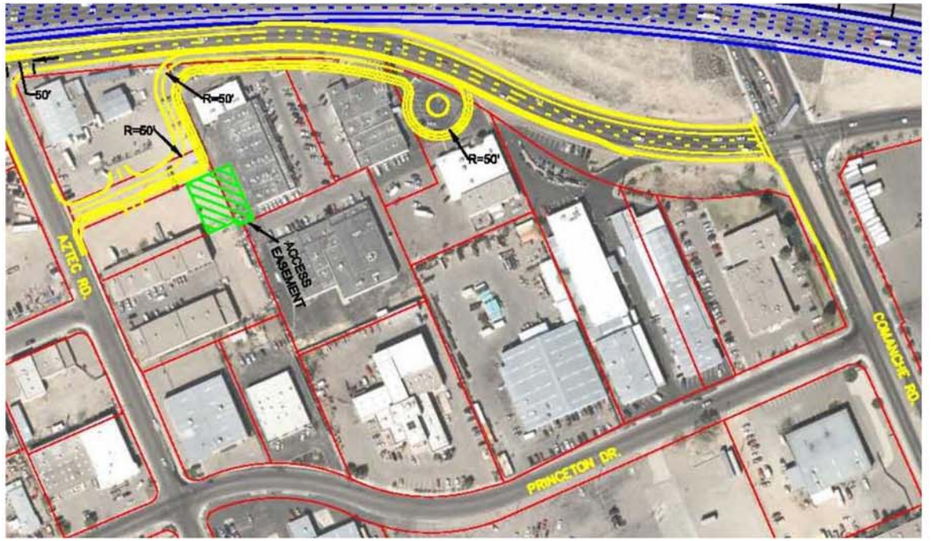


Eliminated primarily because of the property impacts connecting to Princeton Drive. Other solutions exist to avoid taking the long building and still provide reasonable access.

Figure 2-4, Eliminated Local Access Road Alternatives



Concept is okay but is eliminated because the access easements would result in an incomplete access situation and require further expansion.



Eliminated primarily because the 60-foot radii are insufficient and reasonable access is not provided to the northernmost property that has access to the frontage road.

Eliminated because insufficient access is provided to property further north along the frontage road, and the 60-foot radii north of Aztec Road are insufficient.

Eliminated because the access easement serving the northernmost property is not viable.

Figure 2-4, Eliminated Local Access Road Alternatives (continued)

Montgomery/Montaño Interchange Area

Many improvement options were conceptually designed at the onset of Phase 1B for the ramps and frontage roads within the Montgomery Boulevard/Montaño Road interchange area. The improvement concepts were organized by three specific locations:

- I-25/Montgomery Interchange and Southbound Ramps from Montgomery/Montaño to Comanche
- I-25 Northbound Ramps, Montgomery/Montaño to Jefferson
- I-25 Southbound Ramps, Jefferson to Montgomery/Montaño

A comparative analysis of several layouts was completed for this location which can be found in the "Montgomery Boulevard/Montaño Road Interchange Area" white paper on the DVD included in this report. Summaries of the alternatives eliminated follow.

I-25/Montgomery Interchange and Southbound Ramps from Montgomery/Montaño to Comanche

Concepts developed for this location focus on the Montgomery Boulevard/Montaño Road Interchange, and southbound I-25 from the Montgomery/Montaño on-ramp(s) to the Comanche off-ramp. The segment of Montgomery/Montaño from Cutler Drive to the northbound frontage road is included. Five primary concepts were developed of which two were eliminated from further consideration and one was modified to be advanced.

- Figure 2-5, Diamond with W-S Loop Ramp and E-S Right-turn Enhanced – This layout was eliminated because sufficient merging length could not be provided for the two southbound on-ramps while maintaining sufficient weave length on mainline I-25 to the Comanche off-ramp.
- Figure 2-6, Compressed Diamond with W-S Loop Ramp and E-S Directional Ramp – This layout was eliminated because of the insufficient merge and weave lengths stated above and due to access impacts and costs to the development in the southwest quadrant of the interchange.
- Figure 2-7, Tight Diamond with Braid just south of Montaño Road – The tight diamond interchange layout was advanced but the braided configuration shown was not acceptable in this layout. A braided configuration developed further south was applied to the tight diamond to be evaluated further.

Three alternative layouts were advanced for the Montgomery/Montaño interchange and southbound ramps to Comanche Road.

I-25 Northbound Ramps, Montgomery/Montaño to Jefferson

Three conceptual layouts were developed for the Montgomery/Montaño on-ramp and the Jefferson off-ramp on northbound I-25. All three layouts were advanced. However, a concept was eliminated that involved a realignment of McLeod Road at the northbound frontage road which was intended to allow the Jefferson off-ramp to be moved further south to provide more distance between the off-ramp and Jefferson Street (see Figure 2-8). Rather than impact the existing development in this area, channelization can be used to achieve the same objective so this realignment of McLeod Road was eliminated.

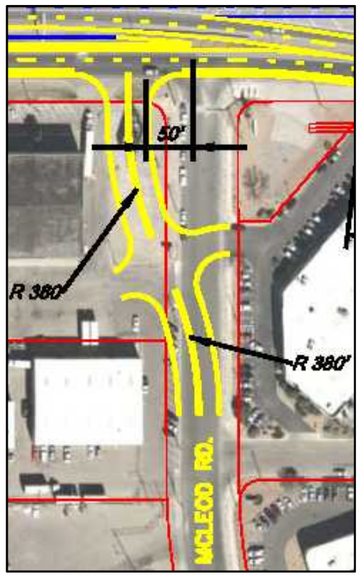


Figure 2-8, Eliminated Realignment of McLeod Road

I-25 Southbound Ramps, Jefferson to Montgomery/Montaño

Three conceptual layouts were developed on southbound I-25 for the Jefferson on-ramp and the Montgomery/Montaño off-ramp. The layouts were developed for three interchange configurations at I-25/Montgomery to consider the difference in the distance available from the off-ramp to the intersection at Montgomery Boulevard/Montaño Road. The only concept eliminated is shown in Figure 2-9. The channelized right-turn movement from Commerce Drive to the southbound frontage road was eliminated because of right-of-way impacts and the weave conflicts that would be created on the approach to the Montgomery/Montaño intersection.

Jefferson Interchange Area

Concepts developed for this location focus on the Jefferson Street Interchange, and the segment of Jefferson Street from Restaurant Lane to Singer Boulevard. Three primary concepts were developed. Each of the alternatives was based on a diamond interchange configuration and addressed the angle points in the frontage roads at their intersection with Jefferson Street. All three interchange alternatives were advanced for detailed evaluation. A comparative analysis of several layouts was completed for this location which can be found in the "Jefferson Street and San Mateo Boulevard/Osuna Road Interchange Area" white paper on the DVD included in this report.

The need for side-by-side dual left-turn lanes within the interchange, based on the short spacing between the frontage roads, results in wide medians approaching the interchange which requires improvements to Jefferson Street for approximately 1,000 feet in both directions and influences how access is provided. The need for improved access management on Jefferson Street in the vicinity of its interchange with I-25 did result in the elimination of a few access schemes east of I-25. The first median opening east of the northbound frontage road is within 300 feet of the frontage road and should be closed. Right-in/right-out access to the existing driveways is acceptable. The eliminated access schemes are shown in Figure 2-10.

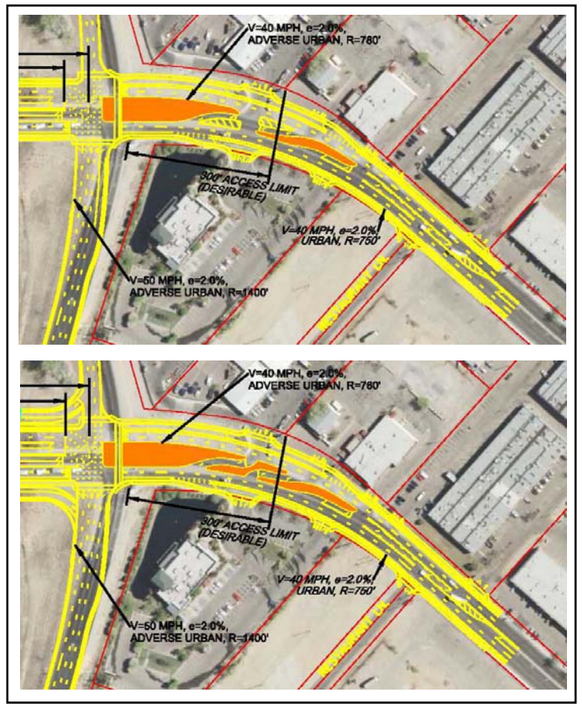


Figure 2-10, Eliminated Access Schemes on Jefferson Street East of I-25

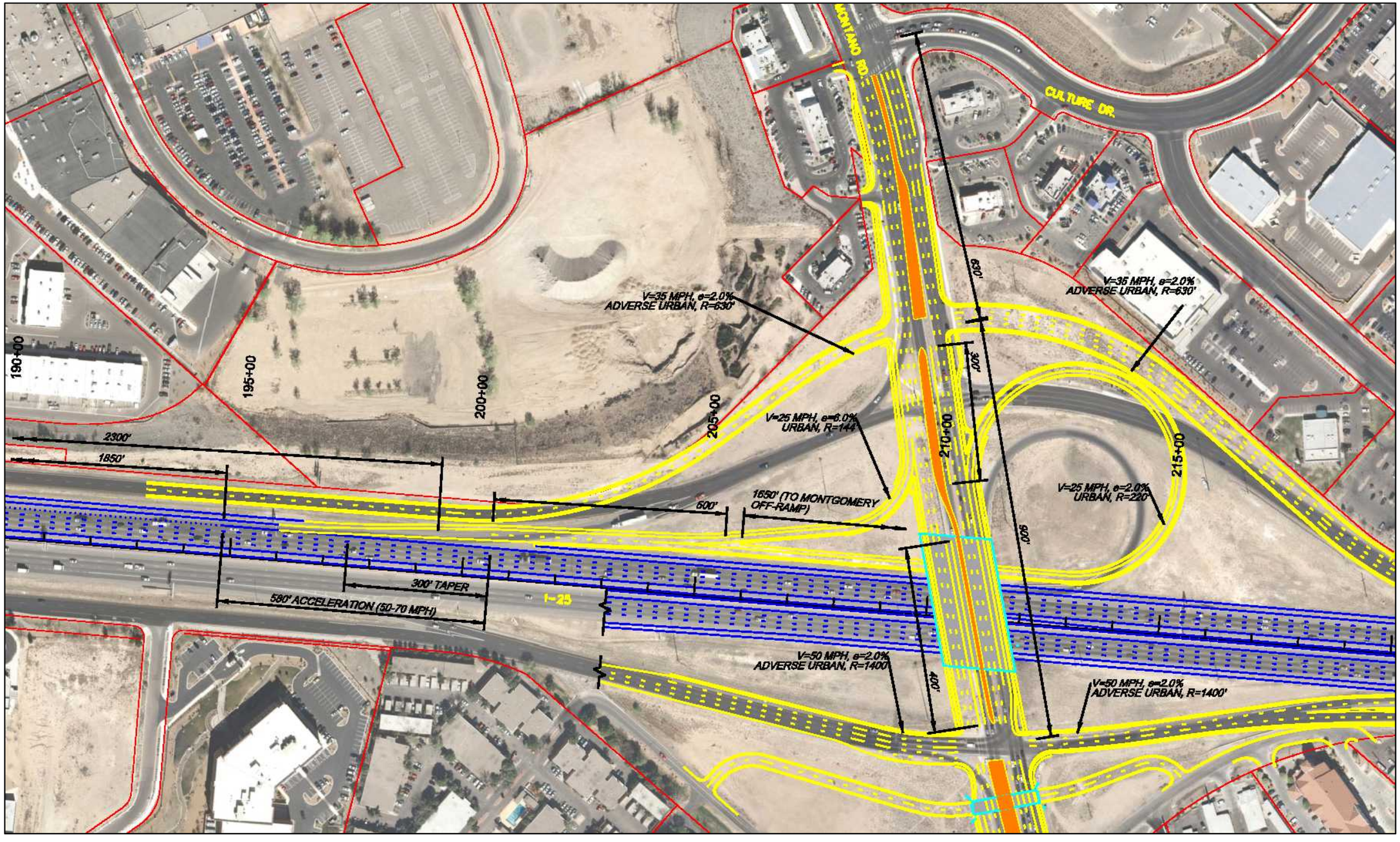


Figure 2-5, Eliminated Montgomery/Montaño Interchange Layout, Diamond with W-S Loop Ramp and E-S Right-turn Enhanced

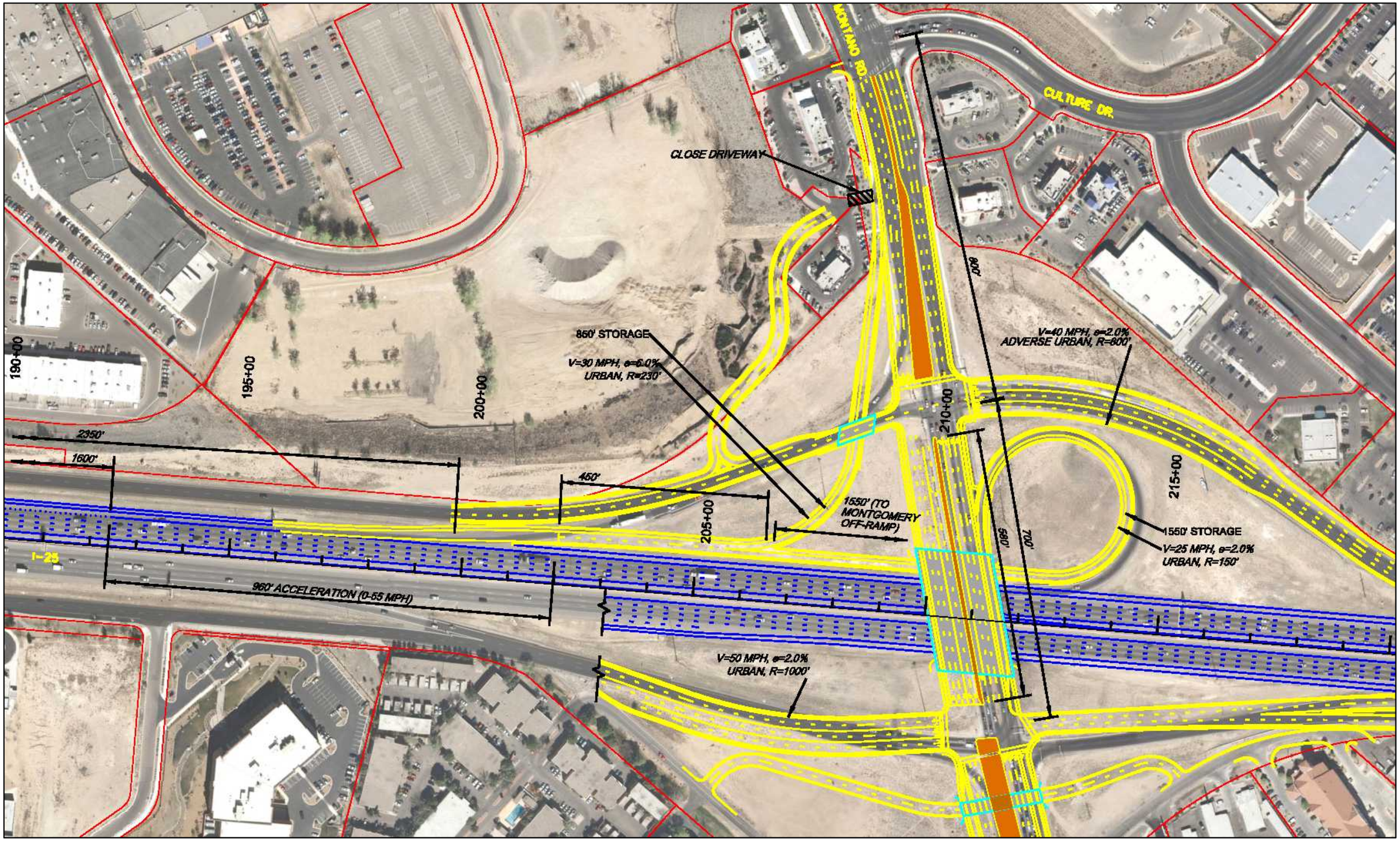


Figure 2-6, Eliminated Montgomery/Montaño Interchange Layout, Compressed Diamond with W-S Loop Ramp and E-S Directional Ramp

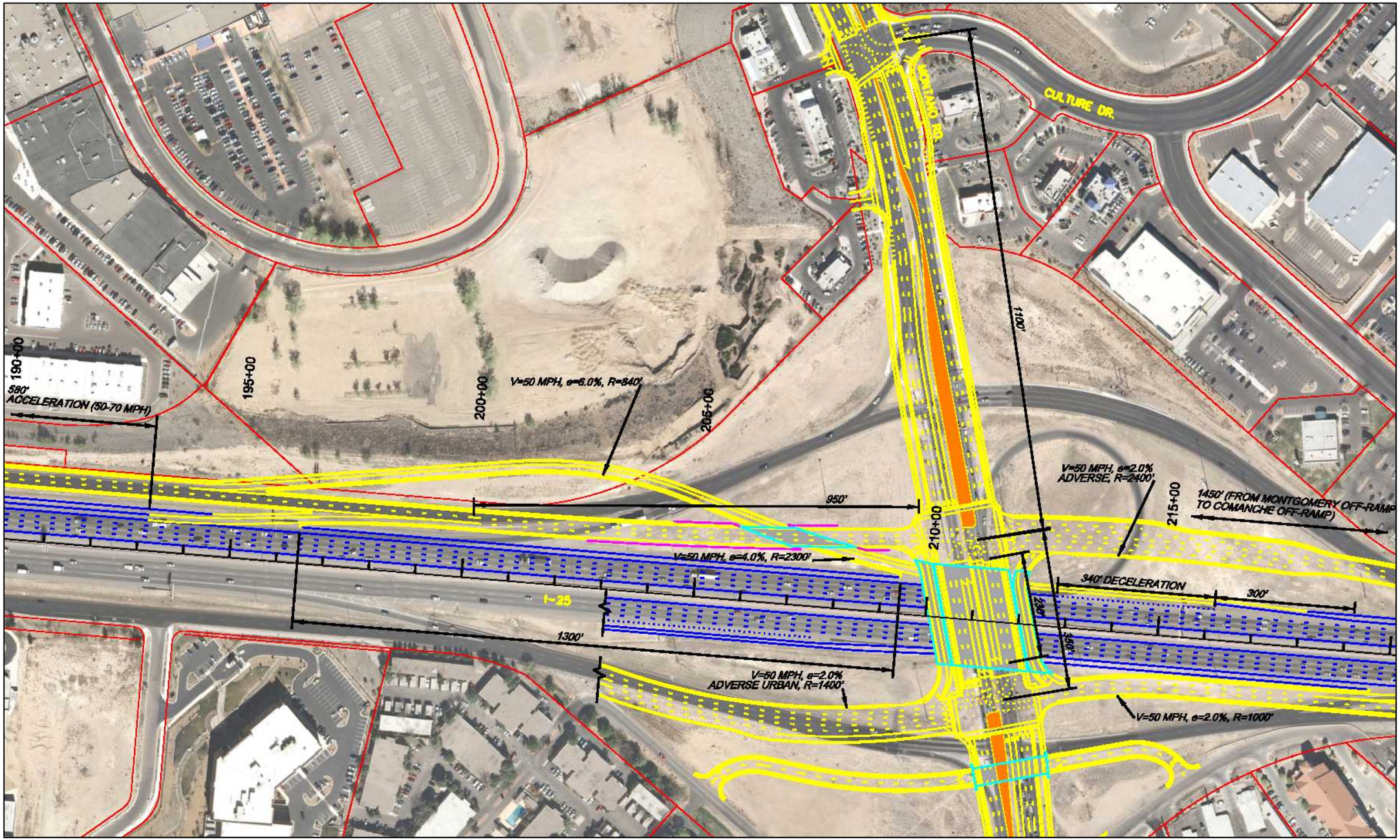


Figure 2-7, Eliminated Braid/Tight Diamond Montgomery/Montaño Interchange Layout, Tight Diamond Advanced with Modified Braid Further South

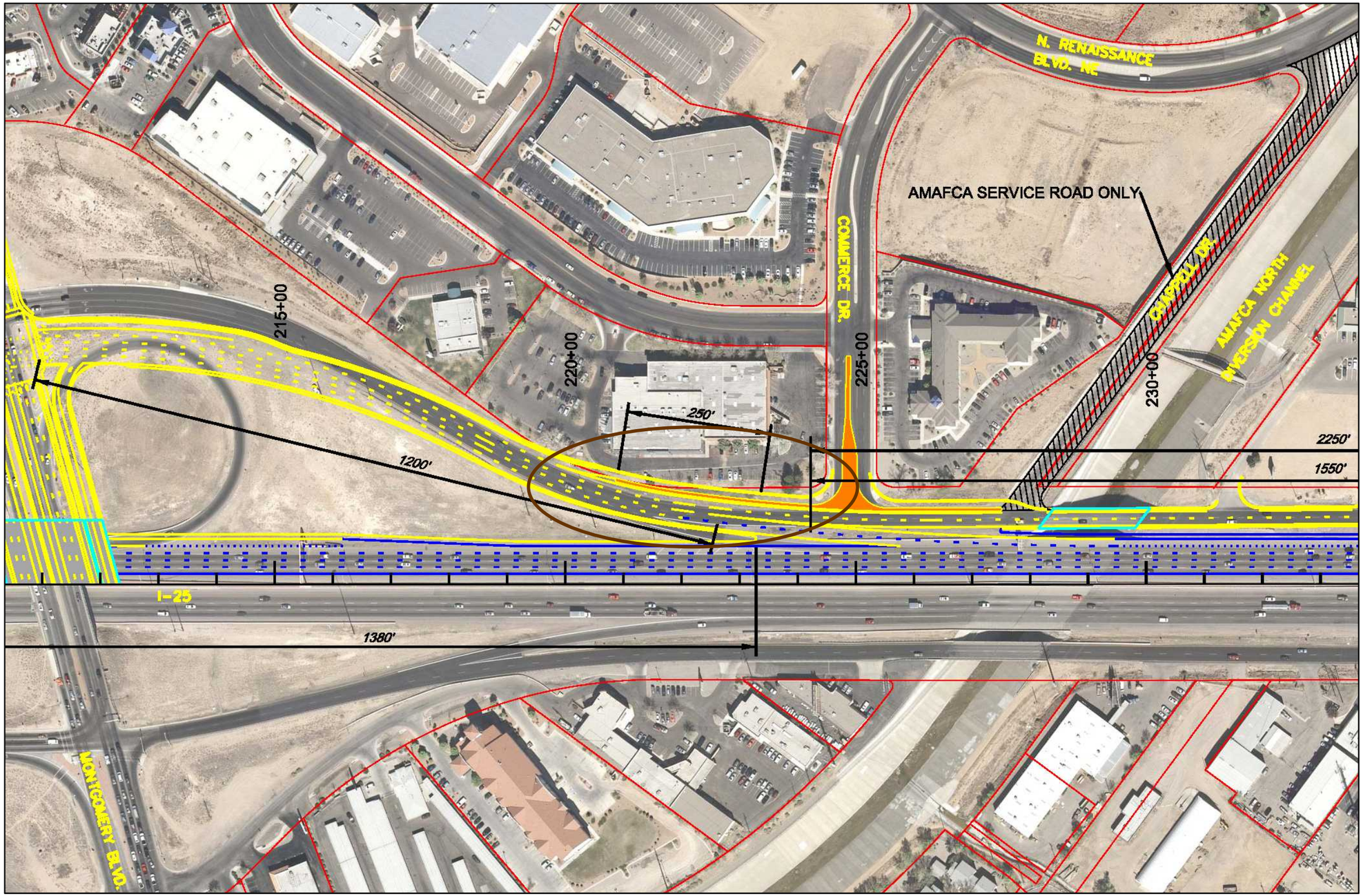


Figure 2-9, Eliminated Southbound Off-Ramp Layout at the Montgomery/Montaño Interchange, Commerce Drive Intersection with Frontage Road

San Mateo/Osuna Interchange Area

Alternatives for the San Mateo/Osuna interchange area were coordinated with the Jefferson Street, San Antonio and Paseo del Norte interchanges because of the close spacing of these arterial streets. Several improvement options were conceptually designed for this area and were organized by three specific locations as follows:

- I-25 Northbound Ramps, Jefferson to the proposed Paseo del Norte Off-Ramps
- I-25 Southbound Ramps, Proposed Paseo del Norte On-Ramp to Jefferson
- I-25/San Mateo Boulevard/Osuna Road Interchange

A comparative analysis of several layouts was completed for this location which can be found in the "Jefferson Street and San Mateo Boulevard/Osuna Road Interchange Area" white paper on the DVD included in this report. Summaries of the alternatives eliminated follow.

I-25 Northbound Ramps, Jefferson to the proposed Paseo del Norte Off-Ramps

Four conceptual layouts were developed for the segment of northbound I-25 from the Jefferson on-ramp to the proposed Paseo del Norte off-ramps. While refinements were made to the layouts, no specific concepts were eliminated for this location.

I-25 Southbound Ramps, Proposed Paseo del Norte On-Ramp to Jefferson

Five conceptual layouts were developed for the segment of southbound I-25 from the proposed Paseo del Norte on-ramp to the Jefferson Street interchange. Two layouts were eliminated. The layout shown in Figure 2-11 was eliminated because it maintained a weave section between the San Antonio on-ramp and a downstream off-ramp. The layout shown in Figure 2-12 was eliminated because it did not address the weave on the horizontal curve between San Mateo/Osuna and Jefferson and would not allow the San Mateo/Osuna on-ramp to be ramp metered.

I-25/San Mateo Boulevard/Osuna Road Interchange

Four concepts focusing on the San Mateo Boulevard/Osuna Road Interchange were developed. The key variations in the concepts concern the loop ramp, the intersection of San Mateo Boulevard/Pan American, and the right-turn lanes from westbound San Mateo Boulevard to the northbound frontage road. While refinements were made to the interchange layouts, no specific interchange concepts were eliminated for this location. However, one concept was eliminated for the intersection of San Mateo Boulevard and Pan American East Drive, which is shown in Figure 2-13. It was decided to either maintain the traffic signal control at this location or close the median completely. As such, the concept that provided partial access was eliminated.

Alameda Interchange Area

Alternatives for the Alameda interchange area primarily focused on the southbound Alameda off-ramp where improvements are needed due to the proposed modifications to the I-25/Paseo del Norte interchange. Improvement concepts were evaluated in the "I-25 Northbound and Southbound, Paseo del Norte to Tramway Road" white paper on the DVD included in this report. With the exception of refinements to how access is provided along the southbound frontage road in the vicinity of the off-ramp, there was no specific concept eliminated for the Alameda Interchange Area. However, when considering the proposed improvements shown in the I-25/Paseo del Norte Interchange Draft Environmental Impact Statement (DEIS) for the Alameda off-ramp, further refinements are needed and have been incorporated into this Phase 1B evaluation.

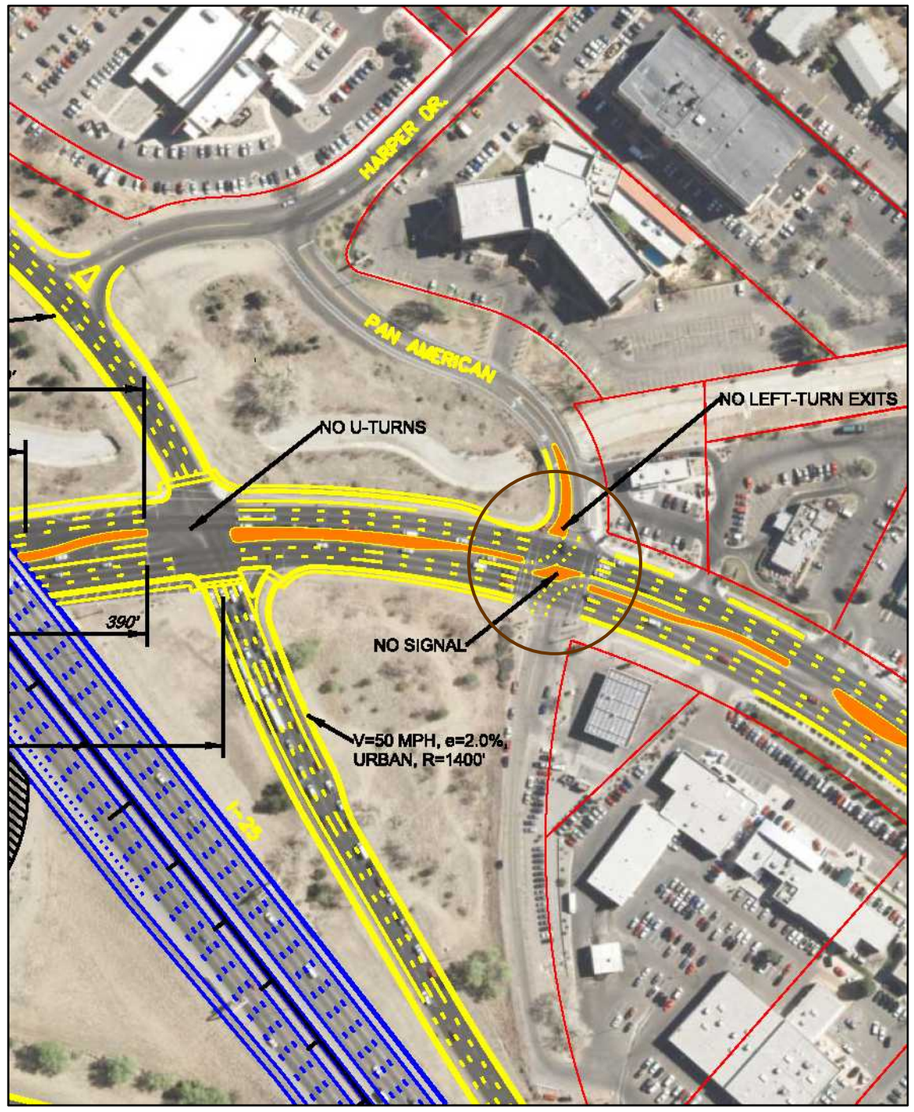


Figure 2-13, Partial Access Intersection Eliminated at San Mateo Boulevard/Pan American East Drive

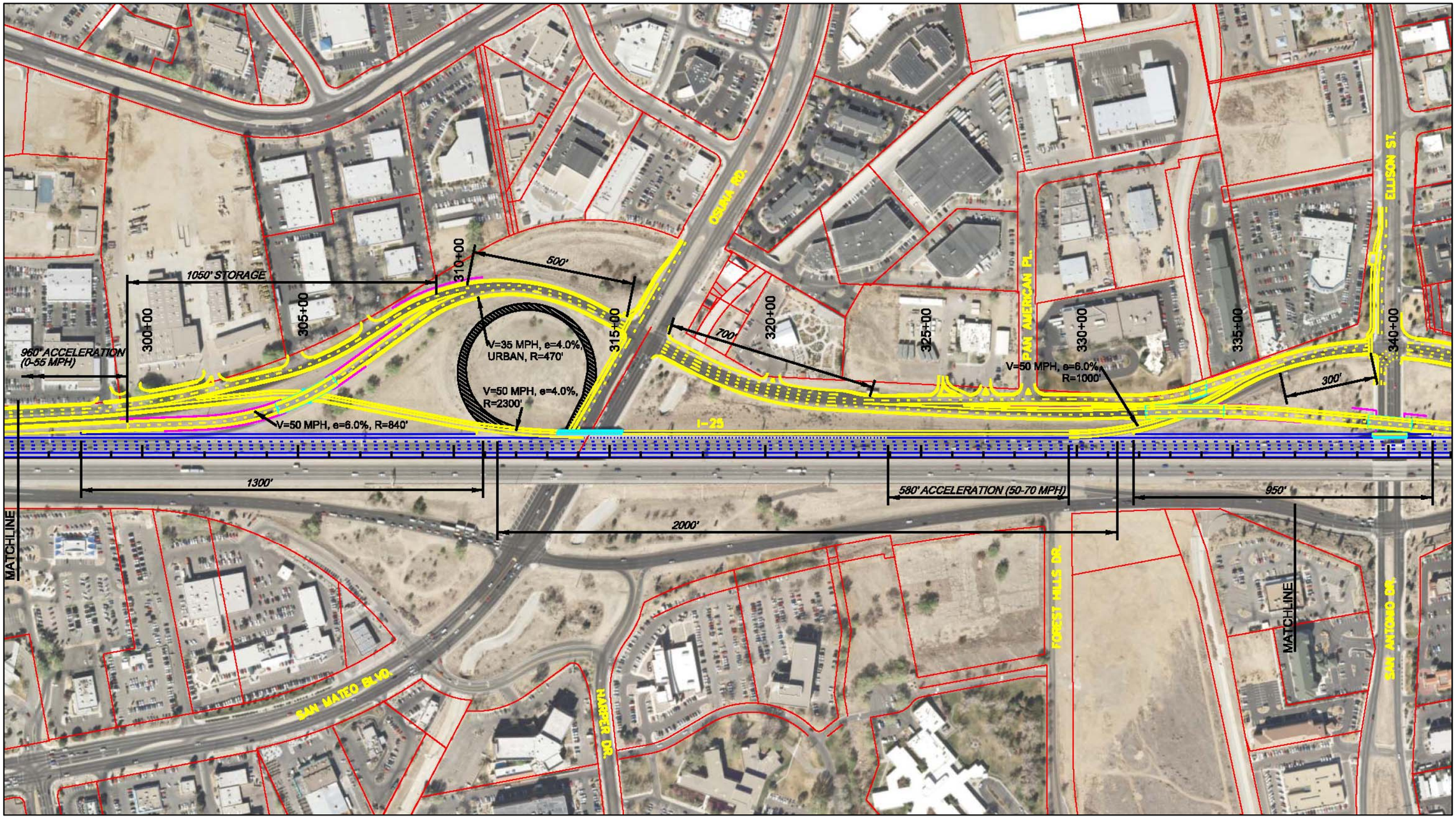


Figure 2-11, Eliminated Southbound Ramps Layout at the San Mateo/Osuna Interchange, Weave Section between San Antonio On-Ramp and Jefferson Off-Ramp

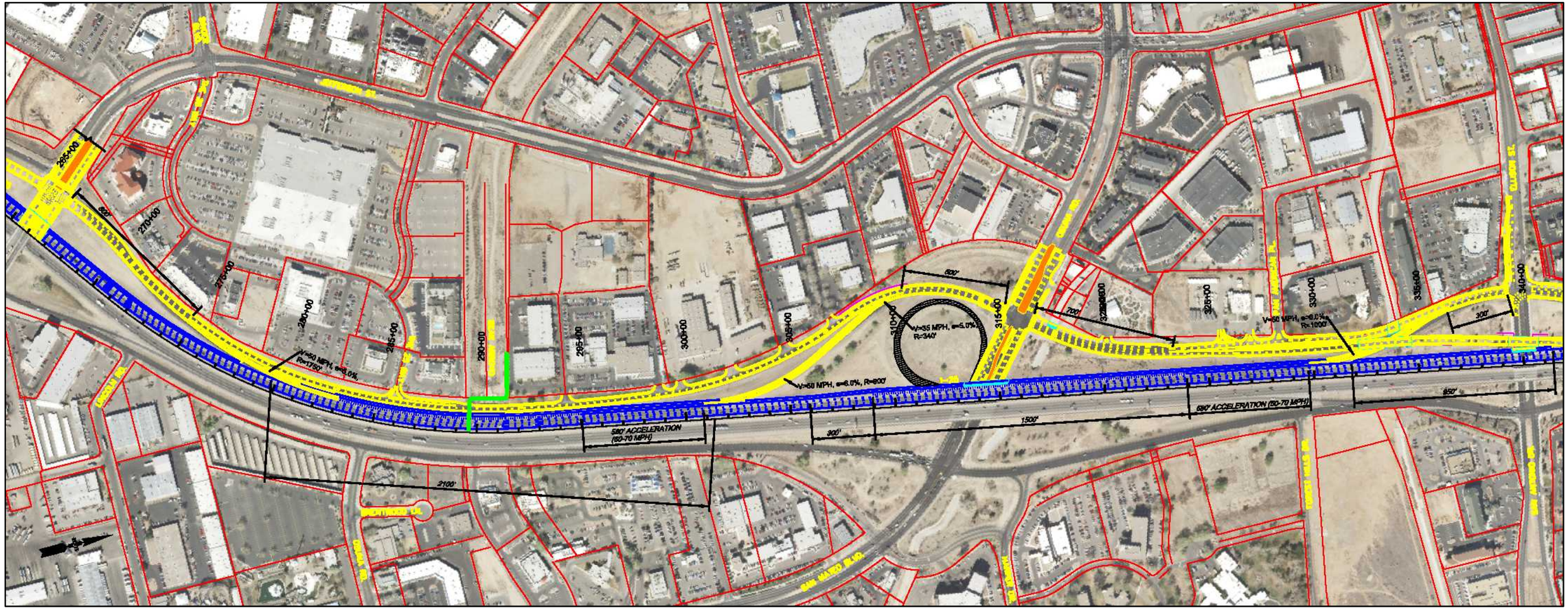


Figure 2-12, Eliminated Southbound Ramps Layout at the San Mateo/Osuna Interchange, Weave Section between San Mateo/Osuna On-Ramp and Jefferson Off-Ramp

Alternatives Advanced for Detailed Evaluation

The following summarizes the alternatives advanced for detailed evaluation. This section also summarizes other improvement strategies that are applicable to the build alternatives but are not specific to an alternative. These other improvement strategies include modal alternatives and transportation systems management.

No-Build Alternative

The No-Build Alternative assumes that the number of lanes and ramp configurations within the study area are maintained in their existing configuration. No major changes to interchanges, the mainline freeway or the frontage roads within the North I-25 corridor are made. However, the NMDOT may implement interim improvements to extend the life of the existing facilities. The No-Build Alternative does not alter access nor require additional right-of-way. Improvements are limited to maintenance projects for pavement, bridge structures, drainage structures, pavement markings, traffic signals, signing, and other basic roadway elements. Grade separation structures crossing I-25 for bicycle and pedestrian travel that are independent of other interchange improvements are also included. Existing typical sections are shown in Figure 2-14.

Improvements to the I-25/Paseo del Norte interchange are not included in the No-Build Alternative. While the No-Build Alternative does not meet the project purpose and need, as an existing condition, it is considered a viable alternative and provides a baseline against which the build alternatives are compared.

Build Alternatives

Three build alternatives were developed for the entire North I-25 corridor from north of I-40 to Tramway Road based on the results of the white papers by specific location, and including refinements made during the conceptual design process of assembling the corridor-wide alternatives. These alternatives are referred to as ***Build Alternative 1***, ***Build Alternative 2***, and ***Build Alternative 3***. The conceptual design plan layouts for each build alternative are included in Appendix A, Appendix B and Appendix C, respectively. Descriptions of each build alternative are provided in subsequent chapters. Figure 2-15 provides a schematic layout of the three build alternatives which illustrates how access to and from the mainline I-25 freeway is proposed in each alternative.

A fundamental need in the North I-25 corridor is to provide four basic freeway lanes on mainline I-25 from the Comanche Interchange to the Paseo del Norte Interchange. Each build alternative incorporates four basic (i.e., general purpose) lanes in each travel direction for this expanse (the incorporation of auxiliary lanes is dependent on the configuration of exit and entrance ramps in each build alternative). Another aspect of the build alternatives that is consistent is the incorporation of the I-25/Paseo del Norte Interchange Study improvements. For the purposes of this study, Alternative 16 for the I-25/Paseo del Norte Interchange is shown because it is considered the locally preferred alternative by the NMDOT.

Coordination with I-25/Paseo del Norte Reconstruction Project

Improvements to the I-25/Paseo del Norte interchange were developed in a separate study which culminated with a Draft Environmental Impact Statement (DEIS). In addition to improvements within the Paseo del Norte corridor, modifications to the following interchanges along North I-25 are included: San Mateo Boulevard/ Osuna Road, San Antonio Drive, Paseo del Norte, and Alameda Boulevard. The locally preferred alternative for the I-25/Paseo del Norte Interchange, Alternative 16, was incorporated into each build alternative developed for this study.

A listing of the ramp modifications included in each build alternative associated with the proposed improvements identified for Alternative 16 is provided as follows:

- Northbound I-25 Ramp Modifications
  - A new San Mateo on-ramp is provided.
  - An off-ramp to the frontage road is provided midway between San Antonio Drive and Paseo del Norte.
  - A two-lane directional off-ramp is provided to both directions of Paseo del Norte.
  - The San Antonio on-ramp is relocated north, just south of Paseo del Norte.
  - A new Paseo del Norte loop on-ramp is provided for the eastbound-to-northbound movement.
  - The Paseo del Norte on-ramp from westbound Paseo del Norte is eliminated.

- Southbound I-25 Ramp Modifications
  - The Alameda off-ramp is relocated several hundred feet north of its existing location and also serves Paseo del Norte and San Antonio Drive traffic.
  - A new southbound I-25 to westbound Paseo del Norte directional off-ramp is provided.
  - A two-lane directional on-ramp is provided from both directions of Paseo del Norte.
  - The San Antonio off-ramp is eliminated.

Based on the detailed Phase 1B evaluation completed for this study, modifications to the improvements proposed in Alternative 16 were identified and incorporated at the San Mateo/Osuna, San Antonio and Alameda interchanges. No changes were identified for the Paseo del Norte interchange.

Modal Alternatives as part of the Build Alternatives

Modal alternatives include strategies that increase the person-carrying capacity of a highway corridor. This is typically accomplished through a shift from automobile use to transit, rail, carpools, bicycles, or walking. While many types of modal alternatives exist, their applicability to the North I-25 corridor is dependent on several factors including: local policies, connectivity to adjoining systems or facilities, and their ability to substantially contribute to the resolution of the transportation problems found within the project area. Because one of the primary needs of the North I-25 Freeway Operations Study is to provide continuity in design of the freeway system, which requires improvements in highway capacity, modal alternatives alone are not expected to satisfy the purpose and need of this project. They can, however, enhance the transportation system within and proximate to the North I-25 corridor.

Note that the MRCOG is building higher transit mode use into the 2035 MTP. The MRCOG Metropolitan Transportation Board (MTB) has assigned targets to increase transit's share of Albuquerque's peak hour river crossings to 10% in 2020 and 20% in 2035.

Managed Lanes

For the North I-25 corridor, potential lane management strategies could include either high occupancy vehicle lanes or high occupancy toll lanes. High occupancy vehicle (HOV) lanes reserve existing or new highway lanes for exclusive use by car pools and transit vehicles. High occupancy toll (HOT) lanes are similar to HOV lanes except that they can be used by vehicles that do not meet passenger occupancy requirements for a cost (toll). The primary purpose of both HOV and HOT lanes is to increase the total number of people moved through a congested corridor by offering the incentives of substantial savings in travel time, along with a reliable and predictable travel time.

Neither the MRCOG nor NMDOT have adopted policies or plans for the implementation of lane management strategies within the Albuquerque metropolitan area, at this time. Thus, a systems context for lane management does not exist. However, based on past studies, the 2030 MTP identifies corridors with lane management potential. These corridors include I-25 from Los Lunas to Bernalillo, I-40 from Paseo del Volcan to Tramway Boulevard, and Paseo del Norte from I-25 to Coors Boulevard. Given the use of the study portion of I-25 for longer-distance intra-regional travel, measures to allow the future implementation of managed lanes were considered.

All of the build alternatives include12 to 14-foot shoulders on both sides of the freeway. The shoulder width could be converted to a managed lane using either an HOV or HOT lane concept without the need for a substantial difference in the geometric configuration of the freeway mainline. Use of the shoulders would require a design exception form the FHWA. HOV and HOT lanes are typically separated from general purpose lanes using either a wall barrier or a

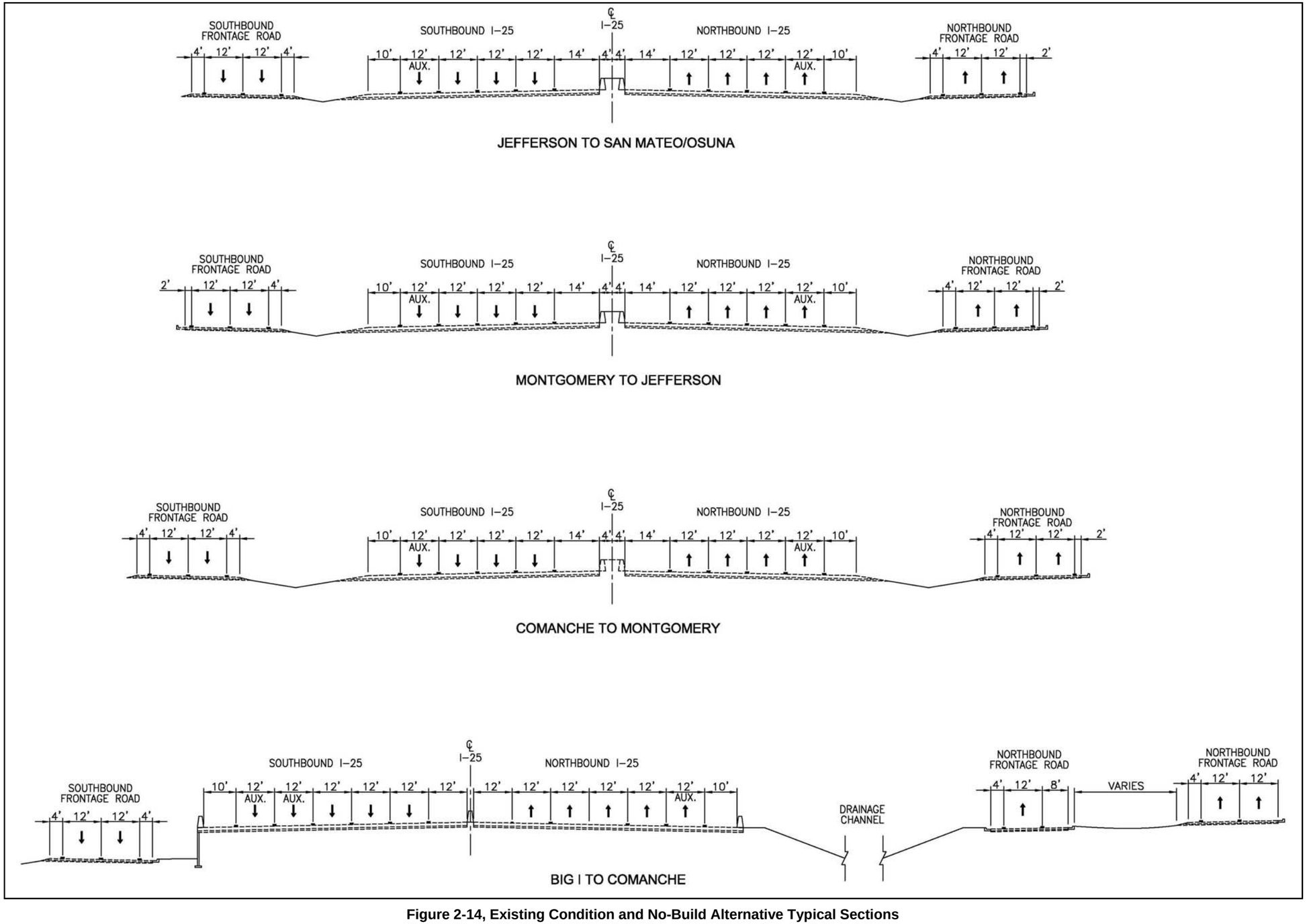


Figure 2-14, Existing Condition and No-Build Alternative Typical Sections

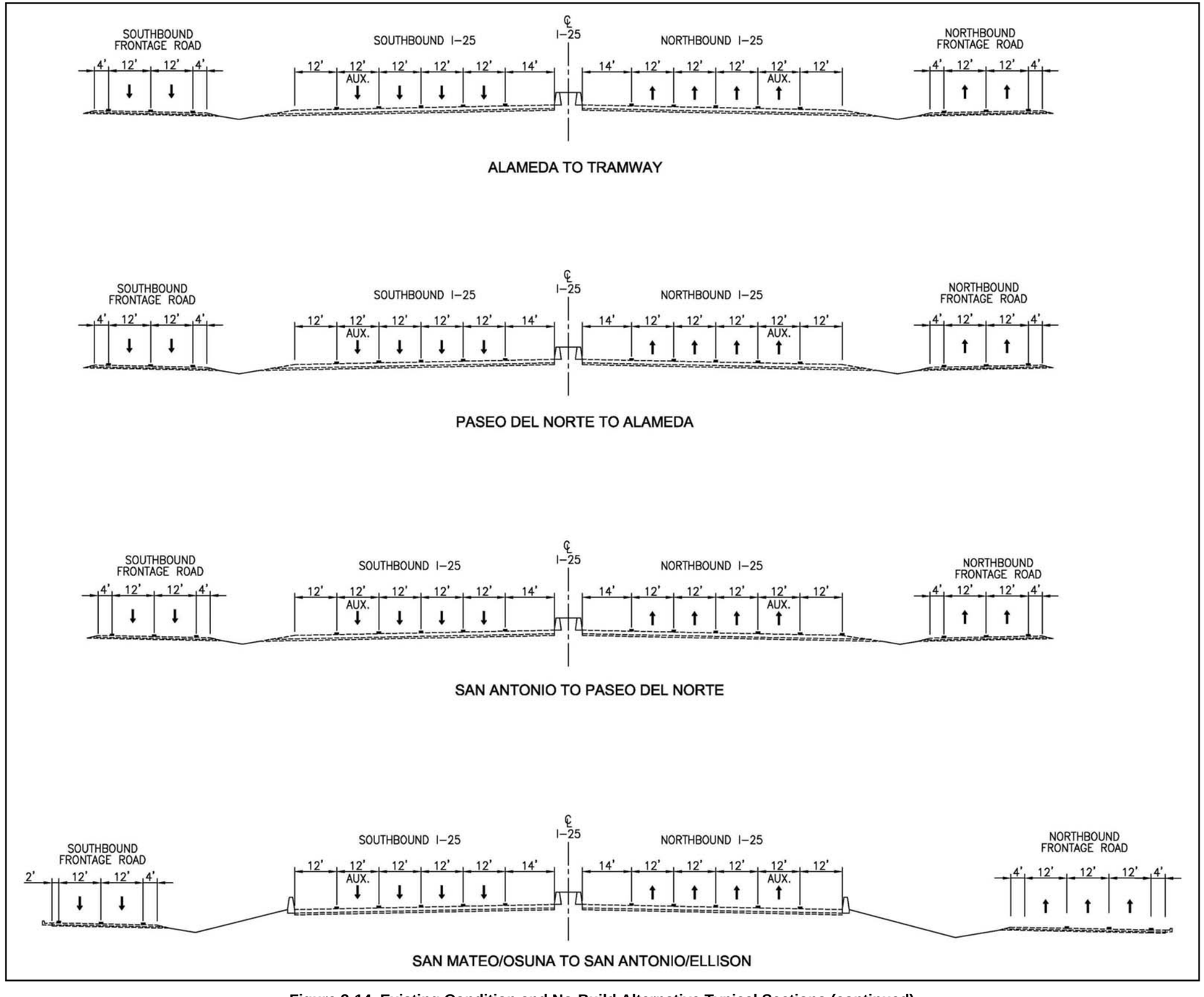


Figure 2-14, Existing Condition and No-Build Alternative Typical Sections (continued)

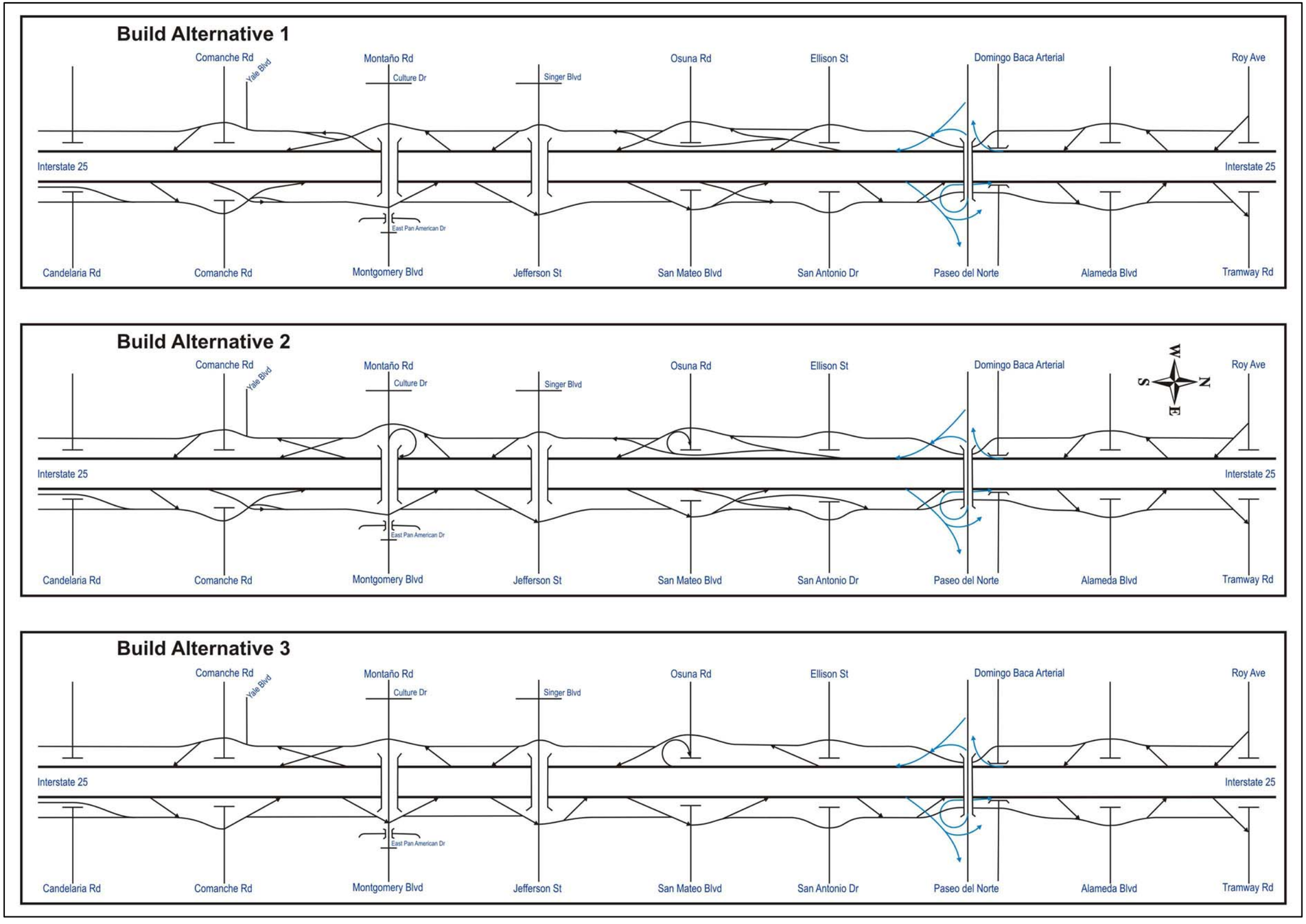


Figure 2-15, Schematic Line Sketches of the Proposed Build Alternatives

painted buffer, depending on access needs, enforcement, and available space. The addition of a painted buffer typically requires a minimum of four feet beyond that required by a general purpose lane alone. If a positive barrier is used, this additional width can be much greater particularly if shoulders are included on both the managed lane and the general purpose lanes. A painted buffer is considered more practical for Albuquerque given (1) the need for multiple access points to the I-25 managed lanes, (2) the close interchange spacing between the major thoroughfares that could be included in a managed lanes system such as the river crossings at Montaño Road, Paseo del Norte and Alameda Boulevard, and (3) the geometric configuration of mainline I-25 and/or the constraints of the I-25 corridor. By using a painted buffer, implementation of a managed lane as part of the proposed improvements would not be precluded but would require reductions in shoulder width. As such, the decision to implement managed lanes in the North I-25 corridor can be deferred until a later time as part of a lane management system planning effort.

Public Transportation

At the onset of this project, it was acknowledged that the investment in the New Mexico Rail Runner provides the *separated* public transportation system in the North I-25 corridor. That is, bus rapid transit (BRT) lanes or light rail within the North I-25 rights-of-way are not alternatives that need to be considered. Use of the North I-25 highway for ABQ Ride services such as Rapid Ride is considered a basic service and no special accommodations are included in the proposed improvements.

Bicycle and Pedestrian

Bicycle and pedestrian systems that are part of the adopted 2030 Metropolitan Transportation Plan (MTP) are included in the improvement alternatives for the North I-25 corridor, whether they are independent projects or projects that will be implemented as part of interchange upgrades. Bicycle and pedestrian improvements included in the 2030 MTP that occur within the North I-25 study area are:

- Montano/Montgomery bike corridor, Culture Drive to North Diversion Channel
- Grade-separated crossings of I-25 north of East Osuna Road (Bear Arroyo), south of San Antonio Drive (Piño Arroyo), and south of Paseo del Norte (Domingo Baca Arroyo).
- Bike lanes on Alameda Boulevard and Jefferson Street through the interchanges.

In addition, bicycle and pedestrian accommodations are identified on nearly all of the arterial street crossings of North I-25, and would be improved or provided along with the proposed improvements of the North I-25 Freeway Operations Study and the I-25/Paseo del Norte Interchange project.

Transportation Systems Management as part of the Build Alternatives

Transportation Systems Management (TSM) consists of minor improvements to existing streets to eliminate points of congestion that contribute to overall poor system performance. Typically, TSM strategies focus on improvements to the overall system including and parallel to the route under investigation. The objective of TSM strategies is to provide a series of relatively minor improvements to improve overall traffic flow and to balance traffic flows. Common TSM strategies include the elimination of bottlenecks at intersections and along short segments of roadways. This may be accomplished by the addition of auxiliary lanes at intersections (e.g., right- and left-turn lanes), changes to traffic signal systems to optimize intersection capacity, the addition of auxiliary lanes between freeway ramps to improve merging problems, and the use of technologies to provide real-time monitoring of major roadways to detect congestion and convey timely information to motorists. These types of improvements will be incorporated in the Phase 1B alternatives development process.

Local Street System Improvements

Local street system improvements could include new streets, extensions of existing streets, new grade-separated crossings of I-25, or general improvements to improve adjacent routes. This element of the improvement alternatives for the North I-25 corridor incorporates those local street system improvements identified by the I-25/Paseo del Norte Interchange project, most notably the Channel Road within the North Diversion Channel corridor.

South of the I-25/Paseo del Norte Interchange project area, the extension of Carlisle Boulevard north and across I-25 to Chappell Road was identified as a potential local street system improvement. This would allow traffic to bypass the I-25/Montgomery interchange. However, the extension of Carlisle Boulevard across I-25 would be costly not only because of the width across I-25 but also the complications associated with the North Diversion Channel. Based on project team discussions, there are other transportation needs of a higher priority than the Carlisle extension within the design horizon. A similar new grade separation of I-25 was identified south of Jefferson Street connecting McLeod Road to Office Boulevard. Due to substantial access impacts that would result, this grade separation concept was eliminated from further consideration.

North of the I-25/Paseo del Norte Interchange project area, the extension of San Diego Avenue across I-25 should be considered as identified in the *North I-25 Sector Plan* currently being prepared by the City of Albuquerque. This new grade-separation is tied to new/future development activity in this part of North I-25 and would be beneficial for traffic control during the annual Balloon Fiesta event. This grade-separation is not a part of this study.

Intersection improvements are included in the North I-25 build alternatives primarily for the signalized arterial street/frontage road intersections comprising the interchanges within the study corridor, but may also include intersection improvements required at access points in close proximity to the interchanges such as the Montgomery Boulevard/East Pan American (old frontage road) unsignalized intersection. Traffic signal progression improvements should also be incorporated into the improved condition to optimize traffic flow throughout the study corridor. This may involve a comprehensive signal system that would control the arterial streets and frontage roads in an interconnected network capable of adjusting to real-time traffic conditions. Fiber-optic cable exists along the frontage road system.

Intelligent Transportation System (ITS) Alternatives

ITS equipment has been deployed in the North I-25 and Paseo del Norte corridors. Continued improvements to the ITS systems are planned and programmed and will be needed to successfully manage traffic operations in the North I-25 corridor as congestion builds. The following summarizes ITS plans and/or alternatives for the North I-25 corridor.

Information Systems

In addition to the existing ITS systems and projects that are ongoing, the 2030 Metropolitan Transportation Plan (MTP) identifies several near-term (2015) projects to be implemented along the North I-25 corridor. The emphasis of the ITS plan is to provide integration of ITS with the backbone of the Federal Interstate system and complementary implementation on the major arterial system, as well as integration with other modes of travel such as the Rail Runner, Rapid Ride, and other transit systems within the AMPA. ITS improvements indentified in the MTP are broadly defined, however, specific installations in proximity of the project include:

- Fiber-optic rings along I-25 and Paseo del Norte
- Closed Circuit Television (CCTV) camera installation at the I-25/Alameda Boulevard Interchange
- Dynamic Message Sign (DMS) installation at the I-25/Osuna Boulevard Interchange
- Microwave Vehicle Detection Sensors (MVDS) installation on Paseo del Norte in the vicinity of Jefferson Street

In conjunction with interstate widening north of the Tramway Road interchange, the NMDOT intends on extending its fiber optic network along I-25 to Bernalillo, approximately 8 miles. Additional ITS equipment (CCTV cameras, DMS, MVDS) will also be deployed along the corridor with the project. These improvements will be implemented in conjunction with the I-25 reconstruction project.

Ramp Metering

Documents addressing ramp metering were reviewed from several states including California, Arizona, Nevada, and Texas. Ramp metering is the deployment of traffic signal control to manage the rate vehicles enter a freeway facility. By controlling the rate vehicles are allowed to enter a freeway, traffic flow onto the freeway becomes more consistent, in essence smoothing the flow of traffic on the mainline and allowing efficient use of existing freeway capacity.

Ramp meters may be programmed to release vehicles one at a time or in a small group, usually no more than two vehicles, to mitigate the impacts that vehicles entering the freeway have on freeway traffic flow. A ramp meter may be coordinated with other ramp meters to smooth traffic flow at a point or along a stretch of freeway or alternatively for several freeways within a regional network. Additionally, ramp meters may be programmed to optimize freeway flow and/or reduce congestion and its effects (collisions, delay, emissions, and fuel consumption). However, it should be noted that motorists may elect to bypass metered ramps in lieu of other ramps upstream or downstream of those that are metered. The potential for diversion is an issue that practitioners need to take into consideration before deploying ramp meters.

A "Ramp Meter Evaluation" white paper was prepared as part of Phase 1B discussing various aspects of ramp metering which is included on the DVD included in this report. Refer to the white paper for detailed information on ramp metering. Further, the *Ramp Management and Control Handbook*, FHWA (PB Farradyne) January 2006, is a useful reference from which much of the following information was copied/extracted.

Ramp metering is regarded as a traffic management tool that should be considered in the North I-25 corridor and was incorporated into Build Alternative 1 and Build Alternative 2. Refer to the conceptual layouts in Appendix A and Appendix B to review the geometry proposed to accommodate ramp metering in the study corridor. Ramp metering provides a means to manage traffic access to a freeway but should not be relied upon to mitigate severe congestion. There are many competing factors within the North I-25 corridor when determining how freeway access should be provided within the available space. Between two arterial street interchanges, the four factors by priority include:

1. Mainline I-25: Weaving, acceleration and deceleration lengths.
2. Frontage Road: Off-ramp/frontage road gore to Cross Street intersection distance.
3. Frontage Road: Cross Street to on-ramp/frontage road gore distance.
4. Frontage Road (with Ramp Metering): Storage length provided on ramp roadway.

While all of the above are key issues, the approach to designing the queue storage (item #4 above) ultimately depends on the type of ramp metering employed whether it is traffic-responsive, fixed-timed, or metered-at-demand.

Based on the Year 2030 traffic forecasts for a widened and improved I-25, the peak demands are expected to be greater than the volume that can be accommodated while maintaining relatively smooth flow at travel speeds in the 50 mph range. There are at least three primary options:

- Accept less than desirable operation during peak periods.
- Provide additional capacity (beyond the four basic mainline lanes plus auxiliary lanes).
- Implement demand management strategies such as ramp metering.

Many approaches exist that can be used to meter ramps. Metering strategies should reflect the goals and objectives of the system. If the primary objective is to reduce crashes at specific areas near merge points and overall congestion is not a concern, then a ramp metering strategy that implements isolated ramp meters that meter on-ramps at demand (i.e., establishing the metering rate equal to or greater than the ramp demand) may be sufficient to meet the objective.

If there is a complex set of objectives that include congestion reduction, regional mobility improvement, safety improvement, and perhaps others, then a system of ramp meters, probably managed by a central computer system, will be required with a more complex control strategy or algorithm. A brief description of local control and system-wide control is provided below.

- Local Control:
  - Local control is a process of selecting metering rates based on conditions present at an individual ramp, rather than conditions along a segment of freeway, freeway corridor, or regional freeway network. Therefore, local control is appropriate for individual, non-adjacent ramps where problems are isolated. When local ramp metering is used, one or more ramps may be metered, however, there is no effort made to coordinate the effects of ramp meters. The primary concern is improving conditions and reducing congestion near the local ramp. In some cases, when local ramp metering is used, congestion problems at the local ramp may appear to be fixed, when in reality problems are transferred to or uncovered at downstream locations. In these situations, local ramp metering is not recommended.
- System-wide/Coordinated Control:
  - System-wide control takes into account conditions beyond those adjacent to the ramp when determining metering rates for an individual ramp. To this extent, system-wide control can be used for a freeway segment, an entire corridor, or several freeway corridors where problems extend from ramp to adjacent ramp. The primary concern therefore focuses on improving freeway conditions for a broader freeway system(s). This makes system-wide control more flexible than local control in handling reductions in capacity that occur as a result of delay, collisions, and road blockages.

The two methods of controlling ramp meters are:

- Fixed-timed (also referred to as time-of-day or pre-timed). Meter rates are pre-set based on historical conditions and are fixed according to the time of day. Meters are activated based on pre-set schedules.
- Traffic-responsive. Real-time data are used to determine control parameters, perhaps including when ramp meters are active. Traffic-responsive systems can also be constrained to operate only during selected times of day, based on policy decisions.

Fixed-timed metering is the simplest and least expensive form of ramp metering for construction and installation. The low cost of this approach is due in part to the fact that detection and communication with a Traffic Management Center (TMC) is not required. However, this approach is also the most rigid because it cannot make adjustments for real-time conditions including non-recurring congestion (i.e., congestion that occurs as a result of weather, collisions, etc.). Similarly, as fixed-timed metering rates are based on historical data, metering rates will typically be slightly (or significantly, if the rates are not updated periodically) too low or high for current conditions. This may result in less restrictive metering rates than optimal when congestion is heavy, resulting in more freeway congestion than necessary. It may also result in over restrictive metering rates when congestion subsides, resulting in unnecessary queuing and delays on ramps and arterials.

As such, fixed-timed metering approaches are best applied to address traffic problems that are a direct result of recurring congestion or localized safety problems that can be reduced by simply breaking up the queues of vehicles entering the freeway. In other words, fixed-timed metering is best used to address conditions that are predictable from day-to-day. The low cost of these systems make them attractive backups to other metering approaches or for situations when the primary approach fails. If there is no mainline or ramp detection, agencies must regularly collect data by alternative means to analyze traffic conditions on the freeway and determine the appropriate metering rates. The metering operation will require frequent observation so rates can be adjusted to meet traffic conditions.

Traffic-responsive strategies use freeway loop detectors or other surveillance systems to calculate or select ramp metering rates based on current freeway conditions (see Figure 2-16). Traffic-responsive metering systems often produce results that are generally five to ten percent better than those of fixed-timed metering. A traffic-responsive approach can be used either locally or system-wide as follows:

- Local traffic-responsive metering approaches are based on metering rates for freeway conditions near the metered ramp (i.e., immediately upstream and downstream of the ramp, or at the merge point). Similar to fixed-timed systems, local traffic-responsive systems are proven strategies that are often used as backups when system-wide algorithms fail. Unlike fixed-timed systems, surveillance of the freeway using traffic detectors is required. Although, more capital costs are required to implement traffic-responsive systems, they more easily adapt to changing conditions and can provide better results than their fixed-timed counterparts.
- The goal of system-wide traffic-responsive systems is to optimize traffic flow along a metered stretch of roadway, rather than at a specific point on the freeway (as is the case of local traffic-responsive systems). As such, metering rates at any given ramp will be influenced by conditions at other ramps within the system or corridor that is metered. Like local traffic-responsive systems, system-wide traffic-responsive systems require data from ramp detectors and local freeway detectors. In addition to these components, system-wide traffic-responsive systems are unique in the fact that data is also needed from downstream detectors and/or upstream detectors at multiple locations, potentially from cross-street signal controllers, and from the central computer. System-wide traffic-responsive systems have the most complex hardware configuration compared to the other metering approaches discussed so far (i.e., fixed-timed and local traffic-responsive).

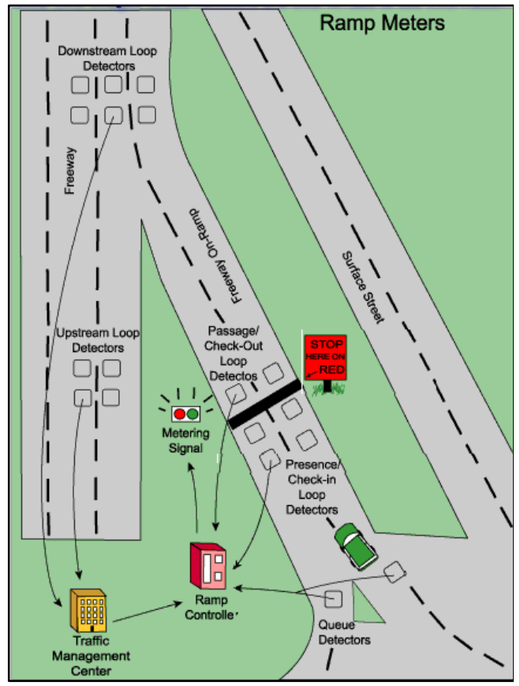


Figure 2-16, Illustration of Traffic-Responsive Ramp Meter Layout

Metering at demand, also referred to as non-restrictive ramp metering, establishes the metering rate equal to or greater than the ramp demand. This approach is often used when the sole objective is to reduce the collisions on the mainline due to vehicle platoons that form on ramps; however, it may also be useful in delaying the onset of congestion on the freeway. Because the metering rate is set equal to ramp demand, the main benefit occurs when platoons are broken up to smooth the flow of traffic onto the freeway. Metering in this fashion is beneficial when ramp metering is first introduced in an area, since it allows motorists to become familiar with metering operations while not subjecting them to lengthy delays. As motorists become familiar with the system, meter rates can be set gradually more restrictive. Metering at demand may also be used at ramps within a corridor where traffic diversion is not acceptable or at specific ramps where there is not enough ramp capacity to support normal, more restrictive metering. In this regard, metering at demand ensures that queues do not spill onto the upstream arterial.

Based on the close spacing of arterial cross streets and associated access needs, it is expected that insufficient space is available for a full traffic-responsive metering system because of the high mainline freeway peak-hour volumes and the low metering rates that would occur due to the lack of available gaps in the traffic stream. In addition, while some traffic diversion can probably be accommodated, it is not considered desirable to increase the frontage road volumes too much because of the turbulence expected on the frontage road between the off-ramp/frontage road gore and the cross street signalized intersection. While queue detectors could be located on the ramp roadway and frontage road, they would likely be adjusting the meter rate often to allow more vehicles to enter the freeway making the expense of an elaborate traffic-responsive system questionable for peak-period metering. Finally, resources would need to be made available for operations and maintenance if a complex traffic-responsive metering system were implemented.

Use of a metered-at-demand strategy would break up the platoons of vehicles from the upstream signalized intersections which should facilitate the merging of vehicles into the mainline freeway traffic stream without excessive queuing on the ramp roadway and without much diversion to other routes. A fixed-metering strategy could be used to limit the volume entering the freeway while also breaking up platoons, but queuing could be an issue.

For the purposes of this study, ramp metering was considered an appropriate alternative from Comanche Road to Paseo del Norte. The conceptual designs incorporating ramp metering focused on the conceptual geometric layout of ramp metering on the freeway mainline and frontage roads considering the four factors listed above. Further, the geometric layouts provided queue storage based on this aspect of the design being the lowest priority of the four factors listed above. While this study will not fully address the ramp meter system components, queue detection systems on the ramp roadways and frontage roads will be identified at a minimum along with the ability to enhance the intelligence of the system as ramp metering matures in the North I-25 corridor.

With regard to the ramp meter operation, the type of system employed will depend on the resources available to manage the system. If resources can be made available, a traffic responsive system could be considered. However, during peak travel periods, it is expected that the ramp meters would be operated in a metered-at-demand mode due to the high mainline traffic flows on I-25. Traffic responsive metering could be utilized at other times when mainline freeway volumes are under capacity to maintain smooth traffic flow and potentially reduce the duration of recurring congestion on I-25 during peak travel periods.

If ramp metering is recommended based on the Phase 1B detailed evaluation of alternatives, a separate subsequent ramp metering evaluation and study should be conducted to refine the approach for implementation. Responsible agencies will need to consider if resources (e.g., staff, funding, equipment) can be made available to support ramp metering programs and if these systems can be effectively maintained. If resources to deploy, operate, and maintain these systems are not available, ramp metering programs will ultimately fail. In addition to these resources, staff must also consider how they intend to enforce ramp meter compliance, and should investigate if law enforcement is committed to the ramp meter program.

Implementation of ramp metering in the North I-25 corridor would require substantial modifications to accommodate queuing, acceleration requirements, and to balance the location of on and off-ramps in the corridor. While improvements are required, the benefits of ramp metering could be realized today if used to simply break up vehicle platoons to smooth the flow of traffic onto the freeway. The highest priority would be the northbound Comanche Road on-ramp.

Geometric Design Criteria

The basic geometric design criteria used to develop the alternatives is summarized in Table 2-1. The freeway geometric design improvements, the configuration of access to I-25, and the arterial street design were reviewed and improved based on several design references which primarily included:

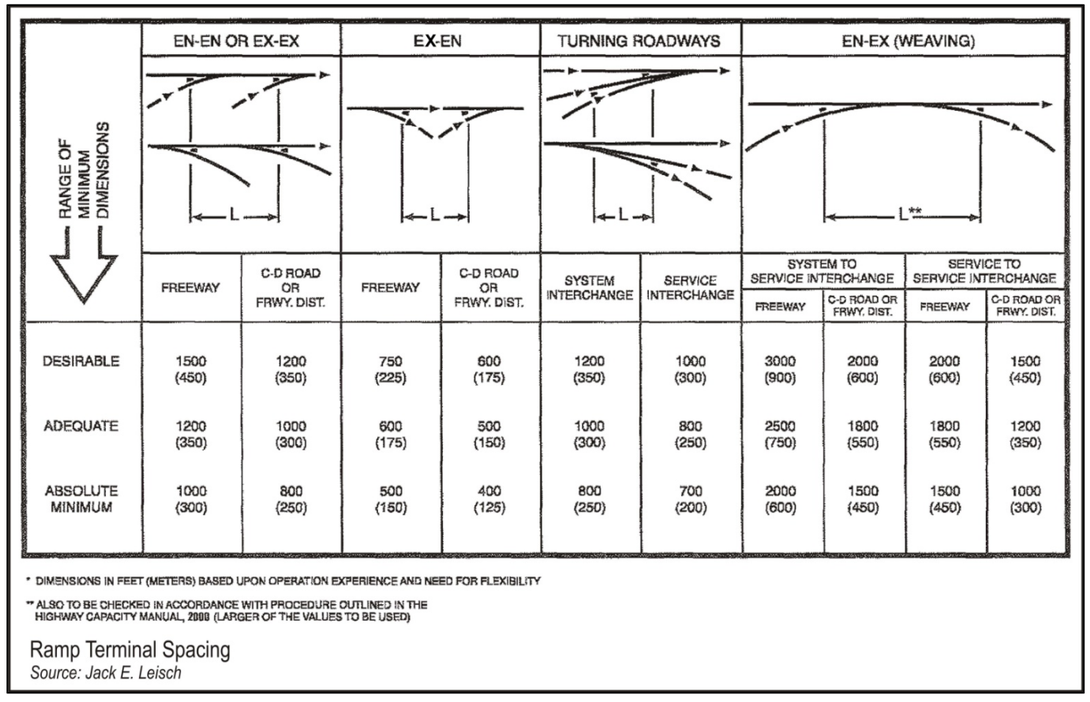
- A Policy on Geometric Design of Highways and Streets, 2004 AASHTO (Green Book)
- Freeway and Interchange Geometric Design Handbook, 2005 ITE
- A Policy on Design Standards Interstate System, January 2005, AASHTO
- Ramp Management and Control Handbook, January 2006 FHWA

Table 2-1, Basic Geometric Design Criteria

Description	*Criteria*	*Comments / Reference*
Design Speed (I-25)	70 mph	
Design Speed (Local Arterial)	35-50 mph	Varies by roadway classification
Design Speed (Directional Ramps, Frontage Roads)	50 mph (35 mph min.)	
Design Speed (Loop Ramps)	25 mph min.	
Curve Radius (I-25 / Ramps / Frontage Roads / Arterial Roadways)	Per 2004 AASHTO	
Emax (I-25)	6.0%	
Emax (Frontage Roads)	4.0%	
Emax (Ramps)	6.0%	
Maximum Grade (I-25 & Frontage Roads)	4.0%	
Maximum Grade (Ramps / Arterial Roadways)	6.0%	
Minimum Grade	0.5%	* Existing grades on I-25 do not meet criteria
Vertical clearance (Roadway)	16.5 ft	
Normal Cross Slope	2.0%	
Fill Slopes	Varies by fill height	See standard NMDOT Slope Selection Table
Cut Slopes	Varies by cut depth	See standard NMDOT Slope Selection Table
Lane Width	12 ft	
Lane Width (Single Lane Ramps)	16 ft	
Shoulder Width (I-25)	14 ft left / 12 ft right	1. 14 ft existing shoulder on left 2. 10 ft shld + 2 ft shy for a total of 12 ft on right
Shoulder Width (Frontage Roads)	4 ft left / 4 ft right	1. Includes shy distance 2. 4 ft plus gutter pan 3. 4 ft left / 8 ft right desirable
Shoulder Width (Directional Ramps, One Lane)	4 ft left / 8 ft right	1. Inside shoulder of ramps may vary based on SSD / curvature 2. Includes shy distance
Shoulder Width (Directional Ramps, Two Lanes)	4 ft left / 4 ft right	
Bike Trail Width	12 ft	12 ft paved with 2 ft unpaved shy distance to barriers and fences
On-street Bike Lane	5 ft	5 ft plus gutter pan
Sidewalk Width	6 - 8 ft	Varies by roadway classification

- State Access Management Manual, September 2001 NMDOT
- Access Management Manual, 2003 TRB
- Roadway Design Manual, October 2006 TxDOT
- Development Process Manual (DPM), City of Albuquerque

Ramp spacing criteria are summarized in Figure 2-17, which is an excerpt from the ITE Freeway and Interchange Geometric Design Handbook. Figure 2-18 schematically illustrates access control along one-way frontage roads at ramps. The schematics are based on Texas design guidelines and reflect practical application more so than what may be desirable.



	FREEWAY	C-D ROAD OR FRWY. DIST.	FREEWAY	C-D ROAD OR FRWY. DIST.	SYSTEM INTERCHANGE	SERVICE INTERCHANGE	SYSTEM TO SERVICE INTERCHANGE		SERVICE TO SERVICE INTERCHANGE	
							FREEWAY	C-D ROAD OR FRWY. DIST.	FREEWAY	C-D ROAD OR FRWY. DIST.
DESIRABLE	1500 (450)	1200 (350)	750 (225)	600 (175)	1200 (350)	1000 (300)	3000 (900)	2000 (600)	2000 (600)	1500 (450)
ADEQUATE	1200 (350)	1000 (300)	600 (175)	500 (150)	1000 (300)	800 (250)	2500 (750)	1800 (550)	1800 (550)	1200 (350)
ABSOLUTE MINIMUM	1000 (300)	800 (250)	500 (150)	400 (125)	800 (250)	700 (200)	2000 (600)	1500 (450)	1500 (450)	1000 (300)

* DIMENSIONS IN FEET (METERS) BASED UPON OPERATION EXPERIENCE AND NEED FOR FLEXIBILITY

** ALSO TO BE CHECKED IN ACCORDANCE WITH PROCEDURE OUTLINED IN THE HIGHWAY CAPACITY MANUAL, 2000 (LARGER OF THE VALUES TO BE USED)

Ramp Terminal Spacing
Source: Jack E. Leisch

Figure 2-17, Ramp Spacing Criteria

Note: AASHTO Green Book dimensions are reflected by the Absolute Minimum category.

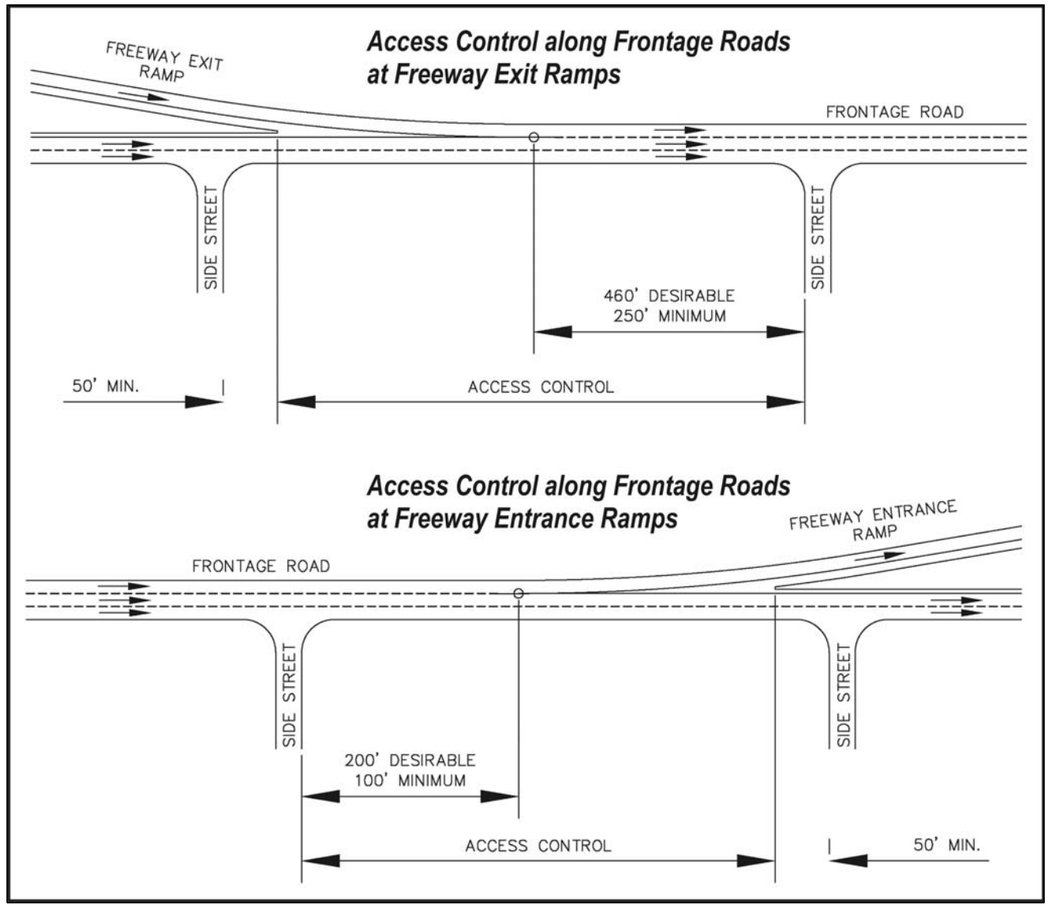


Figure 2-18, Schematic Illustrations of Access Control along Frontage Roads at Ramps

Note: The guidelines are based on Texas design guidelines and reflect practical application more so than what may be desirable.

Year 2030 Traffic Forecasts

The travel demand assessment for Phase 1B was conducted based on the MRCOG EMME/2 travel demand models developed for the 2030 Metropolitan Transportation Plan. Phase 1B focuses on the AM and PM peak periods of the 2030 model year. The travel demand assessment was performed by Planning Technologies, LLC and Parsons Brinckerhoff in cooperation with MRCOG. The base models developed in Phase 1A for the North I-25 corridor were modified to reflect the roadway and interchange improvements advanced for detailed evaluation. The No-Build Alternative and three Build Alternatives were specifically modeled for this study. Travel demand modeling statistics are summarized in Table 2-2, and the AM and PM peak hour forecasts for each alternative are presented in Figure 2-19 through Figure 2-22. Note that the statistics summarized in Table 2-2 are for two time frames; one is based on six hours comprised of the three-hour AM and PM peak periods, while the other is based on two hours comprised of the one-hour AM and PM peak hours. The value of reviewing peak period statistics is evident when congested conditions are expected for more than the peak one-hour. That is, if all alternatives modeled are mostly congested, the comparison of statistics will not show much difference. However, when a three-hour peak period is evaluated, more variation between alternatives could arise because congestion is not dominating the evaluation period. Notable observations are summarized below.

- Role of I-25 in Albuquerque region during peak periods
  - Roughly 10% of all peak period trips in the region use the corridor for all or part of a trip.
  - Regionally, I-25 accounts for only 4% of the Vehicle-Miles Traveled (VMT) and 2% of the Vehicle-Hours of Travel (VHT).
  - Traffic stays on I-25 on average approximately 3.4 miles, or about 45% of the North I-25 corridor. This does not vary much between the alternatives considered.
  - The frontage road system roughly serves 15% of all North I-25 corridor traffic, which is generally consistent in all alternatives.

- Peak hour observations
  - The average travel speed for the No-Build Alternative was 51 mph, while it increased to 55 to 56 mph for the build alternatives. This is a substantial improvement in efficiency because the increased speed occurs at higher VMT's than the No-Build Alternative.
  - The VHD decreased substantially when comparing the build alternatives to the No-Build Alternative.
  - The frontage road system roughly serves 15% of all North I-25 corridor traffic, which is generally consistent in all alternatives.

Table 2-2, Summary of Selected Travel Demand Model Statistics

Statistic [1,2]	No-Build Alternative	Build Alternative 1	Build Alternative 2	Build Alternative 3
Peak Period Metrics [3]				
Regional VMT	13,047,399	13,065,528	13,064,089	13,076,048
VMT on I-25 Mainline	500,608	535,219	530,209	558,412
%	3.8%	4.1%	4.1%	4.3%
Regional VHT	459,597	453,779	453,473	453,744
VHT on I-25 Mainline	9,906	9,878	9,514	10,022
%	2.2%	2.2%	2.1%	2.2%
VHD on I-25 Mainline	2,435	1,887	1,598	1,683
Average Trip Length on I-25 (miles)	3.44	3.41	3.38	3.39
VMT on Frontage Road System	79,516	80,015	83,330	81,937
% of I-25 Corridor	15.9%	14.9%	15.7%	14.7%
Peak Hour Metrics [4]				
VMT on I-25 Mainline	195,877	209,482	207,490	218,598
VHT on I-25 Mainline	3,848	3,842	3,703	3,903
VHD on I-25 Mainline	925	715	605	639
Average Speed (mph)	50.9	54.5	56.0	56.0
VMT on Frontage Road System	30,884	31,112	32,393	31,865
% of I-25 Corridor	15.8%	14.9%	15.6%	14.6%
AM Peak Travel Time (minutes) [5]				
Northbound	8.002	7.432	7.379	7.366
Southbound	8.089	7.695	7.543	7.669
PM Peak Travel Time (minutes) [5]				
Northbound	9.347	8.361	8.273	8.327
Southbound	9.250	8.599	8.225	8.265
Network Descriptors				
Freeway Lane Miles	55.89	62.64	62.74	65.06
Frontage Road Lane Miles	32.92	34.92	35.98	34.75
Mainline Route Length (miles)	7.56	7.56	7.57	7.57

Notes:

1. *I-25 Mainline is from Comanche to Tramway.*
2. *VMT = Vehicle Miles of Travel; VHT = Vehicle Hours of Travel; VHD = Vehicle hours of Delay*
3. *Peak Period metrics are the total of both the 3-hour AM and PM peak periods.*
4. *Peak Hour metrics are the total of both the 1-hour AM and PM peak hours.*
5. *Peak hour travel time is based on free-flow speed of 65 mph, or a travel time of 6.8 minutes.*

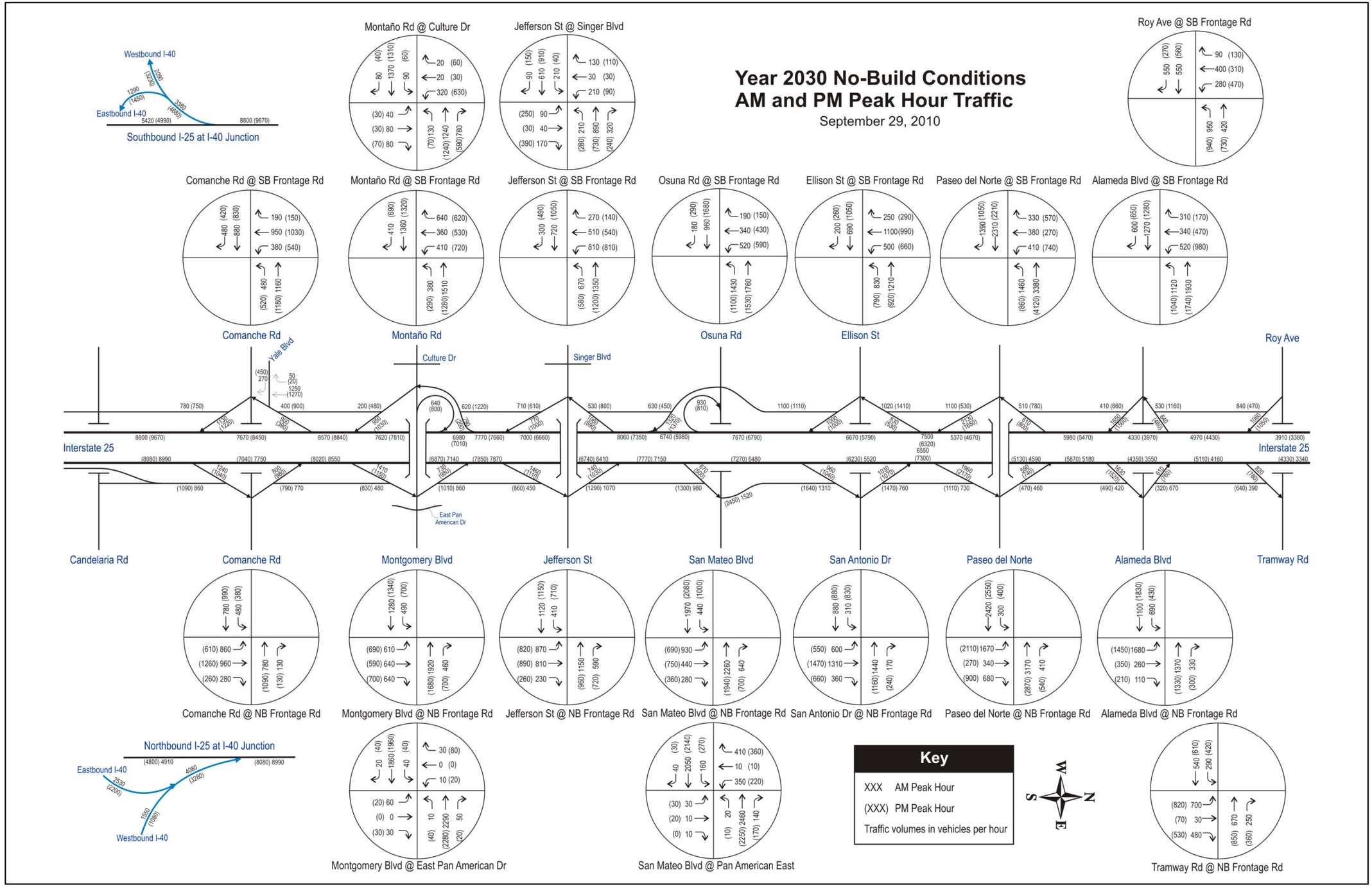


Figure 2-19, Year 2030 Traffic Forecasts – No-Build Alternative

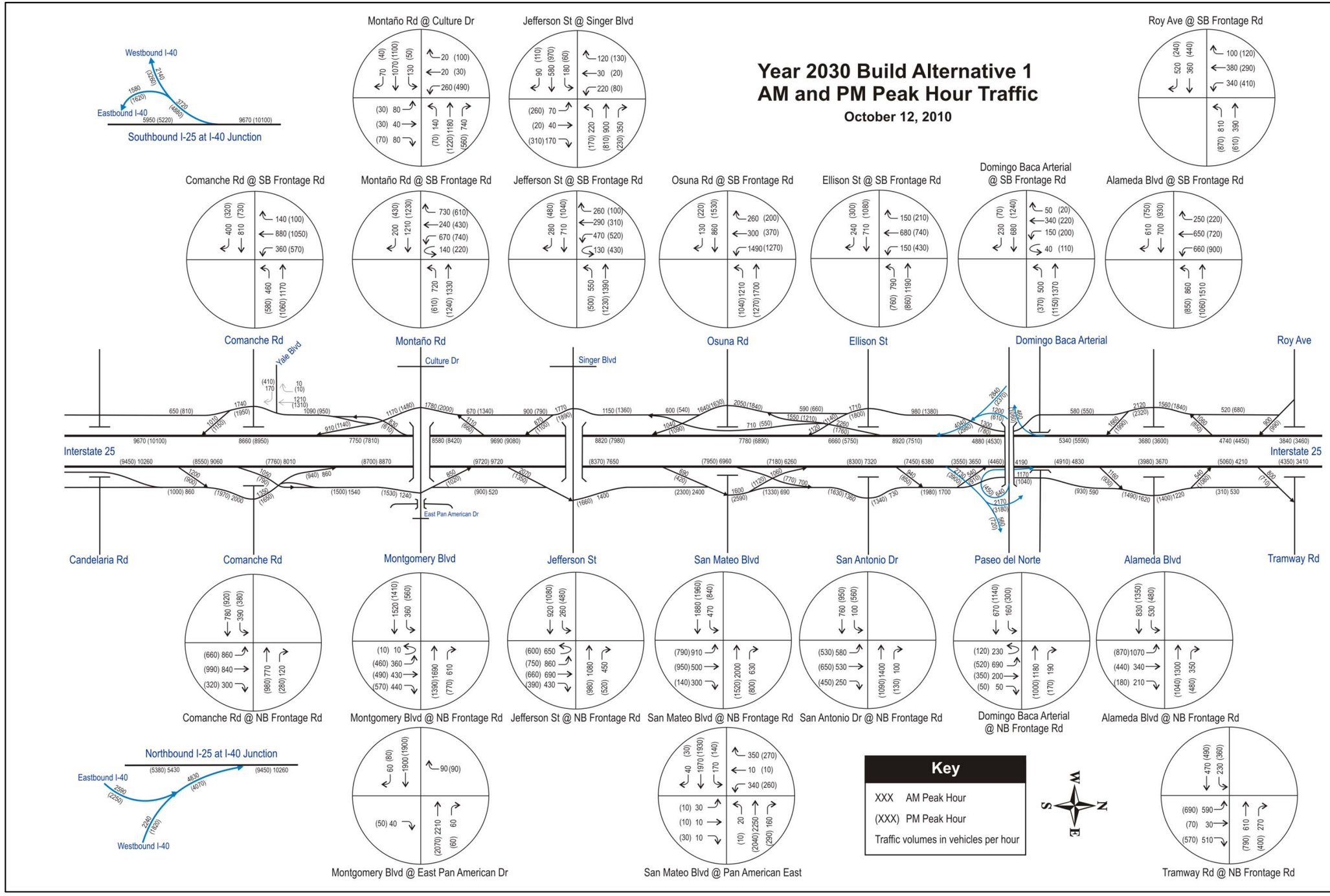


Figure 2-20, Year 2030 Traffic Forecasts – Build Alternative 1

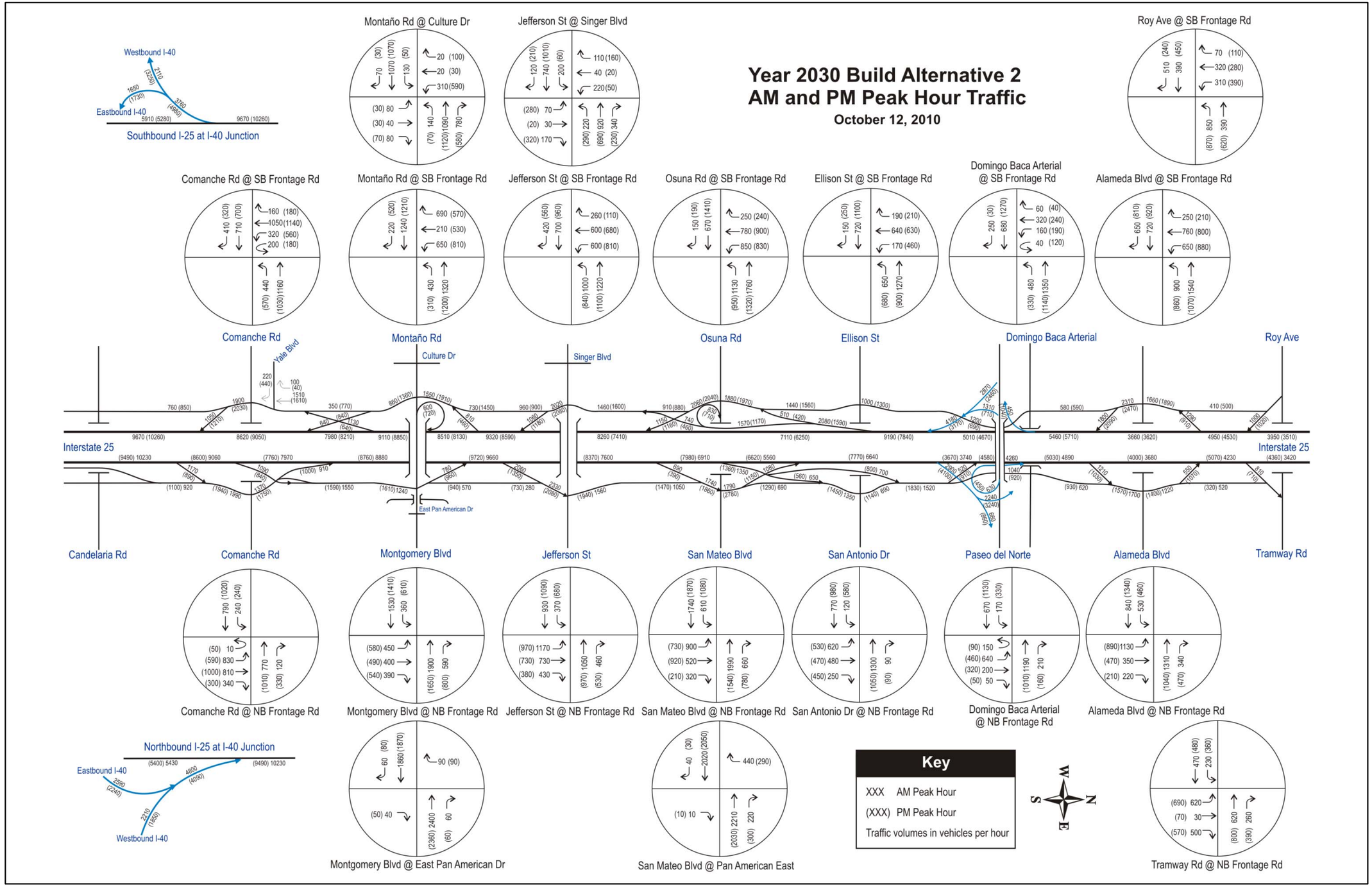


Figure 2-21, Year 2030 Traffic Forecasts – Build Alternative 2

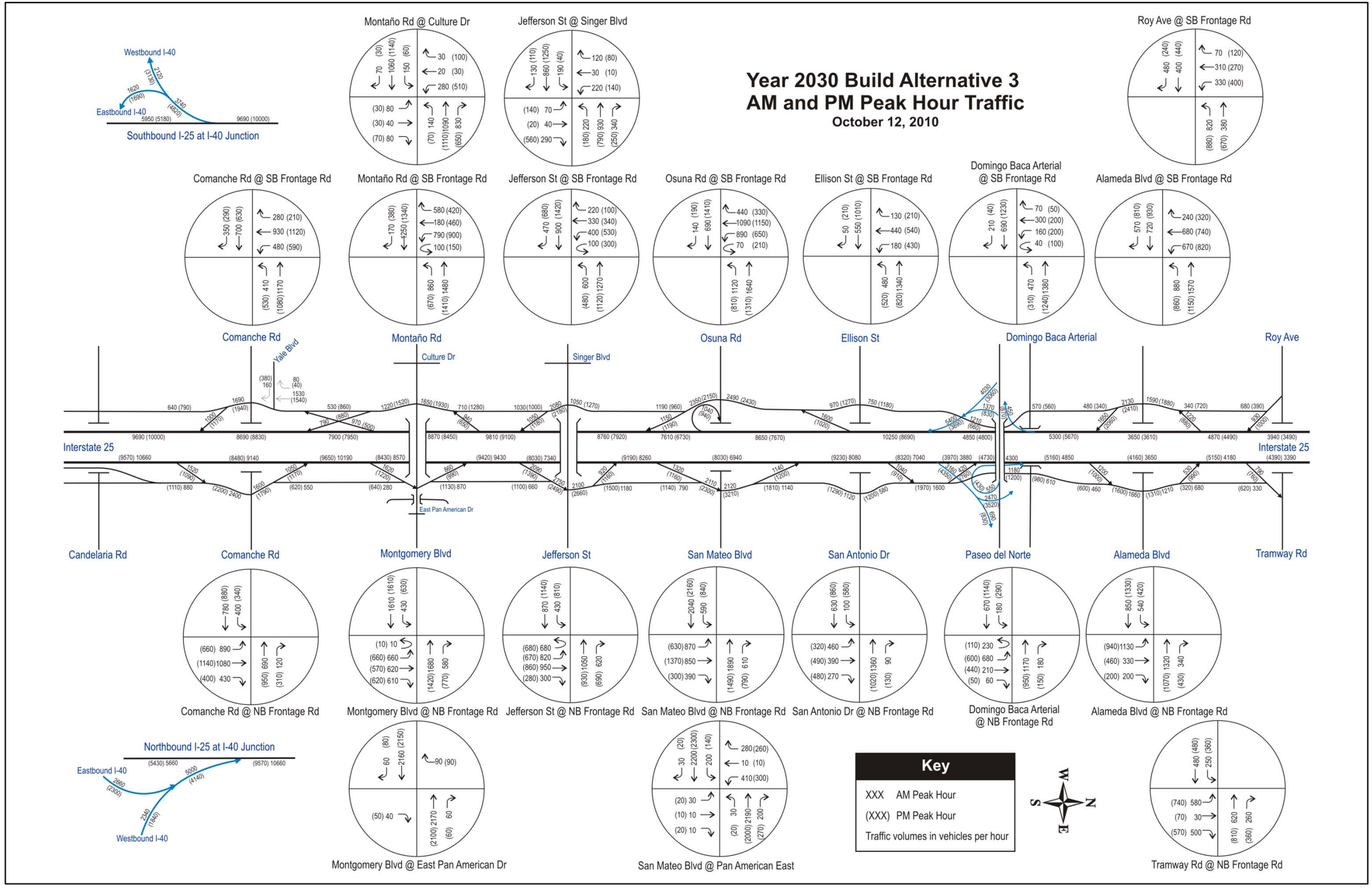


Figure 2-22, Year 2030 Traffic Forecasts – Build Alternative 3

CHAPTER 3 BUILD ALTERNATIVE 1 DESCRIPTION

Introduction

This chapter describes the layout and key features of Build Alternative 1. Alternatives are best described through illustration; as such, refer to Appendix A for the conceptual plan view layout of Build Alternative 1. In addition, the proposed typical sections are illustrated in Figure 3-1. Details regarding the interchange layouts are summarized in Table 3-1, and details regarding ramps and frontage roads are provided in Table 3-2. Estimated project costs are shown in Table 3-3. Additional information, such as Microstation files, is provided on the project CD included in this report.

The salient aspects of the alternative that should be considered for its evaluation and comparison to the other build alternatives are summarized below. When reviewing this information, keep in mind that one overall recommended alternative will result from this study which may reflect a combination of the favored aspects of the three build alternatives.

Mainline I-25

One of the primary needs of the North I-25 corridor is to provide four basic lanes from north of I-40 to Paseo del Norte in both travel directions. Build Alternative 1 does that along with providing 12 to 14 foot shoulders and also providing auxiliary lanes to supplement on and off-ramp operations as appropriate (see Table 3-2). The bottleneck in the northbound direction at Comanche is eliminated, and the proper number of lanes is provided southbound exiting the I-25/Paseo del Norte interchange. Lane balance and lane continuity are provided in both travel directions. It should be noted that narrower shoulder widths exist north of I-40 approximately to Comanche which were constructed by the Big I project.

The proposed mainline improvements also include ITS applications to facilitate management of the corridor including ramp metering at selected on-ramps. While much of the system is expected to be installed by other projects and the specific elements of the ITS system are not defined by this study, costs for an ITS system are included in the project cost estimate.

Interchanges

Key features of the proposed interchange layouts are summarized in Table 3-1. The interchange layouts accommodate pedestrian and bicycle crossings of I-25. Summary statements for each interchange are provided below:

- Comanche Road: Full access is provided although the southbound off-ramp is relocated further north at Montgomery, braided with the southbound frontage road. The existing interchange structure is retained with additional lanes on the frontage road approaches and an exclusive right-turn lane west-to-north. An exclusive right-turn lane is needed east-to-south but it was not provided due to right-of-way impacts. Access modifications are proposed on the west side of the interchange.
- Montgomery Boulevard/Montaño Road: Total reconstruction is proposed based on a compressed diamond configuration with advance u-turns. Full access is provided but the loop ramp is eliminated. The northbound off-ramp is relocated further south at Comanche, braided with the Comanche on-ramp. Dual left-turn lanes are provided in both directions. Access modifications are provided on the east side which includes a grade-separated local service road.
- Jefferson Street: Reduced access is proposed as the northbound on-ramp is eliminated. The southbound off-ramp is combined with the San Mateo/Osuna off-ramp continuing south via a CD road then braided with the San Mateo/Osuna on-ramp. The existing bridge structure is widened to provide dual left-turn lanes in both directions and advance u-turns. Access modifications are proposed on the east side of the interchange.
- San Mateo Boulevard/Osuna Road: Full access is proposed, which includes direct access to Osuna Road from southbound I-25, but the loop ramp is eliminated. The existing overpass structure is retained. Additional lanes are provided on the frontage road approaches and exclusive right-turn lanes are provided west-to-north (duals) and east-to-south. Access modifications are proposed on the west side.
- San Antonio Drive: Access is reduced as the northbound on-ramp and the southbound off-ramp are eliminated. However, a northbound slip ramp from the frontage road is provided just south of Paseo del Norte which could be construed as a relocated San Antonio on-ramp. The existing overpass is retained with additional lanes on the frontage road approaches and an exclusive right-turn lane east-to-south. Access modifications are proposed on the east side along San Antonio.
- Paseo del Norte: The design of this interchange was determined by the I-25/Paseo del Norte Interchange Study, CN D3026, referred to as Alternative 16, and includes access restrictions. A system interchange is proposed for regional movements, while local movements are accommodated by the Domingo Baca Arterial and the frontage road system. The Domingo Baca Arterial passes under I-25 in a compressed diamond configuration with advance u-turns.
- Alameda Boulevard: Full access is provided. The existing overpass is retained with additional lanes provided on the southbound frontage road approach. Access modifications are proposed on both sides of the interchange. It should be noted that a project (PIN 578.0) is identified in the 2030 MTP to widen Alameda Boulevard from Edith Boulevard to I-25, and a another project (PIN 506.0) is identified to widen Alameda from San Pedro to Ventura. While not identified in this North I-25 study, the I-25 bridge structure may require reconstruction to provide the required number of travel lanes and pedestrian/bicycle improvements within and through the interchange. The need for this will be determined by the planned Alameda widening projects.
- Tramway Road: Full access is provided. No modifications are proposed for this interchange.

Ramps and Frontage Roads

Key features associated with ramps and the frontage road approaches and departures to the major cross streets are summarized in Table 3-2. Build Alternative 1 does include ramp metering as part of the proposed improvements. Additional information follows that addresses notable aspects of the proposed conceptual design:

- Access to the properties fronting the northbound frontage road south of Comanche is provided by modified access to/from the frontage road, similar to the existing condition. However, channelization is extended south past Aztec Road so that the Comanche northbound off-ramp from mainline I-25 could be relocated further south to provide more distance along the frontage road to Comanche Road for vehicle maneuvers and queue storage.
- Metered on-ramps were designed to provide sufficient acceleration length to reach 55 mph at the end of the painted gore where the on-ramp is adjacent to the mainline lane. As vehicles continue accelerating from 55 mph to 70 mph, a solid lane line is proposed for the pavement marking between the on-ramp and the mainline.
- Modifications are proposed to Alternative 16 for the I-25/Paseo del Norte interchange involving I-25 south of Paseo del Norte.
    - Northbound Direction: A northbound on-ramp from the Jefferson interchange is provided in Alternative 16 which is eliminated in Build Alternative 1.
    - Southbound Direction: Alternative 16 includes a San Antonio Drive on-ramp, elimination of the San Mateo loop off-ramp, and a Jefferson off-ramp. In Build Alternative 1, the loop off-ramp is still eliminated, but the Jefferson off-ramp is combined with a two-lane San Mateo/Osuna off-ramp braided with the San Antonio on-ramp. The Jefferson off-ramp continues south over San Mateo/Osuna via a CD road which is then braided with the San Mateo/Osuna on-ramp before joining the southbound frontage road.

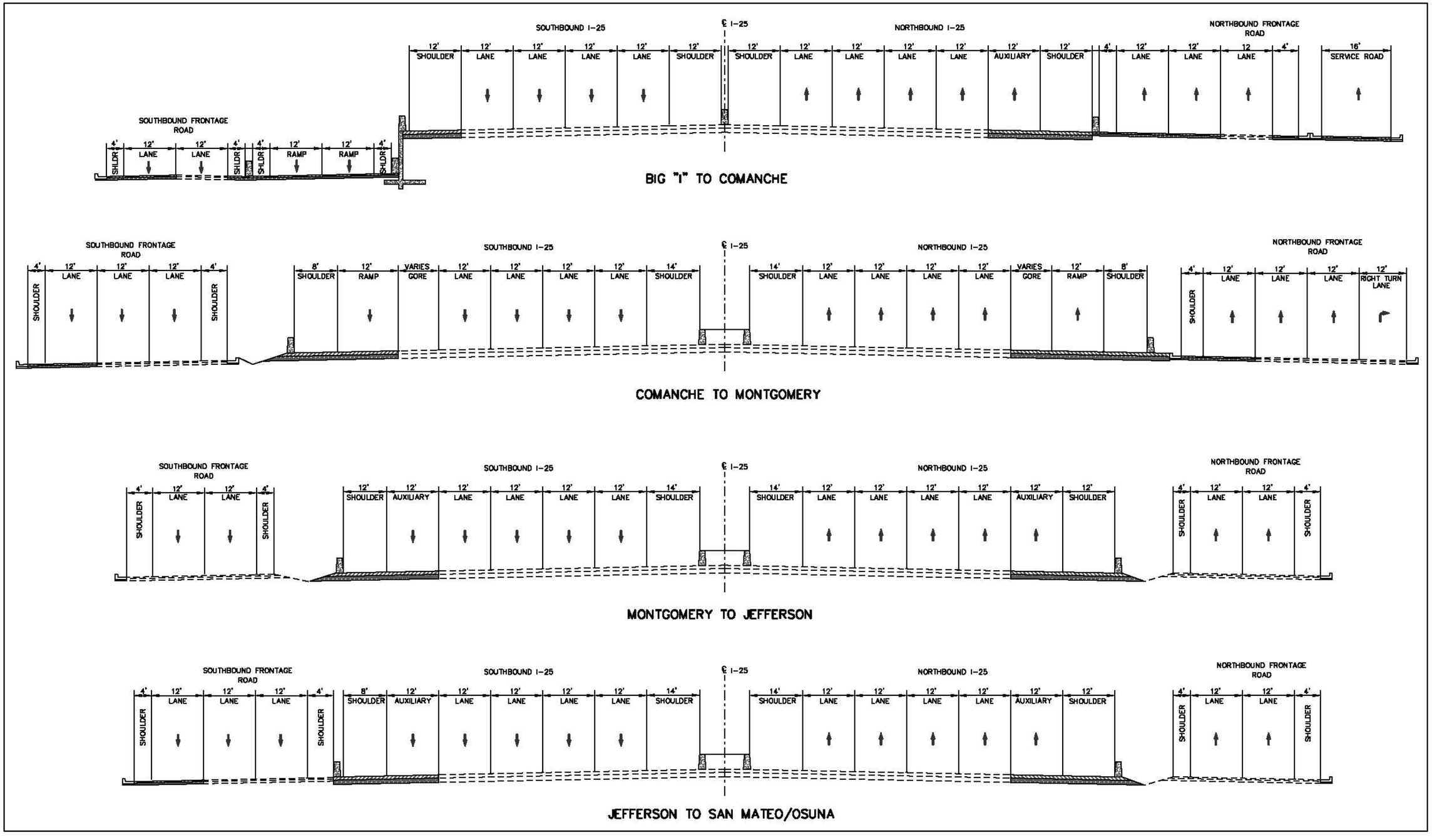
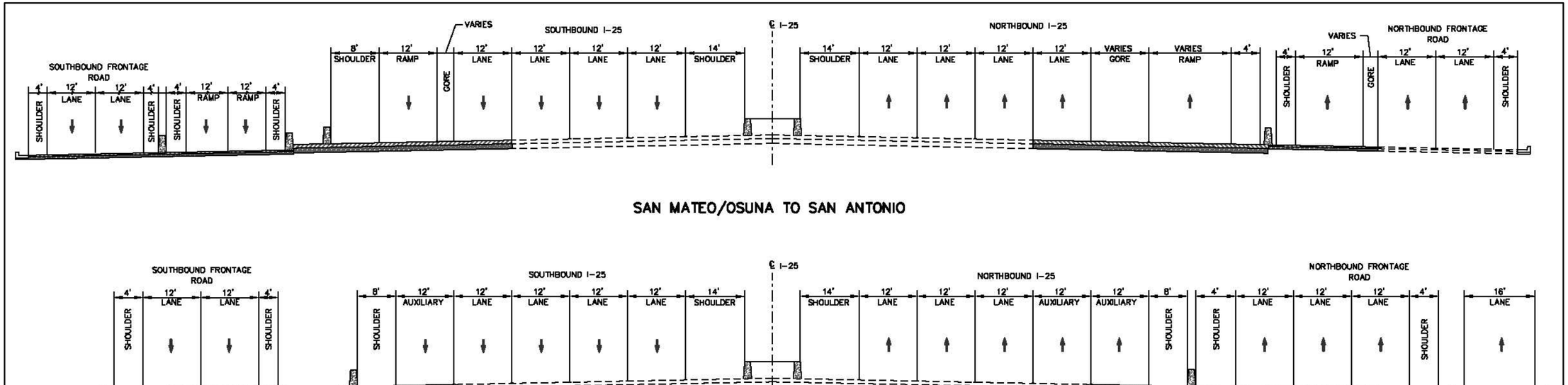


Figure 3-1, Build Alternative 1 Typical Sections



SAN MATEO/OSUNA TO SAN ANTONIO

SAN ANTONIO TO PASEO DEL NORTE

PASEO DEL NORTE TO ALAMEDA

ALAMEDA TO TRAMWAY

Figure 3-1, Build Alternative 1 Typical Sections (continued)

Table 3-1, Interchange Aspects of Build Alternative 1

Description (See Appendix A)	Comanche Road Interchange	Montgomery Boulevard/Montaño Road Interchange	Jefferson Street Interchange	San Mateo Boulevard/Osuna Road Interchange
Type of Interchange	Compressed Diamond	Compressed Diamond with Advance U-turns	Compressed Diamond with Advance U-turns	Compressed Diamond
Status of Bridge Structure	Existing	New	Widen Existing	Widen Existing
Signalized Frontage Road Intersection Spacing (centerline)	500 feet	630 feet	490 feet	780 feet
Eastbound Left-turn Storage (total)	370 feet (existing)	1000 feet (side-by-side)	700 feet (side-by-side)	440 feet (existing)
Westbound Left-turn Storage (total)	450 feet (existing)	1000 feet (side-by-side)	670 feet (side-by-side)	640 feet (existing)
Northbound Frontage Road Design Speed thru Intersection	45 mph	50 mph	50 mph	50 mph
Southbound Frontage Road Design Speed thru Intersection	50 mph	50 mph	50 mph	45 mph
Cross Street Design Speed, West of I-25	45 mph	50 mph	35 mph	50 mph
Cross Street Design Speed, East of I-25	45 mph	50 mph	40 mph	50 mph
Access Management to the East	No changes proposed	Close first median opening; provide grade-separated service road	Close first median opening; realign Restaurant Lane; Access easement connecting Jefferson St to Monroe St	No changes proposed
Access Management to the West	Extend raised median to Alexander Blvd; move driveway on north side further west; eliminate first drive on south side	No changes proposed	No changes proposed	First median opening converted to right-in/right-out on both sides and left-in allowed east-to-north

Description (See Appendix A)	San Antonio Drive/Ellison Street Interchange	Paseo del Norte Interchange/ Domingo Baca Arterial	Alameda Boulevard Interchange	Tramway Road Interchange
Type of Interchange	Compressed Diamond	Alternative 16; Compressed Diamond with Advance U-turns	Compressed Diamond	Compressed Diamond
Status of Bridge Structure	Widen Existing	New	Existing	Existing
Signalized Frontage Road Intersection Spacing (centerline)	570 feet	390 feet	575 feet	680 feet
Eastbound Left-turn Storage (total)	180 feet (existing)	250 feet (single)	160 feet (existing)	410 feet (existing)
Westbound Left-turn Storage (total)	375 feet (existing)	280 feet (single)	390 feet (existing)	820 feet (existing)
Northbound Frontage Road Design Speed thru Intersection	45 mph	35 mph	45 mph	50 mph
Southbound Frontage Road Design Speed thru Intersection	45 mph	35 mph	40 mph	50 mph
Cross Street Design Speed, West of I-25	35 mph	40 mph	50 mph	50 mph
Cross Street Design Speed, East of I-25	45 mph	35 mph	35 mph	50 mph
Access Management to the East	First median opening modified to eliminate minor street thrus and left-turns	Per Standard	First median opening modified to eliminate minor street thrus and left-turns	No changes proposed
Access Management to the West	No changes proposed	Per Standard	First median opening modified to eliminate minor street thrus and left-turns	No changes proposed

Table 3-2, Ramp and Frontage Road Attributes of Build Alternative 1

Description (See Appendix A)	Comanche Road Interchange		Montgomery Boulevard/Montaño Road Interchange		Jefferson Street Interchange		San Mateo Boulevard/Osuna Road Interchange		San Antonio Boulevard/Ellison Street Interchange		Alameda Boulevard Interchange	
Northbound	**Off-Ramp**	**On-Ramp**	**Off-Ramp**	**On-Ramp**	**Off-Ramp**	**On-Ramp**	**Off-Ramp**	**On-Ramp**	**Off-Ramp**	**On-Ramp**	**Off-Ramp**	**On-Ramp**
Number of Lanes at the Ramp/Freeway Junction	1	1	1	1	2	Eliminated	1	1	1	Eliminated	1	1
Type of Ramp Junction	Diverge	Merge	Lane Drop	Weave	Weave	-	Diverge	Weave	Lane Drop	-	Weave	Lane Add
Type of Speed Change Lane/Length (feet)	Decel/800	Accel/2300	Aux	Aux	Aux	-	Decel/700	Aux	Decel/2100	-	Aux	Aux
Ramp Controlling Curve Design Speed	50	45	35	50	50	-	50	35	35	-	50	35
Metered or Not Metered	-	Metered	-	Metered	-	-	-	Metered	-	-	-	Not Metered
Braided or Not Braided	Not Braided	Braided	Braided	Not Braided	Not Braided	-	Not Braided	Braided	Braided	-	Not Braided	Not Braided
Distance along Frontage Road from Off-ramp to Intersection	1500 feet	-	-	-	1170 feet	-	1340 feet	-	850 feet	-	930 feet	-
Distance along Frontage Road from Intersection to On-ramp	-	820 feet	-	740 feet	-	-	-	600 feet	-	-	-	780 feet
Storage for Metered Vehicles on the On-ramp	-	1720 feet	-	1040 feet	-	-	-	1920 feet	-	-	-	-
Southbound	**Off-Ramp**	**On-Ramp**	**Off-Ramp**	**On-Ramp**	**Off-Ramp**	**On-Ramp**	**Off-Ramp**	**On-Ramp**	**Off-Ramp**	**On-Ramp**	**Off-Ramp**	**On-Ramp**
Number of Lanes at the Ramp/Freeway Junction	1	1	2	1	1: CD Road	1	2	1	Eliminated	1	1	1
Type of Ramp Junction	Diverge	Lane Add	Weave	Merge	-	Weave	Lane Drop	Merge	-	Merge	Lane Drop	Weave
Type of Speed Change Lane/Length (feet)	Decel/340	Aux	Aux	Accel/800	-	Aux	Aux	Accel/2200	-	Accel/1500	Aux	Aux
Ramp Controlling Curve Design Speed	50	50	50	50	35	50	50	35	-	35	50	50
Metered or Not Metered	-	Metered	-	Metered	-	Metered	-	Metered	-	Not Metered	-	Not Metered
Braided or Not Braided	Braided	Not Braided	Not Braided	Braided	Braided	Not Braided	Braided	Braided	-	Braided	Not Braided	Not Braided
Distance along Frontage Road from Off-ramp to Intersection	-	-	1320 feet	-	-	-	750 feet	-	-	-	1220 feet	-
Distance along Frontage Road from Intersection to On-ramp	-	740 feet	-	900 feet	-	670 feet	-	470 feet	-	350 feet	-	660 feet
Storage for Metered Vehicles on the On-ramp	-	1500 feet	-	2180 feet	-	1640 feet	-	860 feet	-	-	-	-

Notes:

1. *Paseo del Norte Interchange as determined by the I-25/Paseo del Norte Interchange Study, CN D3026.*
2. *Tramway Road Interchange no change.*
3. *Type of Speed Change Lane: Aux = ramp to ramp auxiliary lane; Decel = exclusive deceleration lane; Accel = exclusive acceleration lane.*
4. *Urban design criteria were applied to the frontage roads while freeway design criteria were applied to the freeway elements including ramps.*

- Channelization islands are proposed in the vicinity of the off-ramp junctions with the frontage roads to prohibit movements and to reduce conflicts.
- The desired design speed of the frontage roads is 50 mph. However, horizontal and/or vertical curvature limited the design speed that could be attained at several locations (see Table 3-2). Other speed-related design issues are as follows:
  - The sag vertical curve at the terminal of the Comanche Road northbound off-ramp does not meet stopping sight distance for 50 mph. The existing vertical curve has a sight distance adequate for a design speed of 35 mph (under comfort criteria).
  - The northbound frontage road approaching Comanche Road has a design speed of 45 mph due to the existing roadway geometry.
  - The northbound frontage road departing Comanche Road has a design speed of 45 mph to accommodate the braided ramps.
  - The braided northbound Montgomery Boulevard off-ramp has vertical curves with a 35 mph design speed.
  - The northbound frontage road departing San Mateo Boulevard has a design speed of 40 mph to accommodate the braided ramps.
  - The braided northbound San Antonio Drive off-ramp has vertical curves with a 40 mph design speed.
  - The southbound frontage road departing San Mateo Boulevard has a design speed of 40 mph due to right-of-way constraints.
  - The southbound on-ramp from San Mateo Boulevard has a design speed of 35 mph due to the existing roadway geometry.
  - The braided southbound San Mateo Boulevard on-ramp has vertical curves with a 40 mph design speed.

Right-of-Way Requirements

The right-of-way impacts estimated for Build Alternative 1 comprise 242,100 square feet (5.56 acres) of property, excluding the additional right-of-way needed for the Paseo del Norte interchange, and 79,200 square feet (1.82 acres) of access easements. With a few exceptions, many of the impacts involve slivers of frontage property both along the frontage roads and at intersections. Based on existing land use and/or size of impact, the noteworthy impacts occur at the following locations:

- Northbound Montaño Off-Ramp Braid, north of Comanche Road
- Access Easements at Jefferson Interchange Area, east of Jefferson Street
- Southbound Comanche Off-Ramp Braid, south of Montaño Road

At the conceptual design level, gross estimates of right-of-way costs are typically prepared based on a cost per square foot of property. Other costs such as damages that may be associated with access changes are ignored because they are too difficult to estimate without an appraisal. For the purposes of this study, $20.00 per square foot was used for access easements, and $30 per square foot was used for property acquisitions. These unit costs should capture some of the unknown costs and are considered sufficient for this phase of project development.

Refer to Appendix H for plan view sheets showing the right-of-way impacts and Appendix K for cost information.

Estimated Cost

The project cost estimates for Build Alternative 1 are summarized in Table 3-3 with additional detail provided in Appendix K. Costs are estimated in today's (2009) dollars and are intended to be all inclusive at the conceptual level, including New Mexico gross receipts tax.

Table 3-3, Conceptual Project Cost Estimate for Build Alternative 1

Description	Cost
Roadway	$32,000,000
Bridges	$26,000,000
Drainage	$11,000,000
Signing & Striping	$3,000,000
Lighting	$1,000,000
Signalization/Ramp Metering/ITS	$3,000,000
Baseline Cost	**$76,000,000**
Construction Engineering	$26,000,000
Utilities	$5,000,000
Subtotal	**$107,000,000**
Contingency (30%)	$32,000,000
Engineering Design (8%)	$9,000,000
Right-of-Way / Access Easements	$9,000,000
Construction Management (12%)	$12,000,000
New Mexico Gross Receipts Tax (7%)	$7,000,000
Total Estimated Cost	**$176,000,000**

Notes: 1. Costs are based on current unit bid prices (2009).
2. Contingency percentages are based on a phased implementation of project.
3. See Appendix K for more cost information.

CHAPTER 4 BUILD ALTERNATIVE 2 DESCRIPTION

Introduction

This chapter describes the layout and key features of Build Alternative 2. Alternatives are best described through illustration; as such, refer to Appendix B for the conceptual plan view layout of Build Alternative 2. In addition, the proposed typical sections are illustrated in Figure 4-1 and photo simulations are provided in Figures 4-2 through 4-6 (note that photo simulations were only developed for Build Alternative 2 due to budget constraints). Details regarding the interchange layouts are summarized in Table 4-1, and details regarding ramps and frontage roads are provided in Table 4-2. Estimated project costs are shown in Table 4-3. Additional information, such as Microstation files, is provided on the project CD included in this report.

The salient aspects of the alternative that should be considered for its evaluation and comparison to the other build alternatives are summarized below. When reviewing this information, keep in mind that one overall recommended alternative will result from this study which may reflect a combination of the favored aspects of the three build alternatives.

Mainline I-25

One of the primary needs of the North I-25 corridor is to provide four basic lanes from north of I-40 to Paseo del Norte in both travel directions. Build Alternative 2 does that along with providing 12 to 14 foot shoulders and also providing auxiliary lanes to supplement on and off-ramp operations as appropriate (see Table 4-2). The bottleneck in the northbound direction at Comanche is eliminated, and the proper number of lanes is provided southbound exiting the I-25/Paseo del Norte interchange. Lane balance and lane continuity is provided in both travel directions. It should be noted that narrower shoulder widths exist north of I-40 approximately to Comanche Road which were constructed by the Big I project.

The proposed mainline improvements also include ITS applications to facilitate management of the corridor including ramp metering at selected on-ramps. While much of the system is expected to be installed by other projects and the specific elements of the ITS system are not defined by this study, costs for an ITS system are included in the project cost estimate.

Interchanges

Key features of the proposed interchange layouts are summarized in Table 4-1. The interchange layouts accommodate pedestrian and bicycle crossings of I-25. Summary statements for each interchange are provided below:

- Comanche Road (Figure 4-2): The overpass structure is reconstructed to provide additional width for Comanche Road for dual left-turn lanes in both directions and advance u-turns. Full access is provided. The northbound on-ramp and the southbound off-ramp are braided with the respective Montgomery/Montaño ramps. Additional lanes are provided on the frontage road approaches and an exclusive right-turn lane west-to-north is proposed. An exclusive right-turn lane is needed east-to-south but it was not provided due to right-of-way impacts. Access modifications are proposed on the west side of the interchange.
- Montgomery Boulevard/Montaño Road (Figure 4-3): Total reconstruction is proposed based on a compressed diamond configuration with a west-to-south loop ramp. Full access is provided. The northbound off-ramp is relocated further south at Comanche, braided with the Comanche on-ramp. The southbound on-ramp is braided with the Comanche off-ramp. Dual left-turn lanes are provided in both directions. Access modifications are provided on the east side which includes a grade-separated local service road.
- Jefferson Street (Figure 4-4): Reduced access is proposed as the northbound on-ramp is eliminated. The southbound off-ramp is combined with the San Mateo/Osuna off-ramp continuing south via a collector-distributor (CD) road then braided with the San Mateo/Osuna on-ramp. The existing bridge structure is widened to provide dual left-turn lanes in both directions. Access modifications are proposed on the east side of the interchange.
- San Mateo Boulevard/Osuna Road (Figure 4-5): Full access is proposed, which includes direct access to Osuna Road from southbound I-25 and a south-to-east loop ramp. The existing overpass structure is retained and widened. In this alternative, the loop ramp yields at its junction with San Mateo Boulevard because there is insufficient width for both an add lane at the loop ramp and a sidewalk (a sidewalk is provided). Additional lanes are provided on the frontage road approaches and exclusive right-turn lanes are provided west-to-north (duals) and east-to-south. Access modifications are proposed on both sides including the removal of the signalized intersection of San Mateo Boulevard/East Pan American Drive, which is converted to right-in/right-out on both sides of San Mateo Boulevard.
- San Antonio Drive (Figure 4-6): Access is reduced as the northbound on-ramp, the southbound off-ramp and the southbound on-ramp are eliminated. However, a northbound slip ramp from the frontage road is provided just south of Paseo del Norte which could be construed as a relocated San Antonio on-ramp. Only the northbound off-ramp is retained near its current location, braided with the San Mateo on-ramp. The existing overpass is retained with additional lanes on the frontage road approaches and an exclusive right-turn lane east-to-south. Access modifications are proposed on the east side along San Antonio.
- Paseo del Norte: The design of this interchange was determined by the I-25/Paseo del Norte Interchange Study, CN D3026, referred to as Alternative 16, and includes access restrictions. A system interchange is proposed for regional movements, while local movements are accommodated by the Domingo Baca Arterial and the frontage road system. The Domingo Baca Arterial passes under I-25 in a compressed diamond configuration with advance u-turns.
- Alameda Boulevard: Full access is provided however the southbound off-ramp is relocated further north and is converted to a two-lane ramp. The existing overpass is retained with additional lanes provided on the southbound frontage road approach. Access modifications are proposed on both sides of the interchange. It should be noted that a project (PIN 578.0) is identified in the 2030 MTP to widen Alameda Boulevard from Edith Boulevard to I-25, and a another project (PIN 506.0) is identified to widen Alameda from San Pedro to Ventura. While not identified in this North I-25 study, the I-25 bridge structure may require reconstruction to provide the required number of travel lanes and pedestrian/bicycle improvements within and through the interchange. The need for this will be determined by the planned Alameda widening projects.
- Tramway Road: Full access is provided. No modifications are proposed for this interchange.

Ramps and Frontage Roads

Key features associated with ramps and the frontage road approaches and departures to the major cross streets are summarized in Table 4-2. Build Alternative 2 does include ramp metering as part of the proposed improvements. Additional information follows that addresses notable aspects of the proposed conceptual design:

- Access to the properties fronting the northbound frontage road south of Comanche is provided by a new local service road which is connected to Aztec Road. The service road is a dead-end road designed with horizontal curves that meet a 25 mph design speed and includes a turnaround with a 50-foot radius. A channelization island is also provided along the frontage road through and south of Aztec Road so that the Comanche northbound off-ramp from mainline I-25 could be relocated further south to provide more distance along the frontage road to Comanche Road for vehicle maneuvers and queue storage.
- Metered on-ramps were designed to provide sufficient acceleration length to reach 55 mph at the end of the painted gore where the on-ramp is adjacent to the mainline lane. As vehicles continue accelerating from 55 mph to 70 mph, a solid lane line is proposed for the pavement marking between the on-ramp and the mainline.

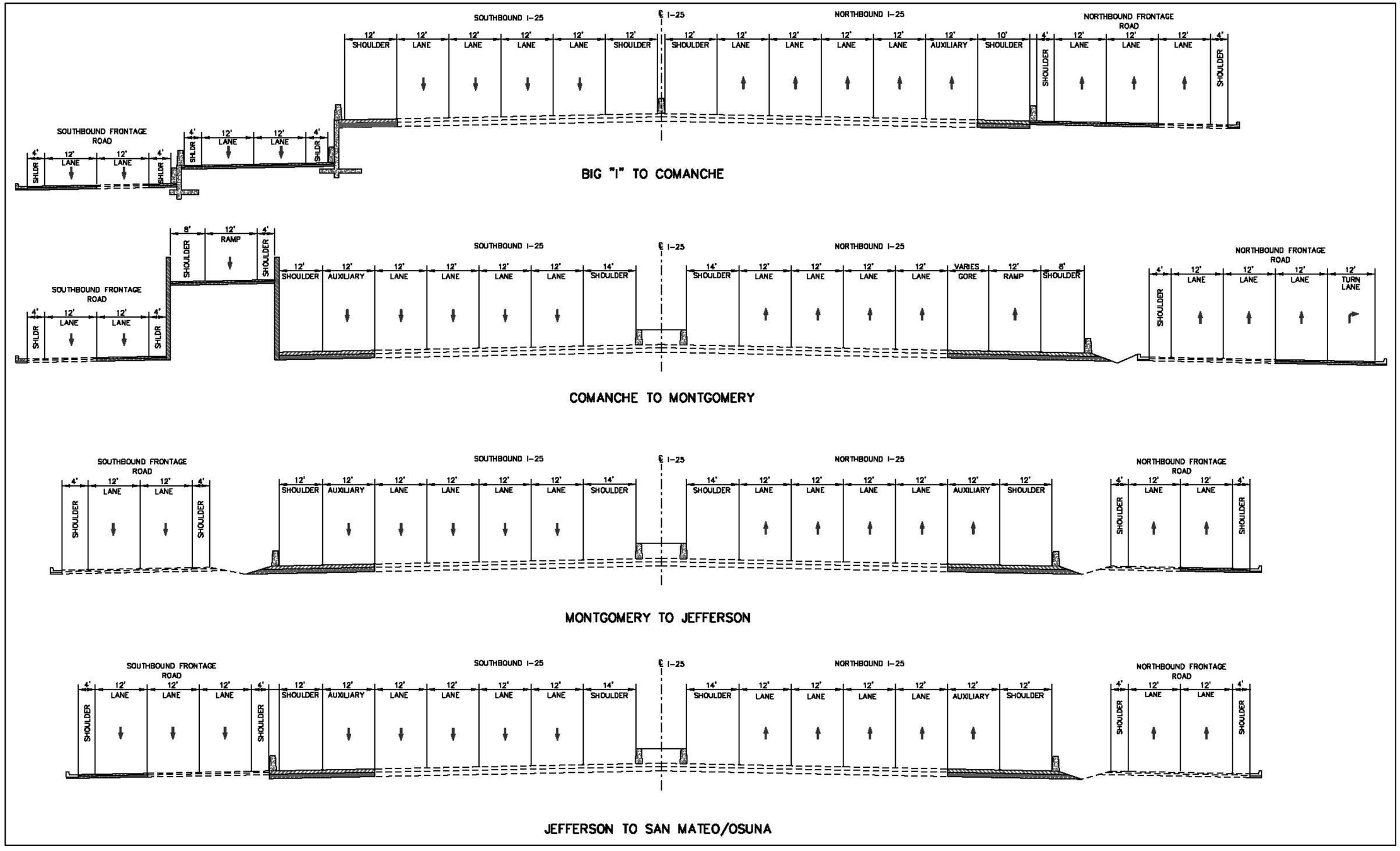


Figure 4-1, Build Alternative 2 Typical Sections

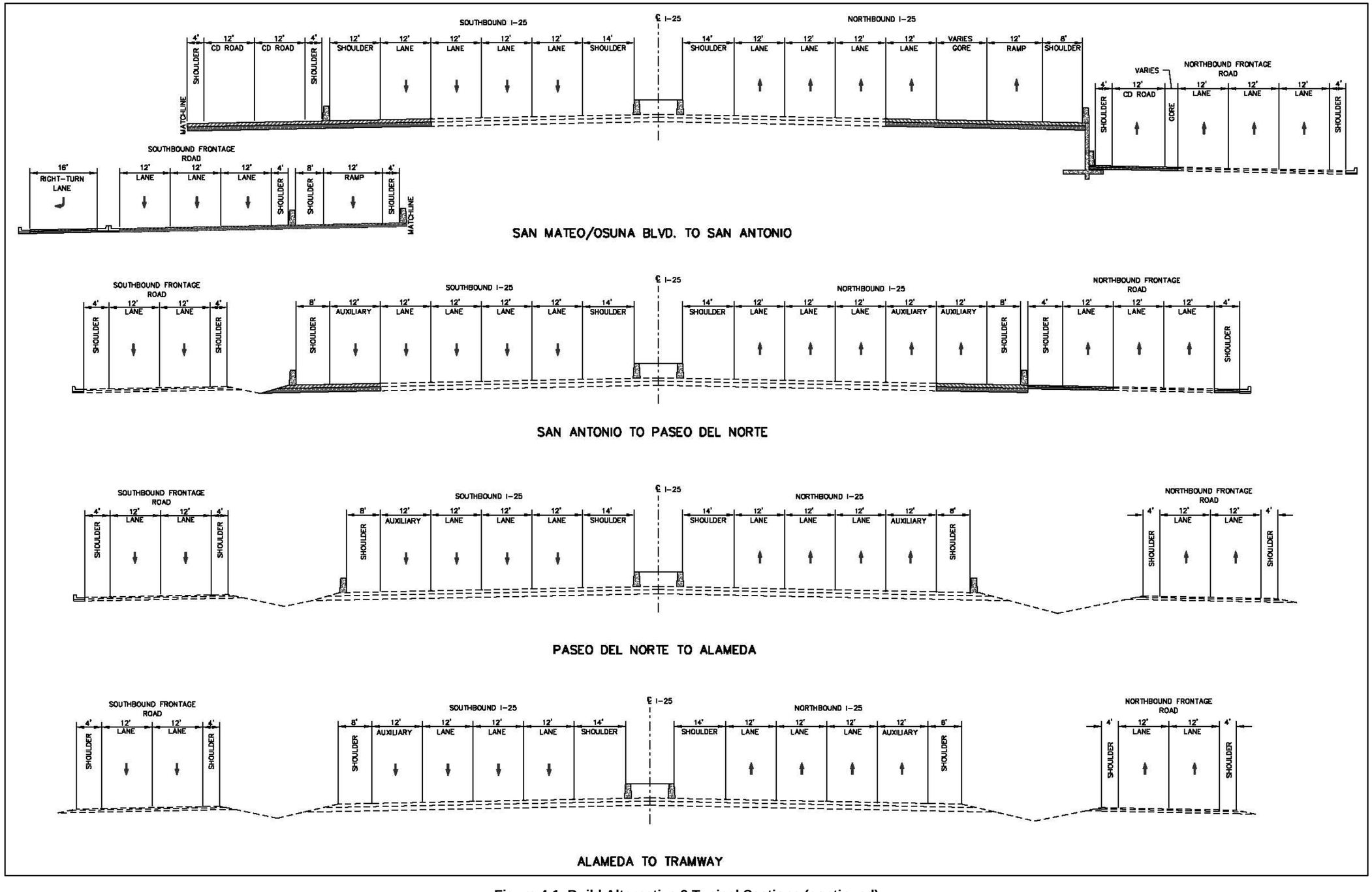


Figure 4-1, Build Alternative 2 Typical Sections (continued)

Figure 4-2, Photo Simulation of the I-25/Comanche Interchange as Proposed in Build Alternative 2 – View Looking North

Figure 4-3, Photo Simulation of the I-25/Montgomery/Montaño Interchange as Proposed in Build Alternative 2 – View Looking North

Figure 4-4, Photo Simulation of the I-25/Jefferson Interchange as Proposed in Build Alternative 2 – View Looking North

Figure 4-5, Photo Simulation of the I-25/San Mateo/Osuna Interchange as Proposed in Build Alternative 2 – View Looking South

Figure 4-6, Photo Simulation of the I-25/San Antonio/Ellison Interchange as Proposed in Build Alternative 2 – View Looking South

Table 4-1, Interchange Aspects of Build Alternative 2

Description (See Appendix B)	Comanche Road Interchange	Montgomery Boulevard/Montaño Road Interchange	Jefferson Street Interchange	San Mateo Boulevard/Osuna Road Interchange
Type of Interchange	Compressed Diamond with Advance U-turns	Compressed Diamond with Loop Ramp	Compressed Diamond	Compressed Diamond with Loop Ramp
Status of Bridge Structure	New	New	Widen Existing	Widen Existing
Signalized Frontage Road Intersection Spacing (centerline)	500 feet	680 feet	490 feet	780 feet
Eastbound Left-turn Storage (total)	700 feet (side-by-side)	1100 feet (side-by-side)	700 feet (side-by-side)	440 feet (existing)
Westbound Left-turn Storage (total)	700 feet (side-by-side)	1100 feet (side-by-side)	670 feet (side-by-side)	640 feet (existing)
Northbound Frontage Road Design Speed thru Intersection	45 mph	50 mph	50 mph	50 mph
Southbound Frontage Road Design Speed thru Intersection	50 mph	40 mph	50 mph	40 mph
Cross Street Design Speed, West of I-25	45 mph	50 mph	35 mph	50 mph
Cross Street Design Speed, East of I-25	45 mph	50 mph	40 mph	50 mph
Access Management to the East	No changes proposed	Close first median opening; provide grade-separated service road	Close first median opening; realign Restaurant Lane; Access easement connecting Jefferson St to Monroe St	First median opening converted to right-in/right-out on both sides; traffic signal removed
Access Management to the West	Extend raised median to Alexander Blvd; move driveway on north side further west; eliminate first drive on south side	No changes proposed	No changes proposed	First median opening converted to right-in/right-out on both sides and left-in allowed east-to-north

Description (See Appendix B)	San Antonio Drive/Ellison Street Interchange	Paseo del Norte Interchange/ Domingo Baca Arterial	Alameda Boulevard Interchange	Tramway Road Interchange
Type of Interchange	Compressed Diamond	Alternative 16; Compressed Diamond with Advance U-turns	Compressed Diamond	Compressed Diamond
Status of Bridge Structure	Widen Existing	New	Existing	Existing
Signalized Frontage Road Intersection Spacing (centerline)	570 feet	390 feet	575 feet	680 feet
Eastbound Left-turn Storage (total)	180 feet (existing)	250 feet (single)	160 feet (existing)	410 feet (existing)
Westbound Left-turn Storage (total)	375 feet (existing)	280 feet (single)	390 feet (existing)	820 feet (existing)
Northbound Frontage Road Design Speed thru Intersection	45 mph	35 mph	45 mph	50 mph
Southbound Frontage Road Design Speed thru Intersection	45 mph	35 mph	40 mph	50 mph
Cross Street Design Speed, West of I-25	35 mph	40 mph	50 mph	50 mph
Cross Street Design Speed, East of I-25	45 mph	35 mph	35 mph	50 mph
Access Management to the East	First median opening modified to eliminate minor street thrus and left-turns	Per Standard	First median opening modified to eliminate minor street thrus and left-turns	No changes proposed
Access Management to the West	No changes proposed	Per Standard	First median opening modified to eliminate minor street thrus and left-turns	No changes proposed

Table 4-2, Ramp and Frontage Road Attributes of Build Alternative 2

Description (See Appendix B)	Comanche Road Interchange	Montgomery Boulevard/Montaño Road Interchange	Jefferson Street Interchange	San Mateo Boulevard/Osuna Road Interchange	San Antonio Boulevard/Ellison Street Interchange	Alameda Boulevard Interchange

Northbound	Off-Ramp	On-Ramp	Off-Ramp	On-Ramp	-	Off-Ramp	On-Ramp	Off-Ramp	On-Ramp	-	Off-Ramp	Off-Ramp	On-Ramp
Number of Lanes at the Ramp/ Freeway Junction	1	1	1	1	-	2	Eliminated	1	1	-	2	1	1
Type of Ramp Junction	Diverge	Merge	Lane Drop	Weave	-	Weave	-	Diverge	Lane Add	-	Lane Drop	Weave	Lane Add
Type of Speed Change Lane/Length (feet)	Decel/800	Accel/2300	Aux	Aux	-	Aux	-	Decel/1400	Aux	-	Decel/1800	Aux	Aux
Ramp Controlling Curve Design Speed	50	45	35	50	-	50	-	50	35	-	35	50	35
Metered or Not Metered	-	Metered	-	Metered	-	-	-	-	Metered	-	-	-	Not Metered
Braided or Not Braided	Not Braided	Braided	Braided	Not Braided	-	Not Braided	-	Not Braided	Braided	-	Braided	Not Braided	Not Braided
Distance along Frontage Road from Off-ramp to Intersection	1690 feet	-	-	-	-	1020 feet	-	1300 feet	-	-	780 feet	930 feet	-
Distance along Frontage Road from Intersection to On-ramp	-	820 feet	-	780 feet	-	-	-	-	600 feet	-	-	-	780 feet
Storage for Metered Vehicles on the On-ramp	-	1720 feet	-	600 feet	-	-	-	-	2000 feet	-	-	-	-

Southbound	Off-Ramp	On-Ramp	Off-Ramp	Loop Ramp	On-Ramp	Off-Ramp	On-Ramp	Off-Ramp	Loop Ramp	On-Ramp	Off-Ramp/On-Ramp	Off-Ramp	On-Ramp
Number of Lanes at the Ramp/ Freeway Junction	2	1	2	1	1	1: CD Road	1	2	1: CD Road	1	Eliminated	2	1
Type of Ramp Junction	Weave	Lane Add	Weave	Weave	Merge	-	Weave	Lane Drop	Lane Drop	Merge	-	Lane Drop	Weave
Type of Speed Change Lane/Length (feet)	Aux	Aux	Aux	Aux	Accel/800	-	Aux	Aux	CD Road	Accel/1800	-	Aux	Aux
Ramp Controlling Curve Design Speed	50	50	35	25.0	40	45	50	50	25.5	35	-	50	50
Metered or Not Metered	-	Metered	-	Metered	Metered	-	Metered	-	-	Metered	-	-	Not Metered
Braided or Not Braided	Braided	Not Braided	Not Braided	Not Braided	Braided	Braided	Not Braided	Not Braided	Not Braided	Braided	-	Not Braided	Not Braided
Distance along Frontage Road from Off-ramp to Intersection	1710 feet	-	1210 feet	-	-	-	-	1260 feet	-	-	-	2000 feet	-
Distance along Frontage Road from Intersection to On-ramp	-	740 feet	-	-	830 feet	-	650 feet	-	-	560 feet	-	-	660 feet
Storage for Metered Vehicles on the On-ramp	-	1500 feet	-	1200 feet	2800 feet	-	1700 feet	-	-	2200 feet	-	-	-

Notes:

1. *Paseo del Norte Interchange as determined by the I-25/Paseo del Norte Interchange Study, CN D3026.*
2. *Tramway Road Interchange no change.*
3. *Type of Speed Change Lane: Aux = ramp to ramp auxiliary lane; Decel = exclusive deceleration lane; Accel = exclusive acceleration lane*
4. *Urban design criteria were applied to the frontage roads while freeway design criteria were applied to the freeway elements including ramps.*

- Modifications are proposed to Alternative 16 for the I-25/Paseo del Norte interchange involving I-25 south of Paseo del Norte (see Figures 4-5 and 4-6) which include:
  - Northbound Direction: In Alternative 16, a slip ramp for local access is provided approximately at San Francisco Road north of San Antonio Drive. In Build Alternative 2, it is proposed to eliminate the slip ramp and combine it with the San Antonio Drive off-ramp. From the San Antonio off-ramp, a CD road is provided over San Antonio Drive for traffic to continue north. In addition, the Jefferson northbound on-ramp is eliminated.
  - Southbound Direction: Alternative 16 includes a San Antonio Drive on-ramp, elimination of the San Mateo loop off-ramp, and a Jefferson off-ramp. In Build Alternative 2, the San Antonio Drive on-ramp is eliminated, and several movements are combined at a proposed two-lane off-ramp south of the San Antonio Drive overpass. The two-lane off-ramp serves Osuna Road, a south-to-east loop ramp to San Mateo Boulevard, and a Jefferson off-ramp via a CD Road braided with the San Mateo/Osuna on-ramp.
- Channelization islands are proposed in the vicinity of the off-ramp junctions with the frontage roads to prohibit movements and to reduce conflicts.
- The desired design speed of the frontage roads is 50 mph. However, horizontal and/or vertical curvature limited the design speed that could be attained at several locations (see Table 4-2). Other speed-related design issues are as follows:
  - The sag vertical curve at the terminal of the Comanche Road northbound off-ramp does not meet stopping sight distance for 50 mph. The existing vertical curve has a sight distance adequate for a design speed of 35 mph (under comfort criteria).
  - The northbound frontage road approaching Comanche Road has a design speed of 45 mph due to the existing roadway geometry.
  - The northbound frontage road departing Comanche Road has a design speed of 45 mph to accommodate the braided ramps.
  - The braided northbound Montgomery Boulevard off-ramp has vertical curves with a 35 mph design speed.
  - Due to the loop ramp and right-of-way, the southbound frontage road approaching Montgomery Boulevard has a design speed of 40 mph.
  - The braided southbound Montgomery Boulevard on-ramp has vertical curves with a 40 mph design speed.
  - The northbound frontage road departing San Mateo Boulevard has a design speed of 40 mph to accommodate the braided ramps.
  - The braided northbound San Antonio Drive off-ramp has vertical curves with a 40 mph design speed.
  - The southbound frontage road departing San Mateo Boulevard has a design speed of 40 mph due to right-of-way constraints.
  - The southbound on-ramp from San Mateo Boulevard has a design speed of 35 mph due to the existing roadway geometry.
  - The braided southbound San Mateo Boulevard on-ramp has vertical curves with a 40 mph design speed.

Right-of-Way Requirements

The right-of-way impacts estimated for Build Alternative 2 comprise 305,400 square feet (7.01 acres) of property, excluding the additional right-of-way needed for the Paseo del Norte interchange, and 79,200 square feet (1.82 acres) of access easements. With a few exceptions, many of the impacts involve slivers of frontage property both along the frontage roads and at intersections. Based on existing land use and/or size of impact, the noteworthy impacts occur at the following locations:

- New local service road for properties abutting the northbound frontage road, south of Comanche Road
- Northbound Montaño off-ramp braid, north of Comanche Road
- Access easements at Jefferson interchange area, east of Jefferson Street
- Property on both sides of I-25 for braided ramps/CD roads, south of San Antonio Drive/Ellison Street

At the conceptual design level, gross estimates of right-of-way costs are typically prepared based on a cost per square foot of property. Other costs such as damages that may be associated with access changes are ignored because they are too difficult to estimate without an appraisal. For the purposes of this study, $20.00 per square foot was used for access easements, and $30 per square foot was used for property acquisitions. These unit costs should capture some of the unknown costs and are considered sufficient for this phase of project development.

Refer to Appendix I for plan view sheets showing the right-of-way impacts and Appendix L for cost information.

Estimated Cost

The project cost estimates for Build Alternative 2 are summarized in Table 4-3 with additional detail provided in Appendix L. Costs are estimated in today's (2009) dollars and are intended to be all inclusive at the conceptual level, including New Mexico gross receipts tax.

Table 4-3, Conceptual Project Cost Estimate for Build Alternative 2

Description	Cost
Roadway	$35,000,000
Bridges	$30,000,000
Drainage	$11,000,000
Signing & Striping	$3,000,000
Lighting	$1,000,000
Signalization/Ramp Metering/ITS	$3,000,000
Baseline Cost	**$83,000,000**
Construction Engineering	$28,000,000
Utilities	$5,000,000
Subtotal	**$116,000,000**
Contingency (30%)	$35,000,000
Engineering Design (8%)	$9,000,000
Right-of-Way / Access Easements	$11,000,000
Construction Management (12%)	$14,000,000
New Mexico Gross Receipts Tax (7%)	$8,000,000
Total Estimated Cost	**$193,000,000**

Notes: 1. Costs are based on current unit bid prices (2009).
2. Contingency percentages are based on a phased implementation of project.
3. See Appendix L for more cost information.

CHAPTER 5 BUILD ALTERNATIVE 3 DESCRIPTION

Introduction

This chapter describes the layout and key features of Build Alternative 3. Alternatives are best described through illustration; as such, refer to Appendix C for the conceptual plan view layout of Build Alternative 3. In addition, the proposed typical sections are illustrated in Figure 5-1. Details regarding the interchange layouts are summarized in Table 5-1, and details regarding ramps and frontage roads are provided in Table 5-2. Estimated project costs are shown in Table 5-3. Additional information, such as Microstation files, is provided on the project CD included in this report.

The salient aspects of the alternative that should be considered for its evaluation and comparison to the other build alternatives are summarized below. When reviewing this information, keep in mind that one overall recommended alternative will result from this study which may reflect a combination of the favored aspects of the three build alternatives.

Mainline I-25

One of the primary needs of the North I-25 corridor is to provide four basic lanes from north of I-40 to Paseo del Norte in both travel directions. Build Alternative 3 does that along with providing 12 to 14 foot shoulders and also providing auxiliary lanes to supplement on and off-ramp operations as appropriate (see Table 5-2). The bottleneck in the northbound direction at Comanche Road is eliminated, and the proper number of lanes is provided southbound exiting the I-25/Paseo del Norte interchange. Lane balance and lane continuity is provided in both travel directions. It should be noted that narrower shoulder widths exist north of I-40 approximately to Comanche Road which were constructed by the Big I project.

The proposed mainline improvements also include ITS applications to facilitate management of the corridor including ramp metering at selected on-ramps. While much of the system is expected to be installed by other projects and the specific elements of the ITS system are not defined by this study, costs for an ITS system are included in the project cost estimate.

Interchanges

Key features of the proposed interchange layouts are summarized in Table 5-1. The interchange layouts accommodate pedestrian and bicycle crossings of I-25. Summary statements for each interchange are provided below:

- Comanche Road: Full access is provided much like it is today. A notable change is the southbound off-ramp is braided with the southbound Montgomery/Montaño on-ramp. The northbound on-ramp is not braided with the Montgomery off-ramp. The existing interchange structure is retained with additional lanes on the frontage road approaches and an exclusive right-turn lane west-to-north. An exclusive right-turn lane is needed east-to-south but it was not provided due to right-of-way impacts. Access modifications are proposed on the west side of the interchange.
- Montgomery Boulevard/Montaño Road: Total reconstruction is proposed based on a tight diamond configuration with advance u-turns. Full access is provided but the loop ramp is eliminated. The northbound off-ramp is not braided with the Comanche on-ramp. Dual left-turn lanes are provided in both directions with additional storage provided upstream of the frontage road intersections. Access modifications are provided on the east side which includes a grade-separated local service road.
- Jefferson Street: Reduced access is proposed as the southbound off-ramp is eliminated. Total reconstruction is proposed based on a tight diamond configuration with advance u-turns. Access modifications are proposed on the east side of the interchange.
- San Mateo Boulevard/Osuna Road: Full access is proposed, which includes direct access to Osuna Road from southbound I-25 and a south-to-east loop ramp. A new bridge structure is proposed to provide side-by-side dual left-turns lanes, an advance u-turn on the north side, a lane add from the loop ramp, and the width to accommodate future bus rapid transit on San Mateo Boulevard/Osuna Road. Additional lanes are provided on the frontage road approaches and exclusive right-turn lanes are provided west-to-north (duals) and east-to-south. Access modifications are proposed on the west side. The lane addition from the loop ramp continues south to the Academy Road intersection where the fourth lane is dropped.
- San Antonio Drive: Direct freeway access at San Antonio Drive/Ellison Street is not provided in this alternative. However, a northbound slip ramp from the frontage road is provided just south of Paseo del Norte which could be construed as a relocated San Antonio on-ramp. The existing overpass is retained with additional lanes on the frontage road approaches and an exclusive right-turn lane east-to-south. Access modifications are proposed on the east side along San Antonio.
- Paseo del Norte: The design of this interchange was determined by the I-25/Paseo del Norte Interchange Study, CN D3026, referred to as Alternative 16, and includes access restrictions. A system interchange is proposed for regional movements, while local movements are accommodated by the Domingo Baca Arterial and the frontage road system. The Domingo Baca Arterial passes under I-25 in a compressed diamond configuration with advance u-turns.
- Alameda Boulevard: Full access is provided and the existing overpass is retained. The southbound off-ramp is moved north and is converted to a two-lane off-ramp. Additional lanes are provided on the southbound frontage road from the ramp to Alameda Boulevard. Access modifications are proposed on both sides of the interchange. It should be noted that a project (PIN 578.0) is identified in the 2030 MTP to widen Alameda Boulevard from Edith Boulevard to I-25, and a another project (PIN 506.0) is identified to widen Alameda from San Pedro to Ventura. While not identified in this North I-25 study, the I-25 bridge structure may require reconstruction to provide the required number of travel lanes and pedestrian/bicycle improvements within and through the interchange. The need for this will be determined by the planned Alameda widening projects.
- Tramway Road: Full access is provided. No modifications are proposed for this interchange.

Ramps and Frontage Roads

Key features associated with ramps and the frontage road approaches and departures to the major cross streets are summarized in Table 5-2. Build Alternative 3 does not include ramp metering as part of the proposed improvements. Additional information follows that addresses notable aspects of the proposed conceptual design:

- Access to the properties fronting the northbound frontage road south of Comanche is eliminated from the frontage road and is replaced by access easements from Aztec Road and Princeton Drive through adjacent properties.
- Modifications are proposed to Alternative 16 for the I-25/Paseo del Norte interchange involving I-25 south of Paseo del Norte.
  - Northbound Direction: A San Antonio northbound off-ramp is provided in Alternative 16 which is eliminated in Build Alternative 3.
  - Southbound Direction: Alternative 16 includes a San Antonio Drive on-ramp and a Jefferson off-ramp. In Build Alternative 3, both of these ramps are eliminated.
- Channelization islands are proposed in the vicinity of the off-ramp junctions with the frontage roads to prohibit movements and to reduce conflicts.
- The desired design speed of the frontage roads is 50 mph. However, horizontal and/or vertical curvature limited the design speed that could be attained at several locations (see Table 5-2). Other speed-related design issues are as follows:

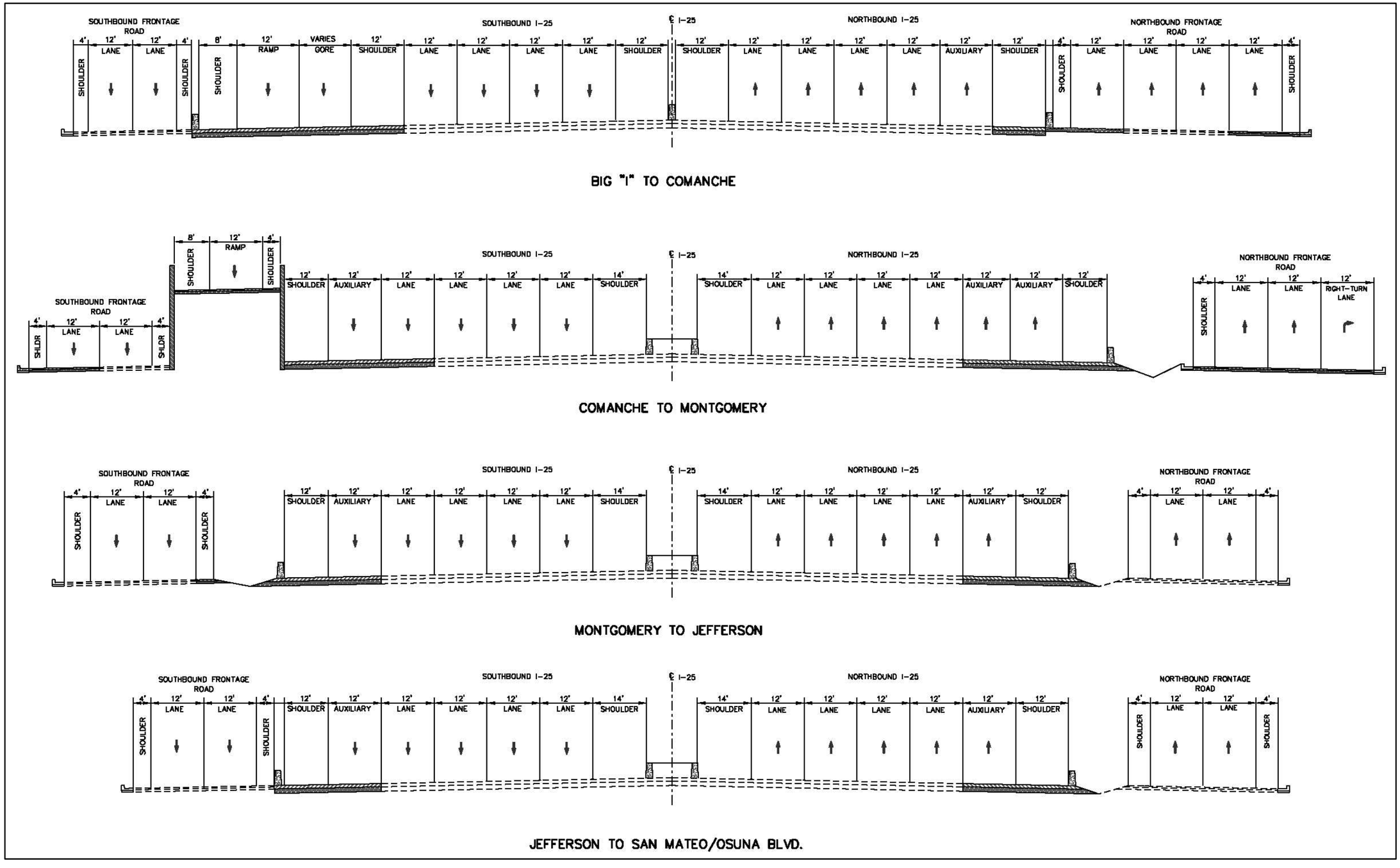


Figure 5-1, Build Alternative 3 Typical Sections

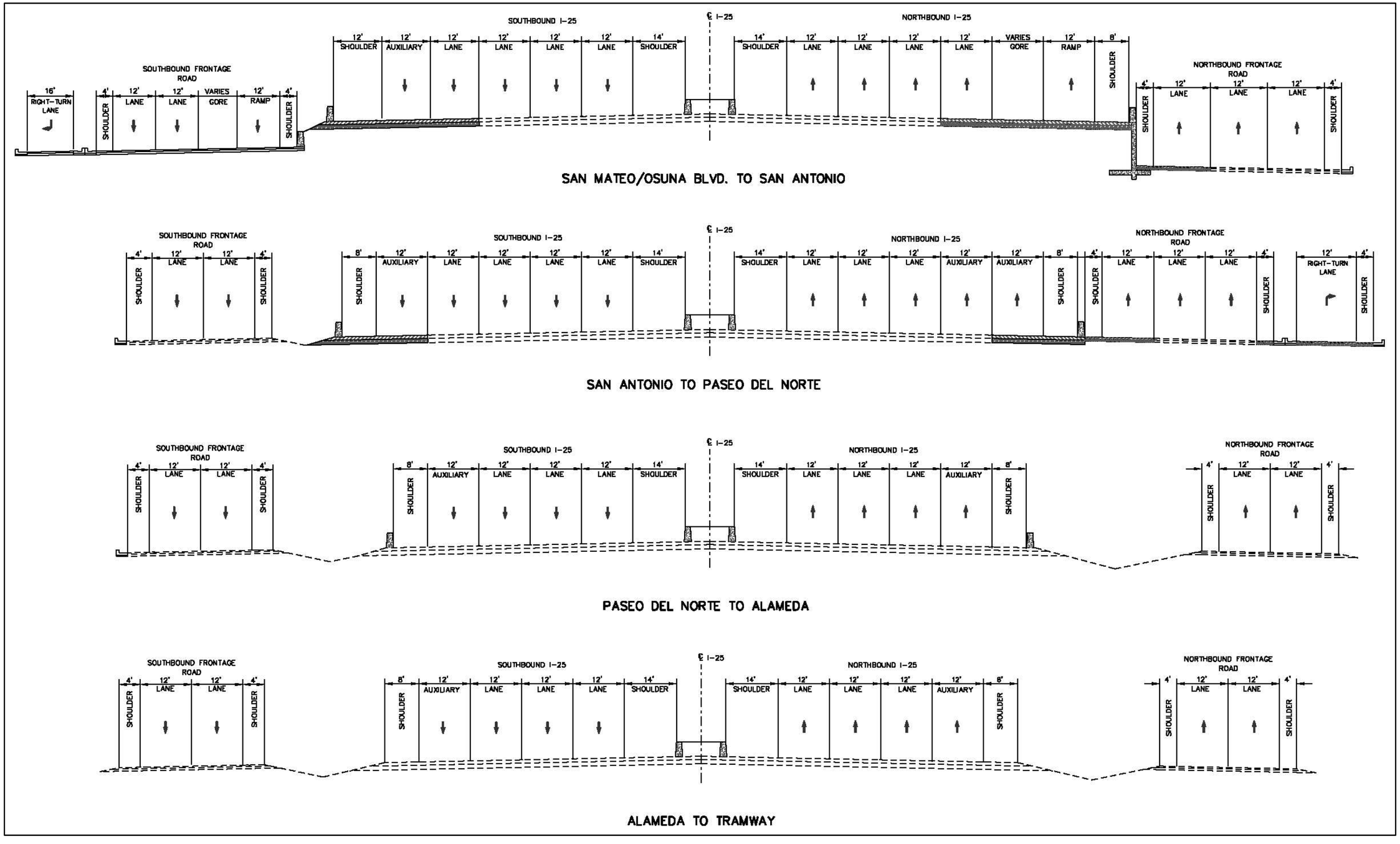


Figure 5-1, Build Alternative 3 Typical Sections (continued)

Table 5-1, Interchange Aspects of Build Alternative 3

DESCRIPTION (SEE APPENDIX C)	COMANCHE ROAD INTERCHANGE	MONTGOMERY BOULEVARD/MONTAÑO ROAD INTERCHANGE	JEFFERSON STREET INTERCHANGE	SAN MATEO BOULEVARD/OSUNA ROAD INTERCHANGE
Type of Interchange	Compressed Diamond	Tight Diamond with Advance U-turns	Tight Diamond with Advance U-turns	Compressed Diamond with Loop Ramp and Advance U-turn on North Side
Status of Bridge Structure	Existing	New	New	New
Signalized Frontage Road Intersection Spacing (centerline)	500 feet	350 feet	360 feet	780 feet
Eastbound Left-turn Storage (total)	370 feet (existing)	430 feet (side-by-side), plus upstream storage of 1000 feet (side-by-side)	430 feet (side-by-side), plus upstream storage of 740 feet (side-by-side)	1260 feet (side-by-side)
Westbound Left-turn Storage (total)	450 feet (existing)	450 feet (side-by-side), plus upstream storage of 650 feet (side-by-side)	420 feet (side-by-side), plus upstream storage of 630 feet (side-by-side)	1260 feet (side-by-side)
Northbound Frontage Road Design Speed thru Intersection	45 mph	50 mph	50 mph	50 mph
Southbound Frontage Road Design Speed thru Intersection	50 mph	50 mph	50 mph	40 mph
Cross Street Design Speed, West of I-25	45 mph	50 mph	35 mph	50 mph
Cross Street Design Speed, East of I-25	45 mph	50 mph	40 mph	50 mph
Access Management to the East	No changes proposed	Close first median opening; provide grade-separated service road	Close first median opening; realign Restaurant Lane; Access easement connecting Jefferson St to Monroe St	No changes proposed
Access Management to the West	Extend raised median to Alexander Blvd; move driveway on north side further west; eliminate first drive on south side	No changes proposed	No changes proposed	First median opening converted to right-in/right-out on both sides and left-in allowed east-to-north

DESCRIPTION (SEE APPENDIX C)	SAN ANTONIO DRIVE/ELLISON STREET INTERCHANGE	PASEO DEL NORTE INTERCHANGE/ DOMINGO BACA ARTERIAL	ALAMEDA BOULEVARD INTERCHANGE	TRAMWAY ROAD INTERCHANGE
Type of Interchange	Compressed Diamond (no direct freeway access is provided)	Alternative 16; Compressed Diamond with Advance U-turns	Compressed Diamond	Compressed Diamond
Status of Bridge Structure	Widen Existing	New	Existing	Existing
Signalized Frontage Road Intersection Spacing (centerline)	570 feet	390 feet	575 feet	680 feet
Eastbound Left-turn Storage (total)	180 feet (existing)	250 feet (single)	160 feet (existing)	410 feet (existing)
Westbound Left-turn Storage (total)	375 feet (existing)	280 feet (single)	390 feet (existing)	820 feet (existing)
Northbound Frontage Road Design Speed thru Intersection	45 mph	35 mph	45 mph	50 mph
Southbound Frontage Road Design Speed thru Intersection	45 mph	35 mph	40 mph	50 mph
Cross Street Design Speed, West of I-25	35 mph	40 mph	50 mph	50 mph
Cross Street Design Speed, East of I-25	45 mph	35 mph	35 mph	50 mph
Access Management to the East	First median opening modified to eliminate minor street thrus and left-turns	Per Standard	First median opening modified to eliminate minor street thrus and left-turns	No changes proposed
Access Management to the West	No changes proposed	Per Standard	First median opening modified to eliminate minor street thrus and left-turns	No changes proposed

Table 5-2, Ramp and Frontage Road Attributes of Build Alternative 3

Description (See Appendix C)	Comanche Road Interchange	Montgomery Boulevard/Montaño Road Interchange	Jefferson Street Interchange	San Mateo Boulevard/Osuna Road Interchange	San Antonio Boulevard/Ellison Street Interchange	Alameda Boulevard Interchange

Northbound	Off-Ramp	On-Ramp	Off-Ramp	On-Ramp	Off-Ramp	On-Ramp	Off-Ramp	On-Ramp	-	Off-Ramp	On-Ramp	Off-Ramp	On-Ramp
Number of Lanes at the Ramp/Freeway Junction	2	1	2	1	2	1	2	1	-	Eliminated	Eliminated	1	1
Type of Ramp Junction	Diverge	Weave	Weave	Weave	Weave	Weave	Weave	Weave	-	-	-	Weave	Lane Add
Type of Speed Change Lane/Length (feet)	Decel/800	Aux plus Recovery	Aux	Aux	Aux	Aux	Aux	Aux	-	-	-	Aux	Aux
Ramp Controlling Curve Design Speed	50	50	50	50	50	50	50	40	-	-	-	50	35
Metered or Not Metered	-	Not Metered	-	Not Metered	-	Not Metered	-	Not Metered	-	-	-	-	Not Metered
Braided or Not Braided	Not Braided	Not Braided	Not Braided	Not Braided	Not Braided	Not Braided	Not Braided	Not Braided	-	-	-	Not Braided	Not Braided
Distance along Frontage Road from Off-ramp to Intersection	1150 feet	-	1150 feet	-	1100 feet	-	1330 feet	-	-	-	-	930 feet	-
Distance along Frontage Road from Intersection to On-ramp	-	770 feet	-	800 feet	-	750 feet	-	710 feet	-	-	-	-	780 feet
Storage for Metered Vehicles on the On-ramp	-	-	-	-	-	-	-	-	-	-	-	-	-

Southbound	Off-Ramp	On-Ramp	Off-Ramp	On-Ramp	Off-Ramp	On-Ramp	Off-Ramp	Loop Ramp	On-Ramp	Off-Ramp	On-Ramp	Off-Ramp	On-Ramp
Number of Lanes at the Ramp/Freeway Junction	2	1	1	1	Eliminated	1	1	1	1	Eliminated	Eliminated	2	1
Type of Ramp Junction	Diverge	Lane Add	Diverge	Merge	-	Merge	Diverge	Lane Drop	Merge	-	-	Lane Drop	Weave
Type of Speed Change Lane/Length (feet)	Decel/1200	Aux	Aux	Accel/1100	-	Aux	No Decel	Aux	Accel/1900	-	-	Aux	Aux
Ramp Controlling Curve Design Speed	50	50	50	40	-	50	50	25.5	35	-	-	50	50
Metered or Not Metered	-	Not Metered	-	Not Metered	-	Not Metered	-	-	Not Metered	-	-	-	Not Metered
Braided or Not Braided	Braided	Not Braided	Not Braided	Braided	-	Not Braided	Not Braided	Not Braided	Not Braided	-	-	Not Braided	Not Braided
Distance along Frontage Road from Off-ramp to Intersection	1730 feet	-	1050 feet	-	-	-	1290 feet	-	-	-	-	2300 feet	-
Distance along Frontage Road from Intersection to On-ramp	-	890 feet	-	820 feet	-	700 feet	-	-	580 feet	-	-	-	660 feet
Storage for Metered Vehicles on the On-ramp	-	-	-	-	-	-	-	-	-	-	-	-	-

Notes:

1. *Paseo del Norte Interchange as determined by the I-25/Paseo del Norte Interchange Study, CN D3026.*
2. *Tramway Road Interchange no change.*
3. *Type of Speed Change Lane: Aux = ramp to ramp auxiliary lane; Decel = exclusive deceleration lane; Accel = exclusive acceleration lane*
4. *Urban design criteria were applied to the frontage roads while freeway design criteria were applied to the freeway elements including ramps.*

- The sag vertical curve at the terminal of the Comanche Road northbound off-ramp does not meet stopping sight distance for 50 mph. The existing vertical curve has a sight distance adequate for a design speed of 35 mph (under comfort criteria).
- The northbound frontage road approaching Comanche Road has a design speed of 45 mph due to the existing roadway geometry.
- The braided southbound Montgomery Boulevard on-ramp has vertical curves with a 40 mph design speed.
- The bicycle lane for westbound Montgomery Boulevard is located between three through lanes and two right turn lanes. This is an undesirable and potentially unsafe location for a bicycle lane.
- The southbound frontage road departing San Mateo Boulevard has a design speed of 40 mph due to right-of-way constraints.
- The southbound on-ramp from San Mateo Boulevard has a design speed of 35 mph due to the existing roadway geometry.

Right-of-Way Requirements

The right-of-way impacts estimated for Build Alternative 3 comprise 70,500 square feet (1.62 acres) of property, excluding the additional right-of-way needed for the Paseo del Norte interchange, and 132,000 square feet (3.03 acres) of access easements. With a few exceptions, many of the impacts involve slivers of frontage property both along the frontage roads and at intersections. Based on existing land use and/or size of impact, the noteworthy impacts occur at the following locations:

- Access Easements for Properties abutting the Northbound Frontage Road, south of Comanche Road
- Access Easements at Jefferson Interchange Area, east of Jefferson Street

At the conceptual design level, gross estimates of right-of-way costs are typically prepared based on a cost per square foot of property. Other costs such as damages that may be associated with access changes are ignored because they are too difficult to estimate without an appraisal. For the purposes of this study, $20.00 per square foot was used for access easements, and $30 per square foot was used for property acquisitions. These unit costs should capture some of the unknown costs and are considered sufficient for this phase of project development.

Refer to Appendix J for plan view sheets showing the right-of-way impacts and Appendix M for cost information.

Estimated Cost

The project cost estimates for Build Alternative 3 are summarized in Table 5-3 with additional detail provided in Appendix M. Costs are estimated in today's (2009) dollars and are intended to be all inclusive at the conceptual level, including New Mexico gross receipts tax.

Table 5-3, Conceptual Project Cost Estimate for Build Alternative 3

Description	Cost
Roadway	$28,000,000
Bridges	$27,000,000
Drainage	$11,000,000
Signing & Striping	$3,000,000
Lighting	$1,000,000
Signalization/Ramp Metering/ITS	$2,000,000
Baseline Cost	**$72,000,000**
Construction Engineering	$25,000,000
Utilities	$5,000,000
Subtotal	**$102,000,000**
Contingency (30%)	$30,000,000
Engineering Design (8%)	$8,000,000
Right-of-Way / Access Easements	$5,000,000
Construction Management (12%)	$12,000,000
New Mexico Gross Receipts Tax (7%)	$7,000,000
Total Estimated Cost	**$164,000,000**

Notes: 1. Costs are based on current unit bid prices (2009).
2. Contingency percentages are based on a phased implementation of project.
3. See Appendix M for more cost information.

CHAPTER 6 EVALUATION AND COMPARISON OF ALTERNATIVES

Introduction

The North I-25 corridor is a developed corridor with established features that were incorporated into the proposed improvement alternatives. The retrofitted improvements in the corridor focus on solutions that optimize the capacity of the existing facility to achieve a reasonable level of service. The highest priority for proposed improvements is the performance of the mainline freeway. Accommodating access to and from the mainline freeway is secondary to mainline functionality in the overall management of the corridor.

The engineering component of the Phase 1B detailed analysis was performed at a conceptual level but with enough engineering effort to determine the extents and costs associated with required improvements to support subsequent planning and programming activities for the project. In addition to the No Build Alternative, three build alternatives were developed, which are evaluated in this chapter. Because the objective of this phase of the analysis is to compare project alternatives and to select those that will be evaluated in Phase 1C, the No Build Alternative is generally not included in the evaluation. The No Build Alternative is a viable action and provides a baseline against which other alternatives can be compared; it will be automatically included in subsequent Phase 1C documentation. The NMDOT desire for this study is to identify one recommended alternative for the corridor.

The primary evaluation factors discussed in this report include the following:

- Key Design Features
- Access Management
- Guide Signing Review
- Estimated Costs (2009 dollars)
- Right-of-Way Requirements
- Traffic Performance
- Conceptual Drainage Analysis
- Underground and Overhead Utilities Review
- Environmental Items

The evaluation of business, community and environmental impacts is an important part of the evaluation of alternatives process. For the purposes of this study, these aspects were evaluated to identify critical issues and factors that will require detailed analyses in Phase 1C of the project development process, and to determine major differences between alternatives with regard to their effect on the human and natural environment.

Key Design Features

This section discusses conceptual design and configuration aspects of the mainline freeway and the interchanges. At the planning stage of the project development process, it is prudent to conceptualize improvements using desired design standards, minimum standards acceptable, while striving for no design exceptions. This is the approach the design team utilized to develop the build alternatives evaluated in Phase 1B. The design criteria used for this phase were summarized in Chapter 2. Refer to Chapters 3, 4 and 5 for the descriptions of the build alternatives.

Mainline I-25

Each of the build alternatives provide four basic lanes in both travel directions from north of I-40 to Paseo del Norte along with auxiliary lanes to supplement on and off-ramp operations as appropriate. As such, the primary differences between the alternatives involve the ramp and interchange layouts rather than the mainline freeway. The major differences involve (1) ramp spacing and sequence, (2) ramp design to accommodate ramp metering, and (3) techniques to reduce conflicts. Each of these is discussed in the following paragraphs.

Ramp Spacing and Sequence

The ramp spacing criteria used for the development of the build alternatives was included in Chapter 2 as Figure 2-17. The proposed ramp spacing in all of the build alternatives exceeds the AASHTO Green Book requirements and in many cases desirable criteria are exceeded.

Figure 6-1 is a schematic illustration of ramp spacing and sequence for each of the build alternatives which highlights closely-spaced successive ramps and weave sections. From a spatial context, the highlighted segments represent portions of the proposed layouts that can be used to compare the alternatives even though they are configured to standard. Notable observations include:

- **Northbound I-25**
  - *Comanche off-ramp to Montgomery off-ramp*: Better spacing is provided in Build Alt 2 which is favored over the layout of Build Alt 1.
  - *Comanche on-ramp to Montgomery off-ramp*: This weave section is only proposed in Build Alt 3. The braided configuration eliminating the weave section is preferred because it reduces conflicts on the freeway and ramp metering can be accommodated on the Comanche on-ramp.
  - *Montgomery on-ramp to Jefferson off-ramp*: The layout in Build Alt 2 provides better separation between these ramps by reducing the amount of queue storage on the Montgomery on-ramp for metering (see Figure 6-2 for the competing design aspects associated with ramp metering). Build Alt 3 lengthens the ramp spacing beyond the weave length definition because ramp metering is not accommodated, which is not preferred.
  - *Jefferson on-ramp to San Mateo/Osuna off-ramp*: Build Alt 3 includes a Jefferson on-ramp which creates a weave section on the freeway. This is not preferred because the weave occurs on a horizontal curve and creates more conflicts on the freeway, and ramp metering is not accommodated. Eliminating the Jefferson on-ramp in Build Alts 1 and 2 is preferred but will result in higher traffic volumes at the San Mateo Boulevard/Northbound Frontage Road intersection where operational deficiencies are expected.
  - *San Antonio off-ramp*: This ramp is only eliminated in Build Alt 3. Eliminating the San Antonio off-ramp will result in higher traffic volumes at the San Mateo Boulevard/Northbound Frontage Road intersection where operational deficiencies are expected. However, the successive off-ramps proposed in Build Alts 1 and 2 are preferred because they may draw more traffic off the freeway prior to the San Mateo/Osuna on-ramp than a single, combined off-ramp.
  - *San Mateo/Osuna on-ramp to Paseo del Norte local off-ramp*: Build Alt 1 and Build Alt 3 propose a weave section along this segment of I-25 while Build Alt 2 eliminates the local off-ramp and weave section by combining the local off-ramp with the San Antonio off-ramp and by providing a CD road over San Antonio Drive to continue north. The layout of Build Alt 2 is preferred because it eliminates the weave section and provides greater distance for the San Mateo on-ramp and Paseo del Norte regional off-ramp traffic to merge and diverge (i.e., change lanes in general).
  - *San Antonio on-ramp to Alameda off-ramp*: Proposed conditions are the same in all build alternatives along this segment of northbound I-25. The weave section between Paseo del Norte and Alameda is retained however the Paseo del Norte loop on-ramp only serves the east-to-north movement so the weaving volumes will be lower than in the No Build condition. Access from westbound Paseo del Norte is eliminated which will require this traffic to redistribute to either the relocated San Antonio on-ramp or the Alameda on-ramp via the local street system and/or the northbound frontage road.

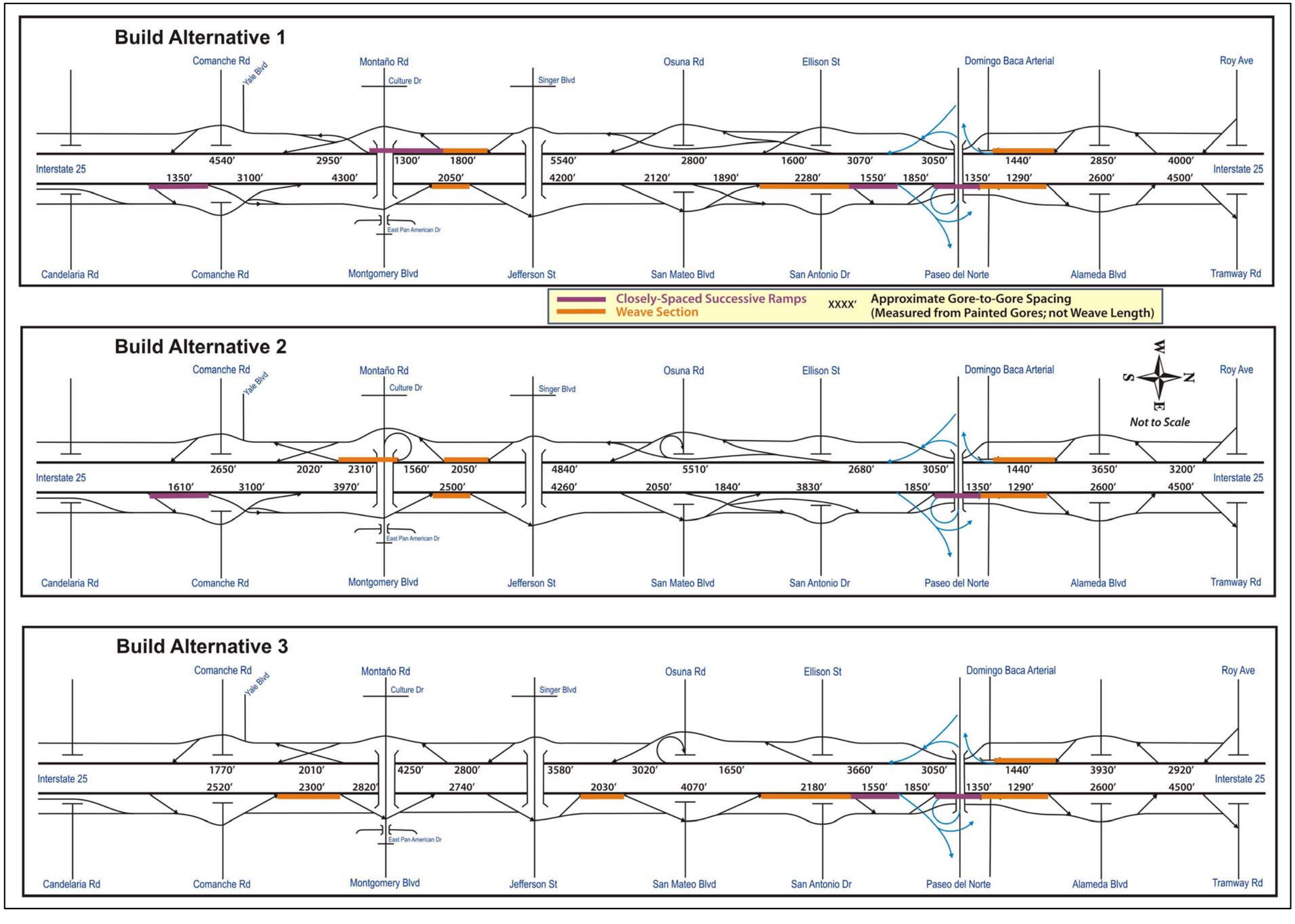


Figure 6-1, Ramp Spacing Schematic for the Build Alternatives

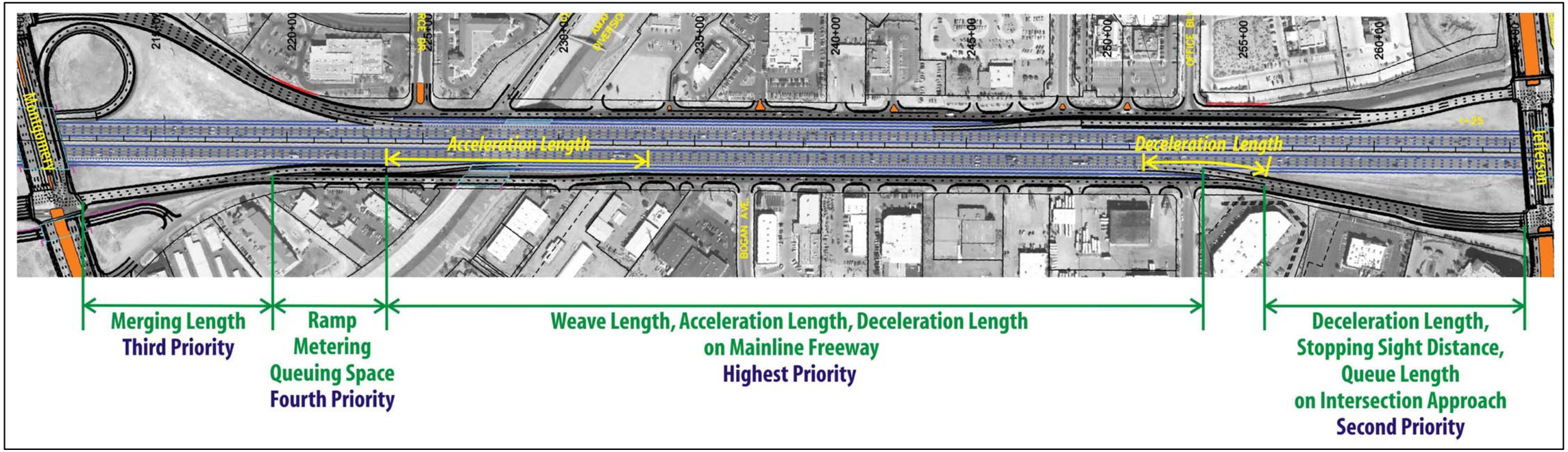


Figure 6-2, Competing Design Aspects associated with Ramp Metering

- **Southbound I-25**
  - *Alameda off-ramp*: This ramp is relocated in all build alternatives. The preferred layout is shown in Build Alt 2 because it maintains 3000 feet between the Tramway on-ramp and Alameda off-ramp, it provides a two-lane exit, and has lesser impact on the local street connectivity to the southbound frontage road. Based on the proposed improvements, this off-ramp will serve Alameda Boulevard, Paseo del Norte, and San Antonio Drive/Ellison Street which is the purpose for moving the off-ramp north.
  - *Alameda on-ramp to Paseo del Norte off-ramp*: Proposed conditions are the same in all build alternatives along this segment of southbound I-25. The weave section between Alameda and Paseo del Norte is retained however the Paseo del Norte directional off-ramp only serves the south-to-west movement so the weaving volumes will be lower than in the No Build condition.
  - *San Antonio on-ramp and San Mateo loop off-ramp*: Based on the existing problems along this segment of freeway, either the San Antonio on-ramp or the San Mateo loop off-ramp must be eliminated from having direct access to the mainline freeway. Build Alt 1 provides an on-ramp from San Antonio/Ellison however the layout is not desirable because insufficient length exists between San Antonio/Ellison and San Mateo/Osuna for merging, weaving and queuing on the frontage road. Build Alt 2 provides a San Mateo loop off-ramp via a CD road, which is consistent with AASHTO guidance, and includes a two-lane off-ramp from the freeway. Build Alt 3 also provides a San Mateo loop off-ramp but it diverges directly from the mainline freeway. The Build Alt 3 layout provides longer distance for Paseo del Norte traffic to merge into the four-lane freeway because the fifth lane is dropped at the loop ramp as the San Mateo/Osuna off-ramp is a diverge from the freeway. Build Alt 2 is preferred because access to and from the San Mateo/Osuna interchange is a higher priority than at the San Antonio/Ellison interchange, and it accommodates the loop off-ramp and better access to Jefferson Street. San Antonio/Ellison traffic will pass through the at-grade Osuna Road/ Southbound Frontage Road intersection in Build Alt 2 to access the southbound freeway.
  - *Jefferson off-ramp*: Direct access from the mainline freeway to Jefferson Street is eliminated in all alternatives, and all alternatives require Jefferson traffic to exit at the San Mateo/Osuna off-ramp. Build Alts 1 and 2 provide a CD road over San Mateo Boulevard that is braided with the San Mateo/Osuna on-ramp to provide access to Jefferson Street. Build Alt 3 requires Jefferson traffic to pass through the at-grade Osuna Road/Southbound Frontage Road intersection. Eliminating the Jefferson Street CD road continuation in Build Alt 2 is not preferred because it would overload the Osuna Road/Southbound Frontage Road intersection (because San Antonio traffic is also using the intersection).
  - *Jefferson on-ramp to Montgomery/Montaño off-ramp*: Build Alt 1 and Build Alt 2 differ slightly because of the different layouts at the Montgomery/Montaño off-ramp junction. Build Alt 3 lengthens the ramp spacing beyond the weave length definition because ramp metering is not accommodated, which is not preferred. As such, the layout in Build Alt 1 and/or Build Alt 2 is preferred and the final layout can be adjusted to balance the requirements along this segment of the corridor.
  - *Montgomery/Montaño off-ramp to Comanche off-ramp*: This applies only to Build Alt 1. While the layout shown in Build Alt 1 can be designed to provide ramp spacing that is consistent with standards, the overall length from the Jefferson on-ramp to the Comanche off-ramp is tight. Greater weave distance between the Jefferson on-ramp and Montgomery/Montaño off-ramp is desirable and moving the Comanche off-ramp further south to increase the separation between successive off-ramps would result in greater impacts and costs. In addition, the Comanche off-ramp serves multiple arterial streets so maximizing the sign-ability of this off-ramp is desirable.

- *Comanche off-ramp/Montgomery/Montaño on-ramp braid*: A braided ramp configuration is proposed for these ramps in all build alternatives. The configuration shown in Build Alts 2 and 3 is preferred primarily because it keeps the Comanche off-ramp nearer to its existing location and requires less right-of-way than the layout shown in Build Alt 1.
- *Montgomery loop on-ramp to Comanche off-ramp*: The Montgomery loop on-ramp shown in Build Alt 2 creates a weave section on the mainline freeway which is not desirable. Also, to accommodate ramp metering, a two-lane roadway is proposed which has not been attempted in this region and may not be consistent with driver expectation.

Ramp Design to Accommodate Ramp Metering

Build Alternative 1 and Build Alternative 2 accommodate ramp metering, Build Alternative 3 does not. Ramp metering is proposed for the on-ramps between I-40 and Paseo del Norte to facilitate future traffic management of the North I-25 corridor. If ramp metering is included in the recommended improvements, the implementation and design of the ramp metering system will require further evaluation which may require several design iterations to determine the best solution specific to the North I-25 corridor.

The frontage road system introduces a few complexities when applying ramp metering to North I-25. There are many competing objectives to consider which all must be balanced including (see Figure 6-2):

1. Weave length, acceleration length, and deceleration length on mainline freeway.
2. Sufficient separation from the off-ramp/frontage road junction to the downstream signalized intersection.
3. Sufficient distance from the signalized intersection to downstream ramp/frontage road junction.
4. Queue storage on the on-ramp roadways, or ramp proper, with potential for spillover onto the frontage road.
5. Right-of-way impacts.

The differences between Build Alts 1 and 2 with regard to ramp metering primarily involve the queue storage length provided on the ramp roadway. Because Build Alt 2 benefited from the experience of laying out Build Alt 1, the layouts in Build Alt 2 are generally preferred. A common technique used in both alternatives is to provide two-lane off-ramps which provide some mitigation for weave operations. In addition, the San Antonio southbound on-ramp in Build Alt 1 was the only on-ramp between Paseo del Norte and I-40 without metering because of the limited space available. Also, in all build alternatives, the Paseo del Norte directional southbound on-ramps are not metered. The east-to-south ramp is self-metered as the design includes a one-lane ramp whereas the travel demand requires two lanes of capacity.

Reduction of Conflicts

Conflicts along a freeway are introduced whenever an on-ramp or off-ramp is provided. The degree to which the freeway can absorb these conflicts depends primarily on traffic demand (i.e., density) and the spacing between ramps (assuming all ramps are properly designed). With increasing traffic density, the ability of the freeway to absorb conflicts is reduced even with well-spaced ramps.

The North I-25 corridor has closely-spaced ramps and high traffic demand making methods to mitigate conflicts applicable to the corridor. The techniques used to reduce conflicts along the mainline freeway included:

- Use of braided ramps
- Use of collector-distributor (CD) roads
- Elimination of ramps

Build Alts 1 and 2 incorporate all of the techniques while Build Alt 3 does not propose any CD roads. Many of the locations where minimum design speeds were used in the build alternatives involve braided ramp configurations either due to horizontal or vertical curvature. Refer to the above for further discussion on the attributes of the build alternatives with respect to conflict reduction.

Interchanges

The interchange layouts shown in the build alternatives are interchangeable except where loop ramps are shown because the loop ramp may change the ramp configuration on the mainline freeway. Therefore, this discussion is not specific to a build alternative but compares interchange types and considerations by individual interchange. The key differences in the interchange layouts involve the following:

- Widening the existing bridge structure or complete reconstruction
- Spacing between signalized frontage road intersections
- Left-turn queue storage on the arterial within the interchange
- Frontage road design speed through the signalized intersections
- Lane configuration on the frontage roads approaching the signalized intersections
- Loop ramps
- Advance u-turns

The interchange types must be consistent along the North I-25 corridor to adhere to driver expectation and route continuity considerations. The signalized intersection spacing within the interchanges varies from 350 feet to 780 feet because of the frontage road system, adjacent intersections, and right-of-way constraints. When referring to diamond interchange configurations, a compressed diamond has signal spacing of 400 to 800 feet and a tight diamond has a signal spacing of 250 to 400 feet.

Refer to Chapters 3, 4 and 5 for descriptions of the build alternatives and key design features of the interchanges. Design features are not repeated in this chapter; rather, the following discussion provides insights into the interchange layouts proposed for the North I-25 interchanges.

Comanche Road Interchange

The key issue at this interchange is whether or not the existing bridge structure should be replaced. Factors similar in the proposed alternatives include the compressed diamond intersection spacing, frontage road design speed, and no loop ramps. The bridge structure controls other key issues as follows:

- Keep the Existing Bridge Structure
  - No improvements over the existing condition.

- Reconstruct the Bridge Structure
  - Side-by-side dual left-turn lanes for queue storage are provided.
  - Advance u-turns are provided.
  - Improved pedestrian and bicycle accommodations are provided.

Other improvements such as adding lanes to the frontage road approaches and adding a right-turn lane on the westbound approach apply to both proposed alternatives. For programming purposes, the reconstruction alternative is considered the preferred alternative.

Montgomery Boulevard/Montaño Road Interchange

The Montgomery/Montaño interchange must be reconstructed to accommodate the proposed improvements to the mainline freeway due to insufficient clearance between the bridge piers. With reconstruction, all alternatives include pedestrian and bicycle improvements and maximized lane configurations for capacity and queue storage. The three alternatives considered and notable aspects of them are:

- Compressed Diamond with Advance U-turns
  - Eliminating the loop ramp and providing advance u-turns differs from the existing configuration but provides a geometric design that meets design standards.

- Compressed Diamond with a Loop Ramp
  - The loop ramp is consistent with the existing interchange configuration. The proposed loop is a two-lane, metered ramp with a 25 mph design speed and a deceleration lane on the Montgomery bridge.
  - The loop ramp provides additional capacity compared to the other two alternatives.
  - The loop ramp introduces another ramp junction and creates a weave section on the mainline freeway, which is not desirable.
  - The extra space required to provide the loop ramp reduces the design speed of the southbound frontage road from 50 mph to 40 mph.
  - Advance u-turns are not included. An advance u-turn could be added on the south side but the loop ramp precludes it on the north side.

- Tight Diamond with Advance U-turns
  - Provides a compact, urban design.
  - Increases separation from access points adjacent to the interchange.
  - Left-turn queue storage upstream of the frontage roads was voiced as a concern due to the possibility of turning the wrong way down a frontage road.
  - Requires specialized traffic signal phasing and operation to achieve the benefits of the tight diamond layout.

The compressed diamond with advance u-turns is the leading alternative for this interchange. The loop ramp provides additional arterial capacity but creates additional conflicts on the mainline freeway. Because mainline freeway operations are the highest priority, the loop ramp is not preferred. The upstream storage required in the tight diamond increases the potential for wrong-way entry. AASHTO guidelines state that designs should discourage wrong-way entry therefore the tight diamond is not preferred.

Jefferson Street Interchange

Primary needs at this interchange include (1) eliminating the angle points where the frontage roads intersect and cross Jefferson Street to improve the frontage road design speed, and (2) providing additional capacity and queue storage on the Jefferson Street overpass. The interchange types proposed include a compressed diamond, which widens the existing bridge structure, or a tight diamond, which assumes full reconstruction. Two compressed diamond alternatives are proposed with the only difference being advance u-turns. As indicated above, the tight diamond is not preferred due to wrong-way entry concerns.

San Mateo Boulevard/Osuna Road Interchange

This is one of the more complicated interchanges in the North I-25 corridor because of its interaction with the San Antonio/Ellison and Jefferson interchanges and the high traffic demand that uses the interchange. The intersection spacing of the interchange is constant (780 feet) and the design speeds are similar for all the alternatives. The alternatives proposed and key observations for each are as follows:

- Compressed Diamond
  - Widens the existing bridge and eliminates the loop ramp.
  - Adds a sidewalk along the south side of San Mateo Boulevard through the interchange.
  - Left-turn storage within the interchange is insufficient.
  - Issues are expected on the southbound frontage road approach due to the short distance from the off-ramp to the intersection and the additional left-turn traffic from the loop ramp.

- Compressed Diamond with Loop Ramp
  - Widens the existing bridge and retains the loop ramp.
  - Loop ramp has a 25 mph design speed and yields at its junction with San Mateo Boulevard.
  - Adds a sidewalk along the south side of San Mateo Boulevard through the interchange.
  - Left-turn storage within the interchange is insufficient.

- Compressed Diamond with Loop Ramp (Reconstructed)
  - Reconstructs the bridge and retains the loop ramp.
  - A fourth lane is added at the loop ramp junction with San Mateo Boulevard which continues to the San Mateo/Academy Road intersection. The design speed of the loop ramp is 25 mph.
  - Does not provide a sidewalk on the south side of San Mateo Boulevard.
  - Provides an advance u-turn on the north side.
  - Provides side-by-side dual left-turn lanes for queue storage needs.
  - Location of bridge abutment on north side must consider the existing drainage channel (Borealis Arroyo).

Other improvements such as adding lanes to the frontage road approaches, adding dual right-turn lanes on the westbound approach, and adding an eastbound right-turn lane apply to all proposed alternatives. For programming purposes, the reconstruction alternative is considered the preferred alternative. However, the reconstructed bridge width should be increased to accommodate a future dedicated transit facility being considered in the 2035 MTP development, a sidewalk on the south side of San Mateo Boulevard through the interchange, and enough span to avoid impacts to the Borealis Arroyo on the north side.

San Antonio Drive Interchange

Direct access to the San Antonio/Ellison interchange is proposed to be substantially reduced in all alternatives. The proposed improvements include additional lanes on the frontage road approaches and adding a right-turn lane on the eastbound approach. The bridge structure will be retained, but widened for additional lanes on I-25. These improvements are consistent for all build alternatives.

Paseo del Norte Interchange

The design of this interchange was determined by the I-25/Paseo del Norte Interchange Study, CN D3026. Two build alternatives were advanced to the DEIS stage, Alternative 7 and Alternative 16. At this time, the locally preferred alternative is Alternative 16. A system interchange is proposed for regional movements, while local movements are accommodated by the Domingo Baca Arterial and the frontage road system. The Domingo Baca Arterial passes under I-25 in a compressed diamond configuration with advance u-turns.

Alameda Boulevard Interchange

The proposed improvements at this interchange are consistent for all build alternatives and only involve the southbound off-ramp and frontage road approaching Alameda Boulevard. The existing overpass is retained with additional lanes provided on the southbound frontage road approach so only minor modifications are proposed at the interchange.

It should be noted that a project (PIN 578.0) is identified in the 2030 MTP to widen Alameda Boulevard from Edith Boulevard to I-25, and a another project (PIN 506.0) is identified to widen Alameda from San Pedro to Ventura. While not identified in this North I-25 study, the I-25 bridge structure may require reconstruction to provide the required number of travel lanes and pedestrian/bicycle improvements within and through the interchange. The need for this will be determined by the planned Alameda widening projects.

Tramway Road/Roy Road Interchange

No changes are proposed.

Access Management

This section summarizes how access to and from the mainline freeway is modified in the build alternatives compared to the No Build condition. The proposed changes to local access along the frontage road system and crossing arterial streets are also discussed.

Mainline I-25

Table 6-1 summarizes how direct access to and from the mainline freeway is provided in each build alternative. The following lists summarize key changes in how access is modified.

Access Modifications Common to All Build Alternatives

- Northbound I-25
  - The San Antonio northbound on-ramp is relocated further north and is braided with the Paseo del Norte north-to-west directional ramp. This ramp provides northbound access to I-25 from San Antonio Drive, Ellison Street, and from San Pedro Drive via several local streets including Del Rey Avenue, San Francisco Road and Piño Avenue.
  - The Paseo del Norte northbound on-ramp is eliminated. The only movement with direct access to northbound I-25 from Paseo del Norte is the east-to-north movement via a loop ramp. The Alameda on-ramp is the next on-ramp to northbound I-25.
- Southbound I-25
  - Several movements are combined at the Alameda southbound off-ramp including Alameda Boulevard, local traffic destined for the Paseo del Norte corridor (Paseo del Norte to the east, Domingo Baca Arterial to the west), and San Antonio Drive/Ellison Street. The off-ramps to the southbound frontage road at Paseo del Norte and San Antonio Drive/Ellison Street are eliminated. The only movement with direct access to Paseo del Norte from southbound I-25 is the south-to-west movement via a directional ramp.
  - A southbound on-ramp for local traffic from the Domingo Baca Arterial is not provided. This traffic will either use the Alameda southbound on-ramp or the next on-ramp south which will either be at San Antonio/Ellison (Build Alt 1) or San Mateo/Osuna (Build Alts 2 and 3).
  - Direct access to Jefferson Street is eliminated. Traffic destined to Jefferson Street will exit at the San Mateo/Osuna off-ramp.

Access Modifications Common to Build Alternative 1 and Build Alternative 2

- Northbound I-25
  - The Montgomery/Montaño northbound off-ramp is relocated south and is braided with the Comanche on-ramp. As such, the Montgomery/Montaño off-ramp exits the freeway at the Comanche overpass.
  - The Jefferson northbound on-ramp is eliminated. The next on-ramp to northbound I-25 is the San Mateo/Osuna on-ramp.

Access Modifications Common to Build Alternative 2 and Build Alternative 3

- Southbound I-25
  - The San Antonio/Ellison southbound on-ramp is eliminated. The next on-ramp to southbound I-25 is the San Mateo/Osuna on-ramp. As such, the San Mateo/Osuna on-ramp would serve Domingo Baca Arterial traffic, San Antonio/Ellison traffic, and San Mateo/Osuna traffic.

Access Modifications Exclusive to Build Alternative 1

- Southbound I-25
  - The Comanche southbound off-ramp is moved further north and is braided with the southbound frontage road just south of Montaño Road. The relocated ramp will continue to serve Comanche Road, Candelaria Road, and Menaul Boulevard.

Table 6-1, Summary of Direct Access to and from Mainline I-25

Interchange/Access Ramp	Direct Access To/From Mainline I-25		
	Build Alternative 1	Build Alternative 2	Build Alternative 3
Comanche Interchange			
Northbound Exit	Provided	Provided	Provided
Northbound Entrance	Provided	Provided	Provided
Southbound Exit	Provided	Provided	Provided
Southbound Entrance	Provided	Provided	Provided
Montgomery/Montaño Interchange			
Northbound Exit	Provided	Provided	Provided
Northbound Entrance	Provided	Provided	Provided
Southbound Exit	Provided	Provided	Provided
Southbound Entrance	Provided	Provided	Provided
Jefferson Interchange			
Northbound Exit	Provided	Provided	Provided
Northbound Entrance	Eliminated	Eliminated	Provided
Southbound Exit	Eliminated	Eliminated	Eliminated
Southbound Entrance	Provided	Provided	Provided
San Mateo/Osuna Interchange			
Northbound Exit	Provided	Provided	Provided
Northbound Entrance	Provided	Provided	Provided
Southbound Exit	Provided	Provided	Provided
Southbound Entrance	Provided	Provided	Provided
San Antonio/Ellison Interchange			
Northbound Exit	Provided	Provided	Eliminated
Northbound Entrance	Provided	Provided	Provided
Southbound Exit	Eliminated	Eliminated	Eliminated
Southbound Entrance	Provided	Eliminated	Eliminated
Paseo del Norte Regional			
Northbound Exit	Provided	Provided	Provided
Northbound Entrance	East-to-North Only	East-to-North Only	East-to-North Only
Southbound Exit	South-to-West Only	South-to-West Only	South-to-West Only
Southbound Entrance	Provided	Provided	Provided
Paseo del Norte Local			
Northbound Exit	Provided	Eliminated	Provided
Northbound Entrance	Eliminated	Eliminated	Eliminated
Southbound Exit	Eliminated	Eliminated	Eliminated
Southbound Entrance	Eliminated	Eliminated	Eliminated
Alameda Interchange			
Northbound Exit	Provided	Provided	Provided
Northbound Entrance	Provided	Provided	Provided
Southbound Exit	Provided	Provided	Provided
Southbound Entrance	Provided	Provided	Provided
Tramway Interchange			
Northbound Exit	Provided	Provided	Provided
Northbound Entrance	Provided	Provided	Provided
Southbound Exit	Provided	Provided	Provided
Southbound Entrance	Provided	Provided	Provided

Access Modifications Exclusive to Build Alternative 2

- Northbound I-25
  - The off-ramp to the northbound frontage road for local Paseo del Norte traffic is eliminated. This traffic will use the San Antonio/Ellison off-ramp and will continue north via a CD road which is grade-separated over San Antonio Drive.

Access Modifications Exclusive to Build Alternative 3

- Northbound I-25
  - The San Antonio/Ellison northbound off-ramp is eliminated. The San Mateo/Osuna off-ramp is the previous off-ramp and would be expected to serve most of the San Antonio off-ramp traffic.

Frontage Roads

The frontage road system provides access to properties abutting the I-25 corridor as long as the access does not have a detrimental effect on freeway functionality, specifically proximate to ramps. The application of channelization islands in the vicinity of ramp/frontage road junctions was required at several locations in all build alternatives. Key access modifications along the frontage road system include:

Build Alternative 1

- Northbound Frontage Road
  - South of Comanche Road, the channelization island separating the frontage road from the one-lane service road is extended south past Aztec Road. Access to the properties abutting the frontage road is still provided from the frontage road.
  - The Carpenters Union site loses access to the northbound frontage road because of the braided Montgomery off-ramp configuration. Access to the site would be provided exclusively from Vassar Drive.
  - An access driveway is eliminated and access is consolidated at the Accent Windows property just south of the North Diversion Channel, north of Montgomery Boulevard.
  - The first driveway south of McLeod Road is closed. Other access to the property exists.
  - Access modifications are required at the properties south of San Francisco Road, just north of the NMDOT District 3 site.

- Southbound Frontage Road
  - Eagle Rock Avenue is closed at southbound frontage road.
  - Access modifications are required at the driveways just south of Pan American Place, north of Osuna Road.
  - With the elimination of the Jefferson off-ramp, access could be allowed to the @I-25 development from the frontage road.
  - Chappell Drive is closed at the southbound frontage road. North Diversion Channel maintenance access would be provided from Renaissance Boulevard.

Build Alternative 2

- Northbound Frontage Road
  - Several access points are eliminated and access is modified along the northbound frontage road at Aztec Road. Build Alternative 2 proposes a new local service road from Aztec Road to provide access to the effected properties. Further discussion of the impacts associated with the new service road is included in the Right-of-Way Requirements section of this chapter.
  - The Carpenters Union site loses access to the northbound frontage road because of the braided Montgomery off-ramp configuration. Access to the site would be provided exclusively from Vassar Drive.
  - A new access point from the frontage road to the Holiday Inn north of Jefferson Street may be possible although it would impact site circulation.
  - Access modifications are required at the properties south of San Francisco Road, just north of the NMDOT District 3 site.

- Southbound Frontage Road
  - Existing driveways are closed and a new driveway is relocated further north for the property between Modesto Avenue and San Diego Avenue.
  - Access modifications are required at the driveways including and north of the BMW car dealership
  - With the elimination of the Jefferson off-ramp, access could be allowed to the *@I-25* development from the frontage road.

Build Alternative 3

- Northbound Frontage Road
  - Several access points are eliminated along the northbound frontage road between Aztec Road and Comanche Road. Build Alternative 3 proposes an access easement from Aztec Road and an access easement from Princeton Road to provide access to the effected properties. Further discussion of the impacts associated with the new service road is included in the Right-of-Way Requirements section of this chapter.
  - An access driveway is eliminated and access is consolidated at the Accent Windows property just south of the North Diversion Channel, north of Montgomery Boulevard.
  - The first driveway south of McLeod Road is closed. Other access to the property exists.
  - Access modifications are required at Lincoln Road and the first driveway north of Lincoln Road.
  - Access modifications are required at the properties south of San Francisco Road, just north of the NMDOT District 3 site.

- Southbound Frontage Road
  - One driveway is closed and the other is modified for the property between Modesto Avenue and San Diego Avenue.
  - Access modifications are required at the driveways at and including Pan American Place, north of Osuna Road.
  - With the elimination of the Jefferson off-ramp, access could be allowed to the @I-25 development from the frontage road.

Arterial Streets within Interchange Areas

Access management improvements are needed at the North I-25 interchanges, at a minimum within 300 feet from the frontage roads. The proposed access treatments are generally consistent on the arterial streets within the interchange areas. Notable modifications include:

All Build Alternatives

- Comanche Interchange: West of I-25, the median is extended on Comanche to Alexander Boulevard. The driveway to American Home Furnishings on the north side of Comanche is relocated further west. Driveway consolidation is proposed on the south side. Changes are not proposed east of I-25.

- Montgomery Boulevard/Montaño Road Interchange: The Pan American East Drive median is closed on Montgomery. Access points are converted to right-in/right-out with left-turn access provided via a new grade-separated service road. One driveway is closed at the gas stations on both sides of Montgomery Boulevard. Changes are not proposed west of I-25.
- Jefferson Street Interchange: Several access modifications are needed east of I-25. The first median opening is closed. Restaurant Lane is realigned at Jefferson Street, and an access easement is proposed connecting Jefferson Street to Lincoln Road via Monroe Street to create a full access intersection at Jefferson/ Restaurant Lane. A driveway to Landry's is closed and relocated to Restaurant Lane. One driveway to the adult entertainment business on the north side of Jefferson is closed. Changes are not proposed west of I-25.
- San Mateo Boulevard/Osuna Road Interchange: West of I-25, access is restricted at the first median opening by eliminating the westbound left-turn movement. Also on the west side, the first driveway on the north side cannot be closed because it is the only public access to the property. No changes are proposed on the east side in Build Alternatives 1 and 3; see below for Build Alternative 2.
- San Antonio Drive/Ellison Street Interchange: East of I-25, the first median opening is modified to prohibit through and left-turn movements from the adjacent properties. Left-in and right-in/right-out movements are allowed. Changes are not proposed west of I-25.
- Alameda Boulevard Interchange: On both sides of I-25, the first median opening is modified to prohibit through and left-turn movements from the adjacent properties. Left-in and right-in/right-out movements are allowed.

Build Alternative 2

- San Mateo Boulevard/Osuna Road Interchange: The Pan American East Drive median is closed on San Mateo Boulevard and the traffic signal is removed in Build Alternative 2. Right-in/right-out movements are allowed. The busiest movement affected is the left-turn from Pan American East to San Mateo as there are no good alternatives for this movement.

Guide Signing Review

The 2009 Manual on Uniform Traffic Control Devices (MUTCD) was used to determine guide signing criteria for each freeway alternative. The MUTCD encourages the use of "sign spreading" in urban areas like the I-25 corridor. Sign spreading is a concept where major overhead signs are spaced so that road users are not overloaded with a group of signs at a single location.

In keeping with the concept of sign spreading, guide signing along I-25 for each exit from a shared lane will consist of an Advance Guide sign, an Exit Direction sign, and an Exit Gore sign for each off-ramp. Guide signing along I-25 for each exit with a lane drop will consist of an Advance Guide sign, an overhead "EXIT ONLY" with downward arrow-per-lane Advance Guide sign, an overhead "EXIT ONLY" with diagonal up arrow-per lane Exit Direction signs, and an Exit Gore sign for each off-ramp. The Advance Guide signs, where possible, will be mounted overhead on a cross street overpass. Where overpass mounting is not possible, the Advance Guide signs will be mounted on sign bridges over the freeway lanes. Advance Guide signs and Exit Direction signs with "EXIT ONLY" arrows will be mounted on cantilever sign supports so as to delineate the usage of the lanes below. Interchange Sequence signs will be posted in the median of the freeway throughout the corridor to notify drivers of the next three upcoming exits.

Each alternative has some exit ramps that will serve multiple cross streets as shown in Table 6-2. These configurations pose one of the more complicated guide sign sequences, as shown in Figure 6-3. This figure presents the freeway guide signing scheme for the southbound shared exit to Osuna Road, San Mateo Boulevard, and Jefferson Street in Build Alternative 2.

Table 6-2, Cross Streets Sharing an Off-Ramp

NORTHBOUND	SOUTHBOUND
Build Alternative 1	
None	Alameda-Paseo del Norte[1]-San Antonio/Ellison
	San Mateo/Osuna-Jefferson
	Comanche-Candelaria-Menaul
Build Alternative 2	
San Antonio/Ellison-Paseo del Norte[1]	Alameda-Paseo del Norte[1]-San Antonio/Ellison
	San Mateo/Osuna-Jefferson
	Comanche-Candelaria-Menaul
Build Alternative 3	
San Mateo/Osuna-San Antonio/Ellison	Alameda-Paseo del Norte[1]-San Antonio/Ellison
	San Mateo/Osuna-Jefferson
	Comanche-Candelaria-Menaul

1. Paseo del Norte refers to local access not the regional movements served by directional ramps.

A great deal of information has to be conveyed to drivers within a short distance through the I-25 corridor, a situation which is exacerbated by the fact that four of the cross streets have different names east and west of the freeway. Still, none of the three build alternatives for North I-25 is expected to pose difficulties for guide signing. Grouping the signs for each exit together to provide information about only the next exit, and supplementing these signs with the use of advance Interchange Sequence signs throughout the entire corridor, should provide a methodical way of keeping drivers informed of the locations of and streets served by each off-ramp.

Comparison of Estimated Costs

A comparison of estimated project costs including major items is provided in Table 6-3. These costs exclude improvements to the Paseo del Norte interchange including the segment of I-25 from north of San Antonio Drive to Alameda Boulevard. North of Paseo del Norte, only the costs for modifications to the southbound Alameda off-ramp and associated frontage road improvements are included. The right-of-way costs are based on costs per square foot of property and do not specifically address building acquisitions nor billboard acquisitions or relocations. Depending on how the recommended alternative is assembled from the three build alternatives, the costs associated with the recommended alternative to be used for programming purposes may be higher than the estimates included in Table 6-3 (see Chapter 7). Additional cost information is provided in Appendices K through M.

Right-of-Way Requirements

A comparison of the areas of additional right-of-way and access easements is provided in Table 6-4 (note, the Paseo del Norte interchange is not included). Areas of impact identified for the build alternatives are shown in Appendices H through J. All of the build alternatives will result in property acquisition, access impacts, billboard acquisition or relocation, and a few building impacts. Build Alternative 3 right-of-way impacts are less because it has fewer braided ramp configurations and proposes access easements to serve the properties between Aztec Road and Comanche Road in the southeast quadrant of the Comanche interchange. Notable impacts are summarized by alternative as follows:

Figure 6-3, Conceptual Guide Sign Sequence for Southbound I-25, Build Alternative 2

Table 6-3, Comparison of Project Cost Estimates for Build Alternatives

Description	Build Alt 1	Build Alt 2	Build Alt 3
Roadway	$32,000,000	$35,000,000	$28,000,000
Bridges	$26,000,000	$30,000,000	$27,000,000
Drainage	$11,000,000	$11,000,000	$11,000,000
Signing & Striping	$3,000,000	$3,000,000	$3,000,000
Lighting	$1,000,000	$1,000,000	$1,000,000
Signalization/Ramp Metering/ITS	$3,000,000	$3,000,000	$2,000,000
Baseline Cost	**$76,000,000**	**$83,000,000**	**$72,000,000**
Construction Engineering	$26,000,000	$28,000,000	$25,000,000
Utilities	$5,000,000	$5,000,000	$5,000,000
Subtotal	**$107,000,000**	**$116,000,000**	**$102,000,000**
Contingency (30%)	$32,000,000	$35,000,000	$30,000,000
Engineering Design (8%)	$9,000,000	$9,000,000	$8,000,000
Right-of-Way / Access Easements	$9,000,000	$11,000,000	$5,000,000
Construction Management (12%)	$12,000,000	$14,000,000	$12,000,000
New Mexico Gross Receipts Tax (7%)	$7,000,000	$8,000,000	$7,000,000
Total Estimated Cost	**$176,000,000**	**$193,000,000**	**$164,000,000**

Notes: 1. Costs are based on current unit bid prices (2009).
2. Contingency percentages are based on a phased implementation of project.
3. See Appendices K through M for more cost information.

Table 6-4, Comparison of Additional Right-of-Way Required for Build Alternatives

Description	Build Alt 1	Build Alt 2	Build Alt 3
Property Takes	5.56 acres	7.01 acres	1.62 acres
Access Easements	1.82 acres	1.82 acres	3.03 acres
Business Acquisitions	0	2	0

- Build Alternative 1 (Refer to Appendix H)
  - Much of the right-of-way required for this alternative is property frontage which primarily impacts landscaping buffers but may also have minor impacts to access drives, parking, site circulation, and drainage areas.
  - The largest area identified for acquisition is along the southbound frontage road south of Montaño Road at the old water park.
  - East of the Jefferson interchange, the realignment of Restaurant Lane and the access easements to extend Monroe Street to Jefferson Street would result in property impacts. Refer to Figure 6-4 for photos of the properties potentially impacted. Based on field observations, these improvements appear to be viable but further investigation should be performed in Phase 1C.
  - Other notable areas of impact include the drainage/wetland area north of Comanche Road on the east side of the northbound frontage road and continuing along the Carpenters Union site, and the cul-de-sac at Eagle Rock Road north of Alameda Boulevard on the west side.
  - No building acquisitions were identified for Build Alternative 1.

Figure 6-4, Existing (2011) Condition of Restaurant Lane and Monroe Street

- Build Alternative 2 (Refer to Appendix I)
  - Build Alternative 2 has the greatest impacts of the build alternatives. As for the other alternatives, much of the right-of-way required for this alternative is property frontage which primarily impacts landscaping buffers but may also have minor impacts to access drives, parking, site circulation, and drainage areas.
  - Building acquisitions were identified for Build Alternative 2 associated with the proposed new local service road from Aztec Road (see Figure 6-5). The Air Gas/Puritan Medical property may be impacted to the extent of full acquisition. The front of the building complex housing Adecco employment services would need to be acquired. The impacted billboard could be relocated.
  - The drainage/wetland area north of Comanche Road on the east side of the northbound frontage road is impacted, which continues north along the Carpenters Union site frontage.
  - East of the Jefferson interchange, the realignment of Restaurant Lane and the access easements to extend Monroe Street to Jefferson Street would result in property impacts. Refer to Figure 6-4 for photos of the properties potentially impacted. Based on field observations, these improvements appear to be viable but further investigation should be performed in Phase 1C.
- Build Alternative 3 (Refer to Appendix J)
  - Similar to the other alternatives, much of the right-of-way required for this alternative is property frontage which primarily impacts landscaping buffers but may also have minor impacts to access drives, parking, site circulation, and drainage areas.
  - The viability of the access easements from Aztec Road and Princeton Road may be questionable because much of the property is fenced today and security may be compromised with access easements (see Figure 6-5). Further investigation would be required if this alternative is favored.
  - East of the Jefferson interchange, the realignment of Restaurant Lane and the access easements to extend Monroe Street to Jefferson Street would result in property impacts. Refer to Figure 6-4 for photos of the properties potentially impacted. Based on field observations, these improvements appear to be viable but further investigation should be performed in Phase 1C.

Traffic Performance

The traffic performance of the build alternatives was evaluated using the Highway Capacity Software (HCS) and Synchro. The evaluations were completed based on the methodologies of the 2000 Highway Capacity Manual (HCM2000). The HCS was used to analyze basic freeway segments, ramp junctions, and weave sections. Ramp roadways were evaluated based on volume-to-capacity ratios using capacities from the HCM2000. Synchro was used to analyze intersections. The analyses were completed for the design-year (2030) AM and PM peak hours. Detailed summary tables for each build alternative are included in Appendix E, Appendix F and Appendix G, and complete compilations of the traffic analysis output reports for each alternative are included on the project CD.

The results of the traffic analyses are summarized in Figures 6-6, 6-7 and 6-8 for the three build alternatives, respectively. Build Alternatives 1 and 2 were designed to accommodate ramp metering; however, the results shown in the figures are based on the 2030 traffic forecasts without volume reductions associated with ramp metering. A discussion of the expected traffic performance with ramp metering is provided later in this section.

Design Year Traffic Performance Expectations

The traffic performance evaluations were completed for three improvement scenarios and specifically address mainline I-25 and its ramps, the frontage roads, and the associated arterial intersections within the North I-25 corridor. While not specifically included in the evaluation, parallel and other major routes were considered in the

Figure 6-5, Existing (2011) Condition of Properties Potentially Impacted by Build Alternatives 2 and 3

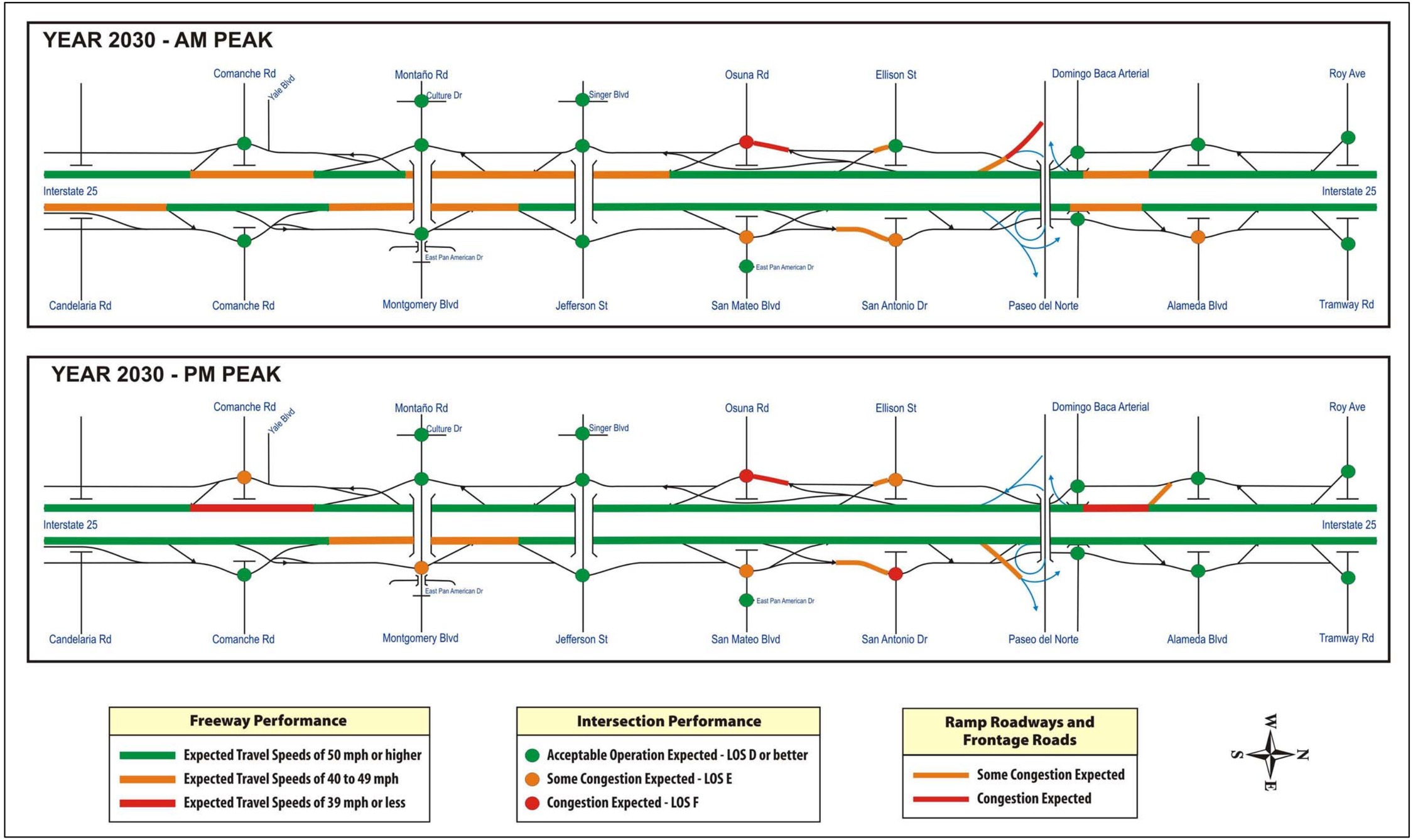


Figure 6-6, Build Alternative 1 Year 2030 Traffic Performance Aggregated Summary

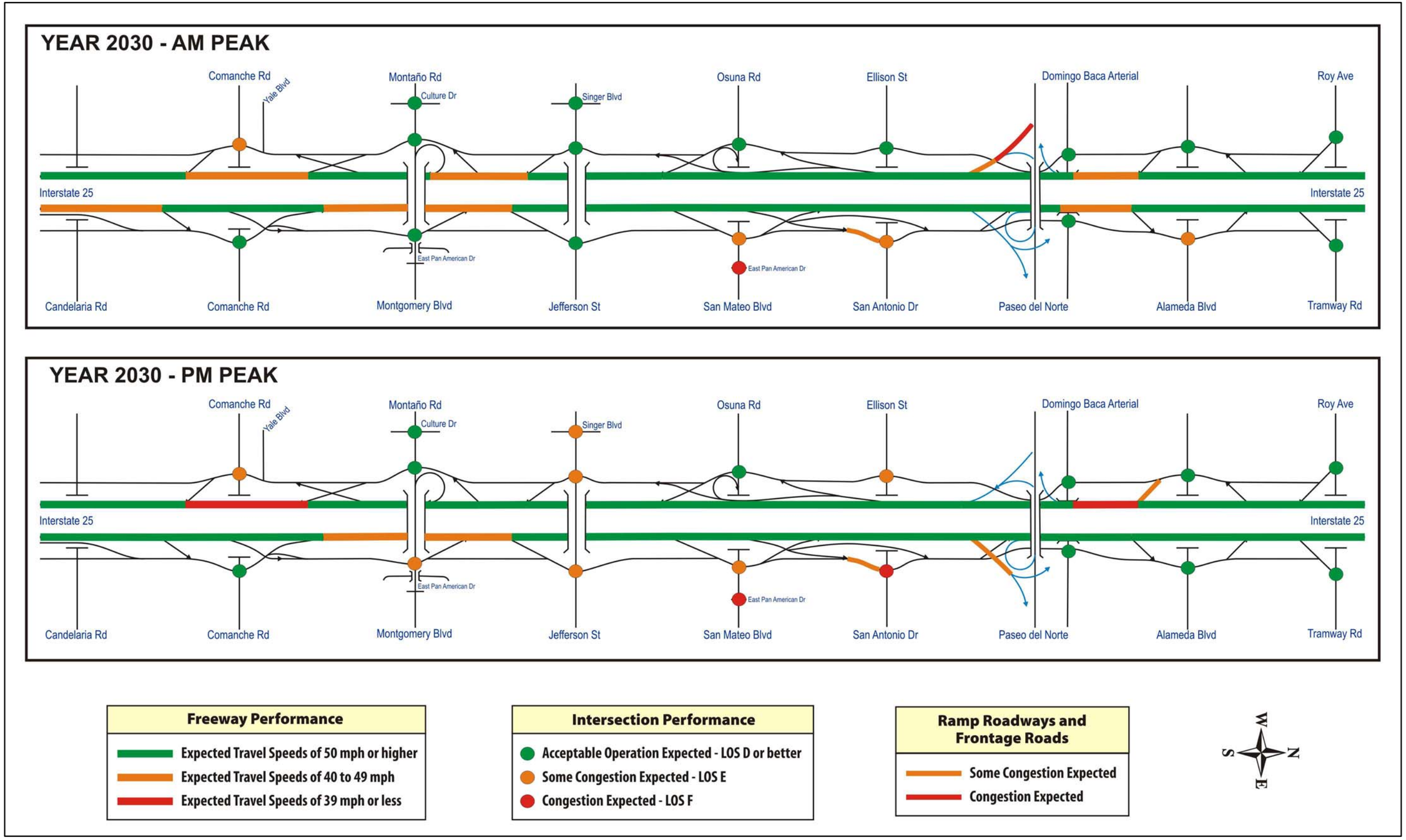


Figure 6-7, Build Alternative 2 Year 2030 Traffic Performance Aggregated Summary

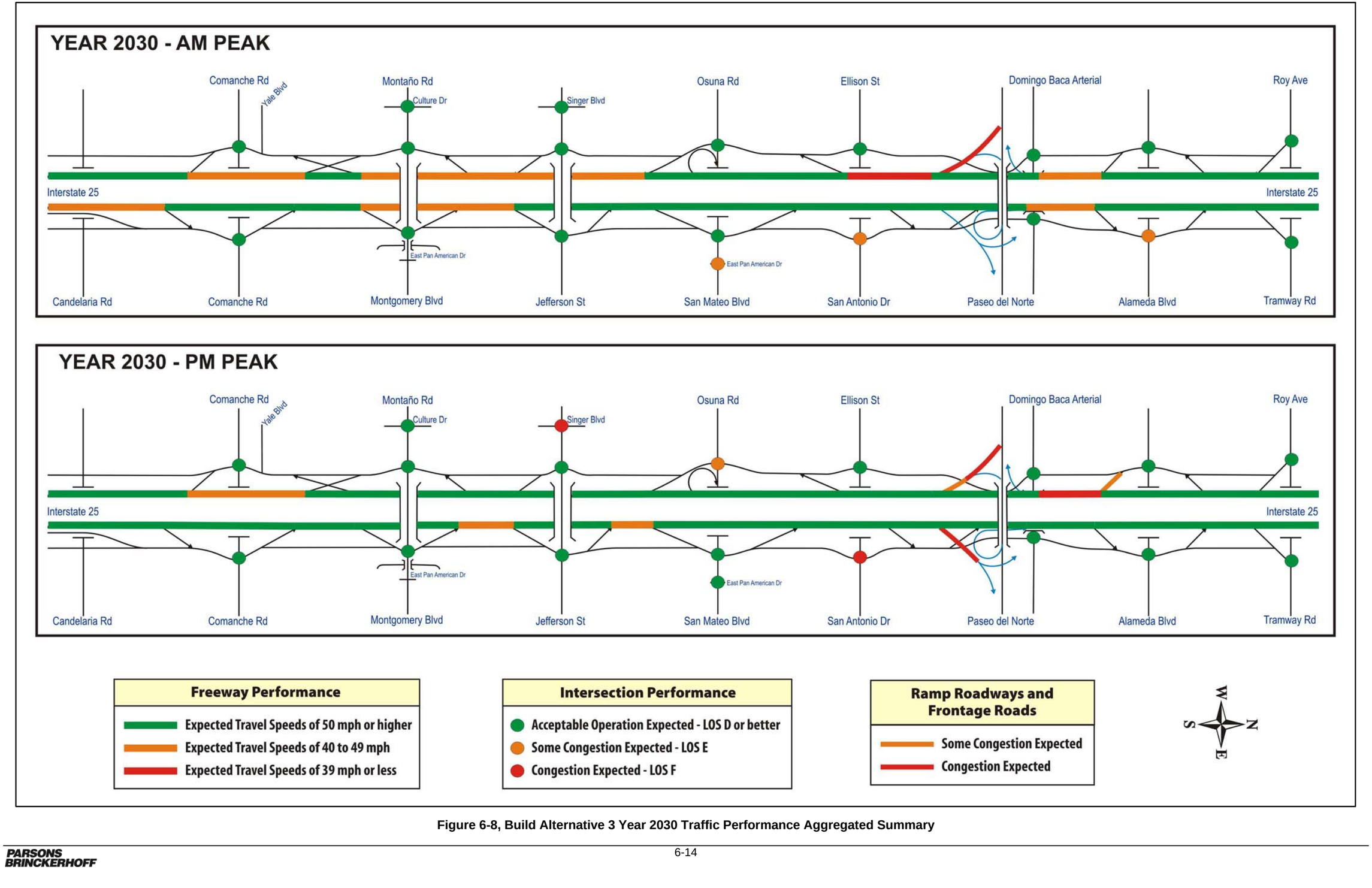


Figure 6-8, Build Alternative 3 Year 2030 Traffic Performance Aggregated Summary

assessment of traffic volumes. That is, without improvements in the study corridor, the additional traffic attracted to the improved I-25 facilities (shown in the build forecasts) would be required to use other routes. Given the growth expected in the Albuquerque region, higher levels of congestion would be expected throughout the transportation system because of the role North I-25 serves.

As shown in the traffic analysis figures, some congestion is projected under design-year conditions. However, this finding does not understate the need for improvements in the North I-25 corridor. Congestion is projected to be widespread and will affect most of the major roadways within the metropolitan area. Moreover, the feasibility of major improvements to the arterial street system in the area east of the Rio Grande will be limited. For this reason, the Albuquerque region will need to get the most out of its transportation system to meet future traffic demand. In some cases, capacity improvements can be made but in others, the existing capacity will need to be managed. High-capacity corridors like I-25, which passes through the middle of the region, will continue to be highly utilized so investments into the I-25 Corridor will provide value to the region and should be programmed even if full mitigation of congestion cannot be achieved. Furthermore, managing congested traffic conditions, as well as incidents, would be difficult with the existing configuration of I-25.

Freeway Performance

Analyzing an urban freeway system using the HCS is appropriate for planning-level evaluations. However, while the methods are based on extensive research, they are deterministic and may not quite capture the affects of ramp merge, diverge and weave interactions on overall performance, particularly when congestion is expected. Micro-simulation is the preferred method of evaluating congestion, however developing micro-simulation models was not a part of the scope of this study. Going forward, micro-simulation evaluations will be necessary to satisfy the FHWA Interstate Access Change Request (IACR) Policy requirements and should be developed to refine the recommendations of this study.

Level of service (LOS) D is not a reasonable performance goal for the North I-25 corridor. The performance of the No Build alternative illustrated in the charts provided in Chapter 1 of this report indicate numerous failures along the freeway; LOS F conditions. As such, the IACR policy states that the absolute minimum performance goal is reached when freeway speeds fall below 40 mph. Considering the HCM2000 methodology, which is based on a jam density (i.e., when all traffic stops, parking lot conditions) of 190 passenger cars per mile per lane (pcpmpl), the 40 mph travel speed translates into a density of nearly 70 pcpmpl or a traffic flow rate of approximately 2900 passenger cars per hour per lane (0.95 PHF, 5% trucks, level terrain, 65 mph base free-flow speed). These values are well outside the parameters of the HCS because the HCS does not provide results when LOS F is reached and the density exceeds 45 pcpmpl, which occurs at about 51 mph or 2300 passenger cars per hour per lane (pcphpl).

Instead of evaluating North I-25 based on the minimum IACR condition of 40 mph, a minimum speed threshold of 50 mph was used to indicate acceptable traffic performance for the design-year build condition. This speed translates into a density of approximately 46 pcpmpl. Further, while it may not be achievable in the North I-25 corridor without ramp metering, a performance goal of densities in the 41 to 42 pcpmpl (52-53 mph; 2250 pcphpl) realm are considered desirable.

The performance summaries illustrated in Figures 6-6 through 6-8 were developed by combining the results from the basic freeway segments, ramp junctions and weave sections analyses. These results do not consider traffic volume reductions associated with ramp metering. Notable assumptions made for the various analyses and to aggregate the results include (refer to the summary tables in Appendix E, Appendix F and Appendix G for detailed results):

- The freeway performance thresholds used in the illustrative summaries were generally defined as follows:
  - **Acceptable**, Speeds of 50 mph or higher – 45 pcpmpl max density, 2300 pcphpl max flow
  - **Some Congestion**, Speeds of 40 to 49 mph – 46 to 59 pcpmpl density, 2300 to 2500 pcphpl flow
  - **Congested**, Speeds of 39 mph or less – 60 pcpmpl or higher density, 2500 pcphpl or higher flow
- Basic Freeway Segments
  - Segments with auxiliary lanes were analyzed with and without the auxiliary lane. The results were then averaged to approximate the performance of these freeway segments.
  - In cases where the flow, density and/or speed exceed the limits of the HCS methodology, the density was estimated based on the flow rate per lane through the use of the Greenshield's Model traffic flow theory assuming a 65 mph free-flow speed and a jam density of 160 pcpmpl, which is conservative compared to the HCS 190 pcpmpl. An excel spreadsheet developed by others is included on the project CD. The results based on this method should be viewed as approximate.
- Ramp Junctions
  - A primary analysis and a secondary analysis was performed for the ramp junctions, as appropriate, to provide added insight into the expected performance. The various types of analyses include diverge, merge, weave, lane drop, lane add, major merge, and major diverge.
  - In addition to the LOS reported, freeway volume thresholds were also reviewed. Merge areas consider the freeway volume downstream of the on-ramp (V_{FO} or V_{R12}). Diverge areas consider volume in lanes 1 and 2 (V_{12}) approaching the off-ramp and the total freeway volume (V_F) upstream of the off-ramp. If the volume thresholds were exceeded, LOS F was noted even though the calculated density may indicate acceptable operation.
- Weave Sections
  - Weave section analysis was used if the distance between successive on and off-ramps was 2500 feet or less. Weave lengths for Build Alternative 1 and Build Alternative 2 designed for ramp metering were not estimated where the on-ramp painted gore is separated by two feet from the mainline (HCM2000 definition). Instead, these weave lengths were measured from near the end of the acceleration length indicated by the solid lane line in the conceptual layouts. Of note, based on observations of how people drive on Albuquerque freeways, it is anticipated that vehicles may merge across the solid lane line if a gap exists and their speed is somewhat close to prevailing speeds on the freeway (which during peak travel periods would be expected to be well below the 65-mph free-flow speed).
  - In addition to the LOS reported based on density within the weave section, the volume ratio and weaving flow rate were also reviewed. While a LOS D may be shown based on density, there may be too much traffic weaving which causes the volume ratio or weaving flow rate to exceed the established max values. If so, the weave segment was indicated as deficient; LOS E if the volume ratio was exceeded, and LOS F if both the volume ratio and weaving flow rate were exceeded).
  - Build Alternative 3 has five mainline lanes and an auxiliary lane between the Comanche on-ramp and the Montgomery off-ramp. The six-lane section exceeds the HCS weave section method. As such, this section was analyzed as a five-lane weave assuming a volume reduction of 1000 vph.

Comparison of Freeway Performance

Substantial improvements can be expected for the build alternatives when compared to the No Build alternative. The build alternatives would serve higher volumes of traffic at a higher level of efficiency than the No Build condition. The key findings of the freeway analyses include:

- This study was conducted based on the currently adopted 2030 MTP datasets and assumptions. It is probable that the travel demand in the North I-25 will increase in the 2035 MTP and subsequent plans. In the traffic performance figures, the orange and red elements are where the weaknesses are and will be the first to deteriorate has demand increases.
- Congestion is expected on northbound I-25 from I-40 to Comanche in all alternatives.

- In the northbound direction south of Montgomery, the Build Alt 3 performance is better because it carries five lanes through the Montgomery off-ramp and has a sixth auxiliary lane between the Comanche on-ramp and Montgomery off-ramp.
- Accommodating ramp metering creates reduced spacing between successive on and off-ramps which has some affect on capacity. An example is between Montgomery and Jefferson where weave sections exist in Build Alts 1 and 2 compared to Build Alt 3 where the spacing between these ramps exceeds the 2500-foot weave length spacing. It is important to note, however, that with ramp metering these segments can be improved to acceptable levels.
- The southbound freeway generally has more issues than the northbound freeway. Key differences between the alternatives are:
  - Build Alt 1 has a San Antonio on-ramp, one more than Build Alt 3.
  - Build Alt 2 has a Montgomery loop on-ramp, one more than Build Alt 3.
  - Build Alt 3 was modeled with two lanes of capacity on the east-to-south Paseo del Norte directional ramp, while the other alternatives only had one lane for this high-demand movement. Build Alt 3 also provides two off-ramps immediately downstream of Paseo del Norte which attracts a higher volume of traffic exiting the freeway. The result is slightly less traffic continuing south than in the other alternatives.
  - Considering the above, the deficiency shown downstream of the southbound Montgomery/Montaño on-ramp for Build Alts 1 and 2 is the result of slightly higher traffic volumes than in Build Alt 3. Estimated speeds in Build Alts 1 and 2 are lower than but near the 40 mph threshold.
- Many of the weave sections are designed with two-lane off-ramps creating Type B weaves. The added capacity of the Type B weaves aids the performance of the weave sections.
- The weave sections between the Alameda ramps and the Paseo del Norte ramps are expected to be deficient in all alternatives. The northbound weave could be improved by providing a two-lane off-ramp to Alameda thereby creating a Type B weave. In the southbound direction, a Type B weave could be created by extending the auxiliary lane through the off-ramp junction which would then be merged prior to the Paseo del Norte directional ramps major merge junction. However, this would require moving pier columns for the flyover ramps, widening the bridge over the Domingo Baca Arterial, and may result in the need for additional right-of-way from the Coronado Village property.

Overall, the build alternatives provide a substantial improvement in freeway performance. The advantage of Build Alternative 1 and Build Alternative 2 is that they can accommodate ramp metering to further manage North I-25 as the region grows beyond the 2030 design-year. Build Alternative 3 would provide an acceptable design per the IACR policy; however, this finding could change with the growth expected beyond the 2030 design year. Therefore, an improvement solution that includes ramp metering is recommended.

Interchange and Intersection Performance

The overall performance of the intersections was indicated in Figures 6-6 through 6-8. The intersection performance results do not consider the potential impacts associated with ramp metering. Tabular summaries comparing the Synchro results for all the intersections by alternative and tabular summaries of the queue analyses results are included in Appendix E. Additional information is provided on the project CD.

The intersection performance thresholds used in the illustrative summaries were generally defined as follows:

- **Acceptable**, Overall Intersection LOS D or better and maximum v/c ratio of 1.0 or less for all movements
- **Some Congestion**, Overall Intersection LOS E, or maximum v/c ratio between 1.0 and 1.20 for any movement
- **Congested**, Overall Intersection LOS F, or maximum v/c ratio of 1.20 or greater for any movement

Comanche Road Interchange

The design-year intersection operations for the Comanche Road interchange are summarized in Table 6-5. In general, there is not much space to change this interchange layout so the basic layout will remain. More improvements would be possible with a new bridge structure, including the addition of advance u-turns. All alternatives include widened frontage road approaches and an exclusive westbound right-turn lane. The key findings for this interchange are:

- Acceptable performance is expected at the Northbound Frontage Road intersection in all alternatives.
- Additional capacity would benefit the Southbound Frontage Road intersection. An eastbound right-turn lane is needed however there is insufficient space to provide a meaningful exclusive lane without acquiring property and impacting businesses.
- While the Southbound Frontage Road intersection is expected to operate slightly over capacity, this level of performance is reasonable for the design-year condition.
- The forecast volume for the north-to-south advance u-turn is lower than expected at 10 vph, and is a few hundred for the south-to-north advance u-turn.

Table 6-5, Comparison of Intersection Operations at the Comanche Road Interchange

Major Street/Minor Street Intersection	Cycle Length (sec)	Overall Intersection Delay (veh/sec)	LOS	Max V/C	Deficient Movements V/C Ratio > 1.0
AM PEAK HOUR					
Comanche Rd @ NB Frontage Rd					
Build Alternative 1	90	27	C	0.84	-
Build Alternative 2	90	24	C	0.75	-
Build Alternative 3	90	29	C	0.85	-
Comanche Rd @ SB Frontage Rd					
Build Alternative 1	90	38	D	0.99	-
Build Alternative 2	90	43	D	1.02	EBT, SBT
Build Alternative 3	90	31	C	0.94	-
PM PEAK HOUR					
Comanche Rd @ NB Frontage Rd					
Build Alternative 1	90	30	C	0.92	-
Build Alternative 2	90	26	C	0.83	-
Build Alternative 3	90	31	C	0.90	-
Comanche Rd @ SB Frontage Rd					
Build Alternative 1	90	45	D	1.03	EBTR, WBL, SBT
Build Alternative 2	90	49	D	1.07	EBTR, SBT
Build Alternative 3	90	38	D	1.00	EBTR

Montgomery Boulevard/Montaño Road Interchange

The design-year intersection operations for the Montgomery Boulevard/Montaño Road interchange are summarized in Table 6-6. Notable observations regarding this interchange include:

- All of the build alternatives include six-lane approaches on the frontage roads (i.e., two left, two through, two right) and an exclusive right-turn lane eastbound. The differences in lane configurations are;
  - Build Alternative 1 – exclusive right-turn lane westbound, dual side-by-side left-turn lanes within the interchange, advance u-turns.
  - Build Alternative 2 – exclusive right-turn lane westbound, west-to-south loop ramp, single left-turn lane westbound, dual left-turn lanes eastbound, no advance u-turns.
  - Build Alternative 3 - exclusive dual right-turn lanes westbound, dual side-by-side left-turn lanes within the interchange, dual left-turn storage lanes on Montgomery/Montaño upstream of the frontage roads, advance u-turns.
- While the Northbound Frontage Road intersection is expected to operate slightly over capacity in Build Alternatives 1 and 2, this level of performance is reasonable for the design-year condition. Dual westbound right-turn lanes would improve both alternatives to acceptable levels.
- Build Alternative 3 has dual westbound right-turn lanes, unlike the other build alternatives, and is expected to operate at capacity. Without dual rights, the intersection fails. Overall, the tight diamond does not provide substantial benefit over the other alternatives.
- The forecast volume for the north-to-south advance u-turn is low at 10 vph, and is a 150 to 200 vph for the south-to-north advance u-turn.

Table 6-6, Comparison of Intersection Operations at the Montgomery/Montaño Interchange

Major Street/Minor Street Intersection	Cycle Length (sec)	Overall Intersection Delay (veh/sec)	LOS	Max V/C	Deficient Movements V/C Ratio > 1.0
AM PEAK HOUR					
Montgomery Blvd @ NB Frontage Rd					
Build Alternative 1	110	25	C	0.79	-
Build Alternative 2	110	25	C	0.78	-
Build Alternative 3	90	26	C	0.88	-
Montaño Rd @ SB Frontage Rd					
Build Alternative 1	110	29	C	0.91	-
Build Alternative 2	110	31	C	0.95	-
Build Alternative 3	90	37	D	0.88	-
PM PEAK HOUR					
Montgomery Blvd @ NB Frontage Rd					
Build Alternative 1	120	40	D	1.02	EBL, WBR
Build Alternative 2	120	46	D	1.06	EBL, WBR, NBL
Build Alternative 3	90	31	C	0.99	-
Montaño Rd @ SB Frontage Rd					
Build Alternative 1	120	30	C	0.88	-
Build Alternative 2	120	32	C	0.90	-
Build Alternative 3	90	28	C	0.99	-

Jefferson Street Interchange

The design-year intersection operations for the Jefferson Street interchange are summarized in Table 6-7. Key findings of the analyses include:

- Each of the build alternatives has side-by-side dual left-turn lanes on a widened Jefferson Street and a five-lane approach on the northbound frontage road. The differences in lane configurations are;
  - Build Alternative 1 – exclusive right-turn lanes eastbound and westbound, four lanes on the southbound approach, advance u-turns on both sides.
  - Build Alternative 2 – exclusive right-turn lane westbound, add lane from Singer that drops to the eastbound right-turn lane at the southbound frontage road, five lanes on the southbound approach, no advance u-turns.
  - Build Alternative 3 - exclusive dual right-turn lanes westbound, add lane from Singer that drops to the eastbound right-turn lane at the southbound frontage road, four lanes on the southbound approach, dual left-turn storage lanes on Jefferson upstream of the frontage roads, advance u-turns.
- The forecast volumes for the advance u-turns are quite high at 600 to 680 vph north-to-south and 300 to 430 vph south-to-north. These volumes are too high for peak-hour conditions and are not expected to function at an acceptable level. Motorists may force their way into traffic thereby creating conflicts on the frontage road departures from Jefferson Street.
- Because the advance u-turns will not accommodate the forecast volume in Build Alts 1 and 3, the expected performance of this interchange is reflected by the Build Alt 2 results. The interchange is expected to operate at or slightly over capacity under design-year conditions with improvements.
- The add lane from Singer in Build Alts 2 and 3 would create merging issues for bicyclists on eastbound/southbound Jefferson Street.

Table 6-7, Comparison of Intersection Operations at the Jefferson Street Interchange

Major Street/Minor Street Intersection	Cycle Length (sec)	Overall Intersection Delay (veh/sec)	LOS	Max V/C	Deficient Movements V/C Ratio > 1.0
AM PEAK HOUR					
Jefferson St @ NB Frontage Rd					
Build Alternative 1	110	29	C	0.81	-
Build Alternative 2	110	34	C	0.94	-
Build Alternative 3	90	30	C	0.84	-
Jefferson St @ SB Frontage Rd					
Build Alternative 1	110	21	C	0.82	-
Build Alternative 2	110	37	D	0.95	-
Build Alternative 3	90	22	C	0.84	-
PM PEAK HOUR					
Jefferson St @ NB Frontage Rd					
Build Alternative 1	110	31	C	0.88	-
Build Alternative 2	110	42	D	1.02	NBL
Build Alternative 3	90	36	D	0.97	-
Jefferson St @ SB Frontage Rd					
Build Alternative 1	110	22	C	0.84	-
Build Alternative 2	110	39	D	1.02	SBL
Build Alternative 3	90	25	C	0.97	-

San Mateo Boulevard/Osuna Road Interchange

The design-year intersection operations for the San Mateo Boulevard/Osuna Road interchange are summarized in Table 6-8. Notable observations regarding this interchange include:

- All of the build alternatives included widened frontage road approaches, dual westbound right-turn lanes, and an exclusive eastbound right-turn lane. Variations between the alternatives are;
  - The southbound frontage road approach had triple left-turn lanes in Build Alternative 1. The third left-turn lane was a shared through/left.
  - Build Alternative 3 had three through lanes northbound, more left-turn storage within the interchange, and a fourth eastbound through lane that was added from loop ramp.
- Build Alternative 1 is considered deficient. The other two alternatives are expected to operate at or slightly over capacity which is reasonable for the design-year condition.
- Build Alternatives 1 and 2 retain the existing left-turn lane configurations on San Mateo Boulevard. The storage provided by these left-turn lanes is inadequate to accommodate design-year queues.
- While not shown in the table below, in Build Alternative 2, high delays are expected for the unsignalized Pan American East Drive intersection (southbound right-turn movement).

Table 6-8, Comparison of Intersection Operations at the San Mateo/Osuna Interchange

Major Street/Minor Street Intersection	Cycle Length (sec)	Overall Intersection Delay (veh/sec)	LOS	Max V/C	Deficient Movements V/C Ratio > 1.0
AM PEAK HOUR					
San Mateo Blvd @ NB Frontage Rd					
Build Alternative 1	110	31	C	1.07	EBL
Build Alternative 2	110	38	D	1.03	EBL, NBL
Build Alternative 3	110	30	C	0.97	-
Osuna Rd @ SB Frontage Rd					
Build Alternative 1	110	67	E	1.21	EBT, WBL, SBL, SBT
Build Alternative 2	110	31	C	0.91	-
Build Alternative 3	110	38	D	0.98	-
PM PEAK HOUR					
San Mateo Blvd @ NB Frontage Rd					
Build Alternative 1	120	43	D	1.08	EBL, WBT, NBT
Build Alternative 2	120	50	D	1.07	EBL, NBT
Build Alternative 3	120	35	D	0.99	-
Osuna Rd @ SB Frontage Rd					
Build Alternative 1	120	81	F	1.19	EBT, WBL, SBL, SBT
Build Alternative 2	120	47	D	1.00	WBL, SBT
Build Alternative 3	120	50	D	1.05	WBL, SBT

San Antonio Drive/Ellison Street Interchange

The design-year intersection operations for the San Antonio Drive/Ellison Street interchange are summarized in Table 6-9. The same intersection lane configurations were used in the build alternatives, both frontage road approaches were widened and an exclusive eastbound right-turn lane was added. Key findings of the analyses include:

- The results indicate that further improvements over those shown in the three build alternatives are needed to provide acceptable operations. A third westbound lane could be provided in the median of San Antonio Drive as far east as is needed. The third lane would drop to the westbound left-turn lanes at the interchange.
- The storage provided for the eastbound left-turn is inadequate in all alternatives. Dual left-turn lanes could be provided for this movement by using the excess median width for a second left-turn lane. However, dual left-turn lanes would not be possible if a third westbound lane were added.
- Overall, the highest delays are expected for Build Alternative 1 because direct access to the southbound freeway is provided.
- Build Alternative 3 shows the best results because the 2030 traffic forecasts are lower than the other alternatives. The lower forecasts are attributed to;
  - A direct northbound off-ramp to San Antonio is not provided.
  - A direct on-ramp to southbound I-25 is not provided.
  - The additional capacity provided for the east-to-south movement at Paseo del Norte is thought to have resulted in less demand using the San Antonio/Ellison interchange.

Table 6-9, Comparison of Intersection Operations at the San Antonio Drive/Ellison Street Interchange

Major Street/Minor Street Intersection	Cycle Length (sec)	Overall Intersection Delay (veh/sec)	LOS	Max V/C	Deficient Movements V/C Ratio > 1.0
AM PEAK HOUR					
San Antonio Dr @ NB Frontage Rd					
Build Alternative 1	90	49	D	1.07	WBT, NBL
Build Alternative 2	90	46	D	1.07	WBT, NBL
Build Alternative 3	90	35	D	1.02	WBT
Ellison St @ SB Frontage Rd					
Build Alternative 1	90	26	D	0.96	-
Build Alternative 2	90	22	C	0.87	-
Build Alternative 3	90	14	B	0.65	-
PM PEAK HOUR					
San Antonio Dr @ NB Frontage Rd					
Build Alternative 1	90	85	F	1.24	EBL, WBT, NBT, NBR
Build Alternative 2	90	75	E	1.28	EBL, WBT, NBR
Build Alternative 3	90	68	E	1.23	EBL, WBT, NBR
Ellison St @ SB Frontage Rd					
Build Alternative 1	90	40	D	1.07	WBL, SBT
Build Alternative 2	90	30	C	1.02	WBL
Build Alternative 3	90	23	C	0.81	-

Paseo del Norte and Domingo Baca Arterial Interchange

The configuration of this interchange was as shown in the DEIS for the I-25/Paseo del Norte interchange and was the same for all the alternatives. Acceptable operations are expected and no further improvements were identified.

Alameda Boulevard Interchange

The build alternatives were evaluated based on the same configurations, and only minor variations in design-year traffic were shown in the design-year forecasts. Whereas the conceptual designs only showed additional lanes for the southbound approach, the intersection operational analysis results reflect the assumption that Alameda Boulevard would be widened to a six-lane roadway by other projects including an exclusive right-turn lane for the east-to-south right-turn movement.

The analyses indicate that improvements are needed at the Alameda Boulevard interchange. The AM peak is the critical condition as several movements are expected to operate near or at-capacity at the Northbound Frontage Road intersection including the eastbound left-turn, westbound through, northbound left-turn and northbound through movements. The east-to-south right-turn movement at the Southbound Frontage Road intersection is also a high-demand movement. Improvements to this interchange and the adjacent segments of Alameda Boulevard will be included in the recommended build alternative. A wider bridge structure will be required to provide sufficient left-turn queue storage within the interchange, an additional through lane in each direction, and appropriate pedestrian and bicycle improvements. Advance u-turns on both sides of Alameda Boulevard will also be considered.

Tramway Road/Roy Road Interchange

Acceptable traffic performance is expected for this interchange under forecast design-year conditions. No improvements were identified so there is no difference between the build alternatives.

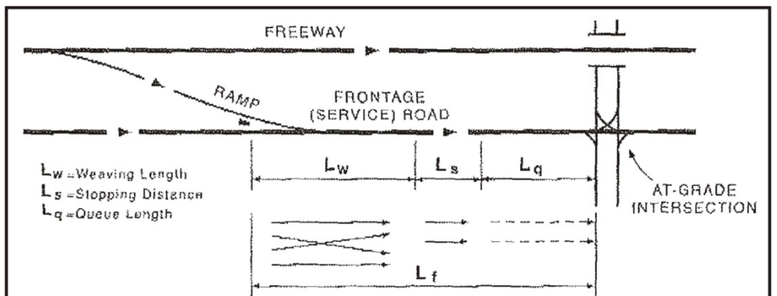
Frontage Roads

One-way frontage roads exist throughout the North I-25 freeway corridor with slip ramps providing access between the mainline freeway and the frontage road system. With this configuration, the distance from the slip ramps to the signalized crossroad intersection is a critical element for efficient frontage road and freeway operation. The frontage road segments from the signalized intersections to the downstream on-ramps are not as problematic (without ramp metering).

An analysis of the I-25 frontage roads was performed to evaluate the placement of the slip ramps on both the approach to and the departure from the signalized crossroad intersections without ramp metering. The methodology contained in the ITE *Freeway and Interchange Geometric Design Handbook* for frontage roads was used. Figure 6-9 illustrates the frontage road design elements for the distance required from the exit ramp merge with the frontage road to the signalized crossroad intersection. With regard to the frontage road segments from the signalized intersections to the downstream on-ramps, use of two-lane ramps with an option lane will aid the performance of the frontage road. The ITE methodology does not address two-lane ramp roadways.

The evaluation was completed using spreadsheets which are included in Appendices E, F and G for the three build alternatives, respectively. The key findings are discussed below.

- **Build Alternative 1**
  - Northbound Frontage Road
    - San Mateo Boulevard to San Mateo on-ramp: A deficient length of 100 feet was identified but the two-lane ramp should mitigate any issues, thus this was not identified as an issue.
    - San Antonio off-ramp to San Antonio Drive: A deficient length of 105 feet was identified. Providing more length would be difficult due to the upstream braided ramps.
  - Southbound Frontage Road
    - San Antonio Drive to San Antonio on-ramp: A deficient length of 350 feet was identified. Extensive queues are expected on westbound San Antonio Drive because poor lane utilization is expected for the dual left-turn movement (as exists today).
    - San Mateo/Osuna off-ramp to San Mateo Boulevard/Osuna Road: The required weave length is only 290 feet because the high left-turn volume from the off-ramp is not considered weaving volume. While the analysis indicates a deficient length of 80 feet, practical experience suggests that issues should be expected for this segment of frontage road.



Frontage Road Design Elements

Source: Leisch, Jack E. Procedure for Analysis and Design of Weaving Sections - A User's Guide. Washington, DC: FHWA 1984.

Figure 6-9, Frontage Road Design Elements Approaching Crossroad Intersection

- **Build Alternative 2**
  - Northbound Frontage Road
    - San Mateo Boulevard to San Mateo on-ramp: A deficient length of 100 feet was identified but the two-lane ramp should mitigate any issues, thus this was not identified as an issue.
    - San Antonio off-ramp to San Antonio Drive: A deficient length of 105 feet was identified. Providing more length would be difficult due to the upstream braided ramps.
  - Southbound Frontage Road
    - San Mateo Boulevard/Osuna Road to San Mateo/Osuna on-ramp: A deficient length of 140 feet was identified but the two-lane ramp should mitigate any issues. Providing more length would be difficult because of horizontal curvature and the downstream braided ramp configuration.
- **Build Alternative 3**
  - No substantive issues were identified for this alternative.

Ramp Roadways

A spreadsheet was used to perform a simple volume-to-capacity (v/c) ratio analysis of the ramp roadways based on design-year traffic volumes. Summary tables are included in the appendices. The following capacity values were obtained from Exhibit 25-3 of the HCM2000:

- One-lane ramp – 2000 pcphpl or 1880 vphpl
- Two-lane ramp – 1900 pcphpl or 1790 vphpl
- Loop ramp – 1700 pcphpl or 1600 vphpl

The v/c ratio thresholds used to identify potentially congested ramp roadways were the same as those stated for the intersection performance. Potential issues were shown at the northbound Paseo del Norte regional off-ramp, the southbound Alameda on-ramp, and the southbound Paseo del Norte regional on-ramp. This is consistent for all of the build alternatives. Congestion is more severe in Build Alternative 3 because the Paseo del Norte east-to-south ramp was forecasted with two lanes of capacity.

Ramp Metering Evaluation

Ramp metering is the deployment of traffic signal control to manage the rate that vehicles enter a freeway facility. By controlling the rate vehicles are allowed to enter a freeway, traffic flow onto the freeway becomes more consistent, in essence smoothing the flow of traffic on the mainline and allowing efficient use of existing freeway capacity.

Ramp meters may be programmed to release vehicles one at a time or in a small group, usually no more than two vehicles, to mitigate the impacts that vehicles entering the freeway have on freeway traffic flow. A ramp meter may be coordinated with other ramp meters to smooth traffic flow at a point or along a stretch of freeway or alternatively for several freeways within a regional network. Additionally, ramp meters may be programmed to optimize freeway flow and/or reduce congestion and its effects (collisions, delay, emissions, and fuel consumption). However, it should be noted that motorists may elect to bypass metered ramps in lieu of other ramps upstream or downstream of those that are metered. The potential for diversion is an issue that practitioners need to take into consideration before deploying ramp meters.

Advantages of Ramp Metering

Ramp metering helps balance capacity and demand. Even in an uncongested state, a platoon of vehicles merging onto a freeway can cause enough turbulence to cause localized congestion around the ramp merge area. Metering can minimize these impacts by releasing vehicles in a controlled manner depending on the freeway mainline's ability to accept traffic.

Experience with ramp meters has shown safety, travel time, speed, throughput, and environmental benefits. When ramp meters were turned off for a six-week study in Minneapolis, a before and after evaluation concluded that meters were responsible for a 21 percent reduction in crashes and a 9 percent increase in mainline volumes. Surveys in Minnesota and Glasgow, Scotland showed a majority of motorists viewed ramp metering as a beneficial traffic management strategy.

Advantages of ramp meters in regard to freeway operations include:

- Improved system operation.
- Increased vehicle throughput.
- Increased vehicle speeds.
- Improved use of existing capacity.
- Improved safety.
- Reduction in number of crashes and crash rate in merge zones.
- Reduction in number of crashes and crash rate on the freeway upstream of the ramp/freeway merge zone.
- Reduced environmental effects.
- Reduced vehicle emissions.
- Reduced fuel consumption.
- Promotion of multi-modal operation.

Disadvantages of Ramp Metering

Potential adverse impacts of ramp meters in regard to freeway operations include:

- Queue Spillback – Ramp meters have the potential to create queues on the ramp that may encroach into the adjacent arterial intersection. This may result in safety concerns and increased delay.
- Potential for traffic diversion – Motorists may elect to bypass queues that form at ramp meters in lieu of arterials that parallel a freeway facility. This is especially true for motorists who take short trips, in which case wait times at meters may exceed the additional travel time in taking slower arterial routes. If available routes cannot support diverted traffic, operations on nearby arterials may be negatively affected.
- Socioeconomic considerations – Ramp meters may shift traffic congestion and associated impacts from one location to another. In areas where traffic problems are minimized, or are all together eliminated, property values may increase due to the fact that these areas are seen more favorably. Consequently, in areas where traffic congestion and associated problems are increased, property values may decrease.
- Equity – Arguments have suggested that ramp meters favor suburban motorists who make longer trips, versus those that live within metered zones who make shorter trips. This argument is based on the assumption that the suburban motorist lives outside a metered zone and is not delayed by ramp meters when entering a freeway and traveling through a metered zone. As such, the possibility exists that the motorist who lives within the city may have a proportionally unfair commute when comparing travel time against travel distance. As such, ramp meters are sometimes considered to promote longer trips.

Despite the benefits of ramp meters, there are several other considerations practitioners need to consider before selecting this strategy. Practitioners need to consider if resources (e.g., staff, funding, equipment) are available internally to support ramp metering programs and if these systems can be effectively maintained. If resources to deploy, operate, and maintain these systems are not available, ramp metering programs will ultimately fail. In addition to these resources, staff must also consider how they intend to enforce ramp meter compliance, and must investigate if law enforcement is committed to the ramp meter program.

Traffic Volume Reduction Analysis for Mainline I-25

Build Alternatives 1 and 2 were designed to accommodate ramp metering. The specific type of ramp metering such as fixed-timed, traffic-responsive, or metered-at-demand is not identified herein and would require further investigation. The intent of this evaluation is to identify the traffic volume reductions required to achieve reasonable travel speeds on mainline I-25.

As stated previously, a performance goal of densities in the 41 to 42 pcpmpl (52-53 mph; 2250 pcphpl) realm are considered desirable for mainline I-25. As such, the ramp metering evaluation was performed to determine the required on-ramp adjustments to maintain no more than 2250 pcphpl (2080 vphpl) on both directions of the mainline freeway. The tabular evaluation spreadsheets are included in Appendix E and Appendix F, and key findings are discussed below.

- **Northbound I-25**
  - All the forecast demand can be accommodated in the North I-25 corridor during both the AM and PM peak-hour periods. However, this finding requires aggressive metering at the Comanche on-ramp reducing the forecast demand by over 500 vph in the AM peak and by approximately 400 vph in the PM peak. If the diverted traffic from the Comanche on-ramp travels up the northbound frontage road, it will eventually enter the freeway at one of the downstream on-ramps.

- **Southbound I-25**
  - The freeway performance downstream of the Montgomery/Montaño on-ramp is critical in the southbound direction. For analysis purposes, the minimum volume established for the Montgomery/Montaño on-ramp was 500 vph. In addition, the Comanche on-ramp was capped at 1400 vph.
  - In Build Alt 1, the San Antonio on-ramp was not metered because of space limitations.
  - In Build Alt 2, the loop ramp at Montgomery did not require metering but this ramp also could not accommodate any diverted traffic from the metered upstream on-ramps because it does not connect to the southbound frontage road. While not assumed in this analysis, some of the traffic diverted from the North I-25 corridor could use the surface street network to access the loop ramp.
  - Under the above assumptions, some traffic diversion from the North I-25 corridor would be expected during the peak travel periods.
    - The overall loss during the AM peak was the same for both build alternatives at 320 vph.
    - For the PM peak, 750 vph were diverted for Build Alt 1 and 910 vph were diverted for Build Alt 2.
  - AM Peak Hour Metering:
    - For Build Alt 1, aggressive metering was required at the San Mateo/Osuna and Montgomery/Montaño on-ramps as the ramp volumes were reduced by 475 vph and over 400 vph, respectively.
    - For Build Alt 2, while the adjacent freeway volumes were below the 2250 pcphpl threshold, the San Mateo/Osuna and Jefferson on-ramps were metered to improve downstream operations. The on-ramp volumes at these ramps were kept at 800 vph.
  - PM Peak Hour Metering:
    - For Build Alt 1, while the adjacent freeway volumes were below the 2250 pcphpl threshold, the San Mateo/Osuna and Jefferson on-ramps were metered to improve downstream operations. The on-ramp volumes at these ramps were kept at 900 vph.
    - For Build Alt 1, in addition to metering upstream on-ramps, aggressive metering was required at the Montgomery/Montaño on-ramp as the ramp volume was reduced by over 600 vph.
    - For Build Alt 2, while the adjacent freeway volumes were below the 2250 pcphpl threshold, the San Mateo/Osuna and Jefferson on-ramps were metered to improve downstream operations. The on-ramp volumes at these ramps were kept at 780 vph.
    - For Build Alt 2, the Montgomery/Montaño on-ramp volume was reduced by 320 vph.

Ramp Metering Impacts on Arterial Street System

Ramp metering has the potential to create queues on the entrance ramps that may encroach into the adjacent arterial intersection resulting in detrimental impacts to arterial street operations. Motorists may also elect to bypass queues that form at ramp meters either using the frontage road system to continue within the North I-25 corridor or using the surface street system. This is especially true for motorists who take short trips who may realize that wait times at meters may exceed the additional travel time in taking slower arterial routes.

While the potential for impacts on the arterial street system exists with ramp metering, these impacts were not evaluated as part of this study. The highest priority in the North I-25 corridor is the operation of the mainline freeway. Consequently, preserving reasonable travel speeds on the freeway may result is necessary operational sacrifices on the surface street system. Because of the complexities associated with the system of the freeway, ramps, frontage roads and arterials comprising the study area roadway network, micro-simulation software is the best tool to evaluate the system as a whole. In addition, the various types of ramp metering strategies can be accurately modeled with micro-simulation software. Specialized vehicle actuated programming (VAP) applications are needed to use VISSIM to model ramp metering.

Conceptual Drainage Analysis

Methodologies and Procedures

The drainage evaluation addressed the effect of the proposed project on drainage conditions in the area. Because of the size of the study and the number of alternatives being considered, the assessment was general in nature. It included a survey of existing drainage facilities, limited field investigations, review of existing drainage studies, and general recommendations for drainage improvements associated with the alternatives being considered. Coordination took place with the NMDOT and drainage representatives from the City of Albuquerque (COA) and the Albuquerque Metropolitan Arroyo Flood Control Authority (AMAFCA). The criteria and preliminary computational methods were in accordance with the NMDOT Drainage Manuals Volumes I and II (December 1995 and November 1998), NMDOT Drainage Design Criteria (Fourth Revision, June 2007), the COA Development Process Manual (DPM) (including 2008 revisions), and the AMAFCA Drainage Policy (1980). The NMDOT Drainage Design Criteria specifies “In jurisdictions that have stricter criteria than those in this manual, the local jurisdiction criteria govern the drainage design.” For this reason, a set of criteria was assumed that met the drainage requirements of the agencies involved with this project and its surroundings.

Drainage Analysis

The study area slopes toward the west, with runoff flowing from east to west generally. The area is predominantly developed, and drainage facilities have been constructed to convey flows. The majority of the study area drains to facilities running from east to west into the Alameda Drain and the North Diversion Channel (NDC).

The Alameda Drain, an earthen channel parallel to Second Street, carries flows toward the south. The Alameda Drain was designed as an irrigation facility when the valley was primarily agricultural. As such, it is not designed to convey flows from the developed watershed. Major detention ponds such as the Menaul Detention Dam and Claremont Detention Pond, located between I-25 and the Alameda Drain, control the discharge into the Drain.

The NDC is a large concrete-lined flood control trapezoidal channel that collects the runoff from northeast part of Albuquerque and carries it toward the north and into the Rio Grande. The NDC crosses under I-25 just north of the Montgomery/Montaño Interchange. Two pre-stressed concrete girder bridges (Bridge Number 6698 and Bridge Number 6699) span I-25 over the channel. Bridge Number 6698 spans the northbound lanes and is 166 feet long, and Bridge Number 6699 spans the southbound lanes and is 169 feet long.

A number of concrete-lined drainage channels flow east to west through the study area, crossing under I-25 in concrete box culverts (CBC’s). These include, from south to north, the Bear Canyon Arroyo, Borealis Arroyo, South and North Piño Arroyos, and the South and North Domingo Baca Arroyos. The Broadbent Channel and South La Cueva Arroyo also flow from east to west through the study area, crossing under I-25 in a structural plate arch pipe and a set of reinforced concrete pipes (RCP’s), respectively.

The Broadbent Channel is located north of Menaul Boulevard and it crosses I-25 in a single 126-inch structural plate pipe. The Bear Canyon Arroyo is located between Jefferson Street and Osuna Road/San Mateo Boulevard and crosses under I-25 in an eight barrel 10-foot span by 4-foot rise CBC; the bridge number for this structure is 5751. An extensive baffle drop structure exists at the outlet of this structure. The Borealis Arroyo crosses I-25 just north of San Mateo/Osuna Interchange in a single barrel 8-foot span by 8-foot rise CBC. The South Piño Arroyo is located south of San Antonio Drive and crosses under I-25 in a one barrel 8-foot span by 8-foot rise CBC. The I-25/Paseo del Norte Interchange Study (CN D3026) evaluated the North Piño, the South Domingo Baca, and the North Domingo Baca Arroyos. The South La Cueva Arroyo is located north of Alameda Boulevard; eight 36-inch diameter RCP’s carry the drainage for this channel east to west toward the NDC. Large diameter storm drains carry the runoff into the

Broadbent Channel and Bear Canyon Arroyo just east of the I-25. Refer to Appendix N, Existing Utility Maps, for a depiction of the drainage facilities along the corridor.

The existing drainage within the corridor is generally collected in parallel roadside ditches and median drop inlets. For the most part, these roadside ditches are located along both sides of the frontage roads. The existing crown of the interstate directs the runoff from the inside two lanes and the shoulder to drop inlets that are located along the center barrier wall. A number of small diameter storm drain systems collect the roadway drainage and discharge it into the major facilities described previously. Existing profile grade on the interstate from the San Mateo Boulevard/Osuna Road Interchange to San Antonio Drive are less than 0.3% in sections.

Several relatively small detention/retention ponds exist in the study area. The ponds located east of the corridor attenuate the flow crossing under I-25.

Drainage Options

Improvements Common to All Alternatives

Drainage inlets will be constructed to collect runoff flows from pavement and off-site areas. These inlets will be connected with pipes to existing drainage facilities. Manholes will be constructed for maintenance access. Existing historic flow patterns will be maintained. Backwater onto private property will be avoided wherever possible. Drainage analysis will assume full development within the watershed, and it will accommodate existing accepted drainage plans. The conceptual layout of the drop inlets was based on the assumption that no work will be performed on the inside lanes and shoulder of the interstate and that the existing drop inlets along the center barrier wall are adequate. An assumption has also been made that no improvements will be made to the flat grades of less than 0.3% on the interstate from the San Mateo Boulevard/Osuna Road Interchange to San Antonio Drive, since the existing conditions are not linked to any known regular maintenance problems.

Existing storm drains and culverts will be checked for hydraulic and structural capacity and replaced, realigned, and/or adjusted to accommodate the new roadways. Conversations with personnel from the NMDOT, COA, and AMAFCA indicated that no overtopping at the major crossings has been observed; it is anticipated that the majority of the crossing culverts are adequate and will be extended as required.

Storm drain systems will be designed under NMDOT or City of Albuquerque criteria as appropriate, depending on which entity maintains the facilities in that area.

Open areas in gores can be used for small detention ponds. This will attenuate peak flow rates, reducing the size of downstream storm drains. It also will allow sediment and pollutants to settle out, improving the water quality.

Storm water treatment ponds or manholes will be constructed to treat all drainage from NMDOT right-of-way that does not reach another water quality facility. These ponds/manholes typically include flow controls that are intended to separate as much debris, oil, and suspended sediment as possible from the runoff.

A new local access road will be constructed east of the Montgomery Interchange. The profile of this roadway will contain a sag vertical curve just south of Montgomery Boulevard. The runoff from this section of the roadway will be collected via a storm drain system. Preliminary investigations show that the outfall of this system is too low to connect to the existing drainage facilities in the area; a new retention pond just east of the access road and south of Montgomery Boulevard may be required.

The twin bridges over the NDC will be widened to accommodate the proposed improvements. The outlet of the Bear Canyon Arroyo box culvert, located north of Jefferson Street, will be extended to contain the new roadway. Segments of open channels along the Borealis Arroyo will be replaced by box culverts at the outlets of the drainage crossings under I-25 and southbound frontage road, north of San Mateo Boulevard. The outlet of the South Piño Arroyo box culvert, located south of San Antonio Drive, will be extended to accommodate the new roadways.

The proposed roadway improvements will increase runoff flow rates and volumes, due to the additional pavement area. The capacity of existing downstream drainage facilities will be verified during design. Detention ponds may be required to maintain historic flow rates. These ponds will be located within existing NMDOT right-of-way.

Build Alternative 1

The northbound Montgomery Boulevard off-ramp will encroach into the existing detention pond located on the United Postal Service (UPS) property. This detention pond controls the discharge into the Griegos Pond, located north of Comanche Road and east of Edith Boulevard. Additional right-of-way from the Carpenters Union Training Center property may be required to maintain the existing storage volume.

Build Alternative 2

The northbound Montgomery Boulevard off-ramp will encroach into the existing detention pond located on the UPS property. This detention pond controls the discharge into the Griegos Pond, located north of Comanche Road and east of Edith Boulevard. Additional R/W from the Carpenters Union Training Center property may be required to maintain the existing storage volume.

The extension length at the outlet of the Bear Canyon Arroyo CBC, located north of Jefferson Street, is longer for this alternative than the other two options. This additional length may alter the hydraulics of the baffle drop structure. Further analysis will be required during design. The inlet of the South Piño Arroyo box culvert, located south of San Antonio Drive, will be extended to accommodate the new roadway.

Build Alternative 3

The outlet of the CBC at Borealis Arroyo under the northbound frontage road will be extended to accommodate the proposed advance u-turn roadway. Depending on the requirements of the I-25 bridge structures, assuming reconstruction, further investigations would be required to determine appropriate modifications to the Borealis Arroyo.

Underground and Overhead Utilities

Research of available maps and records indicates that numerous underground and overhead utilities are present in the I-25 corridor throughout the study area. Because of the number of utilities within the study area, a detailed description of each utility is not provided in this report; rather, the locations and type of existing utilities are shown in Appendix N. The existing utilities identified in the corridor are:

- Underground
  - Water (City of Albuquerque)
  - Sanitary Sewer (City of Albuquerque)
  - Storm Drain (City of Albuquerque)
  - Gas (Gas Co. of New Mexico)
  - Electric (Public Service Co. of New Mexico, PNM)
  - Telecommunications (Qwest)
  - Telecommunications (Time Warner)
  - Telecommunications (Verizon)
  - Cable TV (Comcast)

- Overhead
  - Electric (Public Service Co. of New Mexico, PNM)
  - Telecommunications (Qwest)
  - Telecommunications (Time Warner)
  - Telecommunications (Verizon)
  - Cable TV (Comcast)

The existing utilities are generally either parallel lines located near the edges of the right-of-way, or crossing lines that span the right-of-way from one side to the other. Utility lines may also be located on some of the existing bridge structures.

In comparing the locations of existing utilities with the build alternatives, new construction will occur near underground utilities and overhead utilities at many places in the corridor thereby creating the potential for significant utility impacts. This will be the case regardless of the build alternative selected for implementation. The level of impacts to existing utilities does not appear to vary significantly between the build alternatives. Due to the extensive presence of utilities and potential for impact, careful coordination will be needed and modifications should be anticipated as this project progresses.

Environmental Evaluation of Alternatives

This section contains a comparison of impacts of the various project alternatives on environmental, social, and cultural conditions that exist within the project area. The primary objectives of the environmental analysis are to identify and compare the impacts of the alternatives under consideration and contribute to recommendations regarding which alternatives should be carried forward. The No Build Alternative, which is carried forward as an alternative in any future environmental documents, is not discussed unless it has impacts to a specific resource. Otherwise, the No Build Alternative is assumed to have no impacts. This analysis builds on information collected during Phase 1A of the study; refer to the Phase IA Report for more detailed information on existing environmental and community conditions (included on the project CD).

Environmental Resources

Because the North I-25 study area is within the urbanized Albuquerque metropolitan area, there are few environmental resources present. The project alternatives are all similar in terms of their effects to environmental resources. Most of the study area consists of the existing paved highway and adjacent development. A brief discussion on each environmental resource is listed below:

- **Vegetation and Wildlife**: The small amount of vegetation in the project area consists of weedy species and landscaping. Three Class C noxious weeds are present within the project area; however, no action is recommended. Wildlife includes primarily avian species that pass through the area; little nesting habitat is present. Some of these birds are protected by the Migratory Bird Treaty Act, and it is recommended that further investigations be performed during the environmental documentation phase to ensure that no nesting habitat will be affected.
- **Threatened and Endangered Species**: There is no habitat for any threatened or endangered species, nor are any of the species present within the project area.
- **Water Quality:** There are several drainages and flood control facilities within the project area that fall under the jurisdiction of the Albuquerque Metropolitan Arroyo Flood Control Authority (AMAFCA), including the Hahn, Bear Canyon, South Piño, and Domingo Baca Arroyos. The City of Albuquerque has maintenance responsibilities for the Borealis and North Piño Arroyos that also pass through the project area. Any work in these water bodies will require authorization from the US Army Corps of Engineers (USACE) under Section 404 of the Clean Water Act. Additionally, Section 401 of the CWA requires water quality certification from the New Mexico Environment Department Surface Water Quality Bureau (SWQB).
- **Wetlands:** Two small low-quality wetlands are present within the project area (see Figure 6-10). These are a result of roadway drainage and site runoff and do not fall under the jurisdiction of the USACE.
- **Floodplains:** Floodplains in the project area are primarily Zone A and Zone AO, which have base flood depths of 1 to 3 feet. Base flood elevations will not be altered by any of the alternatives, nor will the functional characteristics of the floodplain be degraded.

Figure 6-10, Low-Quality Wetland North of Comanche Road on East side of I-25

- **Air Quality:** Because the project is intended to reduce congestion and improve bottlenecks, adverse impacts to regional air quality are not anticipated. Modeling using the current MOBILE emissions model and the CAL3QHC dispersion model will be performed for major intersection alternatives carried forward into the environmental document. Emissions burden analysis will be prepared to verify conformity with the Metropolitan Transportation Plan (MTP) in place at that time. Also, an air toxics analysis and greenhouse gas calculations will be prepared during the environmental documentation phase. Construction phase impacts to air quality will also be considered.
- **Hazardous Materials:** No formal investigation of the presence of hazardous materials has been conducted for the project. The potential for hazardous wastes within the project area will be determined by a Preliminary Initial Site Assessment (PISA), which will identify recognized environmental conditions (RECs) that may exist within the project area. The PISA will be performed during the environmental documentation phase. Once the PISA is completed, additional investigations of any RECs identified within the project area may be recommended.
- **Noise**: Some of the more noise-sensitive uses such as hotels, apartments, and mobile home communities located closer to the interstate are likely to be affected by traffic noise impacts. Current noise levels adjacent to I-25 exceed FHWA noise abatement criteria in several locations. Noise is anticipated to increase as additional capacity is added to I-25. Changes in ramp locations and how traffic is distributed will also affect noise levels at specific locations. Preliminary analysis indicates that modeled noise levels for the year 2030 increase only slightly over existing conditions. However, given the overall high noise levels in the project corridor, consideration of noise abatement will likely be required as the project progresses. Construction noise will also be a factor and will be addressed in the environmental document. A summary of the

preliminary noise analysis can be found in the documents "*North I-25 Corridor: South of Comanche to North of San Mateo: Summary of Noise Analysis*" prepared by PB in November 2010, and "*I-25/PDN Proposed Improvements: Traffic Noise Impact Technical Memo*" prepared by PB in July 2009.

Social, Economic, and Cultural Resources

Development along the interstate frontage roads is primarily commercial, industrial, and institutional; residential neighborhoods and communities are typically located away from the interstate mainline and frontage roads. Therefore, impacts to communities and community facilities are anticipated to be minimal. Social, economic, and cultural resources are briefly discussed below.

- **Communities**: None of the project alternatives will require residential relocations or changes in neighborhood cohesion. While there are some low-income, minority, and other special status populations within the study area, they will not be disproportionately impacted by any alternative. Access to some community facilities such as hospitals and schools may be differentially affected by the proposed alternatives. Elimination of some on- and off-ramps will change the way drivers reach these destinations. The No Build alternative will not improve traffic operations or decrease congestion within the project area, nor will it meet the projected traffic demands.
- **Businesses:** Impacts to businesses in the project area will be primarily in the form of changes to access, both during construction and as a result of the build alternatives. In addition, the visibility of several businesses adjacent to the southbound frontage road north of Comanche Road will be affected by the braided southbound on and off-ramps at this location in Build Alternatives 2 and 3. Construction-related access changes may occur as a result of ramps and/or sections of the frontage roads being closed for short durations. Access to all properties will be maintained at all times during construction; signage will direct motorists to businesses. Permanent changes to access will occur as a result of all of the build alternatives; each alternative proposes slightly different access configurations (see Access Management section of this chapter). These changes will be particularly important to businesses such as hotels, service stations, and restaurants that depend on drive-by traffic for patronage. Visibility and a clear access route are important to attracting customers from the highway. Most of the access changes are proposed at the Jefferson, San Antonio/Ellison, and Paseo del Norte interchanges. Hotels such as the Holiday Inn and Drury Inn and the large number of restaurants at the Jefferson interchanges will be affected by the elimination of the southbound off-ramp under all alternatives. Traffic destined to these businesses from the north will exit at San Mateo/Osuna. There are a number of hotels both north and south of the San Antonio/Ellison interchange on both sides of the interstate. Elimination of the southbound off-ramp under all build alternatives and the northbound off-ramp under Alternative 3 will require drivers to exit at Alameda Blvd (southbound) or San Mateo/Osuna (northbound, Alternative 3). Similarly, major changes at the Paseo del Norte interchange will affect access to the hotels and restaurants in that corridor. Many of these changes will require drivers to exit the interstate before they can see the destination. Note that specific impacts to businesses as a result of the reconstruction of the I-25/Paseo del Norte interchange are described in detail in the DEIS for that project.

  Build Alternative 2 will have direct impacts to two businesses as a result of the proposed new access road from Aztec Road (see Figure 6-5). The building housing Adecco employment services would be acquired and the business would be required to relocate. The property containing Air Gas/Puritan Medical would also be impacted and may be fully acquired. These businesses would also be required to relocate. The billboard located north of Adecco would need to be removed but could be replaced after construction is complete. All alternatives will affect roadside billboards throughout the corridor. These will be relocated wherever possible.

  The visibility of two office buildings located on Midtown Road west of the southbound frontage road and adjacent to the braided ramp pair north of Comanche Road will be partially obscured by the Montgomery/Montaño on-ramp (see Figure 6-11 and also Figure 4-2 in Chapter 4). Under Build Alternatives 2 and 3, the freeway on-ramp is elevated above the off-ramp and frontage road by approximately 29 feet. The raised ramp will block visibility of these buildings from the section of freeway mainline approximately 500 feet north and south of Midtown Road. The businesses at this location are housed in two buildings and consist of office, service commercial, and medical office uses. A total of eight separate businesses are affected. These types of businesses do not generally rely on roadside visibility to attract their customer base. For this reason, the loss of visibility from the freeway mainline is not expected to have a substantive adverse impact.

  The No Build alternative will not directly impact businesses in the project area. However, increasing congestion within the project area may affect growth of these businesses. As regional traffic on I-25 increases, the delays for traffic within the project area will increase, which could have detrimental effects on economic activity within the study area as it may become a less attractive place for businesses to locate.

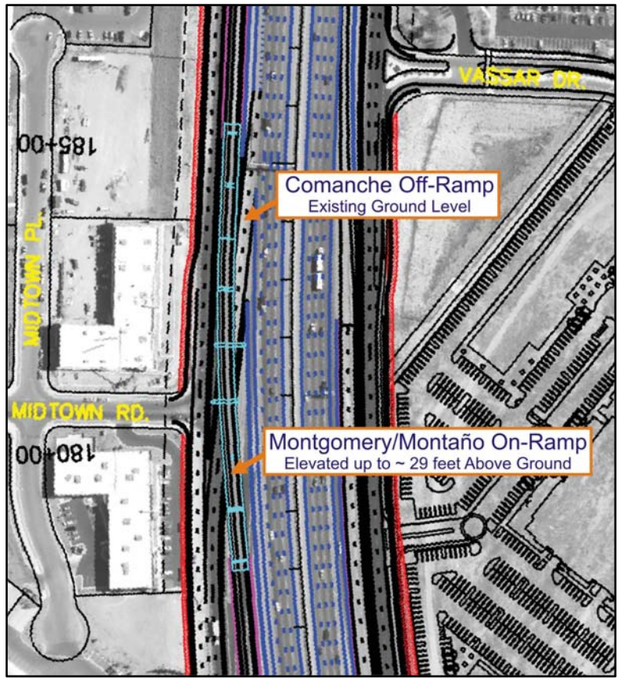


Figure 6-11, Buildings Obscured from I-25 by Proposed Braided Ramp Configuration

- **Cultural and Visual Resources**: A cultural resource survey was conducted of the project area. No cultural or historic resources were identified. Results of the survey are documented in the report *Cultural Resource Survey for the I-25 North Corridor Study, Candelaria to Tramway, Bernalillo County, New Mexico*, prepared by Criterion Environmental Consulting and on file at the NMDOT. The project area does not have particularly high visual quality. Background views of the Sandia Mountains and West Mesa/volcanoes will be preserved. No visual impacts are anticipated with any of the build alternatives.

Environmental Class of Action

The preliminary evaluation of environmental and cultural issues and impacts did not identify issues where significant impacts are likely to occur. For this reason, it is recommended that future project(s) be evaluated using an environmental assessment. Coordination with the following agencies is anticipated as part of the environmental documentation:

- US Army Corps of Engineers
- US Fish and Wildlife Service
- New Mexico Environment Department
- New Mexico Department of Game and Fish
- New Mexico Historic Preservation Division
- Mid-Region Council of Governments
- AMAFCA
- Bernalillo County
- City of Albuquerque
  - Municipal Development
  - Air Quality
  - ABQ Ride
  - Police & Fire

CHAPTER 7 RECOMMENDATIONS

Introduction

The purpose of the *North I-25 Freeway Operations Study* is to identify strategies to improve the efficiency of the freeway mainline and associated ramp, frontage road and interchange systems, and to update and prepare the North I-25 corridor for continued growth of the Albuquerque metropolitan area. Growth within the metropolitan area and at the major employment and activity centers accessed by the I-25 corridor, together with improvements to the I-40/I-25 interchange, has resulted in travel demand that exceeds the available capacity and has rendered the configuration of access to and from the mainline freeway inadequate. While the existing configuration of ramps was reasonably able to accommodate traffic into the 21st century, the facility has become outdated creating the need for additional capacity and the reconfiguration of access to preserve the safe and efficient function of the interstate.

The transportation improvement needs of the North I-25 corridor are being addressed by this study, the *North I-25 Freeway Operations Study*, and the *I-25/Paseo del Norte Interchange Study*. The recommendations described in this chapter address the entire North I-25 corridor. However, while the improvements identified for I-25 in the I-25/Paseo del Norte Interchange Study were reevaluated, the Paseo del Norte interchange itself was not. As such, the results of this study provide information to plan and program improvements for the North I-25 corridor with the exception of the Paseo del Norte interchange.

Recommendations

The North I-25 corridor includes the mainline freeway, the frontage road system, and the arterial cross-street intersections within and in close proximity to I-25 from north of I-40 to Tramway Road. Recommendations are provided for the corridor including the interchanges at Comanche Road, Montgomery Boulevard/Montaño Road, Jefferson Street, San Mateo Boulevard/Osuna Road, San Antonio Drive/Ellison Street, and Alameda Boulevard. The improvements identified for I-25 in the Paseo del Norte Interchange Study DEIS were refined based on the findings of this study and the proposed modifications are reflected in the recommendations herein. Further improvements to the Alameda interchange than were shown previously in this report are also included in the Recommended Build Alternative. The Tramway Road/Roy Road interchange was recently improved and further improvements were not identified by this study.

As demonstrated by the 2030 traffic forecasts and traffic analyses completed for this study, some congestion is projected under design-year conditions. However, this finding does not understate the need for improvements in the North I-25 corridor. Congestion is projected to be widespread and will affect most of the major roadways within the metropolitan area. Moreover, the feasibility of major improvements to the arterial street system in the area east of the Rio Grande will be limited. For this reason, the Albuquerque region will need to get the most out of its transportation system to meet future traffic demand. In some cases, capacity improvements can be made but in others, the existing capacity will need to be managed. High-capacity corridors like I-25, which passes through the middle of the region, will continue to be highly utilized so investments into the I-25 Corridor will provide value to the region and should be programmed even if full mitigation of congestion cannot be achieved. Furthermore, managing congested traffic conditions would be difficult with the existing configuration of I-25.

The following recommendations are made based on the Phase 1B engineering and environmental evaluations of the proposed improvement alternatives.

- The No-Build alternative will be advanced to Phase 1C, Environmental Documentation and Processing. It is a viable alternative and will serve as the baseline to compare the impacts and benefits of the proposed build alternative.
- The Recommended Build Alternative incorporates selected features of all three build alternatives evaluated with most features taken from Build Alternative 2. The Recommended Build Alternative is illustrated schematically in Figure 7-1, typical sections along I-25 are shown in Figure 7-2 (page 7-4), and the conceptual design layout is provided in Appendix O. Further descriptions are provided next.

Interstate 25

The Recommended Build Alternative provides four basic lanes from north of I-40 to Paseo del Norte in both travel directions. In addition, 12 to 14-foot shoulders and auxiliary lanes to supplement on and off-ramp operations are provided, as appropriate. The bottleneck in the northbound direction at Comanche Road is eliminated, and the appropriate number of lanes is provided southbound exiting the I-25/Paseo del Norte interchange. Lane balance and lane continuity are provided in both travel directions. It should be noted that narrower shoulder widths exist north of I-40 approximately to Comanche Road which were constructed by the I-40/I-25 (Big I) interchange project.

The reduction of conflicts along the study corridor was accomplished through the use of braided ramp pairs and by removing ramps to eliminate weave sections along the mainline freeway. Collector-distributor (CD) roads were incorporated at the San Mateo Boulevard/Osuna Road and San Antonio Drive/Ellison Street interchanges as well.

The proposed mainline improvements also include ITS applications to facilitate management of the corridor including ramp metering at selected on-ramps (see Figure 7-1). While much of the system is expected to be installed by other projects and the specific elements of the ITS system are not defined by this study, costs for an ITS system are included in the project cost estimate.

Several modifications to the improvements included in the I-25/Paseo del Norte Interchange DEIS are recommended which will need to be addressed in future environmental documents and the Interstate Access Change Request (IACR) for the interchange. These modifications are listed below:

- Northbound I-25
  - The Jefferson Street on-ramp is eliminated.
  - Ramp metering is recommended for the San Mateo Boulevard/Osuna Road on-ramp.
  - The off-ramp north of San Antonio Drive to the northbound frontage road, which would have provided local access to Paseo del Norte and other local streets, is eliminated. The recommendation is to combine this access with the San Antonio Drive off-ramp. A CD road is provided over San Antonio Drive to intersect the frontage road at the approximate location of the slip ramp proposed in the DEIS.
  - A two-lane ramp diverge is proposed at the Alameda Boulevard off-ramp.
- Southbound I-25
  - The Alameda Boulevard off-ramp is moved further north which requires widening and access modifications to the southbound frontage road.
  - The San Antonio Drive on-ramp is eliminated.
  - A two-lane off-ramp is proposed to provide access to San Mateo Boulevard/Osuna Road as well as access to Jefferson Street via a CD road over San Mateo Boulevard. A slip ramp diverges from the two-lane ramp roadway to the southbound frontage road to provide access to San Mateo Boulevard and Osuna Road. The two-lane ramp roadway continues south with one lane dropping to a loop ramp to southbound San Mateo Boulevard and the other continuing to the frontage road south of San Mateo Boulevard/Osuna Roa to provide access to Jefferson Street. The CD road is braided with the San Mateo Boulevard/Osuna Road on-ramp.
  - The San Mateo Boulevard/Osuna Road Interchange is reconstructed *(may be considered a separate project similar to the reconstruction of the Alameda Boulevard interchange)*.
    - A lane is added to southbound San Mateo Boulevard starting at the loop ramp and ending at Academy Road.
    - An advance u-turn is provided on the north side serving the south-to-north movement.
  - Ramp metering is recommended for the San Mateo Boulevard/Osuna Road on-ramp.
  - The direct off-ramp to Jefferson Street is relocated as described above.

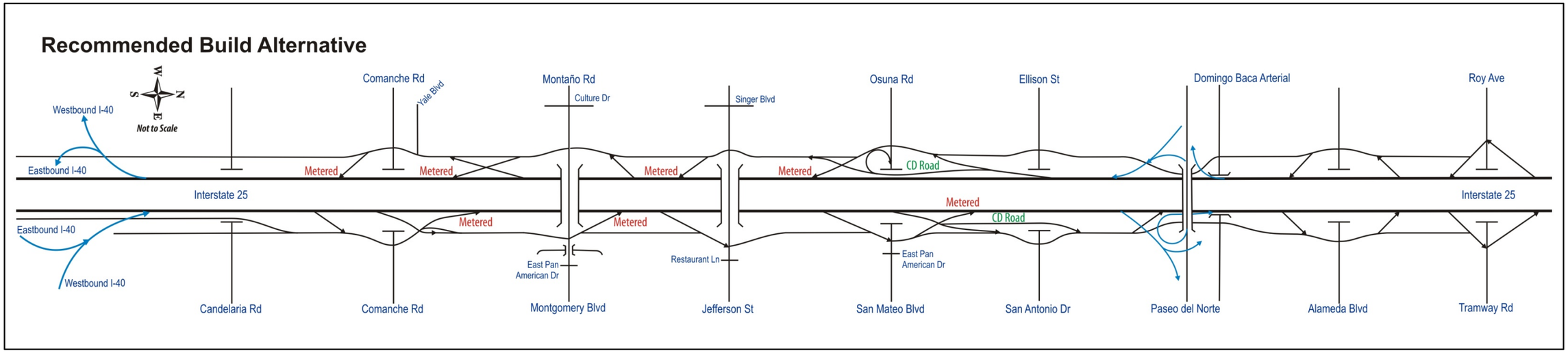


Figure 7-1, Ramp Layout Schematic for the Recommended Build Alternative

Interchanges

The following summarizes the key modifications recommended for the interchanges along North I-25. Refer to the plan view layouts in Appendix O for more information. Note that the queuing expected with ramp metering will be better accommodated with new bridge structures because left-turn lane improvements are included within the interchanges. Improvements to the intersection lane configurations are included at each interchange.

1. Comanche Road Interchange: Reconstructed, full access retained, compressed diamond layout, on-ramps metered, advance u-turns on both sides, access management on west side.
   - Local service road from Aztec Road eliminates access to the northbound frontage road between Aztec Road and Comanche Road.

2. Montgomery Boulevard/Montaño Road Interchange: Reconstructed, full access retained, compressed diamond layout, on-ramps metered, advance u-turns on both sides, access management on east side.
   - Grade-separated local service road which maintains full access to and from Pan American East Drive.
   - Loop ramp eliminated.

3. Jefferson Street Interchange: Widen existing bridge structure, access reduced, compressed diamond layout, on-ramp metered, advance u-turns on both sides, access management on east side.
   - Northbound on-ramp eliminated.
   - Southbound off-ramp relocated north; combined with San Mateo Boulevard/Osuna Road off-ramp continuing grade-separated over the arterial via a CD road and braided with the San Mateo Boulevard/Osuna Road on-ramp.
   - Realignment of Restaurant Lane and access easement extensions associated with Monroe Street connection to Jefferson Street.

4. San Mateo Boulevard/Osuna Road Interchange: Reconstructed, full access added, compressed diamond layout, on-ramps metered, advance u-turn on north side, access management on west side.
   - Traffic signal control at Pan American East Drive to remain.
   - Fourth lane added to southbound San Mateo Boulevard from the proposed loop ramp.

5. San Antonio Drive/Ellison Street Interchange: Existing bridge and layout, access reduced, access management on east side.
   - Northbound off-ramp braided with new San Mateo Boulevard on-ramp.
   - Northbound on-ramp relocated north, braided with the Paseo del Norte directional off-ramp.
   - Southbound off-ramp eliminated.
   - Southbound on-ramp eliminated.

6. Alameda Boulevard Interchange: Reconstructed, full access retained, compressed diamond layout, advance u-turns on both sides, access management on both sides.

Ramp Metering

Ramp metering is recommended for the North I-25 corridor from Comanche Road to Paseo del Norte. A ramp metering evaluation and study should be conducted to refine the approach for implementation and subsequent operation (e.g., fixed time, metered-at-demand, traffic responsive). Responsible agencies will need to consider if resources (e.g., staff, funding, equipment) can be made available to support ramp metering programs and if these systems can be effectively maintained. In addition to these resources, staff must also consider how they intend to enforce ramp meter compliance, and should investigate if law enforcement is committed to the ramp meter program.

Multi-Modal Elements

Alternative transportation modes are accommodated in the Recommended Build Alternative as follows:

- **Pedestrians**: Sidewalks are provided for pedestrians along both sides of each crossing arterial street through the I-25 interchanges. Typical sidewalk widths are a minimum of six to eight feet.
- **Bicycles**: On-street bicycle lanes are incorporated into the interchanges identified for reconstruction. Bicycle trail improvements are shown connecting both sides of Montgomery Boulevard to the North Diversion Channel trail. The grade-separated structure at the Bear Arroyo crossing of I-25was incorporated into the conceptual design (City of Albuquerque project). A grade-separated structure is also included as part of the Paseo del Norte interchange improvements.
- **Transit**: The costs associated with the I-25 bridges over San Mateo Boulevard/Osuna Road were increased to accommodate future bus rapid transit (BRT). Providing improvements to I-25 will improve the reliability of travel within the corridor which would make it available for use by ABQ Ride transit routes (using general purpose travel lanes).
- **Managed Lanes**: Full shoulder widths are provided along both sides of mainline I-25 in both travel directions. Future managed lanes could be added to the North I-25 corridor if the shoulder width is utilized and design exceptions are obtained for the reduced shoulder widths.

In addition, the Rail Runner commuter rail, which is parallel to the North I-25 corridor, provides service from Belen to Santa Fe.

Estimated Cost and Right-of-Way

The estimated project cost estimate for the Recommended Build Alternative is summarized in Table 7-1. Costs are estimated in today's (2009) dollars and are intended to be all inclusive at the conceptual level, including New Mexico gross receipts tax. The costs increased substantially over the previous costs shown because nearly all the interchanges include new bridge structures and improvements to the Alameda Boulevard interchange are added.

Right-of-way impacts are similar to those expected under Build Alternative 2 and include impacts to two businesses, approximately seven acres of property acquisition, excluding the additional right-of-way needed for the Paseo del Norte interchange, and less than two acres of access easements. With a few exceptions, many of the impacts involve slivers of frontage property both along the frontage roads and at intersections. Based on existing land use and/or size of impact, the noteworthy impacts occur at the following locations:

- New local service road for properties abutting the northbound frontage road, south of Comanche Road
- Northbound Montaño off-ramp braid, north of Comanche Road
- Access easements at Jefferson Interchange area, east of Jefferson Street
- Property on both sides of I-25 for braided ramps/CD roads, south of San Antonio Drive/Ellison Street

Table 7-1, Conceptual Project Cost Estimate for Recommended Build Alternative

Description	Cost
Roadway	$37,000,000
Bridges	$46,000,000
Drainage	$12,000,000
Signing & Striping	$3,000,000
Lighting	$2,000,000
Signalization/Ramp Metering/ITS	$3,000,000
Baseline Cost	**$103,000,000**
Construction Engineering	$36,000,000
Utilities	$5,000,000
Subtotal	**$144,000,000**
Contingency (30%)	$44,000,000
Engineering Design (8%)	$12,000,000
Right-of-Way / Access Easements	$11,000,000
Construction Management (12%)	$18,000,000
New Mexico Gross Receipts Tax (7%)	$10,000,000
Total Estimated Cost	**$239,000,000**

Notes: 1. Costs are based on current unit bid prices (2009).
2. Contingency percentages are based on a phased implementation of project.

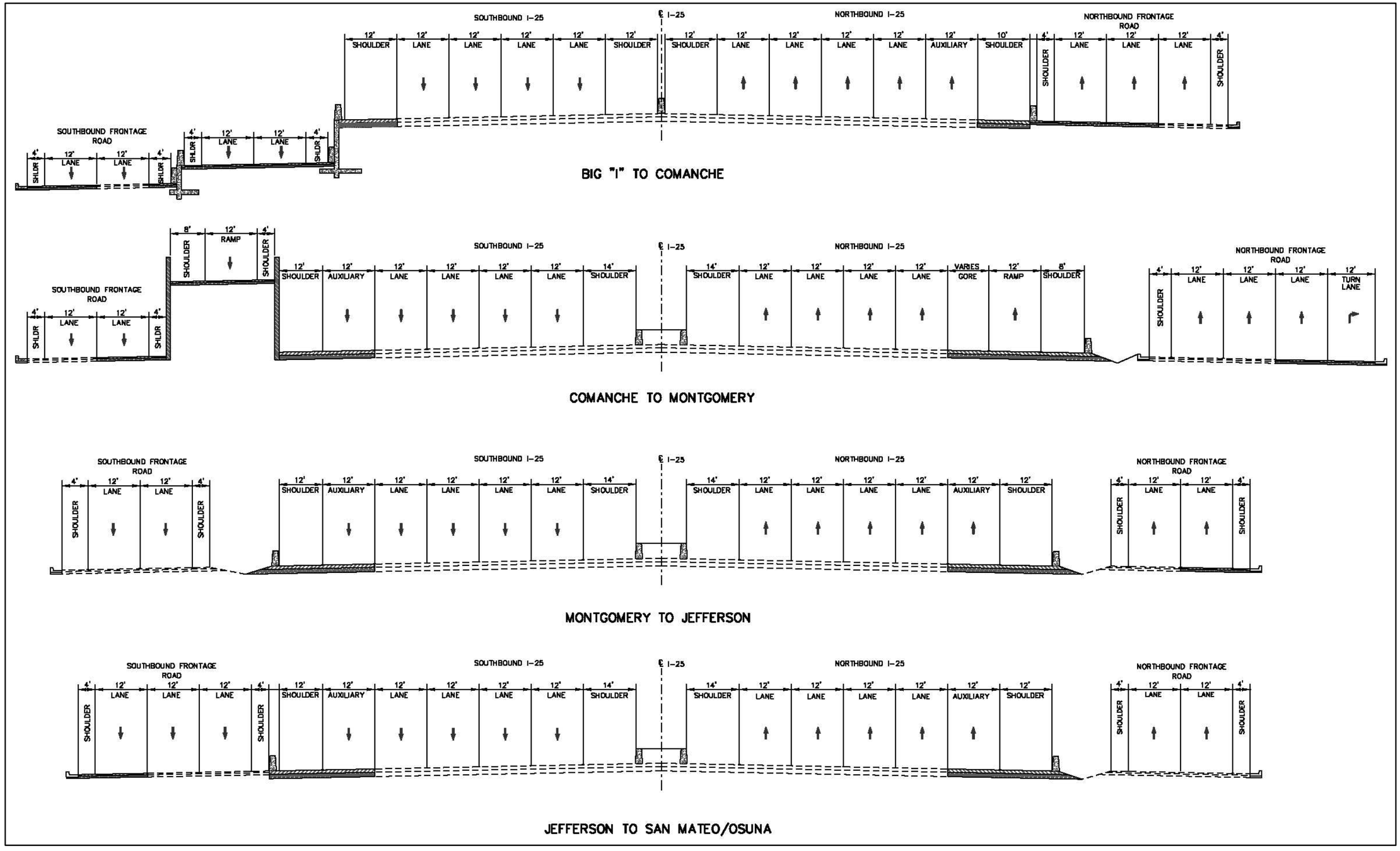


Figure 7-2, Recommended Build Alternative Typical Sections along North I-25

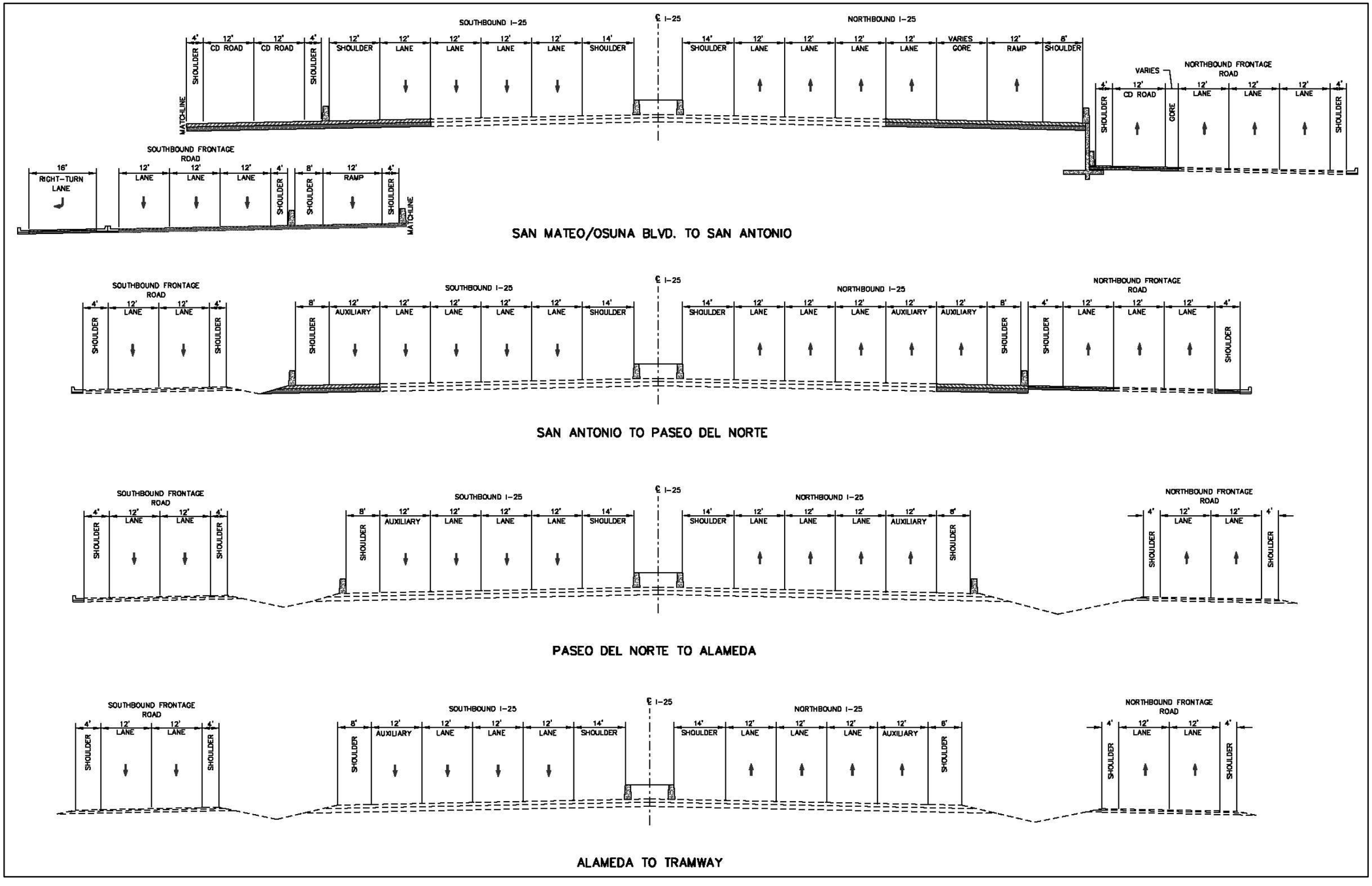


Figure 7-2 (continued), Recommended Build Alternative Typical Sections along North I-25

CHAPTER 8 PHASING AND IMPLEMENTATION PLAN

Introduction

The proposed improvements will require a substantial capital investment and are expected to be implemented in phases over time. There are multiple approaches that could be utilized to phase and prioritize the identified improvements. One possible phasing and implementation plan is provided below.

Study Phase

Two Federal policies for transportation improvement projects must be addressed as part of the project development process to obtain approval for final design, right-of-way acquisition, and construction. The first involves National Environmental Policy Act (NEPA) procedures, which is required for all projects. The second is the FHWA/NMDOT policy requiring preparation of an Interstate Access Change Request (IACR) report, which is required when access to an interstate highway is proposed. The two processes can be performed concurrently. Typically, a draft version of the IACR should be prepared to identify and confirm the type and extent of proposed improvements required for the study corridor. The draft IACR may be conditionally approved by FHWA prior to the completion of NEPA requirements. Final approval of the IACR is contingent on approval of the NEPA and planning processes. The NEPA requirements should be completed through preparation of an environmental assessment (EA/FONSI) or an environmental impact statement (DEIS/FEIS/ROD), including a public hearing.

Because of the capital investment required by the proposed improvements, phased implementation is anticipated. While the improvements are expected to be implemented in phases, it is recommended that the NEPA environmental documentation be completed for the entire length of project. An EA/FONSI is anticipated based on the expected impacts. The EA should request approval for right-of-way acquisition and final design activities. To authorize construction, environmental re-evaluations would be completed specific to the phase to be constructed.

Similarly, the IACR should consider the entire study corridor as a system. An assumption document should be prepared at the onset to establish the scope of effort required by FHWA to obtain approvals. Once the level of effort is established, the appropriate analyses would be performed and the IACR report would be prepared. The IACR analyses should be comprehensive involving specific evaluations by phase as well as for the entire system at full build-out. A comprehensive IACR is anticipated for the North I-25 corridor because of the number of phases identified to implement the proposed improvements and the multiple evaluations of interim conditions between the phases. Completion of the IACR will require that the implementation priorities are established with certainty otherwise IACR re-evaluations will also be required.

Construction Phasing Approach

A potential construction phasing approach was developed based on a cost per phase ranging from $15 to $30 million to facilitate programming the identified improvements. The costs reflect complete projects including design, right-of-way acquisition and construction based on 2009 dollars. Eleven (11) phases were identified and are shown in Figure 8-1, including cost estimates for each phase. The phasing approach shown in Figure 8-1 is not prioritized and does not address the I-25/Paseo del Norte interchange improvements. Further breakdown of the conceptual cost estimates for each phase is provided in Table 8-1.

Note that the frontage road projects could be further divided as needed based on available funding amounts. The interchange bridge and street improvement projects should be implemented as a complete project, although median access modifications adjacent to the interchanges could be implemented at any time. Refer to the next section, *Implementation Priorities*, for a discussion of the suggested order of implementation of the identified phases.

- Northbound and Southbound Frontage Roads, South Segments
  - Right-of-way acquisition
  - Northbound Frontage Road reconstruction from south of Comanche Road to north of Jefferson Street, excluding segments adjacent to the Montgomery Boulevard/Montaño Road interchange
  - Southbound Frontage Road reconstruction from north of Jefferson Street to south of Comanche Road excluding segments adjacent to the Montgomery Boulevard/Montaño Road interchange
  - Utility and access modifications including conduit runs for the ITS and ramp metering systems.
  - Local street improvements east of the northbound frontage road between Aztec Road and Comanche Road.
- Northbound and Southbound Frontage Roads, North Segments
  - Right-of-way acquisition
  - Northbound Frontage Road reconstruction from north of Jefferson Street to south of Paseo del Norte
  - Southbound Frontage Road reconstruction from south of Paseo del Norte to north of Jefferson Street and including the segment north of Alameda Boulevard associated with relocation of the Alameda Boulevard southbound off-ramp
  - San Antonio Drive access modifications
  - Utility and access modifications including conduit runs for the ITS and ramp metering systems.
- Northbound Comanche/Montgomery Braid and Mainline
  - Braid Comanche Road on-ramp and Montgomery Boulevard off-ramp
  - Relocate Comanche Road off-ramp
  - Modify Jefferson Street off-ramp
  - Mainline widening from south of Comanche Road to north of Jefferson Street
  - Ramp meter system for the Comanche Road on-ramp
- Northbound San Mateo/San Antonio Braid, CD Road, and Mainline
  - Braid San Mateo Boulevard on-ramp and San Antonio Drive off-ramp
  - Build collector-distributor (CD) road across San Antonio Drive
  - Modify San Mateo Boulevard off-ramp
  - Mainline widening from north of Jefferson Street to south of Paseo del Norte
  - Ramp meter system for the San Mateo Boulevard on-ramp
- Southbound Montaño/Comanche Braid and Mainline
  - Braid Montaño Road on-ramp and Comanche Road off-ramp
  - Modify Jefferson Street on-ramp and Comanche Road on-ramp
  - Mainline widening from north of Jefferson Street to south of Comanche Road
  - Ramp meter system for the Jefferson Street on-ramp
  - Ramp meter system for the Montaño Road on-ramp
  - Ramp meter system for the Comanche Road on-ramp
- Southbound CD Road, Osuna/Jefferson Braid, and Mainline
  - Build collector-distributor (CD) road across San Mateo Boulevard/Osuna Road
  - Provide a new off-ramp to San Mateo Boulevard/Osuna Road
  - Modify south-to-east loop off-ramp to southbound San Mateo Boulevard
  - Braid Osuna Road on-ramp and CD Road/Jefferson Street off-ramp
  - Mainline widening from south of Paseo del Norte to north of Jefferson Street
  - Ramp meter system for the Osuna Road on-ramp
- Comanche I-25 Bridge and Street
  - Right-of-way acquisition
  - New I-25 bridges over Comanche Road
  - Comanche Road widening and access modifications

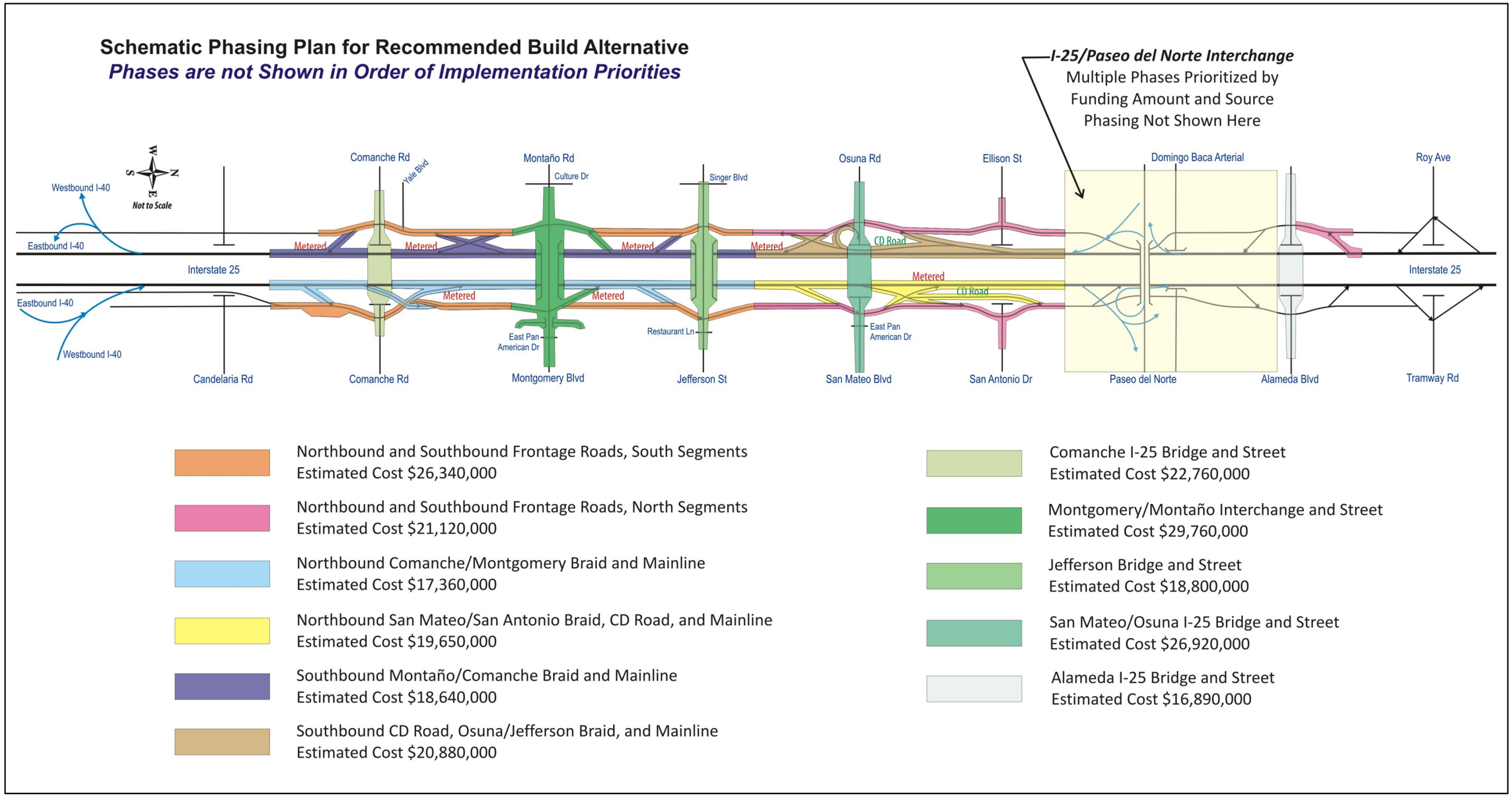


Figure 8-1, Suggested Phasing Plan and Estimated Costs per Phase, Not in Prioritized Order

Table 8-1, Conceptual Cost Estimates by Phase (Not Prioritized, 2009 Dollars)

DESCRIPTION	NORTHBOUND AND SOUTHBOUND FRONTAGE RDS, SOUTH	NORTHBOUND AND SOUTHBOUND FRONTAGE RDS, NORTH	NORTHBOUND COM/MONT BRAID AND MAINLINE	NORTHBOUND SAN MATEO/SAN ANT BRAID AND MAINLINE	SOUTHBOUND MONT/COM BRAID AND MAINLINE	SOUTHBOUND OSUNA/JEFF BRAID AND MAINLINE
CATEGORY	ESTIMATED COST	ESTIMATED COST	ESTIMATED COST	ESTIMATED COST	ESTIMATED COST	ESTIMATED COST
ROADWAY	$4,740,000	$4,670,000	$3,180,000	$4,000,000	$4,500,000	$4,690,000
BRIDGES	$890,000	$240,000	$4,010,000	$4,170,000	$3,130,000	$4,340,000
DRAINAGE	$2,590,000	$2,830,000	$310,000	$200,000	$530,000	$520,000
SIGNING & STRIPING	$120,000	$140,000	$500,000	$500,000	$480,000	$290,000
LIGHTING	$240,000	$250,000	$170,000	$220,000	$70,000	$10,000
SIGNALIZATION/ITS	$500,000	$780,000	$70,000	$250,000	$140,000	$70,000
SUBTOTAL	**$9,080,000**	**$8,910,000**	**$8,240,000**	**$9,340,000**	**$8,850,000**	**$9,920,000**
BASELINE COST	**$9,080,000**	**$8,910,000**	**$8,240,000**	**$9,340,000**	**$8,850,000**	**$9,920,000**
CONSTRUCTION ENGINEERING AND UTILITIES	$3,510,000	$3,420,000	$2,810,000	$3,180,000	$3,020,000	$3,380,000
CONSTRUCTION COST	**$12,590,000**	**$12,330,000**	**$11,050,000**	**$12,520,000**	**$11,870,000**	**$13,300,000**
CONTINGENCY (30%)	$3,770,000	$3,700,000	$3,310,000	$3,750,000	$3,560,000	$3,980,000
ENGINEERING DESIGN (8%)	$1,010,000	$990,000	$890,000	$1,000,000	$950,000	$1,070,000
RIGHT-OF-WAY / ACCESS EASEMENTS	$6,580,000	$1,750,000	$0	$0	$0	$0
CONSTRUCTION MANAGEMENT (12%)	$1,510,000	$1,480,000	$1,330,000	$1,500,000	$1,430,000	$1,600,000
NM GROSS RECIEPTS TAX (7%)	$880,000	$870,000	$780,000	$880,000	$830,000	$930,000
TOTAL COST	**$26,340,000**	**$21,120,000**	**$17,360,000**	**$19,650,000**	**$18,640,000**	**$20,880,000**

DESCRIPTION	COMANCHE I-25 BRIDGE AND STREET	MONTGOMERY INTERCHANGE AND STREET	JEFFERSON BRIDGE AND STREET	SAN MATEO/OSUNA I-25 BRIDGE AND STREET	ALAMEDA I-25 BRIDGE AND STREET	TOTALS
CATEGORY	ESTIMATED COST	ESTIMATED COST	ESTIMATED COST	ESTIMATED COST	ESTIMATED COST	
ROADWAY	$1,750,000	$3,740,000	$1,710,000	$3,310,000	$1,560,000	**$37,850,000**
BRIDGES	$7,700,000	$8,710,000	$5,320,000	$6,630,000	$4,690,000	**$49,830,000**
DRAINAGE	$270,000	$760,000	$390,000	$1,730,000	$800,000	**$10,930,000**
SIGNING & STRIPING	$100,000	$300,000	$10,000	$30,000	$250,000	**$2,720,000**
LIGHTING	$120,000	$310,000	$60,000	$240,000	$60,000	**$1,750,000**
SIGNALIZATION/ITS	$480,000	$530,000	$400,000	$480,000	$450,000	**$4,150,000**
SUBTOTAL	**$10,420,000**	**$14,350,000**	**$7,890,000**	**$12,420,000**	**$7,810,000**	**$107,230,000**
BASELINE COST	**$10,420,000**	**$14,350,000**	**$7,890,000**	**$12,420,000**	**$7,810,000**	**$107,230,000**
CONSTRUCTION ENGINEERING AND UTILITIES	$3,930,000	$4,440,000	$2,990,000	$4,730,000	$2,950,000	**$38,360,000**
CONSTRUCTION COST	**$14,350,000**	**$18,790,000**	**$10,880,000**	**$17,150,000**	**$10,760,000**	**$145,590,000**
CONTINGENCY (30%)	$4,300,000	$5,630,000	$3,270,000	$5,140,000	$3,220,000	**$43,630,000**
ENGINEERING DESIGN (8%)	$1,150,000	$1,510,000	$870,000	$1,370,000	$860,000	**$11,670,000**
RIGHT-OF-WAY / ACCESS EASEMENTS	$230,000	$250,000	$1,700,000	$0	$0	**$10,510,000**
CONSTRUCTION MANAGEMENT (12%)	$1,720,000	$2,260,000	$1,310,000	$2,060,000	$1,290,000	**$17,490,000**
NM GROSS RECIEPTS TAX (7%)	$1,010,000	$1,320,000	$770,000	$1,200,000	$760,000	**$10,230,000**
TOTAL COST	**$22,760,000**	**$29,760,000**	**$18,800,000**	**$26,920,000**	**$16,890,000**	**$239,120,000**

- Montgomery/Montaño Interchange and Street
  - Right-of-way acquisition
  - Reconstruction of the interchange including adjacent segments of frontage roads
  - New grade-separated service road on the east side
  - Montgomery Boulevard/Montaño Road widening and access modifications
  - Ramp meter system for the Montgomery on-ramp
- Jefferson Bridge and Street
  - Right-of-way acquisition
  - Widen the existing bridge
  - Jefferson Street widening and access modifications
  - Local street improvements involving Restaurant Lane and Monroe Street
- San Mateo/Osuna I-25 Bridge and Street
  - New I-25 bridges over San Mateo Boulevard/Osuna Road
  - San Mateo Boulevard/Osuna Road widening and access modifications
- Alameda I-25 Bridge and Street
  - New I-25 bridges over Alameda Boulevard
  - Alameda Boulevard widening and access modifications

Ramp Metering

Implementation of ramp metering in the North I-25 corridor will require substantial modifications to accommodate queuing, acceleration requirements, and to balance the location of on and off-ramps in the corridor. The benefits of ramp metering could be realized today if used to simply break up vehicle platoons to smooth the flow of traffic onto the freeway. Therefore, once the on-ramp roadways are reconstructed to accommodate ramp metering, ramp metering operations should be utilized. A ramp metering evaluation and study should be conducted to refine the approach for implementation and subsequent operation (e.g., fixed time, metered-at-demand, traffic responsive).

Initially, during peak travel periods, it is expected that the ramp meters would be operated in a *metered-at-demand mode* due to the high mainline traffic flows on I-25. Metering in this fashion would be beneficial when ramp metering is first introduced because it allows motorists to become familiar with metering operations while not subjecting them to lengthy delays. As motorists become familiar with the system, meter rates can be set gradually more restrictive.

If determined applicable to the North I-25 corridor, traffic responsive metering could be utilized at off-peak times when mainline freeway volumes are under capacity to maintain smooth traffic flow and potentially reduce the duration of recurring congestion on I-25 during peak travel periods. A full traffic-responsive metering system is not recommended for use during peak travel periods because of the high mainline freeway peak-hour volumes and the low metering rates that would occur due to the lack of available gaps in the traffic stream. It is expected that insufficient space is available for full traffic-responsive operation due to the close spacing of arterial cross streets and associated access needs.

Implementation Priorities

The construction phasing approach was based on building from the outside in. The frontage roads would be reconstructed, including access modifications and utility work, to make room for the ramp roadway modifications, braided ramps and mainline freeway widening. Improvements to the arterial interchange crossings could be constructed before or after the frontage road projects. Temporary transitions will be needed between the phases which may modify how access is provided to and from the mainline freeway hence the need to evaluate the specific phases in the IACR report.

The suggested approach to defining the implementation priorities is to determine where the first project should be constructed. There are critical operational and safety concerns at both the I-40/I-25 interchange and at the I-25/Paseo del Norte interchange that could be used as a basis for establishing where the initial project should occur. Improvements could begin at the south end focusing on northbound I-25 to improve operations within and north of the I-40/I-25 interchange to address queue back-ups onto mainline I-40 associated with the east-to-north and west-to-north ramps. Alternatively, they could begin at the north end to focus on improving operations at the I-25/Paseo del Norte interchange. These concerns are not addressed in detail here, but are summarized as follows:

- Existing Issues at the I-40/I-25 Interchange
  - The bottleneck on northbound I-25 at Comanche Road results in recurring congestion that propagates southward to the I-40/I-25 interchange resulting in extensive queuing on both eastbound and westbound I-40 which is associated with the east-to-north ramp and the west-to-north ramp, respectively.
  - The queuing on I-40 represents a key safety concern due to the high travel speeds and the high proportion of heavy commercial vehicle traffic on I-40.

- Existing Issues at the I-25/Paseo del Norte Interchange
  - Recurring congestion is prevalent at this interchange which results in extensive queuing on northbound I-25 approaching Paseo del Norte and in both directions of Paseo del Norte.
  - The heaviest turning movements at the interchange are the north-to-west movement and the east-to-south movement.
  - Congested operations at this interchange are also associated with capacity deficiencies at the Paseo del Norte/Jefferson Street intersection.

If one of these locations had to be prioritized over the other, the I-40/I-25 interchange is considered the higher priority because it is a full system interchange involving two, high-speed interstate highways. Overall, based on existing conditions, the potential for severe crashes is lower at I-25/Paseo del Norte interchange than at the I-40/I-25 interchange because the expectation for traveling at high speeds is lower and travel speeds are lower on Paseo del Norte, and the volume of heavy commercial vehicle traffic is lower on both I-25 and Paseo del Norte.

Other key factors influencing the location of the initial project include, but are not limited to, the amount and source of available funding, the relief provided by the interim project that will be constructed soon to extend the fourth freeway lane on northbound I-25 from Comanche Road through the Montgomery Boulevard interchange, and political priorities and influences. From an engineering perspective, there are no structural deficiencies that require immediate correction.

Suggested priority listings are provided below. In either scenario, advance right-of-way acquisition should occur as soon as practical for those identified properties that are currently undeveloped.

Priority Listing with Initial Project at South End to Address Issues at the I-40/I-25 Interchange

1. Northbound and Southbound Frontage Roads, South Segments
2. Montgomery/Montaño Interchange and Street
3. Northbound Comanche/Montgomery Braid and Mainline
4. Southbound Montaño/Comanche Braid and Mainline
5. Northbound and Southbound Frontage Roads, North Segments
6. Northbound San Mateo/San Antonio Braid, CD Road, and Mainline
7. Southbound CD Road, Osuna/Jefferson Braid, and Mainline
8. Jefferson Bridge and Street
9. San Mateo/Osuna I-25 Bridge and Street
10. Comanche I-25 Bridge and Street
11. Alameda I-25 Bridge and Street

Priority Listing with Initial Project at North End to Address Issues at the I-25/Paseo del Norte Interchange

1. Northbound and Southbound Frontage Roads, North Segments
2. Northbound San Mateo/San Antonio Braid, CD Road, and Mainline
3. Southbound CD Road, Osuna/Jefferson Braid, and Mainline
4. Northbound and Southbound Frontage Roads, South Segments
5. Montgomery/Montaño Interchange and Street
6. Northbound Comanche/Montgomery Braid and Mainline
7. Southbound Montaño/Comanche Braid and Mainline
8. Jefferson Bridge and Street
9. San Mateo/Osuna I-25 Bridge and Street
10. Comanche I-25 Bridge and Street
11. Alameda I-25 Bridge and Street

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