

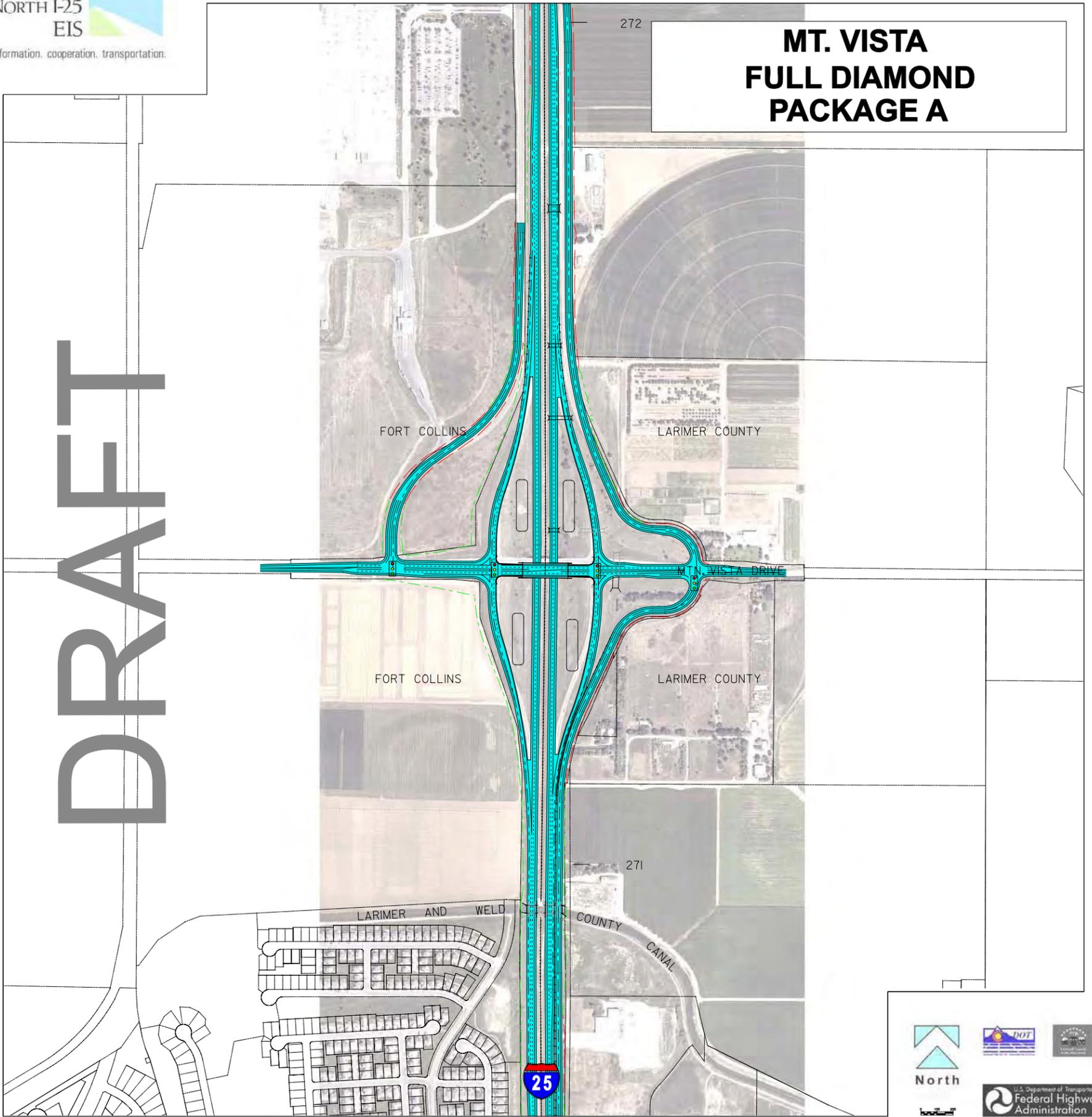
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MT. VISTA FULL DIAMOND PACKAGE A

DRAFT



October 1, 2007



MT. VISTA FULL DIAMOND

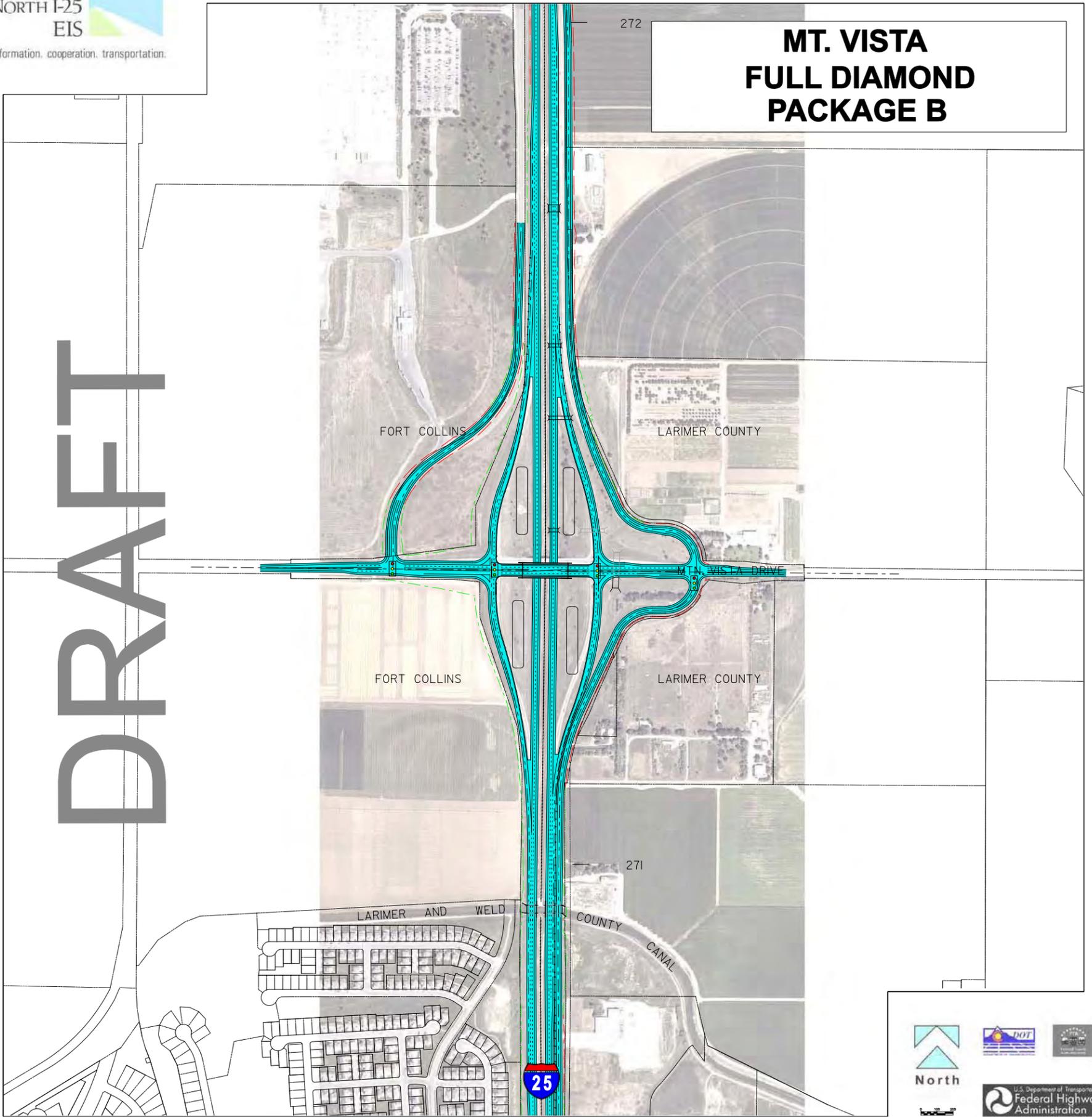
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MT. VISTA FULL DIAMOND PACKAGE B

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MT. VISTA FULL DIAMOND

Mountain Vista (LCR 50) at I-25 DEIS Interchange Evaluation

August 20, 2007

Introduction

This report describes the existing traffic volumes at this interchange and the adjacent intersections, as well as future traffic conditions with an improved interchange.

Existing Conditions

The interchange of Mountain Vista, (Larimer County Road, LCR 50) with I-25 (milepost 271) connects I-25 to the rural areas north of Fort Collins to the west and rural agricultural areas to the east. Figure 1 illustrates the location of Mountain Vista along I-25. This interchange was constructed in 1985. This interchange is a diamond interchange configuration.

The interchange area includes the following roadways:

Mountain Vista (LCR 50). Mountain Vista is a three-lane roadway in the vicinity of the interchange, with one through lane in each direction and the center-lane forming left-turn lanes at access points. The land along Mountain Vista is primarily open fields on both sides of the interstate. The interchange ramps are one-lane with no dedicated turn lanes at the ramp terminals, but the curb radii at both ramp terminals allow for a right turning vehicle to maneuver around up to one vehicle waiting to turn left onto Mountain Vista. Both ramp intersections are stop sign-controlled. Mountain Vista changes from a paved surface to a treated gravel surface approximately ¼ mile east of the northbound ramps.

Frontage Roads. Frontage roads are located on both sides of the interchange. The frontage road on the west (Busch Drive) runs from Mountain Vista north to County Road 52. An Anheuser Busch brewery/distribution center has access to this frontage road.

Figure 2 summarizes the traffic counts collected in August 2004 at this interchange. As shown, average daily traffic on Mountain Vista is around 6,300 vehicles per day (vpd) west of the interchange and 2,500 vpd east of the interchange. Daily traffic on Busch Drive is around 3,800 vpd, and the east side frontage road has daily traffic volumes in the 1,400 to 1,500 range. Daily ramp volumes range between 800 and 3,700 vehicles per day, with volumes greater to and from the south. At the interchange, turn movements to/from the ramps are less than 100 vehicles per hour during the peak periods, except for northbound left-turn and eastbound right-turn movements during the peak hours. The eastbound to southbound movement represents the highest traffic volumes in the morning and the northbound to westbound movement represents the highest volumes in the afternoon.

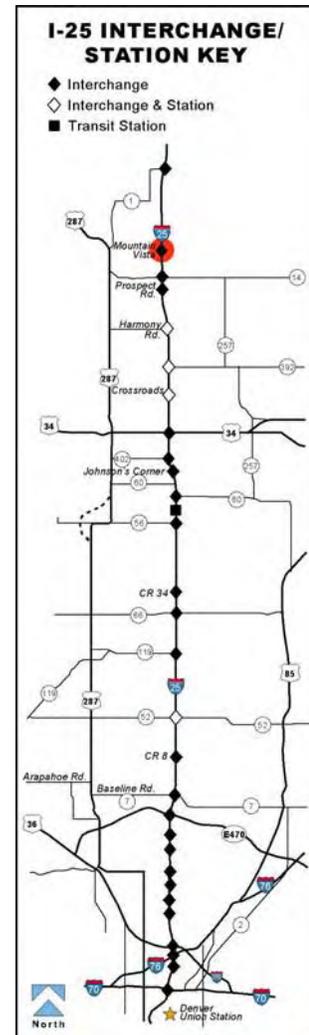


Figure 1. Vicinity Map

Mountain Vista (LCR 50) at I-25 DEIS Interchange Evaluation

Traffic Operations

An operational analysis of the interchange was conducted based on methodology developed in the Highway Capacity Manual (Transportation Research Board, 2000). The result of such analysis is a level of service (LOS) rating. Level of service is a qualitative assessment of the traffic flow based on the average stopped delay per vehicles at controlled intersections (i.e. traffic signal, stop-sign).

Levels of service are described by a letter designation ranging from “A” to “F”, with LOS A representing essentially uninterrupted flow, and LOS F representing a breakdown of traffic flow with excessive congestion and delay. Signalized intersection analyses result in a level of service rating for each movement and for the entire intersection but typically only the level of service for the entire intersection is reported. For unsignalized intersections a level of service rating is determined for each turn movement that must yield to another turn movement but an overall level of service rating is not determined for the entire intersection. At ramp merge and diverge locations the level of service rating is based on density and represents operations where ramps merge to or diverge from the I-25 main lanes. The following table shows how average stopped delay at controlled intersections equates to levels of service.

Table 1. Equivalent Level of Service to Average Stopped Delay and Density

Level of Service	Average Delay at Signalized Intersections in (sec./veh.)	Average Delay at Stop-Controlled intersections in (sec./veh.)
A	0 to <=10.0	0 to <=10.0
B	> 10.0 to <= 20.0	> 10.0 to <= 15.0
C	> 20.0 to <= 35.0	> 15.0 to <= 25.0
D	> 35.0 to <= 55.0	> 25.0 to <= 35.0
E	> 55.0 to <= 80.0	> 35.0 to <= 50.0
F	> 80.0	> 50.0

Figure 2 illustrates existing peak period levels of service at the ramp terminals, adjacent intersections and ramp junctions with I-25. Currently, all turning movements in the vicinity of the interchange operate at LOS B or better during both the AM and PM peak periods.

In addition to the intersection level of service shown in the figure, Table 2 provides additional information for key movements at each intersection to provide further insight into existing operations at the interchange. Key movements are those movements that could have an impact on adjacent intersections or an impact to I-25. For example, east-west movements along Mountain Vista can queue into adjacent intersections and impede traffic flow at those locations, while vehicles on the ramps could queue back onto the interstate. North-south movements at the east frontage road intersection have not been included in the table because they would not impede traffic flow on Mountain Vista. As shown in the table, the 95th percentile queue lengths for all movements were not greater than the distance between intersections or did not exceed the current storage length provided on the ramps.

Mountain Vista (LCR 50) at I-25 DEIS Interchange Evaluation

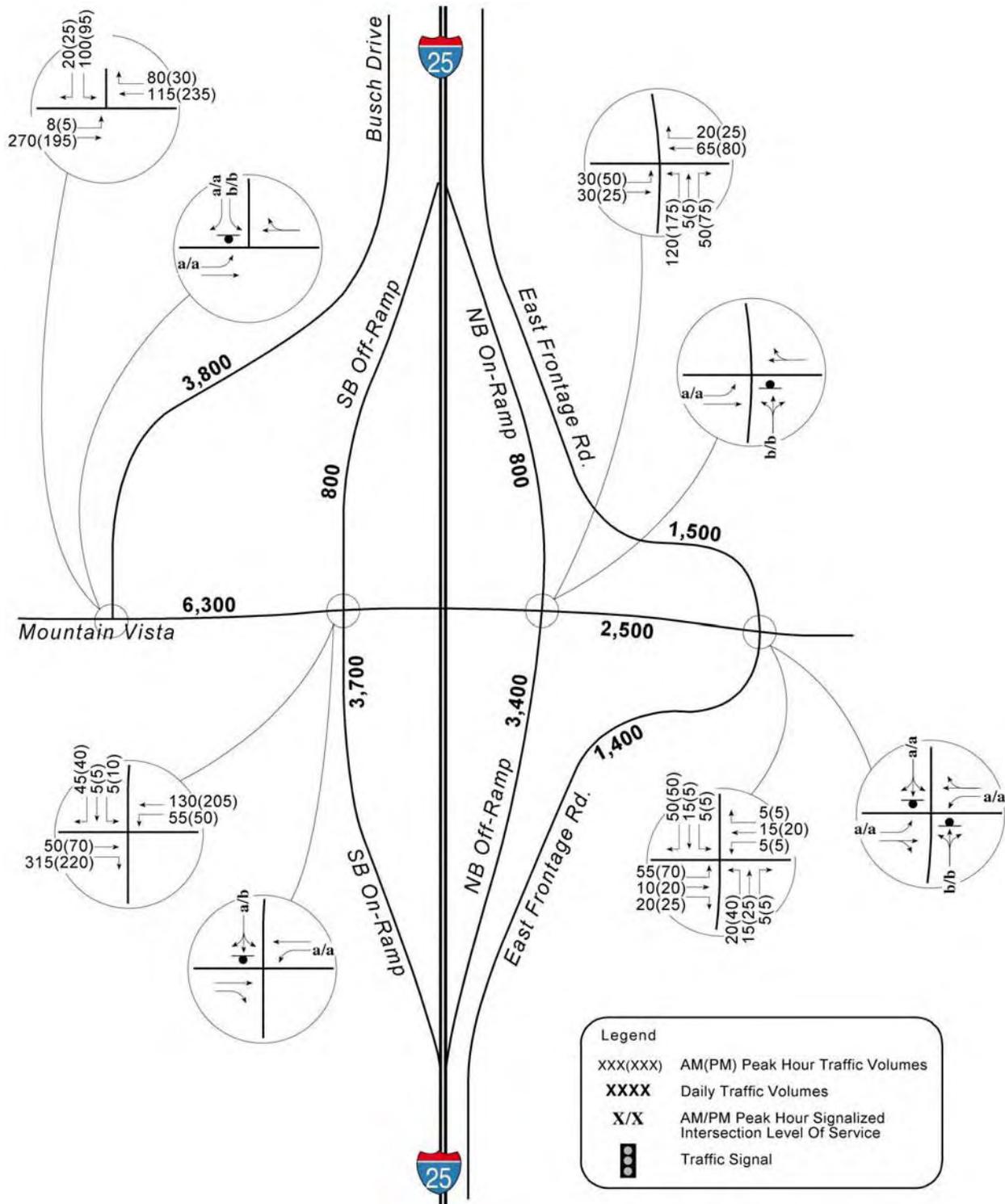


Figure 2. Existing Conditions

Mountain Vista (LCR 50) at I-25 DEIS Interchange Evaluation

Table 2. Existing Level of Service and Queue Lengths For Key Movements

Intersection / Movement	Level of Service		Estimated 95 th Percentile Queue ¹		Intersection Spacing and Storage Length Provisions
	AM	PM	AM	PM	
Busch Drive					
WB Approach	A	A	0'	0'	Distance to Adjacent Intersection – 650'
Southbound Ramp Terminal					
WB Approach	A	A	40'	40'	Distance to Adjacent Intersection – 585'
SB Approach	A	B	50'	50'	Ramp Length – 1,100'
Northbound Ramp Terminal					
EB Approach	A	A	20'	20'	Distance to Adjacent Intersection – 585'
NB Approach	A	B	50'	70'	Ramp Length – 1,100'
East Frontage Road Intersection					
EB Approach	A	A	10'	20'	Distance to Adjacent Intersection – 600'
¹ The queue lengths given in this table primarily come from SimTraffic with some engineering judgment. SimTraffic gives a queue length for each lane. For example, with dual left-turn lanes SimTraffic estimates a queue for each lane. In the table, for thru movements the queue length is the longest queue observed in any through lane. For multiple turn lanes (i.e. dual lefts), the queue length is the sum of the queues in each lane. For a single turn lane (i.e. right turn), the queue is just the queue for that lane.					

2030 Conditions

2030 traffic projections were developed for the three alternatives being considered:

- 1) No-Action Alternative
- 2) Package A: GPL + CR + CB85
- 3) Package B: TEL + BRT.

These three packages are illustrated in Figures 3 through 5. In developing peak hour turning movements at the ramp terminals and the nearest adjacent intersections, model results were calibrated against existing traffic counts to derive an adjusted model forecast. These adjusted forecasts along with existing turning movement data were used in the NCHRP 255 balancing procedure to develop 2030 peak hour turning movement forecasts. These forecasts were further adjusted, as necessary, to balance between intersections and for reasonableness.

Mountain Vista (LCR 50) at I-25 DEIS Interchange Evaluation



Figure 3. No Action Alternative

Mountain Vista (LCR 50) at I-25 DEIS Interchange Evaluation

LEGEND

- █ 1 New General Purpose Lane (GPL) in Each Direction
- ▤ 1 New General Purpose Lane (GPL) + Auxiliary Lane in Each Direction
- █ Commuter Rail (CR)
- █ Commuter Bus (CB) Service on US 85
- █ Feeder Bus Service
- ◆ Interchange Upgrades
- X Number of Lanes
- Commuter Bus Station / Stop
- Commuter Rail Station
- █ FasTracks Rail Line
- FasTracks / RTD Transit Station
- Potential Commuter Rail Operational & Maintenance Facility
- Potential Commuter Bus Operational & Maintenance Facility

Congestion Management Measures include:

- Enhanced carpool lot parking capacity and amenities
- Courtesy patrol (incident management) from SH 14 to SH 7
- Variable messaging signs at all transit stations
- Automated Vehicle Locaters on all transit vehicles - "next bus" technology
- Links to local bike and pedestrian systems at station areas
- Support for development of Transportation Management Organization (TMO)

NOTE:

- Select sections of I-25 would require auxiliary lanes and / or an additional through lane in addition to this 6-lane cross section.
- Where widening is needed between SH 66 and SH 7, the median would be used.
- Commuter Rail Service without a Longmont to North Metro connection will also be evaluated.

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TYPICAL I-25 CROSS SECTION - 6 GENERAL PURPOSE LANES

Figure 4. Package A: GPL + CR + CB85

Mountain Vista (LCR 50) at I-25 DEIS Interchange Evaluation

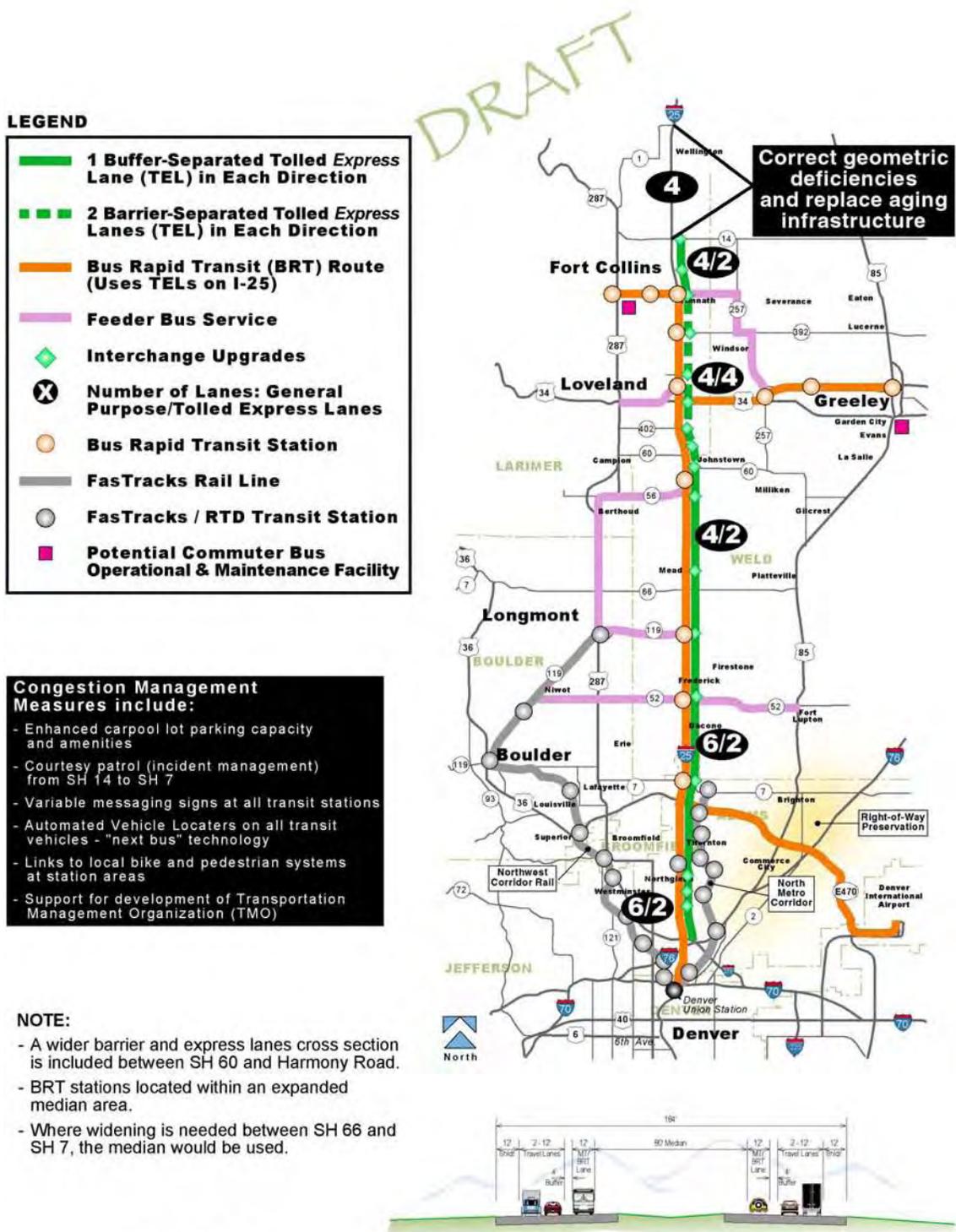


Figure 5. NOT TO SCALE Package B: TEL + BRT

Mountain Vista (LCR 50) at I-25 DEIS Interchange Evaluation

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2030 No Action Traffic Volumes

Figure 6 depicts 2030 daily and peak hour No Action traffic projections for the Mountain Vista interchange and adjacent intersections. As shown, daily volume projections on Mountain Vista range from 7,000 vpd east of the interchange to 33,700 vpd west of the interchange, and ramp volumes range from 2,100 to 13,600 vehicles per day. These volumes show the same patterns as existing counts; the highest traffic flows are to and from the west on Mountain Vista and to and from the south on the ramps.

2030 Package A Traffic Volumes

Figure 7 depicts 2030 daily and peak hour Package A traffic projections for the Mountain Vista interchange and adjacent intersections. The volumes in the figure are generally similar to those presented in the No Action Alternative. Daily volume projections on Mountain Vista range from 7,000 vpd east of the interchange to 35,500 vpd west of the interchange, and ramp volumes range from 2,100 to 14,600 vehicles per day.

2030 Package B Volumes

Figure 8 depicts 2030 daily and peak hour Package B traffic projections for the Mountain Vista interchange and adjacent intersections. The volumes in the figure are generally similar to those presented in the No Action Alternative. Daily volume projections on Mountain Vista range from 7,600 vpd east of the interchange to 38,200 vpd west of the interchange, and ramp volumes range from 2,100 to 14,600 vehicles per day.

2030 No Action Traffic Operations

Figure 6 shows the projected levels of service at the frontage road and ramp intersections on Mountain Vista under the No Action Alternative. As the figure indicates, many side street and ramp movements would operate at LOS F in at least one of the peak periods. Table 3 shows the projected queuing for key movements at the interchange and further underscores that the existing interchange would be significantly over capacity with the projected traffic volumes.

It should be noted that signaling the four intersections without any widening improvements would improve the operations at the ramp terminals in both peak periods, but would still result in LOS E operations.

Mountain Vista (LCR 50) at I-25 DEIS Interchange Evaluation

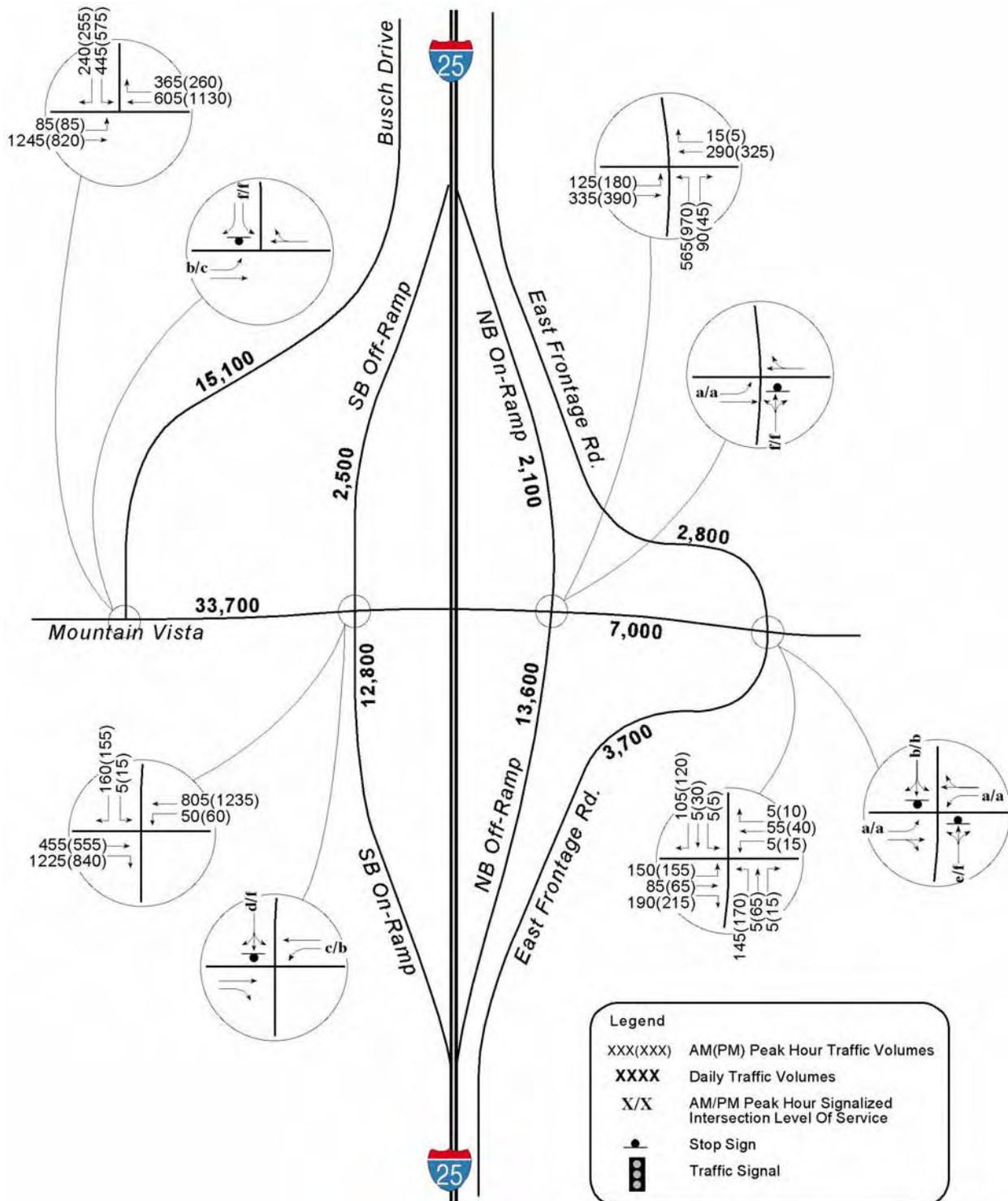


Figure 6. No Action Forecasts and Levels of Service

Mountain Vista (LCR 50) at I-25 DEIS Interchange Evaluation

Table 3. 2030 No Action Level of Service and Queue Lengths for Key Movements

Intersection / Movement	Level of Service		Estimated 95 th Percentile Queue ¹		Intersection Spacing and Storage Length Provisions
	AM	PM	AM	PM	
Busch Drive					
WB Approach	C	F	340'	400'	Distance to Adjacent Intersection – 650'
Southbound Ramp Terminal					
WB Approach	C	B	150'	50'	Distance to Adjacent Intersection – 585'
SB Approach	D	F	90'	70'	Ramp Length – 1,100'
Northbound Ramp Terminal					
EB Approach	A	A	60'	60'	Distance to Adjacent Intersection – 585'
NB Approach	F	F	670'	590'	Ramp Length – 1,100'
East Frontage Road Intersection					
EB Approach	A	A	30'	40'	Distance to Adjacent Intersection – 600'
¹ The queue lengths given in this table primarily come from SimTraffic with some engineering judgment. SimTraffic gives a queue length for each lane. For example, with dual left-turn lanes SimTraffic estimates a queue for each lane. In the table, for thru movements the queue length is the longest queue observed in any through lane. For multiple turn lanes (i.e. dual lefts), the queue length is the sum of the queues in each lane. For a single turn lane (i.e. right turn), the queue is just the queue for that lane.					

2030 Package A Traffic Operations

Interchange Configuration

The proposed configuration for the Mountain Vista DEIS interchange evaluation is a diamond configuration (Figure 7). The new bridge would be widened to accommodate five lanes; two through lanes in each direction with back-to-back left turn lanes. The northbound off ramp would be constructed with a three lane cross-section; a left, a shared left-through, and a right turn lane. The southbound off ramp would be constructed as a two lane cross-section; a shared left-through and a right turn lane. All four intersections would be signalized.

Interchange Operations

Figure 7 also shows the levels of service for the ramps and frontage road intersections, along with recommendations for laneage and storage at each location. As shown, all four intersections in the vicinity of the ramp are anticipated to operate at LOS C or better with the forecasted traffic volumes and the enhancements identified.

Mountain Vista (LCR 50) at I-25 DEIS Interchange Evaluation

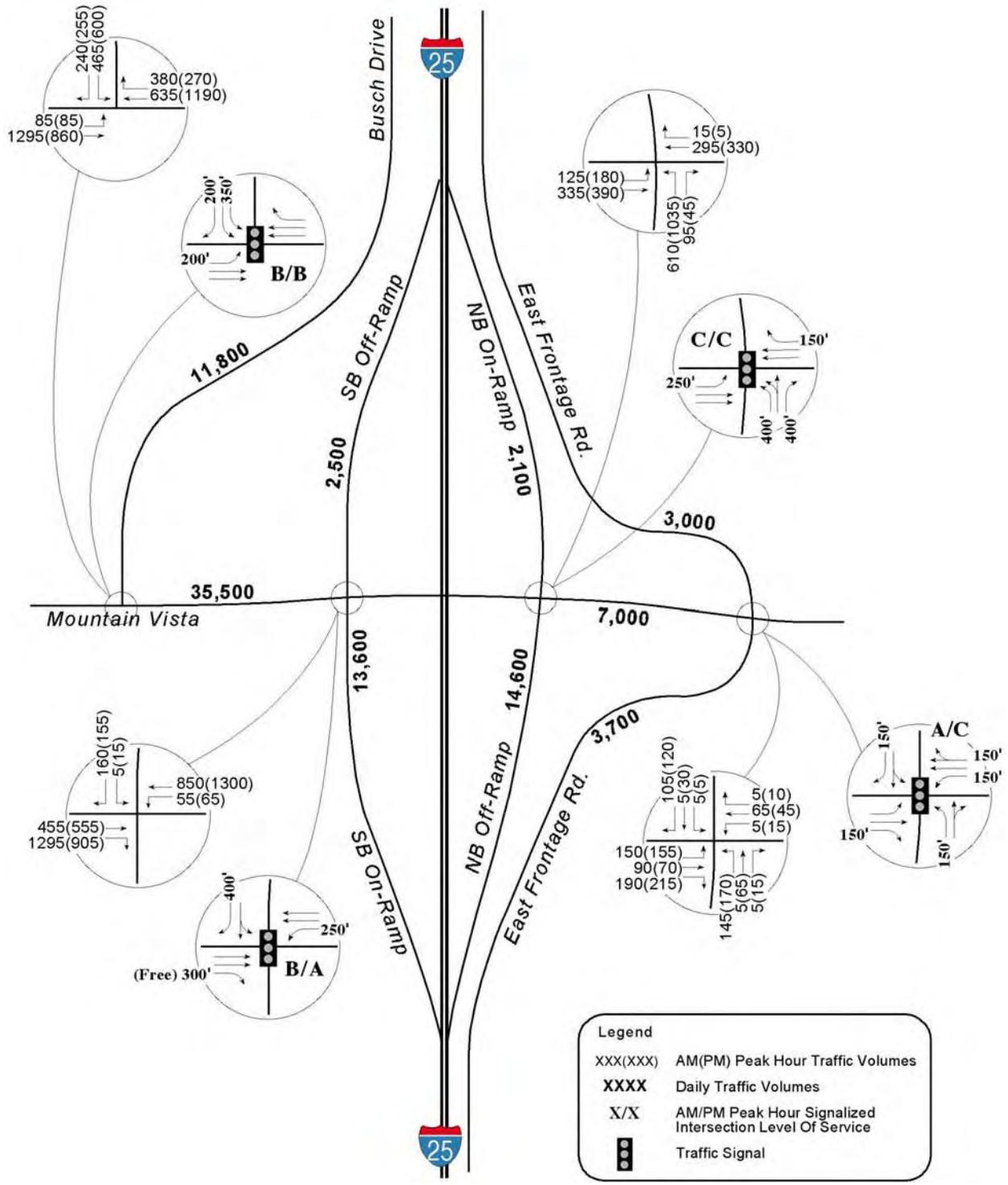


Figure 7. Package A Forecasts and Levels of Service

Mountain Vista (LCR 50) at I-25 DEIS Interchange Evaluation

Table 4 summarizes the levels of service, queue lengths, intersection spacing and designed storage lengths for key movements at the interchange. As shown in the table, specific movement levels of service at this interchange range from LOS A to LOS D. No single movement operates with a substandard level of service; thus, the improvements identified at this interchange appear to provide good operations at both ramp terminals and at the frontage road intersection.

Table 4 also compares SimTraffic estimates of the 95th percentile queue length for key movements to the storage distance available for each. For turning movements, the distance listed is the planned turn lane storage length, while for through movements the length listed is the distance between intersections. The queuing analysis shows that in all cases the estimated 95th percentile queues would be contained within the turn bays or within the space between adjacent intersections. On both the northbound and southbound ramp terminals, the left and right turn queues would be accommodated well within the storage length and would not extend into the I-25 main lanes.

Table 4. 2030 Package A Level of Service and Queue Lengths For Key Movements

Intersection / Movement	Level of Service		Estimated 95 th Percentile Queue ¹		Distance Between Intersections and Storage Length Provisions
	AM	PM	AM	PM	
Busch Drive					
WB Thru	A	A	140'	220'	Distance to Adjacent Intersection – 650'
WB Right	B	A	60'	60'	Storage Provided in Design – 650'
Southbound Ramp Terminal					
EB Right	Free	Free	N/A	N/A	Storage Provided in Design – 300'
WB Left	A	A	40'	60'	Storage Provided in Design – 250'
WB Thru	A	A	40'	40'	Distance to Adjacent Intersection – 650'
SB Left	D	D	20'	40'	Storage Provided in Design – 400'
SB Right	D	D	80'	90'	Storage Provided in Design – 400'
Northbound Ramp Terminal					
EB Left	B	C	100'	180'	Storage Provided in Design – 250'
EB Thru	A	C	140'	220'	Distance to Adjacent Intersection – 585'
WB Thru	B	B	110'	130'	Distance to Adjacent Intersection – 600'
WB Right	B	A	10'	10'	Storage Provided in Design – 150'
NB Left	D	D	540'	760'	Storage Provided in Design – 800'
NB Right	C	B	50'	40'	Storage Provided in Design – 400'
East Frontage Road Intersection					
EB Left	A	B	70'	150'	Distance to Adjacent Intersection – 585'
EB Thru	A	A	30'	40'	Distance to Adjacent Intersection – 585'
¹ The queue lengths given in this table primarily come from SimTraffic with some engineering judgment. SimTraffic gives a queue length for each lane. For example, with dual left-turn lanes SimTraffic estimates a queue for each lane. In the table, for thru movements the queue length is the longest queue observed in any through lane. For multiple turn lanes (i.e. dual lefts), the queue length is the sum of the queues in each lane. For a single turn lane (i.e. right turn), the queue is just the queue for that lane.					

Mountain Vista (LCR 50) at I-25 DEIS Interchange Evaluation

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2030 Package B Traffic Operations

Interchange Configuration

The proposed configuration for the Mountain Vista interchange in Package B is the same as in Package A (Figure 8).

Interchange Operations

Figure 8 also shows the levels of service for the ramps and frontage road intersections, along with recommendations for laneage at each location. As shown, all four intersections would operate at LOS C or better with the forecasted traffic volumes and the enhancements identified.

Table 5 summarizes levels of service for key individual turning movements and compares SimTraffic estimates of the 95th percentile queue length for those key movements to the storage distance available for each. The queuing analysis shows that the estimated 95th percentile queues would be contained well within the turn bays or within the space between adjacent intersections during both peak periods. On both the northbound and southbound ramp terminals, left and right turn queues would be accommodated within the storage length and would not extend into the I-25 main lanes.

Mountain Vista (LCR 50) at I-25 DEIS Interchange Evaluation

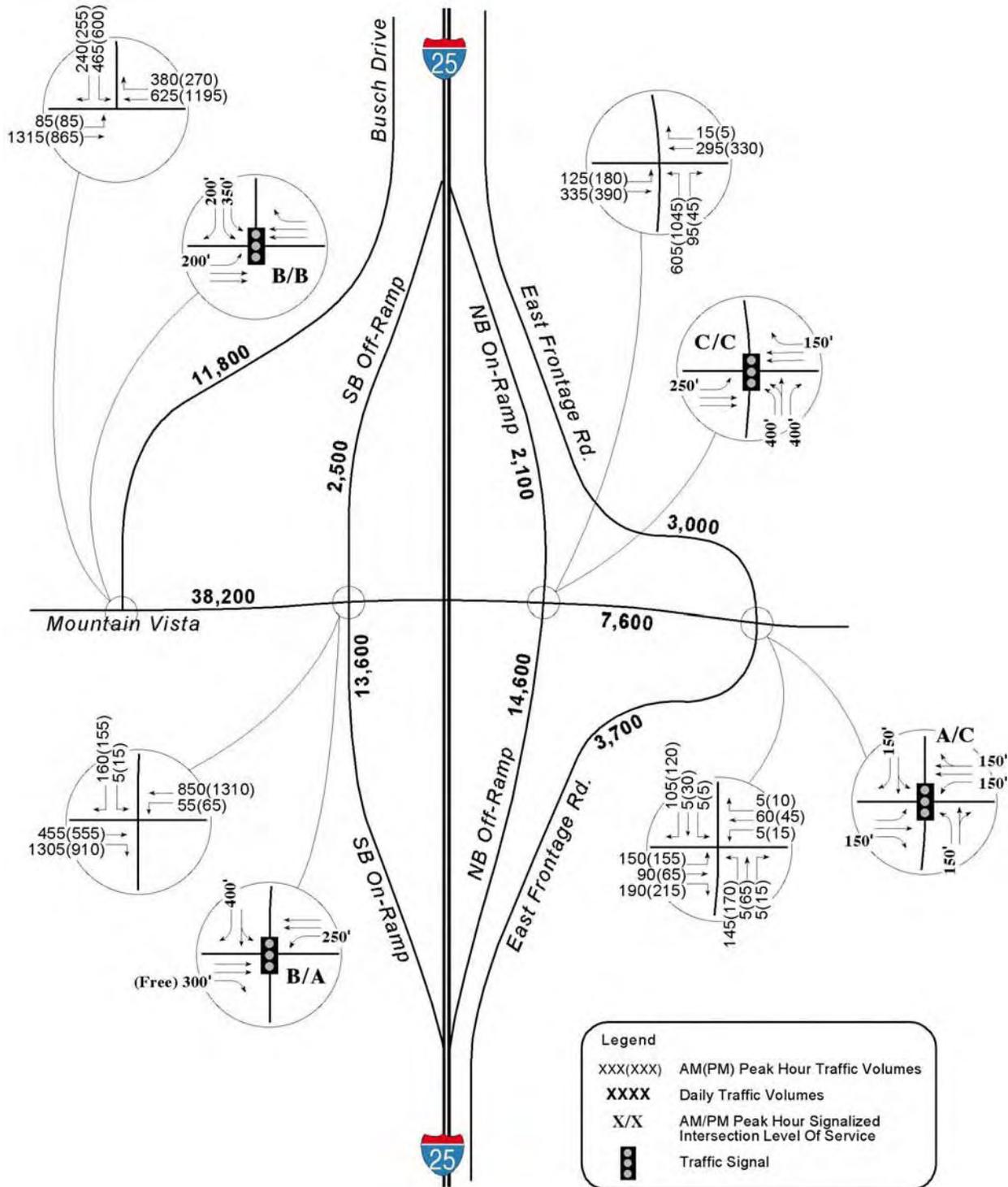


Figure 8. Package B Forecasts and Levels of Service

Mountain Vista (LCR 50) at I-25 DEIS Interchange Evaluation

Table 5. 2030 Package B Level of Service and Queue Lengths for Key Movements

Intersection / Movement	Level of Service		Estimated 95 th Percentile Queue ¹		Distance Between Intersections and Storage Length Provisions
	AM	PM	AM	PM	
Busch Drive					
WB Thru	A	A	110'	220'	Distance to Adjacent Intersection – 650'
WB Right	B	A	60'	60'	Storage Provided in Design – 650'
Southbound Ramp Terminal					
EB Right	Free	Free	N/A	N/A	Storage Provided in Design – 300'
WB Left	A	A	40'	60'	Storage Provided in Design – 250'
WB Thru	A	A	50'	50'	Distance to Adjacent Intersection – 650'
SB Left	D	D	20'	40'	Storage Provided in Design – 400'
SB Right	D	D	100'	90'	Storage Provided in Design – 400'
Northbound Ramp Terminal					
EB Left	B	C	90'	180'	Storage Provided in Design – 250'
EB Thru	A	C	130'	210'	Distance to Adjacent Intersection – 585'
WB Thru	B	B	110'	120'	Distance to Adjacent Intersection – 600'
WB Right	B	A	20'	10'	Storage Provided in Design – 150'
NB Left	D	D	540'	790'	Storage Provided in Design – 800'
NB Right	C	B	50'	40'	Storage Provided in Design – 400'
East Frontage Road Intersection					
EB Left	A	B	80'	150'	Distance to Adjacent Intersection – 585'
EB Thru	A	A	30'	40'	Distance to Adjacent Intersection – 585'
¹ The queue lengths given in this table primarily come from SimTraffic with some engineering judgment. SimTraffic gives a queue length for each lane. For example, with dual left-turn lanes SimTraffic estimates a queue for each lane. In the table, for thru movements the queue length is the longest queue observed in any through lane. For multiple turn lanes (i.e. dual lefts), the queue length is the sum of the queues in each lane. For a single turn lane (i.e. right turn), the queue is just the queue for that lane.					

Alternatives Evaluation Comparison

Traffic Operational Analysis

Table 6 compares the levels of service and delay at the Mountain Vista interchange for the three packages. As the table indicates, without improvements at this location, Busch Drive and northbound ramp intersections would operate at LOS E or F during the PM peak hour. With the improvements identified above, however, all four intersections operate at LOS C or better during both peak periods. The levels of service and delays at each intersection are virtually the same for both alternatives, so it would appear that either package would result in adequate operations at this interchange.

Mountain Vista (LCR 50) at I-25 DEIS Interchange Evaluation

Table 6. Intersection Level of Service and Delay

Intersection	No Action ¹		Package A		Package B	
	AM Peak	PM Peak	AM Peak	PM Peak	AM Peak	PM Peak
Busch Drive	LOS E (55 sec)	LOS F (>80 sec)	LOS B (16 sec)	LOS B (16 sec)	LOS B (16 sec)	LOS B (16 sec)
Southbound Ramps	LOS D (30 sec.)	LOS F (>50 sec.)	LOS B (10 sec.)	LOS A (5 sec.)	LOS B (11 sec.)	LOS A (5 sec.)
Northbound Ramps	LOS F (>50 sec.)	LOS F (>50 sec.)	LOS C (28 sec.)	LOS C (31 sec.)	LOS C (28 sec.)	LOS C (31 sec.)
East Frontage Road	LOS E (38 sec.)	LOS F (>50 sec.)	LOS A (9 sec.)	LOS C (31 sec.)	LOS A (9 sec.)	LOS C (31 sec.)

1. Assumes traffic signals only at each intersection (no turn lane revisions)

LOS X – Level of service

XX- Average delay in seconds per vehicle