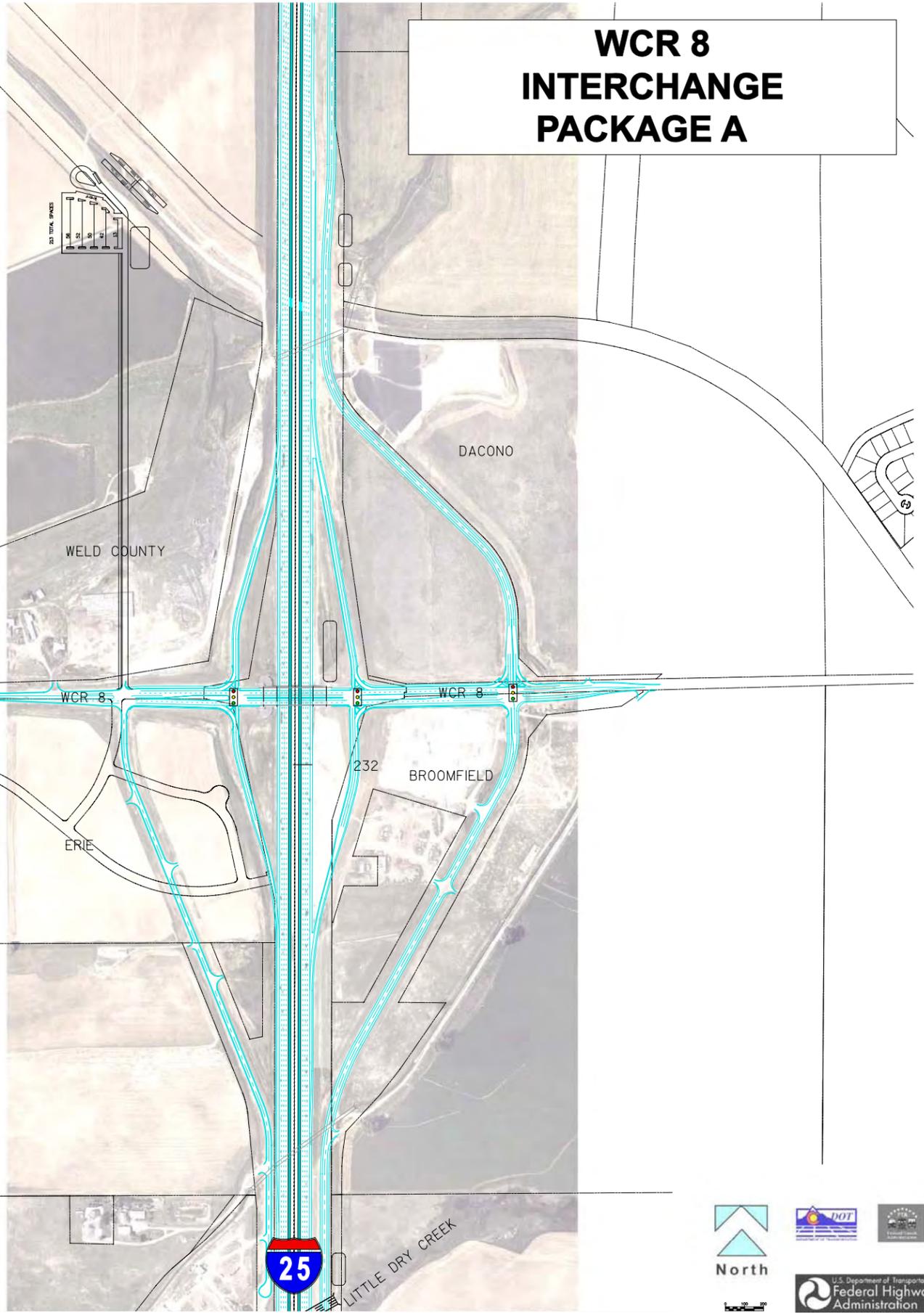


DRAFT

WCR 8
INTERCHANGE
PACKAGE A



North



October 1, 2007



WCR 8

DRAFT

**WCR 8
INTERCHANGE
PACKAGE B**



North



October 1, 2007



U.S. Department of Transportation
Federal Highway
Administration

WCR 8

WCR 8 at I-25 DEIS Interchange and Parking

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 Weld County Road 8 (WCR 8) interchange with I-25 (milepost 232) was constructed in 2004 and is a diamond configuration. The north and southbound off ramps are double-lane approaches, while the north and southbound on ramps are two lanes. It provides access for the town of Erie, which is located approximately four miles to the west of I-25 and provides access to rural areas to the east. Approximately one mile east of the northbound ramp terminals, the road surface changes from paved to gravel. Figure 1 shows the location of WCR 8 along I-25.

The interchange area includes the following roadways:

WCR 8. WCR 8 is an east-west two lane roadway that connects the Town of Erie to I-25. Currently, the land along WCR 8 is primarily open fields on both sides of the interchange.

Frontage Roads. A frontage road is located on the east side of the interchange and on the southwest side of the interchange. Both of these frontage roads have been relocated when the interchange was reconstructed; where they were previously spaced less than 100 feet on either side of the ramp terminals, they are now at least 550 feet on either side of the ramp terminals.

Figure 2 summarizes the traffic counts collected in August 2004 at this interchange. As shown, average daily traffic on WCR 8 is around 4,700 vehicles per day (vpd) west of the interchange and 2,500 vpd east of the interchange. The frontage road has daily traffic volumes of ranging from 600 vehicles north of WCR 8 to 600 south of WCR 8. Daily ramp volumes range between 1,000 and 2,500 vehicles per day, with total volumes generally greater to and from the south direction. At the interchange, turn movements to/from the ramps range from 15 to 165 vehicles per hour during the peak periods, with the eastbound to southbound movement representing the highest traffic volumes in the morning and the northbound to westbound movement the highest in the afternoon.

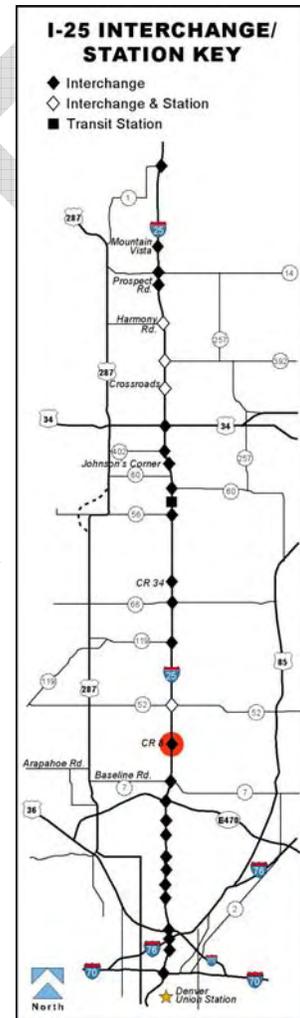


Figure 1. Vicinity Map

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. 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

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 to <=10
B	> 10 to <= 20	> 10 to <= 15
C	> 20 to <= 35	> 15 to <= 25
D	> 35 to <= 55	> 25 to <= 35
E	> 55 to <= 80	> 35 to <= 50
F	> 80	> 50

As shown on Figure 2, the stop controlled movements at the intersections in the vicinity of the WCR 8 interchange operate at LOS B or better during the peak hours.

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 WCR 8 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 WCR 8. 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.

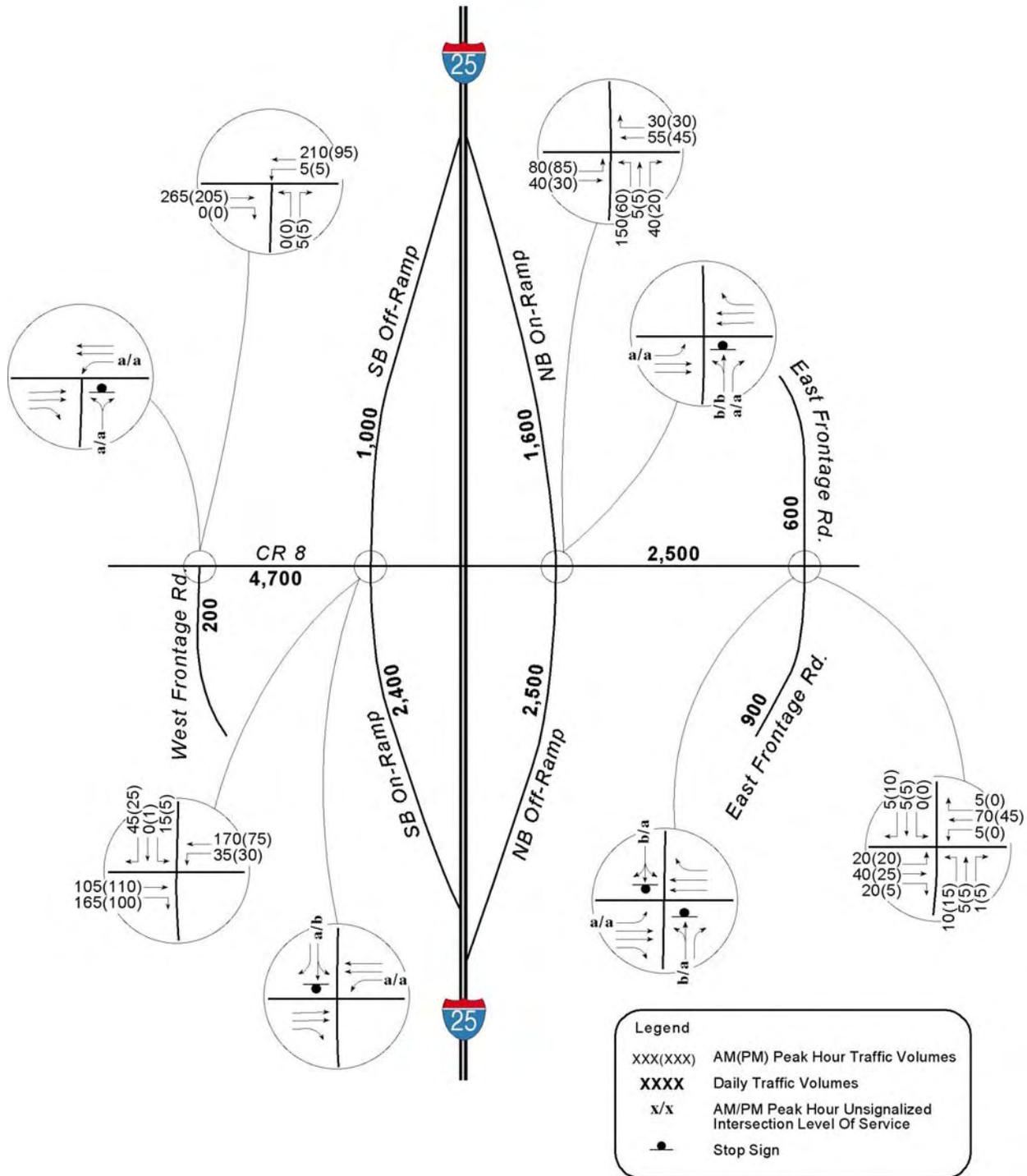


Figure 2. Existing Conditions

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	
West Frontage Road Intersection					
WB Approach	A	A	20'	10'	Distance to Adjacent Intersection – 580'
Southbound Ramp Terminal					
WB Approach	A	A	30'	20'	Distance to Adjacent Intersection – 630'
SB Approach	A	A	40'	10'	Ramp Length – 1,165'
Northbound Ramp Terminal					
EB Approach	A	A	20'	20'	Distance to Adjacent Intersection – 630'
NB Approach	B	B	60'	50'	Ramp Length – 1,245'
East Frontage Road Intersection					
EB Approach	A	A	10'	10'	Distance to Adjacent Intersection – 830'
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 + CB 85
- 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.

LEGEND

- ★ Major Structure Rehab by 2030
- Minor Structure Rehab by 2030
- Replace / Rehab Pavement by 2030
- Minor Safety Modifications by 2030
- FasTracks Rail Line

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Figure 3. No-Action Alternative

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
	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.

NOT TO SCALE



Figure 4. Package A : GPL+CR+CB85

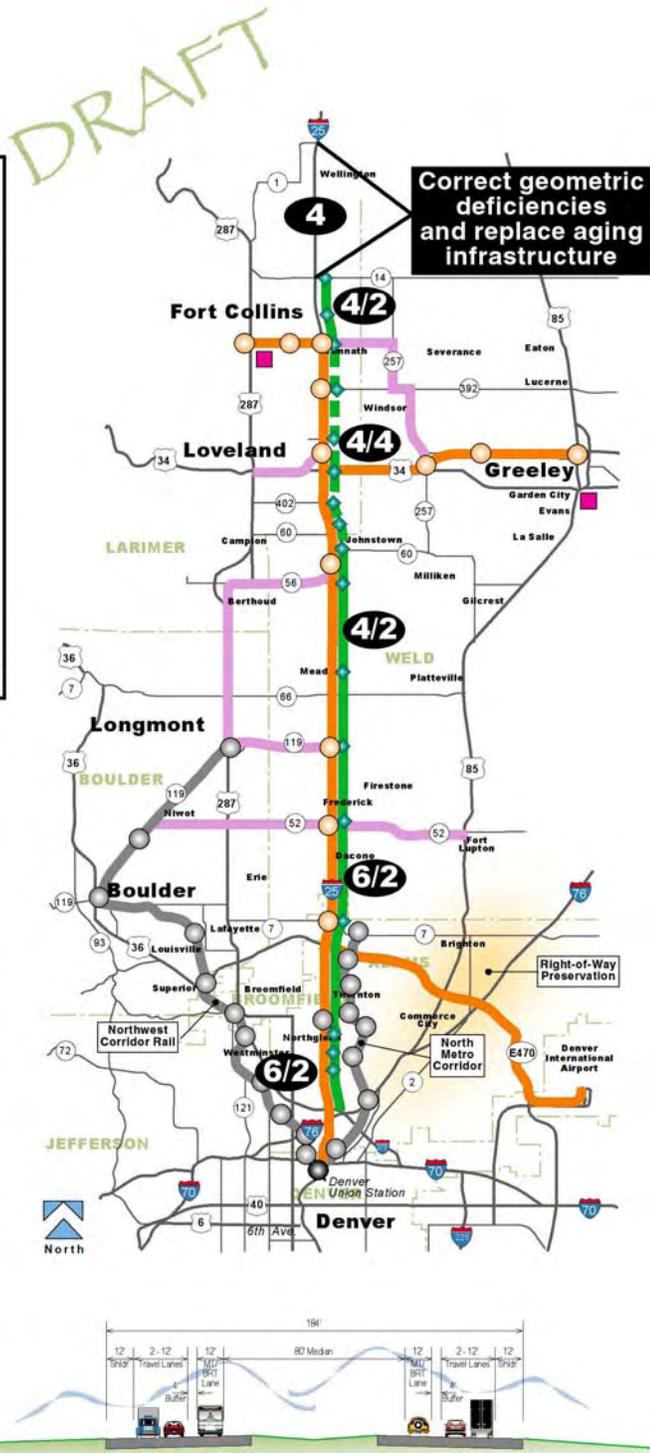
LEGEND

- 1 Buffer-Separated Tolled Express Lane (TEL) in Each Direction**
- 2 Barrier-Separated Tolled Express Lanes (TEL) in Each Direction**
- Bus Rapid Transit (BRT) Route (Uses TELs on I-25)**
- Feeder Bus Service**
- Interchange Upgrades**
- X **Number of Lanes: General Purpose/Tolled Express Lanes**
- Bus Rapid Transit Station**
- FasTracks Rail Line**
- FasTracks / RTD Transit Station**
- 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:

- A wider barrier and express lanes cross section is included between SH 60 and Harmony Road.
- BRT stations located within an expanded median area.
- Where widening is needed between SH 66 and SH 7, the median would be used.



NOT TO SCALE

TYPICAL I-25 CROSS SECTION - BUFFERED SEPARATED TOLLED EXPRESS LANES

Figure 5. Package B : TEL + BRT

2030 No Action Traffic Volumes

Figure 6 depicts 2030 daily and peak hour No Action traffic projections for the WCR 8 interchange and adjacent intersections. As shown, daily volume projections on WCR 8 range from 18,700 vpd east of the interchange to 16,600 vpd west of the interchange, and ramp volumes range from 3,200 to 11,500 vehicles per day. These volumes show different patterns than the existing counts; large increases in land use to the east of the interchange will switch the highest traffic flows to and from the east instead of the existing condition of to and from the west. On the ramps, the highest traffic flows will remain to and from the south.

2030 Package A Traffic Volumes

Figure 7 depicts 2030 daily and peak hour Package A traffic projections for the WCR 8 interchange and adjacent intersections. The volumes in the figure are generally similar, but slightly higher than, those presented in the No Action Alternative. Daily volume projections on WCR 8 range from 19,600 vpd east of the interchange to 17,000 vpd west of the interchange, and ramp volumes range from 3,400 to 12,600 vehicles per day.

2030 Package B Volumes

Figure 8 depicts 2030 daily and peak hour Package B traffic projections for the WCR 8 interchange and adjacent intersections. The volumes in the figure are generally similar to those presented in the No Action Alternative. Daily volume projections on WCR 8 range from 19,100 vpd east of the interchange to 16,500 vpd west of the interchange, and ramp volumes range from 3,500 to 12,900 vehicles per day.

2030 No Action Traffic Operations

Figure 6 shows the projected levels of service at the frontage road and ramp intersections on WCR 8 under the No Action Alternative. As the figure indicates, movements at the frontage roads and the northbound off-ramp would operate at LOS F during the peak periods. Table 3 shows the projected queuing for key movements at the interchange.

It should be noted that signaling the four intersections without any widening improvements would improve the ramp terminals and the west frontage road intersections to LOC C or better during both peak periods, but would still result in LOS F operations at the east frontage road in both peaks.

WCR 8 at I-25 DEIS Interchange and Parking

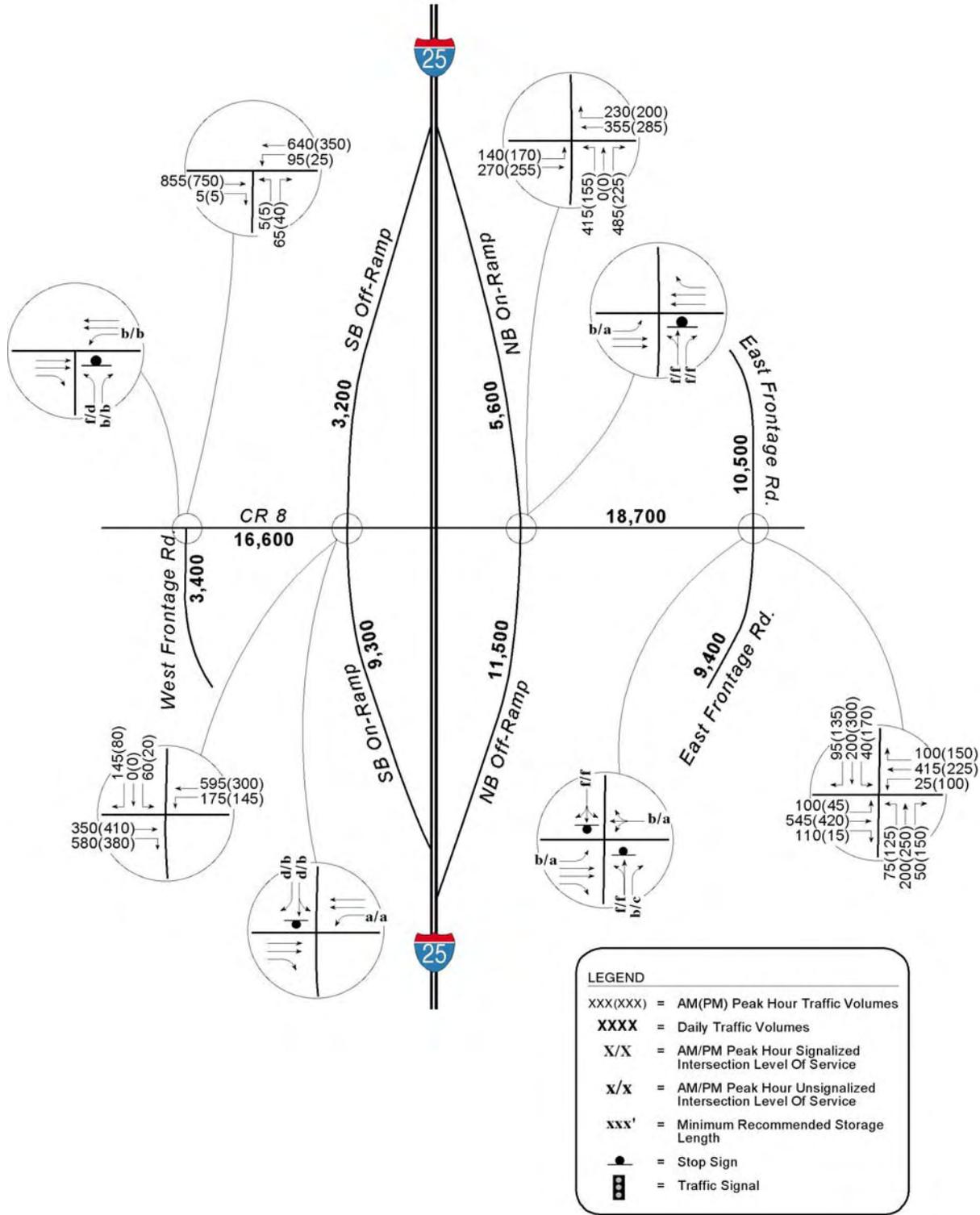


Figure 6. No Action Forecasts and Levels of Service

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	
West Frontage Road					
WB Approach	B	B	90'	40'	Distance to Adjacent Intersection – 580'
Southbound Ramp Terminal					
WB Approach	A	A	60'	60'	Distance to Adjacent Intersection – 630'
SB Approach	D	B	80'	40'	Ramp Length – 1,165'
Northbound Ramp Terminal					
EB Approach	A	A	60'	60'	Distance to Adjacent Intersection – 630'
NB Approach	F	F	630'	100'	Ramp Length – 1,245'
East Frontage Road Intersection					
EB Approach	B	A	60'	50'	Distance to Adjacent Intersection – 830'
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 WCR 8 DEIS interchange evaluation is a diamond configuration (Figure 7). The new interchange would retain the basic existing geometry, with an additional northbound left turn lane at the northbound ramp terminal. All four intersections would be signalized.

A commuter rail park-and-ride lot with 213 parking stalls would be located at the north end of the west frontage road just south of the abandon rail line that previously crossed I-25.

Interchange Operations

Figure 7 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 in the vicinity of the ramp are anticipated to operate at LOS C or better with the forecasted traffic volumes and the enhancements identified.

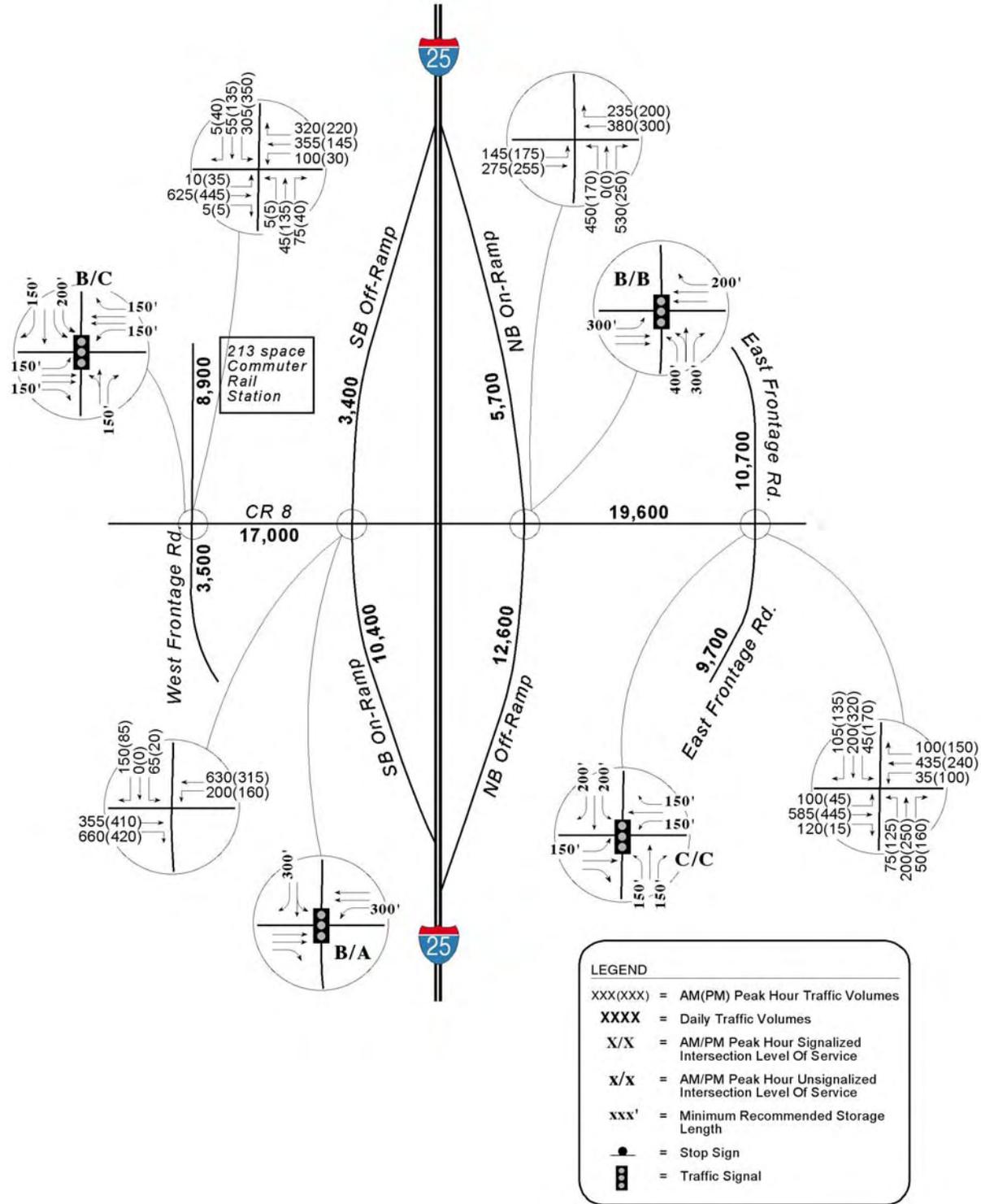


Figure 7. Package A Forecasts and Levels of Service

WCR 8 at I-25 DEIS Interchange and Parking

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	
West Frontage Road					
WB Left	B	B	80'	50'	Storage Provided in Design – 150'
WB Thru	A	B	90'	100'	Distance to Adjacent Intersection – 580'
Southbound Ramp Terminal					
EB Right	C	A	180'	80'	Storage Provided in Design – 300'
WB Left	B	A	150'	90'	Storage Provided in Design – 300'
WB Thru	A	A	60'	30'	Distance to Adjacent Intersection – 630'
SB Left	D	D	100'	50'	Storage Provided in Design – 300'
SB Right	D	D	80'	50'	Storage Provided in Design – 300'
Northbound Ramp Terminal					
EB Left	A	A	120'	90'	Storage Provided in Design – 300'
EB Thru	A	A	140'	100'	Distance to Adjacent Intersection – 630'
WB Thru	A	A	140'	80'	Distance to Adjacent Intersection – 830'
WB Right	A	A	60'	40'	Storage Provided in Design – 200'
NB Left	D	D	320'	200'	Storage Provided in Design – 800'
NB Right	C	D	110'	70'	Storage Provided in Design – 300'
East Frontage Road Intersection					
EB Left	D	E	130'	70'	Storage Provided in Design – 600'
EB Thru	B	C	250'	340'	Distance to Adjacent Intersection – 830'
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 B Traffic Operations

Interchange Configuration

The proposed configuration for WCR 8 in Package B is the same as in Package A (Figure 8). A 273-space carpool is included in Package B. Like the CR station in Package A the carpool lot would be accessed from the west frontage road.

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 well within the storage length and would not extend into the I-25 main lanes. The park-and-ride access would also operate acceptably in this package.

WCR 8 at I-25 DEIS Interchange and Parking

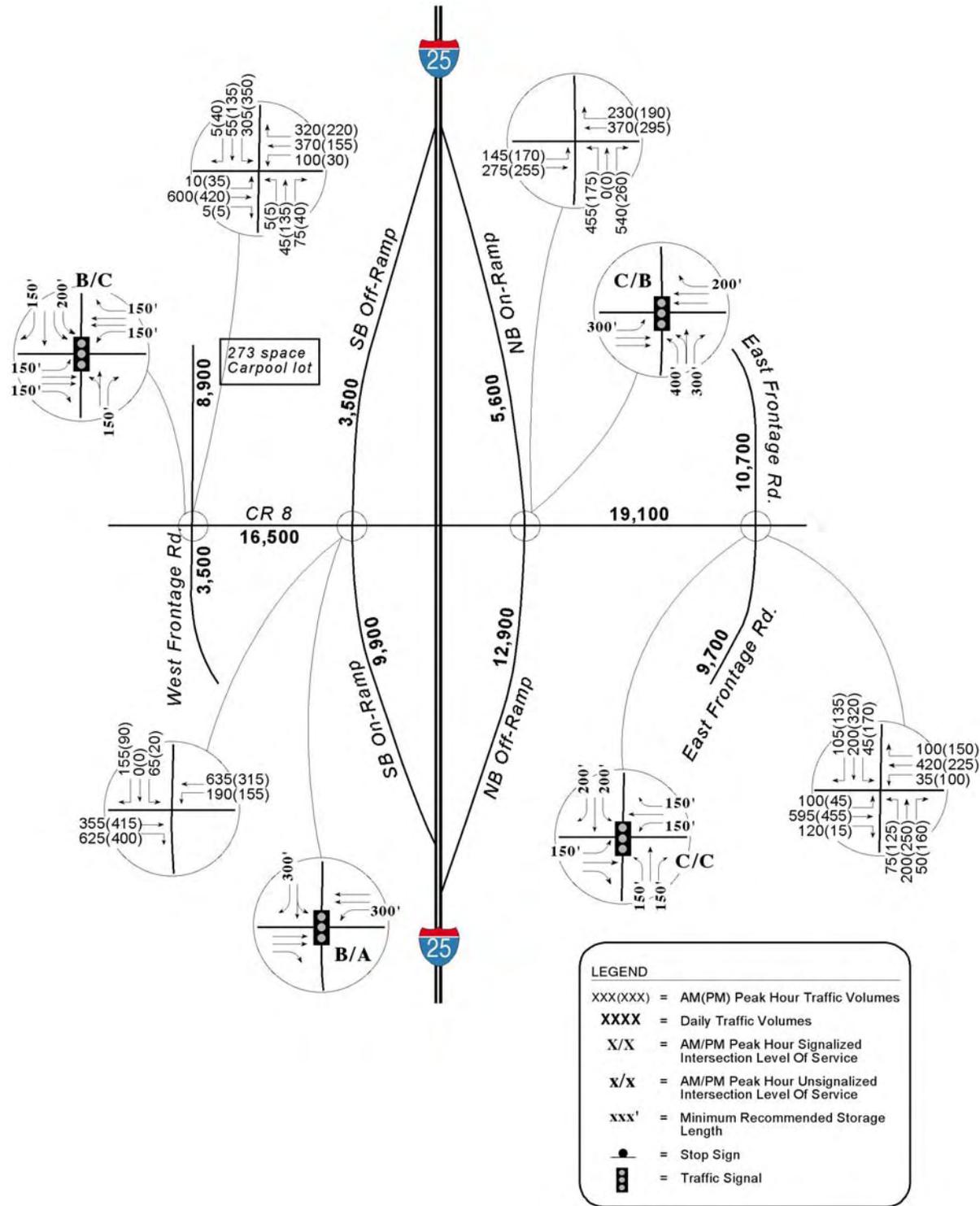


Figure 8. Package B Forecasts and Levels of Service

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	
West Frontage Road					
WB Left	A	B	80'	50'	Storage Provided in Design – 150'
WB Thru	A	B	130'	90'	Distance to Adjacent Intersection – 580'
Southbound Ramp Terminal					
EB Right	C	A	180'	90'	Storage Provided in Design – 300'
WB Left	A	A	170'	100'	Storage Provided in Design – 300'
WB Thru	A	A	50'	30'	Distance to Adjacent Intersection – 630'
SB Left	D	D	100'	50'	Storage Provided in Design – 300'
SB Right	D	D	70'	50'	Storage Provided in Design – 300'
Northbound Ramp Terminal					
EB Left	A	A	110'	100'	Storage Provided in Design – 300'
EB Thru	A	A	150'	100'	Distance to Adjacent Intersection – 630'
WB Thru	A	A	170'	90'	Distance to Adjacent Intersection – 830'
WB Right	A	A	70'	40'	Storage Provided in Design – 200'
NB Left	C	D	320'	200'	Storage Provided in Design – 800'
NB Right	C	D	100'	70'	Storage Provided in Design – 300'
East Frontage Road Intersection					
EB Left	D	D	120'	70'	Storage Provided in Design – 600'
EB Thru	B	C	320'	250'	Distance to Adjacent Intersection – 830'
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 WCR 8 interchange for the three packages. As the table indicates, the eastbound frontage road intersection would operate at LOS F without any widening improvements to the interchange, but with the improvements identified above; all four intersections would 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.

WCR 8 at I-25
DEIS Interchange and Parking

Table 6. Intersection Level of Service and Delay Comparison

Intersection	No Action ¹		Package A		Package B	
	AM Peak	PM Peak	AM Peak	PM Peak	AM Peak	PM Peak
West Frontage Road	LOS B (17 sec.)	LOS C (26 sec.)	LOS B (17 sec.)	LOS C (25 sec.)	LOS B (17 sec.)	LOS C (25 sec.)
Southbound Ramps	LOS A (8 sec.)	LOS A (6 sec.)	LOS B (16 sec.)	LOS A (6 sec.)	LOS B (15 sec.)	LOS A (6 sec.)
Northbound Ramps	LOS C (21 sec.)	LOS B (14 sec.)	LOS C (28 sec.)	LOS B (15 sec.)	LOS C (20 sec.)	LOS B (15 sec.)
East Frontage Road	LOS F (>80 sec.)	LOS F (>80 sec.)	LOS B (20 sec.)	LOS C (31 sec.)	LOS C (24 sec.)	LOS C (31 sec.)

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

LOS X – Level of service

##.# - Average delay in seconds per vehicle

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