NORTH I-25 EIS

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US 34 INTERCHANGE PACKAGE A

DRAFT

LOVELAND

LOVELAND

ROCKY MTN. AVE.

McWHINNEY BLVD.

HAHN'S PEAK

34

LARIMER COUNTY

JOHNSTOWN

LCR 5

LCR 3E

LCR 20E

GWRR

25

North

0 200 400

SCALE: 1"=400'

October 1, 2007

U.S. Department of Transportation Federal Highway Administration

US 34 INTERCHANGE

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10/4/2007

NORTH I-25 EIS

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US 34 INTERCHANGE PACKAGE B

DRAFT

LOVELAND

LOVELAND

ROCKY MTN. AVE.

McWHINNEY BLVD.

HAHN'S PEAK

34

LARIMER COUNTY

JOHNSTOWN

LCR 5

LCR 3E

LCR 20E

GWRR

25

North

0 200 400

SCALE: 1"=400'

October 1, 2007

U.S. Department of Transportation Federal Highway Administration

US 34 INTERCHANGE

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10/5/2007

Weld County Road 34 at I-25
DEIS Interchange Evaluation

NORTH I-25 EIS
information. cooperation. transportation.

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 34 (WCR 34) interchange at I-25 was constructed in 1961. The interchange is a diamond and is similar to several other diamond interchanges (i.e. SH 66, WCR 34) in the corridor.

The interchange area includes the following roadways:

WCR 34. WCR 34 is an east-west two lane arterial that provides connections to I-25 for the Town of Mead and the Town of Platteville. There is an existing racetrack, Mountain View Raceway on the northeast corner of the interchange. The other quadrants are open fields. There are no turn lanes at the ramp terminals, which are stop sign-controlled off of the interstate, but the curb radii at both ramp terminals allow for a right turning vehicle to maneuver around up to two vehicles waiting to turn left onto WCR 34.

East Frontage Road. A frontage road is located on the east side of the interchange, approximately 100 feet east of the northbound ramp intersection. The intersection is stop-sign controlled, and the speed limit on the frontage road in the vicinity of the interchange is 35 mph.

Figure 1. Vicinity Map

Figure 2 summarizes the traffic counts collected in August 2004 at this interchange. As shown, average daily traffic on WCR 34 is around 2,300 vehicles per day (vpd) west of the interchange and 1,600 vpd east of the interchange. The east side frontage road has daily traffic volumes of ranging from 1,300 north of WCR 34 to 2,000 south of WCR 34. Daily ramp volumes range between 800 and 1,000 vehicles per day, with total volumes generally equal between the north and south directions. At the interchange, turn movements to/from the ramps are less than 100 vehicles per hour during the peak periods, with the westbound to southbound movement representing the highest traffic volumes in the morning and the northbound to eastbound movement representing the highest volumes in the afternoon peak hour.

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

Figure 2 illustrates existing peak period levels of service at the ramp terminals, adjacent intersections and ramp junctions with I-25. Currently, all stop controlled movements in the interchange area operate at LOS B or better during the 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 WCR 34 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 34. 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.

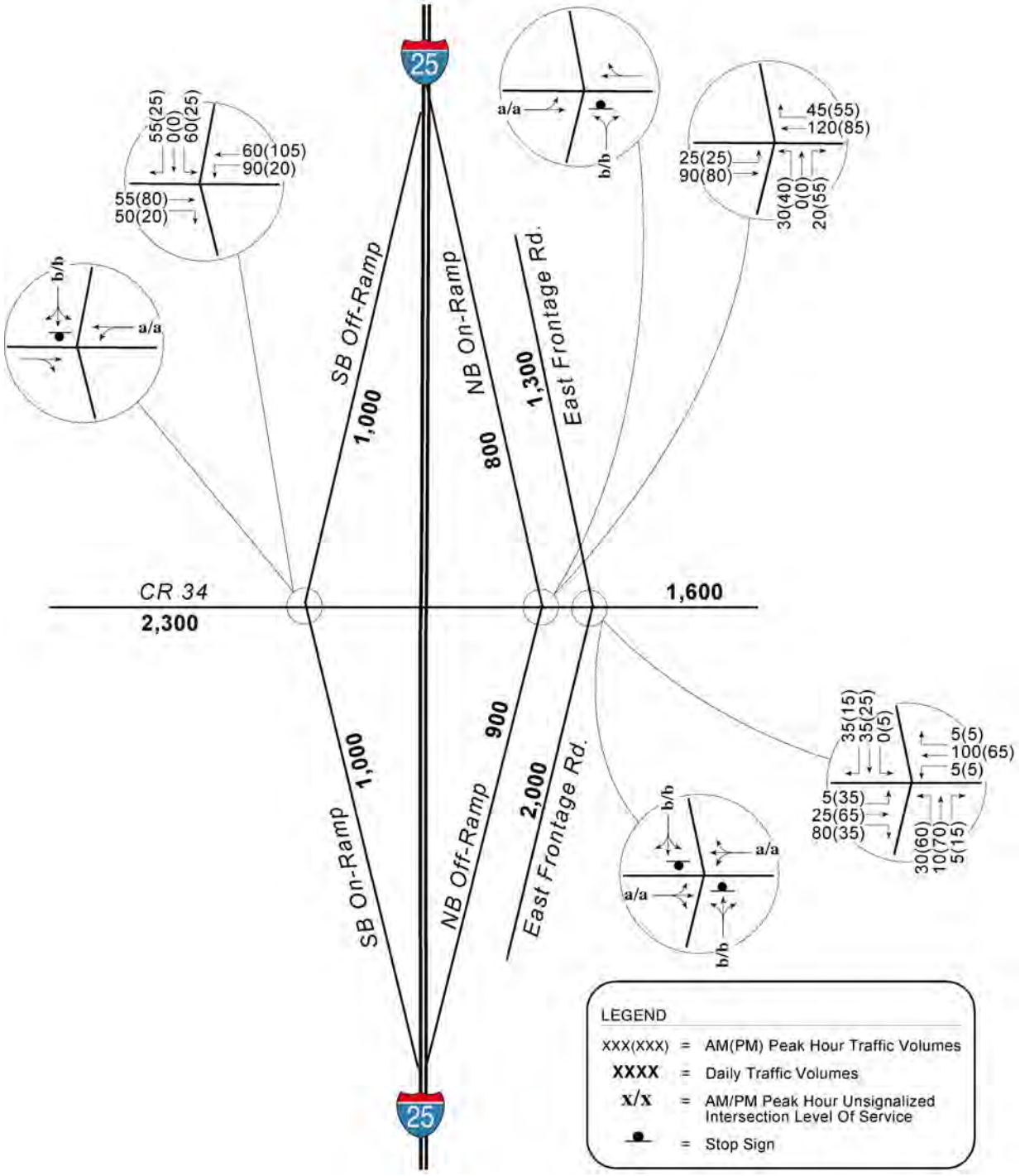

Figure 2. Existing Conditions

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

Intersection / Movement	Level of Service		Estimated 95th Percentile Queue[1]		Intersection Spacing and Storage Length Provisions
	AM	PM	AM	PM	
Southbound Ramp Terminal					
WB Approach	A	A	50'	20'	Distance to Adjacent Intersection – 540'
SB Approach	B	B	60'	60'	Ramp Length – 900'
Northbound Ramp Terminal					
EB Approach	A	A	20'	30'	Distance to Adjacent Intersection – 540'
NB Approach	B	B	50'	60'	Ramp Length – 900'
East Frontage Road Intersection					
EB Approach	A	A	20'	20'	Distance to Adjacent Intersection – 100'

[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.

Figure 3. No Action Alternative

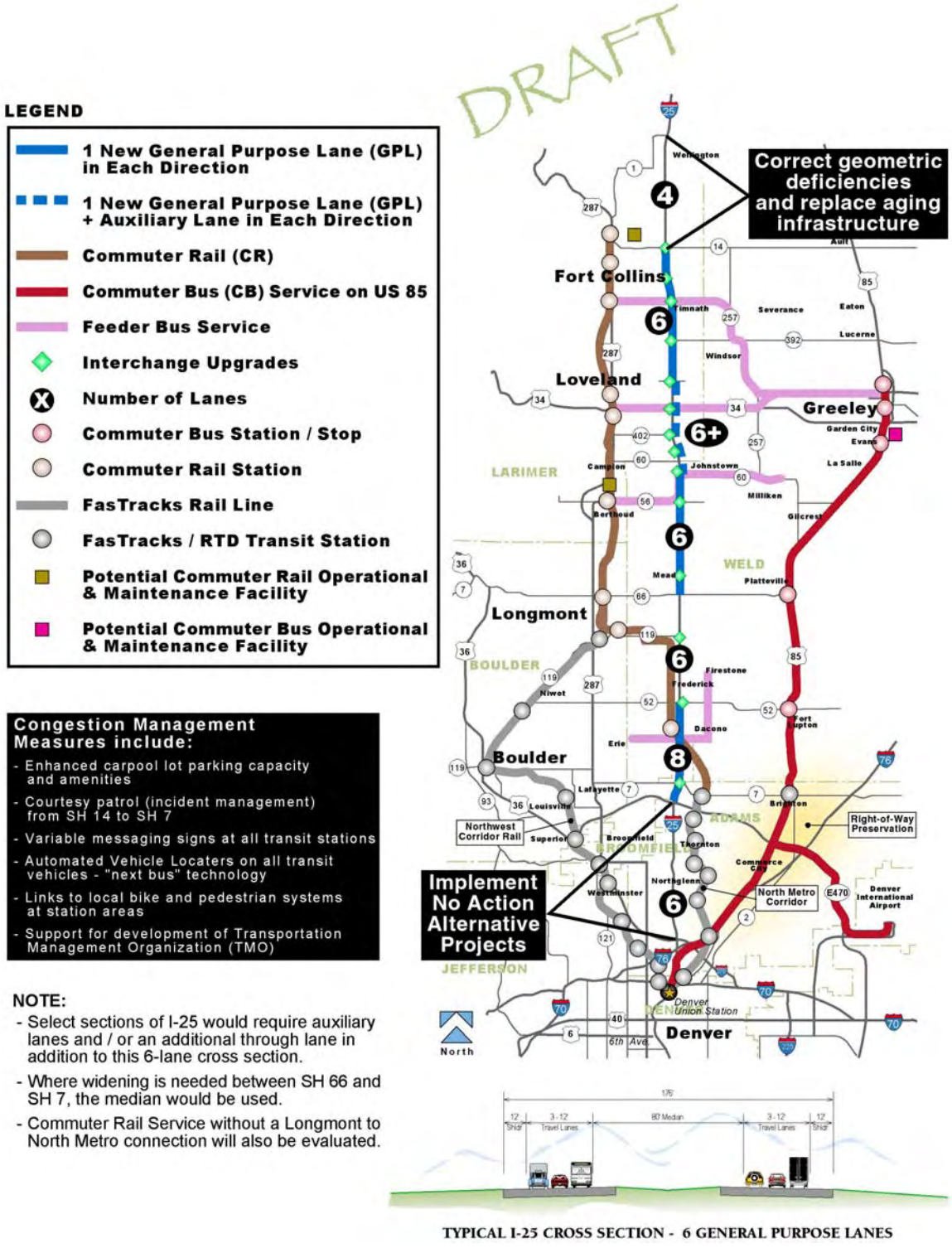

Figure 4. Package A: GPL + CR + CB 85

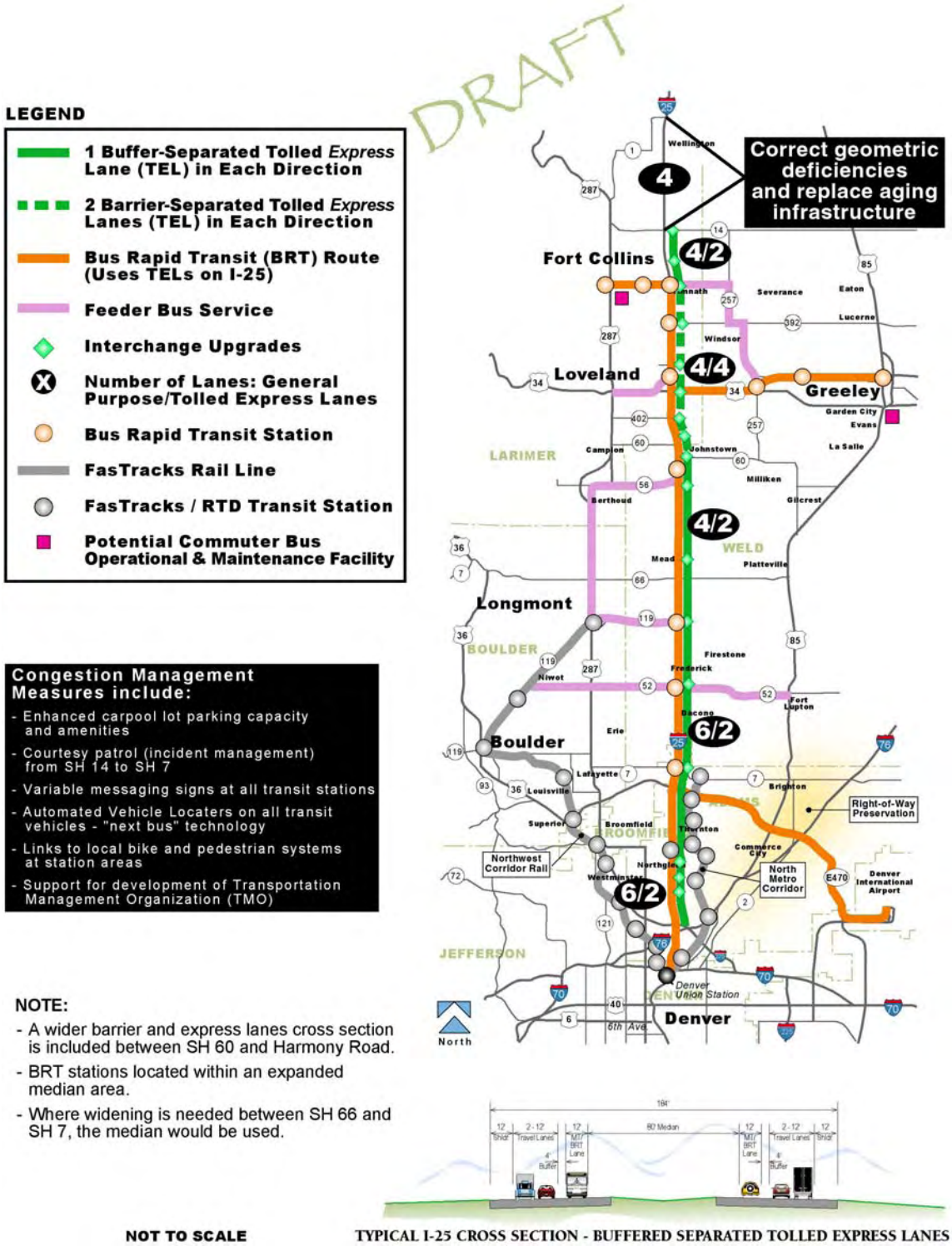

Figure 5. Package B: TEL + BRT

2030 No Action Traffic Volumes

Figure 6 depicts 2030 daily and peak hour No Action traffic projections for the WCR 34 interchange and adjacent intersections. As shown, daily volume projections on WCR 34 range from 3,600 vpd west of the interchange to 5,600 vpd east of the interchange, and ramp volumes range from 1,500 to 2,500 vehicles per day. These volumes show the same overall daily patterns to and from the north and south on I-25; evenly split from the north and south. A slight shift in daily volumes is shown on WCR 34, volumes east of I-25 are anticipated to be higher to the east of I-25 than to the west.

2030 Package A Traffic Volumes

Figure 7 depicts 2030 daily and peak hour Package A traffic projections for the WCR 34 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 34 range from 4,100 vpd west of the interchange to 6,300 vpd east of the interchange, and ramp volumes range from 1,600 to 3,600 vehicles per day. The volumes patterns show higher flow to and from the north as compared to No Action conditions.

2030 Package B Volumes

Figure 8 illustrates daily and peak hour Package B 2030 traffic projections. The volumes and patterns are similar to those in Package A.

2030 No Action Traffic Operations

Figure 6 shows the projected levels of service at the frontage road and ramp intersections on WCR 34 under the No Action scenario. As the figure indicates, all movements in the interchange area would operate at LOS D or better, except for northbound movements at the stop sign-controlled intersection of the frontage road with WCR 34. Table 3 shows the projected queuing for key movements at the interchange.

It should be noted that signalizing the three intersections without any widening or auxiliary lane improvements, the intersections would operate at LOS D or better during the peak periods, but may cause more problems with the spacing between the northbound off ramp and the east frontage road.

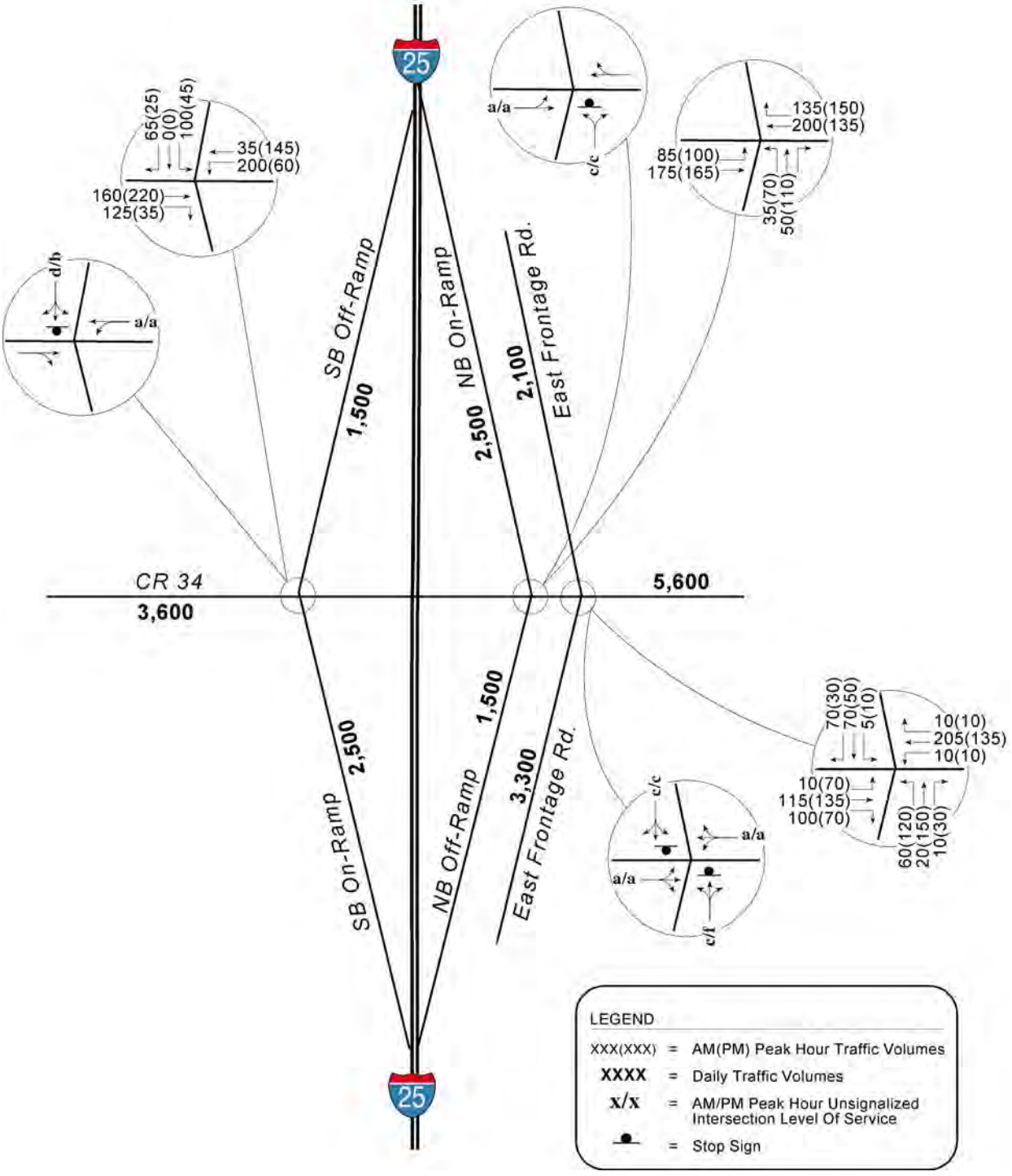

Figure 6. No Action Forecasts and Levels of Service

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

Intersection / Movement	Level of Service		Estimated 95th Percentile Queue[1]		Intersection Spacing and Storage Length Provisions
	AM	PM	AM	PM	
Southbound Ramp Terminal					
WB Approach	A	A	70'	40'	Distance to Adjacent Intersection – 540'
SB Approach	D	B	80'	50'	Ramp Length – 900'
Northbound Ramp Terminal					
EB Approach	A	A	60'	60'	Distance to Adjacent Intersection – 540'
NB Approach	C	C	60'	100'	Ramp Length – 900'
East Frontage Road Intersection					
EB Approach	A	A	30'	50'	Distance to Adjacent Intersection – 100'

[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 34 DEIS interchange evaluation is a diamond configuration (Figure 7). The new interchange would shift the east frontage road intersection east to provide more space between the northbound ramp terminals. The bridge would be widened to accommodate three lanes, one through in each direction with back-to-back left turn lanes. The northbound and southbound off ramps would be constructed with a shared through-left turn lane and a right turn lane. All three 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 three 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.

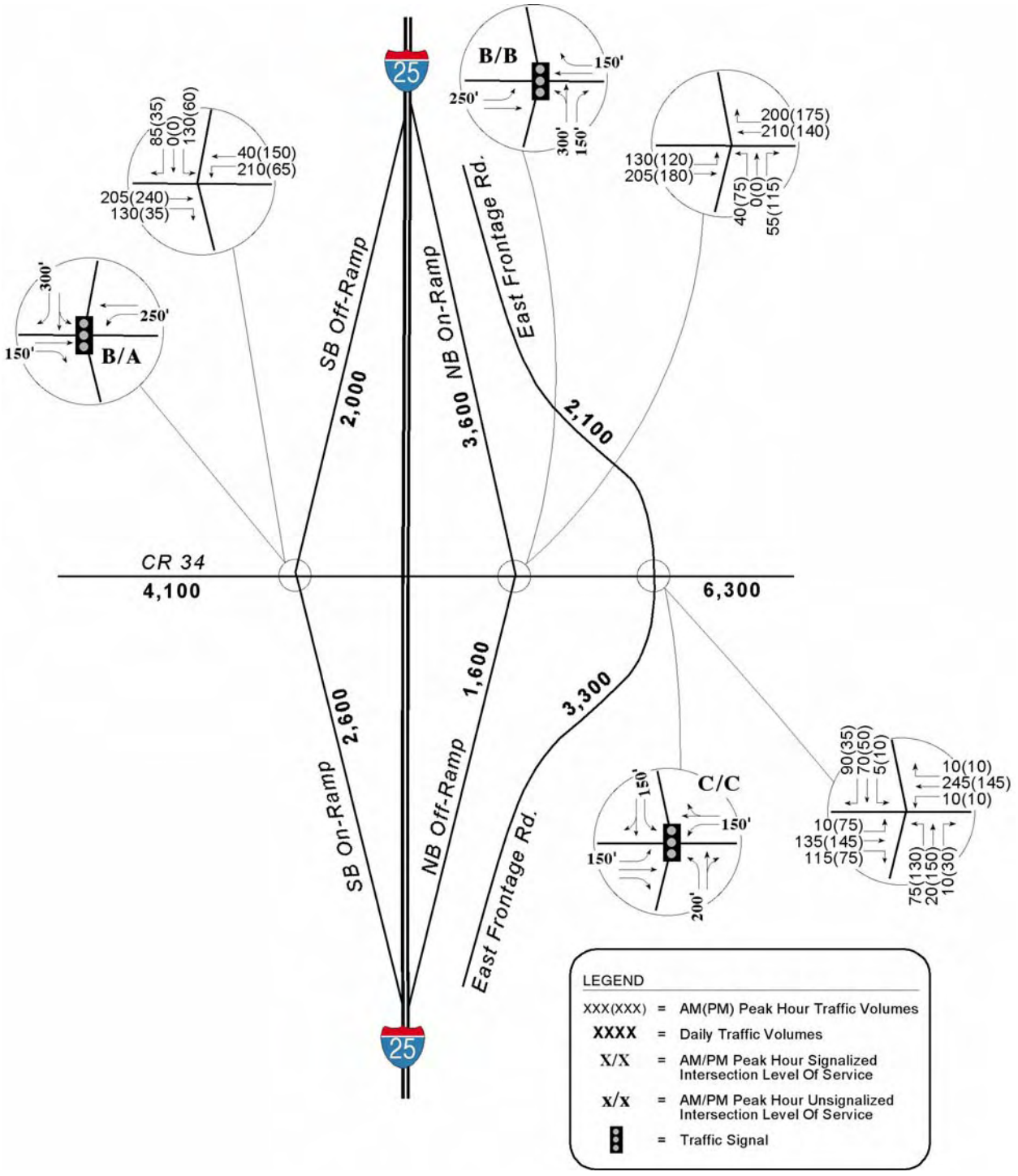

Figure 7. Package A Forecasts and Levels of Service

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 operation 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 95th Percentile Queue[1]		Distance Between Intersections and Storage Length Provisions
	AM	PM	AM	PM	
Southbound Ramp Terminal					
EB Right	A	A	30’	10’	Storage Provided in Design – 150’
WB Left	A	A	90’	50’	Storage Provided in Design – 250’
WB Thru	A	A	20’	20’	Distance to Adjacent Intersection –500 ’
SB Left	D	D	160’	90’	Storage Provided in Design – 300’
SB Right	D	D	50’	50’	Storage Provided in Design – 300’
Northbound Ramp Terminal					
EB Left	A	A	70’	80’	Storage Provided in Design – 250’
EB Thru	A	A	130’	60’	Distance to Adjacent Intersection – 500’
WB Thru	A	A	50’	60’	Distance to Adjacent Intersection – 850’
WB Right	B	A	30’	40’	Storage Provided in Design – 150’
NB Left	D	D	80’	120’	Storage Provided in Design – 300’
NB Right	D	D	50’	50’	Storage Provided in Design – 400’
East Frontage Road Intersection					
EB Left	A	A	20’	60’	Storage Provided in Design – 150’
EB Thru	A	A	40’	70’	Distance to Adjacent Intersection – 850’

[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 34 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 well within the storage length and would not extend into the I-25 main lanes.

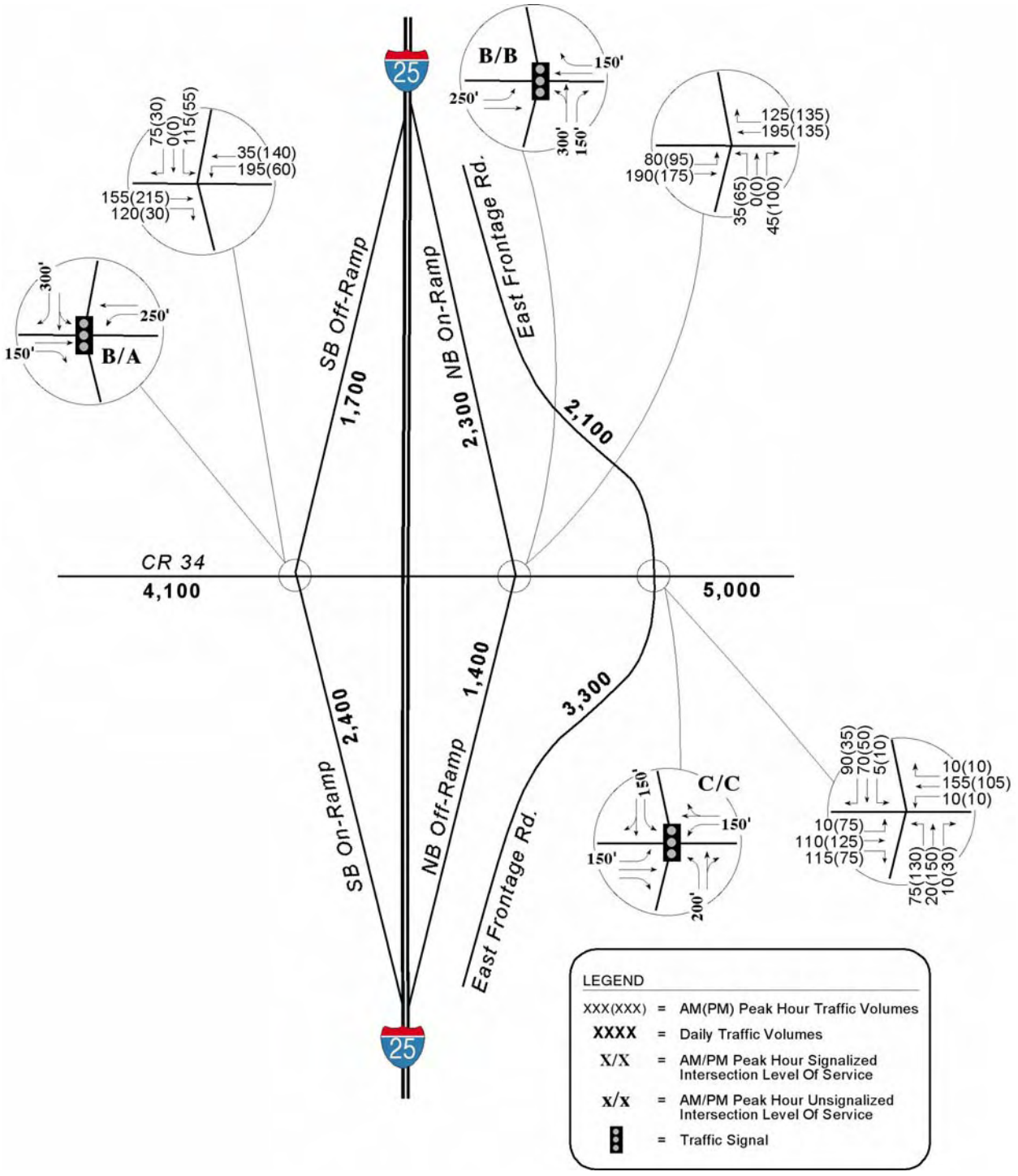

Figure 8. Package B Forecasts and Levels of Service

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

Intersection / Movement	Level of Service		Estimated 95th Percentile Queue[1]		Distance Between Intersections and Storage Length Provisions
	AM	PM	AM	PM	
Southbound Ramp Terminal					
EB Right	A	A	20'	10'	Storage Provided in Design – 150'
WB Left	A	A	70'	30'	Storage Provided in Design – 250'
WB Thru	A	A	10'	20'	Distance to Adjacent Intersection –500 '
SB Left	D	D	150'	100'	Storage Provided in Design – 300'
SB Right	D	D	50'	40'	Storage Provided in Design – 300'
Northbound Ramp Terminal					
EB Left	A	A	50'	60'	Storage Provided in Design – 250'
EB Thru	A	A	80'	60'	Distance to Adjacent Intersection – 500'
WB Thru	A	A	40'	70'	Distance to Adjacent Intersection – 850'
WB Right	B	B	20'	40'	Storage Provided in Design – 150'
NB Left	D	D	50'	90'	Storage Provided in Design – 300'
NB Right	D	D	50'	50'	Storage Provided in Design – 400'
East Frontage Road Intersection					
EB Left	A	A	30'	70'	Storage Provided in Design – 150'
EB Thru	A	A	40'	70'	Distance to Adjacent Intersection – 850'

[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 34 interchange for the three packages. As the table indicates, signalizing the three intersections without any widening or auxiliary lane improvements would result in LOS D or better conditions during both peak periods, but may create problems due to the spacing between the northbound off ramp and the east frontage road. With the improvements identified above, all three 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.

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
Southbound Ramps	LOS B (15 sec.)	LOS D (38 sec.)	LOS B (14 sec.)	LOS A (8 sec.)	LOS B (14 sec.)	LOS A (8 sec.)
Northbound Ramps	LOS B (12 sec.)	LOS B (11 sec.)	LOS B (12 sec.)	LOS B (14 sec.)	LOS B (12 sec.)	LOS B (14 sec.)
East Frontage Road	LOS C (23 sec.)	LOS C (32 sec.)	LOS C (29 sec.)	LOS C (25 sec.)	LOS C (33 sec.)	LOS C (26 sec.)

1. Assumes traffic signals only at each intersection (no turn lane revisions)
LOS X – Level of service
##.# - Average delay in seconds per vehicle