

US 85 Commuter Bus - Evans DEIS Evaluation

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August 20, 2007

Introduction

The North I-25 DEIS Package A alternative considers two commuter bus routes: one that would extend from the Denver Union Station (DUS), and a second that would extend from the Denver International Airport (DIA). Both routes will terminate in Greeley. Line stations will be located at designated existing transit stops in Denver, Commerce City, and Brighton, as well as new proposed stops in Fort Lupton, Platteville, Evans, and Greeley.

The proposed commuter bus route generally follows the existing US 85 alignment. The end-of-line station along with a parking/development opportunity is proposed in the vicinity of US 85/D Street intersection. A map of the commuter bus routes showing the station locations is provided in Figure 1.

This report documents the potential traffic impacts of the proposed commuter bus station in the vicinity of the US 85/42nd Street intersection in Evans and provides technical documentation of the traffic data analysis. The other proposed commuter bus stations are addressed in separate reports.

Existing Conditions

The proposed commuter bus station is located southeast of the US 85/42nd Street intersection and would have approximately 72 parking spaces. The surrounding area includes several land use types, including residential, commercial, retail development, gas stations, and small offices.

The proposed study area includes the following major roadways and intersections:

United States Highway 85 (US 85)

US 85 is a four lane divided highway from I-76 exit 12 north through Brighton, Platteville, and Greeley to the north side of Ault. The expressway has grade-separated interchanges at SH 7, SH 52, US 34, and USB-85 (Business Route 85).

US 85/31st Street intersection

The US 85/31st Street intersection is signalized. The posted speed limit on 31st Street near the intersection is 35 mph and is 45 mph on US 85. 31st Street travels in an east-west direction while US 85 travels in a north-south direction. Traffic operations at this intersection are complicated by a second

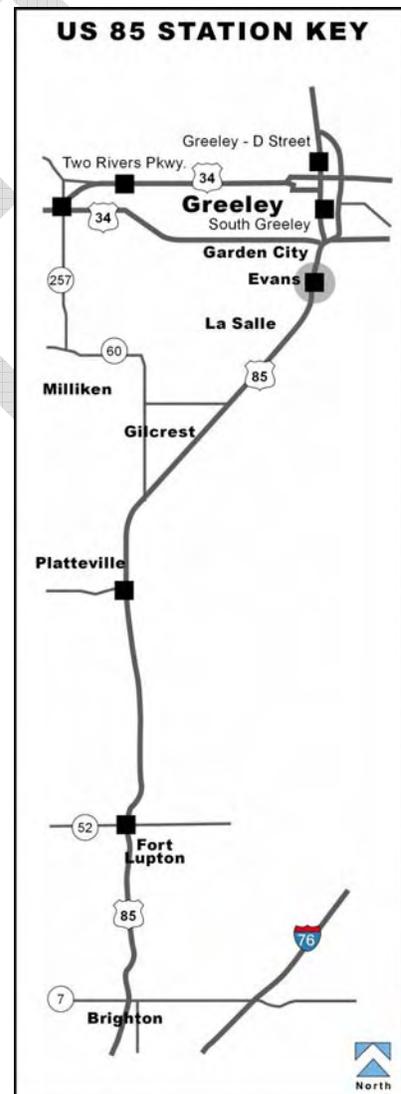


Figure 1. Vicinity Map

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signal serving the West Service Road intersection immediately west of US 85 and a third signal serving the State Street intersection immediately east of US 85. The intersection geometry on both the eastbound and westbound approaches consists of a left turn and a shared through/right turn lane. The southbound and northbound approaches consist of a left turn lane, two through lanes and a right turn lane. US 85 carries moderate southbound and northbound through traffic during both the AM and PM peak hours.

Figure 2 summarizes the peak hour traffic counts collected in August 2006 within the study area. Additionally, the Average Daily Traffic (ADT) data was obtained from the North I-25 Travel Demand Model – 2001 base year. As shown, the average daily traffic on US 85 north of the intersection is around 27,600 vehicles per day (vpd) and south of the intersection is around 26,900 vpd. The average daily traffic on 31st Street west of the intersection is around 3,000 vpd and east of the intersection is around 1,200 vpd. At the intersection, the westbound to northbound right-turning movement represents the highest turning volume (95 vehicles per hour) during the morning peak and the southbound to eastbound left-turning movement represents the highest turning volume (140 vehicles per hour) during the afternoon peak hour.

US 85/37th Street intersection

The US 85/37th Street intersection is signalized. The posted speed limit on 37th Street near the intersection is 35 mph and is 45 mph on US 85. 37th Street runs in the east-west direction while US 85 runs in the north-south direction. Traffic operations at this intersection are complicated by a second signal serving the West Service road intersection immediately west of US 85. The intersection geometry on the eastbound approach includes a left turn lane and a shared through/right turn lane. The westbound approach consists of a left turn lane, a through lane and a right turn lane. The southbound and northbound approaches consist of a left turn lane, two through lanes and a right turn lane. US 85 carries moderate southbound and northbound through traffic during both the AM and PM peak hours.

Average daily traffic on US 85 north of the intersection is around 26,900 vehicles per day (vpd) and south of the intersection is around 32,000 vpd. Average daily traffic on 37th Street west of the intersection is around 8,500 vpd and east of the intersection is around 13,300 vpd. At the intersection, eastbound to northbound left-turning movement represents the highest turning volume (100 vehicles per hour) during the morning peak and northbound to westbound left-turning movement represents the highest turning volume (200 vehicles per hour) during the afternoon peak hour.

US 85/42nd Street intersection

The US 85/42nd Street intersection is signalized. The posted speed limit on 42nd Street near the intersection is 35 mph and is 45 mph on US 85. 42nd Street runs in the east-west direction while US 85 runs in the north-south direction. Intersection geometry on the eastbound approach includes a shared left/through lane and a right turn lane. The westbound approach consists of a shared left/through lane and a right turn lane. The southbound and northbound approaches consist of a left turn lane, two through lanes and a right turn lane. US 85 carries moderate southbound and northbound through traffic during the AM and PM peak hours. At the intersection, eastbound to southbound right-turning movement represents highest turning volume (200-230 vehicles per hour) during both the morning and afternoon peak hours.

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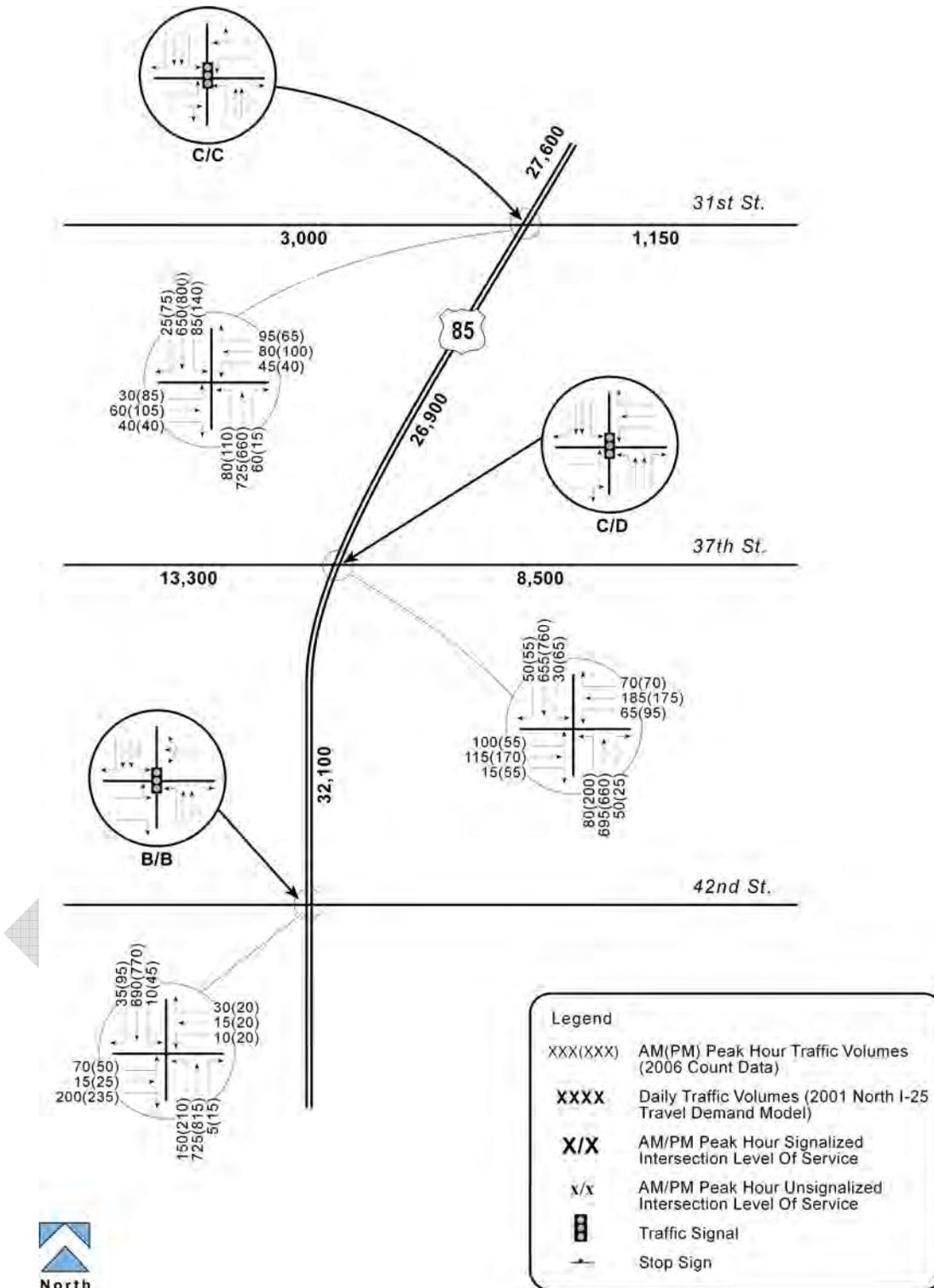


Figure 2. Existing Conditions

Traffic Operations Evaluation

Operational analyses of each key intersection were 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 intersections controlled by traffic signals and stop-signs.

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 (sec./veh.)	Average Delay at Stop-Controlled intersections (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

Peak hour traffic counts were conducted in August 2006 at the study area intersections. Other background parameters are documented in the *DEIS Traffic Evaluation – Methodology Summary*.

Figure 2 and Table 2 illustrate the existing peak hour levels of service at the signalized intersections within the study area. Currently, the 31st Street/US 85 intersection operates at Level of Service (LOS) C during both the AM and PM peak hour without any considerable queue back up or delay. The 37th Street/US 85 intersection operates at LOS C during the AM peak hour and LOS D during the PM peak hour. The 42nd Street/US 85 intersection operates at LOS B during both the AM and PM peak hours.

Table 2 Existing Intersection LOS and Delay

Intersection / Movement	Level of Service		Delay (seconds)	
	AM	PM	AM	PM
US 85 and 31st Street	C	C	26	28
US 85 and 37th Street	C	D	26	39
US 85 and 42nd Street	B	B	17	19

2030 Conditions

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

- 1) No Action Alternative
- 2) Package A: GPL + CR + CB 85

These packages are illustrated in Figures 3 and 4. Since there are no project elements in the Evans area in Package B, the No-Action results are representative of Package B conditions. In developing peak hour turning movements at the study area intersections, the North I-25 Travel Demand Model – 2001 base year, 2030 No Action, and 2030 Package A results were utilized to calculate the growth factors over a 29 year period. Since the actual traffic counts were conducted in year 2006, the growth factors were adjusted to reflect a 24 year growth rate. These growth factors 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 checked for balancing between intersections and reasonableness.

2030 No Action Traffic Volumes

The 2030 No Action daily and peak hour projections for the study area intersections are shown in Figure 5. As shown, the average daily volume projection on US 85 north of the 31st Street/US 85 intersection is around 46,100 vehicles per day (vpd) and south of the intersection is around 48,600 vpd. The average daily volume projection on 31st Street west of the intersection is around 6,300 vpd and east of the intersection is around 2,300 vpd. The average daily traffic projection on US 85 just north of the 37th Street and US 85 intersection is around 48,600 vehicles per day (vpd) and south of the intersection is around 55,900 vpd. The average daily projected traffic on 37th Street west of the intersection is around 18,500 vpd and east of the intersection is around 12,400 vpd.

During the AM and PM peak hours, both the northbound and southbound lanes on US 85 would carry heavy traffic volumes that are split equally in both directions.

2030 Package Traffic A Volumes

The same methodology used to develop the 2030 No Action volumes was applied to estimate 2030 background traffic volumes for the Package A alternative. The North I-25 Travel Demand Model does not include park-n-ride patrons in its traffic assignment procedure. Therefore, in addition to these background forecasts – which are shown in Figure 6 – peak hour site traffic associated with the development of the commuter bus station and park-n-ride lots was estimated and assigned to the local road network according to the methodology outlined in the *Park-and-Ride Trip Generation and Distribution Methodology* report. A summary of this methodology and its application for this park-and-ride is provided below.

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LEGEND

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

DRAFT



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 in US 85 General Purpose Lanes and Que Jumps
	Feeder Bus Service
	Interchange Upgrades
	Number of Lanes
	Commuter Bus Station / Stop
	Commuter Rail Station
	FasTracks Rail Line
	FasTracks 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

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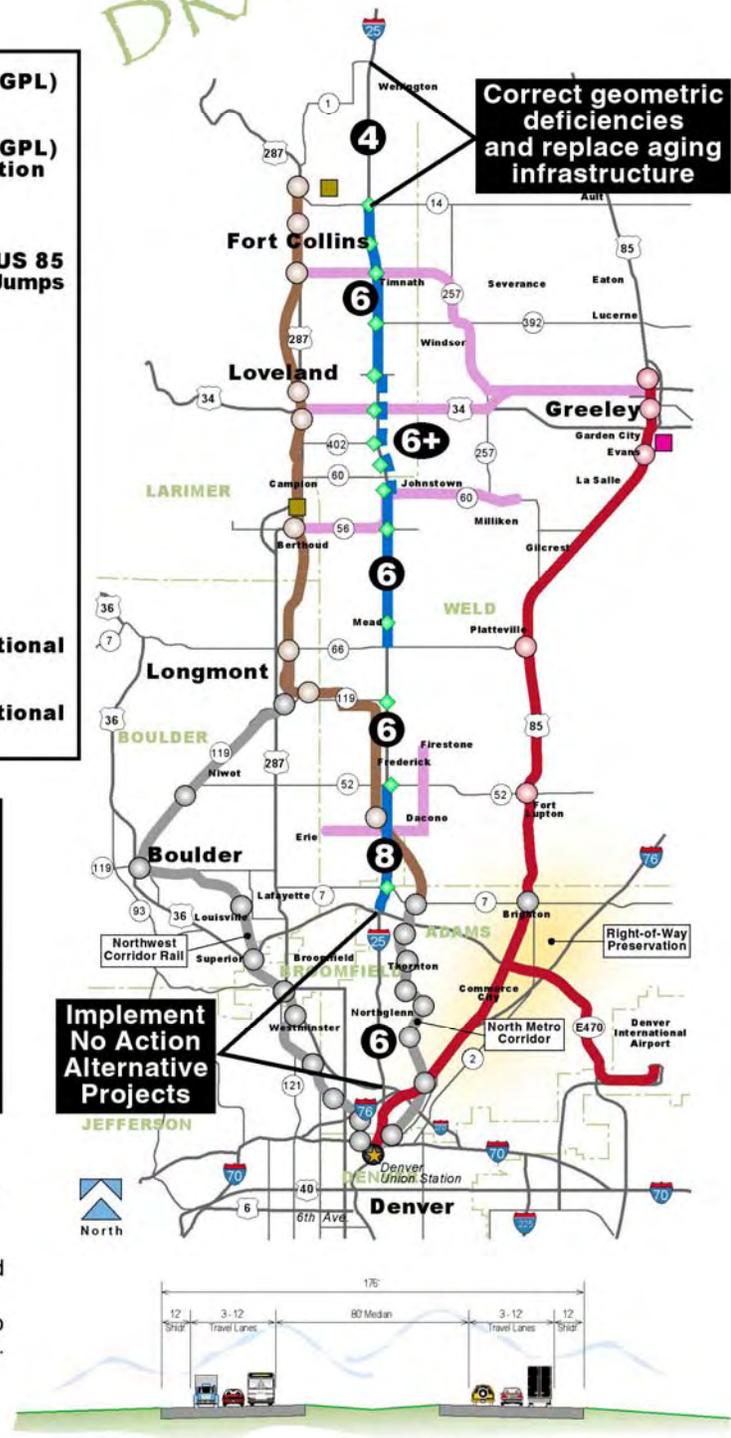


Figure 4. Package A Alternative

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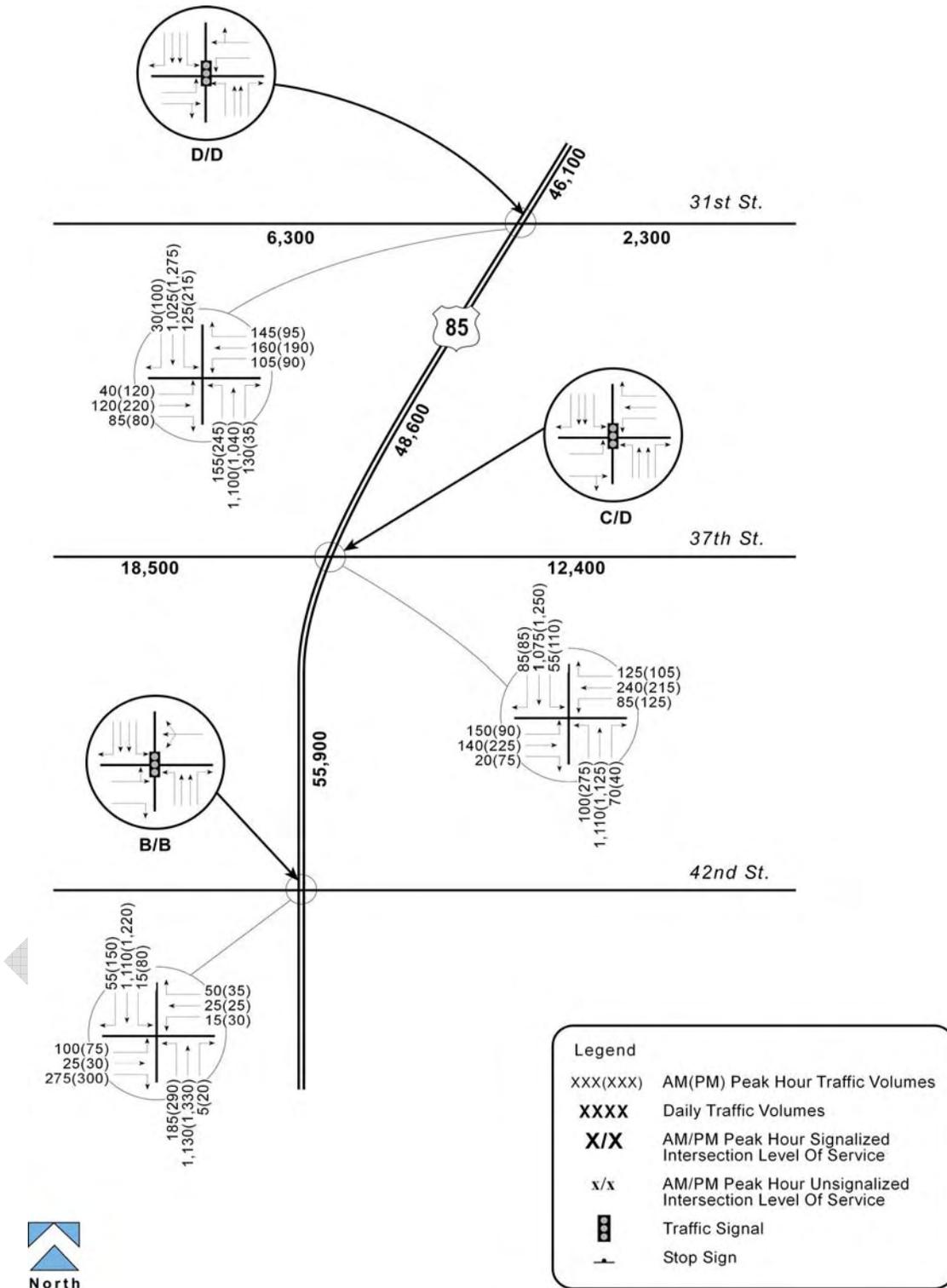


Figure 5. 2030 No Action Forecasts and Levels of Service

Park-and-Ride Trip Generation

The number of proposed spaces at the Evans park-and-ride lot was determined using the methodology outlined in the *North I-25 DEIS Parking Results* report (Carter & Burgess, November 2006). Using the results of this report, trip generation is estimated at each site, by applying the following factors.

- First, a conservative estimate of maximum utilized spaces is determined by multiplying the number of spaces provided by 90 percent (or 0.9). This is referred to as the *number of occupied spaces*.
- Then, the number of occupied spaces is multiplied by the factors shown in Table 4.

Table 4 – Peak Hour Trip Generation for North I-25 EIS Park-and Ride Lots

	Trip Rate	Entering	Exiting
AM Peak Hour			
Trips per occupied space	0.75	87%	13%
PM Peak Hour			
Trips per occupied space	0.50	20%	80%

The Evans commuter bus station would be constructed on the southeast corner of the US 85/42nd Street intersection and would have 72 parking spaces. The future peak hour traffic from the proposed station is shown in Table 5.

Table 5 Future Peak Hour Traffic from the Evans Park-and-Ride Lot

Location	Daily Trips	AM Peak			PM Peak		
		In	Out	Total	In	Out	Total
Evans PNR Lot	150	42	6	48	6	26	32

Trip Distribution

The trip distribution and assignment for the station was determined based on existing and future residential land use patterns in the vicinity of the site. It was assumed that the access to the station would be provided from 42nd Street. Another access from Denver Street is also being considered. The distribution and assignment of trips to and from the lot are shown in Figure 7. These trips are added to the background traffic projections to achieve total traffic estimates, which are displayed in Figure 8.

As shown in Figure 6, the average daily volume projection on US 85 north of the 31st Street/US 85 intersection is around 43,800 vehicles per day (vpd) and south of the intersection is around 45,700 vpd. The average daily volume projection on 31st Street west of the intersection is around 6,000 vpd and east of the intersection is around 2,300 vpd. The average daily traffic projection on US 85 north of the 37th Street/US 85 intersection is around 45,700 vehicles per day (vpd) and south of the intersection is around 51,900 vpd. The average daily projected traffic on 37th Street west of the intersection is around 17,900 vpd and east of the intersection is around 12,400 vpd. During the AM and PM peak hours, both the northbound and southbound

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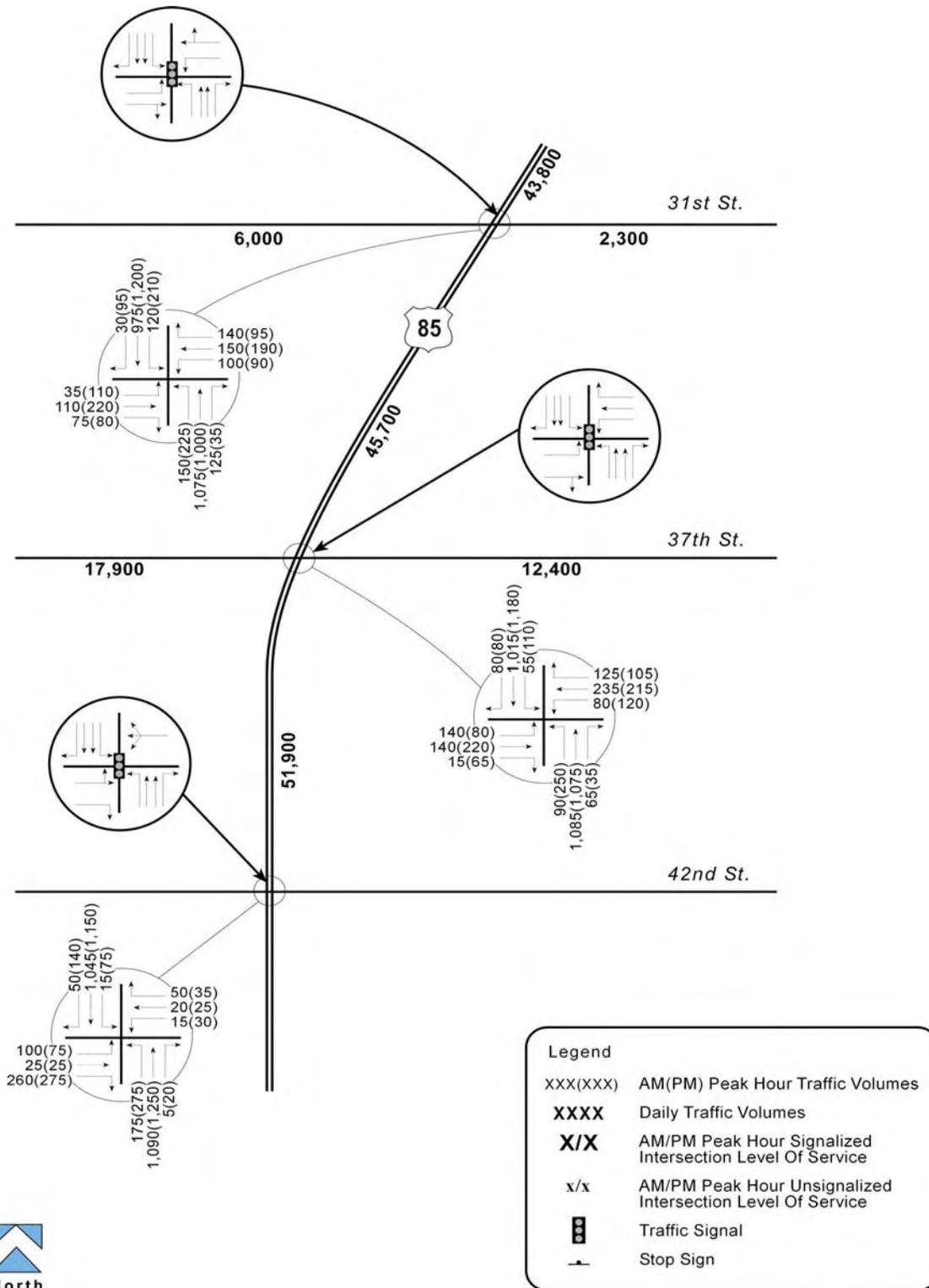


Figure 6. 2030 Package A Background Traffic Forecasts

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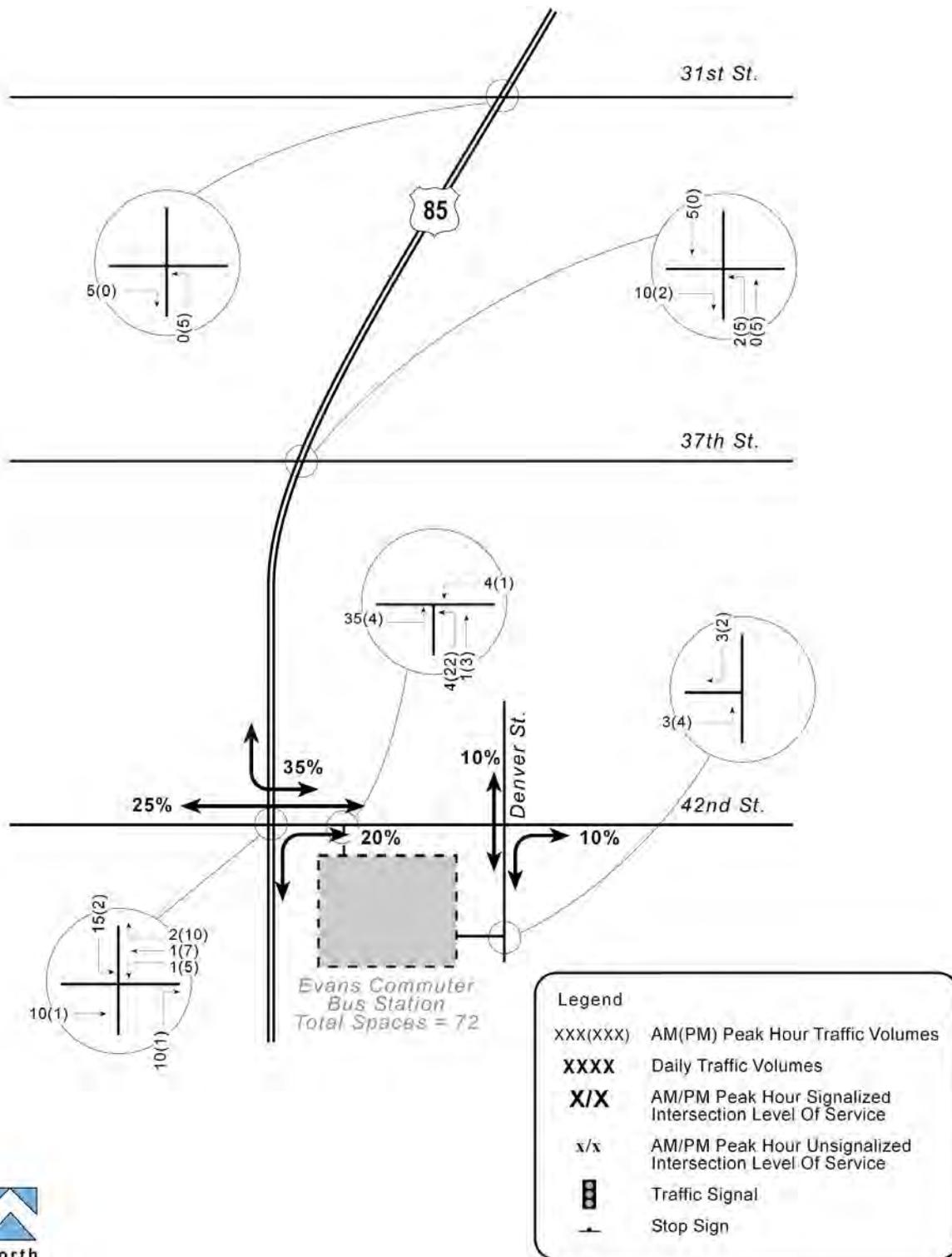


Figure 7. Park and Ride Lot Trip Distribution and Assignment

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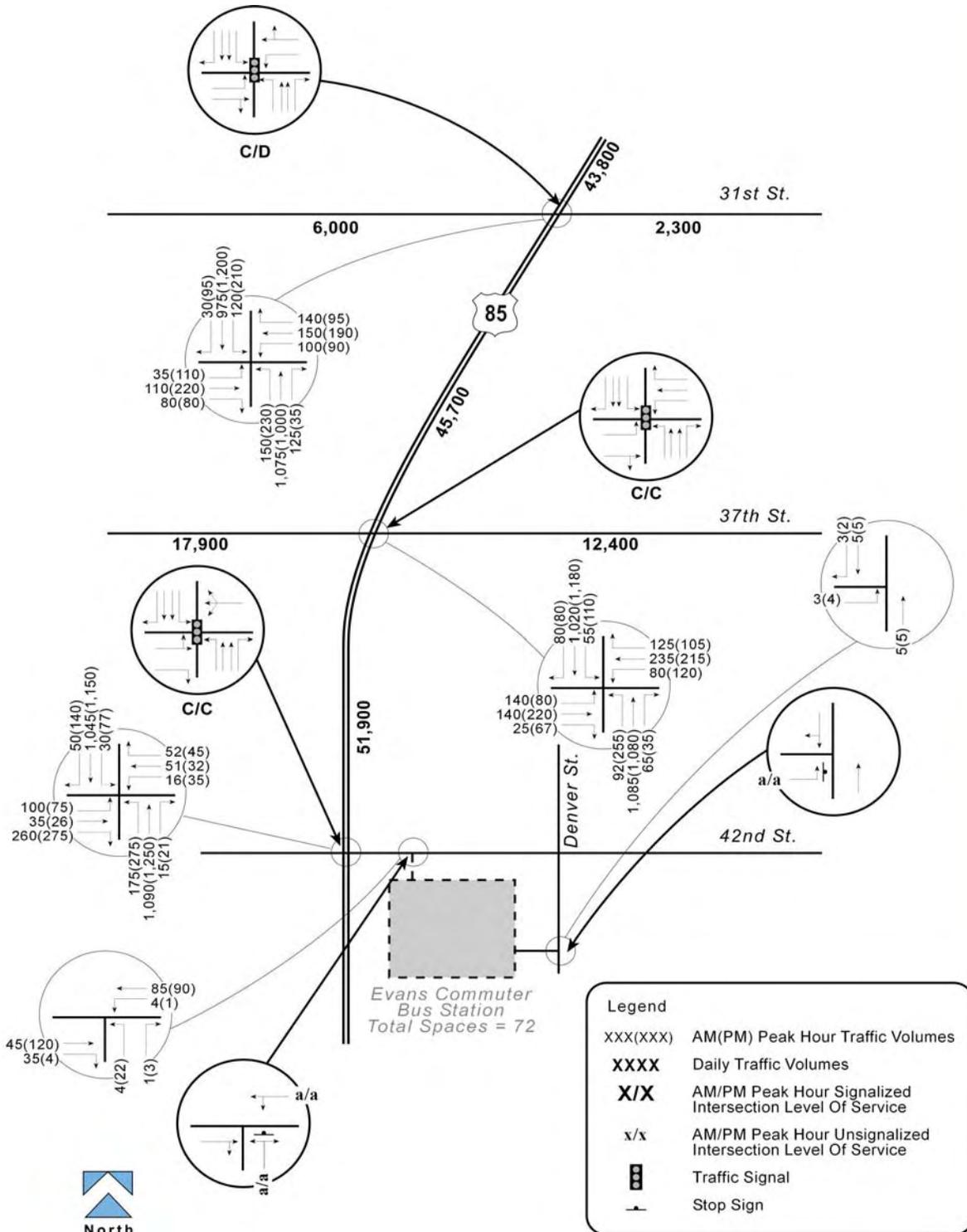


Figure 8. 2030 Package A Total Traffic Forecasts and Levels of Service

lanes on US 85 carry heavy traffic volumes that are split equally in both directions. In general, daily traffic is projected to be less along US 85 in the Package A alternative, as more regional traffic is attracted to the improved I-25 corridor.

2030 No Action Traffic Operations

Figure 5 and Table 3 show the projected levels of service at the study area intersections under the no action scenario. For the purpose of the No Action analysis it was assumed that the US 85 would remain as a four-lane roadway, since that geometry is more representative of true future no action conditions in the area. As Figure 5 indicates, the 31st Street/US 85 intersection would operate at Level of Service (LOS) D during both the AM and PM peak hour. However, it should be note that during both the AM and PM peak hour the westbound approach would operate at LOS E, resulting in considerable queues and delays. The 37th Street/US 85 intersection would operate at LOS C during the AM peak hour and LOS D during the PM peak hour. The 42nd Street/US 85 intersection would operate at LOS C during both the AM and PM peak hours.

Table 3 2030 No Action Intersection LOS and Delay

Intersection / Movement	Level of Service		Delay (seconds)	
	AM	PM	AM	PM
US 85/31st Street	D	D	37	55
US 85/37th Street	C	D	27	45
US 85/42nd Street	B	B	20	21

Commuter Bus Station Evaluation

2030 Package A Traffic Operations

As Figure 8 and Table 6 indicate, the 31st Street/US 85 intersection would operate at Level of Service (LOS) C during the AM peak hour and LOS D during the PM peak hour. It should be noted, however, that during the PM peak hour the westbound approach would operate at LOS E resulting in considerable queues and delays. The 37th Street/US 85 intersection would operate at LOS C during both the AM and PM peak hours. The 42nd Street and US 85 intersection would operate at LOS C during both the AM and PM peak hours.

Access to the commuter bus station will be provided at 42nd Street. As shown on Figure 8, this access would be a single lane with stop-control on the station approach, and would operate at acceptable levels of service without any need for laneage improvements to 42nd Street. Another access at the end of Denver Street south of 42nd Street is also being planned. The existing condition at this location is a dead-end, so no future traffic impacts are anticipated. As shown on Figure 8, this access would be a single lane with stop-control on the station approach, and would operate at acceptable levels of service without any need for laneage improvements to 42nd Street.

Table 6 2030 Package A Intersection LOS and Delay

Intersection / Movement	Level of Service		Delay (seconds)	
	AM	PM	AM	PM
US 85/31st Street	C	D	35	50
US 85/37th Street	C	C	26	32
US 85/42nd Street	C	C	21	21

Proposed Mitigation

The Package A alternative includes six general purpose lanes on I-25 and commuter rail in addition to the proposed commuter bus routes. This would result in more trip attractions towards I-25 lowering the average daily traffic and peak hour traffic volumes on US 85. However, the results of the traffic analysis indicate that some improvements will be needed to address the westbound approach of the US 85 and 31st Street intersection regardless of the Package A consideration. The proposed mitigation is discussed below.

US 85/31st Street Intersection

Under the No-Action alternative, this intersection is forecast to drop from LOS C to LOS D in year 2030. The westbound approach from 31st Street would operate at LOS E during both the AM and PM peak hours. The following intersection improvements are proposed.

- Exclusive westbound right-turn lane on 31st Street instead of shared right-turn lane.

This would result in LOS D for the westbound approach. Because this improvement addresses an existing deficiency, it should be considered regardless of the proposed North I-25 EIS preferred alternative.

In addition to the above improvement, the following improvements in the vicinity of the proposed Evans commuter bus station were identified in CDOT's *US 85 Access Control Plan*, December 1999:

US 85/39th Street intersection

This four-legged intersection is currently unsignalized. The west side approach from the West Service Road would be closed entirely.

US 85/37th Street intersection

Traffic operations at this location are complicated by a second signal serving the West Service Road intersection immediately west of US 85. In order to simplify operations, the West Service Road intersection would be closed and traffic would be directed to St. Vrain Street. In addition to improving St. Vrain Street north of 37th Street, 36th Street will also be improved and paved.

US 85/31st Street intersection

Similar to 37th Street, there is a second signal serving the West Service Road intersection immediately west of US 85 and a third signal serving State Street intersection immediately east of US 85. In order to simplify operations, both the West Service Road intersection and State Street intersection would be closed and new frontage road connections would be built both north and south of 31st Street.

Alternatives Evaluation Comparison

Traffic Operational Analysis

Table 7 compares the levels of service and delay at the study area intersections for the two packages. As the table indicates, the area in the vicinity of the Evans Commuter Bus Station would operate at acceptable levels of service.

Table 7. Intersection Level of Service and Delay for No action and Package A

Intersection	No Action		Package A	
	AM Peak	PM Peak	AM Peak	PM Peak
US 85/31st Street	LOS D (37 sec.)	LOS D (55 sec.)	LOS C (35 sec.)	LOS D (50 sec.)
US 85/37th Street	LOS C (26 sec.)	LOS D (45 sec.)	LOS C (26 sec.)	LOS C (32 sec.)
US 85/42nd Street	LOS B (20 sec.)	LOS B (21 sec.)	LOS C (21 sec.)	LOS C (21 sec.)
Station Access/42nd Street (unsignalized)				
Northbound Approach	N/A	N/A	LOS A (9 sec.)	LOS A (10 sec.)
Station Access/Denver St. (unsignalized)				
Eastbound Approach	N/A	N/A	LOS A (9 sec.)	LOS A (9 sec.)

LOS X – Level of service
##.# - Average delay in seconds per vehicle