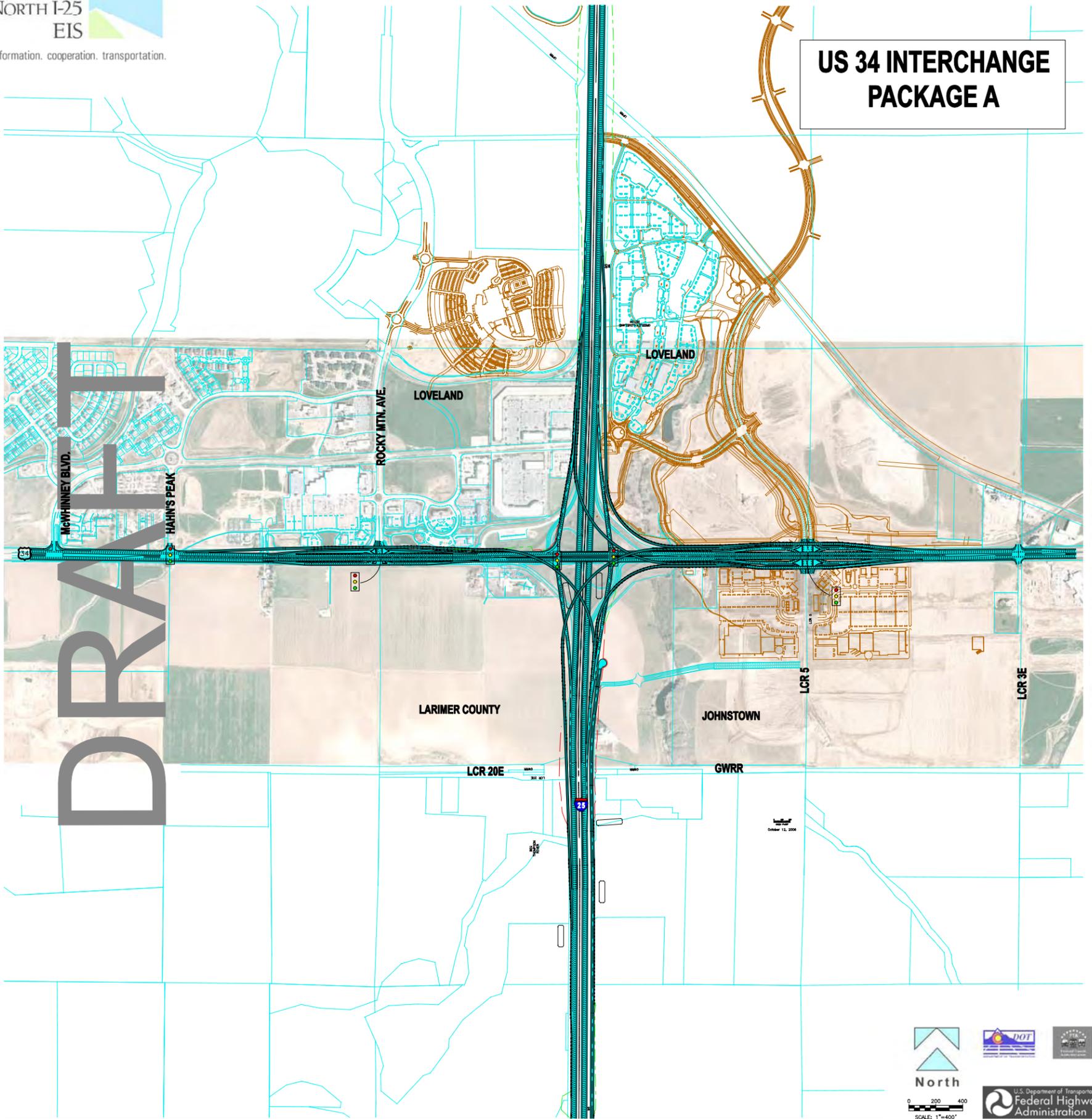




**US 34 INTERCHANGE  
PACKAGE A**



**DRAFT**

North

0 200 400

SCALE: 1"=400'

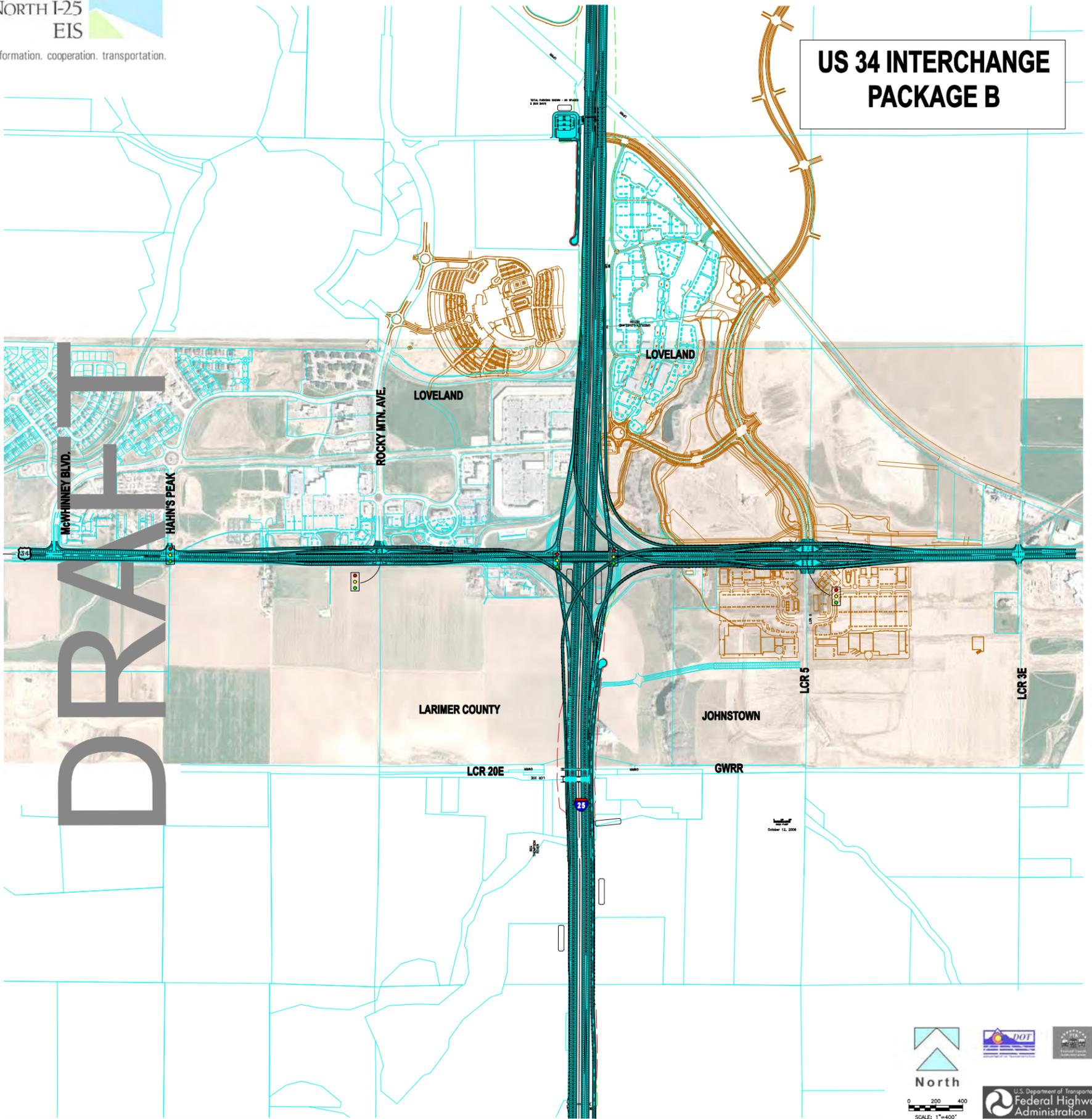
October 1, 2007

U.S. Department of Transportation  
Federal Highway  
Administration

US 34 INTERCHANGE



**US 34 INTERCHANGE  
PACKAGE B**



North

0 200 400  
SCALE: 1"=400'

October 1, 2007



U.S. Department of Transportation  
Federal Highway  
Administration

US 34 INTERCHANGE

# US 34 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. It should be noted existing conditions refers to conditions in 2004 when traffic data was collected at the US 34 interchange. Since the collection of traffic data, Centerra Lifestyle Center opened in the northeast quadrant, the east frontage road intersection was closed and a new intersection (LCR 5) was opened ½ mile from I-25. These changes will not be evaluated in the existing conditions analysis but will be evaluated in the No Action scenario.

## Existing Conditions

The interchange of US 34 with I-25 (milepost 257) connects I-25 to Loveland to the west and to Greeley to the east. It was built in 1962 as a full cloverleaf interchange with loop ramps and straight ramps in all four quadrants. The US 34 bridges over I-25 consist of two-through lanes in each direction and acceleration/deceleration lanes between on and off loop ramps. The interchange ramps are all single lane.

The interchange area includes the following roadways:

**US 34.** US 34 is a major east-west roadway in the north front range area. To the west it connects Loveland to I-25 but also is a route to Rocky Mountain National Park. To the east it connects the City of Greeley to I-25 and continues further east traveling through Kersey and connecting to I-76. US 34 is at least four-lanes from Loveland to the Town of Kersey with a speed limit ranging from 45 to 65 mph. The US 34 corridor is a developing corridor especially around the I-25 interchange. The City of Loveland has jurisdiction in all interchange quadrants except for the southeast quadrant which is under the authority of the Town of Johnstown. Land just east of the interchange is developing rapidly with the recent opening of the Centerra Lifestyle Center and the opening of the 2534 development in 2007. Both of these developments consist of hundreds of thousands of square feet of commercial uses generating significant levels of traffic at the interchange.



Figure 1. Vicinity Map

# US 34 at I-25 DEIS Interchange Evaluation

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**East Frontage Road.** The east side frontage road intersects US 34 approximately 200 feet east of the northbound to eastbound off-ramp and the westbound to northbound on-ramp. The frontage road serves very little development and therefore traffic volumes are very low compared to US 34 volumes. The frontage road intersection with US 34 will be closed when land develops in the northeast and southeast quadrants of the interchange. (Note: In 2004 this intersection existed but recent development has eliminated the east frontage road intersection with US 34). The speed limit on the frontage road in the vicinity of the interchange is 30 mph.

**West Frontage Road.** The west side frontage road intersects US 34 approximately 500 feet west of the southbound to westbound off-ramp and continues a few hundred feet north to serve a carpool lot. A south leg does not exist but the north leg aligns with a driveway access that serves the existing gas station and hotel on the south side of US 34. The frontage road intersection has stop-sign control.

**Rocky Mountain Avenue.** This roadway intersects US 34 about ½ mile west of I-25 and serves as the major access point for development in the northwest quadrant of the interchange. The intersection with US 34 has signal control and the roadway only continues to the north.

Figure 2 shows the existing counts collected in August 2004 at the US 34 interchange. The counts show that traffic at this intersection is about the same on either side of the interchange, with about 38,000 vehicles per day (vpd) west of the interchange and 39,000 vpd east of the interchange. Daily ramp volumes are also generally similar in magnitude, ranging from 5,800 vpd to 6,900 vpd.

## Traffic Operations Evaluation

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 vehicle at controlled intersections (i.e. traffic signal, stop-sign) and on the density in passenger cars per mile per lane in weaving sections.

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. Along US 34 levels of service were calculated for the sections between interchange ramps. The following table shows how average stopped delay at controlled intersections and density in weaving sections equates to levels of service.

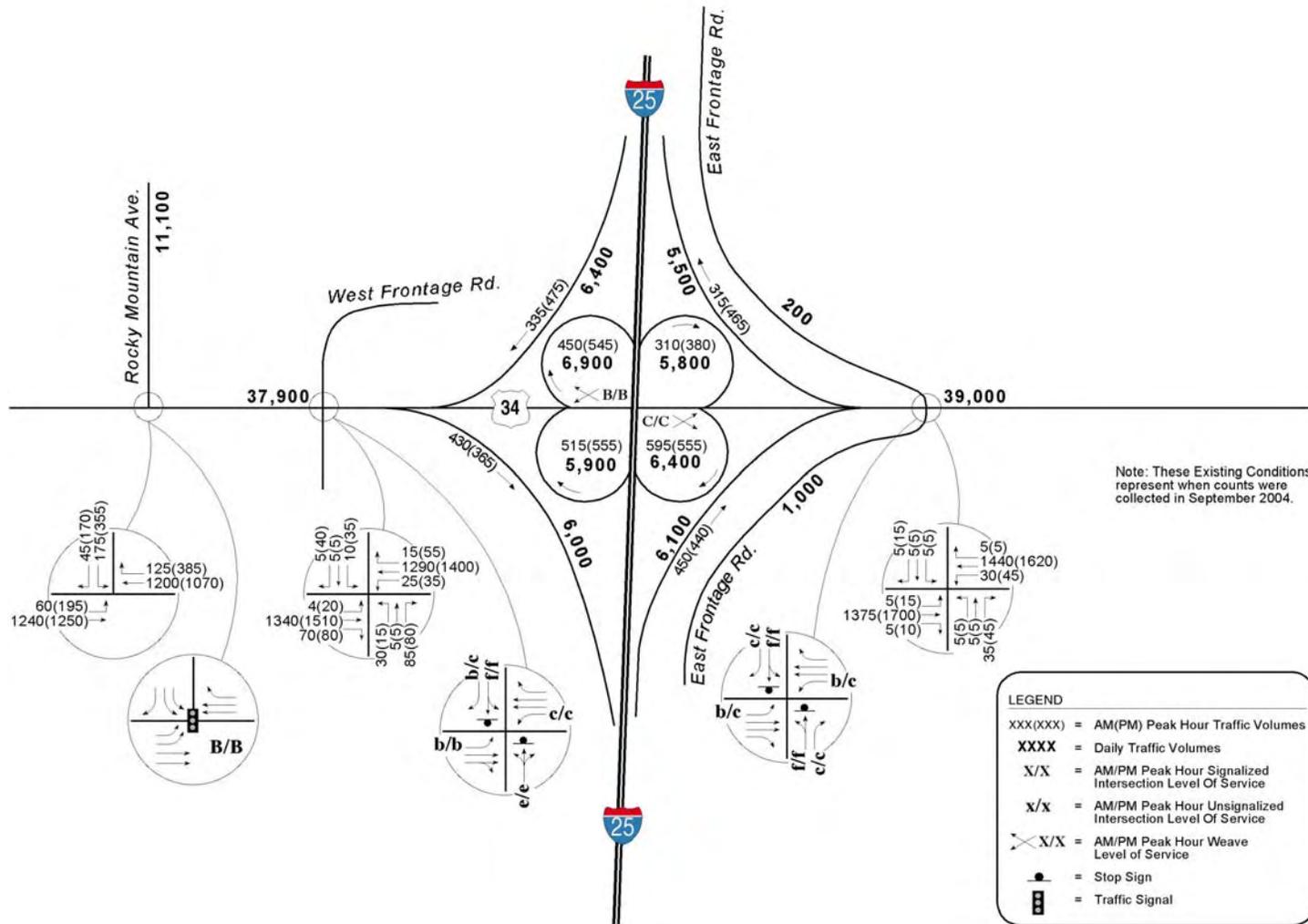


Figure 2. Existing Conditions

# US 34 at I-25 DEIS Interchange Evaluation

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

Level of Service	Average Delay at Signalized Intersections (sec./veh.)	Average Delay at Stop-Controlled intersections (sec./veh.)	Density in Weaving Sections (cars per hour per lane)
A	0 to <=10	0 to <=10	0 to <=12
B	> 10 to <= 20	> 10 to <= 15	> 12 to <= 24
C	> 20 to <= 35	> 15 to <= 25	> 24 to <= 32
D	> 35 to <= 55	> 25 to <= 35	> 32 to <= 36
E	> 55 to <= 80	> 35 to <= 50	> 36 to <= 40
F	> 80	> 50	> 40

Figure 2 illustrates existing peak period levels of service at adjacent intersections and for weaving sections of US 34. At the frontage road intersections, left-turn movements from the frontage road operate at LOS F while other movements operate at LOS D or better during the AM and PM peak periods. In addition, the weaving areas between the ramps show good levels service operating LOS C or better during the peak periods. The signalized intersection at Rocky Mountain Avenue also experiences good levels of service with LOS B during each peak period.

The current cloverleaf configuration uses low speed loop ramps to serve three of the eight movements at the interchange. In general, loop ramps have design capacities of 800 to 1,200 vehicles per hour, with the higher capacity being only applicable where there are no trucks and where the design speed for the ramp is 30 mph or higher. In the case of the US 34 loop ramps, truck percentages range from three to five percent and the ramps likely have a design speed of 25 mph at best. This suggests that the US 34 loop ramps cannot achieve the upper end of typical loop capacities. With that said, existing loop volumes shown on Figure 2 are generally much less than the low end capacity for loops.

## 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 provide reasonable forecasts for individuals turning movements, and to balance volumes along the arterial.

**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**

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

**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.



Figure 4. Package A

**LEGEND**

	<b>1 Buffer-Separated Tolloed Express Lane (TEL) in Each Direction</b>
	<b>2 Barrier-Separated Tolloed Express Lanes (TEL) in Each Direction</b>
	<b>Bus Rapid Transit (BRT) Route (Uses TELs on I-25)</b>
	<b>Feeder Bus Service</b>
	<b>Interchange Upgrades</b>
	<b>Number of Lanes: General Purpose/Tolloed Express Lanes</b>
	<b>Bus Rapid Transit Station</b>
	<b>FasTracks Rail Line</b>
	<b>FasTracks / RTD Transit Station</b>
	<b>Potential Commuter Bus Operational &amp; Maintenance Facility</b>

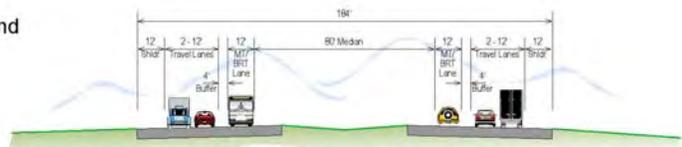
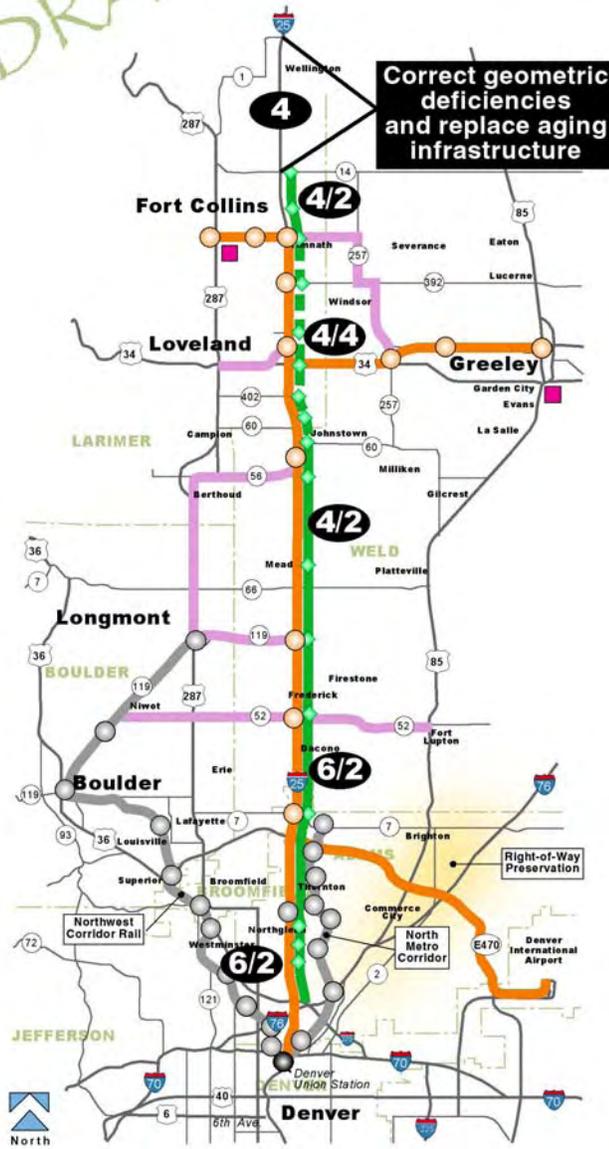
**Congestion Management Measures include:**

- 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.

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NOT TO SCALE

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

Figure 5. Package B

## **2030 No Action Traffic Volumes**

Figure 6 depicts 2030 daily and peak hour No Action projections for the US 34 interchange and for adjacent roadways. As shown, daily volume projections on US 34 range from 67,800 to 84,600 vehicles per day, while ramp volumes range from 7,400 to 19,100 vehicles per day. No Action traffic volume patterns changed slightly from existing patterns; whereas in existing conditions, volumes were generally equal east and west of the interchange on US 34 and ramp volumes were generally equal between the north and south directions, under No Action conditions traffic volumes along US 34 are higher to the east and ramp volumes are higher to and from the south.

## **2030 Package A Traffic Volumes**

Figure 7 depicts 2030 daily and peak hour Package A projections for the US 34 interchange and adjacent roadways. The volumes in the figure are generally similar to those for the No Action Alternative, differing slightly due to the change in capacity on I-25. Daily volume projections on US 34 range from 69,400 vpd west of the interchange to 96,500 vpd east of the interchange, while ramp volumes range from 17,800 to 28,500 vehicles per day. As with No Action traffic projections, volumes are higher to the east and the south of the interchange.

## **2030 Package B Traffic Volumes**

Figure 8 depicts 2030 daily and peak hour Package B projections for the US 34 interchange and adjacent roadways. The volumes in the figure are generally similar to those for the No Action Alternative and Package A, differing slightly due to the change in capacity on I-25. Daily volume projections on US 34 range from 62,300 vpd west of the interchange to 97,100 vpd east of the interchange, while ramp volumes range from 17,800 to 30,000 vehicles per day. In Package B, US 34 volumes are higher than No Action and Package A to the east but lower than No Action and Package A to the west. Off-ramp volumes are lower or nearly the same as Package A, but on-ramp volumes are slightly higher.

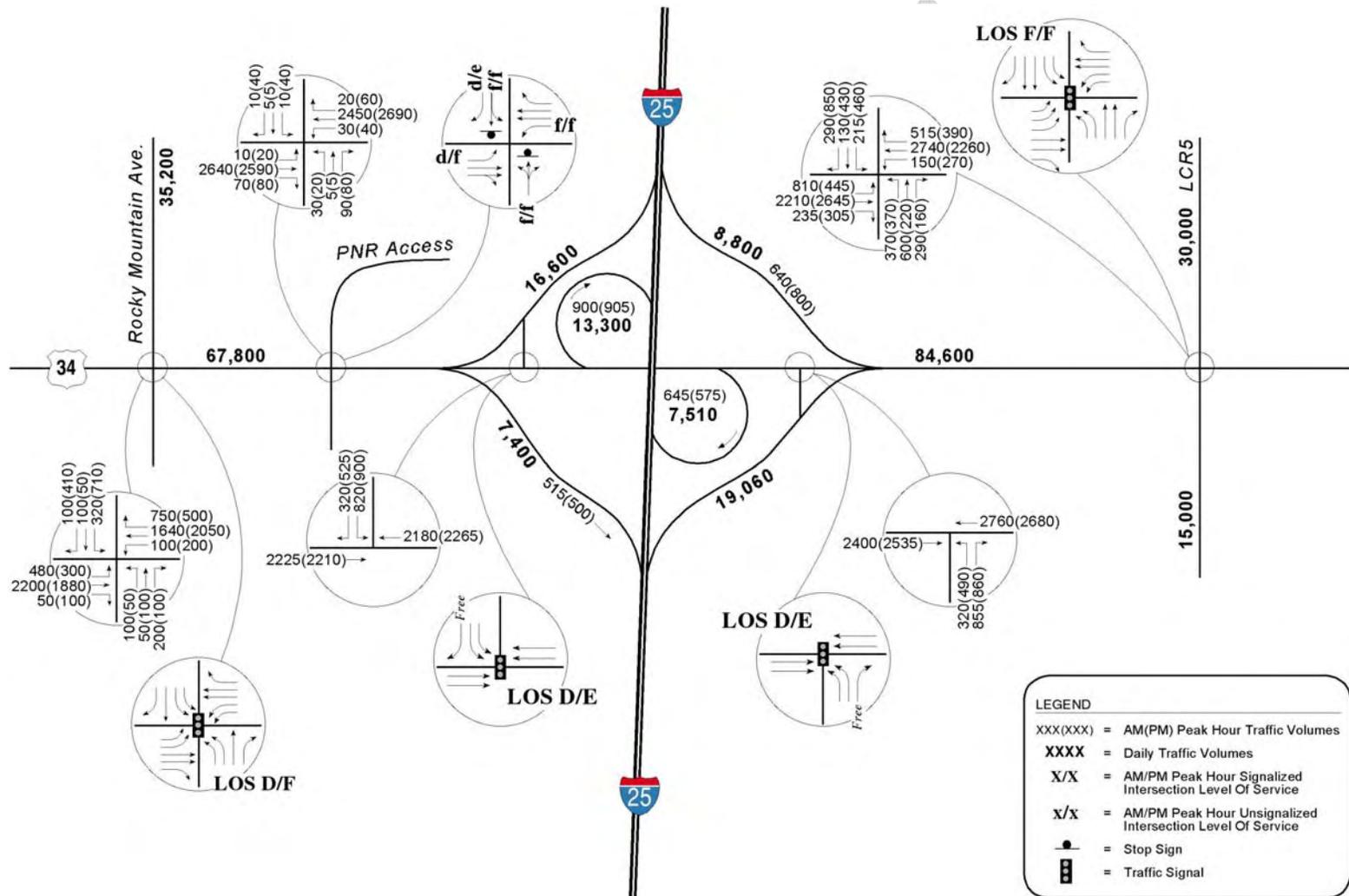
## **2030 No Action Traffic Operations**

### **Interchange Configuration**

The US 34 interchange is currently in the 1601 process for safety improvements. These improvements will likely include eliminating the loop ramps in the northeast and southwest quadrants, which results in an interchange configuration known as a partial cloverleaf (see Figure 6). These changes will require traffic signals at the new ramp terminals on US 34. Since, the interchange is in the 1601 process the partial cloverleaf configuration will represent the No Action condition and will serve as the basis for the No Action operational analysis.

# US 34 at I-25 DEIS Interchange Evaluation

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**Figure 6. No Action Forecasts and Level of Service**

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## **Interchange Operations**

Figure 6 illustrates No Action peak period levels of service at the ramp terminals and adjacent intersections on US 34. The level of service analysis shows the LCR 5 and the Rocky Mountain Avenue intersections operating at LOS F during at least one peak hour, and both ramp new terminal intersections operating at LOS E in the PM peak hour.

As previously discussed, loop ramps have design capacities of 800 to 1,200 vehicles per hour, depending on the presence of trucks and on the design speed of the loop ramps. No Action volume projections for the westbound to southbound ramp exceed 900 vehicles per hour, which given trucks and the low design speed these volumes, likely exceeds the ramp capacity.

Table 2 provides additional information for key movements at each intersection and provides further insight into existing operations at the interchange. Key movements are those that could have an impact on adjacent intersections or an impact to I-25. For example, east-west movements along US 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 Rocky Mountain and LCR 5 intersections have not been included in the table because they would not impede traffic flow on US 34.

As shown in the table, at the Rocky Mountain and LCR 5 intersections, LOS F conditions are projected for US 34 through movements and left-turn movements. At the ramp terminals the left-turn movement from the ramp operates at LOS F in at least one peak hour. In some cases these LOS F conditions translate into significant queue lengths. For example, the eastbound queues at the LCR 5 intersection were estimated at nearly a half mile in the morning while the southbound left-turn queues at the southbound ramp terminal approach 2,000 feet in both the morning and afternoon, which would extend back onto the interstate.

# US 34 at I-25 DEIS Interchange Evaluation

**Table 2. 2030 No Action Level of Service and Queue Lengths for Key Movements**

Intersection / Movement	Level of Service		Estimated 95 <sup>th</sup> Percentile Queue <sup>1</sup>		Intersection Spacing and Storage Length Provisions
	AM	PM	AM	PM	
<b>Rocky Mountain Avenue</b>					
WB Left	E	E	130'	290'	Storage Provided – 600'
WB Thru	C	F	230'	430'	Distance to SB Ramp Terminal – 2,100'
WB Right	B	C	170'	70'	Storage Provided – 1,000'
<b>Southbound Ramp Terminal</b>					
EB Thru	E	E	380'	400'	Distance to NB Ramp Terminal – 850'
WB Thru	D	E	270'	260'	Distance to the Rocky Mountain – 2,100'
SB Left	E	D	1500'	1660'	Storage Provided - 700'
SB Right	Free	Free	NA	NA	NA
<b>Northbound Ramp Terminal</b>					
EB Thru	B	D	280'	>850'	Distance to SB Ramp Terminal – 850'
WB Thru	E	F	310'	150'	Distance to the LCR 5 – 2,100'
NB Left	D	D	560'	850'	Storage Provided - 700'
NB Right	Free	Free	NA	NA	NA
<b>LCR 5</b>					
EB Left	F	F	2,350'	1,260'	Storage Provided – 3,000'
EB Thru	E	F	1,050'	1,760'	Distance to NB Ramp Terminal – 2,100'
EB Right	C	B	510'	910'	Storage Provided – 360'

<sup>1</sup> The queue lengths given in this table primarily come from SimTraffic with some engineering judgment.

## 2030 Package A Traffic Operations

### Interchange Configuration

The proposed configuration for the US 34 interchange is shown schematically in Figures 7 and 8. The interchange configuration is unique in the corridor because two interchange types are used at US 34 and single point urban interchanges (SPUI) are provided at the cross streets east and west of I-25.

The proposed US 34/I-25 interchange consists of a diamond interchange with signalized ramp terminals at US 34 and a partial directional interchange with high speed direct connect ramps connecting most turn movements between I-25 and US 34. Direct connect ramps are not provided from eastbound US 34 to I-25 in order to avoid an historic property in the southwest quadrant of the interchange. The dual interchange design was developed to address both local communities concerns about maintaining local access between I-25 and the Rocky Mountain Avenue and LCR 5 roadways and the desire to provide direct system-to-system connections between I-25 and US 34. Local access is maintained through the diamond interchange, where drivers from I-25 can access Rocky Mountain Avenue or LCR 5 without any out-of-direction travel. The direct connect system of ramps allows most I-25 drivers with origins or destinations west of Rocky Mountain Avenue and east of LCR 5 to bypass the I-25 ramp intersections with US 34.

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Another aspect of this interchange configuration is that both the Rocky Mountain Avenue and LCR 5 intersections with US 34 can still operate as full movement intersections. As shown in the No Action analysis, these intersections operate at LOS F as signalized intersections. To address this, both intersections are proposed as SPUI interchanges which provide full access to Rocky Mountain Avenue and LCR 5 while reducing right-of-way and development impacts along US 34.

## **Interchange Operations**

Figure 7 illustrates Package A peak period levels of service at the ramp terminals and at the adjacent SPUI intersections on US 34. As shown, the ramp terminals and the SPUI intersections at Rocky Mountain Boulevard and LCR 5 are anticipated to operate at LOS D or better with Package A forecasts.

In addition to the intersection level of service additional information, level of service and queuing for key movements can provide further insight into operations at each intersection. Table 3 gives level of service, queue lengths, intersection spacing and designed storage lengths for key movements at both the ramp terminals and the SPUI interchanges.

As shown in the table, anticipated levels of service at this interchange range from LOS A for right turn movements to LOS E or F for some left-turn movements at the ramp terminals. The movement anticipated to experience LOS F conditions was the eastbound left-turn movement at the northbound ramp terminal. In general, most movements show LOS C conditions or better during the peak hours.

Table 3 also compares SimTraffic estimates of the 95<sup>th</sup> percentile queue length for each movement to the storage distance provided in the design. The queuing analysis shows that in all cases the estimated 95<sup>th</sup> percentile queue for through movements would not extend past the adjacent intersection, and that left-turn queues can be accommodated within available left-turn storage. For the northbound and southbound ramp terminals, left and right-turn queues can be accommodated on the ramps will not extend into the I-25 main lanes. The SPUI off-ramps left-turn queues will not extend into the US 34 through lanes, as well.

# US 34 at I-25 DEIS Interchange Evaluation

**Table 3. 2030 Package A Level of Service and Queue Lengths for Key Movements**

Intersection / Movement	Level of Service		Estimated 95 <sup>th</sup> Percentile Queue <sup>2</sup>		Distance Between Intersections and Storage Length Provisions
	AM	PM	AM	PM	
<b>Southbound Ramp Terminal</b>					
<b>EB Thru</b>	B	B	820'	1060'	Distance to SPUI on Ramp – 1,500'
<b>EB Right</b>	A	B	570'	940'	Distance to SPUI on Ramp – 1,500'
<b>WB Left</b>	E	D	110'	250'	Storage Provided in Design – 1,700'
<b>WB Thru</b>	A	A	120'	330'	Distance to Adjacent Intersection – 560'
<b>SB Left</b>	E	E	320'	660'	Storage Provided in Design – 2,000'
<b>SB Right</b>	Free	Free	NA	NA	Storage Provided in Design – 1,000'
<b>Northbound Ramp Terminal</b>					
<b>EB Left</b>	E	F	1090'	1040'	Storage Provided in Design – 1,700'
<b>EB Thru</b>	A	A	510'	540'	Distance to Adjacent Intersection – 560'
<b>WB Thru</b>	E	D	1200'	1270'	Distance to SPUI on Ramp – 1,500'
<b>WB Right</b>	A	B	1400'	1270'	Distance to SPUI on Ramp – 1,500'
<b>NB Left</b>	E	E	120'	310'	Storage Provided in Design – 2,200'
<b>NB Right</b>	Free	Free	NA	NA	Storage Provided in Design – 500'
<b>Rocky Mountain SPUI<sup>1</sup></b>					
<b>EB Left</b>	C	C	350'	220'	Storage Provided in Design – 600'
<b>WB Left</b>	C	C	120'	200'	Storage Provided in Design – 600'
<b>LCR 5 SPUI<sup>1</sup></b>					
<b>EB Left</b>	C	B	410'	230'	Storage Provided in Design – 700'
<b>WB Left</b>	B	B	110'	140'	Storage Provided in Design – 500'
<sup>1</sup> Left-turn movements from the SPUI ramps were the only movements considered key movements due to the potential of queues extending into the US 34 through lanes. <sup>2</sup> 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 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.					

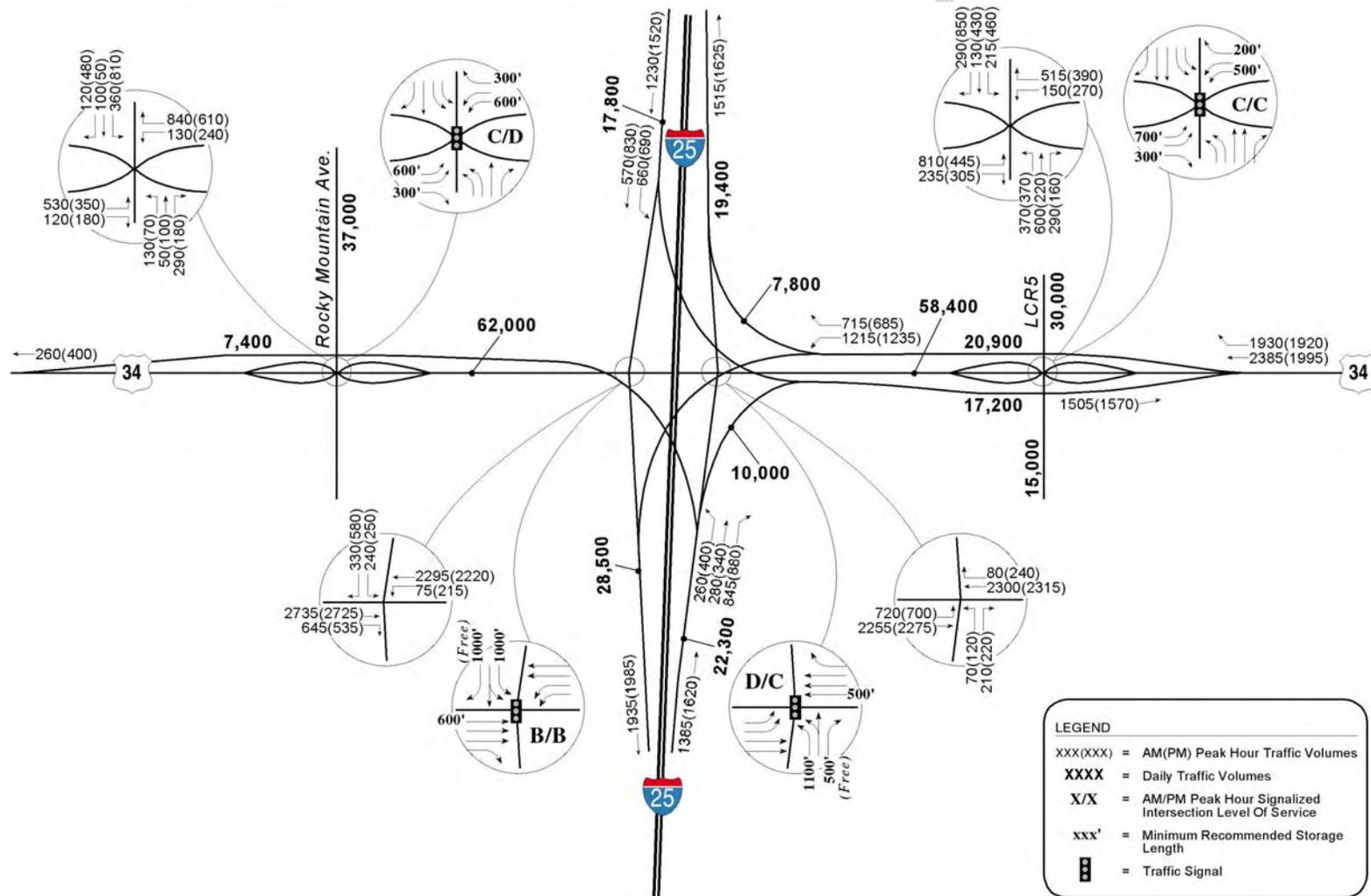


Figure 7. Package A Traffic Forecasts and Levels of Service

# US 34 at I-25 DEIS Interchange Evaluation

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## ***2030 Package B Traffic Operations***

### ***Interchange Configuration***

The proposed interchange configuration for US 34 in Package B is the same as in Package A (Figure 8).

### ***Interchange Operations***

Figure 8 illustrates Package B peak period levels of service at the ramp terminals and at adjacent the SPUI interchanges on US 34. As shown, the ramp terminals and the SPUI Interchanges at Rocky Mountain Boulevard and LCR 5 are anticipated to operate at LOS D or better with Package B forecasts.

In addition to the intersection level of service additional information, level of service and queuing for key movements can provide further insight into operations at ramp terminals and at the SPUI interchanges. Table 4 gives level of service, queue lengths, intersection spacing and designed storage lengths for key movements at both the ramp terminals and the SPUI interchanges.

As shown in the table, anticipated levels of service at this interchange range from LOS A for right turn movements to LOS E for must left-turn movements at the ramp terminals. The eastbound left-turn movement at the northbound ramp terminal is the only critical movement to operate at a LOS F. The westbound through movement is the only movement in both peak hours that experiences LOS E of F conditions.

Table 4 also compares SimTraffic estimates of the 95<sup>th</sup> percentile queue length for each movement to the storage distance provided in the design. The queuing analysis shows that in all cases the estimated 95<sup>th</sup> percentile queue for through movements would not extend past the adjacent intersection, and that left-turn queues can be accommodated within available left-turn storage. For the northbound and southbound ramp terminals, left and right-turn queues can be accommodated on the ramps will not extend into the I-25 main lanes. The SPUI off-ramps left-turn queues will not extend into the US 34 through lanes, as well.

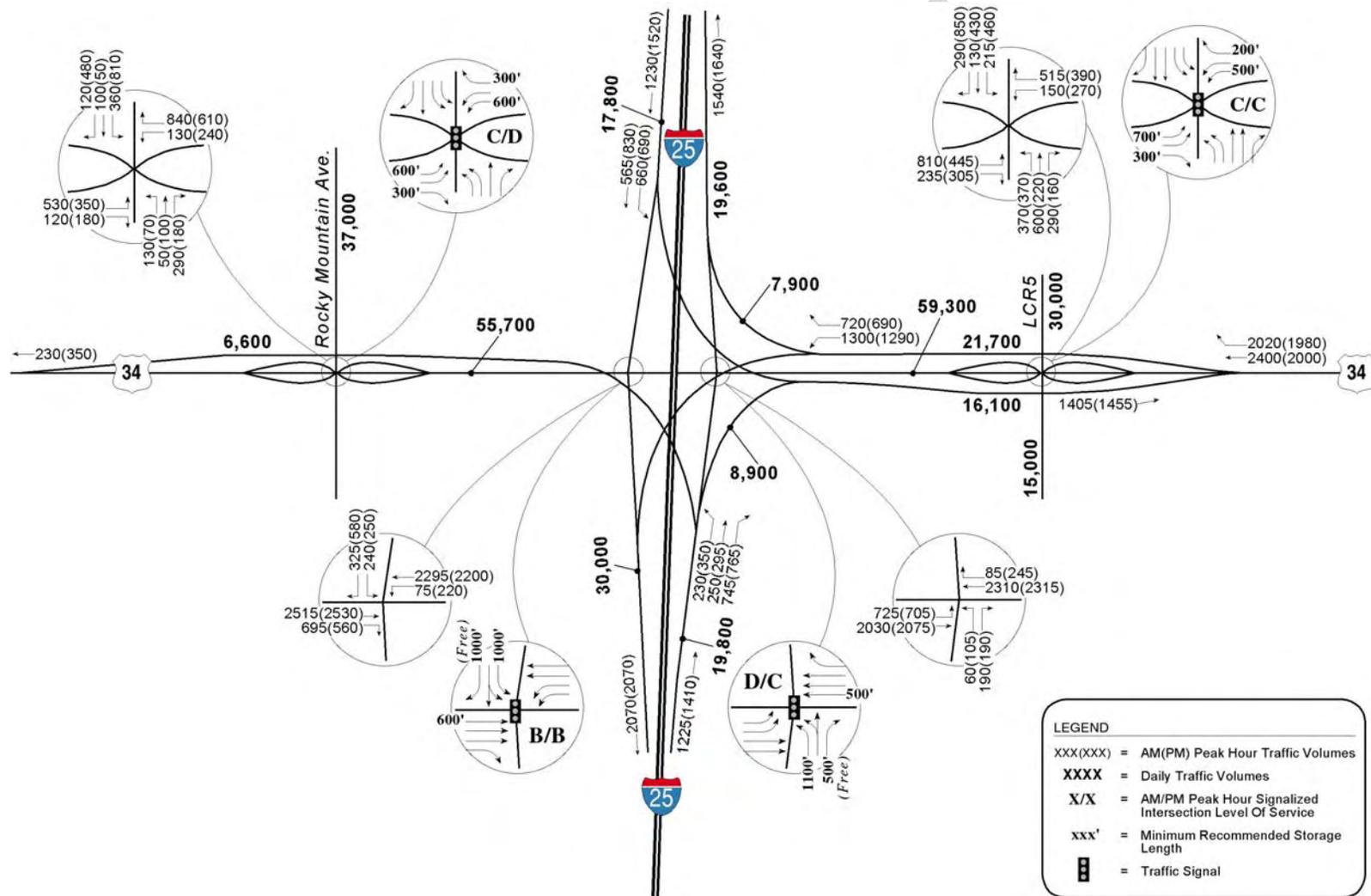
# US 34 at I-25 DEIS Interchange Evaluation

**Table 4. 2030 Package B Level of Service and Queue Lengths for Key Movements**

Intersection / Movement	Level of Service		Estimated 95 <sup>th</sup> Percentile Queue <sup>2</sup>		Distance Between Intersections and Storage Length Provisions
	AM	PM	AM	PM	
<b>Southbound Ramp Terminal</b>					
<b>EB Thru</b>	B	B	790'	490'	Distance to SPUI on Ramp – 1,500'
<b>EB Right</b>	A	B	410'	130'	Distance to SPUI on Ramp – 1,500'
<b>WB Left</b>	E	E	360'	270'	Storage Provided in Design – 1,700'
<b>WB Thru</b>	A	A	130'	230'	Distance to Adjacent Intersection – 560'
<b>SB Left</b>	E	E	300'	300'	Storage Provided in Design – 2,000'
<b>SB Right</b>	Free	Free	NA	NA	Storage Provided in Design – 1,000'
<b>Northbound Ramp Terminal</b>					
<b>EB Left</b>	F	E	1280'	1020'	Storage Provided in Design – 1,700'
<b>EB Thru</b>	A	A	500'	270'	Distance to Adjacent Intersection – 560'
<b>WB Thru</b>	E	D	1210'	1260'	Distance to SPUI on Ramp – 1,500'
<b>WB Right</b>	A	B	1490'	1390'	Distance to SPUI on Ramp – 1,500'
<b>NB Left</b>	E	E	120'	150'	Storage Provided in Design – 2,200'
<b>NB Right</b>	Free	Free	NA	NA	Storage Provided in Design – 500'
<b>Rocky Mountain SPUI<sup>1</sup></b>					
<b>EB Left</b>	C	C	320'	250'	Storage Provided in Design – 600'
<b>WB Left</b>	C	C	120'	180'	Storage Provided in Design – 600'
<b>LCR 5 SPUI<sup>1</sup></b>					
<b>EB Left</b>	C	B	410'	220'	Storage Provided in Design – 700'
<b>WB Left</b>	B	B	110'	140'	Storage Provided in Design – 500'
<sup>1</sup> Left-turn movements from the SPUI ramps were the only movements considered key movements due to the potential of queues extending into the US 34 through lanes. <sup>2</sup> 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 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.					

# US 34 at I-25 DEIS Interchange Evaluation

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**Figure 8. Package B Traffic Forecasts and Levels of Service**

# US 34 at I-25 DEIS Interchange Evaluation

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## Alternatives Evaluation Comparison

### Traffic Operational Analysis

Table 5 compares the levels of service and delay at the US 34 interchange for the three packages. As the table indicates, all four intersections would operate at LOS E or LOS F in the afternoon peak under the No Action Alternative, but with the improvements identified above, all would operate at LOS D or better in both peak hours. The levels of service and delays at each intersection are virtually the same for Packages A and B, so it would appear that either package would result in adequate operations at this interchange.

**Table 5. Intersection Level of Service and Delay**

Intersection	No Action		Package A		Package B	
	AM Peak	PM Peak	AM Peak	PM Peak	AM Peak	PM Peak
Rocky Mountain Avenue	LOS E (66 sec.)	LOS F (>80 sec.)	LOS C (27 sec.)	LOS D (38 sec.)	LOS C (27 sec.)	LOS D (38 sec.)
Southbound Ramps	LOS D (50 sec.)	LOS E (65 sec.)	LOS B (12 sec.)	LOS B (14 sec.)	LOS B (11 sec.)	LOS B (15 sec.)
Northbound Ramps	LOS D (37 sec.)	LOS E (70 sec.)	LOS D (36 sec.)	LOS C (30 sec.)	LOS D (38 sec.)	LOS C (28 sec.)
LCR 5	LOS F (>80 sec.)	LOS F (>80 sec.)	LOS C (20 sec.)	LOS C (23 sec.)	LOS C (20 sec.)	LOS C (23 sec.)

LOS X – Level of Service

## - Average Delay in Seconds per vehicle

### Interchange Phasing

The complexity and the cost associated with the proposed interchange configuration will likely require interchange reconstruction to occur in phases. Figure 9 illustrates the following potential phasing approach to interchange reconstruction. A five-year incremental analysis was conducted to estimate the year when each phase may be needed to provide at least LOS D conditions.

- Phase 1 – Elevate US 34 east and west of I-25 and construct SPUI interchanges at LCR 5 and Rocky Mountain Avenue. Approximate time frame is 2020.
- Phase 2 – Replace the No Action partial cloverleaf interchange at I-25/US 34 with a diamond interchange and the southbound to eastbound and the westbound to southbound directional ramps. This configuration alone would provide acceptable levels of service for several years, but would fail as volumes approach 2030 projections. Approximate time frame is 2025
- Phase 3 - Construct the northbound to westbound directional ramp. Analyses with 2030 Package A volumes shows that this ramp is necessary in order to maintain at least LOS D operations at the ramp terminals. Approximate time frame is 2030.

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- Phase 4 – Construct the remaining directional ramps. The following shows a potential phasing plan for the remaining directional ramps. Approximate time frame is beyond 2030.
  - Phase 4a – Construct northbound to eastbound directional ramp
  - Phase 4b – Construct westbound to northbound directional ramp

It should be noted that based on 2030 traffic projections for Package A and B, the directional ramps listed in phase 4 are not needed to provide adequate levels of service at the diamond interchange ramp terminals, but are required to provide direct connections for movements between US 34 and I-25.

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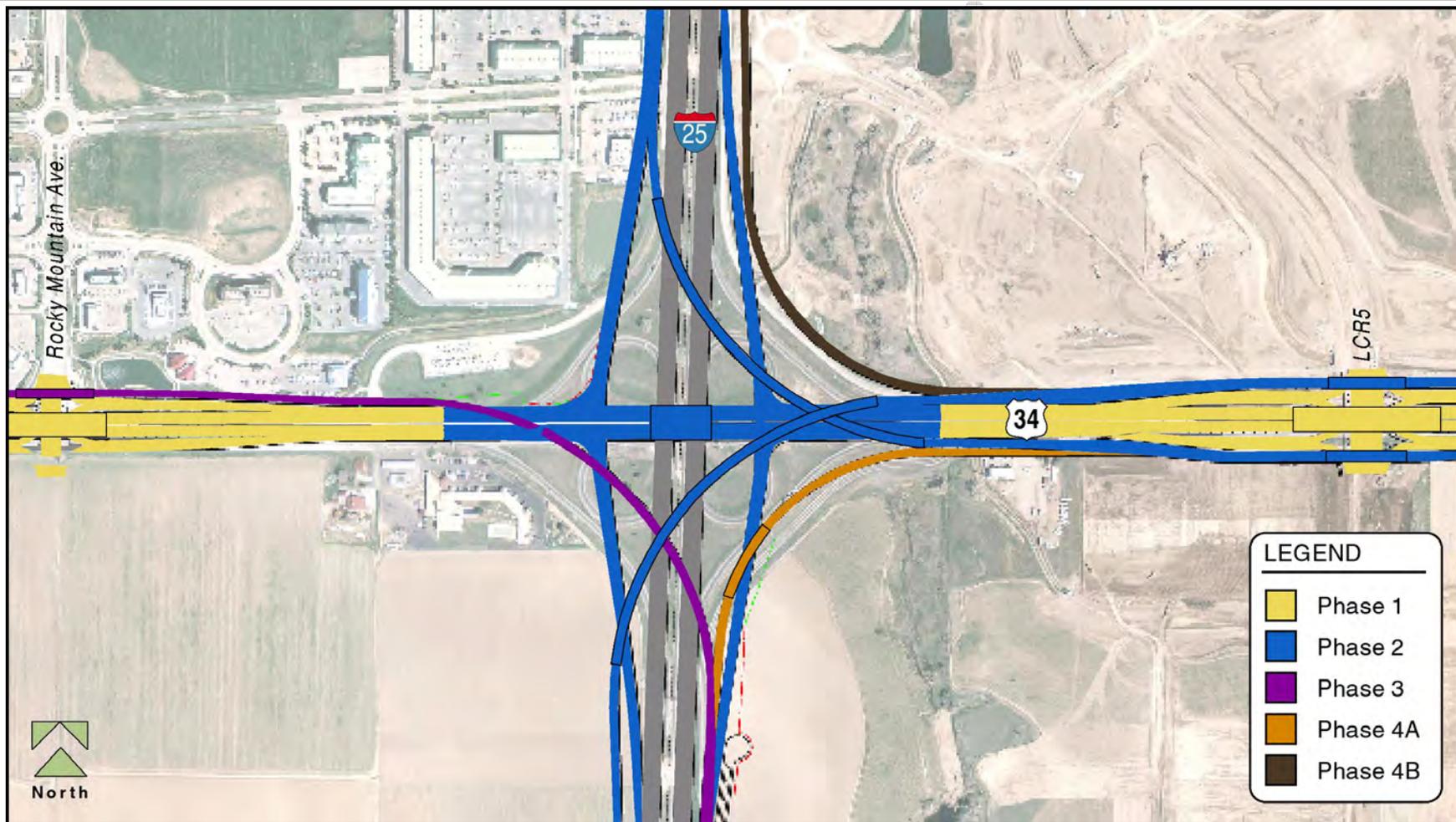


Figure 9. Interchange Phasing