

# Downtown Loveland DEIS Commuter Rail Station Evaluation

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August 20, 2006

## Introduction

The North I-25 DEIS Package A alternative considers a single commuter rail route that will extend from the end of the planned RTD North Metro Commuter Rail Line and terminate in the city of Fort Collins. Proposed stations will be located in Erie, Longmont, Berthoud, Loveland, and Fort Collins.

The proposed commuter rail route follows the existing BNSF alignment which generally parallels the US 287 alignment from Fort Collins to Longmont. Between the Sugar Mill station in Longmont and the North Metro end-of-line station at SH-7, the alignment will parallel SH-119, WCR-7, and the UP Boulder branch. A map of the commuter rail route with station locations is provided in Figure 1.

The proposed downtown Loveland commuter rail station will be located between 4th Street and 5th Street just west of Railroad Avenue in downtown Loveland.

This report documents potential traffic impacts the proposed commuter rail station may have within the vicinity of the 4th Street/Railroad Avenue intersection and provides technical documentation of the traffic data analysis. The other commuter rail stations are addressed in separate reports.

## Existing Conditions

The proposed study area includes the following roadways and intersections:

### 4th Street and 5th Street

4th Street and 5th Street are two-way, two-lane, minor city streets that run east-west on the south side of the City of Loveland. Intersections on 4th and 5th St. consist of two and four-way stops, a signalized railroad crossing, as well as several 3-way traffic signals. Diagonal parking is located along both sides of the streets for nearby businesses.

### Garfield Avenue/4th Street Intersection

Garfield Ave. is a two lane, north/south street located just west of the BSNF railroad. Garfield Ave. provides parallel parking on both sides of the street giving access to the bordering neighborhood and local businesses. The Garfield Ave./4th St.

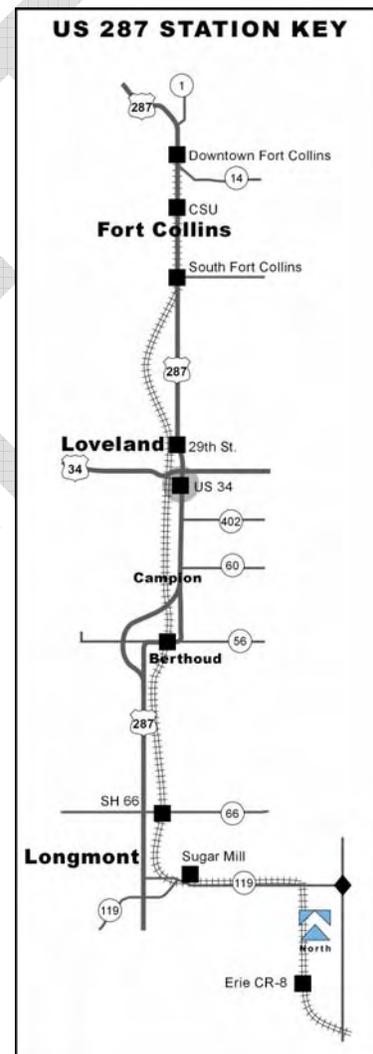


Figure 1. Vicinity Map

intersection is controlled by four-way stop signs and has a crosswalk for each approach.

#### **Garfield Avenue/5th Street Intersection**

The intersection of Garfield Ave. and 5th St. is located one block to the north of Garfield Ave. and 4th St. Two-way stop control and crosswalks are found for the east/west 5th St. approaches, while the north/south approaches of Garfield Ave. do not have intersection control.

#### **Railroad Avenue/4th Street Intersection**

Railroad Ave. is a two lane, north/south street surrounded by local businesses just east of the BSNF railroad. Both north/south approaches on Railroad Ave. are stop controlled by two-way stop signs, while 4th St. does not have intersection control. All four approaches to the intersection have designated crosswalk markings.

#### **Railroad Avenue/5th Street Intersection**

The intersection of Railroad Ave. and 5th St. is located east of the BSNF railroad and one block north of Railroad Ave. and 4th St. 5th St. becomes a dead end as it intersects with Railroad Ave. therefore creating a three legged or "T" intersection. This "T" intersection is unique in that Railroad Ave. runs diagonal through the intersection with 5th St. Railroad Avenue's northbound approach has diagonal parking on both sides of the street while the southbound approach consists of perpendicular parking on the west side of the street. Northbound and southbound movements are controlled by two-way stops giving 5th St. the right-of-way with no intersection control.

#### **Cleveland Avenue/4th Street Intersection and Cleveland Avenue/5th Street Intersection**

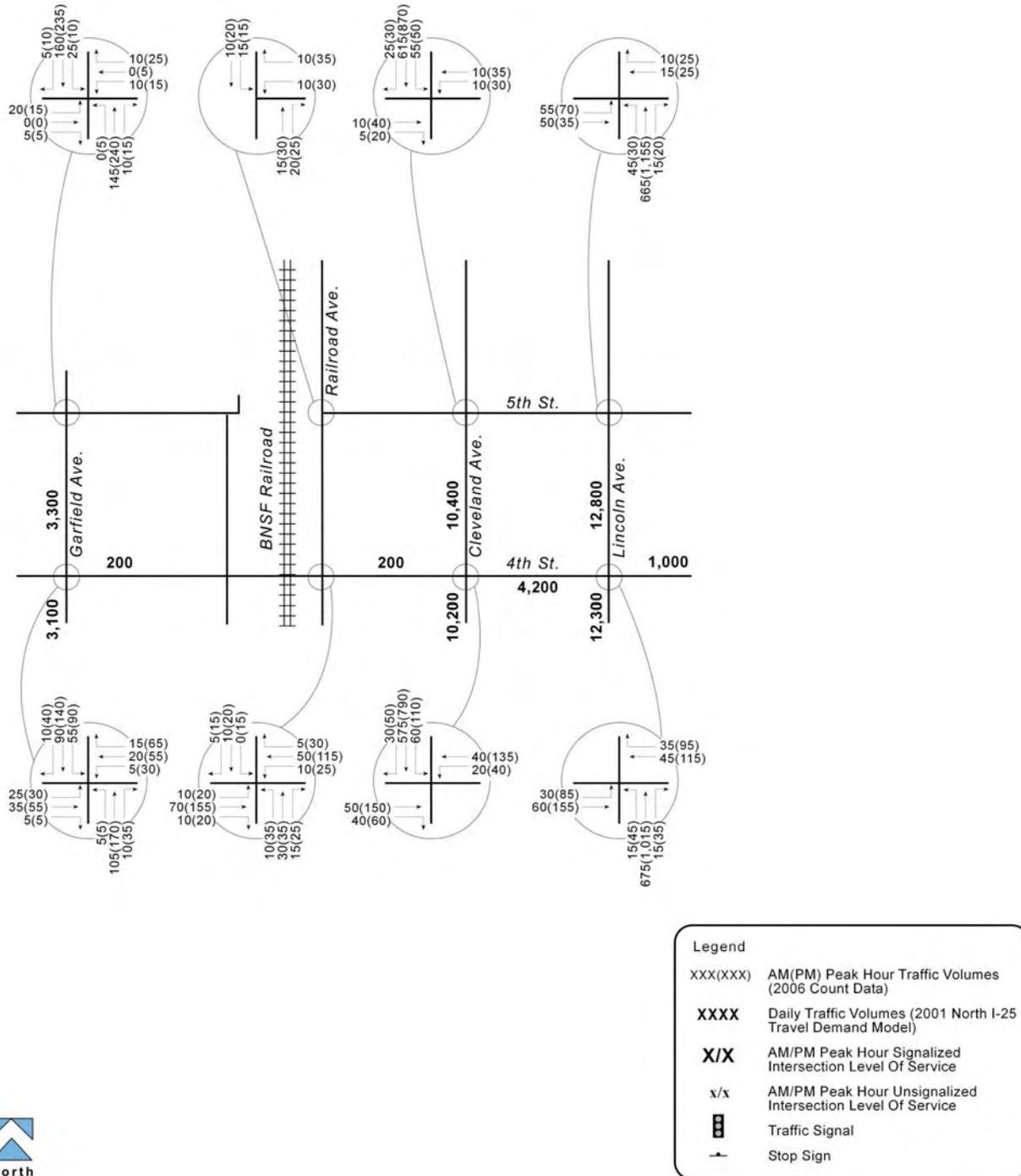
Cleveland Ave. (US 287) is a three lane, one-way, southbound arterial located two blocks east of the BNSF railroad. Parallel parking is located on both east and west sides of Cleveland Ave. between 4th and 5th St. Both intersections have three approaches with coordinated signalization for Cleveland Ave.

#### **Lincoln Avenue/4th Street Intersection and Lincoln Avenue/5th Street Intersection**

Lincoln Ave. (US 287) is a three lane, one-way, northbound arterial located three blocks east of the BNSF railroad. Lincoln is identical to Cleveland, except it runs northbound instead of southbound.

Figure 2 summarizes the traffic counts collected in March of 2006 within the study area. As shown, average daily traffic (ADT) on Cleveland Avenue north of the intersection is around 11,000 vehicles per day (vpd) and south of the intersection is around 10,000vpd. ADT on 4th Street west of the intersection is 200vpd and east of the intersection is 4,200 vehicles per day. Average Daily Traffic (ADT) on Lincoln Avenue north of the intersection is around 13,000 vehicles per day (vpd) and south of the intersection is around 10,000vpd. ADT on 4th Street west of the intersection is 4,000vpd and east of the intersection is 1,000 vehicles per day.

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**Figure 2a. Existing Conditions – Traffic Counts**



**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.

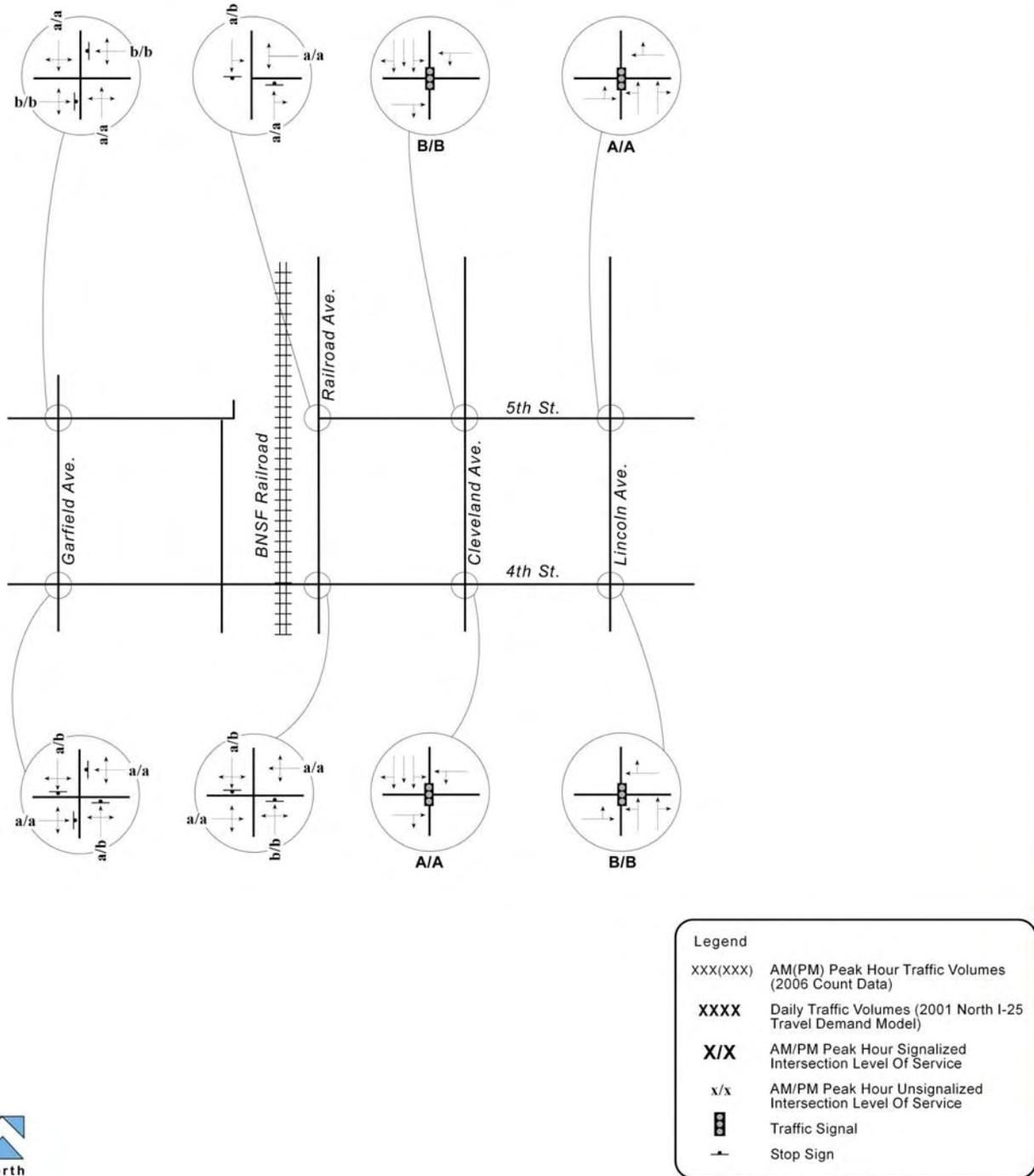
**Table 1. Equivalent Level of Service to Average Stopped Delay**

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	> 10.0 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 2b and Table 2 illustrate existing peak period levels of service at the study area intersections. Currently, Cleveland Ave. and 4th street intersection operates at LOS A during both AM and PM peak hour. Cleveland Ave. and 5th street intersection operates at LOS B during both AM and PM peak hour. Lincoln Ave. and 4th street intersection operates at LOS B during both AM and PM peak hour. Lincoln Ave. and 5th street intersection operates at LOS A during both AM and PM peak hour. All unsignalized intersections within the study area operate at LOS B or better without any considerable queue back up or delay.

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**Figure 2b. Existing Conditions – Intersection Geometry and Levels of Service**

**Table 2 Existing Intersection LOS and Delay**

Intersection / Movement	Level of Service		Delay (seconds)	
	AM	PM	AM	PM
<b>Garfield Ave. &amp; 4th St. (unsignalized)</b>				
Eastbound Approach	A	A	8.	9
Westbound Approach	A	A	8	10
Northbound Approach	A	B	8	10
Southbound Approach	A	B	8	11
<b>Garfield Ave. &amp; 5th St. (unsignalized)</b>				
Eastbound Approach	B	B	13	13
Westbound Approach	B	B	10	12
<b>Railroad Ave. &amp; 4th St. (unsignalized)</b>				
Northbound Approach	B	B	10	15
Southbound Approach	A	B	10	13
<b>Railroad Ave. &amp; 5th St. (unsignalized)</b>				
Northbound Approach	A	A	9	10
Southbound Approach	A	B	9	10
<b>Cleveland Ave. &amp; 4th St.</b>	A	A	5	7
<b>Cleveland Ave. &amp; 5th St.</b>	B	B	13	14
<b>Lincoln Ave. &amp; 4th St.</b>	B	B	14	16
<b>Lincoln Ave. &amp; 5th St.</b>	A	A	5	8

**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 downtown Loveland 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 and 2030 No Action – results were utilized to calculate 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 results were checked for reasonableness and adjusted where necessary. The 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, average daily volume projection on Garfield Avenue north of the 4<sup>th</sup> Street intersection is around 4,800 vehicles per day (vpd) and south of the intersection is around 4,300vpd. ADT on 4th Street west and east of the intersection is around 500 vehicles per day.

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Figure 3. No Action Alternative

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### 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 in US 85 General Purpose Lanes and Que Jumps</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 Transit Station</b>
	<b>Potential Commuter Rail Operational &amp; Maintenance Facility</b>
	<b>Potential Commuter Bus Operational &amp; Maintenance Facility</b>

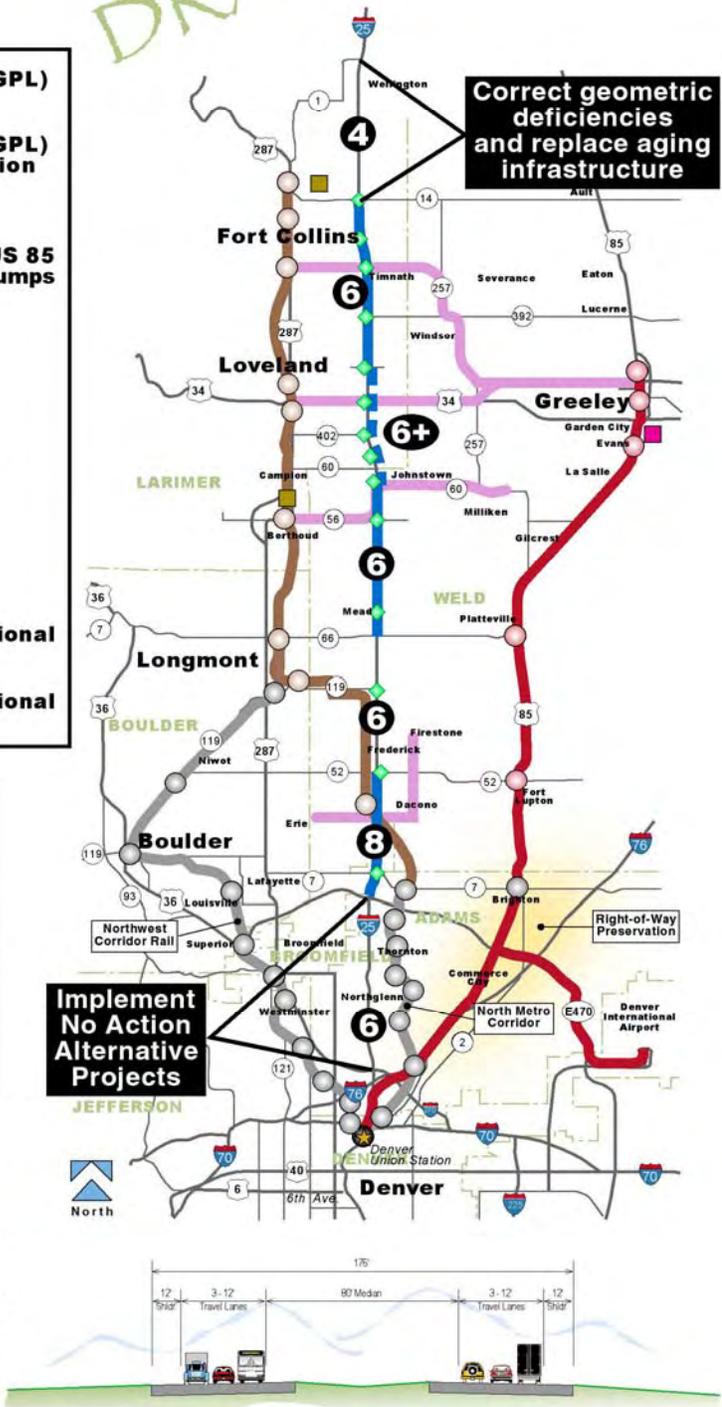
**Congestion Management Measures include:**

- 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.

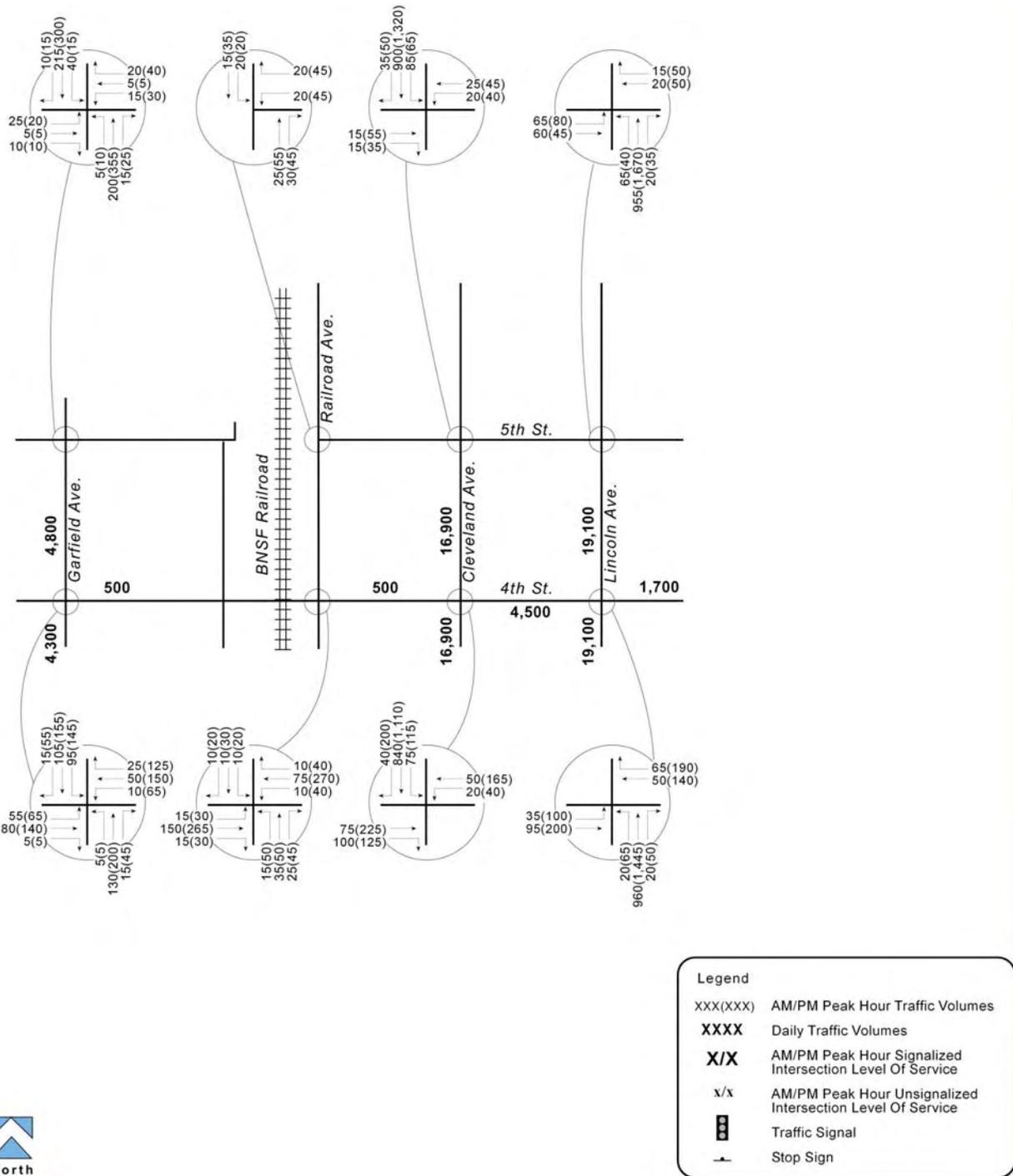
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**NOT TO SCALE**

**Figure 4. 2030 Package A Alternative**

# Downtown Loveland DEIS Commuter Rail Station Evaluation



**Figure 5. 2030 No Action Forecasts**

Average daily traffic projection on Cleveland Avenue north of the 4th Street intersection is around 17,000 vehicles per day (vpd) and south of the intersection is around 16,800vpd. ADT projection on 4th Street west of the intersection is around 500vpd and east of the intersection is around 4,400 vehicles per day. Average daily traffic projection on Lincoln Avenue north and south of the 4th Street intersection is around 19,000 vehicles per day (vpd). ADT projection on 4th Street west of the intersection is 4,500vpd and east of the intersection is 1,700 vehicles per day.

**2030 Package A Traffic 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-and-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 rail station and park-and-ride lot 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.

**Park-and-Ride Trip Generation**

The number of proposed spaces at the Downtown Loveland US 34 park-n-ride site 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.

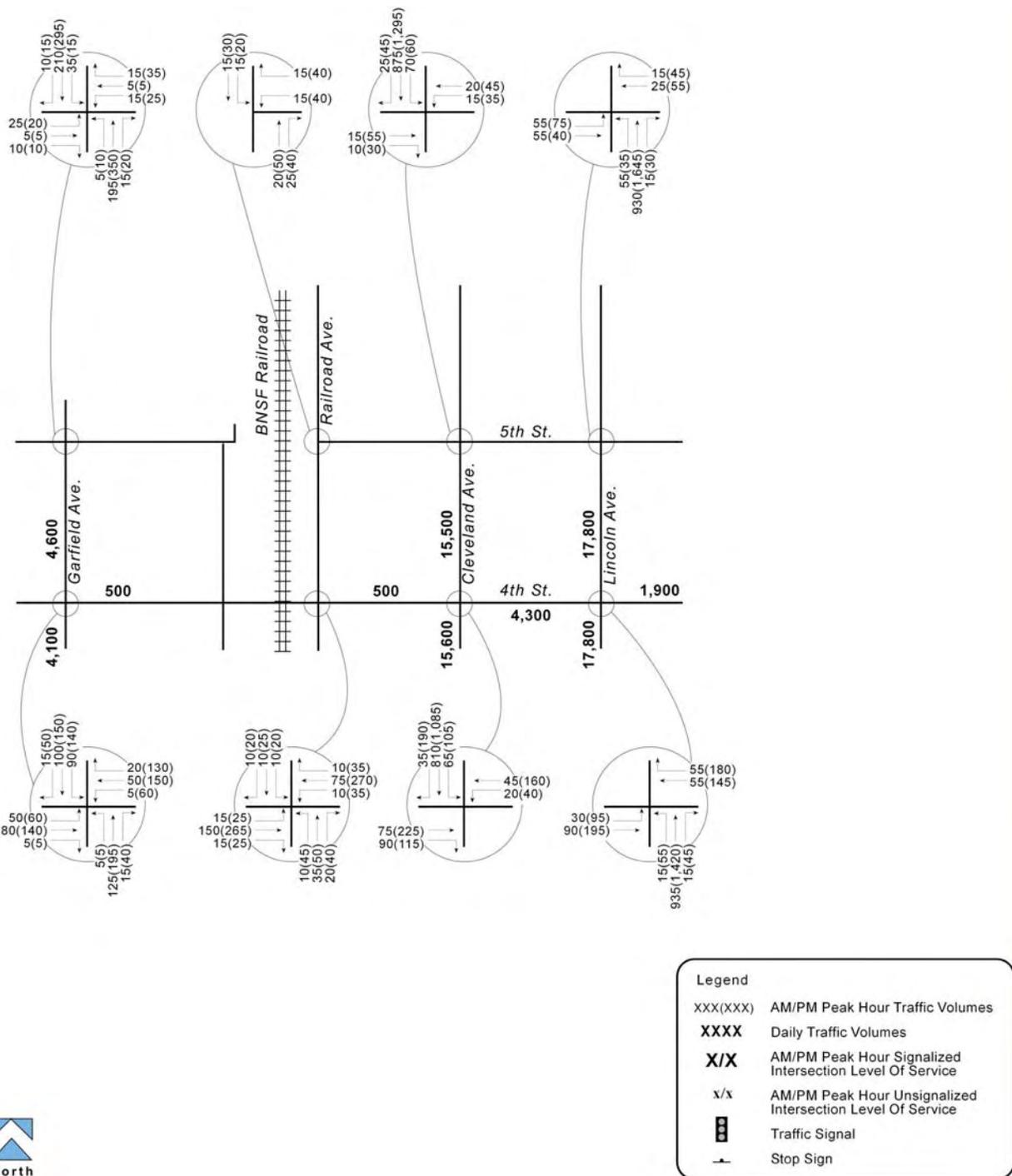
- First, a conservative estimate of maximum utilized spaces is determined by multiplying the number of spaces provided by 90 percent (or 0.9). This is referred to as the *number of occupied spaces*.
- Then, the number of occupied spaces is multiplied by the factors shown in Table 4.

**Table 3. Peak Hour Trip Generation for North I-25 EIS Park-and-Ride Lots**

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

The downtown Loveland commuter rail station would be located between 4th and 5th Streets west of Railroad Avenue with 45 spaces. The future peak hour traffic from the proposed park-and-ride lot was determined and is shown in Table 5 below.

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**Figure 6. 2030 Package A Background Traffic Forecasts**

**Table 4 Future Peak Hour Traffic from the Downtown Loveland US 34 Park-and-Ride Lot**

Location	Daily Trips	AM Peak			PM Peak		
		In	Out	Total	In	Out	Total
Downtown Loveland	100	26	4	30	4	16	20

**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 both 4th and 5th Streets. The peak hour trip generation and distribution estimates for the proposed park-and-ride lot are shown in Figure 7. These peak hour trip generation estimates were combined with the background traffic projections to arrive at the total 2030 Package A peak hour projections in Figure 8.

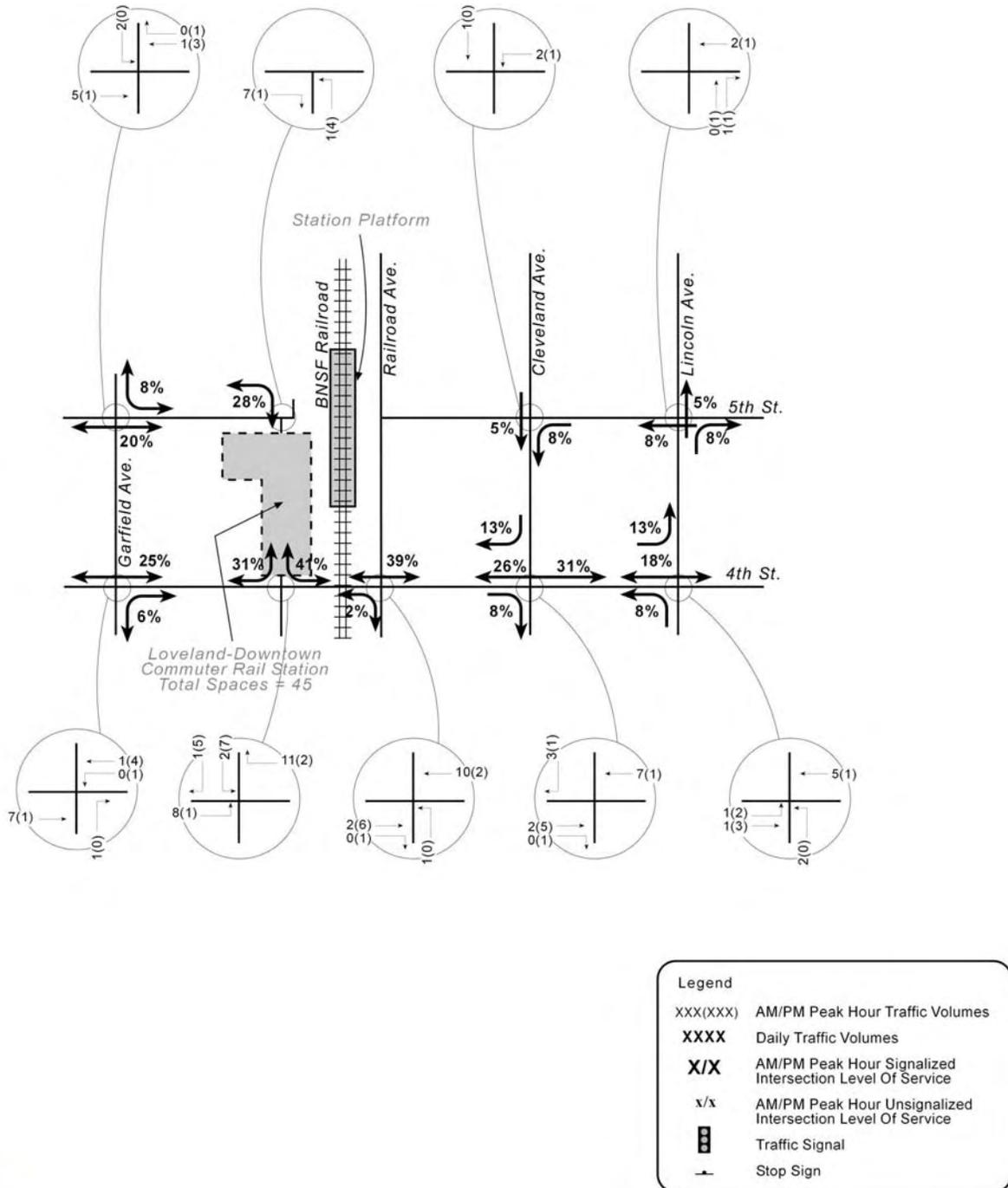
**2030 No Action Traffic Operations**

Figure 9 and Table 5 show the projected levels of service at the study area intersections under the No Action scenario. For the purpose of No Action analysis it was assumed that Cleveland Avenue would remain as a six-lane roadway and Lincoln Avenue would remain as a four-lane roadway, because this is more representative of true future no action conditions in the area. As indicated, all intersections in the study area would operate at acceptable levels of service.

**Table 5. 2030 No Action Intersection LOS and Delay**

Intersection / Movement	Level of Service		Delay (seconds)	
	AM	PM	AM	PM
<b>Garfield Ave. &amp; 4th St. (unsignalized)</b>				
Eastbound Approach	A	C	9	16
Westbound Approach	A	C	9	22
Northbound Approach	A	C	9	17
Southbound Approach	A	C	10	25
<b>Garfield Ave. &amp; 5th St. (unsignalized)</b>				
Eastbound Approach	B	C	15	17
Westbound Approach	B	C	12	16
<b>Railroad Ave. &amp; 4th St. (unsignalized)</b>				
Northbound Approach	B	D	12	34
Southbound Approach	B	C	11	24
<b>Railroad Ave. &amp; 5th St. (unsignalized)</b>				
Northbound Approach	A	B	9	10
Southbound Approach	A	B	10	11
<b>Cleveland Ave. &amp; 4th St.</b>	A	A	6	8
<b>Cleveland Ave. &amp; 5th St.</b>	B	B	15	16
<b>Lincoln Ave. &amp; 4th St.</b>	B	C	16	25
<b>Lincoln Ave. &amp; 5th St.</b>	A	C	6	22

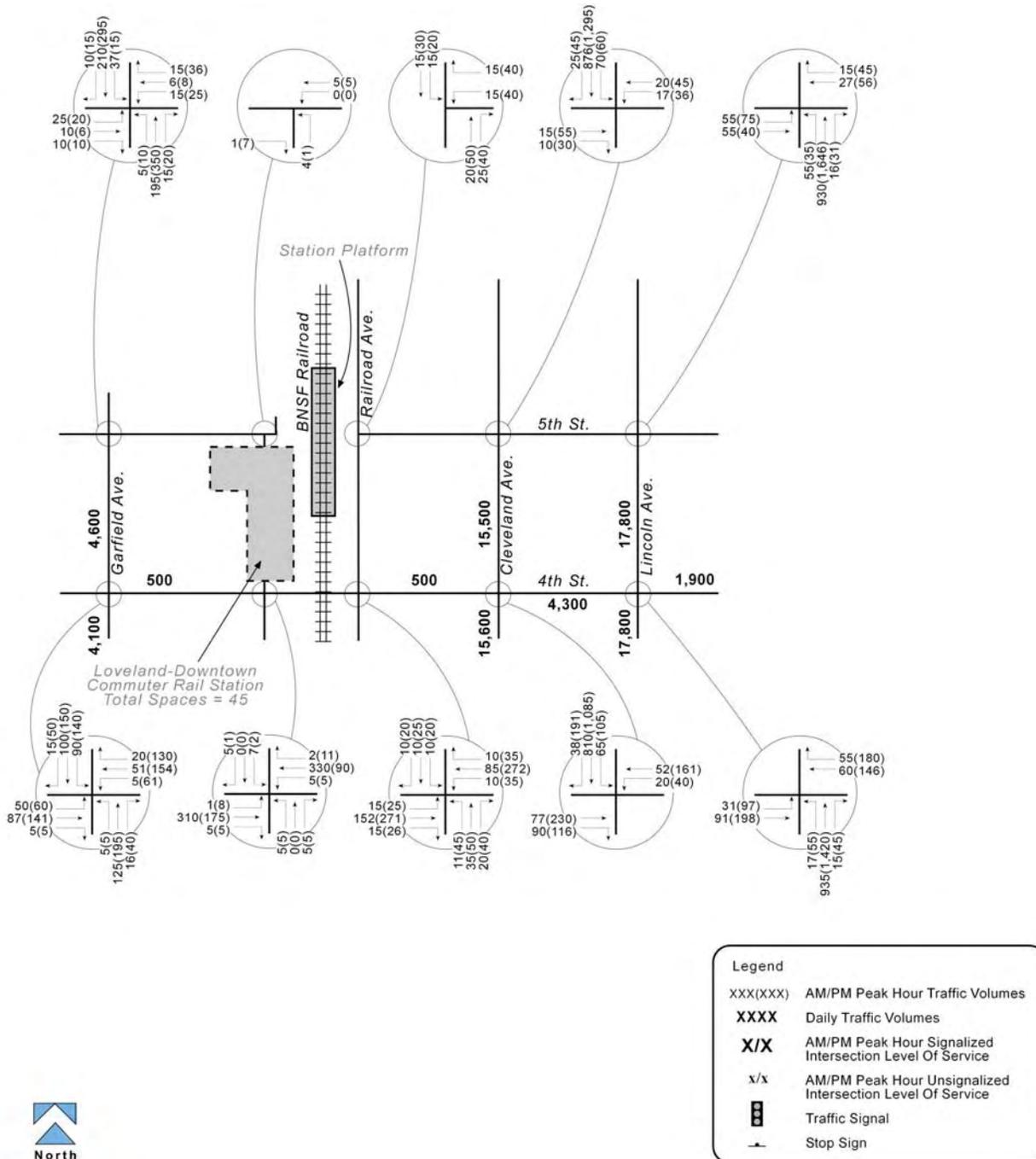
# Downtown Loveland DEIS Commuter Rail Station Evaluation



**Figure 7. Park and Ride Lot Trip Distribution and Assignment**

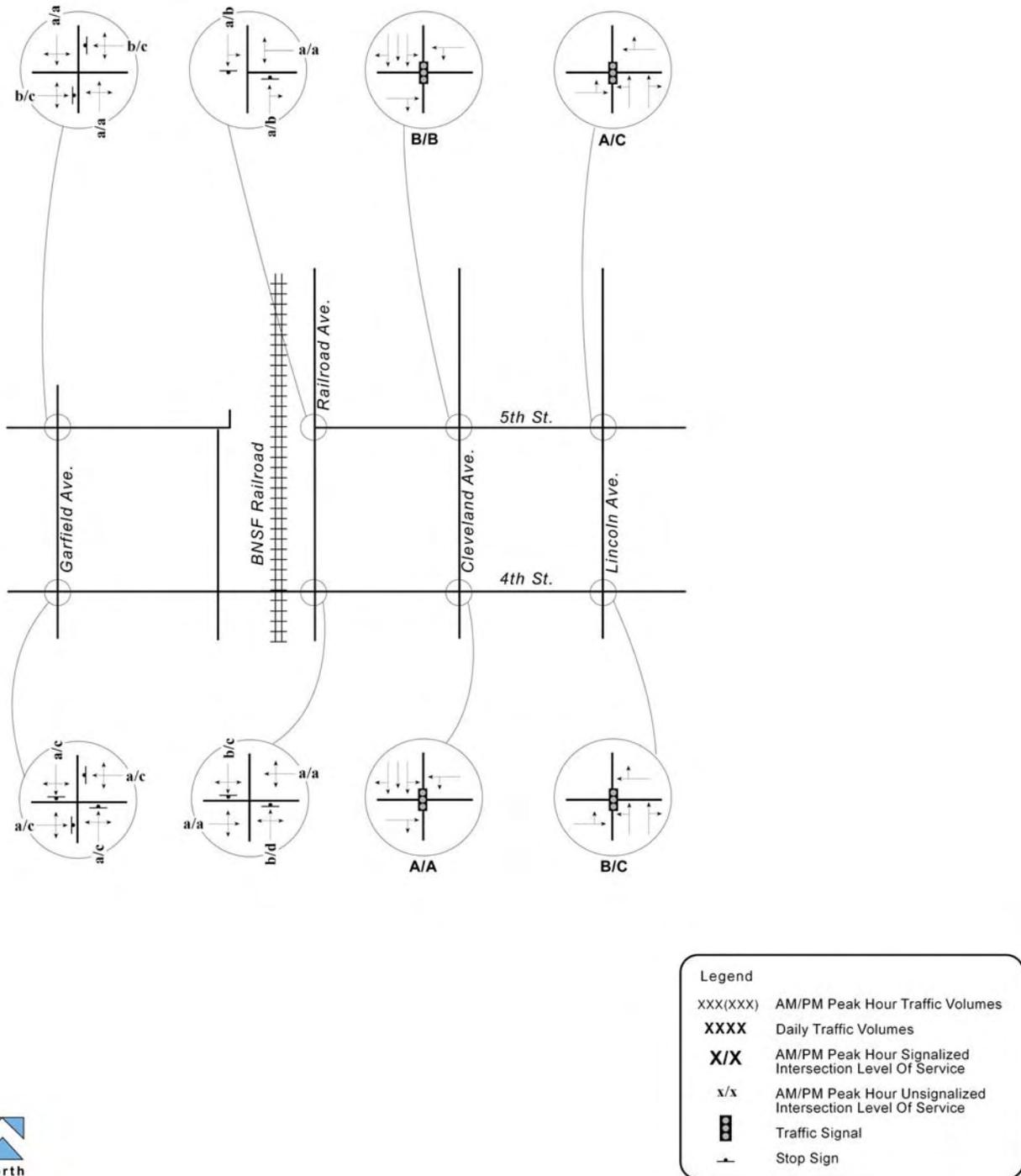


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**Figure 8. 2030 Package A Total Traffic Forecasts**

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**Figure 9. 2030 No Action Intersection Geometry and Levels of Service**



**2030 Package A Traffic Operations**

Figure 10 and Table 6 show the projected levels of service at the study area intersections under the Package A alternative. As indicated, all intersections and approaches within the study area will operate at acceptable levels of service during both AM and PM peak hours in this alternative.

**Table 6. 2030 Package A Intersection LOS and Delay**

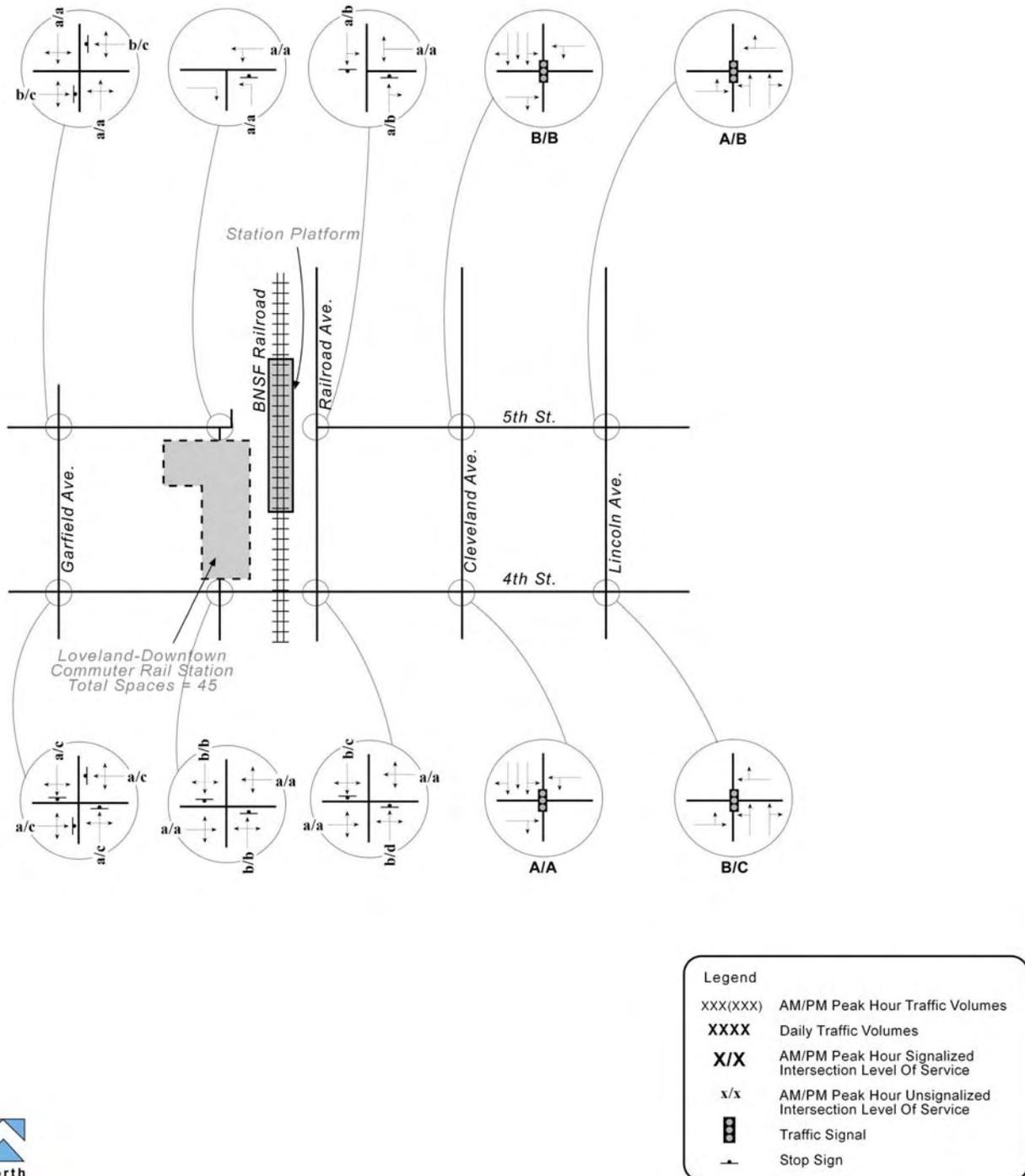
Intersection / Movement	Level of Service		Delay (seconds)	
	AM	PM	AM	PM
<b>Garfield Ave. &amp; 4th St. (unsignalized)</b>				
Eastbound Approach	A	C	10	16
Westbound Approach	A	C	9	23
Northbound Approach	A	C	9	17
Southbound Approach	A	C	10	24
<b>Garfield Ave. &amp; 5th St. (unsignalized)</b>				
Eastbound Approach	B	C	15	17.3
Westbound Approach	B	C	13	16
<b>Railroad Ave. &amp; 4th St. (unsignalized)</b>				
Northbound Approach	B	D	12	30
Southbound Approach	B	C	11	23
<b>Railroad Ave. &amp; 5th St. (unsignalized)</b>				
Northbound Approach	A	B	9	10
Southbound Approach	A	B	10	11
<b>Cleveland Ave. &amp; 4th St.</b>	A	A	6	7
<b>Cleveland Ave. &amp; 5th St.</b>	B	B	14	16
<b>Lincoln Ave. &amp; 4th St.</b>	B	C	16	23
<b>Lincoln Ave. &amp; 5th St.</b>	A	B	5	19
<b>Park and Ride Access/5th Avenue (unsignalized)</b>				
Northbound Left Turn	A	A	9	3
<b>Park and Ride Access/4th Avenue (unsignalized)</b>				
Northbound Approach	B	B	10	13
Southbound Approach	B	B	10	14

**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 Package A alternative has little impact on the key intersections in the study area, and the park-and-ride accesses would operate at acceptable levels of service.

# Downtown Loveland DEIS Commuter Rail Station Evaluation



**Figure 10. 2030 Package A Intersection Geometry and Levels of Service**

# Downtown Loveland DEIS Commuter Rail Station Evaluation

**Table 7. Intersection Level of Service and Delay**

Intersection	No Action		Package A	
	AM Peak	PM Peak	AM Peak	PM Peak
Garfield Ave. & 4th St. (unsignalized)				
Eastbound Approach	LOS A (9 sec.)	LOS C (16 sec.)	LOS A (10 sec.)	LOS C (16 sec.)
Westbound Approach	LOS A (9 sec.)	LOS C (22 sec.)	LOS A (9 sec.)	LOS C (23 sec.)
Northbound Approach	LOS A (9 sec.)	LOS C (17 sec.)	LOS A (9 sec.)	LOS C (17 sec.)
Southbound Approach	LOS A (10 sec.)	LOS C (25 sec.)	LOS A (10 sec.)	LOS C (24sec.)
Garfield Ave. & 5th St. (unsignalized)				
Eastbound Approach	LOS B (15 sec.)	LOS C (17 sec.)	LOS B (15 sec.)	LOS C (17 sec.)
Westbound Approach	LOS B (12 sec.)	LOS C (16 sec.)	LOS B (13 sec.)	LOS C (16sec.)
Railroad Ave. & 4th St. (unsignalized)				
Northbound Approach	LOS B (12sec.)	LOS D (34 sec.)	LOS B (12 sec.)	LOS D (30 sec.)
Southbound Approach	LOS B (11 sec.)	LOS C (24 sec.)	LOS B (11 sec.)	LOS C (23 sec.)
Railroad Ave. & 5th St. (unsignalized)				
Northbound Approach	LOS A (9 sec.)	LOS B (10 sec.)	LOS A (9sec.)	LOS B (10 sec.)
Southbound Approach	LOS A (10 sec.)	LOS B (11 sec.)	LOS A (10 sec.)	LOS B (11 sec.)
Cleveland Ave. & 4th St.	LOS A (6 sec.)	LOS A (8 sec.)	LOS A (6 sec.)	LOS A (7 sec.)
Cleveland Ave. & 5th St.	LOS B (15 sec.)	LOS B (16 sec.)	LOS B (14 sec.)	LOS B (16 sec.)
Lincoln Ave. & 4th St.	LOS B (16sec.)	LOS C (25 sec.)	LOS B (16sec.)	LOS C (23 sec.)
Lincoln Ave. & 5th St.	LOS A (6 sec.)	LOS C (22 sec.)	LOS A (5 sec.)	LOS B (19 sec.)
PNR Access/5th Avenue (unsignalized)				
Northbound Left Turn	N/A	N/A	LOS A (9 sec.)	LOS A (3 sec.)
PNR Access/4th Avenue (unsignalized)				
Northbound Approach	N/A	N/A	LOS B (10 sec.)	LOS B (13 sec.)
Southbound Approach	N/A	N/A	LOS B (10sec.)	LOS B (14 sec.)

LOS X – Level of service

##.# - Average delay in seconds per vehicle