

NORTH 33RD AND CORNHUSKER

Transportation Alternatives Traffic Analysis Report

December 2019

RTSD No. 5919
City Project No. 702614
State Control No. 13294
Olsson Project No. A17-3604



Table of Contents

1.0	Executive Summary.....	1
2.0	Introduction	2
3.0	Existing Conditions	4
3.1	Street Network	4
3.2	Major Traffic Generators	7
3.3	Emergency Services	7
3.4	Data Collection.....	9
3.5	Rail Characteristics	9
3.6	Capacity Analysis.....	13
3.7	Safety Analysis.....	17
3.8	Bus System Discussion.....	21
3.9	Trail Network Discussion.....	23
4.0	2040 Fiscally Constrained Transportation System.....	25
4.1	Travel Demand Forecasting	25
4.2	No-Action Alternative.....	26
4.3	Alternative 1B.....	30
4.4	Alternative 1D.....	36
4.5	Alternative 1E.....	41
4.6	Alternative Modified PEL C.....	45
5.0	Conclusions.....	49

Figures

Figure 1.	Environmental Study Area Location	3
Figure 2.	Existing Street Network.....	5
Figure 3.	Existing Speed Limits.....	6
Figure 4.	Emergency Service Map	8
Figure 5.	Existing Turning Movement Counts.....	10
Figure 6.	Existing Lane Configuration & Traffic Control.....	11
Figure 7.	Rail Crossings.....	12
Figure 8.	Existing Capacity Analysis Summary	16
Figure 9.	StarTran Routes.....	22
Figure 10.	Pedestrian and Bicycle Network.....	24

Figure 11. 2040 Fiscally Constrained Projects Map	27
Figure 12. 2040 No-Action Alternative Lane Configuration & Traffic Control	28
Figure 13. 2040 No-Action Alternative Peak Hour Volumes	29
Figure 14. 2040 No-Action Alternative Capacity Analysis Summary	31
Figure 15. 2040 Alternative 1B Peak Hour Volumes	33
Figure 16. LOS Illustration.....	34
Figure 17. 2040 Alternative 1B Capacity Analysis Summary	35
Figure 18. 2040 Alternative 1D Peak Hour Volumes	38
Figure 19. 2040 Alternative 1D Capacity Analysis Summary	39
Figure 20. 2040 Alternative 1E Peak Hour Volumes	42
Figure 21. 2040 Alternative 1E Capacity Analysis Summary	43
Figure 22. 2040 Alternative Modified PEL C Peak Hour Volumes	46
Figure 23. 2040 Alternative Modified PEL C Capacity Analysis Summary	47

Tables

Table 1. Existing Street National Functional Classification	4
Table 2. Existing Exposure Factor.....	13
Table 3. Intersection LOS Criteria	14
Table 4. Train-Involved Crashes (1980-2018)	17
Table 5. Train-Involved Crashes at Railroad Crossings (1980-2018)	18
Table 6. Intersection Crash Summary	19
Table 7. Alternative 1B Intersection LOS Comparison.....	32
Table 8. Alternative 1D Intersection LOS Comparison	40
Table 9. Alternative 1E Intersection LOS Comparison.....	44
Table 10. Alternative Modified PEL C Intersection LOS Comparison	48

Appendices

Appendix A – Alternatives Concept Design

Appendix B – Existing Count Data

Appendix C – Traffic Volume Forecasts Methodology Memo

Appendix D – Capacity Analysis

1.0 Executive Summary

Cornhusker Highway (U.S. Highway 6 [US 6]), a critical east-west arterial in the roadway system, serves north Lincoln, Nebraska. Adams Street, a minor arterial, provides a direct east-west connection from Cornhusker Highway to the eastern city limits. Together, the Adams Street/Cornhusker Highway corridor provides the only east-west streets connecting Interstate 80 and Interstate 180 to N. 84th Street in northern Lincoln between O Street and Superior Street. This corridor contains three at-grade crossings with the BNSF Railway located at N. 33rd Street south of Cornhusker Highway, Adams Street at approximately N. 35th Street, and N. 44th Street south of Cornhusker Highway. The BNSF Railway currently carries 65 trains per day (63 freight and 2 passenger trains) on the double-track mainline railroad through northeast Lincoln resulting in at least 3.6 hours per day that each of the at-grade railroad crossings is blocked to vehicular, bicycle, and pedestrian traffic. When considering the railroad crossings at N. 33rd Street, at the intersection of N. 35th and Adams streets and at N. 44th Street, this equates to one of the highest exposure ratings in Nebraska. The exposure factor is calculated by multiplying the number of trains per day by the average number of vehicles per day sharing the crossing.

Recognizing the safety, mobility, and congestion concerns caused by at-grade railroad crossings, the Railroad Transportation Safety District (RTSD) and the City of Lincoln undertook multiyear studies to evaluate and identify an appropriate transportation improvement project along the 1.8-mile BNSF rail corridor between N. 27th and N. 48th streets. The process began with a Planning and Environmental Linkages (PEL) study in 2015, which resulted in planning level roadway alignment concepts for the project area. Before making a major financial investment in the transportation infrastructure, the RTSD and City of Lincoln realized that improvements of this magnitude needed to be part of a larger vision to benefit a greater area. In early 2018, the City of Lincoln, with support from the RTSD, launched a subarea planning effort for northeast Lincoln. The subarea plan (SAP) effort provides a broader framework for land use, new development, and redevelopment in the area with transportation playing a key role.

Through the PEL and SAP process, the RTSD and City of Lincoln have identified potential roadway alignments that would serve to eliminate the at-grade crossings in the N. 33rd Street and Cornhusker Highway area. The proposed roadway alignments were developed as an operationally independent project to meet the purpose and need of the RTSD, while remaining compatible with the long-term transportation vision for north Lincoln. Any proposed RTSD transportation projects would use federal funding, which requires the proposed transportation project to comply with the National Environmental Policy Act (NEPA).

This document presents a summary of detailed traffic analyses that were completed for four of the finalist alternatives (1B, 1D, 1E and Modified PEL C) that have passed Tier 1 screening as well as Existing Conditions and 2040 No Action Conditions. Three other finalist alternatives after the Tier 1 screening (12B, 14 and 15A) were not evaluated in detail with this study as they were identified as having overall project costs beyond what was realistically fundable by the RTSD.

2.0 Introduction

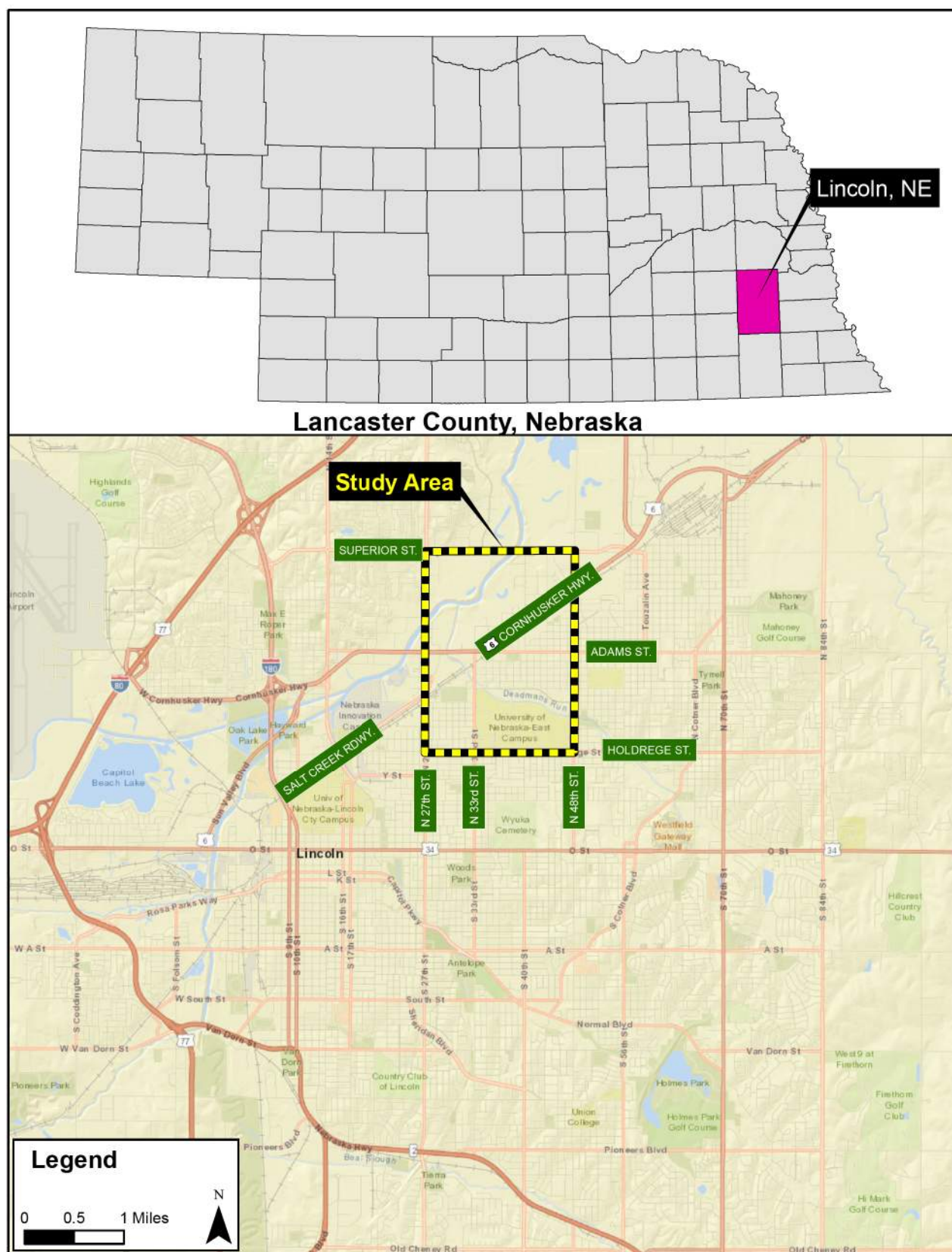
The Lincoln/Lancaster County Railroad Transportation Safety District (RTSD) has identified the at-grade rail crossings of N. 33rd Street, Adams Street, and N. 44th Street for potential closure and replacement with one or more new grade-separated crossings of the BNSF Railway (BNSF) Creston Line between N. 27th Street and N. 48th Street. To evaluate these removals, a traffic analysis was completed that thoroughly examined existing conditions and 2040 future year conditions. This report presents a summary of the findings of this engineering analysis.

The traffic analysis process documented in this study built off the framework for traffic evaluation established in the PEL study. The purpose and need and environmental study area for the project was identical to that in the PEL. **Figure 1** shows the environmental study area location which is bound by Holdrege Street (south), Superior Street (north), N. 27th Street (west), and N. 48th Street (east). The purpose of the proposed project is to accomplish the following:

1. Improve safety along the rail corridor between N. 27th and N. 48th streets by eliminating or reducing the potential conflict points between trains and other transportation modes (vehicles, pedestrians, and bicyclists).
2. Reduce delay for motorists, pedestrians, and bicyclists crossing the rail corridor, including rerouting emergency response vehicles due to crossings blocked by trains.
3. Accommodate existing and future traffic (Year 2040) to reduce congestion along roadways crossing the rail corridor.
4. Improve mobility across the rail corridor in north Lincoln, including public safety response times.
5. Improve multimodal connectivity in north Lincoln for vehicles, pedestrians, bicyclists, and bus transit.

As part of this project, updated traffic counts and crash data were collected and utilized in the analysis. Future travel demand was analyzed using travel demand model outputs for the 2040 No Action Alternative and alternatives 1B, 1D, 1E and Modified PEL C. Traffic analysis for three additional alternatives that passed Tier 1 screening (12B, 14 and 15A) were not evaluated in detail with this study as they were identified as having overall project costs beyond what was realistically fundable by the RTSD. All seven finalist alternative concept designs are included in **Appendix A**. The purpose of this traffic study report is to support the NEPA decision making process.

Environmental Study Area Location



3.0 Existing Conditions

The existing conditions evaluation includes an analysis of existing traffic operations, rail influence on the transportation network, multimodal analysis, and safety.

3.1 Street Network

There are eleven major streets within the study area: N. 27th Street, N. 33rd Street, N. 40th Street, N. 44th Street, N. 48th Street, Holdrege Street, Huntington Avenue/Leighton Avenue, State Fair Park Road, Theresa Street, Adams Street, and Cornhusker Highway. A summary of the existing street National Functional Classifications is illustrated in **Table 1**. **Figure 2** illustrates the number of through lanes of each major street within the study area. **Figure 3** illustrates the speed limits of each major street within the study area.

Table 1. Existing Street National Functional Classification

Street	Functional Classification
N. 27 th Street (S of Cornhusker)	Principal Arterial
N. 27 th Street (N of Cornhusker)	Minor Arterial
N. 33 rd Street	Minor Arterial
N. 40 th Street	Major Collector
N. 44 th Street	Local
N. 48 th Street	Minor Arterial
Holdrege Street	Minor Arterial
Huntington Avenue/Leighton Avenue	Major Collector
Adams Street	Minor Arterial
State Fair Park Road	Major Collector
Theresa Street	Major Collector
Cornhusker Highway	Principal Arterial

Cornhusker Highway is a major east-west route through the City of Lincoln that provides a connection between I-180 in west Lincoln to N. 84th Street in east Lincoln. Cornhusker Highway is a critical east/west route that provides mobility through the north side of the city. Adams Street is an east-west street that intersects Cornhusker Highway at N. 35th Street and extends east to the city limits. Adams Street provides accessibility to residential and industrial users within the local area. Huntington Avenue/Leighton Avenue are east-west streets that are continuations of one another providing accessibility to neighborhoods and extends from N. 33rd Street to Dorothy Drive (which is near N. 75th Street).

FIGURE 2

Existing Street Network

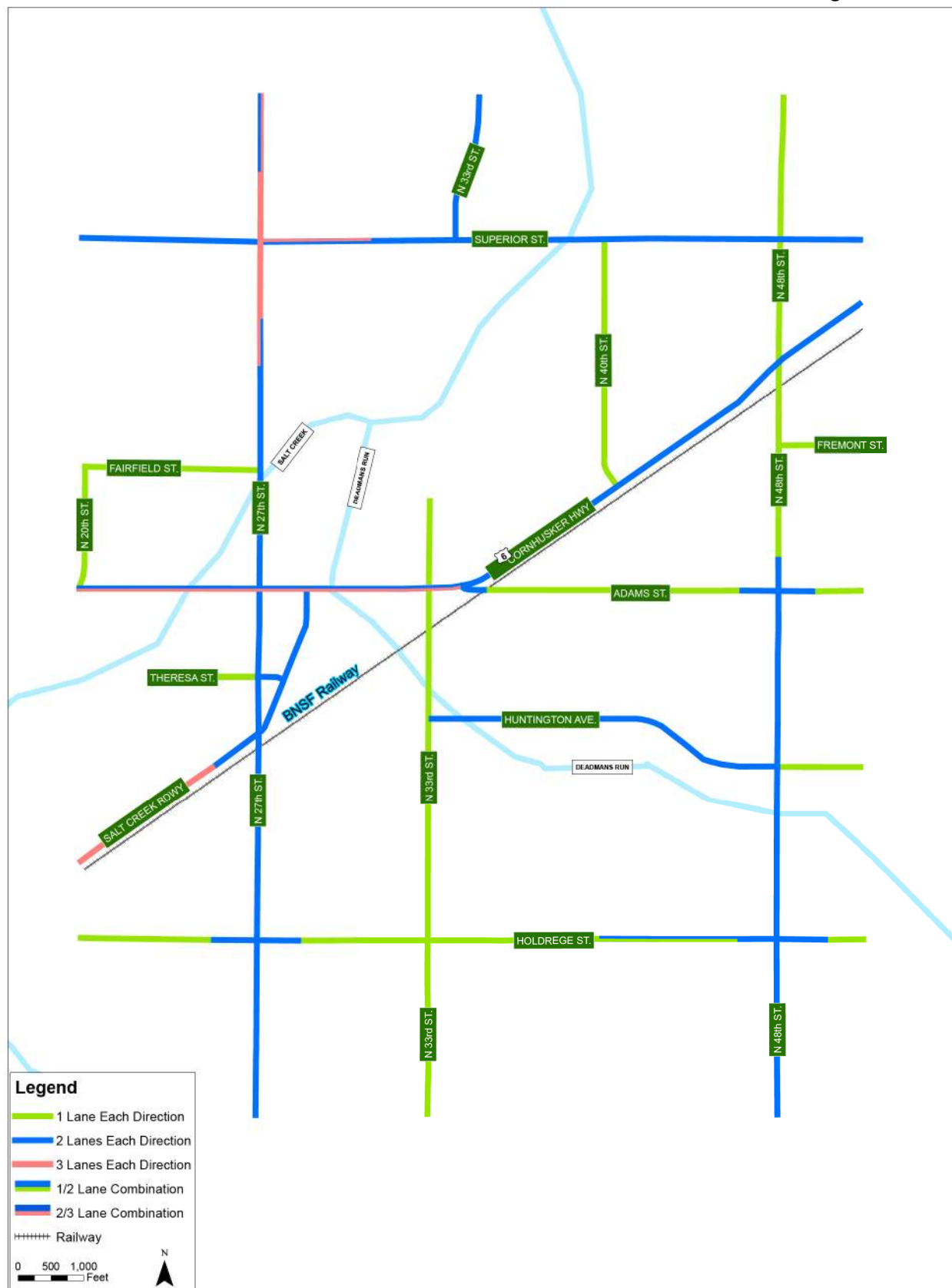
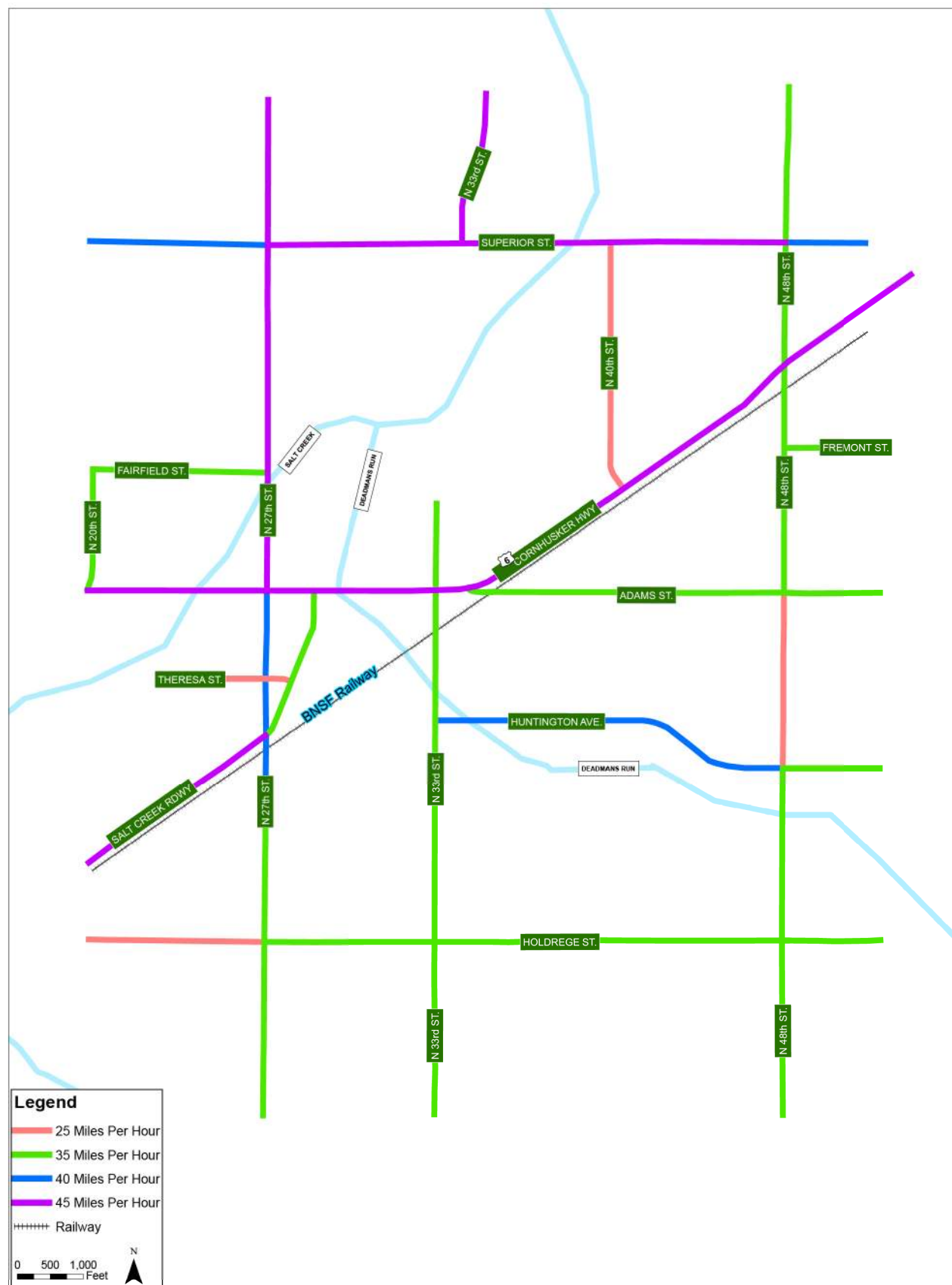


FIGURE 3

Existing Speed Limits



Holdrege Street is an east-west street that provides accessibility to UNL East Campus and runs continuously between N. 19th Street and the eastern city limits. N. 27th Street is a major north-south street that provides mobility throughout the city between Saltillo Road and Arbor Road. N. 33rd Street is a north-south street providing accessibility to UNL East Campus between Normal Boulevard and Cornhusker Highway. N. 48th Street is another major north-south street that provides accessibility to both UNL East Campus, as well as, Nebraska Wesleyan University between Old Cheney Road and Superior Street.

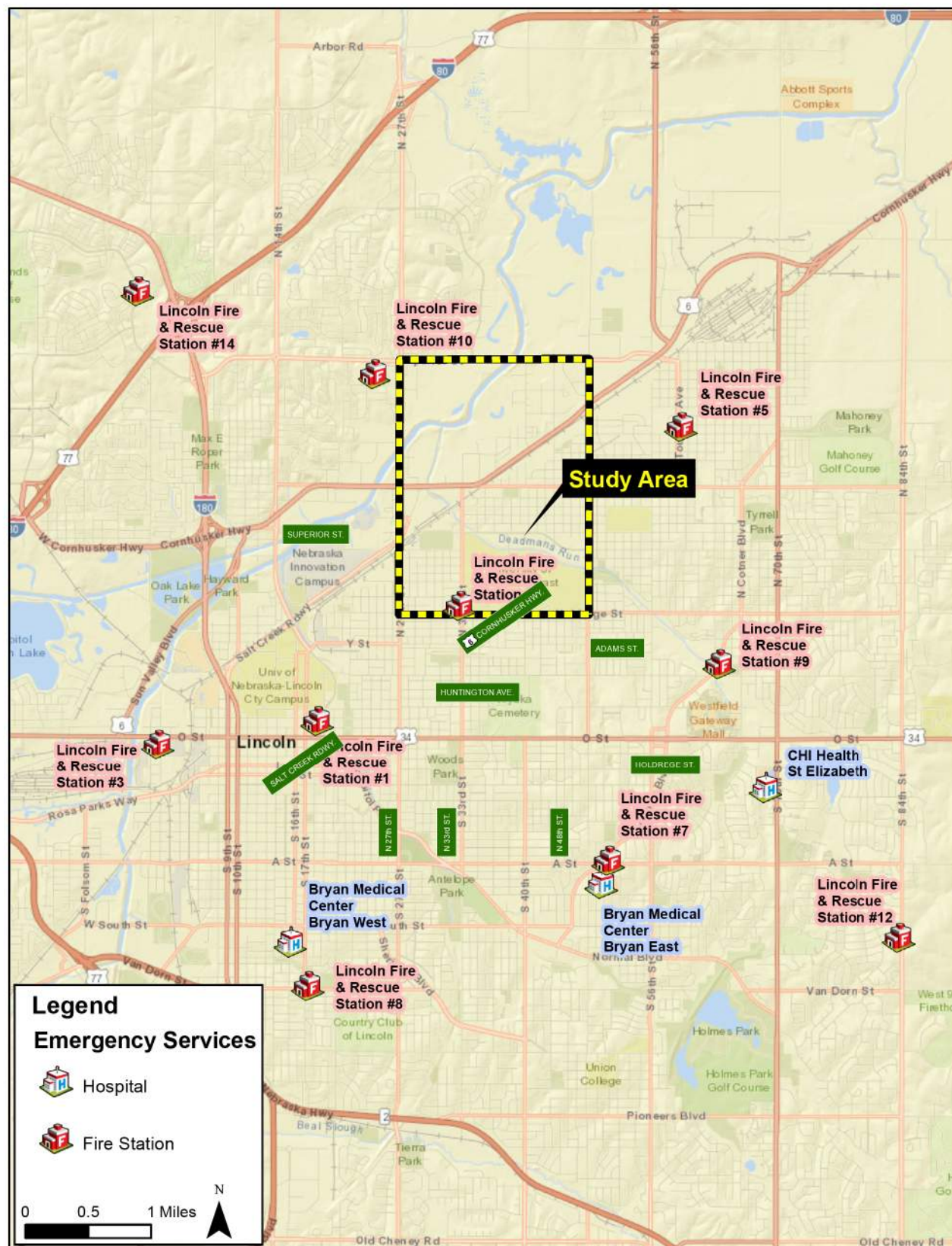
3.2 Major Traffic Generators

Major traffic generators within or immediately adjacent to the study area include the following:

- The UNL East campus between N. 33rd Street and N. 48th Street, Holdrege Street and Huntington Avenue.
- The retail commercial center north of Cornhusker Highway between N. 27th Street and Deadmans Run.
- The retail commercial center along N. 27th Street north of Superior Street.
- The Hansen-Mueller (HM) grain elevator on the south side of Cornhusker Highway between State Fair Park Drive and Deadmans Run.
- Nebraska Innovation Campus (NIC) located on the north side of Salt Creek Roadway west of N. 27th Street, with more than 30,000 trips per day anticipated at full build-out.
- The Nebraska Wesleyan campus between N. 50th Street and N. 56th Street, Huntington Avenue and Madison Avenue.
- University Place business center along N. 48th Street between Walker Avenue and Cleveland Avenue.
- Clinton Elementary School north of Holdrege Street at N. 29th Street.
- Huntington Elementary School south of Adams Street at N. 46th Street.
- Campbell Elementary School south of Superior Street at N. 23rd Street.
- Dawes Middle School north of Fremont Street at N. 52nd Street.

3.3 Emergency Services

Lincoln Fire and Rescue (LFR) Station #2 is located on the west side of N. 33rd Street immediately north of Holdrege Street. Despite being located on N. 33rd Street, when emergency services north of the BNSF Creston Line tracks are required by Station #2, crews avoid utilizing the N. 33rd Street crossing, due to unreliability of the response time. Crews are unable to predict when and how long N. 33rd Street will be impeded, and typically choose one of the grade separated routes to reach their destination. **Figure 4** shows the locations of LFR stations and hospitals within and surrounding the study area.



Depending on the emergency, multiple stations may be required to respond within the study area. In these cases, crews from LFR Station #10, located on N. 24th Street south of Superior Street, and Station #5, located on the corner of Touzalin Avenue & Benton Street, are utilized to respond to emergencies. These stations avoid the at-grade crossings on Adams Street and N. 33rd Street when responding to emergencies, as well, even if it were the most direct route, due to unreliability in response times.

3.4 Data Collection

The data collection effort included updated peak hour turning movement volumes (TMVs). The overall objective with this task was to have all traffic count data be 2018 or newer. The City of Lincoln provided 2018 TMVs for the intersections of N. 27th Street & Holdrege Street, N. 33rd Street & Holdrege, N. 44th Street & Cornhusker, and N. 48th Street & Adams Street. TMVs were collected on Tuesday, April 20, 2019 at the following intersections:

- N. 27th Street & Cornhusker Highway
- N. 27th Street & Theresa Street
- State Fair Park Drive/N. 29th Street & Cornhusker Highway
- N. 33rd Street & Cornhusker Highway
- N. 33rd Street & Huntington Avenue
- N. 35th Street/Adams Street & Cornhusker Highway
- N. 40th Street & Cornhusker Highway
- N. 48th Street & Cornhusker Highway
- N. 48th Street & Leighton Avenue
- N. 48th Street & Holdrege Street

(Average daily traffic) ADTs were estimated for all streets by utilizing a City of Lincoln template for converting TMVs into 24-hour volumes. The template is based on historical count data compiled by the city. Existing Traffic Volumes are illustrated in **Figure 5**. Existing Lane Configuration and Traffic Control are illustrated in **Figure 6**. Existing count data is compiled in **Appendix B**.

3.5 Rail Characteristics

The BNSF Creston Line runs parallel to U.S. Highway 6 between Lincoln and Omaha. Within the study area, the Creston Line is south of Cornhusker Highway. Adams Street, N. 27th Street, N. 33rd Street, N. 44th Street, and N. 48th Street intersect Cornhusker Highway and cross the Creston Line. Adams Street, N. 33rd Street, and N. 44th Street cross the Creston Line at-grade. N. 27th Street and N. 48th Street cross the Creston Line with a grade separated crossing (N. 27th Street overpass, N. 48th Street underpass). **Figure 7** shows the rail crossings within the environmental study area.

LEGEND
AM (PM) Peak Hour Volume

FIGURE 5
Existing
Turning Movement Counts

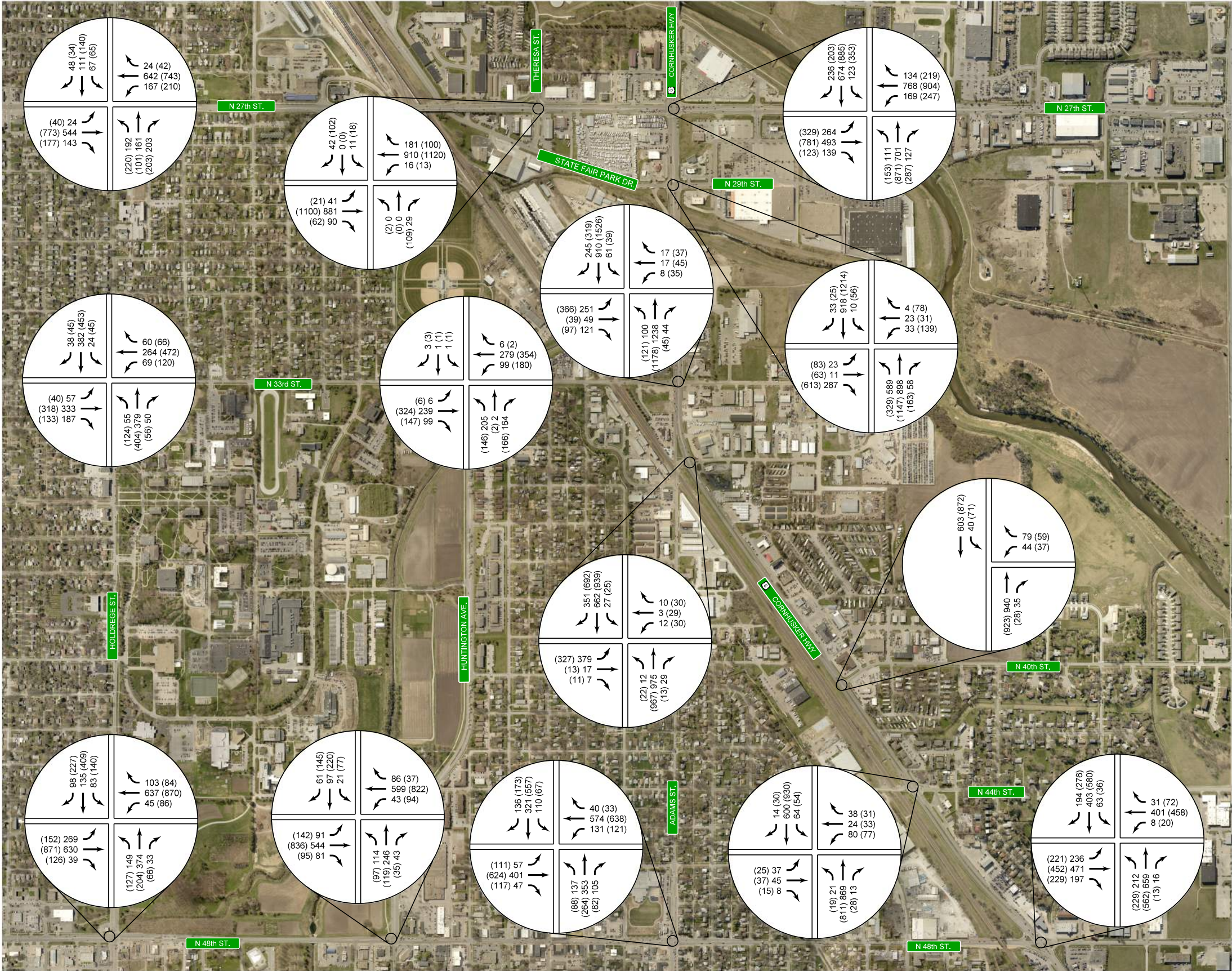


FIGURE 6

Existing Lane Configuration
& Traffic Control



LEGEND

- Existing Signalized Intersection
- Lane Geometry
- Stop Controlled Intersection
- Stop Sign

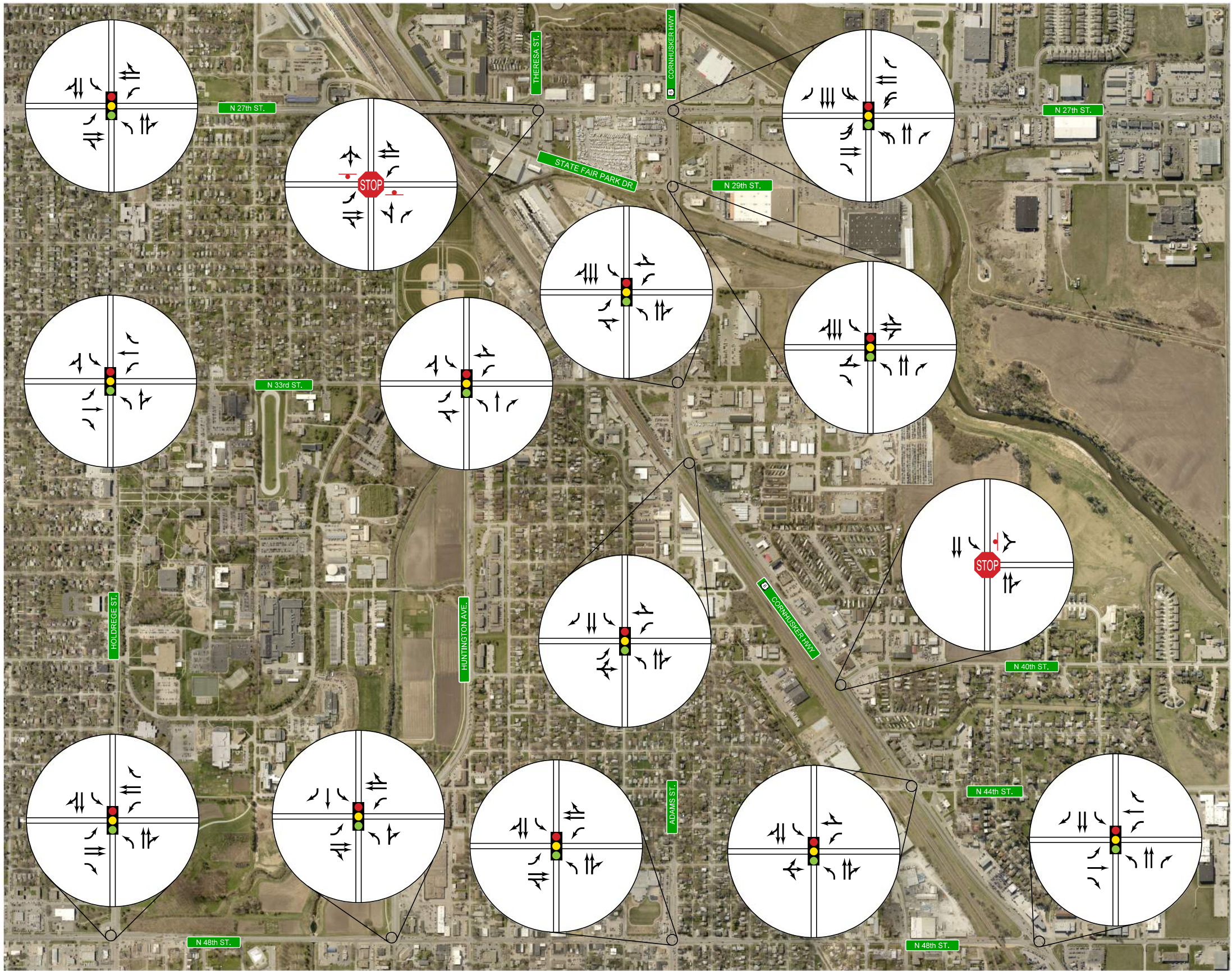


FIGURE 7

Rail Crossings



The BNSF owned Creston Line parallels the south side of Cornhusker Highway through the study area. The Creston Line has two tracks connecting the Hobson Yard in west Lincoln to the Havelock Yard in northeast Lincoln. According to data collected with the PEL study, approximately 65 trains per day pass each crossing with the average train traversing each intersection in under 4 minutes. This is understood to be the most recently provided annual average train count provided formally by BNSF to the RTSD with economy driven high and low spikes throughout the year. Amtrak has operating rights along the Creston Line and as of July 20, 2017 operates two passenger trains along the corridor per day as part of the California Zephyr route. BNSF operates the other 63 trains per day for commercial use.

Exposure factor is the most common indicator of crash potential at an at-grade rail crossing. The exposure factor is calculated by multiplying the number of trains per day by the average number of vehicles per day sharing the crossing. The higher the exposure factor becomes the more opportunities there are for an incident to occur between locomotives and automobiles. **Table 2** summarizes the existing exposure factor for the N. 33rd Street, N. 44th Street, and Adams Street at-grade rail crossings.

Table 2. Existing Exposure Factor

Crossing	Trains/Day	Vehicles/Day	Exposure Factor
N. 33 rd Street	65	10,510	683,150
Adams Street	65	10,573	687,245
N. 44 th Street	65	1,830	118,950

The at-grade crossings of N. 33rd Street and Adams Street are in the top 10 highest predicted number of accidents per year for at-grade rail crossings in the state of Nebraska, according to the Federal Railroad Administration (FRA) Web Accident Prediction System (WBAPS).

3.6 Capacity Analysis

Capacity analyses were performed for the existing study intersections utilizing the existing lane configurations and traffic control. Analyses were conducted using Synchro, Version 10.0 which is based on the Highway Capacity Manual, 6th Edition delay methodologies. For simplicity, the amount of control delay is equated to a grade or Level of Service (LOS) based on thresholds of driver acceptance. The amount of delay is assigned a letter grade A through F, LOS A representing little or no delay and LOS F representing very high delay. **Table 3** shows the delays associated with each LOS grade for signalized and unsignalized intersections, respectively.

Table 3. Intersection LOS Criteria

Level-of-Service	Average Control Delay (seconds)	
	Signalized	Unsignalized
A	≤ 10	≤ 10
B	$> 10-20$	$> 10-15$
C	$> 20-35$	$> 15-25$
D	$> 35-55$	$> 25-35$
E	$> 55-80$	$> 35-50$
F	> 80	> 50
Highway Capacity Manual (HCM, 6 th Ed.)		

Results of the analyses indicate the signalized intersection of State Fair Park Drive/N. 29th Street & Cornhusker Highway operates at LOS E in the PM peak hour. All other intersections operate at LOS D or better in both the AM and PM peak hours. Although most signalized intersections operate at LOS D or better under existing conditions, many individual movements operate near or over capacity at multiple intersections. This leads to increased queue length and higher delay for those specific movements. Individual movements with LOS E or F at signalized intersections include:

- N. 27th Street & Cornhusker Highway
 - WBL (AM/PM)
 - WBT (PM)
 - NBL (AM/PM)
- State Fair Park Drive/N. 29th Street & Cornhusker Highway
 - WBL (AM/PM)
 - NBR (PM)
 - SBL/T/R (PM)
- N. 33rd Street & Cornhusker
 - WBL (AM/PM)
 - NBL (PM)
 - EBT (PM)
- N. 35th Street/Adams Street & Cornhusker Highway
 - NBL/T/R (PM)
 - NBL (PM)
 - SBT/R (AM/PM)
 - SBL (AM/PM)

- N. 44th Street & Cornhusker Highway
 - NBL/T/R (AM)
 - SBL (PM)
- N. 48th Street & Cornhusker Highway
 - WBL (AM/PM)
 - EBL (AM/PM)
 - EBT (PM)
 - SBT (AM)
- N. 48th Street & Adams Street
 - EBT/R (AM/PM)
- N. 48th Street & Leighton Avenue
 - EBL (AM)
- N. 48th Street & Holdrege Street
 - EBT/R (PM)

A summary of each intersection analyzed, summarized by approach, is illustrated in **Figure 8**. All capacity analysis reports are included in **Appendix C**.

In addition to intersection delay, motorists experience delay at rail crossings along N. 33rd Street, N. 44th Street, and Adams Street associated with passing trains. The Synchro model treats each intersection independent of each other and does not account for delay or vehicle progression blockages from the at-grade crossings. Synchro models do not take into account motorists' driving patterns when a crossing is blocked by a train. Drivers are likely to detour during crossing events resulting in different traffic patterns at intersections around these events. The passing trains block the railroad crossings for approximately 15 percent of each day, or about 3.6 hours per day, as determined by the PEL documentation.

FIGURE 8
Existing
Capacity Analysis Summary

LEGEND

AM

PM

Signalized
Intersection
LOS

PM

AM

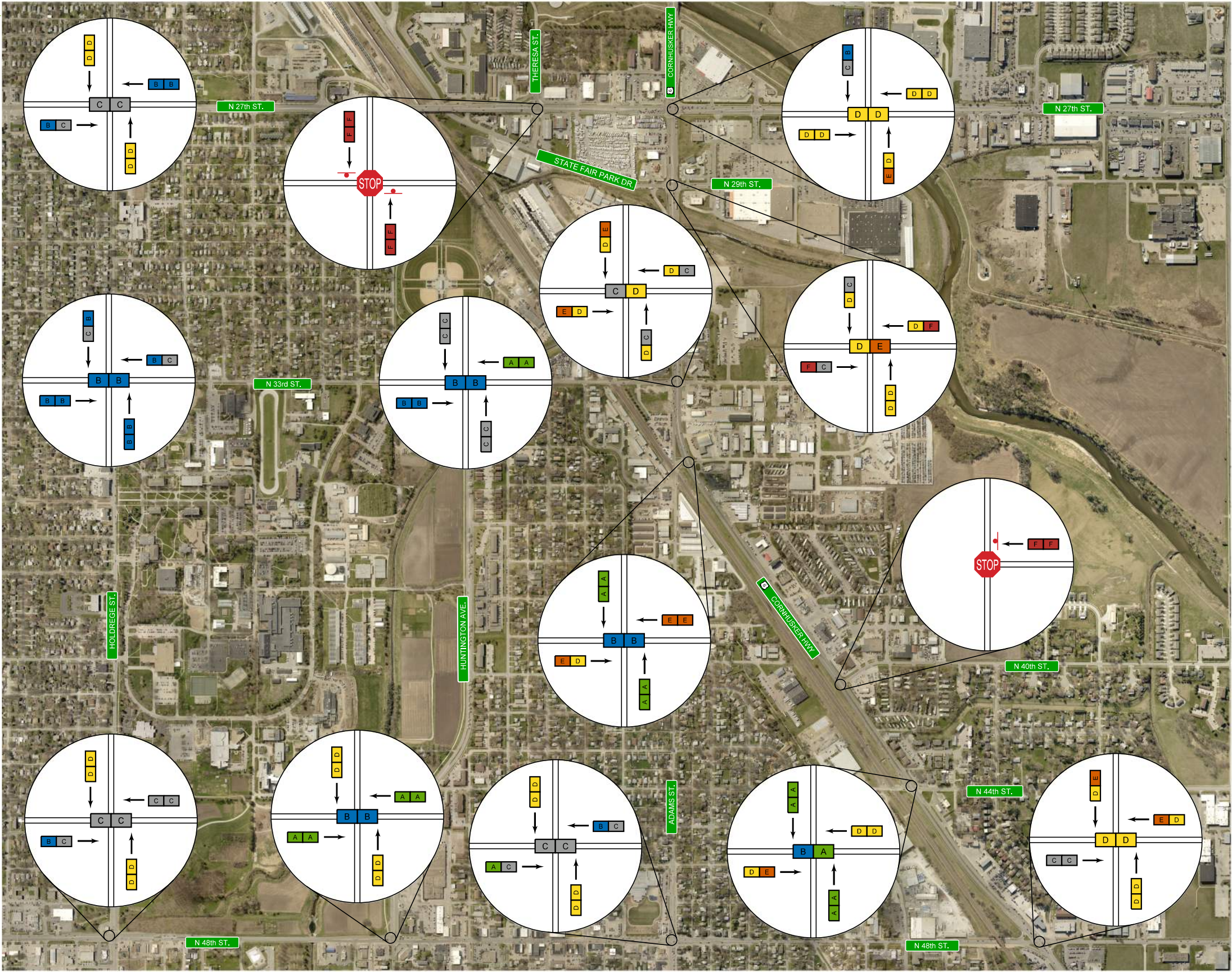
→

Approach LOS

STOP

Stop Controlled
Intersection

Stop Sign



3.7 Safety Analysis

Table 4 lists the crashes involving trains at the BNSF Railway crossings within the study area in the most recent 39-year period (1-1-1980 to 12-31-2018).

Table 4. Train-Involved Crashes (1980-2018)

Crossing	Date	Type of Collision	Severity Fatalities / Injuries	Active Crossing Controls
N. 33rd Street	April 28, 1981	Auto-Train	0/0	Gates, Flashing Lights
	December 15, 1982	Auto-Train	0/0	Gates, Flashing Lights
	March 19, 1985	Auto-Train	2/0	Gates, Flashing Lights
	January 14, 1987	Truck-Train	1/0	Gates, Flashing Lights
	August 16, 1987	Truck-Train	0/1	Gates, Flashing Lights
	November 1, 1996	Auto-Train	0/0	Gates, Flashing Lights
	February 27, 2000	Auto-Train	0/0	Gates, Flashing Lights
	June 23, 2014	Pedestrian-Train	1/0	Gates, Flashing Lights
	November 16, 2018	Auto-Train	0/0	Gates, Flashing Lights
Adams Street	July 9, 1980	Auto-Train	0/0	Flashing Lights
	June 18, 1982	Auto-Train	0/0	Gates, Flashing Lights
	December 26, 1984	Auto-Train	0/0	Gates, Flashing Lights
	February 16, 1989	Auto-Train	2/0	Gates, Flashing Lights
	October 26, 1993	Auto-Train	0/0	Gates, Flashing Lights
	March 26, 1995	Auto-Train	0/0	Gates, Flashing Lights
	June 17, 1995	Auto-Train	0/1	Gates, Flashing Lights
	April 23, 1998	Auto-Train	0/0	Gates, Flashing Lights
	December 5, 1999	Auto-Train	0/0	Gates, Flashing Lights
	October 15, 2017	Auto-Train	0/0	Gates, Flashing Lights
N. 44th Street	None	N/A	N/A	Gates, Flashing Lights

As shown in **Table 4**, Adams Street experienced a total of 10 crashes resulting in two fatalities. The N. 33rd Street crossing experienced nine crashes, resulting in four fatalities. A summary of the train-involved crashes and severity is illustrated in **Table 5**.

Table 5. Train-Involved Crashes at Railroad Crossings (1980-2018)

Crossing	Crashes	Injured	Fatalities
N. 33 rd Street	9	1	4
Adams Street	10	1	2
N. 44 th Street	0	0	0
Total	19	2	6

Of the 19 crashes, nine occurred between the hours of 6:00 a.m. and 6:00 p.m. and 10 occurred between 6:00 p.m. and 6:00 a.m. Freight trains were involved in 16 of the 19 crashes, one crash involved yard switching, and two crashes involved work trains. The average freight train involved in the crash consisted of 97.3 cars and was traveling at an average speed of 32.2 miles per hour (mph).

The City of Lincoln provided comprehensive crash data for the most recent three-year period from January 1, 2016 through December 31, 2018. The safety review focused on identifying safety deficiencies at the 14 study area intersections. The total and type of crashes for each intersection are summarized in **Table 6**. The most common type of crash, rear-end, represents more than 60 percent of the crashes reported at study intersections.

A crash rate per million entering vehicles (MEV) was calculated using the total number of crashes during the three-year period and ADT volumes, as obtained from the most recent count data from the City of Lincoln and TMC counts conducted for this study. A crash rate is a metric used to compare intersections in similar terms despite having different vehicular volumes. **Table 6** provides a breakdown of the crash rates for the study intersections. Turning crashes include any crash involving one or more vehicles making a turn and angle crashes involved both vehicles going through the intersections.

The two highest rate of crashes at intersections in the study area occur at N. 27th Street & Cornhusker Highway and N. 48th Street & Cornhusker Highway. Noticeable trends in crash types and/or direction account for a significant percentage of the total incidents recorded at both intersections.

Table 6. Intersection Crash Summary

Intersection	Angle	Turning	Rear-end	Head-On	Sideswipe (same direction)	Sideswipe (opposite direction)	Backing	Miscellaneous	Total	MEV	Crash Rate (MEV)
N. 27th Street & Cornhusker Highway	11	10	83	0	2	0	2	4	112	63.5	1.76
N. 27th Street & Theresa Street	4	0	4	0	0	0	0	0	8	33.5	0.24
N. 27th Street & Holdrege Street	5	5	34	0	1	0	0	2	47	36.2	1.30
N. 29th Street/ State Fair Park Drive & Cornhusker Highway	5	16	35	0	0	0	0	3	59	45.9	1.28
N. 33rd Street & Cornhusker Highway	2	12	37	0	0	0	2	2	55	44.1	1.25
N. 33rd Street & Huntington Avenue	3	3	3	0	0	0	1	0	10	15.9	0.63
N. 33rd Street & Holdrege Street	3	9	19	0	1	0	0	0	32	28.1	1.14
N. 35th Street/ Adams Street & Cornhusker Highway	1	1	8	0	2	0	1	4	17	36.6	0.46
N. 40th Street & Cornhusker Highway	2	1	6	0	0	0	1	3	13	24.6	0.53
N. 44th Street & Cornhusker Highway	8	4	7	0	3	0	0	9	31	25.5	1.22
N. 48th Street & Cornhusker Highway	1	8	45	0	8	0	1	9	72	39.1	1.84
N. 48th Street & Adams Street	4	5	25	0	1	0	1	2	38	32.8	1.16
N. 48th Street & Leighton Avenue	3	3	16	0	0	0	0	1	23	32.9	0.70
N. 48th Street & Holdrege Street	4	3	32	0	0	0	0	4	43	40.4	1.06

To better summarize the data, the following list shows intersections with particularly high rates of specific crash types or direction listed in descending order by overall crash rate:

- N. 48th Street & Cornhusker Highway (1.84 per MEV)
 - 63 percent of total crashes were rear-end
- N. 27th Street & Cornhusker Highway (1.76 per MEV)
 - 74 percent of total crashes were rear-end
 - 45 percent of rear-end crashes were southbound traffic
- N. 27th Street & Holdrege Street (1.30 per MEV)
 - 72 percent of total crashes were rear-end
 - 50 percent of rear-end crashes were southbound traffic
- State Fair Park Drive/N. 29th Street & Cornhusker Highway (1.28 per MEV)
 - 59 percent of total crashes were rear-end
 - 63 percent of rear-end crashes were westbound traffic
 - 27 percent of total crashes involved turning vehicles
 - 55 percent of turning crashes involved westbound turning movements
- N. 33rd Street & Holdrege Street (1.25 per MEV)
 - 28 percent of total crashes involved turning vehicles
- N. 33rd Street & Cornhusker Highway (1.25 per MEV)
 - 67 percent of total crashes were rear-end
 - 64 percent of rear-end crashes were eastbound traffic
 - 22 percent of total crashes involved turning vehicles
 - 65 percent of turning crashes involved eastbound turning movements
- N. 48th Street & Adams Street (1.16 per MEV)
 - 66 percent of total crashes were rear-end
 - 52 of rear-end crashes were northbound traffic
- N. 48th Street & Holdrege Street (1.06 per MEV)
 - 74 percent of total crashes were rear-end
- N. 48th Street & Leighton Avenue (0.70 per MEV)
 - 70 percent of total crashes were rear-end
- N. 33rd Street & Huntington Avenue (0.63 per MEV)
 - 30 percent of total crashes involved turning vehicles

Although some intersections have high numbers of rear-end crashes, new signal timings were introduced as part of Green Light Lincoln (GL2) Phase 1 for the Cornhusker Highway corridor in 2017 and GL2 Phase 2 for the N. 48th Street corridor in 2018. Under these projects, intersection geometrics and crosswalk distances were measured and utilized to implement proper yellow and all-red timings and new corridor progression timings were implemented which are expected to reduce rear-end crashes. Since these timings were introduced during this analysis period, some trends noted may no longer persist as timings create the proper clearance intervals. Rear-end crashes at the intersections of N. 27th Street and State Fair Park Drive/N. 29th Street with Cornhusker Highway can also be attributed to closely spaced intersections. The distance between these two intersections is approximately 0.15 miles which is less than the desirable distance set by the City of Lincoln Access Management Policy (AMP). A cursory review of the number of rear-end crashes before and after the new signal timings shows little difference at the intersections of N. 27th Street and State Fair Park Drive/N. 29th Street intersections, but a slight reduction in overall rear-end crashes along the rest of Cornhusker Highway. Not enough data after updated timings on N. 48th Street was available to make a final determination on changes to this crash pattern.

As for turning crashes, the intersection of State Fair Park Drive/N. 29th Street & Cornhusker Highway currently serves high numbers of westbound left-turning vehicles heading towards downtown and UNL Innovation Campus. Since the left-turn volume is so high and overcapacity during peak hour traffic, drivers may be more likely to attempt riskier behavior or have more vehicles attempt to advance through the intersection on yellow and all-red time. The westbound left-turn at the intersection currently operates as a protected movement only. A cursory review of before and after updated signal timings, there has been a reduction in westbound left-turn accidents at the intersection, but the sample set is very small.

3.8 Bus System Discussion

StarTran updated their citywide routes to provide more efficient routing and more frequent service on some routes in November of 2016. This adoption of new routes was laid out in the Transportation Development Plan (TDP) which evaluated the service and operations of the system. An alternative during the study of the TDP analyzed a service along Adams Street from N. 20th Street to N. 84th Street. One reason for the service not being adopted was for the uncertainty in travel times when crossing the Adams Street at-grade crossing. The current StarTran routes are illustrated in **Figure 9**.

StarTran has five routes within or adjacent to the study area. Three of the routes cross the BNSF Railway corridor and all three of those use the N. 27th Street overpass or N. 48th Street underpass to avoid unpredictable travel times and delays due to train blockage at N. 33rd Street and Adams Street crossings. Route 49 traverses the study area between N. 33rd Street and Adams Street, but the route cuts through the neighborhood north of Huntington Avenue between N. 33rd Street and N. 48th Street to avoid the at-grade rail crossings.

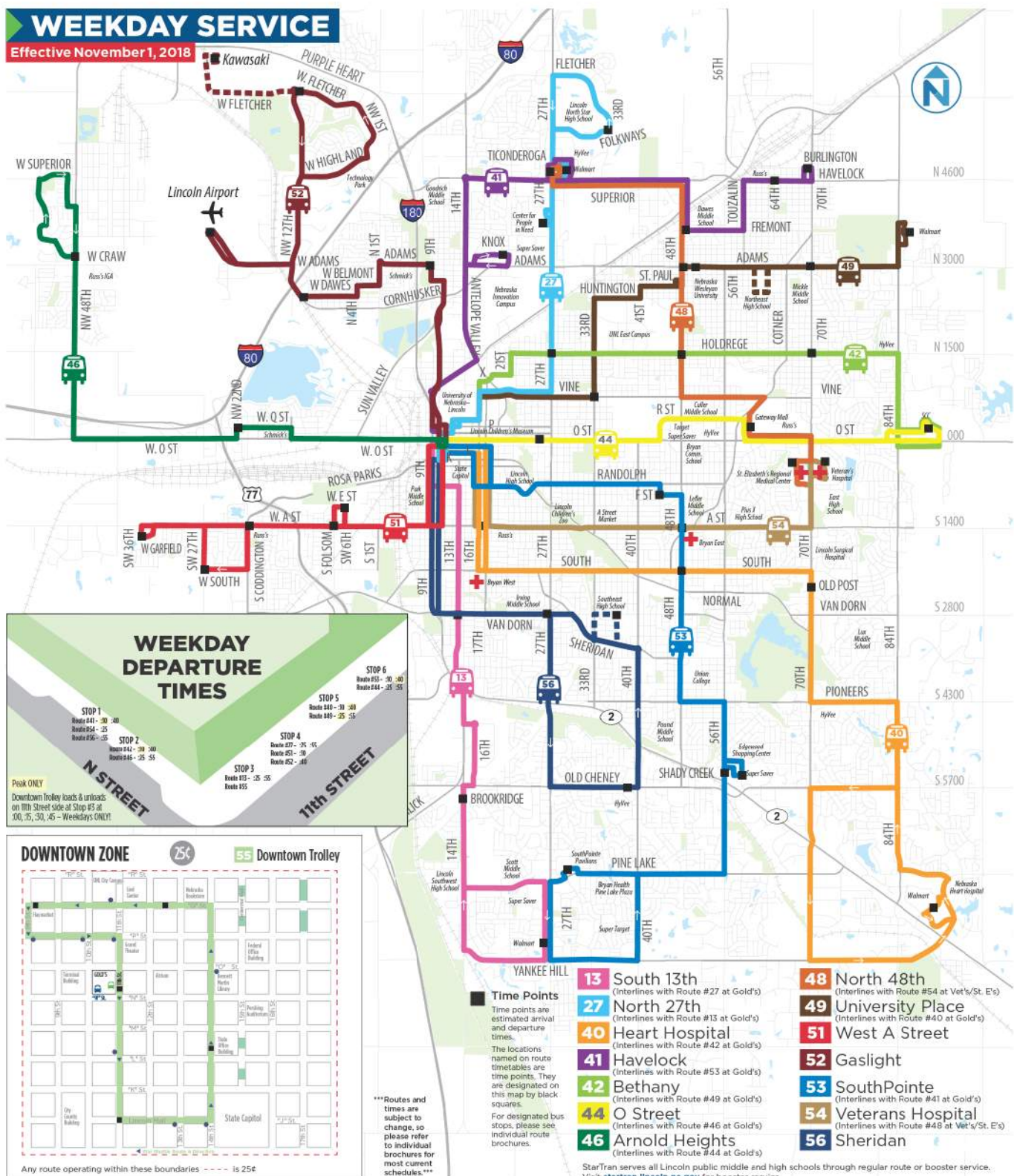
North 33rd and Cornhusker

NEPA and Preliminary Design Phase

www.33rdcornhusker.com

FIGURE 9

StarTran Routes

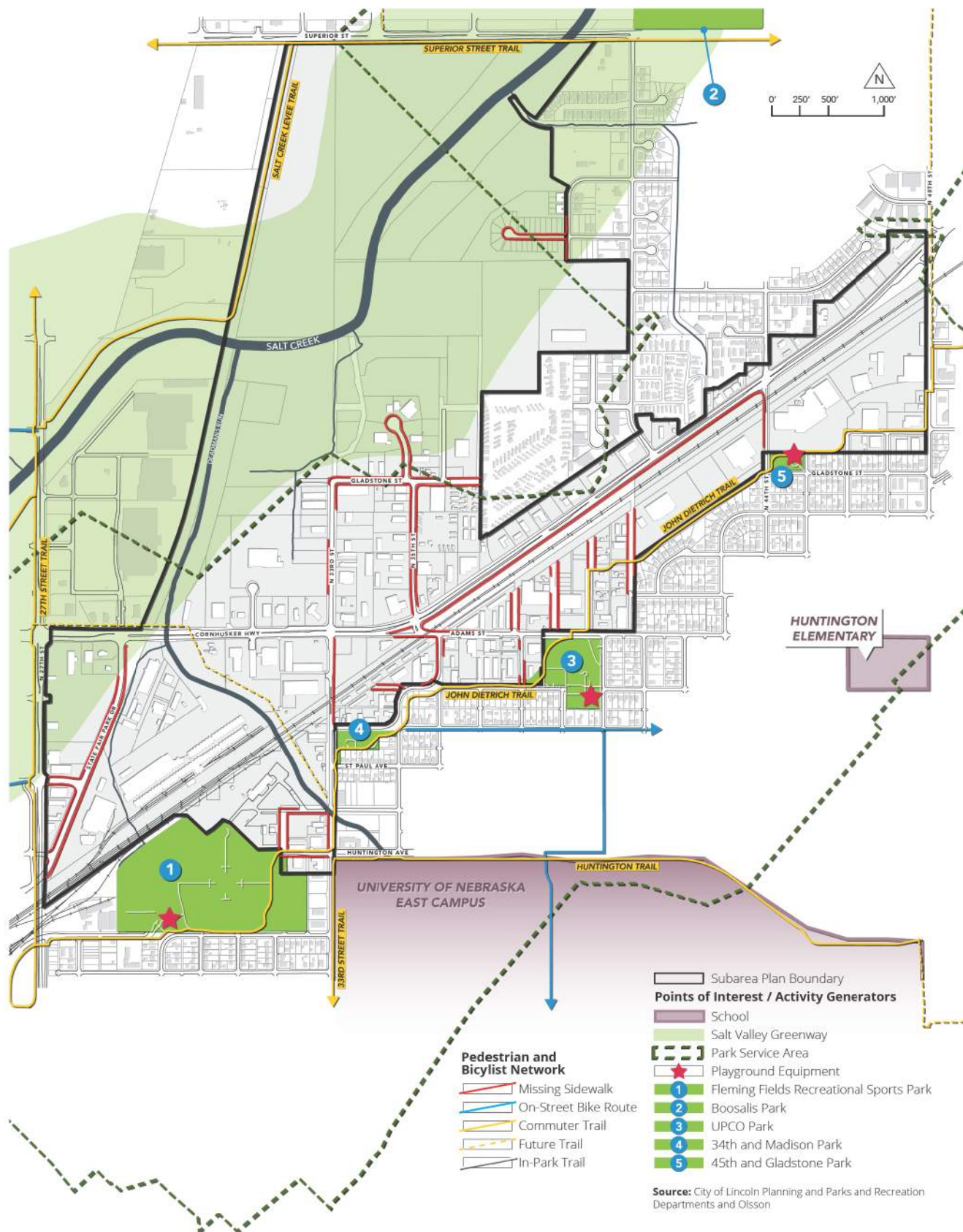


3.9 Trail Network Discussion

The City of Lincoln has an extensive trails network. The trails network provides services to much of the city. The John Dietrich Trail runs through the study area beginning at the Fleming Fields and generally follows the alignment of the BNSF corridor through the residential neighborhood south of the rail corridor. The trail also connects to Upco Park between Cleveland Avenue and Adams Street near N. 39th Street. No trail connections are made across the BNSF corridor linking the neighborhoods on the north side to the south side between N. 27th Street and N. 48th Street. A sidewalk is provided at the at-grade crossing of N. 44th Street on the east side, but gaps in the sidewalk system exist at the Adams Street and N. 33rd Street crossings. Grade separated sidewalks exist on the N. 27th Street overpass and the N. 48th Street underpass. An unnamed paved trail connects to the John Dietrich trail near Fleming Fields and runs along the south side of Huntington Avenue between N. 27th Street and N. 48th Street. A map illustrating the pedestrian and bicycle network is shown in **Figure 10**.

FIGURE 10

Pedestrian and Bicycle Network



4.0 2040 Fiscally Constrained Transportation System

The Lincoln Metropolitan Planning Organization (Lincoln MPO) sets out a 20-year horizon for developing a Long-Range Transportation Plan (LRTP) that acts as a guide for transportation funds that are expected to be available. This process creates a fiscally constrained set of projects anticipated to be funded before the horizon year (2040) to improve the transportation network.

Seven action alternatives (Alternatives 1B, 1D, 1E, 12B, 14, 15A, and Modified PEL C) in addition to the No-Action alternative were modeled on this fiscally constrained network to determine whether each meet the criteria for the RTSD grade separation project and the requirements of the transportation network as a whole. Only four action alternatives have undergone traffic analysis, which involved intersection volume development and capacity analysis, since three alternatives (Alternatives 12B, 14, and 15A) were deemed cost prohibitive.

4.1 Travel Demand Forecasting

The Lincoln MPO travel demand model was used to develop informed transportation planning decisions. Travel demand modeling is a computer model used to estimate travel behavior and travel demand for the 2040 horizon year based on geographic information system (GIS) mapping. The model utilizes the fiscally constrained transportation network to estimate projected daily traffic volumes on streets in the study area based on distinctive characteristics of each alternative. The Travel Volume Forecasts Methodology Memo can be found in **Appendix C**.

These daily volumes are then used to generate AM and PM peak hour intersection volumes. The AM and PM peak hour traffic operations provide a qualitative analysis that can be compared between scenarios. Iterative procedure methodologies for developing intersection turn movement counts are validated in NCHRP 765 and use the percentage of the ADT during peak hours (K factor) from existing counts, the percentage of peak hour travel by direction (D factor), existing traffic counts and future ADT's as data input. The output from this procedure is 2040 intersection turning movement volumes. A summary of K and D factors is summarized at the end of **Appendix B**.

After initial projections were provided by the iterative procedures, final peak hour volumes were adjusted to account for volume balancing between study intersections, minor rounding, priority movement volume checks, and accounting for transportation network changes between alternatives. Iterative calculations are intersection independent and may lead to inaccuracy when transportation network changes are made such as priority routing changes, closing of intersections or intersection leg(s), and bidirectional variances from the travel demand model. Individual movements at intersections were maintained or increased between no-action and action alternatives when projected ADTs were equal or greater in the action alternative. Volumes crossing the railroad corridor were considered the highest priority in the traffic network volume balancing process. After final verification of peak hour volumes crossing the rail corridor, volume balancing occurred along Cornhusker Highway to account for transportation network differences.

such as the addition, removal or modification of access points between action alternatives and the no action roadway network. Finally, starting from Cornhusker Highway and working toward study boundaries, intersection volumes were adjusted to model volume changes experienced by streets and land uses between major intersections in proportion to those in the No-Action Alternative.

Capacity analysis was then conducted using the 2040 peak hour volumes for each alternative in the AM and PM peak hour. Intersection control delay is summarized by LOS categories outlined in previous sections and detailed reports for capacity analysis are provided in **Appendix D**.

4.2 No-Action Alternative

The “No-Action” alternative includes all future committed and funded projects outlined in the 2040 LRTP. It does not include any proposed alternative or solutions to address primary objectives of the RTSD grade separation project.

The current 2040 LRTP lists several major street projects that are identified as needs in the study area including:

- N. 48th Street, between Adams Street and Superior Street: Widening to 4 lanes (2026).
- Cornhusker Highway, between N. 20th Street and N. 33rd Street: Intersection Capacity Improvements (2036).
- N. 33rd Street, between Cornhusker Highway and Superior Street: New 4-lane roadway (Unfunded).

Since the N. 33rd Street connection between Cornhusker Highway and Superior Street is currently unfunded, this link was not considered in the 2040 travel demand model used for projections. **Figure 11** illustrates the 2040 fiscally constrained projects within the study area. 2040 No-Action Alternative Lane Configuration and Traffic Control is illustrated in **Figure 12**. 2040 No-Action Alternative Peak Hour Volumes are illustrated in **Figure 13**.

2040 Fiscally Constrained Projects Map

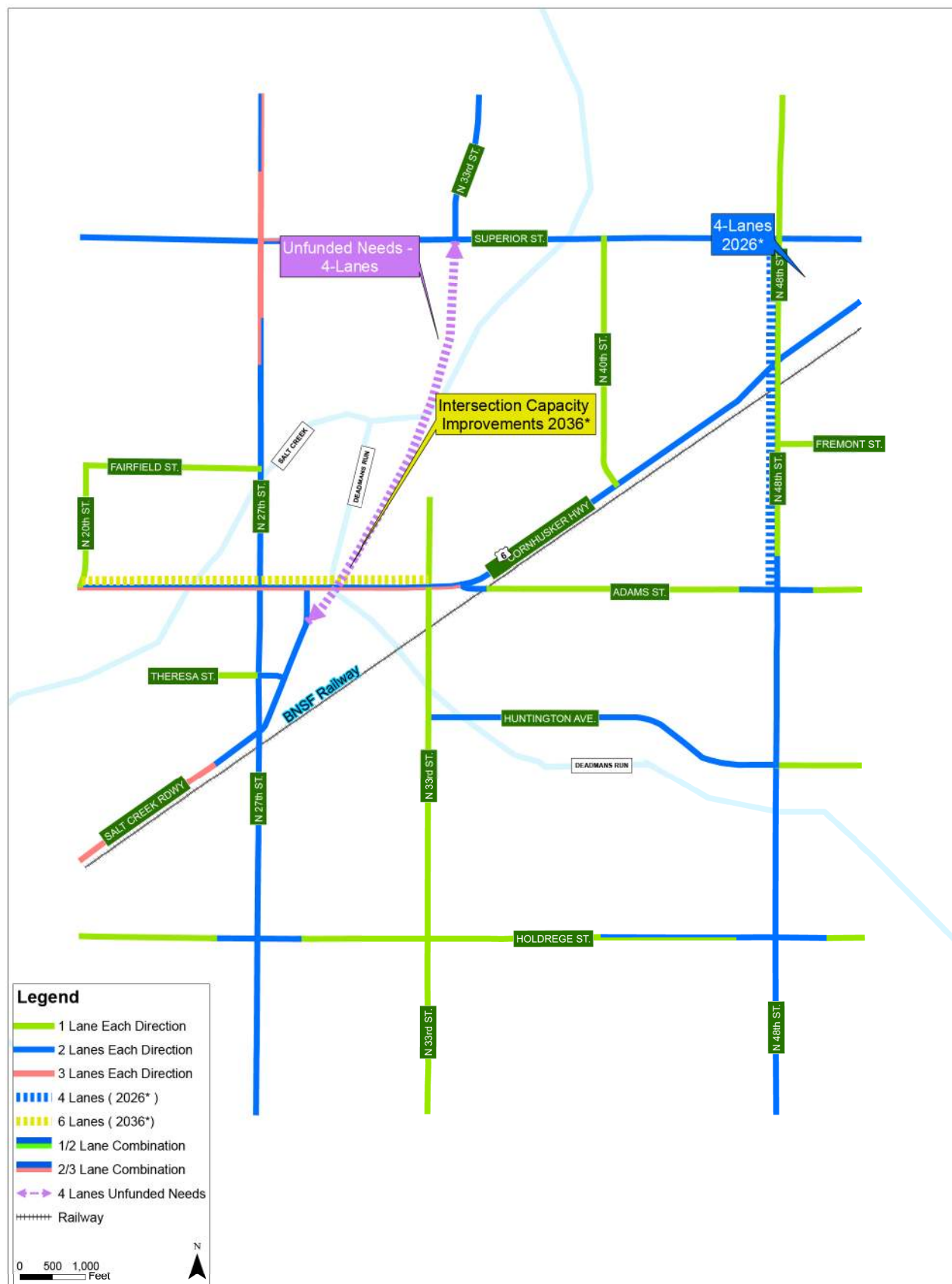


FIGURE 12

2040 No-Action Alternative
Lane Configuration
& Traffic Control



LEGEND

- Existing Signalized Intersection
- Lane Geometry
- Stop Controlled Intersection
- Stop Sign

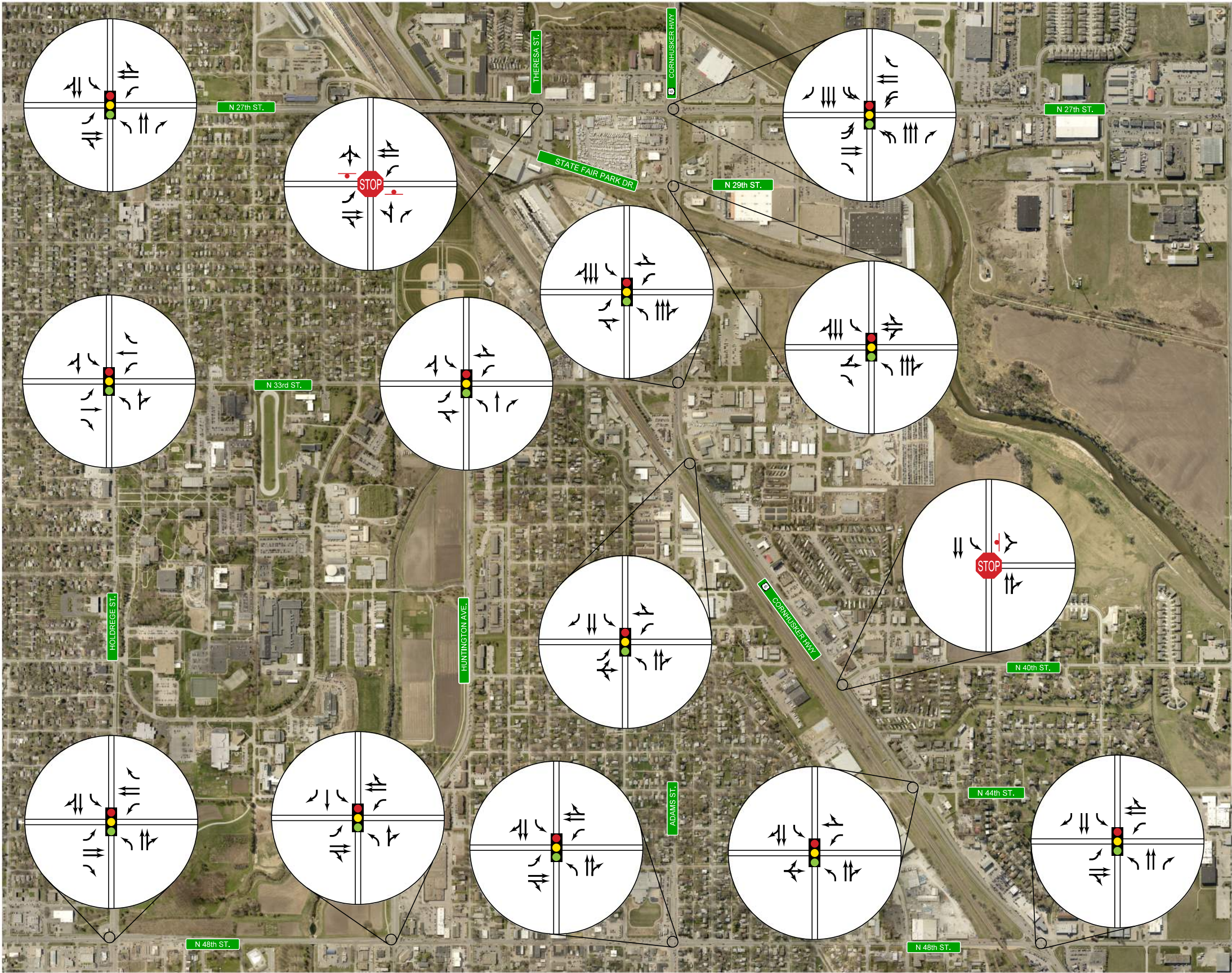
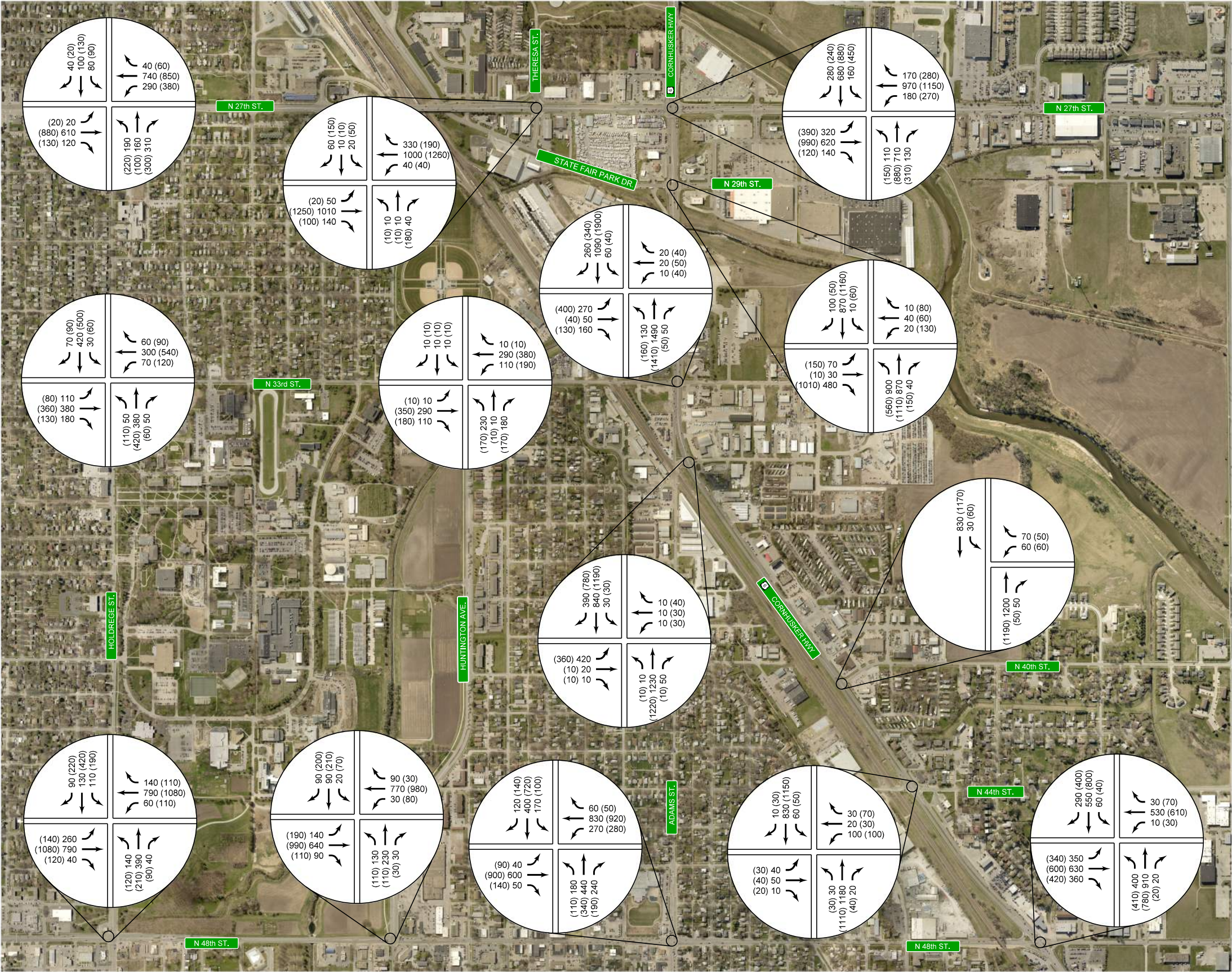


FIGURE 13

2040 No-Action Alternative
Peak Hour Volumes



LEGEND
AM (PM) Peak Hour Volume



When evaluating the network operations, some assumptions were made involving signal timing and coordination. Based on Synchro files provided by the City of Lincoln, all intersections in the study area currently utilize a 120 second cycle or a 60 second half cycle length in both the AM and PM peak hour. Multiple cycle lengths were evaluated for both peak hours. A 140 second cycle length in the PM peak hour provides potential benefits for progression along Cornhusker Highway. Since this evaluation is based on the study area only, 140 second cycle length was assumed for analysis. The impacts of a 140 second cycle length was not analyzed outside the study area. Some timing practices from the GL2 on the Cornhusker Highway and N. 48th Street corridors were included in this analysis, such as violating pedestrian minimum times at certain intersections to improve signal operations (may disrupt corridor progressions), left-turn phasing (protected lefts for sight distance restrictions), and clearance intervals. 2040 No-Action Alternative capacity analysis is illustrated in **Figure 14**. All capacity analysis reports are included in **Appendix D**.

The 2040 No-Action Alternative is used as a baseline comparison for all other action alternatives. Some things to note for further comparison include that the following intersections are expected to be at or over capacity in the designated peak hours:

- N. 27th Street & Cornhusker Highway (PM)
- State Fair Park Drive/N. 29th Street & Cornhusker Highway (AM/PM)
- N. 33rd Street & Cornhusker Highway (PM)
- N. 48th Street & Cornhusker Highway (AM/PM)

4.3 Alternative 1B

Alternative 1B includes all the projects and geometric modifications assumed for the 2040 No-Action alternative along with the following modifications which are incorporated in all four action alternatives:

- A reconfigured N. 33rd Street alignment, with grade separated railroad crossing, starting from Huntington Avenue and tying into Cornhusker Highway with a T-intersection approximately where N. 31st Street exists today.
- Modify State Fair Park Drive/N. 29th Street & Cornhusker Highway to accommodate dual westbound left-turn lanes.
- The southbound approach geometry at State Fair Park Drive/N. 29th Street & Cornhusker Highway would be modified to an exclusive left-turn lane and a shared thru/right-turn lane to separate left-turn vehicles at the intersection.
- The N. 44th Street at-grade crossing would be closed and N. 44th Street would become a local street terminating south of the old crossing with no direct connection to Cornhusker Highway from the south
 - N. 44th Street would become a T-intersection without a south leg

FIGURE 14

2040 No-Action Alternative
Capacity Analysis Summary



LEGEND

AM

PM

Signalized
Intersection
LOS

PM

AM

→

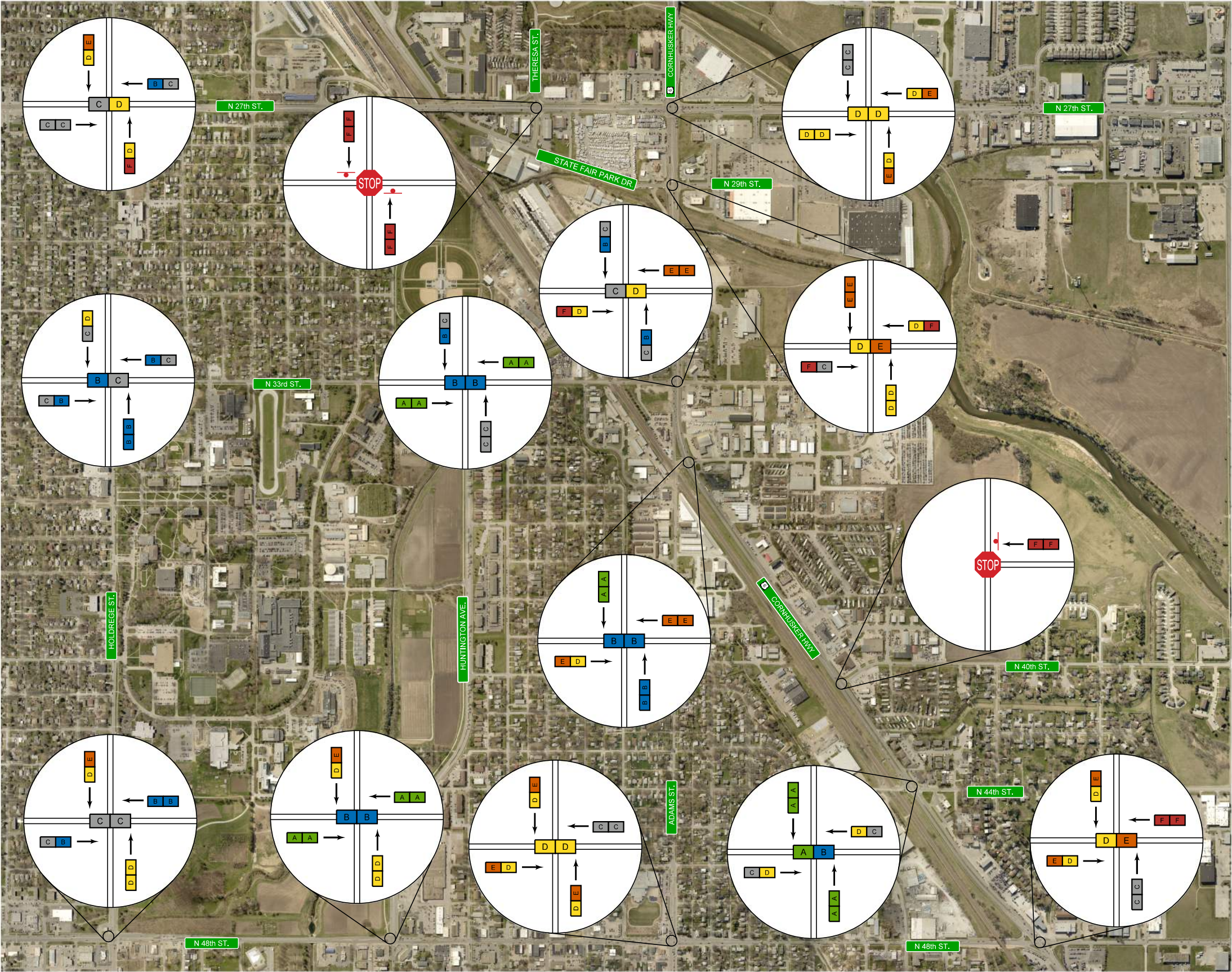
Approach LOS

STOP

Stop Controlled
Intersection

⬇

Stop Sign



Modifications unique to Alternative 1B are:

- The Adams Street at-grade rail crossing would be closed and Adams Street would become a local street terminating east of the old crossing with no direct connection to Cornhusker Highway.
 - N. 35th Street would become a T-intersection without a south leg

2040 Alternative 1B Peak Hour Volumes are illustrated in **Figure 15**. **Figure 16** is an illustration of traffic LOS to aid in comparisons. 2040 Alternative 1B capacity analysis is illustrated in **Figure 17**. **Table 7** summarizes a comparison of intersection LOS for No-Action Alternative and Alternative 1B for signalized intersections and roundabouts.

Table 7. Alternative 1B Intersection LOS Comparison

LOS Comparison				
Intersection	No Action		1B	
	AM	PM	AM	PM
N. 27th Street & Cornhusker Highway	D	D	D	D
N. 27th Street & Holdrege Street	C	D	C	D
N. 29th Street/State Fair Park Drive & Cornhusker Highway	D	E	D	E
N. 31st Street & Cornhusker Highway*	N/A	N/A	B	B
N. 33rd Street & Cornhusker Highway	C	D	N/A	N/A
N. 33rd Street & Huntington Avenue	B	B	A	A
N. 33rd Street & Holdrege Street	B	C	B	C
N. 35th Street & Cornhusker Highway	B	B	A	A
N. 44th Street & Cornhusker Highway	A	A	A	A
N. 48th Street & Cornhusker Highway	D	E	E	E
N. 48th Street & Adams Street	D	D	B	B
N. 48th Street & Leighton Avenue	B	B	C**	C**
N. 48th Street & Holdrege Street	C	C	C	C

*N. 31st Street & Cornhusker is the intersection from the new extension of N. 33rd Street

**Note: Acceptable planning level operations for major intersections is LOS D or better from Lincoln MPO

LEGEND
AM (PM) Peak Hour Volume

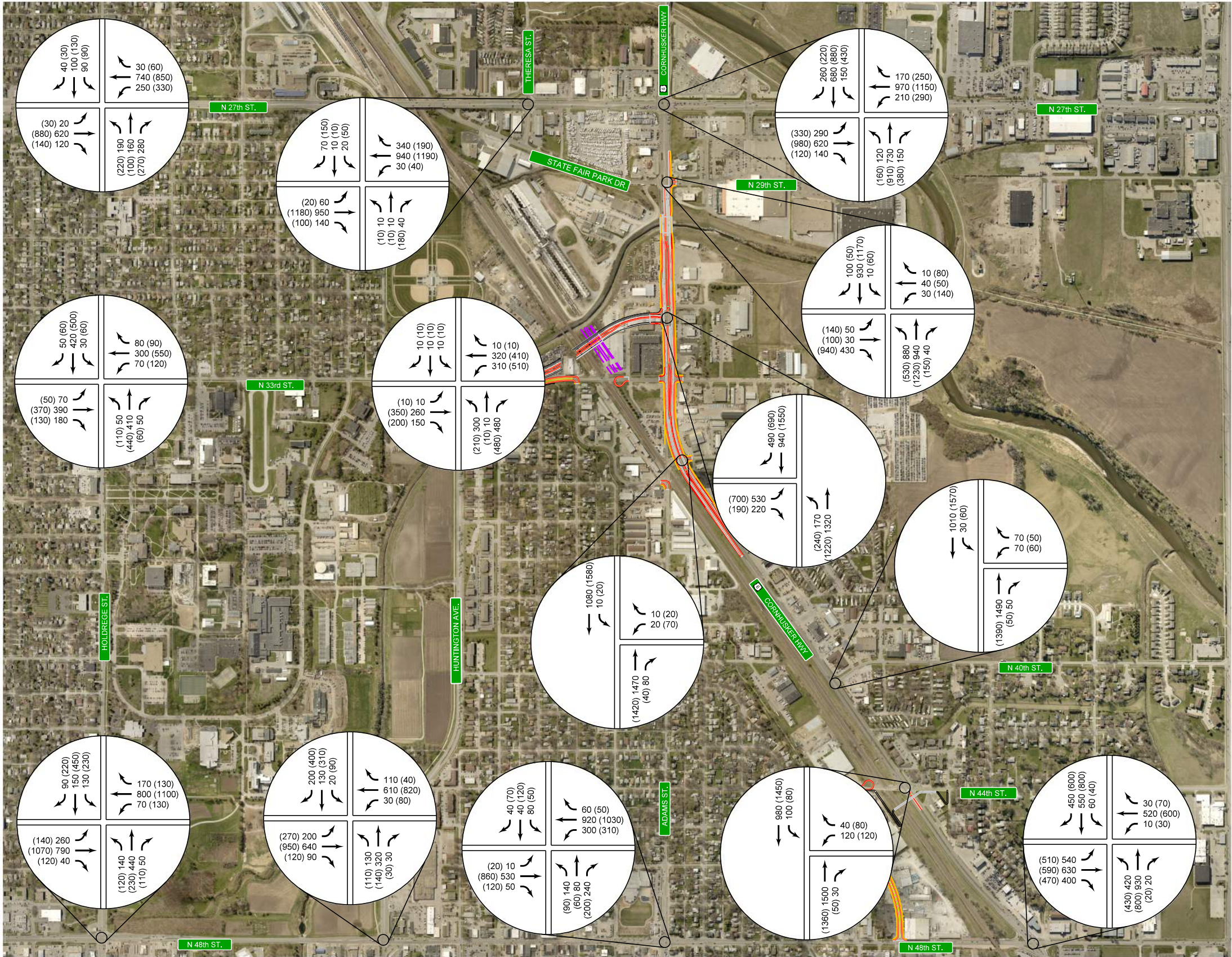


FIGURE 15

2040 Alternative 1B
Peak Hour Volumes



FIGURE 16

LOS Illustration

Traffic Signal Level of Service

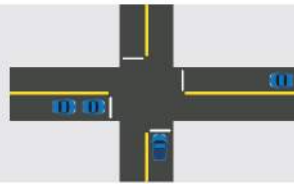
A

- Highly stable, free-flow condition with little or no congestion
- No vehicle waits longer than one signal indication
- Delay: <10 seconds/vehicle



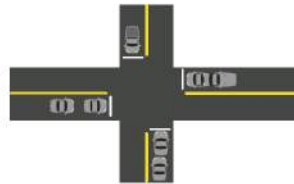
B

- Stable, free-flow condition with little congestion
- On rare occasions vehicles wait through more than one signal indication
- Delay: 10 to 20 seconds/vehicle



C

- Free-flow conditions with moderate congestion
- Intermittently vehicles wait through more than one signal indication and occasional backups may develop
- Delay: 20 to 35 seconds/vehicle



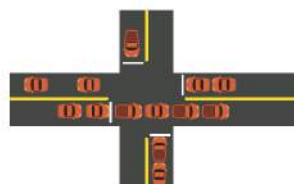
D

- Approaching unstable condition with increasing congestion but without excessive backups
- Level of service D has historically been regarded as a desirable design in urban areas
- Delay: 35 to 55 seconds/vehicle



E

- Unstable, congested condition
- Very long queues may create lengthy delays
- Delay: 55 to 80 seconds/vehicle



F

- Stop and go
- Backups from locations downstream restrict or prevent movement of vehicles out of approach creating "gridlock" condition
- Delay: >80 seconds/vehicle



Roundabout Level of Service

A

- Highly stable, free-flow condition with little or no congestion
- Delay: <10 seconds/vehicle



B

- Stable, free-flow condition with little congestion
- Delay: 10 to 15 seconds/vehicle



C

- Free-flow conditions with moderate congestion
- Occasional backups may develop
- Delay: 15 to 25 seconds/vehicle



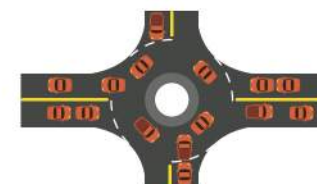
D

- Approaching unstable condition with increasing congestion but without excessive backups
- Level of service D has historically been regarded as a desirable design in urban areas
- Delay: 25 to 35 seconds/vehicle



E

- Unstable, congested condition
- Very long queues may create lengthy delays
- Delay: 35 to 50 seconds/vehicle



F

- Stop and go
- Backups from locations downstream restrict or prevent movement of vehicles out of approach creating "gridlock" condition
- Delay: >50 seconds/vehicle



LEVEL OF SERVICE

- Quantitative measure of traffic operational conditions
- Related to the amount of traffic demand at a given time as compared to the capacity of that type of roadway section.

Six levels of service are defined for each type of roadway section and are given letter designations from A to F.

A = Good

F = Unsatisfactory

LEGEND

AM

PM

Signalized
Intersection
LOS

PM

AM

→

Approach LOS

STOP

Stop Controlled
Intersection

⬮

Stop Sign

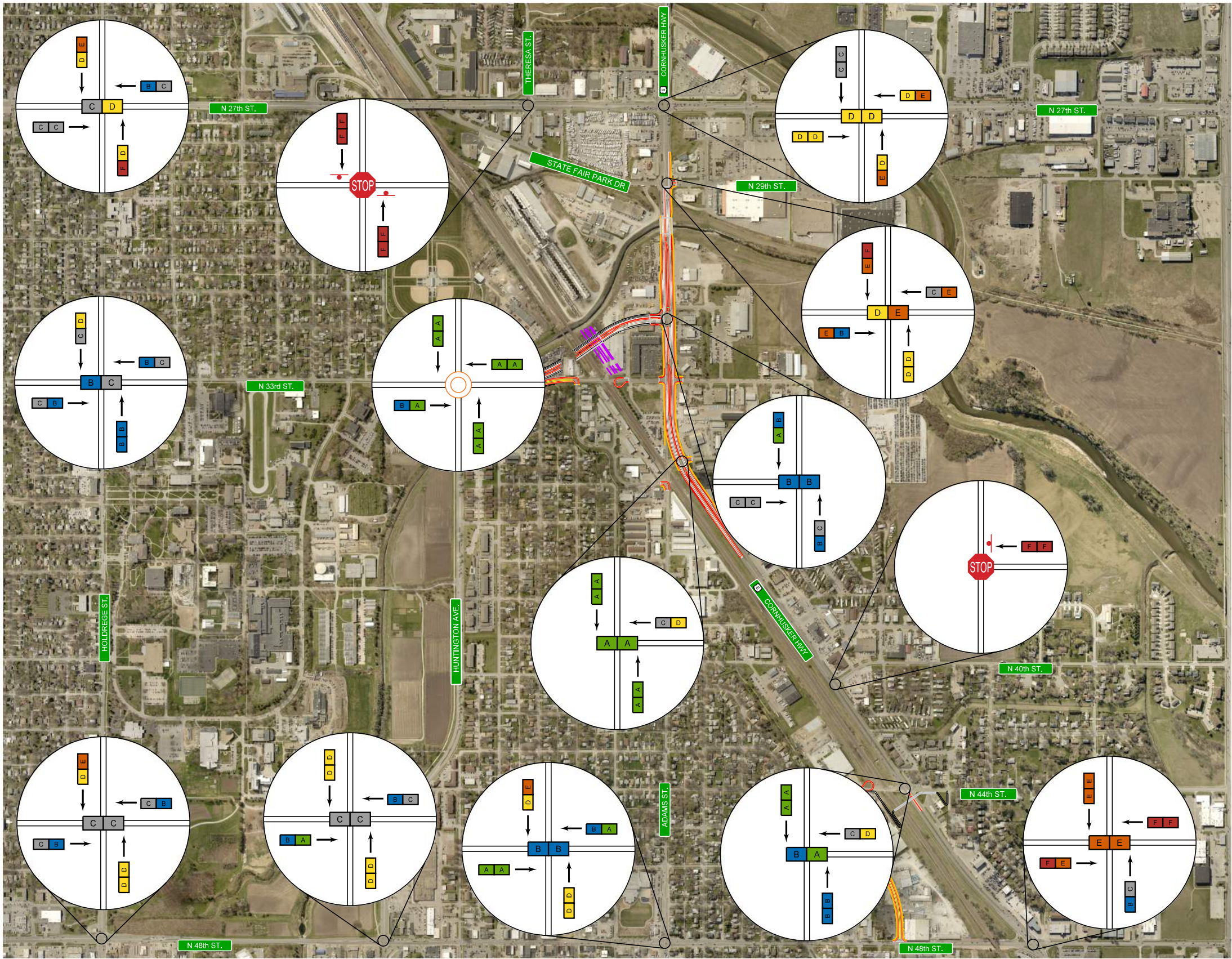


FIGURE 17
2040 Alternative 1B
Capacity Analysis Summary

Closing the Adams Street crossing and not providing a direct link to Cornhusker Highway increases the traffic demand on N. 48th Street to Cornhusker Highway, as well as, Huntington Avenue to N. 33rd Street. Although Huntington Avenue has sufficient lanes to provide extra capacity, N. 48th Street is expected to carry significant volume for a four-lane section in the No-Action Alternative. Increasing traffic along N. 48th Street to the intersection of Cornhusker Highway also increases expected traffic volumes on a priority movement that is over capacity (northbound left-turn). A separate study for the City of Lincoln is identifying the proper approach to solve issues at this intersection, but the grade-separated crossing south of the intersection has been identified as a limiting factor to those solutions. Considering the impacts this additional traffic demand will have on that intersection, a reduction in the overall LOS in the AM peak hour, and the importance of the operations of the intersection to local transportation network, Alternative 1B may not be considered an acceptable alternative due to traffic operations and physical constraints at the 48th & Cornhusker intersection.

Huntington Avenue/Leighton Avenue is expected to carry significantly higher volumes in Alternative 1B. This traffic is expected to develop from users that would have used Adams Street under the No-Action Alternative and have rerouted accordingly. This change increases expected volumes at the intersection of N. 48th Street & Leighton Avenue. The AM and PM peak hours are expected to go from LOS B to LOS C from the No-Action Alternative to Alternative 1B in both the AM and PM peak hour. Despite the overall reduction in LOS, this intersection still operates at an acceptable planning LOS. When evaluating the transportation network and whether an alternative degrades operations and creates a new problem, the operations at the intersection of N. 48th Street & Leighton Avenue would not be considered unacceptable.

4.4 Alternative 1D

Alternative 1D includes all the projects and geometric modifications assumed for the 2040 No-Action alternative and also the following modifications which are incorporated in all four action alternatives:

- A reconfigured N. 33rd Street alignment, with grade separated railroad crossing, starting from Huntington Avenue and tying into Cornhusker Highway with a T-intersection approximately where N. 31st Street exists today.
- Widen the median at State Fair Park Drive/N. 29th Street & Cornhusker Highway to accommodate dual westbound left-turn lanes.
- The southbound approach geometry at State Fair Park Drive/N. 29th Street & Cornhusker Highway would be modified to an exclusive left-turn lane and a shared thru/right-turn lane to separate out left-turn vehicles at the intersection.

- The N. 44th Street at-grade crossing would be closed and N. 44th Street would become a local street terminating south of the old crossing with no direct connection to Cornhusker Highway from the south
 - N. 44th Street would become a T-intersection without a south leg

Modification unique to Alternative 1D:

- A reconfigured Adams Street alignment, with grade separated railroad crossing, starting from approximately N. 44th Street, curving up and over the railroad and Cornhusker Highway, and tying into N. 40th Street before the intersection of N. 40th Street & Cornhusker Highway.
 - N. 40th Street & Cornhusker Highway was analyzed as a signalized intersection.
 - The southbound approach was analyzed as an exclusive left-turn lane and a right-turn lane.

2040 Alternative 1D Peak Hour Volumes are illustrated in **Figure 18**. 2040 Alternative 1D capacity analysis is illustrated in **Figure 19**. **Table 8** summarizes a comparison of intersection LOS for No-Action Alternative and Alternative 1D for signalized intersections and roundabouts.

AM (PM) Peak Hour Volume

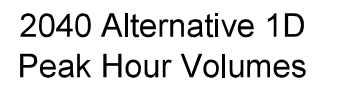


FIGURE 19
2040 Alternative 1D
Capacity Analysis Summary

LEGEND

AM

PM

Signalized
Intersection
LOS

PM

AM

→

Approach
LOS

STOP

Stop
Controlled
Intersection

⬇

Stop
Sign

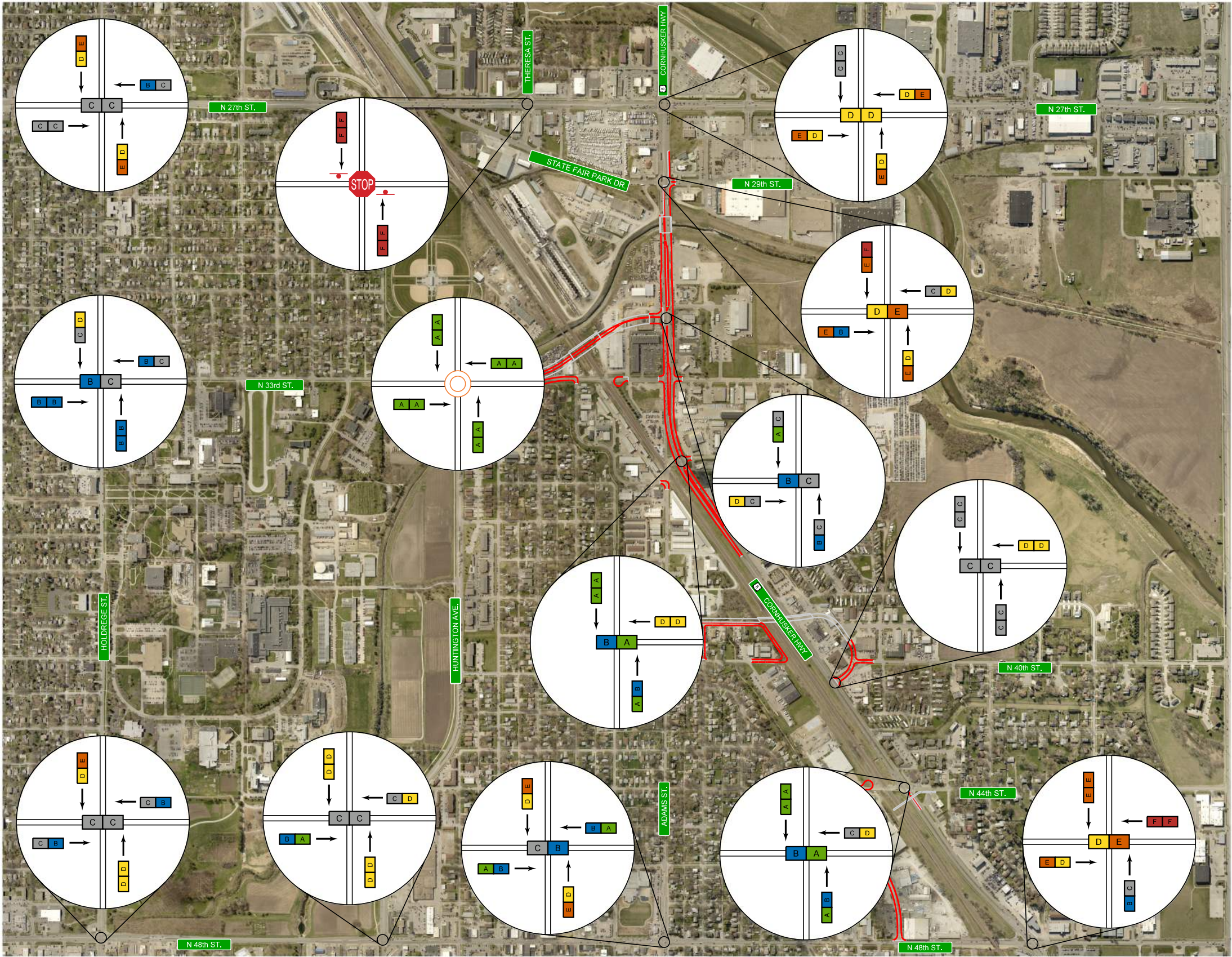


Table 8. Alternative 1D Intersection LOS Comparison

LOS Comparison				
Intersection	No Action		1D	
	AM	PM	AM	PM
N. 27th Street & Cornhusker Highway	D	D	D	D
N. 27th Street & Holdrege Street	C	D	C	C
N. 29th Street/State Fair Park Drive & Cornhusker Highway	D	E	D	E
N. 31st Street & Cornhusker Highway*	N/A	N/A	B	C
N. 33rd Street & Cornhusker Highway	C	D	N/A	N/A
N. 33rd Street & Huntington Avenue	B	B	A	A
N. 33rd Street & Holdrege Street	B	C	B	C
N. 35th Street & Cornhusker Highway	B	B	B	A
N. 40th Street & Cornhusker Highway	N/A	N/A	C	C
N. 44th Street & Cornhusker Highway	A	A	B**	A
N. 48th Street & Cornhusker Highway	D	E	D	E
N. 48th Street & Adams Street	D	D	C	B
N. 48th Street & Leighton Avenue	B	B	C**	C**
N. 48th Street & Holdrege Street	C	C	C	C

*N. 31st Street & Cornhusker is the intersection from the new extension of N. 33rd Street

**Note: Acceptable planning level operations for major intersections is LOS D or better from Lincoln MPO

Results of the capacity analysis indicate that the eastbound left-turn at N. 40th Street & Cornhusker Highway is expected to operate at LOS E in the PM peak hour. Despite overall intersection operations at this intersection operating at LOS C, an acceptable overall planning level LOS, this would be the priority movement for Adams Street traffic.

Alternative 1D also puts more traffic onto N. 48th Street when compared to the No-Action Alternative and increases traffic volumes and expected delay for the northbound left-turn at the intersection of N. 48th Street & Cornhusker Highway. The intersection LOS is expected to stay the same as the No-Action Alternative. Considerations should be given to Alternative 1D on whether or not it meets desirable traffic operations when selecting a preferred alternative. Alternative 1B, Alternative 1D is expected to increase traffic volumes along Huntington Avenue/Leighton Avenue and the intersection of N. 48th Street & Leighton Avenue. The intersection of N. 48th Street & Leighton Avenue is expected to go from LOS B to LOS C from the No-Action Alternative to Alternative 1D in both the AM and PM peak hour. The Alternative 1D operations are expected to be acceptable at the planning level and are not expected to rule out the alternative because of this intersection. The intersection of N. 44th Street & Cornhusker Highway is expected to go from LOS A to LOS B in the AM peak hour and is also not expected to be considered unacceptable for the alternative analysis.

4.5 Alternative 1E

Alternative 1E includes all the projects and geometric modifications assumed for the 2040 No-Action alternative and also the following modifications which are incorporated in all four action alternatives:

- A reconfigured N. 33rd Street alignment, with grade separated railroad crossing, starting from Huntington Avenue and tying into Cornhusker Highway approximately where N. 31st Street exists today.
- Widen the median at State Fair Park Drive/N. 29th Street & Cornhusker Highway to accommodate dual westbound left-turn lanes.
- The southbound approach geometry at State Fair Park Drive/N. 29th Street & Cornhusker Highway would be modified to an exclusive left-turn lane and a shared thru/right-turn lane to separate out left-turn vehicles at the intersection.
- The N. 44th Street at-grade crossing would be closed and N. 44th Street would become a local street terminating south of the old crossing with no direct connection to Cornhusker Highway from the south
 - N. 44th Street would become a T-intersection without a south leg

Modifications unique to Alternative 1E:

- A reconfigured Adams Street alignment, with grade separated railroad crossing, starting from approximately N. 44th Street, curving up and over the railroad tying into an extension of N. 33rd Street realignment north of Cornhusker Highway.
 - As noted, the newly aligned intersection of N. 33rd Street & Cornhusker Highway would be four leg intersection.

2040 Alternative 1E Peak Hour Volumes are illustrated in **Figure 20**. 2040 Alternative 1E capacity analysis is illustrated in **Figure 21**. **Table 9** summarizes a comparison of intersection LOS for No-Action Alternative and Alternative 1E for signalized intersections and roundabouts.

FIGURE 20

2040 Alternative 1E
Peak Hour Volumes



LEGEND
AM (PM) Peak Hour Volume

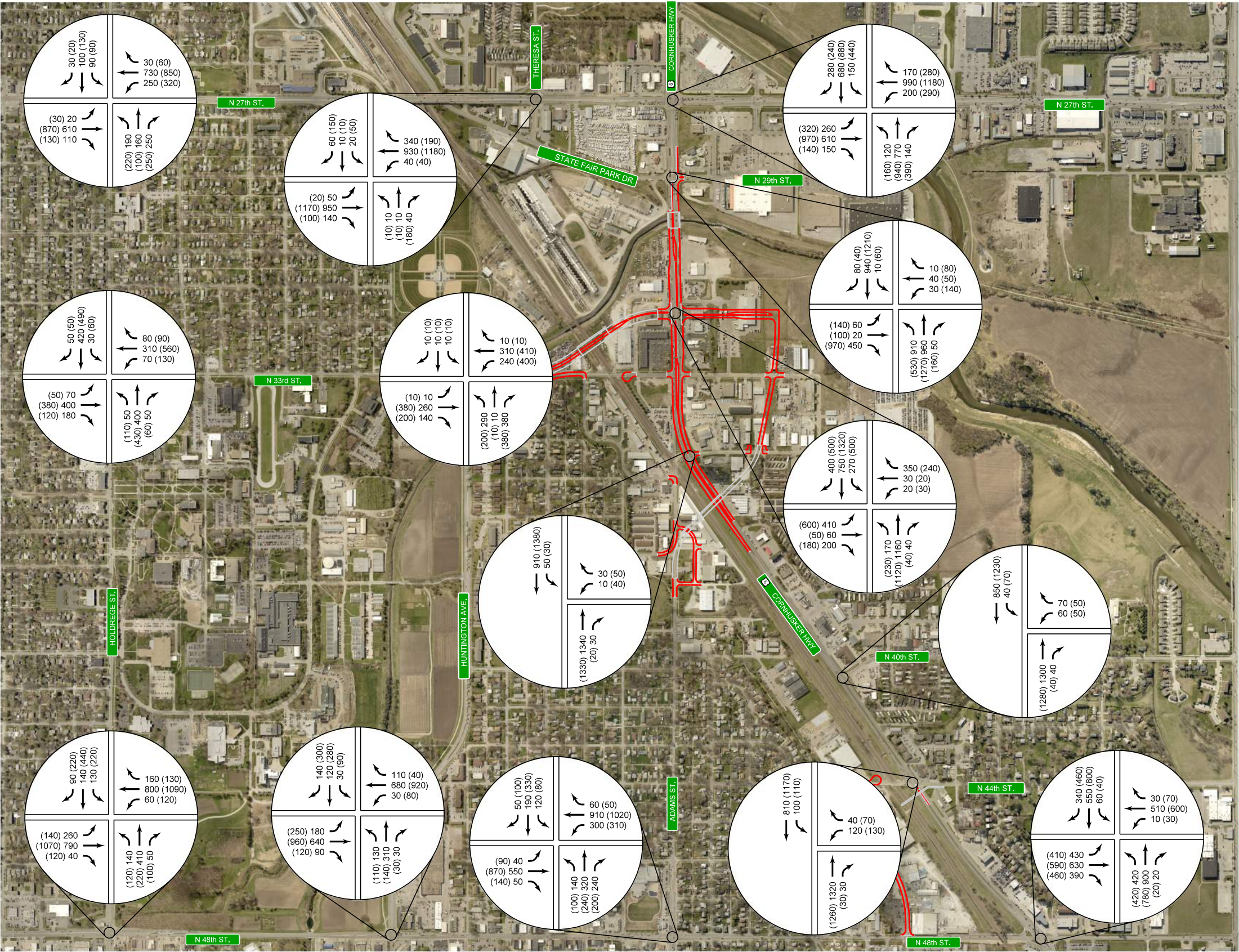


FIGURE 21

2040 Alternative 1E
Capacity Analysis Summary



LEGEND

AM PM Signalized Intersection LOS

PM AM Approach LOS

STOP Stop Controlled Intersection

Stop Sign

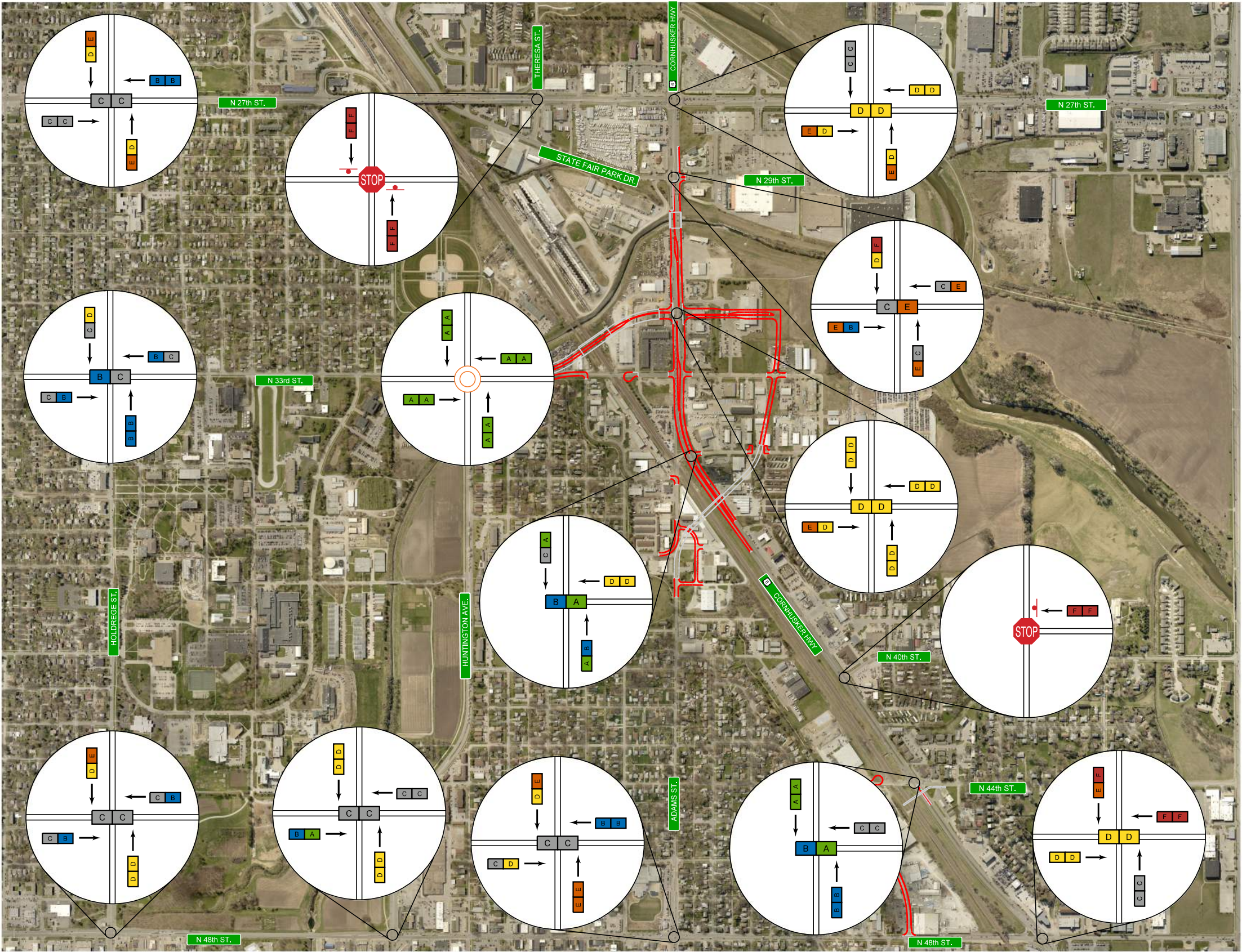


Table 9. Alternative 1E Intersection LOS Comparison

LOS Comparison				
Intersection	No Action		1E	
	AM	PM	AM	PM
N. 27th Street & Cornhusker Highway	D	D	D	D
N. 27th Street & Holdrege Street	C	D	C	C
N. 29th Street/State Fair Park Drive & Cornhusker Highway	D	E	C	E
N. 31st Street & Cornhusker Highway*	N/A	N/A	D	D
N. 33rd Street & Cornhusker Highway	C	D	N/A	N/A
N. 33rd Street & Huntington Avenue	B	B	A	A
N. 33rd Street & Holdrege Street	B	C	B	C
N. 35th Street & Cornhusker Highway	B	B	B	A
N. 44th Street & Cornhusker Highway	A	A	B**	A
N. 48th Street & Cornhusker Highway	D	E	D	D
N. 48th Street & Adams Street	D	D	C	C
N. 48th Street & Leighton Avenue	B	B	C**	C**
N. 48th Street & Holdrege Street	C	C	C	C

*N. 31st Street & Cornhusker is the intersection from the new extension of N. 33rd Street

**Note: Acceptable planning level operations for major intersections is LOS D or better from Lincoln MPO

Alternative 1E is expected to carry similar volumes along Adams Street as the No-Action Alternative. This reduces the expected increase to N. 48th Street traffic volumes when compared to the No-Action Alternative, which in turn, further reduces the impact on the northbound left-turn at N. 48th Street & Cornhusker Highway. The new Adams Street connection to Cornhusker Highway, the intersection of N. 33rd Street & Cornhusker Highway, is expected to operate at LOS D in both peak hours. The new alignment of Adams Street ties into N. 33rd Street which will eventually extend north to Superior Street, as noted previously in this study. The intersection of N. 33rd Street & Adams Street will operate without conflicting movements until that time. When the N. 33rd Street extension is built this intersection will be full access and only 0.18 miles from N. 33rd Street & Cornhusker Highway which is less than the desirable distance in the AMP. Traffic operations for Alternative 1E would be considered acceptable when selecting a preferred alternative.

Alternative 1E is also expected to increase traffic volumes along Huntington Avenue/Leighton Avenue and the intersection of N. 48th Street & Leighton Avenue. The intersection of N. 48th Street & Leighton Avenue is expected to go from LOS B to LOS C from the No-Action Alternative to Alternative 1E in both the AM and PM peak hour. The Alternative 1E operations are expected to be acceptable at the planning level and are not expected to rule out the alternative because of

this intersection. The intersection of N. 44th Street & Cornhusker Highway is expected to go from LOS A to LOS B in the AM peak hour and is also not expected to be considered unacceptable for the alternative analysis.

4.6 Alternative Modified PEL C

Alternative Modified PEL C includes all the projects and geometric modifications assumed for the 2040 No-Action alternative and also the following modifications which are incorporated in all four action alternatives:

- A reconfigured N. 33rd Street alignment, with grade separated railroad crossing, starting from Huntington Avenue and tying into Cornhusker Highway with a T-intersection approximately where N. 31st Street exists today.
- Widen the median at State Fair Park Drive/N. 29th Street & Cornhusker Highway to accommodate dual westbound left-turn lanes.
- The southbound approach geometry at State Fair Park Drive/N. 29th Street & Cornhusker Highway would be modified to an exclusive left-turn lane and a shared thru/right-turn lane to separate out left-turn vehicles at the intersection.
- The N. 44th Street at-grade crossing would be closed and N. 44th Street would become a local street terminating south of the old crossing with no direct connection to Cornhusker Highway from the south
 - N. 44th Street would become a T-intersection without a south leg

Modifications unique to Alternative Modified PEL C:

- A reconfigured Adams Street alignment, with grade separated railroad crossing, starting from approximately N. 44th Street, curving south of the railroad and tying into the N. 33rd Street realignment south of the N. 33rd Street grade-separated crossing.
 - N. 33rd Street & Adams Street was analyzed as a roundabout.

2040 Alternative Modified PEL C Peak Hour Volumes are illustrated in **Figure 22**. 2040 Alternative Modified PEL C capacity analysis is illustrated in **Figure 23**. **Table 10** summarizes a comparison of intersection LOS for No-Action Alternative and Alternative Modified PEL C for signalized intersections and roundabouts.

AM (PM) Peak Hour Volume



FIGURE 23

2040 Alternative Modified PEL C
Capacity Analysis Summary



LEGEND

AM

PM

Signalized
Intersection LOS

PM

AM

→

Approach LOS

STOP

Stop Controlled
Intersection

Stop Sign

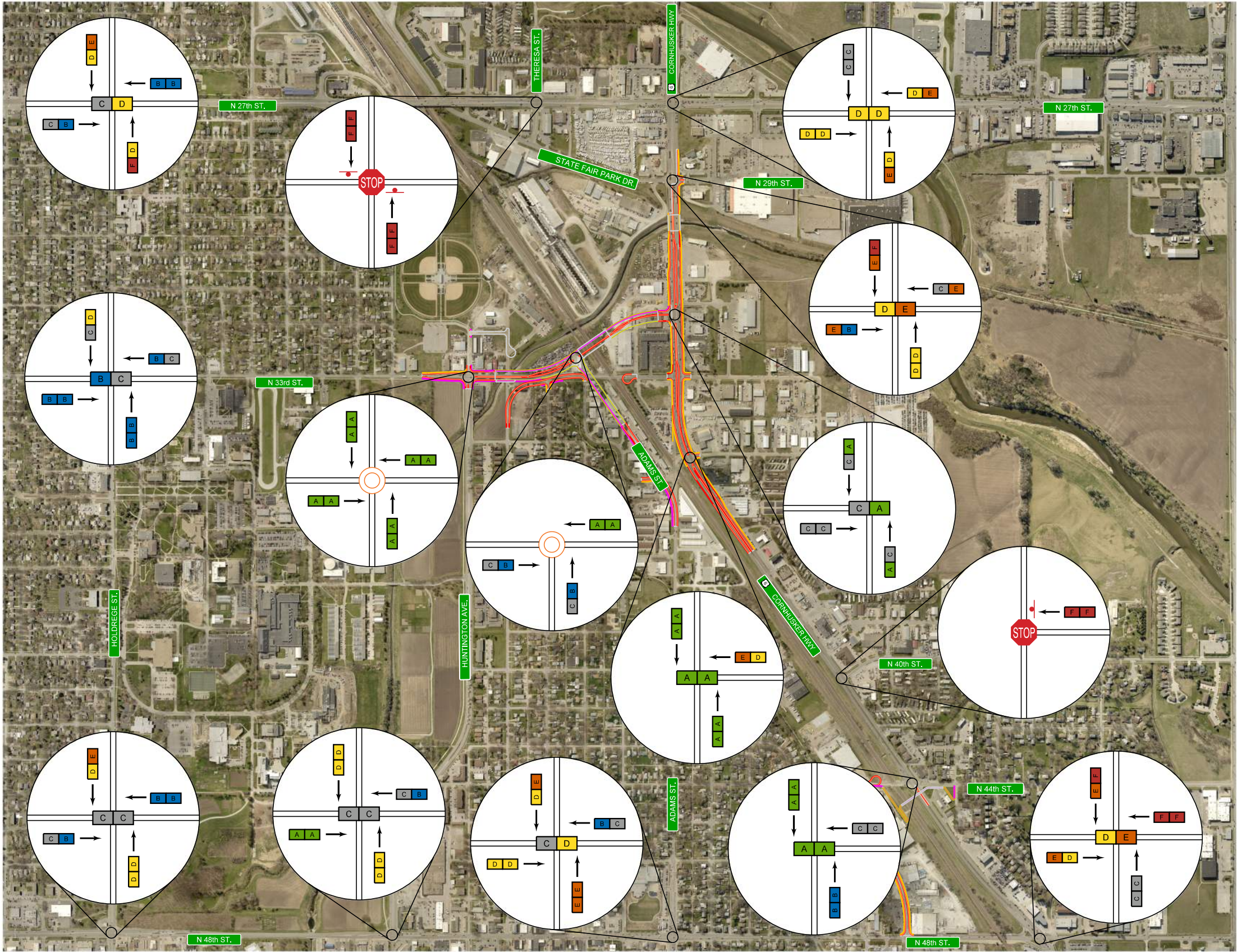


Table 10. Alternative Modified PEL C Intersection LOS Comparison

LOS Comparison				
Intersection	No Action		Modified PEL C	
	AM	PM	AM	PM
N. 27th Street & Cornhusker Highway	D	D	D	D
N. 27th Street & Holdrege Street	C	D	C	D
N. 29th Street/State Fair Park Drive & Cornhusker Highway	D	E	D	E
N. 31st Street & Cornhusker Highway*	N/A	N/A	C	A
N. 33rd Street & Cornhusker Highway	C	D	N/A	N/A
N. 33rd Street & Adams Street	N/A	N/A	A	C
N. 33rd Street & Huntington Avenue	B	B	A	A
N. 33rd Street & Holdrege Street	B	C	B	C
N. 35th Street & Cornhusker Highway	B	B	A	A
N. 44th Street & Cornhusker Highway	A	A	A	A
N. 48th Street & Cornhusker Highway	D	E	D	E
N. 48th Street & Adams Street	D	D	C	D
N. 48th Street & Leighton Avenue	B	B	C**	C**
N. 48th Street & Holdrege Street	C	C	C	C

*N. 31st Street & Cornhusker is the intersection from the new extension of N. 33rd Street

**Note: Acceptable planning level operations for major intersections is LOS D or better from Lincoln MPO

Alternative Modified PEL C is expected to carry similar volumes along Adams Street as the No-Action Alternative. This reduces the expected increase to N. 48th Street traffic volumes when compared to the No-Action Alternative, which in turn, further reduces the impact on the northbound left-turn at N. 48th Street & Cornhusker Highway. The new intersection where Adams Street connects to N. 33rd Street south of Cornhusker Highway is expected to operate at LOS A and LOS C in the AM and PM peak hour, respectively. One issue with this intersection is that it is closely spaced with the intersection of N. 33rd Street & Cornhusker Highway and is less than desirable spacing in the AMP. Traffic operations for Alternative Modified PEL C would be considered acceptable when selecting a preferred alternative.

Alternative Modified PEL C is also expected to increase traffic volumes along Huntington Avenue/Leighton Avenue and the intersection of N. 48th Street & Leighton Avenue. The intersection of N. 48th Street & Leighton Avenue is expected to go from LOS B to LOS C from the No-Action Alternative to Alternative 1E in both the AM and PM peak hour. The Alternative 1E operations are expected to be acceptable at the planning level and are not expected to rule out the alternative because of this intersection.

5.0 Conclusions

This report outlined the traffic analysis for 4 action alternatives (1B, 1D, 1E, and Modified PEL C) to determine whether they meet the screening criteria for the RTSD project to provide grade-separated crossings for the 33rd & Cornhusker project. In evaluating these alternatives, updated turning movement counts were collected, safety concerns regarding the existing transportation network were identified, and travel demand modeling provided future conditions to evaluate traffic operations.

Alternative 1B is expected to greatly increase northbound traffic volumes at the intersection of N. 48th Street & Cornhusker Highway. Alternative 1B is expected to reduce the level of service at the intersection in the AM peak hour. All four action and the no-action alternatives indicate LOS F for the southbound approach to the intersection. Considering that another project is recommending improvements for this intersection, it is not recommended to eliminate any of these action alternatives due to this intersection until the recommended improvements and results of them are known.

All four action alternatives are expected to increase traffic volumes on Huntington Avenue/Leighton Avenue which has the capacity to carry the volumes. This increase in traffic volumes does impact the intersection of N. 48th Street & Leighton Avenue. All four action alternatives are expected to decrease the LOS at the intersection from LOS B to LOS C in both peak hours from the No-Action Alternative. LOS C is appropriate for planning purposes and should not eliminate any action alternative due to this intersection operations.

Alternative 1D and Alternative 1E decreased the LOS of N. 44th Street & Cornhusker Highway from LOS A to LOS B in the AM peak hour. This also should not eliminate any of these action alternatives due to this intersection operations.

