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I-29 Corridor Study
(Exit 73 through Exit 77)
Final Report

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TABLE OF CONTENTS

List of Tables

List of Figures

TABLE OF CONTENTS

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Executive SUMMARY

Introduction

The South Dakota Department of Transportation (SDDOT) in cooperation with the City of Sioux Falls has initiated an assessment of the Interstate 29 (I-29) Corridor in southwest Sioux Falls. This report documents the benefits and impacts associated with a range of Interstate System and arterial corridor improvements in the I-29 study area.

This report documents the benefits and impacts associated with a range of transportation system modifications within the I-29 Corridor study area. The goal of the I-29 Corridor Study is to identify the current and future (2033) transportation needs in the area and as such, a number of elements studied would be focused on needs that are tied more closely with anticipated future development relative to current conditions. In addition, as many of the improvements/ modifications would be on the Interstate System or at interchanges, identifying and obligating funding for the projects would be responsibility of the SDDOT. While the SDDOT understands the economic impact that addressing the accessibility between the interstate and adjacent development areas has on Sioux Falls, the Department has the responsibility of prioritizing the needs throughout the state. The statewide Long Range Transportation Plan (LRTP) documents the current annual transportation system funding capacity relative to the costs to maintain the current system and provide for expansion that is connected to growth in an area. At present, the SDDOT can document:

- A declining overall condition of the existing roadway infrastructure, which is forecasted to see the percentage of poor to fair condition mileage increase from approximately 10 percent of the mileage to approximately 45 percent of the mileage.
- An increasing average age of the bridges and other structures on the state system.
- Increasing congestion on the system.

At the same time that facility condition and capacity improvement needs are expanding, revenue is projected to be relatively constant. When annual construction cost increases that exceed the projected increases in revenue are considered, the mileage that can be repaired, number of structures that can be replaced and rehabilitated and the number of new lane miles and interchanges that can be constructed cannot keep up with the demand. Thus, the SDDOT has the responsibility to develop a prioritization plan that will provide for the safety and convenience of the traveling public and stay within the funding level that is available.

The I-29 Corridor Study grew out of a project that was initiated by the SDDOT and the City of Sioux Falls in 2004. The goal of the initial transportation planning work was a corridor preservation study to determine future improvements needed for the I-29/I-229 and I-90/I-229 System Interchanges. As the preliminary findings of that work were being presented, the question was raised in a public meeting about expanding the study area to the north to include evaluation of whether there was an opportunity to add an I-29 interchange at 57th Street. The result of the I-29/57th Street interchange assessment was that while from a travel demand perspective adding the interchange would reduce the burden on the I-29/41st Street interchange and to the I-229/Louise Avenue interchange, the significance of the impacts to adjacent buildings, parking areas, and intersections outweighed the benefits to the I-29/41st Street and the I-229/Louise Avenue interchange and corridor operations. Adding an interchange on I-29 at 57th

Street would result in poor traffic operations along the Interstate mainline and at the I-29/I-229 System Interchange. For these reasons the concept was eliminated from consideration.

This corridor report represents one of several steps being completed to document the benefits and impacts associated with a range of transportation system modifications in the southwest part of Sioux Falls. This document provides an assessment of a range of alternatives that will address current and future operations and safety concerns in the area.

Alternatives in the corridor address needs that extend well beyond additional access to/from I-29 and I-229. Other arterial and Interstate System concepts addressed in this study process and included in this report are:

- A 69th Street grade-separated crossing of I-29, including an extension of 69th Street between Sundowner Avenue and Tallgrass Avenue.
- Determination of capacity needs and alternatives for the mainline Interstate System in the absence of an additional interchange within the corridor.
- Modifications to the I-29/I-229 interchange to accommodate future traffic demand associated with development in the area adjacent to the interchange and throughout the Sioux Falls metropolitan region.
- A Solberg Avenue to Tallgrass Avenue grade-separated crossing of I-229, including an extension of Solberg Avenue-Tallgrass Avenue south from its current terminus at 59th Street to the intersection of 69th Street.

Study Process

The Corridor Report documents a two-stage alternatives screening process. The first stage screening evaluated individual improvement alternatives for each of the key roadway components (i.e., I-29 and/or I-229 mainlines, I-29/85th Street interchange, I-29/69th Street crossing, and the I-29/I-229 System Interchange) within the study area. Each roadway improvement alternative was evaluated with respect to the following criteria:

- Projected traffic operations.
- Engineering criteria and design standards.
- Influence an improvement alternative has on concepts at adjacent interchanges.
- Access management policies.
- Environmental and social impacts.
- Impacts on the traveling public.

Based on the results of the first stage screening a number of improvement alternatives were eliminated. It should be noted that several of the alternatives did not necessarily have a fatal flaw, but there are certain concepts that provided a better fit than others. Those alternatives eliminated from further consideration are listed below:

- I-29/85th Street Diamond Interchange.
- I-29/85th Street Partial Cloverleaf Interchange.

- I-29/I-229 System Interchange – Ramp Modifications (Alternative 7).
- I-29/I-229 System Interchange – Directional Ramps Option A (Alternative 8).
- I-29/I-229 System Interchange – Realign Southbound I-29 (Alternative 10).

Following the first stage screening the individual area improvement alternatives that were retained were packaged together to form corridor system improvement composites. These composite improvement packages are listed below.

- Composite 1: 69th Street Extension Across I-29.
- Composite 2: 85th Street Extension Across I-29.
- Composite 3: I-29/85th Street Interchange and Southbound I-29 Ramp Braid.
- Composite 4: I-29/85th Street Interchange with Ramp Braid and I-29/I-229 Southbound Flyover.
- Composite 5: I-29/I-229 Complete Interchange Reconstruction.
- Composite 6: I-29/I-229 Major Interchange Modification – Directional Ramps.
- Composite 7: I-29/I-229 Major Interchange Modification – Directional Ramps, Option 2.
- Composite 8: 69th and 85th Street Extensions Across I-29.
- Composite 9: I-29/85th Street Interchange and a 69th Street Crossing of I-29.

Each of the composites include freeway mainline (i.e., auxiliary lanes) and local arterial improvements. During the second stage screening, the above composite alternatives were evaluated based on their ability to address traffic operational and safety concerns, the potential impacts to the adjacent physical and social environment and their costs relative to funding capacity.

Study Results

This study included the collection and development of required supporting traffic volume and land use development information. Based on the data collected, including the updated Sioux Falls regional travel demand model, horizon year 2033 daily and peak hour traffic forecasts for No-build and Build scenarios were prepared. Current and future year traffic operations were completed for study area roadway links. The results of the I-29 Corridor Study are that:

- Substantial increments of residential, commercial (office and retail) and industrial development are anticipated to occur in the study area through the planning horizon. Much of this development is likely to occur north or immediately adjacent to 85th Street on both the east and west sides of I-29.
- In the No-build alternative, traffic operations at many of the interstate mainline ramp junctions, along portions of the I-29 mainline, and at intersections along arterial routes in the study area are projected to fail (operate at LOS E/F) in the peak periods.
- The need for I-29 Corridor improvements has been demonstrated from a traffic operations perspective and study area accessibility perspective.

  - Current traffic operations at the ramp terminals for the 41st Street and Louise Avenue interchanges are LOS D or worse.
  - 2033 No-build scenario traffic operations degrade throughout the study area. The I-29 mainline has several segments that operate at LOS D, E or F in both peak periods. Similarly, the ramp terminal intersections at 41st Street, Louise Avenue and the Highway 106 (Tea) interchanges are LOS F in the 2033 No-build scenario.

- A range of Build project alternatives were evaluated for the I-29 corridor, including an interchange at I-29/85th Street, auxiliary lanes on I-29 and I-229, modifications to the I-29/ I-229 system interchange, and new arterial crossings of the interstates. The alternatives that included a new interchange at I-29/85th Street would provide traffic operations improvement at the Louise Avenue and the Highway 106 (Tea) interchanges and would improve accessibility to and from the study area. The key findings from the evaluation of network modifications, including a new interchange at 85th Street are:
  - Network modifications, including a new interchange at I-29/85th Street meet the project purpose of providing additional access to/from the regional system.
  - All of the composite alternatives, except Composite 7, meet the project purpose of providing sufficient traffic operations for freeway facilities through the planning horizon of 2033.
  - With an I-29/85th Street interchange, minor traffic operations improvements are forecasted at the adjacent service interchanges I-29/Highway 106 (Tea) and I-229/ Louise Avenue compared to the 2033 No-build scenario.
  - Composite 3 would preserve much of the existing infrastructure at the I-29/I-229 interchange, while providing adequate separation between the system interchange and an I-29/85th Street interchange to provide reasonable operations.
- In total, five composite alternatives (Composite, 3, Composite, 4, Composite 5, Composite 6 and Composite 9 [with exception of Composite 9E]) address the two primary goals of improving access to the regional system and they also allow for acceptable operations on the Interstate System.
- While Composite 1, Composite 2 and Composite 8 result in adequate operations on the Interstate System, the concepts do not address the goal of enhancing access to the regional system in the study area.

Recommendations

Based on the information provided in this document it is recommended that the long term improvement plan include a combination of improvements to the current mainline and ramps as well as expansion projects that address:

- Desired additional access to I-29 and I-229.
- Additional arterial crossings of the interstates that would enhance the ability of the multi-jurisdictional arterial system to accommodate short and medium length trips. As the current arterial system in this section of the metro area is discontinuous as it approaches I-29 and I-229, an additional burden is placed on the Interstate System to carry many short and

medium length trips as it is the only facility providing the level of continuity desired by travelers.

- Rehabilitation of the I-29 and I-229 mainline by replacing the pavement and providing auxiliary lanes into and out of each of the existing interchanges.

The most technically feasible concept based on the above requirements is represented in the range of alternatives reviewed as Composite 9A coupled with additional arterial improvements. Composite 9A is a combination of Composite 1 (69th Street crossing) and Composite 3 (I-29/ I-229 System Interchange modifications, I-29/85th Street interchange, and mainline auxiliary lanes). This alternative has been selected for the following reasons:

- Provides an I-29/85th Street interchange.
- Provides sufficient traffic operations for freeway facilities through the planning horizon of 2033.
- Provides improved traffic operations at the adjacent service interchanges I-29/Highway 106 (Tea) and I-229/Louise Avenue.
- Minimizes modifications to the existing I-29/I-229 System Interchange.
- Minimizes traffic disruption for the public during construction.
- Accommodates the I-29/69th Street and I-229/Solberg Avenue grade separated crossings.

It is also recommended that expanded transit service (Alternative 13) into the study area be carried forward for further study.

The recommended improvements represent a significant investment in the transportation infrastructure for the Sioux Falls area. While the SDDOT understands the economic impact that addressing the accessibility between the Interstate and adjacent development areas has on Sioux Falls, the Department has the responsibility of prioritizing the needs throughout the state. Thus, the SDDOT has the responsibility to develop a prioritization plan that will provide for the safety and convenience of the traveling public and stay within the funding level that is available. As a result, the SDDOT has in the statewide transportation improvement program emphasized maintenance of the existing infrastructure relative to system expansion in order to maximize the investment that has already been made.

Phased Implementation of Recommended Plan

The recommended plan for the I-29 corridor includes a number of elements that represent a significant investment in the transportation infrastructure for the Sioux Falls metropolitan area. The cost of these improvements relative to the available funding suggests that these improvements will need to be phased. Key considerations in developing a phasing plan for the I-29 Corridor include the following:

- Need for a project with respect to the following:
  - Pavement condition
  - Traffic operations
  - Traffic safety

  - Adjacent development timeline
- Project cost versus the ability to commit funding. Funding for these improvements would come from a number of agencies and funding types.
- Coordination of city, county and state projects to ensure smooth transition from one transportation system to the next.

The two key critical elements from the above lists are the availability of funding and the timeline for development within the study area. Funding for transportation projects at the statewide and local levels can be dynamic and fluid and the current limiting conditions can change in the future. Development plans for the study area are also dynamic based on economic conditions.

Based on the analysis contained in this report, discussions with governmental (local, state and federal) agencies, and the public involvement process the phasing plan is divided into three parts. The first phase would address the poor pavement conditions throughout the corridor and add auxiliary lanes to address design deficiencies at key access/egress points. The second and third phases of the improvement plan focus more on system expansion to provide additional capacity and accessibility to support future anticipated development in the corridor area. The phasing plan is documented below.

Transportation Improvement Program (TIP) / Programmed Improvements

- Pavement replacement for the I-29 mainline and ramps between the 41st Street Interchange and the Tea Interchange (covered in two projects).
- Auxiliary lanes added between the 41st Street Interchange and the I-29/I-229 System Interchange.
- Auxiliary lanes added between the I-29/I-229 System Interchange and the Tea Interchange.
- Pavement replacement for the I-229 mainline and ramps between the I-29/I-229 System Interchange and the Louise Avenue Interchange.
- Auxiliary lanes added to the I-229 mainline between the I-29/I-229 System Interchange and the Louise Avenue Interchange.
- Reconstruct the southbound I-29 to northbound I-229 ramp to shift it to the north.
- Construct the Solberg Avenue-Tallgrass Avenue overpass of I-229 and associated approach lanes to connect Solberg Avenue between 59th Street and 69th Street.

Intermediate Improvements

- Lincoln County 106/SD 100 reconstruction/construction to Sioux Falls Half Urban Standard between I-29 and Louise Avenue.
- Lincoln County 106 reconstruction to Sioux Falls Half Urban Standard between Sundowner Avenue and I-29.
- Louise Avenue reconstruction to Sioux Falls Half Urban Standard between 85th Street and Lincoln County 106/SD 100.

- Sundowner Avenue reconstruction to Sioux Falls Half Urban Standard from 69th Street to Lincoln County 106.
- Tallgrass Avenue reconstruction to Sioux Falls Half Urban Standard from 69th Street to Lincoln County 106.
- 85th Street reconstruction to Sioux Falls Full Urban Standard between Sundowner Avenue and Louise Avenue.

Ultimate Improvements

- I-29/85th Street Interchange construction.
- New structures for the I-29/I-229 System Interchange.
- Lincoln County 106 reconstruction to Sioux Falls Full Urban Standard from Tea-Ellis Road to Louise Avenue.
- Louise Avenue reconstruction to Sioux Falls Full Urban Standard between 85th Street and Lincoln County 106/SD 100.
- Sundowner Avenue reconstruction to Sioux Falls Full Urban Standard from 69th street to Lincoln County 106.
- Tallgrass Avenue reconstruction to Sioux Falls full Urban standard from 69th Street to Lincoln County 106.
- 69th Street overpass of I-29.
- 69th Street reconstruction to Sioux Falls Full Urban Standard between Tea-Ellis Road and Tallgrass Avenue.
- 85th Street reconstruction to Sioux Falls Full Urban Standard from Tea-Ellis Road to Sundowner Avenue.

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1.1 STUDY BACKGROUND

1.1.1 Study Overview

The South Dakota Department of Transportation (SDDOT) in cooperation with the City of Sioux Falls has initiated an assessment of the Interstate 29 (I-29) Corridor in southwest Sioux Falls. This report documents the benefits and impacts associated with a range of interstate and arterial corridor improvements in the I-29 study area. The study area is illustrated in Figure 1.

The goal of the I-29 Corridor Study is to identify the short, mid, and long-term transportation needs in the area. Alternatives in the corridor address needs relative to maintaining acceptable mainline and arterial traffic operations while providing a safe traveling environment and managing access in support of regional economic development opportunities.

The I-29 Corridor Study grew out of a project that was initiated by the SDDOT and the City of Sioux Falls in 2004. The goal of the initial transportation planning work was to determine whether it was feasible and reasonable to coordinate a new local service interchange with the I-29/I-229 System Interchange. The feasibility of the alternatives was measured relative to the positive and negative impacts to mainline and arterial traffic operations and reasonableness measures of effectiveness included impacts to adjacent properties, cost, and the ability to meet design standards. As the preliminary findings of the I-29/I-229/69th Street work were being presented at a public meeting, the question about expanding the study area to the north to include evaluation of whether there was an opportunity to add an I-29 interchange at 57th Street. To address the public meeting question/request for looking at options at I-29/57th Street, a total of seven alternatives were developed and evaluated for a new service interchange at that location.

The result of the I-29/57th Street interchange assessment was that from a travel demand perspective adding the interchange would reduce the burden on the I-29/41st Street and the I-229/Louise Avenue interchanges. The impacts to adjacent buildings, parking areas, and intersections along 57th Street of adding an interchange and resulting poor traffic operation on the I-29 mainline and at the I-29/I-229 System Interchange, however, were greater than the operations benefits at 41st Street and Louise Avenue. Thus, the I-29/57th street Interchange concept was eliminated from consideration. A technical report documenting the range of alternatives evaluated at I-29/57th Street and the recommendations for the location is provided in Appendix A.

The original 2004 SDDOT study included development and evaluation of 13 alternatives that provided additional freeway access and/or arterial connectivity within the area of the I-29/I-229 System Interchange. Most of these alternatives provided freeway access to one or more of the following arterial roadways: 85th Street, 69th Street, 57th Street, Solberg-Tallgrass Avenue or Marion Road. The initial evaluation of the 13 build alternatives focused primarily on level of service provided by the proposed facilities and the design's ability to meet driver's expectations. The alternatives for providing additional Interstate-arterial connectivity in the I-29/I-229 System Interchange area are documented in Appendix B.

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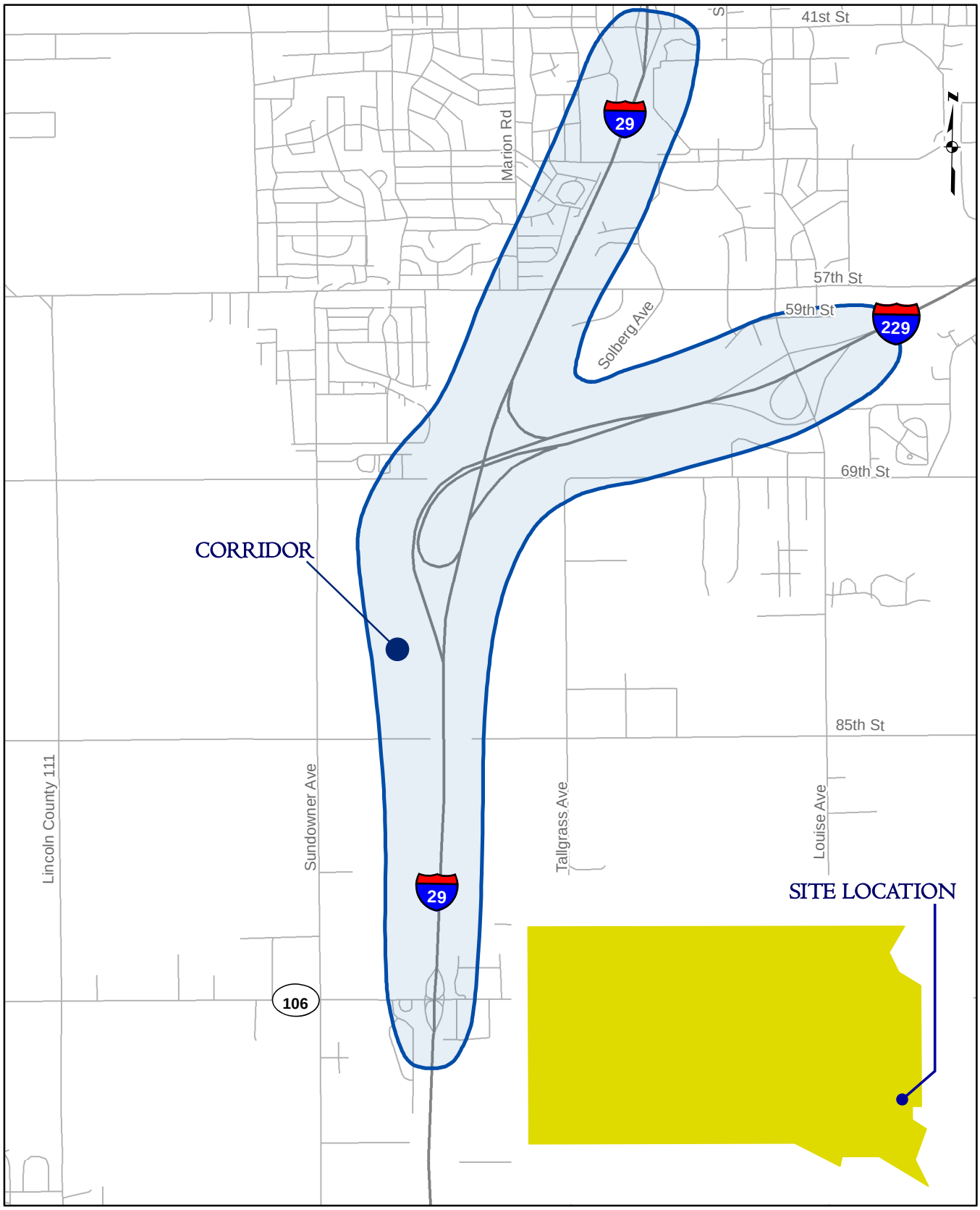

Figure 1. Corridor Study Area

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Through a series of workshop meetings with members of the project steering committee the original group of alternatives was reduced to three alternatives, as listed below:

- 69th Street Interchange
- Arterial Grade Separations
- 69th Street / Tallgrass Avenue Folded Diamond Interchange

Through the operations analysis and design alternatives review process at the System Interchange it was concluded that it is not reasonable and feasible to provide an arterial access (interchange) within the System Interchange area (at what is essentially 69th Street). Key factors leading to this conclusion are:

- An acceptable level of separation to meet FHWA requirements for approval could not be established between the System Interchange ramps and ramps to/from the arterial interchange.
- New access alternatives at I-29/I-229/69th Street that are intended to address operations deficiencies at the I-229/Louise Avenue interchange by providing an additional arterial access adjacent to the I-29/I-229 System Interchange, resulted in the need to substantially reconstruct the I-229/Louise Avenue interchange. Reconstruction of the interchange is undesirable from a cost-effectiveness standpoint.
- The complexity of the most promising of the alternatives based on the footprint impacts resulted in significant concerns regarding the feasibility of providing acceptable traffic control signing.

Eliminating from consideration a new interchange at I-29/57th Street and a new arterial access within the System Interchange area (69th Street) aided in defining what could not be reasonably provided in the I-29 corridor to improve access, operations and safety. These conclusions did not, however, provide much clarity relative to what could be done in the area to address the study goals. To address the goals, the state and local partners:

- Initiated a study of possible future access points to/from I-29 and preservation of the appropriate right-of-way (ROW). The purpose of this action would be to reduce/eliminate the transportation facility-development conflicts present at 57th Street from repeating.
- With the SDDOT in the lead, expanded the focus of the system interchange study to the larger I-29 corridor from 41st Street (Exit 77) through the Highway 106 (Tea) interchange (Exit 73).
- Worked in a collaborative effort to develop a balanced transportation plan of arterial and Interstate System improvements that support a more intense land use development plan for the area than had previously been addressed in metropolitan area planning.

1.1.2 Elements Addressed in the I-29 Corridor Study

Other arterial and Interstate System concepts addressed in this study process and included in this report are:

- A 69th Street grade-separated crossing of I-29, including an extension of 69th Street between Sundowner Avenue and Tallgrass Avenue.
- Determination of capacity needs and alternatives for the mainline Interstate System in the absence of an additional interchange within the corridor.
- Modifications to the I-29/I-229 interchange to accommodate future traffic demand associated with development in the area adjacent to the interchange and throughout the Sioux Falls metropolitan region.
- Development and analysis of arterial corridor improvements (expansion) and extensions that have the potential to reduce the "barrier" impacts associated with the Interstate System, provide system capacity and connectivity support that reduces the dependence on the Interstate System for short and medium length trips, and provide alternate corridors to complement existing arterial routes that are currently or forecasted to be highly congested.
- A Solberg Avenue to Tallgrass Avenue grade-separated crossing of I-229, including an extension of Solberg Avenue-Tallgrass Avenue south from its current terminus at 59th Street to the intersection of 69th Street.
- Additional access across and/or with I-29 at 85th Street. The improvements would be intended to serve a subarea of the metropolitan area where significant development proposals have been submitted to the city and where future housing and employment expansion is expected over the next 20+ years. The range of alternatives addressed are:
  - An arterial crossing of I-29 to fill in the gap between Tallgrass Avenue and Sundowner Avenue that would create a continuous corridor along the southern part of the metro area.
  - A local access interchange that would provide the arterial gap connection of the crossing and an additional level of access to/from the Interstate.

The alternatives for both the I-29/I-229 System Interchange and the I-29/85th Street service interchange evaluated in this document are those that were retained following a rigorous screening of a broader range of individual element location concepts (i.e., six different concepts were focusing on the I-29/I-229 System Interchange, four different concepts focusing on only the I-29/85th Street interchange, two alternatives for the Solberg Avenue-Tallgrass Avenue crossing and five alternatives for the 69th Street crossing of I-229 were evaluated). In the individual focus areas (the I-29/I-229 interchange, I-29 at 85th Street, I-29 at 69th Street and I-229 at Solberg Avenue) an alternatives screening that addressed the pros and cons of numerous options for either providing access to/from the interstate or crossing the interstate was completed. Alternatives were screened based on the following measures of effectiveness:

- Impact on mainline traffic operations. The goal was to improve the No-build conditions.
- Arterial access and operations. The goal was to enhance the level of access to/from adjacent development areas and improve peak hour traffic operations at the adjacent key intersection.

- Consistency with state and city design and access control guidelines.
- Costs including capital construction, right-of-way and maintenance.

Using the listed measures of effectiveness, the range of reasonable concepts for each of the individual focus areas was narrowed to those that met the goals of improving access and improving traffic operations, resulted in manageable impacts to the mainline up and down stream of the focus area, and interacted well with the adjacent arterial system. The most promising of the individual improvement elements have been combined into packages that are referred to in this study as composite alternatives. Each composite contains an element for the Solberg Avenue-Tallgrass Avenue, the 69th Street area along I-29, the 85th Street area along I-29 and the I-29/I-229 System Interchange.

Technical memoranda that document the individual element alternatives screening are included in Appendix C.

1.1.3 Study Steps/Products

Through the corridor study the following were identified:

- Current peak period traffic operating conditions.
- The increment of development by type and location anticipated in the study area based on development plans and ideas held by the land owners of developable properties in the area.
- Forecasted future (2033) traffic reflective of the current volume and the anticipated increment of development.
- Future traffic operations (2033) associated with the increment of traffic and committed capacity enhancements that would be in place by the horizon year.
- A range of interstate and arterial improvements that focus on addressing the capacity, safety and/or access issues within the corridor relative to current and forecasted future conditions.
- A logical and defensible assessment of the range of alternatives, including evaluation relative to measures of effectiveness that address operations, safety, potential impacts to adjacent properties, and cost.
- A recommended course of action for the near and longer term periods that balances arterial and Interstate responsibilities, costs relative to funding capacity and benefits, timing of the need for action

1.1.4 Existing Corridor Description

The I-29 Corridor Study area is bounded by Tea-Ellis Road on the west, Highway 106 on the south, Louise Avenue on the east and 41st Street on the north. Within the eleven-plus square mile study area the transportation system is comprised of the entire range of the regional functional classification from local streets through interstate routes. Key routes are described in the following bullets:

- ***I-29*** in the project area is a four-lane interstate highway, with two northbound lanes and two southbound lanes. The system interchange of I-29/I-229 (I-29 Exit 75) is located approximately two miles south of 41st Street, one mile west of Louise Avenue and two miles north of Highway 106. The three-legged interchange is a trumpet design interchange. Between the I-29/I-229 System Interchange and the local service interchange at 41st Street, both 57th Street and 49th Street cross over I-29, but do not have direct access to I-29.
- ***I-229*** is presently constructed as a four-lane interstate (two lanes in each direction) between the I-29 junction and the Louise Avenue interchange. East of the Louise Avenue interchange auxiliary lanes are provided in both directions, resulting in a six-lane interstate.
- Presently, ***85th Street*** is functionally classified as a minor arterial roadway east of Tallgrass Avenue and is classified as a local system road in the rural area west of Tallgrass Avenue.

  While it is an unpaved roadway, 85th Street is a continuous corridor from Tallgrass Avenue east to approximately 2.5 miles east of South Dakota State Highway 11. West of I-29, 85th Street is a continuous corridor from just west of the interstate right-of-way west to South Dakota State Highway 19. The corridor does not provide an access across I-29 between Sundowner Avenue and Tallgrass Avenue. The corridor is currently a two-lane, unpaved roadway adjacent to I-29 and intersections along the route are either uncontrolled or have stop sign control on two or all four approaches.
- ***Louise Avenue*** is functionally classified as a minor arterial in the study area and includes an I-229 service interchange that consists of a partial cloverleaf design. Between 41st Street and 57th Street, Louise Avenue is a four-lane roadway with a center left-turn lane. From 57th Street to 74th Street, Louise Avenue is a divided roadway with two north-bound lanes and three southbound lanes. Between 74th Street and 85th Street, Louise Avenue is a four lane roadway with a center left-turn lane. South of 85th Street, Louise Avenue is a two-lane rural paved roadway. The following Louise Avenue intersections are signalized in the study area:
  - 41st Street/Louise Avenue
  - 49th Street/Louise Avenue
  - 57th Street/Louise Avenue
  - 59th Street/ Louise Avenue
  - Westbound I-229 ramps/Louise Avenue
  - Eastbound I-229 ramps/Louise Avenue
  - 69th Street/Louise Avenue
  - 77th Street/Louise Avenue
  - 85th Street/Louise Avenue

  The intersection of Louise Avenue/Highway 106 is four-way stop controlled. All other intersections along the corridor are two-way stop controlled, with Louise Avenue operating as the free movement.

- ***69th Street*** is functionally classified as a minor arterial between Tallgrass Avenue and Louise Avenue and is classified as a local system road in the rural area west of I-29. 69th Street is a paved three-lane roadway between Avera Hospital (Medical Court West driveway) and Connie Avenue (just west of Louise Avenue), a paved five-lane roadway between Connie Avenue and Louise Avenue and is unpaved west of Avera. West of I-29, 69th Street is an unpaved, continuous corridor through Tea-Ellis Road and is a continuous corridor to approximately 1 mile west of South Dakota State Highway 19. The corridor does not provide a crossing of I-29 between Sundowner Avenue and Tallgrass Avenue. The intersection of 69th Street/Louise Avenue is signal controlled, while the rest of the corridor is either uncontrolled or stop sign controlled.
- ***57th Street*** is functionally classified as a minor arterial street in the study area. East of I-29, 57th Street is a four-lane divided roadway with traffic signals at Solberg Avenue and Louise Avenue. Between Marion Road and I-29, 57th Street is a four-lane roadway with a traffic signal at the Marion Road/57th Street intersection. West of Marion Road, 57th Street is a three-lane roadway with traffic signals provided at 57th Street/Holbrook Avenue and 57th Street/Sertoma Avenue. All other intersections are two-way stop controlled with 57th Street as the free movement.
- ***Highway 106*** is part of the Lincoln County roadway system, classified as a minor arterial roadway east of I-29 and classified as a rural major collector west of I-29. Highway 106 is a two-lane paved roadway throughout the study area, and includes a single-point urban interchange with I-29. Turn lanes are provided at the I-29/Highway 106 (Tea) interchange and additional east-west through lanes are provided for a short distance on either side of the interchange. The intersection of Highway 106/Tea Ellis Road is signalized, the intersection of Highway 106/Louise Avenue is four-way stop controlled, and the remaining study area intersections are two-way stop controlled with Highway 106 operating as the free movement.
- ***41st Street*** is a six-lane roadway with a center left-turn lane and is functionally classified as a principal arterial street east of I-29. West of I-29, 41st Street is a 4-lane roadway with center left-turn lane, functionally classified as a minor arterial street. 41st street has a diamond-style interchange with I-29. Traffic signals are present at the following 41st Street study area intersections:
  - 41st Street/Shirley Avenue
  - 41st Street/Empire Mall entrance
  - 41st Street/Northbound I-29 ramps
  - 41st Street/Southbound I-29 ramps
  - 41st Street/Terry Road
  - 41st Street/Marion Road

  All other intersections along the corridor are two-way stop controlled, with 41st Street as the free movement.
- ***Tallgrass Avenue*** is functionally classified as a minor arterial street between 69th Street and 85th Street, and classified as a local system roadway south of 85th Street. Tallgrass is

unpaved in the study area, and currently does not provide any access across I-229. All intersections along Tallgrass are either uncontrolled or stop controlled.

- ***Sundowner Avenue*** is functionally classified as a local system roadway throughout the study area. South of approximately 67th Street, Sundowner is an unpaved roadway that is either stop controlled or uncontrolled. Sundowner is a two-lane paved street between approximately 67th Street and 57th Street, its northern terminus. The intersection of Sundowner Avenue and 57th Street utilizes two-way stop control with 57th Street operating as the free movement.

1.1.5 Project Planning

The study area is within the transportation planning area of the Sioux Falls MPO, which is represented by the Urbanized Development Commission (UDC) of the South Eastern Council of Governments (SECOG). As a designated MPO, there is an ongoing transportation planning process in the Sioux Falls region and the study area. This study is being completed within the context of those ongoing regional transportation planning efforts and any recommendations that assume federal government funding sources would be integrated into the LRTP prior to completing adoption of the recommendations.

Over the course of the last five years, numerous transportation system improvements that would enhance access and capacity within the study area have been evaluated, including:

- Enhancing the role that Highway 106 plays in the region by incorporating improvements to the corridor and creation of the East Side and West Side corridors. The combination of the north-south corridors created by the East Side and West Side corridors and improvement of Highway 106 (with the improvements, the East Side Corridor would be renamed SD 100) much progress on establishing a continuous, access controlled regional arterial route would be made.
- Extension of the bike and pedestrian systems from their present termini to the north and east of the study area.
- Enhancements to the current I-29/I-229 System Interchange.
- Arterial crossings of I-29 and I-229 at 69th Street and Solberg Avenue-Tallgrass Avenue.

Study Area Growth

While most of the southern half of the corridor study area is currently rural in nature, it is rapidly developing and several large developments are currently proposed adjacent to the project location. A significant portion of the employment growth has recently been added to the study area or is anticipated to be added in the near future, evidenced by these two development areas:

- Local planning staff estimate that a significant portion of the anticipated study area job growth shown between the area bounded by I-29, Louise Avenue, 57th Street and I-229 (referred to as the “Golden Triangle”) has been added since 2000 and is already in place.

- A significant portion of the job growth in the area between I-29, Tallgrass Avenue, 69th Street and Highway 106 is part of the Sanford Health System's Research Park Development. The Sanford development has begun construction south of 69th Street and is expected to employ 4,000 medical research and office workers.

Thus, while there is significant future traffic demand that is projected to occur as a result of the study area development growth, a good portion of this increased travel demand is currently emerging or is slated for the near term.

The level of residential, office, and retail development now being discussed for the study area, represents a significant departure from assumptions used in the 2005 update of the long range transportation plan (LRTP) covering the Sioux Falls Metropolitan Planning Organization (MPO) area. Table 1 documents the current and updated 2033 horizon levels of development present or forecasted for the study area. The 2033 updated socioeconomic data was derived from information collected by Sioux Falls planning staff through meetings with city and county staffs, landowners of adjacent parcels, developers that have or are presently working in the adjacent area and residents of the area. From the meetings/workshops and a reassessment of the 2025 regional households and employment control totals, an updated development concept for the study area was devised. Within an area of approximately one (1) mile radius of the proposed I-29/85th Street junction, it is anticipated that 17,000 new jobs and 2,600 new households will be established between now and 2033.

TABLE 1. ENTIRE STUDY AREA SOCIOECONOMIC DATA COMPARISONS

Data Descriptor	Period		Percent Change
	2000	2033	'00 – '33
Households	5,480	11,610	112%
Employment	6,890	29,970	335%

Source: City of Sioux Falls

The 2000 to 2033 projected employment growth by traffic analysis zone (TAZ) is provided in Figure 2. The projected housing growth by TAZ is provided in Figure 3.

Study Area Regional Network Access

Access between the regional roadway system elements of I-29 and I-229 and adjacent areas is currently provided at the I-29/Highway 106 (Tea) interchange, the I-29/41st Street interchange, and the I-229/Louise Avenue interchange. The distance between the Highway 106 (Tea) and 41st Street access points along I-29 is approximately four (4) miles. In developed portions of Sioux Falls, interchanges are generally provided every mile, with the most infrequent interchange spacing occurring at approximately one-and-a-half mile spacing.

At the time of the last update to the long range transportation plan (LRTP), land development south of 69th Street and west of Tallgrass Avenue was assumed to be very limited in nature (due to the cost of mitigating high water table issues), and the development generally assumed was low-density residential. Assumptions of limited amounts of low-density development were due primarily to adequate amounts of more readily developable property in other areas of the region.

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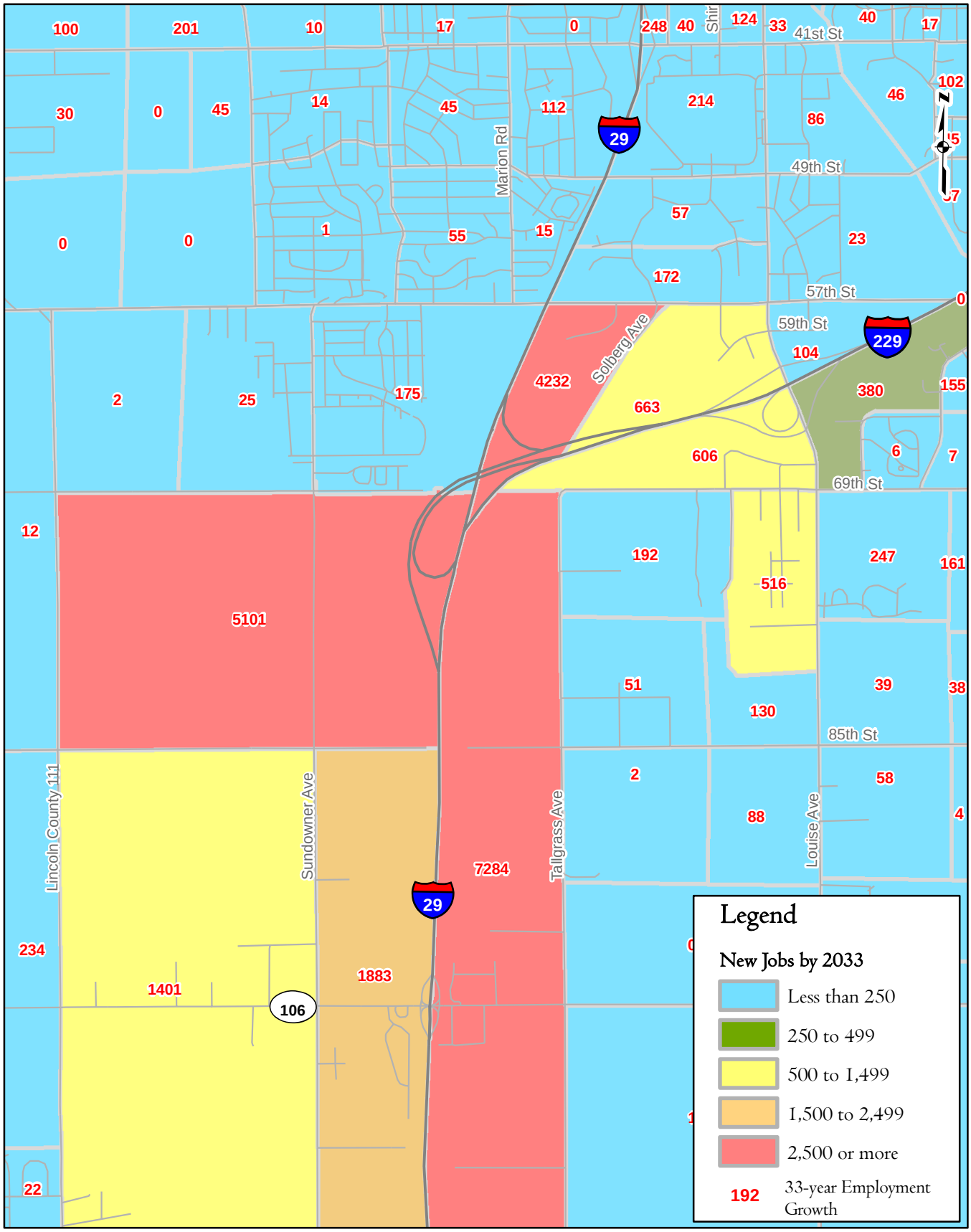

Figure 2. Growth in Employment, 2000 to 2033

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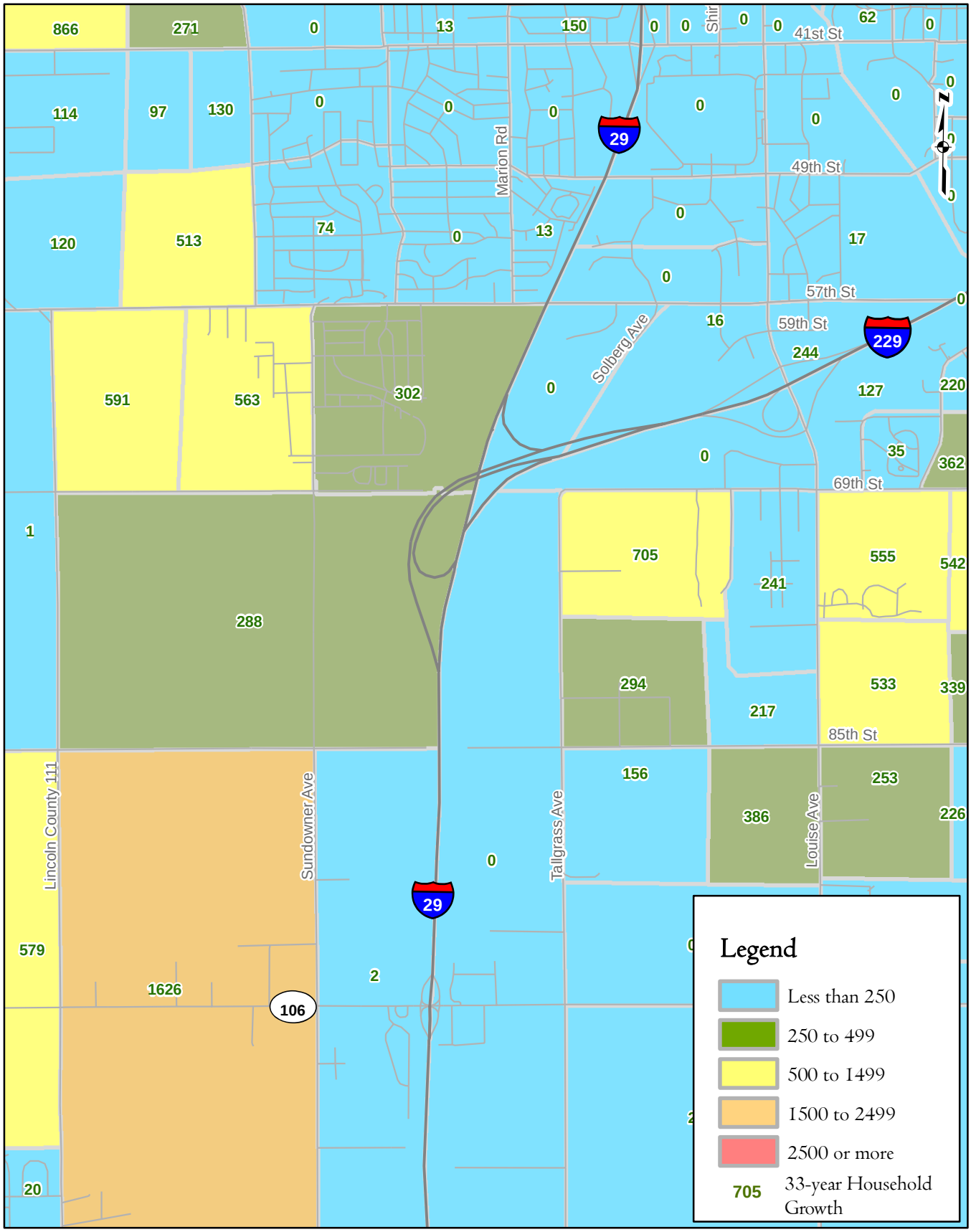

Figure 3. Growth in Housing, 2000 to 2033

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In the period since the last LRTP update (2004), targeted development areas of the region have shifted more to the southwest part of the region and over the last two to three years there has been significant development occurring on the southern fringe of Sioux Falls, including within the study area. Based on updated land development plans for the region, many portions of the study area are projected to develop to urban-scale development densities providing substantial employment opportunities in the office, retail, medical sectors, as well as moderate to high density housing development.

Motorists traveling to/from destinations west of I-29 in the study area must travel north to 41st Street interchange or south to the Tea interchange to access I-29. Motorists west of I-29 can also access the Interstate System by crossing the interstate via the 41st Street, 49th Street (grade-separated), 57th Street (grade-separated) or Highway 106 crossings of I-29, and then access I-229 via the Louise Avenue interchange. The I-29/41st Street and I-229/Louise Avenue interchanges currently experience recurring congestion in peak periods, and peak period travel delays are forecasted to increase over the planning horizon as traffic levels increase. Thus, under the No-build scenario where limited added capacity and no new routes are provided in the area, accessibility to and through the study area will decline as traffic volumes increase and congestion worsens.

As illustrated in Figures 2 and 3, a significant portion of the study area growth noted in Table 1 is forecasted to be immediately adjacent to the I-29 corridor and south of I-229; an area that does not have access to I-29 other than at Highway 106 (Tea). Table 2 documents the level of growth projected in the more focused part of the study area that encompasses the locations around I29/I-229 without I-29 access.

TABLE 2. PROJECTED HOUSING AND EMPLOYMENT GROWTH, 2000 TO 2033 (WITHIN ONE MILE OF I-29/I-229)

Variable	2000	2033	Growth (2000 to 2033) Absolute Number	Growth (2000 to 2033) Percent Change
Households	2,030	3,360	1,330	66%
Employment	2,190	21,150	18,960	870%

Source: City of Sioux Falls, 2008

1.2 STUDY APPROACH

This report provides an overview of the alternatives considered, documents their associated traffic operations, and demonstrates that the action associated with implementing the proposed project does not have any fatal flaws. This report also provides a recommendation for the most technically feasible composite alternative and the phasing of the proposed infrastructure improvements. Demonstrating that no fatal flaws exist does not endorse a particular project, but rather provides information concluding that an alternative is not flawed from the perspective of traffic operations and safety.

These requirements are consistent with those which will be required by the FHWA for approval of Interstate System modifications in the study area. Fatal flaws would include alternatives that:

- Would negatively impact interstate facility traffic operations and cannot be reasonably mitigated.
- Would negatively impact interstate facility/cross street safety and cannot be reasonably mitigated.
- Conflicts with or is inconsistent with local and regional plans.
- Would create the potential for environmental consequences which could not be mitigated.

This report was developed through the following steps:

- Establishment of an appropriate study area: As the issues identified throughout the early stages of the study are greater than isolated bottlenecks in the system, the limits of the analysis must extend beyond areas immediately adjacent to identified developments along I-29 and I-229. The established study area extends from north of the I-29/41st Street interchange to south of the I-29/Highway 106 (Tea) interchange even though much of the higher intensity development is forecasted for the area between I-229 and 85th Street. The study area also extends west to the proposed West Side Corridor and to the east of the I-229/Louise Avenue interchange.
- Review of available current traffic volume data and existing and future land use information for the study area.
- Development of transportation improvement alternatives to address identified traffic operation and safety deficiencies.
- Completing the necessary analyses and evaluations that document the benefits and impacts of the proposed improvement alternatives, including:
  - Development of horizon year traffic forecasts. Daily and peak hour traffic forecasts for 2033 were prepared for the study area interstate segments, interchanges, interstate ramp intersections and adjacent arterial street intersections based on the Sioux Falls regional travel demand model for 2033.
  - Analysis of the current and future traffic operations along study area roadway links. The traffic analyses were completed using the procedures and methodologies found in the *2000 Highway Capacity Manual*.
  - Evaluation of the benefits/impacts to adjacent development associated with the proposed improvement alternatives.
  - Evaluation of the social and environmental impacts associated with each alternative.
  - Evaluation of the constructability of each alterative.
  - Development of construction cost for each alternative.
- Identify the most technically feasible improvement alternative for the I-29 Corridor.
- Develop a phasing plan for implementation of the most technically feasible alternative.

During the course of this study, "open house" style meetings were held on March 30, 2006, July 17, 2008, and February 26, 2009 to gather input and provide project information to the public regarding the I-29 Corridor Study. All of the meetings provided an informal forum for the public to learn about the study and offer comment. Staff from the SDDOT, the City of Sioux Falls and the engineering consultant for the project was available to respond to questions. The meetings were publicized through paid advertisements in the Sioux Falls Argus Leader, a large local newspaper.

During each meeting, a brief slide presentation explaining the study process, the status of the study, and the purpose for the meeting was provided to the public. Additionally, aerial photographs with overlays of the potential design alternatives for the study concepts were displayed for public review. People were encouraged to review the information provided on the aerial displays and ask questions and/or discuss the project with SDDOT and URS team representatives. To provide adequate personal attention necessary to the success of the meeting, SDDOT and URS staffs were available to clarify project objectives, describe the process, answer questions, and record comments.

Comments received from the approximately 100 people who attended the meetings were mostly general and were in regards to the meeting, study process, and prioritization of projects. Each comment was read and considered after the meeting. Some comments were used in the alternative selection process. The sign-in forms and written public comments are included in Appendix D. Video recordings of the July 17, 2008 and February 26, 2009 meetings are available for viewing on the SDDOT website.

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An evaluation of existing and future traffic levels and traffic operations has been completed to assess the transportation system impacts associated with the anticipated level of development and to identify the system upgrades that best address the needs in the study area from a broad range of concepts.

2.1 EXISTING AND FUTURE TRAFFIC DEMAND

Traffic volumes were evaluated for both existing and future (2033) conditions. Existing traffic volumes in the study area were collected from available state (SDDOT) and city (Sioux Falls) data sources. The traffic operations analyses included evaluations of existing and future operations along the Interstate System, at ramp terminal intersections, and at arterial intersections within the defined study area.

Along many interstate segments peak hour freeway volumes required conversion of the observed daily traffic volumes using limited hourly data available from the SDDOT. For this study the only peak hour traffic volume data available for the mainline freeway came from the ramp counts the SDDOT conducted at the I-29/I-229 interchange. These counts along with the service interchange ramp counts developed from intersection turn movement counts served as the starting point for developing peak hour freeway volumes. Across many parts of the study area current intersection volume data was not available or future volumes along many segments are expected to change dramatically from today's volume. For these portions of the study area current daily and peak hour count data and/or the daily-to-hourly relationships observed in the current data would not be good indicators of future conditions. Thus, more generalized peak hour percentages of daily traffic and approach directional splits for suburban mixed use areas were used to develop peak hour volumes for each of the key intersections. Existing daily volumes on the studied links are shown in Figure 4. Existing peak hour volumes are shown in Figure 5.

2.1.1 2033 Daily Traffic Forecasts

The 2033 traffic forecasts provided in this document are based on application of the Sioux Falls MPO's regional travel model. The travel model is a computer application that estimates daily traffic volumes on the regional street and highway network for a given land use and transportation scenario. The travel model was updated by MPO staff to reflect 2033 land use and transportation network conditions. As a part of this update, the travel model was refined in the study area by subdividing the existing traffic analysis zone (TAZ) structure, to allow for more detailed model output. Forecasts of daily traffic volumes were developed by evaluating the growth in daily traffic volumes projected by application of the travel model between 2000 and 2033.

The No-build scenario (Alternative 1) assumed that the following roadway network improvements had been completed in the study area:

- An extension of Solberg Avenue/Tallgrass Avenue south from its current terminus at 59th Street to intersect with 69th Street, including a grade-separated crossing of I-229.

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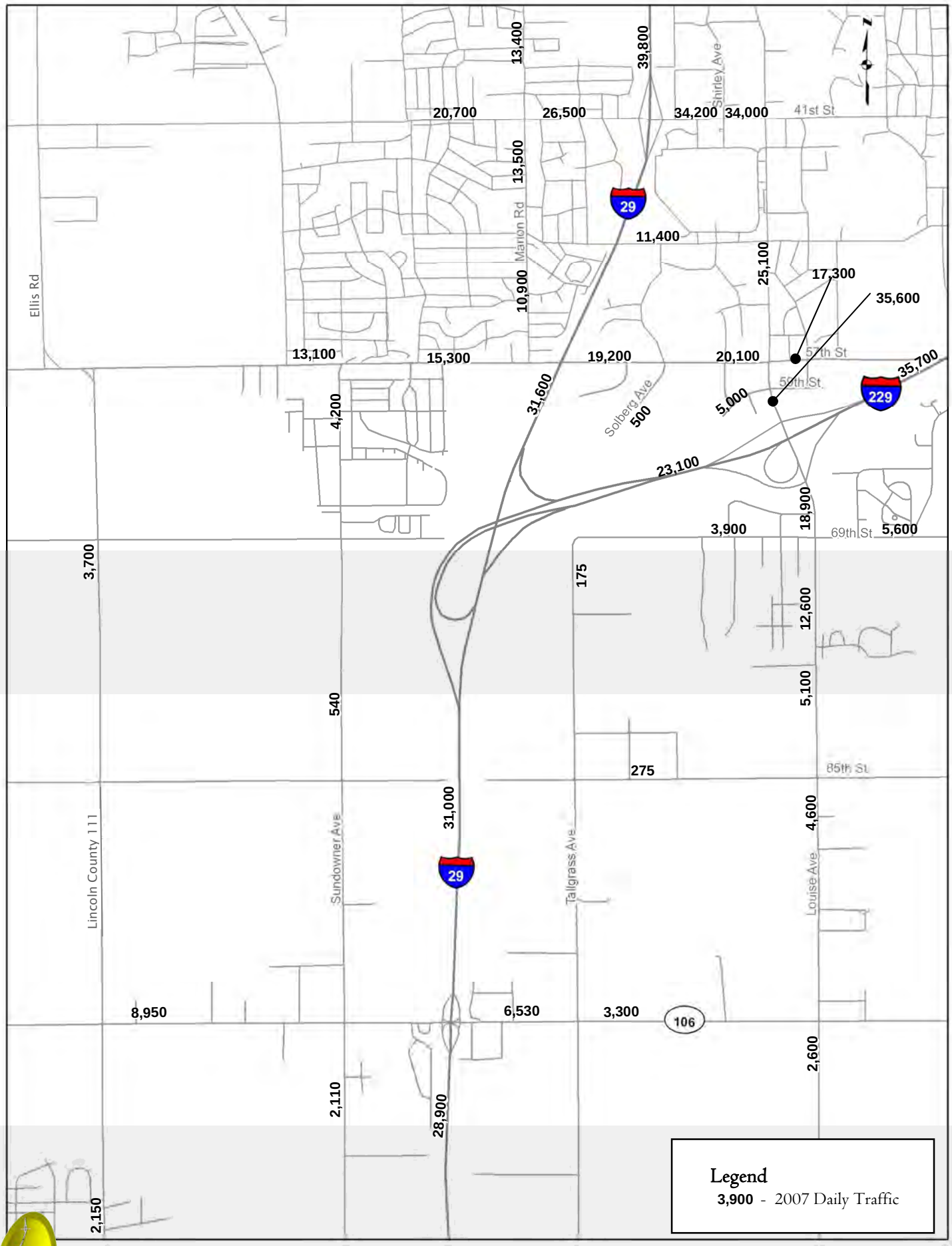

I-29 Corridor Study
41st Street to CR 106

Figure 4. Existing (2007) Daily Traffic Volumes

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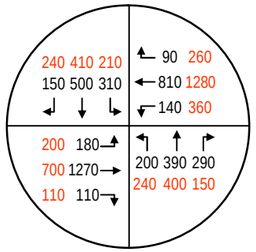
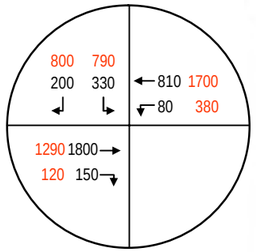
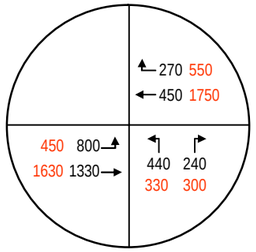


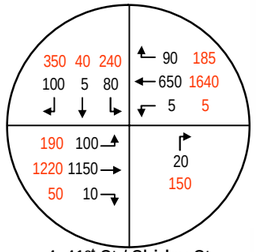
1. 41st St / Marion Rd



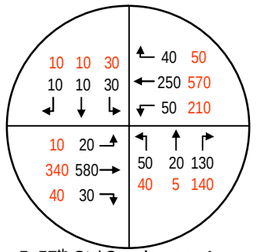
2. 41st St / I-29 SB



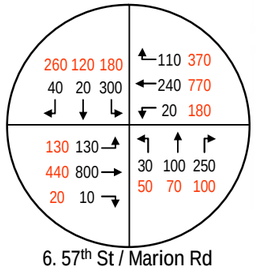
3. 41st St / I-29 NB



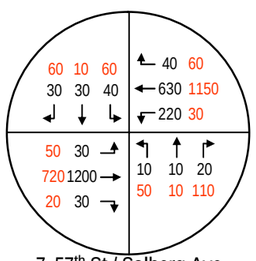
4. 41st St / Shirley St



5. 57th St / Sundowner Ave



6. 57th St / Marion Rd



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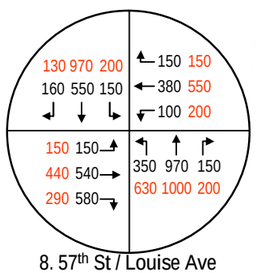
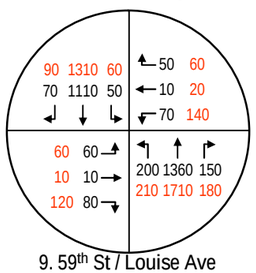
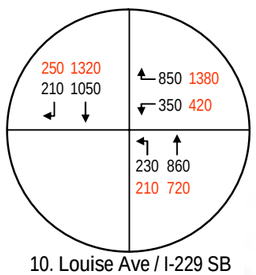


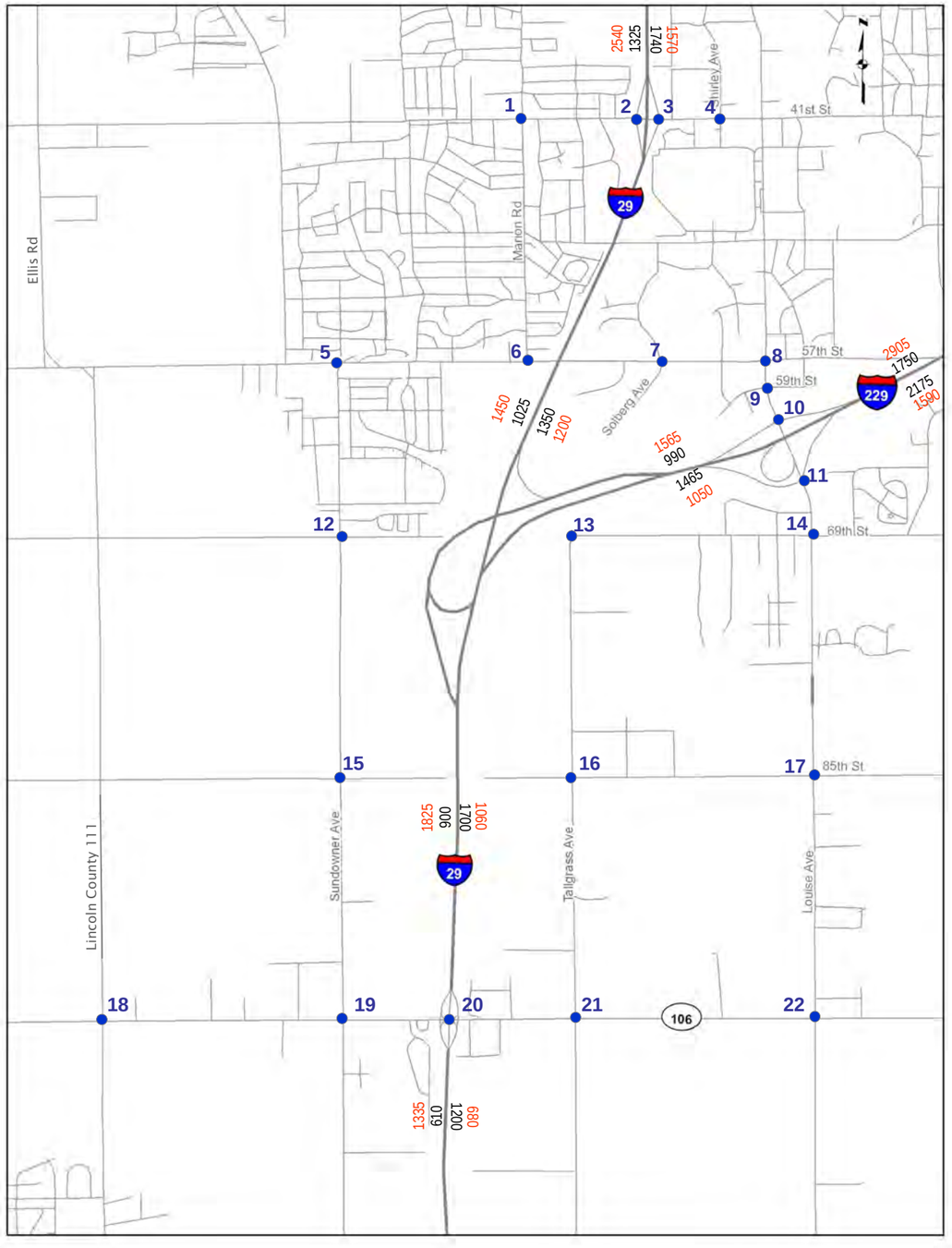
8. 57th St / Louise Ave

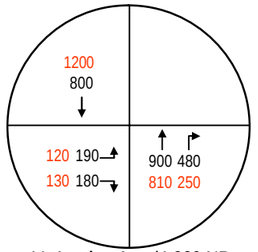


9. 59th St / Louise Ave



10. Louise Ave / I-229 SB





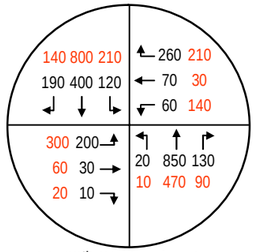
11. Louise Ave / I-229 NB

No Data are Available

12. 69th St / Sundowner Ave

No Data are Available

13. 69th St / Tallgrass Ave



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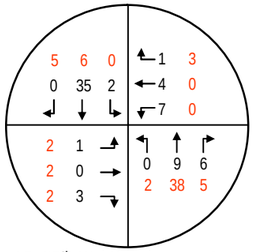

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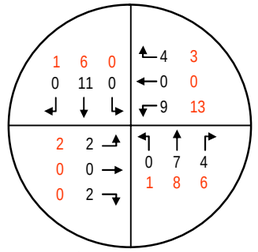

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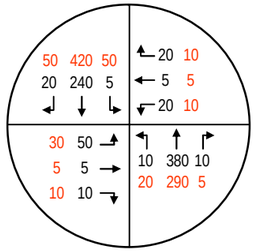
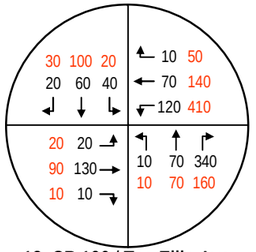
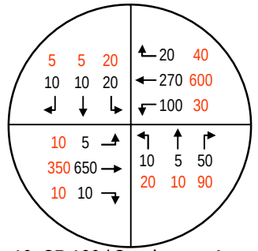


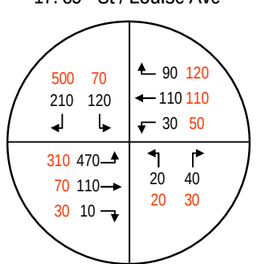
17. 85th St / Louise Ave



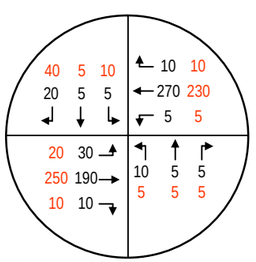
18. CR 106 / Tea-Ellis Ave



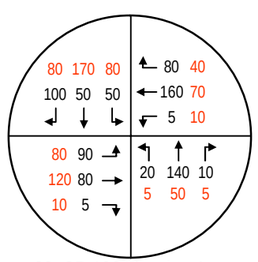
19. CR 106 / Sundowner Ave



20. CR 106 / I-29



21. CR 106 / Tallgrass Ave



22. CR 106 / Louise Ave

Legend

700 - AM Peak Hour Turning Movement

350 - PM Peak Hour Turning Movement

- Evaluated Intersection

I-29 Corridor Study
41st Street to CR 106

URS

DOT

Figure 5. Existing (2007) Peak Hour Traffic Volumes

- The extension of 59th Street west from its current terminus west of Louise Avenue to intersect with the future Solberg Avenue.
- The East Side Corridor is constructed.
- The West Side Corridor is constructed.

The daily traffic forecasts for the 2033 No-build scenario (Alternative 1) are presented in Figure 6.

Network modification scenarios representative of the "build" condition reflect a range of arterial, interstate mainline and interstate access alternatives that combine the following individual elements:

- An extension of 69th Street across I-29 to provide a continuous arterial corridor across the southern portion of Sioux Falls. A range of alignments along the section line, as well as both north and south of the section line, were evaluated for the crossing. The range of concepts included extending 69th Street on-grade, which would result in raising I-29 and the I-29/I-229 interchange ramps and concepts that assumed 69th Street would cross over I-29.
- An extension of 85th Street across I-29 to establish a continuous arterial corridor at the southern limits of Sioux Falls. Only elevated 85th Street crossing alternatives were evaluated.
- A full-access interchange at I-29/85th Street and the east side and west side approach roads that create a continuous corridor with access to the Interstate System. In the earlier stages of the alternatives review four unique interchange configurations were evaluated and coupled with a range of improvement concepts for the I-29/I-229 interchange. The alternatives carried forward into this document are those that best addressed the desire for access at 85th Street, are consistent with city and state design guidelines, and can be reasonably incorporated with I-29 modifications to accommodate forecasted traffic.
- Adding auxiliary lanes to I-29 from Highway 106 (Exit 73) through the 41st Street (Exit 77) and to I-229 from the I-29 interchange through Louise Avenue (Exit 1).
- Modifying and/or reconstructing the I-29/I-229 interchange to better accommodate the increment of development traffic, arterial grade separated crossings at Solberg Avenue-Tallgrass Avenue, 69th Street and 85th Street, and an interchange at I-29/85th Street.

Throughout the alternatives review an I-229 crossing along the Solberg Avenue-Tallgrass Avenue corridor was assumed as a completed project by 2033. Thus, the arterial corridor improvement was included in the No-build and in the range of Build alternatives. The individual components representing Build concepts that could impact travel patterns were combined in a series of composite alternatives. As there are three primary components (a 69th Street crossing, an 85th Street crossing, and an I-29/85th Street interchange) and a Build alternative could include one or more of the individual components, a total of five unique Build daily traffic forecasts were developed. The individual access modification elements (69th Street crossing only, 85th Street crossing only, and the I-29/85th Street interchange only) make up three of the five and the remaining two are:

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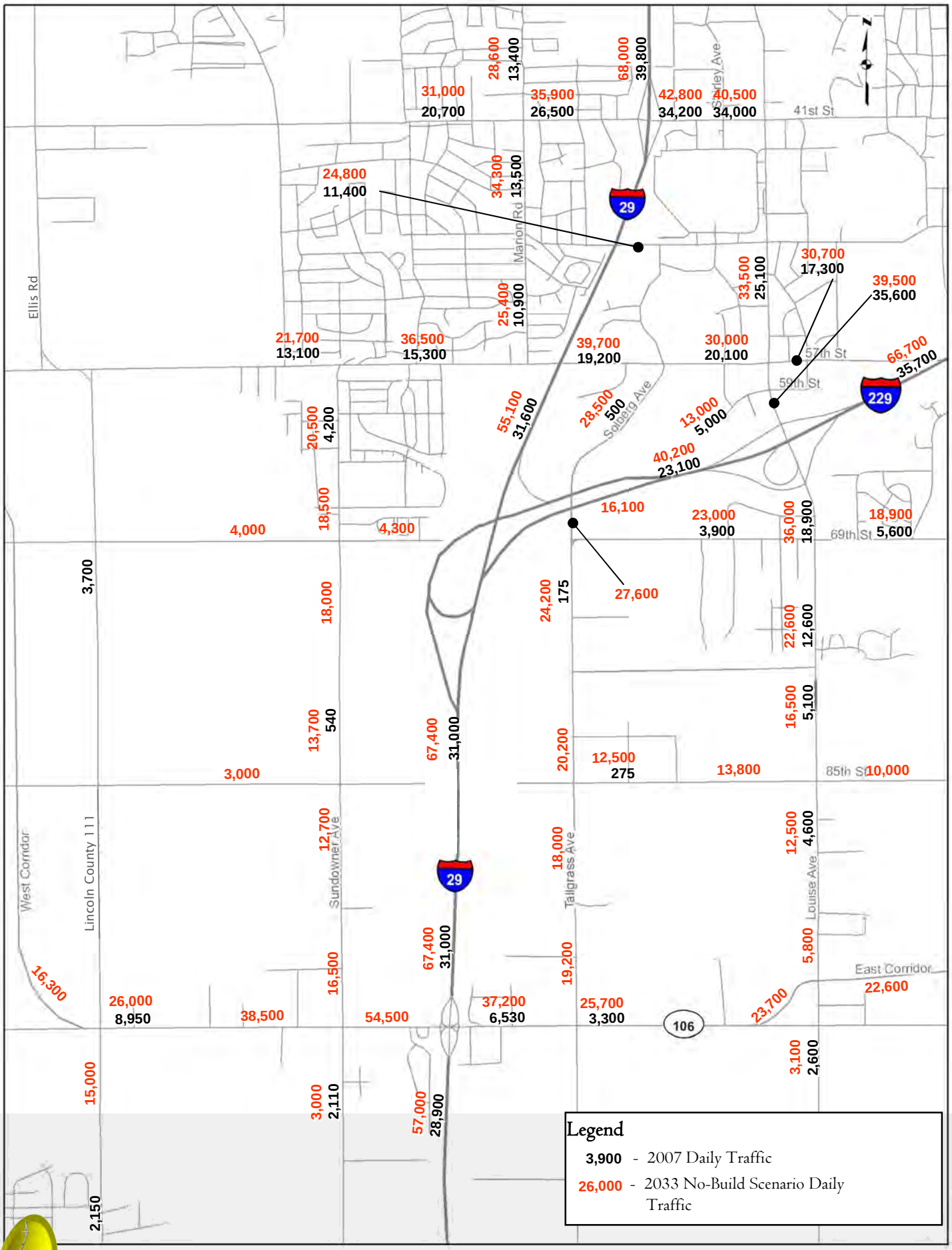

I-29 Corridor Study
41st Street to CR 106

Figure 6. Future (2033) No-Build (Alternative I) Daily Traffic

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- A 69th Street crossing of I-29 and an 85th Street crossing of I-29.
- A 69th Street crossing of I-29 and an I-29/85th Street interchange.

While the operations analysis includes modifications to the interstate mainline and to the I-29/ I-229 System Interchange, the modifications do not result in changes to access that would substantially impact traffic volumes. Thus, a unique daily traffic forecast representative of the interstate modifications is not warranted.

Labels for each of the individual corridor modification alternatives and combinations of the individual improvements have been developed and are listed below:

- Alternative 2: 69th Street extension across I-29 to fill in the Sundowner Avenue to Tallgrass Avenue gap.
- Alternative 3: 85th Street extension across I-29 to fill in the Sundowner Avenue to Tallgrass Avenue gap.
- Alternative 4: Provide a new interchange on I-29 at 85th Street and the associated arterial extensions along 85th Street to fill in the Sundowner Avenue to Tallgrass Avenue gap.
- Alternative 5: The combination of both Alternative 2 and Alternative 3.
- Alternative 6: The combination of Alternative 2 and Alternative 4.

Daily traffic forecasts for each of the five Build network modifications are displayed in Figures 7 through 9.

2.1.2 2033 Peak Hour Traffic Forecasts

The daily traffic forecasts were the basis for developing the 2033 peak hour forecasts for both the No-build and all Build scenarios. The peak hour traffic forecasts were developed by reviewing:

- *Current peak hour traffic characteristics*: In currently established corridors, the existing peak hour percentages of daily traffic and turning movement proportions were used as a starting point for developing 2033 peak hour turning movement forecasts. Some segments are currently experiencing peak hour volumes that are relatively high compared to typical, mature corridors, with peak hour percentages in the range of 12 to 15 percent of daily traffic.

  It was assumed that as traffic volumes increase substantially through the planning horizon that the percentage of daily traffic occurring during the peak hours would decline. This adjustment accounts for the tendency for peak hour percentages to decline as peak hour traffic levels/congestion increases.

- *Model-Projected Travel Patterns*: In corridors that were anticipated to experience very high levels of growth, a select link analysis of model-projected travel desire lines were reported and reviewed. This review was used to establish forecasted general travel patterns along high-growth segments, and was applied as an element in forecasting travel patterns and turning movements during the 2033 peak hours.

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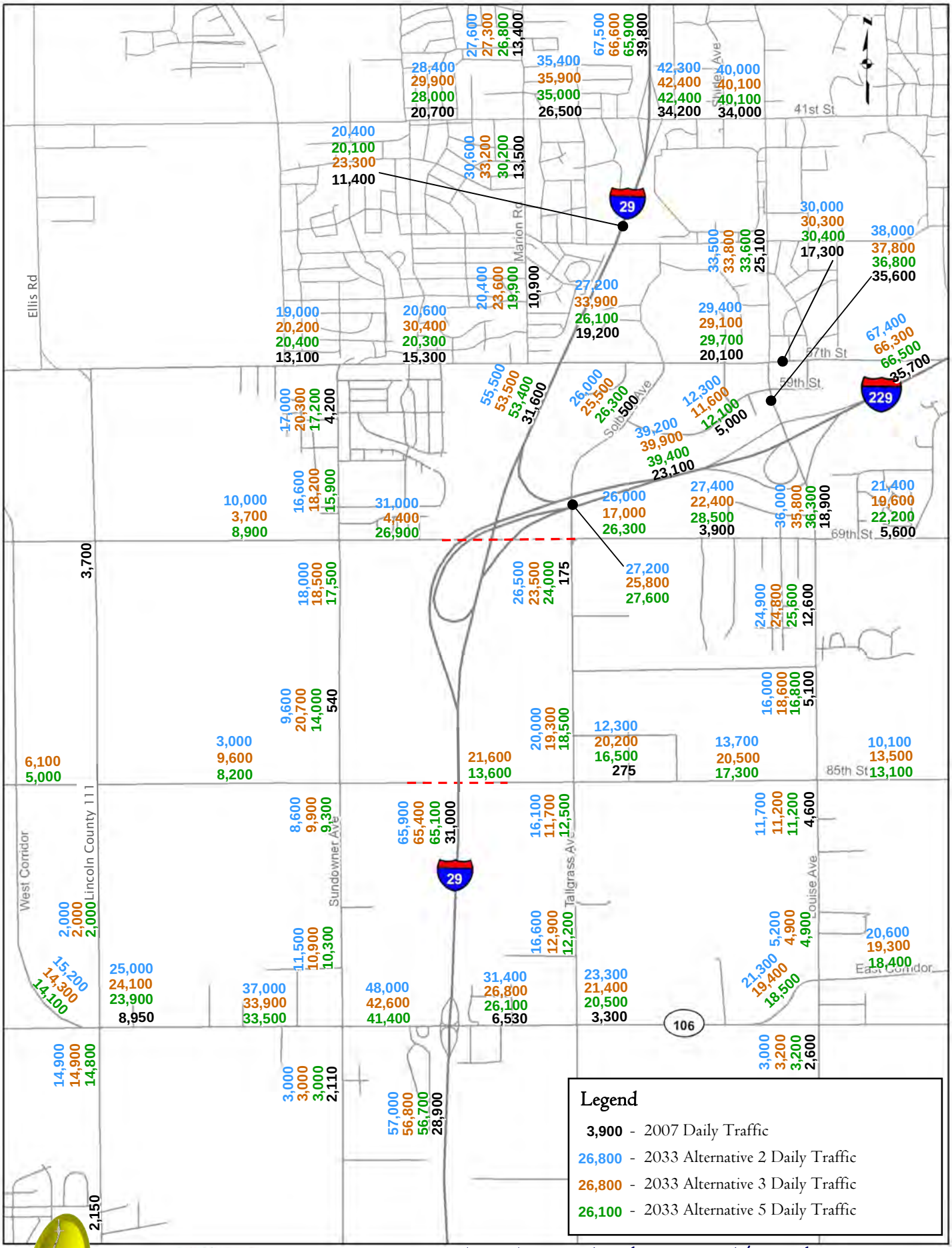

I-29 Corridor Study
41st Street to CR 106

Figure 7. Future (2033) Extend 69th Street and/or 85th Street Across I-29 (Alternative 2/Alternative 3/Alternative 5) Daily Traffic

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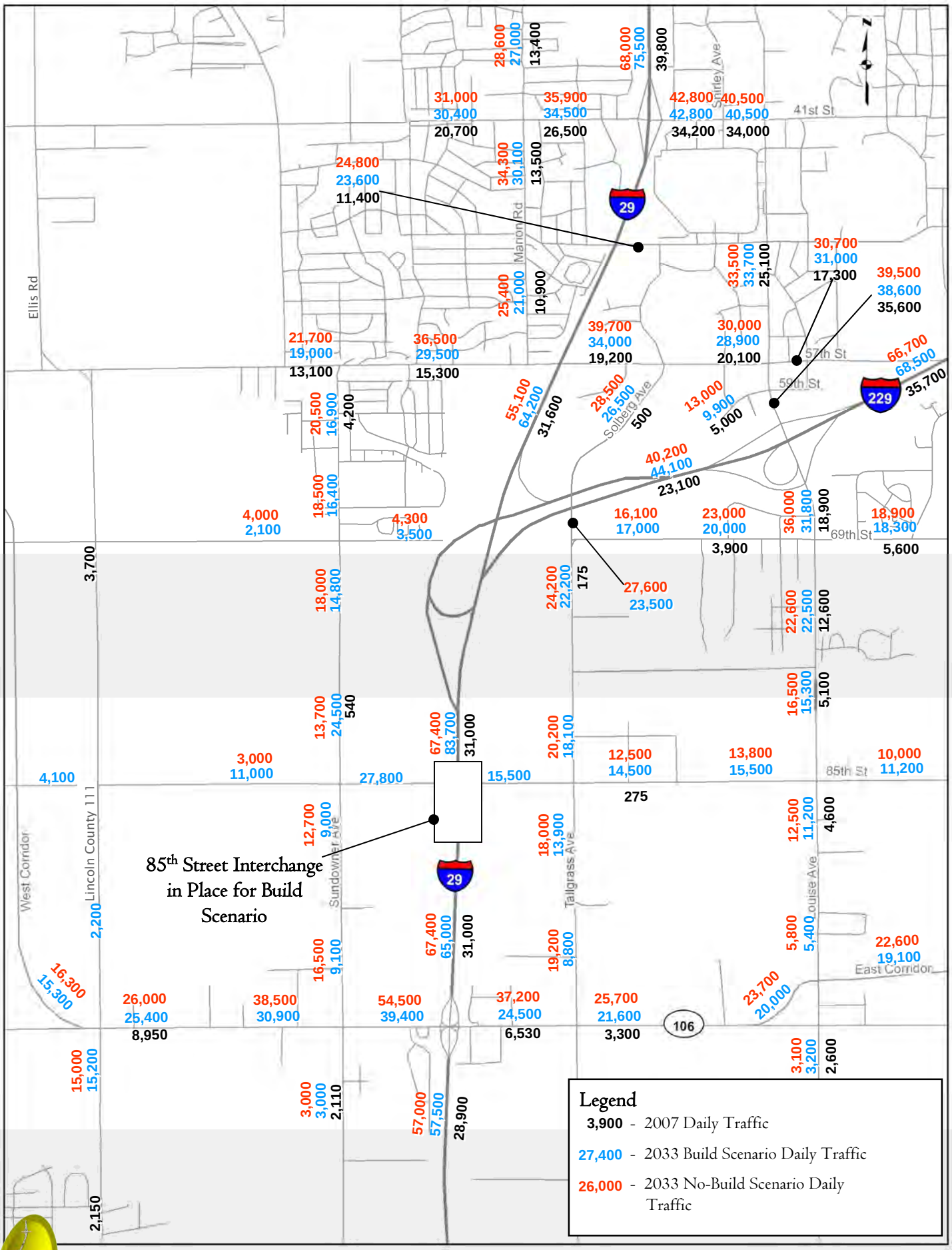

Figure 8. Future (2033) Build I-29/85th Street (Alternative 4) Daily Traffic Volumes

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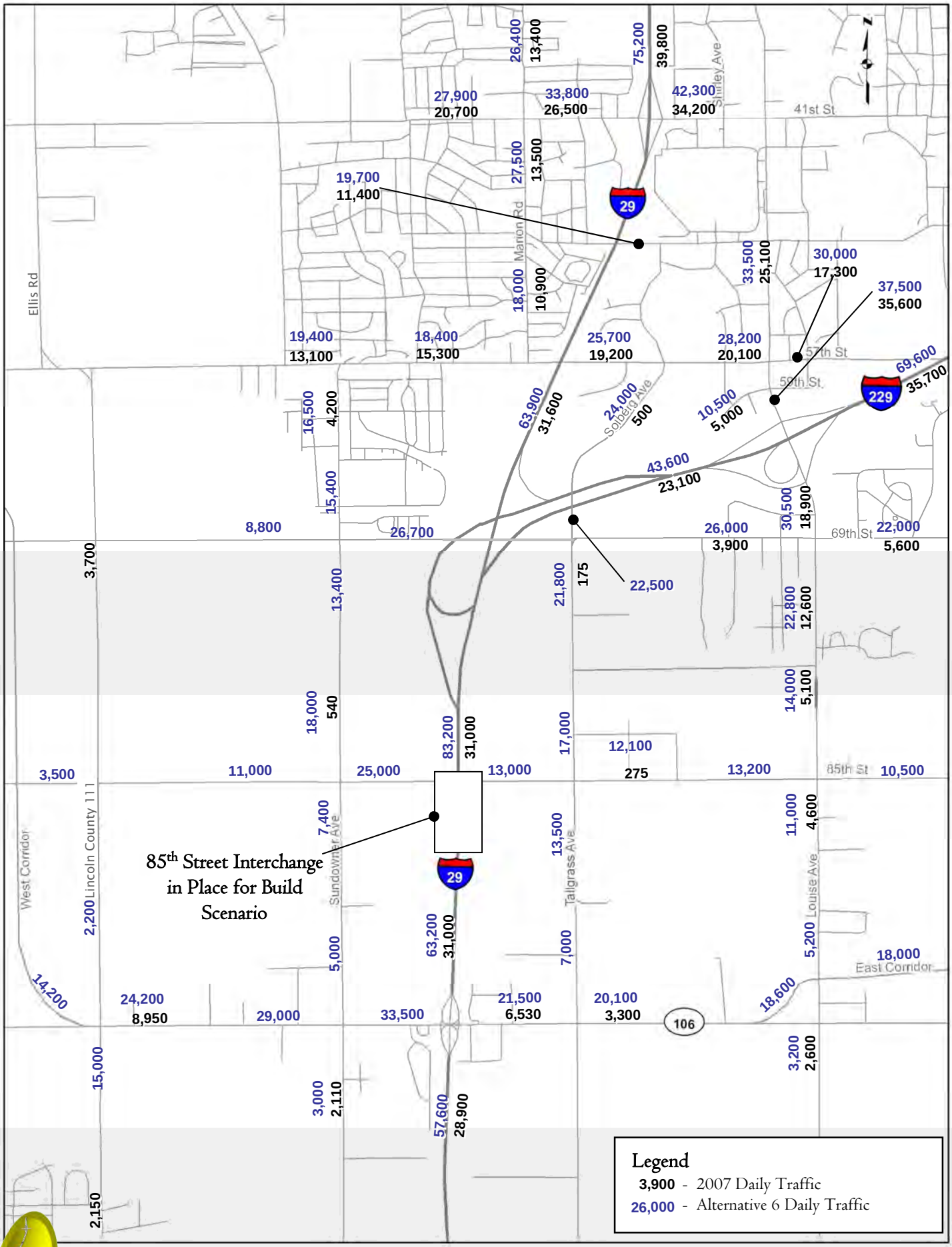

Figure 9. Future (2033) Build I-29-85th Street Interchange-Extend 69th Street Across I-29 (Alternative 6) Daily Traffic

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- *Sanford Site Traffic Forecasts*: A traffic impact study has been developed as a part of the Sanford Health System Research Park development. There was significant coordination between the traffic work on that study and the traffic work that went into this study relative to the traffic patterns associated with the peak hour trip generation they estimated for the Sanford site. The Sanford site analysis traffic information, including turning movements, peak hour percentages of daily traffic and directional traffic patterns was a significant source of information used for the forecasts developed for the remainder of the study area, particularly for the intersections adjacent to the Sanford site.
- *MPO-Projected Socioeconomic Patterns:* The 2033 socioeconomic/land use scenario was reviewed to evaluate how peak hour travel would likely change from existing patterns. Adjustments were made to peak hour percentages of daily traffic and peak hour directional split based on identified locations of new employment and housing.

Through the peak hour forecasting steps outlined above, peak hour traffic forecasts were prepared for the No-build scenario and the Build scenarios. The peak hour forecasts for the No-Build scenario are shown in Figures 10 and 11.

The peak hour forecasts for the Build scenarios are shown in Figures 12 through 17. The range of I-29/85th Street interchange configurations within the Build alternatives offers comparable levels of access between the adjacent area and I-29. Thus, the level of turning traffic through the interchange is forecasted to be the same across each alternative with minor differences according to the location/configuration of the ramps.

2.2 EXISTING AND FUTURE NO-BUILD TRAFFIC OPERATIONS

The evaluation of freeway operations was conducted using the Highway Capacity Software (HCS), which utilizes the procedures and methodologies documented in the *2000 Highway Capacity Manual* (HCM). The freeway analysis included operations of basic freeway segments, ramp junctions, and weaving segments.

Observations of traffic volumes provide an understanding of the general nature of traffic, but do not effectively relate the street network's ability to carry additional traffic or describe the quality of service provided. For this reason, the quality of traffic flow is defined by the concept of level of service (LOS), which is a continuum of letter grades, from A (best) to F (worst), associated with various travel conditions. LOS was developed to correlate numerical traffic volume data to subjective descriptions of traffic performance at intersections, along freeway segments and at ramp junctions. The measures of effectiveness are discussed below:

- *Intersections*: At signalized intersections, level of service is based on the weighted average of all approach delays. For unsignalized intersections, the LOS is based on the worst condition minor street movement delay (usually the left turn movements on the cross street). Table 3 provides the LOS criteria for signalized and unsignalized intersections.
- *Basic Freeway Segments*: The LOS of a basic freeway segment is defined by the density of traffic flow in passenger cars per mile per lane (pc/mile/lane). Density is a measure of the quality of the speed of flow, the ability to maneuver, and the proximity to other vehicles on the freeway. Basic Freeway LOS is described in Table 4.

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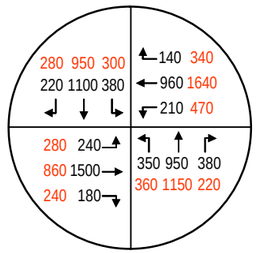
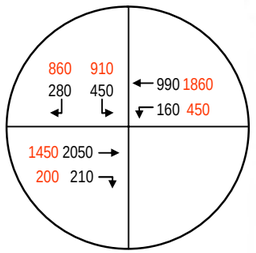
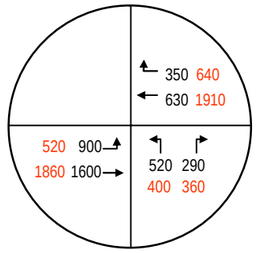


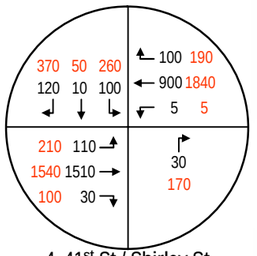
1. 41st St / Marion Rd



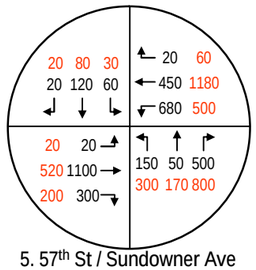
2. 41st St / I-29 SB



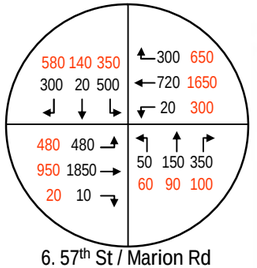
3. 41st St / I-29 NB



4. 41st St / Shirley St



5. 57th St / Sundowner Ave



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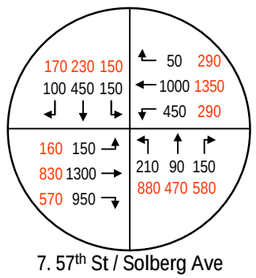
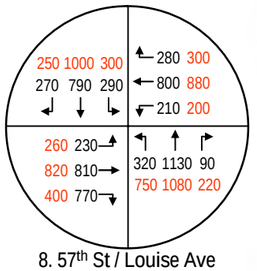
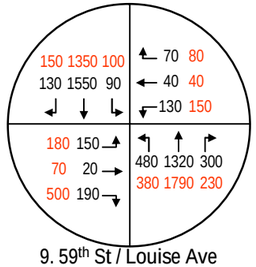


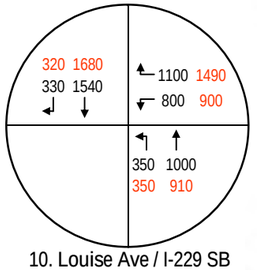
7. 57th St / Solberg Ave



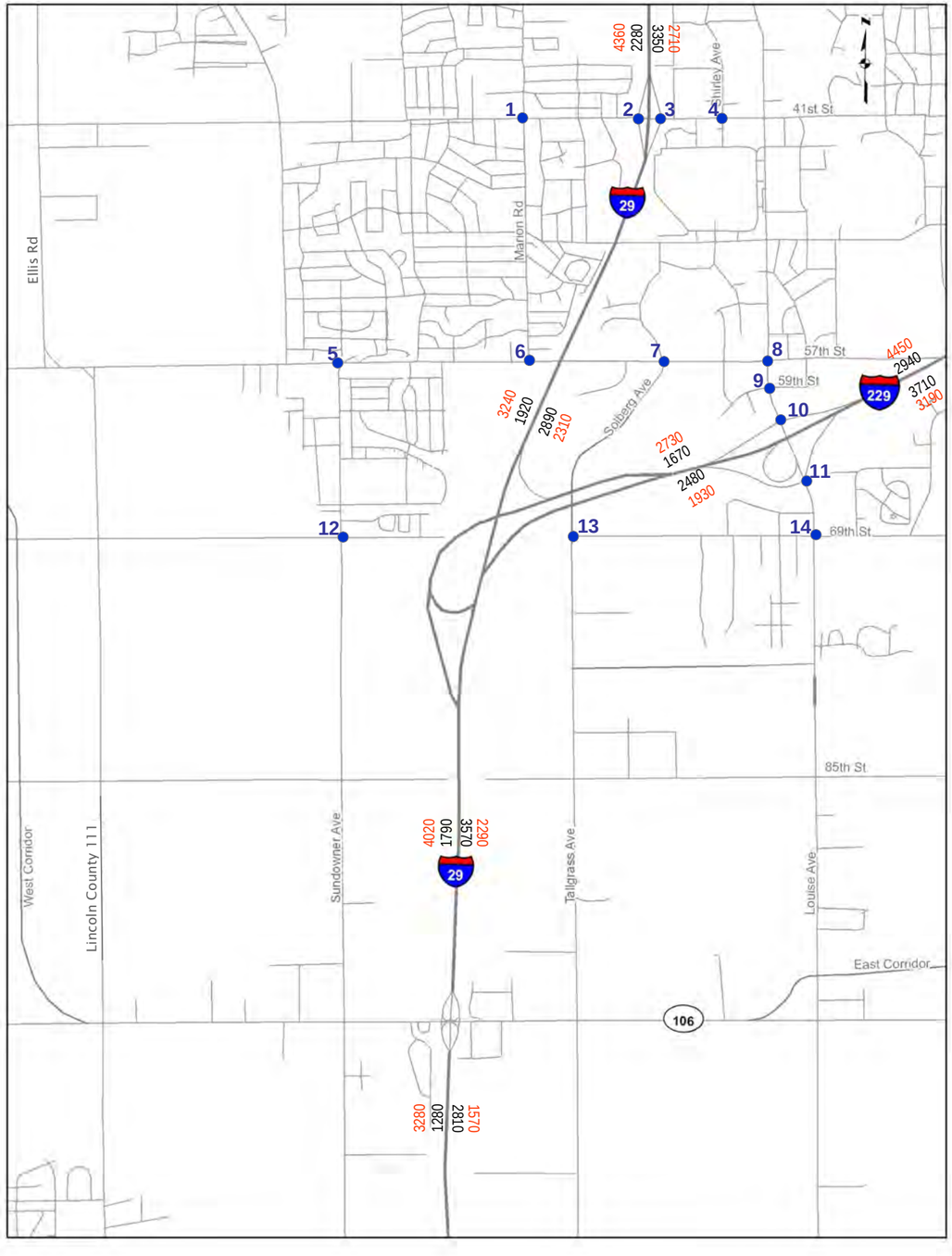
8. 57th St / Louise Ave

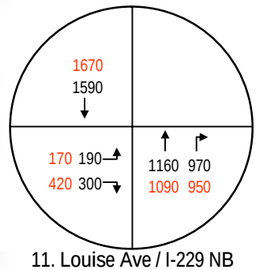


9. 59th St / Louise Ave

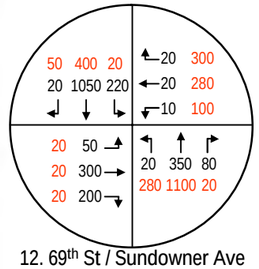


10. Louise Ave / I-229 SB

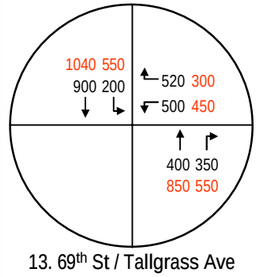




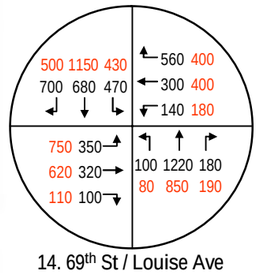
11. Louise Ave / I-229 NB



12. 69th St / Sundowner Ave



13. 69th St / Tallgrass Ave



14. 69th St / Louise Ave

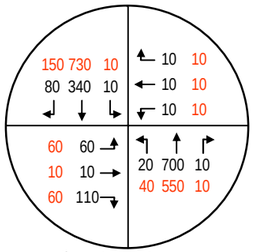
Legend

700 - AM Peak Hour Turning Movement

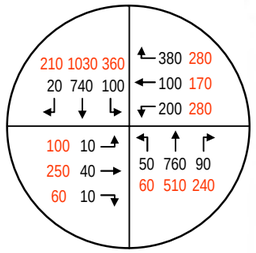
350 - PM Peak Hour Turning Movement

● - Evaluated Intersection

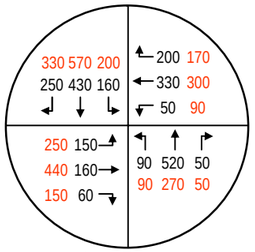
Figure 10. Future (2033) No-Build Scenario Peak Hour Traffic Forecasts



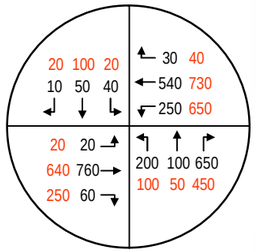
15. 85th St / Sundowner Ave



16. 85th St / Tallgrass Ave



17. 85th St / Louise Ave



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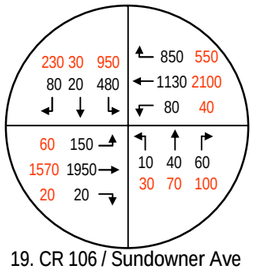
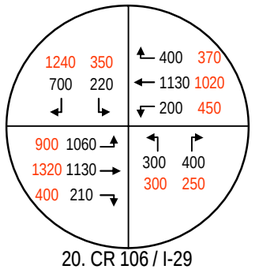
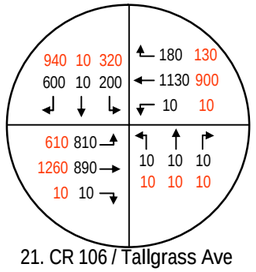


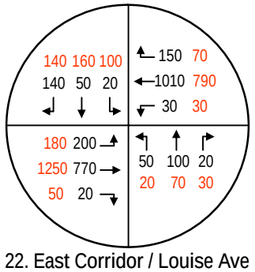
19. CR 106 / Sundowner Ave



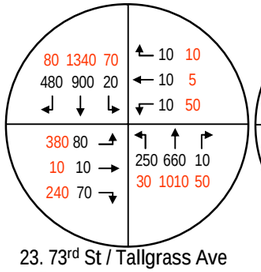
20. CR 106 / I-29



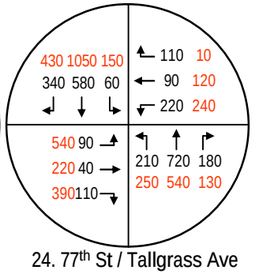
21. CR 106 / Tallgrass Ave



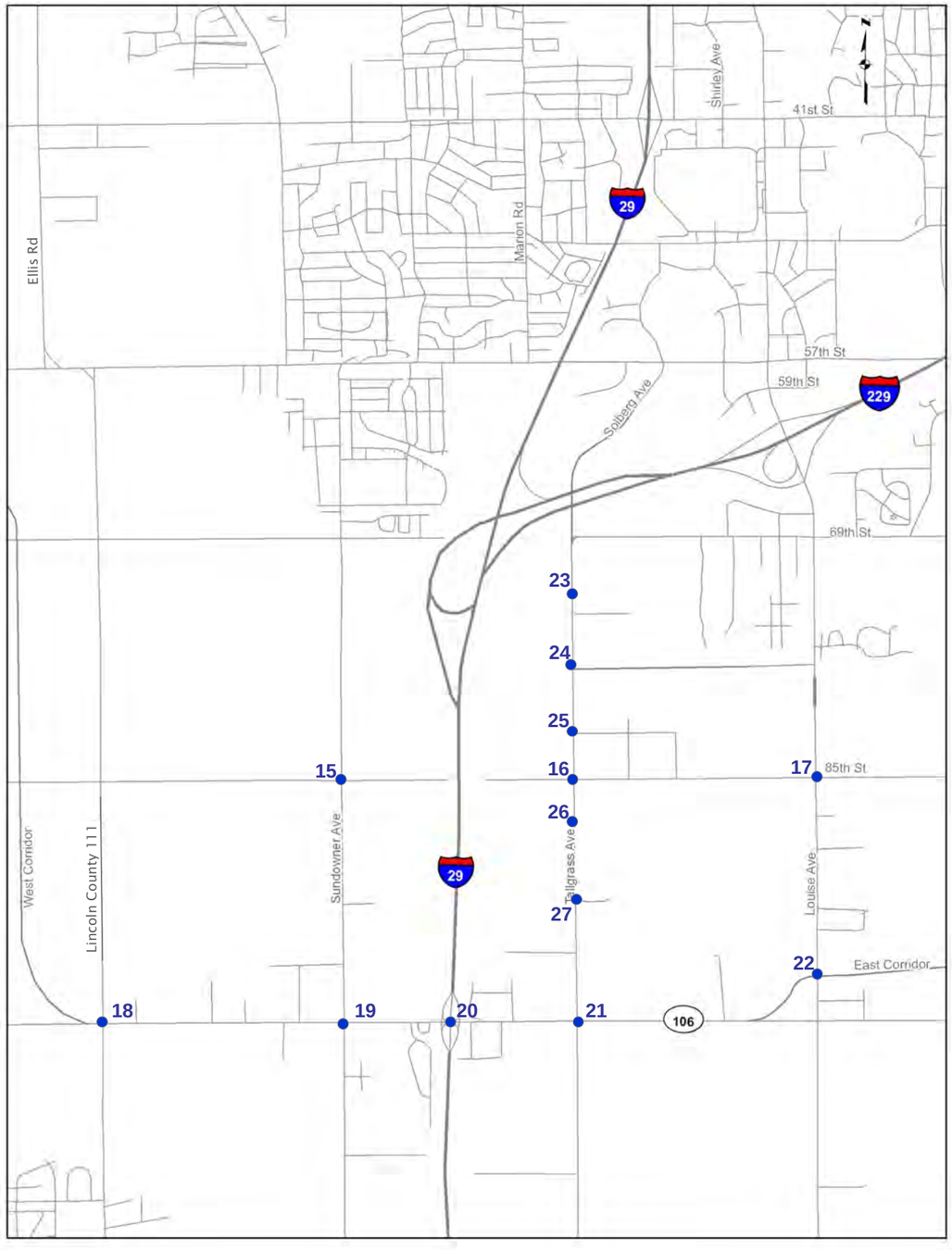
22. East Corridor / Louise Ave

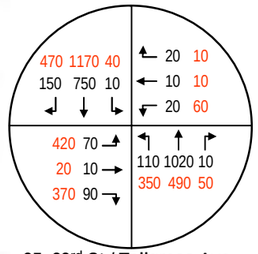


23. 73rd St / Tallgrass Ave

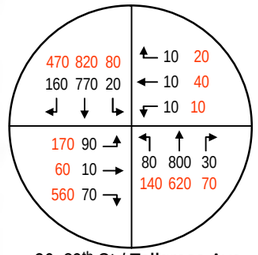


24. 77th St / Tallgrass Ave

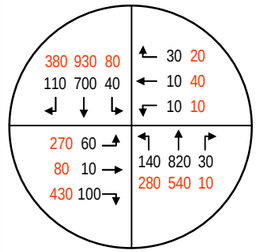




25. 83rd St / Tallgrass Ave



26. 89th St / Tallgrass Ave



27. 93rd St / Tallgrass Ave

Legend

700 - AM Peak Hour Turning Movement

350 - PM Peak Hour Turning Movement

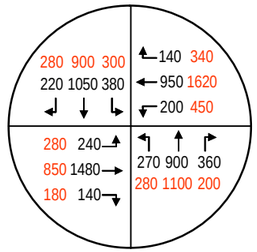
- Evaluated Intersection

I-29 Corridor Study
41st Street to CR 106

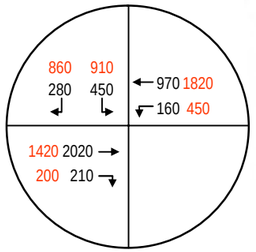
URS

DOT

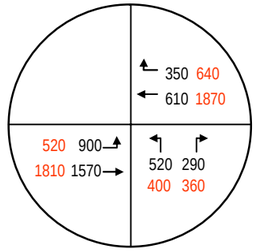
Figure 11. Future (2033) No-Build Scenario Peak Hour Traffic Forecasts (continued)



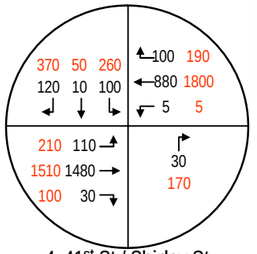
1. 41st St / Marion Rd



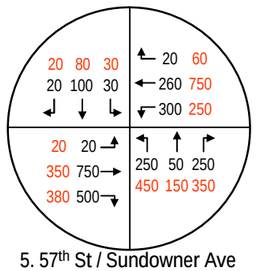
2. 41st St / I-29 SB



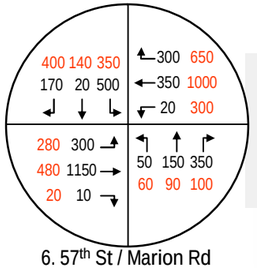
3. 41st St / I-29 NB



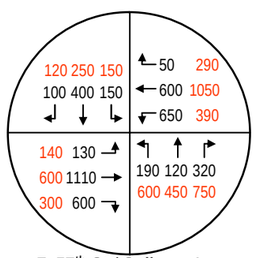
4. 41st St / Shirley St



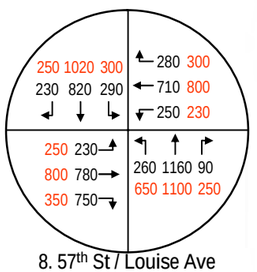
5. 57th St / Sundowner Ave



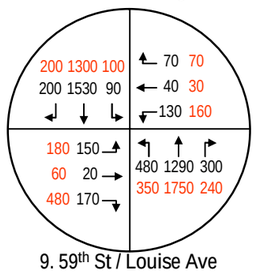
6. 57th St / Marion Rd



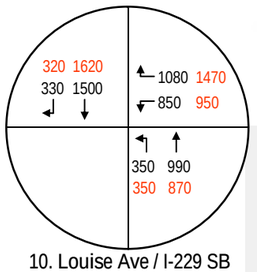
7. 57th St / Solberg Ave



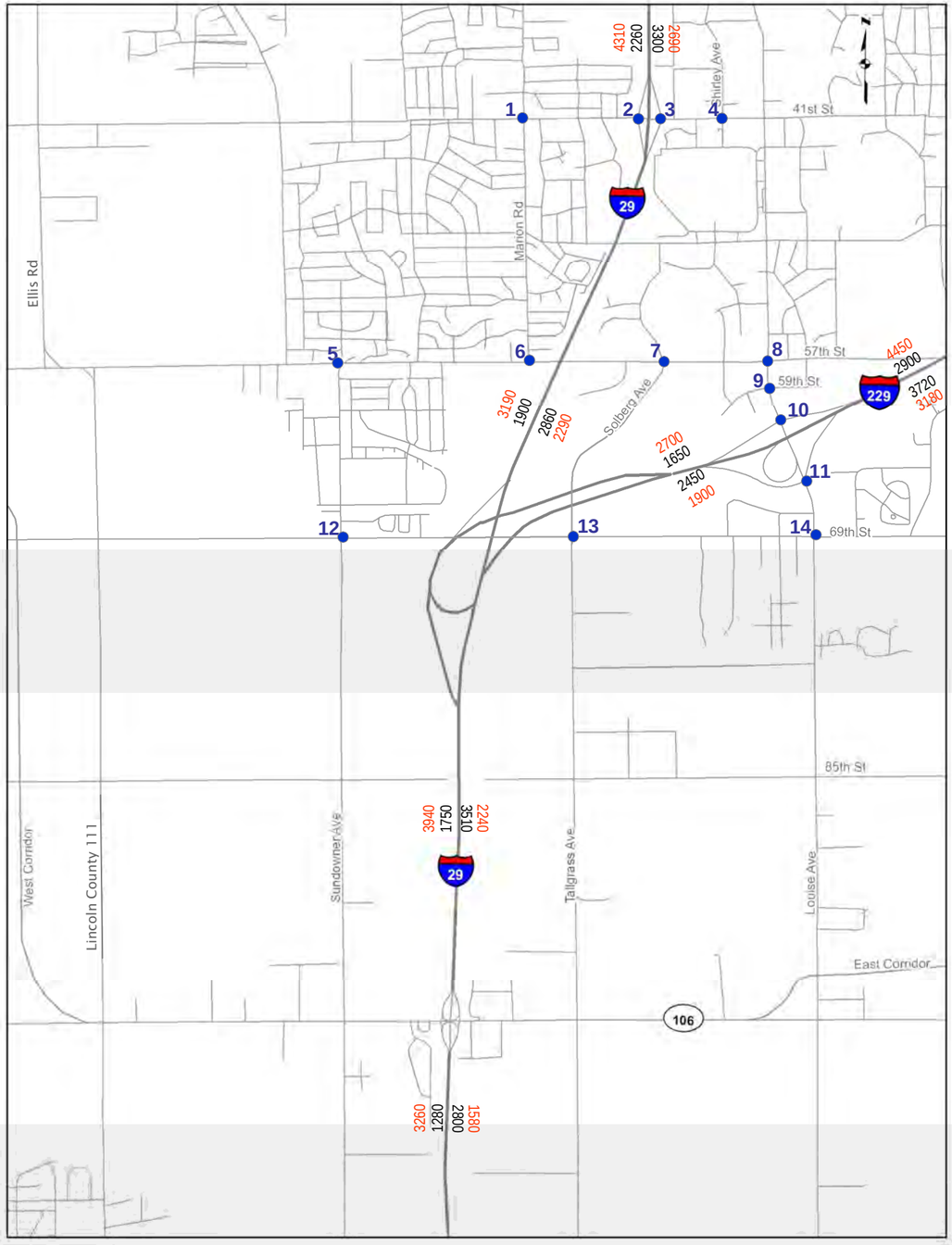
8. 57th St / Louise Ave

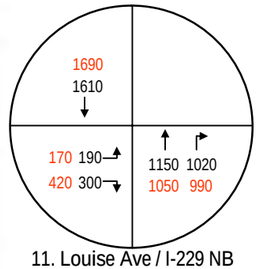


9. 59th St / Louise Ave

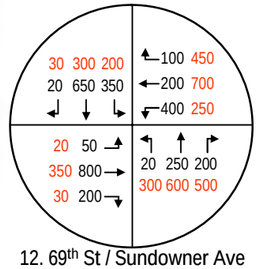


10. Louise Ave / I-229 SB

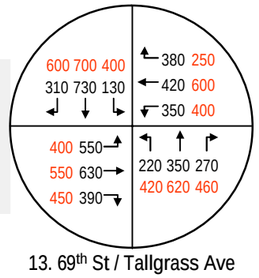




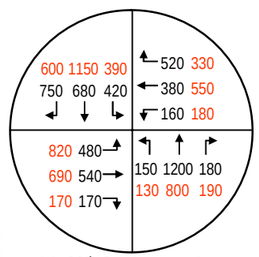
11. Louise Ave / I-229 NB



12. 69th St / Sundowner Ave



13. 69th St / Tallgrass Ave



14. 69th St / Louise Ave

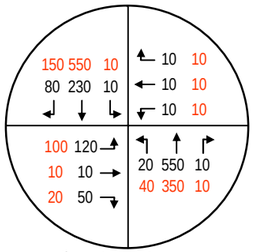
Legend

700 - AM Peak Hour Turning Movement

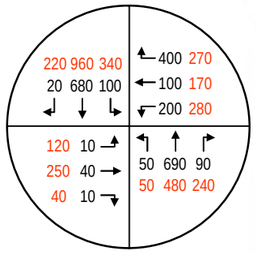
350 - PM Peak Hour Turning Movement

- Evaluated Intersection

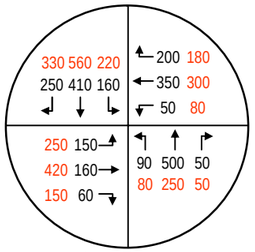
Figure 12. Future (2033) Peak Hour Forecasts - With 69th Street Crossing of I-29



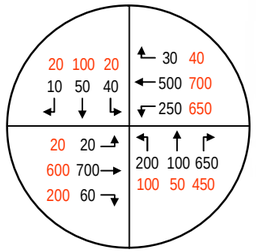
15. 85th St / Sundowner Ave



16. 85th St / Tallgrass Ave



17. 85th St / Louise Ave



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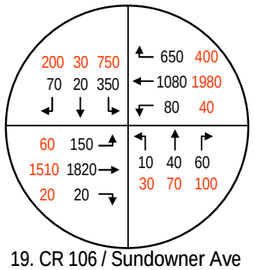
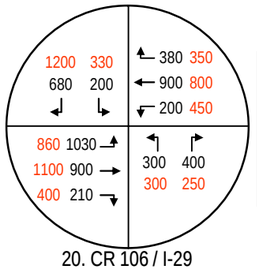
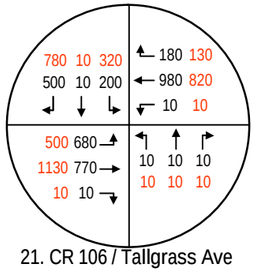


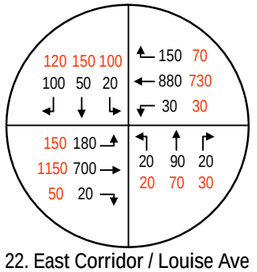
19. CR 106 / Sundowner Ave



20. CR 106 / I-29



21. CR 106 / Tallgrass Ave



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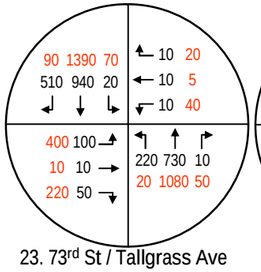
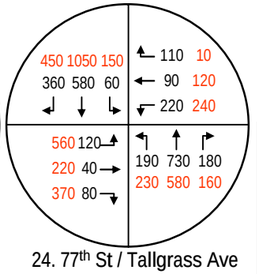
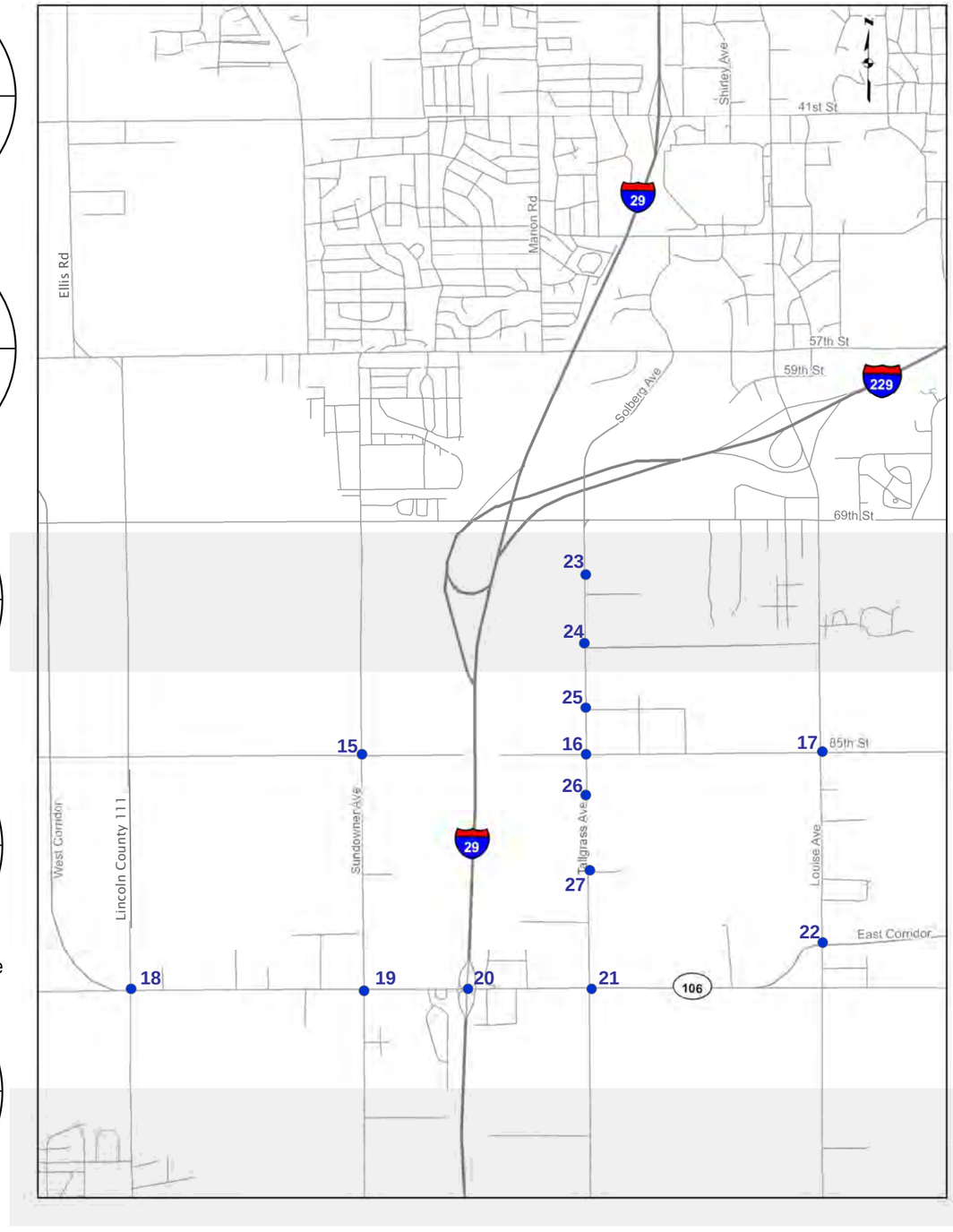
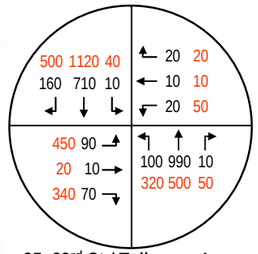


23. 73rd St / Tallgrass Ave

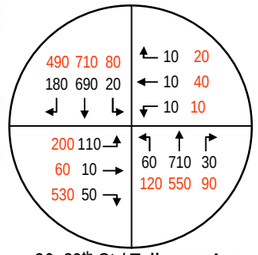


24. 77th St / Tallgrass Ave

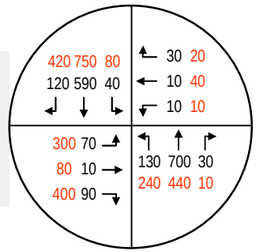




25. 83rd St / Tallgrass Ave



26. 89th St / Tallgrass Ave



27. 93rd St / Tallgrass Ave

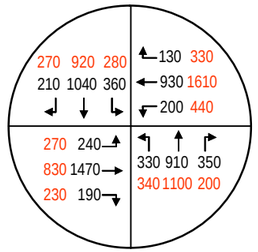
Legend

700 - AM Peak Hour Turning Movement

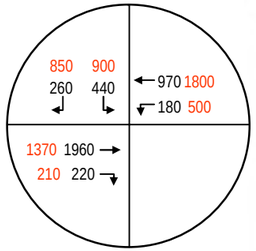
350 - PM Peak Hour Turning Movement

- Evaluated Intersection

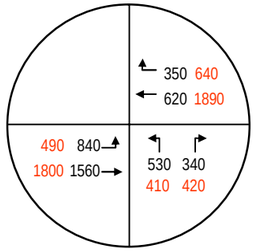
Figure 13. Future (2033) Peak Hour Forecasts - With 69th Street Crossing of I-29 (Continued)



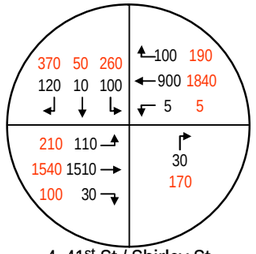
1. 41st St / Marion Rd



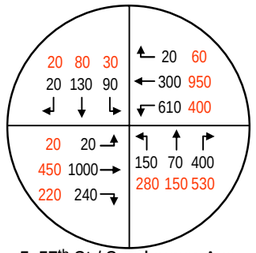
2. 41st St / I-29 SB



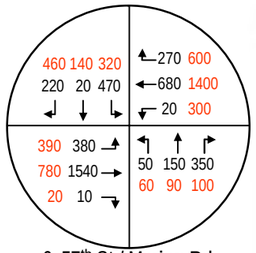
3. 41st St / I-29 NB



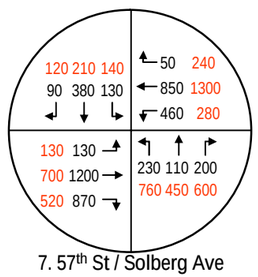
4. 41st St / Shirley St



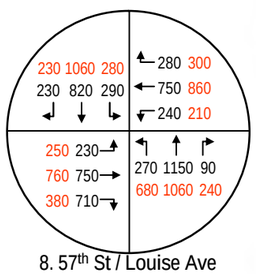
5. 57th St / Sundowner Ave



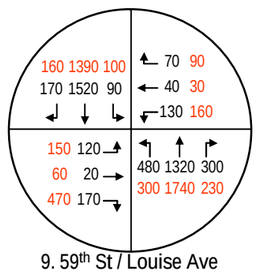
6. 57th St / Marion Rd



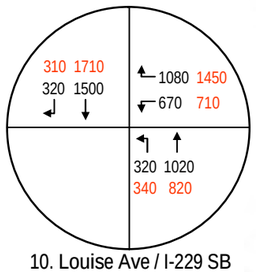
7. 57th St / Solberg Ave



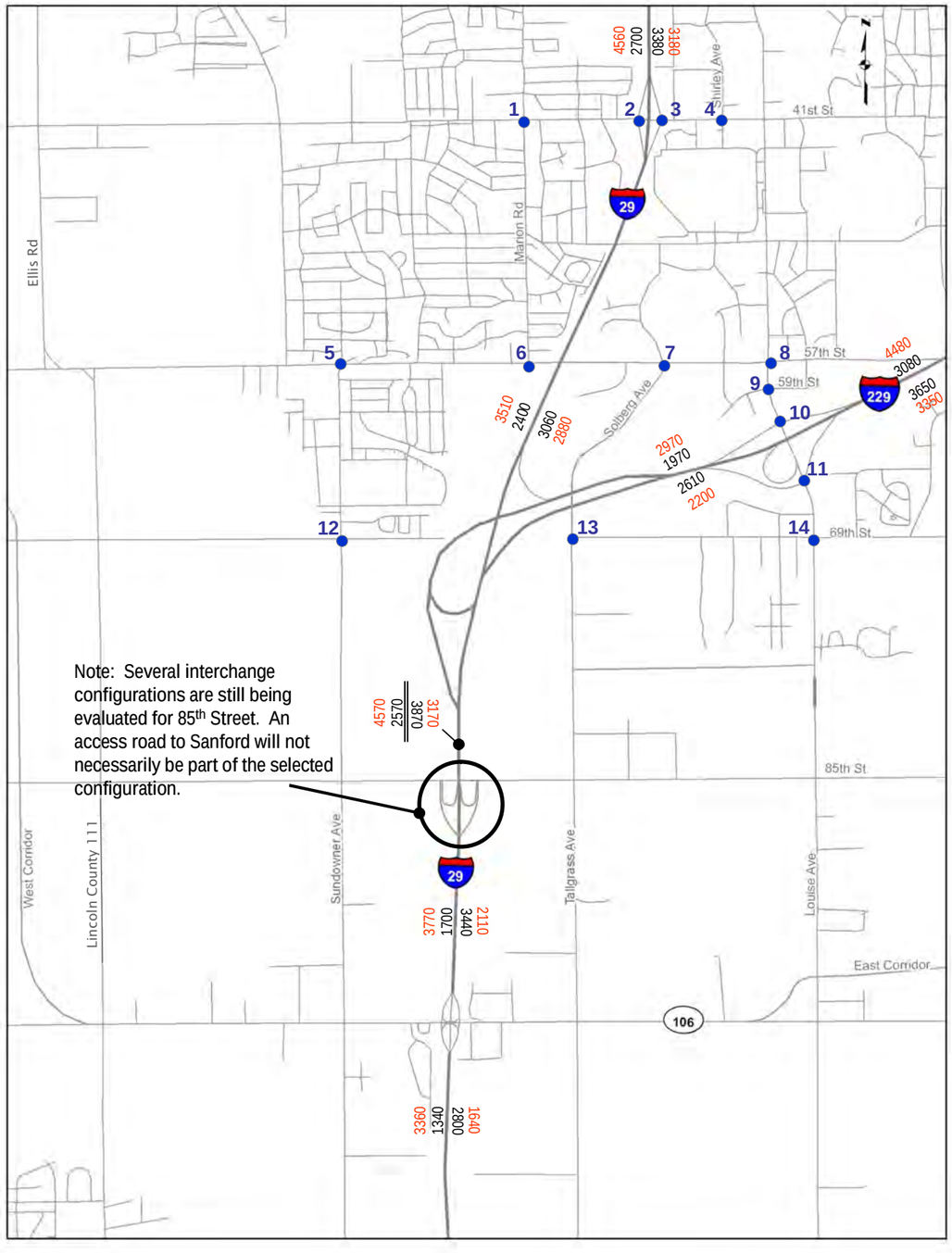
8. 57th St / Louise Ave



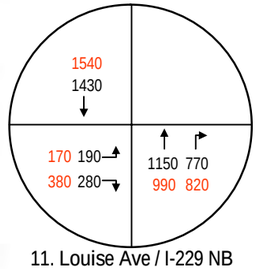
9. 59th St / Louise Ave



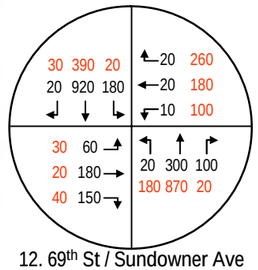
10. Louise Ave / I-229 SB



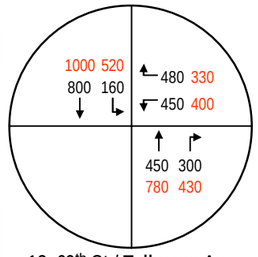
Note: Several interchange configurations are still being evaluated for 85th Street. An access road to Sanford will not necessarily be part of the selected configuration.



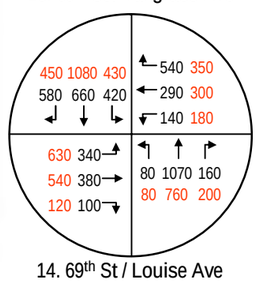
11. Louise Ave / I-229 NB



12. 69th St / Sundowner Ave



13. 69th St / Tallgrass Ave



14. 69th St / Louise Ave

Legend

700 - AM Peak Hour Turning Movement

350 - PM Peak Hour Turning Movement

● - Evaluated Intersection

Figure 14. Future (2033) Peak Hour Traffic Forecasts – With an I-29/85th Street Interchange

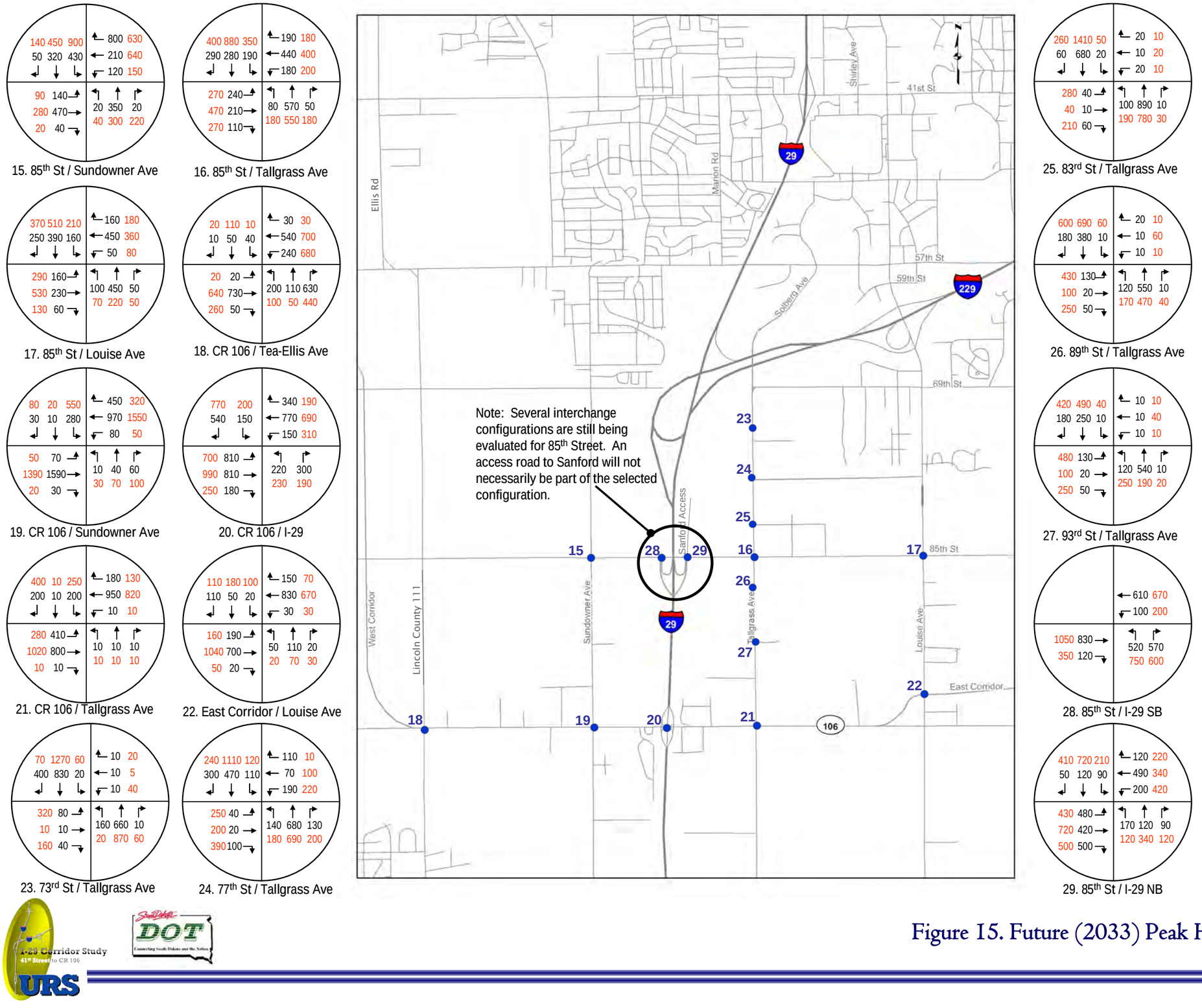
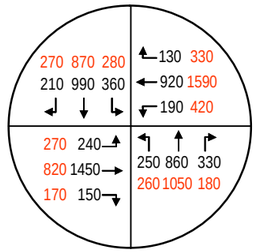
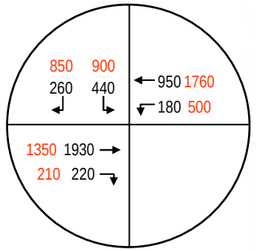


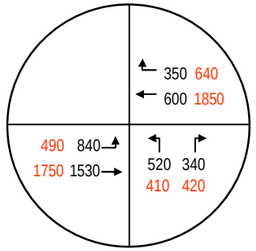
Figure 15. Future (2033) Peak Hour Traffic Forecasts – With an I-29/ 85th Street Interchange (continued)



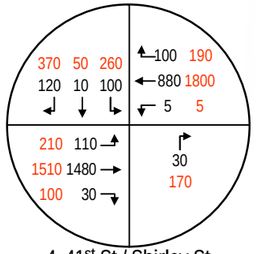
1. 41st St / Marion Rd



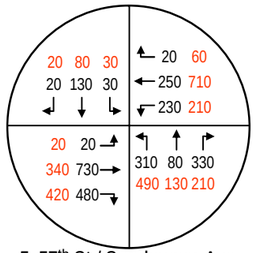
2. 41st St / I-29 SB



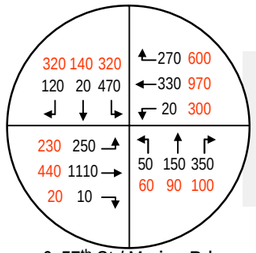
3. 41st St / I-29 NB



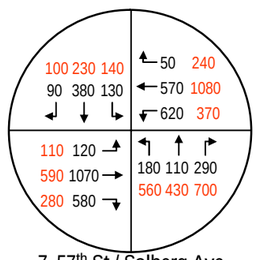
4. 41st St / Shirley St



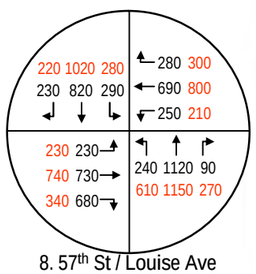
5. 57th St / Sundowner Ave



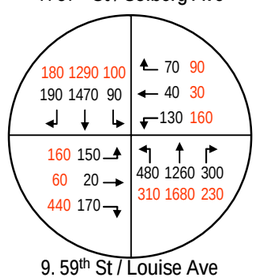
6. 57th St / Marion Rd



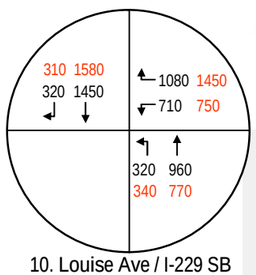
7. 57th St / Solberg Ave



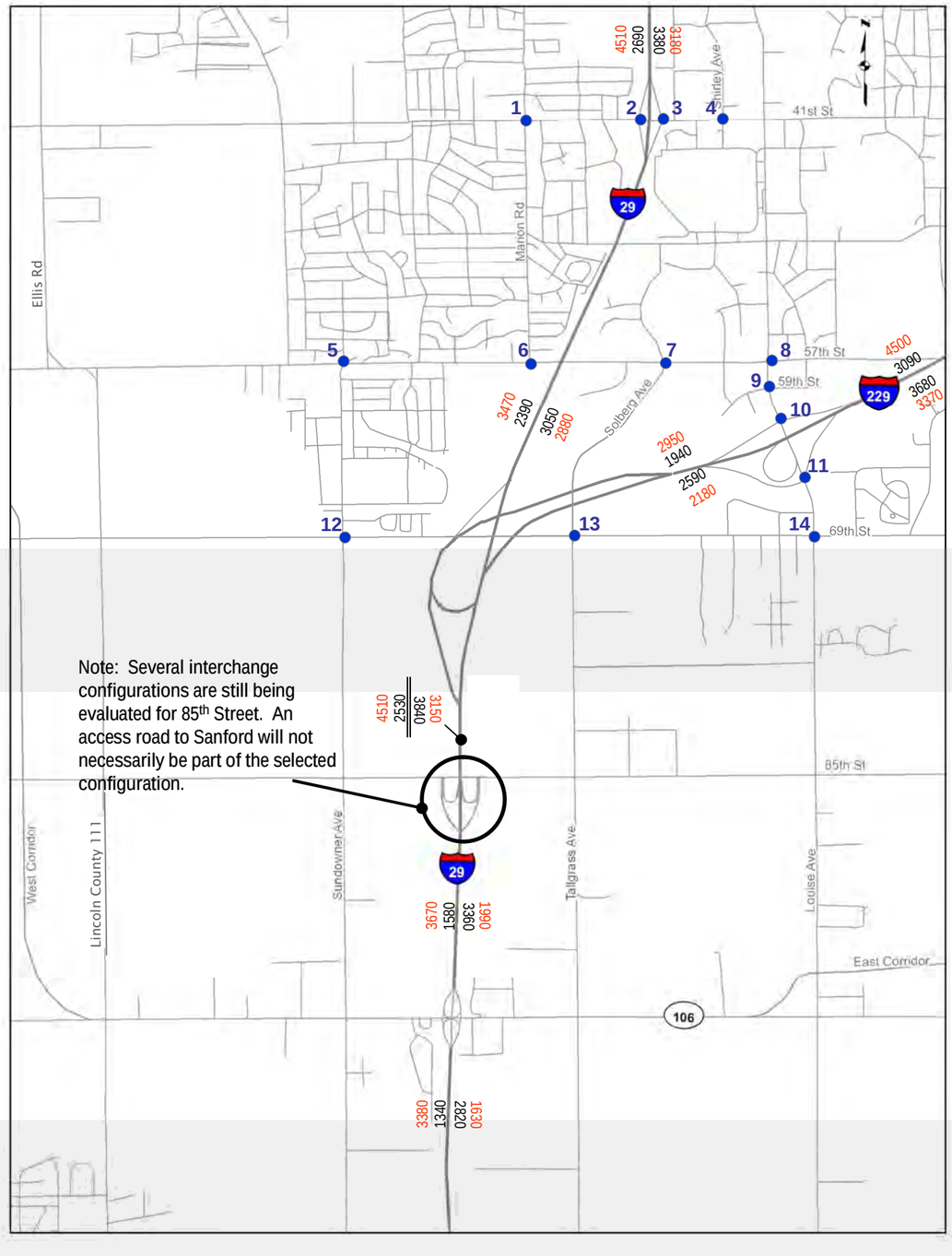
8. 57th St / Louise Ave



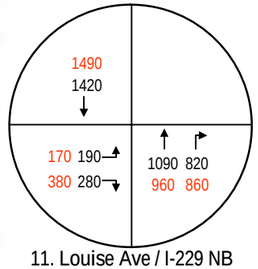
9. 59th St / Louise Ave



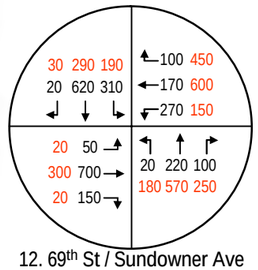
10. Louise Ave / I-229 SB



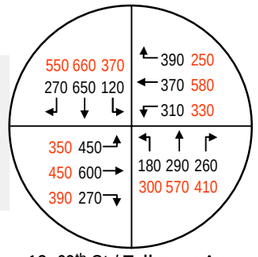
Note: Several interchange configurations are still being evaluated for 85th Street. An access road to Sanford will not necessarily be part of the selected configuration.



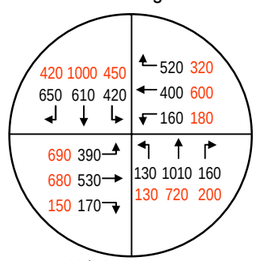
11. Louise Ave / I-229 NB



12. 69th St / Sundowner Ave



13. 69th St / Tallgrass Ave



14. 69th St / Louise Ave

Legend

700 - AM Peak Hour Turning Movement

350 - PM Peak Hour Turning Movement

● - Evaluated Intersection

Figure 16. Future (2033) Peak Hour Traffic - With a 69th Street Crossing of I-29 and an I-29/85th Street Interchange

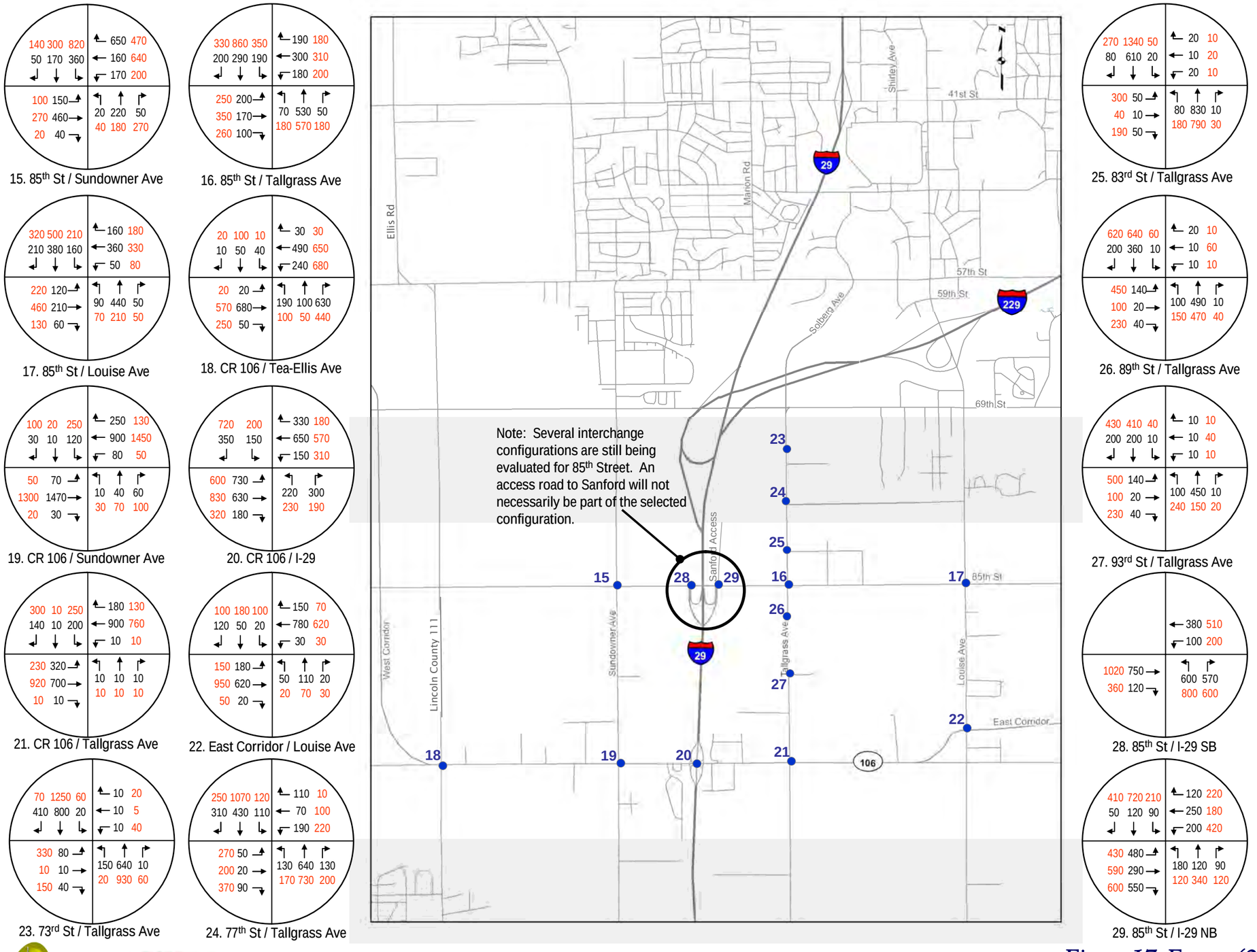


Figure 17. Future (2033) Peak Hour Traffic - With a 69th Street Crossing of I-29 and an I-29/85th Street Interchange (Continued)

- *Ramp Junctions*: The LOS of a ramp junction is also defined by the density of traffic flow in passenger cars per mile per lane (pc/mile/lane) within the influence (merge or diverge) area of the ramp junction. Ramp junction LOS is described in Table 5.
- *Weaving Segments*: The level of service for a weaving segment is also defined by the density of traffic flow in passenger cars per mile per lane (pc/mile/lane) within the weaving segment. Table 6 provides the LOS criteria for weaving segments.

For the purposes of this project, a deficiency is defined as level of service D (LOS D) or worse.

TABLE 3. LEVEL OF SERVICE DESCRIPTIONS FOR INTERSECTIONS

Level of Service	Delay Per Vehicle (Seconds)		Description
	Signalized	Unsignalized	
A	≤10	≤10	Free flow, minimal delays
B	>10 and ≤20	>10 and ≤15	Stable flow, occasional delays
C	>20 and ≤35	>15 and ≤25	Stable flow, periodic delays
D	>35 and ≤55	>25 and ≤35	Restricted flow, regular delays
E	>55 and ≤80	>35 and ≤50	Maximum capacity, extended delays
F	>80	>50	Forced flow, excessive delays

Source: 2000 Highway Capacity Manual, Transportation Research Board
Signalized LOS Criteria taken from Exhibit 16-2; Unsignalized LOS Criteria taken from Exhibit 17-2

TABLE 4. LEVEL OF SERVICE DESCRIPTIONS FOR BASIC FREEWAY SEGMENTS

Level of Service	Performance Measures		Description
	Maximum Density (pc/mi/lane)[1]	Minimum Speed (mph)	
A	≤11	65	Free flow, minimal delays
B	>11 and ≤18	65	Stable flow, occasional delays
C	>18 and ≤26	64.6	Stable flow, periodic delays
D	>26 and ≤35	59.7	Restricted flow, regular delays
E	>35 and ≤45	52.2	Maximum capacity, extended delays
F	>45	---	Forced flow, excessive delays

Note: 1: pc/mi/lane = passenger cars/mile/lane
Source: 2000 Highway Capacity Manual, Transportation Research Board
Maximum density and minimum speed criteria taken from Exhibit 23-2
Minimum speed criteria based on a free-flow speed of 65 mph

TABLE 5. LEVEL OF SERVICE CRITERIA FOR RAMP JUNCTIONS

Level of Service	Density (pc/mi/ln)
A	≤ 10.0
B	> 10.0 – 20.0
C	> 20.0 – 28.0
D	> 28.0 – 35.0
E	> 35.0
F	Demand exceeds Capacity

Note: Density is the primary determinant of LOS for ramp junctions. Other factors (e.g., maximum volumes for merge/diverge area) can result in lower LOS.
Source: 2000 Highway Capacity Manual, Exhibit 25-4

TABLE 6. LEVEL OF SERVICE CRITERIA FOR WEAVING SEGMENTS

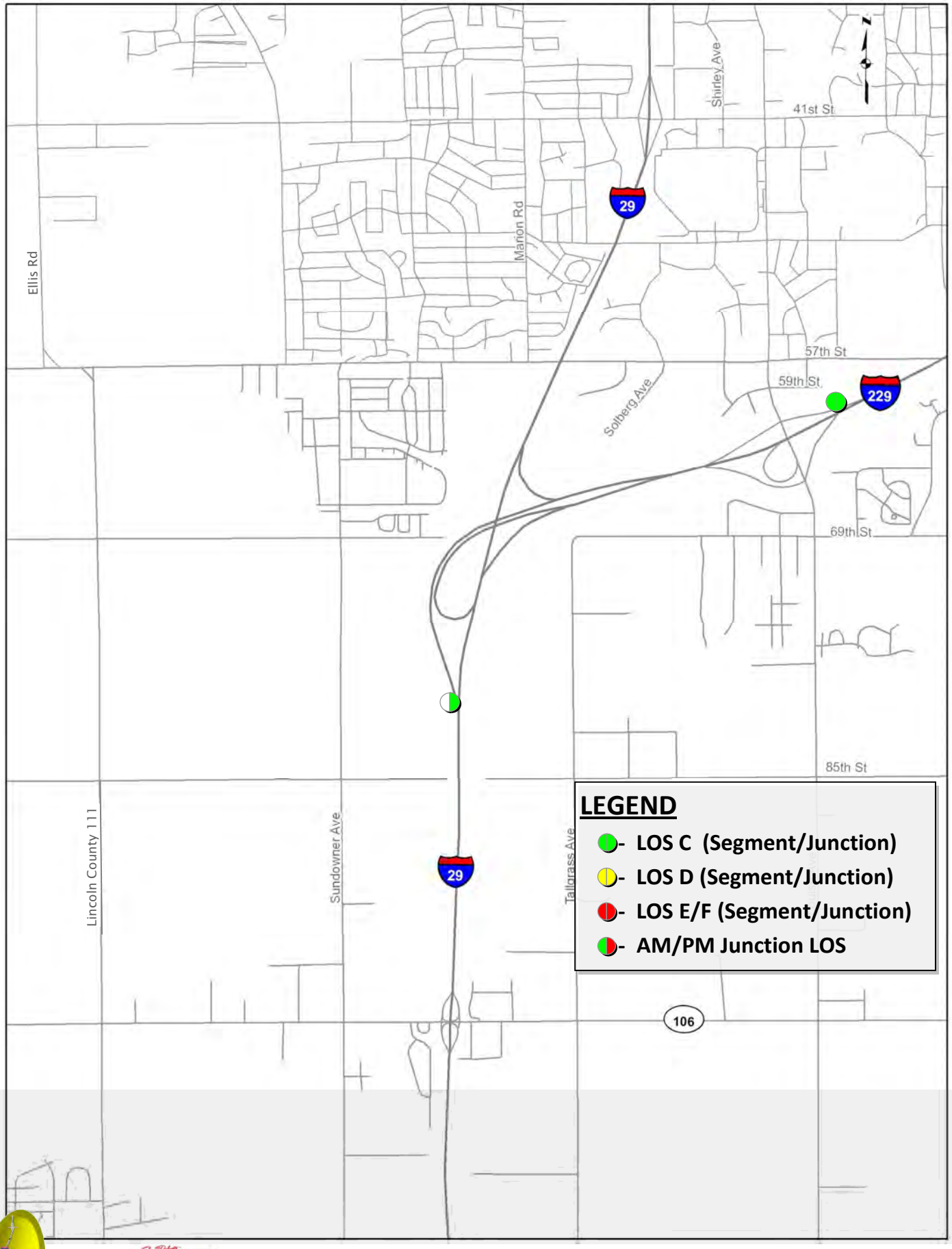
Level of Service	Density (pc/mile/lane)
A	≤ 10.0
B	> 10.0 – 20.0
C	> 20.0 – 28.0
D	> 28.0 – 35.0
E	> 35.0 – 43.0
F	> 43.0

Note: Density is the primary determinant of LOS for weaving segments. Other factors (e.g., maximum weaving volumes) can result in lower LOS.
Source: 2000 Highway Capacity Manual, Exhibit 24-2.

2.2.1 Existing Conditions Traffic Operations Results

Existing traffic conditions in the study area were analyzed for interstate segments, interchanges and adjacent arterial intersections based on the methodologies described above and the existing peak hour volumes shown in Figure 5. The existing conditions and No-build scenario operations analyses describe the anticipated "baseline" study area traffic conditions for 2007 and 2033 respectively.

The results of the existing interstate traffic operations analyses for the basic freeway segments and the ramp junctions indicate that I-29 and I-229 in the study area operate at LOS C or better. The existing condition traffic operations results are provided in Figures 18 and 19. The results of the existing intersection traffic operation analysis completed for the study area indicate that there are several intersections that currently operate at LOS D or worse during at least one peak period of the day.



I-29 Corridor Study
41st Street to CR 106

Figure 18. Existing (2008) Traffic Operations Summary Interstate Mainline and Junctions

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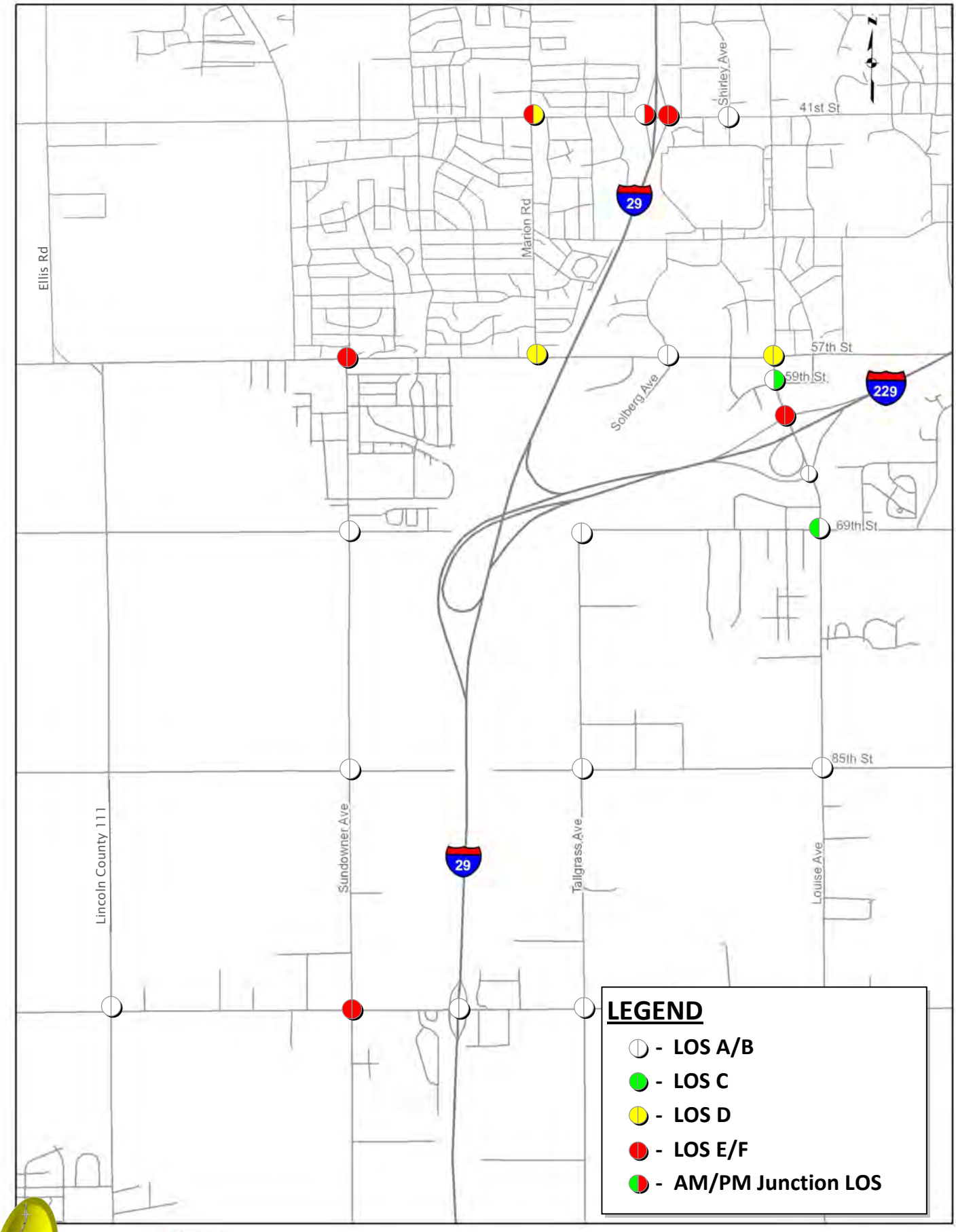

Figure 19. Existing (2008) Intersection Traffic Operations Summary

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For the purposes of this evaluation, those intersections are defined as deficient and are:

- 41st Street/Marion Road Intersection (AM and PM Peak)
- 41st Street/I-29 SB Ramps Intersection (PM Peak)
- 41st Street/I-29 NB Ramps Intersection (AM and PM Peak)
- Louise Avenue/I-229 SB Ramps (AM and PM Peak)

2.2.2 2033 No-build Scenario Traffic Operations Results

Future year 2033 No-build scenario (Alternative 1) conditions in the study area were evaluated for interstate segments, interchanges and adjacent arterial intersections based on the methodologies described above and the No-build scenario peak hour traffic forecasts documented in Figures 10 and 11. The 2033 No-build scenario traffic operations results are provided in Figures 20 and 21. Figure 20 illustrates traffic operations associated with study area freeway segments and junctions. Figure 21 illustrates the traffic operations associated with study area arterial intersections in the 2033 No-build condition.

As shown in Figure 20, the following interstate segments and/or ramp junctions are forecasted to operate at LOS D or worse in the peak hours:

- I-29 from the County Road 106 interchange through the 41st Street interchange all segments and ramp junctions in the AM peak, the PM peak, or both periods.
- Southbound I-229 at the junction of the off-ramp to Louise Avenue and the junction of the on-ramp from Louise Avenue in the PM peak hour.

Similarly, Figure 21 shows several intersections along adjacent arterial corridors from 41st Street to Highway 106 are forecasted to exceed capacity in the 2033 No-build. Those intersections forecasted to operate at LOS E/F include ramp terminal intersections at I-229/Louise, I-29/41st Street and at I-29/Highway 106 (Tea).

Based on the results of the 2033 No-build conditions there is an identified need for mainline interstate capacity improvements to address the identified segment and ramp junction deficiencies.

Development and evaluation of a range of build alternatives employed a multi-phased process that started with an initial focus on individual improvement alternatives. The remainder of this chapter provides a stepwise summary of the range of potential Build scenario alternatives and the associated traffic operations results. Through this approach, a group of alternatives that address a specific issue are introduced/described and their related traffic operations results are presented. In Section 4 of this report these individual improvement alternatives are combined into a series of composites that address issues identified in this section.

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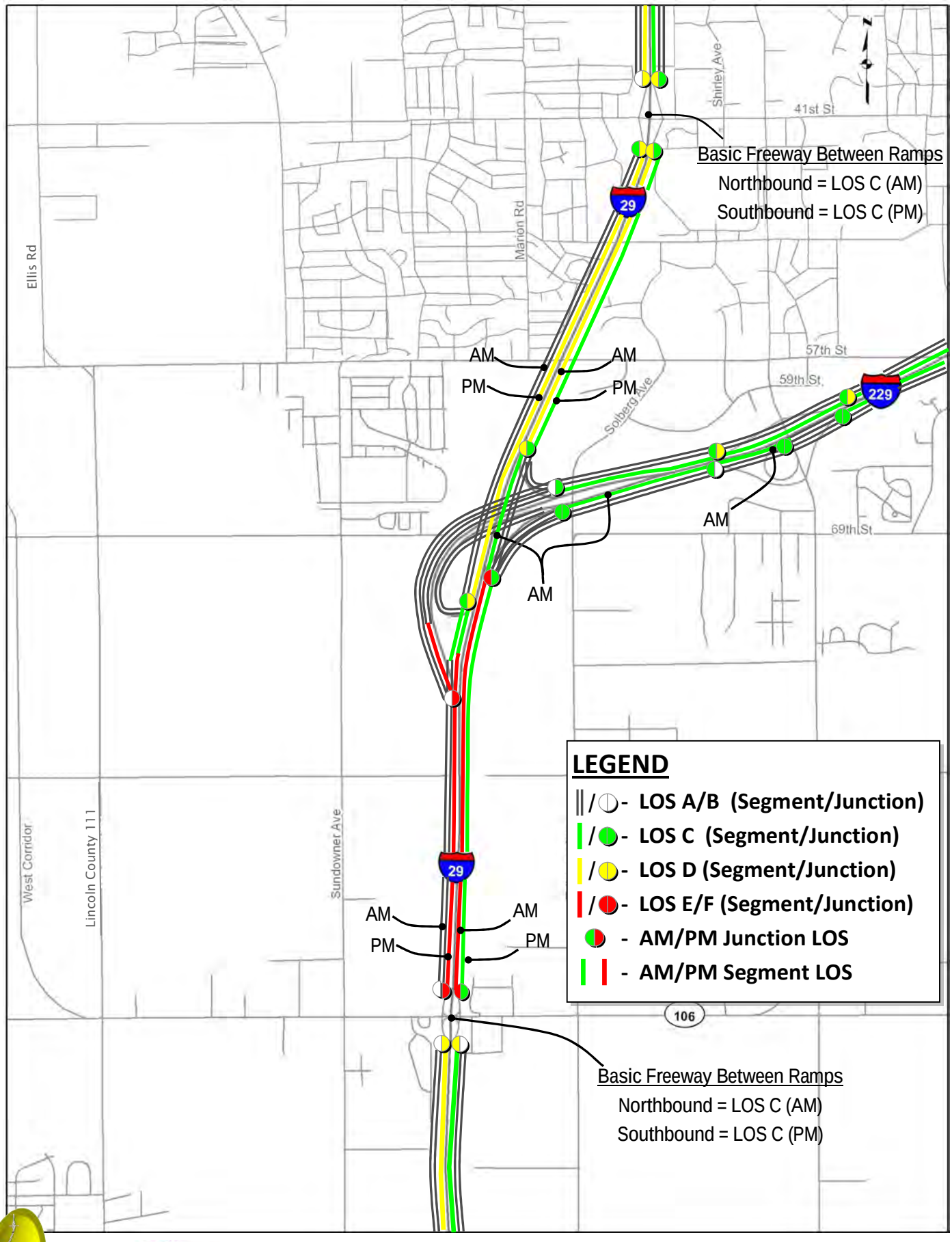

I-29 Corridor Study
41st Street to CR 106

Figure 20. Future (2033) No-Build Scenario Traffic Operations Summary – Interstate Mainline and Junctions

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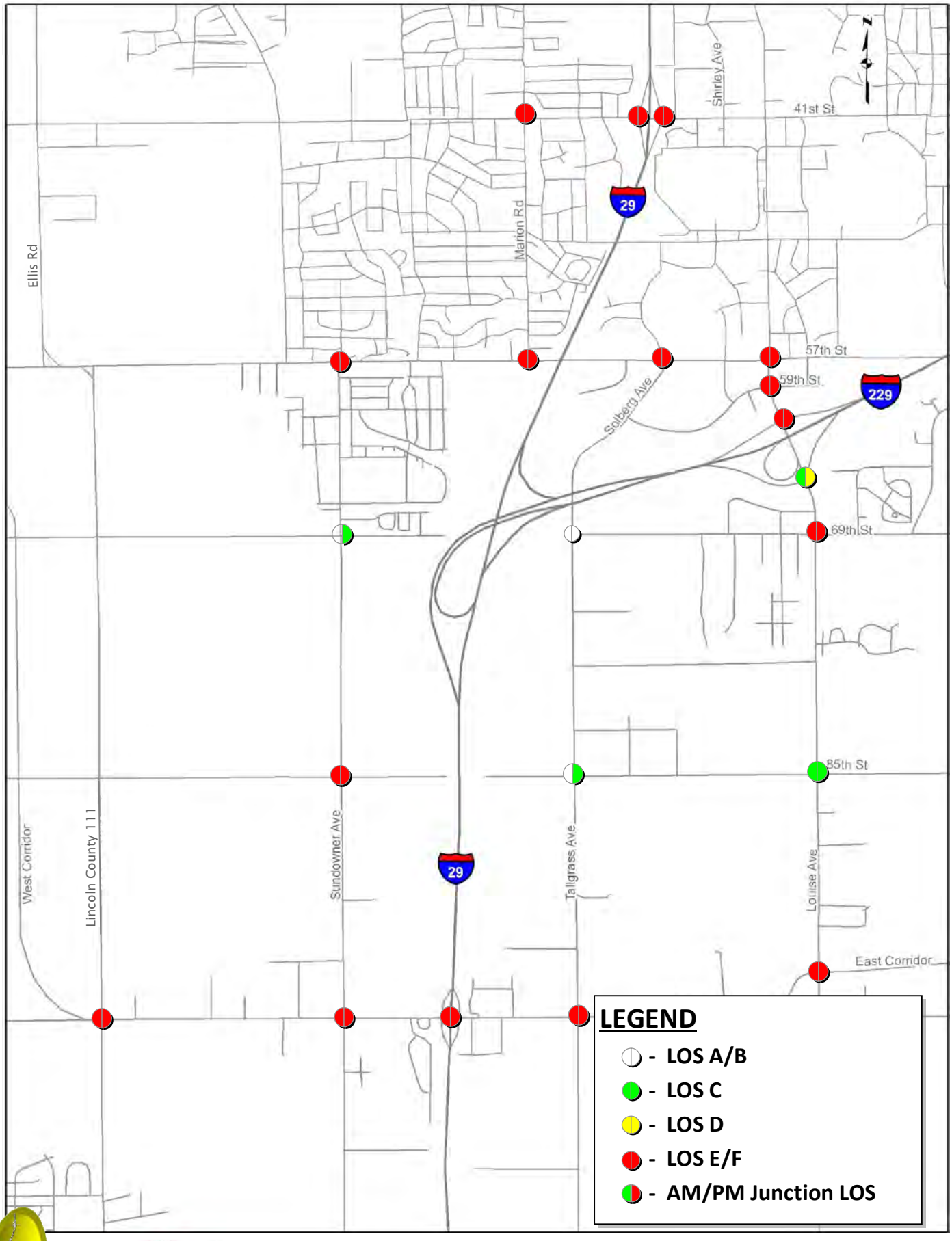

I-29 Corridor Study
41st Street to CR 106

Figure 21. Future (2033) No-Build Scenario Traffic Operations Summary - Intersections

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3.1 I-29 GRADE SEPARATION ALTERNATIVES AND TRAFFIC OPERATIONS

Alternatives to address 2033 mainline and arterial operations issues that are forecasted to occur with or without an interchange at I-29/85th Street were not limited to making modifications to the I-29 and I-229 mainline or the System Interchange. Prior to evaluating Interstate System modifications, a range of arterial system alternatives were investigated. Non-interstate alternatives that were reviewed as stand alone modifications, combination arterial system modifications, and/or as complementary concepts to the I-29/85th Street interchange are:

- *Alternative 2: Extension of 69th Street across I-29*
- *Alternative 3: Extension of 85th Street across I-29*
- *Alternative 5: Extension of 69th and 85th Street across I-29*
- *Alternative 6: Extension of 69th Street across I-29 with an I-29 / 85th Street Interchange*

Alternative 6 will be discussed in Section 3.2 of this report and the remaining arterial grade separation alternatives will be discussed in this section. Each of the above alternatives would extend the arterial routes of 69th Street and/or 85th Street across I-29 to connect between Tallgrass Avenue and Sundowner Avenue. These alternatives represent arterial network expansion projects and supplement the arterial projects already assumed in the 2033 No-build scenario, such as the I-229/Solberg Avenue grade separation and the 59th Street extension. The range of alignments being considered for these three alternatives is illustrated in Figure 22.

The 69th Street crossing alternative would provide a connection between Tallgrass Avenue and Sundowner Avenue, making 69th Street a continuous corridor from the future East Side Corridor to the future West Side Corridor. Establishing the 85th Street connection across I-29 would create a continuous, four-lane divided arterial 85th Street corridor from the Big Sioux River south of Brandon to west of SD 17. The goal of developing a continuous arterial corridor across I-29 is to provide an alternate to the Interstate System.

Along the 69th Street corridor, three alignment options have been evaluated relative to their impact/interaction with the range of alternatives at the I-29/I-229 System Interchange and the I-29/85th Street interchange. The alignment alternatives, displayed in Figure 22, include:

- *69th Street On-grade Along Section Line*: This alignment represents a four-lane divided arterial constructed on the section line at the existing ground elevation, which requires raising the I-29 mainline and ramps and I-229 ramps to cross over the arterial.
- *69th Street Middle South Overpass*: This alignment of 69th Street would cross over I-29 and the I-229 ramps approximately 250 feet south of the section line. This alternative is being included as a means of minimizing the potential for impacts to development areas east and west of I-29.
- *69th Street Southern Crossing Overpass*: Similar to the previous alignment, the southern alignment would cross over the I-29 mainline and ramps, but would do so on an alignment south of the northbound I-29/I-229 ramp junction. The goal of this alternative is to minimize the arterial bridge needs by reducing the number of roadways crossed and reduce the elevation of the 69th Street overpass bridge.

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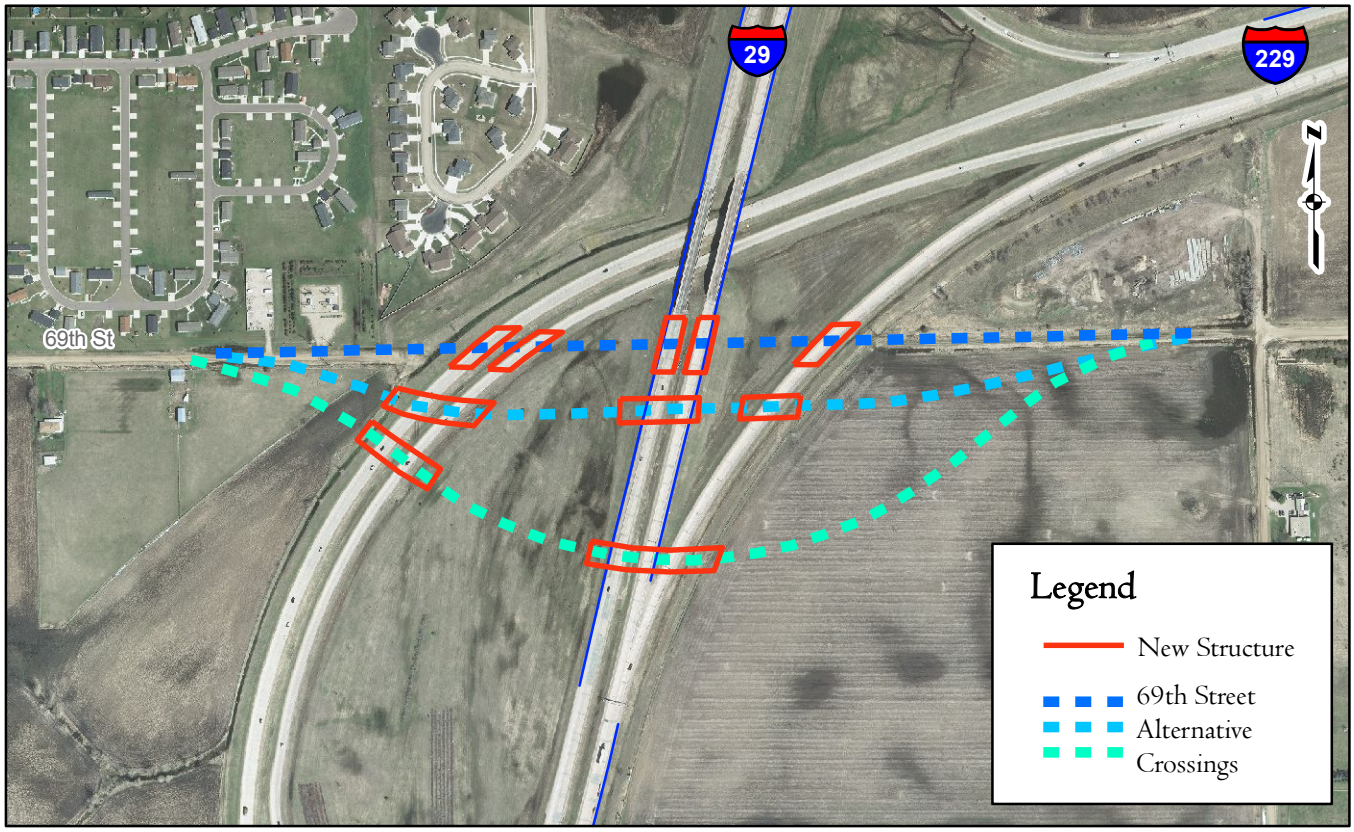

Figure 22. Arterial Crossing Alternatives (2, 3 and 5)

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While the alignment and crossing elevation of the 69th Street crossing concepts are different, the level of access, 69th Street corridor speed assumptions, and capacity are similar. Thus, the traffic impacts on the mainline and surrounding arterials are similar and the traffic operations are similar.

3.1.1 I-29 Grade Separation Traffic Operations Results

Establishing 69th Street and/or 85th Street as continuous corridors across I-29 provides travelers with arterial-only alternates and reduces the level of traffic using the interstate for short to medium trips. Displayed in Figures 23 through 25 are the 2033 traffic operations analyses for Alternatives 2, 3 and 5.

I-29 grade separation alternatives do provide some utility by removing traffic traveling east – west through the Tea interchange and by improving traffic operations somewhat at the Tea ramp intersection. Traffic forecasted to use 57th Street is also reduced, resulting in better traffic operations at the arterial intersections along 57th Street. These alternatives do not, however, significantly improve interstate traffic operations and on its own does not meet the project purpose and need of improving regional access in the study area.

3.2 I-29/85TH STREET INTERCHANGE CONFIGURATION OPTIONS

Based on the outcome of the No-Build and I-29 Arterial Grade Separation scenarios, additional mainline improvements are required to address traffic operation and access issues. A proposed I-29 interchange at 85th Street would provide access to the current and anticipated development areas associated with the assumed future land use plan. In this section, two I-29/85th Street interchange alternatives are described and evaluated.

- *Alternative 4*: Provide a new interchange on I-29 at 85th Street and the associated arterial extensions along 85th Street to fill in the Sundowner Avenue to Tallgrass Avenue gap.
- *Alternative 6*: Provide a new interchange on I-29 at 85th Street and also provide an arterial extension of 69th Street across I-29.

3.2.1 I-29/85th Street Interchange Alternatives

For Alternatives 4 and 6, 85th Street interchange would form a service interchange on I-29 and provide an arterial connection between Sundowner Avenue and Tallgrass Avenue. At this location there are four potential configurations for the service interchange, as listed below:

- I-29/85th Street Diamond Interchange
- I-29/85th Street Folded Diamond Interchange
- I-29/85th Street Partial Cloverleaf Interchange
- I-29/85th Street Single-Point Urban Interchange

The remainder of this section provides summaries of the four interchange configurations.

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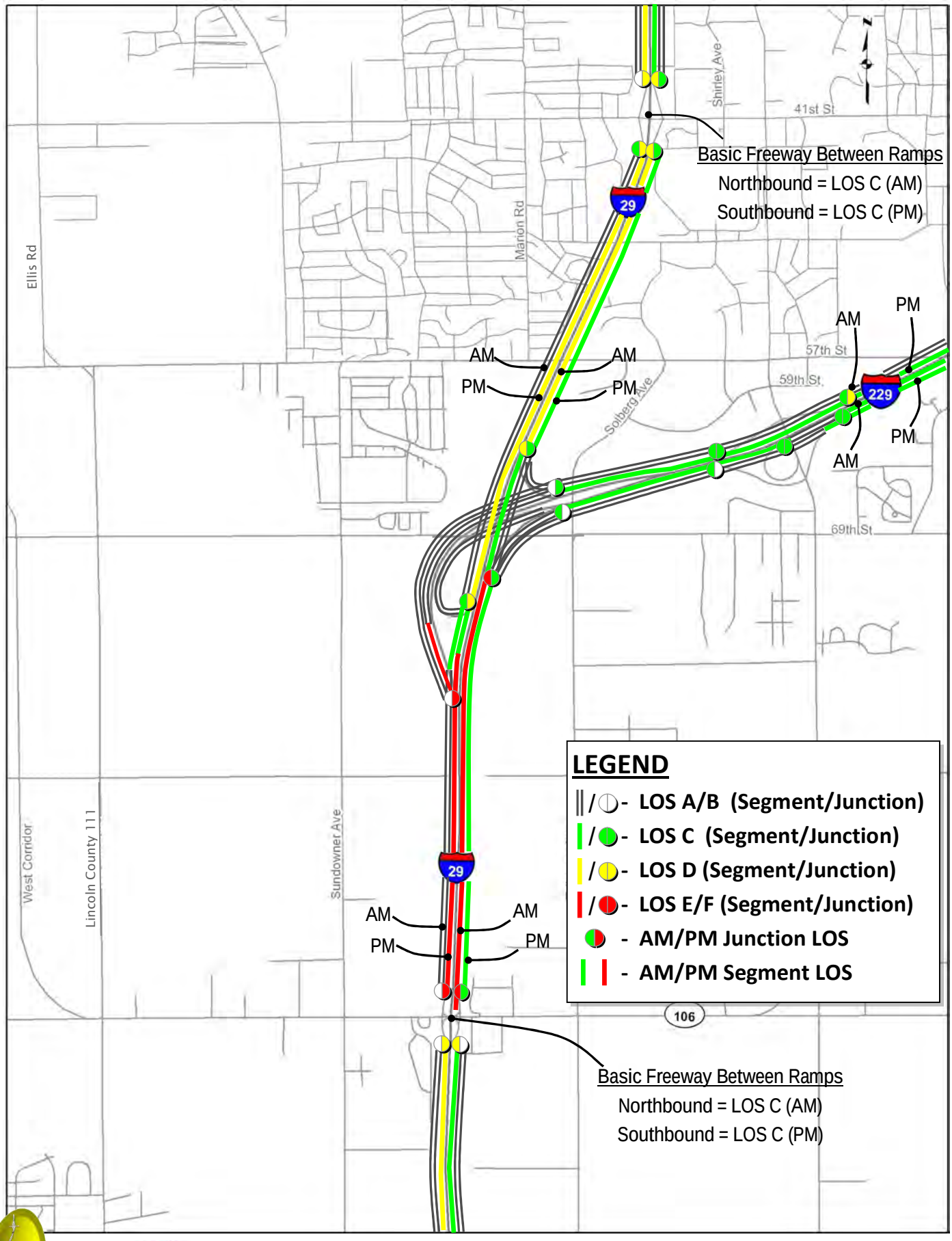

I-29 Corridor Study
41st Street to CR 106

Figure 23. Alternative 2 Mainline Traffic Operations Summary

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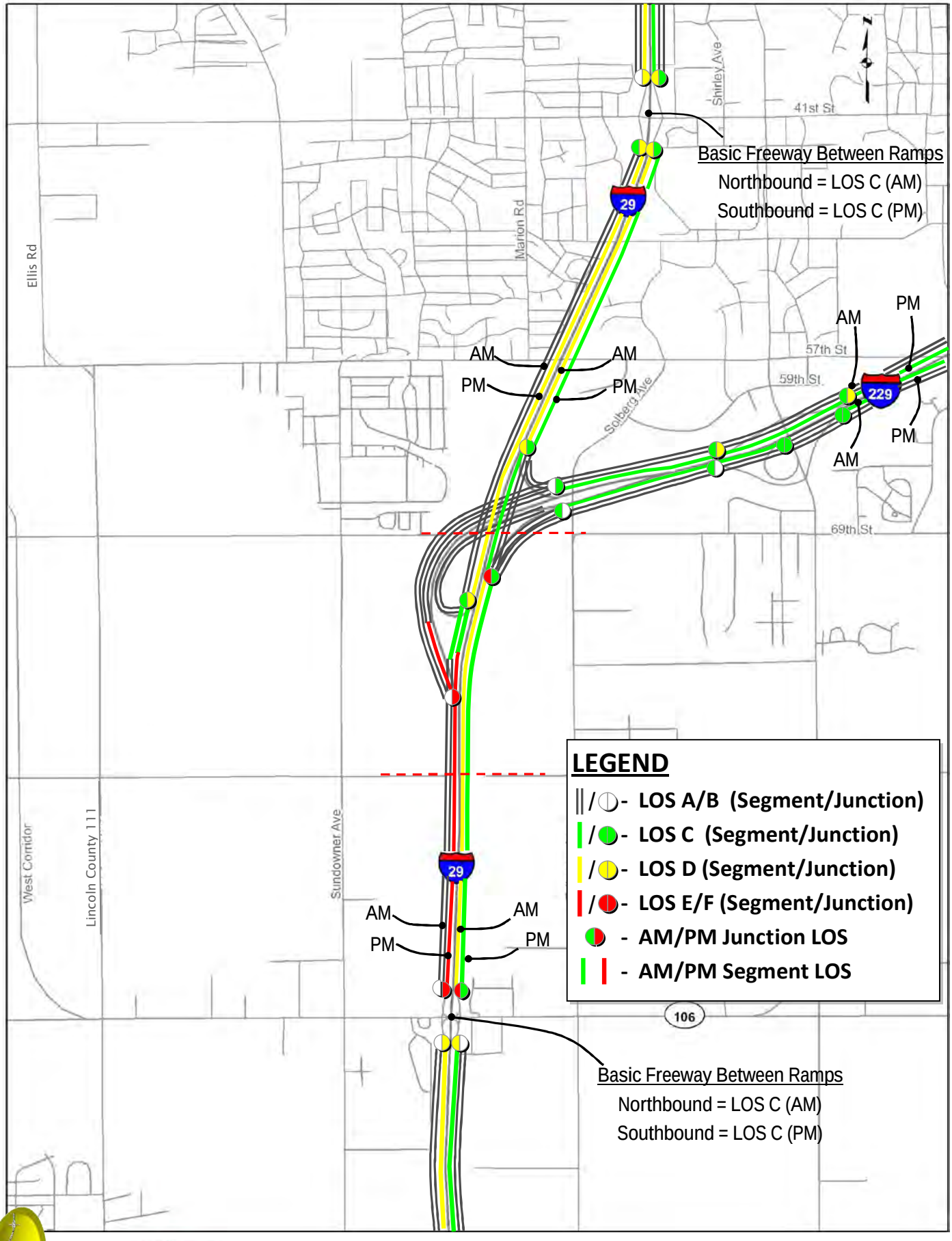

Figure 24. Alternatives 3 and 5 Mainline Traffic Operations Summary

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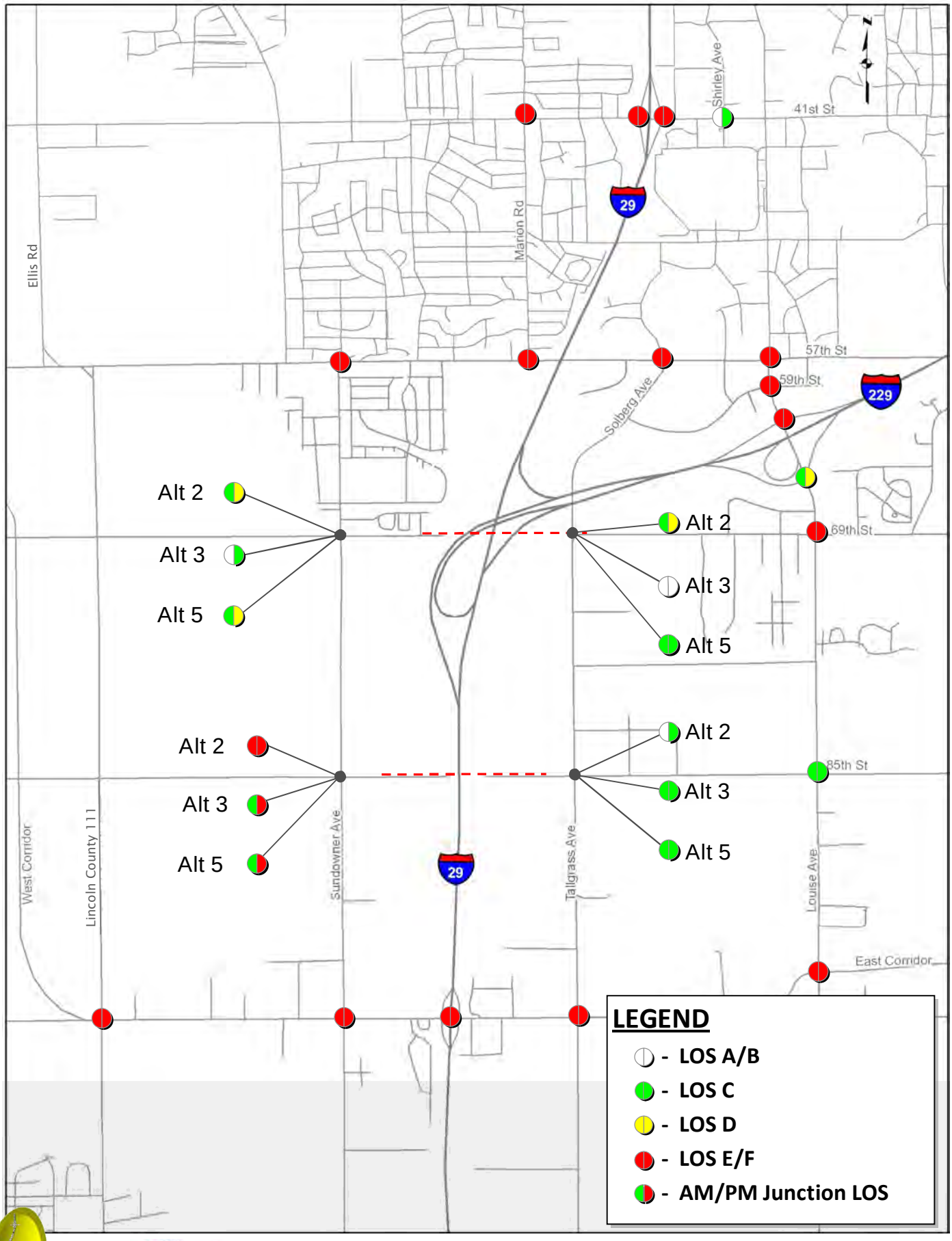

I-29 Corridor Study
41st Street to CR 106

Figure 25. Alternatives 2, 3 and 5 Intersection Traffic Operations Summary

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I-29/85th Street Diamond Interchange Configuration

A full-access diamond configuration interchange located at I-29/ 85th Street is shown in Figure 26. The following bullets summarize the design characteristics and issues associated with this interchange configuration:

- All on-ramps and off-ramps in this configuration are assumed to be a single lane at their I-29 junction.
- By 2033, the 85th Street ramp terminal intersections would be signalized and would have the following turn lane configurations:
  - The southbound off-ramp would have two left-turn lanes and one right-turn lane.
  - Westbound 85th Street at the southbound ramps would have a single left-turn lane.
  - Eastbound 85th Street at the southbound ramps would have a single right-turn lane.
  - The northbound off-ramp would have one left-turn lane and one right-turn lane.
  - Westbound 85th Street at the northbound ramps would have one right-turn lane.
  - Eastbound 85th Street at the northbound ramps would have two left-turn lanes.
- 85th Street is assumed to be extended an additional 1,200 feet to connect between Tallgrass Avenue and Sundowner Avenue. 85th Street would be a four-lane roadway in 2033. It would also be desirable to consolidate residential and commercial accesses along 85th Street between Tallgrass Avenue and Sundowner Avenue.
- A new 85th Street bridge over I-29 would be constructed for this interchange, providing the east-west corridor that is needed in the area.
- For southbound I-29, the separation between the diverge point for the 85th Street southbound off-ramp and the merge point of southbound I-229 to southbound I-29 on-ramp is extremely short (210 feet). The resulting "weaving section" is a conflict area that requires additional attention in the traffic operations and mitigation analysis. Thus, additional treatments such as braiding the I-29/I-229 and 85th Street ramps will likely be warranted.
- Northbound I-29 with this configuration provides an acceptable separation distance between the merge point for the 85th Street northbound on-ramp and the diverge point for the northbound I-229 off-ramp, and would not have any weaving issues.
- The south ramps to/from I-29 result in adequate separation from the Highway 106 (Tea) interchange north ramps so as to not create a weave section.
- This interchange layout directly impacts four (4) properties and would require acquisition of approximately 28 acres of additional right-of-way adjacent to the interchange. The right-of-way acquisition in the northeast quadrant is more than assumed by the Sanford Research Park developers.
- To address, at least partially, the limited weaving distance (210 feet) between the I-29/ I-229 merge point and 85th Street diverge a modified diamond with minimum allowable length on-ramps and off-ramps would add about 400 feet to the weave area between southbound I-29/229 on-ramp and the 85th Street diverge point relative to a standard diamond configuration (total weave distance 610 feet). The resulting weave area would still be relatively short for the traffic volumes forecasted.

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Figure 26. I-29 / 85th Street Diamond Interchange Configuration

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I-29/85th Street Folded Diamond Interchange Configuration

A full-access folded diamond interchange configuration located at I-29/85th Street is illustrated in Figure 27. This interchange configuration would not have ramps on the north side of 85th Street as they would be "folded" into loop ramps in the southern quadrants of the interchange. The following bullets summarize the design characteristics and issues associated with this interchange configuration:

- All on-ramps and off-ramps in this configuration are assumed to be a single lane at their junction with I-29.
- By 2033, the 85th Street ramp terminal intersections would be signalized and would have the following turn lane configurations:
  - The southbound off-ramp would have one right-turn lane, one left-turn lane and a shared left- and right-turn lane.
  - Westbound 85th Street at the southbound ramps would have a single left-turn lane.
  - Eastbound 85th Street at the southbound ramps would have a single right-turn lane.
  - The northbound off-ramp would have one left-turn lane and one right-turn lane.
  - Westbound 85th Street at the northbound ramps would have two left-turn lanes.
  - Eastbound 85th Street at the northbound ramps would have one right-turn lane.
- 85th Street is assumed to be extended an additional 1,200 feet to connect between Tallgrass Avenue and Sundowner Avenue. 85th Street would be a four-lane roadway in 2033. It would also be desirable to consolidate residential and commercial accesses along 85th Street between Tallgrass Avenue and Sundowner Avenue.
- This interchange could potentially allow for a collector roadway connection into the Sanford Research Park development north of the folded northbound ramps. If constructed, this intersection would affect traffic operations at the ramp terminal intersection, and would require approval from the SDDOT.
- This interchange design would expand the southbound I-29 weaving area to approximately 860 feet (650 feet more length compared to the diamond configuration), by moving the diverge point for the 85th Street southbound off-ramp farther south. But, the resulting ramp separation distance still results in a relatively short weaving distance.
- This configuration provides an acceptable separation distance between the merge point for the 85th Street northbound on-ramp and the diverge point for the northbound I-229 off-ramp, and would not have any weaving issues.
- This interchange layout directly impacts two (2) properties and would require acquisition of approximately 18 acres of additional right-of-way adjacent to the interchange.

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Figure 27. I-29 / 85th Street Folded Diamond Interchange Configuration

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I-29/85th Street Partial Cloverleaf Interchange Configuration

A full-access, partial cloverleaf interchange configuration located at I-29/85th Street is shown in Figure 28. This interchange design combines elements of the diamond and folded diamond type interchange configurations, with standard diamond ramp configuration for northbound traffic and folded diamond ramp configuration for the southbound traffic. The following bullets summarize the design characteristics and issues associated with this interchange configuration:

- All on-ramps and off-ramps in this configuration are assumed to be a single lane at their I-29 junctions.
- By 2033, the 85th Street ramp terminal intersections would be signalized and would have the following turn lane configurations:
  - The southbound loop off-ramp would have one right-turn lane, one left-turn lane and a shared left- and right-turn lane.
  - Westbound 85th Street at the southbound ramps would have a single left-turn lane.
  - Eastbound 85th Street at the southbound ramps would have a single right-turn lane.
  - The northbound off-ramp would have one left-turn lane and two right-turn lanes.
  - Westbound 85th Street at the northbound ramps would have one right-turn lane.
  - Eastbound 85th Street at the northbound ramps would have two left-turn lanes.
- 85th Street is assumed to be extended an additional 1,200 feet to connect between Tallgrass Avenue and Sundowner Avenue. 85th Street would be a four-lane roadway in 2033. It would also be desirable to consolidate residential and commercial accesses along 85th Street between Tallgrass Avenue and Sundowner Avenue.
- Similar to the folded diamond, this configuration would expand the southbound I-29 weaving area by approximately 650 feet compared to the diamond interchange configuration, by moving the diverge point for the 85th Street southbound off-ramp farther south (for a total weave section length of approximately 860 feet).
- This configuration provides an acceptable separation distance between the merge point for the 85th Street northbound on-ramp and the diverge point for the northbound I-229 off-ramp, and would not need to be evaluated as a weave area.
- This interchange layout directly impacts two (2) properties and would require acquisition of approximately 21 acres of additional right-of-way adjacent to the interchange. The right-of-way acquisition in the northeast quadrant is more than assumed by the developers of Sanford Research Park developers.

I-29/85th Street Single-Point Urban Interchange Configuration

A full-access single-point urban interchange configuration located at I-29/85th Street is shown in Figure 29. The single-point interchange would be similar to a diamond interchange, but consolidates the ramp terminals into a single intersection with 85th Street. The following bullets summarize the design characteristics and issues associated with this interchange configuration:

- The 85th Street/I-29 ramp intersection would be traffic signal controlled.

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Figure 28. I-29 / 85th Street Partial Cloverleaf Interchange Configuration

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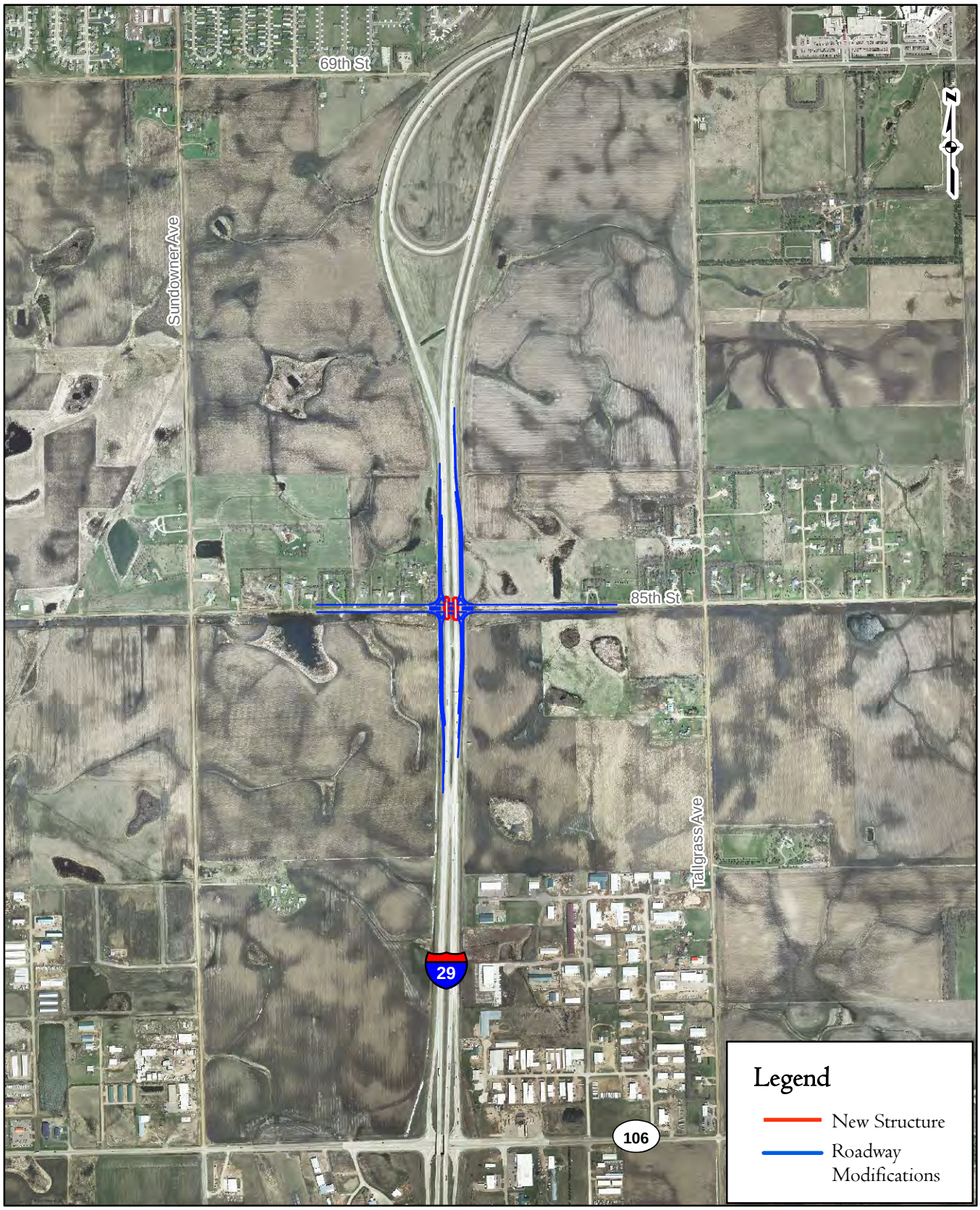

Figure 29. I-29 / 85th Street Single-Point Urban Interchange Configuration

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- All on-ramps and off-ramps in this configuration are assumed to be a single lane at the junction with I-29. The single-point intersection would have two left-turn lanes and one right-turn lane on all approaches.
- 85th Street is assumed to be extended an additional 1,200 feet to connect between Tallgrass Avenue and Sundowner Avenue. 85th Street would be a four-lane roadway in 2033. It would also be desirable to consolidate existing residential and commercial accesses along 85th Street between Tallgrass Avenue and Sundowner Avenue.
- A new 85th Street bridge over I-29 would be constructed with this interchange. The structure would be wider than other interchange configurations in order to accommodate the wide turning radii required with the single-point interchange. In order to reduce bridge deck size 85th Street could be placed at-grade and I-29 would go over utilizing two bridges, one for each direction. A drawback associated with that layout is it requires reconstruction of a significant portion of I-29.
- Similar to diamond interchange design, this interchange configuration would have an 85th Street southbound off-ramp diverge point that is extremely close (within approximately 210 feet) to the I-29/I-229 southbound merge point. At this distance, there are likely to be significant weaving conflicts between the 85th Street off-ramp junction and the current I-29/I-229 System Interchange configuration. Thus, additional treatments such as braiding the I-29/I-229 and 85th Street ramps will likely be warranted.
- This configuration provides an acceptable separation distance between the merge point for the 85th Street northbound on-ramp and the diverge point for the northbound I-229 off-ramp, and would not have any weaving issues.
- The smaller footprint associated with interchange design reduces the property impacts compared to the other 85th Street interchange configuration. This configuration directly impacts one (1) property and would require acquisition of approximately two acres of additional right-of-way adjacent to the interchange.
- The smaller footprint of this interchange and the reduction of interchange related intersections makes it possible to provide a full movement intersection on 85th Street between I-29 and Tallgrass Avenue and be in compliance with the City of Sioux Falls Access Control Policy. None of the other interchange designs provide an opportunity to provide a north side and south side full access intersection in that segment that is in compliance with the Access Control Policy.

Alternative 6 combines any one of the 69th Street crossing alignment concepts in Alternative 2 with one of the I-29/85th Street interchange configurations. As the general access and connectivity parameters of the range of alternatives for the 85th Street interchange and for the 69th Street crossing are similar, the impacts Alternative 6 would have on traffic operations would be similar no matter the combination of 69th Street crossing and I-29/85th Street interchange configuration selected.

3.2.2 I-29/85th Street Interchange Traffic Operations

The potential for impacts associated with providing a new interchange at I-29/85th Street relative to the current and/or future No-build condition traffic operations is substantially influenced by:

- The relative change in traffic volume in the AM and PM peak hours following implementation.
- The relative separation between the I-29/I-229 and the I-29/85th Street interchanges and between the I-29/Highway 106 (Tea) and the I-29/85th Street interchanges.

Through the initial round of alternatives screening the key product of the individual concept review is a conclusion as to whether acceptable traffic operations can be established or maintained with the service interchange in place. As the volume of traffic entering and/or leaving I-29 at 85th Street is forecasted to be the same for each of the interchange alternatives and the separation between the 85th Street ramps and the Highway 106 (Tea) ramps are relatively similar across the range of alternatives, the logical variable in establishing the relative difference between the interchange configurations is the amount of separation between the on/off-ramps for 85th Street and the I-29/ I-229 interchange. In addition, the interchange configuration(s) that provide the greatest separation between the I-29/I-229 interchange and the ramps to/from 85th Street would have the greatest potential for either establishing or maintaining an acceptable level of service. If this first interchange configuration does not provide a reasonable opportunity to establish or maintain acceptable traffic operations, it is highly unlikely any of the other concepts would do so.

Of the four interchange configurations developed for I-29/85th Street, the folded diamond and partial cloverleaf designs provide the greatest amount of separation between the southbound I-229 to I-29 on-ramp merge point and the southbound I-29/85th Street off-ramp diverge point. In the northbound direction on I-29 from 85th Street, the distance between the on-ramp merge point and the northbound I-229 diverge point to the off-ramp is maximized with the folded diamond layout, relative to the other interchange configurations. Based on separation and relative change in traffic volume parameters of the concepts, the folded diamond interchange configuration would represent the I-29/85th Street concept that would minimize the potential for negative traffic operations impacts on the interstate mainline, which is a key concern whenever a new interchange access point is proposed.

As shown in the Figures 30 and 31, 2033 AM and PM peak traffic associated with the I-29/85th Street Interchange Build scenario results in operations deficiencies along freeway segments, ramp junctions, and weaving segments along both I-29 and I-229. As with the current and No-build conditions, deficiencies are defined as peak hour operations of LOS D or worse in 2033. The most severe of the observed deficiencies in the initial Build scenario, are LOS E/F segment deficiencies along I-29 both north and south of 85th Street and at each of the adjacent interchange ramp junctions. The traffic operations results along the interstate segments and ramp junctions are similar to those identified in the No-build scenario. At selected arterial intersections, however, delay is reduced and traffic operations are improved relative to the No-build, including:

- I-29/Highway 106 (Tea) interchange terminal intersections.
- I-229/Louise Avenue interchange terminal intersections.

Details of the operations results for each interchange configuration from a ramp and ramp/ arterial intersection perspective are presented for each Build scenario interchange alternative in Figure 32. While peak hour traffic operations improve somewhat at the ramp/arterial intersections with the I-29/85th Street interchange in place, relative to the No-build scenario,

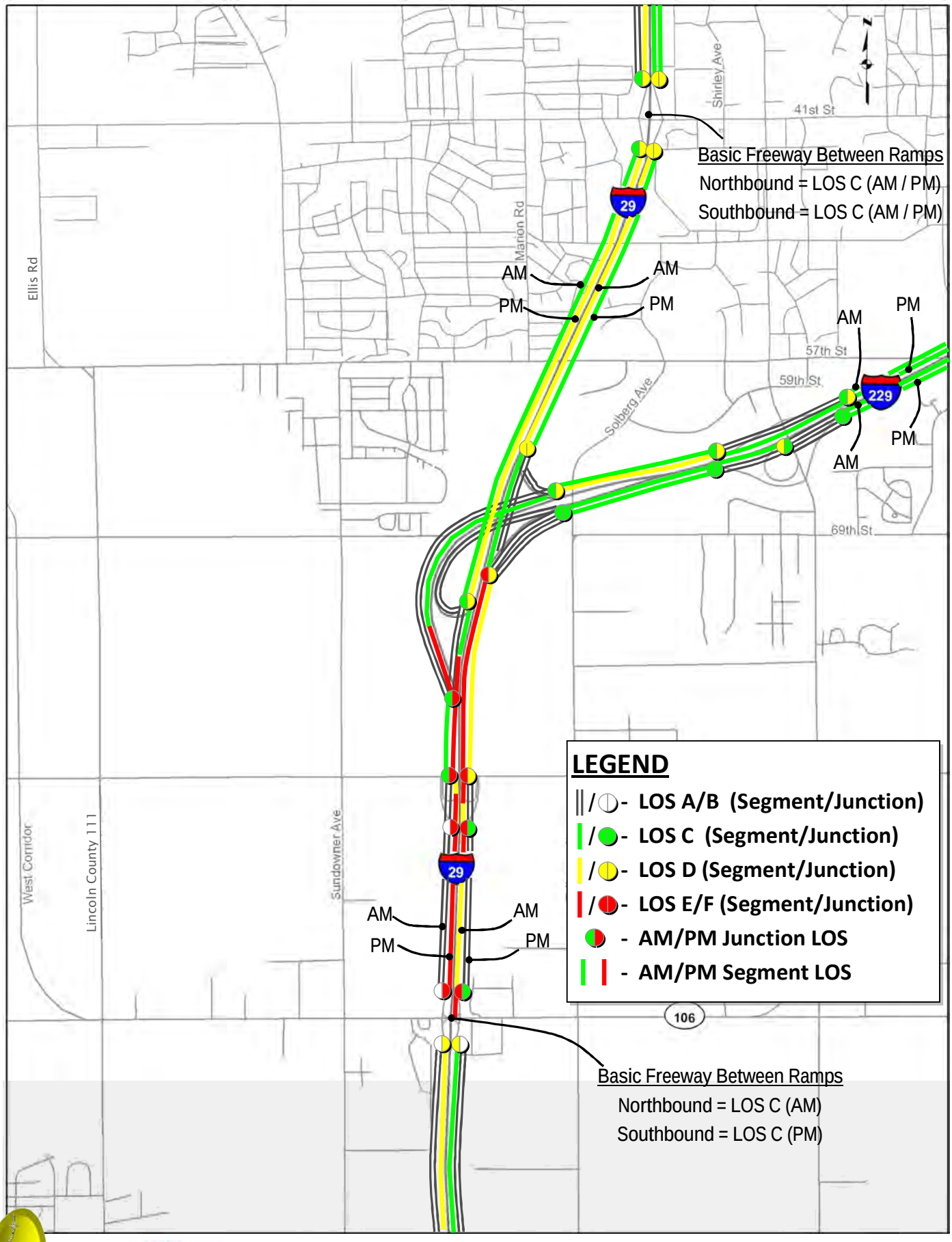

Figure 30. Alternative 4 Mainline Traffic Operations Summary

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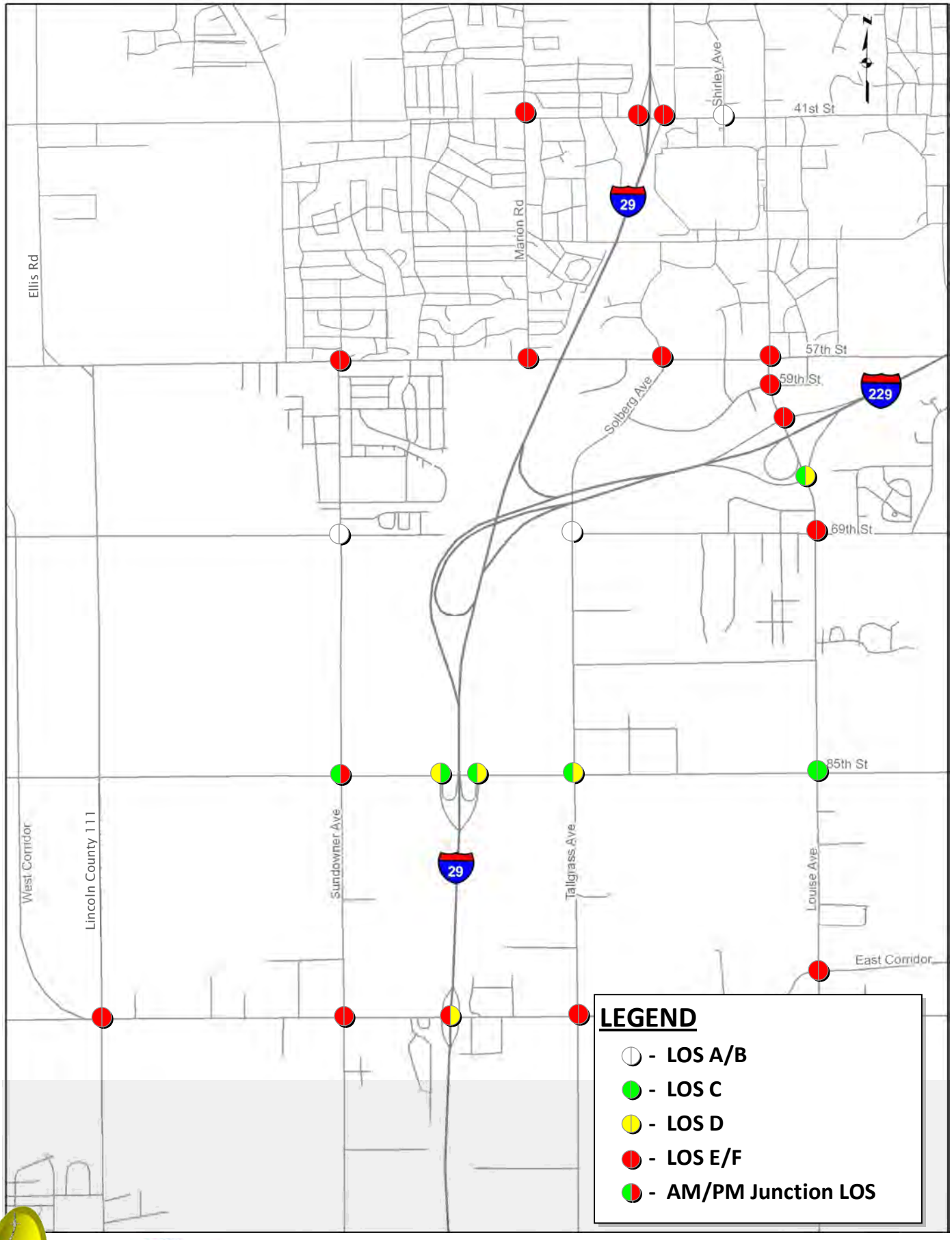

I-29 Corridor Study
41st Street to CR 106

Figure 31. Alternative 4 Intersection Traffic Operations Summary

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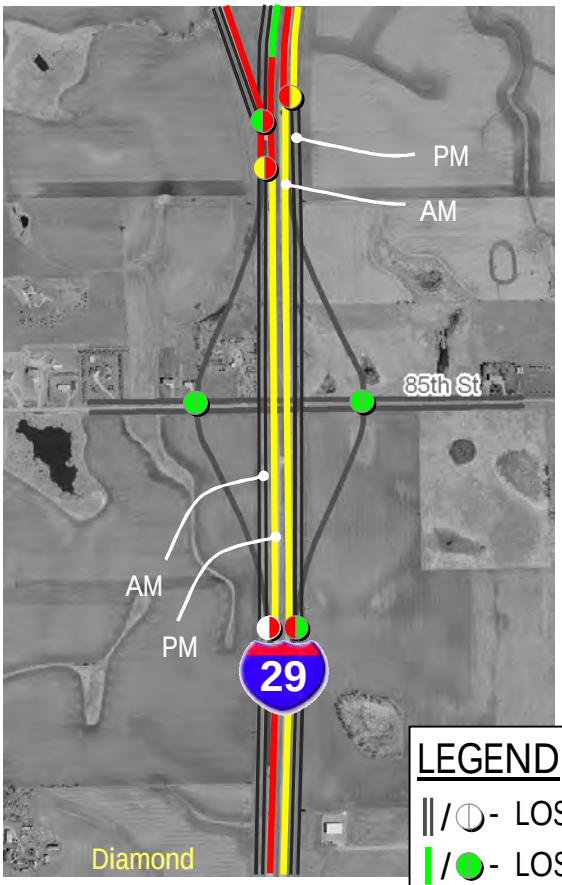
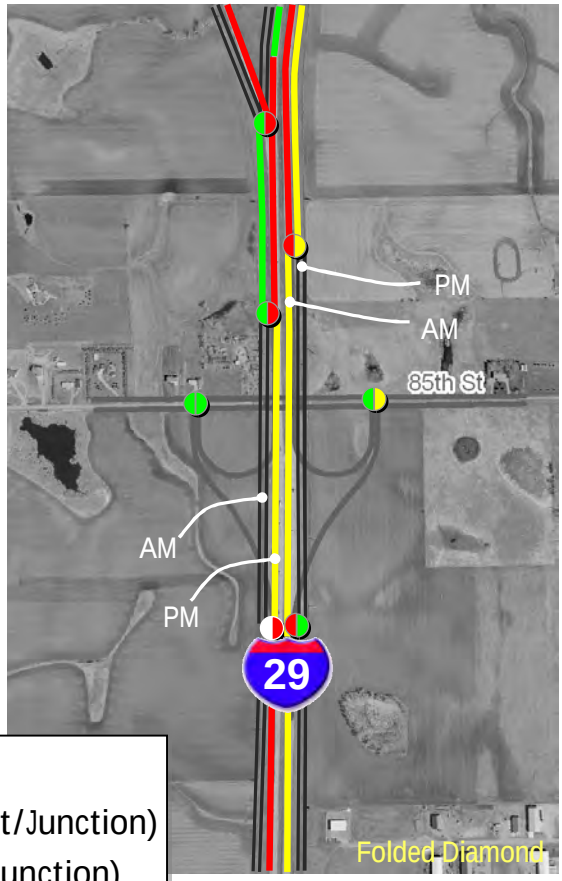
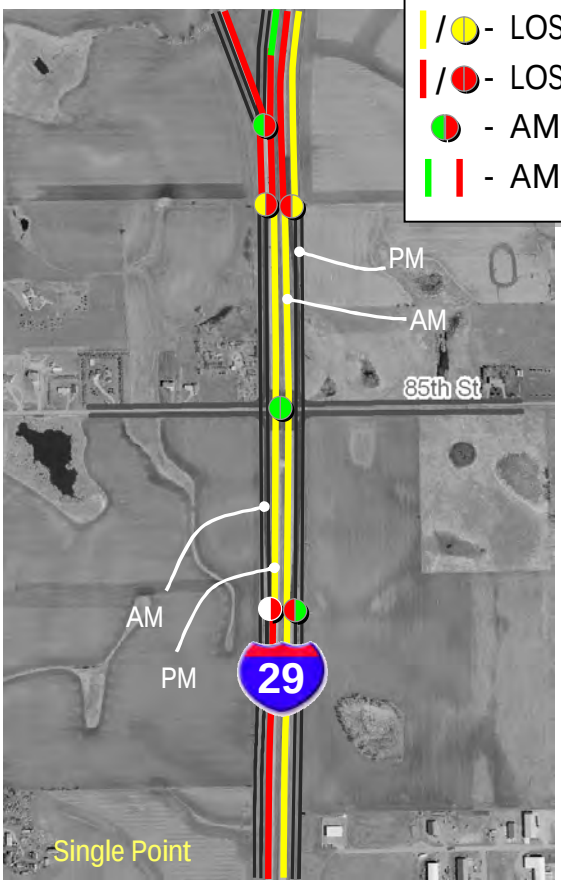
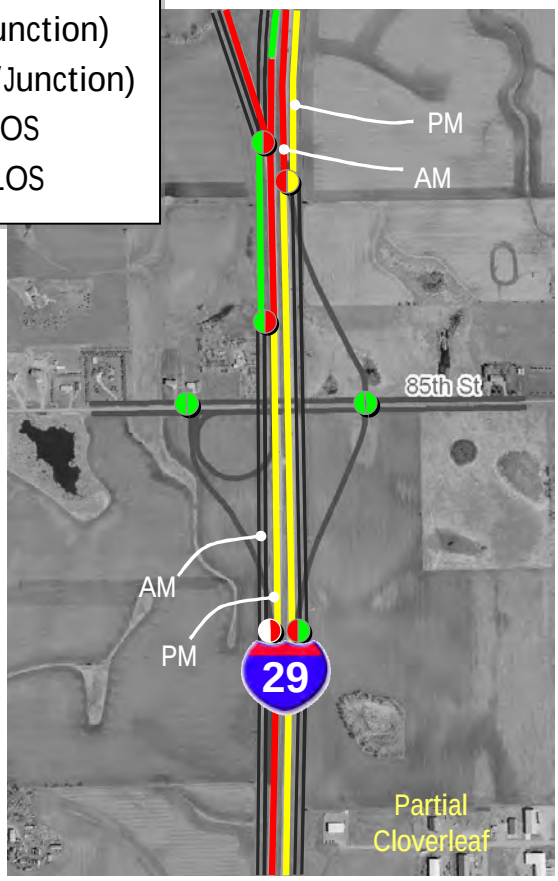




LEGEND

- LOS A/B (Segment/Junction)
- LOS C (Segment/Junction)
- LOS D (Segment/Junction)
- LOS E/F (Segment/Junction)
- AM/PM Junction LOS
- AM/PM Segment LOS





I-29 Corridor Study
41st Street to CR 106

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Figure 32. Interstate Junction Traffic Operations Summary by I-29/85th Street Interchange Configuration

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deficiencies would persist at many arterial intersections. In addition, adding an interchange at I-29/85th Street would create a weave section on I-29 that is not present today.

Combining the 69th Street crossing of I-29 with the I-29/85th Street interchange (Alternative 6) reduces the number of vehicles forecasted to use the interchange relative to what is observed in Alternative 4. The reduction in traffic using the I-29/85th Street interchange, as shown in the forecasts in Figures 16 and 17, is not sufficient to eliminate forecasted mainline deficiencies with the forecasted 2033 traffic, as shown in Figures 33 and 34. Thus, the 69th Street crossing of I-29 would not be a stand alone alternative, but should be considered as a complementary concept to reduce the burden to the interstate in the No-build scenario or the add an interchange at I-29/85th Street alternatives.

3.2.2.1 Additional Traffic Operations for Arterial Intersections

From the traffic analysis, it should be noted that the average delay per vehicle in the 2033 horizon period for most of the key intersections in the study area is well over the 80 seconds of delay per vehicle threshold that marks LOS F operations. When the quality of traffic operations through a series of intersections in adjacent complementary corridors (such as 41st Street, 57th Street, and 69th Street) fall to level-of-service F, it is less likely that adding any one improvement/modification/upgrade would substantially improve operations across the board. Obtaining a substantial improvement in operations will require a multifaceted approach of interstate capacity and access improvements, arterial capacity and access control improvements, and measures that encourage increased vehicle occupancy.

The traffic analysis results presented in Section 3.2.2 focuses on the level of service provided at individual intersections. An alternate approach involves evaluating the cumulative intersection delay for all of the key intersections within the study area. The purpose of evaluating the alternatives using the cumulative delay is that the potential operational improvements and/or reductions that are less than a letter grade at any one intersection are not dismissed from consideration simply because they do not show up on a color coded figure.

Table 7 documents the cumulative arterial intersection delay for the key intersections within the study area. The intersections used in this analysis cover the 41st Street, 57th Street, 69th Street, 85th Street, Highway 106, Louise Avenue, Sundowner Avenue, Tea Ellis Road, and West Side Corridor routes. From the information included in the table the following are concluded:

- In the 2033 No-Build conditions the cumulative delay of 19,250 hours reflects an average per vehicle delay of 540 seconds for each of the vehicles spread across the 20 plus intersections. Thus, on average in the peak hour the typical traveler using the arterial system in the study area will experience LOS F operations at key intersection during their trip.
- Reducing the significance of the I-29 barrier to travel by adding a 69th Street crossing results in a reduction in cumulative delay of almost 17 percent in 2033. With the arterial crossings in place, the subarea-wide average delay per vehicle in the peak hour is 450 seconds in 2033. Typical operations at key intersections would still reflect LOS F operations.

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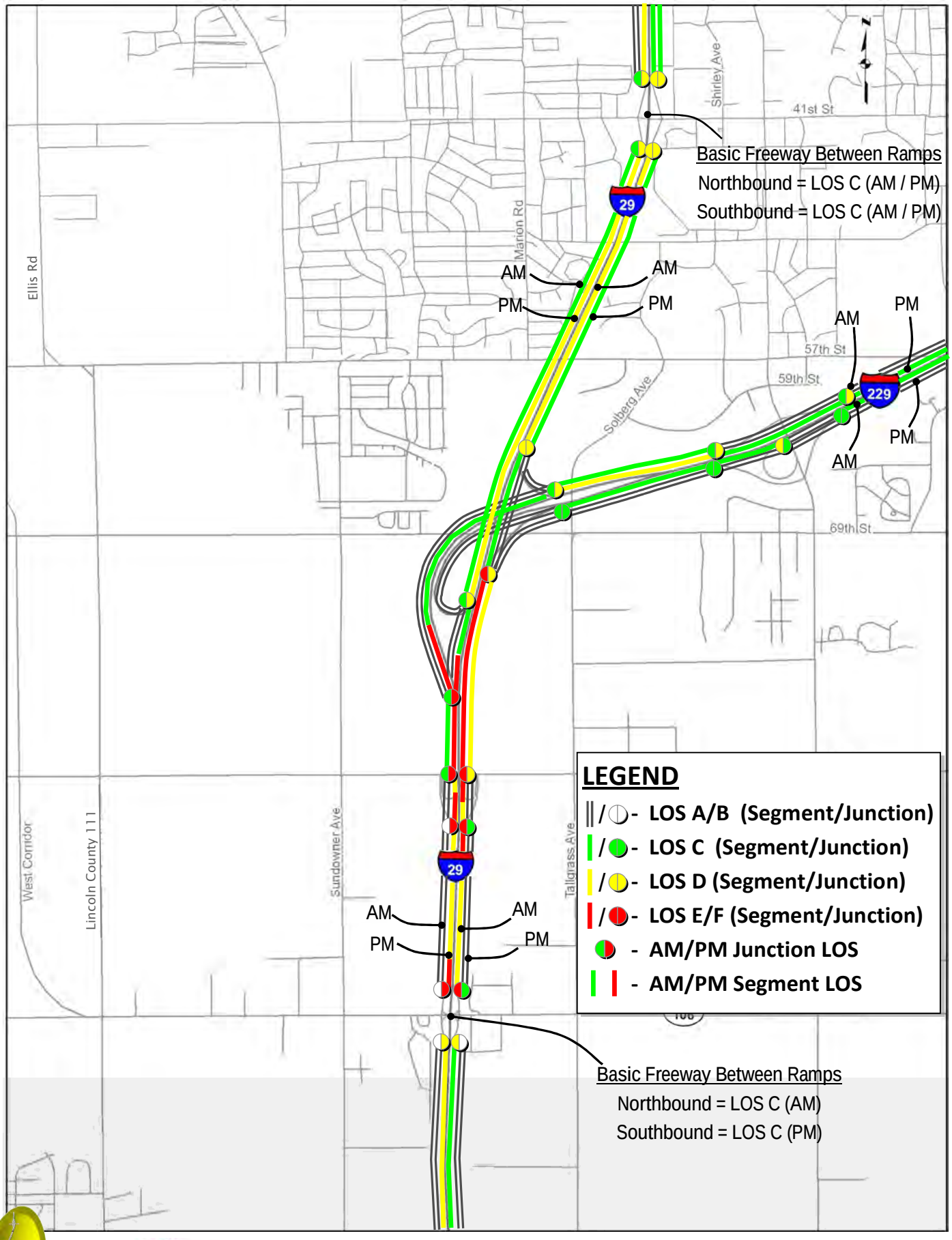

Figure 33. Alternative 6 Mainline Traffic Operations Summary

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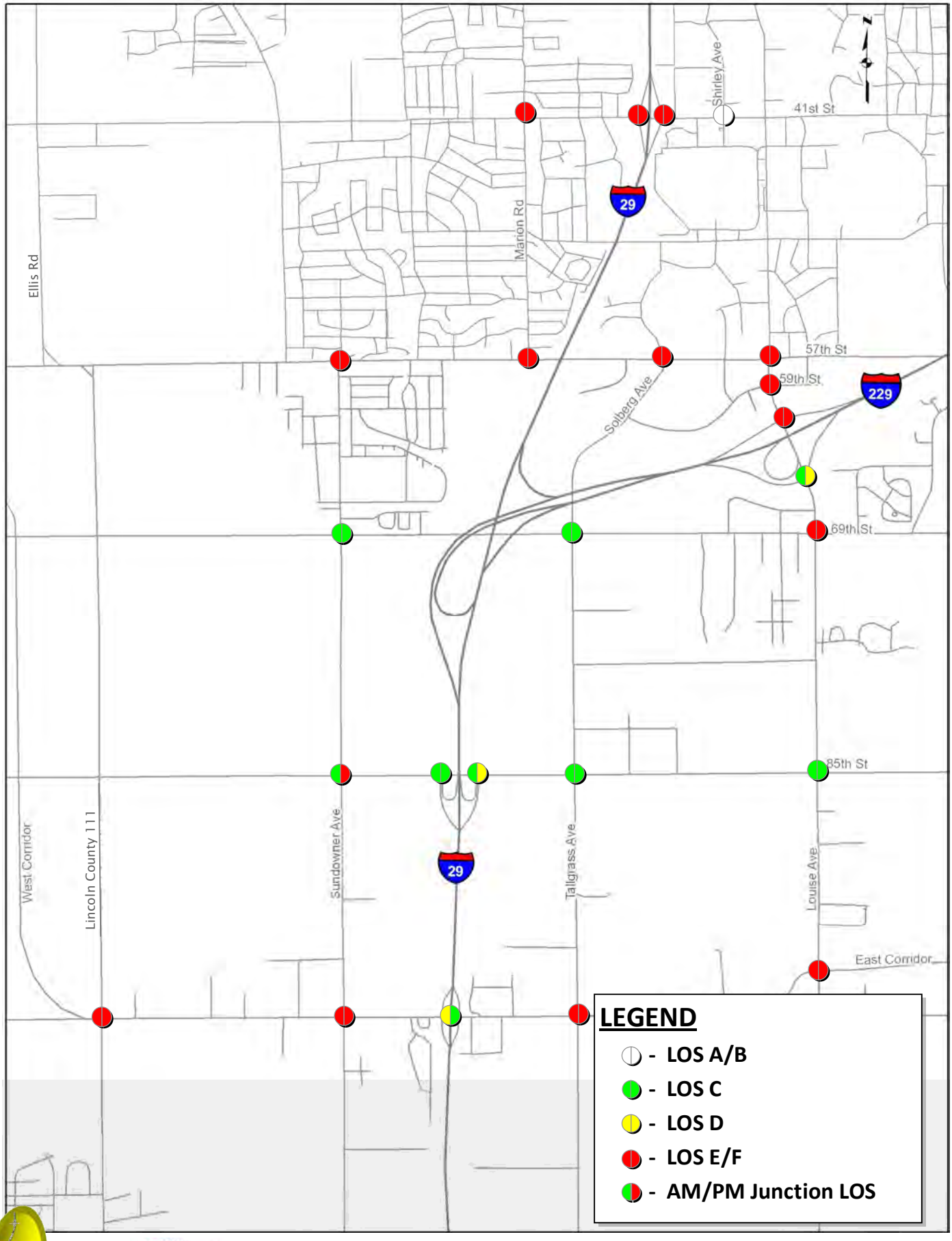

I-29 Corridor Study
41st Street to CR 106

Figure 34. Alternative 6 Intersection Traffic Operations Summary

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TABLE 7. COMPARISON OF INTERSECTION DELAY BY PERIOD AND ALTERNATIVE

Year/Scenario	Cumulative Delay (Hours)	Average Delay Per Vehicle (Seconds)	Percent Change from 2033 No-Build
2007			
Current	725	45	
2033			
No-Build	19,250	540	
No-Build Plus 69th Street Crossing of I-29	15,550	450	-16.7%
No-Build Plus 69th Street and 85th Street Crossings of I-29	14,850	430	-20.4%
Build I-29/85th Street Interchange (Only)	12,700	370	-31.5%
Build I-29/85th Street Interchange and 69th Street Crossing	10,125	310	-42.6%

Delay information represents 21 to 23 intersections depending on the alternative.

- Adding both a crossing of I-29 at 69th Street and at 85th Street (no interstate access) results in a slight improvement in delay relative to the No-build plus 69th Street (additional three percent reduction) crossing alternative and results in a 20 percent reduction from the 2033 No-build. At 430 second of delay per vehicle in the 2033 peak hour, the typical operations at key intersections would still reflect LOS F operations.
- Adding an interchange at I-29/85th Street with no 69th Street arterial crossing reduces the level of traffic on the arterial street system by giving a more centrally located access to/from the interstate. In addition, adding an interchange at 85th Street provides an additional crossing of I-29, which reduces the congestion in the 57th Street, 41st Street and Highway 106 corridors. Providing the interchange reduces the average 2033 peak hour arterial intersection delay by approximately 32 percent from the 2033 No-build. Typical operations at key intersections would still reflect LOS F operations.
- Addressing area needs of accessibility across the interstate and to/from the interstate by adding an I-29/85th Street interchange and a 69th Street crossing results in an average vehicle delay in the 2033 peak hour of approximately 310 seconds per vehicle, which is a 43 percent decrease from the No-build.

From the cumulative delay analysis it can be concluded that each of the arterial and/or interstate access improvement alternatives presented in this chapter would provide additional incremental benefits to the system.

3.3 SUPPLEMENTAL INTERSTATE BUILD ALTERNATIVES EVALUATED

To address the interstate mainline and junction area traffic operations deficiencies identified in both the 2033 No-build (Alternative 1) and Build scenarios (Alternatives 2 through 6), a range of auxiliary lane and ramp reconfiguration alternatives were developed to address the bottlenecks observed in the initial screening of alternatives. The supplemental interstate alternatives evaluated were:

- *Alternative 7: I-29/I-229 Interchange Modification -Southbound Ramp Modifications*
- *Alternative 8: I-29/I-229 Interchange Modification – Southbound Directional Ramps Option A*
- *Alternative 9: I-29/I-229 Interchange Modification – Directional Ramps Option B*
- *Alternative 10: I-29/I-229 Interchange Modification – Realign Southbound I-29*
- *Alternative 11: I-29/I-229 Interchange Modification – Complete Interchange Reconstruction*

Each of the above five alternatives would modify the I-29/I-229 System Interchange, and would move the southbound I-229 to southbound I-29 on-ramp further to the north to reduce/eliminate the southbound weaving section. All five of the concepts, Alternatives 7 through 11, would have several elements in common:

- Each concept is designed to improve the separation of the southbound I-229 on-ramp from the proposed southbound 85th Street off-ramp.
- Each would include the addition of auxiliary lanes to the interstate to provide increased 2033 freeway capacity.
- All five system interchange modification concepts have also been designed to accommodate a 69th Street grade-separated crossing of I-29.

The I-29/I-229 interchange alternatives are described in more detail throughout the remainder of this section.

To address the interstate mainline and junction area traffic operations bottlenecks through the study area auxiliary lanes are included with each system interchange alternative. The locations of the auxiliary lanes are outlined below:

- Southbound I-29: From the 41st Street interchange on-ramp through the I-29/I-229 interchange and the 85th Street interchange area to the Highway 106 (Tea) off-ramp.
- Northbound I-29: From the Highway 106 (Tea) on-ramp through the 85th Street interchange area through the I-29/I-229 interchange to the 41st Street off-ramp.
- Southbound I-229: From the Louise Avenue on-ramp to southbound I-229 to the off-ramp to northbound I-29.

The location of the proposed auxiliary lanes are shown in Figure 35.

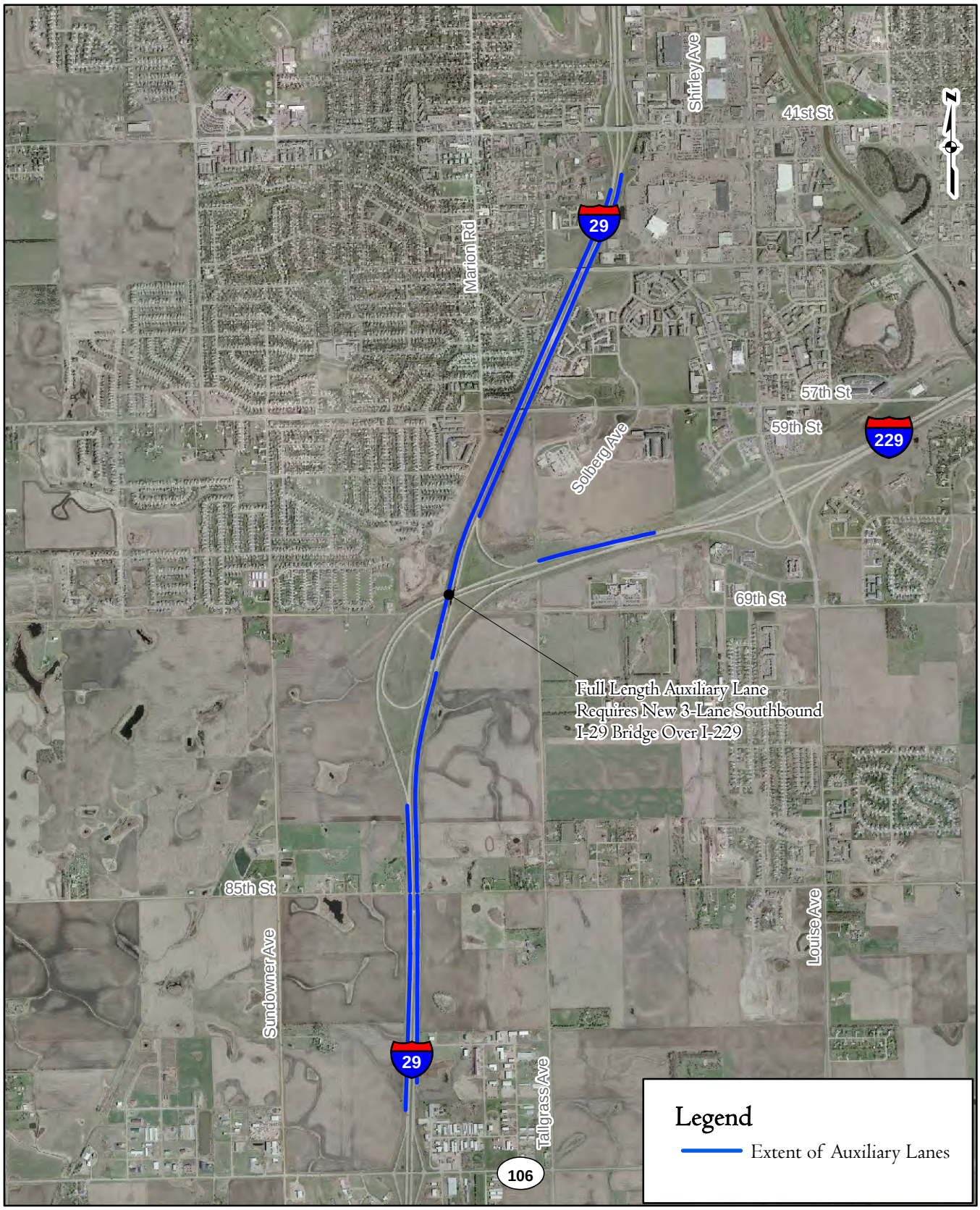

Figure 35. Locations of New Auxiliary Lanes on I-29 and I-229

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3.3.1 I-29/I-229 System Interchange Alternatives

Alternative 7: I-29/I-229 Interchange Modification -Southbound Ramp Modifications

Alternative 7 focuses on retaining the current I-29/I-229 interchange configuration, but incorporating changes that increase the separation between the current merge point of southbound I-229 into I-29 on-ramp and what would be the diverge point to a southbound I-29 off-ramp to 85th Street.

The alternative would not substantially change how the current interchange operates and would accommodate any of the 69th Street crossing concepts developed for on-grade and overpass alignments.

Alternative 7 is displayed in Figure 36.

Alternative 7 would improve the southbound I-29 weaving section between the system interchange and the proposed I-29/85th Street interchange (by increasing the separation between the system interchange ramps and 85th Street ramps to approximately 1,000 feet for the diamond and SPUI and approximately 1,700 feet for the folded diamond and partial cloverleaf alternatives), but would not eliminate the weave. In all of the I-29/85th Street interchange alternatives that include a southbound off-ramp in the northwest quadrant, the weave section along I-29 would be very short, which would result in poor traffic operations in 2033.

Alternative 8: I-29/I-229 Interchange Modification – Southbound Directional Ramps Option A

Alternative 8 would modify the I-29/I-229 System Interchange by:

- Replacing the existing loop ramp connecting southbound I-29 to northbound I-229 with a directional ramp that could go over or under I-29 and I-229.
- Removing the current loop ramp would allow the southbound I-229 to southbound I-29 on-ramp to be shortened so that the I-29 merge point would be approximately 1,500 feet north of the current merge point. Shifting the southbound I-229 to southbound I-29 merge point results in a southbound weave section ranging from 1,700 feet to over 2,300 feet, depending on the I-29/85th Street interchange configuration.

A minor adjustment to the current northbound I-29 to northbound I-229 ramp would be required to accommodate the modified southbound I-29 to northbound I-229 flyover ramp. Alternative 8 implemented as underpass or overpass ramps would be able to accommodate the range of on-grade and overpass alternatives for the 69th Street crossings of I-29. In addition, the alternative would accommodate the Solberg Avenue-Tallgrass Avenue overpass crossing alternative.

Alternative 8 would require less right-of-way than the current interchange configuration. This alternative would allow approximately 30 to 35 acres of existing right-of-way to be used for something else, potentially redevelopment.

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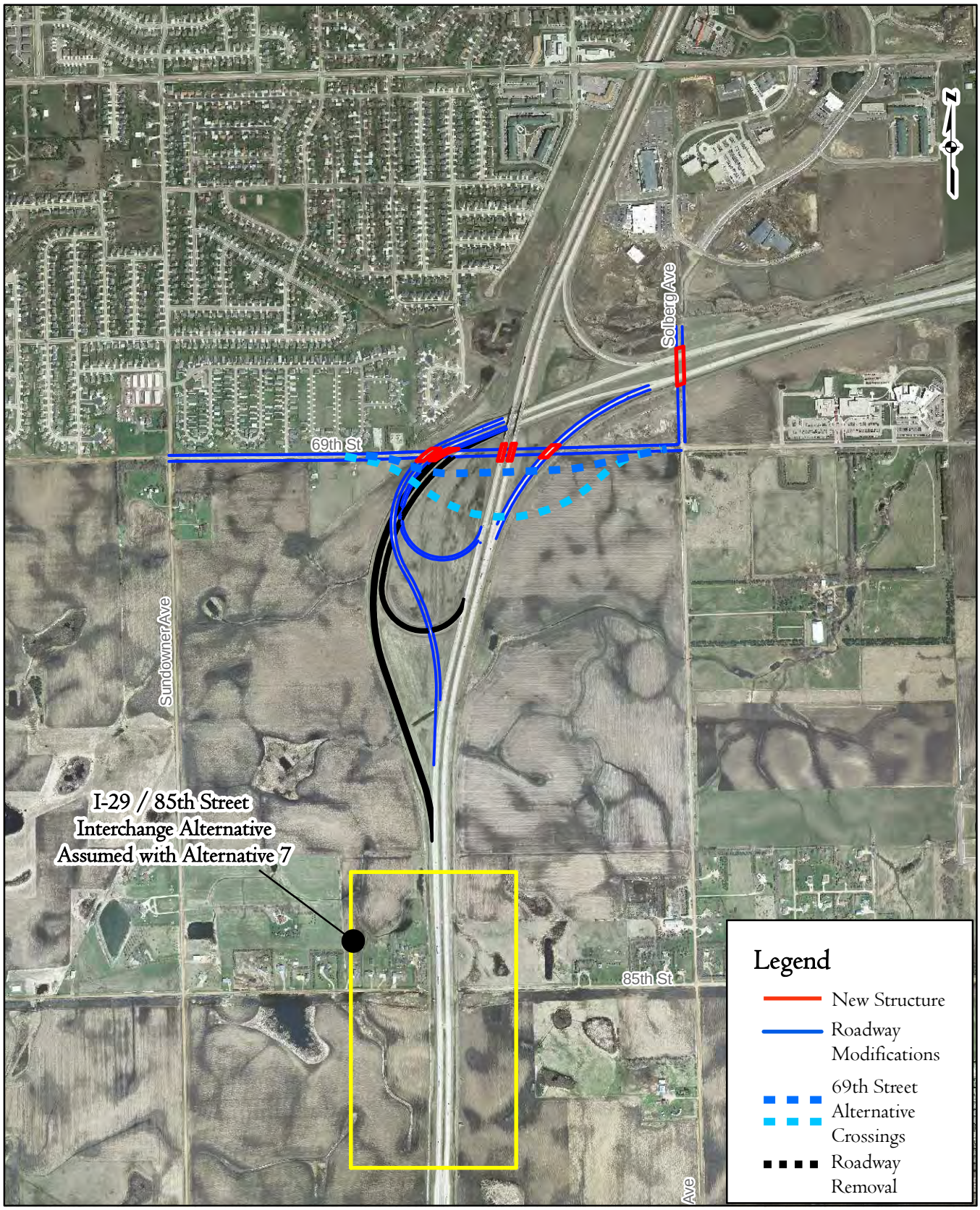

Figure 36. Alternative 7: I-29 / I-229 Interchange Modification - Ramp Modifications

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A design issue with this alternative would result from the left-side ramp entry for the southbound I-29 to northbound I-229 with the added I-229 auxiliary lane in place. This would force some weaving maneuvers across three lanes of traffic to reach the northbound Louise Avenue off-ramp. The weave is forecasted to be acceptable in that the southbound I-29 to Louise Avenue traffic is a fairly light movement.

Alternative 8, shown in Figure 37, would improve the southbound I-29 weaving section by extending the weave section, but would not eliminate the weave. Only the folded diamond and partial cloverleaf alternatives resulted in a weave distance that provided acceptable operations.

Alternative 9: I-29/I-229 Interchange Modification – Directional Ramps Option B

Alternative 9 would modify the I-29/I-229 System Interchange in a similar manner to Alternative 8, with some differences:

- Alternative 9 would also increase the separation distance between the southbound I-229 on-ramp merge point and the southbound 85th Street off-ramp diverge point by approximately 2,500 feet from the current configuration.
- Alternative 9 would require less right-of-way than the current interchange configuration. This alternative would allow approximately 40 to 45 acres of existing right-of-way to be used for something else, potentially redevelopment.

Alternative 9 would be able to accommodate the Solberg Avenue-Tallgrass Avenue grade-separated overpass crossing alternative of I-229. As an overpass, the elevation of the Solberg-Tallgrass Avenue bridge would need to be raised approximately three feet from previous assumptions to accommodate all of the required ramp connections on the mainline.

Alternative 9, shown in Figure 38, would not be compatible with the middle alternative for the 69th Street crossing if 69th Street were to cross over I-29, due to conflicts between the southbound I-229 to southbound I-29 ramp and the elevated 69th Street crossing of I-29.

Alternative 10: I-29/I-229 Interchange Modification – Realign Southbound I-29

Alternative 10 would modify the I-29/I-229 System Interchange by:

- Realigning southbound I-29 to the west by approximately 200 feet through the system interchange.
- Replacing the existing southbound I-229 to southbound I-29 ramp with a new directional ramp that could cross over or under northbound I-29.
- Replacing the existing southbound I-29 to northbound I-229 loop ramp with a directional ramp that could cross over or under northbound I-29 and southbound I-229.

The 69th Street on-grade underpass and southern overpass of 69th Street would be compatible with this system interchange alternative. The bridge associated with the 69th Street middle alternative would likely be longer than would be cost effective. Thus, that crossing concept is likely flawed and would not be considered as an element of this alternative.

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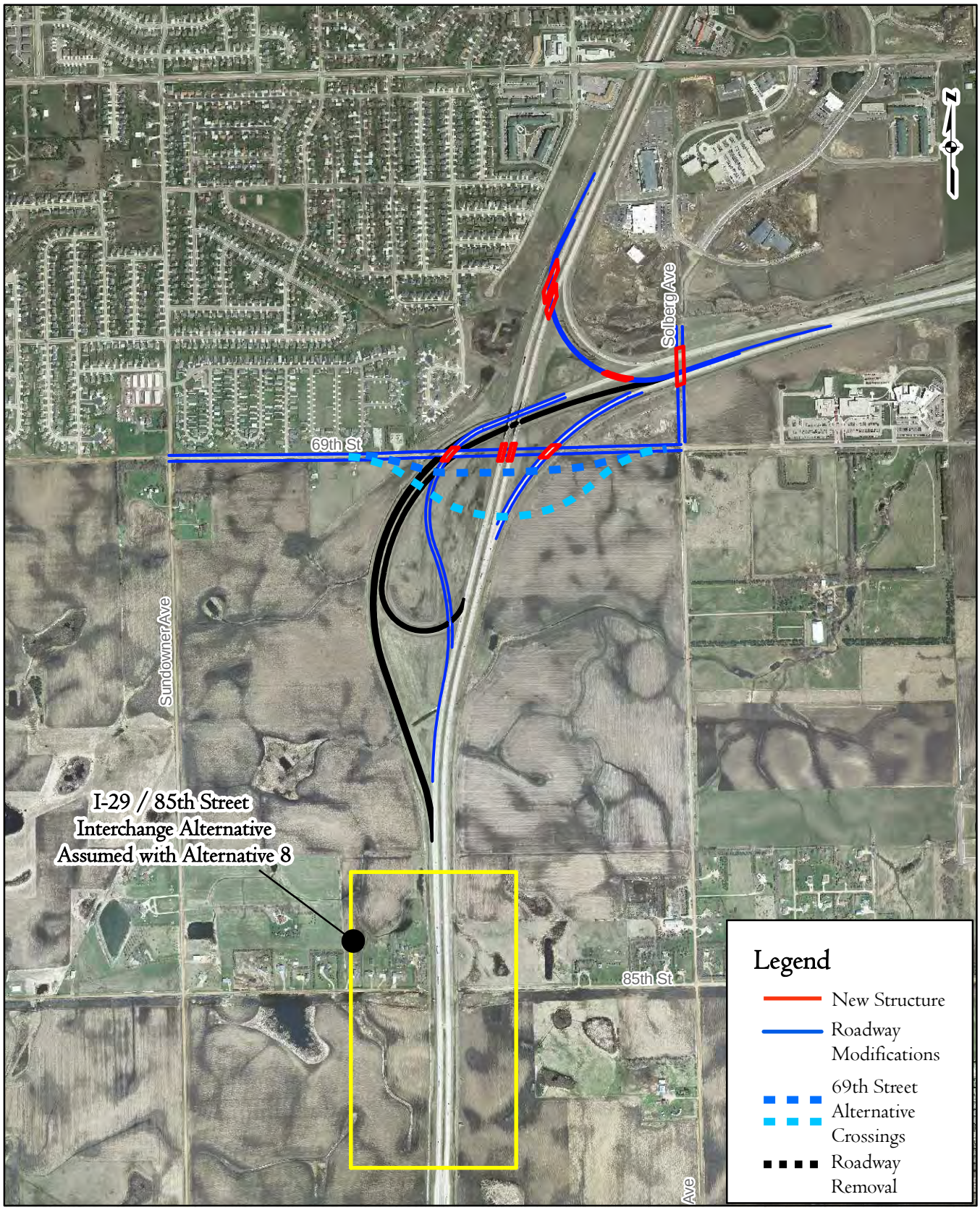

Figure 37. Alternative 8: I-29 / I-229 Interchange Modification - Directional Ramps Option A

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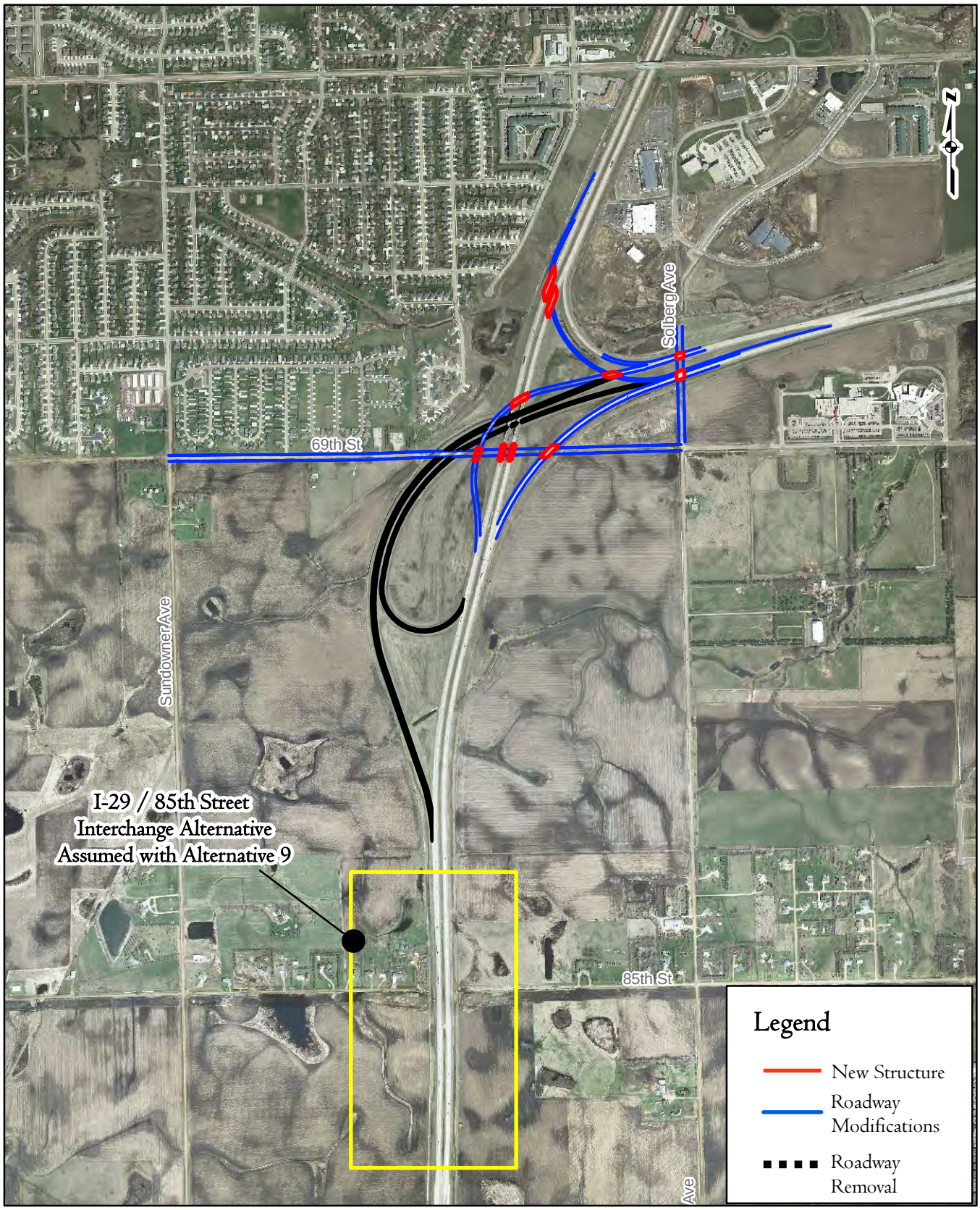

Figure 38. Alternative 9: I-29 / I-229 Interchange Modification - Directional Ramps Option B

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The Solberg Avenue-Tallgrass Avenue overpass crossing of I-229 could be accommodated with this alternative.

Other defining characteristics of the concept include:

- This alternative would increase the separation between the southbound I-229 on-ramp merge point and the southbound 85th Street off-ramp diverge point by approximately 2,500 feet from the current configuration. As with Alternative 9, this change would technically remove the weave designation to the segment, but experience has demonstrated that the section would continue to operate as a weave. Thus, the modification improves the weave, but does not eliminate the weave.
- A design issue with this alternative would result from the left-side ramp entry for the southbound I-29 to northbound I-229 with the added I-229 auxiliary lanes in place. This would force some weaving maneuvers across three lanes of traffic to get to the northbound Louise Avenue off-ramp.
- Unlike the other I-29/I-229 interchange modification alternatives, Alternative 10 would require approximately 10 additional acres of right-of-way.
- By making the I-29 to I-229 connection through a left hand off-ramp from I-29, the alternative reduces the length of the bridge needed over I-29, relative to the alternatives with a right hand off-ramp.

In this alternative the separation between the southbound I-229 on-ramp merge point and the southbound 85th Street off-ramp diverge point would range from just over 2,700 feet (diamond/SPUI) to over 3,500 (folded diamond/partial cloverleaf). As the southbound I-229 to southbound I-29 ramp enters I-29 from the left hand side and would be followed by a right hand off-ramp to 85th Street, traffic flow through the segment would continue to display the characteristics of a weave section (higher percentages of vehicles desiring to change lanes) as the vehicles entering from I-229 on the left merge to the far right if they want to exit to 85th Street. Thus, to be conservative, the southbound I-29 segment between the I-229 and 85th Street was evaluated as if it were a weave section (as documented in the next section).

Alternative 10 is shown in Figure 39.

Left On-Ramp Followed by Right Off-Ramp – Higher Probability for Greater Weaving Traffic

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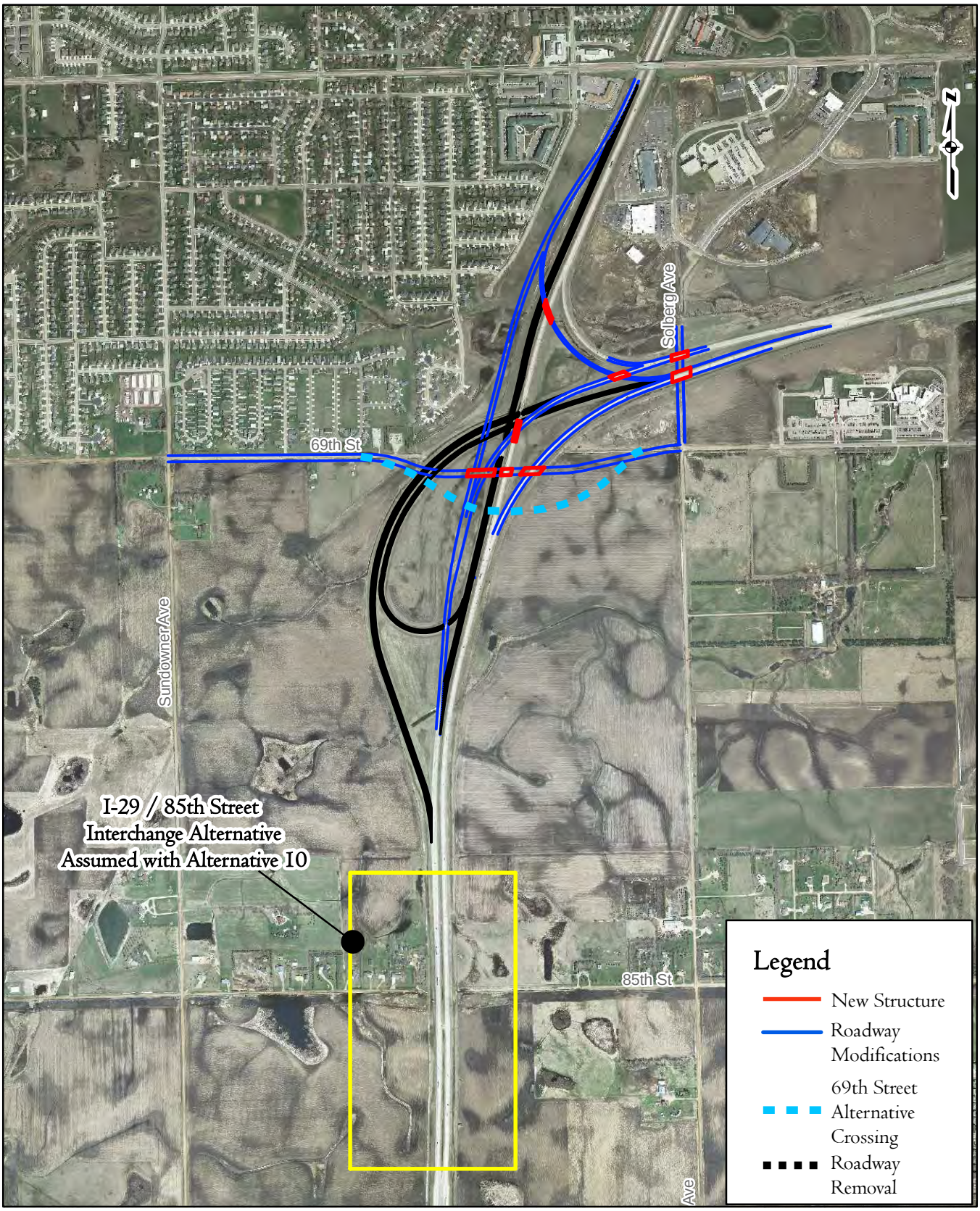

Figure 39. Alternative I0: I-29 / I-229 Interchange Modification - Realign Southbound I-29

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Alternative 11: I-29/I-229 Interchange Modification – Complete Interchange Reconstruction
Alternative 11 would modify the I-29/I-229 System Interchange by completely reconstructing the system interchange to provide for a higher design speed for both mainline interstate and for system interchange ramps. This alternative would:

- Replace the existing southbound I-229 to southbound I-29 ramp with a new directional ramp that could cross under or over I-29.
- Replace the existing southbound I-29 to northbound I-229 loop ramp with a directional ramp that could cross under or over I-29 and I-229.
- Remove the current loop ramp and allow the southbound I-229 to southbound I-29 on-ramp to be shortened so that the I-29 merge point would be approximately 1,400 feet north of the current merge point. Redefining the merge point would improve the operations in the weave section by increasing the length to approximately 1,600 to over 2,400 feet, but it would not eliminate the operational issues.
- Be able to accommodate any of the 69th Street crossing concepts developed (on-grade or either of the overpass alignments).
- Be able to accommodate the Solberg Avenue-Tallgrass Avenue overpass crossing.
- Require less right-of-way than the current interchange configuration. This alternative would allow approximately 45 acres of existing right-of-way to be used for something else, potentially redevelopment.

Alternative 11 is shown in Figure 40.

3.3.2 I-29/I-229 System Interchange Traffic Operations Results

The build conditions traffic forecasts and proposed roadway geometries associated with Alternatives 7 through 11 were evaluated to estimate the traffic operations for each alternative. As noted earlier, these five alternatives were developed to modify the I-29/I-229 System Interchange with a similar goal of moving the southbound I-229 to southbound I-29 on-ramp to the north in order to improve traffic operations through the weave area between the system interchange and the I-29/85th Street interchange concept.

Peak hour (AM and PM) 2033 traffic operations associated with each of the five alternatives are documented in Figures 41 through 45. As noted earlier, while Alternative 10 does not meet the technical definition of a weave, to be conservative the Alternative was evaluated as if it were a weave section. The traffic operations analysis completed for I-29/I-229 System Interchange modification Alternatives 7 through 11 would:

- Result in a minimum of at least one alternative that would provide LOS C or better operations or improve mainline traffic operations relative to the 2033 No-build for all of the basic freeway segments along I-29 and I-229.

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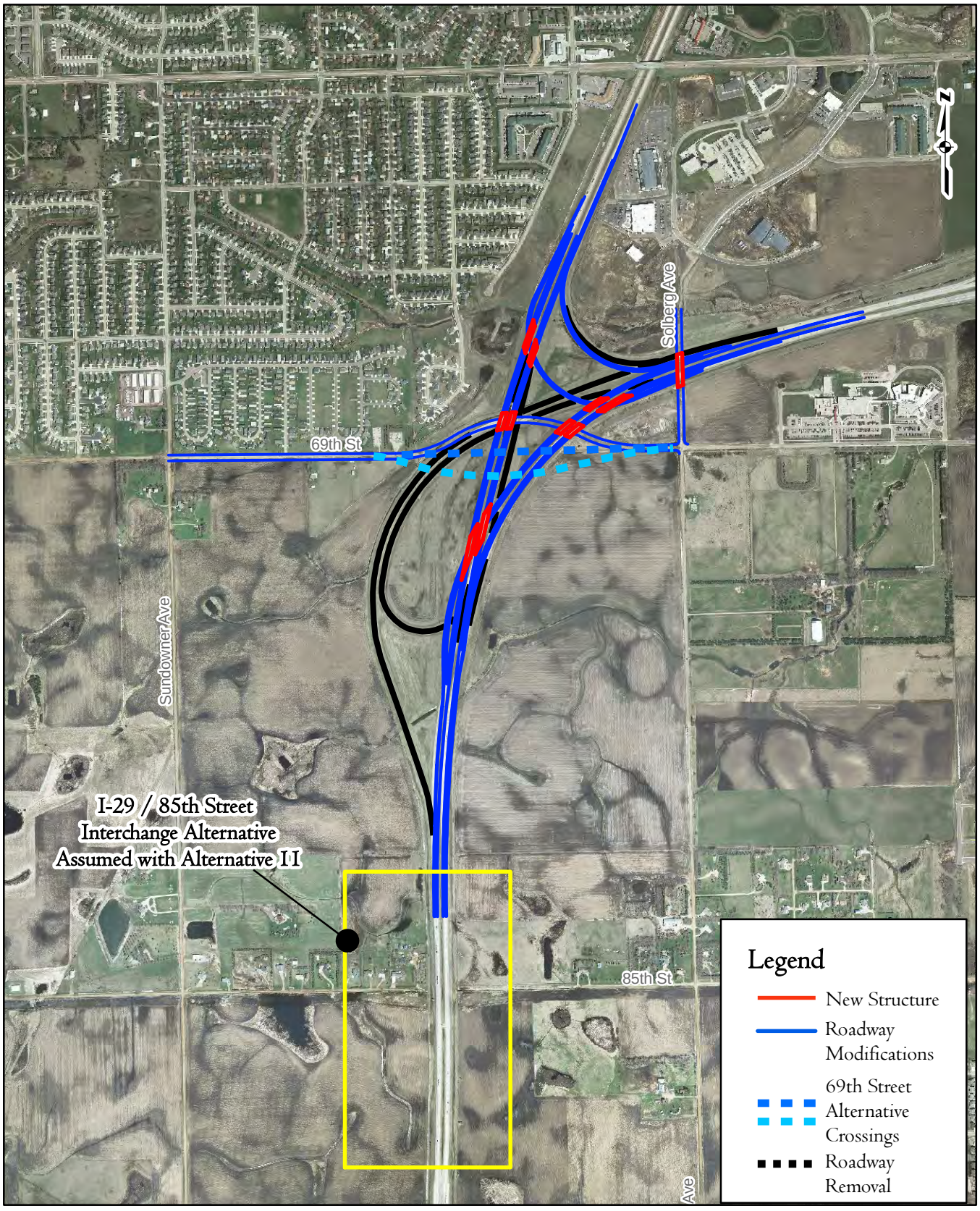

Figure 40. Alternative II: I-29 / I-229 Interchange Modification - Complete Interchange Reconstruction

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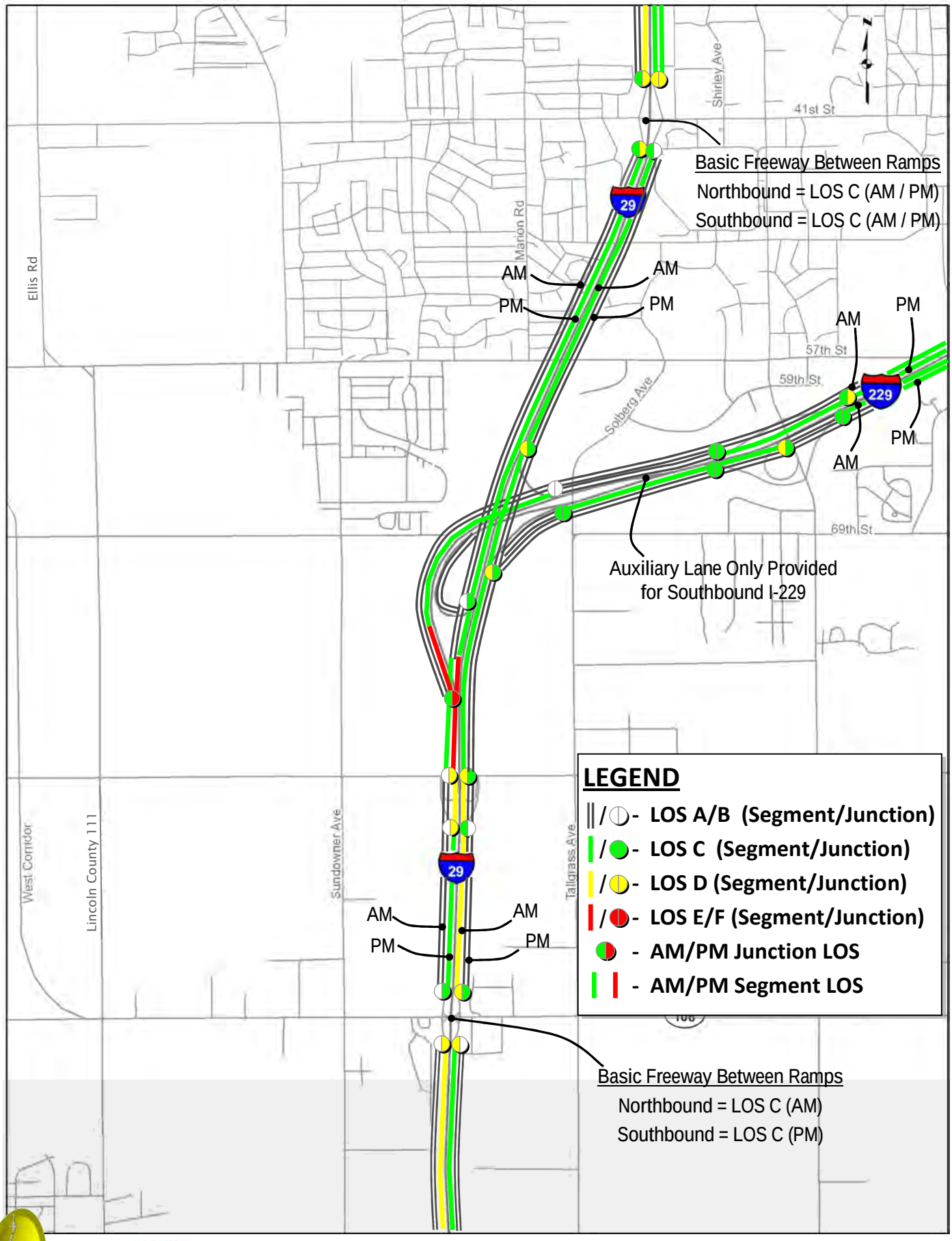

Figure 41. Future (2033) Build Alternative 7 Mainline Traffic Operations Summary

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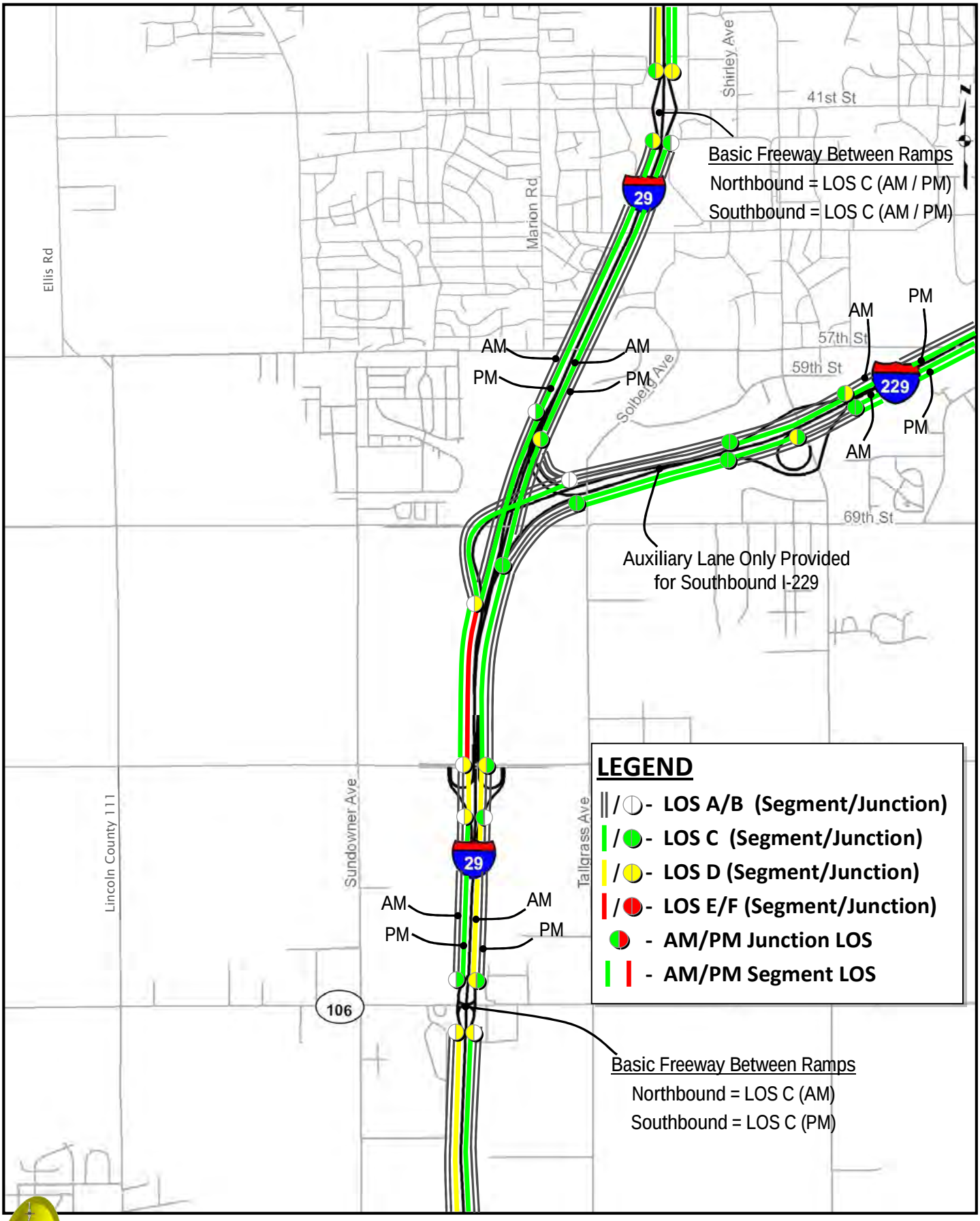

Figure 42. Future (2033) Build Alternative 8 Mainline Traffic Operations Summary

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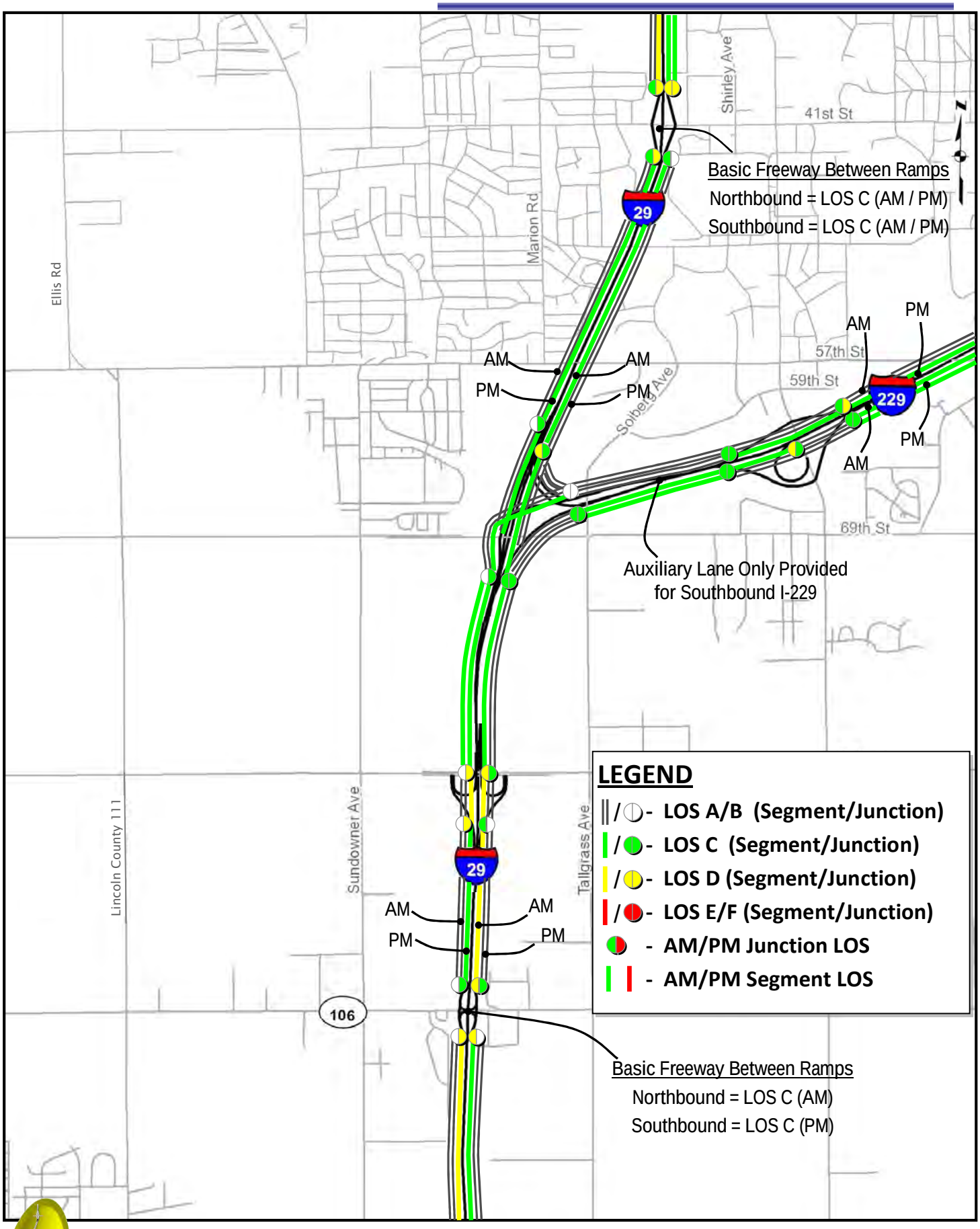

I-29 Corridor Study
41st Street to CR 106

Figure 43. Future (2033) Build Alternative 9 Mainline Traffic Operations Summary

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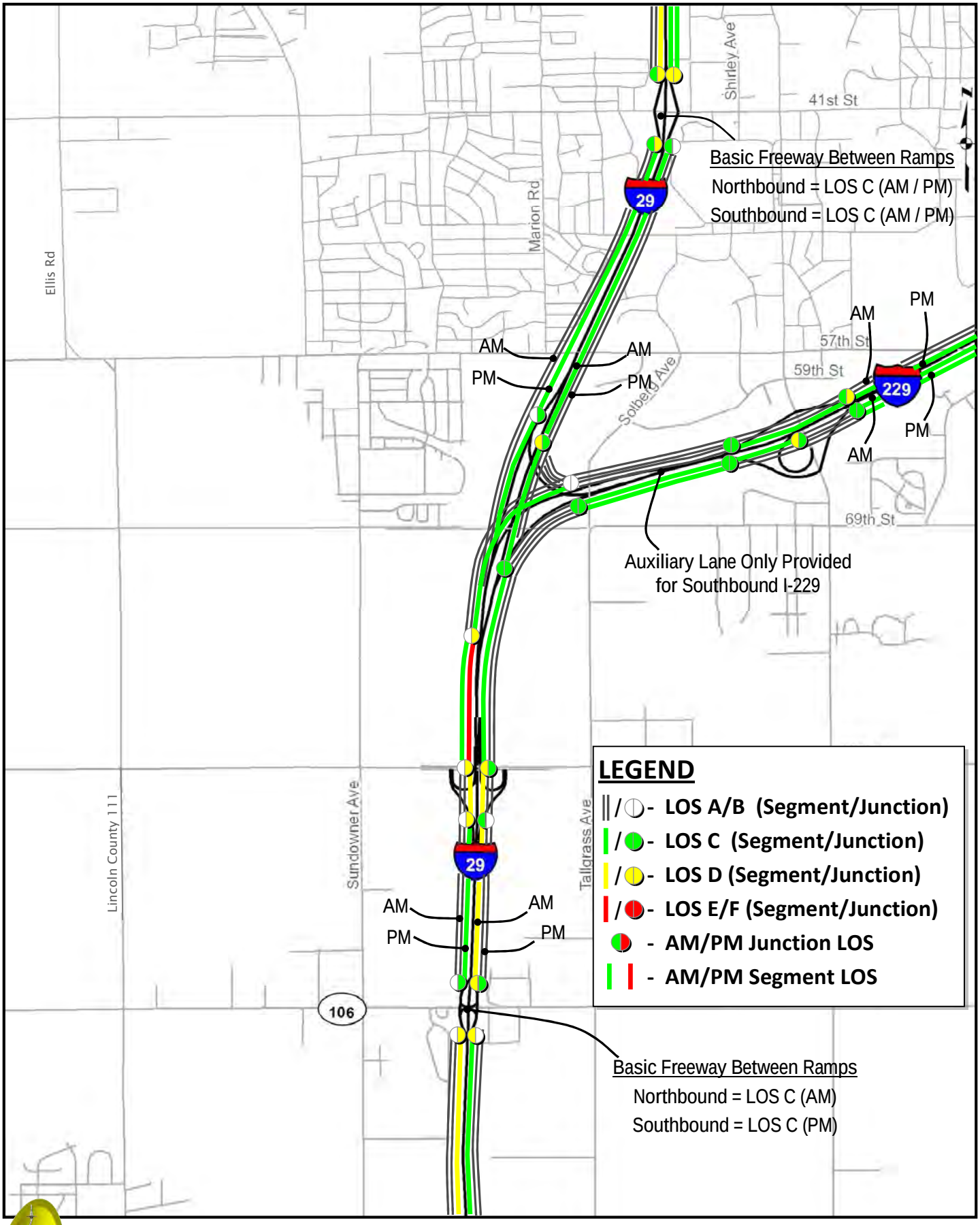

I-29 Corridor Study
41st Street to CR 106

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Figure 44. Future (2033) Build Alternative 10
Mainline Traffic Operations Summary

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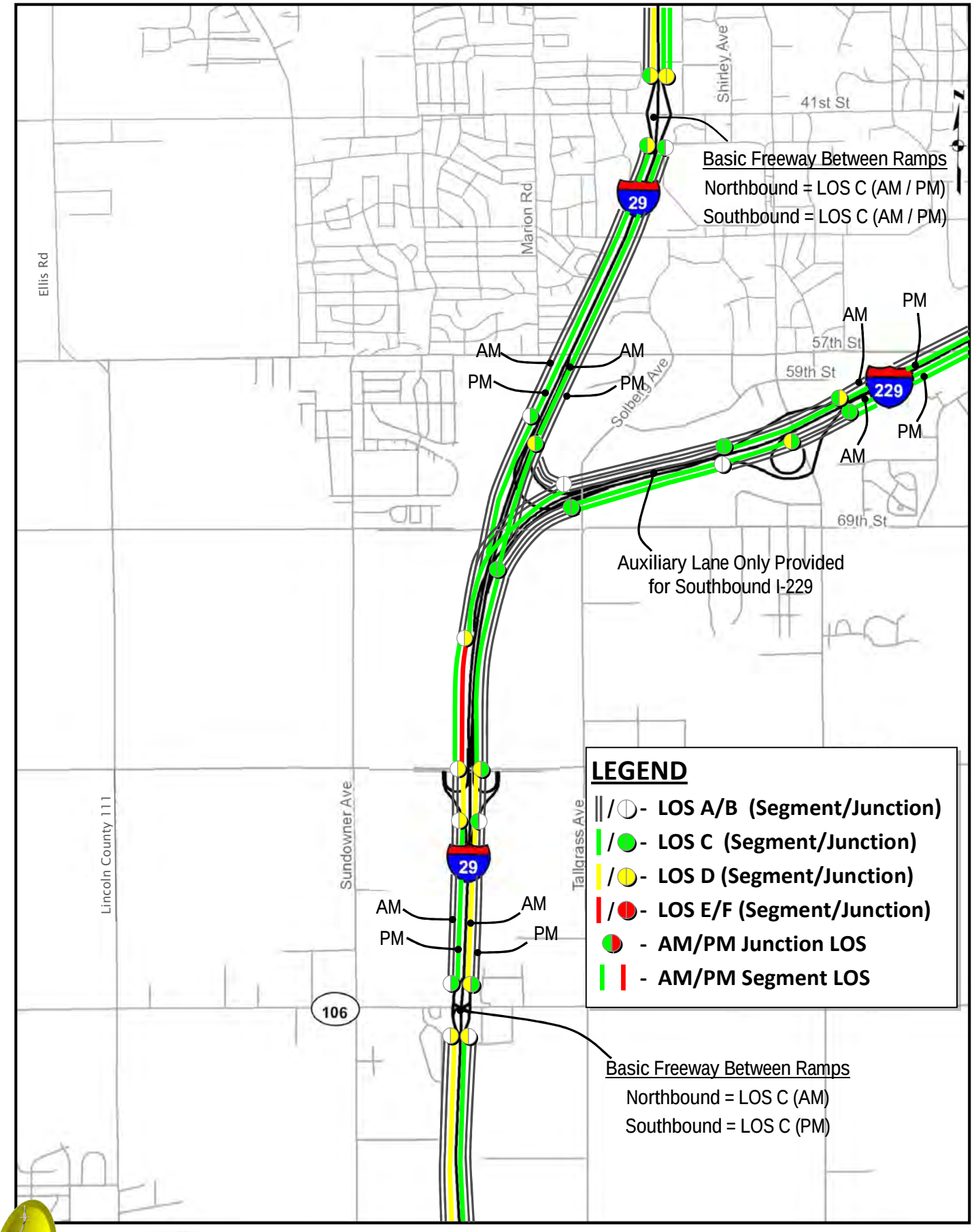

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41st Street to CR 106

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Figure 45. Future (2033) Build Alternative 11
Mainline Traffic Operations Summary

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- Result in one concept (Alternative 9) that would address the southbound I-29 weaving deficiency between the southbound I-229 on-ramp and at least one of the I-29/85th Street interchange concepts (Folded Diamond or Partial Cloverleaf) that would provide acceptable traffic operations (LOS C or better) through 2033. With the Diamond or Single Point interchange configuration a weaving segment would be reintroduced into this segment.
- Substantially reduce the number of interstate ramp junction locations where in the 2033 No-build operations AM and/or PM peak hour traffic operations were LOS D or worse. As auxiliary lanes are included in the range of modified system change alternatives, operations are forecasted to improve. However, LOS D operations would still occur at several of the junctions at I-29/I-229, I-29/41st Street, I-229/Louise Avenue and at I-29/Highway 106 (Tea).
- Improve the traffic operations issues on I-29 north of Highway 106 (Tea), even with the addition of an interchange at I-29/85th Street.

The traffic operations results associated with the five I-29/I-229 System Interchange modification alternatives were similar. All of the I-29/I-229 System Interchange modification alternatives evaluated resolve the vast majority of the operations deficiencies observed through the system interchange and on the mainline segments approaching and leaving the system interchange. Not addressed with most of the system interchange modifications is the weaving section along southbound I-29 between I-229 and the southbound off-ramp to 85th Street. This provided the impetus to develop an alternative to address the southbound weave between I-29/I-229 and I-29/85th Street. That alternative involves vertically separating or reordering these two ramps and will be discussed in greater detail in Section 3.4.

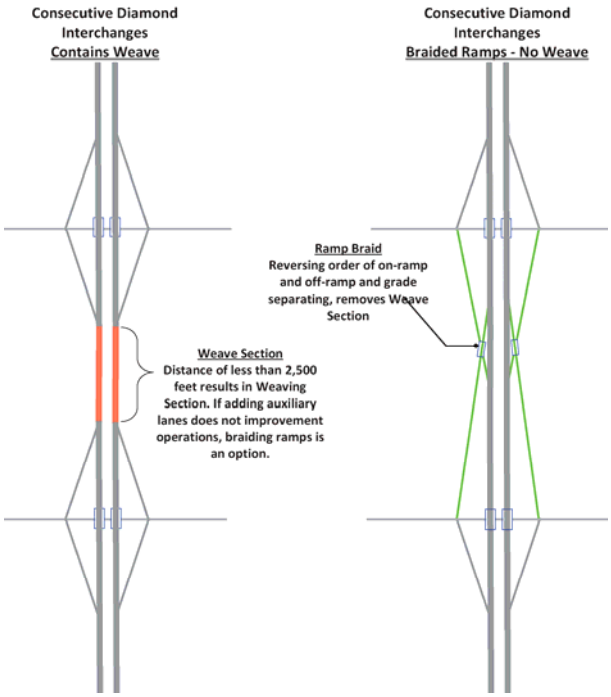
3.4 SOUTHBOUND I-29 WEAVE SUPPLEMENTAL BUILD ALTERNATIVE

While the combinations of I-29/I-229 interchange and I-29/85th Street interchange concepts have been demonstrated to improve mainline traffic operations through the 2033 horizon, it is desirable to continue to refine the other corridor modification alternatives further to develop feasible alternatives. Thus, a final concept for addressing the weave area operations was to review the elements that create the potential for weaving problems:

- Segment length.
- Level of traffic.

The southbound I-29 weave area is the mixing traffic from two of the higher volume movements in the study area (proposed southbound I-29/85th Street off-ramp and the southbound I-229 to southbound I-29 on-ramp). Alternatives that provide connections across I-29 at 69th Street and at 85th Street, in addition to the proposed crossing at Solberg Avenue to Tallgrass Avenue, were evaluated to see if they would reduce the level of traffic mixing along the southbound segment of I-29. While the alternatives reduced the traffic somewhat, the level was not substantial enough to significantly reduce the congested operations in the 2033 period. Thus, alternatives that rearranged the order of the southbound I-29 on-ramp from I-229 and the southbound I-29 off-ramp to 85th Street were proposed. By moving the southbound I-29/85th Street off-ramp to a

point on I-29 north of where the southbound I-229 to southbound I-29 traffic comes in and providing a grade separated crossing of the ramps (braiding), the weave section is eliminated.



Alternative 12: I-29/85th Street Braided Southbound Ramps Interchange

Alternative 12 incorporates braiding the southbound I-29 off-ramp to 85th Street with the southbound I-229 to southbound I-29 on-ramp, separating traffic that in the previous Build alternatives desired to weave across lanes. The braided southbound ramp would be fed by two separate off-ramps, one from southbound I-29 and one from southbound I-229. Figure 46 illustrates Alternative 12 which incorporates braided ramps in a minimal modification of the current I-29/I-229 System Interchange. Keys in the ramp braiding alternative analysis was to determine whether the concept would result in a geometric fit and a traffic operations improvement fit with most or all of the concepts. In general, by braiding the ramps the exit and entrance ramp progression southbound from the system interchange is re-ordered by:

- Moving the southbound off-ramp to 85th Street north of the I-229 on-ramp to southbound I-29.
- Grade separating the crossing of the I-229 on-ramp to southbound I-29 and the southbound I-29 off-ramp to 85th Street.

The following bullets summarize the design characteristics and issues associated with Alternative 12:

- The off-ramps from southbound I-29 and southbound I-229 to 85th Street would each be a single lane, and would combine into a two-lane southbound collector ramp that would allow the exiting I-29 and I-229 traffic adequate distance to weave into the appropriate lanes before reaching the 85th Street intersection.
- The northbound off-ramp, the northbound on-ramp and the southbound on-ramp would all be single lane ramps.
- To provide a standard ramp separation distance between the southbound I-29 to northbound I-229 system interchange ramp and the southbound I-29 to 85th Street off-ramp, the southbound I-29 to northbound I-229 system ramp would need to be modified. The modification, illustrated in Figure 46, would provide 1000 feet of separation between these two diverge points, consistent with AASHTO Geometric Design standards.

Figure 46. Alternative I2: I-29 / 85th Street Braided Southbound Ramps Interchange

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- Alternative 12 includes the additional I-29 and I-229 auxiliary lanes, as described earlier. Based on earlier traffic operations, the I-29 auxiliary lanes are proposed to be carried through the I-29/85th Street interchange.
- By 2033, the 85th Street ramp terminal intersections would be signalized and would have the following turn lane configurations:
  - The southbound off-ramp would have two left-turn lanes and one right-turn lane.
  - Westbound 85th Street at the southbound ramps would have a single left-turn lane.
  - Eastbound 85th Street at the southbound ramps would have a single right-turn lane.
  - The northbound off-ramp would have one left-turn lane and two right-turn lanes.
  - Westbound 85th Street at the northbound ramps would have two left-turn lanes.
  - Eastbound 85th Street at the northbound ramps would have one right-turn lane.
- Although Alternative 12 would require relatively minimal modification to the I-29/I-229 System Interchange, the 85th Street southbound braided ramp concept could be incorporated with any of the I-29/I-229 interchange modification alternatives (Alternatives 7 through 11) and any of the 69th Street crossing alternatives presented in this report.
- This alternative would require two new bridges, one for an extended 85th Street to cross over I-29 and one for the southbound I-29 to 85th Street off-ramp to cross over the southbound I-229 to southbound I-29 system ramp.
- This alternative could also accommodate the diamond and single-point urban interchange configurations at the I-29/85th Street interchange.
- This alternative would eliminate I-29 southbound weaving issues by moving the 85th Street southbound off-ramp to a point north of the southbound I-229 to southbound I-29 on-ramp.
- As with the other alternatives, this alternative provides an acceptable separation distance between the merge point for the 85th Street northbound on-ramp and the diverge point for the northbound I-229 off-ramp, and would not have any weaving issues.
- This alternative directly impacts four (4) properties and would require acquisition of approximately 40 acres of additional right-of-way adjacent to the interchange.

3.4.1 Alternative 12 Traffic Operations Results

The results of the traffic operations analysis associated with Alternative 12 includes:

- The I-29 southbound weaving issues are eliminated by moving the 85th Street southbound off-ramp to a point north of the southbound I-229 to southbound I-29 on-ramp
- LOS C or better traffic operations are provided for all basic freeway segments and ramp junctions.
- The number of interstate ramp junction locations where in the 2033 No-build scenario operations AM and/or PM peak hour traffic operations were LOS D or worse operations are substantially reduced. As auxiliary lanes are included in the range of modified system alternatives, operations are forecasted to improve, however, LOS D operations would still occur at several of the junctions at I-29/I-229, I-29/41st Street, I-229/Louise Avenue and at

I-29/Highway 106 (Tea). If LOS D or worse operations would occur in at most one of the daily peak hours.

- The operations issues on I-29 north of Highway 106 (Tea) even with the addition of an interchange at I-29/85th Street are improved.

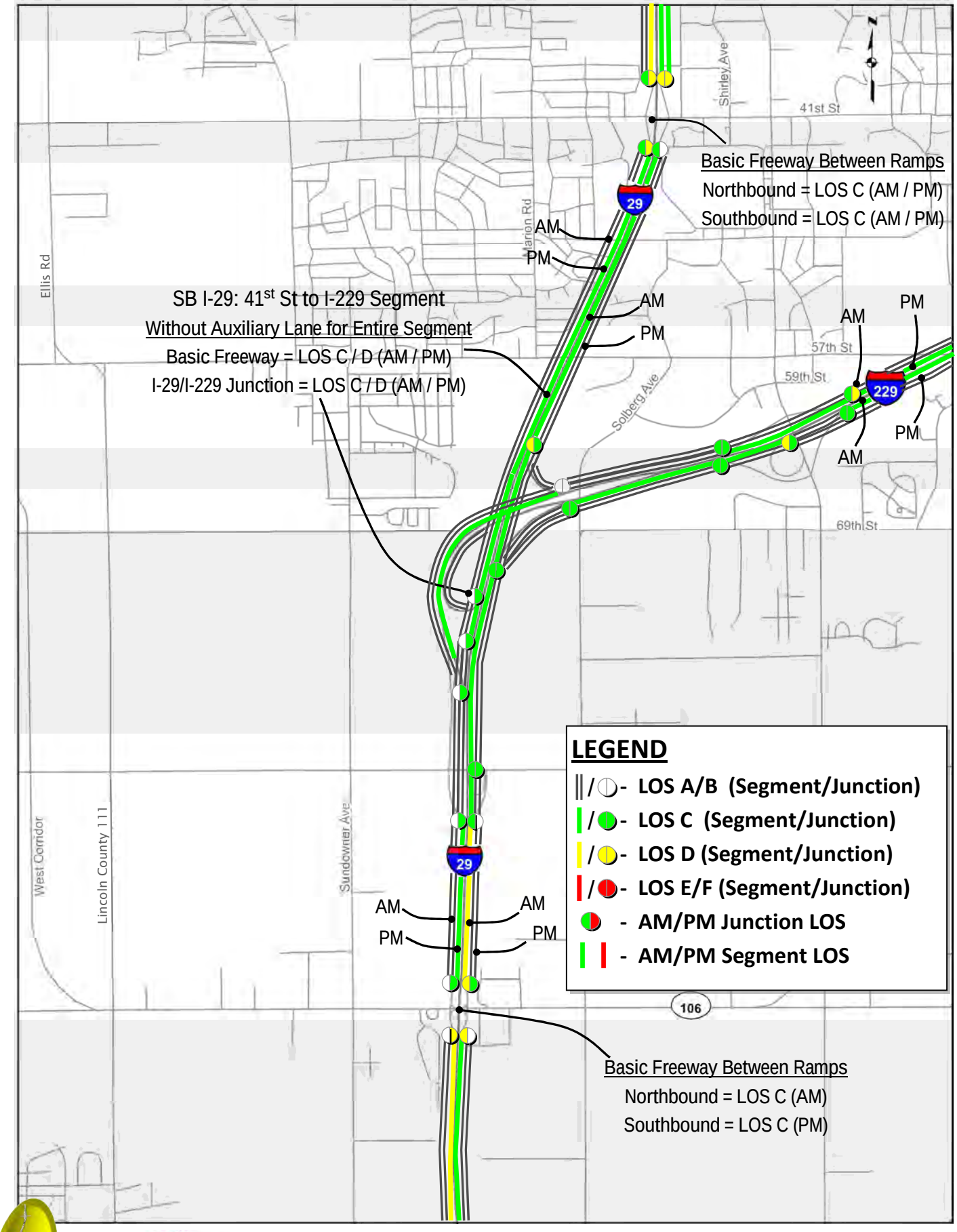
Thus, Alternative 12 would meet the traffic operations goals of improving traffic operations in the study area, while providing improved study area access. Alternative 12 traffic operations results are illustrated in Figure 47.

3.5 SUPPLEMENTAL NON-INTERSTATE BUILD ALTERNATIVES

As adding an interchange at I-29/85th Street did not address all of the arterial deficiencies observed in the No-build scenario and introduced the weave area, a transit improvement concept was evaluated to determine the level of improvement that could be gained as both a stand alone and complementary project. Alternative 13 represents an expanded Sioux Falls Transit Service alternative that would service the study area.

Alternative 13: Expanded Sioux Falls Transit Service Alternative

Presently, the majority of the corridor study area is located outside the Sioux Falls Transit service area, however, the density and types of development proposed are consistent with other areas of the Sioux Falls region where transit service (both fixed routes and paratransit) is provided. Thus, it is reasonable to assume that as the corridor area develops and portions of the study area are annexed into Sioux Falls, transit service would be provided where development activities are similar to areas of the region presently served by transit. The current Sioux Falls Transit bus routes are illustrated in Figure 48. The assumption of annexation into the city is included in the analysis because Sioux Falls Transit is restricted to operating fixed route service within the city limits.



I-29 Corridor Study
41st Street to CR 106

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Figure 47. Alternative 12 Mainline Traffic Operations Summary

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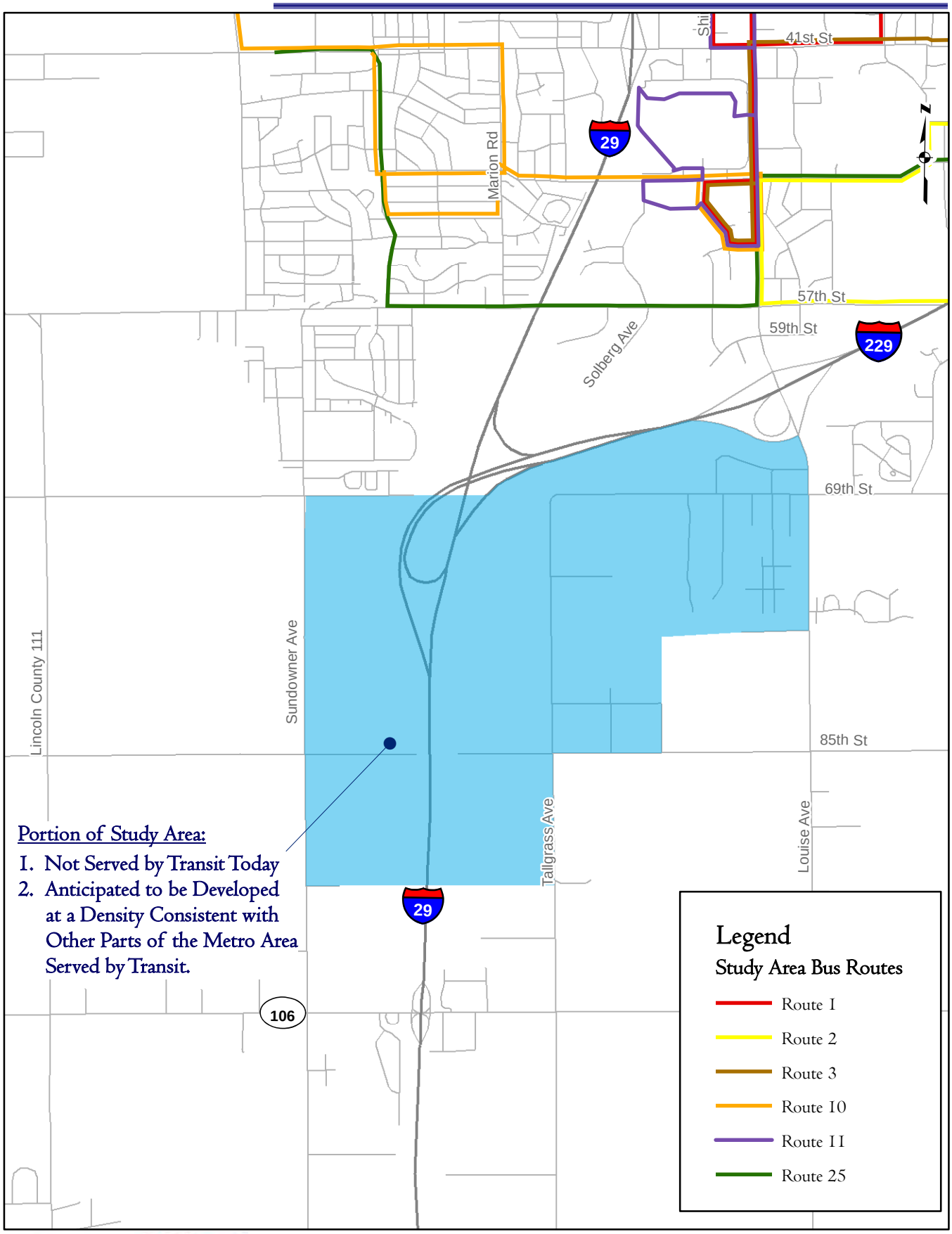

Figure 48. Study Area Transit Service Area and Existing Sioux Falls Transit Service Routes

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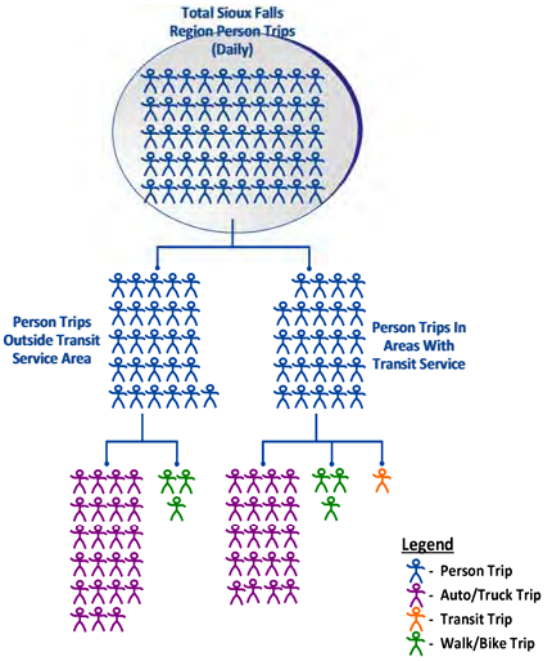
Key assumptions employed in preparation of the transit ridership forecasts are:

- Fixed route service in the region will continue to be provided only within the city limits of Sioux Falls (i.e. a regional authority will not be developed).
- The focus of the transit forecasting analysis is on the combined fixed route and paratransit services, and separate types of service forecasts are not developed as part of this analysis.
- Areas of the I-29 Corridor Study area that are likely to be annexed into the city, therefore would be within the fixed route transit service area, are limited to areas from 85th Street to the north. Areas to the south would be annexed into Tea, Harrisburg, or would remain in the county and outside an incorporated city/town.
- Service levels provided in the I-29 Corridor Study area would reflect similar service day, service hours, and headways as provided on average throughout the current service area.



Ridership Forecasting Process

Expanding bus service into the study area was forecasted to attract approximately 400 bus riders per day. During the peak hour, this alternative is projected to remove 100 to 150 vehicles in the peak hour from the study area streets. Details regarding the forecasting process, assumptions and results are documented in a technical memorandum entitled *Transit Ridership Forecasting Process and Results*, December 22, 2008.

The traffic levels and resulting operations associated with expanding the transit service area were nearly identical to the No-build scenario condition. Thus a separate traffic analysis was not completed for the concept. The operations benefits of extending transit service into the heart of the study area are not substantial enough to suggest this alternative as a stand alone solution in the area. As it does have the potential to reduce vehicle demand in the area, it should continue to be considered a complementary alternative to a capacity improvement alternative.

Removing 150 vehicles from the study area will not be sufficient to significantly impact congestion in any of the focus corridors, however, transit service extension should still be considered as the area is brought into the city. The primary reasons for retaining transit in a supporting role in the recommended plan are:

- The forecasted ridership is consistent, on a passengers per revenue mile basis, with other parts of the region. Thus, if it is a community value to provide transit in other parts of the community, opportunities in this area are consistent with that value.
- The study area lies on the edge of the community and, on average, the trip lengths are longer. As the trips are longer, any shift in person trips from single occupant vehicles to

multi-occupant vehicles will disproportionately reduce the vehicle miles traveled in the region.

- Reducing the number of vehicles idling in congested conditions will have a positive impact on air quality emissions.

Arterial and interchange area modifications/improvements addressed in this phase of the corridor study operations analysis comprise one or more elements from the individual area alternatives that were retained through preliminary stages of the analysis. To differentiate the alternatives in this portion of the analysis from the earlier work, the refined alternatives are referred to as composite concepts. This term is in reference to the idea that many of the refined composites are composed by combining more than one element area improvement to form a system improvement rather than a specific issue or bottleneck improvement that the preliminary screening addressed.

4.1 BUILD CONDITION COMPOSITE ALTERNATIVES

These composite alternatives were developed to address 2033 mainline and arterial operations issues that are forecasted to occur with or without an interchange at I-29/85th Street. Each of the composite alternatives is described below:

- *Composite 1*: Provides for a 69th Street extension across I-29 to fill in the Sundowner Avenue to Tallgrass Avenue gap. In this alternative, 69th street was proposed as a four-lane divided arterial with access consistent with the City of Sioux Falls access management guidelines. In addition to the arterial crossing, auxiliary lanes would be added to I-29 from 41st Street through Highway 106 (Tea) and to southbound I-229 from Louise Avenue to northbound I-29 to better accommodate entering and exiting traffic.
- *Composite 2*: Extends 85th Street across I-29 to fill in the Sundowner Avenue to Tallgrass Avenue gap. The level of traffic forecast for the 85th Street corridor warrants a four-lane divided roadway, based on the results from the traffic forecasting and traffic operations analyses. Similar to Composite 1, this alternative also included adding auxiliary lanes to I-29 from 41st Street through Highway 106 (Tea) and to southbound I-229 from Louise Avenue to northbound I-29.
- *Composite 3*: Includes modifying the current I-29/I-229 interchange by relocating the southbound I-29 to northbound I-229 loop ramp to the north, constructing a new interchange at I-29/85th Street as a single-point urban (SPUI) design. As the present southbound I-29 to northbound I-229 ramp location would remain on the left-hand side as it enters northbound I-229, auxiliary lane additions would be limited to north and southbound I-29 from 41st Street through Highway 106 (Tea) and to southbound I-229 from Louise Avenue to northbound I-29. Through the lesson learned in the preliminary operations analyses, the southbound ramp from I-229 to southbound I-29 and the southbound ramp to 85th Street from I-29 would need to be braided to eliminate the short weave section which was demonstrated to create traffic operations issues.
- *Composite 4*: Includes modifying the current I-29/I-229 interchange by replacing the current loop ramp for the southbound I-29 to northbound I-229 movement with a flyover ramp. This flyover ramp would form a right-hand entrance with I-229. This composite will also include a new interchange at I-29/85th Street as a single-point urban (SPUI) design and adding auxiliary lanes to northbound and southbound I-29 and I-229 throughout the study area. Through the lesson learned in the preliminary operations analyses, the southbound ramp from I-229 to southbound I-29 and the southbound ramp to

85th Street from I-29 would need to be braided to eliminate the short weave section which was demonstrated to create traffic operations issues.

- *Composite 5*: Provides a complete reconstruction of the I-29/I-229 System Interchange to include directional ramps for all movements and right-hand entrances and exits. The concept also includes a SPUI access at I-29 and 85th Street. The ramp braiding that is included in Composite 3 and Composite 4 is not required in this concept as the on and off-ramp sequencing and spacing is revised to eliminate the weave segment issues present in the system interchange modification alternative. The concept includes adding auxiliary lanes to I-29 and I-229 in both the north and southbound directions from 41st Street to Highway 106 (Tea) and from I-29 to Louise Avenue, respectively.
- *Composite 6*: Reconstruct the I-29/I-229 System Interchange to replace the southbound I-29 to northbound I-229 loop ramp with a directional ramp and replace the southbound I-229 to southbound I-29 on-grade ramp (Ramp E) with a flyover ramp that connects to I-29 approximately 2,500 feet north of the current junction. Included in this composite is the I-29/85th Street folded diamond interchange concept, I-29 northbound and southbound auxiliary lanes from 41st Street through Highway 106 (Tea) and an auxiliary lane on southbound I-229 between Louise Avenue and northbound I-29.
- *Composite 7*: Reconstruct the I-29/I-229 System Interchange to replace the southbound I-29 to northbound I-229 loop ramp with a directional ramp and replace the southbound I-229 to southbound I-29 on-grade ramp (Ramp E) with a flyover ramp that connects to I-29 approximately 2,500 feet north of the current junction (same as for Composite 6). This composite would utilize a single-point urban (SPUI) design for the I-29/85th Street interchange and includes I-29 northbound and southbound auxiliary lanes from 41st Street through Highway 106 (Tea) and an auxiliary lane on southbound I-229 between Louise Avenue and northbound I-29.
- *Composite 8*: This alternative combines the elements of Composite 1 and Composite 2. This alternative includes I-29 grade separations at both 69th Street and 85th Street.
- *Composite 9*: Composite 3 through Composite 7 each reflect a unique combination of modifications to the I-29/I-229 System Interchange and adding an interchange of one of two remaining configurations (a single point urban interchange or a folded diamond interchange) at I-29/85th Street. Composite 9 includes with any one of the listed new I-29/85th Street interchange alternatives (Composite 3 through Composite 7), a 69th Street crossing of I-29 along one of the three alignments documented in Composite 1. Thus, Composite 9 could be separated into 10 to 12 additional alternatives or defined as subconcepts within the Composite 9 concept. As a primary purpose of this study is to provide documentation of the Interstate System traffic operations impacts of a requested action and the interstate operations impacts of adding a 69th Street crossing of I-29 to Composites 3 through 7 are similar, it seems more logical and efficient to present the range as subconcepts under the Composite 9 umbrella. Listed in the following bullet points are the subconcepts:
  - *Composite 9A*: Combination of Composite 3 and Composite 1. Both of the south of the 69th Street section line overpass alternatives described in Composite 1 are acceptable for this alternative. The on-grade along the 69th Street section line crossing

alternative would not be included as there would be conflicts between the 69th Street arterial route and interstate mainline and ramp alignments.

- *Composite 9B*: Combination of Composite 4 and Composite 1. The south of the 69th Street section line overpass alternatives would be retained in this composite concept and the on-grade 69th Street extension across I-29 would not be included due to conflicts between the 69th Street arterial route and interstate mainline and ramp alignments.
- *Composite 9C*: Combination of Composite 5 and Composite 1. All three of the remaining 69th Street alignments could be implemented with this concept. Thus, all three are retained in the composite definition.
- *Composite 9D*: Combination of Composite 6 and Composite 1. All three of the remaining 69th Street alignments remain viable with this concept. Thus, all three are retained in the composite definition.
- *Composite 9E*: Combination of Composite 7 and Composite 1. Any of the three remaining 69th Street arterial crossing alignments could be implemented with this alternative. Thus, all three are retained in the composite definition.

4.1.1 Build Condition Composite Alternatives Descriptions

Through the alternatives analyses completed to this point, 85th Street is believed to be the only remaining potentially viable location for I-29 access between 41st Street and Highway 106 (Tea), a distance of approximately four miles. As the adjacent area continues to develop at urban densities, the existing arterial and even the interstate facilities will experience traffic volumes of a level that will result in unacceptable and even failing operations.

For each of the composite alternatives a cursory environmental review was completed. Agency correspondence is provided in Appendix E. There are a number of environmental factors where minimal or no impacts are anticipated for the build alternatives, as listed below:

- Floodplain Zoning: The project area is not located within a designated floodplain.
- 4f Properties: None of the build alternatives would impact any existing parks or bike trails. Arterial roadway extensions would include multi-use trails.
- Socioeconomics: The build alternatives provide a positive impact for residential and commercial development and community growth. There is a potential for long-term economic benefit if the upgraded transportation system aides in the recruitment of businesses to the area.
- Environmental Justice: A review of the demographics for the study area found that up to 15 percent of the population living northeast of the I-29/I-229 interchange is considered to be low income and minorities are spread throughout the study area with a small concentration located southeast of the project area. Although, there are concentrations of low income and minority populations within and surrounding the project area, none of the build alternatives would have a disproportionate adverse impact on these populations.

- Visual Quality / Aesthetics: During the construction of any of the build alternatives, the viewshed would be temporarily altered by construction activities and construction equipment. Although the existing Interstate System would be changed and occupy a larger footprint, post-construction the overall viewshed would not be significantly impacted. The alternative modifications would all occur adjacent to existing transportation corridors.
- Air Quality: During construction, there would be temporary, minor impacts on air quality relating to increased dust levels and vehicle exhaust. Any adverse impacts would be short-term and localized, and no permit would be required with best management practices (BMPs) in place. Even with higher traffic volumes in the future, no long-term significant impacts are anticipated with any of the build alternatives and it is not anticipated that air quality standards would be violated.
- Geology, Topography and Soil: None of the build alternatives have the potential to affect geology or topography. The majority of the soil disturbances are located at the edges of current farm field and adjacent to existing transportation facilities. Soils located along the edge of the new roadways would be temporarily impacted during the construction phase. These soils would be re-vegetated following construction. None of the potentially impacted soils are considered scarce within Lincoln County as all are represented by more than 3,000 acres within the county (SCS 1976). The relatively small number of acquired acres coupled with the identified BMPs would not be considered to be an unacceptable impact.
- Hydrology: None of the build alternatives have the potential to affect hydrology (flow) of any stream within or in the vicinity of the project area.
- Water Quality: With the construction of any of the roadway improvements and associated structures, the contractor would be required to obtain a NPDES Permit Surface Water Discharge Permit under the South Dakota Surface Water Discharge program. The permit application would require the identification of appropriate BMPs to control soil erosion.
- Wildlife Impacts: The vegetation present within the study area provides poor quality habitat for terrestrial wildlife species. The number of acres of vegetation impacted by the build alternatives is relatively small. Therefore, the build alternatives would only have minimal impact on the terrestrial wildlife species within the project area.
- Threatened and Endangered Species: A total of three threatened and endangered species have the potential to occur within Lincoln County / Minnehaha County. Those species include the bald eagle (haliaeetus leucocephalus), the topeka shiner (notropis topeka) and the western prairie fringed orchid (platanthera praeclara). Construction activities associated with modification to the I-29 Corridor would not directly affect any habitat important to the bald eagle. None of the build alternatives would disturb potential habitat for the western prairie fringed orchid. The habitat for the Topeka shiner is located outside of the study area.

  The South Dakota Department of Game, Fish and Parks (SDDGFP) was also contacted and they completed a review of the South Dakota Natural Heritage Database for this project. No rare or state threatened and endangered species were identified as occurring within the study area.

- Invasive Species: No invasive species presently exist within the study area. Construction activity provides an opportunity where an invasive species could become established via wind borne seeds or in the grass seed mixture used to re-vegetate the disturbed area. All seed mixtures used by SDDOT for re-vegetation of disturbed areas are certified to be free of noxious weeds. Therefore, it is expected that none of the build alternatives would result in an increase in the spread of any invasive species.
- Historic and Archaeological Preservation: The South Dakota State Historic Preservation Office (SHPO) was contacted to determine if there were any known cultural resources sites within or in the immediate vicinity of the study area. The search indicated the following:
  - Within the data collection area, five properties have been surveyed.
  - The SHPO has determined that four of the five properties are not eligible for listing in the NRHP.
  - No determination has been made on one of the surveyed properties. The farmstead, located west of Tallgrass Avenue approximately 3/8 miles north of State Highway 106, consists of two houses, two barns, a silo, a granary, and several other buildings (13 structures in all).
  - Several archaeological surveys have been completed in the area and no archaeological sites were identified during those surveys.

  The potentially eligible site is located slightly east of the project area and would not be impacted by any of the proposed modifications to the Interstate System. No other cultural resource site(s) are known to be located in the vicinity of the study area. Therefore, based on this information, it was determined that there would be no impact on known cultural resources regardless of the alternative selected. Further consultation with SHPO, initiated by the SDDOT, will be required to obtain a Section 106 concurrence for the selected build alternative.
- Recognized Environmental Conditions: An Environmental Data Resources (EDR) database search was completed for the area surrounding the existing I-29/I-229 Interchange. The results of EDR search included one leaking underground storage tank (LUST) within 1 mile of the project area, and five additional LUST sites between 1 and 2 miles from the project area. Each site was listed as being either closed or requiring no further action. All the identified recognized environmental conditions (REC) have either been resolved or are not located within the project area. Therefore, construction of any of the build alternatives would not impact any REC sites.

There are a few key environmental factors where the build alternatives will have potential impacts, as listed below:

- Land Use: The build alternatives will require additional right-of-way to expand or construct new transportation facilities. Information on the amount of right-of-way required for each build alternative is provided later in this section.
- Prime Farmland: A portion of the acquired right-of-way would be prime farmland. The land acquisitions would occur adjacent to existing transportation facilities and/or current public right-of-way. These land acquisitions would be from the edges of current farm

fields and would not segment those properties. Impacts to prime farmland cannot be substantially reduced by shifting the locations of proposed Interstate System and arterial street modifications.

- Acquisition and Relocation: Relocation of residences and businesses to accommodate purchase of highway ROW and subsequent construction of the highway is an unavoidable consequence of upgrading transportation systems. In some instances, displacement would involve only a portion of an existing property while in other instances, it would involve the entire property. Federal law requires that relocation assistance be provided to any person, business, or farm operation displaced because of the acquisition of real property by a public entity for public use (Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, PL-91-646 and amendments) (Uniform Act). In recognizing the rights of citizens displaced by transportation improvement projects, SDDOT has adopted policies that assure fair treatment and just compensation for tenants and owners of businesses and residential property. Information on the estimated number of property acquisitions is provided later in this section.
- Noise: Roadway traffic results in traffic noise for the residents and tenants of nearby homes and businesses. The level of noise is dependent on the amount of traffic, vehicle mix, distance between the roadway and the adjacent parcels and the topography. Traffic noise levels for the no-build and build alternatives have the potential to increase due to increased traffic volumes, additional roadway capacity (e.g., auxiliary lanes), geometric modifications (e.g., horizontal or vertical alignment shifts) and new roadways that move traffic closer to adjacent parcels. Information on estimated noise impacts is provided later in this section.
- Wetlands: Numerous small wetlands were identified within the project area from Sundowner Avenue to Louise Avenue and 41st Street to Highway 106. These wetlands were identified through map review (i.e., U.S. Geological Society (USGS) National Map, which includes the U.S. Fish and Wildlife Service (USFWS) National Wetlands Inventory), site visits, and correspondence with the U.S. Army Corps of Engineers (USACE). The USACE indicated that some jurisdictional wetlands are located within the project area.

  EO 11990, entitled Protection of Wetlands, requires federal agencies to take action to minimize the loss of wetlands. Activities disturbing jurisdictional wetlands require a permit from the U.S. Army Corps of Engineers (USACE). Two types of authorization are available from the USACE for activities regulated under Section 404 of the Clean Water Act. Depending on the type of project and potential impacts, either an individual 404 Permit or a Nationwide General permit would be issued by the USACE. Additional information on the projected level of wetland impacts is provided later in this section.

At the corridor study stage of project development the level of detail included in the build alternative designs would be characterized as conceptual / preliminary engineering. At this stage it can be somewhat difficult to accurately quantify certain environmental factors. For those factors a qualitative evaluation system has been developed, as described below:

- Minimal Impacts: Little or no impacts to the natural or built environments are anticipated for a particular build alternative. No mitigation measures would be required.

- Moderate Impacts: Noticeable impacts to the natural or built environments are anticipated for a particular build alternative. The level of mitigation for this category of impact is likely to be fairly simple (e.g., best management practices (BMPs), permits, wetland mitigation).
- Major Impacts: Significant impacts to the natural or built environments are anticipated for a particular build alternative. The level of mitigation for this category of impact is likely to be more complex (e.g., noise walls).

Described below are the unique composite alternatives introduced to address access and congestion issues in the area. Also included in each description are the anticipated impacts to the natural and built environments.

Composite 1, Composite 2 and Composite 8: Extension of 69th Street and/or 85th Street across I-29

These alternatives represent the range of combinations of extending the arterial routes of 69th Street and 85th Street across I-29 to connect Tallgrass Avenue with Sundowner Avenue, which establishes continuous arterial corridors across the southern limits of Sioux Falls. These alternatives also include northbound and southbound auxiliary lanes on I-29 and southbound auxiliary lanes on I-229. The alternatives represent an arterial network expansion and supplements the arterial projects already assumed in the 2033 No-build scenario, such as the Tallgrass Avenue-Solberg Avenue crossing and the 59th Street extension. An extended 69th Street and/or 85th Street, as four-lane divided roadways connecting Tallgrass Avenue to Sundowner Avenue with a grade-separated crossing of I-29, establish continuous corridors from west of the proposed West Side Corridor to east of the East Side Corridor.

The extension of 69th Street would require acquisition of one farm building and would require acquisition of approximately nine acres of additional right-of-way. The extension of 85th Street would directly impact two properties and would require acquisition of approximately five acres of additional right-of-way. With an on-grade 85th St underpass option there would be no complete residential property acquisitions. A new continuous four-lane arterial roadway in these corridors would result in significantly more traffic and traffic noise for these corridors. The anticipated traffic noise impacts outside of the proposed right-of-way along these arterials would be moderate with no mitigation measures expected. The proposed auxiliary lanes for I-29 provide additional traffic capacity and are slightly closer to adjacent properties. The anticipated traffic noise impacts along I-29 mainline would be moderate to major with a possibility that noise mitigation measures may be required north of I-229. The anticipated wetland impacts associated with the 69th Street corridor is projected to be minimal. For the 85th Street corridor, a moderate impact to wetlands is anticipated and wetland mitigation would be required.

Establishing 85th Street, 69th Street or both as continuous arterial corridors provides some relief to the 57th Street and Highway 106 corridors within the study area. The level of traffic removed from the 57th Street corridor is not sufficient to change the level of service within the corridor. The level of traffic diverted from the Highway 106 corridor results in the I-29/Highway 106 (Tea) interchange ramp terminal intersection operations improving, but not by one level of service or more. The range of alternatives for these composite concepts is displayed in Figure 49.

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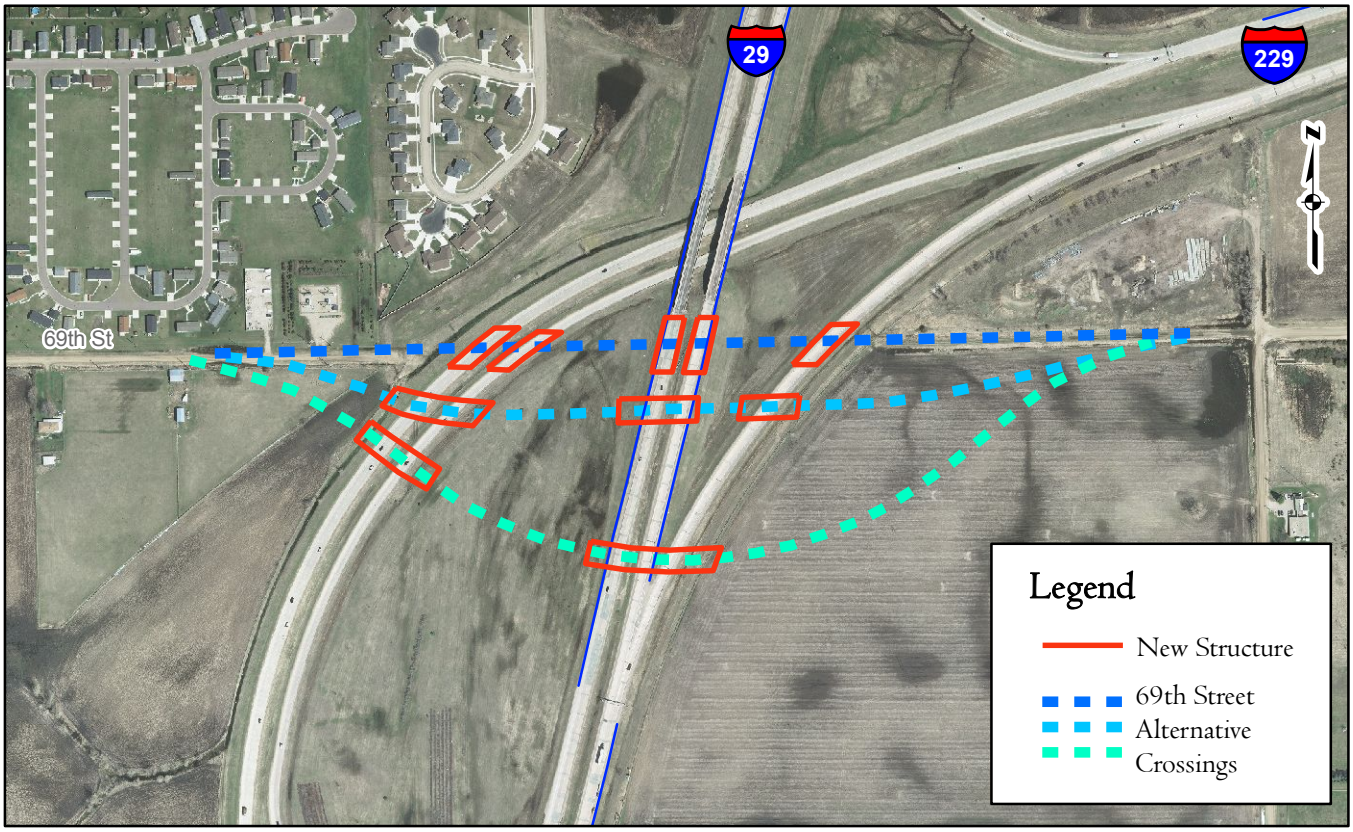

Figure 49. Composite 1 / 2 / 8 Alignments
Plan View

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Composite 3: I-29/85th Street Interchange and Southbound I-29 Ramp Braid

Composite 3 is built around a singe-point urban interchange (SPUI) and minor modification of the current trumpet interchange design that would include braiding the southbound on-ramp from I-229 to I-29 and the southbound I-29 off-ramp to 85th Street. Braiding the southbound I-29 off-ramp to 85th Street with the southbound I-229 to southbound I-29 on-ramp separates two high volume traffic movements and eliminates a weaving segment. The braided southbound ramp would be fed by two separate off-ramps, one from southbound I-29 and one from southbound I-229. Figure 50 illustrates Composite 3.

The following bullets summarize the design characteristics and issues associated with Composite 3:

- The off-ramps from southbound I-29 and southbound I-229 would each be a single lane, and would combine into a two-lane southbound collector ramp. The two lane collector ramp would allow the exiting I-29 and I-229 traffic adequate distance to weave into the appropriate lanes.
- For the I-29/I-229 System Interchange, the ramps from southbound I-229 to northbound I-29 and from southbound I-29 to northbound I-229 and the ramp connecting southbound I-229 to southbound I-29 would all be single lane ramps as they exit or enter the interstate.
- At the 85th Street interchange, the northbound off-ramp, the northbound on-ramp and the southbound on-ramp would all be single lane ramps as they exit or enter the interstate.
- The I-29 northbound off-ramp to northbound I-229 would include two lanes. On I-29 the auxiliary lane would end at the off-ramp while the middle lane would have the option of either exiting at this ramp or continuing northbound on I-29.
- To provide a standard ramp separation distance between the southbound I-29 to northbound I-229 ramp and the southbound I-29 to 85th Street off-ramp, the southbound I-29 to northbound I-229 ramp would need to be relocated to the north. The modification would provide 1,000 feet of separation between these two diverge points, consistent with AASHTO Geometric Design standards.
- I-29 auxiliary lanes in each direction from Highway 106 (Tea) to 41st Street and also for southbound I-229 from Louise Avenue to I-29 northbound.
- By 2033, the 85th Street ramp terminal intersection would be signalized and would have the following turn lane configurations:
  - The southbound off-ramp would have two left-turn lanes and one right-turn lane.
  - Westbound 85th Street at the ramps would have two left-turn lanes and a single right-turn lane.
  - Eastbound 85th Street at the ramps would have two left-turn lanes and a single right-turn lane.
  - The northbound off-ramp would have two left-turn lanes and a single right-turn lane.

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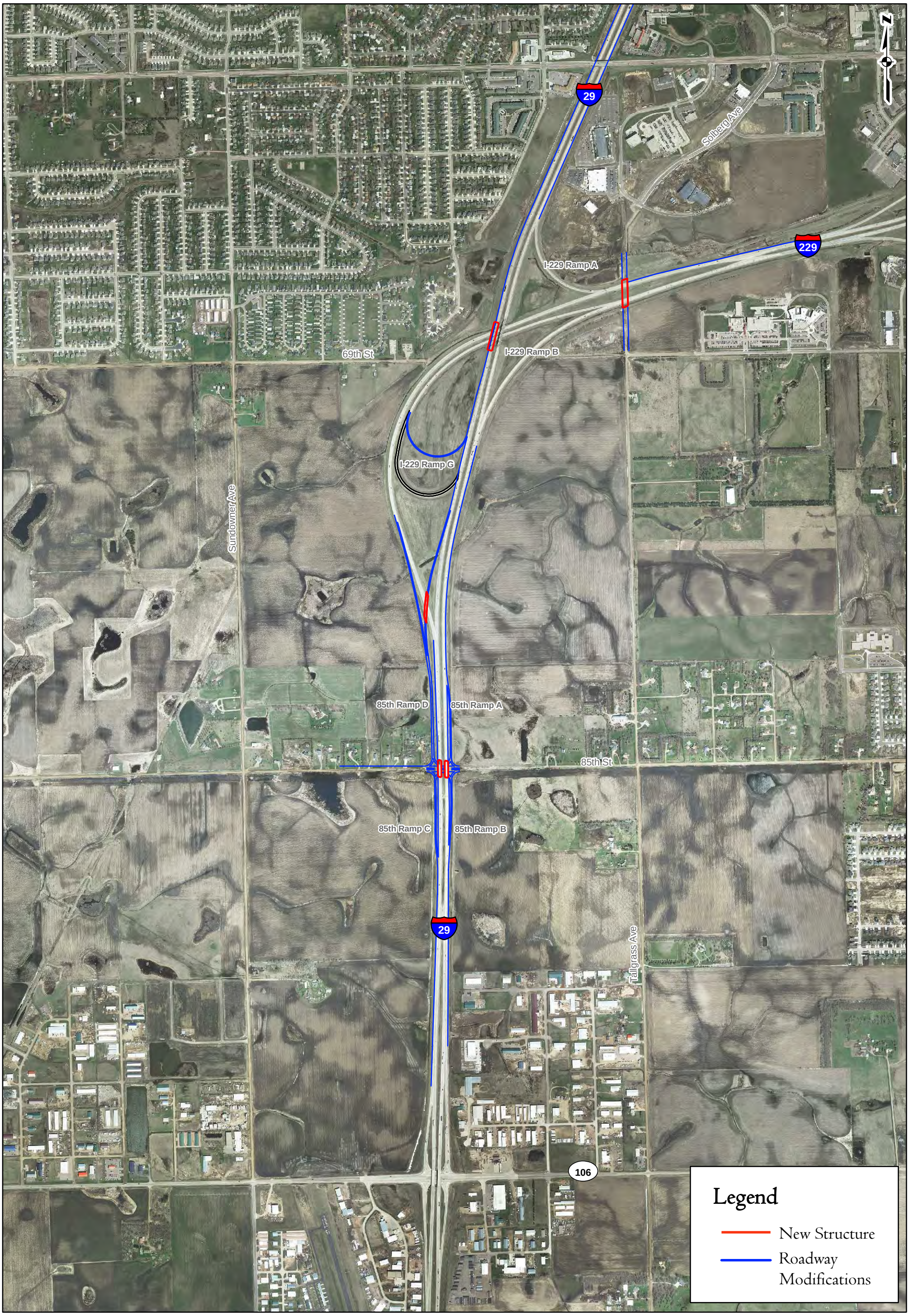

I-29 Corridor Study
41st Street to CR 106

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Figure 50. Composite 3 Plan View

- This alternative would require five (5) new bridges as listed below:
  - Two for I-29 to cross over 85th Street
  - One for the southbound I-29 to 85th Street off-ramp to cross over the southbound I-229 to southbound I-29 system ramp
  - One for the I-229/Solberg Avenue crossing
  - One for the reconstructed southbound I-29 bridge over I-229 that will accommodate the proposed auxiliary lane
- A portion of I-29 will be reconstructed / elevated to accommodate the single point urban interchange configuration.
- This alternative would eliminate southbound I-29 weave segment by moving the 85th Street southbound off-ramp to a point north of the southbound I-229 to southbound I-29 on-ramp.
- As with the other alternatives, it provides an acceptable separation distance between the merge point for the 85th Street northbound on-ramp and the diverge point for the northbound I-29 to northbound I-229 off-ramp, and would not have any interstate weave segments.
- This alternative directly impacts two to five properties and would require acquisition of approximately 10 acres of additional right-of-way adjacent to the interchange.
- This alternative would result in higher traffic noise along 85th Street (new interchange) and along I-29 (new auxiliary lanes). The anticipated level of noise impacts along 85th Street would be moderate with no mitigation measures expected. The anticipated traffic noise impacts along I-29 mainline would be moderate to major with a possibility that noise mitigation measures may be required north of I-229.
- For this alternative, a moderate impact to wetlands is anticipated and wetland mitigation would be required.

The traffic operations analysis indicates that Composite 3, as documented in the Section 4.1.2, would provide sufficient mainline traffic operations, and would not have any deficient traffic weaving sections. This concept would also provide improved traffic operations at the adjacent service interchanges I-29/Highway 106 (Tea) and I-229/Louise Avenue.

Composite 4: I-29/85th Street Interchange with Ramp Braid and I-29/I-229 Southbound Flyover

Composite 4 is very similar to Composite 3 with one exception. Instead of reconstructing the southbound I-29 to northbound I-229 loop ramp, a flyover ramp is provided for that movement. This design would allow for a much longer deceleration lane, compared to Composite 3, for the southbound I-29 to northbound I-229 movement. Compared to Composite 3, this concept would require three additional bridges for the flyover Ramp E, for a total of eight bridges. This composite also differs from Composite 3 with an auxiliary lane provided on northbound I-229. Composite 4 is shown in Figure 51.

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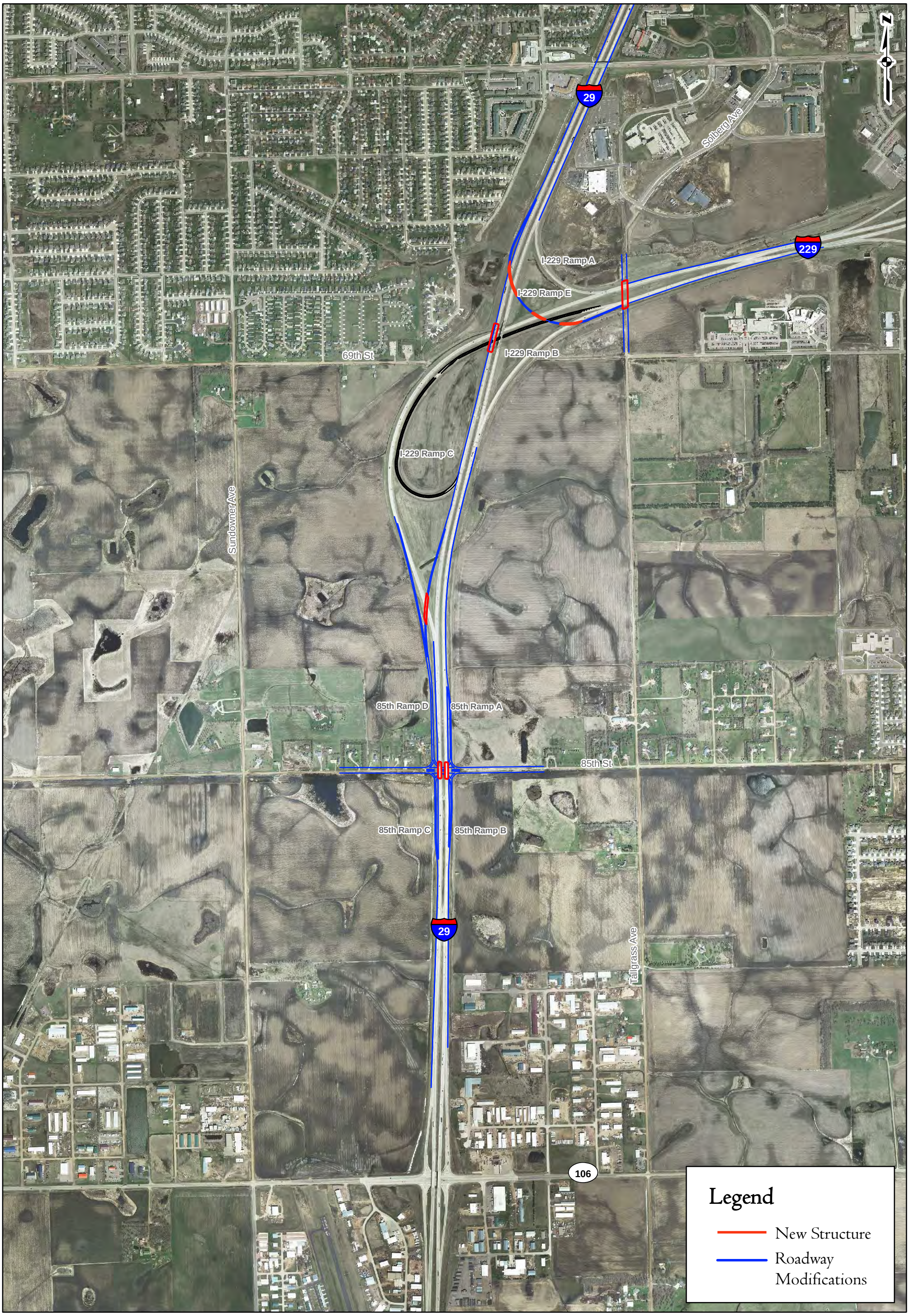

I-29 Corridor Study
41st Street to CR 106

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Figure 51: Composite 4 Plan View

The new flyover ramp moves traffic closer to the neighborhood to the northwest of the I-29/ I-229 interchange. The anticipated level of noise impacts would be moderate to major with a possibility that noise mitigation measures may be required north of I-229.

Composite 5, Composite 6 and Composite 7: I-29/I-229 System Interchange Alternatives

Of the range of study area alternatives, three were concepts that would result in reconfiguring the I-29/I-229 System Interchange and would move the southbound I-229 to southbound I-29 on-ramp further to the north to reduce/eliminate the southbound weaving section. These concepts have several elements in common:

- Each concept is designed to improve the separation of the southbound I-229 on-ramp from the proposed southbound 85th Street off-ramp or reorder the ramps.
- Each would include the addition of auxiliary lanes to the interstate to provide sufficient 2033 freeway capacity.

Each I-29/I-229 modification concept is described below.

Composite 5: I-29/I-229 Complete Interchange Reconstruction

Composite 5 includes reconfiguration and reconstruction of the I-29/I-229 System Interchange through providing higher design speed for both mainline interstate and for system interchange ramps. This alternative would:

- Replace the existing southbound I-229 to southbound I-29 ramp with a new directional ramp that could cross under I-29.
- Replace the existing southbound I-29 to northbound I-229 loop ramp with a directional ramp that could cross under I-29 and I-229. This ramp would form a right-hand entrance ramp on I-229, a shift from the current left-hand on-ramp. Coupled with the right-hand on-ramp is the addition of a northbound I-229 auxiliary lane from the southbound I-29 to northbound I-229 touchdown to the I-229 off-ramp to Louise Avenue.
- Eliminate the southbound I-29 weave (if an I-29/85th Street interchange is built) by re-ordering the ramps with the southbound off-ramp to 85th Street located between the two southbound I-29/I-229 System Interchange ramps. A slip ramp is provided off southbound I-229 to southbound I-29 to allow southbound I-229 vehicles access to the 85th Street interchange.
- While not a part of this composite concept, it would be able to accommodate any of the 69th Street crossing concepts developed (on-grade or either of the overpass alignments).
- This alternative would require nine (9) bridges, as listed below:
  - Two for I-29 to cross over 85th Street
  - Two for I-29 to go over Ramp E
  - Two for I-229 (Ramps B and C) to go over Ramp E
  - Two for I-29 to go over Ramp C
  - One for the I-229/Solberg Avenue crossing

- A portion of I-29 will be reconstructed / elevated to accommodate the single point urban interchange configuration.
- Require reconstruction of I-29 to accommodate the new I-29 underpasses for Ramp E and Ramp C.
- Require approximately 11 additional acres of right-of-way to accommodate the Interstate System and arterial street modifications. The 85th Street interchange would directly impact two to five properties.
- Require less right-of-way than the current interchange configuration. This alternative would allow approximately 30 to 35 acres of existing right-of-way to be used for something else, potentially redevelopment.
- This alternative would result in higher traffic noise along 85th Street (new interchange) and along I-29 (new auxiliary lanes). This alternative also includes alignment shifts (i.e., horizontal and vertical) for the mainline I-29 to accommodate the southbound I-29 to northbound I-229 underpass ramp. The anticipated level of noise impacts would be moderate to major with a possibility that noise mitigation measures may be required north of I-229.
- For this alternative, a moderate impact to wetlands is anticipated and wetland mitigation would be required.

Composite 5 resolves or substantially improves most of the traffic operations deficiencies observed through the system interchange and on the mainline segments, and would not have a deficient weaving segment.

Composite 5 is shown in Figure 52.

Composite 6: I-29/I-229 Major Interchange Modification – Directional Ramps

Composite 6 would modify the I-29/I-229 System Interchange by:

- Replacing the existing loop ramp connecting southbound I-29 to northbound I-229 with a directional ramp that would go under I-29 and I-229.
- Replacing the existing southbound I-29 to southbound I-229 underpass directional ramp with a flyover overpass.
- This alternative would require six (6) new bridges, as listed below:
  - One for 85th Street to cross over I-29
  - Two for I-29 to go over Ramp E
  - Two for Ramp C to go over Ramp E and I-29
  - One for the I-229/Solberg Avenue crossing
- Require reconstruction of I-29 to accommodate the new I-29 underpass for Ramp E and the flyover for Ramp C.

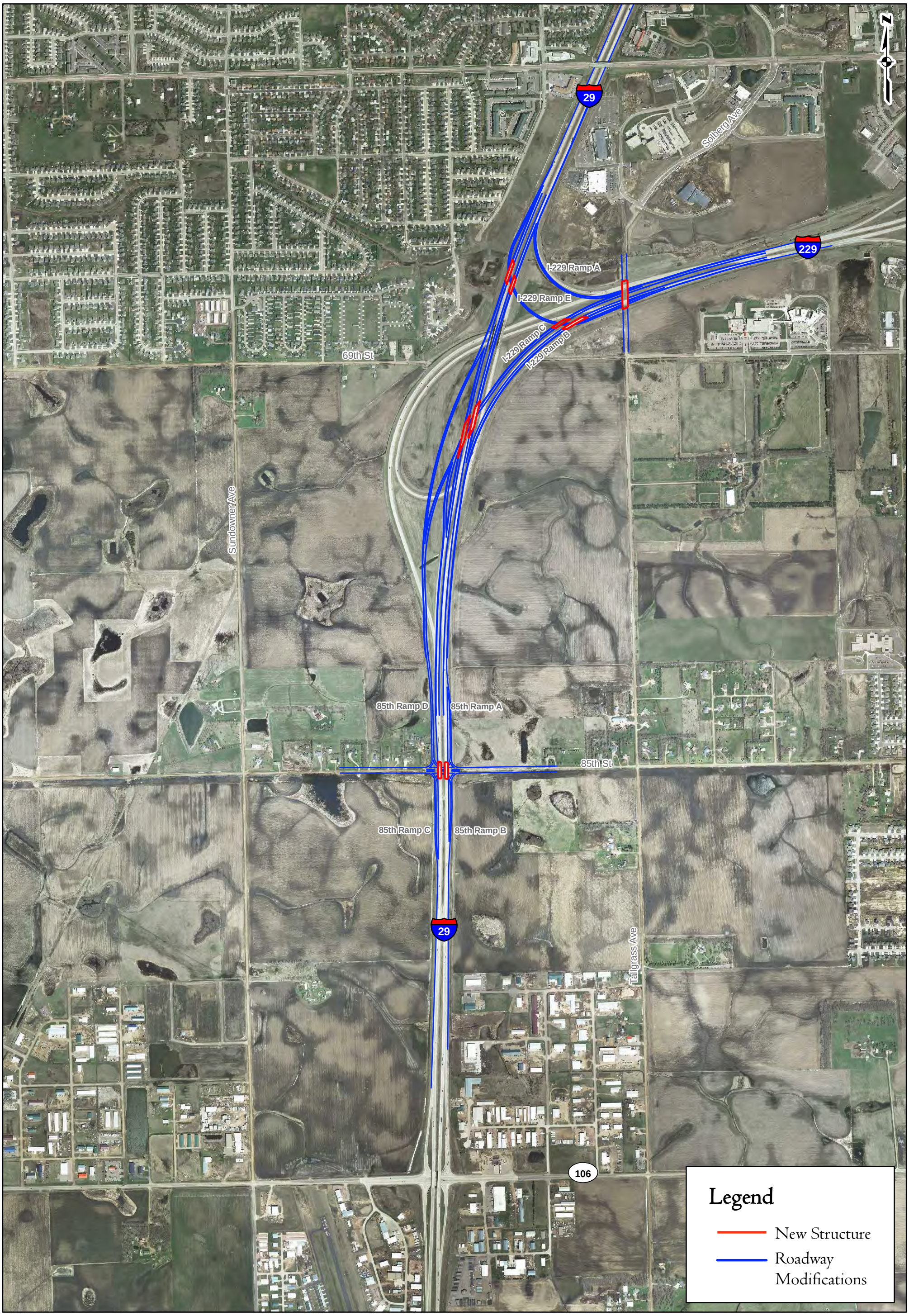

Figure 52: Composite 5 Plan View

- As the left-hand on-ramp configuration from southbound I-29 to northbound I-229 would be retained, a northbound I-229 auxiliary lane would not be required. Auxiliary lanes would be provided along both north and southbound I-29 from 41st Street through Highway 106 (Tea) and on southbound I-229 from Louise Avenue to the northbound I-29 off-ramp.
- Require approximately 22 acres to accommodate the Interstate System and arterial street modifications. The 85th Street interchange would directly impact five to nine properties.
- Require less right-of-way than the current interchange configuration. This alternative would allow approximately 45 to 50 acres of existing right-of-way to be used for something else, potentially redevelopment.
- Removing the current loop ramp would allow the southbound I-229 to southbound I-29 on-ramp be shortened so that the I-29 merge point would be approximately 2,500 feet north of the current merge point, establishing a weave section of 2,700 to 3,500 feet, depending on the I-29/85th Street interchange configuration.
- This alternative would result in higher traffic noise along 85th Street (new interchange) and along I-29 (new auxiliary lanes). A new flyover ramp for the southbound I-229 to southbound I-29 movement would be closer to the neighborhood to the northwest of the I-29/I-229 interchange. This alternative also includes alignment shifts (i.e., horizontal and vertical) for the mainline I-29 to accommodate the southbound I-29 to northbound I-229 underpass ramp. The anticipated level of noise impacts would be moderate to major with a possibility that noise mitigation measures may be required north of I-229.
- For this alternative, a moderate impact to wetlands is anticipated and wetland mitigation would be required.

Composite 6 resolves or substantially improves the traffic operations deficiencies observed through the system interchange and on the mainline segments. The segment operations along southbound I-29 between I-229 and the southbound off-ramp to 85th Street are improved as long as a folded diamond concept is used at the 85th Street interchange. The operations analysis indicates a reasonable level-of-service can be achieved with 2033 traffic. However, the folded-diamond configuration limits ramp roadway expansion options beyond those proposed in this document. In addition, while the folded diamond design for the 85th Street interchange provides for acceptable freeway operations, it creates a conflict between the City of Sioux Falls access control guidelines and allowing a full access signalized intersection along 85th Street immediately east and west of I-29, which is likely to be requested. Finally, the folded diamond design requires an additional traffic signal along the 85th Street corridor, relative to the single-point urban interchange. Composite 6 is shown in Figure 53.

Composite 7: I-29/I-229 Major Interchange Modification – Directional Ramps, Option 2

- Composite 7 is very similar to Composite 6 with one exception. This concept has a single-point urban (SPUI) design for the I-29/85th Street interchange. This modification reduces the available distance between the southbound I-229 to southbound I-29 on-ramp and the southbound off-ramp to 85th Street. That results in degraded traffic operations for the mainline segment due to

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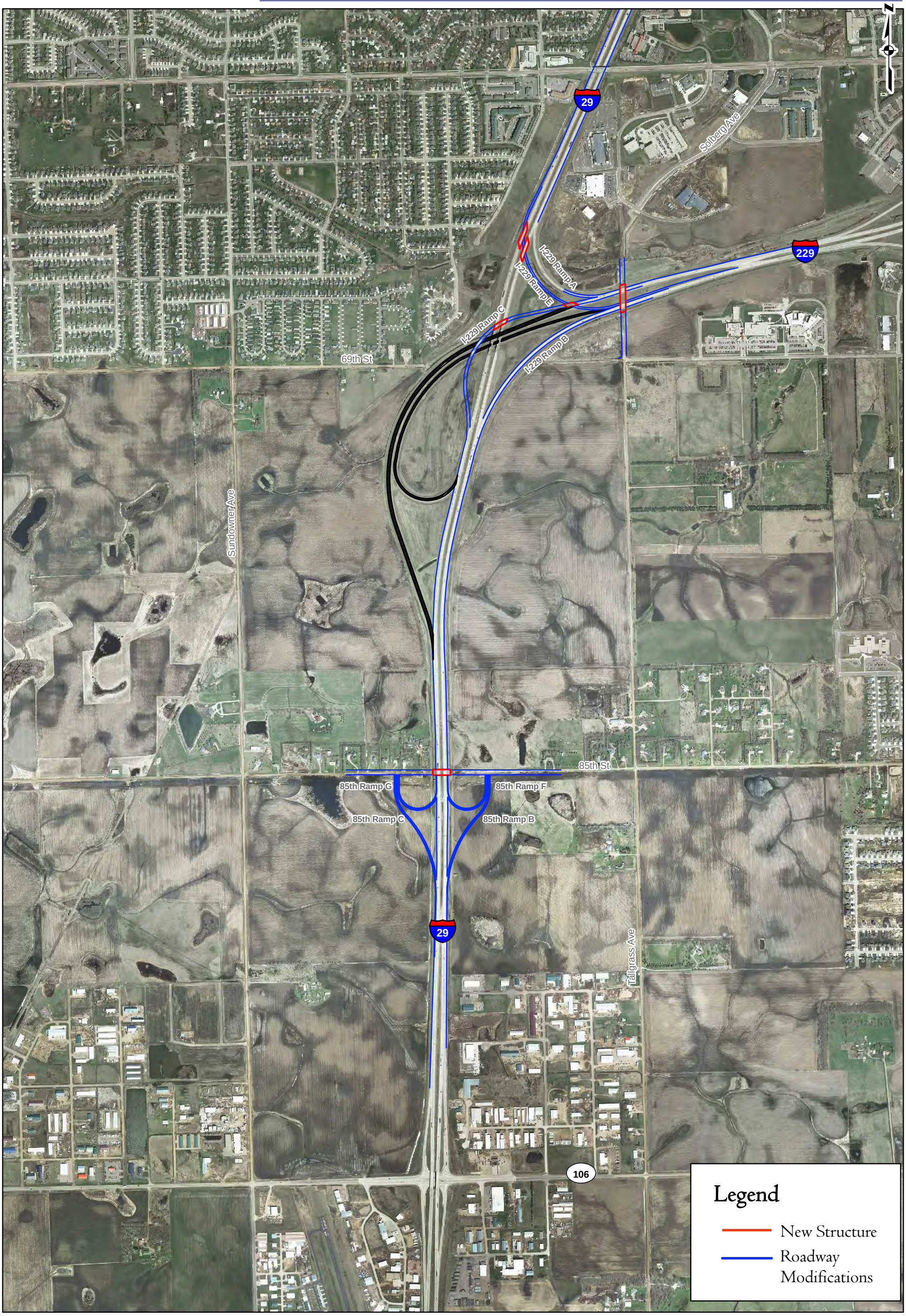

I-29 Corridor Study
41st Street to CR 106

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Figure 53: Composite 6 Plan View

the high volume of weaving maneuvers. This alternative would require seven (7) new bridges, as listed below:

- Two for I-29 over 85th Street.
- Two for I-29 to go over Ramp E.
- Two for Ramp C to go over Ramp E and I-29.
- One for the I-229/Solberg Avenue crossing.

The land use and environmental impacts associated with this alternative are provided below:

- Require approximately 11 additional acres of right-of-way to accommodate the Interstate System and arterial street modifications. The 85th Street interchange would directly impact two to five properties.
- Require less right-of-way than the current interchange configuration. This alternative would allow approximately 45 to 50 acres of existing right-of-way to be used for something else, potentially redevelopment.
- This alternative would result in higher traffic noise along 85th Street (new interchange) and along I-29 (new auxiliary lanes). A new flyover ramp for the southbound I-229 to southbound I-29 movement would be closer to the neighborhood to the northwest of the I-29/I-229 interchange. This alternative also includes alignment shifts (i.e., horizontal and vertical) for the mainline I-29 to accommodate the southbound I-29 to northbound I-229 underpass ramp. The anticipated level of noise impacts would be moderate to major with a possibility that noise mitigation measures may be required north of I-229.
- For this alternative, a moderate impact to wetlands is anticipated and wetland mitigation would be required.

Composite 7 is shown in Figure 54.

Composite 9: New I-29/85th Street Interchange and a 69th Street Crossing of I-29

This concept reflects a combination of Composite 1 (a 69th Street crossing of I-29) and one (1) of the I-29/I-229 System Interchange and I-29/85th Street interchange combinations included in Composite 3 through Composite 7. Similar to all of the previously described composites, auxiliary lanes would be added to the I-29 and I-229 mainlines to better accommodate merging traffic that mixes at the system interchange and service interchanges. In addition to new interchange ramps, mainline auxiliary lanes, and additional arterial lanes, the range of ideas incorporated into Composite 9 includes new bridges and replacement of existing bridges with wider bridges. Adding a 69th Street crossing of I-29 to any one of the new I-29/85th Street interchange composites (Composite 3 through Composite 7), results in the need to provide additional bridges to the initial composite. Listed below is the number of new bridges required to accommodate a 69th Street crossing:

- Composite 9A: Three (3) bridges (added to the five [5] associated with Composite 3).
- Composite 9B: Three (3) bridges (added to the eight [8] associated with Composite 4).

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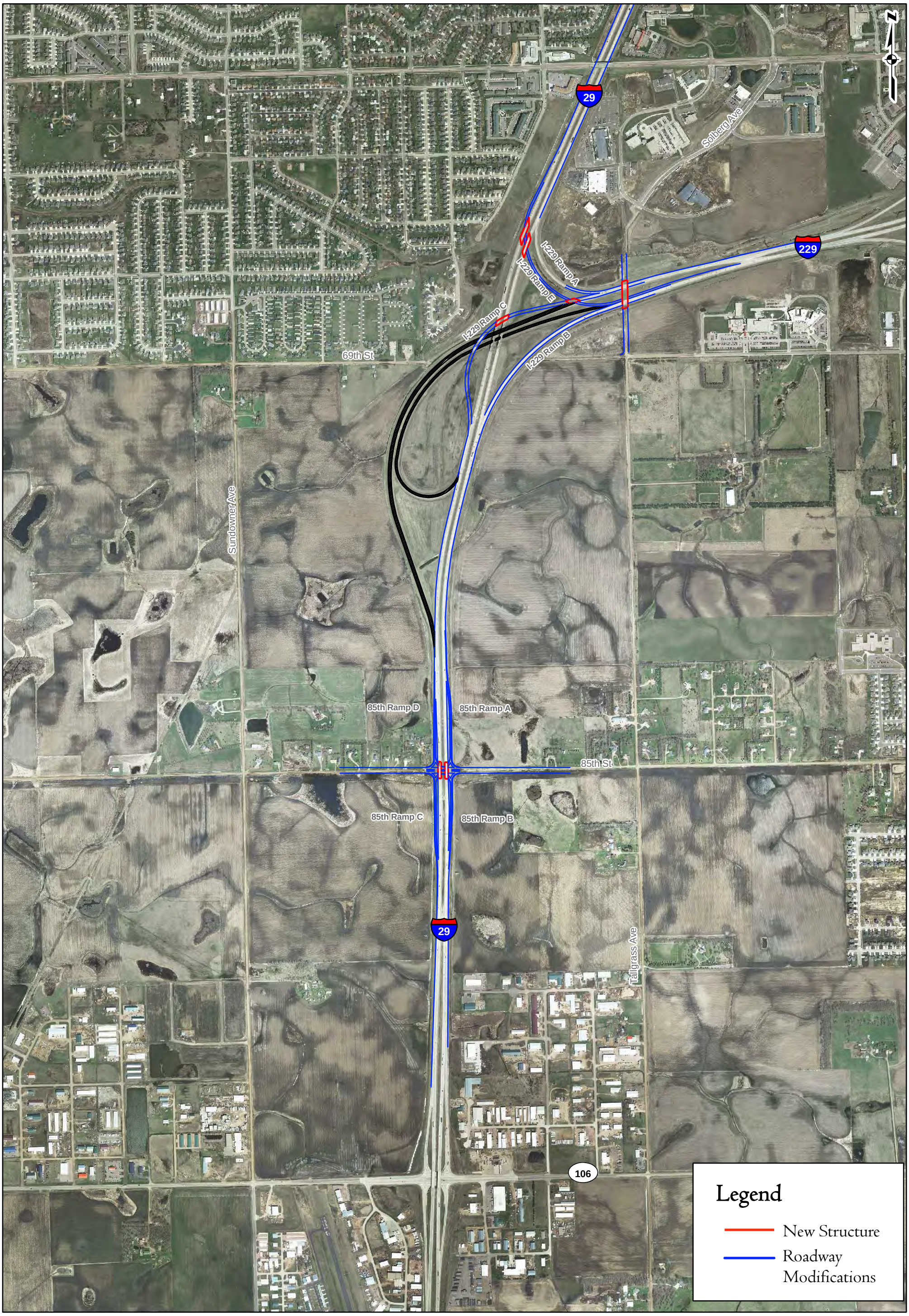

I-29 Corridor Study
41st Street to CR 106

URS

Figure 54: Composite 7 Plan View

- Composite 9C, Two (2) bridges if the 69th Street crossing is an overpass and five (5) bridges if an on-grade 69th Street crossing is provided (added to the nine [9] associated with Composite 5).
- Composite 9D: Three (3) bridges (added to the six [6] associated with Composite 6)
- Composite 9E: Three (3) bridges (added to the seven [7] bridges associated with Composite 7).

Adding both the service interchange at I-29/85th Street and the 69th Street crossing outlined in Composite 9 has similar effects on study area arterial intersection and interstate route traffic operations as adding only the I-29/85th Street interchange of Composite 3 through Composite 7. Including the 69th Street crossing has an added effect of improving traffic operations along the 57th Street corridor by diverting traffic from 57th Street to the 69th Street corridor. While the level of diversion is not sufficient to improve intersection traffic operations in the 57th Street corridor by a level-of-service grade, the queue lengths and potential for queues to spill back into upstream intersections is reduced.

4.1.2 Build Condition Composite Alternatives Traffic Operation Results

Peak hour (AM and PM) 2033 traffic operations associated with each of the composites are documented in Figure 55 through Figure 65. The traffic operations analysis results for the composite concepts demonstrate that the range of alternatives:

- Provide several alternatives that would maintain LOS C or better operations and improve mainline traffic operations relative to the 2033 No-build scenario for all of the basic freeway segments along I-29 and I-229.
- Provide several alternatives that would support the local goal of providing additional regional access to the development area adjacent to I-29 and I-229 and allow for acceptable traffic operations on the Interstate System.
- Substantially reduce the number of interstate ramp junction locations throughout the study area where in the 2033 No-build scenario operations AM and/or PM peak hour traffic operations were LOS D or worse operations (Auxiliary lanes are included in the range of action alternatives and are forecasted to improve operations, however, LOS D operations would still occur at several of the junctions at I-29/I-229, I-29/41st Street, I-229/Louise Avenue and at I-29/Highway 106). For Composites 6 and 7 the ramp junctions at I-29/85th Street are also projected to operate at LOS D. LOS D or worse operations would occur in at most one of the daily peak hours. For Composite 7 the southbound I-29 mainline weaving segment between I-229 and 85th Street is projected to operate at LOS E/F during the PM peak.
- Provide a minimum of at least one alternative for access at I-29/85th Street that would allow an additional full-access intersection on 85th Street both east and west of I-29 between Tallgrass Avenue and Sundowner Avenue.
- Provide a number of alternatives that provide interstate crossings, reducing the current impact of I-29 and I-229 as a barrier to continuous arterial corridors.

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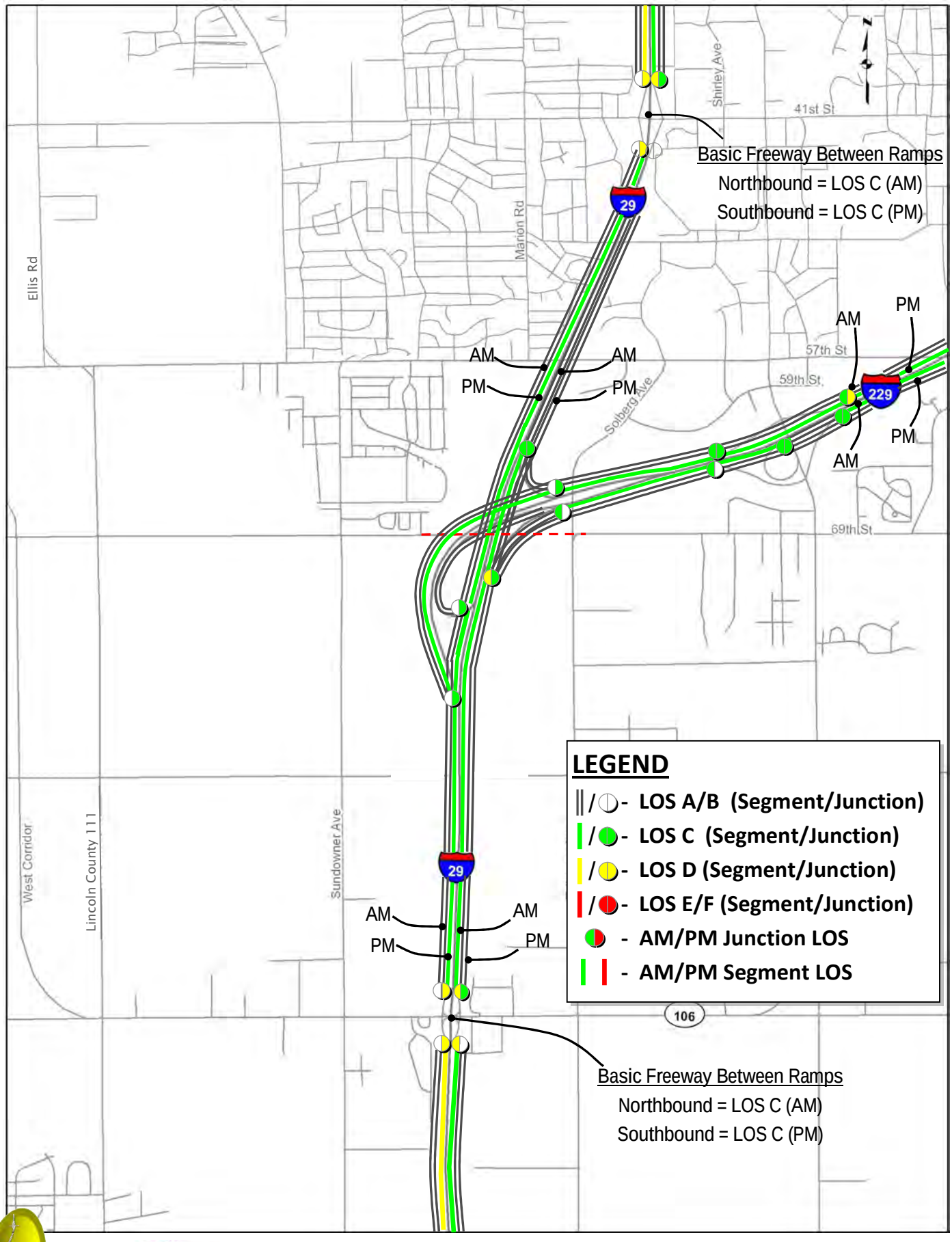

I-29 Corridor Study
41st Street to CR 106

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Figure 55. 2033 Build Composite I Interstate System Level of Service Summary

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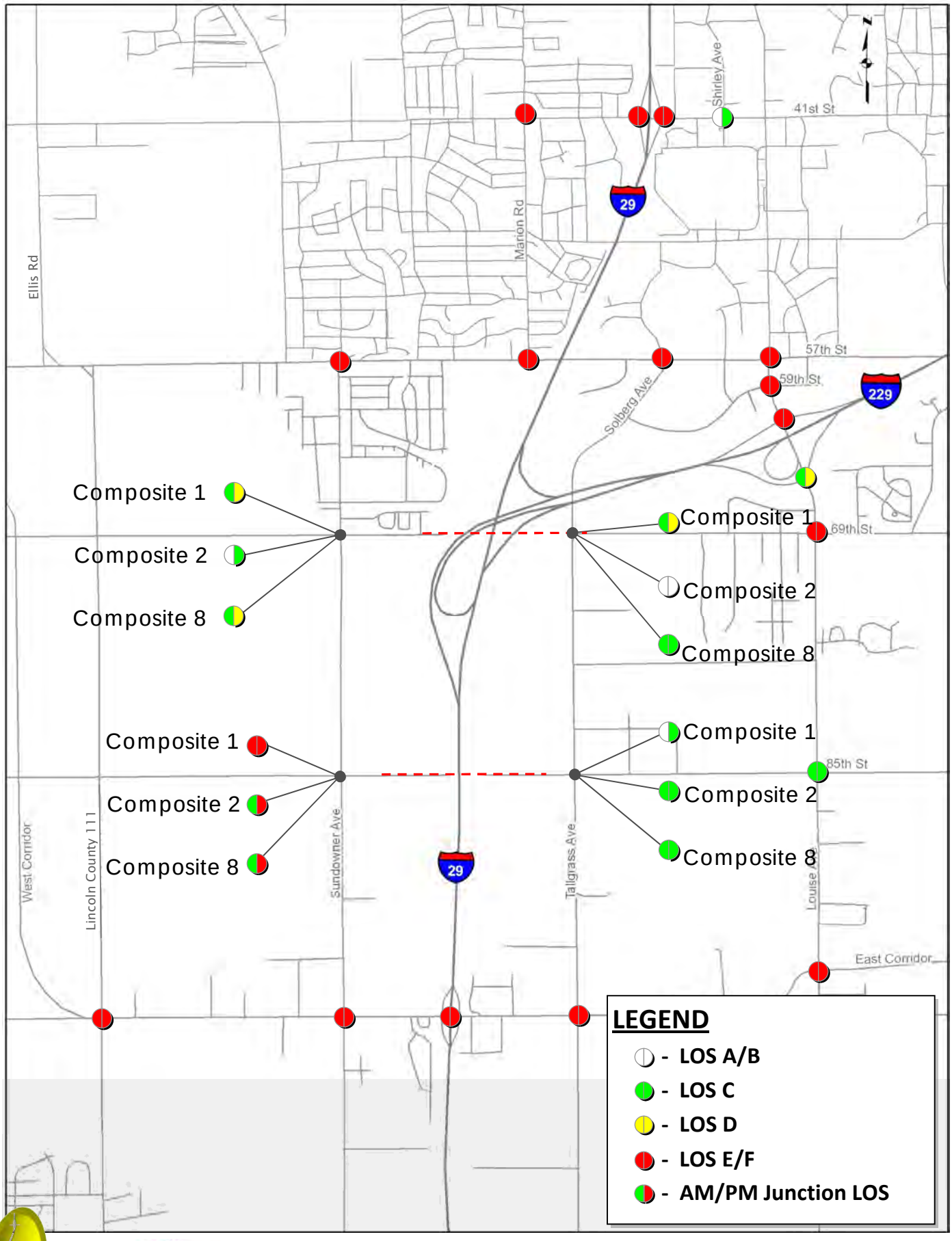

Figure 56. 2033 Build Composite 1/Composite 2/Composite 8 Intersection Traffic Operations Summary

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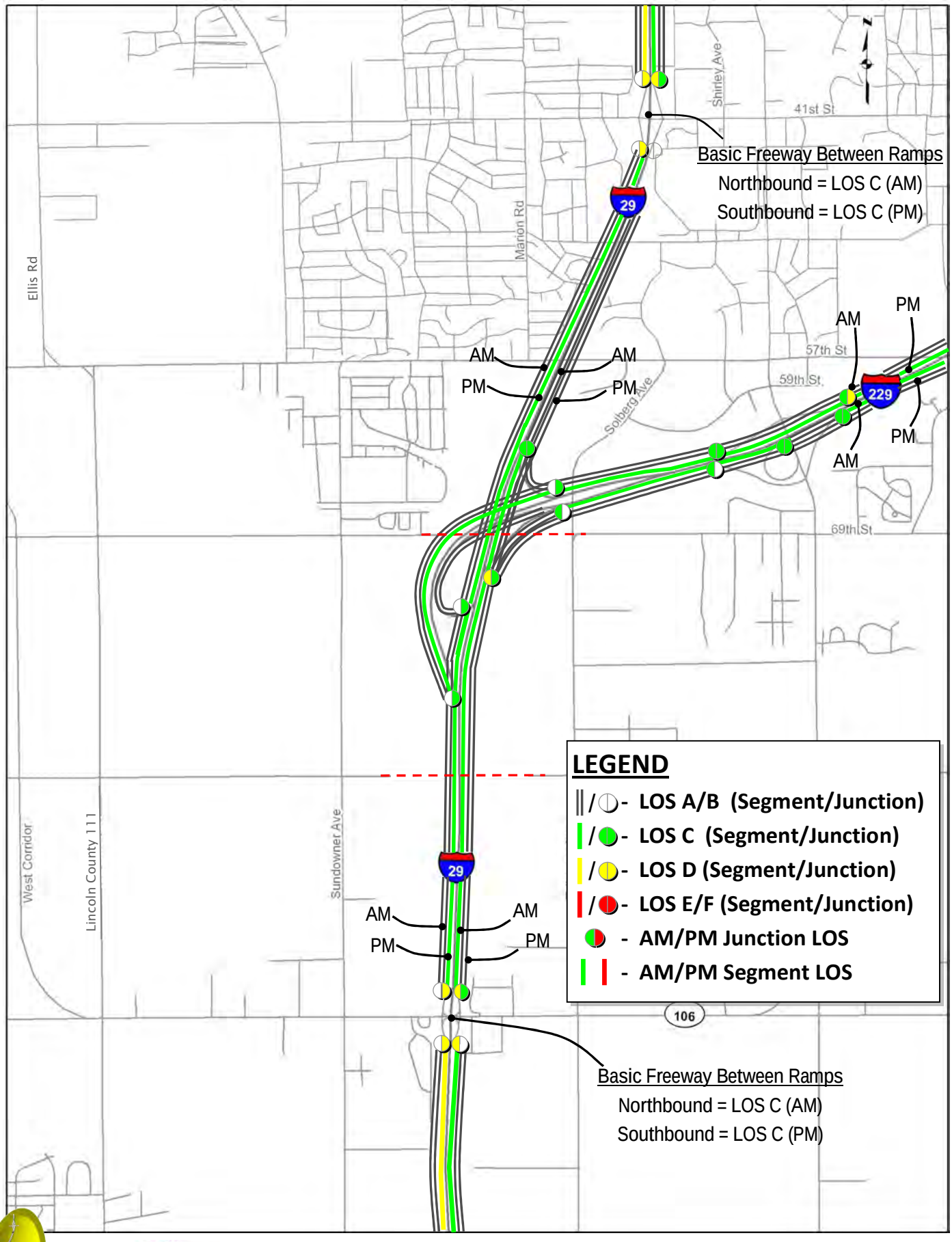

Figure 57. 2033 Build Composite 2/Composite 8 Interstate System Level of Service Summary

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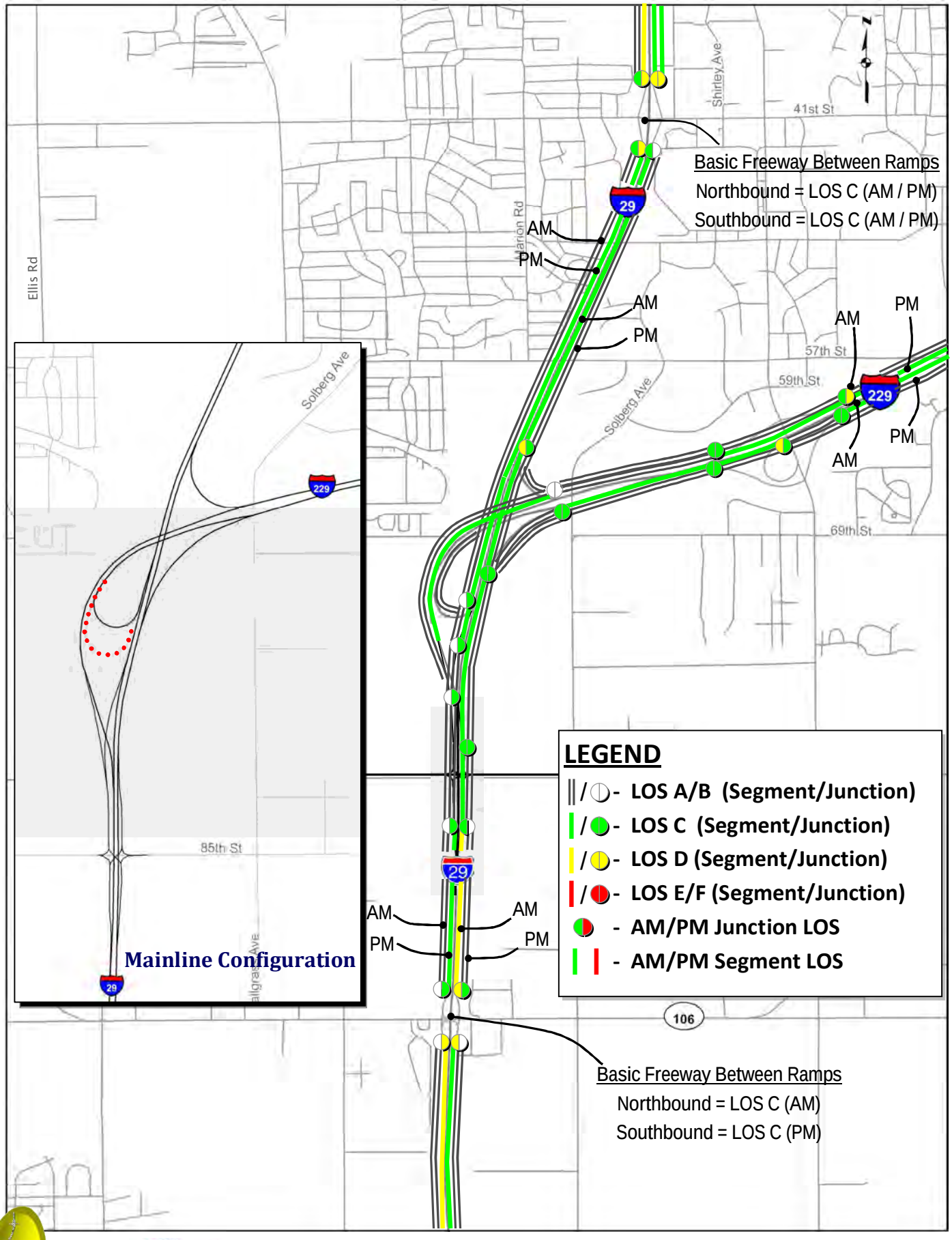

I-29 Corridor Study
41st Street to CR 106

Figure 58. 2033 Build Composite 3 Interstate System Level of Service Summary

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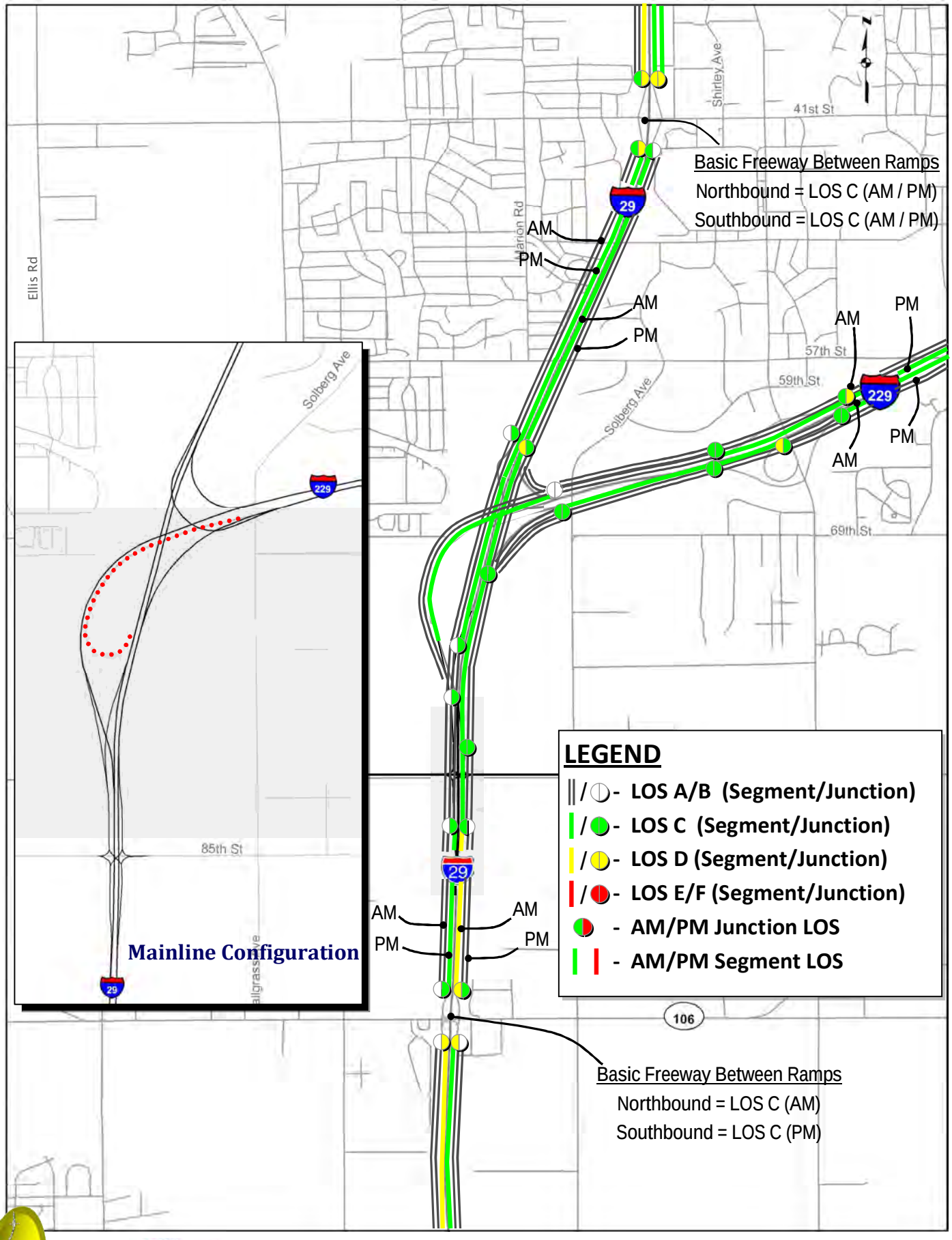

I-29 Corridor Study
41st Street to CR 106

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Figure 59. 2033 Build Composite 4 Interstate System Level of Service Summary

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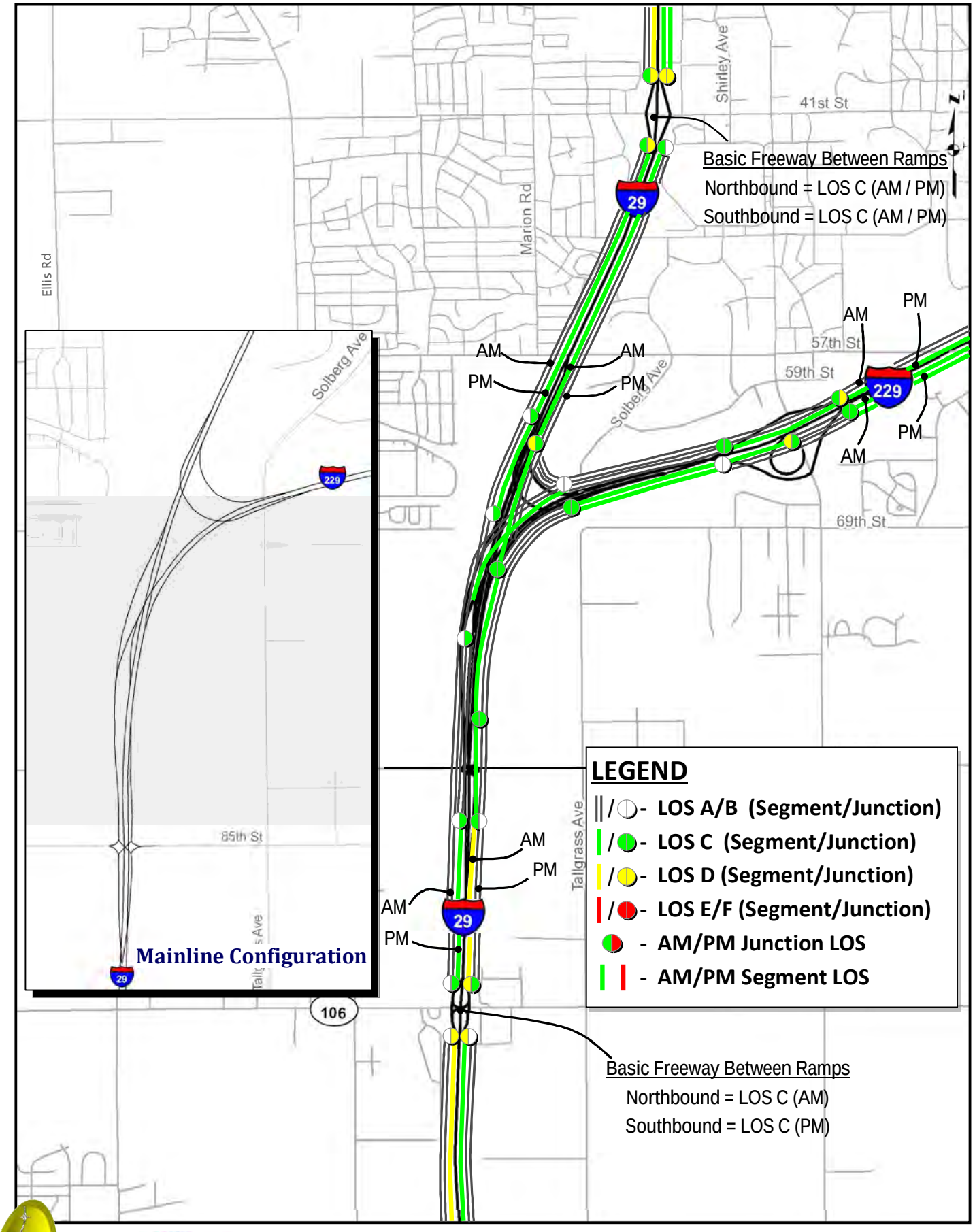

I-25 Corridor Study
41st Street to CR 106

Figure 60. 2033 Build Composite 5 – Interstate System Level of Service Summary

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I-29 Corridor Study
41st Street to CR 106

Figure 61. 2033 Build Composite 6 Interstate Level of Service Summary

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Figure 62. 2033 Build Composite 7 Interstate Level of Service Summary

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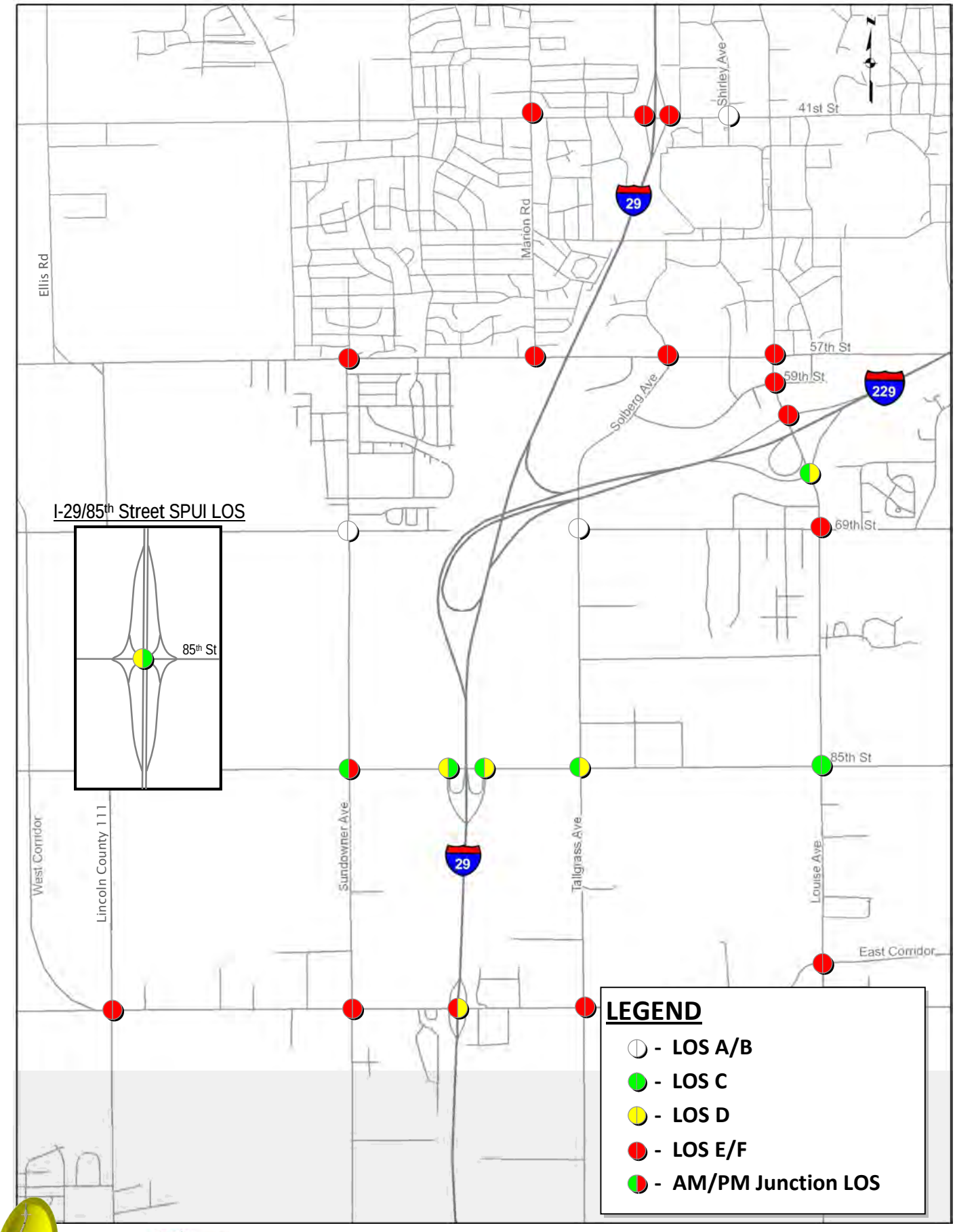

I-29 Corridor Study
41st Street to CR 106

Figure 63. 2033 Build Composite 3 through Composite 7 Arterial System Level of Service Summary

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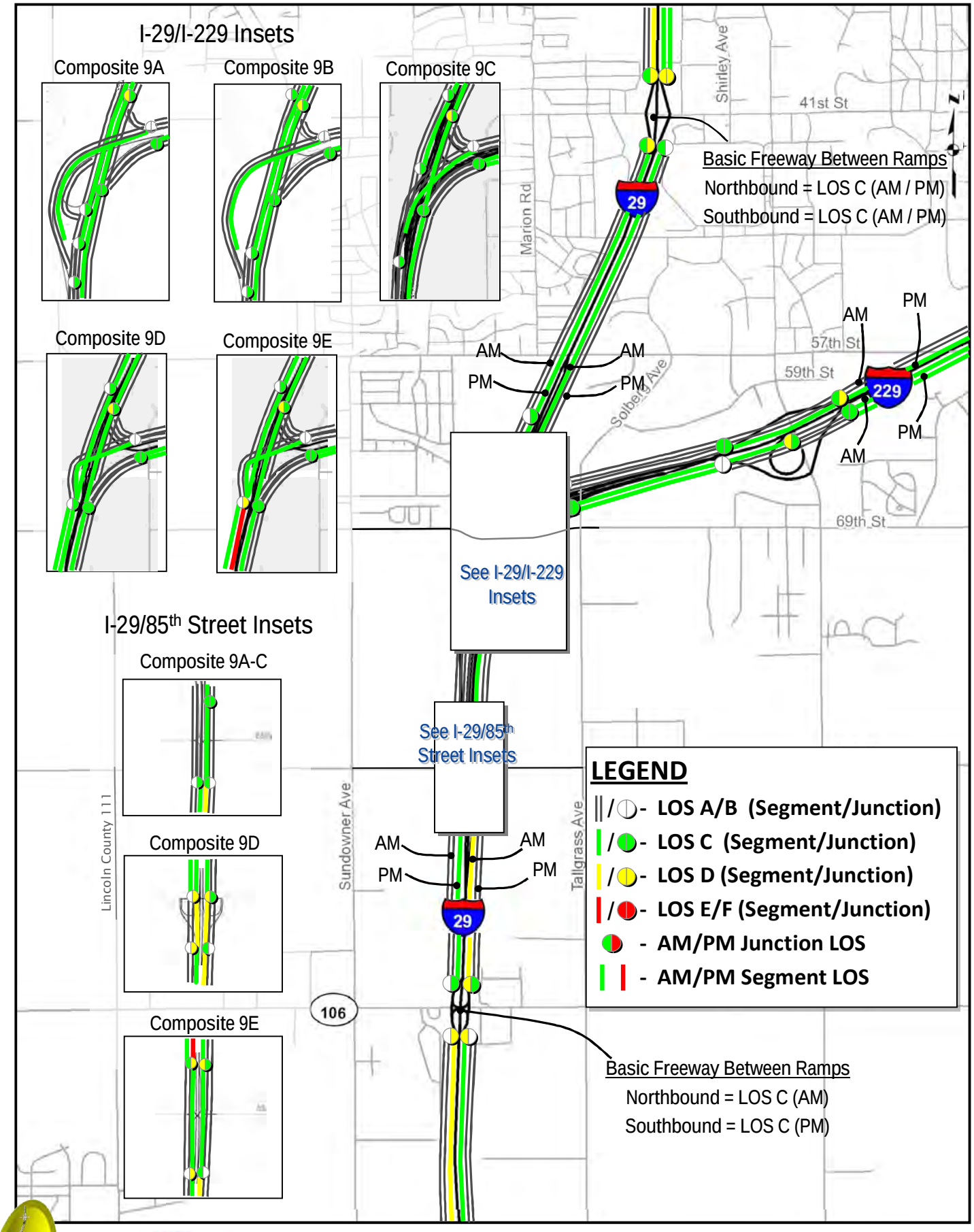

I-29 Corridor Study
41st Street to CR 106

Figure 64. 2033 Build Composite 9 Interstate System Level of Service Summary

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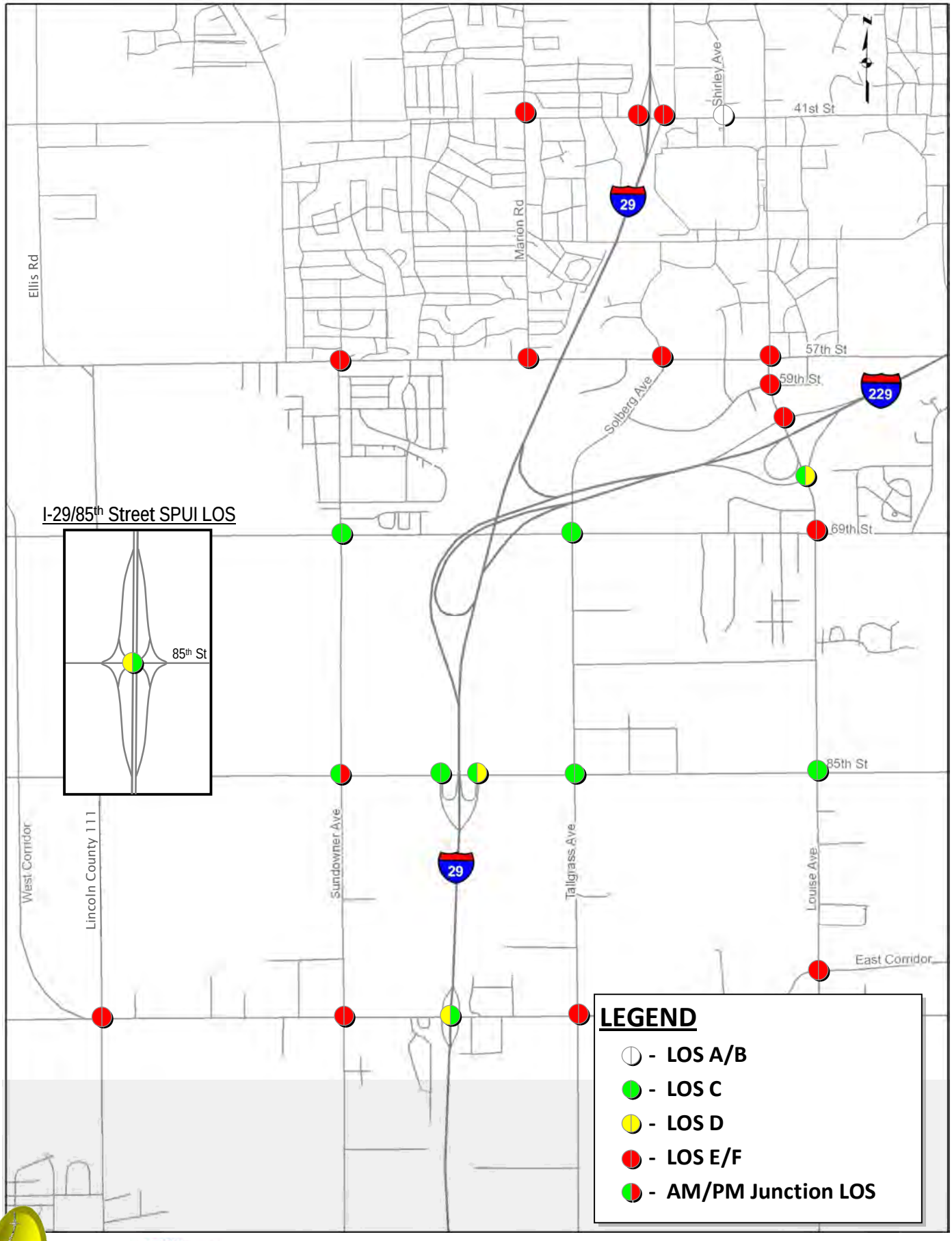

I-29 Corridor Study
41st Street to CR 106

Figure 65. 2033 Build Composite 9 Arterial System Level of Service Summary

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A summary of the assessment of each composite is provided in Table 8. In that table the composites are evaluated with respect to property impacts, conformity with design standards, social and environmental impacts, traffic operations, and preliminary cost estimates. Through a review of the operations results of the No-build scenario and the range of Build "composite" alternatives, the following are concluded:

- The level of traffic getting to the regional system (Interstate System) in the AM and PM peak hours in the No-build scenario condition is substantially lower than in the range of Build alternatives. As many of the trips to/from the study area would logically use the Interstate System for a portion of their trip the limited number of access points to the interstate results in significant overloading of Louise Avenue, 41st Street, and Highway 106 and their Interstate interchanges. In the 2033 No-build condition the terminal ramp intersections and junctions with the interstate mainline adjacent to each of the listed routes reflect LOS E/F traffic operations for the AM and/or PM peak hours, with the exception of the south terminal of I-229/Louise Avenue.
- In the 2033 No-build scenario conditions, I-29 and I-229 through the vast majority of the study area are forecasted to operate at LOS D or worse in either the AM and/or PM peak periods.
- Adding I-29 crossings to the network at 69th Street and/or 85th Street (Composite 1, Composite 2, and Composite 8) improves the immediate study area accessibility for developments in the study area relative to the No-build scenario. However, additional interstate crossings alone do not address regional system access bottlenecks present with the No-build scenario. Adding the 69th Street and the 85th Street crossings improves the connectivity within the immediate subarea, which helps to distribute trips as they load onto the network. However, the interstate crossings provide little benefit to the roadway system outside the immediate study area as the bottlenecks to/from the regional system have not been addressed.
- Adding auxiliary lanes to I-29 from the Highway 106 (Tea) interchange (Exit 73) to the 41st Street interchange (Exit 77) results in adequate mainline operations in all of the composite conditions. Thus, including auxiliary lanes is a high priority element of any of the alternatives.
- In order to maintain reasonable traffic operations, braiding the southbound off-ramp to 85th Street with the southbound I-229 on-ramp to I-29 is likely required within the first few years of opening an interchange at I-29/85th Street. The braided ramps eliminate the I-29 southbound weaving issues by moving the 85th Street southbound off-ramp to a point north of the southbound I-229 to southbound I-29 on-ramp. While the ramp braid adds to the improvement cost, delaying some elements until more development is in place is not logical from an economic point of view; the ramp braid should be added with the I-29/85th Street interchange. Thus, some modification will be required to the system interchange at the time of I-29/85th Street interchange construction.
- All of the Build alternatives substantially reduce the number of interstate ramp junction locations where in the 2033 No-build scenario operations for the AM and/or PM peak hour were LOS D or worse. As auxiliary lanes are included in the range of modified system interchange alternatives, operations are forecasted to improve. However, LOS D operations

would still occur at several of the junctions at I-29/I-229, I-29/41st Street, I-229/Louise Avenue and at I-29/Highway 106 (Tea). At these locations LOS D or worse operations would occur in at most one of the daily peak hours.

- Adding an interchange at I-29/85th Street distributes enough of the subarea traffic away from the I-29/Highway 106 (Tea) interchange to allow the operations at the ramp terminal intersection to improve one to two level-of-service grades compared to 2033 No-build scenario.
- Adding an interchange at I-29/85th Street and an I-29 crossing at 69th Street (Composite 9) distributes enough traffic away from the I-29/Highway 106 (Tea) interchange to allow the ramp terminal intersection to operation one to two level-of-service grades better than in the 2033 No-build scenario. This composite also diverts additional traffic from the 57th Street corridor compared to the 2033 No-build scenario.

TABLE 8. SUMMARY OF I-29 CORRIDOR COMPOSITE ALTERNATIVES ASSESSMENT

ALTERNATIVE	PERFORMANCE MEASURE				
	PROPERTY IMPACTS	CONFORMITY WITH DESIGN STANDARDS	SOCIAL AND ENVIRONMENTAL IMPACTS	TRAFFIC OPERATIONS	COST BY ELEMENT (2008 DOLLARS)*
Composite 1	No residential building acquisitions required. One farm building would be acquired. Acquired Right-of-Way total of approximately 10 acres: • Approximately 9 acres to widen / extend 69th Street and overpass. • Approximately 1 acre total acquired to accommodate fill for Solberg overpass. Retaining walls would eliminate ROW acquisition (retaining wall option more expensive).	Conforms with all design standards. 5 New/reconstructed bridge structures with 69th St overpass. 6 New/reconstructed bridge structures with 69th St on-grade underpass.	Increased arterial traffic will have moderate noise impacts for adjacent residences along 69th Street, no mitigation measures are anticipated. I-29 noise levels adjacent to residential developments are expected to increase and result in moderate to major impacts, mitigation measures are possible. 69th Street – Fill impacts to wetlands is minimal / moderate along this corridor. Any impacted wetlands will be mitigated. Solberg Avenue – Fill impacts to wetlands is moderate and mitigation will be required. Replacing fill with retaining wall reduces wetland impact to small amount, but adds to cost. I-29 and I-229 Auxiliary Lanes – Fill impacts to wetlands is moderate along these corridors and mitigation will be required for each composite.	Does not meet the study goal of providing improved regional access to the Interstate. Concept provides LOS "D" along two segments: • PM peak hour southbound I-29 through system interchange • AM peak hour northbound I-29 between Tea and I-229 interchanges. All other interstate mainline segments provide LOS "C" traffic operations through 2033.	**Solberg-Tallgrass Avenue Overpass:** $7.5 million **69th Street Overpass:** $19 million **I-229 Mainline:** $0.8 million **I-29 Mainline:** $7.5 million **TOTAL: $34.8 million** **Alternative** **69th Street On-grade Underpass:** $22 million **Alternate Total: $37.8 million**
Composite 2	Two residential property acquisitions required. With an on-grade 85th St underpass option there would be no residential property acquisitions. Acquired Right-of-Way total of approximately 6 acres: • Approximately 5 acres to widen / extend 85th Street between Sundowner and Tallgrass. • Approximately 1 acre total acquired to accommodate fill for Solberg overpass. Retaining walls would eliminate ROW acquisition (retaining wall option more expensive).	Conforms with all design standards. 3 New/reconstructed bridge structures with 85th St overpass. 4 New/ reconstructed bridge structures with 85th St on-grade underpass.	Increased arterial traffic will have moderate noise impacts for adjacent residences along 85th Street, no mitigation measures are anticipated. I-29 noise levels adjacent to residential developments are expected to increase and result in moderate to major impacts, mitigation measures are possible. 85th Street – Fill impacts to wetlands is moderate along this corridor and wetland mitigation will be required. Solberg Avenue – Fill impacts to wetlands is moderate and mitigation will be required. Replacing fill with retaining wall reduces wetland impact to small amount, but adds to cost.	Does not meet the study goal of providing improved regional access to the Interstate. Concept provides LOS "D" along two segments: • PM peak hour southbound I-29 through system interchange • AM peak hour northbound I-29 between Tea and I-229 interchanges. All other interstate mainline segments provide LOS "C" traffic operations through 2033.	**Solberg-Tallgrass Avenue Overpass:** $7.5 million **85th Street Overpass:** $8.5 million **I-229 Mainline:** $0.8 million **I-29 Mainline:** $7.5 million **TOTAL: $24.3 million**

* Planning level cost estimates in 2008 dollars based upon conceptual designs. Actual costs at time of construction will vary due to inflation and specific project deliverables.

Table 8. (continued) Summary of I-29 Corridor Composite Alternatives Assessment

Alternative	Performance Measure				
	Property Impacts	Conformity with Design Standards	Social and Environmental Impacts	Traffic Operations	Cost by Element (2008 Dollars)*
Composite 3	Acquisition of 2 to 5 residences along 85th Street west of I-29 required, depending on implementation of access policy. Acquired Right-of-Way total of approximately 10 acres: • Approximately 5 acres to widen 85th Street between Sundowner and Tallgrass and provide I-29 overpass. • Approximately 3 acres west of I-29 and north of 85th Street adjacent to 85th Street Ramp D. • Approximately 1 acre total acquired adjacent to 85th / I-29 due to I-229 Ramps A, B and C. • Approximately 1 acre total acquired to accommodate fill for Solberg overpass. Retaining walls would eliminate ROW acquisition (retaining wall option more expensive).	Meets all design criteria. Two ramps are approaching applicable criteria: • I-229 Ramp G: Superelevation of 6% - at criteria maximum (matches existing). • 85th Street Ramp D: Grade = 5% – meets criteria but is approaching maximum of 6% . 5 New/replacement bridge structures.	Interstate mainline - Minor impacts due to increasing the footprint and raising the mainline. Increased arterial traffic will have moderate noise impacts for adjacent residences along 85th Street, no mitigation measures are anticipated. I-29 noise levels adjacent to residential developments are expected to increase and result in moderate to major impacts, mitigation measures are possible. Solberg Avenue – Fill impacts to wetlands is moderate and mitigation will be required. Replacing fill with retaining wall reduces wetland impact to small amount, but adds to cost. 85th Street – Fill impacts to wetlands is moderate along this corridor and wetland mitigation will be required.	85th Street Ramp D eliminates SB I-229 to 85th Street weave. LOS “D” along two segments: • PM peak hour southbound I-29 through system interchange. • AM peak hour northbound I-29 between Tea and 85th Street interchanges. All other interstate mainline segments provide LOS “C” traffic operations through 2033. Minor traffic operations improvements at arterial intersections over No-build.	**Solberg-Tallgrass Avenue Overpass:** $7.5 million **System Interchange:** $0.5 million **I-229 Mainline:** $0.8 million **I-29 Mainline:** $17.5 million **I-29/85th Street Interchange:** $23.5 million **TOTAL: $49.8 million**
Composite 4	Acquisition of 2 to 5 residences along 85th Street west of I-29 required, depending on implementation of access policy. Acquired Right-of-Way total of approximately 11 acres: • Approximately 5 acres to widen / extend 85th Street between Sundowner and Tallgrass. • Approximately 3 acres west of I-29 and north of 85th Street adjacent to 85th Street Ramp D. • Approximately 1 acre total acquired adjacent to 85th / I-29 due to I-229 Ramps A, B and C. • Approximately 1 acre acquired west of I-29 and north of 69th Street due to I-229 Ramp E. • Approximately 1 acre total acquired to accommodate fill for Solberg overpass. Retaining walls would eliminate ROW acquisition (retaining wall option more expensive).	Meets all design criteria. One ramp is approaching applicable criteria: • I-229 Ramp E: Superelevation of 6% - at criteria maximum. 8 New/replacement bridge structures – Ramp E includes 2 longer curved bridges.	Interstate mainline - Minor impacts due to increasing the footprint and raising the mainline. Increased arterial traffic will have moderate noise impacts for adjacent residences along 85th Street, no mitigation measures are anticipated. Ramp E is approximately 50’ closer to the subdivision northwest of I-29/I-229. I-29 noise levels adjacent to residential developments are expected to increase and result in moderate to major impacts, mitigation measures are possible. Solberg Avenue – Fill impacts to wetlands is moderate and mitigation will be required. Replacing fill with retaining wall reduces wetland impact to small amount, but adds to cost. 85th Street – Fill impacts to wetlands is moderate along this corridor and wetland mitigation will be required.	85th Street Ramp D eliminates SB I-229 to 85th Street weave. LOS “D” in one segment: AM peak hour northbound I-29 between Tea and 85th Street interchanges. All other interstate mainline segments - LOS “C” or better through 2033. Higher speed operations on system interchange ramp E relative to current conditions with loop ramp.	**Solberg-Tallgrass Avenue Overpass:** $7.5 million **System Interchange:** $14 million **I-229 Mainline:** $1.5 million **I-29 Mainline:** $17.5 million **I-29/85th Street Interchange:** $23.5 million **TOTAL: $64 million**

* Planning level cost estimates in 2008 dollars based upon conceptual designs. Actual costs at time of construction will vary due to inflation and specific project deliverables.

Table 8. (continued) Summary of I-29 Corridor Composite Alternatives Assessment

Alternative	Performance Measure				
	Property Impacts	Conformity with Design Standards	Social and Environmental Impacts	Traffic Operations	Cost by Element (2008 Dollars)*
Composite 5	Acquisition of 2 to 5 residences along 85th Street west of I-29 required, depending on implementation of access policy. Acquired Right-of-Way total of approximately 11 acres: • Approximately 5 acres to widen / extend 85th Street between Sundowner and Tallgrass. • Approximately 3 acres west of I-29 and north of 85th Street adjacent to 85th Street Ramp D. • Approximately 1 acre total acquired adjacent to 85th / I-29 due to I-229 Ramps A, B and C. • Approximately 1 acre acquired west of I-29 and north of 69th Street due to I-229 Ramp E. • Approximately 1 acre total acquired to accommodate fill for Solberg overpass. Retaining walls would eliminate ROW acquisition (retaining wall option more expensive). Approximately 30 - 35 acres of existing roadway ROW west of I-29 and south of 69th Street could be disposed/redeveloped.	Meets all design criteria. Three ramps are approaching applicable criteria: • I-229 Ramps B and C: Grade of 5% - meets criteria but is approaching maximum of 6%. • I-229 Ramps C and E: Superelevation of 6% - at criteria maximum. 9 New/replacement bridge structures.	Interstate mainline - Minor impacts due to increasing the footprint and raising the mainline. Increased arterial traffic will have moderate noise impacts for adjacent residences along 85th Street, no mitigation measures are anticipated. I-29 noise levels adjacent to residential developments are expected to increase and result in moderate to major impacts, mitigation measures are possible. Solberg Avenue – Fill impacts to wetlands is moderate and mitigation will be required. Replacing fill with retaining wall reduces wetland impact to small amount, but adds to cost. 85th Street – Fill impacts to wetlands is moderate along this corridor and wetland mitigation will be required.	85th Street Ramp D eliminates SB I-229 to 85th Street weave. LOS “D” in one segments: AM peak hour northbound I-29 between Tea and 85th Street interchanges. All other interstate mainline segments - LOS “C” or better through 2033. Higher speed operations on system interchange ramp E relative to current conditions with loop ramp. Minor traffic operations improvements at arterial intersections over No-build.	**Solberg-Tallgrass Avenue Overpass:** $7.5 million **System Interchange:** $38 million **I-229 Mainline:** $1.5 million **I-29 Mainline:** $8.0 million **I-29/85th Street Interchange:** $22 million **TOTAL: $77 million**
Composite 6	Acquisition of up to 9 residences along 85th Street west of I-29 required, depending on implementation of access policy. Acquired Right-of-Way total of approximately 22 acres: • Approximately 20 acres required at I-29/85th Street interchange. • Less than 1 acre required west of I-29 and north of 69th Street due to I-229 Ramp C and Ramp E. • Approximately 1 acre total acquired to accommodate fill for Solberg overpass. Retaining walls would eliminate ROW acquisition (retaining wall option more expensive). Approximately 45 to 50 acres of existing roadway ROW west of I-29 and south of 69th Street could be disposed / redeveloped due to reduced system interchange width.	Meets all design criteria. Two ramps are approaching applicable criteria: • I-229 Ramp C: Grade of 5% - meets criteria but is approaching maximum of 6%. • I-229 Ramps C and E: Superelevation of 6% - at criteria maximum. 6 New/replacement bridge structures.	Interstate mainline - Minor impacts due to increasing the footprint and raising the mainline. Increased arterial traffic will have moderate noise impacts for adjacent residences along 85th Street, no mitigation measures are anticipated. I-29 noise levels adjacent to residential developments are expected to increase and result in moderate to major impacts, mitigation measures are possible. Solberg Avenue – Fill impacts to wetlands is moderate and mitigation will be required. Replacing fill with retaining wall reduces wetland impact to small amount, but adds to cost. 85th Street – Fill impacts to wetlands is moderate along this corridor and wetland mitigation will be required.	The separation distance between the southbound I-229 on-ramp merge point and the southbound 85th Street off-ramp diverge point would be approximately 3,500 feet long, an acceptable separation providing LOS “C” or better through 2033. LOS “D” in one segment: AM peak hour northbound I-29 between Tea and 85th Street interchanges. All other interstate mainline segments - LOS “C” or better through 2033. LOS “D” is also projected for both southbound I-29/85th Street ramp junctions. Higher speed operations on system interchange ramp E relative to current conditions with loop ramp.	**Solberg-Tallgrass Avenue Overpass:** $7.5 million **System Interchange:** $32 million **I-229 Mainline:** $0.8 million **I-29 Mainline:** $8.5 million **I-29/85th Street Interchange:** $14 million **TOTAL: $62.8 million**

* Planning level cost estimates in 2008 dollars based upon conceptual designs. Actual costs at time of construction will vary due to inflation and specific project deliverables.

Table 8. (continued) Summary of I-29 Corridor Composite Alternatives Assessment

Alternative	Performance Measure				
	Property Impacts	Conformity with Design Standards	Social and Environmental Impacts	Traffic Operations	Cost by Element (2008 Dollars)*
Composite 7	Acquisition of 2 to 5 residences along 85th Street west of I-29 required, depending on implementation of access policy. Acquired Right-of-Way total of approximately 11 acres: • Approximately 5 acres to widen / extend 85th Street between Sundowner and Tallgrass. • Approximately 3 acres west of I-29 and north of 85th Street adjacent to 85th Street Ramp D. • Approximately 1 acre total acquired adjacent to 85th / I-29 due to I-229 Ramps A, B and C. • Approximately 1 acre acquired west of I-29 and north of 69th Street due to I-229 Ramp E. • Approximately 1 acre total acquired to accommodate fill for Solberg overpass. Retaining walls would eliminate ROW acquisition (retaining wall option more expensive). Approximately 45 to 50 acres of existing roadway ROW west of I-29 and south of 69th Street could be disposed/redeveloped – due to reduced system interchange width.	Meets all design criteria. Two ramps are approaching applicable criteria: • I-229 Ramp C: Grade of 5% - meets criteria but is approaching maximum of 6%. • I-229 Ramps C and E: Superelevation of 6% - at criteria maximum. 7 New/replacement bridge structures.	Interstate mainline - Minor impacts due to increasing the footprint and raising the mainline. Increased arterial traffic will have moderate noise impacts for adjacent residences along 85th Street, no mitigation measures are anticipated. I-29 noise levels adjacent to residential developments are expected to increase and result in moderate to major impacts, mitigation measures are possible. Solberg Avenue – Fill impacts to wetlands is moderate and mitigation will be required. Replacing fill with retaining wall reduces wetland impact to small amount, but adds to cost. 85th Street – Fill impacts to wetlands is moderate along this corridor and wetland mitigation will be required.	The separation distance between the southbound I-229 on-ramp merge point and the southbound 85th Street off-ramp diverge point would be approximately 2,300 feet long, creating a weaving segment that is projected to have LOS "E/F" operations by 2033. LOS "D" in one segment: AM peak hour northbound I-29 between Tea and 85th Street interchanges. All other interstate mainline segments - LOS "C" or better through 2033. LOS "D" is also projected for both southbound I-29/85th Street ramp junctions. Higher speed operations on system interchange ramp E relative to current conditions with loop ramp.	**Solberg-Tallgrass Avenue Overpass:** $7.5 million **System Interchange:** $32 million **I-229 Mainline:** $0.8 million **I-29 Mainline:** $8.5 million **I-29/85th Street Interchange:** $22 million **TOTAL: $70.8 million**
Composite 8	Two residential property acquisitions and one farm building required. With an on-grade 85th St underpass option there would be no residential property acquisitions. Acquired Right-of-Way total of approximately 15 acres: • Approximately 9 acres to widen / extend 69th Street and overpass. • Approximately 5 acres to widen / extend 85th Street between Sundowner and Tallgrass. • Approximately 1 acre total acquired to accommodate fill for Solberg overpass. Retaining walls would eliminate ROW acquisition (retaining wall option more expensive).	Conforms with all design standards. 6 New/replacement bridge structures with all three crossings using overpass structures. 8 New/replacement bridge structures with all three crossings using underpass structures.	Increased arterial traffic will have moderate noise impacts for adjacent residences along 69th and 85th Street, no mitigation measures are anticipated. I-29 noise levels adjacent to residential developments are expected to increase and result in moderate to major impacts, mitigation measures are possible. Solberg Avenue – Fill impacts to wetlands is moderate and mitigation will be required. Replacing fill with retaining wall reduces wetland impact to small amount, but adds to cost. 69th Street and 85th Street – Fill impacts to wetlands is moderate along these corridors and wetland mitigation will be required.	Does not meet the study goal of providing improved regional access to the Interstate. Concept provides LOS "D" along two segments: • PM peak hour southbound I-29 through system interchange • AM peak hour northbound I-29 between Tea and I-229 interchanges. All other interstate mainline segments provide LOS "C" traffic operations through 2033.	**Solberg-Tallgrass Avenue Overpass:** $7.5 million **69th Street Overpass:** $19 million **85th Street Overpass:** $8.5 million **I-229 Mainline:** $0.8 million **I-29 Mainline:** $7.5 million **TOTAL: $43.3 million**

* Planning level cost estimates in 2008 dollars based upon conceptual designs. Actual costs at time of construction will vary due to inflation and specific project deliverables.

Table 8. (continued) Summary of I-29 Corridor Composite Alternatives Assessment

Alternative	Performance Measure				
	Property Impacts	Conformity with Design Standards	Social and Environmental Impacts	Traffic Operations	Cost by Element (2008 Dollars)*
Composite 9A **Composite 1 plus Composite 3**	Acquisition of 2 to 5 residences along 85th Street, depending on implementation of access policy. One farm building along 69th Street would be acquired. Acquired Right-of-Way (ROW) total of approximately 19 acres: • Approximately 9 acres to widen and provide 69th Street overpass– including 5 acres from Sanford site (east of I-29) and 2 acres from Schatz and Sunset Meadows properties (west of I-29). • Approximately 5 acres to widen 85th Street between Sundowner and Tallgrass and provide I-29 overpass. • Approximately 3 acres west of I-29 and north of 85th Street adjacent to 85th Street Ramp D. • Approximately 1 acre total acquired adjacent to 85th / I-29 due to I-229 Ramps A, B and C. • Approximately 1 acre acquired to accommodate fill for Solberg overpass. Retaining walls would eliminate ROW acquisition (retaining wall option more expensive).	Meets all design criteria. Two ramps are approaching applicable criteria: • I-229 Ramp G: Superelevation of 6% - at criteria maximum (matches existing). • 85th Street Ramp D: Grade = 5% – meets criteria but is approaching maximum of 6%. 8 New/replacement bridge structures.	Interstate mainline - Minor impacts due to increasing the footprint and raising the mainline. Increased arterial traffic will have moderate noise impacts for adjacent residences along 69th and 85th Street, no mitigation measures are anticipated. I-29 noise levels adjacent to residential developments are expected to increase and result in moderate to major impacts, mitigation measures are possible. Solberg Avenue – Fill impacts to wetlands is moderate and mitigation will be required. Replacing fill with retaining wall reduces wetland impact to small amount, but adds to cost. 69th Street and 85th Street – Fill impacts to wetlands is moderate along these corridors and wetland mitigation will be required.	85th Street Ramp D eliminates SB I-229 to 85th Street weave. LOS “D” along two segments: • PM peak hour southbound I-29 through system interchange • AM peak hour northbound I-29 between Tea and 85th Street interchanges. All other interstate mainline segments provide LOS “C” traffic operations through 2033. Minor traffic operations improvements at arterial intersections over No-build.	**Solberg-Tallgrass Avenue Overpass:** $7.5 million **69th Street Overpass:** $19 million **System Interchange:** $0.5 million **I-229 Mainline:** $0.8 million **I-29 Mainline:** $17.5 million **I-29/85th Street Interchange:** $23.5 million **TOTAL: $68.8 million**
Composite 9B **Composite 1 plus Composite 4**	Acquisition of 2 to 5 residences along 85th Street, depending on implementation of access policy. One farm building along 69th Street would be acquired. Acquired ROW total of approximately 20 acres: • Approximately 9 acres to widen / extend 69th Street and overpass. • Approximately 5 acres to widen / extend 85th Street between Sundowner and Tallgrass. • Approximately 3 acres west of I-29 and north of 85th Street adjacent to 85th Street Ramp D. • Approximately 1 acre total acquired adjacent to 85th / I-29 due to I-229 Ramps A, B and C. • Approximately 1 acre acquired west of I-29 and north of 69th Street due to I-229 Ramp E. • Approximately 1 acre total acquired to accommodate fill for Solberg overpass. Retaining walls would eliminate ROW acquisition (retaining wall option more expensive).	Meets all design criteria. One ramp is approaching applicable criteria: • I-229 Ramp E: Superelevation of 6% - at criteria maximum. 11 New/replacement bridge structures – Ramp E includes 2 longer curved bridges.	Interstate mainline - Minor impacts due to increasing the footprint and raising the mainline. Increased arterial traffic will have moderate noise impacts for adjacent residences along 69th and 85th Street, no mitigation measures are anticipated. I-29 noise levels adjacent to residential developments are expected to increase and result in moderate to major impacts, mitigation measures are possible. Solberg Avenue – Fill impacts to wetlands is moderate and mitigation will be required. Replacing fill with retaining wall reduces wetland impact to small amount, but adds to cost. 69th Street and 85th Street – Fill impacts to wetlands is moderate along these corridors and wetland mitigation will be required.	85th Street Ramp D eliminates SB I-229 to 85th Street weave. LOS “D” in one segment: AM peak hour northbound I-29 between Tea and 85th Street interchanges. All other interstate mainline segments - LOS “C” or better through 2033. Higher speed operations on system interchange ramp E relative to current conditions with loop ramp.	**Solberg-Tallgrass Avenue Overpass:** $7.5 million **69th Street Overpass:** $19 million **System Interchange:** $14 million **I-229 Mainline:** $1.5 million **I-29 Mainline:** $17.5 million **I-29/85th Street Interchange:** $23.5 million **TOTAL: $83 million**

* Planning level cost estimates in 2008 dollars based upon conceptual designs. Actual costs at time of construction will vary due to inflation and specific project deliverables.

Table 8. (continued) Summary of I-29 Corridor Composite Alternatives Assessment

Alternative	Performance Measure				
	Property Impacts	Conformity with Design Standards	Social and Environmental Impacts	Traffic Operations	Cost by Element (2008 Dollars)*
Composite 9C **Composite 1 plus Composite 5**	Acquisition of 2 to 5 residences along 85th Street, depending on implementation of access policy. One farm building along 69th Street would be acquired. Acquired ROW total of approximately 20 acres: • Approximately 9 acres to widen / extend 69th Street between Sundowner and Tallgrass. • Approximately 5 acres to widen / extend 85th Street between Sundowner and Tallgrass. • Approximately 3 acres west of I-29 and north of 85th Street adjacent to 85th Street Ramp D. • Approximately 1 acre total acquired adjacent to 85th / I-29 due to I-229 Ramps A, B and C. • Approximately 1 acre acquired west of I-29 and north of 69th Street due to I-229 Ramp E. • Approximately 1 acre total acquired to accommodate fill for Solberg overpass. Retaining walls would eliminate ROW acquisition (retaining wall option more expensive). Approximately 30 - 35 acres of existing roadway ROW west of I-29 and south of 69th Street could be disposed/redeveloped.	Meets all design criteria. Three ramps are approaching applicable criteria: • I-229 Ramps B and C: Grade of 5% - meets criteria but is approaching maximum of 6%. • I-229 Ramps C and E: Superelevation of 6% - at criteria maximum. 11 New/replacement bridge structures with 69th Street overpass 14 New/replacement bridge structures with 69th Street on grade underpass	Interstate mainline - Minor impacts due to increasing the footprint and raising the mainline. Increased arterial traffic will have moderate noise impacts for adjacent residences along 69th and 85th Street, no mitigation measures are anticipated. I-29 noise levels adjacent to residential developments are expected to increase and result in moderate to major impacts, mitigation measures are possible. Solberg Avenue – Fill impacts to wetlands is moderate and mitigation will be required. Replacing fill with retaining wall reduces wetland impact to small amount, but adds to cost. 69th Street and 85th Street – Fill impacts to wetlands is moderate along these corridors and wetland mitigation will be required.	85th Street Ramp D eliminates SB I-229 to 85th Street weave. LOS “D” in one segments: AM peak hour northbound I-29 between Tea and 85th Street interchanges. All other interstate mainline segments - LOS “C” or better through 2033. Higher speed operations on system interchange ramp E relative to current conditions with loop ramp. Minor traffic operations improvements at arterial intersections over No-build.	**Solberg-Tallgrass Avenue Overpass:** $7.5 million **69th Street Overpass:** $21 million **System Interchange:** $38 million **I-229 Mainline:** $1.5 million **I-29 Mainline:** $8.0 million **I-29/85th Street Interchange:** $22 million **TOTAL: $98 million** **Alternative** **69th Street On-grade Underpass:** $17.5 million **Alternate Total: $94.5 million**
Composite 9D **Composite 1 plus Composite 6**	Acquisition of up to 9 residences along 85th Street, depending on implementation of access policy. One farm building along 69th Street would be acquired. Acquired ROW total of approximately 31 acres: • Approximately 20 acres required at I-29/85th Street interchange. • Less than 1 acre required west of I-29 and north of 69th Street due to I-229 Ramp C and Ramp E. • 69th overpass: acquire approximately 5 acres from Sanford site and 4 acres combined from Schatz and Sunset Meadows properties • Approximately 1 acre total acquired to accommodate fill for Solberg overpass. Retaining walls would eliminate ROW acquisition (retaining wall option more expensive). Approximately 45 to 50 acres of existing roadway ROW west of I-29 and south of 69th Street could be disposed / redeveloped due to reduced system interchange width.	Meets all design criteria. Two ramps are approaching applicable criteria: • I-229 Ramp C: Grade of 5% - meets criteria but is approaching maximum of 6%. • I-229 Ramps C and E: Superelevation of 6% - at criteria maximum. 9 Bridge structures.	Interstate mainline - Minor impacts due to increasing the footprint and raising the mainline. Increased arterial traffic will have moderate noise impacts for adjacent residences along 69th and 85th Street, no mitigation measures are anticipated. I-29 noise levels adjacent to residential developments are expected to increase and result in moderate to major impacts, mitigation measures are possible. Solberg Avenue – Fill impacts to wetlands is moderate and mitigation will be required. Replacing fill with retaining wall reduces wetland impact to small amount, but adds to cost. 69th Street and 85th Street – Fill impacts to wetlands is moderate along these corridors and wetland mitigation will be required.	The separation distance between the southbound I-229 on-ramp merge point and the southbound 85th Street off-ramp diverge point would be approximately 3,500 feet long, an acceptable separation providing LOS “C” or better through 2033. LOS “D” in one segment: AM peak hour northbound I-29 between Tea and 85th Street interchanges. All other interstate mainline segments - LOS “C” or better through 2033. LOS “D” is also projected for both southbound I-29/85th Street ramp junctions. Higher speed operations on system interchange ramp E relative to current conditions with loop ramp.	**Solberg-Tallgrass Avenue Overpass:** $7.5 million **69th Street Overpass:** $21 million **System Interchange:** $32 million **I-229 Mainline:** $0.8 million **I-29 Mainline:** $8.5 million **I-29/85th Street Interchange:** $14 million **TOTAL: $83.8 million**

* Planning level cost estimates in 2008 dollars based upon conceptual designs. Actual costs at time of construction will vary due to inflation and specific project deliverables.

Table 8. (continued) Summary of I-29 Corridor Composite Alternatives Assessment

Alternative	Performance Measure				
	Property Impacts	Conformity with Design Standards	Social and Environmental Impacts	Traffic Operations	Cost by Element (2008 Dollars)*
Composite 9E **Composite 1 plus Composite 7**	Acquisition of 2 to 5 residences along 85th Street, depending on implementation of access policy. One farm building along 69th Street would be acquired. Acquired ROW total of approximately 20 acres: • Approximately 9 acres to widen / extend 69th Street between Sundowner and Tallgrass. • Approximately 5 acres to widen / extend 85th Street between Sundowner and Tallgrass. • Approximately 3 acres west of I-29 and north of 85th Street adjacent to 85th Street Ramp D. • Approximately 1 acre total acquired adjacent to 85th / I-29 due to I-229 Ramps A, B and C. • Approximately 1 acre acquired west of I-29 and north of 69th Street due to I-229 Ramp E. • Approximately 1 acre total acquired to accommodate fill for Solberg overpass. Retaining walls would eliminate ROW acquisition (retaining wall option more expensive). Approximately 45 to 50 acres of existing roadway ROW west of I-29 and south of 69th Street could be disposed / redeveloped due to reduced system interchange width.	Meets all design criteria. Two ramps are approaching applicable criteria: • I-229 Ramp C: Grade of 5% - meets criteria but is approaching maximum of 6%. • I-229 Ramps C and E: Superelevation of 6% - at criteria maximum. 10 Bridge structures.	Interstate mainline - Minor impacts due to increasing the footprint and raising the mainline. Increased arterial traffic will have moderate noise impacts for adjacent residences along 69th and 85th Street, no mitigation measures are anticipated. I-29 noise levels adjacent to residential developments are expected to increase and result in moderate to major impacts, mitigation measures are possible. Solberg Avenue – Fill impacts to wetlands is moderate and mitigation will be required. Replacing fill with retaining wall reduces wetland impact to small amount, but adds to cost. 69th Street and 85th Street – Fill impacts to wetlands is moderate along these corridors and wetland mitigation will be required.	The separation distance between the southbound I-229 on-ramp merge point and the southbound 85th Street off-ramp diverge point would be approximately 2,300 feet long, creating a weaving segment that is projected to have LOS “E/F” operations by 2033. LOS “D” in one segment: AM peak hour northbound I-29 between Tea and 85th Street interchanges. All other interstate mainline segments - LOS “C” or better through 2033. LOS “D” is also projected for both southbound I-29/85th Street ramp junctions. Higher speed operations on system interchange ramp E relative to current conditions with loop ramp.	**Solberg-Tallgrass Avenue Overpass:** $7.5 million **69th Street Overpass:** $21 million **System Interchange:** $32 million **I-229 Mainline:** $0.8 million **I-29 Mainline:** $8.5 million **I-29/85th Street Interchange:** $22 million **TOTAL: $91.8 million**

* Planning level cost estimates in 2008 dollars based upon conceptual designs. Actual costs at time of construction will vary due to inflation and specific project deliverables.

5.1 SUMMARY

This report documents the benefits and impacts associated with a range of transportation system modifications within the I-29 Corridor study area. The goal of the I-29 Corridor Study is to identify the current and future (2033) transportation needs in the area and as such, a number of elements studied would be focused on needs that are tied more closely with anticipated future development relative to current conditions. In addition, as many of the improvements/ modifications would be on the Interstate System or at interchanges, identifying and obligating funding for the projects would be responsibility of the SDDOT. While the SDDOT understands the economic impact that addressing the accessibility between the interstate and adjacent development areas has on Sioux Falls, the Department has the responsibility of prioritizing the needs throughout the state. The statewide Long Range Transportation Plan (LRTP) documents the current annual transportation system funding capacity relative to the costs to maintain the current system and provide for expansion that is connected to growth in an area. At present, the SDDOT can document:

- A declining overall condition of the existing roadway infrastructure, which is forecasted to see the percentage of poor to fair condition mileage increase from approximately 10 percent of the mileage to approximately 45 percent of the mileage.
- An increasing average age of the bridges and other structures on the state system.
- Increasing congestion on the system.

At the same time that facility condition and capacity improvement needs are expanding, revenue is projected to be relatively constant. When annual construction cost increases that exceed the projected increases in revenue are considered, the mileage that can be repaired, number of structures that can be replaced and rehabilitated and the number of new lane miles and interchanges that can be constructed cannot keep up with the demand. Thus, the SDDOT has the responsibility to develop a prioritization plan that will provide for the safety and convenience of the traveling public and stay within the funding level that is available.

The SDDOT has in the statewide transportation improvement program emphasized maintenance of the existing infrastructure to maximize the investment that has already been made relative to expansion of the system through:

- Adding new interchanges to the Interstate System.
- Adding new lane miles to the system that the SDDOT maintains.

The maintenance of the current system-first prioritization focus relative to addressing the needs in the I-29 corridor from 41st Street through Highway 106 (Tea) results in:

- Immediately addressing the pavement conditions along I-29 and I-229 in the study area.
- Making safety improvements such as:
  - Adding auxiliary lanes that improve flow through merge and diverge areas of existing interchanges along the I-29 and I-229 mainline.
  - Making ramp enhancements to improve flow between I-29 and I-229.

Improvements that focus on future development in areas adjacent to and logically feeding into the I-29 and I-229 corridor would be addressed following implementation of improvements that

address current deficiencies in the corridors and more concurrent with implementation of proposed development plans. Thus, elements such as a new interchange at I-29/85th Street and completely rebuilding the I-29/I-229 System Interchange would be delayed in favor of allocating limited funding to the safety and pavement improvements previously listed. This proposal is considered by the SDDOT to be consistent with needs in the corridor and their ability to fund desired expansion of the system.

5.2 RECOMMENDATIONS

Based on the information provided in this document it is recommended that the long term improvement plan include a combination of improvements to the mainline and ramps as well as expansion projects that address:

- Desired additional access to I-29 and I-229.
- Additional arterial crossings of the interstates and expansion of the existing arterial system. Improvement of the arterial corridors by providing added capacity and connectivity enhances the ability of the arterial system to accommodate short and medium length trips that currently use the Interstate System as it is the only facility providing the level of continuity desired by travelers.
- Rehabilitation of the I-29 and I-229 mainline by replacing the pavement and providing auxiliary lanes into and out of each of the existing interchanges.

The most technically feasible concept based on the above requirements is represented in the range of alternatives reviewed as Composite 9A coupled with additional arterial improvements. Figure 66 displays Composite 9A which is a combination of Composite 1 (69th Street crossing) and Composite 3 (I-29/ I-229 System Interchange modifications, I-29/85th Street interchange, and mainline auxiliary lanes). This alternative has been selected for the following reasons:

- Provides sufficient traffic operations for freeway facilities through the planning horizon of 2033.
- Provides improved traffic operations at the adjacent service interchanges I-29/Highway 106 (Tea) and I-229/Louise Avenue.
- Minimizes modifications to the existing I-29/I-229 System Interchange.
- Provides an I-29/85th Street interchange.
- Minimizes traffic disruption for the public during construction.
- Accommodates the I-29/69th Street and I-229/Solberg Avenue grade separated crossings.

Lane assignments through the system interchange for the most technically feasible alternative, Composite 9A, are displayed in Figure 67. Included in the schematic figure are:

- A delineation of the number of northbound and southbound lanes and ramps through the I-29/I-229 System Interchange area.
- Identification of the estimated merge and diverge points along the interstate mainline and/or interchange ramps.

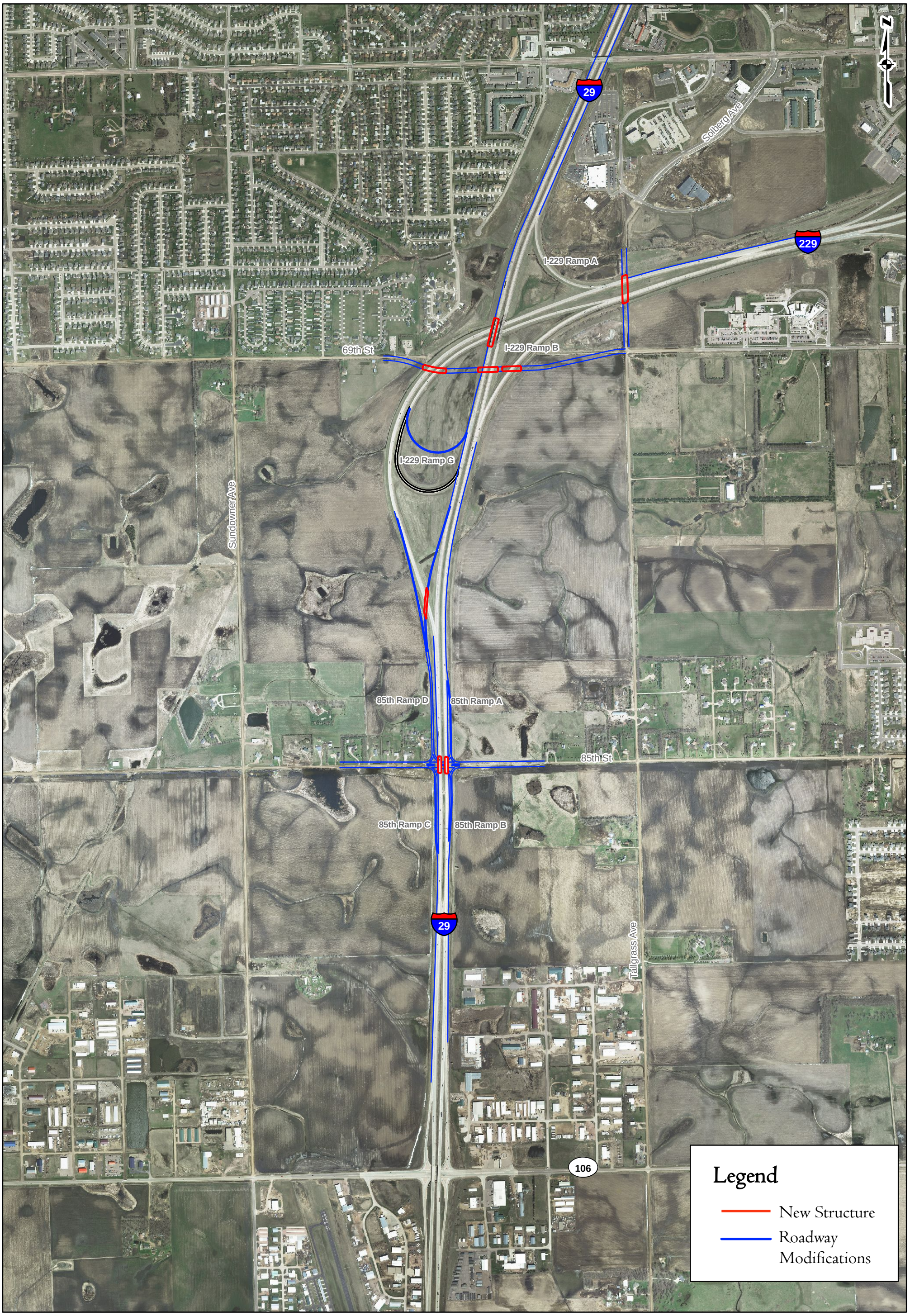
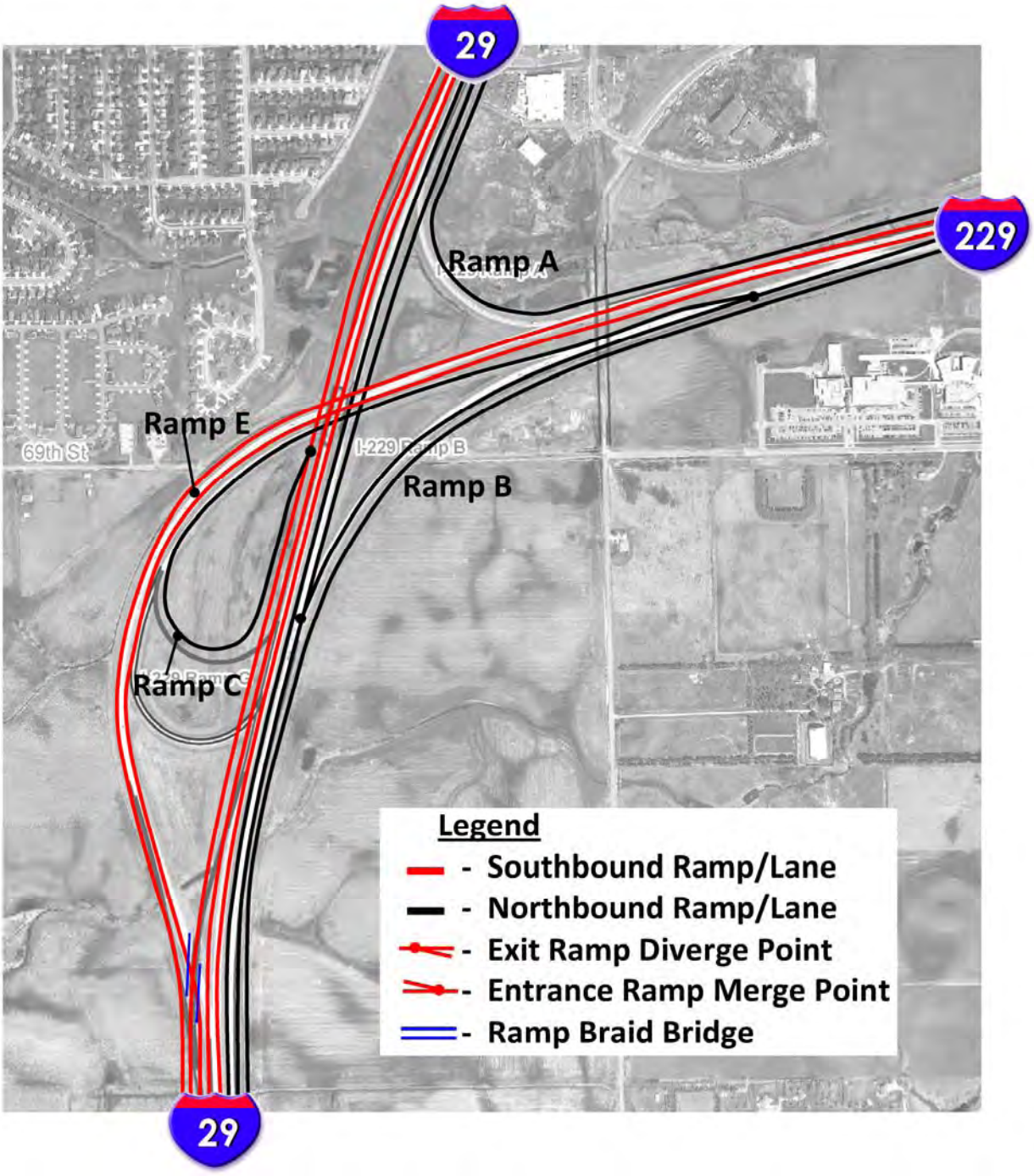


Figure 66: Most Technically Feasible Concept

FIGURE 67. COMPOSITE 9A – I-29/I-229 INTERCHANGE LANE ASSIGNMENTS AND MERGE/DIVERGE POINTS



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It is also recommended that expanded transit service (Alternative 13) into the study area be carried forward to provide alternative transportation mode choice for the study area as levels of development emerge to support the service.

5.3 PHASED IMPLEMENTATION OF RECOMMENDED PLAN

The recommended mainline and arterial improvement plan for the I-29 corridor includes a number of elements that represent significant investments in the transportation infrastructure for the Sioux Falls metropolitan area. The cost of these improvements relative to the available funding suggests that implementation of the improvements will need to be phased over a number of years. Key considerations in developing a phasing plan for the I-29 corridor include the following:

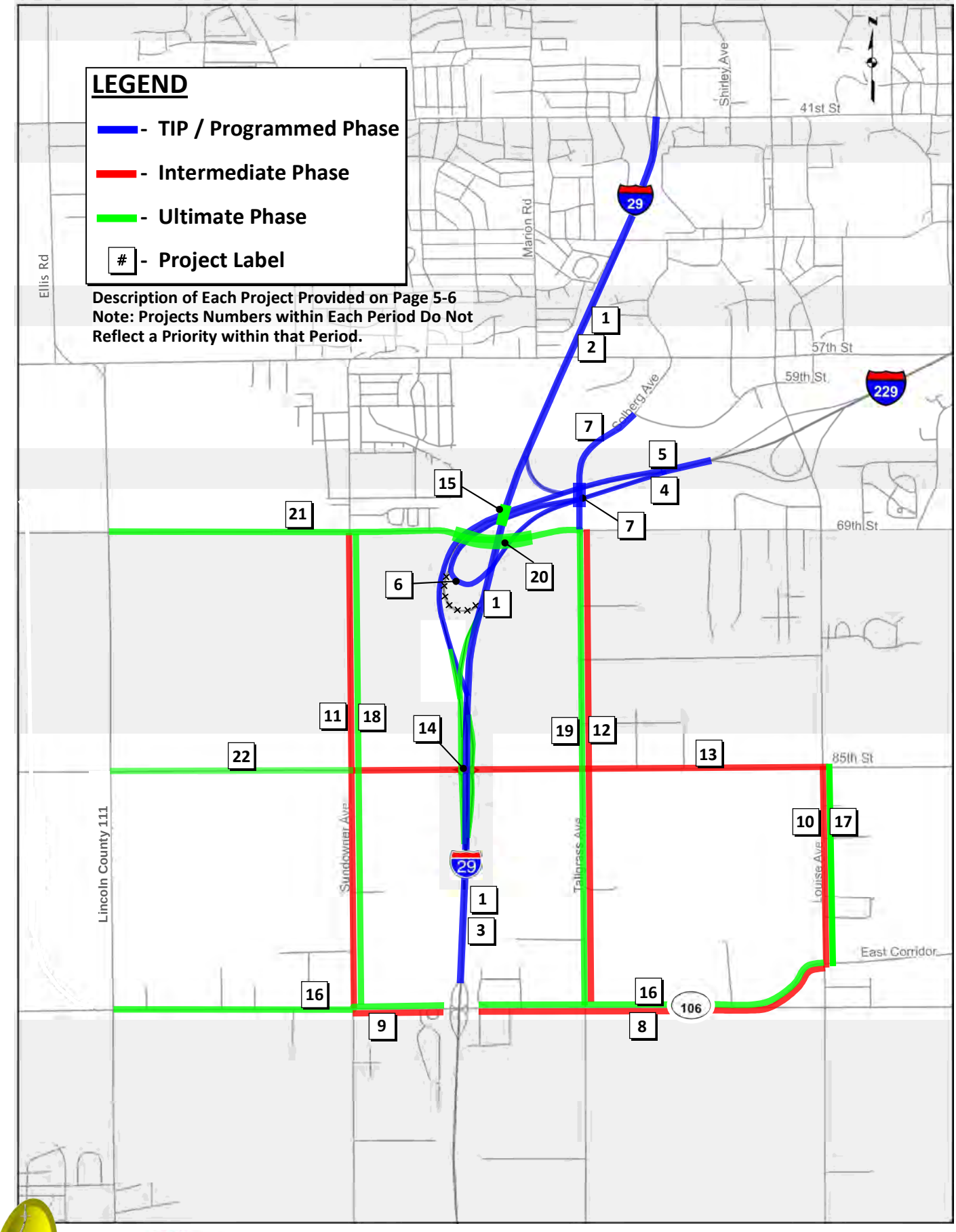
- Project need with respect to the following:
  - Pavement condition
  - Traffic operations
  - Traffic safety
  - Adjacent development timeline
- Project cost versus the ability to commit funds for the various jurisdictions. Funding for corridor improvement would come from a number of agencies/jurisdictions and funding types. Commitment of funds prior to implementation will need to be coordinated across the jurisdictions and local, state and federal budget constraints will need to be coordinated.
- Coordination of city, county and state projects to ensure smooth transition from one transportation system to the next.

The two key critical elements from the above list are the availability of funding and the proposed timing for land development within the study area. Funding for transportation projects at the statewide and local levels can be dynamic and fluid and the current limiting conditions can change in the future. Development plans for the study area are also dynamic based on economic conditions.

Based on the analysis contained in this report, discussions with local/state agencies, and the public involvement process the phasing plan has been divided into three periods. While the corridor study alternatives analysis that led to the implementation plan included the potential for environmental impacts and benefits, a more detailed environmental evaluation will be required as part of continued future development of the individual projects in the plan. The first phase of improvements would focus on reconstruction/rehabilitation and minor expansion projects included in the current Transportation Improvement Program (TIP) and/or are programmed for funding. Implementation of the second and third period/phase improvements would be coordinated with land development in study area and with development in areas that feed roadways in the study area. The conceptual phasing plan by period for identified improvements is listed below by period and is displayed in Figure 68. The programmed improvements included in the TIP for the study area are shown in Figure 69.

Map Location	Implementation Phase and Project Description
	Transportation Improvement Program (TIP) / Programmed Improvements
1	Pavement replacement for the I-29 mainline and ramps between the 41st Street Interchange and the Tea Interchange (covered in two projects).
2	Auxiliary lanes added between the 41st Street Interchange and the I-29/I-229 System Interchange.
3	Auxiliary lanes added between the I-29/I-229 System Interchange and the Tea Interchange.
4	Pavement replacement for the I-229 mainline and ramps between the I-29/I-229 System Interchange and the Louise Avenue Interchange.
5	Auxiliary lanes added to the I-229 mainline between the I-29/I-229 System Interchange and the Louise Avenue Interchange.
6	Reconstruct the southbound I-29 to northbound I-229 ramp to shift it to the north.
7	Construct the Solberg Avenue-Tallgrass Avenue overpass of I-229 and associated approach lanes to connect Solberg Avenue between 59th Street and 69th Street.
	Intermediate Period Improvements
8	Lincoln County 106/SD 100 reconstruction/construction to Sioux Falls Half Urban Standard between I-29 and Louise Avenue.
9	Lincoln County 106 reconstruction to Sioux Falls Half Urban Standard between Sundowner Avenue and I-29.
10	Louise Avenue reconstruction to Sioux Falls Half Urban Standard between 85th Street and Lincoln County 106/SD 100.
11	Sundowner Avenue reconstruction to Sioux Falls Half Urban Standard from 69th Street to Lincoln County 106.
12	Tallgrass Avenue reconstruction to Sioux Falls Half Urban Standard from 69th Street to Lincoln County 106.
13	85th Street reconstruction to Sioux Falls Full Urban Standard between Sundowner Avenue and Louise Avenue.
	Ultimate Period Improvements
14	I-29/85th Street Interchange construction (Including Braided Ramps).
15	New structures for the I-29/I-229 System Interchange.
16	Lincoln County 106 reconstruction to Sioux Falls Full Urban Standard from Tea-Ellis Road to Louise Avenue.
17	Louise Avenue reconstruction to Sioux Falls Full Urban Standard between 85th Street and Lincoln County 106/SD 100.
18	Sundowner Avenue reconstruction to Sioux Falls Full Urban Standard from 69th street to Lincoln County 106.
19	Tallgrass Avenue reconstruction to Sioux Falls full Urban standard from 69th Street to Lincoln County 106.
20	69th Street overpass of I-29.
21	69th Street reconstruction to Sioux Falls Full Urban Standard between Tea-Ellis Road and Tallgrass Avenue.
22	85th Street reconstruction to Sioux Falls Full Urban Standard from Tea-Ellis Road to Sundowner Avenue.

Note: Projects are not listed in a prioritized order within any of the periods.



I-29 Corridor Study
41st Street to CR 106

Figure 68. Phasing Plan for Interstate and Arterial Roadway Improvements

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I-29 Corridor Study
41st Street to CR 106

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Figure 69: Programmed Interstate Improvements for Study Area

Due to the dynamic nature of the development plans within the study area and the availability of funding it is important to setup a monitoring plan to assist in the decision making process and timeline for implementation of the improvement elements included in the ultimate plan for the I-29 Corridor. Items that should be monitored include the following:

- Traffic operations for mainline and interchanges.
- Traffic volumes on arterial routes.
- Traffic safety.
- Development proposals and timelines.
- Local support for proposed action.

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