Northern Lincoln County Corridors Study

Corridor Plan

SD11 and SD115

Lincoln County, SD

South Dakota Department of Transportation

Agreement No. 410788, Work Order PD-10-21

March 2024

benesch

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EXECUTIVE SUMMARY

The South Dakota Department of Transportation (SDDOT) conducted a corridor planning study to identify needed improvements for two corridors in north Lincoln County. The study corridors are defined as follows, with corresponding mile reference markers (MRM):

- SD11 – from the west junction with US 18 (MRM 55.43) to the 69th Street intersection (MRM 68.39) in Sioux Falls; length is approximately 13.0 miles.
- SD115 – from the junction with US 18 (MRM 67.39) to the junction with Willow Street/Lincoln County 110/273rd Street (MRM 76.33); length is approximately 9.0 miles.

The purpose of this corridor study was to evaluate existing and future conditions to identify short-term and long-term improvements to the study corridor and ten study intersections. These intersections are listed in Table ES-1 below.

Table ES-1 – Study Intersections

Mainline	Cross Street
SD11	US 18
	Lincoln County 116 (276th Street)
	Lincoln County 110 (273rd Street)
	272nd Street
	Lincoln County 106 (271st Street)
	85th Street (270th Street)
SD115	US 18
	Lincoln County 124 (280th Street)
	Lincoln County 116 (276th Street)
	Lincoln County 110 (273rd Street)

Study development was guided by a Study Advisory Team (SAT) and followed the methodology laid out in the Method and Assumptions memorandum. The SAT was comprised of members from the SDDOT, Federal Highway Administration (FHWA), Lincoln County, City of Sioux Falls, City of Harrisburg and Sioux Falls MPO/South Eastern Council of Governments (SECOG). Additional community outreach included two public meetings and coordination with stakeholders.

In summary, the overall corridor study process consisted of the following milestones:

- Documentation of existing conditions
- Development of future conditions
- Identification of deficiencies and needs
- Environmental review
- Recommendations

This corridor report documents the study process and the recommendations formulated by the study team, based on technical analyses and public input. Final recommendations are listed below and illustrated in Exhibit 1 to Exhibit 3 from the second public meeting.

SD11

US 18 to 271st Street/CR 106

The existing two-lane cross section with 6-foot surfaced shoulders is adequate to accommodate the anticipated traffic volumes through 2050, with the addition of geometric intersection improvements. In addition, intersection lighting is recommended at 273rd Street and Willow Street to address safety. No further improvements are recommended for this segment.

271st Street/CR 106 to S. Veterans Parkway

The northern segment of the SD11 corridor will experience greater traffic volumes, driven by the population expansion and outward growth of the Sioux Falls urbanized area. To meet expected traffic volumes from residential and commercial growth, it's recommended to reconstruct the existing two-lane roadway as a four-lane divided urban corridor with raised center median. The raised median allows for access management of the multiple driveways in this segment.

Intersection Improvements

To maintain an acceptable level of service (LOS) In the Build year, the growth in traffic volumes is expected to warrant turn lanes at all study intersections, as identified in Table ES-2. In addition, traffic signals are warranted at the intersection of SD11 with US 18 and with 271st Street.

SD115

The SD11 corridor will continue to function acceptably through 2050 as a two-lane roadway, with the addition of intersection turn lane improvements as detailed in Table ES-2.

Table ES-2 – Summary of Intersection Improvements (Build)

Major Street	Minor Street	Approach				Signal[1]	Lighting	Timing[2]
		NB	SB	EB	WB			
SD11	US 18/282nd St	-	LTL RTL	-	-	Y	-	Tier 1
	276th St/CR 116	LTL	LTL RTL	LTL	LTL	-	-	Tier 3
	273rd St/Willow St	LTL	LTL RTL	LTL	LTL	-	Y	Tier 1
	272nd St/ Prospect St	LTL RTL	LTL	LTL	LTL	-	-	Tier 2
	271st St/CR 106	LTL	LTL RTL	LTL	LTL	Y	-	Tier 1
	270th St/85th St	LTL	LTL RTL	LTL	LTL	-	-	Tier 1
SD115	US 18/282nd St	-	LTL	-	-	-	-	Tier 1
	280th St	-	-	-	-	-	-	-
	276th St /CR 116	LTL	LTL RTL	LTL	LTL	-	-	Tier 2
	273rd St/Willow St	-	-	LTL	LTL	[3]	-	Tier 1

[1] *When warranted*

[2] *Tier 1 = recommended by 2035; Tier 2 = recommended between 2030-2040; Tier 3 = recommended between 2040-2050*

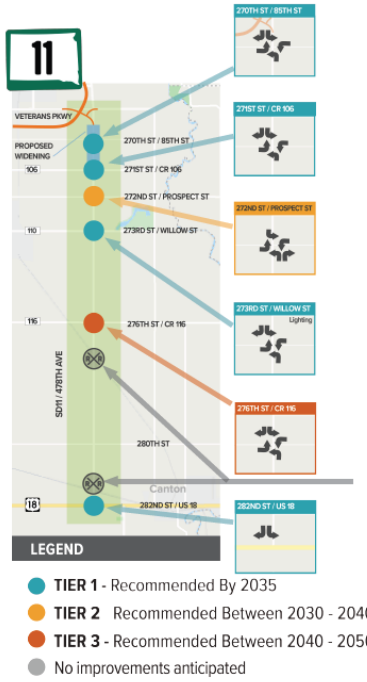
[3] *Existing signal*

SAFETY IMPROVEMENTS

For the rural sections of both SD11 and SD115, maintain the rumble striping. Conduct an intersection lighting assessment at SD11 and 273rd Street during the concept phase.

For all traffic signals, consider use of retroreflective backplates and 4-section signal heads with Flashing Yellow Arow (FYA) where appropriate. If there are pedestrian features, provide high emphasis crosswalks and pedestrian signals.

SUMMARY OF SD11 RECOMMENDATIONS



INTERSECTION RECOMMENDATIONS

270TH ST / 85TH ST: Intersection turn lane improvements

271ST ST / CR 106: Intersection turn lane improvements

272ND ST / PROSPECT ST: Intersection turn lane improvements

273RD ST / WILLOW ST: Intersection lighting & intersection turn lane improvements

276TH ST / CR 116: Intersection turn lane improvements

At Grade Crossing with BNSF: Due to low volume, grade separated overpass determined not feasible for further considerations

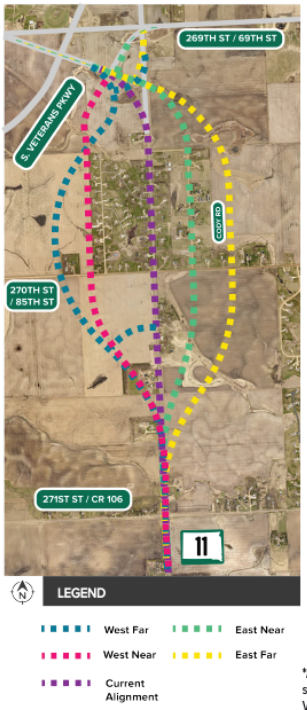
282ND ST / US 18: Intersection turn lane improvements

CORRIDOR IMPROVEMENTS

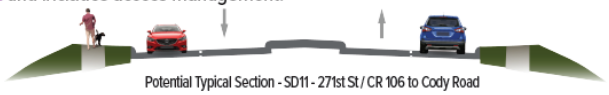
- Reconstruct existing roadway as a 4-lane divided urban corridor from S. Veterans Parkway to 271st St.
- Utilize new paved shoulders for sidewalk/trail connectivity from 271st St / CR 106 to 273rd St / Willow St.
- Maintain rumble striping.

Exhibit 1 – SD11 Recommendations

CORRIDOR IMPROVEMENTS NEAR SHINDLER



Multiple improvements were considered, as seen in the map and matrix. The recommended alternative follows the Current Alignment and includes access management.



Potential Typical Section - SD11 - 271st St / CR 106 to Cody Road

Description	Travel Distance	Overall Network Geometry / Connectivity	Access Management	Level of Service/Congestion	Multimodal/Bicycle and Pedestrian Facilities	Water Resources	Other Enviornmental Considerations*	Right-of-Way, Acquisition and Relocation Potential	Land Use and Economic Impacts	Construction Cost
No Build	≈	👎	👎	👎	👎	≈	≈	≈	👎	≈
West Far	👎	👎	👍	👍	👍	👎	≈	👎	👎	$$
West Near	👎	👎	👍	👍	👍	👎	≈	👎	👎	$$
Current Alignment	≈	≈	👍	👍	👍	≈	≈	≈	👍	$
East Near	👎	≈	👍	👍	👍	👎	≈	👎	👎	$$
East Far	👎	≈	👍	👍	👍	👎	≈	👎	👎	$$

LEGEND
- 👍 Better Outcome
- 👎 Worse Outcome
- $$ Higher Cost
- ≈ Neutral Outcome

*An environmental report was completed that reviewed the following environmental considerations: water resources, wetlands, stormwater, floodplains, wild and scenic rivers, threatened and endangered species, migratory birds, unique wildlife habitat, cultural resources, Section 4(f) and 6(f) Resources, paleontological resources, land use, economic resources, community and social resources, Title VI, environmental justice, climate change, climate equity, bicycle and pedestrian facilities, visual resources and aesthetics, prime and unique farmlands, air quality, hazardous materials, acquisition, relocations, utilities, and railroad crossings. Consideration of cultural resources and noise analysis would occur as projects that are determined from this study proceed.

Exhibit 2 – SD11 Improvements Near Shindler

SUMMARY OF SD115 RECOMMENDATIONS

INTERSECTION RECOMMENDATIONS

273RD ST / WILLOW ST: Intersection turn lane improvements

276TH ST / CR 116: Intersection turn lane improvements

280TH ST: No improvements planned

At Grade Crossing with BNSF:
Due to low volume, grade separated overpass determined not feasible for further considerations

282ND ST / US 18: Intersection turn lane improvements
Improvements may be accomplished with the SD11/US 18 intersection improvements

CORRIDOR IMPROVEMENTS

- Maintain rumble striping.
- Protect the corridor for future right of way acquisition (150 feet).

Exhibit 3 – SD115 Recommendations

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Appendix F – Shindler Bypass Concepts

Appendix G – Turn Lane Warrants

Appendix H – Signal Warrant Analysis (Build)

Appendix I – Predictive Safety Analysis

Appendix J – Probable Construction Costs

ACRONYMS

AADT:	Annual Average Daily Traffic
ADT:	Average Daily Traffic
AWSC:	All-way, stop control
FEMA:	Federal Emergency Management Agency
FLUM:	Future Land Use Map
HCM:	Highway Capacity Manual
HCS:	Highway Capacity Software
HSM:	Highway Safety Manual
IHSDM:	Highway Safety Design Model
ITS:	Intelligent Transportation System Master Plan
LOS:	Level of service
M&A:	Methods and Assumptions
mph:	Miles per hour
MRM:	Mile Reference Marker
MPO:	Metropolitan Planning Organization
MEV:	Million entering vehicles
MOE:	Measure of effectiveness
MVM:	Million vehicle miles
MUTCD:	Manual on Uniform Traffic Control Devices
PSL:	Posted speed limit
SDDANR:	South Dakota Department of Agriculture and Natural Resources
SDDOT:	South Dakota Department of Transportation
SDGFP:	South Dakota Game, Fish and Parks
SECOG	South Eastern Council of Governments
TSM&O:	Transportation Systems Management and Operations

TWSC:	Two-way, stop control
UAO:	Utility Agent/Owners
USFWS:	U.S. Fish and Wildlife Service
USACE:	United States Army Corps of Engineers
VPD:	Vehicles per day

1 INTRODUCTION

1.1 PURPOSE AND NEED

The South Dakota Department of Transportation's (SDDOT) pavement management system has determined that some of the segments of SD11 and SD115 in Lincoln County should have a major rehabilitation or be reconstructed in the 2029 to 2035 timeframe. It is likely that, with the growth of the population in northern Lincoln County along the southern edge of Sioux Falls and around Harrisburg, traffic volumes will increase as portions of these corridors urbanize in the anticipated lifespan of the improvements. This corridor study was needed to ensure that the correct typical sections are provided to accommodate the anticipated traffic volume for the duration of the service life of the rehabilitated or reconstructed pavement.

The primary purpose of the study was to:

- Plan for and accommodate the anticipated growth within the area.
- Plan for and manage access within the SDDOT corridors.
- Develop a program of projects to address the needs within the corridor.

The study identified future improvements, or Needs, for approximately the next 30 years, through 2050, and fulfilled the following objectives:

1. Determined the need for additional through, turning, and/or passing lanes along the SD11 and SD115 mainline.
2. Determined potential intersection configurations for 10 key intersections along the study corridor.
3. Provided Typical Sections
4. Provided a feasibility analysis for a potential Shindler bypass
5. Provided a feasibility analysis for the potential for railroad grade separation(s) at 3 existing rail crossings.
6. Developed planning level project quantities and costs.
7. Developed an overall corridor implementation plan by prioritizing improvements for construction.
8. Created environmental scan documentation for an approximately 500-foot buffer surrounding each of the primary study corridors.
9. Created final products for use by SDDOT, Lincoln County, the City of Harrisburg and the Sioux Falls MPO which will provide guidance to implement recommended improvements.

1.2 STUDY AREA

The SD11 corridor extends from US 18, west of Canton, to the intersection with 69th Street which is essentially the connection to the future planned South Veteran's Parkway, north of the community of Shindler. The SD115 corridor extends from US 18 to Willow Street/Lincoln County 110/273rd Street in

the City of Harrisburg. The study corridors and surrounding area are depicted in Figure 1. The study intersections are listed in Table 1.

Table 1 – Study Intersections

Mainline	Cross Street	
SD11	US 18	272nd Street
	Lincoln County 116 (276th Street)	Lincoln County 106 (271st Street)
	Lincoln County 110 (273rd Street)	85th Street (270th Street)
SD115	US 18	Lincoln County 116 (276th Street)
	Lincoln County 124 (280th Street)	Lincoln County 110 (273rd Street)

1.3 STUDY ADVISORY TEAM

The SDDOT Project Manager and a Study Advisory Team (SAT) provided study oversight and guided the study through completion. The SAT was comprised of representative parties of the SDDOT, City of Harrisburg, City of Sioux Falls, Lincoln County, the Sioux Falls MPO/South Eastern Council of Governments (SECOG) and the FHWA. Members of the SAT are detailed in Table 2.

Table 2 – Study Advisory Team

Representative	Organization	Representative	Organization
Shannon Ausen	City of Sioux Falls	Sarah Gilkerson	SDDOT – Project Development
Chad Babcock	SDDOT – Administration	Steve Gramm	SDDOT – Project Development
Kit Bramblee	SDDOT - Administration	Joanne Hight	SDDOT – Administration
Jeff Brosz	SDDOT – Trans. Inv. Management	Mark Hoines	FHWA
Toby Brown	Lincoln County – Planning	Harry Johnston	SDDOT – Sioux Falls Area
Travis Dressen	SDDOT – Mitchell Region	Zach Nevitt	SDDOT – Project Development
Stacy DuChene	SDDOT – Road Design	Joe Sestak	SDDOT – Mitchell Region
Jim Feeney	Sioux Falls MPO	Joe Stonesifer	City of Harrisburg
Terry Fluit	Lincoln County – Highway		

While not a SAT member, BNSF Railway was contacted separately to provide a stakeholder perspective.

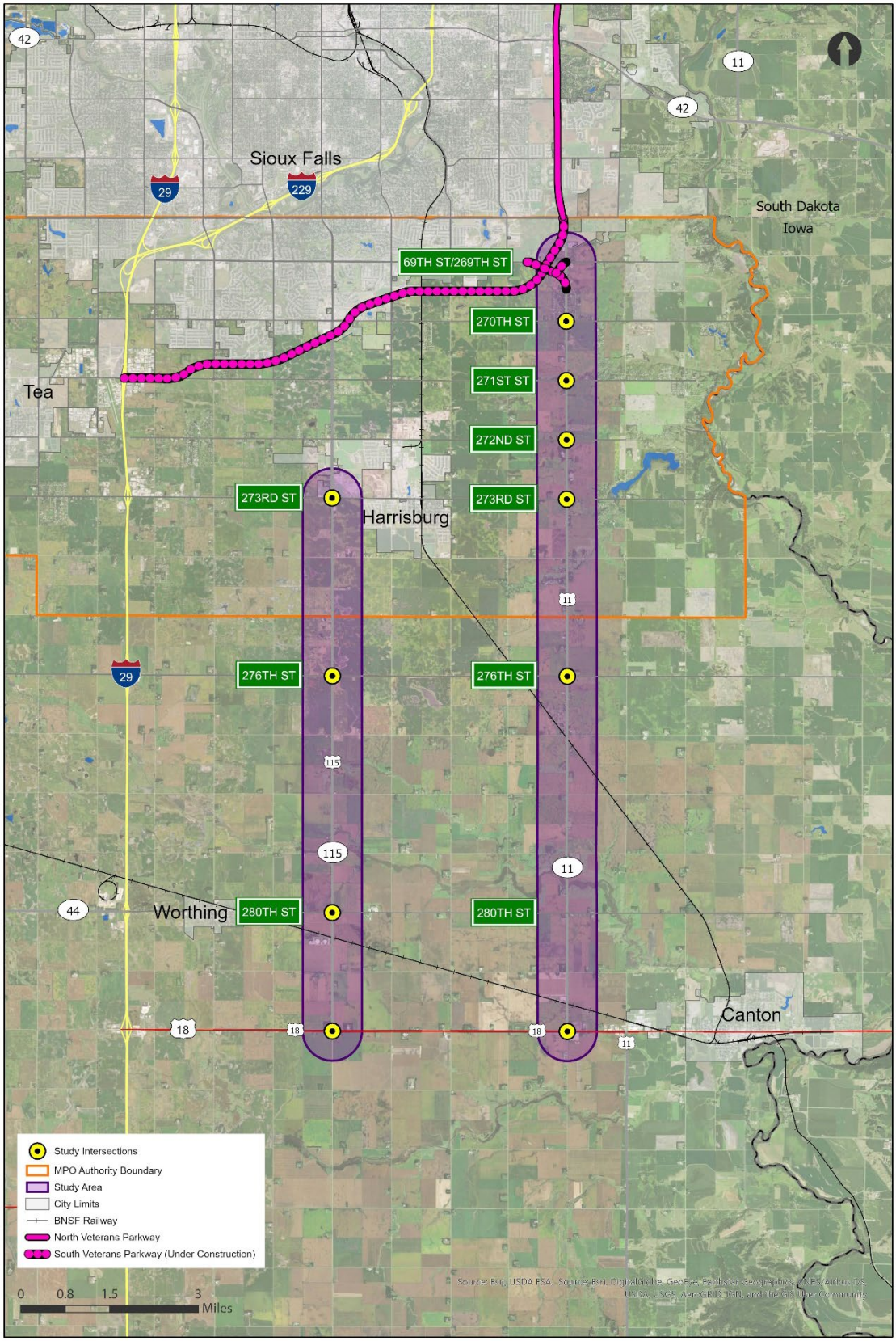

Figure 1 – Location Map

The SAT also participated in five meetings, provided feedback and reviewed the following: project kickoff, Existing Conditions Report, public meeting materials, recommendations and final Corridor Report.

A series of SAT meetings, as well as two public meetings, were conducted throughout the study as listed below. Meeting summaries are included in Appendix A.

- Kickoff Meeting – 9/16/2021
- SAT Meeting No. 1 – 2/24/2022
- SAT Meeting No. 2 – 4/27/2022
- Public Meeting No. 1 – 5/4/2022
- SAT Meeting No. 3 – 7/27/2022
- SAT Meeting No. 4 – 10/17/2022
- SAT Meeting No. 5 – 11/1/2022
- Public Meeting No. 2 – 11/9/2022
- SAT Meeting No. 6 – 1/31/2023

1.4 METHODS AND ASSUMPTIONS

Consistent with SDDOT practice for planning studies, the study team, in collaboration with SDDOT and FHWA authorities, developed a Methods & Assumptions document at the outset of the study to define the parameters and traffic analysis procedures to be used for completion of the corridor study. The approved Methods & Assumptions document is provided as Appendix B.

2 EXISTING CONDITIONS

An Existing Conditions Report was prepared as a prior study deliverable and approved in March 2022. The report inventoried the existing conditions of both the corridors and surrounding area to identify existing and future needs. The following sections provide an overview of the characteristics of the study corridors. The complete report, which contains more detailed information and analysis, is provided as Appendix C.

The population in Sioux Falls, Harrisburg, and Lincoln County continues to climb due to jobs and development bringing families to the area. Growth in this area accounts for more than half of the state's estimated population growth. As a result of this growth, there are numerous infrastructure projects occurring concurrently, including the recent approval of two new Harrisburg School District Schools, the future completion of the southern segment of Veteran's Parkway, intersection improvements at 475th Avenue and CR 110 or Willow St, and the reconstruction of US 18 from I-29 to 478th Avenue, west of Canton. Development activity is driven by the availability of utilities, such as water and sewer, and the new wastewater treatment facility at Harrisburg will contribute to the anticipated growth within the county.

2.1 LAND USE AND ZONING

SD11 and SD115 are primarily surrounded by farmland and scattered residences.

Outside of the incorporated municipalities, the zoning is primarily agricultural (A-1) allowing single family dwelling units on lots of one acre or more. There are also several rural residential developments, which are allowed at a density of one unit to the acre without water and sewer utilities. On both corridors, there are scattered commercial parcels and light industrial parcels adjacent to the BNSF rail crossing.

The Lincoln County Future Land Use Map (FLUM) anticipates that the county will remain predominantly rural, with urban expansion areas extending out from Beresford, Canton, Harrisburg, Lennox, Tea and Worthing. This is reinforced by current land use and development patterns on both corridors, which will transition this area from rural to urban as development activity is driven by expansion of the sewer improvement area. The north end of SD115 lies within the urban expansion area of Harrisburg and the south end of SD11 lies within the urban expansion area for Canton. The timing of development within these areas is dependent on the availability of utilities which may result in denser land uses and higher traffic volumes on both corridors.

2.2 FACILITY CHARACTERISTICS

Various elements of the SD11 and SD115 corridors were inventoried to provide an assessment of the existing facility conditions.

2.2.1 Right of Way

SD11 has a typical ROW width of 150 feet, decreasing to 140 feet around 271st Street and 130 feet around 270th Street. At the two BNSF rail crossings, the ROW is 100 feet centered on the rail. There is 180 feet of ROW at US 18.

SD115 has a typical ROW of 66 feet, with varying width of 80 to 186 feet within the areas of 280th Street, 279th Street, 275th Street, 274th Street and 273rd Street.

At the BNSF rail crossing, the ROW is 100 feet centered on the rail. There is 66 feet of ROW at US 18.

2.2.2 Roadway Network

The Sioux Falls metro area is served by a network of Interstates and State highways. Major east-west access is provided by I-90. North-south routes include I-29, I-229 around Sioux Falls, US 75, and US 81. Within Lincoln County, a grid network of State highways provides connectivity and mobility for a variety of users. These roadways include I-29, US 18, SD44, SD115, SD11 and SD46. Access is further provided by county roads, township, local and other minor collector roadways.

South Veterans Parkway is a planned limited access, six-lane divided facility along the southern edge of Sioux Falls that will connect I-29 to the previously completed Veterans Parkway. Construction will begin on the first segment of South Veterans Parkway in 2023, with the final segment scheduled to begin in 2026.

Beginning in 2023, an 8.12-mile segment of US 18 will be reconstructed to four lanes. The project limits extend from east of I-29 to west of SD11.

2.2.3 Typical Sections

The SD11 corridor from US 18 through 270th Street has a typical paved roadway width consisting of two, 12-foot driving lanes with 6-foot shoulders, a 30-foot obstacle clear zone and 150-foot width right of way section. The roadway, shoulder and right of way width varies in several locations along the corridor.

The SD115 corridor from US 18 through 273rd Street has a typical paved roadway width consisting of two, 12-foot driving lanes with 4-foot shoulders, a 30-foot obstacle clear zone and 66-foot width right of way section. The roadway, shoulder and right of way width varies in several locations along the corridor.

The minor street side roads have varying surfacing material, roadway and shoulder width, obstacle clear zone and right of way. In general, the roadways have two, 12-foot driving lanes with 0 to 4-foot shoulders, a 15 to 30-foot obstacle clear zone and 66 to 150 foot width right of way section.

The typical sections for both corridors as well as the side roads are depicted in Figure 2.

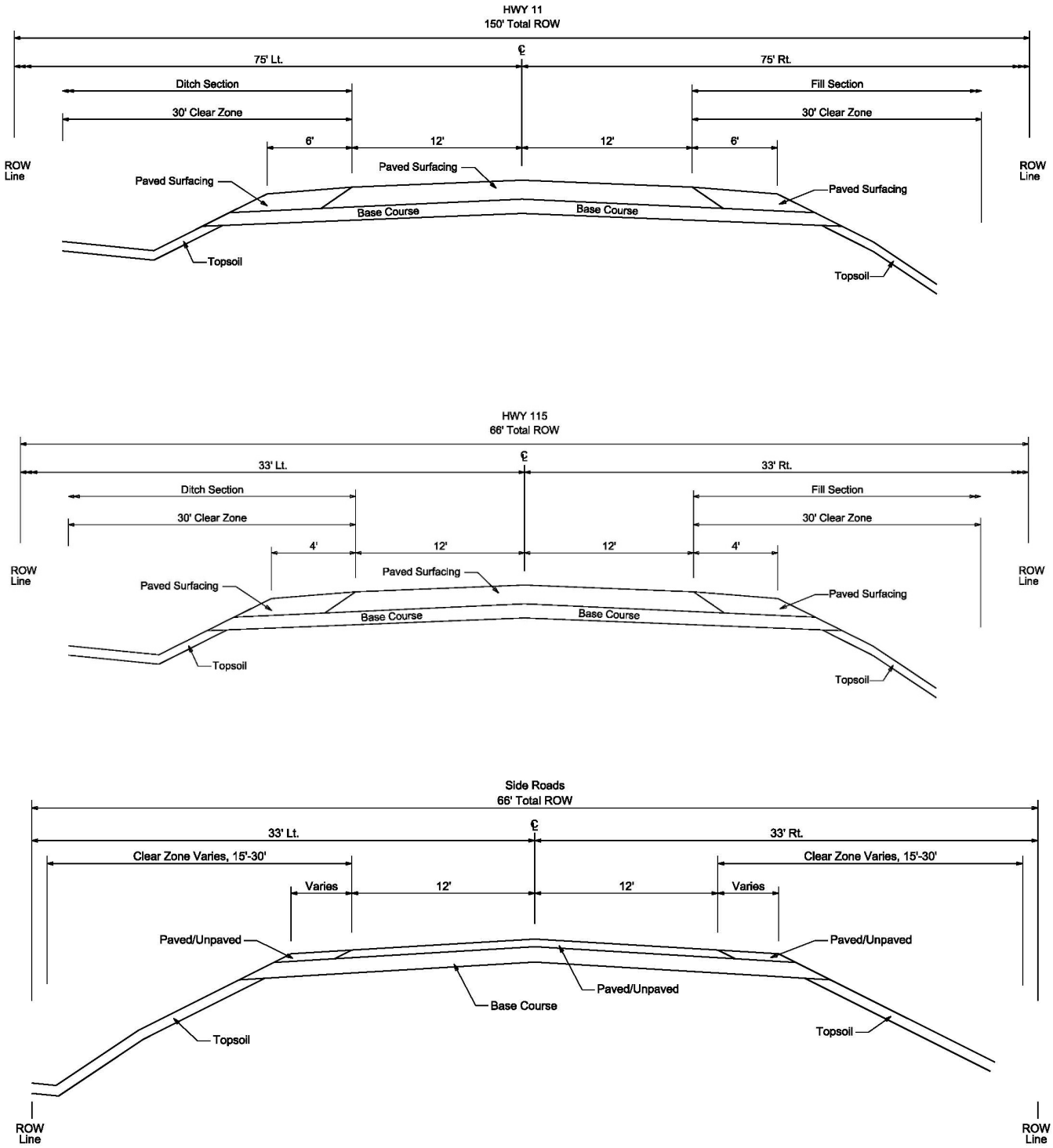

Figure 2 – Typical Sections

2.2.4 Posted Speed Limit

SD11 has a posted speed limit (PSL) of 65 miles per hour (mph). SD115 has a 65 mph PSL from US 18 to 0.5 miles south of Lincoln County 110/273rd Street, north of which it is reduced to 55 mph.

Both corridors have a design speed of 70 mph for current existing conditions. The design speed is reduced at the north end of SD115 to 60 mph approximately ½ mile south of 273rd Street (MRM 75.83). The design speed for SD11 will be reduced as it approaches Veterans Parkway once constructed.

2.2.5 Functional Classification

The SD11 corridor is classified as a minor arterial from US 18 on the south (MRM 55.43) to 270th Street at the unincorporated community of Shindler (MRM 67.38). It is classified as an Other Principal Arterial for the remainder of the study corridor, from 270th Street to 69th Street (MRM 68.39).

For SD115, the corridor is classified as a minor arterial from US 18 on the south (MRM 67.39) to 274th Street in Harrisburg (MRM 75.36). It is classified as an Other Principal Arterial for the remainder of the study corridor, from 274th Street to 273rd Street (MRM 76.33).

2.2.6 Access Classification

Segments of SD11 and SD115 located within the Sioux Falls MPO boundary are considered Urban Fringe. Standards for this classification include 1,000-foot spacing for unsignalized intersections, ¼ mile spacing for signalized intersections and no more than five access points per mile per side of roadway.

Study segments south of the MPO boundary are classified as Rural. This classification allows 1,000-foot spacing for unsignalized intersection and no more than 5 access points per mile.

The SD11 corridor (from US 18 to 270th Street) is approximately 13 miles in length and has a total of 99 access locations, while SD115 (from US 18 to 273rd Street) is approximately 9 miles in length and has a total of 49 access locations. Access density varies along both corridors and ranges from approximately 40 feet up to ¾ of a mile.

2.2.7 Structures

On SD11, there are three bridge-size structures on the corridor, consisting of one reinforced concrete box culvert (RCBC) (42-140-017) in very good condition (sufficiency rating of 84.7); one continuous concrete slab bridge (42-140-063) in good condition (sufficiency rating of 87.0); and one continuous steel girder bridge (42-140-115) in good condition (sufficiency rating of 87.0). Some cracking and delamination was noted in the latter two structures.

On SD115, there are two RCBCs. Structure 42-100-056 is in very good condition (sufficiency rating of 95.6). Structure 42-100-109 is in very good condition (sufficiency rating of 98.8. No significant defects were noted for either structure.

2.2.8 Pavement Condition

SD11 within the project limits is surfaced with asphaltic concrete pavement. The current condition ranges from fair to excellent, with the section from MRM 64.40+0.024 (~273rd Street) to MRM 68.00+0.355 (~69th Street) currently programmed for regrading and PCC surfacing in 2029 (PCN 03XE).

From US 18 to 273rd Street, SD115 is surfaced with asphaltic concrete pavement. North of MRM 76.187, SD115 has a concrete surface. SD115 from MRM 67.39+0.000 to 76.00+0.059 was overlaid in summer 2021 (PCN 04ET) and the current condition of the study corridor is excellent.

2.3 GEOMETRIC REVIEW

Both SD11 and SD115 are north/south section line highways that serve Lincoln County and Sioux Falls. The geometric review focuses on the corridors and ten study intersections, with information on the section line county roads, township roads and other intersections available in Appendix C.

2.3.1 SD11

Within the study corridor, SD11 is primarily a north/south two-lane rural highway which begins at US 18 and runs along the section line where it transitions to Veterans Parkway. SD11 will eventually connect into the new South Veterans Parkway that run east/west along the southern edge of Sioux Falls. The typical section consists of two, 12-foot lanes and 6-foot paved shoulders. The vertical profile of the roadway is flat with some rolling terrain. The corridor has a 65 mph PSL.

Corridor no passing zones are primarily located in advance of intersections and railroad crossings.

There are two at-grade railroad crossings along the corridor. A BNSF railroad line crosses SD11 about 2,400 feet north of US 18. At this location, there is a transfer station for Growmark, Inc. A no passing zone is posted 775 feet south and 840 feet north of the railroad crossing for the northbound approach and southbound lanes, respectively.

2.3.1.1 SD11 at US 18 (MRM 55.43)

West of SD11, US 18 is a two-lane highway with 3-foot paved shoulders and a 65 mph PSL. The intersection with SD11 is a two-way stop controlled intersection for the northbound and southbound approaches. The south leg of the intersection is a gravel township roadway with stop control. The southbound approach is a single lane with stop control. The eastbound approach has an 85-foot dedicated left-turn lane, with a 680’ taper, and a thru/right-turn lane. The westbound approach has a dedicated right-turn lane that is a capture lane from the 4-lane section to the east. Beginning directly east of SD11, a 400-foot taper begins to add an additional westbound thru lane. A no passing lane is striped and posted 640-foot in advance of US 18 for the southbound approach. For the eastbound approach there is a 1,700-foot no passing striped and posted west of SD11.

Approximately 500 feet east of SD11, US 18 transitions to a 4-lane undivided highway with 10-foot paved shoulders. SDDOT Project No. NH 0018(157)438, PCN 6923 is planned to widen US 18 to four

lanes with a center median, from I-29 towards Canton to just west of the west junction of SD11. Construction is planned for 2023 and 2024.

There is a surface parking lot located in the northeast corner of the intersection that has a full access driveway located 360-foot north of US 18.

2.3.1.2 SD11 at 276th Street (MRM 61.43)

276th Street (Lincoln County 116) is a two-lane east/west county roadway with a 55 mph PSL. The roadway section is a paved section with 12-foot lanes and no shoulders. The eastbound and westbound approaches are two-way stop controlled. The northbound approach has a 140-foot dedicated left-turn lane and the southbound approach has 410-foot dedicated left-turn lane.

2.3.1.3 SD11 at 273rd Street (MRM 64.40)

273rd Street (Lincoln County 110) is a two-lane east/west county roadway with a 55 mph PSL. The roadway section is paved with 11-foot lanes with a combination 2-foot paved shoulder and 3-foot rock shoulder. The eastbound and westbound approaches are two-way stop controlled. The west leg of 273rd Street is the main east/west corridor that serves Harrisburg. The east leg of the intersection provides access to Lake Alvin State Recreation Area. The northbound approach has a 515-foot dedicated left-turn lane and the southbound approach has 525-foot dedicated left-turn lane.

2.3.1.4 SD11 at 272nd Street (MRM 65.40)

272nd Street is a section line township road with a gravel surface and two-way stop control for the eastbound and westbound approaches.

2.3.1.5 SD11 at 271st Street (MRM 66.40)

271st Street (Lincoln County 106) is a two-lane east/west county roadway with a 55 mph PSL. The roadway section is paved with 12-foot lanes with a 2-foot rock shoulder. The intersection is currently All-way stop controlled.

2.3.1.6 SD11 at 270th Street (MRM 67.38)

270th Street is a section line township road with a gravel surface and two-way stop control for the eastbound and westbound approaches. The north leg of the intersection runs through the Shindler residential neighborhood.

2.3.2 SD115

Within the study corridor, SD115 is primarily a north/south two-lane rural highway which begins at US 18 and continues north along the section line until it becomes South Minnesota Avenue at 271st Street. The typical section consists of two, 12-foot lanes and 4-foot paved shoulders. The vertical profile of the roadway is flat with some rolling terrain. The corridor has a 65 mph PSL. Beginning 725 feet south of

273rd Street, SD115 transitions to a four-lane divided urban roadway with curb and gutter. A 10-foot multi-use path runs along the east side of SD115 beginning at 273rd Street.

There is one at-grade railroad crossing along the corridor. A BNSF railroad line crosses SD115 about 2,450 feet south of the intersection of 280th Street. A no passing zone is posted 765 feet south and 775 feet north of the railroad crossing for the northbound approach and southbound lanes, respectively.

Corridor no passing zones are primarily located in advance of intersections and railroad crossings.

2.3.2.1 SD115 at US 18 (MRM 67.39)

West and east of SD115, US 18 is a two-lane east/west highway with 3-foot paved shoulders and a 65 mph PSL. The intersection with SD115 is a two-way stop controlled intersection for the northbound and southbound approaches. The south leg of the intersection is a gravel county roadway (474th Avenue/Lincoln County 121) with stop control. The southbound approach has a right-turn bypass lane with stop control and a thru-left turn lane with stop control. The westbound approach has a 65-foot dedicated left-turn lane, with a 250-foot taper, a thru lane, and a channelized right-turn lane. The eastbound approach has an 85-foot dedicated left-turn lane, with a 290-foot taper and a thru-right turn lane.

SDDOT Project No. NH 0018(157)438, PCN 6923 is planned to widen US 18 to four lanes with a center median, from I-29 towards Canton to just west of the west junction of SD11. Construction is planned for 2023 and 2024.

There is a residential property at the northwest corner of the intersection with a driveway entrance approximately 400 feet north of the intersection. On the southwest corner, there is another residential property with a driveway entrance approximately 250 feet south of the intersection.

2.3.2.2 SD115 at 280th Street (MRM 69.41)

280th Street is a two-lane east/west roadway, with a 55 mph PSL. It serves the town of Worthing and has an existing interchange to access I-29. The west leg of 280th Street (Lincoln County 124) is a paved rural roadway section with 12-foot lanes, a 2-foot paved shoulder and 4-foot rock shoulder. The east leg of 280th Street is a gravel surface township roadway. The intersection has two-way stop control for the eastbound and westbound approaches.

2.3.2.3 SD115 at 276th Street (MRM 73.33)

276th Street (Lincoln County 116) is a two-lane east/west county roadway with a 55 mph PSL. The roadway is a paved rural section with 12-foot lanes and no shoulders. The eastbound and westbound approaches are two-way stop controlled.

2.3.2.4 SD115 at 273rd Street (MRM 76.33)

273rd Street (Lincoln County 110) is a two-lane east/west county roadway. The intersection with SD115 is signalized and there are pedestrian crosswalks on each leg. The PSL on 273rd Street is 35 mph east of SD115 and 45 mph west of SD115.

The east leg of 273rd Street, also known as Willow Street, is the main east/west roadway that serves Harrisburg. Harrisburg High School is located about 2,000 feet east of SD115 and has a collector roadway (Tiger Way) that serves the school. Tiger Way runs diagonally to the northwest where it intersects with SD115 approximately 1,300 feet north of 273rd Street.

The eastbound approach has a 60-foot dedicated left-turn lane and a thru-right turn lane. On the westbound approach, there is a 65-foot dedicated left turn-lane with a 200-foot taper, a thru lane, and a 110-foot dedicated right-turn lane with a 135-foot taper. The northbound approach is a four-lane section with a 565-foot dedicated left-turn lane, a dedicated 565-foot right-turn lane, and two thru lanes. The southbound approach is a four-lane section with a 600-foot dedicated left-turn lane, a dedicated 465-foot right-turn lane, and two thru lanes.

2.4 TRAFFIC SIGNALS

There is only one traffic signal located within the study area for the SD11 and SD115 corridors. This traffic signal is located at the intersection of SD115 with 273rd Street. Each quadrant has a combination traffic signal and street lighting pole. The traffic signal provides protected left-turn signal phasing for the northbound and southbound approaches.

The eastbound and westbound approaches have protected/permissive left-turn phasing. No evidence of loop detection or video/radar vehicle detection was observed. Reflective back plates are provided for each signal head, including the pole mounted signal heads.

Each leg of the intersection has a pedestrian crosswalk and pedestrian signal phasing, including pedestrian pushbutton posts. The sidewalk ramp in the northwest quadrant is designed to accommodate the multi-use trail that runs along the east side SD115.

2.5 UTILITIES

On both the SD11 and SD115 study corridors, there are multiple utility companies and infrastructure along, under and above the highway and county roads. Based on information provided through South Dakota 811 One Call, Utility Agent/Owners (UAOs) include cable, fiberoptic and telephone lines; crude oil, electric and gas; and high voltage overhead electric.

Above ground pedestals, poles, junction boxes and other utility markers adjacent to existing right of way are present at most of the study intersections on SD11 and at a couple of study intersections on SD115.

2.6 RAIL

As listed below, there are three existing at grade rail crossings of the BNSF mainline track within the study area. The rail line is owned by BNSF Railway Company and is used by freight trains. All three crossings are at grade.

- Crossing 385875Y is located on SD11, 0.5 miles north of US 18 (MRM 55.89) near Canton
- Crossing 381627L is located on SD11, 5 miles north of US 18 (MRM 60.36)
- Crossing 385882J is located on SD115, 1.5 miles north of US 18 (MRM 68.98) near Canton and 2.0 miles east of Worthing

All three are public crossings, each with an estimated daily train movement of one through train during the day (6 AM to 6 PM) and one through train during the night (6 PM to 6 AM) according to the FRA database. The maximum timetable speed is 25 mph.

2.7 MULTIMODAL FEATURES

Due to the rural nature of the Lincoln County roadway system, paved and/or gravel shoulders serve as the primary opportunities for bicycle and pedestrian users. Both SD11 and SD115 are considered to have adequate shoulder width for accommodating bicycle and pedestrian use, although both are considered high connectivity, low comfort routes as per the Sioux Falls MPO Bicycle Plan. Within the study corridor, SD11 has 6-foot paved shoulders and SD115 has 4-foot paved shoulders. A 10-foot multi-use path runs north along the east side of SD115 beginning at 273rd Street.

There is no fixed route transit service in Lincoln County.

2.8 TRAFFIC OPERATIONS

Traffic operations analysis follows the parameters set forth in the approved Methods and Assumptions (M&A) Memo, provided as Appendix B. The selected measure of effectiveness (MOE) was Level of Service (LOS). LOS is a qualitative assessment of a highway's operating conditions and references the average stop delay per vehicle (expressed as seconds of delay per vehicle, or sec/veh). LOS is ranked on a scale of A through F, reflecting the relative ease of traffic flow. The minimum LOS standard for SD11 and SD115 is LOS D or better for both the overall intersection and individual movements.

Based on the existing traffic volumes, the unsignalized intersection of SD11 and 271st Street exceeds the LOS standard in the PM peak period. The overall intersection is currently operating with an overall LOS E during the PM peak period with the southbound approach operating at LOS F and the eastbound approach at LOS E. Traffic signal warrant analyses indicated that the intersection turning movement volumes currently meet the volume criteria to meet Manual on Uniform Traffic Control Devices (MUTCD) Warrant 2 (Four Hour Vehicular Volume), Warrant 3 (Peak Hour Volume), and Warrant 7 (Crash Experience).

All other study intersections operate at an acceptable LOS.

2.9 CRASH HISTORY REVIEW

Crash data was provided by SDDOT for the five-year period of 2016 to 2020. The data was organized by roadway corridor (SD11 or SD115) and is used for the purposes of analyzing historical crashes and the identification of trends or needs along the corridors. Within this period, a total of 154 crashes were reported along SD11 and 60 crashes on SD115.

On SD11, 74 crashes were identified as intersection crashes and the remaining 80 were categorized as highway segment crashes. Non-injury and animal collisions make up 78.57% of crashes on the corridor, followed by possible injury (9.09%) and non-incapacitating injury (8.44%). There was one fatal and 5 incapacitating injury crashes during the study period, for 3.90% of the total crashes.

On SD115, 32 crashes were identified as intersection crashes and the remaining 28 were categorized as highway segment crashes. Non-injury and animal collisions make up 67% of crashes on the corridor, followed by possible injury (16.67%) and non-incapacitating injury (8.33%). There was one fatal and four incapacitating injury crashes during the study period, for 8.34% of the total crashes.

On both corridors, while the most commonly listed harmful event was “no collision between 2 motor vehicles in transport,” the next most common crash event was an “Angle” collision followed by “Rear End.” The most common manner of collision was “motor vehicle in transport” and “Wild Animal.”

Crash rates were calculated for each segment as crashes per million vehicle miles (MVM) traveled. The highest segment crash rate was on SD11 from 272nd Street to 271st Street (1.2489). All segments examined are well under the South Dakota 2020 weighted average crash rate for similar facilities. The crash rates for all the study segments are also lower than the statewide averages for the South Dakota critical crash rate.

Intersection crash rates were calculated as crashes per million entering vehicles (MEV). The highest intersection rate on SD11 was at 273rd Street, at 1.4893 MEV. On SD115, the intersection of SD115 at 276th Street had the highest crash rate, at 1.8193 MEV.

Over half of the crashes on both corridors occurred at night. Over two-thirds of nighttime crashes involved a wild animal strike. The ratio of night to day collision rates (N/D Ratio) for the study corridors exceeds the warranting condition of greater than 2.1 for roadway lighting. However, because there were only two incapacitating crashes and most of the crashes involved a wild animal strike, full corridor lighting may not achieve a positive benefit cost ratio. Select intersection lighting may be more beneficial.

2.10 INTELLIGENT TRANSPORTATION SYSTEMS

SDDOT has implemented intelligent transportation systems (ITS) technology throughout the state to improve operations and safety and provide enhanced traveler information. Through the Transportation

Systems Management and Operations (TSM&O) Program Plan, which provides a framework for action, the SDDOT directly manages the causes of recurring and non-recurring congestion in real time and prepares individual action plans to respond to events that affect the operation of the transportation system.

TSM&O focuses on safety, real-time flow of traffic and avoidance of problems that might delay motorists. ITS recommendations are directly developed for three system areas:

- Traveler information systems
- Event traffic management
- Incident (safety) improvements

Examples include managing congestion during winter weather events, traffic incidents, work zones and special events.

The Sioux Falls MPO has not developed an Intelligent Transportation System (ITS) Master Plan nor is there an existing ITS network in proximity to the study corridors.

3 ENVIRONMENTAL SCREENING REPORT

Provided in Appendix D, the Environmental Screening Report for each corridor was developed to identify environmental resources and environmentally sensitive areas for the Northern Lincoln County Corridors Study (SD11 and SD115). Its purpose is to identify resources early in the planning process to avoid fatal flaws and to consider sensitive environmental resources in the Project and NEPA Study Areas. It also connects the long-range transportation planning and NEPA requirements so that planning decisions are carried forward into project development.

The Environmental Screening Report aids in determining the most reasonable and feasible option(s) to be advanced into further environmental studies. Potential environmental resource impacts will be considered in the alternatives analysis to avoid and minimize impacts during subsequent study phases, while also developing alternatives that meet a project's purpose and need. The results of the Environmental Screen will be carried forward into NEPA.

3.1 ENVIRONMENTAL DATA SOURCES AND RESOURCES

The review included a desktop analysis of the latest available data and a field survey of both Project Study Areas. The review specifically covers resources with the potential to delay or stop project development or make permitting project activities challenging, including those resources with specific regulatory drivers such as the Endangered Species Act and Clean Water Act. Environmental resources evaluated include:

- Water Resources, including Waters of the United States, Waters of the State, Wetlands, Storm Water and Floodplains
- Wild and Scenic Rivers
- Threatened and Endangered Species, Migratory Birds, Eagles, and Unique Wildlife Habitat
- Cultural Resources
- Section 4(f) and Section 6(f) Resources
- Paleontological Resources
- Land Use and Economic Resources
- Community and Social Resources
- Title VI/Environmental Justice
- Climate Change/Equity
- Bicycle and Pedestrian Facilities
- Visual Resources and Aesthetics
- Prime and Unique Farmlands
- Air Quality
- Hazardous Materials
- Noise

- Right-of-Way, Acquisition, and Relocation Potential
- Utilities

Based on the desktop analysis, the following resources were determined not to be present in the study vicinity and were, therefore, excluded from further review:

- Wild and Scenic Rivers
- Paleontological Resources
- Community and Social Resources
- Title VI/Environmental Justice
- Climate Change/Equity
- Visual Resources and Aesthetics
- Air Quality
- Railroad Crossings

3.2 KEY FINDINGS FROM ENVIRONMENTAL SCREEN

Information provided in the following sections summarizes those environmental resources that are likely to be impacted by the proposed improvements, or that will likely require special attention during the next phase of environmental review and evaluation to avoid, minimize, or mitigate potential impacts. Detailed information regarding each of these environmental resources, as well as those listed in the previous section, can be found in Appendix D.

Table 3 provides a summary of the resources noted for each corridor that are present and should be further considered for each project. If a resources category is not noted, the resource was not present. Items that are needed during the NEPA process for each identified project are listed below.

- Wetland field delineations are needed and an approved jurisdictional determination from USACE.
- A Section 404 permit is needed with a Section 401 State Water Quality Certification. Depending upon the level of impact, wetland mitigation may be required. Wetland credits would be purchased from a private wetland bank or if available utilized from the SDDOT Wetland Mitigation Bank.
- Obtain a SDDANR General Permit.
- Coordination with USFWS and SDGFP to determine effects to threatened and endangered species would be completed. Concurrence of effects to these species is required from USFWS.
- Complete Level III cultural resources survey and consult with SHPO to determine the project effect determination.
- Identify Section 4(f) and 6(f) properties and determine if any temporary or permanent use of the properties is required.
- Access to residences and businesses will need to be considered during final design.

- Review the final design to confirm its consistent with land use plans and economic growth patterns.
- Consider the need for and future of recreational bicycle and pedestrian trail systems during final design.
- Updated review of the SDDANR Tanks, Spills, and Environmental Map database is recommended, along with SDDANR agency coordination.
- Review the need to complete a noise analysis for proposed improvements at intersections.
- All ROW and relocation impacts would be mitigated in conformance with the Uniform Relocation Assistance and Real Property Acquisition Act (UA) of 1970.

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Table 3 – Summary of Environmental Screen

Environmental, and Social Resources	SD11	SD115
Water Resources	Wetlands (slope, riverine, and depressional) and streams are present within the Study Area.	Wetlands (slope, riverine, and depressional) and streams are present within the Study Area.
Stormwater	Runoff and stormwater would need to be considered due to the terrain and current drainage conditions.	Runoff and stormwater would need to be considered due to the terrain and current drainage conditions.
Floodplains	Zones A and AE are present.	Zones A and AE are present.
Groundwater	Groundwater Protection Zones A and B are present.	Groundwater Protection Zones A and B are present.
Federal and State Threatened and Endangered Species (including candidate species)	Northern long-eared bat, monarch butterfly, northern redbelly dace, Topeka shiner, and lined snake are potentially present.	Northern long-eared bat, monarch butterfly, northern redbelly dace, Topeka shiner, and lined snake are potentially present.
Cultural Resources	Eligible sites are present within previously surveyed areas within the corridor. All undisturbed areas would need to be surveyed to identify sites for future projects.	Eligible sites are present within previously surveyed areas within the corridor. All undisturbed areas would need to be surveyed to identify sites for future projects.
Section 4(f) Resources	Potentially cultural resource sites	Potentially cultural resource sites
Land Use and Economic Resources	Numerous businesses are present within the corridor.	Numerous businesses are present within the corridor.
Bicycle and Pedestrian Facilities	Future facilities have been noted in planning documents. No specific route or design has been developed.	Future facilities have been noted in planning documents. No specific route or design has been developed.
Farmland	Prime farmland is present.	Prime farmland is present.
Hazardous Materials	Spill events and noted facilities were present.	Spill events and noted facilities were present.
Noise	Receptors are located adjacent to roadway by potential improvements.	Receptors are located adjacent to roadway by potential improvements.

4 TRAFFIC FORECASTS

The approved methodology for development of the future traffic volumes is documented in the Methods and Assumptions memo, provided as Appendix B. In the Existing Conditions Report (Appendix C), future traffic volumes were developed for the 2050 forecast scenario using the Sioux Falls MPO Travel Demand Model. Growth rates were derived by extrapolating between the travel demand model base and forecast years to develop the projected year 2050 ADT volumes.

The travel demand model volumes and growth rate summary are provided in Appendix E of the Existing Conditions report. Projected year 2050 ADT volumes for both corridors are shown in Table 4 and Table 5. A summary of the intersection turning movements for the 2050 Future Year AM and PM peak hours is provided in Figure 8 through Figure 11.

Table 4 – SD11 Segment ADT Volumes

Corridor	Segment	2021	2050
SD11	North of 270th St	7,500	10,380
	B/W 270th St and 271st St	7,185	9,695
	B/W 271st St and 272nd St	5,265	7,905
	B/W 272nd St and 273rd St	5,125	8,270
	B/W 273rd St and 276th St	4,120	6,805
	B/W 276th St and US 18	2,885	5,460
270th St	West of SD11	450	900
	East of SD11	360	770
271st St	West of SD11	5,220	6,500
	East of SD11	3,450	4,120
272nd St	West of SD11	70	550
	East of SD11	160	1,180
273rd St	West of SD11	2,740	4,010
	East of SD11	1,260	2,100
276th St	West of SD11	1,740	2,750
	East of SD11	2,020	3,250
US 18	West of SD11	4,560	6,500
	East of SD11	6,490	9,680

Table 5 – SD115 Segment ADT Volumes

Corridor	Segment	2021	2050
SD115	North of 273rd St	6,720	14,470
	B/W 273rd St and 276th St	3,330	6,930
	B/W 276th St and 280th St	2,690	4,320
	B/W 280th St and US 18	2,035	3,330
273rd St	West of SD115	6,360	9,250
	East of SD115	8,230	12,740
276th St	West of SD115	2,270	3,450
	East of SD115	1,950	2,940
280th St	West of SD115	890	1,020
	East of SD115	130	190
US 18	West of SD115	3,820	8,730
	East of SD115	4,470	9,000

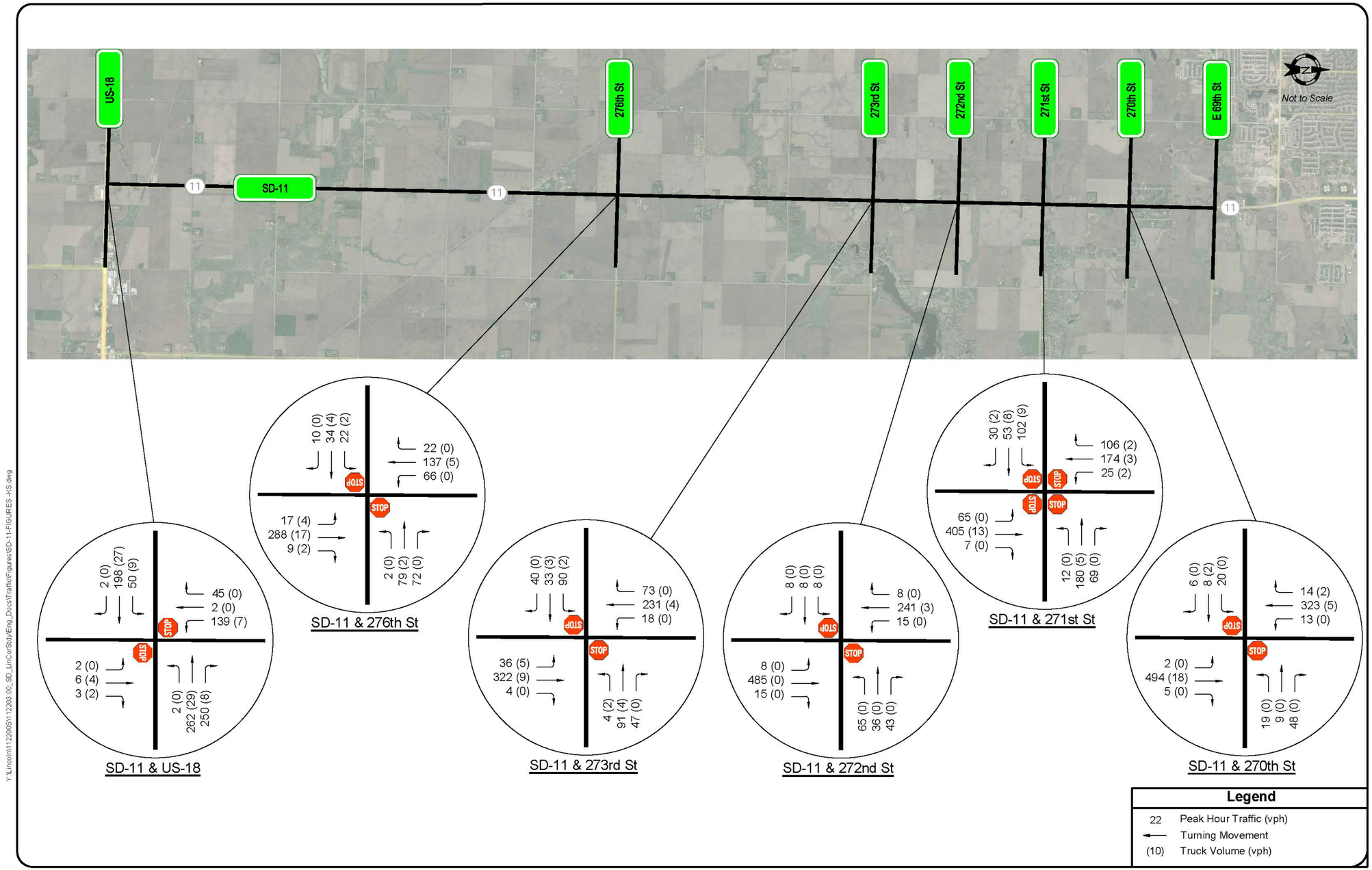


Figure 3 – 2050 Future No Build AM Peak Hour Turning Movement Volumes (SD11)

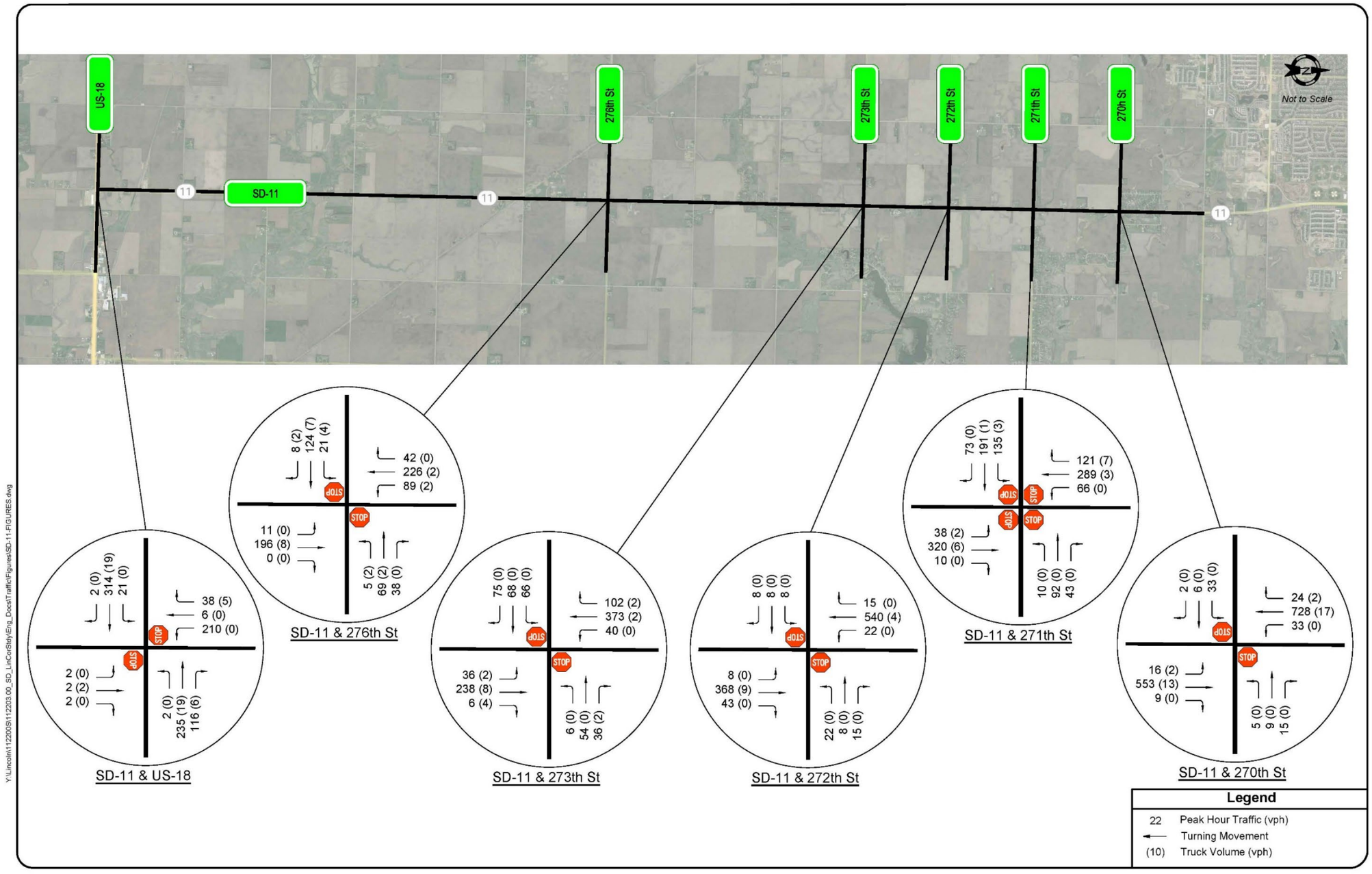


Figure 4 – 2050 Future No Build PM Peak Hour Turning Movement Volumes (SD11)

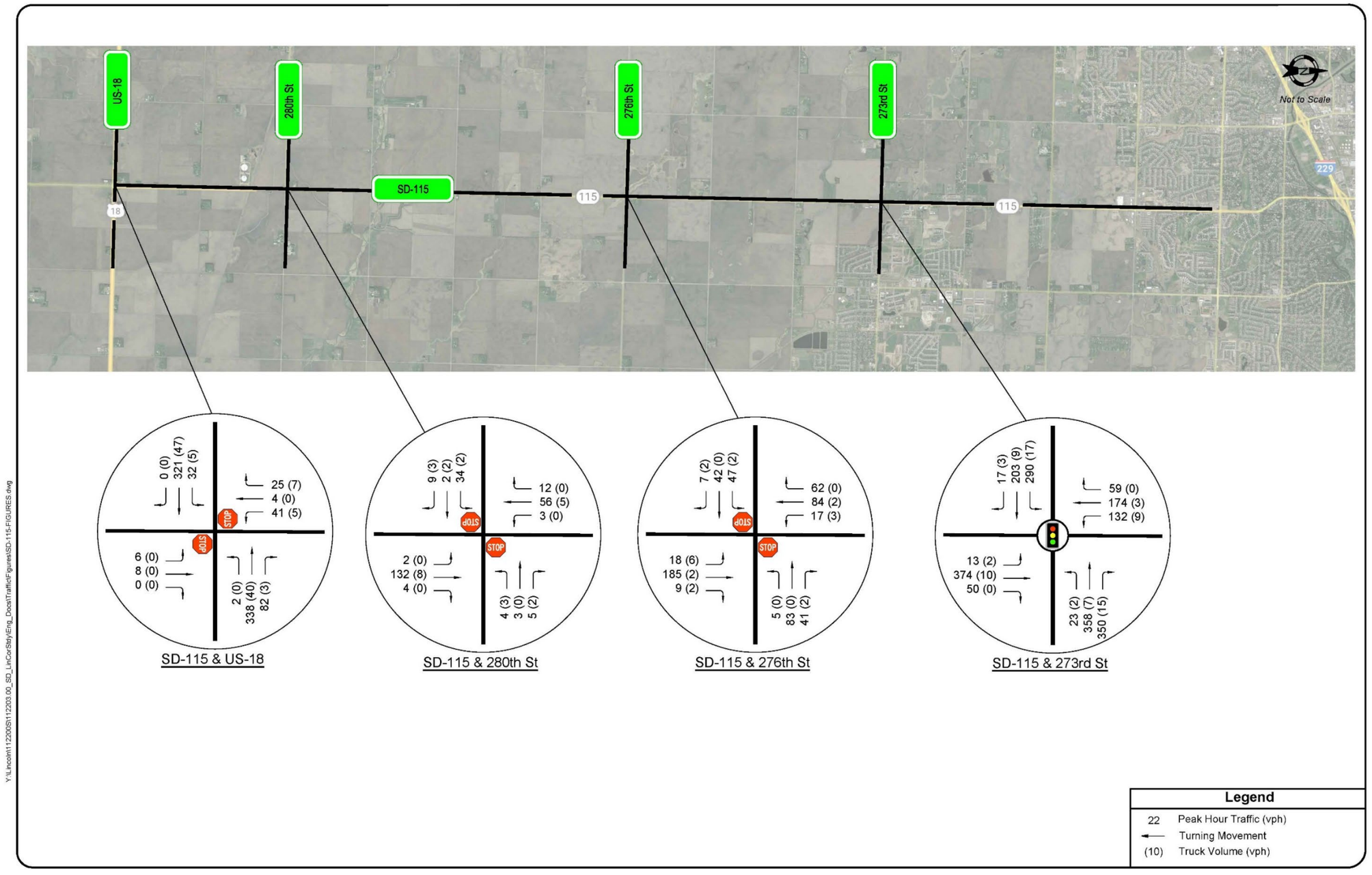


Figure 5 – 2050 Future No Build AM Peak Hour Turning Movement Volumes (SD115)

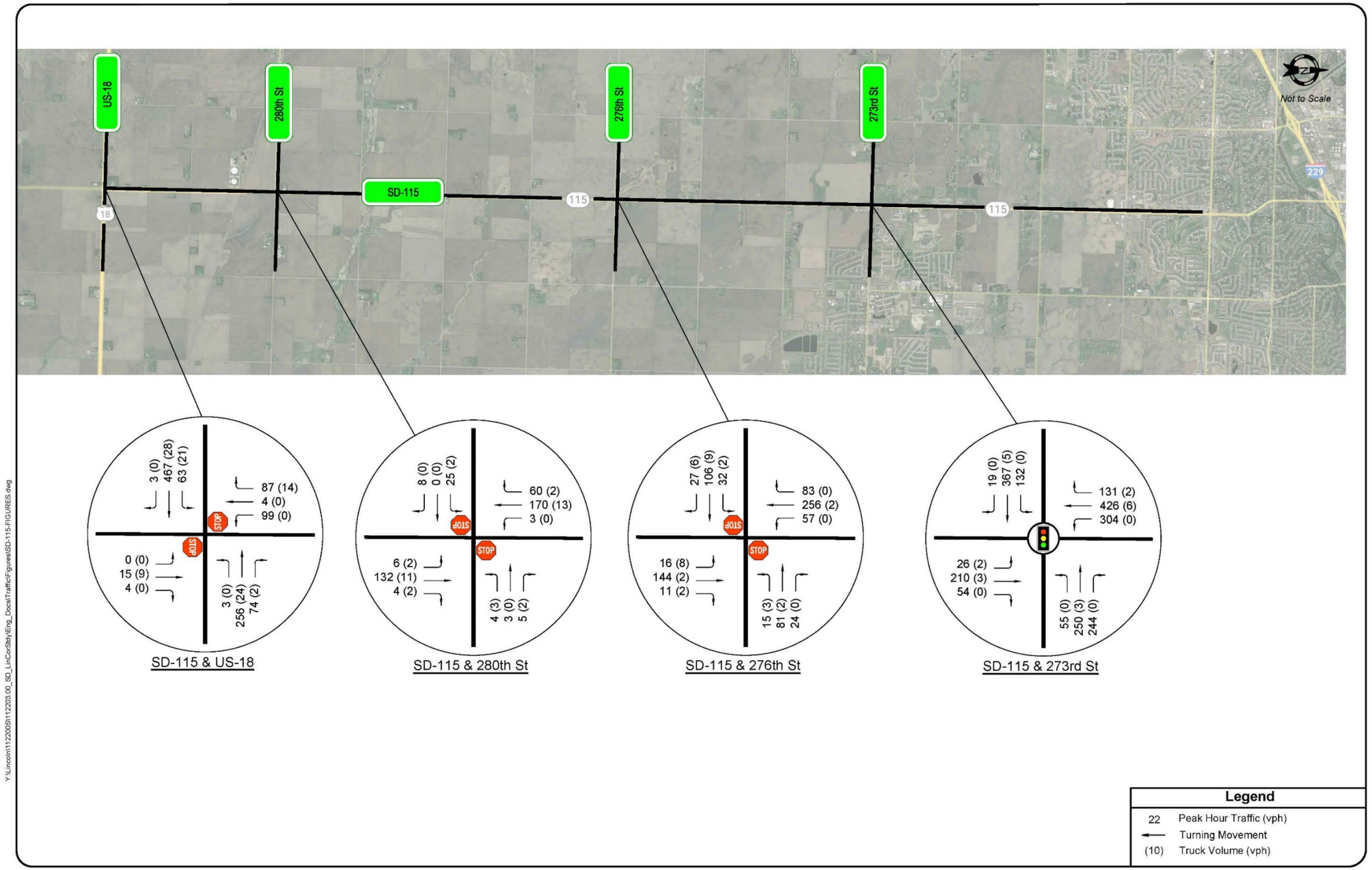


Figure 6 – 2050 Future No Build AM Peak Hour Turning Movement Volumes (SD115)

5 FUTURE (2050) NO BUILD CAPACITY ANALYSIS

Intersection capacity analyses for the projected year 2050 traffic volumes and the existing intersection geometrics/traffic control were provided in the Existing Conditions Report. This 2050 No Build scenario was used to determine the traffic operation for the corridor if no improvements were made.

The following sections detail the 2050 No Build levels LOS for the study intersections. For SD11 and SD115, Figure 12 through Figure 15 provide a summary of the overall intersection LOS, individual turning movement LOS and the 95th percentile vehicle queue lengths, to the nearest 5 feet.

Refer to Appendix F in the Existing Conditions Report (provided as Appendix C to this document) for the HCS printouts.

5.1 SD11 AND US 18

Based on the unsignalized capacity analyses for the future 2050 volumes, the individual turning movements are anticipated to operate with LOS C or better for both AM and PM peak periods except for the following movement:

- Southbound Approach – LOS E (PM Peak)

5.2 SD11 AT 276TH STREET

Based on the unsignalized capacity analyses for the future 2050 volumes, the individual turning movements are anticipated to operate with LOS C or better for both AM and PM peak periods except for the following movement:

- Eastbound Approach – LOS E (PM Peak)

5.3 SD11 AND 273RD STREET

Based on the unsignalized capacity analyses for the future 2050 volumes, the individual turning movements are anticipated to operate with LOS C or better for both AM and PM peak periods except for the following movement:

- Eastbound Approach – LOS F (AM and PM Peak)

Due to the poor level of service for the eastbound approach, traffic signal warrant analyses were completed using the projected 2050 intersection volumes. As shown in Table 6, the analysis indicates that the intersection would be expected to only meet Warrant 3 (Peak Hour Volume).

Table 6 – Future No Build (2050) Signal Warrant Analysis

Intersection	Warrant 1	Warrant 2	Warrant 3	Warrant 7
SD11 and 273rd St	Not Met	Not Met	Met	Not Met
SD11 and 271st St	Met	Met	Met	Met
SD11 and 270th St	Not Met	Not Met	Not Met	Not Met

5.4 SD11 AND 272ND STREET

Based on the unsignalized capacity analyses for the future 2050 volumes, the individual turning movements are anticipated to operate with LOS D or better for both AM and PM peak periods.

5.5 SD11 AND 271ST STREET

Based on the unsignalized capacity analyses for the future 2050 volumes, the unsignalized capacity analyses indicate the overall intersection is anticipated to operate with an overall LOS E and F during the AM and PM peak periods respectively. The individual turning movements are currently operating with LOS C or better, except for the following movement:

- Southbound Approach – LOS F (PM Peak)
- Eastbound Approach – LOS E (PM Peak)

Due to the poor overall intersection level of service, traffic signal warrant analyses were completed using the projected 2050 traffic volumes. As shown in Table 6, the analysis indicates that the project traffic volumes would be expected to exceed the volume thresholds for Warrant 1 (Eight Hour Vehicular Volume), Warrant 2 (Four Hour Vehicular Volume) and Warrant 3 (Peak Hour Volume).

5.6 SD11 AND 270TH STREET

Based on the unsignalized capacity analyses for the future 2050 volumes, the individual turning movements are anticipated to operate with LOS D or better for both AM and PM peak periods except for the following movement.

- Eastbound Approach – LOS E (PM Peak)

Due to the poor level of service for eastbound approach, traffic signal warrant analyses were completed using the projected 2050 intersection volumes. As shown in Table 6, the analysis indicates that the intersection would not be expected to meet any of the volume thresholds.

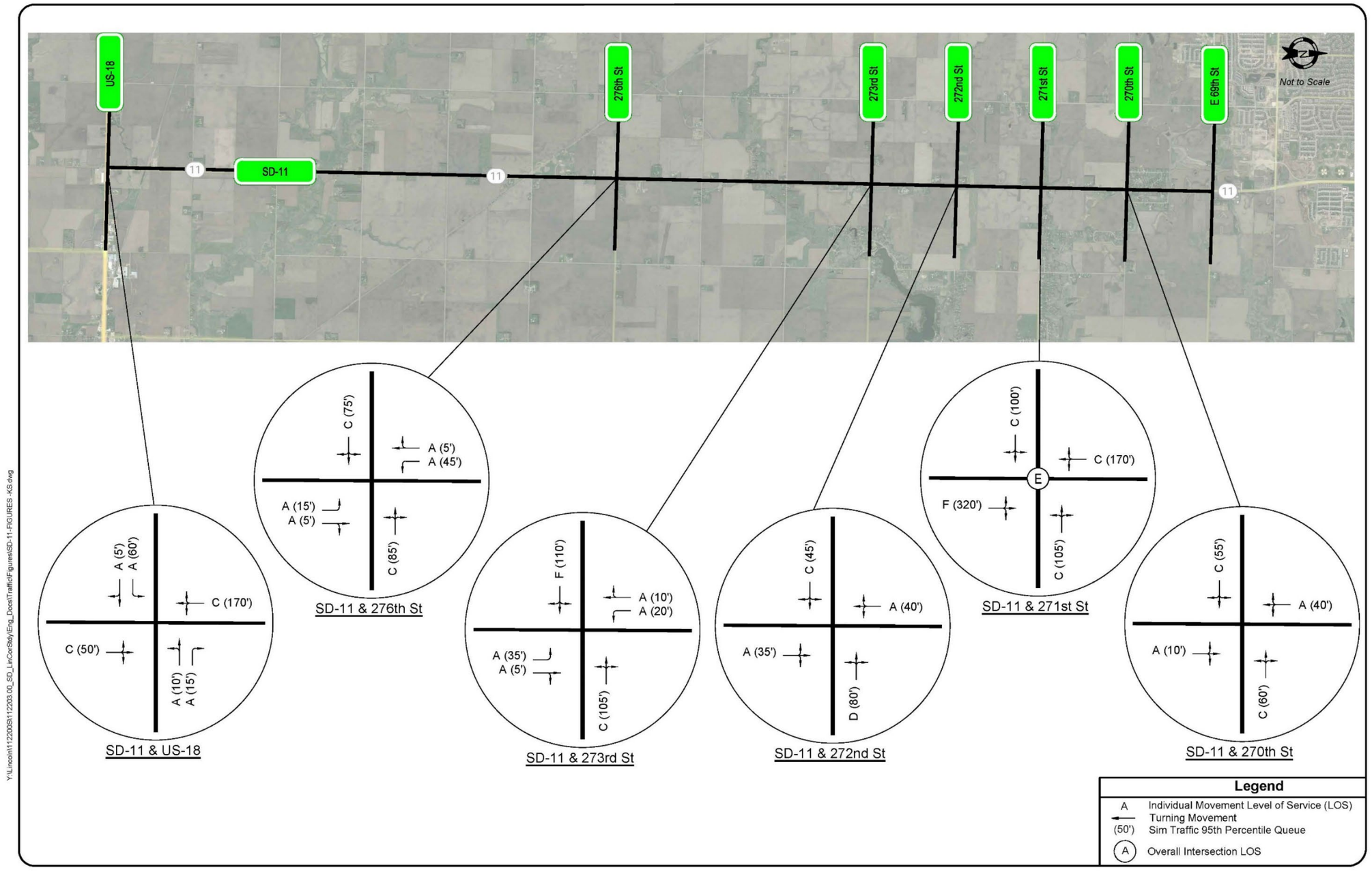


Figure 7 – 2050 AM Peak Hour Intersection LOS and Queue Summary (SD11)

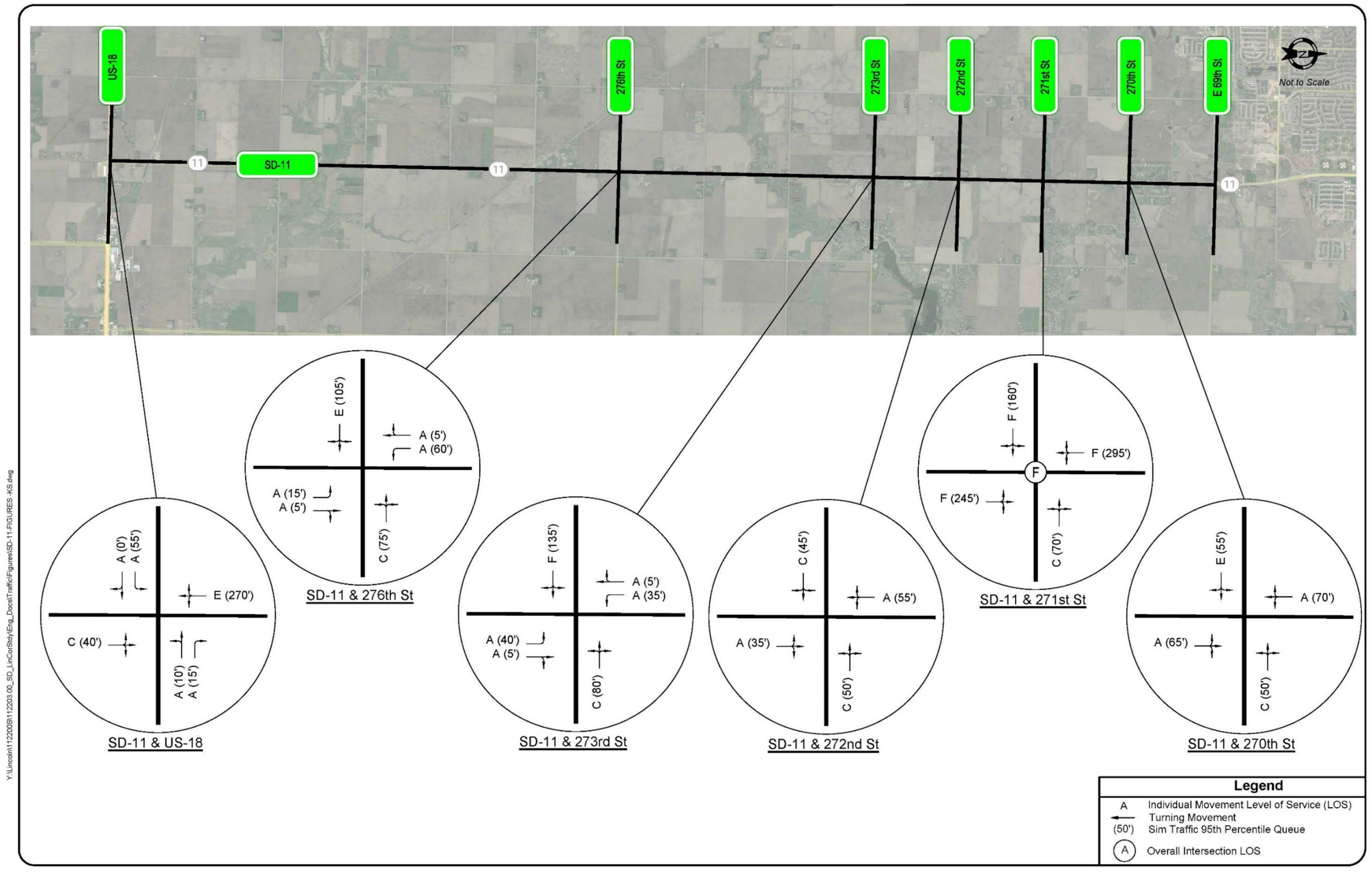


Figure 8 – 2050 PM Peak Hour Intersection LOS and Queue Summary (SD11)

5.7 SD115 AND US 18

Based on the unsignalized capacity analyses for the future 2050 volumes, the individual turning movements are anticipated to operate with LOS C or better for both AM and PM peak periods except for the following movement.

- Southbound Left-Thru movement – LOS E (PM Peak)

5.8 SD115 AND 280TH STREET

Based on the unsignalized capacity analyses for the future 2050 volumes, the individual turning movements are anticipated to operate with LOS B or better for both AM and PM peak periods.

5.9 SD115 AND 276TH STREET

Based on the unsignalized capacity analyses for the future 2050 volumes, the individual turning movements are anticipated to operate with LOS D or better for both AM and PM peak periods.

5.10 SD115 AND 273RD STREET

The signalized capacity analyses for the future 2050 volumes indicate the overall intersection is anticipated to operate with an overall LOS D and C during the AM and PM peak periods respectively. The individual turning movements are anticipated to operate with LOS D or better.

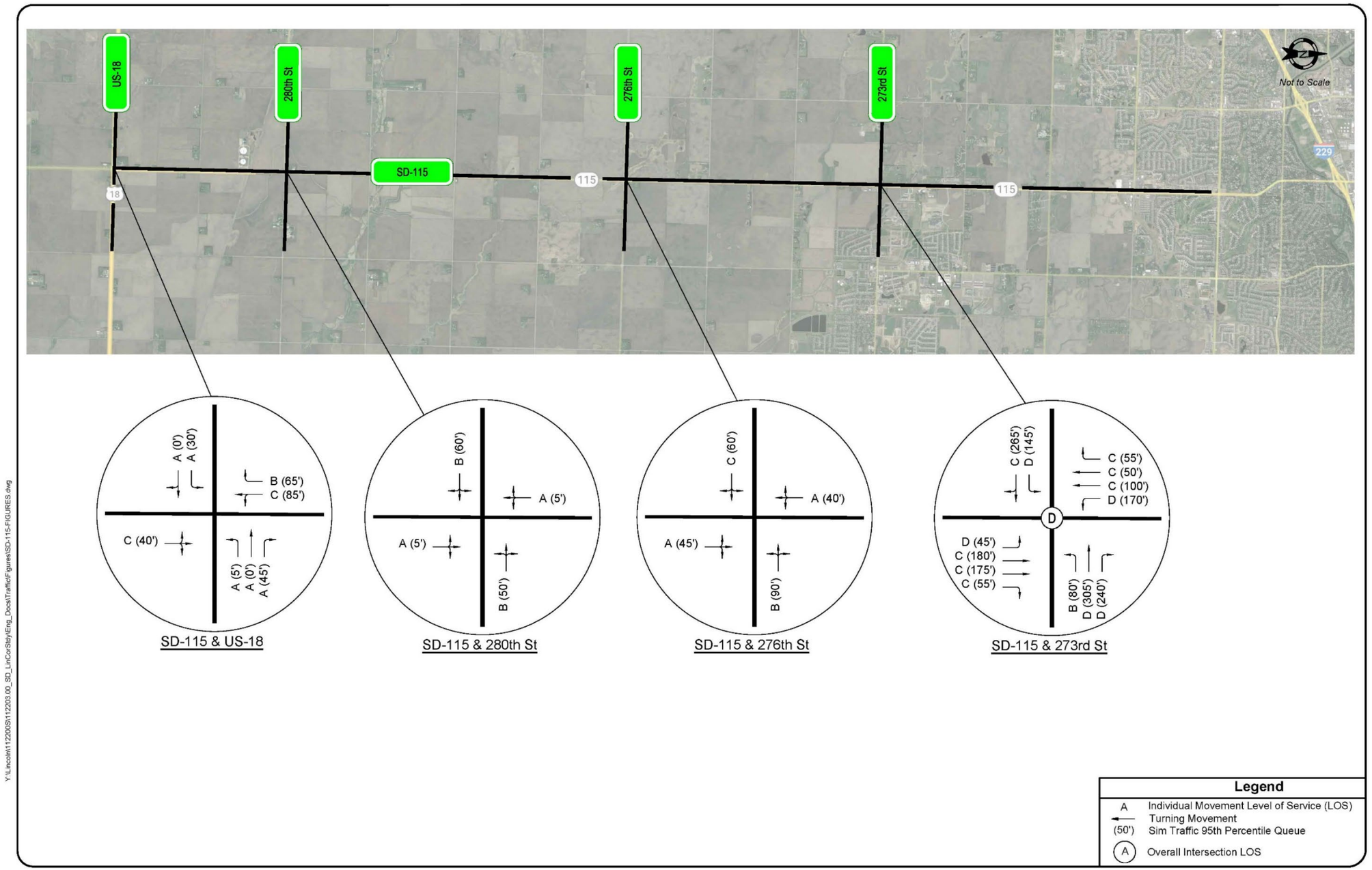


Figure 9 – 2050 PM Peak Hour Intersection LOS and Queue Summary (SD115)

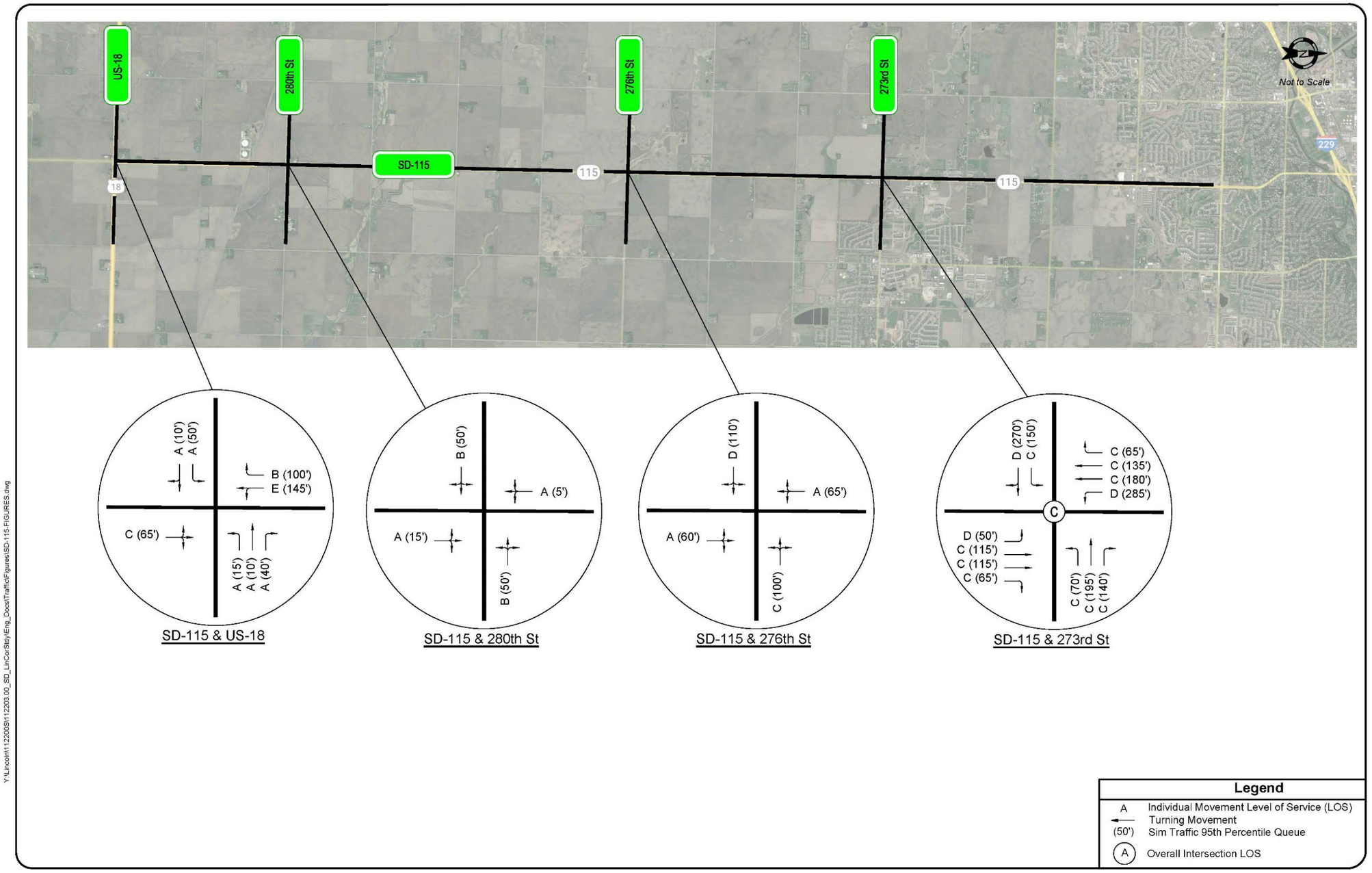


Figure 10 – 2050 PM Peak Hour Intersection LOS and Queue Summary (SD115)

6 IDENTIFICATION OF NEEDS

Identification of corridor needs is based on physical corridor deficiencies, crash analysis and the Future No Build Capacity Analysis from the Existing Conditions Report, provided as Appendix C. Additional input was also received from the SAT and at two public meetings (May 4, 2022 and November 9, 2022).

6.1 PAVEMENT CONDITION

Based on the pavement condition data provided by SDDOT, SD11 has several areas where the pavement is in fair condition. As alternatives and roadway typical sections are evaluated, pavement condition and timing for rehabilitation will need to be considered as part of the overall implementation plan for roadway modifications.

6.2 ACCESS MANAGEMENT

As development continues to grow south of Sioux Falls and around the Harrisburg area, management of access along both SD11 and SD115 will be important to maintain acceptable traffic operation and reduce the number of potential conflicts points.

Segments of SD11 and SD115 located within the Sioux Falls MPO boundary are considered Urban Fringe, with spacing standards of 1,000-foot spacing for unsignalized intersections, ¼ mile spacing for signalized intersections and no more than five access points per mile per side of roadway. Study segments south of the MPO boundary are classified as Rural which allows 1,000-foot spacing for unsignalized intersection and no more than 5 access points per mile.

An inventory of current access locations on SD11 and SD115 within study limits was conducted as part of the Existing Conditions Analysis (see Appendix C). The SD11 corridor (from US 18 to 270th Street) is approximately 13 miles in length and has a total of 99 access locations. The corridor exceeds the driveway spacing standards in both the rural (US 18 to 270th Street) and urban (270th Street to 69th Street) segments. The spacing is 12.87 driveways per mile north of 270th Street and 8.28 driveways per mile south of 270th Street.

SD115 (from US 18 to 273rd Street) is approximately 9 miles in length and has a total of 49 access locations. The spacing is 5.45 driveways per mile which marginally exceeds the standard.

6.3 ROADWAY SECTION

Several typical sections will be reviewed for the SD11 and SD115 corridors to accommodate the projected 2050 traffic volumes and to manage access. Within the Shindler area, roadway typical sections or other alternatives will need to be evaluated to minimize impacts the adjacent residential homes.

For SD11, the following 2050 Future Build scenarios will be considered to meet the needs for corridor improvement and performance:

- Two-lane corridor with turn lanes as warranted
- Three-lane corridor with turn lanes as warranted
- Four-lane undivided corridor with turn lanes as warranted

For SD115, the 2050 Build scenario will consider adding a 12’ center median to the existing conditions.

Both SD11 and SD115 corridors were analyzed to determine potential fixed objects within the clear zone of the roadways. This includes above ground utility infrastructure, culvert pipes 36-inches and larger and concrete box culverts. SD11 corridor has multiple culvert pipes and a box culvert that require additional evaluation during the alternate development process. SD115 corridor has multiple culvert pipes, box culverts, above ground utility infrastructure cabinets/regulators and overhead power poles that require additional evaluation during the alternate development process.

6.4 INTERSECTION OPERATIONS

Based on existing traffic volumes, the following intersections are operating below the LOS D standard.

6.4.1 SD11 and 271st Street

The intersection is currently operating under AWSC conditions and is at an overall LOS E during the PM peak hour. The intersection would be expected to operate with a LOS E and F during the AM and PM peak periods for the 2050 No Build volume condition. The intersection does meet MUTCD traffic signal warrants. The intersection has experienced 11 crashes within the study period and has a crash rate of 0.57 crashes/MEV. Alternative evaluation should be considered to improve overall traffic operation and safety.

6.4.2 SD11 and 273rd Street

The intersection is currently a two-way stop sign controlled intersection for the eastbound and westbound approaches. 273rd Street is the main east/west roadway to enter Harrisburg and the Lake Alvin State Recreation Area. The eastbound approach is expected to operate with a LOS F during the AM and PM peak periods for the 2050 No Build conditions. In addition to poor level of service in 2050, the intersection experienced 18 total crashes from 2016 to 2020 and currently has an intersection crash rate of 1.49 MEV. Alternative evaluation should be considered to improve overall traffic operation and safety. Alternatives should evaluate improved lighting.

6.5 SAFETY

The segment crash rates for both corridors are below the statewide averages weighted rates for similar facility types. For the period from 2016 to 2020, over half of the crashes on both corridors occur at night and many involve a wild animal. In particular, the intersection of SD11 and 273rd Street had the highest number of nighttime intersection crashes, with 11 of 18 crashes (61%) occurring in dark, not

lighted conditions. Two of these were incapacitating angle crashes, in dark, not lighted conditions. An intersection lighting assessment should be considered during the concept phase.

6.6 MULTI-MODAL/BICYCLE AND PEDESTRIAN FACILITIES

Both SD11 and SD115 are considered low comfort routes, high speed roadway with no or minimal paved shoulder for users, per Sioux Falls MPO Bicycle Plan. Due to the primary rural nature of the Project Study Area, paved and/or gravel shoulders serve as the primary opportunities for multi-modal users.

SD11 currently does not have any dedicated facilities for either bicyclists or pedestrians. Bike trails that parallel or intersect SD11 are in the long-term, future trail category in the Sioux Falls Bike Plan. As part of the roadway section evaluation, consideration will need to be given to improve pedestrian/bike connectivity, especially to destination locations like the Lake Alvin State Recreation Area.

SD115 currently has a multi-use path running along the east side of the road, north of 273rd Street. Bike trails that parallel or intersect SD115 are in the long-term, future trail category in the Sioux Falls Bike Plan. Area existing side paths in Harrisburg include the side path along the north side of Willow Street and the east side of SD115. Consideration should be given to connectivity between SD115 and parallel paths to develop a bicycle and pedestrian network along SD115 adjacent to the city limits of Harrisburg.

6.7 RAILROAD CROSSINGS

There are two at-grade rail crossings of the BNSF mainline track on SD11 and one at-grade crossing of the BNSF mainline track on SD115. Each crossing averages one train a day within separate 12-hour periods (6 AM to 6 PM and 6 PM to 6 AM).

Exposure factor is calculated by taking the number of trains per day multiplied by the ADT. The study crossings have an exposure factor of 4,070 to 5,770. Typically, grade separations are considered when the exposure factor is over 50,000. The study team developed preliminary concept plans to elevate the roadway over the tracks at these locations, which are provided in Appendix E. However, these alternatives were determined “not feasible” given the relatively high known cost and minimal exposure created from the low volume of trains at these three crossing locations.

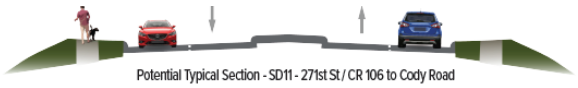
6.8 SOUTH VETERANS’ PARKWAY

The planned construction of Veterans’ Parkway will have a significant impact on the growth of this area. SD11 will intersect with the proposed South Veterans Parkway north of Shindler. The current connection to SD11 is designed with a 45 mph design speed.

6.9 SHINDLER BYPASS

Given the projected volumes and the significant number of residential access points in this area, the study team considered alternative alignments in and around the Shindler area. A range of alternatives were developed with a constraint that any new alignment would need to tie into the planned intersection location with Veteran's Parkway. These are depicted in the adjacent image with concepts included in Appendix F.

In addition to staying on alignment, the study team considered two alignments around the west side and two alignments around the east side of the Shindler development. There were many criteria considered in the evaluation as shown in the matrix and the study team determined that keeping SD11 on the existing alignment and within the existing 150 LF right-of-way corridor would be the most feasible alternative.



Description	Travel Distance	Overall Network Geometry / Connectivity	Access Management	Level of Service/Congestion	Multimodal/Bicycle and Pedestrian Facilities	Water Resources	Other Enviornmental Considerations*	Right-of-Way, Acquisition and Relocation Potential	Land Use and Economic Impacts	Construction Cost
No Build	≈	👎	👎	👎	👎	≈	≈	≈	👎	≈
West Far	👎	👎	👍	👍	👍	👎	≈	👎	👎	$$
West Near	👎	👎	👍	👍	👍	👎	≈	👎	👎	$$
Current Alignment	≈	≈	👍	👍	👍	≈	≈	≈	👍	$
East Near	👎	≈	👍	👍	👍	👎	≈	👎	👎	$$
East Far	👎	≈	👍	👍	👍	👎	≈	👎	👎	$$

Ten criteria were used to evaluate the potential Shindler alignments.

LEGEND
- Better Outcome
- Worse Outcome
- $$ Higher Cost
- ≈ Neutral Outcome

Multiple alignments were considered to route SD11 at Shindler.

7 ALTERNATIVES ANALYSIS

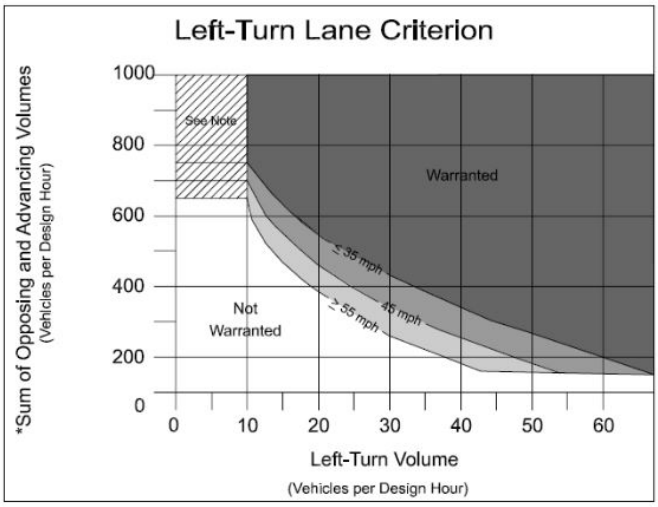
7.1 BUILD INTERSECTION IMPROVEMENTS

The ten study intersections were analyzed to determine when warrants were met for each type of improvement.

Alternative build analyses were developed from the performance of the intersection capacity analysis. Chapter 15 of the SDDOT Road Design Manual was referenced to evaluate if a left and/or right turn lane(s) would be warranted based on the projected traffic volumes. If a turn lane was warranted, further evaluation was completed to identify the year warrant criteria and the warranted year. Two criteria were evaluated for whether a left and/or right turn lane should be installed: 1) Vehicular Volume and 2) Crash Experience. Two additional criteria should be evaluated for right turn lanes only: 1) railroad crossing and 2) geometric/safety concerns.

Figure 15-2 (Left Turn Lane Volume Warrant) of the Road Design Manual was referred to for recommended left turn lanes and Figure 15-3 (Right Turn Lane Volume Warrant) was used for recommended right turn lanes for unsignalized intersections. Refer to the images at the right.

Appendix G includes the left-turn and right-turn criteria charts for each of the study intersections for the AM and PM peak periods to determine when the auxiliary lanes are warranted.



Source: Oregon DOT Analysis Procedures Manual 2008

*(Advancing Vol/ # of Advancing Through Lanes)+
(Opposing Vol/ # of Opposing Through Lanes)

Note: The criterion is not met from zero to ten left turn vehicles per hour, but careful consideration should be given to installing a left turn lane due to the increased potential for crashes in the through lanes. While the turn volumes are low, the adverse safety and operational impacts may require installation of a left turn. The final determination will be based on a field study.

Figure 15-2 Left Turn Lane Volume Warrant

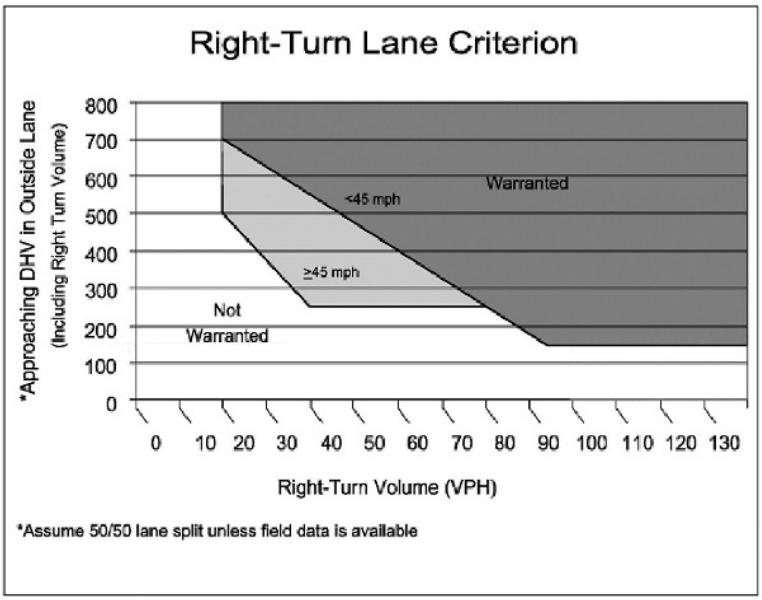


Figure 15-3 Right Turn Lane Volume Warrant

7.1.1 SD11 Corridor

All existing intersections along the SD11 segment are unsignalized. All intersections meet the vehicular volume criterion to install a left tune lane. Table 7 and Table 8 summarize which intersection(s) meet left and right turn lane warrants for the existing, future 2050 and threshold volumes.

7.1.1.1 SD11 and US-18

There is an existing eastbound left turn lane and westbound right turn lane. Based on the warrant analysis, a southbound left turn lane meets the warrant criterion for the existing turning lane volume warrant analysis. Based on the future turning lane volume warrant analyses, a southbound right turn lane is estimated to be warranted by the Year 2045.

7.1.1.2 SD11 and 276th Street

There is an existing northbound and southbound left turn lane. A northbound left turn lane would be expected to be warranted by the Year 2050 and a southbound right turn lane would be expected to meet the volume warrants by 2045.

7.1.1.3 SD11 and 273rd Street

There are existing northbound and southbound left turn lanes. A northbound and southbound left turn lane, and a southbound right turn lanes are currently warranted based on the existing traffic volumes. The northbound right turn did not meet the criteria. For the 3-Lane Corridor with a 12’ Median, a southbound right turn was warranted in the year 2045.

7.1.1.4 SD11 and 272nd Street

There are no existing turning lanes and no existing turning lanes were warranted. Based on the future 2045 turning lane volume warrant analyses, a left turn is warranted for both the north and southbound lanes. A southbound right turn lane is also met. For the 3-Lane Corridor with a 12’ Median analysis, a northbound right turn met the warrant in 2050.

7.1.1.5 SD11 and 271st Street

There are no existing turn lanes. Based on the existing turning lane volume warrant analyses, a left turn is warranted for both the north and southbound lanes. A northbound right turn lane is also met. For the 3-Lane Corridor with a 12’ Median analysis, a southbound right turn was warranted in the existing year.

7.1.1.6 SD11 and 270th Street

There are no existing turn lanes. Based on the existing turning lane volume warrant analyses, a left turn is warranted for both the north and southbound lanes. For the future 2045 turning lane warrant analysis, a southbound right turn lane is met based on the existing two-lane condition. With a proposed 4-lane roadway, a southbound right-turn lane is not warranted..

Table 7 – SD11 Turn Lane Warrant Summary (2 Lane Corridor)

INTERSECTION	Warranted Year			
	Left Turn		Right Turn	
	SB	NB	SB	NB
SD11 and US 18	2022	-	2045	-
SD11 and 276th St	2022	2050	2045	-
SD11 and 273rd St	2022	2022	2022	-
SD11 and 272nd St	2035	2045	-	2045
SD11 and 271st St	2022	2022	2022	-
SD11 and 270th St	2022	2022	2045	-

Table 8 – SD11 Turn Lane Warrant Summary (4-Lane Corridor)

SEGMENT	Warranted Year			
	Left Turn		Right Turn	
	SB	NB	SB	NB
SD11 and US 18	2022	-	-	-
SD11 and 276th St	2022	2050	-	-
SD11 and 273rd St	2022	2022	2045	-
SD11 and 272nd St	2035	2045	-	2050
SD11 and 271st St	2022	2022	2022	-
SD11 and 270th St	2022	2022	-	-

7.1.2 SD115 Corridor

Only the intersection of SD115 and 273rd Street is currently signalized. All intersections meet the vehicular volume criterion to install a left tune lane. Table 9 summarizes which intersections meet left and right turn lane warrants for the existing, future 2050 and threshold volumes.

7.1.2.1 SD115 and US 18

There are existing left turn eastbound and westbound left turn lanes. Based on the existing volumes, a left turn is warranted for the southbound lane.

7.1.2.2 SD115 and 280th Street

There are no existing left or right turn lanes. Based on the future 2050 turning lane volume warrant analyses, no turning lanes were warranted for either the left or right turn.

7.1.2.3 SD115 and 276th Street

There are no existing turning lanes. Based on the future 2045 turning lane volume warrant analyses, a left and a right turn lane were warranted for the southbound movement. A northbound left turn lane was also warranted. An eastbound left turn lane was added to improve LOS performance.

7.1.2.4 SD115 and 273rd Street

At the existing signalized intersection, there are designated left and right turning lanes for the north and southbound movements. The westbound approach has a left and right turn lane. The eastbound approach has a left turn lane.

Table 9 – SD115 Turn Lane Warrant Summary (2 Lane Corridor)

INTERSECTION	Warranted Year			
	Left Turn		Right Turn	
	SB	NB	SB	NB
SD115 and US 18	2022	-	-	-
SD115 and 280th St	-	-	-	-
SD115 and 276th St	2025	2045	2030	-
SD115 and 273rd St	2022	2045	2022	2035

7.1.3 Railroad Crossings

Railroad crossings were considered for railroads parallel to the roadway. There is an existing railroad that intersects 230’ west and 290’ south of the intersection of SD11 and 277th Street. There is another existing railroad between the intersection of SD11 and US 18 and SD11 and 281st Street. At the

intersection of SD11 and 277th Street, there is the probability it will impact the turning movements for both the west leg and the westbound movement.

7.1.4 Turn Lane Design

Chapter 12 of the Road Design Manual was used referenced to determine the taper, deceleration and storage length of where turning lanes were warranted.

Both SD11 and SD115 have a 65 mph PSL with a design speed of 70 mph. Referring to the Turn Lane Design guidelines in Chapter 12, for a design speed greater than 45 mph, the bay taper length for a single turn lane is L=WS, where L=taper length, W=width of offset, and S=Design Speed. For this design, the lane is shifted 6 feet rather than a full 12 feet; therefore the length used is L=(W/2)*S. For single right turn lanes that met warrants, the storage length used was 200'.

The total turning lane length is the storage length plus the total deceleration distance. Note that the taper length is included in the deceleration length. The taper length is used for design purposes. For the design speed at 70 mph, the total deceleration distance, L, is 590'. The storage length was developed from the No Build 2050 estimated 95th percentile queue values using SimTraffic software, version 7.

For the east and westbound movement with added left turn lanes, the storage length added was 100' to meet the minimum criteria as listed in Chapter 12. If the east and westbound movements continued to operate with LOS E or F, the storage length was increased to reduce the queues.

7.1.4.1 SD11

Future 2050 Build analysis was completed using the turning lane warrant criteria and turning lane design criteria. Figures 11 through 16 provide a summary of the estimated levels of service for the projected 2050 traffic volumes and a preliminary layout for the proposed turn lanes. As illustrated in the figures, the majority of the intersection and individual turning movements operate with acceptable levels of service. However, the intersection of SD11 and 271st Street would be expected to operate with LOS F with the current All-way stop control and additional turn lanes. Traffic signal warrant analyses were completed and are summarized in Section 7.1.5. Figures 11 to 16 illustrate the design of the auxiliary lanes per SDDOT design criteria at each intersection.

7.1.4.2 SD115

Future 2050 Build analysis was completed using the turning lane warrant criteria and turning lane design criteria. Figures 17 through 20 provide a summary of the estimated levels of service for the proposed 2050 traffic conditions and a preliminary layout for the proposed turn lanes. Figures 17 through 20 illustrate the design of the auxiliary lanes per SDDOT design criteria at each intersection.

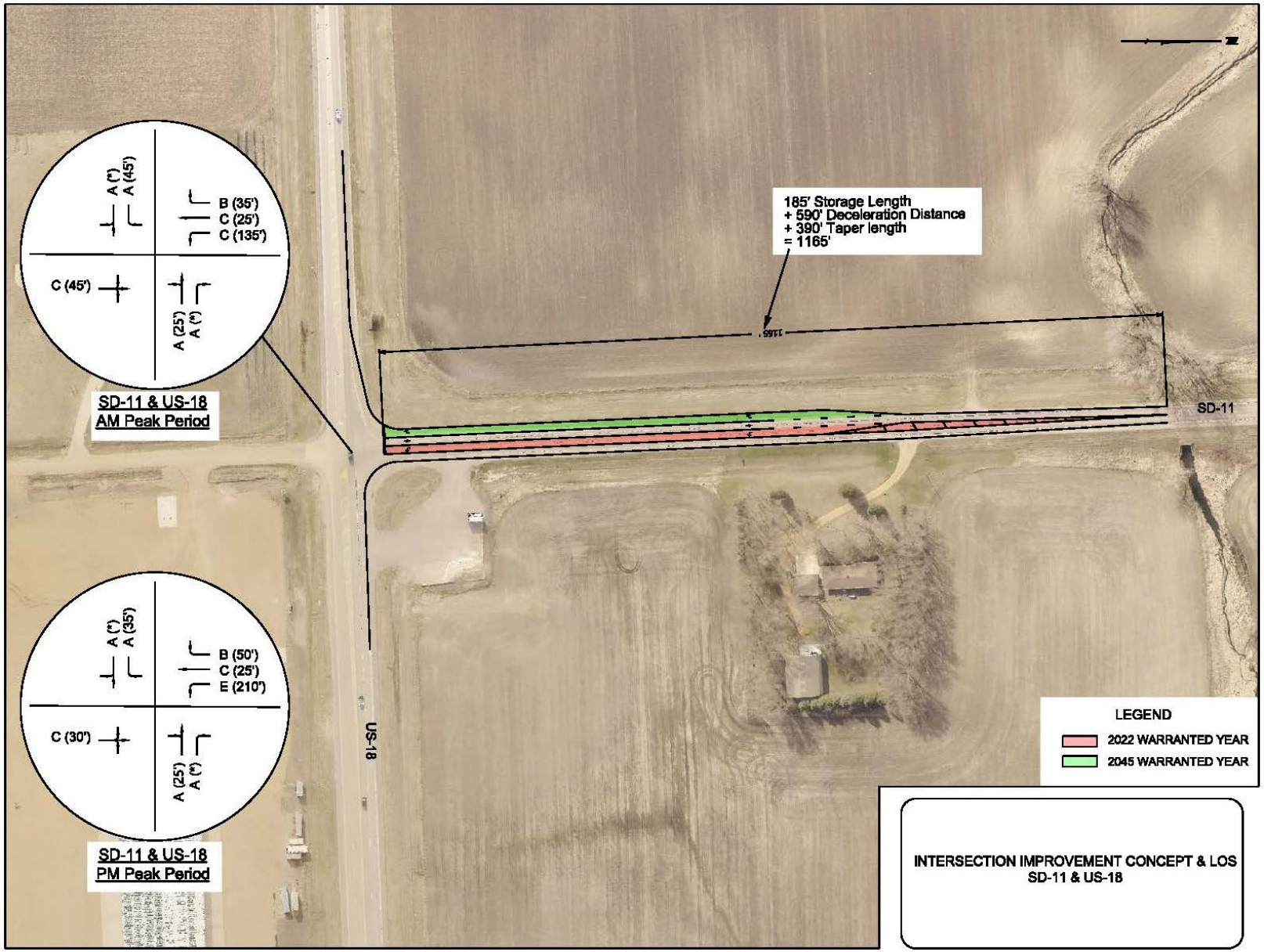


Figure 11 – SD11 and US 18 (2050 Build)

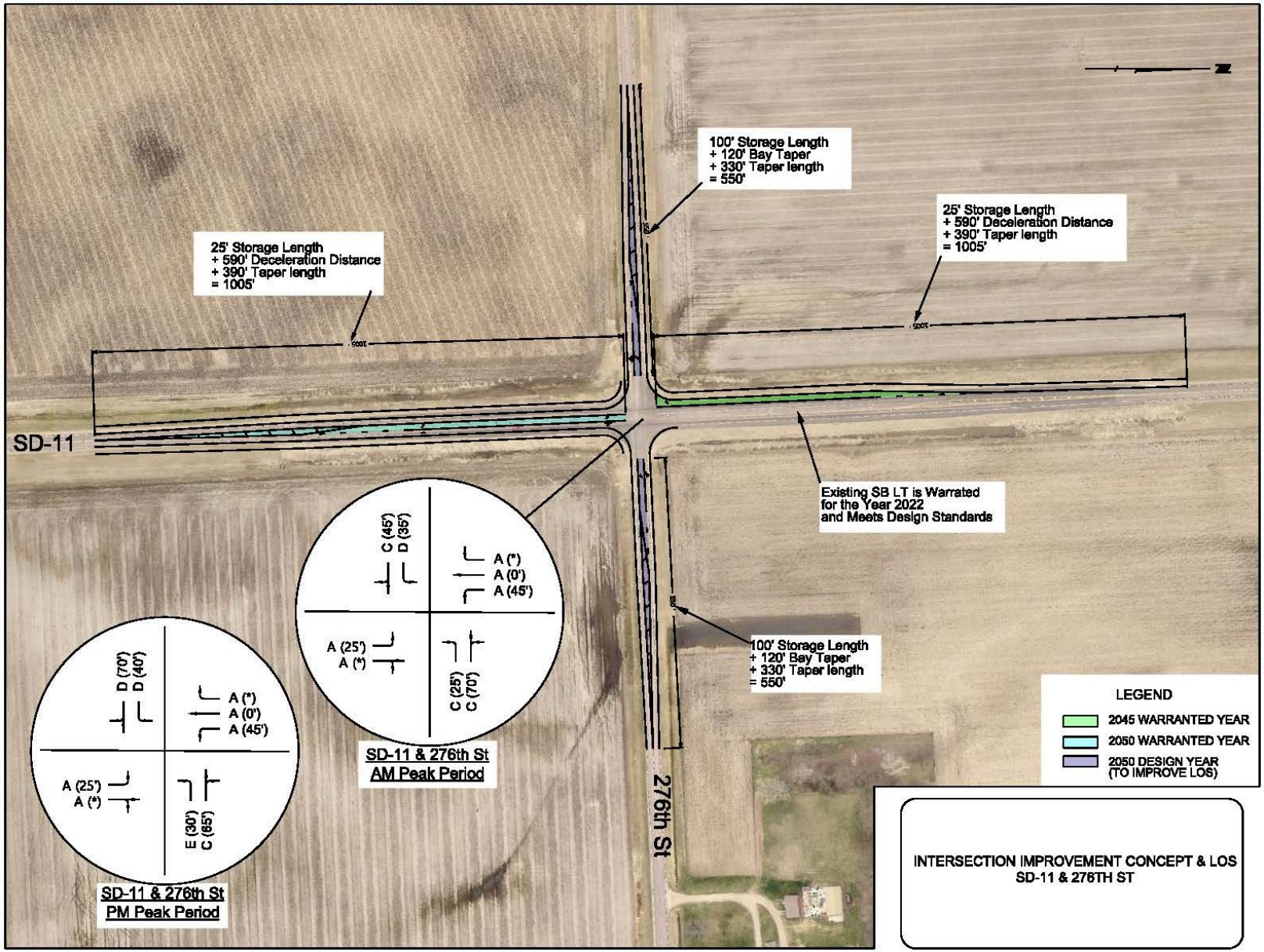


Figure 12 – SD11 and 276th St (2050 Build)

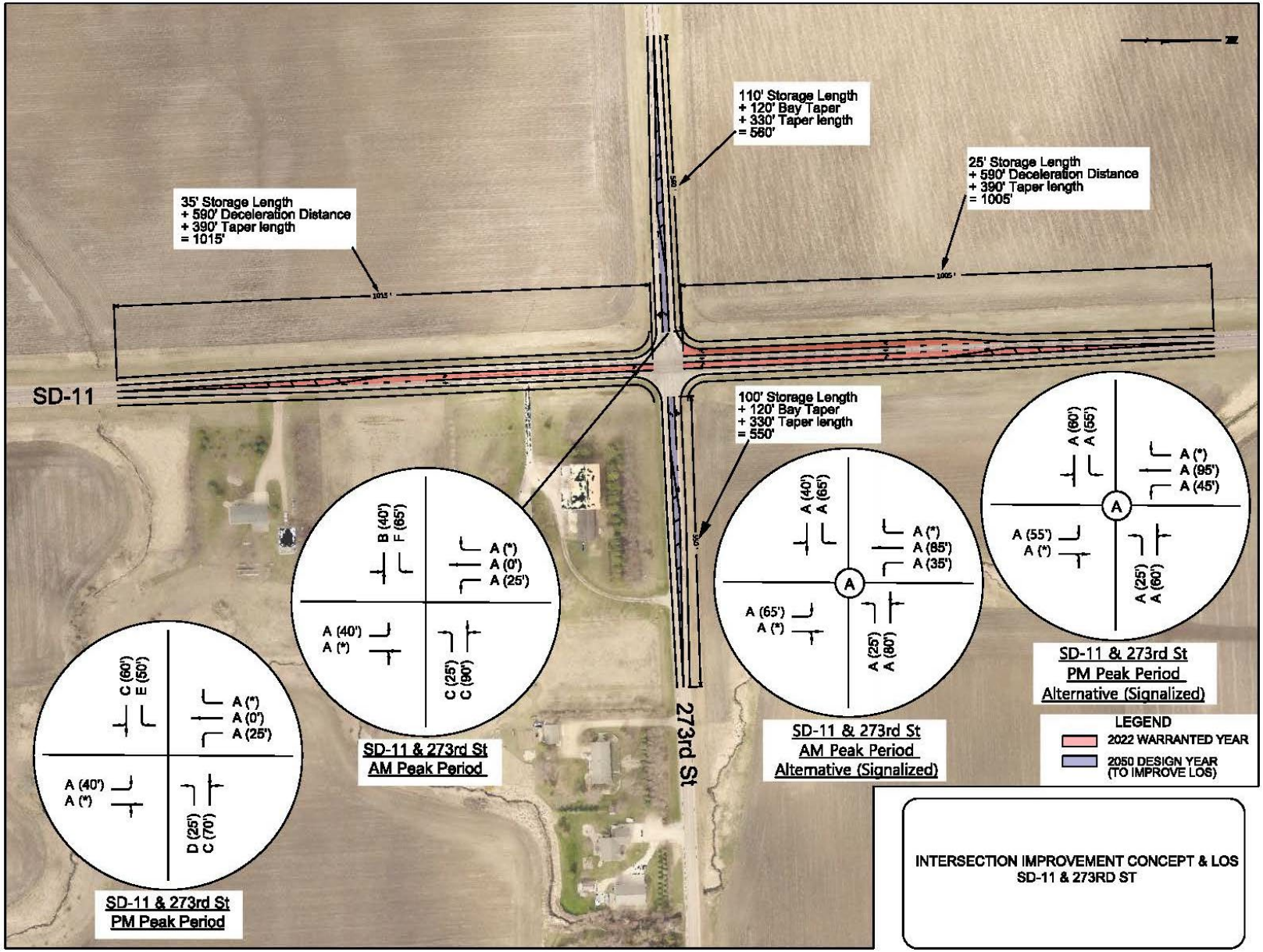


Figure 13 – SD11 and 273rd St (2050 Build)

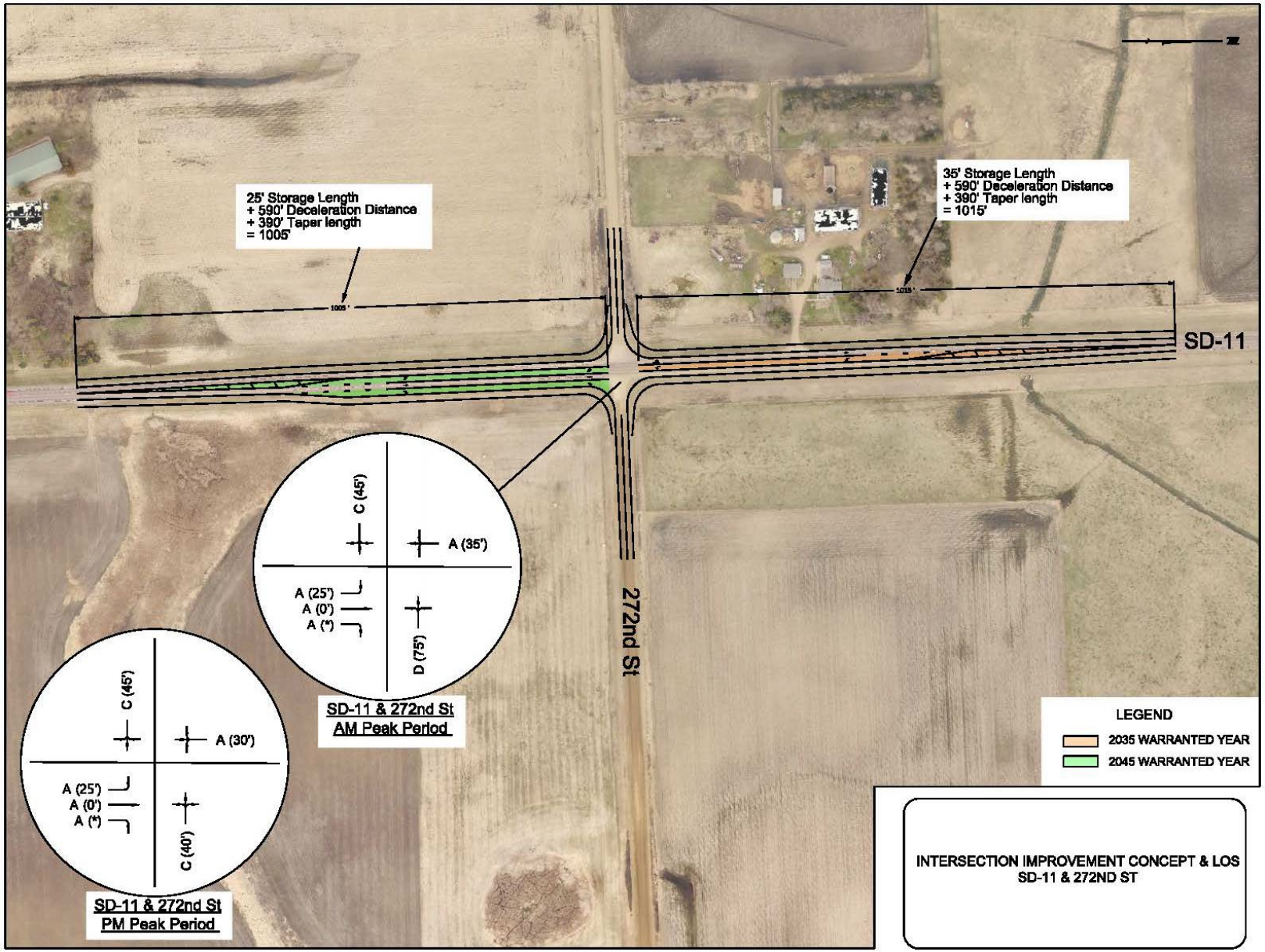


Figure 14 – SD11 and 272nd St (2050 Build)

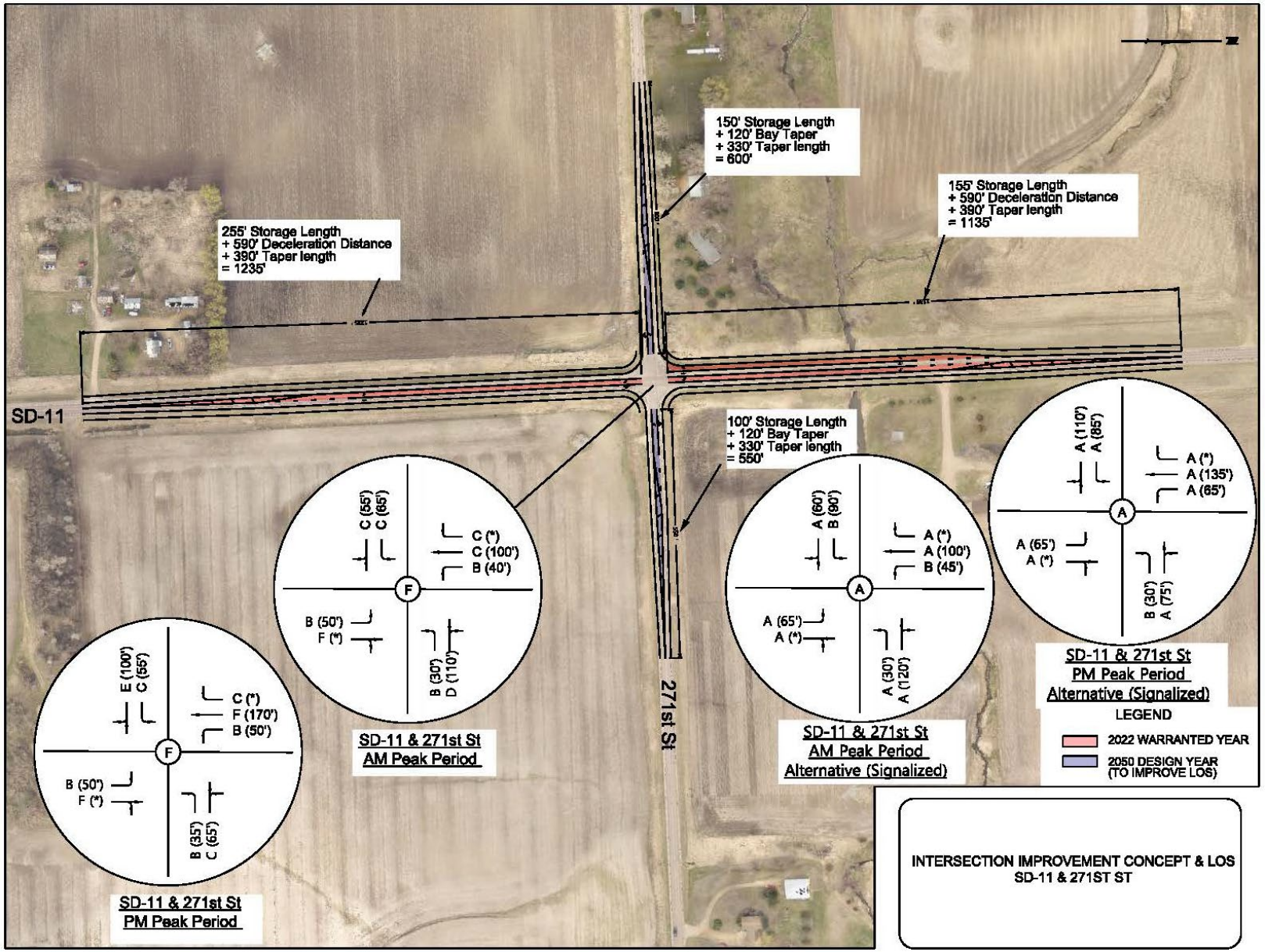


Figure 15 – SD11 and 271st St (2050 Build)

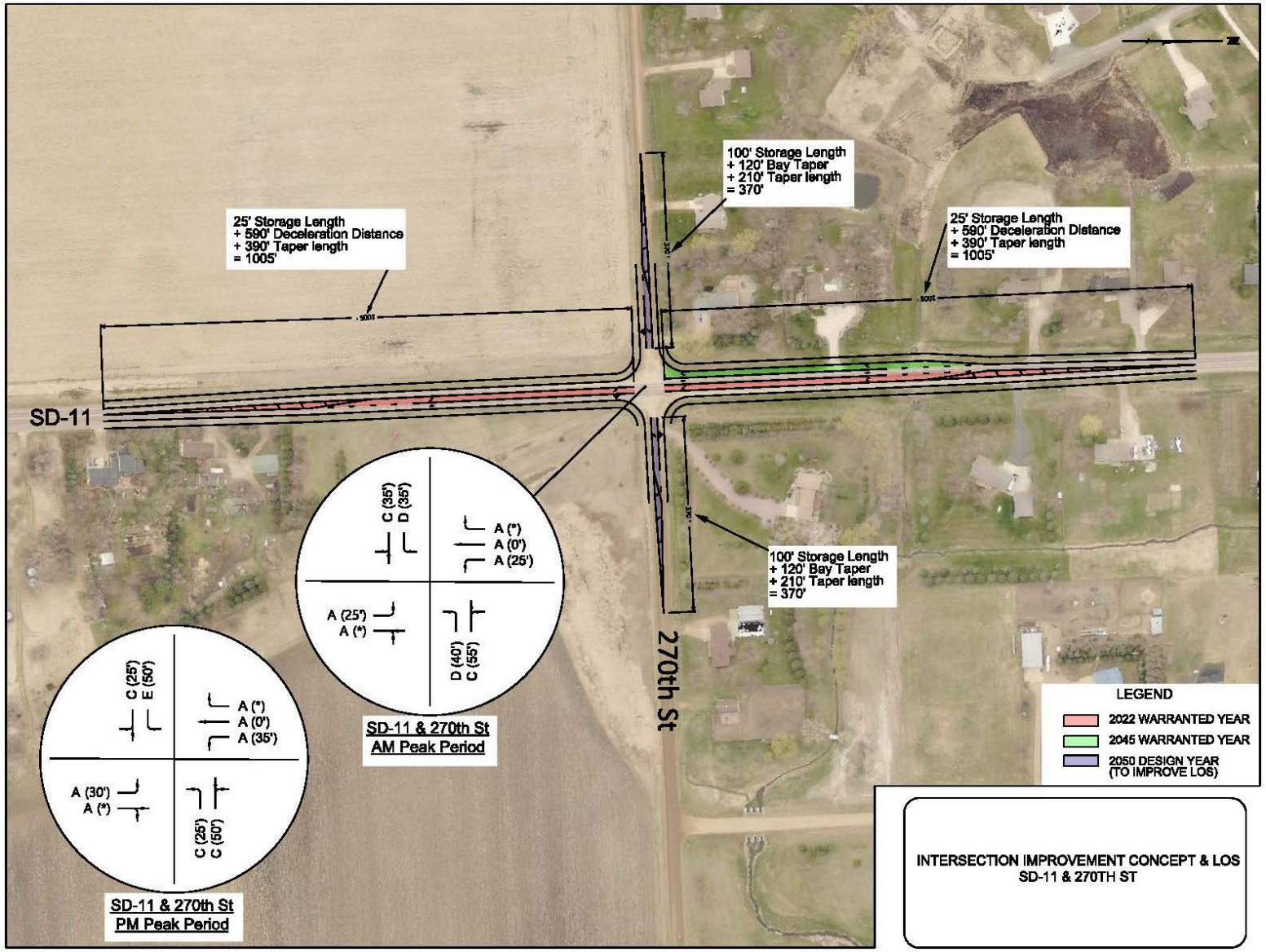


Figure 16 – SD11 and 270th St (2050 Build)

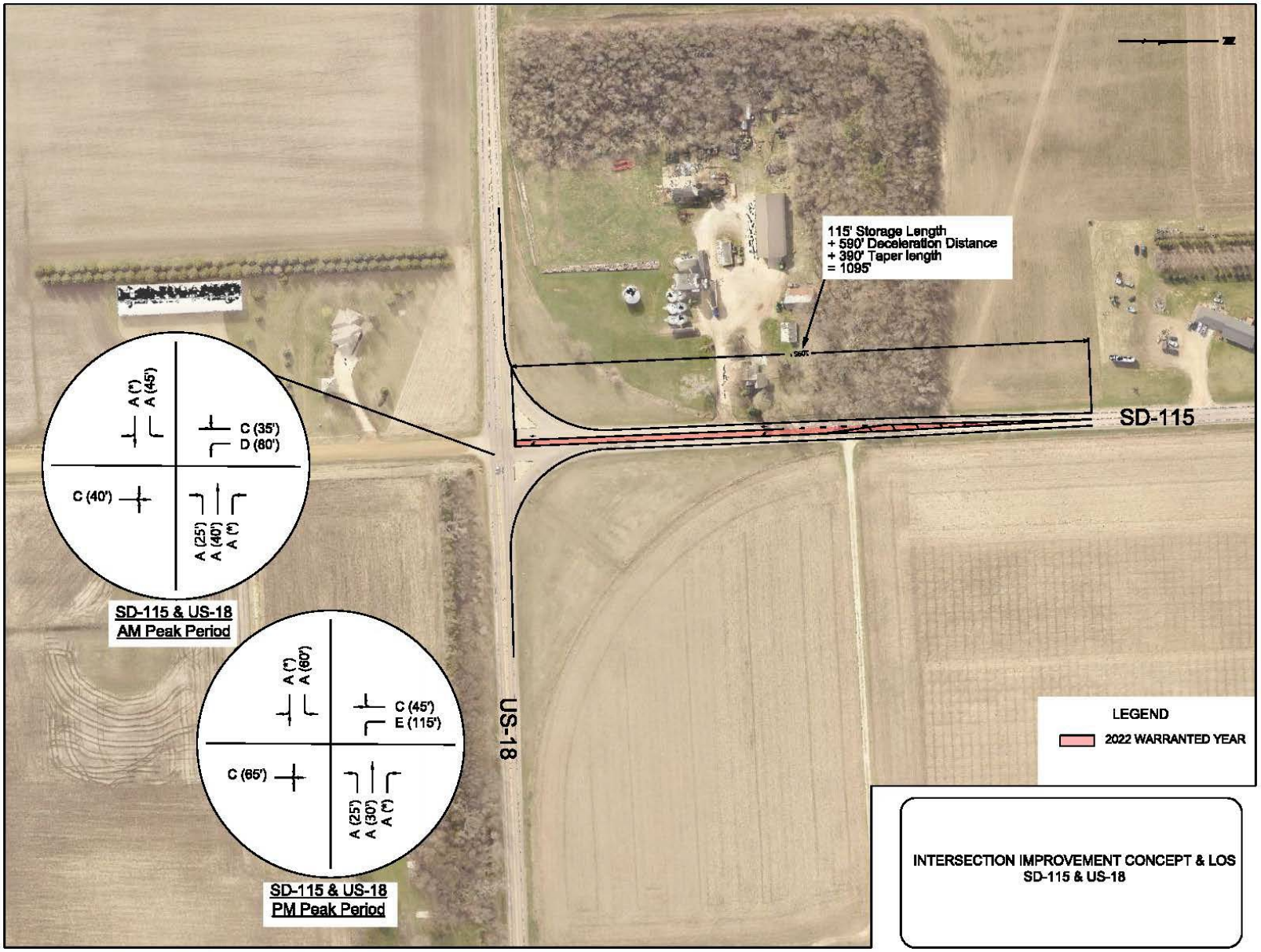


Figure 17 – SD115 and US 18 (2050 Build)

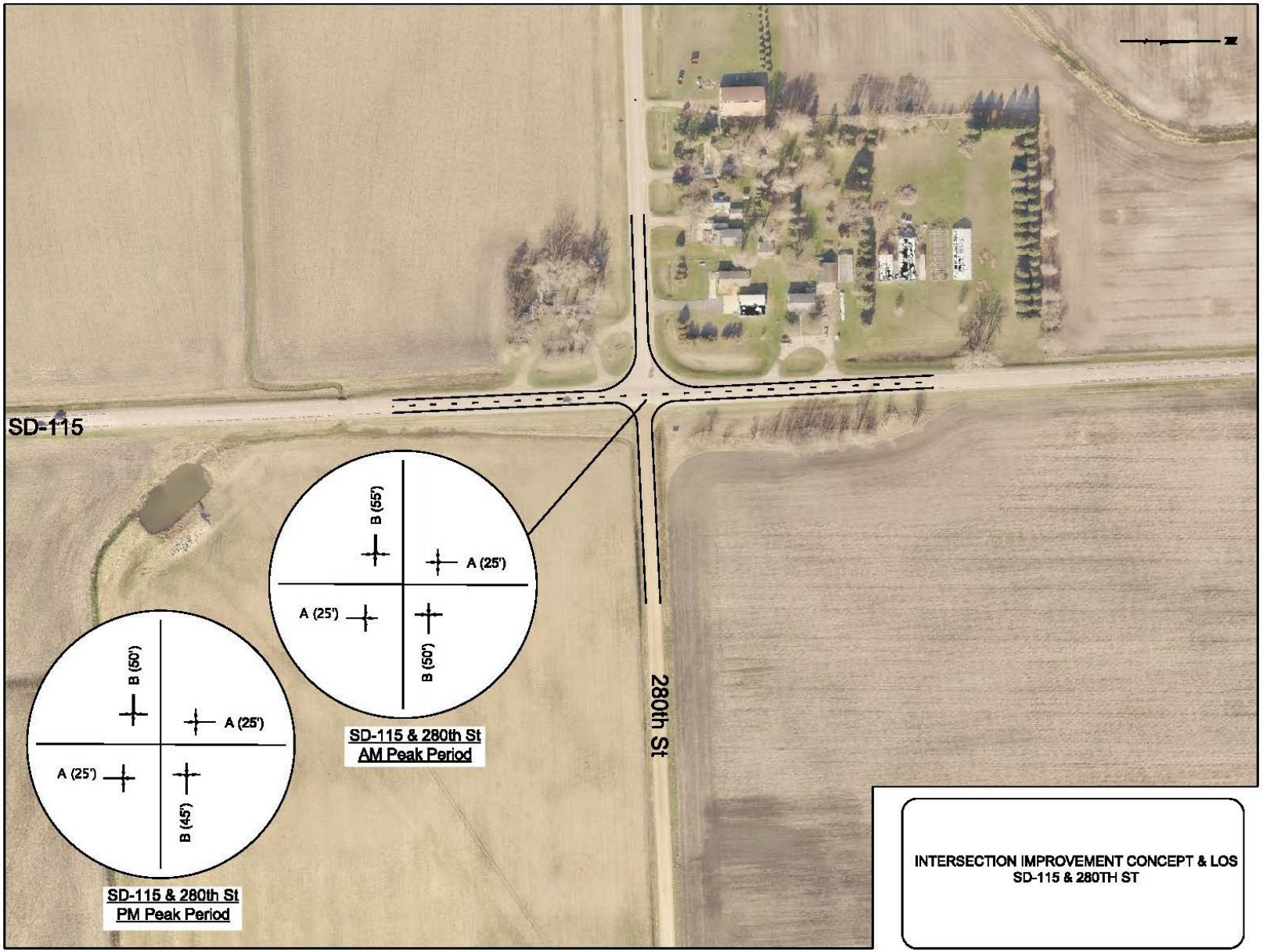


Figure 18 – SD115 and 280th St (2050 Build)

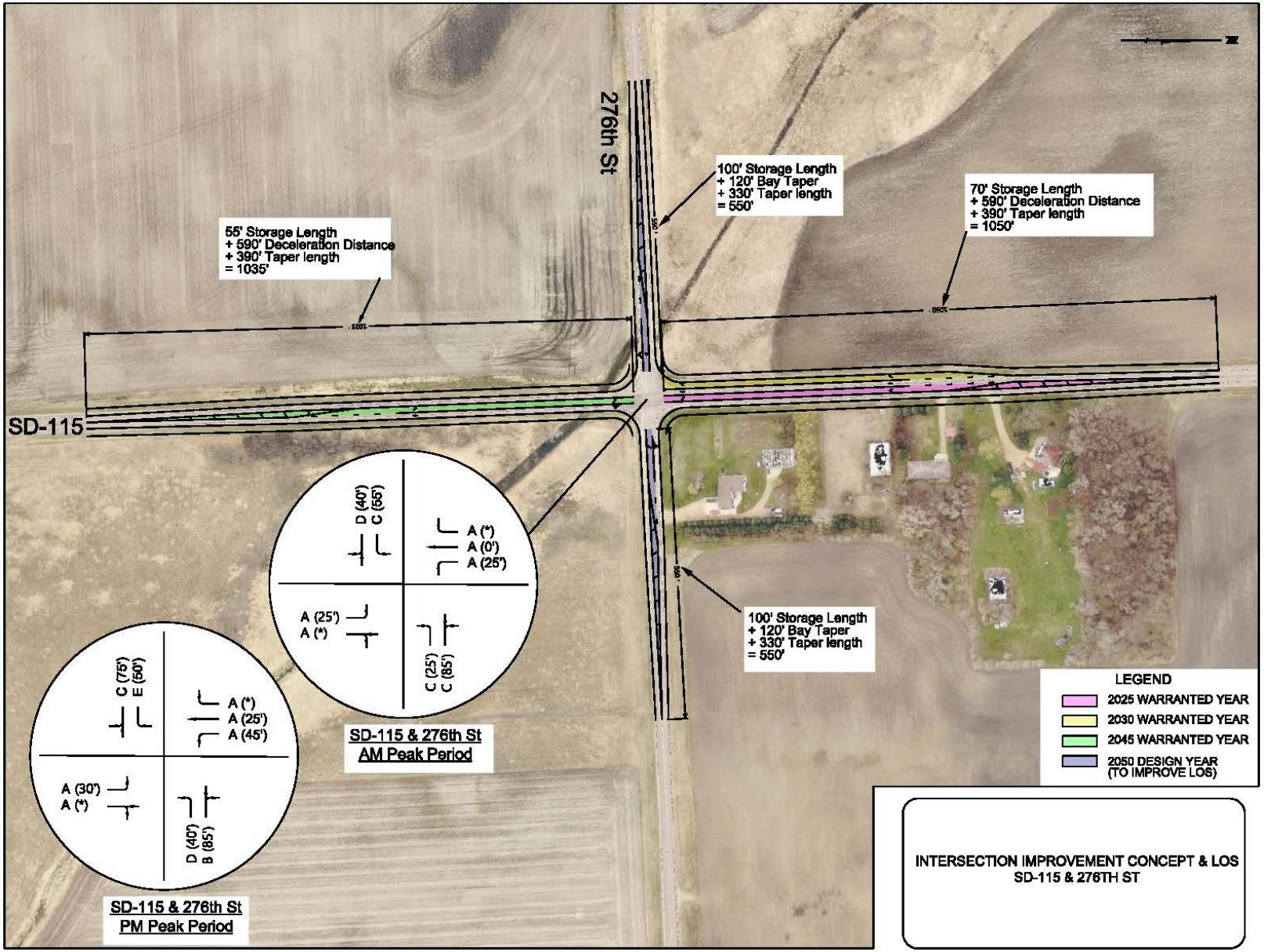


Figure 19 – SD115 and 276th St (2050 Build)

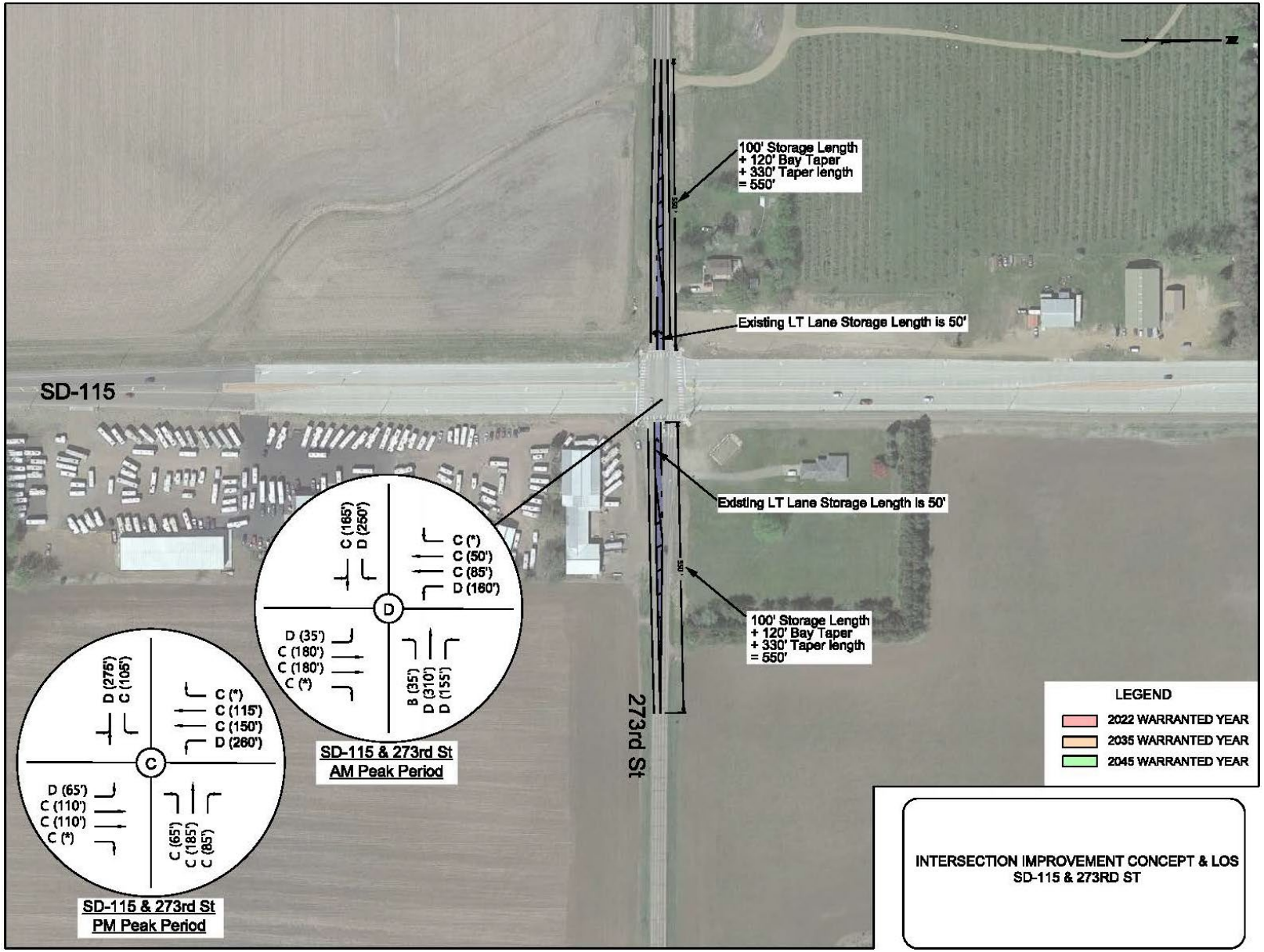


Figure 20 – SD115 and 273rd St (2050 Build)

7.1.5 Signal Warrant Analysis

Signal warrant analyses was completed using the criteria described in Part 4 of the MUTCD for Warrant 1 (Eight-Hour), Warrant 2 (Four-Hour), Warrant 3 (Peak Hour) and Warrant 7 (Crash Experience). Highway Capacity Software (HCS) version 7 was used to report if and which intersections warrant a traffic signal warrant for existing, 2050 and the threshold years, as summarized in Appendix H.

The results as well as the threshold year are summarized in Table 10. Based on the signal warrant analysis for the 2050 traffic volumes, three of the six intersections along SD11 meet one or more of the signal warrants examined. For the SD115 intersections, only the intersection at 273rd Street meets all four signal warrants.

Table 10 – Signal Warrant Summary

Intersection	Signal Warrant Year			
	Warrant 1	Warrant 2	Warrant 3	Warrant 7
SD11				
SD11 and US 18	2050	2050	2045	2045
SD11 and 276th St	-	-	-	-
SD11 and 273rd St	Not Met	Not Met	Not Met	Not Met
SD11 and 272nd St	-	-	-	-
SD11 and 271st St *	Not Met	2045	2030	2040
SD11 and 270th St	-	-	-	-
SD115				
SD115 andUS-18	-	-	-	-
SD115 and 280th St	-	-	-	-
SD115 and 276th St	-	-	-	-
SD115 and 273rd St	2050	2022	2022	2030

* Warrant analysis based on the ultimate 4-lane corridor

- **SD11 and US 18:** Based on the future 2050 signal warrant analysis, all four warrants are met.
- **SD11 and 276th Street:** No warrants are met for this intersection.
- **SD11 and 273rd Street:** No warrants are met for this intersection.
- **SD11 and 272nd Street:** No warrants are met for this intersection.

- **SD11 and 271st Street:** Based on the existing geometrics and volume, the intersection currently meets signal warrant criteria. With the proposed 4-lane section, the traffic signal is expected to meet three of the four warrants (Warrant 2, Warrant 3, and Warrant 7).
- **SD11 and 270th Street:** No warrants are met for this intersection.
- **SD-115 and 273rd Street:** This intersection is currently signalized. Based on the traffic signal warrant analysis for the SD115 intersections, only the intersection at 273rd Street meets all four signal warrants.

7.2 BUILD CAPACITY ANALYSIS

Future Build 2050 intersection capacity analyses was completed using Synchro and SimTraffic traffic software to analyze different build scenarios to evaluate future LOS improvements.

7.2.1 SD11

Analysis of the 2050 Build scenarios is provided in the following sections. Table 11 summarizes and compares the capacity analysis for the different build alternatives.

Three build analyses were completed to evaluate the corridor improvement and performance:

1. Two-lane corridor with turn lanes as warranted
2. Three-lane corridor with turn lanes as warranted
3. Four-lane undivided corridor with turn lanes as warranted

7.2.1.1 2-Lane Corridor w/12' Median

SD11 and US 18: There is an existing eastbound left turn lane and westbound right turn lane. A southbound left turn lane was warranted and added. Based on the unsignalized capacity analysis, the individual turning movements for the future 2050 build volumes would be expected to operate with LOS C or better for AM and PM peak periods, respectively.

SD11 and 276th Street: There is an existing northbound and southbound left turn lane. A southbound right was added. The east and westbound movements operate with LOS C and D for the AM and PM peak periods, respectively. The north and southbound movements operate with LOS A for the AM and PM peak periods.

SD11 and 273rd Street: There are existing northbound and southbound left turn lanes. A northbound and southbound left turn lane, and a southbound right turn lane are warranted and added. The eastbound movement operates with LOS F for the AM and PM peak periods. The westbound movement operates with LOS D for the AM and PM peak periods. The north and southbound movements operate with LOS A for the AM and PM peak periods.

Table 11 – SD11 Capacity Analysis for 2050 Build Scenarios

Intersection	Approach	2050 No Build		2050 Build											
		Existing Configuration		EX + Turn Lane		2 Lane w/ 12' Median		4-Lane		5-Lane		Alternative 1 AWSC @ 273rd		Alternative 2 Signalized @ 271st & 273rd	
		AM LOS	PM LOS	AM LOS	PM LOS	AM LOS	PM LOS	AM LOS	PM LOS	AM LOS	PM LOS	AM LOS	PM LOS	AM LOS	PM LOS
SD11 and US 18	EB	A	A	A	A	A	A	A	A	A	A	NA	NA	NA	NA
	WB	A	A	A	A	A	A	A	A	A	A	NA	NA	NA	NA
	NB	C	C	C	C	C	C	C	C	C	C	NA	NA	NA	NA
	SB	C	E	C	D	C	D	C	D	C	D	NA	NA	NA	NA
SD11 and 276th St	EB	C	F	C	D	C	D	C	E	C	E	NA	NA	NA	NA
	WB	C	D	C	D	C	D	C	C	C	C	NA	NA	NA	NA
	NB	A	A	A	A	A	A	A	A	A	A	NA	NA	NA	NA
	SB	A	A	A	A	A	A	A	A	A	A	NA	NA	NA	NA
SD11 and 273rd St	EB	F	F	F	F	F	F	E	E	E	E	B	B	A	A
	WB	D	D	D	D	D	D	C	C	C	C	B	B	A	A
	NB	A	A	A	A	A	A	A	A	A	A	C	C	A	A
	SB	A	A	A	A	A	A	A	A	A	A	C	D	A	A
	OVERALL													A	A

Intersection	Approach	2050 No Build		2050 Build											
		Existing Configuration		EX + Turn Lane		2 Lane w/ 12' Median		4-Lane		5-Lane		Alternative 1 AWSC @ 273rd		Alternative 2 Signalized @ 271st & 273rd	
		AM LOS	PM LOS	AM LOS	PM LOS	AM LOS	PM LOS	AM LOS	PM LOS	AM LOS	PM LOS	AM LOS	PM LOS	AM LOS	PM LOS
SD11 and 272nd St	EB	C	C	C	C	C	C	C	C	C	C	NA	NA	NA	NA
	WB	D	C	D	C	D	C	C	C	C	C	NA	NA	NA	NA
	NB	A	A	A	A	A	A	A	A	A	A	NA	NA	NA	NA
	SB	A	A	A	A	A	A	A	A	A	A	NA	NA	NA	NA
SD11 and 271st St	EB	C	F	C	F	C	F	[1]	[1]	[1]	[1]	[1]	[1]	B	B
	WB	C	C	D	C	D	C	[1]	[1]	[1]	[1]	[1]	[1]	B	B
	NB	F	F	F	F	F	F	[1]	[1]	[1]	[1]	[1]	[1]	A	A
	SB	E	F	C	F	C	F	[1]	[1]	[1]	[1]	[1]	[1]	A	B
	OVERALL	F	F	F	F	F	F	[1]	[1]	[1]	[1]	[1]	[1]	A	B
SD11 and 270th St	EB	D	F	D	E	D	E	C	D	C	D	NA	NA		
	WB	C	D	C	C	C	C	C	C	C	C	NA	NA		
	NB	A	A	A	A	A	A	A	A	A	A	NA	NA		
	SB	A	A	A	A	A	A	A	A	A	A	NA	NA		

[1] *Highway Capacity Manual All-Way Stop Control analysis is limited to a maximum of two lanes per approach.*

SD11 and 272nd Street: A left turn, and right turn lane was added to the south leg. The east and westbound movements operate with LOS C and D for the AM and PM peak periods, respectively. The north and southbound movements operate with LOS A for the AM and PM peak periods.

SD11 and 271st Street: 271st Street acts as all-way, stop control (AWSC). A left turn was added for both the north and southbound lanes. A southbound right turn lane is also added. The east and southbound movements operate with LOS C for the AM peak. The westbound movement operates with LOS D and the northbound movement operates with LOS F for the AM peak.

SD11 and 270th Street: There are no existing turn lanes. Based on the existing turning lane volume warrant analyses, a left turn is warranted for both the north and southbound lanes. For the future 2050 turning lane warrant analysis, a northbound right turn lane is met.

7.2.1.2 4-Lane Corridor

The intersection configurations are a build of the "Existing + Turn Lane(s) (where warranted)" design. An additional through lane was added to the north and south legs at all six intersections. The east and west movements were kept consistent.

SD11 and US 18: Based on the unsignalized capacity analysis, the north and southbound movements for the future 2050 build volumes would be expected to operate with LOS C and LOS D for AM and PM peak periods, respectively. The east and westbound movements operate with LOS A for both the AM and PM peak periods.

SD11 and 276th Street: The north and southbound movements operate with LOS A for both the AM and PM peak periods. The east and westbound movements operate with LOS C for the AM peak period. The eastbound movement operates with LOS E and the westbound movement operates with LOS C for the PM peak period.

SD11 and 273rd Street: For the AM and PM peak periods, the north and southbound movements operate with LOS A. The westbound movement operates with LOS C. The eastbound movement operates with LOS E.

SD11 and 272nd Street: The north and southbound movements operate with LOS A for both the AM and PM peak periods. The east and westbound movements operate with LOS C for both the AM and PM peak periods.

SD11 and 271st Street: HCM 6th Edition all-way stop controlled intersection methodology supports a maximum of three lanes.

SD11 and 270th Street: The north and southbound movements operate with LOS A for both the AM and PM peak periods. The east and westbound movements operate with LOS C for the AM peak hour. For the PM peak period, the eastbound operates with LOS D and LOS C for the westbound movement.

7.2.1.3 5-Lane Corridor

The 5-lane corridor design is a replication of the 4-lane design with an added 12' median along SD11.

SD11 and US 18: Based on the unsignalized capacity analysis, the north and southbound movements for the future 2050 build volumes would be expected to operate with LOS C or better for AM and PM peak periods. The east and westbound movements operate with LOS A for both the AM and PM peak periods.

SD11 and 276th Street: The north and southbound movements operate with LOS A for both the AM and PM peak periods. The east and westbound movements operate with LOS C for both the AM and PM peak periods.

SD11 and 273rd Street: For the AM and PM peak periods, the north and southbound movements operate with LOS A. The westbound movement operates with LOS C for both the AM and PM peak periods. The eastbound movement operates with LOS E for both the AM and PM peak periods.

SD11 and 272nd Street: The north and southbound movements operate with LOS A and the east and westbound movements operate with LOS C for both the AM and PM peak periods.

SD11 and 271st Street: HCM 6th Edition all-way stop controlled intersection methodology supports maximum of three lanes.

SD11 and 270th Street: The north and southbound movements operate with LOS A for both the AM and PM peak periods. The westbound movement operates with LOS C for both the AM and PM peak periods. The eastbound operates with LOS C and LOS D for the AM and PM periods, respectively.

7.2.2 Alternative 1

The first alternative is a build of the existing condition with turning lane(s) warranted network. For non-operating movements with LOS F or E, the volumes and the design were evaluated for further improvement. All intersections are operating with LOS D or better, except at 271st Stret and 273rd Street. The eastbound left movement continues to operate with LOS E at 273rd Street and the westbound left movement also operates with LOS E at 271stStreet. Using Synchro and SimTraffic, an All-way stop was added to the intersection at 273rdStreet. Table 11 summarizes the LOS values for the individual movements for Alternative 1.

SD11 and 273rd Street: The intersection was modified to be an all-way stop. Left and/or right turn lanes were added if met the warrant criteria. Left turn lanes were added to the north and southbound as they were warranted. Based on the unsignalized capacity analyses for the future 2050 volumes, the individual turning movements are anticipated to operate with LOS D or better for both AM and PM peak periods as summarized in Table 11**.** The east and westbound movements for both the AM and PM peak periods operate with LOS B. The north and southbound movements for the AM peak operate with LOS C. The northbound movement for the PM peak operates with LOS C and LOS D for the southbound movement.

7.2.3 Alternative 2

The signalized capacity analysis was completed for the intersections at 271st Street and 273rd Street. There is no change at the other four intersections. Table 11 summarizes LOS values for the individual movements for Alternative 2.

SD11 and 273rd Street: The existing conditions with turning lanes (where warranted) was kept at this intersection. Left turn lanes were added to the north and southbound as they were warranted. Based on the signalized capacity analyses for the future 2050 volumes, the individual turning movements all operate with LOS A or better for both AM and PM peak periods as**.**

SD11 and 271st Street: A signalized capacity analysis was run at this intersection with existing conditions and no added turn lanes. Based on the signalized capacity analyses for the future 2050 volumes, the signalized capacity analyses improved the LOS to operate with LOS A and B or better for both the AM and PM peak periods, respectively**.**

7.2.3.1 SD115

The 2050 Build scenario included adding a 12' center median to the existing conditions. Table 12 summarizes and compares the capacity analysis for the alternative.

SD115 and US 18: Based on the unsignalized capacity analyses for the future 2050 volumes, the individual turning movements are anticipated to operate with LOS C or better for both AM and PM peak periods except for the following movement, as summarized in Figure 17.

- Southbound Left-Thru-Right movement – LOS E (PM Peak)

SD115 and 280th Street: Based on the unsignalized capacity analyses for the future 2050 volumes, the individual turning movements are anticipated to operate with LOS B or better for both AM and PM peak periods as summarized in Figure 18.

SD115 and 276th Street: Based on the unsignalized capacity analyses for the future 2050 volumes, the individual turning movements are anticipated to operate with LOS D or better for both AM and PM peak periods, as summarized in Figure 19.

SD115 and 273rd Street: Based on the signalized capacity analyses for the future 2050 volumes, the individual turning movements are anticipated to operate with LOS D or better for both AM and PM peak periods, as summarized in Figure 20.

Table 12 – SD115 Capacity Analysis for 2050 Build Scenarios

SD115 Segment	Approach	2050 Build	
		2-Lane W/ 12' Median	
		AM LOS	PM LOS
SD115 and US 18	EB	A	A
	WB	A	A
	NB	C	C
	SB	C	E
SD115 and 280th St	EB	B	B
	WB	B	B
	NB	A	A
	SB	A	A
SD115 and 276th St	EB	D	C
	WB	C	D
	NB	A	A
	SB	A	A
SD115 and 273rd St	EB	C	C
	WB	D	C
	NB	C	C
	SB	C	C
	OVERALL	D	C

7.3 PREDICTIVE CRASH EVALUATION

Predicted crash calculations were performed for both corridors using Highway Safety Design Model (IHSDM) software for the following alternatives. The analysis, including the distribution of crashes by segment and intersection, is provided in Appendix I.

- No Build (Existing Conditions)
- Proposed Recommendations

The IHSDM uses methodology of the Highway Safety Manual (HSM) to measure different alternatives in quantitative terms of expected crash frequency to allow for a level comparison of safety with respect to the no-build scenario.

Table 13 summarizes the predicted crashes for the No Build and Build alternatives for both corridors.

For SD11 and under the No Build scenario, it is anticipated that an average of 237.36 crashes would occur along the study corridor. Under the same base assumption for traffic volumes, but changing the traffic control, lane arrangement, and segment cross-sections to the recommended improvements, it is anticipated that crashes would be reduced to 221.8 crashes, a 6.5 percent reduction in total crashes.

SD-115 showed a 7.4% reduction, from 84.78 to 78.53 crashes.

Overall, the predicted number of fatal and injury crashes decreased as well as the crash rates.

Table 13 – Predicted Crashes of No-Build vs. Build Alternative

IHSDM Crash Prediction Evaluation	No Build		Build	
	SD-11	SD-115	SD-11	SD-115
First Year of Analysis	2022	2022	2045	2045
Last Year of Analysis	2027	2027	2050	2050
Evaluated Length (mi)	12.9735	8.94	12.9735	8.94
Average Future Road AADT (vpd)	3,249	2,035	6,881	4,876
Predicted Crashes				
Total Crashes	237.36	84.78	221.88	78.53
Fatal and Injury Crashes	94.05	34.02	72.34	26.3
Fatal and Serious Injury Crashes	-	3.06	-	-
Property-Damage-Only Crashes	143.31	50.76	149.53	52.24
Percent of Total Predicted Crashes				
Percent Fatal and Injury Crashes (%)	40	40	33	33
Percent Fatal and Serious Injury Crashes (%)	-	4	-	-
Percent Property-Damage-Only Crashes (%)	60	60	67	67
Predicted Crash Rate				
Crash Rate (crashes/mi/yr.)	3.0493	1.5806	2.8504	1.455
FI Crash Rate (crashes/mi/yr.)	1.2082	0.6343	0.9294	0.4872
FI no/C Crash Rate (crashes/mi/yr.)	-	0.0569	-	-
PDO Crash Rate (crashes/mi/yr.)	1.8411	0.9462	1.921	0.9678
Predicted Travel Crash Rate				
Total Travel (MVM)	92.31	39.84	195.5	54.8
Travel Crash Rate (crashes/MVM)	2.57	2.13	1.14	1.43
Travel FI Crash Rate (crashes/MVM)	1.02	0.85	0.37	0.48
Travel FI no/C Crash Rate (crashes/MVM)	-	0.08	-	-
Travel PDO Crash Rate (crashes/MVM)	1.55	1.27	0.77	0.95

8 RECOMMENDATIONS

Recommended improvements to the SD11 and SD115 corridors are based on technical analysis of traffic, safety, geometrics, multimodal facilities and access management. Consideration is also given to the potential for adjacent property impacts and input received through the SAT, public meetings and stakeholder input throughout the study.

8.1 SD11

8.1.1 US 18 to 271st Street/CR 106

The existing two-lane cross section with 6-foot surfaced shoulders is adequate to accommodate the anticipated traffic volumes through 2050, with the addition of geometric intersection improvements. Table 14 lists the intersection recommendations. In addition, intersection lighting is recommended at 273rd Street and Willow Street to address safety. No further improvements are recommended for this segment.

8.1.2 271st Street/CR 106 to S. Veterans Parkway

The northern segment of the SD11 corridor will experience greater traffic volumes, driven by residential and commercial developments associated with the population expansion and outward growth of the Sioux Falls urbanized area. To meet this need, it's recommended to reconstruct the existing two-lane roadway as a four-lane divided urban corridor with raised center median. The raised median allows for access management of the multiple driveways in this segment. The old highway SD11 will be transferred to Sioux Falls to manage. For more information, please review the Veterans Parkway environmental assessment. The proposed typical section is illustrated in Figure 21.

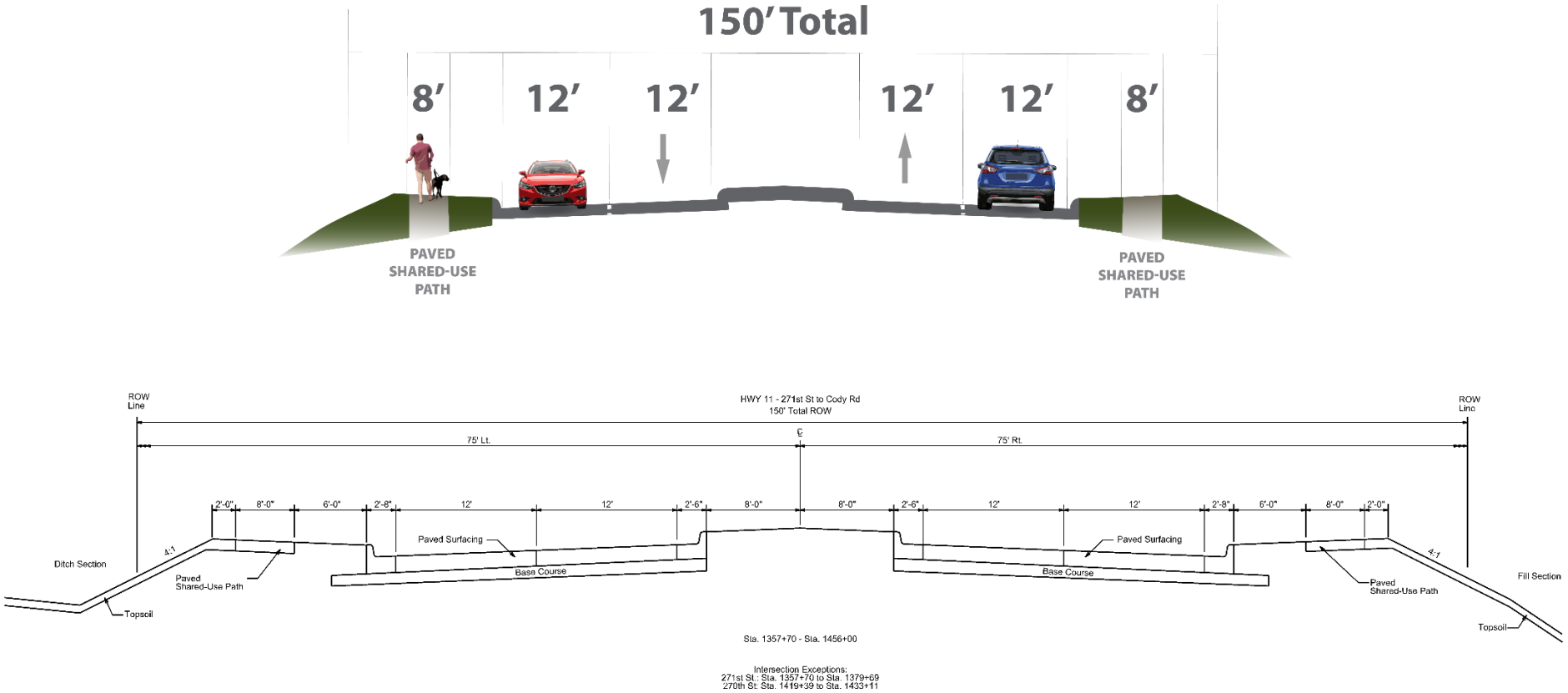


Figure 21 – SD11 (271St St/CR 106 to Cody Rd)

8.1.3 Intersection Improvements

Most study intersections currently operate at LOS C or better with the exception of the intersection of SD11 and 271st Street, which operates at LOS E in the PM peak hour. To maintain an acceptable LOS In the future Build year (2050), the growth in traffic volumes is expected to warrant turn lanes at all study intersections, as identified in Table 14. In addition, traffic signals are warranted at the intersection of SD11 with US 18 and with 271st Street.

Table 14 – Summary of Intersection Improvements (Future Build)

Major Street	Minor Street	Approach				Signal[1]	Lighting	Timing[2]
		NB	SB	EB	WB			
SD11	US 18/282nd St	-	LTL RTL	-	-	Y	-	Tier 1
	276th St/CR 116	LTL	LTL RTL	LTL	LTL	-	-	Tier 3
	273rd St/Willow St	LTL	LTL RTL	LTL	LTL	-	Y	Tier 1
	272nd St/ Prospect St	LTL RTL	LTL	LTL	LTL	-	-	Tier 2
	271st St/CR 106	LTL	LTL RTL	LTL	LTL	Y	-	Tier 1
	270th St/85th St	LTL	LTL RTL	LTL	LTL	-	-	Tier 1
SD115	US 18/282nd St	-	LTL	-	-	-	-	Tier 1
	280th St	-	-	-	-	-	-	-
	276th St /CR 116	LTL	LTL RTL	LTL	LTL	-	-	Tier 2
	273rd St/Willow St	-	-	LTL	LTL	[3]	-	Tier 1

[1] *When warranted*

[2] *Tier 1 = recommended by 2035; Tier 2 = recommended between 2030-2040; Tier 3 = recommended between 2040-2050*

[3] *Existing signal*

8.2 SD115

The SD11 corridor will continue to function acceptably through 2050 as a two-lane roadway, with the addition of intersection turn lane improvements as detailed in Table 14.

8.3 SAFETY IMPROVEMENTS

For the rural sections of both SD11 and SD115, maintain the rumble striping. Conduct an intersection lighting assessment at SD11 and 273rd Street during the concept phase.

New traffic signals are warranted at US 18 and SD11 and SD11 and 271st Street. There is an existing signal at SD115 and 273rd Street. For all traffic signals, consider use of retroreflective backplates and 4-section signal heads with Flashing Yellow Arow (FYA) where appropriate. If there are pedestrian features, provide high emphasis crosswalks and pedestrian signals.

8.4 PEDESTRIAN AND BICYCLE ACCOMMODATIONS

SD11 is considered to have an adequate shoulder width for accommodating bicycle and pedestrian uses and was identified in the Sioux Falls MPO Bicycle Plan as providing connectivity from the southern Sioux Falls MPO boundary. The MPO Bicycle Plan states that SD11 is currently bicycle compatible, but the highway is not designated as a trail.

At the Shindler Bypass, multimodal users can utilize new paved shoulders for sidewalk/trail connectivity from 271st Street/CR 106 to 273rd Street/Willow Street.

Bike trails that parallel or intersect SD11 and SD115 are in the long-term, future trail category in the Sioux Falls Bike Plan. Potential additions to the multimodal network include the following:

- Within the environmental study area, the Harrisburg Future Land Use Plan recommends a bicycle and pedestrian network along 272nd Street and 273rd Street that may extend towards SD11.
- The Harrisburg Comprehensive Plan designates that each neighborhood within the community should have its sidewalk system tied into a community-wide pedestrian bicycle trail system and that efforts to create a regional trail system should be supported and encouraged with other government entities.
- Existing side paths in Harrisburg include the side path along the north side of Willow Street and the east side of SD115/Minnesota Avenue, with recommendations for a bicycle and pedestrian network along SD115 adjacent to the city limits of Harrisburg.

8.5 PROBABLE CONSTRUCTION COSTS

An estimate of probable construction costs for the recommended improvements is provided in Table 15. In addition to construction costs, total project costs include engineering design, construction engineering inspection (CEI), utilities and anticipated ROW costs.

For SD11, corridor costs are summarized into two segments based on the expected typical section. For the southern segment which will remain two lanes, the probable cost to mill and resurface as well as make select turn lane improvements is estimated to be $8.7 million, with a total project cost of $12.0 million. For the proposed four-lane segment at Shindler (271st Street to S. Veterans Parkway), the probable cost to reconstruct SD11 to a four-lanes divided urban section as well as make select intersection turn lane improvements is estimated to be $8.0 million, with a total project cost of $11.0 million. The total estimated probable construction cost for the SD11 corridor is $16.7 million and the total project cost is $23.0 million.

On SD115, the probable cost to mill and resurface as well as make select intersection turn lane improvements is estimated to be $1.6 million, with a total project cost of $2.2 million.

The total estimated probable construction cost for both corridors is $18.3 million and the total project cost is $25.2 million. Summaries of the quantity and cost details by segment are provided in Appendix J.

Table 15 – Probable Construction Costs

Roadway	Location	Improvement	Probable Construction Cost ($ million)	Total Project Cost
SD11	US 18 to 271st St	2-lane M&R and addition of turn lanes at US 18, 276th St, 273rd St and 272nd St. Lighting at 273rd St.	$8.7	$12.0
	271st St to S. Veterans Pkwy	Reconstruct to 4-lane divided urban corridor with turn lanes	$8.0	$11.0
Subtotal			$16.7	$23.0
SD115	US 18 to 273rd St	2-lane M&R and addition of turn lanes at US 18, 276th St and 273rd St	$1.6	$2.2
TOTAL			$18.3	$25.2

Corridor Study Plans

SD11


785+00
790+00
795+00
800+00
805+00
STATE OF SOUTH DAKOTA
PROJECT
LINCOLN COUNTY CORRIDOR STUDY
SHEET
TOTAL SHEETS
Plotting Date: 12/14/2022
SD-18
SD-11
SD-11 & SD-18
SD-18
PVI 796+00.00
Elev. 1327.30
L 80.00ft
PVI 794+50.00
Elev. 1328.00
G1 -0.67 %
G2 -0.31 %
L 200.00ft
K 225
G1 0.03 %
G2 -0.67 %
K 288
PVI 791+81.82
Elev. 1328.23
PVI 804+00.00
Elev. 1324.80
+0.03 %
-0.67 %
-0.63 %
-0.31 %
1380
1370
1360
1350
1340
1330
1320
1310
1300
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1,328.11
1,328.24
1,328.07
1,328.26
1,328.20
1,328.25
1,327.95
1,327.82
1,327.24
1,327.34
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1,326.99
1,326.62
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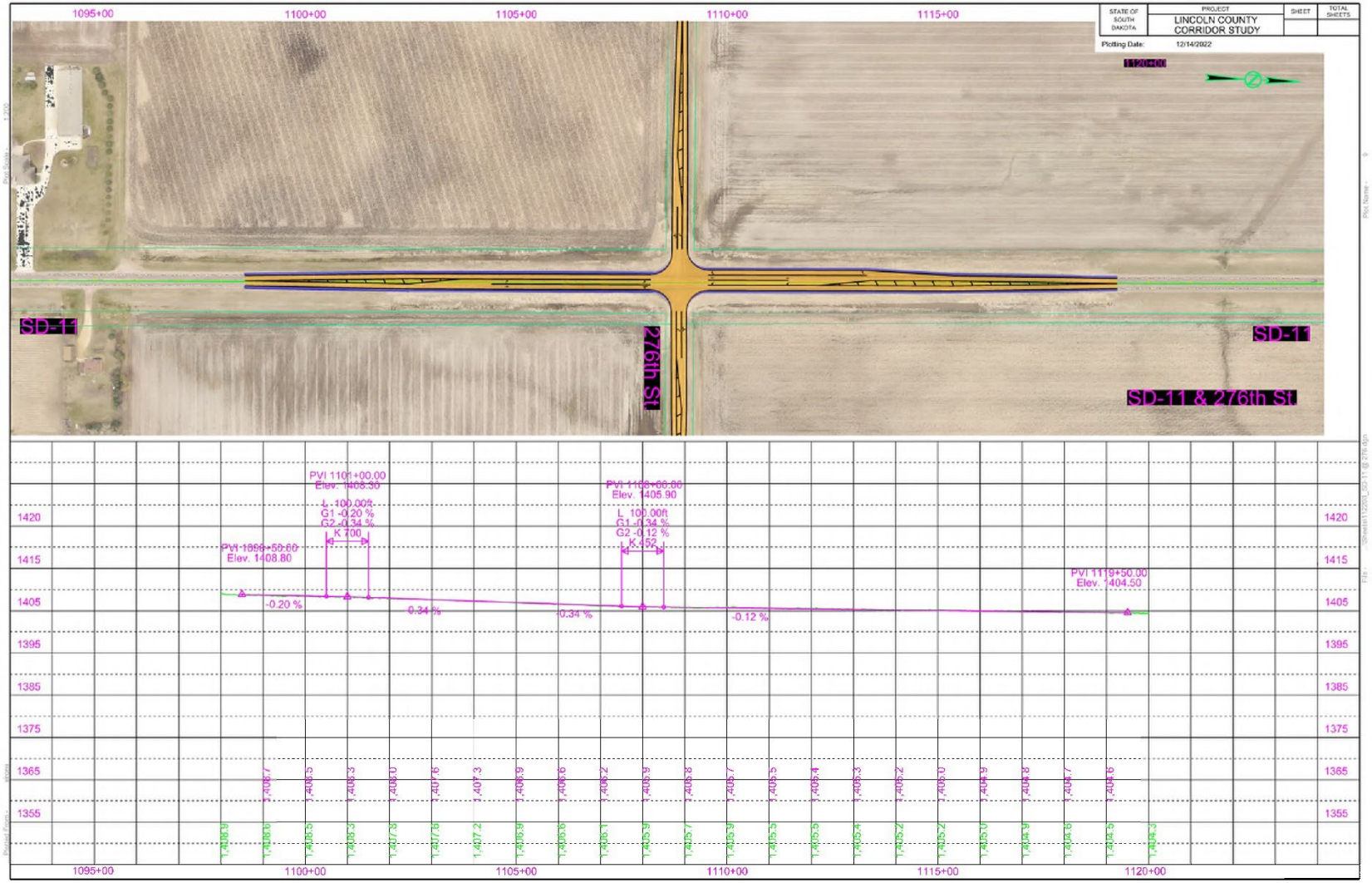
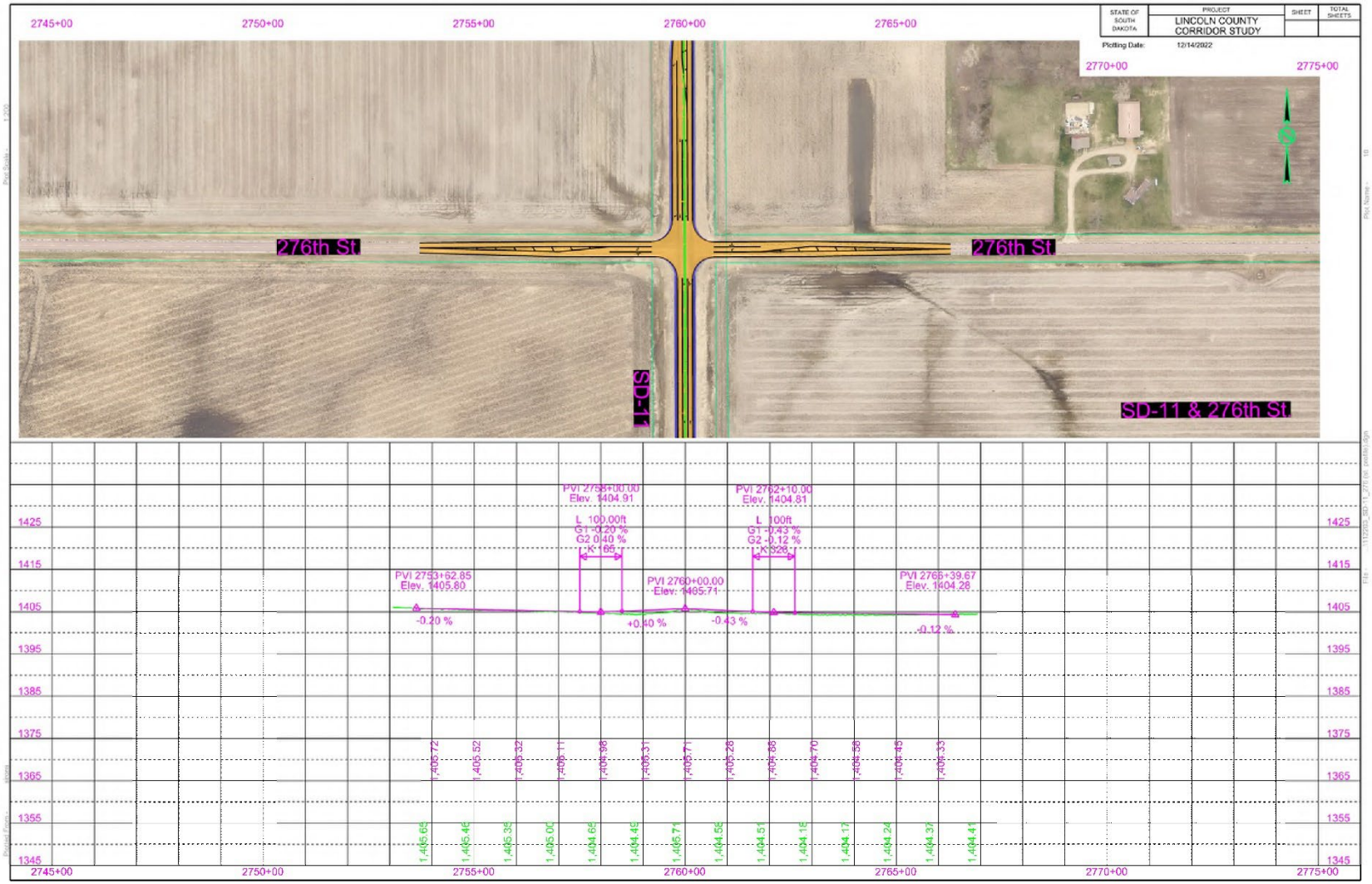
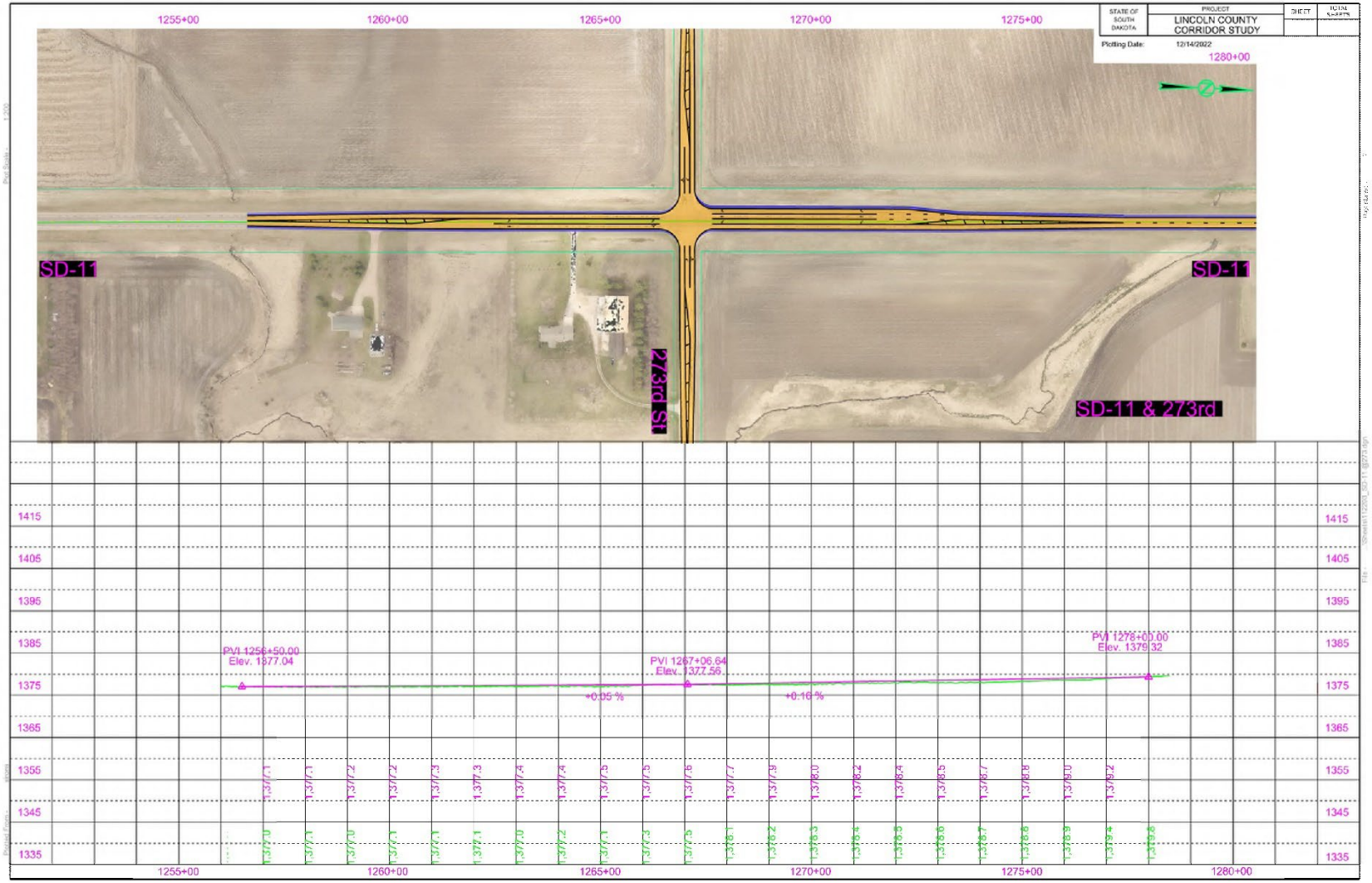
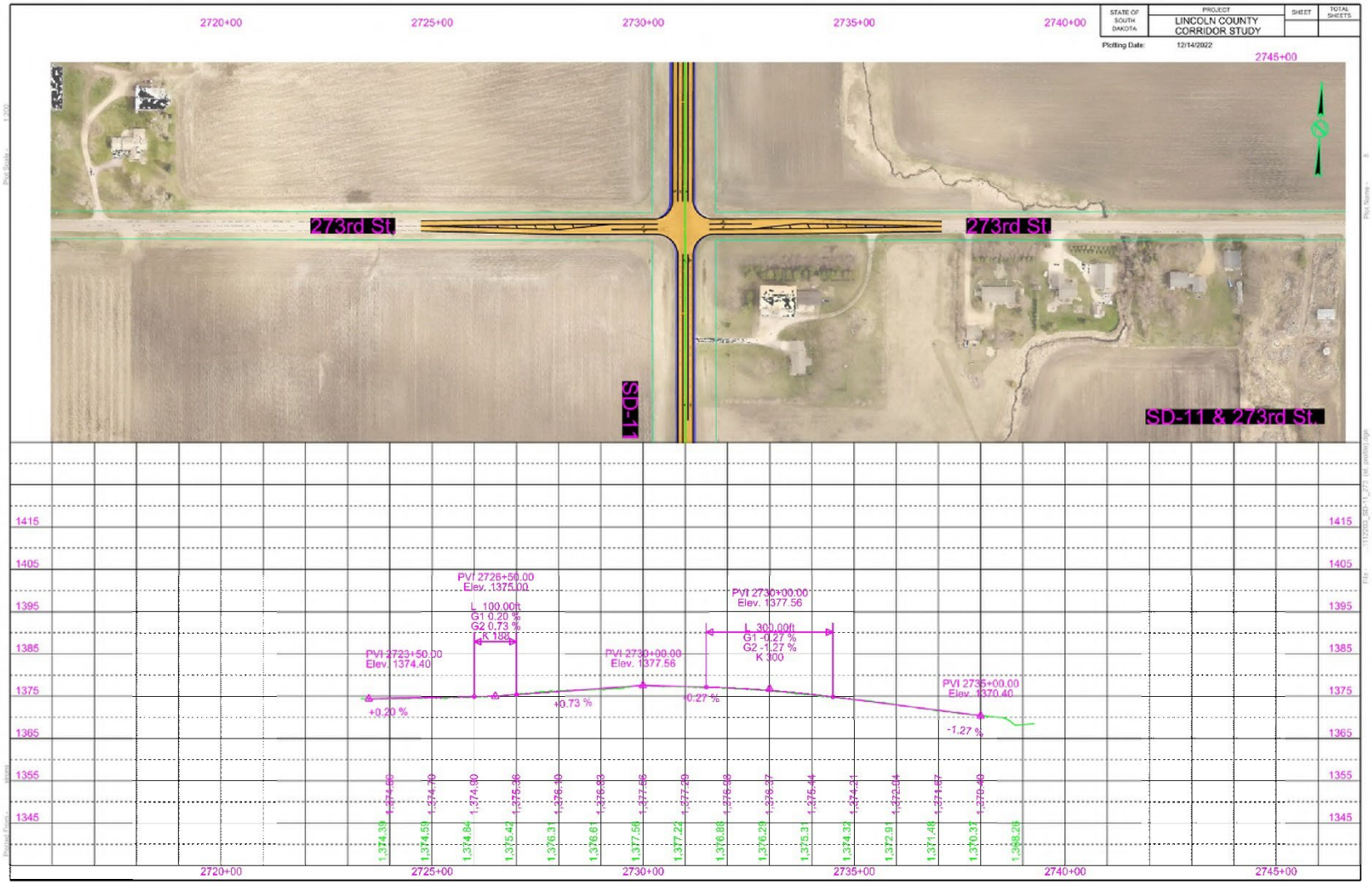
1,325.74
1,325.41
1,325.42
1,325.16
1,325.11
1,324.77
785+00
790+00
795+00
800+00
805+00
810+00

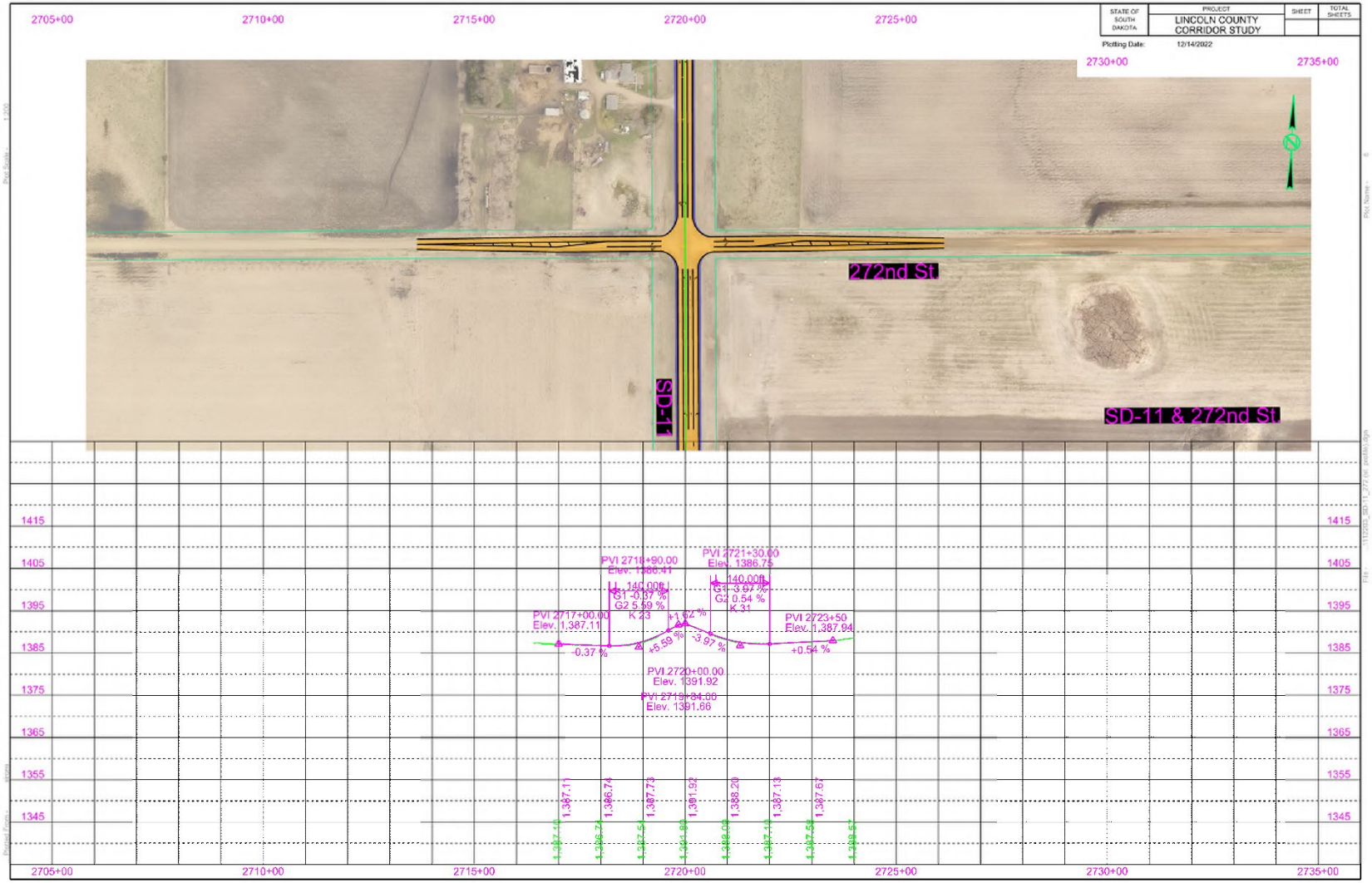

1095+00
1100+00
1105+00
1110+00
1115+00
STATE OF SOUTH DAKOTA
PROJECT
LINCOLN COUNTY CORRIDOR STUDY
SHEET
TOTAL SHEETS
Plotting Date: 12/14/2022
SD-11
276th St
SD-11
SD-11 & 276th St
PVI 1101+00.00
Elev. 1408.30
L 100.00ft
G1 -0.20 %
G2 -0.34 %
K 700
PVI 1096+50.60
Elev. 1408.80
PVI 1108+66.66
Elev. 1405.90
L 100.00ft
G1 -0.34 %
G2 -0.12 %
K 452
PVI 1119+50.00
Elev. 1404.50
-0.20 %
-0.34 %
-0.34 %
-0.12 %
1420
1415
1405
1395
1385
1375
1365
1355
1120+00


2745+00
2750+00
2755+00
2760+00
2765+00
2770+00
2775+00
STATE OF SOUTH DAKOTA
PROJECT
LINCOLN COUNTY CORRIDOR STUDY
SHEET
TOTAL SHEETS
Plotting Date: 12/14/2022
276th St
276th St
SD-11
SD-11 & 276th St
PVI 2753+62.85
Elev. 1405.80
-0.20 %
PVI 2758+00.00
Elev. 1404.91
L 100.00ft
G1 -0.20 %
G2 0.40 %
K 165
+0.40 %
PVI 2760+00.00
Elev. 1405.71
PVI 2762+10.00
Elev. 1404.81
L 100ft
G1 -0.43 %
G2 -0.12 %
K 326
-0.43 %
PVI 2766+39.67
Elev. 1404.28
-0.12 %
1425
1415
1405
1395
1385
1375
1365
1355
1345


STATE OF SOUTH DAKOTA
PROJECT
LINCOLN COUNTY CORRIDOR STUDY
SHEET
TOTAL SHEETS
Plotting Date: 12/14/2022
1255+00
1260+00
1265+00
1270+00
1275+00
1280+00
SD-11
SD-11
273rd St
SD-11 & 273rd
1415
1405
1395
1385
1375
1365
1355
1345
1335
PVI 1256+50.00
Elev. 1377.04
PVI 1267+06.64
Elev. 1377.56
PVI 1278+00.00
Elev. 1379.32
+0.05 %
+0.16 %


2720+00
2725+00
2730+00
2735+00
2740+00
2745+00
STATE OF SOUTH DAKOTA
PROJECT
LINCOLN COUNTY CORRIDOR STUDY
SHEET
TOTAL SHEETS
Plotting Date: 12/14/2022
273rd St
273rd St
SD-11
SD-11 & 273rd St
PVI 2726+50.00
Elev. 1375.00
L 100.00ft
G1 0.20 %
G2 0.73 %
K 186
PVI 2723+50.00
Elev. 1374.40
PVI 2730+00.00
Elev. 1377.56
PVI 2730+00.00
Elev. 1377.56
L 300.00ft
G1 0.27 %
G2 -1.27 %
K 300
PVI 2735+00.00
Elev. 1370.40
+0.20 %
+0.73 %
0.27 %
-1.27 %
1415
1405
1395
1385
1375
1365
1355
1345


1305+00
1310+00
1315+00
1320+00
1325+00
1330+00
1335+00
STATE OF SOUTH DAKOTA
PROJECT
LINCOLN COUNTY CORRIDOR STUDY
SHEET
TOTAL SHEETS
Plotting Date: 12/14/2022
SD-11
SD-11
272nd St
SD-11 & 272nd St
PVI 1309+50.00
Elev. 1389.92
PVI 1320+05.24
Elev. 1391.82
PVI 1331+00.00
Elev. 1391.50
+0.18 %
-0.03 %
1415
1405
1395
1385
1375
1365
1355
1345
1335


2705+00
2710+00
2715+00
2720+00
2725+00
2730+00
2735+00
STATE OF SOUTH DAKOTA
PROJECT
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SHEET
TOTAL SHEETS
Plotting Date: 12/14/2022
272nd St
SD-11
SD-11 & 272nd St
1415
1405
1395
1385
1375
1365
1355
1345
PVI 2718+90.00
Elev. 1386.41
L 140.00ft
G1 -0.37 %
G2 5.59 %
K 23
PVI 2721+30.00
Elev. 1386.75
L 140.00ft
G1 -3.97 %
G2 0.54 %
K 31
PVI 2717+00.00
Elev. 1387.11
PVI 2723+50
Elev. 1387.04
-0.37 %
+5.59 %
+1.62 %
-3.97 %
+0.54 %
PVI 2720+00.00
Elev. 1391.92
PVI 2719+34.06
Elev. 1391.66
1387.11
1386.74
1387.73
1391.92
1388.20
1387.13
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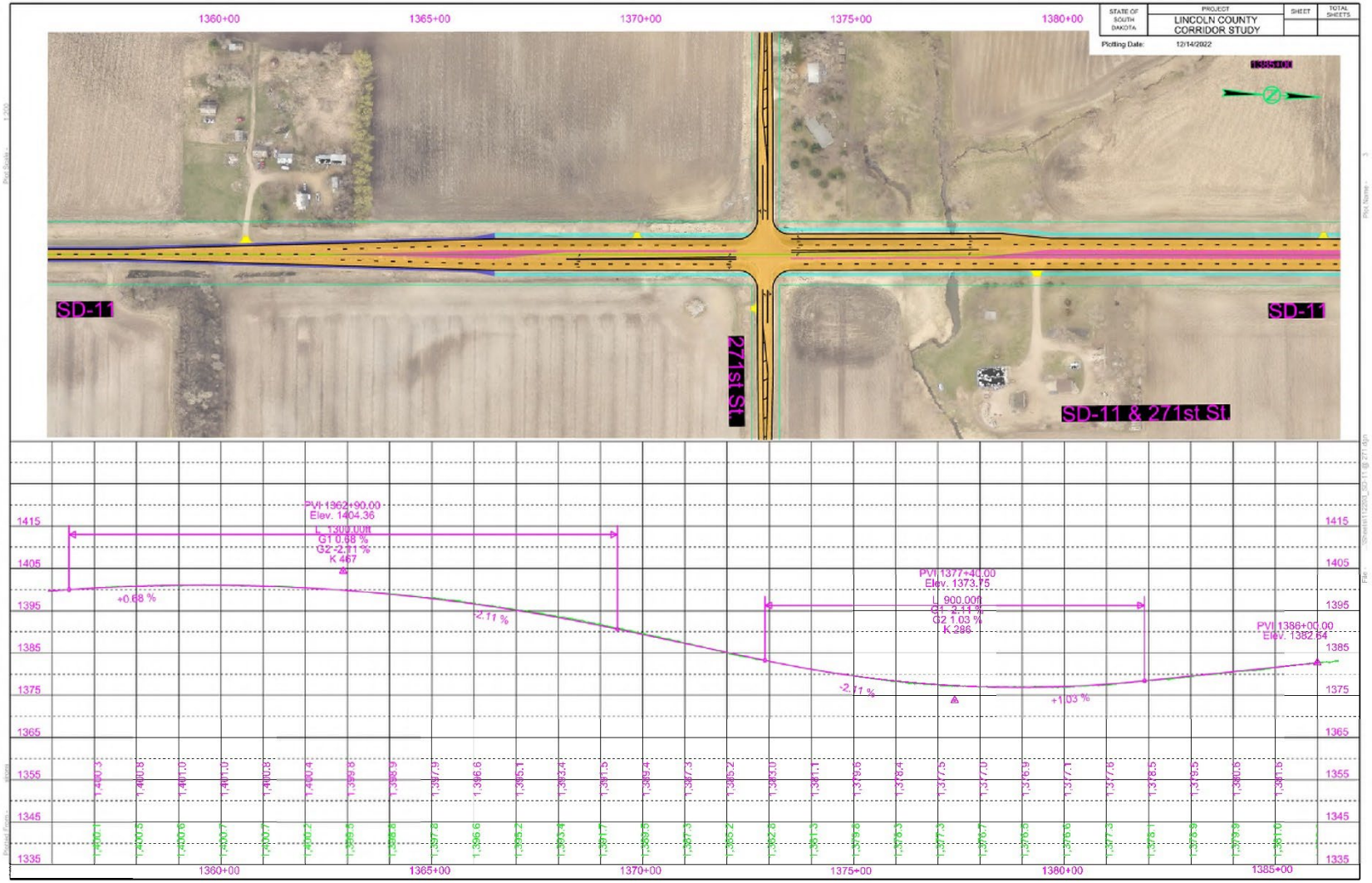
1387.51
1391.80
1388.09
1387.10
1387.50
1388.51


1360+00
1365+00
1370+00
1375+00
1380+00
STATE OF SOUTH DAKOTA
PROJECT
LINCOLN COUNTY CORRIDOR STUDY
SHEET
TOTAL SHEETS
Plotting Date: 12/14/2022
SD-11
271st St
SD-11
SD-11 & 271st St
PVI 1362+90.00
Elev. 1404.36
L 1300.00ft
G1 0.68 %
G2 -2.11 %
K 467
+0.68 %
-2.11 %
PVI 1377+40.00
Elev. 1373.75
L 900.00ft
G1 -2.11 %
G2 1.03 %
K 296
-2.11 %
+1.03 %
PVI 1386+00.00
Elev. 1382.84
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1405
1395
1385
1375
1365
1355
1345
1335
1360+00
1365+00
1370+00
1375+00
1380+00
1385+00


2695+00
2700+00
2705+00
2710+00
2715+00
2720+00
2725+00
STATE OF SOUTH DAKOTA
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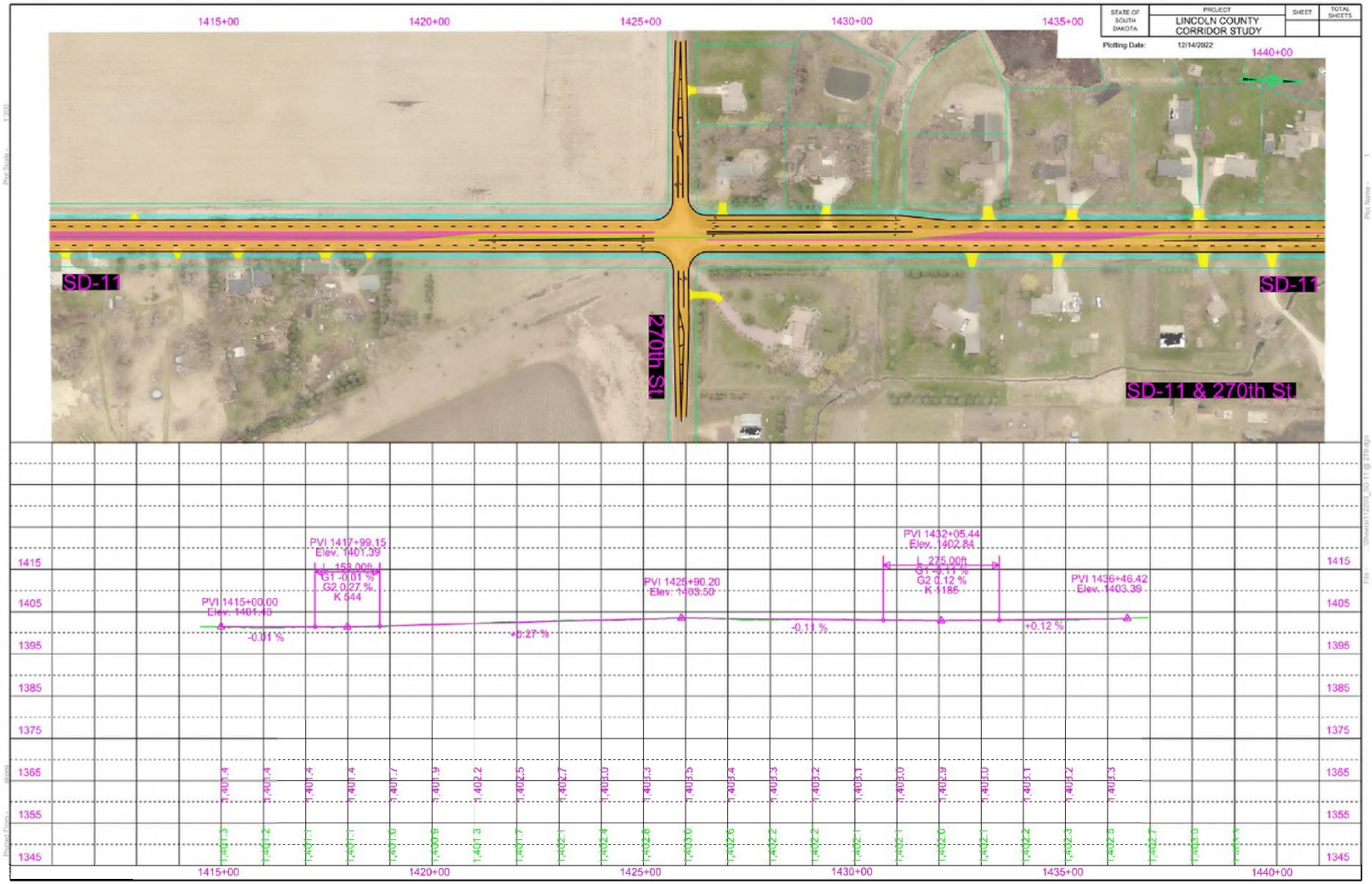
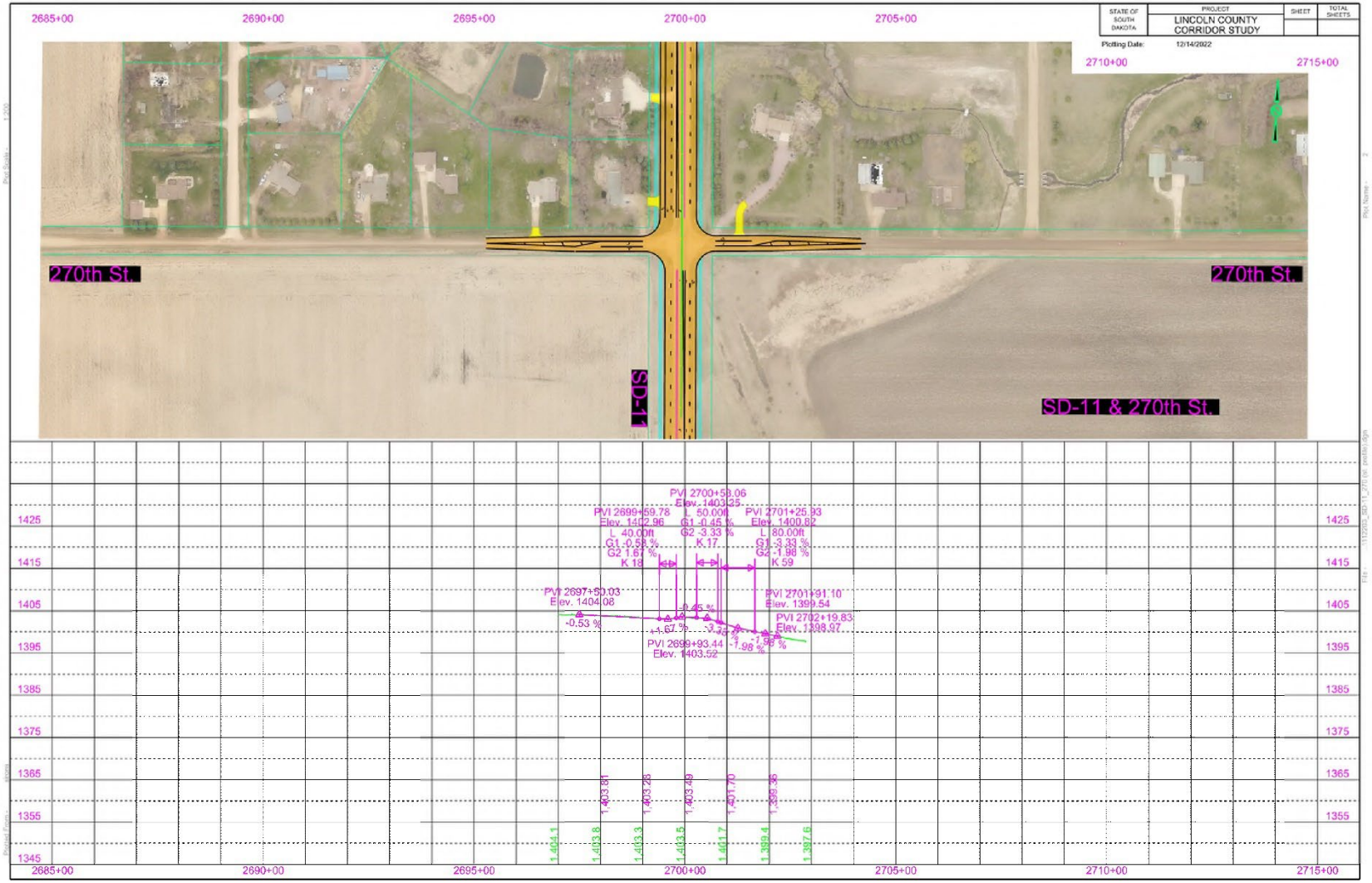
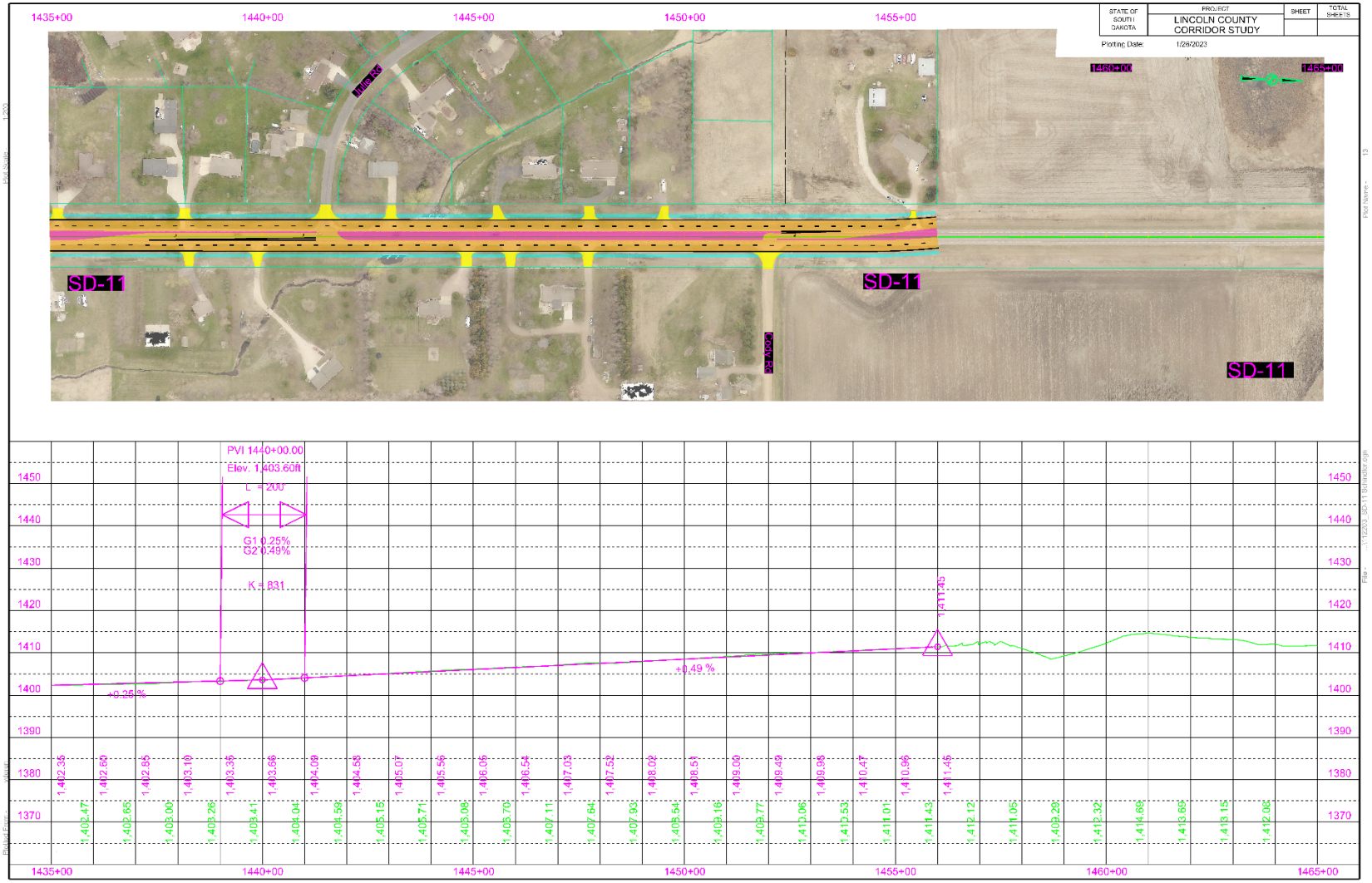
271st St
271st St
SD-11
SD-11 & 271st St
PVI 2703+40.00
Elev. 1387.25
-0.85 %
PVI 2709+00.00
Elev. 1382.48
+0.77 %
PVI 2710+90.00
Elev. 1381.15
-2.33 %
PVI 2716+00.00
Elev. 1377.50
-0.72 %
1415
1405
1395
1385
1375
1365
1355
1345
1335
1386.74
1385.89
1385.03
1384.18
1383.33
1382.48
1381.25
1381.08
1380.36
1379.65
1378.93
1378.22
1377.50
1386.60
1385.64
1385.09
1384.57
1383.61
1382.12
1383.22
1380.99
1380.14
1379.26
1378.72
1378.40
1377.51
1376.90

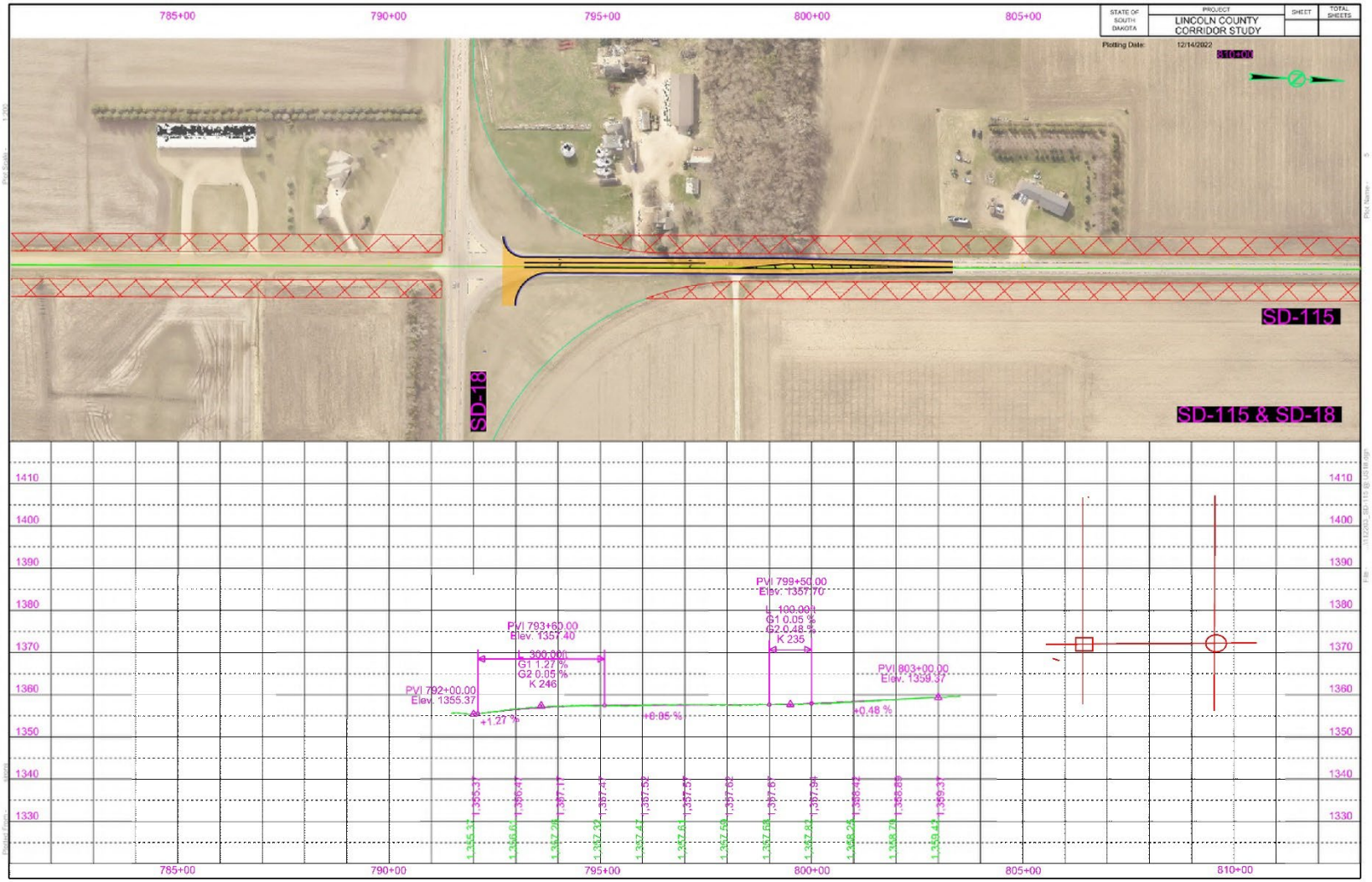

1415+00
1420+00
1425+00
1430+00
1435+00
1440+00
STATE OF SOUTH DAKOTA
PROJECT
LINCOLN COUNTY CORRIDOR STUDY
SHEET
TOTAL SHEETS
Plotting Date: 12/14/2022
SD-11
SD-11
270th St
SD-11 & 270th St
PVI 1415+00.00
Elev. 1401.40
-0.01 %
PVI 1417+99.15
Elev. 1401.39
L 153.00ft
G1 -0.01 %
G2 0.27 %
K 544
+0.27 %
PVI 1425+90.20
Elev. 1403.50
-0.11 %
PVI 1432+05.44
Elev. 1402.84
L 275.00ft
G1 -0.11 %
G2 0.12 %
K 1186
+0.12 %
PVI 1436+46.42
Elev. 1403.39
1415
1405
1395
1385
1375
1365
1355
1345

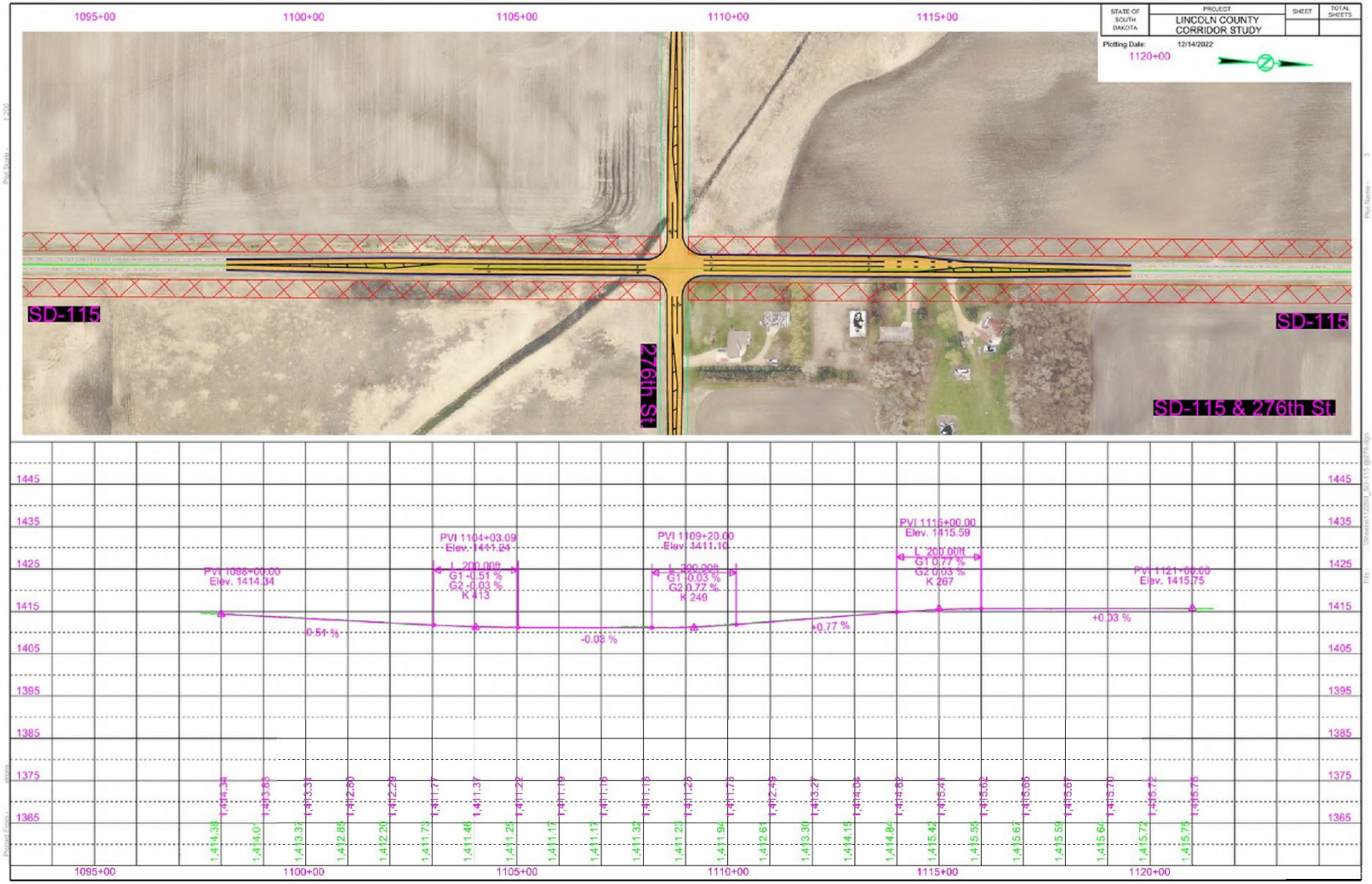

2685+00
2690+00
2695+00
2700+00
2705+00
2710+00
2715+00
STATE OF SOUTH DAKOTA
PROJECT
LINCOLN COUNTY CORRIDOR STUDY
SHEET
TOTAL SHEETS
Plotting Date: 12/14/2022
270th St.
270th St.
SD-11
SD-11 & 270th St.
PVI 2700+58.06
Elev. 1403.25
L 50.00ft
G1 -0.45 %
G2 -3.33 %
K 17
PVI 2699+59.78
Elev. 1402.96
L 40.00ft
G1 -0.58 %
G2 1.67 %
K 18
PVI 2701+25.93
Elev. 1400.82
L 80.00ft
G1 -3.33 %
G2 -1.98 %
K 59
PVI 2697+50.03
Elev. 1404.08
-0.53 %
PVI 2701+91.10
Elev. 1399.54
PVI 2702+19.83
Elev. 1398.97
PVI 2699+93.44
Elev. 1403.52
1425
1415
1405
1395
1385
1375
1365
1355
1345
1403.81
1403.28
1403.49
1401.70
1399.36
1404.1
1403.8
1403.3
1403.5
1401.7
1399.4
1397.6


1435+00
1440+00
1445+00
1450+00
1455+00
1460+00
1465+00
STATE OF SOUTH DAKOTA
PROJECT
LINCOLN COUNTY CORRIDOR STUDY
SHEET
TOTAL SHEETS
Plotting Date: 1/26/2023
SD-11
SD-11
SD-11
PVI 1440+00.00
Elev. 1,403.60ft
L = 200'
G1 0.25%
G2 0.49%
K = 831
+0.25 %
+0.49 %
1,411.45
1450
1440
1430
1420
1410
1400
1390
1380
1370

Corridor Study Plans

SD115

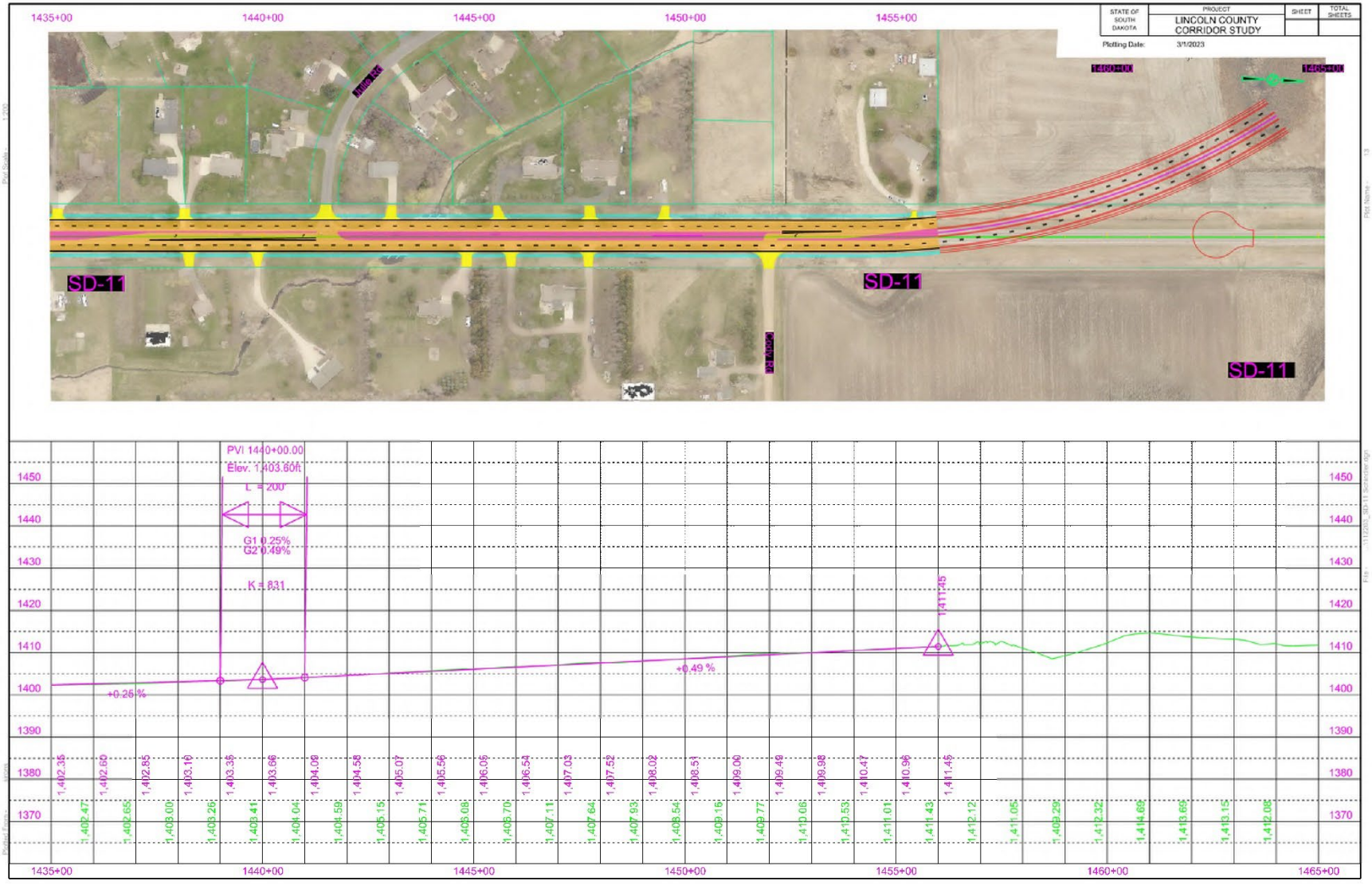

785+00
790+00
795+00
800+00
805+00
STATE OF SOUTH DAKOTA
PROJECT
LINCOLN COUNTY CORRIDOR STUDY
SHEET
TOTAL SHEETS
Plotting Date: 12/14/2022
SD-115
SD-18
SD-115 & SD-18
PVI 792+00.00
Elev. 1355.37
PVI 793+60.00
Elev. 1357.40
300.00ft
G1 1.27 %
G2 0.05 %
K 246
PVI 799+50.00
Elev. 1357.70
100.00ft
G1 0.05 %
G2 0.48 %
K 235
PVI 803+00.00
Elev. 1359.37
+1.27 %
+0.05 %
+0.48 %
1410
1400
1390
1380
1370
1360
1350
1340
1330
810+00


1095+00
1100+00
1105+00
1110+00
1115+00
1120+00
STATE OF SOUTH DAKOTA
PROJECT
LINCOLN COUNTY CORRIDOR STUDY
SHEET
TOTAL SHEETS
Plotting Date: 12/14/2022
SD-115
276th St
SD-115
SD-115 & 276th St
PVI 1088+00.00
Elev. 1414.34
PVI 1104+03.09
Elev. 1411.24
L 200.00ft
G1 -0.51 %
G2 -0.03 %
K 413
PVI 1109+20.00
Elev. 1411.10
L 200.00ft
G1 -0.03 %
G2 0.77 %
K 249
PVI 1116+00.00
Elev. 1415.59
L 200.00ft
G1 0.77 %
G2 0.03 %
K 267
PVI 1121+00.00
Elev. 1415.75
-0.51 %
-0.03 %
+0.77 %
+0.03 %
1445
1435
1425
1415
1405
1395
1385
1375
1365


STATE OF SOUTH DAKOTA
PROJECT
LINCOLN COUNTY CORRIDOR STUDY
SHEET
TOTAL SHEETS
Plotting Date: 12/14/2022
2785+00
2790+00
2795+00
2800+00
2805+00
276th St.
276th St.
SD-115 & 276th St.
1395
1385
1375
1365
1355
1345
1335
1325
1315
PVI 2796+26.00
Elev. 1358.30
L 100.00ft
G1 0.29 %
G2 -0.25 %
PVI 2798+06.00
Elev. 1357.95
L 50.00ft
G1 -0.25 %
G2 1.23 %
PVI 2802+00.00
Elev. 1356.50
L 200.00ft
G1 -0.97%
G2 0.34%
2796+50.00
Elev. 1357.80
+0.29 %
-0.25 %
+1.23 %
-0.97 %
+0.34 %
PVI 2800+00.00
Elev. 1358.44
1357.89
1358.22
1358.17
1358.41
1357.42
1356.67
1356.79
1357.07
1357.86
2785+00
2790+00
2795+00
2800+00
2805+00
2810+00
2815+00

Corridor Study Plans

Shindler


1435+00
1440+00
1445+00
1450+00
1455+00
1460+00
1465+00
STATE OF SOUTH DAKOTA
PROJECT
LINCOLN COUNTY CORRIDOR STUDY
SHEET
TOTAL SHEETS
Plotting Date: 3/1/2023
SD-11
SD-11
SD-11
PVI 1440+00.00
Elev. 1,403.60ft
L = 200
G1 0.25%
G2 0.49%
K = 831
+0.26 %
+0.49 %
1411.45
1450
1440
1430
1420
1410
1400
1390
1380
1370