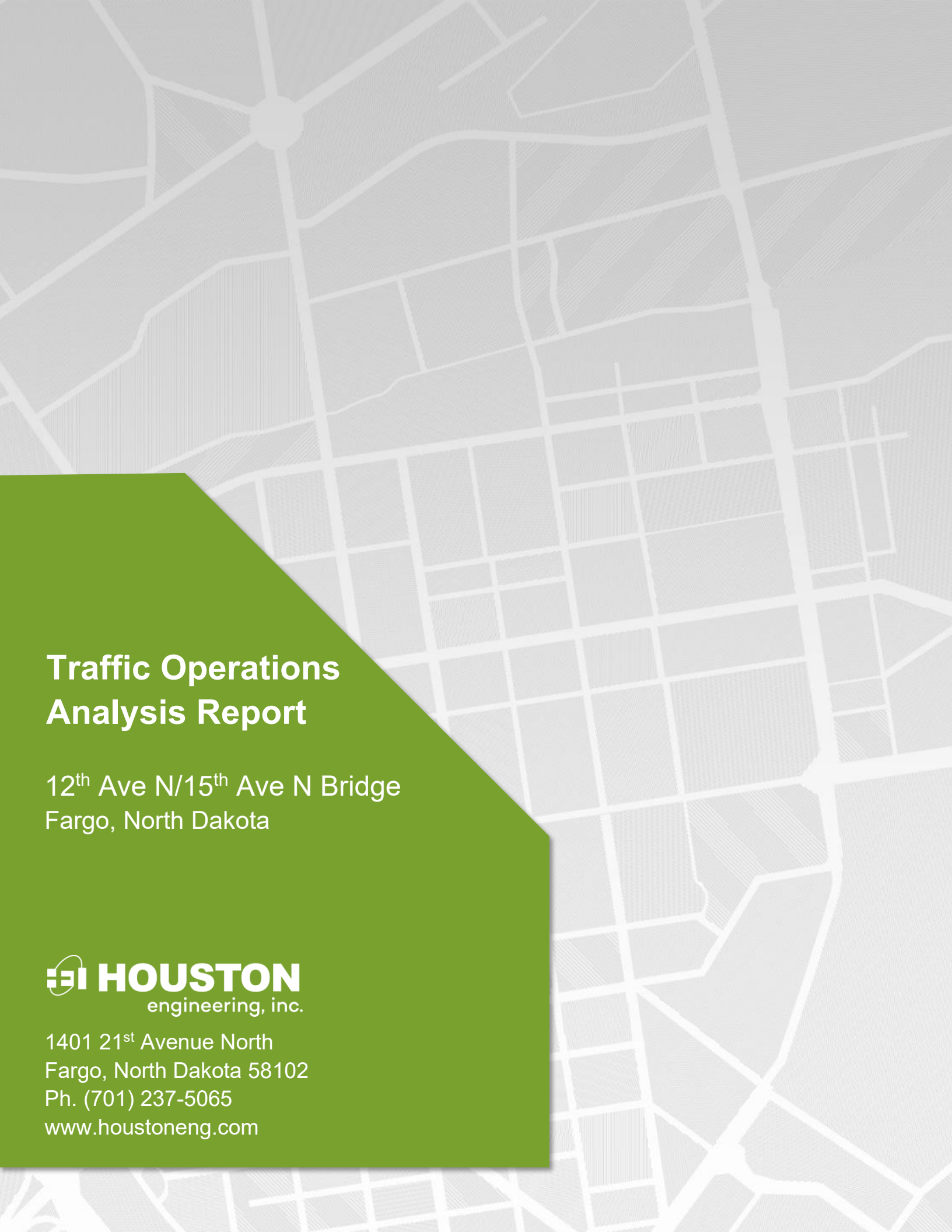


A light gray background map of Fargo, North Dakota, showing a grid of streets and a central roundabout. A large green diagonal shape covers the bottom-left portion of the page, serving as a backdrop for the text.

Traffic Operations Analysis Report

12th Ave N/15th Ave N Bridge
Fargo, North Dakota



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12th Avenue N/15th Avenue N Bridge Traffic Operations Analysis Report

Fargo, North Dakota

Prepared by:

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Prepared for:

City of Fargo, North Dakota

Submitted to:

City of Fargo, North Dakota

September 24, 2025



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I hereby certify that this plan, specification, or report was prepared by me or under my direct supervision and that I am a duly Licensed Professional Engineer under the laws of the State of North Dakota.

A handwritten signature in blue ink, reading 'Steven L. Strack', is written over a horizontal line.

Steven L. Strack
License No. 10621

Date: 9/24/2025



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1.0 Introduction

This study has been prepared to assess the existing and future traffic and safety needs at the intersection of 12th Avenue N and Elm Street N and along 12th Avenue N in Fargo, North Dakota. This analysis is synchronous with the redesign and reconstruction of the 12th Avenue N /15th Avenue N Bridge. The purpose of the study is to determine the most appropriate form of traffic control at the intersection of 12th Avenue N and Elm Street in response to increasing traffic volumes and potential safety concerns; to analyze existing multi-modal operations and, if necessary, recommend improvements; and to identify bridge cross section needs. Existing 2025, year 2030, and year 2050 conditions were analyzed as part of the study.

Recommendations are based on the following resources:

- North Dakota Department of Transportation (NDDOT) Traffic Operations Manual (August 2025)
- Highway Capacity Manual 7th Edition (2022)
- Synchro 12
- NDDOT Traffic Count Data System
- Fargo-Moorhead Council of Governments Travel Demand Model (FMCOG TDM)
- 2023 Manual on Uniform Traffic Control Devices (11th Edition)
- North Dakota Vision Zero Plan 2024 (Strategic Highway Safety Plan [SHSP])
- AASHTO Highway Safety Manual
- AASHTO A Policy on Geometric Design of Highways and Streets (2018)
- NCHRP Research Report 1043 Guide for Roundabouts (2023)
- Transportation Research Board (TRB) Access Management Manual (2nd Edition)
- Fargo-Moorhead Metropolitan Bicycle and Pedestrian Plan (October 2022)
- 2050 Fargo-Moorhead Metropolitan Transportation Plan
- Draft MATBUS 2026-2030 Transit Development Plan
- City of Fargo Truck Route Map (March 2020)

2.0 Existing Conditions

A cursory review was performed to establish existing 2025 conditions. The evaluation of existing conditions is limited to the operational and geometric characteristics of the study area and does not include an assessment of build alternatives. The existing conditions serve as the basis for all alternatives evaluation to follow. Evaluation of existing conditions has been described in the following subsections.

2.1 Study Area Limits

Study area limits have been shown in **Figure 1**. Although the reconstruction limits for the 12th Avenue N/15th Avenue N Bridge will extend into Moorhead, conversations with Fargo and Moorhead staff indicated focus of the study should be on 12th Avenue N west of the Red River.

Figure 1: Study Area Limits



2.2 Land Use

Land use within and surrounding the study area is primarily residential with public and institutional uses along the Red River. Public uses include Mickelson Park, Trefoil Park, and Jack Williams Stadium. No land uses changes are anticipated within the future study year horizon that would significantly change traffic volumes or patterns.

2.3 Existing Roadway Characteristics

A cursory review was performed to identify roadway characteristics within the study area limits and a summary is provided below. Existing intersection traffic control and lane configuration have been shown in **Figure 2**.

- **12th Avenue N Segment**

- Two-lane undivided urban collector with 12' driving lanes.
- Bridge clear width of 32'.
- Statutory speed limit of 25 miles per hour (mph)
 - 30 mph on the Moorhead side of the Red River.
- Existing multi-modal facilities east of Elm Street N:
 - Pedestrian sidewalk on the south side of the road. Sidewalk provides access across the 12th Avenue N/15th Avenue N Bridge.
 - Shared use path on the north side of the road that provides access to the Fargo Mickelson/Tricorn bike path.
- Existing multi-modal facilities west of Elm Street N:
 - Pedestrian sidewalks and bicycle lanes on both sides of the road.
- Marked midblock crossing to facilitate access from the Jack Williams Stadium to the overflow parking lot.
- No parking restrictions on both sides of the road.

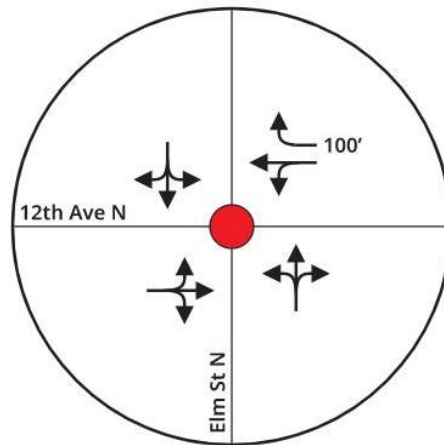
- **Elm Street N Segment**

- Two-lane undivided urban collector with 12' driving lanes.
- Statutory speed limit of 25 miles per hour (mph).
- Sidewalks are present on both sides of the road.
- No parking restrictions on both sides of the road with the exception of the east side south of 12th Avenue N.

- **Intersection of 12th Avenue N and Elm Street N**

- Existing all-way stop control (AWSC).
- Pedestrian crossings on all legs. However, no painted crosswalks present.
- Single lane approaches with a 100' westbound right turn lane.

Figure 2: Existing Intersection Lane Configuration



2.4 Existing Multimodal Characteristics

A review of previous planning documents, studies, and maps were reviewed to obtain an understanding of the existing and future multimodal needs. A summary of findings has been provided below.

2.4.1 Pedestrians and Bicyclists

The Fargo-Moorhead Metropolitan Bicycle and Pedestrian Plan Dated October 2022 was referenced for future pedestrian and bicycle improvements. According to the Plan, there are no pedestrian priority projects within the study area and the 12th Avenue N/15th Avenue N bridge was identified as a bike network public priority project. The 2050 Fargo-Moorhead Metropolitan Transportation Plan indicated there are no pedestrian or bicycle fiscally constrained projects within the study area. However, the 12th Avenue N/15th Avenue N Bridge is included as a “vision” project.

2.4.2 Transit

Transit within the Fargo-Moorhead is serviced by MATBUS. No fixed routes are located in the study area. MATBUS also has an on-demand transit service, but those services only provide coverage in the Fargo Industrial Park and North Dakota State University (NDSU). The Draft MATBUS 2026-2030 Transit Development Plan was reviewed and no expansion of fixed route services are planned in the study area.

2.4.3 Commercial Vehicles

The City of Fargo Truck Route Map dated March 2020 indicates the 12th Avenue N/15th Avenue N Bridge is weight restricted. A search of MnDOT’s load rating reports indicates the bridge is structurally sufficient with no load restriction specified. Currently, “NO TRUCKS” regulatory signing is posted on the north, east, and west legs of the 12th Avenue N and Elm Street N intersection.

Observed commercial vehicle volumes at the 12th Avenue N and Elm Street N intersection were obtained from the NDDOT Traffic Count Data System. Volumes reported from 2024 data are two-way volumes. For the purposes of this study, 2024 traffic volumes are assumed to be representative of 2025 conditions. Existing 2025 daily commercial vehicle volumes are shown in **Table 1**. It should be noted that the volumes shown in **Table 1** are slightly different than the volumes shown in **Table 2** as they are raw and do not have seasonal adjustment factors applied.

Table 1: Existing 2025 Daily Commercial Vehicle Volumes

Intersection Approach	FHWA Class 4	FHWA Class 5	FHWA Class 9	Total
EB	13	65	6	84
WB	14	79	9	102
NB	1	10	5	16
SB	6	30	2	38
Total	34	184	22	240

Notes:

FHWA Class 4: Buses (2 or 3 axles, full length)

FHWA Class 5: Single Unit 2-Axle Trucks (2 axles, 6 tires (dual rear tires), single-unit)

FHWA Class 9: Single Trailer 5-Axle Trucks (5 axles, single trailer)

Table reports two-way volumes on each intersection leg.

2.5 Existing Traffic Conditions

2024 annual average daily traffic (AADT) volumes were obtained from the NDDOT Traffic Count Data System. Year 2024 counts are assumed reflective of 2025 conditions. This assumption is made with consideration that future daily volumes are forecasted from the 2025 base year. Existing 2025 AADT volumes are shown in **Table 2**.

Table 2: Existing 2025 AADT Volumes

	Eastbound Approach	Westbound Approach	Northbound Approach	Southbound Approach
2025 AADT	7,075	9,661	1,691	5,256
Heavy Commercial Average Annual Daily Traffic (HCAADT)	79	95	15	36
HCAADT Percent Share of AADT	1.1%	1.0%	0.9%	0.7%

24-hour turning movement counts (TMCs) were collected on Tuesday, April 15, 2025, to represent typical weekday traffic conditions. The observed AM and PM peak hours are from 7:15 – 8:15 AM and 4:15 – 5:15 PM, respectively. Under existing conditions, the eastbound and westbound travel directions prescribe 12th Avenue N as the major roadway.

Table 3 and 4 show the existing turning movement volumes at the intersection for the AM and PM peaks, respectively. Likewise, **Figure 3** shows the AM and PM peak hour volumes. The complete daily dataset for the TMC's is in **Appendix A**.

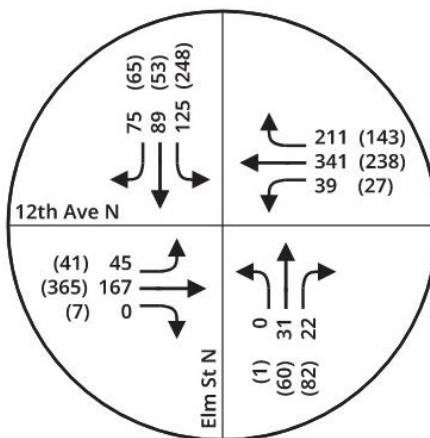
Table 3: Existing 2025 AM Peak Hour Turning Movement Volumes

	Time	Northbound				Southbound				Westbound				Eastbound				Auto Total
		Left	Thru	Right	Ped/Bike	Left	Thru	Right	Ped/Bike	Left	Thru	Right	Ped/Bike	Left	Thru	Right	Ped/Bike	
AM Peak	7:15 AM	-	3	7	0	27	21	14	0	10	79	54	0	16	31	0	0	262
	7:30 AM	-	16	6	1	30	20	19	0	6	89	62	1	13	48	0	0	309
	7:45 AM	-	9	7	0	42	27	21	0	15	92	54	0	11	46	0	0	324
	8:00 AM	-	3	2	1	26	21	21	1	8	81	41	2	5	42	0	2	250
	Total	-	31	22	2	125	89	75	1	39	341	211	3	45	167	0	2	1,145

Table 4: Existing 2025 PM Peak Hour Turning Movement Volumes

	Time	Northbound				Southbound				Westbound				Eastbound				Auto Total
		Left	Thru	Right	Ped/Bike	Left	Thru	Right	Ped/Bike	Left	Thru	Right	Ped/Bike	Left	Thru	Right	Ped/Bike	
PM Peak	4:15 PM	0	14	21	1	62	15	15	1	2	67	38	2	14	81	0	0	329
	4:30 PM	0	17	12	1	70	12	20	1	12	60	40	3	8	83	2	2	336
	4:45 PM	1	4	17	1	55	17	14	2	4	63	25	0	7	105	3	1	315
	5:00 PM	0	25	32	0	61	9	16	0	9	48	40	0	12	96	2	0	350
	Total	1	60	82	3	248	53	65	4	27	238	143	5	41	365	7	3	1,330

Figure 3: Existing 2025 Peak Hour Turning Movement Volumes



AM (PM) Peak Hour

2.6 Existing Crash Analysis

Crash data provided by the NDDOT shows a total of 5 reported crashes within the study limits over the last 5 years (July 1, 2020 to June 30, 2025), indicating a crash frequency of 1.0 crashes per year. All crashes occurred at the intersection of 12th Avenue N and Elm Street N. Crashes included three angle crashes, one rear-end crash, and one ped/bike crash.

These crashes are categorized by severity, an important consideration evaluating an intersection for safety. The five levels of severity are as follows:

- Fatal (K): One or more deaths resulting from injuries sustained during a crash.
- Incapacitating Injury (A): Severe injuries that require hospitalization and/or medical care such as a broken bone or amputation.
- Non-Incapacitating Injury (B): Injuries that are evident such as bruises, cuts, and sprains which do not incapacitate an individual.
- Possible Injury (C): Injuries that are claimed or report with no evident signs of wounds or injuries. Includes simple complaints of pain.
- Property Damage Only (O): Crashes that result in no injuries and only damage to property.

Of the five crashes, one resulted in a non-incapacitating injury (B), two resulted in possibly injuries (C), and two of the crashes resulted in property damage only (O). There were no fatal (K) or incapacitating injury (A) crashes reported during the analysis period.

Further observation of the crash data indicates the following:

- None of the crashes were alcohol or drug related.
- 4 of the 5 crashes occurred during dry conditions, with the remaining one occurring during wet conditions.
- All the crashes occurred during daylight.
- All three angle crashes resulted from the intersection's conflict point between the southbound and westbound directions.
- The sole pedestrian/bicycle crash involved a northbound bicycle being struck by a westbound pickup. The crash represents a blind spot conflict, as an eastbound pickup was stopped at the intersection, obstructing the westbound driver's view. The northbound bicycle crossed behind the stopped vehicle and was subsequently struck by the westbound pickup as it departed the intersection.

The intersection was also evaluated for crash rate, which normalizes the number of crashes to the relative traffic volumes present at a particular intersection or segment, and can be used to compare against statewide or other typical averages to assess the relative safety. Intersection crash rates are calculated as the number of crashes per million entering vehicles (MEV). The crash rate at the study intersection is 0.23 crashes per MEV, which is generally considered a low crash rate for similar type of intersection.

For the full crash history see **Appendix B**.

2.7 Existing Intersection Capacity Analysis

Existing intersection capacity analysis was completed using Synchro/SimTraffic Software (Version 12). Synchro is a Highway Capacity Manual (HCM) based deterministic tool that can estimate intersection capacity, delay, and other performance measures. SimTraffic is a microsimulation tool that analyzes the movement of individual vehicles as they travel through a network. SimTraffic uses Synchro and other inputs to simulate real-world driver behavior. Microsimulation is often used to address specific limitations of the HCM methodologies, such as over-saturated conditions. Measures of effectiveness (MOEs) were reported from SimTraffic. Detailed existing capacity analysis outputs have been provided in **Appendix C** and summarized in **Table 6**.

Level of Service (LOS) is a qualitative measure used to translate complex numerical performance into a simplified system that defines a travelers' perception of the quality of service provided by a facility. A letter grade, similar to a report card, ranging from A to F, is assigned based on various metrics such as speed, volume to capacity ratio, delay, stops, and other criteria. The HCM defines six levels of service with LOS A representing the best operating conditions and LOS F the worst. HCM level of service (LOS) for signalized and unsignalized intersections have been summarized in **Table 5**. The NDDOT Traffic Operations Manual guidance is to meet or exceed an intersection LOS D or better.

Table 5: Level of Service (LOS) Summary

LOS Designation	Signalized Intersection Avg Delay / Vehicle (Seconds)	Unsignalized Intersection Avg Delay / Vehicle (Seconds)	Description
A	0-10	0-10	Free Flowing / No Congestion
B	>10-20	>10-15	Stable Flow / Minimal Congestion
C	>20-35	>15-25	Stable Flow / Moderate Congestion
D	>35-55	>25-35	Approaching Unstable Flows / Increasing Congestion
E	>55-80	>35-50	Unstable Flows / Congested Conditions
F	>80	>50	Stop and Go / Volume Exceeds Capacity

Table 6: Year 2025 Existing Level of Service (LOS)

Scenario		App	AM Peak				PM Peak					
Year	Control		Movement Delay (LOS)			App. Delay (LOS)	Int. Delay (LOS)	Movement Delay (LOS)			App. Delay (LOS)	Int. Delay (LOS)
			Left	Thru	Right			Left	Thru	Right		
2025	AWSC	EB	8.2 (A)	8.1 (A)	—	8.1 (A)	9.5 (A)	44.6 (E)	50.9 (F)	51.6 (F)	50.4 (F)	30.1 (D)
		WB	11.7 (B)	12.4 (B)	6.6 (A)	10.3 (B)		14.2 (B)	14.7 (B)	6.4 (A)	11.9 (B)	
		NB	—	7.9 (A)	4.2 (A)	6.3 (A)		7.6 (A)	12.6 (B)	9.5 (A)	10.9 (B)	
		SB	9.8 (A)	10.4 (B)	7.6 (A)	9.4 (A)		34.7 (D)	34.0 (D)	34.5 (D)	34.5 (D)	

Notes:

Delay is measured in seconds/vehicle

“—” indicates there is no existing volume for the movement, or an LOS metric is not quantifiable in HCM methodology.

AWSC: All-Way Stop Control

Capacity analysis indicates the AM peak hour operates at an intersection LOS A with minimal or no queuing. The PM peak hour operates at an intersection LOS D with unstable flows and congestion. The PM peak hour LOS is driven by poor operations on the eastbound approach with all movements having a LOS E or worse. Although the intersection meets the NDDOT guidance of an intersection LOS D or better, capacity analysis indicates the existing intersection should be redesigned to mitigate observed queuing and operational deficiencies.

3.0 Future Traffic Forecasts

Future traffic volume forecasts were produced from the FMCOG Travel Demand Model (TDM). The TDM is the basis for determining planning horizon traffic volume forecasts for the entire Fargo-Moorhead area. The model can be used to test various existing and planned transportation alternative scenarios to make reasonable traffic volume estimates and recommendations for future improvements.

TDM forecasts were available for year 2035 and year 2050 planning horizons. Comparing the forecasted 2035 volumes against the 2025 AADT volumes shown in **Table 2**, the TDM is forecasting less traffic than currently observed on 12th Avenue N. As traffic volumes are expected to increase from 2025 to 2050, forecasted 2035 volumes were not incorporated into this study. 2025 AADTs, 2050 AADTs, and calculated annual average growth rates have been provided in **Table 7**.

This study considers alternatives for future year 2030 and year 2050 conditions. The year 2030 was chosen as the opening year (year bridge reconstruction is completed by) and year 2050 as the 20-year horizon. Year 2030 AADTs were interpolated between existing 2025 and forecasted 2050 AADTs.

Table 7: Future Traffic Forecasts

	Eastbound Approach	Westbound Approach	Northbound Approach	Southbound Approach
2025 AADT	7,075	9,661	1,691	5,256
2050 AADT	7,500	10,180	2,230	6,080
Annual Average Growth Rate	0.23%	0.21%	1.11%	0.58%
2030 AADT (Interpolated)	7,170	9,780	1,820	5,435

Turning movement forecasts were developed using the existing peak hour turning movement volumes and forecasted AADTs shown in **Table 7**. The existing turning movement volumes were converted into a 4 x 4 matrix and forecasted to peak hour approach volumes using the FRATAR methodology. This methodology iterates between scaling the matrix's column totals (entering approach volumes) and the matrix's row totals (exiting approach volumes) until a certain level of convergence in cell values occurs. The targets for entering and exiting approach volumes were calculated by assuming the same peak hour percentages under future alternatives as under existing conditions. This process aims to systematically balance the turning movement volumes to the assumed growth, instead of applying a standard growth rate. The forecasted turning movement volumes for year 2030 and year 2050 conditions are shown in **Table 8** and **Table 9**, respectively. **Figures 4 and 5** also show the year 2030 and year 2050 volumes in diagrams.

Table 8: Year 2030 Peak Hour Turning Movement Volumes

	Northbound				Southbound				Westbound				Eastbound				Auto Total
	Left	Thru	Right	Ped/ Bike	Left	Thru	Right	Ped/ Bike	Left	Thru	Right	Ped/ Bike	Left	Thru	Right	Ped/ Bike	
AM Peak	5	35	25	2	125	95	75	2	40	345	215	3	45	170	5	3	1,180
PM Peak	5	65	85	4	250	60	70	5	30	240	145	5	45	365	10	3	1,370

Table 9: Year 2050 Peak Hour Turning Movement Volumes

	Northbound				Southbound				Westbound				Eastbound				Auto Total
	Left	Thru	Right	Ped/ Bike	Left	Thru	Right	Ped/ Bike	Left	Thru	Right	Ped/ Bike	Left	Thru	Right	Ped/ Bike	
AM Peak	5	40	30	2	130	120	80	2	55	400	230	3	50	195	5	3	1,340
PM Peak	5	80	115	5	270	70	75	5	40	280	155	5	45	420	10	5	1,565

Figure 4: Year 2030 Peak Hour Turning Movement Volumes

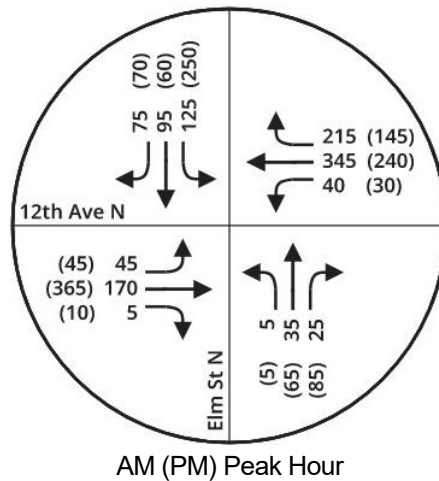
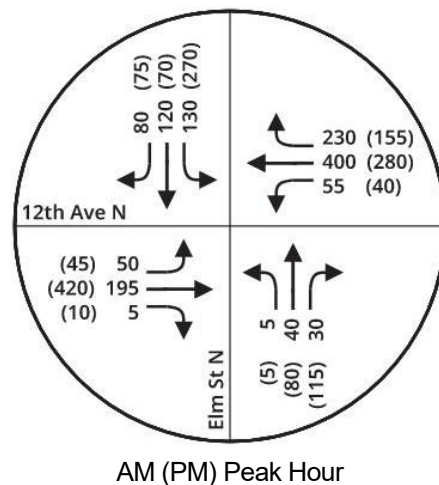


Figure 5: Year 2050 Peak Hour Turning Movement Volumes



4.0 Alternatives and Future Conditions Analysis

Intersection control warrant, turn lane, and capacity analyses were completed for alternative intersection control types and future conditions. The analysis considered existing year 2025 traffic conditions, year 2030 traffic conditions, and year 2050 traffic conditions.

The following design alternatives were considered:

- Two-Way Stop Control (TWSC)
- All-Way Stop Control (AWSC)
- Single-Lane Roundabout
- Signalized Intersection

Due to right of way and other environmental constraints, a standard single lane roundabout with a non-traversable central island is not a viable alternative. However, preliminary investigations indicate that a

mini- or compact roundabout with a traversable center island can be accommodated. These two types of roundabouts have similar features and are often named interchangeably between agencies. The primary design differences include the inscribed circle diameter (ICD) and design vehicle. ICDs for a mini- and compact roundabouts are 45 ft to 90 ft and 65 ft to 120 ft, respectively. Whether considering a mini- or compact roundabout, it is imperative to perform design checks on the design vehicle's turning paths. For the purposes of this study, all references to roundabouts will pertain to a mini- or compact roundabout. **Table 10** includes a summary of common mini- and compact roundabout characteristics.

Table 10: Common Mini- and Compact Roundabout Characteristics

Roundabout Feature	Mini-Roundabout	Compact Roundabout
Central Island	Traversable	Traversable
Splitter Islands	May be traversable with one-stage pedestrian crossing	Non-traversable with one-stage pedestrian crossing
Common Inscribed Circle Diameter (ICD) range	45 ft to 90 ft	65 ft to 120 ft
Typical AASHTO Design Vehicle	SU-30	BUS-40, WB-10

To coordinate North Dakota and Minnesota speed limits on 12th Avenue N, design speed for the westbound approach was revised from 25 mph to 30 mph. All alternatives and future conditions analysis used a design speed of 25 mph for the eastbound approach and 30 mph for the westbound approach.

4.1 Intersection Control Warrants

The study intersection was evaluated to verify if all-way stop control and traffic signal control is warranted under existing year 2025, year 2030, and year 2050 conditions. As the all-way stop control warrants were satisfied using existing 2025 volumes and traffic is expected to increase, 2030 and 2050 warrant analysis was not performed. To note, roundabouts do not have specific warrants but are generally acceptable when AWSC or traffic signal control is warranted. The warrant analysis results are summarized in **Table 11**. For the complete warrant worksheets, see **Appendix D**.

Table 11: Intersection Control Warrant Summary

Scenario	All-Way Stop Control			Traffic Signal Control		
	Criteria	Criteria Met	Warranted	Warrant	Warrant Met	Warranted
2025	A	No	Yes	1A	No	Yes
	B	No		1B	No	
	C	Yes		1C	No	
	D	Yes		2	Yes	
2030	Analysis not performed since traffic volumes are expected to increase.			1A	No	Yes
				1B	No	
				1C	No	
				2	Yes	
2050	Analysis not performed since traffic volumes are expected to increase.			1A	No	Yes
				1B	No	
				1C	No	
				2	Yes	

The analysis revealed that all-way stop control and traffic signal control are warranted for all conditions evaluated in this study. Traffic signal warrant analysis indicated Warrant 1 Condition A was close to being met with 6 out of 8 and 7 out of 8 hourly periods being met using 2025 and 2050 traffic volumes, respectively. Using 2050 traffic volumes, Warrant 1 Condition B was satisfied for half the required hourly periods.

4.2 Turn Lane Analysis

Per the NDDOT Traffic Operations Manual, for reconstruction projects, turn lanes were evaluated with projected 20-year traffic (year 2050) volumes. Turn lanes were assessed for TWSC and AWSC operations, however, PM peak operation was resistant to mitigation efforts. LOS F was observed under varying lane configurations, even under existing traffic conditions. Engineering judgement eliminated these intersection controls as a feasible near-term and long-term intersection designs. This considered, both the TWSC and AWSC intersections were included in the operations analysis under the current lane configuration as a baseline for intersection operations. No turn lane analysis was completed for the roundabout alternative as the NDDOT Traffic Operations Manual does not contain specific guidance for roundabout turn lanes. In general, it is a best practice to use single lane roundabouts unless turn lanes are required to address capacity deficiencies. The following turn lane analysis will be limited to the traffic signal alternative.

4.2.1 Turn Lane Warrants

For intersections where traffic signal control is warranted, the NDDOT Traffic Operations Manual recommends left turn lanes. The northbound left turn movement under existing conditions is low volume and is expected to remain trivial in year 2050. However, to prevent a negative offset and left turn sight distance issues, it is recommended to provide a northbound left turn lane.

For right turn lanes to be warranted at a signalized intersection, the NDDOT Traffic Operations Manual provides concisely defined criteria. For roadways with a posted speed limit of 25 or 30 mph, the following criteria must be met for a right turn lane to be recommended:

- A. Major Road AADT (two-way) on approach with analyzed right turns greater than or equal to 3,000 vehicles per day.
- B1. For 25 mph, 3,000 right turning vehicles per day OR 300 right turning vehicles in the peak hour.
- B2. For 30 mph, 2,500 right turning vehicles per day OR 250 right turning vehicles in the peak hour.
- C. Engineering judgment – this may include (but is not limited to) the following:
 - a. Is there a crash issue susceptible to correction by a right turn lane?
 - b. Does the capacity analysis show a need for a right turn lane?

If criteria (A) and (B) are simultaneously met on the major road approaches, right turn lanes are generally recommended. Where the criteria are not met, engineering judgement (criteria [C]) may be applied. Engineering judgment may also be applied to the minor approaches. **Table 12** evaluates the intersection based on this criterion.

Table 12: Right Turn Lane Warrants

Approach	2050 2-Way Approach AADT (Criteria A)	2050 Right Turn Volumes (Criteria B)			Warrants		
		Daily (Veh/Day)	AM Peak (Veh/Hr)	PM Peak (Veh/Hr)	(Criteria A)	(Criteria B)	
					2-Way Approach AADT > 3,000	Daily Vol > 3,000 Veh/Day	Peak Vol > 300 Veh/Hr
Eastbound	7,500	50	5	10	Yes	No	No

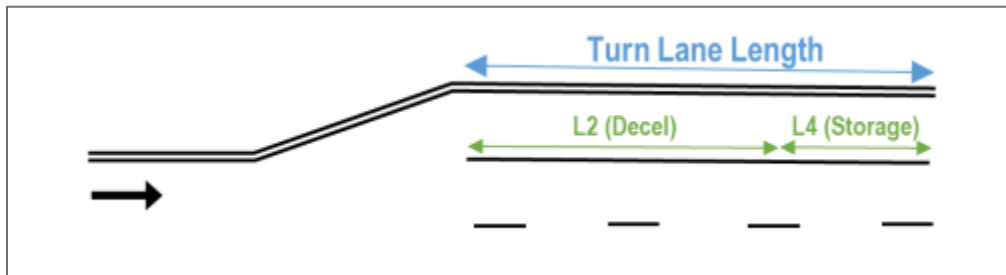
Approach	2050 2-Way Approach AADT (Criteria A)	2050 Right Turn Volumes (Criteria B)			Warrants		
		Daily (Veh/Day)	AM Peak (Veh/Hr)	PM Peak (Veh/Hr)	(Criteria A)	(Criteria B)	
					2-Way Approach AADT > 3,000	Daily Vol > 2,500 Veh/Day	Peak Vol > 250 Veh/Hr
Westbound	10,180	1,865	230	155	Yes	No	No

Under the guidelines of the criteria stated above, both criteria (A) and (B) are not simultaneously met on the major road approach. Therefore, no right turn lanes are recommended on the major road approaches. Likewise, right turn lanes on the minor approaches are also not recommended. The study intersection does not have a history of safety issues and the right turn volumes are not significant contributors to capacity issues at the intersection.

4.2.2 Left Turn Lane Lengths

The warranted and recommended left turn lanes were evaluated for turn lane lengths. This evaluation was again conducted in accordance with the NDDOT Traffic Operations Manual. The manual specifies specific criteria for intersections with signalized control and 25 or 30 mph design speeds. For a signalized intersection, the minimum storage (L4) for a left turn lane is zero (0) feet. Note that *turn lane length* is the combined length of the deceleration distance (L2) and the storage distance (L4) as shown in **Figure 6**.

Figure 6: Turn Lane Length Definition



The traffic operations manual recommends that turn lane length be the highest of the following three values:

1. The 95th percentile queue of turning vehicles rounded up to the nearest 25 feet.
2. The average queue distance of the adjacent through lane rounded up to the nearest 25 feet.
3. Deceleration length plus minimum storage (50 feet for 25 mph, 75 feet for 30 mph).

Table 13 shows the results of the traffic signal alternative turn lane length analysis. The 95th percentile and average queue lengths were compiled from the SimTraffic reports for the recommended intersection geometry under year 2050 conditions.

Table 13: Traffic Signal Alternative Turn Lane Length Analysis (2050 Conditions)

Approach	Minimum Turn Lane Length (feet)	AM Peak Turn Lane Length		PM Peak Turn Lane Length		Recommended Turn Lane Length (feet) [*Maximum of other columns]
		95th Percentile Queue of Left Turning Vehicles (feet)	Average Queue of Through Vehicles (feet)	95th Percentile Queue of Left Turning Vehicles (feet)	Average Queue of Through Vehicles (feet)	
Eastbound	50	75	75	125	150	150
Westbound	75	150	225	100	150	225
Southbound	50	125	100	175	75	175
Northbound	50	25	50	25	100	100

4.2.3 Left Turn Signal Phasing

Left turn phasing and signal head analysis was performed for all approaches in accordance with the NDDOT Traffic Operations Manual. Results of signal head analysis have been shown in **Table 14**.

Table 14: Left Turn Signal Head Analysis

	Eastbound Approach	Westbound Approach	Northbound Approach	Southbound Approach
Shared Left/Through or Shared Left/Through/Right?	No	No	No	No
Two or More Left-Turn Lanes on Subject Approach?	No	No	No	No
Four or More Through Lanes on Opposing Approach?	No	No	No	No
Adequate Left Turn Sight Distance to Oncoming Vehicles?	Yes	Yes	Yes	Yes
Has the Limit of Left Turn Related Crashes Been Exceeded?	No	No	No	No
Signal Head to Use	4-Section (FYA)	4-Section (FYA)	4-Section (FYA)	4-Section (FYA)

For approaches with 4-section flashing yellow arrow (FYA) signal heads, left turn phasing varies throughout the day. Permissive phasing is generally recommended unless a more restrictive phasing is deemed appropriate. Time-of-day phasing was analyzed in accordance with the NDDOT Traffic Operations Manual methodology. Results of left turn phasing analysis are included in **Appendix E**. A summary of the analysis has been provided below:

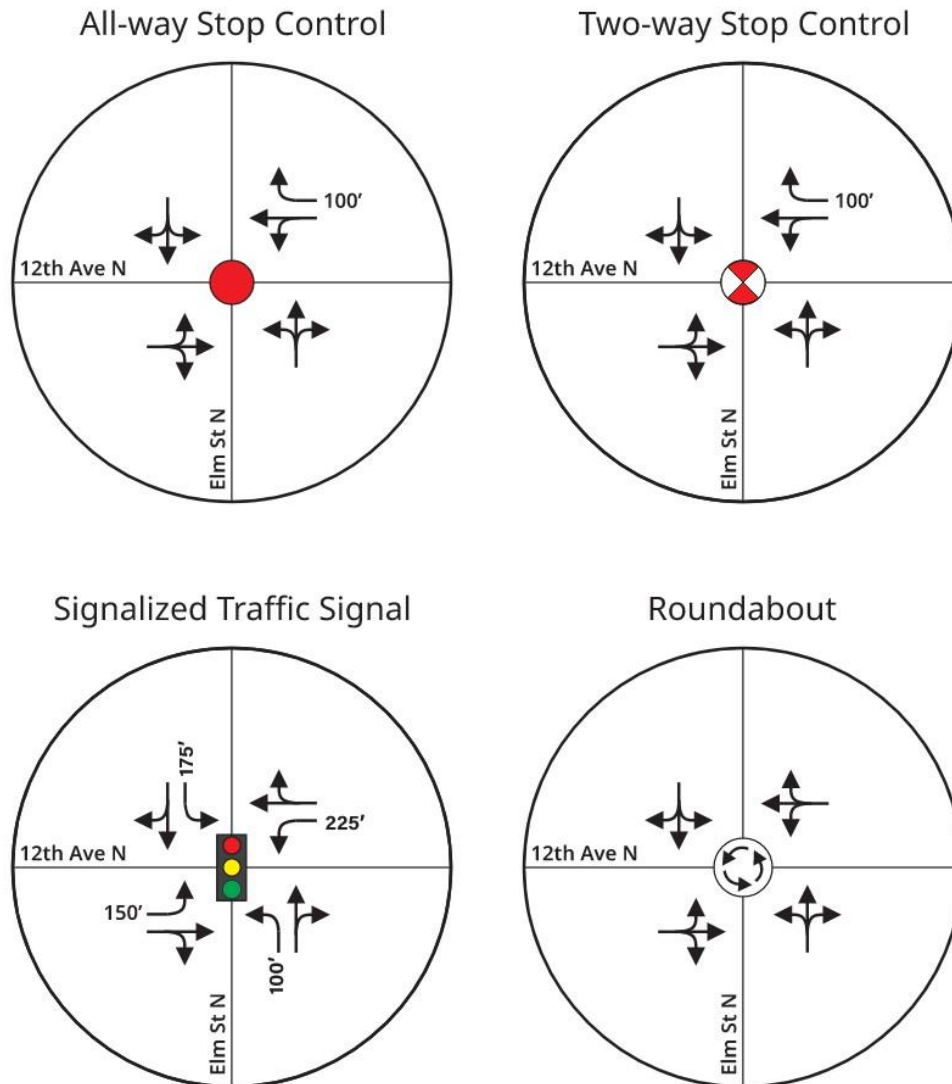
- **Eastbound Approach:** Protected-permissive left turn phasing during the AM peak hour (7:15 AM to 8:15 AM). Permissive left turn phasing for the remainder of the day.
- **Westbound Approach:** Analysis did not indicate a need for protected-permissive left turn phasing. However, it is recommended to run protected-permissive left turn phasing concurrently with the eastbound approach. Permissive left turn phasing for the remainder of the day.
- **Southbound Approach:** Protected-permissive left turn phasing starting at 7:15 AM and ending at 8:15 PM. Permissive left turn phasing for the remainder of the day.
- **Northbound Approach:** Analysis did not indicate a need for protected-permissive left turn phasing. Due to low volume of left turn movements, it is recommended to use permissive only left turn phasing.

4.3 Alternative Characteristics

Considering the intersection control warrant, turn lane, and future forecasted traffic conditions analysis, the following intersection control designs were chosen for further evaluation. This study is evaluating two-way stop control, all-way stop control, single-lane roundabout, and traffic signal control for existing and future conditions.

The TWSC and AWSC scenarios were evaluated with the existing lane geometry. These control types were evaluated in this study to show how the existing lane geometry is not adequate with stop control, and to serve as a baseline for the roundabout and traffic signal scenarios. As stated in the turn lane analysis, adding turn lanes to the stop control scenarios was considered, but eliminated as a feasible intersection control due to poor intersection operations. The traffic signal alternative uses the recommended turn lanes, turn lane lengths, and signal phasing resulting from the turn lane analysis. Intersection lane configurations for the TWSC, AWSC, traffic signal, and roundabout alternatives have been shown in **Figure 7**. A single-lane roundabout was the only roundabout design considered in the evaluation.

Figure 7: Alternative Intersection Lane Configurations



4.4 Alternatives and Future Conditions Capacity Analysis

Alternatives and future conditions capacity analysis was completed using Synchro/SimTraffic Software (Version 12). Measures of effectiveness (MOEs) were reported from SimTraffic. Detailed alternatives and future conditions capacity analysis outputs have been provided in **Appendix F** and summarized in **Table 15**.

A summary of HCM level of service (LOS) for signalized and unsignalized intersections can be found in **Table 5**. The NDDOT Traffic Operations Manual guidance is to meet or exceed an intersection LOS D or better.

As previously discussed, due to right of way and other environmental constraints, a standard single lane roundabout with a non-traversable median is not a viable alternative. However, preliminary

investigations indicated that a mini- or compact roundabout with a traversable center island can be accommodated. Oversized vehicles can have a negative impact to mini- and compact roundabout capacity as movements will occupy most of the intersection, preventing vehicles from entering the roundabout. However, if properly designed to accommodate the design vehicle, mini- and compact roundabouts are expected to have similar traffic operations (i.e. capacity) as a standard single lane roundabout. Roundabout capacity analysis assumes proper design vehicle selection and analysis.

Table 15: Alternatives Level of Service (LOS)

Scenario		App	AM Peak					PM Peak				
Year	Control		Movement Delay (LOS)			App. Delay (LOS)	Int. Delay (LOS)	Movement Delay (LOS)			App. Delay (LOS)	Int. Delay (LOS)
			Left	Thru	Right			Left	Thru	Right		
2025	TWSC	EB	5.3 (A)	1.2 (A)	—	2.1 (—)	10.1 (—)	4.7 (A)	1.3 (A)	0.8 (A)	1.6 (—)	83.3 (—)
		WB	3.4 (A)	1.5 (A)	1.2 (A)	1.5 (—)		4.3 (A)	1.3 (A)	0.8 (A)	1.3 (—)	
		NB	—	18.0 (C)	7.6 (A)	13.5 (B)		8.1 (A)	33.6 (D)	21.9 (C)	26.5 (D)	
		SB	34.4 (D)	33.4 (D)	29.0 (D)	32.8 (D)		276.3 (F)	291.4 (F)	266.2 (F)	276.7 (F)	
2030	TWSC	EB	6.2 (A)	1.6 (A)	1.4 (A)	2.5 (—)	12.0 (—)	5.0 (A)	1.7 (A)	0.6 (A)	2.0 (—)	104.3 (—)
		WB	3.6 (A)	1.9 (A)	1.2 (A)	1.8 (—)		4.8 (A)	1.5 (A)	0.7 (A)	1.5 (—)	
		NB	14.6 (B)	19.1 (C)	7.6 (A)	14.2 (B)		34.1 (D)	37.6 (E)	25.0 (C)	30.5 (D)	
		SB	42.0 (E)	39.4 (E)	34.7 (D)	39.1 (E)		345.7 (F)	343.9 (F)	340.2 (F)	344.4 (F)	
2050	TWSC	EB	6.8 (A)	1.7 (A)	1.1 (A)	2.7 (—)	34.8 (—)	5.5 (A)	1.9 (A)	1.4 (A)	2.2 (—)	234.2 (—)
		WB	4.1 (A)	2.3 (A)	1.3 (A)	2.1 (—)		5.5 (A)	1.9 (A)	1.0 (A)	1.9 (—)	
		NB	24.1 (C)	26.0 (D)	10.8 (B)	19.4 (C)		91.9 (F)	113.3 (F)	97.2 (F)	103.6 (F)	
		SB	127.2 (F)	128.3 (F)	120.7 (F)	126.3 (F)		813.3 (F)	800.3 (F)	801.4 (F)	808.9 (F)	
2025	AWSC	EB	8.2 (A)	8.1 (A)	—	8.1 (A)	9.5 (A)	44.6 (E)	50.9 (F)	51.6 (F)	50.4 (F)	30.1 (D)
		WB	11.7 (B)	12.4 (B)	6.6 (A)	10.3 (B)		14.2 (B)	14.7 (B)	6.4 (A)	11.9 (B)	
		NB	—	7.9 (A)	4.2 (A)	6.3 (A)		7.6 (A)	12.6 (B)	9.5 (A)	10.9 (B)	
		SB	9.8 (A)	10.4 (B)	7.6 (A)	9.4 (A)		34.7 (D)	34.0 (D)	34.5 (D)	34.5 (D)	
2030	AWSC	EB	8.5 (A)	8.5 (A)	5.6 (A)	8.4 (A)	11.4 (B)	51.7 (F)	52.8 (F)	52.1 (F)	52.8 (F)	30.5 (D)
		WB	14.5 (B)	16.2 (C)	8.3 (A)	13.3 (B)		16.3 (C)	16.8 (C)	7.1 (A)	13.6 (B)	
		NB	7.7 (A)	8.1 (A)	4.5 (A)	6.8 (A)		9.3 (A)	13.6 (B)	10.3 (B)	11.5 (B)	
		SB	10.9 (B)	11.6 (B)	8.5 (A)	10.5 (B)		32.7 (D)	33.7 (D)	28.4 (D)	32.0 (D)	
2050	AWSC	EB	9.9 (A)	9.9 (A)	6.6 (A)	9.8 (A)	19.5 (C)	286.7 (F)	292.2 (F)	296.3 (F)	292.3 (F)	128.3 (F)
		WB	28.5 (D)	31.1 (D)	17.6 (C)	26.4 (D)		24.7 (C)	23.4 (C)	9.9 (A)	19.0 (C)	
		NB	8.7 (A)	9.0 (A)	5.3 (A)	7.4 (A)		13.0 (B)	19.9 (C)	16.3 (C)	17.7 (C)	
		SB	15.3 (C)	16.2 (C)	13.1 (B)	15.0 (B)		114.3 (F)	116.3 (F)	108.6 (F)	113.7 (F)	

Notes:

Delay is measured in seconds/vehicle.

“—” indicates there is no volume for the movement, or an LOS metric is not quantifiable in HCM methodology.

TWSC: Two-Way Stop Control

AWSC: All-Way Stop Control

Future capacity analysis for the two-way stop control (TWSC) alternative indicates the southbound approach is expected to operate with a LOS E or worse in the 2025 PM, 2030 AM and PM, and 2050 AM and PM peak hours. The northbound approach is expected to operate with a LOS F in the 2050 PM

peak hour. LOS F conditions are directly related to the approaches having a volume to capacity (v/c) ratio greater than 1.0, representing oversaturated conditions.

Future capacity analysis for the all-way stop control (AWSC) alternative indicates the 2025, 2030, and 2050 AM peak hours are expected to operate at an intersection LOS C or better. The eastbound approach is expected to operate with a LOS F in the 2025, 2030, and 2050 PM peak hours. The southbound approach is expected to operate with a LOS F in the 2050 PM peak hour. During the 2050 PM peak hour, the intersection is anticipated to operate with a LOS F. LOS F conditions are directly related to the approaches having a volume to capacity (v/c) ratio greater than 1.0, representing oversaturated conditions.

Table 15: Alternatives Level of Service (LOS) (Continued)

Scenario		App	AM Peak					PM Peak				
Year	Control		Movement Delay (LOS)			App. Delay (LOS)	Int. Delay (LOS)	Movement Delay (LOS)			App. Delay (LOS)	Int. Delay (LOS)
			Left	Thru	Right			Left	Thru	Right		
2025	RNDABT	EB	2.9 (A)	3.2 (A)	—	3.2 (A)	4.1 (A)	5.2 (A)	5.6 (A)	5.1 (A)	5.6 (A)	4.7 (A)
		WB	4.2 (A)	4.5 (A)	4.2 (A)	4.4 (A)		3.0 (A)	3.6 (A)	3.3 (A)	3.4 (A)	
		NB	—	3.1 (A)	2.5 (A)	2.9 (A)		5.0 (A)	5.4 (A)	4.9 (A)	5.1 (A)	
		SB	4.3 (A)	4.6 (A)	4.2 (A)	4.4 (A)		5.0 (A)	5.0 (A)	5.2 (A)	5.1 (A)	
2030	RNDABT	EB	2.8 (A)	3.2 (A)	2.9 (A)	3.1 (A)	4.6 (A)	5.6 (A)	6.0 (A)	6.1 (A)	6.0 (A)	5.2 (A)
		WB	5.0 (A)	5.8 (A)	5.1 (A)	5.5 (A)		3.9 (A)	4.8 (A)	4.0 (A)	4.4 (A)	
		NB	2.9 (A)	3.0 (A)	2.5 (A)	2.8 (A)		4.8 (A)	5.3 (A)	5.0 (A)	5.1 (A)	
		SB	4.4 (A)	4.8 (A)	4.1 (A)	4.5 (A)		5.3 (A)	5.2 (A)	5.0 (A)	5.2 (A)	
2050	RNDABT	EB	3.1 (A)	3.6 (A)	3.5 (A)	3.5 (A)	6.1 (A)	6.8 (A)	7.1 (A)	6.2 (A)	7.1 (A)	6.2 (A)
		WB	7.2 (A)	8.0 (A)	6.8 (A)	7.6 (A)		4.5 (A)	5.5 (A)	4.7 (A)	5.1 (A)	
		NB	3.1 (A)	3.3 (A)	2.6 (A)	3.0 (A)		5.5 (A)	6.1 (A)	6.0 (A)	6.0 (A)	
		SB	5.6 (A)	6.0 (A)	5.3 (A)	5.7 (A)		6.6 (A)	6.7 (A)	6.5 (A)	6.7 (A)	
2025	SIGNAL	EB	14.0 (B)	8.2 (A)	—	9.5 (A)	14.0 (B)	28.5 (C)	13.9 (B)	10.7 (B)	15.2 (B)	15.2 (B)
		WB	9.6 (A)	15.2 (B)	11.2 (B)	13.4 (B)		22.3 (C)	14.7 (B)	9.9 (A)	13.5 (B)	
		NB	—	25.3 (C)	8.3 (A)	18.2 (B)		—	21.9 (C)	10.9 (B)	15.6 (B)	
		SB	20.7 (C)	19.7 (B)	11.4 (B)	17.9 (B)		17.9 (B)	21.1 (C)	9.7 (A)	16.9 (B)	
2030	SIGNAL	EB	15.1 (B)	8.7 (A)	4.4 (A)	9.8 (A)	15.4 (B)	28.7 (C)	14.3 (B)	11.6 (B)	15.7 (B)	15.4 (B)
		WB	11.6 (B)	17.7 (B)	13.7 (B)	15.9 (B)		23.4 (C)	15.1 (B)	9.5 (A)	13.7 (B)	
		NB	21.9 (C)	27.8 (C)	9.1 (A)	20.0 (B)		28.3 (C)	21.9 (C)	11.9 (B)	16.3 (B)	
		SB	19.5 (B)	20.0 (B)	11.8 (B)	17.6 (B)		17.7 (B)	19.3 (B)	9.0 (A)	16.3 (B)	
2050	SIGNAL	EB	19.0 (B)	10.1 (B)	9.3 (A)	12.0 (B)	18.9 (B)	36.4 (D)	16.9 (B)	13.0 (B)	18.7 (B)	18.8 (B)
		WB	14.0 (B)	23.4 (C)	18.8 (B)	21.1 (C)		29.2 (C)	17.5 (B)	11.7 (B)	16.6 (B)	
		NB	29.5 (C)	27.4 (C)	10.7 (B)	20.5 (C)		26.9 (C)	24.5 (C)	14.7 (B)	18.8 (B)	
		SB	20.8 (C)	21.2 (C)	13.4 (B)	19.1 (B)		24.4 (C)	20.0 (B)	10.3 (B)	21.2 (C)	

Notes:

Delay is measured in seconds/vehicle.

“—” indicates there is no volume for the movement, or an LOS metric is not quantifiable in HCM methodology.

RNDABT: Roundabout

SIGNAL: Traffic Signal

Future capacity analysis for the roundabout alternative is expected to operate with an intersection LOS A in the 2025, 2030, and 2050 AM and PM peak hours. The roundabout had the best intersection LOS compared to the other alternatives.

Future capacity analysis for the traffic signal alternative is expected to operate with an intersection LOS B in the 2025, 2030, and 2050 AM and PM peak hours.

Roundabout and traffic signal capacity analysis suggests these intersection control forms will experience minimal congestion and provide efficient operations.

4.5 Alternatives Safety Evaluation

From the capacity analysis, it was determined that a single lane roundabout and traffic signal are viable solutions to accommodate future traffic volumes at the intersection of 12th Avenue N and Elm Street N. Safety evaluation of each alternative is discussed below.

4.5.1 Vehicle Safety

Crash data from July 1, 2020, to June 30, 2025, shows a total of five reported crashes at the intersection, resulting in a crash frequency of 1.0 crashes per year. Crashes included three angle crashes, one rear-end crash, and one ped/bike crash. No fatal or incapacitating injury crashes occurred during this period, and the calculated crash rate of 0.23 crashes per million entering vehicles (MEV) which is generally considered a low crash rate for similar type of intersection. However, all three angle crashes involved conflicts between the southbound and westbound approaches, suggesting an opportunity for further reduction in risk through design that addresses this conflict pattern.

A single-lane roundabout addresses such risks by physically reducing conflict points from 32 to 8 and managing vehicle speeds to the 15–20 mph range on entry. FHWA has documented national injury crash reductions at compact/moderate size roundabouts at 73 percent. In North Dakota, NDDOT reports roundabouts have reduced severe and fatal crashes by 59 percent. For the study intersection, the roundabout's geometry would remove the direct crossing conflict that produced the majority of existing crashes, while likely maintaining the observed low severity of crashes.

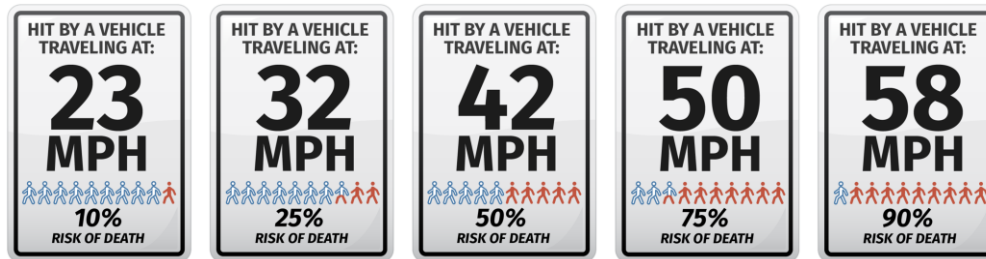
Traffic control signals that are properly designed and timed can reduce the frequency and severity of certain crash types, including right-angle crashes. By controlling movements, traffic signals separate vehicles and vulnerable road users in time and space. FHWA research notes that well-timed clearance intervals, high-visibility backplates, and supplemental signal heads can mitigate severe right-angle crashes. While signals can still be susceptible to rear-end collisions due to stop-and-go operations, these are generally less severe than right-angle collisions. However, it should be noted that when right-angle crashes do occur at signalized intersections, they are more severe and often result from motorists speeding and failing to yield. A roundabout design would remove this conflict point entirely.

4.5.2 Multimodal Safety

The 12th Avenue N and Elm Street N intersection currently features sidewalks on all approaches, dedicated bike lanes west of Elm Street, and a shared-use path east of Elm Street that connects to the Fargo Mickelson/Tricorn Bike Path. Pedestrian activity was observed at moderate levels, with eight pedestrians during the AM peak hour and fifteen during the PM peak hour. One reported crash in the last 5 years involved a pedestrian or bicyclist.

A single-lane roundabout offers multimodal benefits by shortening crossing distances, providing refuge within the splitter island, and lowering vehicle speeds, which significantly reduce the severity of potential pedestrian and cyclist crashes. FHWA research in **Figure 8** shows that pedestrian survivability rates are much higher at vehicle impact speeds under 20 mph, which is typical at roundabout entries. However, attention to yielding compliance, crosswalk placement, and visibility is essential, particularly during the initial driver adjustment period.

Figure 8: Vulnerable Road User Risk at Various Travel Speeds



A traffic signal provides structured pedestrian phases, which can be supplemented with accessible pedestrian signals to increase safety. The geometry associated with the traffic signal alternative, including the addition of turn lanes, may lengthen crossing distances slightly but allows for complete traffic stops during pedestrian crossings. NDDOT and FHWA guidance suggest that incorporating high-visibility crosswalk markings, tightened turning radii, and controlled crossing phases can reduce pedestrian and bicycle crash likelihood, even with higher volumes in future conditions. Vulnerable road user safety can be further enhanced with leading pedestrian intervals.

4.5.3 SPICE Crash Evaluation

Both alternatives were evaluated using the SPICE (Safety Performance for Intersection Control Evaluations) tool developed through the Federal Highway Administration (FHWA) and the National Cooperative Highway Research Program (NCHRP). SPICE applies the Highway Safety Manual's (HSM) predictive methods to estimate crash frequency for different intersection control strategies, accounting for geometry, control type, and traffic volumes. Outputs from the SPICE tool are shown in **Table 16**.

From **Table 16**, a single lane roundabout is predicted to experience an estimated 1.17 crashes per year in year 2030 and 1.25 crashes per year in year 2050, with 0.16 and 0.17 predicted to result in a fatal or injury outcome, respectively. The signalized intersection is predicted to experience an estimated 1.18

crashes per year in year 2030 and 1.27 crashes per year in year 2050, with 0.39 and 0.42 predicted to result in a fatal or injury outcome, respectively. These results suggest both options are expected to perform well from a safety perspective, though the roundabout is predicted to have fewer fatal and severe injury crashes under the modeled conditions.

Table 16: Alternative Safety Performance Evaluation Using SPICE

Alternative	Crash Type	Year 2030	Year 2050
Single Lane Roundabout	Total	1.17	1.25
	Fatal & Injury	0.16	0.17
Traffic Signal	Total	1.18	1.27
	Fatal & Injury	0.39	0.42

5.0 Sight Distance

Intersection sight distance was calculated at the intersection of 12th Avenue N and Elm Street N for the traffic signal and roundabout alternatives. The following analysis provides the methodology and results. Intersection sight distance calculations have been provided in **Appendix G**.

Intersection sight distance for the traffic signal alternative analyzed sight distance for left turns and right turns on red (RTOR). Sight distance for left turns was obtained from the NDDOT Traffic Operations Manual. Sight distance for RTOR was obtained from the AASHTO Green Book for Case B2. Left turn sight distance analysis indicated sufficient sight distance is available to left turning traffic. This is to be expected for left turn lanes designed with a neutral offset. RTOR sight distance analysis indicated there are sight obstructions for the northbound RTOR movement. There is an existing driveway on the south side of 12th Avenue N (approx. 120' west of Elm Street N) that blocks the view of oncoming traffic. As this access is redundant and access can be obtained via the alleyway directly to the west, it is recommended to remove this driveway to improve sight lines. Removal of this driveway is also recommended in the access management analysis.

Intersection sight distance for the roundabout alternative was analyzed for sight distance at the roundabout entry and upstream of the entry. Analysis indicated the presence of mature trees within the intersection sight triangles. Although it is recommended to avoid obstructions within the intersection sight triangles, the existing mature trees should, at a minimum, be trimmed to clear branches and foliage from blocking view of oncoming traffic.

To raise the 12th Avenue N/15th Avenue N Bridge above the 100-year flood elevation, a significant grade raise will be required. To accommodate bridge grading, access points to the Jack Williams Stadium and overflow parking are likely to be relocated from their current locations. Once revised locations have been determined, it is recommended to analyze access point sight distance to determine if items such as guardrail or bridge barrier obstruct sight lines to 12th Avenue N traffic. If sight lines are obstructed, measures such as restricting turning movements, relocation, or removal access point(s) should be investigated to mitigate safety risks.

6.0 Access Management

Access management strives to provide vehicular access that results in safe and efficient movement of people and goods by managing conflicts. Access management strategies and requirements vary depending on roadway classification, with higher classified roads requiring stricter standards. Access management strategies for collector streets are aimed at providing an acceptable degree of both mobility and access. According to NDDOT urban functional classification maps, 12th Avenue N and Elm Street N are classified as urban collector streets.

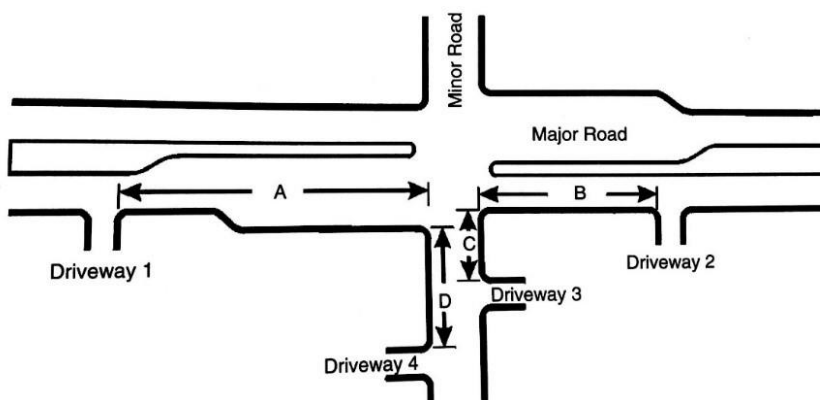
6.1 City of Fargo Access Spacing Requirements

Per the City of Fargo zoning ordinances, for collectors, a minimum spacing of 300' is to be provided between driveways and intersections. The zoning ordinances state that "Existing lot sizes and access locations do not always allow for the practical enforcement of spacing standards. In these areas, the City Engineer shall have the authority to review driveway and intersection spacing on a case-by-case basis, taking into consideration the necessity of the access, the relative location of other access points along the same and opposite sides of the street, opportunities for shared access, and opportunities for on-site modifications that will optimize the location of the driveway or intersection."

6.2 TRB Access Management Manual Guidance

The TRB Access Management Manual provides access management standards and guidelines, including corner clearance. Corner clearance refers to the distance between the corner of an intersection and the nearest access point or driveway. Corner clearance is an important consideration at signalized intersections, especially those that have turn lanes. The TRB Access Management Manual recommends that no access points are to be located within the following corner clearances.

Figure 9: Corner Clearance Access Management



Corner Clearance Type A is defined by the upstream functional area. The upstream functional area consists of perception reaction time (d_1), lane change and deceleration (d_2), and storage (d_3). **Table 17** provides a summary of the upstream functional areas.

- Perception reaction time (d_1) was obtained from the TRB Access Management Manual. The manual recommends 1.5 seconds for urban and suburban conditions; resulting in a PRT distance of 55' and 65' for 25 mph and 30 mph, respectively.
- The taper defines the start of lane change and deceleration (d_2). Assuming a left turn lane width of 12', using an 8:1 taper results in a lane change distance of 96'.
- Full width left turn lane lengths were obtained from the traffic signal alternative turn lane analysis.

Table 17: Upstream Functional Area Distances

Approach	PRT (d_1)	Lane Change	Full Width Left Turn Lane Length	Total
Eastbound	55'	96'	150'	301'
Westbound	65'	96'	225'	386'
Southbound	55'	96'	175'	326'
Northbound	55'	96'	100'	251'

As 12th Avenue N and Elm Street N are undivided roadways, no access points should be located on either side of the street within the upstream functional area.

Corner Clearance Type B is defined by the downstream functional area. The downstream functional area is typically defined by either acceleration distance or sight distance. Using decision sight distance is preferred; however, stopping sight distance is often used due to the constraints found in urban locations. Downstream functional area distances have been summarized in **Table 18**.

- Acceleration distance is 150' and 220' for a 25 mph and 30 mph design speed, respectively.
- Stopping sight distance is 155' and 200' for a 25 mph and 30 mph design speed, respectively.

Table 18: Downstream Functional Area Distances

Approach	Acceleration Distance	Stopping Sight Distance
Eastbound	150'	155'
Westbound	220'	200'
Southbound	150'	155'
Northbound	150'	155'

Considering that Elm Street N is functionally classified as an urban collector, it is desirable to maintain Corner Clearance Type A and Type B to improve traffic operations and safety. As shown in **Figure 9**, Corner Clearance Type C and Type D may be applied to the minor roadway approaches.

Corner Clearance Type C is defined by the longest queue anticipated on the minor road approach. Locating the driveway or access point upstream of the minor street queue allows a left turn to be made at the end of queue, thus reducing blocking. If blocking occurs for an extended period of time, it can

potentially lead to traffic backing up into the intersection. Queues for the traffic signal alternative under year 2050 conditions have been shown in **Table 19**.

Table 19: Elm Street N Queues Under Traffic Signal Control and Year 2050 Conditions

Approach	AM Peak		PM Peak	
	Average Queue	95 th Percentile Queue	Average Queue	95 th Percentile Queue
Southbound	100'	150'	125'	175'
Northbound	50'	100'	100'	150'

Note:

Lengths shown are the longest queue in either the left turn lane or shared through/right lane.
Queues rounded up to the nearest 25'.

Corner Clearance Type D is the separation from the intersection to the nearest driveway or access point on the minor road. The TRB Access Management Manual recommends a minimum of 150' to allow vehicles enough time to fully complete the maneuver before being faced with vehicles at a downstream access point.

Although it is desirable to avoid access points within the functional areas, this is not always possible in developed areas. If an access point must be permitted within the functional area, the TRB Access Management Manual provides the following recommendations:

- Require access to be located as far away as possible.
- Limit movements to right-in right-out.

Another important consideration in the TRB Access Management manual is the location of access points on opposite sides of the roadway. It is ideal to locate access points to avoid overlapping left turns shown in **Figure 10**. If possible, it is recommended to locate the Jack Williams Stadium and overflow parking access points where left turn paths do not conflict with each other.

Figure 10: Access Point Offsets



6.3 NCHRP 1043 Guide for Roundabouts

NCHRP 1043 provides access management guidance for public and private access points near roundabouts. As with any other form of intersection control, it is ideal to place access points as far away as possible. As this is not always possible in developed areas, if an existing access point is located adjacent to the splitter island, NCHRP 1043 provides the following recommendations:

- Close the access if it is redundant.
- Shift the access to a location outside the splitter island.
- Investigate whether the access can be relocated to another roadway that can provide better separation from the roundabout.
- Provide a break in the painted taper or splitter island to serve low-volume access points.

Queues for the roundabout alternative under year 2050 conditions have been shown in **Table 20**. If feasible, it is recommended to relocate access points outside the queue limits to avoid queues blocking the access points.

Table 20: Queues Under Roundabout Control and Year 2050 Conditions

Approach	AM Peak		PM Peak	
	Average Queue	95 th Percentile Queue	Average Queue	95 th Percentile Queue
Eastbound	50'	75'	75'	150'
Westbound	75'	200'	50'	100'
Northbound	25'	50'	50'	100'
Southbound	75'	125'	75'	125'

Note:

Queues rounded up to the nearest 25'.

6.4 Access Management Analysis and Recommendations

Considering the existing development, study area constraints, topography, and access management guidance, the following analysis and recommendations are provided for the traffic signal and roundabout alternatives.

- Access to residential driveways must be maintained. However, it is recommended to remove the existing driveway approach on the south side of 12th Avenue N (approx. 120' west of Elm Street N). This driveway is redundant as access is accommodated via the alleyway to the west.
- For the traffic signal alternative, the existing alleyway on the south side of 12th Avenue N (approx. 180' west of Elm Street N) will be within the recommended eastbound full width left turn lane and associated upstream functional area. It was investigated to see if the access could be removed or revised to right-in right out.

- The existing alleyway has access off 12th Avenue N and 11th Avenue N. The alleyway is paved and has a cross section of 20' allowing two-way traffic operations. If the access point on 12th Avenue N was closed, it would require a turn-around to avoid a dead end with limited opportunity to maneuver. As space for a turn-around does not exist, this improvement is not feasible.
- The alleyway services approximately 75 trips per day with trips distributed to both 12th Avenue N and 11th Avenue N. Considering the limited number of trips, 25 mph speed limit on 12th Avenue N, and lack of reported crashes, keeping the alleyway full access (i.e. not restricting to right-in right-out) does not pose significant safety or operational concerns.
- For the traffic signal alternative, the Jack Williams Stadium and overflow parking lot access points will be located within the recommended westbound full width left turn lane and associated upstream functional area. As access must be maintained and revising the access points to right-in right-out would produce undesirable travel patterns, it is recommended to locate the access points as far away as possible from the intersection.
 - As traffic volumes are significantly lower on Elm Street N compared to 12th Avenue N, it is also recommended to investigate if the Jack Williams Stadium access point can be relocated to Elm Street N.
- For the roundabout alternative, it is recommended to locate the Jack Williams Stadium and overflow parking lot access points as far away as possible from the intersection. If feasible, it is recommended to relocate access points outside the queue limits shown in **Table 20** to avoid queues from blocking the access points.
- For the traffic signal and roundabout alternatives, it is recommended that the Jack Williams Stadium and overflow parking lot access points be located to avoid overlapping left turns.

7.0 Lighting Analysis

NDDOT guidance and best practices from the AASHTO Green Book indicate that intersection lighting is generally warranted in urban settings to enhance nighttime visibility and safety. Under existing conditions, lighting infrastructure is currently present at the intersection.

Several lighting warrants outlined in the NDDOT Traffic Operations Manual are applicable to this intersection evaluation, including:

- Warrant 4B.2 – The major road current AADT (two-way volume) is 1,000 or more
- Warrant 5A – All signalized intersections
- Warrant 5B – All roundabout intersections and all reduced conflict intersections
- Warrant 5D – Where roadway segment lighting is installed

Based on existing conditions, lighting is currently warranted under Warrants 4B.2 and 5D. Additionally, depending on the selected intersection control alternative, Warrants 5A or 5B may also be met if a signalized or roundabout intersection configuration is implemented.

Given the operational characteristics of the build alternatives and existing volume levels, it is recommended that the existing lighting along 12th Avenue N and Elm Street N be retained. Continued illumination will support nighttime visibility for all modes of transportation and remains consistent with NDDOT urban intersection lighting criteria.

8.0 Multimodal Conditions Analysis

From turning movement counts at the intersection of 12th Avenue N and Elm Street N, a total of eight pedestrians were observed during the AM peak hour and 15 during the PM peak hour. While pedestrian activity is considered moderate, there is a presence of active land uses nearby, including residential neighborhoods, Jack Williams Stadium, Mickelson Park, and Trefoil Park. This suggests there is observable pedestrian and bicycle demand.

It is recommended to provide or maintain the following pedestrian and bicycle facilities regardless of whether a roundabout or traffic signal is selected as the preferred design alternative:

- Maintain the existing sidewalks and bicycle lanes on the north and south sides of 12th Avenue N west of Elm Street N.
- Maintain the existing shared use path on the north side of 12th Avenue N east of Elm Street N to maintain access to the Mickelson/Tricorn Bike Path.
- Provide a shared use path on the south side of 12th Avenue N east of Elm Street N. Shared use path will provide access across the Red River and connect with the existing shared use path on the Moorhead side, filling in an existing gap in the F-M bike network.
- Maintain the existing Mickelson/Tricorn Bike Path under the bridge. Diverting the path up and around could lead to pedestrians and bicyclists crossing 12th Avenue N at undesirable locations.
- Maintain the existing sidewalks on the east and west sides of Elm Street N.
- Provide pedestrian crossings on all legs of the 12th Avenue N and Elm Street N intersection. It is recommended to mark the crosswalks with high visibility marking for both the roundabout and traffic signal alternatives.

There is an existing marked mid-block crossing approximately 240' east of the 12th Avenue N and Elm Street N intersection that facilitates pedestrians crossing from the Jack Williams Stadium to the overflow parking lot. If the overflow parking is removed to accommodate bridge reconstruction, then the crossing should be removed. If the overflow parking is to remain, a mid-block crossing should not be provided considering the following factors:

- Considering the grade raise required to bring the 12th Avenue N/15th Avenue N Bridge above the 100-year flood elevation, it is anticipated the existing Jack Williams Stadium and overflow

parking access points will need to be relocated west. Additional features such as guardrail and retaining walls will likely prevent placement of a mid-block crossing east of the access points. This will result in the mid-block crossing being located closer to the intersection than existing conditions.

- Potential sight distance and visibility issues with the crossing being located near the end of a curve could increase crash risk. Also, navigating curves places a higher cognitive demand on drivers.
- It is a best practice to locate mid-block crossings outside the intersection functional area to allow drivers to react to the crossing and intersection as discrete events. This also reduces the crossing length and exposure to uncontrolled traffic.
- It is typical for local municipalities to not install midblock crossing where another marked or controlled crossing is less than 300' away.

9.0 Bridge Cross Section Analysis

Forecasted year 2050 AADT over the 12th Avenue N/15th Avenue N Bridge is 10,180 vehicles per day, which falls within the typical planning-level service range for a two-lane undivided urban facility (approximately 8,000–12,000 vehicles per day for acceptable operations per HCM-based planning tables). It is recommended to provide a two-way two-lane cross section with 12-foot lanes and 4-foot shoulders, for a clear bridge width of 32 feet. The inclusion of shoulders provides additional lateral clearance and limited refuge for stopped vehicles, which increases operational flexibility and further supports the adequacy of the two-lane configuration.

This conclusion is reinforced by the operational analysis conducted for this study, which showed acceptable levels of service during the AM and PM peak hours for the two-lane alternatives evaluated. While the 4-foot shoulders are not wide enough for a full pull-off of larger vehicles, they reduce the likelihood that a stopped vehicle would fully block a travel lane, minimizing operational disruption. The shoulders also provide recovery space and increased lateral clearance between the traveled way and bridge railing, enhancing both safety and functionality while maintaining consistency with the adjacent roadway segments.

10.0 Summary

This traffic operations analysis report identified and evaluated existing and future conditions associated with the redesign and reconstruction of the 12th Avenue N/15th Avenue N Bridge. The following conclusions and **recommendations** are offered for consideration.

- Existing land uses within the study limits include residential, public, and institutional uses. No future land uses changes were identified that would significantly change future traffic volumes or travel patterns.

- Multimodal review indicated no priority pedestrian or bicycle projects within the study area. The 12th Avenue N/15th Avenue N Bridge is included as a “vision” project in the 2050 Fargo-Moorhead Metropolitan Transportation Plan.
- There are currently no MATBUS transit services within the study area. Review of the Draft MATBUS 2026-2030 Transit Development Plan indicates no expansion of fixed route services by the end of 2030.
- Within the study limits, truck restrictions are currently posted on the north, east, and west legs of the 12th Avenue N and Elm Street N intersection. **Table 21** below reports existing 2025 commercial truck volumes.

Table 21: Existing 2025 Commercial Vehicle Volumes

Intersection Approach	FHWA Class 4	FHWA Class 5	FHWA Class 9	Total
EB	13	65	6	84
WB	14	79	9	102
NB	1	10	5	16
SB	6	30	2	38
Total	34	184	22	240

Notes:

FHWA Class 4: Buses (2 or 3 axles, full length)

FHWA Class 5: Single Unit 2-Axle Trucks (2 axles, 6 tires (dual rear tires), single-unit)

FHWA Class 9: Single Trailer 5-Axle Trucks (5 axles, single trailer)

Table reports two-way volumes on each intersection leg.

If the roundabout alternative is selected for design, due to right of way and other environmental constraints, it will have to be in the form of a mini- or compact roundabout. For these subsets of roundabouts, it is important to properly identify and design for the appropriate design vehicle. The table above indicates that over 90% of the commercial vehicle volume is comprised of buses or single unit trucks such as the SU-30.

- Review of existing crash data at the intersection of 12th Avenue N and Elm Street N indicated a crash frequency of 1.0 crashes per year over the last 5 years. No fatal or incapacitating injury crashes were reported. Analysis indicated no apparent safety concerns under existing all-way stop control. No crashes were reported outside of the intersection.
- Existing 2025 capacity analysis at the intersection of 12th Avenue N and Elm Street N indicated an intersection LOS A and LOS D in the AM and PM peak hours, respectively. From existing and future analysis, it is evident the eastbound and southbound approaches are transitioning from undersaturated to oversaturated conditions.
- Intersection control warrants were performed for the all-way stop control and traffic signal alternatives. All-way stop control and traffic signal control warrants were met using 2025, 2030, and 2050 traffic volumes.

- **Turn lane analysis for the traffic signal design alternative provided the following recommendations:**
 - **Right turn lanes are not recommended as volume criteria were not met.**
 - **Left turn lanes are recommended on all approaches.**
 - **Left turn signal phasing analysis recommended protected-permissive signal timing based on time of day.**
 - **It is recommended to use flashing yellow arrow (FYA) signal heads for all left turn lanes.**
- Future capacity analysis for the two-way stop control (TWSC) alternative indicated the southbound approach is expected to operate with a LOS E or worse in the 2025 PM, 2030 AM and PM, and 2050 AM and PM peak hours. The northbound approach is expected to operate with a LOS F in the 2050 PM peak hour. **The TWSC alternative is not a viable design alternative.**
- Future capacity analysis for the all-way stop control (AWSC) alternative indicated the eastbound approach is expected to operate with a LOS F in the 2025, 2030, and 2050 PM peak hours. The southbound approach is expected to operate with a LOS F in the 2050 PM peak hour. During the 2050 PM peak hour, the intersection is anticipated to operate with a LOS F. **The AWSC alternative is not a viable design alternative.**
- Future capacity analysis for the roundabout alternative is expected to operate with an intersection LOS A in the 2025, 2030, and 2050 AM and PM peak hours. The roundabout had the best intersection LOS compared to the other alternatives. **The roundabout alternative is a viable design alternative.**
 - Due to right of way and other environmental constraints, a standard single lane roundabout with a non-traversable median is not a viable alternative. Preliminary investigations indicated that a mini- or compact roundabout with a traversable center island can be accommodated. Oversized vehicles can have a negative impact to mini- and compact roundabout capacity as movements will occupy most of the intersection, preventing vehicles from entering the roundabout. However, if properly designed to accommodate the design vehicle, mini- and compact roundabouts are expected to have similar traffic operations (i.e. capacity) as a standard single lane roundabout.
- Future capacity analysis for the traffic signal alternative is expected to operate with an intersection LOS B in the 2025, 2030, and 2050 AM and PM peak hours. **The traffic signal alternative is a viable design alternative.**
- Roundabout and traffic signal alternatives were evaluated using the SPICE (Safety Performance for Intersection Control Evaluations) tool developed through the Federal Highway Administration (FHWA) and the National Cooperative Highway Research Program (NCHRP). Both alternatives

are expected to perform well from a safety perspective, though the roundabout is predicted to have fewer fatal and severe injury crashes under the modeled conditions.

- Sight distance was calculated at the intersection of 12th Avenue N and Elm Street N for the traffic signal and roundabout alternatives.
 - **Intersection sight distance analysis for the traffic signal alternative recommended removing the existing driveway on the south side of 12th Avenue N (approx. 120' west of Elm Street N).** Driveway restricts sight distance for the northbound right turn on red (RTOR) movement.
 - Roundabout intersection sight distance analysis identified mature trees are within the sight triangles. **It is recommended, at a minimum, to trim trees to prevent branches and foliage from blocking view of oncoming traffic.**
- To raise the 12th Avenue N/15th Avenue N Bridge above the 100-year flood elevation, a significant grade raise will be required. To accommodate bridge grading, access points to the Jack Williams Stadium and overflow parking are likely to be relocated from their current locations. **Once revised locations have been determined, it is recommended to analyze access point sight distance to determine if items such as guardrail or bridge barrier obstruct sight lines to 12th Avenue N traffic. If sight lines are obstructed, measures such as restricting turning movements, relocation, or removal access point(s) should be investigated to mitigate safety risks.**
- Access management analysis was performed at the intersection of 12th Avenue N and Elm Street N for the traffic signal and roundabout alternatives.
 - **It is recommended to remove the existing driveway on the south side of 12th Avenue N (approx. 120' west of Elm Street N).** Driveway is redundant as access is accommodated via the alleyway to the west.
 - **For the traffic signal alternative, it is recommended to locate that Jack Williams Stadium and overflow parking lot access points as far away as possible from the intersection. It is also recommended to investigate if the Jack Williams Stadium access point can be relocated to Elm Street N.**
 - **For the roundabout alternative, it is recommended to locate the Jack Williams Stadium and overflow parking lot access points as far away as possible from the intersection. If feasible, it is recommended to relocate access points outside of the queue limits to avoid queues blocking the access points.**
 - **For the traffic signal and roundabout alternatives, it is recommended that the Jack Williams Stadium and overflow parking lot access points be located to avoid overlapping left turns.**

- **Review of NDDOT lighting warrants recommended maintaining corridor lighting.** This will improve safety for both vehicles and vulnerable road users.
- **It is recommended to provide or maintain the following pedestrian and bicycle facilities regardless of whether a roundabout or traffic signal is selected as the preferred design alternative:**
 - **Maintain the existing sidewalks and bicycle lanes on the north and south sides of 12th Avenue N west of Elm Street N.**
 - **Maintain the existing shared use path on the north side of 12th Avenue N east of Elm Street N to maintain access to the Mickelson/Tricorn Bike Path.**
 - **Provide a shared use path on the south side of 12th Avenue N east of Elm Street N. Shared use path will provide access across the Red River and connect with the existing shared use path on the Moorhead side, filling in an existing gap in the F-M bike network.**
 - **Maintain the existing Mickelson/Tricorn Bike Path under the bridge. Diverting the path up and around could lead to pedestrians and bicyclists crossing 12th Avenue N at undesirable locations.**
 - **Maintain the existing sidewalks on the east and west sides of Elm Street N.**
 - **Provide pedestrian crossings on all legs of the 12th Avenue N and Elm Street N intersection. It is recommended to mark the crosswalks with high visibility marking for both the roundabout and traffic signal alternatives.**
- **It is recommended to remove the mid-block crossing from Jack Williams Stadium to the overflow parking lot due to safety concerns. In addition, both the traffic signal and roundabout alternatives will provide a controlled crossing less than 300' away.**
- **Bridge cross section analysis indicated a two-way two-lane bridge will provide acceptable operations based on forecasted traffic volumes. It is recommended to provide a two-way two-lane bridge cross section with 12-foot lanes and 4-foot shoulders, for a clear bridge width of 32 feet.**

Appendices

APPENDIX A – EXISTING TMC DATA

Time	Northbound				Southbound				Westbound				Eastbound				Total Autos
	Left	Thru	Right	Ped/Bicycle	Left	Thru	Right	Ped/Bicycle	Left	Thru	Right	Ped/Bicycle	Left	Thru	Right	Ped/Bicycle	
12:00 AM	0	1	1	0	2	0	2	0	0	3	2	0	0	9	0	0	20
12:15 AM	0	0	2	0	2	0	1	0	0	2	1	0	0	4	0	0	12
12:30 AM	0	0	1	0	2	1	0	0	0	2	0	0	1	1	0	0	8
12:45 AM	0	1	0	0	2	0	0	0	0	1	1	0	0	2	0	0	7
Hourly Total	0	2	4	0	8	1	3	0	0	8	4	0	1	16	0	0	47
1:00 AM	0	0	0	0	3	0	0	0	0	3	1	0	0	2	0	0	9
1:15 AM	0	2	0	0	0	0	1	0	0	1	1	0	0	1	0	0	6
1:30 AM	0	0	0	0	0	1	0	0	0	2	1	0	0	2	0	0	6
1:45 AM	0	1	0	0	0	0	1	0	1	3	0	0	0	4	0	0	10
Hourly Total	0	3	0	0	3	1	2	0	1	9	3	0	0	9	0	0	31
2:00 AM	0	0	1	0	0	1	0	0	0	2	0	0	0	6	0	0	10
2:15 AM	0	0	0	0	0	0	0	0	0	1	1	0	0	5	0	0	7
2:30 AM	0	0	0	0	0	0	0	0	0	2	0	0	0	2	0	0	4
2:45 AM	0	0	0	0	1	1	0	0	0	3	2	0	1	5	0	0	13
Hourly Total	0	0	1	0	1	2	0	0	0	8	3	0	1	18	0	0	34
3:00 AM	0	0	0	0	0	0	0	0	0	8	1	0	1	5	0	0	15
3:15 AM	0	0	1	0	1	0	0	0	0	1	0	0	1	2	0	0	6
3:30 AM	0	0	2	0	5	0	2	0	0	7	1	0	0	2	0	0	19
3:45 AM	0	1	0	0	0	0	0	0	0	5	3	0	0	3	0	0	12
Hourly Total	0	1	3	0	6	0	2	0	0	21	5	0	2	12	0	0	52
4:00 AM	0	0	0	0	1	0	0	0	0	5	2	0	0	4	0	1	12
4:15 AM	0	0	0	0	2	1	0	0	0	7	3	0	0	4	0	0	17
4:30 AM	0	0	1	0	1	0	3	0	0	17	3	0	0	0	0	0	25
4:45 AM	0	0	0	0	1	2	1	0	0	16	2	0	0	1	0	0	23
Hourly Total	0	0	1	0	5	3	4	0	0	45	10	0	0	9	0	1	77
5:00 AM	0	1	1	0	3	4	3	0	0	20	4	0	0	8	0	0	44
5:15 AM	0	1	0	0	4	2	2	0	0	20	6	0	1	3	0	0	39
5:30 AM	0	0	1	0	8	2	1	0	1	32	6	0	1	8	0	0	60
5:45 AM	1	1	1	0	13	5	4	0	1	37	13	0	4	10	0	0	90
Hourly Total	1	3	3	0	28	13	10	0	2	109	29	0	6	29	0	0	233
6:00 AM	0	1	0	0	4	2	3	0	0	34	11	0	2	8	0	0	65
6:15 AM	0	4	1	0	8	0	2	0	3	37	18	0	2	23	0	0	98
6:30 AM	0	4	1	0	7	5	2	1	2	53	27	0	8	27	0	0	136
6:45 AM	0	6	3	0	19	4	10	0	2	72	52	1	10	50	0	0	228
Hourly Total	0	15	5	0	38	11	17	1	7	196	108	1	22	108	0	0	527

Time	Northbound				Southbound				Westbound				Eastbound				Total Autos
	Left	Thru	Right	Ped/Bicycle	Left	Thru	Right	Ped/Bicycle	Left	Thru	Right	Ped/Bicycle	Left	Thru	Right	Ped/Bicycle	
7:00 AM	0	6	2	0	21	11	10	0	5	68	47	0	9	24	0	0	203
7:15 AM	0	3	7	0	27	21	14	0	10	79	54	0	16	31	0	0	262
7:30 AM	0	16	6	1	30	20	19	0	6	89	62	1	13	48	0	0	309
7:45 AM	0	9	7	0	42	27	21	0	15	92	54	0	11	46	0	0	324
Hourly Total	0	34	22	1	120	79	64	0	36	328	217	1	49	149	0	0	1098
8:00 AM	0	3	2	1	26	21	21	1	8	81	41	2	5	42	0	2	250
8:15 AM	0	9	4	1	23	20	12	0	4	54	17	0	13	32	2	1	190
8:30 AM	0	2	4	0	20	15	14	0	3	51	24	1	6	32	0	0	171
8:45 AM	0	6	3	0	24	10	8	0	4	47	23	0	6	38	1	0	170
Hourly Total	0	20	13	2	93	66	55	1	19	233	105	3	30	144	3	3	781
9:00 AM	0	4	2	0	28	5	8	0	3	39	19	1	9	20	0	0	137
9:15 AM	0	4	3	0	16	7	5	0	5	50	27	0	5	28	1	0	151
9:30 AM	0	2	4	0	13	7	7	0	3	21	17	1	2	30	0	0	106
9:45 AM	0	9	3	0	18	10	11	0	1	37	24	1	8	38	2	0	161
Hourly Total	0	19	12	0	75	29	31	0	12	147	87	3	24	116	3	0	555
10:00 AM	0	7	3	0	26	8	5	0	4	28	24	1	8	34	0	0	147
10:15 AM	0	1	3	0	19	9	5	0	4	37	17	0	5	30	0	1	130
10:30 AM	0	6	0	0	14	12	11	0	1	46	26	2	7	32	0	0	155
10:45 AM	0	5	2	0	20	8	6	1	0	38	22	0	6	38	1	0	146
Hourly Total	0	19	8	0	79	37	27	1	9	149	89	3	26	134	1	1	578
11:00 AM	0	7	5	0	14	7	5	0	4	35	23	0	10	40	1	0	151
11:15 AM	0	6	5	1	23	6	11	0	2	39	20	1	12	40	1	0	165
11:30 AM	0	11	5	0	45	3	12	0	2	34	24	0	12	46	0	0	194
11:45 AM	0	5	7	0	13	5	14	0	3	50	15	1	6	41	0	0	159
Hourly Total	0	29	22	1	95	21	42	0	11	158	82	2	40	167	2	0	669
12:00 PM	0	14	4	1	27	7	9	1	5	48	16	1	4	53	0	0	187
12:15 PM	0	9	4	0	24	8	9	1	4	34	18	0	9	45	0	0	164
12:30 PM	0	5	7	0	25	10	8	0	3	43	26	1	11	43	1	0	182
12:45 PM	0	8	4	0	17	8	13	0	5	39	35	2	12	45	3	1	189
Hourly Total	0	36	19	1	93	33	39	2	17	164	95	4	36	186	4	1	722
1:00 PM	1	11	5	0	31	14	3	0	5	38	16	0	9	32	0	1	165
1:15 PM	0	10	5	2	17	8	7	0	0	37	16	1	7	44	1	0	152
1:30 PM	0	6	10	1	20	8	9	1	4	40	15	0	7	48	0	0	167
1:45 PM	1	7	7	1	23	11	13	1	2	47	23	0	7	48	0	0	189
Hourly Total	2	34	27	4	91	41	32	2	11	162	70	1	30	172	1	1	673

Time	Northbound				Southbound				Westbound				Eastbound				Total Autos
	Left	Thru	Right	Ped/Bicycle	Left	Thru	Right	Ped/Bicycle	Left	Thru	Right	Ped/Bicycle	Left	Thru	Right	Ped/Bicycle	
2:00 PM	0	6	7	0	24	6	9	1	2	49	17	0	13	46	1	2	180
2:15 PM	0	8	4	0	40	12	10	1	3	45	31	1	9	42	1	0	205
2:30 PM	0	13	7	0	30	8	10	1	5	42	25	2	11	54	0	1	205
2:45 PM	0	8	8	1	44	14	12	1	1	48	21	0	11	61	3	0	231
Hourly Total	0	35	26	1	138	40	41	4	11	184	94	3	44	203	5	3	821
3:00 PM	0	5	14	2	45	9	12	0	3	62	26	1	9	61	1	1	247
3:15 PM	0	13	6	0	28	16	11	2	6	51	35	0	9	73	1	0	249
3:30 PM	0	9	11	0	42	14	15	0	4	58	36	0	8	75	2	1	274
3:45 PM	0	10	14	0	40	11	12	1	7	49	34	1	8	104	1	1	290
Hourly Total	0	37	45	2	155	50	50	3	20	220	131	2	34	313	5	3	1060
4:00 PM	0	13	14	0	60	22	13	1	7	73	33	1	12	73	2	1	322
4:15 PM	0	14	21	1	62	15	15	1	2	67	38	2	14	81	0	0	329
4:30 PM	0	17	12	1	70	12	20	1	12	60	40	3	8	83	2	2	336
4:45 PM	1	4	17	1	55	17	14	2	4	63	25	0	7	105	3	1	315
Hourly Total	1	48	64	3	247	66	62	5	25	263	136	6	41	342	7	4	1302
5:00 PM	0	25	32	0	61	9	16	0	9	48	40	0	12	96	2	0	350
5:15 PM	1	15	11	2	46	17	11	1	6	48	31	4	10	92	0	4	288
5:30 PM	0	18	18	1	44	9	12	4	4	47	30	2	9	81	0	1	272
5:45 PM	0	11	6	0	25	13	9	3	4	63	32	1	19	66	1	0	249
Hourly Total	1	69	67	3	176	48	48	8	23	206	133	7	50	335	3	5	1159
6:00 PM	0	7	12	28	30	7	10	1	6	42	30	4	14	54	2	1	214
6:15 PM	1	12	12	2	27	8	9	2	7	39	32	0	10	49	0	3	206
6:30 PM	0	10	6	3	31	4	7	0	3	44	31	2	9	46	3	1	194
6:45 PM	0	10	3	2	23	11	9	3	3	46	18	1	7	48	0	3	178
Hourly Total	1	39	33	35	111	30	35	6	19	171	111	7	40	197	5	8	792
7:00 PM	1	6	7	0	14	7	8	0	0	48	30	1	15	40	0	1	176
7:15 PM	0	4	3	3	23	8	6	0	4	35	19	17	8	48	0	3	158
7:30 PM	1	11	5	1	20	7	6	3	4	57	23	5	7	59	1	2	201
7:45 PM	0	3	5	0	11	4	0	0	10	30	20	3	4	44	1	1	132
Hourly Total	2	24	20	4	68	26	20	3	18	170	92	26	34	191	2	7	667
8:00 PM	0	4	5	1	27	5	3	0	3	58	18	1	9	34	0	1	166
8:15 PM	0	14	6	0	16	7	9	0	3	45	25	0	6	36	0	2	167
8:30 PM	0	1	3	0	15	3	5	0	4	38	25	0	5	25	1	0	125
8:45 PM	0	7	3	0	8	3	2	0	4	18	15	0	11	36	2	1	109
Hourly Total	0	26	17	1	66	18	19	0	14	159	83	1	31	131	3	4	567

Time	Northbound				Southbound				Westbound				Eastbound				Total
	Left	Thru	Right	Ped/Bicycle	Left	Thru	Right	Ped/Bicycle	Left	Thru	Right	Ped/Bicycle	Left	Thru	Right	Ped/Bicycle	Autos
9:00 PM	0	6	4	0	10	4	4	0	3	26	14	0	4	29	1	0	105
9:15 PM	0	1	2	0	5	4	3	0	3	23	15	0	1	19	1	0	77
9:30 PM	1	3	2	0	8	0	1	0	2	14	9	0	5	19	0	0	64
9:45 PM	0	1	3	0	5	3	1	0	3	23	10	0	3	13	0	0	65
Hourly Total	1	11	11	0	28	11	9	0	11	86	48	0	13	80	2	0	311
10:00 PM	0	0	1	0	6	2	2	0	4	47	8	0	2	14	0	0	86
10:15 PM	0	0	0	0	4	2	1	0	1	9	6	0	2	14	1	0	40
10:30 PM	1	4	1	0	2	1	1	0	3	17	3	1	4	9	0	0	46
10:45 PM	0	2	1	0	4	1	0	0	0	13	4	0	1	10	0	0	36
Hourly Total	1	6	3	0	16	6	4	0	8	86	21	1	9	47	1	0	208
11:00 PM	0	0	1	0	3	0	1	0	1	20	6	0	0	5	0	0	37
11:15 PM	0	0	0	0	8	2	0	0	0	5	2	0	0	8	0	0	25
11:30 PM	0	1	1	0	2	2	0	0	0	3	6	0	1	9	0	0	25
11:45 PM	0	1	0	0	2	0	0	0	4	3	1	0	1	6	0	0	18
Hourly Total	0	2	2	0	15	4	1	0	5	31	15	0	2	28	0	0	105
Grand Total	10	512	428	58	1755	636	617	36	279	3313	1771	71	565	3136	47	41	13069
Passenger Cars	10	506	428		1743	633	606		277	3286	1762		549	3108	46		12954
Heavy Vehicles	0	6	0		12	3	11		2	27	9		16	28	1		115
Heavy Vehicle %	0.0%	1.2%	0.0%		0.7%	0.5%	1.8%		0.7%	0.8%	0.5%		2.8%	0.9%	2.1%		0.9%

AM Peak Hour

Time	Northbound				Southbound				Westbound				Eastbound				Total Autos
	Left	Thru	Right	Ped/Bicycle	Left	Thru	Right	Ped/Bicycle	Left	Thru	Right	Ped/Bicycle	Left	Thru	Right	Ped/Bicycle	
7:15 AM	0	3	7	0	27	21	14	0	10	79	54	0	16	31	0	0	262
7:30 AM	0	16	6	1	30	20	19	0	6	89	62	1	13	48	0	0	309
7:45 AM	0	9	7	0	42	27	21	0	15	92	54	0	11	46	0	0	324
8:00 AM	0	3	2	1	26	21	21	1	8	81	41	2	5	42	0	2	250
Peak Hour Total	0	31	22	2	125	89	75	1	39	341	211	3	45	167	0	2	1145
PHF																	0.883

PM Peak Hour

Time	Northbound				Southbound				Westbound				Eastbound				Total Autos
	Left	Thru	Right	Ped/Bicycle	Left	Thru	Right	Ped/Bicycle	Left	Thru	Right	Ped/Bicycle	Left	Thru	Right	Ped/Bicycle	
4:15 PM	0	14	21	1	62	15	15	1	2	67	38	2	14	81	0	0	329
4:30 PM	0	17	12	1	70	12	20	1	12	60	40	3	8	83	2	2	336
4:45 PM	1	4	17	1	55	17	14	2	4	63	25	0	7	105	3	1	315
5:00 PM	0	25	32	0	61	9	16	0	9	48	40	0	12	96	2	0	350
Peak Hour Total	1	60	82	3	248	53	65	4	27	238	143	5	41	365	7	3	1330
PHF																	0.950

APPENDIX B – CRASH HISTORY

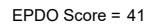
Intersection and/or Urban Crash Summary Sheets		
Total Crashes:	5 (Sorted by Date)	Notes: Non-injury animal crashes were not included.
City:	Fargo	
Location:	12 Ave N & Elm St	
Start - End Date:	7/1/2020 - 6/30/2025 (5 Years)	

23 USC § 407 Documents
NDDOT Reserves All Objections

VISION
ZERO

Statistics for Total Crashes

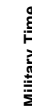
5



Day of Week		
Monday =	0	0%
Tuesday =	1	20%
Wednesday =	3	60%
Thursday =	0	0%
Friday =	1	20%
Saturday =	0	0%
Sunday =	<u>0</u>	0%
	<u>5</u>	

Lighting Conditions			Breakdown by Severity				
			K	A	B	C	O
Dawn/Dusk	0	0%	0	0	0	0	0
Daylight	5	100%	0	0	1	2	2
Dark	0	0%	0	0	0	0	0
Dark (lighted)	0	0%	0	0	0	0	0
Unknown	0	0%	0	0	0	0	0
	5	100%	0	0	1	2	2

D1 and D2 Age/Sex			
Age	M	F	Total
0-17	0	0	0
18-20	1	0	1
21-24	1	0	1
25-34	0	2	2
35-44	0	0	0
45-54	0	1	1
55-64	1	1	2
65-74	1	0	1
75+	0	1	1
	4	5	9

[illegible]

Intersection and/or Urban Crash Summary Sheets									
Total Crashes: 5 (Sorted by Date)		23 USC § 407 Documents NDDOT Reserves All Objections		LEGEND ▶ Fatal ▶ Incapacitating Injury ▶ Non-Incapacitating Injury ▷ Possible Injury ◆ Wet surface ❄ Snow, Ice, Slush, Frost ▲ Crash related to work zone ① Unit number		1. <u>Contributing Factor</u> * = alcohol or drugs involved 2. <u>Most Harmful Event</u> For single vehicle crashes, the most harmful event is shown in parentheses in the "Type of Collision" column		VISION ZERO	
City: Fargo		Location: 12 Ave N & Elm St		Start - End Date: 7/1/2020 - 6/30/2025 (5 Years)					
Crash No.		Crash Severity Date, Day Surface Conditions, Weather Lighting, Time	Type of Collision	① AGE SEX CITY STATE Unit Configuration Movement (traffic control) Contributing Factor ¹ Most Harmful Event ²		Shortened Narrative		Diagram	
1	1097237	▶ Non-incapacitating injury 08/07/20 Friday Dry Cloudy Daylight 3:40 PM	Ped / Bike	① 59F FARGO ND Pickup - Van - Utility WB Going Straight (Stop)	② <Null> MOORHEAD MN Pedalcycle WB Crossing (Stop)	V1 WB after stopping. There was a pickup facing EB stopped at the stop sign. A person riding their bike traveled NB behind the stopped pickup as V1 was traveling WB. V1 struck the bicyclist on the west side of the intersection.		No Diagram	
2	1113176	▷ Possible Injury 10/06/21 Wednesday Dry Clear Daylight 3:14 PM	Rear End	① 18M FARGO ND Passenger Car WB Going Straight (Stop)	② 46F FARGO ND Pickup - Van - Utility WB Going Straight (Stop)			←←	
3	1151649	PDO 03/27/24 Wednesday Wet Clear Daylight 8:08 AM	◆ Angle	① 71M FARGO ND Pickup - Van - Utility SB Going Straight (Stop)	② 25F DILWORTH MN Passenger Car WB Going Straight (Stop)			↓ ←	
4	1155983	▷ Possible Injury 07/30/24 Tuesday Dry Clear Daylight 5:05 PM	Angle	① 31F FARGO ND Pickup - Van - Utility WB Going Straight (Stop) To Fast for Conditions	② 59M FARGO ND Passenger Car SB Going Straight (Stop)			↓ ←	
5	1168665	PDO 06/18/25 Wednesday Dry Clear Daylight 12:05 PM	Angle	① 83F FARGO ND Passenger Car SB Going Straight (Stop)	② 21M FARGO ND Passenger Car WB Going Straight (Stop)			↓ ←	
6									
7									
8									
9									
10									

APPENDIX C – EXISTING CAPACITY ANALYSIS OUTPUTS

Volume

2: Elm St N & 12th Ave N

08/27/2025

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Traffic Volume (vph)	45	167	0	39	341	211	0	31	22	125	89	75
Future Volume (vph)	45	167	0	39	341	211	0	31	22	125	89	75
Confl. Peds. (#/hr)	4		3	4		5	3		4	5		4
Confl. Bikes (#/hr)												
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	51	190	0	44	388	240	0	35	25	142	101	85
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	241	0	0	432	240	0	60	0	0	328	0
Intersection Summary												

2: Elm St N & 12th Ave N Performance by approach

Approach	EB	WB	NB	SB	All
Denied Del/Veh (s)	0.2	1.6	0.1	0.3	0.9
Total Del/Veh (s)	8.1	10.3	6.3	9.4	9.5

2: Elm St N & 12th Ave N Performance by movement

Movement	EBL	EBT	WBL	WBT	WBR	NBT	NBR	SBL	SBT	SBR	All
Denied Del/Veh (s)	0.2	0.2	0.9	0.8	3.0	0.1	0.1	0.3	0.2	0.3	0.9
Total Del/Veh (s)	8.2	8.1	11.7	12.4	6.6	7.9	4.2	9.8	10.4	7.6	9.5

Queuing and Blocking Report

Baseline

09/05/2025

Intersection: 2: Elm St N & 12th Ave N

Movement	EB	WB	WB	NB	SB
Directions Served	LTR	LT	R	LTR	LTR
Maximum Queue (ft)	109	249	124	59	134
Average Queue (ft)	53	87	60	27	60
95th Queue (ft)	87	172	112	53	106
Link Distance (ft)	706	818		579	1202
Upstream Blk Time (%)					
Queuing Penalty (veh)					
Storage Bay Dist (ft)			100		
Storage Blk Time (%)		6	0		
Queuing Penalty (veh)		13	1		

Volume

2: Elm St N & 12th Ave N

08/27/2025

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Traffic Volume (vph)	41	365	7	27	238	143	1	60	82	248	53	65
Future Volume (vph)	41	365	7	27	238	143	1	60	82	248	53	65
Confl. Peds. (#/hr)	9		7	6		8	7		6	8		9
Confl. Bikes (#/hr)												
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	43	384	7	28	251	151	1	63	86	261	56	68
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	434	0	0	279	151	0	150	0	0	385	0
Intersection Summary												

2: Elm St N & 12th Ave N Performance by approach

Approach	EB	WB	NB	SB	All
Denied Del/Veh (s)	1.1	1.5	0.2	0.3	0.9
Total Del/Veh (s)	50.4	11.9	10.9	34.5	30.1

2: Elm St N & 12th Ave N Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	0.9	1.2	1.0	0.6	0.6	3.2	0.4	0.2	0.2	0.3	0.3	0.3
Total Del/Veh (s)	44.6	50.9	51.6	14.2	14.7	6.4	7.6	12.6	9.5	34.7	34.0	34.5

2: Elm St N & 12th Ave N Performance by movement

Movement	All
Denied Del/Veh (s)	0.9
Total Del/Veh (s)	30.1

Queuing and Blocking Report

Baseline

09/05/2025

Intersection: 2: Elm St N & 12th Ave N

Movement	EB	WB	WB	NB	SB
Directions Served	LTR	LT	R	LTR	LTR
Maximum Queue (ft)	502	183	125	105	353
Average Queue (ft)	212	79	51	50	148
95th Queue (ft)	489	141	101	83	320
Link Distance (ft)	708	817		579	1202
Upstream Blk Time (%)	2				
Queuing Penalty (veh)	0				
Storage Bay Dist (ft)			100		
Storage Blk Time (%)		5	0		
Queuing Penalty (veh)		7	0		

APPENDIX D – INTERSECTION CONTROL WARRANTS

TRAFFIC CONTROL STUDY - CRITERIA FOR MULTI-WAY STOPNorth Dakota Department of Transportation, Programming
SFN 59012 (3-2023)**23 USC § 407 Documents**
NDDOT Reserves All Objections

Date 07/23/2025	Prepared by Brett Gunderson	City Fargo	Analysis Year 2025																																																																
Major Road Name 12th Ave N		Minor Road Name Elm St N																																																																	
Major Road Speed Limit (mph) 25		Minor Road Speed Limit (mph) 25																																																																	
Major Road 8 Highest Hours: total vehicular volume entering the intersection from the major road approaches (total of both approaches)		Minor Road 8 Highest Hours: for the same 8 hours, the combined vehicular, pedestrian, and bicycle volume entering the intersection from the minor street approaches (total of both approaches)																																																																	
% of 300 vph <table><tr><td>1</td><td> 779 </td><td>259</td><td>%</td></tr><tr><td>2</td><td> 534 </td><td>178</td><td>%</td></tr><tr><td>3</td><td> 502 </td><td>167</td><td>%</td></tr><tr><td>4</td><td> 541 </td><td>180</td><td>%</td></tr><tr><td>5</td><td> 723 </td><td>241</td><td>%</td></tr><tr><td>6</td><td> 814 </td><td>271</td><td>%</td></tr><tr><td>7</td><td> 750 </td><td>250</td><td>%</td></tr><tr><td>8</td><td> 543 </td><td>181</td><td>%</td></tr></table>		1	779	259	%	2	534	178	%	3	502	167	%	4	541	180	%	5	723	241	%	6	814	271	%	7	750	250	%	8	543	181	%	% of 200 units/hr <table><tr><td>1</td><td> 320 </td><td>160</td><td>%</td></tr><tr><td>2</td><td> 250 </td><td>125</td><td>%</td></tr><tr><td>3</td><td> 223 </td><td>111</td><td>%</td></tr><tr><td>4</td><td> 285 </td><td>142</td><td>%</td></tr><tr><td>5</td><td> 342 </td><td>171</td><td>%</td></tr><tr><td>6</td><td> 496 </td><td>248</td><td>%</td></tr><tr><td>7</td><td> 420 </td><td>210</td><td>%</td></tr><tr><td>8</td><td> 290 </td><td>145</td><td>%</td></tr></table>		1	320	160	%	2	250	125	%	3	223	111	%	4	285	142	%	5	342	171	%	6	496	248	%	7	420	210	%	8	290	145	%
1	779	259	%																																																																
2	534	178	%																																																																
3	502	167	%																																																																
4	541	180	%																																																																
5	723	241	%																																																																
6	814	271	%																																																																
7	750	250	%																																																																
8	543	181	%																																																																
1	320	160	%																																																																
2	250	125	%																																																																
3	223	111	%																																																																
4	285	142	%																																																																
5	342	171	%																																																																
6	496	248	%																																																																
7	420	210	%																																																																
8	290	145	%																																																																

Average delay to
minor road vehicular
traffic during the
highest hour
(seconds per vehicle)
Identify crashes of types susceptible to correction by multi-way stop control.
Such crashes include right-turn and left-turn collisions as well as right-angle collisions.

Highest Number of Crashes within 12-month period	Comments
2	SB + WB angle crashes

Traffic Signal Warrants Met?

☒ Yes ☐ No

If so, identify warrant number(s):

Where traffic signals are justified, the multi-way stop is an interim measure that can be installed quickly to control traffic while arrangements are being made for the installation of the traffic control signal.

Criteria A
☐ Satisfied ☒ Not Satisfied

Crashes $\geq$ 5?

Criteria B
☐ Satisfied ☒ Not Satisfied

Major & Minor $\geq$ 100% for 8 Hours and
peak hour delay $\geq$ 30 seconds?

Criteria D.1 & D.2
☒ Yes ☐ No

Criteria C
☒ Satisfied ☐ Not Satisfied

Major & Minor $\geq$ 70% for 8 Hours and
Major Road $\geq$ 40 mph?

Criteria D.3
☐ Yes ☒ No

Major & Minor $\geq$ 80% for 8 Hours and
peak hour delay $\geq$ 24 seconds and crashes $\geq$ 4? ☒ No

Criteria D
☒ Satisfied ☐ Not Satisfied

Refer to the MUTCD, section 2B.07 for other optional criteria that may be considered in an engineering study for a multi-way STOP sign installation.

CONCLUSION

Criteria Satisfied	Criteria C and D	Multi-Way Stop
Comments Average delay to minor road vehicular traffic obtained from SimTraffic analysis under two-way stop control (TWSC) conditions.		☒ Yes ☐ No

TRAFFIC CONTROL STUDY - WARRANTS FOR TRAFFIC SIGNALS

North Dakota Department of Transportation, Programming
SFN 7924 (3-2023)

23 USC § 407 Documents
NDDOT Reserves All Objections

Date 07/23/2025	Prepared by Brett Gunderson	City Fargo	Analysis Year 2025
Major Road 12th Ave N		Speed Limit (mph) 25	Number of Lanes 1
Minor Road Elm St N		Speed Limit (mph) 25	Number of Lanes 2

Minor road right-turn traffic excluded from the analysis because there is an exclusive right-turn lane and right-turn traffic enters the Major Road with minimal conflict:

1. Posted or 85th-percentile speed of major road traffic is > 40 mph:

☐ Yes ☒ No

☐ Yes ☒ No

2. In built-up area of isolated community < 10,000 population:

☐ Yes ☒ No

If question 1 or 2 is answered yes, then use 70% volume criteria:

☐ 70% ☒ 100%

WARRANT 1, EIGHT-HOUR VEHICULAR VOLUME

Requirements: Either Condition A (Minimum Vehicular Volume) or Condition B (Interruption of Continuous Traffic) is satisfied to 100% of the stated volumes for each of any 8 hours of an average day.

Or: Both Condition A and Condition B are satisfied to 80% of the stated volumes for each of any 8 hours of an average day.

Table 4C-1. Warrant 1, Eight-Hour Vehicular Volume

Condition A - Minimum Vehicular Volume

Number of lanes for moving traffic on each approach		Vehicles per hour on major street (total of both approaches)				Vehicles per hour on higher-volume minor-street approach (one direction only)			
Major Street	Minor Street	100% ^a	80% ^b	70% ^c	56% ^d	100% ^a	80% ^b	70% ^c	56% ^d
1	1	500	400	350	280	150	120	105	84
2 or more	1	600	480	420	336	150	120	105	84
2 or more	2 or more	600	480	420	336	200	160	140	112
1	2 or more	500	400	350	280	200	160	140	112

Condition B - Interruption of Continuous Traffic

Number of lanes for moving traffic on each approach		Vehicles per hour on major street (total of both approaches)				Vehicles per hour on higher-volume minor-street approach (one direction only)			
Major Street	Minor Street	100% ^a	80% ^b	70% ^c	56% ^d	100% ^a	80% ^b	70% ^c	56% ^d
1	1	750	600	525	420	75	60	53	42
2 or more	1	900	720	630	504	75	60	53	42
2 or more	2 or more	900	720	630	504	100	80	70	56
1	2 or more	750	600	525	420	100	80	70	56

^a Basic minimum hourly volume

^b Used for combination of Conditions A and B after adequate trial of other remedial measures

^c May be used when the major-street speed exceeds 40 mph or in an isolated community with a population of less than 10,000

^d May be used for combination of Conditions A and B after adequate trial of other remedial measures when the major-street speed exceeds 40 mph or in an isolated community with a population of less than 10,000

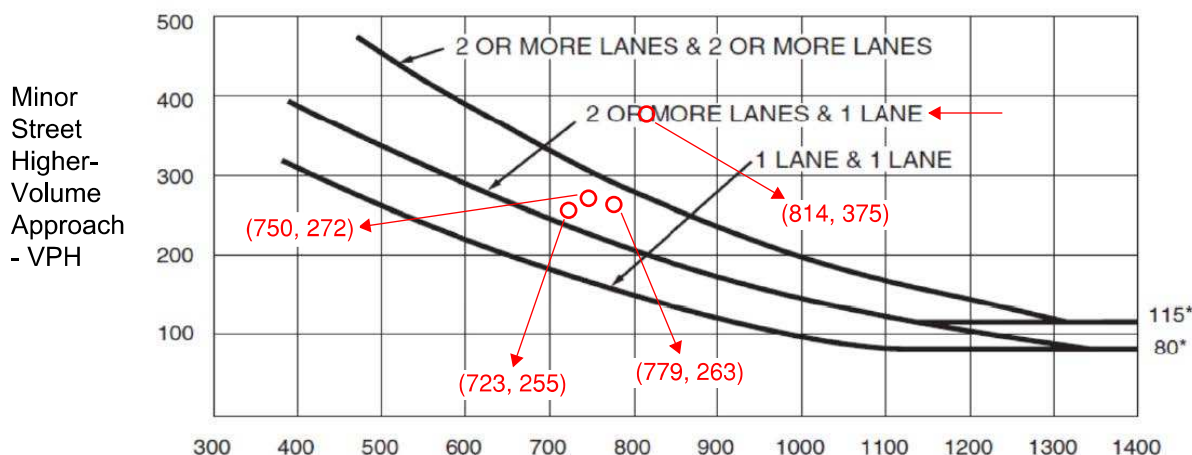
8 Highest Hour Volumes								
	1	2	3	4	5	6	7	8
Both Approaches Major Road	779	534	502	541	723	814	750	543
Highest Approach Minor Road	263	214	165	219	255	375	272	176

Warrant 1 Met? ☐ Yes ☒ No ☐ Does not apply

WARRANT 2, FOUR-HOUR VEHICULAR VOLUME

Requirements: Plot four highest hour volumes on the applicable figure below. If four points lie above the applicable curve then the warrant is satisfied.

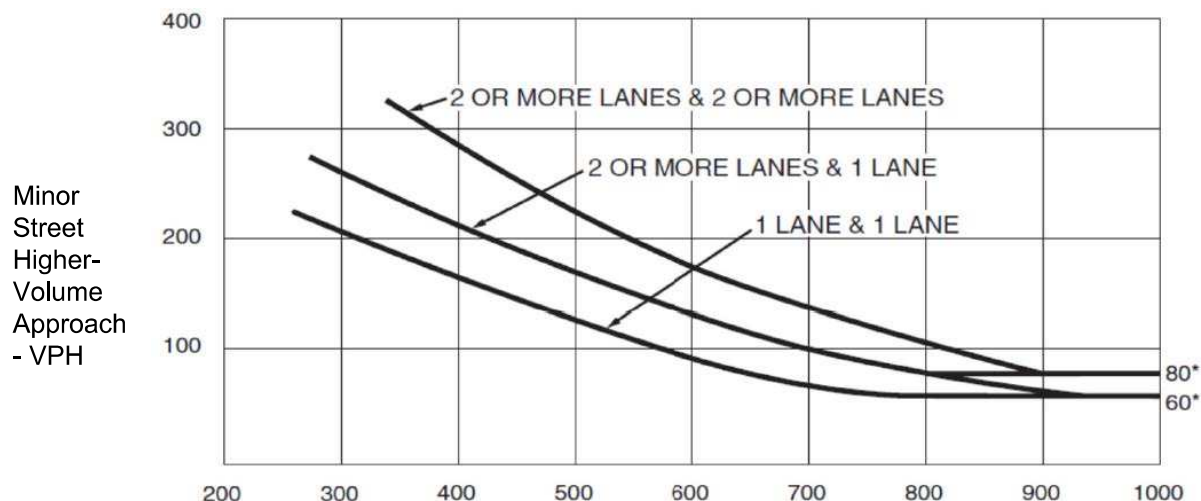
Figure 4C-1. Warrant 2, Four-Hour Vehicular Volume



MAJOR STREET - TOTAL OF BOTH APPROACHES
VEHICLES PER HOUR (VPH)

*Note: 115 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 80 vph applies as the lower threshold volume for a minor-street approach with one lane.

Figure 4C-2. Warrant 2, Four-Hour Vehicular Volume (70% Factor)
(Community Less than 10,000 Population or Above 40 MPH on Major Street)



MAJOR STREET -- TOTAL OF BOTH APPROACHES
VEHICLES PER HOUR (VPH)

*Note: 80 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 60 vph applies as the lower threshold volume for a minor-street approach with one lane.

Warrant 2 Met? ☒ Yes ☐ No ☐ Does not apply

TRAFFIC CONTROL STUDY - WARRANTS FOR TRAFFIC SIGNALS

North Dakota Department of Transportation, Programming
SFN 7924 (3-2023)

23 USC § 407 Documents
NDDOT Reserves All Objections

Date 07/23/2025	Prepared by Brett Gunderson	City Fargo	Analysis Year 2030
Major Road 12th Ave N		Speed Limit (mph) 30	Number of Lanes 1
Minor Road Elm St N		Speed Limit (mph) 25	Number of Lanes 2

Minor road right-turn traffic excluded from the analysis because there is an exclusive right-turn lane and right-turn traffic enters the Major Road with minimal conflict:

1. Posted or 85th-percentile speed of major road traffic is > 40 mph:

☐ Yes ☒ No

☐ Yes ☒ No

2. In built-up area of isolated community < 10,000 population:

☐ Yes ☒ No

If question 1 or 2 is answered yes, then use 70% volume criteria:

☐ 70% ☒ 100%

WARRANT 1, EIGHT-HOUR VEHICULAR VOLUME

Requirements: Either Condition A (Minimum Vehicular Volume) or Condition B (Interruption of Continuous Traffic) is satisfied to 100% of the stated volumes for each of any 8 hours of an average day.

Or: Both Condition A and Condition B are satisfied to 80% of the stated volumes for each of any 8 hours of an average day.

Table 4C-1. Warrant 1, Eight-Hour Vehicular Volume

Condition A - Minimum Vehicular Volume

Number of lanes for moving traffic on each approach		Vehicles per hour on major street (total of both approaches)				Vehicles per hour on higher-volume minor-street approach (one direction only)			
Major Street	Minor Street	100% ^a	80% ^b	70% ^c	56% ^d	100% ^a	80% ^b	70% ^c	56% ^d
1	1	500	400	350	280	150	120	105	84
2 or more	1	600	480	420	336	150	120	105	84
2 or more	2 or more	600	480	420	336	200	160	140	112
1	2 or more	500	400	350	280	200	160	140	112

Condition B - Interruption of Continuous Traffic

Number of lanes for moving traffic on each approach		Vehicles per hour on major street (total of both approaches)				Vehicles per hour on higher-volume minor-street approach (one direction only)			
Major Street	Minor Street	100% ^a	80% ^b	70% ^c	56% ^d	100% ^a	80% ^b	70% ^c	56% ^d
1	1	750	600	525	420	75	60	53	42
2 or more	1	900	720	630	504	75	60	53	42
2 or more	2 or more	900	720	630	504	100	80	70	56
1	2 or more	750	600	525	420	100	80	70	56

^a Basic minimum hourly volume

^b Used for combination of Conditions A and B after adequate trial of other remedial measures

^c May be used when the major-street speed exceeds 40 mph or in an isolated community with a population of less than 10,000

^d May be used for combination of Conditions A and B after adequate trial of other remedial measures when the major-street speed exceeds 40 mph or in an isolated community with a population of less than 10,000

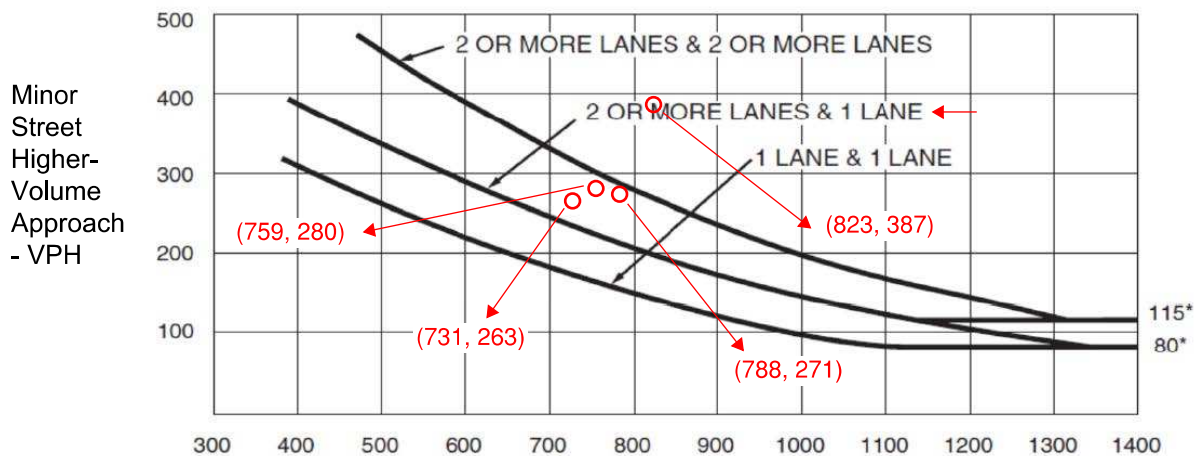
8 Highest Hour Volumes								
	1	2	3	4	5	6	7	8
Both Approaches Major Road	788	540	508	547	731	823	759	549
Highest Approach Minor Road	271	221	170	226	263	387	280	182

Warrant 1 Met? ☐ Yes ☒ No ☐ Does not apply

WARRANT 2, FOUR-HOUR VEHICULAR VOLUME

Requirements: Plot four highest hour volumes on the applicable figure below. If four points lie above the applicable curve then the warrant is satisfied.

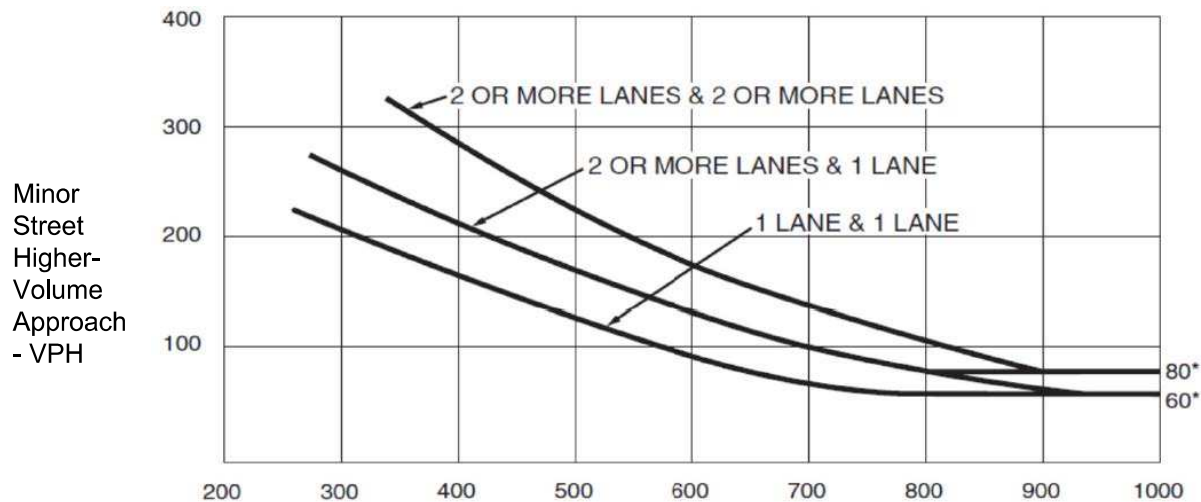
Figure 4C-1. Warrant 2, Four-Hour Vehicular Volume



MAJOR STREET - TOTAL OF BOTH APPROACHES
VEHICLES PER HOUR (VPH)

*Note: 115 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 80 vph applies as the lower threshold volume for a minor-street approach with one lane.

Figure 4C-2. Warrant 2, Four-Hour Vehicular Volume (70% Factor)
(Community Less than 10,000 Population or Above 40 MPH on Major Street)



MAJOR STREET -- TOTAL OF BOTH APPROACHES
VEHICLES PER HOUR (VPH)

*Note: 80 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 60 vph applies as the lower threshold volume for a minor-street approach with one lane.

Warrant 2 Met? ☒ Yes ☐ No ☐ Does not apply

TRAFFIC CONTROL STUDY - WARRANTS FOR TRAFFIC SIGNALS

North Dakota Department of Transportation, Programming
SFN 7924 (3-2023)

23 USC § 407 Documents
NDDOT Reserves All Objections

Date 07/23/2025	Prepared by Brett Gunderson	City Fargo	Analysis Year 2050
Major Road 12th Ave N		Speed Limit (mph) 30	Number of Lanes 1
Minor Road Elm St N		Speed Limit (mph) 25	Number of Lanes 2

Minor road right-turn traffic excluded from the analysis because there is an exclusive right-turn lane and right-turn traffic enters the Major Road with minimal conflict:

1. Posted or 85th-percentile speed of major road traffic is > 40 mph:

☐ Yes ☒ No

☐ Yes ☒ No

2. In built-up area of isolated community < 10,000 population:

☐ Yes ☒ No

If question 1 or 2 is answered yes, then use 70% volume criteria:

☐ 70% ☒ 100%

WARRANT 1, EIGHT-HOUR VEHICULAR VOLUME

Requirements: Either Condition A (Minimum Vehicular Volume) or Condition B (Interruption of Continuous Traffic) is satisfied to 100% of the stated volumes for each of any 8 hours of an average day.

Or: Both Condition A and Condition B are satisfied to 80% of the stated volumes for each of any 8 hours of an average day.

Table 4C-1. Warrant 1, Eight-Hour Vehicular Volume

Condition A - Minimum Vehicular Volume

Number of lanes for moving traffic on each approach		Vehicles per hour on major street (total of both approaches)				Vehicles per hour on higher-volume minor-street approach (one direction only)			
Major Street	Minor Street	100% ^a	80% ^b	70% ^c	56% ^d	100% ^a	80% ^b	70% ^c	56% ^d
1	1	500	400	350	280	150	120	105	84
2 or more	1	600	480	420	336	150	120	105	84
2 or more	2 or more	600	480	420	336	200	160	140	112
1	2 or more	500	400	350	280	200	160	140	112

Condition B - Interruption of Continuous Traffic

Number of lanes for moving traffic on each approach		Vehicles per hour on major street (total of both approaches)				Vehicles per hour on higher-volume minor-street approach (one direction only)			
Major Street	Minor Street	100% ^a	80% ^b	70% ^c	56% ^d	100% ^a	80% ^b	70% ^c	56% ^d
1	1	750	600	525	420	75	60	53	42
2 or more	1	900	720	630	504	75	60	53	42
2 or more	2 or more	900	720	630	504	100	80	70	56
1	2 or more	750	600	525	420	100	80	70	56

^a Basic minimum hourly volume

^b Used for combination of Conditions A and B after adequate trial of other remedial measures

^c May be used when the major-street speed exceeds 40 mph or in an isolated community with a population of less than 10,000

^d May be used for combination of Conditions A and B after adequate trial of other remedial measures when the major-street speed exceeds 40 mph or in an isolated community with a population of less than 10,000

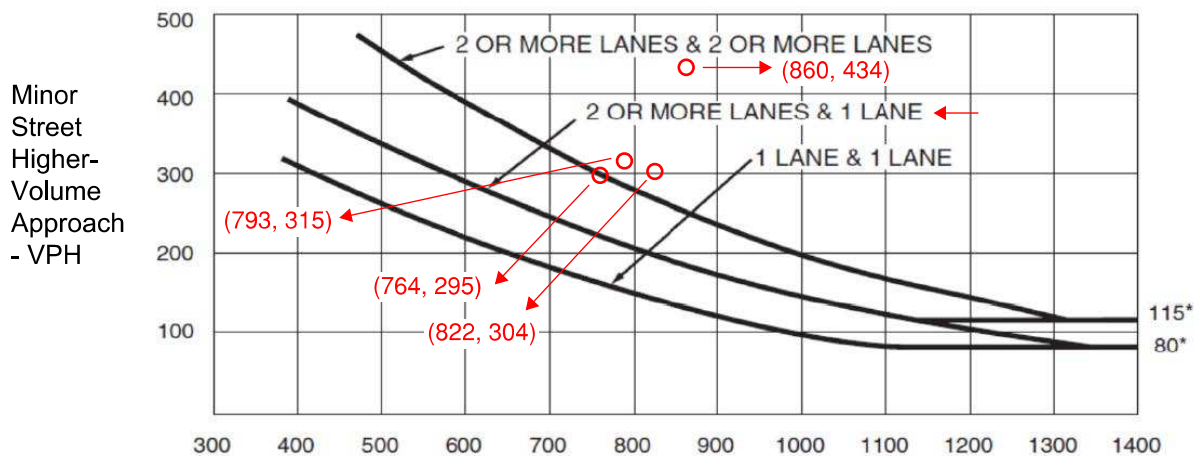
8 Highest Hour Volumes								
	1	2	3	4	5	6	7	8
Both Approaches Major Road	822	564	531	572	764	860	793	574
Highest Approach Minor Road	304	248	191	254	295	434	315	204

Warrant 1 Met? ☐ Yes ☒ No ☐ Does not apply

WARRANT 2, FOUR-HOUR VEHICULAR VOLUME

Requirements: Plot four highest hour volumes on the applicable figure below. If four points lie above the applicable curve then the warrant is satisfied.

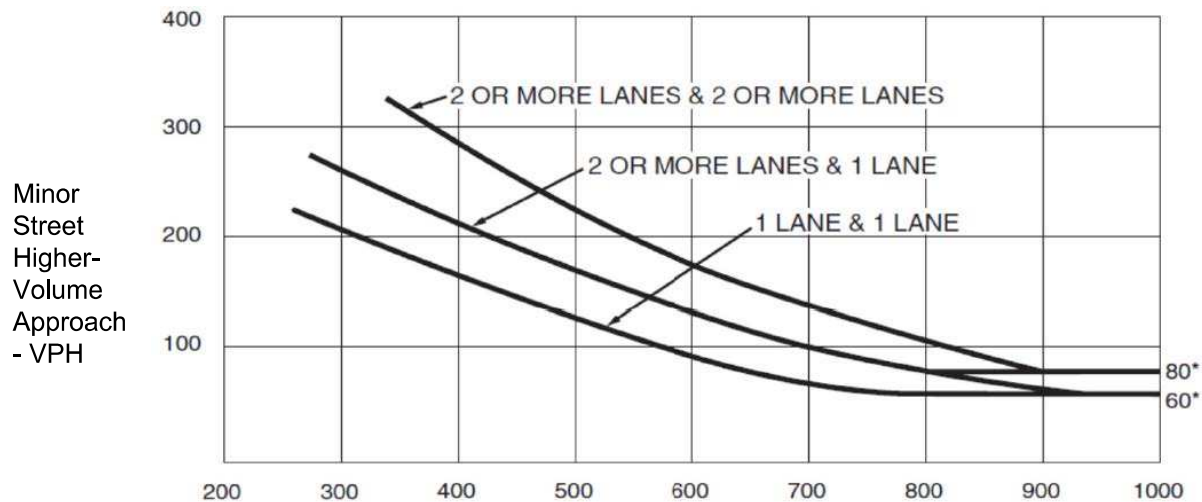
Figure 4C-1. Warrant 2, Four-Hour Vehicular Volume



MAJOR STREET - TOTAL OF BOTH APPROACHES
VEHICLES PER HOUR (VPH)

*Note: 115 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 80 vph applies as the lower threshold volume for a minor-street approach with one lane.

Figure 4C-2. Warrant 2, Four-Hour Vehicular Volume (70% Factor)
(Community Less than 10,000 Population or Above 40 MPH on Major Street)



MAJOR STREET -- TOTAL OF BOTH APPROACHES
VEHICLES PER HOUR (VPH)

*Note: 80 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 60 vph applies as the lower threshold volume for a minor-street approach with one lane.

Warrant 2 Met? ☒ Yes ☐ No ☐ Does not apply

APPENDIX E – LEFT TURN SIGNAL PHASING ANALYSIS

Left Turn Signal Phasing Analysis (Sheet 1 of 3)

Observed Turning Movement (Collected Tuesday April 15, 2025)														
Start Time	NB L	NB T	NB R	SB L	SB T	SB R	WB L	WB T	WB R	EB L	EB T	EB R	Total	PHF
0.00	0	1	1	2	0	2	0	3	2	0	9	0	20	
0.25	0	0	2	2	0	1	0	2	1	0	4	0	12	
0.50	0	0	1	2	1	0	0	2	0	1	1	0	8	
0.75	0	1	0	2	0	0	0	1	1	0	2	0	7	
1.00	0	0	0	3	0	0	0	3	1	0	2	0	9	
1.25	0	2	0	0	0	1	0	1	1	0	1	0	6	
1.50	0	0	0	0	1	0	0	2	1	0	2	0	6	
1.75	0	1	0	0	0	1	1	3	0	0	4	0	10	
2.00	0	0	1	0	1	0	0	2	0	0	6	0	10	
2.25	0	0	0	0	0	0	0	1	1	0	5	0	7	
2.50	0	0	0	0	0	0	0	2	0	0	2	0	4	
2.75	0	0	0	1	1	0	0	3	2	1	5	0	13	
3.00	0	0	0	0	0	0	0	8	1	1	5	0	15	
3.25	0	0	1	1	0	0	0	1	0	1	2	0	6	
3.50	0	0	2	5	0	2	0	7	1	0	2	0	19	
3.75	0	1	0	0	0	0	0	5	3	0	3	0	12	
4.00	0	0	0	1	0	0	0	5	2	0	4	0	12	
4.25	0	0	0	2	1	0	0	7	3	0	4	0	17	
4.50	0	0	1	1	0	3	0	17	3	0	0	0	25	
4.75	0	0	0	1	2	1	0	16	2	0	1	0	23	
5.00	0	1	1	3	4	3	0	20	4	0	8	0	44	
5.25	0	1	0	4	2	2	0	20	6	1	3	0	39	
5.50	0	0	1	8	2	1	1	32	6	1	8	0	60	
5.75	1	1	1	13	5	4	1	37	13	4	10	0	90	
6.00	0	1	0	4	2	3	0	34	11	2	8	0	65	
6.25	0	4	1	8	0	2	3	37	18	2	23	0	98	
6.50	0	4	1	7	5	2	2	53	27	8	27	0	136	
6.75	0	6	3	19	4	10	2	72	52	10	50	0	228	
7.00	0	6	2	21	11	10	5	68	47	9	24	0	203	
7.25	0	3	7	27	21	14	10	79	54	16	31	0	262	0.883
7.50	0	16	6	30	20	19	6	89	62	13	48	0	309	
7.75	0	9	7	42	27	21	15	92	54	11	46	0	324	
8.00	0	3	2	26	21	21	8	81	41	5	42	0	250	
8.25	0	9	4	23	20	12	4	54	17	13	32	2	190	
8.50	0	2	4	20	15	14	3	51	24	6	32	0	171	
8.75	0	6	3	24	10	8	4	47	23	6	38	1	170	

Left Turn Volume ≥ 90 VPH (Hr Equiv.)			
NB L	SB L	WB L	EB L
0	8	0	0
0	8	0	0
0	8	0	4
0	8	0	0
0	12	0	0
0	0	0	0
0	0	0	0
0	0	4	0
0	0	0	0
0	0	0	0
0	4	0	4
0	0	0	4
0	4	0	4
0	20	0	0
0	0	0	0
0	4	0	0
0	8	0	0
0	4	0	0
0	4	0	0
0	12	0	0
0	16	0	4
0	32	4	4
4	52	4	16
0	16	0	8
0	32	12	8
0	28	8	32
0	76	8	40
0	84	20	36
0	108	40	64
0	120	24	52
0	168	60	44
0	104	32	20
0	92	16	52
0	80	12	24
0	96	16	24

LT Cross Product (Hr Equiv.)			
NB L	SB L	WB L	EB L
0	64	0	0
0	64	0	0
0	32	0	32
0	32	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	64	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	80
0	0	0	144
0	16	0	16
0	160	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	16	0	0
0	0	0	0
0	96	0	0
0	64	0	416
0	128	128	608
144	416	160	3,200
0	64	0	1,440
0	640	1,104	1,760
0	560	864	10,240
0	2,736	1,600	19,840
0	2,688	1,920	16,560
0	4,320	4,960	34,048
0	10,560	4,608	31,408
0	10,752	11,040	25,696
0	2,080	5,376	9,760
0	4,784	2,176	14,768
0	1,920	1,536	7,200
0	3,456	2,496	6,720

Left Turn Phasing			
NB L	SB L	WB L	EB L
Perm	Perm	Perm	Perm
Perm	Perm	Perm	Perm
Perm	Perm	Perm	Perm
Perm	Perm	Perm	Perm
Perm	Perm	Perm	Perm
Perm	Perm	Perm	Perm
Perm	Perm	Perm	Perm
Perm	Perm	Perm	Perm
Perm	Perm	Perm	Perm
Perm	Perm	Perm	Perm
Perm	Perm	Perm	Perm
Perm	Perm	Perm	Perm
Perm	Perm	Perm	Perm
Perm	Perm	Perm	Perm
Perm	Perm	Perm	Perm
Perm	Perm	Perm	Perm
Perm	Perm	Perm	Perm
Perm	Perm	Perm	Perm
Perm	Perm	Perm	Perm
Perm	Perm	Perm	Perm
Perm	Perm	Perm	Perm
Perm	Perm-Prot	Perm	Perm-Prot
Perm	Perm-Prot	Perm	Perm-Prot
Perm	Perm-Prot	Perm	Perm
Perm	Perm-Prot	Perm	Perm
Perm	Perm-Prot	Perm	Perm
Perm	Perm	Perm	Perm
Perm	Perm	Perm	Perm
Perm	Perm-Prot	Perm	Perm

Left Turn Signal Phasing Analysis (Sheet 2 of 3)

Observed Turning Movement (Collected Tuesday April 15, 2025)														
Start Time	NB L	NB T	NB R	SB L	SB T	SB R	WB L	WB T	WB R	EB L	EB T	EB R	Total	PHF
9.00	0	4	2	28	5	8	3	39	19	9	20	0	137	
9.25	0	4	3	16	7	5	5	50	27	5	28	1	151	
9.50	0	2	4	13	7	7	3	21	17	2	30	0	106	
9.75	0	9	3	18	10	11	1	37	24	8	38	2	161	
10.00	0	7	3	26	8	5	4	28	24	8	34	0	147	
10.25	0	1	3	19	9	5	4	37	17	5	30	0	130	
10.50	0	6	0	14	12	11	1	46	26	7	32	0	155	
10.75	0	5	2	20	8	6	0	38	22	6	38	1	146	
11.00	0	7	5	14	7	5	4	35	23	10	40	1	151	
11.25	0	6	5	23	6	11	2	39	20	12	40	1	165	
11.50	0	11	5	45	3	12	2	34	24	12	46	0	194	
11.75	0	5	7	13	5	14	3	50	15	6	41	0	159	
12.00	0	14	4	27	7	9	5	48	16	4	53	0	187	
12.25	0	9	4	24	8	9	4	34	18	9	45	0	164	
12.50	0	5	7	25	10	8	3	43	26	11	43	1	182	
12.75	0	8	4	17	8	13	5	39	35	12	45	3	189	
13.00	1	11	5	31	14	3	5	38	16	9	32	0	165	
13.25	0	10	5	17	8	7	0	37	16	7	44	1	152	
13.50	0	6	10	20	8	9	4	40	15	7	48	0	167	
13.75	1	7	7	23	11	13	2	47	23	7	48	0	189	
14.00	0	6	7	24	6	9	2	49	17	13	46	1	180	
14.25	0	8	4	40	12	10	3	45	31	9	42	1	205	
14.50	0	13	7	30	8	10	5	42	25	11	54	0	205	
14.75	0	8	8	44	14	12	1	48	21	11	61	3	231	
15.00	0	5	14	45	9	12	3	62	26	9	61	1	247	
15.25	0	13	6	28	16	11	6	51	35	9	73	1	249	
15.50	0	9	11	42	14	15	4	58	36	8	75	2	274	
15.75	0	10	14	40	11	12	7	49	34	8	104	1	290	
16.00	0	13	14	60	22	13	7	73	33	12	73	2	322	
16.25	0	14	21	62	15	15	2	67	38	14	81	0	329	0.950
16.50	0	17	12	70	12	20	12	60	40	8	83	2	336	
16.75	1	4	17	55	17	14	4	63	25	7	105	3	315	
17.00	0	25	32	61	9	16	9	48	40	12	96	2	350	
17.25	1	15	11	46	17	11	6	48	31	10	92	0	288	
17.50	0	18	18	44	9	12	4	47	30	9	81	0	272	
17.75	0	11	6	25	13	9	4	63	32	19	66	1	249	

Left Turn Volume ≥ 90 VPH (Hr Equiv.)			
NB L	SB L	WB L	EB L
0	112	12	36
0	64	20	20
0	52	12	8
0	72	4	32
0	104	16	32
0	76	16	20
0	56	4	28
0	80	0	24
0	56	16	40
0	92	8	48
0	180	8	48
0	52	12	24
0	108	20	16
0	96	16	36
0	100	12	44
0	68	20	48
4	124	20	36
0	68	0	28
0	80	16	28
4	92	8	28
0	96	8	52
0	160	12	36
0	120	20	44
0	176	4	44
0	180	12	36
0	112	24	36
0	168	16	32
0	160	28	32
0	240	28	48
0	248	8	56
0	280	48	32
4	220	16	28
0	244	36	48
4	184	24	40
0	176	16	36
0	100	16	76

LT Cross Product (Hr Equiv.)			
NB L	SB L	WB L	EB L
0	2,688	960	8,352
0	1,792	2,320	6,160
0	1,248	1,440	1,216
0	3,456	640	7,808
0	4,160	2,176	6,656
0	1,216	1,920	4,320
0	1,344	512	8,064
0	2,240	0	5,760
0	2,688	2,624	9,280
0	4,048	1,312	11,328
0	11,520	1,472	11,136
0	2,496	1,968	6,240
0	7,776	4,240	4,096
0	4,992	2,880	7,488
0	4,800	2,112	12,144
0	3,264	3,840	14,208
272	7,936	2,560	7,776
0	4,080	0	5,936
0	5,120	3,072	6,160
384	5,152	1,536	7,840
0	4,992	1,504	13,728
0	7,680	2,064	10,944
0	9,600	4,320	11,792
0	11,264	1,024	12,144
0	13,680	2,976	12,672
0	8,512	7,104	12,384
0	13,440	4,928	12,032
0	15,360	11,760	10,624
0	25,920	8,400	20,352
0	34,720	2,592	23,520
0	32,480	16,320	12,800
496	18,480	6,912	9,856
0	55,632	14,112	16,896
448	19,136	8,832	12,640
0	25,344	5,184	11,088
0	6,800	4,288	28,880

[illegible]

Left Turn Signal Phasing Analysis (Sheet 3 of 3)

Observed Turning Movement (Collected Tuesday April 15, 2025)														
Start Time	NB L	NB T	NB R	SB L	SB T	SB R	WB L	WB T	WB R	EB L	EB T	EB R	Total	PHF
18.00	0	7	12	30	7	10	6	42	30	14	54	2	214	
18.25	1	12	12	27	8	9	7	39	32	10	49	0	206	
18.50	0	10	6	31	4	7	3	44	31	9	46	3	194	
18.75	0	10	3	23	11	9	3	46	18	7	48	0	178	
19.00	1	6	7	14	7	8	0	48	30	15	40	0	176	
19.25	0	4	3	23	8	6	4	35	19	8	48	0	158	
19.50	1	11	5	20	7	6	4	57	23	7	59	1	201	
19.75	0	3	5	11	4	0	10	30	20	4	44	1	132	
20.00	0	4	5	27	5	3	3	58	18	9	34	0	166	
20.25	0	14	6	16	7	9	3	45	25	6	36	0	167	
20.50	0	1	3	15	3	5	4	38	25	5	25	1	125	
20.75	0	7	3	8	3	2	4	18	15	11	36	2	109	
21.00	0	6	4	10	4	4	3	26	14	4	29	1	105	
21.25	0	1	2	5	4	3	3	23	15	1	19	1	77	
21.50	1	3	2	8	0	1	2	14	9	5	19	0	64	
21.75	0	1	3	5	3	1	3	23	10	3	13	0	65	
22.00	0	0	1	6	2	2	4	47	8	2	14	0	86	
22.25	0	0	0	4	2	1	1	9	6	2	14	1	40	
22.50	1	4	1	2	1	1	3	17	3	4	9	0	46	
22.75	0	2	1	4	1	0	0	13	4	1	10	0	36	
23.00	0	0	1	3	0	1	1	20	6	0	5	0	37	
23.25	0	0	0	8	2	0	0	5	2	0	8	0	25	
23.50	0	1	1	2	2	0	0	3	6	1	9	0	25	
23.75	0	1	0	2	0	0	4	3	1	1	6	0	18	
Total	10	512	428	1,755	636	617	279	3,313	1,771	565	3,136	47	13,069	

Left Turn Volume ≥ 90 VPH (Hr Equiv.)			
NB L	SB L	WB L	EB L
0	120	24	56
4	108	28	40
0	124	12	36
0	92	12	28
4	56	0	60
0	92	16	32
4	80	16	28
0	44	40	16
0	108	12	36
0	64	12	24
0	60	16	20
0	32	16	44
0	40	12	16
0	20	12	4
4	32	8	20
0	20	12	12
0	24	16	8
0	16	4	8
4	8	12	16
0	16	0	4
0	12	4	0
0	32	0	0
0	8	0	4
0	8	16	4

LT Cross Product (Hr Equiv.)			
NB L	SB L	WB L	EB L
0	9,120	5,376	16,128
272	10,368	5,488	11,360
0	7,936	2,352	10,800
0	4,784	2,304	7,168
240	2,912	0	18,720
0	2,576	3,072	6,912
208	5,120	3,840	8,960
0	1,408	7,200	3,200
0	3,888	1,632	10,944
0	5,120	1,728	6,720
0	960	1,664	5,040
0	1,280	2,432	5,808
0	1,600	1,440	2,560
0	240	960	608
16	640	608	1,840
0	320	624	1,584
0	96	896	1,760
0	0	240	480
32	160	432	1,280
0	192	0	272
0	48	80	0
0	0	0	0
0	64	0	144
0	32	384	64

[illegible]

APPENDIX F – ALTERNATIVES AND FUTURE CONDITIONS **CAPACITY ANALYSIS OUTPUTS**

Volume

2: Elm St N & 12th Ave N

08/27/2025

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Traffic Volume (vph)	45	167	0	39	341	211	0	31	22	125	89	75
Future Volume (vph)	45	167	0	39	341	211	0	31	22	125	89	75
Confl. Peds. (#/hr)	4		3	4		5	3		4	5		4
Confl. Bikes (#/hr)												
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	51	190	0	44	388	240	0	35	25	142	101	85
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	241	0	0	432	240	0	60	0	0	328	0
Intersection Summary												

2: Elm St N & 12th Ave N Performance by approach

Approach	EB	WB	NB	SB	All
Denied Del/Veh (s)	0.2	1.6	0.1	0.3	0.9
Total Del/Veh (s)	2.1	1.5	13.5	32.8	10.1

2: Elm St N & 12th Ave N Performance by movement

Movement	EBL	EBT	WBL	WBT	WBR	NBT	NBR	SBL	SBT	SBR	All
Denied Del/Veh (s)	0.2	0.2	0.9	0.8	3.0	0.1	0.1	0.3	0.2	0.3	0.9
Total Del/Veh (s)	5.3	1.2	3.4	1.5	1.2	18.0	7.6	34.4	33.4	29.0	10.1

Queuing and Blocking Report

Baseline

09/05/2025

Intersection: 2: Elm St N & 12th Ave N

Movement	EB	WB	WB	NB	SB
Directions Served	LTR	LT	R	LTR	LTR
Maximum Queue (ft)	80	65	44	71	298
Average Queue (ft)	26	12	4	28	117
95th Queue (ft)	67	46	23	58	266
Link Distance (ft)	709	813		579	2884
Upstream Blk Time (%)					
Queuing Penalty (veh)					
Storage Bay Dist (ft)			100		
Storage Blk Time (%)		0			
Queuing Penalty (veh)		0			

Volume

2: Elm St N & 12th Ave N

08/27/2025

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Traffic Volume (vph)	41	365	7	27	238	143	1	60	82	248	53	65
Future Volume (vph)	41	365	7	27	238	143	1	60	82	248	53	65
Confl. Peds. (#/hr)	9		7	6		8	7		6	8		9
Confl. Bikes (#/hr)												
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	43	384	7	28	251	151	1	63	86	261	56	68
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	434	0	0	279	151	0	150	0	0	385	0
Intersection Summary												

2: Elm St N & 12th Ave N Performance by approach

Approach	EB	WB	NB	SB	All
Denied Del/Veh (s)	0.3	1.5	0.2	0.3	0.7
Total Del/Veh (s)	1.6	1.3	26.5	276.7	83.3

2: Elm St N & 12th Ave N Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	0.3	0.3	0.3	0.5	0.6	3.2	0.1	0.2	0.2	0.3	0.3	0.3
Total Del/Veh (s)	4.7	1.3	0.8	4.3	1.3	0.8	8.1	33.6	21.9	276.3	291.4	266.2

2: Elm St N & 12th Ave N Performance by movement

Movement	All
Denied Del/Veh (s)	0.7
Total Del/Veh (s)	83.3

Queuing and Blocking Report
Baseline

09/05/2025

Intersection: 2: Elm St N & 12th Ave N

Movement	EB	WB	WB	NB	SB
Directions Served	LTR	LT	R	LTR	LTR
Maximum Queue (ft)	99	83	47	166	1576
Average Queue (ft)	24	16	4	70	782
95th Queue (ft)	71	55	25	131	1573
Link Distance (ft)	709	808		579	2884
Upstream Blk Time (%)					
Queuing Penalty (veh)					
Storage Bay Dist (ft)			100		
Storage Blk Time (%)		0			
Queuing Penalty (veh)		0			

Volume

2: Elm St N & 12th Ave N

08/27/2025

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Traffic Volume (vph)	45	170	5	40	345	215	5	35	25	125	95	75
Future Volume (vph)	45	170	5	40	345	215	5	35	25	125	95	75
Confl. Peds. (#/hr)	4		3	4		5	3		4	5		4
Confl. Bikes (#/hr)												
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	51	193	6	45	392	244	6	40	28	142	108	85
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	250	0	0	437	244	0	74	0	0	335	0
Intersection Summary												

2: Elm St N & 12th Ave N Performance by approach

Approach	EB	WB	NB	SB	All
Denied Del/Veh (s)	0.2	1.7	0.1	0.2	1.0
Total Del/Veh (s)	2.5	1.8	14.2	39.1	12.0

2: Elm St N & 12th Ave N Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	0.2	0.2	0.2	0.9	0.8	3.3	0.1	0.1	0.1	0.2	0.2	0.3
Total Del/Veh (s)	6.2	1.6	1.4	3.6	1.9	1.2	14.6	19.1	7.6	42.0	39.4	34.7

2: Elm St N & 12th Ave N Performance by movement

Movement	All
Denied Del/Veh (s)	1.0
Total Del/Veh (s)	12.0

Queuing and Blocking Report
Baseline

09/07/2025

Intersection: 2: Elm St N & 12th Ave N

Movement	EB	WB	WB	NB	SB
Directions Served	LTR	LT	R	LTR	LTR
Maximum Queue (ft)	106	67	47	82	329
Average Queue (ft)	27	13	5	33	135
95th Queue (ft)	77	47	25	62	319
Link Distance (ft)	709	811		579	2883
Upstream Blk Time (%)					
Queuing Penalty (veh)					
Storage Bay Dist (ft)			100		
Storage Blk Time (%)		0			
Queuing Penalty (veh)		0			

Volume

2: Elm St N & 12th Ave N

08/27/2025

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Traffic Volume (vph)	45	365	10	30	240	145	5	65	85	250	60	70
Future Volume (vph)	45	365	10	30	240	145	5	65	85	250	60	70
Confl. Peds. (#/hr)	9		7	6		8	7		6	8		9
Confl. Bikes (#/hr)												
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	47	384	11	32	253	153	5	68	89	263	63	74
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	442	0	0	285	153	0	162	0	0	400	0
Intersection Summary												

2: Elm St N & 12th Ave N Performance by approach

Approach	EB	WB	NB	SB	All
Denied Del/Veh (s)	0.4	1.6	0.2	0.4	0.7
Total Del/Veh (s)	2.0	1.5	30.5	344.4	104.3

2: Elm St N & 12th Ave N Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	0.4	0.4	0.4	0.6	0.6	3.5	0.2	0.2	0.2	0.4	0.4	0.4
Total Del/Veh (s)	5.0	1.7	0.6	4.8	1.5	0.7	34.1	37.6	25.0	345.7	343.9	340.2

2: Elm St N & 12th Ave N Performance by movement

Movement	All
Denied Del/Veh (s)	0.7
Total Del/Veh (s)	104.3

Queuing and Blocking Report

Baseline

09/05/2025

Intersection: 2: Elm St N & 12th Ave N

Movement	EB	WB	WB	NB	SB
Directions Served	LTR	LT	R	LTR	LTR
Maximum Queue (ft)	115	73	38	182	1889
Average Queue (ft)	30	15	3	80	990
95th Queue (ft)	84	51	21	149	2070
Link Distance (ft)	707	807		579	2883
Upstream Blk Time (%)					0
Queuing Penalty (veh)					0
Storage Bay Dist (ft)			100		
Storage Blk Time (%)		0	0		
Queuing Penalty (veh)		0	0		

Volume

2: Elm St N & 12th Ave N

08/27/2025

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Traffic Volume (vph)	50	195	5	55	400	230	5	40	30	130	120	80
Future Volume (vph)	50	195	5	55	400	230	5	40	30	130	120	80
Confl. Peds. (#/hr)	4		3	4		5	3		4	5		4
Confl. Bikes (#/hr)												
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	57	222	6	63	455	261	6	45	34	148	136	91
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	285	0	0	518	261	0	85	0	0	375	0
Intersection Summary												

2: Elm St N & 12th Ave N Performance by approach

Approach	EB	WB	NB	SB	All
Denied Del/Veh (s)	0.2	1.7	0.2	0.3	1.0
Total Del/Veh (s)	2.7	2.1	19.4	126.3	34.8

2: Elm St N & 12th Ave N Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	0.2	0.2	0.2	1.1	1.0	3.2	0.2	0.2	0.1	0.3	0.3	0.3
Total Del/Veh (s)	6.8	1.7	1.1	4.1	2.3	1.3	24.1	26.0	10.8	127.2	128.3	120.7

2: Elm St N & 12th Ave N Performance by movement

Movement	All
Denied Del/Veh (s)	1.0
Total Del/Veh (s)	34.8

Queuing and Blocking Report
Baseline

09/05/2025

Intersection: 2: Elm St N & 12th Ave N

Movement	EB	WB	WB	NB	SB
Directions Served	LTR	LT	R	LTR	LTR
Maximum Queue (ft)	104	79	36	91	782
Average Queue (ft)	32	21	5	39	359
95th Queue (ft)	78	62	23	73	785
Link Distance (ft)	708	820		579	2883
Upstream Blk Time (%)					
Queuing Penalty (veh)					
Storage Bay Dist (ft)			100		
Storage Blk Time (%)		0			
Queuing Penalty (veh)		0			

Volume

2: Elm St N & 12th Ave N

08/27/2025

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Traffic Volume (vph)	45	420	10	40	280	155	5	80	115	270	70	75
Future Volume (vph)	45	420	10	40	280	155	5	80	115	270	70	75
Confl. Peds. (#/hr)	9		7	6		8	7		6	8		9
Confl. Bikes (#/hr)												
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	47	442	11	42	295	163	5	84	121	284	74	79
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	500	0	0	337	163	0	210	0	0	437	0
Intersection Summary												

2: Elm St N & 12th Ave N Performance by approach

Approach	EB	WB	NB	SB	All
Denied Del/Veh (s)	0.4	1.5	1.3	6.7	2.5
Total Del/Veh (s)	2.2	1.9	103.6	808.9	234.2

2: Elm St N & 12th Ave N Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	0.4	0.4	0.5	0.7	0.6	3.4	0.2	1.4	1.3	6.6	5.8	7.9
Total Del/Veh (s)	5.5	1.9	1.4	5.5	1.9	1.0	91.9	113.3	97.2	813.3	800.3	801.4

2: Elm St N & 12th Ave N Performance by movement

Movement	All
Denied Del/Veh (s)	2.5
Total Del/Veh (s)	234.2

Queuing and Blocking Report

Baseline

09/07/2025

Intersection: 2: Elm St N & 12th Ave N

Movement	EB	WB	WB	NB	SB
Directions Served	LTR	LT	R	LTR	LTR
Maximum Queue (ft)	149	94	35	404	4189
Average Queue (ft)	38	23	4	189	2302
95th Queue (ft)	101	65	20	421	4273
Link Distance (ft)	707	818		579	4445
Upstream Blk Time (%)				2	5
Queuing Penalty (veh)				0	0
Storage Bay Dist (ft)			100		
Storage Blk Time (%)		0			
Queuing Penalty (veh)		0			

Volume

2: Elm St N & 12th Ave N

08/27/2025

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Traffic Volume (vph)	45	167	0	39	341	211	0	31	22	125	89	75
Future Volume (vph)	45	167	0	39	341	211	0	31	22	125	89	75
Confl. Peds. (#/hr)	4		3	4		5	3		4	5		4
Confl. Bikes (#/hr)												
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	51	190	0	44	388	240	0	35	25	142	101	85
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	241	0	0	432	240	0	60	0	0	328	0
Intersection Summary												

2: Elm St N & 12th Ave N Performance by approach

Approach	EB	WB	NB	SB	All
Denied Del/Veh (s)	0.2	1.6	0.1	0.3	0.9
Total Del/Veh (s)	8.1	10.3	6.3	9.4	9.5

2: Elm St N & 12th Ave N Performance by movement

Movement	EBL	EBT	WBL	WBT	WBR	NBT	NBR	SBL	SBT	SBR	All
Denied Del/Veh (s)	0.2	0.2	0.9	0.8	3.0	0.1	0.1	0.3	0.2	0.3	0.9
Total Del/Veh (s)	8.2	8.1	11.7	12.4	6.6	7.9	4.2	9.8	10.4	7.6	9.5

Queuing and Blocking Report

Baseline

09/05/2025

Intersection: 2: Elm St N & 12th Ave N

Movement	EB	WB	WB	NB	SB
Directions Served	LTR	LT	R	LTR	LTR
Maximum Queue (ft)	109	249	124	59	134
Average Queue (ft)	53	87	60	27	60
95th Queue (ft)	87	172	112	53	106
Link Distance (ft)	706	818		579	1202
Upstream Blk Time (%)					
Queuing Penalty (veh)					
Storage Bay Dist (ft)			100		
Storage Blk Time (%)		6	0		
Queuing Penalty (veh)		13	1		

Volume

2: Elm St N & 12th Ave N

08/27/2025

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Traffic Volume (vph)	41	365	7	27	238	143	1	60	82	248	53	65
Future Volume (vph)	41	365	7	27	238	143	1	60	82	248	53	65
Confl. Peds. (#/hr)	9		7	6		8	7		6	8		9
Confl. Bikes (#/hr)												
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	43	384	7	28	251	151	1	63	86	261	56	68
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	434	0	0	279	151	0	150	0	0	385	0
Intersection Summary												

2: Elm St N & 12th Ave N Performance by approach

Approach	EB	WB	NB	SB	All
Denied Del/Veh (s)	1.1	1.5	0.2	0.3	0.9
Total Del/Veh (s)	50.4	11.9	10.9	34.5	30.1

2: Elm St N & 12th Ave N Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	0.9	1.2	1.0	0.6	0.6	3.2	0.4	0.2	0.2	0.3	0.3	0.3
Total Del/Veh (s)	44.6	50.9	51.6	14.2	14.7	6.4	7.6	12.6	9.5	34.7	34.0	34.5

2: Elm St N & 12th Ave N Performance by movement

Movement	All
Denied Del/Veh (s)	0.9
Total Del/Veh (s)	30.1

Queuing and Blocking Report

Baseline

09/05/2025

Intersection: 2: Elm St N & 12th Ave N

Movement	EB	WB	WB	NB	SB
Directions Served	LTR	LT	R	LTR	LTR
Maximum Queue (ft)	502	183	125	105	353
Average Queue (ft)	212	79	51	50	148
95th Queue (ft)	489	141	101	83	320
Link Distance (ft)	708	817		579	1202
Upstream Blk Time (%)	2				
Queuing Penalty (veh)	0				
Storage Bay Dist (ft)			100		
Storage Blk Time (%)		5	0		
Queuing Penalty (veh)		7	0		

Volume

2: Elm St N & 12th Ave N

08/27/2025

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Traffic Volume (vph)	45	175	5	40	355	215	5	35	25	125	95	75
Future Volume (vph)	45	175	5	40	355	215	5	35	25	125	95	75
Confl. Peds. (#/hr)	4		3	4		5	3		4	5		4
Confl. Bikes (#/hr)												
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	51	199	6	45	403	244	6	40	28	142	108	85
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	256	0	0	448	244	0	74	0	0	335	0
Intersection Summary												

2: Elm St N & 12th Ave N Performance by approach

Approach	EB	WB	NB	SB	All
Denied Del/Veh (s)	0.2	1.8	0.1	0.3	1.0
Total Del/Veh (s)	8.4	13.3	6.8	10.5	11.4

2: Elm St N & 12th Ave N Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	0.2	0.2	0.2	1.0	0.9	3.3	0.2	0.1	0.1	0.3	0.3	0.3
Total Del/Veh (s)	8.5	8.5	5.6	14.5	16.2	8.3	7.7	8.1	4.5	10.9	11.6	8.5

2: Elm St N & 12th Ave N Performance by movement

Movement	All
Denied Del/Veh (s)	1.0
Total Del/Veh (s)	11.4

Queuing and Blocking Report

Baseline

09/05/2025

Intersection: 2: Elm St N & 12th Ave N

Movement	EB	WB	WB	NB	SB
Directions Served	LTR	LT	R	LTR	LTR
Maximum Queue (ft)	110	291	124	63	151
Average Queue (ft)	54	101	62	30	64
95th Queue (ft)	88	232	118	56	115
Link Distance (ft)	708	831		579	1201
Upstream Blk Time (%)					
Queuing Penalty (veh)					
Storage Bay Dist (ft)			100		
Storage Blk Time (%)		9	0		
Queuing Penalty (veh)		21	1		

Volume

2: Elm St N & 12th Ave N

08/27/2025

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Traffic Volume (vph)	45	365	10	30	240	145	5	65	85	250	60	70
Future Volume (vph)	45	365	10	30	240	145	5	65	85	250	60	70
Confl. Peds. (#/hr)	9		7	6		8	7		6	8		9
Confl. Bikes (#/hr)												
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	47	384	11	32	253	153	5	68	89	263	63	74
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	442	0	0	285	153	0	162	0	0	400	0
Intersection Summary												

2: Elm St N & 12th Ave N Performance by approach

Approach	EB	WB	NB	SB	All
Denied Del/Veh (s)	0.5	1.6	0.2	0.3	0.8
Total Del/Veh (s)	52.8	13.6	11.5	32.0	30.5

2: Elm St N & 12th Ave N Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	0.4	0.5	0.7	0.6	0.6	3.5	0.2	0.2	0.2	0.3	0.4	0.3
Total Del/Veh (s)	51.7	52.8	52.1	16.3	16.8	7.1	9.3	13.6	10.3	32.7	33.7	28.4

2: Elm St N & 12th Ave N Performance by movement

Movement	All
Denied Del/Veh (s)	0.8
Total Del/Veh (s)	30.5

Queuing and Blocking Report
Baseline

09/05/2025

Intersection: 2: Elm St N & 12th Ave N

Movement	EB	WB	WB	NB	SB
Directions Served	LTR	LT	R	LTR	LTR
Maximum Queue (ft)	493	180	124	115	335
Average Queue (ft)	227	82	51	53	141
95th Queue (ft)	489	143	100	90	280
Link Distance (ft)	708	839		579	1201
Upstream Blk Time (%)	1				
Queuing Penalty (veh)	0				
Storage Bay Dist (ft)			100		
Storage Blk Time (%)		6	0		
Queuing Penalty (veh)		8	0		

Volume

2: Elm St N & 12th Ave N

08/27/2025

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Traffic Volume (vph)	50	195	5	55	400	230	5	40	30	130	120	80
Future Volume (vph)	50	195	5	55	400	230	5	40	30	130	120	80
Confl. Peds. (#/hr)	4		3	4		5	3		4	5		4
Confl. Bikes (#/hr)												
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	57	222	6	63	455	261	6	45	34	148	136	91
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	285	0	0	518	261	0	85	0	0	375	0
Intersection Summary												

2: Elm St N & 12th Ave N Performance by approach

Approach	EB	WB	NB	SB	All
Denied Del/Veh (s)	0.2	1.9	0.2	0.3	1.1
Total Del/Veh (s)	9.8	26.4	7.4	15.0	19.5

2: Elm St N & 12th Ave N Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	0.2	0.2	0.2	1.3	1.1	3.3	0.2	0.2	0.1	0.3	0.3	0.3
Total Del/Veh (s)	9.9	9.9	6.6	28.5	31.1	17.6	8.7	9.0	5.3	15.3	16.2	13.1

2: Elm St N & 12th Ave N Performance by movement

Movement	All
Denied Del/Veh (s)	1.1
Total Del/Veh (s)	19.5

Queuing and Blocking Report
Baseline

09/05/2025

Intersection: 2: Elm St N & 12th Ave N

Movement	EB	WB	WB	NB	SB
Directions Served	LTR	LT	R	LTR	LTR
Maximum Queue (ft)	130	521	125	67	216
Average Queue (ft)	62	190	86	33	83
95th Queue (ft)	101	488	152	58	163
Link Distance (ft)	711	831		579	1203
Upstream Blk Time (%)		1			
Queuing Penalty (veh)		0			
Storage Bay Dist (ft)			100		
Storage Blk Time (%)		28	1		
Queuing Penalty (veh)		66	2		

Volume

2: Elm St N & 12th Ave N

08/27/2025

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Traffic Volume (vph)	45	420	10	40	280	155	5	80	115	270	70	75
Future Volume (vph)	45	420	10	40	280	155	5	80	115	270	70	75
Confl. Peds. (#/hr)	9		7	6		8	7		6	8		9
Confl. Bikes (#/hr)												
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	47	442	11	42	295	163	5	84	121	284	74	79
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	500	0	0	337	163	0	210	0	0	437	0
Intersection Summary												

2: Elm St N & 12th Ave N Performance by approach

Approach	EB	WB	NB	SB	All
Denied Del/Veh (s)	1.1	1.6	0.2	1.1	1.1
Total Del/Veh (s)	292.3	19.0	17.7	113.7	128.3

2: Elm St N & 12th Ave N Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	0.9	1.2	1.5	0.7	0.7	3.4	0.2	0.2	0.2	1.1	1.4	0.8
Total Del/Veh (s)	286.7	292.2	296.3	24.7	23.4	9.9	13.0	19.9	16.3	114.3	116.3	108.6

2: Elm St N & 12th Ave N Performance by movement

Movement	All
Denied Del/Veh (s)	1.1
Total Del/Veh (s)	128.3

Queuing and Blocking Report
Baseline

09/07/2025

Intersection: 2: Elm St N & 12th Ave N

Movement	EB	WB	WB	NB	SB
Directions Served	LTR	LT	R	LTR	LTR
Maximum Queue (ft)	1913	267	125	164	741
Average Queue (ft)	1031	111	70	73	379
95th Queue (ft)	2183	206	133	130	812
Link Distance (ft)	2594	838		579	1202
Upstream Blk Time (%)	2				1
Queuing Penalty (veh)	0				0
Storage Bay Dist (ft)			100		
Storage Blk Time (%)		17	0		
Queuing Penalty (veh)		26	1		

Volume

2: Elm St N & 12th Ave N

08/27/2025

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Traffic Volume (vph)	45	167	0	39	341	211	0	31	22	125	89	75
Future Volume (vph)	45	167	0	39	341	211	0	31	22	125	89	75
Confl. Peds. (#/hr)	4		3	4		5	3		4	5		4
Confl. Bikes (#/hr)												
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	51	190	0	44	388	240	0	35	25	142	101	85
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	241	0	0	672	0	0	60	0	0	328	0
Intersection Summary												

2: Elm St N & 12th Ave N Performance by approach

Approach	EB	WB	NB	SB	All
Denied Del/Veh (s)	0.2	0.5	0.1	0.3	0.4
Total Del/Veh (s)	3.2	4.4	2.9	4.4	4.1

2: Elm St N & 12th Ave N Performance by movement

Movement	EBL	EBT	WBL	WBT	WBR	NBT	NBR	SBL	SBT	SBR	All
Denied Del/Veh (s)	0.2	0.2	0.5	0.5	0.5	0.1	0.1	0.3	0.2	0.3	0.4
Total Del/Veh (s)	2.9	3.2	4.2	4.5	4.2	3.1	2.5	4.3	4.6	4.2	4.1

Queuing and Blocking Report

Baseline

09/05/2025

Intersection: 2: Elm St N & 12th Ave N

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LTR	LTR
Maximum Queue (ft)	71	136	40	110
Average Queue (ft)	22	34	8	40
95th Queue (ft)	56	102	31	84
Link Distance (ft)	689	814	561	1201
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Volume

2: Elm St N & 12th Ave N

08/27/2025

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Traffic Volume (vph)	41	365	7	27	238	143	1	60	82	248	53	65
Future Volume (vph)	41	365	7	27	238	143	1	60	82	248	53	65
Confl. Peds. (#/hr)	9		7	6		8	7		6	8		9
Confl. Bikes (#/hr)												
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	43	384	7	28	251	151	1	63	86	261	56	68
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	434	0	0	430	0	0	150	0	0	385	0
Intersection Summary												

2: Elm St N & 12th Ave N Performance by approach

Approach	EB	WB	NB	SB	All
Denied Del/Veh (s)	0.4	0.3	0.2	0.3	0.3
Total Del/Veh (s)	5.6	3.4	5.1	5.1	4.7

2: Elm St N & 12th Ave N Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	0.3	0.4	0.4	0.3	0.3	0.3	0.1	0.2	0.2	0.3	0.3	0.3
Total Del/Veh (s)	5.2	5.6	5.1	3.0	3.6	3.3	5.0	5.4	4.9	5.0	5.0	5.2

2: Elm St N & 12th Ave N Performance by movement

Movement	All
Denied Del/Veh (s)	0.3
Total Del/Veh (s)	4.7

Queuing and Blocking Report

Baseline

09/05/2025

Intersection: 2: Elm St N & 12th Ave N

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LTR	LTR
Maximum Queue (ft)	142	96	81	121
Average Queue (ft)	55	24	33	51
95th Queue (ft)	110	68	69	98
Link Distance (ft)	687	827	561	1197
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Volume

2: Elm St N & 12th Ave N

08/27/2025

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Traffic Volume (vph)	45	170	5	40	345	215	5	35	25	125	95	75
Future Volume (vph)	45	170	5	40	345	215	5	35	25	125	95	75
Confl. Peds. (#/hr)	4		3	4		5	3		4	5		4
Confl. Bikes (#/hr)												
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	51	193	6	45	392	244	6	40	28	142	108	85
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	250	0	0	681	0	0	74	0	0	335	0
Intersection Summary												

2: Elm St N & 12th Ave N Performance by approach

Approach	EB	WB	NB	SB	All
Denied Del/Veh (s)	0.2	0.5	0.1	0.3	0.4
Total Del/Veh (s)	3.1	5.5	2.8	4.5	4.6

2: Elm St N & 12th Ave N Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	0.2	0.2	0.2	0.6	0.5	0.5	0.1	0.1	0.1	0.3	0.3	0.3
Total Del/Veh (s)	2.8	3.2	2.9	5.0	5.8	5.1	2.9	3.0	2.5	4.4	4.8	4.1

2: Elm St N & 12th Ave N Performance by movement

Movement	All
Denied Del/Veh (s)	0.4
Total Del/Veh (s)	4.6

Queuing and Blocking Report

Baseline

09/05/2025

Intersection: 2: Elm St N & 12th Ave N

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LTR	LTR
Maximum Queue (ft)	71	152	42	110
Average Queue (ft)	20	40	9	40
95th Queue (ft)	54	108	33	82
Link Distance (ft)	690	822	561	1198
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Volume

2: Elm St N & 12th Ave N

08/27/2025

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Traffic Volume (vph)	45	365	10	30	240	145	5	65	85	250	60	70
Future Volume (vph)	45	365	10	30	240	145	5	65	85	250	60	70
Confl. Peds. (#/hr)	9		7	6		8	7		6	8		9
Confl. Bikes (#/hr)												
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	47	384	11	32	253	153	5	68	89	263	63	74
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	442	0	0	438	0	0	162	0	0	400	0
Intersection Summary												

2: Elm St N & 12th Ave N Performance by approach

Approach	EB	WB	NB	SB	All
Denied Del/Veh (s)	0.3	0.3	0.2	0.3	0.3
Total Del/Veh (s)	6.0	4.4	5.1	5.2	5.2

2: Elm St N & 12th Ave N Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	0.3	0.4	0.3	0.4	0.3	0.3	0.2	0.2	0.2	0.3	0.3	0.3
Total Del/Veh (s)	5.6	6.0	6.1	3.9	4.8	4.0	4.8	5.3	5.0	5.3	5.2	5.0

2: Elm St N & 12th Ave N Performance by movement

Movement	All
Denied Del/Veh (s)	0.3
Total Del/Veh (s)	5.2

Queuing and Blocking Report

Baseline

09/05/2025

Intersection: 2: Elm St N & 12th Ave N

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LTR	LTR
Maximum Queue (ft)	166	86	85	133
Average Queue (ft)	60	27	35	51
95th Queue (ft)	128	70	70	100
Link Distance (ft)	688	820	561	1197
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Volume

2: Elm St N & 12th Ave N

08/27/2025

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Traffic Volume (vph)	50	195	5	55	400	230	5	40	30	130	120	80
Future Volume (vph)	50	195	5	55	400	230	5	40	30	130	120	80
Confl. Peds. (#/hr)	4		3	4		5	3		4	5		4
Confl. Bikes (#/hr)												
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	57	222	6	63	455	261	6	45	34	148	136	91
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	285	0	0	779	0	0	85	0	0	375	0
Intersection Summary												

2: Elm St N & 12th Ave N Performance by approach

Approach	EB	WB	NB	SB	All
Denied Del/Veh (s)	0.2	0.6	0.1	0.3	0.4
Total Del/Veh (s)	3.5	7.6	3.0	5.7	6.1

2: Elm St N & 12th Ave N Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	0.2	0.2	0.2	0.7	0.6	0.6	0.2	0.1	0.1	0.3	0.3	0.3
Total Del/Veh (s)	3.1	3.6	3.5	7.2	8.0	6.8	3.1	3.3	2.6	5.6	6.0	5.3

2: Elm St N & 12th Ave N Performance by movement

Movement	All
Denied Del/Veh (s)	0.4
Total Del/Veh (s)	6.1

Queuing and Blocking Report

Baseline

09/05/2025

Intersection: 2: Elm St N & 12th Ave N

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LTR	LTR
Maximum Queue (ft)	77	223	49	139
Average Queue (ft)	28	63	11	53
95th Queue (ft)	64	178	37	106
Link Distance (ft)	688	821	561	1199
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Volume

2: Elm St N & 12th Ave N

08/27/2025

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Traffic Volume (vph)	45	420	10	40	280	155	5	80	115	270	70	75
Future Volume (vph)	45	420	10	40	280	155	5	80	115	270	70	75
Confl. Peds. (#/hr)	9		7	6		8	7		6	8		9
Confl. Bikes (#/hr)												
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	47	442	11	42	295	163	5	84	121	284	74	79
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	500	0	0	500	0	0	210	0	0	437	0
Intersection Summary												

2: Elm St N & 12th Ave N Performance by approach

Approach	EB	WB	NB	SB	All
Denied Del/Veh (s)	0.4	0.4	0.2	0.4	0.4
Total Del/Veh (s)	7.1	5.1	6.0	6.7	6.2

2: Elm St N & 12th Ave N Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	0.4	0.4	0.3	0.4	0.4	0.4	0.1	0.2	0.2	0.3	0.4	0.4
Total Del/Veh (s)	6.8	7.1	6.2	4.5	5.5	4.7	5.5	6.1	6.0	6.6	6.7	6.5

2: Elm St N & 12th Ave N Performance by movement

Movement	All
Denied Del/Veh (s)	0.4
Total Del/Veh (s)	6.2

Queuing and Blocking Report

Baseline

09/05/2025

Intersection: 2: Elm St N & 12th Ave N

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LTR	LTR
Maximum Queue (ft)	170	128	104	151
Average Queue (ft)	69	40	43	64
95th Queue (ft)	136	96	81	121
Link Distance (ft)	689	812	561	1201
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Lanes, Volumes, Timings

2: Elm St N & 12th Ave N

09/07/2025

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	45	167	0	39	341	211	0	31	22	125	89	75
Future Volume (vph)	45	167	0	39	341	211	0	31	22	125	89	75
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	11	11	12	11	11	12	11	11	12	11	11
Grade (%)	0%			0%			0%			0%		
Storage Length (ft)	150		0	225		0	100		0	175		0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor				0.99	0.99			0.99		0.99	0.99	
Frt				0.943				0.937			0.931	
Flt Protected	0.950			0.950						0.950		
Satd. Flow (prot)	1787	1818	0	1787	1693	0	1881	1682	0	1787	1670	0
Flt Permitted	0.226			0.638						0.851		
Satd. Flow (perm)	425	1818	0	1190	1693	0	1881	1682	0	1580	1670	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)					47			25			59	
Link Speed (mph)		25			25			25			25	
Link Distance (ft)		744			585			615			1256	
Travel Time (s)		20.3			16.0			16.8			34.3	
Confl. Peds. (#/hr)	4		3	4		5	3		4	5		4
Confl. Bikes (#/hr)												
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	51	190	0	44	388	240	0	35	25	142	101	85
Shared Lane Traffic (%)												
Lane Group Flow (vph)	51	190	0	44	628	0	0	60	0	142	186	0
Turn Type	D.P+P	NA		D.P+P	NA		D.Pm	NA		D.P+P	NA	
Protected Phases	5	2		1	6			4		3	8	
Permitted Phases	6			2			8			4		
Detector Phase	5	2		1	6		8	4		3	8	
Switch Phase										4		
Minimum Initial (s)	5.0	10.0		5.0	10.0		5.0	5.0		5.0	5.0	
Minimum Split (s)	11.0	20.0		11.0	20.0		21.0	19.0		11.0	21.0	
Total Split (s)	11.0	34.0		11.0	34.0		30.0	19.0		11.0	30.0	
Total Split (%)	14.7%	45.3%		14.7%	45.3%		40.0%	25.3%		14.7%	40.0%	
Maximum Green (s)	5.0	28.0		5.0	28.0		24.0	13.0		5.0	24.0	
Yellow Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
All-Red Time (s)	2.0	2.0		2.0	2.0		2.0	2.0		2.0	2.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	6.0	6.0		6.0	6.0		6.0	6.0		6.0	6.0	
Lead/Lag	Lead	Lag		Lead	Lag			Lag		Lead		
Lead-Lag Optimize?												
Vehicle Extension (s)	2.0	5.0		2.0	5.0		3.0	3.0		2.0	3.0	

2025 AM PK Hour (Signal)

Synchro 12 Report

Lanes, Volumes, Timings

2: Elm St N & 12th Ave N

09/07/2025

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Minimum Gap (s)	2.0	3.0		2.0	3.0		3.0	3.0		2.0	3.0	
Time Before Reduce (s)	0.0	25.0		0.0	25.0		0.0	0.0		0.0	0.0	
Time To Reduce (s)	0.0	5.0		0.0	5.0		0.0	0.0		0.0	0.0	
Recall Mode	None	Min		None	Min		None	None		None	None	
Walk Time (s)		7.0			7.0		7.0	7.0			7.0	
Flash Don't Walk (s)		7.0			7.0		8.0	6.0			8.0	
Pedestrian Calls (#/hr)		2			3		1	2			1	
90th %ile Green (s)	5.0	28.0		5.0	28.0		24.0	13.0		5.0	24.0	
90th %ile Term Code	Max	Hold		Max	Max		Hold	Ped		Max	Hold	
70th %ile Green (s)	5.0	28.0		5.0	28.0		19.1	8.1		5.0	19.1	
70th %ile Term Code	Max	Hold		Max	Max		Hold	Gap		Max	Hold	
50th %ile Green (s)	5.0	28.0		5.0	28.0		17.8	6.8		5.0	17.8	
50th %ile Term Code	Max	Hold		Max	Max		Hold	Gap		Max	Hold	
30th %ile Green (s)	0.0	25.0		0.0	25.0		7.6	0.0		7.6	7.6	
30th %ile Term Code	Skip	Hold		Skip	Gap		Gap	Skip		Hold	Gap	
10th %ile Green (s)	0.0	24.7		0.0	24.7		5.6	0.0		0.0	5.6	
10th %ile Term Code	Skip	Dwell		Skip	Dwell		Gap	Skip		Skip	Gap	

Intersection Summary

Area Type: Other

Cycle Length: 75

Actuated Cycle Length: 60.2

Natural Cycle: 75

Control Type: Actuated-Uncoordinated

90th %ile Actuated Cycle: 75

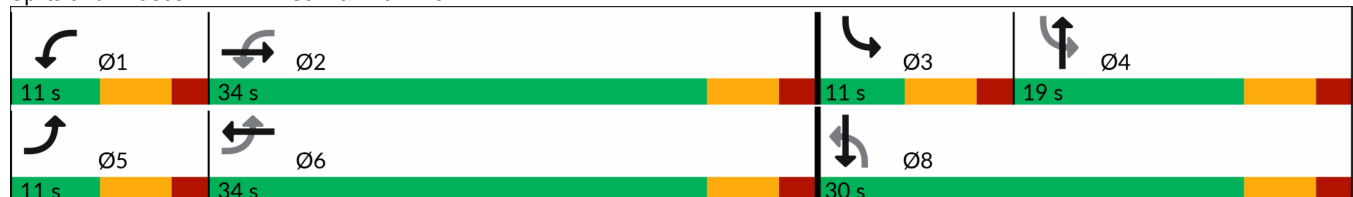
70th %ile Actuated Cycle: 70.1

50th %ile Actuated Cycle: 68.8

30th %ile Actuated Cycle: 44.6

10th %ile Actuated Cycle: 42.3

Splits and Phases: 2: Elm St N & 12th Ave N



2: Elm St N & 12th Ave N Performance by approach

Approach	EB	WB	NB	SB	All
Denied Del/Veh (s)	1.1	0.8	0.2	1.4	1.0
Total Del/Veh (s)	9.5	13.4	18.2	17.9	14.0

2: Elm St N & 12th Ave N Performance by movement

Movement	EBL	EBT	WBL	WBT	WBR	NBT	NBR	SBL	SBT	SBR	All
Denied Del/Veh (s)	3.8	0.3	3.3	0.6	0.7	0.1	0.2	2.7	0.5	0.5	1.0
Total Del/Veh (s)	14.0	8.2	9.6	15.2	11.2	25.3	8.3	20.7	19.7	11.4	14.0

Queuing and Blocking Report

Baseline

09/07/2025

Intersection: 2: Elm St N & 12th Ave N

Movement	EB	EB	WB	WB	NB	SB	SB
Directions Served	L	TR	L	TR	TR	L	TR
Maximum Queue (ft)	74	126	176	344	74	136	154
Average Queue (ft)	27	50	25	152	29	61	67
95th Queue (ft)	59	97	94	283	62	110	119
Link Distance (ft)		706		539	576		1206
Upstream Blk Time (%)							
Queuing Penalty (veh)							
Storage Bay Dist (ft)	150		225			175	
Storage Blk Time (%)		0		3	0	0	0
Queuing Penalty (veh)		0		1	0	0	0

Lanes, Volumes, Timings
2: Elm St N & 12th Ave N

09/07/2025

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	41	365	7	27	238	143	1	60	82	248	53	65
Future Volume (vph)	41	365	7	27	238	143	1	60	82	248	53	65
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	11	11	12	11	11	12	11	11	12	11	11
Grade (%)		0%			0%			0%			0%	
Storage Length (ft)	150		0	225		0	100		0	175		0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor	0.99	1.00		0.99	0.99		0.99	0.98		0.99	0.98	
Frt		0.997			0.944			0.913			0.918	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1787	1812	0	1787	1693	0	1787	1628	0	1787	1635	0
Flt Permitted	0.425			0.439			0.677			0.662		
Satd. Flow (perm)	792	1812	0	821	1693	0	1259	1628	0	1229	1635	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		2			56			86			68	
Link Speed (mph)		25			25			25			25	
Link Distance (ft)		744			585			615			1254	
Travel Time (s)		20.3			16.0			16.8			34.2	
Confl. Peds. (#/hr)	9		7	6		8	7		6	7		9
Confl. Bikes (#/hr)												
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	43	384	7	28	251	151	1	63	86	261	56	68
Shared Lane Traffic (%)												
Lane Group Flow (vph)	43	391	0	28	402	0	1	149	0	261	124	0
Turn Type	D.Pm	NA		D.Pm	NA		D.Pm	NA		D.P+P	NA	
Protected Phases		2			6			4		3	8	
Permitted Phases	6			2			8			4		
Detector Phase	6	2		2	6		8	4		3	8	
Switch Phase										4		
Minimum Initial (s)	10.0	10.0		10.0	10.0		5.0	5.0		5.0	5.0	
Minimum Split (s)	20.0	20.0		20.0	20.0		21.0	19.0		11.0	21.0	
Total Split (s)	27.0	27.0		27.0	27.0		33.0	19.0		14.0	33.0	
Total Split (%)	45.0%	45.0%		45.0%	45.0%		55.0%	31.7%		23.3%	55.0%	
Maximum Green (s)	21.0	21.0		21.0	21.0		27.0	13.0		8.0	27.0	
Yellow Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
All-Red Time (s)	2.0	2.0		2.0	2.0		2.0	2.0		2.0	2.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	6.0	6.0		6.0	6.0		6.0	6.0		6.0	6.0	
Lead/Lag								Lag		Lead		
Lead-Lag Optimize?												
Vehicle Extension (s)	5.0	5.0		5.0	5.0		3.0	3.0		2.0	3.0	

2025 PM PK Hour (Signal)

Synchro 12 Report

Lanes, Volumes, Timings

2: Elm St N & 12th Ave N

09/07/2025

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Minimum Gap (s)	3.0	3.0		3.0	3.0		3.0	3.0		2.0	3.0	
Time Before Reduce (s)	25.0	25.0		25.0	25.0		0.0	0.0		0.0	0.0	
Time To Reduce (s)	5.0	5.0		5.0	5.0		0.0	0.0		0.0	0.0	
Recall Mode	Min	Min		Min	Min		None	None		None	None	
Walk Time (s)	7.0	7.0		7.0	7.0		7.0	7.0			7.0	
Flash Don't Walk (s)	7.0	7.0		7.0	7.0		8.0	6.0			8.0	
Pedestrian Calls (#/hr)	5	3		3	5		4	3			4	
90th %ile Green (s)	21.0	21.0		21.0	21.0		27.0	13.0		8.0	27.0	
90th %ile Term Code	Max	Max		Max	Max		Hold	Max		Max	Hold	
70th %ile Green (s)	21.0	21.0		21.0	21.0		23.4	9.4		8.0	23.4	
70th %ile Term Code	Max	Max		Max	Max		Hold	Gap		Max	Hold	
50th %ile Green (s)	18.3	18.3		18.3	18.3		21.5	7.5		8.0	21.5	
50th %ile Term Code	Hold	Gap		Gap	Hold		Hold	Gap		Max	Hold	
30th %ile Green (s)	14.5	14.5		14.5	14.5		0.0	6.6		7.7	0.0	
30th %ile Term Code	Hold	Gap		Gap	Hold		Skip	Gap		Gap	Skip	
10th %ile Green (s)	11.0	11.0		11.0	11.0		0.0	0.0		6.1	0.0	
10th %ile Term Code	Dwell	Dwell		Dwell	Dwell		Skip	Skip		Gap	Skip	

Intersection Summary

Area Type: Other

Cycle Length: 60

Actuated Cycle Length: 48.8

Natural Cycle: 55

Control Type: Actuated-Uncoordinated

90th %ile Actuated Cycle: 60

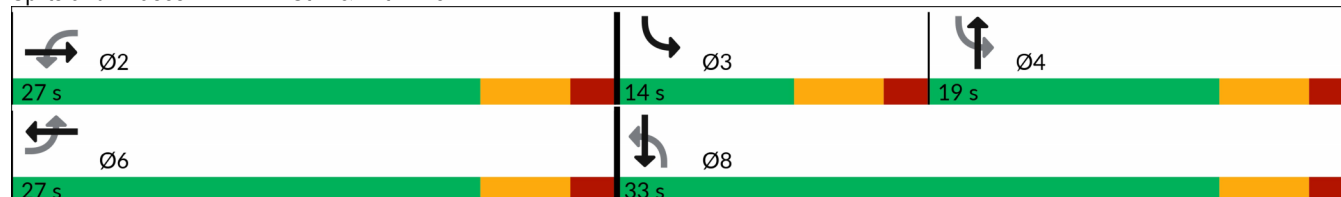
70th %ile Actuated Cycle: 56.4

50th %ile Actuated Cycle: 51.8

30th %ile Actuated Cycle: 46.8

10th %ile Actuated Cycle: 29.1

Splits and Phases: 2: Elm St N & 12th Ave N



2: Elm St N & 12th Ave N Performance by approach

Approach	EB	WB	NB	SB	All
Denied Del/Veh (s)	0.7	0.6	0.2	1.8	0.9
Total Del/Veh (s)	15.2	13.5	15.6	16.9	15.2

2: Elm St N & 12th Ave N Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	3.5	0.5	0.4	3.6	0.4	0.4		0.2	0.2	2.3	0.6	0.6
Total Del/Veh (s)	28.5	13.9	10.7	22.3	14.7	9.9		21.9	10.9	17.9	21.1	9.7

2: Elm St N & 12th Ave N Performance by movement

Movement	All
Denied Del/Veh (s)	0.9
Total Del/Veh (s)	15.2

Queuing and Blocking Report
Baseline

09/07/2025

Intersection: 2: Elm St N & 12th Ave N

Movement	EB	EB	WB	WB	NB	NB	SB	SB
Directions Served	L	TR	L	TR	L	TR	L	TR
Maximum Queue (ft)	114	252	54	242	12	122	168	117
Average Queue (ft)	30	115	19	110	0	60	92	52
95th Queue (ft)	78	199	49	191	5	103	152	94
Link Distance (ft)		706		539		576		1204
Upstream Blk Time (%)								
Queuing Penalty (veh)								
Storage Bay Dist (ft)	150		225		100		175	
Storage Blk Time (%)		3		1		1	0	
Queuing Penalty (veh)		1		0		0	0	

Lanes, Volumes, Timings
2: Elm St N & 12th Ave N

09/07/2025

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	45	170	5	40	345	215	5	35	25	125	95	75
Future Volume (vph)	45	170	5	40	345	215	5	35	25	125	95	75
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	11	11	12	11	11	12	11	11	12	11	11
Grade (%)		0%			0%			0%			0%	
Storage Length (ft)	150		0	225		0	100		0	175		0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor		1.00		0.99	0.99		0.99	0.99		0.99	0.99	
Frt		0.995			0.942			0.938			0.934	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1787	1808	0	1787	1691	0	1787	1684	0	1787	1676	0
Flt Permitted	0.219			0.633			0.636			0.833		
Satd. Flow (perm)	412	1808	0	1181	1691	0	1190	1684	0	1546	1676	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		2			48			28			56	
Link Speed (mph)		25			30			25			25	
Link Distance (ft)		743			585			615			1253	
Travel Time (s)		20.3			13.3			16.8			34.2	
Confl. Peds. (#/hr)	4		3	4		5	3		4	5		4
Confl. Bikes (#/hr)												
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	51	193	6	45	392	244	6	40	28	142	108	85
Shared Lane Traffic (%)												
Lane Group Flow (vph)	51	199	0	45	636	0	6	68	0	142	193	0
Turn Type	D.P+P	NA		D.P+P	NA		D.Pm	NA		D.P+P	NA	
Protected Phases	5	2		1	6			4		3	8	
Permitted Phases	6			2			8			4		
Detector Phase	5	2		1	6		8	4		3	8	
Switch Phase										4		
Minimum Initial (s)	5.0	10.0		5.0	10.0		5.0	5.0		5.0	5.0	
Minimum Split (s)	11.0	20.0		11.0	20.0		21.0	19.0		11.0	21.0	
Total Split (s)	11.0	34.0		11.0	34.0		30.0	19.0		11.0	30.0	
Total Split (%)	14.7%	45.3%		14.7%	45.3%		40.0%	25.3%		14.7%	40.0%	
Maximum Green (s)	5.0	28.0		5.0	28.0		24.0	13.0		5.0	24.0	
Yellow Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
All-Red Time (s)	2.0	2.0		2.0	2.0		2.0	2.0		2.0	2.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	6.0	6.0		6.0	6.0		6.0	6.0		6.0	6.0	
Lead/Lag	Lead	Lag		Lead	Lag			Lag		Lead		
Lead-Lag Optimize?												
Vehicle Extension (s)	2.0	5.0		2.0	5.0		3.0	3.0		2.0	3.0	

2030 AM PK Hour (Signal)

Synchro 12 Report

Lanes, Volumes, Timings

2: Elm St N & 12th Ave N

09/07/2025

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Minimum Gap (s)	2.0	3.0		2.0	3.0		3.0	3.0		2.0	3.0	
Time Before Reduce (s)	0.0	25.0		0.0	25.0		0.0	0.0		0.0	0.0	
Time To Reduce (s)	0.0	5.0		0.0	5.0		0.0	0.0		0.0	0.0	
Recall Mode	None	Min		None	Min		None	None		None	None	
Walk Time (s)		7.0			7.0		7.0	7.0			7.0	
Flash Don't Walk (s)		7.0			7.0		8.0	6.0			8.0	
Pedestrian Calls (#/hr)		2			3		1	2			1	
90th %ile Green (s)	5.0	28.0		5.0	28.0		24.0	13.0		5.0	24.0	
90th %ile Term Code	Max	Hold		Max	Max		Hold	Ped		Max	Hold	
70th %ile Green (s)	5.0	28.0		5.0	28.0		19.3	8.3		5.0	19.3	
70th %ile Term Code	Max	Hold		Max	Max		Hold	Gap		Max	Hold	
50th %ile Green (s)	5.0	28.0		5.0	28.0		18.0	7.0		5.0	18.0	
50th %ile Term Code	Max	Hold		Max	Max		Hold	Gap		Max	Hold	
30th %ile Green (s)	0.0	26.2		0.0	26.2		7.8	0.0		7.8	7.8	
30th %ile Term Code	Skip	Hold		Skip	Gap		Gap	Skip		Hold	Gap	
10th %ile Green (s)	0.0	24.8		0.0	24.8		5.9	0.0		0.0	5.9	
10th %ile Term Code	Skip	Dwell		Skip	Dwell		Gap	Skip		Skip	Gap	

Intersection Summary

Area Type: Other

Cycle Length: 75

Actuated Cycle Length: 60.6

Natural Cycle: 75

Control Type: Actuated-Uncoordinated

90th %ile Actuated Cycle: 75

70th %ile Actuated Cycle: 70.3

50th %ile Actuated Cycle: 69

30th %ile Actuated Cycle: 46

10th %ile Actuated Cycle: 42.7

Splits and Phases: 2: Elm St N & 12th Ave N

 Ø1	 Ø2	 Ø3	 Ø4
11 s	34 s	11 s	19 s
 Ø5	 Ø6	 Ø8	
11 s	34 s	30 s	

2: Elm St N & 12th Ave N Performance by approach

Approach	EB	WB	NB	SB	All
Denied Del/Veh (s)	1.0	0.9	0.5	1.4	1.0
Total Del/Veh (s)	9.8	15.9	20.0	17.6	15.4

2: Elm St N & 12th Ave N Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	3.7	0.3	0.4	3.2	0.7	0.7	4.1	0.2	0.2	2.6	0.5	0.5
Total Del/Veh (s)	15.1	8.7	4.4	11.6	17.7	13.7	21.9	27.8	9.1	19.5	20.0	11.8

2: Elm St N & 12th Ave N Performance by movement

Movement	All
Denied Del/Veh (s)	1.0
Total Del/Veh (s)	15.4

Queuing and Blocking Report
Baseline

09/07/2025

Intersection: 2: Elm St N & 12th Ave N

Movement	EB	EB	WB	WB	NB	NB	SB	SB
Directions Served	L	TR	L	TR	L	TR	L	TR
Maximum Queue (ft)	71	123	134	407	41	86	120	148
Average Queue (ft)	28	53	26	161	5	34	59	71
95th Queue (ft)	59	100	92	315	27	69	100	122
Link Distance (ft)		705		539		576		1203
Upstream Blk Time (%)				0				
Queuing Penalty (veh)				0				
Storage Bay Dist (ft)	150		225		100		175	
Storage Blk Time (%)		0		4		0		0
Queuing Penalty (veh)		0		2		0		0

Lanes, Volumes, Timings
2: Elm St N & 12th Ave N

09/07/2025

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	45	365	10	30	240	145	5	65	85	250	60	70
Future Volume (vph)	45	365	10	30	240	145	5	65	85	250	60	70
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	11	11	12	11	11	12	11	11	12	11	11
Grade (%)		0%			0%			0%			0%	
Storage Length (ft)	150		0	225		0	100		0	175		0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor	0.99	1.00		0.99	0.99		0.99	0.98		0.99	0.98	
Frt		0.996			0.943			0.915			0.919	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1787	1809	0	1787	1691	0	1787	1632	0	1787	1637	0
Flt Permitted	0.417			0.431			0.669			0.657		
Satd. Flow (perm)	777	1809	0	806	1691	0	1244	1632	0	1218	1637	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		3			56			89			74	
Link Speed (mph)		25			30			25			25	
Link Distance (ft)		743			585			615			1254	
Travel Time (s)		20.3			13.3			16.8			34.2	
Confl. Peds. (#/hr)	9		7	6		8	7		6	8		9
Confl. Bikes (#/hr)												
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	47	384	11	32	253	153	5	68	89	263	63	74
Shared Lane Traffic (%)												
Lane Group Flow (vph)	47	395	0	32	406	0	5	157	0	263	137	0
Turn Type	D.Pm	NA		D.Pm	NA		D.Pm	NA		D.P+P	NA	
Protected Phases		2			6			4		3	8	
Permitted Phases	6			2			8			4		
Detector Phase	6	2		2	6		8	4		3	8	
Switch Phase										4		
Minimum Initial (s)	10.0	10.0		10.0	10.0		5.0	5.0		5.0	5.0	
Minimum Split (s)	20.0	20.0		20.0	20.0		21.0	19.0		11.0	21.0	
Total Split (s)	27.0	27.0		27.0	27.0		33.0	19.0		14.0	33.0	
Total Split (%)	45.0%	45.0%		45.0%	45.0%		55.0%	31.7%		23.3%	55.0%	
Maximum Green (s)	21.0	21.0		21.0	21.0		27.0	13.0		8.0	27.0	
Yellow Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
All-Red Time (s)	2.0	2.0		2.0	2.0		2.0	2.0		2.0	2.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	6.0	6.0		6.0	6.0		6.0	6.0		6.0	6.0	
Lead/Lag								Lag		Lead		
Lead-Lag Optimize?												
Vehicle Extension (s)	5.0	5.0		5.0	5.0		3.0	3.0		2.0	3.0	

2030 PM PK Hour (Signal)

Synchro 12 Report

Lanes, Volumes, Timings

2: Elm St N & 12th Ave N

09/07/2025

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Minimum Gap (s)	3.0	3.0		3.0	3.0		3.0	3.0		2.0	3.0	
Time Before Reduce (s)	25.0	25.0		25.0	25.0		0.0	0.0		0.0	0.0	
Time To Reduce (s)	5.0	5.0		5.0	5.0		0.0	0.0		0.0	0.0	
Recall Mode	Min	Min		Min	Min		None	None		None	None	
Walk Time (s)	7.0	7.0		7.0	7.0		7.0	7.0			7.0	
Flash Don't Walk (s)	7.0	7.0		7.0	7.0		8.0	6.0			8.0	
Pedestrian Calls (#/hr)	5	3		3	5		4	3			4	
90th %ile Green (s)	21.0	21.0		21.0	21.0		27.0	13.0		8.0	27.0	
90th %ile Term Code	Max	Max		Max	Max		Hold	Max		Max	Hold	
70th %ile Green (s)	21.0	21.0		21.0	21.0		23.6	9.6		8.0	23.6	
70th %ile Term Code	Max	Max		Max	Max		Hold	Gap		Max	Hold	
50th %ile Green (s)	18.5	18.5		18.5	18.5		21.7	7.7		8.0	21.7	
50th %ile Term Code	Hold	Gap		Gap	Hold		Hold	Gap		Max	Hold	
30th %ile Green (s)	14.6	14.6		14.6	14.6		20.3	6.6		7.7	20.3	
30th %ile Term Code	Hold	Gap		Gap	Hold		Hold	Gap		Gap	Hold	
10th %ile Green (s)	10.0	10.0		10.0	10.0		0.0	0.0		6.1	0.0	
10th %ile Term Code	Min	Min		Min	Min		Skip	Skip		Gap	Skip	

Intersection Summary

Area Type: Other

Cycle Length: 60

Actuated Cycle Length: 48.8

Natural Cycle: 55

Control Type: Actuated-Uncoordinated

90th %ile Actuated Cycle: 60

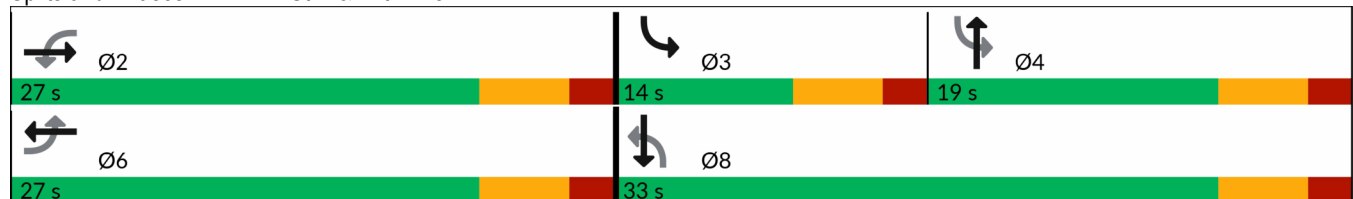
70th %ile Actuated Cycle: 56.6

50th %ile Actuated Cycle: 52.2

30th %ile Actuated Cycle: 46.9

10th %ile Actuated Cycle: 28.1

Splits and Phases: 2: Elm St N & 12th Ave N



2: Elm St N & 12th Ave N Performance by approach

Approach	EB	WB	NB	SB	All
Denied Del/Veh (s)	0.8	0.7	0.3	1.8	1.0
Total Del/Veh (s)	15.7	13.7	16.3	16.3	15.4

2: Elm St N & 12th Ave N Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	3.4	0.5	0.3	3.6	0.5	0.4	4.1	0.2	0.2	2.4	0.7	0.6
Total Del/Veh (s)	28.7	14.3	11.6	23.4	15.1	9.5	28.3	21.9	11.9	17.7	19.3	9.0

2: Elm St N & 12th Ave N Performance by movement

Movement	All
Denied Del/Veh (s)	1.0
Total Del/Veh (s)	15.4

Queuing and Blocking Report

Baseline

09/07/2025

Intersection: 2: Elm St N & 12th Ave N

Movement	EB	EB	WB	WB	NB	NB	SB	SB
Directions Served	L	TR	L	TR	L	TR	L	TR
Maximum Queue (ft)	111	260	61	232	32	130	160	144
Average Queue (ft)	34	116	21	104	4	62	88	55
95th Queue (ft)	79	199	51	184	20	106	144	111
Link Distance (ft)		705		539		576		1204
Upstream Blk Time (%)								
Queuing Penalty (veh)								
Storage Bay Dist (ft)	150		225		100		175	
Storage Blk Time (%)		3		0		2		1
Queuing Penalty (veh)		1		0		0		1

Lanes, Volumes, Timings
2: Elm St N & 12th Ave N

09/07/2025

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	50	195	5	55	400	230	5	40	30	130	120	80
Future Volume (vph)	50	195	5	55	400	230	5	40	30	130	120	80
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	11	11	12	11	11	12	11	11	12	11	11
Grade (%)		0%			0%			0%			0%	
Storage Length (ft)	150		0	225		0	100		0	175		0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor		1.00		0.99	0.99		0.99	0.99		0.99	0.99	
Fr't		0.996			0.945			0.935			0.940	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1787	1810	0	1787	1698	0	1787	1677	0	1787	1689	0
Flt Permitted	0.148			0.616			0.571			0.800		
Satd. Flow (perm)	278	1810	0	1150	1698	0	1069	1677	0	1486	1689	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		2			44			34			47	
Link Speed (mph)		25			30			25			25	
Link Distance (ft)		743			585			615			1254	
Travel Time (s)		20.3			13.3			16.8			34.2	
Confl. Peds. (#/hr)	4		3	4		5	3		4	5		4
Confl. Bikes (#/hr)												
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	57	222	6	63	455	261	6	45	34	148	136	91
Shared Lane Traffic (%)												
Lane Group Flow (vph)	57	228	0	63	716	0	6	79	0	148	227	0
Turn Type	D.P+P	NA		D.P+P	NA		D.Pm	NA		D.P+P	NA	
Protected Phases	5	2		1	6			4		3	8	
Permitted Phases	6			2			8			4		
Detector Phase	5	2		1	6		8	4		3	8	
Switch Phase										4		
Minimum Initial (s)	5.0	10.0		5.0	10.0		5.0	5.0		5.0	5.0	
Minimum Split (s)	11.0	20.0		11.0	20.0		21.0	19.0		11.0	21.0	
Total Split (s)	11.0	34.0		11.0	34.0		30.0	19.0		11.0	30.0	
Total Split (%)	14.7%	45.3%		14.7%	45.3%		40.0%	25.3%		14.7%	40.0%	
Maximum Green (s)	5.0	28.0		5.0	28.0		24.0	13.0		5.0	24.0	
Yellow Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
All-Red Time (s)	2.0	2.0		2.0	2.0		2.0	2.0		2.0	2.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	6.0	6.0		6.0	6.0		6.0	6.0		6.0	6.0	
Lead/Lag	Lead	Lag		Lead	Lag			Lag		Lead		
Lead-Lag Optimize?												
Vehicle Extension (s)	2.0	5.0		2.0	5.0		3.0	3.0		2.0	3.0	

2050 AM PK Hour (Signal)

Synchro 12 Report

Lanes, Volumes, Timings

2: Elm St N & 12th Ave N

09/07/2025

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Minimum Gap (s)	2.0	3.0		2.0	3.0		3.0	3.0		2.0	3.0	
Time Before Reduce (s)	0.0	25.0		0.0	25.0		0.0	0.0		0.0	0.0	
Time To Reduce (s)	0.0	5.0		0.0	5.0		0.0	0.0		0.0	0.0	
Recall Mode	None	Min		None	Min		None	None		None	None	
Walk Time (s)		7.0			7.0		7.0	7.0			7.0	
Flash Don't Walk (s)		7.0			7.0		8.0	6.0			8.0	
Pedestrian Calls (#/hr)		2			3		1	2			1	
90th %ile Green (s)	5.0	28.0		5.0	28.0		24.0	13.0		5.0	24.0	
90th %ile Term Code	Max	Hold		Max	Max		Hold	Ped		Max	Hold	
70th %ile Green (s)	5.0	28.0		5.0	28.0		19.6	8.6		5.0	19.6	
70th %ile Term Code	Max	Hold		Max	Max		Hold	Gap		Max	Hold	
50th %ile Green (s)	5.0	28.0		5.0	28.0		18.3	7.3		5.0	18.3	
50th %ile Term Code	Max	Hold		Max	Max		Hold	Gap		Max	Hold	
30th %ile Green (s)	0.0	28.0		0.0	28.0		9.0	0.0		9.0	9.0	
30th %ile Term Code	Skip	Hold		Skip	Max		Gap	Skip		Hold	Gap	
10th %ile Green (s)	0.0	28.0		0.0	28.0		6.7	0.0		0.0	6.7	
10th %ile Term Code	Skip	Hold		Skip	Max		Gap	Skip		Skip	Gap	

Intersection Summary

Area Type: Other

Cycle Length: 75

Actuated Cycle Length: 62.1

Natural Cycle: 80

Control Type: Actuated-Uncoordinated

90th %ile Actuated Cycle: 75

70th %ile Actuated Cycle: 70.6

50th %ile Actuated Cycle: 69.3

30th %ile Actuated Cycle: 49

10th %ile Actuated Cycle: 46.7

Splits and Phases: 2: Elm St N & 12th Ave N

 Ø1	 Ø2	 Ø3	 Ø4
11 s	34 s	11 s	19 s
 Ø5	 Ø6	 Ø8	
11 s	34 s	30 s	

2: Elm St N & 12th Ave N Performance by approach

Approach	EB	WB	NB	SB	All
Denied Del/Veh (s)	1.0	1.1	0.4	1.3	1.1
Total Del/Veh (s)	12.0	21.1	20.5	19.1	18.9

2: Elm St N & 12th Ave N Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	3.8	0.3	0.3	3.3	0.9	0.9	3.8	0.2	0.1	2.6	0.5	0.5
Total Del/Veh (s)	19.0	10.1	9.3	14.0	23.4	18.8	29.5	27.4	10.7	20.8	21.2	13.4

2: Elm St N & 12th Ave N Performance by movement

Movement	All
Denied Del/Veh (s)	1.1
Total Del/Veh (s)	18.9

Queuing and Blocking Report
Baseline

09/07/2025

Intersection: 2: Elm St N & 12th Ave N

Movement	EB	EB	WB	WB	NB	NB	SB	SB
Directions Served	L	TR	L	TR	L	TR	L	TR
Maximum Queue (ft)	75	147	210	440	33	103	161	195
Average Queue (ft)	31	62	41	212	5	40	64	85
95th Queue (ft)	64	116	135	388	23	79	117	150
Link Distance (ft)		705		539		576		1204
Upstream Blk Time (%)				1				
Queuing Penalty (veh)				0				
Storage Bay Dist (ft)	150		225		100		175	
Storage Blk Time (%)		0		9		1		0
Queuing Penalty (veh)		0		5		0		0

Lanes, Volumes, Timings
2: Elm St N & 12th Ave N

09/07/2025

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	45	420	10	40	280	155	5	80	115	270	70	75
Future Volume (vph)	45	420	10	40	280	155	5	80	115	270	70	75
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	11	11	12	11	11	12	11	11	12	11	11
Grade (%)		0%			0%			0%			0%	
Storage Length (ft)	150		0	225		0	100		0	175		0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor	0.99	1.00		0.99	0.99		0.99	0.98		0.99	0.98	
Frt		0.996			0.947			0.911			0.923	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1787	1810	0	1787	1700	0	1787	1624	0	1787	1646	0
Flt Permitted	0.364			0.370			0.660			0.629		
Satd. Flow (perm)	680	1810	0	692	1700	0	1228	1624	0	1167	1646	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		2			52			110			79	
Link Speed (mph)		25			30			25			25	
Link Distance (ft)		741			585			615			1253	
Travel Time (s)		20.2			13.3			16.8			34.2	
Confl. Peds. (#/hr)	9		7	6		8	7		6	8		9
Confl. Bikes (#/hr)												
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	47	442	11	42	295	163	5	84	121	284	74	79
Shared Lane Traffic (%)												
Lane Group Flow (vph)	47	453	0	42	458	0	5	205	0	284	153	0
Turn Type	D.Pm	NA		D.Pm	NA		D.Pm	NA		D.P+P	NA	
Protected Phases		2			6			4		3	8	
Permitted Phases	6			2			8			4		
Detector Phase	6	2		2	6		8	4		3	8	
Switch Phase										4		
Minimum Initial (s)	10.0	10.0		10.0	10.0		5.0	5.0		5.0	5.0	
Minimum Split (s)	20.0	20.0		20.0	20.0		21.0	19.0		11.0	21.0	
Total Split (s)	28.0	28.0		28.0	28.0		32.0	19.0		13.0	32.0	
Total Split (%)	46.7%	46.7%		46.7%	46.7%		53.3%	31.7%		21.7%	53.3%	
Maximum Green (s)	22.0	22.0		22.0	22.0		26.0	13.0		7.0	26.0	
Yellow Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
All-Red Time (s)	2.0	2.0		2.0	2.0		2.0	2.0		2.0	2.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	6.0	6.0		6.0	6.0		6.0	6.0		6.0	6.0	
Lead/Lag								Lag		Lead		
Lead-Lag Optimize?												
Vehicle Extension (s)	5.0	5.0		5.0	5.0		3.0	3.0		2.0	3.0	

2050 PM PK Hour (Signal)

Synchro 12 Report

Lanes, Volumes, Timings

2: Elm St N & 12th Ave N

09/07/2025

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Minimum Gap (s)	3.0	3.0		3.0	3.0		3.0	3.0		2.0	3.0	
Time Before Reduce (s)	25.0	25.0		25.0	25.0		0.0	0.0		0.0	0.0	
Time To Reduce (s)	5.0	5.0		5.0	5.0		0.0	0.0		0.0	0.0	
Recall Mode	Min	Min		Min	Min		None	None		None	None	
Walk Time (s)	7.0	7.0		7.0	7.0		7.0	7.0			7.0	
Flash Don't Walk (s)	7.0	7.0		7.0	7.0		8.0	6.0			8.0	
Pedestrian Calls (#/hr)	5	3		3	5		4	3			4	
90th %ile Green (s)	22.0	22.0		22.0	22.0		26.0	13.0		7.0	26.0	
90th %ile Term Code	Max	Max		Max	Max		Hold	Max		Max	Hold	
70th %ile Green (s)	22.0	22.0		22.0	22.0		24.6	11.6		7.0	24.6	
70th %ile Term Code	Max	Max		Max	Max		Hold	Gap		Max	Hold	
50th %ile Green (s)	20.5	20.5		20.5	20.5		21.8	8.8		7.0	21.8	
50th %ile Term Code	Gap	Gap		Gap	Gap		Hold	Gap		Max	Hold	
30th %ile Green (s)	16.1	16.1		16.1	16.1		19.8	6.8		7.0	19.8	
30th %ile Term Code	Hold	Gap		Gap	Hold		Hold	Gap		Max	Hold	
10th %ile Green (s)	12.4	12.4		12.4	12.4		0.0	0.0		6.2	0.0	
10th %ile Term Code	Hold	Gap		Gap	Hold		Skip	Skip		Gap	Skip	

Intersection Summary

Area Type: Other

Cycle Length: 60

Actuated Cycle Length: 50.3

Natural Cycle: 60

Control Type: Actuated-Uncoordinated

90th %ile Actuated Cycle: 60

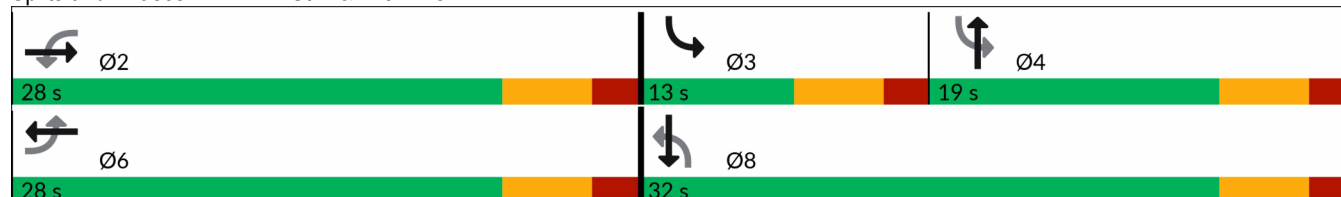
70th %ile Actuated Cycle: 58.6

50th %ile Actuated Cycle: 54.3

30th %ile Actuated Cycle: 47.9

10th %ile Actuated Cycle: 30.6

Splits and Phases: 2: Elm St N & 12th Ave N



2: Elm St N & 12th Ave N Performance by approach

Approach	EB	WB	NB	SB	All
Denied Del/Veh (s)	0.8	0.8	0.3	1.8	1.0
Total Del/Veh (s)	18.7	16.6	18.8	21.2	18.8

2: Elm St N & 12th Ave N Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	3.5	0.6	0.5	3.4	0.5	0.6	4.5	0.3	0.2	2.3	0.7	0.7
Total Del/Veh (s)	36.4	16.9	13.0	29.2	17.5	11.7	26.9	24.5	14.7	24.4	20.0	10.3

2: Elm St N & 12th Ave N Performance by movement

Movement	All
Denied Del/Veh (s)	1.0
Total Del/Veh (s)	18.8

Queuing and Blocking Report
Baseline

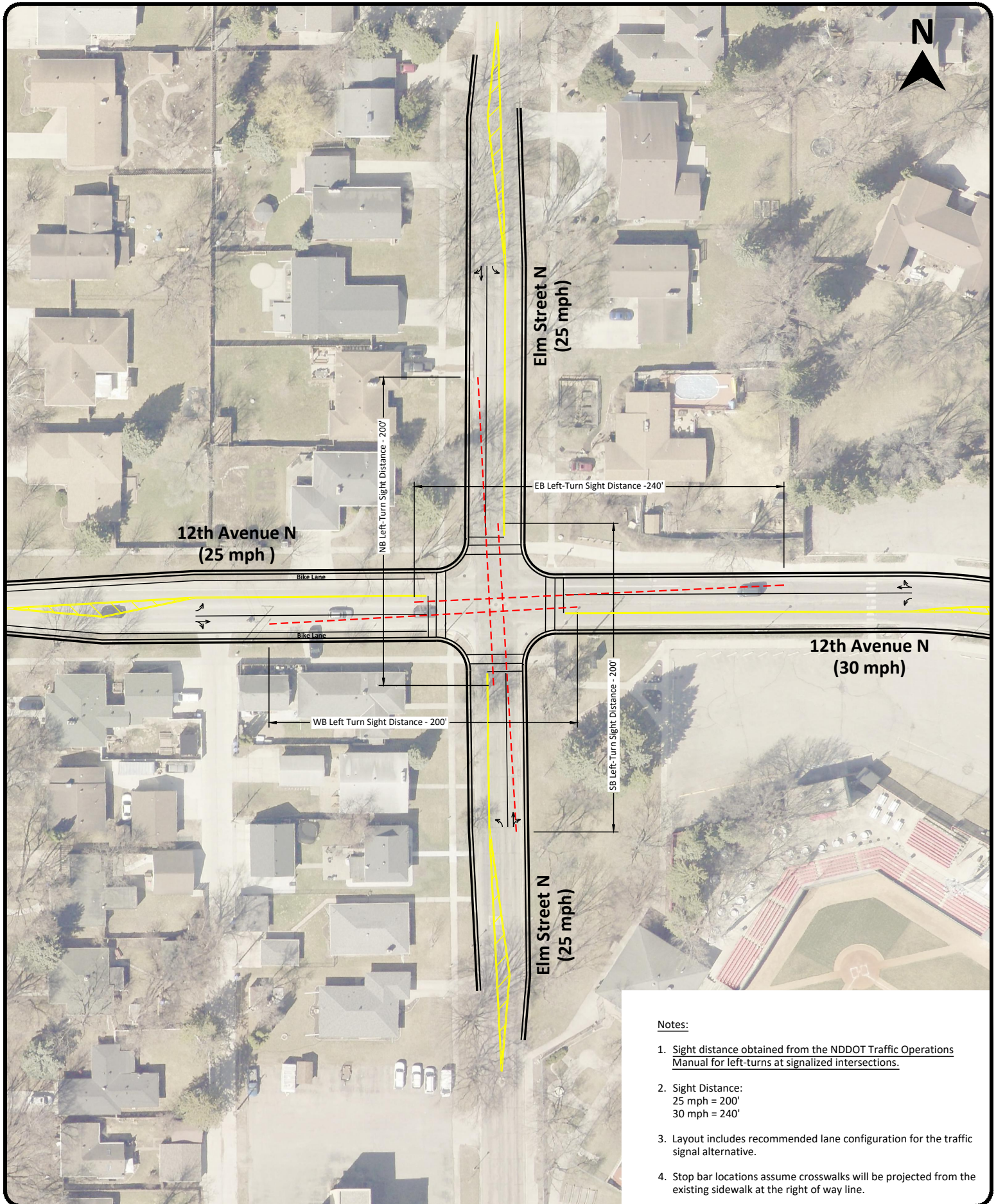
09/07/2025

Intersection: 2: Elm St N & 12th Ave N

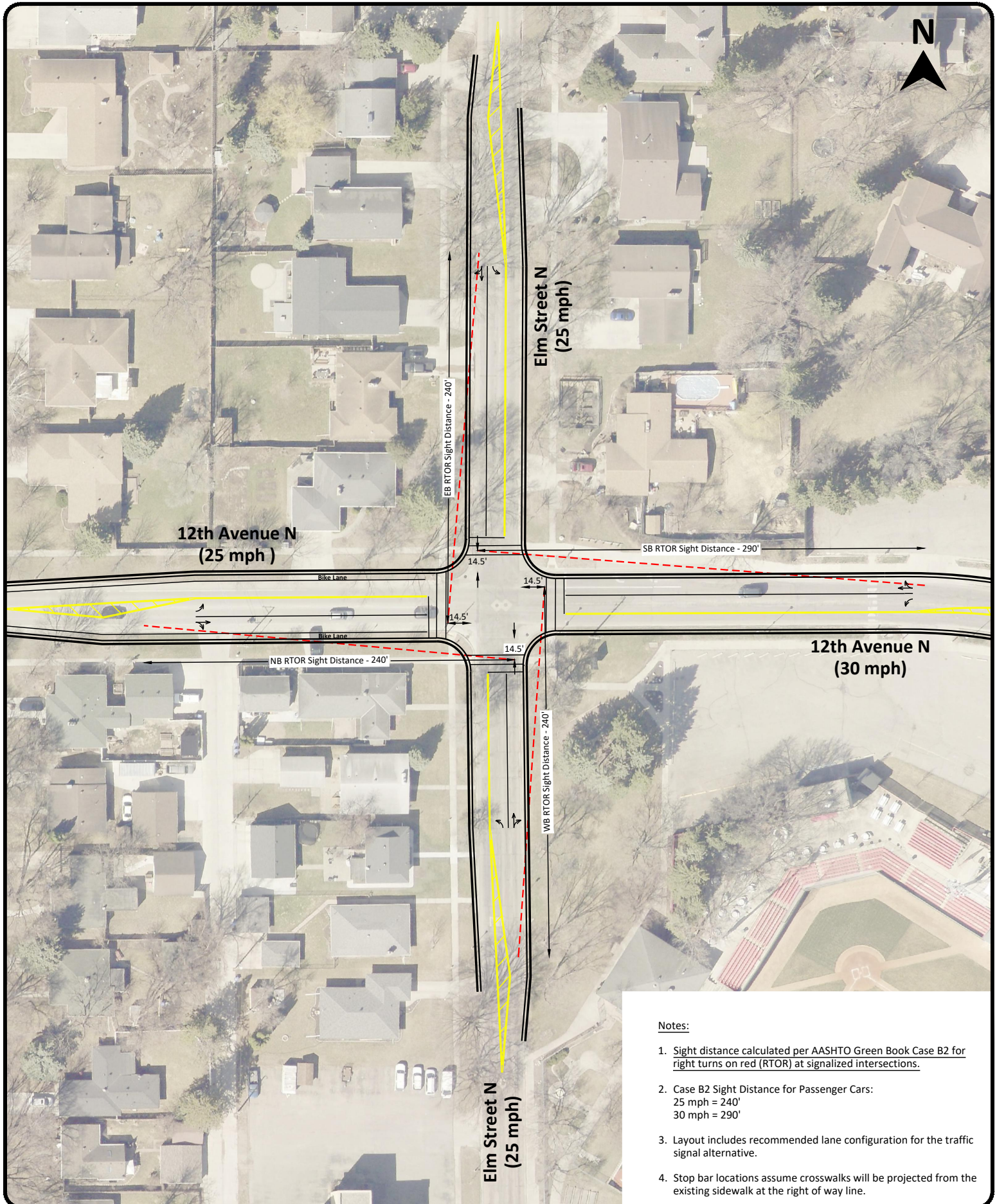
Movement	EB	EB	WB	WB	NB	NB	SB	SB
Directions Served	L	TR	L	TR	L	TR	L	TR
Maximum Queue (ft)	164	268	111	263	30	165	187	240
Average Queue (ft)	42	142	33	130	2	78	107	70
95th Queue (ft)	108	230	83	228	14	136	176	155
Link Distance (ft)		703		539		576		1203
Upstream Blk Time (%)								
Queuing Penalty (veh)								
Storage Bay Dist (ft)	150		225		100		175	
Storage Blk Time (%)	0	6		1		5	3	0
Queuing Penalty (veh)	0	3		0		0	5	0

APPENDIX G – SIGHT DISTANCE ANALYSIS

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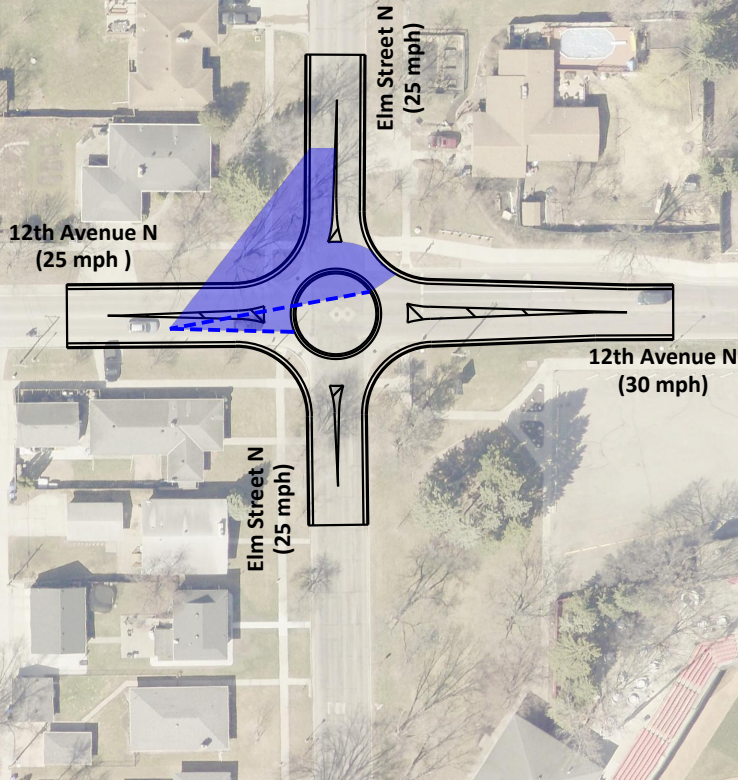


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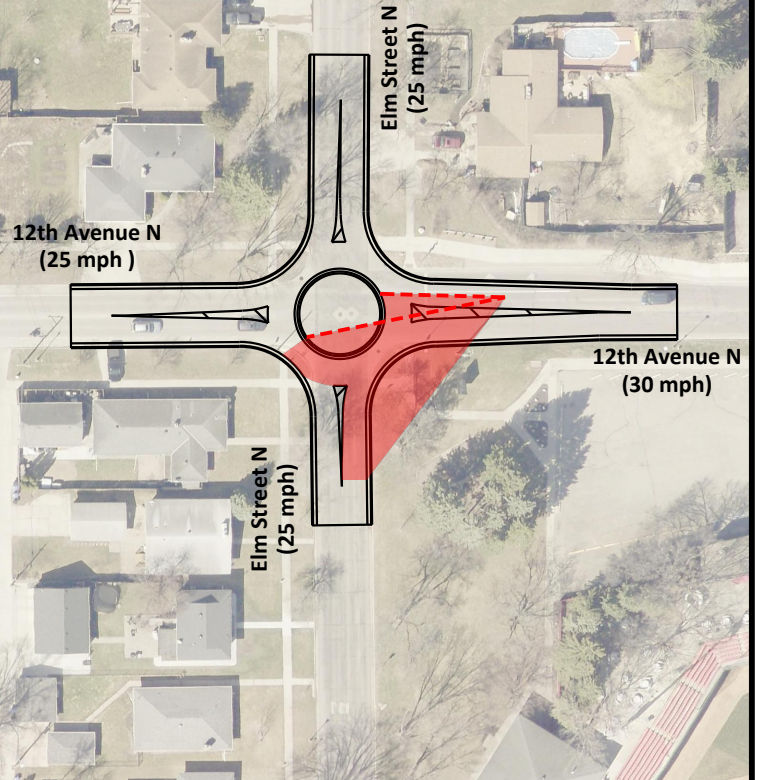
EASTBOUND APPROACH

N



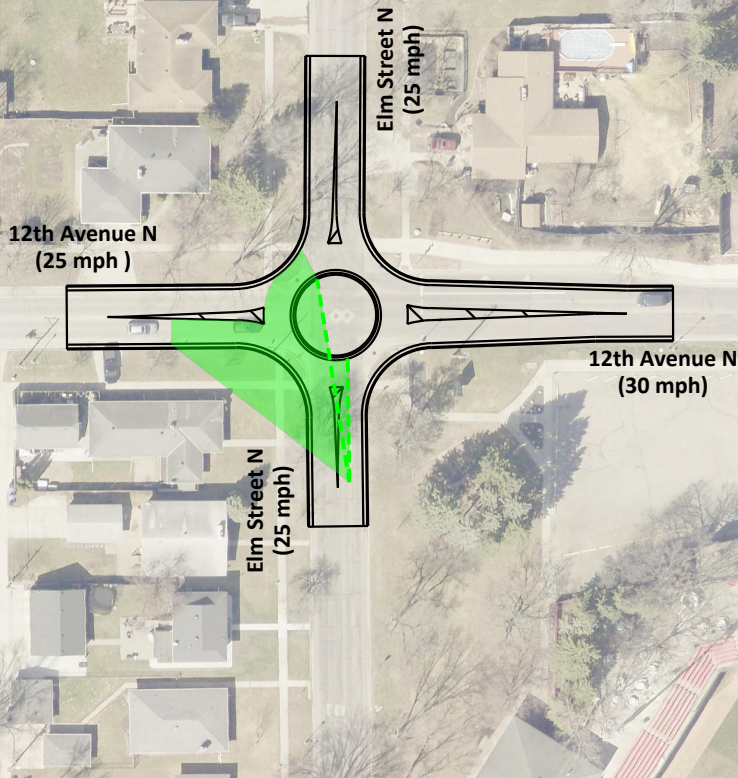
WESTBOUND APPROACH

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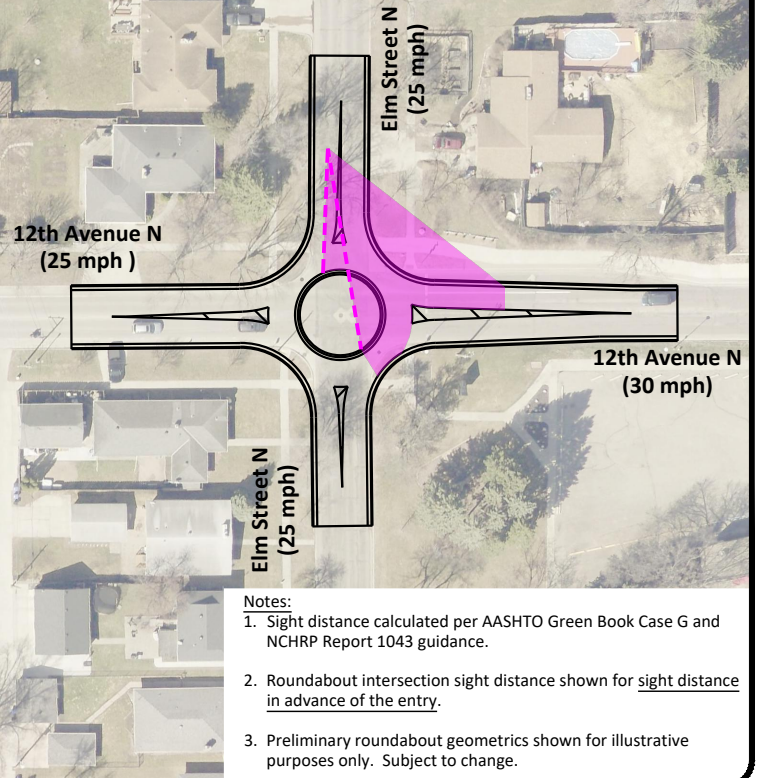
NORTHBOUND APPROACH

N



SOUTHBOUND APPROACH

N

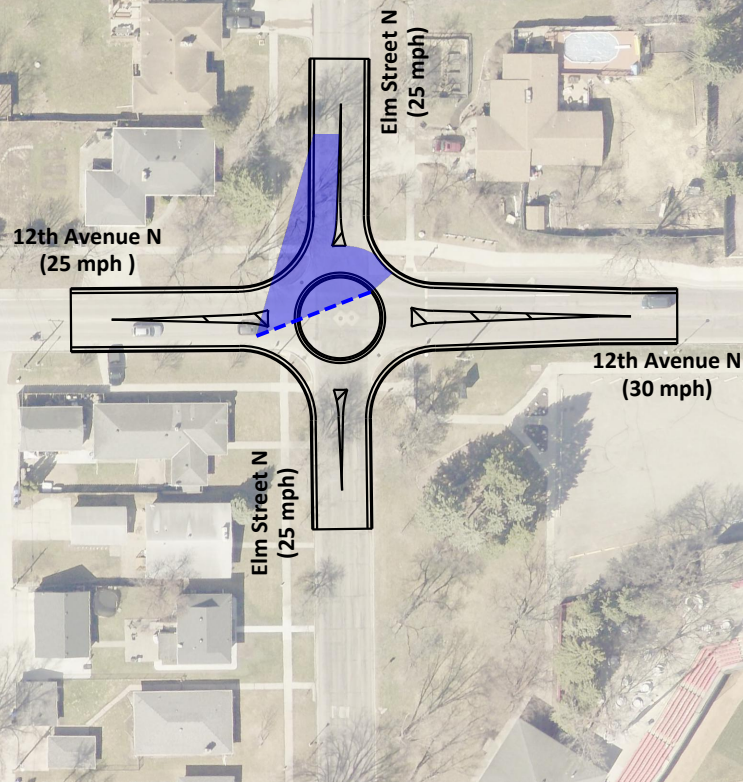


Notes:

1. Sight distance calculated per AASHTO Green Book Case G and NCHRP Report 1043 guidance.
2. Roundabout intersection sight distance shown for sight distance in advance of the entry.
3. Preliminary roundabout geometrics shown for illustrative purposes only. Subject to change.

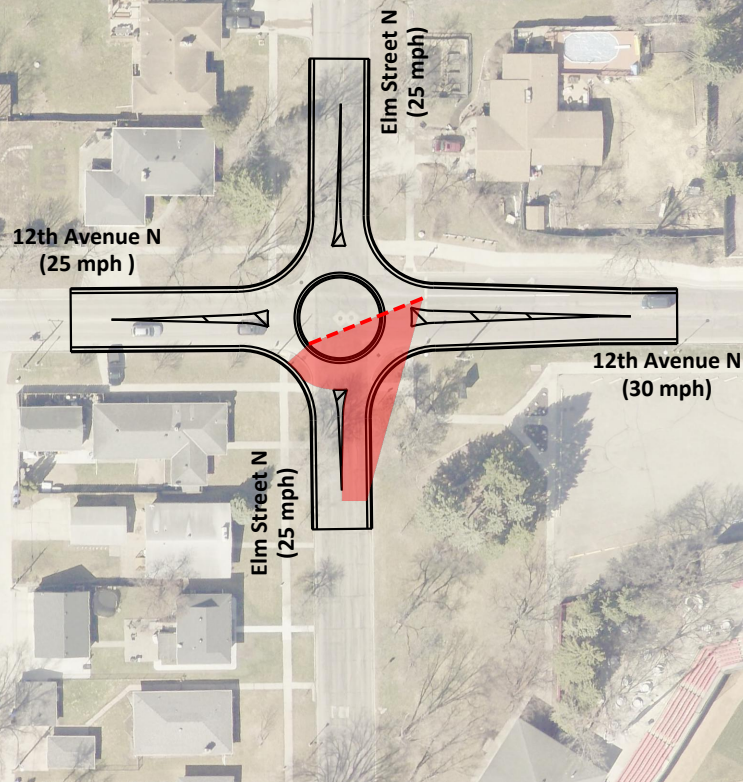
EASTBOUND APPROACH

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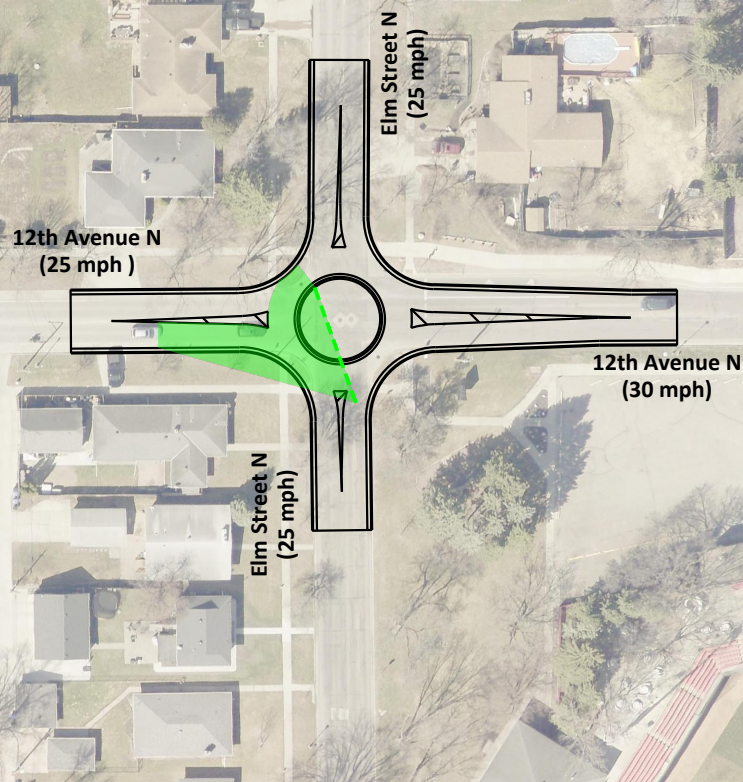
WESTBOUND APPROACH

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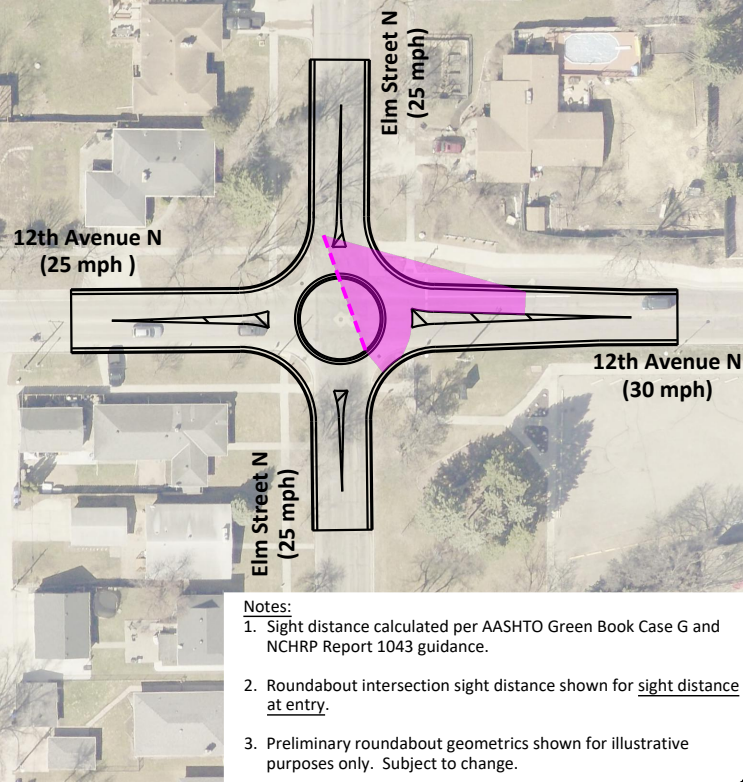
NORTHBOUND APPROACH

N



SOUTHBOUND APPROACH

N



Notes:

1. Sight distance calculated per AASHTO Green Book Case G and NCHRP Report 1043 guidance.
2. Roundabout intersection sight distance shown for sight distance at entry.
3. Preliminary roundabout geometrics shown for illustrative purposes only. Subject to change.