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October 22, 2025

Cory Bienfang, PE
City of Mankato
10 Civic Center Plaza
Mankato, MN 56001
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cbienfang@mankatomn.gov

Reference: Endless Adventures
Mankato, Minnesota

Subject: Traffic Impact Analysis

Dear Mr. Bienfang:

The following is a Traffic Impact Analysis for the proposed Endless Adventures development to be located along Premier Drive, south of Augusta Drive in Mankato, Minnesota. This memorandum has been prepared to analyze the effects of traffic generated by the proposed development on the surrounding roadway network. The general study area and development location is shown in **Figure 1**.

Figure 1: Study Area Map

Development Details

This analysis assumes the development will consist of an approximately 22,800 square-foot (s.f.) indoor playground to be completed by 2026. Access to the development is assumed to be provided via one (1) full-movement driveway along Premier Drive.

Existing Traffic Conditions

Study Intersections

Based on coordination with the City of Mankato (City), this traffic impact analysis includes the following intersections:

- Augusta Drive and Premier Drive
- N Victory Drive (CSAH 3) and Premier Drive
- Premier Drive and Proposed Site Access

Existing Intersection Configuration

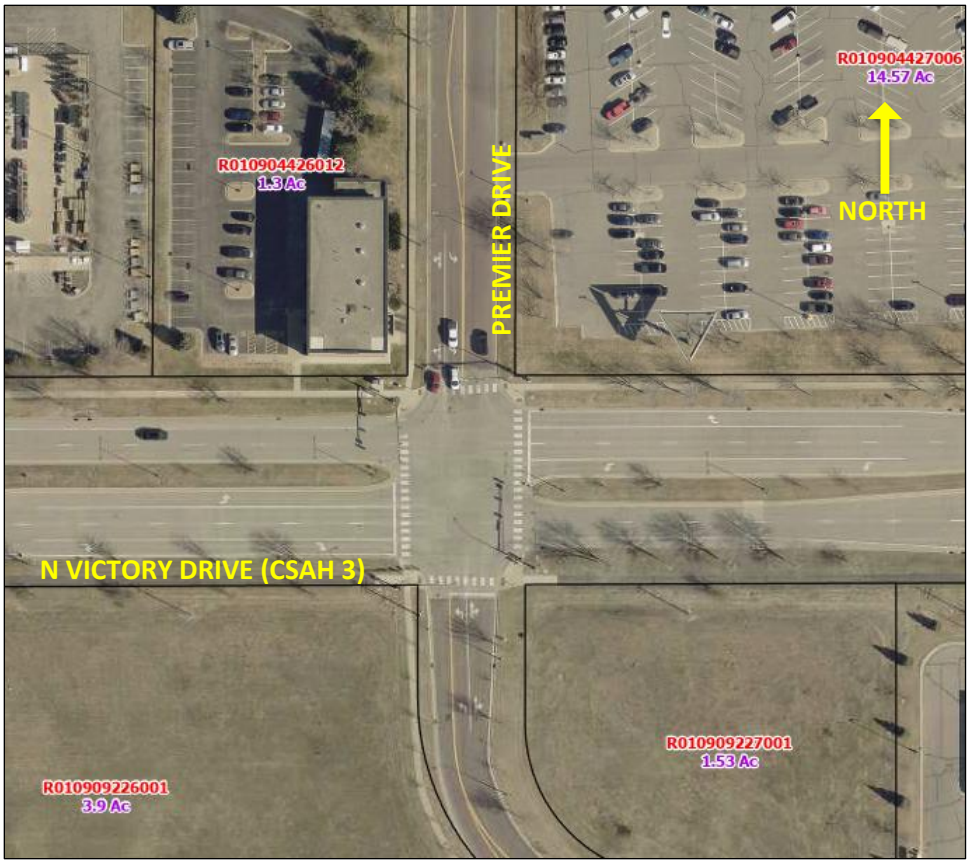
The intersection of Augusta Drive and Premier Drive is a four-legged intersection with dedicated right-turn lanes on the northbound and southbound approaches and dedicated left-turn lanes on the eastbound and westbound approaches. The intersection is currently under northbound/southbound two-way stop-control.

The intersection of N Victory Drive (CSAH 3) and Premier Drive is a four-legged intersection with dedicated left and right-turn lanes on the eastbound and westbound approaches, while the northbound and southbound approaches each have a dedicated left-turn lane. The intersection is currently under signal control.

The existing intersection configuration is shown in **Figure 2a and Figure 2b**.

Figure 2a: Existing Intersection Configuration - Augusta Drive & Premier Drive

Figure 2b: Existing Intersection Configuration - N Victory Drive (CSAH 3) & Premier Drive



Daily Traffic Volumes

Based on coordination with the City, existing traffic data was not collected at the study intersections due to the current construction along TH 22 and the associated detours. The most recent daily traffic volumes (2024) available from the MnDOT Traffic Mapping Application are as follows:

Augusta Drive and Premier Drive

- South Approach (Premier Drive): 2,261 vehicles per day
- West Approach (Augusta Drive): 3,589 vehicles per day

N Victory Drive (CSAH 3) and Premier Drive

- North Approach (Premier Drive): 2,261 vehicles per day
- West Approach (N Victory Drive): 9,072 vehicles per day (2023)

Peak Hour Traffic Volumes

Since no existing traffic data was collected for this study, peak hour traffic volumes at the study intersections were determined utilizing existing information.

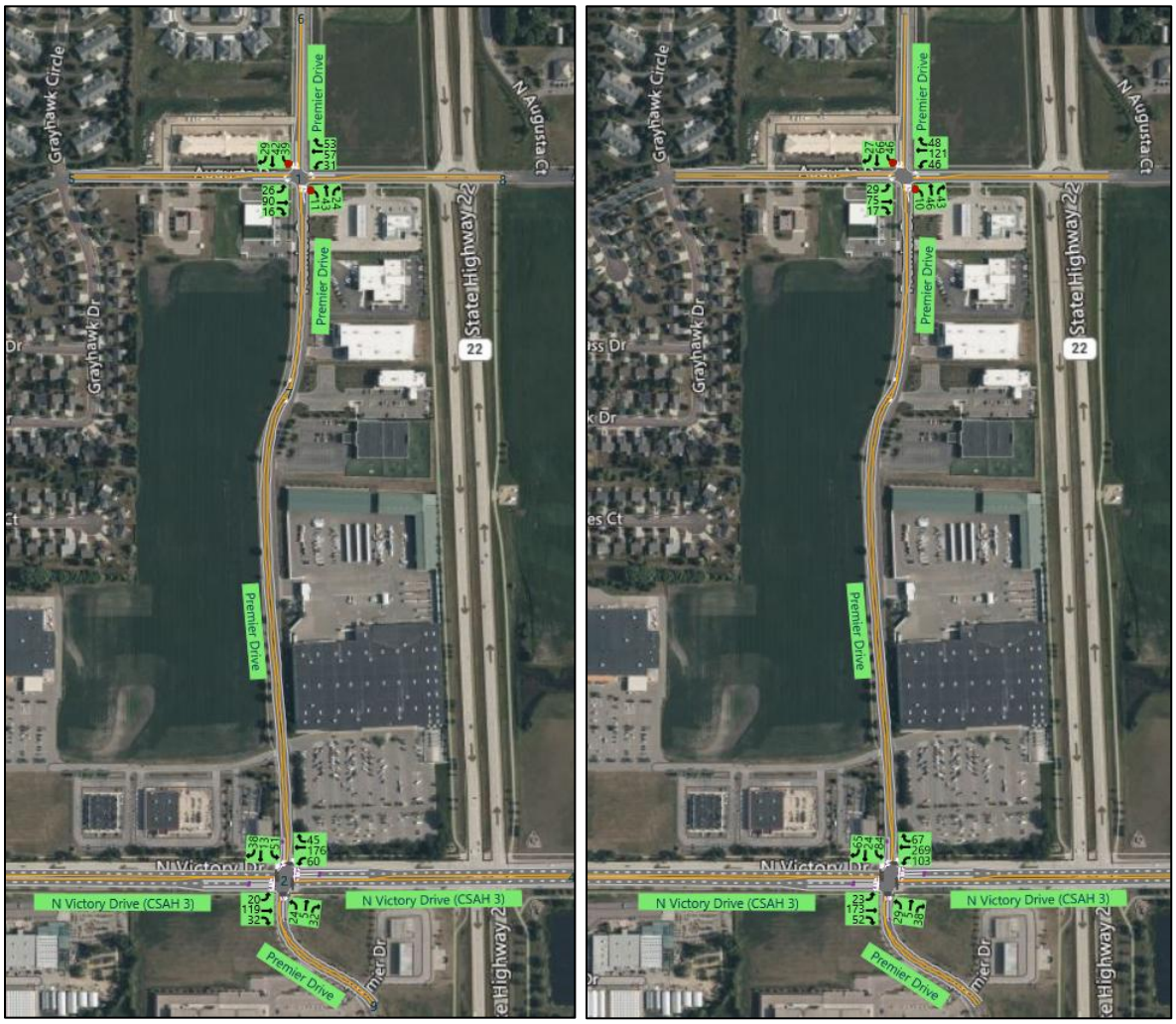
Turning movement counts from the 2022 Augusta Park Estates TIS were utilized at the intersection of Augusta Drive and Premier Drive. The 2022 counts were projected to 2025 using a 0.5% annual growth rate to adjust for known development that has occurred since then. Site trips associated

with the Augusta Park Estates development were also added on top of the projected counts as that development was completed in 2024.

There were no recent studies that have been completed that included turning movement counts at the intersection of N Victory Drive (CSAH 3) and Premier Drive. In lieu of collecting new traffic data, intersection turning movement counts for the four intersections immediately to the west were referenced from the 2022 Highway 14/Victory Drive Development TIA to determine traffic patterns along N Victory Drive (CSAH 3). MnDOT historical AADTs at the N Victory Drive (CSAH 3) and Premier Drive intersection and the traffic patterns for the four intersections immediately west were used to calculate turning movement counts at the intersection.

2025 AM and PM peak hour turning movement counts without the development are shown in **Figure 3**.

Figure 3: 2025 Existing AM and PM Turning Movement Counts



AM PEAK *PM PEAK*

Crash Analysis

Five years of crash data (2020-2024) was analyzed using MnDOT's crash mapping application (MnCMAT2). The type and severity of crashes were reviewed, and crash rates were calculated for the two existing study intersections.

- Augusta Drive and Premier Drive
- N Victory Drive (CSAH 3) and Premier Drive

The crash rate at each intersection is expressed as a number of crashes per million entering vehicles (MEV). The critical crash rate is a statistical value that is unique to each intersection and is based on vehicular exposure and the statewide average crash rate for similar intersections. An intersection with a crash rate higher than the critical rate can indicate a safety concern at the intersection and the site should be reviewed. Refer to **Table 1** and **Table 2** for summaries of the crash rate and crash severity/type at the study intersections, respectively.

Table 1: Intersection Crash Rates

Intersection	Traffic Control	Total Crashes (2020 - 2024)	Crash Rate				Fatal & Serious Injury Rate			
			Int. Rate	*Statewide Average*	*Critical Rate*	Crash Index	Int. Rate	*Statewide Average*	*Critical Rate*	Crash Index
Augusta Dr	TWSC	2	0.202	*0.15*	*0.51*	0.4	0.0	*0.41*	*8.08*	0.0
N Victory Dr	Signal	12	0.639	*0.64*	*1.15*	0.56	0.0	*1.21*	*7.12*	0.0

Table 2: Intersection Crash Severity & Crash Types

Intersection	Crash Severity					Crash Types								
	F	A	B	C	PDO	Right Angle	Left Turn	Head On	Rear End	Sideswipe Passing	Sideswipe Opposing	Run Off Road	Ped/Bike	Other
Augusta Dr	0	0	0	1	1	2	0	0	0	0	0	0	0	0
N Victory Dr	0	0	1	4	7	7	5	0	0	0	0	0	0	0

Based on the crash analysis, neither of the study intersections have observed crash rates that exceed the critical rate, indicating there are no existing safety concerns at the intersections. The signalized intersection of N Victory Drive (CSAH 3) and Premier Drive experiences a total of 12 crashes categorized as either a right-angle or left-turn crash, which is not uncommon at signalized intersections.

Existing Operations Analysis

Existing AM and PM peak hour intersection level of service was estimated using the Synchro 12 analysis software. Synchro 12 implements an analysis method based on that prescribed in the *Highway Capacity Manual* (7th Edition), which is an industry standard for intersection traffic operations analysis. This analysis will consider operations at LOS "E" or worse to be deficient and in need of some type of mitigation to improve traffic flow. Existing AM and PM peak hour level of service reported by Synchro and average and 95th percentile queue lengths reported by SimTraffic are summarized in **Table 3**.

Table 3: Existing 2025 Operational Analysis Results

			AM PEAK													
			Traffic Delay (sec/veh)					Traffic Queuing (feet)								
Intersection	Control	Approach	Movement (Delay - LOS)			Approach (Delay - LOS)	Intersection (Delay - LOS)	Left Turn			Through		Right Turn			
			L	T	R			Storage	Avg	95th	Avg	95th	Storage	Avg	95th	
Augusta Drive & Premier Drive	Stop	EB	2 - A	0 - A	0 - A	1 - A	3 - A	130	25	25	-	-	-	-	-	
		WB	2 - A	1 - A	0 - A	1 - A		90	25	25	0	25	-	0	25	
		NB	6 - A	7 - A	3 - A	6 - A		-	50	50	50	50	60	25	50	
		SB	7 - A	7 - A	3 - A	6 - A		-	50	75	50	75	100	25	50	
Premier Drive & N Victory Drive (CSAH 3)	Signalized	EB	4 - A	3 - A	1 - A	3 - A	16 - B	265	25	25	25	50	265	25	25	
		WB	4 - A	3 - A	1 - A	3 - A		275	25	50	25	75	275	25	25	
		NB	78 - E	99 - F	11 - B	41 - D		100	25	75	25	75	-	25	75	
		SB	80 - F	78 - E	16 - B	57 - E		100	75	125	50	75	-	50	75	

			PM PEAK													
			Traffic Delay (sec/veh)					Traffic Queuing (feet)								
Intersection	Control	Approach	Movement (Delay - LOS)			Approach (Delay - LOS)	Intersection (Delay - LOS)	Left Turn			Through		Right Turn			
			L	T	R			Storage	Avg	95th	Avg	95th	Storage	Avg	95th	
Augusta Drive & Premier Drive	Stop	EB	2 - A	0 - A	0 - A	1 - A	3 - A	130	25	25	-	-	-	-	-	
		WB	2 - A	1 - A	0 - A	1 - A		90	25	25	-	-	-	-	-	
		NB	7 - A	8 - A	3 - A	6 - A		-	50	75	50	75	60	25	75	
		SB	8 - A	8 - A	3 - A	8 - A		-	50	75	50	75	100	25	50	
Premier Drive & N Victory Drive (CSAH 3)	Signalized	EB	7 - A	6 - A	1 - A	6 - A	17 - B	265	25	50	50	125	265	25	50	
		WB	6 - A	4 - A	1 - A	5 - A		275	25	75	50	100	275	25	50	
		NB	79 - E	82 - F	11 - B	46 - D		100	50	100	25	75	-	25	75	
		SB	70 - E	75 - E	25 - C	53 - D		100	100	150	75	150	-	75	150	

Under existing conditions, AM and PM peak hour intersection operations are at an overall LOS B or better for both study intersections. It should be noted that all approaches, with the exception of the southbound approach at the signal, are expected to operate acceptably.

95th percentile queues reported by SimTraffic exceed the storages provided by 1-2 vehicles on the northbound right-turn movement at the Augusta/Premier intersection and on the southbound left-turn movement at the N Victory/Premier intersection. This is expected to have a negligible impact on intersection operations.

Traffic Conditions with Proposed Development

Trip Generation

The amount of traffic generated by the proposed development was estimated using data from the Institute of Transportation Engineers' (ITE) *Trip Generation Manual (12th Edition)*. The ITE Manual is an industry standard for estimating traffic volumes associated with new developments. Based on coordination with the City, land use code (LUC) 436 [Trampoline Park] was used to provide a conservative estimate of generated site trips as a "land-use" specific trip generation study was unavailable for the proposed land use (indoor playground). Based on this data, the following trip generation totals are estimated:

- Daily trips = 340
    - *Due to lack of information within the ITE Manual, PM peak hour trips are assumed to account for 10% of daily traffic.*

- AM peak hour trips = 0 (development is not expected to be operational during the AM peak)
- PM peak hour trips = 34

Trip generation estimate details are summarized in **Table 4**.

Table 4: Trip Generation Summary

Land Use (ITE Code)	Intensity	Daily Traffic (vpd)	Weekday AM Peak Hour Trips (vph)		Weekday PM Peak Hour Trips (vph)	
			Enter	Exit	Enter	Exit
Trampoline Park (436)	22,800 s.f.	340	0	0	16	18

Trip Distribution

Trip Distribution refers to the origins and destinations of traffic leaving and entering a site. Trip origin and destination locations for site-generated traffic were estimated based on available traffic data at the study intersections, previous traffic studies done in the surrounding area, and engineering judgement. This analysis assumes the following regional distribution:

- 15% to/from the north via Premier Drive
- 25% to/from the west via Augusta Drive
- 35% to/from the east via Augusta Drive
- 25% to/from the east via N Victory Drive (CSAH 3)

Trip Assignment

Trip Assignment refers to the roadways used to travel between trip origins and destinations. The roadways used to enter and exit the proposed development were based on proposed access locations, existing traffic patterns in the study area, and engineering judgement.

Peak Hour Traffic Volumes with Proposed Development

To determine volumes with the proposed site fully developed, existing peak hour AM and PM volumes were projected to the anticipated build year, 2026, using a 0.5% annual growth rate. Using the trip generation estimates described in **Table 4**, site-generated traffic was added to the 2026 projected AM and PM traffic volumes to calculate turning movement volumes at the study intersections with the site fully developed.

2026 AM and PM peak hour turning movement volumes with the development are shown in **Figure 4.**

Figure 4: 2026 Build AM and PM Turning Movement Counts – With Development

AM PEAK

PM PEAK

Build Operations Analysis with Proposed Development

Build AM and PM peak hour intersection level of service is summarized in **Table 5**. The inclusion of site-generated traffic is not expected to introduce traffic operation deficiencies.

Table 5: Build 2026 Operational Analysis Results - With Development

			AM PEAK													
			Traffic Delay (sec/veh)					Traffic Queuing (feet)								
Intersection	Control	Approach	Movement (Delay - LOS)			Approach (Delay - LOS)	Intersection (Delay - LOS)	Left Turn			Through		Right Turn			
			L	T	R			Storage	Avg	95th	Avg	95th	Storage	Avg	95th	
Augusta Drive & Premier Drive	Stop	EB	2 - A	0 - A	0 - A	1 - A	3 - A	130	25	25	-	-	-	-	-	
		WB	2 - A	1 - A	0 - A	1 - A		90	25	25	0	25	-	0	25	
		NB	6 - A	7 - A	3 - A	6 - A		-	50	75	50	75	60	25	50	
		SB	6 - A	7 - A	3 - A	6 - A		-	50	50	50	50	100	25	50	
Premier Drive & N Victory Drive (CSAH 3)	Signalized	EB	4 - A	3 - A	1 - A	3 - A	16 - B	265	25	25	25	50	265	25	25	
		WB	4 - A	3 - A	1 - A	3 - A		275	25	50	25	50	275	25	25	
		NB	79 - E	76 - E	8 - A	41 - D		100	25	75	25	75	-	25	75	
		SB	75 - E	74 - E	16 - B	55 - E		100	50	125	50	75	-	50	75	
Premier Drive & Site Access	Stop	EB	-	-	-	-	1 - A	-	-	-	-	-	-	-	-	
		WB	-	-	-	-		-	-	-	-	-	-	-	-	
		NB	-	0 - A	-	0 - A		-	-	-	-	-	-	-	-	
		SB	-	1 - A	-	1 - A		-	-	-	-	-	-	-	-	

			PM PEAK													
			Traffic Delay (sec/veh)					Traffic Queuing (feet)								
Intersection	Control	Approach	Movement (Delay - LOS)			Approach (Delay - LOS)	Intersection (Delay - LOS)	Left Turn			Through		Right Turn			
			L	T	R			Storage	Avg	95th	Avg	95th	Storage	Avg	95th	
Augusta Drive & Premier Drive	Stop	EB	2 - A	0 - A	0 - A	1 - A	3 - A	130	25	25	0	25	-	0	25	
		WB	2 - A	1 - A	0 - A	2 - A		90	25	25	0	25	-	0	25	
		NB	6 - A	8 - A	4 - A	7 - A		-	50	75	50	75	60	25	75	
		SB	8 - A	8 - A	3 - A	8 - A		-	50	75	50	75	100	25	50	
Premier Drive & N Victory Drive (CSAH 3)	Signalized	EB	6 - A	6 - A	1 - A	6 - A	18 - B	265	25	50	50	75	265	25	50	
		WB	6 - A	4 - A	2 - A	5 - A		275	50	75	50	100	275	25	50	
		NB	84 - F	76 - E	13 - B	44 - D		100	50	75	50	75	-	50	75	
		SB	74 - E	75 - E	25 - C	56 - E		100	100	175	75	125	-	75	125	
Premier Drive & Site Access	Stop	EB	5 - A	-	3 - A	5 - A	1 - A	-	25	50	-	-	-	25	50	
		WB	-	-	-	-		-	-	-	-	-	-	-	-	
		NB	3 - A	1 - A	-	2 - A		-	25	25	25	25	-	-	-	
		SB	-	1 - A	1 - A	1 - A		-	-	-	-	-	-	-	-	

Based on the capacity analysis, the southbound approach at the signal is expected to improve by 2 seconds compared to existing conditions during the AM peak hour. This is likely due to the southbound left-turn's perm+prot phasing and better gaps for traffic to make the turning movement during the permissive phase. Although this approach degrades to LOS E during the PM peak hour, only three seconds are added to the approach delay compared to existing. All study intersections are expected to operate with overall acceptable intersection operations.

The proposed development is expected to have a negligible impact on queue lengths as 95th percentile queues only increased by one vehicle on the southbound left-turn movement at the signal.

Turn Lane Warrant Analysis

Site access to the development is proposed via one (1) full movement driveway along Premier Drive. The potential need for a southbound right-turn lane and a northbound left-turn lane into the proposed development was evaluated based on guidance from federal research (NCHRP Report 457) and the MnDOT *Access Management Manual* assuming a 30 mile per hour (mph) speed limit on Premier Drive. Neither a southbound right-turn lane, nor a northbound left-turn lane are recommended due to low-volume driveways and traffic volumes below recommended NCHRP 457 thresholds for turn lane implementation.

Roadway Capacity Analysis

The capacity of the surrounding roadway network was analyzed to determine if roadway capacity is sufficient to accommodate the additional traffic generated by the proposed development. **Table 6** provides a comparison of 2024 MnDOT AADTs along Premier Drive, Augusta Drive, and Trunk Highway (TH) 22 to the future AADT with the addition of daily trips generated by the proposed development. Metro Council's *Imagine 2050* transportation policy plan and FHWA's *Highway Functional Classification Concepts, Criteria and Procedures 2023 Edition* were utilized to determine typical AADT ranges based on roadway classification. Based on these guidelines, Augusta Drive and TH 22 are expected to have sufficient capacity to accommodate the additional traffic generated by the proposed development.

Table 6 - AADT Comparison (vehicles/day)

Roadway	Roadway Classification	2024 MnDOT AADT	Anticipated Distribution	Added Daily Traffic	2024 MnDOT AADT + Added Daily Traffic	Imagine 2050 Typical ADT	FHWA Typical ADT	Sufficient Capcity Avaiable?
Premier Drive	Urban Local	2261	100%	340	2601	<1,000	80-700	No
Augusta Drive	Urban Minor Collector	3589	60%	48	3637	50-10,000+	1,000-6,300	Yes
TH 22	Urban Principal Arterial	14105	60%	48	14153	5,000-60,000+	7,000-27,000	Yes

It should be noted that based on MnDOT's 2024 AADTs, Premier Drive currently operates with an AADT that exceeds the typical ADT for urban local roads according to the Metro Council's *Imagine 2050* transportation policy plan and FHWA's *Highway Functional Classification Concepts, Criteria and Procedures 2023 Edition*. The proposed development is anticipated to have a negligible increase this AADT, accounting for minimal impact to the roadway. Premier Drive serves multiple commercial developments that may have varying peak hours that spread the projected AADT across multiple hours of the day.

Summary of Analyses and Recommendations

Based on the traffic impact analysis described in this report, it is not expected that the proposed development will introduce operational deficiencies that require intersection geometry or traffic control improvements.

While overall intersection traffic operations are expected to be acceptable without roadway geometry or traffic control changes, there are some low-cost improvements that should be considered to improve traffic flow and safety:

N Victory Drive (CSAH 3) & Premier Drive

- Extending the striping for the southbound left-turn lane at the intersection should be considered to accommodate storage lengths experienced during the peak hours. There is available pavement for this extension along Premier Drive.
- Optimizing the signal timings to increase the green time allotted to the minor-street left-turning movements should be considered. It should be noted that this intersection may be coordinated with adjacent signals along the N Victory Drive (CSAH 3) corridor which could improve traffic progression and intersection operations.

Due to the proposed development's minor impacts to the surrounding roadway network and existing operational issues at the signal, the improvements listed above are only shown for consideration by the City and not recommended to be implemented by the development.

If you have any questions or concerns, please do not hesitate to contact me. 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 Minnesota.

Sincerely,
Bolton & Menk, Inc.

Danielle Troutman, PE
Transportation Project Engineer
License No. 63168