Appendix G

Traffic Study

Trott Brook Crossing EAW

TROTT BROOK

RESIDENTIAL DEVELOPMENT

STS

Swing Traffic Solutions

TRAFFIC IMPACT STUDY

in

Ramsey, MN

September 3, 2021

TROTT BROOK

Ramsey, MN

TRAFFIC IMPACT STUDY

PROJECT NO. 2021045

September 3, 2021

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

Vernon E. Swing, P.E.

Date: 9-3-2021 Lic. No.: 41417

TRAFFIC IMPACT STUDY

TROTT BROOK

RAMSEY, MINNESOTA

September 3, 2021

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Project No. 2021045

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I. INTRODUCTION

Sotarra proposes to develop an approximately 200-acres site referred to as Sotarra - Trott Brook as single family detached residential homes. The project will consist of 270 single-family homes. For the purposes of this study, it is anticipated that construction will be complete, and the facilities fully occupied by 2026.

The proposed site is located between Nowthen Boulevard to the east and Variolite Street to the west and is bordered on the south by Trott Brook, and on the north by an extension of 173rd Avenue NW. The site location is illustrated on Figure 1, "Vicinity Map". Direct access to the site is proposed via two locations, a new public roadway originating at a new intersection along Variolite Street at approximately 170th Avenue NW and progressing eastward into the site, and from 173rd Avenue NW at the intersection with Nowthen Boulevard moving westward into the site. Indirect access is available from 175th Avenue NW, 167th Avenue NW, Alpine Avenue NW and Ramsey Boulevard via the intersections with Variolite Street and Nowthen Boulevard. The location of these accesses is illustrated on the Concept Site Plan, Figure 2.

The purpose of this study is to support the EAW completed for the Sotarra Trott Brook development, particularly to evaluate the impact of traffic generated by the proposed development on the operations and safety of the adjacent roadway network. The study focuses on the roads and intersections that provide direct and indirect access into the site. This study details the existing and future roadway conditions at studied intersections and includes traffic volumes, lane geometrics and traffic operational analysis results. Recommendations regarding roadway improvements to accommodate site generated traffic, as well as the anticipated growth in background traffic are included as necessary.

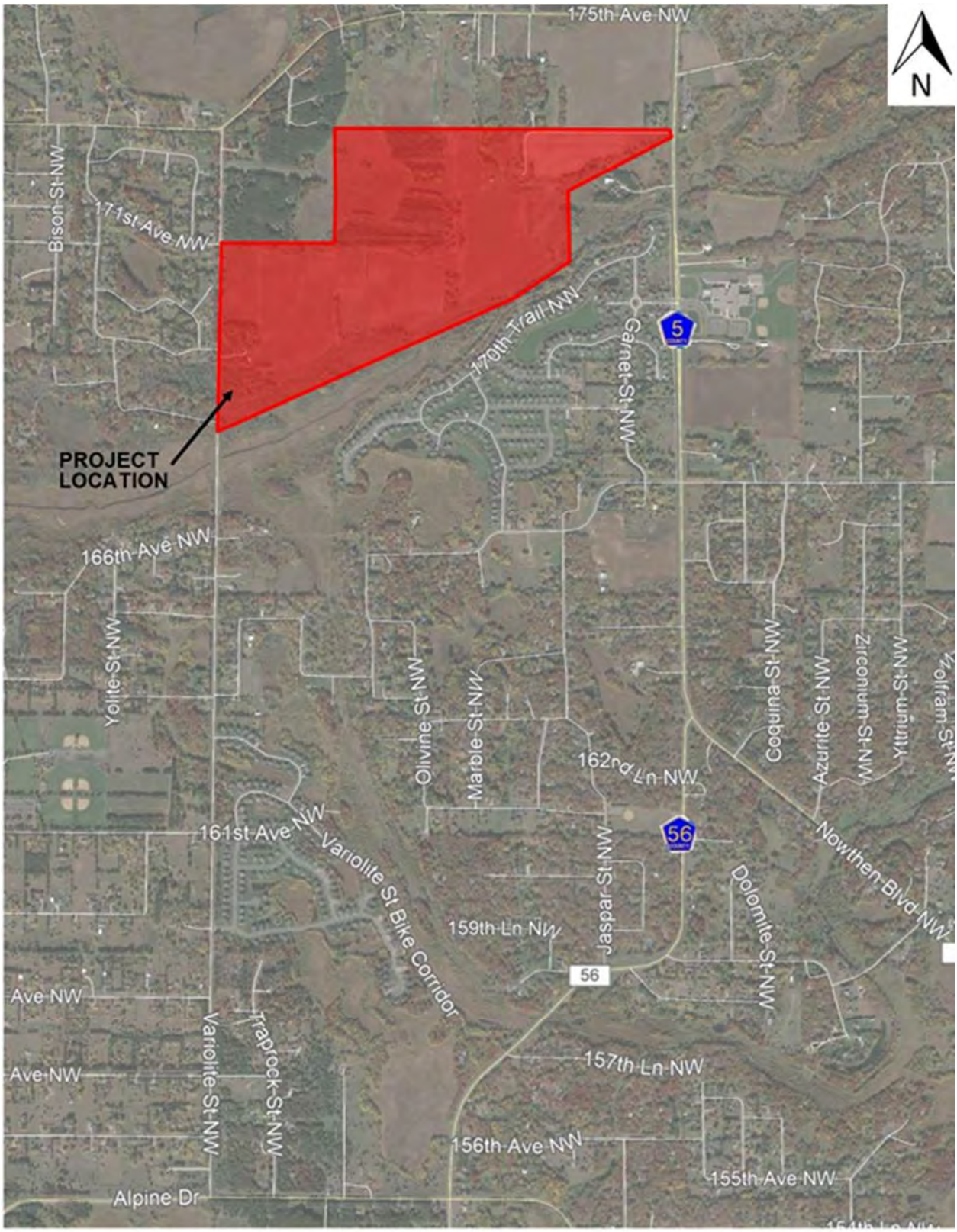

Figure 1 - Project Location

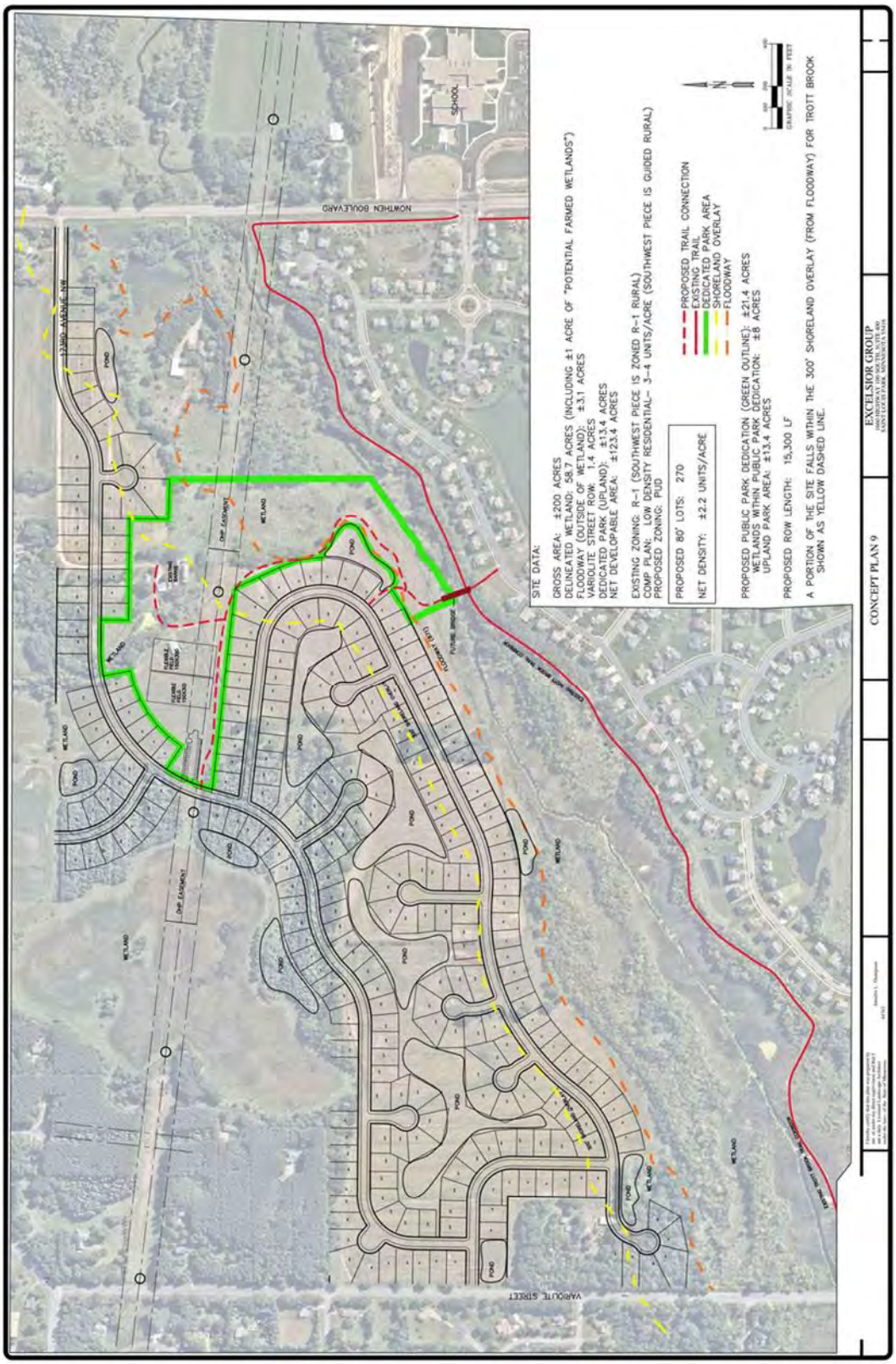

Figure 2 - Site Plan

I. Existing Conditions

A. Data Collection

The existing conditions of the nearby roadway system were documented by a field inventory conducted during the week of July 25, 2021. The purpose was to identify features that affect roadway capacity, including traffic control, sight distances, turn lanes, speed limits, etc. In addition, turning movement traffic counts were conducted revealing the AM Peak hour occurs at 7:00 – 8:00 AM and the PM Peak hour at 4:30 PM – 5:30 PM at the following intersections:

- Variolite Street NW and Alpine Drive
- Variolite Street NW and 161st Avenue NW
- Variolite Street NW and 173rd Avenue NW
- Nowthen Boulevard NW and Ramsey Boulevard NW
- Nowthen Boulevard NW and 167th Avenue NW
- Nowthen Boulevard NW and 173rd Avenue NW
- Nowthen Boulevard NW and 175th Avenue NW

Figure 3 illustrates the study area and the traffic control, and Figure 4 shows the existing AM and PM Peak hour turning movement counts. Also, the 2018-2019 average daily traffic volumes in the study area as published by MnDOT are included on Figure 4.

B. Roadway Descriptions

The existing geometrics of the Study Area Roadway Network have been documented based on a field review. The discussion that follows details specific items such as lane and shoulder layout, roadway classifications, and turn lane storage lengths.

- **Variolite Street NW,** runs generally north/south to the west of the site. It is a City of Ramsey Minnesota State Aid (MSA) road and is functionally classified as a future Major Collector. In the vicinity of the site, it is a 2-lane undivided road with designated left (or by-pass) and right turn

lanes at intersections with other streets. It provides indirect access to the site via the proposed new 170th Avenue NW intersection. It is signed for 50 mph, has a rural cross-section.

- **Nowthen Boulevard NW,** runs generally north-south to the east of the site. It is an Anoka County road (CSAH 5) and is functionally classified as an A Minor Expander. It provides indirect access to the site via its intersection with 173rd Avenue NW and is a 2-lane undivided facility with designated right and left (or by-pass) lanes at intersections with other streets. Nowthen Boulevard is signed for 55-mph, and currently has a rural cross-section.

- **175th Avenue NW,** runs generally east-west to the north of the site. To the west of Nowthen Boulevard and prior to its intersection with Variolite Street NW, the alignment shifts to the south and it becomes 173rd Avenue NW to the west of Variolite Street NW. It is an Anoka County Road (CR 63) and is functionally classified as Major Collector. In the vicinity of the site, it is a 2-lane undivided facility with designated right and left (or by-pass) lanes at intersections with other streets. It provides indirect access to the site via Variolite Street NW and Nowthen Boulevard NW and is signed for 50 mph with a rural cross-section.

- **167th Avenue NW,** runs in generally an east-west direction to the south of the site. It is a City of Ramsey Minnesota State Aid (MSA) road and is functionally classified as a future Major Collector to the east of Nowthen Boulevard NW, and as a local street to the west. In the vicinity of the site, it is a 2-lane undivided road. It provides indirect access to the site via the Nowthen Boulevard and 173rd Avenue NW intersection. It is signed for 50 mph to the east of Nowthen Boulevard and for 30mph to the west, and generally has a rural cross-section.

- **161st Avenue NW,** runs in generally an east-west direction to the south of the site. It is a City of Ramsey MSA roadway and is functionally classified as a local street. It provides indirect access to the site via its intersection with Variolite Street NW, is a 2-lane facility and is signed for 30 mph.

- **Ramsey Boulevard NW,** runs generally north-south to the south of the site. It is an Anoka County road (CSAH 56) and is functionally classified as an A Minor Expander. It provides indirect access to the site via its intersection with Nowthen Boulevard and is a 2-lane undivided facility with designated right and left (or by-pass) lanes at intersections with other streets. Ramsey Boulevard is signed for 55-mph, and currently has a rural cross-section.

- **Alpine Drive NW,** runs generally east/west to the south of the site. It is a City of Ramsey Minnesota State Aid (MSA) roadway and is functionally classified as a future Major Collector. In the vicinity of the site, it is a 2-lane undivided road with designated left (or by-pass) and right turn lanes at intersections with other streets. It provides indirect access to the site via its intersection with Variolite Street NW intersection. It is signed for 45 mph, has a rural cross-section to the east of Variolite Street NW and an urban cross-section to the west.

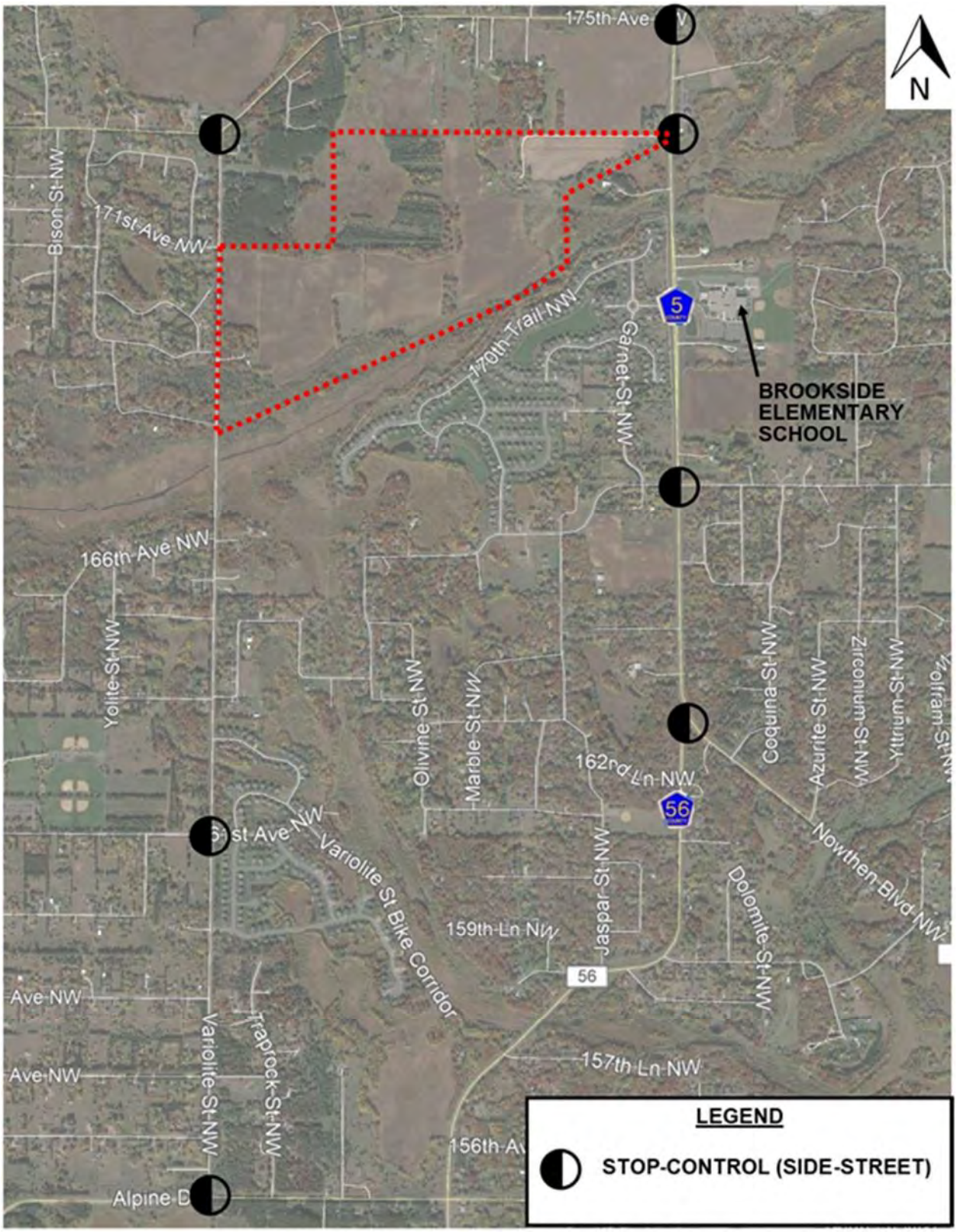

Figure 3 - Study Area

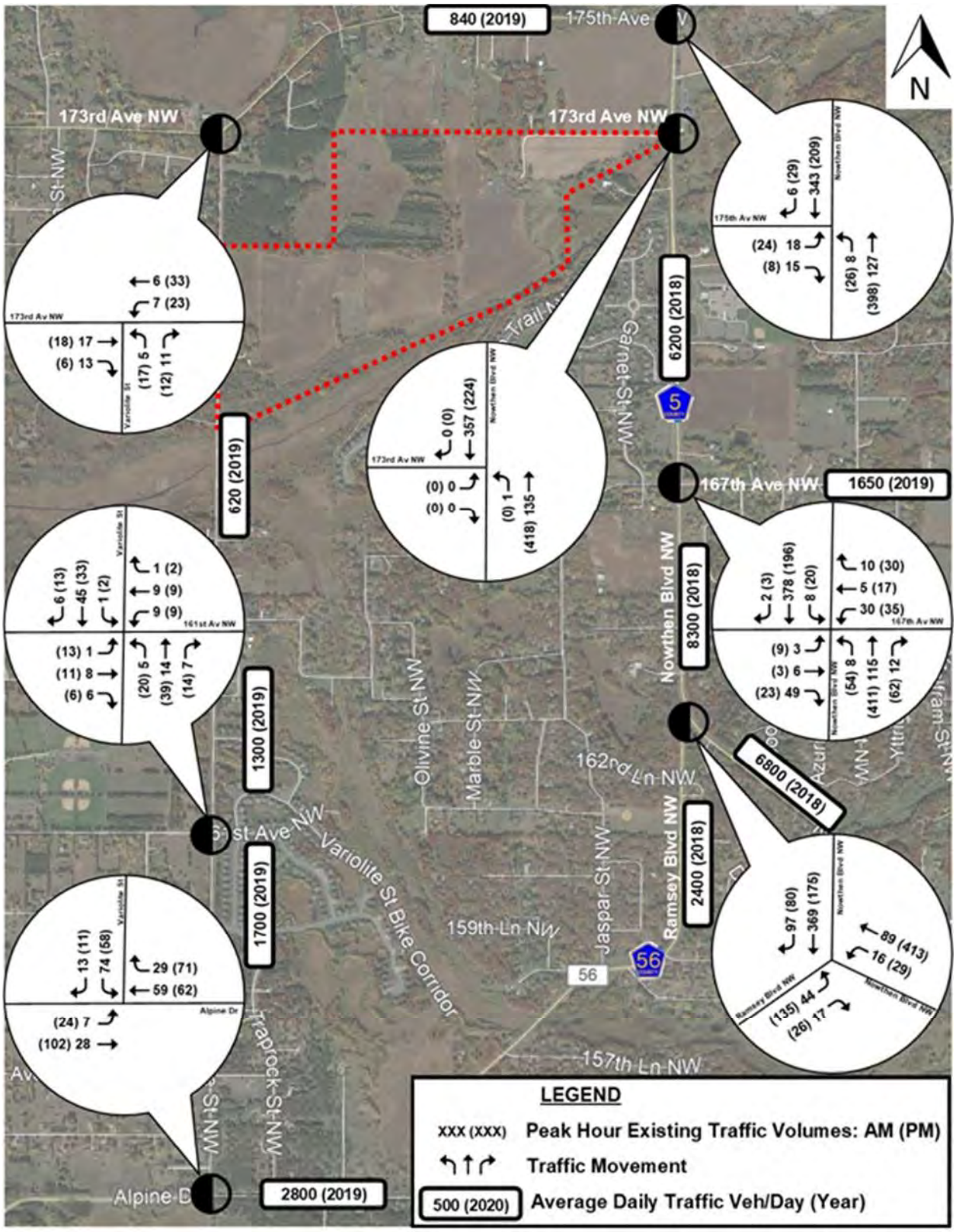

Figure 4 - Existing Traffic Volumes

C. Intersection Descriptions

- **175th Avenue NW and Nowthen Boulevard NW,** form a three-legged unsignalized intersection north of the site. The Nowthen Boulevard approaches are free flowing and include a northbound left turn by-pass lane and a southbound dedicated right turn lane. The eastbound 175th Avenue NW approach is stop controlled and includes a dedicated right turn lane.

- **175th Avenue NW/173rd Avenue NW and Variolite Street NW,** form a three-legged unsignalized intersection to the north of the site. The intersection is stop controlled on the minor Variolite Street NW approach with one approach lane and one departure lane. The 175th Avenue NW/173rd Avenue NW approaches include a westbound by-pass lane and an eastbound right turn lane.

- **173rd Avenue NW and Nowthen Boulevard NW,** form a three-legged unsignalized intersection providing access to the site from the east. The Nowthen Boulevard NW approaches are free flowing and include a southbound dedicated right turn lane and a northbound left turn by-pass lane. The eastbound 173rd Avenue NW approach is stop controlled with one lane in each direction. It is recommended it include a dedicated right turn lanes for the Build condition.

- **167th Avenue NW and Nowthen Boulevard NW,** form a four-legged unsignalized intersection south of the site. The 167th Avenue approaches include one lane in each direction and are stop controlled. The Nowthen Boulevard approaches are free flowing and include dedicated northbound and southbound dedicated right turn lanes.

- **161st Avenue NW and Variolite Street NW,** form a four-legged unsignalized intersection to the southwest of the site. 161st Avenue NW approaches are stop controlled and include one lane in each direction. The Variolite Street NW approaches are free flowing and include dedicated northbound and southbound right turn lanes.

- **Ramsey Boulevard NW and Nowthen Boulevard NW,** form a three legged unsignalized intersection to the southeast of the site. The Ramsey Boulevard approach is stop controlled and includes a dedicated right turn lane. The Nowthen Boulevard approaches are free flowing and the southbound approach includes a dedicated right turn lane and the northbound approach includes a left turn by-pass lane.

- **Alpine Drive NW and Variolite Street NW**, form a three legged unsignalized intersection to the southwest of the site. The Variolite Street NW approach is stop controlled and includes one lane entering and one lane exiting the intersection. The Alpine Drive NW approaches are free flowing, with the westbound approach including a dedicated right turn lane, while the eastbound approach only has one lane entering and exiting the intersection.

III. NO-BUILD ALTERNATIVE

To address the impacts of a development on the surrounding roadway system, it is necessary to predict the traffic that would be present on the roadway system at the time (the design year) of completion of the proposed development, without the inclusion of the proposed development. This is considered the No-Build scenario, and serves as a basis with which to compare Build scenarios. In this study two design years were analyzed 2026, the year after the development is fully built and occupied, and 2040, the current planning year horizon.

A. Background Growth

Review of the latest City of Ramsey Comprehensive Transportation Plan and Anoka County 2040 Transportation Plan indicate the traffic in the area is expected to increase. Two methods of estimating future conditions were employed in the comprehensive plan, a factor was applied to background conditions, and traffic from Transportation Analysis Zones (TAZs) was considered. The results show traffic will grow by approximately 2.0 percent per year between now and 2040. That said, the development of this site was considered and included in the TAZ forecast of future traffic on the roadways surrounding the site, accounting for more than 80 percent of the future estimates. To ensure a conservative estimate this study includes a growth factor of 1.0 percent per year added to the existing traffic. It is noted, the growth factor plus the traffic from proposed development exceeds the traffic forecast by Anoka County and the City of Ramsey estimates. Further, this rate is likely conservative as ITE and the Transportation Research Board suggest traffic patterns will permanently change due to the impact of COVID-19 with fewer home to work and work to home trips likely to occur in the future. Figures 5 and 6 illustrate the anticipated 2026 and 2040 No-Build peak hour traffic volumes.

B. Anticipated Improvements for No-Build Conditions

There are no programmed improvements identified for the roadways surrounding the site. For the purposes of this study it is assumed that the current roadway condition will remain as is.

C. Results of Analysis

The study area intersections identified in Section II were analyzed for the 2026 and 2040 No-Build scenarios. Complete discussion of the results of these analyses is provided in Section IV, where a comparison with corresponding design year Build alternatives are made.

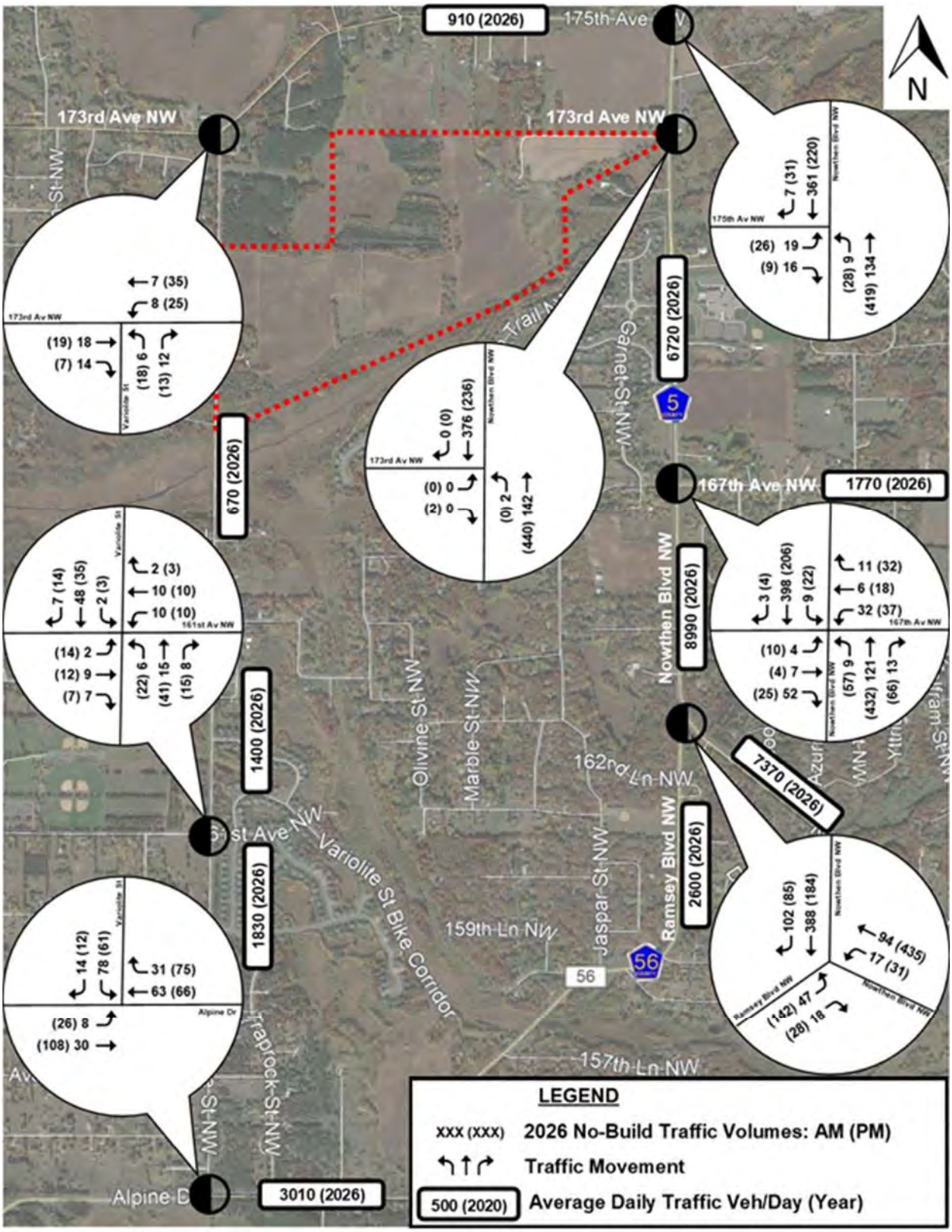

Figure 5 - 2026 No-Build Traffic Volumes

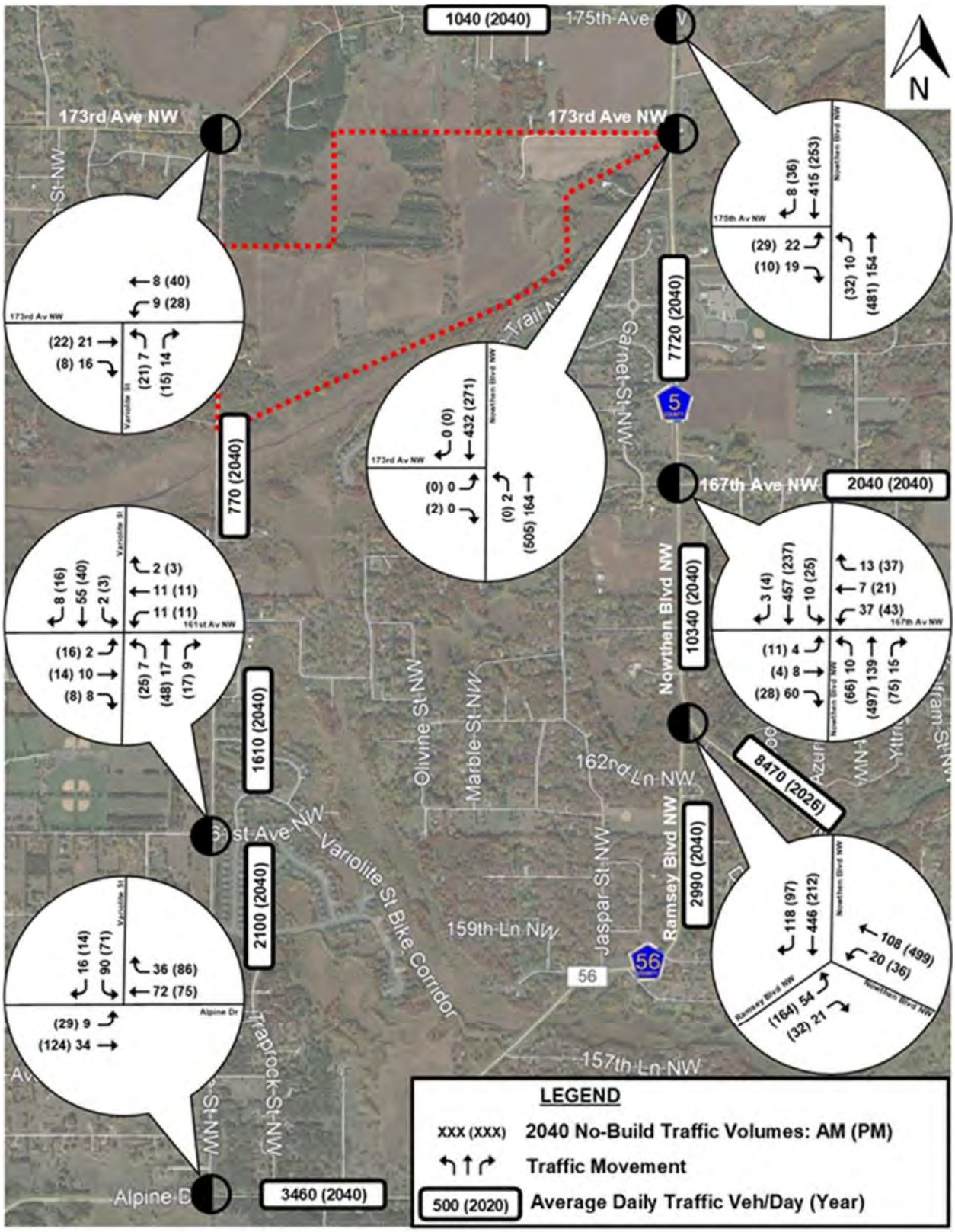

Figure 6 - 2040 No-Build Traffic Volumes

IV. BUILD ALTERNATIVE

A. Site-Generated Traffic

The number of vehicle trips generated by the 270 single family homes to be developed as part of the Sotarra - Trott Brook residential development were estimated for the weekday daily, and AM and PM traffic peak hours using the data and methodologies contained in the 10th Edition of Trip Generation, published by the Institute of Transportation Engineers (ITE). The proposed development will include single-family homes corresponding to ITE Land Use Code 210. Table 1 summarizes the trip generation estimates.

Table 1
Trip Generation

Land Use	Land Use Code	Size		Trips Generated				
				AM peak		PM Peak		Weekday ADT
				Enter	Exit	Enter	Exit	
Single Family Housing	210	270	Units	49	147	166	98	2593
Totals				**49**	**147**	**166**	**98**	**2593**
				196		**264**		

1. Per the data and methodologies in Trip Generation, 10th Edition, published by ITE.

B. Trip Distribution and Assignment

The distribution of site-generated traffic from and to the adjacent street system was based on existing traffic patterns. Figure 7, titled "Trip Distribution and Trip Assignment," depicts the distribution of the estimated site-generated traffic entering and exiting the study area roadway network, with 33 percent destined to/from the south on 8 percent on Variolite Street and Ramsey Boulevard, 15 percent destined to/from the north, 50 percent to/from the southeast via Nowthen Boulevard, and 2 percent to and from the west. Site-generated traffic was assigned to the network accordingly and is also illustrated on Figure 7.

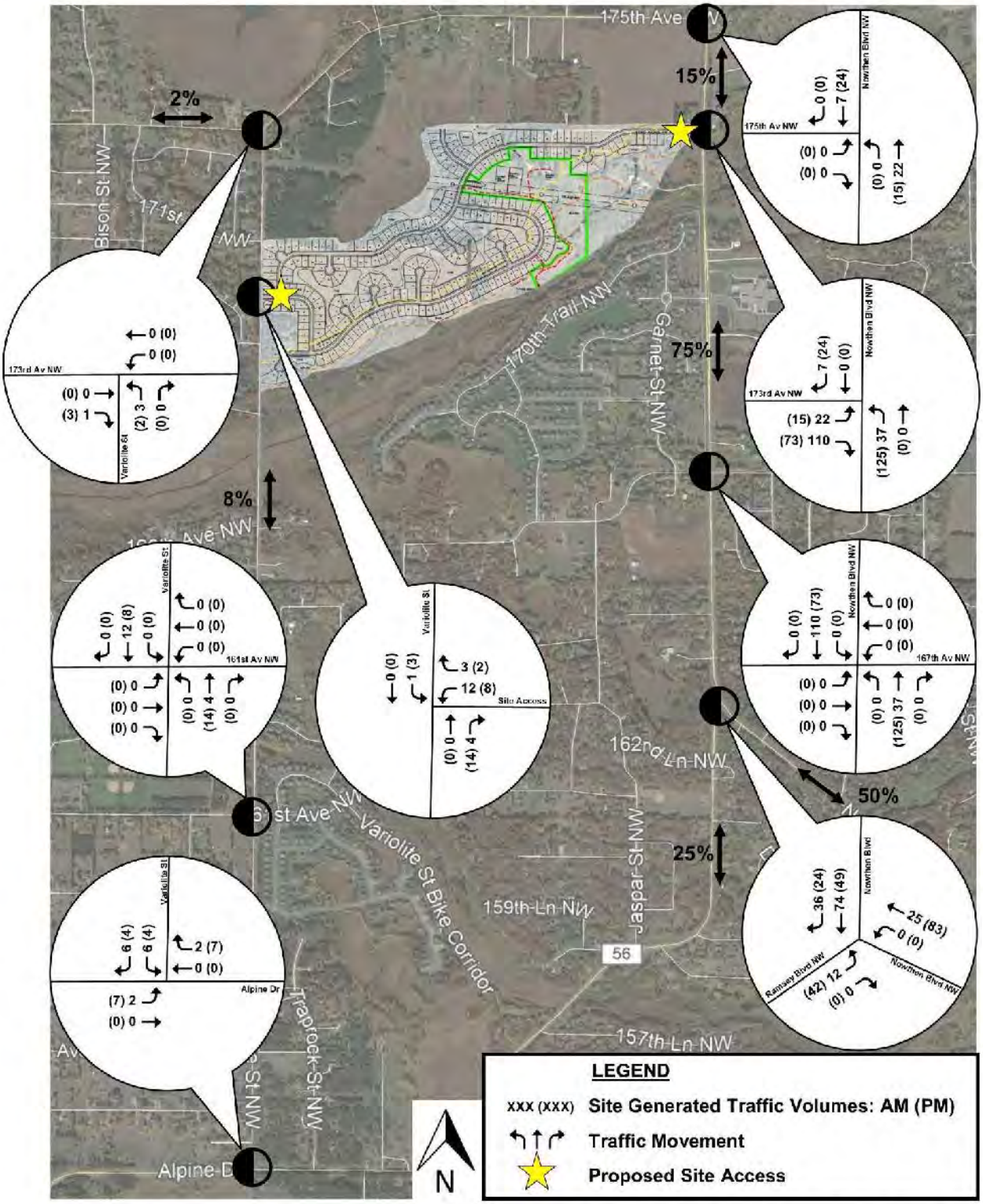

Figure 7 - Trip Assignment & Distribution

C. Build Traffic Volumes

When combined, the site-generated traffic volumes and No-Build scenario traffic volumes result in the Build scenario traffic volumes, shown on Figures 8 and 9 for the 2026 and 2040 design years, respectively.

D. Intersection Operational Analysis Description

The operating conditions of transportation facilities, such as roadways, traffic signals and stop-controlled intersections, are evaluated based on the relationship of the theoretical capacity of a facility to the actual traffic volume on that facility. Various factors affect capacity including travel speed, roadway geometry, grade, number of travel lanes, and intersection control. The current standards for evaluating capacity and operating conditions are contained in the 6th Edition of Highway Capacity Manual, published by the Transportation Research Board. The procedures describe operating conditions in terms of driver delay represented as a Level of Service (LOS). Operations are given letter designations with "A" representing the best operating conditions and "F" representing the worst. Generally, level of service "D" represents the threshold for acceptable overall intersection operating conditions during a peak hour. The Chart below summarizes the level of service and delay criteria for signalized and unsignalized intersections.

LOS Designation	Signalized Intersection Average Delay/Vehicle (Sec.)	Unsignalized Intersection Average Delay/Vehicle (Sec.)
A	≤ 10	≤ 10
B	> 10-20	> 10-15
C	> 20-35	> 15-25
D	> 35-55	> 25-35
E	> 55-80	> 35-50
F	> 80	> 50

A final fundamental component of operational analyses is a study of vehicular queuing, or the line of vehicles waiting to pass through an intersection. An intersection can operate with an acceptable Level of Service, but if queues from the intersection extend back to block entrances to turn lanes or accesses to adjacent land uses, unsafe operating conditions could result. In this report, the Industry Design Standard 95th percentile queue length is used. The 95th Percentile Queue Length refers to that length of vehicle queue that has only a five-percent probability of occurring during an analysis hour.

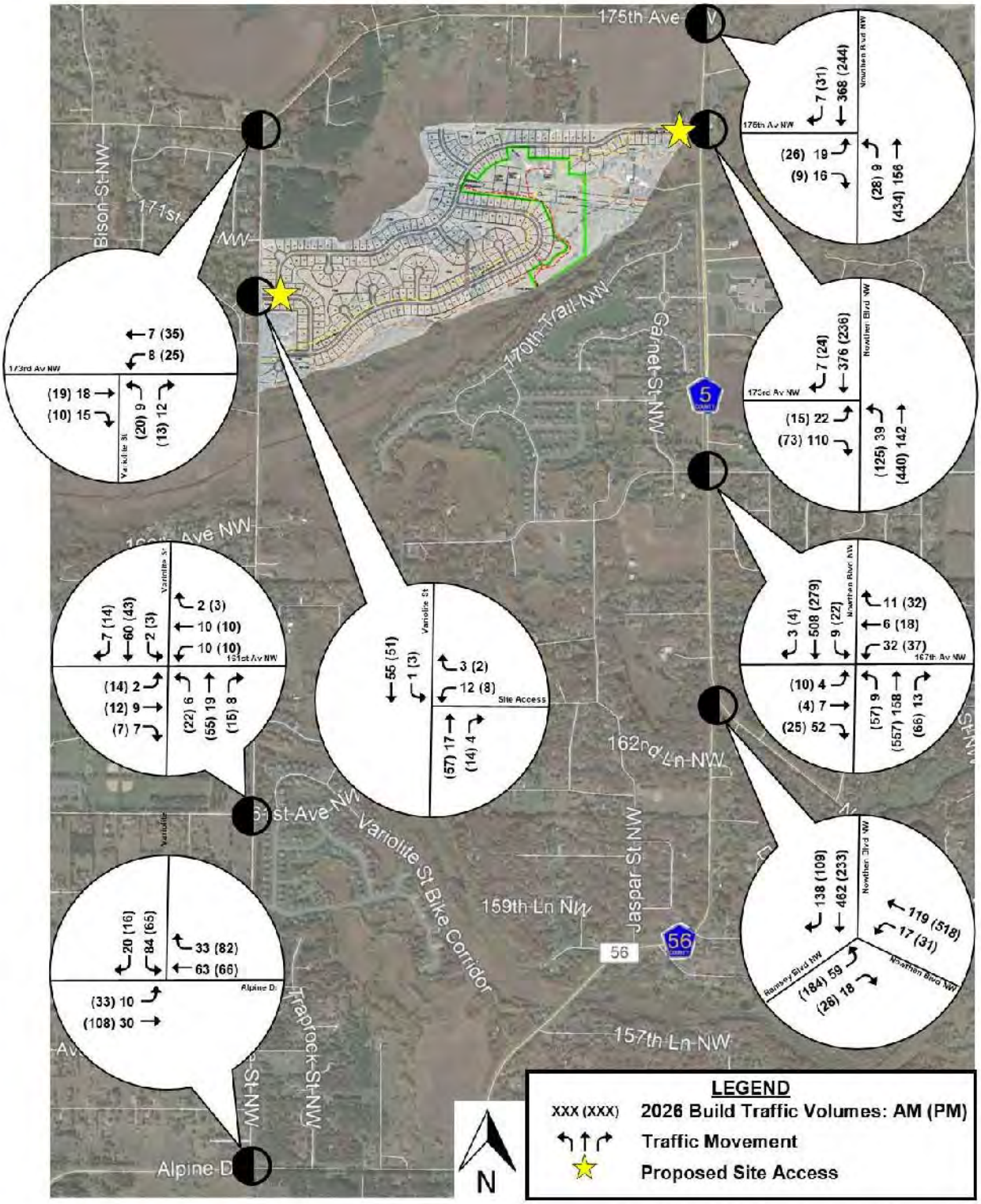

Figure 8– 2026 Build Traffic Volumes

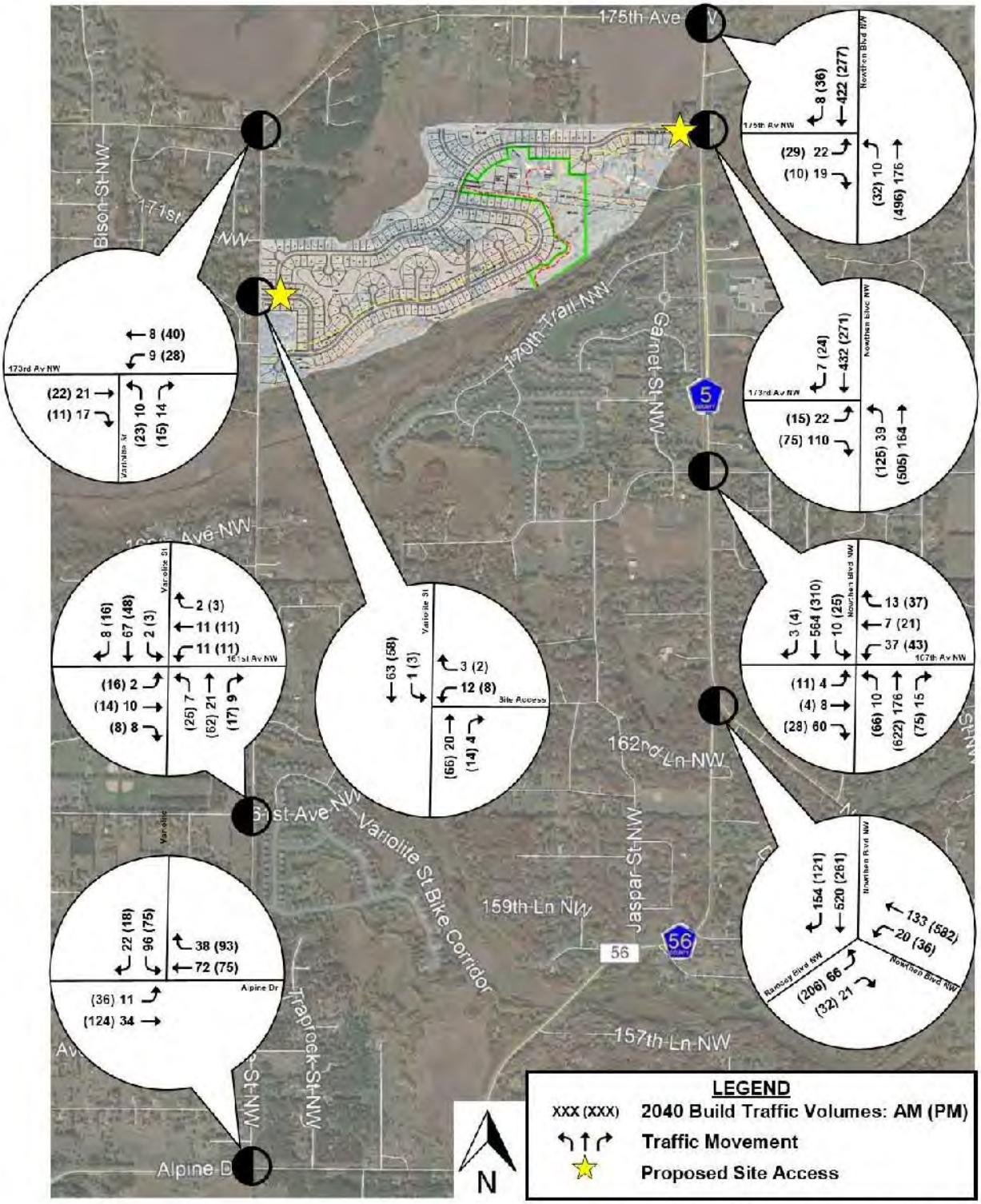

Figure 9– 2040 Build Traffic Volumes

E. Results of Analysis

This section contains the results of the intersection operational analyses based on Synchro/Simtraffic, 11th Edition, and provides recommendations, as necessary to mitigate the impacts. It is noted, the reported results are from the aggregate of 10 SimTraffic simulations which use a random number generator to seed the network with vehicles. These results reflect dynamic conditions and a more accurate than the results of the static analysis reported by Synchro, however, due to random number generator can sometimes show slightly better results on minor movements under higher traffic conditions when the intersections are operating at very good LOS. Table 2 summarize the results of the operational analyses for the 2026 No Build scenario (assumes 1.0 percent annual growth in traffic from existing conditions).

Table 2
2026 No-Build Operations

Intersection	Overall/Worst Movement LOS & Delay (sec)		Notes/95th Percentile Q
	AM Peak Hour	PM Peak Hour	
Variolite St NW & 173rd Ave NW/ 175th Ave NW	a (0.4)/a nbl (1.7)	a (1.2)/a nbl (6.1)	NB Q is 27 ft in AM; NB Q is 32 ft in PM
Variolite St NW & 161st Avenue NW	a (1.4)/a wbt (6.6)	a (1.7)/a wbt (5.7)	EB Q is 37 ft in AM; EB Q is 43 ft in PM
Variolite St NW & Alpine Dr NW	a (1.9)/a sbl (3.8)	a (1.5)/a sbl (3.9)	SB Q is 45 ft in AM; SB Q is 32 ft in PM
Nowthen Blvd NW & 175th Avenue NE	a (1.2)/a ebl (4.5)	a (2.3)/a ebl (5.6)	EBL Q is 43 ft in AM; EBL Q is 30 ft in PM
Nowthen Blvd NW & 173rd Avenue NW	a (0.8)/a nbt (1.1)	a (2.4)/a nbt (3.5)	NBL Q is 8 ft in AM; EBR Q is 14 ft in PM
Nowthen Blvd NW & 167th Avenue NW	a (3.4)/b ebl (11.1)	a (3.8)/b wbl (12.7)	EB Q is 30 ft in AM; WB Q is 64 ft in PM
Nowthen Blvd NW & Ramsey Blvd NW	a (3.9)/a ebl (8.1)	a (3.9)/b ebl (11.1)	EBL Q is 46 ft in AM; EBL Q is 71 ft in PM

1. Overall Level of Service reported from SimTraffic delay, first letter represents intersection LOS, while second letter represents worst LOS of individual approach. Upper case letters indicate signalized intersection, and lower-case letters indicate unsignalized intersection
2. 95th percentile queues are a result from an average of 10 SimTraffic simulations.

The results shown in Table 2 indicate all intersections and worst movements are expected to operate at acceptable LOS in 2026 without the proposed project. Further, the results indicate all intersections will experience short vehicle queues. No intersection modifications are suggested for the 2026 No-Build

condition. Table 3 summarizes the operational analyses results for the 2026 Build conditions. Note it is assumed the new intersection at Variolite Street NW and 170th Avenue NW will include a dedicated northbound right turn lane and a southbound left turn by-pass lane, and the 173rd Avenue NW approach to Nowthen Boulevard will include a dedicated right turn lane.

Table 3
2026 Build Operations

Intersection	Overall LOS & Delay (sec)		Notes/95th Percentile Q
	AM Peak Hour	PM Peak Hour	
Variolite St NW & 173rd Ave NW/ 175th Ave NW	a (0.7)/a nbl (2.7)	a (0.6)/a nbl (1.8)	NB Q is 31 ft in AM; NB Q is 33 ft in PM
Variolite St NW & Site Access (170th Ave NW)	a (0.6)/a wbl (3.8)	a (0.7)/ a wbl (4.0)	WB Q is 25 ft in AM; WB Q is 20 ft in PM
Variolite St NW & 161st Avenue NW	a (1.5)/a wbt (6.3)	a (1.5)/a ebt (7.0)	EB Q is 38 ft in AM; EB Q is 45 ft in PM
Variolite St NW & Alpine Dr NW	a (2.3)/a sbl (4.5)	a (1.6)/a sbl (4.3)	SB Q is 54 ft in AM; SB Q is 34 ft in PM
Nowthen Blvd NW & 175th Avenue NE	a (1.1)/a ebl (8.5)	a (2.5)/b ebl (11.2)	EBL Q is 26 ft in AM; EBL Q is 37 ft in PM
Nowthen Blvd NW & 173rd Avenue NW	a (2.4)/a ebl (9.3)	a (3.5)/b ebl (13.4)	EBL Q is 68 ft in AM; EBL Q is 48 ft in PM
Nowthen Blvd NW & 167th Avenue NW	a (3.3)/a wb (9.8)	a (4.1)/c wb (21.1)	EB Q is 40 ft in AM; WB Q is 53 feet in PM
Nowthen Blvd NW & Ramsey Blvd NW	a (4.1)/a ebl (9.9)	a (5.2)/c ebl (17.2)	EBL Q is 38 ft in AM; EBL Q is 103 ft in PM

1. Overall Level of Service reported from SimTraffic delay, first letter represents intersection LOS, while second letter represents worst LOS of individual approach. Upper case letters indicate signalized intersection, and lower-case letters indicate unsignalized intersection.
2. 95th percentile queues are a result from an average of 10 SimTraffic simulations.

The results shown in Table 3 indicate all intersections and worst movements are expected to operate at acceptable LOS in 2026 with the proposed project. Further, the results indicate all intersections will experience short vehicle queues. (Again, when the operations of the intersection and critical movements are at LOS A, the random number generator can sometimes show slightly better delay or queuing results on minor movements even with higher traffic conditions.)

F. 2040 Operations

The long-range planning horizon year is 2040, as mentioned in the No-Build section. The results of the analysis of the 2040 No-Build traffic conditions, which continue to reflect a 1.0 percent annual growth rate,

assume the roadways surrounding the site have the current configuration. Table 4 summarizes the 2040 No-Build operations at the study area intersections.

Table 4
2040 No-Build Operations

Intersection	Overall/Worst Movement LOS & Delay (sec)		Notes/95th Percentile Q
	AM Peak Hour	PM Peak Hour	
Variolite St NW & 173rd Ave NW/ 175th Ave NW	a (0.7)/a nbl (2.8)	a (0.8)/a nbl (3.4)	NB Q is 28 ft in AM; NB Q is 40 ft in PM
Variolite St NW & 161st Avenue NW	a (1.8)/a eb (5.8)	a (2.2)/a wb (6.6)	EB Q is 41 ft in AM; EB Q is 45 ft in PM
Variolite St NW & Alpine Dr NW	a (2.0)/a sbl (3.9)	a (1.8)/a sbl (5.0)	SB Q is 45 ft in AM; SB Q is 43 ft in PM
Nowthen Blvd NW & 175th Avenue NE	a (1.2)/a ebl (4.8)	a (2.4)/a ebl (7.6)	EBL Q is 33 ft in AM; EBL Q is 28 ft in PM
Nowthen Blvd NW & 173rd Avenue NW	a (0.8)/a nbt (0.9)	a (2.4)/a nbt (3.3)	NBL Q is 8 ft in AM; EBR Q is 9 ft in PM
Nowthen Blvd NW & 167th Avenue NW	a (3.4)/b ebl (12.2)	a (3.8)/b wbl (15.0)	EB Q is 32 ft in AM; WB Q is 62 ft in PM
Nowthen Blvd NW & Ramsey Blvd NW	a (3.9)/b ebl (10.8)	a (4.7)/c ebl (15.4)	EBL Q is 49 ft in AM; EBL Q is 80 ft in PM

3.
1. Overall Level of Service reported from SimTraffic delay, first letter represents intersection LOS, while second letter represents worst LOS of individual approach. Upper case letters indicate signalized intersection, and lower-case letters indicate unsignalized intersection
2. 95th percentile queues are a result from an average of 10 SimTraffic simulations.

The results shown in Table 4 indicate all intersections and worst movements are expected to operate at acceptable LOS in 2040 without the proposed project. Further, the results indicate all intersections will experience short vehicle queues. (Again, when the operations of the intersection and critical movements are at LOS A, the random number generator can sometimes result in slightly better delay or queuing results on minor movements even with higher traffic conditions.) It is note, the left turning volume from Ramsey Blvd to Nowthen Blvd is great enough to consider a change in traffic control in 2040 at this intersection, however, the forecast operations and queues are acceptable. It is suggested this intersection be monitored as volumes in the area grow to determine if safety or traffic control changes are needed. Table 5 summarizes the results of the 2040 Build traffic operational analysis, assuming no improvements or mitigation.

Table 5
2040 Build Operations

Intersection	Overall LOS & Delay (sec)		Notes/95th Percentile Q
	AM Peak Hour	PM Peak Hour	
Variolite St NW & 173rd Ave NW/ 175th Ave NW	a (0.5)/a nbl (2.3)	a (0.4)/a nbl (2.3)	NB Q is 30 ft in AM; NB Q is 31 ft in PM
Variolite St NW & Site Access (170th Ave NW)	a (0.9)/a wbl (3.9)	a (0.8)/ a wbl (4.7)	WB Q is 30 ft in AM; WB Q is 21 ft in PM
Variolite St NW & 161st Avenue NW	a (2.1)/a eb (5.8)	a (1.8)/a wb (6.4)	EB Q is 43 ft in AM; EB Q is 46 ft in PM
Variolite St NW & Alpine Dr NW	a (2.2)/a sbl (4.2)	a (2.0)/a sbl (5.6)	SB Q is 46 ft in AM; SB Q is 44 ft in PM
Nowthen Blvd NW & 175th Avenue NE	a (1.3)/a ebl (6.2)	a (2.8)/b ebl (11.9)	EBL Q is 26 ft in AM; EBL Q is 45 ft in PM
Nowthen Blvd NW & 173rd Avenue NW	a (2.2)/a ebl (8.9)	a (3.8)/b ebl (13.6)	EBL Q is 56 ft in AM; EB Q is 44 ft in PM
Nowthen Blvd NW & 167th Avenue NW	a (3.8)/a wb (9.4)	a (4.9)/c wb (20.3)	EB Q is 40 ft in AM; WB Q is 70 ft in PM
Nowthen Blvd NW & Ramsey Blvd NW	a (5.0)/c ebl (18.1)	a (8.9)/e ebl (36.9)	EBL Q is 38 ft in AM; EBL Q is 187 feet in PM

3.
1. Overall Level of Service reported from SimTraffic delay, first letter represents intersection LOS, while second letter represents worst LOS of individual approach. Upper case letters indicate signalized intersection, and lower-case letters indicate unsignalized intersection.
2. 95th percentile queues are a result from an average of 10 SimTraffic simulations.

The results shown in Table 5 indicate all intersections are expected to operate at acceptable overall LOS in 2040 with the proposed project. Further, the results indicate all intersections will experience short to moderate vehicle queues, which are typical for peak hour conditions. (Again, when the operations of the intersection and critical movements are at LOS A, the random number generator can sometimes result in slightly better delay or queuing results on minor movements even with higher traffic conditions.) However, the eastbound approach to Nowthen Boulevard NW from Ramsey in the PM Peak hour will be at capacity, and changes to the traffic control should be considered. Preliminary review of traffic signal and roundabout warrants suggest this intersection will satisfy peak hour warrant in the 2040 planning horizon year. Operational analysis of the potential traffic control change options indicates all movements will operate at LOS B or better, with short queues. It is noted if traffic control changes occur modifications to the intersection geometry will be needed. Review of minor modifications such as converting the northbound by-pass lane to a dedicated left turn lane will improve safety and show a slight reduction in northbound left

turn queues but do not address the critical eastbound movement. Crash data has been provided by Anoka County and shows the intersection has a crash rate that is 0.56 per million entering vehicles which is greater than the statewide average of 0.26 for similar intersections. It is suggested that this intersection be monitored to determine if safety or traffic control changes may be needed. No other intersection modifications are suggested for the 2040 Build condition to improve operations.

V. SUMMARY AND SUGGESTIONS

The preceding analysis has evaluated the potential traffic impacts of the proposed development of the Sotarra - Trott Brook residential project, on the operations of the study area intersections. The site is located adjacent to the west side of Nowthen Boulevard NW and east side of Variolite Street NW just north of Trott Brook and south of 173rd Avenue NW in Ramsey, Minnesota.

Two design years were considered in this study, 2026 to correspond to the year after build-out and 2040 to remain consistent with the long range planning horizon. For both design years a No-Build and Build scenario, was analyzed and compared to assess the development's impact, and the area's future infrastructure needs. Development of the Sotarra - Trott Brook residential project on the site by 2026 is expected to result in approximately 2,593 new vehicle trips on the study area roadway network per average weekday. Peak hour trips generated by the development are estimated at 196 during the AM peak hour and 264 during the PM peak hour.

The site access will include the extension 173rd Avenue NW westward from Nowthen Boulevard NW into the site and the construction of a new intersection on Variolite Street NW at approximately 170th Avenue NW. It is assumed the new 170th Avenue NW intersection with Variolite Street NW will include a dedicated northbound right turn lane and a southbound left turn by-pass lane on Variolite Street NW.

Growth in background traffic at a rate of 1.0 percent per year was accounted for in the analysis. Results of the operational analyses in the 2026 and 2040 No-Build and 2026 and 2040 Build scenarios indicate all the intersections will operate at acceptable levels of service with typical Peak Hour short to moderate vehicle queues. It is recommended that the new intersection at 170th Avenue NW and Variolite Street include a northbound right turn lane and a southbound left turn by-pass lane, and it is recommended the 173rd Avenue NW approach to Nowthen Boulevard include a dedicated right turn lane. No other improvements to the

roadways or intersections within the study area are required. However, it is suggested the intersection of Ramsey Boulevard NW and Nowthen Boulevard NW be monitored for to determine if future safety and/or traffic control changes are warranted by 2040.