EBERSOLE AVENUE PROJECT

SSTS
S² TRAFFIC SOLUTIONS

TRAFFIC IMPACT STUDY

in

Delano, MN

September 7, 2023

EBERSOLE AVENUE PROJECT
DELANO, MN
TRAFFIC IMPACT STUDY
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Prepared For:

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PROJECT NO. 2022_026

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:

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Table of Contents

List of Tables

List of Figures

TECHNICAL APPENDICES (Available Upon Request)

A. Traffic Counts
B. Trip Generation Calculations
C. Results of the Operational Analysis
D. Crash Data

I. Introduction

Capstone Homes is proposing to develop the Ebersole Avenue Project on approximately 88 acres in Delano, MN as a single family residential project (referred to as the Proposed Project here after). The Proposed Project will develop 194 single family homes on a parcel located approximately 850 feet north of Trunk Highway 12 (TH 12). The site includes two parcels, the southern parcel is currently bordered on west by Ebersole Ave SE on the north by 65th Ave SE, and northern parcel is bordered on south by 65th Ave SE, and is offset to the northwest from the southern parcel. The Proposed Project will realign and extend Ebersole Ave SE through the two parcels, and will expand the Ebersole Ave SE approach to TH 12 to include a dedicated right turn lane and a share through and left turn lane. Also, the City of Delano Long Range Plan includes the extension of 65th Ave SE to the west to intersect TH 12 as demands warrants. The site location is illustrated on Figure 1, Vicinity Map.

Access to the site is proposed via the following:

- Access through the site (both the southern and northern parcels) via realigned Ebersole Ave SE
- Access to the southern parcel from 65th Ave SE located east of Ebersole Ave SE
- Access to the northern parcel from 65th Ave SE located west of Ebersole Ave SE

The site layout and access locations are illustrated on the Concept Site Plan, Figure 2. It is noted that 65th Ave SE does not currently connect with TH 12. This study reviews a possible future connection and associated traffic impact changes. The purpose of this study is to evaluate the impact of traffic generated by the Proposed Project on the operations and safety of the adjacent roadway network and will support transportation section of the Environmental Assessment Worksheet (EAW) completed for the subject development. The study focuses on the roads and intersections that provide direct and indirect access to/from the site. This study details the existing and future roadway conditions at studied intersections and access points 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. The traffic operational review considers conditions with and without the Proposed Project during the year after completion and full occupation of the development, 2028, and for the Long-Range Planning Horizon, 2045.

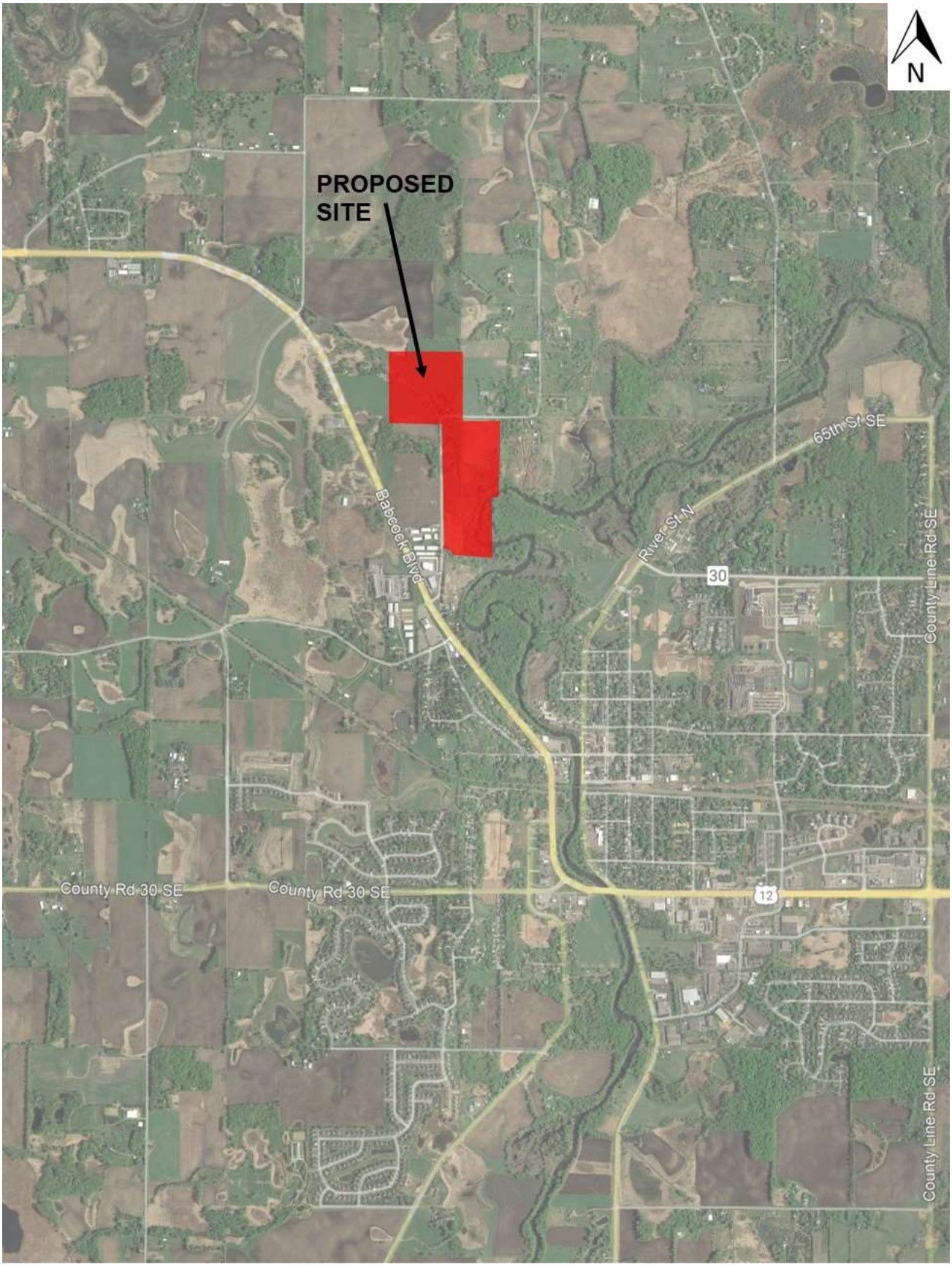


Figure 1 - Vicinity Map

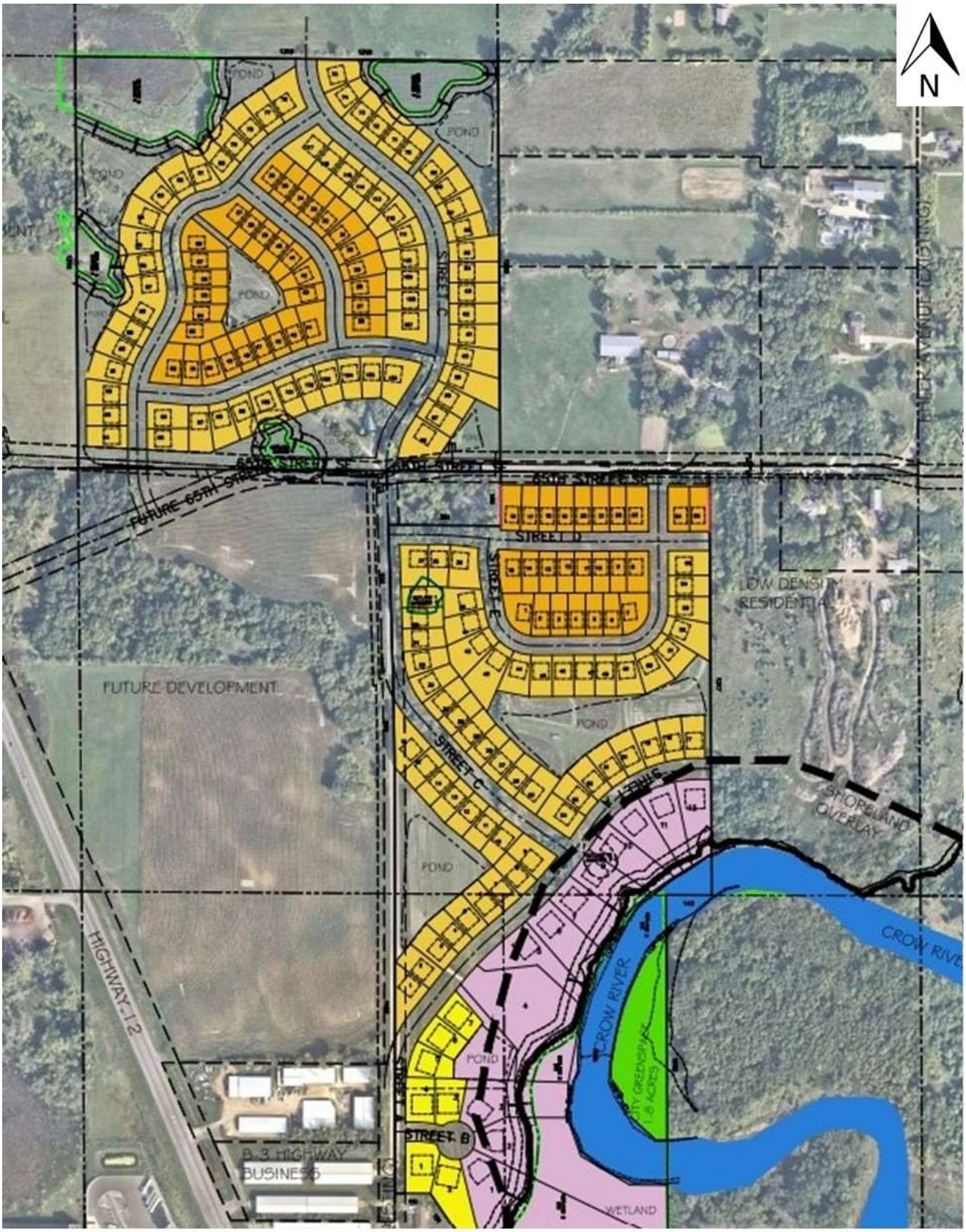


Figure 2 - Conceptual Site Plan (From Others)

II. Existing Conditions

A. Study Area Intersections

Study area intersections were defined with input from the City of Delano and includes the intersections listed below and the site accesses.

- Ebersole Ave SE & TH 12
- Bridge Ave E & TH 12
- Bridge Ave E & River St N (CSAH 30)
- Woodland Rd (CSAH 30) & TH 12

B. Roadway Descriptions

The existing conditions of the study area roadways are noted in Table 1. Additionally, Figure 3 shows the existing lane geometry and traffic control at the study intersections.

Table 1. Study Roadway Characteristics

Roadway	Functional Class	Typical Section	Posted Speed	AADT*
Trunk Highway 12	Minor Arterial	3-Lane Undivided Urban (60 - foot section)	50 mph at site; 40mph SE of site	Near Site 12,300, SE of Woodland 19,100 (2018)*
Bridge Ave E	Major Collector	2-Lane Undivided Urban	30 mph	6700 (2016)*
River St N (CSAH 30)	Major Collector	2-Lane Undivided Urban	30 mph	4850 (2016)*
Woodland Rd (CSAH 30)	Major Collector	3-Lane Undivided Urban (55 - foot section)	35 mph	12,000 (2022)**
Ebersole/65th	Local Street	2-Lane Undivided Urban	30 mph	200 (2022)**

AADT Sources: *From MnDOT data; **From 2022 turning movement PM Count assuming PM counts are ~10% of ADT

C. Data Collection and Existing Traffic Volumes

AM and PM peak hour turning movement counts were conducted at all study area intersections on Thursday May 19th, 2022. The AM peak traffic hour was found to generally occur from 7:15 – 8:15 AM and the PM peak traffic hour was found to occur from 4:15 - 5:15 PM (See **Figure 4**, Existing Traffic Volumes). It is noted the intersection of Bridge Ave E and River St N was added after the original counts were conducted in June of 2022 after school was out for summer. The May counts at Bridge Ave E and TH 12 include the school traffic and were used as a basis for increasing the Bridge Ave E and River St N volume.

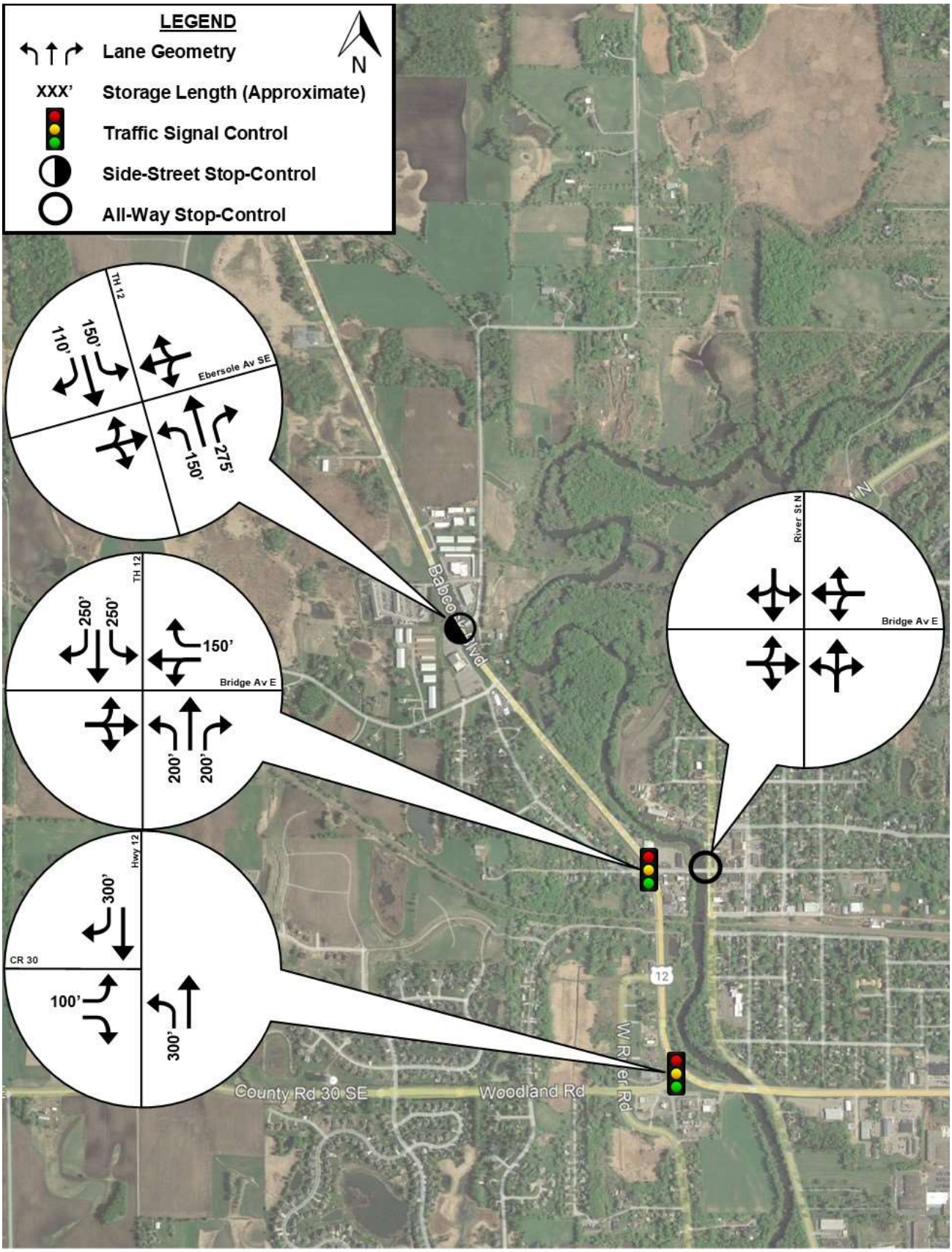


Figure 3 - Existing Geometrics

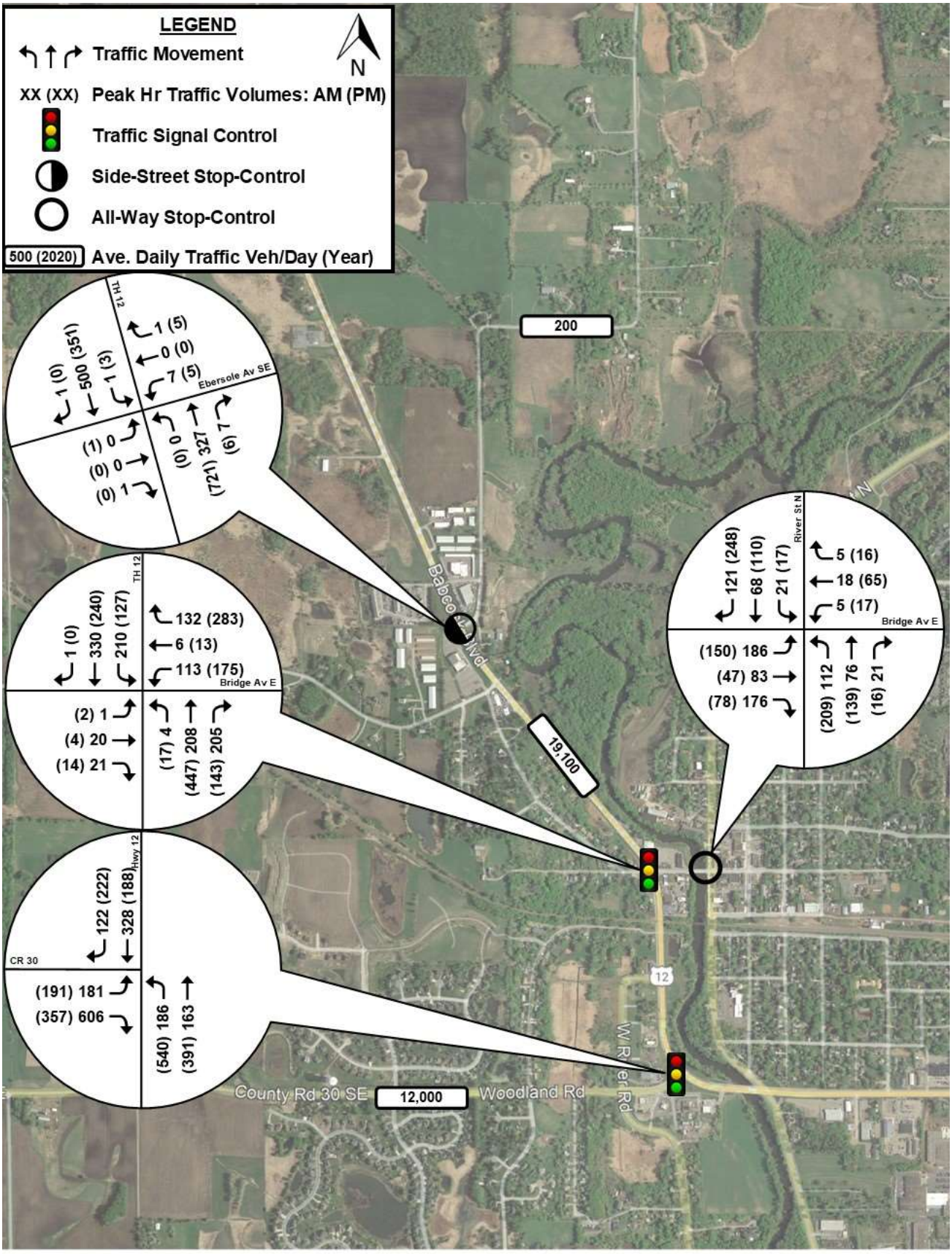


Figure 4 - Existing Traffic Volumes

III. No-Build Alternative

To quantify the impacts of a development on the surrounding roadway system, it is necessary to first forecast and analyze traffic conditions that would be present on the roadway system without the inclusion of the Proposed Project. 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 2028 and 2045, the current planning year horizon.

A. Background Growth

The anticipated construction completion date for the Proposed Project is 2027, thus year 2028 was selected for analysis so as to compare traffic conditions after initial traffic patterns to and from the Proposed Project have become established. Also, the planning horizon year 2045 conditions were forecast. To determine the future traffic conditions two methods were considered: A review of the City of Delano census data regarding population growth, and a review of MnDOT's historical daily traffic counts. The review of the census data suggests the population will grow at 1.5 percent per year, while the MnDOT data suggests traffic will increase by 1.7 percent per year. To present a worst case condition this report utilizes the 1.7 percent annual growth rate to estimate background No-Build) conditions in 2028 and 2045. The 1.7 percent annual growth rate in background traffic is inclusive of other developments that may occur in Delano by 2045. Figure 5 and 6 illustrated the 2028 and 2045 No-Build traffic conditions with this growth rates applied to the existing volumes, respectively.

B. Anticipated Improvements for No-Build Conditions

At this time there are no planned improvements by the City or MnDOT to the area roadways. That said, the City of Delano long range plans discuss the extension of 65th Ave SE to connect with TH 12 by the year 2045. Also, MnDOT with input from the City of Delano will be conducting a corridor study for TH 12 in the fall of 2023 which may identify future roadway projects.

C. Results of Analysis

The study area intersections identified in Section II were analyzed for the 2028 and 2045 No-Build scenarios. Complete discussion of the results of these analyses is provided in Section V – Operational Analysis, where a comparison with corresponding design year Build alternatives is made.

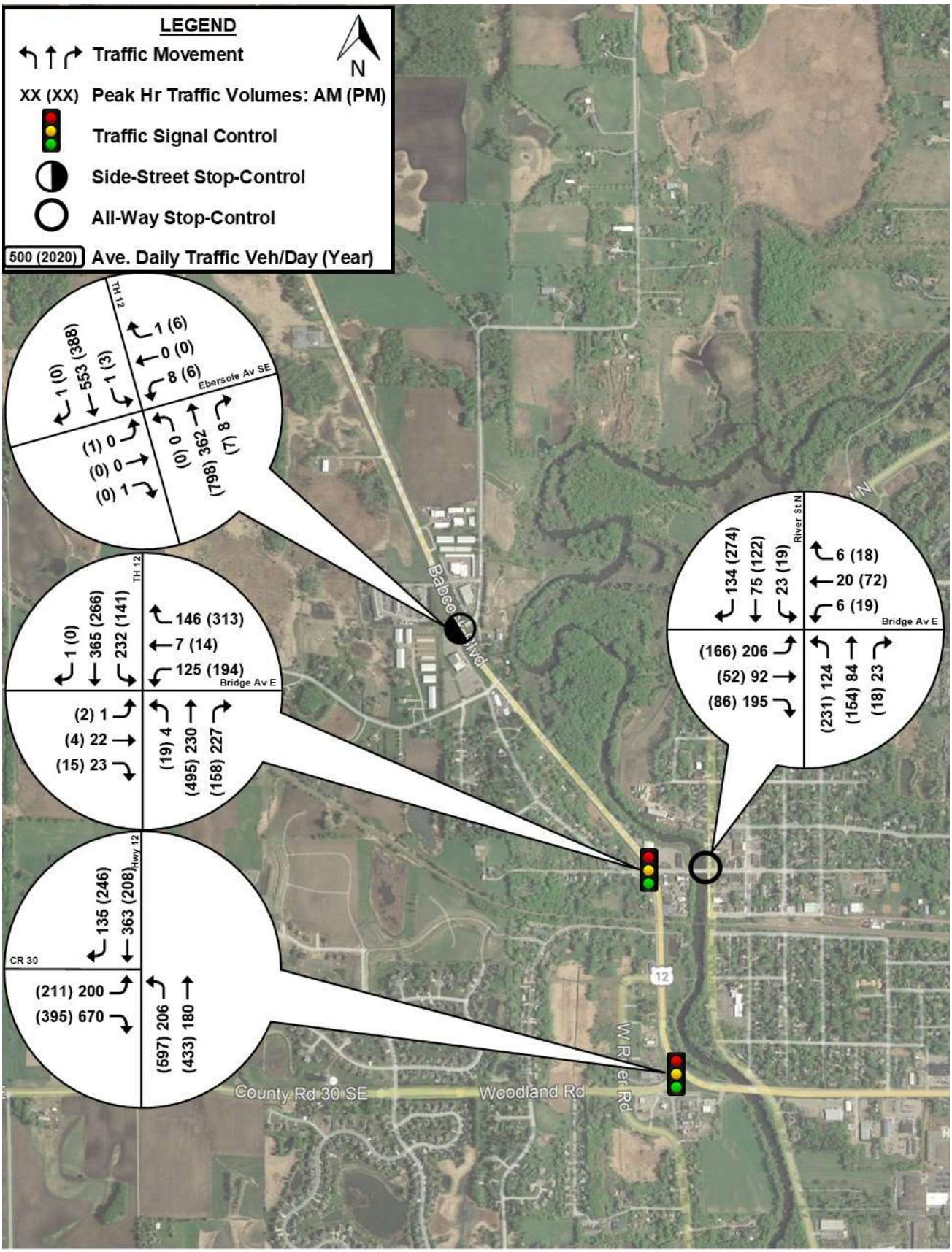


Figure 5 - 2028 No-Build Traffic Volumes

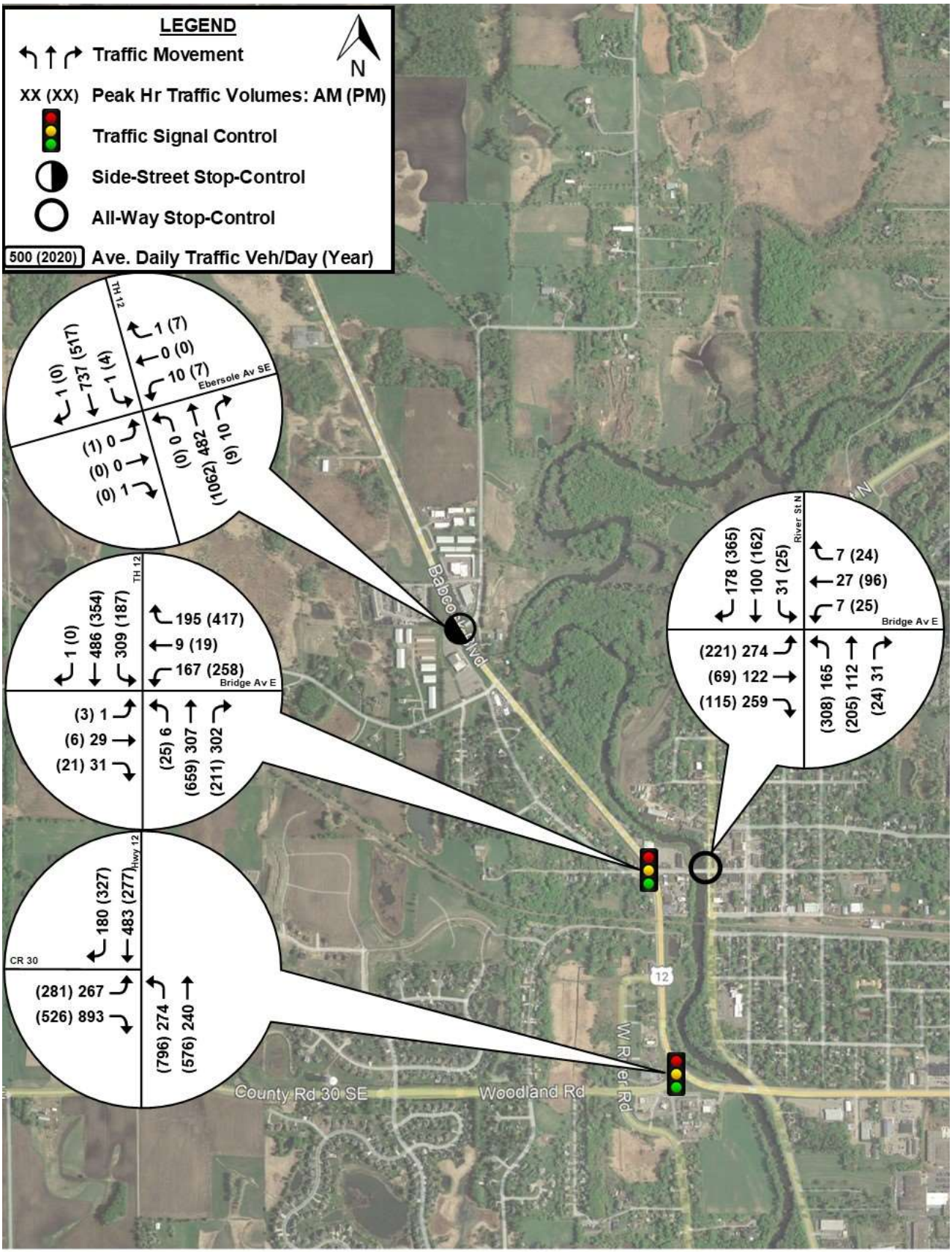


Figure 6 - 2045 No-Build Traffic Volumes

IV. Build Alternative

A. Site-Generated Traffic

The Proposed Project will include 194 single family homes. The volume of vehicle trips generated by the Proposed Project has been estimated for the weekday AM and PM peak hours and on a daily basis using the data methodology described in the Institute of Transportation Engineers' ***Trip Generation Manual***[1]**,** 11 Edition. ITE's Land Use Code corresponding to Single Family Homes is Code 210 and Table 2 summarizes the trip generation estimate for the new uses.

Table 2 - Trip Generation

Land Use	Type	Block No.	Land Use Code	Size	Trips Generated: AM peak Enter	AM peak Exit	PM Peak Enter	PM Peak Exit	Weekday ADT
Single Family Housing	Residential	1	210	194 units	34	102	117	69	1,856
Total					**34**	**102**	**117**	**69**	**1,856**
					136		**186**		

As shown in Table 2, the Proposed Project will generate 136 trips (34 entering and 102 exiting) during the morning traffic peak hour, 186 trips (117 entering and 69 exiting) during the evening traffic peak hour and 1,856 daily trips.

B. Trip Distribution and Assignment

As mentioned earlier, the Proposed Project will realign Ebersole Ave SE through the site, and the Proposed Project will access 65th Ave SE. The forecast traffic for the Proposed Project has been assigned to the roadway network according to the existing traffic patterns in the area and according to anticipated travel times. It is noted, the travel times surveyed during the AM and PM traffic peak times using Apple Maps and Google Maps indicated traffic destined to the east will utilize TH 12 versus TH 55 as the trip length is 4-6 minutes shorter on average. That said, to provide a very conservative estimate, 10 percent of the site traffic is assigned to travel north on Ehler Ave SE to reach TH 55. Figure 7 illustrates the general trip distribution, and the trip assignment at the accesses and study intersections. When 65th Ave SE is extended to intercept with TH 12 traffic patterns from this development will change. Figure 7a illustrates the trip assignment with the addition of the new extension of 65th Ave SE to the west to intersect TH 12. It is noted, the trip assignment for the 65th Ave SE and TH 12 intersection versus the Ebersole Ave SE and TH 12 intersection is based on proximity and may vary over time as travel times favor one intersection versus the other.

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 Figure 8, 8a and 9, which illustrates the 2028 Build, 2028 Build

[1] Trip Generation Manual, Institute of Transportation Engineers (ITE), 11th Edition

if 65th Ave SE extension occurs by then, and 2045 Build (with the 65th Ave SE extension) conditions, respectively. These figures reflect the combination of the 2028 and 2045 No-Build traffic on Figures 5 and 6 with the trip assignments on Figure 7 and 7a. It is noted the intersection traffic at Farmington and 50th Ave SE will increase by 3 southbound and 10 northbound trips during the AM Peak (or approximately 1 trip every 4 minutes), 12 southbound and 7 northbound trips during PM Peak (or approximately 1 trip every three minutes), and 190 daily trips. This level of traffic will not result in a change in operations at the intersection.

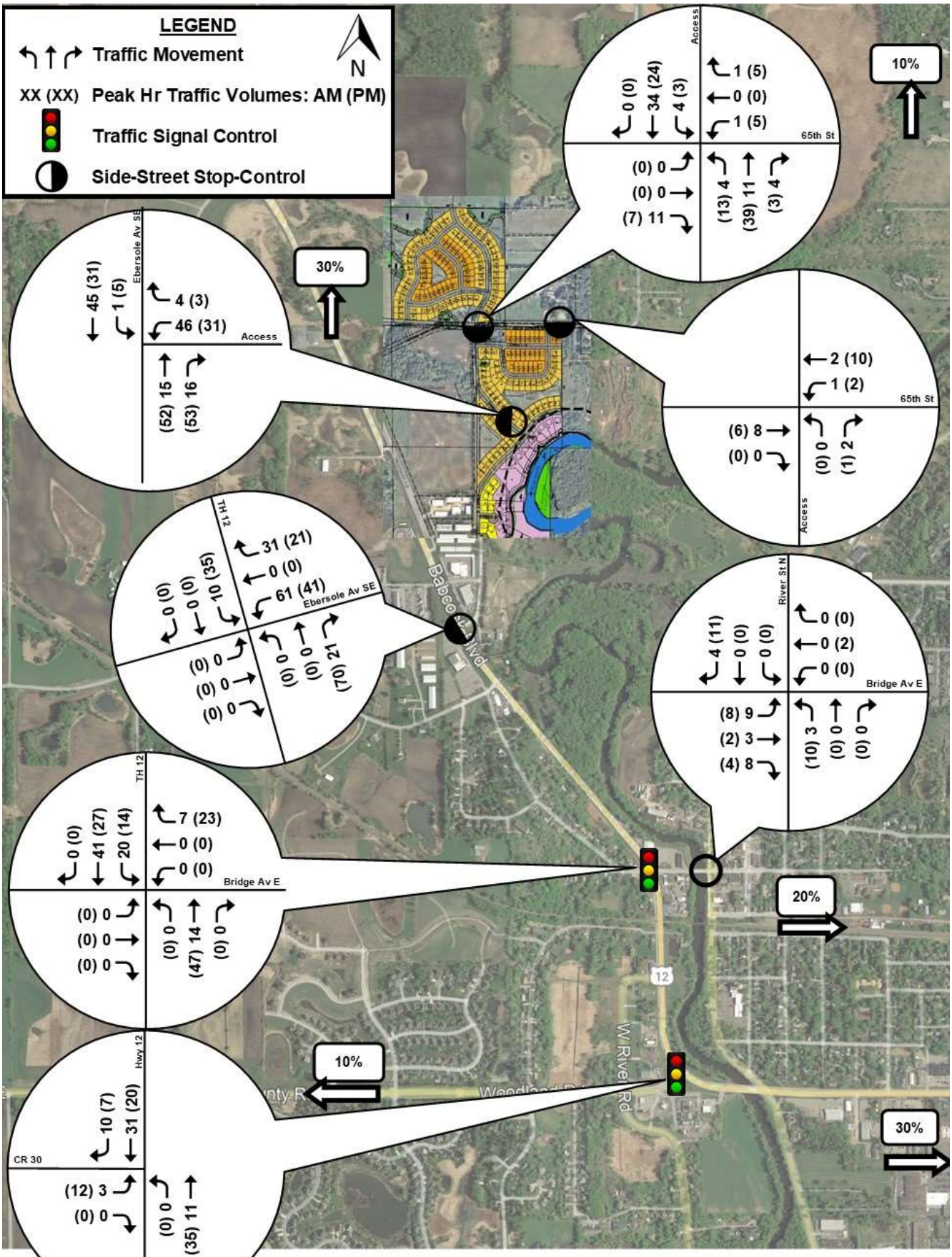


Figure 7 - Trip Assignment

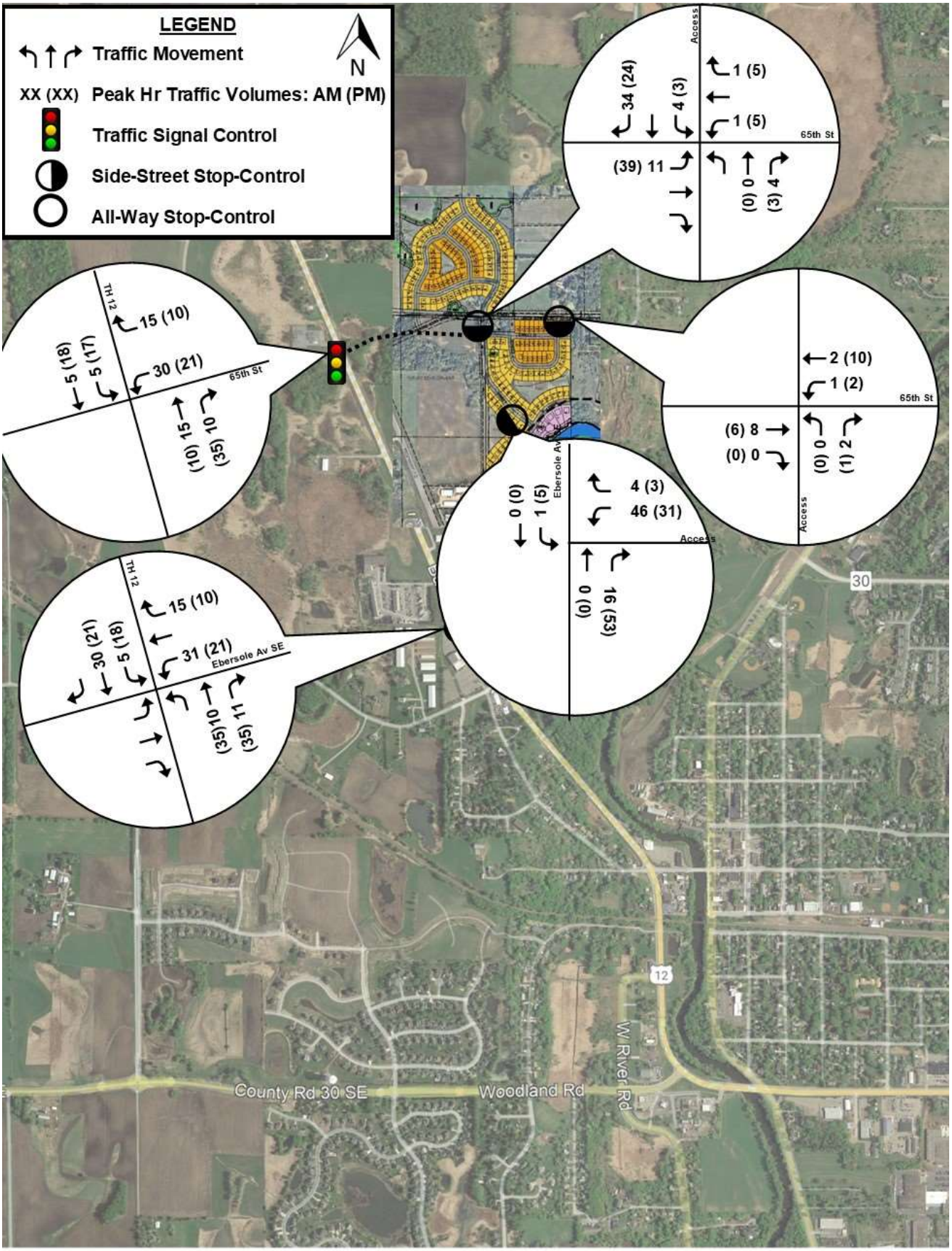


Figure 7a - 2045 Trip Assignment Change

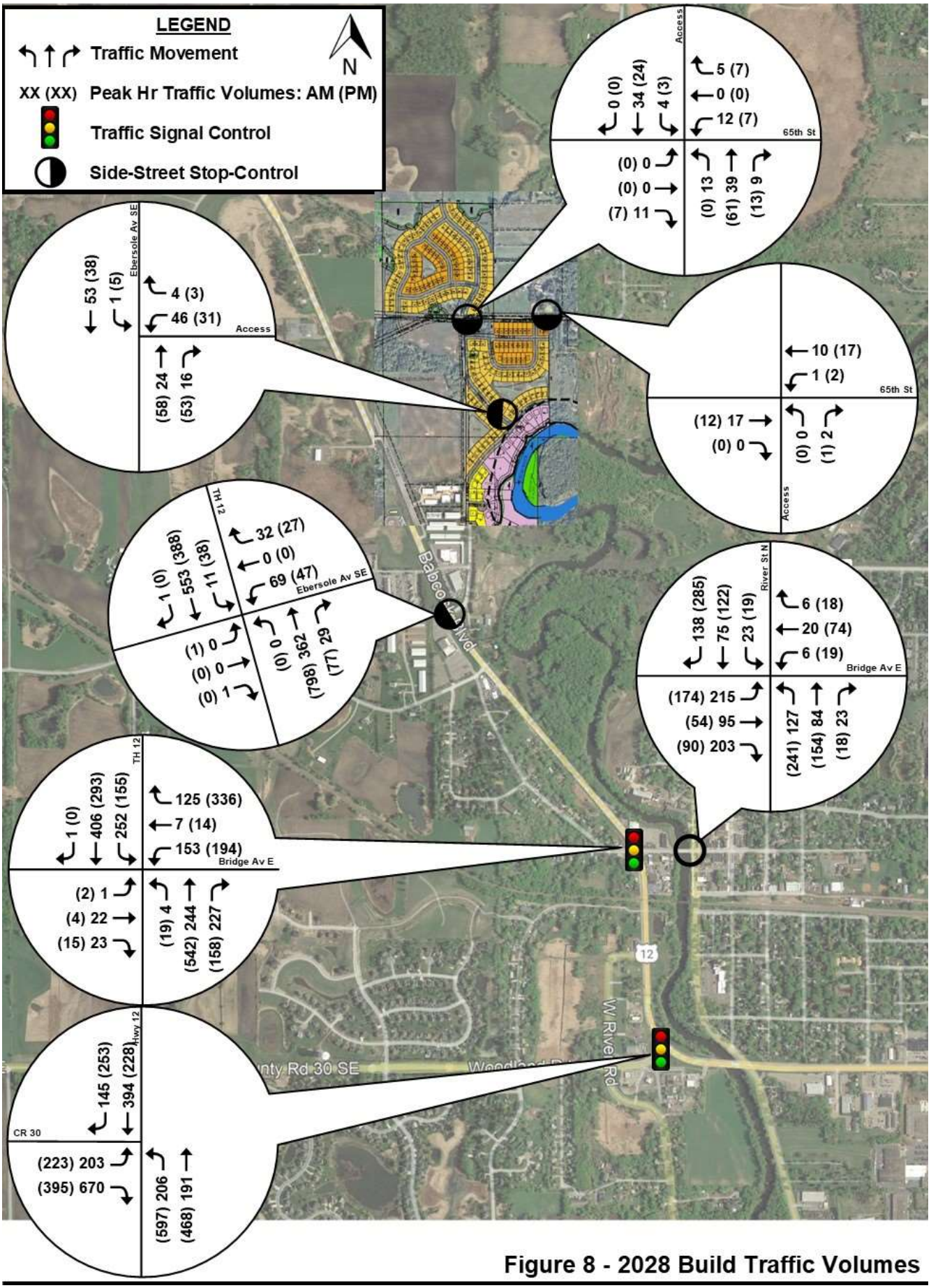


Figure 8 - 2028 Build Traffic Volumes

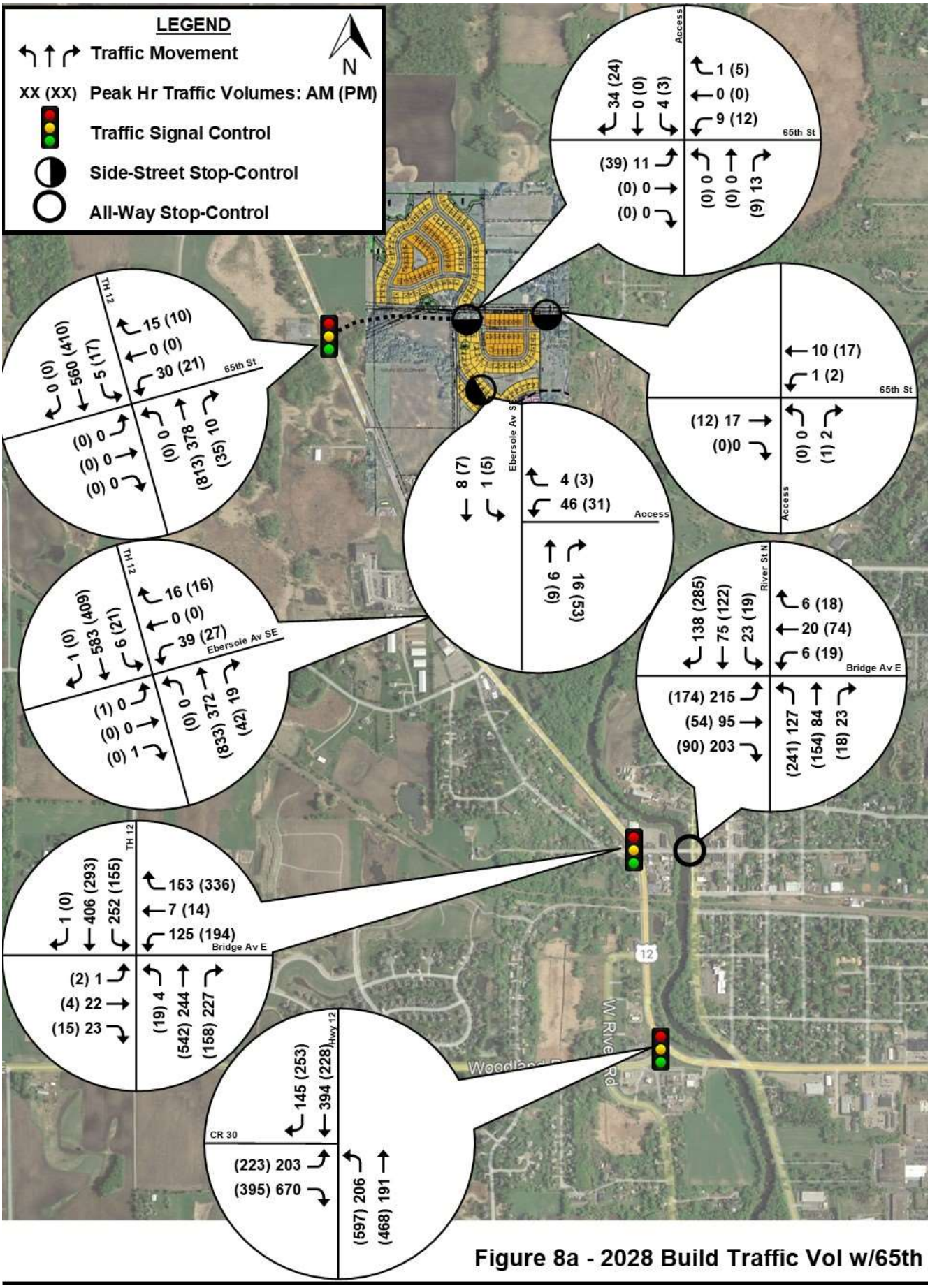


Figure 8a - 2028 Build Traffic Vol w/65th

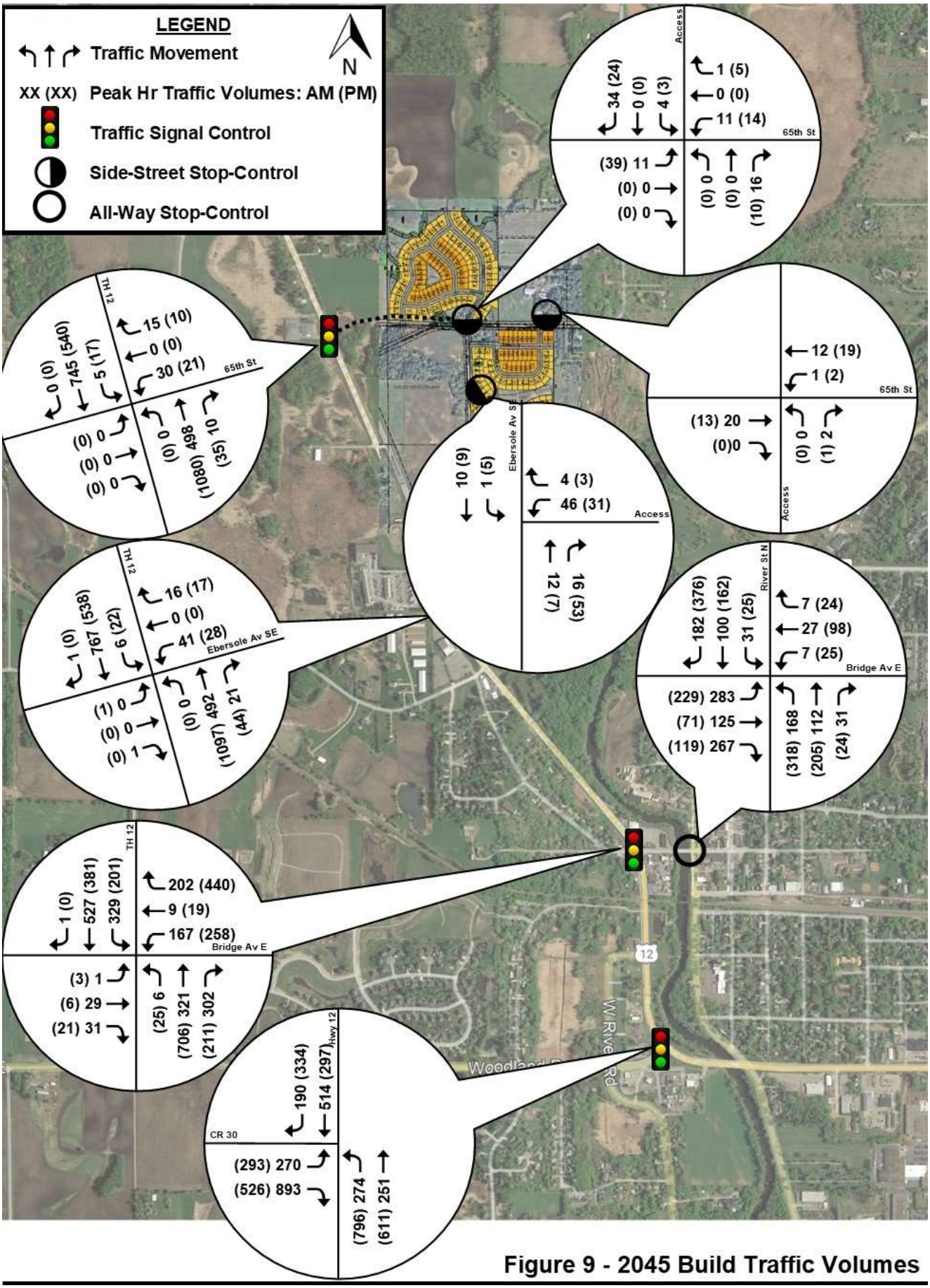
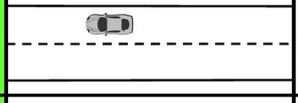
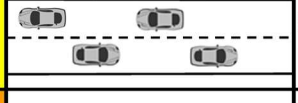
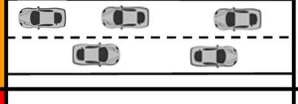
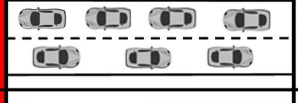
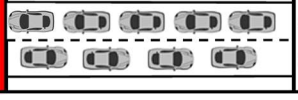


Figure 9 - 2045 Build Traffic Volumes

V. Operational Analysis

A. Intersection Operational Description

The operating conditions of transportation facilities, such as roadways, traffic signals, roundabouts 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 **Highway Capacity Manual**[2]. 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 following chart summarizes the level of service and delay criteria for signalized and unsignalized intersections.

Level of Service		Description	Delay (sec)	
			Signalized	Unsignalized/ Roundabout
A		Primarily free-flow operation.	0-10	0-10
B		Reasonably unimpeded operation.	>10-20	>10-15
C		Stable operation. The ability to maneuver is more restricted than LOS B.	>20-35	>15-25
D		Less stable operation. Small increases in flow may cause large increases in delay and reduced speeds.	>35-55	>25-35
E		Unstable operation. Low speeds and considerable delay.	>55-80	>35-50
F		Congested operation. High delay and extensive queuing.	>80	>50

For side street stop-controlled intersections special emphasis is given to providing an estimate for the level of service of the minor approaches. Traffic operations at an unsignalized intersection with side street stop-control can be described two ways. First, consideration is given to the overall intersection level of service. This takes into account the total number of vehicles entering the intersection and the capability of the intersection to support these volumes. Second, it is important to consider the delay on the minor approaches, since the mainline does not have to stop. It is common for intersections with higher

[2] **Highway Capacity Manual (HCM)**, Transportation Research Board, 6th Edition

mainline traffic volumes to experience increased levels of delay and poor level of service on the side streets. For example, the acceptable threshold for a high-priority/high-volume mainline movement might be "C," while LOS "F" on a low-priority/low-volume side-street movement might be appropriate.

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 the length of vehicle queue that has only a five-percent probability of occurring during an analysis hour.

This study has utilized the current industry Synchro/SimTraffic software package (11th Edition) to analyze the 2028 and 2045 No-Build and Build conditions for both the AM and PM peak hours. 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 are more accurate than the results of the static analysis reported by Synchro. Due to the random number generator results can sometimes show slightly better operations on minor movements when the intersections are operating well and have increased traffic volumes. This can be seen when delays and queues noted for minor movements in the Build Scenario are slightly less than the No-Build Scenario.

B. Results of Analysis

This section contains the results of the intersection operational analyses and provides recommendations, as necessary to mitigate the impacts. Table 3 summarizes the results of the operational analysis. Note the 2028 and 2045 No-Build and Build operations reflect the additional traffic associated with the 1.7 percent annual growth rate applied to existing traffic volumes. Additionally, the Build operations include the new traffic forecast for the Proposed Project. Also, the 2045 Build conditions reflect the future City of Delano project to extend 65th Ave SE to intersect with TH 12 to the west as a signalized intersection. Additionally, unpublished potential improvements to the existing infrastructure by 2045 have been studied to provide acceptable roadway operations and are represented in Table 3 as 2045 NB (AM or PM) M. These improvements are necessary for the 2045 No-Build conditions, and are assumed to be in place and are reflected in the analysis of the 2045 Build conditions. Further discussion of these changes follows Table 3. (Note, the intersection of Farmington/50th Ave SE is not included in Table 3 as the increase in traffic discussed earlier will have a non-measurable impact on the intersection traffic operations.)

Table 3. Operational Analysis

LOS (Delay in sec) plus Vehicle Queuing in Feet

Intersection No.	2028 NB AM	2028 B AM	2028 B AM w 65	2028 NB PM	2028 B PM	2028 B PM w 65	2045 NB AM	2045 NB AM M	2045 B AM wo 65	2045 B AM w 65	2045 NB PM	2045 NB PM M	2045 B PM wo 65	2045 B PM w 65
10 (Side Stop)	a (3.3)	a (5.2)	a (4.5)	a (5.8)	a (8.0)	a (7.1)	a (4.1)	a (4.7)	a (6.2)	a (5.9)	a (7.1)	a (7.0)	b (10.6)	a (8.0)
Worst Movement	b wbl (14.4)	c wbl (17.8)	b wbl (12.0)	c wbl (23.9)	e wbl (43.3)	c wbl (24.8)	c wbl (16.5)	c wbl (16.6)	d wbl (31.3)	c wbl (16.8)	f wbl (56.9)	f wbl (52.3)	f wbl (113.6)	f wbl (79.5)
95th Percentile Q	wb 22	wb 68	wbl 56	wb 28	wbl 84	wbl 43	wb 28	wb 28	wbl 79	wbl 47	wb 32	wb 44	wbl 125	wbl 48
15 (Signal)	b (12.6)	b (12.5)	c (20.3)	b (16.4)	c (19.2)	c (20.3)	b (15.9)	b (17.9)	b (18.0)	c (20.3)	c (26.0)	c (23.7)	c (33.1)	c (26.9)
Worst Movement	c wbt (21.9)	c wbl (22.2)	c wbl (31.5)	c wbl (27.5)	c wbl (29.6)	c wbl (31.5)	c wbl (29.5)	c wbt (28.1)	c wbl (28.8)	c wbl (31.5)	d sbl (36.8)	c wbl (33.9)	d nbt (45.2)	e sbl (63.5)
95th Percentile Q	wbl 128	nbt 148	sb 264	nbt 298	nbt 347	sb 264	nbt 189	nbt 182	nb 252	sb 264	nb 600	nbt 437	nb 650	nb 547
20 (All Stop)	a (8.3)	b (10.8)	a (7.1)	b (10.8)	c (17.6)	a (7.1)	c (24.0)	a (5.9)	a (7.1)	a (7.1)	f (139.2)	a (9.3)	b (11.8)	b (12.2)
Worst Movement	b ebt (11.5)	c ebt (15.2)	a ebt (9.6)	c nbt (15.4)	d sbl (26.1)	a ebt (9.6)	e ebt (43.2)	a ebl (7.4)	a eb (9.7)	a ebt (9.6)	f nbt (230.3)	c sbl (16.0)	c nb (19.2)	c nbt (17.3)
95th Percentile Q	eb 137	eb 207	eb 195	nb 212	sb 264	eb 195	eb 552	eb 127	eb 195	eb 195	nb 1476	sb 248	sb 227	nb 263
25 (Signal)	c (24.5)	c (26.3)	b (16.7)	c (20.4)	c (20.6)	b (16.7)	f (158.2)	b (14.6)	b (14.9)	b (16.7)	f (82.2)	c (24.9)	c (32.0)	c (27.6)
Worst Movement	c ebl (30.8)	d ebl (49.9)	d ebl (38.7)	d ebl (37.6)	d ebl (41.0)	d ebl (38.7)	f ebl (347.3)	c ebl (26.7)	d ebl (38.7)	d ebl (38.7)	f ebl (143.8)	e ebl (55.9)	e nbl (55.0)	d nbl (50.4)
95th Percentile Q	ebr 471	ebr 575	sb 296	wbl 297	nbt 311	sb 296	eb 3671	sbt 227	sb 242	sb 296	ebr 2021	nbl 517	nbl 795	nbl 789
30 (Side Stop)		a (0.2)	a (0.4)		a (0.3)	a (0.3)			a (0.2)	a (0.5)			a (0.1)	a (0.2)
Worst Movement	N/A	a wb (1.6)	a wbl (2.4)	N/A	a nbr (3.9)	a nbr (0.3)	N/A	N/A	a nbr (2.6)	a nbr (2.1)	N/A	N/A	a wbl (1.9)	a nbr (2.3)
95th Percentile Q		-	nb 45		nb 14	-			nb 12	nb 17			-	nb 17
35 (Side Stop)		a (0.9)	a (2.3)		a (1.4)	a (2.2)			a (1.0)	a (2.3)			a (1.3)	a (1.8)
Worst Movement	N/A	a wbl (4.7)	a sbl (4.5)	N/A	a wbl (4.9)	a sbl (4.4)	N/A	N/A	a wbl (5.0)	a sbl (4.7)	N/A	N/A	a wbl (5.7)	a sb (2.4)
95th Percentile Q		eb 42	sb 45		wb 44	sb 45			wb 42	sb 54			nb 51	sb 45
40 (Side Stop)		a (1.3)	a (2.4)		a (1.2)	a (1.7)			a (1.4)	a (2.7)			a (0.8)	a (1.6)
Worst Movement	N/A	a wbl (5.1)	a wbl (4.3)	N/A	a wbl (5.1)	a wbl (4.5)	N/A	N/A	a wbl (4.9)	a wbl (4.6)	N/A	N/A	a wbl (4.5)	a wbl (4.3)
95th Percentile Q		wb 51	wb 45		wb 53	wb 52			wb 53	wb 49			wb 49	wb 53
45 (Side Stop)		a (2.4)	a (0.6)		a (1.1)	a (0.7)			a (2.8)	a (0.7)			a (1.0)	a (0.6)
Worst Movement	N/A	a sbl (3.9)	a sbr (2.3)	N/A	a sbl (3.9)	a sbr (2.9)	N/A	N/A	a sbl (4.1)	a sbr (2.2)	N/A	N/A	a sbl (4.0)	a sb (2.3)
95th Percentile Q		sb 32	sb 31		sb 30	sb 28			sb 30	sb 30			sb 31	sb 27
50 (Side S/Signal)			a (2.9)			a (5.6)				a (5.6)				a (7.7)
Worst Movement	N/A	N/A	c wbl (11.9)	N/A	N/A	c wbl (19.2)	N/A	N/A	N/A	c wbl (25.7)	N/A	N/A	N/A	b wbl (20.1)
95th Percentile Q			wb 45			wb 31				nb 91				nb 174

- Level of Service reported from an average delay from 10 SimTraffic simulations for overall intersection and worst movement.
- 95th percentile queues are a result from an average of 10 SimTraffic simulations and the longest queue per intersection is reported.

Intersection Key:

10	TH 12 & Ebersole Ave SE (TH 12 is north/south in this location)
15	TH 12 & Bridge Ave E (TH 12 is north/south in this location)
20	Bridge Ave E & River St N
25	TH 12 & Woodland Rd (TH 12 is north/south in this location)
30	65th Ave SE & South Site Access (east)
35	65th Ave SE & Ebersole Ave SE
40	Ebersole Ave SE & Site Access
45	65th Ave SE & North Site Access (west)
50	TH 12 & 65th Ave SE (TH 12 is north/south in this location)

The results shown in Table 3 indicate the overall operations are acceptable at LOS C or better at all intersections for the 2028 No-Build and Build AM and PM peak scenarios. During the 2028 PM Peak for Build conditions the left turn operations from southbound Ebersole Ave SE to eastbound TH 12 will operate at LOS E. This operational condition is due to the magnitude of volume during the PM Peak of TH 12 traffic resulting in fewer acceptable gaps in traffic for Ebersole Ave SE drivers to merge into the eastbound flow and is not uncommon for minor street approaches. Further the 95th percentile vehicle queues are manageable. No improvements are necessary. That said, if the City of Delano extends 65th Ave SE to intercept TH 12 by 2028, the results shown in the Table indicate improvements in delay and operations at Ebersole Ave SE and TH 12 to LOS C during the PM Peak. In 2028 it is anticipated this intersection will be side street stop controlled.

The growth in traffic at 1.7 percent to the 2045 planning year results in reduced capacity of the roadway network, in particular at the intersections of TH 12 with Woodland Rd, as well as the intersection of Bridge Ave E and River St N. To address the capacity issues for the **2045 No-Build** conditions the following are the minimum improvements. (The operational results reported in Table 3 referred to as 2045 NB AM M and 2045 NB PM M reflect these improvements.)

- **TH 12 and Woodland Rd** – As mentioned earlier, TH 12 is a three-lane facility with approximately 60 feet of pavement, and Woodland Rd is a 3-lane facility with nearly 55 feet of pavement. It is suggested that intersection be restriped to include an additional southbound/eastbound lane on TH 12 to the south of the intersection that runs to at least the Holiday/Circle K access to allow the eastbound to southbound Woodland Rd traffic to free flow; and the eastbound to northbound left turn lane on Woodland Rd be extended to 450 feet (this can fit with the existing left turn lane at W River Rd if laid out back to back with minimum 4:1 tapers). Also, the two-way left turn lane between Woodland Rd and Kelsey St should be converted to a dedicated left turn lane for northbound TH 12. These improvements will restore the operations to acceptable norms.
- **Bridge Ave E and River St N** – The all-way stop intersection is forecast to operate poorly at LOS F with long vehicle queuing in the 2045 No-Build scenarios. The existing geometry is constrained by the presence of buildings on the eastern corners, and by the Crow River to the west. It is suggested that a mini-roundabout be considered at this location, which results in greatly improved operations.

As mentioned earlier, the City of Delano has indicated they will extend 65th Ave SE to intersect with TH 12 as development occurs in area. It is anticipated this intersection will be signalized by 2045 and will occur prior to 2045 if this development and others are built by then. (Note, the 1.7 percent annual background growth rate anticipates development occurring.) This study considered two cases, one without

the extension of 65th and the other includes the extension. In the case without the extension, the operations on Ebersole are at or over capacity with 113 seconds of delay forecast for each vehicle. A traffic control change such as a traffic signal or roundabout would need to be considered. The 2045 Build operations including the inclusion of extension of 65th Ave SE with a traffic signal at TH 12, as well as the other improvements identified above result in acceptable overall operations at all the study intersections. The operations continue to identify the westbound to southbound left turn from Ebersole Ave SE to TH 12 as operating at capacity. The analysis, however, does not fully take into account the impact of the upstream traffic signal at TH 12 and 65th Ave SE which may create additional gaps for the left turning traffic. Also, the addition of the signal at TH 12 and 65th Ave SE may result in additional traffic diverting from the Ebersole Ave SE to 65th Ave SE if the delay on Ebersole Ave SE is greater than two and half minutes. That said, while the delay is over 30 seconds the 95th percentile traffic queue is only 48 feet or approximately 2 vehicles. The SimTraffic simulation shows this queue dissipates quickly. TH 12 near Ebersole Ave SE includes 60 feet of pavement suggesting a future 5-lane section could be considered.

Internal Roadways

The planned internal roadways for this project emphasize a traffic calming element. For the local streets, the plans include a 30 foot pavement section which is two feet less than the City standard of 32 feet, but does provide for 22 feet of drive lanes with parking on one side. This layout is not uncommon in dense urban settings and does result in slower traffic making it safer for future pedestrian and neighborhood traffic. The collector street sections are also planned to be two feet narrow, 34 feet, than the City's typical cross-section of 36 feet. Again, this is planned to keep speeds down and provide a more complete street environment enhancing pedestrian and bicycle safety at the expense of faster mobility. It is noted the planned internal local streets have capacity for approximately 6,000 trips per day with the 30-foot cross-section including parking on both sides, and the collector street has capacity for approximately 15,000 trips per day with the 34-foot cross-section assuming parking on side which could be limited if potentially turn lanes become necessary. The total development will generate 2,486 trips per day, which will be dispersed based on trip origin, indicating there is sufficient roadway capacity on the planned streets for the anticipated traffic from the development.

VI. Safety Review

A review of intersection crash records was conducted to evaluate the safety of the study area and to determine if the addition of future traffic growth could exacerbate existing safety issues. Historical crash data from the most recent 5 years of data (2017 to 2021) was obtain from MnDOT's Crash Mapping Analysis Tool (MnCMAT2) and the following two factors were considered in the crash analysis:

1. **Crash Rate** - Crashes are a function of exposure. Roadways with higher traffic volumes experience more crashes than similar roadways with lower volumes and a crash rate must be considered to normalize the locations and accurately assess the safety. Intersection crash rates are defined by the number of crashes occurring per million entering vehicles (MEV).

2. **Critical Crash Rate** - Critical crash rate comparison identifies locations that have a crash rate higher than similar facilities by a statistically significant amount. The critical crash rate is calculated by adjusting the system wide average crash rate based on the amount of exposure and a statistical constant indicating level of confidence. Although varying confidence levels are typically utilized, the 99.5 percentile confidence interval was selected for all safety calculations for this study. At locations where the actual crash rate exceeds the critical crash rate, it is 99.5 percent certain that the crashes are a result of deficiencies in the intersection design or other factors.

Table 4 summarizes the intersection crash data for the study area and provides a comparison of crash rates to critical crash rates and the statewide average for similar intersections.

Table 4. Intersection Crash Summary

Study Intersection	Control	Total Crashes	Entering ADT	Crash Rate	Critical Crash Rate	Statewide Average	Under Critical Threshold?
Ebersole Ave & TH 12	Side-Street Stop	3	19,100	0.09	0.32	0.41	Yes
Bridge Ave & River St	All-Way Stop	5	10,000	0.27	0.61	0.35	Yes
Woodland Rd & TH 12	Signal	12	31,100	0.21	0.86	0.97	Yes
Bridge Ave & TH 12	Signal	26	24,100	0.59	0.86	0.97	Yes

* System wide average crash rates were found in MnDOT's Intersection Green Sheets

The study area intersections have a crash rate under the critical crash rate. Existing conditions and intersection design are not currently contributing to a safety problem and future traffic growth is not likely to exacerbate existing safety issues.

The sight distance was measured to ensure the intersection of Ebersole Ave SE and TH 12 has sufficient sight lines for Ebersole traffic to safely enter TH 12. The measured distance is over 1,800 feet looking northwest and approximately 1,000 feet looking to the southeast. Per AASHTO the minimum sight distance required is 555 feet. The sight distance exceeds the minimum requirements. Further, the number of gaps in traffic on TH 12 was reviewed. For vehicles to safely turn left from a stopped condition and

merge into traffic flow requires a gap of approximately 8.5 seconds per AASHTO. The results of the gap analysis indicate there are 98 gaps of 8.5 seconds or more during the AM Peak time and 91 gaps during the PM Peak time. See Table 5.

Table 5. Intersection Gap Analysis

GAP STUDY
TH 12 & Ebersole - Delano, MN
8/17/2023; 7:15-8:15 AM
Westbound - Left Turn from Ebersole

AASHTO Gap acceptance for two lane road 7.5 sec - add 0.5 sec for additional left and right turn lanes; at Ebersole use 8.5 sec.

Time (AM)	Length of Gap (sec)	Number of 8.5 Sec Gap		Time (AM)	Length of Gap	Number of 8.5 Sec Gap		Time (PM)	Length of Gap (sec)	Number of 8.5 Sec Gap		Time (PM)	Length of Gap	Number of 8.5 Sec Gap
7:15	14	1		7:45	9, 9	2		4:15	11	1		4:45	16	1
7:16	11	1		7:46	11, 9, 11	3		4:16	19	2		4:46	-	0
7:17	18	2		7:47	9	1		4:17	11	1		4:47	9	1
7:18	17, 15	3		7:48	9	1		4:18	9, 11	2		4:48	12	1
7:19	10	1		7:49	20, 9	3		4:19	9, 10	2		4:49	12	1
7:20	11, 9	2		7:50	16	1		4:20	10, 10	2		4:50	17	2
7:21	9	1		7:51	10	1		4:21	15	1		4:51	17, 12	3
7:22	10, 22	3		7:52	15	1		4:22	10	1		4:52	9, 30	5
7:23	19	2		7:53	15, 11	2		4:23	10	1		4:53	9, 14	2
7:24	14	1		7:54	9, 13	2		4:24	11	1		4:54	-	0
7:25	9, 10	2		7:55	9, 11	2		4:25	13	1		4:55	9	1
7:26	11	1		7:56	9, 10	2		4:26	9	1		4:56	10	1
7:27	10	1		7:57	10	1		4:47	10	1		4:57	12	1
7:28	16	1		7:58	9	1		4:28	15	1		4:58	15	1
7:29	11, 11	2		7:59	10, 14	2		4:29	15	1		4:59	-	0
7:30	12, 9	2		8:00	11, 9, 10	3		4:30	9, 17	3		5:00	10, 12	2
7:31	14, 15	2		8:01	14	1		4:31	9, 11	2		5:01	14	1
7:32	10	1		8:02	9	1		4:32	14, 15	2		5:02	11, 11	2
7:33	12	1		8:03	17	2		4:33	10	1		5:03	9	1
7:34	16	1		8:04	9	1		4:34	14, 14, 11	3		5:04	10	1
7:35	11, 11	2		8:05	11, 10	2		4:35	12, 17	3		5:05	10	1
7:36	9	1		8:06	11, 12, 10	3		4:36	9	1		5:06	9	1
7:37	12	1		8:07	12	1		4:37	12	1		5:07	12, 9	1
7:38	15	1		8:08	9, 9	2		4:38	14	1		5:08	12, 23	3
7:39	12	1		8:09	9, 14	2		4:39	18	2		5:09	9	1
7:40	15, 19	3		8:10	21	2		4:40	12, 10, 12	3		5:10	18	2
7:41	12	1		8:11	9, 10, 14	3		4:41	13, 20	3		5:11	14	1
7:42	9	1		8:12	10, 9	2		4:42	11	1		5:12	10, 15	2
7:43	14	1		8:13	9	1		4:43	11	1		5:13	15, 9	2
7:44	18	2		8:14	15, 10	2		4:44	15, 10	2		5:14	24	2
Gaps in 30 Minutes -		**45**				**53**		Gaps in 30 Minutes -		**48**				**43**
Total Gaps in AM Peak = **98**								Total Gaps in the PM Peak = **91**						
Multiple cars may be able to utilize a gap over 9 sec.														

VII. Summary and Recommendations

The proposed Ebersole Avenue project has been analyzed to determine the trip generation potential, the distribution of the traffic, and the impacts to the surrounding roadway network. The Proposed Project will develop 194 single family homes on approximately 88 acres on a parcel located approximately 850 feet north of Trunk Highway 12 (TH 12).

The Ebersole Avenue project will result in the realignment of the local streets in the vicinity of the site and is forecast to generate approximately 136 trips during the morning traffic peak time, 186 trips during the afternoon traffic peak and 1,856 trips per day. These trips were assigned to the local roadway network based on travel time surveys and existing traffic patterns. In general, ninety percent of the Proposed Project traffic will favor TH 12 to get to its destination and ten percent will favor TH 55.

Traffic operational analysis was conducted for the study area intersections for the No-Build and Build conditions for two design years, 2028, the year after completion of the project and 2045 the long-range planning horizon. It is assumed that traffic in the area will grow at a rate consistent with the historical growth in the area, calculated at 1.7 percent per year. The results of the analysis suggest there is sufficient capacity on the surrounding roadways in 2028 to accommodate the traffic from this development.

The 2045 analysis identified that there is insufficient intersection capacity at some of the study area intersections in their current striped geometrics to accommodate the 2045 No-Build traffic. Improvements including restriping the intersection of TH 12 and Woodland Rd, and the installation of a mini-roundabout at Bridge Ave E and River St N were reviewed and adopted to provide acceptable operations. The 2045 analysis of the Build condition indicate the improvements discussed for the 2045 No-Build, plus the City's planned extension of 65th Ave SE to form a new signalized intersection at TH 12 (thus reducing traffic at the Ebersole Ave SE and TH 12 intersection) will provide acceptable operations.

The project realigns Ebersole Ave SE through the site and provides other local streets. The design of these streets focuses on traffic calming and safety of the neighborhood as opposed to mobility by providing roadways that are two feet narrower than the City's typical sections. This will provide a more urban feel and will calm traffic creating a more pedestrian and bicycle friendly environment. It is noted these streets as planned have sufficient roadway capacity to accommodate neighborhood traffic.

Safety analysis indicates that the crash rates at the study intersection are less than the critical rates as well as the statewide averages. Sight distance and gap analysis indicate there are sufficient sight lines as well as sufficient gaps in traffic to allow traffic from Ebersole Ave SE to merge into TH 12 without incident.

In conclusion, the proposed development has appropriate access to the site and to the surrounding roadway network. The traffic operational analysis indicates there is available capacity on the roadways surrounding the site to accommodate the new site-generated traffic in the 2028 design year, and there is sufficient capacity available in the 2045 design year assuming minor improvements at some intersections are completed.