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MEMORANDUM

Date: November 19, 2019

To: Craig Eldred, Public Services Director, City of Waconia
Darin Mielke, Assistant Public Works Director, Carver County

From: Jacob Bongard, P.E., PTOE
Mike Larson, E.I.T.

Subject: CSAH 10 & Waconia Parkway South Corridor Study
Waconia, Carver County, Minnesota
Traffic Analysis Memorandum

Introduction

County State Aid Highway (CSAH) 10 is classified as a Minor Arterial – Connector roadway and serves as the primary route linking the City of Waconia and Trunk Highway (TH) 5 to the communities of Watertown/Mayer and TH 7. Carver County has long-range plans to transition this roadway into a bypass route of the city of Waconia as growth in the area continues. Waconia Parkway South is a City street classified as a municipal arterial after the recent realignment and new construction of CSAH 10 between Waconia Parkway South and TH 5. The roadway connects large residential areas of Waconia to CSAH 10, with several nearby parks, as well as Waconia High School and Middle School. The study area relating to this traffic analysis stretches from Waconia Parkway North to Oak Avenue. Much of the existing corridor is a rural section with pedestrian facilities scattered throughout. A large parcel of undeveloped land, the Burandt property, between Oak Avenue and CSAH 32 is slated for staged residential development beginning in the near-term. As traffic volumes increase in the area due to this development and others, the operations of this corridor will become an important factor in the ease of local and regional mobility. This study will evaluate the existing conditions in the study area, evaluate these existing conditions under forecasted traffic volumes, and analyze potential intersection improvements in effort to provide safe and efficient mobility throughout the corridor now and into the future.

Existing Conditions Analysis

Data Collection

Turning movement counts were completed at five intersections in February of 2019. Traffic operations analysis considers the AM and PM Peak Hours of the day with the highest traffic volumes. 13-hour traffic counts from 6:00 am to 7:00 pm were completed for the five intersections and AM and PM peak hours were established as 7:00 am to 8:00 am and 4:15 pm to 5:15 pm. AM and PM peak hour traffic volume figures can be found in **Appendix A**. The following lists the five intersections where traffic counts were completed:

- CSAH 10 & Waconia Parkway North
- CSAH 10 & CSAH 32
- CSAH 10 & Waconia Parkway South
- Waconia Parkway South & Pond Lane
- Waconia Parkway South & Oak Avenue

Warrant Analysis – Existing Conditions

Traffic warrants have been developed as national guidelines to promote continuity of traffic control devices to ensure that traffic signals and stop signs are installed at intersections that would benefit from their use. Detailed warrant information can be found in the Minnesota Manual on Uniform Traffic Control Devices (MnMUTCD) Chapter 4.

Traffic signal warrants and all-way stop control warrants were completed using the 2019 turning movement counts for all five intersections. Results of this analysis show that only the intersection of CSAH 10 at Waconia Parkway South currently meets signal warrants with existing volumes. No intersections are shown to meet all-way stop warrants. **Table 1**, below, shows the number of warrants met versus the number required. Detailed warrant analysis results can be found in **Appendix B.**

Table 1: 2019 Volumes - Warrants Met

Warrant	Hours Required	2019 Volumes - Hours Met				
		Waconia Pkwy N	CSAH 32	Waconia Pkwy S	Pond Ln	Oak Ave
Warrant 1A	8	0	0	1	0	0
Warrant 1B	8	1	0	1	0	0
Warrant 2	4	1	0	6	0	0
Warant 3	1	0	0	4	0	0
AWSC Warrants	8	4	0	6	0	1

Safety Analysis

A review of recent crash history was completed for study area intersections using crash data collected from the Minnesota Crash Mapping Analysis Tool (MnCMAT) and from Carver County, for the previous five years of available data (2013-2017). Note that crash data dated 2013-2015 was obtained via MnCMAT, and 2016-2017 data was obtained from Carver County.

GAZER generated reports including 2018 crash data may be found in **Appendix C.** From this recent data, the intersection of Waconia Parkway North is shown to have a historically decreasing crash rate since 2015 and recorded traffic volumes have been relatively constant over the same period. However, the intersection is shown to have a crash rate above the statewide average for intersections of similar characteristics over 3-, 5-, and 10-year periods.

All intersections within the study area were analyzed to establish the observed crash rate, statewide average crash rate, critical crash rate and critical index. The same parameters for injury crashes were also calculated. The observed crash rate is the number of crashes per million entering vehicles (MEV) for the intersection. The statewide average crash rate is the average crash rate for similar type locations statewide. The critical crash rate is the statistical comparison based on similar locations statewide. The critical index is the comparison of the observed crash rate to the critical crash rate; a critical index greater than 1.0 indicates that the observed crash rate is greater than the critical rate and that the intersection operates outside the expected, normal range. The remaining intersections along Waconia Parkway S. between Oak Avenue and CSAH 10 were also evaluated. This includes the intersections of Waconia Parkway South at Farm Line Road, Heather Lane, and Strong/Countryside Roads were analyzed as part of this study. Note that the intersection of CSAH 10 at Waconia Parkway South was excluded from this analysis due to its recent conversion to a roundabout intersection, as there is not enough data to properly identify any crash trends. **Tables 2 and 3** summarize the safety analysis results for the intersections.

Table 2: Intersection Crash Data

Intersection	Traffic Control	Total Crashes (5 Years)	Crash Rate				Severity Rate			
			Observed	*Statewide Average*	*Critical Rate*	Crash Index	Observed	*Statewide Average*	*Critical Rate*	Severity Index
CSAH 10 at Waconia Pkwy N	TWSC	3	0.16	0.25	0.58	0.28	0.00	1.05	6.71	0.00
CSAH 10 at Sterling Rd	TWSC	4	0.28	0.25	0.63	0.45	0.00	1.05	8.04	0.00
CSAH 10 at CSAH 32	TWSC	4	0.22	0.25	0.58	0.37	0.00	1.05	6.82	0.00
Waconia Pkwy S at Pond Ln	TWSC	3	0.15	0.18	0.46	0.33	0.00	0.33	4.52	0.00
Waconia Pkwy S at Oak Ave	AWSC	9	0.39	0.35	0.69	0.57	4.36	0.57	4.78	0.91
Waconia Pkwy S at Farm Line Rd	TWSC	5	0.26	0.18	0.46	0.56	0.00	0.33	4.57	0.00
Waconia Pkwy S at Heather Lane	TWSC	5	0.27	0.25	0.58	0.46	0.00	1.05	6.74	0.00
Waconia Pkwy S at Strong/Countyside	TWSC	4	0.19	0.18	0.44	0.42	0.00	0.33	4.22	0.00

Analysis shows that all intersections currently operate as statistically safe. While several intersections have crash rates at or slightly above the statewide average crash rates, the intersection at Oak Avenue is an area of concern due to a severe injury crash involving a pedestrian occurring during the analysis period.

Table 3: Crash Severity & Type Breakdown

Intersection	Crash Severity					Crash Type								
	Fatal	Incapacitating	Non-Incapacitating	Possible Injury	PDO	Right Angle Crashes	Left Turn Crashes	Rear End Crashes	Head On	Right Turn Crashes	Sideswipe Passing	Bike/ Pedestrian	Ran Off Road	Total
CSAH 10 at Waconia Pkwy N	0	0	0	1	2	0	1	2	0	0	0	0	0	3
CSAH 10 at Sterling Rd	0	0	0	2	2	0	0	2	1	0	0	0	1	4
CSAH 10 at CSAH 32	0	0	1	1	2	0	0	2	0	1	0	0	1	4
Waconia Pkwy S at Pond Ln	0	0	0	0	3	0	0	0	0	0	0	0	3	3
Waconia Pkwy S at Oak Ave	0	1	0	1	7	3	0	5	0	0	0	1	0	9
Waconia Pkwy S at Farm Line Rd	0	0	0	2	3	1	1	3	0	0	0	0	0	5
Waconia Pkwy S at Heather Lane	0	0	0	1	4	0	0	1	0	1	1	0	2	5
Waconia Pkwy S at Strong/Countyside	0	0	0	0	4	0	0	2	0	0	1	0	1	4

An analysis of crash types and severities identifies trends and common safety issues. This analysis reveals that right-angle and rear end crashes are the most common crash types along the corridor. An examination of crash severities shows that most crashes are non-injury crashes. The one severe injury crash observed within the analysis period was recorded as a pedestrian related crash occurring in 2014 at Oak Avenue. A non-intersection related, severe injury crash was recorded near the Oak Avenue in 2015, recorded as a ran off road crash. Intersection safety screening worksheets can be found in **Appendix C**.

Traffic Operations Analysis – Existing Conditions

A level of service (LOS) analysis of peak conditions was completed using the existing turning movement counts in conjunction with the microsimulation software, Trafficware Synchro/SimTraffic. The LOS results are based on average delay per vehicle as calculated by the 6th Edition Highway Capacity Manual (HCM), which defines the level of service, based on control delay. Control delay is the delay experienced by vehicles slowing down as they are approaching the intersection, the wait time at the intersection, and the time for the vehicle to speed up through the intersection and enter the traffic stream. Additionally, the simulation software is able to determine average and maximum queues.

AM and PM peak hour traffic operations analysis using collected traffic volumes and existing roadway geometry is shown in **Table 4**. Intersection delay and limiting movement delay are shown in seconds per vehicle. The limiting movement refers to the highest delay movement at the intersection during the respective peak hour. The maximum approach queue is based upon the movement with the longest maximum queue, referring to the 95th percentile queue. Detailed SimTraffic Reports can be found in **Appendix D**.

Table 4: 2019 Existing Traffic Operations Analysis

Intersection	Peak Hour	Intersection Delay (1.)		Maximum Delay-LOS (2.)		Limiting Movement (3.)	Max Approach Queue	
							Direction	Max Queue (ft)
CSAH 10 & Waconia Pkwy N	AM	4	A	16	C	WBL	WBL	125
Stop Controlled	PM	3	A	10	B	WBL	WBR	75
CSAH 10 & CSAH 32	AM	2	A	8	A	EBL	EBR	75
Stop Controlled	PM	1	A	10	B	EBL	NBL	50
CSAH 10 & Waconia Pkwy S	AM	5	A	6	A	SBL	WBL/R	50
Roundabout	PM	6	A	8	A	WBL/R	WBL/R	75
Pond Ln & Waconia Pkwy S	AM	2	A	7	A	NBL	NBL/R	75
Stop Controlled	PM	3	A	8	A	NBL	NBL/R	75
Oak Ave & Waconia Pkwy S	AM	11	B	15	C	EBL	EBL/T/R	250
Stop Controlled	PM	10	B	12	B	WBT	WBL/T	200

Analysis indicates that the overall operations at all intersections are currently operating at an acceptable Level of Service (LOS) B or better during the peak hours. Movements approaching problematic levels are present, particularly the westbound left turning movement at Waconia Parkway N, which operates at LOS C during the AM peak hour, and the eastbound approach at Oak Avenue which also operates at LOS C during the AM peak hour. Queuing is not shown to be problematic under existing conditions, although queuing is present on several problematic movements.

Future (2040) Conditions No-Build Analysis

Traffic Forecasting

Traffic volume forecasts for the design year (2040) were developed using forecasted daily traffic volumes obtained from Carver County (Scenario 3). Existing/base volumes were taken as the collected volumes from the 13-hour turning movement counts conducted as data collection for this study. Forecasted turning movement counts and traffic volumes can be found in **Appendix A**.

Warrant Analysis – Future Conditions

Traffic signal warrants and all-way stop control warrants were completed using the forecasted 2040 volumes. Intersections meeting warrants for signals under the forecasted traffic volumes include CSAH 10 at Waconia Parkway N and Waconia Parkway S as well as Waconia Parkway South at Oak Avenue. The intersection of CSAH 10 and Waconia Parkway South is also expected to meet all-way stop warrants. **Table 5**, below, shows the number of warrants met versus the number required. Detailed warrant analysis results can be found in the **Appendix B.**

Table 5: 2040 Volumes (No Development) - Warrants Met

Warrant	Hours Required	2040 Volumes - Hours Met				
		Waconia Pkwy N	CSAH 32	Waconia Pkwy S	Pond Ln	Oak Ave
Warrant 1A	8	1	0	**9**	0	0
Warrant 1B	8	6	0	3	2	4
Warrant 2	4	**4**	0	**12**	2	**4**
Warant 3	1	**1**	0	**6**	0	0
AWSC Warrants	8	6	1	**13**	0	4

Traffic Operations Analysis – No Build

The existing corridor was modeled under the forecasted 2040 traffic volumes to identify any problem areas as area traffic increases. The AM and PM peak hour traffic operations using the forecasted volumes and existing roadway geometry is shown below in **Table 6**.

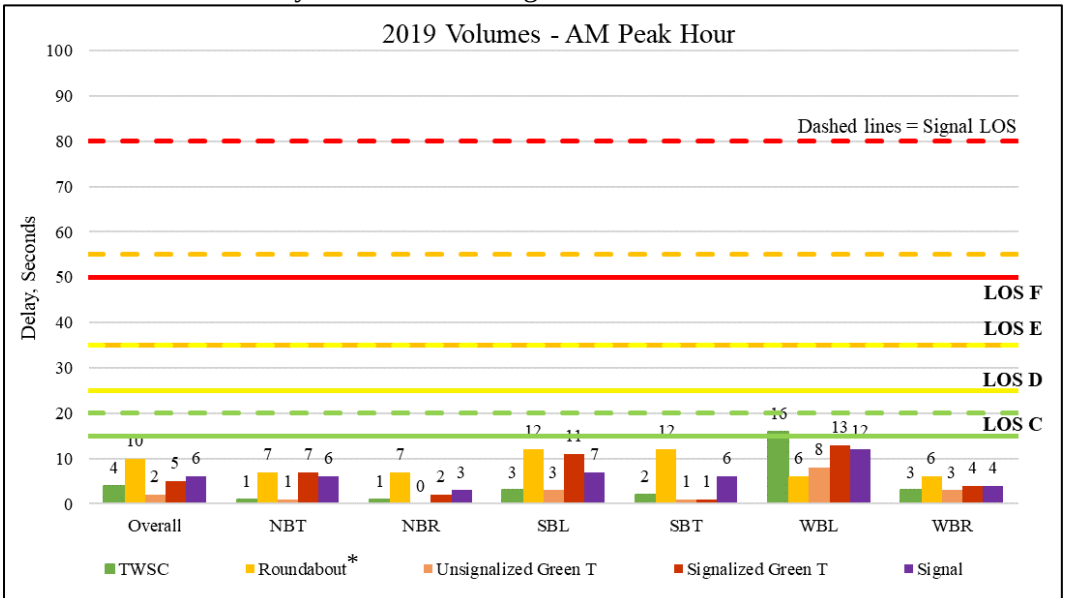
Table 6: 2040 No Build Traffic Operations Analysis

Intersection	Peak Hour	Intersection Delay (1.)		Maximum Delay-LOS (2.)		Limiting Movement (3.)	Max Approach Queue		
							Direction	Average Queue (ft)	Max Queue (ft)
CSAH 10 & Waconia Pkwy N	AM	19	C	149	F	WBL	WBL	200	775
Stop Controlled	PM	6	A	27	D	WBL	WBR	50	150
CSAH 10 & CSAH 32	AM	3	A	19	C	EBL	EBR	50	125
Stop Controlled	PM	2	A	15	C	EBL	EBR	25	50
CSAH 10 & Waconia Pkwy S	AM	13	B	25	D	NBR	SBT	75	350
Roundabout	PM	6	A	7	A	WBR	WBL/R	50	125
Pond Ln & Waconia Pkwy S	AM	44	E	75	F	EBR	EBT	350	1400
Stop Controlled	PM	3	A	14	B	NBL	NBR	25	75
Oak Ave & Waconia Pkwy S	AM	79	F	216	F	EBL	EBL/T/R	750	1375
Stop Controlled	PM	52	F	82	F	WBT	WBL/T	550	1000

Analysis shows that the intersections of Waconia Parkway South at Pond Lane and Oak Avenue are expected to operate at an unacceptable level during peak hours. Pond Lane operates at LOS E during the AM peak, and Oak Avenue operates at LOS F during both peak periods. Problematic movements are more widespread, however. Westbound left turn movements onto CSAH 10 from Waconia Parkway North are delayed approximately 2 ½ minutes during the AM peak hour. The single lane of approach and all-way stop control at Oak Avenue is also anticipated to be a major failure point along the corridor under forecasted volumes with overall delays well into unacceptable levels. Extensive eastbound and westbound delays and queues may create further delays as queues spillback into upstream intersection. The effect is shown at Pond Lane where eastbound queues from Oak Avenue are expected to block movements to/from Pond Lane.

CSAH 10 at Waconia Parkway North Analysis

Due to the isolated nature of Waconia Parkway North, all intersection control analysis for this intersection was completed independently of the analysis of the southern corridor area. Options considered at the location include a traffic signal, unsignalized and signalized Green-T controls, a single-lane and unbalanced 2x1 roundabout. Delays per movement are shown in **Figure 1**, below, for each of the considered build options, as well as the existing TWSC condition, during the AM Peak Hour under 2019 volumes. Note that the unbalanced roundabout was not analyzed under existing conditions as the single-lane option is shown to efficiently handle the existing traffic volumes.



*The Unbalanced 2x1 roundabout is expected to operate at LOS A on all approaches.

Figure 1: 2019 Volumes - AM Peak Hour Operations by Movement at Waconia Parkway North

Figure 2 shows the delay per movement for the PM Peak Hour under 2019 volumes.

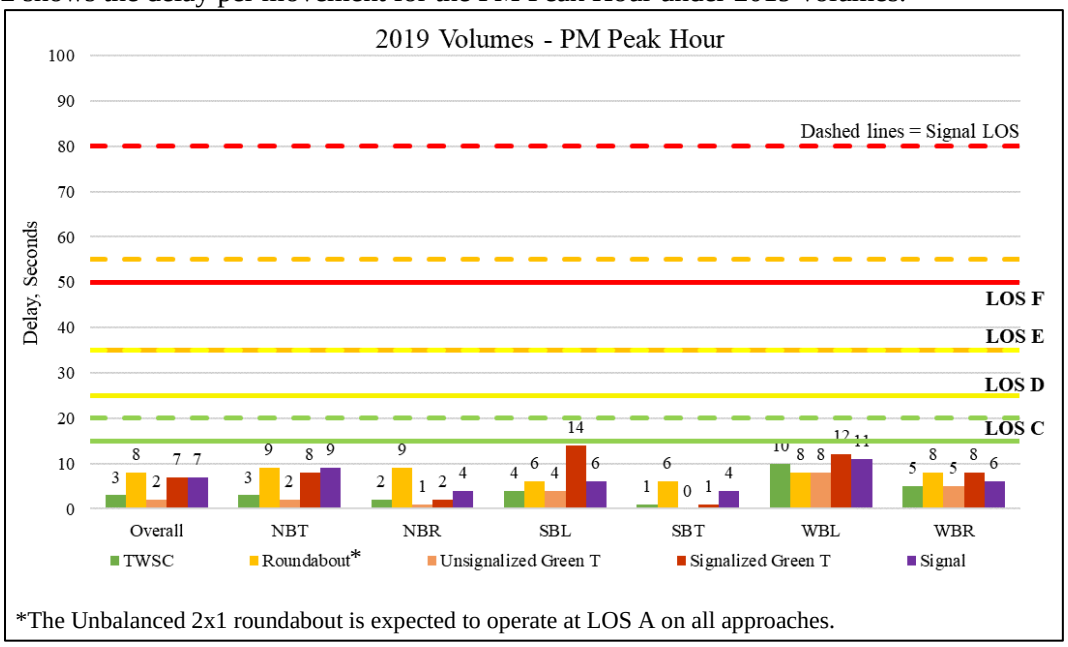


Figure 2: 2019 Volumes – PM Peak Hour Operations by Movement at Waconia Parkway North

Analysis of the intersection control options under existing reviews shows that all considered options will provide acceptable delays on all approaches during both peak hours. Adding control to the CSAH 10 approaches does increase overall delay but does improve Waconia Parkway North operations and safety.

Figure 3 shows the delay per movement for the AM Peak Hour under 2040 volumes.

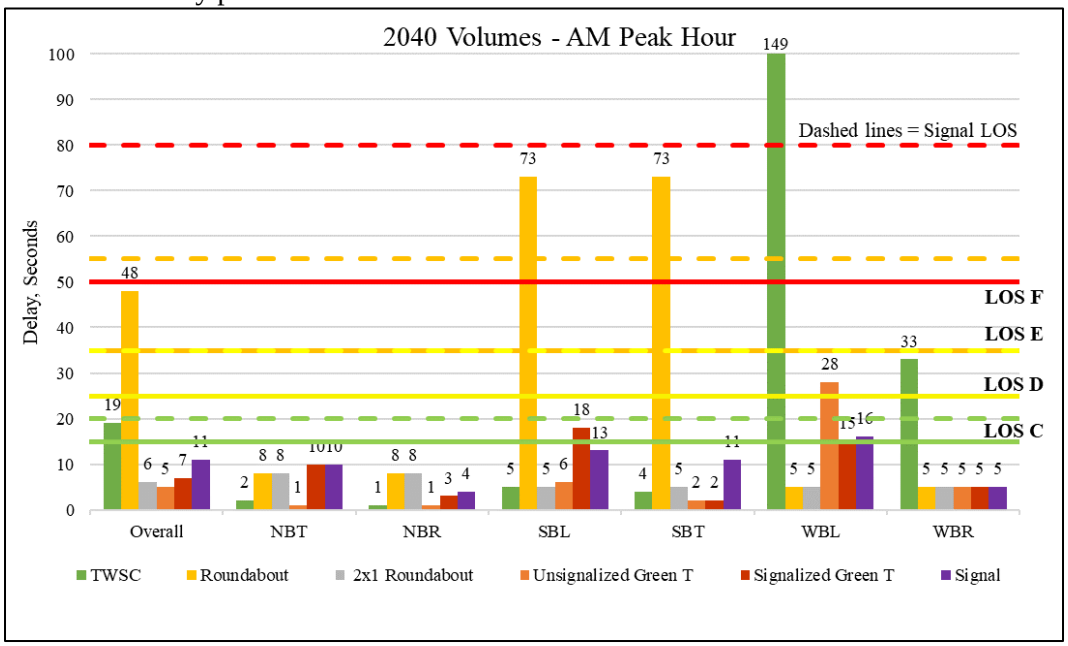


Figure 3: 2040 Volumes - AM Peak Hour Operations by Movement at Waconia Parkway North

Figure 4 shows the delay per movement for the PM Peak Hour under 2040 volumes.

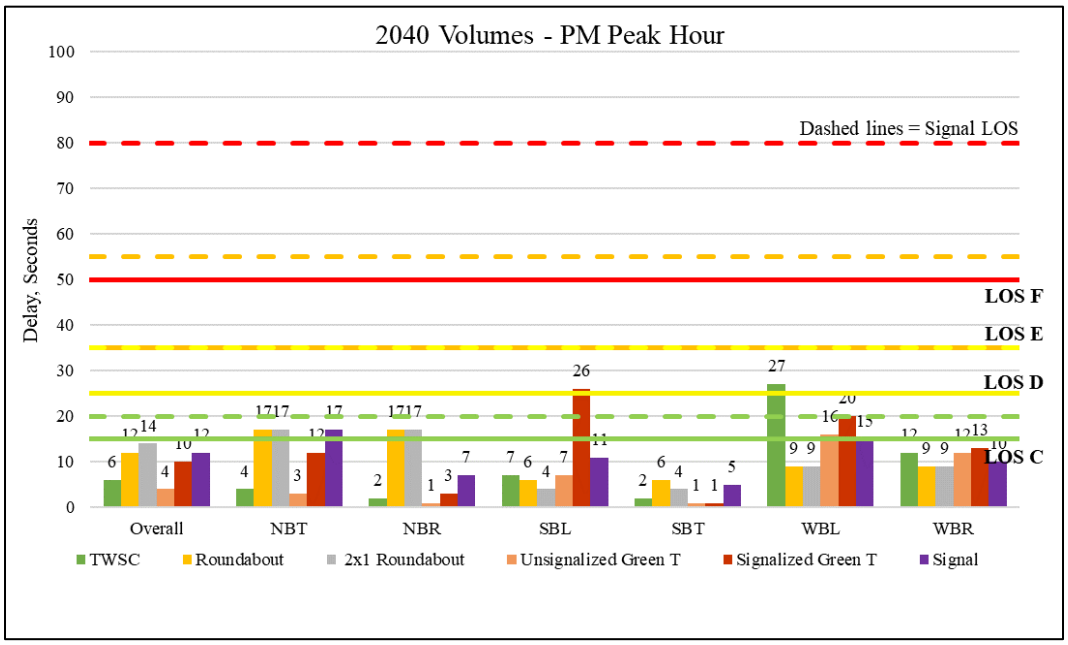


Figure 4: 2040 Volumes - PM Peak Hour Operations by Movement at Waconia Parkway North

It is anticipated that Waconia Parkway North delays will become largely unacceptable during the AM peak hour under future volumes if the existing two-way stop remains in place. All the considered intersection controls are shown to improve operations on this approach to an acceptable level, operating at LOS C or better. The single-lane roundabout alternative is overcapacity during the AM peak hour due to the high volume of southbound thru movements forecasted. The addition of a second southbound lane through the roundabout is shown to greatly improve operations offered by a roundabout. Green-T geometry is shown to offer similar or even improved operations when compared to a traditional signal design. Southbound through movement delays are due to left turning vehicles decreasing their speed in the through lane before moving into the turn lane.

CSAH 10 at Waconia Parkway North Analysis - Sensitivity Analysis

A sensitivity analysis was conducted as part of the Waconia Parkway North intersection control evaluations as the existing conditions analysis yielded better than expected results at the intersection during the busiest 15-30 minutes of the morning peak. The nearby school campus and rural environment create a brief peak in traffic during the AM peak hour that was targeted in better understanding how each considered alternative might handle these short spikes in volumes utilizing the intersection. This analysis was performed by applying a larger peak hour factor to the westbound movements, as well as the southbound left turn movement, in order to calibrate the model to more accurately reflect field observations. The results of the analysis under existing volumes is shown in **Figure 5**, below.

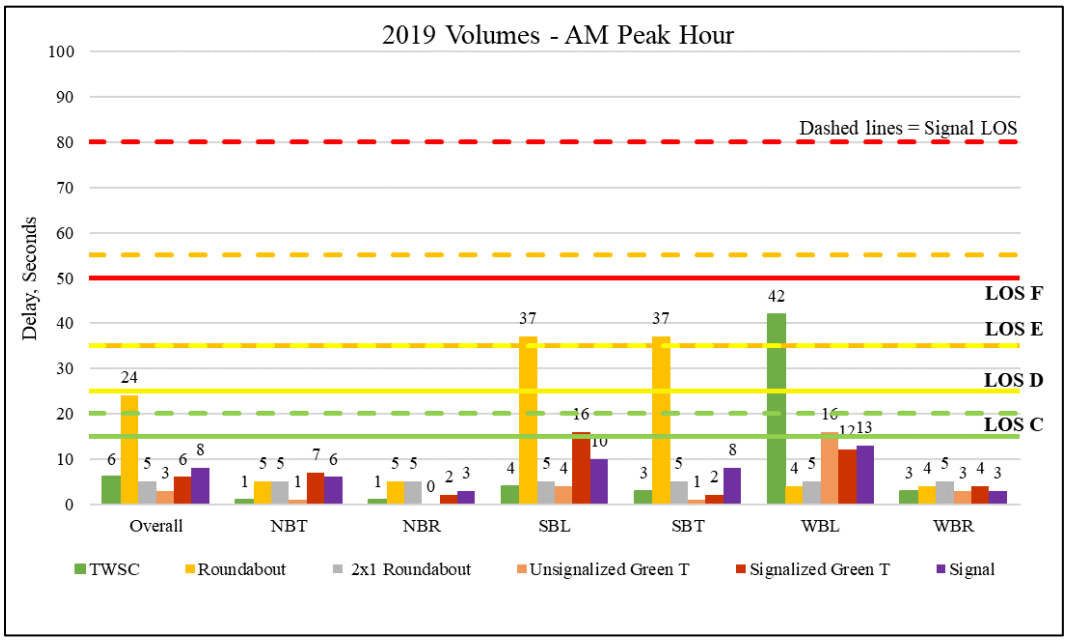


Figure 5: 2019 Volumes Sensitivity Analysis – AM Peak Hour Operations by Movement at Waconia Parkway North

Results of the sensitivity analysis for 2019 volumes indicate that operations of the considered intersection control types will be able to handle any fluctuations in traffic except for the single-lane roundabout. Increases in westbound traffic volumes results increased delays on the southbound leg, with unacceptable delays for both southbound movements. All other proposed treatments are anticipated to operate well in under existing traffic levels.

Figure 6 shows the results of the sensitivity analysis for forecasted traffic volume conditions during the AM peak hour.

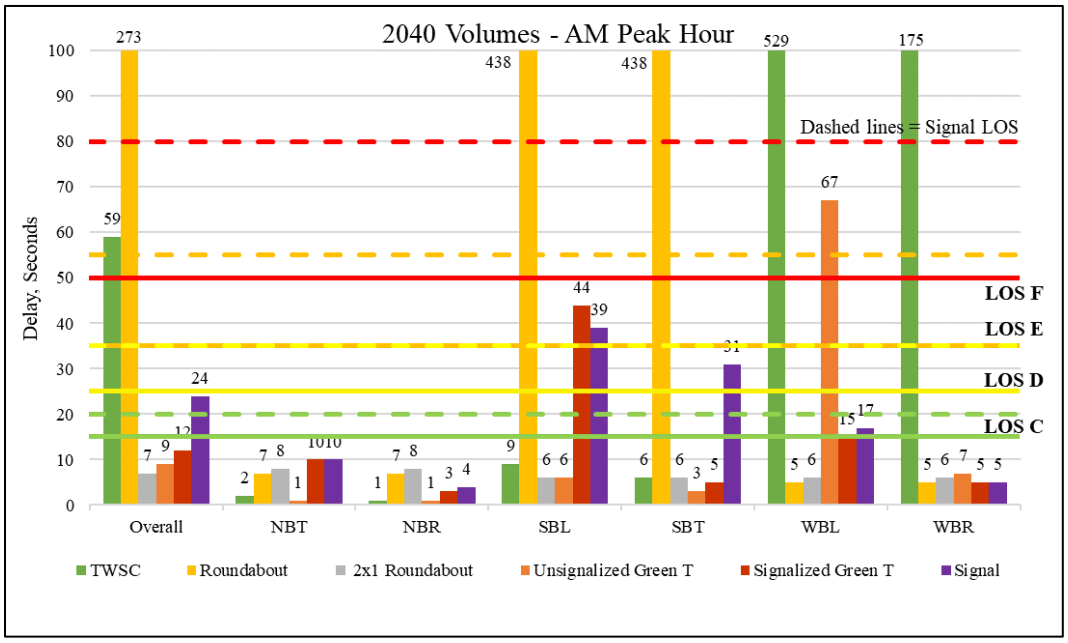


Figure 6: 2040 Volumes Sensitivity Analysis – AM Peak Hour Operations by Movement at Waconia Parkway North

Results of the sensitivity analysis for 2040 volumes are similar to those of the 2019 volumes, with the single-lane roundabout shown to be over capacity during the AM peak hour with overall and southbound delays anticipated to be upwards of four minutes of delay per vehicle; southbound queues are anticipated to reach over 5,000 feet and westbound queues may reach 400 feet. The unbalanced roundabout is shown to be able to efficiently handle these assumed fluctuations without issue. An unsignalized Green-T is modeled to suffer operationally from the peaking traffic volumes as westbound left movements experience unacceptable delays at LOS E, but offers better operations to the southbound left turn movement than the signalized Green-T. Queuing on the westbound approach is anticipated to reach a maximum of 150 feet under signalized Green-T control. Southbound left queues for the sensitivity analysis of the AM peak hour are modeled to reach up to 375 feet under signalized Green-T control, and 75 feet under a single-lane and unbalanced roundabout control. The traditional signal is also shown to be able to efficiently handle any possible fluctuations in traffic volumes.

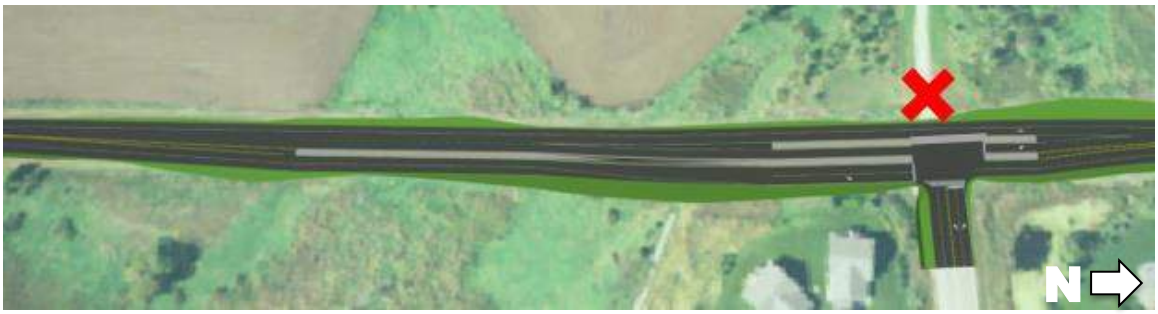
Design Considerations - Impacts, Safety and Cost Analysis

An investigation into the potential right-of-way impacts, expected safety performance and construction costs of each of the considered intersection treatments was conducted at a high-level. The estimated construction costs assume no soils corrections will be needed; soils testing should be performed to determine if any costly soils corrections work would be necessary with roadway widening or realignment. Minnesota average crash rates and severe crash rates were compared amongst the various traffic control devices considered. Note, the existing intersection has a crash rate of 0.18 crashes per million entering vehicles (MEV), and a severe injury rate of 0.0 MEV while the statewide average for a rural TWSC is 0.25 crashes/MEV and an injury rate of 1.05 crashes/MEV. The findings of this analysis, including preliminary concepts of each alternative, are as follows:

- Traffic Signal (w/ exclusive left turn lanes on CSAH 10)

  - ROW Impacts: 0.35 acres permanent right-of-way (potential easements needed)
  - Safety: Crash rate = 0.45 crashes/MEV, Injury rate = 0.48 crashes/MEV
  - Base Estimated Cost: $750,000 + Contingency of up to $1.0 M
    Note: Contingency included to account for risk associated with muck excavation/soil corrections and other factors amplified by the extended project length and widening identified with the addition of turn lanes and roadway realignment to avoid Transmission Line conflicts.

- Unsignalized Green-T



  - ROW Impacts: 0.4 acres permanent right-of-way (potential easements needed)
  - Safety: Crash rate = 0.18 crashes/MEV, Injury rate = 1.05 crashes/MEV
  - Base Estimated Cost: $1.1 M + Contingency of up to $1.0 M
    Note: Contingency included to account for risk associated with muck excavation/soil corrections and other factors amplified by the extended project length and widening identified with the addition of raised median, turn lanes and roadway realignment to avoid Transmission Line conflicts.

- Signalized Green-T

  - ROW Impacts: 0.4 acres permanent right-of-way (potential easements needed)
  - Safety: Crash rate = 0.45 crashes/MEV, Injury rate = 0.48 crashes/MEV
  - Estimated Cost: $1.35 M + Contingency of up to $1.0 M
    Note: Contingency included to account for risk associated with muck excavation/soil corrections and other factors amplified by the extended project length and widening identified with the addition of raised median, turn lanes and roadway realignment to avoid Transmission Line conflicts.

- Single-Lane Roundabout

  - ROW Impacts: 0.2 acres permanent right-of-way (potential easements needed)
  - Safety: Crash rate = 0.32 crashes/MEV, Injury rate = 0.31 crashes/MEV
  - Base Estimated Cost: $1.2 M + Contingency of up to $300,000

Note: Contingency included to account for risk associated with muck excavation/soil corrections necessary with the widening proposed at the intersection.

- Unbalanced Roundabout

  - ROW Impacts: 0.37 acres permanent right-of-way (potential easements needed)
  - Safety: Crash rate = 0.76 crashes/MEV, Injury rate = 0.15 crashes/MEV
  - Estimated Cost: $1.4 M + Contingency of up to $375,000
    Note: Contingency included to account for risk associated with muck excavation/soil corrections necessary with the widening proposed at the intersection. Contingency is slightly greater for the unbalanced roundabout as the expected footprint is larger.

Due to existing electrical transmission utility poles running along the east side of CSAH 10, efforts must be made to minimize impacts to the east side of the corridor. This may require the realignment of CSAH 10 to the west of its current alignment through the intersection at Waconia Parkway North for concepts that require widening of the roadway, this includes the signal and Green-T concepts. The approximate length of realignment is estimated to be 1,920 feet, with a conservative 12-foot shift in alignment to the west. This realignment is estimated to add approximately $600,000 at minimum to the base cost of the signal or Green-T concepts. The exact amount and degree of realignment required to avoid unacceptable utility impacts will be determined in the final design phase.

Waconia Parkway South Analysis

A separate analysis was conducted for the Waconia Parkway South, from the CSAH 10 intersection to Oak Avenue, due to the area residential development and the interactions between the intersections. In addition to forecasted 2040 volumes, several additional build scenarios were considered for this section of the corridor relating to the number of homes built within the development. The considered traffic and development levels in each scenario are as follows:

- 2019 volumes + 50 developed homes: development access at Pond Lane
- 2029 volumes + 228 developed homes: development access at Pond Lane
- 2040 volumes + 428 homes (full build): development access at Pond Lane and potentially Oak Avenue, right in/out at CSAH 32

Trip Generation
Traffic generated by the developed property was calculated using ITE Trip Generation Methodology. The trips generated for each build phase are shown in **Table 7**, below.

Table 7: Burandt Development - Trip Generation

# Homes	AM		PM		Full Day
	Enter	Exit	Enter	Exit	
50	11	31	34	20	550
228	42	126	142	84	2220
428	78	232	259	153	3962

It was assumed that the trips generated by the development were factored into the 2040 daily traffic volume forecasts. Assigning and distributing these trips onto the network was conducted by taking forecasted trips off the mainline and redistributing to the nearest development access. Assumed trip distributions for the traffic generated by the development were made and assigned to the network.

Development Warrants

Traffic signal warrants and all-way stop control warrants were completed using the forecasted volumes and the trips generated and redistributed due to the Burandt development. The Pond Lane intersection is estimated to meet warrants 2 and 3 under the full development build condition in addition to the 2040 forecasted volumes when there is no access to the development via Oak Avenue. When Oak Avenue is provided access to the development, Pond Lane is estimated to meet warrant 3 only. Oak Avenue is anticipated to meet warrant 2 for signals under 2040 forecasted volumes regardless of development access or development size. Detailed warrant analysis results for the development scenarios are available upon request. **Table 8**, below, shows the number of hours met for signal and all-way stop warrants under the considered development and forecast scenarios.

Table 8: Burandt Development - Warrants Met

Warrant	Hours Required	Pond Lane						Oak Ave			
		2019	50 Homes	228 Homes	2040	428 Homes Oak T	428 Homes	2019	2040	428 Homes T	428 Homes
Warrant 1A	8	0	0	1	0	3	1	0	0	0	1
Warrant 1B	8	0	0	2	2	5	3	0	4	4	4
Warrant 2	4	0	0	1	2	**4**	1	0	**4**	**4**	**4**
Warant 3	1	0	0	0	0	**3**	**1**	0	0	0	0
AWSC Warrants	8	0	0	1	0	2	1	1	4	2	4

Traffic Operations Analysis

Analysis of the development in the near term includes 2019 traffic volumes and the added trips associated with 50 new homes. The near-term site plan would feature a single access point at Pond Lane; this intersection would remain as a two-way stop control and turn lanes would be provided for movements entering the development in the form of and eastbound left turn lane and a westbound right turn lane. **Figures 7 and 8**, below, compare the operations of the movements at the Pond Lane intersection of the existing conditions with the added volumes and movements due to the development.

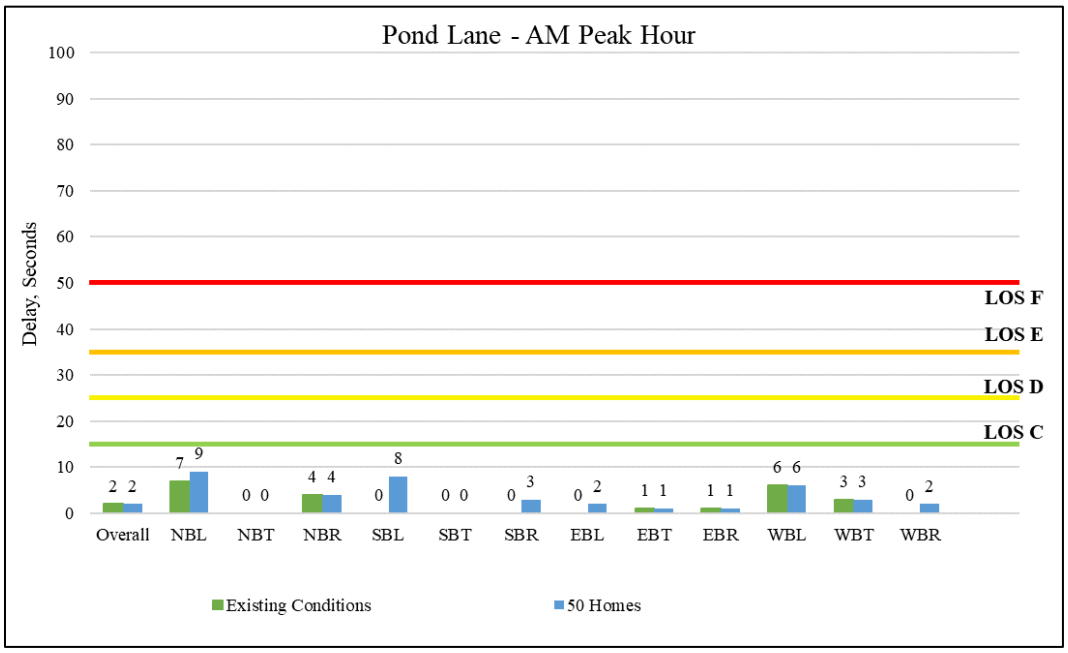


Figure 7: 2019 Volumes + 50 Homes – AM Peak Hour Operations by Movement

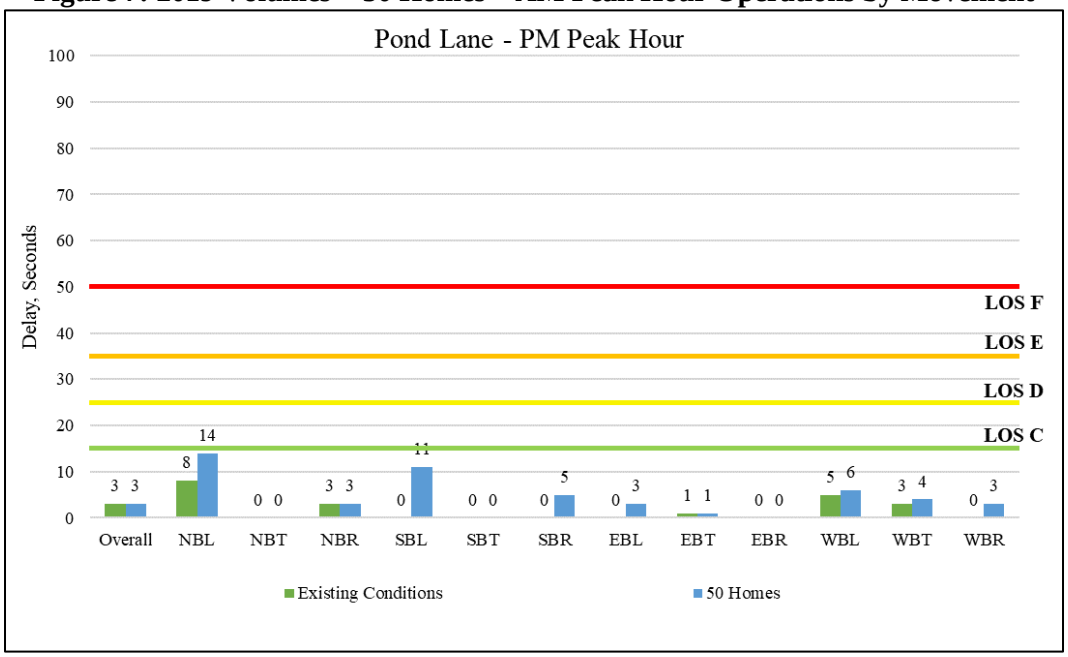


Figure 8: 2019 Volumes + 50 Homes – PM Peak Hour Operations by Movement

Analysis reveals that the additional traffic added to the new north leg of Pond Lane will add little overall delay to the intersection in its current two-way stop control condition; all movements operate at LOS C or better during the peak hours.

Analysis of the Pond Lane intersection was further conducted to determine if the existing two-way stop control can efficiently serve the development access when 228 homes are built and traffic volumes in the area grow to 2029 forecasted levels. The 2029 forecast was interpolated between the final 2040 forecasts and the existing traffic volumes. **Figure 9**, below, illustrate the operations of the movements at the Pond

Lane intersection during both peak hours with the added volumes and movements due to the development.

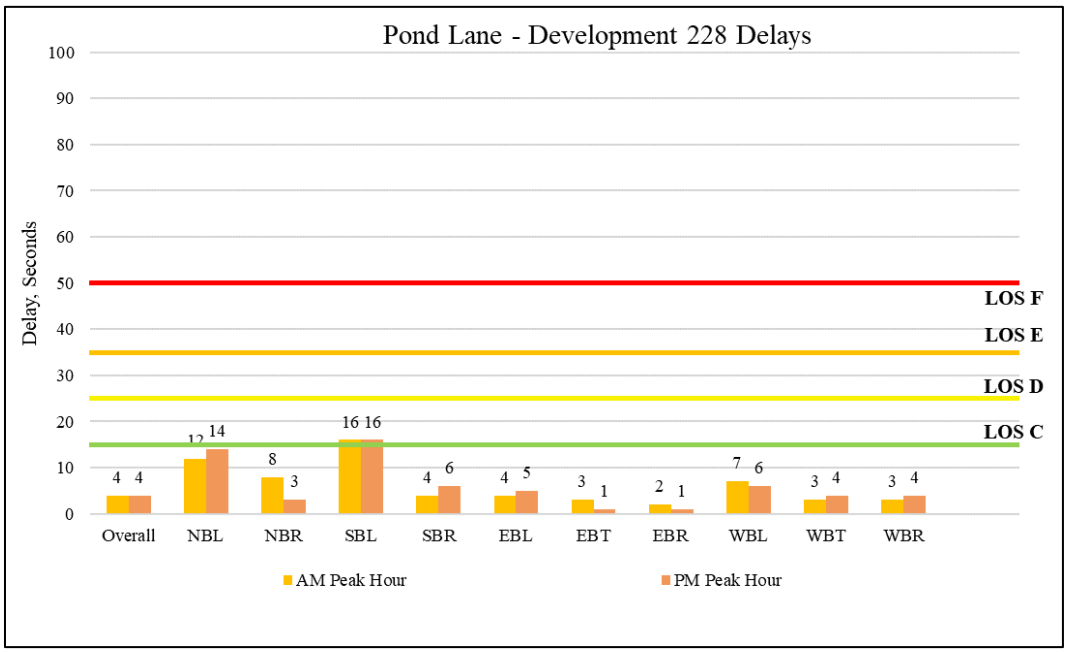


Figure 9: 2029 Volumes + 228 Homes – AM & PM Peak Hour Operations by Movement

The development is shown to be efficiently served by a single access at Pond Lane when 228 homes are built, and traffic volumes are equivalent to the 2029 forecasted volumes. The northbound and southbound left turn movements are anticipated to be the limiting movements during both peak hours, operating at or near LOS D.

Finally, ultimate build conditions were modeled and analyzed at the Pond Lane intersection. Several options were considered for this analysis in addition to a no build option; Pond Lane may remain a two-way stop control and be the only access to the development as the north leg of the Oak Avenue intersection is closed, creating a T-intersection in which a signal or roundabout control are considered, or Pond Lane may remain as a two-way stop control or be converted to a single-lane roundabout and Oak Avenue is converted to a three-legged signalized intersection.

Figures 10 and 11, below, compare the operations by movement at Pond Lane for the possible scenarios during the 2040 design year for both peak hours.

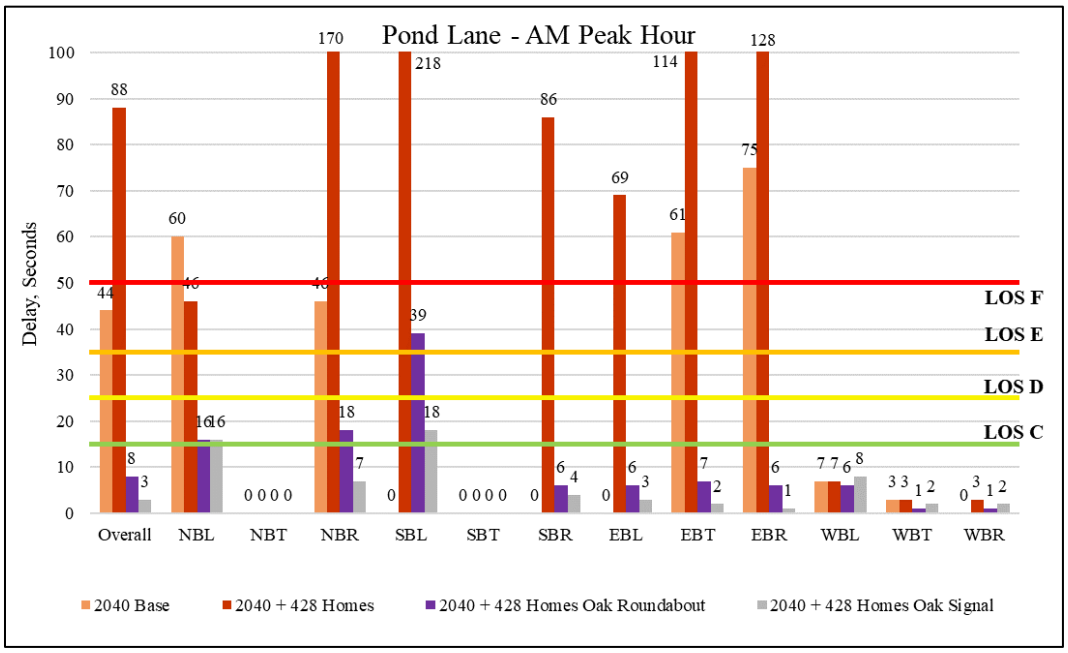


Figure 10: 2040 Volumes + 428 Homes at Pond Lane – AM Peak Hour Operations by Movement

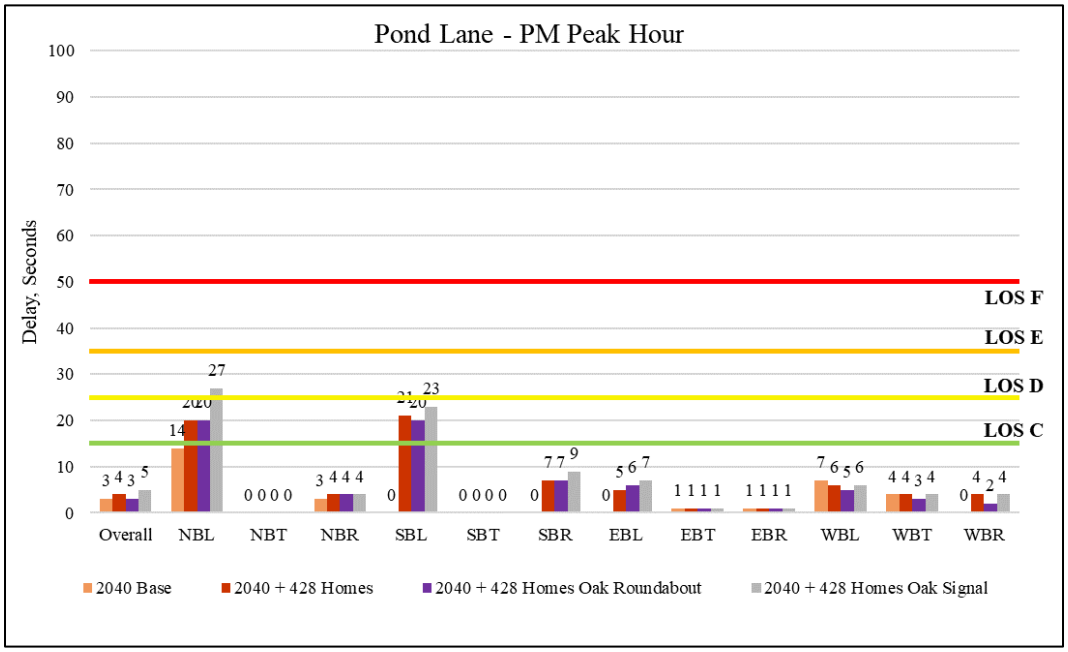


Figure 11: 2040 Volumes + 428 Homes at Pond Lane – PM Peak Hour Operations by Movement

Analysis of Pond Lane under the ultimate build conditions reveals several important trends that occur at the intersection. As noted in the no build operations analysis section above, the all-way stop control at Oak Avenue becomes a major bottleneck along the corridor during both peak hours under forecasted volumes. Queues are shown to spill back through the Pond Lane intersection (maximum queues may reach 1350 feet) during the AM peak causing significant delays. Adding development traffic at Pond Lane is shown to only exacerbate the operational issues anticipated. However, during the PM peak hour, when these queues are not blocking Pond Lane, a two-way stop is shown to provide overall efficient operation. Northbound and southbound left turn movements remain at acceptable levels, operating at LOS C. Improving operations at Oak Avenue via a signal or roundabout is shown to greatly improve operations at

Pond Lane. Reduction of spillback queues and increased frequency of acceptable gaps for traffic entering Waconia Parkway South results in decreased delays on the northbound and southbound approaches. However, the Oak Avenue roundabout option is anticipated to provide the southbound left movement at LOS E during the AM peak hour, while the platooning offered by the signal alternative offers a LOS D. Conversely, the northbound left turn movement during the PM peak operates at LOS E while Oak Avenue is signalized, but the roundabout control offers a LOS D.

Operations at Oak Avenue under the existing, signalized, and single-lane roundabout control are shown the **Figures 12 and 13**, below.

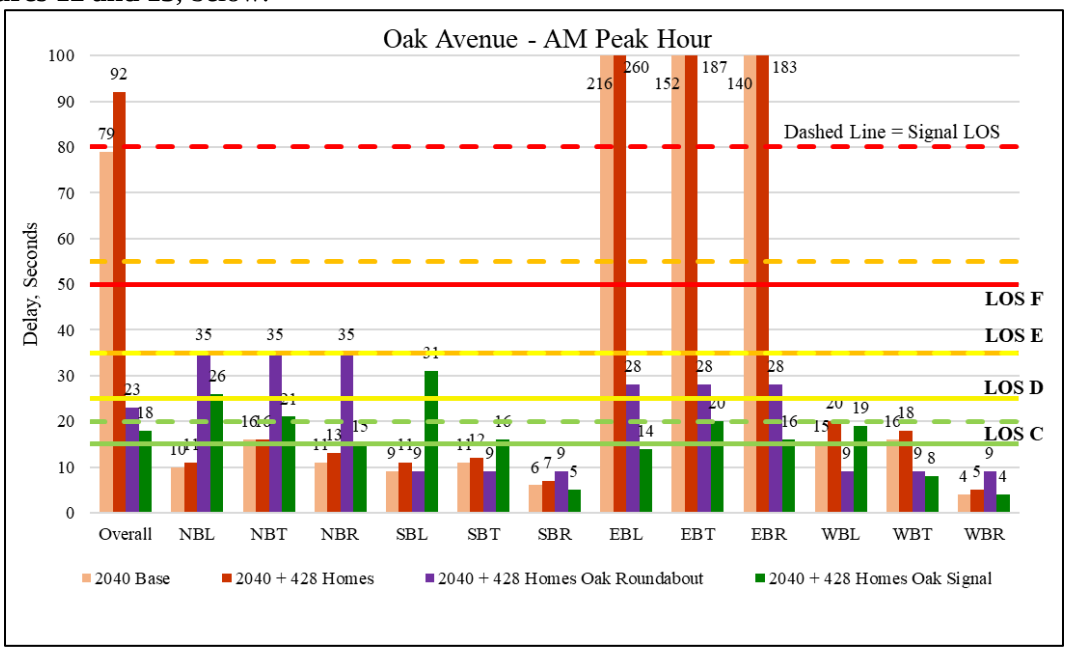


Figure 12: 2040 Volumes + 428 Homes at Oak Avenue – AM Peak Hour Operations by Movement

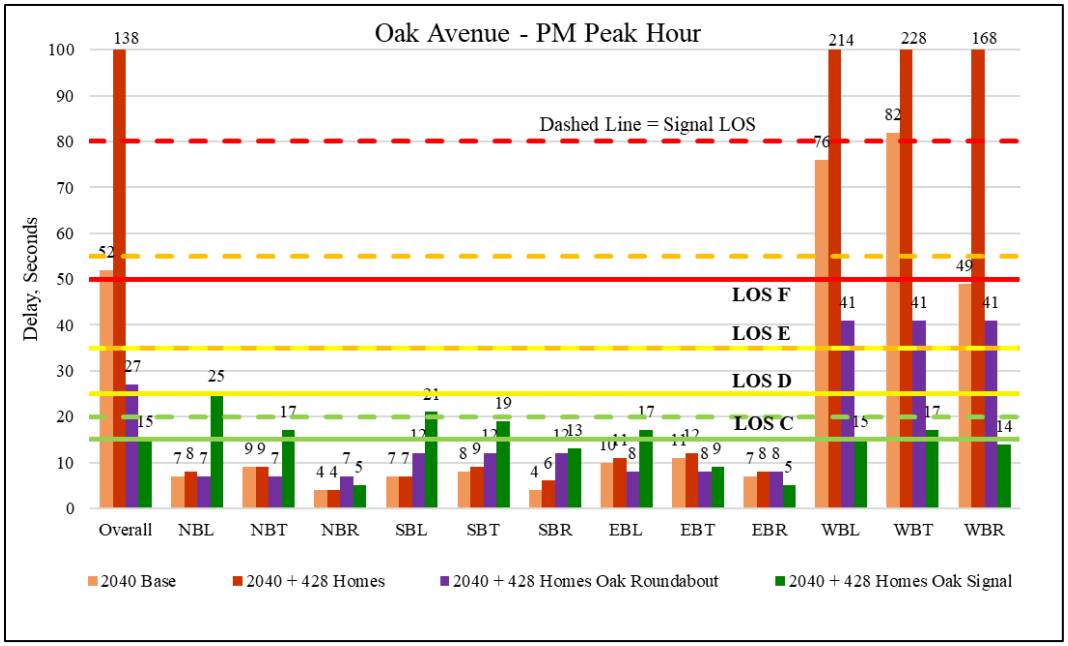


Figure 13: 2040 Volumes + 428 Homes at Oak Avenue – PM Peak Hour Operations by Movement

As might be expected, the added development traffic to the intersection causes further deterioration of operations at Oak Avenue. However, both a signal and roundabout control are anticipated to greatly improve overall operations during the peak hours. Queuing distances are also reduced, with maximum queues reaching between 300 and 500 feet on Waconia Parkway South. The roundabout is anticipated to provide slightly shorter maximum queue lengths in comparison to the signalized alternative.

A second full build scenario was considered, featuring a three-legged Oak Avenue under signalized control, and either the existing two-way stop control or a single-lane roundabout at Pond Lane. Operations at Pond Lane with a two-way stop control versus a single-lane roundabout are illustrated in **Figures 14 and 15**, below.

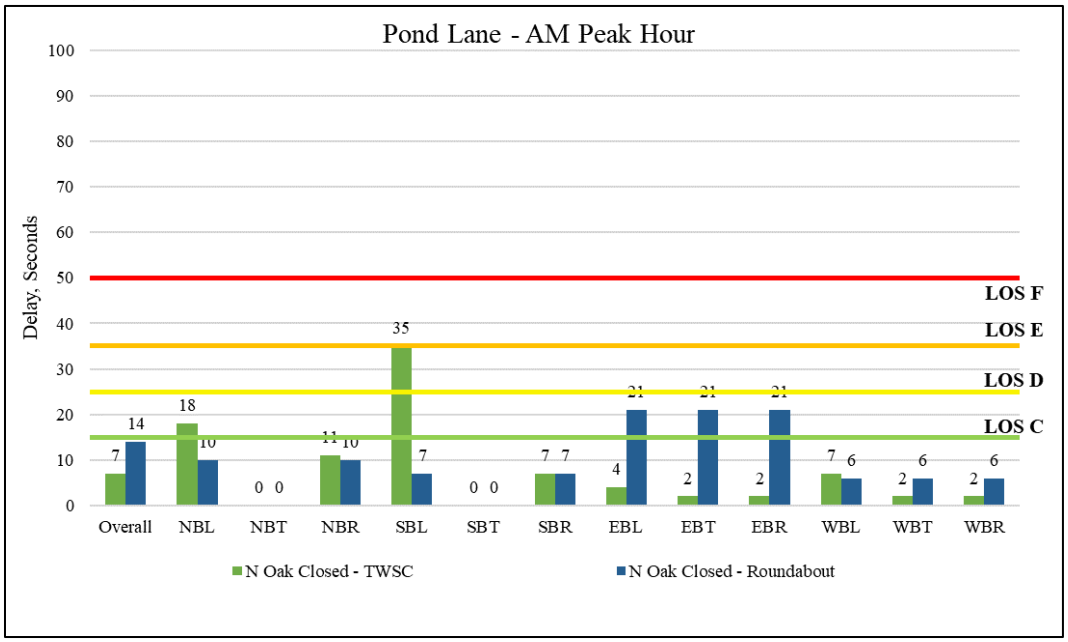


Figure 14: Full Build w/ Three-Leg Oak – AM Peak Hour Operations by Movement at Pond

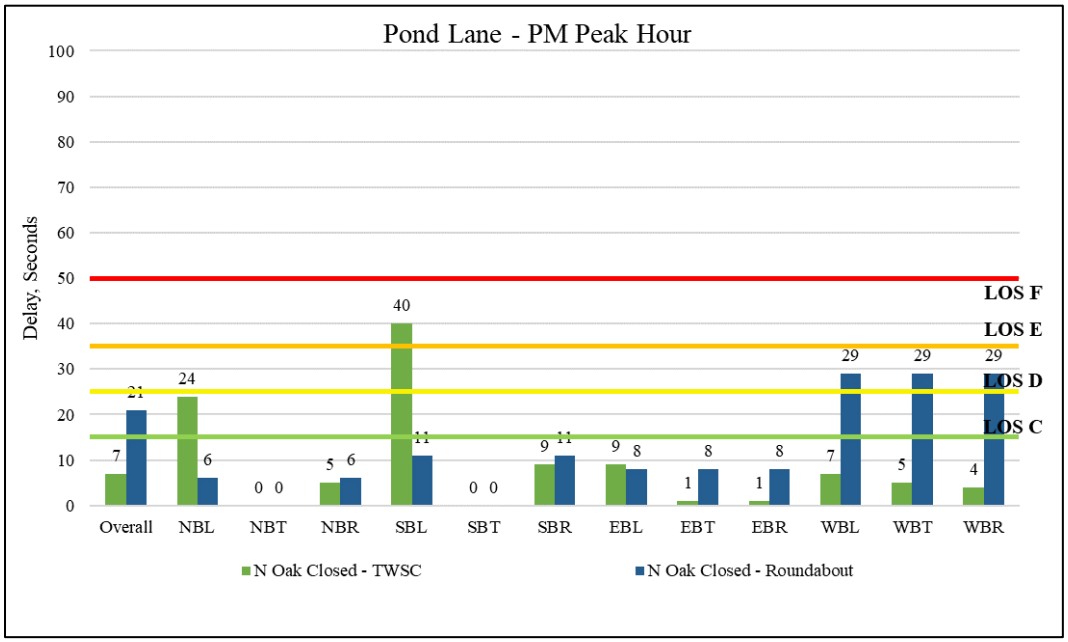


Figure 15: Full Build w/ Three-Leg Oak – PM Peak Hour Operations by Movement at Pond

It is anticipated that while a two-way stop control at the Pond Lane access will provide better overall operation during both peak hours, the left turn movements from the side streets will operate at or near unacceptable LOS E. Conversely, a roundabout control will provide the side street movement with improved delays, mainline operations are sacrificed with delays rising to LOS D or better during the peak hours.

Operations at Oak Avenue operating as a signalized T-intersection are shown in **Figure 16**, below.

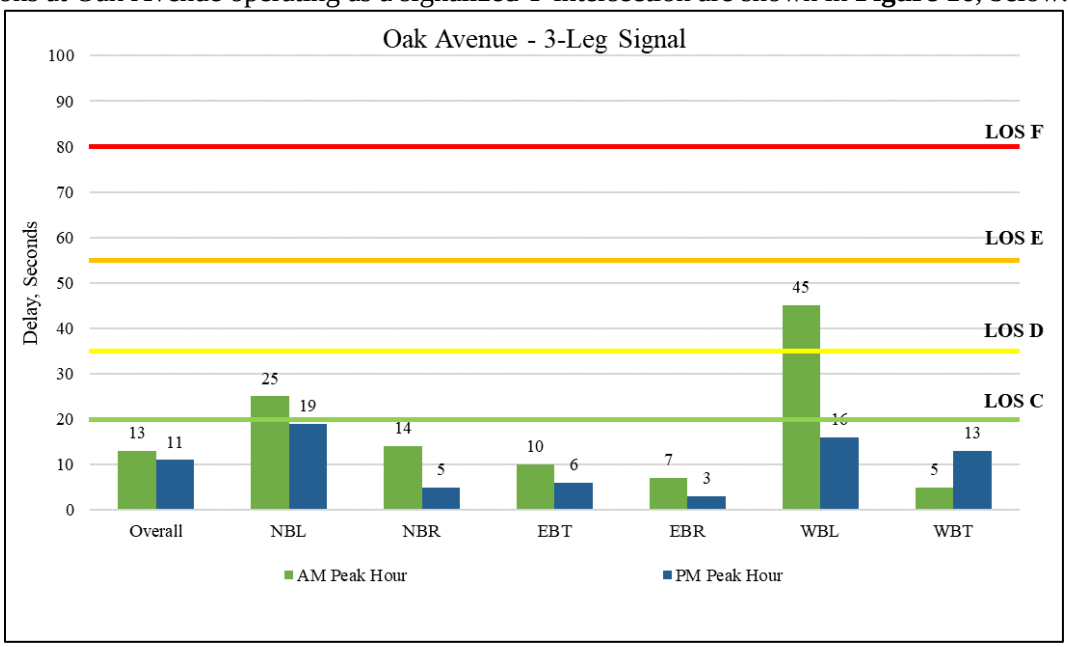


Figure 16: Full Build w/ Three-Leg Oak – AM & PM Peak Hour Operations by Movement at Oak

Oak Avenue operations are anticipated to be acceptable on all movements during both peak hours while operating as a signalized three-legged intersection. Overall operations are shown as LOS B during both peak hours.

CSAH 10 at CSAH 32/Development Access Analysis

For all ultimate development build analyses, a right in-right out intersection was assumed at the CSAH 10/32 intersection, with CSAH 32 being stop controlled. An access here allows some relief from the Pond Lane or Oak Avenue intersections by allowing additional access to/from the site. **Figures 17 and 18**, below, compare the operations by movement for no access (existing conditions), partial access (right-in/right-out), and full access (four-leg side street stop) at the CSAH 32 intersection.

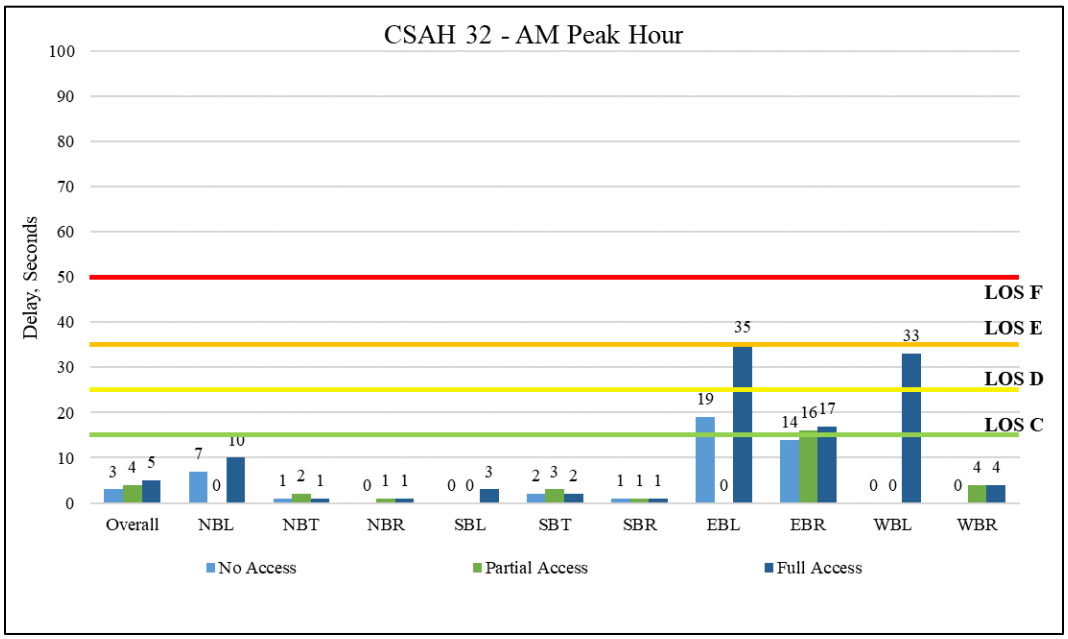


Figure 17: CSAH 32 – AM Peak Hour Operations by Movement

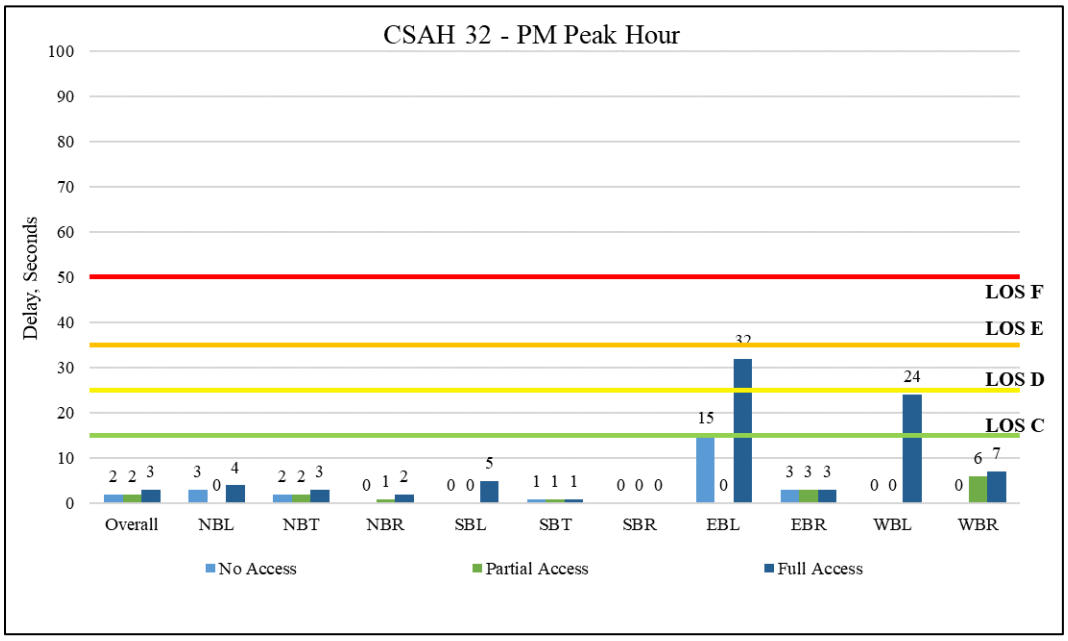


Figure 18: CSAH 32 – PM Peak Hour Operations by Movement

Models anticipate that while differences in overall operations are negligible between access options at CSAH 32, the left turn movements from CSAH 32 do experience notable delays, operating at LOS E or better, and experiencing queues of up to 125 feet during the AM peak hour. Allowing a full access intersection may provide additional mobility to the site, but access spacing, and sight line considerations should be reviewed if safety issues arise with increasing traffic volumes on CSAH 10.

Summary and Conclusions

The analysis of existing conditions along the CSAH 10 & Waconia Parkway South corridors was completed to discover any existing safety or operations issues. While a safety analysis discovered that all intersections are operating within the expected safety thresholds, periodic safety reviews should be conducted as traffic grows in the area. Similarly, operations are currently acceptable throughout the corridor, though several movements do experience notable delays. As traffic continues to grow in the area, these delays will continue to increase, further degrading the operations and safety of the corridor to an unacceptable level.

The analysis of the CSAH 10 and Waconia Parkway North intersection evaluated various intersection control types under existing and future traffic volumes. This analysis shows that an unbalanced roundabout, signalized Green-T, and traditional signalized intersection options are all expected to efficiently serve traffic at the intersection during peak conditions. A sensitivity analysis of the AM peak hour volumes was conducted in order to verify these results. This analysis revealed that the unbalanced roundabout and signalized Green-T will provide the best overall and side street operations now and into the future. Right-of-way impacts, vehicle safety, and estimated cost were also considered; while the roundabout and signalized Green-T have similar estimated construction costs, preliminary impact estimates show that the roundabout option may require permanent land acquisition. Additionally, while a signalized Green-T may offer a lower crash rate, the average injury crash rate is anticipated to be higher than that of the unbalanced roundabout.

Analysis of traffic growth along with the Burandt Development site was conducted and shows that the site can efficiently access CSAH 10 and Waconia Parkway South with one two-way stop-controlled access at Pond Lane in the near-term to mid-term future. As the development is built out and other area traffic continues to grow, periodic traffic studies should be conducted to assess the need for making further accommodations and access improvements to the site.

Appendix A

Traffic Volume Details

CSAH 10 & Waconia Pkwy South Corridor Study

City of Waconia, MN

Existing Turning Movements

April 2019

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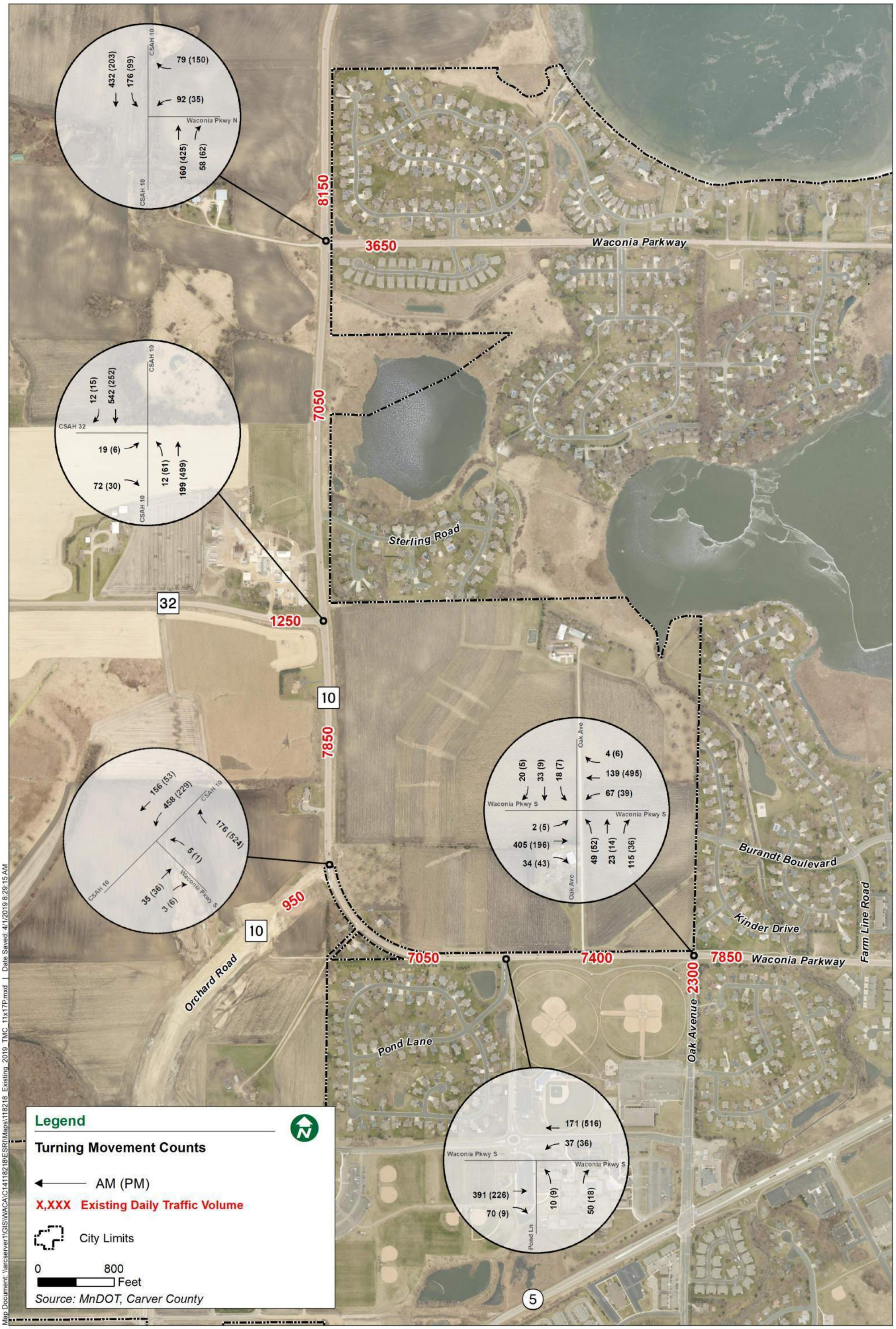


Legend

Turning Movement Counts

AM (PM)

X,XXX Existing Daily Traffic Volume

City Limits

0 800 Feet

Source: MnDOT, Carver County

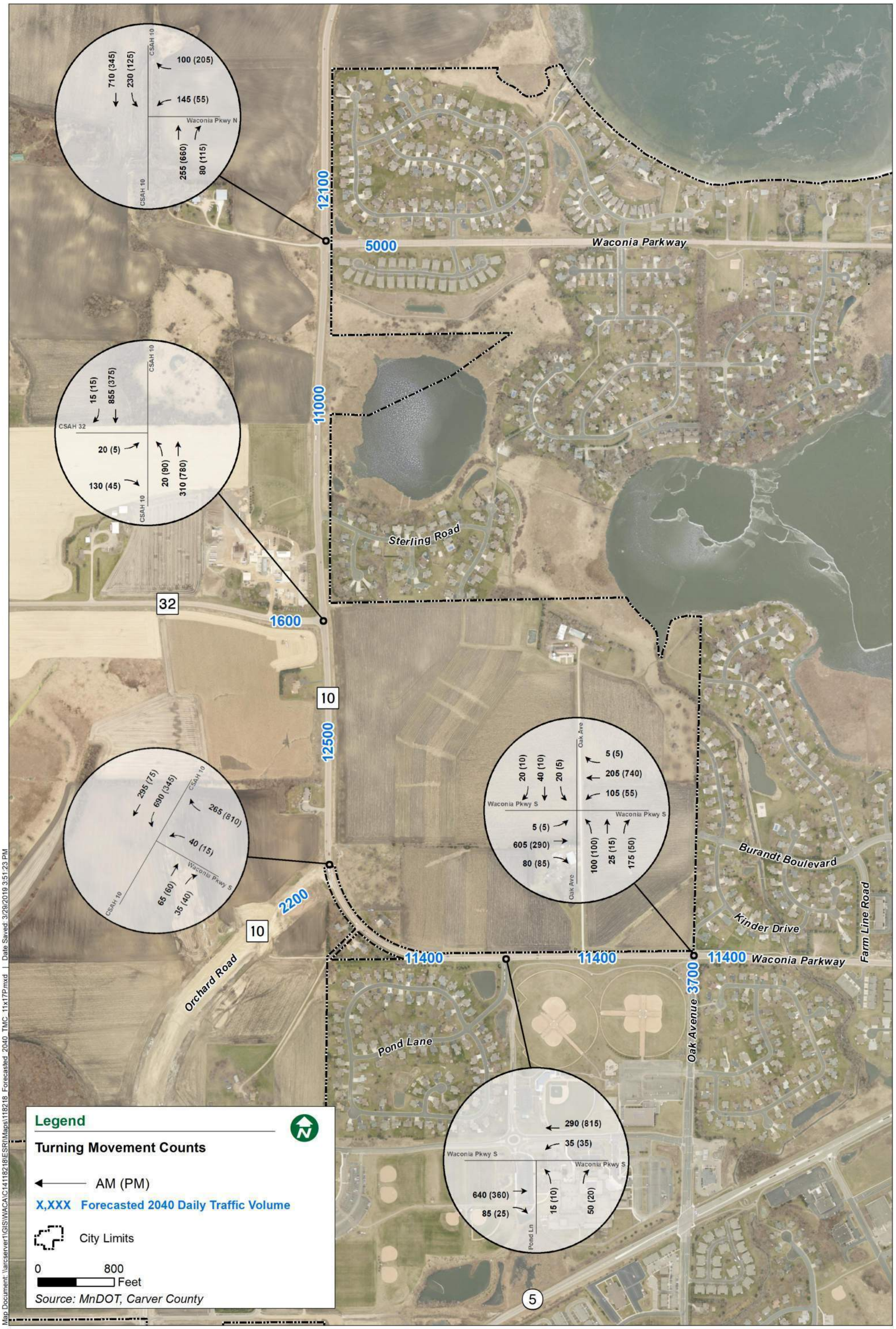
CSAH 10 & Waconia Pkwy South Corridor Study

Forecasted 2040 Turning Movements

City of Waconia, MN

April 2019

BOLTON & MENK
Real People. Real Solutions.



Legend

Turning Movement Counts

AM (PM)

X,XXX Forecasted 2040 Daily Traffic Volume

City Limits

0 800 Feet

Source: MnDOT, Carver County

Map Document: \\arcserver1\GIS\WACA\C14118218\ESRI\Maps\1118218_Forecasted_2040_TMC_11x17P.mxd | Date Saved: 3/29/2019 3:51:23 PM

CSAH 10 & Waconia Pkwy South Corridor Study

City of Waconia, MN

Short-Term Development Turning Movement Counts

April 2019

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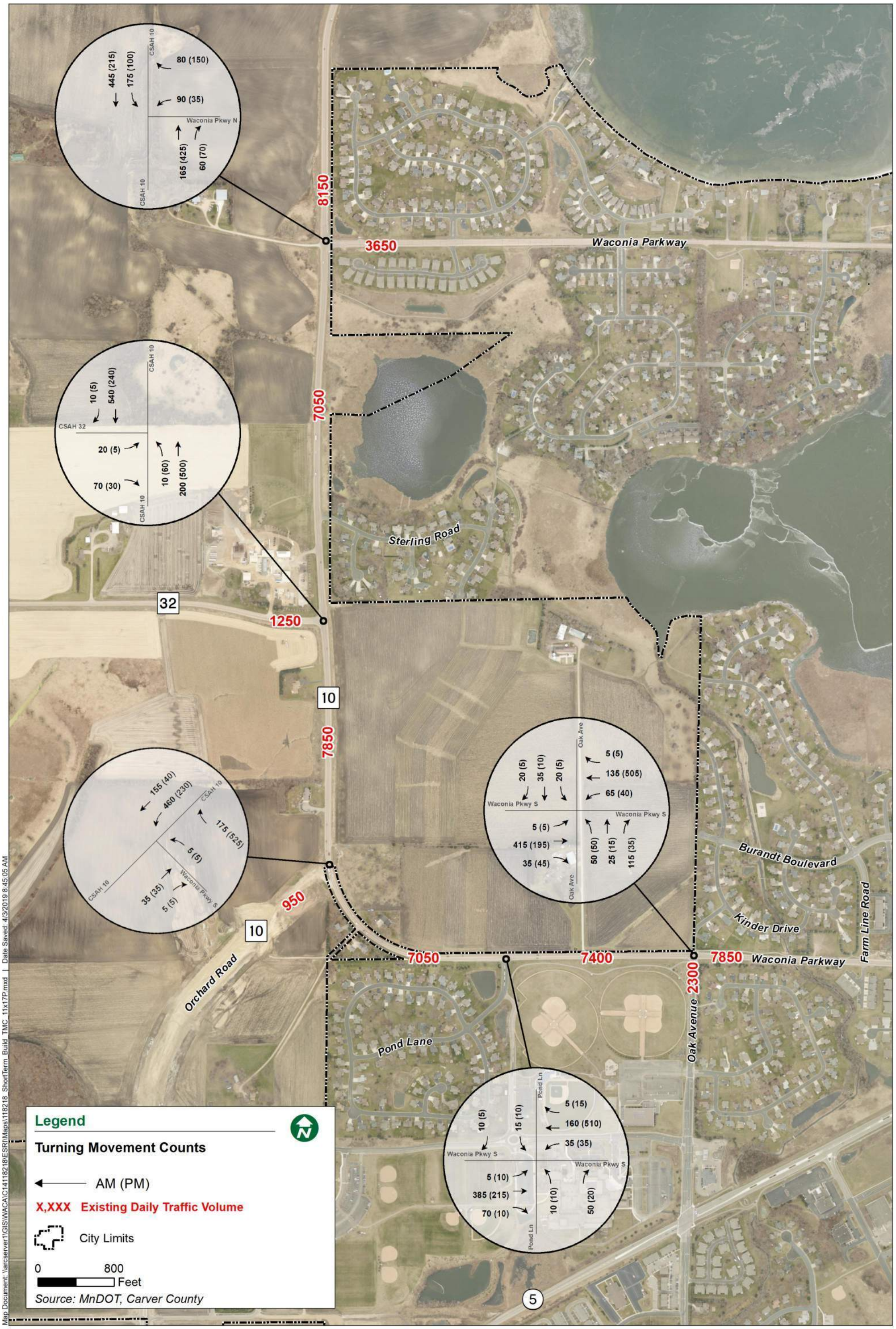

Legend

Turning Movement Counts

AM (PM)

X,XXX Existing Daily Traffic Volume

City Limits

0 800 Feet

Source: MnDOT, Carver County

CSAH 10 & Waconia Pkwy South Corridor Study

City of Waconia, MN

Mid-Term Development Turning Movement Counts

April 2019

BOLTON & MENK
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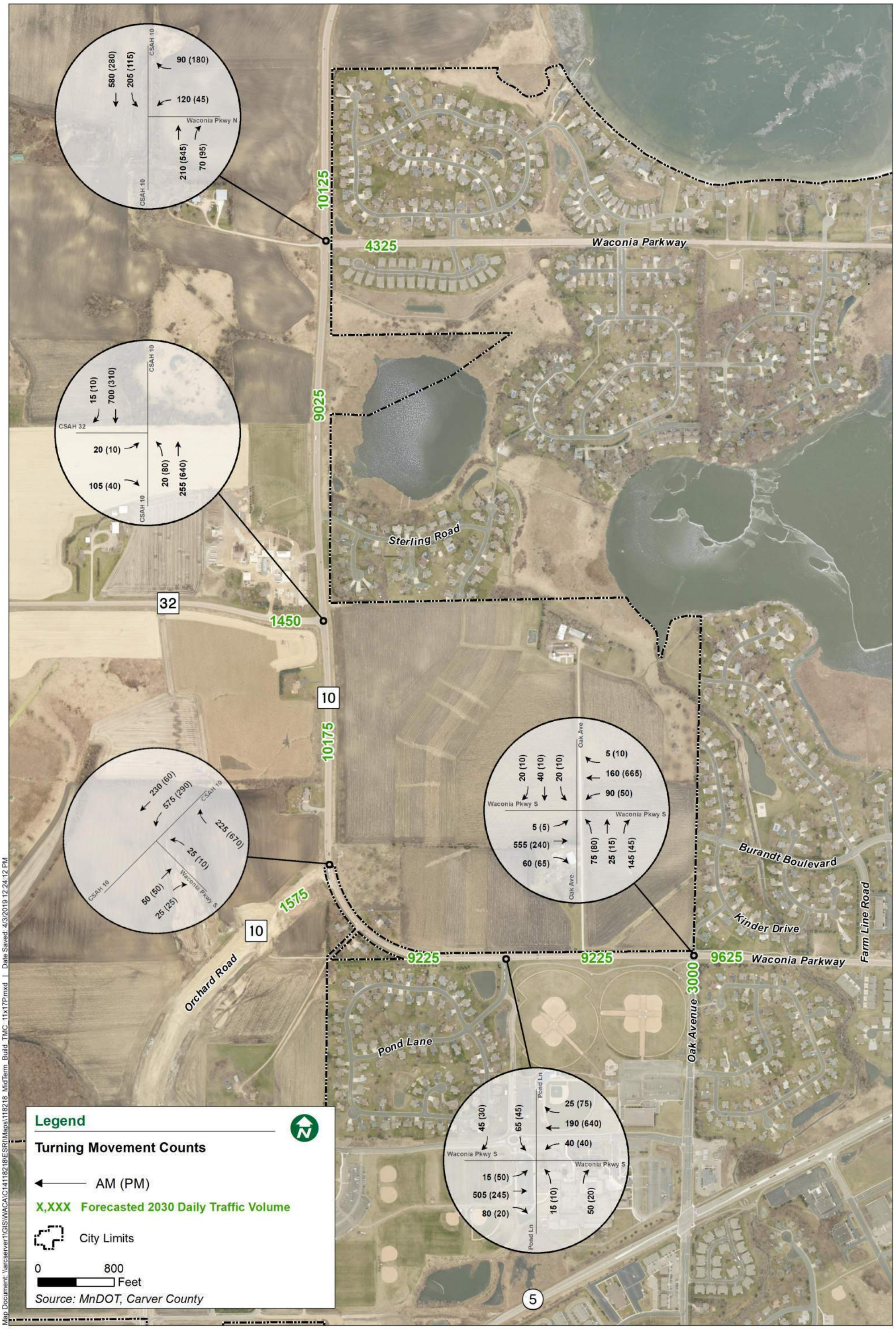

Legend

Turning Movement Counts

AM (PM)

X,XXX Forecasted 2030 Daily Traffic Volume

City Limits

0 800 Feet

Source: MnDOT, Carver County

Map Document: \\arcserver1\GIS\WACA\C14118218\ESRIMaps\118218_MidTerm_Build_TMC_11x17P.mxd | Date Saved: 4/3/2019 12:24:12 PM

CSAH 10 & Waconia Pkwy South Corridor Study

City of Waconia, MN

Long-Term Development Turning Movement Counts

April 2019

BOLTON & MENK
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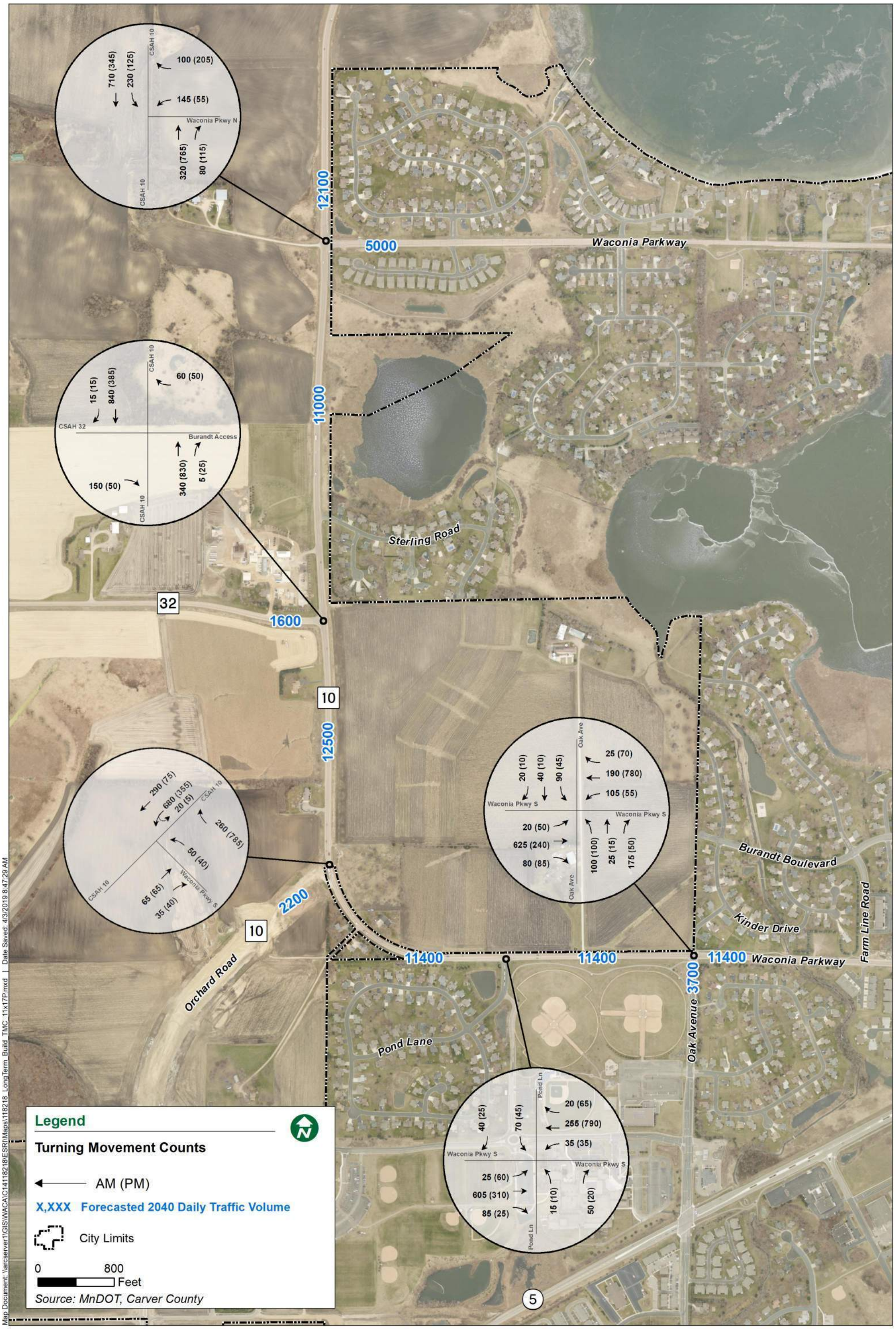


Legend

Turning Movement Counts

← AM (PM)

X,XXX Forecasted 2040 Daily Traffic Volume

City Limits

0 800 Feet

Source: MnDOT, Carver County

Map Document: \\arcserver1\GIS\WACA\C14118218\ESRIMaps\118218_LongTerm_Build_TMC_11x17P.mxd | Date Saved: 4/3/2019 8:47:29 AM

Appendix B

Warrant Analysis Details

SIGNAL WARRANTS ANALYSIS

Minor Rights Excluded

LOCATION: Waconia
COUNTY: Carver
REF. POINT:
DATE: 2/28/2019
OPERATOR: MSL

Speed	Approach Description		Lanes
50	Major App1:	NB CSAH 10	1
50	Major App3:	SB CSAH 10	2
50	Minor App2:	WB CSAH 30	1
	Minor App4:		

0.70 FACTOR USED? YES
POPULATION < 10,000? No
EXISTING SIGNAL ? No
THRESHOLDS 1A/1B: 420/630 105/52

HOUR	MAJOR APP. 1	MAJOR APP. 3	TOTAL 1+3	MAJOR 1A/1B	MINOR APP. 2	MINOR 2 1A/1B	MINOR APP. 4	MINOR 4 1A/1B	**MET SAME 1A/1B**
0:00 - 1:00			0	/		/			/
1:00 - 2:00			0	/		/			/
2:00 - 3:00			0	/		/			/
3:00 - 4:00			0	/		/			/
4:00 - 5:00			0	/		/			/
5:00 - 6:00			0	/		/			/
6:00 - 7:00	85	309	394	/	29	/			/
7:00 - 8:00	218	608	826	X/X	92	/X			**/X**
8:00 - 9:00	149	312	461	X/	30	/			/
9:00 - 10:00	130	216	346	/	18	/			/
10:00 - 11:00	146	210	356	/	28	/			/
11:00 - 12:00	171	191	362	/	31	/			/
12:00 - 13:00	174	169	343	/	29	/			/
13:00 - 14:00	174	189	363	/	20	/			/
14:00 - 15:00	247	221	468	X/	42	/			/
15:00 - 16:00	426	260	686	X/X	47	/			/
16:00 - 17:00	451	281	732	X/X	39	/			/
17:00 - 18:00	430	274	704	X/X	41	/			/
18:00 - 19:00	284	236	520	X/	35	/			/
19:00 - 20:00			0	/		/			/
20:00 - 21:00			0	/		/			/
21:00 - 22:00			0	/		/			/
22:00 - 23:00			0	/		/			/
23:00 - 24:00			0	/		/			/

	Met (Hr)	Required (Hr)	
Warrant 1A	0	8	Not satisfied
Warrant 1B	1	8	Not satisfied
Warrant 2	1	4	Not satisfied
Warrant 3	0	1	Not satisfied
Warrant 7	2	8	Not satisfied

ALL WAY STOP WARRANT

LOCATION: Waconia
COUNTY: Carver
REF. POINT:
DATE: 2/28/2019
OPERATOR: MSL

Speed	Approach Description	Lanes
50	Major App1: NB CSAH 10	1
50	Major App3: SB CSAH 10	2
50	Minor App2: WB CSAH 30	1
	Minor App4:	

0.70 FACTOR USED? Yes

					210	140	
HOUR	MAJOR APP. 1	MAJOR APP. 3	MINOR APP. 2	MINOR APP. 4	MAJOR TOTAL Σ (APP. 1 & APP. 3)	MINOR TOTAL APP. 2 + APP. 4	WARRANT MET
0:00 - 1:00							
1:00 - 2:00							
2:00 - 3:00							
3:00 - 4:00							
4:00 - 5:00							
5:00 - 6:00							
6:00 - 7:00	85	309	62		394	62	X/
7:00 - 8:00	218	608	171		826	171	X/X
8:00 - 9:00	149	312	87		461	87	X/
9:00 - 10:00	130	216	59		346	59	X/
10:00 - 11:00	146	210	69		356	69	X/
11:00 - 12:00	171	191	95		362	95	X/
12:00 - 13:00	174	169	91		343	91	X/
13:00 - 14:00	174	189	78		363	78	X/
14:00 - 15:00	247	221	123		468	123	X/
15:00 - 16:00	426	260	161		686	161	X/X
16:00 - 17:00	451	281	189		732	189	X/X
17:00 - 18:00	430	274	159		704	159	X/X
18:00 - 19:00	284	236	99		520	99	X/
19:00 - 20:00							
20:00 - 21:00							
21:00 - 22:00							
22:00 - 23:00							
23:00 - 24:00							

	Met (Hr)	Required (Hr)	
Allway Stop Warrant:	4	8	Not satisfied

REMARKS:

SIGNAL WARRANTS ANALYSIS

Minor Rights Excluded

LOCATION: Waconia
COUNTY: Carver
REF. POINT:
DATE: 2/28/2019
OPERATOR: MSL

Speed	Approach Description		Lanes
50	Major App1:	NB CSAH 10	2
50	Major App3:	SB CSAH 10	1
50	Minor App2:	EB CSAH 32	1
	Minor App4:		

0.70 FACTOR USED? YES
POPULATION < 10,000? No
EXISTING SIGNAL ? No
THRESHOLDS 1A/1B: 420/630 105/52

HOUR	MAJOR APP. 1	MAJOR APP. 3	TOTAL 1+3	MAJOR 1A/1B	MINOR APP. 2	MINOR 2 1A/1B	MINOR APP. 4	MINOR 4 1A/1B	**MET SAME 1A/1B**
0:00 - 1:00			0	/		/			/
1:00 - 2:00			0	/		/			/
2:00 - 3:00			0	/		/			/
3:00 - 4:00			0	/		/			/
4:00 - 5:00			0	/		/			/
5:00 - 6:00			0	/		/			/
6:00 - 7:00	102	295	397	/	6	/			/
7:00 - 8:00	211	554	765	X/X	22	/			/
8:00 - 9:00	152	251	403	/	12	/			/
9:00 - 10:00	129	170	299	/	11	/			/
10:00 - 11:00	151	164	315	/	9	/			/
11:00 - 12:00	195	169	364	/	7	/			/
12:00 - 13:00	190	150	340	/	7	/			/
13:00 - 14:00	178	145	323	/	7	/			/
14:00 - 15:00	280	184	464	X/	9	/			/
15:00 - 16:00	496	238	734	X/X	10	/			/
16:00 - 17:00	507	250	757	X/X	9	/			/
17:00 - 18:00	467	242	709	X/X	12	/			/
18:00 - 19:00	309	195	504	X/	9	/			/
19:00 - 20:00			0	/		/			/
20:00 - 21:00			0	/		/			/
21:00 - 22:00			0	/		/			/
22:00 - 23:00			0	/		/			/
23:00 - 24:00			0	/		/			/

	Met (Hr)	Required (Hr)	
Warrant 1A	0	8	Not satisfied
Warrant 1B	0	8	Not satisfied
Warrant 2	0	4	Not satisfied
Warrant 3	0	1	Not satisfied
Warrant 7	0	8	Not satisfied

ALL WAY STOP WARRANT

LOCATION: Waconia
COUNTY: Carver
REF. POINT:
DATE: 2/28/2019

OPERATOR: MSL

0.70 FACTOR USED? Yes

Speed	Approach Description	Lanes
50	Major App1: NB CSAH 10	2
50	Major App3: SB CSAH 10	1
50	Minor App2: EB CSAH 32	1
	Minor App4:	

					210	140	
HOUR	MAJOR APP. 1	MAJOR APP. 3	MINOR APP. 2	MINOR APP. 4	MAJOR TOTAL Σ (APP. 1 & APP. 3)	MINOR TOTAL APP. 2 + APP. 4	WARRANT MET
0:00 - 1:00							
1:00 - 2:00							
2:00 - 3:00							
3:00 - 4:00							
4:00 - 5:00							
5:00 - 6:00							
6:00 - 7:00	102	295	53		397	53	X/
7:00 - 8:00	211	554	94		765	94	X/
8:00 - 9:00	152	251	52		403	52	X/
9:00 - 10:00	129	170	42		299	42	X/
10:00 - 11:00	151	164	26		315	26	X/
11:00 - 12:00	195	169	34		364	34	X/
12:00 - 13:00	190	150	29		340	29	X/
13:00 - 14:00	178	145	22		323	22	X/
14:00 - 15:00	280	184	39		464	39	X/
15:00 - 16:00	496	238	44		734	44	X/
16:00 - 17:00	507	250	45		757	45	X/
17:00 - 18:00	467	242	38		709	38	X/
18:00 - 19:00	309	195	24		504	24	X/
19:00 - 20:00							
20:00 - 21:00							
21:00 - 22:00							
22:00 - 23:00							
23:00 - 24:00							

	Met (Hr)	Required (Hr)	
Allway Stop Warrant:	0	8	Not satisfied

REMARKS:

SIGNAL WARRANTS ANALYSIS

LOCATION: Waconia
COUNTY: Carver
REF. POINT:
DATE: 2/28/2019
OPERATOR: MSL

Speed	Approach Description		Lanes
50	Major App1:	NB CSAH 10	1
50	Major App3:	SB CSAH 10	1
50	Minor App2:	WB Waconia Pkwy S	1
	Minor App4:		

0.70 FACTOR USED? YES
POPULATION < 10,000? No
EXISTING SIGNAL ? No
THRESHOLDS 1A/1B: 350/525 105/52

HOUR	MAJOR APP. 1	MAJOR APP. 3	TOTAL 1+3	MAJOR 1A/1B	MINOR APP. 2	MINOR 2 1A/1B	MINOR APP. 4	MINOR 4 1A/1B	**MET SAME 1A/1B**
0:00 - 1:00			0	/		/			/
1:00 - 2:00			0	/		/			/
2:00 - 3:00			0	/		/			/
3:00 - 4:00			0	/		/			/
4:00 - 5:00			0	/		/			/
5:00 - 6:00			0	/		/			/
6:00 - 7:00	9	333	342	/	95	/X			/
7:00 - 8:00	38	617	655	X/X	182	X/X			**X/X**
8:00 - 9:00	20	281	301	/	131	X/X			/
9:00 - 10:00	19	203	222	/	113	X/X			/
10:00 - 11:00	19	171	190	/	134	X/X			/
11:00 - 12:00	15	189	204	/	182	X/X			/
12:00 - 13:00	18	170	188	/	179	X/X			/
13:00 - 14:00	20	150	170	/	163	X/X			/
14:00 - 15:00	34	202	236	/	261	X/X			/
15:00 - 16:00	92	252	344	/	418	X/X			/
16:00 - 17:00	39	241	280	/	488	X/X			/
17:00 - 18:00	43	259	302	/	426	X/X			/
18:00 - 19:00	13	204	217	/	300	X/X			/
19:00 - 20:00			0	/		/			/
20:00 - 21:00			0	/		/			/
21:00 - 22:00			0	/		/			/
22:00 - 23:00			0	/		/			/
23:00 - 24:00			0	/		/			/

	Met (Hr)	Required (Hr)	
Warrant 1A	1	8	Not satisfied
Warrant 1B	1	8	Not satisfied
Warrant 2	6	4	**Satisfied**
Warrant 3	4	1	**Satisfied**
Warrant 7	**6**	8	Not satisfied

ALL WAY STOP WARRANT

LOCATION: Waconia
COUNTY: Carver
REF. POINT:
DATE: 2/28/2019
OPERATOR: MSL

0.70 FACTOR USED? Yes

Speed	Approach Description	Lanes
50	Major App1: NB CSAH 10	1
50	Major App3: SB CSAH 10	1
50	Minor App2: WB Waconia Pkwy S	1
	Minor App4:	

					210	140	
HOUR	MAJOR APP. 1	MAJOR APP. 3	MINOR APP. 2	MINOR APP. 4	MAJOR TOTAL Σ (APP. 1 & APP. 3)	MINOR TOTAL APP. 2 + APP. 4	WARRANT MET
0:00 - 1:00							
1:00 - 2:00							
2:00 - 3:00							
3:00 - 4:00							
4:00 - 5:00							
5:00 - 6:00							
6:00 - 7:00	9	333	95		342	95	X/
7:00 - 8:00	38	617	182		655	182	X/X
8:00 - 9:00	20	281	131		301	131	X/
9:00 - 10:00	19	203	113		222	113	X/
10:00 - 11:00	19	171	134		190	134	/
11:00 - 12:00	15	189	182		204	182	/X
12:00 - 13:00	18	170	179		188	179	/X
13:00 - 14:00	20	150	163		170	163	/X
14:00 - 15:00	34	202	261		236	261	X/X
15:00 - 16:00	92	252	418		344	418	X/X
16:00 - 17:00	39	241	488		280	488	X/X
17:00 - 18:00	43	259	426		302	426	X/X
18:00 - 19:00	13	204	300		217	300	X/X
19:00 - 20:00							
20:00 - 21:00							
21:00 - 22:00							
22:00 - 23:00							
23:00 - 24:00							

	Met (Hr)	Required (Hr)	
Allway Stop Warrant:	6	8	Not satisfied

REMARKS:

SIGNAL WARRANTS ANALYSIS

Minor Rights Excluded

LOCATION: Waconia
COUNTY: Carver
REF. POINT:
DATE: 2/28/2019

OPERATOR: MSL

Speed	Approach Description		Lanes
40	Major App1:	EB Waconia Pkwy S	1
35	Major App3:	WB Waconia Pkwy S	2
30	Minor App2:	NB Pond Ln	1
	Minor App4:		

0.70 FACTOR USED? No
POPULATION < 10,000? No
EXISTING SIGNAL ? No

THRESHOLDS 1A/1B: 420/630 105/52

HOUR	MAJOR APP. 1	MAJOR APP. 3	TOTAL 1+3	MAJOR 1A/1B	MINOR APP. 2	MINOR 2 1A/1B	MINOR APP. 4	MINOR 4 1A/1B	**MET SAME 1A/1B**
0:00 - 1:00			0	/		/			/
1:00 - 2:00			0	/		/			/
2:00 - 3:00			0	/		/			/
3:00 - 4:00			0	/		/			/
4:00 - 5:00			0	/		/			/
5:00 - 6:00			0	/		/			/
6:00 - 7:00	299	89	388	/	5	/			/
7:00 - 8:00	466	208	674	X/X	10	/			/
8:00 - 9:00	261	133	394	/	6	/			/
9:00 - 10:00	192	115	307	/	3	/			/
10:00 - 11:00	158	147	305	/	1	/			/
11:00 - 12:00	180	195	375	/	3	/			/
12:00 - 13:00	154	190	344	/	5	/			/
13:00 - 14:00	138	180	318	/	6	/			/
14:00 - 15:00	170	283	453	X/	3	/			/
15:00 - 16:00	246	417	663	X/X	23	/			/
16:00 - 17:00	227	502	729	X/X	9	/			/
17:00 - 18:00	237	453	690	X/X	7	/			/
18:00 - 19:00	185	328	513	X/	5	/			/
19:00 - 20:00			0	/		/			/
20:00 - 21:00			0	/		/			/
21:00 - 22:00			0	/		/			/
22:00 - 23:00			0	/		/			/
23:00 - 24:00			0	/		/			/

	Met (Hr)	Required (Hr)	
Warrant 1A	0	8	Not satisfied
Warrant 1B	0	8	Not satisfied
Warrant 2	0	4	Not satisfied
Warrant 3	0	1	Not satisfied
Warrant 7	0	8	Not satisfied

ALL WAY STOP WARRANT

LOCATION: Waconia
COUNTY: Carver
REF. POINT:
DATE: 2/28/2019
OPERATOR: MSL

Speed	Approach Description	Lanes
40	Major App1: EB Waconia Pkwy S	1
35	Major App3: WB Waconia Pkwy S	2
30	Minor App2: NB Pond Ln	1
	Minor App4:	

0.70 FACTOR USED? No

					300	200	
HOUR	MAJOR APP. 1	MAJOR APP. 3	MINOR APP. 2	MINOR APP. 4	MAJOR TOTAL Σ (APP. 1 & APP. 3)	MINOR TOTAL APP. 2 + APP. 4	WARRANT MET
0:00 - 1:00							
1:00 - 2:00							
2:00 - 3:00							
3:00 - 4:00							
4:00 - 5:00							
5:00 - 6:00							
6:00 - 7:00	299	89	30		388	30	X/
7:00 - 8:00	466	208	62		674	62	X/
8:00 - 9:00	261	133	26		394	26	X/
9:00 - 10:00	192	115	11		307	11	X/
10:00 - 11:00	158	147	16		305	16	X/
11:00 - 12:00	180	195	19		375	19	X/
12:00 - 13:00	154	190	17		344	17	X/
13:00 - 14:00	138	180	22		318	22	X/
14:00 - 15:00	170	283	22		453	22	X/
15:00 - 16:00	246	417	60		663	60	X/
16:00 - 17:00	227	502	31		729	31	X/
17:00 - 18:00	237	453	30		690	30	X/
18:00 - 19:00	185	328	30		513	30	X/
19:00 - 20:00							
20:00 - 21:00							
21:00 - 22:00							
22:00 - 23:00							
23:00 - 24:00							

	Met (Hr)	Required (Hr)	
Allway Stop Warrant:	0	8	Not satisfied

REMARKS:

SIGNAL WARRANTS ANALYSIS

Minor Rights Excluded

LOCATION: Waconia
COUNTY: Carver
REF. POINT:
DATE: 2/28/2019
OPERATOR: MSL

Speed	Approach Description		Lanes
35	Major App1:	EB Waconia Pkwy S	1
35	Major App3:	WB Waconia Pkwy S	1
30	Minor App2:	NB Oak Ave	2
30	Minor App4:	SB Oak Ave	1

0.70 FACTOR USED? No
POPULATION < 10,000? No
EXISTING SIGNAL ? No

THRESHOLDS 1A/1B: 500/750 200/100 150/75

HOUR	MAJOR APP. 1	MAJOR APP. 3	TOTAL 1+3	MAJOR 1A/1B	MINOR APP. 2	MINOR 2 1A/1B	MINOR APP. 4	MINOR 4 1A/1B	**MET SAME 1A/1B**
0:00 - 1:00			0	/		/		/	/
1:00 - 2:00			0	/		/		/	/
2:00 - 3:00			0	/		/		/	/
3:00 - 4:00			0	/		/		/	/
4:00 - 5:00			0	/		/		/	/
5:00 - 6:00			0	/		/		/	/
6:00 - 7:00	321	89	410	/	11	/	12	/	/
7:00 - 8:00	438	210	648	X/	72	/	51	/	/
8:00 - 9:00	270	136	406	/	19	/	15	/	/
9:00 - 10:00	196	119	315	/	24	/	13	/	/
10:00 - 11:00	171	165	336	/	18	/	8	/	/
11:00 - 12:00	189	208	397	/	25	/	10	/	/
12:00 - 13:00	166	181	347	/	30	/	3	/	/
13:00 - 14:00	149	191	340	/	17	/	9	/	/
14:00 - 15:00	190	309	499	/	29	/	20	/	/
15:00 - 16:00	265	398	663	X/	74	/	14	/	/
16:00 - 17:00	240	507	747	X/	58	/	16	/	/
17:00 - 18:00	249	426	675	X/	72	/	25	/	/
18:00 - 19:00	207	332	539	X/	41	/	11	/	/
19:00 - 20:00			0	/		/		/	/
20:00 - 21:00			0	/		/		/	/
21:00 - 22:00			0	/		/		/	/
22:00 - 23:00			0	/		/		/	/
23:00 - 24:00			0	/		/		/	/

	Met (Hr)	Required (Hr)	
Warrant 1A	0	8	Not satisfied
Warrant 1B	0	8	Not satisfied
Warrant 2	0	4	Not satisfied
Warrant 3	0	1	Not satisfied
Warrant 7	0	8	Not satisfied

ALL WAY STOP WARRANT

LOCATION: Waconia
COUNTY: Carver
REF. POINT:
DATE: 2/28/2019
OPERATOR: MSL

Speed	Approach Description	Lanes
35	Major App1: EB Waconia Pkwy S	1
35	Major App3: WB Waconia Pkwy S	1
30	Minor App2: NB Oak Ave	2
30	Minor App4: SB Oak Ave	1

0.70 FACTOR USED? No

					300	200	
HOUR	MAJOR APP. 1	MAJOR APP. 3	MINOR APP. 2	MINOR APP. 4	MAJOR TOTAL Σ (APP. 1 & APP. 3)	MINOR TOTAL APP. 2 + APP. 4	WARRANT MET
0:00 - 1:00							
1:00 - 2:00							
2:00 - 3:00							
3:00 - 4:00							
4:00 - 5:00							
5:00 - 6:00							
6:00 - 7:00	321	89	49	15	410	64	X/
7:00 - 8:00	438	210	187	71	648	258	X/X
8:00 - 9:00	270	136	73	18	406	91	X/
9:00 - 10:00	196	119	66	14	315	80	X/
10:00 - 11:00	171	165	62	10	336	72	X/
11:00 - 12:00	189	208	68	11	397	79	X/
12:00 - 13:00	166	181	62	5	347	67	X/
13:00 - 14:00	149	191	48	11	340	59	X/
14:00 - 15:00	190	309	60	22	499	82	X/
15:00 - 16:00	265	398	144	19	663	163	X/
16:00 - 17:00	240	507	97	20	747	117	X/
17:00 - 18:00	249	426	103	27	675	130	X/
18:00 - 19:00	207	332	79	13	539	92	X/
19:00 - 20:00							
20:00 - 21:00							
21:00 - 22:00							
22:00 - 23:00							
23:00 - 24:00							

	Met (Hr)	Required (Hr)	
Allway Stop Warrant:	1	8	Not satisfied

REMARKS:

SIGNAL WARRANTS ANALYSIS

Minor Rights Excluded - 2040 Volumes

LOCATION: Waconia
COUNTY: Carver
REF. POINT:
DATE: 2/28/2019
OPERATOR: MSL

Speed	Approach Description		Lanes
50	Major App1:	NB CSAH 10	1
50	Major App3:	SB CSAH 10	2
50	Minor App2:	WB CSAH 30	1
	Minor App4:		

0.70 FACTOR USED? YES
POPULATION < 10,000? No
EXISTING SIGNAL ? No

THRESHOLDS 1A/1B: 420/630 105/52

HOUR	MAJOR APP. 1	MAJOR APP. 3	TOTAL 1+3	MAJOR 1A/1B	MINOR APP. 2	MINOR 2 1A/1B	MINOR APP. 4	MINOR 4 1A/1B	**MET SAME 1A/1B**
0:00 - 1:00			0	/		/			**/**
1:00 - 2:00			0	/		/			**/**
2:00 - 3:00			0	/		/			**/**
3:00 - 4:00			0	/		/			**/**
4:00 - 5:00			0	/		/			**/**
5:00 - 6:00			0	/		/			**/**
6:00 - 7:00	138	518	656	X/X	49	/			**/**
7:00 - 8:00	343	998	1341	X/X	154	X/X			**X/X**
8:00 - 9:00	238	508	746	X/X	50	/			**/**
9:00 - 10:00	206	353	559	X/	30	/			**/**
10:00 - 11:00	229	337	566	X/	47	/			**/**
11:00 - 12:00	272	311	583	X/	52	/X			**/**
12:00 - 13:00	275	278	553	X/	49	/			**/**
13:00 - 14:00	276	306	582	X/	33	/			**/**
14:00 - 15:00	395	356	751	X/X	70	/X			**/X**
15:00 - 16:00	677	427	1104	X/X	79	/X			**/X**
16:00 - 17:00	728	454	1182	X/X	65	/X			**/X**
17:00 - 18:00	687	449	1136	X/X	69	/X			**/X**
18:00 - 19:00	455	388	843	X/X	59	/X			**/X**
19:00 - 20:00			0	/		/			**/**
20:00 - 21:00			0	/		/			**/**
21:00 - 22:00			0	/		/			**/**
22:00 - 23:00			0	/		/			**/**
23:00 - 24:00			0	/		/			**/**

	Met (Hr)	Required (Hr)	
Warrant 1A	1	8	Not satisfied
Warrant 1B	6	8	Not satisfied
Warrant 2	4	4	**Satisfied**
Warrant 3	1	1	**Satisfied**
Warrant 7	**11**	8	**Satisfied, check accident record**

ALL WAY STOP WARRANT

LOCATION: Waconia
COUNTY: Carver
REF. POINT:
DATE: 2/28/2019
OPERATOR: MSL

Speed	Approach Description	Lanes
50	Major App1: NB CSAH 10	1
50	Major App3: SB CSAH 10	2
50	Minor App2: WB CSAH 30	1
	Minor App4:	

0.70 FACTOR USED? Yes

					210	140	
HOUR	MAJOR APP. 1	MAJOR APP. 3	MINOR APP. 2	MINOR APP. 4	MAJOR TOTAL Σ (APP. 1 & APP. 3)	MINOR TOTAL APP. 2 + APP. 4	WARRANT MET
0:00 - 1:00							
1:00 - 2:00							
2:00 - 3:00							
3:00 - 4:00							
4:00 - 5:00							
5:00 - 6:00							
6:00 - 7:00	138	518	92		656	92	X/
7:00 - 8:00	343	998	256		1341	256	X/X
8:00 - 9:00	238	508	124		746	124	X/
9:00 - 10:00	206	353	83		559	83	X/
10:00 - 11:00	229	337	100		566	100	X/
11:00 - 12:00	272	311	135		583	135	X/
12:00 - 13:00	275	278	129		553	129	X/
13:00 - 14:00	276	306	108		582	108	X/
14:00 - 15:00	395	356	174		751	174	X/X
15:00 - 16:00	677	427	226		1104	226	X/X
16:00 - 17:00	728	454	259		1182	259	X/X
17:00 - 18:00	687	449	221		1136	221	X/X
18:00 - 19:00	455	388	142		843	142	X/X
19:00 - 20:00							
20:00 - 21:00							
21:00 - 22:00							
22:00 - 23:00							
23:00 - 24:00							

	Met (Hr)	Required (Hr)	
Allway Stop Warrant:	6	8	Not satisfied

REMARKS:

SIGNAL WARRANTS ANALYSIS

Minor Rights Excluded - 2040 Volumes

LOCATION: Waconia
COUNTY: Carver
REF. POINT:
DATE: 2/28/2019
OPERATOR: MSL

Speed	Approach Description		Lanes
50	Major App1:	NB CSAH 10	2
50	Major App3:	SB CSAH 10	1
50	Minor App2:	EB CSAH 32	1
	Minor App4:		

0.70 FACTOR USED? YES
POPULATION < 10,000? No
EXISTING SIGNAL ? No
THRESHOLDS 1A/1B: 420/630 105/52

HOUR	MAJOR APP. 1	MAJOR APP. 3	TOTAL 1+3	MAJOR 1A/1B	MINOR APP. 2	MINOR 2 1A/1B	MINOR APP. 4	MINOR 4 1A/1B	**MET SAME 1A/1B**
0:00 - 1:00			0	/		/			/
1:00 - 2:00			0	/		/			/
2:00 - 3:00			0	/		/			/
3:00 - 4:00			0	/		/			/
4:00 - 5:00			0	/		/			/
5:00 - 6:00			0	/		/			/
6:00 - 7:00	143	503	646	X/X	5	/			/
7:00 - 8:00	308	943	1251	X/X	17	/			/
8:00 - 9:00	220	427	647	X/X	9	/			/
9:00 - 10:00	187	290	477	X/	9	/			/
10:00 - 11:00	219	279	498	X/	7	/			/
11:00 - 12:00	282	282	564	X/	5	/			/
12:00 - 13:00	273	255	528	X/	5	/			/
13:00 - 14:00	258	242	500	X/	5	/			/
14:00 - 15:00	402	308	710	X/X	7	/			/
15:00 - 16:00	707	396	1103	X/X	8	/			/
16:00 - 17:00	735	418	1153	X/X	7	/			/
17:00 - 18:00	674	408	1082	X/X	9	/			/
18:00 - 19:00	446	330	776	X/X	7	/			/
19:00 - 20:00			0	/		/			/
20:00 - 21:00			0	/		/			/
21:00 - 22:00			0	/		/			/
22:00 - 23:00			0	/		/			/
23:00 - 24:00			0	/		/			/

	Met (Hr)	Required (Hr)	
Warrant 1A	0	8	Not satisfied
Warrant 1B	0	8	Not satisfied
Warrant 2	0	4	Not satisfied
Warrant 3	0	1	Not satisfied
Warrant 7	0	8	Not satisfied

ALL WAY STOP WARRANT

LOCATION: Waconia
COUNTY: Carver
REF. POINT:
DATE: 2/28/2019
OPERATOR: MSL

Speed	Approach Description	Lanes
50	Major App1: NB CSAH 10	2
50	Major App3: SB CSAH 10	1
50	Minor App2: EB CSAH 32	1
	Minor App4:	

0.70 FACTOR USED? Yes

					210	140	
HOUR	MAJOR APP. 1	MAJOR APP. 3	MINOR APP. 2	MINOR APP. 4	MAJOR TOTAL Σ (APP. 1 & APP. 3)	MINOR TOTAL APP. 2 + APP. 4	WARRANT MET
0:00 - 1:00							
1:00 - 2:00							
2:00 - 3:00							
3:00 - 4:00							
4:00 - 5:00							
5:00 - 6:00							
6:00 - 7:00	143	503	86		646	86	X/
7:00 - 8:00	308	943	140		1251	140	X/X
8:00 - 9:00	220	427	78		647	78	X/
9:00 - 10:00	187	290	62		477	62	X/
10:00 - 11:00	219	279	36		498	36	X/
11:00 - 12:00	282	282	51		564	51	X/
12:00 - 13:00	273	255	43		528	43	X/
13:00 - 14:00	258	242	31		500	31	X/
14:00 - 15:00	402	308	58		710	58	X/
15:00 - 16:00	707	396	66		1103	66	X/
16:00 - 17:00	735	418	69		1153	69	X/
17:00 - 18:00	674	408	54		1082	54	X/
18:00 - 19:00	446	330	33		776	33	X/
19:00 - 20:00							
20:00 - 21:00							
21:00 - 22:00							
22:00 - 23:00							
23:00 - 24:00							

	Met (Hr)	Required (Hr)	
Allway Stop Warrant:	1	8	Not satisfied

REMARKS:

SIGNAL WARRANTS ANALYSIS

2040 Volumes

LOCATION: Waconia
COUNTY: Carver
REF. POINT:
DATE: 2/28/2019
OPERATOR: MSL

Speed	Approach Description		Lanes
50	Major App1:	NB CSAH 10	1
50	Major App3:	SB CSAH 10	1
50	Minor App2:	WB Waconia Pkwy S	1
	Minor App4:		

0.70 FACTOR USED? YES
POPULATION < 10,000? No
EXISTING SIGNAL ? No

THRESHOLDS 1A/1B: 350/525 105/52

HOUR	MAJOR APP. 1	MAJOR APP. 3	TOTAL 1+3	MAJOR 1A/1B	MINOR APP. 2	MINOR 2 1A/1B	MINOR APP. 4	MINOR 4 1A/1B	**MET SAME 1A/1B**
0:00 - 1:00			0	/		/			**/**
1:00 - 2:00			0	/		/			**/**
2:00 - 3:00			0	/		/			**/**
3:00 - 4:00			0	/		/			**/**
4:00 - 5:00			0	/		/			**/**
5:00 - 6:00			0	/		/			**/**
6:00 - 7:00	14	548	562	X/X	146	X/X			**X/X**
7:00 - 8:00	73	1247	1320	X/X	320	X/X			**X/X**
8:00 - 9:00	35	465	500	X/	198	X/X			**X/**
9:00 - 10:00	48	323	371	X/	162	X/X			**X/**
10:00 - 11:00	38	285	323	/	212	X/X			**/**
11:00 - 12:00	23	307	330	/	262	X/X			**/**
12:00 - 13:00	42	279	321	/	286	X/X			**/**
13:00 - 14:00	35	251	286	/	253	X/X			**/**
14:00 - 15:00	76	367	443	X/	404	X/X			**X/**
15:00 - 16:00	235	427	662	X/X	601	X/X			**X/X**
16:00 - 17:00	88	398	486	X/	701	X/X			**X/**
17:00 - 18:00	80	433	513	X/	622	X/X			**X/**
18:00 - 19:00	24	346	370	X/	441	X/X			**X/**
19:00 - 20:00			0	/		/			**/**
20:00 - 21:00			0	/		/			**/**
21:00 - 22:00			0	/		/			**/**
22:00 - 23:00			0	/		/			**/**
23:00 - 24:00			0	/		/			**/**

	Met (Hr)	Required (Hr)	
Warrant 1A	**9**	8	**Satisfied**
Warrant 1B	3	8	Not satisfied
Warrant 2	**12**	4	**Satisfied**
Warrant 3	6	1	**Satisfied**
Warrant 7	**13**	8	**Satisfied, check accident record**

ALL WAY STOP WARRANT

LOCATION: Waconia
COUNTY: Carver
REF. POINT:
DATE: 2/28/2019
OPERATOR: MSL

Speed	Approach Description	Lanes
50	Major App1: NB CSAH 10	1
50	Major App3: SB CSAH 10	1
50	Minor App2: WB Waconia Pkwy S	1
	Minor App4:	

0.70 FACTOR USED? Yes

					210	140	
HOUR	MAJOR APP. 1	MAJOR APP. 3	MINOR APP. 2	MINOR APP. 4	MAJOR TOTAL Σ (APP. 1 & APP. 3)	MINOR TOTAL APP. 2 + APP. 4	WARRANT MET
0:00 - 1:00							
1:00 - 2:00							
2:00 - 3:00							
3:00 - 4:00							
4:00 - 5:00							
5:00 - 6:00							
6:00 - 7:00	14	548	146		562	146	X/X
7:00 - 8:00	73	1247	320		1320	320	X/X
8:00 - 9:00	35	465	198		500	198	X/X
9:00 - 10:00	48	323	162		371	162	X/X
10:00 - 11:00	38	285	212		323	212	X/X
11:00 - 12:00	23	307	262		330	262	X/X
12:00 - 13:00	42	279	286		321	286	X/X
13:00 - 14:00	35	251	253		286	253	X/X
14:00 - 15:00	76	367	404		443	404	X/X
15:00 - 16:00	235	427	601		662	601	X/X
16:00 - 17:00	88	398	701		486	701	X/X
17:00 - 18:00	80	433	622		513	622	X/X
18:00 - 19:00	24	346	441		370	441	X/X
19:00 - 20:00							
20:00 - 21:00							
21:00 - 22:00							
22:00 - 23:00							
23:00 - 24:00							

	Met (Hr)	Required (Hr)	
Allway Stop Warrant:	13	8	Satisfied

REMARKS:

SIGNAL WARRANTS ANALYSIS

Minor Rights Excluded - 2040 Volumes

LOCATION: Waconia
COUNTY: Carver
REF. POINT:
DATE: 2/28/2019
OPERATOR: MSL

Speed	Approach Description		Lanes
40	Major App1:	EB Waconia Pkwy S	1
35	Major App3:	WB Waconia Pkwy S	2
30	Minor App2:	NB Pond Ln	1
	Minor App4:		

0.70 FACTOR USED? No
POPULATION < 10,000? No
EXISTING SIGNAL ? No

THRESHOLDS 1A/1B: 420/630 105/52

HOUR	MAJOR APP. 1	MAJOR APP. 3	TOTAL 1+3	MAJOR 1A/1B	MINOR APP. 2	MINOR 2 1A/1B	MINOR APP. 4	MINOR 4 1A/1B	**MET SAME 1A/1B**
0:00 - 1:00			0	/		/			**/**
1:00 - 2:00			0	/		/			**/**
2:00 - 3:00			0	/		/			**/**
3:00 - 4:00			0	/		/			**/**
4:00 - 5:00			0	/		/			**/**
5:00 - 6:00			0	/		/			**/**
6:00 - 7:00	451	150	601	X/	32	/			**/**
7:00 - 8:00	611	331	942	X/X	66	/X			**/X**
8:00 - 9:00	397	221	618	X/	28	/			**/**
9:00 - 10:00	291	191	482	X/	12	/			**/**
10:00 - 11:00	241	242	483	X/	17	/			**/**
11:00 - 12:00	281	320	601	X/	21	/			**/**
12:00 - 13:00	233	312	545	X/	19	/			**/**
13:00 - 14:00	211	290	501	X/	24	/			**/**
14:00 - 15:00	256	463	719	X/X	24	/			**/**
15:00 - 16:00	359	691	1050	X/X	68	/X			**/X**
16:00 - 17:00	341	829	1170	X/X	34	/			**/**
17:00 - 18:00	356	749	1105	X/X	33	/			**/**
18:00 - 19:00	270	539	809	X/X	32	/			**/**
19:00 - 20:00			0	/		/			**/**
20:00 - 21:00			0	/		/			**/**
21:00 - 22:00			0	/		/			**/**
22:00 - 23:00			0	/		/			**/**
23:00 - 24:00			0	/		/			**/**

	Met (Hr)	Required (Hr)	
Warrant 1A	0	8	Not satisfied
Warrant 1B	2	8	Not satisfied
Warrant 2	2	4	Not satisfied
Warrant 3	0	1	Not satisfied
Warrant 7	2	8	Not satisfied

ALL WAY STOP WARRANT

LOCATION: Waconia
COUNTY: Carver
REF. POINT:
DATE: 2/28/2019
OPERATOR: MSL

Speed	Approach Description	Lanes
40	Major App1: EB Waconia Pkwy S	1
35	Major App3: WB Waconia Pkwy S	2
30	Minor App2: NB Pond Ln	1
	Minor App4:	

0.70 FACTOR USED? No

					300	200	
HOUR	MAJOR APP. 1	MAJOR APP. 3	MINOR APP. 2	MINOR APP. 4	MAJOR TOTAL Σ (APP. 1 & APP. 3)	MINOR TOTAL APP. 2 + APP. 4	WARRANT MET
0:00 - 1:00							
1:00 - 2:00							
2:00 - 3:00							
3:00 - 4:00							
4:00 - 5:00							
5:00 - 6:00							
6:00 - 7:00	481	150	32		631	32	X/
7:00 - 8:00	832	331	66		1163	66	X/
8:00 - 9:00	418	221	28		639	28	X/
9:00 - 10:00	309	191	12		500	12	X/
10:00 - 11:00	253	242	17		495	17	X/
11:00 - 12:00	281	320	21		601	21	X/
12:00 - 13:00	248	312	19		560	19	X/
13:00 - 14:00	220	290	24		510	24	X/
14:00 - 15:00	274	463	24		737	24	X/
15:00 - 16:00	406	691	68		1097	68	X/
16:00 - 17:00	368	829	34		1197	34	X/
17:00 - 18:00	383	749	33		1132	33	X/
18:00 - 19:00	305	539	32		844	32	X/
19:00 - 20:00							
20:00 - 21:00							
21:00 - 22:00							
22:00 - 23:00							
23:00 - 24:00							

	Met (Hr)	Required (Hr)	
Allway Stop Warrant:	0	8	Not satisfied

REMARKS:

SIGNAL WARRANTS ANALYSIS

Minor Rights Excluded - 2040 Volumes

LOCATION: Waconia
COUNTY: Carver
REF. POINT:
DATE: 2/28/2019
OPERATOR: MSL

Speed	Approach Description		Lanes
35	Major App1:	EB Waconia Pkwy S	1
35	Major App3:	WB Waconia Pkwy S	1
30	Minor App2:	NB Oak Ave	2
30	Minor App4:	SB Oak Ave	1

0.70 FACTOR USED? No
POPULATION < 10,000? No
EXISTING SIGNAL ? No

THRESHOLDS 1A/1B: 500/750 200/100 150/75

HOUR	MAJOR APP. 1	MAJOR APP. 3	TOTAL 1+3	MAJOR 1A/1B	MINOR APP. 2	MINOR 2 1A/1B	MINOR APP. 4	MINOR 4 1A/1B	**MET SAME 1A/1B**
0:00 - 1:00			0	/		/		/	**/**
1:00 - 2:00			0	/		/		/	**/**
2:00 - 3:00			0	/		/		/	**/**
3:00 - 4:00			0	/		/		/	**/**
4:00 - 5:00			0	/		/		/	**/**
5:00 - 6:00			0	/		/		/	**/**
6:00 - 7:00	468	127	595	X/	24	/	16	/	**/**
7:00 - 8:00	643	321	964	X/X	146	/X	79	/X	**/X**
8:00 - 9:00	396	203	599	X/	39	/	23	/	**/**
9:00 - 10:00	294	172	466	/	52	/	19	/	**/**
10:00 - 11:00	251	240	491	/	37	/	13	/	**/**
11:00 - 12:00	273	302	575	X/	53	/	15	/	**/**
12:00 - 13:00	245	264	509	X/	64	/	4	/	**/**
13:00 - 14:00	218	275	493	/	35	/	13	/	**/**
14:00 - 15:00	283	451	734	X/	61	/	34	/	**/**
15:00 - 16:00	400	572	972	X/X	151	/X	20	/	**/X**
16:00 - 17:00	366	733	1099	X/X	124	/X	25	/	**/X**
17:00 - 18:00	386	612	998	X/X	153	/X	38	/	**/X**
18:00 - 19:00	324	479	803	X/X	85	/	17	/	**/**
19:00 - 20:00			0	/		/		/	**/**
20:00 - 21:00			0	/		/		/	**/**
21:00 - 22:00			0	/		/		/	**/**
22:00 - 23:00			0	/		/		/	**/**
23:00 - 24:00			0	/		/		/	**/**

	Met (Hr)	Required (Hr)	
Warrant 1A	0	8	Not satisfied
Warrant 1B	4	8	Not satisfied
Warrant 2	4	4	**Satisfied**
Warrant 3	0	1	Not satisfied
Warrant 7	**5**	8	Not satisfied

ALL WAY STOP WARRANT

LOCATION: Waconia
COUNTY: Carver
REF. POINT:
DATE: 2/28/2019
OPERATOR: MSL

Speed	Approach Description	Lanes
35	Major App1: EB Waconia Pkwy S	1
35	Major App3: WB Waconia Pkwy S	1
30	Minor App2: NB Oak Ave	2
30	Minor App4: SB Oak Ave	1

0.70 FACTOR USED? No

					300	200	
HOUR	MAJOR APP. 1	MAJOR APP. 3	MINOR APP. 2	MINOR APP. 4	MAJOR TOTAL Σ (APP. 1 & APP. 3)	MINOR TOTAL APP. 2 + APP. 4	WARRANT MET
0:00 - 1:00							
1:00 - 2:00							
2:00 - 3:00							
3:00 - 4:00							
4:00 - 5:00							
5:00 - 6:00							
6:00 - 7:00	468	127	84	24	595	108	X/
7:00 - 8:00	643	321	327	131	964	458	X/X
8:00 - 9:00	396	203	124	31	599	155	X/
9:00 - 10:00	294	172	118	22	466	140	X/
10:00 - 11:00	251	240	106	18	491	124	X/
11:00 - 12:00	273	302	121	18	575	139	X/
12:00 - 13:00	245	264	114	9	509	123	X/
13:00 - 14:00	218	275	84	18	493	102	X/
14:00 - 15:00	283	451	110	39	734	149	X/
15:00 - 16:00	400	572	261	33	972	294	X/X
16:00 - 17:00	366	733	185	35	1099	220	X/X
17:00 - 18:00	386	612	202	43	998	245	X/X
18:00 - 19:00	324	479	145	22	803	167	X/
19:00 - 20:00							
20:00 - 21:00							
21:00 - 22:00							
22:00 - 23:00							
23:00 - 24:00							

	Met (Hr)	Required (Hr)	
Allway Stop Warrant:	4	8	Not satisfied

REMARKS:

Appendix C

Intersection Safety Screening Worksheets

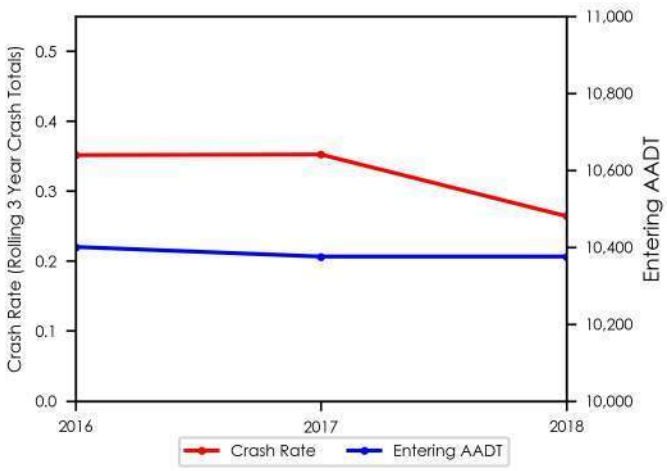
CSAH-10 (WACONIA PKWY N) & CSAH-30 (WACONIA PKWY N) & CR-10

Carver County, Minnesota

Intersection Report
3 Year Crashes (2016-2018)
Created September 2019

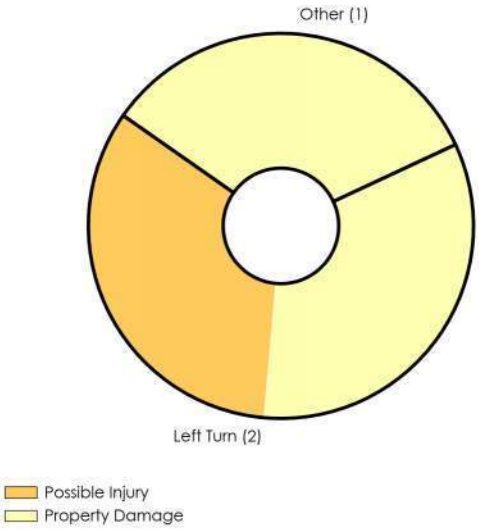
GAZER™ patent pending

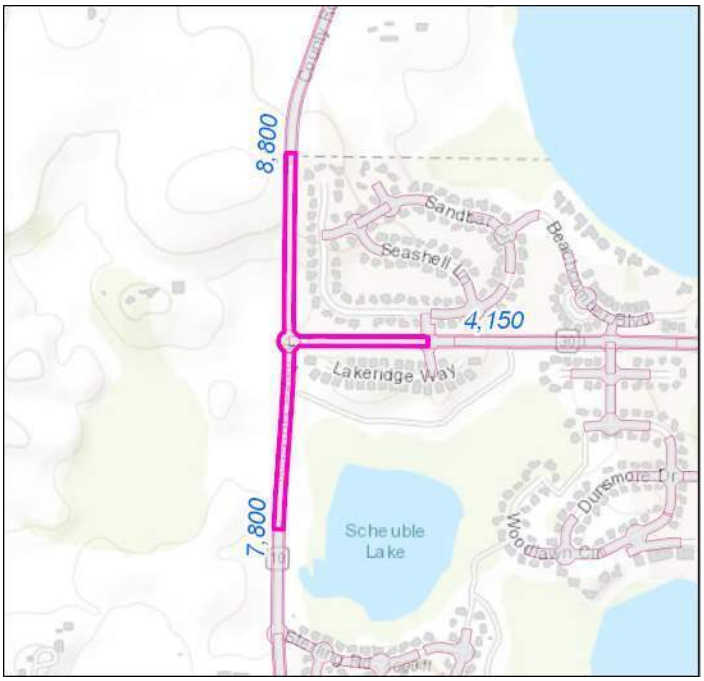
Intersection Characteristics	
Traffic Control Device	Thru Stop
Roads	CSAH-10 (WACONIA PKWY N) & CSAH-30 (WACONIA PKWY N) & CR-10
Entering Daily Volume	10,375
Volume on Highest Leg	4,400
Max Speed	55
Environment	Rural



Crash Summary (3 Years)	All Crashes	Fatal & Suspected Serious Crashes
Total Crashes	3	0
Crash Rate	0.26	0.00
Avg Crash Rate	0.23	0.81
Critical Index	0.42	0.00

	2016	2017	2018
Fatal	0	0	0
Suspected Serious Injury	0	0	0
Suspected Minor Injury	0	0	0
Possible Injury	0	0	1
Property Damage	0	1	1
Cost	$0	$7,600	$90,600





ID: CACO-I-1236

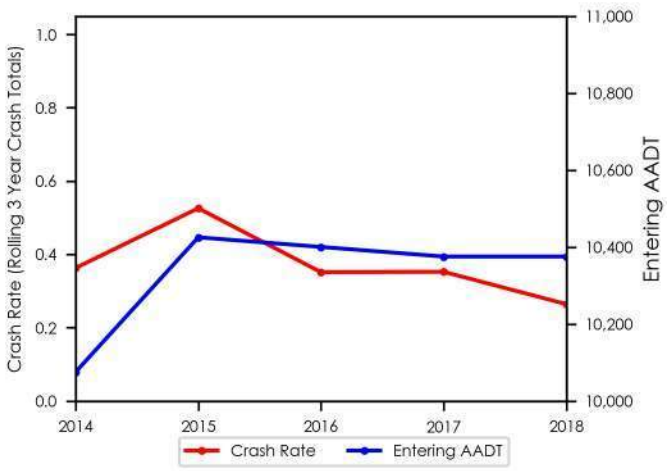
CSAH-10 (WACONIA PKWY N) & CSAH-30 (WACONIA PKWY N) & CR-10

Carver County, Minnesota

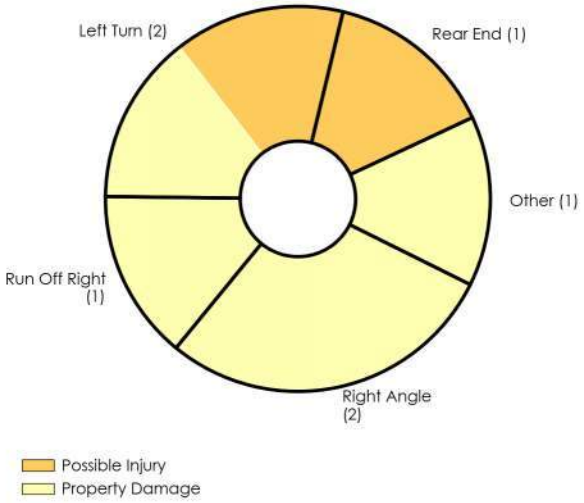
Intersection Report
5 Year Crashes (2014-2018)
Created September 2019

GAZER™ patent pending

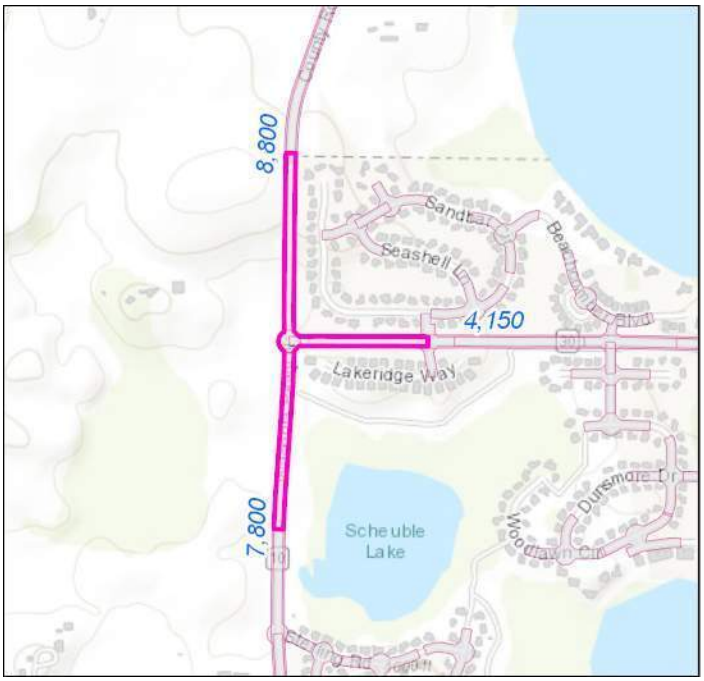
Intersection Characteristics	
Traffic Control Device	Thru Stop
Roads	CSAH-10 (WACONIA PKWY N) & CSAH-30 (WACONIA PKWY N) & CR-10
Entering Daily Volume	10,375
Volume on Highest Leg	4,400
Max Speed	55
Environment	Rural



Crash Summary (5 Years)	All Crashes	Fatal & Suspected Serious Crashes
Total Crashes	7	0
Crash Rate	0.37	0.00
Avg Crash Rate	0.26	0.81
Critical Index	0.64	0.00



	2014	2015	2016	2017	2018
Fatal	0	0	0	0	0
Suspected Serious Injury	0	0	0	0	0
Suspected Minor Injury	0	0	0	0	0
Possible Injury	0	1	0	0	1
Property Damage	1	2	0	1	1
Cost	$7,600	$98,200	$0	$7,600	$90,600



ID: CACO-I-1236

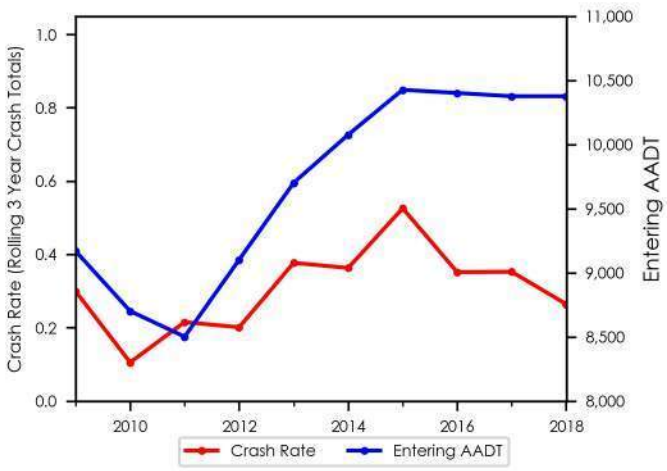
CSAH-10 (WACONIA PKWY N) & CSAH-30 (WACONIA PKWY N) & CR-10

Carver County, Minnesota

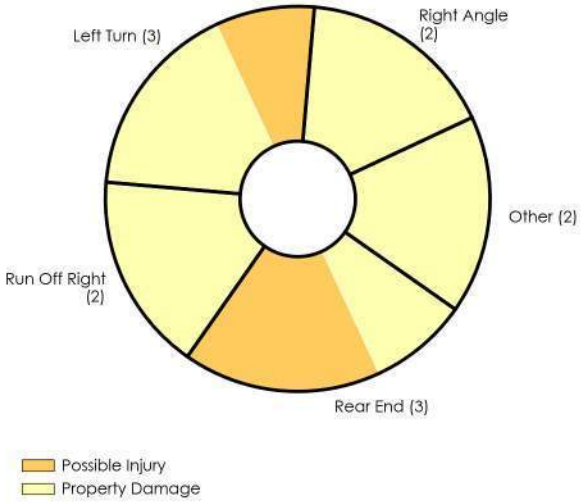
Intersection Report
10 Year Crashes (2009-2018)
Created September 2019

GAZER™ patent pending

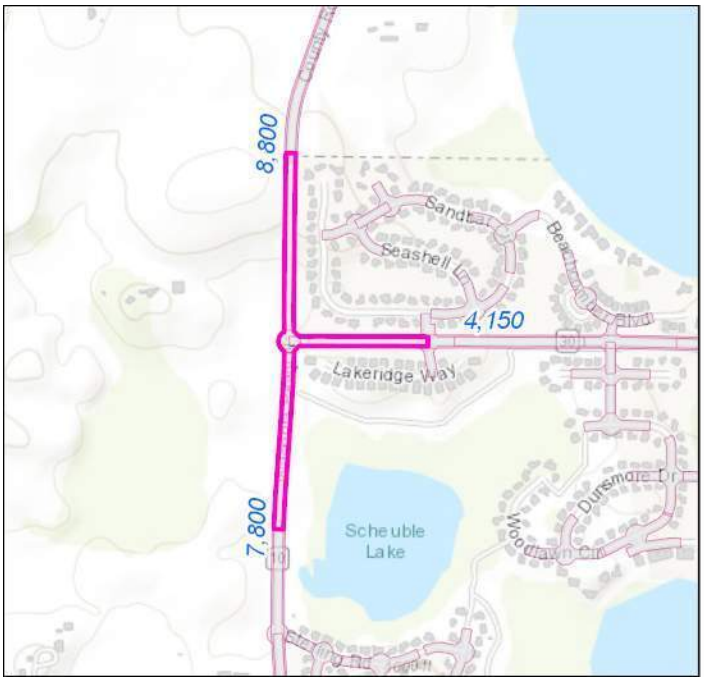
Intersection Characteristics	
Traffic Control Device	Thru Stop
Roads	CSAH-10 (WACONIA PKWY N) & CSAH-30 (WACONIA PKWY N) & CR-10
Entering Daily Volume	10,375
Volume on Highest Leg	4,400
Max Speed	55
Environment	Rural



Crash Summary (10 Years)	All Crashes	Fatal & Suspected Serious Crashes
Total Crashes	12	0
Crash Rate	0.32	0.00
Avg Crash Rate	0.25	0.76
Critical Index	0.66	0.00



	2009-2013	2014	2015	2016	2017	2018
Fatal	0	0	0	0	0	0
Suspected Serious Injury	0	0	0	0	0	0
Suspected Minor Injury	0	0	0	0	0	0
Possible Injury	1	0	1	0	0	1
Property Damage	4	1	2	0	1	1
Cost	$113,400	$7,600	$98,200	$0	$7,600	$90,600



ID: CACO-I-1236

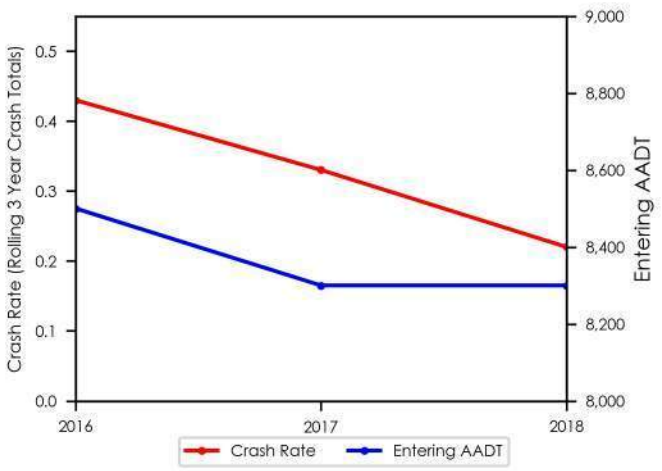
CSAH-10 (WACONIA PKWY N) & STERLING RD

Carver County, Minnesota

Intersection Report
3 Year Crashes (2016-2018)
Created September 2019

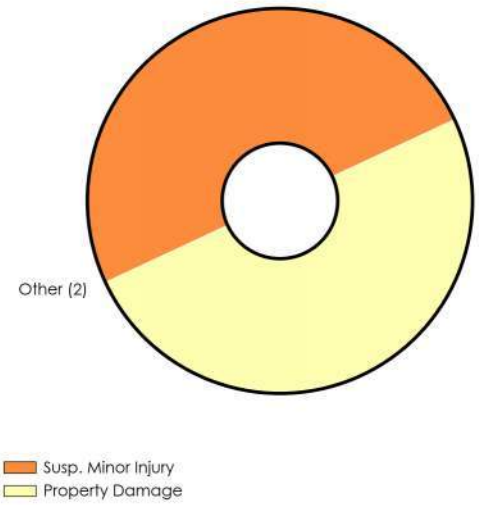
GAZER™ patent pending

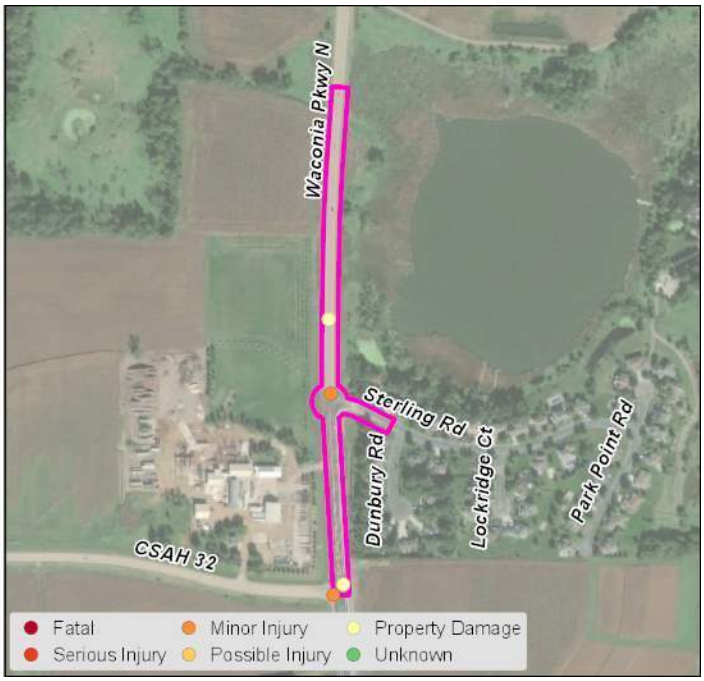
Intersection Characteristics	
Traffic Control Device	Thru Stop
Roads	CSAH-10 (WACONIA PKWY N) & STERLING RD
Entering Daily Volume	8,300
Volume on Highest Leg	3,900
Max Speed	55
Environment	Rural



Crash Summary (3 Years)	All Crashes	Fatal & Suspected Serious Crashes
Total Crashes	2	0
Crash Rate	0.22	0.00
Avg Crash Rate	0.23	0.81
Critical Index	0.32	0.00

	2016	2017	2018
Fatal	0	0	0
Suspected Serious Injury	0	0	0
Suspected Minor Injury	0	1	0
Possible Injury	0	0	0
Property Damage	1	0	0
Cost	$7,600	$170,000	$0





ID: CACO-I-1237

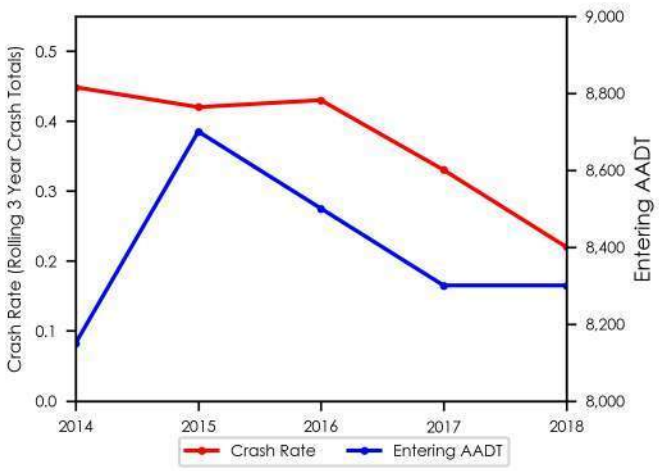
CSAH-10 (WACONIA PKWY N) & STERLING RD

Carver County, Minnesota

Intersection Report
5 Year Crashes (2014-2018)
Created September 2019

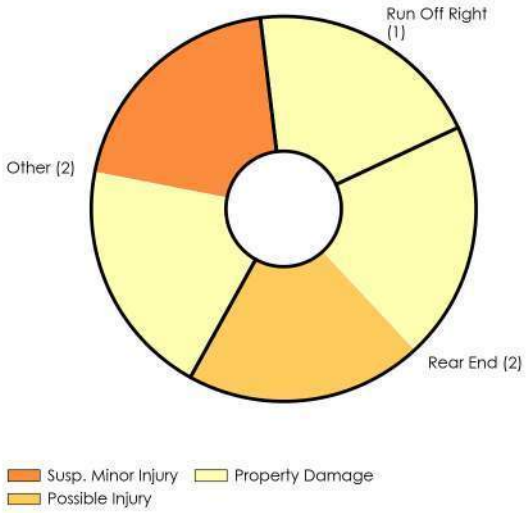
GAZER™ patent pending

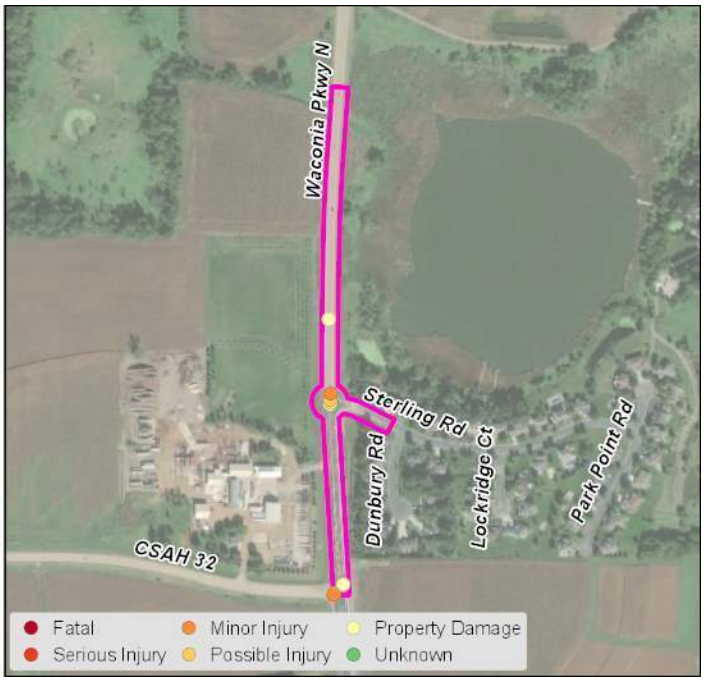
Intersection Characteristics	
Traffic Control Device	Thru Stop
Roads	CSAH-10 (WACONIA PKWY N) & STERLING RD
Entering Daily Volume	8,300
Volume on Highest Leg	3,900
Max Speed	55
Environment	Rural



Crash Summary (5 Years)	All Crashes	Fatal & Suspected Serious Crashes
Total Crashes	5	0
Crash Rate	0.33	0.00
Avg Crash Rate	0.26	0.81
Critical Index	0.53	0.00

	2014	2015	2016	2017	2018
Fatal	0	0	0	0	0
Suspected Serious Injury	0	0	0	0	0
Suspected Minor Injury	0	0	0	1	0
Possible Injury	0	1	0	0	0
Property Damage	2	0	1	0	0
Cost	$15,200	$83,000	$7,600	$170,000	$0





ID: CACO-I-1237

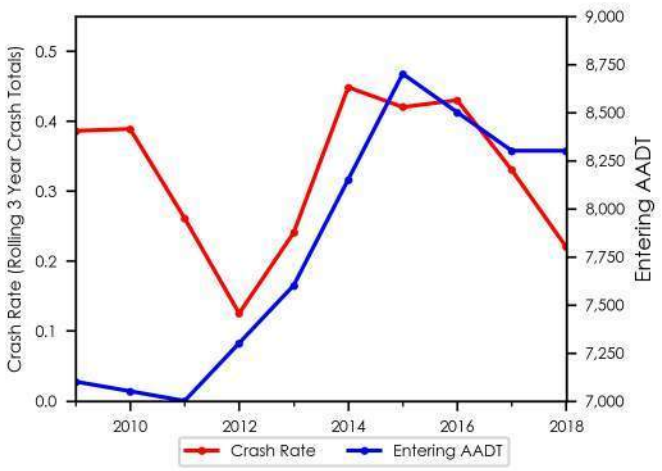
CSAH-10 (WACONIA PKWY N) & STERLING RD

Carver County, Minnesota

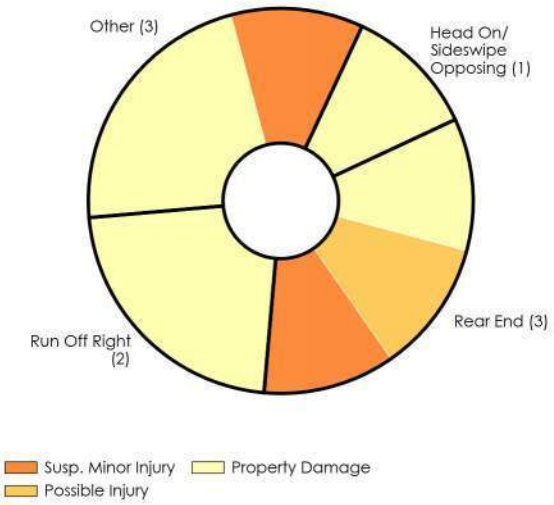
Intersection Report
10 Year Crashes (2009-2018)
Created September 2019

GAZER™ patent pending

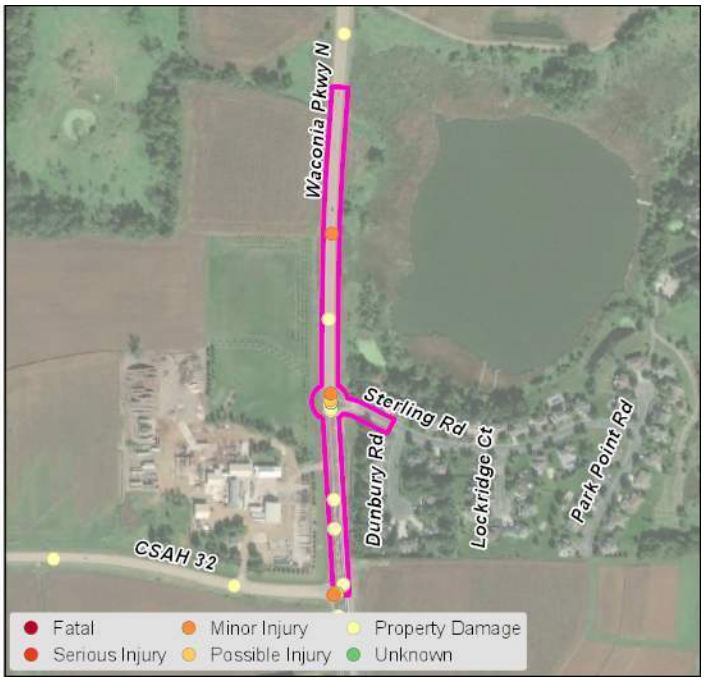
Intersection Characteristics	
Traffic Control Device	Thru Stop
Roads	CSAH-10 (WACONIA PKWY N) & STERLING RD
Entering Daily Volume	8,300
Volume on Highest Leg	3,900
Max Speed	55
Environment	Rural



Crash Summary (10 Years)	All Crashes	Fatal & Suspected Serious Crashes
Total Crashes	9	0
Crash Rate	0.30	0.00
Avg Crash Rate	0.25	0.76
Critical Index	0.59	0.00



	2009-2013	2014	2015	2016	2017	2018
Fatal	0	0	0	0	0	0
Suspected Serious Injury	0	0	0	0	0	0
Suspected Minor Injury	1	0	0	0	1	0
Possible Injury	0	0	1	0	0	0
Property Damage	3	2	0	1	0	0
Cost	$192,800	$15,200	$83,000	$7,600	$170,000	$0



ID: CACO-I-1237

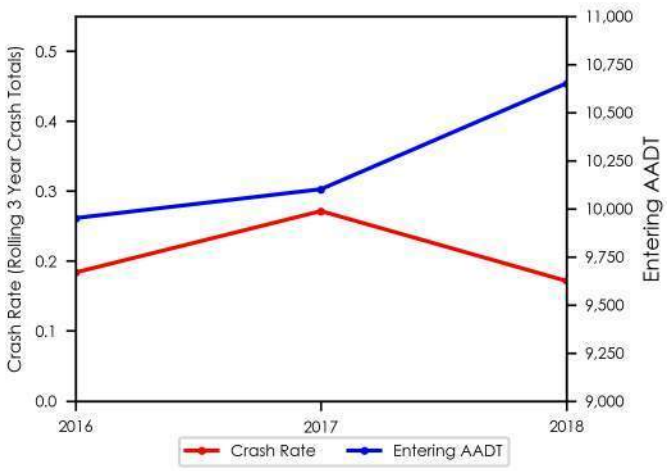
CSAH-10 (WACONIA PKWY N) & CSAH-10 (WACONIA PKWY S) & CR-32

Carver County, Minnesota

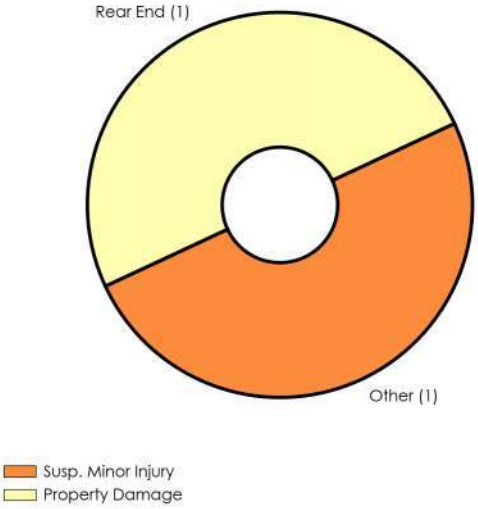
Intersection Report
3 Year Crashes (2016-2018)
Created September 2019

GAZER™ patent pending

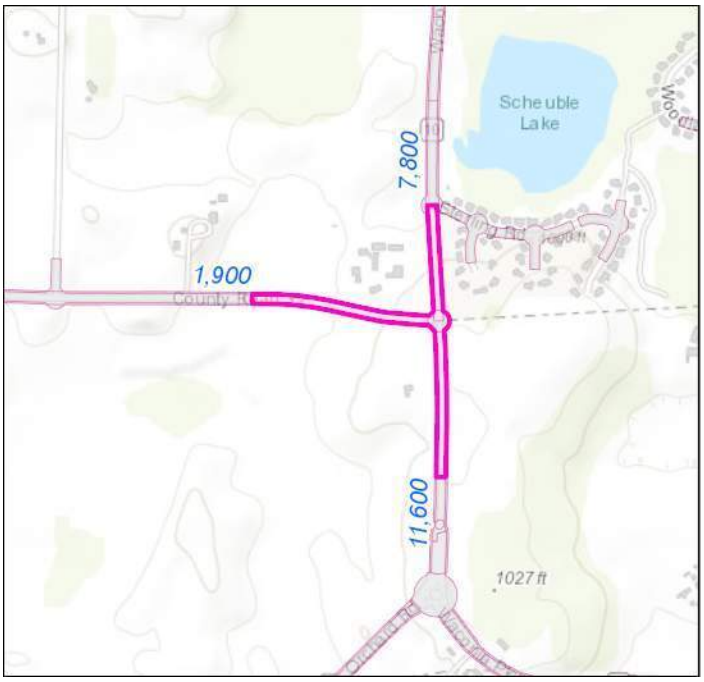
Intersection Characteristics	
Traffic Control Device	Thru Stop
Roads	CSAH-10 (WACONIA PKWY N) & CSAH-10 (WACONIA PKWY S) & CR-32
Entering Daily Volume	10,650
Volume on Highest Leg	5,800
Max Speed	55
Environment	Rural

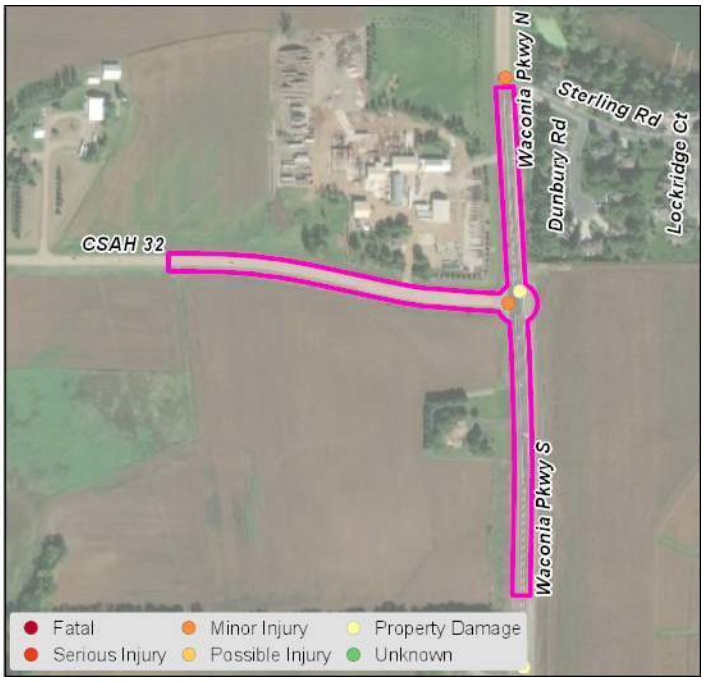


Crash Summary (3 Years)		
	All Crashes	Fatal & Suspected Serious Crashes
Total Crashes	2	0
Crash Rate	0.17	0.00
Avg Crash Rate	0.23	0.81
Critical Index	0.27	0.00



	2016	2017	2018
Fatal	0	0	0
Suspected Serious Injury	0	0	0
Suspected Minor Injury	0	1	0
Possible Injury	0	0	0
Property Damage	0	1	0
Cost	$0	$177,600	$0





ID: CACO-I-1235

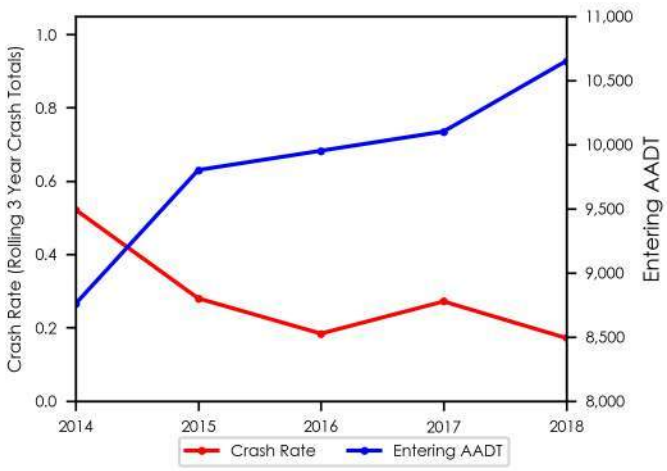
CSAH-10 (WACONIA PKWY N) & CSAH-10 (WACONIA PKWY S) & CR-32

Carver County, Minnesota

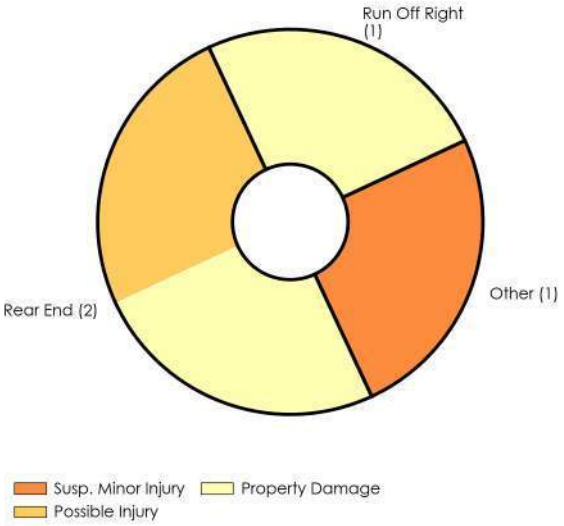
Intersection Report
5 Year Crashes (2014-2018)
Created September 2019

GAZER™ patent pending

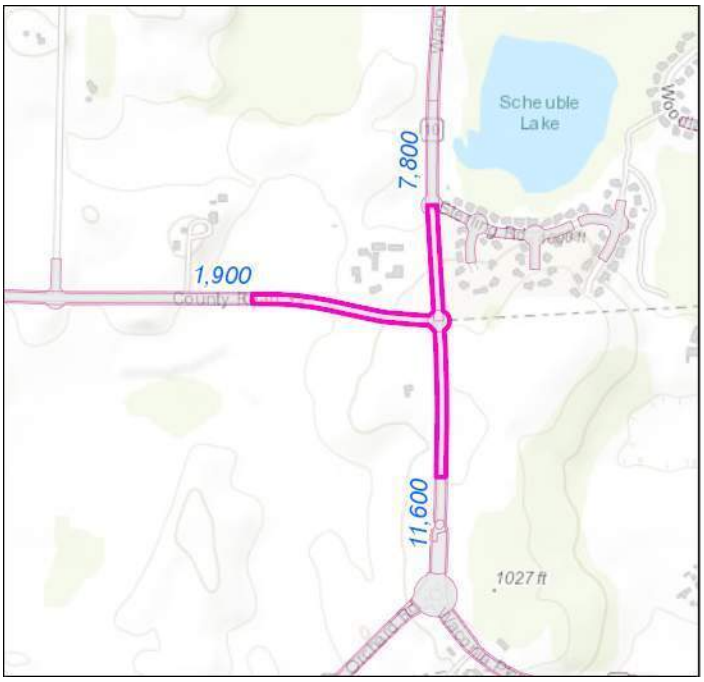
Intersection Characteristics	
Traffic Control Device	Thru Stop
Roads	CSAH-10 (WACONIA PKWY N) & CSAH-10 (WACONIA PKWY S) & CR-32
Entering Daily Volume	10,650
Volume on Highest Leg	5,800
Max Speed	55
Environment	Rural

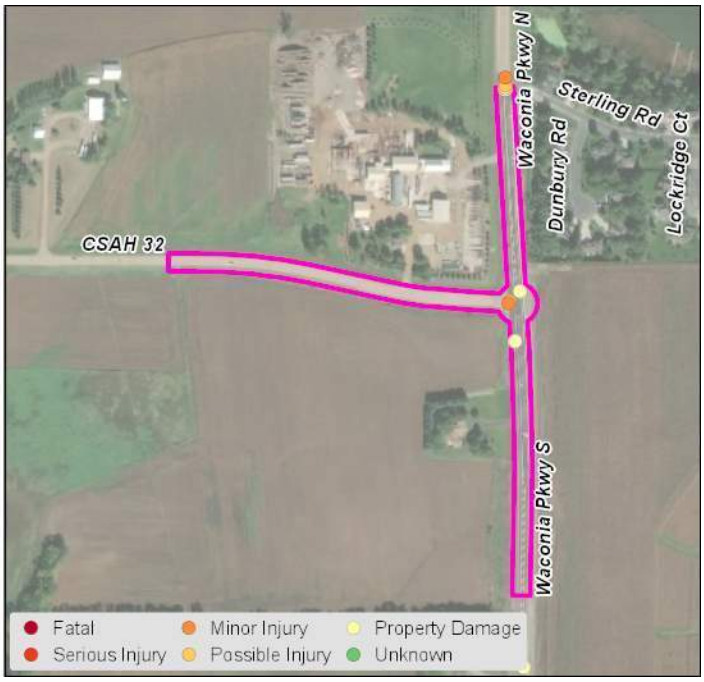


Crash Summary (5 Years)	All Crashes	Fatal & Suspected Serious Crashes
Total Crashes	4	0
Crash Rate	0.21	0.00
Avg Crash Rate	0.26	0.81
Critical Index	0.36	0.00



	2014	2015	2016	2017	2018
Fatal	0	0	0	0	0
Suspected Serious Injury	0	0	0	0	0
Suspected Minor Injury	0	0	0	1	0
Possible Injury	1	0	0	0	0
Property Damage	0	1	0	1	0
Cost	$83,000	$7,600	$0	$177,600	$0





ID: CACO-I-1235

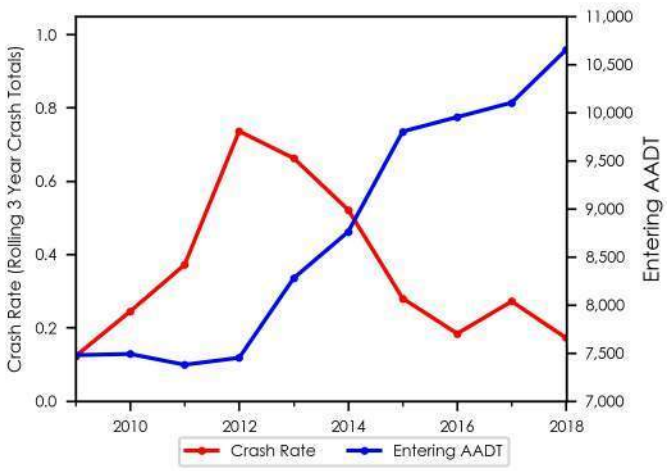
CSAH-10 (WACONIA PKWY N) & CSAH-10 (WACONIA PKWY S) & CR-32

Carver County, Minnesota

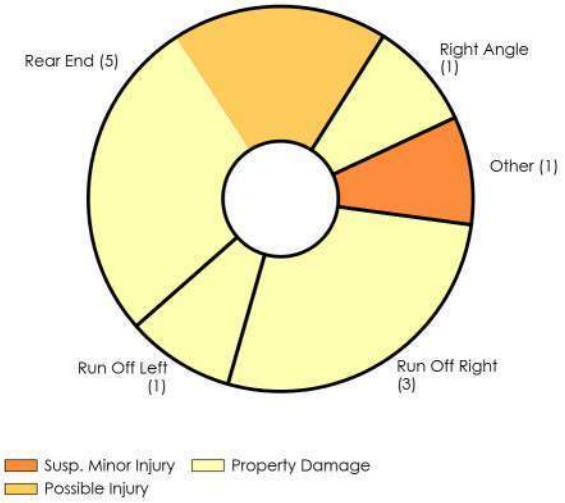
Intersection Report
10 Year Crashes (2009-2018)
Created September 2019

GAZER™ patent pending

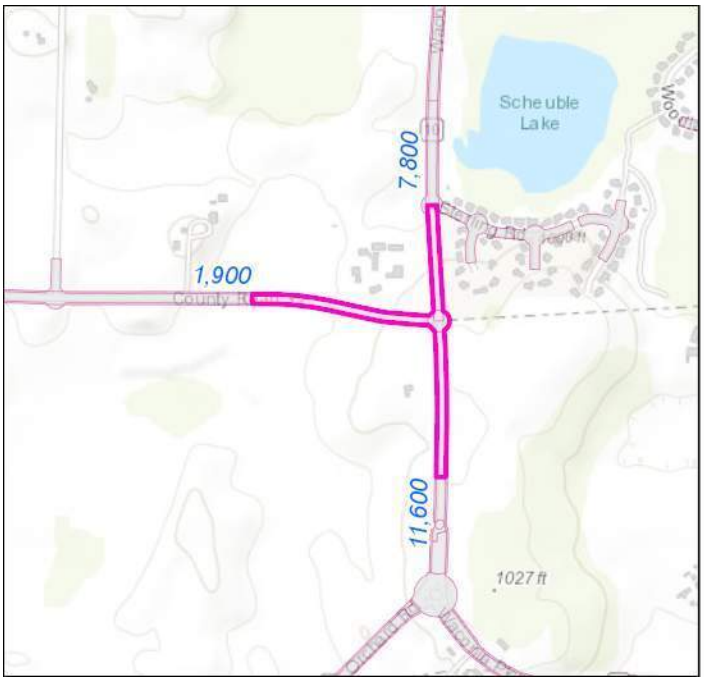
Intersection Characteristics	
Traffic Control Device	Thru Stop
Roads	CSAH-10 (WACONIA PKWY N) & CSAH-10 (WACONIA PKWY S) & CR-32
Entering Daily Volume	10,650
Volume on Highest Leg	5,800
Max Speed	55
Environment	Rural

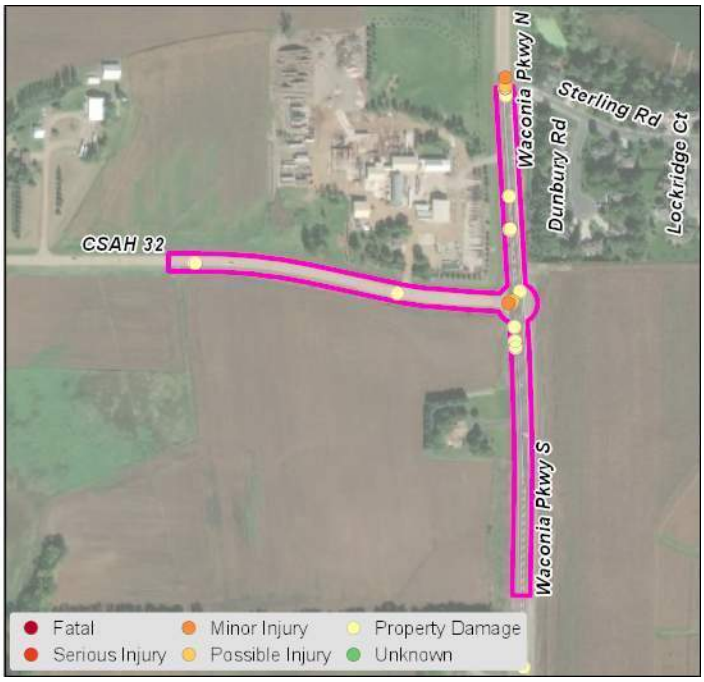


Crash Summary (10 Years)	All Crashes	Fatal & Suspected Serious Crashes
Total Crashes	11	0
Crash Rate	0.28	0.00
Avg Crash Rate	0.25	0.76
Critical Index	0.59	0.00



	2009-2013	2014	2015	2016	2017	2018
Fatal	0	0	0	0	0	0
Suspected Serious Injury	0	0	0	0	0	0
Suspected Minor Injury	0	0	0	0	1	0
Possible Injury	1	1	0	0	0	0
Property Damage	6	0	1	0	1	0
Cost	$128,600	$83,000	$7,600	$0	$177,600	$0





ID: CACO-I-1235

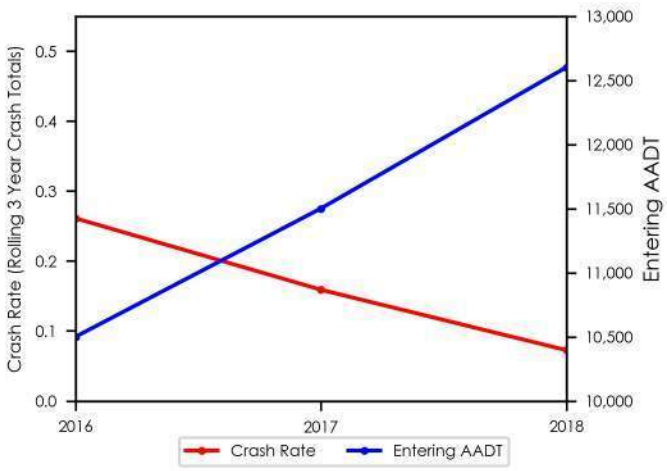
CSAH-32 (WACONIA PKWY S) & POND LN

Carver County, Minnesota

Intersection Report
3 Year Crashes (2016-2018)
Created September 2019

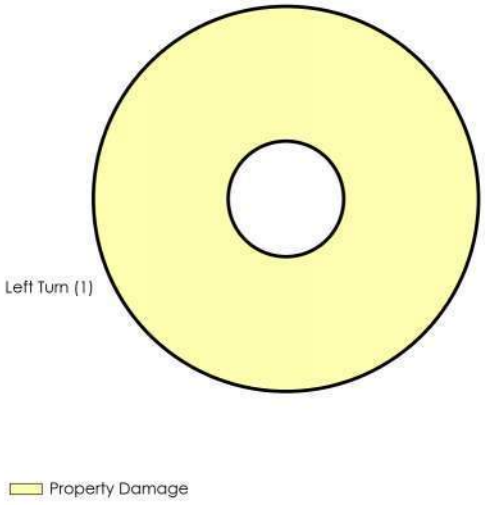
GAZER™ patent pending

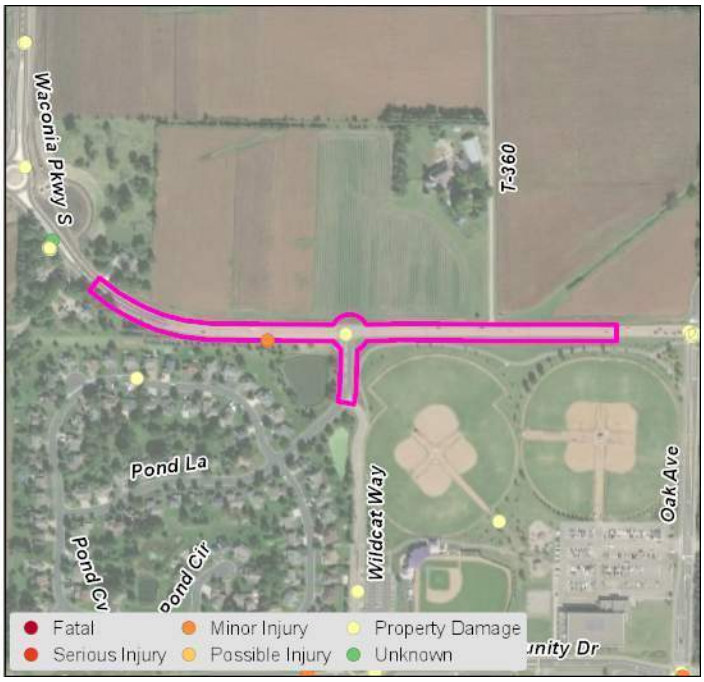
Intersection Characteristics	
Traffic Control Device	Thru Stop
Roads	CSAH-32 (WACONIA PKWY S) & POND LN
Entering Daily Volume	12,600
Volume on Highest Leg	5,800
Max Speed	50
Environment	Rural



Crash Summary (3 Years)	All Crashes	Fatal & Suspected Serious Crashes
Total Crashes	1	0
Crash Rate	0.07	0.00
Avg Crash Rate	0.23	0.81
Critical Index	0.12	0.00

	2016	2017	2018
Fatal	0	0	0
Suspected Serious Injury	0	0	0
Suspected Minor Injury	0	0	0
Possible Injury	0	0	0
Property Damage	0	0	1
Cost	$0	$0	$7,600





ID: CACO-I-1461

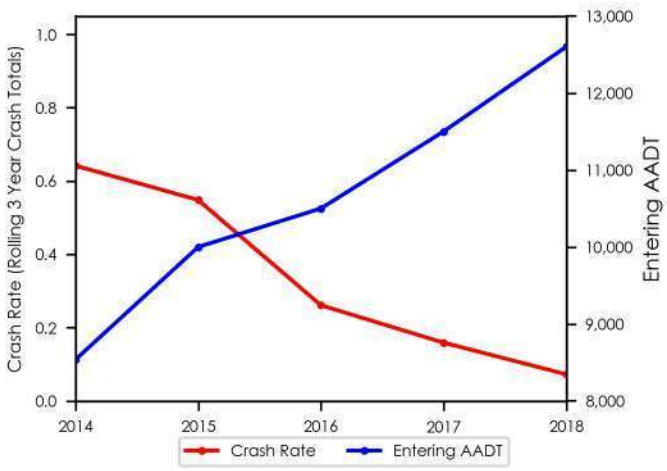
CSAH-32 (WACONIA PKWY S) & POND LN

Carver County, Minnesota

Intersection Report
5 Year Crashes (2014-2018)
Created September 2019

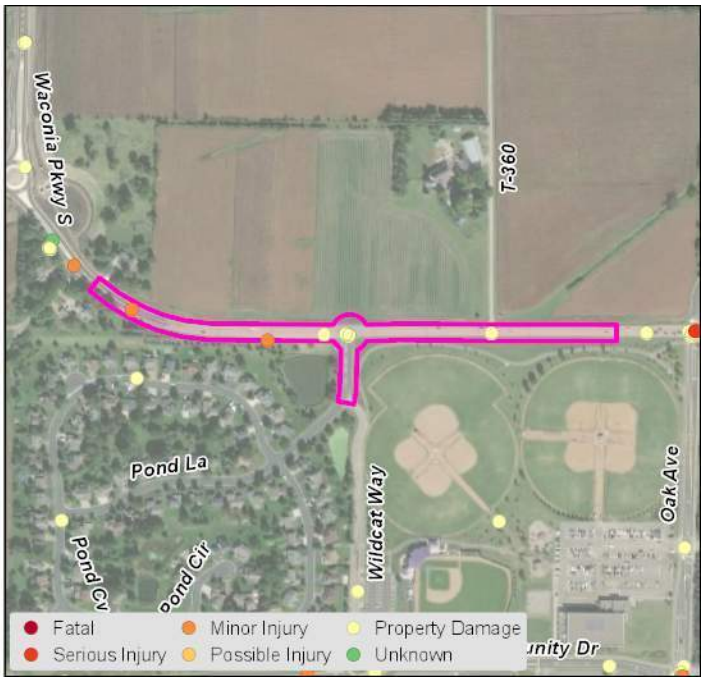
GAZER™ patent pending

Intersection Characteristics	
Traffic Control Device	Thru Stop
Roads	CSAH-32 (WACONIA PKWY S) & POND LN
Entering Daily Volume	12,600
Volume on Highest Leg	5,800
Max Speed	50
Environment	Rural



Crash Summary (5 Years)	All Crashes	Fatal & Suspected Serious Crashes
Total Crashes	4	0
Crash Rate	0.17	0.00
Avg Crash Rate	0.26	0.81
Critical Index	0.32	0.00

	2014	2015	2016	2017	2018
Fatal	0	0	0	0	0
Suspected Serious Injury	0	0	0	0	0
Suspected Minor Injury	0	1	0	0	0
Possible Injury	0	0	0	0	0
Property Damage	1	1	0	0	1
Cost	$7,600	$177,600	$0	$0	$7,600



ID: CACO-I-1461

CSAH-32 (WACONIA PKWY S) & POND LN

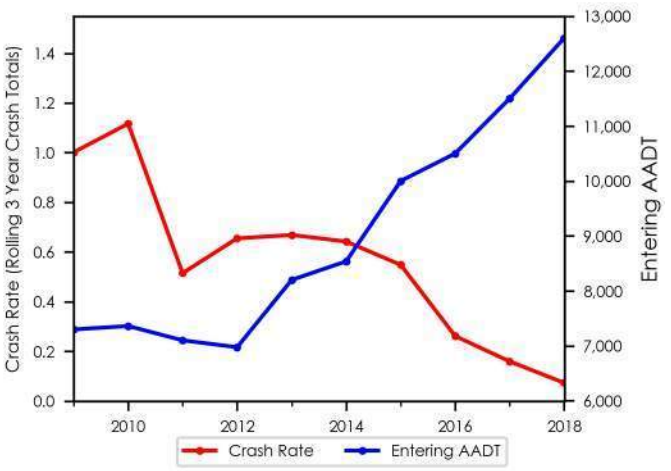
Carver County, Minnesota

Intersection Report
10 Year Crashes (2009-2018)
Created September 2019

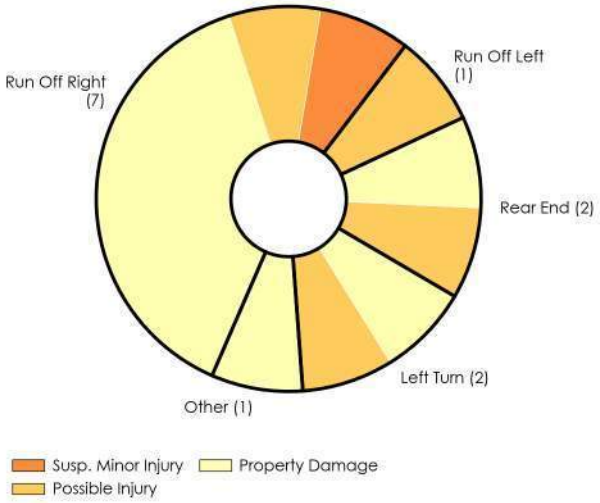
GAZER™ patent pending

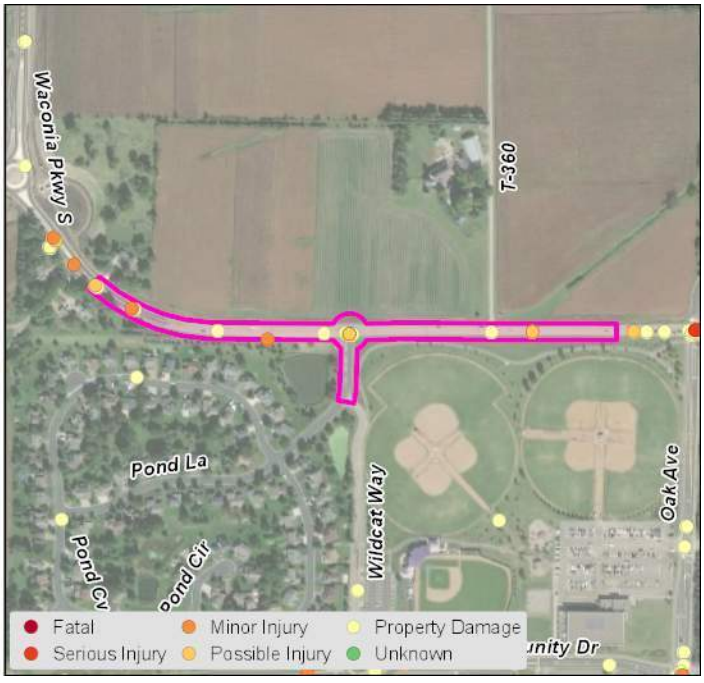
Intersection Characteristics	
Traffic Control Device	Thru Stop
Roads	CSAH-32 (WACONIA PKWY S) & POND LN
Entering Daily Volume	12,600
Volume on Highest Leg	5,800
Max Speed	50
Environment	Rural

Crash Summary (10 Years)	All Crashes	Fatal & Suspected Serious Crashes
Total Crashes	13	0
Crash Rate	0.28	0.00
Avg Crash Rate	0.25	0.76
Critical Index	0.62	0.00



	2009-2013	2014	2015	2016	2017	2018
Fatal	0	0	0	0	0	0
Suspected Serious Injury	0	0	0	0	0	0
Suspected Minor Injury	0	0	1	0	0	0
Possible Injury	4	0	0	0	0	0
Property Damage	5	1	1	0	0	1
Cost	$370,000	$7,600	$177,600	$0	$0	$7,600





ID: CACO-I-1461

CSAH-32 (WACONIA PKWY S) & OAK AVE

Carver County, Minnesota

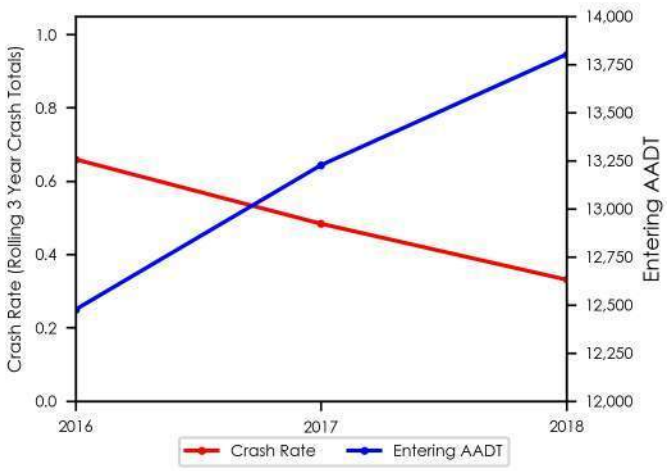
Intersection Report
3 Year Crashes (2016-2018)
Created September 2019

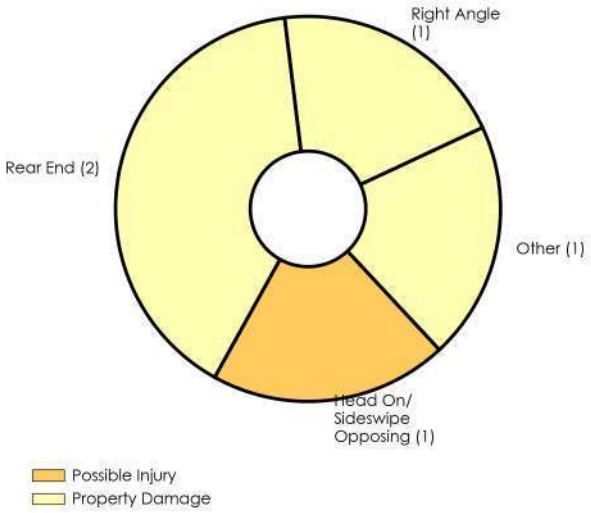
GAZER™ patent pending

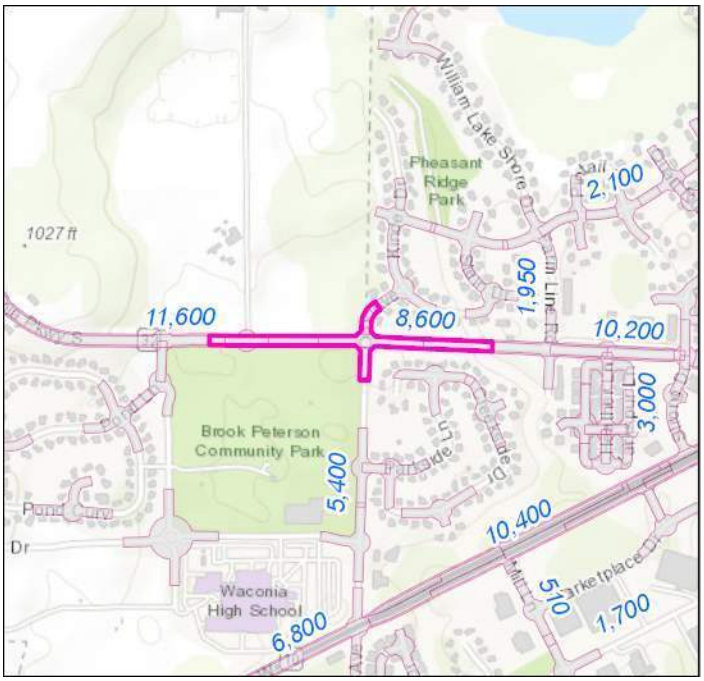
Intersection Characteristics	
Traffic Control Device	All Stop
Roads	CSAH-32 (WACONIA PKWY S) & OAK AVE
Entering Daily Volume	13,800
Volume on Highest Leg	5,800
Max Speed	50
Environment	Urban

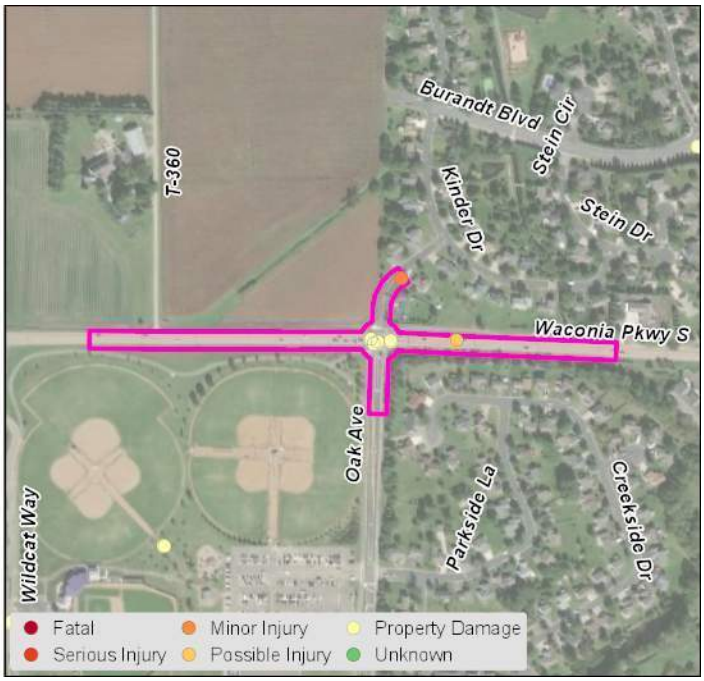
Crash Summary (3 Years)	All Crashes	Fatal & Suspected Serious Crashes
Total Crashes	5	0
Crash Rate	0.33	0.00
Avg Crash Rate	0.22	0.38
Critical Index	0.58	0.00

	2016	2017	2018
Fatal	0	0	0
Suspected Serious Injury	0	0	0
Suspected Minor Injury	0	0	0
Possible Injury	0	0	1
Property Damage	2	1	1
Cost	$15,200	$7,600	$90,600









ID: CACO-I-1460

CSAH-32 (WACONIA PKWY S) & OAK AVE

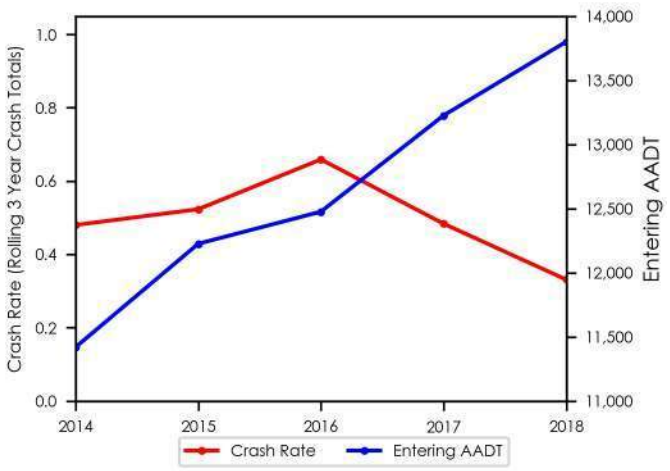
Carver County, Minnesota

Intersection Report
5 Year Crashes (2014-2018)
Created September 2019

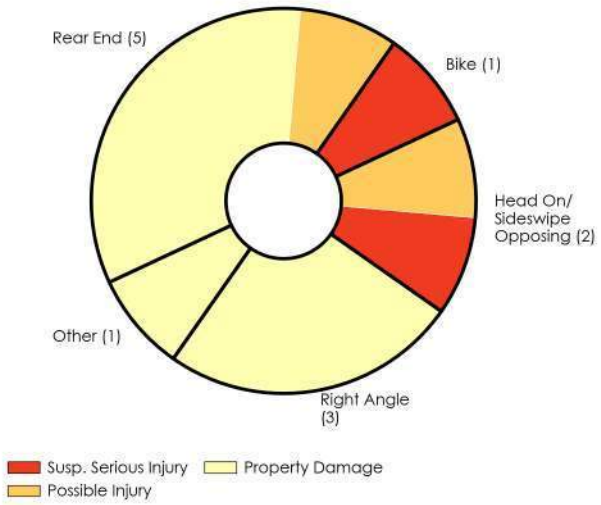
GAZER™ patent pending

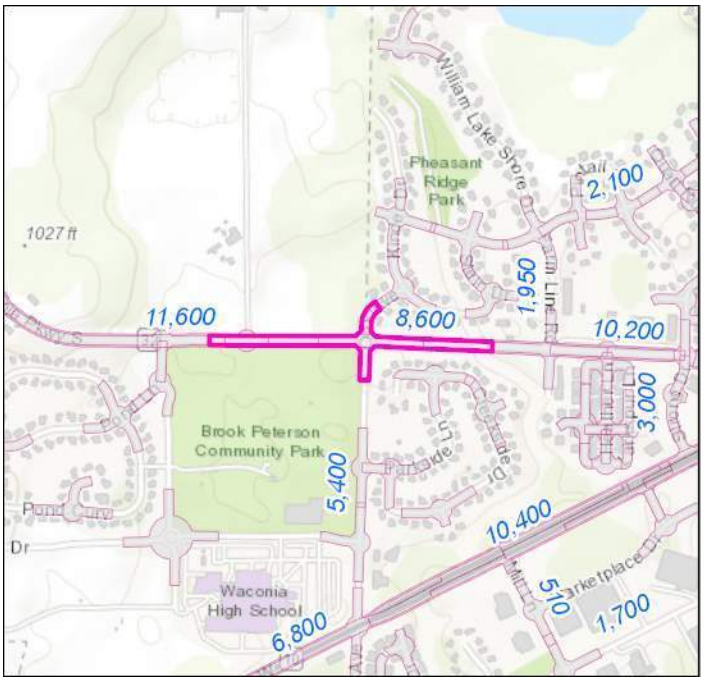
Intersection Characteristics	
Traffic Control Device	All Stop
Roads	CSAH-32 (WACONIA PKWY S) & OAK AVE
Entering Daily Volume	13,800
Volume on Highest Leg	5,800
Max Speed	50
Environment	Urban

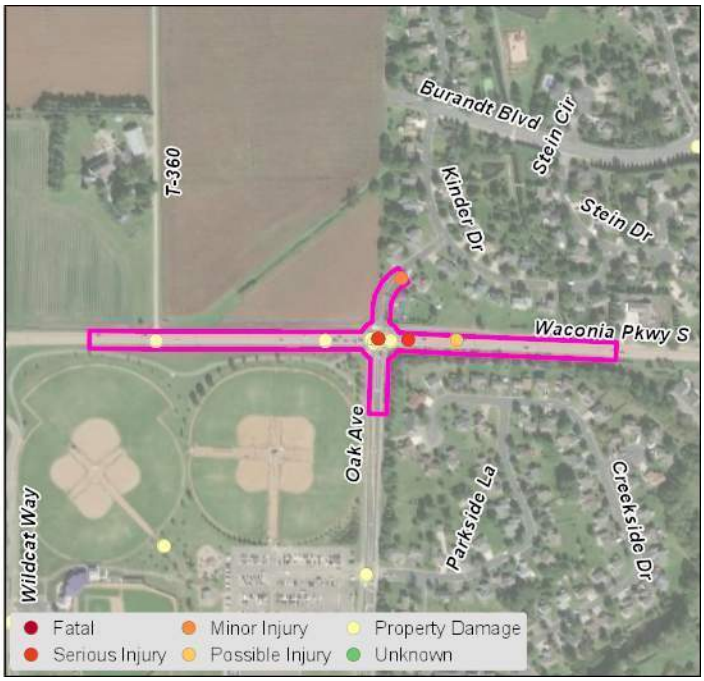
Crash Summary (5 Years)	All Crashes	Fatal & Suspected Serious Crashes
Total Crashes	12	2
Crash Rate	0.48	7.94
Avg Crash Rate	0.23	0.42
Critical Index	0.95	1.96



	2014	2015	2016	2017	2018
Fatal	0	0	0	0	0
Suspected Serious Injury	1	1	0	0	0
Suspected Minor Injury	0	0	0	0	0
Possible Injury	0	1	0	0	1
Property Damage	2	2	2	1	1
Cost	$585,200	$668,200	$15,200	$7,600	$90,600







ID: CACO-I-1460

CSAH-32 (WACONIA PKWY S) & OAK AVE

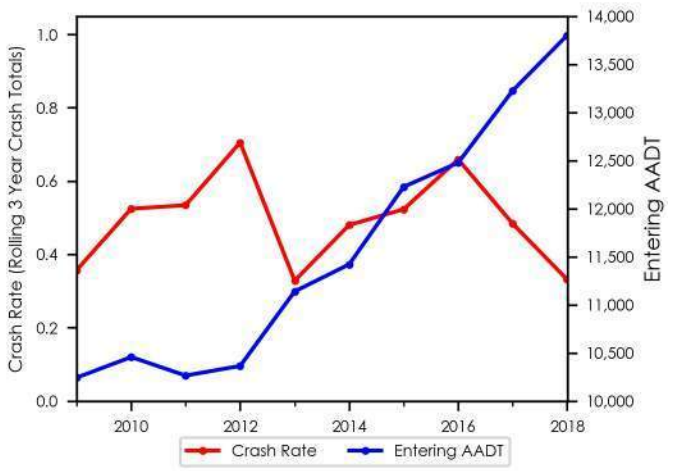
Carver County, Minnesota

Intersection Report
10 Year Crashes (2009-2018)
Created September 2019

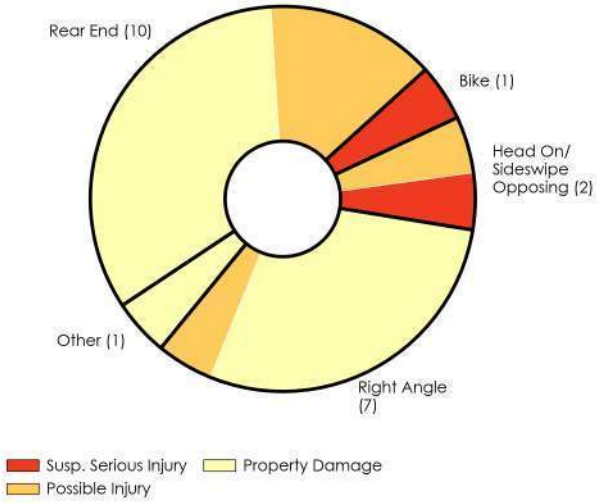
GAZER™ patent pending

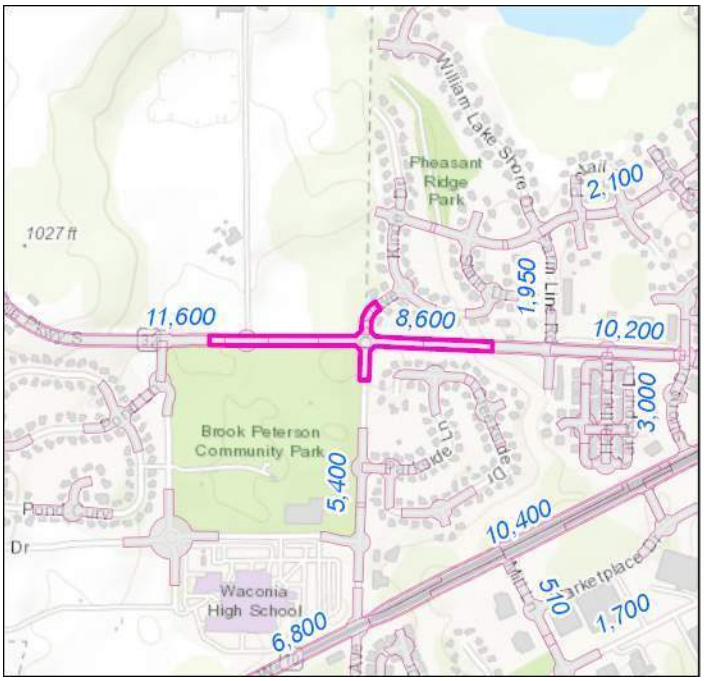
Intersection Characteristics	
Traffic Control Device	All Stop
Roads	CSAH-32 (WACONIA PKWY S) & OAK AVE
Entering Daily Volume	13,800
Volume on Highest Leg	5,800
Max Speed	50
Environment	Urban

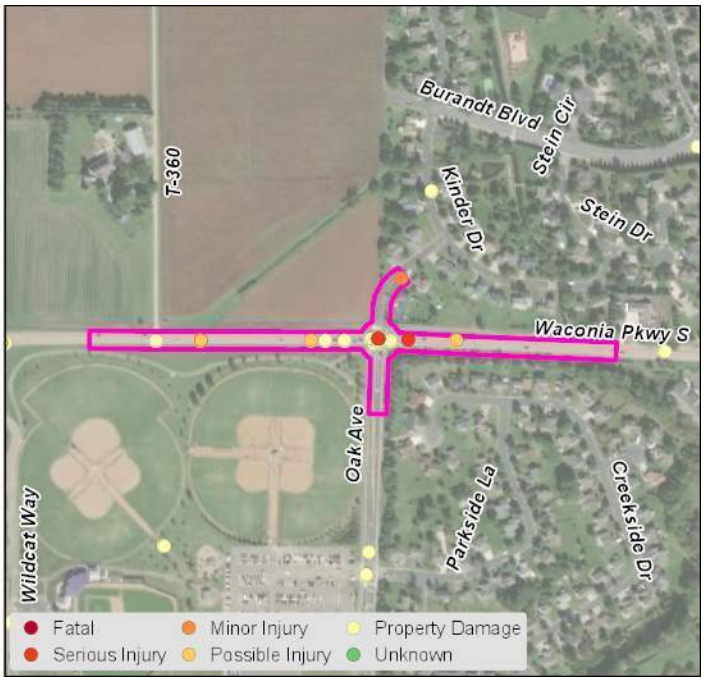
Crash Summary (10 Years)	All Crashes	Fatal & Suspected Serious Crashes
Total Crashes	21	2
Crash Rate	0.42	3.97
Avg Crash Rate	0.25	0.26
Critical Index	0.96	1.83



	2009-2013	2014	2015	2016	2017	2018
Fatal	0	0	0	0	0	0
Suspected Serious Injury	0	1	1	0	0	0
Suspected Minor Injury	0	0	0	0	0	0
Possible Injury	3	0	1	0	0	1
Property Damage	6	2	2	2	1	1
Cost	$294,600	$585,200	$668,200	$15,200	$7,600	$90,600







ID: CACO-I-1460

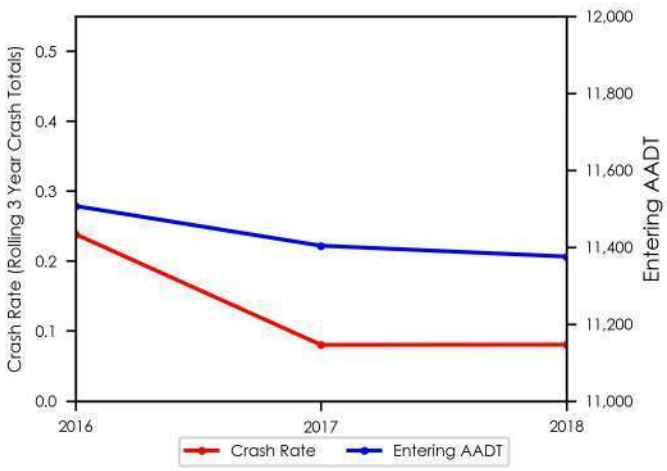
CSAH-32 (WACONIA PKWY S) & FARM LINE RD & PROVENCE LN

Carver County, Minnesota

Intersection Report
3 Year Crashes (2016-2018)
Created September 2019

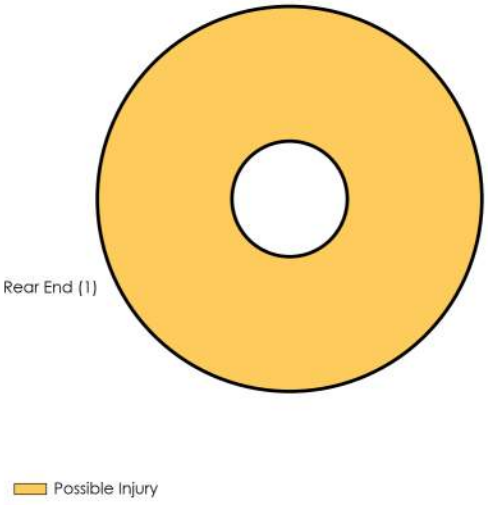
GAZER™ patent pending

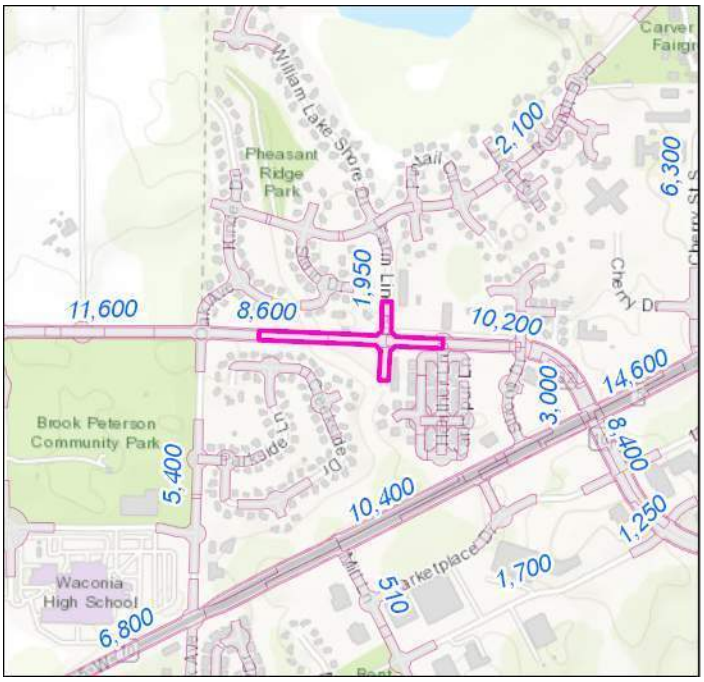
Intersection Characteristics	
Traffic Control Device	Thru Stop
Roads	CSAH-32 (WACONIA PKWY S) & FARM LINE RD & PROVENCE LN
Entering Daily Volume	11,375
Volume on Highest Leg	5,100
Max Speed	45
Environment	Urban

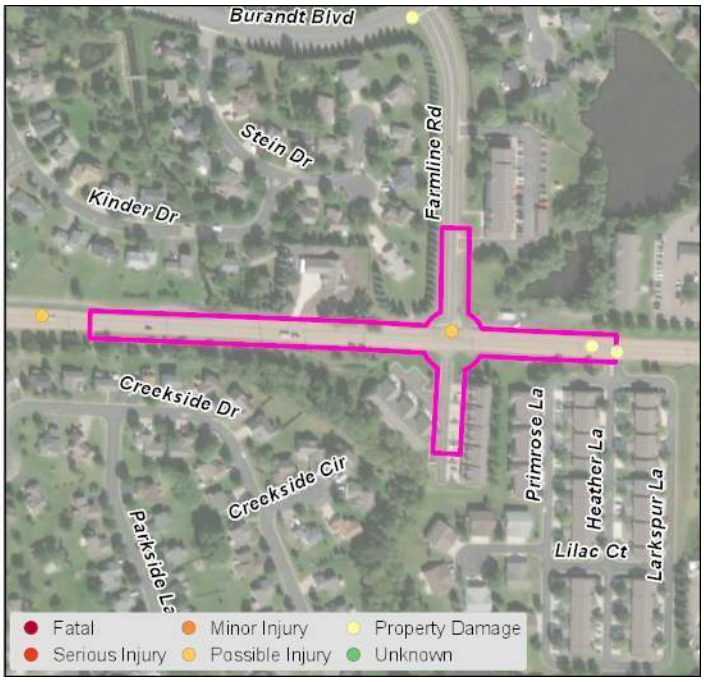


Crash Summary (3 Years)	All Crashes	Fatal & Suspected Serious Crashes
Total Crashes	1	0
Crash Rate	0.08	0.00
Avg Crash Rate	0.23	0.81
Critical Index	0.13	0.00

	2016	2017	2018
Fatal	0	0	0
Suspected Serious Injury	0	0	0
Suspected Minor Injury	0	0	0
Possible Injury	0	1	0
Property Damage	0	0	0
Cost	$0	$83,000	$0







ID: CACO-I-1458

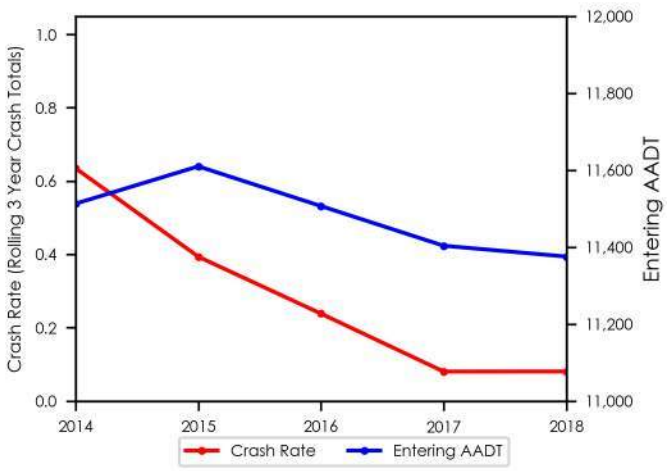
CSAH-32 (WACONIA PKWY S) & FARM LINE RD & PROVENCE LN

Carver County, Minnesota

Intersection Report
5 Year Crashes (2014-2018)
Created September 2019

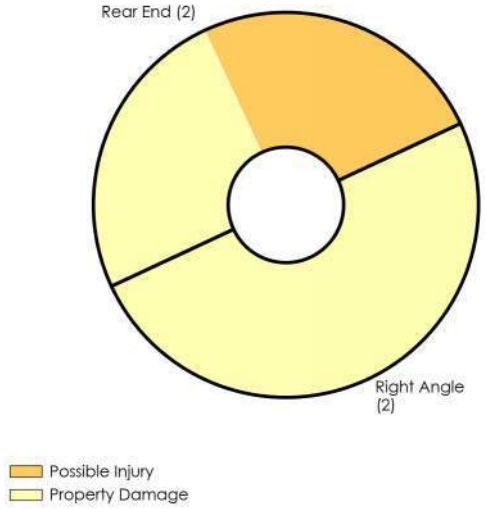
GAZER™ patent pending

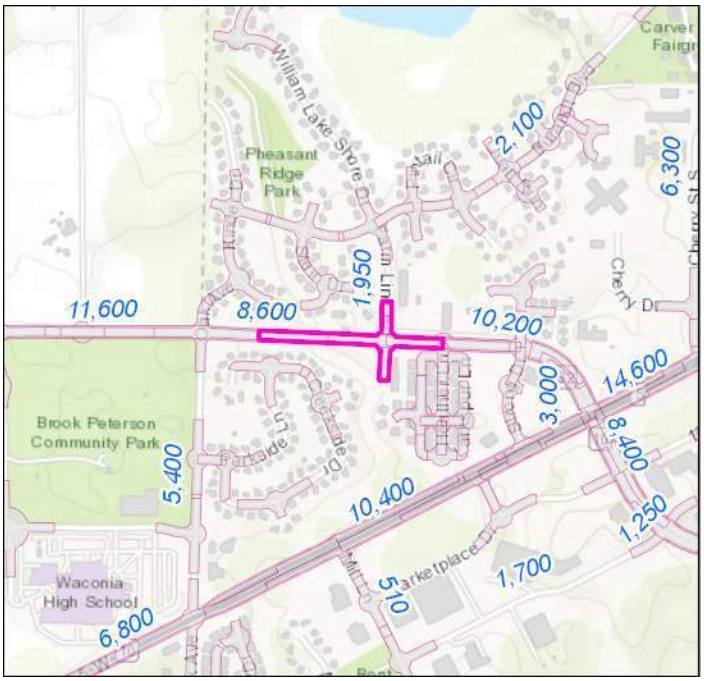
Intersection Characteristics	
Traffic Control Device	Thru Stop
Roads	CSAH-32 (WACONIA PKWY S) & FARM LINE RD & PROVENCE LN
Entering Daily Volume	11,375
Volume on Highest Leg	5,100
Max Speed	45
Environment	Urban

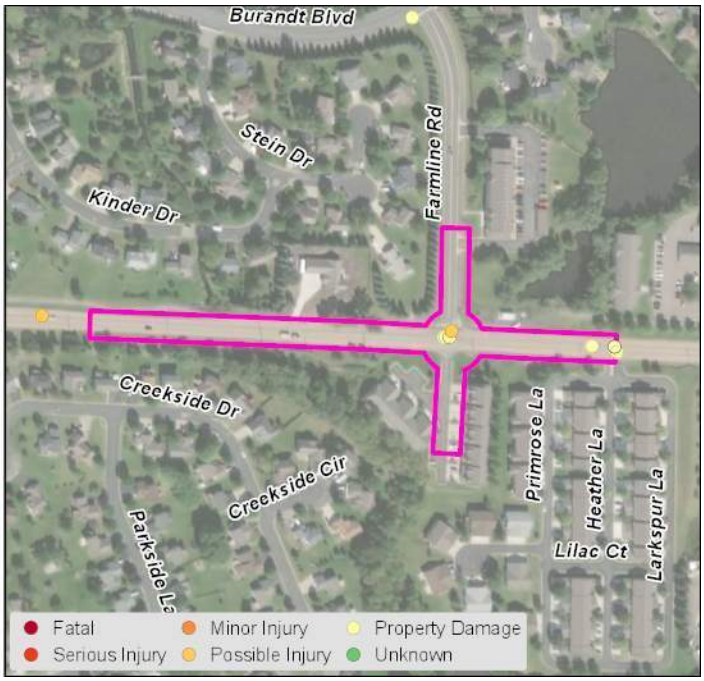


Crash Summary (5 Years)	All Crashes	Fatal & Suspected Serious Crashes
Total Crashes	4	0
Crash Rate	0.19	0.00
Avg Crash Rate	0.26	0.81
Critical Index	0.34	0.00

	2014	2015	2016	2017	2018
Fatal	0	0	0	0	0
Suspected Serious Injury	0	0	0	0	0
Suspected Minor Injury	0	0	0	0	0
Possible Injury	0	0	0	1	0
Property Damage	3	0	0	0	0
Cost	$22,800	$0	$0	$83,000	$0







ID: CACO-I-1458

CSAH-32 (WACONIA PKWY S) & FARM LINE RD & PROVENCE LN

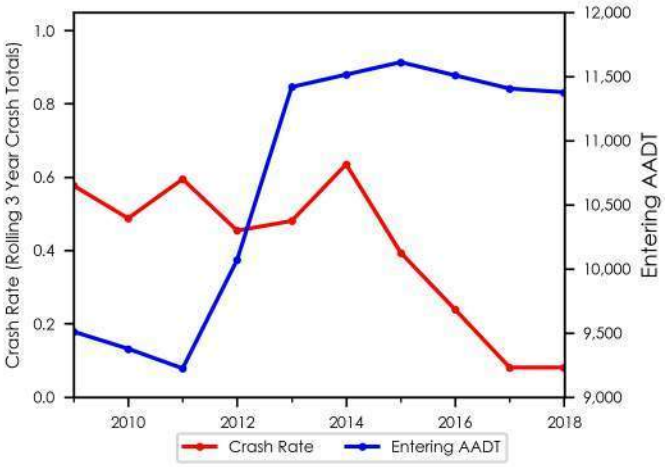
Carver County, Minnesota

Intersection Report
10 Year Crashes (2009-2018)
Created September 2019

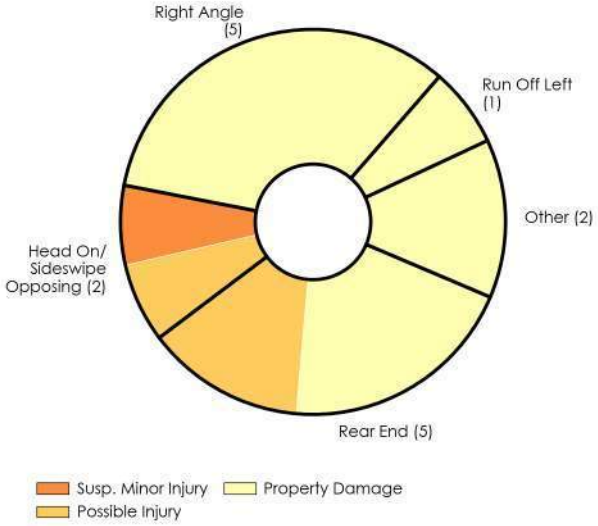
GAZER™ patent pending

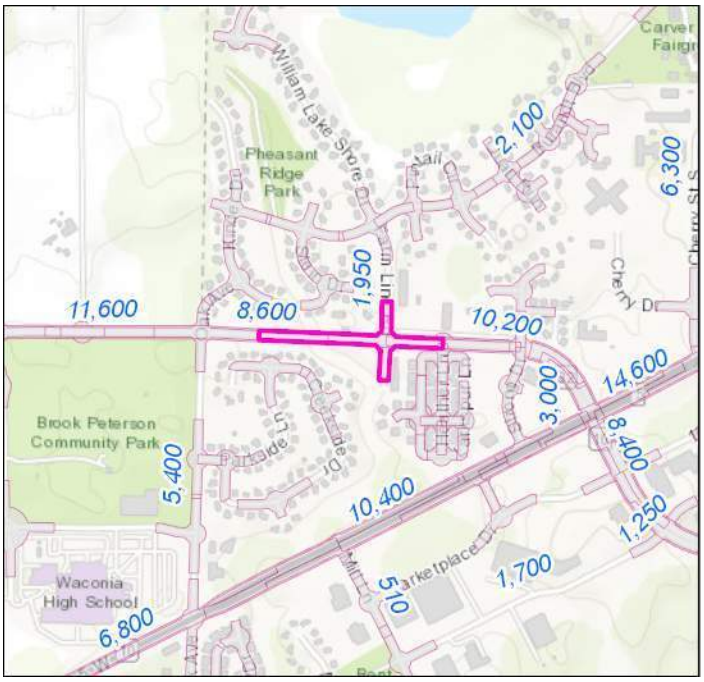
Intersection Characteristics	
Traffic Control Device	Thru Stop
Roads	CSAH-32 (WACONIA PKWY S) & FARM LINE RD & PROVENCE LN
Entering Daily Volume	11,375
Volume on Highest Leg	5,100
Max Speed	45
Environment	Urban

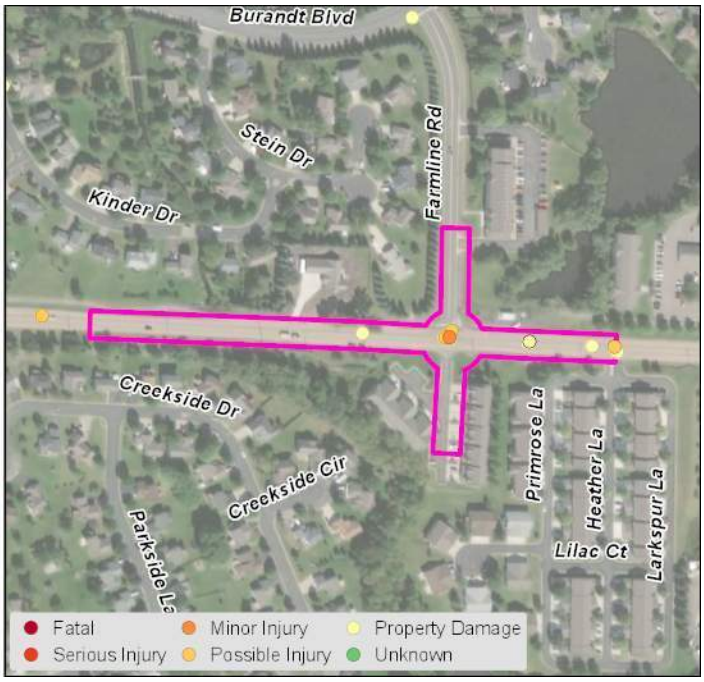
Crash Summary (10 Years)	All Crashes	Fatal & Suspected Serious Crashes
Total Crashes	15	0
Crash Rate	0.36	0.00
Avg Crash Rate	0.25	0.76
Critical Index	0.77	0.00



	2009-2013	2014	2015	2016	2017	2018
Fatal	0	0	0	0	0	0
Suspected Serious Injury	0	0	0	0	0	0
Suspected Minor Injury	1	0	0	0	0	0
Possible Injury	2	0	0	0	1	0
Property Damage	8	3	0	0	0	0
Cost	$396,800	$22,800	$0	$0	$83,000	$0







ID: CACO-I-1458

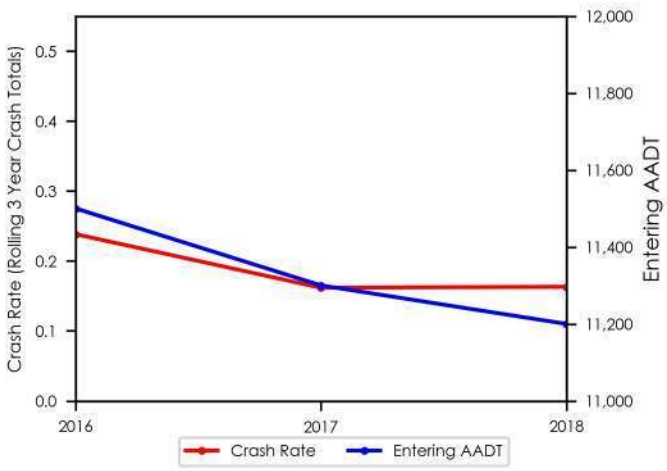
CSAH-32 (WACONIA PKWY S) & HEATHER LN

Carver County, Minnesota

Intersection Report
3 Year Crashes (2016-2018)
Created September 2019

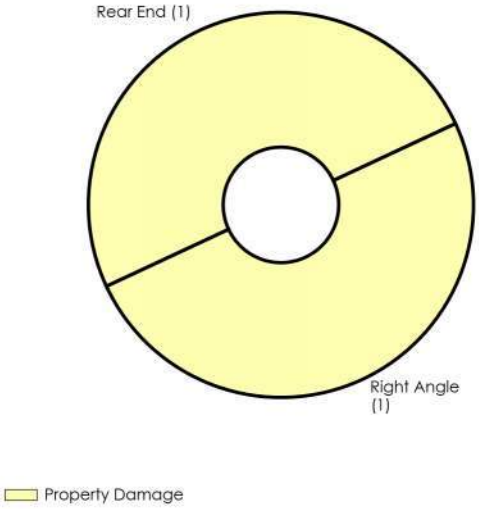
GAZER™ patent pending

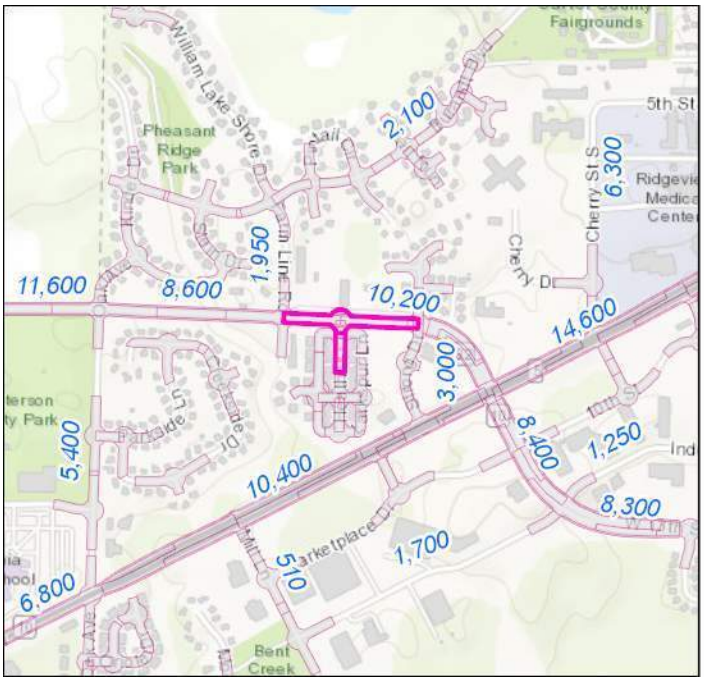
Intersection Characteristics	
Traffic Control Device	Thru Stop
Roads	CSAH-32 (WACONIA PKWY S) & HEATHER LN
Entering Daily Volume	11,200
Volume on Highest Leg	5,100
Max Speed	45
Environment	Urban

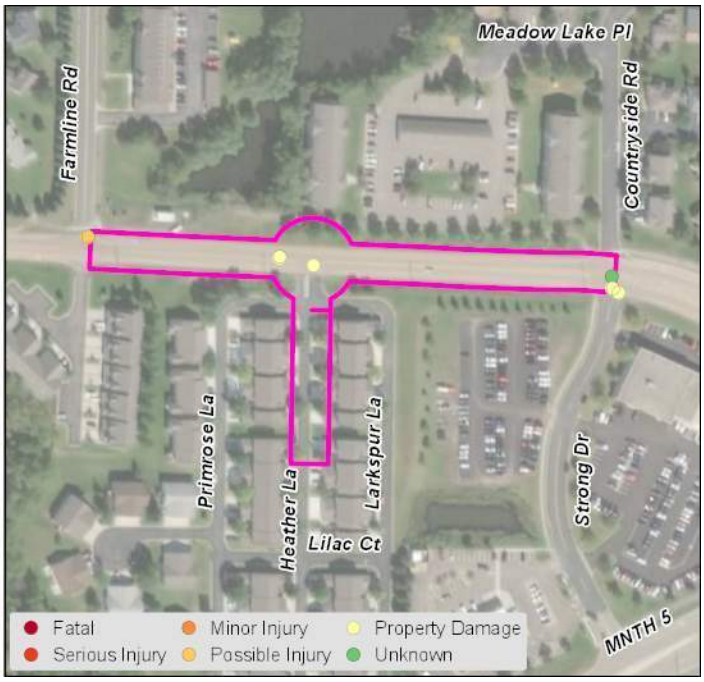


Crash Summary (3 Years)	All Crashes	Fatal & Suspected Serious Crashes
Total Crashes	2	0
Crash Rate	0.16	0.00
Avg Crash Rate	0.23	0.81
Critical Index	0.26	0.00

	2016	2017	2018
Fatal	0	0	0
Suspected Serious Injury	0	0	0
Suspected Minor Injury	0	0	0
Possible Injury	0	0	0
Property Damage	0	1	1
Cost	$0	$7,600	$7,600







ID: CACO-I-1459

CSAH-32 (WACONIA PKWY S) & HEATHER LN

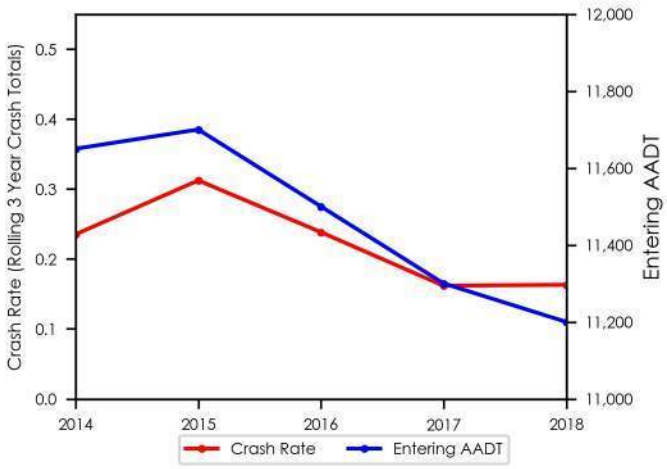
Carver County, Minnesota

Intersection Report
5 Year Crashes (2014-2018)
Created September 2019

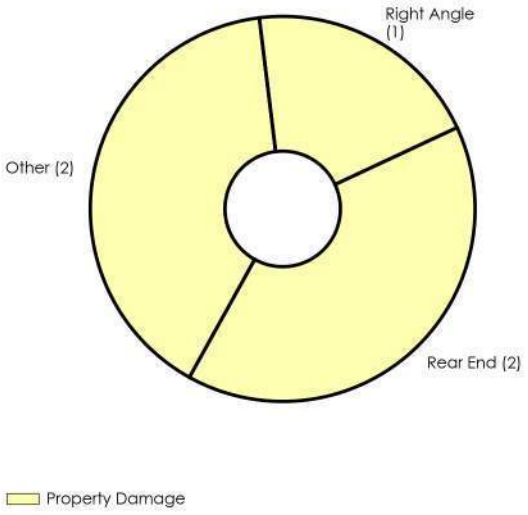
GAZER™ patent pending

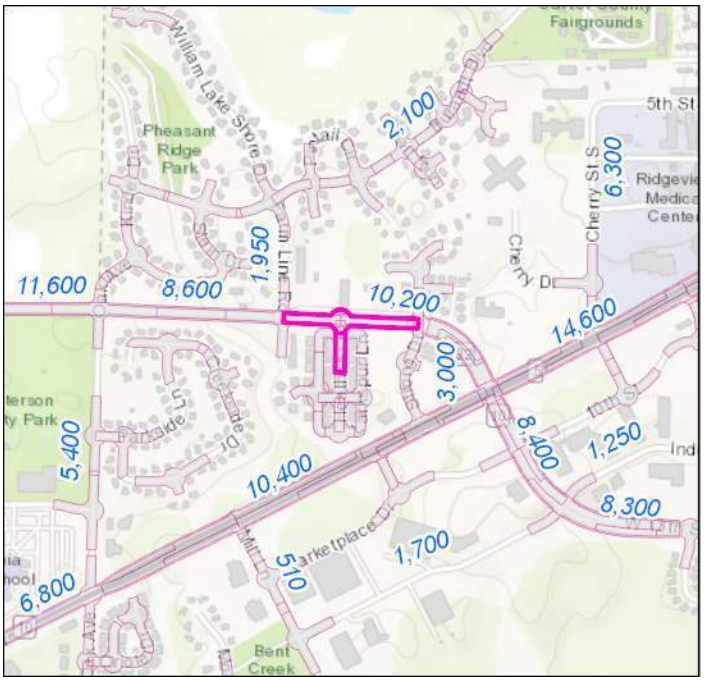
Intersection Characteristics	
Traffic Control Device	Thru Stop
Roads	CSAH-32 (WACONIA PKWY S) & HEATHER LN
Entering Daily Volume	11,200
Volume on Highest Leg	5,100
Max Speed	45
Environment	Urban

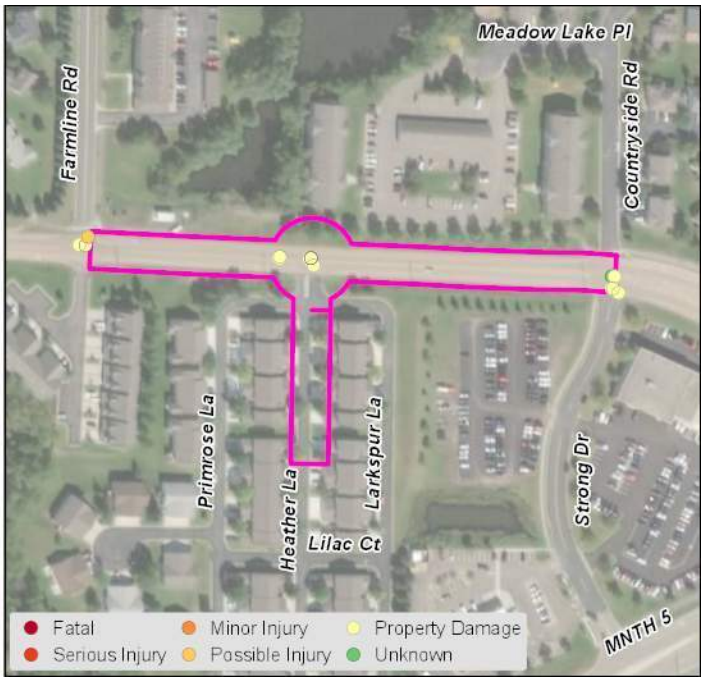
Crash Summary (5 Years)	All Crashes	Fatal & Suspected Serious Crashes
Total Crashes	5	0
Crash Rate	0.24	0.00
Avg Crash Rate	0.26	0.81
Critical Index	0.43	0.00



	2014	2015	2016	2017	2018
Fatal	0	0	0	0	0
Suspected Serious Injury	0	0	0	0	0
Suspected Minor Injury	0	0	0	0	0
Possible Injury	0	0	0	0	0
Property Damage	2	1	0	1	1
Cost	$15,200	$7,600	$0	$7,600	$7,600







ID: CACO-I-1459

CSAH-32 (WACONIA PKWY S) & HEATHER LN

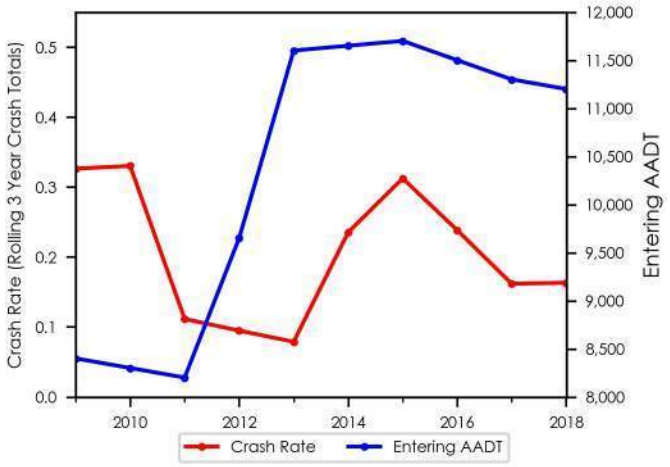
Carver County, Minnesota

Intersection Report
10 Year Crashes (2009-2018)
Created September 2019

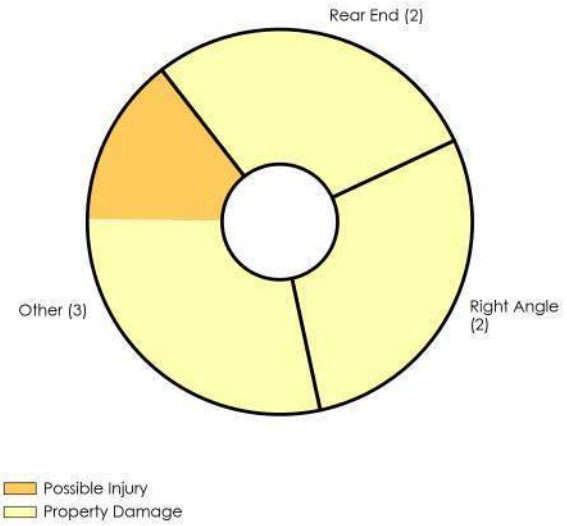
GAZER™ patent pending

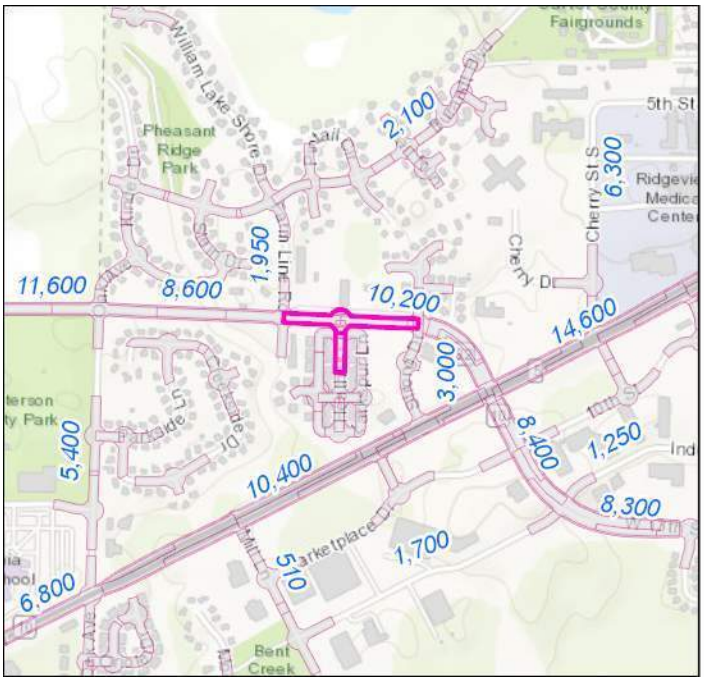
Intersection Characteristics	
Traffic Control Device	Thru Stop
Roads	CSAH-32 (WACONIA PKWY S) & HEATHER LN
Entering Daily Volume	11,200
Volume on Highest Leg	5,100
Max Speed	45
Environment	Urban

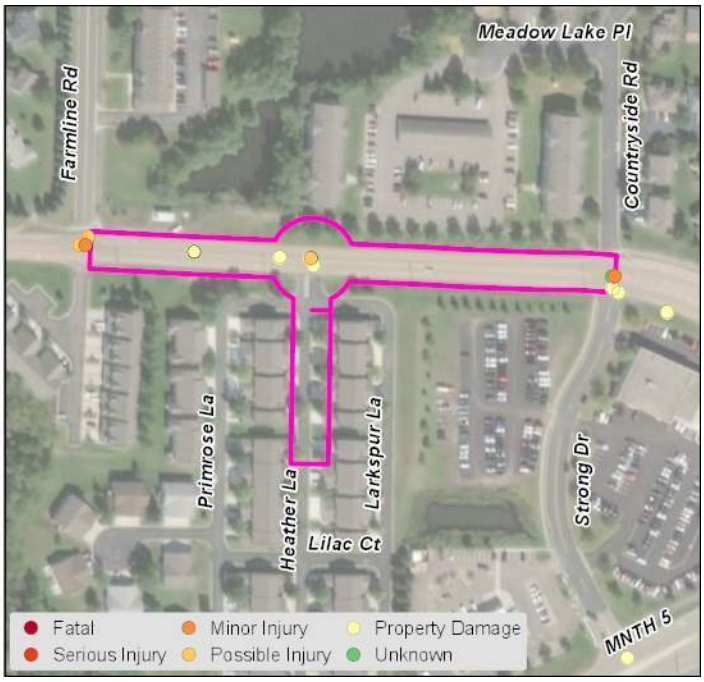
Crash Summary (10 Years)	All Crashes	Fatal & Suspected Serious Crashes
Total Crashes	7	0
Crash Rate	0.17	0.00
Avg Crash Rate	0.25	0.76
Critical Index	0.36	0.00



	2009-2013	2014	2015	2016	2017	2018
Fatal	0	0	0	0	0	0
Suspected Serious Injury	0	0	0	0	0	0
Suspected Minor Injury	0	0	0	0	0	0
Possible Injury	1	0	0	0	0	0
Property Damage	1	2	1	0	1	1
Cost	$90,600	$15,200	$7,600	$0	$7,600	$7,600







ID: CACO-I-1459

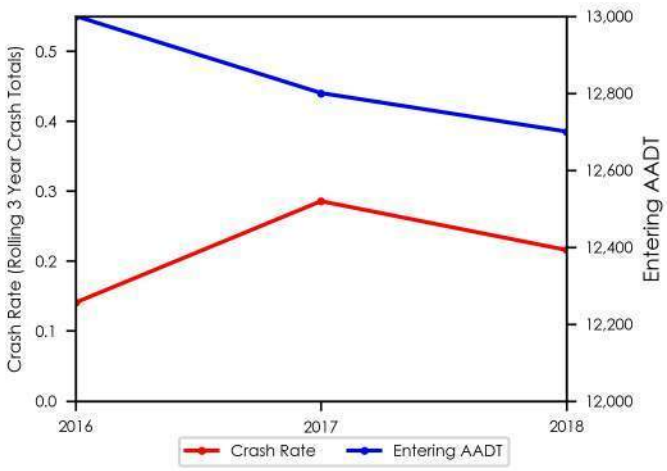
CSAH-32 (WACONIA PKWY S) & COUNTRYSIDE RD & STRONG DR

Carver County, Minnesota

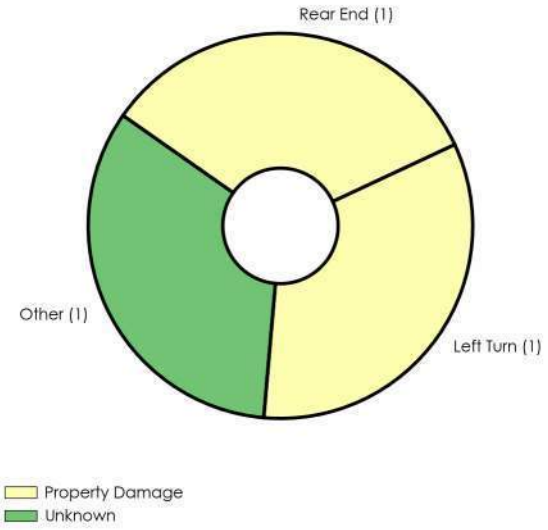
Intersection Report
3 Year Crashes (2016-2018)
Created September 2019

GAZER™ patent pending

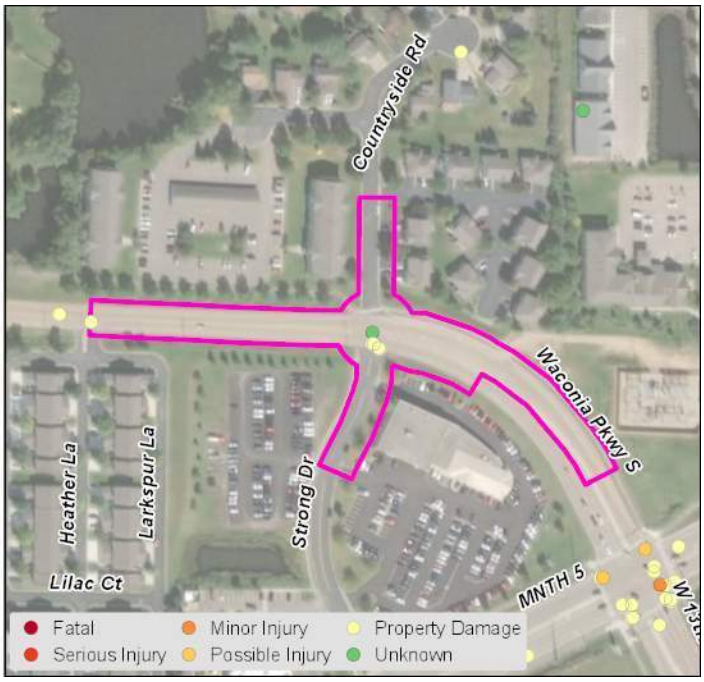
Intersection Characteristics	
Traffic Control Device	Thru Stop
Roads	CSAH-32 (WACONIA PKWY S) & COUNTRYSIDE RD & STRONG DR
Entering Daily Volume	12,700
Volume on Highest Leg	5,100
Max Speed	35
Environment	Urban



Crash Summary (3 Years)	All Crashes	Fatal & Suspected Serious Crashes
Total Crashes	3	0
Crash Rate	0.22	0.00
Avg Crash Rate	0.23	0.81
Critical Index	0.36	0.00



	2016	2017	2018
Fatal	0	0	0
Suspected Serious Injury	0	0	0
Suspected Minor Injury	0	0	0
Possible Injury	0	0	0
Property Damage	1	1	0
Unknown	0	1	0
Cost	$7,600	$15,200	$0



ID: CACO-I-1457

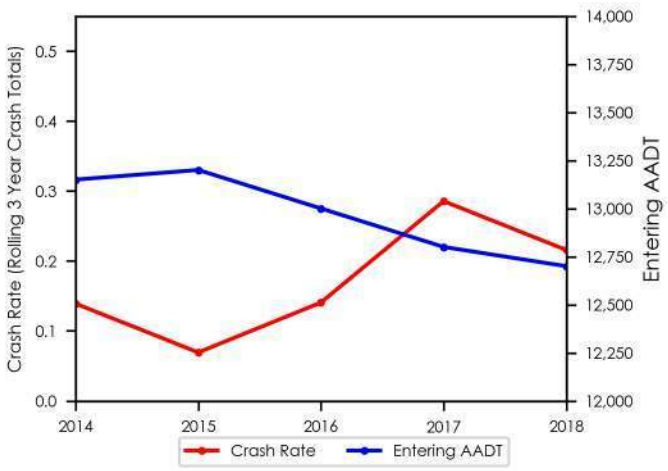
CSAH-32 (WACONIA PKWY S) & COUNTRYSIDE RD & STRONG DR

Carver County, Minnesota

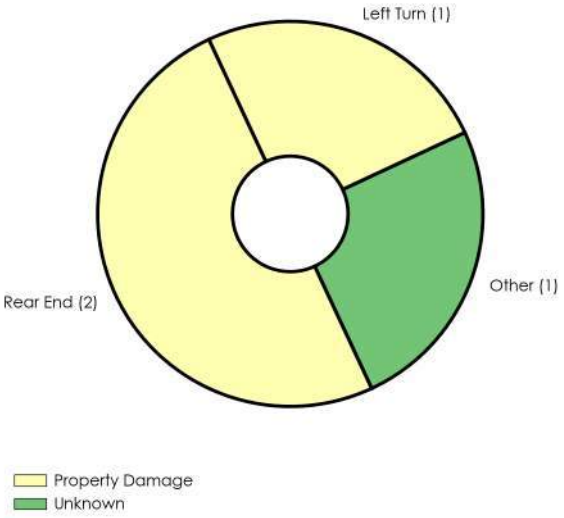
Intersection Report
5 Year Crashes (2014-2018)
Created September 2019

GAZER™ patent pending

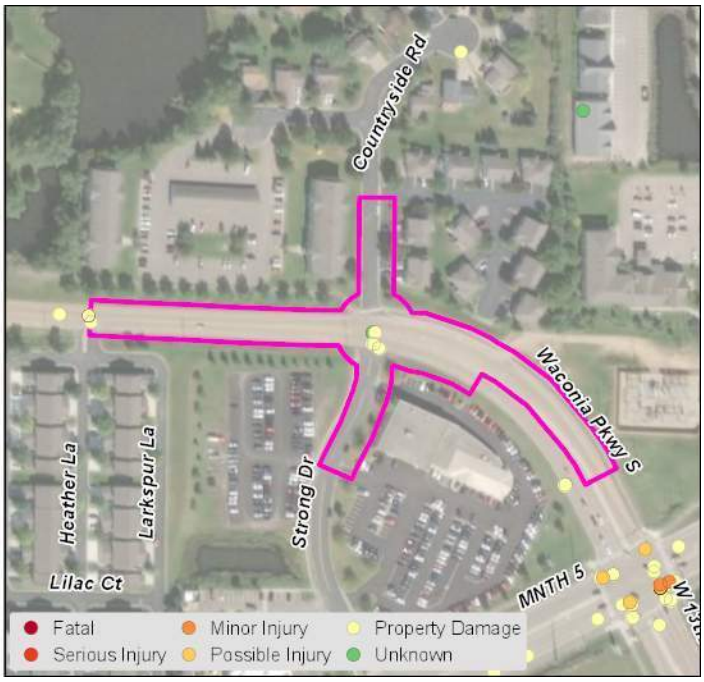
Intersection Characteristics	
Traffic Control Device	Thru Stop
Roads	CSAH-32 (WACONIA PKWY S) & COUNTRYSIDE RD & STRONG DR
Entering Daily Volume	12,700
Volume on Highest Leg	5,100
Max Speed	35
Environment	Urban



Crash Summary (5 Years)	All Crashes	Fatal & Suspected Serious Crashes
Total Crashes	4	0
Crash Rate	0.17	0.00
Avg Crash Rate	0.26	0.81
Critical Index	0.32	0.00



	2014	2015	2016	2017	2018
Fatal	0	0	0	0	0
Suspected Serious Injury	0	0	0	0	0
Suspected Minor Injury	0	0	0	0	0
Possible Injury	0	0	0	0	0
Property Damage	0	1	1	1	0
Unknown	0	0	0	1	0
Cost	$0	$7,600	$7,600	$15,200	$0



ID: CACO-I-1457

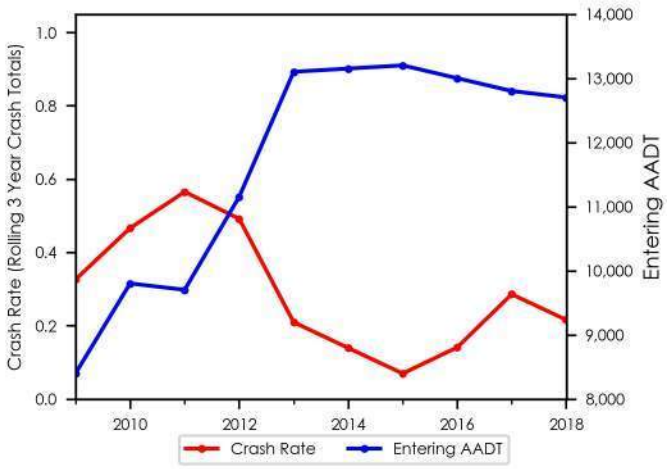
CSAH-32 (WACONIA PKWY S) & COUNTRYSIDE RD & STRONG DR

Carver County, Minnesota

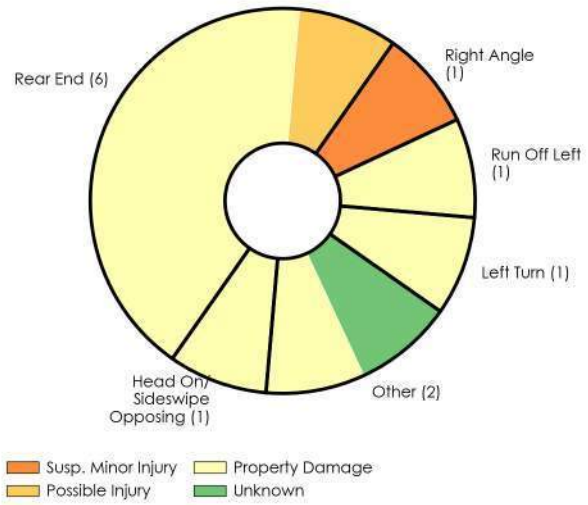
Intersection Report
10 Year Crashes (2009-2018)
Created September 2019

GAZER™ patent pending

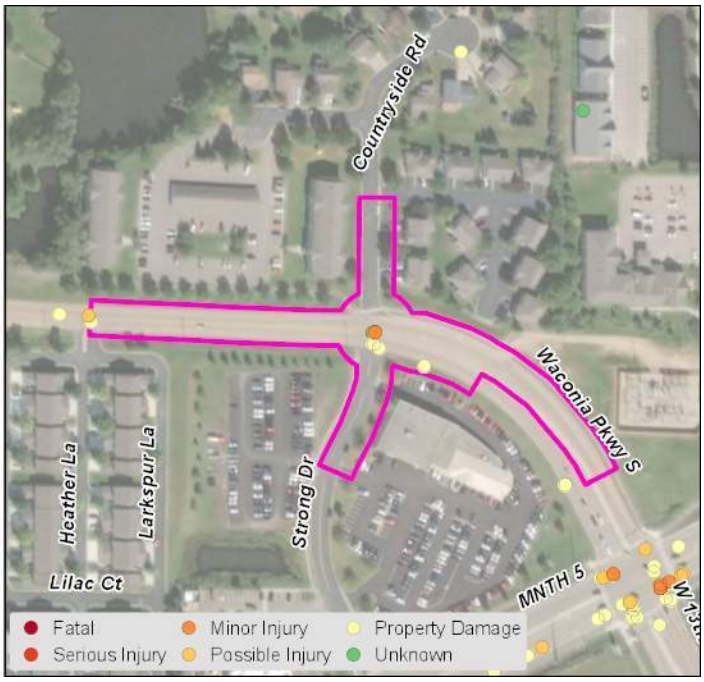
Intersection Characteristics	
Traffic Control Device	Thru Stop
Roads	CSAH-32 (WACONIA PKWY S) & COUNTRYSIDE RD & STRONG DR
Entering Daily Volume	12,700
Volume on Highest Leg	5,100
Max Speed	35
Environment	Urban



Crash Summary (10 Years)	All Crashes	Fatal & Suspected Serious Crashes
Total Crashes	12	0
Crash Rate	0.26	0.00
Avg Crash Rate	0.25	0.76
Critical Index	0.57	0.00



	2009-2013	2014	2015	2016	2017	2018
Fatal	0	0	0	0	0	0
Suspected Serious Injury	0	0	0	0	0	0
Suspected Minor Injury	1	0	0	0	0	0
Possible Injury	1	0	0	0	0	0
Property Damage	6	0	1	1	1	0
Unknown	0	0	0	0	1	0
Cost	$298,600	$0	$7,600	$7,600	$15,200	$0



ID: CACO-I-1457

Appendix D

SimTraffic Results
(Available Upon Request)