

MEMORANDUM

Date: July 26, 2018

Re: **The Bluffs at Marystown/Windermere Traffic Study Update**
File 0014194.00

To: Micah Heckman, City of Shakopee

From: Steve Manhart, P.E., PTOE, PTP

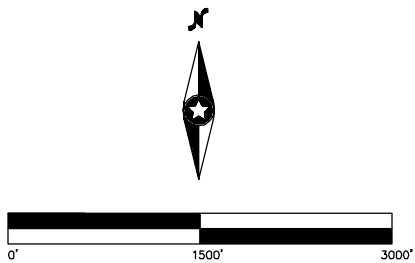
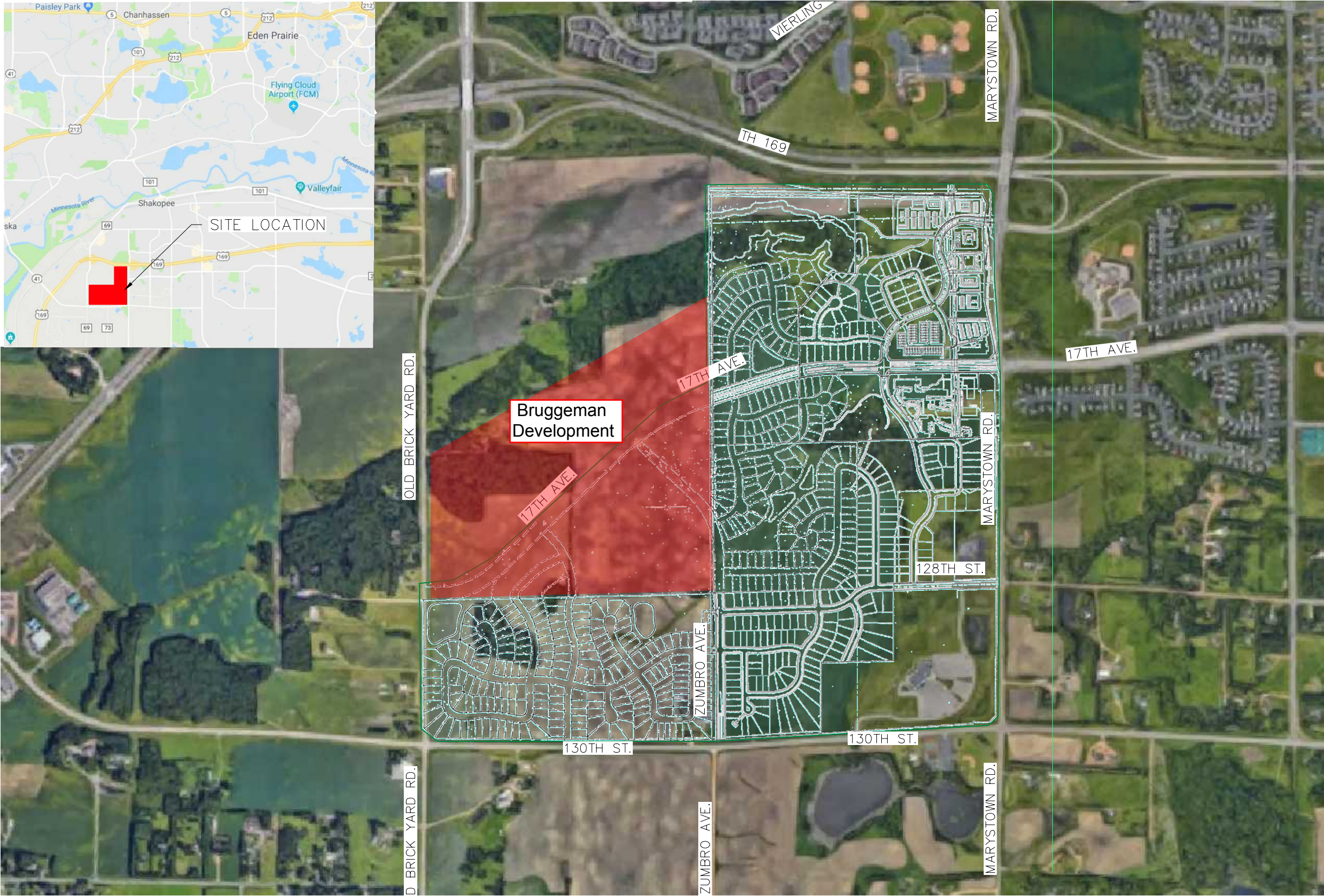
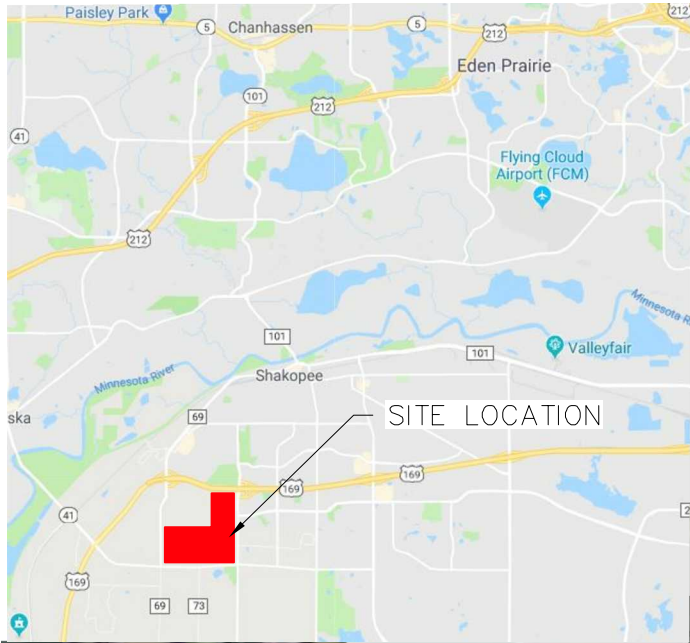
Westwood Professional Services has completed a traffic study for the proposed Windermere Development in Shakopee, MN. This is an update of several documents that have preceded this analysis:

- Traffic Study For The Proposed Bluffs At Marystown Residential Development, prepared by SRF Consulting Group, 03/27/2006
- Traffic Study For The Proposed Bluffs At Marystown Residential Development – Update, prepared by SRF Consulting Group, 08/08/2006
- Traffic Impact Study – Bluffs of Marystown, prepared by Westwood Professional Services, 08/07/2014
- Traffic Impact Study – Windermere, prepared by Westwood Professional Services, 03/29/2017
- Traffic Impact Study – Windermere (BHS-Shakopee), prepared by Westwood Professional Services, 03/22/2018

This update is in response to comments from the Metropolitan Council requesting an update of the traffic section from the previous EAW. Their request was to see the impact of the land uses, which have changed over the years.

The purpose of this study is to determine the traffic impacts on the adjacent roadway system related to the development of this site (See Figure 1). This traffic study includes a.m. and p.m. peak hour operations analysis for existing and year 2025 no-build and build conditions.

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**WINDERMERE EAW
UPDATE**
Shakopee, MN

SITE LAYOUT

Date: 7/19/18 Figure: 1

EXISTING CONDITIONS

To determine how traffic is currently operating in the study area, traffic operations for existing a.m. and p.m. peak hour conditions were analyzed at the following key intersections:

- Marystown Road (County Road 15) and Vierling Drive
- Marystown Road (County Road 15) and TH 169 SB Ramps
- Marystown Road (County Road 15) and TH 169 NB Ramps
- Marystown Road (County Road 15) and 17th Avenue
- Marystown Road (County Road 15) and 128th Street West
- Marystown Road (County Road 15) and 130th Street West (County Road 78)
- Zumbro Avenue (County Road 73) and 130th Street West (County Road 78)
- Old Brick Yard Road (County Road 69) and 130th Street West (County Road 78)
- Old Brick Yard Road (County Road 69) and TH 169 NB Ramps
- Old Brick Yard Road (County Road 69) and TH 169 SB Ramps

Westwood had taken counts in 2015 for all Marystown Road (County Road 15) intersections except at 130th Street West (County Road 78). These counts were then extrapolated to the 2018 condition using the 2.0% annual growth rate utilized in the Traffic Study for the Proposed Bluffs at Marystown Residential Development.¹

For the remaining intersections, Westwood deployed video cameras to record turning movements. Westwood then added these peak hour turning movement counts to the counts extrapolated from the earlier study.

Current traffic controls include:

Side Street Stop

- TH 169 ramps at Old Brick Yard Road
- Old Brick Yard Road at 130th Street
- Zumbro Avenue at the 130th Street
- 128th Street at Marystown Road
- 17th Avenue at Marystown Road
- NB & SB TH 169 Ramps at Marystown Road

All-Way Street Stop

- Marystown Road and Vierling Drive
- Old Brick Yard Road (and 130th Street West)

¹ Traffic Study for the Proposed Bluffs at Marystown Residential Development, prepared for the City of Shakopee, by SRF Consulting Group, March 27, 2006.

Current peak hour traffic volumes for the key intersections are shown in Figure 2. Existing lane geometrics appear on a figure in the Appendix.

An operations analysis was conducted for the a.m. and p.m. peak hours at the key intersections to determine how traffic currently operates in the study area. All intersections were analyzed using the *Synchro/SimTraffic, Version 10* software. Capacity analysis results identify a Level of Service (LOS) which indicates how well an intersection is operating. Facilities are given letter designations from A, representing the best operating conditions, to F, representing the worst. Generally in the Twin Cities metropolitan area, Level of Service D (LOS-D) represents the threshold for acceptable overall intersection operating conditions during a peak hour. A full discussion of the methodology in determining levels of service is found in the Appendix.

Results of the analysis shown in Table 1 indicate that all of the key intersections are currently operating at an overall LOS C or better during the a.m. and p.m. peak periods, with existing traffic control and geometric layout.

Table 1 - Existing Peak Hour Capacity Analysis - Level of Service Results

INTERSECTION	LEVEL OF SERVICE	
	A.M. PEAK	P.M. PEAK
Marystown Road and Vierling Drive*	A/B	A/B
Marystown Road and TH 169 SB Ramps*	A/A	A/A
Marystown Road and TH 169 NB Ramps*	A/A	A/A
Marystown Road and 17th Avenue*	A/A	A/A
Marystown Road and 128th Street*	A/A	A/A
Marystown Road and 130th Street*	A/B	A/B
Zumbro Avenue and 130th Street*	A/A	A/A
Old Brick Yard Road and 130th Street*	A/B	A/A
Old Brick Yard Road and TH 169 SB Ramps*	A/A	A/A
Old Brick Yard Road and TH 169 NB Ramps*	A/B	A/A

** Indicates an unsignalized intersection. The overall LOS is shown followed by the worst approach LOS.*

Note that in this area, the TH 169 SB Ramps appear to run westbound, and the TH 169 NB Ramps appear to run eastbound.

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Legend

- LANE DESIGNATION
- AM PEAK HOUR VOLUME
- PM PEAK HOUR VOLUME
- UNSIGNALIZED INTERSECTION

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EXISTING PEAK HOUR
VOLUMES
Date: 07/19/2018 Figure:2

FUTURE 2025 NO-BUILD CONDITIONS

Traffic forecasts for no-build conditions were developed for year 2025. This scenario was analyzed to determine future traffic operations without the proposed Windermere residential development. In order to account for background growth for year 2025 traffic forecasts, a 2.0% yearly growth rate was applied to all roadways. This growth rate was the same as was used in the 2006 SRF report. This growth rate is more aggressive than the 0.9% growth rate calculated by applying the Traffic Projection Factor for Scott County, as published by MnDOT's office of State Aid for Local Transportation (SALT).²

The background traffic counts taken in 2015 and extrapolated to 2025 conditions are assumed to take into account traffic from the surrounding developments. The trips for the adjacent developments were distributed to the adjacent roadways based on existing travel patterns in the area (See Figure 3).

As with the 2006 Study, Westwood included land use assumptions for the Bruggeman Development to the northwest of the Windermere development. It is assumed 750 single family residential units will be developed before 2025. It is assumed the majority of these trips will trend to and from Old Brick Yard Road, as opposed to Marystown Road.

Scott County, in partnership with MnDOT, is finalizing the design for a diverging diamond interchange at the TH 169/TH 41 and Co. Rd 78 intersection, frontage roads and an overpass at Co. Rd, 14. This construction will begin in the fall of 2018 and last through the fall of 2020.

Further, Scott County is constructing a new frontage road along the southeast side of TH 169 to the west of Old Brick Yard Road (CSAH 69). This project will remove direct access to TH 169 and will provide direct access to Old Brick Yard Road across from the north/east bound ramps at the TH 169 interchange.

These projects have been added to the current analysis assumptions.

To determine year 2025 no-build traffic performance, a traffic operations analysis was conducted for the a.m. and p.m. peak hours. As shown in Table 2, all key intersections are expected to continue to operate at an acceptable LOS A during the peak hours with the existing and future geometric layout and traffic control. Full SimTraffic reports and No-Build Lane Arrangements figure appear in the Appendix.

² Traffic Projection Factors for Needs, State Aid for Local Transportation, Minnesota Department of Transportation, Saint Paul, MN, Fall 2017.

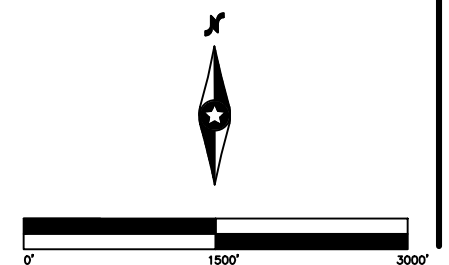
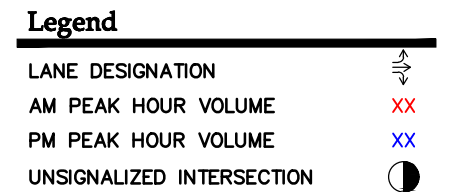


Figure 3 – 2025 No Build Peak Hour Volumes

Table 2 -- 2025 No-Build Peak Hour Capacity Analysis Level of Service Results

INTERSECTION	LEVEL OF SERVICE	
	A.M. PEAK	P.M. PEAK
Marystown Road and Vierling Drive*	A/B	A/B
Marystown Road and TH 169 SB Ramps*	A/B	A/A
Marystown Road and TH 169 NB Ramps*	A/A	A/A
Marystown Road and 17th Avenue*	A/B	A/A
Marystown Road and 128th Street*	A/A	A/A
Marystown Road and 130th Street*	A/B	A/B
Zumbro Avenue and 130th Street*	A/A	A/A
Old Brick Yard Road and 130th Street*	A/B	A/B
Old Brick Yard Road and TH 169 SB Ramps*	A/A	A/A
Old Brick Yard Road and TH 169 NB Ramps*	A/B	A/A

** Indicates an unsignalized intersection. The overall LOS is shown followed by the worst approach LOS*

Note that in this area, the TH 169 SB Ramps appear to run westbound, and the TH 169 NB Ramps appear to run eastbound.

PROPOSED DEVELOPMENT

The proposed development is to be constructed to the west of Marystown Road, to the north of 130th Street and to the east of Old Brick Yard Road. The site is currently vacant with the exception of two churches and a few single family homes. The proposed development will consist predominantly of residential homes, with some neighborhood retail, office and senior living center. The proposed development is planned to be constructed in phases with build-out within five years. For the sake of this analysis, a design year of 2025 was selected (one year after projected build-out). Figure 5 displays the proposed site plan.

TRAFFIC FORECASTS

Trip generation estimates for the a.m. and p.m. peak periods and on a daily basis were calculated for the proposed development. The trip generation estimates were calculated based on the Institute of Transportation Engineers' Trip Generation Manual, Tenth Edition (2017) using the land use type and size. These estimates include reductions for internal capture (i.e., trips to and from uses within the development itself). Trip generation estimates for the proposed development are shown in Table 3.

Table 3 – Projected Trip Generation

Land Use	Size	Daily	A.M. Peak		P.M. Peak	
		Trips	In	Out	In	Out
Windermere Development						
Single Family Housing	590 units	4,784	100	300	272	160
Multifamily Housing (Low-Rise)	38 units	222	4	14	12	7
Multifamily Housing (Low-Rise)	312 units	2,084	30	102	79	46
Gasoline/Service Station w/ Convenience Market	16 fueling positions	2,816	100	96	88	85
Pharmacy/Drugstore w/o Drive-Thru	10 ksf	798	16	8	42	43
Senior Adult Housing - Attached	185 beds	646	12	23	26	21
Assisted Living	68 beds	158	8	5	5	9
Nursing Home	24 employees	114	8	2	3	6
Shopping Center	78 ksf	4,564	111	68	168	182
Subtotal		16,186	389	618	695	559
Bruggeman Residential Development						
Single Family Homes	750 units	6,148	129	387	340	199
Grand Total (2025 Build)		22,334	518	1,005	1,035	758

(Source: ITE *Trip Generation Manual, Tenth Edition*, 2017)

The directional distribution of future trips was developed based on current local travel patterns in the study area (See Figure 4). Traffic forecasts were developed for year 2025 (one year after construction). The trips were assigned to the adjacent roadway system using the directional distribution (see Figure 5).

The combination of background traffic growth assumptions and the developments assumed for the 2025 no-build analysis, plus the estimated trips generated by the proposed development is shown on Figure 6.

COMPARISON WITH 2006 TRAFFIC STUDY

The 2006 EAW prepared by SRF Consulting Group estimated the following 2015 Build trips for the site (using ITE *Trip Generation Report, Seventh Edition*, 2003), including the Bruggeman Residential Development, as shown on Table 4 of their report and reprinted below.

“Table 4 – Trip Generation Estimates” (from 2006 SRF Study)

Land Use	Size	Daily Trips	A.M. Peak		P.M. Peak	
			In	Out	In	Out
<i>Bluffs at Marystown Development</i>						
Single Family Homes	451 units	4,157	81	244	262	154
Town homes	292 units	1,596	21	101	97	48
Neighborhood Commercial	22,500 sq. ft	2,983	45	29	130	141
Office	22,500 sq. ft.	423	50	7	18	86
Elementary School	600 students	774	139	113	76	92
Subtotal		9,933	335	494	583	522
<i>Bruggeman Residential Development</i>						
Single Family Homes	750 units	6,637	134	401	414	243
<i>Total from No-Build analysis(Table2)</i>		6,689	877	434	459	386
Grand Total (2015) Build		23,259	1,346	1,329	1,456	1,151

In comparison, Westwood estimated trip generation for the Windermere Development, as shown in Table 3. The ITE Trip Generation Manual, Tenth Edition (2017) was utilized for these estimates. To provide a more direct comparison with the 2006 trip generation estimates, the estimated trips from the Bruggeman development were included.

It is noted that in the 2006 report, traffic was added to the No-Build analysis to account for then-proposed developments east of Marystown Road. These developments were in place at the time of the traffic counts taken in 2015, and have been assumed in the Westwood EAW update to be part of the background traffic along Marystown Road.. Therefore, no additional “No-Build” development traffic was assumed, other than applying the overall 2% background growth rate.

Therefore, to provide a more accurate comparison between the two studies, the “Total from No-Build analysis (Table 2)” line item has been removed from the 2006 SRF Table. Thus the following “apples-to-apples” comparison is provided:

Table 5 – Comparison of Trip Generation – 2006 Study vs. 2018 Study Update

Land Use	Size	Daily Trips	A.M. Peak		P.M. Peak	
			In	Out	In	Out
<i>Bluffs at Marystown + Bruggeman Developments</i>		16,570	469	895	997	765
<i>Windermere + Bruggeman Developments</i>		22,334	518	1,005	1,035	758

It is not apparent from the text of the report whether the 2006 study factored internal capture and pass-by trips into the analysis. However, when adding the outbound peak hour Build volumes, it appears that internal capture must account for the reduction in outbound trip totals. Further, without knowing what land uses were assumed for

“Neighborhood Commercial” in the 2006 study, it cannot be definitively determined whether pass-by trips were calculated.

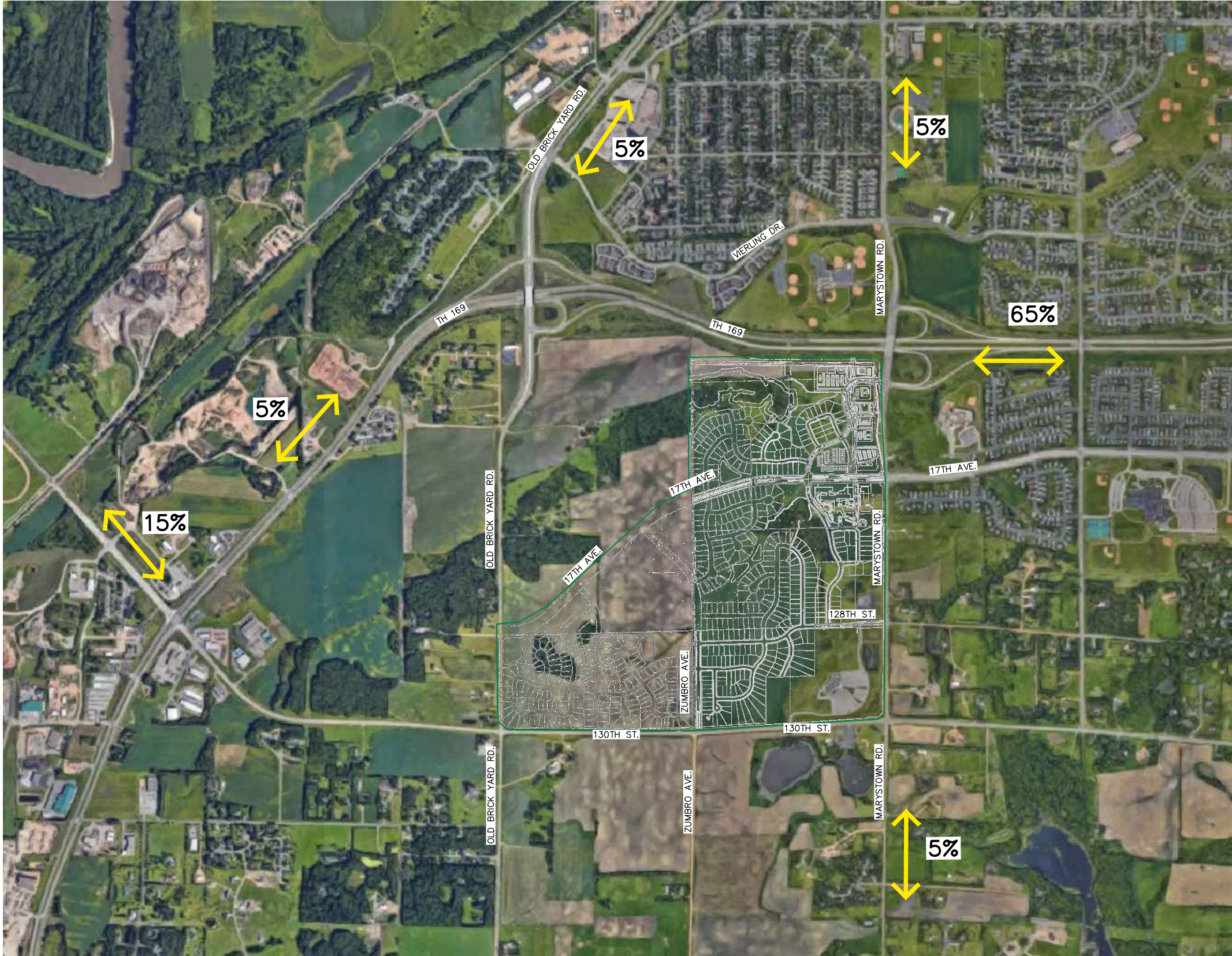
The 2018 Windermere update did incorporate internal capture and pass-by trip reductions. Land uses assumed in the analysis, such as shopping center, pharmacy and gas station/convenience store provide reduction factors for internal capture and pass-by trips, per the ITE Trip Generation Handbook, Third Edition (2017).

FUTURE CONDITIONS

To determine how well the existing and future roadway system will accommodate the proposed development, a.m. and p.m. peak hour operations analyses were conducted for year 2025 build conditions. The geometric layout and traffic control assumed for the 2025 no-build analysis was assumed for all key intersections for the 2025 build analysis. Projected traffic was distributed using the trip distribution pattern from the 2006 report.

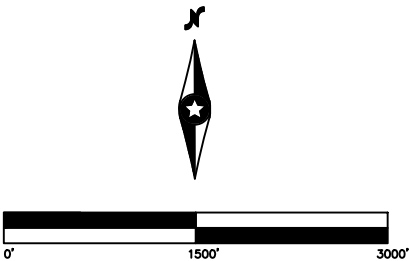
As shown in Table 5, all key intersections will continue to operate at an overall acceptable LOS A during the peak hours with the assumed geometric layout and traffic control. The intersections along Marystown Road at the TH 169 Ramps and at 17th Avenue will have specific lane groups that will operate at LOS-C or LOS-D, but no movements will operate at unacceptable levels (e.g., LOS-E or LOS-F). These lane movements will see increased delay due to the significant increase of traffic that causes queuing on side-street approaches. High traffic volumes on the mainline do not allow for gaps for side-street vehicles.

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DISTRIBUTION DIRECTION
DIRECTIONAL PERCENTAGE



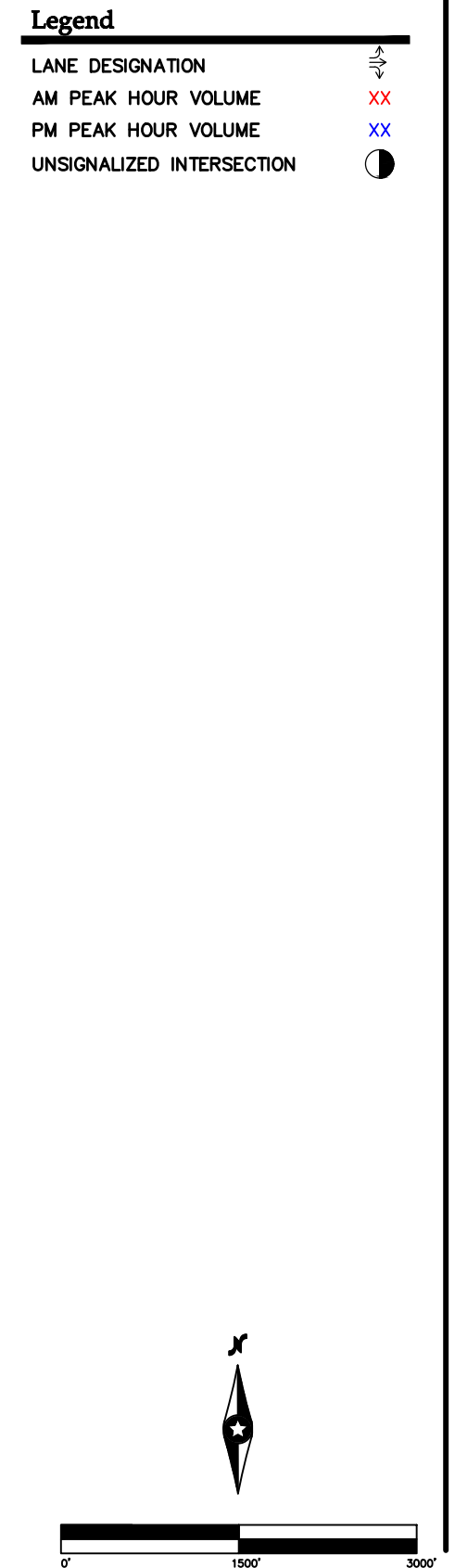
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**DIRECTIONAL
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**WINDERMERE EAW
UPDATE**
Shakopee, MN

**2025 BUILD PEAK
HOUR VOLUMES**
Date: 07/19/2018 Figure:6

Table 5 – 2025 Build Peak Hour Capacity Analysis - Level of Service Results

INTERSECTION	LEVEL OF SERVICE	
	A.M. PEAK	P.M. PEAK
Marystown Road and Vierling Drive*	A/B	A/B
Marystown Road and TH 169 SB Ramps*	A/A	A/C
Marystown Road and TH 169 NB Ramps*	A/B	A/C
Marystown Road and 17th Avenue*	A/A	A/D
Marystown Road and 128th Street*	A/A	A/B
Marystown Road and 130th Street*	A/B	B/C
Zumbro Avenue and 130th Street*	A/A	A/B
Old Brick Yard Road and 130th Street*	A/B	A/C
Old Brick Yard Road and 17 th Avenue*	A/A	A/B
Old Brick Yard Road and TH 169 SB Ramps*	A/A	A/A
Old Brick Yard Road and TH 169 NB Ramps*	A/A	A/B
Zumbro Avenue and 17 th Avenue*	A/A	A/A
Zumbro Avenue and 128 th Street*	A/A	A/A

** Indicates an unsignalized intersection. The overall LOS is shown followed by the worst approach LOS*

Note that in this area, the TH 169 SB Ramps appear to run westbound, and the TH 169 NB Ramps appear to run eastbound.

In order for these intersections to operate at acceptable levels, Traffic conditions should be monitored regularly at these intersections to determine whether warrants will be met for other traffic control improvements.

The recommended 2025 Build Lane Arrangements figure appears in the Appendix. Specifically, the following intersection improvements are recommended:

Marystown Road & TH 169 Southbound Ramps

- As warrants are met, installation of a traffic signal.
- In conjunction with the new traffic signal, the lane geometry for the westbound approach should be reassigned from a shared left-through and right-turn lane to a left-turn lane and shared through-right-turn lane. This allows for through vehicles to cross the intersection without being blocked by yielding left-turn vehicles and also allows for protected-permissive signal phasing

Marystown Road & TH 169 Northbound Ramps

- As warrants are met, installation of a traffic signal. This may occur when traffic from the west side of Marystown establishes its traffic patterns, and as eastbound delay occurs at the intersection.
- In conjunction with a new traffic signal, the side-street approaches should include a left-turn lane and a shared through-right-turn lane.

Marystown Road & 17th Avenue

- Based on high delay experienced by eastbound vehicles, a traffic signal or other traffic control may become warranted at this location.
- It is recommended that the geometrics for the new west leg include a left-turn lane and two through lanes and a right-turn lane. Left-turn lanes should be built for northbound and southbound traffic. For safety reasons, a southbound right-turn lane is recommended due to the high volume and high speed limit on Marystown Road.

Old Brick Yard Road & 17th Avenue

- As warrants are met, installation of a traffic signal.
- The side-street approach should include a left-turn lane and a right-turn lane.

Internal Intersections with 17th Avenue and Zumbro Avenue

- Side street stop recommended.
- As conditions warrant, and/or as traffic volumes equalize from each direction, consider all-way stop control. This, however, decreases effective mobility and increases delay for each approach.

SYSTEM CONTEXT AND ACCESS SPACING

The Scott County 2040 Comprehensive Plan Update (Draft - May 2018) identifies functional classification for various roadways in the Windermere study area:

- TH 169 – Principal Arterial
- Marystown south of TH 160 – A-Minor Arterial
- 130th Street between Marystown and Old Brick Yard Road – Principal Arterial
- Old Brick Yard Road south of TH 169 – A-Minor Arterial
- 17th Avenue between Marystown and Old Brick Yard Road– A-Minor Arterial

Further, the Scott County 2040 Comprehensive Plan Update identifies possible road jurisdiction redesignation of 130th Street from County to MnDOT control sometime in the future.

In addition, the Scott County 2040 Comprehensive Plan Update discusses the ways that the County highway system must adequately service long range mobility needs while balancing the needs for appropriate land use access. To that end Principal Arterials will be designed to serve the highest mobility with no direct land access. Conversely, Local Streets will be designed to serve the lowest mobility while providing unrestricted land access. Arterials and Collector streets will provide a varying range of mobility versus access in between Principal Arterials and Local Streets. To that end, Scott County has proposed draft Minimum Access Spacing Guidelines, as found in the Appendix of this report.

Further, the City of Shakopee had adopted their 2008 Transportation Plan, which provides detailed spacing guidelines for full and partial access from driveways and streets onto City roadways based on functional classification.

CONCLUSIONS AND RECOMMENDATIONS

Based on the analysis, the following conclusions and recommendation are offered for your consideration:

- 1) All key intersections currently operate at an acceptable LOS A during the a.m. and p.m. peak hours with existing geometric layout and traffic control.
- 2) Under 2025 no-build conditions, all key intersections are expected to continue to operate at an acceptable LOS A during the peak hours with the existing and future geometric layout and traffic control.
- 3) Under 2025 build conditions, all key intersections are expected to continue to operate at an overall acceptable LOS A during the peak hours with the geometric layout and traffic control assumed for the 2025 no-build analysis. Some intersections along Marystown (specifically, Marystown Road & TH 169 NB Ramps, Marystown Road/17th Avenue for both peak hours, and Marystown Road/TH 169 North Ramps for the p.m. peak hour) have lane groups that operate at diminished levels of service (LOS-C or LOS-D) due to the significant increase of traffic that causes queuing on side-street approaches. High traffic volumes on the mainline do not allow for gaps for side-street vehicles. In order for these intersections to operate at acceptable levels, changes in traffic control or geometric improvements may be warranted.

- 4) 130th Street may be designated as a Principal Arterial, which would restrict direct access to adjacent land uses in the future.
- 5) 17th Avenue may be designated as an A-Minor Arterial by the County. It will become a heavily traveled internal roadway that feeds the residential area; therefore it is recommended that no homes face this roadway.

Appendix I - Level of Service Methodology

Traffic operations for the peak hour conditions within the study area were analyzed using the industry-standard *Synchro/SimTraffic Version 10* software package, which uses the data and methodology contained in the Highway Capacity Manual, Sixth Edition published by the Transportation Research Board. The software model was calibrated to replicate existing conditions as accurately as possible before being used to assess future conditions.

The operating conditions of transportation facilities, such as traffic signals, stop-controlled intersections and roundabouts, are evaluated based on the relationship of the theoretical capacity of a facility to the actual traffic volumes on that facility. Various factors affect capacity, including travel speed, roadway geometry, grade, number and width of travel lanes, and intersection control. The current standards for evaluating capacity and operating conditions are contained in the Highway Capacity Manual, Sixth Edition (HCM). The procedures describe operating conditions in terms of a Level of Service (LOS). Facilities are given letter designations from A, representing the best operating conditions, to F, representing the worst. Generally, Level of Service D (LOS-D) represents the threshold for acceptable overall intersection operating conditions during a peak hour.

At intersections, Levels of Service are assigned differently for signalized or unsignalized intersections (which include Two-Way Stop Control [TWSC], All-way Stop Control [AWSC] and roundabouts). For signalized intersections, Level of Service is calculated by taking the total Intersection Delay and converting it to a letter grade as shown in the right side of Table A-1. For an unsignalized intersection, Level of Service is calculated by taking the Intersection Delay and converting it to a letter grade, as shown in the left side of Table A-1. While similar, the signalized control delay totals are higher than that of unsignalized intersections. In any condition, when the LOS by Volume to Capacity Ratio exceeds 1.0, the LOS is always F.

Under the HCM, common movements are included into lane groups. Control Delay is then determined for each lane group and Levels of Service are based on this Control Delay. For each lane group, Control Delay is quantified by number of seconds. Control Delay is defined as the difference between the travel time that would have occurred in the absence of the intersection control, and the travel time that results because of the presence of the intersection control. Levels of Service are then based on the control delay per vehicle.

Table A-1 - Level of Service vs. Control Delay - Signalized and Unsignalized Intersections (TWSC, AWSC & Roundabouts)

<u>TWSC, AWSC & Roundabouts</u>		<u>Signalized Intersections</u>	
LOS by Volume to Capacity Ratio (≤ 1)*	Control Delay per Vehicle (Seconds)	LOS by Volume to Capacity Ratio (≤ 1)*	Control Delay per Vehicle (Seconds)
A	≤ 10	A	≤ 10
B	>10 and ≤ 15	B	>10 and ≤ 20
C	>15 and ≤ 25	C	>20 and ≤ 35
D	>25 and ≤ 35	D	>35 and ≤ 55
E	>35 and ≤ 50	E	>55 and ≤ 80
F	>50	F	>80

Per the 2010 Highway Capacity Manual, published by the Transportation Research Board.

* NOTE: When LOS by Volume to Capacity Ratio >1.00 , LOS is F.

The acceptable Level of Service threshold for a particular movement at an intersection depends on both the priority assigned to that movement and its traffic volume. In general, the higher the priority and the higher the traffic volume, the more stringent the acceptable threshold will be. For example, the acceptable threshold for a high-priority/high-volume rural movement might be C, while LOS F on a low-priority/low-volume urban movement might be appropriate.

For two-way stop-controlled intersections, a key measure of operational effectiveness is the side street LOS. Since the mainline does not have to stop, the majority of delay is attributed to the side-street/minor approaches. Long delays and poor LOS can sometimes result on the side street, even if the overall intersection is functioning well, making it a valuable design criterion. As the side-street/minor approach delay approaches and exceeds 60 seconds per vehicle, drivers may divert to another route or become impatient and accept gaps in the mainline traffic that are less than acceptable/safe gaps resulting in the potential for traffic safety concerns. Therefore, depending on priority and traffic volume, acceptable side-street LOS can range from D to F. Side streets can operate at LOS F without the intersection warranting a change in traffic control.

A final fundamental component of operational analyses is a study of vehicular queuing, as defined the line of vehicles waiting to pass through an intersection. An intersection can operate with an acceptable Level of Service, but if queues from the

intersection extend back to block entrances to turn lanes or accesses to adjacent land uses, unsafe operating conditions could result.

In reporting Levels of Service, the information from the signalized intersection analysis comes directly from the Synchro 10 and SimTraffic 10 reports. Intersection Levels of Service are reported based on the Control Delay calculated for the overall intersection and for each critical movement as determined by SimTraffic 10, and as adjusted for driver behavior.

For queuing, the 95th Percentile and the Maximum Queue Lengths that are generated after five runs. In this report, the 95th Percentile Queue Length is used to discern adequate lengths of turn lanes. The 95th Percentile Queue Length refers to that length of queue that has only a five-percent probability of being exceeded during an analysis period. This is the standard factor used to determine optimal turn lane lengths.

APPENDIX II – Scott County Minimum Access Spacing Guidelines 2040 Plan

MINIMUM ACCESS SPACING GUIDELINES 2040 PLAN

TYPE OF ACCESS BEING REQUESTED	TYPE OF COUNTY HIGHWAY FUNCTION AFFECTED BY ACCESS			
	PRINCIPAL ARTERIAL	Minor Arterial A and B Minor	Collector	Local
A. Private Residential (3 or less shared driveways)	Not Permitted	Not Permitted 1/4 mile in Agricultural & Transition Area	1/8 Mile	Determination based on other criteria
B. Commercial Driveways, Or Private Streets	Not Permitted	Not Permitted	Full access at 1/4 Mile Limited access at 1/8 Mile	Determination based on other criteria
C. Local Streets	Not Permitted	Full access at 1/4 Mile Limited access at 1/8 Mile	1/8 Mile	1/8 Mile
D. Collector Streets	1 Mile Full Access (rural) Limited access at 1/2 Mile (urban)	Full access at 1/4 Mile Limited access at 1/8 Mile	1/4 Mile	1/4 Mile
E. Minor Arterial	1 Mile full Access (urban) 1 Mile Full (rural)	1/2 to 1 Mile (urban) 1/2 Mile to 1 Mile (rural)	1/4 to 1 Mile (urban) 1/2 to 1 Mile (rural)	1/4 to 1 Mile (urban) 1/2 to 1 Mile (rural)

Notes:

1. The Functional Classification is based on the Future Functional Classification Map in the 2040 Transportation Plan.
2. Fully developed urban area will require individual evaluation on a case by case basis.
3. When there is opportunity for private or public access on more than one public roadway, access shall be taken on lower functional roadway.
4. Turn lanes shall be required at all public road access locations on County or State roads, turn lanes at private access will be evaluated on a case by case basis.
5. Intersection Control/Signals shall be installed only where warranted and justified, consistent with the MNMUTCD and County practice. 1 mile signal spacing on Principals and 1/2 mile signal spacing will be preserved on other roadways.
6. Access spacing may be modified to be more or less restrictive per County corridor study.
7. Private access shall be located where there is the optimum sight distance, future local street locations, or future shared access opportunities.
8. Environmental constraints, geometric constraints, or sight distance requirements may be considered when determining access spacing location.
9. No access permitted between interchange ramps and first full access location.
10. Existing private access on Principal Arterials in the unincorporated area may be relocated at time of platting or land use change provided sight distance is improved and opportunities for access consolidation do not exist. Future removal of the access must be planned.
11. Only one access per parcel permitted including shared access, where in determination by the County the property has no other local access.
12. Field access may be permitted where, in the determination of the County, the property has no other local road access. One field access to a property under the same ownership or controlling interest may be granted. A field access is defined as restricted use by agricultural equipment only to access a field and does not lead to a rock or paved surface on the private property.
13. Limited Access is not a full movement access.
14. Minimum Access Spacing Guidelines for subdivisions in the unincorporated area is established in the County Subdivision Ordinance.
15. Minimum public street length to be permitted as a public street shall be 500 feet.

(Source: *Scott County 2040 Comprehensive Plan, Public Hearing Draft, April 2018*)

APPENDIX III – Access Spacing Guidelines – City of Shakopee Roadways

Type Of Access	Minor Arterial	Major Collector	Minor Collector	Local Feeders	Local
Residential Driveways	No Direct Access	No Direct Access	No Direct Access	As Required	As Required
Commercial Driveways	Based on: Speed, Traffic Volume, Sight Distances, etc. (1/8 to 1/4 mile)	Based on: Speed, Traffic Volume, Sight Distances, etc. (min. 500 ft.)	Based on: Speed, Traffic Volume, Sight Distances, etc. (min. 200 ft.)	Based on: Speed, Traffic Volume, Sight Distances, etc. (min. 100 ft.)	Based on: Speed, Traffic Volume, Sight Distances, etc. (min. 100 ft.)
Low Volume Streets	Full Access – 1/8 mile	Full Access – 1/8 mile	Full Access – 1/8 mile	Full Access – 330 ft.	Full Access – 330 ft.
	Partial Access – 330 ft.	Partial Access – 330 ft.	Partial Access – 330 ft.	Partial Access – 330 ft.	Partial Access – 330 ft.
High Volume Streets < 10,000 ADT	Full Access – 1/4 mile	Full Access – 1/4 mile	Full Access – 1/8 mile	Full Access – 330 ft.	Full Access – 330 ft.
	Partial Access – 1/8 mile	Partial Access – 1/8 mile	Partial Access – 330 ft.	Partial Access – 330 ft.	Partial Access – 330 ft.
Collector Streets	Full Access – 1/2 mile	Full Access – 1/4 mile	Full access – 1/4 mile	Full Access – 1/8 mile	Full Access – 1/8 mile
	Partial Access – 1/4 mile	Partial Access – 1/8 mile	Partial Access – 1/8 mile	Partial Access – 330 ft.	Partial Access – 330 ft.

PLEASE NOTE: The spacing guidelines identified in this table may be adjusted on a case-specific basis pending detailed traffic engineering analysis and review by the City Engineer. The Scott County Transportation Plan identifies access spacing guidelines for County-level roadways which serve Shakopee and the rest of the County.

(Source: Shakopee Transportation Plan, December 2008)

Appendix IV – SimTraffic Operational and Performance Output

(NOTE: TH 169 EB Ramps actually refer to TH 169 NB Ramps; TH 169 WB Ramps actually refer to TH 169 SB Ramps)

Intersection	Lane Assignment	Intersection Traffic Control	2018 EXISTING CONDITIONS							
			AM PEAK				PM PEAK			
			Intersection Delay and LOS	Level of Service	Approach Delay (sec)	95th %ile Queue (ft)	Intersection Delay and LOS	Level of Service	Approach Delay (sec)	95th %ile Queue (ft)
Marystown Rd. & Vierling Dr.	EB Left	N	7.7 sec/veh = LOS A	A	5.3	43	7.8 sec/veh = LOS A	A	5.3	51
	EB Thru			A	6.3	47		A	6.8	51
	EB Right			A	3.0	47		A	3.1	51
	WB Left			A	5.2	47		A	5.3	49
	WB Thru			A	6.4	47		A	7.0	49
	WB Right			A	2.9	39		A	2.9	44
	NB Left			A	5.0	56		A	5.1	56
	NB Thru			B	10.9	56		B	10.5	64
	NB Right			A	2.4	55		A	4.2	64
	SB Left			A	5.7	57		A	7.6	68
	SB Thru			B	11.2	57		B	12.2	68
	SB Right			A	1.6	34		A	1.4	49
Marystown Rd. & Park/US 169 SB	WB Left	N	1.2 sec/veh = LOS A	-			2.6 sec/veh = LOS A	A	6.8	58
	WB Right			-				A	3.0	71
	NB Left			-				A	2.6	10
	NB Thru			A	0.4			A	0.5	
	NB Right			A	0.4			A	0.1	
	SB Left			A	3.7	12		A	4.4	18
	SB Thru			A	1.6			A	2.0	
	SB Right			-				-		
Marystown Rd. & US 169 NB	WB Left	N	1.6 sec/veh = LOS A	A	9.4	36	1.4 sec/veh = LOS A	A	7.1	32
	WB Right			A	2.2	30		A	2.4	39
	NB Thru			A	0.3			A	0.2	
	NB Right			A	0.6	13		A	0.1	14
	SB Left			A	4.2	67		A	3.5	52
	SB Thru			A	0.3			A	0.6	
	SB Right			-				-		
Marystown Rd. & 17th Ave	WB Left	N	2.6 sec/veh = LOS A	A	6.3	24	1.7 sec/veh = LOS A	A	4.7	29
	WB Right			A	4.0	47		A	2.6	30
	NB Thru			A	1.5			A	1.0	
	NB Right			A	1.1			A	0.7	5
	SB Left			A	3.0	50		A	2.6	37
	SB Thru			A	0.3			A	0.3	
Marystown Rd. & 128th St.	EB Left	N	1.6 sec/veh = LOS A	A	4.4	8	1.5 sec/veh = LOS A	A	4.4	33
	EB Right			-				A	1.9	7
	WB Left			A	4.2	36		-		
	WB Right			A	2.4	36		A	3.8	17
	NB Left			A	6.3	7		-		
	NB Thru			A	1.8	7		A	1.5	
	NB Right			A	2.6	7		A	1.1	
	SB Left			-				A	3.0	15
	SB Thru			A	0.5			A	1.1	15
	SB Right			A	1.1			A	0.9	

Marystown Rd. & 130th St.	EB Left	N	7.7 sec/veh = LOS A	A	5.1	53	8.2 sec/veh = LOS A	A	6.3	60
	EB Thru			B	10.1	53		B	11.1	60
	EB Right			A	3.9	53		A	3.8	60
	WB Left			A	6.5	53		A	5.1	59
	WB Thru			B	10.7	53		B	10.6	59
	WB Right			A	3.1	53		A	3.4	59
	NB Left			A	0.8	69		A	5.9	51
	NB Thru			A	7.4	69		A	6.6	51
	NB Right			A	3.7	69		A	3.3	51
	SB Left			A	4.6	51		A	6.6	80
	SB Thru			A	6.8	51		A	7.9	80
	SB Right			A	3.1	51		A	4.5	80
Zumbro Ave. & 130th St.	EB Thru	N	3.7 sec/veh = LOS A	A	0.7		3.3 sec/veh = LOS A	A	0.8	
	EB Right			A	0.3			A	0.1	
	WB Left			-				A	4.4	8
	WB Thru			A	6.2			A	5.7	8
	NB Right			A	1.2	10		-		
Old Brick Yard Rd. & 130th St.	EB Left	N	2.8 sec/veh = LOS A	A	2.2	14	3.2 sec/veh = LOS A	A	1.8	10
	EB Thru			A	0.2			A	0.6	
	EB Right			A	0.1			A	0.2	
	WB Left			A	2.2	13		A	3.6	16
	WB Thru			A	1.2			A	1.3	
	WB Right			A	0.7			A	0.1	
	NB Left			A	4.4	56		A	4.4	40
	NB Thru			B	10.6	56		A	8.4	40
	NB Right			A	4.2	56		A	2.6	40
	SB Left			A	5.5	33		A	7.2	57
	SB Thru			A	8.6	33		A	9.4	57
	SB Right			A	1.5	33		A	4.7	57
Old Brick Yard Rd. & US 169 NB Ramp	WB Left	N	2.9 sec/veh = LOS A	-			1.3 sec/veh = LOS A	A	4.4	9
	WB Right			A	4.2	69		A	3.0	49
	NB Thru			A	0.5			A	0.3	
	NB Right			A	0.0			A	0.0	
	SB Left			A	1.2	20		A	1.0	8
	SB Thru			A	0.2			A	0.3	
	SB Right			-				-		
Old Brick Yard Rd. & US 169 SB Ramp	WB Left	N	1.2 sec/veh = LOS A	A	6.5	34	1.6 sec/veh = LOS A	A	5.5	42
	WB Right			A	4.0	53		A	3.2	45
	NB Left			A	1.1	8		A	2.1	17
	NB Thru			A	0.7			A	0.5	
	SB Thru			A	0.2			A	0.6	
	SB Right			A	0.7			A	1.9	2

Intersection	Lane Assignment	Intersection Traffic Control	2025 NO BUILD CONDITIONS							
			AM PEAK				PM PEAK			
			Intersection Delay and LOS	Level of Service	Approach Delay (sec)	95th %ile Queue (ft)	Intersection Delay and LOS	Level of Service	Approach Delay (sec)	95th %ile Queue (ft)
Marystown Rd. & Vierling Dr.	EB Left	N	7.9 sec/veh = LOS A	A	4.6	42	8.6 sec/veh = LOS A	A	5.4	39
	EB Thru			A	6.9	54		A	7.4	50
	EB Right			A	3.1	54		A	3.1	50
	WB Left			A	5.9	55		A	6.1	52
	WB Thru			A	8.2	55		A	7.4	52
	WB Right			A	3.0	36		A	2.9	50
	NB Left			A	4.9	55		A	6.5	56
	NB Thru			B	10.6	61		B	11.3	61
	NB Right			A	3.2	61		A	4.7	61
	SB Left			A	6.5	64		A	8.2	72
	SB Thru			B	11.4	64		B	12.6	72
	SB Right			A	1.4	25		A	1.1	49
Marystown Rd. & Park/US 169 SB	WB Left	N	1.9 sec/veh = LOS A	A	6.9	52	3.1 sec/veh = LOS A	A	9.1	74
	WB Right			A	2.7	60		A	3.7	91
	NB Thru			A	0.4			A	0.4	
	NB Right			A	0.3			A	0.4	
	SB Left			A	3.9	19		A	4.3	17
	SB Thru			A	1.6			A	2.2	
	SB Right			-				-		
Marystown Rd. & US 169 NB	WB Left	N	2.3 sec/veh = LOS A	B	13.8	43	1.4 sec/veh = LOS A	A	9.6	35
	WB Right			A	2.4	43		A	2.5	35
	NB Thru			A	0.3			A	0.2	
	NB Right			A	0.7	24		A	0.2	
	SB Left			A	5.7	73		A	3.5	52
	SB Thru			A	0.4			A	0.6	
	SB Right			-				-		
Marystown Rd. & 17th Ave	WB Left	N	3 sec/veh = LOS A	B	10.8	27	2.2 sec/veh = LOS A	A	8.2	43
	WB Right			A	4.2	51		A	2.3	18
	NB Thru			A	1.0			A	1.0	
	NB Right			A	1.1			A	1.4	
	SB Left			A	3.9	71		A	2.9	51
	SB Thru			A	0.2			A	0.3	
Marystown Rd. & 128th St.	EB Left	N	1.7 sec/veh = LOS A	-			0.8 sec/veh = LOS A	A	6.7	25
	EB Right			-				A	2.8	14
	WB Left			A	4.5	36		A	6.2	31
	WB Thru			-		36		A	5.2	31
	WB Right			A	3.0	36		A	2.3	31
	NB Left			A	3.7	7		-		
	NB Thru			A	1.8	7		A	1.7	
	NB Right			A	0.7	7		A	2.9	
	SB Left			A	2.0			A	3.1	21
	SB Thru			A	0.8			A	1.5	21
	SB Right			A	1.0			A	0.4	

Marystown Rd. & 130th St.	EB Left	N	8 sec/veh = LOS A	A	4.5	56	9.4 sec/veh = LOS A	A	7.0	78
	EB Thru			B	10.7	56		B	12.2	78
	EB Right			A	3.3	56		A	4.8	78
	WB Left			A	5.3	64		A	7.5	63
	WB Thru			B	10.8	64		B	12.3	63
	WB Right			A	4.1	64		A	3.9	63
	NB Left			A	5.8	63		A	6.3	67
	NB Thru			A	7.1	63		A	7.6	67
	NB Right			A	3.8	63		A	4.4	67
	SB Left			A	5.7	49		A	8.2	97
	SB Thru			A	6.7	49		A	9.9	97
	SB Right			A	3.9	49		A	5.9	97
Zumbro Ave. & 130th St.	EB Thru	N	3.7 sec/veh = LOS A	A	0.6		3.2 sec/veh = LOS A	A	0.8	
	EB Right			A	0.2			A	0.3	
	WB Left			-				A	4.5	8
	WB Thru			A	6.3			A	5.7	8
	NB Right			A	2.1			-		
Old Brick Yard Rd. & 130th St.	EB Left	N	3 sec/veh = LOS A	A	2.0	14	sec/veh = LOS A	A	2.0	10
	EB Thru			A	0.2			A	0.4	
	EB Right			A	0.1			A	0.4	
	WB Left			A	2.9	15		A	3.0	17
	WB Thru			A	1.0			A	1.4	
	WB Right			A	1.1			A	3.1	
	NB Left			A	5.2	68		A	6.7	52
	NB Thru			B	11.3	68		B	10.3	52
	NB Right			A	4.4	68		A	3.0	52
	SB Left			A	8.7	36		A	5.4	58
	SB Thru			A	8.3	36		A	9.8	58
	SB Right			A	1.5	36		A	1.6	58
Old Brick Yard Rd. & US 169 NB Ramp	WB Left	N	3.4 sec/veh = LOS A	-			1.4 sec/veh = LOS A	A	7.2	19
	WB Right			A	4.9	83		A	2.9	45
	NB Thru			A	0.3			A	0.4	
	NB Right			A	0.2			A	0.1	
	SB Left			A	1.1	23		A	1.3	28
	SB Thru			A	0.1			A	0.3	
Old Brick Yard Rd. & US 169 SB Ramp	EB Left	N	1.2 sec/veh = LOS A	-			1.7 sec/veh = LOS A	-		
	WB Left			A	6.5	40		A	5.2	43
	WB Right			A	7.2	58		A	3.1	40
	NB Left			A	0.4			A	6.0	28
	NB Thru			A	0.7			A	0.5	
	SB Thru			A	0.1			A	0.7	
	SB Right			A	0.9			A	2.0	3

Intersection	Lane Assignment	Intersection Traffic Control	2025 BUILD CONDITIONS							
			AM PEAK				PM PEAK			
			Intersection Delay and LOS	Level of Service	Approach Delay (sec)	95th %ile Queue (ft)	Intersection Delay and LOS	Level of Service	Approach Delay (sec)	95th %ile Queue (ft)
Marystown Rd. & Vierling Dr.	EB Left	N	7.5 sec/veh = LOS A	A	5.1	40	8.4 sec/veh = LOS A	A	5.7	45
	EB Thru			A	7.3	47		A	7.4	56
	EB Right			A	3.4	47		A	3.5	56
	WB Left			A	5.3	47		A	7.0	65
	WB Thru			A	7.5	47		A	9.1	65
	WB Right			A	2.6	36		A	3.0	38
	NB Left			A	5.6	50		A	7.0	67
	NB Thru			B	10.4	56		A	9.3	75
	NB Right			A	2.4	56		A	4.5	75
	SB Left			A	5.2	51		A	8.3	76
	SB Thru			B	11.2	51		B	13.0	76
	SB Right			A	1.3	38		A	2.0	54
Marystown Rd. & Park/US 169 SB	WB Left	N	1 sec/veh = LOS A	-			4.9 sec/veh = LOS A	C	19.4	129
	WB Right			-				A	3.4	79
	NB Left			-				A	2.8	
	NB Thru			A	0.3			A	0.5	
	NB Right			A	0.4			A	0.6	
	SB Left			A	3.0	15		A	6.1	32
	SB Thru			A	1.4			A	1.9	
	SB Right			-				-		
Marystown Rd. & US 169 NB	WB Left	N	2.1 sec/veh = LOS A	B	10.8	41	3.5 sec/veh = LOS A	C	24.2	109
	WB Right			A	2.4	40		A	2.9	34
	NB Thru			A	0.2			A	0.2	
	NB Right			A	0.6	8		A	0.4	22
	SB Left			A	4.8	62		A	5.3	68
	SB Thru			A	0.4			A	0.8	
	SB Right			-				-		
Marystown Rd. & 17th Ave	EB Left	N	2.2 sec/veh = LOS A	-			6.8 sec/veh = LOS A	D	33.1	121
	EB Thru			A	0.0			B	12.8	31
	EB Right			-				A	5.6	34
	WB Left			A	8.2	28		C	22.4	57
	WB Thru			-				C	22.7	30
	WB Right			A	3.1	28		A	6.7	60
	NB Left			-				A	5.8	46
	NB Thru			A	0.9			A	1.7	
	NB Right			A	1.1			A	1.3	
	SB Left			A	3.3	54		A	3.4	53
	SB Thru			A	0.3			A	0.7	5
	SB Right			-				A	0.5	5
Marystown Rd. & 128th St.	EB Left	N	1.6 sec/veh = LOS A	-			3 sec/veh = LOS A	A	9.5	52
	EB Thru			A	0.1			-		52
	EB Right			-				A	3.7	39
	WB Left			A	4.9	36		-		22
	WB Thru			A	3.0	36		B	11.0	22
	WB Right			A	3.0	36		A	2.8	22
	NB Left			A	4.3			A	5.4	43
	NB Thru			A	1.7			A	2.2	43
	NB Right			A	2.4			A	2.2	43
	SB Left			-				A	3.4	26
	SB Thru			A	0.8			A	1.9	26
	SB Right			A	0.2			A	1.9	7

Marystown Rd. & 130th St.	EB Left	N	8sec/veh = LOS A	A	4.0	64	13.2 sec/veh = LOS B	B	12.1	116
	EB Thru			B	10.5	64		C	17.7	116
	EB Right			A	2.2	64		A	9.9	116
	WB Left			A	9.6	62		B	12.6	111
	WB Thru			B	10.8	62		C	16.8	111
	WB Right			A	4.7	62		A	9.6	111
	NB Left			A	5.5	56		A	8.4	81
	NB Thru			A	7.0	56		B	10.5	81
	NB Right			A	3.6	56		A	7.0	81
	SB Left			A	5.2	57		B	11.5	118
	SB Thru			A	6.8	57		B	12.0	118
	SB Right			A	4.2	57		A	7.7	118
Zumbro Ave. & 130th St.	EB Left	N	3.2 sec/veh = LOS A	-			5.9 sec/veh = LOS A	A	3.5	68
	EB Thru			A	0.6			A	4.2	68
	EB Right			A	0.4			A	1.1	68
	WB Left			-				B	12.6	22
	WB Thru			A	6.3			A	7.0	22
	WB Right			-				A	5.5	22
	NB Right			A	2.7	30		-		
	SB Left			-				B	11.9	69
	SB Thru			A	0.6			-		69
	SB Right			-				A	6.1	69
Old Brick Yard Rd. & 130th St.	EB Left	N	2.7 sec/veh = LOS A	A	2.2	9	6.4 sec/veh = LOS A	A	2.9	49
	EB Thru			A	0.2			A	0.8	12
	EB Right			A	0.2			A	0.5	12
	WB Left			A	1.9			A	4.7	29
	WB Thru			A	0.8			A	1.7	10
	WB Right			A	0.3			A	1.6	10
	NB Left			A	5.6	49		A	9.1	89
	NB Thru			B	10.6	49		C	15.9	89
	NB Right			A	3.5	49		A	8.2	89
	SB Left			A	3.0	35		C	15.4	106
	SB Thru			A	8.5	35		C	17.5	106
	SB Right			A	0.9	35		B	10.3	106
Old Brick Yard Rd. & 17th Ave.	WB Left	N	2.4 sec/veh = LOS A	-			4.5 sec/veh = LOS A	B	10.9	73
	WB Thru			A	0.3			-		
	WB Right			-				A	4.0	64
	NB Thru			A	4.3			A	5.8	
	NB Right			-				A	3.0	
	SB Left			-				A	3.4	69
	SB Thru			A	0.0			A	4.8	69
Old Brick Yard Rd. & US 169 NB Ramp	EB Left	N	3.2 sec/veh = LOS A	-			3.4 sec/veh = LOS A	-		
	WB Left			-				B	12.1	95
	WB Right			A	4.6	71		A	3.2	49
	NB Thru			A	0.3			A	0.6	
	NB Right			A	0.1			A	0.3	11
	SB Left			A	1.1	21		A	2.9	46
	SB Thru			A	0.3			A	1.2	
	SB Right			-				-		

Old Brick Yard Rd. & US 169 SB Ramp	WB Left	N	1.3 sec/veh = LOS A	A	8.2	30	2.9 sec/veh = LOS A	A	9.4	84
	WB Thru			A	9.1	30		-		84
	WB Right			A	4.0	51		A	3.1	42
	NB Left			A	0.4			A	2.7	20
	NB Thru			A	0.7			A	0.7	
	NB Right			-				A	0.5	
	SB Thru			A	0.1			A	1.2	
	SB Right			A	0.9			A	1.9	8
Zumbro Ave. & 17th Ave.	EB Thru	N	1.1 sec/veh = LOS A	A	0.0		0.8 sec/veh = LOS A	A	0.5	
	EB Right			A	0.0			A	1.0	
	WB Left			A	3.2	10		A	3.0	
	WB Thru			A	0.0	10		A	0.9	
	NB Left			A	4.5	44		A	4.5	47
Zumbro Ave. & 128th Street	EB Left	N	3.1 sec/veh = LOS A	-			0.9 sec/veh = LOS A	-		
	WB Left			A	4.5	49		A	5.3	50
	WB Thru			-				A	0.6	
	WB Right			A	2.7	49		A	3.0	50
	NB Thru			-				A	0.3	
	NB Right			A	0.0			A	0.3	
	SB Left			A	2.0			A	2.1	
	SB Thru			A	0.1			A	0.2	
	SB Right			-				-		

1: Marystown Road & Vierling Dr. Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	0.1	0.1	0.2	0.2	0.1	0.1	0.0	0.0	0.0	0.3	0.1	0.1
Total Del/Veh (s)	4.6	6.9	3.1	5.9	8.2	3.0	4.9	10.6	3.2	6.5	11.4	1.4

1: Marystown Road & Vierling Dr. Performance by movement

Movement	All
Denied Del/Veh (s)	0.1
Total Del/Veh (s)	7.9

2: Marystown Road & Park/US 169 W Performance by movement

Movement	WBL	WBR	NBT	NBR	SBL	SBT	All
Denied Del/Veh (s)	0.1	0.1	0.0	0.0	0.0	0.0	0.0
Total Del/Veh (s)	6.9	2.7	0.4	0.3	3.9	1.6	1.9

3: Marystown Road & US 169 E Performance by movement

Movement	WBL	WBR	NBT	NBR	SBL	SBT	All
Denied Del/Veh (s)	0.1	0.1	0.0	0.0	0.0	0.0	0.0
Total Del/Veh (s)	13.8	2.4	0.3	0.7	5.7	0.4	2.3

4: Marystown Road & Street A/17th Ave E Performance by movement

Movement	WBL	WBR	NBT	NBR	SBL	SBT	All
Denied Del/Veh (s)	4.0	0.2	0.0	0.0	0.0	0.0	0.2
Total Del/Veh (s)	10.8	4.2	1.0	1.1	3.9	0.2	3.0

5: Marystown Road & 128th Street W Performance by movement

Movement	WBL	WBR	NBL	NBT	NBR	SBL	SBT	SBR	All
Denied Del/Veh (s)	0.1	0.1	0.0	0.0	0.3	0.0	0.0	0.0	0.0
Total Del/Veh (s)	4.5	3.0	3.7	1.8	0.7	2.0	0.8	1.0	1.7

6: Marystown Road & 130th St. Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	0.0	0.0	0.0	0.1	0.2	0.3	0.1	0.2	0.2	0.0	0.0	0.1
Total Del/Veh (s)	4.5	10.7	3.3	5.3	10.8	4.1	5.8	7.1	3.8	5.7	6.7	3.9

6: Marystown Road & 130th St. Performance by movement

Movement	All
Denied Del/Veh (s)	0.1
Total Del/Veh (s)	8.0

7: Zumbro Ave. & 130th St. Performance by movement

Movement	EBT	EBR	WBT	NBR	All
Denied Del/Veh (s)	0.0	0.0	0.0	0.1	0.0
Total Del/Veh (s)	0.6	0.2	6.3	2.1	3.7

8: Old Brick Yard Rd. & 130th St. Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	4.0	0.2	0.4	0.0	0.0	0.0	0.1	0.1	0.1	0.0	0.0	0.0
Total Del/Veh (s)	2.0	0.2	0.1	2.9	1.0	1.1	5.2	11.3	4.4	8.7	8.3	1.5

8: Old Brick Yard Rd. & 130th St. Performance by movement

Movement	All
Denied Del/Veh (s)	0.2
Total Del/Veh (s)	3.0

10: Old Brick Yard Rd. & 169 NB Ramp Performance by movement

Movement	WBR	NBT	NBR	SBL	SBT	All
Denied Del/Veh (s)	0.3	0.0	0.5	0.0	0.0	0.2
Total Del/Veh (s)	4.9	0.3	0.2	1.1	0.1	3.4

11: Old Brick Yard Rd. & 169 SB Ramp Performance by movement

Movement	WBL	WBR	NBL	NBT	SBT	SBR	All
Denied Del/Veh (s)	0.1	0.1	0.0	0.0	0.2	3.8	0.5
Total Del/Veh (s)	6.4	4.2	0.4	0.7	0.1	0.9	1.2

25: US 169 E Performance by movement

Movement	EBT	All
Denied Del/Veh (s)	0.0	0.0
Total Del/Veh (s)	0.4	0.4

27: US 169 W Performance by movement

Movement	EBT	All
Denied Del/Veh (s)	0.0	0.0
Total Del/Veh (s)	0.2	0.2

Total Network Performance

Movement	All
Denied Del/Veh (s)	0.4
Total Del/Veh (s)	11.1

Intersection: 1: Marystown Road & Vierling Dr.

Movement	EB	EB	WB	WB	NB	NB	SB	SB
Directions Served	LT	TR	LT	TR	LT	TR	LT	TR
Maximum Queue (ft)	29	77	72	46	66	74	76	30
Average Queue (ft)	23	33	34	14	36	39	40	6
95th Queue (ft)	42	54	55	36	55	61	64	25
Link Distance (ft)	845	845	561	561	1036	1036	519	519
Upstream Blk Time (%)								
Queuing Penalty (veh)								
Storage Bay Dist (ft)								
Storage Blk Time (%)								
Queuing Penalty (veh)								

Intersection: 2: Marystown Road & Park/US 169 W

Movement	WB	WB	SB
Directions Served	LT	R	L
Maximum Queue (ft)	87	77	22
Average Queue (ft)	27	29	5
95th Queue (ft)	52	60	19
Link Distance (ft)			
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)		180	165
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 3: Marystown Road & US 169 E

Movement	WB	WB	NB	SB
Directions Served	L	R	R	L
Maximum Queue (ft)	47	69	22	94
Average Queue (ft)	19	20	7	43
95th Queue (ft)	43	43	24	73
Link Distance (ft)				
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)			250	370
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 4: Marystown Road & Street A/17th Ave E

Movement	WB	WB	SB
Directions Served	L	R	L
Maximum Queue (ft)	41	55	86
Average Queue (ft)	9	28	28
95th Queue (ft)	27	51	71
Link Distance (ft)	1186		
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)	400		200
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 5: Marystown Road & 128th Street W

Movement	WB	NB
Directions Served	LTR	LTR
Maximum Queue (ft)	31	20
Average Queue (ft)	12	1
95th Queue (ft)	36	7
Link Distance (ft)	448	1204
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 6: Marystown Road & 130th St.

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LTR	LTR
Maximum Queue (ft)	67	71	78	55
Average Queue (ft)	37	43	40	34
95th Queue (ft)	56	64	63	49
Link Distance (ft)	2420	708	682	1204
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 7: Zumbro Ave. & 130th St.

Movement	NB
Directions Served	LR
Maximum Queue (ft)	28
Average Queue (ft)	1
95th Queue (ft)	9
Link Distance (ft)	1361
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 8: Old Brick Yard Rd. & 130th St.

Movement	EB	WB	NB	SB
Directions Served	L	L	LTR	LTR
Maximum Queue (ft)	30	24	96	28
Average Queue (ft)	2	3	38	18
95th Queue (ft)	14	15	68	36
Link Distance (ft)			1159	3184
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)	300	300		
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 10: Old Brick Yard Rd. & 169 NB Ramp

Movement	WB	SB
Directions Served	R	L
Maximum Queue (ft)	112	26
Average Queue (ft)	55	5
95th Queue (ft)	83	23
Link Distance (ft)	730	
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		300
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 11: Old Brick Yard Rd. & 169 SB Ramp

Movement	WB	WB
Directions Served	LT	R
Maximum Queue (ft)	30	76
Average Queue (ft)	15	36
95th Queue (ft)	40	58
Link Distance (ft)	639	639
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 25: US 169 E

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Intersection: 27: US 169 W

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Network Summary

Network wide Queuing Penalty: 0

1: Marystown Road & Vierling Dr. Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	0.2	0.1	0.1	0.2	0.1	0.1	0.0	0.0	0.0	0.2	0.1	0.1
Total Del/Veh (s)	5.4	7.4	3.1	6.1	7.4	2.9	6.5	11.3	4.7	8.2	12.6	1.1

1: Marystown Road & Vierling Dr. Performance by movement

Movement	All
Denied Del/Veh (s)	0.1
Total Del/Veh (s)	8.6

2: Marystown Road & Park/US 169 W Performance by movement

Movement	WBL	WBR	NBT	NBR	SBL	SBT	All
Denied Del/Veh (s)	0.1	0.3	0.0	0.0	0.0	0.0	0.1
Total Del/Veh (s)	9.1	3.7	0.4	0.4	4.3	2.2	3.1

3: Marystown Road & US 169 E Performance by movement

Movement	WBL	WBR	NBT	NBR	SBL	SBT	All
Denied Del/Veh (s)	0.1	0.1	0.0	0.0	0.0	0.0	0.0
Total Del/Veh (s)	9.6	2.5	0.2	0.2	3.5	0.6	1.4

4: Marystown Road & Street A/17th Ave E Performance by movement

Movement	WBL	WBR	NBT	NBR	SBL	SBT	All
Denied Del/Veh (s)	3.8	0.2	0.0	0.1	0.0	0.0	0.4
Total Del/Veh (s)	8.2	2.3	1.0	1.4	2.9	0.3	2.2

5: Marystown Road & 128th Street W Performance by movement

Movement	EBL	EBR	WBL	WBT	WBR	NBT	NBR	SBL	SBT	SBR	All
Denied Del/Veh (s)	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0
Total Del/Veh (s)	6.7	2.8	6.2	5.2	2.3	1.7	2.9	3.1	1.5	0.4	1.8

6: Marystown Road & 130th St. Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	0.1	0.0	0.0	0.3	0.2	0.2	0.2	0.2	0.1	0.0	0.0	0.0
Total Del/Veh (s)	7.0	12.2	4.8	7.5	12.3	3.9	6.3	7.6	4.4	8.2	9.9	5.9

6: Marystown Road & 130th St. Performance by movement

Movement	All
Denied Del/Veh (s)	0.1
Total Del/Veh (s)	9.4

7: Zumbro Ave. & 130th St. Performance by movement

Movement	EBT	EBR	WBL	WBT	All
Denied Del/Veh (s)	0.0	0.0	0.0	0.0	0.0
Total Del/Veh (s)	0.8	0.3	4.5	5.7	3.2

8: Old Brick Yard Rd. & 130th St. Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	3.5	0.2	0.4	0.0	0.0	0.0	0.3	0.1	0.1	0.0	0.0	0.0
Total Del/Veh (s)	2.0	0.4	0.4	3.0	1.4	3.1	6.7	10.3	3.0	5.4	9.8	1.6

8: Old Brick Yard Rd. & 130th St. Performance by movement

Movement	All
Denied Del/Veh (s)	0.1
Total Del/Veh (s)	3.3

10: Old Brick Yard Rd. & 169 NB Ramp Performance by movement

Movement	WBL	WBR	NBT	NBR	SBL	SBT	All
Denied Del/Veh (s)	0.1	0.2	0.0	0.3	0.0	0.0	0.1
Total Del/Veh (s)	7.2	2.9	0.4	0.1	1.3	0.3	1.4

11: Old Brick Yard Rd. & 169 SB Ramp Performance by movement

Movement	WBL	WBR	NBL	NBT	SBT	SBR	All
Denied Del/Veh (s)	0.1	0.1	0.0	0.0	0.4	3.3	1.5
Total Del/Veh (s)	5.2	3.1	6.0	0.5	0.7	2.0	1.7

25: US 169 E Performance by movement

Movement	EBT	All
Denied Del/Veh (s)	0.0	0.0
Total Del/Veh (s)	0.2	0.2

27: US 169 W Performance by movement

Movement	EBT	All
Denied Del/Veh (s)	0.0	0.0
Total Del/Veh (s)	0.2	0.2

Total Network Performance

Movement	All
Denied Del/Veh (s)	0.7
Total Del/Veh (s)	11.9

Intersection: 1: Marystown Road & Vierling Dr.

Movement	EB	EB	WB	WB	NB	NB	SB	SB
Directions Served	LT	TR	LT	TR	LT	TR	LT	TR
Maximum Queue (ft)	29	51	65	61	54	70	76	52
Average Queue (ft)	27	29	32	23	38	41	48	24
95th Queue (ft)	39	50	52	50	56	61	72	49
Link Distance (ft)	845	845	561	561	1036	1036	519	519
Upstream Blk Time (%)								
Queuing Penalty (veh)								
Storage Bay Dist (ft)								
Storage Blk Time (%)								
Queuing Penalty (veh)								

Intersection: 2: Marystown Road & Park/US 169 W

Movement	WB	WB	SB
Directions Served	LT	R	L
Maximum Queue (ft)	92	116	22
Average Queue (ft)	41	48	4
95th Queue (ft)	74	91	17
Link Distance (ft)			
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)		180	165
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 3: Marystown Road & US 169 E

Movement	WB	WB	SB
Directions Served	L	R	L
Maximum Queue (ft)	25	45	55
Average Queue (ft)	15	19	26
95th Queue (ft)	35	35	52
Link Distance (ft)			
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)			370
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 4: Marystown Road & Street A/17th Ave E

Movement	WB	WB	SB
Directions Served	L	R	L
Maximum Queue (ft)	45	28	74
Average Queue (ft)	21	12	19
95th Queue (ft)	43	18	51
Link Distance (ft)	1186		
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)	400	200	
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 5: Marystown Road & 128th Street W

Movement	EB	EB	WB	SB
Directions Served	LT	R	LTR	LT
Maximum Queue (ft)	26	21	31	31
Average Queue (ft)	7	3	9	4
95th Queue (ft)	25	14	31	21
Link Distance (ft)	2427		448	1812
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)	300			
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 6: Marystown Road & 130th St.

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LTR	LTR
Maximum Queue (ft)	77	76	75	111
Average Queue (ft)	51	42	41	59
95th Queue (ft)	78	63	67	97
Link Distance (ft)	2420	708	682	1204
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 7: Zumbro Ave. & 130th St.

Movement	WB
Directions Served	LT
Maximum Queue (ft)	24
Average Queue (ft)	1
95th Queue (ft)	8
Link Distance (ft)	2420
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 8: Old Brick Yard Rd. & 130th St.

Movement	EB	WB	NB	SB
Directions Served	L	L	LTR	LTR
Maximum Queue (ft)	30	23	61	74
Average Queue (ft)	1	4	31	35
95th Queue (ft)	10	17	52	58
Link Distance (ft)			1159	3184
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)	300	300		
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 10: Old Brick Yard Rd. & 169 NB Ramp

Movement	WB	WB	SB
Directions Served	L	R	L
Maximum Queue (ft)	28	50	52
Average Queue (ft)	4	28	6
95th Queue (ft)	19	45	28
Link Distance (ft)	730	730	
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)			300
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 11: Old Brick Yard Rd. & 169 SB Ramp

Movement	WB	WB	NB	SB
Directions Served	LT	R	L	R
Maximum Queue (ft)	30	48	50	6
Average Queue (ft)	20	30	5	1
95th Queue (ft)	43	40	28	3
Link Distance (ft)	639	639		
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)			300	250
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 25: US 169 E

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Intersection: 27: US 169 W

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Network Summary

Network wide Queuing Penalty: 0

1: Marystown Road & Vierling Dr. Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.1	0.1	0.1
Total Del/Veh (s)	5.1	7.3	3.4	5.3	7.5	2.6	5.6	10.4	2.4	5.2	11.2	1.3

1: Marystown Road & Vierling Dr. Performance by movement

Movement	All
Denied Del/Veh (s)	0.1
Total Del/Veh (s)	7.5

2: Marystown Road & Park/US 169 W Performance by movement

Movement	NBT	NBR	SBL	SBT	All
Denied Del/Veh (s)	0.0	0.0	0.0	0.0	0.0
Total Del/Veh (s)	0.3	0.4	3.0	1.4	1.0

3: Marystown Road & US 169 E Performance by movement

Movement	WBL	WBR	NBT	NBR	SBL	SBT	All
Denied Del/Veh (s)	0.1	0.1	0.0	0.0	0.7	0.0	0.2
Total Del/Veh (s)	10.8	2.4	0.2	0.6	4.8	0.4	2.1

4: Marystown Road & 17th Ave E./17th Ave E Performance by movement

Movement	EBT	WBL	WBR	NBT	NBR	SBL	SBT	All
Denied Del/Veh (s)	0.0	3.8	3.8	0.0	0.0	0.0	0.0	1.1
Total Del/Veh (s)	0.0	8.2	3.1	0.9	1.1	3.3	0.3	2.2

5: Marystown Road & 128th Street W Performance by movement

Movement	EBT	WBL	WBR	NBL	NBT	NBR	SBT	SBR	All
Denied Del/Veh (s)	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0
Total Del/Veh (s)	0.1	4.9	3.0	4.3	1.7	2.4	0.8	0.2	1.6

6: Marystown Road & 130th St. Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	0.0	0.0	0.0	0.6	0.2	0.2	0.1	0.2	0.1	0.1	0.0	0.0
Total Del/Veh (s)	4.0	10.5	2.2	9.6	10.8	4.7	5.5	7.0	3.6	5.2	6.8	4.2

6: Marystown Road & 130th St. Performance by movement

Movement	All
Denied Del/Veh (s)	0.1
Total Del/Veh (s)	8.0

7: Zumbro Ave. & 130th St. Performance by movement

Movement	EBT	EBR	WBT	NBR	SBT	All
Denied Del/Veh (s)	0.0	0.0	0.0	0.1	0.0	0.0
Total Del/Veh (s)	0.6	0.4	6.3	2.7	0.6	3.2

8: Old Brick Yard Rd. & 130th St. Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	4.2	0.1	0.2	0.0	0.0	0.2	0.2	0.1	0.1	0.0	0.0	0.0
Total Del/Veh (s)	2.2	0.2	0.2	1.9	0.8	0.3	5.6	10.6	3.5	3.0	8.5	0.9

8: Old Brick Yard Rd. & 130th St. Performance by movement

Movement	All
Denied Del/Veh (s)	0.2
Total Del/Veh (s)	2.7

9: Old Brick Yard Rd. & 17th Ave E. Performance by movement

Movement	WBT	NBT	SBT	All
Denied Del/Veh (s)	0.0	0.0	0.0	0.0
Total Del/Veh (s)	0.3	4.3	0.0	2.4

10: Old Brick Yard Rd. & 169 EB Ramp Performance by movement

Movement	WBR	NBT	NBR	SBL	SBT	All
Denied Del/Veh (s)	0.3	0.0	0.4	0.1	0.0	0.2
Total Del/Veh (s)	4.6	0.3	0.1	1.1	0.3	3.2

11: Old Brick Yard Rd. & 169 WB Ramp Performance by movement

Movement	WBL	WBT	WBR	NBL	NBT	SBT	SBR	All
Denied Del/Veh (s)	0.1	0.1	0.1	0.0	0.0	0.2	4.0	0.5
Total Del/Veh (s)	8.2	9.1	4.0	0.4	0.7	0.1	0.9	1.3

12: Zumbro Ave. & 17th Ave E. Performance by movement

Movement	EBT	EBR	WBL	WBT	NBL	NBR	All
Denied Del/Veh (s)	0.1	0.1	0.1	0.1	0.0	0.0	0.1
Total Del/Veh (s)	0.0	0.0	3.2	0.0	4.5	2.6	1.1

13: Zumbro Ave. & 128th Street W Performance by movement

Movement	WBL	WBR	NBR	SBL	SBT	All
Denied Del/Veh (s)	0.1	0.1	0.1	0.0	0.0	0.1
Total Del/Veh (s)	4.5	2.7	0.0	2.0	0.1	3.1

25: US 169 E Performance by movement

Movement	EBT	All
Denied Del/Veh (s)	0.0	0.0
Total Del/Veh (s)	0.3	0.3

27: US 169 W Performance by movement

Movement	EBT	All
Denied Del/Veh (s)	0.0	0.0
Total Del/Veh (s)	0.1	0.1

Total Network Performance

Denied Del/Veh (s)		0.7
Total Del/Veh (s)		10.1

Intersection: 1: Marystown Road & Vierling Dr.

Movement	EB	EB	WB	WB	NB	NB	SB	SB
Directions Served	LT	TR	LT	TR	LT	TR	LT	TR
Maximum Queue (ft)	29	53	52	28	54	78	54	31
Average Queue (ft)	17	32	29	14	34	35	35	16
95th Queue (ft)	40	47	47	36	50	56	51	38
Link Distance (ft)	845	845	561	561	1036	1036	519	519
Upstream Blk Time (%)								
Queuing Penalty (veh)								
Storage Bay Dist (ft)								
Storage Blk Time (%)								
Queuing Penalty (veh)								

Intersection: 2: Marystown Road & Park/US 169 W

Movement	SB
Directions Served	L
Maximum Queue (ft)	45
Average Queue (ft)	2
95th Queue (ft)	15
Link Distance (ft)	
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	165
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 3: Marystown Road & US 169 E

Movement	WB	WB	NB	SB
Directions Served	L	R	R	L
Maximum Queue (ft)	47	69	23	78
Average Queue (ft)	19	18	1	35
95th Queue (ft)	41	40	8	62
Link Distance (ft)				
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)			250	370
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 4: Marystown Road & 17th Ave E./17th Ave E

Movement	WB	WB	SB
Directions Served	L	R	L
Maximum Queue (ft)	45	37	52
Average Queue (ft)	9	16	25
95th Queue (ft)	28	28	54
Link Distance (ft)			
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)	400	300	200
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 5: Marystown Road & 128th Street W

Movement	WB
Directions Served	LTR
Maximum Queue (ft)	31
Average Queue (ft)	12
95th Queue (ft)	36
Link Distance (ft)	448
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 6: Marystown Road & 130th St.

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LTR	LTR
Maximum Queue (ft)	76	71	55	55
Average Queue (ft)	42	40	38	33
95th Queue (ft)	64	62	56	57
Link Distance (ft)	2414	708	682	1204
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 7: Zumbro Ave. & 130th St.

Movement	NB
Directions Served	LTR
Maximum Queue (ft)	30
Average Queue (ft)	3
95th Queue (ft)	17
Link Distance (ft)	1360
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 8: Old Brick Yard Rd. & 130th St.

Movement	EB	NB	SB
Directions Served	L	LTR	LTR
Maximum Queue (ft)	28	55	29
Average Queue (ft)	1	34	14
95th Queue (ft)	9	49	35
Link Distance (ft)		1159	3167
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)	300		
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 9: Old Brick Yard Rd. & 17th Ave E.

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Intersection: 10: Old Brick Yard Rd. & 169 EB Ramp

Movement	WB	SB
Directions Served	R	L
Maximum Queue (ft)	94	31
Average Queue (ft)	45	5
95th Queue (ft)	71	21
Link Distance (ft)	730	
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		300
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 11: Old Brick Yard Rd. & 169 WB Ramp

Movement	WB	WB
Directions Served	LT	R
Maximum Queue (ft)	30	52
Average Queue (ft)	8	33
95th Queue (ft)	30	51
Link Distance (ft)	639	639
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 12: Zumbro Ave. & 17th Ave E.

Movement	WB	NB
Directions Served	LT	LR
Maximum Queue (ft)	29	31
Average Queue (ft)	1	21
95th Queue (ft)	10	44
Link Distance (ft)		1826
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 13: Zumbro Ave. & 128th Street W

Movement	WB
Directions Served	LR
Maximum Queue (ft)	55
Average Queue (ft)	26
95th Queue (ft)	49
Link Distance (ft)	2404
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 25: US 169 E

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Intersection: 27: US 169 W

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Network Summary

Network wide Queuing Penalty: 0

1: Marystown Road & Vierling Dr. Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	0.1	0.1	0.1	0.2	0.1	0.1	0.0	0.0	0.0	0.2	0.1	0.1
Total Del/Veh (s)	5.7	7.4	3.5	7.0	9.1	3.0	7.0	9.3	4.5	8.3	13.0	2.0

1: Marystown Road & Vierling Dr. Performance by movement

Movement	All
Denied Del/Veh (s)	0.1
Total Del/Veh (s)	8.4

2: Marystown Road & Park/US 169 W Performance by movement

Movement	WBL	WBR	NBL	NBT	NBR	SBL	SBT	All
Denied Del/Veh (s)	0.8	0.6	2.9	0.0	0.8	1.0	0.0	0.4
Total Del/Veh (s)	19.4	3.4	2.8	0.5	0.6	6.1	1.9	4.9

3: Marystown Road & US 169 E Performance by movement

Movement	WBL	WBR	NBT	NBR	SBL	SBT	All
Denied Del/Veh (s)	0.2	0.1	0.0	0.0	0.0	0.0	0.0
Total Del/Veh (s)	24.2	2.9	0.2	0.4	5.3	0.8	3.5

4: Marystown Road & 17th Ave. E./17th Ave E Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	1.6	0.1	1.7	3.8	0.1	0.2	0.0	0.0	0.2	0.3	0.0	0.0
Total Del/Veh (s)	33.1	12.8	5.6	22.4	22.7	6.7	5.8	1.7	1.3	3.4	0.7	0.5

4: Marystown Road & 17th Ave. E./17th Ave E Performance by movement

Movement	All
Denied Del/Veh (s)	0.4
Total Del/Veh (s)	6.8

5: Marystown Road & 128th Street W Performance by movement

Movement	EBL	EBR	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	All
Denied Del/Veh (s)	0.1	1.2	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.1
Total Del/Veh (s)	9.5	3.7	11.0	2.8	5.4	2.2	2.2	3.4	1.9	1.9	3.0

6: Marystown Road & 130th St. Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	0.0	0.0	0.1	0.5	0.3	0.3	0.2	0.2	0.1	0.0	0.0	0.0
Total Del/Veh (s)	12.1	17.7	9.9	12.6	16.8	9.6	8.4	10.5	7.0	11.5	12.0	7.7

6: Marystown Road & 130th St. Performance by movement

Movement	All
Denied Del/Veh (s)	0.1
Total Del/Veh (s)	13.2

7: Zumbro Ave. & 130th St. Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	SBL	SBR	All
Denied Del/Veh (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0
Total Del/Veh (s)	3.5	4.2	1.1	12.6	7.0	5.5	11.9	6.1	5.9

8: Old Brick Yard Rd. & 130th St. Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	3.4	0.5	0.5	0.0	0.0	0.0	0.1	0.3	0.2	0.0	0.0	0.0
Total Del/Veh (s)	2.9	0.8	0.5	4.7	1.7	1.6	9.1	15.9	8.2	15.4	17.5	10.3

8: Old Brick Yard Rd. & 130th St. Performance by movement

Movement	All
Denied Del/Veh (s)	0.5
Total Del/Veh (s)	6.4

9: Old Brick Yard Rd. & 17th Ave. E. Performance by movement

Movement	WBL	WBR	NBT	NBR	SBL	SBT	All
Denied Del/Veh (s)	0.1	0.1	0.0	0.0	0.0	0.0	0.0
Total Del/Veh (s)	10.9	4.0	5.8	3.0	3.4	4.8	4.5

10: Old Brick Yard Rd. & 169 EB Ramp Performance by movement

Movement	WBL	WBR	NBT	NBR	SBL	SBT	All
Denied Del/Veh (s)	0.2	0.2	0.0	0.5	0.0	0.0	0.1
Total Del/Veh (s)	12.1	3.2	0.6	0.3	2.9	1.2	3.4

11: Old Brick Yard Rd. & 169 WB Ramp Performance by movement

Movement	WBL	WBR	NBL	NBT	NBR	SBT	SBR	All
Denied Del/Veh (s)	0.2	0.1	0.0	0.0	0.0	0.3	3.3	1.1
Total Del/Veh (s)	9.4	3.1	2.7	0.7	0.5	1.2	1.9	2.9

12: Zumbro Ave. & 17th Ave. E. Performance by movement

Movement	EBT	EBR	WBL	WBT	NBL	NBR	All
Denied Del/Veh (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Del/Veh (s)	0.5	1.0	3.0	0.9	4.5	3.4	0.8

13: Zumbro Ave. & 128th Street W Performance by movement

Movement	WBL	WBT	WBR	NBT	NBR	SBL	SBT	All
Denied Del/Veh (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Del/Veh (s)	5.3	0.6	3.0	0.3	0.3	2.1	0.2	0.9

25: US 169 E Performance by movement

Movement	EBT	All
Denied Del/Veh (s)	0.0	0.0
Total Del/Veh (s)	0.3	0.3

27: US 169 W Performance by movement

Movement	EBT	All
Denied Del/Veh (s)	0.0	0.0
Total Del/Veh (s)	0.2	0.2

Total Network Performance

Movement	EBT	All
Denied Del/Veh (s)		0.8
Total Del/Veh (s)		17.3

Intersection: 1: Marystown Road & Vierling Dr.

Movement	EB	EB	WB	WB	NB	NB	SB	SB
Directions Served	LT	TR	LT	TR	LT	TR	LT	TR
Maximum Queue (ft)	50	54	83	28	90	94	89	54
Average Queue (ft)	25	36	39	17	40	45	52	29
95th Queue (ft)	45	56	65	38	67	75	76	54
Link Distance (ft)	845	845	561	561	1036	1036	519	519
Upstream Blk Time (%)								
Queuing Penalty (veh)								
Storage Bay Dist (ft)								
Storage Blk Time (%)								
Queuing Penalty (veh)								

Intersection: 2: Marystown Road & Park/US 169 W

Movement	WB	WB	SB
Directions Served	LT	R	L
Maximum Queue (ft)	128	90	42
Average Queue (ft)	88	50	10
95th Queue (ft)	129	79	32
Link Distance (ft)			
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)		180	165
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 3: Marystown Road & US 169 E

Movement	WB	WB	NB	SB
Directions Served	L	R	R	L
Maximum Queue (ft)	113	46	55	75
Average Queue (ft)	65	16	3	34
95th Queue (ft)	109	34	22	68
Link Distance (ft)				
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)			250	370
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 4: Marystown Road & 17th Ave. E./17th Ave E

Movement	EB	EB	EB	EB	WB	WB	WB	WB	NB	SB	SB	SB
Directions Served	L	T	T	R	L	T	T	R	L	L	T	R
Maximum Queue (ft)	144	22	43	40	66	42	41	74	52	52	15	16
Average Queue (ft)	65	10	11	15	28	11	3	28	23	26	1	1
95th Queue (ft)	121	27	31	34	57	30	16	60	46	53	5	5
Link Distance (ft)		2412	2412			1186	1186	1186			644	644
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (ft)	200			200	400				200	200		
Storage Blk Time (%)												
Queuing Penalty (veh)												

Intersection: 5: Marystown Road & 128th Street W

Movement	EB	EB	WB	NB	SB	SB
Directions Served	LT	R	LTR	LTR	LT	R
Maximum Queue (ft)	68	46	30	60	53	20
Average Queue (ft)	29	16	5	16	5	1
95th Queue (ft)	52	39	22	43	26	7
Link Distance (ft)	2399		448	1204	1812	
Upstream Blk Time (%)						
Queuing Penalty (veh)						
Storage Bay Dist (ft)		300			250	
Storage Blk Time (%)						
Queuing Penalty (veh)						

Intersection: 6: Marystown Road & 130th St.

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LTR	LTR
Maximum Queue (ft)	134	139	77	142
Average Queue (ft)	78	66	54	75
95th Queue (ft)	116	111	81	118
Link Distance (ft)	2413	708	682	1204
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 7: Zumbro Ave. & 130th St.

Movement	EB	WB	SB
Directions Served	LTR	LTR	LTR
Maximum Queue (ft)	89	51	77
Average Queue (ft)	28	4	45
95th Queue (ft)	68	22	69
Link Distance (ft)	2464	2413	1215
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 8: Old Brick Yard Rd. & 130th St.

Movement	EB	EB	WB	WB	NB	SB
Directions Served	L	TR	L	TR	LTR	LTR
Maximum Queue (ft)	68	22	29	22	96	136
Average Queue (ft)	19	2	8	1	51	65
95th Queue (ft)	49	12	29	10	89	106
Link Distance (ft)		608		2464	1159	3167
Upstream Blk Time (%)						
Queuing Penalty (veh)						
Storage Bay Dist (ft)	300		300			
Storage Blk Time (%)						
Queuing Penalty (veh)						

Intersection: 9: Old Brick Yard Rd. & 17th Ave. E.

Movement	WB	WB	SB
Directions Served	L	R	LT
Maximum Queue (ft)	78	76	76
Average Queue (ft)	42	41	29
95th Queue (ft)	73	64	69
Link Distance (ft)	2265	2265	812
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 10: Old Brick Yard Rd. & 169 EB Ramp

Movement	WB	WB	NB	SB
Directions Served	L	R	R	L
Maximum Queue (ft)	113	49	22	53
Average Queue (ft)	54	31	2	20
95th Queue (ft)	95	49	11	46
Link Distance (ft)	730	730		
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)			200	300
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 11: Old Brick Yard Rd. & 169 WB Ramp

Movement	WB	WB	NB	SB
Directions Served	LT	R	L	R
Maximum Queue (ft)	97	54	28	25
Average Queue (ft)	54	30	5	1
95th Queue (ft)	84	42	20	8
Link Distance (ft)	639	639		
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)			300	250
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 12: Zumbro Ave. & 17th Ave. E.

Movement	NB
Directions Served	LR
Maximum Queue (ft)	52
Average Queue (ft)	23
95th Queue (ft)	47
Link Distance (ft)	1857
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 13: Zumbro Ave. & 128th Street W

Movement	WB
Directions Served	LR
Maximum Queue (ft)	56
Average Queue (ft)	24
95th Queue (ft)	50
Link Distance (ft)	2399
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 25: US 169 E

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Intersection: 27: US 169 W

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Network Summary

Network wide Queuing Penalty: 0

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Appendix V – Existing, 2025 No-Build and 2025 Build Lane Arrangement Maps

Windermere EAW Update Existing Lane Arrangement

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07/26/2018



Westwood Professional Services

Windermere EAW Update 2025 No-Build Lane Arrangement

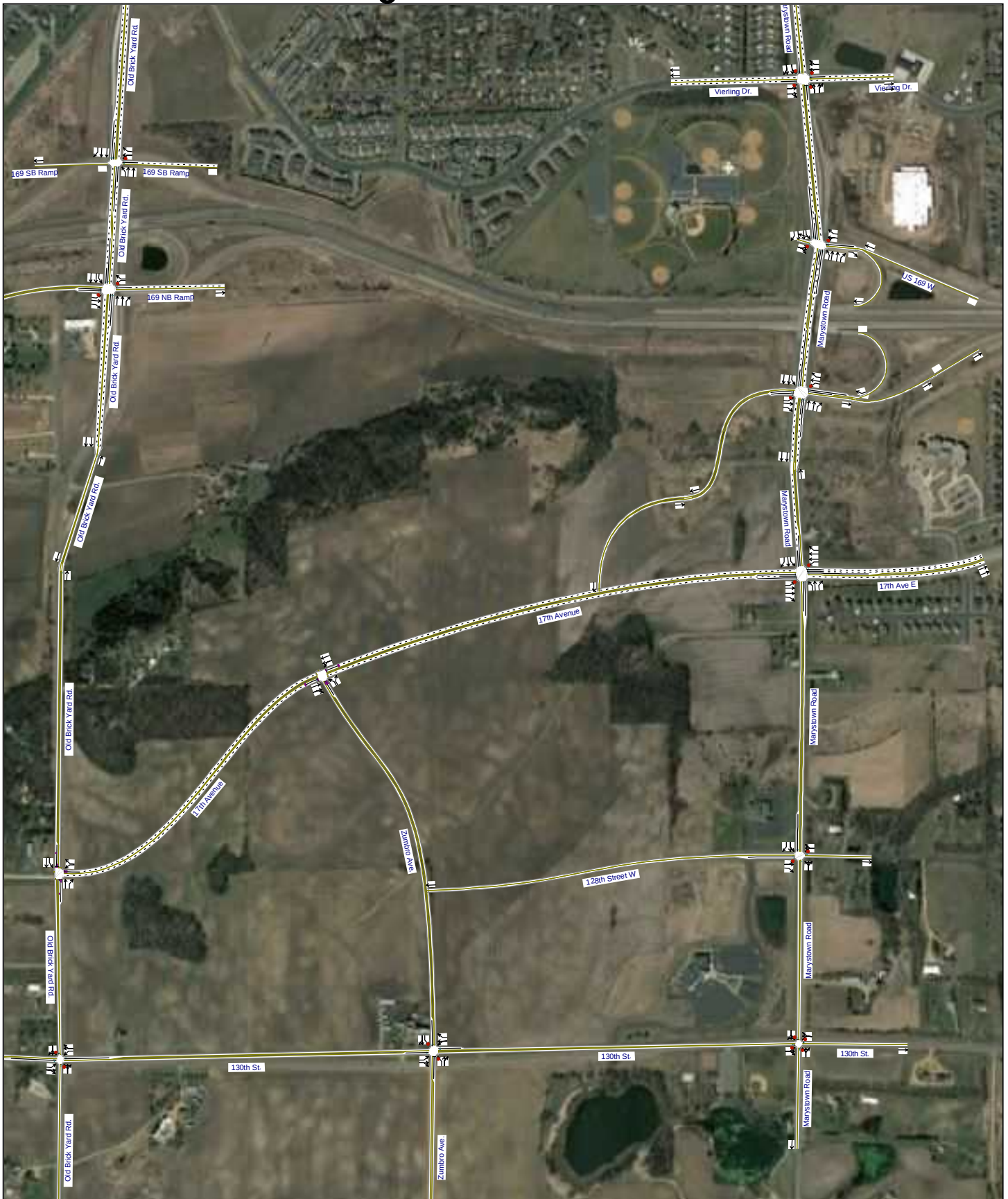
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07/26/2018



westwood Professional Services

Windermere EAW Update 2025 Build Lane Arrangement

Appendix V-3
07/26/2018



Westwood Professional Services