



March 11, 2021

To: Jason Palmby, Magellan Land Development

From: Vernon Swing, PE

Re: Traffic Analysis Memorandum – Valley Crest Development, Shakopee, MN

Per your request, Swing Traffic Solutions, LLC has conducted a traffic analysis for the proposed Valley Crest Development including 175 single family residential homes on the Schneider Property in Shakopee, MN. The proposed project will develop the approximately 56.2 acre site located on the west side of Mystic Lake Drive (CSAH 83) and bisected by the extension of Thrush Street. Thrush St which will run east west through the property will provide direct access from the regional roadway network to the proposed homes, and will connect to the existing neighborhood to the west. (See Figures 1 and 2 for the Vicinity Map and Site Plan, respectively.) This memorandum documents the existing conditions, the anticipated site generated traffic and its distribution, the anticipated existing neighborhood traffic that will use the new Thrush Street and CSAH 83 intersection, and reviews the traffic control options and operations at the new intersection.

Existing Conditions

The existing conditions of the roadways surrounding the proposed Valley Crest Single Family Development site in Shakopee, MN were gathered during a site visit conduct in December of 2020. The field review revealed the new intersection of Thrush Street with CSAH 83 currently has the following characteristics:

- South approach (CSAH 83) – signed for 55 mph, with a 300 foot northbound to westbound left turn lane and 300 foot northbound to eastbound right turn lane, as well as two through lanes in each direction. There is a recreational trail adjacent to the northbound lanes.
- North approach (CSAH 83) – signed for 55 mph, with a 300 foot southbound to westbound right turn lane and 300 foot southbound to eastbound left turn lane, as well as two through lanes in each direction. There is a recreational trail adjacent to the southbound lanes.
- West approach (Thrush Street) – is not currently constructed, but is planned for 30 mph, with a designated 150 foot right turn lane and a shared through and left turn lane approaching the intersection, and one lane leaving the intersection.
- East approach (Thrush Street) – is a 30 mph road providing access to the SMSC Recycling Facility, with one shared left/through/right lane approaching the intersection and one lane leaving.

A turning movement traffic count was conducted at the Thrush Street and CSAH 83 intersection on December 22, 2020 to document the existing AM and PM peak hour traffic conditions. (See Figure 3, Existing Peak Hour Counts). The MnDOT COVID adjustment data was considered to determine if the



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counts should be increased to account for the pandemic related reductions. The MnDOT data indicated that December 22, 2020 did not require adjustment.

Trip Generation and Distribution

To forecast the future traffic that may use the new intersection, a trip generation estimate for the proposed Valley Crest development, and the diversion of traffic associated with 150 homes from the neighborhood to the west has been completed. The methodology described by the Institute of Transportation Engineers (ITE) in *Trip Generation*, 10th Edition, was used to complete the forecast. The ITE land code coinciding with the proposed development is Code 210 for Single Family Homes, and the code for the neighborhood to the west is again 210 for Single Family Homes. Table 1 summarizes the findings.

Table 1
Trip Generation

Land Use	AM Peak Hour		PM Peak Hour		Daily Trips
	Enter	Exit	Enter	Exit	
Valley Crest Homes (177 units)	33 Trips	97 Trips	111 Trips	65 Trips	1,758 Trips
West Neighborhood (150 units)	28 Trips	83 Trips	94 Trips	56 Trips	1,510 Trips
TOTAL	241 Trips		326 Trips		3,268 Trips

As shown in Table 1, the combination of the new development, the ghost development and the existing neighborhood traffic will result in 61 inbound trips from CSAH 83 and 180 outbound trips to CSAH 83 during the morning traffic peak time; and 205 inbound trips outbound trips from CSAH 83 and 121 outbound trips to CSAH 83 in the afternoon traffic peak time.

The new trips have been assigned to the new intersection according to the existing traffic patterns, with 55 percent destined to north and 45 percent destined to the south in the AM traffic peak, and 45 percent destined to the north and 55 percent to the south in the PM Peak. Figure 4 illustrates the trip distribution, and Figure 5 illustrates the Build condition by combining the existing traffic on Figure 3 with the trip assignment on Figure 4. It is noted, traffic from the new development is not expected to travel to the west through the existing neighborhood as the Regional traffic generators are north, south and east of the site.

Traffic Operations

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



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

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

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

The proposed intersection at Thrush Street and CSAH 83 was studied for this report using Synchro/SimTraffic software, 11th Edition, and assumes, full build out of the Valley Crest development. The intersection has been studied as side street stop control.

Table 2
Build Peak Hour Operations

Intersection/Approach	AM Peak		PM Peak	
	LOS & Delay (sec)	Queue(ft)	LOS & Delay (sec)	Queue(ft)
Thrush St & CSAH 83				
<i>Northbound</i>	a(2.7 sec) left turn	32 Left	a(9.6 sec) left turn	66 Left
<i>Southbound</i>	a(1.5 sec) thru	-	a(2.1 sec) thru	7 Right
<i>Eastbound</i>	c(15.2 sec) left turn	76 Left	e(49.7 sec) left turn	83 Left
<i>Westbound</i>	c(6.2 sec) left turn	17 Left	a(6.0 sec) right turn	16 Left
Overall	a(3.5 sec)		a(4.2 sec)	

1. LOS and delay reported from SimTraffic for the worst movement by approach.
2. 95th percentile queues are a result from an average of 10 SimTraffic simulations.

The results shown in Table 2 for the Build scenario indicate the overall traffic operations of the Thrush Street and CSAH 83 intersection will be acceptable with generally short delays and manageable vehicle queues on all approaches. That said, the eastbound left turning delay in the PM Peak has increased delay due to the magnitude of traffic on CSAH 83.



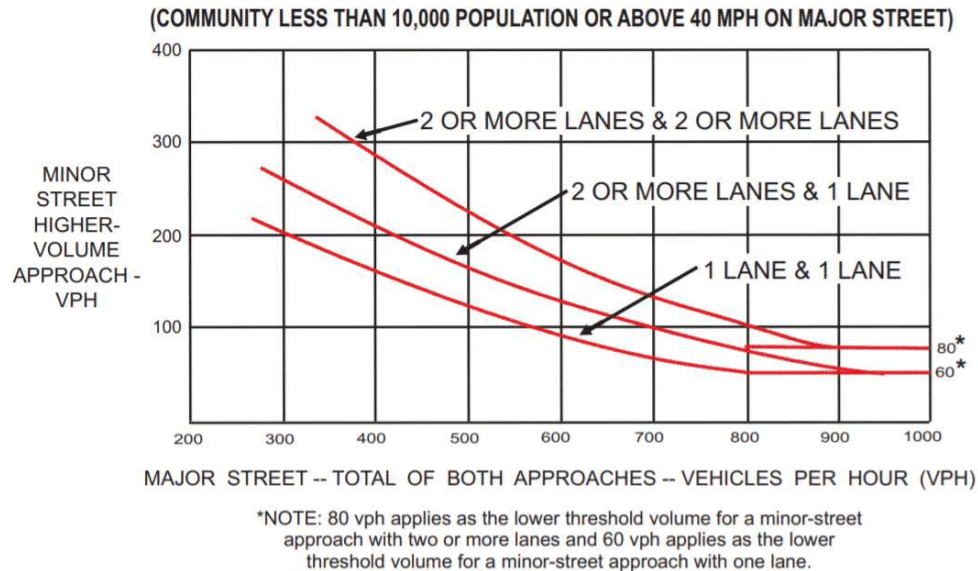
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Signal Warrants

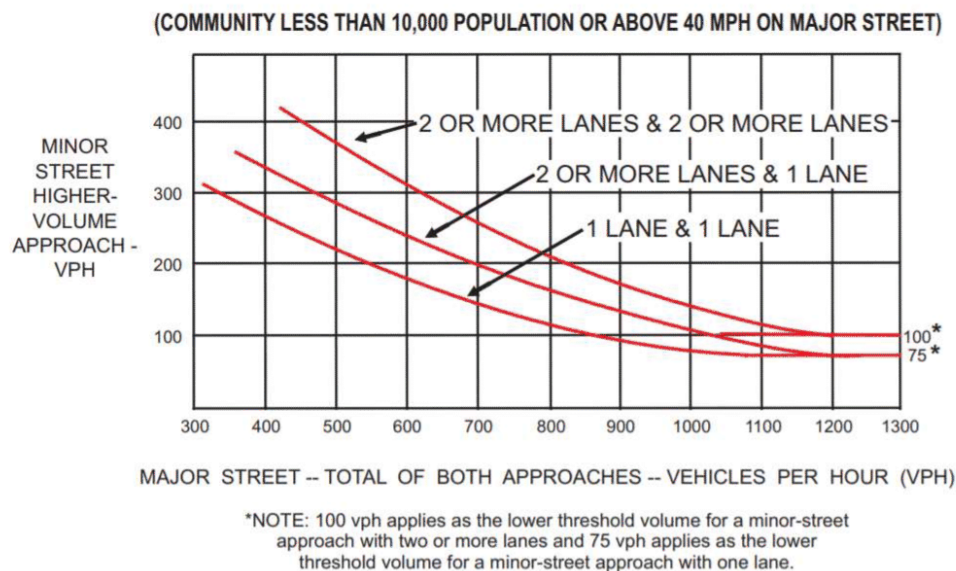
In addition to traffic operational analysis, traffic signal warrants per the methods defined in the MN Manual of Uniform Traffic Control Devices (MNMUTCD) were tested against the volume warrant criteria for Peak hour and 4-Hour conditions (Warrants 2 and 3) and shown in the graphs below none of these warrants are satisfied.

Warrant 2



For a 4-hour duration, the combination of mainline total versus side street volume that would benefit from the installation of a traffic signal would need to intersect above the highest line. Review of the traffic counts indicates this is not satisfied.

Warrant 3





Again, the combination of through volume versus side street traffic that would benefit by the installation of a traffic signal would need to be above the highest redline. This warrant is also not satisfied.

Conclusion

In conclusion, the proposed development has appropriate access to the site and to the surrounding roadway network. The traffic operations at the new intersection are expected to be at acceptable levels. Traffic signal warrants were tested and are not satisfied at this time. In other words, the roadway network serving the proposed development will function adequately with the addition of the single family homes project.

Please contact Vernon Swing at vswingtraffic@gmail.com or 612-968-4142 with any questions.

Attachments: Figures 1-5



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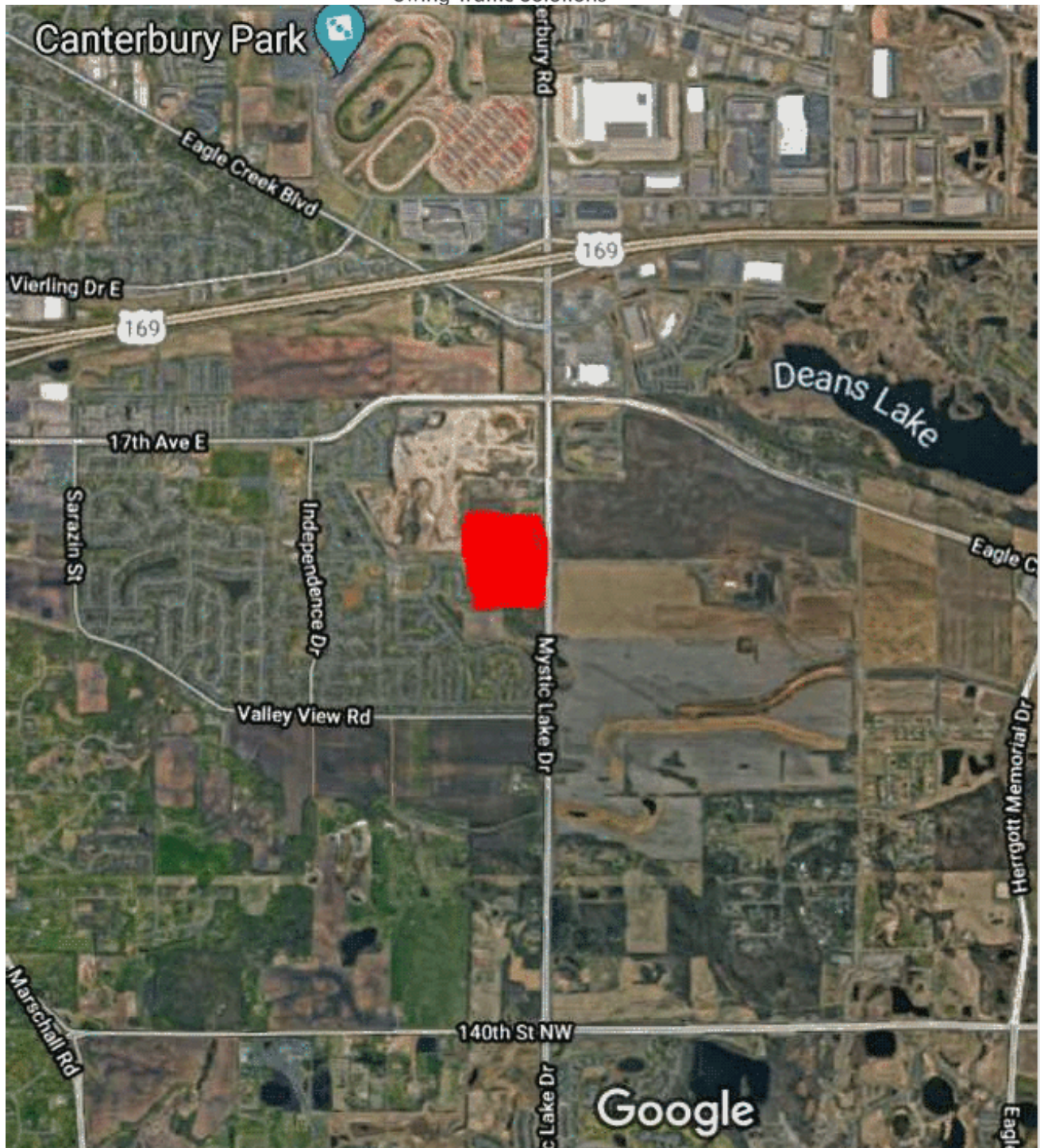


Figure 1
Vicinity Map



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Existing AM Peak



Existing PM Peak

Figure 3
Existing Peak Traffic



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AM Trip Assignment



PM Trip Assignment

Figure 4
Trip Assignment



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Build AM Peak



Build PM Peak

Figure 5
Build Peak Traffic