

Memorandum

To: Mr. Edward (Bo) Carrington
Seven Development

From: Carlos G. Garcia, P.E.

Date: September 20, 2019

Re: Valvoline – Traffic Operations Assessment

The purpose for this memorandum is to determine the number of trips anticipated for the proposed Valvoline oil and lube facility, and the potential impacts to the adjacent intersection of Garrisonville Road and Barrett Heights Road.

Background

The proposed 1,850 SF Valvoline oil and lube facility site is located at the northeast corner of the intersection of Garrisonville Road and Barrett Heights Road. The current land use of the 0.8 Acre site is a Garden Center. Access to the site is provided by a driveway on Barret Heights Road. See **Figure 1** below.



Figure 1. Site location

Garrisonville Road is a six-lane divided east-west roadway with a posted speed limit of 40 mph. The lane configuration for the westbound approach includes three through lanes and 1 exclusive right turn lane.

Barrett Heights Road is a two-lane roadway with a posted speed limit of 25 mph. Barrett Heights Road is controlled by a stop sign at the intersection with Garrisonville Road. Barrett Heights Road operates as a right-in /right-out since Garrisonville Road is divided at the intersection.

The average daily traffic (ADT) for Garrisonville Road is 37,000 and the ADT for Barrett Heights Road is 3,900. This information was obtained directly from VDOT’s Virginia Roads system.

Trip Generation

The Institute of Transportation Engineers (ITE) *Trip Generation Manual, 10th edition* was used to determine the number of trips generated by the existing and proposed land uses (for comparison purposes). **Table 1** displays the morning, evening, and daily trip generation for the existing and proposed land uses.

| Trip Generation (Per ITE Trip Generation Manual - 10th Edition)(1) | | | | | | | | | | | | |
|--|---------------|-------|-------|--------------|-----|-------|--------------|-----|-------|---------|-----|-------|
| Land Use | Land Use Code | Size | Units | AM Peak Hour | | | PM Peak Hour | | | Weekday | | |
| | | | | In | Out | Total | In | Out | Total | In | Out | Total |
| <i>Previous Land Use</i> | | | | | | | | | | | | |
| Nursery (Garden Center) | 817 | 0.8 | Acres | 1 | 1 | 2 | 3 | 3 | 6 | 43 | 43 | 86 |
| <i>Proposed Land Use</i> | | | | | | | | | | | | |
| Valvoline (Quick lubrication vehicle shop) | 941 | 1,850 | SF | 8 | 3 | 11 | 7 | 9 | 16 | 65 | 64 | 129 |
| TOTAL DIFFERENCE | -- | -- | -- | +7 | +2 | +9 | +4 | +6 | +10 | +18 | +21 | +43 |

Notes:
 (1) Pass By rates are not calculated and/or included as a conservative approach.

| <u>Garrisonville Road</u> | | <u>Barrett Heights Road</u> | |
|---------------------------|--------|-----------------------------|--------|
| Posted Speed Limit: | 40 MPH | Posted Speed Limit: | 25 MPH |
| ADT: | 37,000 | ADT: | 3,900 |
| 50/50 Directional split | 18,500 | 50/50 Directional split | 1,950 |
| Peak Hour Estimate 10% | 1,850 | Peak Hour Estimate 10% | 195 |

As shown in **Table 1**, the proposed Valvoline oil and lube facility is expected to generate an additional nine (9) trips in the morning peak hour (7 in/2 out), ten (10) trips in evening peak hour (4 in/6 out) and 43 trips during the weekday (18 in/21 out).

Please note that most of the trips to the proposed Valvoline oil and lube facility would be pass-by trips that are already in the roadway system, and therefore would lessen the impact to the adjacent roadway system. As a conservative approach, the pass-by rates were not included in the capacity analysis.

Capacity Analysis

The intersection of Garrisonville Road and Barrett Heights Road was evaluated using the Highway Capacity Manual (HCM) methodologies and the computer software package Synchro 10 with SimTraffic. The analysis uses capacity, Level of Service, control delay, and queuing as the criteria for the performance of the intersections.

Capacity, as defined by the HCM, is a measure of the maximum number of vehicles in an hour that can travel through an intersection or section of roadway under typical conditions. Level of Service (LOS) is a marker of the driving conditions and perception of drivers while traveling during the given time period. LOS ranges from LOS “A” which represents free flow conditions, to LOS “F” which represents breakdown conditions. **Table 2** shows the LOS for intersections as defined by the HCM.

Table 2: HCM Level of Service Criteria

| Unsignalized Intersections | |
|----------------------------|---------------------------------|
| Level of Service | Average Control Delay (sec/veh) |
| A | ≤10 |
| B | >10 and ≤15 |
| C | >15 and ≤25 |
| D | >25 and ≤35 |
| E | >35 and ≤50 |
| F | >50 |

Typically, LOS “A” through “D” is considered acceptable, while LOS “E” and “F” are considered failing or unacceptable. Control delay is a measure of the total amount of delay experienced by an individual vehicle and includes delay related to deceleration, queue delay, stopped delay, and acceleration. **Table 2** shows the amount of control delay (in seconds per vehicle) that corresponds to the LOS for signalized and unsignalized intersections.

The reported queues, or linear distance of delayed vehicles, in this study are average maximum queues as reported by SimTraffic after 10 runs of 60 minutes each with a 15-minute seeding time. They are reported to ensure that the storage lengths of lanes at intersections are of adequate length and that queued vehicles will not interfere with free flow vehicles or adjacent intersections.

Capacity analyses were completed for the above referenced study intersection using the ADT information obtained from VDOT’s Virginia Roads system. For the calculations, the following assumptions were implemented:

- 50/50 Directional split and
- 10% of the overall ADT for peak hour volumes

Based on the assumptions, the traffic volumes calculated for a peak hour are 1,850 for Garrisonville Road and 195 for Barrett Heights Road. As a conservative approach the evening peak hour was evaluated. The traffic volumes for the No Build and Build conditions are summarized in **Figure 2**.

The No Build Conditions include the ADT information obtained from VDOT’s Virginia Roads system and the trips generated by the existing Garden Center. The Build Conditions add the anticipated traffic volumes for the proposed Valvoline store without considering pass-by rates (conservative approach).

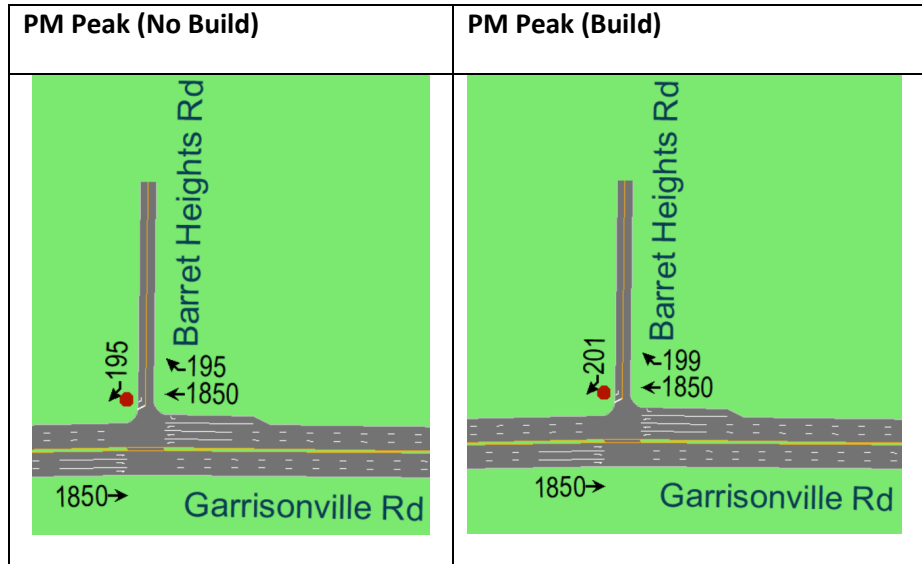


Figure 2. Traffic Volumes

The results of the capacity analysis indicate that the intersection of Garrisonville Road and Barrett Heights Road is expected to operate at acceptable levels of service (LOS) C during the No Build and Build Conditions. The westbound approach would continue to operate as a free flow facility with a LOS A. The southbound approach is expected to continue to operate at a LOS C with an increase in delay of less than 1.0 seconds. The capacity analysis results are summarized in **Table 2**.

Table 2. Capacity Analysis

| INTERSECTION | | | PM Peak (No Build) | | | PM Peak (Mitigated) | | |
|--|----|----------|--------------------|-----|---------------------|---------------------|-----|---------------------|
| | | | Conditions | | | Conditions | | |
| | | | DELAY (S) | LOS | Maximum Queue (ft)* | DELAY (S) | LOS | Maximum Queue (ft)* |
| Intersection: Garrisonville Rd/Barrett Heights Rd | EB | T | 0.0 | A | 0 | 0.0 | A | 0 |
| | | Approach | 0.0 | A | 0 | 0.0 | A | 0 |
| | WB | TR | 0.0 | A | 0 | 0.0 | A | 0 |
| | | Approach | 0.0 | A | 0 | 0.0 | A | 0 |
| | SB | R | 23.8 | C | 72 | 24.3 | C | 72 |
| | | Approach | 23.8 | C | 72 | 24.3 | C | 72 |

*Extracted from SimTraffic simulation software

Conclusions

Based on the results of this traffic operations assessment, the proposed 1,850 SF Valvoline oil and lube facility is projected to have no significant or minimal impact on the existing roadway system.