



MEMORANDUM

Date: June 21, 2018

To: Stewart Schwartz, Executive Director

Organization: Coalition for Smarter Growth

From: Ken Ray, PLA , Ian Lockwood, PE

Project: Route 15 Roundabout Conceptual Analysis

Introduction

The purpose of this memo is to summarize the options for constructing a roundabout at the intersection of US Hwy 15 and Raspberry Drive/Whites Ferry Road.

Existing Conditions

Hwy 15 is a north-south rural road that connects the City of Leesburg and its neighboring communities to the Maryland-Virginia state border. The road is used for commuter traffic during the AM/PM peak periods, and seems busier and more congested than it is because of the design of the road today. The signalized intersection at Raspberry Drive/Whites Ferry Road is one of the design bottlenecks that stops the flow of through traffic and causes backups along Hwy 15.

The lane configuration at the intersection is complex because of the signalization and the need for turn lanes. Currently there is only one lane of through traffic in each direction on Hwy 15, and the impulse reaction to relieve any congestion is to widen the road to four lanes. Unfortunately, the congestion along the roadway is caused by the traffic signal and the time it takes to serve the protected left-turn phases and side-street phases. Hwy 15 has dedicated right-turn lanes on each approach and dedicated left-turns and phases that impact the signal timing and stop the heavier flow of vehicles along Hwy 15.

Raspberry Road is a two-lane neighborhood street that connects several subdivisions to Hwy 15 and has a dedicated right-turn lane to allow a free flow of vehicles turning southbound toward Leesburg. Whites Ferry Road is a two-lane road that connects Hwy 15 to the historic ferry that crosses the Potomac River and connects the Virginia/Maryland state borders. The ferry has limited capacity to move a large volume of vehicles across the river at one time and White Ferry Road experiences gaps in traffic while the ferry loads, floats across, and unloads. These small surges of 10-12 cars every 15-20 minutes contribute a very small volume of vehicles to process through the east side of the intersection, and do not add enough

vehicles to significantly impact the volume processed through the intersection, but rather add another variable to impact the signal timing.

Design Desires and Principles

The impetus of studying this intersection is because of the community's values and desires, conflicting reports from consultant firms studying the corridor, and the need for a better solution to efficiently process vehicles through the intersection and along Hwy 15. The community has grown frustrated by having Hwy 15 become either a high-speed roadway when it isn't rush hour, or a congested traffic jam when commuter traffic uses the road to get to and from homes outside of the community and in many cases outside of the state of Virginia. The community would like for vehicles to travel through Hwy 15 on their terms and for the character of the road to remain context sensitive and maintain two-lanes.

Several other consultant firms have studied this corridor and have recommended everything from grade separated flyovers to widening the roadway to a four-lane cross section. Basically, disregarding the community's vision and focusing more on how to move a greater number of vehicles faster through the corridor. Some of the studies have merit because there is some valuable data and projections that can be analyzed through the lens of the community's values, but at this intersection the concepts are overcomplicated and estimated to be too expensive.

Design Concept

One of the solutions that was presented in the previous studies was a roundabout at this intersection, but because of the perceived traffic volumes, a two-lane roundabout was the only type that made it through the recommendation metrics. This concept was disregarded because the cost estimate deemed it was not feasible. The reason that the roundabout option performed better operationally than the signalized intersection was because of the free-flowing movement of traffic through the roundabout compared to the stop and go platoons of vehicles that are processed through the signal. A one-lane roundabout can process a daily traffic volume of approximately 20,000 ADT, and Hwy 15 is lower than this threshold at this intersection. The percentage of left-turns also impacts the capacity of a roundabout but the percentage of left-turns onto Raspberry Drive or Whites Ferry Roads is low so it will have minimal impact on the overall volume of traffic that the roundabout can process.

One element that varies along Hwy 15 is the directional volume traveling through the intersection during the AM and PM peak periods. In the morning the peak is in the southbound direction, while in the afternoon the peak is in the northbound direction. In the 2020 projected traffic volumes, which is the year when the roundabout would theoretically open, the volume circulating during the AM peak is 1,472 vehicles per hour and during the PM peak is 1,390 vehicles per hour. The high number of circulating vehicles compared to the number of entering vehicles is what likely caused the previous studies to immediately consider a two-lane roundabout. When the numbers are plotted on the FHWA "Approach capacity of a single-lane roundabout" chart, the points are slightly above the threshold line for a one-lane roundabout. The main caveat for this FHWA chart is that the number of vehicles circulating the roundabout should not exceed 1,800 vehicles per hour. Hwy 15 does have a steady flow of vehicles traveling through this intersection during AM and PM peak hours, but the flow remains less than 1,800 vehicles per hour.

Design judgement also informs that widening the roundabout to two-lanes will likely make the roundabout more dangerous for all users. The single lane roundabout will require vehicles to deflect before entering it and slow them down to a steady speed as they travel through it. By widening it to two-lanes the vehicles will not necessarily have to deflect and can pass through it at a faster speed and negate the traffic calming benefits of the roundabout. Placing additional concrete islands and diverters to direct vehicles to different lanes will not help resolve this issue because most of the vehicles are traveling straight through the intersection and not turn east or west out of it. Essentially the two-lane roundabout would split the approach lane on Hwy 15 into two lanes, cycle the two lanes through the roundabout, and then merge it back down on the other side. At intersections it is necessary to provide the extra lanes to hold the additional vehicles in the queue, but the additional lanes in roundabouts don't provide the same benefit because the vehicles must weave and merge through and after the roundabout.

The rural single lane roundabout will provide efficient travel along Hwy 15 while processing the existing and projected traffic volumes. This roundabout can act as a gateway to White's Ferry and into Leesburg and as a traffic calming treatment to slow vehicles to a reasonable speed as they enter the communities along Hwy 15. Another benefit is the ease of allowing vehicles to yield and turn south out of Raspberry Drive just as they do today with the free right-turn lane. The roundabout will also act as a pedestrian safety enhancement and allow for new trails and sidewalks to be added along Hwy 15 and process the pedestrians through the roundabout. Today's signalized intersection does not have a pedestrian phase and adding pedestrian phases would increase the congestion because of the additional signal crossing time. The single lane roundabout is also cheaper than widening the roadway and impacting property outside of the existing right of way. The single lane roundabout will fit easily within the right of way and the reclaimed space along the edges of Hwy 15 can be repurposed for a shoulder, bike facilities, sidewalk, trail, trees, etc.