ROUTE 9

Safety and Operational Study West Virginia to Route 7

Public Input Meeting

September 22, 2021

Long-Term (2040) Corridor Improvement Concept Alternatives Narrative Description

Introduction

This document summarizes two alternative long-term (2040) corridor improvement concepts that were developed to address future traffic needs of the Route 9 corridor. Several of the short- and mid-term improvements presented earlier in the study addressed safety challenges at hot spots, introduced turn lanes where existing traffic conditions warranted them, and identified enforcement areas for law officers to enforce travel speeds. The purpose of the next phase of the study is to examine the longer-term future needs of the corridor and answer the question *"To accommodate estimated traffic in the year 2040, what does the Route 9 corridor need to look like and how do we meet those transportation needs in a way that further enhances safety and the rural character of the corridor?"*

While these alternatives focus on the future roadway configuration and traffic control needs of the corridor, there are also shared use path recommendations provided in the next section of the meeting handouts.

Long-Term Corridor Challenges to Address

Operational

Several of the challenges that exist on the corridor today are projected to worsen as volumes increase on the corridor and the intersecting roadways over time. These challenges include excessive delays in peak commuting periods, long rolling queues at the major intersections, as well as variation in travel speeds as traffic comes to a stop at signalized intersections then accelerates between intersections before coming to the back of the queue at the next downstream intersection. The intersections estimated to have the longest queues on Route 9 in 2040 are: eastbound at Harpers Ferry Road (AM peak hour), westbound at Hillsboro Road (PM peak hour), eastbound at Hamilton Station Road (AM peak hour), and westbound at Clarkes Gap Road (PM peak hour). The intersection of Route 9 and Berlin Turnpike is not included in this list of locations with long queues, as an intersection improvement project is already programmed to address the challenges at this location and that future configuration is assumed to be in place in 2040. In the future, there are also some intersections with increased side street volumes that would benefit from new intersection control and/or new turn lanes where they currently don't exist.

Safety

The two most prevalent crash types along the corridor are rear end crashes and angle crashes. Rear end crashes were particularly prominent in the queues along the corridor, caused by congestion and slowing vehicles on approach to intersections. The angle crashes were also observed at the intersections, including

those intersections already operating with signal control but without turn bays or turn signal phases (i.e., no left-turn arrow during which the turn movement has the right-of-way). Improvements that reduce congestion and queuing would have a positive impact on the rear end crash problem. Similarly, intersection improvements that improve turning movement operation would help address the angle crashes.

Long-Term Alternatives

This document presents two long-term corridor improvement concepts, Alternatives A and B, which are the culmination of a broader evaluation of numerous concepts and variations that were qualitatively assessed. The evaluation leading up to this point included consideration of various improvements' effects on operations, safety, access, public interest (i.e., addressing problem areas identified by the Focus Group and the public), cost, impacts to right-of-way, and impacts to environmental/cultural resources. These two corridor concept alternatives were deemed the most appropriate for further consideration and they present a range of options.

Since these alternatives are conceptual and functional recommendations only at this planning stage, specific design elements are not yet determined, such as the ultimate intersection configurations, locations, approach alignments, and access management considerations such as driveway connections. These concepts are not funded for design or construction, and they are also subject to change based on additional engineering analyses that would be required in the future prior to any design concepts being advanced. Should any conceptual recommendations be approved by the Board of Supervisors, funded, and then advance to design, decisions regarding the topics above will be made at that time.

For a brief technical summary of the roundabout configurations described in this document, please review the Attachment on roundabouts, located at the back of this document.

<u>Improvements included in Both Alternatives</u>

Alternatives A and B are described in the following sections of this document and a graphic is provided for each. The spot improvements listed below are incorporated into both Alternative A and B.

- Sweet Springs Country Store
  - Westbound left turn lane on Route 9
  - Eastbound right turn lane on Route 9
- Purcellville Road
  - Westbound left turn lane on Route 9
- Berlin Turnpike
  - Multilane hybrid (2x1) roundabout (a project already programmed in the County Capital Improvement Program)
- Old Wheatland Road
  - Eastbound left turn lane on Route 9
- Beacon Hill Drive
  - Intersection reconfiguration to allow the following movements only: right-turn in, right-turn out, and left-turn in (i.e., prohibit left turns out from Beacon Hill Drive).
  - Each alternative also includes an option for U-turns at Clarkes Gap Road for drivers from Beacon Hill Drive destined for eastbound Route 9.

The improvements above, which both alternatives have in common, are shown in the white text boxes on the graphic for each of the two alternatives. The white text boxes alongside the icon at each intersection provide a description of the improvements.

Alternatives A and B

The additional improvements within each corridor concept are described below. In the graphic for each of the two alternatives, these additional improvements are described in the shaded text boxes alongside the icon at each intersection. If you are seeking to understand the primary differences between Alternative A and B, you'll want to observe the shaded text boxes and improvements.

Please note that discussion within this document is focused largely on operational and safety conditions, and the study team recognizes that there are other factors to consider such as environmental and right-of-way impacts, access, and costs, among others.

Alternative A – Minor Intersection Improvements Only

In addition to the turn lanes and improvements described above, Alternative A includes minor spot safety and operational improvements at key signalized intersections throughout the corridor. These spot improvements include additional turn lanes, new left turn signal phasing (e.g., introducing a green arrow at a traffic signal for left turners to have the right-of-way), and an additional auxiliary through lane at one intersection so as to process turning traffic entering and exiting the intersection.

A brief description of each improvement in Alternative A is summarized as follows:

Harpers Ferry Road

Proposed Improvements:

- Install an eastbound left turn lane on Route 9
- Provide an eastbound left-turn signal phase for that movement
- Realign the westbound Route 9 right turn lane so that it is a more conventional yield-controlled turning lane that turns closer to a 90-degree angle (to replace the wide sweeping slip lane in place today that enables high speed movements).

Anticipated Operational and Safety Outcomes:
The additional capacity for turning movements would reduce some of the eastbound queueing on Route 9 at the intersection. The left turn signal and turn lane would improve safety for turning vehicles and reduce the potential for angle crashes. The westbound right turn lane realignment would encourage slower turning speeds and would eliminate the existing unconventional yield requirement for left turners from eastbound Route 9 turning onto Harpers Ferry Road that have to abruptly stop in the receiving lane. Both of these safety challenges were observed during the field safety assessment. The westbound queues on Route 9 would increase approaching this intersection, as the new left-turn phase for eastbound vehicles would require the westbound Route 9 vehicles to stop for a longer period of time to allow those opposing left-turning vehicles to pass.

Cider Mill Road

Proposed Improvements:

- Install traffic signal control.

- Maintain eastbound right-turn lane on Route 9, proposed as part of the mid-term improvements.

Anticipated Operational and Safety Outcomes:
Traffic volumes turning to and from Cider Mill Road are estimated to increase in 2040 and a traffic signal would provide the control of movements and assignment of right-of-way in an orderly fashion. As part of any intersection improvement at this location, intersection sight distance would also be improved.. This signalized intersection treatment would introduce another point for queueing along Route 9.

Hamilton Station Road

Proposed Improvements:
- Install left turn lanes on both approaches of Route 9
- Provide left turn signal phases for both new movements on Route 9

Anticipated Operational and Safety Outcomes:
The additional capacity for turning movements would improve the safety for turning vehicles and reduce the potential for angle crashes. The westbound queues on Route 9 would increase approaching this intersection in the PM peak hour, as the new left-turn phase for eastbound vehicles would require the westbound Route 9 vehicles to stop for a longer period of time to allow those opposing left-turning vehicles to pass.

Clarkes Gap Road (and associated improvements to serve Beacon Hill Drive movements)

Proposed Improvements:
- Restripe the southbound approach of Clarkes Gap Road to provide two left turn lanes. The two lanes on southbound Clarkes Gap Road would operate as one left-turn only lane and one shared left-right turn lane.
- Provide an additional eastbound auxiliary lane on Route 9 just east of the intersection to receive the dual left turn movements from Clarkes Gap Road.
- Lengthen the eastbound Route 9 left turn lane so that it extends further upstream in front of the business driveways.
- Lengthen the westbound right turn lane on Route 9, to extend back to Beacon Hill Drive.
- Provide a westbound U-turn lane on Route 9.

Anticipated Operational and Safety Outcomes:
Traffic volumes for southbound left turns from Clarks Gap Road and westbound right turns from Route 9 onto Clarkes Gap Road are estimated to increase in the year 2040. This additional intersection capacity would support those expected travel pattern changes. The lengthening of the westbound right turn lane on Route 9 would also provide an area for vehicles exiting Beacon Hill Drive to merge onto Route 9 and gain speed prior to merging with mainline traffic. Route 9 directly west of the intersection is a crash hot spot, particularly involving slowing and turning vehicles accessing the busines driveways. The extended eastbound left turn lane would provide an enhanced area for those maneuvers and vehicles waiting to turn.

Please see also the graphic summarizing Alternative A at the back of this document.

Alternative B: Intersection Capacity Improvements w/ Lane Continuity Enhancement East of Clarkes Gap Road and Northbound Hillsboro Road Realignment

Alternative B includes roundabouts at key intersections throughout the corridor, instead of traffic signals as proposed in Alternative A. This alternative also includes expansion of one existing roundabout on the corridor, as well as a proposed modification to Hillsboro Road directly south of Route 9 to tie into a roundabout at Mountain Road. Lastly, Alternative B includes lane continuity enhancements between Clarkes Gap Road and Simpson Circle (southern/eastern intersection with Route 9), to tie in with the auxiliary lanes at the Clarkes Gap Road intersection.

According to the Federal Highway Administration (FHWA), roundabouts are a Proven Safety Countermeasure because they can substantially reduce crashes that result in serious injury or death. Roundabouts can:

- Improve safety
- Promote lower speeds and traffic calming
- Reduce conflict points
- Lead to improved operational performance
- Meet a wide range of traffic conditions because they are versatile in size, shape, and design.

A brief description of each improvement in Alternative B is summarized as follows:

Harpers Ferry Road Intersection

Proposed Improvements:

- Install a hybrid, 2x1 roundabout
- Provide two lanes on Route 9 for a short segment on either side of the roundabout to process turn movements then transition back to the existing Route 9 cross section with one lane in each direction.

Anticipated Operational and Safety Outcomes:
The roundabout configuration would enhance safety and substantially decrease queues, on eastbound Route 9 in the AM peak hour in particular. As the first major intersection on Route 9 for traffic coming from the west, this would set the stage for a slower travel experience entering the corridor.

Cider Mill Road

Proposed Improvements:

- Install a hybrid, 2x1 roundabout
- Provide two lanes on Route 9 for a short segment on either side of the roundabout to process turn movements with through traffic then transition back to the existing Route 9 cross section with one lane in each direction.

Anticipated Operational and Safety Outcomes:
The roundabout configuration would enhance safety and provide the capacity needed for the increased turn movements estimated in 2040 to and from Cider Mill Road. The roundabout would reduce queueing on northbound Cider Mill Road in the AM peak hour and provide a consistent travel experience, continuing the trend of the lower travel speeds on Route 9. Eastbound vehicles

would be slowing further in advance of the Town of Hillsboro, prior to entering the lower-speed segment of Route 9.

Stony Point Road

Proposed Improvements:

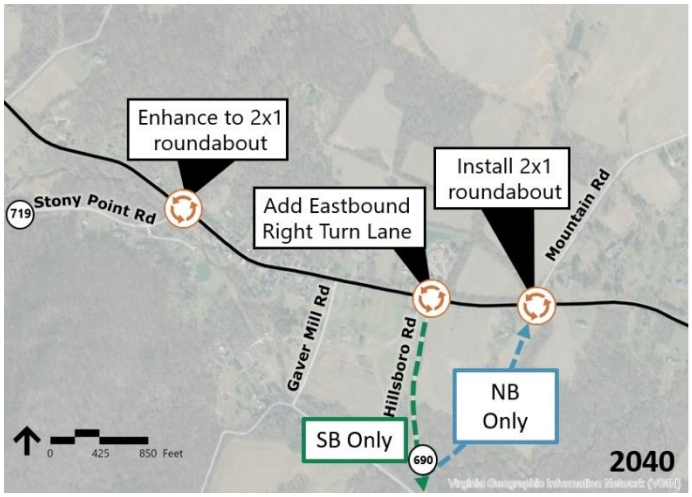
- Enhance and build upon the new roundabout at this intersection by providing a short additional lane in both directions on Route 9 through the roundabout, to transition the single-lane roundabout to a hybrid 2x1 roundabout.
- Provide two lanes on Route 9 for a short segment on either side of the roundabout to process turn movements with through vehicles then transition back to the existing Route 9 cross section with one lane in each direction.

Anticipated Operational and Safety Outcomes:
The roundabout configuration would provide the additional capacity needed to reduce queueing on Route 9 and process the traffic flow that would arrive at a steadier pace with the introduction of roundabouts to the west under this alternative.

Hillsboro Road and Mountain Road Intersections

Proposed Improvements:

- Install an eastbound right turn lane on Route 9 approaching the Hillsboro Road roundabout.
- Maintain the single-lane roundabout at Route 9 and Hillsboro Road.
- For the +/- 1,500-ft segment of Hillsboro Road south of Route 9 (see green dashed line on the map below), change the existing alignment to carry southbound vehicles only and realign a new path for northbound Hillsboro Road traffic (see blue dashed line) to intersect Route 9 opposite Mountain Road. Any future design efforts would consider feasibility of maintaining two-way traffic for the short segment of Hillsboro Road between the Stoneybrook Farm Market southern driveway and Route 9.
- Install a new hybrid, 2x1 roundabout at Mountain Road.



Anticipated Operational and Safety Outcomes:

The roundabout at Route 9 and Hillsboro Road was designed to fit both physically and contextually within the adjacent built and natural environment in the Town of Hillsboro. From a traffic standpoint, the roundabout was designed to accommodate mid-term traffic conditions so as to balance traffic needs with the rural context and beauty of the Town, while also providing sufficient roadside area for multi-modal facilities and connections. The roundabout is surrounded by immediately-adjacent cultural and historic features, and expansion of the roundabout at Route 9 and Hillsboro Road would be in conflict with feedback received from the community.

Traffic to/from Route 9 and Hillsboro Road is expected to increase in 2040, specifically the eastbound right turn vehicles heading south on Hillsboro Road in the morning peak hour and the northbound left turning traffic heading west on Route 9 in the PM peak hour. In 2040, the heavier northbound left turn traffic flow from Hillsboro Road to westbound Route 9 would be entering the Hillsboro Road roundabout at a higher flow rate than it does today, thereby preventing westbound Route 9 through vehicles from entering the roundabout during more of the peak hour. This would result in an extensive queue on westbound Route 9 during the evening peak periods.

The intersection at Mountain Road contains more "open space" for a 2x1 roundabout that could better-accommodate those heavier northbound left turns. The intent of the northbound Hillsboro Road realignment is to shift that heavier movement to access Route 9 at the intersection with Mountain Road.

Queueing would still occur on westbound Route 9 upstream of Mountain Road during portions of the PM peak hour only, due to the single-lane roundabout at Hillsboro Road. The westbound maximum queue would be reduced by approximately 30% compared to Alternative A conditions without the Mountain Road roundabout. This alternative also provides another means by which to slow westbound vehicles prior to entering the Town and enhanced access for vehicles to/from Mountain Road.

Hamilton Station Road

Proposed Improvements:

- Install a hybrid, 2x1 roundabout
- Provide two lanes on Route 9 for a short segment on either side of the roundabout to process turn movements and through vehicles then transition back to the existing Route 9 cross section with one lane in each direction.

Anticipated Operational and Safety Outcomes:
The roundabout configuration would enhance safety and substantially decrease queues on eastbound and westbound Route 9. There was consideration of alterations to the five-leg configuration and tying in the fifth leg outside of the intersection footprint, but given low volumes on the fifth leg, the roundabout is projected to function adequately, and this would maintain current access conditions.

Clarkes Gap Road (and associated improvements for Beacon Hill Drive movements)

Proposed Improvements:

- Install a hybrid, 2x1 roundabout

- Provide two lanes on eastbound Route 9 and southbound Clarkes Gap Road for a short segment on approach to the roundabout to align and process turn movements.
- Provide a westbound right turn "slip lane" outside of the roundabout footprint for the movement from westbound Route 9 to northbound Clarkes Gap Road.
- Northbound Clarkes Gap Road heading away from the roundabout would be two lanes until the movements merged and the roadway would taper back to one lane and the existing cross section.

Anticipated Operational and Safety Outcomes:
This roundabout configuration would enhance safety and substantially reduce queuing on southbound Clarkes Gap Road in the AM peak hour and would also reduce queueing in both directions of Route 9. The roundabout would also provide a better travel experience for vehicles exiting Beacon Hill Drive that desire to head east on Route 9. In the 2040 alternatives, left-turns out of Beacon Hill Drive are prohibited and vehicles would need to turn right out of Beacon Hill Drive and perform a U-turn through the roundabout at Clarkes Gap Road to head east on Route 9. The roundabout provides a more efficient U-turn and reduces travel time for Beacon Hill Drive vehicles making that maneuver during AM peak, compared to the signalized alternative. The driveways to/from the gas station at this intersection would need to be analyzed for access management standards and the driveway on Clarkes Gap Road likely would need to be shifted north or alternative access designed as part of the intersection improvement.

Route 9 between Clarkes Gap Road and Simpson Circle (southern/eastern intersection)

Proposed Improvements:

- For a +/- 0.4-mile segment of Route 9, provide auxiliary lanes at the intersection with Clarkes Gap Road and additional pavement for lane continuity in the southern section.
- This +/- 0.4-mile segment would include a section east of Clarkes Gap Road for which the cross section would include one through lane in each direction on Route 9 with auxiliary and turn lanes from the intersection, plus a +/- 900-ft segment of Route 9 that would be converted from two through lanes to four through lanes for lane continuity for connection to the interchange.

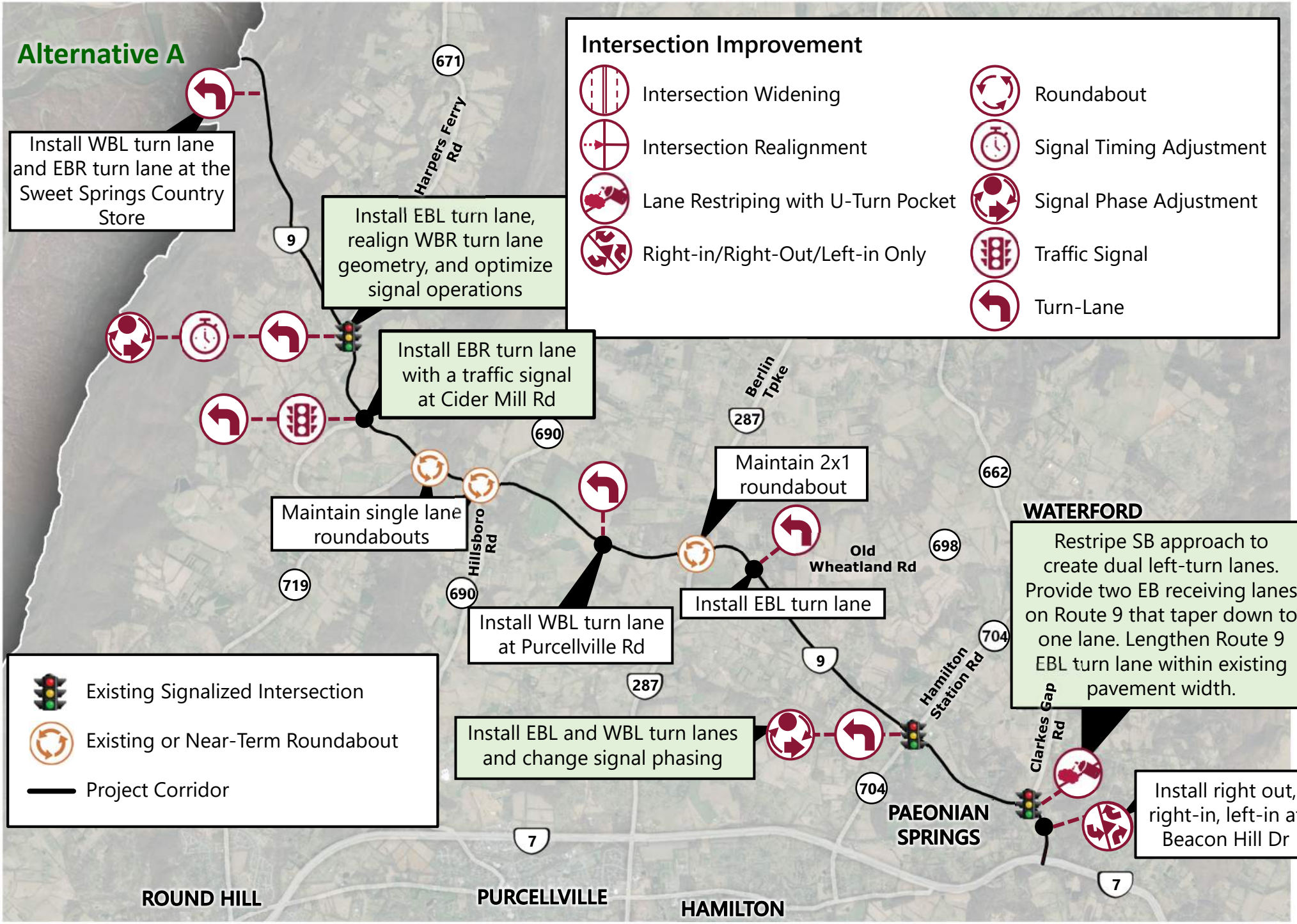
Anticipated Operational and Safety Outcomes:
Traffic volumes for southbound left turns from Clarks Gap Road and westbound right turns from Route 9 onto Clarkes Gap Road are estimated to increase in the year 2040. Two turn lanes are needed to receive southbound left turn vehicles from Clarkes Gap Road onto eastbound Route 9. Also, two lanes are needed on westbound Route 9 approaching Clarkes Gap Road to accommodate the through vehicles and the heavier westbound right turn onto Clarkes Gap Road. That results in pavement width covering four lanes (some auxiliary lanes for the intersection) between Beacon Hill Drive and Clarkes Gap Road, and leaves approximately 900-ft that would remain as two lanes on Route 9. Converting that short segment to four-lanes would provide lane continuity that would both enhance safety and provide an experience more in line with driver expectations.

All new 2x1 roundabouts described above are recommended to be opened to traffic initially as single lane roundabouts if opening-day volumes indicate it would be appropriate, until such time as the additional lane is needed for capacity.

Conclusion

Long-term corridor improvement concept Alternatives A and B are presented in this document in order to seek feedback from the public. It is important to note that these are planning-level concepts only at this time, for the purpose of identifying a sound baseline to support decision-making and guide future changes on Route 9, as development or transportation improvement projects are explored by others in the future. These concepts are not funded for design or construction, and they are also subject to change based on additional engineering analyses that would be required in the future prior to any design concepts being advanced.

During the Public Input Meeting, the study team will describe these alternatives, answer questions, and receive feedback from the community. The study team looks forward to that dialogue. Following the Public Input Meeting, an electronic survey will be distributed as another method for providing feedback.



2040 Alternative A: Minor Intersection Improvements Only

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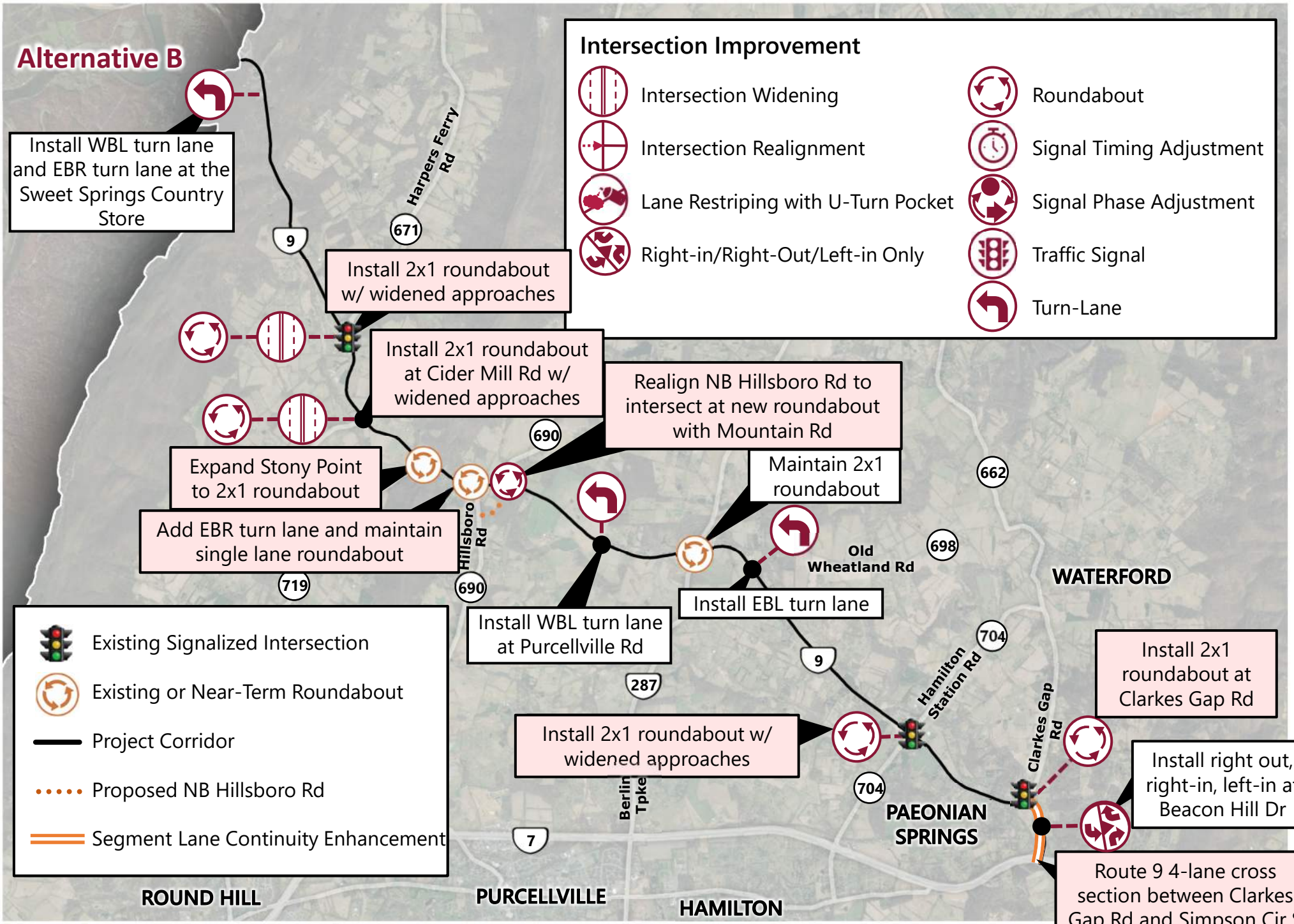

2040 Alternative B: Intersection Capacity Improvements w/ Lane Continuity Enhancement East of Clarkes Gap Rd & NB Hillsboro Rd Realignment

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Attachment – Roundabouts

For further information on roundabouts from the Virginia Department of Transportation and the Federal Highway Administration, please visit the following websites:

https://www.virginiadot.org/info/innovative_intersections_and_interchanges/roundabout.asp

https://safety.fhwa.dot.gov/intersection/innovative/roundabouts/fhwasa08006/fhwasa08006.pdf

Roundabouts can be configured with:

- **Single lanes on all approaches** and in the circulatory roadway. As an example, the new roundabouts in the Town of Hillsboro are single-lane roundabouts.
- **Multilane approaches** on all legs. As an example, the roundabout in Purcellville at Business Route 7 and Berlin Turnpike is a roundabout with multi-lane approaches on all legs and in the circulatory roadway.
- **A hybrid configuration that has a combination of one-lane and two-lane entries and circulatory roadways** (referred to as hybrid or 2x1 roundabouts). Please see example figure below.

Some of the roundabouts proposed in Alternative B are proposed as "hybrid 2x1 roundabouts." These have two lanes on the Route 9 approaches and the circulatory roadway in both travel directions of Route 9, and one lane on the side street approaches and one circulatory lane in the direction of the side street. An example of this configuration is shown below.

In Alternative B, the 2x1 roundabouts proposed include a short segment of two-lanes on Route 9 in the immediate vicinity of the roundabout, and then the number of lanes on Route 9 narrows back down to one lane in each direction to tie into the current cross section with one lane in each direction. These additional lanes in the vicinity of the roundabout, allow for processing the various turn movements and through vehicle interactions.

Example of a Hybrid (2x1) Roundabout