

Technical Memorandum

To: Fredericksburg Area Metropolitan Planning Organization (FAMPO)

From: Michael Baker International

Date: July 17, 2018

Re: I-95 Corridor Evaluation Phase 2: Benefit/Cost Quotient Analysis

Background

The evaluation of alternatives in this study, incorporated future travel conditions predicted by the Version 3.1 Travel Forecasting Model adopted for long-range transportation planning in the George Washington Regional Commission (GWRC) area. The version 3.1 model was developed for FAMPO in early 2017 and includes the most recent zonal socioeconomic data and traffic analysis zone (TAZ) structure developed for the 2045 Long-Range Transportation Plan (LRTP). The base year for the version 3.1 model is 2015. The details of the updates for the version 3.1 model and corresponding regional validation results are available in the memorandum to FAMPO from Cambridge Systematics, *FAMPO Travel Demand Model Version 3.1 Update*, February 24, 2017.

Future Scenarios

As part of the analysis of future build scenarios for the I-95 corridor evaluation, four scenarios were identified for the development of potential benefits and costs. These scenarios are comprised of new interchanges, each evaluated independently, at Exit 131 (near the Rest Area), Exit 128 (Harrison Road), Exit 126 (Super-ramp), and Exit 124 (Jackson Village).

For the comparison of the new access scenarios, the following assumptions were incorporated into the 2045 no-build network. These include the I-95 southbound river crossing, the I-95 northbound river crossing, and a fourth lane added to I-95 northbound and southbound between Exits 130 and 126.

The Exit 131 scenario proposes a new full access interchange providing direct access to development at Celebrate Virginia South. New ramps to and from I-95 southbound and northbound will connect to Carl D. Silver Parkway and Gordon W. Shelton Boulevard.

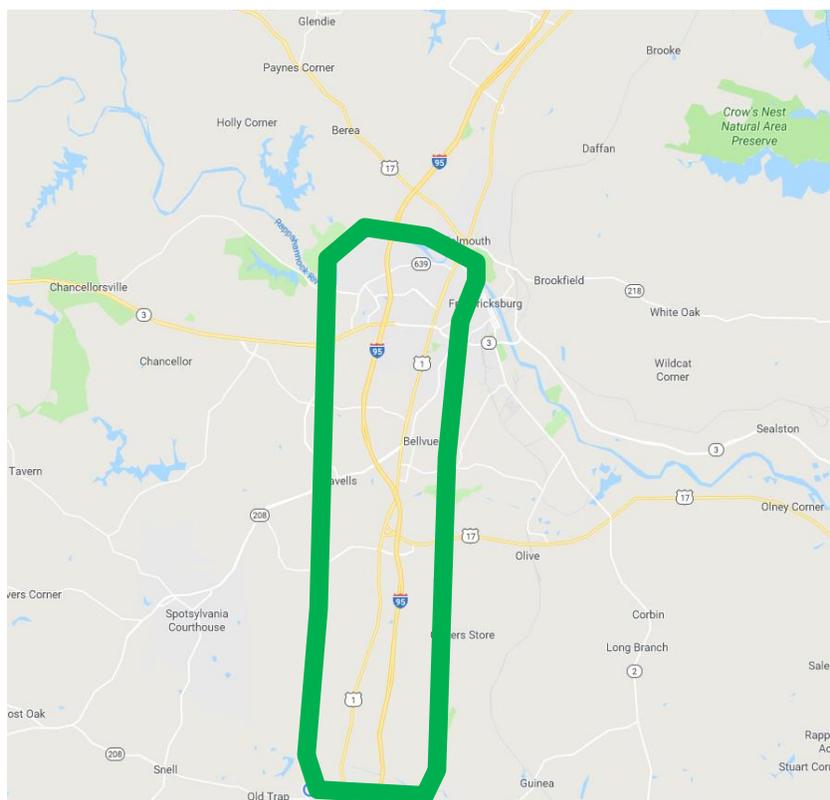
The Exit 128 scenario proposes a new full access interchange at Harrison Road between Route 3 and Courthouse Road. In addition to the interchange, Harrison Road will be widened to 4 lanes from I-95 to Salem Church Road.

The proposed changes to Exit 126 include the new Super Ramp connecting southbound I-95 to eastbound US 17, with an additional ramp providing access to southbound US 1. A northbound CD lane facility will be added along I-95 from south of Mills Drive to south of Courthouse Road. A new on-ramp will allow westbound traffic on US 17 to access the northbound CD lanes. Through preliminary analysis, it was estimated that two CD lanes will be needed to accommodate future demand. Additional improvements recommended by the VDOT STARS Study will include a second lane on the northbound on-ramp at Exit 126 as well as a second lane on the southbound off-ramp supplemented by a 5th southbound deceleration lane on I-95.

The Exit 124 scenario includes a new full access interchange at mile-point 124. This interchange will provide access to a new roadway crossing I-95 which is planned to connect future development at Jackson Village and Alexander's Crossing.

Benefit Cost Analysis

To compare the scenarios described above, a methodology was developed to quantify the benefits and costs associated with each of the scenarios. Among the performance measures associated with each scenario, the reduction of hours of delay was chosen as the most meaningful to convert to an equivalent value of benefit. The delay is defined as the difference between congested travel time and free-flow travel time within the defined study area below.



The forecasted reduction in daily delay for each of the candidate interstate access improvements was converted to equivalent dollars considering items such as:

- Number of weekdays and weekend days per year (250 workdays)
- Value of time for weekdays equal to \$17.06/hour in 2008 dollars (100% benefit)
- Value of time for weekends equal to \$13.65/hour in 2008 dollars (20% benefit)
- Consumer Price Index (2017 CPI = 246.52, 2008 CPI = 214.429)
- 30-year lifespan for infrastructure (2025 – 2055)
- Regular background traffic growth of 2%

The value of daily delay savings is calculated using the following equation:

$$\text{Value of daily delay savings} = \text{hours of daily delay savings} \times [(250 \text{ weekdays} \times \$17.06/\text{hr.}) + (20\% \times 104 \text{ weekend days} \times \$13.65/\text{hr.})] \times 30 \text{ years} \times [1 / (1.02^{20})] \times (1.02^{30}) \times (246.52 / 214.429)$$

Daily Delay Savings expressed as dollars over 30-year project lifespan (in 2017 dollars)				
	Exit 131	Exit 128	Exit 126	Exit 124
2025 - 2055 Study Corridor	\$271,191,542	\$705,518,759	\$516,946,925	\$246,711,629

Opinion of cost was developed using VDOT cost estimates, where available, inflation adjusted to 2025 dollars. If VDOT cost estimates were not available, planning level estimates were developed using the 2015 VDOT Planning Level Cost spreadsheet tool with costs inflation adjusted to 2025 dollars. The costs presented below only represent surface street and interchange ramp improvements needed for each interchange. I-95 mainline improvements needed between Exit 130 and Exit 126 to accommodate the Exit 128, Exit 126, and Exit 124 interchange improvements are not included in these cost figures. The latest VDOT cost estimate for the I-95 mainline improvements to widen I-95 from 6 to 8 lanes between Exit 130 and 126 is \$72 Million.

Project Cost Estimate (in 2025 dollars)				
	Exit 131	Exit 128	Exit 126	Exit 124
Study Corridor	\$53,675,052	\$160,929,808	\$211,706,540	\$141,435,000

The resulting preliminary ratio between benefit and cost is not a comprehensive Benefit/Cost Analysis but is instead a relative quotient between the limited items identified above.

Relative Benefit/Cost 'Quotient'				
	Exit 131	Exit 128	Exit 126	Exit 124
Study Corridor	5.05	4.38	2.4	1.74