

MD State Highway Administration Project No. M00695172 IS 270 – Innovative Congestion Management Project



MARC Brunswick/Frederick Line Improvement Proposal

MARC Brunswick/Frederick Line & I-270 Improvement Proposal

Commuter rail – cost-effective congestion management for I-270

I-270 and the parallel MARC Brunswick/Frederick Line serve one of the most heavily travelled highway corridors in the region. The mix of long-distance and commuter traffic on I-270 creates peak hour congestion that is among the worst in the area.

In the same corridor, MARC carries nearly 8,000 passengers a day, the same as two lanes of I-270 in each peak direction during rush hour, with less pollution, less energy consumed, fewer accidents, more trip time predictability and less stress. If the MARC trains were not available many of the current rail passengers instead would be driving long distances on I-270.

The Brunswick/Frederick rail lines owned by CSX, and used by the MARC trains, provide an excellent option for expanding capacity in the I-270 corridor, while preserving CSX's ability to move vital freight to our markets and ports. Commuter and freight capacity can be increased almost entirely within the existing right of way, at a cost and in a time frame competitive with highway and heavy rail construction projects in the region.

Investing in U.S. commuter rail lines has proved cost-effective at increasing capacity and reducing vehicle miles traveled while maintaining individual mobility. In our region, Virginia Railway Express's on-going investments in the CSX freight line are increasing ridership and mobility more cost effectively than the HOT lanes on I-495, MD's ICC, or even Phase 2 of Metro's Silver Line (see Appendix A).

This proposal from the Action Committee for Transit (ACT) is an innovative, workable, near-term, \$100 million investment in the Brunswick/Frederick line that stands on its own merits, reduces congestion on I-270, and that can be the first of a longer-term strategy of prudent and coordinated investments to increase capacity in the I-270 corridor without more highway widening.

In the near term, ACT's proposal adds nearly a half lane of capacity at the most congested times of the day. By the year 2040, extensive triple tracking of the CSX line, expanded station parking, better bus feeder service, more trains, storage, and service facilities remove two lanes of traffic each way from I-270. And, icing on the cake, MARC passengers add more ridership and revenue to Metro, TransIT, Ride-On, and other transit systems than do drivers on I-270.

By investing in MARC's Brunswick/Frederick service and the CSX rail line, as ACT proposes, Maryland will reduce congestion on I-270, improve freight and commuter rail service, and support a sustainable future for our State.

Additional MARC trains from/to Frederick to lessen congestion on I-270

For the project budget of \$100 million to innovatively manage congestion on I-270, the Action Committee for Transit (ACT) proposes to add one rush hour train from/to Frederick, as well as a mid-day train to attract trips to Frederick from DC/Montgomery County.

The current timetable of three trains from/to Frederick is shown in Table 1, along with conceptual schedules of the 4th peak period train that ACT proposes. (Specific and exact schedules would have to be worked out with the host railroad CSX, as would the similarly augmented evening service.)

In addition, the added train equipment would make it possible to run a train from the central Washington region to Frederick in the morning, and to return it to Washington Union Station before the commuter rush back to Frederick. Depending on the demand, the midday trains could be oriented towards day visits to Frederick from the DC and Montgomery area, as shown in Table 1a (leave DC at 7:05 am, and return at 3:30 pm). Alternatively the midday service could be oriented towards day visits to Washington from the Frederick area as shown in Table 1b (leave Frederick 9:30 am, and return on any afternoon / evening train).

Table 1a Current Frederick MARC schedule

	Trains from Frederick (read down)			Trains to Frederick (read up)		
Frederick	5:00a	6:05a	7:10a	5:29p	6:59p	8:21p
Gaithersburg	5:55a	7:06a	8:04a	4:36p	6:04p	7:35p
Washington Union Station	6:40a	7:56a	8:52a	3:45p	5:20p	6:40p

Table 1b Proposed conceptual schedule with mid-day oriented to Frederick day visits

Proposed concept	Trains from Frederick (read down)					Trains to Frederick (read up)				
Frederick	5:00a	5:50a	6:20a	7:10a	3:30p	9:00a	5:29p	6:25p	7:23p	8:21p
Gaithersburg	5:55a	6:51a	7:22a	8:04a	4:25p	7:58a	4:36p	5:22p	6:36p	7:31p
Washington Union Station	6:40a	7:41a	8:13a	8:52a	5:10p	7:05a	3:45p	4:45p	5:45p	6:40p

Table 1c Proposed conceptual schedule with mid-day oriented to DC day visits

Proposed concept	Trains from Frederick (read down)					Trains to Frederick (read up)				
Frederick	5:00a	5:50a	6:20a	7:10a	9:30a	9:00a	5:29p	6:25p	7:23p	8:21p
Gaithersburg	5:55a	6:51a	7:22a	8:04a	10:25a	7:58a	4:36p	5:22p	6:36p	7:31p
Washington Union Station	6:40a	7:41a	8:13a	8:52a	11:15a	7:05a	3:45p	4:45p	5:45	6:40p

Capital investment for the additional trains from/to Frederick

The two additional round trips proposed will require investing in sections of triple track so that CSX can continue to reliably serve its global freight customers, Maryland ports, and local businesses. To realize the full potential of the service to Frederick a new platform at Point of Rocks will be needed to allow Frederick trains to load and unload, as will an additional locomotive and five (5) passenger cars. ACT's proposal also includes provisions for contingency, project management, and various other facilities to be determined through negotiations between CSX and the State of Maryland (MTA). Table 2 shows the total cost of \$100 million, broken down into its component parts.

Table 2 – Capital investment for MARC Brunswick/Frederick line improvement
(2016 dollars)

Items	Unit cost	Units	Cost
Locomotive	\$ 4.7 MM each	1	\$ 4.7 MM
Passenger coaches	\$ 2.75 MM each	4	\$ 11.0 MM
Cab car	\$3 .3 MM each	1	\$ 3.3 MM
Platform, Point of Rocks	\$ 8,750 per foot	400	\$ 3.5 MM
Third track, including Barnesville Hill	\$12.8 MM / mile	4	\$ 51.2 MM
Other facilities & contingency	n.a.	n.a.	\$ 14.3 MM
Design, project management	12% of total	n.a.	\$ 12.0 MM
Total Cost			\$ 100.0 MM

One additional trainset is needed to provide the two new round trips. The capital cost includes one locomotive, four regular passenger cars, and one “cab” car to allow driving from either end of the train. The unit costs were based on trainset and 2013 dollar cost information in the Virginia Railway Express 2040 System Plan¹, increased by 10% to allow for inflation.

Today Frederick trains do not stop at Point of Rocks because the station has no platforms on the Frederick branch, only on the Brunswick branch. To enhance ridership and improve accessibility, a new platform is proposed. The unit cost was based on platform lengthening included in the VRE system plan, with length for a five-car train. The cost was increased 25%, both for inflation, and for extra costs of an entirely new platform instead of extending an existing one. Depending on the outcome of negotiations, the cost of pedestrian access to the platform may need to use some of the contingency funds (see below).

Capacity increases identified in prior Maryland Transit Administration (MTA) studies² have included stretches of triple-tracking at Barnesville Hill between south of the Monocacy River and Boyds, as well as smaller stretches elsewhere. The proposal includes the high priority 3 miles of the Barnesville Hill third track, as well as an allowance for additional trackage in locations to be determined. The unit cost was estimated from the average cost of the VRE System Plan triple-tracking of the CSX rail line south of Alexandria VA, with a 15% increase for inflation and potential difficulties.

Design and project management in large infrastructure projects is a significant cost. Because the improvement of the existing rail right-of-way and acquisition of standard train equipment has a well-understood process of implementation, the proposal anticipates that 12% of the \$100 million project cost will be in design (4%) and project management (8%).

The remaining cost to make up the \$100 million is available for other facility improvements such as station parking / access, train storage needs, and other rail line improvements. It also serves as a contingency pool of nearly 20% for the \$73.7 million in physical improvements and train equipment identified in the proposal.

¹ “Final Report, Virginia Railway Express, System Plan 2040 Study”, submitted by Parsons Brinckerhoff, Baltimore Maryland, February 2014; section 5, System Plan Capital Investments.

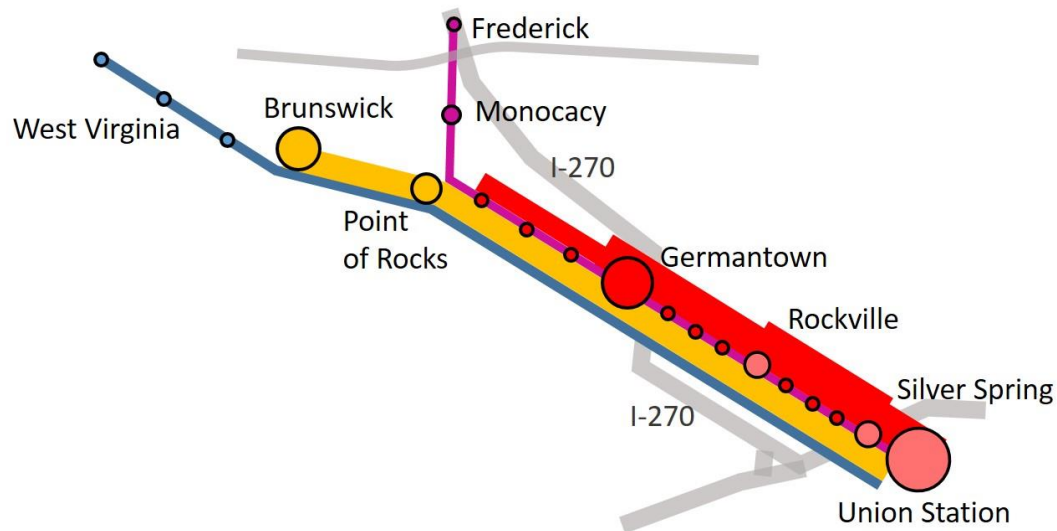
² MTA, “MARC Growth and Investment Plan Update, 2013 to 2050 (Draft)”, September 3, 2013, available at: https://mta.maryland.gov/sites/default/files/mgip_update_2013-09-13.pdf and MTA, “MARC Growth and Investment Plan”, September 2007, available at: <https://mta.maryland.gov/sites/default/files/marcplanfull.pdf>

New MARC riders and increase in I-270 corridor capacity

ACT's proposal to increase rush hour service from/to Frederick and to add a new mid-day service will attract an additional 1,400 passengers daily by 2025 compared to 2015. This translates into 700 new passengers in the peak direction at each rush hour, the equivalent capacity of nearly half a highway lane on I-270 in each direction by 2025.

Passengers on the Brunswick/Frederick line are drawn from all along the I-270 corridor, with about half of the traffic originating from Montgomery County between Dickerson and Rockville, the area of greatest congestion on I-270. The other half of riders come from Brunswick, West Virginia, and Frederick, making longer trips parallel to I-270, but critically also travelling the heaviest traffic stretch of I-270 in Montgomery County.³ Figure 3 shows the distribution of riders originating eastbound, with the size of each station circle showing approximately the number boarding at the station. Three stations shown in pink are the biggest destinations: Rockville, Silver Spring, and above all Union Station. I-270 is shown in grey, along with I-70 and I-495.

Figure 3 Volume and origin of riders on the Brunswick/Frederick line



³ Data from ridership counts conducted in February and March 2012, provided to MTA's MARC Riders Advisory Committee in April 2012, and reported in Schoenbaum, Miriam, "New data show ridership patterns on the Brunswick Line", Greater Greater Washington, April 27, 2012. The post is at <http://greatergreaterwashington.org/post/14528/new-data-show-ridership-patterns-on-the-brunswick-line/>

The Frederick branch ridership is only a third as large the Brunswick branch's today, largely because Frederick has only half the service – three trains in the rush hour, compared to 6 for Brunswick. ACT's proposal will increase the trains to four in the rush hour and add a mid-day train. The effect of more frequent service has been quantified in numerous studies and experiences around the country. Values from the most recent Transportation Research Board manual⁴ were used to estimate the change in riders on each section of the line, as shown in Table 4.

Table 4 Change in riders from increased frequency from/to Frederick

	Frederick branch	Montgomery spine	Brunswick & West VA
Increase in rush hour trains	+ 33%	+ 11%	n.a.
Sensitivity to frequency	0.8	0.5	n.a.
% increase in passengers	+ 26.7%	+ 5.5%	n.a.

The increased ridership from frequency will be accompanied by growth due to the capacity provided by the additional trains. The Brunswick/Frederick line ridership grew about 3% a year from 2007 to 2012, but has remained essentially level for the last four years, due to capacity constraints in the trains (seats) and at the stations (parking). Taken together, the added rush hour train will increase riders from 7,980 daily in 2015 to 10,785 in 2025.

With additional investment and capacity, the service can attract and serve many more riders in the years beyond. Even with slower growth after 2025 to 2% annually will result in total ridership during the rush hours will result in over 14,500 weekday riders on the Brunswick/Frederick line. Table 5 shows the contribution of the various branches to this growth.

⁴ Transportation Research Board, "Transit Capacity and Quality of Service Manual, 2nd ed.", National Academy of Sciences, Washington D.C., 2003; p. 1-11. The manual provides a range of sensitivity to peak hour service increase, depending on the current frequency of service. The Montgomery County traffic with trains more frequent than 30 minutes apart are expected to be less sensitive to additional service than the Frederick branch with service 45 minutes apart.

Table 5 Peak month weekday riders in 2015, 2025, and 2040

Year	Frederick branch	Montgomery spine	Brunswick & West VA	Total
2015	840	3,950	3,190	7,980
2025	1,360	5,340	4,085	10,785
2040	1,830	7,185	5,500	14,515

The rush hour capacity per direction is half of these volumes, and the peak congested hour capacity provided is half of the directional volume, taking into account that the peak hour of the rush accounts for more of the traffic, congestion, and passenger load than the shoulder hours.

The passengers carried at the peak hour, and the equivalent lanes of capacity that are provided are shown in Table 6. The ACT proposal results in a lane and half in each direction of capacity in 2025, an increase over today of about half a lane each way. By 2040, with added investment in the MARC Brunswick/Frederick line, the capacity provided and used by passengers would be equivalent to 4 lanes on I-270.

Table 6 Estimation of equivalent lanes provided by Brunswick/Frederick improvements

Year	Passengers at peak	Per direction	Per peak hour	Lane equivalent*	Total lane equivalents
2015 total	7,980	3,990	1,995	1.1	2.2
2025 total	10,785	5,390	2,695	1.5	3.0
<i>Increase over 2015</i>	<i>2,805</i>	<i>1,400</i>	<i>700</i>	<i>0.4</i>	<i>0.8</i>
2040	14,515	7,255	3,630	2.0	4.0
<i>Increase over 2015</i>	<i>6,535</i>	<i>3,265</i>	<i>1,635</i>	<i>0.9</i>	<i>1.8</i>
* Using 1.1 person per vehicle, and 1,600 vehicles / hour / lane					

The additional riders from the mid-day train would not affect rush hour congestion, but would be an added service to the entire line from Frederick through Montgomery County. Based on mid-day experience with other commuter rail lines, the first train would carry fewer trips than at rush hour, but loads on the order of 100 trips each way might be expected initially.

Appendix A Comparison of Virginia commuter rail investment to other major transportation investments in the Washington region

In 2014, Virginia Railway Express published an investment and growth plan for expanding commuter rail in Northern Virginia on CSX and Norfolk Southern rail lines.

In the VRE System Plan Summary, the following comparison was made of various projects in the region, on their costs, capacity, and cost effectiveness.

The VRE Plan does well in terms of incremental capacity, notably compared to the I-495 express lanes. Cost per unit of incremental capacity is lower for VRE's Plan than for any of the other projects, as is its cost for passenger-mile carried.

VRE – Cost-Effective Capacity

The VRE System Plan investments provide more peak capacity than an equivalent amount invested in highways or heavy rail.

Major Washington Area Capital Initiatives

Project	Total Capital Cost (\$M)	Route-Miles Constr.	Incremental Peak Hour Capacity*	Unit Cost/ Capacity Ratio**	Capital / Annual Pass-Mi ***
Express Lanes, I-495	\$1,400	14	3,700	\$26.5	\$10.00
Intercounty Connector, MD	\$2,600	18	9,700	\$14.9	\$7.10
Woodrow Wilson Bridge Replacement	\$2,500	6.5	9,700	\$39.7	\$6.80
Dulles Metrorail – Phase 1	\$2,900	11.7	19,200	\$12.9	\$6.10
VRE Railroad Capacity (System Plan Phase 2)	\$2,000	33.4	7,600	\$7.9	\$4.90

*Capacity in passengers/hr in peak direction, at location of peak demand, over and above existing capacity. Highway capacities assume a portion of peak hour traffic allocated to buses. Metrorail capacity per WMATA standards, at 3 min. peak headways.

**\$M/route-mi. per 1,000 p/hr of incremental capacity provided.

***Assuming peak hour is 15% of daily traffic, annual=daily * 325, avg. trip lengths of 18 mi. for highway, 12 mi. for Metrorail and 25 mi. for rail, and system operates at capacity during peak hour.

Source: 2014 Virginia Railway Express (VRE) System Plan Summary, p. 1; available at <http://www.vre.org/vre/assets/File/VRE%20System%20Plan%20Summary%20Final.pdf>