ITEM 9 - Information
January 19, 2011

Briefing on the Metrobus Priority Corridor Network (PCN) Evaluation Study

Staff Recommendation: Receive briefing on the Metrobus Priority Corridor Network Evaluation study.

Issues: None

Background: The Metrobus Priority Corridor Network Evaluation Study has identified the locations and benefits in 2030 of running way improvements including transit signal priority and exclusive bus lanes on corridors in the region.

WMATA Priority Corridor Network (PCN) Evaluation:
Identification of Running-way Locations and Benefits

Buses operating on surface streets in mixed traffic experience delay from a variety of sources, including traffic congestion, bus stops, traffic signals and passenger movements. As our region continues to grow and economic conditions make bus an ever-more appealing option for travelers of all kinds, Metrobus corridors experience more and more delay. This delay results in increased costs for bus passengers in terms of travel time, and increases the cost of providing bus service: additional buses and operators must be added to maintain desired service frequencies.

One of Metro's proposed solutions to the increasing costs and continued degradation of bus service is the Priority Corridor Network (PCN). Metro has identified 23 high ridership corridors to receive priority treatments, which consist of both service adjustments as well as improvements to the bus (street) runningway. Service adjustments proposed include restructured routes and schedules, skip-stop operations and additional service overlays. Runningway improvements could include bus lanes, transit signal priority, queue jumpers, bus stop location, and off-board fare payment systems.

Metro is moving forward with implementing the service enhancements along many priority corridors, however nearly all runningway improvements require cooperation and coordination with the state and local departments of transportation (DOTs) who own and maintain the bus runningway (street) and bus stop (sidewalk) real estate.

This following executive summary is from a Metro and COG/TPB initiative to evaluate the potential benefits and costs of implementing runningway improvements for the PCN. This study evaluated the need for dedicated bus lanes for the entire PCN, determining which segments could support such high priority treatments and which required a lower level of investment. The study's final report, released on May 10, 2010, concluded that approximately 90 miles of the 235-mile PCN system warranted dedicated bus lanes, while the rest of the network warranted "spot" improvements at defined locations that generate significant travel time delay for buses.

Metro is in the process of sharing these results with the state and local DOTs, working with them to determine how these bus priority treatments can be implemented. Work on some of the corridors has already begun, funded by the $58.8 million TIGER grant awarded to the Transportation Planning Board on behalf of the Washington region. Additional details are provided in the following:

- Table 1: PCN Corridor Improvements Funded with TIGER Grant
- Table 2: Top 10 Priority Corridors for Performance Enhancements ("Hot Spots") for each major jurisdiction
- Map: Top 10 Priority Corridors for Performance Enhancements ("Hot Spots") for each major jurisdiction

Executive Summary: PCN Evaluation Study

This document is a brief summary of the PCN Evaluation study completed at COG with funds from Maryland Department of Transportation (MDOT), District Department of Transportation (DDOT), Virginia Department of Transportation (VDOT) and the Washington Metropolitan Area Transit Authority (WMATA) in the spring of 2010.

The study lays out a long range (2030) vision for bus priority treatments on the existing MetroBus arterial street network and quantifies the benefits such a network would provide including the reduction of Metro operating subsidies, the increase in system ridership and the diversion of trips from the heavy rail network to the surface transit system.

The full report is titled "Priority Corridor Network Running-way Evaluation" and is available on-line at:

http://www.wmata.com/pdfs/planning/PCN_Eval_final_report.pdf

Priority Corridor Network Concept

The region's bus system carries nearly half of all transit trips and connects numerous activity centers not served by Metrorail. In 2003, the Regional Bus Study described a vision for a "Family of Bus Services" that would tailor bus service to different markets around the region, including the development of a network of rapid bus routes that would serve the bus corridors with the heaviest demand. Increasingly, traffic congestion limits the operation efficiency of the bus system. The Priority Corridor Network (PCN) concept was developed with the idea of focusing resources on the most productive lines in the Metrobus system. There are three goals for the PCN:

1. Improve competitiveness of bus transit;
2. Support existing and planned land use and economic development; and
3. Improve efficiency of the transportation system

Typically, a bus spends 50-60% of its run time in motion, 20% serving bus stops and 20% held up in traffic signal or congestion delay. While there are a number of elements to improve the bus customer experience in general, two specific types of improvements are needed to improve travel time specifically. First, a range of service types must be layered upon each other in these corridors to create a "family of service" package focused on meeting numerous market segments within each corridor. Second, improvements along the bus running way (street operations) must be made to reduce time spent at traffic signals and in congestion.

Corridor Selection

Planners identified several key operational bench mark characteristics for corridors to be included in the network including the requirement for existing Metrobus service and high ridership (over 5,000 riders a day). Additionally, consideration was given to jurisdictional equity. Consequently, the PCN currently consists of 23 existing, arterial, bus corridors over

approximately 235 miles of roadway. Nine corridors are in Washington DC, nine in Maryland and five in Virginia. Together, bus routes on these corridors carry more than half of Metrobus daily ridership (approximately 250,000 trips per day).

While the current PCN has 23 corridors, "emerging" corridors are being tracked and if they eclipse the 5,000 riders a day threshold, could be added to the existing network for future evaluation.

Current Status

WMATA has begun service enhancement evaluations and has completed nine corridor studies to date, while 3-4 studies are planned each of the next several years. These studies make recommendations to enhance service operations, including implementation of limited stop, express service overlays. Studies have also noted specific locations of running way improvements such as intersections that would benefit from Transit Signal Priority (TSP) and queue jump implementation. These location specific running way recommendations were the submissions WMATA made to the TIGER I grant application that eventually resulted in the successful award of more than $27 million of bus priority projects along the PCN corridors. .

PCN Evaluation Project

While the service enhancement evaluation studies have been underway, and have noted small intersection-level improvements, a comprehensive study of system-wide bus priority treatment applications had not been conducted. Planners had not quantified the benefits associated with a system of bus priority treatments, in terms of transit ridership, Metrorail capacity relief and operating subsidy benefits from transit priority infrastructure. This lack of quantitative information regarding system benefits of the PCN made advocating for bus priority treatments difficult.

Since the DOTs control both street and traffic signal operations, WMATA does not have the ability to implement improvements without DOT concurrence. Consequently, this study was designed to take a system-level view of the benefits obtained regionwide of bus priority improvements and identify segments where bus only-lanes would be "warranted" in an attempt to both involve, and advocate with, roadway owners for surface transit priority improvements.

Project Purpose

There are three specific reasons for this project:

1. Identification of arterial corridor segments on the existing Metrobus network where running way improvements appear to be most beneficial,

2. Quantification of regional benefits associated with bus-only lane network, and

3. Advocate for infrastructure improvements that meet regional goals identified in the Transportation Planning Board Vision Document.

Project Methodology

Analysis Tools

The analysis uses a planning horizon year of 2030, reflecting sufficient time for the service and running-way improvements to be fully implemented. The regional travel demand model maintained by the Council of Governments (COG) was identified as the most appropriate tool for analysis since the evaluation needed to be regional, , and sensitive to travel impacts for both transit and automobile trips.

Funding

The study was funded through the Transportation Planning Board's UPWP Technical Funds. WMATA, Maryland Department of Transportation (MDOT), Virginia Department of Transportation (VDOT) and the District Department of Transportation (DDOT) all contributed technical assistance funds for the study and provided active participants on the Technical Advisory Committee (TAC).

Stakeholder Participation

Aside from the DOTs, TAC membership included a number of jurisdictional staff associated with either transit or roadway operations, including Arlington County, Fairfax County, City of Alexandria, City of Fairfax, Montgomery County and Prince Georges County to name a few.

Research

A national review was conducted regarding four treatments being analyzed for effectiveness as part of this study:

- Exclusive transit lanes
- Queue jumpers
- Transit Signal Priority
- Limited stop service

Locations around the county where these treatments have been implemented were studied to determine the actual, realized, time savings of each treatment type. The project team then developed input assumptions for the regional travel demand model based on this research.

Since the regional travel demand model assigns mode choice based on trip times, time savings on a per mile basis associated with the national research described above was input to represent the presence of bus priority improvements.

Concurrently, all 235 miles of the PCN were divided into homogeneous segments of approximately 2-3 miles each. Segmentation was based on land use typology and roadway geometrics (ie number of lanes, design speeds etc), which allowed the analysis discussed in the next section to be vague enough to avoid specific intersection discussions, but specific enough to account for variations in corridor operating characteristics.

Analysis

Analysis of the PCN bus priority needs was completed using the COG cooperative land use forecast 7.1 and the regional travel demand model version 3.2. The 2030 baseline run was based on 2030 travel demand, and included all projects in the 2008 CLRP to account for previously planned transit infrastructure projects.

The evaluation compared three scenarios against the 2030 Baseline:

- 2030 Service Only Improvements
- 2030 Full Build Priority Improvements
- 2030 Modified Priority Improvements

The Full Build scenario assumed that all of the segments in the 235 mile PCN took a lane from general traffic for transit-only use in 2030. In order to simulate the service enhancements in the modeled environment, the team assumed 10 minute headway overlay service on all of the PCN corridors while keeping the base, local route headways the same as baseline model conditions.

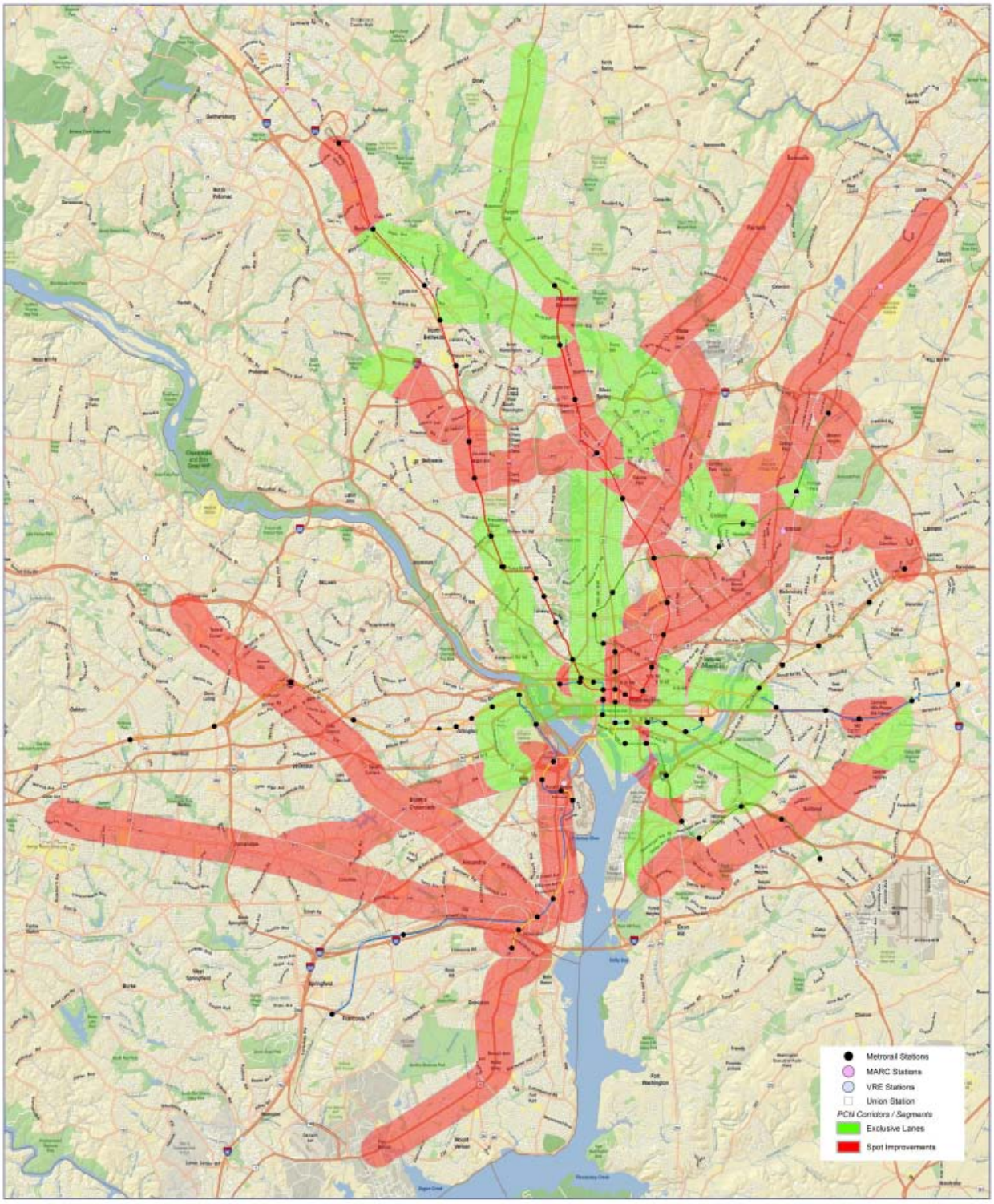
Results from each segment were then analyzed to determine if a bus-only lane was “warranted” based on two auto related and two transit related criteria:

- 2030 Bus Ridership
- Change in bus ridership 2030 no build vs. 2030 full build
- Adjacent lane volume/capacity ratio
- Reduction in auto trips

Reviewing the quantitative results of these criteria for each segment created a basic “warrant” check and helped determine the segments where transit-only travel lanes were and were not justified. For the segments where a transit-only lane was not justified, it was assumed that small intersection- level running-way improvements would still be made in order to support the PCN system such as transit signal priority or queue jump implementation.

The resulting network was called the “Modified” network. Approximately 90 miles of the total 235 mile PCN system “warranted” a bus only lane, while the rest of the system only warranted spot level improvements, as shown in Figure 1 below.

FIGURE 1 : Modified PCN Bus Priority Network



Results

Scenario	*Operational Cost (over 20 years, in $millions)*	*Capital Cost (in $millions)*	*New Transit Riders*	*Transit Riders Diverted from Rail*
Service Only	$1,200	$0		
Full Build	<$840	$1,175	>115,000	>100,000
Modified	$840	$500	>100,000	>90,000

The modified network attracted over 100,000 new daily transit riders to the regional system. Additionally, the modified network diverted over 90,000 daily riders from the Metrorail system, relieving some of the capacity concerns on the system and diverting major capital expansion of the heavy rail system by a number of years. The transit ridership in the PCN corridors themselves increased 25% over the baseline 2030 analysis.

From the individual traveler's perspective, the modified network increased average bus speeds by 15% and decreased travel time for the average PCN transit rider by 10%. Alternatively, average daily auto vehicle hours increased slightly (2%) for those auto trips on the PCN corridors as drivers either took alternate routes or experienced a slight increase in traffic congestion. However, no significant impact on regional VMT was observed.

In addition to conducting the three model runs described above, a model run that only included service enhancements was conducted in order to ascertain the benefits the network was receiving from the express stop, frequent headway operation. It was found that new ridership was fairly similar under the two scenarios. However, the exclusive lane modified model run diverted substantially more riders from the heavy rail network. Additionally, the bus only lane modified option provides all the benefits of attracting new transit riders, removing some capacity constraints on the heavy rail system, and increasing travel speeds while requiring 175 buses to serve the skip stop overlay service. The service only option, on the other hand, requires over 250 buses to achieve the same benefits, a difference in operating budgets of approximately $360 million (150,000 less operating hours a year over a 20 year period).

This study identifies, from a system perspective, where segments in the regional PCN network warrant bus only lanes. However, further study must be conducted along each of the bus only segments when for specific alignment and capital cost issues. That being said, the type of on-street bus lanes analyzed in this report typically cost $5 million a mile. Therefore, if the recommendations from this study were constructed, the total capital cost would be approximately $500 million.

Conclusion

Over the last several years, WMATA has taken an active role in working with local Department of Transportation (DOT) agencies to gain bus priority improvements that address the efficiency (operating costs) and effectiveness (ridership growth) of surface transit in the Washington DC region. Although WMATA does not own or operate any road segments or traffic signals in the

region, we have advocated for optimal use of existing surface transportation infrastructure through bus priority treatments. Aside from ridership and livability benefits, bus priority treatments also lower operating costs, as demonstrated with the PCN Evaluation study, which showed large surface transit ridership gains while reducing operating costs by $360 million over 20 years when compared to the service only enhancement scenario.

Table 1 – PCN Corridor Improvements Funded with TIGER Grant

PCN Corridor	Lead Implementing Agency	TIGER Funding (millions)	Description
14th Street	DDOT	$ 5.200	Real time arrival displays and transit signal priority connecting the 14th Street Bridge with K Street
16th Street	DDOT	$ 1.295	Real time arrival displays and transit signal priority
Georgia Avenue	DDOT	$ 4.111	Real time arrival displays and transit signal priority and transit only lane between W and Florida
TR Bridge to K Street	DDOT	$ 1.800	Real time arrival displays and transit signal priority
Wisconsin Avenue	DDOT	$ 0.745	Real time arrival displays and transit signal priority
H Street/Benning	DDOT	$ 0.415	Bus stop improvements and real time arrival displays
Route 1 (VA)	City of Alexandria	$ 8.500	Develop BRT transitway in the median of Route 1 in Alexandria
Leesburg Pike	WMATA	$ 1.340	Real time arrival displays and transit signal priority
Addison Road	WMATA	$ 0.200	Bus stop improvements and real time arrival displays
University Boulevard	MDOT	$ 1.262	Bus stop improvements real time arrival displays and transit signal priority
Route 1 (MD)	MDOT	$ 0.805	Queue jump lanes and transit signal priority
Veirs Mill Road	MDOT	$ 0.265	Bus stop improvements real time arrival displays
Total		*$ 25.938*	

Table 2: Top 10 Priority Corridors for Performance Enhancements ("Hot Spots") for each major jurisdiction

DC Corridors

Rank	Corridor	Direction	Start	End	Length (mi)	Average Speed	Buses per Day
1.	I St NW	WB	13th St NW	19th St NW	0.7	6.0	443
2.	11th St NW	NB	Pennsylvania Ave NW	H St NW	0.4	2.5	209
3.	13th St NW	NB	H St NW	K St NW	0.4	6.0	376
4.	H St NW	EB	17th St NW	13th St NW	0.5	6.1	369
5.	Connecticut Ave NW	SB	Dupont Cir	K St NW	0.5	4.7	225
6.	New Hampshire Ave NW	SB	Georgia Ave NW	Sherman Ave NW	0.3	3.5	155
7.	14th St NW	NB	I St NW	Monroe St NW	2.1	6.4	246
8.	14th St NW	SB	Monroe St NW	I St NW	2.1	6.3	205
9.	7th St NW	SB	P St NW	K St NW	0.5	7.4	254
10.	K St NW	EB	20th St NW	13th St NW	0.7	7.2	211

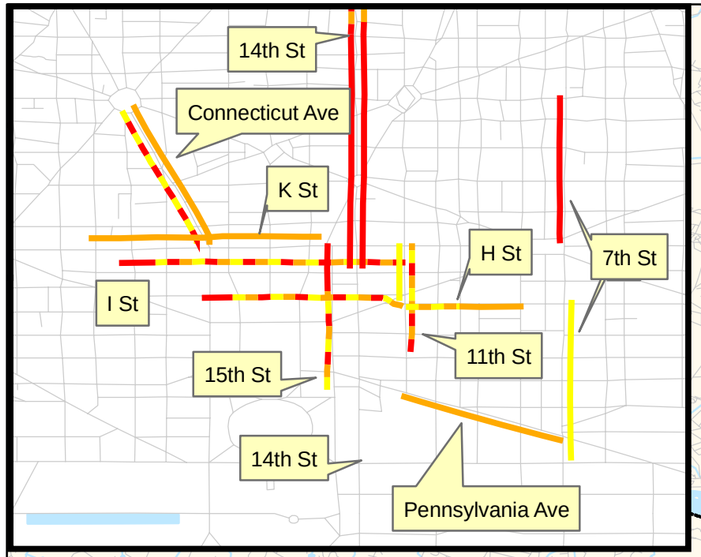
Maryland Corridors

Rank	Corridor	Direction	Start	End	Length	Average Speed	Buses per Day
1.	Georgia Ave	NB	Eastern Ave	Spring St	1.1	7.7	170
2.	East-West Hwy	WB	Georgia Ave	Colesville Rd	0.5	9.5	185
3.	East-West Hwy	WB	Colesville Rd	Connecticut Ave	2.7	7.0	98
4.	US 1	NB	Queensbury Rd	Campus Dr	1.8	3.6	62
5.	University Blvd	WB	New Hampshire Ave	Riggs Rd	0.6	10.7	122
6.	Veirs Mill Rd	EB	Randolph Rd	Georgia Ave	2.3	11.8	145
7.	Wisconsin Ave	NB	Norfolk Ave	Wood Rd	0.5	9.9	83
8.	University Blvd	EB	Colesville Rd	Piney Branch Rd	1.8	11.8	101
9.	Campus Dr	WB	Adelphi Rd	Baltimore Ave	1.3	12.1	110
10.	Georgia Ave	SB	Veirs Mill Rd	Capital Beltway	1.6	12.7	121

Virginia Corridors

Rank	Corridor	Direction	Start	End	Length	Average Speed	Buses per Day
1.	Columbia Pike	WB	Walter Reed Dr	George Mason Dr	0.8	9.1	187
2.	Joyce St	NB	Army Navy Dr	Columbia Pike	0.3	10.4	205
3.	Army Navy Dr	WB	Fern St	Joyce St	0.4	9.7	156
4.	N Barton St	SB	Clarendon Blvd	Pershing St	0.6	2.3	64
5.	Leesburg Pike	WB	Patrick Henry Dr	Arlington Blvd	0.5	10.6	176
6.	Washington St	NB	Duke St	Pendleton St	0.6	11.6	143
7.	Columbia Pike	EB	Walter Reed Dr	Joyce St	1.4	12.1	162
8.	Washington St	SB	Duke St	Capital Beltway	0.6	9.9	92
9.	Columbia Pike	WB	George Mason Dr	Jefferson St	1.1	12.1	161
10.	Arlington Blvd	SB	Queen St	N Pershing Dr	0.8	10.7	106

Top 10 Priority Corridors for Performance Enhancement for Each Jurisdiction



Montgomery

Georgia Ave/ Veirs Mill Rd

Democracy Blvd

University Blvd

Georgia Ave

Campus Dr

Wisconsin Ave

Fenton St

East - West Hwy

US 1

Eastern Ave

14th St

Washington

New Hampshire Ave

Clarendon Blvd

Lee Hwy

Barton St

23rd St

Falls Church

Arlington

Arlington Blvd

Leesburg Pike

Eads St / Army Navy Dr / Joyce St

Prince George's

Fairfax

Columbia Pike

Jefferson Davis Hwy

Alexandria

Washington St

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TRANSPORTATION ENGINEERING/PLANNING

Priority Period

- AM Peak
- PM Peak
- All Day

Washington Metropolitan Area Transportation Authority