Executive Summary

This document is meant as a brief summary and compendium to the PowerPoint presentation regarding the PCN Evaluation study completed by WMATA/COG in the spring of 2010. The full report is available on-line at www.wmata.com

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.

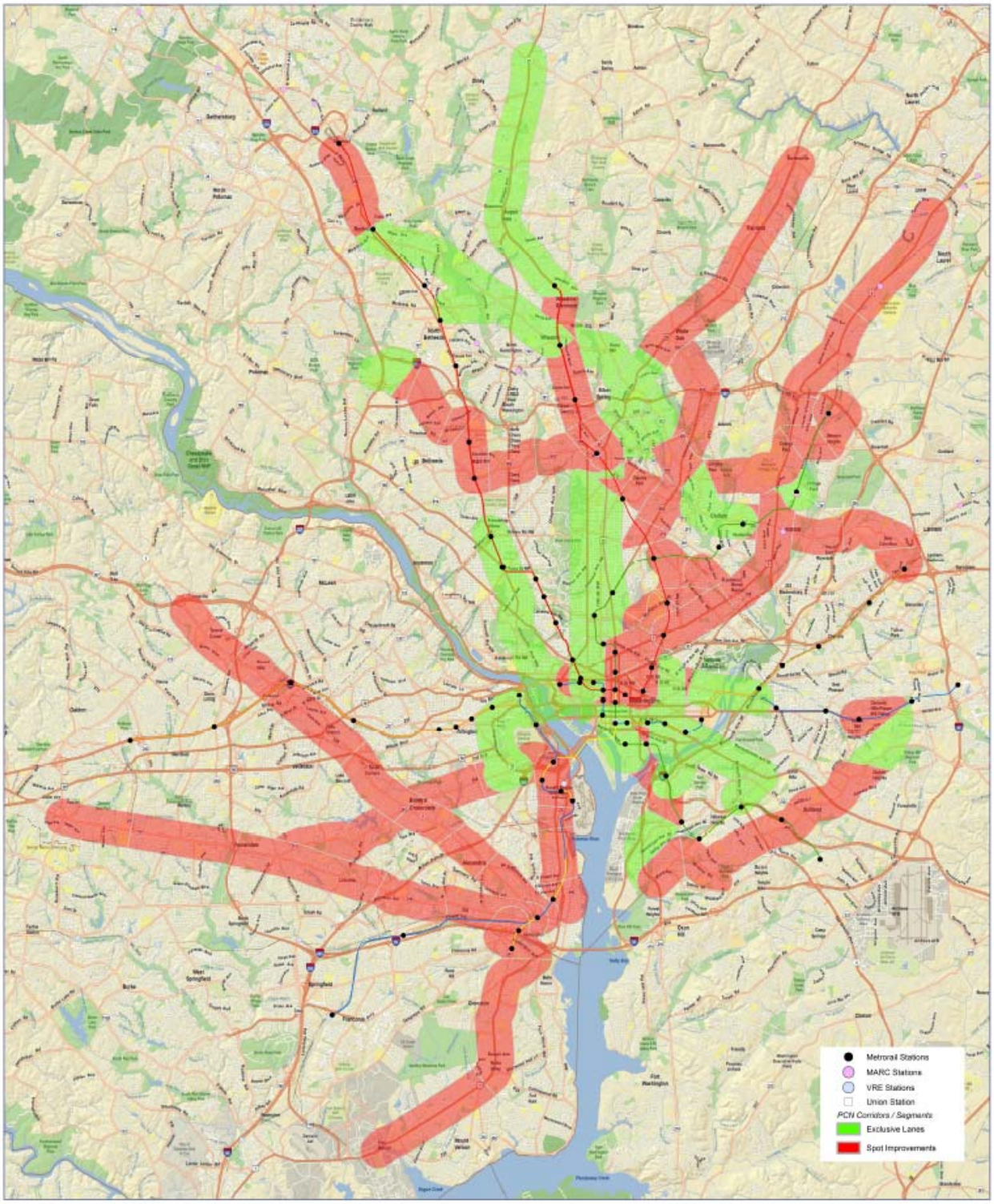
The resulting network was called the "Modified" network. Approximately 90 miles of the total 235 mile PCN system "warranted" a bus only lane, while the rest of the system only warranted spot level improvements, as shown in Figure 1 below.

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.

FIGURE 1 : Modified PCN Bus Priority Network



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.