Mid-Atlantic Area Express (MAAX): Exploring the Feasibility of a Bus Rapid Transit (BRT) System Within the Delaware Region

A Briefing Paper for
BRT Forum of Transportation Stakeholders
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“Our economic vitality and prosperity as a nation are increasingly becoming dependent on our willingness to embrace new transportation strategies.”

—U.S. Secretary of Transportation Mary E. Peters, June 2008

Introduction

The original scope of this research study, funded by the Delaware Center for Transportation, was “A Feasibility Study of Bus Rapid Transit (BRT) in Delaware.” The initial research done by the University of Delaware Institute for Public Administration (IPA) consisted of a review of BRT literature, functioning BRT systems, local demographic information, transit data, and commuting patterns. Based on the analysis of this data and subsequent meetings meeting with local transportation officials, the scope of work evolved from examining the feasibility of deployment of BRT in Delaware to exploring the viability of a regional BRT system.

A number of complex, interrelated issues point to the need for a regional BRT. First, congestion along the I-95 corridor transcends Delaware into its neighboring states—Pennsylvania, Maryland, and New Jersey. As a high-quality, high-capacity transit service, BRT has the potential to increase transit use by commuters during peak-demand periods. When BRT is incorporated with demand-management strategies, regional congestion chokepoints can be more effectively addressed. Second, BRT is needed to enhance mobility, reduce driving, promote transit access to regional employment centers, and support economic growth. Express-transit bus service is already being successfully deployed in Delaware, Maryland, and Pennsylvania. Transit ridership data suggest this service is in high demand. Third, there is a need to proactively build an integrated transit network. Regional transit strategies are warranted to link specific transit connections and/or transportation corridors, develop multi-modal hubs and transportation centers, and provide seamless connections between existing transportation modes. While BRT will not solve the region’s complex transportation issues, it can be developed incrementally and integrated within an overall family of regional transit service options.

Unlike most local conventional bus operations, the proposed BRT system will transcend multiple jurisdictional boundaries and involve multiple transportation stakeholders. Therefore, it is critical to build consensus among transportation stakeholders on a number of important issues. Political commitment, public and private support, and establishment of an appropriate institutional arrangement are essential. While the initial scope of work did not include a forum, the IPA research team, after meeting with several local transportation professionals, felt it was essential to convene a representative group of regional transportation stakeholders.

Problem Statement

A Multi-Faceted Transportation Problem

Our transportation infrastructure is under stress. Roadways that were designed and constructed decades ago are congested, outdated, and strains to meet capacity needs. Metropolitan area growth trends are aggravating roadway conditions to the extent that many infrastructure improvement projects, which are underway or planned, are unable to meet current or projected travel demand. This stress comes at a time when the Federal Highway Trust Fund is faltering
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and state trust funds are being stretched thin by a backlog of transportation infrastructure projects.

The volume of freight and automobile traffic has ballooned in the past two decades. The Federal Highway Administration expects that trend to continue, as more metropolitan areas experience non-peak periods of traffic congestion and become regarded as “chokepoint” regions.¹

So why should Delaware and its neighboring states care? Travel and freight movement problems are tied to related issues of traffic congestion, economic competitiveness, and environment. The concept of planning for megaregions—clusters of neighboring large metropolitan centers that share economic activity and transportation—is gaining favor. The concept suggests that, “With the economic, environmental, and social fortunes of nearby urban areas increasingly linked, there is growing interest in developing new strategies for large-scale regional planning.”² The Philadelphia area is already considered part of the larger Washington-Boston corridor.

While the Philadelphia area (Pa.-N.J.-Del.-Md.) fares better congestion-wise than other similar-size metropolitan areas, it is still costly. In 2005 Philadelphia motorists experienced more than 111,704 hours in traffic delays and wasted in excess of 70,902 gallons of gas at a total cost of over $2 million.³ Moreover, the I-95 at State Route (SR) 1 interchange in Delaware is identified as one of the worse traffic chokepoints in America.

Because Delaware sits at the crossroads of the Northeast Corridor, it is heavily utilized and referred to as “The East Coast’s Main Street.”⁴ The 24-mile stretch of I-95, which runs through Delaware between Pennsylvania and Maryland, carries more than 230,000 vehicles daily. As one of the nation’s busiest freeways, it is a vital link for commerce and travel throughout the Mid-Atlantic region. Meeting travel capacity needs, maintaining good transportation infrastructure, promoting mobility, and providing travel alternatives for access to jobs are critical to the economic viability of the entire Philadelphia area. When accompanied by complementary land-use policies, BRT can promote smart growth practices that enhance job creation, promote transit-oriented development, and spur economic growth.

Finally, traffic congestion has been found to contribute to air-quality problems. The transportation sector accounts for more than 30 percent of all greenhouse-gas emissions in the United States, with over 88 percent of all trips being made by car.⁵ The Philadelphia-Wilmington, Pa.-N.J.-Del., area has been designated by the Environmental Protection Agency as a “non-attainment” area for non-particle National Ambient Air Quality Standards. Public transportation plays an important role in advancing environmental sustainability. Greater transit use can improve air quality, reduce greenhouse-gas emissions, facilitate efficient land-use patterns, and save fuel.

¹ FHWA, n.d.
³ Schrank and Lomax, 2007, p.34.
⁵ APTA, 2008.
New Transportation Strategies Needed
The 2007 Urban Mobility Report observes that, because urban roadway congestion is a complex problem, multiple solutions are required. The report states “…congestion relief is not just a matter of highway and transit agencies building big projects.” The report notes that, while there are a number of strategies being implemented to address urban congestion problems, “the supply of solutions is not being implemented at a rate anywhere near the rate of travel demand growth.”

New transportation strategies are needed to solve mobility problems in metropolitan areas. The solutions vary but should consist of a combination of policies, practices, infrastructure improvements, and transit options. An inclusive approach includes the continued funding of roadway improvements and transportation assets, seeking alternative transportation financing mechanisms, exerting political pressure for federal reauthorization of SAFETEA-LU, integrating land-use planning with transportation, facilitating more efficient freight movement along the Northeast Corridor, utilizing technology to manage transportation systems and demand, and investing in integrated, multi-modal transit options.

Transportation influences the regional economy, environment, community livability, and quality of life. BRT is one component in a comprehensive, multi-modal transportation system that can enhance public transportation and mobility options. While there is no “one-size-fits-all” approach to BRT, it can provide an alternative to driving and provide more transportation options to commuters. BRT can promote a more efficient transportation system by supplementing existing transit services, improving the reliability of public transportation, and providing linkages to other modes of transportation such as bus or rail. BRT supports economic development goals by efficiently transporting people to jobs, connecting major centers of commerce and employment, providing transportation linkages that cross state lines, and promoting transit-supportive land development.

Research finds that “best-practice” BRT systems are designed and implemented as part of an integrated transit system and set of mobility options. BRT systems may serve as a “spine” that serves a functional network of public-transportation corridors, connects major employment centers or transit hubs, provides modal integration, and attracts “choice” riders who normally commute to work by car.

BRT may also be implemented in conjunction with transportation demand-management strategies. One such strategy includes value pricing or dedicated, HOT lanes that establish or variably set toll rates based on peak periods of demand. Another demand-management strategy includes the use of intelligent transportation systems and technology (ITS) that provide traffic signal prioritization and optimizes intersection performance.

It is important to emphasize that a BRT system may be incrementally developed and evolve gradually. The operational scope of a BRT system reflects the available funding, political will, level of public-private commitment, and a response to customer needs. Often a new BRT service is a hybrid that exhibits some characteristics of BRT but does not operate yet as a full BRT system. In other cases, BRT systems in metropolitan areas have been designed as a cost-effective “place holder” for future light-rail service. A Transportation Cooperative Research

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6 Schrank and Lomax, 2007, p.1
Board report indicates that “BRT can be used to reserve right-of-way, build transit markets, spur transit-oriented development, and build community support,” if it is incrementally developed and designed for future conversion to rail transit.\(^7\)

**What is BRT?**

The Federal Transit Administration (FTA) defines BRT as an “enhanced bus system that operates on bus lanes or other transitways in order to combine the flexibility of buses with the efficiency of rail.”\(^8\) The Transportation Cooperative Research Board further defines BRT as a “flexible, rubber-tired rapid-transit mode that combines stations, vehicles, services, running ways, and Intelligent Transportation System (ITS) elements into an integrated system with a strong positive identity that evokes a unique image.”\(^9\)

While characteristics of a BRT system may vary, it may include the following general elements:

- **Running ways** – Dedicated running ways or exclusive transit lanes can increase speed, reduce travel time, and facilitate peak-period travel by commuters. In cases where BRT operates in general traffic, traffic signalization and intersection improvements allow BRT vehicles to “queue jump” and receive priority over stopped traffic.
- **Stations** – While the size varies from smaller, protected shelters to large transit hubs, BRT stations provide level boarding and alighting, a consistent “branded” appearance, and high-quality, attractive amenities. BRT stations often serve as focal points of transit-oriented development.
- **Vehicles** – BRT vehicles have a sleek, modern, “branded” appearance and accommodate a high capacity of riders. With multiple doors and low profile, the vehicles promote quick boarding and exiting. Many vehicles use clean fuels with low or zero emissions.
- **Service** – BRT provides frequent, all-day service with frequent headway intervals.
- **Route Structure** – BRT offers a simple, direct-route layout and focuses on service to major transit hubs or activity centers. Transfers to other conventional transit service are seamless and convenient.
- **Fare Collection** – Prepaid, off-vehicle fare collection is fast and easy. Often, “Smart Card” technology is used, and fare integration exists among routes, corridors, and feeder services by other regional transit systems.
- **ITS** – The use of advanced technologies enhances operating efficiencies and improves customer convenience, reliability, and safety.\(^10\)

A key advantage of BRT is that a system can be installed in phases. Initial funding may be used to develop routes, priority rights-of-way, and stations. Subsequent funding can continue to bolster amenities, upgrade to more advanced versions of key elements (e.g., stations, vehicles, fare-collection systems), increase service, relocate services to an off-road running way or augment a segregated right-of-way, and extend the system corridor. Still, it is important that the project have enough recognizable elements of BRT to achieve real service improvements.

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\(^7\) Transit Cooperative Research Board, 2003, pp. 9-14.
\(^8\) FTA, n.d.
\(^10\) Gray et al, p. 6.
Where has BRT Been Deployed?

Based on guidelines for a successful BRT system, a region considering BRT ideally should have

• Large urban areas where peak-period and all-day passenger flows warrant frequent service.
• One or more strong anchors, such as a major activity or employment center.
• An area population that generally exceeds 750,000.
• A central area of employment of at least 50,000.
• Streets and corridors with existing long, heavily traveled bus routes.\textsuperscript{11}

Many metropolitan areas in the United States already utilize BRT as an integral component of their transit systems. To provide perspectives of the various operations, several successful systems were studied. These particular systems were chosen either for their relevance to Delaware based on population base or due to their flourishing operations. Features of these systems are summarized below.

**Emerald Express “EmX” – Eugene, Oregon**

Operated by the Lane Transit District, EmX serves the Eugene and Springfield areas in Oregon’s Emerald Valley. Eugene and Springfield have a combined estimated 2006 population of 205,596. Lane County, where the cities are located, has a population of 322,959.\textsuperscript{12}

The initial line of the EmX system, the Green Line, was launched on January 15, 2007. The Green Line is a four-mile route that uses dedicated single and dual bus lanes for about 60 percent of the route. For the remaining 40 percent of the route, buses operate in mixed traffic, relying on signal priority and queue-jump lanes to maneuver through other vehicle traffic. There are ten stops along the route with eight enhanced stations every half mile. Currently, passengers do not pay a fare for the service, but plans exist to implement off-board fare-collection machines after the system expands. Weekday headways for the Green Line are ten minutes, with evening and weekend headways of 15-20 minutes. Since it was launched, corridor ridership increased by almost 50 percent, with average daily boardings of 4,700.\textsuperscript{13}

**Metropolitan Area Express “MAX” – Las Vegas, Nevada**

MAX operates in the Las Vegas, which has a 2006 estimated metropolitan population of 1,777,539. Launched in June 2004, MAX was designed to resemble a futuristic, rail-like system, using sleek vehicles, attractively designed stations, and unique coloring and logos. MAX runs along a 7.8-mile route on the Las Vegas Boulevard that is one of the area’s busiest bus routes. During its first five months of operation, total transit ridership increased by 25 percent.

The route has 4.5 miles of semi-dedicated lanes, with BRT sharing lanes with other transit and right-turning vehicles. The other three miles of the route use mixed-traffic lanes. There is one queue-jump lane at a congested intersection. MAX buses use traffic-signal priority at more than 20 intersections to shorten red lights or extend green lights. Stations are approximately one mile

\textsuperscript{11} Kittelson & Associates, et al., 2007
\textsuperscript{12} U.S. Census Bureau.
\textsuperscript{13} Lane Transit District, 2007 and The Bus Rapid Transit Policy Center, 2007.
apart, with 11 stations in each direction. MAX operates each day from 5 a.m. to 10 p.m. Headways are 12 minutes from 5 a.m. to 7 p.m., and 15 minutes from 7 p.m. to 10 p.m.

Fare collection is off-board; the current fare the same as conventional bus service, $1.25. Ten articulated diesel-electric buses operate on the route, with total capacity of 120 passengers. Eight of the low-level boarding buses are in operation at a time.  

Busways – Pittsburgh, Pennsylvania
Pittsburgh, Pa., has an estimated population of 2.4 million. The Port Authority of Allegheny County runs three BRT lines for Pittsburgh and the surrounding region: the South, East, and West Busways. Each of the busways has similar characteristics such as the use of traffic-light synchronization and route termination in the central business district of Pittsburgh.

The South Busway opened in 1977 and is the oldest operating busway in the United States. The busway is 4.3 miles long, and 14 bus routes operate on all or part of the South Busway’s two exclusive bus lanes. There are nine stops along the busway. The Martin Luther King, Jr., East Busway opened in February 1983. There are nine stations along the 9.1-mile busway, and 34 bus routes use at least part of the busway. Headways range from 12 minutes during peak hours to 20 minutes on Sundays. Fare collection is on the vehicle. The West Busway launched in September 2000 and is a five-mile exclusive roadway along an unused railroad right-of-way. Eight bus routes operate along the West Busway, which also serves the airport. There are six stations located along the West Busway.  

Why BRT?
Advantages of BRT Over Light Rail
BRT systems have several advantages over light-rail systems. Depending on the design of the system, capital costs of a BRT system can be lower than light-rail systems but offer similar passenger capacity, performance, and service levels. Most BRT systems can be planned and implemented more quickly than comparable light-rail systems. Unlike light rail, BRT systems can be developed incrementally, expand in stages, and provide operating flexibility in terms of route adjustments.

According to Breakthrough Technologies Institute, the cost of constructing a heavy-rail system in the U.S. averages over $200 million per mile, while construction of a light-rail system averages over $70 million per mile. In contrast, most BRT systems in the U.S. cost less than $25 million per mile to construct.  

Capital Costs/Costs per Mile of BRT
Capital costs of a new BRT system vary but may include costs of design and engineering; required pre-construction studies; roadway and infrastructure improvements; the construction of running ways, stations, park-and-ride facilities or improvements, and storage facilities; vehicle

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16 Breakthrough Technologies Institute, 2007, p. 4.
procurement; and ITS. Operating costs of a BRT system also fluctuate but are governed by fuel costs, maintenance, ridership levels, service plan features, marketing costs, fare-collection systems, labor and personnel costs, performance monitoring systems, and ITS.

The table below illustrates the total capital costs and cost per mile of constructing major BRT systems in the United States. Capital costs for the Busways and EmX systems exclude costs of vehicles. The capital costs for Pittsburgh’s West Busways is also atypical because it involved costly reconstruction of a tunnel and over difficult terrain. In some cases, capital costs may include both design and engineering.

### BRT Capital Costs

<table>
<thead>
<tr>
<th>CITY</th>
<th>TRANSIT ENTITY</th>
<th>PHASE</th>
<th>YEAR OPERATIONAL</th>
<th>LENGTH IN MILES</th>
<th>TOTAL CAPITAL COST</th>
<th>COST PER MILE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pittsburgh, Pa.</td>
<td>Busways</td>
<td>South Busways</td>
<td>1977</td>
<td>4.3</td>
<td>$27M</td>
<td>$6M</td>
</tr>
<tr>
<td></td>
<td></td>
<td>East Busways</td>
<td>1983</td>
<td>6.8</td>
<td>$113M</td>
<td>$16.1M</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>2003</td>
<td>2.3</td>
<td>$69M</td>
<td>$30M</td>
</tr>
<tr>
<td></td>
<td></td>
<td>West Busways</td>
<td>2000</td>
<td>5.0</td>
<td>$275</td>
<td></td>
</tr>
<tr>
<td>Eugene, Ore.</td>
<td>Lane Transit District</td>
<td>EmX Green Line</td>
<td>2007</td>
<td>4.0</td>
<td>$25M</td>
<td>$6.25M</td>
</tr>
<tr>
<td>Las Vegas, Nev.</td>
<td>RTC of S. Nevada</td>
<td>North MAX Line</td>
<td>2004</td>
<td>7.8</td>
<td>$20.3M</td>
<td>$2.8M</td>
</tr>
<tr>
<td>Cleveland, Ohio</td>
<td>GCRTA</td>
<td>Euclid Corridor Rapid Transit</td>
<td>2008</td>
<td>6.7</td>
<td>$168.4M</td>
<td>$25M</td>
</tr>
<tr>
<td>Kansas City, Kan. &amp; Mo.</td>
<td>KCATA</td>
<td>Metro Area Express (MAX)</td>
<td>2005</td>
<td>23.8</td>
<td>$21M</td>
<td>$2.3M</td>
</tr>
<tr>
<td>Boston, Mass.</td>
<td>MBTA</td>
<td>Boston Silver Line (Phase I)</td>
<td>2002</td>
<td>2.3</td>
<td>$27.3M</td>
<td>$5.77M</td>
</tr>
<tr>
<td>Orlando, Fla.</td>
<td>Central Florida RTA</td>
<td>Lynx Lymmo</td>
<td>1997</td>
<td>3.0</td>
<td>$21M</td>
<td>$7M</td>
</tr>
</tbody>
</table>

Information derived from Bus Rapid Transit Policy Center Database, www.gobrt.org
Funding of BRT Systems

There are several funding sources that support the development of BRT systems. The following section provides a brief overview of the maze of funding options which, because of costs involved in the deployment of BRT, will need be substantially leveraged with other funding sources and public-private partnerships. It should also be noted that the reauthorization of SAFETEA-LU is slated to expire in 2009. It is expected that a new authorization and significant program changes will take place.17

Federal SAFETEA-LU Program

The passage of SAFETEA-LU in 2005 provides $6.6 billion in New Starts funding through 2009, including $600 million specifically for Small Starts projects. Funding for the New Starts and Small Starts programs is provided in the form of capital-investment grants (CIG). All transportation investment projects in metropolitan areas must emerge from a regional, multimodal planning process. The type of project funding is based on the scope of the transit investment project and grant amount sought, as follows:

- **New Starts projects** are those with a total cost that exceeds $250 million and requires more than $75 million in federal funding.
- **Small Starts projects** are major transit investment projects with a total project cost of less than $250 million and that require no more than $75 million in federal funding.
- **Very Small Starts** provides funding for low-risk, low-cost transit investment projects. These projects qualify for a simpler evaluation and rating process by FTA.

Federal Highway Administration (FHWA) Programs under SAFETEA-LU

- **Bus and Bus Facilities Program (Section 5309)** provides public-transit providers with funds to replace, rehabilitate, and purchase buses and construct bus-related facility projects. Eligible capital projects include the acquisition of new or replacement buses, bus maintenance and administrative facilities, transfer facilities, transportation centers, intermodal terminals, park-and-ride stations, bus rebuilds, bus preventive maintenance, accessory equipment, passenger amenities, and bus-maintenance equipment.

Highway Funds or Flexible Funds

- **Congestion Mitigation and Air Quality Improvement Program (CMAQ)** is jointly administered by FTA and FHWA for projects that impact air quality, including public-transportation improvements, transportation-demand management, traffic-flow improvements, alternative-fuel projects, and ITS.
- **Surface Transportation Program (STP)** provides flexible funding to states and local governments for projects on any federally aided highway. Examples of transportation capital projects that may be funded include public bus terminals and facilities, public transit, and corridor parking facilities.

Urbanized Area Formula Grants (Section 5307)

This program funds capital activities in urban areas such as bus and bus-related activities, fixed-use guideway systems, leasing of capital projects, capital maintenance costs, joint development

17 Vazzalo, 2008.
activities, and transit-related technology or ITS.

Value Pricing Pilot Program
This program provided financial support to pilot programs in states that instituted value pricing by using new tolling strategies and technology. This program facilitates the collection of variable tolls through the use of transponders, Global Positioning Systems (GPS), or cameras. Funds are no longer available as these funds were awarded to Urban Partnership projects.

U.S. Department of Transportation (DOT)

Urban Partnership Agreements were introduced as a national strategy to reduce congestion on the nation’s roads, rails, runways, and waterways. This initiative is designed to encourage communities to embrace new approaches to reduce congestion through tolling, transit, telecommuting, and technology. However, no new funding solicitations were issued in 2008.

Congressional Earmarks
Earmarks are “funds provided by Congress for projects or programs where the congressional direction circumvents the merit-based or competitive allocation process, or specifies the location or recipient, or otherwise curtails the ability of the Executive Branch to properly manage funds.” While there has been pressure to reform congressional earmarks, it is likely that the practice will continue. Therefore, congressional earmarks should not be discounted as a viable source of transportation project funding.

Other Funding Sources
- Value Pricing or Toll-Road Financing involves instituting user charges that vary by time of day and demand during peak periods of travel. Vehicles are equipped with electronic transponders, which are read by overhead antennas. Toll rates may be either established based on peak periods of demand or be set “dynamically” to respond to changing levels of traffic congestion.
- Public Funds at the state and local level may be budgeted to support costs of public transportation. Local financing strategies to fund public transportation include the establishment of tax increment–financing districts, creation of benefit-assessment or -development districts, or the issuance of project-specific bonds.
- Transportation Finance and Innovation Act is designed to provide credit assistance on flexible terms directly to public-private sponsors of major surface transportation projects to assist them in gaining access to the capital markets.
- State Infrastructure Banks (SIBs) are revolving-loan funds for transportation projects, which are enabled by cooperative agreements between state DOTs and the U.S. DOT. Any eligible private or public entity may apply for SIB assistance if the project is classified as a highway project, transit capital project, or bikeway- or pedestrian-access project on a highway right-of-way.
- Public-Private Partnerships (PPPs) are defined as contractual agreements formed between a public agency and private-sector entity that allow for greater private sector participation in the delivery of transportation projects. Types of PPPs include transit joint development partnerships, private-activity bonds, private company support, and fee-based contract services.

Is a Regional BRT System Feasible?

Looking at the four-state region under consideration (Figure 1), it is apparent how politically, economically, and socially diverse it is. It encompasses parts of nine counties: New Castle and Kent Counties in Delaware; Cecil and Harford Counties in Maryland; Salem County in New Jersey; and Philadelphia, Chester, Montgomery and Delaware Counties in Pennsylvania. However, regardless of the diversity within the region, the counties exhibit similar trends.

Figure 1. Political Jurisdictions
Regional Demographic Trends
A May 2007 WILMAPCO data report examines regional population trends and household growth projections between 2000 and 2030. The report provides regional comparisons of population change in the 16 counties surrounding the WILMAPCO region, including the nine counties that are being considered in this regional BRT study. Significant regional population trends, as indicated by the WILMAPCO data report are summarized below:19

- By 2030, New Castle and Kent Counties in Delaware; Cecil and Harford Counties in Maryland; Salem County, New Jersey; and Philadelphia, Chester, Montgomery, and Delaware counties in Pennsylvania may reach a combined population of over 4.8 M.
- By 2030, the WILMAPCO region (New Castle County, Del., and Cecil County, Md.) is anticipated to have a combined population of 761,293.
- Within the study area, six of the nine jurisdictions are projected to experience double-digit population growth between 2000 and 2030. These include the Delaware counties of New Castle (19.8%) and Kent (49.1%), Maryland counties of Cecil (86.1%) and Harford (29.9%), and Pennsylvania counties of Chester (31.9%) and Montgomery (17.1%).
- Of these jurisdictions, Kent County, Del., Cecil and Harford Counties, Md., and Chester County, Pa., are expected to grow faster than the 28.9% rate projected for the United States between 2000 and 2030.
- Delaware County, Pa., and Philadelphia are projected to lose population, by .7 percent and .8 percent respectively, between 2000 and 2030.

A separate study considered possible impacts related to the Base Realignment and Closure (BRAC) for the Aberdeen Proving Ground (APG) in Maryland. While it is difficult to predict, the APG BRAC may result in a population growth of up to 45,042 in Harford County, Md., and its adjacent seven jurisdictions by 2012.20 In addition, APG BRAC may bring more than 16,500 new households to Harford County, Md., and its seven surrounding jurisdictions by 2012.21

Regional Commuter Patterns
For transportation planning purposes, it is important to have an overall understanding of regional commuter patterns within the potential BRT area. Workers travel across state boundaries to diverse job opportunities and employment centers. Data reveal that the modal choice for the majority of commuters in the region is the car. In 1990, cars were the modal choice for 80 percent of all commuters in seven of the nine counties within the study area; this figure grew to 85 percent by 1996. Not only are more cars on the road within the region, but traffic is growing and commuter time is becoming longer. Specific data indicate

- Traffic has grown in the Delaware Valley by 10.5% between 1990 and 1995. All sections of the region where Delaware Valley Regional Planning Commission (DVRPC) traffic counts occur have shown traffic increases since 1990.22
- Travel time to work in all counties continued to rise between 1990 and 2006.
- By 2006, every county in the study area showed an increase in the percentage of commuters reporting trips of over 45 minutes by 2006.

19 WILMAPCO, 2007
21 Ibid.
22 DVRPC, n.d.
• New Castle County, Del., is a net importer of commuter traffic. Chester County, Pa., Delaware County, Pa., and Cecil County, Md. showed the highest percentage of ingress of commuters to northern New Castle County, Del.23
• Cecil County, Md., showed a daily egress of roughly 20,000 commuters, as opposed to a roughly 6,000 daily ingress. Commuting patterns may change as a result of the impact of BRAC-related employment in Harford County, Md., which may bring up to 20,000 new jobs to the region by 2012.24

Regional Transit Use
The public transportation network consists of service provided by Delaware’s DART First State (DART), the Philadelphia area’s SEPTA, New Jersey’s NJ Transit, and the Maryland Transportation Administration (MTA). Local fixed-route bus, express bus, and train service is provided within the transit providers’ respective service areas, but seamless connections are lacking among other modes of service and/or other regional providers. Some observations of area transit-use trends include:
• Travel south or west on public transit from Elkton, Md., is problematic. The Maryland Area Regional Commuter (MARC) and MTA routes stop short of connecting to the DART service. Prospective commuters traveling south to APG will be challenged to find public transit.
• The connection between New Castle County and Salem County, N.J., is limited. Only one of the three NJ Transit routes with connections to Carney’s Point crosses the bridge and connects to Wilmington.
• Only the DART U.S. Rt. 301 bus connects commuters between Kent County and New Castle County, Del.
• The SEPTA # 306 and DART # 2 provide bus service along the U.S. Route 202 corridor, which crosses the Pennsylvania-Delaware state line.
• The only option for commuters from Delaware to Philadelphia is the DART/SEPTA R2 commuter rail.
• Examples of commuter bus services that operate within the region include DART’s U.S. Rt. 301 bus to/from Dover and Wilmington, Transportation Management Association of Chester County’s (TMACC) Beeline commuter express service and the SEPTA # 306 service in Chester County, Pa., and MTA’s Commuter Bus to/from the Baltimore, Md., area.

Assessment of Transit Demand
In addition to examining regional demographic trends, commuter patterns, and transit use, other data were considered to assess regional transit demand. Sources of data included WILMAPCO’s Transit Segment Capacity map, Average Annual Daily Traffic map, and WILMAPCO’s 2008 Congestion Management Study (CMS), DVRPC’s Congestion Management Process report, South Jersey Transportation Planning Organization’s (SJTPO) Congestion Management System report, and population-density data. The assessment of data revealed
• Near-capacity ridership between Newark, Del., and Wilmington Del. (On SR 2, and I-95).

23 WILMAPCO, 2005.
• Over 50 percent capacity on U.S. Rt. 40 before redlining again at its merger with U.S. Rt. 13 north towards Wilmington and Philadelphia.
• High demand of DART’s inter-county U.S. Rt. 301 bus route.
• High volumes of traffic on I-95 headed north between Newark and Wilmington, on U.S. Rt. 13 from Delaware County, Pa., to Dover, on U.S. Rt. 202 north from the junction of U.S. Rt. 30 to King of Prussia, Pa., and on I-95 south from Cecil to Harford Counties, Md.
• Using a systems-management approach and four performance measures, the WILMAPCO CMS delineated ten congested corridors within the planning area. These corridors are: City of Newark, SR 213 (Elkton), U.S. Rt. 301 (Middletown), Polly Drummond/Red Mill Rds. to SR 2 (Kirkwood Highway), SR 41 (Pa. to Prices Corner), SR 273 (Harmony Rd. to Airport Rd.), I-95 (SR 273 to Wilmington, City of Wilmington, and Marsh & Silverside Rds.).
• Most all the major thoroughfares from Delaware north to Pennsylvania are congested, such as U.S. Rt. 13 north into Philadelphia, the I-95 corridor between Delaware and Philadelphia, the U.S. Rt. 202 corridor north to King of Prussia.
• SJTPOs Congestion Management System report notes that Carney’s Point in Salem County, N.J., is the primary area in need of transportation enhancements.

2030 Transit Score Based on DVRPC’s “Portable Transit Scoring” Methodology
DVRPC created a regional transit score protocol to “assess the appropriateness of various modes and intensities of transit service” throughout its planning region. The methodology was adapted by WILMAPCO to assess important requisites for various intensities of transit service and assigns a value or score to traffic-analysis zones for current conditions and those expected in the future. A transit score for a particular mode is based on three factors—gross population densities, jobs, and zero-car households per acre.

The table below illustrates how the Transit Score Tool applies each score category to the appropriateness of a particular transit-service investment. WILMAPCO has applied the Transit Score Tool (Figure 2 below), which graphically displays the extent to which transit modal investments may be appropriate in 2030, depending on other planning conditions.

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26 DVRPC, 2006.
### Appropriateness of Transit Service Intensity/Investment by Transit Score Category

<table>
<thead>
<tr>
<th>Transit modal investment</th>
<th>High</th>
<th>Med.-High</th>
<th>Medium</th>
<th>Marginal</th>
<th>Low</th>
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<tr>
<td>Heavy Urban Rail</td>
<td>A</td>
<td>N</td>
<td>N</td>
<td>N</td>
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<tr>
<td>Light Rail Transit (LRT)</td>
<td>A</td>
<td>A</td>
<td>C</td>
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<tr>
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<td>A</td>
<td>C</td>
<td>C</td>
<td>N</td>
</tr>
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<td>A</td>
<td>A</td>
<td>C</td>
<td>N</td>
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<tr>
<td>Bus Lanes</td>
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<td>N</td>
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<tr>
<td>Bus Priority Treatment</td>
<td>A</td>
<td>A</td>
<td>C</td>
<td>N</td>
<td>N</td>
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<tr>
<td>Fixed Route/Line Haul Bus Service</td>
<td>A</td>
<td>A</td>
<td>A</td>
<td>C</td>
<td>N</td>
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<tr>
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<td>A</td>
<td>C</td>
<td>C</td>
<td>C</td>
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<tr>
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<td>A</td>
<td>A</td>
<td>A</td>
<td>A</td>
<td>A</td>
</tr>
</tbody>
</table>

A = Appropriate  C = May be appropriate depending on conditions  N = Not appropriate

**Source:** WILMAPCO, 2008

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**Figure 2.** WILMAPCO map of 2030 Transit Score Based on DVRPC’s “Portable Transit Scoring” Methodology
Figure 3. Map of Potential Pilot BRT Routes/Corridor
Potential Pilot BRT Routes/Corridors

Following a study of BRT systems and analysis of regional trends, IPA conducted a series of meetings to share ideas on the BRT concept and obtain input from select transportation professionals (see Public Involvement and Regional Outreach). As a result, potential pilot BRT routes and corridors were mapped for further consideration, input, and dialogue.

Potential Pilot System Overview

The Potential Pilot BRT Routes/Corridor map (Figure 3 above) illustrates the scope of the potential BRT corridor in the four-state region. The beige overlay on the pilot-routes map shows, in broader terms, areas and corridors potentially suitable for some level of BRT service. The darker thick lines, eight in all, represent potential road-routes for high-amenity buses running within the corridors. The orange circle/stars represent likely hubs, transfers, stops, or destinations.

Comparing the Potential Pilot BRT Routes/Corridors with the Transit Score maps, it is evident that a pilot route may initially operate as a hybrid system and transition later to a full-fledged BRT. Additional input from regional transportation stakeholders is needed to further explore the feasibility of each potential BRT route, rank order each route by priority, and recommend the priority route(s) for further study. A description of the origin and terminus points, transit hubs, and length of each potential BRT routes will be provided in greater detail at the forum event.

Potential Routes within the Corridor

- 301 North/South Main Line and I-95 & U.S. Rt. 13 spurs to Wilmington, Del.
- 301 Points West
- Route 40
- Route 202
- Route 13
- Route 295-NJ
- Lancaster Pike
- Pennsylvania Avenue
Public Involvement and Regional Outreach

Stakeholder-Driven Process
Stakeholder involvement and regional outreach will help shape the vision for a regional BRT system. In this phase of the project, outreach has focused on key transportation professionals. Many transportation colleagues have been involved in this project since its inception last fall and have provided a broad spectrum of regional perspectives, interests, resources, and expertise, regarding the viability of the regional BRT concept. Ideas and suggestions from agencies, stakeholder groups, and transportation professionals have been gathered and integrated into an initial vision for a “new regional interstate and intrastate BRT system serving the Mid-Atlantic area that will be incrementally developed to link communities, centers of commerce, and modes of transportation.”

If consensus is reached that the concept is worth pursuing, subsequent phases of public involvement and regional outreach may include additional focus group workshops, public meetings, open houses, and outreach tools. This level of public engagement is critical to build community awareness, interest, and support for the regional BRT concept.

Input from Transportation Professionals
As the study progressed, and the concept of a regional BRT system emerged, the IPA project team began realized the need to conduct stakeholder involvement and outreach. A major focus of outreach involved a series of meetings to share ideas and obtain input from select transportation professionals. The following individuals graciously offered their time and expertise to help refine and shape the vision of the regional BRT concept:

<table>
<thead>
<tr>
<th>Individuals</th>
<th>Entity(ies)</th>
<th>Date</th>
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<tbody>
<tr>
<td>Catherine Dennis Smith</td>
<td>DTC</td>
<td>September 28, 2007</td>
</tr>
<tr>
<td>Dave Gula</td>
<td>WILMAPCO</td>
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<tr>
<td>Catherine Dennis Smith</td>
<td>DTC</td>
<td>February 14, 2008</td>
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<td>Joe Watson</td>
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<tr>
<td>Jim Johnson</td>
<td>Delaware River Basin Commission</td>
<td>April 29, 2008</td>
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<tr>
<td>Bill Osborne</td>
<td>Transportation Management</td>
<td>June 10, 2008</td>
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<td></td>
<td>Association of Delaware</td>
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<tr>
<td>Tigist Zegeye</td>
<td>WILMAPCO</td>
<td>June 18, 2008</td>
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<tr>
<td>Dave Gula</td>
<td>WILMAPCO</td>
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<tr>
<td>Mike Herron</td>
<td>Chester County Transportation</td>
<td>June 25, 2008</td>
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<td></td>
<td>Management Association</td>
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<tr>
<td>Stephen Kingsberry</td>
<td>DART First State</td>
<td>July 17, 2008</td>
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<td>Kennard Potts</td>
<td>DTC</td>
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<tr>
<td>Catherine Dennis Smith</td>
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<td>Wayne Henderson</td>
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<tr>
<td>Ralph Reeb</td>
<td>DelDOT</td>
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<tr>
<td>Stephen Kingsberry</td>
<td>DART First State</td>
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Site Visit to MTA
In addition to interactive dialogue with transportation professionals, IPA conducted a site visit to MTA on January 16, 2008. Following the interview, IPA was invited to attend a joint MTA and Maryland Department of Transportation (MDOT) meeting to plan for transportation impacts resulting from BRAC in Aberdeen, Maryland. IPA learned that:

- MTA’s Commuter Bus provides express transit service to commuters at a premium price within the Baltimore and Washington, D.C., metropolitan areas.
- Commuter bus operates to peak-travel destinations during peak-travel times on weekdays only. Commuters are able to access the express lines on a first-come, first-served basis from park-and-ride lots throughout the two metropolitan areas.
- MTA contracts for express bus service through four private transportation providers—Dillon Bus Service, Eyre Bus Service, Keller Transportation, and Veolia Transportation.
- Demand for the commuter bus service is at an all-time high. MTA’s Commuter Bus service has seen double-digit ridership increases within the past year.
- MTA/MDOT is exploring the feasibility of a future commuter bus service to provide transportation services to/from the Newark, Del., area and APG in Aberdeen, Md.

Presentation to Delaware Transportation Energy Use Work Group
Another component of the outreach process involved making a presentation on August 28, 2008 to the Delaware Transportation Energy Use Work Group, which is involved in preparing transportation recommendations for the Delaware Energy Plan. The presentation provided an overview of the BRT concept, vision of a regional system, “branded” identity, possible steps toward development of the concept, and need to enlist partners and stakeholders in project development. The work group acknowledged that providing alternative transportation modes saves energy. Meeting notes included BRT as a “concept for potential recommendation” by the work group to reduce vehicle miles traveled as a means to reduce energy use.

Identification of Stakeholders/Project Partners
Because the IPA project team feels strongly that concept for a regional BRT system should be a stakeholder-driven process, considerable time was invested in identifying key transportation stakeholders and potential project partners. For each of the states (Delaware, Maryland, Pennsylvania, and New Jersey) a list of stakeholders/project partners was prepared that includes representatives from:

- State departments of transportation
- State agencies
- Public transit agencies
- Local governments
- Chambers of commerce
- Metropolitan planning organizations
- Private companies
- Economic-development entities
- Elected officials

BRT Forum
Identification of regional transportation stakeholders became the basis of the list of invitees to a November 13, 2008, BRT stakeholders’ forum. The purpose of this forum is to explore the
feasibility of the BRT concept in the Delaware region. One goal of the forum is to foster a regional perspective and approach to shape the vision for the concept and to develop a future plan of action. Another goal is to build consensus and collectively develop a vision for a regional, premium transit service, which supports the economic framework and meets the mobility needs of people within the greater Philadelphia area. Possible outcomes include

- Encouraging innovative thinking, discourse, and action on regional transportation issues.
- Garnering support from transportation stakeholders to seek a regional transportation solution to transportation problems within the Philadelphia metropolitan region.
- Building a foundation for political buy-in to the BRT concept.
- Fostering a coalition that will further develop the vision for an integrated BRT service that may include a distinct identity and unique brand, rail-like appearance, achieve high-peak carrying capacity, some enhanced operational capabilities, and connect to multi-modal transit options.
- Exploring the viability of a new institutional arrangement that supports transportation operations and infrastructure.
- Considering an incremental or phased approach to BRT.
- Developing a consensus on pilot route(s) and a possible demonstration project.
- Focusing on scoping and funding needs, including public-private partnerships.
- Forming a steering committee to move forward on an action plan.

A Response to Regional Transportation Needs

Successful BRT systems serve as a community asset that improves mobility and fosters linkages to jobs, centers of commerce, and community travel destinations. Delaware and its neighboring states lie at the heart of the Northeast Corridor and share considerable volumes of surface transportation—both highway and rail. While a large amount of the transportation serves interstate purposes, there is also a mutual inter-dependence to improve the regional transportation network by establishing a market for BRT, leverage resources, and concurrently engage in long-term planning to achieve land-use and economic-development benefits. This presents an opportunity for partnering states/entities to become catalysts and join forces to explore the viability of a regional BRT system. The MAAX BRT concept, serving the Mid-Atlantic, could provide a means to address congestion, provide additional roadway capacity, and further unite the region as an economic force.

The review of literature and sample BRT systems shows that deployment of this transit mode varies significantly in degrees of sophistication in operations, use of ITS, incremental development, and institutional arrangements for operating entities. The MAAX concept is envisioned as part of a full range of multi-modal transportation options that complements, but does not compete with, existing services offered by regional transit providers. Unlike most local conventional bus operations, the proposed BRT system will transcend multiple jurisdictional boundaries and involve multiple transportation stakeholders. Therefore, it is critical to build consensus among transportation stakeholders on a number of important issues.

Political commitment, public support, and establishment of an appropriate institutional arrangement are essential. Key questions for participants at the BRT forum include:
• How will a new institutional arrangement be created for the new BRT system? How will the operating entity be structured?  
• How can cooperative agreements among transit entities and transportation agencies be established?  
• How should each potential BRT route (Figure 3) be evaluated? Which potential BRT routes should be prioritized as a pilot areas and recommended for further study?  
• How can stakeholders be involved in planning, designing, building, and operating the system?  

Path Forward

Formation of a BRT Steering Committee
As a stakeholder-driven process, the development of the BRT concept should be directed by an executive steering committee that comprises a diverse group of regional leaders. The role of the steering committee is to engage stakeholders, refine the vision of the concept, consider the appropriate institutional setting for the BRT system, and plan for a major investment study of the transportation corridor.

Identification of Additional Stakeholders/Partners
One of the first tasks of the BRT steering committee and project team is to identify a broader group of stakeholders. The level of public involvement must be extensive to inform the public and solicit necessary input. An outreach plan should be prepared to effectively engage the public and/or involve the public through focus groups, task forces, or advisory committees. This process ensures that the process is open, transparent, and responsive to community needs. Public-private partnerships are needed to leverage funding support, develop an investment strategy, consider economic-development opportunities, and maximize funding resources.

Visioning of MAAX
A visioning process, with public-input opportunities, is needed from the onset to incorporate the diverse views of regional stakeholders, decision-makers, and the public-at-large. A series of public meetings, stakeholder interviews, design workshops, and public presentations should be planned to uncover key issues, areas of concern, transportation-improvement opportunities, critical goals, and input on all aspects of a proposed BRT system.

Because BRT is a concept foreign to people within this region, the visioning process may involve “branding” to create a visual identity for the transportation concept. The development of a unique and distinct brand and logo for the vehicles and stations needs to be planned to the same extent as routes, service areas, stop locations, and fares. “MAAX,” or Mid-Atlantic Area Express, is the initial branding name given to the proposed premium-level transportation service. MAAX (or another branding name) will be marketed to attract “choice riders” who normally drive. The branding of a BRT service includes sleek vehicle design, logo, and system identity.

Institutional Setting for a BRT System
States have increasingly encouraged private-sector involvement in the operation of public transportation services, particularly commuter shuttle buses. Several transportation management associations (TMAs) and councils of governments are garnering private company support to
alleviate congestion during peak commuter times. For example, the Regional Transportation Commission of Southern Nevada (RTC) serves a dual role as the region’s metropolitan planning organization and transit operator for the MAX BRT line. RTC contracts with Veolia Transportation, the largest private transportation provider in the U.S., to operate the MAX.

The point is that there is not one ideal institutional setting for a regional BRT entity. A steering committee must consider the best institutional arrangement for a multi-jurisdictional system. From authority-like entities to multi-jurisdictional sponsorship, there are a number of ways to structure an operating entity. Private support is a critical component. The institutional setting must provide sustainability and reinforce the system’s hallmark of providing rapid, reliable, efficient, flexible, and quality service that transcends state lines and connects seamlessly to area transit services.
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