

# Baltimore Regional Management and Operations (M&O) Strategic Deployment Plan



Prepared for:



**Baltimore  
Metropolitan  
Council**

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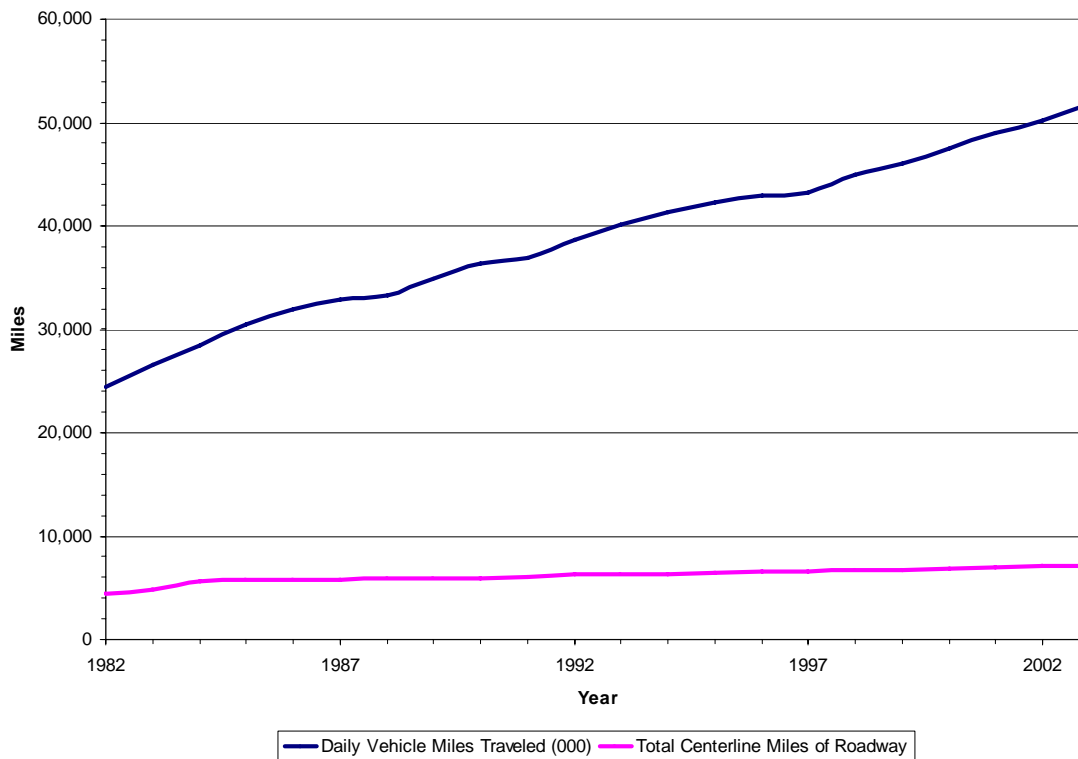
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## EXECUTIVE SUMMARY

### Background

A comparison of 2000 and 2004 mobility data shows a dramatic increase in vehicle miles traveled annually in the Baltimore region. During this four-year period, annual vehicle miles traveled increased by 9.6 percent or 2.1 billion miles.



This graph illustrates the relationship between the rate at which the amount of vehicle miles traveled has increased versus the rate at which roadway miles have increased over time. This relationship illustrates the importance of investing in regional transportation system management and operations (M&O).

One of the tools used to enhance transportation system M&O within the Baltimore region is Intelligent Transportation System (ITS). ITS is described as the application of current and evolving technologies to enhance transportation system safety and mobility.

In 1998, the Baltimore region developed the Metropolitan Baltimore ITS Strategic Deployment Plan which provided a framework for regional ITS deployment and identified nine high priority ITS projects. Since its adoption, significant progress has been made on a number of the identified high priority projects. The status of those nine high priority projects is presented in the succeeding table. This table also indicates whether the project has been initiated as a regional effort.

Other regional transportation system M&O initiatives have evolved since 1998 and are presented below:

- Baltimore Regional Operations Coordination Committee – initiated in 2000 to enhance coordination, cooperation, and communication during incidents impacting the regional transportation network.
- Traffic Signal Subcommittee – initiated in 2001 to provide a forum for the region’s signal engineers to discuss and address common issues.
- Multi-Modal Traveler Information System – a regional initiative to provide accurate and timely traveler information.
- Regional Protective Action Coordination Guidelines – completed in October 2006, this document addresses regional coordination issues arising as a result of a major emergency. Five major areas are covered: command and management, communications, public information, evacuation, and shelter/mass care.

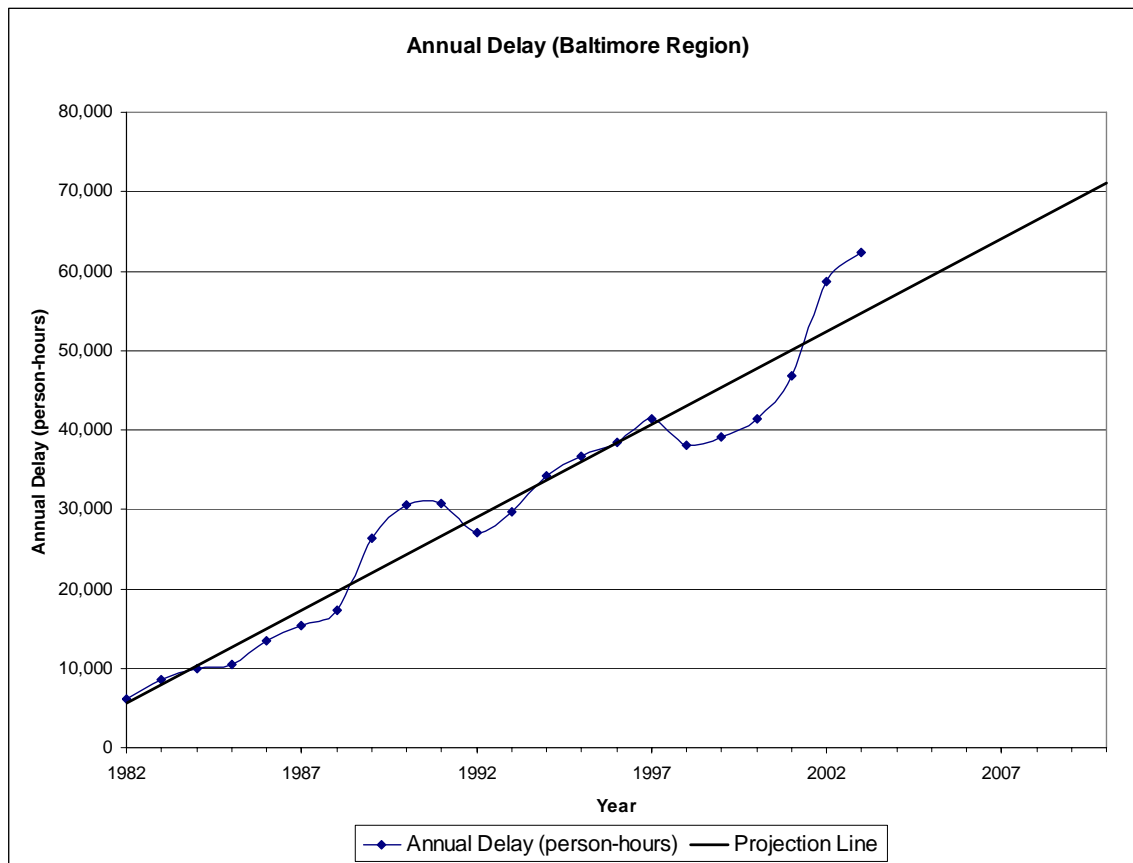
Like many urban areas in the country, the Baltimore region continues to experience increasing levels of congestion and delay on its transportation system, and opportunities to add capacity are severely limited. The safe, secure, reliable and efficient movement of people and goods throughout the Baltimore region is critical to the region’s socio-economic vitality.

This graph shows that annual delay has continuously grown in the Baltimore region. At this rate, annual delay will exceed 70 million person-hours annually. Recent studies<sup>1</sup>, done by the University of Maryland, estimate that delay costs travelers \$19.58/hour. Therefore, it can be projected that delay will cost the region’s travelers over \$1 billion dollars in 2010.

Catastrophic events, such as Hurricane Katrina and the 9/11 terrorist attacks, have heightened the nation’s awareness of the role and importance of transportation system management and operations (M&O) in emergency preparedness, response, and recovery. In addition, safety is a core program of SAFETEA-LU. The SAFETEA-LU Highway Safety Improvement Program targets transportation system M&O improvements such as work zone management.

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<sup>1</sup> Performance Evaluation of CHART – Year 2005



This Plan identifies various transportation system M&O strategies that enable the safe, secure, reliable, and efficient movement of people and goods throughout the Baltimore region and provides a framework for continued expansion of the region's M&O program.

The Baltimore Regional M&O Strategic Deployment Plan scope of work included:

- Updating the 1998 ITS Strategic Deployment Plan, including a review of regional M&O project deployments and development of a new priority project list and a path for deployment of the high priority projects
- Developing a vision for regional M&O deployment and a road map to achieve that vision
- Providing recommendations for continued integration of M&O into the transportation planning process, with consideration given to provisions in SAFETEA-LU
- Providing updates to the Maryland ITS Architecture<sup>2</sup>

<sup>2</sup> See Plan Appendix

**Status of Projects from the Metropolitan Baltimore ITS Strategic Deployment Plan**

Project	Description	Status Update	Reflects Regional Activity
Expand Incident Management Program	Expansion of the areas covered by the state's Emergency Traffic Patrols (ETP's), as well as improved communications among emergency service providers.	ETP coverage has increased but continued funding is required to maintain these services. Improved incident management procedures have shown measurable reductions in incident duration with additional estimated benefits of reduced delay, fuel consumption, and secondary incidents. The Baltimore Regional Operations Coordination (B-ROC) Committee supports interagency communication through training, policy improvements, self-assessments, and other activities. Acceptance and implementation of the Memorandum of Regional Coordination (MORC) may facilitate desired improvements in communications. Continued expansion of the CHART program also supports improved communications.	No
Provide Multi-Modal Traveler Information	An automated, region-wide multi-modal traveler information system that includes real-time traffic and transit information. This will provide both pre-trip and en-route information in a format that is readily accessible to the traveling public such as the telephone and internet.	This project has resulted in the development of a concept of operations, identification of federal funding, and award of a contract to develop, deploy, and operate a regional Multi-Modal Traveler Information System (MMTIS). The system is scheduled for an initial operational release in 2007. Internet access to real-time traffic information will be available as part of the initial release with system enhancements such as real-time transit information and telephone-based access planned for future deployment.	Yes
Provide En-Route Transit Information	The objective of this project is to provide en-route transit/travel information to the public. Real-time information will be relayed to customers using Variable Message Signs (VMS) and interactive kiosks. Location and schedule adherence data from the Automated Vehicle Location (AVL) project will also be applied.	The Maryland Transit Administration (MTA) is deploying information technology to provide AVL based real-time transit information via variable message signs located at the region's busiest transit stops. Other regional transit agencies have successfully deployed real-time transit information systems. Howard Transit utilizes the commercially available NextBus system to provide AVL based real-time transit information via message signs at bus stops and also via the Internet. Regional initiatives such as the MMTIS are expected to leverage available AVL data for transit/travel information services.	No

**Status of Projects from the Metropolitan Baltimore ITS Strategic Deployment Plan**

Project	Description	Status Update	Reflects Regional Activity
Expand Surveillance and Detection	Building on the success of the CHART program, it is suggested that surveillance and detection be expanded to cover all arterial roadways in the Baltimore Metropolitan region. Prime candidates would be those that parallel interstate routes.	Arterial surveillance and detection has been supplemented with CCTV deployments, particularly in Baltimore City, with plans to deploy similar systems in counties such as Anne Arundel and Harford. Not all CCTV systems are integrated with the current CHART program. The MMTIS project will provide surveillance functions to the region by utilizing floating vehicle probe data to monitor conditions on arterial routes.	Yes
Expand Motorist Information	It is proposed that motorist information be provided on major arterial roadways in the Baltimore Metropolitan region in the form of Variable Message Signs (VMS) and Traveler Advisory Radio (TAR).	There has been minimal deployment of VMS and Highway Advisory Radio (HAR) based motorist information services. Baltimore City has deployed VMS to support stadium event traffic management. Plans for regional deployment of a 511-type telephone based interactive voice response system for motorist information have been developed as part of the MMTIS. The SHA conducted a pilot study on I-70 in which travel time information was provided to drivers using VMS.	Yes
Encourage Use/Management of Parking Capacity	The purpose of this project is to encourage the use of transit from satellite parking lots to the downtown area by providing real-time information on available parking.	There has been minimal deployment of advanced parking information systems in the downtown area. Commercial broadcast traffic reports provide limited parking lot information during stadium events. The planned renovation of the Baltimore City Transportation Management Center may support this functionality in the future.	No
Improve Traffic Signal Coordination	The purpose of this project is to improve coordination between Baltimore City and the individual county controlled signal equipment. This will accommodate remote access from the Statewide Operations Center (SOC) to county signal systems for incident management purposes. Emergency vehicle preemption is also of importance.	The Traffic Signal Subcommittee was formed to provide a forum to discuss and plan for coordinated signal control and other options to improve traffic signal system operations. Corridors for interagency coordination have been identified. The planned system-wide update of Baltimore City traffic signal controllers, central signal system equipment, field communication equipment and operating software will support this functionality in the future. Emergency vehicle preemption systems have seen limited deployment throughout the region. Transit preemption has been investigated for the Howard Street Light Rail corridor.	Yes

**Status of Projects from the Metropolitan Baltimore ITS Strategic Deployment Plan**

<b>Project</b>	<b>Description</b>	<b>Status Update</b>	<b>Reflects Regional Activity</b>
Provide a Common Electronic Payment System	This project will develop an electronic payment system to allow travelers to pay for transportation services with a common fare medium.	The MTA has developed plans to deploy an electronic payment system known as Maryland Transit Pass. This system will be integrated with the SmarTrip system currently deployed in the National Capital Region for a planned Maryland statewide electronic payment system for transit services. Additional transportation services may be added to this system in the future. The Maryland Transportation Authority (MdTA) operates EZ Pass, an electronic payment system serving toll facilities in the Baltimore region. This system builds upon the earlier M-TAG system but now supports electronic toll payment through EZ Pass facilities in other states.	No

## **M&O Strategic Deployment Plan Development Approach & Results**

Stakeholder input into the development of the M&O Strategic Deployment Plan was solicited from the Project Steering Committee, through a survey of a wide range of regional stakeholders, and through stakeholder participation in a one-day Visioning Workshop. Information gathered led to the development of regional M&O:

- Vision,
- Needs,
- Goals and Objectives and
- Projects/Strategies.

The regional M&O vision, goals, objectives, strategies and projects are all components of the M&O Strategic Deployment Plan.

Ten survey responses were received from transportation, transit and public safety agencies throughout the region.

In summary, the survey revealed:

- With the exceptions of Maryland State Highway Administration (SHA) and Baltimore City DOT, there has been limited ITS deployed within the Baltimore region.
- Congested roadways exist throughout the region, not just in urban areas.
- Better inter/intra-agency coordination is needed to manage congestion.

On March 30, 2006, a one-day Visioning Workshop was held. The workshop was attended by 30 regional stakeholders from local, state, federal and academic agencies/organizations. During the Visioning Workshop, stakeholders identified regional M&O issues. Those issues were then compiled and ranked.

Leveraging the results of the survey and workshop, a vision for regional transportation system M&O and goals were identified.

### **Regional M&O Vision**

***The Baltimore regional transportation system will be managed and operated such that people and goods arrive at their destinations safely, securely, reliably and efficiently; thereby protecting the environment and supporting economic vitality.***

## Regional M&O Goals

- **Goal 1: Coordinated regional transportation system M&O**

Coordinated transportation system M&O requires the establishment of policies, practices, and procedures that will allow stakeholders to address regional M&O issues in a collaborative manner. The sharing of information between operating agencies is an outcome of coordinated transportation system M&O.

- **Goal 2: Stakeholders educated on the benefits of coordinated transportation system M&O**

In this goal, stakeholders represent regional transportation system planners, operators, senior agency personnel (i.e. decision makers) and users (i.e. the traveling public) and their legislative representatives. Educated stakeholders will promote regionally coordinated transportation system M&O within their own jurisdictions. Stakeholders educated on the benefits of coordinated transportation system M&O are critical to realizing the regional M&O vision.

- **Goal 3: Accessible real-time, multi-modal transportation network condition data**

Access to real-time, multi-modal transportation network condition data will help transportation system operators collaboratively manage the regional transportation network. Access to real-time, multi-modal transportation network condition data will keep transportation system users informed, which allows users to make better trip choices. Transportation system operator and user access to real-time, multi-modal transportation network condition data supports the realization of the regional M&O vision.

- **Goal 4: Allocated funding for regional transportation system M&O initiatives**

Some sources that have been traditionally used to fund regional M&O initiatives no longer exist. Therefore, allocated funding for regional transportation system M&O initiatives is needed to ensure that the regional M&O vision is reached.

- **Goal 5: Secure critical transportation infrastructure and data**

In order to achieve the regional M&O vision, critical transportation infrastructure and data must be reliable. Securing critical transportation infrastructure and data will ensure critical transportation infrastructure and data reliability.

- **Goal 6: Influence roadway design**

M&O initiatives can be implemented most efficiently when done in coordination with roadway/interchange enhancement or construction projects. Through early coordination in the planning and design phases, M&O initiatives can be implemented most cost effectively.

## **Regional M&O Vision Realization**

In order to achieve the regional M&O vision and associated goals, two enabling initiatives and eight high priority projects were identified. The enabling initiatives will provide a basis from which the M&O Strategic Deployment Plan will be executed and maintained and should be implemented prior to or in conjunction with the high priority regional projects. The enabling initiatives outlined below should be undertaken by the BRTB working with the M&O Partnership.

### Enabling Initiatives

*Define BRTB Role in Regional Transportation System M&O.* The role of an MPO in regional transportation system M&O varies from region-to-region. An Association of Metropolitan Planning Organizations (AMPO) White Paper titled, The MPO Role in M&O, defines the “traditional” role of the MPO in M&O as one that merely promotes efficient transportation system M&O as required (initially) by TEA-21. Beyond the “traditional” role, the AMPO White Paper suggests that an MPO could assume the following transportation system M&O responsibilities:

- **Convener** of meetings to facilitate the planning for transportation system M&O improvements.
- **Champion** of plans to improve transportation system M&O efficiency.
- **Developer** of metropolitan-level transportation system M&O plans.
- **Operator** of the metropolitan transportation system.

Using the AMPO White Paper as a starting point, the BRTB needs to define its role in regional transportation system M&O. This will help determine the role of the BRTB in the implementation of the projects identified in this Plan as well as other regional M&O initiatives.

*Establish Regional Transportation System M&O Performance Measures.* Based on the regional M&O objectives identified in the Strategic Deployment Plan, metrics, benchmarks and temporal constraints need to be established in order to monitor and track the execution of the Plan and to assist in the definition of regional M&O performance measures.

### Prioritized High Priority Projects

Out of the 38 regional M&O projects identified in this Plan, eight high priority projects were selected. Seven screening factors were used to prioritize the high priority projects.

The prioritized high priority projects are listed and described in the table below. All eight of the high priority projects are valuable; they were identified by the region's stakeholders as critical to implement because of the benefits they would bring to the transportation system. Since it is not possible to implement all of the projects at the same time, the project prioritization was performed to provide an implementation framework. Through this process, two **early winners** were identified, **priority projects 1 and 2**, based on their low cost and ease of implementation, as well as the role they play in helping to gain support for future M&O projects.

## **Regional Planning for Operations**

Regional transportation system M&O projects were traditionally funded through federal ITS earmarks. The new transportation legislation, SAFETEA-LU, marks the end of the ITS Integration (or Earmark) Program. Therefore, funding for regional transportation system M&O projects has to be secured via the regional transportation planning process or from alternative funding sources (i.e. grants, public-private partnerships, etc.).

Regional planning for operations is a joint effort between regional transportation system operators and planners that enables effective regional transportation system M&O. Regional planning for operations requires:

1. Regional transportation operations coordination,
2. Consideration of M&O within the context of the ongoing regional transportation planning and investment process, and
3. Establishment of a link between regional operations coordination and regional planning.

<b>Project Priority</b>	<b>Project Name</b>	<b>Project Description</b>	<b>Proposed Committee Assignment</b>
1	<i>Facilitate Incident Management Training Opportunities</i>	<i>In most cases, incident management involves many agencies and organizations. Education and training opportunities, such as incident management training, conferences, and table-top exercises, improve coordination amongst the many stakeholders.</i>	<i>B-ROC Committee</i>
2	<i>Facilitate Regional M&amp;O Outreach, Education and Training Opportunities</i>	<i>Develop and use regional M&amp;O outreach, education and training material in order to educate decision makers on the benefits of regional transportation system M&amp;O.</i>	<i>M&amp;O Strategic Deployment Plan Implementation Steering Committee*</i>
3	Link Regional Transportation Planning and Operations	This project involves the implementation of policies, practices and procedures that maximize the utilization of traditional and alternative funding sources including, but not limited to: integrating M&O into the regional transportation system planning process, securing funding from non-traditional funding sources (i.e. public-private partnerships and homeland security grants), regional planning and operations coordination and collaboration and performance measurement	BRTB M&O Partnership
3	Enhance M&O along Critical Corridors and Evacuation Routes	Congestion on the transportation network can be categorized into two types: recurring and non-recurring. This effort attempts to address non-recurring congestion that is the result of a major incident. This project will identify and implement M&O improvements that support integrated corridor/incident management along critical corridors and evacuation routes.	Transportation & Public Works Subcommittee

<b>Project Priority</b>	<b>Project Name</b>	<b>Project Description</b>	<b>Proposed Committee Assignment</b>
5	Establish a Regional Transportation Information System	SAFETEA-LU requires the establishment of data exchange formats that ensure that data provided by highway and transit monitoring systems can be exchanged across jurisdictional boundaries and be available nationally. A regional effort to develop such a system would be an extension of the federal program and allow transportation system planners and operators, responders, and other travelers access to real-time and archived data collected via automated transportation infrastructure.	Baltimore Region Technology Group
6	Traffic Control System Reliability Enhancements	Replace existing conventional traffic signals with LED (Light Emitting Diode) Traffic Signals and specify LED traffic signals for all future installations. And, install battery backup systems on LED traffic signals along evacuation/critical routes to increase reliability during emergencies.	Traffic Signal Subcommittee
7	Secure Critical Regional Transportation Infrastructure	Threats to transportation infrastructure can result from acts of nature, terrorist attacks and other incidents that cause damage to the infrastructure. Transportation infrastructure can be protected by a wide range of ITS technologies. This Project will explore and implement the most appropriate policies and technologies to secure regional transportation infrastructure.	Transportation & Public Works Subcommittee
8	Implement Regionally Coordinated Adaptive Traffic Control Systems	This project promotes the evolution of local traffic control systems to adaptive traffic control systems and proposes to coordinate local adaptive control systems via the exchange of real-time traffic conditions data between local traffic management centers/signal operations centers.	Traffic Signal Subcommittee

The Baltimore region has made substantial strides towards linking planning and operations. Those efforts have been included in the table below.

<b>Mechanism For Linking Planning And Operations</b>	<b>Corresponding Regional Effort to Link Planning and Operations</b>
Performance Measurement Systems	Following the development of national and statewide performance measures  Customer Satisfaction Survey
Congestion Management	Established under Guidelines for the Congestion Management System (CMS) in the Baltimore region. As required by SAFETEA-LU, the Baltimore region's CMS will be replaced by a Congestion Management Process (CMP).
Regional ITS Architecture	Maryland Statewide ITS Architecture
Institutional Arrangements	The M&O Partnership oversees, recommends, and directs regional M&O initiatives. The M&O Partnership is supported by the following committees: <ul style="list-style-type: none"> <li>• Baltimore Regional Operations Coordination Committee</li> <li>• Traffic Signal Subcommittee</li> <li>• Transportation and Public Works Subcommittee</li> </ul> The M&O Partnership annually recommends projects to the BRTB.  The M&O Partnership is currently drafting a regional priority letter.  Memorandum of Regional Cooperation has been established in order to encourage cooperation between regional agencies during an incident.
Data Collection and Sharing	The region is in the process of developing the Multi-Modal Traveler Information System to collect and share traveler information throughout the region.
Funding and Resource Sharing	Baltimore Regional Emergency Assistance Compact
Regional Transportation Systems Management and Operations Projects	The advancement of projects recommended in the 1998 ITS Strategic Deployment Plan.

In an effort to improve the coordination between transportation system planning and operations, it is recommended that the Baltimore region consider the development of regional M&O priority letters and regional ITS project architectures and use of planning analysis tools that acknowledge transportation system O&M improvements. Each recommendation has been detailed below.

**Priority Letters**

The M&O Partnership is currently drafting a Regional M&O Priority Letter. State law requires each jurisdiction to submit a priority letter to MDOT each year. Priority letters request that certain projects be included in the Maryland Consolidated Transportation Program (CTP) and in the regional Transportation Improvement Program (TIP). The Regional M&O Priority Letter will be submitted to MDOT requesting that a list of regional M&O projects be included in the CTP and the TIP. The priority letter that is currently being drafted represents the first time that the Baltimore region has collectively submitted a Regional Priority Letter. This approach will identify several regional M&O projects that are considered a priority by all jurisdictions.

Alternatively, it has been suggested that a regional M&O project be included in all jurisdictional priority letters. This approach would identify one or more regional M&O project(s) that the entire region considers as a priority.

*Regional ITS Project Architecture Development.* The FHWA Rule on ITS Architecture and Standards (Rule 940) requires that all ITS projects funded with highway trust funds shall be developed based on system engineering analysis. Rule 940 states that a systems engineering analysis should include:

1. Identification of portions of the regional ITS architecture being implemented (or if a regional ITS architecture does not exist, the applicable portions of the National ITS Architecture);
2. Identification of participating agencies' roles and responsibilities;
3. Requirements definitions;
4. Analysis of alternative system configurations and technology options to meet requirements;
5. Procurement options;
6. Identification of applicable ITS standards and testing procedures; and
7. Procedures and resources necessary for operations and management of the system.

The development of a project ITS architecture satisfies FHWA Rule 940 systems engineering analysis requirements 1, 2, 3 and 6 and provides a basis for satisfying the remaining requirements.

Furthermore, the development of a project ITS architecture:

- Provides a forum in which an ITS project can be properly explored
- Documents stakeholder roles and responsibilities
- Documents high-level ITS project requirements
- Identifies standards

The development of Regional ITS Project Architectures based on the Maryland Statewide ITS Architecture can be used as a forum to initiate relationships and institutional arrangements that support regional transportation system planning for operations.

*Planning Analysis Tools.* Planning analysis tools such as ITS Deployment Analysis System (IDAS) and Dynamic Network Assignment Simulation Model for Advanced Road Telematics for Planning Applications (DYNASMART-P) determine the benefits and costs associated with ITS deployments. Benefit-cost data can be used to help transportation planners and decision makers program ITS projects.

In support of regional planning for operations, the use of planning analysis tools should be integrated into the regional planning process.

### **Next Steps**

In summary, the next steps for the region are to execute and maintain the M&O Strategic Deployment Plan. This can only be successful if the region's stakeholders continue to be included in the process.

Prior to execution of the high priority projects, it will be important for the region to undertake the two enabling initiatives which will help lay a strong foundation for future M&O implementation. Once the enabling initiatives have been addressed, it is suggested that the region use the Maryland Statewide ITS Architecture to develop high priority regional ITS project architectures (as necessary). This will allow regional stakeholders the opportunity to collaboratively scope high priority projects. Also, the development of the ITS project architectures will satisfy the majority of FHWA Rule 940.