# Transit Signal Priority Subtask Scope

## BACKGROUND AND TASK PURPOSE

A key component of a successful Rapid Transit System (RTS) will be the provision and operation of a transit signal priority (TSP) system to reduce delay for rapid transit vehicles along the operating corridors. Transit signal priority systems are designed to detect transit vehicles and adjust typical traffic signal operations to provide priority treatment to transit vehicles through early or extended green time at traffic signals along the RTS routes. The purpose of the TSP system is typically to reduce overall delay and improve schedule adherence along transit routes.

This task will provide a concept plan for TSP system capabilities and integration in the RTS in coordination with the service and operations plan developed in Task 1. For the purposes of this evaluation, the concept and evaluation of TSP will cover signal systems proposed for queue jump lanes, which have been proposed to provide RTS vehicles with an advance signal phase to bypass queued vehicles or to enter/exit fixed guideways at numerous locations on the RTS corridors.

Montgomery County and the Maryland State Highway Administration (MSHA) are currently exploring transit signal priority systems on several highway corridors in the county in support of WMATA, MTA and Ride On bus systems. Montgomery County and MSHA are working with a consultant to plan and develop an implementation policy for TSP for the existing local transit environment. WMATA is also pursuing a program to make WMATA buses compatible with TSP system capabilities. It is desirable to coordinate the future TSP systems on the RTS corridors with the current TSP initiative for local bus operations on state and county highways.

The purpose of this task will be to complete the following:

* Define the current state of traffic signal control and transit signal priority systems used in Montgomery County.
* Define key measures of effectiveness and range of functional attributes associated with a TSP system designed to support the Montgomery County RTS on the seven study corridors.
* Define qualitative impacts associated with TSP system operations on the seven RTS study corridors.
* Recommend an approach to coordinate implementation of planned MCDOT/MSHA TSP systems and the TSP systems planned for the RTS.
* Define a Systems Engineering Approach to TSP planning, design, and implementation for the seven RTS study corridors.
* Establish guidelines for TSP systems on RTS study corridors and address the degree to which the system should maintain consistency with TSP systems used on other county and state highways in Montgomery County.
* Establish proposed guidelines for clear coordination between agencies regarding implementation of TSP on RTS corridors.

A primary goal of this study will be to define the appropriate metrics for the implementation of TSP systems on each RTS corridor, building on what was developed for TSP for local bus operations. The operational metrics will provide the basis for selecting appropriate TSP technology and individual intersections for implementation.

### **INPUTS AND ASSUMPTIONS**

Several previous studies of the Montgomery County RTS have addressed the need for TSP systems to support the operation of an efficient and effective transit network. The Countywide Bus Rapid Transit Study by Parsons Brinkerhoff (PB) performed an overview assessment of TSP applicability at the signalized intersections along each RTS route. The PB study limited its evaluation of TSP to green extension and/or red truncation for RTS vehicles operating straight through at intersections and relied on intersection level-of-service as the measure to determine potential TSP applicability. Intersection LOS data was confined to existing conditions data from Maryland SHA and M-NCPPC resources for approximately 70 percent of the RTS network. Intersections with weekday peak period LOS “C” or “D” were assumed to be candidates for TSP. The PB study did not include within its scope a more detailed assessment of TSP applicability using Synchro models or other detailed operations analysis data. The Traffic Group’s Rapid Transit study for Montgomery County does not state how proposed TSP locations were selected along RTS corridors. However, Sabra Wang did utilize Synchro models to screen corridors for TSP suitability as part of its Countywide TSP Deployment Policy/Criteria Study.

VHB plans to use the proposed RTS guideway and stop locations identified in the PB and/or Traffic Group’s Rapid Transit System studies as the basis for evaluation of signal operations along the seven RTS corridors. Changes to station locations developed as part o the related Service Planning task will be accounted for in this task. VHB will use locations identified for TSP or queue jump signal operations in both the PB and Traffic Group studies as the basis for system review. VHB will rely on publicly available traffic volume, operations, and forecast data from MSHA, MCDOT, or other available sources for any quantitative evaluation of traffic operations. VHB will not collect new traffic count data or develop new traffic forecasts for this task.

## METHODOLOGY

The consultant will complete a primarily qualitative evaluation of the planned TSP system for the Montgomery County RTS, with focused quantitative evaluation of TSP integration with existing MCDOT signal systems. The consultant will focus the TSP evaluation task on the following RTS study corridors identified for detailed review in this study (assumed study limits are based on PB study corridor boundaries):

1. MD 355 South/Rockville Pike (Gaithersburg (Watkins Mill Road) to Bethesda (Bethesda Metro))
2. MD 586/Veirs Mill Road (Wheaton Metro to Rockville Metro)
3. MD 97/Georgia Avenue North (Glenmont (Metro) to Olney (Montgomery General Hospital))
4. Randolph Road (White Flint Metro Station East to FDA campus)
5. US 29 Columbia Pike (Silver Spring Transit Center to Burtonsville Park)
6. CCT South (Shady Grove Metro to Metropolitan Grove Station)
7. MD 200/Intercounty Connector (ICC) (Darnestown Road to Briggs Chaney Park & Ride)

The Intercounty Connector (ICC) will not be included in this evaluation as this corridor consists of a limited access freeway without traffic signal control on the corridor itself. Signalized intersections providing access for RTS vehicles between ICC corridor and route termini will be reviewed in.

This evaluation will be divided into four components: TSP System Development Guidelines, Existing Conditions Evaluation, Operational Parameters and Criteria, and RTS Corridor Evaluation. The following summarizes the tasks that the consultant will complete as a part of each component:

### Existing Conditions Evaluation

* Research information related to existing TSP programs and regional ITS architecture with bearing on the system in Montgomery County
* Coordinate and meet with existing traffic signal operations personnel within MCDOT and MSHA to obtain system information, understand current policies and procedures, and define needs and goals for the RTS TSP system
* Coordinate with Montgomery County Transit Division and WMATA regarding compatibility of on-board vehicle equipment with TSP technology
* Document current Montgomery County & MSHA traffic signal and TSP technology/equipment attributes and constraints
* Perform a review of performance characteristics of existing intersections equipped for TSP along the seven RTS study corridors
* Perform focused field review of existing equipment at key representative intersections, and/or use signal control plans and information provided by MCDOT, to verify system capabilities or limitations

### TSP System Development Guidelines

* Develop a recommended Systems Engineering Approach to TSP implementation on the seven RTS study corridors, including integration with existing TSP programs in Montgomery County
* Establish policy recommendations regarding the minimum criteria for TSP implementation at RTS corridor intersections
* Develop recommended guidelines for implementing TSP on RTS corridors, addressing some or all of the following areas of interest:
	+ Recommended technology and equipment specifications
	+ Typical schedule for TSP implementation relative to RTS construction
	+ Recommended signal timing and operational guidelines
	+ Installation and maintenance guidelines for RTS corridors
* Develop recommendations for inter-agency partnership and coordination with regard to TSP operation and signal coordination.

### Operational Parameters and Criteria

* Research the state of the practice with regards to TSP system interaction with bus rapid transit facilities, including but not necessarily limited to the following:
	+ Passive Priority
	+ Detection technologies
	+ Actuated transit priority
	+ Automatic Vehicle Location
* Assess the appropriate metrics for system operation, including one or more of the following:
	+ Overall intersection traffic operations
	+ Transit vehicle travel time
	+ Transit service reliability
* Convene a group of stakeholders, including representatives from MCDOT, SHA, and WMATA to develop consensus regarding system requirements and operational metrics.
* Develop a set of best-practice parameters and minimum criteria for system architecture and performance to support the Montgomery County RTS

### RTS Corridor Evaluation

* Review RTS service and operations plan developed for the seven RTS corridors for potential conflicts and qualitative impacts associated with TSP system operations, based on VHB’s understanding of existing signal equipment and traffic operations
* Utilize RTS service and operations plan, TSP selection metrics, and TSP selection criteria used in the previous RTS studies to confirm TSP applicability to previously identified locations
* Identify traffic signal equipment modifications or upgrades necessary on a corridor level to support TSP systems on the RTS study corridors

## DELIVERABLES

* Technical Memorandum summarizing a Needs Assessment and Goals/Objectives for TSP System operations, including:
	+ TSP system purpose and capabilities
	+ Role of TSP in the RTS program
	+ Stakeholders involved in TSP implementation, operation, and maintenance
* Technical Memorandum summarizing information obtained on the existing conditions of signal systems and traffic/transit operations on corridors planned for TSP implementation
* RTS Transit Signal Priority Planning Technical Memorandum, including documentation of findings and recommendations for the following elements:
	+ Existing conditions and assumptions
	+ High-level Concept of Operations for TSP integration with the RTS system (based on RTS attributes defined in previous RTS planning studies)
	+ Recommended system control architecture
	+ Integration of TSP with other transit ITS, traffic engineering, and EMS pre-emption systems
	+ Preferred detection system parameters
	+ Preferred active priority strategies
	+ Preferred traffic control system parameters, including coordination and recovery process
	+ Preferred minimum criteria and Measures of Effectiveness (MOE) for selection and evaluation of TSP locations
	+ Preliminary operational review of RTS study corridors
	+ Recommended Montgomery County RTS-related TSP policies and procedures