Assessment of the Feasibility of Bus On Shoulders (BOS) at Specific Locations

Draft Technical Memorandum 2

Prepared for the Bus On Shoulders Task Force of the National Capital Region Transportation Planning Board (TPB)

February 28, 2013

Table of Contents

Section A: Introduction and Background on the BOS Task Force

Bus On Shoulders Task Force - Background

At the July 18, 2012 meeting of the Transportation Planning Board (TPB), it was requested that a task force be established to identify promising locations in the region to operate buses on the shoulders of highways. The task force brings together stakeholder agencies, including transit operators, departments of transportation, and local jurisdictions, to coordinate an assessment of the experience and potential for Bus On Shoulder (BOS) operations on the region's freeways and major arterials. The task force is overseeing a scoping of potential locations for BOS, including a high-level benefit-cost analysis of implementing BOS along select corridors and bus routes. The proposed membership, work plan, and schedule for the Task Force were approved at the September 19, 2012 TPB meeting.

Task Force Membership

The task force co-Chairs are Ms. Carol Krimm, of the City of Frederick Board of Aldermen, and Mr. Chris Zimmerman, of the Arlington County Board. Other members include:

Departments of Transportation	Transit Operators	Jurisdictions
• District of Columbia (DDOT) • Maryland (MDOT) • Virginia (VDOT)	• WMATA • PRTC • MTA Commuter Bus • Loudoun Transit	• Fairfax County • Frederick County • Montgomery County • Charles County • and other Members of the TPB

Work Plan and Schedule

The regional assessment of BOS feasibility is being coordinated through a series of meetings, with necessary work assigned through discussion.

Task 1 – Summary of Local and National Experience with Bus On Shoulders

The task force developed a summary of critical experience with current and previous BOS operations, including an overview of safety, roadway engineering, and bus service operations aspects. In addition, a summary of national experience and its applicability and use in this region was prepared and reviewed, including federal regulations, requirements for requesting design exceptions, and supporting state legislation. This information serves a resource for discussion and development of the assessment.

A copy of Technical Memorandum One is available on the task force's website at:

http://www.mwcog.org/bostf

Task 2 – Assessment of the Feasibility of BOS at Specific Locations

Stakeholder agencies worked to identify potential corridors for BOS operation on the region's highway network, based on 1) existing highway congestion locations, 2) current bus service, and 3) highway shoulder conditions. This information will be used to screen out infeasible locations and to identify potential corridors and bus routes for further analysis.

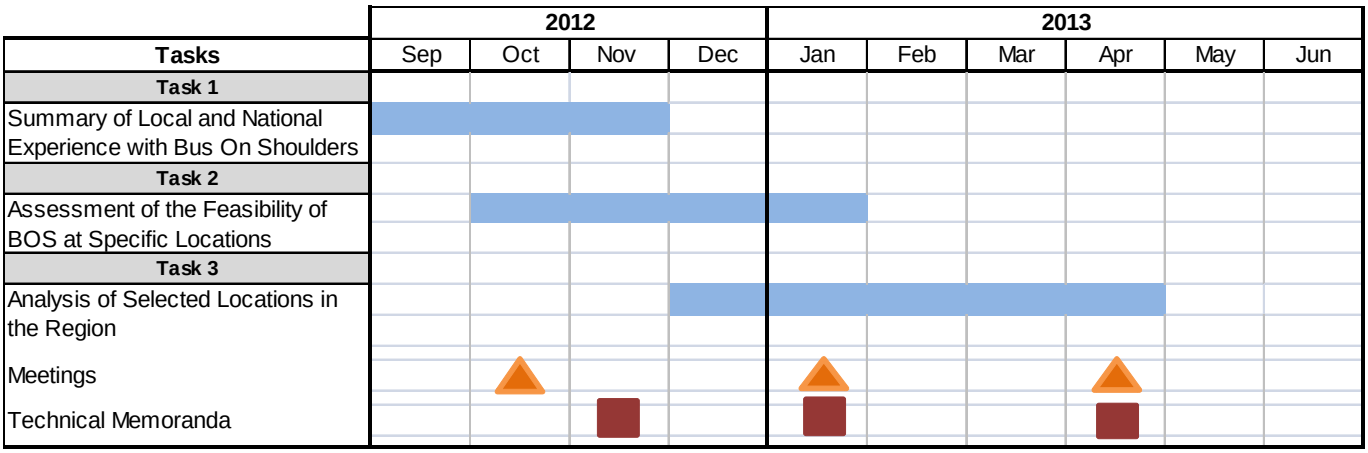
Task 3 – Analysis of Select Corridors/Routes in the Region

Using the results of Tasks 1 and 2, the TPB staff, with assistance from the respective highway and transit agencies, will conduct an analysis of the feasibility of BOS on the potential corridors/routes in the region. The analysis will:

1. Identify issues and challenges with safe operation,
2. Develop capital cost and operating cost inputs, as provided by the stakeholder agencies.
3. Determine potential travel time savings for bus routes based on highway congestion,
4. Present a benefit-cost analysis of the prospective benefits to riders and traffic relative to the projected costs of implementation of BOS service on the selected corridors/routes.

For each task, technical memoranda summarizing the results have or are being prepared, with supporting presentations for the task force. The work schedule and months for task force meetings and delivery of the technical memoranda are shown below in Figure 1.

Figure 1: TPB BOS Task Force Work Plan and Schedule



Section B: Identifying Specific Locations for Potential BOS Operations

In order to assess the feasibility of BOS at specific locations, three data elements were identified as being critical: bus service, congestion, and shoulder conditions. The study methodology therefore consisted of reviewing available data for each element or identifying what data is needed. This methodology was then applied to specific locations proposed by regional stakeholders to identify those locations which offered the most potential for feasibility analysis.

Methodology

Three data elements were evaluated to determine their application to assessing BOS feasibility.

Bus Service

Bus ridership was selected as the most relevant data item for the element of bus service. The TPB's Regional Transit Data Clearinghouse (RTDC) provides GIS functions and data support that enables selecting and combining data from geographically co-located bus routes. The primary data factor available is average weekday ridership over the past fiscal year. Combining the data for all transit routes along a corridor produces a total of daily ridership, all-day and in both directions, that could benefit from improved travel times and reliability. Other bus service data items for a corridor that could be considered include the number of bus trips, the on-time performance of bus routes, the scheduled and/or actual running times of bus routes, and more detailed analysis by time period and direction. A full-fledged analysis would consider these elements in a more detailed BOS study.

Traffic Congestion

The specific data item of interest in evaluating traffic congestion was general traffic speeds during the peak hours and directions of travel and the percentage of time speeds fall below 35 mph. The 35 mph general traffic speed figure is the most commonly accepted policy setpoint below which BOS operations are typically authorized. These data elements are available from INRIX data, to which the TPB has access as an affiliate member of the I-95 Corridor Coalition. Generally, data is collated from Tuesdays, Wednesdays, and Thursdays throughout a calendar year, thereby avoiding many holidays and the less typical traffic of Fridays.

Shoulder Conditions

The most uncertain data element is the conditions of the shoulders along Interstate and arterial highways. Data on shoulder width, pavement thickness, grade or slope, and

obstructions is not generally measured or collected by road agencies. While design standards or contract specifications should ideally determine shoulder conditions, in some cases these may date back forty or more years. Subsequent repaving work or reconstruction of interchanges may have significantly altered original conditions. In only a relatively few cases do road agencies have more detailed shoulder condition data available, generally when specific corridors or locations have been the focus of engineering studies preliminary to planned rehabilitation work or to support multimodal analysis studies. Potential sources of shoulder condition data include aerial surveys, planimetrics using Computer Assisted Design (CAD) drawings, field samples with measurements and shoulder thickness sampling, and other surveys.

Proposed Locations

Following discussion at the first BOS Task Force meeting, specific locations on which to assess the feasibility of BOS were proposed by regional stakeholders. Based on the above methodology, the study corridors were further narrowed to three locations.

Maryland

Corridors to be studied:

- MD 5/US 301 Corridor in Prince George's and Charles Counties; more than 70 AM and PM bus trips service MD 5/US 301 between Charles County and D.C.
    - Segment 1 – MD-5 from Beltway south to MD-223 (Clinton)
    - Segment 2 – MD-5 from MD-223 to US-301 split (northern end)
    - Segment 3 – US-301 from MD-5 split to MD-228 (Waldorf)
- I-270 Corridor from City of Frederick to the Capital Beltway.
    - Segment 1 – I-270 from I-70 interchange (Frederick) to MD-121 (Clarksburg)
    - Segment 2 – I-270 from MD-121 to MD-124 (Gaithersburg)
    - Segment 3 – I-270 from MD-124 to MD-28 (Rockville)
    - Segment 4 – I-270 from MD-28 to Beltway.

Other proposed study corridors:

- US-29 corridor - key route linking Baltimore region with the DC region and Howard County. The proposed corridor continued from the existing BOS at Burtonsville onwards to Columbia to the I-70 interchange. However, this corridor mostly lies outside the TPB area, and the need for BOS operations is uncertain.
- MD 355 corridor – Germantown to Rockville. A queue jump system is a more appropriate treatment, as little or no shoulders exist.

Virginia

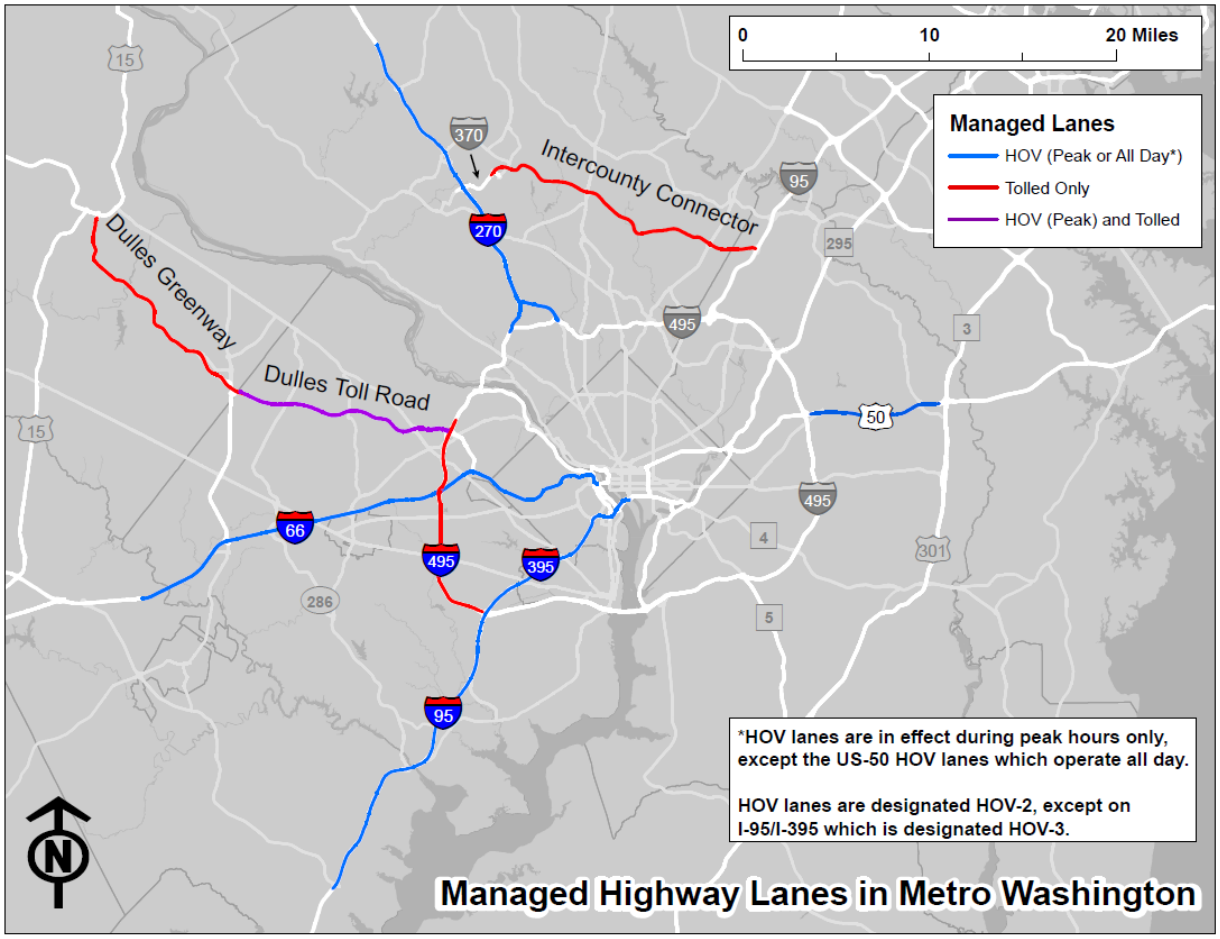
Corridor to be studied:

- I-66 Inside the Beltway – as part of the concurrent VDOT pilot project.

Other proposed study corridors in Virginia:

- The only other corridor proposed was US-50 (Virginia), for which limited data was available.
- Most corridors in Virginia have HOV or restricted access that should enable relatively congestion-free travel by bus, as shown in Figure 2, including: I-66 Outside the Beltway, VA-267 (Dulles Access Road), I-495 Express Lanes, and the I-95 HOV Lanes (to be converted to HOT Lanes).

Figure 2: Managed Lanes on Principal Highways in the Washington Metropolitan Region



District of Columbia

The only potential corridor suggested for the District was DC-295. However bus use of this corridor is small and the shoulders are narrow, so it was judged as not meriting further analysis for the purposes of the task force assessment. It was noted that the 14th Street Bridge has HOV lane access, while downtown circulation is the primary issue impacting bus travel times over their complete routes.

Section C: Assessment of the Feasibility of BOS at Specific Locations

In support of the second meeting of the TPB task force on January 23, 2013; VDOT, SHA, and TPB staff worked together to collect available data on the specific corridors selected for assessment. Please refer to the meeting presentations for graphics and more detailed discussion.

MD 5/US 301 Corridor in Prince George's and Charles Counties

Bus Service

Bus service in the corridor is provided by MTA Commuter Bus, WMATA Metrobus, Prince George's The Bus, and VANGO. At the maximum point along the corridor, average weekday ridership, all-day and in both directions, totals up to approximately 5,775 riders.

Traffic Congestion

Traffic speeds in the southern part of the corridor during the AM peak-hour, inbound, average only below 20 mph. This portion of the corridor is signalized, which limits travel speeds. Traffic falls below 35 mph almost all the time. In the northern portion of the corridor, past Surratts Road where the corridor becomes limited-access and grade-separated before connecting to the Beltway, travel speeds are typically in the 50 mph range, and speeds rarely fall below 35 mph.

Shoulder Conditions

SHA collected data on shoulder width along the segment of MD-5 between Surratts Road and Burch Hill Road, in the vicinity south of Clinton. While much of the shoulder is greater than 10 feet, especially on the northbound side of the road, there are pinch points narrower than this at merging intersections and at some bridges. Further effort would be needed to collect more shoulder data as well as available right-of-way. SHA will evaluate further data collection opportunities. Overall, it would appear that it would be feasible to have some BOS operations along the corridor, if some pinch points could be physically improved.

I-270 Corridor from City of Frederick to the Capital Beltway.

Bus Service

Bus service in the corridor is provided by MTA Commuter Bus, WMATA Metrobus, and Montgomery County Ride-On Bus. At the maximum point along the corridor, average weekday ridership, all-day and in both directions, totals up to approximately 14,248 riders.

Traffic Congestion

Traffic speeds in the corridor during the AM peak-hour, inbound, average about 30 mph between Father Hurley Boulevard and Montrose Road. Traffic falls below 35 mph approximately 75% of the time, indicating BOS operations would be common if implemented for general traffic speeds below this policy setpoint.

Shoulder Conditions

Little specific data is available on shoulder conditions along I-270, especially for the portion of the highway north of the collector/distributor lanes, which would be the likely focus of BOS operations. South of these lanes, which begin in the southbound direction just before the I-370 interchange, buses would ideally use the HOV lanes to keep moving. Further effort would be needed to collect more shoulder data as well as available right-of-way. SHA will evaluate further data collection opportunities.

I-66 Inside the Beltway

Bus Service

In the case of I-66, VDOT has focused on the numbers of bus trips, with a maximum bus density of up to 33 buses per hour along some segments. Bus operators include Loudoun County Transit, WMATA Metrobus, PRTC Omniride, and Fairfax County Connector.

Traffic Congestion

Average traffic speeds in the corridor during the AM peak-hour, inbound, fall below 35 mph between Westmoreland Street and Sycamore Street. In the PM peak-hour, outbound, average speeds in this segment are below 30 mph.

Shoulder Conditions

VDOT has conducted substantial shoulder condition data collection along I-66 in support of previous multi-modal studies, including an aerial survey. They have identified several segments along which shoulders are wider than their criteria of 11 feet. Other segments, however, are narrower, and there are also intersections to consider. Based on their pilot program analysis, VDOT has identified two segments in each direction on which they intend to pilot BOS

operations, with some additional segments identified for possible physical improvements to the shoulders to make BOS feasible.

Next Steps

Going forward, staff will work to improve the information available for evaluating the feasibility of BOS on the select corridors. This will primarily involve the collection of additional, more detailed data and information on the three corridors above. The two goals will be to:

1. Develop a benefit cost analysis framework for assessing the feasibility of BOS, comparing rider benefits from improved bus travel time and reliability compared to the capital and operating costs associated with BOS implementation.
2. Refine available information on shoulder conditions in particular, to itemize the engineering studies and consequent funding that would be needed to more definitively identify the feasibility of using highway shoulders for BOS operations.

Technical staff from the TPB, VDOT, MDOT and SHA will coordinate next steps, the results of which will be presented at the third task force meeting, summarizing in a third technical memorandum. To complete the task force's work, the three technical memoranda and key items from discussion at the task force meetings will be combined into a final report.

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Section D: References

All publications and presentation of the TPB Bus On Shoulder (BOS) Task Force are posted at:
http://www.mwcog.org/bostf

Additional references include the following studies and presentations in professional literature on bus on shoulders operations.

TCRP Synthesis 64: Bus Use of Shoulders, 2006
http://onlinepubs.trb.org/onlinepubs/tcrp/tcrp_syn_64.pdf

TCRP Report 151: A Guide for Implementing Bus On Shoulder (BOS) Systems, 2012
http://onlinepubs.trb.org/onlinepubs/tcrp/tcrp_rpt_151.pdf

NCDOT I-40 BOSS Implementation and Operations Plan, May 2012
www.letsgetmoving.org/bossiop

Miami Dade MPO Bus On Shoulder Service Evaluation, January 2009
http://www.miamidade.gov/mpo/docs/MPO_bus_shoulders_eval_final_200901.pdf

FTA Bus-Only Shoulders in the Twin Cities, June 2007
http://www.hhh.umn.edu/img/assets/11475/Bus%20Only%20Shoulders%20Report%20FINAL.pdf