The quality of outsourced probe data on freeways has led many departments of transportation to consider such data for arterial performance monitoring. From April 2013 through June of 2014, we gathered travel times from several arterial corridors within the mid-Atlantic region using Bluetooth traffic monitoring (BTM) equipment, and compared these travel times with the data reported to the I-95 Vehicle Probe Project (VPP) from an outsourced probe data vendor. The analysis consisted of several methodologies: (1) A traditional analysis using precision and bias speed metrics. (2) A slowdown analysis which quantified the percentage of significant traffic disruptions accurately captured in the VPP data. (3) A sampled distribution method in which uses overlay methods to enhance and analyze recurring congestion patterns.

Traditional Validation

The traditional validation originally developed for freeways and adapted for arterials. This analysis results in the assessment of Average Absolute Speed Error (AASE) and Speed Error Bias (SEB) by speed category. A sample of the daily 24-hour data plots is shown in Figure 1 and the AASE and SEB numbers in Table 1.

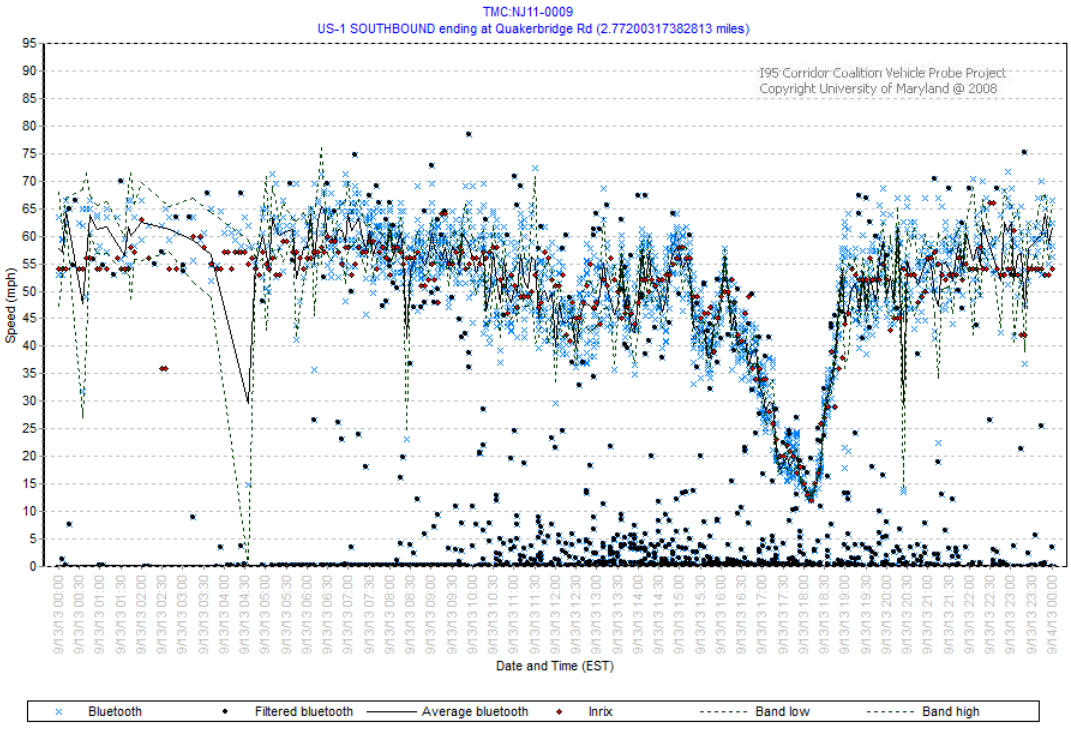

FIGURE 1 Sample daily plot of traditional analysis for a principal arterial facility.

TABLE 1 Sample of the AASE and SEB Results on a Principal Arterial Corridor Level

Speed Bin	Absolute Speed Error (<10mph)		Speed Error Bias (<5mph)		Number of 5 Minute Samples	Hours of Data Collection
	Comparison with SEM Band	Comparison with Mean	Comparison with SEM Band	Comparison with Mean		
0-15 MPH	2.9	4.4	2.8	3.8	224	18.7
15-25 MPH	5.3	7.3	5.2	6.9	1742	145.2
25-35 MPH	5.4	9.6	5.2	8.8	3155	262.9
>35 MPH	2.3	6.5	-1.3	-2.9	21276	1773.0
All Speeds	2.9	6.9	-0.1	-0.8	26397	2199.8

Slowdown Analysis Method

Three categories are used for slowdowns: Fully Captured, Partially Captured, and Failed to Capture.

Fully Captured slowdown: means that the probe data indicated a significant disruption in traffic flow, and accurately (threshold of 80%) characterized its magnitude both in reduction in speed, and in length of duration. An example of fully captured slowdown is shown in Figure 2.A.

Partially Captured slowdown: means that the probe data indicated a significant disruption to traffic, but the magnitude of the slowdown was not accurate either in reduction of speed or duration of event. One sample of partially captured slowdown is shown in Figure 2.B.

Failed to Capture slowdown: indicates that the probe data either completely missed the slowdown, or the extent of severity of the slowdown was significantly different from the reference data. One example of failed to capture slowdown is shown in Figure 2.C.

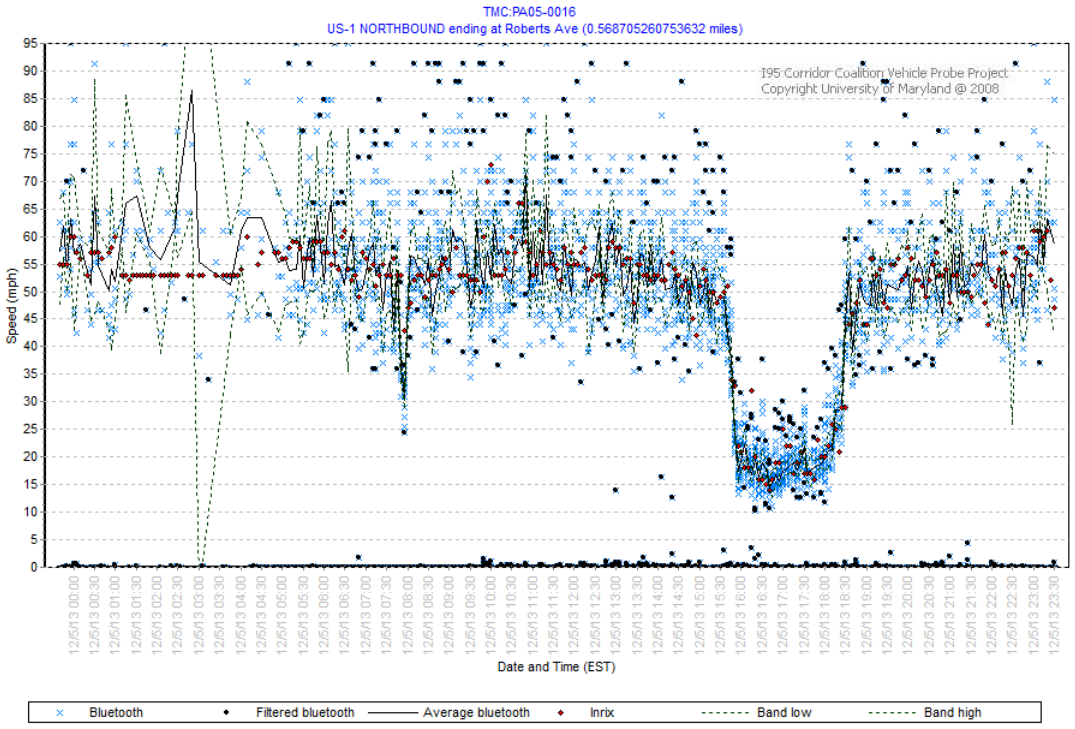

FIGURE 2.A Sample of fully captured slowdown.

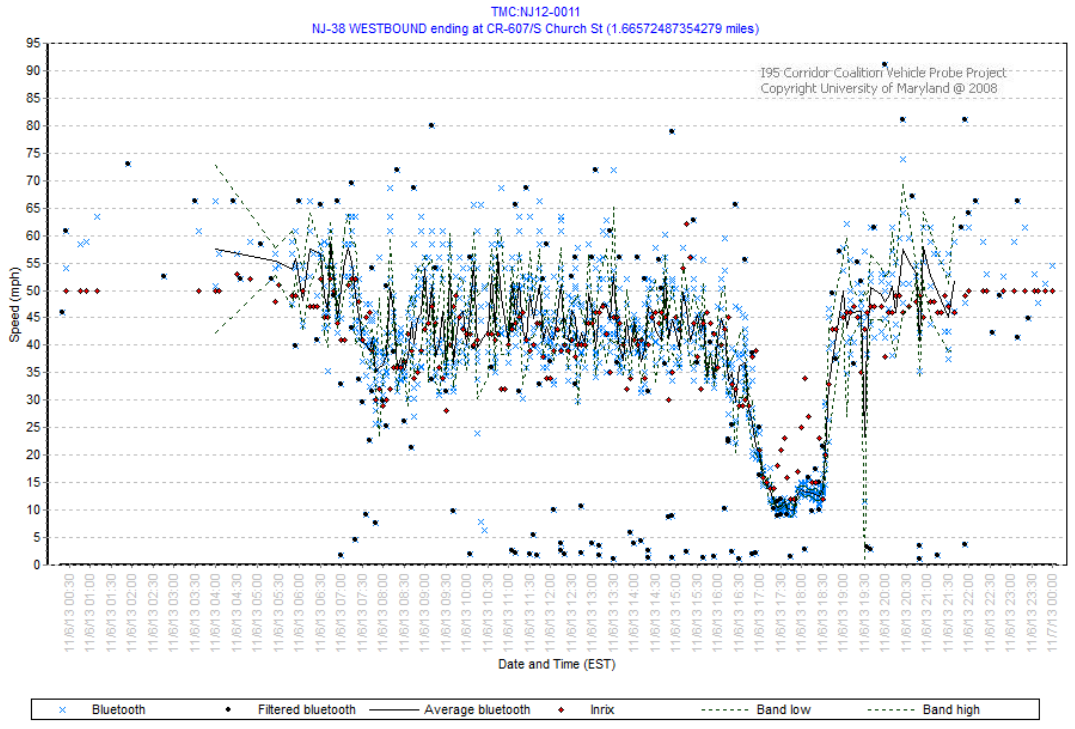

FIGURE 2.B Sample of partially captured slowdown.

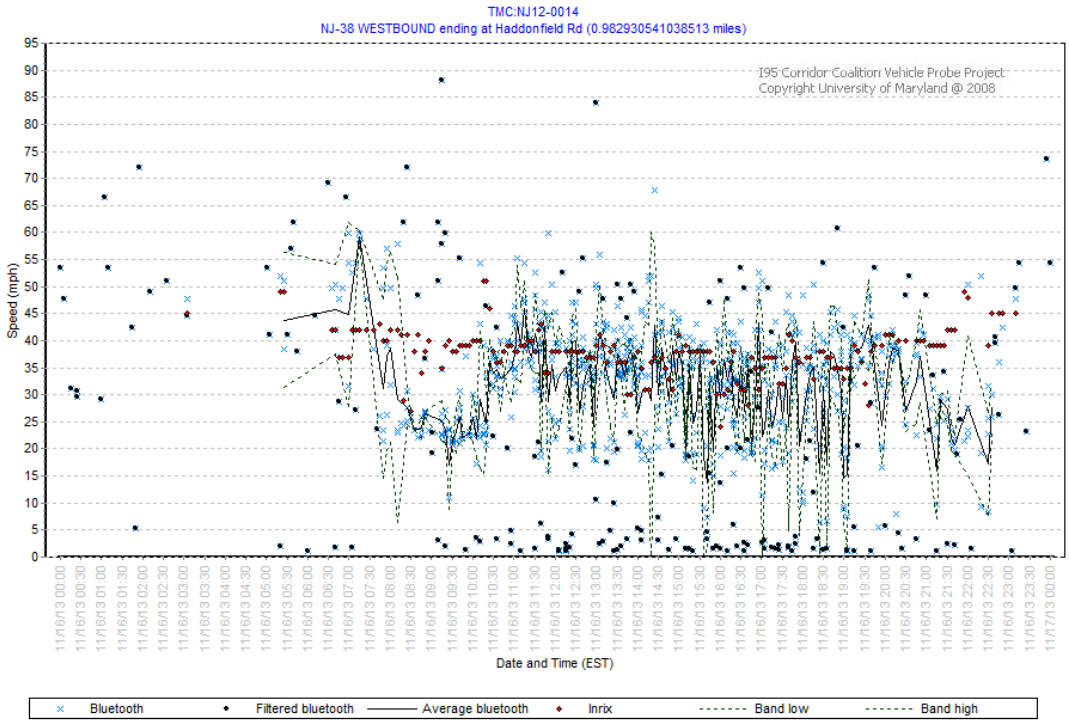

FIGURE 2.C Sample of failed to capture slowdown.

Sampled Distribution Method

The sampled distribution method is based on 24-hour overlay plots and corresponding cumulative frequency diagrams (CFDs). Overlay plots are constructed by graphing multiple days (typically only weekdays) of travel time observations on a single 24 hour timeline. Overlaying data reinforces repeatable traffic phenomenon, enhancing the density of travel-time samples and thus increasing the detail of any recurring congestion. The left graphs of Figure 3 show an example of an overlay plot which contrasts the performance of weekday VPP data (the bottom graph) against weekday BTM reference data (the top graph) in capturing repeatable traffic patterns.

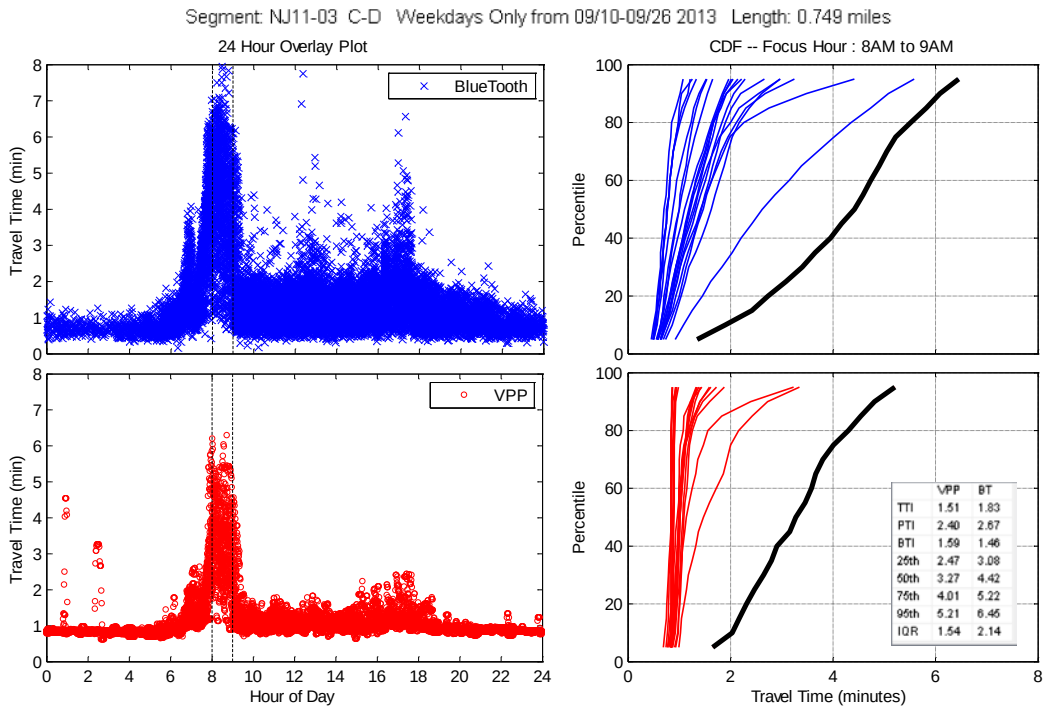

FIGURE 3 Sample of 24-hour overlay plot; BTM (left top) and VPP (left bottom) and sample of CFD diagrams; BTM (right top) and VPP (right bottom).