



# I-95 Corridor Coalition

## I-95 Corridor Coalition Vehicle Probe Project: Validation of INRIX Data

Monthly Report: Maryland



*December 2013*

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# I-95 CORRIDOR COALITION VEHICLE PROBE PROJECT VALIDATION OF INRIX DATA JULY 2013

## *Monthly Report*

*Prepared for:*

I-95 Corridor Coalition

*Sponsored by:*

I-95 Corridor Coalition

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*December 2013*

# Evaluation Results for the State of Maryland

## Executive Summary

The data from the Vehicle Probe Project is validated using Bluetooth™ Traffic Monitoring (BTM) technology on a near monthly basis. BTM sensors were deployed at the beginning and ending points of 10 segments along the MD-355 corridor and six segments along the MD-586 corridor for both directions. The Bluetooth sensor deployment covers the range from East-West Hwy to Germantown Rd along MD-355 and the range from Maryland Ave to MD-355 along MD-586. Travel time data was collected for both directions along the arterial from July 6, 2013 through July 20, 2013. Since a single BTM sensor covered both directions of the arterial, validation was not performed on TMC segments significantly different from sensor deployment locations. The dataset collected represents approximately 1,603 hours of observations along 16 arterial segments, totaling approximately 34 miles. The number of effective five-minute travel time samples observed was 19,239 in total.

ES Table 1 summarizes the results of the comparison between the validation data and the INRIX data for arterial segments during the above noted periods. As shown, the average absolute speed error (AASE) were within specification in all speed bins, and Speed Error Bias (SEB) were within specification in all speed bins except for the 0-15 MPH category and the 35+ MPH category.

<b>ES Table 1 - Maryland Evaluation Summary for Arterial</b>						
<b>Speed Bin</b>	<b>Absolute Speed Error (&lt;10mph)</b>		<b>Speed Error Bias (&lt;5mph)</b>		<b>Number of 5 Minute Samples</b>	<b>Hours of Data Collection</b>
	<b>Comparison with SEM Band</b>	<b>Comparison with Mean</b>	<b>Comparison with SEM Band</b>	<b>Comparison with Mean</b>		
0-15 MPH	<b>7.0</b>	13.1	<b>6.9</b>	13.0	1341	111.8
15-25 MPH	<b>3.1</b>	7.9	<b>3.1</b>	7.6	6271	522.6
25-35 MPH	<b>1.0</b>	4.2	<b>0.6</b>	1.8	6614	551.2
35+ MPH	<b>5.1</b>	10.9	<b>-5.0</b>	-10.6	5013	417.8
All Speeds	3.2	7.8	0.4	1.2	19239	1603.3

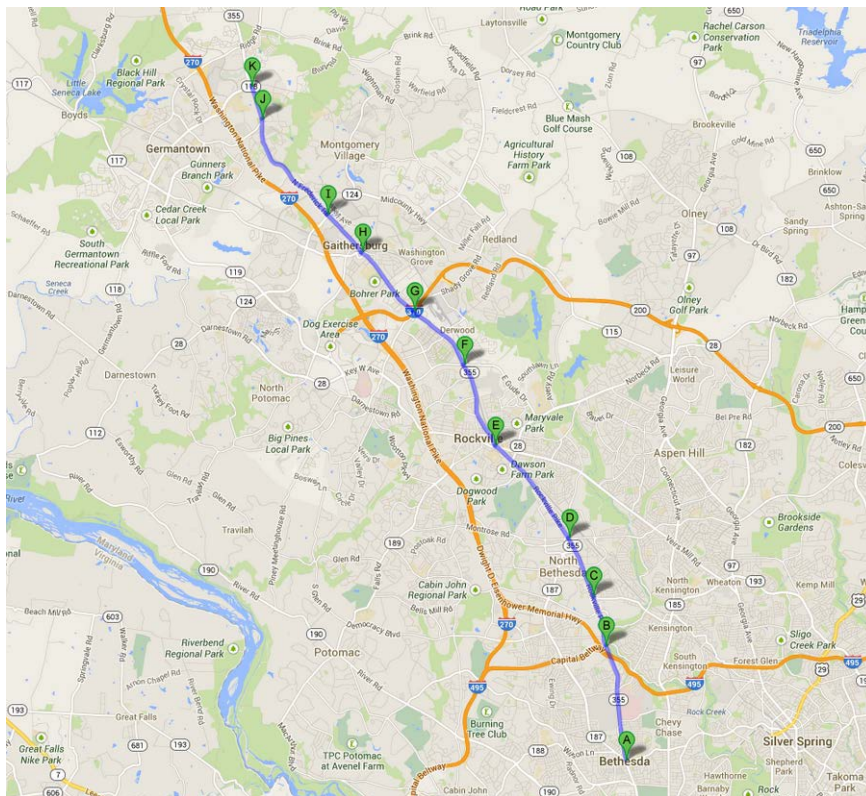
Based upon data collected from July 6, 2013 through July 20, 2013 across 34.1 miles of roadway.

As part of the on-going validation process, vehicle probe data from each state is validated on a rotating basis. This is the seventh time that data has been validated in Maryland. As additional validation is performed, a summary of the cumulative validation effort will be provided.

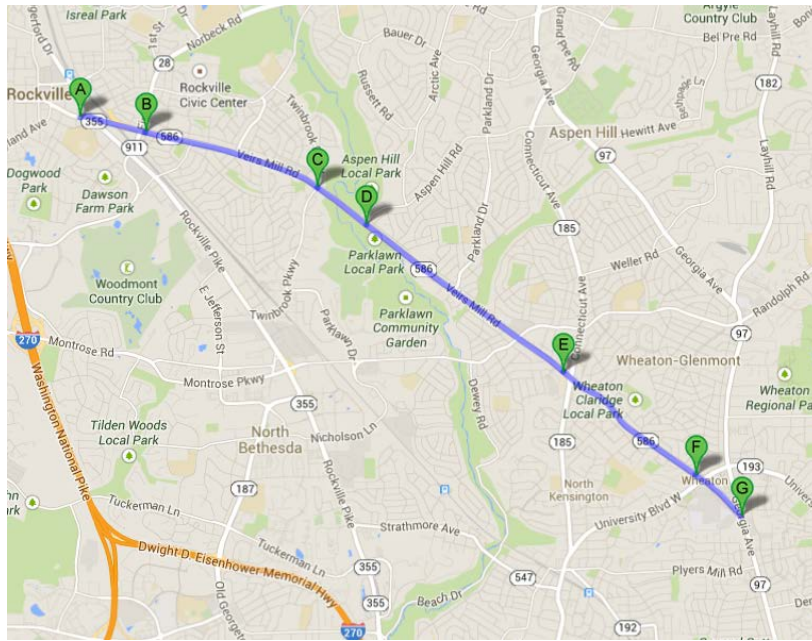
## Data Collection

The data from the Vehicle Probe Project is validated using Bluetooth™ Traffic Monitoring (BTM) technology on a near monthly basis. BTM sensors were deployed at the beginning and ending points of 10 segments along the MD-355 corridor and 6 segments along the MD-586 corridor. The Bluetooth sensor deployment covers the range from East-West Hwy to Germantown Rd along the MD-355 and the range from Maryland Ave to MD-355 along the MD-586. Travel time data was collected for both directions along the arterial from July 6, 2013 through July 20, 2013 with the assistance of Maryland Department of Transportation (MDOT) personnel. Since a single BTM sensor covered both directions of arterial, validation was not performed on TMC segments significantly different from sensor deployment locations. This round of data collection in Maryland was designed to capture the traffic data on a sample of arterial anticipated to have significant traffic. Segment locations are chosen with a high-likelihood of observing recurrent and non-recurrent congestion during peak or off-peak periods.

Figures 1 and 2 presents an overview snapshot of the roadway segments, over which Bluetooth sensors were deployed along the MD-355 and MD-586 corridors in Maryland. Blue segments represent arterial segments selected for analysis.



**Figure 1** — Locations of segments MD-355 corridor selected for analysis in Maryland



**Figure 2** — Locations of segments MD-586 corridor selected for analysis in Maryland

### TMC segments selected for validation in Maryland

Table 1 presents a list of data collection segments in Maryland. In total, these segments cover a length of 34.1 arterial miles. Data collection segments are comprised of one or more Traffic Message Channel (TMC) base segments, such that total length of the data collection segment is one mile long or greater on the arterial. When appropriate, consecutive TMC segments are combined to form a data collection segment longer than one mile. The results of validation performed on the 16 arterial segments are included in this report. Table 1 contains summary information on each data collection segment. The latitude/longitude coordinates of the locations at which the Bluetooth sensors were deployed throughout the state of Maryland are provided in Table 1 as well as an active map link to view the data collection segment in detail. Click on the map link to see a detailed map for the respective data collection segment. It should be noted that the configuration of test segments is often such that the endpoint of one segment coincides with the start point of the next segment, so that one Bluetooth sensor covers both data collection segments.

Table 1 also provides data on the precise length of the TMCs comprising the test segment as compared to the measured length between Bluetooth<sup>TM</sup> Traffic Monitoring (BTM) sensors placed on the roadway. Details of the algorithm used to estimate equivalent path travel times based on INRIX data feeds for individual data collection segments are provided in a separate report. This algorithm finds an equivalent INRIX travel time (and therefore travel speed) corresponding to each sample BTM travel time observation on the test segment of interest.

**Table 1**  
**Segments selected for validation in Maryland**

SEGMENT (Map Link)	DESCRIPTION			TMC CODES		Deployment		
	Arterial Direction	State County	Starting at Ending at	Begin End	Number Length	Begin Lat/Lon End Lat/Lon	Length % Diff	
<b>Arterial</b>								All Lengths in Miles
A1 <a href="#">MD0735501</a>	MD-355 Northbound	Maryland Montgomery	East-West Hwy I-495	110+05861 110P05864	8 2.48	38.984757 -77.094135 39.019849 -77.102172	2.74 10.29%	
A2 <a href="#">MD0735502</a>	MD-355 Northbound	Maryland Montgomery	I-495 Strathmore Ave	110+06990 110P07798	4 1.11	39.019849 -77.102172 39.035356 -77.107043	0.90 -18.80%	
A3 <a href="#">MD0735503</a>	MD-355 Northbound	Maryland Montgomery	Strathmore Ave Randolph Rd	110+06991 110P06991	2 1.35	39.035356 -77.107043 39.05342 -77.116776	1.25 -7.67%	
A4 <a href="#">MD0735504</a>	MD-355 Northbound	Maryland Montgomery	Randolph Rd Veirs Mill Rd	110+06992 110P06993	4 2.53	39.05342 -77.116776 39.081803 -77.145973	2.67 5.72%	
A5 <a href="#">MD0735505</a>	MD-355 Northbound	Maryland Montgomery	Veirs Mill Rd Gude Dr	110+11340 110P11341	4 1.88	39.081803 -77.145973 39.106627 -77.158365	1.91 1.56%	
A6 <a href="#">MD0735506</a>	MD-355 Northbound	Maryland Montgomery	Gude Dr I-370	110+11342 110+11344	4 1.59	39.106627 -77.158365 39.123076 -77.178225	1.55 -2.77%	
A7 <a href="#">MD0735507</a>	MD-355 Northbound	Maryland Montgomery	I-370 MD-117/W Diamond Ave	110P11344 110P11346	5 1.69	39.123076 -77.178225 39.141312 -77.198848	1.37 -18.97%	
A8 <a href="#">MD0735508</a>	MD-355 Northbound	Maryland Montgomery	MD-117/W Diamond Ave Montgomery Village Ave	110+11347 110P11349	5 1.10	39.141312 -77.198848 39.153082 -77.212564	1.37 24.46%	

**Table 1 (Cont'd)**  
**Segments selected for validation in Maryland**

SEGMENT (Map Link)	DESCRIPTION			TMC CODES		Deployment		
	Arterial Direction	State County	Starting at Ending at	Begin End	Number Length	Begin Lat/Lon End Lat/Lon	Length % Diff	
<b>Arterial</b>								All Lengths in Miles
A9 <a href="#">MD0735509</a>	MD-355 Northbound	Maryland Montgomery	Montgomery Village Ave Middlebrook Road	110+11350 110P11352	5 2.60	39.153082 -77.212564 39.182115 -77.238309	2.58 -0.68%	
A10 <a href="#">MD0735510</a>	MD-355 Northbound	Maryland Montgomery	Middlebrook Road Germantown Rd	110+11353 110P11353	2 0.74	39.182115 -77.238309 39.192284 -77.24254	0.80 8.40%	
A11 <a href="#">MD0735553</a>	MD-355 Southbound	Maryland Montgomery	Montgomery Village Ave MD-117/W Diamond Ave	110N11349 110-11346	5 1.12	39.153062 -77.212838 39.14116 -77.198841	1.37 22.62%	
A12 <a href="#">MD0735556</a>	MD-355 Southbound	Maryland Montgomery	Gude Dr Veirs Mill Rd	110N11341 110-06993	4 1.89	39.107501 -77.159168 39.082599 -77.146696	1.91 1.22%	
A13 <a href="#">MD0735557</a>	MD-355 Southbound	Maryland Montgomery	Veirs Mill Rd Randolph Rd	110N06993 110-06991	4 2.59	39.082599 -77.146696 39.05345 -77.117038	2.67 3.24%	
A14 <a href="#">MD0735558</a>	MD-355 Southbound	Maryland Montgomery	Randolph Rd Strathmore Ave	110N06991 110-07798	2 1.36	39.05345 -77.117038 39.035316 -77.107204	1.25 -8.12%	
A15 <a href="#">MD0758601</a>	MD-586 Westbound	Maryland Montgomery	Georgia Ave University Blvd	110N06810 110N06809	3 0.43	39.035859 -77.049652 39.040099 -77.055457	0.39 -9.29%	
A16 <a href="#">MD0758602</a>	MD-586 Westbound	Maryland Montgomery	University Blvd Connecticut Ave	110-06808 110N06808	2 1.35	39.040099 -77.055457 39.051978 -77.075217	1.33 -1.63%	

**Table 1 (Cont'd)**  
**Segments selected for validation in Maryland**

SEGMENT (Map Link)	DESCRIPTION			TMC CODES		Deployment		
	Highway Direction	State County	Starting at Ending at	Begin End	Number Length	Begin Lat/Lon End Lat/Lon	Length % Diff	
<b>Arterial</b>								All Lengths in Miles
A17 <a href="#">MD0758603</a>	MD-586 Westbound	Maryland Montgomery	Connecticut Ave Aspen Hill Rd	110-06807 110-06807	1 1.98	39.051978 -77.075217 39.069173 -77.104787	2.03 2.27%	
A18 <a href="#">MD0758604</a>	MD-586 Westbound	Maryland Montgomery	Aspen Hill Rd Twinbrook Pkwy	110-06806 110-06806	1 0.48	39.069173 -77.104787 39.073462 -77.111866	0.48 -0.47%	
A19 <a href="#">MD0758605</a>	MD-586 Westbound	Maryland Montgomery	Twinbrook Pkwy 1st Street	110-06805 110-06805	1 1.43	39.073462 -77.111866 39.079665 -77.137134	1.48 3.36%	
A20 <a href="#">MD0758606</a>	MD-586 Westbound	Maryland Montgomery	1st Street MD-355	110N06805 110N06804	3 0.55	39.079665 -77.137134 39.081428 -77.146925	0.44 -19.54%	
A21 <a href="#">MD0758651</a>	MD-586 Eastbound	Maryland Montgomery	MD-355 1st Street	110P06804 110P06805	3 0.51	39.081322 -77.147051 39.079702 -77.13786	0.44 -14.39%	
A22 <a href="#">MD0758652</a>	MD-586 Eastbound	Maryland Montgomery	1st Street Twinbrook Pkwy	110+06806 110+06806	1 1.47	39.079702 -77.13786 39.073357 -77.11195	1.48 0.84%	
A23 <a href="#">MD0758655</a>	MD-586 Eastbound	Maryland Montgomery	Connecticut Ave University Blvd	110P06808 110+06809	2 1.33	39.052313 -77.075991 39.040533 -77.05656	1.33 -0.30%	
A24 <a href="#">MD0758656</a>	MD-586 Eastbound	Maryland Montgomery	University Blvd Georgia Ave	110P06809 110P06810	3 0.49	39.040533 -77.05656 39.03579 -77.049828	0.39 -20.55%	



## ***Analysis of Arterial Results***

Table 2 summarizes the data quality measures obtained as a result of comparison between Bluetooth and all reported INRIX speeds. Specifications include the Average Absolute Speed Error (AASE) and the Speed Error Bias (SEB).

### Average Absolute Speed Error (AASE)

The AASE is defined as the mean absolute value of the difference between the mean speed reported from the VPP and the ground truth mean speed for a specified time period. The AASE is the primary accuracy metric. Based on the contract specifications, the speed data from the VPP shall have a maximum average absolute error of 10 miles per hour (MPH) in each of four speed ranges: 0-15 MPH, 15-25 MPH, 25-35 MPH and 35+ MPH.

### Speed Error Bias (SEB)

The SEB is defined as the average speed error (not the absolute value) in each speed range. SEB is a measure of whether the speed reported in the VPP consistently under or over estimates speed as compared to ground truth speed. Based on the contract specifications, the VPP data shall have a maximum SEB of +/- 5 MPH in each of speed ranges as defined above.

The results are presented as compared against the mean of the ground truth data as well as the 95<sup>th</sup> percent confidence interval for the mean, referred to as the Standard Error of the Mean (SEM) band. The SEM band takes into account any uncertainty in the ground truth speed as measured by BTM equipment due to limited samples and/or data variance. Contract specifications are assessed against the SEM band. (See the *Vehicle Probe Project: Data Use and Application Guide* for additional details on the validation process.) The AASE in the lower two speed bands have proven to be the critical specification (and most difficult) to attain, and are highlighted in Table 2. AASE below 10 MPH meet contract specifications. As shown, the average absolute speed error (AASE) was within specification for all speed bins.

**TABLE 2**  
**Data quality measures for arterial segments in Maryland**

<b>SPEED BIN</b>	<b>Data Quality Measures for</b>				<b>No. of 5 Minute Samples</b>	<b>Hours of Data Collection</b>
	<b>1.96 SEM Band</b>		<b>Mean</b>			
	<b>SEB</b>	<b>AASE</b>	<b>SEB</b>	<b>AASE</b>		
	5 mph	10 mph				
<b>(contract specifications)</b>						
0-15	6.9	7	13	13.1	1341	111.8
15-25	3.1	3.1	7.6	7.9	6271	522.6
25-35	0.6	1	1.8	4.2	6614	551.2
35+	-5	5.1	-10.6	10.9	19239	1603.3

Table 3 shows the percentage of the time INRIX data falls within 5 mph of the SEM band and the mean for each speed bin for all arterial data segments in Maryland.

**Table 3**  
**Percent observations meeting data quality criteria for arterial segments in Maryland**

<b>SPEED BIN</b>	<b>Data Quality Measures for</b>				<b>No. of Obs.</b>
	<b>1.96 SEM Band</b>		<b>Mean</b>		
	<b>Percentage falling inside the band</b>	<b>Percentage falling within 5 mph of the band</b>	<b>Percentage equal to the mean</b>	<b>Percentage within 5 mph of the mean</b>	
0-15	10%	37%	0%	8%	1341
15-25	34%	72%	0%	28%	6271
25-35	67%	93%	0%	67%	6614
35+	39%	61%	0%	25%	19239

Tables 4 and 5 present detailed data for individual TMC segments in Maryland in a similar format as Tables 2 and 3, respectively. Note that for some segments and in some speed bins the comparison results may not be reliable due to small number of observations.

**Table 4**  
**Data quality measures for individual arterial validation segments in the state of Maryland**

TMC	Standard TMC length	Bluetooth distance	SPEED BIN	Data Quality Measures for				No. of Obs.
				1.96 SEM Band		Mean		
				Speed Error Bias	Average Absolute Speed Error	Speed Error Bias	Average Absolute Speed Error	
MD0735501	2.48	2.74	0-15	4.5	4.5	8.7	8.7	45
			15-25	2.3	2.4	5.7	6.0	67
			25-35	0.9	0.9	2.8	3.2	38
			35+	-	-	-	-	-
MD0735502	1.11	0.90	0-15	10.5	10.5	10.8	10.8	1*
			15-25	2.2	2.4	5.1	5.9	160
			25-35	0.3	0.6	1.5	4.1	489
			35+	-1.5	1.6	-7.6	8.5	425
MD0735503	1.35	1.25	0-15	6.9	6.9	11.8	11.8	172
			15-25	3.6	3.6	6.6	6.8	800
			25-35	0.1	0.4	0.2	3.0	93
			35+	-3.7	3.7	-5.7	8.0	5*
MD0735504	2.53	2.67	0-15	9.2	9.2	17.4	17.4	15*
			15-25	1.2	1.2	7.1	7.1	15*
			25-35	0.3	0.3	1.1	2.6	10*
			35+	-	-	-	-	-
MD0735505	1.88	1.91	0-15	7.6	7.6	15.9	15.9	26*
			15-25	2.9	2.9	9.8	9.8	56*
			25-35	0.8	1.0	3.3	4.0	50
			35+	-1.1	1.1	-5.3	5.3	11*
MD0735506	1.59	1.55	0-15	6.8	6.8	15.3	15.3	110
			15-25	2.6	2.6	9.4	9.5	479
			25-35	0.5	0.8	1.4	3.4	443
			35+	-1.6	1.6	-4.7	4.9	54
MD0735507	1.69	1.37	0-15	10.7	10.7	20.6	20.6	3*
			15-25	3.1	3.1	9.5	9.5	318
			25-35	0.9	1.0	2.9	3.8	1071
			35+	-0.9	0.9	-4.5	4.7	129
MD0735508	1.10	1.37	0-15	5.0	5.0	11.7	11.7	125
			15-25	1.3	1.5	4.9	5.5	195
			25-35	-0.4	1.1	-1.0	3.0	94
			35+	-5.8	5.8	-10.5	10.5	7*

\*Results in the specified row may not be reliable due to small number of observations

**Table 4 (Cont'd)**  
**Data quality measures for individual arterial validation segments in the state of Maryland**

TMC	Standard TMC length	Bluetooth distance	SPEED BIN	Data Quality Measures for				No. of Obs.
				1.96 SEM Band		Mean		
				Speed Error Bias	Average Absolute Speed Error	Speed Error Bias	Average Absolute Speed Error	
MD0735509	2.60	2.58	0-15	16.0	16.0	24.7	24.7	8*
			15-25	3.9	3.9	14.9	14.9	16*
			25-35	2.4	2.4	5.9	6.0	27*
			35+	-	-	-	-	-
MD0735510	0.74	0.80	0-15	-	-	-	-	-
			15-25	3.4	3.4	12.3	12.3	7*
			25-35	0.2	0.2	4.2	4.5	78
			35+	-0.9	0.9	-4.0	4.2	82
MD0735553	1.36	1.36	0-15	6.1	6.1	10.2	10.2	103
			15-25	3.0	3.1	5.8	6.1	928
			25-35	0.3	0.6	0.9	3.1	245
			35+	-0.9	2.4	-4.3	6.7	13*
MD0735556	1.51	1.51	0-15	-	-	-	-	-
			15-25	0.0	0.0	8.1	8.1	5*
			25-35	-1.0	1.2	-2.1	4.2	365
			35+	-4.0	4.0	-9.5	9.5	908
MD0735557	1.68	1.68	0-15	9.8	9.8	18.2	18.2	1*
			15-25	0.1	0.1	5.7	6.3	33
			25-35	-0.9	0.9	-1.5	4.3	170
			35+	-9.8	9.8	-16.9	16.9	1605
MD0735558	1.11	1.11	0-15	6.0	6.0	14.9	14.9	61
			15-25	3.0	3.0	7.7	7.7	190
			25-35	0.1	0.8	0.6	2.8	181
			35+	-2.1	2.1	-4.4	4.6	39
MD0758601	0.43	0.39	0-15	6.7	6.7	13.5	13.6	146
			15-25	1.2	1.3	6.4	7.1	262
			25-35	0.0	0.3	-1.9	3.4	106
			35+	-1.4	1.4	-11.6	11.6	16*
MD0758602	1.35	1.33	0-15	9.1	9.1	18.2	18.2	20*
			15-25	4.1	4.1	11.8	11.8	389
			25-35	0.9	1.2	4.0	5.0	580
			35+	-0.5	0.5	-2.3	3.3	148

\*Results in the specified row may not be reliable due to small number of observations

**Table 4 (Cont'd)**  
**Data quality measures for individual arterial validation segments**  
**in the state of Maryland**

TMC	Standard TMC length	Bluetooth distance	SPEED BIN	Data Quality Measures for				No. of Obs.
				1.96 SEM Band		Mean		
				Speed Error Bias	Average Absolute Speed Error	Speed Error Bias	Average Absolute Speed Error	
MD0758603	1.98	2.03	0-15	7.3	7.3	16.4	16.4	66
			15-25	3.8	3.8	9.8	9.9	317
			25-35	0.7	1.1	2.8	4.0	219
			35+	-0.1	0.1	-3.0	3.4	10*
MD0758604	0.48	0.48	0-15	13.3	13.3	16.7	16.7	3*
			15-25	4.2	4.3	8.6	9.1	344
			25-35	1.9	2.2	4.5	5.7	865
			35+	-0.5	0.8	-2.2	4.1	226
MD0758605	1.43	1.48	0-15	10.5	10.5	14.1	14.1	105
			15-25	2.7	2.7	10.5	10.5	245
			25-35	0.5	0.7	2.0	3.5	468
			35+	-2.0	2.0	-5.3	5.5	95
MD0758606	0.55	0.44	0-15	5.6	5.6	16.3	16.3	1*
			15-25	0.1	0.1	6.6	6.6	19*
			25-35	-0.1	0.2	-0.7	2.9	83
			35+	-3.0	3.0	-12.2	12.2	118
MD0758651	0.49	0.49	0-15	5.0	5.1	8.9	9.1	180
			15-25	0.6	0.9	2.4	4.4	298
			25-35	-0.8	0.8	-6.1	6.5	215
			35+	-8.8	8.8	-18.2	18.2	164
MD0758652	1.33	1.33	0-15	-	-	-	-	-
			15-25	3.3	3.3	11.6	11.7	66
			25-35	0.2	0.5	2.4	4.1	356
			35+	-2.7	2.7	-6.6	6.8	888
MD0758655	1.47	1.47	0-15	9.1	9.1	16.3	16.3	146
			15-25	4.3	4.4	7.8	8.0	980
			25-35	0.8	1.2	2.8	3.8	243
			35+	-1.3	1.3	-3.4	3.4	2*
MD0758656	0.51	0.51	0-15	2.5	2.5	11.4	11.4	4*
			15-25	0.9	0.9	5.5	6.0	82
			25-35	-0.3	0.3	-1.9	3.5	125
			35+	-4.6	4.6	-12.1	12.1	68

\*Results in the specified row may not be reliable due to small number of observations

**Table 5**  
**Observations meeting data quality criteria for individual arterial validation segments**  
**in the state of Maryland**

TMC	SPEED BIN	Data Quality Measures for								No. of Obs.
		1.96 SEM Band				Mean				
		Speed Error Bias		Average Absolute Speed Error		Speed Error Bias		Average Absolute Speed Error		
		No. falling inside the band	% falling inside the band	No. falling within 5 mph of the band	% falling within 5 mph of the band	No. equal to the mean	% equal to the mean	No. within 5 mph of the mean	% within 5 mph of the mean	
MD0735501	0-15	8.0	18%	25.0	56%	0	0%	13	29%	45
	15-25	17.0	25%	55.0	82%	0	0%	32	48%	67
	25-35	19.0	50%	37.0	97%	0	0%	30	79%	38
	35+	-	-	-	-	-	-	-	-	-
MD0735502	0-15	0.0	0%	0.0	0%	0	0%	0	0%	1*
	15-25	75.0	47%	126.0	79%	0	0%	69	43%	160
	25-35	387.0	79%	475.0	97%	0	0%	323	66%	489
	35+	295.0	69%	370.0	87%	0	0%	144	34%	425
MD0735503	0-15	11.0	6%	48.0	28%	0	0%	12	7%	172
	15-25	178.0	22%	536.0	67%	0	0%	248	31%	800
	25-35	78.0	84%	92.0	99%	0	0%	75	81%	93
	35+	2.0	40%	3.0	60%	0	0%	0	0%	5*
MD0735504	0-15	0.0	0%	8.0	53%	0	0%	0	0%	15*
	15-25	8.0	53%	14.0	93%	0	0%	7	47%	15*
	25-35	8.0	80%	10.0	100%	0	0%	10	100%	10*
	35+	-	-	-	-	-	-	-	-	-
MD0735505	0-15	1.0	4%	7.0	27%	0	0%	0	0%	26*
	15-25	19.0	34%	42.0	75%	0	0%	10	18%	56*
	25-35	26.0	52%	49.0	98%	0	0%	39	78%	50
	35+	4.0	36%	11.0	100%	0	0%	7	64%	11*
MD0735506	0-15	5.0	5%	37.0	34%	0	0%	0	0%	110
	15-25	167.0	35%	385.0	80%	0	0%	93	19%	479
	25-35	292.0	66%	423.0	95%	0	0%	346	78%	443
	35+	30.0	56%	49.0	91%	0	0%	30	56%	54
MD0735507	0-15	0.0	0%	0.0	0%	0	0%	0	0%	3*
	15-25	96.0	30%	234.0	74%	0	0%	33	10%	318
	25-35	664.0	62%	1013.0	95%	0	0%	732	68%	1071
	35+	89.0	69%	121.0	94%	0	0%	80	62%	129
MD0735508	0-15	20.0	16%	64.0	51%	0	0%	7	6%	125
	15-25	97.0	50%	179.0	92%	0	0%	94	48%	195
	25-35	60.0	64%	88.0	94%	0	0%	74	79%	94
	35+	2.0	29%	3.0	43%	0	0%	0	0%	7*

\*Results in the specified row may not be reliable due to small number of observations

**Table 5 (Cont'd)**  
**Observations meeting data quality criteria for individual arterial validation segments**  
**in the state of Maryland**

TMC	SPEED BIN	Data Quality Measures for								No. of Obs.
		1.96 SEM Band				Mean				
		Speed Error Bias		Average Absolute Speed Error		Speed Error Bias		Average Absolute Speed Error		
		No. falling inside the band	% falling inside the band	No. falling within 5 mph of the band	% falling within 5 mph of the band	No. equal to the mean	% equal to the mean	No. within 5 mph of the mean	% within 5 mph of the mean	
MD0735509	0-15	0.0	0%	0.0	0%	0	0%	0	0%	8*
	15-25	3.0	19%	10.0	63%	0	0%	0	0%	16*
	25-35	10.0	37%	23.0	85%	0	0%	11	41%	27*
	35+	-	-	-	-	-	-	-	-	-
MD0735510	0-15	-	-	-	-	-	-	-	-	-
	15-25	1.0	14%	5.0	71%	0	0%	0	0%	7*
	25-35	68.0	87%	78.0	100%	0	0%	46	59%	78
	35+	55.0	67%	79.0	96%	0	0%	49	60%	82
MD0735553	0-15	12.0	12%	38.0	37%	0	0%	16	16%	103
	15-25	270.0	29%	675.0	73%	0	0%	359	39%	928
	25-35	190.0	78%	240.0	98%	0	0%	205	84%	245
	35+	6.0	46%	10.0	77%	0	0%	3	23%	13*
MD0735556	0-15	-	-	-	-	-	-	-	-	-
	15-25	5.0	100%	5.0	100%	0	0%	1	20%	5*
	25-35	229.0	63%	331.0	91%	0	0%	232	64%	365
	35+	348.0	38%	596.0	66%	0	0%	202	22%	908
MD0735557	0-15	0.0	0%	0.0	0%	0	0%	0	0%	1*
	15-25	32.0	97%	33.0	100%	0	0%	13	39%	33
	25-35	137.0	81%	156.0	92%	0	0%	112	66%	170
	35+	211.0	13%	439.0	27%	0	0%	39	2%	1605
MD0735558	0-15	7.0	11%	28.0	46%	0	0%	0	0%	61
	15-25	73.0	38%	138.0	73%	0	0%	50	26%	190
	25-35	109.0	60%	176.0	97%	0	0%	146	81%	181
	35+	18.0	46%	32.0	82%	0	0%	22	56%	39
MD0738601	0-15	17.0	12%	64.0	44%	0	0%	7	5%	146
	15-25	164.0	63%	240.0	92%	0	0%	79	30%	262
	25-35	95.0	90%	104.0	98%	1	1%	86	81%	106
	35+	12.0	75%	15.0	94%	0	0%	2	13%	16*
MD0738602	0-15	1.0	5%	4.0	20%	0	0%	0	0%	20*
	15-25	96.0	25%	239.0	61%	0	0%	26	7%	389
	25-35	364.0	63%	535.0	92%	0	0%	317	55%	580
	35+	124.0	84%	141.0	95%	0	0%	116	78%	148

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**Table 5 (Cont'd)**  
**Observations meeting data quality criteria for individual arterial validation segments**  
**in the state of Maryland**

TMC	SPEED BIN	Data Quality Measures for								No. of Obs.
		1.96 SEM Band				Mean				
		Speed Error Bias		Average Absolute Speed Error		Speed Error Bias		Average Absolute Speed Error		
		No. falling inside the band	% falling inside the band	No. falling within 5 mph of the band	% falling within 5 mph of the band	No. equal to the mean	% equal to the mean	No. within 5 mph of the mean	% within 5 mph of the mean	
MD0738603	0-15	10.0	15%	24.0	36%	0	0%	0	0%	66
	15-25	82.0	26%	204.0	64%	0	0%	34	11%	317
	25-35	113.0	52%	206.0	94%	0	0%	155	71%	219
	35+	8.0	80%	10.0	100%	0	0%	7	70%	10*
MD0738604	0-15	0.0	0%	0.0	0%	0	0%	0	0%	3*
	15-25	107.0	31%	213.0	62%	1	0%	83	24%	344
	25-35	429.0	50%	709.0	82%	2	0%	427	49%	865
	35+	172.0	76%	217.0	96%	1	0%	160	71%	226
MD0738605	0-15	1.0	1%	19.0	18%	0	0%	11	10%	105
	15-25	98.0	40%	187.0	76%	0	0%	28	11%	245
	25-35	344.0	74%	447.0	96%	0	0%	363	78%	468
	35+	51.0	54%	76.0	80%	0	0%	46	48%	95
MD0738606	0-15	0.0	0%	0.0	0%	0	0%	0	0%	1*
	15-25	18.0	95%	19.0	100%	0	0%	5	26%	19*
	25-35	78.0	94%	82.0	99%	0	0%	72	87%	83
	35+	50.0	42%	91.0	77%	0	0%	6	5%	118
MD0758651	0-15	41.0	23%	97.0	54%	0	0%	38	21%	180
	15-25	228.0	77%	274.0	92%	0	0%	186	62%	298
	25-35	178.0	83%	204.0	95%	0	0%	96	45%	215
	35+	32.0	20%	58.0	35%	0	0%	3	2%	164
MD0758652	0-15	-	-	-	-	-	-	-	-	-
	15-25	31.0	47%	46.0	70%	0	0%	4	6%	66
	25-35	281.0	79%	347.0	97%	0	0%	237	67%	356
	35+	401.0	45%	693.0	78%	0	0%	338	38%	888
MD0758655	0-15	1.0	1%	31.0	21%	0	0%	1	1%	146
	15-25	191.0	19%	575.0	59%	0	0%	241	25%	980
	25-35	132.0	54%	229.0	94%	0	0%	171	70%	243
	35+	0.0	0%	2.0	100%	0	0%	2	100%	2*
MD0758656	0-15	1.0	25%	3.0	75%	0	0%	0	0%	4*
	15-25	60.0	73%	76.0	93%	0	0%	31	38%	82
	25-35	109.0	87%	122.0	98%	0	0%	93	74%	125
	35+	23.0	34%	43.0	63%	0	0%	0	0%	68

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