



I-95 Corridor Coalition

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

Report for Georgia (#2)
GA-141, US-19, and US-41



April 2016

I-95 CORRIDOR COALITION VEHICLE PROBE PROJECT VALIDATION OF TOMTOM DATA APRIL 2016

*Report for Georgia (#2)
GA-141, US-19, and US-41*

Prepared for:

I-95 Corridor Coalition

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I-95 Corridor Coalition

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Evaluation Results for the State of Georgia

Executive Summary

The data from the Vehicle Probe Project is validated using BluetoothTM Traffic Monitoring (BTM) technology on a near monthly basis. The validation of arterial data is similar to that of freeway data, however the following should be noted. The boundaries of the speed bins used for arterials are different than those used for freeways to accommodate the lower speeds on this type of corridor.

BTMs sensor were deployed at the beginning and ending points of 16 different segments along the GA-141, US-19, and US-41 corridors. The number of lanes for GA-141 and US-41 varies between two and three per direction. For US-19, the number of lanes per direction varies between two and four. Average signal density is around two signals per mile for both GA-141 and US-41. Average Annual Daily Traffic (AADT) is 43,207 along GA-141, 146,516 along US-19, and 30,830 along US-41. The speed limit is 55 MPH for GA-141, 65 MPH for US-19, and 45 MPH for US-41.

The Bluetooth sensor deployment covers the range from McGinnis Ferry Rd to Holcomb Bridge Rd along GA-141, McFarland Rd/Exit 12 to I-285/Exit 4 along US-19, and GA-120 Loop to Windy Hill Rd along US-41. Travel time data was collected for both directions along each arterial, between February 3 and February 18, 2016. During this period, the area experienced three days with rain and three days with snow. The dataset collected represents approximately 3,715 hours of observations along 16 arterial segments, totaling approximately 29 miles. The total number of effective five-minute travel time samples observed was 44,575.

ES Table 1, below summarizes the results of the comparison between the BTM reference data and the TomTom data for arterial segments during the above noted time period. As shown, the average absolute speed error (AASE) was within specification in all speed bins. The Speed Error Bias (SEB) was also within specifications for all speed bins. Although the data are compared to these specifications, caution should be used when using probe data on arterial roadways. Other factors including signal density and traffic volume should be considered.

ES Table 1 - Georgia Evaluation Summary for Arterial

Speed Bin	Average 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	4.3	5.9	4.3	5.8	1006	84
15-25 MPH	6.3	10.1	6.2	9.7	3990	333
25-35 MPH	5.2	10.3	4.6	8.7	6129	511
>35 MPH	2.0	5.5	-1.5	-3.5	33450	2788
All Speeds	2.9	6.6	0.1	-0.4	44575	3715
Based upon data collected from February 3, 2016 through February 18, 2016 across 29 miles of roadway.						

Data Collection

Travel time samples were collected along 16 arterial segments with the assistance of Georgia Department of Transportation (GDOT) personnel. Arterial segments studied were located on the GA-141 corridor from McGinnis Ferry Rd to Holcomb Bridge Rd, on US-19 from McFarland Rd/Exit 12 to I-285/Exit 4, and on US-41 corridor from GA-120 Loop to Windy Hill Rd. Travel time data was collected for both directions along GA-141, US-19, and US-41 between February 3 and February 18, 2016. Segment locations were chosen with a high-likelihood of observing recurrent and non-recurrent congestion during peak and off-peak periods.

Figure 1, 2, and 3 present an overview snapshot of the placement of sensors for the collection of data on the GA-141, US-19, and US-41 corridors, respectively. Blue segments represent arterial segments selected for analysis. The number of lanes for GA-141 and US-41 corridors varies between two and three per direction with average signal density of around two signal per mile. For US-19, The number of lanes varies between two and four per direction. Average Annual Daily Traffic (AADT) is 43,207 along GA-141, 146,516 along US-19, and 30,830 along US-41. The speed limit is 55 MPH for GA-141, 65 MPH for US-19, and 45 MPH for US-41.

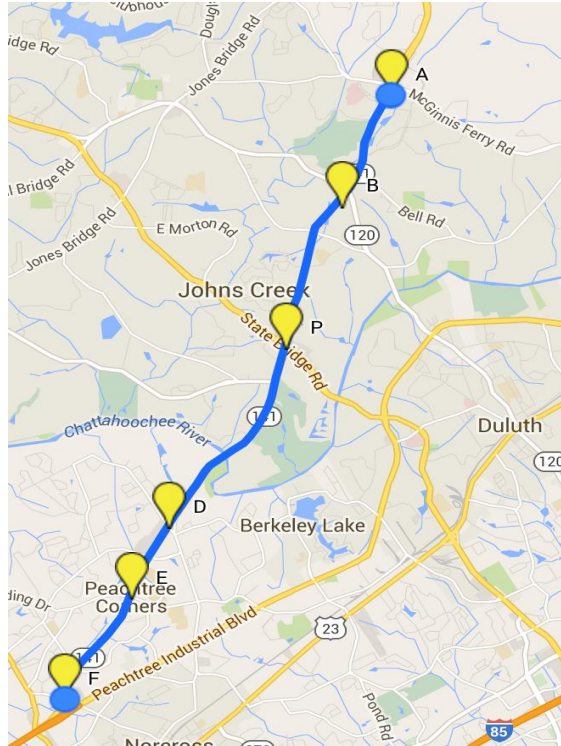


Figure 1 — Locations of all segments selected on GA-141 for analysis in Georgia

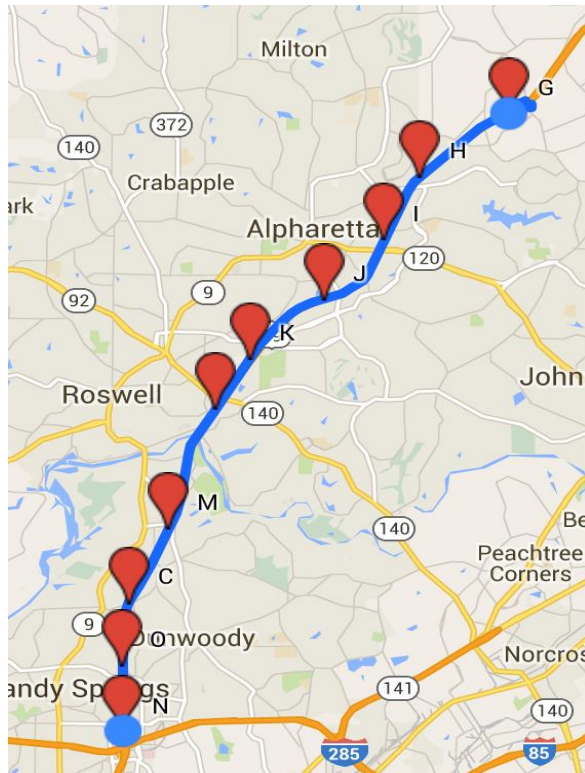


Figure 2 — Locations of all segments selected on US-19 for analysis in Georgia

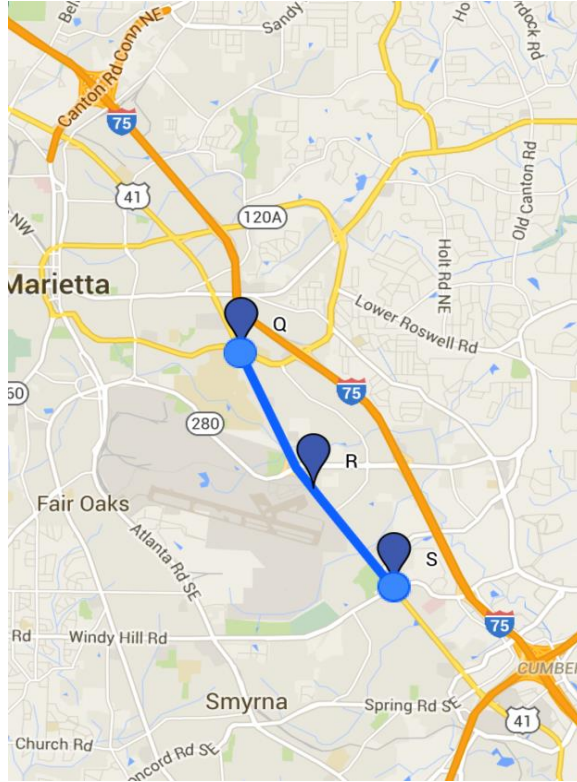


Figure 3 — Locations of all segments selected on US-41 for analysis in Georgia

TMC segments selected for validation in Georgia

Table 1 presents the data collection segments from Georgia. As a whole, these segments cover a total length of 29 arterial miles. Data collection segments are comprised of one or more Traffic Message Channel (TMC) base segments, such that the total length of the data collection segment is in most cases one mile long or greater for arterials. When appropriate, consecutive TMC segments are combined to form a data collection segment longer than one mile. The results of the validation performed on 16 bidirectional arterial segments are included in this report. Table 1 contains the summary information on each data collection segment including the latitude/longitude coordinates of the locations at which the Bluetooth sensors were deployed along GA-141, US-19, and US-41 in Georgia 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 the 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 BluetoothTM Traffic Monitoring (BTM) sensors placed on the roadway. An algorithm was developed and documented in a separate report¹ as part of the initial VPP project and is being used for the validation of all vendors in VPPII. Details of the algorithm used to estimate equivalent path travel times based on TomTom data feeds for individual data collection segments are provided in this separate report. This algorithm finds an equivalent TomTom travel time (and therefore travel speed) corresponding to each sample BTM travel time observation on the test segment of interest.

¹ Ali Haghani, Masoud Hamed, Kaveh Farokhi Sadabadi, Estimation of Travel Times for Multiple TMC Segments, prepared for I-95 Corridor Coalition, February 2010 ([link](#))

Table 1
Segments selected for validation in Georgia

SEGMENT (Map Link)	DESCRIPTION			TMC CODES		Deployment	
	Highway Georgia	State County	Starting at Ending at	Begin End	Length Number	Begin Lat/Lon End Lat/Lon	Length % Diff
Arterials							All Lengths in Miles
A1 GA02-0001	GA-141 Southbound	Georgia Fulton	McGinnis Ferry Rd GA-120/Abbotts Bridge Rd	101n05325 101n05325	1.50 1	34.067770 34.047667	-84.168335 -84.177651 -0.70%
A2 GA02-0002	GA-141 Southbound	Georgia Fulton	GA-120/Abbotts Bridge Rd State Bridge Rd	101n05324 101n05324	2.23 1	34.047667 34.017889	-84.177651 -84.190105 0.90%
A3 GA02-0003	GA-141 Southbound	Georgia Fulton	State Bridge Rd Medlock Bridge Rd	101n05323 101n05322	2.82 2	34.017889 33.983319	-84.190105 -84.213912 0.00%
A4 GA02-0004	GA-141 Southbound	Georgia Gwinnett	Medlock Bridge Rd Spalding Dr	101n05321 101n05320	1.03 2	33.983319 33.969906	-84.213912 -84.221566 0.00%
A5 GA02-0005	GA-141 Southbound	Georgia Gwinnett	Spalding Dr Holcomb Bridge Rd	101n05319 101n05319	1.54 1	33.969906 33.950248	-84.221566 -84.235174 1.72%
A6 GA02-0006	GA-141 Northbound	Georgia Gwinnett	Holcomb Bridge Rd Spalding Dr	101p05320 101p05320	1.62 1	33.950248 33.970252	-84.235174 -84.221168 -1.24%
A7 GA02-0007	GA-141 Northbound	Georgia Gwinnett	Spalding Dr Medlock Bridge Rd	101p05321 101p05322	0.99 2	33.970252 33.983181	-84.221168 -84.213746 2.02%
A8 GA02-0008	GA-141 Northbound	Georgia Fulton	Medlock Bridge Rd State Bridge Rd	101p05322 101p05324	2.84 3	33.983181 34.018014	-84.213746 -84.189926 -1.06%
A9 GA02-0009	GA-141 Northbound	Georgia Fulton	State Bridge Rd GA-120/Abbotts Bridge Rd	101p05325 101p05325	2.23 1	34.018014 34.047800	-84.189926 -84.177379 0.19%
A10 GA02-0010	GA-141 Northbound	Georgia Fulton	GA-120/Abbotts Bridge Rd McGinnis Ferry Rd	101p05326 101p05326	1.50 1	34.047800 34.067891	-84.177379 -84.168133 0.39%
A11 GA02-0011	US-19 Southbound	Georgia Fulton	McFarland Rd/Exit 12 Windward Pkwy/Exit 11	101n04223 101n04223	2.54 1	34.112405 34.088774	-84.228050 -84.261583 -13.95%

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

SEGMENT (Map Link)	DESCRIPTION			TMC CODES		Deployment		
	Freeway Georgia	State County	Starting at Ending at	Begin End	Length Number	Begin Lat/Lon End Lat/Lon	Length % Diff	
Arterials								All Lengths in Miles
A12 GA02-0012	US-19 Southbound	Georgia Fulton	Windward Pkwy/Exit 11 GA-120 /Exit 10	101n04223 101n04222	1.26 2	34.071962 34.053000	-84.270373 -84.290916	1.53 21.36%
A13 GA02-0013	US-19 Southbound	Georgia Fulton	GA-120/ /Exit 10 Haynes Bridge Rd/Exit 9	101n04222 101n04221	1.87 2	34.053000 34.033876	-84.290916 -84.315628	1.86 -0.54%
A14 GA02-0014	US-19 Southbound	Georgia Fulton	Haynes Bridge Rd/Exit 9 Mansell Rd/Exit 8	101n04220 101n04220	1.99 1	34.033876 34.016804	-84.315628 -84.328026	1.97 -1.00%
A15 GA02-0015	US-19 Southbound	Georgia Fulton	Mansell Rd/Exit 8 GA-140 /Exit 7	101n04219 101n04219	1.38 1	34.016804 33.981744	-84.328026 -84.342161	1.27 -8.00%
A16 GA02-0016	US-19 Southbound	Georgia Fulton	GA-140/ Exit 7 Northridge Rd/Exit 6	101n04219 101n04218	2.58 2	33.981744 33.957061	-84.342161 -84.356395	2.79 8.13%
A17 GA02-0017	US-19 Southbound	Georgia Fulton	Northridge Rd/Exit 6 Spalding Dr	101n04218 101n04217	3.29 2	33.957061 33.936931	-84.356395 -84.357943	1.80 -45.31%
A18 GA02-0018	US-19 Southbound	Georgia Fulton	Spalding Dr Abernathy Rd/Exit 5	101n04217 101n04217	2.94 1	33.936931 33.914983	-84.357943 -84.357797	1.39 -52.76%
A19 GA02-0019	US-19 Southbound	Georgia Fulton	Abernathy Rd/Exit 5 I-285/Exit 4	101n04217 101n04216	1.51 3	33.914983 33.937871	-84.357797 -84.357735	1.40 -7.27%
A20 GA02-0020	US-19 Northbound	Georgia Fulton	I-285/Exit 4 Abernathy Rd/Exit 5	101p04237 101p04217	1.33 3	33.937871 33.957061	-84.357735 -84.356395	1.44 8.29%
A21 GA02-0021	US-19 Northbound	Georgia Fulton	Abernathy Rd/Exit 5 Spalding Dr	101p04218 101p04218	3.30 1	33.957061 34.112405	-84.356395 -84.228050	1.40 -57.60%
A22 GA02-0022	US-19 Northbound	Georgia Fulton	Spalding Dr Northridge Rd/Exit 6	101p04218 101p04218	3.30 1	33.982782 33.982782	-84.341420 -84.341420	1.79 -45.79%

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

SEGMENT (Map Link)	DESCRIPTION			TMC CODES		Deployment	
	Freeway Georgia	State County	Starting at Ending at	Begin End	Length Number	Begin Lat/Lon End Lat/Lon	Length % Diff
Arterials							All Lengths in Miles
A23 GA02-0023	US-19 Northbound	Georgia Fulton	Northridge Rd/Exit 6 GA-140/ Exit 7	101p04218 101p04219	2.55 2	34.017312 34.017312	-84.327398 -84.327398 2.78 9.10%
A24 GA02-0024	US-19 Northbound	Georgia Fulton	GA-140 /Exit 7 Mansell Rd/Exit 8	101p04219 101p04220	1.36 2	34.034233 34.034233	-84.315100 -84.315100 1.27 -6.60%
A25 GA02-0025	US-19 Northbound	Georgia Fulton	Mansell Rd/Exit 8 Haynes Bridge Rd/Exit 9	101p04220 101p04221	1.84 2	34.052313 34.052313	-84.292477 -84.292477 1.96 6.51%
A26 GA02-0026	US-19 Northbound	Georgia Fulton	Haynes Bridge Rd/Exit 9 GA-120/Exit 10	101p04221 101p04222	2.00 3	34.072086 34.072086	-84.270005 -84.270005 1.88 -6.01%
A27 GA02-0027	US-19 Northbound	Georgia Fulton	GA-120/ Exit 10 Windward Pkwy/Exit 11	101p04223 101p04223	1.20 1	34.088063 34.088063	-84.261716 -84.261716 1.52 26.68%
A28 GA02-0028	US-19 Northbound	Georgia Fulton	Windward Pkwy/Exit 11 McFarland Rd/Exit 12	101p04223 101p04224	2.56 2	34.112083 34.112083	-84.228182 -84.228182 2.20 14.08%
A29 GA02-0029	US-41 Southbound	Georgia Cobb	GA-120 Loop/S Marietta Pkwy SE GA-280/Cobb Dr	101n04589 101n04589	1.84 1	33.942754 33.918840	-84.516202 -84.502125 1.74 -5.42%
A30 GA02-0030	US-41 Southbound	Georgia Cobb	GA-280/Cobb Dr Windy Hill Rd	101n04588 101n04587	1.40 2	33.918840 33.902789	-84.502125 -84.487262 1.41 0.89%
A31 GA02-0031	US-41 Northbound	Georgia Cobb	Windy Hill Rd GA-280/Cobb Dr	101p04588 101p04589	1.40 2	33.902789 33.918840	-84.487262 -84.502125 1.41 0.89%
A32 GA02-0032	US-41 Northbound	Georgia Cobb	GA-280/Cobb Dr GA-120 Loop/S Marietta Pkwy SE	101p04589 101p04590	1.84 2	33.918840 33.942754	-84.502125 -84.516202 1.74 -5.43%

Analysis of Arterial Results

Table 2 summarizes the data quality measures obtained as a result of comparison between Bluetooth and all reported TomTom speeds. Specifications used for comparison 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 95th 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. As shown, the average absolute speed error (AASE) was within specification for all the speed bins. The Speed Error Bias (SEB) was also within specifications for all speed bins.

TABLE 2 Data quality measures for arterial segments in Georgia

SPEED BIN	Data Quality Measures for				No. of 5 Minute Samples	Hours of Data Collection
	1.96 SEM Band		Mean			
	SEB	AASE	SEB	AASE		
	5 mph (contract specifications)	10 mph				
0-15	4.3	4.3	5.8	5.9	1006	84
15-25	6.2	6.3	9.7	10.1	3990	333
25-35	4.6	5.2	8.7	10.3	6129	511
35+	-1.5	2.0	-3.5	5.5	33450	2788

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

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

SPEED BIN	Data Quality Measures for				No. of Obs.
	1.96 SEM Band		Mean		
	Percentage falling inside the band	Percentage falling within 5 mph of the band	Percentage equal to the mean	Percentage within 5 mph of the mean	
0-15	12%	69%	0%	56%	1006
15-25	14%	48%	0%	24%	3990
25-35	25%	54%	0%	20%	6129
35+	43%	88%	0%	51%	33450

Tables 4 and 5 present detailed data for individual TMC segments in this validation 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 the small number of observations.

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

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	
GA02-0001	1.49	1.49	0-15	5.0	5.0	8.6	8.6	27*
			15-25	6.1	6.1	10.4	10.4	462
			25-35	5.0	5.0	10.1	10.5	517
			35+	0.1	0.8	2.9	5.3	165
GA02-0002	2.25	2.25	0-15	5.0	5.0	7.1	7.1	94
			15-25	8.9	8.9	13.3	13.3	240
			25-35	9.2	9.2	14.5	14.5	490
			35+	1.7	2.0	5.9	7.2	328
GA02-0003	2.83	2.82	0-15	4.0	4.0	5.1	5.1	41
			15-25	6.3	6.3	8.5	8.5	102
			25-35	6.6	6.6	12.6	12.7	238
			35+	1.2	1.5	4.4	5.7	1050
GA02-0004	1.03	1.03	0-15	11.1	11.1	16.1	16.1	30*
			15-25	5.8	6.4	8.5	10.7	629
			25-35	-1.9	4.6	-3.9	11.2	488
			35+	-16.3	16.3	-23.1	23.4	173
GA02-0005	1.57	1.56	0-15	3.3	3.3	5.0	5.0	35
			15-25	6.6	6.6	10.8	11.0	106
			25-35	6.7	6.7	13.3	13.4	365
			35+	0.3	1.2	3.1	5.9	767
GA02-0006	1.59	1.60	0-15	8.9	8.9	10.7	10.7	6*
			15-25	4.2	4.2	6.8	6.8	64
			25-35	6.1	6.1	10.8	11.1	238
			35+	0.8	1.5	3.7	5.9	1267
GA02-0007	1.01	1.01	0-15	7.3	7.3	8.6	8.6	193
			15-25	7.1	7.1	12.3	12.3	587
			25-35	1.2	1.2	5.5	5.7	565
			35+	-2.6	2.6	-7.1	7.3	179
GA02-0008	2.80	2.81	0-15	2.2	2.2	2.8	2.8	21*
			15-25	2.8	2.8	4.3	4.4	171
			25-35	5.2	5.2	9.0	9.2	344
			35+	0.9	1.5	2.8	4.7	1017
GA02-0009	2.23	2.23	0-15	2.1	2.1	3.4	3.4	60
			15-25	5.7	5.7	8.1	8.2	246
			25-35	8.2	8.2	12.3	12.4	649
			35+	2.1	2.4	5.5	6.8	231
GA02-0010	1.51	1.50	0-15	4.3	4.3	6.1	6.1	26*
			15-25	8.7	8.7	12.7	12.7	306
			25-35	5.2	5.2	10.2	10.5	768
			35+	0.2	0.9	3.3	5.3	251
GA02-0011	2.19	2.19	0-15	-	-	-	-	-
			15-25	-	-	-	-	-
			25-35	-	-	-	-	-
			35+	-3.4	3.4	-7.2	7.2	2205

*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 Georgia

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	
GA02-0012	1.53	1.53	0-15	45.9	45.9	50.6	50.6	1*
			15-25	-	-	-	-	-
			25-35	19.6	19.6	21.7	21.7	1*
			35+	-1.5	1.5	-4.4	4.7	2467
GA02-0013	1.86	1.86	0-15	1.9	1.9	2.8	2.9	21*
			15-25	0.7	0.8	1.7	2.1	39
			25-35	2.6	4.5	2.2	7.0	21*
			35+	-1.6	1.7	-4.3	4.7	1648
GA02-0014	1.97	1.97	0-15	1.1	1.1	1.5	1.7	108
			15-25	1.3	1.5	1.8	2.5	72
			25-35	2.1	2.3	2.5	3.5	40
			35+	-0.7	1.0	-2.4	3.2	1768
GA02-0015	1.26	1.27	0-15	2.0	2.0	3.0	3.1	55
			15-25	1.6	1.6	2.9	3.1	68
			25-35	1.6	1.7	3.0	3.3	81
			35+	-2.4	2.5	-5.7	6.0	2596
GA02-0016	2.88	2.79	0-15	0.8	0.8	1.5	1.6	15*
			15-25	0.7	0.9	1.3	1.7	93
			25-35	0.7	1.1	1.1	2.2	34
			35+	-0.9	1.0	-2.9	3.3	2306
GA02-0017	1.80	1.80	0-15	-	-	-	-	-
			15-25	0.2	0.2	0.7	0.9	6*
			25-35	-1.7	1.7	-3.2	3.2	16*
			35+	-7.1	7.1	-10.9	10.9	250
GA02-0018	1.39	1.39	0-15	-	-	-	-	-
			15-25	2.9	2.9	7.0	7.0	1*
			25-35	0.0	0.0	2.9	2.9	2*
			35+	-0.3	0.7	-0.1	3.0	119
GA02-0019	1.40	1.40	0-15	18.1	18.1	19.3	19.3	3*
			15-25	21.8	21.8	23.8	23.8	8*
			25-35	18.7	18.7	21.2	21.2	7*
			35+	-1.6	1.9	-6.5	7.1	109
GA02-0020	1.44	1.44	0-15	-	-	-	-	-
			15-25	1.6	1.6	2.9	2.9	7*
			25-35	1.5	1.5	3.7	3.7	11*
			35+	-8.4	8.4	-14.5	14.7	98
GA02-0021	1.40	1.40	0-15	-	-	-	-	-
			15-25	8.1	8.1	9.4	9.4	8*
			25-35	5.2	5.2	7.3	7.3	16*
			35+	1.2	1.3	3.4	3.9	103
GA02-0022	1.79	1.79	0-15	2.1	2.1	3.7	3.7	3*
			15-25	-0.4	3.6	1.0	7.1	3*
			25-35	0.0	0.7	-0.5	2.0	20*
			35+	-3.2	3.3	-6.0	6.4	284

*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 Georgia

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	
GA02-0023	2.78	2.78	0-15	12.1	12.1	13.2	13.2	3*
			15-25	7.2	7.2	11.4	11.4	5*
			25-35	2.0	2.9	2.4	5.1	18*
			35+	-2.1	2.2	-5.7	6.0	2295
GA02-0024	1.27	1.27	0-15	23.1	23.1	24.1	24.1	2*
			15-25	5.8	5.8	6.8	7.5	16*
			25-35	-0.1	0.1	1.3	4.9	3*
			35+	-1.9	1.9	-5.3	5.8	2626
GA02-0025	1.96	1.96	0-15	20.8	20.8	23.5	23.5	5*
			15-25	9.6	9.6	15.8	15.8	8*
			25-35	7.4	7.4	12.9	19.3	4*
			35+	-0.8	0.9	-2.5	3.5	1903
GA02-0026	1.88	1.88	0-15	-	-	-	-	-
			15-25	3.6	3.6	7.1	7.1	2*
			25-35	2.6	2.6	3.9	4.6	3*
			35+	-2.4	2.4	-7.1	7.2	1695
GA02-0027	1.52	1.52	0-15	-	-	-	-	-
			15-25	0.0	0.0	-0.3	0.7	3*
			25-35	-0.9	2.7	-2.5	6.2	13*
			35+	-0.9	1.0	-3.2	4.1	2470
GA02-0028	2.20	2.20	0-15	0.4	0.6	0.7	1.3	36
			15-25	-0.7	0.7	-1.5	1.7	74
			25-35	-4.1	4.1	-6.0	6.1	23*
			35+	-3.8	3.8	-7.2	7.3	2060
GA02-0029	1.75	1.74	0-15	-	-	-	-	-
			15-25	10.9	10.9	18.3	18.3	13*
			25-35	4.8	4.8	10.8	11.0	285
			35+	0.8	1.3	3.4	4.8	522
GA02-0030	1.41	1.41	0-15	2.8	2.9	4.5	4.7	175
			15-25	5.5	5.5	9.1	9.3	282
			25-35	1.3	1.5	3.7	5.2	123
			35+	-4.0	4.0	-7.3	7.3	19*
GA02-0031	1.41	1.41	0-15	9.8	9.8	20.5	20.5	8*
			15-25	10.2	10.2	16.5	16.5	262
			25-35	4.1	4.1	10.3	10.4	410
			35+	0.1	0.2	2.1	3.3	77
GA02-0032	1.75	1.74	0-15	4.9	4.9	6.0	6.0	38
			15-25	5.4	5.4	8.0	8.1	107
			25-35	2.6	2.8	6.0	7.0	336
			35+	-0.8	1.2	-1.1	3.9	402

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

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	
GA02-0001	0-15	0	0%	13	48%	0	0%	8	30%	27*
	15-25	4	1%	106	23%	0	0%	63	14%	462
	25-35	21	4%	149	29%	0	0%	115	22%	517
	35+	28	17%	117	71%	0	0%	79	48%	165
GA02-0002	0-15	0	0%	44	47%	0	0%	39	41%	94
	15-25	0	0%	19	8%	0	0%	12	5%	240
	25-35	7	1%	28	6%	0	0%	22	4%	490
	35+	24	7%	137	42%	0	0%	92	28%	328
GA02-0003	0-15	0	0%	30	73%	0	0%	29	71%	41
	15-25	0	0%	31	30%	0	0%	26	25%	102
	25-35	3	1%	17	7%	0	0%	15	6%	238
	35+	133	13%	622	59%	0	0%	453	43%	1050
GA02-0004	0-15	0	0%	3	10%	0	0%	2	7%	30*
	15-25	27	4%	162	26%	0	0%	112	18%	629
	25-35	21	4%	102	21%	0	0%	73	15%	488
	35+	1	1%	12	7%	0	0%	7	4%	173
GA02-0005	0-15	2	6%	23	66%	0	0%	20	57%	35
	15-25	2	2%	35	33%	0	0%	24	23%	106
	25-35	19	5%	56	15%	0	0%	37	10%	365
	35+	148	19%	484	63%	6	1%	351	46%	767
GA02-0006	0-15	0	0%	3	50%	0	0%	1	17%	6*
	15-25	6	9%	33	52%	0	0%	30	47%	64
	25-35	9	4%	61	26%	0	0%	47	20%	238
	35+	234	18%	771	61%	3	0%	546	43%	1267
GA02-0007	0-15	0	0%	27	14%	0	0%	22	11%	193
	15-25	1	0%	29	5%	0	0%	7	1%	587
	25-35	105	19%	389	69%	0	0%	267	47%	565
	35+	45	25%	112	63%	0	0%	93	52%	179
GA02-0008	0-15	0	0%	20	95%	0	0%	19	90%	21*
	15-25	3	2%	129	75%	0	0%	121	71%	171
	25-35	5	1%	79	23%	0	0%	44	13%	344
	35+	155	15%	707	70%	0	0%	574	56%	1017
GA02-0009	0-15	1	2%	54	90%	0	0%	50	83%	60
	15-25	11	4%	100	41%	0	0%	88	36%	246
	25-35	18	3%	107	16%	0	0%	80	12%	649
	35+	24	10%	104	45%	0	0%	82	36%	231
GA02-0010	0-15	0	0%	15	58%	0	0%	13	50%	26*
	15-25	2	1%	42	14%	0	0%	30	10%	306
	25-35	36	5%	171	22%	0	0%	134	17%	768
	35+	36	14%	174	69%	0	0%	116	46%	251
GA02-0011	0-15	-	-	-	-	-	-	-	-	-
	15-25	-	-	-	-	-	-	-	-	-
	25-35	-	-	-	-	-	-	-	-	-
	35+	71	3%	926	42%	0	0%	492	22%	2205

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

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	
GA02-0012	0-15	0	0%	0	0%	0	0%	0	0%	1*
	15-25	-	-	-	-	-	-	-	-	-
	25-35	0	0%	0	0%	0	0%	0	0%	1*
	35+	349	14%	1897	77%	0	0%	1423	58%	2467
GA02-0013	0-15	5	24%	20	95%	0	0%	20	95%	21*
	15-25	14	36%	36	92%	0	0%	36	92%	39
	25-35	3	14%	11	52%	0	0%	9	43%	21*
	35+	252	15%	1264	77%	0	0%	974	59%	1648
GA02-0014	0-15	15	14%	107	99%	0	0%	107	99%	108
	15-25	10	14%	68	94%	0	0%	64	89%	72
	25-35	8	20%	32	80%	0	0%	28	70%	40
	35+	412	23%	1609	91%	0	0%	1447	82%	1768
GA02-0015	0-15	5	9%	49	89%	0	0%	48	87%	55
	15-25	12	18%	62	91%	0	0%	56	82%	68
	25-35	11	14%	74	91%	0	0%	65	80%	81
	35+	194	7%	1538	59%	0	0%	989	38%	2596
GA02-0016	0-15	2	13%	15	100%	0	0%	15	100%	15*
	15-25	10	11%	92	99%	0	0%	91	98%	93
	25-35	8	24%	32	94%	0	0%	31	91%	34
	35+	484	21%	2068	90%	0	0%	1794	78%	2306
GA02-0017	0-15	-	-	-	-	-	-	-	-	-
	15-25	2	33%	6	100%	0	0%	6	100%	6*
	25-35	0	0%	16	100%	0	0%	13	81%	16*
	35+	4	2%	80	32%	0	0%	41	16%	250
GA02-0018	0-15	-	-	-	-	-	-	-	-	-
	15-25	0	0%	1	100%	0	0%	0	0%	1*
	25-35	1	50%	2	100%	0	0%	2	100%	2*
	35+	45	38%	108	91%	0	0%	96	81%	119
GA02-0019	0-15	0	0%	0	0%	0	0%	0	0%	3*
	15-25	0	0%	0	0%	0	0%	0	0%	8*
	25-35	0	0%	0	0%	0	0%	0	0%	7*
	35+	12	11%	67	61%	0	0%	37	34%	109
GA02-0020	0-15	-	-	-	-	-	-	-	-	-
	15-25	0	0%	7	100%	0	0%	7	100%	7*
	25-35	1	9%	11	100%	0	0%	8	73%	11*
	35+	0	0%	10	10%	0	0%	5	5%	98
GA02-0021	0-15	-	-	-	-	-	-	-	-	-
	15-25	0	0%	0	0%	0	0%	0	0%	8*
	25-35	0	0%	5	31%	0	0%	3	19%	16*
	35+	17	17%	88	85%	0	0%	71	69%	103
GA02-0022	0-15	0	0%	3	100%	0	0%	2	67%	3*
	15-25	0	0%	2	67%	0	0%	0	0%	3*
	25-35	2	10%	19	95%	0	0%	19	95%	20*
	35+	17	6%	153	54%	0	0%	99	35%	284

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

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	
GA02-0023	0-15	0	0%	0	0%	0	0%	0	0%	3*
	15-25	0	0%	2	40%	0	0%	1	20%	5*
	25-35	3	17%	14	78%	0	0%	14	78%	18*
	35+	168	7%	1423	62%	0	0%	905	39%	2295
GA02-0024	0-15	0	0%	0	0%	0	0%	0	0%	2*
	15-25	2	13%	13	81%	0	0%	13	81%	16*
	25-35	1	33%	3	100%	0	0%	2	67%	3*
	35+	448	17%	1768	67%	0	0%	1293	49%	2626
GA02-0025	0-15	0	0%	0	0%	0	0%	0	0%	5*
	15-25	0	0%	0	0%	0	0%	0	0%	8*
	25-35	0	0%	0	0%	0	0%	0	0%	4*
	35+	526	28%	1688	89%	1	0%	1468	77%	1903
GA02-0026	0-15	-	-	-	-	-	-	-	-	-
	15-25	0	0%	1	50%	0	0%	1	50%	2*
	25-35	1	33%	2	67%	0	0%	1	33%	3*
	35+	92	5%	861	51%	0	0%	445	26%	1695
GA02-0027	0-15	-	-	-	-	-	-	-	-	-
	15-25	2	67%	3	100%	0	0%	3	100%	3*
	25-35	0	0%	8	62%	0	0%	7	54%	13*
	35+	638	26%	2064	84%	1	0%	1641	66%	2470
GA02-0028	0-15	5	14%	36	100%	0	0%	36	100%	36
	15-25	19	26%	73	99%	0	0%	71	96%	74
	25-35	1	4%	13	57%	0	0%	8	35%	23*
	35+	95	5%	1064	52%	0	0%	649	32%	2060
GA02-0029	0-15	-	-	-	-	-	-	-	-	-
	15-25	0	0%	0	0%	0	0%	0	0%	13*
	25-35	4	1%	26	9%	0	0%	20	7%	285
	35+	49	9%	363	70%	0	0%	291	56%	522
GA02-0030	0-15	13	7%	129	74%	0	0%	119	68%	175
	15-25	12	4%	82	29%	0	0%	61	22%	282
	25-35	15	12%	79	64%	0	0%	55	45%	123
	35+	1	5%	10	53%	0	0%	7	37%	19*
GA02-0031	0-15	0	0%	0	0%	0	0%	0	0%	8*
	15-25	1	0%	8	3%	0	0%	4	2%	262
	25-35	10	2%	67	16%	0	0%	36	9%	410
	35+	20	26%	75	97%	0	0%	61	79%	77
GA02-0032	0-15	0	0%	19	50%	0	0%	17	45%	38
	15-25	5	5%	43	40%	0	0%	34	32%	107
	25-35	26	8%	140	42%	0	0%	96	29%	336
	35+	86	21%	338	84%	0	0%	305	76%	402