



I-95 Corridor Coalition

I-95 Corridor Coalition Vehicle
Probe Project: Validation of
INRIX Data
Monthly Report
Virginia



February 2010

I-95 CORRIDOR COALITION VEHICLE PROBE PROJECT: VALIDATION OF INRIX DATA FEBRUARY 2010

Monthly Report

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February 2010

Evaluation Results for the State of Virginia

Executive Summary

Travel time samples were collected along nearly 14 miles of freeways and two miles of arterials in Virginia from Thursday, November 5, 2009 to Tuesday, November 17, 2009 and compared with travel time and speed data reported by INRIX as part of the I-95 Vehicle Probe project. The validation data represents approximately 1660 hours of observations along eight freeway segments in Virginia, two of which are standard TMC segments and the other six are path segments comprised of multiple standard TMC segments. Since some TMC segments in this corridor are less than one mile long, when appropriate, consecutive TMC segments were combined to form path segments longer than one mile.

ES Table 1, below summarizes the results of the comparison between the validation data and the INRIX data for freeway segments for the same period. Both the absolute average speed error and speed error bias were within specification for all speed bins. It is worth noting that these results are the best the evaluation team has seen since the start of its work.

ES Table 1 - VA Evaluation Summary						
State	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		
0-30 MPH	4.50	5.60	0.70	0.80	2567	213.9
30-45 MPH	7.10	9.80	0.60	1.80	1652	137.7
45-60 MPH	3.20	5.40	-0.10	0.60	8141	678.4
> 60 MPH	3.10	5.30	-1.90	-2.90	7551	629.3
All Speeds	3.65	5.75	-0.62	-0.60	19911	1659.3

Based upon data collected from Nov 5, 2009 through Nov 17, 2009 across 15.5 miles of roadway.

As part of the on-going validation process, vehicle probe data from each state is validated on a rotating basis. Since the inception of the validation process, data on roadways in the State of Virginia were validated on four occasions: July 2008, November 2008, May 2009, and November 2009. This represents more than 4000 hours of observations along 83 miles of freeway segments in Virginia. ES Table 2 provides a summary of the cumulative validation effort. As shown, both the absolute average speed error and speed error bias were within specification for all speed bins.

ES Table 2 - VIRGINIA - Cumulative to Date						
State	Absolute Speed Error		Speed Error Bias		Number of 5 Minute Samples	Hours of Data Collection
	Comparison with SEM Band	Comparison with Mean	Comparison with SEM Band	Comparison with Mean		
0-30 MPH	4.47	5.64	1.17	1.35	3811	317.6
30-45 MPH	6.88	9.17	1.15	2.04	2990	249.2
45-60 MPH	2.76	4.82	-0.10	0.54	16133	1344.4
> 60 MPH	2.31	4.43	-1.79	-3.13	25461	2121.8
All Speeds	2.91	4.95	-0.81	-1.23	48395	4032.9

Based upon data collected in July 2008, November 2008, May 2009, and November 2009

As mentioned, travel time samples were also collected along two miles of arterials in Virginia from Thursday, November 5, 2009 to Tuesday, November 17, 2009 and compared with travel time and speed data reported by INRIX as part of this project. The arterial data is included for informational purposes noting that INRIX has volunteered arterial data at no cost to the Coalition for the first three years, and that the method to evaluate quality on arterial roadways has not been fully evaluated. As the Coalition collects additional data on arterials, more appropriate quality metrics will be developed.

Data Collection

Bluetooth sensor deployments in Virginia started on Thursday, November 5, 2009. The actual deployments in Virginia were performed with the assistance of Virginia Department of Transportation (VDOT) personnel. Sensors remained in the same position until they were retrieved two weeks later on Tuesday, November 17, 2009. This round of data collections in Virginia was designed to cover segments of the highways along which both recurrent and non-recurrent congestions could be expected during both peak and off-peak periods.

Figure 1 presents snapshots of the roadway segments over which Bluetooth sensors were deployed in Virginia. In this figure, red segments represent freeway segments while blue segments are the ones that are chosen on arterials.

Table 1 presents a list of specific TMC segments that were selected as the validation sample in Virginia. These segments cover a total length of about 14 freeway miles as well as about 2 miles of arterials. Since some TMC segments in this corridor are less than one mile long, when appropriate, consecutive TMC segments are combined to form path segments longer than one mile. In total, in this document results of validation performed on eight freeway segments are reported; two of which are standard TMC segments and the other six are path segments combined from multiple standard TMC segments. The coordinates of the locations at which the Bluetooth sensors were deployed throughout the state of Virginia are highlighted in Table 2. It should be noted that the configuration of consecutive TMC segments is such that the endpoint of one TMC segment and the start point of the next TMC segment are overlapping, so one Bluetooth sensor in that location is covering both TMC segments.

Finally, Table 3 summarizes the segment definitions used in the validation process which also presents the distances that have been used in the estimation of Bluetooth speeds based on travel times. Details of the algorithm used to estimate equivalent path travel times based on INRIX feeds for individual TMC segment are provided in the report titled “Estimation of Travel Times for Multiple TMC Segments” (dated February 2010) and available on the I-95 Corridor Coalition website. This algorithm finds an equivalent INRIX travel time (and therefore travel speed) corresponding to each sample Bluetooth travel time observation on the path segment of interest.

Analysis of Results

Table 4 summarizes the data quality measures obtained as a result of comparison between Bluetooth and all reported INRIX speeds. In all speed bins, INRIX data meets the data quality measures set forth in the contract when errors are measured as a distance from the 1.96 times the standard error band. Even when errors are measured as a distance from the mean, INRIX data quality is deemed as satisfactory based on the same requirements. It is worth noting that these results are the best the evaluation team has seen since the start of its work.

It should be noted that while the total number of observations in the low speed bins across all TMC segments are reasonable, as Table 6 indicates, the number of observations in low speed bins for some individual TMC segments may be low.

Table 5 shows the percentage of the time intervals that fall within 5 mph of the SEM band and the mean for each speed bin for all TMC segments in Virginia. Tables 6 and 7 present detailed data for individual TMC segments in Virginia in similar format as Tables 4 and 5 respectively. Note that for some TMC segments in some speed bins the comparison results may not be reliable due to small number of observations.

Figures 2 and 3 show the overall speed error biases for different speed bins, and the average absolute speed errors for all validation segments in Virginia, respectively. These figures correspond to Table 4.

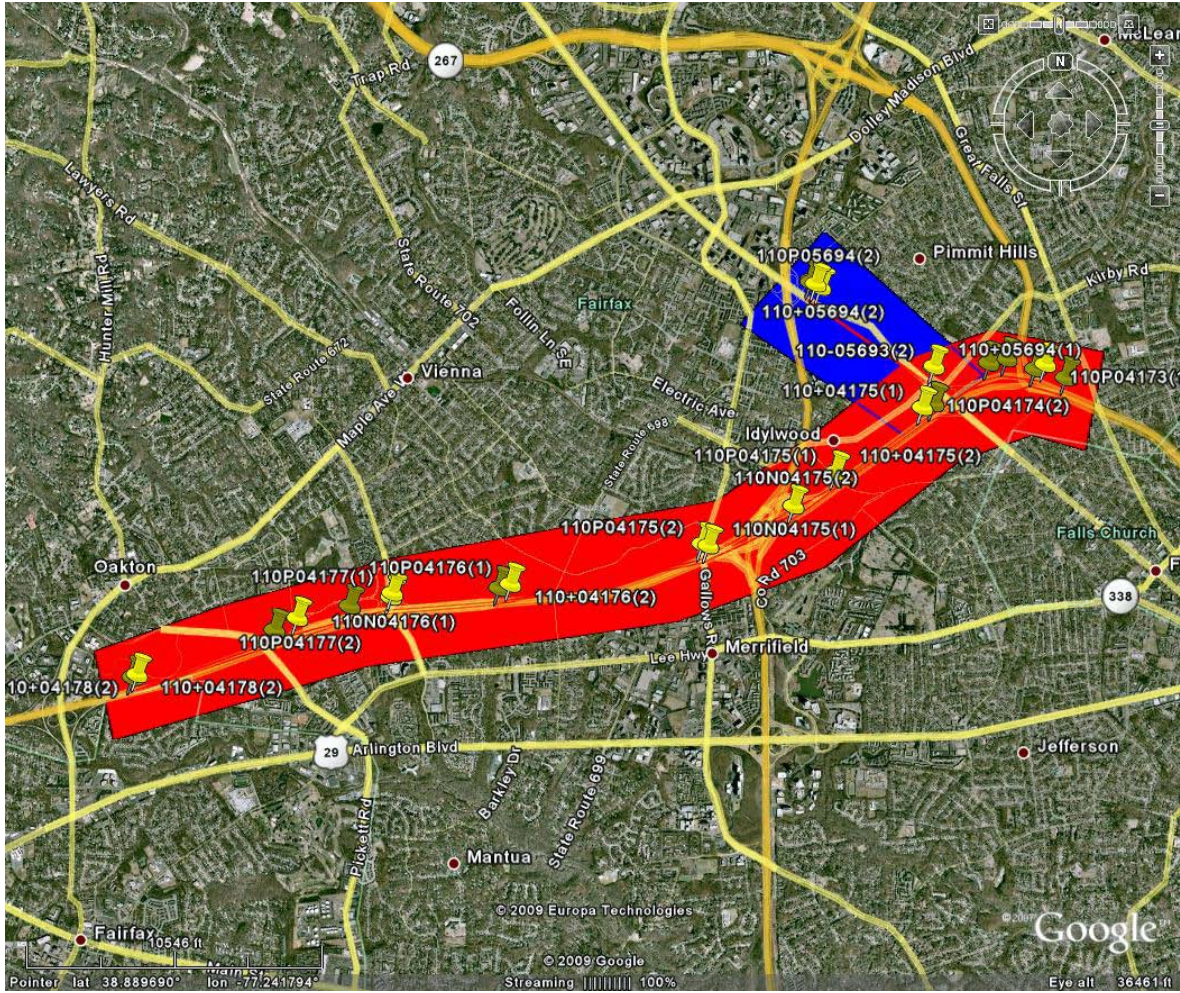


Figure 1
TMC segments selected for validation in Virginia

Table 1
Traffic Message Channel segments picked for validation in Virginia

TYPE	TMC	HIGHWAY	STARTING AT	ENDING AT	COUNTY	DIRECTION	LENGTH (mile)
Freeway	110-04177	I-66	VA-123/EXIT 60	VADEN DR/EXIT 62	FAIRFAX	EASTBOUND	1.01
Freeway	110N04177	I-66	VADEN DR/EXIT 62	VADEN DR/EXIT 62	FAIRFAX	EASTBOUND	0.53
Freeway	110-04176	I-66	VADEN DR/EXIT 62	VA-243/NUTLEY ST/EXIT 62	FAIRFAX	EASTBOUND	0.29
Freeway	110N04176	I-66	VA-243/NUTLEY ST/EXIT 62	VA-243/NUTLEY ST/EXIT 62	FAIRFAX	EASTBOUND	0.74
Freeway	110-04175	I-66	VA-243/NUTLEY ST/EXIT 62	I-495/EXIT 64	FAIRFAX	EASTBOUND	1.45
Freeway	110N04175	I-66	I-495/EXIT 64	I-495/EXIT 64	FAIRFAX	EASTBOUND	0.64
Freeway	110-04174	I-66	I-495/EXIT 64	VA-7/LEESBURG PIKE/EXIT 66	FAIRFAX	EASTBOUND	1.17
Freeway	110N04174	I-66	VA-7/LEESBURG PIKE/EXIT 66	VA-7/LEESBURG PIKE/EXIT 66	FAIRFAX	EASTBOUND	0.75
Freeway	110N04173	I-66	VA-7/LEESBURG PIKE/EXIT 66	VA-267/EXIT 67	FAIRFAX	EASTBOUND	0.22
Freeway	110P04173	I-66	VA-267/EXIT 67	VA-267/EXIT 67	FAIRFAX	WESTBOUND	0.27
Freeway	110+04174	I-66	VA-267/EXIT 67	VA-7/LEESBURG PIKE/EXIT 66	FAIRFAX	WESTBOUND	0.12
Freeway	110P04174	I-66	VA-7/LEESBURG PIKE/EXIT 66	VA-7/LEESBURG PIKE/EXIT 66	FAIRFAX	WESTBOUND	0.54
Freeway	110+04175	I-66	VA-7/LEESBURG PIKE/EXIT 66	I-495/EXIT 64	FAIRFAX	WESTBOUND	0.73
Freeway	110P04175	I-66	I-495/EXIT 64	I-495/EXIT 64	FAIRFAX	WESTBOUND	1.03
Freeway	110+04176	I-66	I-495/EXIT 64	VA-243/NUTLEY ST/EXIT 62	FAIRFAX	WESTBOUND	1.34
Freeway	110P04176	I-66	VA-243/NUTLEY ST/EXIT 62	VA-243/NUTLEY ST/EXIT 62	FAIRFAX	WESTBOUND	0.80
Freeway	110P04177	I-66	VA-243/NUTLEY ST/EXIT 62	VADEN DR/EXIT 62	FAIRFAX	WESTBOUND	0.67
Freeway	110+04178	I-66	VADEN DR/EXIT 62	VA-123/EXIT 60	FAIRFAX	WESTBOUND	1.15
SUBTOTAL							13.45
Arterial	110+05694	VA-7	IDYLWOOD RD	LISLE AVE	FAIRFAX	WESTBOUND	0.96
Arterial	110P05694	VA-7	LISLE AVE	LISLE AVE	FAIRFAX	WESTBOUND	0.04
Arterial	110+05695	VA-7	LISLE AVE	I-495/CAPITAL BELTWAY	FAIRFAX	WESTBOUND	0.04
Arterial	110N05694	VA-7	I-495/CAPITAL BELTWAY	LISLE AVE	FAIRFAX	EASTBOUND	0.04
Arterial	110-05693	VA-7	LISLE AVE	IDYLWOOD RD	FAIRFAX	EASTBOUND	1.00
SUBTOTAL							2.08
TOTAL							15.53

Table 2
TMC segment lengths and distances between sensor deployment locations in the state of Virginia

SEGMENT TYPE	TMC	STANDARD TMC					SENSOR DEPLOYMENT					ERROR IN SEGMENT LENGTH (%)
		Endpoint (1)		Endpoint (2)		Length (mile)	Endpoint (1)		Endpoint (2)		Length (mile)	
		Lat	Long	Lat	Long		Lat	Long	Lat	Long		
Freeway	110-04177	38.870268	-77.300510	38.874900	-77.282635	1.01	38.869793	-77.300702	38.874913	-77.282622	1.03	2.0%
Freeway	110N04177	38.874900	-77.282635	38.877260	-77.273192	0.53	38.874913	-77.282622	38.877025	-77.271672	0.61	14.4%
Freeway	110-04176	38.877260	-77.273192	38.878120	-77.267986	0.29	38.877025	-77.271672	38.877948	-77.266772	0.27	-5.0%
Freeway	110N04176	38.878120	-77.267986	38.879022	-77.254353	0.74	38.877948	-77.266772	38.878653	-77.254842	0.65	-12.1%
Freeway	110-04175	38.879022	-77.254353	38.883156	-77.228071	1.45	38.878653	-77.254842				
Freeway	110N04175	38.883156	-77.228071	38.887032	-77.217345	0.64			38.886957	-77.214762		
Freeway	110-04174	38.887032	-77.217345	38.897042	-77.199700	1.17	38.886957	-77.214762	38.896235	-77.199332	1.05	-10.8%
Freeway	110N04174	38.897042	-77.199700	38.900425	-77.186916	0.75	38.896235	-77.199332				
Freeway	110N04173	38.900425	-77.186916	38.899562	-77.183077	0.22			38.899455	-77.183217		
Freeway	110P04173	38.900900	-77.185618	38.901429	-77.190539	0.27	38.900600	-77.184227				
Freeway	110+04174	38.901429	-77.190539	38.901036	-77.192734	0.12			38.901008	-77.193212		
Freeway	110P04174	38.901036	-77.192734	38.896667	-77.201106	0.54	38.901008	-77.193212	38.897205	-77.200550	0.47	-12.7%
Freeway	110+04175	38.896667	-77.201106	38.890337	-77.212055	0.73	38.897205	-77.200550	38.890512	-77.212390	0.79	7.1%
Freeway	110P04175	38.890337	-77.212055	38.883328	-77.228814	1.03	38.890512	-77.212390				
Freeway	110+04176	38.883328	-77.228814	38.879397	-77.252957	1.34			38.879542	-77.253078		
Freeway	110P04176	38.879397	-77.252957	38.878524	-77.267819	0.80	38.879542	-77.253078				
Freeway	110P04177	38.878524	-77.267819	38.876072	-77.279769	0.67			38.876622	-77.279413		
Freeway	110+04178	38.876072	-77.279769	38.870528	-77.299956	1.15	38.876622	-77.279413	38.870680	-77.300757	1.23	6.4%
SUBTOTAL						13.45						
Arterial	110+05694	38.900699	-77.199639	38.908431	-77.213932	0.96	38.900627	-77.199243				
Arterial	110P05694	38.908431	-77.213932	38.908761	-77.214533	0.04						
Arterial	110+05695	38.908761	-77.214533	38.909113	-77.215182	0.04			38.908915	-77.213637		
Arterial	110N05694	38.908924	-77.215155	38.908633	-77.214605	0.04	38.908158	-77.214870				
Arterial	110-05693	38.908633	-77.214605	38.900603	-77.199733	1.00			38.900888	-77.199927		
SUBTOTAL						2.08						
TOTAL						15.53						

Table 3
Path segments identified for validation in Virginia

Type	Validation Segment	STANDARD SEGMENTS INCLUDED				STARTING AT	ENDING AT	LENGTH (MILE)		
		TMC(1)	TMC(2)	TMC(3)	TMC(4)			Standard	Deployment	Error (%)
Freeway	110-04177	110-04177				VA-123/EXIT 60	VADEN DR/EXIT 62	1.01	1.03	2.03%
Freeway	VA04-0001	110N04177	110-04176	110N04176		VADEN DR/EXIT 62	VA-243/NUTLEY ST/EXIT 62	1.56	1.53	-1.71%
Freeway	VA04-0002	110-04175	110N04175			VA-243/NUTLEY ST/EXIT 62	I-495/EXIT 64	2.09	2.23	6.65%
Freeway	VA04-0003	110-04174	110N04174	110N04173		I-495/EXIT 64	VA-267/EXIT 67	2.14	2.02	-5.40%
Freeway	VA04-0004	110P04173	110+04174	110P04174	110+04175	VA-267/EXIT 67	I-495/EXIT 64	1.67	1.75	5.12%
Freeway	VA04-0005	110P04175	110+04176			I-495/EXIT 64	VA-243/NUTLEY ST/EXIT 62	2.37	2.37	0.08%
Freeway	VA04-0006	110P04176	110P04177			VA-243/NUTLEY ST/EXIT 62	VADEN DR/EXIT 62	1.47	1.43	-2.36%
Freeway	110+04178	110+04178				VADEN DR/EXIT 62	VA-123/EXIT 60	1.15	1.23	6.41%
SUBTOTAL								13.45	13.60	1.07%
Arterial	VA04-0007	110+05694	110P05694	110+05695		IDYLWOOD RD	I-495/CAPITAL BELTWAY	1.04	0.98	-5.70%
Arterial	VA04-0008	110N05694	110-05693			I-495/CAPITAL BELTWAY	IDYLWOOD RD	1.03	0.98	-5.66%
SUBTOTAL								2.08	1.96	-5.68%
TOTAL								15.53	15.56	0.17%

Table 4
Data quality measures for freeway segments greater than one mile in Virginia

SPEED BIN	Data Quality Measures for				No. of Obs.
	1.96 SE Band		Mean		
	Speed Error Bias	Average Absolute Speed Error	Speed Error Bias	Average Absolute Speed Error	
0-30	0.7	4.5	0.8	5.6	2567
30-45	0.6	7.1	1.8	9.8	1652
45-60	-0.1	3.2	0.6	5.4	8141
60+	-1.9	3.1	-2.9	5.3	7551

Table 5
Percent observations meeting data quality criteria for freeway segments greater than one mile in Virginia

SPEED BIN	Data Quality Measures for				No. of Obs.
	1.96 SE 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	
0-30	13%	67%	0%	59%	2567
30-45	13%	46%	0%	30%	1652
45-60	32%	79%	0%	58%	8141
60+	34%	80%	0%	59%	7551

Table 6
Data quality measures for individual freeway validation segments greater than one mile in the state of Virginia

TMC	Standard TMC length	Bluetooth distance	SPEED BIN	Data Quality Measures for				No. of Obs.
				1.96 SE Band		Mean		
				Speed Error Bias	Average Absolute Speed Error	Speed Error Bias	Average Absolute Speed Error	
110+04178	1.15	1.23	0-30	1.8	3.7	1.9	4.4	363
			30-45	0.0	5.6	0.2	6.8	298
			45-60	1.9	3.4	2.9	5.4	854
			60+	-0.2	2.3	-0.6	4.4	1276
110-04177	1.01	1.03	0-30	3.3	4.6	4.1	6.3	264
			30-45	3.2	5.7	4.5	8.0	183
			45-60	0.1	1.8	0.9	3.6	1298
			60+	-0.9	1.2	-1.9	3.2	632
VA04-0001	1.56	1.53	0-30	-2.7	3.6	-3.0	4.5	470
			30-45	-8.7	9.8	-9.5	11.6	180
			45-60	-4.8	4.9	-6.5	6.7	1369
			60+	-5.4	5.4	-7.9	7.9	725
VA04-0002	2.09	2.23	0-30	-0.7	5.2	-1.0	6.4	643
			30-45	2.2	8.3	3.0	10.4	328
			45-60	0.0	1.6	0.7	3.4	1234
			60+	-0.9	0.9	-2.5	2.9	125
VA04-0003	2.14	2.02	0-30	5.8	8.1	6.2	9.4	154
			30-45	2.8	8.2	4.9	12.0	126
			45-60	-2.4	3.3	-1.8	6.7	268
			60+	-5.2	5.2	-7.8	7.8	1837
VA04-0004	1.67	1.75	0-30	5.5	8.2	9.0	13.4	41
			30-45	6.2	12.1	13.2	20.9	121
			45-60	1.9	5.3	4.5	8.7	1116
			60+	0.7	2.9	1.6	4.9	885
VA04-0005	2.37	2.37	0-30	-1.5	4.7	-2.0	6.3	183
			30-45	-1.0	3.9	0.8	7.4	235
			45-60	-0.7	1.3	-0.2	3.8	839
			60+	-1.6	1.6	-3.6	3.8	889
VA04-0006	1.47	1.43	0-30	2.6	3.1	3.1	4.0	449
			30-45	2.1	5.7	2.6	7.6	181
			45-60	2.3	3.6	4.2	5.7	1163
			60+	0.8	1.6	2.0	3.5	1182

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

Table 7
Observations meeting data quality criteria for individual freeway validation segments
greater than one mile in the state of Virginia

TMC	SPEED BIN	Data Quality Measures for								No. of Obs.
		1.96 SE 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	
110+04178	0-30	43	12%	275	76%	0	0%	261	72%	363
	30-45	31	10%	156	52%	0	0%	131	44%	298
	45-60	237	28%	617	72%	0	0%	480	56%	854
	60+	532	42%	1066	84%	1	0%	845	66%	1276
110-04177	0-30	56	21%	173	66%	0	0%	147	56%	264
	30-45	30	16%	89	49%	0	0%	67	37%	183
	45-60	578	45%	1158	89%	0	0%	971	75%	1298
	60+	371	59%	591	94%	0	0%	503	80%	632
VA04-0001	0-30	49	10%	338	72%	0	0%	306	65%	470
	30-45	9	5%	46	26%	0	0%	32	18%	180
	45-60	191	14%	912	67%	0	0%	608	44%	1369
	60+	50	7%	380	52%	0	0%	131	18%	725
VA04-0002	0-30	72	11%	370	58%	0	0%	300	47%	643
	30-45	36	11%	120	37%	0	0%	77	23%	328
	45-60	608	49%	1131	92%	0	0%	977	79%	1234
	60+	60	48%	120	96%	0	0%	109	87%	125
VA04-0003	0-30	15	10%	80	52%	0	0%	65	42%	154
	30-45	12	10%	50	40%	0	0%	27	21%	126
	45-60	155	58%	218	81%	0	0%	149	56%	268
	60+	351	19%	1175	64%	0	0%	655	36%	1837
VA04-0004	0-30	3	7%	23	56%	0	0%	21	51%	41
	30-45	16	13%	33	27%	0	0%	10	8%	121
	45-60	247	22%	767	69%	0	0%	401	36%	1116
	60+	416	47%	775	88%	0	0%	667	75%	885
VA04-0005	0-30	31	17%	115	63%	0	0%	93	51%	183
	30-45	48	20%	159	68%	0	0%	82	35%	235
	45-60	464	55%	775	92%	0	0%	621	74%	839
	60+	388	44%	807	91%	0	0%	649	73%	889
VA04-0006	0-30	67	15%	350	78%	0	0%	325	72%	449
	30-45	30	17%	99	55%	0	0%	77	43%	181
	45-60	157	14%	878	75%	1	0%	510	44%	1163
	60+	434	37%	1122	95%	0	0%	932	79%	1182

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

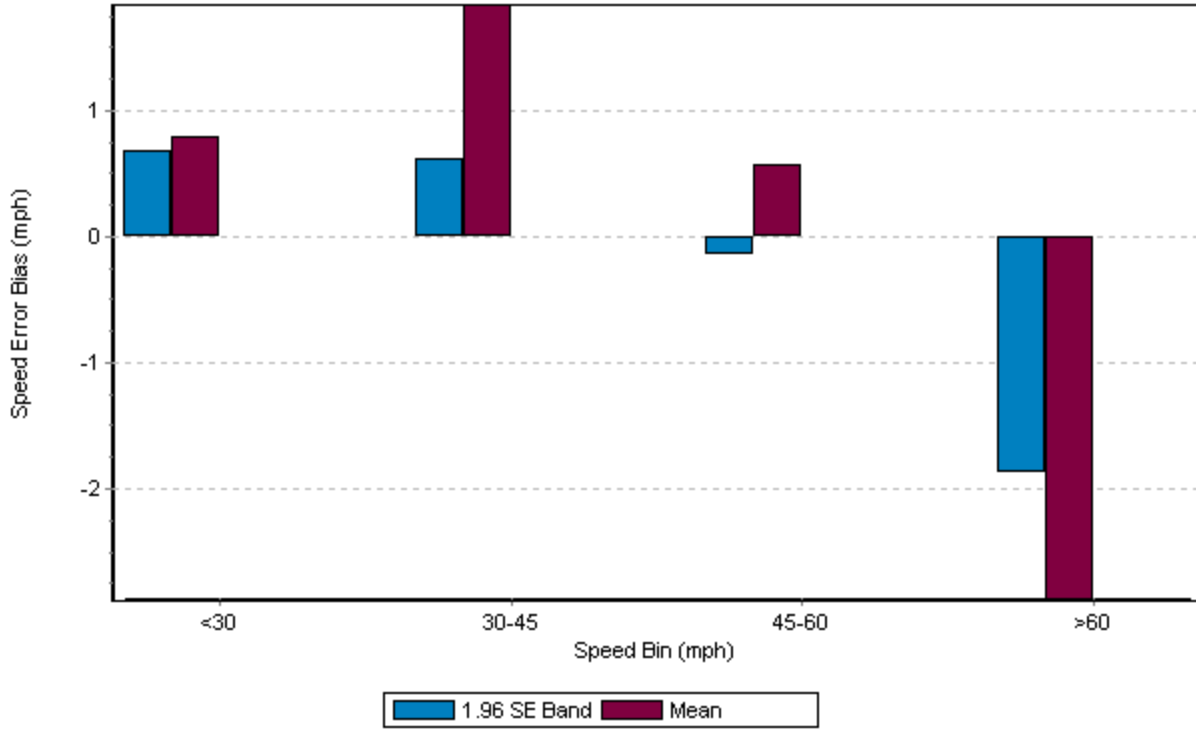


Figure 2
Speed error bias for freeway segments greater than one mile in Virginia

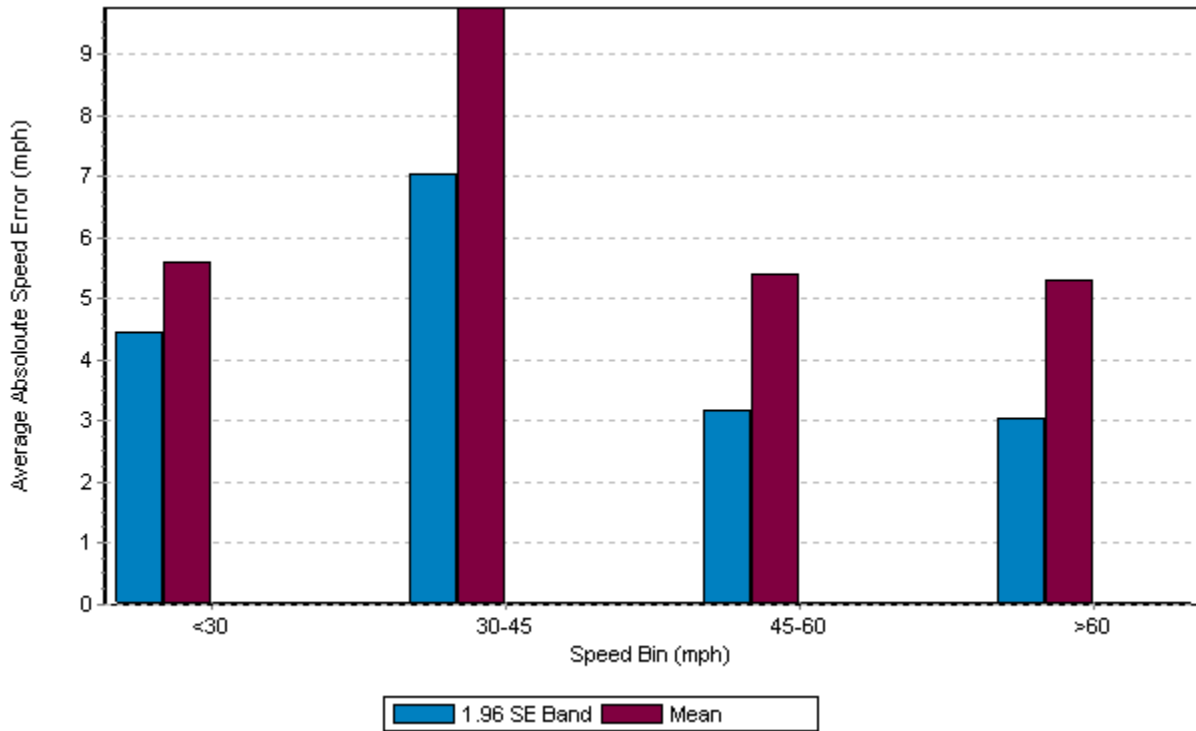


Figure 3
Average absolute speed error for freeway segments greater than one mile in Virginia

Analysis of Results for Arterials

Table 8 summarizes the data quality measures obtained as a result of comparison between Bluetooth and all reported INRIX speeds on two arterial segments considered in this round of validations. Note, that in the absence of quality metrics specific to arterials, the freeway metrics have been applied.

In all speed bins below 45mph, INRIX data meets the data quality measures set forth in the contract when errors are measured as a distance from the 1.96 times the standard error band. In speed bins over 45mph, there is only one observation made as reported in Tables 10 and 11. Since this single observation is not a reliable indicator of INRIX data quality in the 45 to 60 mph bin, it has been dropped from Figures 4 and 5 altogether. In addition, as the posted speed limit is less than 60 mph, no observations would be made in the 60+ mph bin.

Table 9 shows the percentage of the time intervals that fall within 5 mph of the SEM band and the mean for each speed bin for all arterial segments in Virginia. Tables 10 and 11 present detailed data for individual arterial segments in Virginia in similar format as Tables 8 and 9, respectively. Note that for some segments and in some speed bins the comparison results may not be reliable due to small number of observations.

Figures 4 and 5 show the overall speed error biases for different speed bins, and the average absolute speed errors for all considered arterial segments in Virginia, respectively. These figures correspond to Table 8.

Table 8
Data quality measures for arterial segments greater than one mile in Virginia

SPEED BIN	Data Quality Measures for				No. of Obs.
	1.96 SE Band		Mean		
	Speed Error Bias	Average Absolute Speed Error	Speed Error Bias	Average Absolute Speed Error	
0-30	4.8	5.3	7.6	8.6	2563
30-45	-1.6	1.8	-3.1	4.3	297
45-60	-14.7	14.7	-16.6	16.6	1
60+					

Table 9
Percent observations meeting data quality criteria for arterial segments greater than one mile in Virginia

SPEED BIN	Data Quality Measures for				No. of Obs.
	1.96 SE 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	
0-30	26%	59%	0%	33%	2563
30-45	44%	88%	0%	62%	297
45-60	0%	0%	0%	0%	1
60+					

Table 10
Data quality measures for individual arterial validation segments greater than one mile in the state of Virginia

TMC	Standard TMC length	Bluetooth distance	SPEED BIN	Data Quality Measures for				No. of Obs.
				1.96 SE Band		Mean		
				Speed Error Bias	Average Absolute Speed Error	Speed Error Bias	Average Absolute Speed Error	
VA04-0007	1.04	0.98	0-30	5.5	6.0	7.9	8.9	1512
			30-45	-1.6	1.8	-3.0	4.1	76
			45-60					
			60+					
VA04-0008	1.03	0.98	0-30	3.8	4.2	7.0	8.1	1051
			30-45	-1.6	1.9	-3.1	4.4	221
			45-60	-14.7	14.7	-16.6	16.6	1*
			60+					

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

Table 11
Observations meeting data quality criteria for individual arterial validation segments greater than one mile in the state of Virginia

TMC	SPEED BIN	Data Quality Measures for								No. of Obs.
		1.96 SE 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	
VA04-0007	0-30	289	19%	819	54%	0	0%	467	31%	1512
	30-45	36	47%	67	88%	0	0%	50	66%	76
	45-60									
	60+									
VA04-0008	0-30	387	37%	681	65%	1	0%	391	37%	1051
	30-45	94	43%	193	87%	0	0%	134	61%	221
	45-60	0	0%	0	0%	0	0%	0	0%	1*
	60+									

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

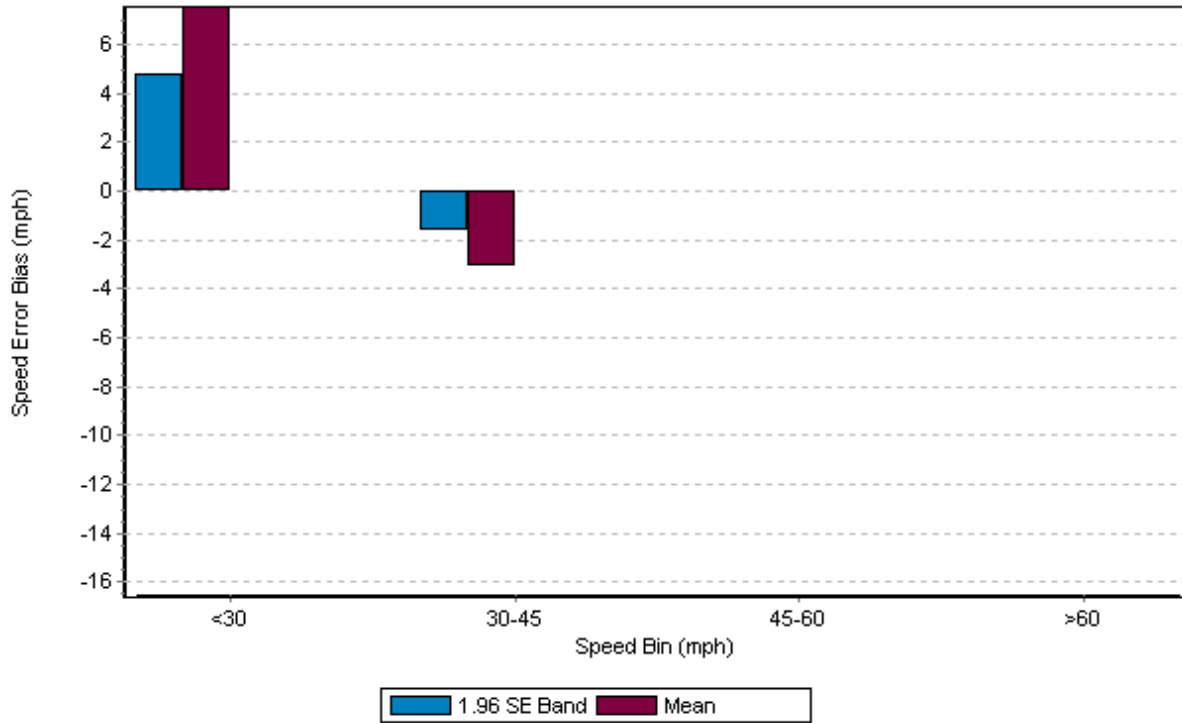


Figure 4
Speed error bias for arterial segments greater than one mile in Virginia

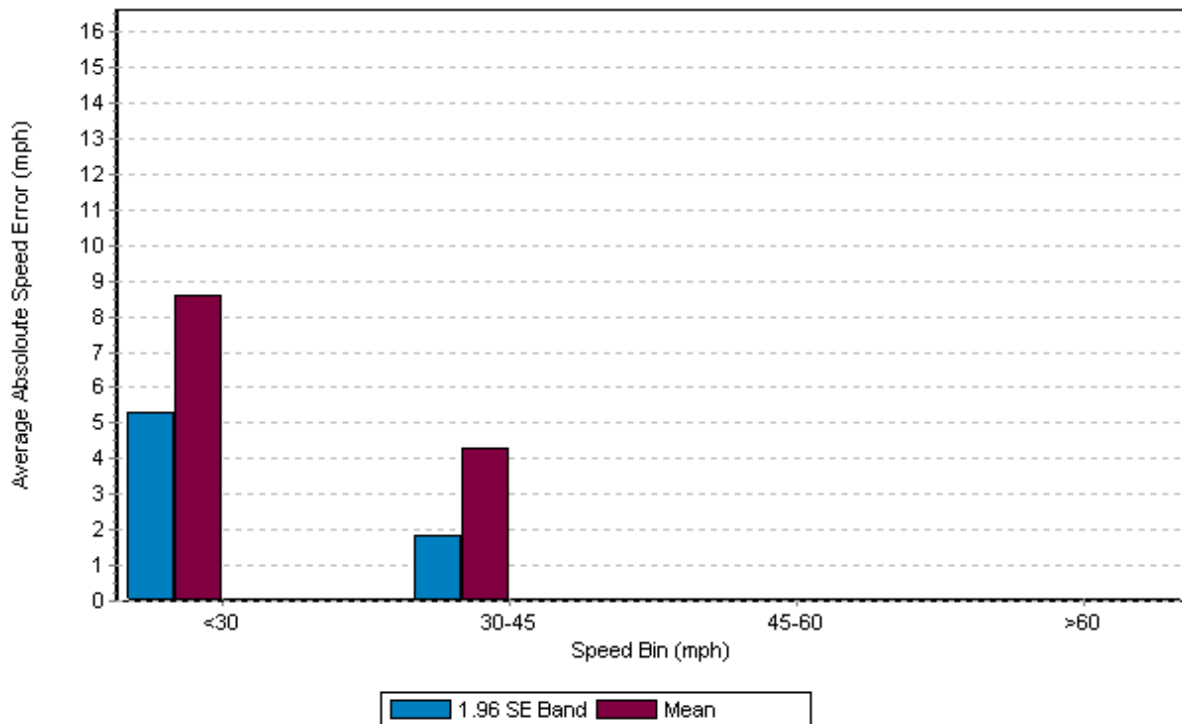


Figure 5
Average absolute speed error for arterial segments greater than one mile in Virginia