

I-95 Corridor Coalition Vehicle Probe Project: HERE, INRIX and TOMTOM Data Validation

Report for New Jersey (#14) US-1 and US-9



Prepared by:

*Masoud Hamedi, Zachary Vander Laan, Sanaz Aliari, Sara Zahedian
University of Maryland, College Park*

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Executive Summary

Wireless re-identification traffic monitoring (WRTM) data is collected to validate data from the Vehicle Probe Project, and includes Bluetooth, Wi-Fi and other wireless traffic monitoring devices that collect signals emitted by in-vehicle electronic equipment. The specific device type used for each validation is determined based on applicability, and will be defined in the report. Specifications used for comparison include Average Absolute Speed Error (AASE) and Speed Error Bias (SEB).

- Both Bluetooth and Wi-Fi re-identification sensors were deployed at the beginning and end points of 48 different segments along US-1 and US-9 corridors.
- US-1/9 segments stretch from Roanoke Ave to the US-1 & US-9 Junction. (Refer to Figure 1 below).
- US-1 segments cover the range from US-1 & US-9 Junction to US-130. (Refer to Figure 2 below).
- US-9 segments include the stretch between Amboy Ave and Texas Rd. (Refer to Figure 3 below).
- Travel time data was collected for both directions along the corridors, between November 16 and November 28, 2017.
- The dataset collected represents approximately 8,700 hours of observations along 48 arterial segments, totaling approximately 47 miles.
- The total number of effective five-minute travel time samples observed was 104,402.
- 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.

ES Table 1 provides a summary description of the study corridor.

ES Table 1 - US-1 and US-9 Arterial Corridor Description			
Corridor Name	Number of Lanes	AADT	Speed Limit
US 1/9	3 lanes	35,410	45 <i>mph</i>
US 1	3 lanes	45,975	50 <i>mph</i>
US 9	3 lanes	41,805	50 <i>mph</i>

ES Tables 2, 3 and 4 below summarize the results of the comparison between the WRTM reference data and the probe data from each vendor for arterial segments during the data collection time period.

ES Table 2 - HERE Arterial Evaluation Summary for New Jersey					
Speed Bin	Average Absolute Speed Error (<10mph)		Speed Error Bias (<5mph)		Number of 5 Minute Samples
	Comparison with SEM Band	Comparison with Mean	Comparison with SEM Band	Comparison with Mean	
0-15 MPH	2.85	5.05	2.83	4.90	6623
15-25 MPH	1.79	4.77	1.57	3.11	14311
25-35 MPH	1.46	5.18	0.85	2.25	21312
>35 MPH	1.73	5.95	-1.29	-3.52	60041
All Speeds	1.75	5.57	-0.18	-0.84	102287
Based upon data collected from November 16, through November 28, 2017 across 47 miles of roadway.					

- As shown for HERE data in ES Table 2, the average absolute speed error (AASE) was within specification (<10 mph) in all speed bins.
- The Speed Error Bias (SEB) was within the specifications (< 5mph) for all speed bins when compared with the Standard Error of the Mean (SEM) Band.

ES Table 3 - INRIX Arterial Evaluation Summary for New Jersey					
Speed Bin	Average Absolute Speed Error (<10mph)		Speed Error Bias (<5mph)		Number of 5 Minute Samples
	Comparison with SEM Band	Comparison with Mean	Comparison with SEM Band	Comparison with Mean	
0-15 MPH	3.63	5.44	3.57	5.18	6776
15-25 MPH	3.05	5.88	2.84	4.93	14637
25-35 MPH	2.54	6.34	1.98	4.09	21765
>35 MPH	1.73	5.90	-0.66	-1.69	61224
All Speeds	2.10	5.97	0.40	0.42	104402
Based upon data collected from November 16, through November 28, 2017 across 47 miles of roadway.					

- As shown for INRIX data in ES Table 3, the average absolute speed error (AASE) was within specification (<10 mph) in all speed bins.
- The Speed Error Bias (SEB) was within the specifications (< 5mph) for all speed bins when compared with the Standard Error of the Mean (SEM) Band.

ES Table 4 - TOMTOM Arterial Evaluation Summary for New Jersey					
Speed Bin	Average Absolute Speed Error (<10mph)		Speed Error Bias (<5mph)		Number of 5 Minute Samples
	Comparison with SEM Band	Comparison with Mean	Comparison with SEM Band	Comparison with Mean	
0-15 MPH	1.81	3.91	1.79	3.75	6614
15-25 MPH	1.31	4.10	1.02	2.01	14544
25-35 MPH	1.10	4.38	0.58	1.27	21719
>35 MPH	1.97	6.32	-1.57	-4.07	59259
All Speeds	1.68	5.43	-0.53	-1.56	102136
Based upon data collected from November 16, through November 28, 2017 across 47 miles of roadway.					

- As shown for TOMTOM data in ES Table 4, the average absolute speed error (AASE) was within specification (<10 mph) in all speed bins.
- The Speed Error Bias (SEB) was within the specifications (< 5mph) for all speed bins when compared with the Standard Error of the Mean (SEM) Band.

Methodology

Corridor Description and Data Collection

Travel time samples were collected along 48 arterial segments with the assistance of New Jersey Department of Transportation (NJDOT) personnel. Arterial segments studied were located on the US-1/9 corridor from Roanoke Ave to US-1 & US-9 Junction, the US-1 corridor from US-1 & US-9 Junction to US-130, and the US-9 corridor from Amboy Ave to Texas Rd. Travel time data was collected for both directions along the arterial segments between November 16 and November 28, 2017. Segment locations were chosen with a high likelihood of observing recurrent and non-recurrent congestion during peak and off-peak periods.

Figures 1 to 3 present overview snapshots of the sensor placements along the US-1 and US-9 corridors in New Jersey. Markers shows the start and end points of arterial segments selected for analysis.

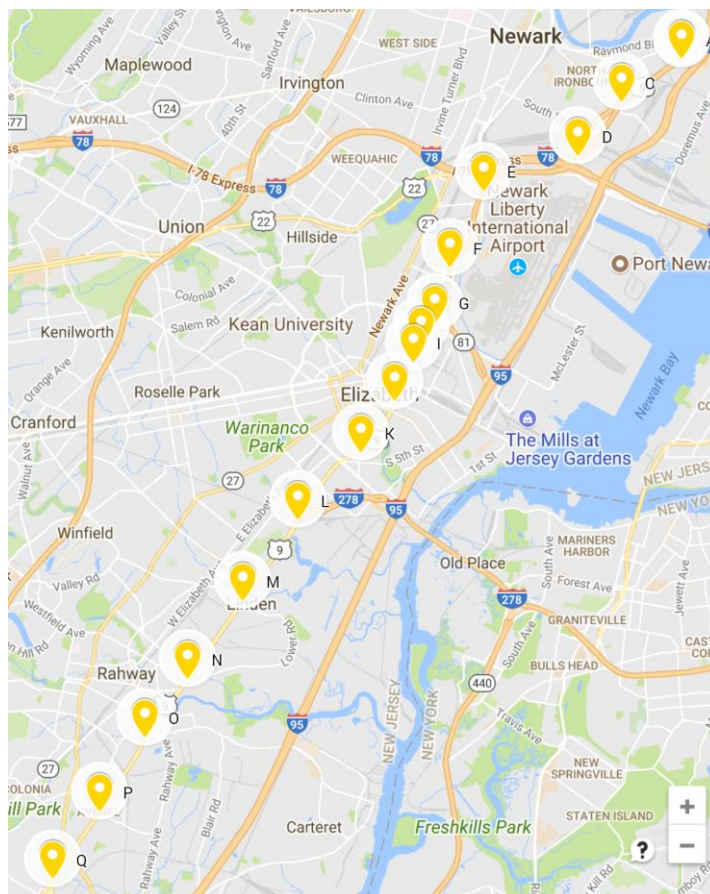


Figure 1- Locations of all segments selected on the US-1/9 corridor for analysis in New Jersey

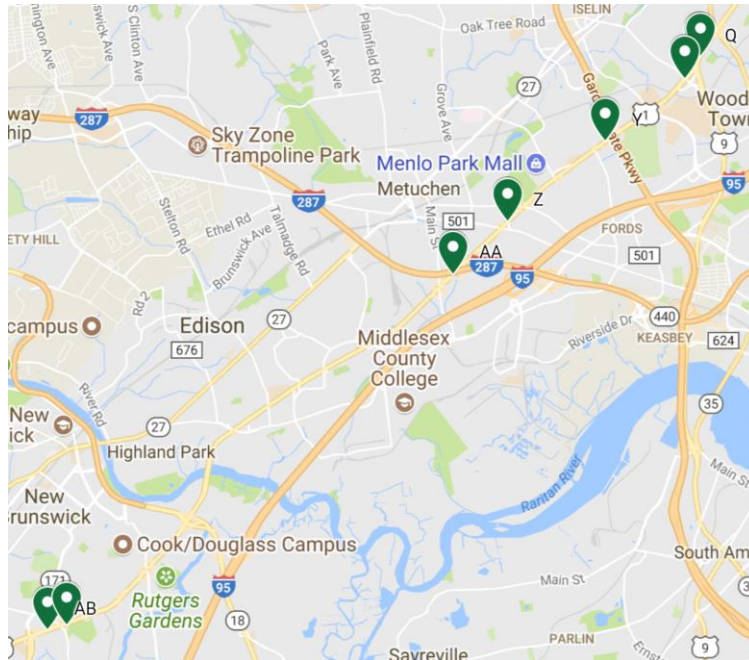


Figure 2- Locations of all segments selected on the US-1 corridor for analysis in New Jersey

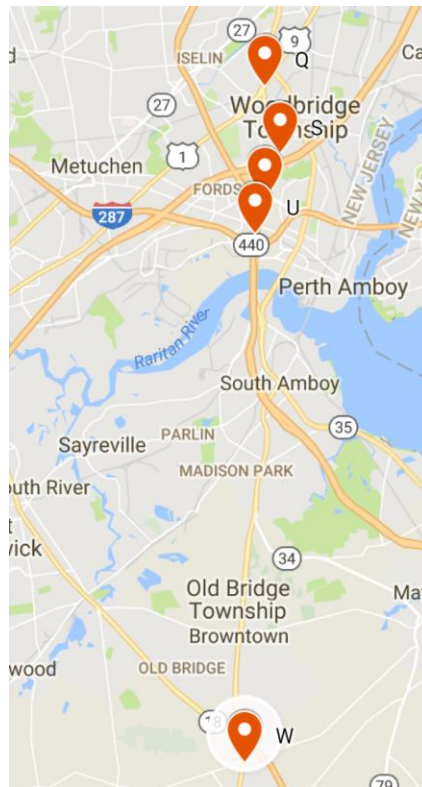


Figure 3- Locations of all segments selected on the US-9 corridor for analysis in New Jersey

Segments selected for validation in New Jersey

Table 1 presents the data collection segments from New Jersey. As a whole, these segments cover a total length of 47 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 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 48 directional arterial segments are included in this report.

Table 1 contains the summary information for each data collection segment including the latitude/longitude coordinates of the locations at which the WRTM sensors were deployed along the US-1 and US-9 corridors in New Jersey 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 WRTM sensor covers both data collection segments.

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 probe data feeds for individual data collection segments are provided in this separate report. This algorithm finds an equivalent probe travel time (and therefore travel speed) corresponding to each sample WRTM 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 New Jersey

Segment (Map Link)	DESCRIPTION					Deployment	
	Highway Direction	Starting at Ending at	Lane (Min) Lane (Max)	AADT (Min) AADT (Max)	Access Points Speed Limit	Begin Lat/Lon End Lat/Lon	Length (mile)
Freeway							
A1 NJ14-0001	US 1-9 Southbound	Roanoke Ave Wilson Ave	4 4	50,454 54,256	0 50	40.731100 -74.131900 40.222400 -74.144700	1.01
A2 NJ14-0002	US 1-9 Southbound	Wilson Ave I-78	4 4	49,055 54,256	2 50	40.722400 -74.147400 40.711800 -74.158500	0.96
A3 NJ14-0003	US 1-9 Southbound	I-78 I-78/US-22/NJ-21	2 4	49,932 60,537	6 50	40.711800 -74.158500 40.704500 -74.183600	1.53
A4 NJ14-0004	US 1-9 Southbound	I-78/US-22/NJ-21 McClellan St	2 3	56,582 62,089	5 50	40.704500 -74.183600 40.689400 -74.192300	1.14
A5 NJ14-0005	US 1-9 Southbound	McClellan St North Ave	2 2	26,348 58,560	3 50	40.689400 -74.192300 40.678200 -74.196600	0.82
A6 NJ14-0006	US 1-9 Southbound	North Ave Fairmount Ave	2 3	23,485 26,483	1 50	40.678200 -74.196600 40.673800 -74.200220	0.36
A7 NJ14-0007	US 1-9 Southbound	Fairmount Ave Olive St	3 3	26,483 26,483	3 40	40.673800 -74.200220 40.670300 -74.202300	0.27
A8 NJ14-0008	US 1-9 Southbound	Olive St E Jersey St	3 3	26,483 27,168	5 40	40.670300 -74.202300 40.662600 -74.207200	0.58
A9 NJ14-0009	US 1-9 Southbound	E Jersey St Broad St	3 3	27,168 29,138	3 40	40.662600 -74.207200 40.652200 -74.215900	0.88
A10 NJ14-0010	US 1-9 Southbound	Broad St I-278	3 3	30,440 30,440	7 40	40.652200 -74.215900 40.638800 -74.232600	1.31
A11 NJ14-0011	US 1-9 Southbound	I-278 Stiles St	3 3	30,440 30,353	5 35	40.638800 -74.232600 40.622700 -74.247000	1.35

Table 1 (continued)
Segments selected for validation in New Jersey

Segment (Map Link)	DESCRIPTION					Deployment	
	Highway Direction	Starting at Ending at	Lane (Min) Lane (Max)	AADT (Min) AADT (Max)	Access Points Speed Limit	Begin Lat/Lon End Lat/Lon	Length (mile)
Freeway							
A12 NJ14-0012	US 1-9 Southbound	Stiles St Grand Ave	3 3	31,563 31,563	8 45	40.622700 -74.247000 40.606700 -74.261700	1.35
A13 NJ14-0013	US 1-9 Southbound	Grand Ave Randolph Ave	3 3	31,563 33,293	4 45	40.606700 -74.261700 40.595210 -74.273100	1.01
A14 NJ14-0014	US 1-9 Southbound	Randolph Ave Avenel St	3 3	33,293 33,29.3	13 50	40.595210 -74.273100 40.580300 -74.284900	1.20
A15 NJ14-0015	US 1-9 Southbound	Avenel St US-1 & US-9	3 3	31,609 31,609	8 50	40.580300 -74.284900 40.566700 -74.297300	1.14
A16 NJ14-0016	US 1-9 Northbound	US-1 & US-9 Avenel St	3 4	33,354 49,479	10 50	40.566700 -74.297300 40.580200 -74.284800	1.16
A17 NJ14-0017	US 1-9 Northbound	Avenel St Randolph Ave	3 3	33,293 33,293	11 50	40.580200 -74.284800 40.595210 -74.273100	1.21
A18 NJ14-0018	US 1-9 Northbound	Randolph Ave Grand Ave	3 4	31,563 33,293	5 45	40.595210 -74.273100 40.606700 -74.261600	1.01
A19 NC08-0019	US 1-9 Northbound	Grand Ave Stiles St	2 4	30,389 31,563	7 40	40.606700 -74.261600 40.622700 -74.247000	1.35
A20 NJ14-0020	US 1-9 Northbound	Stiles St I-278	3 3	29,756 30,389	7 40	40.622700 -74.247000 40.638800 -74.232600	1.35
A21 NJ14-0021	US 1-9 Northbound	I-278 Broad St	3 3	30,440 30,440	4 40	40.638800 -74.232600 40.652100 -74.216000	1.31
A22 NJ14-0022	US 1-9 Northbound	Broad St E Jersey St	3 3	27,158 29,148	5 40	40.652100 -74.216000 40.665500 -74.204900	0.88
A23 NJ14-0023	US 1-9 Northbound	E Jersey St Olive St	3 3	26,648 26,648	7 40	40.665500 -74.204900 40.670300 -74.202300	0.58

Table 1 (continued)
Segments selected for validation in New Jersey

Segment (Map Link)	DESCRIPTION					Deployment	
	Highway Direction	Starting at Ending at	Lane (Min) Lane (Max)	AADT (Min) AADT (Max)	Access Points Speed Limit	Begin Lat/Lon End Lat/Lon	Length (mile)
Freeway							
A24 NJ14-0024	US 1-9 Northbound	Olive St Fairmount Ave	3 3	26,648 26,648	3 40	40.670300 -74.202300 40.673800 -74.200220	0.27
A25 NJ14-0025	US 1-9 Northbound	Fairmount Ave North Ave	3 2	20,284 28,711	2 40	40.673800 -74.200220 40.678200 -74.196600	0.36
A26 NJ14-0026	US 1-9 Northbound	North Ave McClellan St	2 4	43,292 56,604	2 50	40.678200 -74.196600 40.689400 -74.192300	0.82
A27 NJ14-0027	US 1-9 Northbound	McClellan St I-78/US-22/NJ-21	4 4	59,097 62,089	4 50	40.580300 -74.284900 40.704500 -74.183600	1.14
A28 NJ14-0028	US 1-9 Northbound	I-78/US-22/NJ-21 I-78	4 4	49,055 59,742	2 50	40.704500 -74.183600 40.711700 -74.157100	1.53
A29 NJ14-0029	US 1-9 Northbound	I-78 Wilson Ave	4 4	49,055 52,192	3 50	40.711700 -74.157100 40.722400 -74.147400	0.96
A30 NJ14-0030	US 1-9 Northbound	Wilson Ave Roanoke Ave	4 4	53,686 54,256	2 50	40.722400 -74.147400 40.734700 -74.124600	1.01
A31 NC08-0031	US 1 Southbound	US-1 & US-9 Green St	3 3	7,017 33,605	3 50	40.566700 -74.297300 40.563000 -74.300500	0.31
A32 NJ14-0032	US 1 Southbound	Green St Garden State Pkwy	3 3	33,605 43,570	12 50	40.563000 -74.300500 40.551600 -74.319300	1.27
A33 NJ14-0033	US 1 Southbound	Garden State Pkwy CR-501/Amboy Ave	3 4	48,574 48,574	9 50	40.551600 -74.319300 40.537200 -74.342400	1.57
A34 NJ14-0034	US 1 Southbound	CR-501/Amboy Ave I-287	3 4	39,488 47,285	9 50	40.537200 -74.342400 40.527800 -74.355300	0.94
A35 NJ14-0035	US 1 Southbound	I-287 US-130/Georges Rd	2 4	36,447 53,783	40 50	40.527800 -74.355300 40.464200 -74.450100	6.88

Table 1 (continued)
Segments selected for validation in New Jersey

Segment (Map Link)	DESCRIPTION					Deployment	
	Highway Direction	Starting at Ending at	Lane (Min) Lane (Max)	AADT (Min) AADT (Max)	Access Points Speed Limit	Begin Lat/Lon End Lat/Lon	Length (mile)
Freeway							
A36 NJ14-0036	US 1	US-130/Georges Rd	3	39,199	41	40.464700 -74.447900	6.69
	Northbound	I-287	4	56,449	50	40.527800 -74.355300	
A37 NJ14-0037	US 1	I-287	3	46,633	7	40.527800 -74.355300	0.94
	Northbound	CR-501/Amboy Ave	3	47,285	50	40.537300 -74.342600	
A38 NJ14-0038	US 1	CR-501/Amboy Ave	3	47,285	8	40.537300 -74.342600	1.57
	Northbound	Garden State Pkwy	3	48,622	50	40.551400 -74.319500	
A39 NJ14-0039	US 1	Garden State Pkwy	3	33,605	8	40.551400 -74.319500	1.27
	Northbound	Green St	3	48,967	50	40.562700 -74.300000	
A40 NJ14-0040	US 1	Green St	3	35,852	1	40.562700 -74.300000	0.31
	Northbound	US-1 & US-9	3	55,852	50	40.566300 -74.297100	
A41 NJ14-0041	US 9	Amboy Ave	2	20,651	9	40.570200 -74.294200	1.43
	Southbound	NJ Tpke	3	33,843	50	40.547100 -74.291200	
A42 NJ14-0042	US 9	NJ Tpke	2	33,843	6	40.547100 -74.291200	1.03
	Southbound	Pond Rd	3	33,843	50	40.533300 -74.297500	
A43 NC08-0043	US 9	Pond Rd	3	33,843	2	40.533300 -74.297500	0.75
	Southbound	NJ-440	3	37,238	55	40.522700 -74.300900	
A44 NJ14-0044	US 9	NJ-440	2	26,965	37	40.522700 -74.300900	11.35
	Southbound	Texas Rd	3	111,471	50	40.363800 -74.305200	
A45 NJ14-0045	US 9	Texas Rd	2	27,965	6	40.363900 -74.305000	11.48
	Northbound	NJ-440	4	111,249	50	40.522700 -74.301100	
A46 NJ14-0046	US 9	NJ-440	3	33,843	3	40.522700 -74.301100	0.75
	Northbound	Pond Rd	4	37,238	50	40.533200 -74.297300	
A47 NJ14-0047	US 9	Pond Rd	3	33,843	9	40.533200 -74.297300	1.03
	Northbound	NJ Tpke	3	33,843	50	40.546800 -74.291400	
A48 NJ14-0048	US 9	NJ Tpke	2	25,363	12	40.546800 -74.291400	1.46
	Northbound	Amboy Ave	3	33,843	50	40.570000 -74.294100	

Analysis of Arterials

The following sections summarize the data quality measures obtained as a result of comparison between WRTM and all reported probe 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 WRTM 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 bins have proven to be the critical specification (and most difficult) to attain².

² The ground-truth data collected for this report as well as detailed daily comparison graphs for all segments are available for download upon request. Please email zvanderl@umd.edu for such inquiries.

Results

Analysis of Arterial Results for HERE Data

Table 2 shows the results of the comparison between the WRTM reference data and the HERE data. As stated before, the average absolute speed error (AASE) was within specification in all speed bins. The Speed Error Bias (SEB) was within specifications for all speed bins when compared with the Standard Error of the Mean (SEM) Band.

Table 2 - HERE Data quality measures for arterial segments in New Jersey

Speed Bin	Average Absolute Speed Error (<10mph)		Speed Error Bias (<5mph)		Number of 5 Minute Samples
	Comparison with SEM Band	Comparison with Mean	Comparison with SEM Band	Comparison with Mean	
0-15 MPH	2.85	5.05	2.83	4.90	6623
15-25 MPH	1.79	4.77	1.57	3.11	14311
25-35 MPH	1.46	5.18	0.85	2.25	21312
>35 MPH	1.73	5.95	-1.29	-3.52	60041
All Speeds	1.75	5.57	-0.18	-0.84	102287
Based upon data collected from November 16, through November 28, 2017 across 47 miles of roadway.					

Table 3 shows the percentage of the time the HERE 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 HERE data quality criteria for arterial segments in New Jersey

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	27%	80%	0%	57%	6623
15-25	55%	87%	0%	65%	14311
25-35	59%	90%	0%	59%	21312
35+	60%	87%	0%	52%	60041

Analysis of Arterial Results for INRIX Data

Table 4 shows the results of the comparison between the WRTM reference data and the INRIX data. As stated before, the average absolute speed error (AASE) was within specification in all speed bins. The Speed Error Bias (SEB) was within specifications for all speed bins when compared with the Standard Error of the Mean (SEM) Band.

Table 4- INRIX Data quality measures for arterial segments in New Jersey

Speed Bin	Average Absolute Speed Error (<10mph)		Speed Error Bias (<5mph)		Number of 5 Minute Samples
	Comparison with SEM Band	Comparison with Mean	Comparison with SEM Band	Comparison with Mean	
0-15 MPH	3.63	5.44	3.57	5.18	6776
15-25 MPH	3.05	5.88	2.84	4.93	14637
25-35 MPH	2.54	6.34	1.98	4.09	21765
>35 MPH	1.73	5.90	-0.66	-1.69	61224
All Speeds	2.10	5.97	0.40	0.42	104402
Based upon data collected from November 16, through November 28, 2017 across 47 miles of roadway.					

Table 5 shows the percentage of the time the INRIX 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 5 - Percent observations meeting INRIX data quality criteria for arterial segments in New Jersey

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	10%	35%	0%	27%	6776
15-25	24%	49%	0%	34%	14637
25-35	40%	68%	0%	40%	21765
35+	59%	86%	0%	52%	61224

Analysis of Arterial Results for TOMTOM Data

Table 6 shows the results of the comparison between the WRTM reference data and the TOMTOM data. As stated before, the average absolute speed error (AASE) was within specification in all speed bins. The Speed Error Bias (SEB) was within specifications for all speed when compared with the Standard Error of the Mean (SEM) Band.

Table 6 - TOMTOM Data quality measures for arterial segments in New Jersey

Speed Bin	Average Absolute Speed Error (<10mph)		Speed Error Bias (<5mph)		Number of 5 Minute Samples
	Comparison with SEM Band	Comparison with Mean	Comparison with SEM Band	Comparison with Mean	
0-15 MPH	1.81	3.91	1.79	3.75	6614
15-25 MPH	1.31	4.10	1.02	2.01	14544
25-35 MPH	1.10	4.38	0.58	1.27	21719
>35 MPH	1.97	6.32	-1.57	-4.07	59259
All Speeds	1.68	5.43	-0.53	-1.56	102136
Based upon data collected from November 16, through November 28, 2017 across 47 miles of roadway.					

Table 7 shows the percentage of the time the 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 7 - Percent observations meeting TOMTOM data quality criteria for arterial segments in New Jersey

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	34%	93%	0%	72%	6614
15-25	61%	93%	0%	74%	14544
25-35	67%	92%	0%	69%	21719
35+	58%	86%	0%	50%	59259

Appendix

Table A.1 to A.3 presents detailed data for individual segments in this validation for all three vendors. 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 A. 1
HERE data quality measures for individual arterial validation segments in the state of New Jersey

Path	Standard TMC length	Sensor 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	
NJ14-0001	1.02	1.02	0-15	-	-	-	-	-
			15-25	-	-	-	-	-
			25-35	6.13	6.13	9.06	9.06	4*
			35+	-0.28	1.37	-0.92	4.64	3120
NJ14-0002	1.00	1.00	0-15	-	-	-	-	-
			15-25	-	-	-	-	-
			25-35	1.08	3.06	0.70	6.48	10*
			35+	-2.64	2.85	-6.59	7.53	3030
NJ14-0003	1.51	1.51	0-15	11.83	11.83	16.27	16.27	7*
			15-25	1.63	2.08	3.12	7.33	9*
			25-35	0.10	0.77	-2.56	5.55	20*
			35+	-2.47	2.55	-5.82	6.84	2692
NJ14-0004	1.14	1.14	0-15	5.24	5.24	9.37	9.37	12*
			15-25	1.25	1.56	4.03	6.58	47
			25-35	-0.10	0.88	-1.62	4.08	329
			35+	-1.40	1.52	-4.97	5.84	2661
NJ14-0005	0.81	0.81	0-15	3.79	3.79	9.85	9.85	22*
			15-25	1.16	1.16	5.30	6.12	88
			25-35	-0.07	0.66	-0.31	4.35	357
			35+	-3.14	3.23	-7.68	8.49	1869
NJ14-0006	0.37	0.37	0-15	4.35	4.35	7.39	7.41	1534
			15-25	1.19	1.25	4.02	4.78	805
			25-35	-0.09	0.38	-3.57	5.16	56
			35+	-4.11	4.11	-12.76	13.03	11*
NJ14-0007	0.28	0.28	0-15	1.17	1.21	2.38	2.85	447
			15-25	-0.10	0.75	-1.45	3.74	1420
			25-35	-2.76	2.76	-8.94	9.24	387
			35+	-9.05	9.05	-18.89	18.89	51
NJ14-0008	0.59	0.59	0-15	3.04	3.04	4.91	4.95	1264
			15-25	0.95	1.05	2.37	3.54	776
			25-35	-1.49	1.70	-4.31	5.61	142
			35+	-7.82	7.82	-13.85	13.85	14*
NJ14-0009	0.86	0.86	0-15	4.96	4.96	7.25	7.25	3*
			15-25	2.51	2.56	5.60	6.03	264
			25-35	0.40	0.85	1.02	4.19	1315
			35+	-1.78	1.88	-5.50	6.66	645
NJ14-0010	1.32	1.32	0-15	4.17	4.17	5.42	5.42	328
			15-25	2.98	3.01	5.61	5.81	893
			25-35	0.77	1.16	2.27	4.17	665
			35+	-1.41	1.49	-5.25	6.03	55

*Results in the specified row may not be reliable due to a small number of observations. Based on the central limit theorem, the trigger for this result is when there are less than 30 observations.

Table A. 2 (Cont'd)

HERE data quality measures for individual arterial validation segments in the state of New Jersey

Path	Standard TMC length	Sensor 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	
NJ14-0011	1.34	1.34	0-15	2.47	2.47	3.70	3.71	171
			15-25	0.71	0.90	1.50	2.60	984
			25-35	-0.41	0.89	-1.24	3.74	1108
			35+	-3.08	3.11	-7.73	8.14	484
NJ14-0012	1.35	1.35	0-15	2.78	2.78	4.16	4.16	35
			15-25	0.58	0.84	1.05	2.63	829
			25-35	-0.30	1.02	-0.81	3.70	1227
			35+	-2.13	2.18	-5.63	6.38	413
NJ14-0013	1.02	1.02	0-15	6.42	6.42	8.76	8.76	4*
			15-25	4.84	4.84	7.93	8.13	87
			25-35	1.81	1.89	5.47	6.12	840
			35+	-1.27	1.56	-2.73	5.89	1514
NJ14-0014	1.20	1.20	0-15	6.87	6.87	7.77	7.77	2*
			15-25	4.93	4.93	6.59	6.65	100
			25-35	3.06	3.21	5.79	6.43	824
			35+	-0.05	1.39	0.42	4.54	1731
NJ14-0015	1.15	1.15	0-15	-	-	-	-	-
			15-25	5.35	5.35	12.49	12.49	2*
			25-35	1.04	1.15	2.91	4.03	425
			35+	-1.07	1.54	-2.72	5.13	2140
NJ14-0016	1.16	1.16	0-15	2.84	2.84	3.49	3.49	13*
			15-25	3.56	3.56	5.92	6.11	27*
			25-35	1.33	1.51	3.04	4.28	690
			35+	-1.17	1.48	-3.62	5.56	1676
NJ14-0017	1.20	1.20	0-15	3.06	3.06	4.41	4.41	4*
			15-25	4.79	4.79	6.66	6.66	11*
			25-35	2.67	2.88	5.58	6.37	86
			35+	-0.36	1.41	-0.78	4.60	2422
NJ14-0018	1.02	1.02	0-15	-	-	-	-	-
			15-25	4.12	4.12	7.17	7.17	67
			25-35	1.36	1.50	3.66	4.74	977
			35+	-0.67	1.07	-2.08	4.73	1353
NJ14-0019	1.35	1.35	0-15	3.02	3.02	5.82	5.82	72
			15-25	0.44	0.67	1.20	2.82	1034
			25-35	-0.36	1.07	-1.20	4.47	923
			35+	-2.12	2.17	-6.69	7.28	312
NJ14-0020	1.34	1.34	0-15	6.98	6.98	9.30	9.30	4*
			15-25	1.48	1.54	3.19	3.78	811
			25-35	0.05	0.61	0.04	3.44	1339
			35+	-1.93	1.98	-6.63	7.29	504
NJ14-0021	1.31	1.31	0-15	4.17	4.17	6.41	6.41	18*
			15-25	1.04	1.13	2.78	3.45	778
			25-35	-0.19	0.99	-0.88	3.87	455
			35+	-2.08	2.11	-7.51	8.18	41
NJ14-0022	0.90	0.90	0-15	7.73	7.73	9.89	9.89	17*
			15-25	1.48	1.55	3.80	4.45	217
			25-35	0.03	0.95	-0.30	4.42	972
			35+	-2.32	2.38	-6.68	7.46	405

*Results in the specified row may not be reliable as there are less than 30 observations.

Table A. 3 (Cont'd)

HERE data quality measures for individual arterial validation segments in the state of New Jersey

Path	Standard TMC length	Sensor 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	
NJ14-0023	0.59	0.59	0-15	2.02	2.03	3.89	4.03	807
			15-25	0.19	0.61	0.12	2.94	862
			25-35	-2.07	2.07	-7.78	8.05	75
			35+	-9.18	9.18	-16.35	16.35	6*
NJ14-0024	0.28	0.28	0-15	1.62	1.62	3.74	4.00	764
			15-25	0.07	0.31	-0.88	3.37	751
			25-35	-1.15	1.15	-8.11	8.44	117
			35+	-8.69	8.69	-18.49	18.49	23*
NJ14-0025	0.39	0.39	0-15	1.30	1.33	3.44	3.68	570
			15-25	-0.01	0.33	-0.72	3.01	775
			25-35	-1.22	1.22	-8.80	9.03	102
			35+	-5.88	5.88	-19.18	19.18	27*
NJ14-0026	0.81	0.81	0-15	-	-	-	-	-
			15-25	2.13	2.13	20.77	20.77	2*
			25-35	2.00	2.36	7.04	8.39	233
			35+	-1.32	1.71	-3.43	6.30	1219
NJ14-0027	1.16	1.16	0-15	-	-	-	-	-
			15-25	5.91	5.91	10.98	13.81	24*
			25-35	0.72	1.14	1.12	7.48	114
			35+	-1.24	1.53	-3.36	5.41	2422
NJ14-0028	1.53	1.53	0-15	13.28	13.28	15.82	16.95	8*
			15-25	5.87	5.87	19.61	20.58	20*
			25-35	1.70	1.70	12.84	13.85	85
			35+	-1.32	1.53	-4.02	9.07	492
NJ14-0029	0.94	0.94	0-15	6.41	6.41	9.37	10.44	15*
			15-25	2.46	2.61	8.27	10.02	57
			25-35	2.66	3.12	9.52	13.10	112
			35+	0.41	1.49	1.68	6.84	655
NJ14-0030	1.01	1.01	0-15	1.09	1.26	1.53	1.99	169
			15-25	2.20	2.34	3.41	3.99	120
			25-35	1.83	2.12	5.01	6.01	77
			35+	-0.84	1.57	-2.44	5.81	1980
NJ14-0031	0.31	0.31	0-15	17.49	17.49	21.63	21.63	7*
			15-25	4.32	4.32	10.85	10.94	555
			25-35	1.07	1.13	5.43	6.97	1083
			35+	-1.48	1.78	-4.85	8.15	604
NJ14-0032	1.27	1.27	0-15	5.89	5.89	8.90	8.90	10*
			15-25	2.47	2.47	5.65	5.72	45
			25-35	0.34	0.86	0.85	3.21	1021
			35+	-0.85	1.20	-3.00	5.11	1062
NJ14-0033	1.57	1.57	0-15	3.24	3.24	4.66	4.66	8*
			15-25	3.25	3.25	5.73	5.78	255
			25-35	2.10	2.14	5.06	5.38	1123
			35+	0.47	0.88	1.93	4.10	1194
NJ14-0034	0.94	0.94	0-15	4.10	4.10	6.05	6.07	10*
			15-25	5.94	5.94	8.70	10.73	10*
			25-35	3.87	3.87	14.00	14.41	38
			35+	-3.18	3.21	-8.47	9.29	2823

*Results in the specified row may not be reliable as there are less than 30 observations.

Table A. 4 (Cont'd)

HERE data quality measures for individual arterial validation segments in the state of New Jersey

Path	Standard TMC length	Sensor 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	
NJ14-0035	6.88	6.88	0-15	-0.75	0.75	-1.31	1.31	4*
			15-25	1.61	1.61	1.82	3.54	23*
			25-35	1.59	1.61	3.69	3.78	247
			35+	-0.17	0.72	-0.29	3.14	866
NJ14-0036	6.69	6.69	0-15	1.66	3.99	1.25	5.71	6*
			15-25	1.50	1.60	2.72	2.99	141
			25-35	1.13	1.18	2.77	2.97	331
			35+	-0.30	0.83	-0.52	3.08	1369
NJ14-0037	0.94	0.94	0-15	2.46	2.82	2.62	4.39	45
			15-25	2.21	2.39	3.55	4.95	104
			25-35	2.12	2.44	7.57	8.99	105
			35+	-0.94	1.34	-3.03	5.77	2652
NJ14-0038	1.56	1.56	0-15	2.60	2.60	4.03	4.03	225
			15-25	2.83	2.83	5.40	5.48	582
			25-35	1.80	1.87	4.57	5.13	1072
			35+	-0.13	1.51	-0.28	5.63	455
NJ14-0039	1.29	1.29	0-15	7.12	7.12	19.28	19.28	1*
			15-25	3.06	3.06	8.79	8.79	55
			25-35	0.38	0.44	2.23	3.61	497
			35+	-1.86	1.94	-5.80	6.48	963
NJ14-0040	0.30	0.30	0-15	18.15	18.15	24.01	24.01	3*
			15-25	8.43	8.43	15.49	15.49	623
			25-35	2.94	2.96	8.71	8.88	1246
			35+	0.04	0.58	0.40	4.43	244
NJ14-0041	1.43	1.43	0-15	-	-	-	-	-
			15-25	-	-	-	-	-
			25-35	2.20	2.22	3.92	4.65	13*
			35+	-0.39	0.74	-1.11	3.34	1650
NJ14-0042	1.03	1.03	0-15	-	-	-	-	-
			15-25	6.33	6.33	14.83	14.83	15*
			25-35	2.34	2.59	12.45	13.25	56
			35+	-1.62	1.78	-4.48	6.49	2149
NJ14-0043	0.75	0.75	0-15	-	-	-	-	-
			15-25	-	-	-	-	-
			25-35	5.68	5.68	18.07	18.07	2*
			35+	-1.43	1.63	-5.71	7.11	2451
NJ14-0044	11.35	11.35	0-15	-	-	-	-	-
			15-25	3.39	3.40	7.27	7.76	26*
			25-35	1.13	1.47	4.11	5.16	214
			35+	-0.03	0.48	0.96	3.54	862
NJ14-0045	11.48	11.48	0-15	-	-	-	-	-
			15-25	6.14	6.14	10.52	10.52	4*
			25-35	2.17	2.19	6.45	6.70	157
			35+	-0.12	0.65	1.07	3.93	872
NJ14-0046	0.76	0.76	0-15	0.00	0.00	4.66	4.66	1*
			15-25	12.31	12.31	19.94	19.94	5*
			25-35	7.65	8.59	15.71	17.38	15*
			35+	-0.49	0.98	-2.11	5.72	2300

*Results in the specified row may not be reliable as there are less than 30 observations.

Table A. 5 (Cont'd)

HERE data quality measures for individual arterial validation segments in the state of New Jersey

Path	Standard TMC length	Sensor 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	
NJ14-0047	1.01	1.01	0-15	3.62	3.62	4.27	4.27	10*
			15-25	9.13	9.13	12.12	12.12	3*
			25-35	1.84	4.46	7.52	13.70	6*
			35+	-2.90	2.98	-6.70	7.68	2097
NJ14-0048	1.46	1.46	0-15	4.08	4.08	6.18	6.18	3*
			15-25	7.21	7.21	13.22	13.67	5*
			25-35	3.57	3.96	7.83	9.03	20*
			35+	-0.39	0.90	-1.12	3.53	1461

*Results in the specified row may not be reliable as there are less than 30 observations.

Table A.2 presents detailed data for individual segments for INRIX.

Table A. 6
INRIX data quality measures for individual arterial validation segments in the state of New Jersey

Path	Standard TMC length	Sensor 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	
NJ14-0001	1.02	1.02	0-15	-	-	-	-	-
			15-25	-	-	-	-	-
			25-35	9.36	9.36	13.56	13.56	4*
			35+	0.47	1.29	0.80	4.44	3173
NJ14-0002	1.00	1.00	0-15	-	-	-	-	-
			15-25	-	-	-	-	-
			25-35	0.65	2.30	2.60	6.58	10*
			35+	-2.15	2.39	-5.82	6.94	3084
NJ14-0003	1.51	1.51	0-15	11.40	11.40	15.84	15.84	7*
			15-25	1.28	1.73	1.12	6.22	9*
			25-35	0.04	0.90	-4.60	7.49	21*
			35+	-2.64	2.78	-5.75	7.02	2743
NJ14-0004	1.14	1.14	0-15	6.74	6.74	10.87	10.87	12*
			15-25	1.98	2.10	4.62	6.93	47
			25-35	0.24	0.72	0.07	3.78	335
			35+	-1.28	1.42	-4.68	5.64	2707
NJ14-0005	0.81	0.81	0-15	14.01	14.01	19.76	20.40	22*
			15-25	10.11	10.24	16.57	17.12	90
			25-35	3.23	3.46	7.89	8.98	362
			35+	0.04	1.52	0.41	5.63	1909
NJ14-0006	0.37	0.37	0-15	2.49	2.53	4.62	4.97	1559
			15-25	0.59	1.03	1.35	4.59	826
			25-35	-1.06	1.06	-6.83	7.38	56
			35+	-7.77	7.77	-19.39	19.39	11*
NJ14-0007	0.28	0.28	0-15	1.85	1.92	3.11	3.69	455
			15-25	0.12	1.36	-0.93	4.87	1454
			25-35	-2.91	3.00	-8.37	9.19	394
			35+	-10.27	10.27	-19.82	19.82	52
NJ14-0008	0.59	0.59	0-15	3.58	3.66	5.13	5.50	1282
			15-25	1.87	2.10	3.82	5.22	798
			25-35	-1.20	1.82	-3.33	5.53	147
			35+	-9.10	9.10	-14.64	14.75	14*
NJ14-0009	0.86	0.86	0-15	0.01	0.01	2.92	2.92	3*
			15-25	2.93	3.08	5.73	6.55	263
			25-35	0.87	1.56	2.01	5.33	1349
			35+	-2.03	2.39	-5.74	7.69	658
NJ14-0010	1.32	1.32	0-15	2.75	2.87	3.77	4.01	330
			15-25	2.54	2.88	4.39	5.48	917
			25-35	0.30	1.72	0.36	4.90	679
			35+	-2.79	2.84	-6.78	7.91	56

*Results in the specified row may not be reliable due to a small number of observations. Based on the central limit theorem, the trigger for this result is when there are less than 30 observations.

Table A. 2 (Cont'd)

INRIX data quality measures for individual arterial validation segments in the state of New Jersey

Path	Standard TMC length	Sensor 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	
NJ14-0011	1.34	1.34	0-15	2.89	2.89	4.14	4.16	171
			15-25	2.64	2.86	4.39	5.09	1018
			25-35	1.00	1.94	2.22	5.26	1121
			35+	-2.29	2.78	-5.06	7.57	485
NJ14-0012	1.35	1.35	0-15	2.44	2.44	3.79	3.79	35
			15-25	2.27	2.45	4.02	4.72	846
			25-35	0.79	1.44	1.68	4.23	1257
			35+	-1.80	2.25	-4.38	6.68	414
NJ14-0013	1.02	1.02	0-15	9.92	9.92	12.26	12.26	4*
			15-25	6.29	6.29	9.56	9.74	87
			25-35	2.67	2.90	6.58	7.58	852
			35+	-0.99	1.60	-1.59	6.06	1551
NJ14-0014	1.20	1.20	0-15	4.87	4.87	5.77	5.77	2*
			15-25	5.72	5.72	7.34	7.46	100
			25-35	5.68	5.90	8.87	9.35	845
			35+	1.10	2.37	2.67	6.04	1762
NJ14-0015	1.15	1.15	0-15	-	-	-	-	-
			15-25	6.35	6.35	13.49	13.49	2*
			25-35	2.16	2.46	4.63	5.79	432
			35+	-0.79	1.92	-1.82	5.51	2183
NJ14-0016	1.16	1.16	0-15	1.77	1.77	2.41	2.41	13*
			15-25	3.87	3.95	5.32	6.33	29*
			25-35	1.44	2.21	2.82	5.31	700
			35+	-1.68	2.29	-4.23	6.78	1711
NJ14-0017	1.20	1.20	0-15	3.06	3.06	4.41	4.41	4*
			15-25	4.94	4.94	7.02	7.02	11*
			25-35	5.25	5.28	9.06	9.33	87
			35+	0.76	2.09	1.63	5.53	2469
NJ14-0018	1.02	1.02	0-15	-	-	-	-	-
			15-25	10.37	10.37	13.54	13.54	67
			25-35	4.12	4.17	8.24	8.50	1007
			35+	0.14	1.40	0.61	5.28	1369
NJ14-0019	1.35	1.35	0-15	3.88	3.88	6.54	6.59	72
			15-25	1.87	2.00	3.76	4.61	1061
			25-35	0.36	1.62	0.50	5.24	937
			35+	-2.65	3.28	-6.20	8.70	318
NJ14-0020	1.34	1.34	0-15	6.23	6.23	8.55	8.55	4*
			15-25	3.78	3.88	6.32	6.73	827
			25-35	1.19	1.79	2.83	5.32	1370
			35+	-1.36	2.17	-3.41	7.11	505
NJ14-0021	1.31	1.31	0-15	3.80	3.80	5.83	5.83	23*
			15-25	3.05	3.27	5.28	6.18	795
			25-35	0.59	1.57	1.24	4.77	464
			35+	-1.79	2.43	-5.14	7.89	41
NJ14-0022	0.90	0.90	0-15	3.89	3.89	5.95	6.06	17*
			15-25	2.00	2.37	4.03	5.56	226
			25-35	0.05	1.35	-0.28	5.11	998
			35+	-2.71	2.98	-6.83	8.39	413

*Results in the specified row may not be reliable as there are less than 30 observations.

Table A. 2 (Cont'd)

INRIX data quality measures for individual arterial validation segments in the state of New Jersey

Path	Standard TMC length	Sensor 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	
NJ14-0023	0.59	0.59	0-15	3.71	3.74	5.64	5.89	827
			15-25	1.12	1.63	1.88	4.50	883
			25-35	-1.89	2.10	-6.97	7.85	78
			35+	-6.88	6.88	-11.52	11.52	6*
NJ14-0024	0.28	0.28	0-15	2.93	2.95	5.42	5.85	796
			15-25	0.51	0.85	0.89	4.68	764
			25-35	-1.35	1.61	-7.38	9.07	117
			35+	-8.67	8.67	-17.62	17.62	23*
NJ14-0025	0.39	0.39	0-15	4.04	4.04	7.23	7.33	599
			15-25	0.91	1.04	2.76	4.87	790
			25-35	-0.54	0.55	-5.07	7.12	104
			35+	-5.70	5.70	-16.36	16.36	27*
NJ14-0026	0.81	0.81	0-15	-	-	-	-	-
			15-25	4.63	4.63	21.27	21.27	2*
			25-35	4.08	4.34	11.89	12.49	236
			35+	0.28	1.07	1.90	5.36	1254
NJ14-0027	1.16	1.16	0-15	-	-	-	-	-
			15-25	6.80	6.80	13.48	15.00	24*
			25-35	1.75	1.97	3.74	8.68	114
			35+	-0.68	1.29	-1.87	5.05	2471
NJ14-0028	1.53	1.53	0-15	20.14	20.14	24.32	24.56	8*
			15-25	10.49	10.49	25.73	25.73	22*
			25-35	4.26	4.26	19.51	19.51	87
			35+	0.06	1.07	2.39	8.40	502
NJ14-0029	0.94	0.94	0-15	10.95	10.95	15.39	15.39	16*
			15-25	2.39	2.39	8.97	10.21	58
			25-35	0.83	1.24	6.47	9.73	113
			35+	-0.73	1.28	-2.63	6.21	673
NJ14-0030	1.01	1.01	0-15	1.19	1.30	1.77	2.10	180
			15-25	2.44	2.81	3.12	4.52	122
			25-35	3.18	3.92	5.82	8.66	81
			35+	-0.10	1.44	-0.32	5.61	2012
NJ14-0031	0.31	0.31	0-15	18.33	18.33	22.80	22.80	6*
			15-25	6.44	6.51	12.49	13.23	569
			25-35	1.88	2.52	6.08	9.49	1109
			35+	-1.92	2.88	-4.28	9.46	612
NJ14-0032	1.27	1.27	0-15	7.66	7.66	10.80	10.80	10*
			15-25	5.83	5.83	9.21	9.21	45
			25-35	3.22	3.41	5.98	6.61	1041
			35+	-0.18	1.79	-0.25	6.02	1090
NJ14-0033	1.57	1.57	0-15	3.87	3.87	5.29	5.29	8*
			15-25	2.89	2.92	4.84	5.09	255
			25-35	2.02	2.24	4.27	5.32	1150
			35+	0.17	1.58	0.62	5.07	1216
NJ14-0034	0.94	0.94	0-15	4.84	4.84	6.53	6.53	9*
			15-25	8.84	8.84	12.50	13.23	10*
			25-35	5.29	5.29	15.92	16.23	38
			35+	-1.38	1.93	-3.96	7.08	2874

*Results in the specified row may not be reliable as there are less than 30 observations.

Table A. 2 (Cont'd)

INRIX data quality measures for individual arterial validation segments in the state of New Jersey

Path	Standard TMC length	Sensor 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	
NJ14-0035	6.88	6.88	0-15	3.59	3.59	4.69	4.69	4*
			15-25	6.07	6.07	7.65	8.04	23*
			25-35	3.75	3.75	6.27	6.29	256
			35+	0.55	1.31	1.51	4.10	890
NJ14-0036	6.69	6.69	0-15	2.97	3.97	3.09	5.49	6*
			15-25	4.56	4.61	6.01	6.13	141
			25-35	3.72	3.76	6.00	6.09	339
			35+	0.35	1.25	1.12	3.89	1401
NJ14-0037	0.94	0.94	0-15	2.24	2.26	3.29	3.69	45
			15-25	2.23	2.25	4.18	4.55	105
			25-35	2.43	2.65	7.51	9.13	105
			35+	-0.26	1.27	-0.96	5.59	2698
NJ14-0038	1.56	1.56	0-15	4.10	4.11	5.56	5.58	229
			15-25	4.11	4.16	6.59	6.83	590
			25-35	3.90	4.01	7.02	7.68	1101
			35+	0.55	2.53	1.13	7.02	460
NJ14-0039	1.29	1.29	0-15	10.12	10.12	22.28	22.28	1*
			15-25	4.52	4.52	10.26	10.48	55
			25-35	1.01	1.15	4.29	5.70	501
			35+	-1.69	2.07	-4.19	6.36	997
NJ14-0040	0.30	0.30	0-15	28.15	28.15	34.01	34.01	3*
			15-25	13.41	13.45	20.43	20.57	646
			25-35	7.28	7.39	13.80	14.30	1264
			35+	1.67	2.78	5.02	8.37	246
NJ14-0041	1.43	1.43	0-15	-	-	-	-	-
			15-25	-	-	-	-	-
			25-35	3.31	3.40	4.61	6.05	13
			35+	0.19	1.12	0.73	3.99	1693
NJ14-0042	1.03	1.03	0-15	-	-	-	-	-
			15-25	9.36	9.36	17.76	17.76	15*
			25-35	4.99	5.04	15.56	15.85	56
			35+	-0.07	1.23	0.10	5.60	2192
NJ14-0043	0.75	0.75	0-15	-	-	-	-	-
			15-25	-	-	-	-	-
			25-35	0.00	0.00	-2.43	3.18	2*
			35+	-2.86	2.92	-9.07	9.55	2498
NJ14-0044	11.35	11.35	0-15	-	-	-	-	-
			15-25	4.59	4.89	9.66	10.25	28*
			25-35	2.72	2.85	6.70	7.13	219
			35+	0.60	0.87	3.07	4.56	877
NJ14-0045	11.48	11.48	0-15	-	-	-	-	-
			15-25	5.64	5.64	10.02	10.02	4*
			25-35	2.32	2.34	6.81	6.93	173
			35+	-0.14	0.81	1.08	4.19	890
NJ14-0046	0.76	0.76	0-15	8.85	8.85	17.66	17.66	1*
			15-25	17.06	17.06	24.74	24.74	5*
			25-35	7.92	8.59	16.65	18.05	15*
			35+	-0.26	1.05	-1.23	5.63	2351

*Results in the specified row may not be reliable as there are less than 30 observations.

Table A. 2 (Cont'd)

INRIX data quality measures for individual arterial validation segments in the state of New Jersey

Path	Standard TMC length	Sensor 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	
NJ14-0047	1.01	1.01	0-15	3.38	3.38	4.17	4.17	10*
			15-25	9.50	10.25	10.45	13.08	3*
			25-35	5.32	5.32	12.85	14.36	6*
			35+	-0.85	1.68	-1.58	5.82	2142
NJ14-0048	1.46	1.46	0-15	5.74	5.74	7.85	7.85	3*
			15-25	12.37	12.37	19.02	19.02	5*
			25-35	5.81	5.81	11.28	11.36	20*
			35+	0.43	1.17	1.34	3.91	1501

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

Table A.3 presents detailed data for individual segments for TomTom.

Table A. 7
TOMTOM data quality measures for individual arterial validation segments in the state of New Jersey

Path	Standard TMC length	Sensor 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	
NJ14-0001	1.02	1.02	0-15	-	-	-	-	-
			15-25	-	-	-	-	-
			25-35	6.36	6.36	10.56	10.56	4*
			35+	0.49	0.70	1.42	3.56	3178
NJ14-0002	1.00	1.00	0-15	-	-	-	-	-
			15-25	-	-	-	-	-
			25-35	-0.22	0.22	-3.30	3.30	10*
			35+	-1.91	1.92	-6.24	6.51	3088
NJ14-0003	1.51	1.51	0-15	8.26	8.26	12.69	12.69	7*
			15-25	1.85	2.74	-0.21	8.40	9*
			25-35	-0.97	1.62	-6.03	9.15	21*
			35+	-2.14	2.18	-5.48	6.26	2747
NJ14-0004	1.14	1.14	0-15	6.74	6.74	10.87	10.87	12*
			15-25	1.59	1.72	4.05	6.37	47
			25-35	-0.03	0.32	-1.32	3.01	337
			35+	-1.45	1.47	-6.04	6.29	2710
NJ14-0005	0.81	0.81	0-15	1.30	1.30	6.03	6.25	22*
			15-25	0.61	0.98	3.78	5.62	90
			25-35	-0.43	0.44	-1.44	3.06	364
			35+	-3.43	3.43	-9.32	9.32	1911
NJ14-0006	0.37	0.37	0-15	2.50	2.50	5.35	5.35	1560
			15-25	0.18	0.25	1.57	2.70	829
			25-35	-0.66	0.66	-7.44	7.44	56
			35+	-6.83	6.83	-18.39	18.39	11*
NJ14-0007	0.28	0.28	0-15	0.69	0.69	1.75	2.09	456
			15-25	-0.67	0.76	-3.75	4.33	1455
			25-35	-3.64	3.64	-11.15	11.15	394
			35+	-11.89	11.89	-22.30	22.30	52
NJ14-0008	0.59	0.59	0-15	1.94	1.96	3.54	3.76	1286
			15-25	0.16	0.27	0.61	2.13	799
			25-35	-2.80	2.80	-7.79	7.79	147
			35+	-11.37	11.37	-17.64	17.64	14*
NJ14-0009	0.86	0.86	0-15	0.68	0.68	1.25	2.01	3*
			15-25	0.92	0.95	3.50	3.78	264
			25-35	0.02	0.14	0.10	2.24	1352
			35+	-1.79	1.79	-7.34	7.34	659
NJ14-0010	1.32	1.32	0-15	2.58	2.58	3.82	3.82	330
			15-25	1.56	1.57	4.24	4.31	919
			25-35	-0.01	0.17	-0.30	2.18	682
			35+	-3.09	3.09	-9.07	9.07	56

*Results in the specified row may not be reliable due to a small number of observations. Based on the central limit theorem, the trigger for this result is when there are less than 30 observations.

Table A. 8 (Cont'd)

TOMTOM data quality measures for individual arterial validation segments in the state of New Jersey

Path	Standard TMC length	Sensor 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	
NJ14-0011	1.34	1.34	0-15	0.37	0.68	0.63	1.61	172
			15-25	-0.28	0.41	-0.88	1.86	1020
			25-35	-0.91	0.91	-4.04	4.13	1122
			35+	-5.54	5.54	-12.11	12.11	486
NJ14-0012	1.35	1.35	0-15	0.82	0.86	1.82	2.00	35
			15-25	0.86	0.87	2.77	2.97	848
			25-35	0.04	0.20	0.23	1.99	1259
			35+	-1.89	1.89	-6.68	6.68	415
NJ14-0013	1.02	1.02	0-15	6.17	6.17	8.51	8.51	4*
			15-25	1.64	1.67	4.26	4.43	87
			25-35	0.31	0.37	2.38	3.52	854
			35+	-1.44	1.44	-4.84	5.48	1554
NJ14-0014	1.20	1.20	0-15	6.37	6.37	7.27	7.27	2*
			15-25	3.53	3.53	5.34	5.34	100
			25-35	3.81	3.89	7.33	7.50	848
			35+	0.31	0.63	1.82	3.59	1764
NJ14-0015	1.15	1.15	0-15	-	-	-	-	-
			15-25	8.35	8.35	15.49	15.49	2*
			25-35	1.15	1.15	4.30	4.45	431
			35+	-0.92	1.12	-2.42	4.30	2181
NJ14-0016	1.16	1.16	0-15	0.95	0.97	1.18	1.56	13*
			15-25	0.99	1.26	2.60	3.61	29
			25-35	0.07	0.47	0.09	2.72	702
			35+	-1.93	1.93	-6.42	6.53	1714
NJ14-0017	1.20	1.20	0-15	2.36	2.36	3.41	3.41	4*
			15-25	3.60	3.60	5.75	5.75	11*
			25-35	4.84	4.84	8.72	8.78	87
			35+	0.62	1.22	1.90	4.38	2474
NJ14-0018	1.02	1.02	0-15	-	-	-	-	-
			15-25	2.08	2.08	4.72	4.83	67
			25-35	0.28	0.40	1.85	2.86	1009
			35+	-0.94	0.94	-4.28	4.62	1372
NJ14-0019	1.35	1.35	0-15	1.68	1.71	3.87	4.16	72
			15-25	0.37	0.42	1.83	2.42	1065
			25-35	-0.28	0.29	-2.32	2.84	938
			35+	-3.94	3.94	-10.86	10.86	318
NJ14-0020	1.34	1.34	0-15	4.48	4.48	6.80	6.80	4*
			15-25	1.14	1.16	3.36	3.52	830
			25-35	-0.06	0.14	-0.55	2.19	1372
			35+	-2.79	2.79	-9.23	9.23	505
NJ14-0021	1.31	1.31	0-15	0.96	1.16	2.39	2.98	23*
			15-25	0.22	0.36	0.93	2.15	799
			25-35	-0.61	0.61	-3.32	3.46	464
			35+	-5.07	5.07	-12.80	12.80	41
NJ14-0022	0.90	0.90	0-15	3.84	3.84	5.60	5.62	17*
			15-25	2.00	2.00	5.62	5.64	226
			25-35	0.13	0.22	1.03	2.40	1001
			35+	-1.51	1.51	-6.53	6.53	414

*Results in the specified row may not be reliable as there are less than 30 observations.

Table A. 3 (Cont'd)

TOMTOM data quality measures for individual arterial validation segments in the state of New Jersey

Path	Standard TMC length	Sensor 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	
NJ14-0023	0.59	0.59	0-15	1.34	1.37	3.21	3.31	830
			15-25	-0.23	0.28	-1.38	2.30	883
			25-35	-3.13	3.13	-10.48	10.48	78
			35+	-11.22	11.22	-20.02	20.02	6*
NJ14-0024	0.28	0.28	0-15	0.99	0.99	2.95	3.11	800
			15-25	-0.14	0.17	-2.41	3.03	764
			25-35	-1.72	1.72	-10.86	10.86	117
			35+	-11.90	11.90	-21.84	21.84	23*
NJ14-0025	0.39	0.39	0-15	1.15	1.15	3.50	3.60	600
			15-25	-0.08	0.17	-1.34	2.56	792
			25-35	-0.96	0.96	-10.26	10.26	104
			35+	-7.57	7.57	-22.03	22.03	27*
NJ14-0026	0.81	0.81	0-15	-	-	-	-	-
			15-25	3.42	3.42	22.27	22.27	2*
			25-35	3.69	3.72	12.15	12.24	237
			35+	0.21	0.50	2.20	4.53	1257
NJ14-0027	1.16	1.16	0-15	-	-	-	-	-
			15-25	6.28	6.28	12.06	13.71	24*
			25-35	1.33	1.45	3.46	7.17	114
			35+	-0.71	0.87	-2.16	4.28	2476
NJ14-0028	1.53	1.53	0-15	17.70	18.11	19.32	21.74	8*
			15-25	8.00	8.00	23.14	23.19	22*
			25-35	1.95	2.12	15.17	16.26	88
			35+	-0.64	0.90	-1.73	7.70	502
NJ14-0029	0.94	0.94	0-15	9.75	9.75	14.07	14.15	16*
			15-25	6.10	6.10	14.77	15.13	58
			25-35	2.91	2.98	11.86	13.41	114
			35+	0.72	1.63	3.78	7.06	674
NJ14-0030	1.01	1.01	0-15	-	-	-	-	-
			15-25	-	-	-	-	-
			25-35	-	-	-	-	-
			35+	-	-	-	-	-
NJ14-0031	0.31	0.31	0-15	15.28	15.28	19.92	19.92	7*
			15-25	1.04	1.04	5.62	5.82	568
			25-35	0.01	0.08	0.07	3.35	1110
			35+	-2.70	2.70	-10.28	10.30	609
NJ14-0032	1.27	1.27	0-15	4.74	4.74	5.90	7.07	10*
			15-25	2.02	2.05	4.94	5.27	45
			25-35	0.66	0.75	2.48	3.16	1045
			35+	-1.31	1.39	-3.58	5.03	1082
NJ14-0033	1.57	1.57	0-15	1.17	1.17	2.16	2.16	8*
			15-25	1.94	1.97	4.26	4.36	256
			25-35	0.44	0.70	1.03	3.04	1148
			35+	-4.19	4.42	-9.32	9.81	1213
NJ14-0034	0.94	0.94	0-15	2.49	2.49	2.75	4.15	10*
			15-25	3.25	3.25	4.50	7.49	10*
			25-35	0.12	0.84	5.84	7.41	38
			35+	-6.64	6.67	-13.43	13.70	2869

*Results in the specified row may not be reliable as there are less than 30 observations.

Table A. 3 (Cont'd)

TOMTOM data quality measures for individual arterial validation segments in the state of New Jersey

Path	Standard TMC length	Sensor 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	
NJ14-0035	6.88	6.88	0-15	1.13	1.13	1.69	1.69	4*
			15-25	3.68	3.77	4.43	5.45	23*
			25-35	3.11	3.11	5.53	5.59	256
			35+	-5.03	6.17	-6.74	9.88	891
NJ14-0036	6.69	6.69	0-15	3.70	4.96	3.59	6.38	6*
			15-25	2.39	2.66	3.63	4.07	142
			25-35	1.75	1.92	3.67	4.05	340
			35+	-1.94	2.65	-3.34	5.82	1404
NJ14-0037	0.94	0.94	0-15	1.40	1.51	1.60	2.56	45
			15-25	1.48	1.59	2.68	3.70	105
			25-35	2.33	2.63	8.00	9.45	105
			35+	0.43	0.78	1.70	4.70	2694
NJ14-0038	1.56	1.56	0-15	2.14	2.14	3.57	3.57	230
			15-25	1.97	1.98	4.30	4.46	591
			25-35	0.82	1.25	2.16	4.14	1098
			35+	-8.57	8.66	-15.41	15.72	456
NJ14-0039	1.29	1.29	0-15	5.12	5.12	17.28	17.28	1*
			15-25	0.80	0.80	4.23	4.48	56
			25-35	-0.12	0.20	-1.16	2.96	502
			35+	-3.34	3.34	-8.99	8.99	992
NJ14-0040	0.30	0.30	0-15	21.82	21.82	27.67	27.67	3*
			15-25	10.85	10.85	18.05	18.05	647
			25-35	4.52	4.54	11.26	11.33	1267
			35+	0.07	0.31	1.76	4.24	246
NJ14-0041	1.43	1.43	0-15	-	-	-	-	-
			15-25	-	-	-	-	-
			25-35	0.85	0.85	2.69	3.08	13*
			35+	-0.01	0.52	-0.13	3.00	1697
NJ14-0042	1.03	1.03	0-15	-	-	-	-	-
			15-25	6.00	6.00	12.90	13.71	15*
			25-35	2.68	2.75	12.95	13.32	56
			35+	-1.25	1.36	-3.95	5.91	2197
NJ14-0043	0.75	0.75	0-15	-	-	-	-	-
			15-25	-	-	-	-	-
			25-35	5.18	5.18	17.57	17.57	2*
			35+	-0.33	0.63	-3.00	5.09	2502
NJ14-0044	11.35	11.35	0-15	-	-	-	-	-
			15-25	3.32	3.33	7.56	7.97	28*
			25-35	1.70	2.34	4.92	6.35	219
			35+	0.41	0.81	2.44	4.19	879
NJ14-0045	11.48	11.48	0-15	-	-	-	-	-
			15-25	2.14	2.14	6.52	6.52	4*
			25-35	1.70	1.73	5.06	5.43	173
			35+	-2.85	3.08	-5.63	7.23	891
NJ14-0046	0.76	0.76	0-15	-0.54	0.54	-9.34	9.34	1*
			15-25	5.46	12.98	9.94	20.66	5*
			25-35	5.92	8.84	12.51	18.31	15*
			35+	-1.00	1.15	-4.41	6.13	2356

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Table A. 3 (Cont'd)

TOMTOM data quality measures for individual arterial validation segments in the state of New Jersey

Path	Standard TMC length	Sensor 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	
NJ14-0047	1.01	1.01	0-15	0.75	0.75	1.17	1.39	10*
			15-25	-2.66	6.42	-2.21	9.75	3*
			25-35	3.06	5.63	12.02	16.01	6*
			35+	-2.57	2.61	-6.48	7.20	2147
NJ14-0048	1.46	1.46	0-15	0.80	0.80	2.18	3.10	3*
			15-25	5.27	5.27	9.82	10.58	5*
			25-35	1.84	2.00	7.43	7.95	20*
			35+	-0.25	0.72	-0.78	3.19	1505

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