



I-95 Corridor Coalition

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



July 2010

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

Monthly Report

Prepared for:

I-95 Corridor Coalition

Sponsored by:

I-95 Corridor Coalition

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July 2010

Evaluation Results for the State of New Jersey

Executive Summary

Travel time samples were collected in New Jersey along approximately 13 freeway miles including a mile-long ramp segment for one week from Tuesday, May 25, 2010 through Thursday, June 2, 2010 and compared with travel time and speed data reported by INRIX as part of the I-95 Vehicle Probe project. The validation data below represents approximately 1350 hours of observations along seven freeway TMC segments, totaling nearly 12 miles.

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. As shown, both the average absolute speed error and speed error bias were within specification for all speed bins. Even when errors are measured against the mean (as opposed to the SEM band), INRIX data quality is within specification.

| ES Table 1 - New Jersey Evaluation Summary | | | | | | |
|---|----------------------------------|-------------------------|--------------------------------|-------------------------|----------------------------------|--------------------------------|
| Speed | 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 | 3.20 | 4.10 | 1.70 | 2.00 | 872 | 72.7 |
| 30-45 MPH | 4.00 | 6.20 | 1.10 | 1.90 | 588 | 49.0 |
| 45-60 MPH | 1.70 | 4.10 | 0.20 | 1.40 | 2095 | 174.6 |
| > 60 MPH | 2.30 | 4.90 | -2.10 | -4.00 | 12649 | 1054.1 |
| All Speeds | 2.33 | 4.80 | -1.48 | -2.76 | 16204 | 1350.3 |

Based upon data collected from May 25, 2010 through June 2, 2010 across 11.5 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 New Jersey were validated on six occasions: September/October 2008, April 2009, June 2009, September 2009, and October 2009, and May/June 2010. This represents more than 8100 hours of observations along nearly 150 miles of freeway segments in New Jersey. ES Table 2 provides a summary of the cumulative validation effort. As shown, the absolute average speed error is within specification for all speed bins. The speed error bias is within specification for the 45-60 MPH speed bin and the over 60 MPH speed bin.

ES Table 2 - New Jersey - Cumulative to Date

| Speed | 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 | 7.88 | 8.98 | 5.56 | 6.02 | 1911 | 159.3 |
| 30-45 MPH | 9.14 | 11.80 | 5.93 | 7.36 | 1424 | 118.7 |
| 45-60 MPH | 2.84 | 5.33 | 0.78 | 2.00 | 9700 | 808.3 |
| > 60 MPH | 2.71 | 5.23 | -2.47 | -4.37 | 84496 | 7041.3 |
| All Speeds | 2.92 | 5.41 | -1.87 | -3.36 | 97531 | 8127.6 |

It should be noted that data from the freeway ramp segment was analyzed separately and not included in this analysis described above. In all speed bins, INRIX data collected on the ramp segment studied meets the data quality measures set forth in the contract. However, since the numbers of observations below 45 mph were minimal, the comparison results may not be a reliable indicator of anticipated data quality at slower speeds.

Data Collection

Bluetooth sensor deployments in New Jersey started on Tuesday, May 25, 2010. The actual deployments in New Jersey were performed with the assistance of New Jersey Department of Transportation (NJDOT) personnel. Sensors remained in the same position until they were retrieved a week later on Thursday, June 2, 2010. This round of data collections in New Jersey 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 New Jersey. In this figure, red segments represent freeway segments while the blue segment is the single ramp segment selected for analysis in this round of validation.

Table 1 presents a list of specific TMC segments that were selected as the validation sample in New Jersey. These segments cover a total length of approximately 13 freeway miles including a mile long ramp segment. 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 seven freeway segments are reported; five of which are standard TMC segments and the other two 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 New Jersey 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 a separate 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. In addition, when errors are measured as a distance from the mean, INRIX data quality is also deemed as satisfactory based on the same requirements.

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 New Jersey. Tables 6 and 7 present detailed data for individual TMC segments in New Jersey 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 New Jersey, respectively. These figures correspond to Table 4.

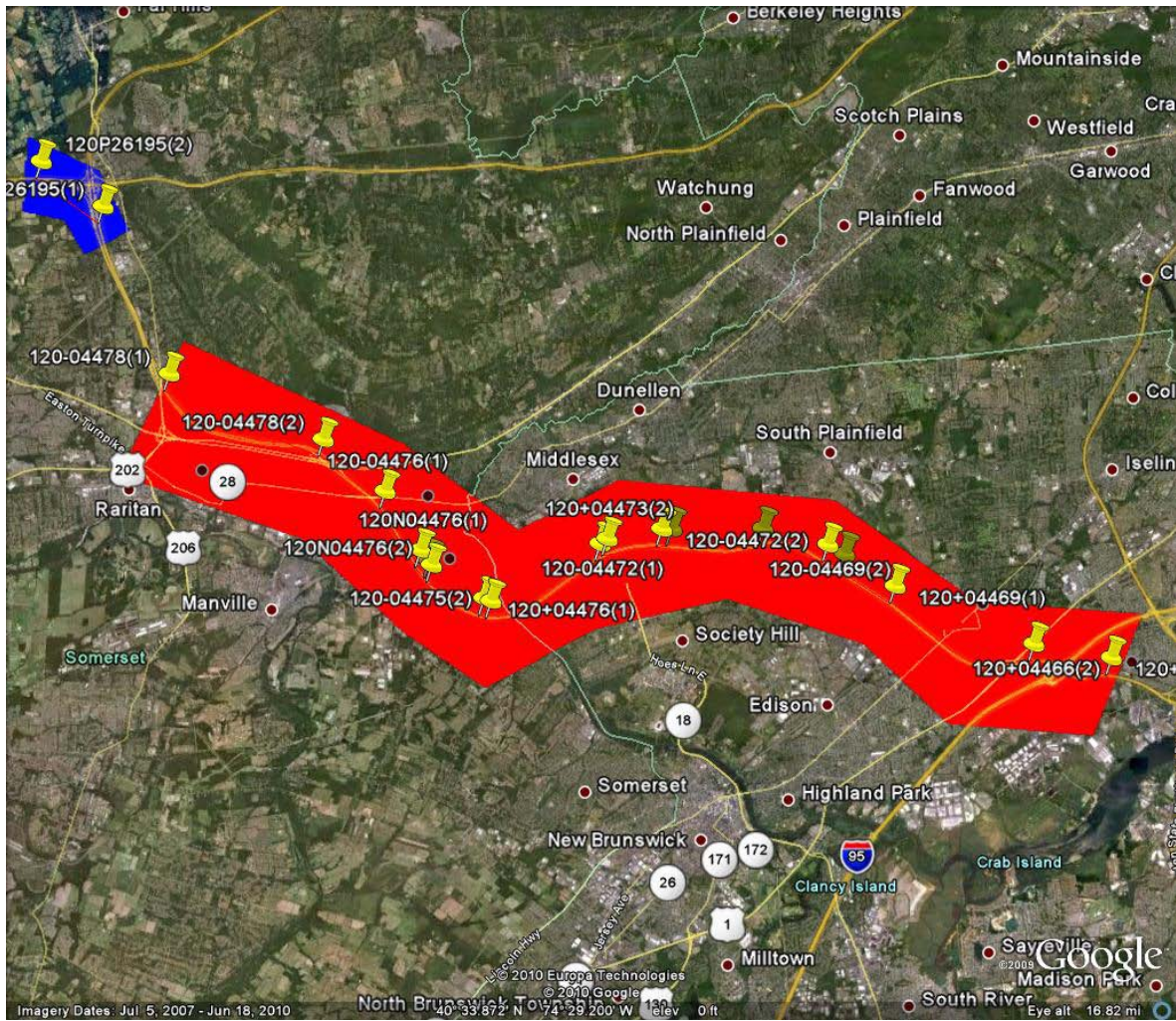


Figure 1
TMC segments selected for validation in New Jersey

Table 1
Traffic Message Channel segments picked for validation in New Jersey

| TYPE | TMC | HIGHWAY | STARTING AT | ENDING AT | COUNTY | DIRECTION | LENGTH (mile) |
|--------------|------------|----------------|--|--|---------------|------------------|--------------------------|
| Freeway | 120+04466 | I-287 | WOODBRIIDGE AVE/CO ROAD 514 | US-1/EXIT 1 | MIDDLESEX | NORTHBOUND | 1.3 |
| Freeway | 120P04473 | I-287 | CENTENNIAL AVE/POSSUMTOWN RD/EXIT 8 | CENTENNIAL AVE/POSSUMTOWN RD/EXIT 8 | MIDDLESEX | NORTHBOUND | 0.3 |
| Freeway | 120+04474 | I-287 | CENTENNIAL AVE/POSSUMTOWN RD/EXIT 8 | RIVER RD/EXIT 9 | MIDDLESEX | NORTHBOUND | 1.0 |
| Freeway | 120P04474 | I-287 | RIVER RD/EXIT 9 | RIVER RD/EXIT 9 | MIDDLESEX | NORTHBOUND | 0.4 |
| Freeway | 120+04475 | I-287 | RIVER RD/EXIT 9 | EASTON AVE/EXIT 10 | SOMERSET | NORTHBOUND | 0.1 |
| Freeway | 120P04475 | I-287 | EASTON AVE/EXIT 10 | EASTON AVE/EXIT 10 | SOMERSET | NORTHBOUND | 0.4 |
| Freeway | 120+04476 | I-287 | EASTON AVE/EXIT 10 | WESTON CANAL RD/EXIT 12 | SOMERSET | NORTHBOUND | 1.1 |
| Freeway | 120-04469 | I-287 | CR-501/NEW DURHAM RD/EXIT 3 | DURHAM AVE/EXIT 4 | MIDDLESEX | SOUTHBOUND | 1.2 |
| Freeway | 120-04475 | I-287 | RIVER RD/EXIT 9 | EASTON AVE/EXIT 10 | SOMERSET | SOUTHBOUND | 1.2 |
| Freeway | 120N04476 | I-287 | WESTON CANAL RD/EXIT 12 | WESTON CANAL RD/EXIT 12 | SOMERSET | SOUTHBOUND | 0.3 |
| Freeway | 120-04476 | I-287 | EASTON AVE/EXIT 10 | WESTON CANAL RD/EXIT 12 | SOMERSET | SOUTHBOUND | 1.1 |
| Freeway | 120-04478 | I-287 | NJ-28/EXIT 13 | US-22/EXIT 14 | SOMERSET | SOUTHBOUND | 2.9 |
| Ramp | 120P26195 | I-78 | EXIT 21B | EXIT 21B | SOMERSET | WESTBOUND | 1.4 |
| TOTAL | | | | | | | 12.9 |

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

| 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 | 120+04466 | 40.526167 | -74.324027 | 40.529422 | -74.348526 | 1.32 | 40.526428 | -74.326200 | 40.529367 | -74.350023 | 1.28 | -2.8% |
| Freeway | 120P04473 | 40.554226 | -74.483613 | 40.551736 | -74.488865 | 0.33 | 40.553742 | -74.485118 | | | | |
| Freeway | 120+04474 | 40.551736 | -74.488865 | 40.543000 | -74.503920 | 0.99 | | | | | | |
| Freeway | 120P04474 | 40.543000 | -74.503920 | 40.539941 | -74.510927 | 0.43 | | | | | | |
| Freeway | 120+04475 | 40.539941 | -74.510927 | 40.539523 | -74.513157 | 0.12 | | | | | | |
| Freeway | 120P04475 | 40.539523 | -74.513157 | 40.539724 | -74.521589 | 0.45 | | | 40.539748 | -74.521428 | | |
| Freeway | 120+04476 | 40.539828 | -74.522221 | 40.548854 | -74.539536 | 1.12 | 40.539748 | -74.521428 | 40.549173 | -74.539758 | 1.18 | 5.9% |
| Freeway | 120-04469 | 40.556860 | -74.434257 | 40.553085 | -74.413757 | 1.16 | 40.556588 | -74.435440 | 40.553048 | -74.413828 | 1.22 | 5.1% |
| Freeway | 120-04475 | 40.547779 | -74.538822 | 40.539206 | -74.520021 | 1.17 | | | 40.539162 | -74.519507 | | |
| Freeway | 120N04476 | 40.551323 | -74.542306 | 40.547779 | -74.538822 | 0.31 | 40.551175 | -74.542300 | | | | |
| Freeway | 120-04476 | 40.565413 | -74.553604 | 40.551323 | -74.542306 | 1.14 | 40.565252 | -74.553585 | 40.551175 | -74.542300 | 1.14 | -0.1% |
| Freeway | 120-04478 | 40.593268 | -74.622025 | 40.577748 | -74.573243 | 2.92 | 40.591487 | -74.620618 | 40.577298 | -74.572750 | 2.82 | -3.4% |
| Ramp | 120P26195 | 40.633350 | -74.643287 | 40.644068 | -74.662994 | 1.45 | 40.636153 | -74.644063 | 40.643645 | -74.655440 | 0.85 | -41.0% |
| TOTAL | | | | | | 12.91 | | | | | | |

Table 3
Path segments identified for validation in New Jersey

| Type | Validation Segment | STANDARD SEGMENTS INCLUDED | | | | | STARTING AT | ENDING AT | LENGTH (MILE) | | |
|--------------|--------------------|----------------------------|-----------|-----------|-----------|-----------|--------------------------------------|--------------------------|---------------|------------|-----------|
| | | TMC(1) | TMC(2) | TMC(3) | TMC(4) | TMC(5) | | | Standard | Deployment | Error (%) |
| Freeway | 120+04466 | 120+04466 | | | | | WOODBIDGE AVE /CO ROAD 514 | US-1/EXIT 1 | 1.32 | 1.28 | -2.81% |
| Freeway | 120+04476 | 120+04476 | | | | | EASTON AVE/EXIT 10 | WESTON CANAL RD /EXIT 12 | 1.12 | 1.18 | 5.94% |
| Freeway | 120-04478 | 120-04478 | | | | | NJ-28/EXIT 13 | US-22/EXIT 14 | 2.92 | 2.82 | -3.38% |
| Freeway | 120-04476 | 120-04476 | | | | | EASTON AVE /EXIT 10 | WESTON CANAL RD /EXIT 12 | 1.14 | 1.14 | -0.11% |
| Freeway | 120-04469 | 120-04469 | | | | | CR-501/NEW DURHAM RD /EXIT 3 | DURHAM AVE/EXIT 4 | 1.16 | 1.22 | 5.14% |
| Freeway | NJ06-0001 | 120N04476 | 120-04475 | | | | WESTON CANAL RD /EXIT 12 | EASTON AVE/EXIT 10 | 1.48 | 1.50 | 1.33% |
| Freeway | NJ06-0002 | 120P04473 | 120+04474 | 120P04474 | 120+04475 | 120P04475 | CENTENNIAL AVE /POSSUMTOWN RD/EXIT 8 | EASTON AVE/EXIT 10 | 2.31 | 2.22 | -3.99% |
| Ramp | 120P26195 | 120P26195 | | | | | EXIT 21B | EXIT 21B | 1.45 | 0.85 | -41.03% |
| TOTAL | | | | | | | | 12.91 | 12.21 | | |

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

| 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 | 1.7 | 3.2 | 2.0 | 4.1 | 872 |
| 30-45 | 1.1 | 4.0 | 1.9 | 6.2 | 588 |
| 45-60 | 0.2 | 1.7 | 1.4 | 4.1 | 2095 |
| 60+ | -2.1 | 2.3 | -4.0 | 4.9 | 12649 |

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

| 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 | 16% | 82% | 0% | 78% | 872 |
| 30-45 | 19% | 69% | 0% | 55% | 588 |
| 45-60 | 51% | 89% | 0% | 70% | 2095 |
| 60+ | 41% | 83% | 0% | 60% | 12649 |

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

| 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 | |
| 120+04466 | 1.31 | 1.28 | 0-30 | 1.5 | 2.5 | 1.6 | 3.2 | 121 |
| | | | 30-45 | 3.7 | 8.7 | 7.8 | 15.3 | 16* |
| | | | 45-60 | 0.0 | 1.0 | 0.6 | 2.8 | 582 |
| | | | 60+ | -1.9 | 2.1 | -3.9 | 4.7 | 1732 |
| 120+04476 | 1.12 | 1.18 | 0-30 | 4.7 | 5.9 | 6.2 | 7.7 | 83 |
| | | | 30-45 | 1.3 | 3.3 | 1.9 | 4.7 | 239 |
| | | | 45-60 | 0.6 | 2.0 | 2.0 | 4.3 | 335 |
| | | | 60+ | -0.9 | 1.4 | -1.9 | 3.4 | 1870 |
| 120-04469 | 1.18 | 1.22 | 0-30 | 1.0 | 2.3 | 1.1 | 2.8 | 183 |
| | | | 30-45 | 3.0 | 5.5 | 3.3 | 6.8 | 21* |
| | | | 45-60 | 0.5 | 1.6 | 2.3 | 4.4 | 227 |
| | | | 60+ | -2.4 | 2.6 | -4.6 | 5.6 | 2155 |
| 120-04476 | 1.14 | 1.14 | 0-30 | 3.3 | 4.7 | 3.6 | 5.6 | 56 |
| | | | 30-45 | -0.7 | 4.0 | -1.0 | 5.4 | 149 |
| | | | 45-60 | -0.9 | 2.8 | -0.4 | 5.2 | 195 |
| | | | 60+ | -2.4 | 2.5 | -4.7 | 5.4 | 2151 |
| 120-04478 | 2.91 | 2.82 | 0-30 | 1.4 | 3.6 | 1.5 | 4.5 | 86 |
| | | | 30-45 | 3.7 | 6.7 | 7.4 | 12.5 | 26* |
| | | | 45-60 | 0.1 | 3.2 | 4.1 | 8.3 | 41 |
| | | | 60+ | -3.0 | 3.1 | -5.3 | 5.7 | 1796 |
| NJ06-0001 | 1.48 | 1.5 | 0-30 | 2.5 | 3.6 | 3.2 | 5.0 | 40 |
| | | | 30-45 | 0.5 | 2.6 | 1.1 | 4.7 | 83 |
| | | | 45-60 | 0.7 | 1.8 | 2.0 | 4.2 | 613 |
| | | | 60+ | -0.7 | 1.3 | -1.3 | 3.2 | 1465 |
| NJ06-0002 | 2.32 | 2.22 | 0-30 | 1.1 | 2.9 | 1.2 | 3.7 | 303 |
| | | | 30-45 | 3.1 | 6.3 | 6.6 | 11.0 | 54 |
| | | | 45-60 | -0.5 | 2.6 | 1.3 | 6.2 | 102 |
| | | | 60+ | -2.9 | 2.9 | -5.5 | 5.9 | 1480 |

*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 New Jersey

| 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 | |
| 120+04466 | 0-30 | 19 | 16% | 105 | 87% | 0 | 0% | 99 | 82% | 121 |
| | 30-45 | 0 | 0% | 5 | 31% | 0 | 0% | 0 | 0% | 16* |
| | 45-60 | 402 | 69% | 559 | 96% | 0 | 0% | 497 | 85% | 582 |
| | 60+ | 694 | 40% | 1502 | 87% | 0 | 0% | 1070 | 62% | 1732 |
| 120+04476 | 0-30 | 9 | 11% | 47 | 57% | 0 | 0% | 40 | 48% | 83 |
| | 30-45 | 48 | 20% | 178 | 74% | 0 | 0% | 158 | 66% | 239 |
| | 45-60 | 131 | 39% | 288 | 86% | 0 | 0% | 231 | 69% | 335 |
| | 60+ | 947 | 51% | 1734 | 93% | 0 | 0% | 1445 | 77% | 1870 |
| 120-04469 | 0-30 | 26 | 14% | 163 | 89% | 0 | 0% | 158 | 86% | 183 |
| | 30-45 | 2 | 10% | 10 | 48% | 0 | 0% | 10 | 48% | 21* |
| | 45-60 | 125 | 55% | 200 | 88% | 0 | 0% | 142 | 63% | 227 |
| | 60+ | 855 | 40% | 1716 | 80% | 6 | 0% | 1139 | 53% | 2155 |
| 120-04476 | 0-30 | 7 | 13% | 41 | 73% | 0 | 0% | 35 | 63% | 56 |
| | 30-45 | 27 | 18% | 105 | 70% | 0 | 0% | 86 | 58% | 149 |
| | 45-60 | 75 | 38% | 151 | 77% | 0 | 0% | 108 | 55% | 195 |
| | 60+ | 869 | 40% | 1718 | 80% | 0 | 0% | 1180 | 55% | 2151 |
| 120-04478 | 0-30 | 18 | 21% | 67 | 78% | 0 | 0% | 64 | 74% | 86 |
| | 30-45 | 5 | 19% | 12 | 46% | 0 | 0% | 7 | 27% | 26* |
| | 45-60 | 19 | 46% | 32 | 78% | 0 | 0% | 17 | 41% | 41 |
| | 60+ | 535 | 30% | 1381 | 77% | 0 | 0% | 901 | 50% | 1796 |
| NJ06-0001 | 0-30 | 10 | 25% | 28 | 70% | 0 | 0% | 26 | 65% | 40 |
| | 30-45 | 22 | 27% | 65 | 78% | 0 | 0% | 51 | 61% | 83 |
| | 45-60 | 260 | 42% | 544 | 89% | 0 | 0% | 417 | 68% | 613 |
| | 60+ | 796 | 54% | 1350 | 92% | 1 | 0% | 1164 | 79% | 1465 |
| NJ06-0002 | 0-30 | 54 | 18% | 264 | 87% | 0 | 0% | 255 | 84% | 303 |
| | 30-45 | 8 | 15% | 30 | 56% | 0 | 0% | 14 | 26% | 54 |
| | 45-60 | 52 | 51% | 82 | 80% | 0 | 0% | 56 | 55% | 102 |
| | 60+ | 542 | 37% | 1107 | 75% | 0 | 0% | 694 | 47% | 1480 |

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

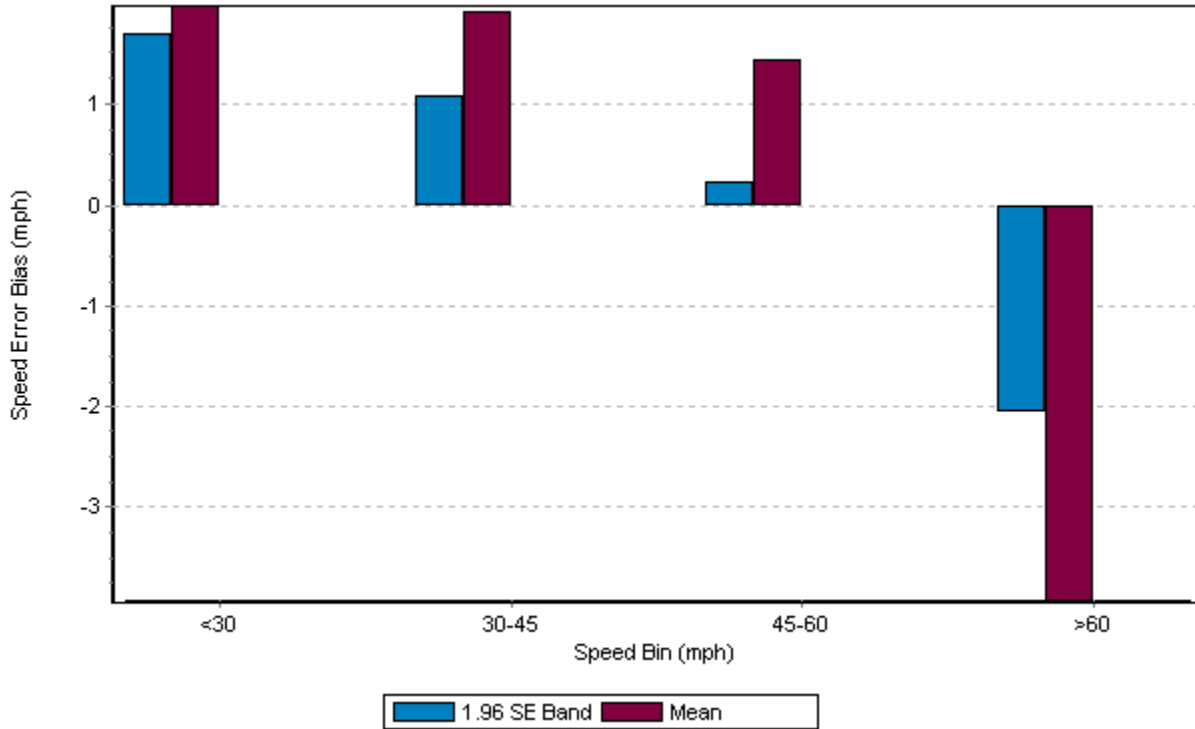


Figure 2
Speed error bias for freeway segments greater than one mile in New Jersey

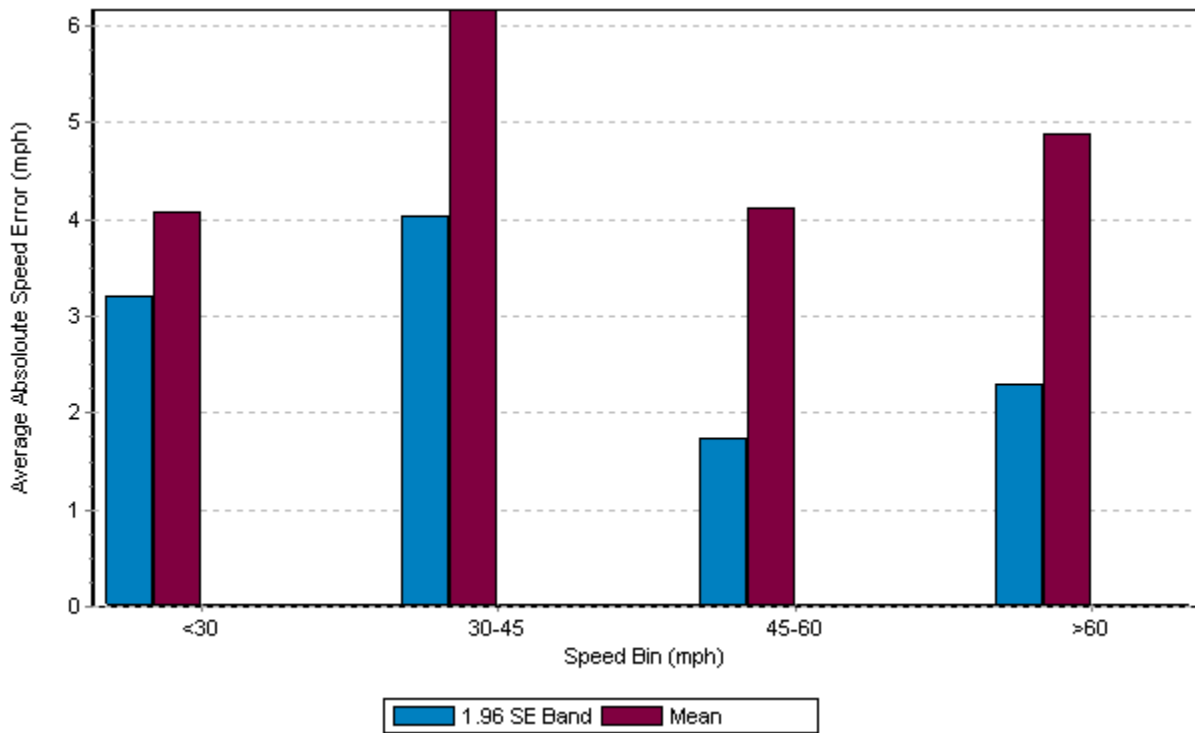


Figure 3
Average absolute speed error for freeway segments greater than one mile in New Jersey

Analysis of Results for a Freeway Ramp Segment

Table 8 summarizes the data quality measures obtained as a result of comparison between Bluetooth and all reported INRIX speeds on a freeway ramp segment considered in this round of validations. 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. However, note that in speed bins below 45 mph the comparison results may not be reliable due to small number of observations.

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 this freeway ramp segment in New Jersey.

Figures 4 and 5 show the speed error biases for different speed bins, and the average absolute speed errors for this freeway ramp segment in New Jersey, respectively. These figures correspond to Table 8.

Table 8

Data quality measures for individual freeway ramp segment in the state of New Jersey

| 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 | |
| 120P26195 | 1.45 | 0.85 | 0-30 | 1.1 | 5.2 | 0.8 | 6.9 | 14* |
| | | | 30-45 | -4.6 | 5.8 | -4.0 | 12.9 | 5* |
| | | | 45-60 | 0.0 | 1.8 | 1.8 | 4.5 | 667 |
| | | | 60+ | -2.5 | 2.5 | -4.3 | 5.0 | 1589 |

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

Table 9

Observations meeting data quality criteria for individual freeway ramp segment in the state of New Jersey

| 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 | |
| 120P26195 | 0-30 | 0 | 0% | 8 | 57% | 0 | 0% | 7 | 50% | 14* |
| | 30-45 | 2 | 40% | 3 | 60% | 0 | 0% | 1 | 20% | 5* |
| | 45-60 | 384 | 58% | 598 | 90% | 4 | 1% | 460 | 69% | 667 |
| | 60+ | 903 | 57% | 1349 | 85% | 0 | 0% | 1098 | 69% | 1589 |

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

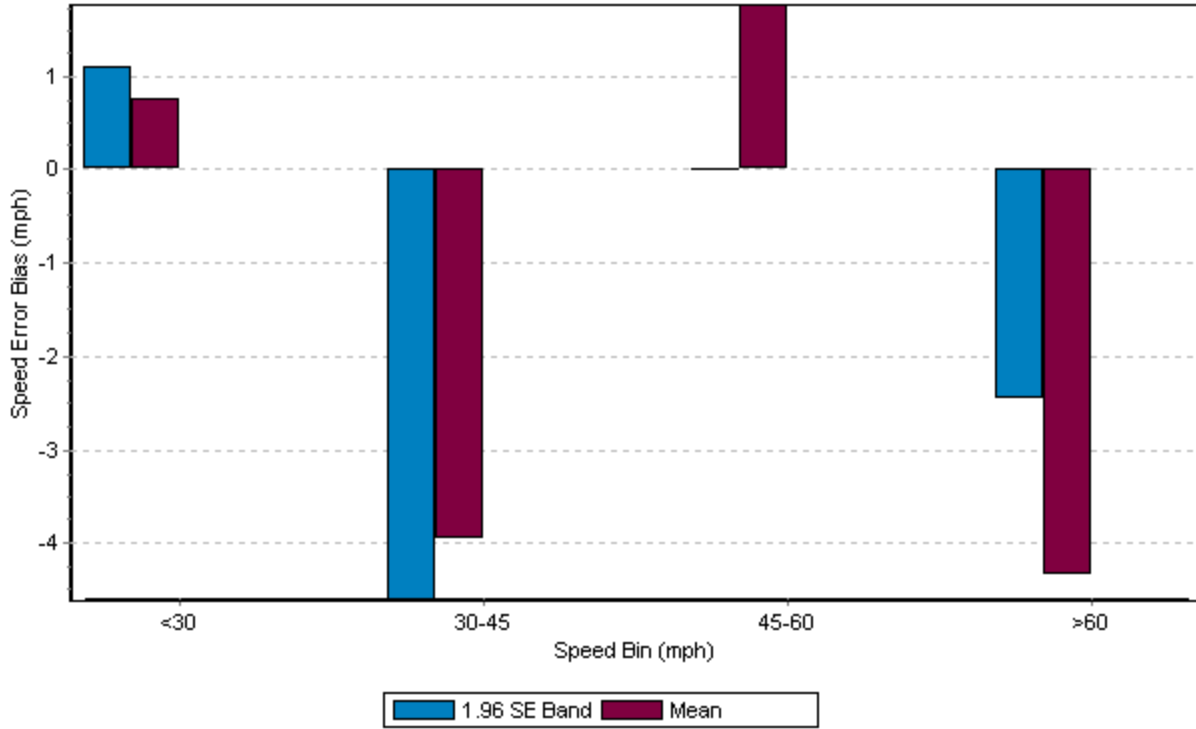


Figure 4
Speed error bias for individual freeway ramp segment in New Jersey

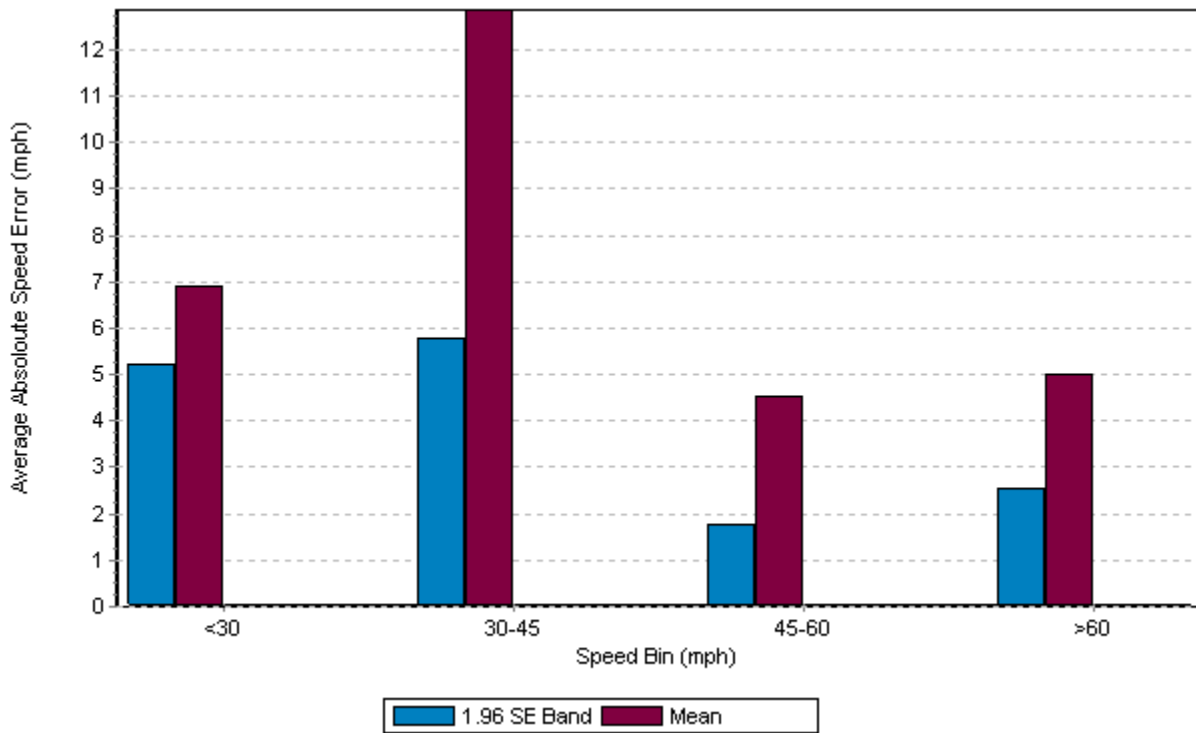


Figure 5
Average absolute speed error for individual freeway ramp segment in New Jersey