I-95 Corridor Coalition

Probe Data Comparison
January 23, 2014
Housekeeping Items

For Greatest Participation

- Stan will pause and take questions at strategic points in his presentation
- Give your name and agency before asking your question (at least the first time)
- Keep your phone muted until asking a question or speaking (press *6 to mute/unmute individual phone lines)
- Do not place call “on hold” as your hold music may be heard by the group

Additional Webcast & Audio Information

- Call 610-662-5569 for difficulties with the web or audio application.
Other Information

Presentation

• Today’s presentation will be posted to the I-95 Corridor Coalition website on the VPP Feature Page (Project Presentations tab)

• Contact Information will be available at the end of this presentation
# Upcoming Coalition & VPP Meetings

<table>
<thead>
<tr>
<th>Meeting/Webcast</th>
<th>Proposed Date(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>TISPTC webcast for Coalition Work Plan process</td>
<td>Feb 4, 2014 (10:30am to 11:30am)</td>
</tr>
<tr>
<td>VPP Team Webcast</td>
<td>Feb 27, 2014 (10:30am to noon)</td>
</tr>
<tr>
<td>TISPTC Meeting/Webcast (DVRPC, Phila, PA)</td>
<td>April 3, 2014 (9:30am to 12:30pm)</td>
</tr>
<tr>
<td>VPP Suite User Group/Partners Using Archived Operations Data - Meeting/Webcast</td>
<td>April 3, 2014 (1:15pm to 3:30pm)</td>
</tr>
</tbody>
</table>
## Agenda

<table>
<thead>
<tr>
<th>Topic</th>
<th>Speaker</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Welcome from the Coalition</td>
<td>George Schoener</td>
</tr>
<tr>
<td>2 Comparison of Probe Data</td>
<td>Stan Young</td>
</tr>
<tr>
<td>NPMRDS &amp; VPP</td>
<td></td>
</tr>
<tr>
<td>3 Wrap Up</td>
<td>George Schoener</td>
</tr>
</tbody>
</table>
Welcome

George Schoener
I-95 Corridor Coalition
Comparison of Probe Data
NPMRDS & VPP

Stan Young
University of Maryland
## Fundamental Difference in Data

<table>
<thead>
<tr>
<th>Attributes / Functions</th>
<th>NPMRDS</th>
<th>Vehicle Probe Project</th>
</tr>
</thead>
</table>
| **Nature of Probe Data** | Vendor is contracted to provide only observed field probe data for travel time.  
If no field data is available, no travel time is reported.  
No data modeling, filtering, blending or smoothing is applied to ensure that only raw observed values are included in this data set. | Vendor is contracted to provide best estimate of speed and travel time for all time periods.  
If density of probe data is insufficient, modeling and historical data may be used in addition to field data to estimate traffic conditions. |
Contrast of Data Sources
VPP, NPMRDS, and Bluetooth

US 1 – High Volume Arterial
9/16/2013

- Bluetooth
- VPP
- NPMRDS-All
- NPMRDS_Passenger Cars
- NPMRDS_Trucks
## Fact Sheet Review

### Geographic Coverage & Archive Timeframe

<table>
<thead>
<tr>
<th>Attributes / Functions</th>
<th>NPMRDS</th>
<th>Vehicle Probe Project</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Geographic Coverage</strong></td>
<td>• NHS and Interstates for all 50 states +</td>
<td>• Approx. 7000 freeway miles and 32,000 arterial miles within coalition.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Major interchange ramps, &amp; segregated special use lanes</td>
</tr>
<tr>
<td><strong>Archive Timeframe</strong></td>
<td>• Posted monthly</td>
<td>• Updated continuously</td>
</tr>
<tr>
<td></td>
<td>• NHS begins July 2013</td>
<td>• Archive available from Jan 2009</td>
</tr>
<tr>
<td></td>
<td>• Interstates Oct 2011 – June 2013</td>
<td></td>
</tr>
</tbody>
</table>
# Fact Sheet Review
## Archive Access & Temporal Reporting

<table>
<thead>
<tr>
<th>Attributes / Functions</th>
<th>NPMRDS</th>
<th>Vehicle Probe Project</th>
</tr>
</thead>
</table>
| Archive Access         | • HERE’s Electronic Data Delivery (EDD) Site  
  • Monthly multi-state data sets  
  • License agreement is required | • VPP Suite : selected network  
  • Monitoring Site : By state and roadway type  
  • License agreement required |
# Fact Sheet Review

## Data Elements, Accuracy/Validation & Confidence Indicator

<table>
<thead>
<tr>
<th>Attributes / Functions</th>
<th>NPMRDS</th>
<th>Vehicle Probe Project</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Data Elements</strong></td>
<td>• Travel Times for</td>
<td>• Travel Time &amp; Speed</td>
</tr>
<tr>
<td></td>
<td>• Passenger Vehicles</td>
<td>• Reference &amp; Historical Speed</td>
</tr>
<tr>
<td></td>
<td>• Freight Vehicles</td>
<td>• Score &amp; Confidence Value</td>
</tr>
<tr>
<td></td>
<td>• Combined</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• TMC Codes</td>
<td>• TMC Codes</td>
</tr>
<tr>
<td><strong>Data Accuracy/Validation</strong></td>
<td>• To be provided quarterly</td>
<td>• Monthly since 2008</td>
</tr>
<tr>
<td><strong>Confidence Indicator</strong></td>
<td>• No record if no data</td>
<td>• Score &amp; Confidence Value</td>
</tr>
</tbody>
</table>
Accessing NPMRDS Data

- Data size: 38.4 GB (compressed)
  - For all Freeway data, and 3 months of NHS
- Expecting monthly data: 5 – 6 GB (compressed)
- FTP client required for downloading
- Data is delivered in two sets of tables
  - Set 1: Travel time information
  - Set 2: Traffic Message Channel (TMC) codes
NPMRDS TMC Codes

• NPMRDS reports using internal TMC codes
  – External segment (‘+’ & ‘-’) between interchanges
  – Internal segment (‘p’ & ‘n’) within interchanges
  – NPMRDS combines internal and external, using internal TMC label

• NPMRDS → VPP TMC Conversion
  – Use common numeric TMC code
    • ‘p’ for NPMRDS -> ‘p’ and ‘+’ in VPP
    • ‘n’ for NPMRDS -> ‘n’ and ‘-’ in VPP
More on TMC Codes

• NPMRDS latitude/longitude
  – Neither begin or end, but somewhere within
  – Same lat/lon position for NB and SB

• VPP & NPMRDS TMC Comparison
  – Generally the same roadway segment
  – End points may differ slightly
  – Length mismatch possible (and likely)
110+04419
VPP
1.97 miles

110P04418
VPP
1.09 miles

110+04418
VPP
0.60 miles

11004418
NPMRDS
1.332 miles
Data Conversion for Comparison

• NPMRDS to VPP
  – Convert TMC Code (previously covered)
  – Convert NPMRDS travel time to speed based on NPMRDS reported TMC length
# Fact Sheet Review

## Shape File, Highway Segments, Tools & Archive Size

<table>
<thead>
<tr>
<th>Attributes / Functions</th>
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<th>Vehicle Probe Project</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Shape File</strong></td>
<td>• Provided, cross referenced to TMC codes</td>
<td>• May be purchased separately</td>
</tr>
<tr>
<td><strong>Highway Segments</strong></td>
<td>• Covered with TMC Codes</td>
<td>• Covered with TMC Codes</td>
</tr>
</tbody>
</table>
| **Tools, Products & Visualizations** | • Not provided by FHWA  
• May be provided by 3rd parties  
• Other products by HERE | • VPP Suite  
• Monitoring Site  
• Overlay products |
| **Archive Size**       | • 100-400 MB monthly for medium state           | • 19TB, growing at 21 GB/day                 |
## Fact Sheet Review
**Cost, Data Licensing Process, Support & Data Type**

<table>
<thead>
<tr>
<th>Attributes / Functions</th>
<th>NPMRDS</th>
<th>Vehicle Probe Project</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Cost</strong></td>
<td>• Provided at no cost to states and MPOs by FHWA</td>
<td>• Freeways ~$750/mile/yr Region-wide arterials +25%</td>
</tr>
<tr>
<td><strong>Data Licensing Process – similar DUA</strong></td>
<td>• For States and MPOs</td>
<td>• For Coalition members</td>
</tr>
<tr>
<td><strong>Support</strong></td>
<td>• Extensive</td>
<td>• Extensive</td>
</tr>
<tr>
<td><strong>Data Type</strong></td>
<td>• Archived data sets</td>
<td>• Real-time data feed resulting in archives</td>
</tr>
</tbody>
</table>
Sample Comparisons
**VPP, NPMRDS, & Bluetooth Data**

- 48 hours timeframes
- Locations based on VPP validation
- NPMRDS converted to VPP (as described)
  - Base segment lengths may and do differ
  - Comparison display in min/mile for normalization
- Case studies
  - high-volume arterial, US-1 in NJ
  - medium-volume arterial, NJ 42
Methodology

• Bluetooth travel time (displayed in blue)
  – Reflect the travel time from individual traversals

• VPP travel time data (displayed red)
  – Reflect one minute data downloaded from the VPP Suite.
  – If multiple TMCs, only times intervals in which all TMCs have data are aggregated and displayed.

• NPMRDS travel time data (displayed in yellow)
  – Pulled from archived in five minute intervals.
  – Data is converted to VPP base segment length.
  – Similar to VPP, only times intervals in which all TMCs have data are aggregated and displayed.
### High–Volume Arterial Sample

**Northbound US 1**

<table>
<thead>
<tr>
<th>Type</th>
<th>PATH ID</th>
<th>Road Name</th>
<th>Direction</th>
<th>Number of Lanes</th>
<th>Number of Signals</th>
<th>LENGTH (MILE)</th>
<th>Number of TMC's</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arterial</td>
<td>NJ11-0003</td>
<td>US-1</td>
<td>NB</td>
<td>3</td>
<td>1</td>
<td>0.75</td>
<td>3</td>
</tr>
</tbody>
</table>

*Bluetooth Segment: 0.74, NPMRDS Segment: 0.5*

*January 23, 2014*
Bluetooth, VPP & NPMRDS Data

24 Hours – Day 1 Comparison

US 1 – High Volume Arterial

9/16/2013
NPMRDS Truck Data & Bluetooth

48 Hours

US 1 – High Volume Arterial
9/16/2013 & 9/17/2013
Data Density Summary
For 48 Hour Period – High-Volume Arterial

• **NPMRDS** (one TMC)
  – Number of 5 minute epochs = 576
  – Number of Passengers records = 228 (40%)
  – Number of Truck records = 40 (7%)
  – Number of Combined records = 242 (42%)

• **VPP** (3 TMC)
  – Number of 1 minute epochs = 2880
  – Number of data records = 2864 (99%)
  – Number of record with Score 30 = 1669 (58%)

• **Bluetooth Data**
  – Number of Bluetooth Readings = 2481
# Medium-Volume Arterial Sample

**Southbound NJ 42**

<table>
<thead>
<tr>
<th>Type</th>
<th>PATH ID</th>
<th>Road Name</th>
<th>Direction</th>
<th>Number of Lanes</th>
<th>Number of Signals</th>
<th>LENGTH (MILE)</th>
<th>Number of TMC's</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arterial</td>
<td>NJ11-0019</td>
<td>NJ-42</td>
<td>SB</td>
<td>2</td>
<td>6</td>
<td>1.37</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1.35</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1.3</td>
<td>2</td>
</tr>
</tbody>
</table>

January 23, 2014
Bluetooth, VPP & NPMRDS Data
48 Hours – Zoomed to Congestion Events

NJ 42 – Medium Volume Arterial
9/12/2013 & 9/13/2013
Bluetooth, VPP & NPMRDS Data
24 Hours – Day 1 Comparison

NJ 42 – Medium Volume Arterial
9/12/2013
NPMRDS Passenger Vehicle Data & Bluetooth

48 Hours

NJ 42 – Medium Volume Arterial
9/12/2013 & 9/13/2013

Min/mile

Hour
NPMRDS Truck Data & Bluetooth
48 Hours

NJ 42 – Medium Volume Arterial
9/12/2013 & 9/13/2013

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Data Density Summary
For 48 Hour Period – Medium-Volume Arterial

- NPMRDS (2 TMCs)
  - Number of 5 minute epochs = 576
  - Number of Passengers records = 75 (13%)
  - Number of Truck records = 1 (0%)
  - Number of Combined records = 79 (14%)

- VPP (3 TMCs)
  - Number of 1 minute epochs = 2880
  - Number of data records = 2877 (99%)
  - Number of record with Score 30 = 993 (34%)

- Bluetooth Data
  - Number of Bluetooth Readings = 1332
Conclusions / Take Aways

• **NPMRDS are field observations data**
  – No filtering or smoothing
  – Records only exist if data are available

• **TMCs are not equivalent**
  Convert NPMRDS internal code to VPP internal and external code
  – Calculate speed or travel time rate based on NPMRDS reported TMC distance
Conclusions / Take Aways

• Data Density
  – Passenger car data density is less than VPP real-time data density
  – Truck data is sparse

• For Performance Measures, NPMRDS will require additional processing
  – Outlier detection and rejection
  – Smoothing
  – Missing values
Wrap Up

George Schoener
I-95 Corridor Coalition
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Thank You