Federal Highway Administration
Long-Term Bridge Performance Program

Long-Term Bridge Performance Program Update

Richard Dunne, P.E.
Michael Baker International, Inc.

Southeast Bridge Preservation Partnership Meeting, March 31, 2016
FHWA LTBP Program

- Intended as a 20+ year *long-term research effort* to improve our knowledge of “Bridge Performance”

- Funding was designated in “SAFETEA-LU” - surface transportation authorization legislation (program starts in 2008)

- “MAP-21” - Moving Ahead for Progress in the 21st Century – funding was used

- FAST – Fixing America’s Surface Transportation – funding will be used for the program
Long-Term Bridge Performance (LTBP) Program

• Definition of Bridge Performance:

Bridge Performance Encompasses How Bridges Function and Behave Under the Complex and Interrelated Factors they are Subjected to Day In and Day Out:

— Traffic Volumes
— Loads
— De-Icing Chemicals
— Freeze-Thaw Cycles
— Environment
— Extreme Events
— Method of Design
— Construction Materials
— Age
— Maintenance History
Long-Term Bridge Performance (LTBP) Program

• **Vision:** The LTBP Program will Serve as the National Platform for Strategic Long-Term Investigation of In-Service Bridge Performance.

• **Mission:** Foster Improved Bridge Performance, Health, Stewardship, and Management Through the Analysis of Data Collected Over a 20-Year Period on a Large Representative Sample of U.S. Highway Bridges. To achieve this, the Program is Designed to Produce or Support Improved Deterioration Models, Reliable Life-Cycle Cost and Forecasting Models, Design Procedures, and Decision-Making Tools.
# Developmental & Execution

## Identify Bridge Performance Issues

Focus Group Meetings With 15 States

<table>
<thead>
<tr>
<th>Category</th>
<th>Issue</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Decks</strong></td>
<td>Untreated Concrete Bridge Decks</td>
</tr>
<tr>
<td><strong>Decks</strong></td>
<td>Treated Concrete Bridge Decks</td>
</tr>
<tr>
<td><strong>Joints</strong></td>
<td>Bridge Deck Joints</td>
</tr>
<tr>
<td><strong>Bearings</strong></td>
<td>Bridge Bearings</td>
</tr>
<tr>
<td><strong>Steel Bridges</strong></td>
<td>Coatings for Steel Superstructure Elements</td>
</tr>
<tr>
<td><strong>Concrete Bridges</strong></td>
<td>Verify Condition of Strands and Tendons</td>
</tr>
</tbody>
</table>
Bridge Types and Sample Size (Most Common Bridges)

14 Suggested Clusters
10 Suggested Corridors

Corridor Candidates
4890 bridges of all types meeting other selection criteria

East-West
I-40, I-70, I-80, I-90, I-94

North-South
LTBP Products for Research Purposes

**LTBP Protocols** - Created over 150 protocols for bridge infrastructure field assessment and evaluation

**LTBP Bridge Portal** - Developed an advanced web-based centralized data storage and retrieval application

**LTBP Data-Driven Deterioration Modeling Methodology** - Developed methodology for a data-driven deterioration and forecasting model to be used within the LTBP Bridge Portal

**NDE Technologies** - Developed, deployed, and validated a number of automated and semi-automated bridge deck assessment tools

**Long-Term Bridge Performance Index** - Developing, testing, and validating a data-driven bridge performance index

**Bridge Practice Timelines** - Creating timelines of changes in bridge practices from 1960 to the present to provide context and assistance for analyzing results obtained from field evaluations of bridges
# Field Data Collection: Untreated Bridge Decks, Joints, and Bearings

<table>
<thead>
<tr>
<th>Contractor</th>
<th>Cluster</th>
<th>States</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rutgers</td>
<td><strong>Mid-Atlantic Steel; Mid-Atlantic</strong></td>
<td>DE, NJ, MD, PA, VA, WV (2nd round of testing and additional bridges: July 2014)</td>
</tr>
<tr>
<td></td>
<td><strong>Prestressed Concrete</strong></td>
<td></td>
</tr>
<tr>
<td>Michael Baker</td>
<td><strong>Gulf Steel; Gulf Prestressed Concrete</strong></td>
<td>AL, AR, FL, LA, MS, TX</td>
</tr>
<tr>
<td>PB</td>
<td><strong>NW Prestressed Concrete; SW Concrete Box</strong></td>
<td>AZ, CA, NV, OR, WA</td>
</tr>
</tbody>
</table>
NDE Data Collection

- Impact Echo
- Electrical Resistivity
- Moisture Scan
- USW
- GPR
- Half-Cell Potential

Bridge Performance Program
FHWA in collaboration with Rutgers University envisioned, planned, designed, and constructed a novel (robotic) system, by integrating multiple non-destructive evaluation (NDE) technologies, for condition assessment of concrete bridge decks. 

*RABIT™ – Robotic Assisted Bridge Inspection Tool.*
Decision Point: Are additional bridges required to achieve program goals?
Growing the Program

Ramp up  Steady state data collection

Legacy data mining

Bridges with Untreated Decks

Bridges with Treated Decks

Corridor Bridges

Long-Term Bridge Performance Program
# LTBP Bridge Breakdown

<table>
<thead>
<tr>
<th>Untreated Decks</th>
<th>Treated Decks</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Steel Multigirder</strong></td>
<td><strong>Concrete</strong></td>
</tr>
<tr>
<td>Prestressed Concrete Multigirder</td>
<td>Prestressed Concrete Box</td>
</tr>
<tr>
<td>Steel Coatings</td>
<td>Prestressing Strands</td>
</tr>
<tr>
<td>Bearings</td>
<td>Joints</td>
</tr>
<tr>
<td>Bearings</td>
<td>Joints</td>
</tr>
</tbody>
</table>

**Treated Decks**

<table>
<thead>
<tr>
<th>Concrete</th>
<th>Steel Multigirder</th>
<th>Prestressed Concrete Multigirder</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prestressed Concrete Box</td>
<td>Box</td>
<td></td>
</tr>
<tr>
<td>Steel Coatings</td>
<td>Prestressing Strands</td>
<td></td>
</tr>
<tr>
<td>Bearings</td>
<td>Joints</td>
<td></td>
</tr>
<tr>
<td>Bearings</td>
<td>Joints</td>
<td></td>
</tr>
</tbody>
</table>

*Long-Term Bridge Performance Program*
FHWA LTBP Program
Gulf Region – Data Collection

- States – Alabama, Arkansas, Florida, Louisiana, Mississippi & Texas

- Contractor - Michael Baker International
  PM - Richard Dunne; richard.dunne@mbakerintl.com;
  Field Mgr. – Juan Rocha; jrocha@mbakerintl.com;

- Bare Concrete Decks – Steel Girder & Concrete Girder bridges
  Alabama - 1 Concrete Reference Bridge & 1 Concrete Cluster Bridge
  Arkansas - 4 Steel Cluster Bridges
  Florida – 2 Concrete Cluster Bridges
  Louisiana – 1 Steel Reference Bridge, 3 Steel & 3 Concrete Cluster Bridges
  Mississippi – 1 Steel Reference Bridge, 1 Concrete Reference Bridge and
    3 Steel & 3 Concrete Cluster Bridges
  Texas – 2 Concrete Cluster Bridges
Key Contacts—LTBP Program


- **Federal Highway Administration:**
  - Hamid Ghasemi: Hamid.Ghasemi@dot.gov
  - Rob Zobel: Robert.Zobel@dot.gov
  - Sue Lane: Susan.Lane@dot.gov
  - Yamayra Rodriguez: Yamayra.Rodriguez@dot.gov
  - Tom Saad: Thomas.Saad@dot.gov
Thank You!

Questions?