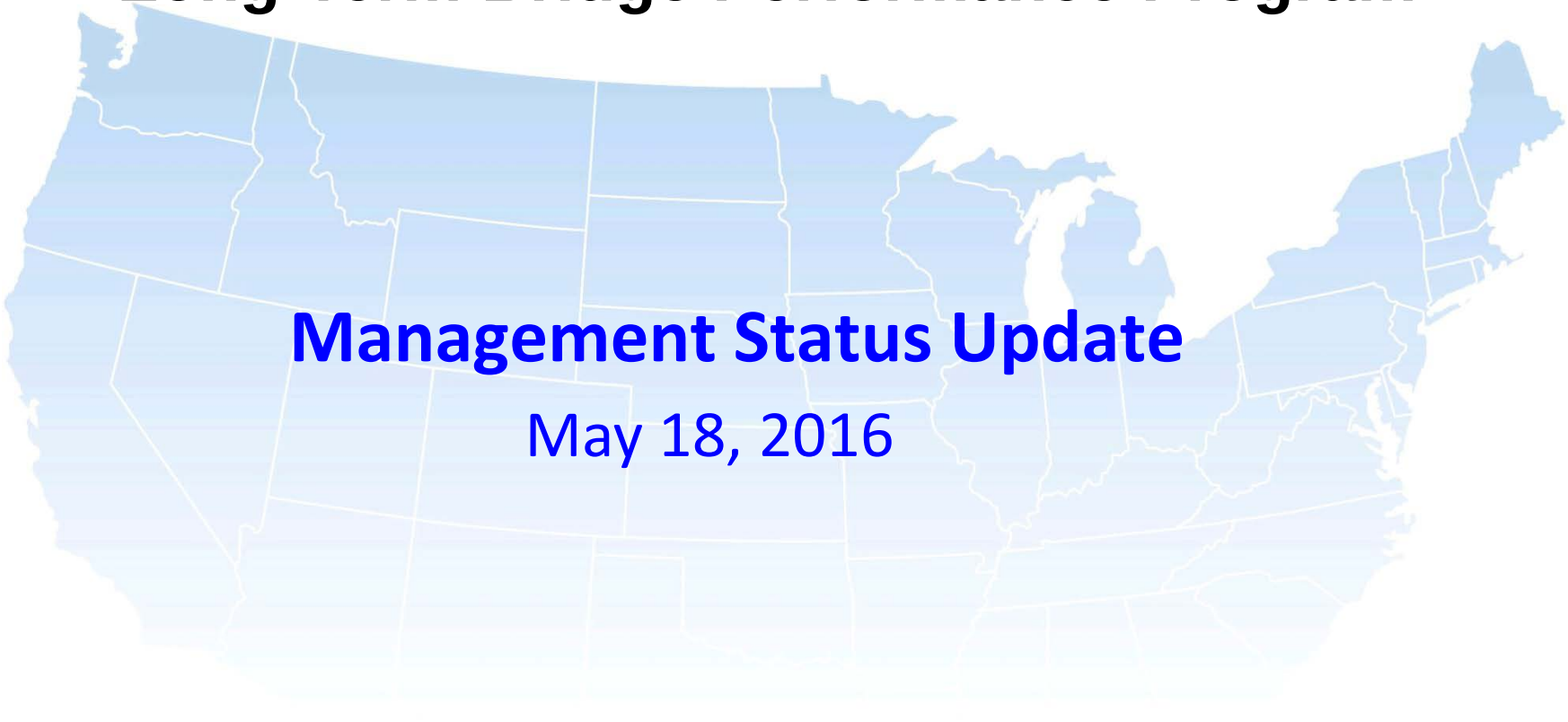
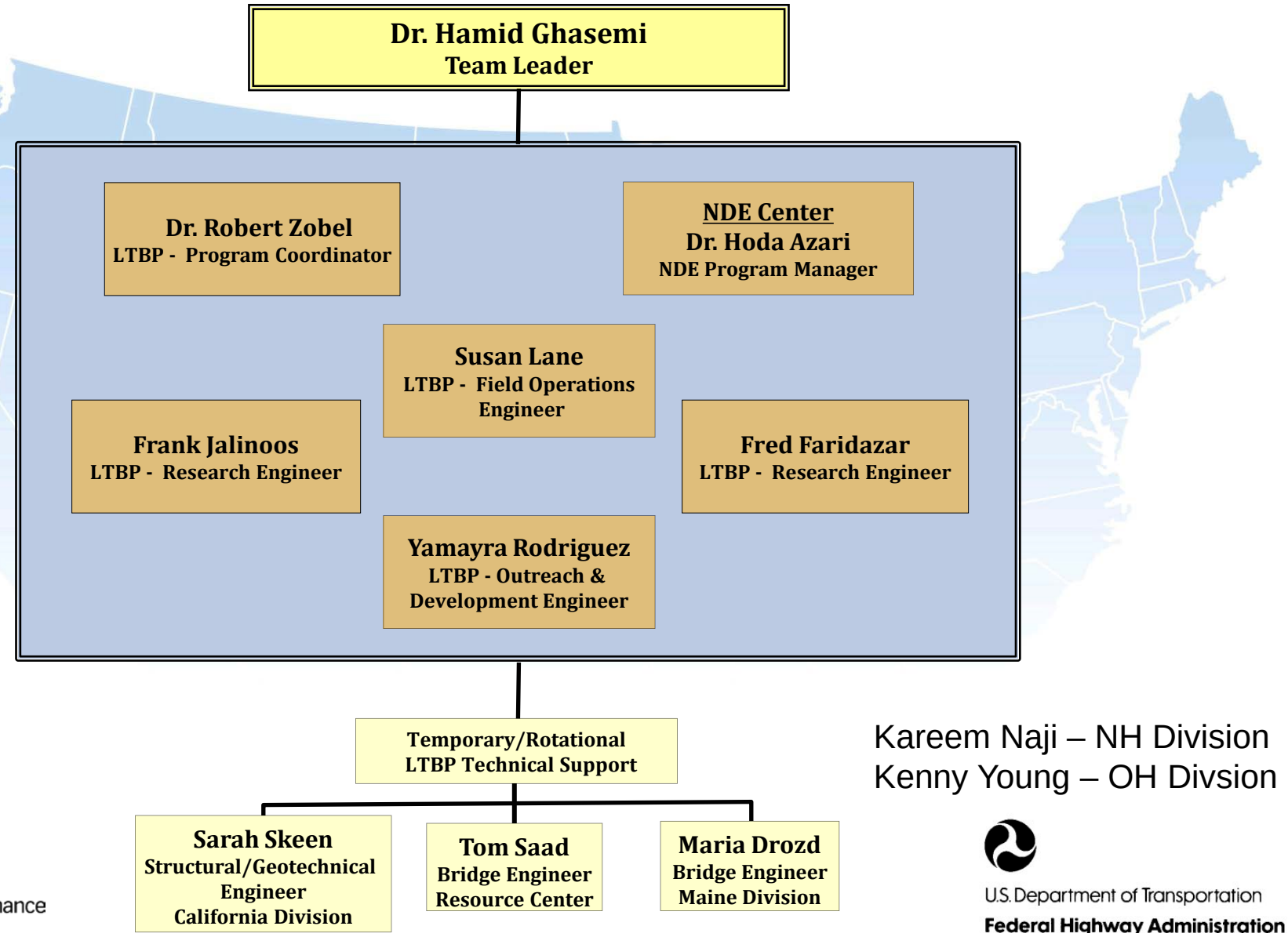
Long-Term Bridge Performance Program



Management Status Update

May 18, 2016

Office of Infrastructure R&D
Infrastructure Management Team



Kareem Naji – NH Division
Kenny Young – OH Divsion

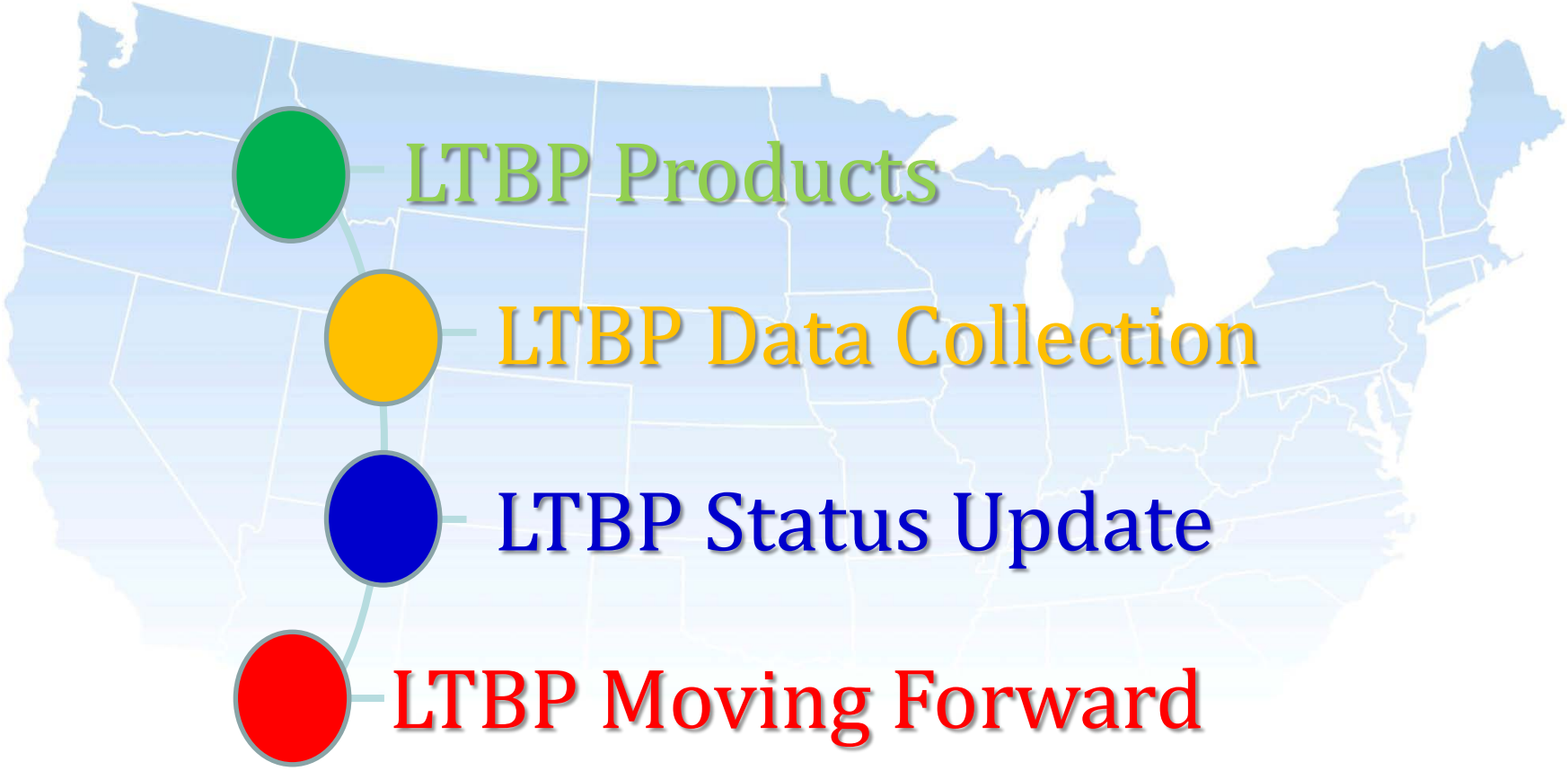
Org Chart

LTBP Program

Long-Term Bridge Performance Program

U.S. Department of Transportation
Federal Highway Administration

Long-Term Bridge Performance Program

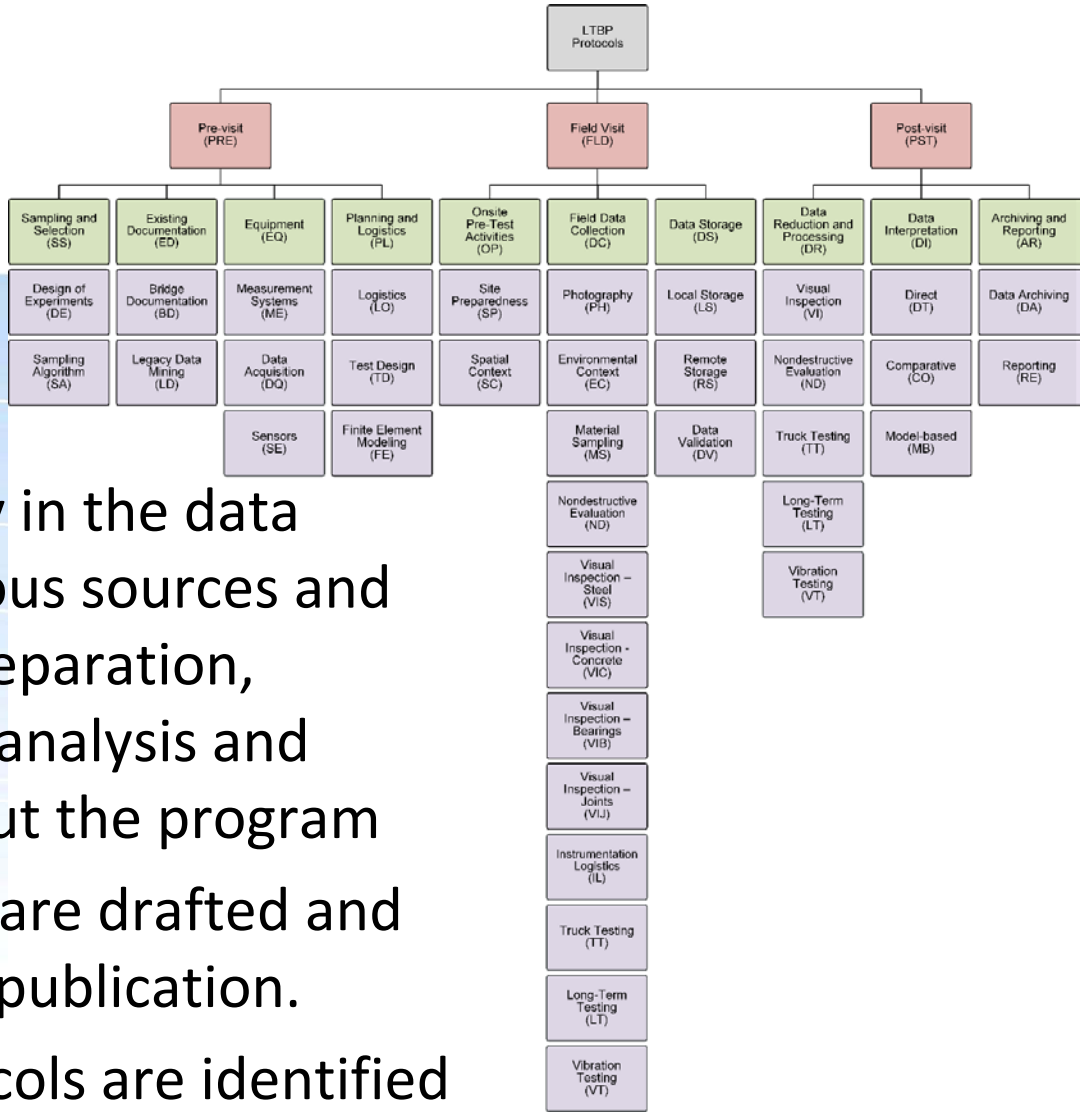


- LTBP Products
- LTBP Data Collection
- LTBP Status Update
- LTBP Moving Forward

LTBP Products

- Protocols
- Bridge Portal (A Data-Driven Decision Tool)
- Deterioration and Forecasting Model
- Bridge Performance Index
- Bridge Practice Timelines (Concrete, Steel, Reinforcing Bars)
- Automated Data Collection
- NDE Data Analysis - 2D Condition Maps
- Summaries of State Practices

LTBP Protocols



Objective

- Ensures consistency in the data collected from various sources and parties including preparation, collection, storage, analysis and reporting throughout the program

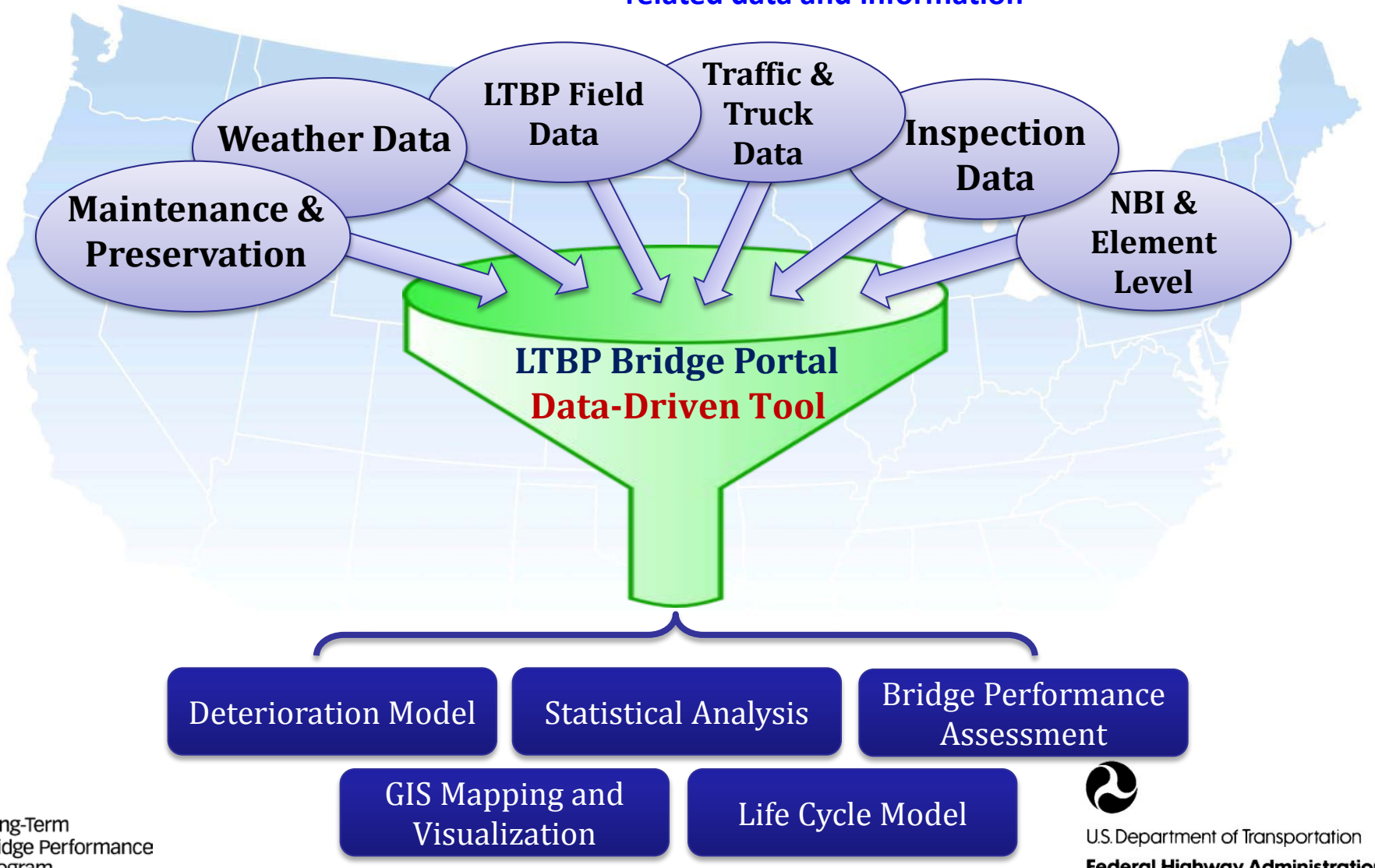
- Future protocols (135) are drafted and undergoing review for publication.
- An additional 32 protocols are identified for development

LTBP Products

LTBP Program

Bridge Portal

A centralized, national-level repository for efficiently and quickly accessing and querying bridge performance-related data and information



LTBP Products

LTBP Program

Long-Term Bridge Performance Program

U.S. Department of Transportation
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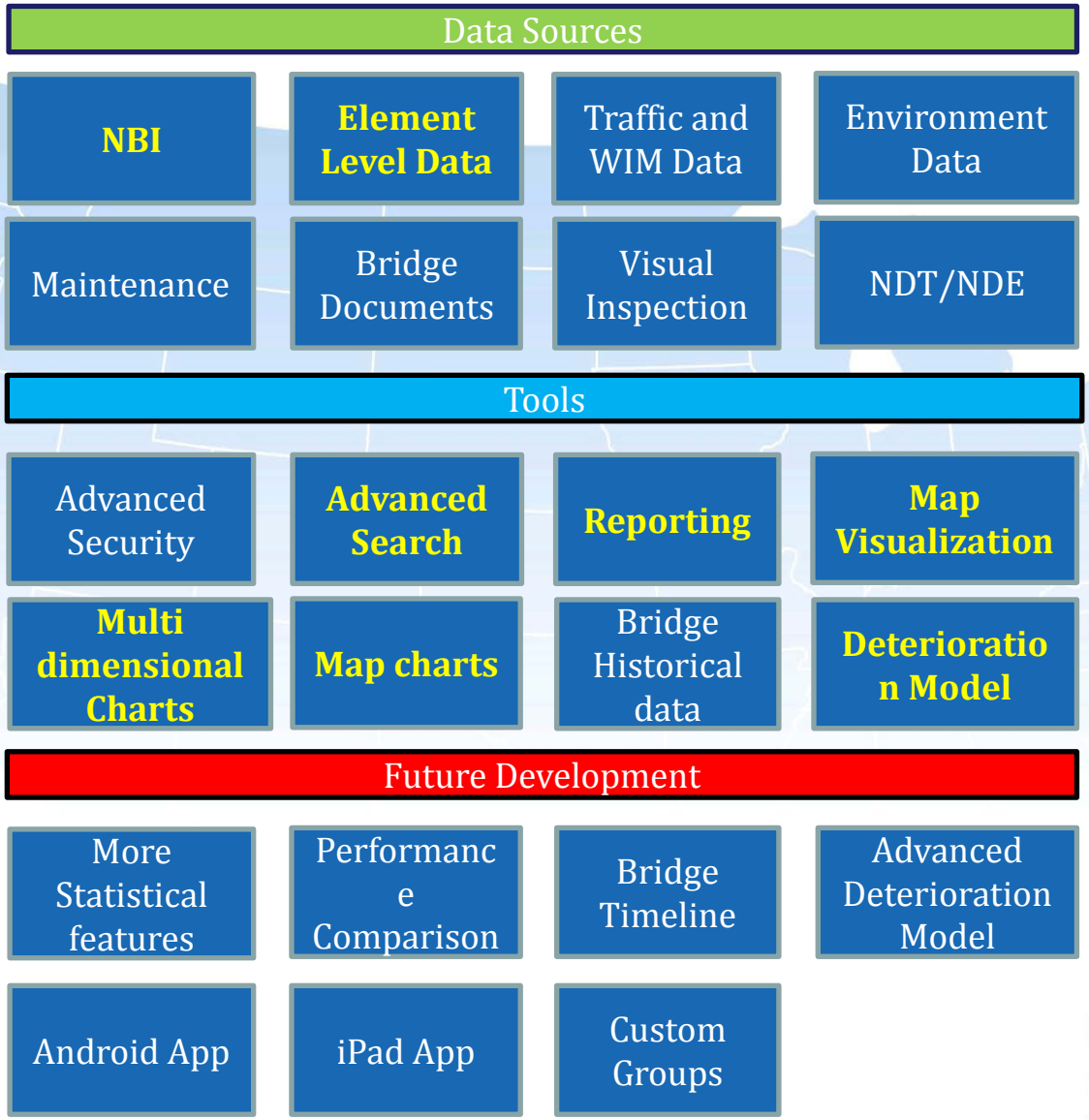
Bridge Portal



Features available in V 1.0 Highlighted

LTBP Products

LTBP Program

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Bridge Portal

- Version 1 of the LTBP Bridge Portal was integrated with UPACS system and is available through FHWA network
- Establishing small working group to guide future development
- Rutgers delivered version 1.1 which has new features and capabilities
- Version 1.1 presented at 2016 TRB/LTBP workshop

Deterioration and Forecasting Model

Current Status:

- Theoretical Model has been developed
- The model needs to be validated with field data as they become available
- TRB BCOM (ETG) is very supportive of the methodology

Remaining Work:

- Model validation (NJ, NY, NH)
- Model implementation
- Model integration with Bridge Portal

Bridge Practice Timelines (Concrete, Steel, Reinforcing Bars)

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

LTBP Tech Brief Published: National Changes in Bridge Practices for Reinforcing Bars

NATIONAL TIMELINES OF CHANGES IN BRIDGE PRACTICES

- TELL US HOW & WHEN MATERIALS CHANGED
- TELL US HOW & WHEN TECHNOLOGIES CHANGED

STATE TIMELINES OF CHANGES IN BRIDGE PRACTICES

- TELL US WHEN EACH STATE ADOPTED THE CHANGED MATERIAL OR CHANGED TECHNOLOGY

Bridge Practice Timelines (Changes in materials and technologies)

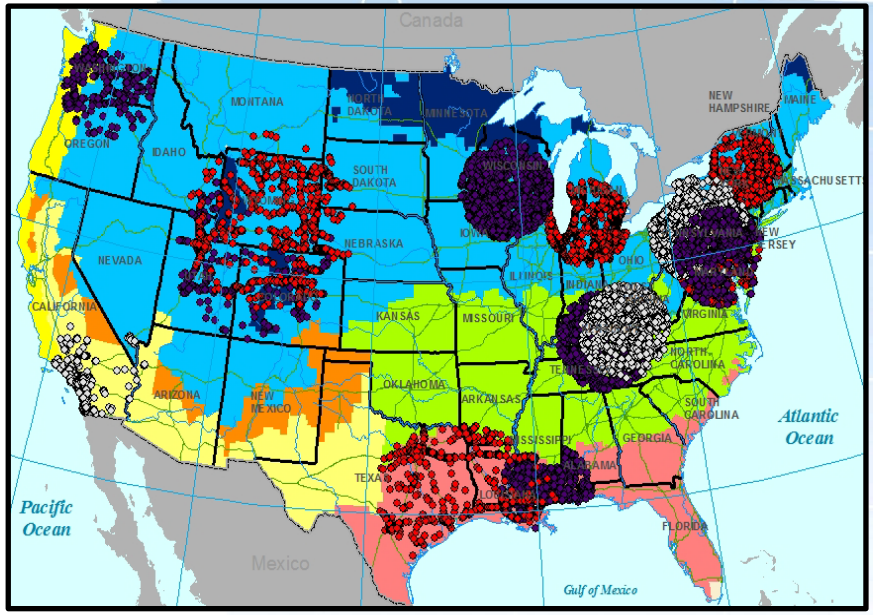
SUMMARIES OF CURRENT STATE PRACTICES FROM STATE COORDINATORS' MEETINGS

- TELL US WHICH STATES HAD SUCCESS
- TELL US WHICH STATES STOPPED USING

EXAMPLE: BRIDGE DECK OVERLAYS

- LATEX MODIFIED CONCRETE (Old Technology)
  - Why Success in Some States and Stopped Using in Others?
- POLYESTER POLYMER CONCRETE (New Technology)
  - Why Success in Western U.S. But Not Many States Tried in Eastern U.S.?

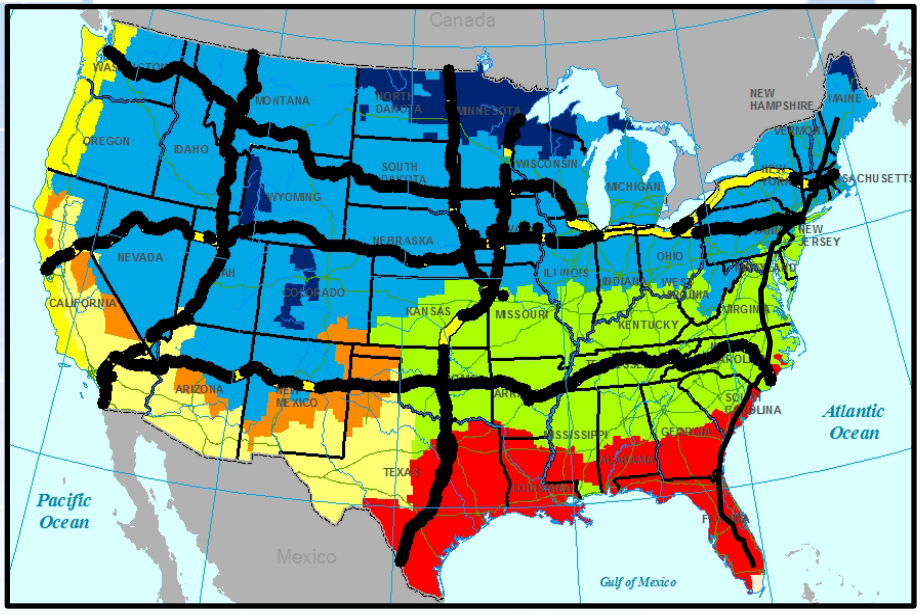
Data Collection –



14 Clusters

4 Bridge Types

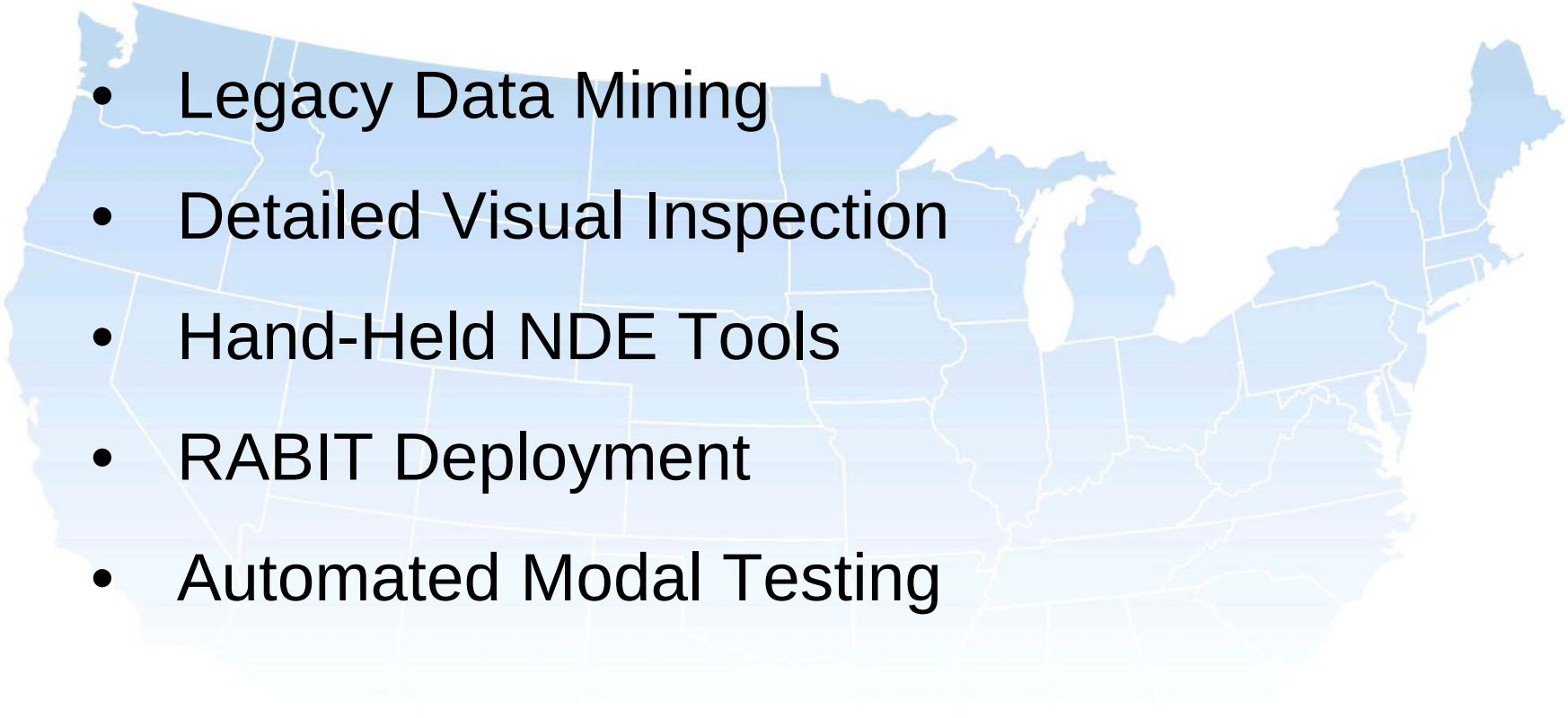
14 clusters (60 Bridges) = 840 Bridges



Corridors

10 Corridors (30 Bridges) = **300** Total (for Corridors Only)

Data Collection Strategy –



- Legacy Data Mining
- Detailed Visual Inspection
- Hand-Held NDE Tools
- RABIT Deployment
- Automated Modal Testing

Data Collection – Legacy Data Mining

Objective – Employing readily available bridge documentation to develop an understanding of the:

- Distribution of bridge characteristics and condition among and between bridge clusters;
- Correlation of bridge condition parameters between bridge cluster data sets; and;
- Comparison of multiple parameters contributing to bridge performance

Data Collection – Legacy Data Mining Status

Status

- Data collected and extracted on 445 of 965 bridges
  - This covers bridges from 19 of 40 states
- Basic statistical analysis completed providing histograms and data distribution studies
- Correlation coefficient analyses and multi-variate analyses are on-going

Future Work

- Completion of data collection and extraction on remaining 520 bridges
- Continued statistical analyses

Data Collection –

Data Collection: Untreated Bridge Decks, Joints, and Bearings

Contractor	Cluster	States
Rutgers	Mid-Atlantic Steel; Mid-Atlantic Prestressed Concrete (Visual/NDE/RABIT + LDM)	DE, NJ, MD, PA, VA, WV
Michael Baker	Gulf Steel; Gulf Prestressed Concrete (Visual)	AL, AR, FL, LA, MS, TX
PSI	Mid-Atlantic Steel, Mid-Atlantic Prestressed Concrete; Mid-Atlantic Concrete Box; NE Steel (LDM)	CT, DC, DE, MA, MD, ME, NH, NJ, NY, OH, PA, RI, VA, VT, WV
PB	NW Prestressed Concrete; SW Concrete Box (Visual)	AZ, CA, NV, OR, WA
Pennoni	NA	WIM Study, NDE/RABIT™ Construction/Validation

Data Collection – Projects at a Glance

Rutgers

- Data-Driven Modeling
- Bridge Portal
- Field Data Collection
  - Mid-Atlantic Region
- Legacy Data Mining
- Bridge Protocols
- Other Projects

PB

- NW and SW visual inspection

Michael Baker

- Gulf Region Visual inspection, material sampling

PSI

- Legacy Data Mining for Mid Atlantic and North East Cluster – 415 bridges

Pennoni

- WIM
- LTBP Performance Index
- Develop an accelerated testing bridge DB
- Website & Newsletter
- Protocol Publication
- RABIT Acquisition

Data Collection –

Michael Baker – Gulf Region Bridges

- Bridge Breakdown
  - Alabama – 2 Bridges (1 Reference Concrete & 1 Cluster Concrete)
  - Arkansas – 4 Bridges (4 Cluster Steel)
  - Florida – 2 Bridges (2 Cluster Concrete)
  - Louisiana – 7 Bridges (1 Reference Steel, 3 Cluster Steel, 3 Cluster Concrete)
  - Mississippi – 7 Bridges (1 Reference Steel, 3 Cluster Steel, 1 Reference Concrete, 2 Cluster Concrete
  - Texas – 2 Bridges (2 Cluster Concrete)
- Data Collection Complete
- Currently Data Validation & Data Input Underway

Data Collection –

PB – Task Description

Southwest and Northwest Region Bridges
12 CIP PT Box Girders &
12 Prestressed Multi-girders

- Southwest Region
  - Arizona – 4 Bridges (1 Reference CIP PT Box & 3 Cluster CIP PT Boxes)
  - Nevada – 4 Bridges (1 Reference CIP PT Box & 3 Cluster CIP PT Boxes)
  - California – 4 Bridges (4 Cluster CIP PT Boxes)
- Northwest Region
  - Oregon – 6 Bridges (1 Reference Prestressed, 5 Cluster Prestressed)
  - Washington – 6 Bridges (1 Reference Prestressed, 5 Cluster Prestressed)

❖ Data Collection Ongoing

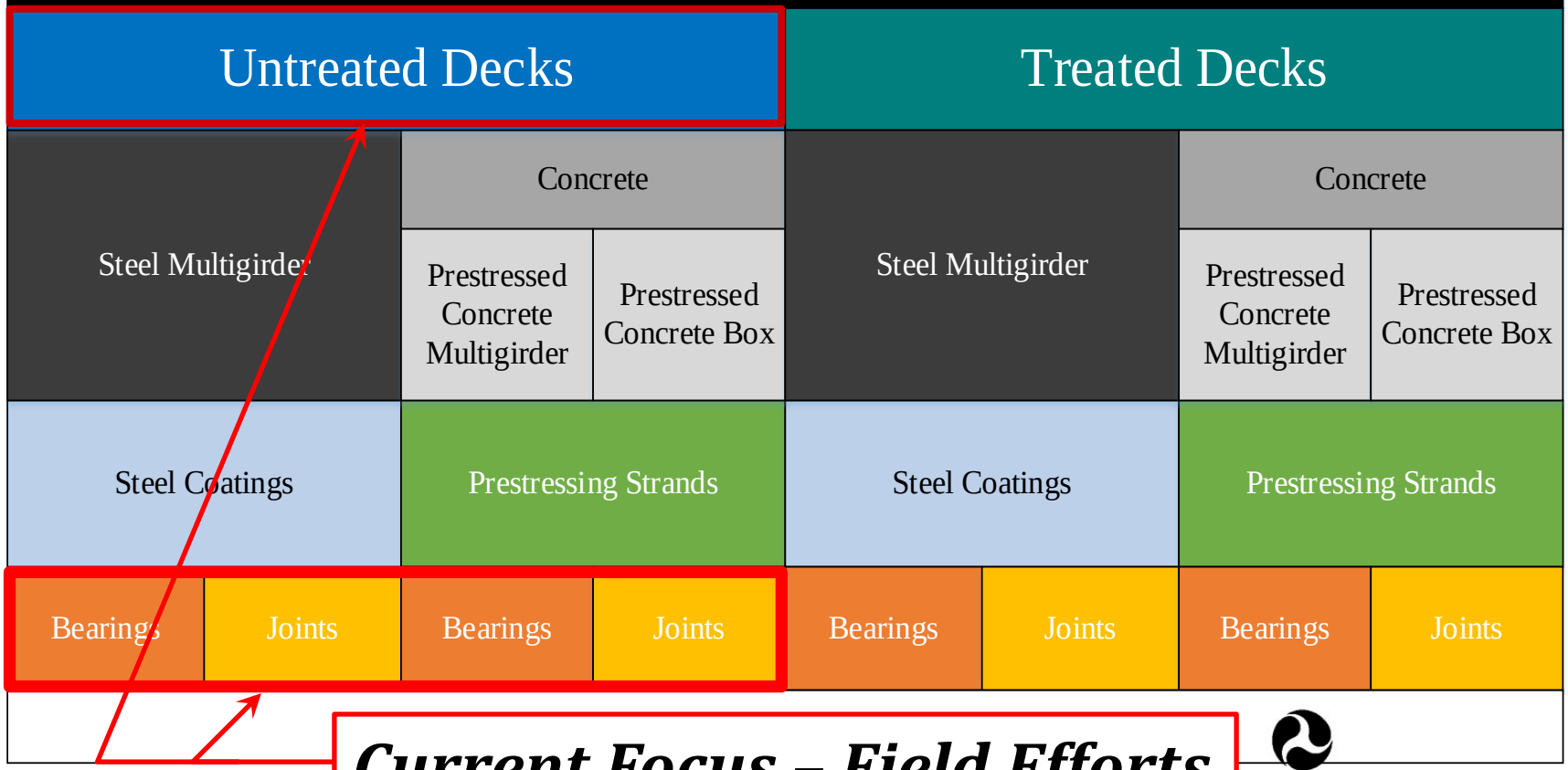
Data Collection –

Pennoni – Tasks Description

1. LTBP Protocols
2. Technical Assistance
3. LTBP Newsletter & Website
4. Onsite Staff
5. Validate NDT Collected Data
6. Develop Bridge Traffic DB
7. Develop an Accelerated Bridge Testing DB
8. Quarterly Progress Report
9. LTBP Research Index

Long-Term Bridge Performance Program

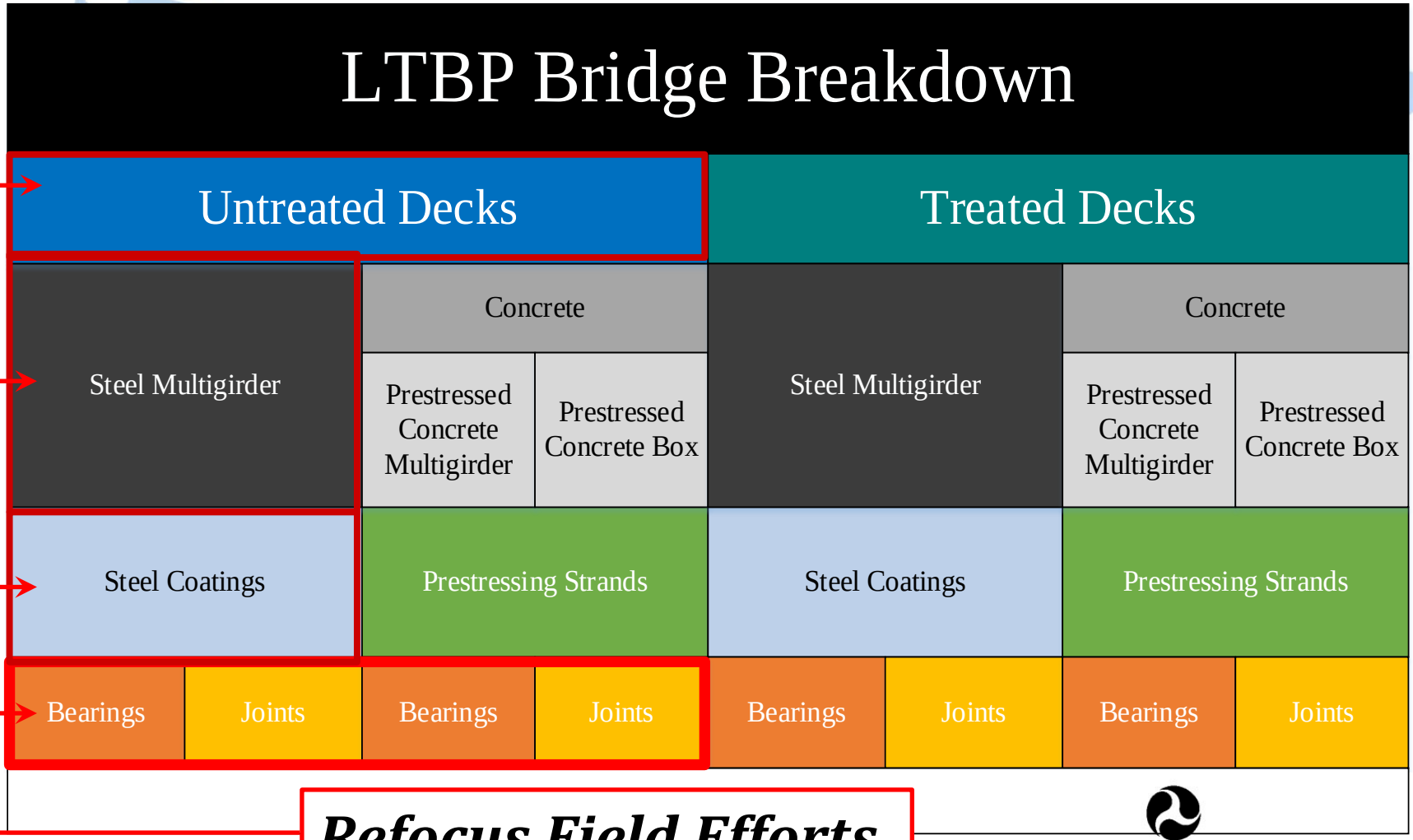
LTBP Bridge Breakdown



Current Focus – Field Efforts

Long-Term Bridge Performance Program

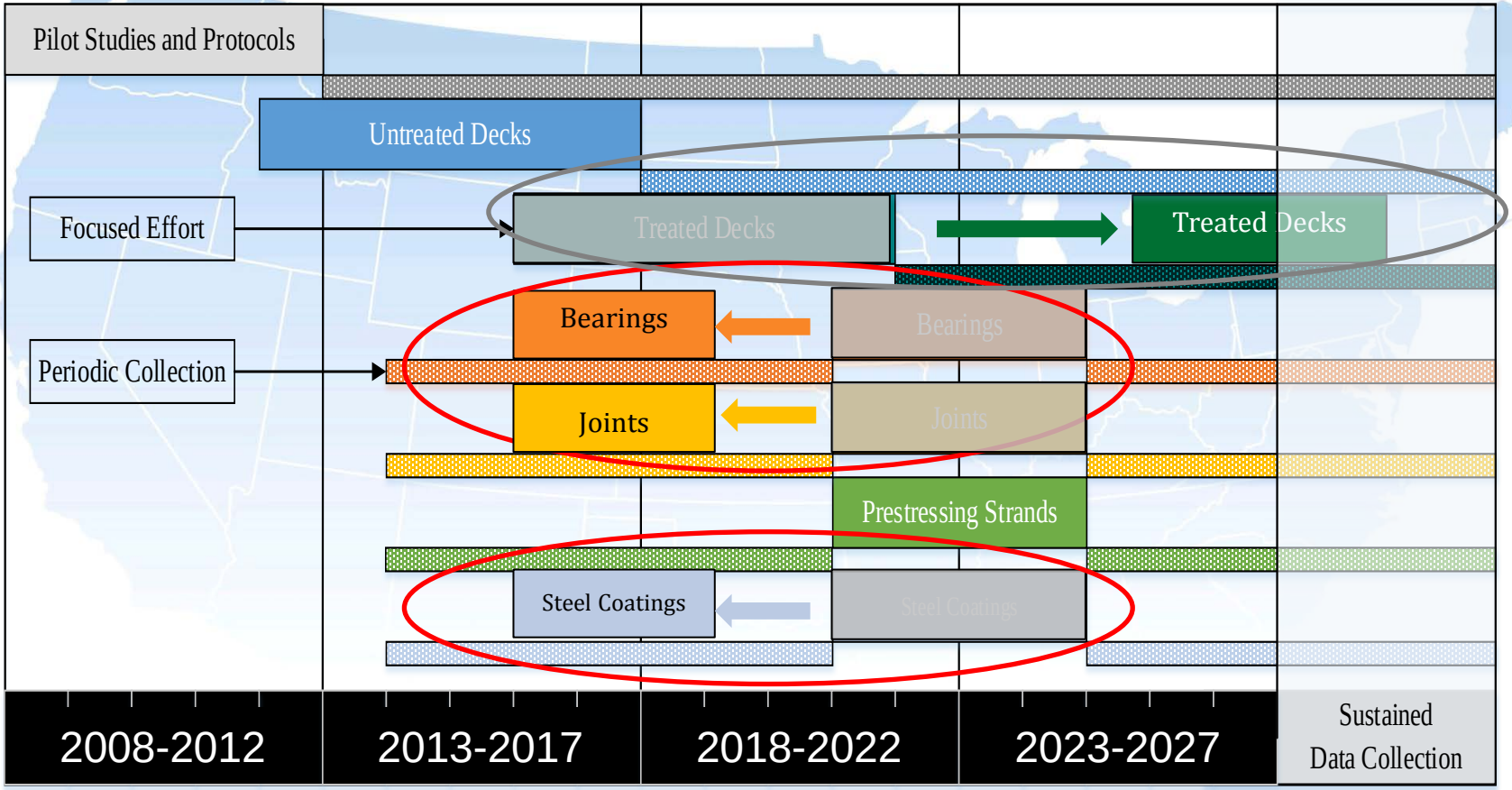
LTBP Bridge Breakdown



Refocus Field Efforts

Long-Term Bridge Performance Program

Schematic Timeline for LTBP Long-Term Data Collection



Refocus of Efforts – Untreated Decks, Steel Multi-Girder Superstructures, Steel Coatings, Joints, and Bearings

Long-Term Bridge Performance Program

14 clusters (60 Bridges) = 840 Bridges (untreated decks)
14 clusters = 140 Bridges (Steel Coating)

980 Total (for Clusters Only)

10 Corridors (30 Bridges) = **300** Total (for Corridors Only)

Ramp up Number of Bridges ***Per Cluster*** with Successive Data Rounds

				Set # 5 (12 Bridges) Round 1	Set # 5 (12 Bridges) Round i-4
			Set # 4 (12 Bridges) Round 1	Set # 4 (12 Bridges) Round 2	Set # 4 (12 Bridges) Round i-3
		Set # 3 (12 Bridges) Round 1	Set # 3 (12 Bridges) Round 2	Set # 3 (12 Bridges) Round 3	Set # 3 (12 Bridges) Round i-2
	Set # 2 (12 Bridges) Round 1	Set # 2 (12 Bridges) Round 2	Set # 2 (12 Bridges) Round 3	Set # 2 (12 Bridges) Round 4	Set # 2 (12 Bridges) Round i-1
Set # 1 (12 Bridges) Round 1	Set # 1 (12 Bridges) Round 2	Set # 1 (12 Bridges) Round 3	Set # 1 (12 Bridges) Round 4	Set # 1 (12 Bridges) Round 5	Set # 1 (12 Bridges) Round i
12 Bridges	24 Bridges	36 Bridges	48 Bridges	60 Bridges	60 Bridges

Long-Term Bridge Performance Program

U.S. Department of Transportation
Federal Highway Administration

Other Items

- Draft LTBP Business Plan (Developed and Submitted to TRB/BCOM)
- Strategic Roadmap (Developed and Submitted to TRB/BCOM)
- Pooled- Fund Study (impact of live load on bridge performance)
- VA Pilot Bridge Deck Sections will be at TFHRC in June 2016 for additional testing and autopsy

Pooled Fund Project TPF-5(283) MN, OR, NC, GA, WI, PN, and IA: The Influence of Vehicular Live Loads on Bridge Performance

Goals

- Develop a National Bridge Traffic Database
- Determine and quantify influence of trucks on bridge component performance
- Develop protocols for collecting research quality bridge traffic data
- Develop tools and products that bridge owners can use to manage and operate loading conditions on existing network of highway bridges

Two Fundamental Questions

What are the current truck loads on our nation's bridges?

- There have been changes in truck geometry, axle configurations, suspension, and tire characteristics.
- Common loaded truck weights are stipulated to have increased in some cases from 72 kips (design truck) to more than 110 kips.

What are the impacts of increased truck loads on the durability of the nation's bridges?

- Which bridge elements are especially being affected by truck loads?
- The freight industry has been requesting increases in allowable truck loads on bridges.
- Bridge owners need to address the effects of live loads on bridge component durability by using better tools and strategies to manage and operate

Thank YOU!