# Statewide Teamwork

## Missouri's Safe & Sound Project

Ken Warbritton, MoDOT

# Overview

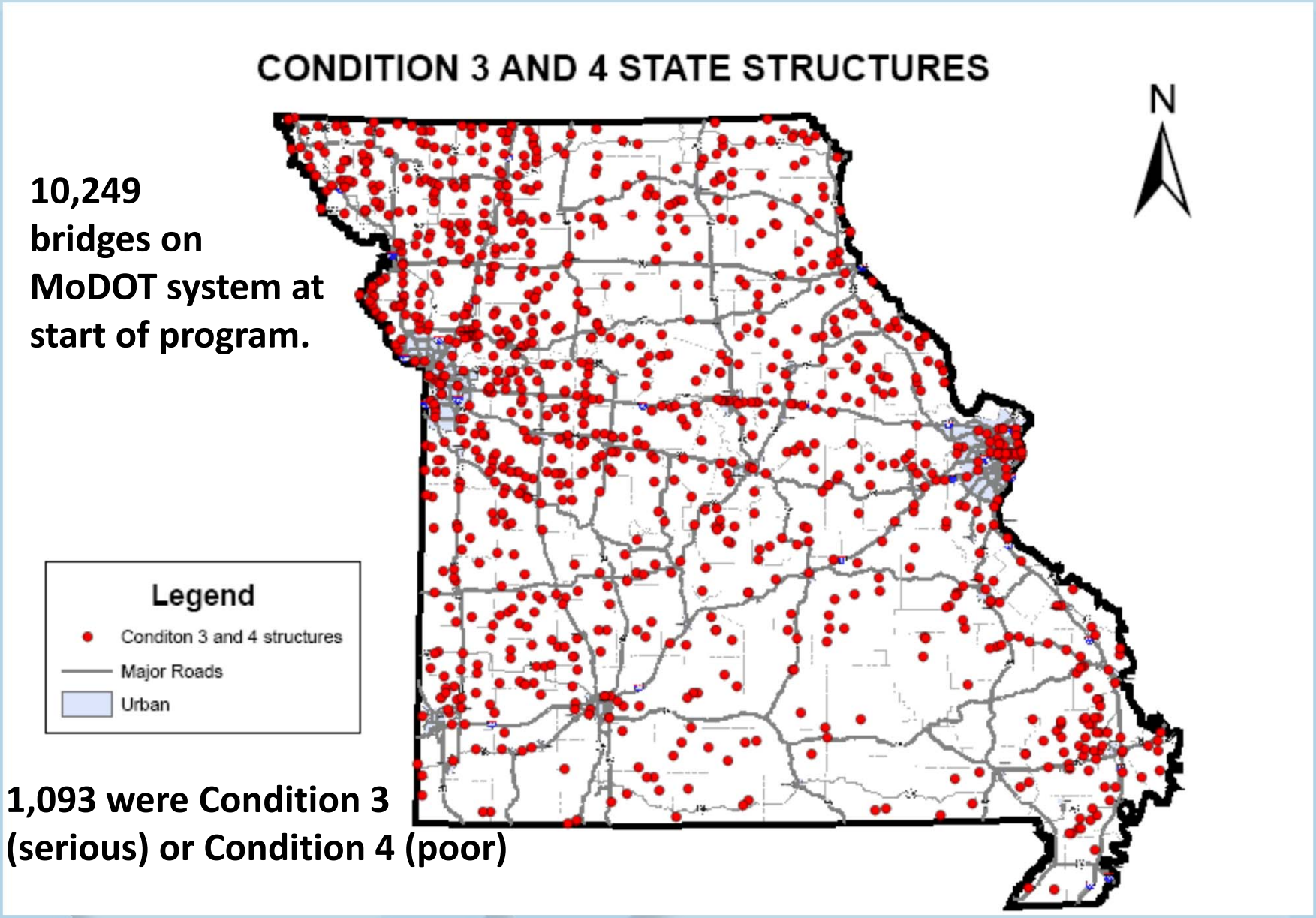
- Brief History
- Team Organization and Communications
- Results
- Public Acceptance
- Lessons Learned

# Contract Models

- Design-Build-Finance-Maintain (DBFM)
- Design-Build
- Modified Design-Bid-Build

# Project Timeline

- ❑ Oct. 2006 — Project announced as DBFM
- ❑ Sep. 2008 — DBFM model viable, but unaffordable … Credit Crisis split procurement into DB (554) and MDBB (248)
- ❑ Apr. 2009 — First Bridge Complete (MDBB)
- ❑ May 2009 — KTU Constructors selected as Design-Builder
- ❑ Dec. 2009 — First 4 DB Bridges Complete
- ❑ May 2010 — DB Design Complete
- ❑ Nov. 2012 — Final Bridge Completed



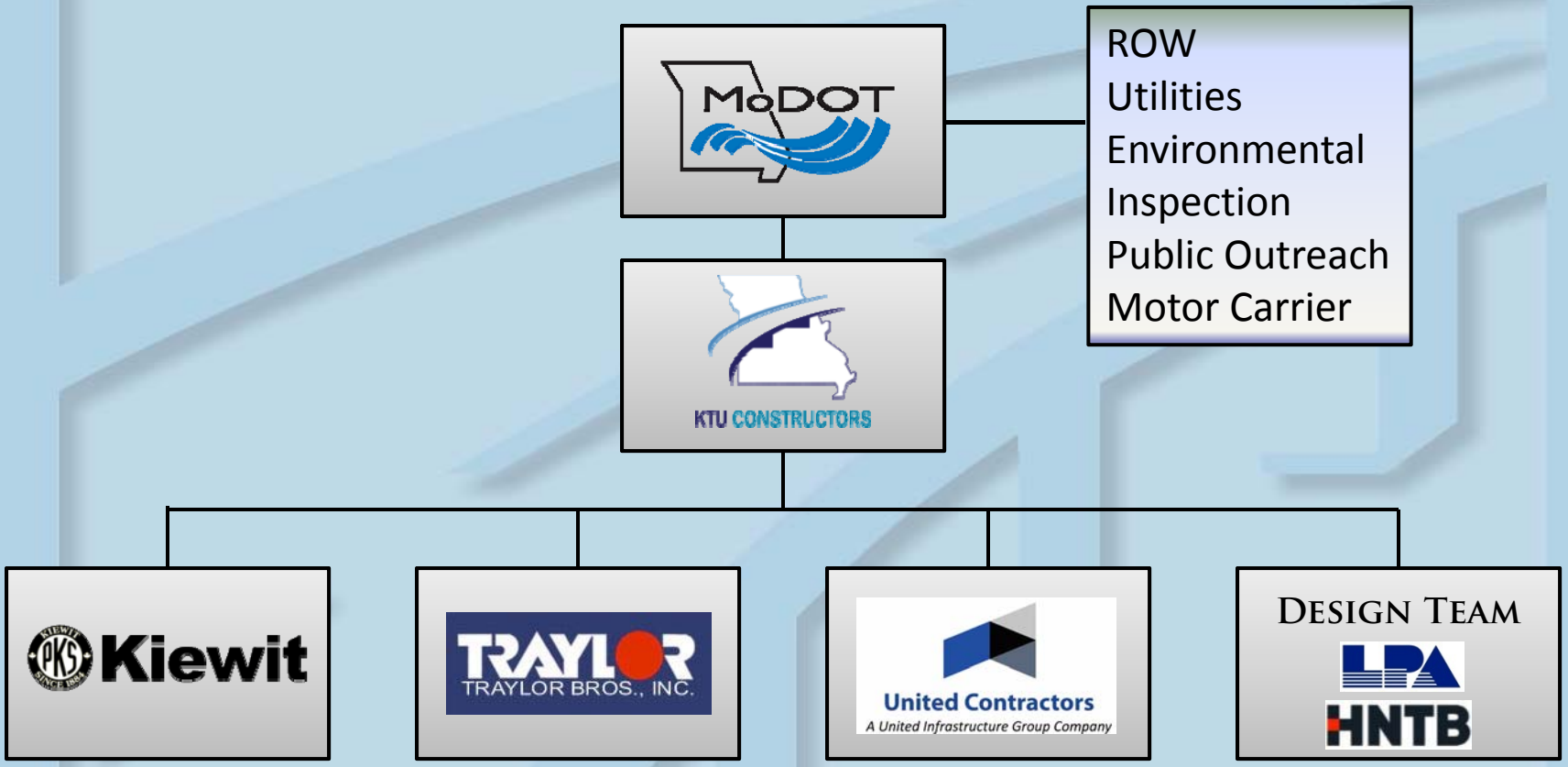

# Why Do a State-wide Bridge Project?

# Bridge Deterioration

# Project Goals

1. Deliver good bridges at a great value.
2. Minimize public inconvenience through increased construction speed & flexible schedule.
3. Complete construction by Dec. 31, 2013.

# Safe & Sound Partners



# Regional Offices

**NW Region**
*2011 Office: St. Joseph*

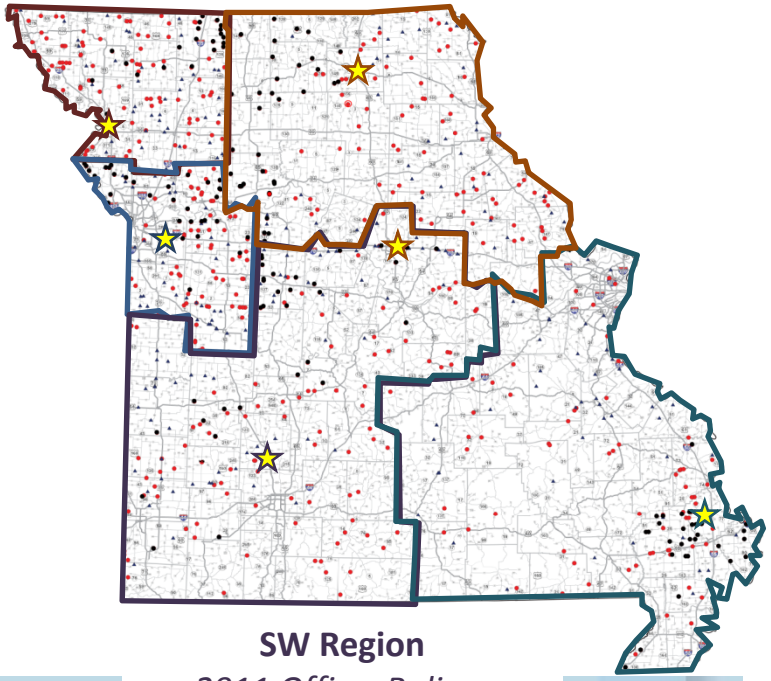
KTU Reg. Sup.
Dave Lehr

MoDOT Reg. Field Eng.
Troy Slagle

**KC Region**
*2011 Office: Lee's Summit*

KTU Reg. Sup.
Cory Gapstur

MoDOT Reg. Field Eng.
Mary Miller



**SW Region**
*2011 Office: Bolivar*

KTU Reg. Sup.
Keith Hoff

MoDOT Reg. Field Eng.
Jim Conley

**NE Region**
*2011 Office: Columbia & Kirksville*

KTU Reg. Sup.
Steve Kullman

MoDOT Reg. Field Eng.
Preston Kramer

**SE Region**
*2011 Office: Benton*

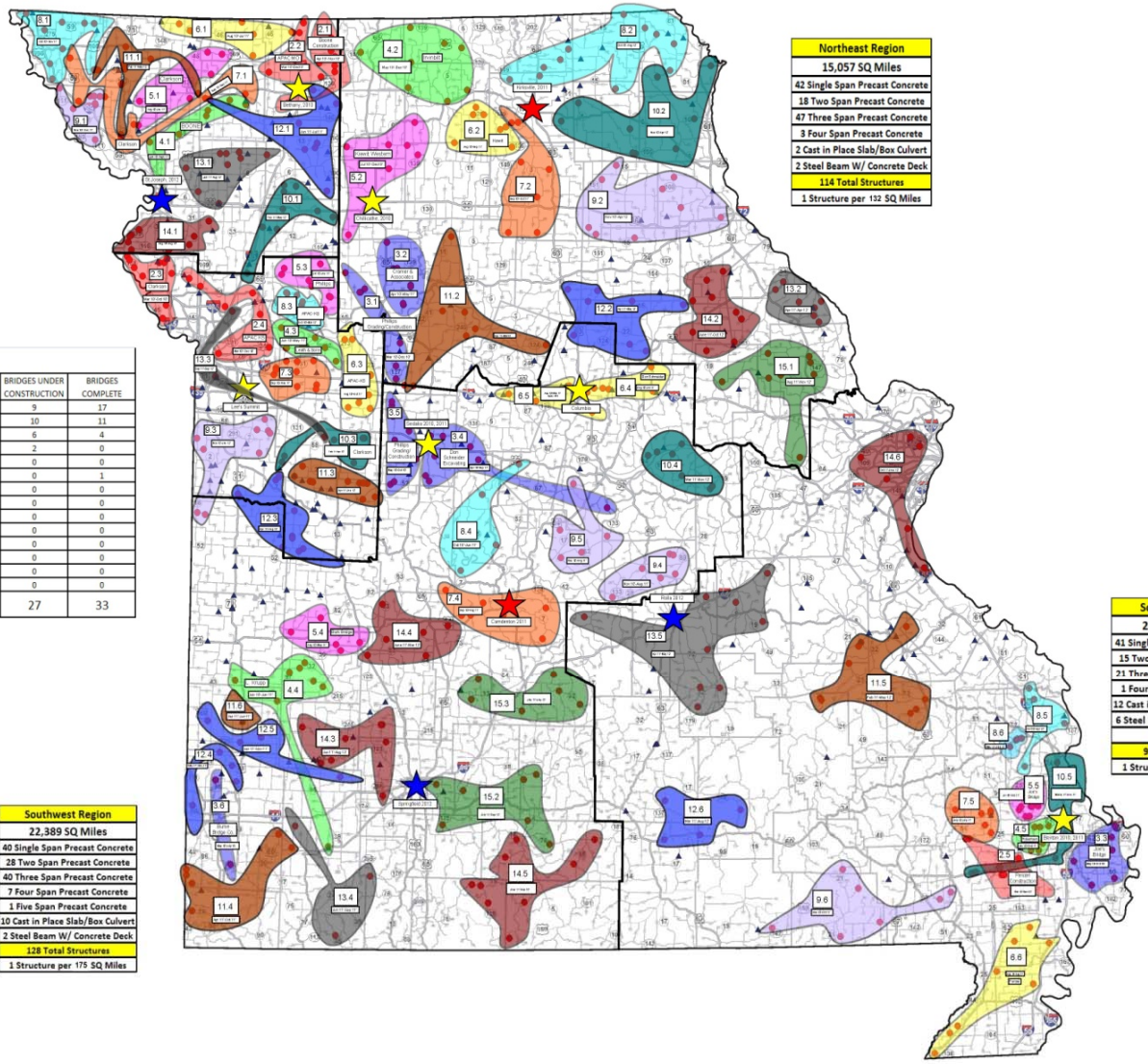
KTU Reg. Sup.
Brian Cruickshank

MoDOT Reg. Field Eng.
Andy Meyer

# SAFE AND SOUND BRIDGE IMPROVEMENT PLAN

KTU CONSTRUCTORS

SAFE & SOUND



| Northwest Region |
|---|
| 6,049 SQ Miles |
| 52 Single Span Precast Concrete |
| 18 Two Span Precast Concrete |
| 38 Three Span Precast Concrete |
| 1 Cast in Place Slab/Box Culvert |
| 2 Steel Beam W/ Concrete Deck |
| 111 Total Structures |
| 1 Structure per 54 SQ Miles |

| Northeast Region |
|---|
| 15,057 SQ Miles |
| 42 Single Span Precast Concrete |
| 18 Two Span Precast Concrete |
| 47 Three Span Precast Concrete |
| 3 Four Span Precast Concrete |
| 2 Cast in Place Slab/Box Culvert |
| 2 Steel Beam W/ Concrete Deck |
| 114 Total Structures |
| 1 Structure per 132 SQ Miles |

LEGEND

| COLOR | BID PACK | # OF PACKAGES | TOTAL BRIDGES | BRIDGES UNDER CONSTRUCTION | BRIDGES COMPLETE |
|---|---|---|---|---|---|
| | BID PACK 2 | 5 | 40 | 9 | 17 |
| | BID PACK 3 | 6 | 41 | 10 | 11 |
| | BID PACK 4 | 5 | 34 | 6 | 4 |
| | BID PACK 5 | 5 | 40 | 2 | 0 |
| | BID PACK 6 | 6 | 42 | 0 | 0 |
| | BID PACK 7 | 5 | 41 | 0 | 1 |
| | BID PACK 8 | 6 | 43 | 0 | 0 |
| | BID PACK 9 | 6 | 45 | 0 | 0 |
| | BID PACK 10 | 5 | 40 | 0 | 0 |
| | BID PACK 11 | 6 | 45 | 0 | 0 |
| | BID PACK 12 | 6 | 39 | 0 | 0 |
| | BID PACK 13 | 5 | 33 | 0 | 0 |
| | BID PACK 14 | 6 | 45 | 0 | 0 |
| | BID PACK 15 | 3 | 22 | 0 | 0 |
| TOTAL | | 75 | 550 | 27 | 33 |

| Kansas City Region |
|---|
| 4,900 SQ Miles |
| 38 Single Span Precast Concrete |
| 14 Two Span Precast Concrete |
| 43 Three Span Precast Concrete |
| 1 Four Span Precast Concrete |
| 5 Cast in Place Slab/Box Culvert |
| 2 Steel Beam W/ Concrete Deck |
| 1 Pipe |
| 1 SuperCore |
| 105 Total Structures |
| 1 Structure per 47 SQ Miles |

| Southwest Region |
|---|
| 22,389 SQ Miles |
| 40 Single Span Precast Concrete |
| 28 Two Span Precast Concrete |
| 40 Three Span Precast Concrete |
| 7 Four Span Precast Concrete |
| 1 Five Span Precast Concrete |
| 10 Cast in Place Slab/Box Culvert |
| 2 Steel Beam W/ Concrete Deck |
| 128 Total Structures |
| 1 Structure per 175 SQ Miles |

| Southeast Region |
|---|
| 20,545 SQ Miles |
| 41 Single Span Precast Concrete |
| 15 Two Span Precast Concrete |
| 21 Three Span Precast Concrete |
| 1 Four Span Precast Concrete |
| 12 Cast in Place Slab/Box Culvert |
| 6 Steel Beam W/ Concrete Deck |
| 1 SuperCore |
| 97 Total Structures |
| 1 Structure per 211 SQ Miles |

# Team Organization/Communications

- Executive — Met 3-4 times/year
- Central — Daily Calls/Weekly Meetings
- Regional — Daily Calls/Weekly Meetings
- Bridge — Daily On-Site Coordination
- Specialist — Variable – Based on Need

# Risk Assignment

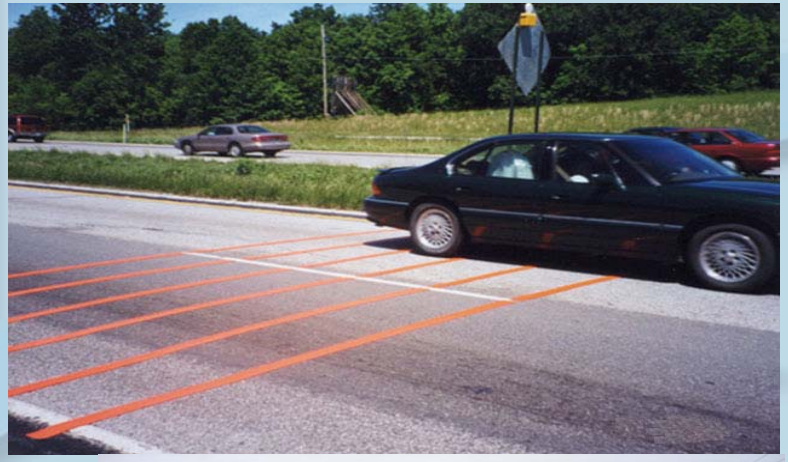
**MoDOT**

- ROW
- Environmental
- Community Relations
- Inspection
- Utilities

**KTU**

- Design
- Suppliers
- Subcontractors
- Schedule

# Safety, Quality, and Speed




# KTU's Design Goals

- Practical Design
- Rapid, Repetitive Construction
- Durability
- Minimize Site Impacts
- Efficient Usage of Labor and Materials
- Maximum Usage of Precast Concrete Units

# Structural Approach

## Additional Applicable Standards (Cored Slabs and Box Beams)

- FHWA Approved
- Allows for Rapid, Repetitive Construction
- Proven Durability in North Carolina, South Carolina, and other states
- A Practical Design for the program's ADT requirements

# Structure Types

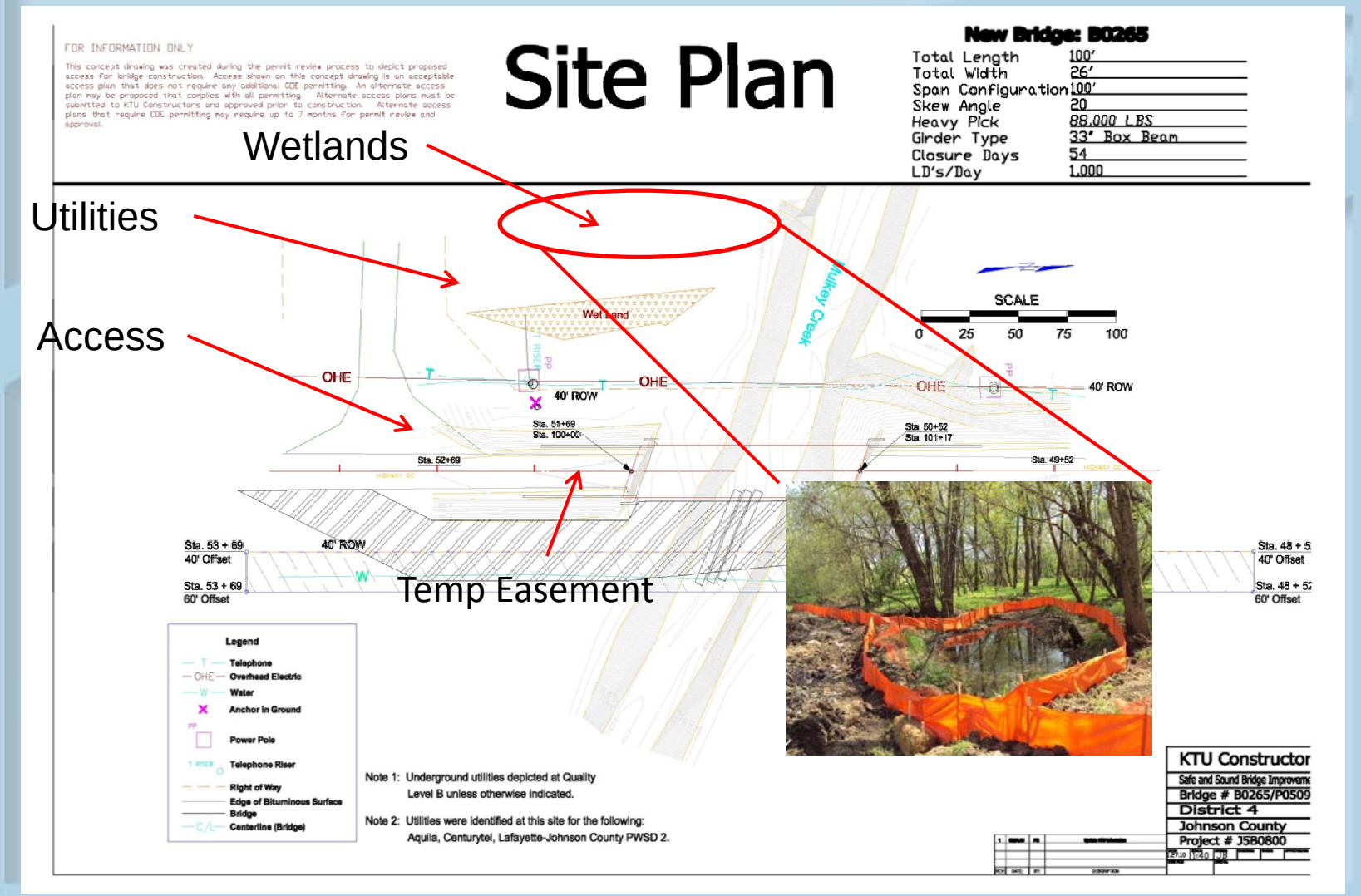
| | |
|---|---|
| • Adjacent Core Slab | 196 |
| • Adjacent Box Beam | 116 |
| • Adjacent CS/BB | 45 |
| • Spread Core Slab | 80 |
| • Spread Box Beam | 41 |
| • Spread CS/BB | 23 |
| • Steel Girder | 8 |

| | |
|---|---|
| • NU Girder | 5 |
| • Flat Slab | 17 |
| • Box Culvert | 15 |
| • Pipe Culvert | 1 |
| • Super-cor | 1 |
| • Prestressed Slab | 3 |
| • Hybrid Composite | 3 |
| **TOTAL** | **554** |

# Pre-Fabricated Materials

- CFM – Contractor-Furnished Materials
- Fabrication off Critical Path
- Pricing/Escalation

# Pre-Construction: Site Plan Review



# Execution


- Planning Challenges
  - Just-in-time design is typical.
  - Accelerated pace (10+ bridges/week)
  - Average 20+ bridges/month
- Logistical Challenges
  - 554 bridges in 111 different counties
  - Average distance between bridges – 11 miles
  - Avg. construction schedule: 45 calendar days/bridge

# Construction Sequence

## Demolition of Existing Bridge

# Construction Sequence

**Pile Foundations Used at Most Sites**

# Construction Sequence


End Bent Construction (beams “stacked and stored” on site)

# Construction Sequence

Erecting Pre-cast Beams

# Construction Sequence

**When All the Dust Settles, Missouri Has A New Bridge**

# Completion Speed

- Average time to complete 42 Days/Bridge

- Completion by Bridge Type:

| | **Shortest** |
|---|---|
| – Box | 27 Hours of Traffic Impact |
| – Single Span | 8 Days |
| – Double Span | 31 Days |
| – Triple Span | 28 Days |
| – Four Span | 33 Days |

***156 Bridges Complete in 2010***
***281 Bridges Completed in 2011***
***117 Bridges Completed in 2012***

# Project Results

1. GOAL: *Deliver good bridges at a great value.*
   - RESULT: **UNDER BUDGET**
2. GOAL: *Minimize public inconvenience through increased construction speed & flexible schedule.*
   - RESULT: **AVG. CLOSURE – 42 DAYS**
3. GOAL: *Complete by Oct. 31, 2014.*
   - RESULT: **2 years ahead of MoDOT requirement.**
   - RESULT: **14 months ahead of KTU commitment (12/31/13).**

# Bridges Completed

# Destinations


# Lessons Learned - Procurement

- Confidential Meetings
- Additional Applicable Standards
- Design Exceptions
- Innovation and Thorough Vetting of Issues
- Scoring Spread

# Lessons Learned - Design

- Standardization
- Prefabricated Elements/Interchangeable Parts
- Constructability Reviews
- Speed/Volume
- Coordinated with Subcontracting
- Work Together from the Start

# Lessons Learned - Construction

- Learn from Early Bridges
- Best Practices Manual – Always Get Better
- Contractor Furnished Materials
- Repetition – Builds Speed and Quality
- Pre-Fabrication - Consistency and Interchangeable Parts
- Flexible Scheduling

# Lessons Learned



# Best Practices

# Big Picture - Lessons Learned

- Build a Team to Build a Project
- Safety and Quality Process and Culture
- Communications, Internal and External
- Issues = Opportunities
- 360 Degree Reviews/Surveys

# Design-Build Contract Model

- Procurement Process Flexibility
- Execution Flexibility
- Adaptable To Changes and Innovations
- Manage Risk (Assign or Limit)

# Safe & Sound

## 800 Better Bridges by 2012