

# SWT SPRING FLOOD EVENT

## State GI Council

**Sarah Prestien**

GIS Program Manager

Tulsa District

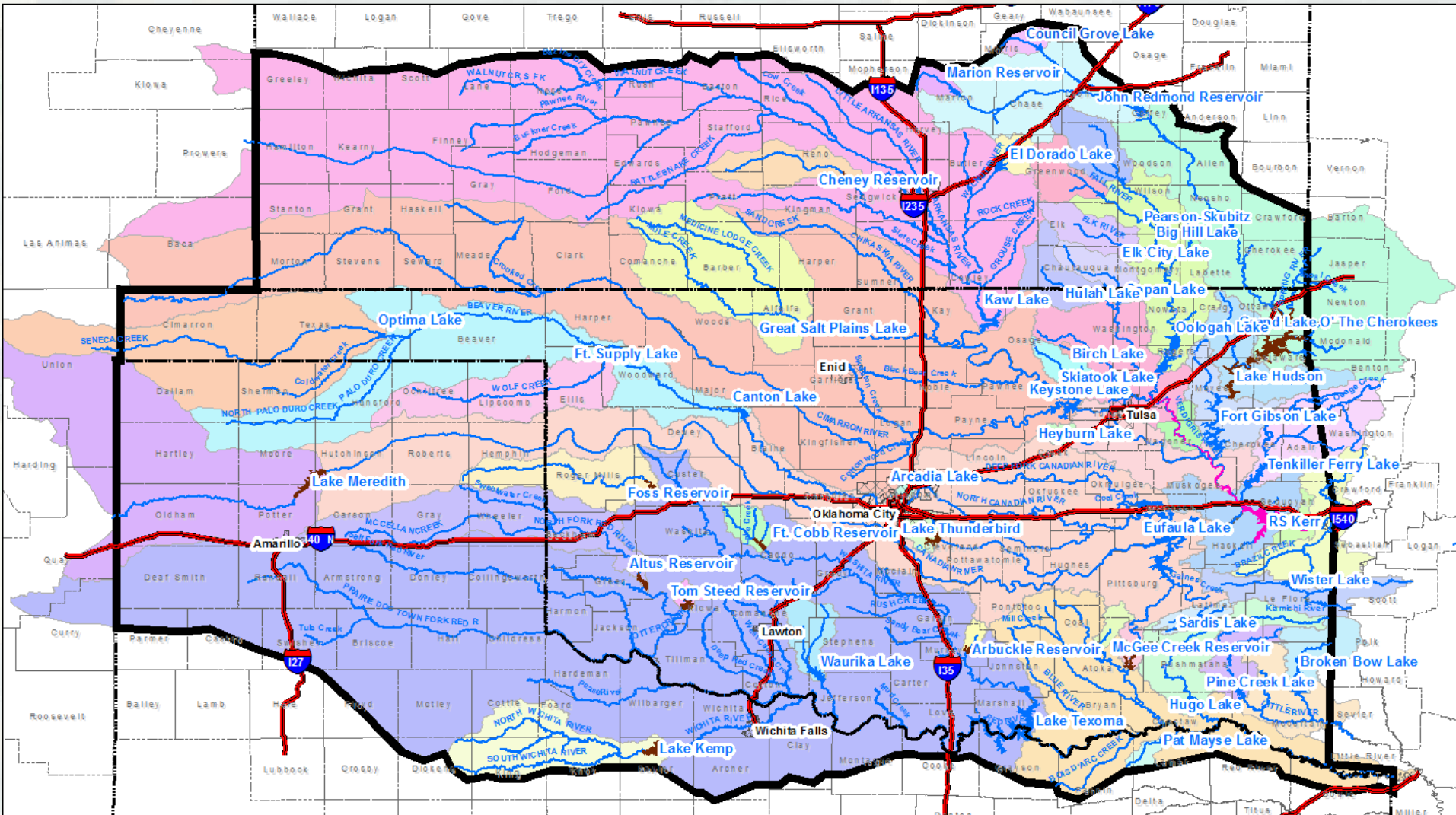
06 November 2015



US Army Corps of Engineers  
**BUILDING STRONG**

# Tulsa District Water Management

- 50 Projects
  - 15 in the Red River Basin
  - 35 in the Arkansas River Basin
- 12 Section-7 lakes (owned by others)
- 23 lakes with gated spillways
- 8 COE Hydropower
- 5 Navigation Locks
- 1 Chloride Control Project



# Tulsa District Reservoirs Over 90% Full – May 2015

## Legend

- 0 to 25% full
- 26% to 75% full
- 76% to 100% full
- Over 100% full
- Pool of Record

### Toronto

Top of FP: 931.0 feet  
 Max. Pool Elev: 932.13 (107%), 5-30-15  
 Max. Inflow: 39,600 cfs, 5-24-15  
 Max. Release: 15,600 cfs, 5-30-15

### John Redmond

Top of FP: 1068.0 feet  
 Max. Pool Elev: 1067.73 (98%), 5-31-15  
 Max. Inflow: 50,000 cfs, 5-24-15  
 Max. Release: 12,300 cfs, 6-8-15

### Kaw

Top of FP: 1044.5 feet  
 Max. Pool Elev: 1042.45 (91%), 6-1-15  
 Max. Inflow: 72,300 cfs, 5-24-15  
 Max. Release: 19,800 cfs, 6-9-15

### Pensacola

Top of FP: 755.0 feet  
 Max. Pool Elev: 754.95 (99.5%), 5-30-15  
 Max. Inflow: 101,400 cfs, 5-29-15  
 Max. Release: 107,500 cfs, 5-30-15

### Keystone

Top of FP: 754.0 feet  
 Max. Pool Elev: 752.68 (94%), 5-30-15  
 Max. Inflow: 140,000 cfs, 5-27-15  
 Max. Release: 40,000 cfs, 6-9-15

### Hudson

Top of FP: 636.0 feet  
 Max. Pool Elev: 635.62 (97%), 5-30-15  
 Max. Inflow: 131,800 cfs, 5-30-15  
 Max. Release: 126,600 cfs, 5-30-15

### Fort Gibson

Top of FP: 582.0 feet  
 Max. Pool Elev: 581.34 (96%), 5-26-15  
 Max. Inflow: 134,300 cfs, 5-31-15  
 Max. Release: 116,700 cfs, 5-31-15

### Wister

Top of FP: 502.5 feet  
 Max. Pool Elev: 508.4 (143%), 5-26-15  
 Max. Inflow: 59,200 cfs, 5-11-15  
 Max. Release: 24,300 cfs, 5-26-15

### Thunderbird (BOR)

Top of FP: 1049.4 feet  
 Max. Pool Elev: 1053.2 (147%), 5-24-15  
 Max. Inflow: 53,900 cfs, 5-24-15  
 Max. Release: 8,200 cfs, 5-24-15

### Eufaula

Top of FP: 597.0 feet  
 Max. Pool Elev: 599.68 (128%), 5-26-15  
 Max. Inflow: 321,500 cfs, 5-10-15  
 Max. Release: 171,800 cfs, 5-26-15

### Sardis

Top of FP: 607.0 feet  
 Max. Pool Elev: 611.12 (160%), 5-30-15  
 Max. Inflow: 53,500 cfs, 5-20-15  
 Max. Release: 4,100 cfs, 5-30-15

### Arbuckle (BOR)

Top of FP: 885.3 feet  
 Max. Pool Elev: 886.9 (114%), 5-29-15  
 Max. Inflow: 9,000 cfs, 5-20-15  
 Max. Release: 2,500 cfs, 5-29-15

### McGee Creek (BOR)

Top of FP: 181.5 meters  
 Max. Pool Elev: 182.88 m (131%), 5-20-15  
 Max. Inflow: 42,400 cfs, 5-20-15  
 Max. Release: 5,900 cfs, 5-20-15

### Broken Bow

Top of FP: 627.5 feet  
 Max. Pool Elev: 628.79 (106%), 5-25-15  
 Max. Inflow: 75,900 cfs, 5-24-15  
 Max. Release: 27,900 cfs, 5-25-15

### Texoma

Top of FP: 640.0 feet  
 Max. Pool Elev: 645.7 (138%), 6-1-15  
 Max. Inflow: 290,700 cfs, 5-29-15  
 Max. Release: 142,000 cfs, 6-1-15

### Hugo

Top of FP: 437.5 feet  
 Max. Pool Elev: 440.3 (113%), 5-25-15  
 Max. Inflow: 74,800 cfs, 5-24-15  
 Max. Release: 59,500 cfs

### Pat Mayse

Top of FP: 460.5 feet  
 Max. Pool Elev: 461.15 (108%), 5-31-15  
 Max. Inflow: 14,100 cfs, 5-9-15  
 Max. Release: 790 cfs, 5-31-15

### Pine Creek

Top of FP: 480.0 feet  
 Max. Pool Elev: 481.08 (104%), 5-30-15  
 Max. Inflow: 69,800 cfs, 5-24-15  
 Max. Release: 5,800 cfs, 6-5-15

# DAMAGE SUMMARY

- 27 Projects Sustained Flood Damages
- Total Flood Damages - \$45.5M+
- \$14.6M Identified for Emergency Relief Funds For Federally Owned Roads (Includes Roads, Parking Lots, Bridges)
- Most Recreation Areas Closed for 60-120 days
- Huge Economic Impacts to State and Local Areas



# Eufaula Lake

An aerial photograph of the Eufaula Lake dam. The dam is a large concrete structure with multiple spillways. Turbulent, brownish water is being released from the spillways, creating a large area of white water and foam. The surrounding landscape is hazy and appears to be a mix of water and land.

**May 24, 2015**

**Pool Elevation: 599.42**

**Release: 171,800 cfs**

**Top of Surcharge Pool: 600.0**

**Top of Flood Pool: 597.0**

**Top of Conservation Pool: 585.0**

**Channel Capacity: 40,000 cfs**

**Max. Pool Elev: 599.68 (128%), May 26, 2015**

**Max. Inflow: 321,500 cfs, May 10, 2015**

**Max. Release: 171,800 cfs, May 26, 2015**

# Broken Bow Lake



**May 25, 2015**

**Pool Elevation: 628.7**

**Release: 27,700 cfs**

**Top of Surge Pool: 632.5**

**Top of Flood Pool: 627.5**

**Top of Conservation Pool: 599.5**

**Channel Capacity: 8,000 cfs**

**Max. Pool Elev: 628.79 (106%), May 25, 2015**

**Max. Inflow: 75,900 cfs, May 24, 2015**

**Max. Release: 27,900 cfs, May 25, 2015**

# Hugo Lake

Max. Pool Elev: 440.3 (113%), May 25, 2015

Max. Inflow: 74,800 cfs, May 24, 2015

Max. Release: 59,500 cfs, May 27, 2015

Top of Surge Pool: 440.5

Top of Flood Pool: 437.5

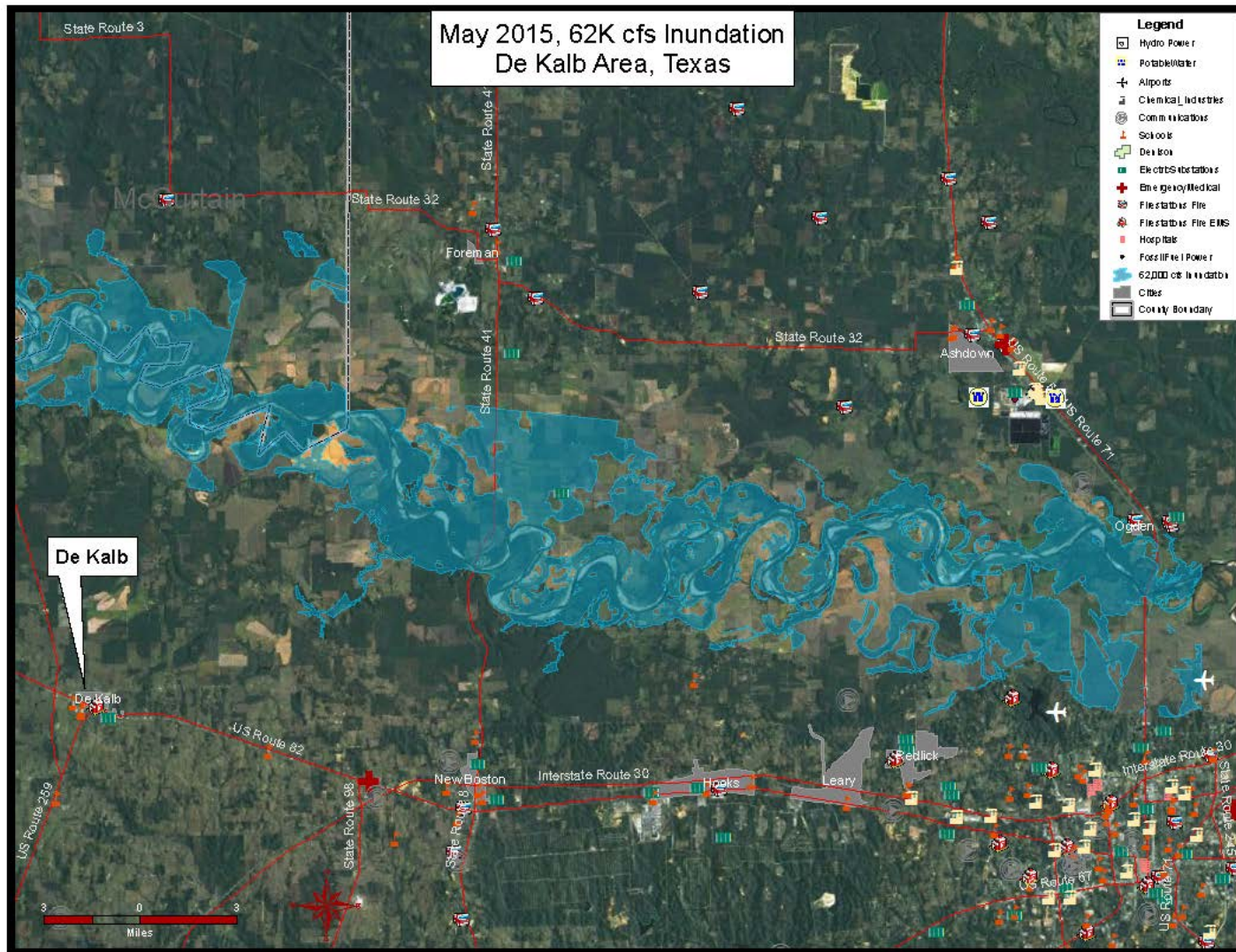
Top of Conservation Pool: 404.5

Channel Capacity: 20,000 cfs

Top of  
Tainter Gate

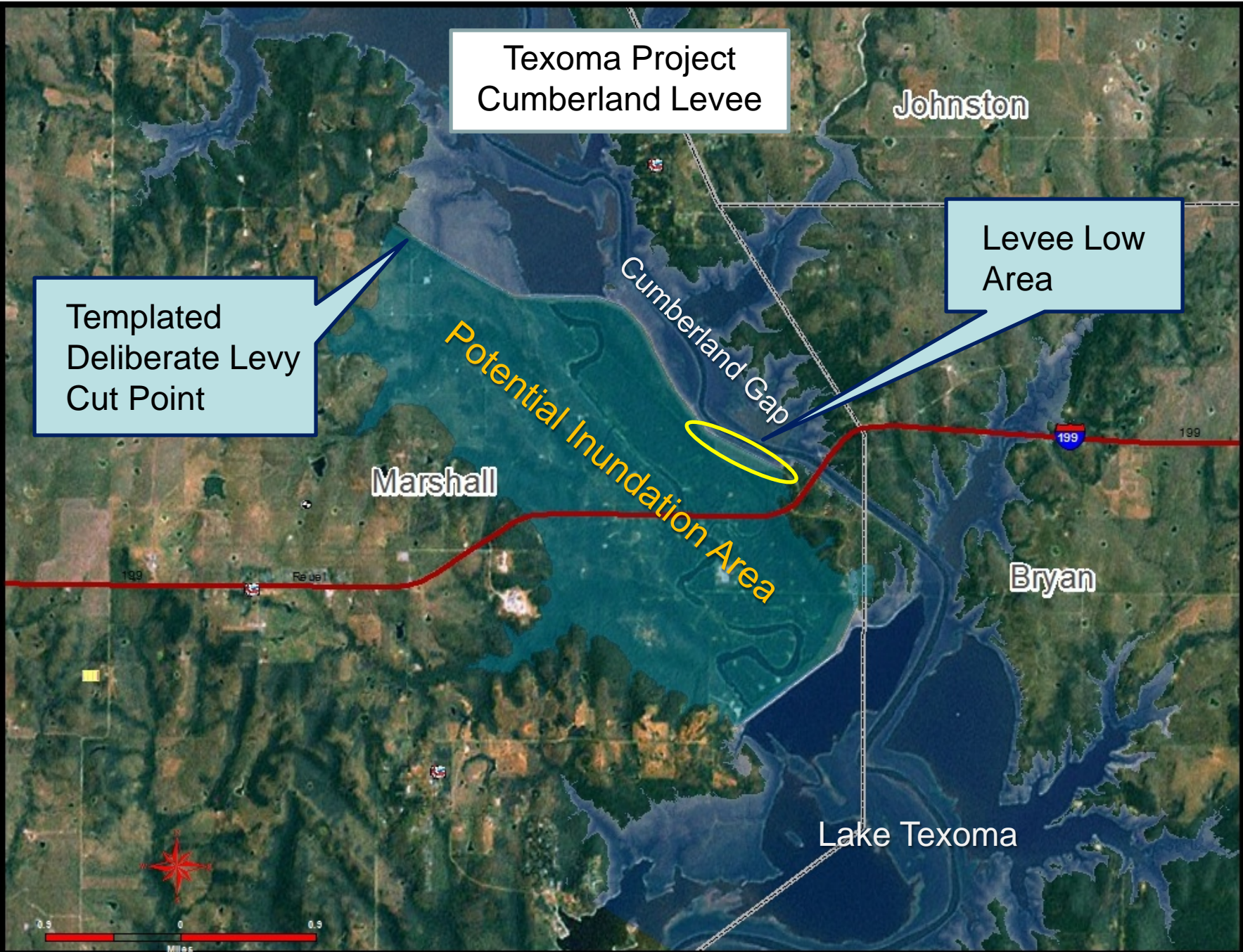


# In-House Inundation Mapping



**BUILDING STRONG®**





Texoma Project  
Cumberland Levee

Johnston

Levee Low  
Area

Templated  
Deliberate Levy  
Cut Point

Cumberland Gap

Potential Inundation Area

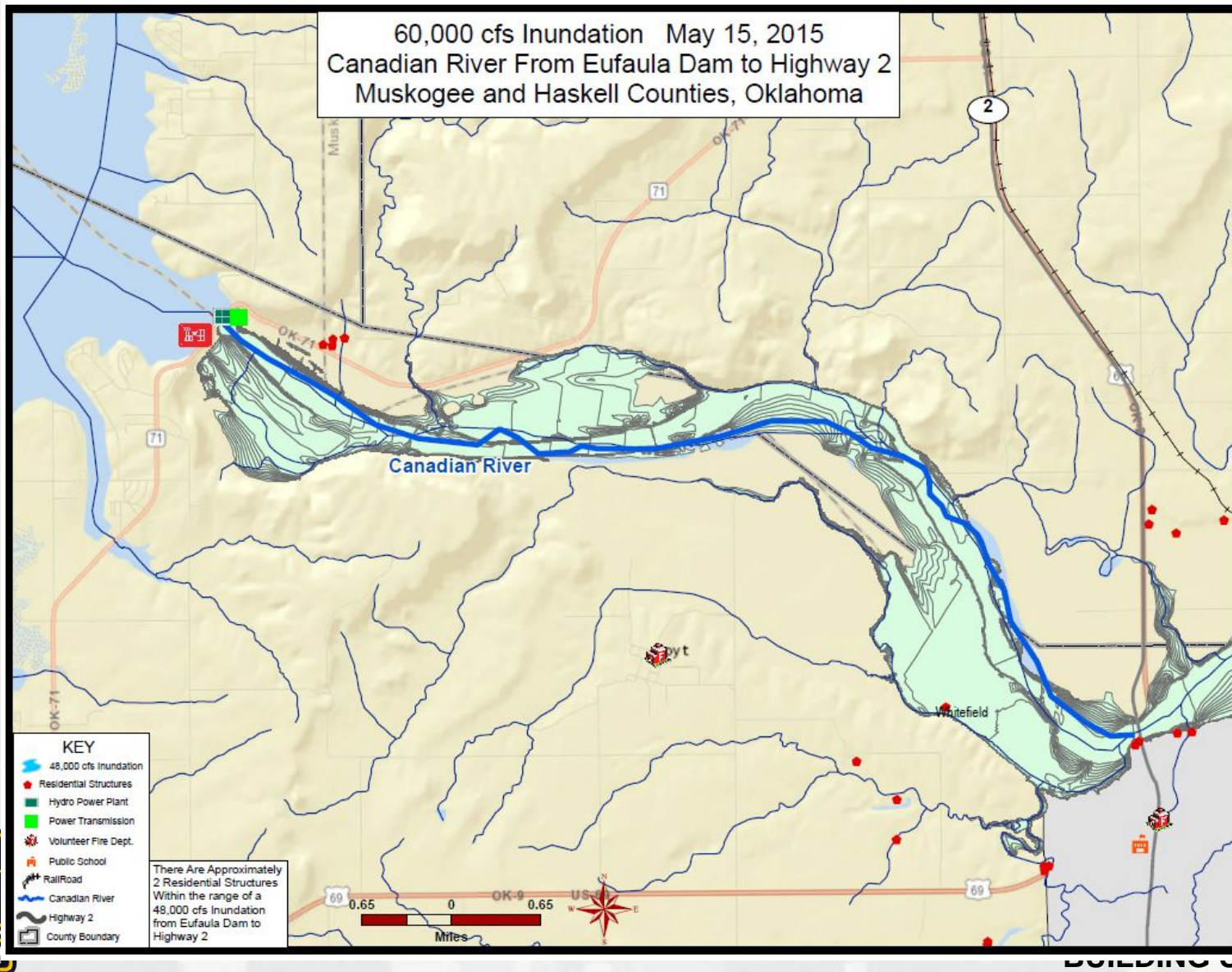
Marshall

Bryan

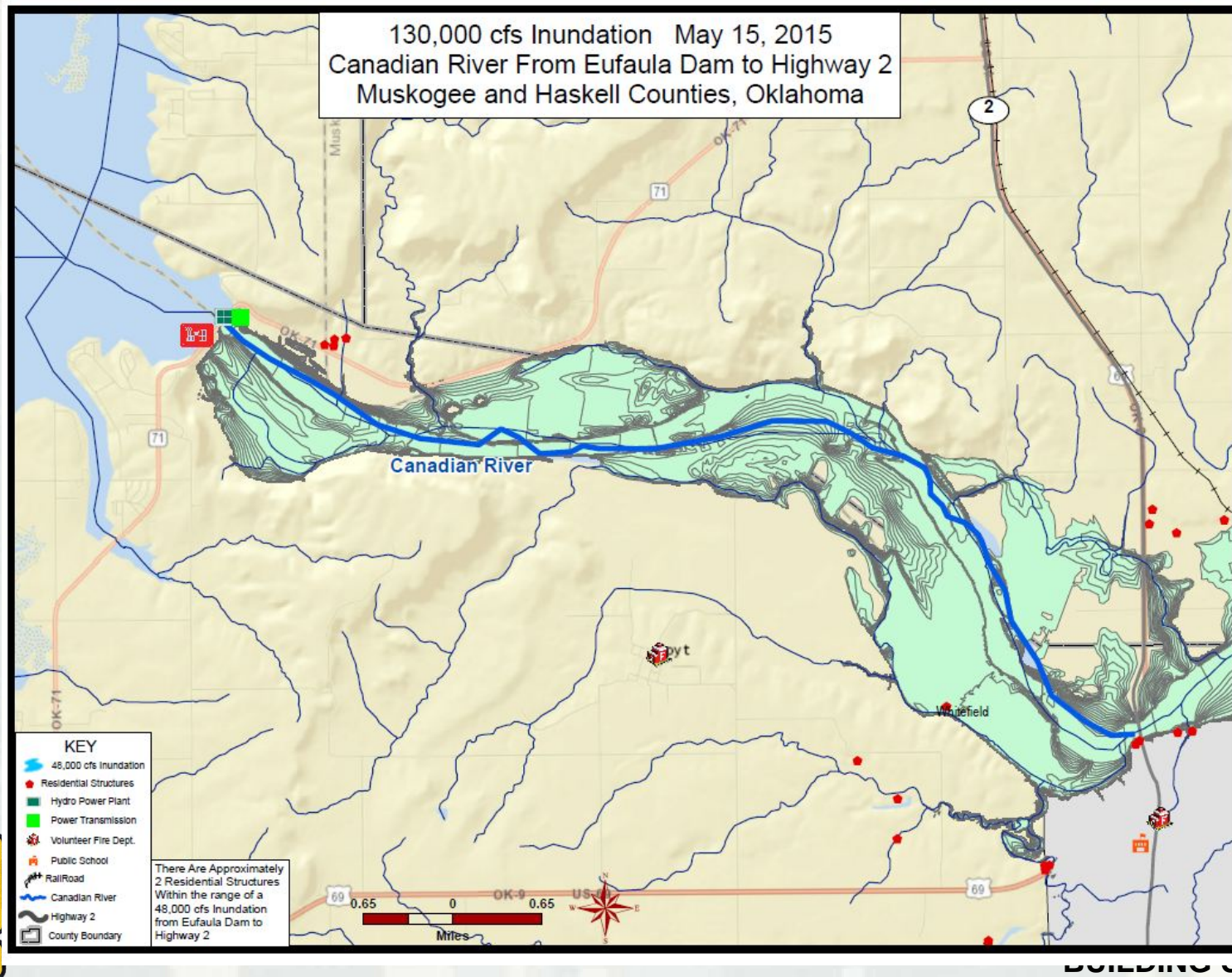
Lake Texoma



# In-House Inundation Mapping



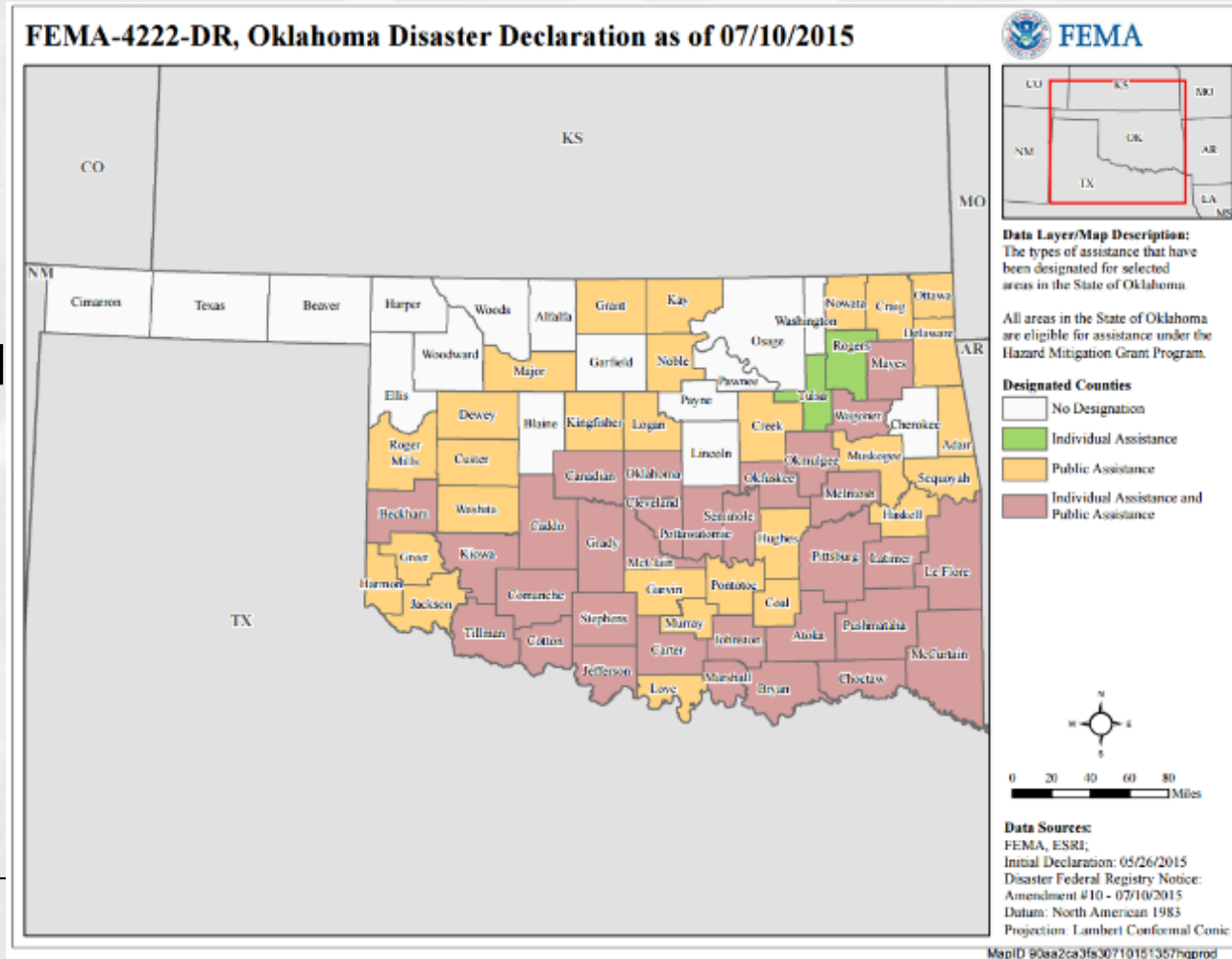
# In-House Inundation Mapping



# FEMA DISASTER DR-4222

Oklahoma Severe Storms, Tornadoes, Straight-line Winds, and Flooding

- **Major Disaster Declaration** declared on May 26, 2015
- **Incident period** May 5, 2015 to June 4, 2015



# OKLAHOMA - DR - 4222 HOTSPOT DAMAGE ASSESSMENT

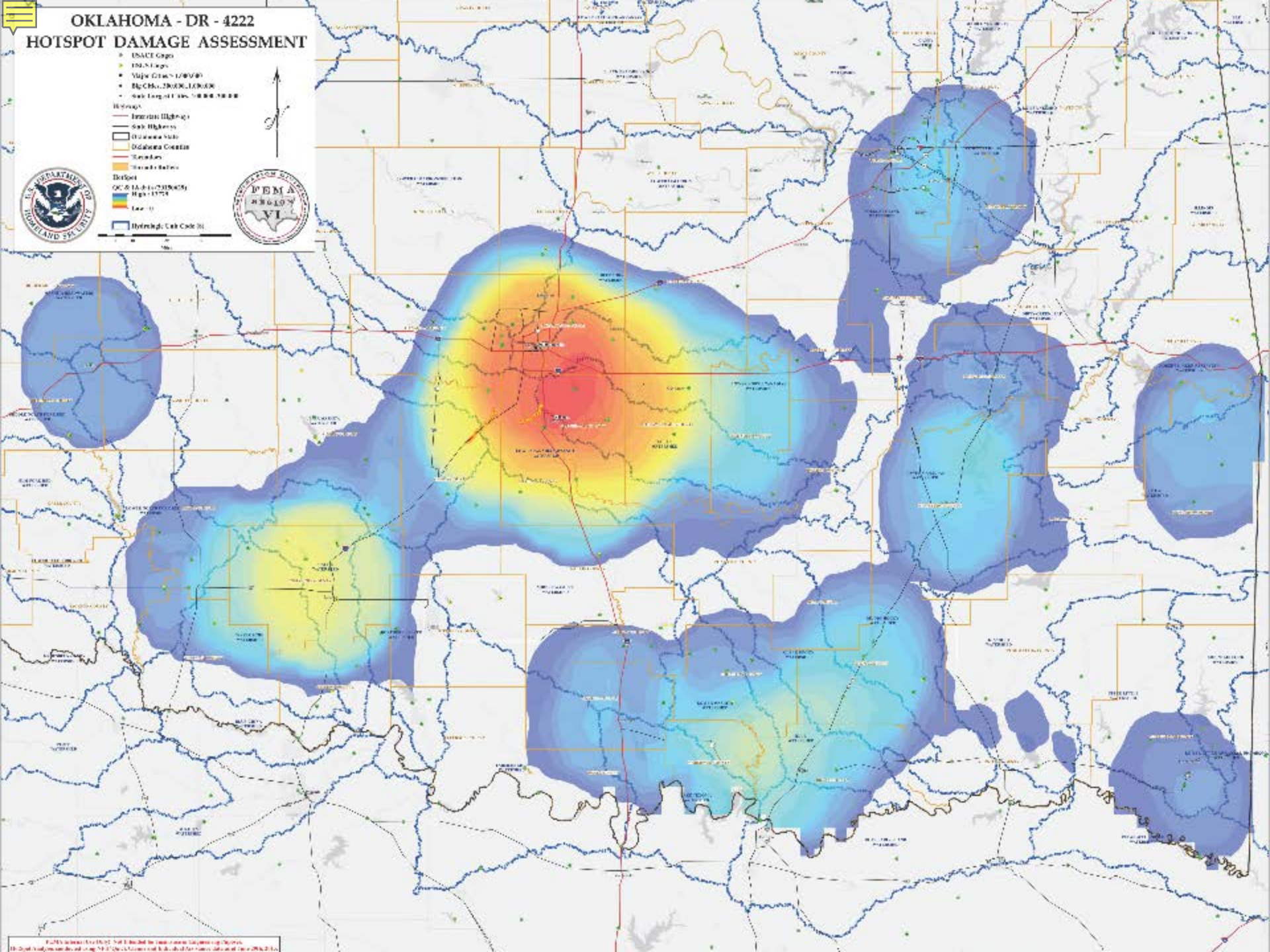
- INACE Gaps
- INAC Gaps
- Major Cities (100,000)
- Major Cities (200,000-1,000,000)
- Major Target Sites (100,000-1,000,000)

### Highways

- Interstate Highways
- State Highways
- Oklahoma Turnpikes
- Oklahoma County
- Turnpikes
- Transit Routes

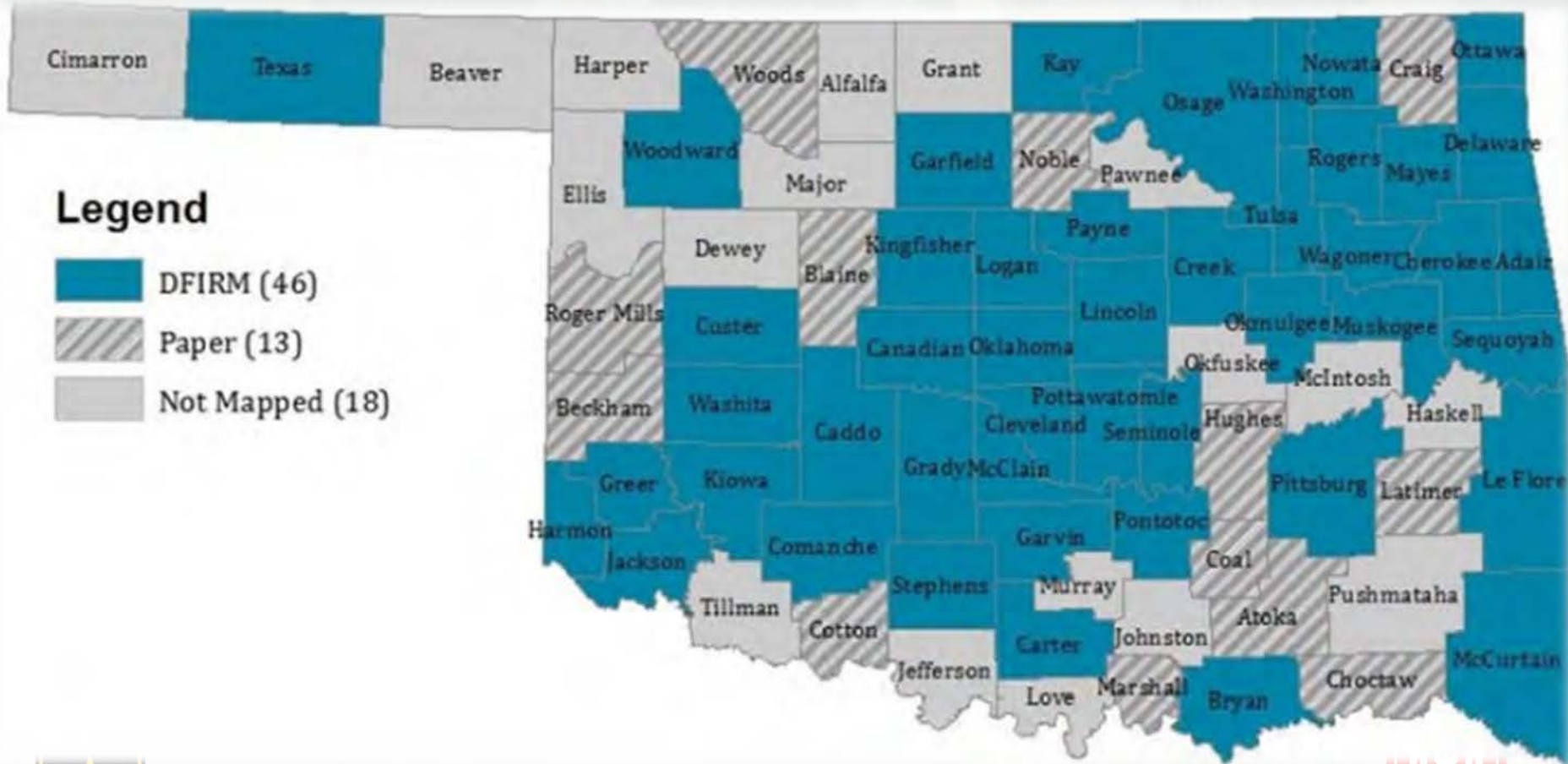
Basin:  
OC 01 (10/15/2004) -  
High 1775

Basin: Link Code 01



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# Flood Insurance Rate Map Availability and Currency



# High Water Marks & Event Determination

*MA 4222DR-OK-COE-SWD-01/02*

- Statement of Work includes tasks to:
  - ▶ Locate and identify high water marks for recording (water stains, debris lines, and other recordable items)
  - ▶ Collect location (lat/long) and elevation of mark
  - ▶ Supply photo documentation and field notes
  - ▶ Provide real-time HWM collection website for reporting and data access to Federal and State partners
  - ▶ High water mark Geodatabase deliverable
  - ▶ Review gage analysis and recent storm radar information to determine amount of rainfall
  - ▶ Perform statistical analysis to determine recent event frequency equivalence



# MICA

MOBILE INFORMATION  
COLLECTION APPLICATION



US ARMY CORPS  
OF ENGINEERS  
ENGINEER RESEARCH &  
DEVELOPMENT CENTER  
301-660-MICA

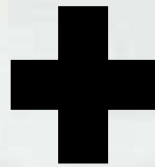
- ▶ Developed by USACE Engineering Research and Development Center (ERDC) Information Technology Laboratory
- ▶ Fully-Digital Data Collection and Rapid Data Transfer
- ▶ Mobile computing reduces errors and saves hours of time by **eliminating manual data entry.**
- ▶ With cellular internet access, mobile computing applications **immediately send data from the field to the server** for review and analysis.
- ▶ Centralizes data collection from multiple remote teams





# Field Collection

- MICA
  - ▶ Longitude, Latitude
  - ▶ Field Notes
  - ▶ Photo Documentation



- TrimbleXH GPS Unit & Zephyr2 Antenna
  - ▶ Collects Elevation
  - ▶ 5-15cm Hz, 30cm Vert (post-processed)
- 4 Field Collection Teams of 2



**MICA**  
MOBILE INFORMATION  
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DEVELOPMENT CENTER



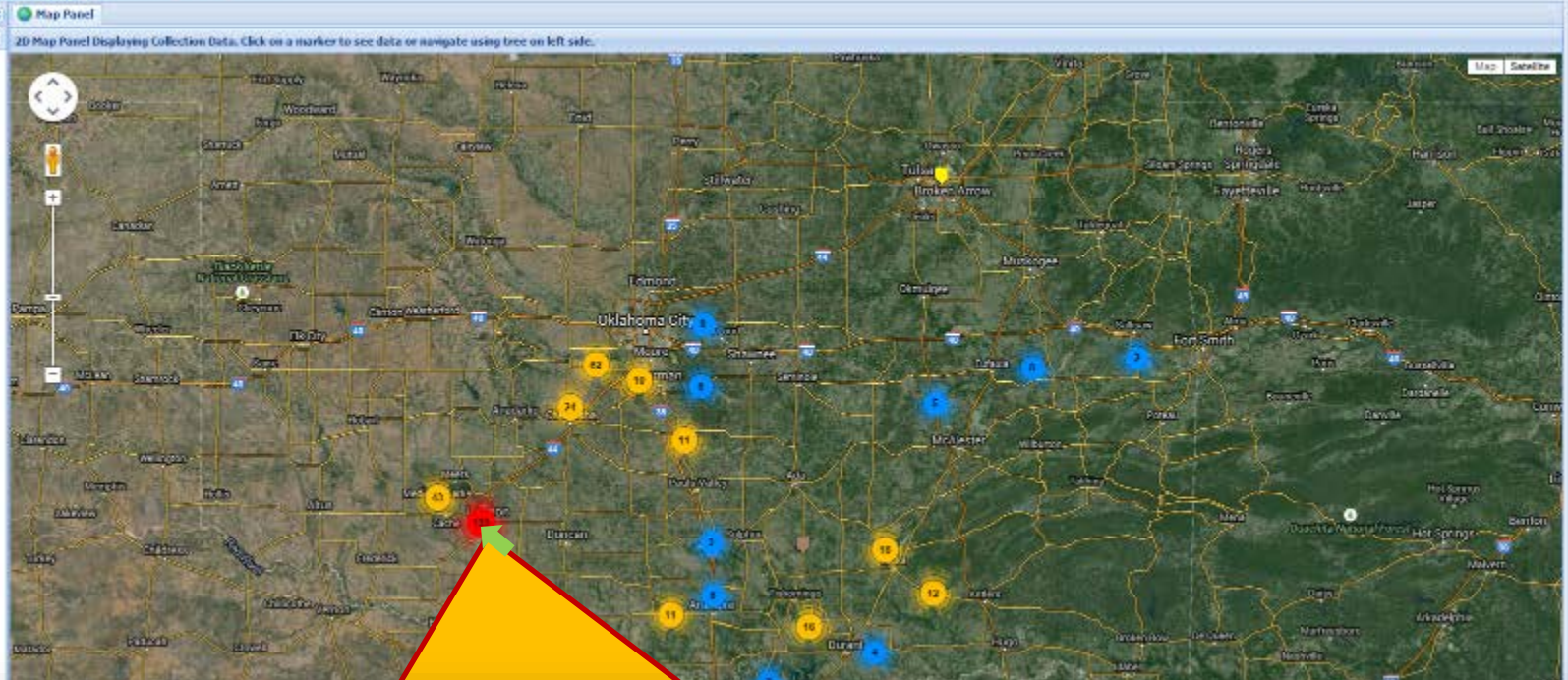


SWT Flooding 2015

Android Data Collector Results

MICA Points

- High Water Marks - 0 points
- Dams - 0 points
- Other - 37 points
- Federal Levees - 0 points
- Non Federal Levees - 0 points

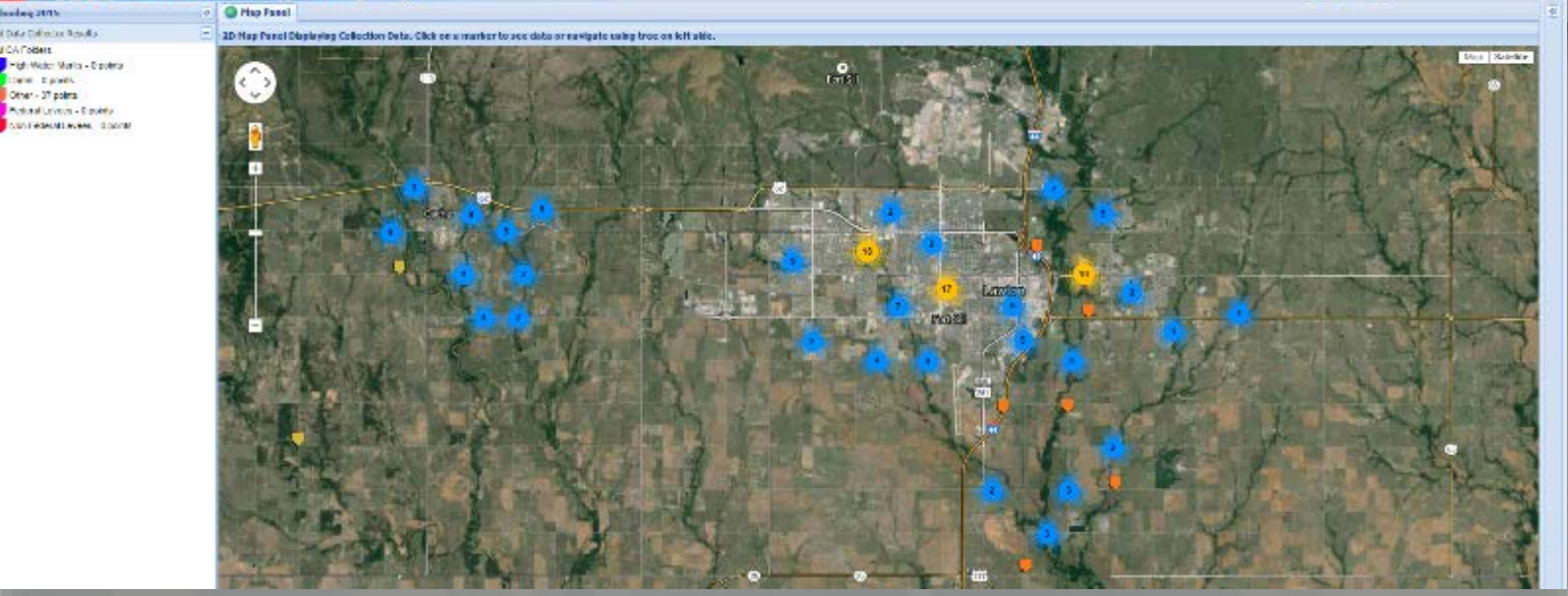


SWT Flooding 2015

Android Data Collector Results

MICA Points

- High Water Marks - 0 points
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# MICA

MOBILE INFORMATION COLLECTION APPLICATION



US ARMY CORPS OF ENGINEERS  
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301-660-MICA

# MICA Portal

The screenshot displays the MICA Portal interface. At the top left, the logo for the US Army Corps of Engineers - ERDC is shown, along with the text "Mobile Information Collection Application (MICA)". The top right corner indicates the version "SWT Flooding 2015 - 2.2.0" and includes a user profile "Admin?".

The main interface is divided into several panels:

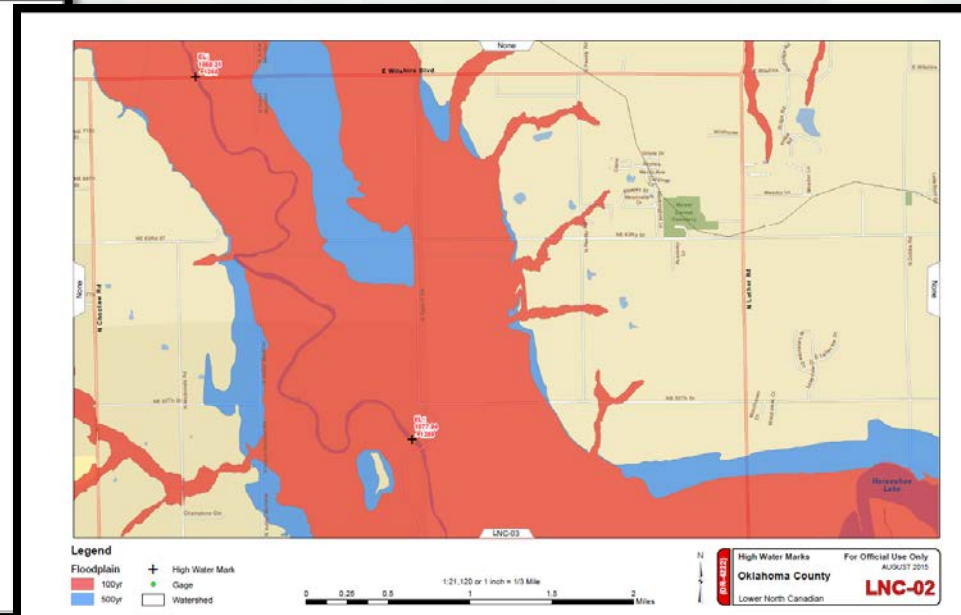
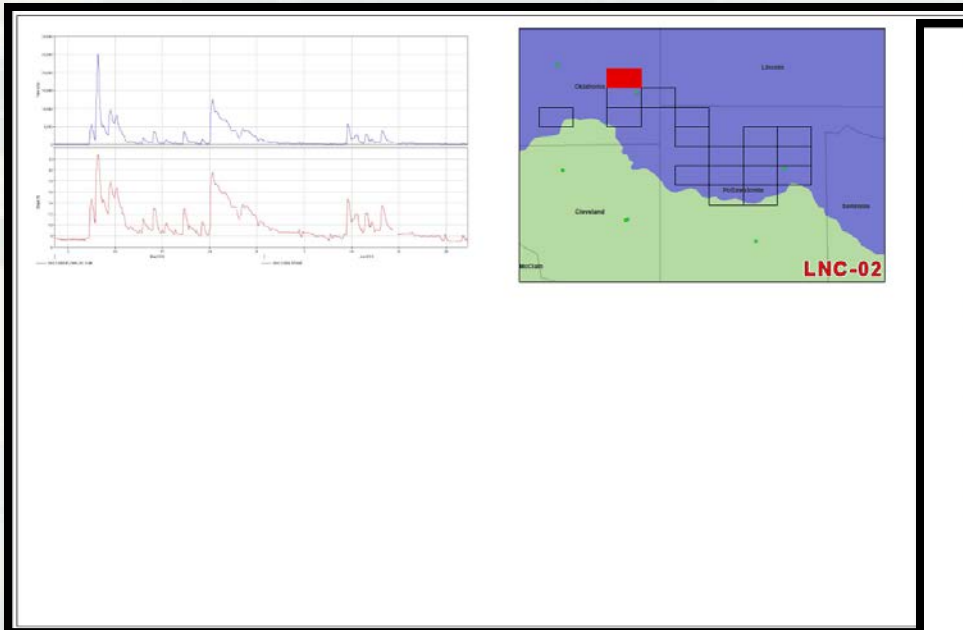
- Left Panel:** "SWT Flooding 2015" and "Android Data Collector Results". It lists "MICA Folders" with categories: "High Water Marks - 0 points", "Dams - 0 points", "Other - 27 points", "Federal Levees - 0 points", and "Non-Federal Levees - 0 points".
- Map Panel:** A 2D map showing a residential area with a bridge. A pop-up window is overlaid on the map.
- Pop-up Window 1 (Left):** Titled "EL311.31\_FlowerMoundRoad", dated "7/8/2015, 5:27:58 PM". The text reads: "Debris on top of bridge however not sure if water crossed roadway."
- Pop-up Window 2 (Right):** Titled "EL311.31\_FlowerMoundRoad\_Debri", dated "7/8/2015, 5:26:00 PM". It contains a photograph of a bridge with debris on top. Below the photo are links for "View Full Size" and "Download File".

The bottom of the interface shows a "Communications Panel" and a footer with copyright information: "Map Data ©2015 Google Imagery ©2015, DigitalGlobe, Terra, Ordnance Survey, USGS, Aero, GeoEye, 1:200 m resolution, Terms of Use | Report a map error."

# Final Products

## Mapbooks by Watershed

- 6 High Water Mark Mapbooks
- 6 60 day Event Precipitation Mapbooks
- 1 File Geodatabase
- 14 MICA Field Reports by County



# Lessons Learned

## *MA 4222DR-OK-COE-SWD-01/02*

- HWM data is EXTREMELY perishable
  - ▶ Suggest interagency coordination in “peace” time to allow data collection efforts to commence with event occurrence in the future
  - ▶ Begin data collection efforts during FEMA response efforts for best data availability
- Train crews just prior to field activation
- Scope of Work elements and specificity is critical to success
  - ▶ Leveraged FEMA’s Region 1 HWM Standard Operating Procedures

