

Presenters and Agenda

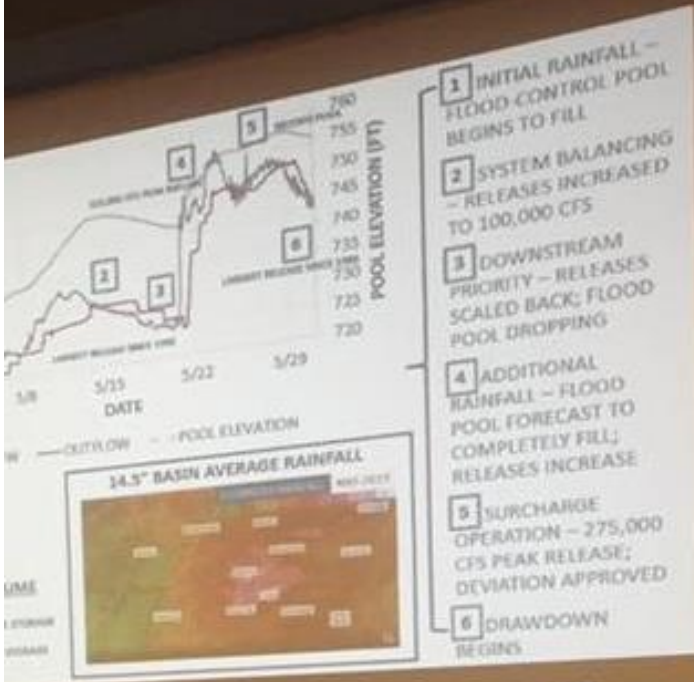
Welcome – Dan Young

Discussion About Hazard Mitigation Assistance Programs and Vulnerability assessments – Miro Kurka

Resilience exercise – Miro Kurka

Question, Answers, and Lessons Learned

Lunch/Spotlight Presentation – Mead & Hunt





Resilience Workshop

Tulsa Post

October 21, 2025



Driving Partnerships to Build Resilient Communities

Miro Kurka – Mead & Hunt

The SAME resilience efforts contribute to government and private sector collaboration, helping to minimize the impacts of natural and man-made threats and to enhance effective response and recovery to these dynamic events

- *Leverage local, regional, national, and international partnerships to educate and train members and stakeholders on infrastructure risks, mitigation efforts, and joint response strategies to natural and man-made events.*
- *Utilize SAME's multidisciplinary network to connect and educate stakeholders on new and existing technologies and to develop solutions to problems across critical infrastructure sectors.*
- *Promote partnerships and collaboration supporting the needs of military installations in pursuit of mission assurance and readiness (such as energy, water, and industrial control system cyber security).*
- *Utilize SAME's national relationships and local Posts to furnish vertical collaboration between all levels of government and private business.*
- *Lead collaboration to advocate for streamlined acquisition and implementation of resilience solutions.*



Agenda



Hazard Mitigation Assistance Programs



Vulnerability assessment overview



Updated vulnerability assessment protocols



Resilience exercise



Question, Answers, and Lessons Learned

Hazard Mitigation Assistance (HMA) Programs

FEMA HMA programs support hazard mitigation activities that reduce or eliminate potential losses to state, local, tribal and territorial governments, fostering resilience against the effects of disasters.

Hazard Mitigation Grant Program (HMGP)





Hazard Mitigation Grant Program Post Fire (HMGP Post Fire)

Building Resilient Infrastructure and Communities (BRIC)

Flood Mitigation Assistance (FMA)



Table 2. HMA Program Comparison

HMA Program Comparison	 HMGP	 HMGP Post Fire	 BRIC	 FMA
Program Type	Post-disaster	Post-disaster	Pre-disaster	Pre-disaster
Funding Availability	Presidentially declared disaster	FMAG-declared disaster	6% set aside from federal post-disaster grant funding	Annual appropriations
Competitive?	No	No	Yes	Yes
Eligible Applicants	States, federally recognized tribes, territories and the District of Columbia (DC)	States, federally recognized tribes, territories and DC	States, federally recognized tribes, territories and DC	States, federally recognized tribes, territories and DC
Eligible Subapplicants	State agencies, local governments, tribes and private nonprofit organizations	State agencies, local governments, tribes and private nonprofit organizations	State agencies, local governments and tribes	State agencies, local governments and tribes
Applicant Hazard Mitigation Plan Requirement*	Yes	Yes	Yes	Yes
Subapplicant Hazard Mitigation Plan Requirement*	Yes (except for a planning subapplication)	Yes (except for a planning subapplication)	Yes (except for certain capability- and capacity-building activities) †	Yes (except for a planning subapplication)
NFIP Participation	Communities with projects in SFHAs	Communities with projects in SFHAs	Communities with projects in SFHAs	Subapplicants and properties

Assessing Vulnerabilities

“

**By failing to plan, you are
planning to fail**

”



- Benjamin Franklin

Assessing Vulnerabilities

- A Vulnerability Assessment identifies, quantifies, and prioritizes the vulnerabilities in a system...
- For our purposes, that “system” is a municipality
- Assessment should include
 - ✓ Identification of the vulnerabilities or potential threats to each resource
 - ✓ A catalog of resources (assets and capabilities)
 - ✓ Assignment of quantifiable values and importance of those resources
 - ✓ Mitigation of the most serious threats to the most valuable resources (prioritization)



Hazard Vulnerability Assessment (HVA) Model

- Kaiser model is the most recognized
 - Probability
 - Human, property, and service impacts
 - Preparedness all considered as separate issues
- Relative threat is reported in a percentage of risk at the end of the process

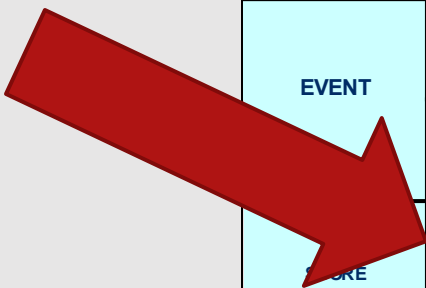


Probability of Occurrence

- Probability may be based on statistics and objective information, but can also be intuitive and highly subjective
- Extremely important to have a multidisciplinary group to complete the HVA
- The following factors are often considered for probability:
 - Known risk
 - Historical risk



Probability for an Event



EVENT	PROBABILITY	SEVERITY = (MAGNITUDE - MITIGATION)						RISK
		HUMAN IMPACT	PROPERTY IMPACT	SERVICE IMPACT	PREPARED-NESS	INTERNAL RESPONSE	EXTERNAL RESPONSE	
	<i>Likelihood this will occur</i>	<i>Possibility of death or injury</i>	<i>Physical losses and damages</i>	<i>Interruption of services</i>	<i>Preplanning</i>	<i>Time, effectiveness, resources</i>	<i>Community/ Mutual Aid staff and supplies</i>	<i>Relative threat*</i>
SCORE	0 = N/A 1 = Low 2 = Moderate 3 = High	0 = N/A 1 = Low 2 = Moderate 3 = High	0 = N/A 1 = Low 2 = Moderate 3 = High	0 = N/A 1 = Low 2 = Moderate 3 = High	0 = N/A 1 = High 2 = Moderate 3 = Low or none	0 = N/A 1 = High 2 = Moderate 3 = Low or none	0 = N/A 1 = High 2 = Moderate 3 = Low or none	0 - 100%
Hurricane								0%
Tornado								0%
Severe Thunderstorm								0%
Snow Fall								0%
Blizzard								0%
Ice Storm								0%
Earthquake								0%
Tidal Wave								0%
Temperature Extremes								0%
Drought								0%
Flood, External								0%
Wild Fire								0%
Landslide								0%
Dam Inundation								0%
Volcano								0%
Epidemic								0%
AVERAGE SCORE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0%
*Threat increases with percentage.								
0		RISK = PROBABILITY * SEVERITY						
0		0.00	0.00	0.00				

Magnitude of the Event

The magnitude of an event is assessment based on:



Magnitude of the Event

Event	PROBABILITY	SEVERITY = (MAGNITUDE - MITIGATION)						RISK
		HUMAN IMPACT	PROPERTY IMPACT	SERVICE IMPACT	PREPARED-NESS	INTERNAL RESPONSE	EXTERNAL RESPONSE	
		Possibility of death or injury	Physical losses and damages	Interruption of services	Preplanning	Time, effectiveness, resources	Community/ Mutual Aid staff and supplies	
SCORE	0 = None 1 = Moderate 2 = High 3 = High	0 = N/A 1 = Low 2 = Moderate 3 = High	0 = N/A 1 = Low 2 = Moderate 3 = High	0 = N/A 1 = Low 2 = Moderate 3 = High	0 = N/A 1 = High 2 = Moderate 3 = Low or none	0 = N/A 1 = High 2 = Moderate 3 = Low or none	0 = N/A 1 = High 2 = Moderate 3 = Low or none	0 - 100%
Hurricane								0%
Tornado								0%
Severe Thunderstorm								0%
Snow Fall								0%
Blizzard								0%
Ice Storm								0%
Earthquake								0%
Tidal Wave								0%
Temperature Extremes								0%
Drought								0%
Flood, External								0%
Wild Fire								0%
Landslide								0%
Dam Inundation								0%
Volcano								0%
Epidemic								0%
AVERAGE SCORE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0%
*Threat increases with percentage.								
0		RISK = PROBABILITY * SEVERITY						
0		0.00	0.00	0.00				

Preparedness / Mitigation

- Preparedness is the organization's ability to manage risks.
- The mitigation of an event is assessment based on:
 - Preparedness (preplanning)
 - Internal response (time, effectiveness & resources)
 - External Response (community mutual aid, staff and supplies)
- Examples of preparedness include:
 - Status of current plans
 - Training
 - Insurance
 - Back up systems
 - Community resources



Assessment of Preparedness on the Event

HVA

EVENT	PROBABILITY <i>Likelihood this will occur</i>	SEVERITY = (MAGNITUDE - MITIGATION)						RISK <i>Relative threat*</i>
		HUMAN IMPACT <i>Possibility death or injury</i>	PROPERTY IMPACT	SERVICE IMPACT	PREPARED-NESS <i>Preplanning</i>	INTERNAL RESPONSE <i>Time, effectiveness, resources</i>	EXTERNAL RESPONSE <i>Community/ Mutual Aid staff and supplies</i>	
SCORE	0 = N/A 1 = Low 2 = Moderate 3 = High	0 = N/A 1 = Low 2 = Moderate 3 = High	0 = N/A 1 = Low 2 = Moderate 3 = High	0 = N/A 1 = Low 2 = Moderate 3 = High	0 = N/A 1 = High 2 = Moderate 3 = Low or none	0 = N/A 1 = High 2 = Moderate 3 = Low or none	0 = N/A 1 = High 2 = Moderate 3 = Low or none	0 - 100%
Hurricane								0%
Tornado								0%
Severe Thunderstorm								0%
Snow Fall								0%
Blizzard								0%
Ice Storm								0%
Earthquake								0%
Tidal Wave								0%
Temperature Extremes								0%
Drought								0%
Flood, External								0%
Wild Fire								0%
Landslide								0%
Dam Inundation								0%
Volcano								0%
Epidemic								0%
AVERAGE SCORE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0%

**Threat increases with percentage.*

0	RISK = PROBABILITY * SEVERITY
0	0.00 0.00 0.00

Completed Example

Alert Type	PROBABILITY	SEVERITY = (MAGNITUDE - MITGATION)						RISK
		HUMAN IMPACT	PROPERTY IMPACT	BUSINESS IMPACT	PREPARED-NESS	INTERNAL RESPONSE	EXTERNAL RESPONSE	
	Likelihood this will occur	Possibility of death or injury	Physical losses and damages	Interruption of services	Preplanning	Time, effectiveness, resources	Community/Mutual Aid staff and supplies	* Relative threat
SCORE	0 = N/A 1 = Low 2 = Moderate 3 = High	0 = N/A 1 = Low 2 = Moderate 3 = High	0 = N/A 1 = Low 2 = Moderate 3 = High	0 = N/A 1 = Low 2 = Moderate 3 = High	0 = N/A 1 = High 2 = Moderate 3 = Low	0 = N/A 1 = High 2 = Moderate 3 = Low	0 = N/A 1 = High 2 = Moderate 3 = Low	0 - 100%
Dam Failure	1	2	3	3	1	1	1	12%
Drought	3	1	1	1	2	2	2	30%
Earthquake	3	1	1	1	3	3	2	37%
Epidemic	2	2	1	1	2	2	2	22%
Wild fire	2	2	2	1	2	2	2	24%
Flood, External	3	1	2	2	2	2	1	33%
Severe Thunderstorm	3	1	2	1	3	2	1	33%
Hurricane	1	1	1	1	2	2	1	9%
Pandemic	1	3	1	2	2	2	2	13%
Power Outage	3	2	2	2	2	2	1	37%
Temperature Extremes	3	2	1	1	1	1	2	27%
Tornado	2	3	3	2	2	2	1	29%
Blizzard	2	2	2	3	2	2	2	29%
Landslide	1	1	1	1	3	2	2	11%
Ice Storm	3	2	2	3	2	2	1	40%
Average Score	2	2	2	2	2	2	2	26%

Assessing Vulnerabilities

• Vulnerability Assessment Protocol Updates

Baseline Indicators for Community Resilience 2020 (County Level)

Social Resilience		
Variable	Calculation	Data Source
Educational attainment	% Population over 25 with college education or more	American Community Survey
Pre-retirement age	% Population between 15 to 65 years of age	American Community Survey
Transportation Access	% Households with at least one vehicle	American Community Survey
Communication capacity	% Households with telephone service available	American Community Survey
English language competency	% Population proficient English speakers	American Community Survey
Non-special needs	% Population without sensory, physical, or mental disability	American Community Survey
Health insurance	% Population under age 65 with health insurance	American Community Survey
Mental health support	Psychosocial support facilities per capita	County Health Ranking
Food provisioning capacity	Food security rate	Map the Meal Gap
Physician access	Physicians per capita	American Community Survey
Economic Resilience		
Variable	Calculation	Data Source
Homeownership	% Owner-occupied housing units	American Community Survey
Employment rate	% Labor force employed	American Community Survey
Race/ethnicity income equality	Gini coefficient (<i>Inverted</i>)	American Community Survey
Non-dependence on primary/tourism sectors	% Employees not in farming, fishing, forestry, extractive industry, or tourism	American Community Survey
Gender income equality	% Absolute difference between male and female median income divided by annual income (<i>Inverted</i>)	American Community Survey
Business size I	Ratio of large to small businesses	County Business Patterns (NAICS)
Business size II	Ratio of employees to establishments	County Business Patterns (NAICS)
Large retail-regional/national geographic distribution	Large retail stores per capita	County Business Patterns (NAICS)
Federal employment	% Labor force employed by federal government	American Community Survey
Energy burden	Average Energy Burden (% income), (<i>Inverted</i>)	Low-Income Energy Affordability Data
Community Capital		
Variable	Calculation	Data Source
Place attachment-not recent immigrants	% Population not foreign-born persons who came to US within previous 5 years	American Community Survey
Place attachment-native born residents	% Population born in state of current residence	American Community Survey
Political engagement	% Voting age population participating in recent election	Presidential election data
Religious organizations	# Religious organizations per capita	County Business Patterns (NAICS)
Civic organizations	# Civic organizations per capita	County Business Patterns (NAICS)
Disaster volunteerism	# AmeriCorps volunteers per capita	AmeriCorps
Institutional Resilience		
Variable	Calculation	Data Source
Mitigation spending	10-year average per capita spending for mitigation projects	FEMA Hazard Mitigation Grant Program
Flood insurance coverage	% Housing units covered by National Flood Insurance Program	FEMA NFIP
Performance regimes-state capital	Distance from county seat to state capital (<i>Inverted</i>)	National Atlas
Performance regimes-nearest metro area	Distance from county seat to nearest county seat within a Metropolitan Statistical Area (<i>Inverted</i>)	National Atlas
Political & jurisdictional fragmentation	# Governments and special districts per 10,000 persons (<i>Inverted</i>)	USA Counties
Disaster aid experience	# Presidential Disaster Declarations divided by # of loss-causing hazard events for 10-year period	FEMA PDD database and SHELUDS
Local disaster training	% Population in communities covered by Citizen Corps programs	FEMA Citizen Corps
Population stability	Population change over previous 5-year period (<i>Inverted</i>)	Census
Nuclear plant accident planning	% Population within 10 miles of nuclear power plant	HIFLD Nuclear Power Plants Database; Census
Crop insurance coverage	Crop insurance policies per square mile	Environmental Working Group Farm Subsidies
Housing/Infrastructural Resilience		
Variable	Calculation	Data Source
Sturdier housing types	% Housing units not mobile homes	American Community Survey
Temporary housing availability	% Vacant housing units that are for rent	American Community Survey
Medical care capacity	# Hospital beds per capita	Covid Care map
Evacuation routes	Intersection density	National Neighborhood Data Archive
Housing stock construction quality	% Housing units built prior to 1970 or after 2000	American Community Survey
Temporary shelter availability	# Hotels/motels per capita	County Business Patterns (NAICS)
School restoration potential	# Public schools per capita	National Center for Education Statistics
Industrial re-supply potential	Rail miles per square mile	HIFLD
High speed internet infrastructure	% Population with access to broadband internet service	American Community Survey
Environmental Resilience		
Variable	Calculation	Data Source
Local food suppliers	Farms marketing products through Community Supported Agriculture per capita	Census of Agriculture
Natural flood buffers	% Land in wetlands	National Land Cover Dataset
Efficient energy use	Megawatt hours per energy consumer (<i>Inverted</i>)	City and County Energy Profiles
Pervious surfaces	Average percent perviousness	National Land Cover Dataset
Efficient water use	Water Supply Stress Index (<i>Inverted</i>)	Water Risk Atlas

Assessing Vulnerabilities

- Vulnerability Assessment Protocol Updates
 - Disaster Vulnerabilities Assessment format replaced by the Baseline Indicators for Community Resilience (BIRC) in 2020...
 - More detailed data capture

Resilience Metrics	Social	Economic	Community Capital	Institutional	Housing/ Infrastructure	Environmental
Variable	→					
Calculation	→					
Data Source	→					

Assessing Vulnerabilities

- Vulnerability Assessment Protocol Updates - 2025
 - Reintroduces a simpler evaluation protocol under the parent federal resilience program, Building Resilient Infrastructure and Communities (BRIC) as part of FEMA's 2025 Hazard Mitigation Assistance Program and Policy Guide...



Hazard Mitigation Assistance Program and Policy Guide

Hazard Mitigation Grant Program, Hazard Mitigation Grant Program Post Fire, Building Resilient Infrastructure and Communities, and Flood Mitigation Assistance

Effective January 20, 2025

Version 2.1

Federal Enterprise Architecture (FEA) Number: FP-206-21-0001



FEMA

Assessing Vulnerabilities

- Main Resilience Components Still Applicable
 - Guiding Principles to help communities undertake hazard mitigation projects to reduce risks from potential natural hazard events...
 - Identify hazard mitigation actions; implement projects that reduce natural hazard risks
 - Encourage and enable innovation, allow for flexibility, consistency, and effectiveness
 - Promote partnerships to strengthen ability to protect critical infrastructure

Public infrastructure

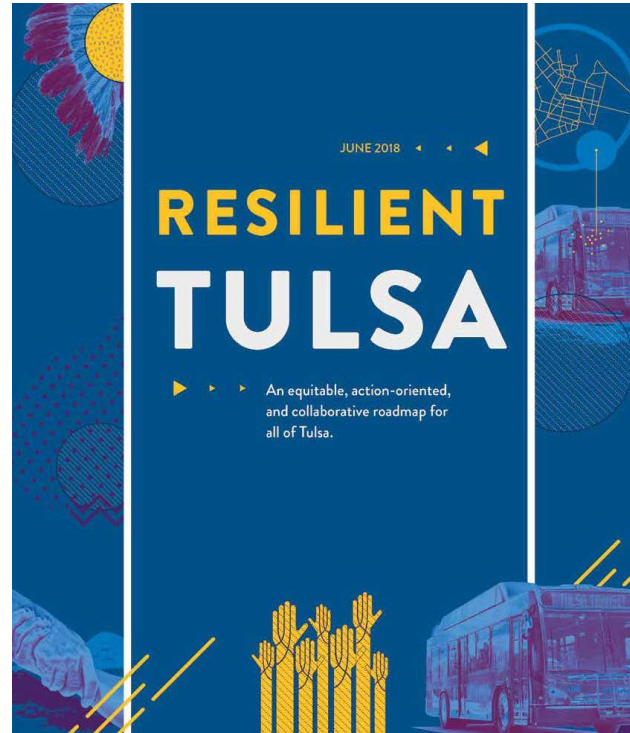
Public safety

Public health



Assessing Vulnerabilities

- Main Components Still Applicable – Resilient Tulsa



TYPE OF HAZARD	Occurrence		Vulnerability					Resources		
	HISTORY	PROBABILITY	HUMAN	PROPERTY	INFRASTRUCTURE	BUSINESS	MIGRATION ACTIVITIES	INTERNAL	EXTERNAL	TOTAL
Extreme Heat	5	5	5	3	4	3	3	4	4	5.4
Tornadoes	5	5	3	4	3	3	2	3	3	5.3
Winter Storm/Ice Storm	5	5	1	3	2	5	2	2	3	5.0
Lightning	5	5	3	2	2	2	1	2	1	4.9
Flooding	5	5	3	4	3	2	3	4	4	4.8
Dam Failure	3	3	4	4	4	3	2	2	2	4.7
Hail	5	5	1	4	2	1	2	2	1	4.6
High Wind Events	5	5	1	4	2	1	2	2	1	4.6
Levee Failure	3	3	3	3	3	3	2	2	2	4.0
Expansive Soils	5	4	1	3	3	1	3	4	4	3.4
Urban (Structure) Fire	5	5	1	2	1	1	4	4	4	3.1
HazMat Incidents, Fixed Site	3	3	4	2	1	2	1	2	3	3.3
Drought	3	3	2	1	2	2	2	2	3	2.8
Transportation Incidents	3	4	4	1	1	1	2	3	4	2.8
Wildfires	2	3	1	2	1	1	2	3	3	1.6
Earthquake	1	1	1	1	1	1	3	4	4	0.3

Workshop

- Resilience
- Gap Analysis

Workshop

Gap Analysis and Actionable Data

Foster Linkages Between the Risk, Vulnerabilities, Hazards. Develop both pre and post event actions that would minimize impacts of the event. (Gaps in Resiliency)

Collaborate to develop actions to be undertaken that will reduce risks and vulnerabilities to the Lowest Acceptable Level(s) to Homes, Businesses, Social and Political Systems (People We Serve)

Make Governance Recommendations to those who Govern – (Support) the Tulsa Resiliency Plan (and others) through our actions.



What will we work on today...

“ Far and away the best prize that life has to offer is the chance to work hard at work worth doing”. - Theodore Roosevelt

”

Scenarios for Flood, Tornado and Severe Weather

- Identify Actions from our Disaster Scenario(s) Observations.
- What can be done pre and post event to mitigate impacts.
- Identify Mitigating Actions to reduce impacts/risk(s).
- SME Primers at each Step: Public Works, NWS, Emergency Manager, Planners, Authority Having Justification



GET INTO GROUPS



EVENT RULES OF ENGAGEMENT

Groups all have input into the Scenario
Group Note Taker....Takes Notes
Group Leader Presents
Pre and Post Event Mitigation Efforts
Complete one worksheet for each event
20 Inputs on each event....Make Them Count!



Mitigation Action Worksheet

Type of Event:

Mitigation Actions		Primary Agencies	
Pre Event	Post Event	Primary Agency	Support Agency



FLOOD SME PRIMERS

Traditional Dam and Levee Safety Activities

Annual Inspection (AI)

Periodic Inspection (PI) (Every 5 years) – Much more detail

Periodic Assessments (PA) (Every 10 years) – Detailed and Includes Risk Assessment

Instrumentation Data Collection and Evaluation

Routine Maintenance

Dam Safety Training

Emergency Action Plans (EAP)

Emergency Exercises



Scenario Introduction

Hurricane Tulsa has moved through the Gulf of Mexico, up through Texas and is now threatening Oklahoma as a Severe Weather event. Rain has already been occurring and the Keystone project is at 80% Flood Control Pool. Downstream releases are occurring at 30CFS.

National Weather Service reports on a QPF (80% Confidence) that the Tulsa Area will receive a minimum of 8 inches but most likely between 10 and 12 inches of rain over the next two days. River Forecast Center has predicted Arkansas River rise to flood stage within the next two days with major flood stage reached within 3 days. Due to the downstream rivers being at bank and over bank levels water is being held at 30,000cfs discharge at Keystone Lake in accordance with the Water Control Manuals.

Partner Coordination is occurring with daily NWS calls with the Response and Recovery Community.

WORK PRE-EVENT ACTIONS

Since the weather pattern is continuing to fill Keystone Lake, USACE must increase releases from Keystone Lake to 150,000 cfs. USACE indicates if the weather pattern continues then releases of 310,000 will be necessary. This will be an increase of 6 cfs and be more water than both the 1984 and 1986 events.

In preparing for the event USACE sends out inundation maps indicating the anticipated area of flooding.



Mitigation Action Worksheet

Type of Event:

Mitigation Actions		Primary Agencies	
Pre Event	Post Event	Primary Agency	Support Agency



Brief Out

Severe Weather SME Primers (Snow and Ice)

Scenario

A wintry mix of rain, freezing rain, sleet, and snow will result in heavy accumulations for most locations today. Travel will be hazardous and temperatures will drop below freezing -- especially on elevated surfaces such as bridges and overpasses.

Snow will be more predominant across the Tulsa Area with accumulations greater than 5 inches. Day two and Three will result in ice accumulations above $\frac{3}{4}$ inch from the North at 412 to the South at I40. Expect ice and snow to remain for 5 to 7 days as temperatures will not reach above freezing for 7 days.









Mitigation Action Worksheet

Type of Event:

Mitigation Actions		Primary Agencies	
Pre Event	Post Event	Primary Agency	Support Agency



Brief Out

Scenario

2 Days Out: Severe Weather Storms are predicted in the Tulsa Area. NWS and Local Television Stations report a very high confidence level that these storms will produce high damaging winds with the potential for Tornadoes to occur.

1 Day Out: NWS and Television stations update threat that Tornadoes are highly likely during this time frame and recommend all people take pre-event actions to prepare.

Day of Event: 6pm High Winds and ESF 1 and ESF 2 Tornadoes move through the area.







Mitigation Action Worksheet

Type of Event:

Mitigation Actions		Primary Agencies	
Pre Event	Post Event	Primary Agency	Support Agency



Brief Out

End Exercise