Lessons Learned from a Benefit-Cost Analysis of Dam Ownership

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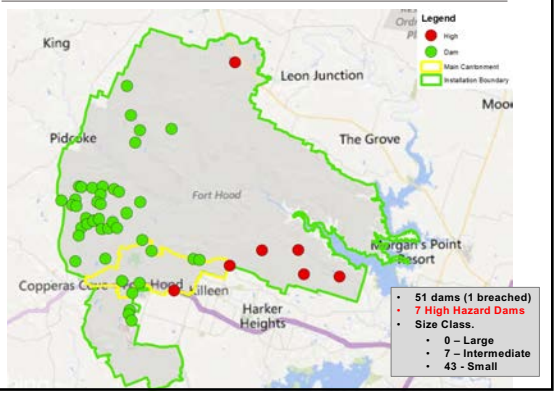
Agenda

- Overview of Fort Hood Dam Safety Program
- Dam Costs/Dam Benefits
- Hydraulic Analysis
- Economic Analysis
- Lessons Learned

Fort Hood Overview

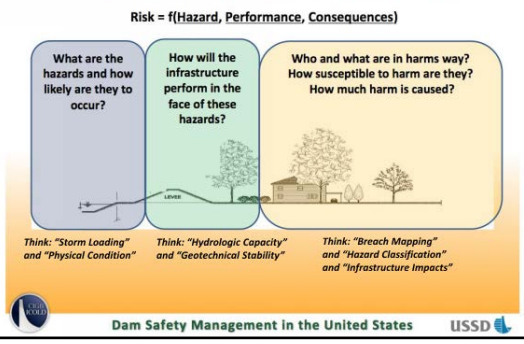
- On Post Population = 62,000+
- Total Area = 342 square miles
- $35+ Billion economic impact on Texas economy

Fort Hood Dam Portfolio



The Dam Safety Program

Risk Informed View of Infrastructure Safety



Hazard Classifications

Hazard Classification	Federal – Army (DA PAM 420-1-3)	State – TCEQ (TAC Chpt. 299)
Low Hazard	No loss of human life (PAR = 0) Low economic losses Low environmental losses	No loss of human life (PAR=0) Minimal economic loss Damage to minor highways
Significant Hazard	No loss of human life (PAR = 0) Some economic loss Some environmental damage Disruption of lifeline facilities	Loss of human life (PAR<6) Appreciable economic loss Damage to secondary highways Damage to public utilities
High Hazard	Loss of human life (PAR > 0)	Loss of human life (PAR>6) Serious economic loss Damage to main highways

Texas Commission on Environmental Quality

Dam Ownership Costs

- Regular Inspection
- Emergency Action Plans
- Engineering Analysis
- Standard Operating Plans
- O&M Plans
- Mowing/Vegetation Control
- Structural Upgrades
- Instrumentation

Dam Benefits

- Water Supply
- Sedimentation & Erosion
- Recreation
- Fish and Wildlife
- **Flood Control**

Less Obvious
Harder to Quantify

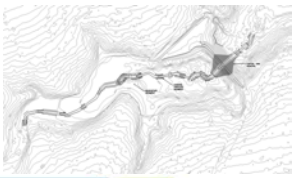
Designs to Bring Dams into Compliance

Rehabilitate

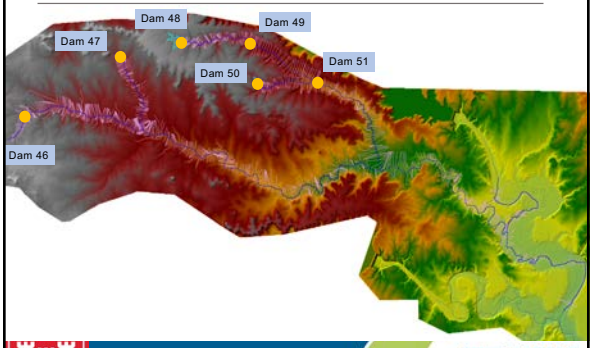
- Raising Embankment
- Add Parapet Wall
- Lower Spillway
- Increase size of Principal Spillway
- Clear trees & blockage from spillways

Decommission

- Design Stable Channel including cut into dam embankment

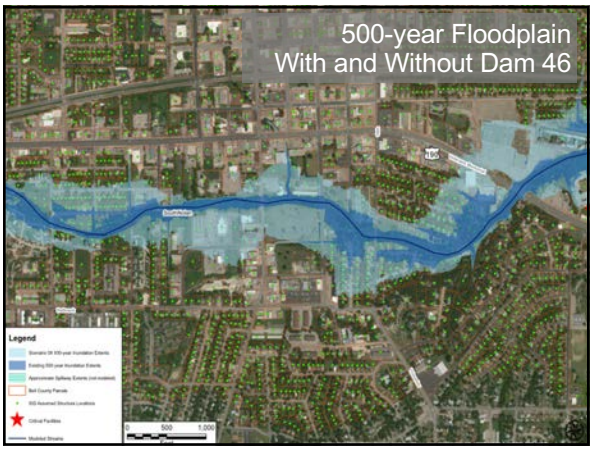


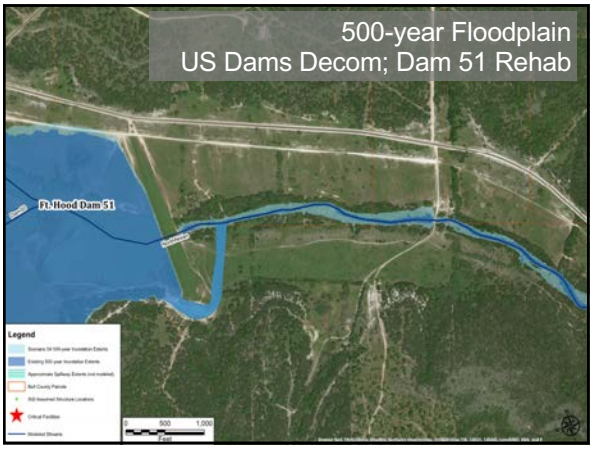
H&H Analysis



H&H Analysis

Modeled Scenario	Dams					
	46	47	48	49	50	51
Without Project: Decommission	Decom	Decom	Decom	Decom	Decom	Decom
Existing	Existing	Existing	Existing	Existing	Existing	Existing
Scenario01	Rehab	Rehab	Decom	Rehab	Existing	Rehab
Scenario02	Rehab	Rehab	Decom	Decom	Existing	Rehab
Scenario03	Rehab	Rehab	Rehab	Rehab	Decom	Rehab
Scenario04	Rehab	Rehab	Decom	Decom	Decom	Rehab
Scenario05	Rehab	Rehab	Rehab	Rehab	Existing	Decom
Scenario06	Rehab	Rehab	Rehab	Decom	Existing	Rehab
Scenario07	Rehab	Decom	Rehab	Rehab	Existing	Rehab
Scenario08	Decom	Rehab	Rehab	Rehab	Existing	Rehab
Scenario09	Rehab	Rehab	Rehab	Rehab	Existing	Rehab
Scenario10	Rehab	Existing	Rehab	Rehab	Existing	Rehab
Scenario11	Rehab	Rehab	Rehab	Rehab	Existing	Existing





ECONOMIC ANALYSIS

Components of HEC-FDA → EAD($)

- Modeled Water Surface Profiles
  - Obtained from HEC-RAS
- Exceedance Probability Functions
  - Assign weighted probability to WSE by reach and therefore associated damage
- ***STRUCTURE INVENTORY DATABASE***
  - All structures subject to damage and pertinent details: value, FFE, etc.
- Content-to-Structure Value Ratio (CSVR)
  - Value of content based on structure value; assigned according to type of structure
- Stage – Damage Curve (Structure and Content)
  - Damage to the structure or content calculated as a percentage of total value and based on the depth of water within the structure

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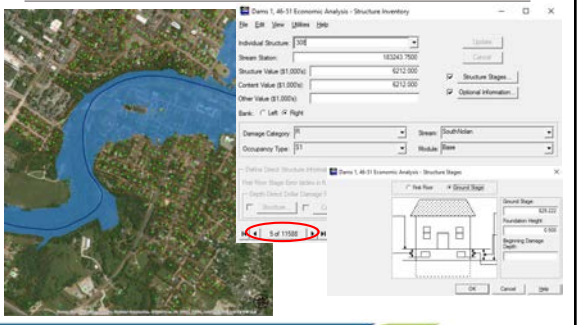
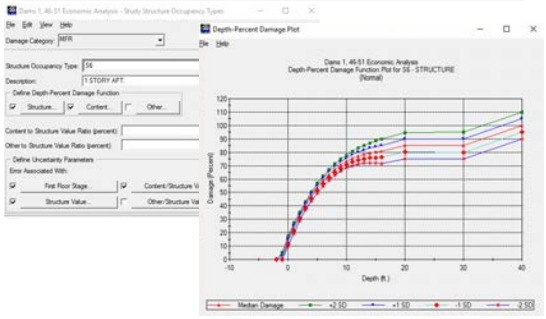
Economic Analysis



Economic Analysis



Economic Analysis Results

Plan Name	Equivalent Annual Damages (With Uncertainty) in Thousands of $		
	Total Without Project	Total With Project	Damages Reduced
Without Project: Decommission	$2,647	$2,647	$0
Existing	$2,647	$1,523	$1,124
Scenario01	$2,647	$1,610	$1,038
Scenario02	$2,647	$1,627	$1,021
Scenario03	$2,647	$1,606	$1,041
Scenario04	$2,647	$1,624	$1,023
Scenario05	$2,647	$1,787	$860
Scenario06	$2,647	$1,626	$1,022
Scenario07	$2,647	$1,773	$875
Scenario08	$2,647	$2,075	$573
Scenario09	$2,647	$1,608	$1,040
Scenario10	$2,647	$1,591	$1,056
Scenario11	$2,647	$1,582	$1,066

MAJOR PROJECT FINDINGS

ADDITIONAL ANALYSIS

Crossing Information		Annual Exceedance Probability Event that Overtops Crossing									
River	Name	**Existing**	Scenario01	Scenario02	Scenario03	Scenario04	Scenario05	Scenario06	Scenario07	Scenario08	Scenario09	Decommissioned
LongBranch	Westcliff Rd	**2-yr**	2-yr	2-yr	2-yr	2-yr	2-yr	2-yr	2-yr	2-yr	2-yr	2-yr
LongBranch	Tripp Trail	**250-yr**	25-yr	25-yr	50-yr	25-yr	25-yr	25-yr	2-yr	25-yr	25-yr	2-yr
LongBranch	N 38th St	**10-yr**	5-yr	5-yr	5-yr	5-yr	5-yr	5-yr	2-yr	5-yr	5-yr	2-yr
LongBranch	Lake Rd	**> 500-yr**	500-yr	500-yr	> 500-yr	250-yr	500-yr	250-yr	25-yr	250-yr	250-yr	25-yr
LongBranch	Lake Inks Ave	**2-yr**	2-yr	2-yr	> 500-yr	2-yr	2-yr	2-yr	2-yr	2-yr	2-yr	2-yr
LongBranch	E Rancier Ave	**100-yr**	100-yr	100-yr	250-yr	100-yr	100-yr	100-yr	10-yr	100-yr	100-yr	10-yr
Nolan	SH 317	**500-yr**	500-yr	500-yr	500-yr	500-yr	500-yr	500-yr	500-yr	500-yr	500-yr	250-yr
Nolan	Penelope St	**500-yr**	500-yr	500-yr	500-yr	500-yr	500-yr	500-yr	500-yr	500-yr	> 500-yr	250-yr
Nolan	IH 35 Frontage Rd	**2-yr**	2-yr	2-yr	2-yr	2-yr	2-yr	2-yr	2-yr	2-yr	2-yr	2-yr
Nolan	IH 35	**> 500-yr**	> 500-yr	500-yr	> 500-yr	> 500-yr	500-yr	500-yr	500-yr	> 500-yr	> 500-yr	250-yr
Nolan	IH 35 Frontage Rd	**2-yr**	2-yr	2-yr	2-yr	2-yr	2-yr	2-yr	2-yr	2-yr	2-yr	2-yr

*Selection from reported table

ADDITIONAL ANALYSIS

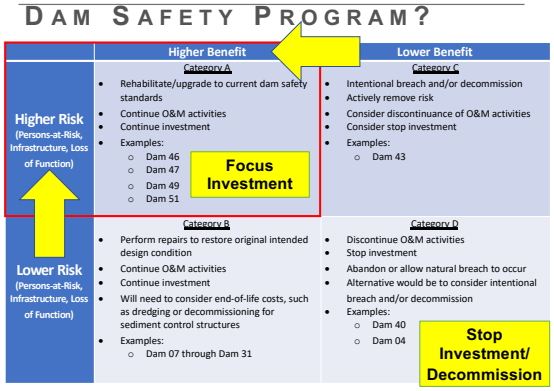
Additional Considerations

The true cost of decommissioning extends beyond the economics

- Avoiding damage – facilitating buyout program; raising road crossings
- Conducting a Physical Map Revision, Coordinating with FEMA and local Floodplain Manager
- Impacts to people

Bottom line: Decommissioning is not low cost

How does this impact the Dam Safety Program?



Lessons Learned

1. **Defining** not just the **original intended purpose** of the dam, but the **current roles** that it plays is important to understanding the dam benefits
2. **Important to consider dams as assets, not just liabilities.** Benefits can be quantified and communicated to justify further investment or decommissioning
3. Maintaining a comprehensive GIS database allows for **effective asset management**

GOAL: Informed Decision-making

QUESTIONS?

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THE NEED FOR SAFETY

Texas floods: 9 soldiers killed in Fort Hood accident

By Ralph Ellis, Steven Visser and Faith Karimi, CNN
Updated 1:44 PM ET, Sun June 5, 2016