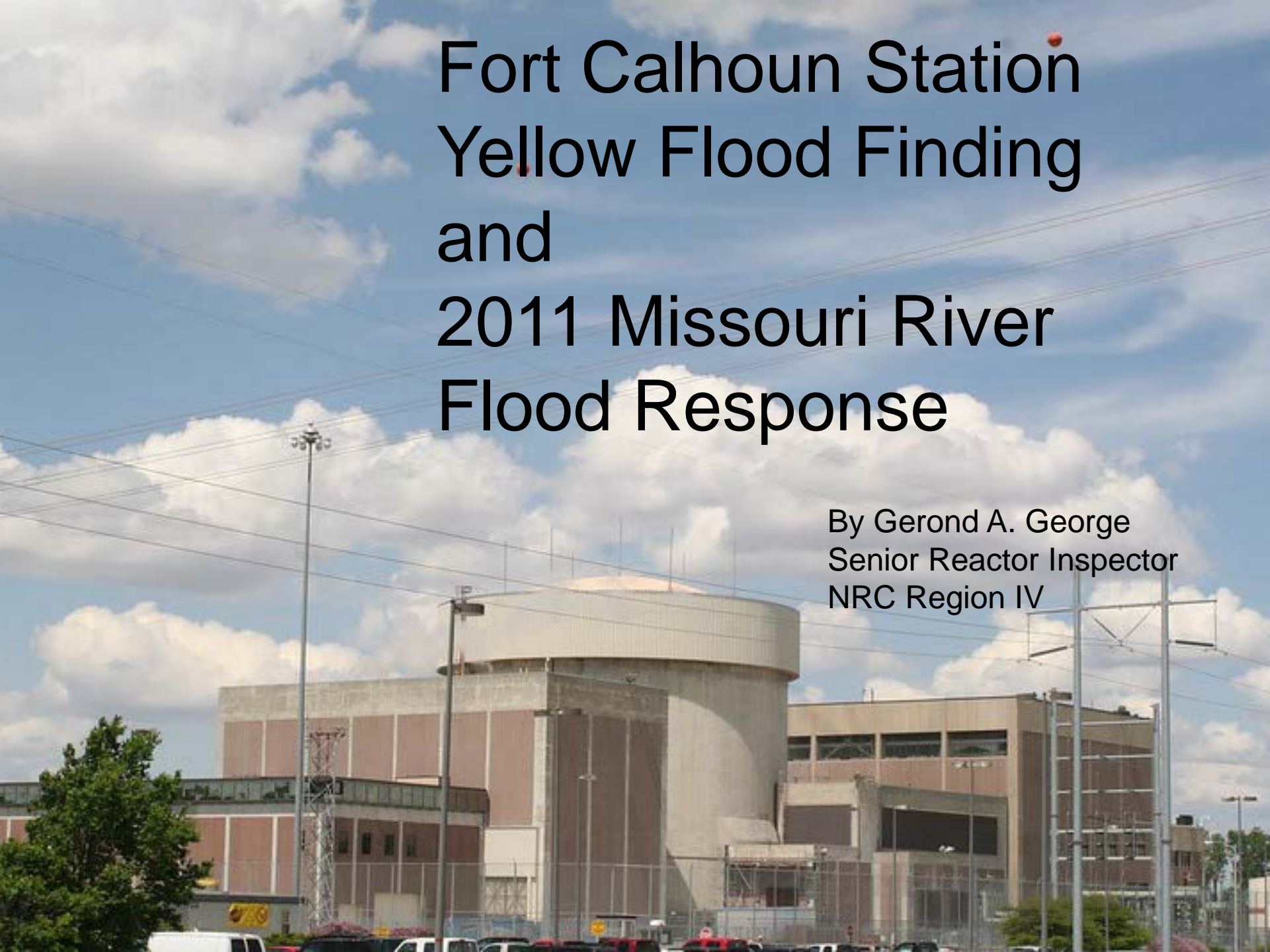


# Fort Calhoun Station Yellow Flood Finding and 2011 Missouri River Flood Response

By Gerond A. George  
Senior Reactor Inspector  
NRC Region IV



# DISCLAIMER

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**“THE PLANT WITHSTOOD THIS  
CHALLENGE INTACT IN LARGE PART  
BECAUSE OF COMMENDABLE  
PERFORMANCE BY NRC INSPECTORS,  
ANALYSTS, AND MANAGERS THE  
PREVIOUS YEAR.”**

*-The NRC and Nuclear Power Plant Safety in 2011: Living on  
Borrowed Time*

*DAVID LOCHBAUM*

*Union of Concerned Scientists*





# Fort Calhoun Station

Licensee: Omaha Public Power District  
Combustion Engineering 1500 MWt (478 Mwe)

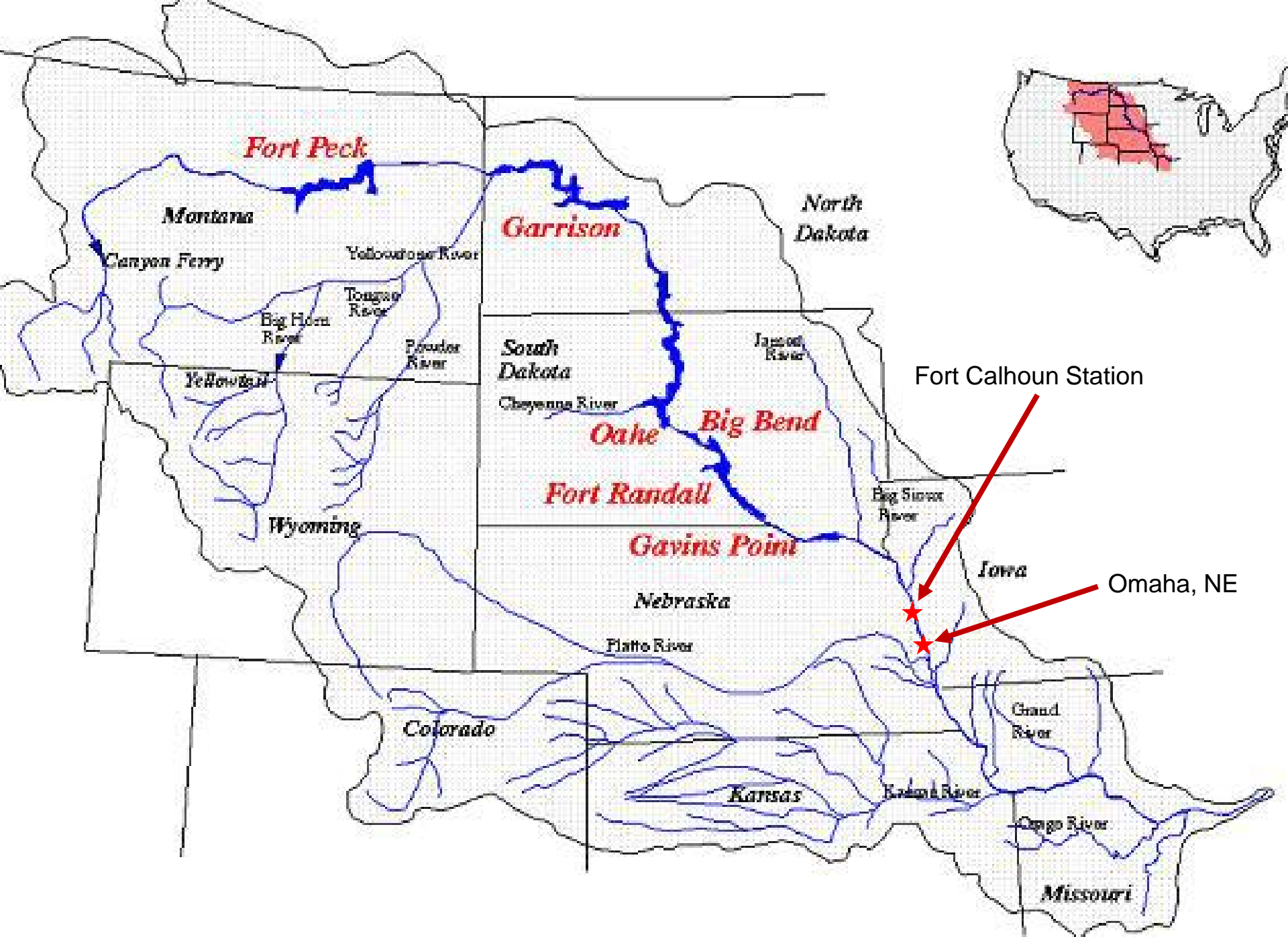
Construction: 1966-1973

Cost: \$175 Million (est. 2022, \$1.15 Billion)

Operation: 1973-2016

Currently in Decommissioning







# Design and Licensing Basis for Flood Protection at FCS



- Construction and Design Licensing was completed under the Atomic Energy Commission
  - 10 CFR Part 100, “Reactor Site Criteria”
  - “1967 Draft Design Criteria”(now App A to 10 CFR Part 50)
- No Regulatory Guides or Standard Review Plan guidance were available to aid licensing reviews.
- AEC’s design basis decisions were made through letters, telephone, and meetings.
- For “Pre-GDC” plants, these decisions are usually preserved in the PSAR, FSAR, FSAR Questions, Safety Evaluation Report, and associated references.



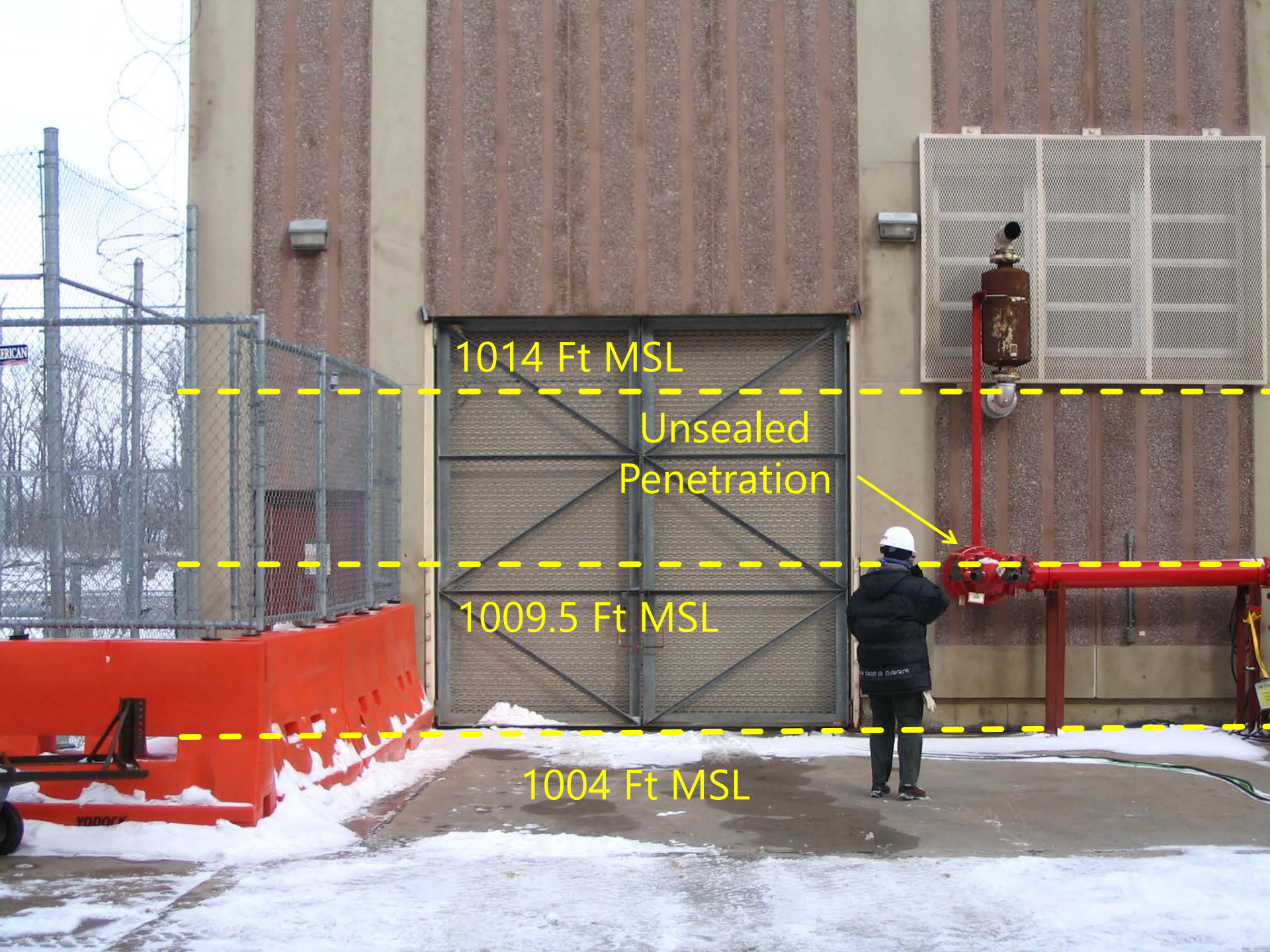
# Design and Licensing Basis for Flood Protection at FCS

- Design basis flood levels for Fort Calhoun Station were established through correspondence between OPPD and US Army Corps of Engineers, reflected in PSAR, FSAR and SER. These were:
  - 1004.2 feet MSL - 1/1000 year flood level (base level of the site)
  - 1009.3 feet MSL - Probable Maximum Flood (Rainstorm plus Gavins Point Dam peak discharge)
  - 1014 feet MSL – Failure of upstream dams
- These values and protective actions were translated into the Technical Specification and Abnormal Operating Procedures.









1014 Ft MSL

Unsealed  
Penetration

1009.5 Ft MSL

1004 Ft MSL







THE **Sandbagger** U.S. PATENT NO. 5437318

800-770-Sand







SAFETY  
FIRST

✓	HEARING PROTECTION REQUIRED
✓	NOISE GUARANTEED - MINIMUM
✓	EYE PROTECTION REQUIRED
✓	HAZARD ALERT - NOISE

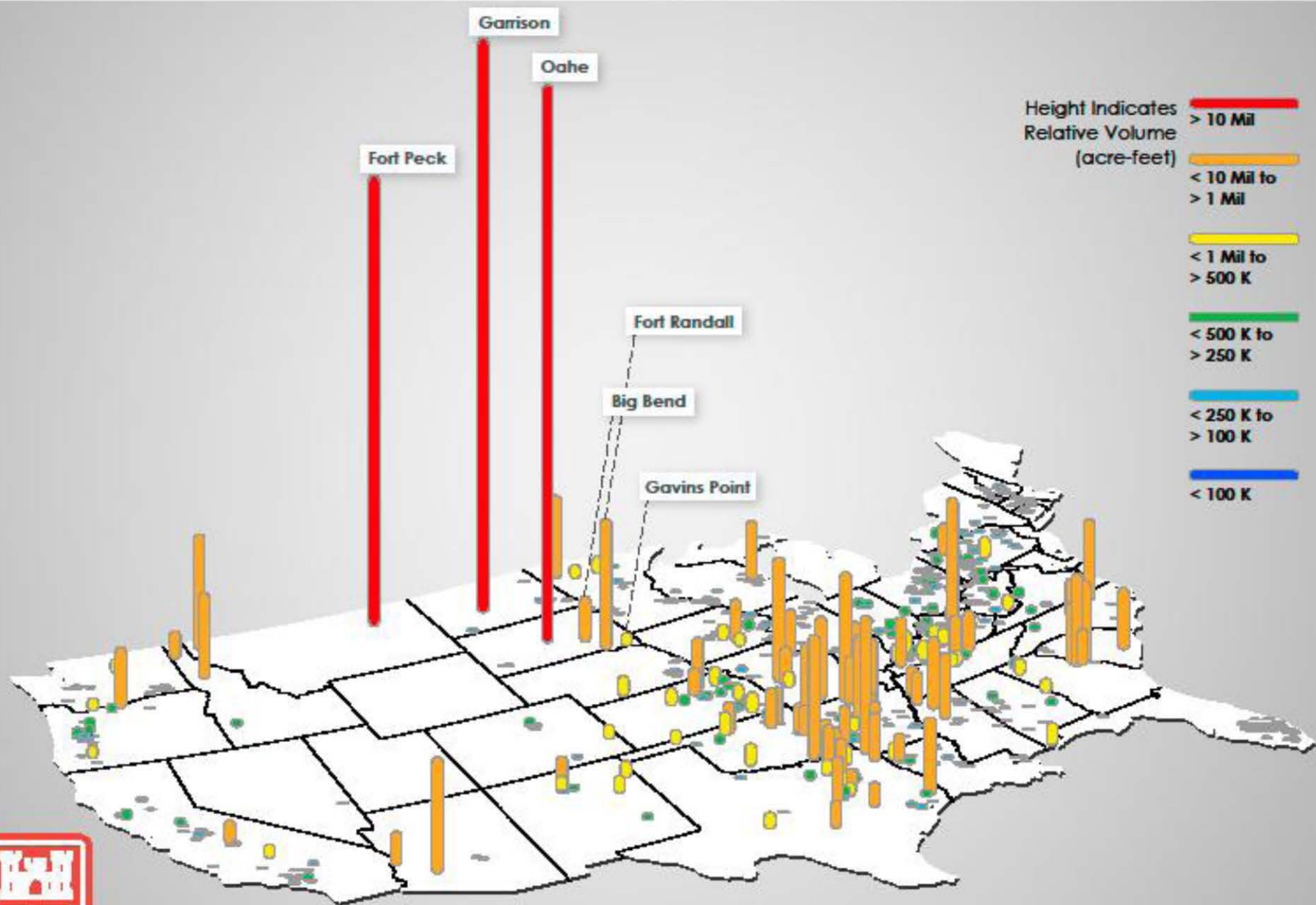
DOOR IS-1

ALL WORK IS BEING DONE  
IN ACCORDANCE WITH  
THE CODES

NO GLOVES ARE REQUIRED  
When it is necessary



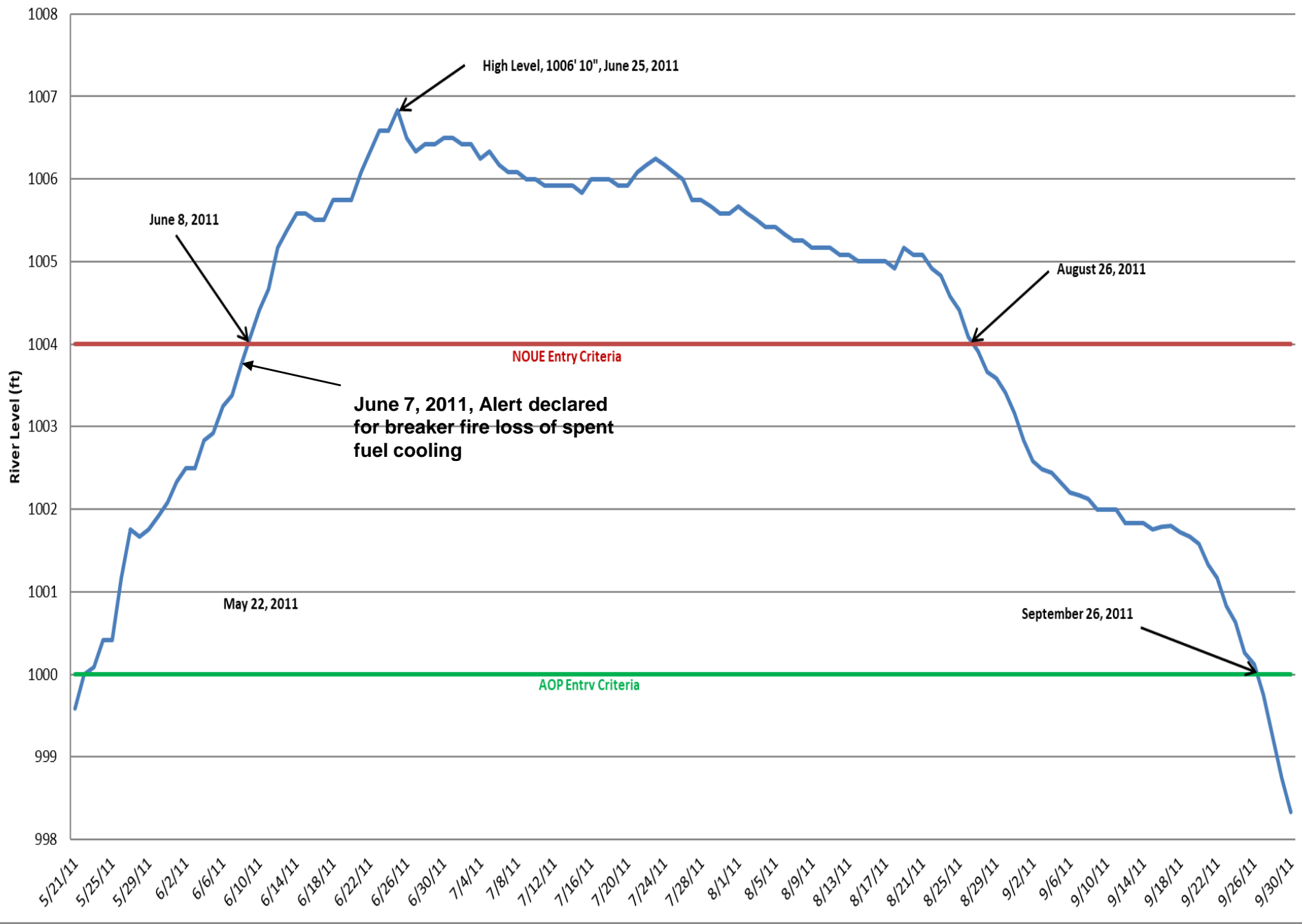
# Storage Capacity of Corps Reservoirs



US Army Corps of Engineers  
**BUILDING STRONG**



# River Level



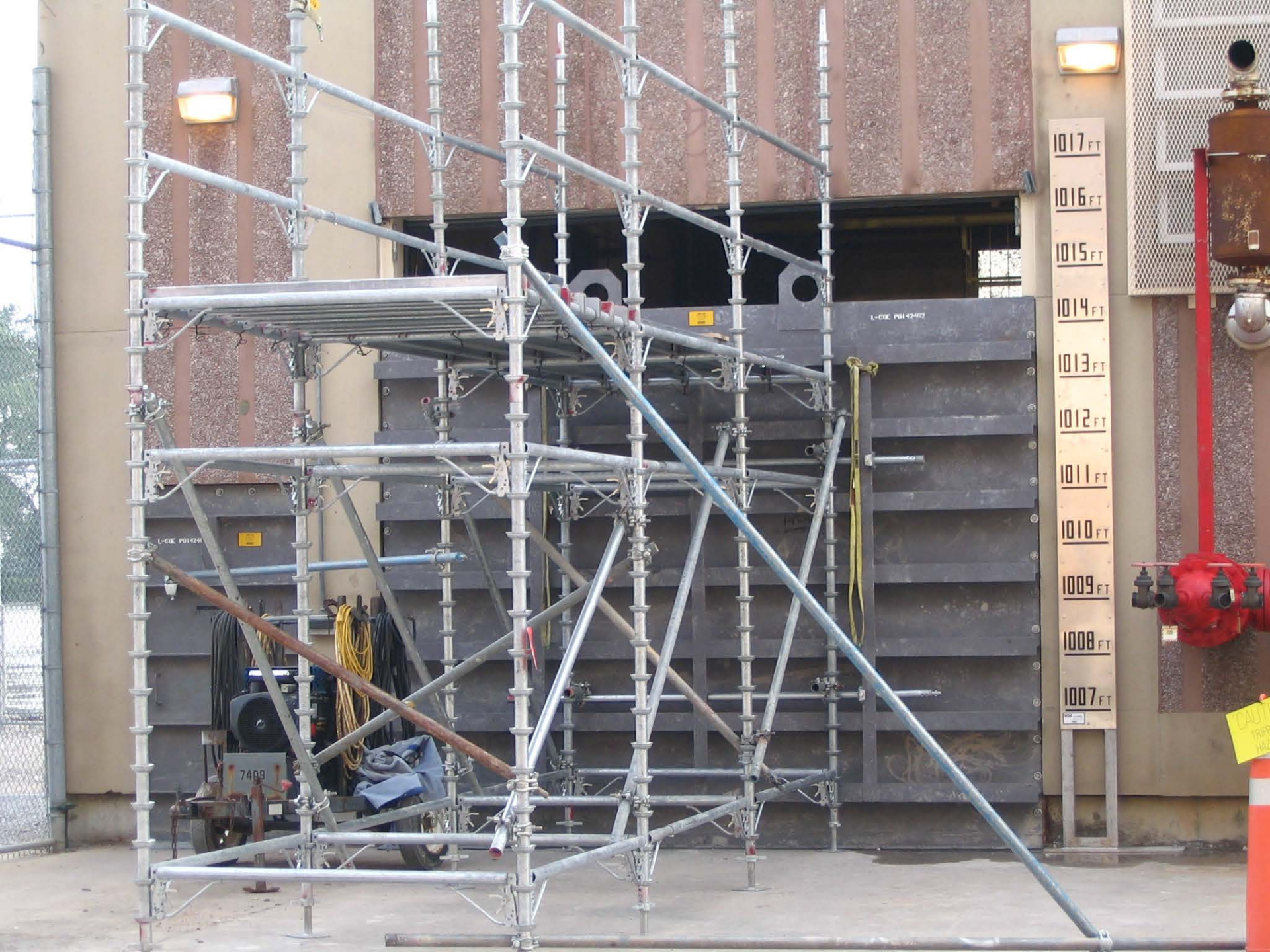
# NRC Emergency Response

- Fort Calhoun was in an extended outage at the time of event.
- Response Mode: “NORMAL”
  - Augmented Resident Staff for 24-hour coverage
  - 2 Residents, 3 additional inspectors, and Branch Chief
  - Late May 2011 to Late August 2011
- Suspended the Baseline inspection program
- Postponed supplemental IP 95002 inspection for the Yellow Flood Finding
- Inspectors shifted from identifying performance deficiencies to identifying industrial hazards that could harm flood protection.













Number - 8-  
FB33-1136

Det. 04

**PRESRAY**  
WASSAIC, NEW YORK



**AE-28**  
AUX BUILDING  
DOOR TO 1st  
FLOOD BARRIER



















08/10/2011 09:56

















08/09/2011 13:52



# *Insights for Enhancing Flood Protection and Risk Assessment*

1. *Rivers Change*
2. *Experience with Sandbags*
3. *Maintenance of Structures and Barriers during the Event*
4. *Potential Hazardous Attitudes and Stress*























[Video](#)













# Hazards

[Video](#)









[Video](#)









[Video](#)



# Aftermath

**Recovery activities began in September 2011. NRC issued a Confirmatory Action Letter to codify flood recovery commitments and restart checklist.**

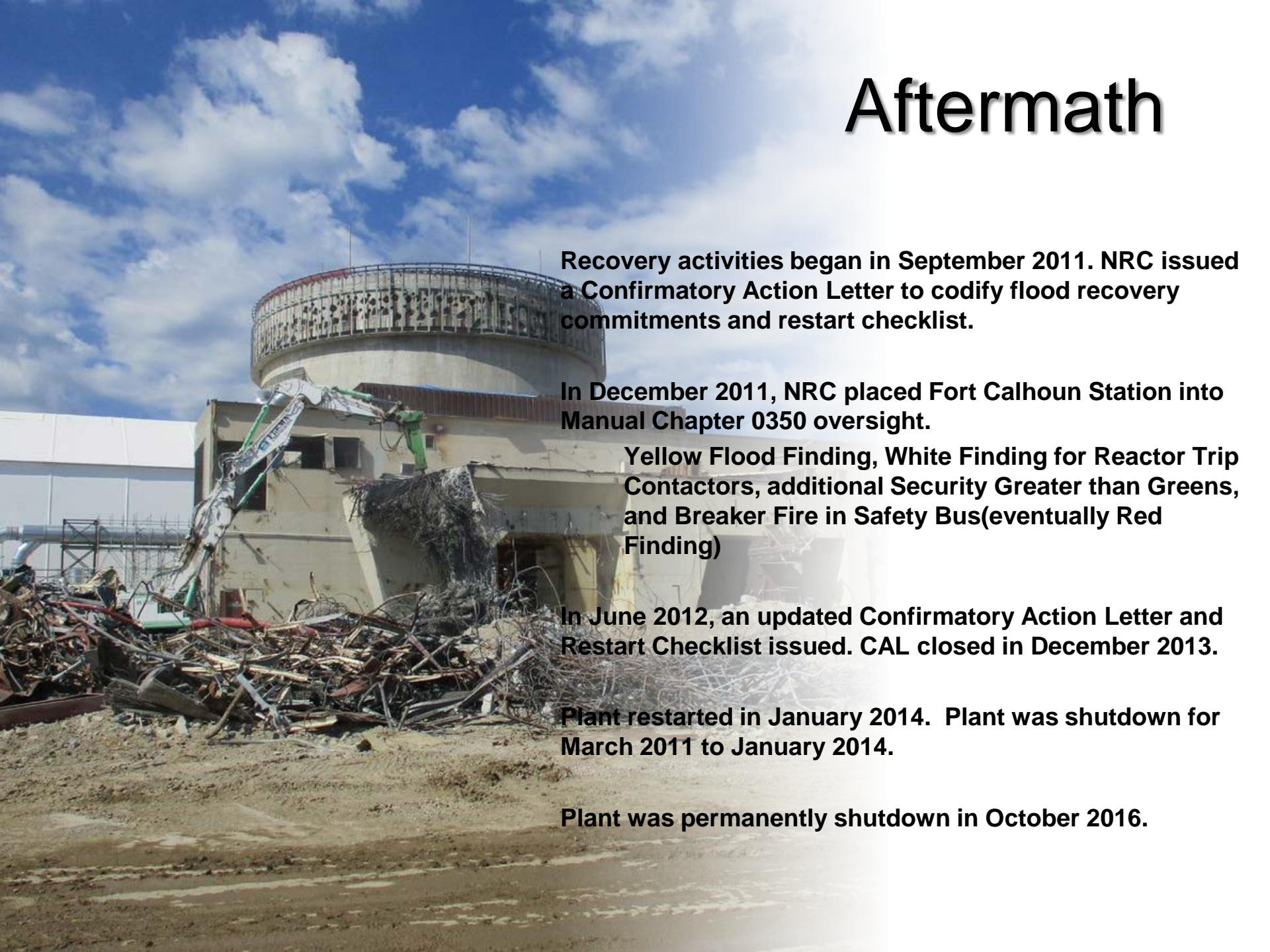
**In December 2011, NRC placed Fort Calhoun Station into Manual Chapter 0350 oversight.**

**Yellow Flood Finding, White Finding for Reactor Trip Contactors, additional Security Greater than Greens, and Breaker Fire in Safety Bus(eventually Red Finding)**

**In June 2012, an updated Confirmatory Action Letter and Restart Checklist issued. CAL closed in December 2013.**

**Plant restarted in January 2014. Plant was shutdown for March 2011 to January 2014.**

**Plant was permanently shutdown in October 2016.**





*Contact Info:*

*Gerond George*

*NRC Region IV*

*Gerond.George@nrc.gov*

*8172001562*