Re-evaluating Flood Hazard Designs at Critical Infrastructure along the Mississippi River

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Presented by: Christine Suhonen on October 25, 2016

GZA GeoEnvironmental, Inc.
OUTLINE

1. The problem
2. The site’s hydrologic setting
3. GZA’s approach
4. Lessons learned
Problem

Is the site protected from the Probable Maximum Flood?

A flood resulting from the most severe combination of hydrologic and meteorological conditions that are considered reasonably possible.
BACKGROUND

Area of Interest

Mississippi River

Site Is Located Here

Mississippi River Watershed
Hydrologic Setting
BACKGROUND

Hydrologic Setting
Hydrologic Setting

Fuse Plug Levee (levee breaks when water overtops it)
BACKGROUND

Hydrologic Setting

Owned and operated by:

US Army Corps of Engineers®
BACKGROUND

History of Mississippi River Flooding

Note: Inundation extents are estimated. Provided by USACE Mississippi Valley Division, June, 2011.
Provided by USACE. Flows are in 1,000s of cubic feet per second.
Project Design Flood

Red River
- 350
- Old River Control Structure
- 620
- Atchafalaya River

Mississippi River
- 2,720
- Morganza Spillway
- 600
- Baton Rouge
- 2,100
- New Orleans
- 1,500
- 1,250
- Bonnet Carre Spillway (flow goes to Lake Pontchartrain)

Fuse Plug Levee (flow comes back to Atchafalaya River)

Provided by USACE.
**APPROACH**

Calculate PMF Flow

\[
PDF = 40\% \text{ to } 60\% \text{ of } PMF
\]

Rearrange

\[
PMF = 2.5 \times PDF
\]
Project Design Flood

Provided by USACE.
Calculate PMF Elevation

HEC-RAS computer program (used to model 1-dimensional flow)
APPROACH

Calculate PMF Elevation
Calculate PMF Elevation

Levee modelled as division between two channels. Flow that overtops this levee can travel between the two channels.

Conservative simplification was used as part of the Hierarchal Hazard Assessment.

Atchafalaya River

Mississippi River

(Looking North, Vertical Scale Exaggerated)
APPROACH

Calculate PMF Elevation
Results

Elevation and Flow in Atchafalaya River.

Elevation and Flow in Mississippi River.

(Looking North, Vertical Scale Exaggerated)
Results
• Adding details to a model can be time consuming
• Focus on the model components that have the largest effect on your result
• Use conservative simplifications (i.e. Hierarchal Hazard Assessment)

• Avoid building critical infrastructure where almost half of the contiguous USA drains to.
Thank You!

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