

# ELLICOTT CITY NONSTRUCTURAL FLOOD PROOFING STUDY

## NONSTRUCTURAL FLOOD PROOFING IN HISTORICALLY SIGNIFICANT AREAS

13<sup>th</sup> Annual MAFSM Conference

Maritime Institute| Linthicum Heights, MD

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*“The views, opinions and findings contained in this report are those of the authors(s) and should not be construed as an official Department of the Army position, policy or decision, unless so designated by other official documentation.”*



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of Engineers.**



# PRESENTATION AGENDA

1. Need for Nonstructural Flood Proofing
2. Nonstructural Flood Proofing Process
3. Historic Ellicott City Examples
4. USACE Programs
5. Questions & Discussion



# WHAT IS NONSTRUCTURAL FLOOD PROOFING?

## Physical:

- Elevation, Relocation, Buyout / Acquisition, Dry Flood Proofing, Wet Flood Proofing

## Nonphysical:

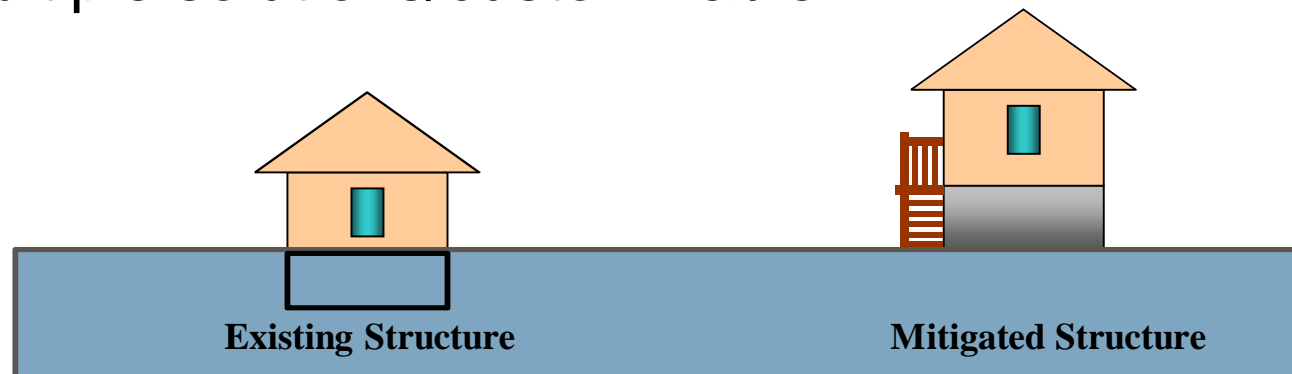
- Flood Warning Systems, Flood Insurance, Floodplain Mapping, Flood Emergency Preparedness Plans, Land Use Regulations, Zoning, Evacuation Plans, Risk Communication

**FOCUS ON REDUCING CONSEQUENCES, NOT PROBABILITY OF FLOODING**



# NEED FOR NONSTRUCTURAL FLOOD PROOFING

- Reduce flood damages
- Typically less expensive than structural solutions
- Structures are protected individually
- Implementable in phases
- Multiple solutions/customizable



# USACE RECENT STUDIES

- City of Annapolis, MD
- Washington Navy Yard, DC
- Baltimore City, MD
- **Ellicott City, MD**



*\* Growing requests for nonstructural flood proofing in historic areas*

# What is our process?



## Flood Characteristics (Modeling)

- Depth/velocity
- Duration/rate of rise
- Debris/wave impacts
- Floodplain

## Site Characteristics (GIS)

- Location/land use
- Topography/soil type

## Structure Characteristics (Site Visit)

- Type of construction/materials
- Condition
- Elevation/locations of openings
- Historic value



# Additional Historic Considerations

- Community Interaction
- Local Ordinances/ Building Codes
- State Preservation Officials
- National Historic Preservation Act - Section 106



**EARLY  
COORDINATION IS  
THE KEY !**

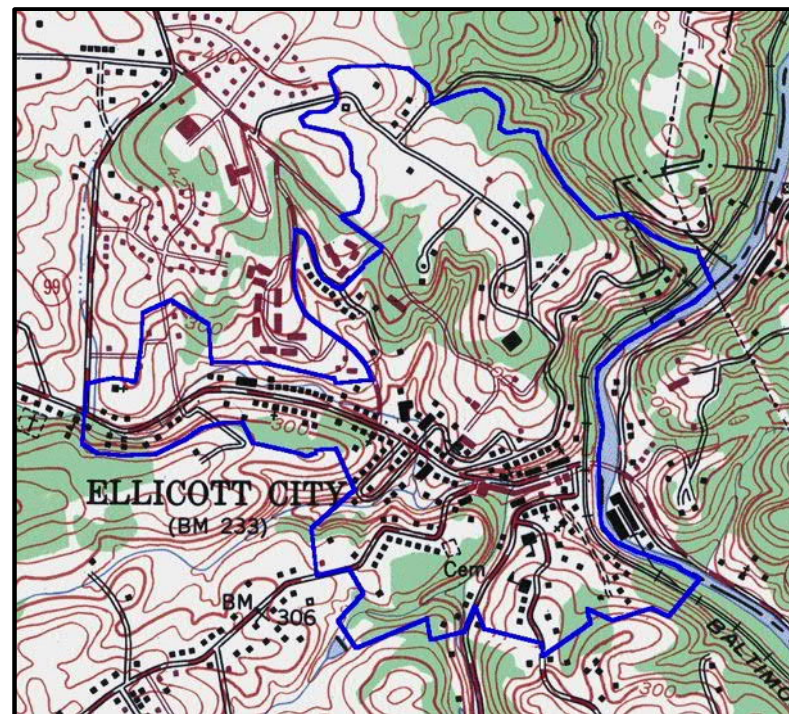
# ELLICOTT CITY, MD STUDY

## Unique Study Area

- High flood vulnerability
- Historic district
- Little warning time

## Prototypical Buildings

- Key building features
- Flood risk



*Maryland National Register Properties  
(MHT)*



# Dry Flood Proofing – County Welcome Center



# Dry Flood Proofing – County Welcome Center

## Key Building Features:

- Stone masonry construction
- Recent addition on rear of structure
- Flood from multiple sides



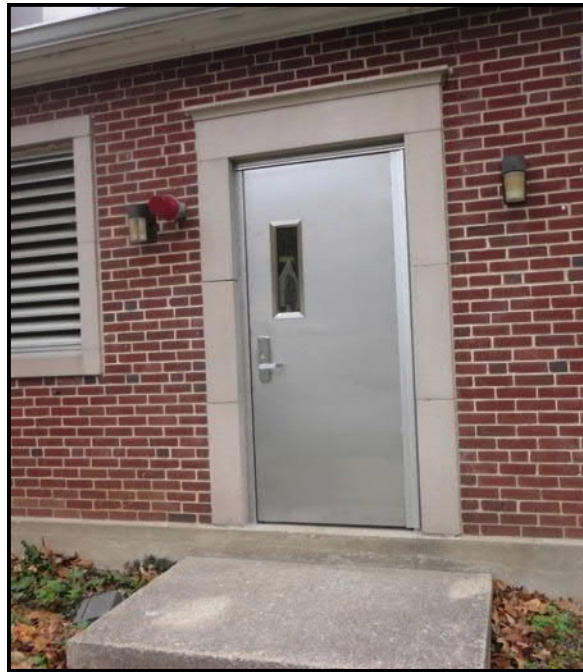
## Considerations:

- Doors/exterior
- Interior contents





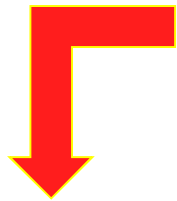
# Flood Barriers for Doors and Windows



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# Dry Flood Proofing – County Welcome Center



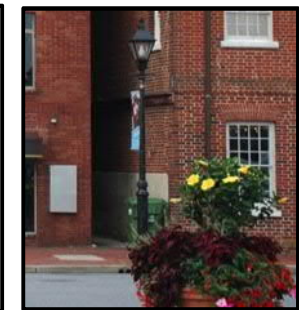




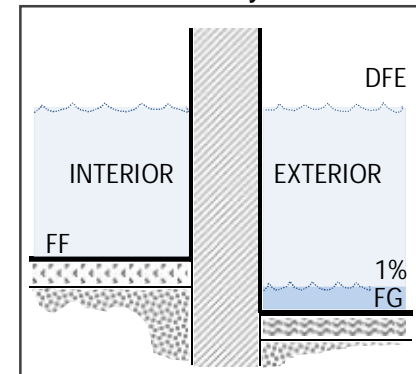
**Historic Annapolis Museum**  
99 Main Street



Rear Equipment/Exit Stair



Alley



**BUILDING SECTION (at Grade)**  
Not to Scale





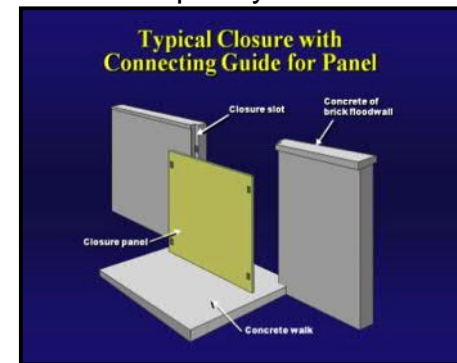


Historic Annapolis Museum  
99 Main Street

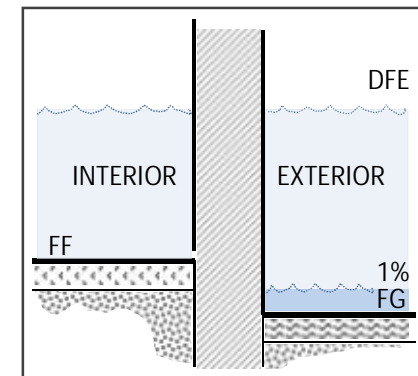


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Temporary Barrier



Closure/Shield



BUILDING SECTION (at Grade)

Not to Scale



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# Dry Flood Proofing – Historic Storefront

## Key Building Features:

- Masonry construction with wooden storefront windows
- Ceiling height

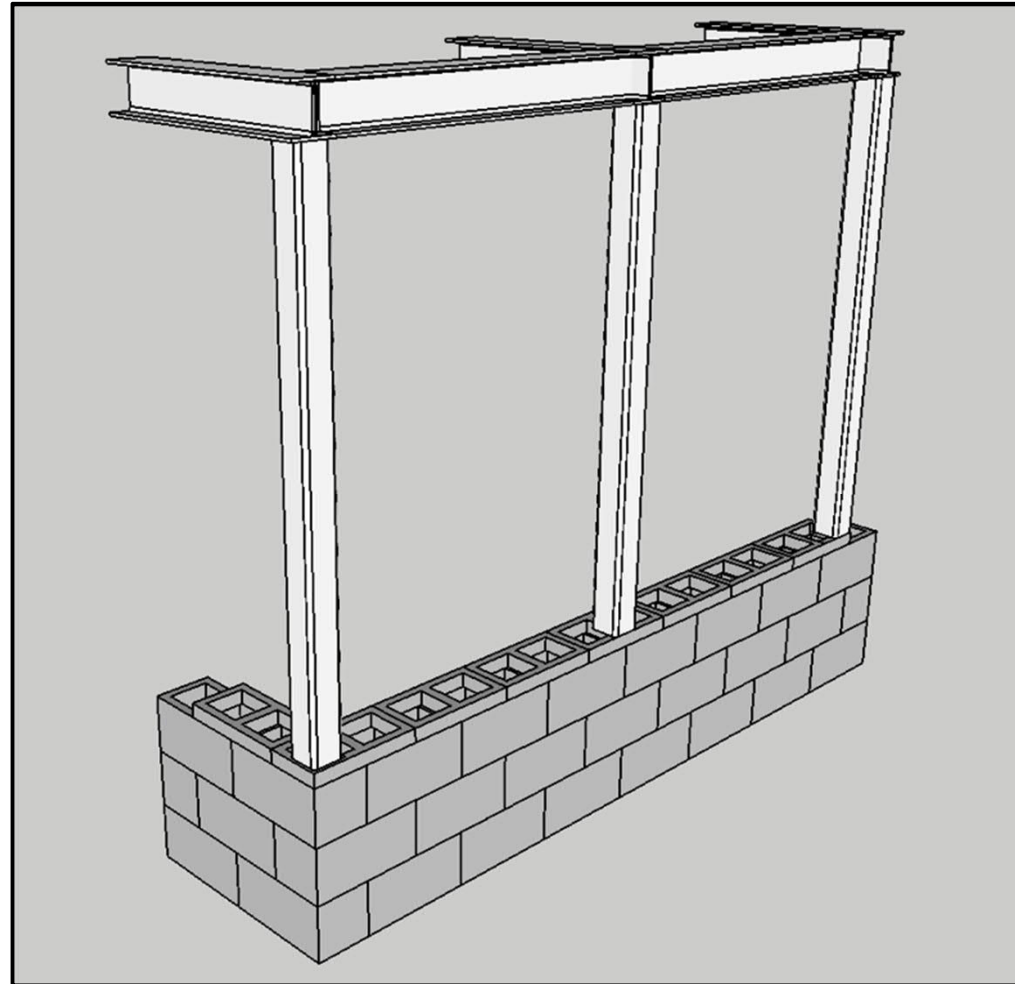
## Considerations:

- Strengthening of window frames with minimal aesthetic impact





# Historic Storefront – Structural Reinforcing Concept



# Historic Storefront – Structural Reinforcing Concept





# Wet Flood Proofing





# Wet Flood Proofing

## Key Building Features:

- Masonry construction below first floor
- Depth of flooding
- Unoccupied basement/limited mechanical equipment

## Considerations:

- Placement of flood vents



# Elevation and Flood Proofing within a Historic Structure





# Elevation – Duplex

## Key Building Features:

- Detached structure
- Wood frame

## Considerations:

- Foundation materials
- Adjacent building layout



# Elevation Methods



**Elevation on Extended Foundation Walls**



**Elevation on Fill**



**Elevation on Piles**





# Elevation of External Utilities





# Relocation – Historic Log Cabin

## Key Building Features:

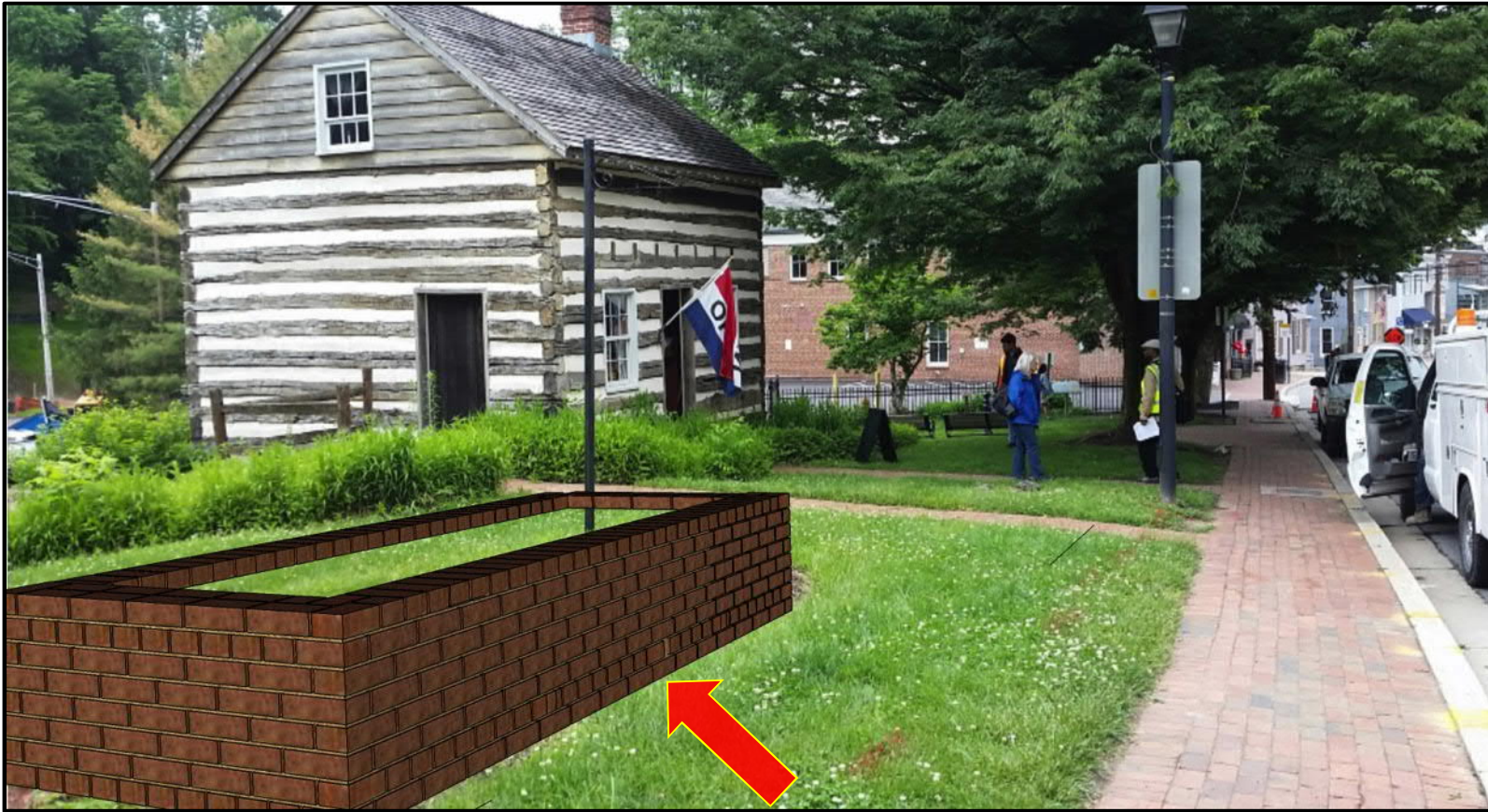
- Depth of flooding/  
dynamic effects
- *Risk of debris damage*
- Small, detached  
structure
- Timber construction

## Considerations:

- Community significance
- Previous relocation



# Debris Barriers



*Reinforced planter box*



# Debris Barriers cont.



*Bollards behind porch*



# NATIONAL FLOOD BARRIER TESTING & CERTIFICATION PROGRAM

- **Test products in four categories**
  - Temporary Barriers, Closure Devices, Backwater Valves, and Flood Mitigation Pumps
- Water forces, material properties, and consistency of product manufacturing

<http://nationalfloodbarrier.org/>



# USACE PROGRAMS

## Technical Assistance

- Planning Assistance to States (PAS)
- Flood Plain Management Services (FPMS)
  - Silver Jackets National Program

## Design and Construction Programs

- General Investigations (GI)- large projects
- Continuing Authorities Program (CAP)- small projects

## USACE Nonstructural Flood Proofing Committee





# QUESTIONS & DISCUSSION

## Points of Contact

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# THANK YOU!

