ELLICOTT CITY NONSTRUCTURAL FLOOD PROOFING STUDY

OUTBRIEF

USACE Project Team
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21 February 2018

“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.”
SCOPE OF THE STUDY

• Agreement signed under *Flood Plain Management Services (FPMS) Program* - 29 September 2016

• **TASK 1**: Data Collection
• **TASK 2**: Assess Flood Proofing Applicability
• **TASK 3**: Building Surveys
• **TASK 4**: Evaluation of Flood Proofing Measures
• **TASK 5**: Preliminary Economic Analysis
• **TASK 6**: Flood Action Plan
• **TASK 7**: Outreach
30 JULY 2016 STORM

Doppler estimated rainfall for flash flood event July 30. (Jordan Tessler)
RAINFALL AND FLASH FLOODING SATURDAY NIGHT

<table>
<thead>
<tr>
<th>Duration</th>
<th>Rainfall Total</th>
<th>Time</th>
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<tr>
<td>1 minute</td>
<td>0.20”</td>
<td>7:51-7:52 pm</td>
</tr>
<tr>
<td>5 minutes</td>
<td>0.80”</td>
<td>7:50-7:55 pm</td>
</tr>
<tr>
<td>10 minutes</td>
<td>1.44”</td>
<td>7:50-8:00 pm</td>
</tr>
<tr>
<td>15 minutes</td>
<td>2.04”</td>
<td>7:46:8:01 pm</td>
</tr>
<tr>
<td>20 minutes</td>
<td>2.48”</td>
<td>7:44-8:04 pm</td>
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<tr>
<td>30 minutes</td>
<td>3.16”</td>
<td>7:36-8:06 pm</td>
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<tr>
<td>60 minutes</td>
<td>4.56”</td>
<td>7:30-8:30 pm</td>
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<tr>
<td>90 minutes</td>
<td>5.52”</td>
<td>7:00-8:30 pm</td>
</tr>
<tr>
<td>2 hours</td>
<td>5.92”</td>
<td>6:45-8:45 pm</td>
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</table>

The storm total rainfall at Ellicott City was 6.50 inches. Based on the preliminary precipitation frequency estimates in NOAA Atlas 14 from the nearest location, the rainfall amounts with duration 10 minutes to 2 hours statistically have a less 0.1% chance of occurring in any given year, or a 1 in 1000 year event.
WHAT IS NONSTRUCTURAL FLOOD PROOFING?

Physical:
• Elevation, Relocation, Buyout / Acquisition, Dry Flood Proofing, Wet Flood Proofing

Nonphysical:

FOCUS ON REDUCING CONSEQUENCES, NOT PROBABILITY OF FLOODING
DRY FLOOD PROOFING

- Outer barrier to prevent water from entering building
  - *Typically 3-4 ft. max*
DRY FLOOD PROOFING: DOOR CLOSURES

Flood Doors

Door Panels

Window Panels
WET FLOOD PROOFING

- Allow water to pass through the structure
  - *Elevate valuables*
ELEVATION

Elevation on Extended Foundation Walls

Elevation on Fill

Elevation on Piles
PASSIVE VS ACTIVE MEASURES

PASSIVE
Little warning time
- Flood proof doors
- Building elevations
- Wet flood proofing

ACTIVE
Require labor and warning time
- Panel door closures
FACTSHEETS IN APPENDIX

NONSTRUCTURAL FLOOD RISK MEASURES

FACTSHEETS

Prepared by: U.S. Army Corps of Engineers, Baltimore District
P.O. Box 1715
Baltimore, Maryland 21203-1715
NEED FOR NONSTRUCTURAL FLOOD PROOFING

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

Existing Structure  Mitigated Structure
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
FLOOD CHARACTERISTICS

- **FEMA**: 1% annual chance (100-yr) and 0.2% annual chance (500-yr) flood maps
- **McCormick Taylor**: 2-D Modeling results

30 July 2016 Storm 2-D Model
BUILDING ELEVATION FIELD SURVEY

- **Elevations**
  - Low Opening
  - First Floor
  - Lowest Adjacent Grade
  - (LAG)

- **Structure Data**
  - Photos
  - Condition
  - Value
  - Building Material
BUILDING ELEVATION FIELD SURVEY (FEB 2017)
BUILDING ELEVATION FIELD SURVEY (FEB 2017)

- 80 buildings surveyed
  - 66 commercial
  - 10 residential
  - 4 public

Microsoft Access Database
NONSTRUCTURAL FLOOD PROOFING FIELD ASSESSMENT

- 16 Example Buildings
- *Considerations:*
  - Volunteered Buildings
  - Historic Status
  - Usage
    - (Commercial v Residential)
  - Architectural Features
SELECTED BUILDINGS

1- 8000 Main Street
2- 8044 Main Street
3- 8068 Main Street
4- 8085 Main Street
5- 8092 Main Street
6- 8202 Main Street
7- 8267 Main Street
8- 8344 Main Street
9- 8358 Main Street
10- 8350 Main Street
11- 8398 Main Street
12- 8512 Main Street
13- 8572 Main Street
14- 8600 Frederick Road
15- 8602 Frederick Road
16- 8637 and 8639 Frederick Road
HISTORIC PRESERVATION

- Property Owner Interaction
- Local Ordinances/ Building Codes (County)
- State and Local Preservation Officials

EARLY COORDINATION IS THE KEY!
SELECTED BUILDINGS

8000 Main Street

8044 Main Street

8069 Main Street

8085 Main Street
SELECTED BUILDINGS

8092 Main Street

8202 Main Street

8267 Main Street

8344 Main Street
SELECTED BUILDINGS

- 8572 Main Street
- 8602 Frederick Road
- 8600 Frederick Road
- 8637 & 8639 Frederick Road
CONCEPT SHEET EXAMPLES

• 8000 Main Street (Law Office)*
• 8069 Main Street (Glass Shop/ Antique Shop)
• 8202 Main Street (Howard House)
• 8267 Main Street (Visitors Center)
• 8300 Main Street (Log Cabin)
• 8637 & 8639 Frederick Road (Residential Duplex)

EXAMPLE CONCEPT SHEETS
8069 Main Street - Glass Shop and Antique Store

Key Building Features:
- Floor retrofitted with concrete slab
- Stone masonry/ wood frame construction
- Multiple commercial tenants
- Located directly over the stream

Considerations:
- Doors/exterior
- Storefront glass windows
Dry + Wet Flood Proofing 8069 Main Street

- Interior Flood Gate
- Structural Window
- Stoplog Panels
- Louvers
8267 Main Street- Visitors Center

Key Building Features:
• Stone masonry construction
• Finished and occupied basement
• Flooding from multiple directions
• Exterior utilities

Considerations:
• MHT Easement
• Doors/exterior
• Interior contents
8267 Main Street- Visitors Center
Dry Flood Proofing- 8267 Main Street
Dry Flood Proofing- 8267 Main Street

Small Wall Around Grate
(Final design should match historic aesthetic)
8367& 8369 Frederick Road- Residential Duplex (Elevation)

Key Building Features:
• BFE+2 >3 ft. above first floor elevation
• Building foundation on stream bank
• Detach duplex structure

Considerations:
• Foundation materials
• Adjacent building layout

Elevate Utilities
Elevate on Foundation

US Army Corps of Engineers.
8358 Main Street - Residential/Commercial (Elevation/ Wet Flood Proofing)
8358 Main Street- Wet Flood Proofing

Key Building Features:
• Masonry construction below first floor
• Significant portion of structure is wood frame
• Unoccupied walkout basement

Considerations:
• Placement of flood vents
8202 Main Street- Howard House

Bollards Hidden Behind Porch

Flood Door Behind Porch
# SUMMARY OF RESULTS

<table>
<thead>
<tr>
<th>Building</th>
<th>Usage</th>
<th>DFE</th>
<th>BFE + 2 ft.</th>
<th>Primary Solution</th>
<th>*Costs</th>
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<tr>
<td>8000 Main St.</td>
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<td>8398 Main St.</td>
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<td>8512 Main St.</td>
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<td>8637&amp;8639 Frederick Rd.</td>
<td>Residential Duplex</td>
<td>255.4</td>
<td>254.9</td>
<td>Elevation</td>
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* Planning construction cost estimates. Costs are subject to change based on final designs.
ECONOMIC ANALYSIS

PRELIMINARY ECONOMIC ANALYSIS BASED ON FUTURE FLOOD DAMAGE REDUCTION ONLY!

- Computed Benefit-to-Cost Ratios (BCRs) for sample bldgs. BCR>1 is considered cost-effective.

Based on Recommendations:
- Passive Dry Flood Proofing: 6/9 had BCR greater than 1
- Active Dry Flood Proofing: 10/11 had BCR greater than 1
- Wet Flood Proofing: 4/4 had BCR greater than 1
- Elevation: 0/6 had BCR greater than 1
FLOOD ACTION PLAN

Recommend general pre-flood actions associated with flood proofing measures

- LIMITED WARNING TIME!!!
- PASSIVE MEASURES MORE EFFECTIVE
- HAVE AN EMERGENCY ACTION PLAN

Image source: Dreamstime.com
NEXT STEPS

• Final Ellicott City Nonstructural Flood Proofing Study Report posted on Howard County website by 2/28/2018
QUESTIONS & DISCUSSION

Points of Contact

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THANK YOU!