Multihazard Mitigation Council Forum

Life-Cycle Performance: Moving Forward to More Resilient Communities
Managing Future Flood Conditions
Stream Restoration Westfield
Westfield Stream Restoration
Presentation Agenda

• Flood History
• Policy Changes and Implementation
  – Proactive – Floodplain Mapping
  – Reactive – Risk Assessment/Risk Reduction
• Questions
In the beginning, creeks were........
Flood History - 1995

- $20M in losses (est.)
Policy History – 1996

• Vision set by the Board
• Creek Use Policy, adopted October 15, 1996
• “....surface waters... are a natural resource to be protected as a source of natural beauty and recreation...”
• “.......all Mecklenburg waters shall be suitable for prolonged human contact.....”
Flood History - 1997

- $60M in losses (est.)
- Flooding outside floodplain
- Majority of homes flooded, again
Pre-2000 Level of Service

• Go buy flood insurance
• 10% discount – you are welcome!!
• We will put you on “the list”
• Unsustainable
Path to Community Resilience

- Change in Storm Water Policies
  - Proactive - Floodplain Development Regulations
  - Reactive – Risk Assessment/Risk Reduction
Floodplain Guidance Document

- Creek Use Policy “…use of creeks…as a storm water disposal method is secondary to preservation of creeks….”
- Strategic Approach to Change Policies
- Floodplain Goals
  - Reduce Loss of Life and Property
  - Enhance Natural and Beneficial Functions
- Six Strategies – challenged tradition
Better Manage FP Development

Land Use Impacts to Floodplain Maps:

- Comparison of Existing land use vs Future landuse floodplains
- “Future (build-out) Floodplain
  – Average increase: +4.3
  – Maximum Increase: +11.0
- Floodway - from 280’ to 410’
- Floodplain - from 430’ to 610’
- Convinced FEMA to Allow Future Floodplains Shown on FIRMs
Shaping Public Policy

- Stakeholders group
- Just the facts, ma’am..
- Plan for the future
- Developers → Engineers → Developers
- Developers → Elected Officials
- Density bonuses, floodplain as open space
- After adoption, quantified losses avoided
Floodplain Regulations and Flood Insurance Rate Map (FIRM)

- FEMA Floodplain (Existing Conditions)
- "Community" Floodplain (Future Conditions)
- FEMA Floodway (0.5’ Floodway)
- Community Encroachment Area (0.1’ Floodway)
Mapping Results

Flooded Structures

32% Increase

FEMA '75  2004  Future

0 500 1000 1500 2000 2500 3000 3500
Mapping Results

Flooded Structures

FEMA '75 2004 Future

59% Increase
Mapping Results

Flooded Structures

Structure Flooding Avoided

FEMA '75 2004 Future

1300
Mapping Results

Losses Avoided (Millions $)

- FEMA '75
- 2004
- Future

$168
Reactive - Storm Water CIP

- Do more than cut vegetation and buy insurance
- Developed Mitigation Plans – GD Strategy
- Golden Rule, based on FEMA criteria
- Need for locally driven Plan
- Guide future CIP
Purpose of the Plan

• Recommend specific flood mitigation techniques at a building level
• Assist in planning and prioritizing future mitigation projects
• Use a dynamic and holistic, risk-based approach
What’s Unique About This Plan

- Determine Individualized Flood Risk
- Develop Public & Private Risk Reduction Actions
- Prioritize Flood Mitigation Projects
- Implement Balanced Flood Mitigation Capital Program
Datasets used in the Plan

- Floodplains/Floodways
- Multi-frequency floodzones
- Water surface/depth grids
- High velocity zones
- Elevation Certificates
- Tax, building, & parcel data
- Aerial & Ortho photos
- Local planning data
- Storm drain inventory
Flood Risk Property Score

- Part of a larger Flood Risk Scoring System
- Relative indicator of a property’s risk
- Analyzes factors related to flood impacts, storm frequency and structure location
Flood Risk Factors

- Finished Floor Elevation (living space)
- Frequency of flooding
- Location within the floodplain (including velocity zones)
- Critical Facility
- Mechanical and electrical systems
- Vehicles
- Ingress/egress from the building and property
- Exterior improvements (detached garages, sheds, pools, etc.)
- Number of dwelling units impacted
Flood Risk Example

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Impact-based Factors</th>
<th>Storm Event</th>
<th>Points*</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Flooding above the lowest finished floor of a building</td>
<td>N/A</td>
<td>0</td>
</tr>
<tr>
<td>B</td>
<td>Flooding of electrical and/or mechanical equipment</td>
<td>25-yr</td>
<td>48</td>
</tr>
<tr>
<td>C</td>
<td>Flood water is touching a portion of the building</td>
<td>10-yr</td>
<td>100</td>
</tr>
<tr>
<td>D</td>
<td>Property is completely surrounded by flood water</td>
<td>25-yr</td>
<td>44</td>
</tr>
<tr>
<td>E</td>
<td>Structure is completely surrounded by flood water</td>
<td>25-yr</td>
<td>20</td>
</tr>
<tr>
<td>F</td>
<td>Structure is completely surrounded by flood water and is a critical facility</td>
<td>N/A</td>
<td>0</td>
</tr>
<tr>
<td>G</td>
<td>Structure is completely surrounded by flood water and is multi-family residential</td>
<td>N/A</td>
<td>0</td>
</tr>
<tr>
<td>H</td>
<td>Flood water touching building with structural damage as a result of cumulative flooding</td>
<td>N/A</td>
<td>0</td>
</tr>
<tr>
<td>I1</td>
<td>Flooding of significant exterior property improvements</td>
<td>10-yr</td>
<td>60</td>
</tr>
<tr>
<td>I2</td>
<td>Flooding of moderate exterior property improvements</td>
<td>N/A</td>
<td>0</td>
</tr>
<tr>
<td>J</td>
<td>Flooding around area where single-family residential vehicles are typically parked</td>
<td>10-yr</td>
<td>60</td>
</tr>
<tr>
<td>K</td>
<td>Flooding of any yard (any portion of parcel)</td>
<td>2-yr</td>
<td>15</td>
</tr>
<tr>
<td><strong>Total Impact-based Score</strong></td>
<td></td>
<td></td>
<td><strong>347</strong></td>
</tr>
</tbody>
</table>

* Points are determined using the matrix provided in Appendix D.

<table>
<thead>
<tr>
<th>Multiplier</th>
<th>Location-based Factors</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1.5</td>
<td>Building located in high danger depth-velocity zone</td>
<td>No</td>
</tr>
<tr>
<td>1.3</td>
<td>Building located in medium danger depth-velocity zone</td>
<td>Yes</td>
</tr>
<tr>
<td>1.3</td>
<td>Building located near area impacted by frequent storm drainage overflows</td>
<td>No</td>
</tr>
<tr>
<td>1.1</td>
<td>Building located in Community Encroachment Area</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Flood Risk Property Score = 347 x 1.3 = 451
Risk Reduction Recommendations

• Guide for public and private flood mitigation activities

• Analyzes the effectiveness and appropriateness of flood mitigation techniques for each building
19 Mitigation Techniques

1. Acquisition and Demolition
2. Demolition and Rebuild
3. Acquisition and Relocation
4. Acquisition, Demolition/Relocation, and partial Re-sale
5. Structure Elevation
6. Abandon Basement and Fill
7. Full Dry Floodproofing
8. Full Wet Floodproofing
9. Audible Flood Warning System
10. Storm Water Detention Facilities
11. Storm Water System Control
12. Automated Flood Notifications
13. Public Education
14. Flood Insurance
15. Levee/Floodwall
16. Protecting Service Equipment
17. Partial Dry Floodproofing
18. Partial Wet Floodproofing
19. Ring Levee/Wall/Berm
Recommendation Categories

• Each mitigation technique is evaluated and placed into one of four categories:

- **Not Recommended**
  The minimum criteria for the mitigation technique is not met. Therefore, the technique is likely not feasible, effective, or may be cost prohibitive.

- **Further Evaluation Needed**
  The minimum criteria for the mitigation technique is met but further evaluation or additional data is needed to determine if the technique is a viable option.

- **Effective**
  The mitigation technique was determined to be feasible and effective by exceeding the minimum criteria and meeting all of the criteria for this category.

- **Highly Effective, Recommended**
  The mitigation technique was determined to be highly effective by exceeding the criteria for the effective category and meeting all of the requirements for this category. This category was developed to identify techniques that were highly effective in reducing risk or have additional community benefit.
### Evaluation Process

<table>
<thead>
<tr>
<th>Technique</th>
<th>Further Evaluation Needed (Minimum Criteria)</th>
<th>Effective</th>
<th>Highly Effective, Recommended</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Property Acquisition and Structure Demolition (BUYOUT)</td>
<td>1 Structure is pre-FIRM OR Structure is post-FIRM and has finished floor elevation lower than the Flood Protection Elevation 2 Property has Risk Score ≥ 300</td>
<td>1 Property is located adjacent to publicly owned land</td>
<td>1 Property is located at potential water quality capital improvement site</td>
</tr>
<tr>
<td>2 Structure Demolition and Rebuild (DEMO REBUILD)</td>
<td>1 Land area outside the FEMA Floodway is large enough to accommodate 1.5x the footprint of the structure (to account for setbacks) 2 Land area outside the high velocity zone is 1.5x the footprint of the structure</td>
<td>1 Land area outside the water quality buffer is large enough to accommodate 1.5x the footprint of the structure 2 Building tax value is ≤ $30,000 3 Building grade is Below Average 4 Land tax value is ≥ 3x the building tax value</td>
<td>1 Property is not surrounded by water during the FEMA Base Flood 2 Property is not located in critical needs area of planned greenway, park, sanitary sewer line, or water line 3 Property is not located at a potential water quality capital improvement site</td>
</tr>
<tr>
<td>3 Property Acquisition and Structure Relocation (RELOCATION)</td>
<td>1 Structure is pre-FIRM OR Structure is post-FIRM and has finished floor elevation lower than the Flood Protection Elevation 2 Structure foundation is not slab-on-grade 3 Structure does not have masonry walls 4 Building tax value is &gt; $30,000 5 Property has Risk Score ≥ 300</td>
<td>1 Structure is a single story (no split levels or multi-story). 2 Structure footprint is ≤ 1500 sf. 3 Property is located adjacent to publicly owned land 4 Any part of the structure is located inside a water quality buffer 5 Property has Risk Score ≥ 300</td>
<td>1 Structure footprint is ≤ 1500 sf. 2 Property is located in critical needs area of planned greenway, park, sanitary sewer line, or water line 3 Property is located at a potential water quality capital improvement site 4 Property has Risk Score ≥ 700</td>
</tr>
</tbody>
</table>
Evaluation Process

- **Blue Criteria**: NOT RECOMMENDED
- **Yellow Criteria**: FURTHER EVALUATION NEEDED
- **Green Criteria**: EFFECTIVE
- **Properties**: HIGHLY EFFECTIVE, RECOMMENDED
Flood Mitigation Priority Score

- Used to prioritize flood mitigation efforts across the county
- Individual properties as well as groups of properties, project areas
- Accounts for:
  - Community-based benefits
  - Other factors not included in the Flood Risk Property Score
Priority Score Factors

- Life and human safety
- Cost effectiveness
- Proximity to other mitigation projects
- Property added to flood zone
- Repetitive Loss (RL) structure
- Property adjacent to publicly owned land
- Property located on five-year planned greenway trail
- Property located on five-year planned sanitary sewer route
- Property intersects with water quality buffer
- Property located in an Environmental Focus Area
- Property covered by NFIP policy
- Historic preservation and cultural asset protection
- Other
### Priority Score Example

<table>
<thead>
<tr>
<th>#</th>
<th>Priority Factors</th>
<th>Criteria Met</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Life and human safety</td>
<td>YES</td>
<td>150</td>
</tr>
<tr>
<td>2</td>
<td>Cost effectiveness (Benefit-Cost Ratio)</td>
<td>LOW</td>
<td>0</td>
</tr>
<tr>
<td>3</td>
<td>Proximity to other mitigation projects</td>
<td>YES</td>
<td>125</td>
</tr>
<tr>
<td>4</td>
<td>Property added to flood zone</td>
<td>NO</td>
<td>0</td>
</tr>
<tr>
<td>5</td>
<td>Repetitive Loss (RL) structure</td>
<td>N/A</td>
<td>0</td>
</tr>
<tr>
<td>6</td>
<td>Property adjacent to publicly owned land *</td>
<td>NO</td>
<td>0</td>
</tr>
<tr>
<td>7</td>
<td>Property located on five-year planned greenway trail *</td>
<td>NO</td>
<td>0</td>
</tr>
<tr>
<td>8</td>
<td>Property located on five-year planned sanitary sewer route *</td>
<td>NO</td>
<td>0</td>
</tr>
<tr>
<td>9</td>
<td>Property intersects with water quality buffer *</td>
<td>YES</td>
<td>50</td>
</tr>
<tr>
<td>10</td>
<td>Property located in an Environmental Focus Area *</td>
<td>NO</td>
<td>0</td>
</tr>
<tr>
<td>11</td>
<td>Property covered by NFIP policy</td>
<td>YES</td>
<td>30</td>
</tr>
<tr>
<td>12</td>
<td>Historic preservation and cultural asset protection</td>
<td>NO</td>
<td>0</td>
</tr>
<tr>
<td>13</td>
<td>Other</td>
<td>NA</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Flood Hazard Mitigation Score</td>
<td></td>
<td>355</td>
</tr>
<tr>
<td></td>
<td>Mitigation Score Multiplier = 1+(355/1085) x 0.20</td>
<td></td>
<td>1.07</td>
</tr>
<tr>
<td></td>
<td>Flood Risk Property Score</td>
<td></td>
<td>451</td>
</tr>
<tr>
<td></td>
<td>Flood Mitigation Priority Score = 451 x 1.07</td>
<td></td>
<td>482</td>
</tr>
</tbody>
</table>
FLOODPLAIN PROPERTY ACQUISITION
FY2014 CIP - 3041 & 3131 Dunlavin Way
Briar Creek

LEGEND
Annexation Status

Related Content

- Stormwater Management
- Community Ponds
Communicating Plan Results

123 Main Street

**Highly Effective**
- Buyout
- Relocation
- Flood Insurance

**Moderately Effective**
- Elevate HVAC
- Dry Floodproofing
- Floodwall
- Audible warning

**Not Recommended**
- Elevation
- Wet Floodproofing
- Stormwater Detention
- Site Re-development
- Storm Water System Controls
Keys to Success

• Leaders at the Policy level
• Quality data
• Active involvement from stakeholders
• Patience – with a purpose
• Holistic approach to mitigation
  – Define your “flood risk” and solution
  – Capitalize on multi-objective projects to achieve other public benefits
  – Quantify successes
Flood Mitigation Results

Cumulative Investment & Benefits in Mitigation

<table>
<thead>
<tr>
<th>Year</th>
<th>Investment/Project Cost (Actual)</th>
<th>Future Losses Avoided (Estimated)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000</td>
<td>$6M</td>
<td>$6M</td>
</tr>
<tr>
<td>2001</td>
<td>$14M</td>
<td>$14M</td>
</tr>
<tr>
<td>2002</td>
<td>$17M</td>
<td>$17M</td>
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<tr>
<td>2003</td>
<td>$19M</td>
<td>$19M</td>
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<tr>
<td>2004</td>
<td>$19M</td>
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<td>2005</td>
<td>$20M</td>
<td>$20M</td>
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<td>2006</td>
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<td>2010</td>
<td>$46M</td>
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<tr>
<td>2011</td>
<td>$49M</td>
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Questions?