LOUISVILLE METRO FLOOD PROTECTION SYSTEM

• Approximately 29 miles long – 4.6 Miles concrete floodwall
• 16 pumping station – 11,520,000,000 GPD Capacity
• 80 Closures
• 150 flood gates
• 150 process gates
• Directly protects 230,000 lives, 87,000 structures with a value of 24 billion dollars
• Louisville Reach was constructed in the 1940s and 1950s. Southwestern Jefferson County Reach was constructed in the 1980s
LOUISVILLE METRO FLOODING - 1937
LOUISVILLE METRO FLOODING - 1997
TOP TEN FLOODS IN LOUISVILLE METRO

1. 1937 52.15’
2. 1945 42.10’
3. 1884 41.70’
4. 1964 41.20’
5. 1883 39.50’
6. 1913 39.40’
7. 1997 38.76’
8. 1907 36.40’
9. 1948 36.00’
10. 1933 34.10’

- All upper gauge readings
ROCKEFELLER 100 RESILIENT CITIES
BACKGROUND

• 2013 - Funding through a $75K grant from the Silver Jackets was secured for an enhancement to the MSD Flood Protection’s Emergency Preparedness Plan (EPP)
• This enhancement included modeling of failures in the flood protection system during a flood event.
• An I-Wall failure and a breech in levee were the chosen failures.
• USACE performed modeling of the surface flooding. MSD GIS personnel projected where our pipes would convey the flood water.
• The need for a closer working relationship between USACE, MSD and Louisville Metro EMA was identified.
EMERGENCY TABLE TOP EXERCISE

• In March 2015, an emergency table top exercise was held. 19 local, state and federal agencies, as well as, private companies participated.

• A breech in the levee at the end of Bells Lane during a .2% annual chance flood event was chosen as the scenario.

• If this scenario occurred, it is believed the devastation to Louisville Metro would be greater than what Hurricane Katrina was to New Orleans.
CATASTROPHIC FLOOD
FLOODWALL FAILURE – NEW ORLEANS
LEVEE FAILURE – NEW ORLEANS
The need for a Catastrophic Urban Flood Plan identified in the Commonwealth’s 2013 Threat and Hazard Identification and Risk Assessment (THIRA) and Louisville Metro’s Hazard Mitigation Plan.

Working through the newly formed Louisville Metro Silver Jackets Team, a collective of federal, state and local organizations have started work on such a plan.

This plan will be reproducible to allow the framework to be shared with other river cities in the Commonwealth and in the region.
CATASTROPHIC FLOOD PLAN

Catastrophic Urban Flooding Plan

Outline

• Plan Maintenance
  o Review and Revisions
  o Periodic Tests
    ▪ Facilitated discussions
    ▪ Table top exercises
  o Revisions and Updated Records

• Approval
  o Partnering Organizations signatures

• Roles and Responsibilities:
  o Proposed ICS Structure
  o Functional Responsibility Chart
  o USACE
    ▪ Tracking
    ▪ Supplemental support to State (personnel, equipment and supplies)
    ▪ FEMA ESF-3
  o U. S. Coast Guard
    ▪ Monitor river and river traffic
    ▪ Establish safety zones and channel markings
    ▪ Aerial overflight
    ▪ Flood strike team
    ▪ Monitor environmental concerns
  o U. S. DHS Infrastructure Protection
    ▪ Promote critical infrastructure security and resiliency efforts
    ▪ Identify critical infrastructure impacts
    ▪ Assist in prioritization for recovery and restoration
  o Kentucky EM
    ▪ Monitoring
    ▪ Direct support or mutual aid for Louisville Metro EMA
    ▪ National Guard
Foot By Foot Analysis
### CATASTROPHIC FLOOD PLAN

<table>
<thead>
<tr>
<th>Action</th>
<th>Upper Gauge</th>
<th>Lower Gauge</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inspect gates 15, 6, 9, 16b, 16c, 59, 62, 63, 64</td>
<td>21.00</td>
<td>55.00</td>
</tr>
<tr>
<td>Inspect gates 86, 92, 106, 107, 110, 111, 112. Open gate 91.</td>
<td>22.00</td>
<td>56.00</td>
</tr>
<tr>
<td>Parks and riverfront areas in Clarksville and New Albany flood. Some yards along US 31W (Dixie Highway) from Pleasure Ridge Park to West Point, KY flood.</td>
<td>23.00</td>
<td>57.00</td>
</tr>
<tr>
<td>Close gates 86, 111, 113. Open gate 110.</td>
<td>23.40</td>
<td>57.40</td>
</tr>
<tr>
<td>Close gate 90</td>
<td>24.00</td>
<td>58.00</td>
</tr>
<tr>
<td>IN 111 floods upstream of Bridgeport</td>
<td>24.50</td>
<td>58.50</td>
</tr>
<tr>
<td>Close gate 118. Paddy’s Run pump station in service.</td>
<td>24.60</td>
<td>58.60</td>
</tr>
<tr>
<td>Open gate 3. R.E. Starkey pumping station in service. Beargrass pump station in service.</td>
<td>25.00</td>
<td>59.00</td>
</tr>
<tr>
<td>Overbrook Rd. floods south of Lake Dreamland Rd.</td>
<td>25.40</td>
<td>59.40</td>
</tr>
<tr>
<td>Inspect gate 140</td>
<td>25.50</td>
<td>59.50</td>
</tr>
<tr>
<td>Close gate 33c</td>
<td>25.00</td>
<td>59.00</td>
</tr>
</tbody>
</table>
DEPARTMENT OF HOMELAND SECURITY
REGIONAL RESILIENCY ASSESSMENT PROGRAM

• Catastrophic Urban Flood Plan is one of twelve projects chosen nationwide for DHS’s FY17RRAP

• Three year process. One year assessment and two years of implementation assistance and follow up.

• Will provide a deep assessment to impacts to life-line infrastructure; Rubbertown and hospitals for failure in our flood protection system in a .2% annual chance flood event.
INTERDEPENDANCIES
FEMA EVACUATION PLANNING
“THE NEW NORMAL”

• In 1993 the annual average cost of damage from natural disasters in the United States was 3.3 billion (FEMA).

• In 2016, there were 15 weather and climate disaster events with losses exceeding $1 billion each across the United States. These events included a drought event, 4 flooding events, 8 severe storm events, a tropical cyclone event, and a wildfire event (NOAA).

• The 1980–2016 annual average is 5.5 events (CPI-adjusted); the annual average for the most recent 5 years (2012–2016) is 10.6 events (CPI-adjusted)(NOAA).
HURRICANE KATRINA
NEW ORLEANS - 2005
HURRICAN SANDY
NEW YORK/NEW JERSEY - 2012
CONGAREE RIVER FLOODING
COLUMBIA - 2015
LOUISIANA 2016
WEST VIRGINIA – 2016
MONTREAL - 2017
FULL DEPTH INUNDATION

Flooding Scenarios
Catastrophic Failure
Flood Protection System
Jefferson County, KY

Legend
- Major Streams
- Sever Intersection
- Jefferson County Boundary

Ohio Flooding
- Action Stage
- Flood Stage
- Moderate Flood Stage
- Major Flood Stage
- 50 YR Flood
- 100 YR Flood

Inundated Areas
County Overview
MITIGATION MATTERS

• According to FEMA, every one dollar spent on planning and mitigation activities equates to a five dollar savings in recovery and economic costs in a natural disaster.

• FEMA’s new policy for reimbursement of funds relating to natural disaster recovery will institute State-by-state “deductible”. Plans like this one will help reduce that deductible.
TEAMWORK

MSD  KyEM  USACE  Louisville EMA

DHS  NWS  USGS  KyDOW

USCG  FEMA  TARC  KyDOT
QUESTIONS