CITY OF WASHINGTON
STORMWATER MASTER PLAN

TWM

WASHINGTON
ILLINOIS

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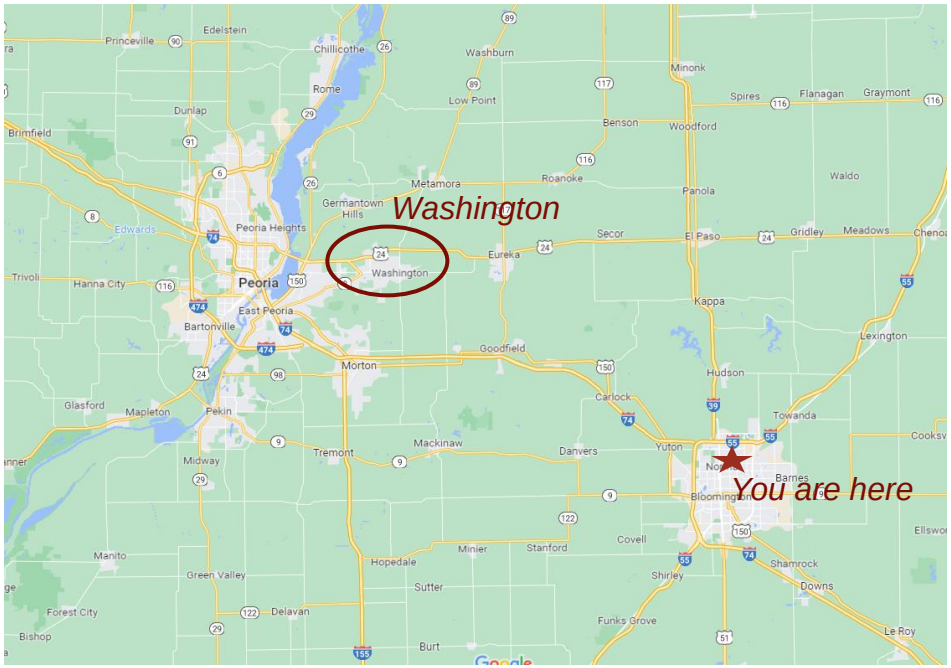
Project Personnel

- City of Washington
  - Dennis Carr, PE – City Engineer

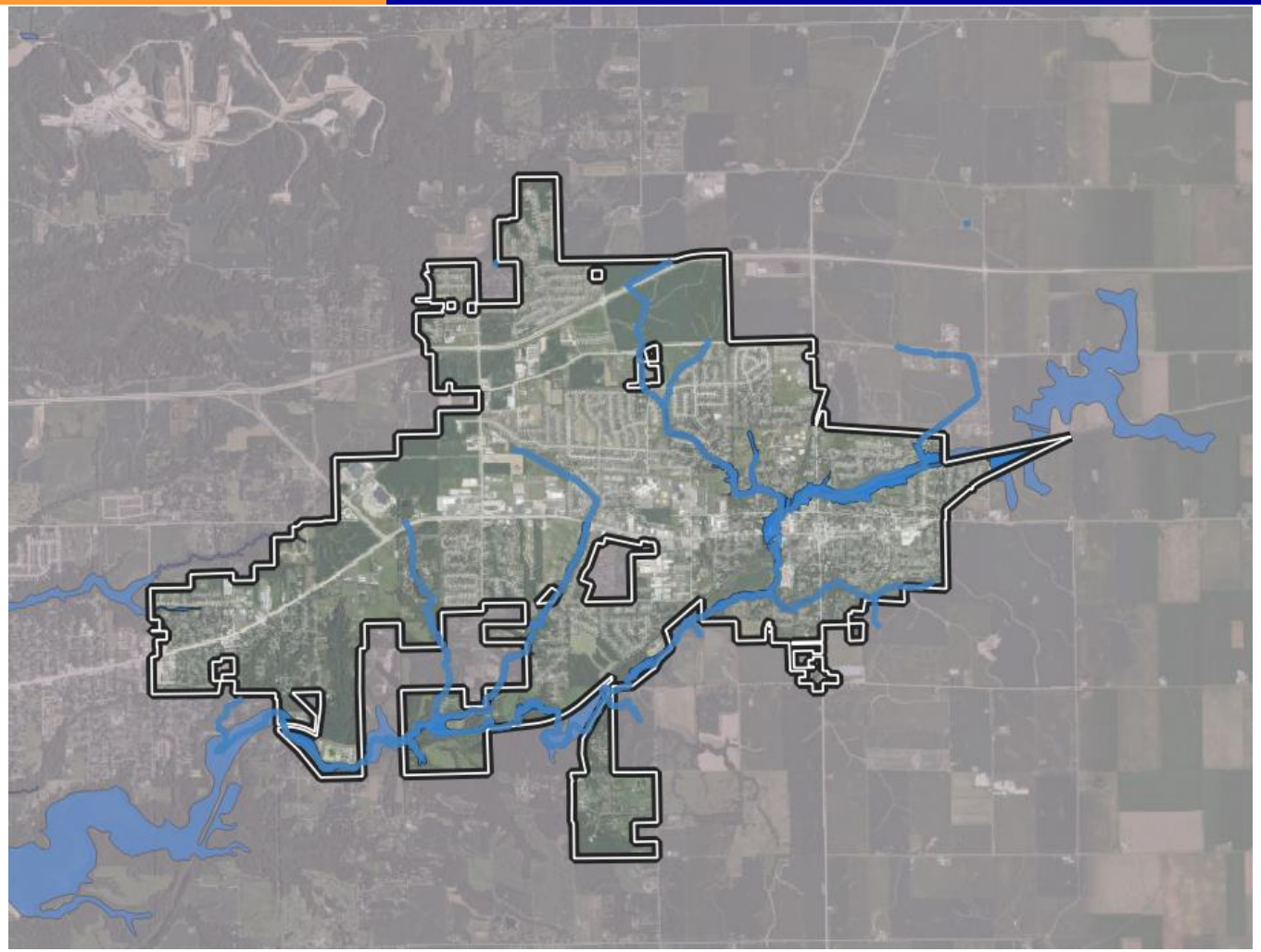


- Consulting Engineers
  - Fehr Graham Engineering & Environmental
    - Jeff Macke, PE, CFM – Senior Project Engineer
    - Marlyn Ripalda – Staff Hydrologist
  - TWM, Inc.
    - Serena Page, PE, PLS – Branch Manager
    - Chris Kuester, PE, CFM – Project Engineer
    - Kyle Lynch, EI – Engineering Designer

City of Washington

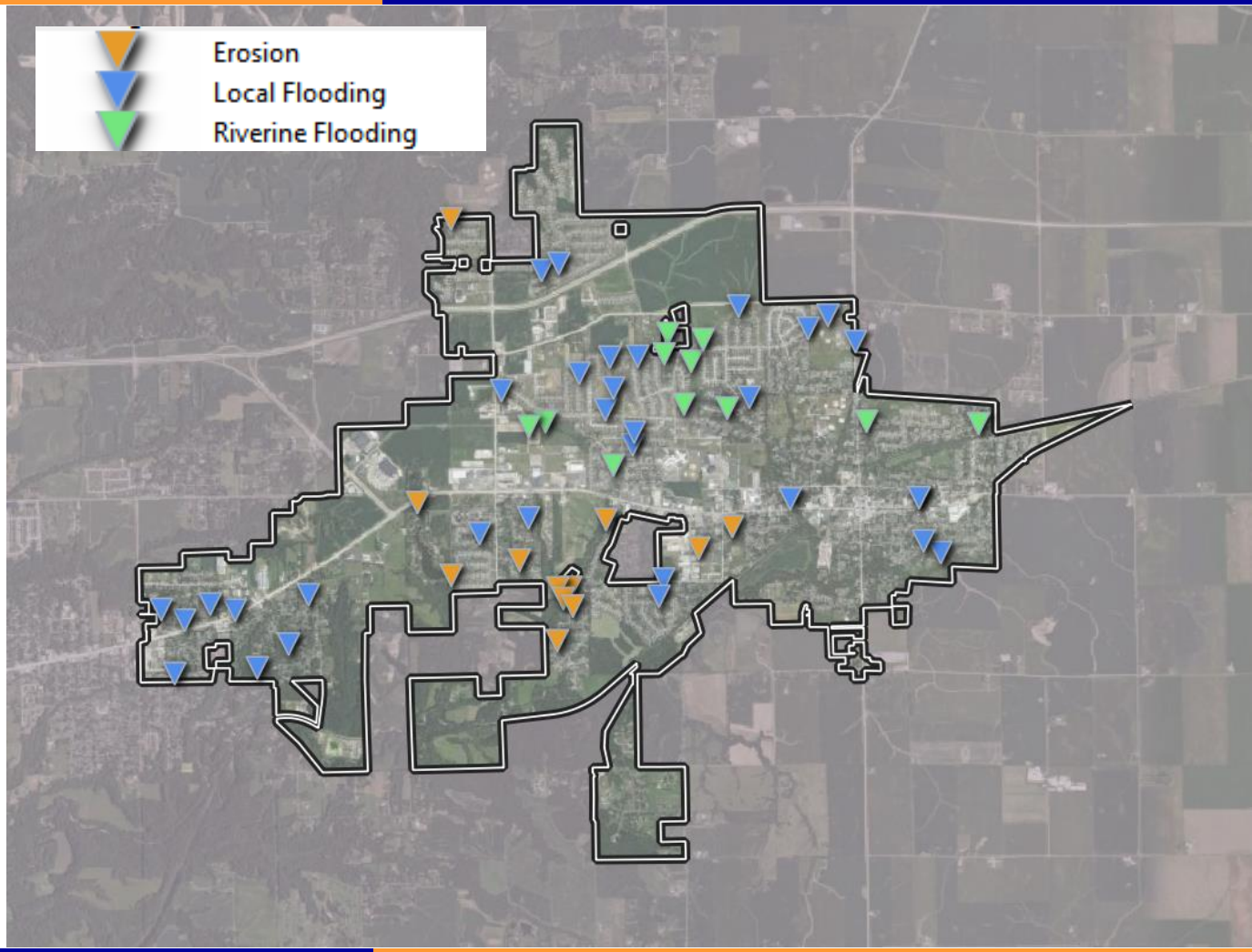
Population = 16,500

City Size = 8.2 sq. mi.



Stormwater Issues

As reported by the City of Washington

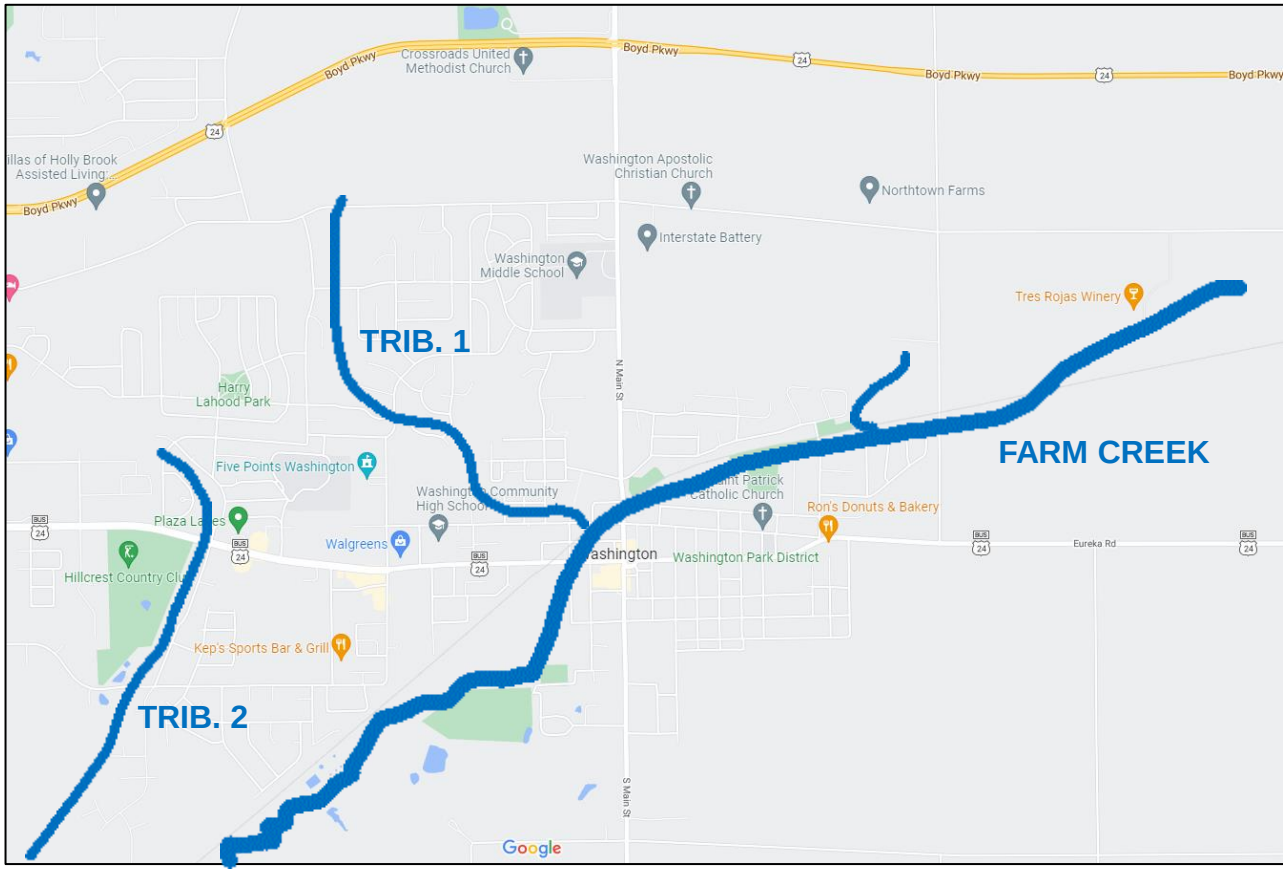


Plan Approach

- Modeling
  - Hydrology
    - Curve Number in SWMM and HEC-HMS
  - Streams in HEC-RAS
    - 1D steady and unsteady
  - Inland areas in PC SWMM
    - 2D model for overflows
- Projects
  - Complaint Areas
  - Risks identified in Modeling
  - Prioritize by combination of the two above factors.

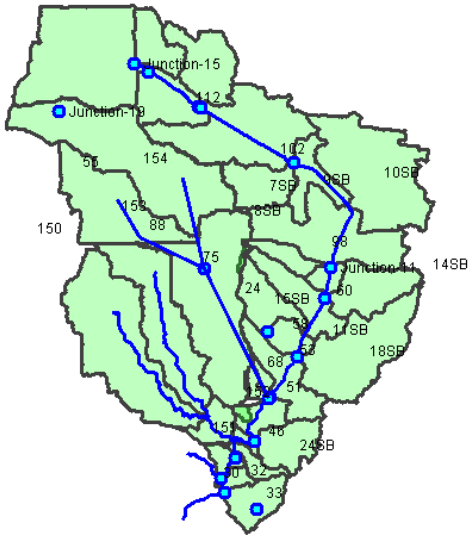
Riverine Flooding

- FEMA Waterways
  - Farm Creek (Zone AE)
  - Defined Tributaries
    - 1 (Zone AE)
    - 1A (Zone A)
    - 2 (Zone A)



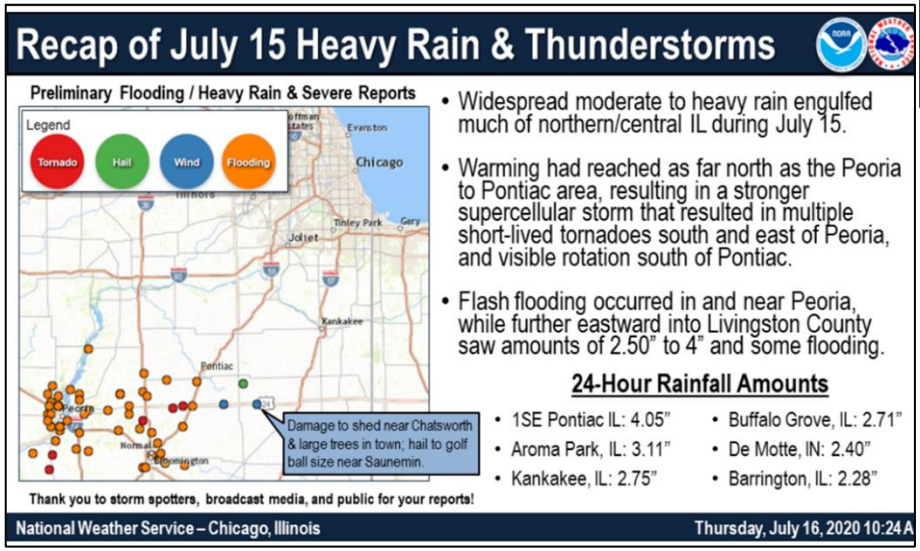
Riverine Flooding

- Hydrologic Calculations
  - Sub-basins per County LiDAR data
  - SCS CN values
- Hydraulic Calculations
  - HEC-RAS calculations
  - Mix of 1D and 2D analysis
    - Primarily steady-state analysis



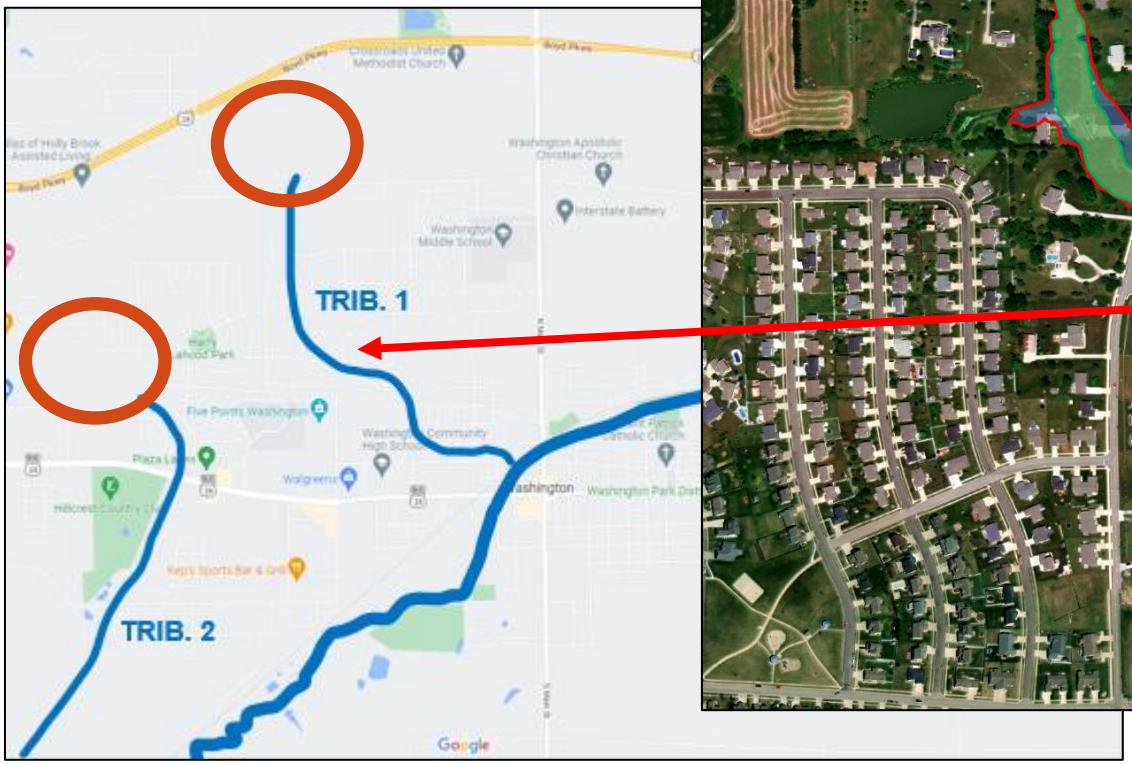
Riverine Flooding

- Recurrence Intervals
  - 2- to 500-year events
  - July 2020 flooding
    - ~5 inches rainfall on July 15 in Peoria



Riverine Flooding

- Regional Detention
  - Used to limit flows through developed areas

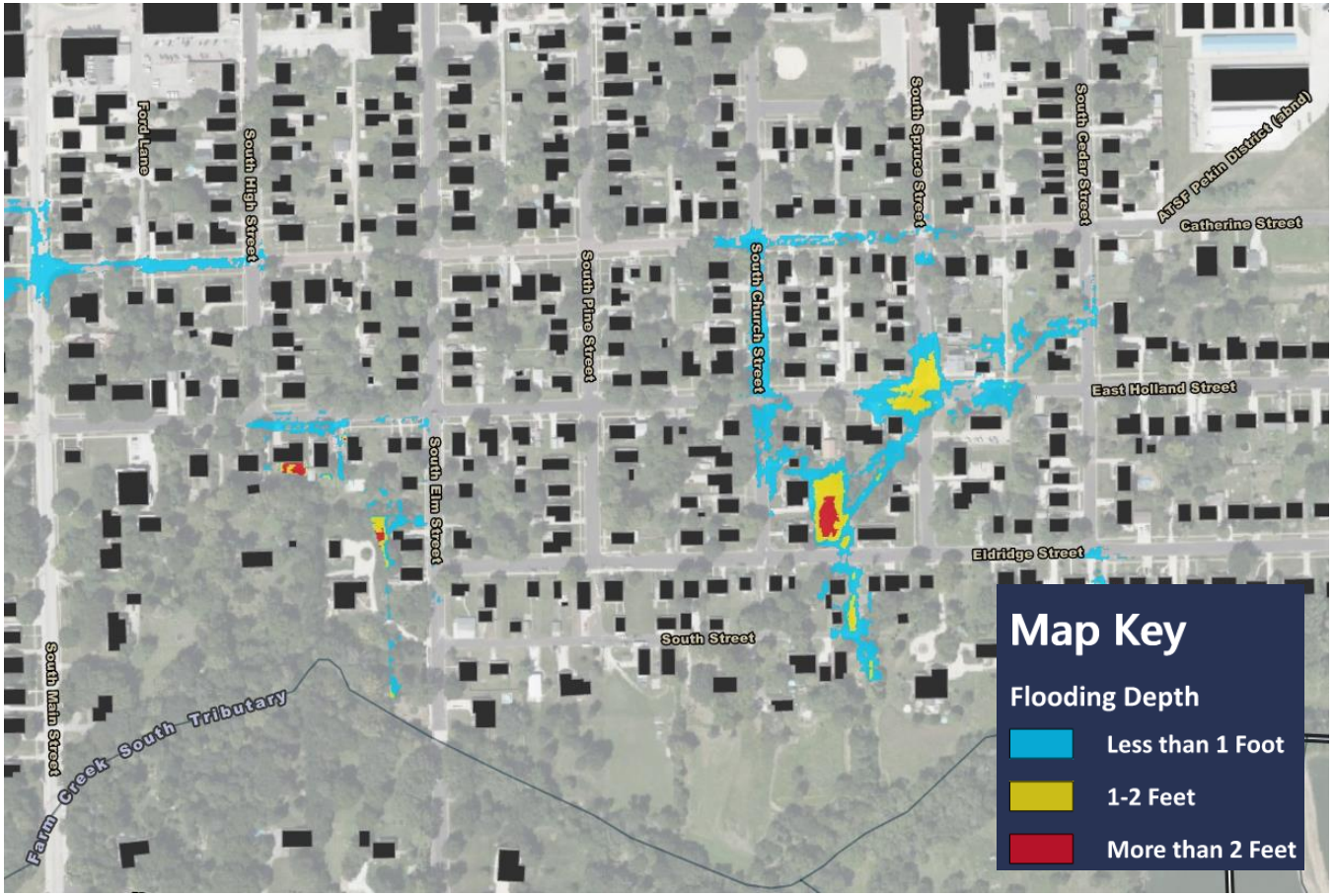


Flash Flooding

Depth Maps

Inland Flooding

10 - 500-yr



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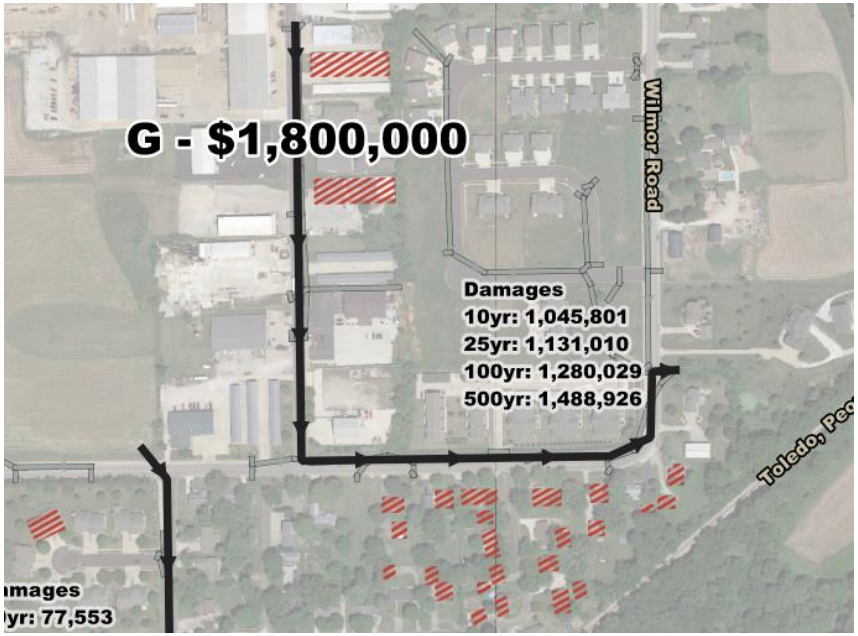
Flood Damages and Cost Effectiveness

- Project G
  - 10-Year Damages = $1.0M
  - Project Cost = $1.8 M



- Project V
  - 10-Year Damages = $0.1M
  - Project Cost = $1.0 M

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Flood Damages from 2022 to 2072

Damage to buildings in Washington, Illinois due to urban flooding.

Run 1 Sim

Sim 1

10-year floods: 2042, 2049, 2052, 2054, 2058, 2070

10-year damages $30,000,000

25-year floods: 2029, 2041, 2057

25-year damages $21,000,000

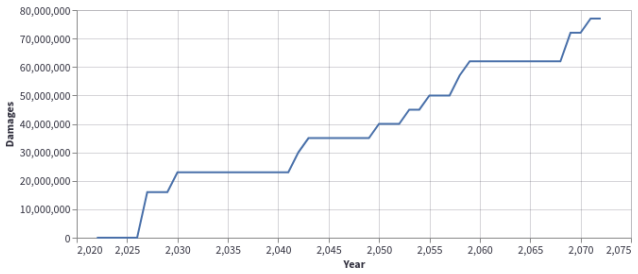
100-year floods: 2068

100-year damages $10,000,000

500-year floods: 2026

500-year damages $16,000,000

Total damages $77,000,000.0



This app performs monte carlo analysis of flood damages in Washington.

- **Python libraries:** seaborn, pandas, random, streamlit

Flood Damages from 2022 to 2072

Damage to buildings in Washington, Illinois due to urban flooding.

Run 1 Sim

Sim 2

10-year floods: 2024, 2026, 2035, 2046, 2052, 2061

10-year damages $30,000,000

25-year floods: 2064

25-year damages $7,000,000

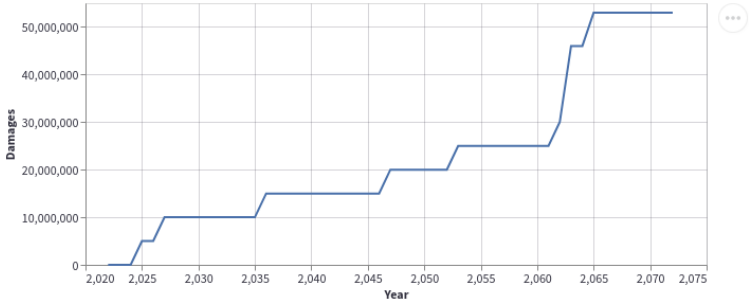
100-year floods:

100-year damages $0

500-year floods: 2062

500-year damages $16,000,000

Total damages $53,000,000.0



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TWM

https://share.streamlit.io/jeffmacke/washingtonfloodingsingle/main/streamlit_wash.py

https://share.streamlit.io/jeffmacke/washingtonflooding/main/wash_floods.py

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Project Priorities

- Key Variables
  - Known complaints
  - Cost Effectiveness
  - Funding Eligibility

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Questions?

Thank you!