Flood Resilience Planning in the District of Columbia

MWCOG Water Resources Technical Committee
March 12, 2021

DEPARTMENT OF ENERGY & ENVIRONMENT

Nicholas Bonard
Meredith Upchurch

Today's Agenda

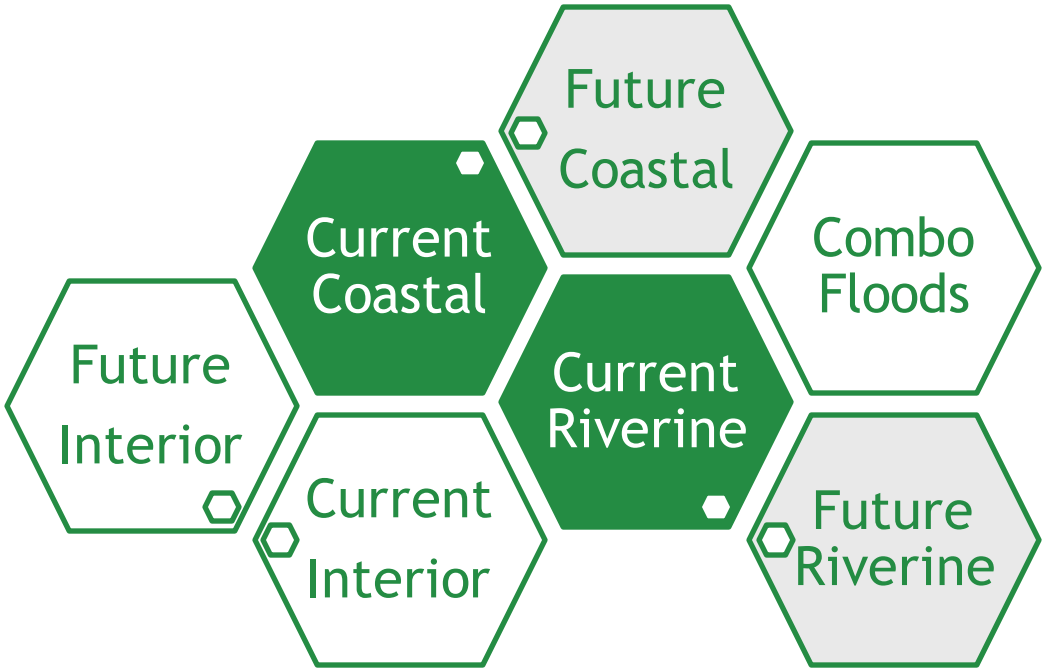
- Resilience through Infrastructure
  - Integrated Flood Model
  - Funding for Urban Flood Mitigation
- Resilience through Floodplain Regulations

Resilience Through Infrastructure

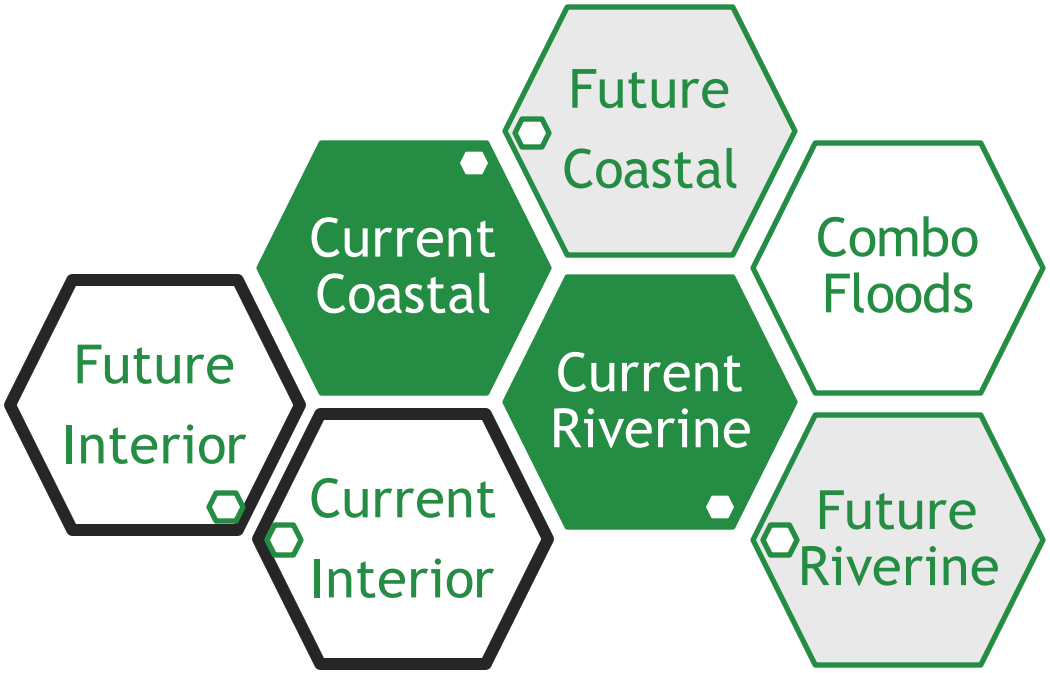
DC's Roadmap to Reduce Flood Risk through Infrastructure

DC's Roadmap to Reduce Flood Risk through Infrastructure

Understanding DC's Flood Risk



Understanding DC's Flood Risk

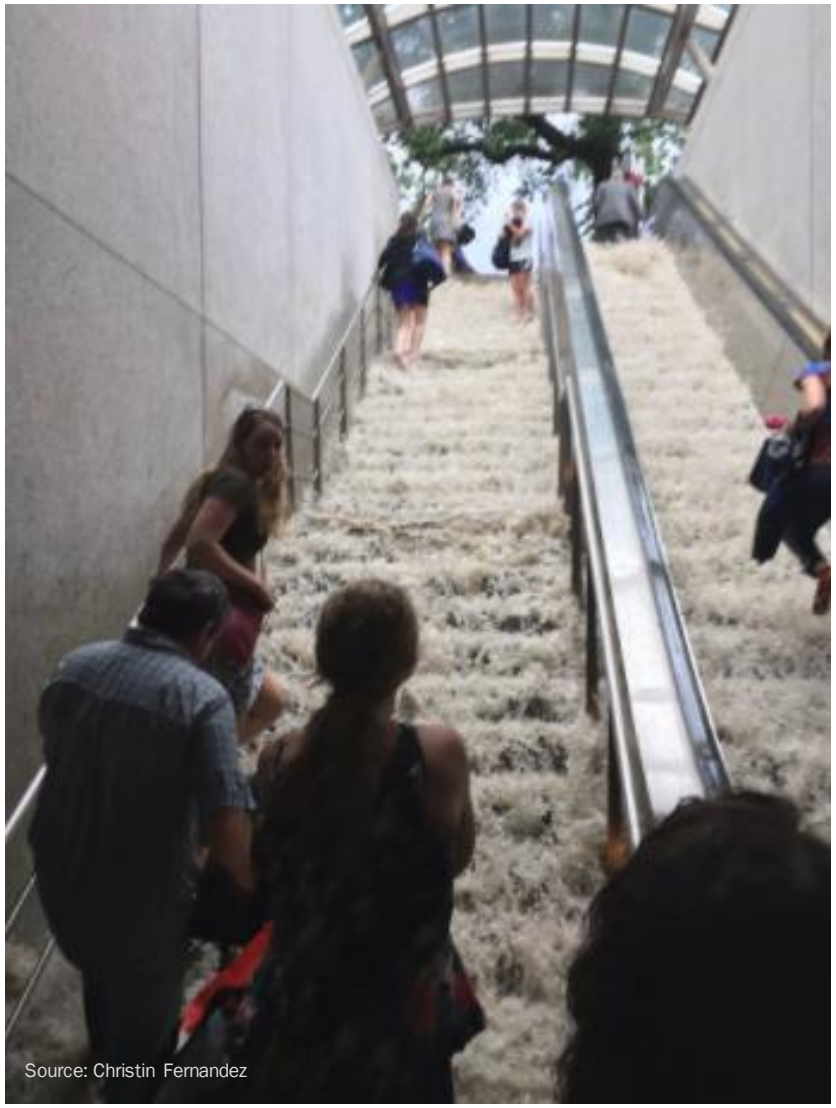


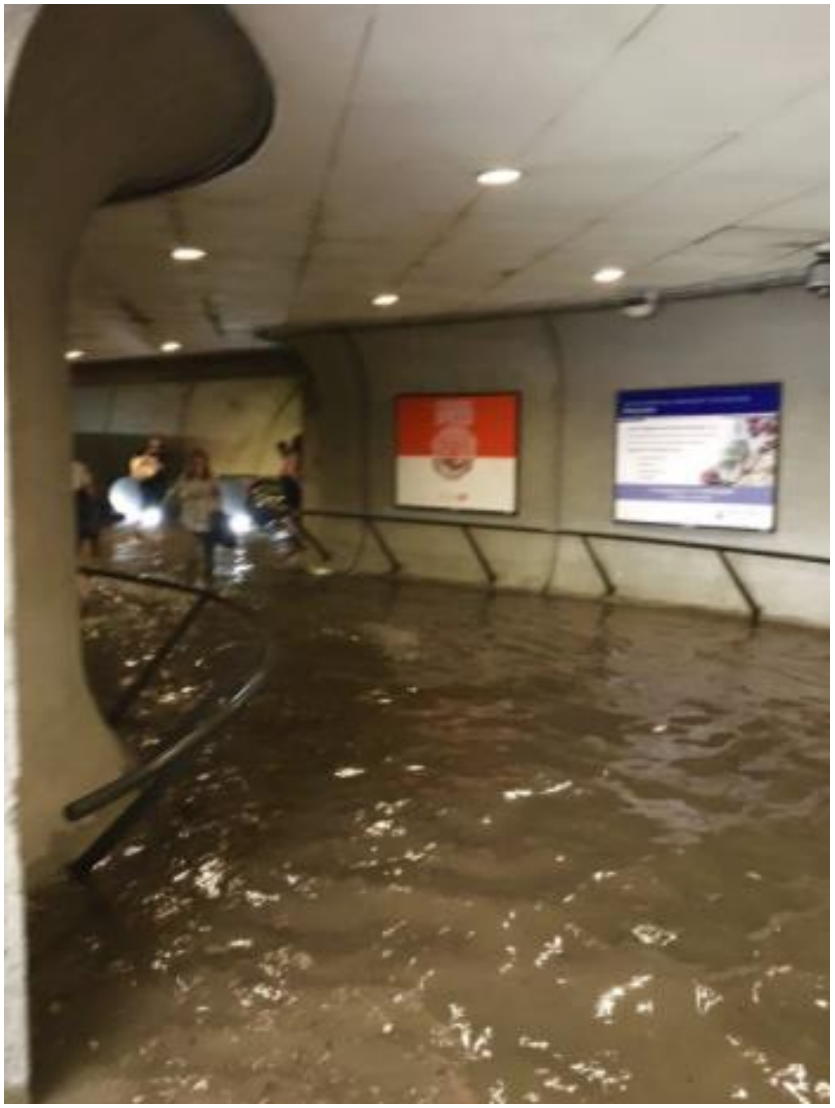
Interior Flooding - 2006

Source: General Services Administration

Interior Flooding - 2012

Interior Flooding - 2016

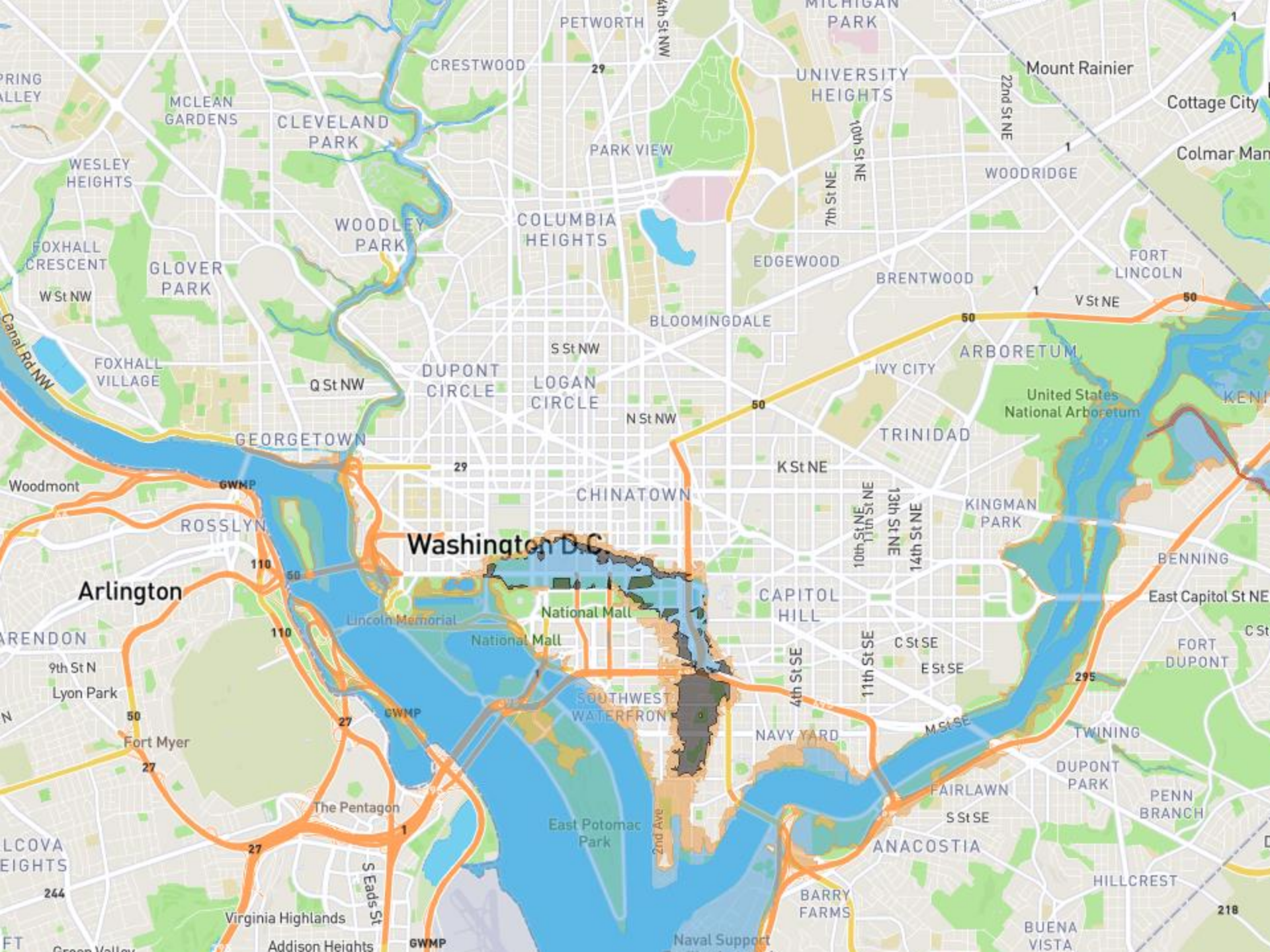




Interior Flooding - 2019

Photographer: Dave Dildine WTOP radio

Interior Flooding – September 10, 2020


PETWORTH
MICHIGAN PARK
CRESTWOOD
UNIVERSITY HEIGHTS
Mount Rainier
Cottage City
MCLEAN GARDENS
CLEVELAND PARK
PARK VIEW
WESLEY HEIGHTS
WOODRIDGE
Colmar Manor
WOODLEY PARK
COLUMBIA HEIGHTS
FOXHALL CRESCENT
GLOVER PARK
EDGEWOOD
FORT LINCOLN
BRENTWOOD
W St NW
V St NE
BLOOMINGDALE
S St NW
FOXHALL VILLAGE
Q St NW
DUPONT CIRCLE
LOGAN CIRCLE
IVY CITY
ARBORETUM
United States National Arboretum
N St NW
GEORGETOWN
TRINIDAD
K St NE
Woodmont
CHINATOWN
KINGMAN PARK
ROSSLYN
Washington D.C.
BENNING
Arlington
CAPITOL HILL
East Capitol St NE
National Mall
Lincoln Memorial
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FORT DUPONT
9th St N
Lyon Park
SOUTHWEST WATERFRONT
C St SE
E St SE
NAVY YARD
TWINING
Fort Myer
DUPONT PARK
The Pentagon
FAIRLAWN
PENN BRANCH
East Potomac Park
S St SE
ANACOSTIA
HILLCREST
BARRY FARMS
Virginia Highlands
Addison Heights
Naval Support
BUENA VISTA
Canal Rd NW
GWMP
4th St NW
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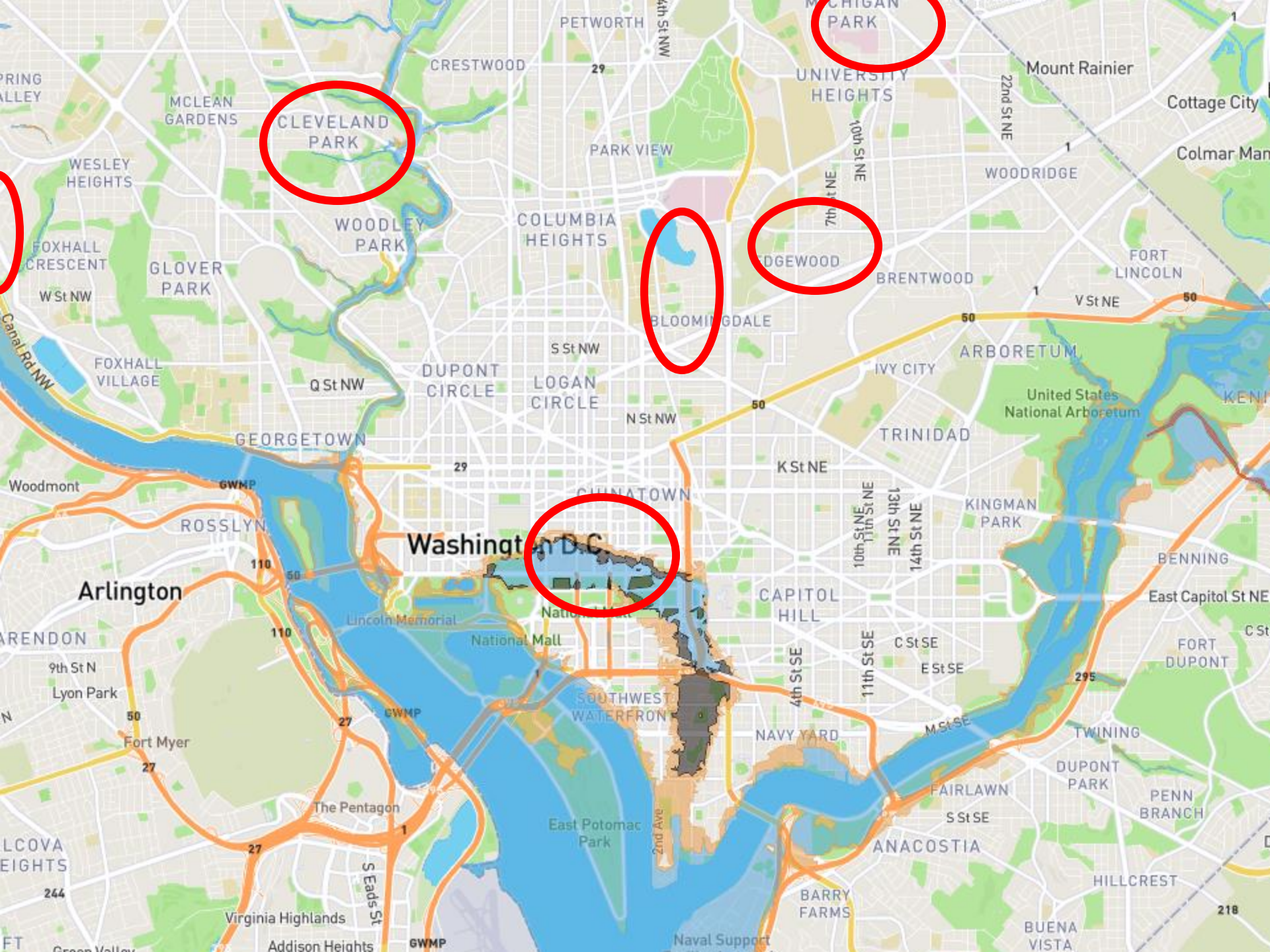
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DC's Roadmap to Reduce Flood Risk through Infrastructure

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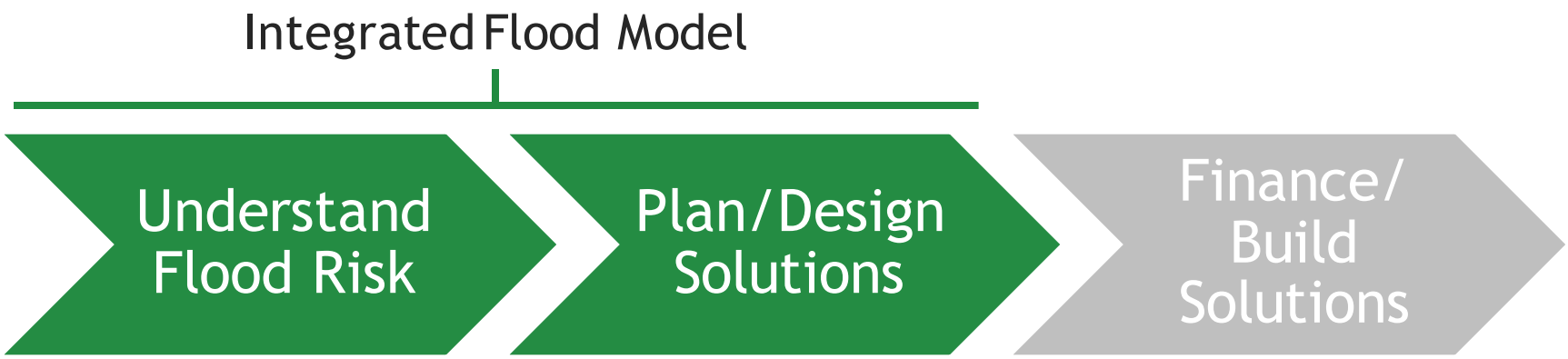
Integrated Flood Model

DC's Roadmap to Reduce Flood Risk through Infrastructure



Creating the Model

- Will integrate various existing and newly created H&H models together
  - Includes modeling of CSS and MS4 pipe networks

- Will allow user to set variables prior to running. Some include:
  - Rainfall duration and depth
  - Sea level rise
  - Pump station capacity
  - Ground infiltration rate

- DOEE will be able to make as many maps as we want showing extent and depth of flooding

- Must be able to deliver 2 outcomes:
  - Outcome 1 - Creation of Scenario Maps
  - Outcome 2 - Ability to test effectiveness of proposed infrastructure

- Will be used to create Floodshed Management Plans

Floodshed Management Plans

- First a Framework Plan

- Multiple FMPs - high-level documents based on desktop analysis of how streets parks and other surface and subsurface spaces can be used to retain and convey water.

- Included in each FMP:
  - Concept locations of individual projects (blue-green, gray, multi-use infrastructure)
  - A construction phasing strategy
  - Rough cost estimates by project
  - Volume calculations
  - Illustrations

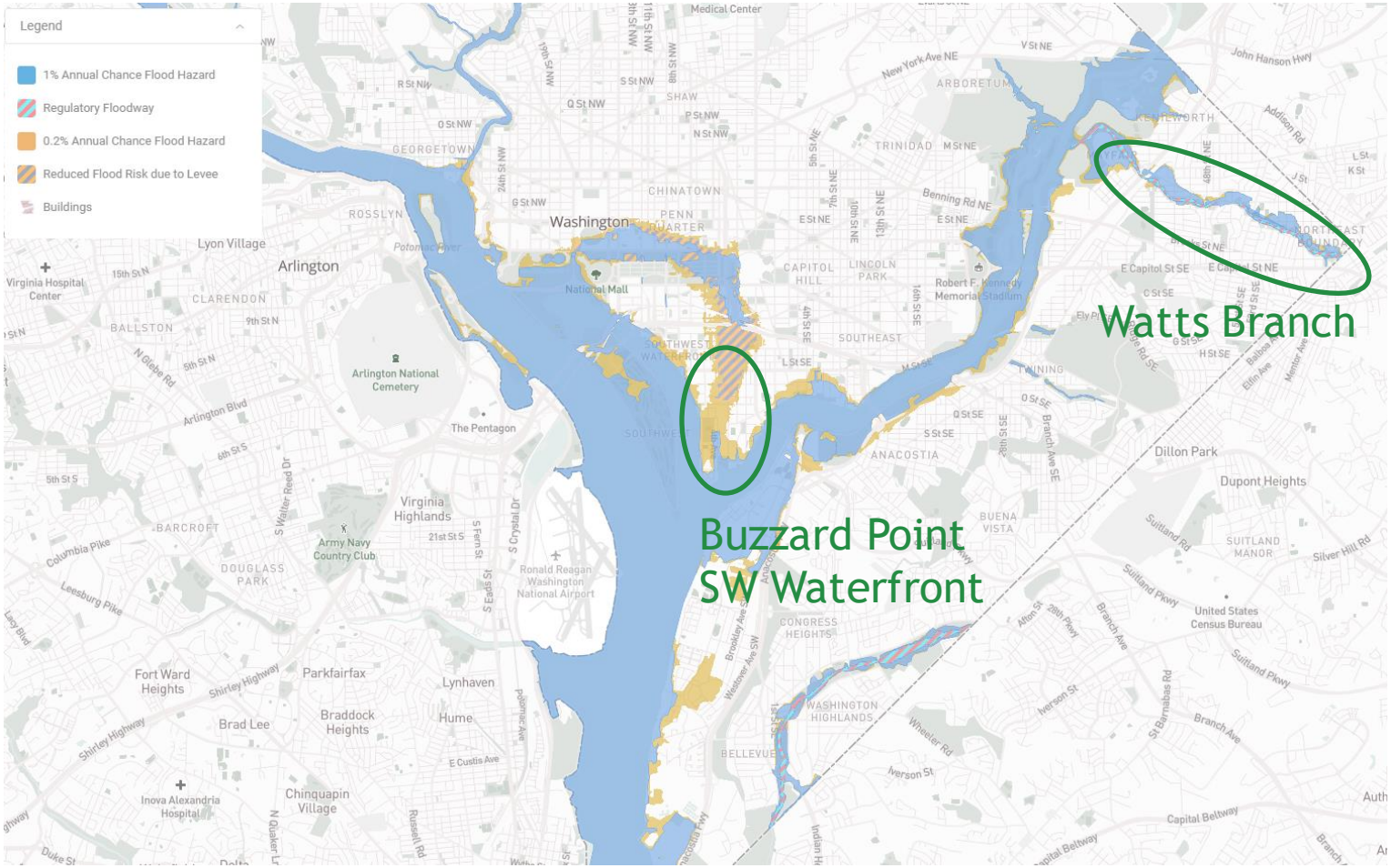
DC's Roadmap to Reduce Flood Risk through Infrastructure

What do we want them look like?

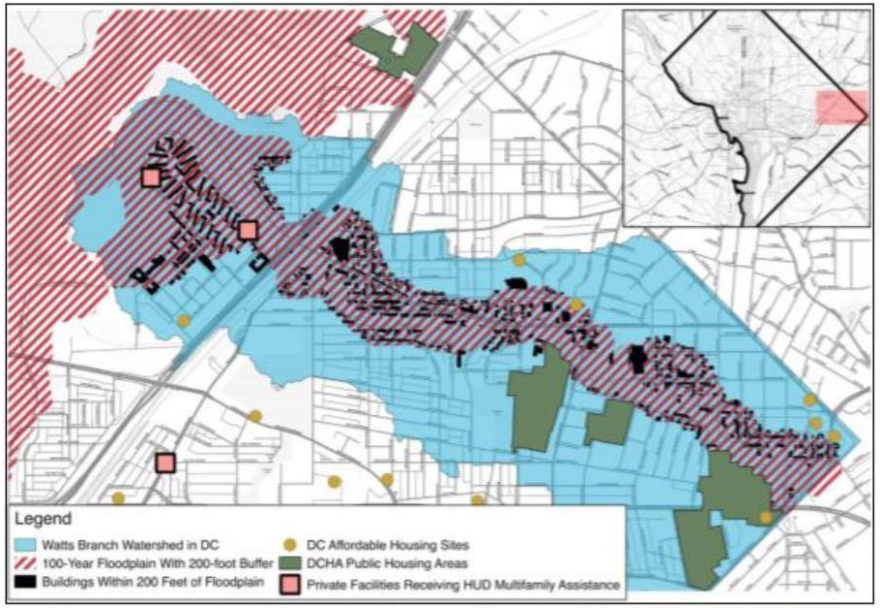

photo Millad Pallesh

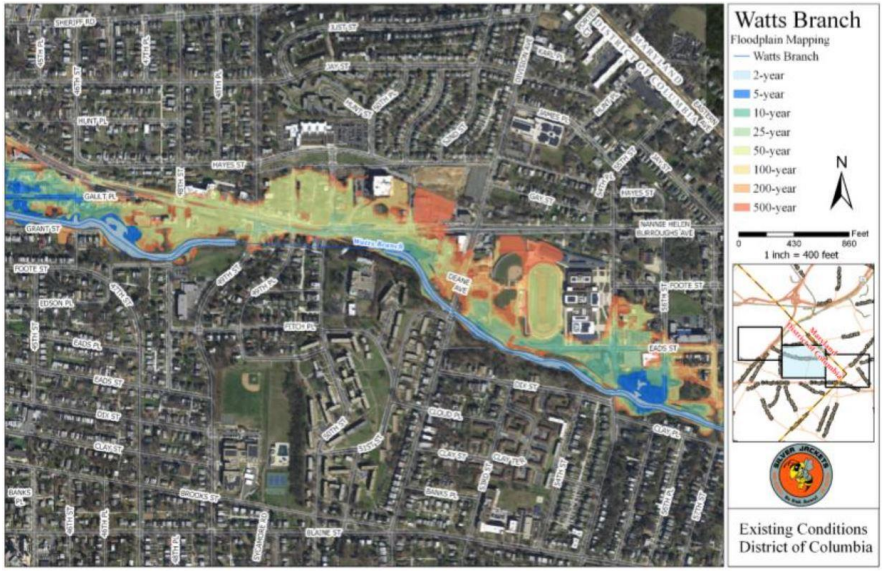
Funding for Urban Flood Mitigation

FEMA BRIC
USACE Civil Works



Watts Branch Flood Risk Mitigation



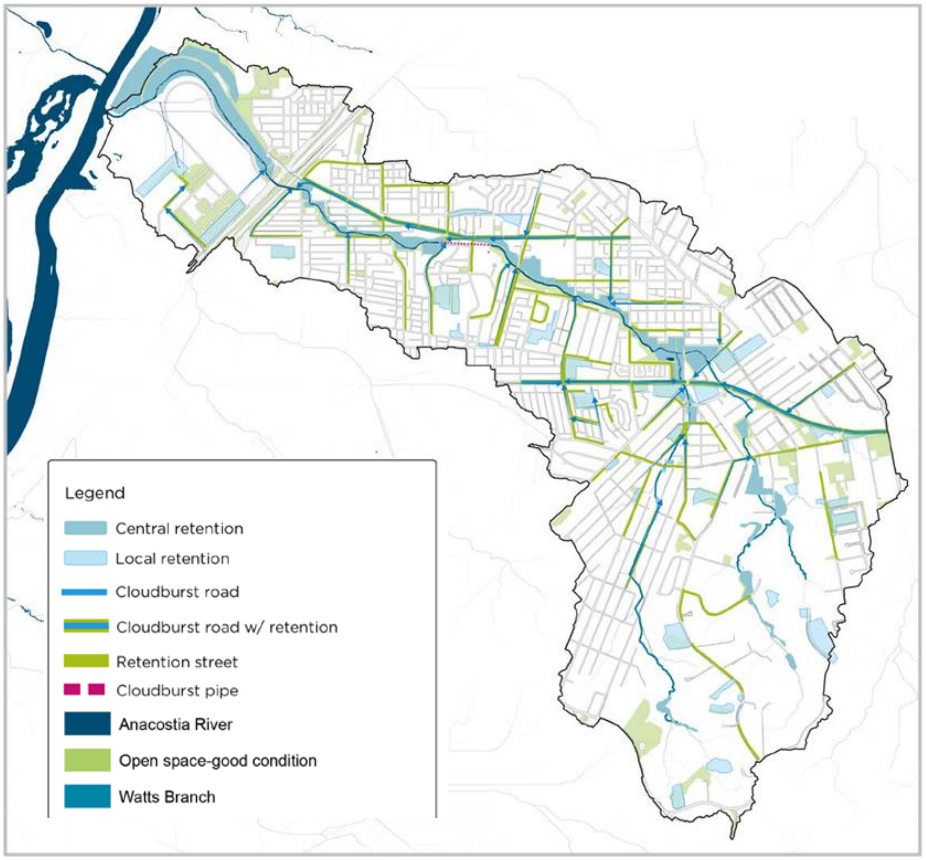


Flood Risk Management Report

To be released Spring 2021
DC Silver Jackets (led by USACE)

- Analyzed holistic approach to flood risk management
- Model current & future flood conditions
- Identify flood management measures
- Modeled 8 infrastructure options

Watts Branch Flood Mitigation Concept Plan



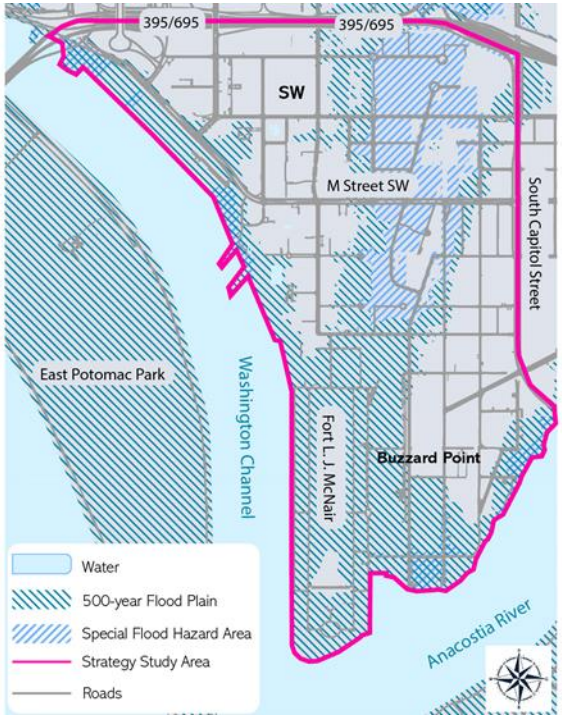
FEMA Flood Mitigation Assistance Advanced Assistance - Grant Application 2021

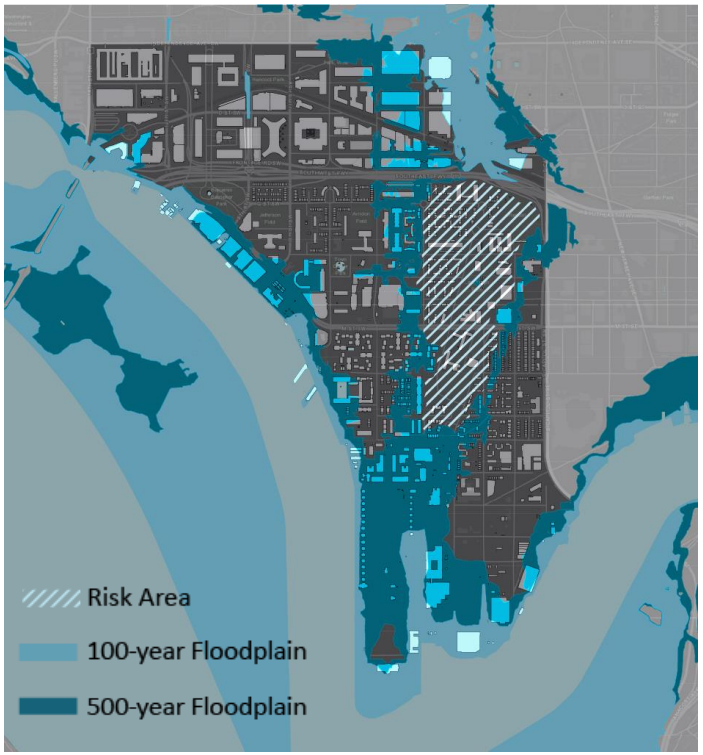
Develop Concept Plan for Infrastructure Improvements

Cost Benefit Analysis

Prioritize improvements

SW/Buzzard Point Flood Resilience Strategy





Flood Risk

100-yr: 91 buildings

500-yr: 391 buildings

Special Hazard Area: 270 buildings

Flood Types

Riverine

Coastal

Interior

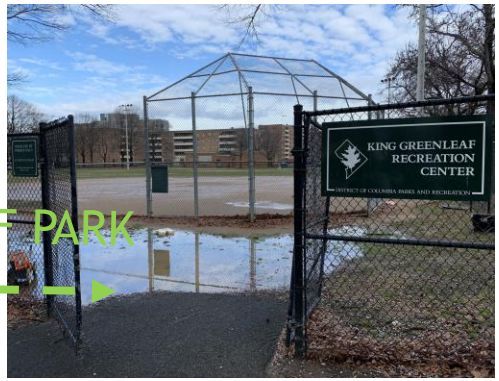
- Design a network of connected & floodable, multipurpose projects in the 500-year floodplain that can revert to their primary function after floods
- Utilize strategy as blue-print for public and private projects
- Leverage strategy to create great spaces for people and nature
- Cost Benefit Analysis and financing strategy
- Prioritize and phase projects
- Concept plan for Flood Mitigation in 1st St Corridor & parks

Credit to:

District of Columbia Office of Planning

Stormwater Flood Mitigation in Southwest Washington DC

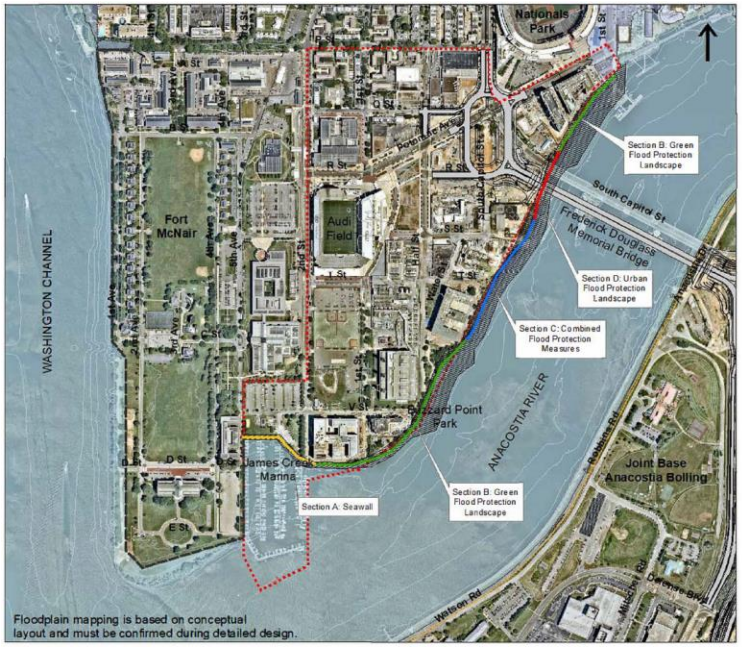
25-yr storm

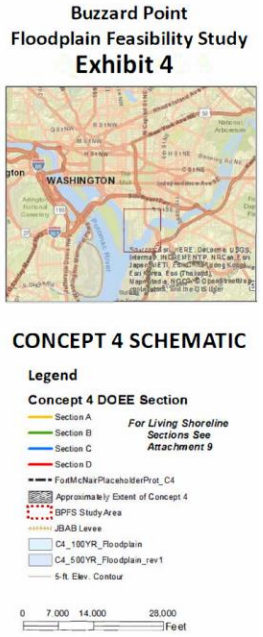


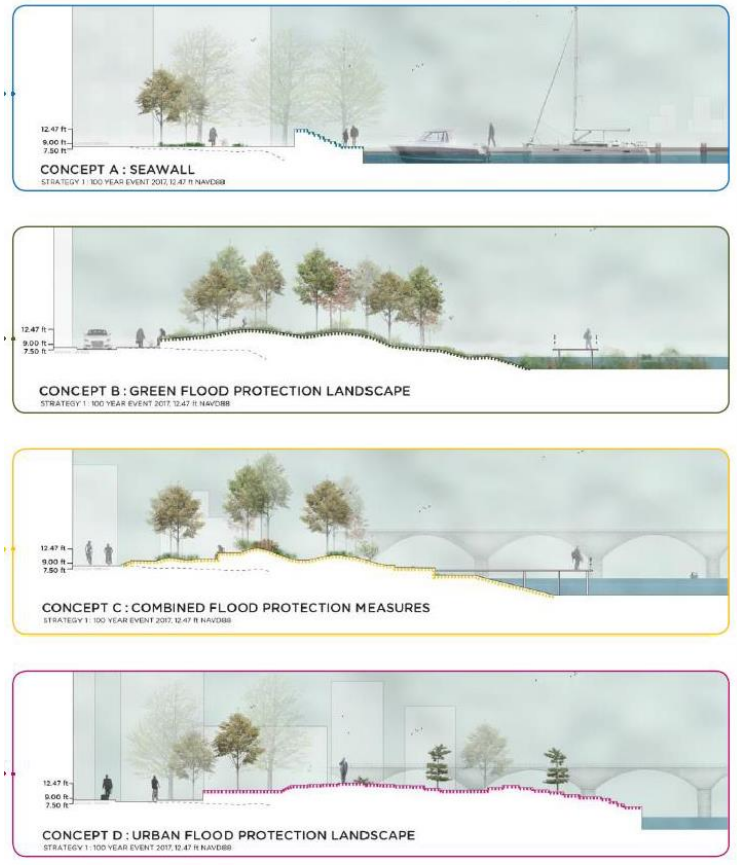
FEMA BRIC Application 2021 (Design & Construction)
Mitigate Flooding along 1st St Corridor & in two parks
Use Blue-Green and Gray Infrastructure for storage and conveyance
Create great open spaces for people

Credit to:
District of Columbia Office of Planning

Buzzard Point Floodplain Protection



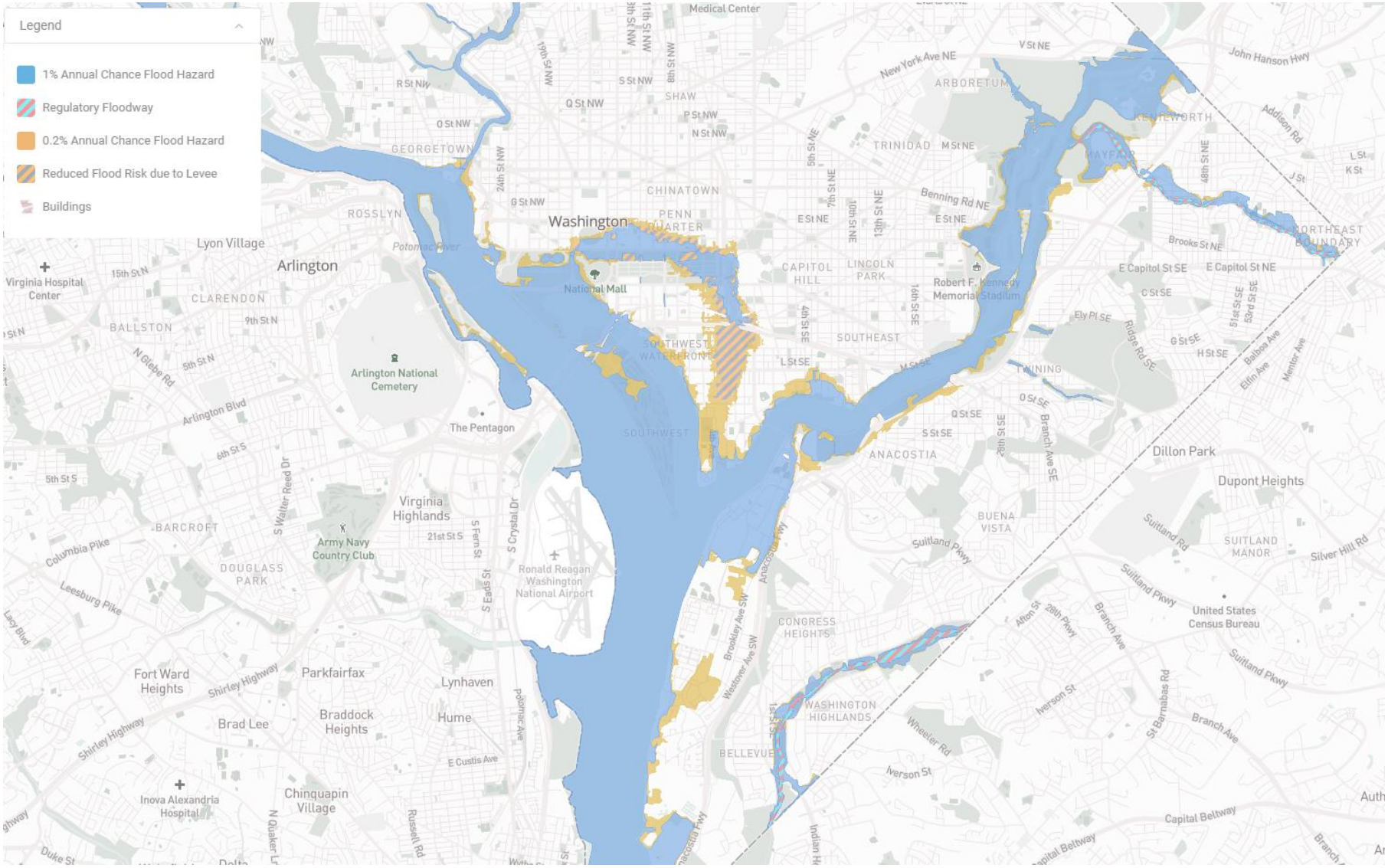




- Buzzard Point Floodplain Feasibility Study
  - Completed 2019
- EA & Concept Plan Development
  - In progress 2020-21
- Pursuing USACE Civil Works Project
  - Feasibility Study (65% design) 2022-24
  - Final Design & Construction 2025+ (best case goal)

Resilience Through Floodplain Regulations

The District's Floodplains



What would change?

- *Terms*
- *Fees*
- **Regulated Areas**
- **Design Flood Elevations**
- **Insurance Requirements**
- **Buffer Areas**
- **Critical Facilities**

- *No Adverse Impact*
- *Mixed Use*
- *Hazardous Materials*
- *Historic Structures*

What would change? – Regulated Areas

Current Flood Hazard Rule:

- Special Flood Hazard Areas
  - FEMA 100-year floodplain
  - Only area regulated

Proposed Update:

- Flood Hazard Areas
  - FEMA 100- and 500-year floodplains
    - Precedents in Baltimore, Houston, Austin, Charlotte, etc.
  - Areas removed from FEMA's 100-year floodplain by LOMR-F

What would change? – Design Flood Elevation

Current Flood Hazard Rule:

All new and substantially improved buildings must be elevated or floodproofed to the:

- Base flood elevation (BFE) + 1.5 feet

Current DC Construction Codes:

All new and substantially improved buildings must be elevated or floodproofed to the:

- Base flood elevation + 2 feet
- or 500-year elevation, whichever is higher

Proposed Update to Flood Hazard Rule:

All new and substantially improved buildings must be elevated or floodproofed to the:

- Base flood elevation + 2 feet
- or 500-year elevation, whichever is higher

What would change? – Flood Insurance

Current Flood Hazard Rule:

- No insurance requirement
  - There is a FEMA mandatory flood insurance requirement within the 100-year floodplain for properties with federally backed loans, but that is enforced directly by banks.

Proposed Update:

- Proof of flood insurance
  - In flood hazard areas
  - Prior to final inspection & continuing for life of structure
  - Amount Required is lesser of:
    - The maximum amount available under the NFIP for the type of structure, or
    - The insurable value of the property minus the value of the land on which it is located.

What would change? – Critical Facilities

Current Flood Hazard Rule:

- Not addressed
- references ASCE design standard (ASCE 24)

Proposed Update:

- Critical Facilities defined
  - Flood Design Class 4 structures (ASCE 24)
  - Some Flood Design Class 3 structures (ASCE 24)
- Prohibit new or substantially improved critical facilities in flood hazard areas without variance or alternatives analysis and stringent protective measures
- HSEMA roles: review and approve evacuation and resilient power plans

What would change? – Buffer Areas

Current Flood Hazard Rule:

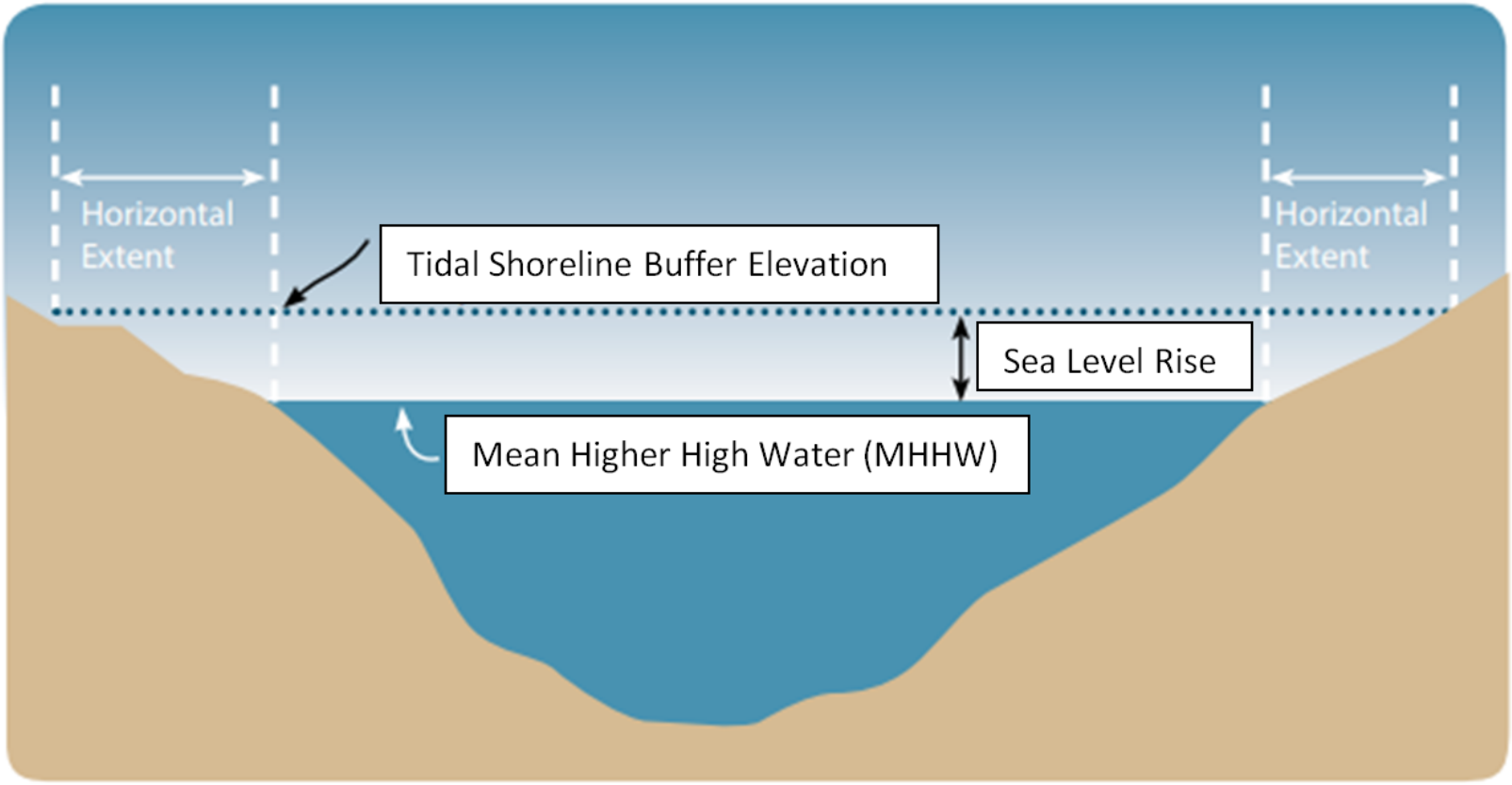
- No buffers

Proposed Update:

- Tidal Shoreline Buffer
  - Areas to be inundated by Sea Level Rise by 2100
  - New development must be protected to **500-year elevation + 6** ft. to account for NOAA predicted sea level rise.
  - Review by OP for harmony with surrounding urban design

Tidal Shoreline Buffer Calculation

Mean Higher High Water (MHHW) in the year 2000: 2.2' NAVD88
+
Relative Sea Level Rise between the year 2000 and 2100: 6.4'
=
Tidal Shoreline Buffer Elevation (MHHW in the year 2100): **8.6' NAVD88**




N
0 0.125 0.25 0.5 0.75 1
Miles
Draft Tidal Shoreline Buffer
TSB

Thank you!