FEMA Region 3

Flood Risk Review Meeting

Berkeley County, WV April 4, 2025

FEMA

Agenda

1. Welcome and Introductions
2. Where We Are - Draft Maps
3. Flood Study Update
4. Using Flood Risk Data to Reduce Risk
5. Floodplain Management
6. Discussion

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Introductions

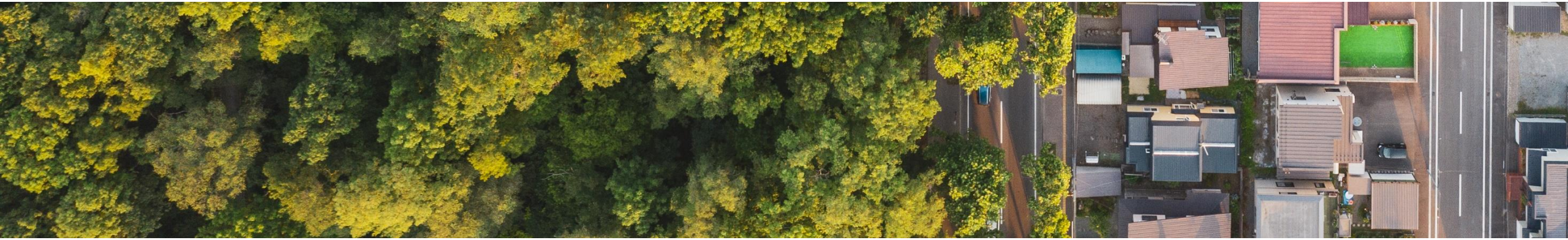
Please Introduce Yourself

- Name.
- Position.
- Organization.

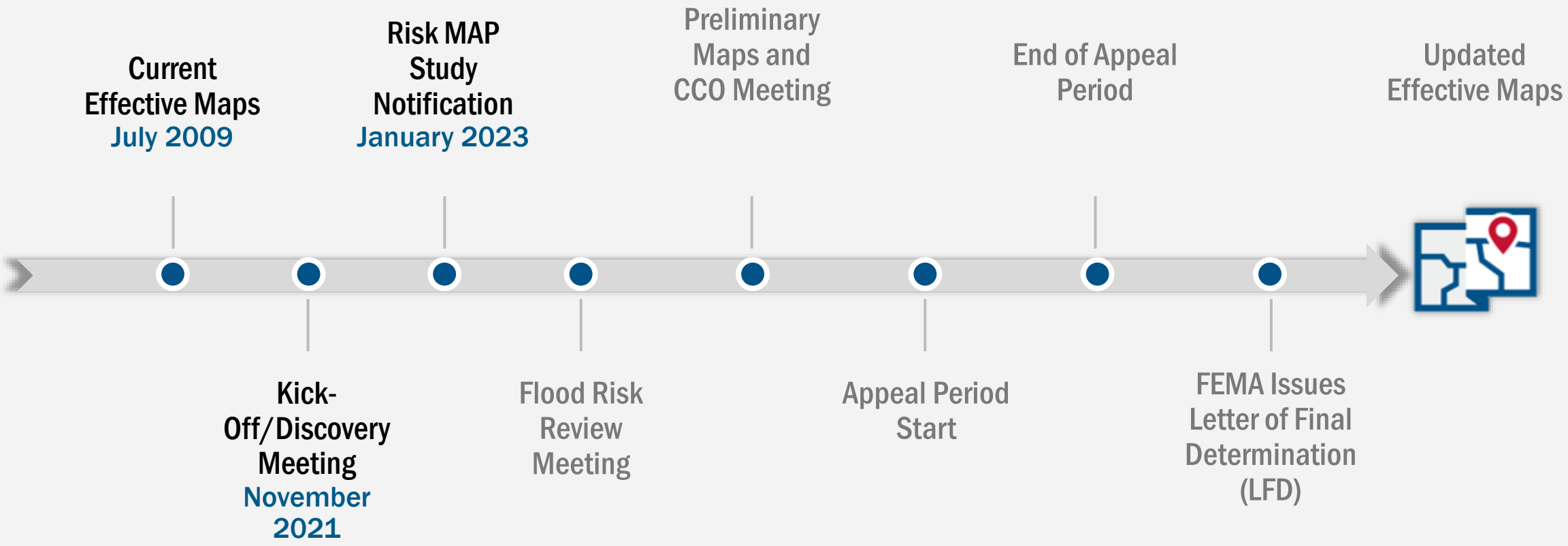
Where We Are – Draft Maps

3 Reasons We Are Here Today

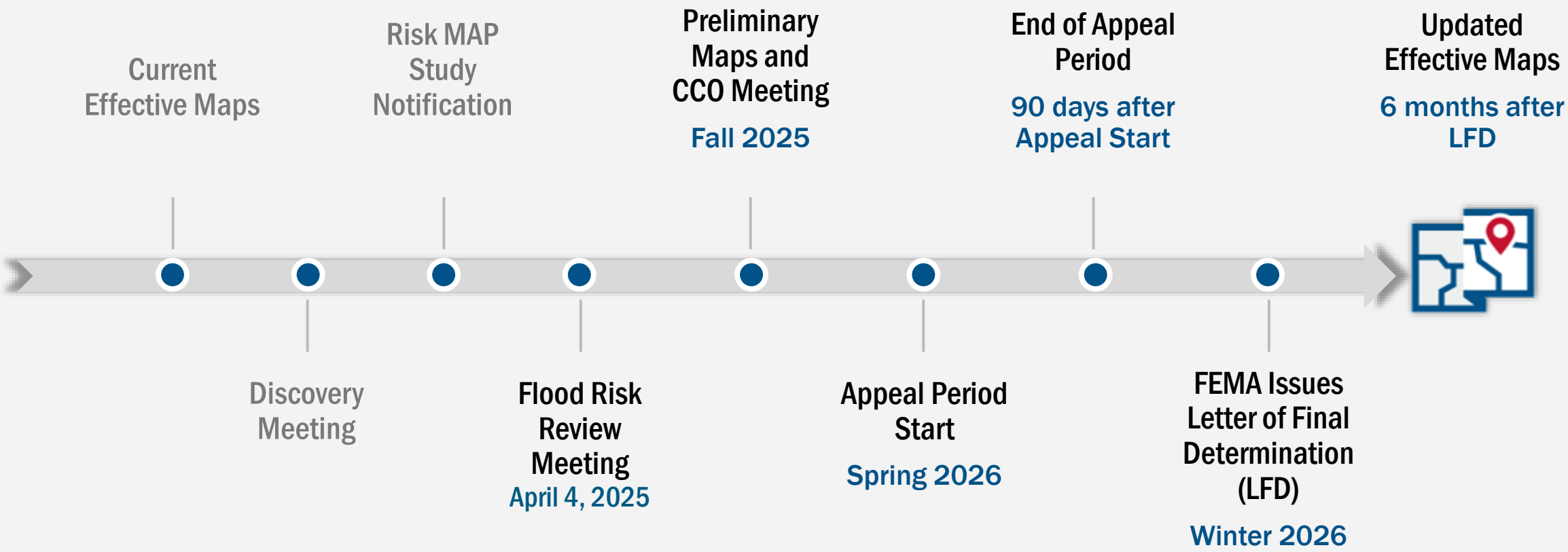
- To preview and discuss the updated Flood Insurance Study (FIS) report and Flood Insurance Rate Map (FIRM) for Berkeley County, West Virginia
- To examine the new study areas, discuss how the analysis and mapping have changed since the previous FIRM, and discuss current and future implications for these changes
- To present a timeline of next steps



Timeline – Looking Back



Timeline – Looking Ahead

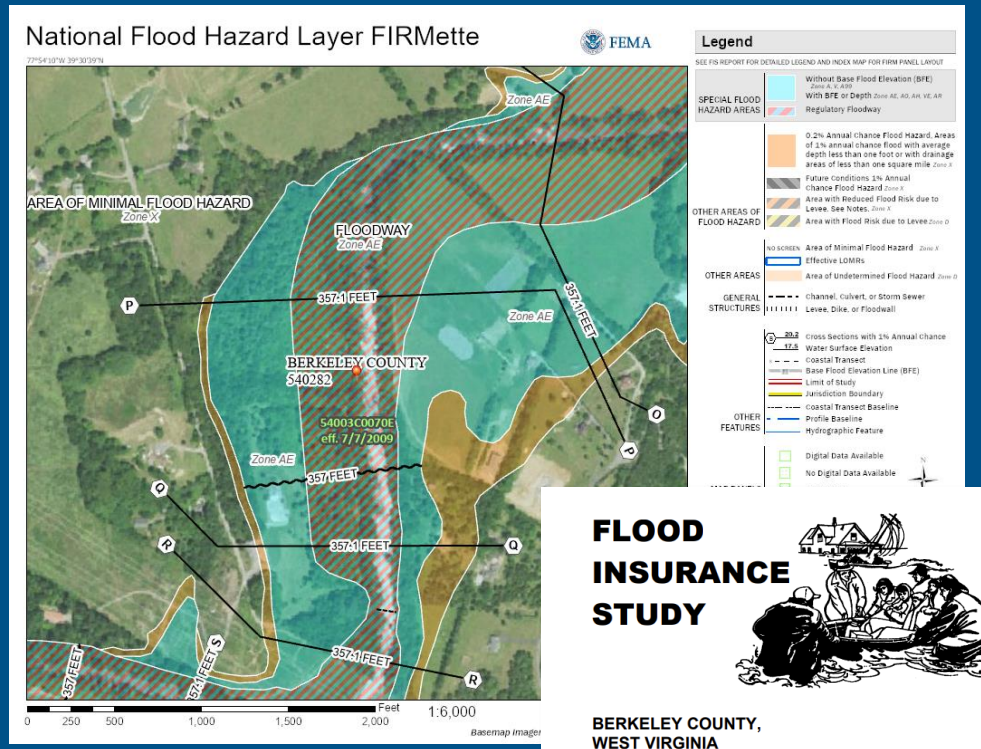


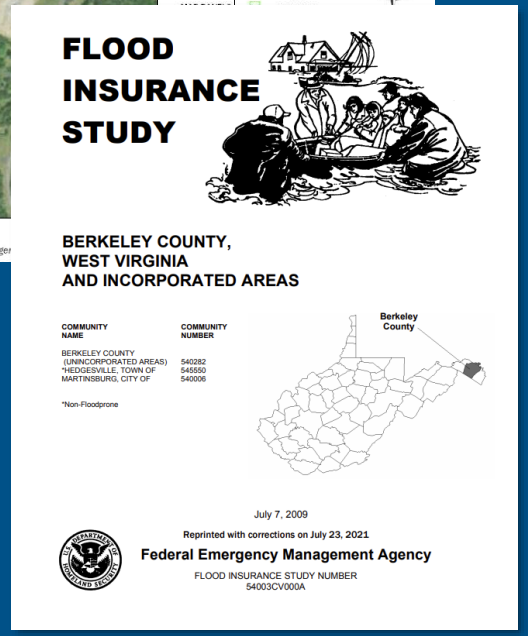
Flood Study Update

Flood Insurance Rate Maps and Studies

Key Terms:

- Flood Insurance Rate Map (**FIRM**)
- Flood Insurance Study (**FIS**) Report
- Special Flood Hazard Area (**SFHA**)
- Flood Zone
- Base Flood Elevation (**BFE**)
- Regulatory Floodway
- Cross Section





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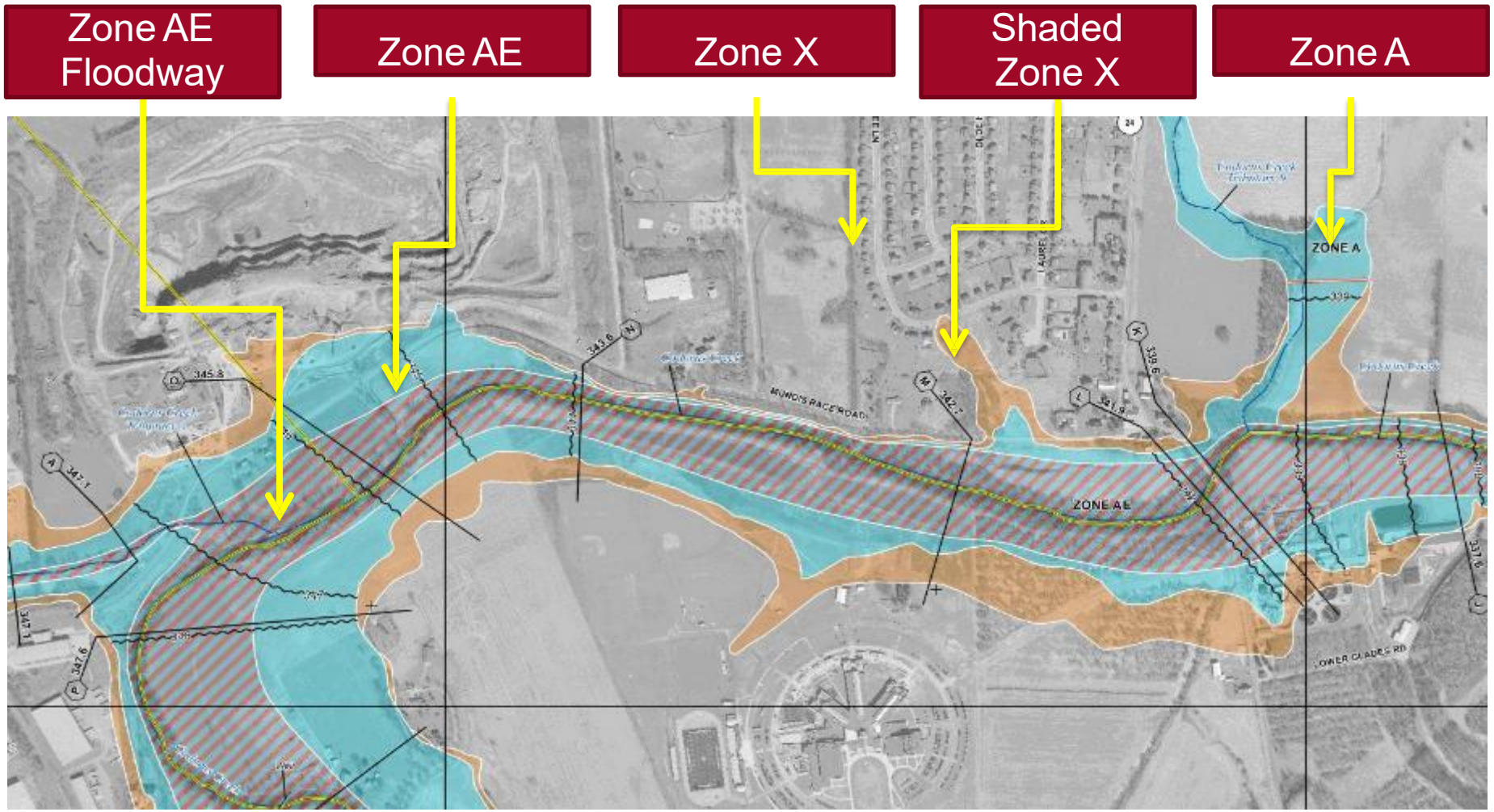
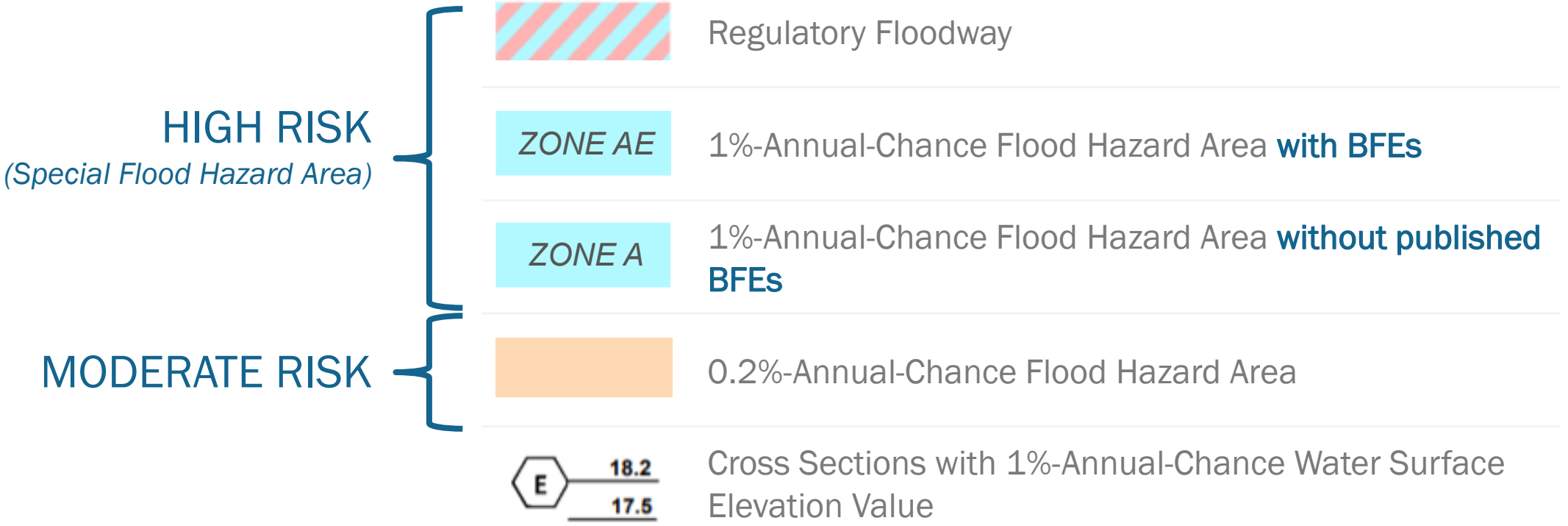
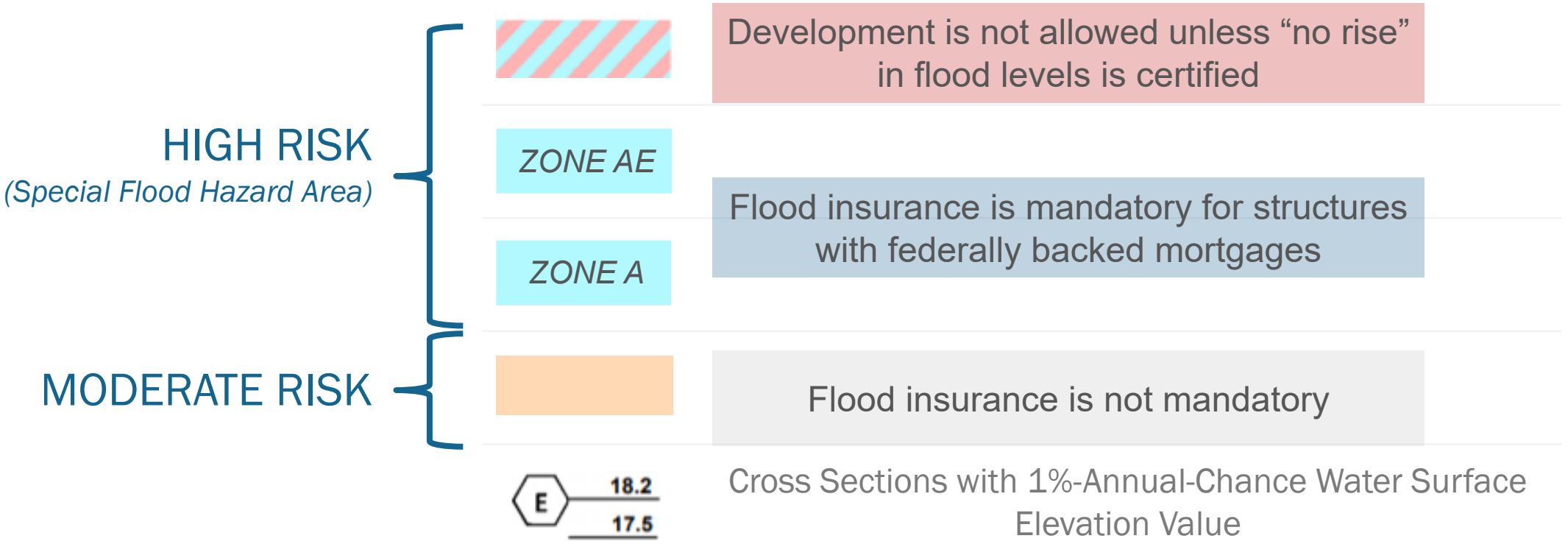
Typical FIRM Panel and Flood Zones



Floodplain Map Overview



Floodplain Map Overview



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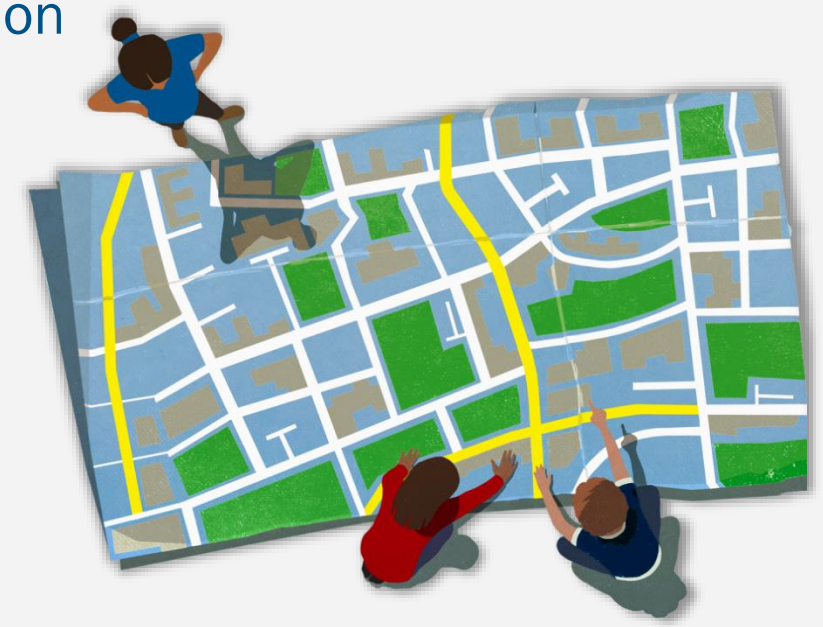
Study Overview

Revised Modeling and Mapping, including:

- ❑ Updated GIS-based regulatory products, including:
  - Updated FIRMs / GIS database / FIS report formats based on new FEMA guidelines and specifications
- ❑ Used high-resolution topographic data (for modeling and mapping)
- ❑ Detailed “Zone AE” Studies – 48 miles
- ❑ Model-backed Approximate “Zone A” Studies – 225 miles
- ❑ Floodplains on the Potomac River are **NOT** being updated as part of this study

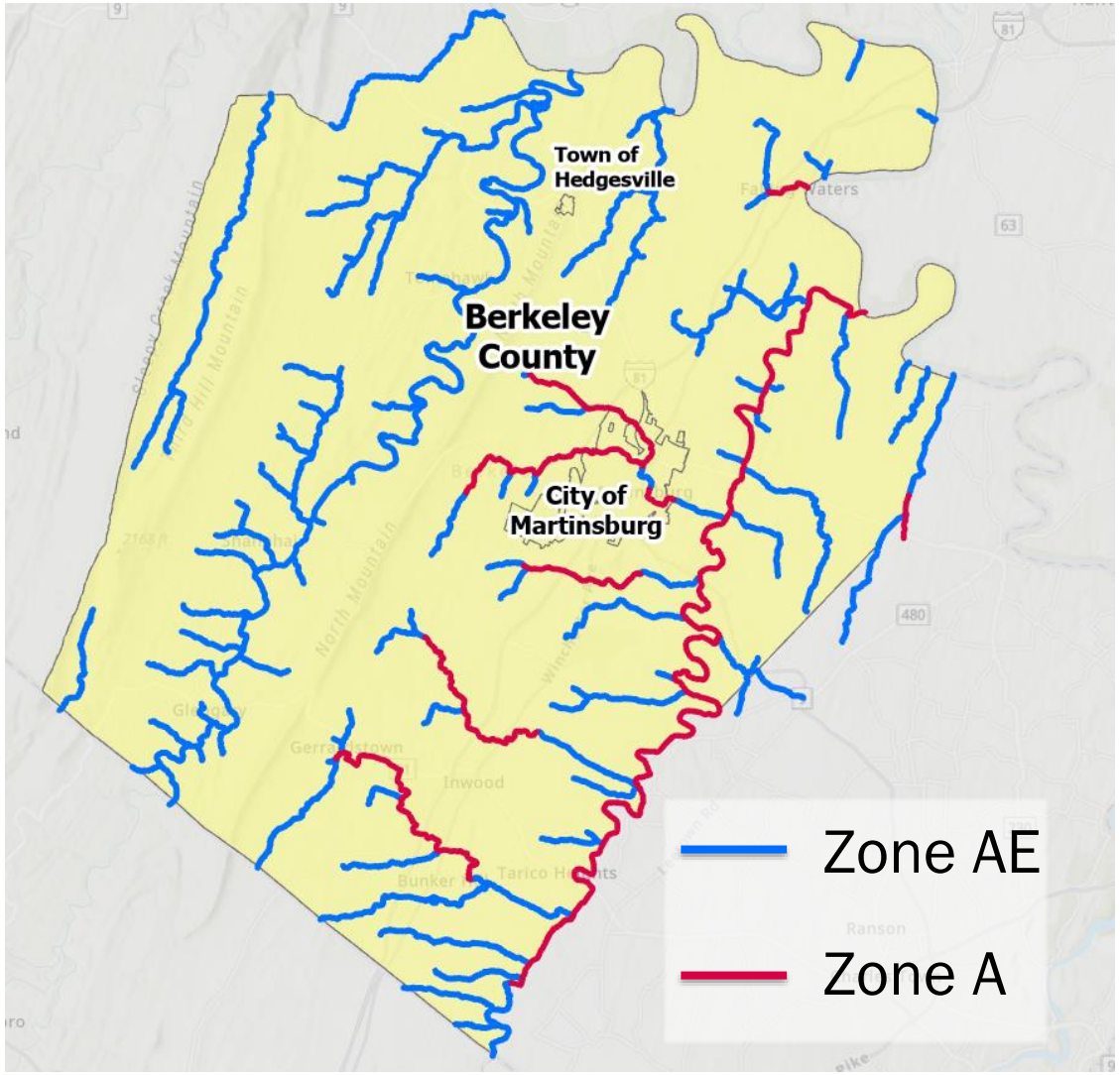


Study Overview (continued)

Revised Modeling and Mapping, including:

- ❑ Evaluation of Letters of Map Change (LOMCs)
  - Case-by-case results shown in a Summary of Map Actions (SOMA) that is sent to applicable communities with Preliminary Maps and Letters of Final Determination (LFDs)
  - Letters of Map Revision (LOMRs)
  - Letters of Map Amendment (LOMAs) – including rectified LOMA locations on the WV Flood Tool
- ❑ Production of associated non-regulatory flood risk

Study Area

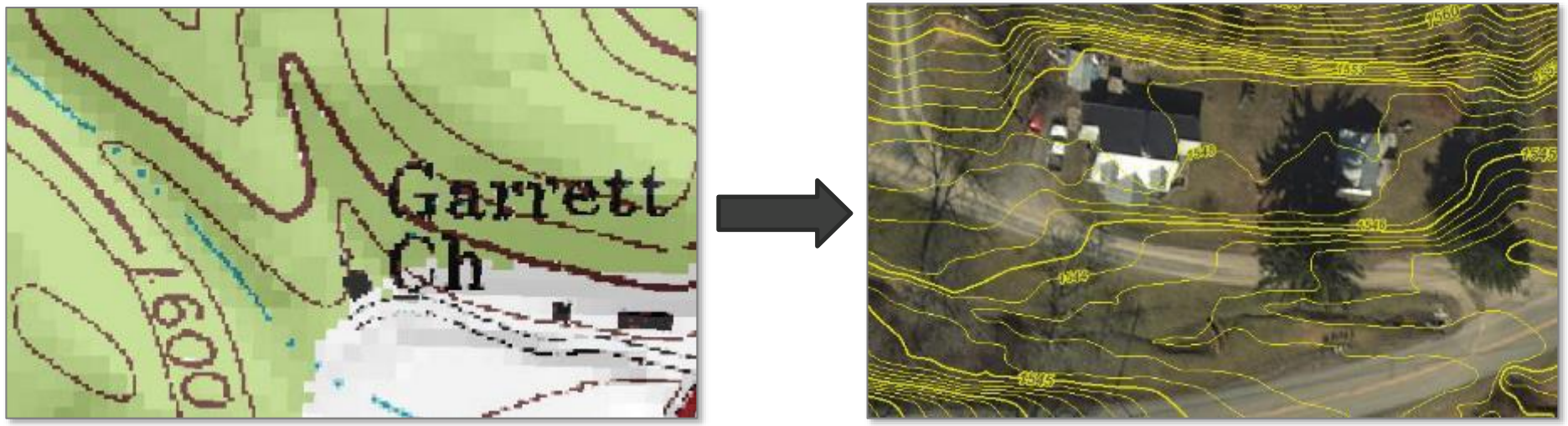

Town of Hedgesville
Berkeley County
City of Martinsburg
Zone AE
Zone A

Topographic Data

2012 LiDAR-Based Digital Elevation Model

LiDAR = Light Detection and Ranging

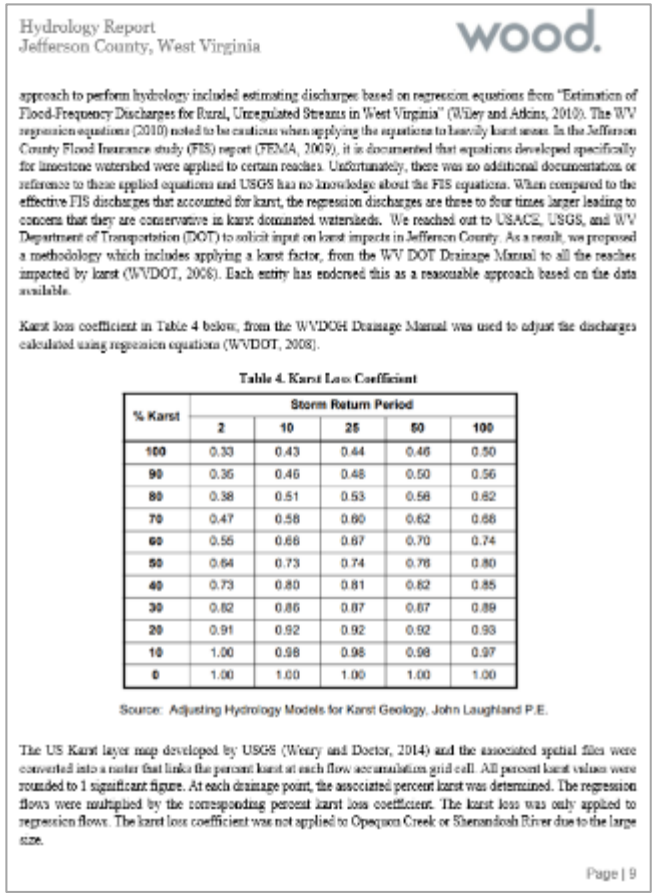
- *Uses light pulses and GPS to survey elevation data*
- *Improves the level of detail for hydraulic modeling and floodplain delineation*



Hydrologic Analyses

- Hydrologic study methods included:
  - Rainfall Runoff Model (HEC-HMS 4.6)
  - USGS Regression Equations
  - Regression Equations Supplemented with USGS Gage Analysis (Bulletin 17C)
- A comprehensive **Hydrology Report** details the study methods for each reach and compares the effective and proposed discharges.
- The hydrologic study methods will also be published in the FIS Report.

Sample page from the Risk MAP Hydrology Report



Hydrology Report
Jefferson County, West Virginia

wood.

approach to perform hydrology included estimating discharges based on regression equations from "Estimation of Flood-Frequency Discharges for Rural, Unregulated Streams in West Virginia" (Wiley and Atkins, 2010). The WV regression equations (2010) noted to be cautious when applying the equations to heavily karst areas. In the Jefferson County Flood Insurance study (FIS) report (FEMA, 2009), it is documented that equations developed specifically for limestone watershed were applied to certain reaches. Unfortunately, there was no additional documentation or reference to these applied equations and USGS has no knowledge about the FIS equations. When compared to the effective FIS discharges that accounted for karst, the regression discharges are three to four times larger leading to concern that they are conservative in karst dominated watersheds. We reached out to USACE, USGS, and WV Department of Transportation (DOT) to solicit input on karst impacts in Jefferson County. As a result, was proposed a methodology which includes applying a karst factor, from the WV DOT Drainage Manual to all the reaches impacted by karst (WVDOT, 2008). Each entity has endorsed this as a reasonable approach based on the data available.

Karst loss coefficient in Table 4 below, from the WVDOH Drainage Manual was used to adjust the discharges calculated using regression equations (WVDOT, 2008).

Table 4. Karst Loss Coefficient

% Karst	Storm Return Period				
	2	10	25	50	100
100	0.33	0.43	0.44	0.46	0.50
90	0.36	0.46	0.48	0.50	0.56
80	0.38	0.51	0.53	0.56	0.62
70	0.47	0.58	0.60	0.62	0.68
60	0.56	0.66	0.67	0.70	0.74
50	0.64	0.73	0.74	0.76	0.80
40	0.73	0.80	0.81	0.82	0.85
30	0.82	0.86	0.87	0.87	0.89
20	0.91	0.92	0.92	0.92	0.93
10	1.00	0.98	0.98	0.98	0.97
0	1.00	1.00	1.00	1.00	1.00

Source: Adjusting Hydrology Models for Karst Geology, John Laughland P.E.

The US Karst layer map developed by USGS (Weary and Doctor, 2014) and the associated spatial files were converted into a raster that links the percent karst at each flow accumulation grid cell. All percent karst values were rounded to 1 significant figure. At each drainage point, the associated percent karst was determined. The regression flows were multiplied by the corresponding percent karst loss coefficient. The karst loss was only applied to regression flows. The karst loss coefficient was not applied to Opequon Creek or Shenandoah River due to the large size.

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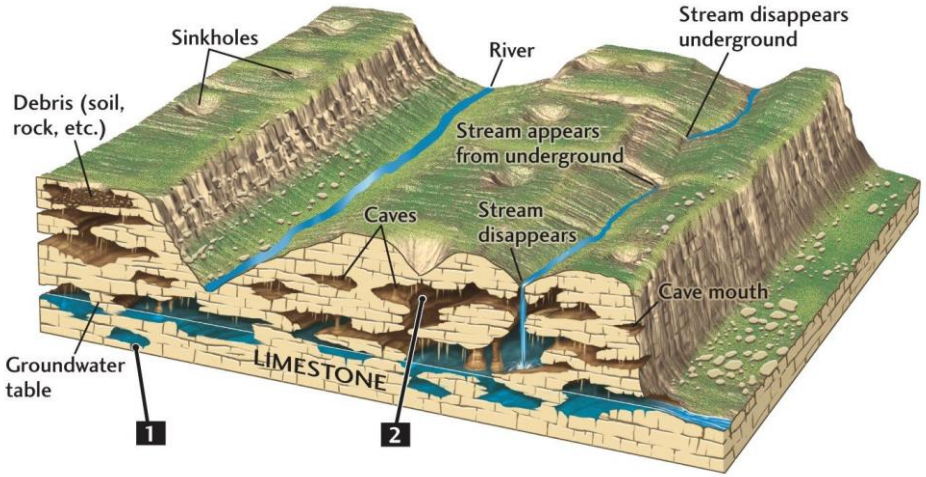
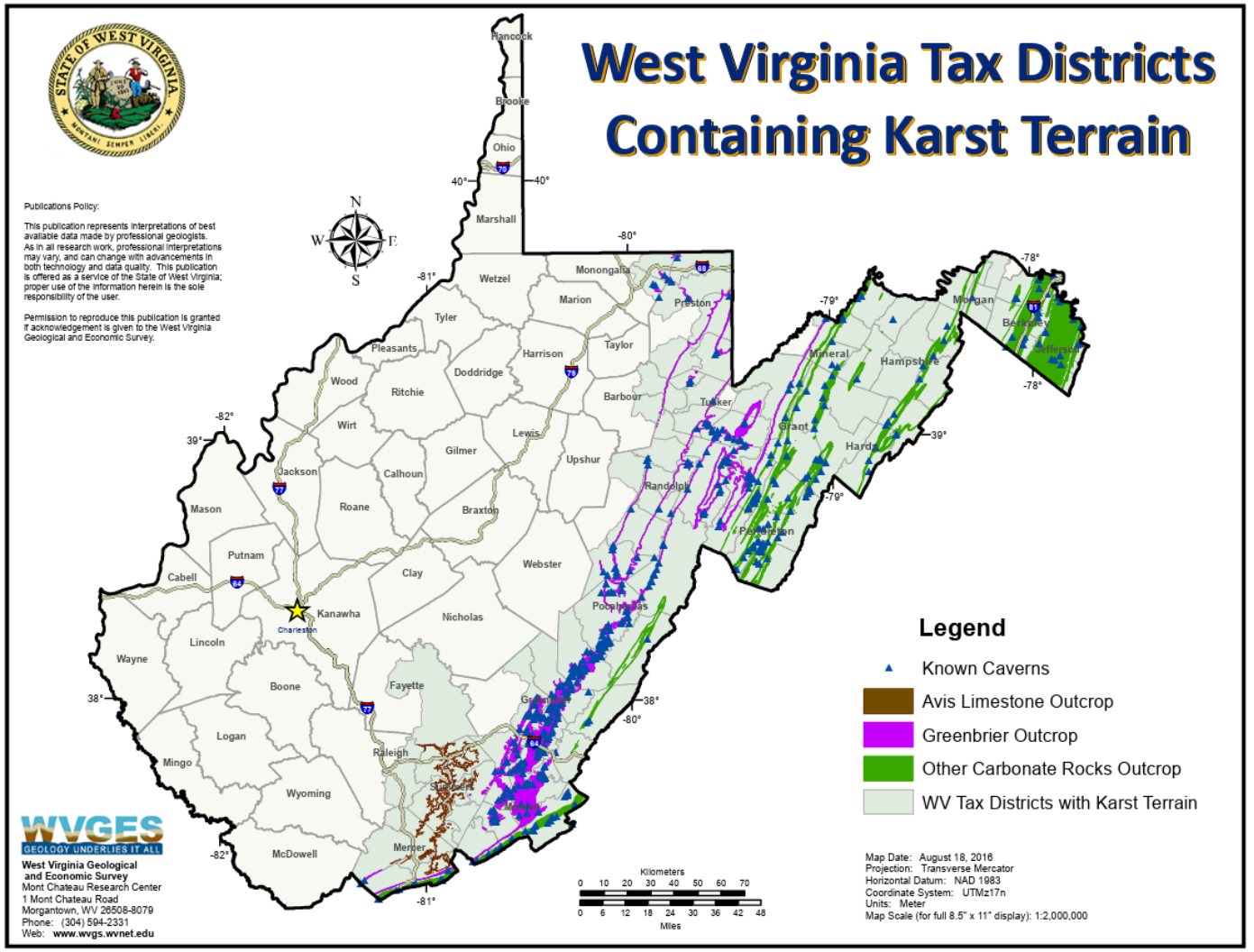
Karst Topography





Karst Correction Factor

- Karst Correction Factor applied to estimate discharges in watersheds where karst was present.
  - Karst Correction Factor values taken from West Virginia Department of Transportation Drainage Manual (2008)
  - Water flow during flood events reduced to account for higher amount of rainfall infiltrating into the limestone bedrock instead of running into streams

% Karst	Storm Return Period				
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100	0.33	0.43	0.44	0.46	0.50
90	0.35	0.46	0.48	0.50	0.56
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70	0.47	0.58	0.60	0.62	0.68
60	0.55	0.66	0.67	0.70	0.74
50	0.64	0.73	0.74	0.76	0.80
40	0.73	0.80	0.81	0.82	0.85
30	0.82	0.86	0.87	0.87	0.89
20	0.91	0.92	0.92	0.92	0.93
10	1.00	0.98	0.98	0.98	0.97
0	1.00	1.00	1.00	1.00	1.00

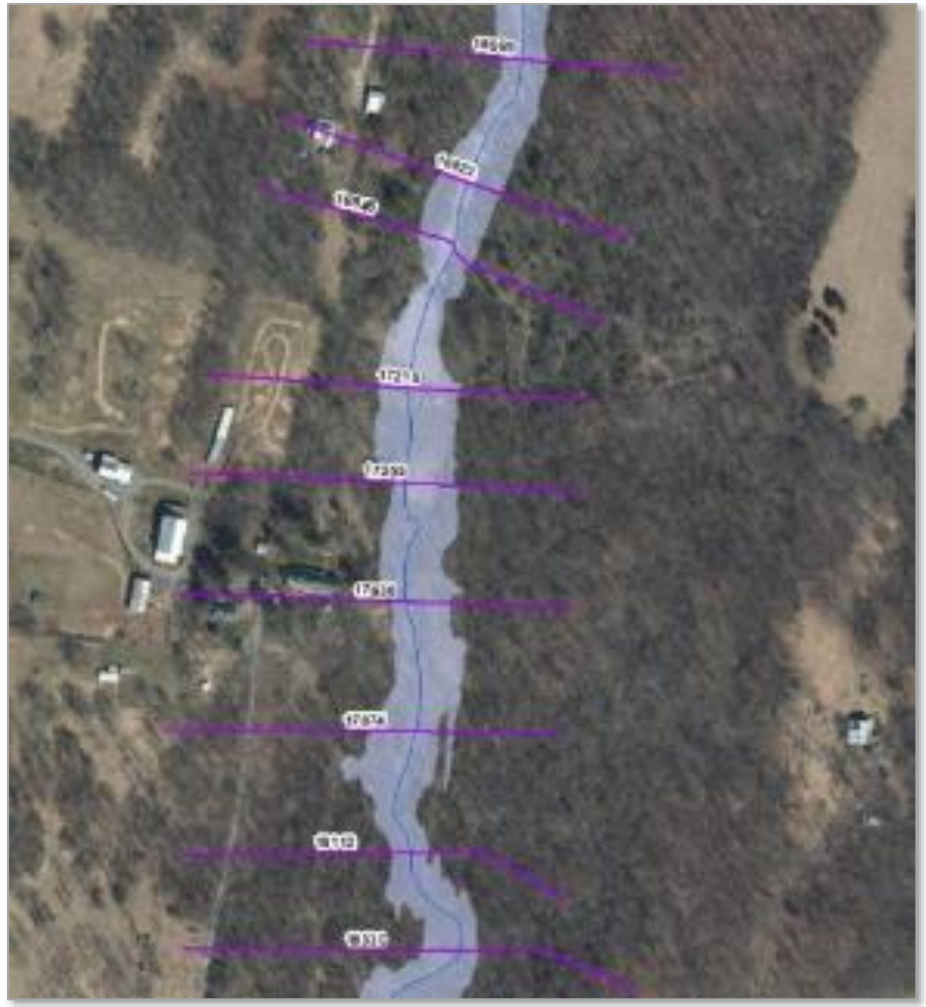
Source: Adjusting Hydrology Models for Karst Geology, John Laughland P.E.

Figure 3. Karst Loss Coefficient

Hydraulic Analyses – Zone A

Approximate "Zone A" Base Level Study (225 miles)

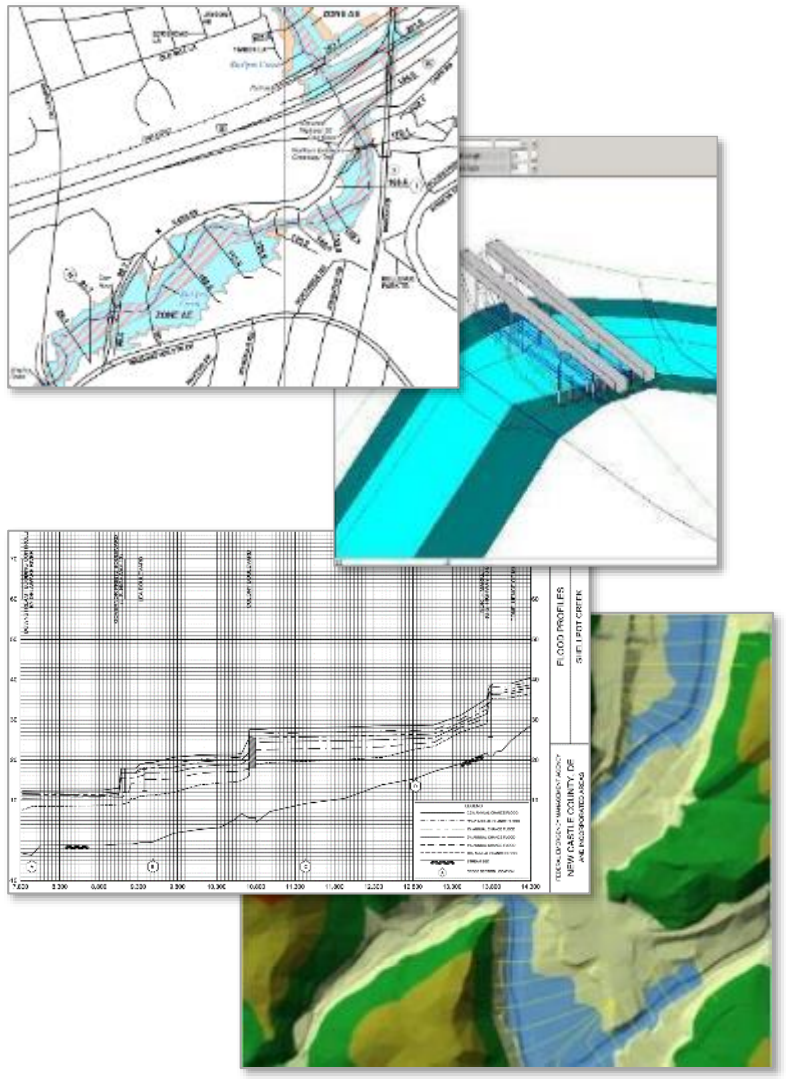
- Generally used in areas with lower development or lower development potential
- Cross sections generated from LiDAR (automated processes)
  - Does not include channel bathymetry
  - No hydraulic structures are surveyed or modeled
- FIRM **will not** show Floodway or BFEs (but FIRM database will include cross sections and their associated water surface elevations in the FIRM GIS Database)
- FIS Report **will not** show flood profiles for Zone A reaches



Hydraulic Analyses – Zone AE

Detailed "Zone AE" Study (48 miles)

- Generally used in areas with higher development or higher development potential
- Cross sections use information from survey and field reconnaissance
  - Include channel bathymetry
  - Structures are modeled (e.g., culverts, bridges)
- Detailed hydraulic parameter refinement (coefficients, obstructions, Manning's 'n' values)
- FIRM **will** show Floodway, BFEs, 1% and 0.2%-annual-chance event floodplains
- FIS Report **will** show flood profiles for 10-, 4-, 2-, 1-, 0.2-, and 1% Plus flood frequencies



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Study Impacts

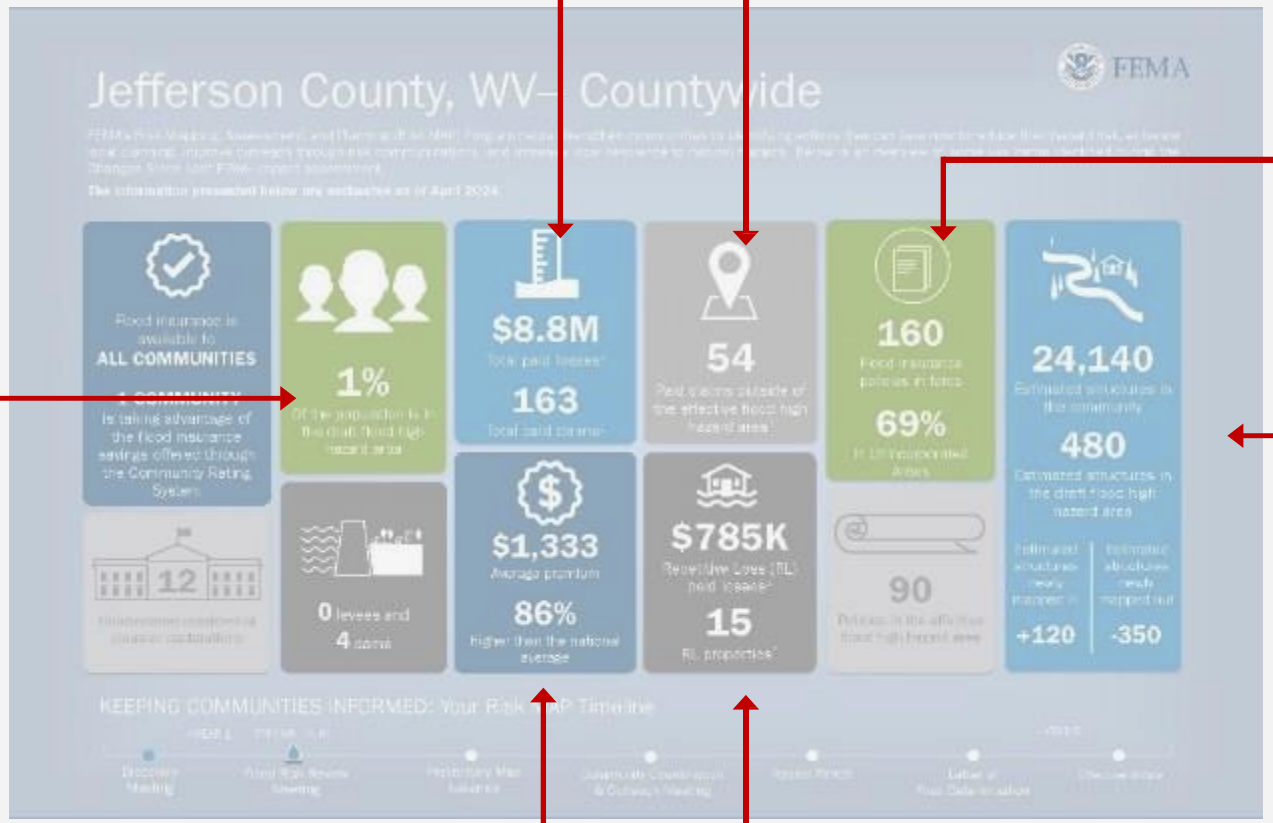
Significant Impacts Overview

- Compared to the effective NFHL, widening and narrowing of the 1%-annual-chance floodplain (SFHA) extent was observed throughout the county.
- Extended study reaches (with drainage areas of 2 square miles and greater, and not on current effective FIRM) result in new properties within the SFHA.
- Most streams experienced both increases and decreases when comparing the computed model WSELs to the current regulatory BFEs.
- More structures will be mapped out than mapped in. Basic estimate: -350 / +120

WV Flood Tool – SFHA Future Map Conditions

No Change SFHA	Mapped In SFHA	Mapped Out SFHA	Total Structures
343 *(+30 Floodway)*	122 *(+3 Floodway)*	276	774

Flood Risk Dashboard



NFIP FLOOD CLAIM PAYOUTS

CLAIMS OUTSIDE OF THE SFHA

NFIP FLOOD POLICIES

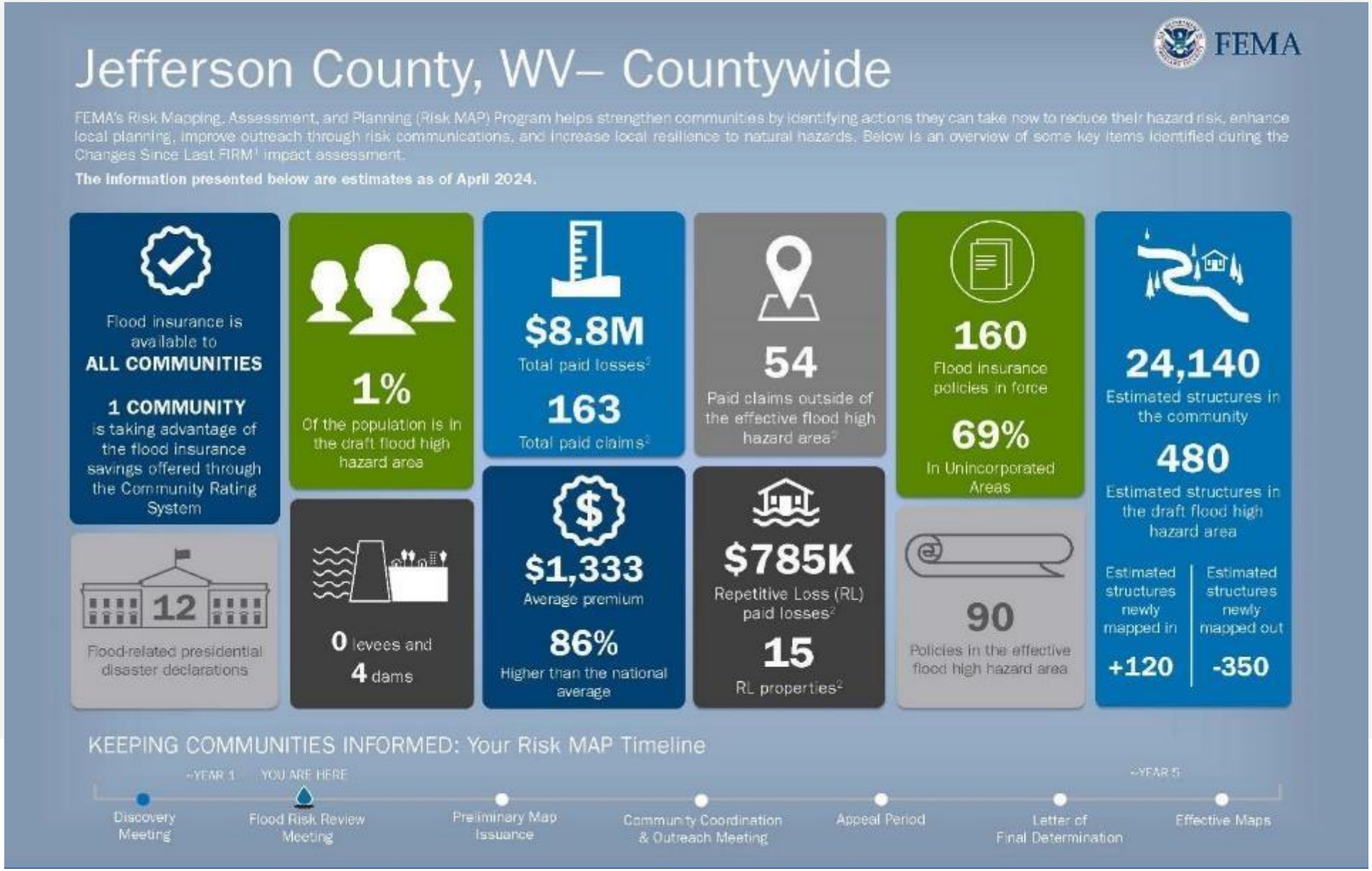
AFFECTED RESIDENTS

HIGH-RISK STRUCTURES

AVERAGE PREMIUM

REPETITIVE LOSSES

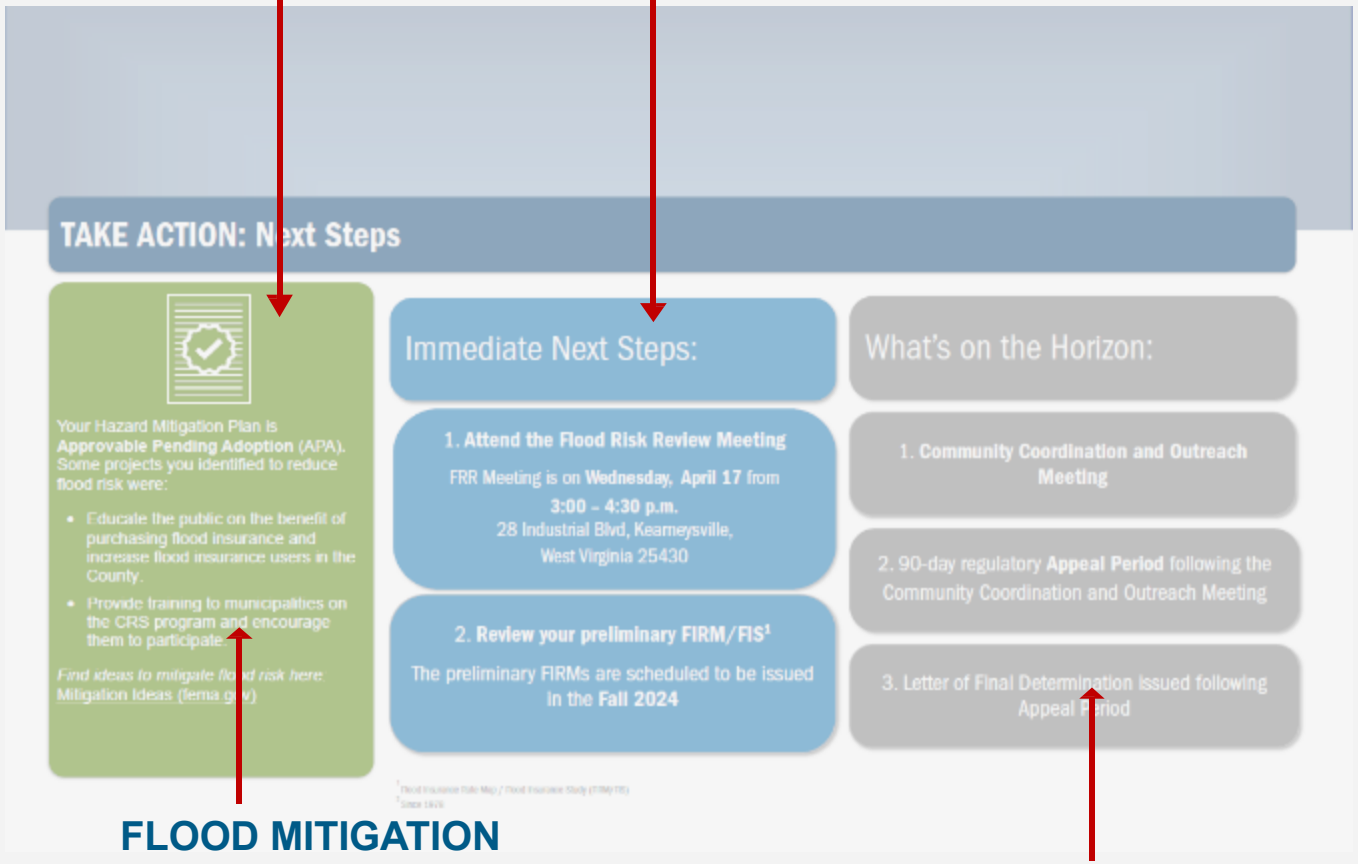
Flood Risk Dashboard



Flood Risk Dashboard (page 2)

HMP EXPIRATION INFO

STEPS BEFORE PRELIMINARY ISSUANCE



FLOOD MITIGATION ACTIONS

STEPS AFTER PRELIMINARY ISSUANCE

Flood Risk Dashboard (page 2)

TAKE ACTION: Next Steps

Your Hazard Mitigation Plan is **Approvable Pending Adoption** (APA). Some projects you identified to reduce flood risk were:

- Educate the public on the benefit of purchasing flood insurance and increase flood insurance users in the County.
- Provide training to municipalities on the CRS program and encourage them to participate.

Find ideas to mitigate flood risk here: Mitigation Ideas (fema.gov)

Immediate Next Steps:

1. **Attend the Flood Risk Review Meeting**

FRR Meeting is on **Wednesday, April 17** from **3:00 – 4:30 p.m.**
28 Industrial Blvd, Kearneysville,
West Virginia 25430

2. **Review your preliminary FIRM/FIS[1]**

The preliminary FIRMs are scheduled to be issued in the **Fall 2024**

What's on the Horizon:

1. **Community Coordination and Outreach Meeting**

2. 90-day regulatory **Appeal Period** following the Community Coordination and Outreach Meeting

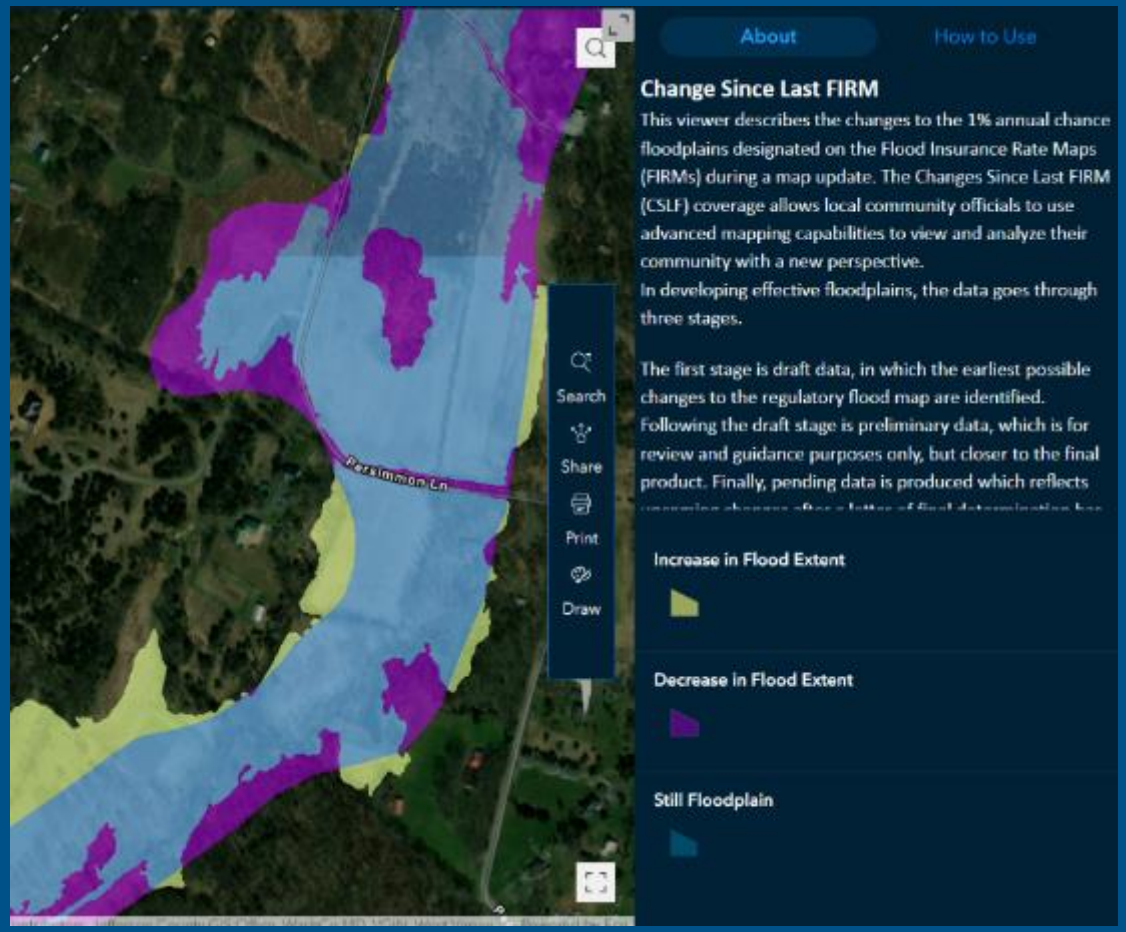
3. Letter of Final Determination issued following Appeal Period

[1] Flood Insurance Rate Map / Flood Insurance Study (FIRM/FIS)
[2] Since 1978

How Did the Floodplain Maps Change?

- FEMA Region 3
  Changes Since Last FIRM (CSLF) Viewer:
  https://arcg.is/ijSne
- Change in Floodplain Extents:
  - Purple – Decrease
  - Blue – Still Floodplain
  - Yellow – Increase

*Map view has scale-dependent layers



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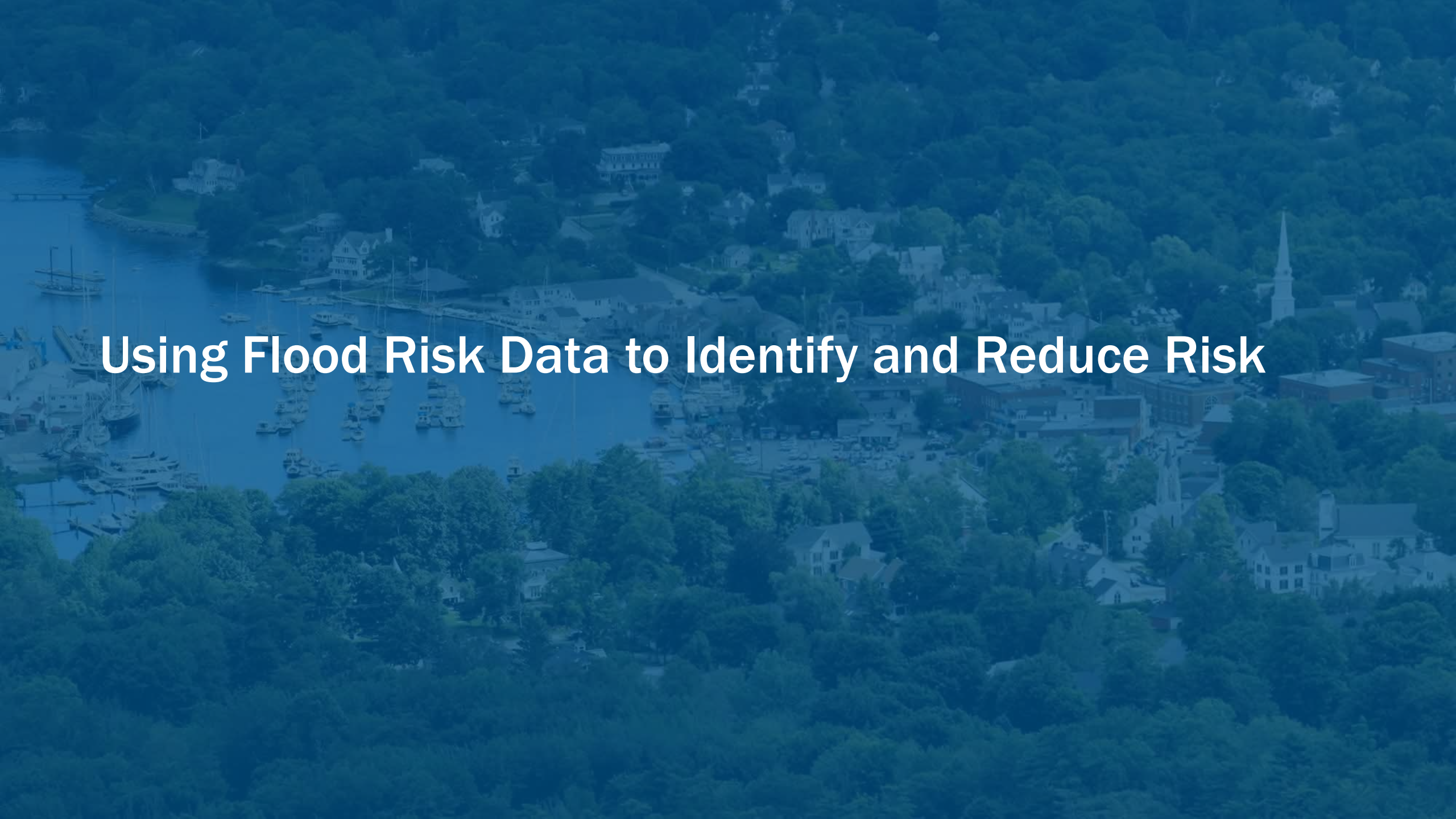
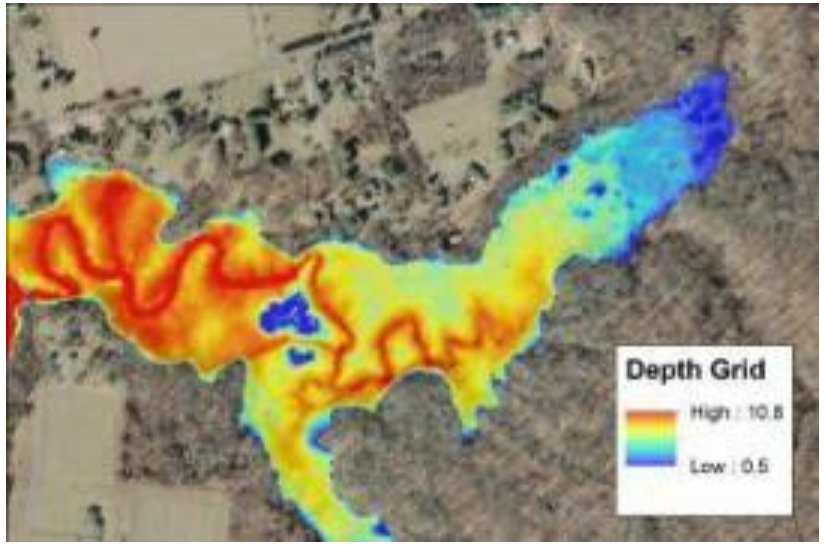


Using Flood Risk Data to Identify and Reduce Risk

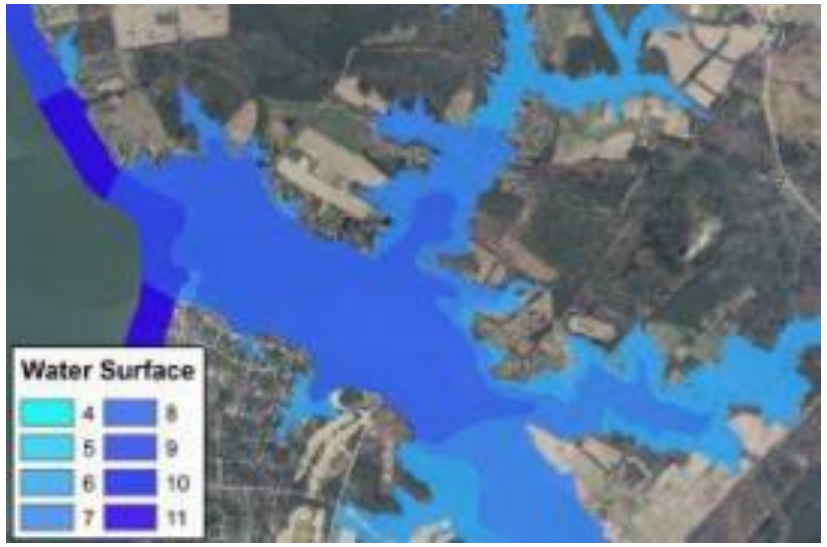
FEMA Flood Risk GIS Datasets

Flood Depth and Analysis Grids



Changes Since Last FIRM

Water Surface Elevation Grids



Flood Risk Assessment

Where to Find Flood Risk Data

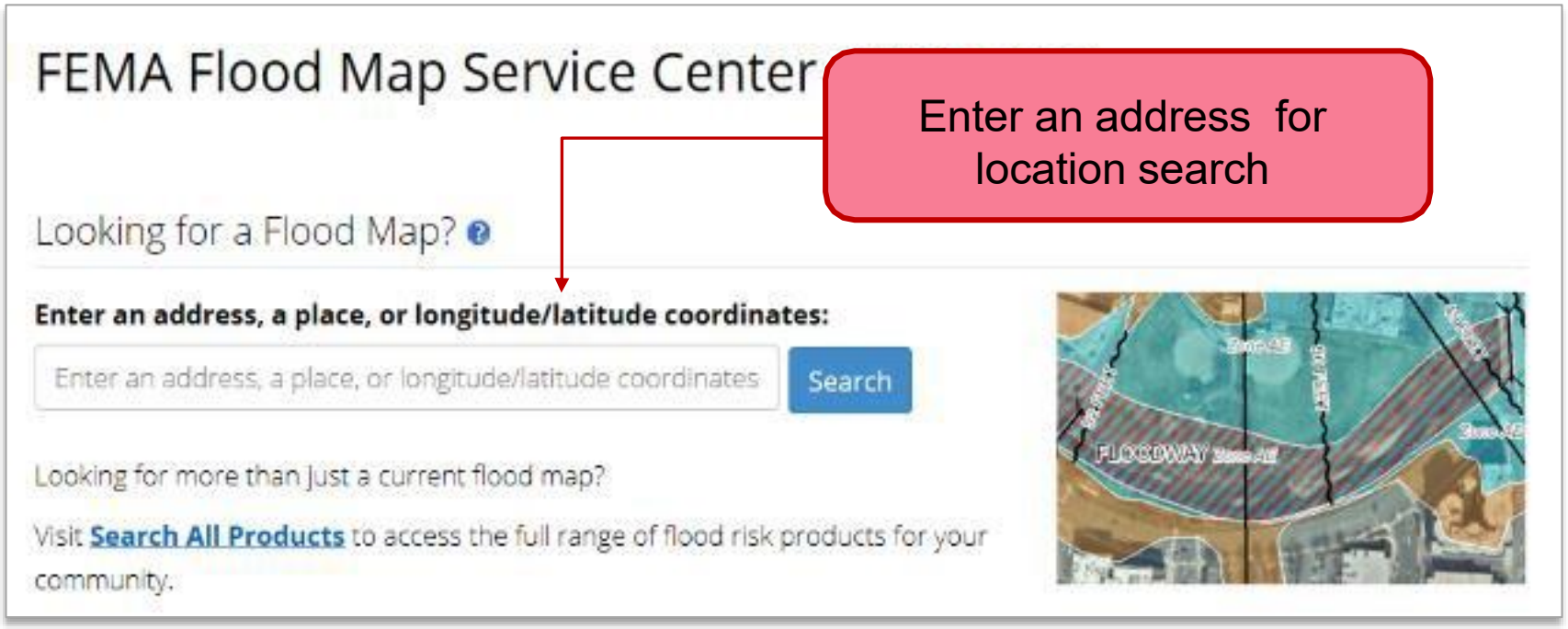
- FEMA's Flood Map Service Center (MSC)
  - Here, you can view effective maps online. You can also download current effective flood hazard data and additional hazard and risk data.
  - https://msc.fema.gov/portal/home

- National Flood Hazard Layer (NFHL)
  - This geospatial data viewer contains current effective flood hazard data.
  - https://www.fema.gov/flood-maps/national-flood-hazard-layer

- State Flood Tool
  - This geospatial data viewer contains current effective flood hazard data and additional hazard and risk data.

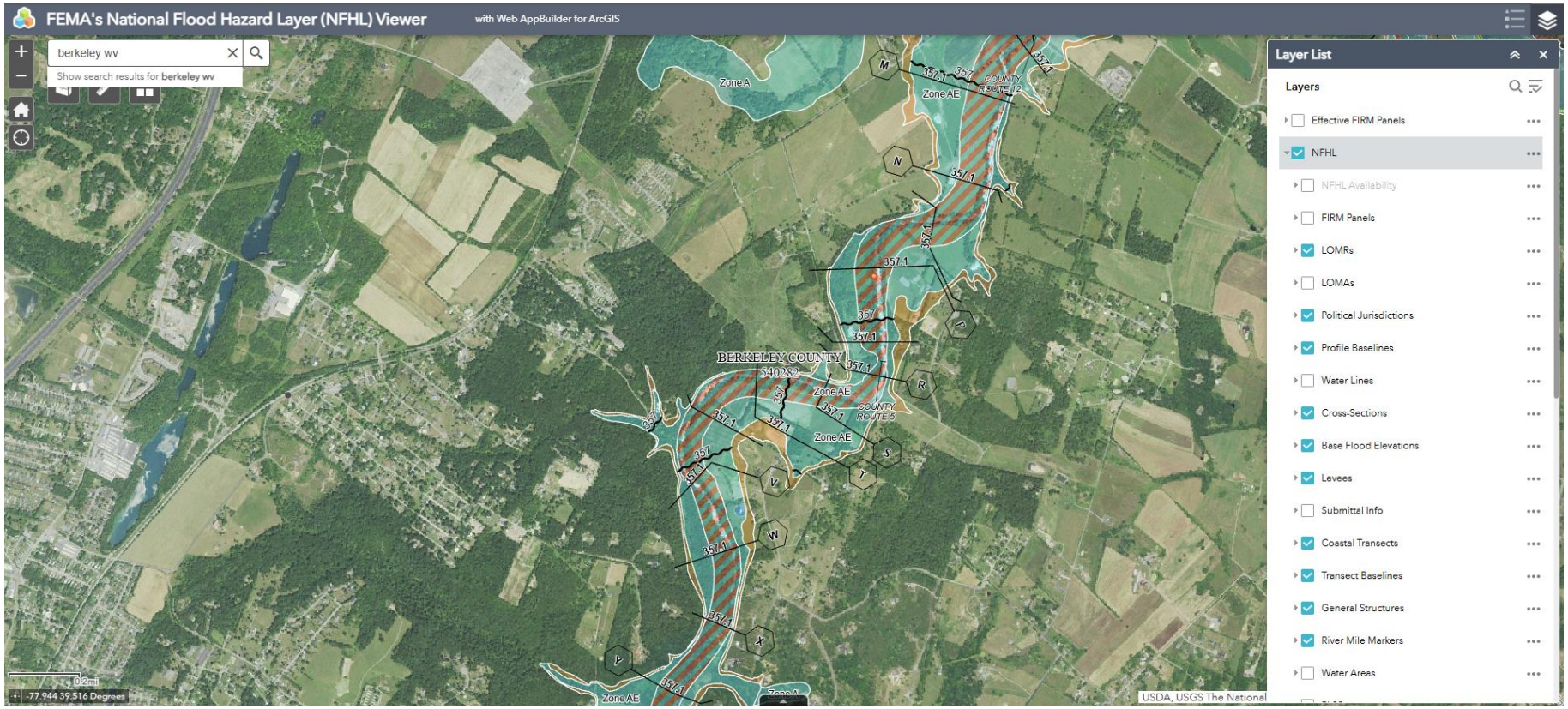
Where Can I Find My Flood Maps?

The FEMA Map Service Center (MSC) is the official public source for flood hazard information: https://msc.fema.gov/portal/home.



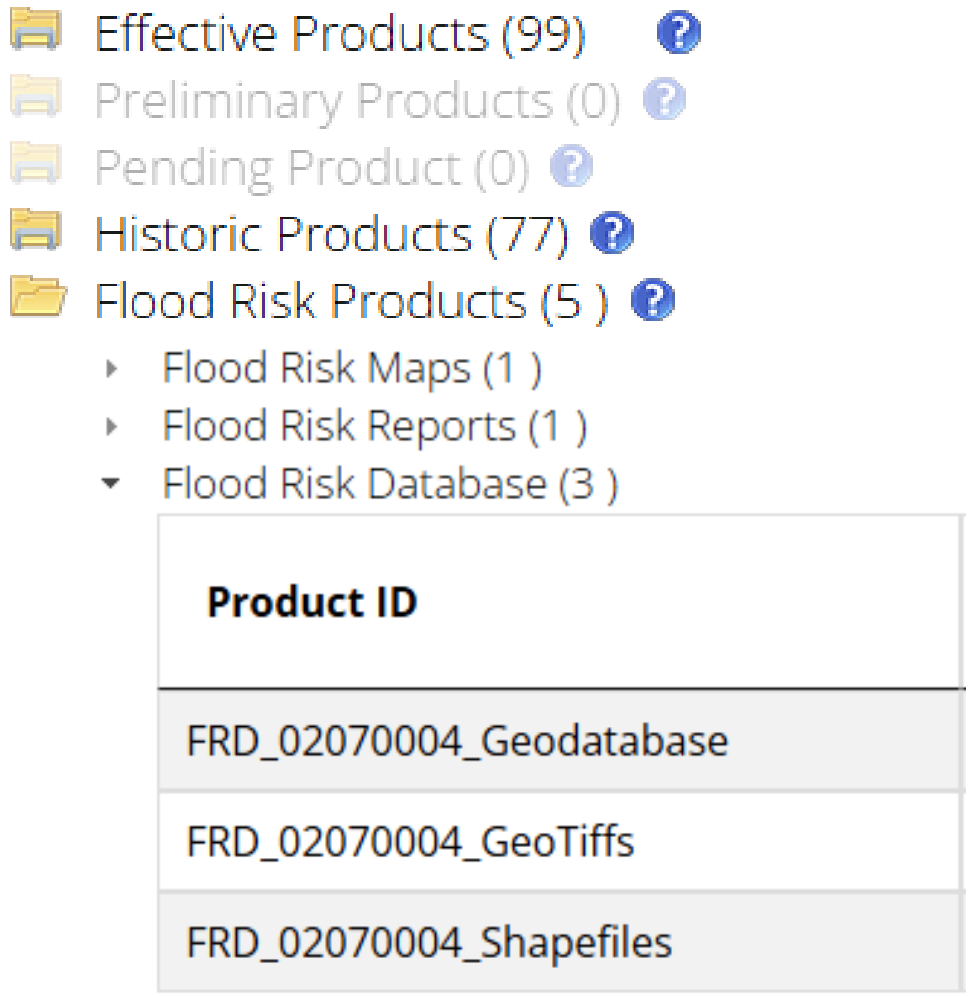
National Flood Hazard Layer

The NFHL shows the effective FEMA flood map data, including Letters of Map Revision (LOMRs).Visit https://www.fema.gov/national-flood-hazard-layer-nfhl for multiple options to view and download NFHL data.



Additional Hazard and Risk Data

If additional hazard and risk data are available for your community, the MSC Search Results will allow you to expand the Flood Risk Products folder.

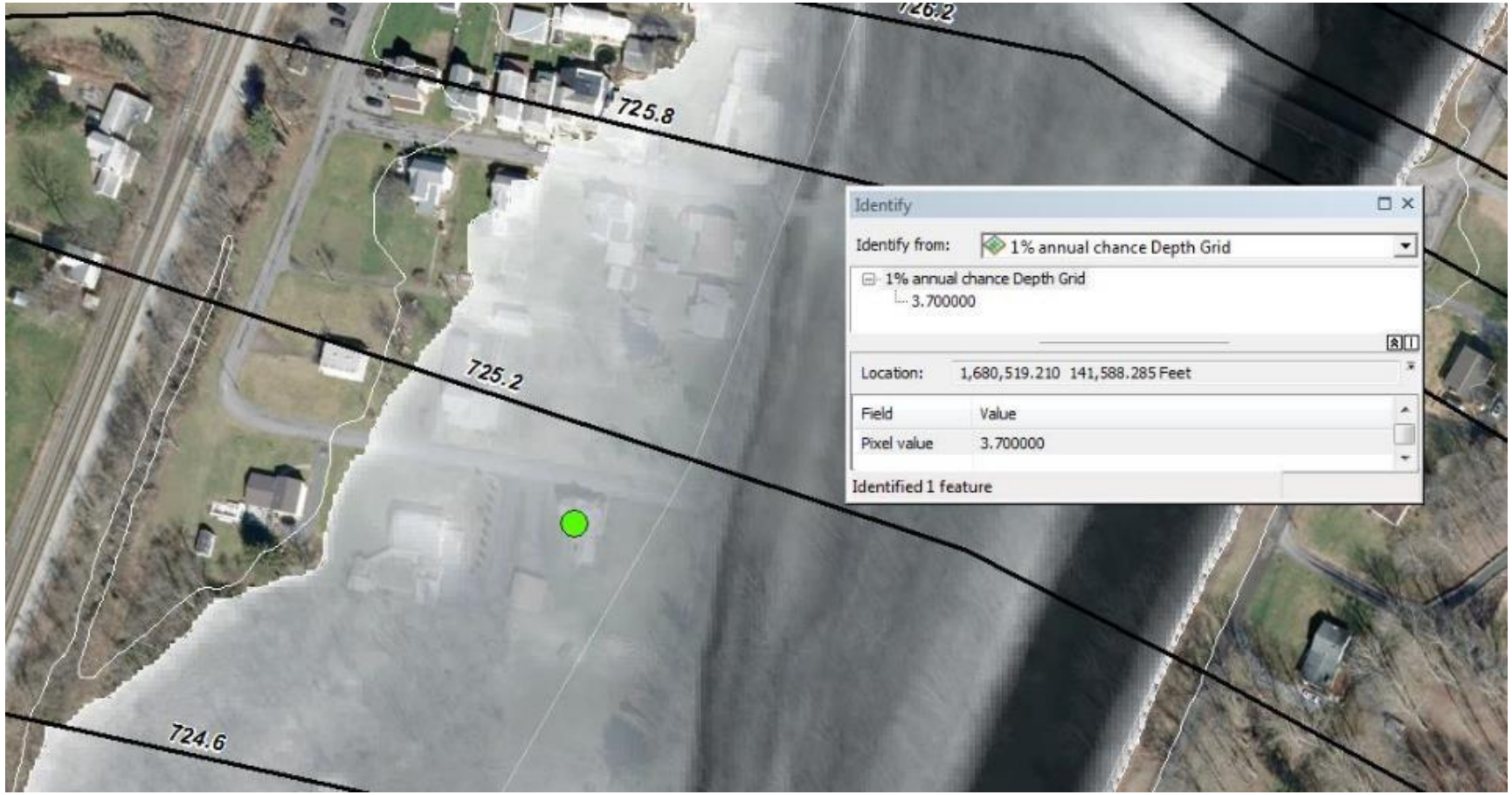


Water Surface Elevation Grids

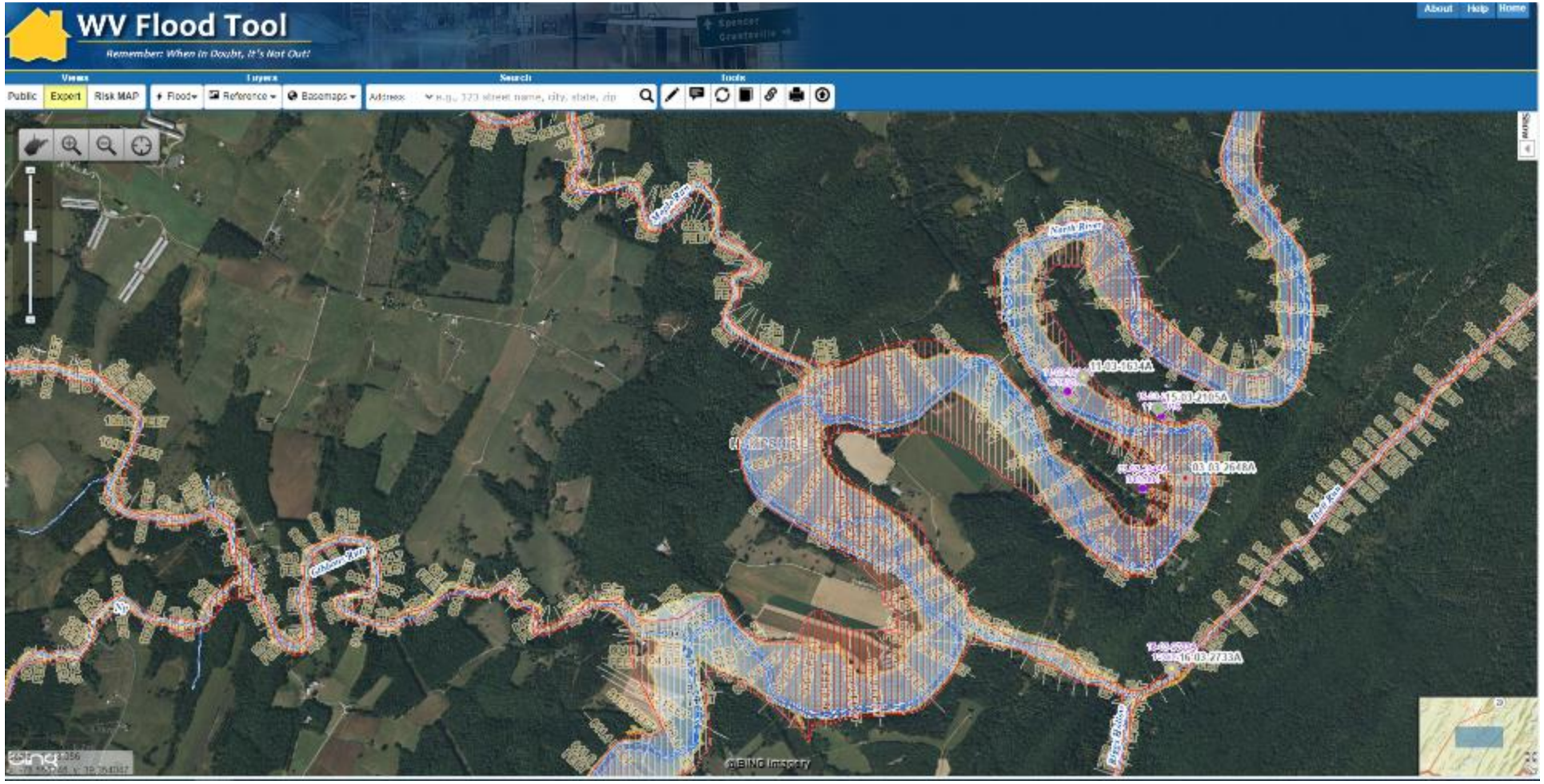
Represents the continuous water surface elevations (as determined at modeled cross sections and interpolated between cross sections) for each of the modeled flood frequencies.

Depth Grids

Represents the difference between the ground surface elevation and the water surface elevations in feet for each of the modeled flood frequencies.



West Virginia Flood Risk Tool



[WV Flood Tool (mapwv.gov)]

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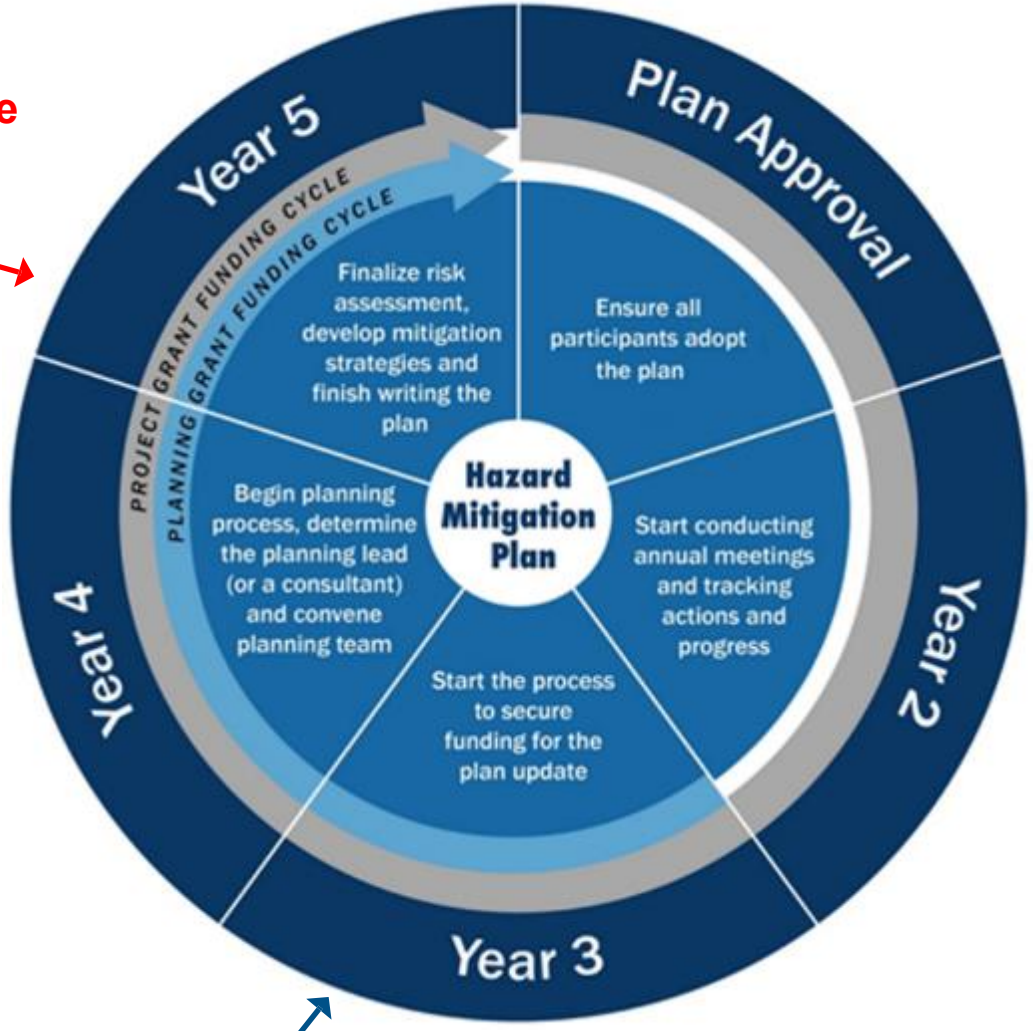
Flood Hazard Mitigation Planning

It's time to update the risk assessment in your hazard mitigation plan



The Berkeley County HMP is here

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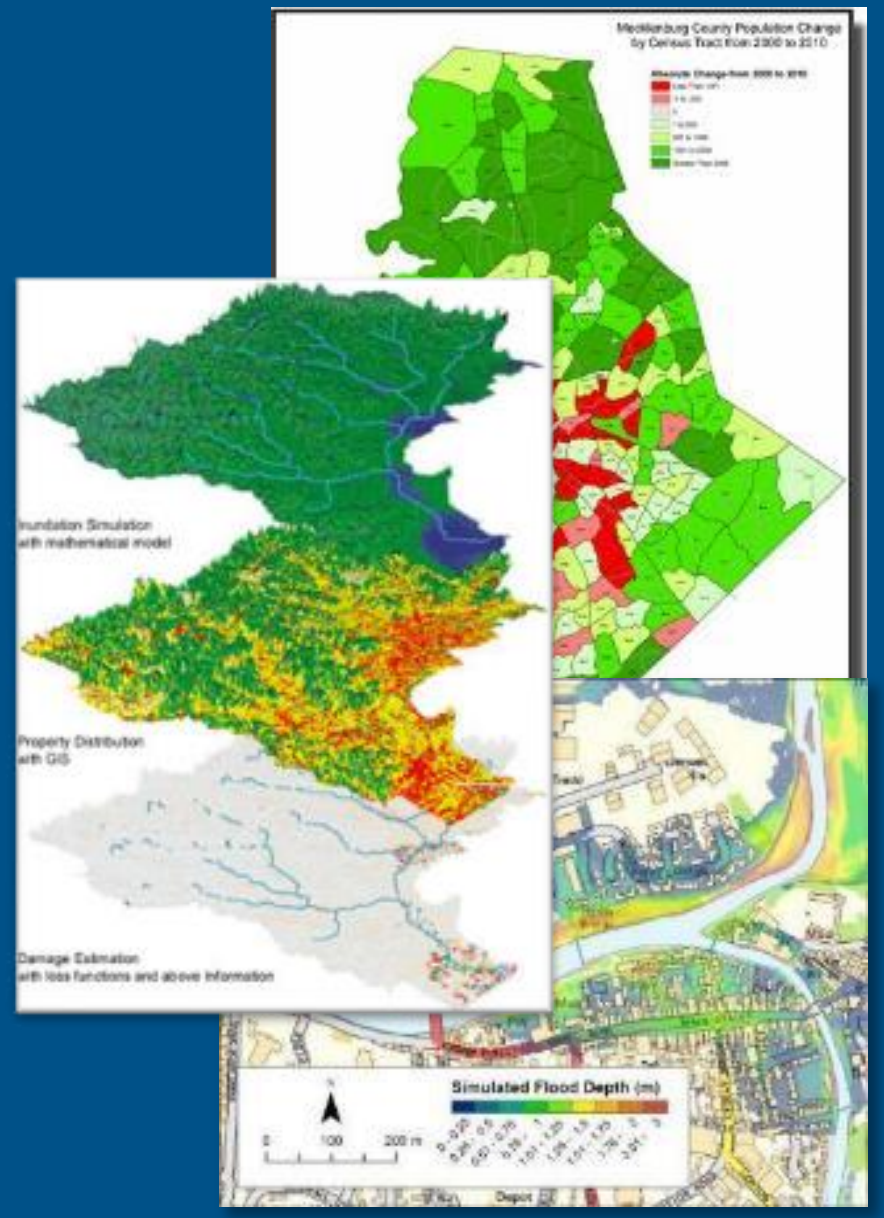
Using Flood Risk Data to Manage Development

- Structure-based depth of flooding analyses
- Prioritization of mitigation action
- Residential/commercial density in the floodplain
- Location/inundation area of historic events
- Properties with insurance policies and as a percentage of the population
- Areas of population growth
- Areas requiring protection



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Floodplain Management

Flood Risk Doesn't Stop at a Line

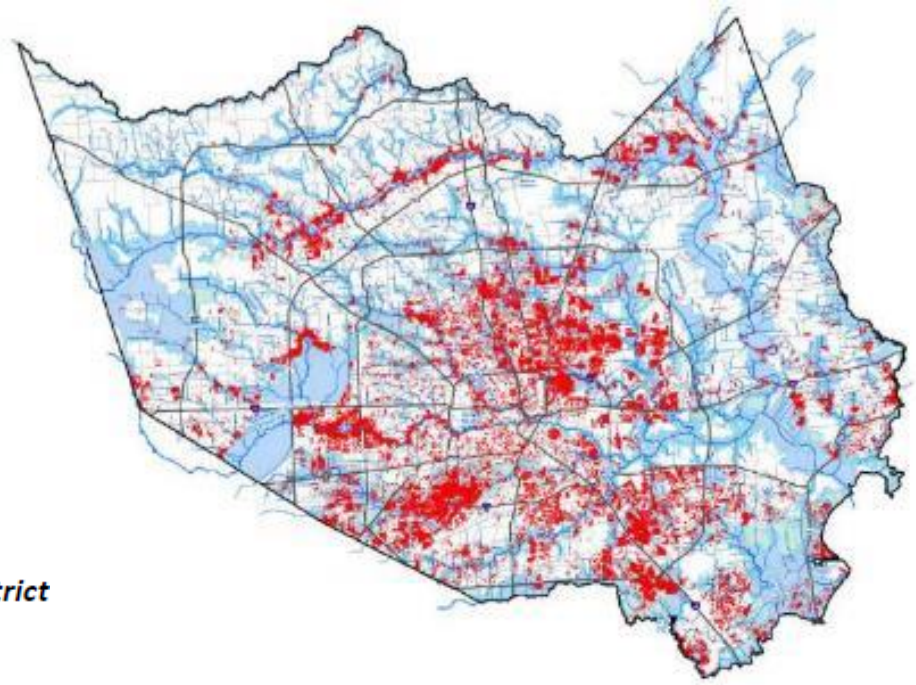
- 40% of all flood insurance claims come from outside high-risk areas.
- Your community can regulate to standards higher than the NFIP minimum standards. Consider strengthening regulations using:
  - 0.2%-annual-chance flood zone
  - "Freeboard" – require additional feet above a BFE
  - Buffer around SFHA
  - Flood depth grids

HURRICANE HARVEY
GREATER HOUSTON

154,170 Homes Flooded

32% < 100-yr
23% > 100 yr, < 500 yr
46% > 500 yr

SOURCE: Harris County Flood Control District



Floodplain Management at FRR

Look at where there are changes to the SFHA in your community

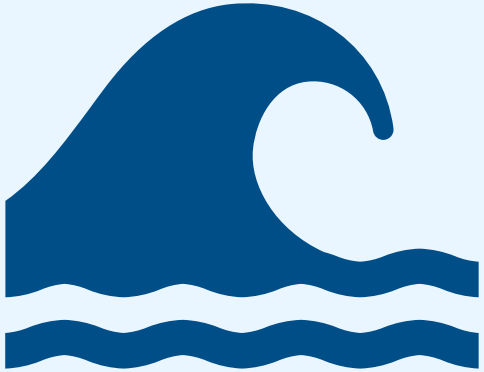
Share with permitting, planning, and other colleagues to direct development outside of the SFHA today and in future

Consider higher standards or joining the Community Rating System to support your community

FRR: Flood Risk Review
SFHA: Special Flood Hazard Area

Floodplain Management Big Picture

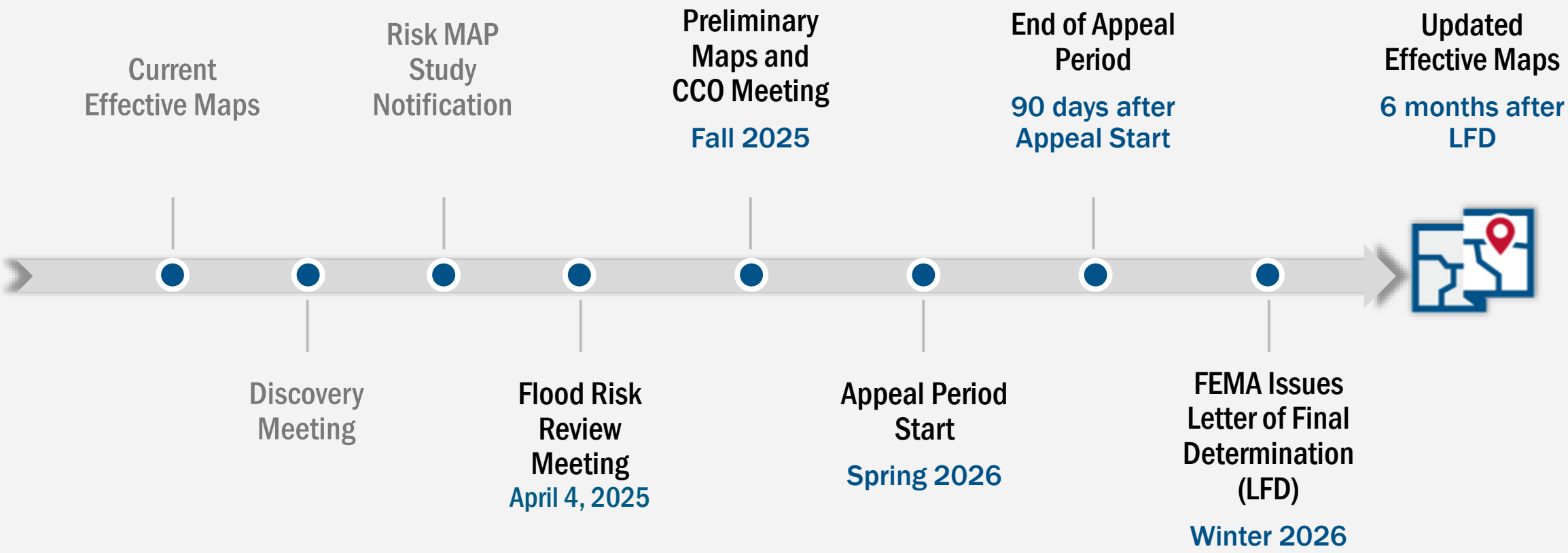
Build it right and lower the impact of future flood losses while improving resiliency



Build it wrong and the result could be increased flood losses and higher flood insurance premiums

Discussion

Timeline – Looking Ahead



Project Contacts – West Virginia

State NFIP/CTP Office:

Gabriel Reed
State Hazard Mitigation Officer
(304) 414-7673
Gabriel.a.reed@wv.gov

Kevin Sneed
CTP Project Officer
304-957-2571
kevin.l.sneed@wv.gov

Julia Sears
State NFIP Coordinator
304-989-8330
julia.r.sears@wv.gov

FEMA Region 3:

Amanuel Ghebreegziabher
FEMA Project Officer
(202) 718-2759
amanuel.ghebreegziabher@fema.dhs.gov

Bill Kuhn
Community Planner
william.kuhn@fema.dhs.gov

Betsy Ranson
Floodplain Management Specialist
(215) 347-0686
elizabeth.ranson@fema.dhs.gov

Bill Bradfield
Insurance Specialist
(202) 880-5906
william.b.bradfield@fema.dhs.gov

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