Statewide Flood Risk Assessment & WV Flood Tool

(TEIF – Total Exposure in Floodplain)

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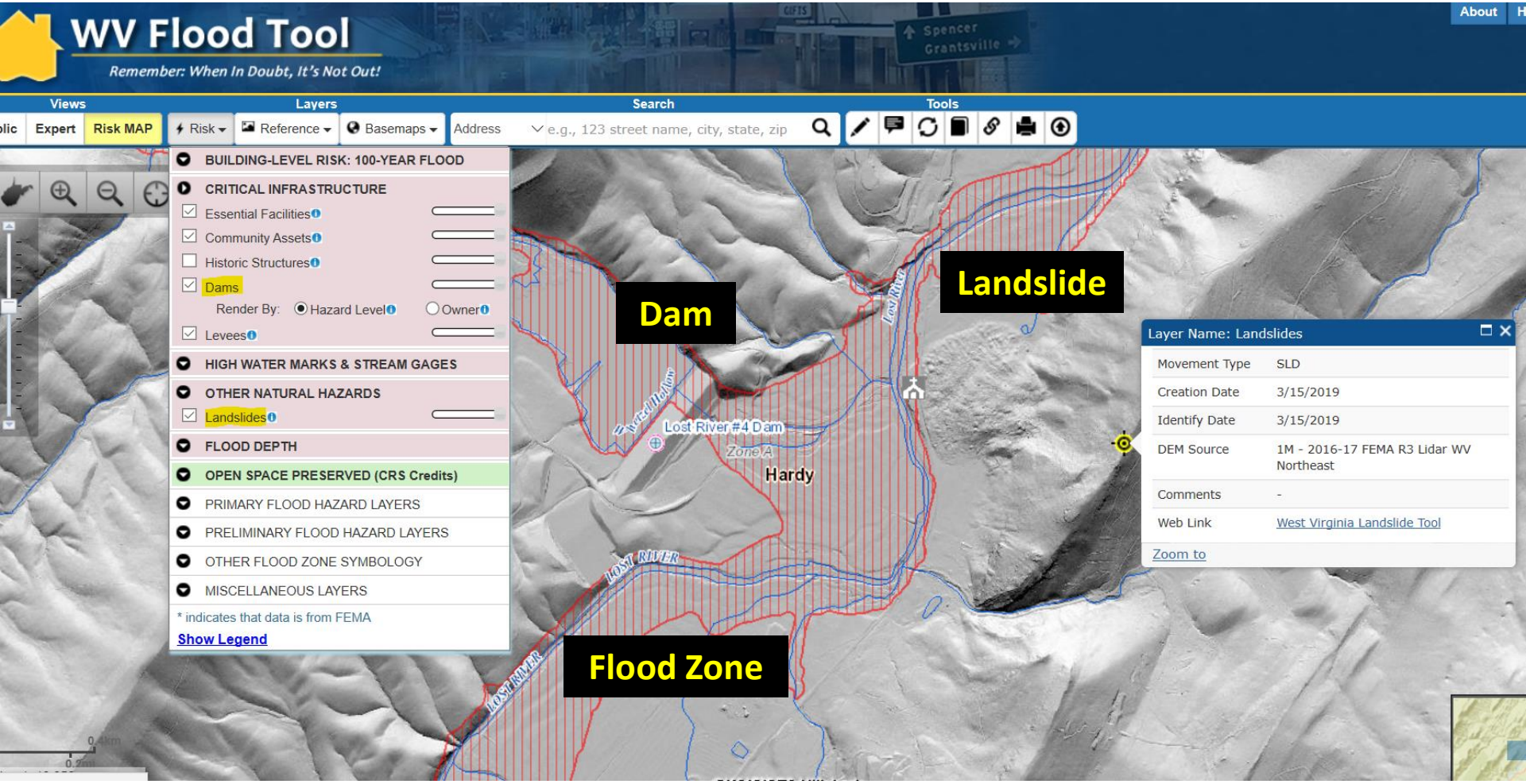
April 19, 2022
WV State Mitigation Planning Workshop

← *Devastating* June 2016 Flood

Risk Assessment Layers on Flood Tool



https://www.mapwv.gov/flood/map/?wkid=102100&x=-8771562&y=4715438&l=7&v=2

https://www.google.com/maps/@38.9409315,-78.805837,1690a,35y,44.59t/data=!3m1!1e3

Potential Flood, Dam Failure and Landslide Vulnerabilities on WV Flood Tool's RiskMAP View

Hardy County, West Virginia

WV Statewide Risk Assessment

Building Level Risk Assessment

WV Building-Level Flood Risk Assessment

Building-Level Flood Risk Assessments support:

- Hazard Mitigation Plans
- Floodplain Management
- Community Assisted Visits
- Community Rating System

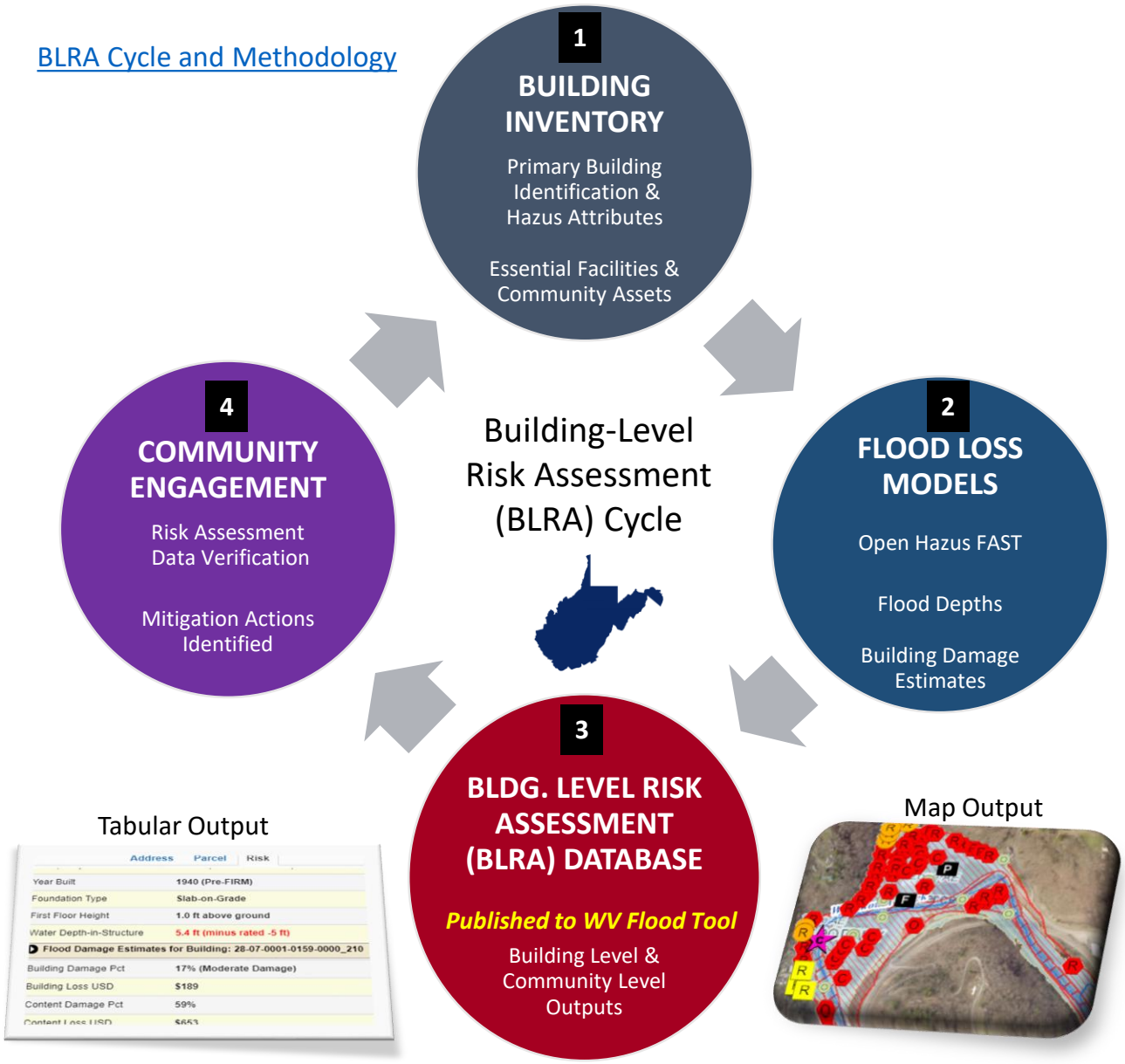
Benefits

- More detailed and accurate assessments
- Automated scripts generate outputs quickly
- Cost savings through efficiencies
- Helps multiple stakeholders
- Comprehensive Building Risk Spatial Database

Methodology

- Consistent methodology statewide
- Semi-automated workflows
- Continuous cycle to improve and update assessments

BLRA Cycle and Methodology



Access Risk Assessment Info

Use the Risk Information Index to access Data and Products

Risk Assessment Information Index
1/28/2022
Data Field Descriptions

Risk Assessment or Mitigation Layer	REPORT	Key Variable	Community Level (CL)			Building Level (BL) or Feature Level (FL)				
			Table	Graphic		Table	Community Extract	State Extract	Graphic	GIS
FLOOD ZONE MAPS & STUDIES										
Flood Zone Breakdown by Length and Area		Zone Length and Area	CL	Yes						GIS
Active Flood Studies and Mapping			CL	Yes	Yes					
Model-Backed A Zones		Info Sheet	CL	Yes						
FLOODPLAIN BUILDING INVENTORY AND FUTURE MAP CONDITIONS (*What at-risk structures are in floodplain?*)										
Primary Buildings in High-Risk Effective and Advisory Floodplains – Future Map Conditions		Flood Zone Type	CL	Yes	Yes	BLRA				GIS
Verified LOMA Properties Removal Status. Future SFHA Status.		SFHA Status	CL	Yes		BL				GIS
Buildings by Stream Name (Flood Source). Community and stream summaries.		Stream Name	CL	Yes		BLRA	FL	Top List	Yes	GIS
SIGNIFCANT STRUCTURES OF IMPORTANCE										
Essential Facilities (0.2% floodplain)	RPT	Facility Type	CL		Yes	BL EC				GIS
Community Assets	RPT	Facility Type	CL	Yes	Yes	BL CA				GIS
Historical Community Assets - National Register Areas	RPT	Register Area	CL			NRA				GIS
FLOODPLAIN BUILDING CHARACTERISTICS	RPT									
Building Exposure Dollar Value		Building Appraisal, Occupancy	CL	Yes	Yes	BLRA	High Value (Top 10%)	Top 100	Yes	GIS
Building Single Family (RES1)		Single Family RES1	CL	Yes	Yes	BLRA		Top 100	Yes	GIS
Building Manufactured Homes (RES2)		Mobile Home RES2	CL	Yes	Yes	BLRA		Top 100		GIS
Building Year and FIRM Status (Pre-FIRM/Post-FIRM)		Initial FIRM Date, Building Year	CL	Yes		BLRA				GIS
Building Median Value		Median Value	CL	Yes	Yes	BLRA				GIS
Building Median Year		Building Year	CL	Yes		BLRA				GIS
Foundation Type and Basement		Foundation Type				BLRA				GIS
FLOOD DAMAGE LOSS ESIMATES (1% FLOOD EVENT) (*What is degree of Flood Risk?*)										

Building Level Risk Assessment (BLRA) Products

- **GIS Files**
- **Tables** (Excel)
  - Community Level (CL)
  - Building (or Feature) Level (BL) with links to online maps
    - Table Extracts
    - Top Lists
- **Maps**
  - Interactive Web Maps
  - Graphics and Maps
- **Reports** (Word Docs)
- **3D Flood Visualizations**

Most of the risk assessment data can be viewed on the **RiskMAP View** of the WV Flood Tool

Risk Assessment Data Verification

Use **Building-Level (BL) Tables** to identify **Most Vulnerable Structures**

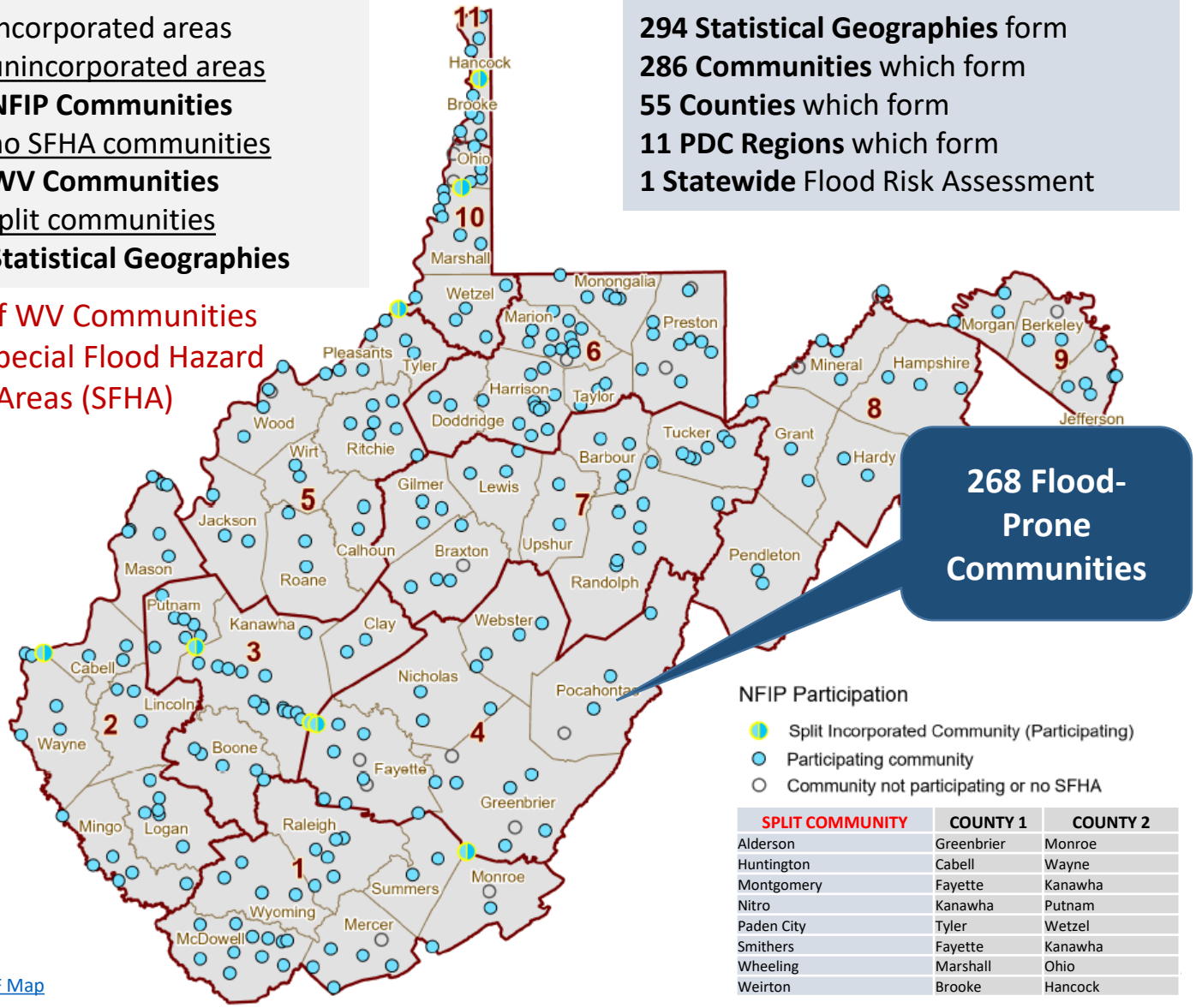
- Statewide BLRA (GIS)
- BLRA County Tables organized by region
- BLRA Data Extract Tables: High Building Value, High Damage Loss, High Minus Ratings
- BLRA Statewide Top Lists: Building Value, Flood Depth, Damage Loss $, Damage Loss %, Minus Rated, Mitigated Structures
- Risk Indicator Matrices: Exposure and Damage Loss Matrices of Risk Indicators

Statewide Hazard Assessment

213 incorporated areas
+55 unincorporated areas
268 NFIP Communities
+18 no SFHA communities
286 WV Communities
+ 8 split communities
294 **Statistical Geographies**

94% of WV Communities have Special Flood Hazard Areas (SFHA)

294 Statistical Geographies form
286 Communities which form
55 Counties which form
11 PDC Regions which form
1 Statewide Flood Risk Assessment



268 Flood-Prone Communities

NFIP Participation

- Split Incorporated Community (Participating)
- Participating community
- Community not participating or no SFHA

SPLIT COMMUNITY	COUNTY 1	COUNTY 2
Alderson	Greenbrier	Monroe
Huntington	Cabell	Wayne
Montgomery	Fayette	Kanawha
Nitro	Kanawha	Putnam
Paden City	Tyler	Wetzel
Smithers	Fayette	Kanawha
Wheeling	Marshall	Ohio
Weirton	Brooke	Hancock

PDF Map

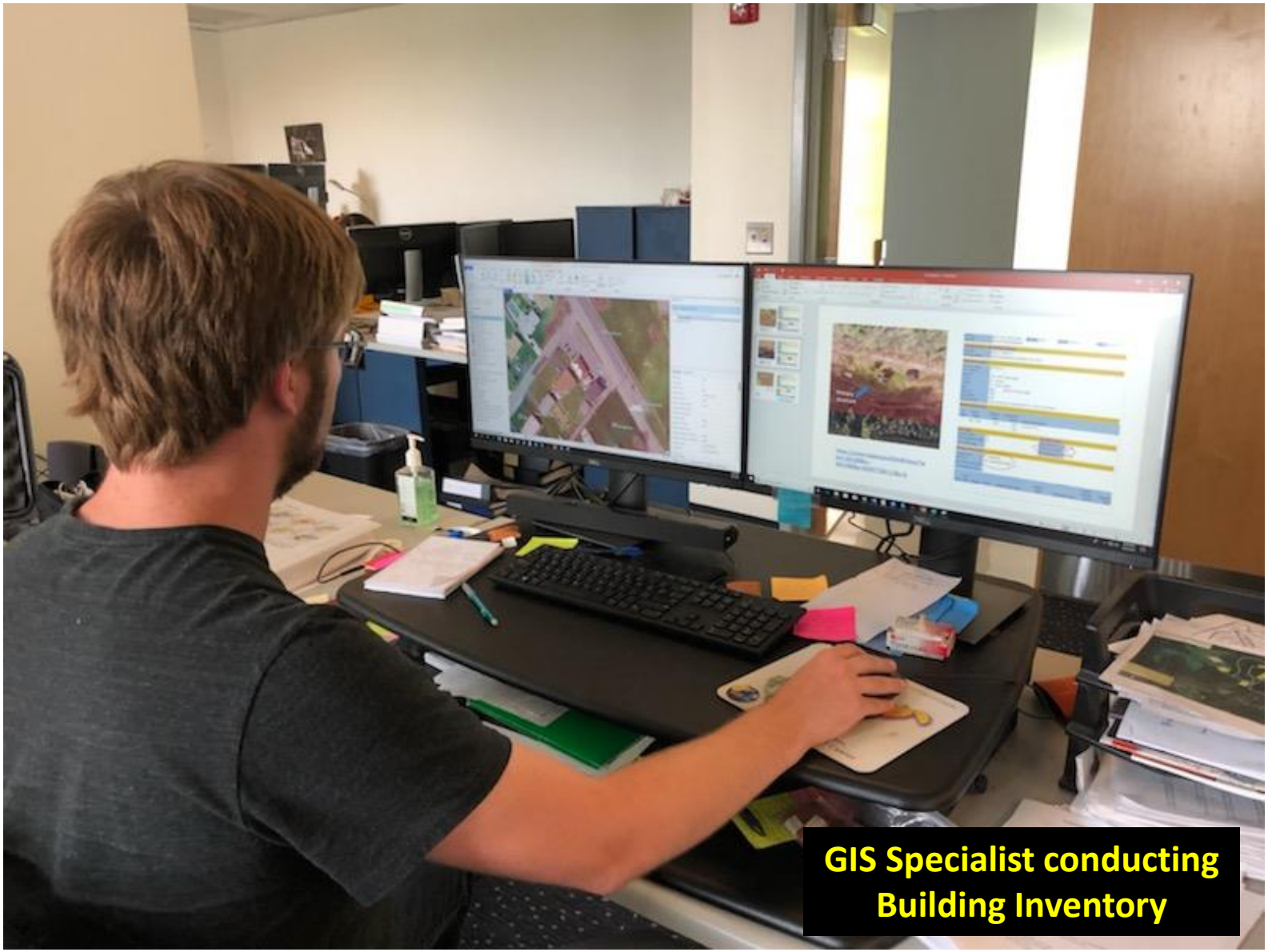
Statewide Flood Risk Assessment

Detailed Floodplain Building Inventory

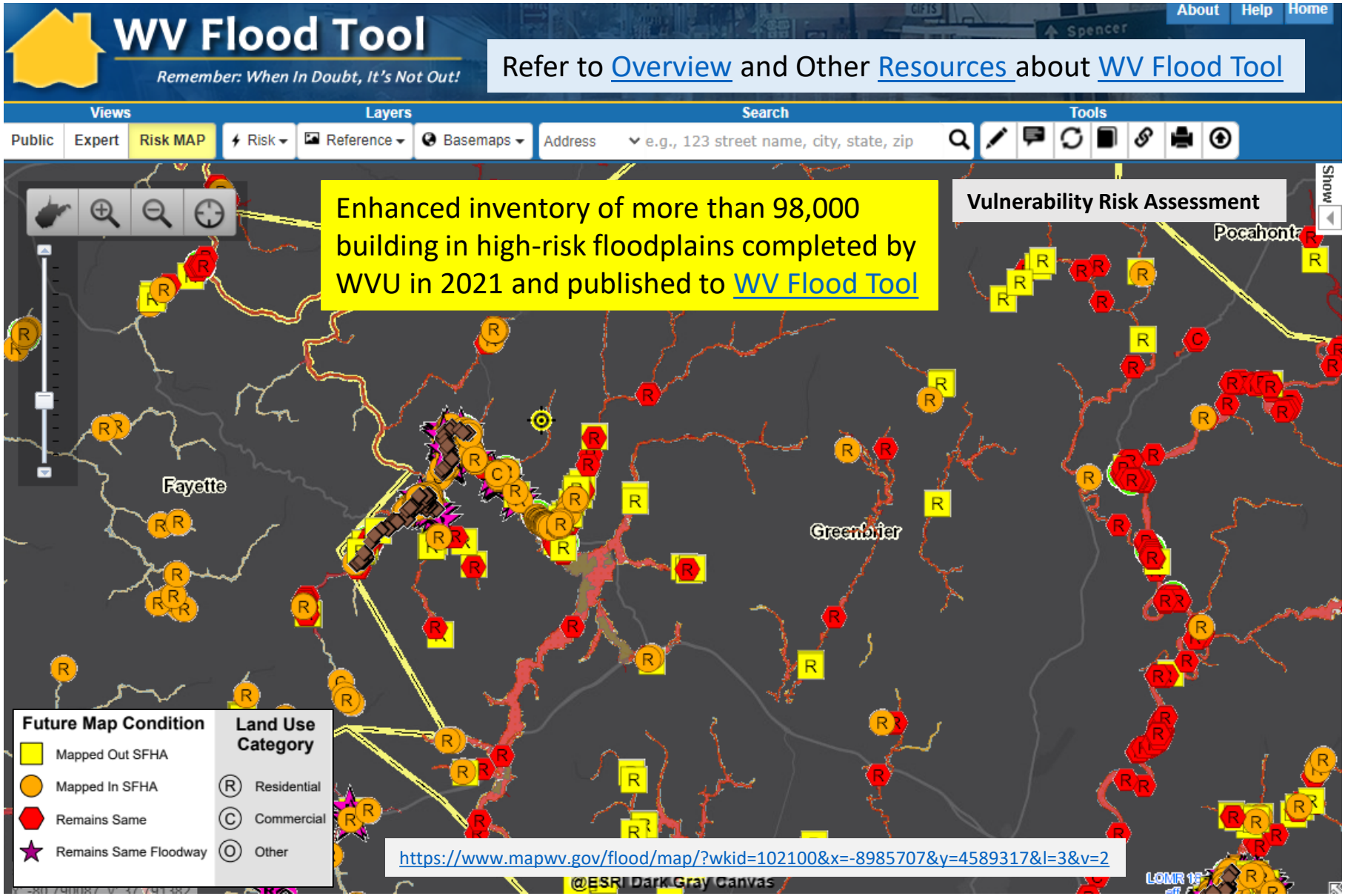
- **Building Inventory Objectives**
  - Identify Primary Structures points
  - Verify Building Identification
    - E-911 Address
    - Parcel geometry and assessment record
    - Aerial and StreetView Images
    - Building Sketches (parcel assessment record)
  - Determine Building Characteristics (Occupancy Class, Cost, Basement, Foundation Type, Stories, Area, etc.)
    - Default Characteristics derived from Assessment Records
    - Overriding Modified Building Characteristics from user-defined values
  - Ensure Building Point in most Restrictive Flood Zone
  - Iterative Process and QC Checks to make more accurate

- **Record Data Issues and Data Gaps**

Building Inventory



2021 R4 Floodplain Building Inventory



Building Definition

CRS Manual Page 300-4

301.a Definition of “Building”

- 2 or more exterior walls and a roof affixed to a site
- Manufactured (mobile) home
- Travel trailer without wheels

Primary Structure: Not a Building

***CRS Manual* Page 300-5**

"Not a Building"

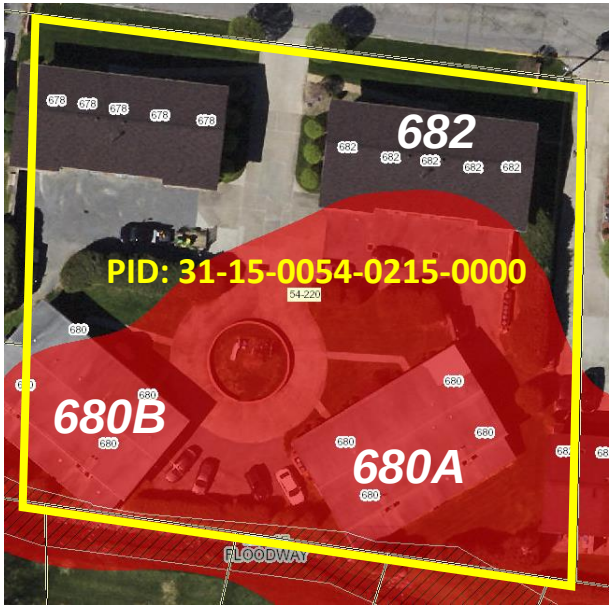
- ✓Open pavilions, carports, underground pump stations, trailers, etc. are not buildings
- ✓Accessory structures are not counted

*All **primary structures** in high-risk flood zones are inventoried.*
***Essential Facilities** in moderate-risk flood zones also inventoried.*

Multiple Structures in a Single Parcel

- Single Building Point for Multiple Buildings on a Single Parcel/Assessment
  - Outbuildings and detached structures associated with a Primary Structure as a single point that correlates with Building Appraisal Value.
  - Multiple buildings associated with commercial, industrial, or agricultural sites are identified as a single Primary Structure point if all structures are in the flood zone and can be correlated with Total Building Appraisal Value in Assessment Report.

- Multiple Building Points in Single Parcel/Assessment (see example below – 4 Apt. Bldgs.)
  - Points are associated with each Primary Structure in Flood Zone. Associated Model Input Parameters (Cost, Area, Occupancy Class, etc.) are recorded as separate building records. 3 apartments below are primary.



Flood Tool Map View

Cost Value		Appraisal Value	
Dwelling Value	---	Land Appraisal	$349,200
Other Bldg/Yard Values	$0	Building Appraisal	$601,000
Commercial Value	$667,800	Total Appraisal	$950,200

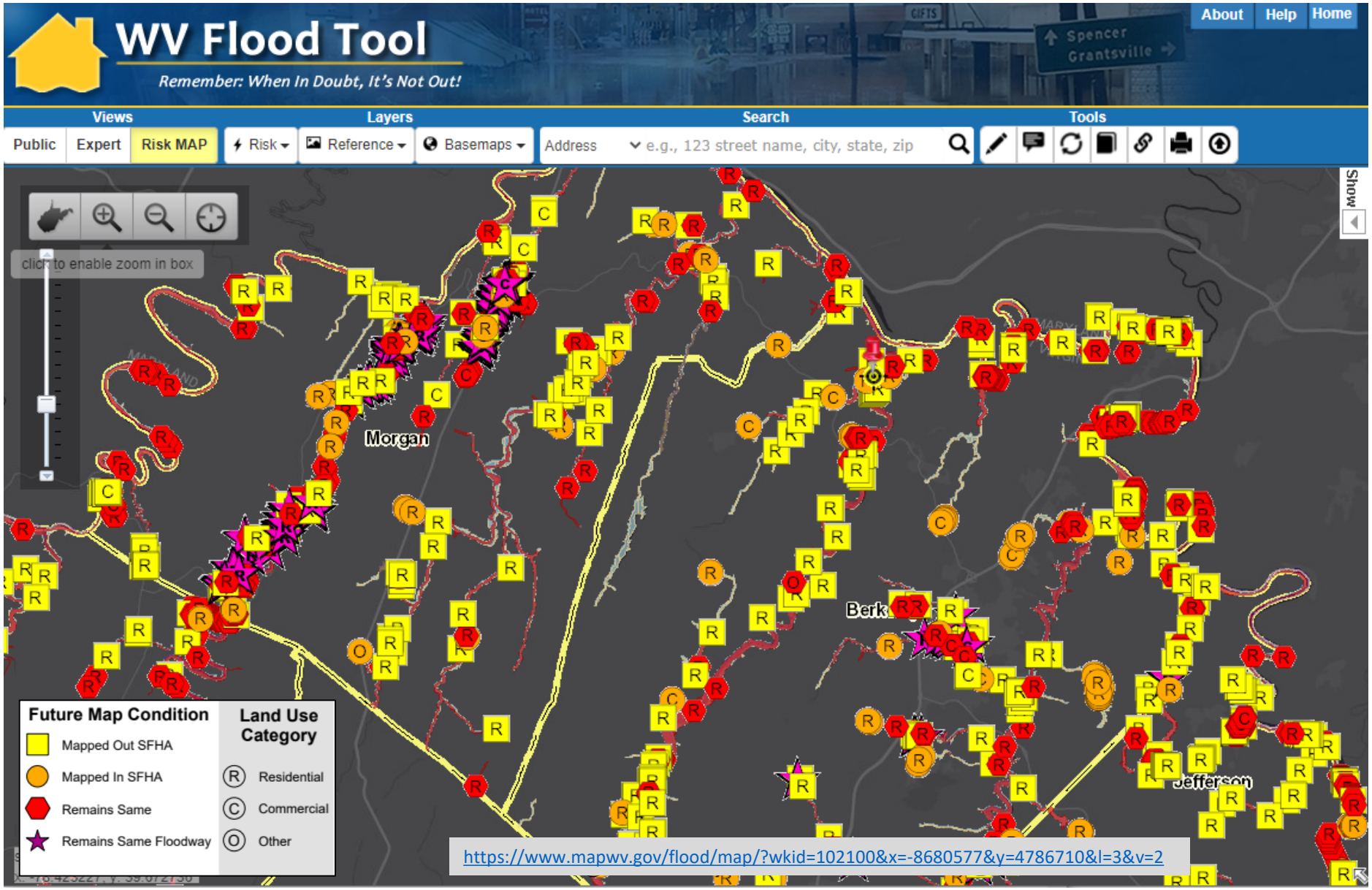
Building Information	
Property Class	A - Apartment
Land Use	211 - Apartment-Garden (1-3 stories)
Use Type	11-Apartment
Living Area	26,572
Cubic Feet	211,688
# of Buildings (Cards)	4
# of Units	

Flood Tool Assessment Report

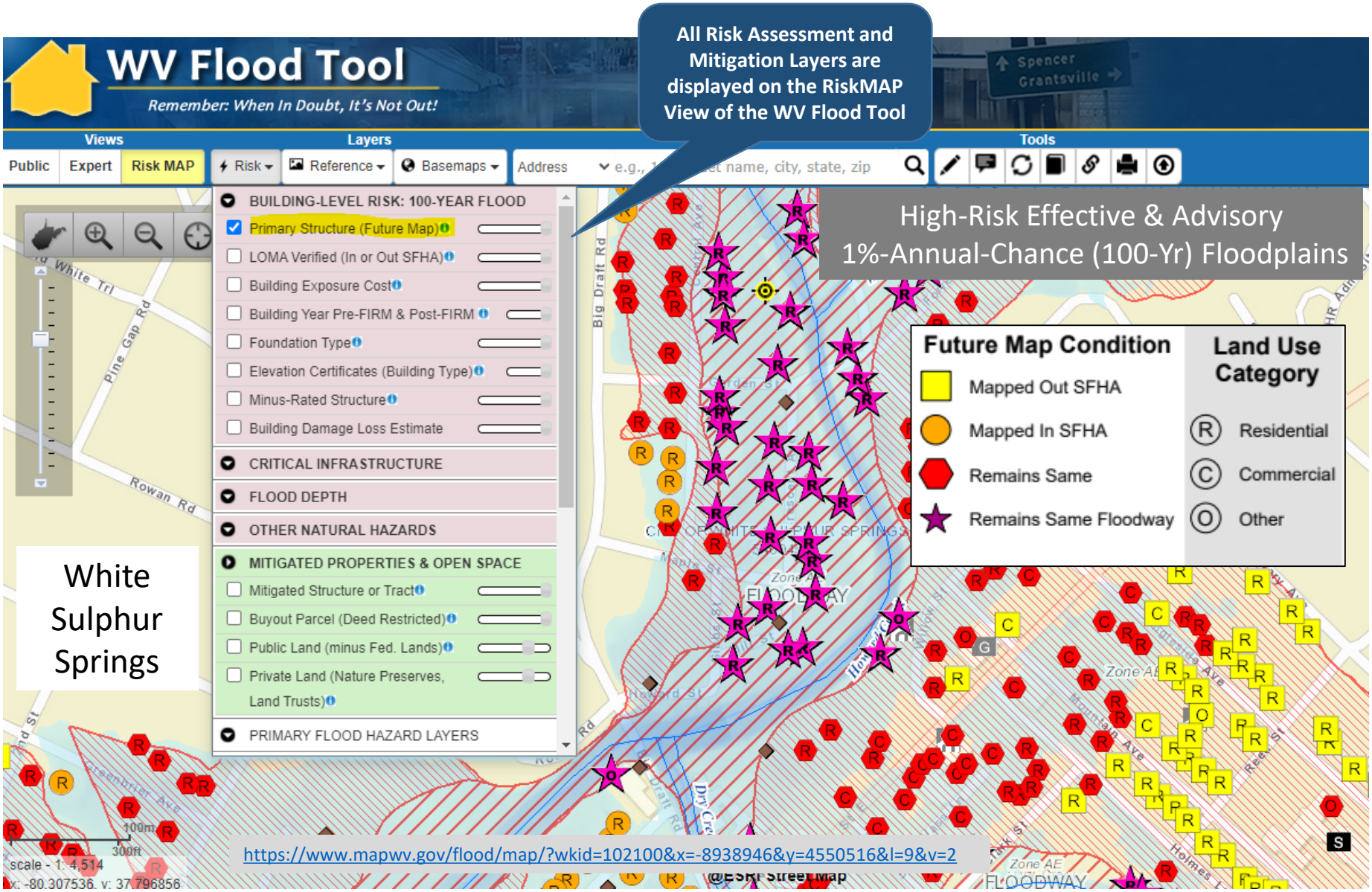
	Bldg/ Card	Year Built	Stories	Units	Grade	Exterior Wall	Construction Type	Commercial Basement	Square Feet	Building Value
682	1	1958	2		D+	Brick or Stone	Wood frame/Joist/Beam	First Basement	7,488	$163,800
680A	2	1956	2		C	Brick or Stone	Wood frame/Joist/Beam	First Basement	7,488	$184,300
680B	3	1960	2		C	Brick or Stone	Wood frame/Joist/Beam	First Basement	5,824	$160,000
	4	1960	2		C	Brick or Stone	Wood frame/Joist/Beam	First Basement	5,772	$159,700
									26,572	$667,800

The Web Parcel Assessment Reports provide a breakdown of individual building values and characteristics in single parcel

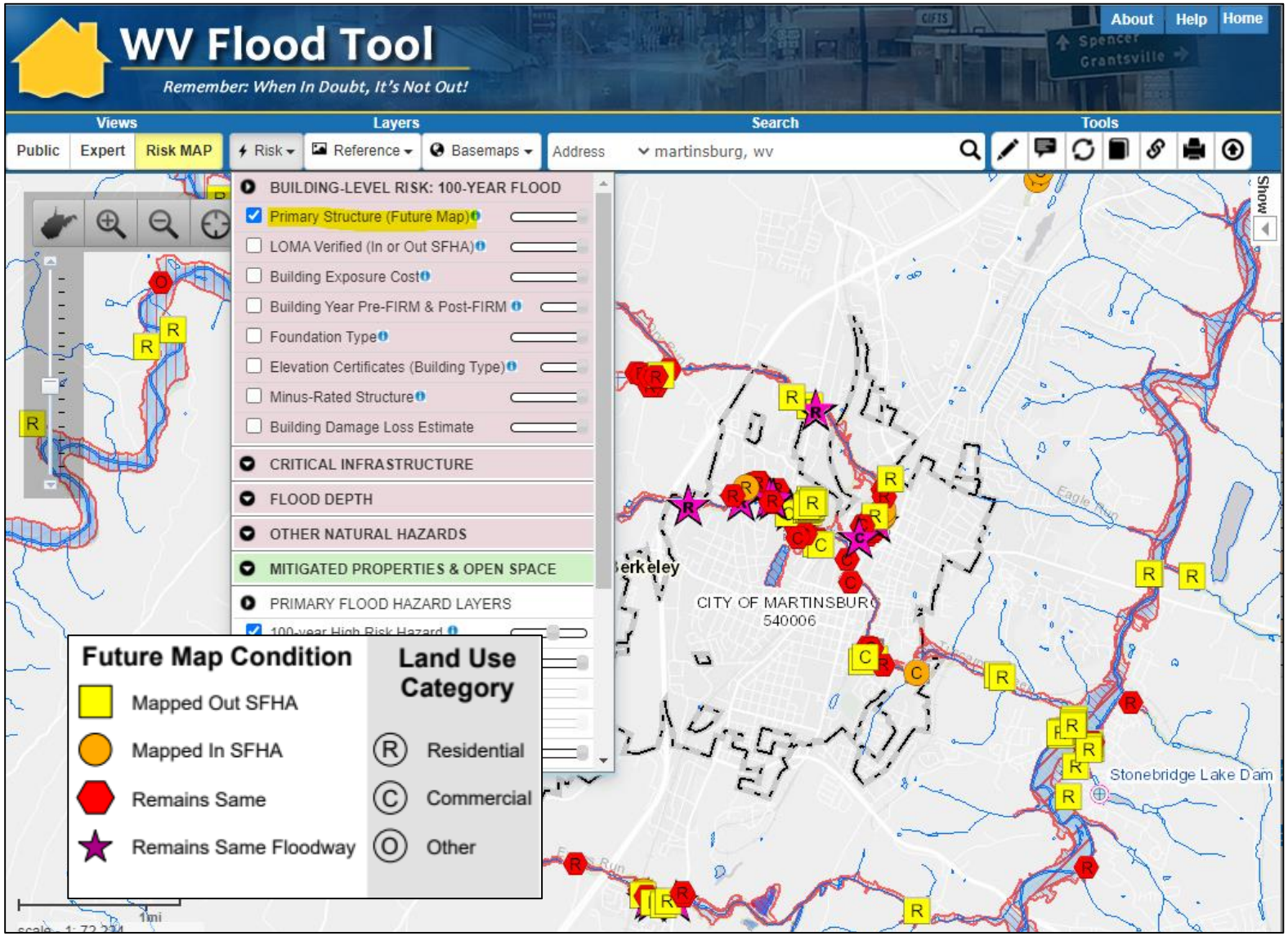
2021 R9 Floodplain Building Inventory



Floodplain Building-Level Risk



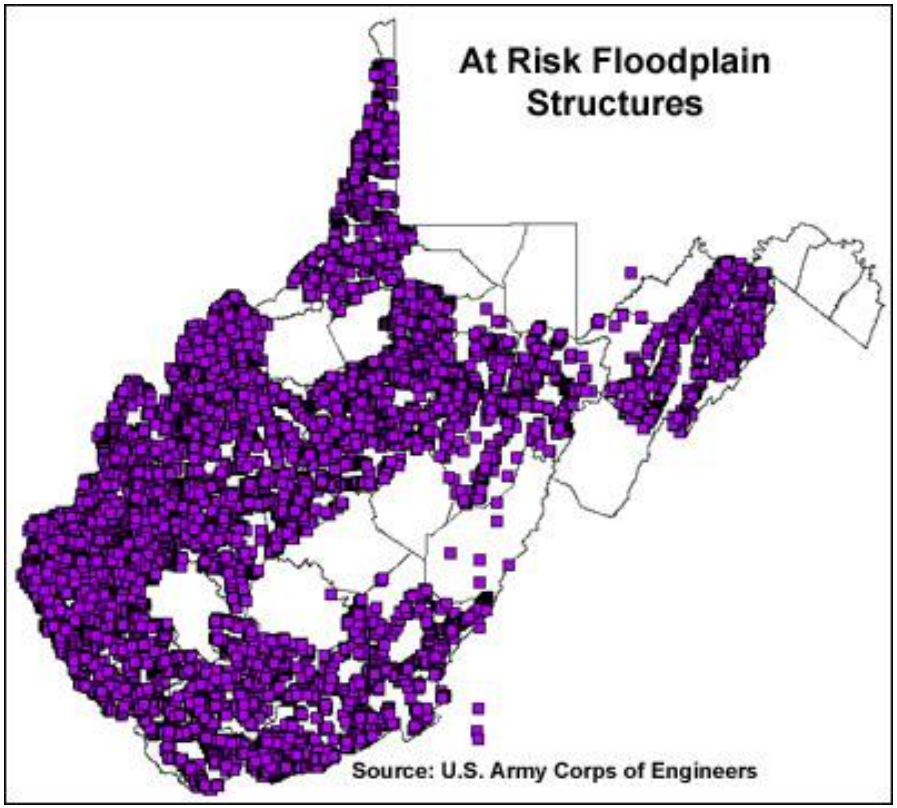
Primary Structures (Martinsburg)



Martinsburg's *primary structures* viewable on the Risk MAP View of the WV Flood Tool. Symbol letters indicate general occupancy (**R**esidential, **C**ommercial, **O**ther Non-Residential).

2002 Building Inventory

Building Inventories

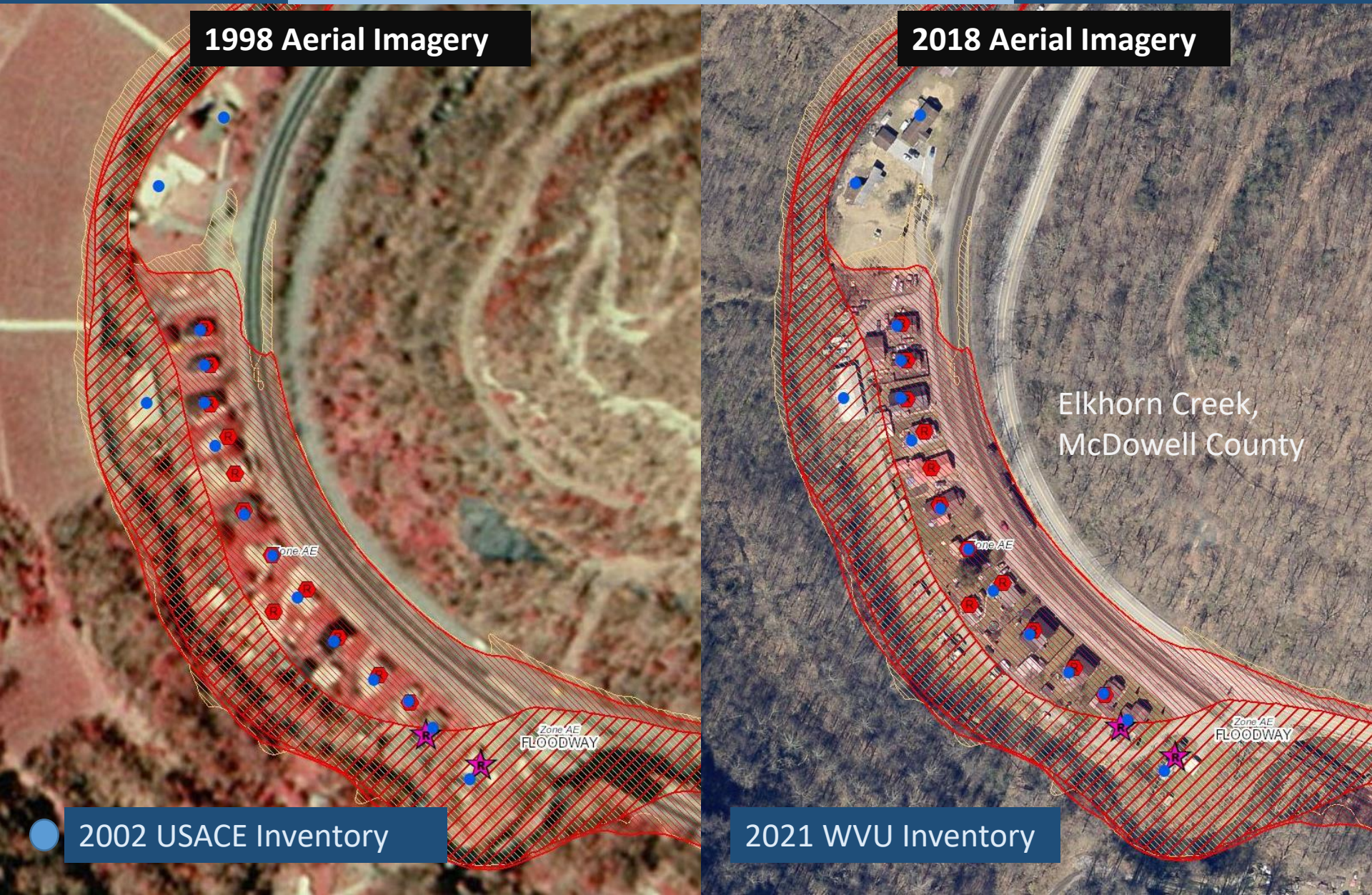


Nearly 20 years ago more than **80,000 structures** in the floodplain were inventoried by the **Pittsburgh District Army Corps of Engineers** using statewide 1996-99 1-meter resolution Digital Orthophoto Quarter Quads. A combination of FEMA's Q3 and DFIRM floodplain data (available for 37 of the 55 counties) was overlaid onto DOQQ's.

<< USACE Inventoried Floodplain Structures >>
http://wvgis.wvu.edu/data/dataset.php?ID=230

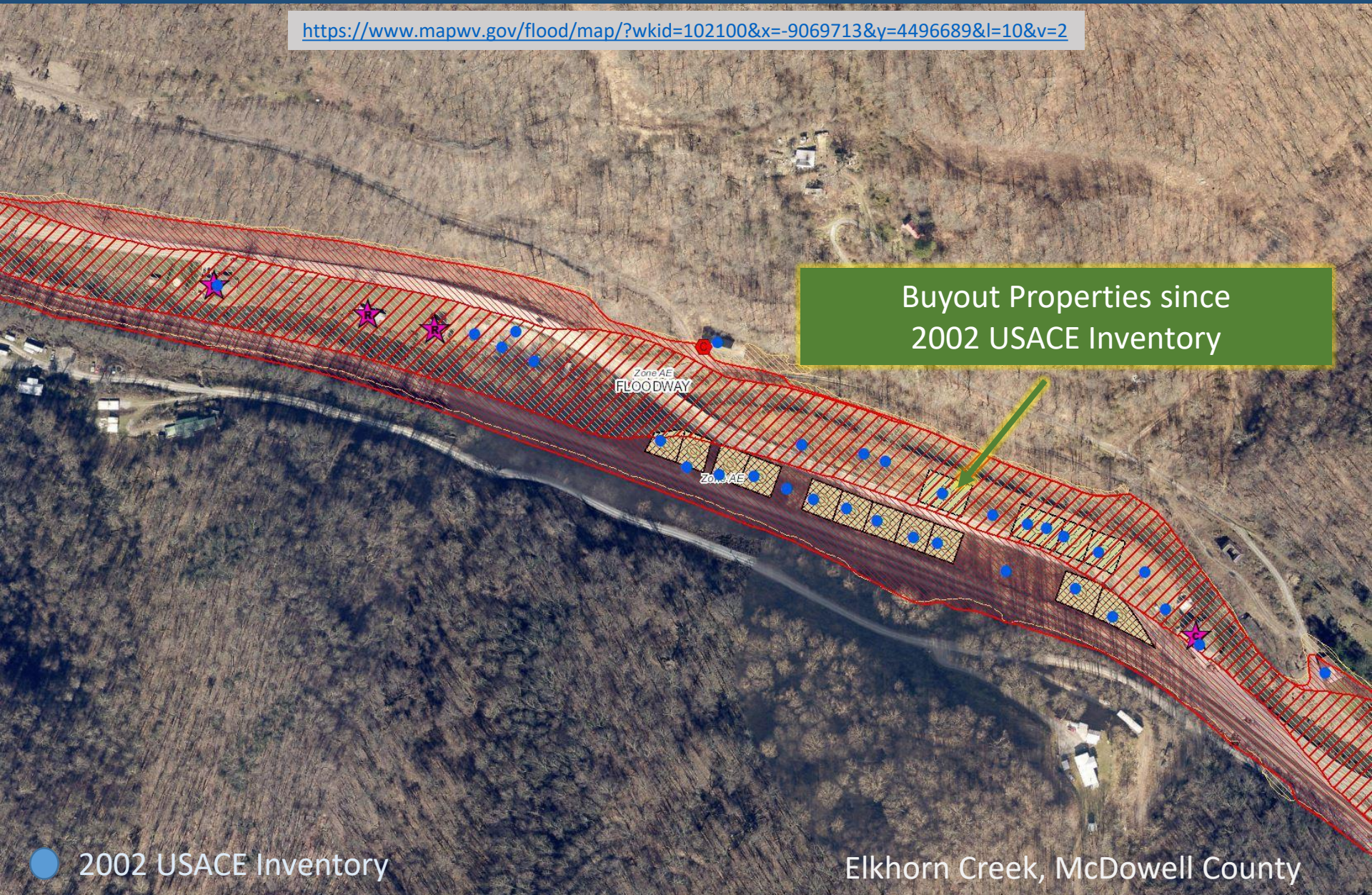
Statewide Building Inventories

https://www.mapwv.gov/flood/map/?wkid=102100&x=-9070843&y=4497058&l=11&v=2



USACE 2002 Building Inventory

https://www.mapwv.gov/flood/map/?wkid=102100&x=-9069713&y=4496689&l=10&v=2

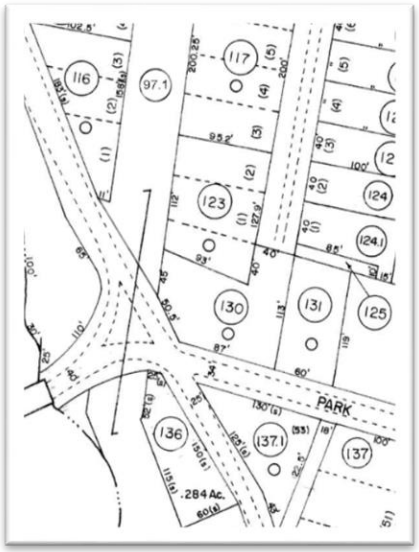


WV Statewide Risk Assessment

GIS Data for Enhanced Building Inventory

GIS Data Development

Parcels



Migrate six counties from paper to digital parcels

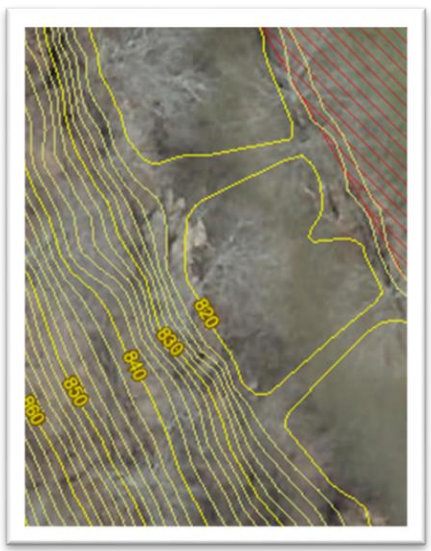
Site Addresses

Flood-risk communities with missing or incorrect E-911 addresses

Aerial Imagery

County Leaf-off imagery no older than 5 years

Elevation



Statewide 1-meter DEM and 1-ft. contours. Flood Studies, Depth & WSEL Grids

1

BUILDING INVENTORY

GIS Reference & Elevation Data

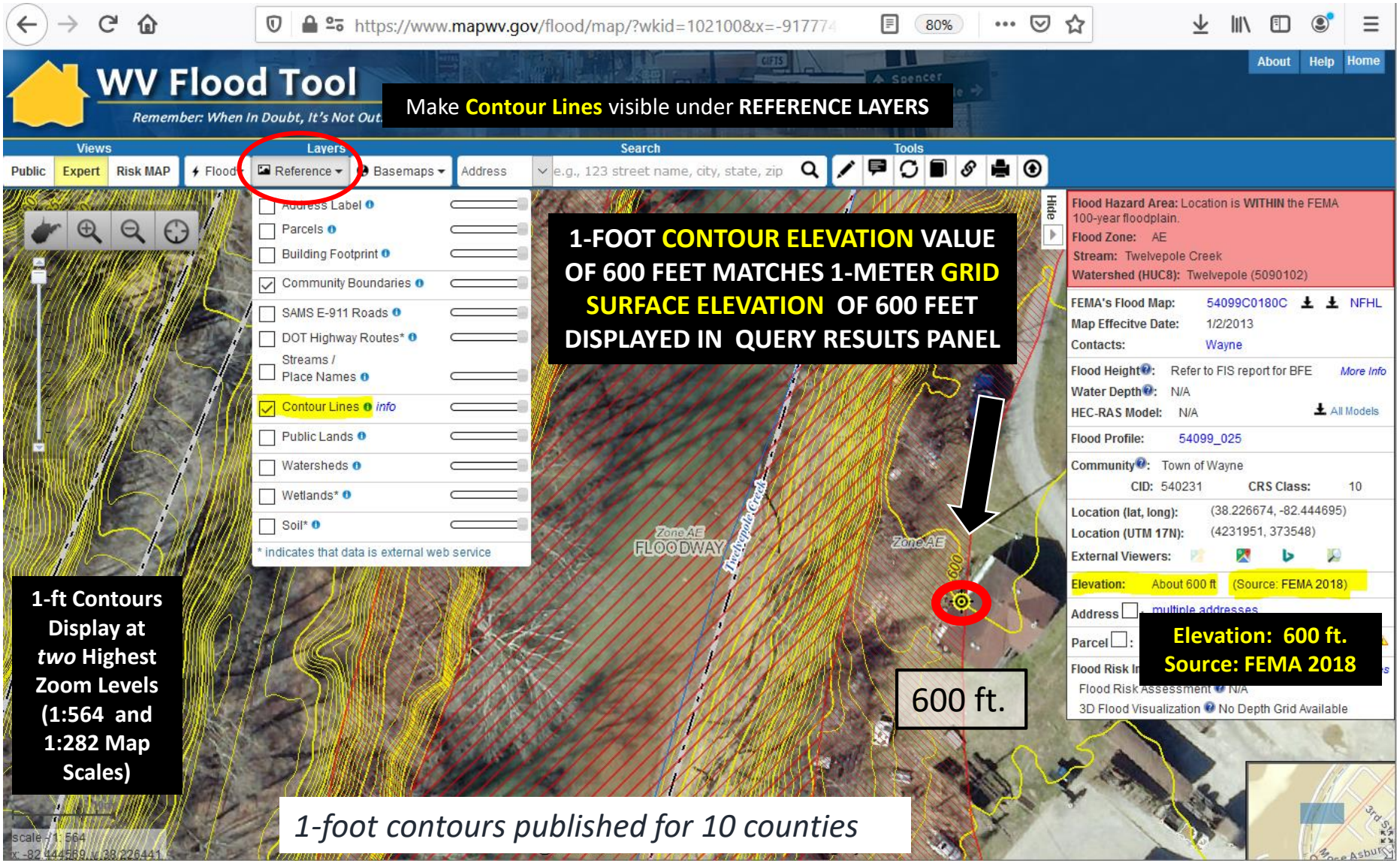
Flood Studies
Depth & WSEL Grids
Building Stock

Parcels, Assessment Records, Aerial Imagery important for pinpointing flood-risk structures

More info about WV Flood Tool's Reference Layers

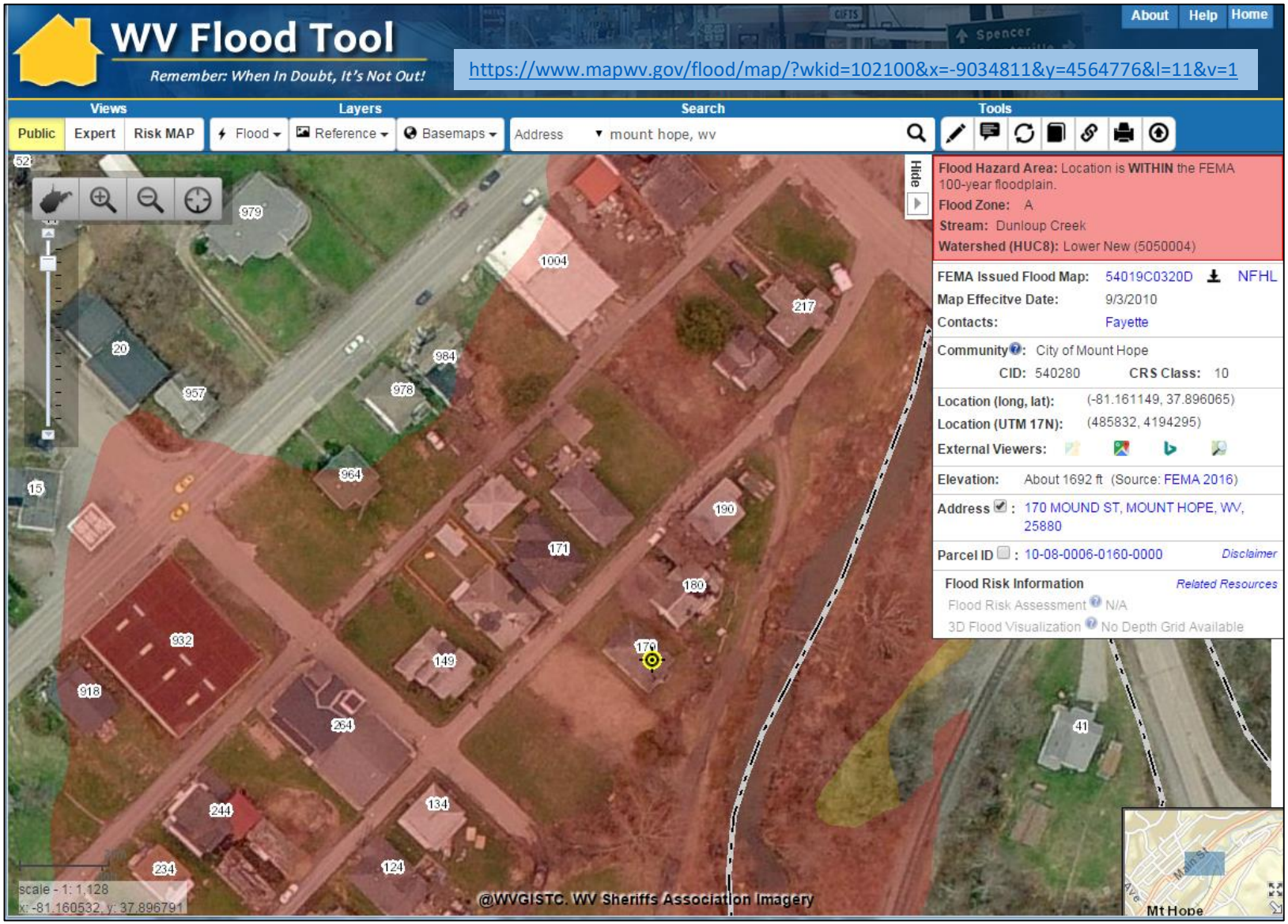
Ground Elevation: 1-ft. Contours

https://www.mapwv.gov/flood/map/?wkid=102100&x=-9177701&y=4611497&l=13&v=1

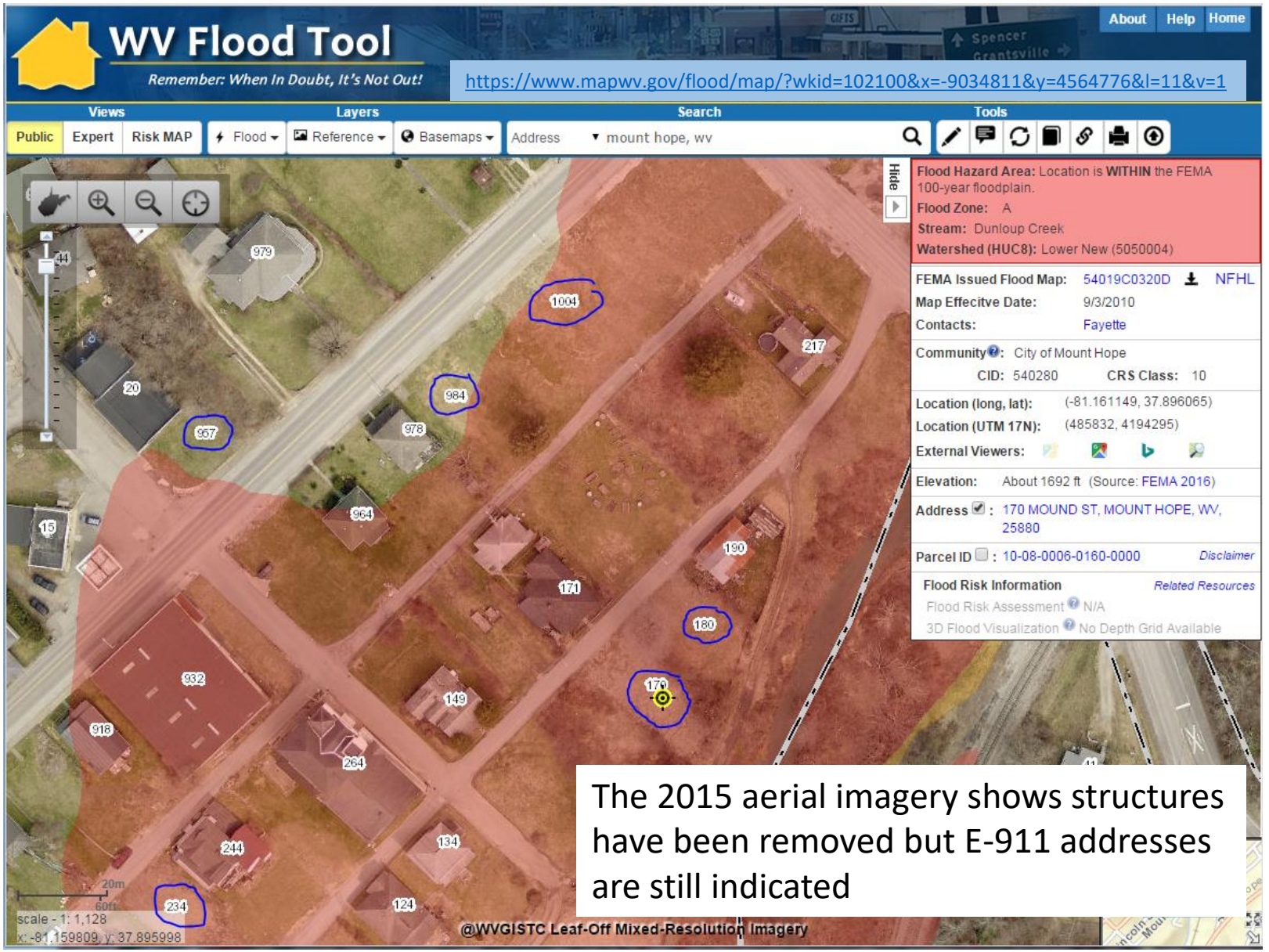


FEMA LiDAR-Derived Products: 1-Meter DEM and 1-Foot Contours

Mount Hope – 2010 Imagery

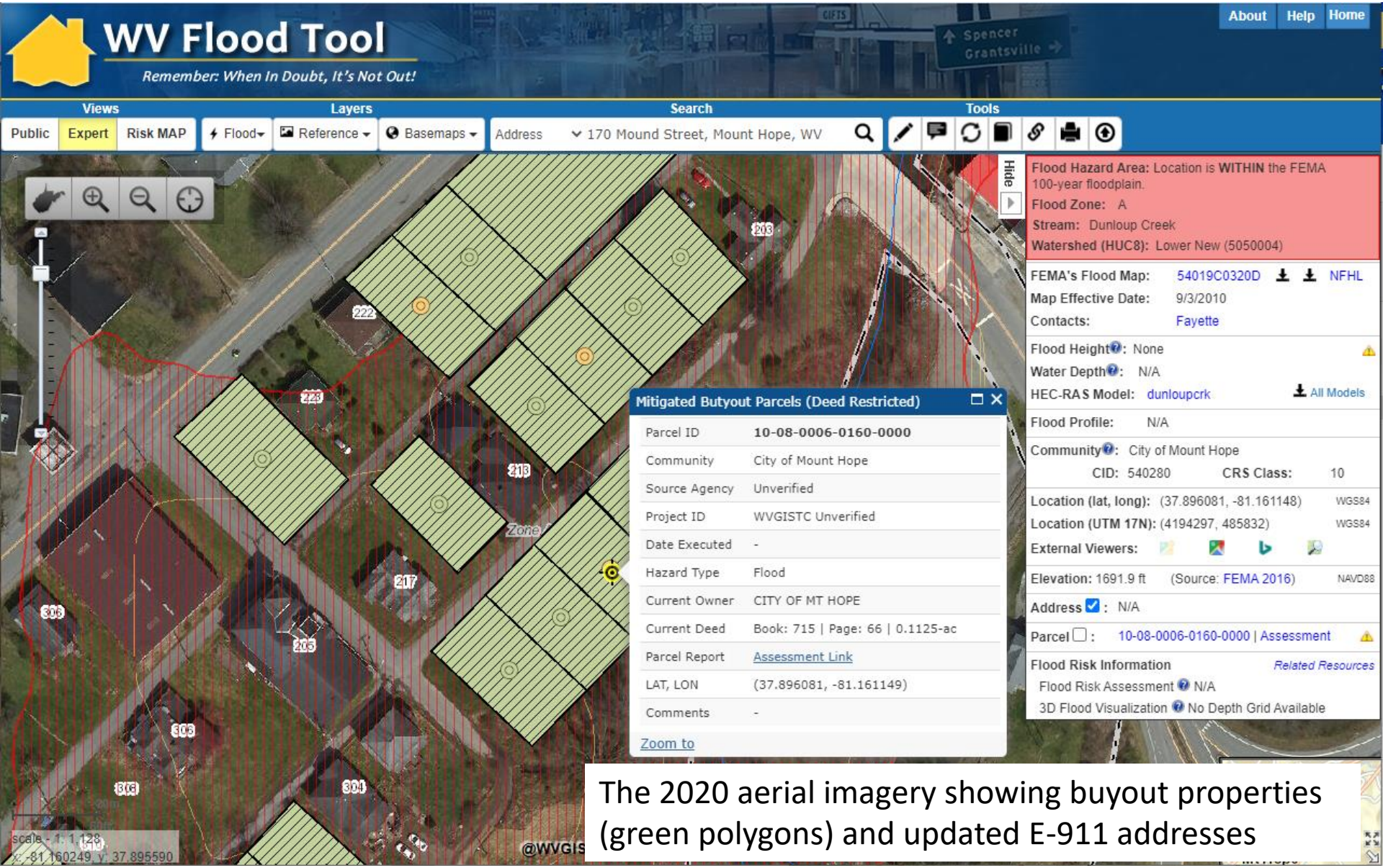


Mount Hope – 2015 Imagery



The 2015 aerial imagery shows structures have been removed but E-911 addresses are still indicated

Mount Hope – 2020 Imagery

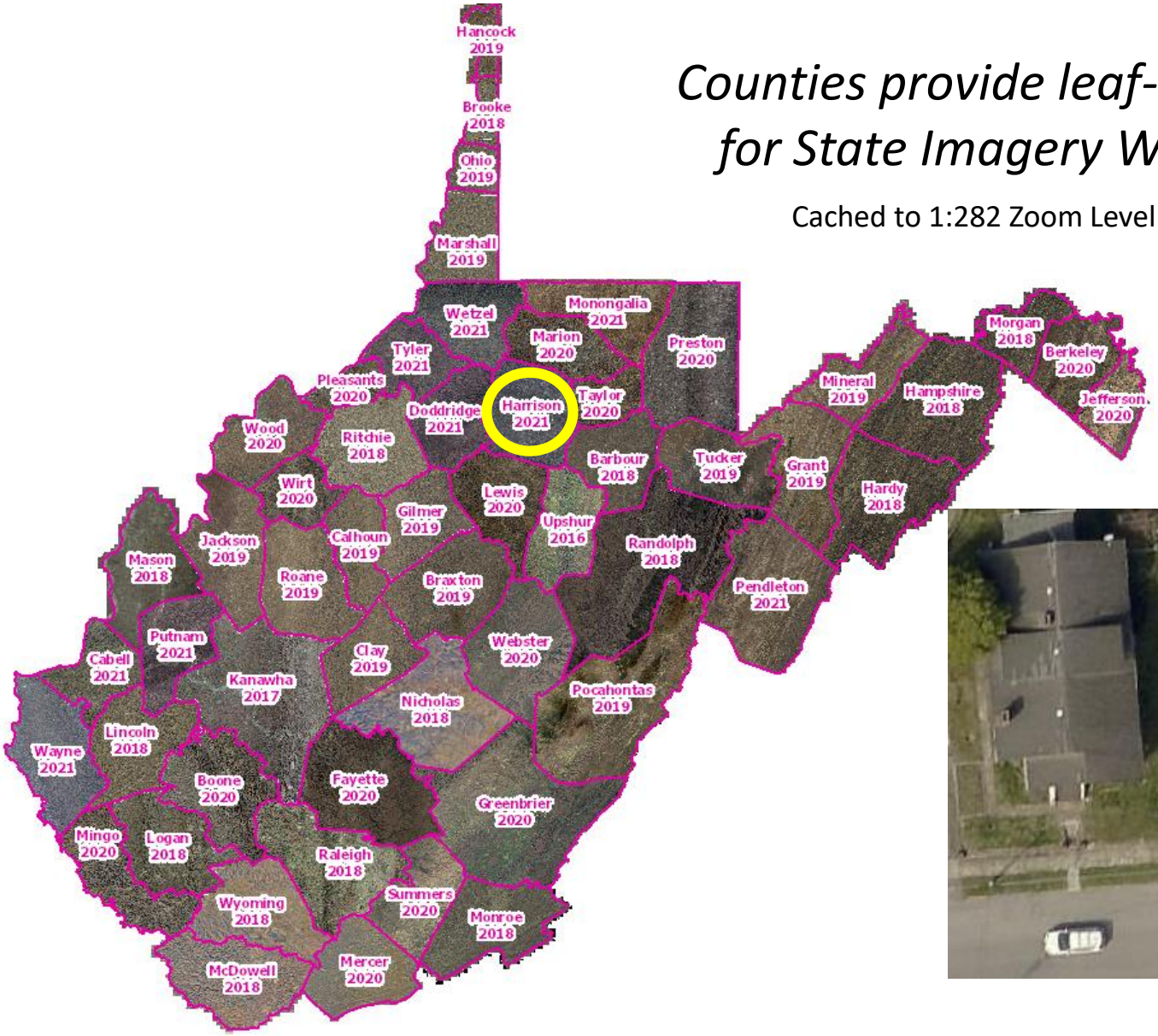


The 2020 aerial imagery showing buyout properties (green polygons) and updated E-911 addresses

https://www.mapwv.gov/flood/map/?wkid=102100&x=-9034818&y=4564756&l=12&v=1

Leaf-Off Aerial Imagery Web Service

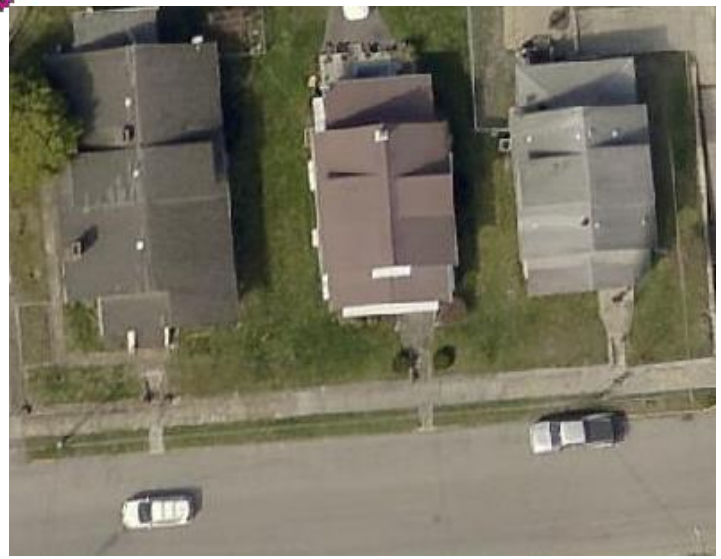
https://services.wvgis.wvu.edu/arcgis/rest/services/Imagery_BaseMaps_EarthCover/wv_imagery_WVGISTC_leaf_off_mosaic/MapServer?f=jsapi



Counties provide leaf-off imagery for State Imagery Web Service

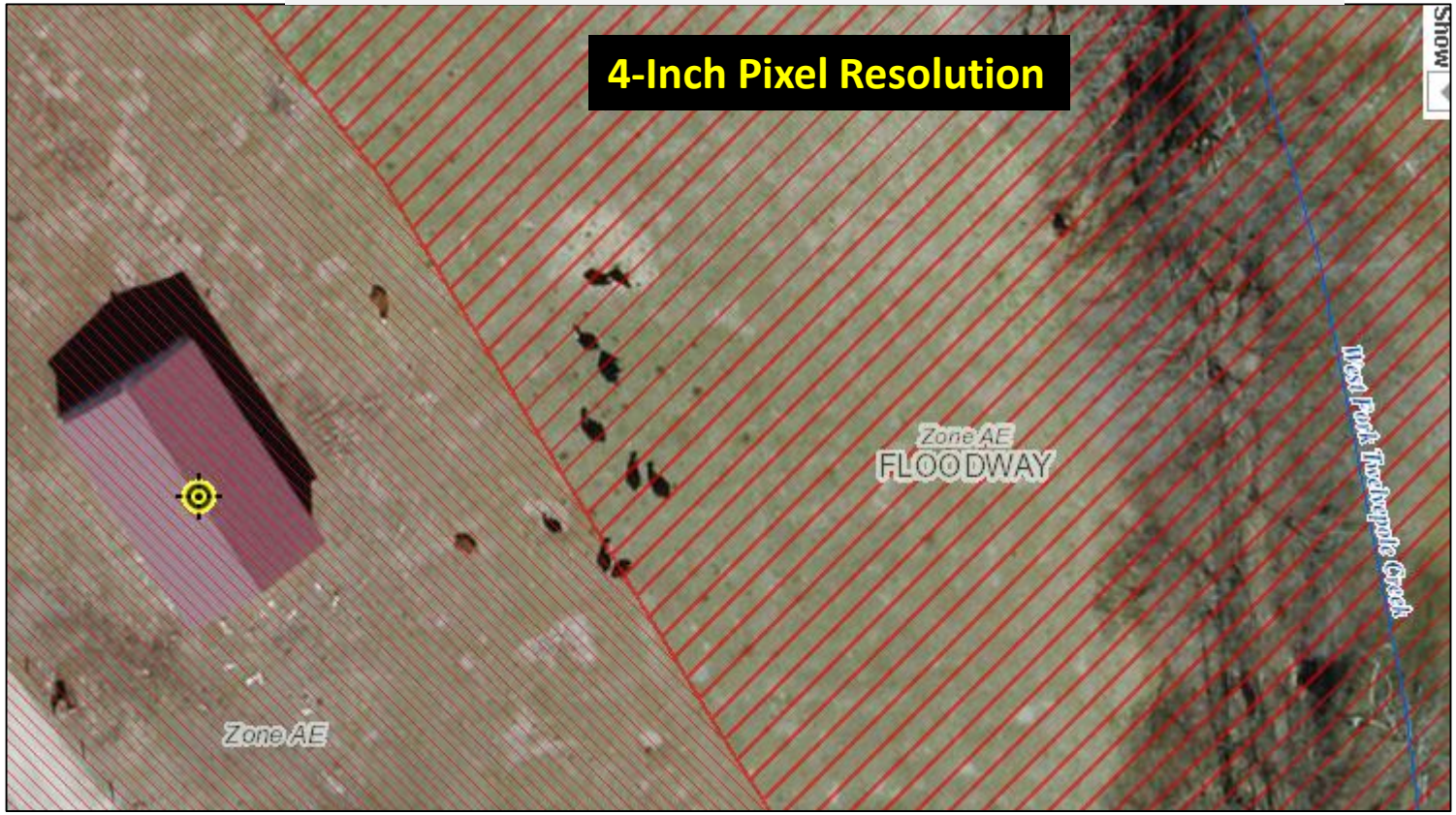
Cached to 1:282 Zoom Level or Map Scale

2021 Harrison County Aerial Imagery



New 2019 Leaf-Off Aerial Imagery

http://www.mapwv.gov/floodtest/?wkid=102100&x=-9176629&y=4583554&l=13&v=1



Choose **WV Best Leaves Off** Base Map


Bing Hybrid


WV Best Leaves Off


Bing Imagery

Cows in the Floodway
West Fork Twelvepole Creek, Wayne County

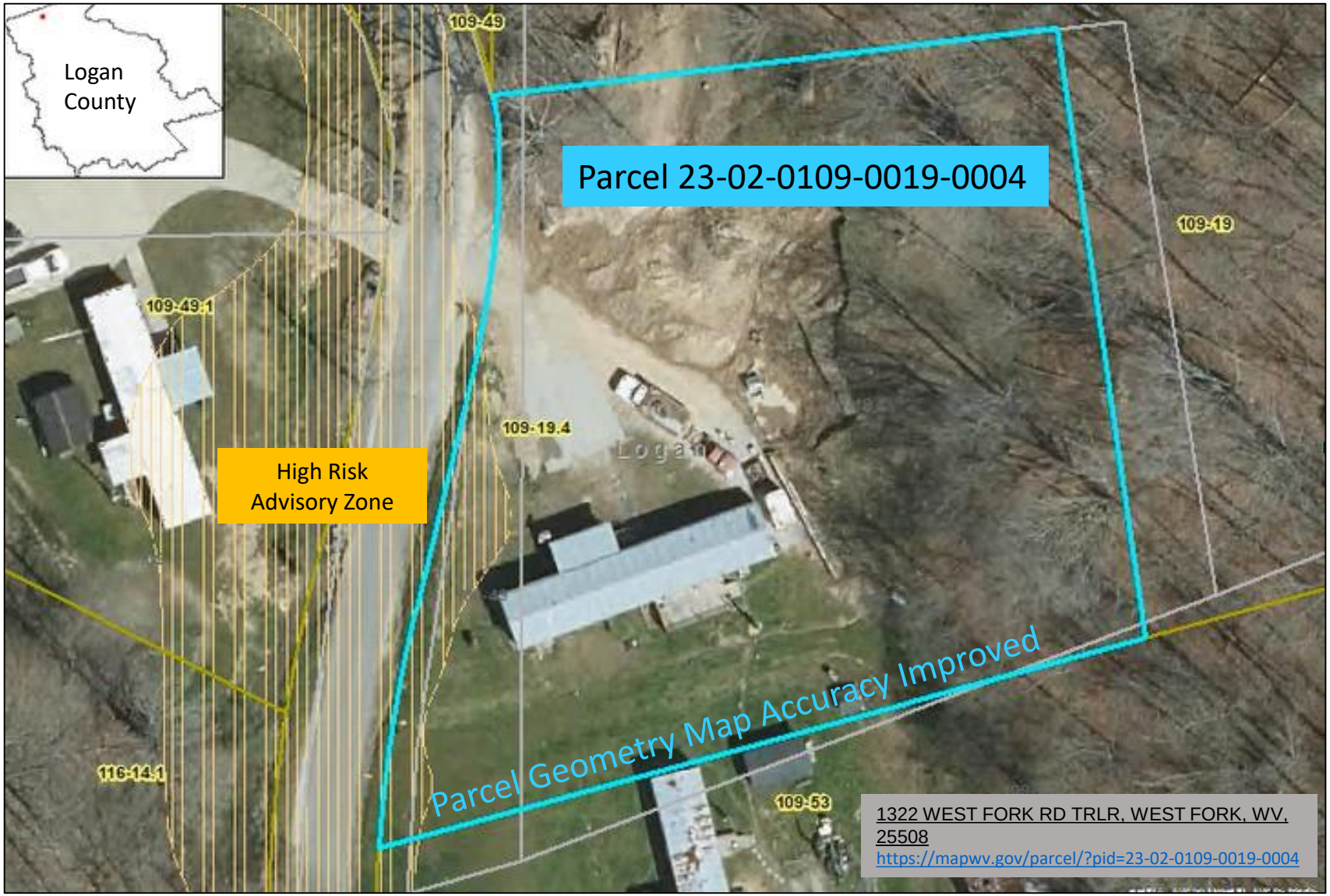
New 2019 Imagery on Flood Tool

- Braxton
- Cabell
- Calhoun
- Clay
- Doddridge
- Gilmer
- Harrison
- Jackson
- Marshall
- Monongalia
- Ohio
- Pocahontas
- Putnam
- Roane
- Taylor
- Tucker
- Tyler
- Wayne
- Wetzel
- Wirt

Statewide E-911 Addresses

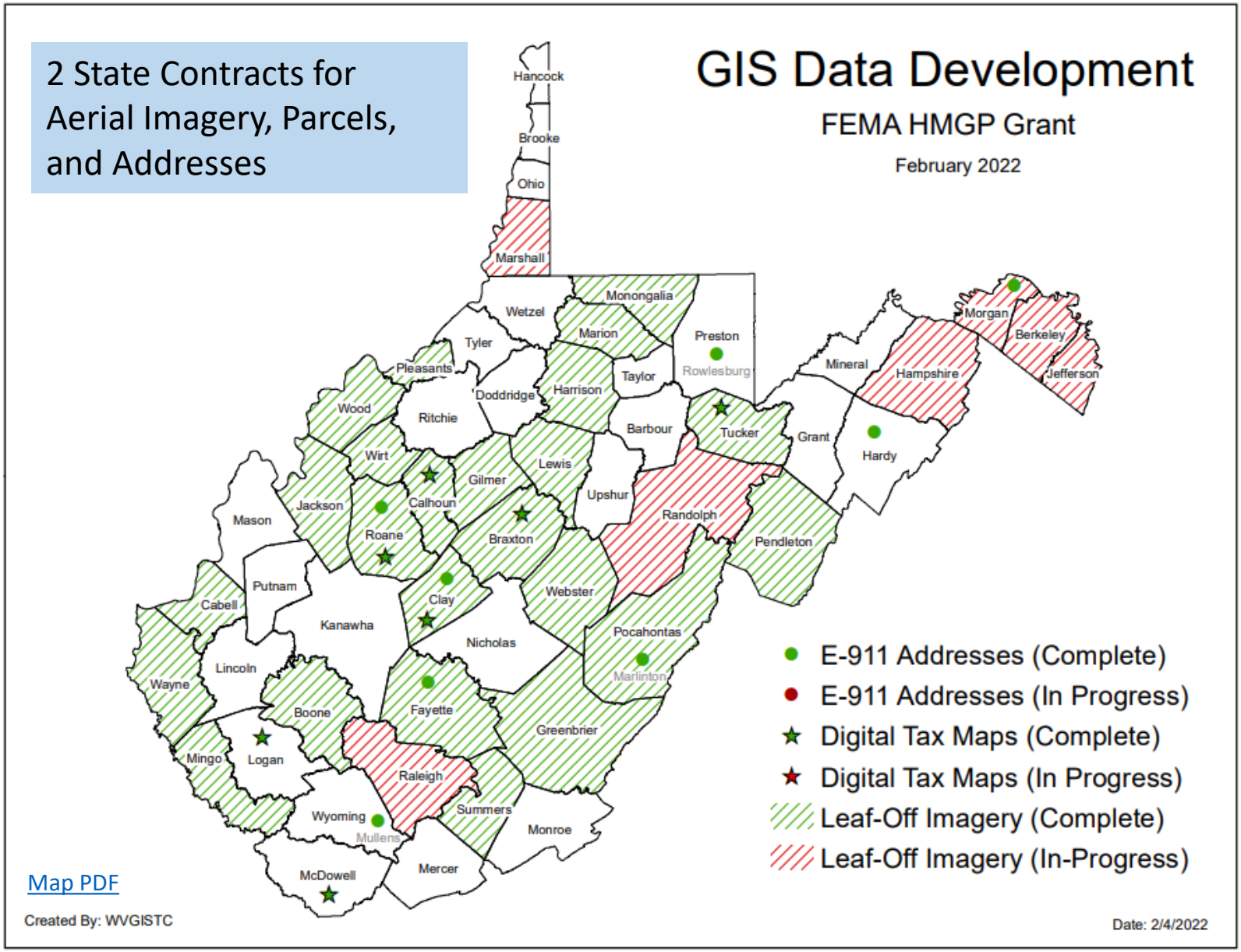
Missing Address Site Numbers

Improved Property Parcel Mapping



State GIS Data Contracts

2 State Contracts for Aerial Imagery, Parcels, and Addresses



Building Footprints

- 2018 **Microsoft Building Footprints** (for WV): 1,020,048 structure footprints
- 2021 **FEMA's USA Structures** (for WV): 1,085,876 structure footprints
- 2022 **WVU Building Footprints** (in progress)

Verification Layer: WV Building-Level Risk Assessment (BLRA): 98,467 points of primary structures located in the 1%-annual-chance floodplain

Building Unique Identifier

Click here for more info on Building Identification

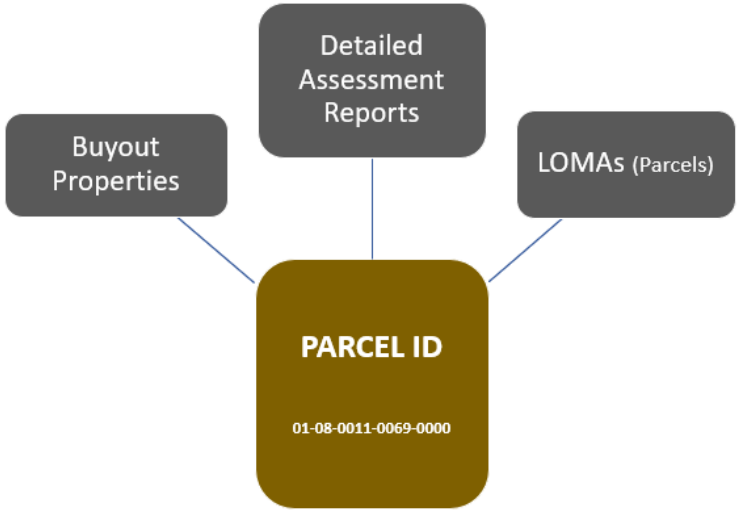
Parcel ID	01-08-0011-0069-0000

01	-	08	-	0011	-	0069	-	0000
County		District		Map		Parcel		Suffix

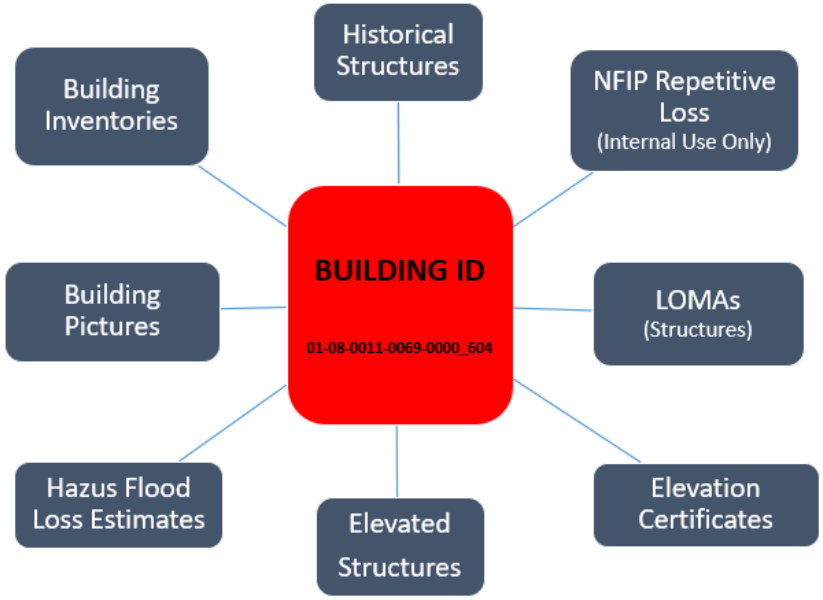
Address	**604** S Main St, Philippi, West Virginia, 26416

★

Building Identifier **(Parcel ID + Address No.)**	**01-08-0011-0069-0000_604**

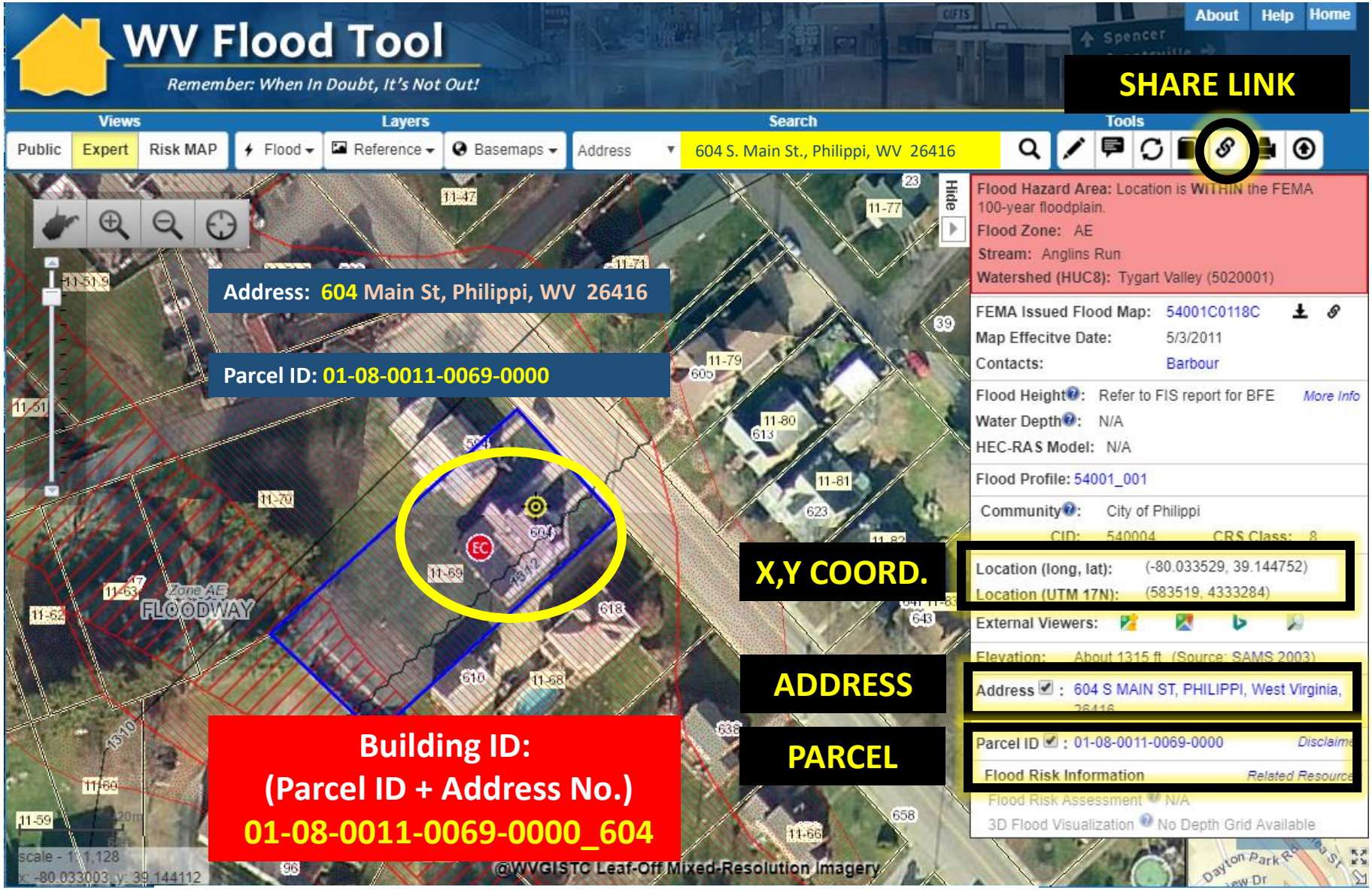


Link to **Property** Record



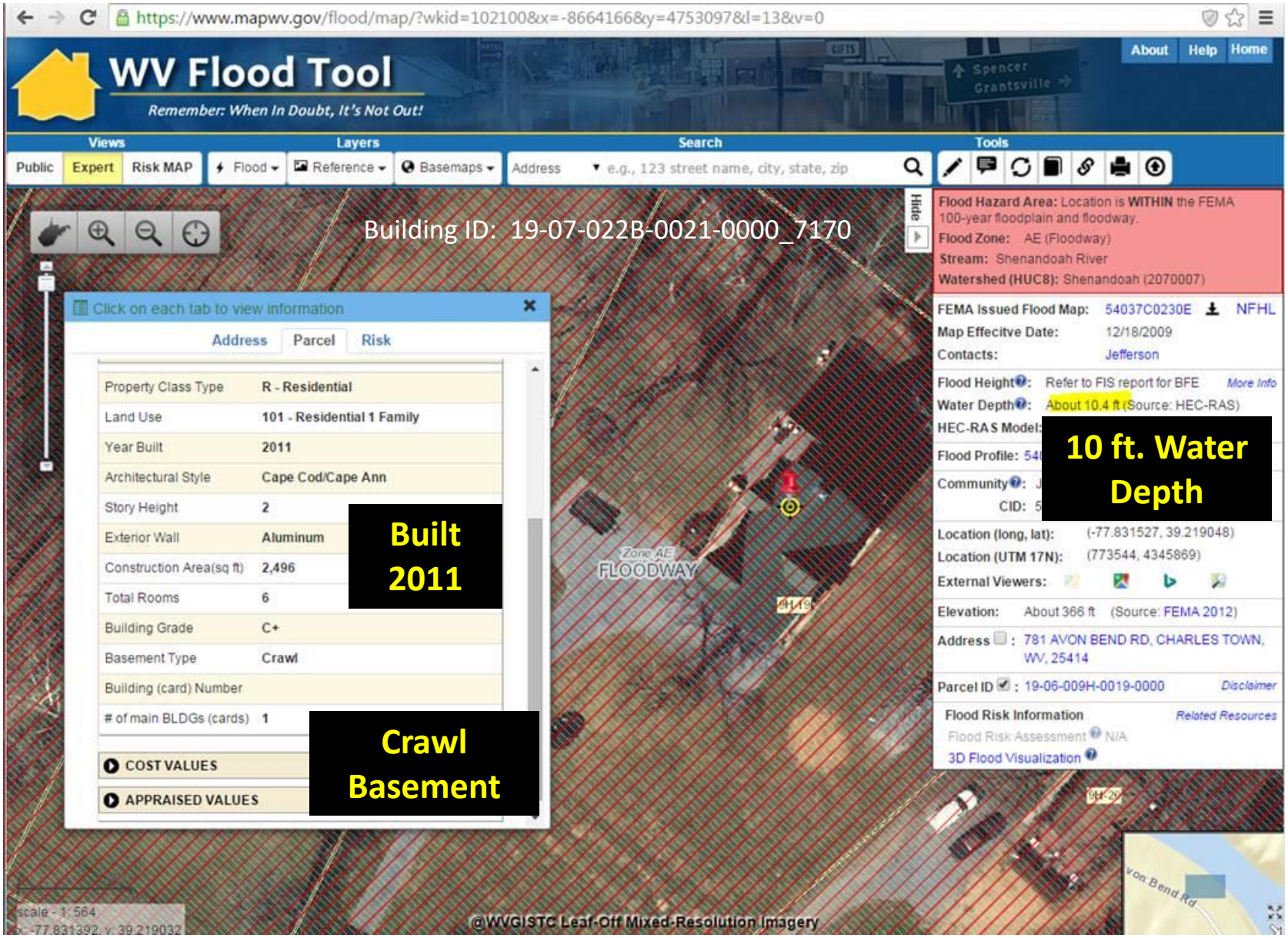
Link to **Structure** Record

Property Identification – Bldg. ID



Share Link: https://www.mapwv.gov/flood/map/?wkid=102100&x=-8909292&y=4742427&l=12&v=1

Building 19-07-022B-0021-0000_7170



Risk Assessment

FLOOD ZONE MAP INFORMATION

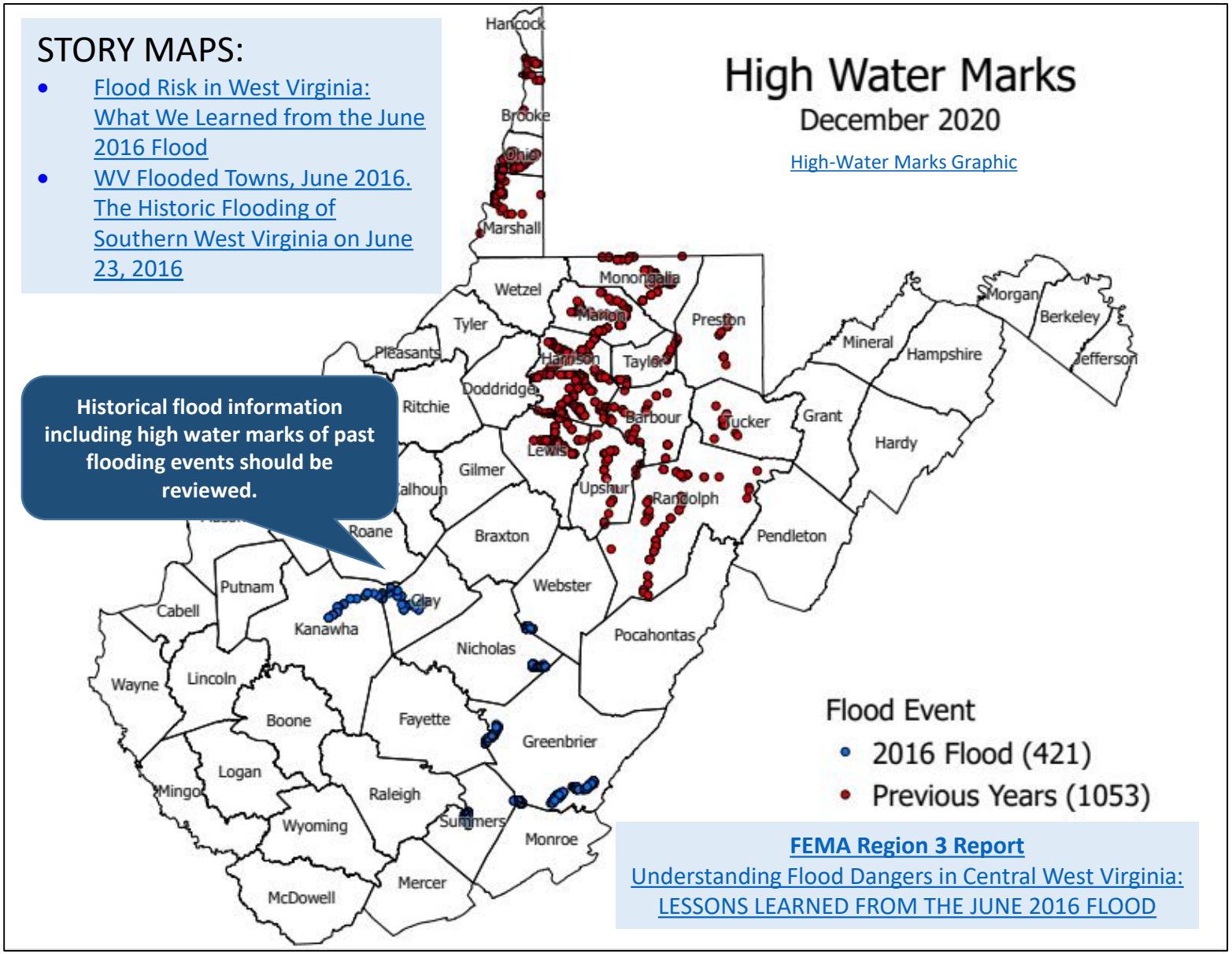
What flood zone map information is available now or in the future?

Historical Flood Information

STORY MAPS:

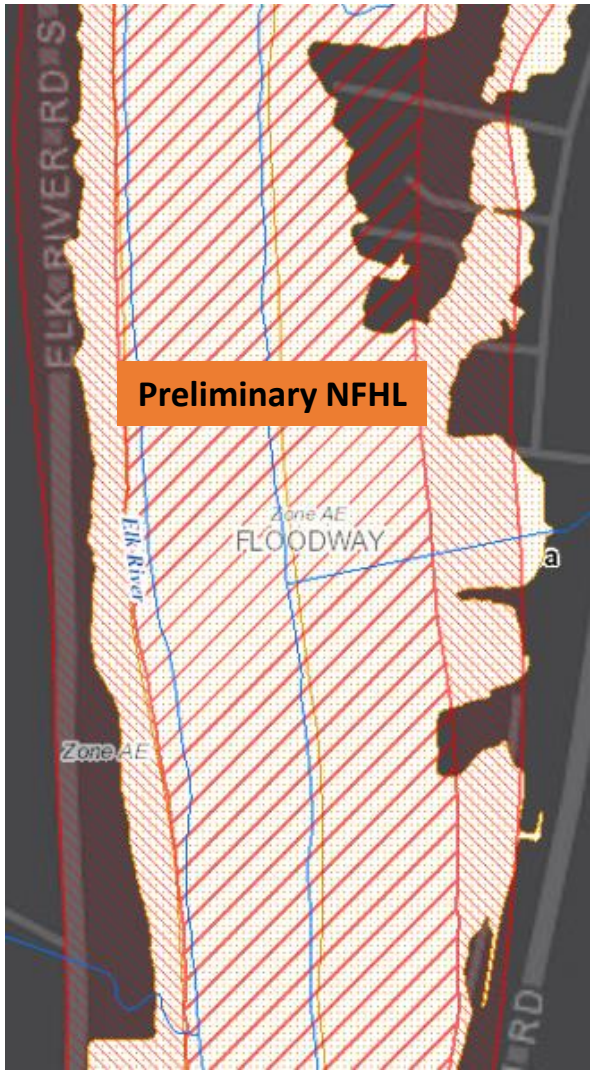
- Flood Risk in West Virginia: What We Learned from the June 2016 Flood
- WV Flooded Towns, June 2016. The Historic Flooding of Southern West Virginia on June 23, 2016

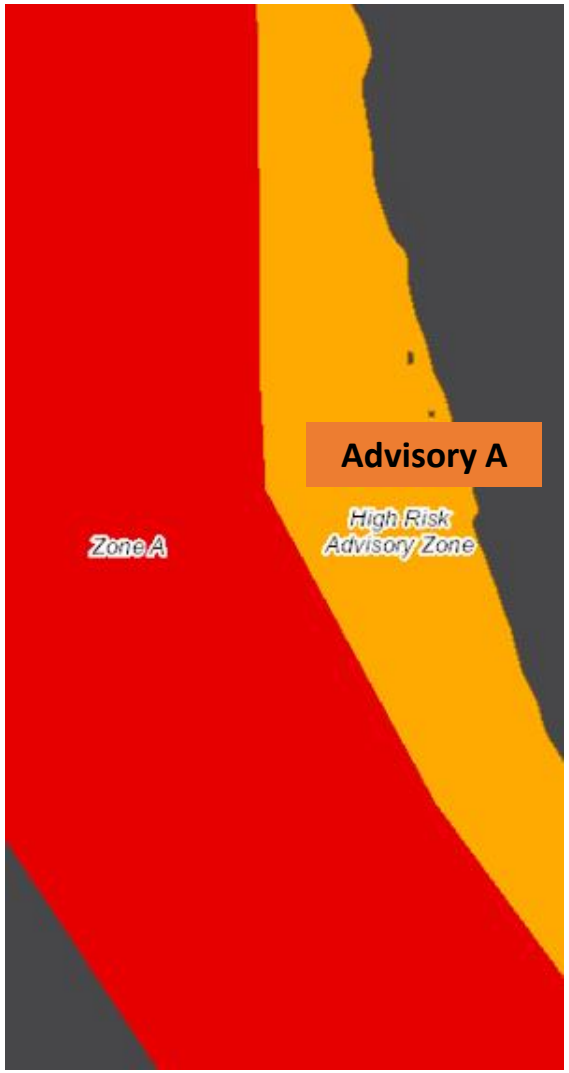
Historical flood information including high water marks of past flooding events should be reviewed.

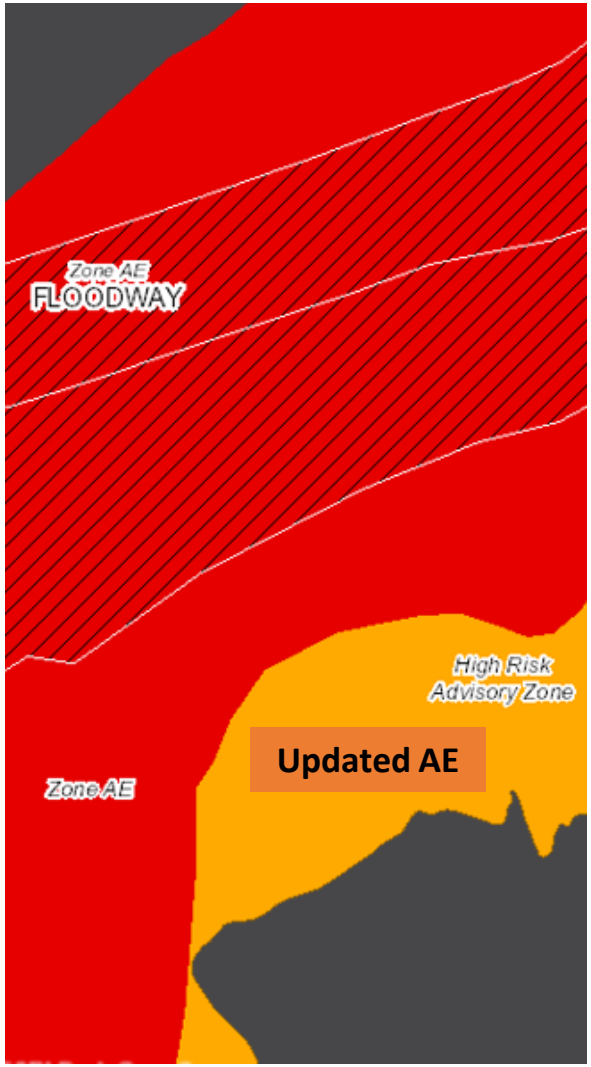


High Risk Advisory Zones

More info on High-Risk Advisory Zones





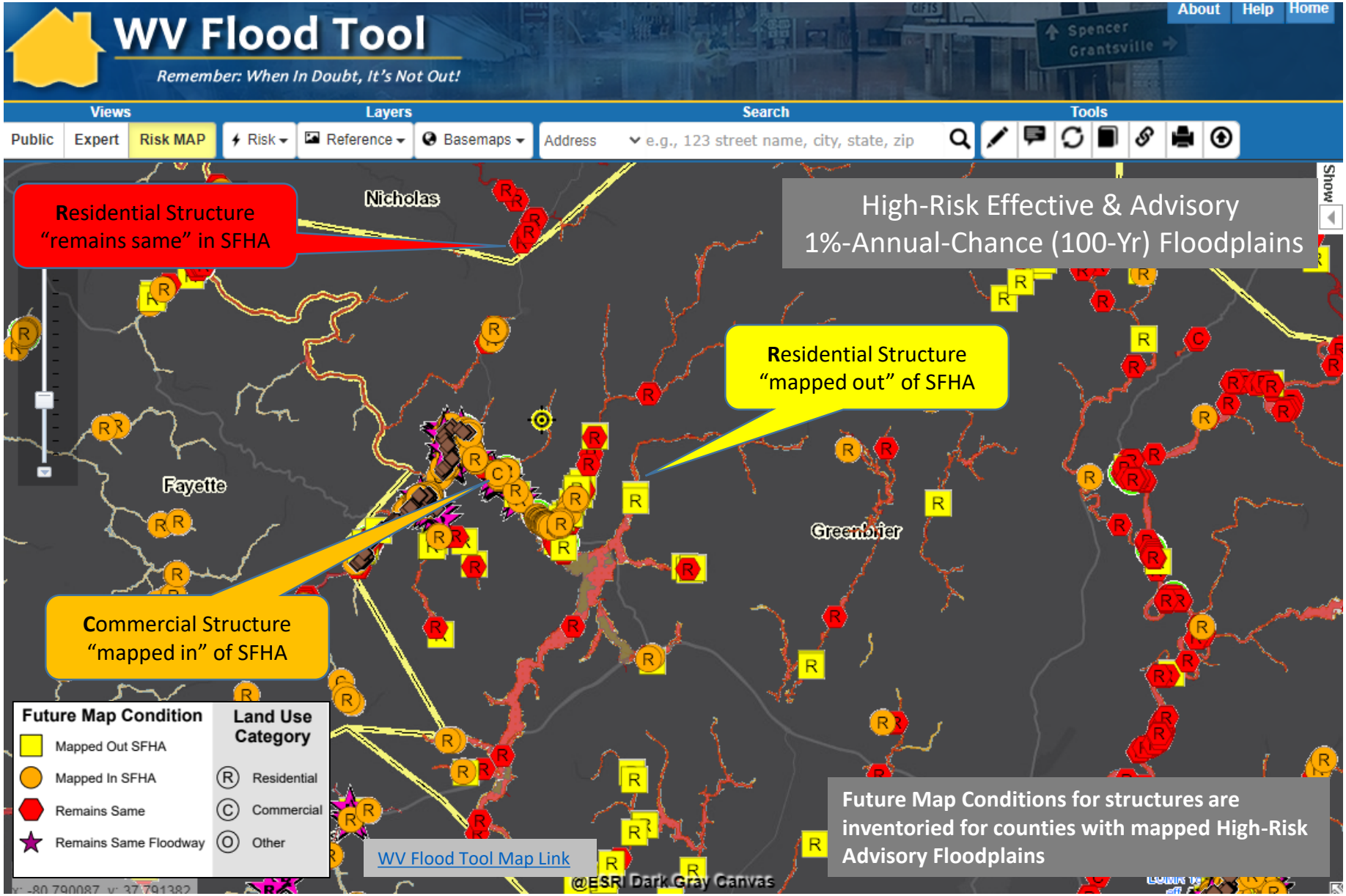


Preliminary NFHL

Advisory A

Updated AE

Advisory: Building Future Map Conditions



Map Revisions→High Risk Advisory Zones

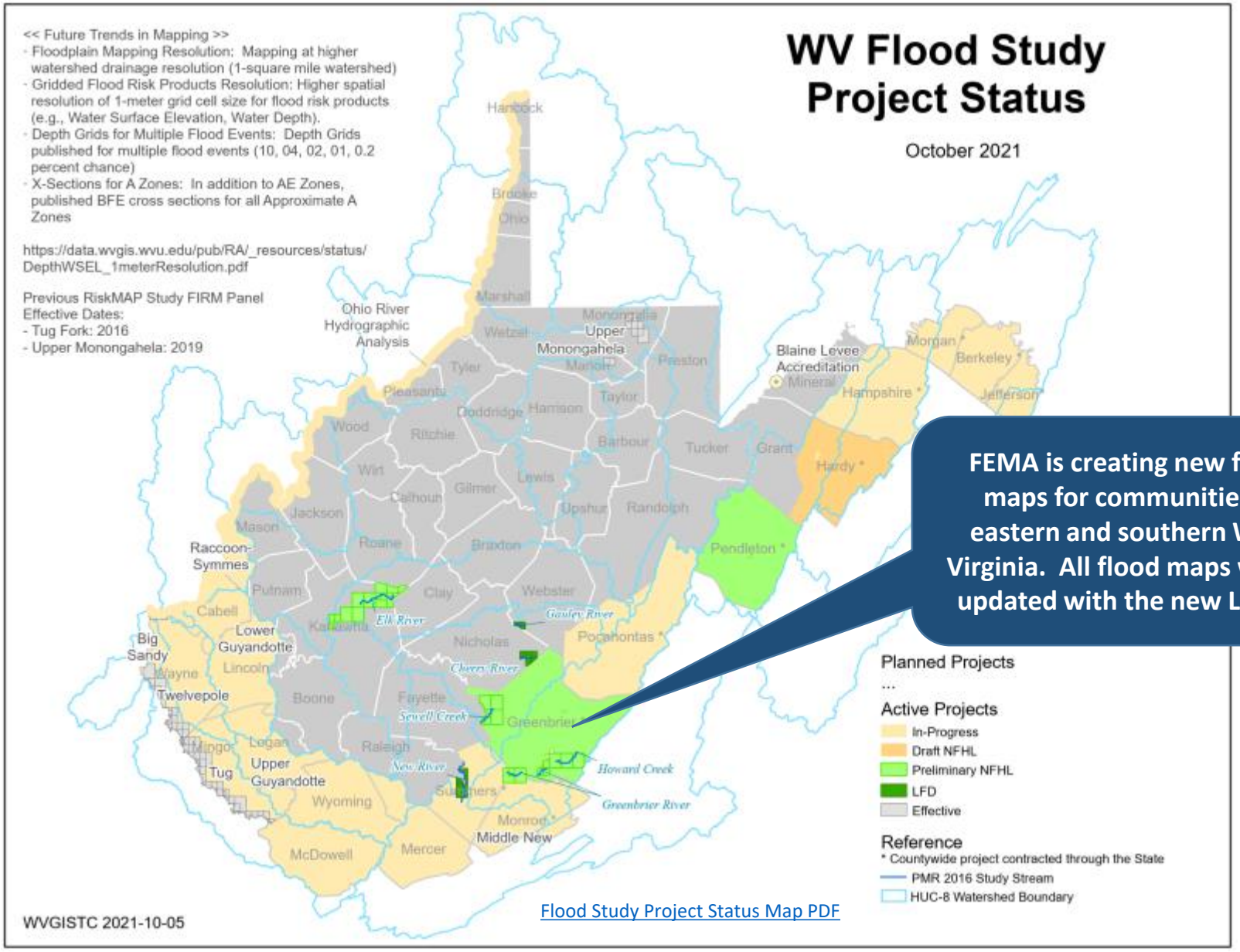
Advisory Flood Zone*	Map Revision Type	Initiated	Applicable Zones
Preliminary NFHL or DFIRM	Risk MAP Restudy or Study	FEMA	A and AE Zones
Draft NFHL or DFIRM	Risk MAP Restudy or Study	FEMA	A and AE Zones
Advisory A	AFH Model-Backed Studies	State CTP	Approximate A Zone
Updated AE	Non-Restudy Redelineation	State CTP	AE Zone

* Note: Advisory Floodplains may be mapped outside of the official FIRM

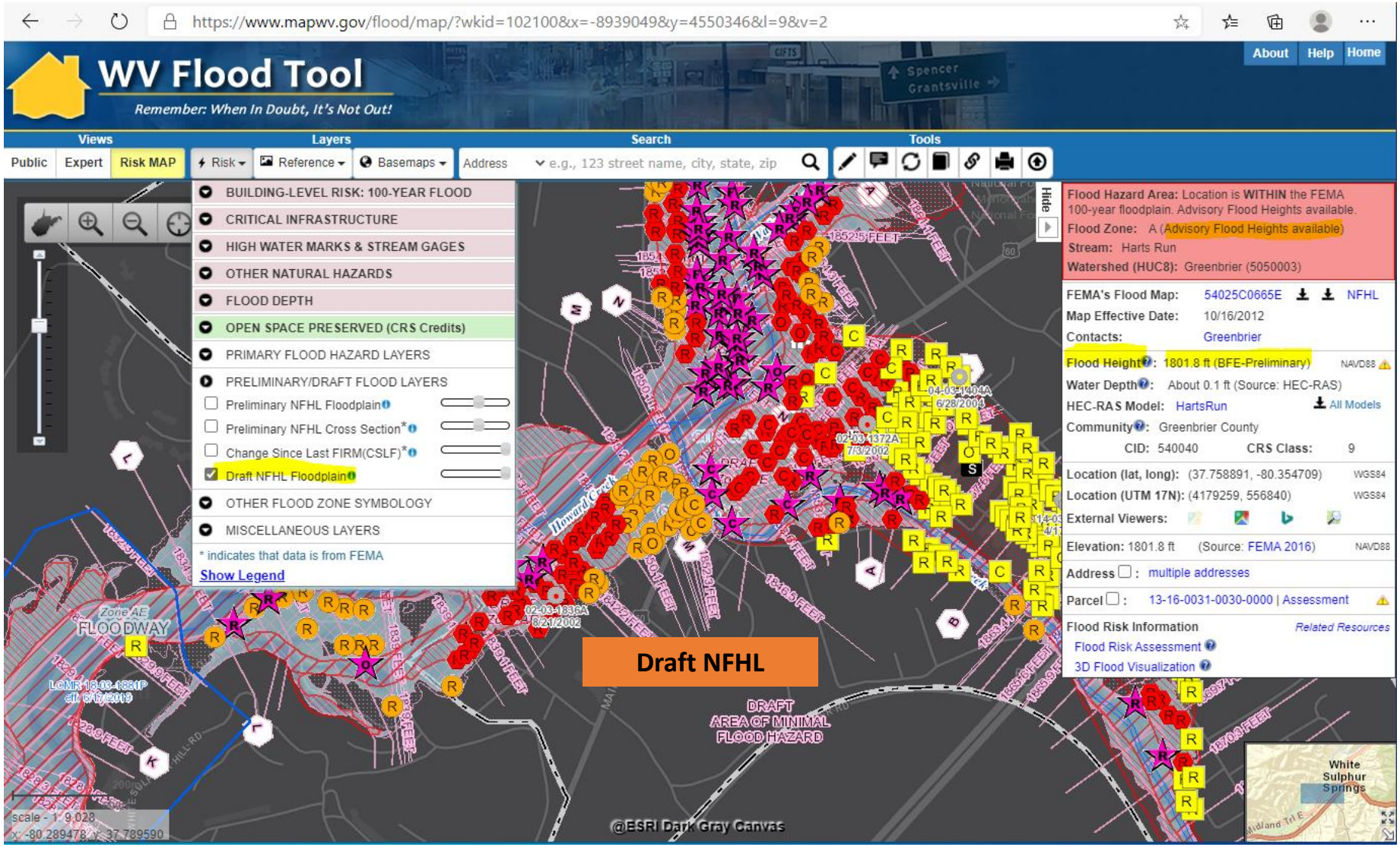
High-Risk Advisory Zone Flood Products:
(1) Advisory Floodplain Boundary, (2) Flood Height Grid, (3) Flood Depth Grid

Refer to WV Flood Tool Glossary for more information

Active FEMA Flood Studies

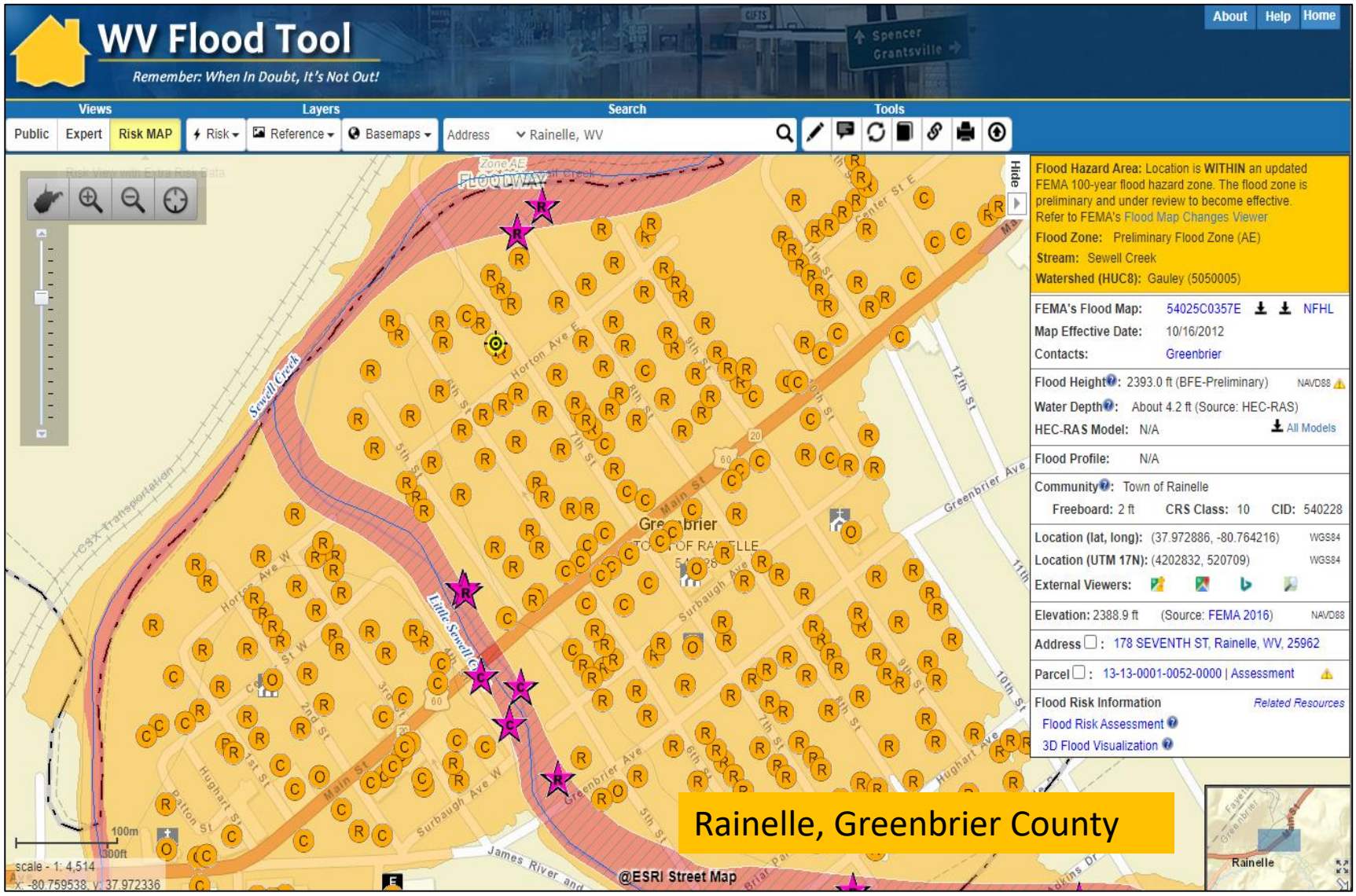


Draft NFHL



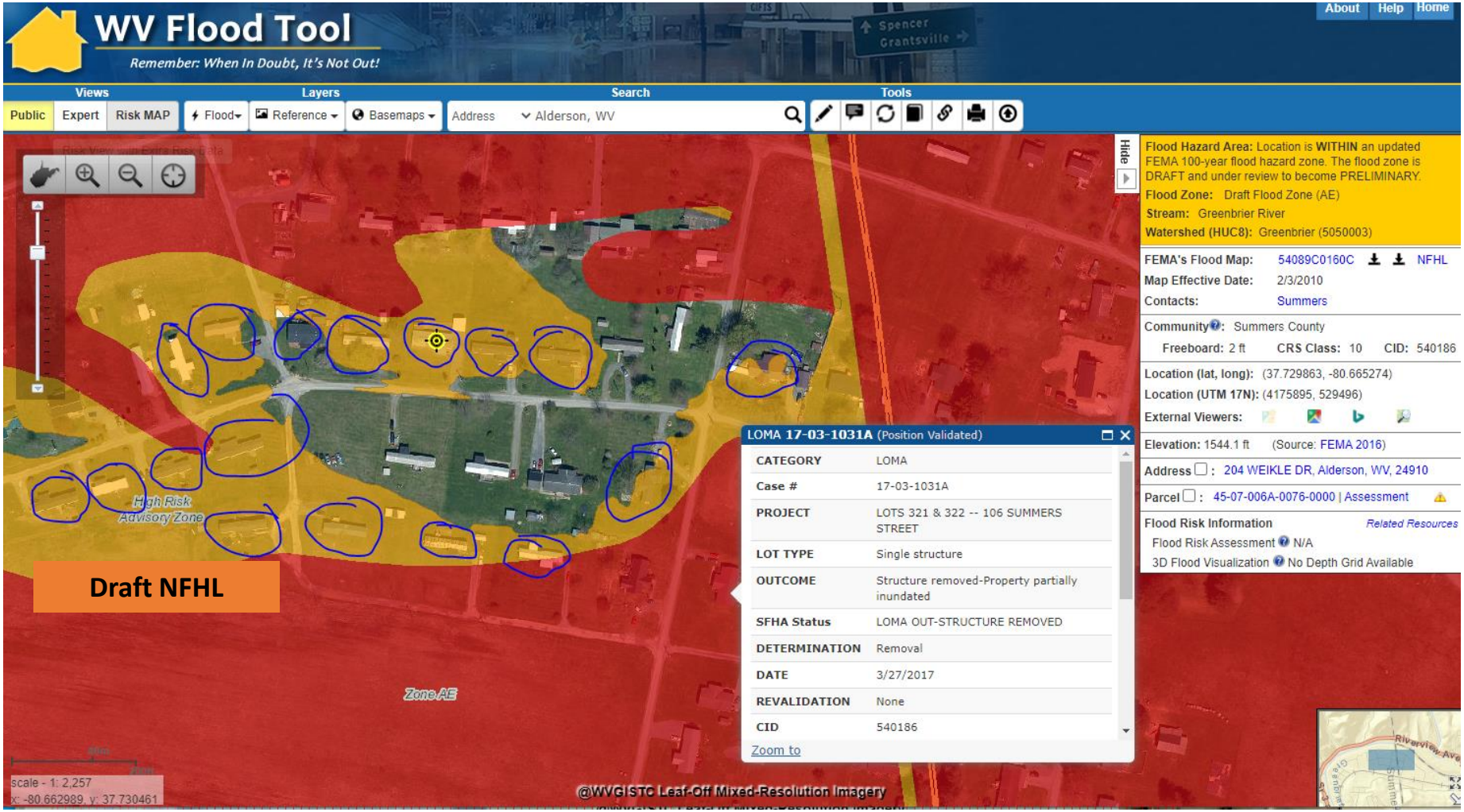
Draft NFHL Flood Zone: Pre-Preliminary FEMA National Flood Hazard Layers (NFHL) pending to become effective on updated Flood Insurance Rate Maps (FIRMs)

Preliminary NFHL (Rainelle, WV)



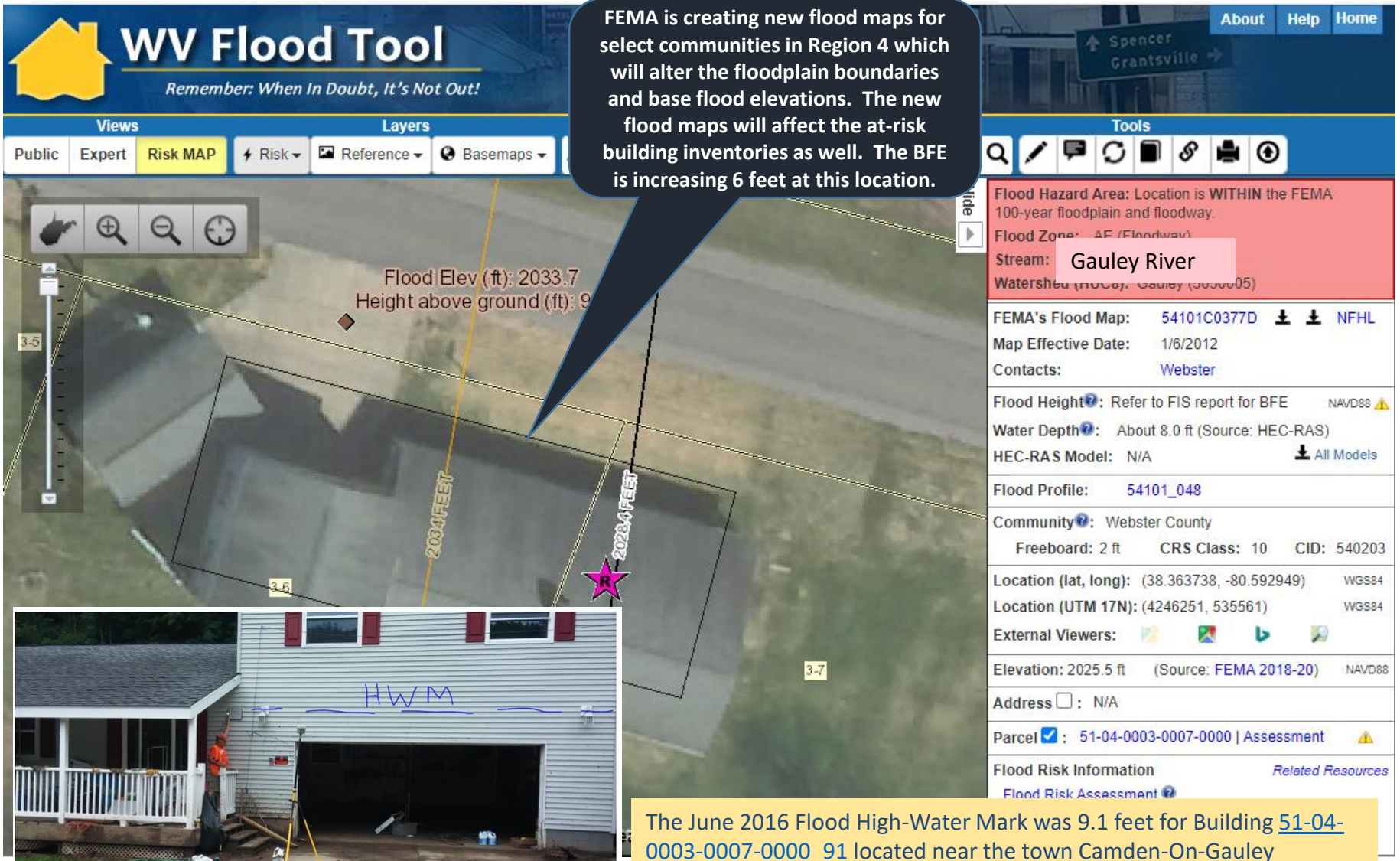
Example of mapped in structures to new SFHA from Preliminary Flood Study of Rainelle, WV. Mapped in structures (orange circles) and flood loss estimates are updated in the statewide Building Level Risk Assessment (BLRA).

Draft NFHL (Summers County)



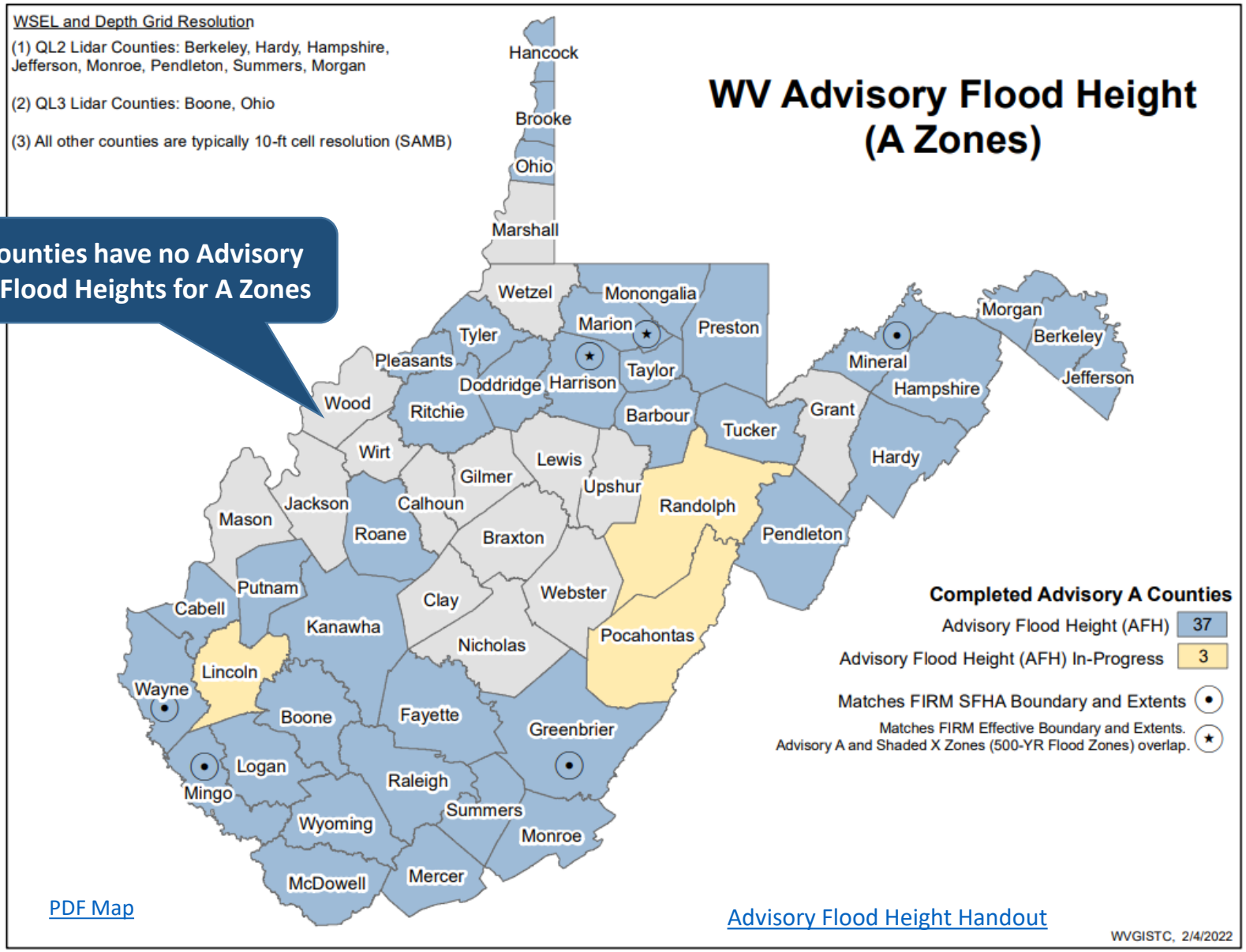
Example of mapped in structures to new SFHA from Preliminary Flood Study along Summer-Greenbrier county border near Glenray. Mapped in structures (orange circles) and flood loss estimates are updated in the statewide Building Level Risk Assessment (BLRA).

New Flood Maps



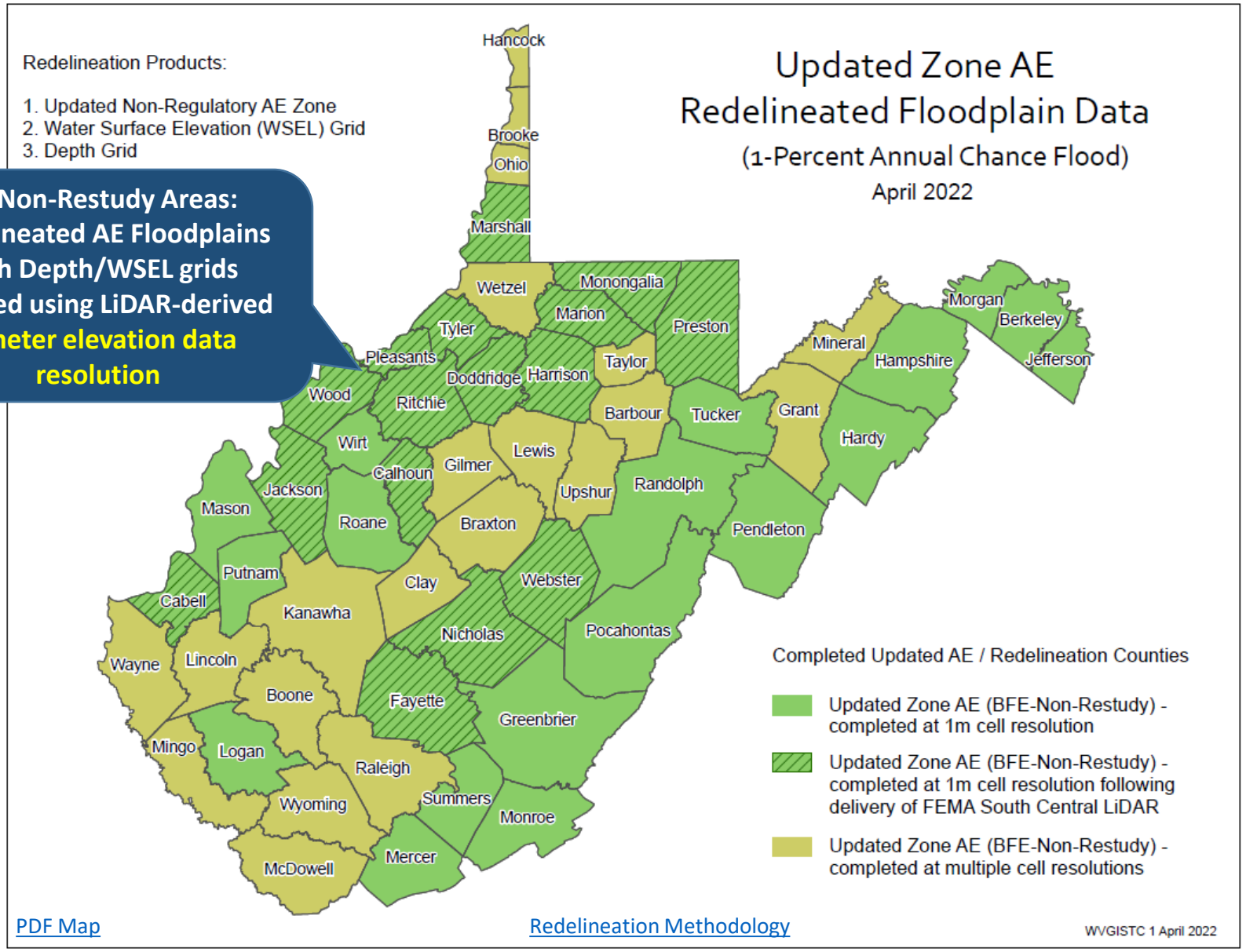
The June 2016 Flood High-Water Mark was 9.1 feet for Building 51-04-0003-0007-0000_91 located near the town Camden-On-Gauley (Webster County) on the Gauley River. The Base Flood Elevation is increasing by 6 feet on the new FEMA flood maps for this location.

Zone A Mapping (Advisory)



AE Redelineation (Advisory)

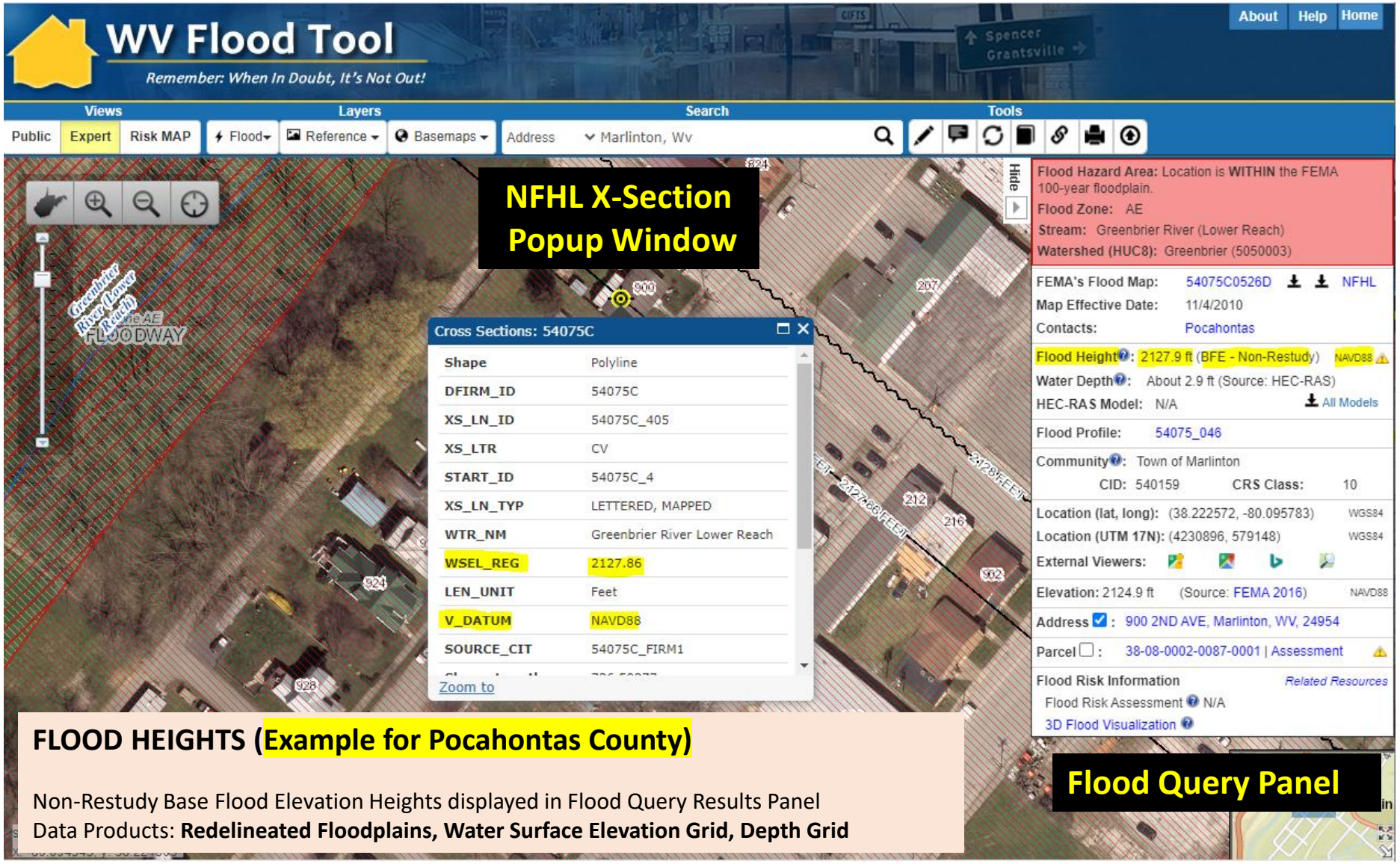
All Non-Restudy Areas: Redelineated AE Floodplains with Depth/WSEL grids mapped using LiDAR-derived 1-meter elevation data resolution



PDF Map

Redelineation Methodology

Updated AE: **BFE Non-Restudy**



FLOOD HEIGHTS (Example for Pocahontas County)

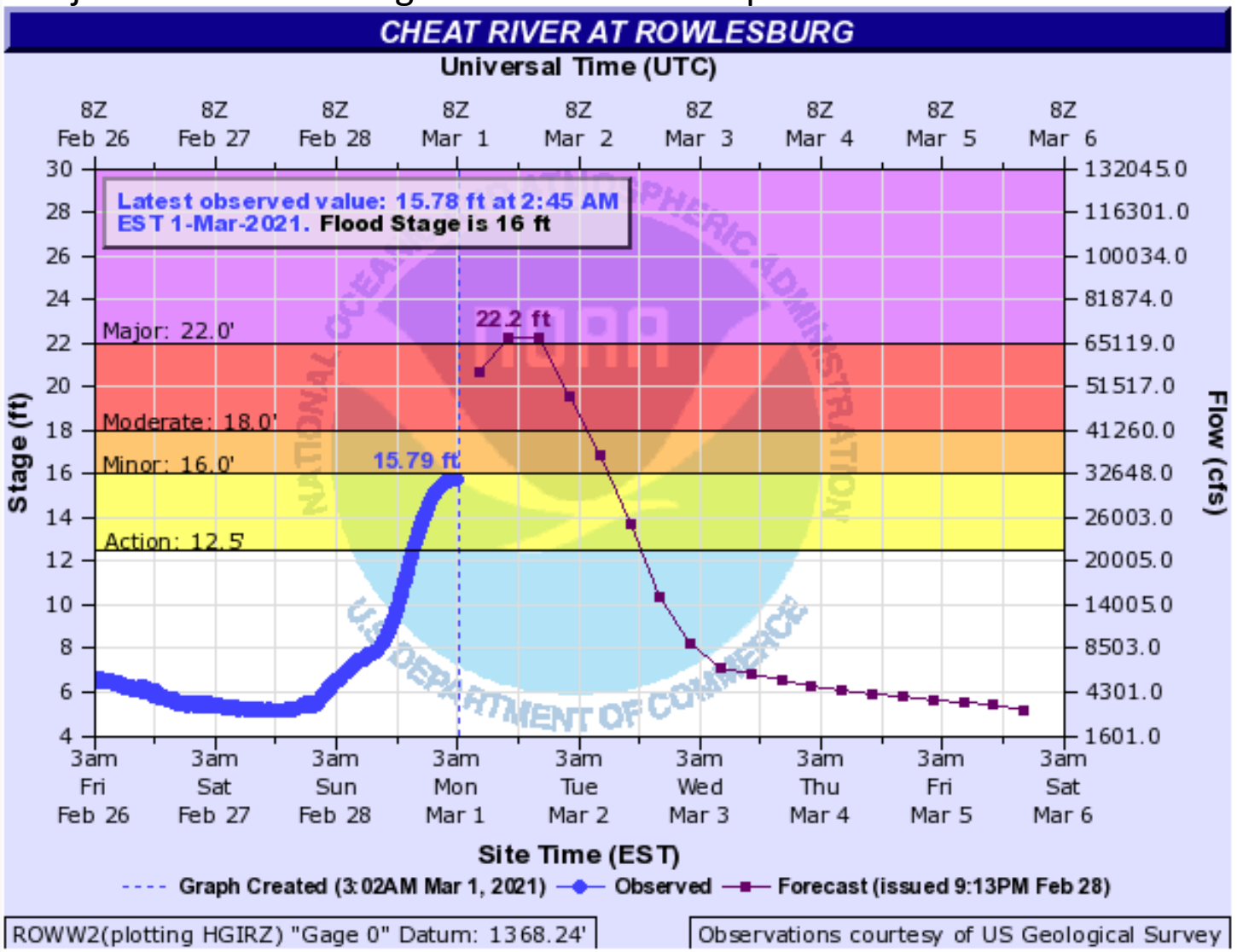
Non-Restudy Base Flood Elevation Heights displayed in Flood Query Results Panel
Data Products: **Redelineated Floodplains, Water Surface Elevation Grid, Depth Grid**

https://www.mapwv.gov/flood/map/?wkid=102100&x=-8916222&y=4610916&l=12&v=1

Updated AE (Camp Dawson)

Updated AE (Camp Dawson)

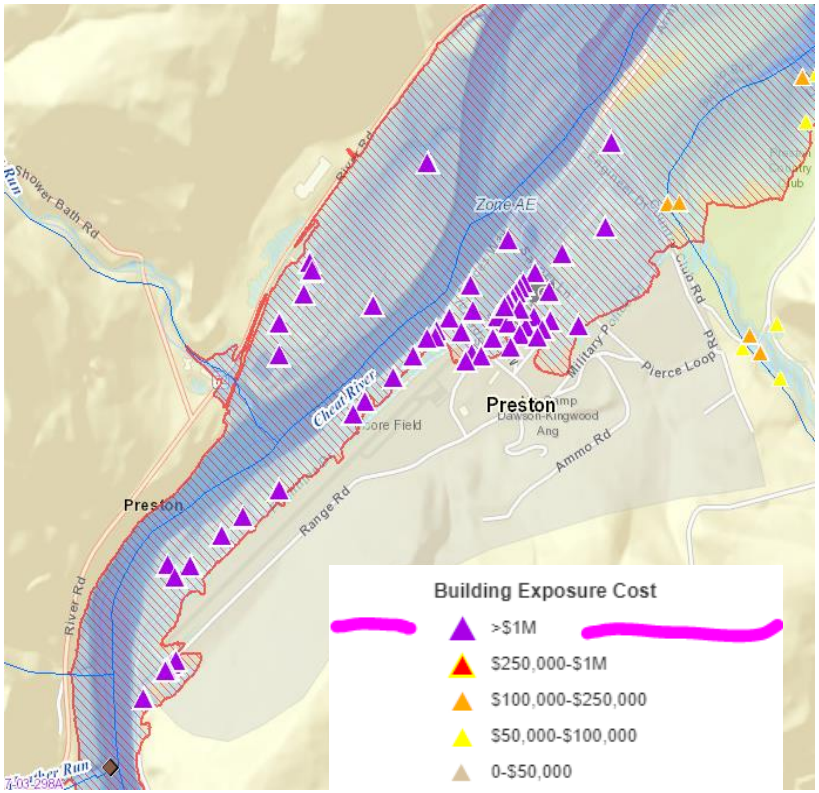
Major Riverine Flooding Forecasted for Camp Dawson on 1 March 2021.

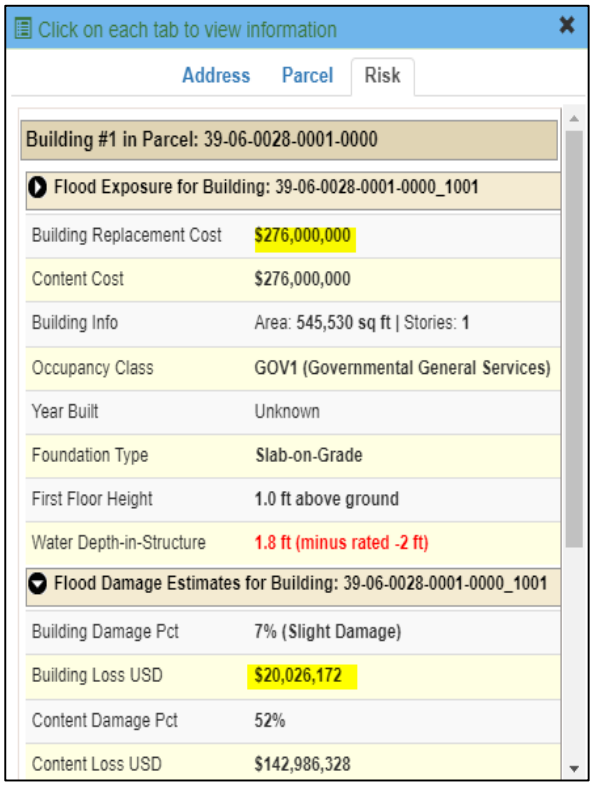


USGS Cheat River Stream Gage at Rowlesburg, WV

Updated AE (Camp Dawson)

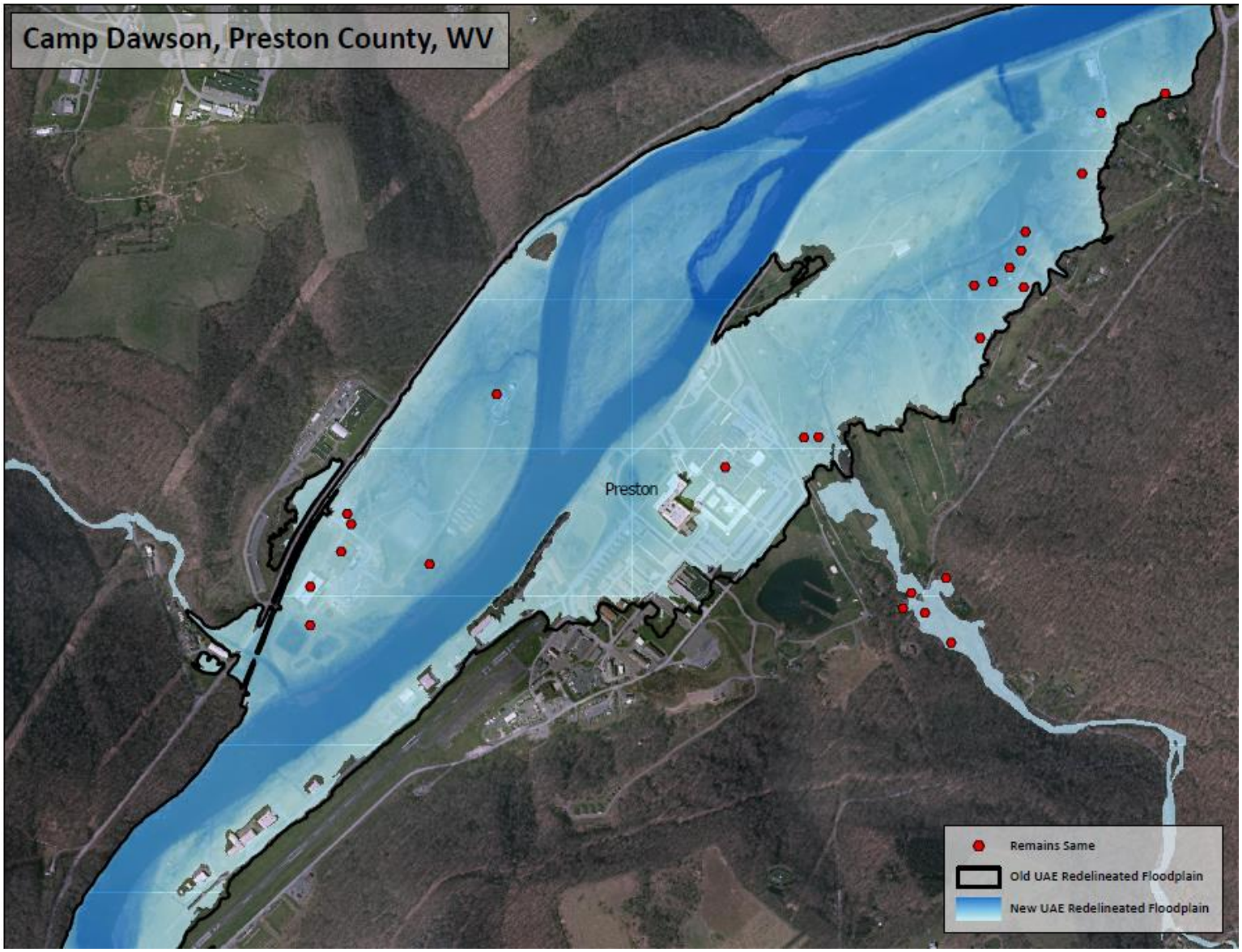
Camp Dawson, Preston County, a military complex on the Cheat River, has one of the highest cumulative building dollar exposures ($276M) and building damage loss estimates ($20M) in the State. A hydrograph on March 1, 2021, predicted major riverine flooding at 22.2 ft. (8 feet above flood stage of 16 feet); however, fortunately the flooding forecast for major flooding did not occur.





High value building exposure of Camp Dawson structures in AE Zone (WV Flood Tool Risk Map View)

Updated AE Depth (Camp Dawson)



https://www.mapwv.gov/flood/map/?wkid=102100&x=-8868186&y=4786467&l=9&v=2

Flood Risk Assessment

FLOODPLAIN BUIDLING INVENTORY & FUTURE MAP CONDITIONS

What buildings are at risk?

Other Flood Risk Indicators

FEMA Risk Indicators: Community Engagement Prioritization (CEP) 2019

Disadvantaged Community Graphics

Statewide Building Inventory

Building Estimates

- **84,351 structures** in **SFHA**
- **13,996 structures** in **"High-Risk" Advisory** (Orange Zones)
- **354 Essential Facilities** in **High-Risk Flood Zones** (K-12 Schools, 911 Centers, Police/Fire Stations Depts., Hospitals, Nursing Homes)
- **38 Essential Facilities** in **Regulatory Floodway**
- **503 Essential Facilities** total in both **high and moderate risk floodplains**

Buildings Pre-FIRM/Post-FIRM

- **67% are Pre-FIRM (majority)**
- 26% are Post-FIRM
- 7% are unknown

*Based on **Building Year** of assessment data*

All ESSENTIAL FACILITIES SHOULD BE FIELD VERIFIED

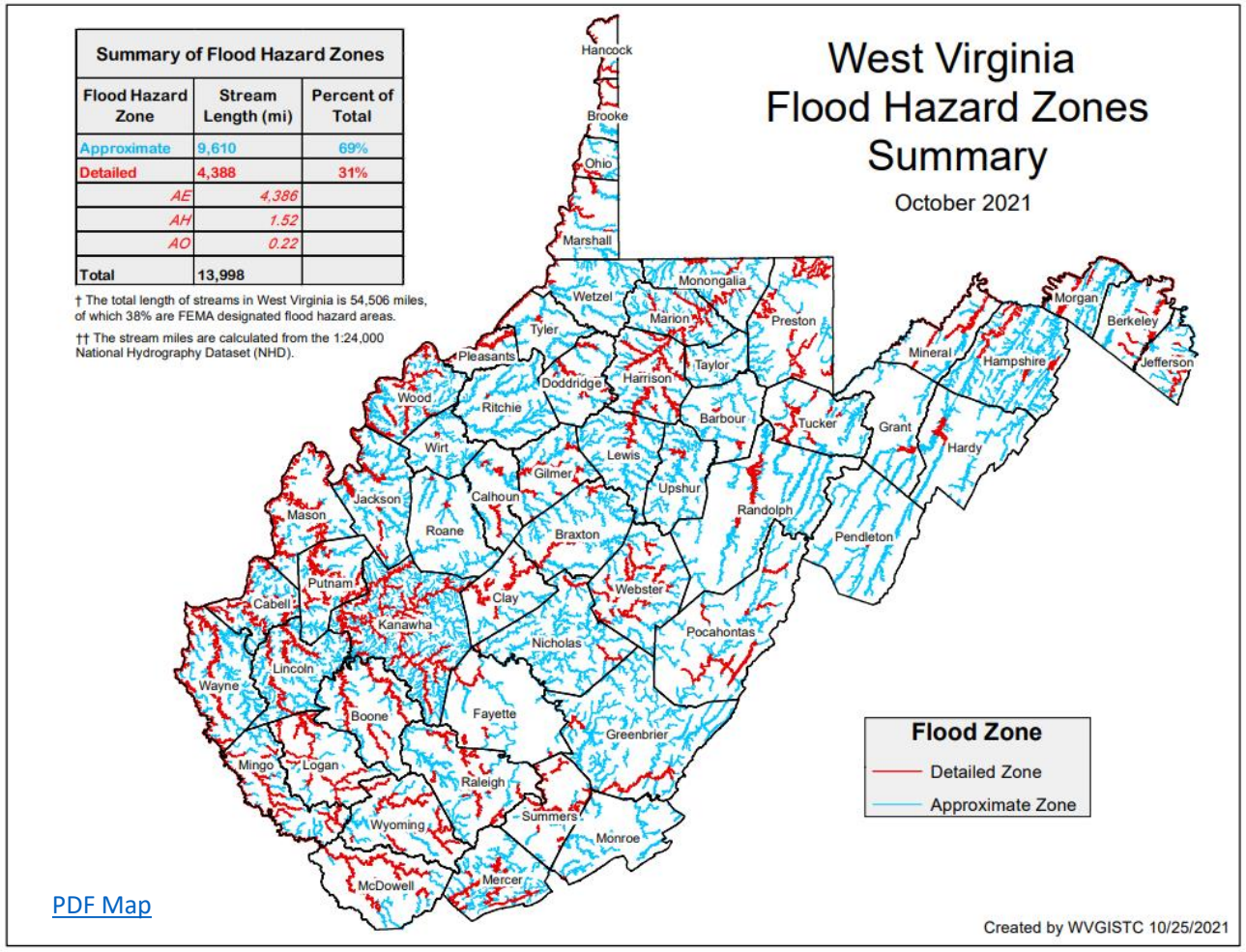
Community	Buildings in SFHA
Kanawha County*	8,890
Logan County*	5,247
Mingo County*	3,393
Boone County*	3,313
Wheeling**	2,836
Lincoln County*	2,563
McDowell County*	2,408
Raleigh County*	2,252
Mercer County*	2,233
Wyoming County*	2,226
Wayne County*	2,221
Putnam County*	1,902
Cabell County*	1,887
Charleston	1,872
Wood County*	1,562
Fayette County*	1,528
Randolph County*	1,268
Greenbrier County*	1,182
Marion County*	1,162
Huntington**	1,148

Top 20 Communities

Building Counts by Flood Zone

Building Stock in Flood Zones

Although only 31% of the State has mapped Detailed Flood Zones (AE / AO / AH), the Detailed Flood Zones contain 65% of the Building Stock Located in SFHA. Most of the buildings are in mapped Detailed Flood Zones.



FLOOD HAZARD ZONES

- Stream Miles Length
- 69% Approximate A
- 31% Detailed Zones

Special Flood Hazard Area

- 84,351 buildings
- 35% in Approximate Zone A
- 65% in Detailed Zone AE (9% in Regulatory Floodway)

BUILDINGS IN NON-REGULATORY ZONES

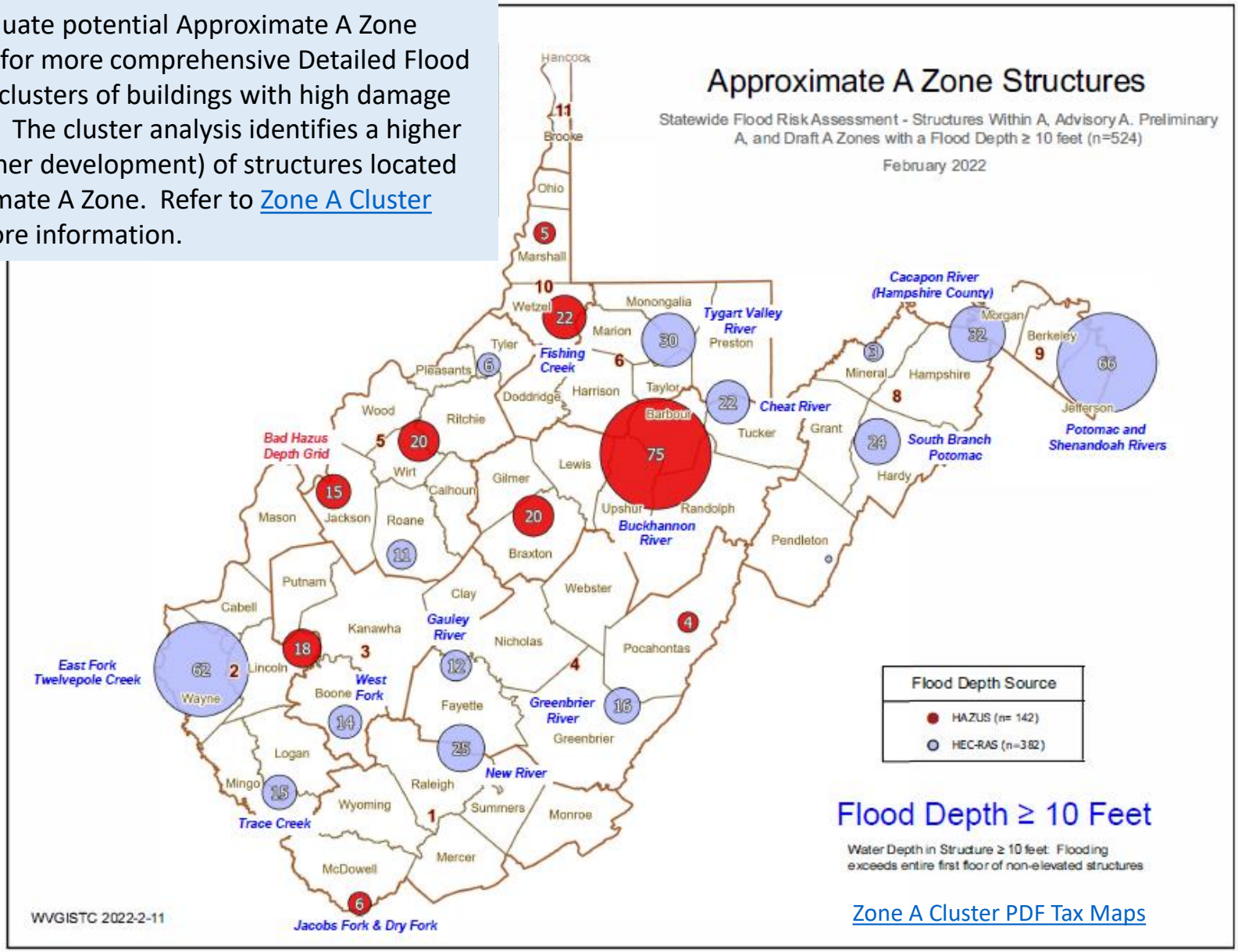
- 13,966 Structures (14%) mapped in High-Risk Zone Advisory A / AE
- 98,347 Total High-Risk

BUILDINGS IN SHADED X

- Moderate Risk
- 44,415 structures in 500-YR floodplains
- 9,718 structures in Levee Protected Zones

Potential Detailed Flood Studies

Objective: Evaluate potential Approximate A Zone rivers/streams for more comprehensive Detailed Flood Studies where clusters of buildings with high damage potential exist. The cluster analysis identifies a higher density (or higher development) of structures located in the Approximate A Zone. Refer to Zone A Cluster Analysis for more information.



Zone A Cluster PDF Tax Maps

Potential Detailed Flood Studies

Rank	1	2	3	4	5
BUILDING COUNT	*Buckhannon*	*East Fork Twelvepole*	*Potomac*	*Shenandoah*	*Cacapon*
	47	42	38	31	28
BUILDING DOLLAR EXPOSURE	*Shenandoah*	*Cheat*	*Buckhannon*	*Tygart Valley*	*Potomac*
	$10.7M	$3.1M	$2.0M	$2.0M	$1.9M
BUILDING DAMAGE LOSS	*Shenandoah*	*Cheat*	*Potomac*	*Buckhannon*	*Tygart Valley*
	$5.5M	$1.7M	$1.3M	$1.3M	$1.3M
DAMAGE ≥ 50%	*Buckhannon*	*East Fork Twelvepole*	*Potomac*	*Shenandoah*	*Cacapon*
	44	38	35	25	25

Water Depth in Structure ≥ 10 feet: Flooding exceeds entire first floor of non-elevated structures

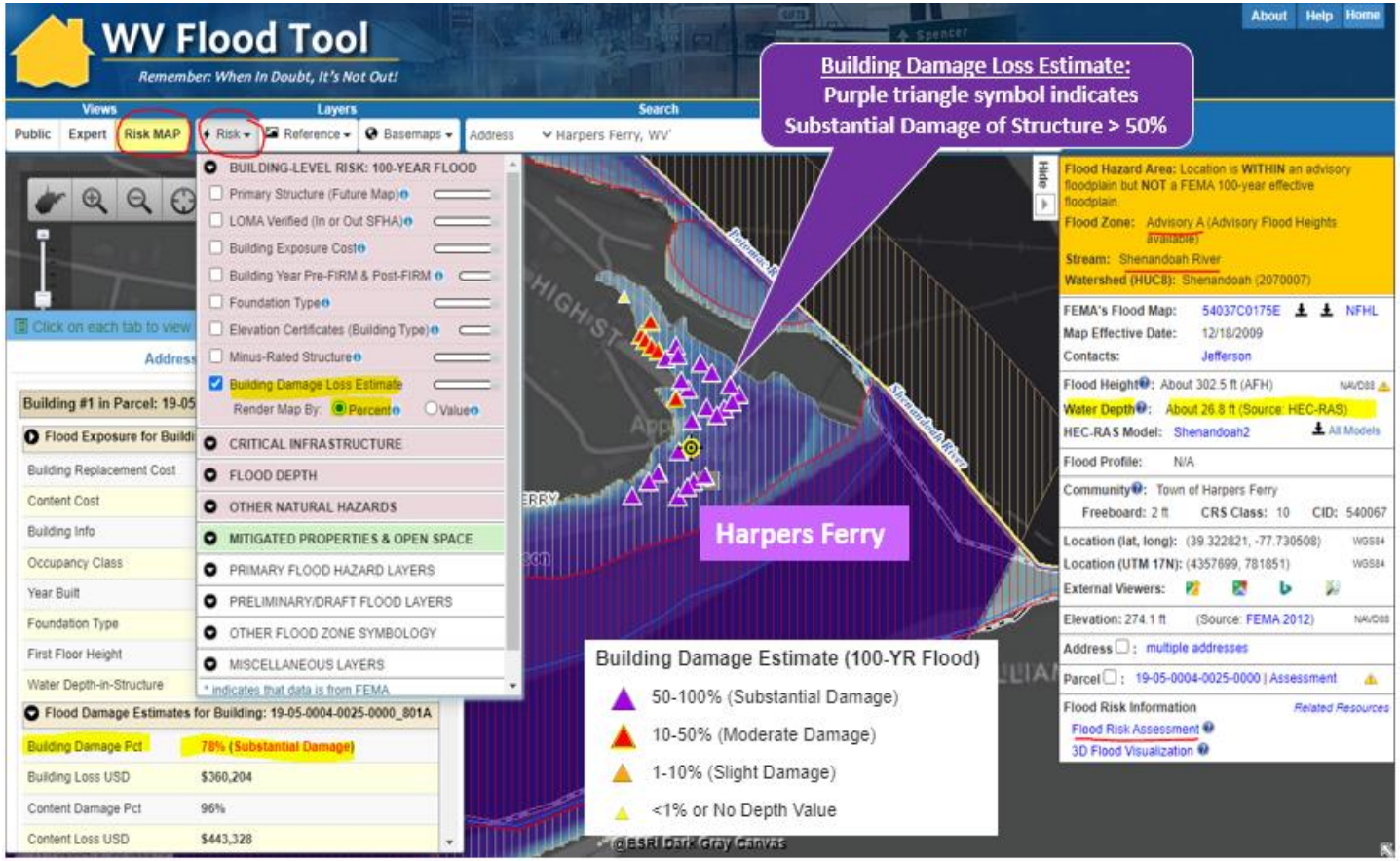
River/Stream Name	**Flood Depth Value (ft.)**	Web Link	County	Flood Depth Source	Hazard Occupancy Code	Building Exposure ($)
Shenandoah River	**33.0**	FT	JEFFERSON COUNTY	HEC-RAS	COM8	532,300
South Branch Potomac	**28.5**	FT	HARDY COUNTY	HEC-RAS	RES2	1,710
Gauley River	**24.3**	FT	FAYETTE COUNTY	HEC-RAS	RES1	9,000
Beech Fork	**24.2**	FT	WAYNE COUNTY	HEC-RAS	GOV1	496,266
New River	**20.6**	FT	FAYETTE COUNTY	HEC-RAS	RES1	18,100

Highest Building Flood Depth for Approximate A Zone Rivers/Streams (table extract). Sorted on building flood depth. Click on Flood Tool map link to view location.

Zone A Cluster Analysis

Potential Detailed Flood Studies

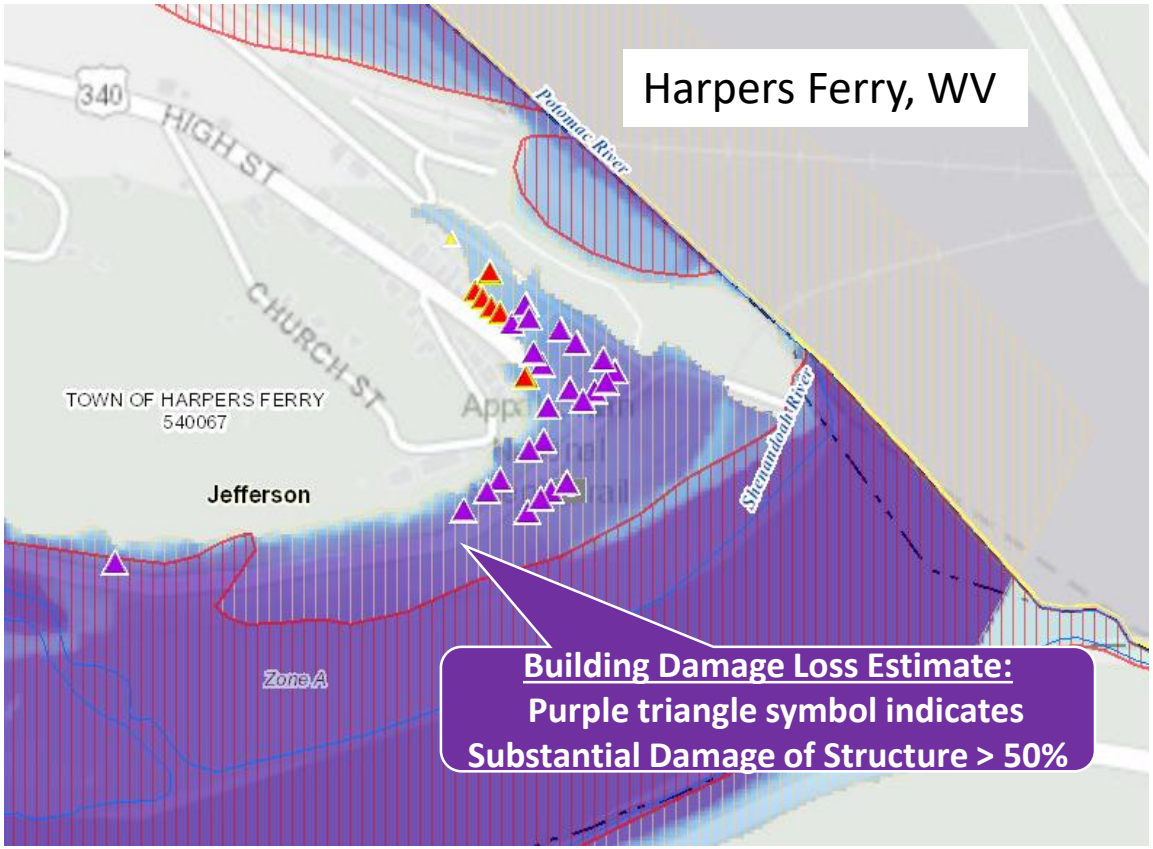
WV Flood Tool's Risk MAP View – Building Damage Loss Estimate Percent Layer: In the Risk MAP View of the WV Flood Tool, the risk assessment layer, **Building Damage Loss Estimate (%)**, provides a relationship between high flood depths and flood loss estimates of substantially damaged structures (> 50% damage). High building-level damage percentages typically correlate to structures in Approximate A Zones with high base flood depths for a 1% annual chance flood.



[Zone A Cluster Analysis]

Potential Detailed Flood Studies

Shenandoah River (Harpers Ferry) Zone A Cluster
A high-value wastewater treatment plant is associated with the high building exposure values of this Zone A cluster. Building 19-05-0004-0025-0000_744 has high-water marks on building side.



https://www.mapwv.gov/flood/map/?wkid=102100&x=-8652936&y=4767965&l=11&v=2

Zone A Cluster Analysis

Acreage of the SFHA (Top 20)

Sample Community-Level Tabular Report

Top 20 Unincorporated / Incorporated Areas with Highest Acreage of SFHA (aSFHA)

County Unincorporated	Modified aSFHA
HAMPSHIRE COUNTY	26,388
MASON COUNTY	21,771
KANAWHA COUNTY	21,196
GREENBRIER COUNTY	20,060
RANDOLPH COUNTY	19,842
WOOD COUNTY	17,523
HARDY COUNTY	16,850
JACKSON COUNTY	15,300
WAYNE COUNTY	13,521
PENDLETON COUNTY	13,218
LINCOLN COUNTY	11,137
BERKELEY COUNTY	10,300
CABELL COUNTY	10,278
POCAHONTAS COUNTY	10,092
PRESTON COUNTY	9,965
PUTNAM COUNTY	9,934
NICHOLAS COUNTY	8,999
WEBSTER COUNTY	8,907
MINERAL COUNTY	8,885
RALEIGH COUNTY	8,719

Incorporated Place	County	Modified aSFHA
CHARLESTON, CITY OF (SPLIT)	KANAWHA COUNTY	1,486
WHEELING, CITY OF (SPLIT)	OHIO COUNTY	1,318
PARKERSBURG, CITY OF	WOOD COUNTY	1,217
HUNTINGTON, CITY OF (SPLIT)	CABELL COUNTY	823
NEW MARTINSVILLE, CITY OF	WETZEL COUNTY	652
BUCKHANNON, CITY OF	UPSHUR COUNTY	616
POINT PLEASANT, CITY OF	MASON COUNTY	614
MOUNDSVILLE, CITY OF	MARSHALL COUNTY	563
MARLINTON, TOWN OF	POCAHONTAS COUNTY	494
MOOREFIELD, TOWN OF	HARDY COUNTY	475
WEIRTON, CITY OF (SPLIT)	HANCOCK COUNTY	456
CLARKSBURG, CITY OF	HARRISON COUNTY	453
FAIRMONT,CITY OF	MARION COUNTY	408
MORGANTOWN, CITY OF	MONONGALIA COUNTY	387
MILTON, CITY OF	CABELL COUNTY	377
BUFFALO, TOWN OF	PUTNAM COUNTY	342
ELEANOR, TOWN OF	PUTNAM COUNTY	340
PRINCETON, CITY OF	MERCER COUNTY	332
BARBOURSVILLE, VILLAGE OF	CABELL COUNTY	314
DUNBAR, CITY OF	KANAWHA COUNTY	313

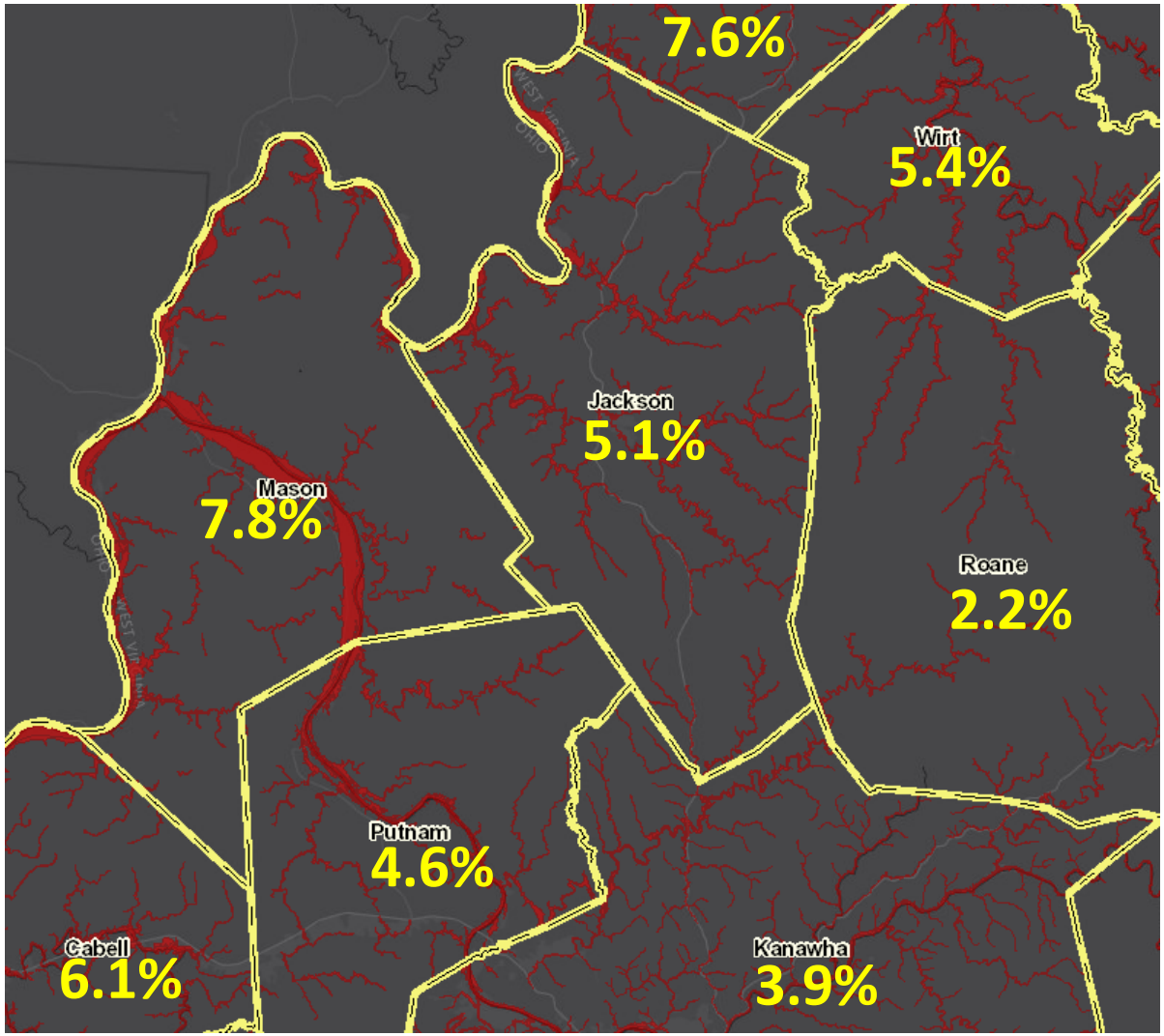
Modified aSFHA = Total aSFHA minus (1) large water bodies and (2) federal lands > 10 acres

Ratio of aSFHA to Community Area

Unincorporated Areas

County Unincorporated	aSFHA
MASON COUNTY	7.8%
WOOD COUNTY	7.6%
JEFFERSON COUNTY	6.8%
HAMPSHIRE COUNTY	6.4%
CABELL COUNTY	6.1%
MORGAN COUNTY	5.7%
WIRT COUNTY	5.4%
JACKSON COUNTY	5.1%
BERKELEY COUNTY	5.1%
TYLER COUNTY	4.9%
PUTNAM COUNTY	4.6%
HARDY COUNTY	4.5%
PLEASANTS COUNTY	4.5%
MINERAL COUNTY	4.3%
WAYNE COUNTY	4.2%
LINCOLN COUNTY	4.0%
KANAWHA COUNTY	3.9%
CALHOUN COUNTY	3.6%
HARRISON COUNTY	3.3%
BROOKE COUNTY	3.3%

Ratio = Acreage of SFHA (aSFHA) divided by Community Area

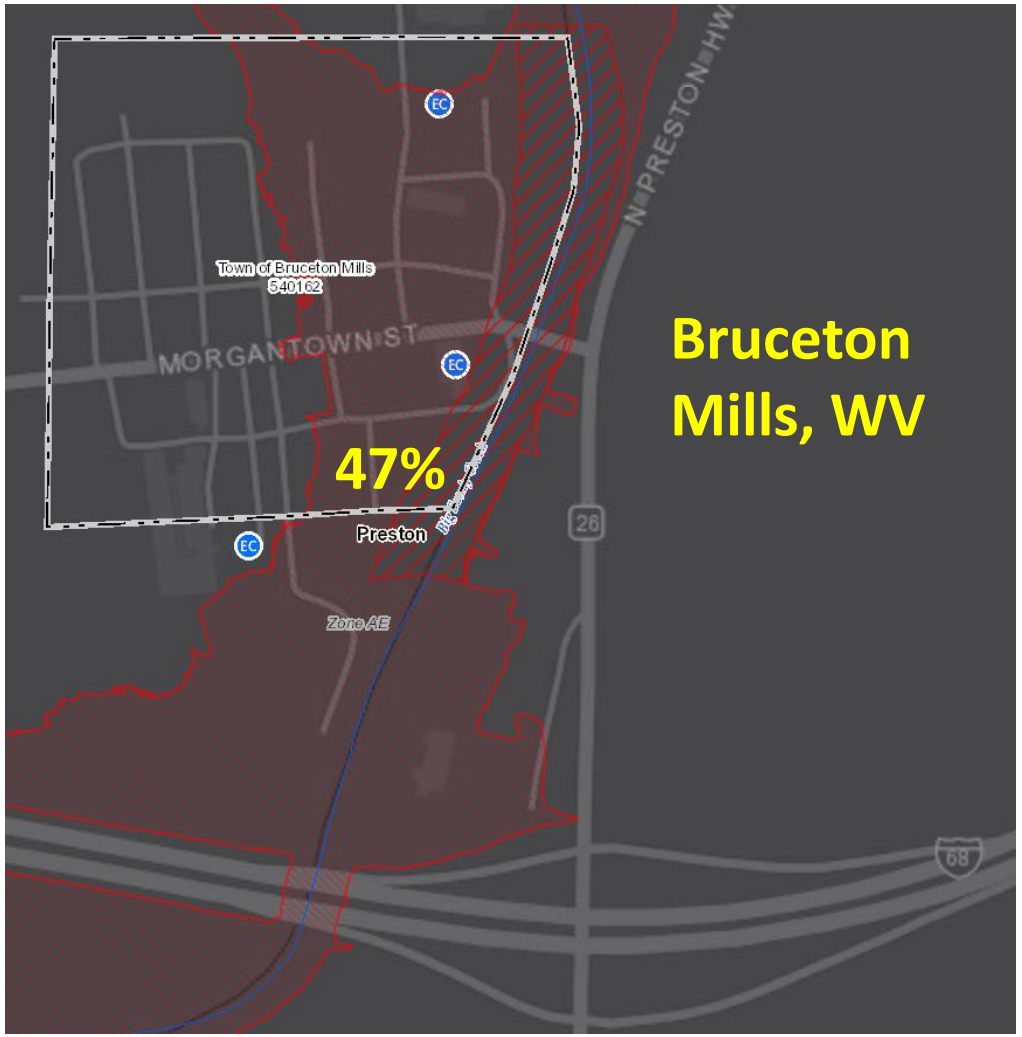


Data Table Source: [Ratio of aSFHA to Community Area]

Ratio of aSFHA to Community Area

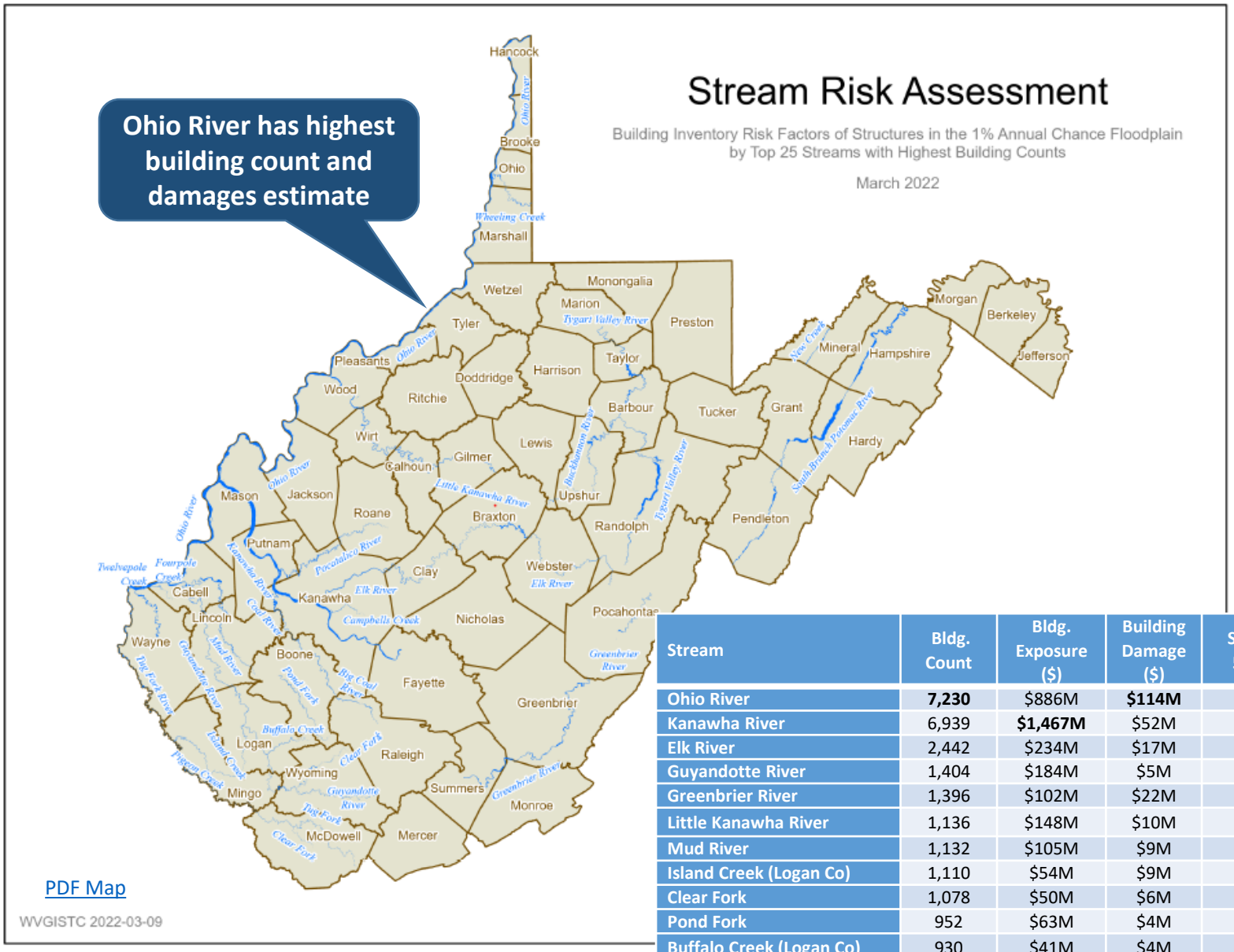
Top 20 Incorporated Areas with Highest Ratio of SFHA Acreage to Community Area

Incorporated Places	County	aSFHA
FRIENDLY, TOWN OF	TYLER COUNTY	58.5%
HAMBLETON, TOWN OF	TUCKER COUNTY	50.0%
REEDY, TOWN OF	ROANE COUNTY	48.0%
BRUCETON MILLS	PRESTON COUNTY	47.2%
PARSONS, CITY OF	TUCKER COUNTY	43.5%
ELIZABETH, TOWN OF	WIRT COUNTY	42.9%
HENDERSON, TOWN OF	MASON COUNTY	42.6%
PINE GROVE, TOWN OF	WETZEL COUNTY	42.4%
MATEWAN, TOWN OF	MINGO COUNTY	41.7%
CAPON BRIDGE TOWN	HAMPSHIRE COUNTY	40.0%
SMITHERS, TOWN OF	KANAWHA COUNTY	40.0%
CHESAPEAKE, TOWN OF	KANAWHA COUNTY	39.4%
ALBRIGHT,TOWN OF	PRESTON COUNTY	38.9%
ROWLESBURG, TOWN OF	PRESTON COUNTY	38.5%
GARY, CITY OF	MCDOWELL COUNTY	37.9%
NEW MARTINSVILLE	WETZEL COUNTY	37.6%
MILTON, CITY OF	CABELL COUNTY	37.5%
ALDERSON, TOWN OF	MONROE COUNTY	37.3%
HARTFORD, TOWN OF	MASON COUNTY	36.4%
BANCROFT, TOWN OF	PUTNAM COUNTY	35.5%



Ratio = Acreage of SFHA (aSFHA) divided by Community Area

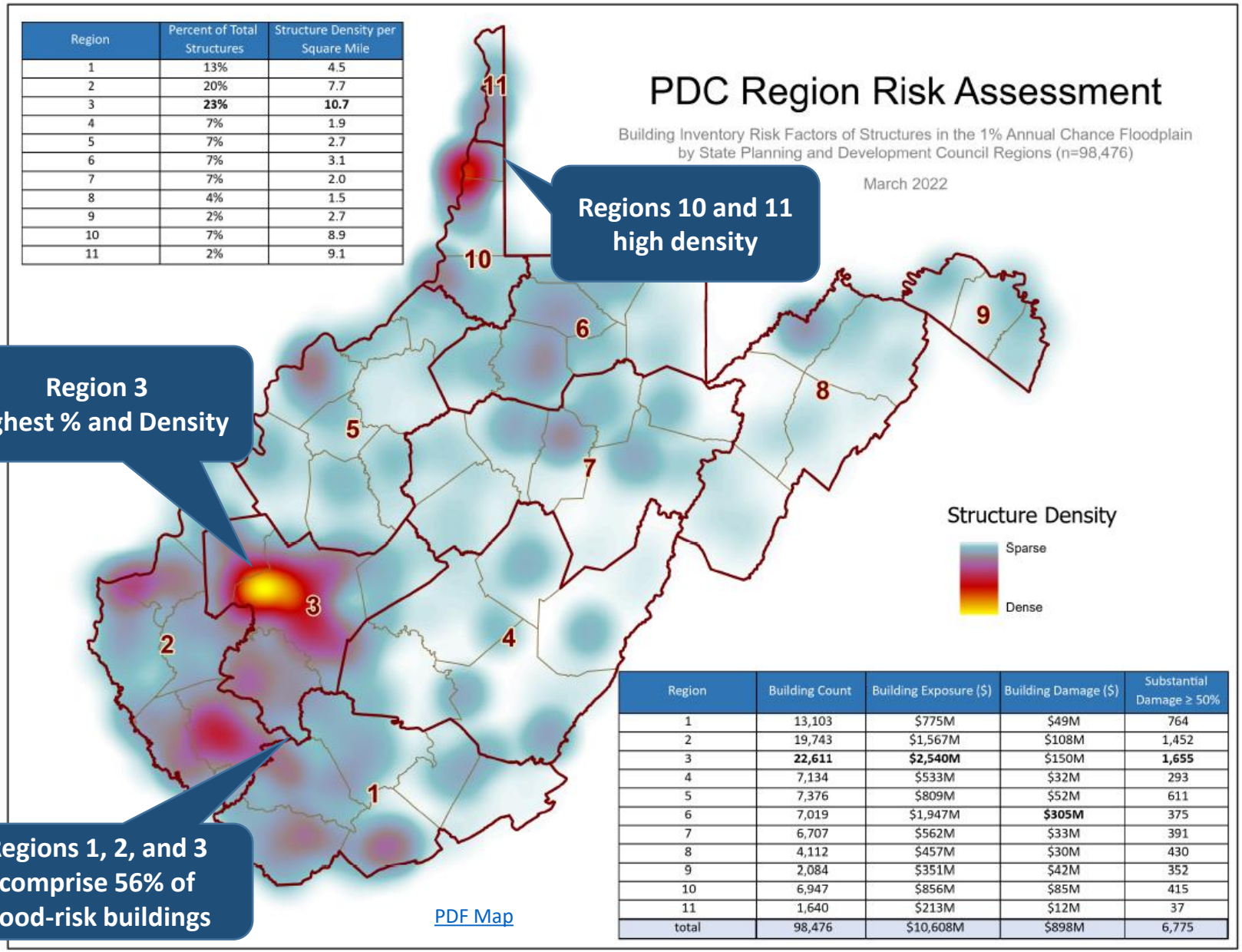
Building Risk by River/Stream



Stream	Bldg. Count	Bldg. Exposure ($)	Building Damage ($)	SDE ≥ 50%
Ohio River	**7,230**	$886M	**$114M**	**907**
Kanawha River	6,939	**$1,467M**	$52M	254
Elk River	2,442	$234M	$17M	179
Guyandotte River	1,404	$184M	$5M	45
Greenbrier River	1,396	$102M	$22M	290
Little Kanawha River	1,136	$148M	$10M	113
Mud River	1,132	$105M	$9M	63
Island Creek (Logan Co)	1,110	$54M	$9M	168
Clear Fork	1,078	$50M	$6M	95
Pond Fork	952	$63M	$4M	128
Buffalo Creek (Logan Co)	930	$41M	$4M	57

Building Risk by Region

Region	Percent of Total Structures	Structure Density per Square Mile
1	13%	4.5
2	20%	7.7
3	**23%**	**10.7**
4	7%	1.9
5	7%	2.7
6	7%	3.1
7	7%	2.0
8	4%	1.5
9	2%	2.7
10	7%	8.9
11	2%	9.1



PDF Map

Region	Building Count	Building Exposure ($)	Building Damage ($)	Substantial Damage ≥ 50%
1	13,103	$775M	$49M	764
2	19,743	$1,567M	$108M	1,452
3	**22,611**	**$2,540M**	$150M	**1,655**
4	7,134	$533M	$32M	293
5	7,376	$809M	$52M	611
6	7,019	$1,947M	**$305M**	375
7	6,707	$562M	$33M	391
8	4,112	$457M	$30M	430
9	2,084	$351M	$42M	352
10	6,947	$856M	$85M	415
11	1,640	$213M	$12M	37
total	98,476	$10,608M	$898M	6,775

R4 Building Risk by Flood Source

Building Counts and Building Exposure $ Values by *Stream Name*

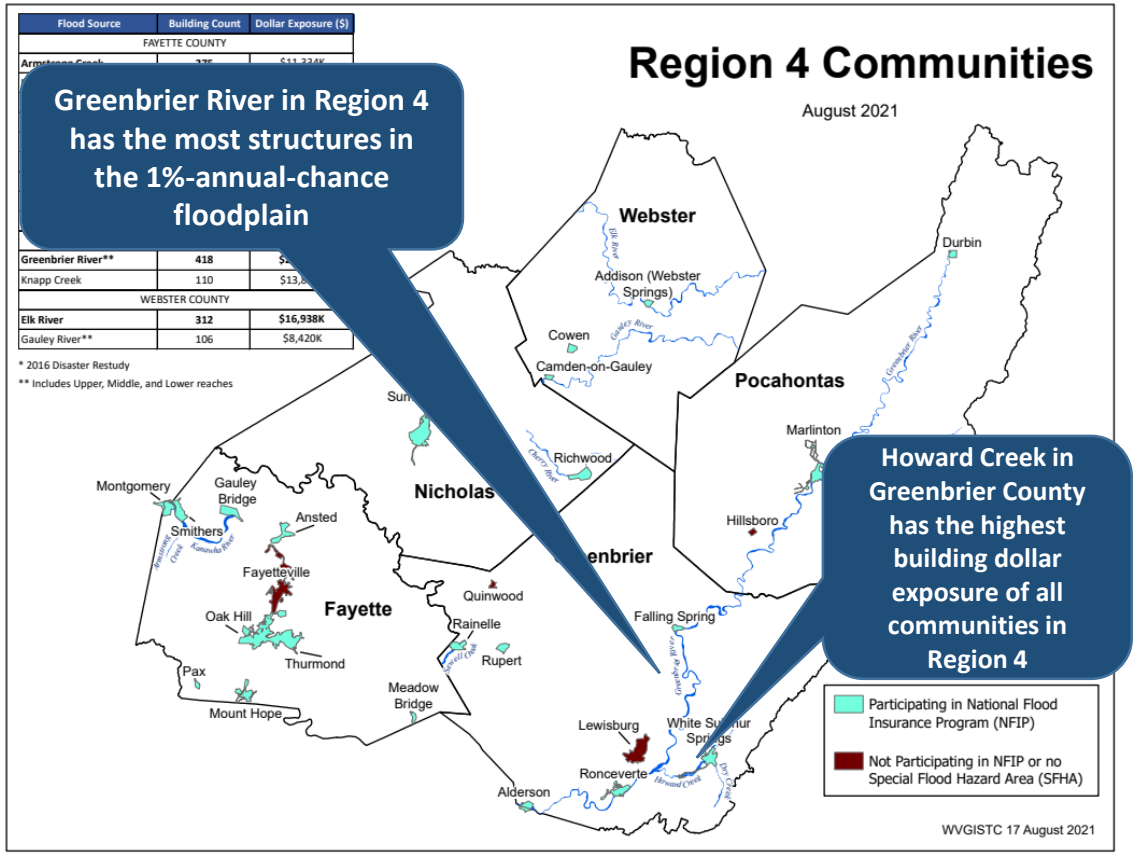
Flood Sources	Building Count	Dollar Exposure ($)
FAYETTE COUNTY		
Armstrong Creek	**275**	$13,334K
Kanawha River	242	**$46,459K**
GREENBRIER COUNTY		
Greenbrier River*	**528**	$60,728K
Howard Creek*	364	**$94,870K**
Sewell Creek*	333	$14,716K
Dry Creek	197	$19,183K
NICHOLAS COUNTY		
Cherry River*	**374**	**$15,719K**
POCAHONTAS COUNTY		
Greenbrier River**	**418**	**$29,097K**
Knapp Creek	110	$13,882K
WEBSTER COUNTY		
Elk River	**312**	**$16,938K**
Gauley River**	106	$8,420K

Computed for 1% (100-yr) floodplain

* 2016 Disaster Restudy

RA Tables: [Buildings by River/Stream Name]

Greenbrier River totals for Greenbrier and Pocahontas counties:
946 buildings in 1% floodplain, **$90M dollar exposure**

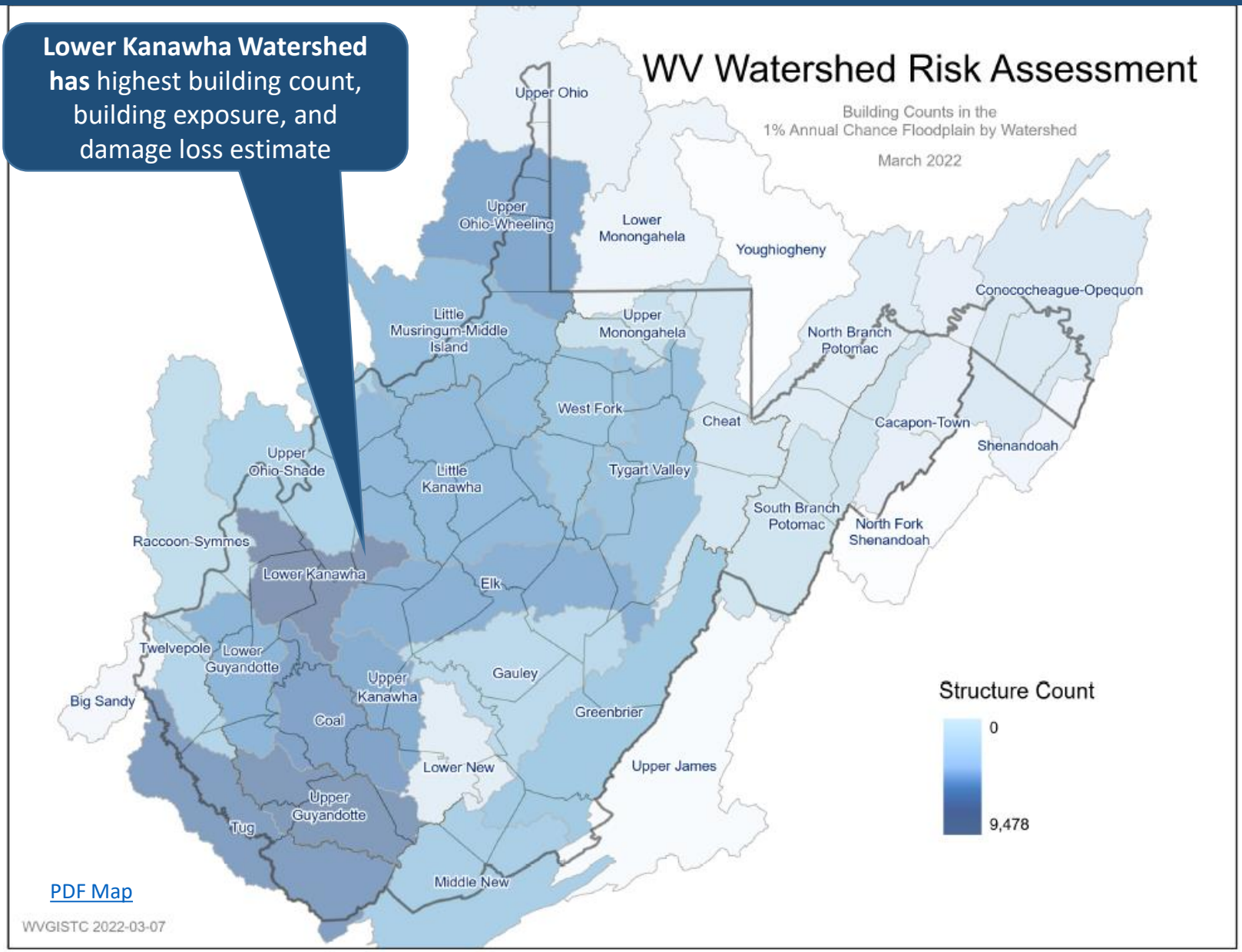


RA Tables: [Buildings by River/Stream Name]

[Region 4 PDF Map] Primary Flood Sources

Building Risk by Watershed

Lower Kanawha Watershed has highest building count, building exposure, and damage loss estimate



Countywide Building Counts (Top 20)

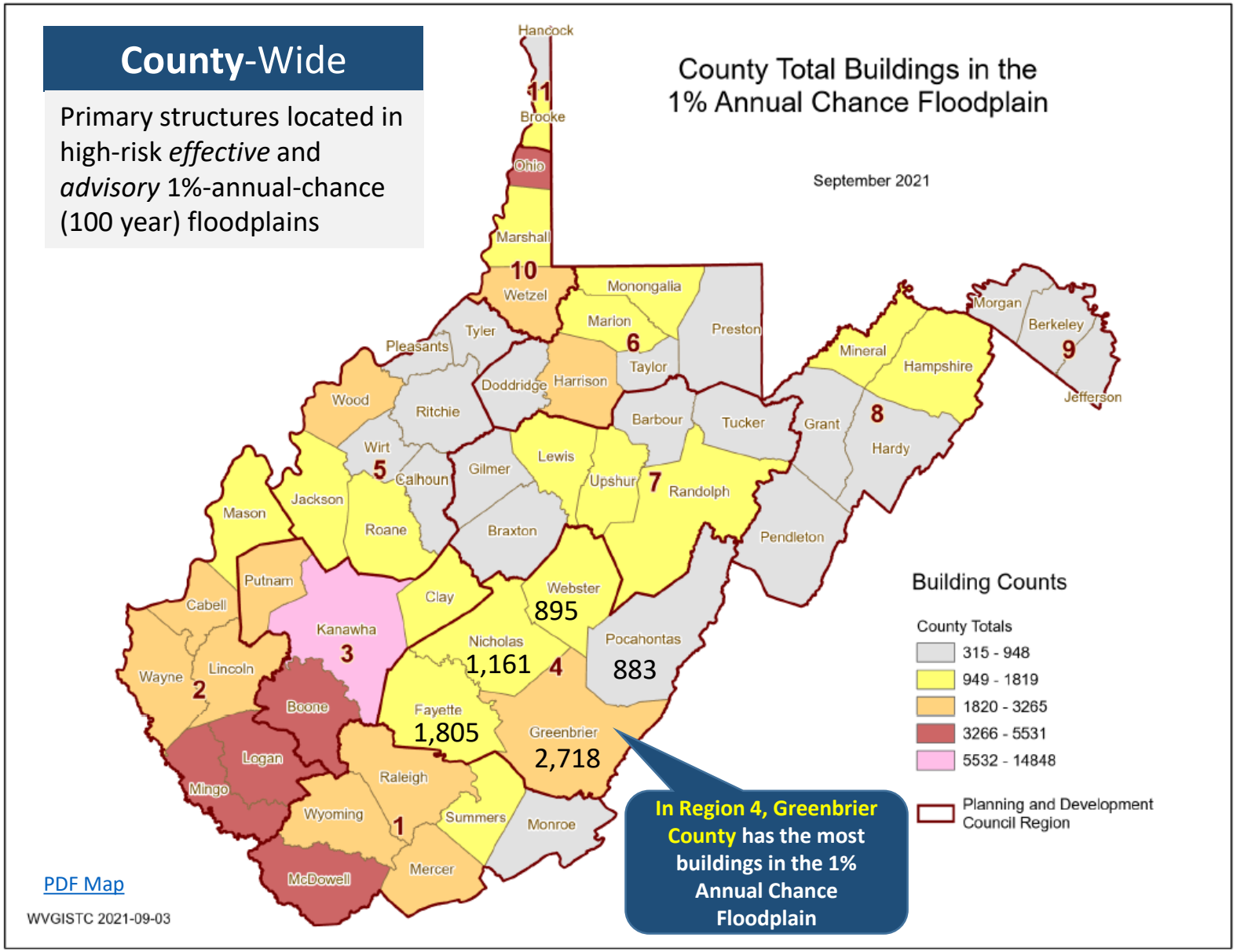
Primary buildings in the **High-Risk effective and advisory 1%-annual chance (100-yr) floodplains**

Rank	County	Region #	BUILDING TYPE				HIGH-RISK FLOOD ZONES			Floodplain Building Ratio
			% Residential	% Commercial	% Other	% Unknown	Effective	Advisory	Total Bldg. Count	
1	**KANAWHA**	3	89%	7%	3%	1%	12,847	2,071	**14,918**	**15%**
2	**LOGAN**	2	87%	9%	3%	2%	4,539	939	**5,478**	**30%**
3	**MCDOWELL**	1	87%	5%	3%	5%	3,678	1,395	**5,073**	**26%**
4	**BOONE**	3	78%	6%	3%	13%	3,727	1,068	**4,795**	**39%**
5	**MINGO**	2	86%	5%	5%	4%	3,114	749	**3,863**	**24%**
6	**OHIO**	10	85%	9%	5%	0%	3,142	175	**3,317**	**17%**
7	**WYOMING**	1	90%	5%	4%	1%	2,019	1,145	**3,164**	**24%**
8	**CABELL**	2	86%	7%	5%	2%	2,368	518	**2,886**	**7%**
9	**GREENBRIER**	4	78%	8%	12%	2%	1,714	1,004	**2,718**	**12%**
10	**RALEIGH**	1	84%	8%	8%	1%	2,350	363	**2,713**	**6%**
11	**LINCOLN**	2	83%	3%	14%	1%	2,555	91	**2,646**	**22%**
12	**WAYNE**	2	89%	4%	5%	2%	2,421	219	**2,640**	**12%**
13	**WOOD**	5	87%	7%	6%	0%	2,463	103	**2,566**	**6%**
14	**MERCER**	1	89%	6%	4%	1%	2,295	206	**2,501**	**7%**
15	**PUTNAM**	3	85%	5%	10%	0%	2,066	384	**2,450**	**9%**
16	**WETZEL**	10	71%	7%	21%	1%	2,006	91	**2,097**	**21%**
17	**MASON**	2	67%	4%	27%	3%	1,859	95	**1,954**	**13%**
18	**RANDOLPH**	7	78%	7%	11%	4%	1,697	225	**1,922**	**11%**
19	**HARRISON**	6	80%	6%	13%	1%	1,475	409	**1,884**	**5%**
20	**FAYETTE**	4	85%	7%	7%	1%	1,254	551	**1,805**	**7%**

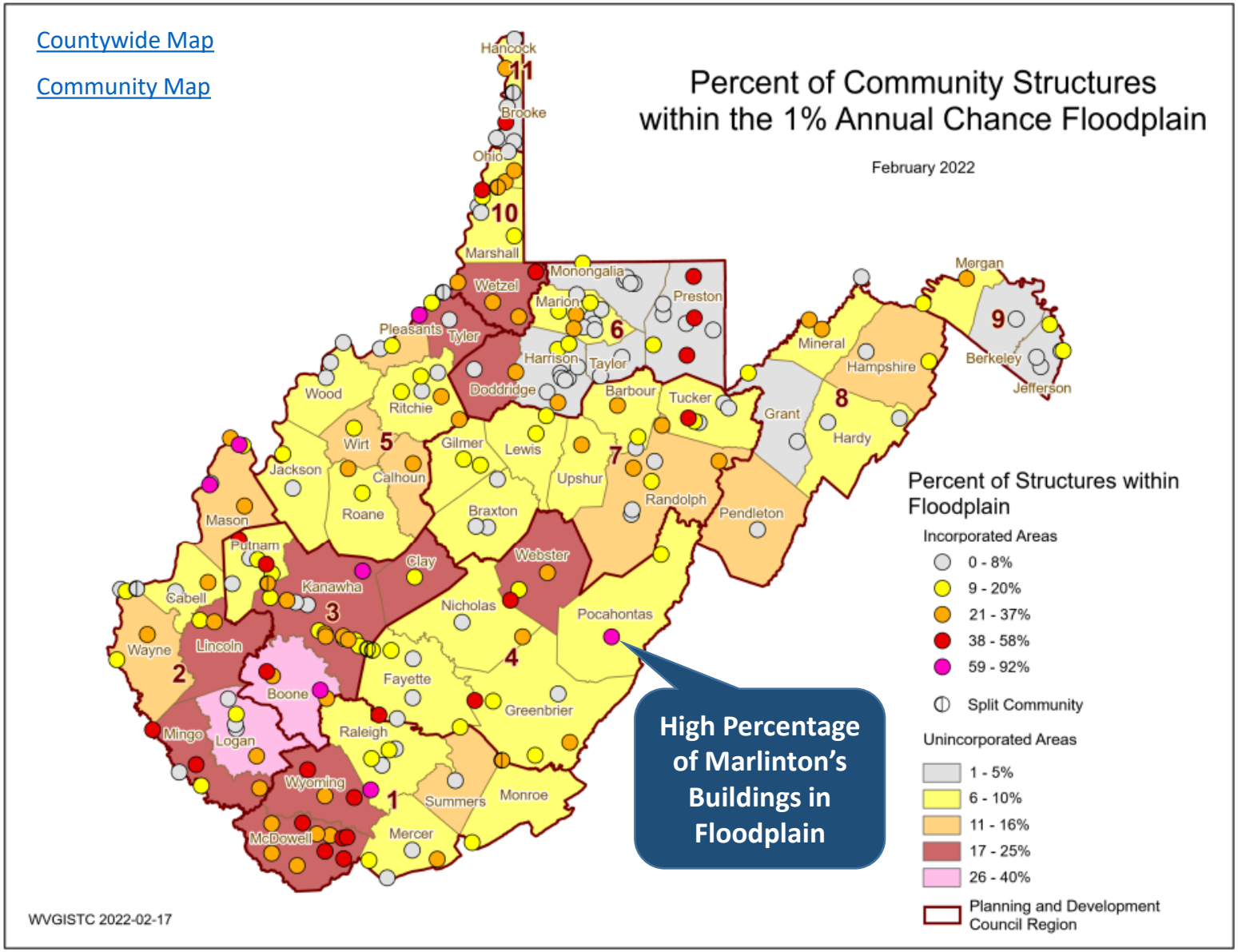
Top 5 Counties with **highest building counts**: Kanawha (14,918), Logan (5,478), and McDowell (5,073), Boone (4,795), and Mingo (3,683)

Top 5 counties with **highest percentage of countywide buildings in the high-risk floodplains**: Boone (39%), Logan (30%), McDowell (26%), Wyoming (24%), Mingo (24%), and Lincoln (22%)

Countywide: # Buildings in 1% Floodplain



% of Buildings in High-Risk Floodplain



Community Building Counts (Top 20)

Communities

Rank	Community Name	Region	Total Buildings
1	Kanawha County*	3	8,890
2	Logan County*	2	5,247
3	Mingo County*	2	3,393
4	Boone County*	3	3,313
5	Wheeling**	10	2,836
6	Lincoln County*	2	2,563
7	McDowell County*	1	2,408
8	Raleigh County*	1	2,252
9	Mercer County*	1	2,233
10	Wyoming County*	1	2,226
11	Wayne County*	2	2,221
12	Putnam County*	3	1,902
13	Cabell County*	2	1,887
14	Charleston	3	1,872
15	Wood County*	5	1,562
16	Fayette County*	4	1,528
17	Randolph County*	7	1,268
18	Greenbrier County*	4	1,182
19	Marion County*	6	1,162
20	Huntington**	2	1,148

Unincorporated Areas

County Unincorporated	Total Buildings
Kanawha County*	8,890
Logan County*	5,247
Mingo County*	3,393
Boone County*	3,313
Lincoln County*	2,563
McDowell County*	2,408
Raleigh County*	2,252
Mercer County*	2,233
Wyoming County*	2,226
Wayne County*	2,221
Putnam County*	1,902
Cabell County*	1,887
Wood County*	1,562
Fayette County*	1,528
Randolph County*	1,268
Greenbrier County*	1,182
Marion County*	1,162
Hampshire County*	1,094
Harrison County*	1,019
Monongalia County*	1,004

Incorporated Places

Community Name	Total Buildings
Wheeling**	2,836
Charleston	1,872
Huntington**	1,148
Dunbar	1,068
New Martinsville	817
Wellsburg	791
Nitro**	732
St. Albans	683
Buckhannon	606
Keyser	511
Clarksburg	455
White Sulphur Springs	428
Milton	419
South Charleston	389
Marlinton	381
Welch	366
Oceana	358
Rainelle	340
Weston	339
Moundsville	335

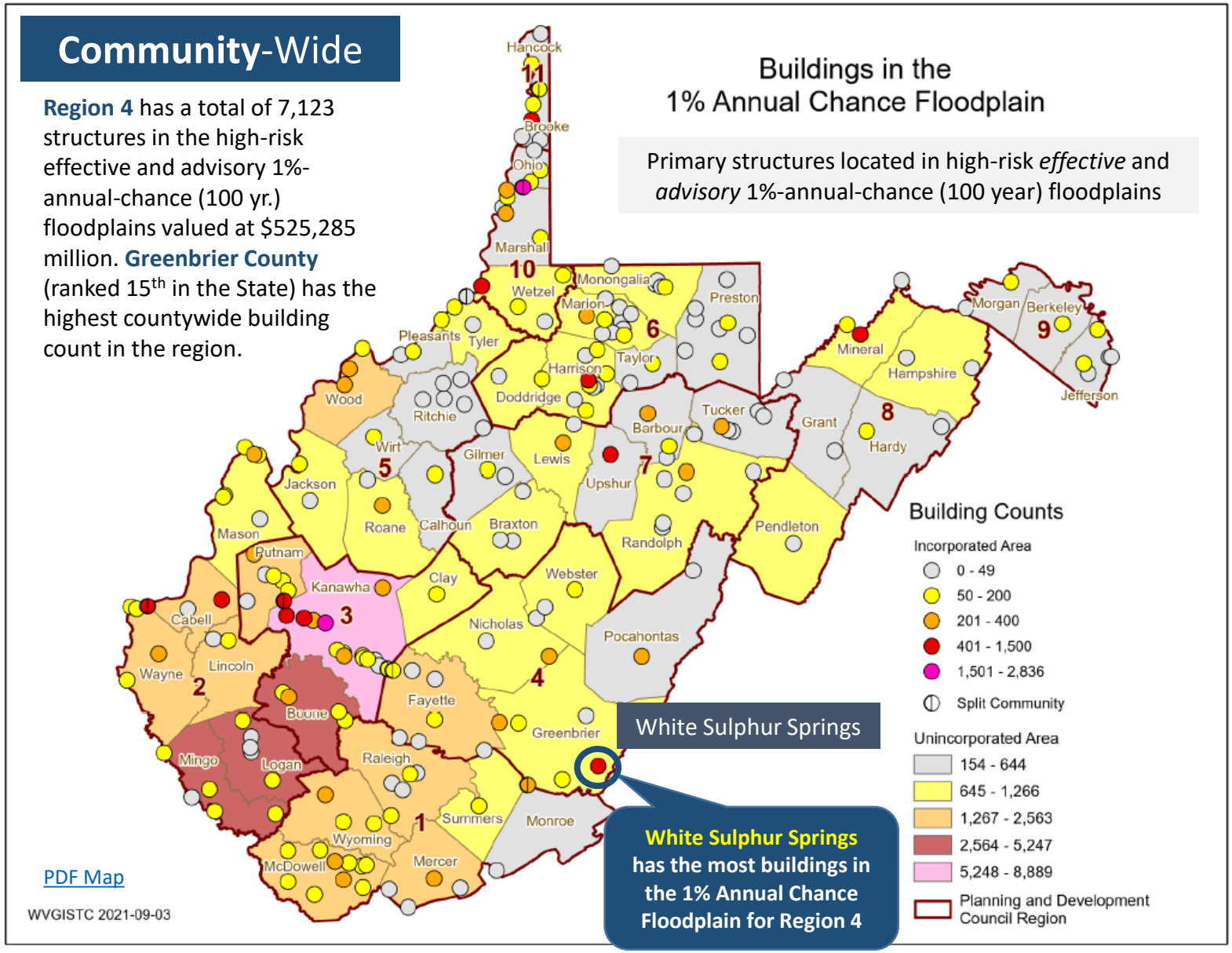
* Unincorporated Area ** Split Community

Primary buildings inventoried in 2022 the **High-Risk 1%-annual chance (100-yr) floodplains**. The building inventory includes both *regulatory effective* Special Flood Hazard Areas (SFHA) and *non-regulatory advisory* flood zones.

Community Level: # Bldgs. in 1% Floodplain

Community-Wide

Region 4 has a total of 7,123 structures in the high-risk effective and advisory 1%-annual-chance (100 yr.) floodplains valued at $525,285 million. **Greenbrier County** (ranked 15th in the State) has the highest countywide building count in the region.



R4 County and Community Rankings

BUILDING COUNT RANKING		
Community	**Region**	**State**
INCORPORATED		
White Sulphur Springs	1	12
Marlinton	2	15
Rainelle	3	18
Richwood	4	21
Alderson**	5	36
Addison (Webster Springs)	6	63
UNINCORPORATED		
Fayette	1	14
Greenbrier	2	16
Webster	3	25
Nicholas	4	41
Pocahontas	5	42
COUNTY		
Greenbrier	1	15
Fayette	2	18
Webster	3	30
Nicholas	4	31
Pocahontas	5	35

Risk Assessment:

White Sulphur Springs ***INCORPORATED AREA*** *has the highest 1% flood zone building counts and dollar exposure*

Fayette *and* ***Greenbrier*** ***UNINCORPORATED AREAS*** *have the highest building counts and dollar exposure, respectively.*

Greenbrier ***COUNTY*** *has the highest building counts and dollar exposure*

BUILDING $ VALUE RANKING		
Community	**Region**	**State**
INCORPORATED		
White Sulphur Springs	1	28
Marlinton	2	29
Rainelle	3	51
Alderson**	4	52
Richwood	5	58
Addison (Webster Springs)	6	59
UNINCORPORATED		
Greenbrier	1	14
Fayette	2	25
Webster	3	33
Nicholas	4	41
Pocahontas	5	42
COUNTY		
Greenbrier	1	17
Fayette	2	31
Pocahontas	3	37
Webster	4	38
Nicholas	5	45

Highest number of primary structures in the 1% floodplain:

- White Sulphur Springs (incorporated)
- Fayette County Unincorporated (unincorporated area)
- Greenbrier County (countywide)

** Split Community
Source: Region 4 Community-Level Building Exposure Table

Highest building dollar exposure in the 1% floodplain:

- White Sulphur Springs (incorporated)
- Greenbrier County Unincorporated (unincorporated)
- Greenbrier County (countywide)

R4 Community Bldgs Risk by Flood Zone

Community Identification		SFHA - FUTURE MAP CONDITIONS				HIGH-RISK FLOOD ZONES		
		Flood way	No Change SFHA	Mapped in SFHA	Mapped Out SFHA	Effective	Advisory	Total
Ansted	FAYETTE	0	0	0	1	1	0	1
Fayette County*	FAYETTE	35	699	547	248	982	547	1529
Gauley Bridge	FAYETTE	2	20	23	0	22	23	45
Meadow Bridge	FAYETTE	0	18	3	2	20	3	23
Montgomery**	FAYETTE	0	12	1	2	14	1	15
Mount Hope	FAYETTE	0	30	0	8	38	0	38
Oak Hill	FAYETTE	0	23	4	28	51	4	55
Pax	FAYETTE	7	30	0	2	39	0	39
Smithers**	FAYETTE	14	44	12	4	62	12	74
	FAYETTE	**58**	**876**	**590**	**295**	**1229**	**590**	**1819**
Alderson**	GREENBRIER	19	111	7	6	136	7	143
Falling Springs	GREENBRIER	0	3	0	0	3	0	3
Greenbrier County*	GREENBRIER	60	652	293	177	889	293	1182
Rainelle	GREENBRIER	9	0	331	0	9	331	340
Ronceverte	GREENBRIER	0	47	0	20	67	0	67
Rupert	GREENBRIER	0	22	36	4	26	36	62
White Sulphur Springs	GREENBRIER	67	175	68	118	360	68	428
	GREENBRIER	**155**	**1010**	**735**	**325**	**1490**	**735**	**2225**
Nicholas County*	NICHOLAS	30	587	25	50	667	25	692
Richwood	NICHOLAS	109	153	30	37	299	30	329
Summersville	NICHOLAS	0	33	0	2	35	0	35
	NICHOLAS	**139**	**773**	**55**	**89**	**1001**	**55**	**1056**
Durbin	POCAHONTAS	1	6	20	0	7	20	27
Marlinton	POCAHONTAS	13	343	20	5	361	20	381
Pocahontas County*	POCAHONTAS	61	318	127	34	413	127	540
	POCAHONTAS	**75**	**667**	**167**	**39**	**781**	**167**	**948**
Addison	WEBSTER	23	79	4	20	122	4	126
Camden-On-Gauley	WEBSTER	0	18	3	0	18	3	21
Cowen	WEBSTER	0	35	0	0	35	0	35
Webster County*	WEBSTER	119	634	55	84	837	55	892
	WEBSTER	**142**	**766**	**62**	**104**	**1012**	**62**	**1074**

Region 4 Table

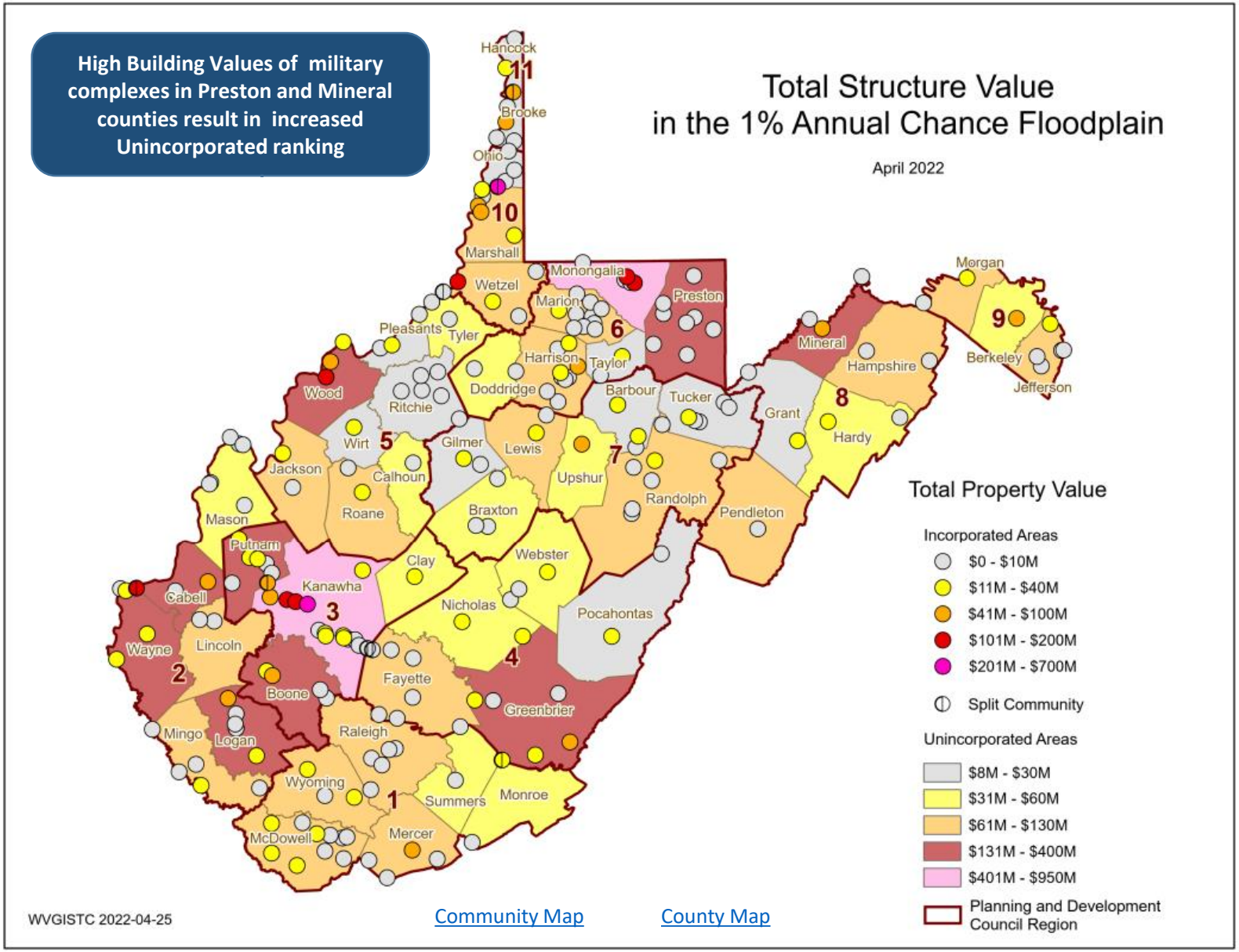
[Community-Level Flood Zone Breakdown]

Risk Assessment:

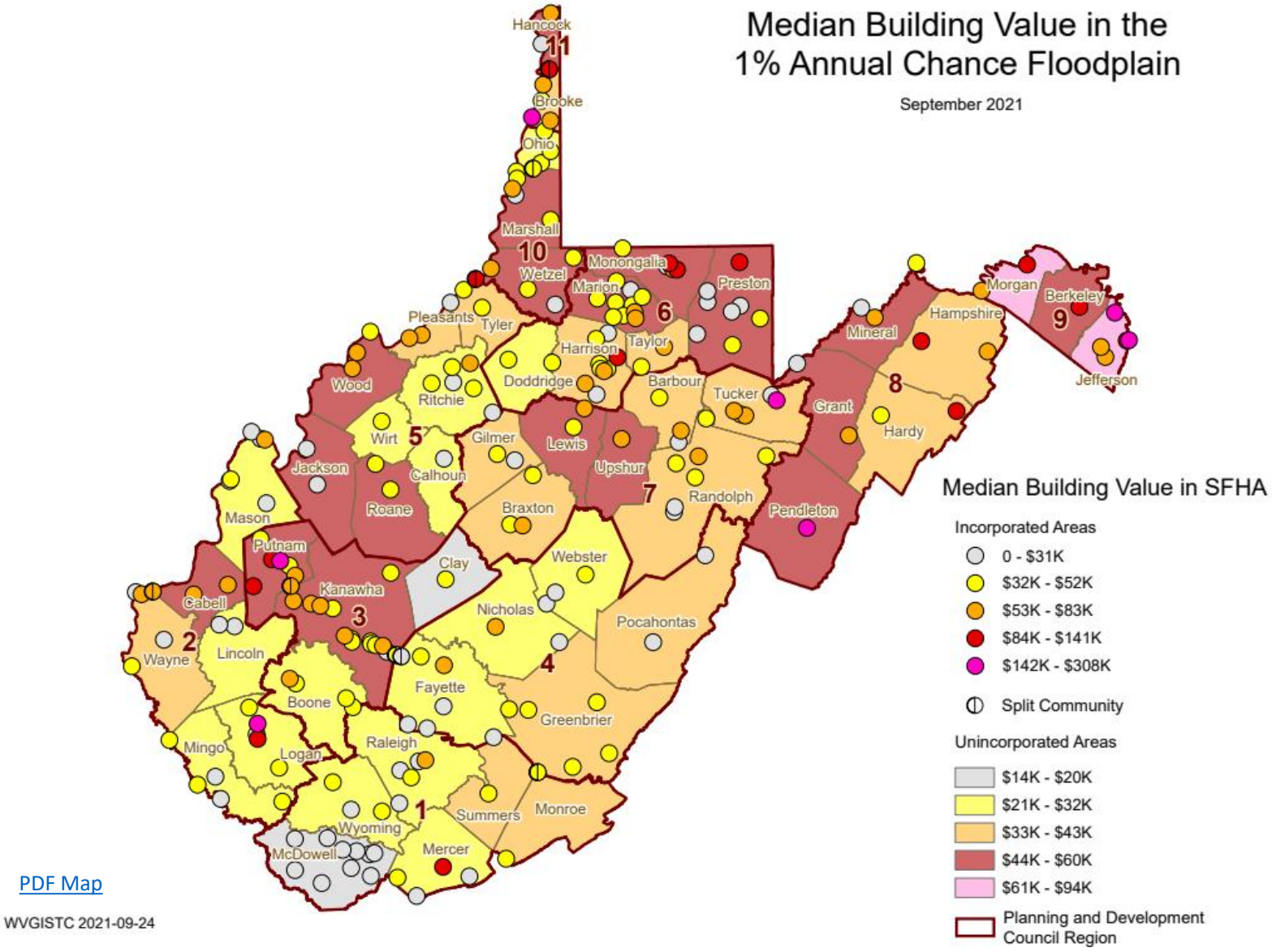
According to future flood maps, **Fayette**, **Greenbrier**, and **Pocahontas** counties have many structures being mapped into the higher risk 1%-annual-chance floodplain.

Webster Unincorporated and **Richwood Incorporated** have the most structures in the floodway. Buildings in the main channel of the river or stream, or close to the flood source, will be subject to the greatest flood depths, highest velocities, and greatest debris potential.

Building Value ($) Floodplain Exposure



Median Building Value



Building Risk Reports

Incorporate information from Risk Assessment Reports into local hazard mitigation planning

Residential **Home** | Residential **Manufactured Home** | Residential **Apartment** | Non-Residential **Commercial** | Non-Residential **Industrial** | Non-Residential **Other**

All Regions: Building Types & Exposure

Police Station | Fire Station | E-911 Dispatch | School | Hospital | Nursing Home

All Regions: Essential Facilities Report

Religious Organization | Educational Building | Emergency Medical Services | Government Building | Utility | National Register Historical Structure

All Regions: Community Assets Report

Residential versus Non-Residential

Community	RESIDENTIAL				COMMERCIAL NON-RESIDENTIAL		OTHER NON-RESIDENTIAL		TOTAL BUILDING VALUE		
Community Name	#	% Count	Value ($)	% Value	#	Value ($)	#	Value ($)	#	Value ($)	Rank[1]
Ansted	1	100.0%	$66K	100.0%	0	$0K	0	$0K	1	$66K	19
Fayette County*	1425	93.2%	$50,385K	66.9%	57	$6,523K	47	$18,398K	1529	$75,307K	2
Gauley Bridge	21	46.7%	$869K	27.4%	24	$2,302K	0	$0K	45	$3,171K	11
Meadow Bridge	21	91.3%	$695K	96.8%	2	$23K	0	$0K	23	$718K	16
Montgomery**	13	86.7%	$1,083K	25.2%	1	$1,000K	1	$2,215K	15	$4,298K	
Mount Hope	32	84.2%	$787K	65.1%	4	$101K	2	$322K	38	$1,210K	14
Oak Hill	50	90.9%	$2,262K	95.3%	5	$111K	0	$0K	55	$2,373K	12
Pax	32	82.1%	$925K	67.9%	3	$98K	4	$340K	39	$1,362K	13
Smithers**	63	85.1%	$2,064K	55.8%	8	$837K	3	$796K	74	$3,698K	
FAYETTE	**1658**	**91.1%**	**$59,136K**	**64.1%**	**104**	**$10,994K**	**57**	**$22,071K**	**1819**	**$92,201K**	**2**
Alderson**	121	84.6%	$6,485K	56.7%	17	$1,028K	5	$3,931K	143	$11,443K	5**
Falling Springs	3	100.0%	$157K	100.0%	0	$0K	0	$0K	3	$157K	18
Greenbrier County*	1101	93.1%	$103,297K	77.7%	68	$6,511K	13	$23,065K	1182	$132,873K	1
Rainelle	253	74.4%	$8,392K	55.4%	78	$5,751K	9	$1,006K	340	$15,149K	4
Ronceverte	34	50.7%	$1,354K	4.5%	32	$4,436K	1	$24,000K	67	$29,790K	3
Rupert	58	93.5%	$2,321K	73.2%	2	$291K	2	$561K	62	$3,173K	10
White Sulphur Springs	375	87.6%	$18,910K	36.4%	42	$5,144K	11	$27,940K	428	$51,994K	1
GREENBRIER	**1945**	**87.4%**	**$140,916K**	**57.6%**	**239**	**$23,161K**	**41**	**$80,503K**	**2225**	**$244,580K**	**1**
Nicholas County*	624	90.2%	$21,060K	68.1%	42	$6,646K	26	$3,230K	692	$30,936K	4
Richwood	265	80.5%	$7,518K	55.8%	47	$1,399K	17	$4,556K	329	$13,473K	6
Summersville	23	63.9%	$1,497K	11.3%	11	$1,657K	2	$10,109K	36	$13,263K	7
NICHOLAS	**912**	**86.3%**	**$30,075K**	**52.1%**	**100**	**$9,703K**	**45**	**$17,895K**	**1057**	**$57,672K**	**5**
Durbin	23	85.2%	$645K	72.4%	2	$157K	2	$89K	27	$891K	15
Marlinton	286	75.1%	$15,309K	44.3%	82	$9,635K	13	$9,586K	381	$34,529K	2
Pocahontas County*	502	93.0%	$23,166K	84.7%	23	$2,460K	15	$1,731K	540	$27,358K	5
POCAHONTAS	**811**	**85.5%**	**$39,120K**	**62.3%**	**107**	**$12,252K**	**30**	**$11,406K**	**948**	**$62,779K**	**4**
Addison	107	84.9%	$3,855K	32.7%	15	$3,053K	4	$4,892K	126	$11,799K	8
Camden-On-Gauley	13	61.9%	$263K	45.9%	4	$32K	4	$279K	21	$573K	17
Cowen	28	80.0%	$814K	15.4%	4	$92K	3	$4,375K	35	$5,281K	9
Webster County*	839	94.1%	$25,759K	51.1%	27	$2,685K	26	$21,957K	892	$50,400K	3
WEBSTER	**987**	**91.9%**	**$30,690K**	**45.1%**	**50**	**$5,861K**	**37**	**$31,502K**	**1074**	**$68,053K**	**3**
SUMMARY	**6,313**	**88.5%**	**$299,937K**	**56.3%**	**600**	**$61,971K**	**210**	**$163,376K**	**7,123**	**$525,285K**	
Alderson (Greenbrier/Monroe) Split Community Total:											
Alderson**	175	0.0%	$8,869K	60.4%	24	$1,482K	10	$4,332K	209	$14,683K	5

[1] Group Rank on Community Type: County, Unincorporated, Incorporated. Table ranking by Region and not Statewide.

Residential **Home**

Residential **Manufactured Home**

Residential **Apartment**

Non-Residential **Commercial**

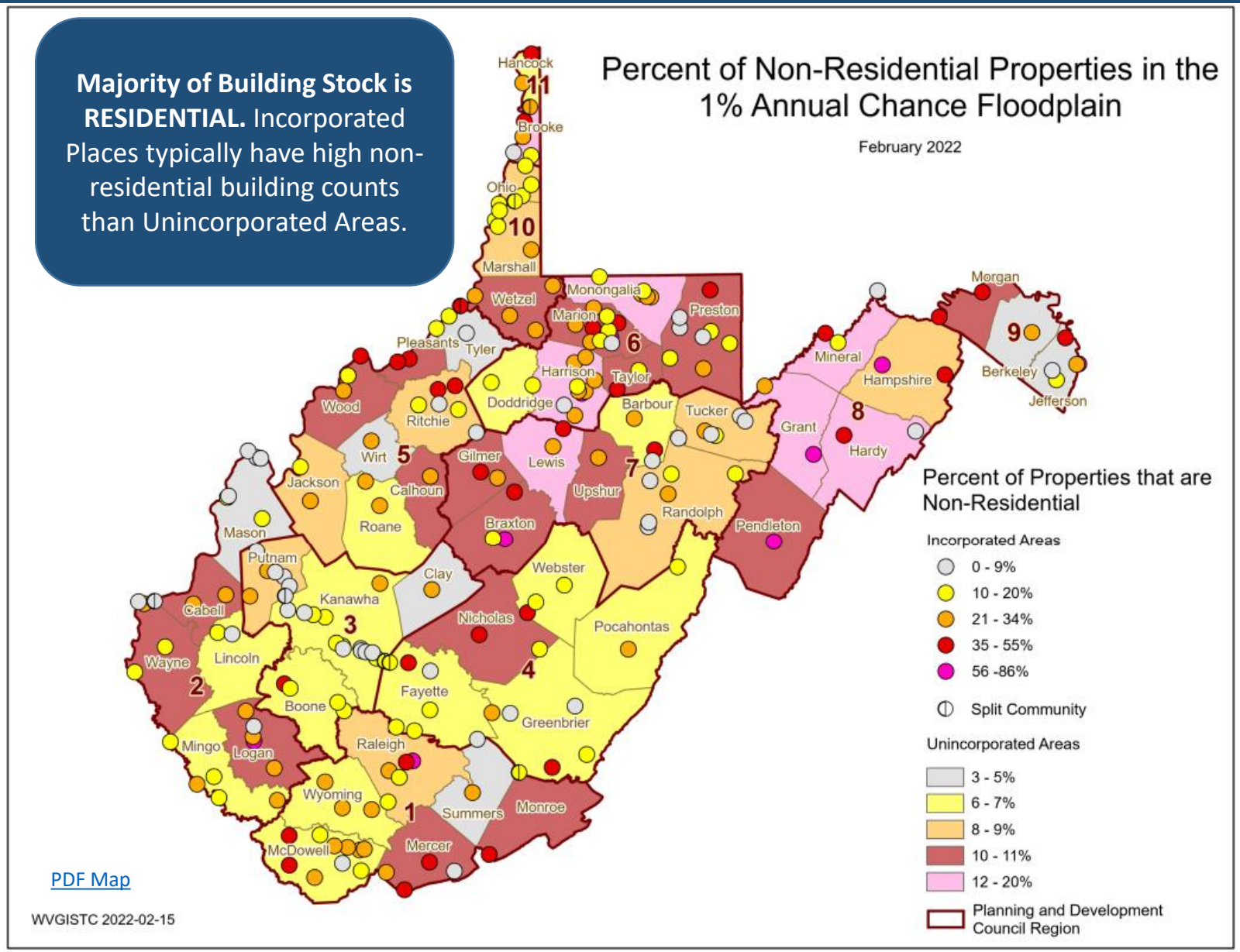
Non-Residential **Industrial**

Non-Residential **Other**

[Building Dollar Exposure Report:](#)
Residential versus Non-Residential

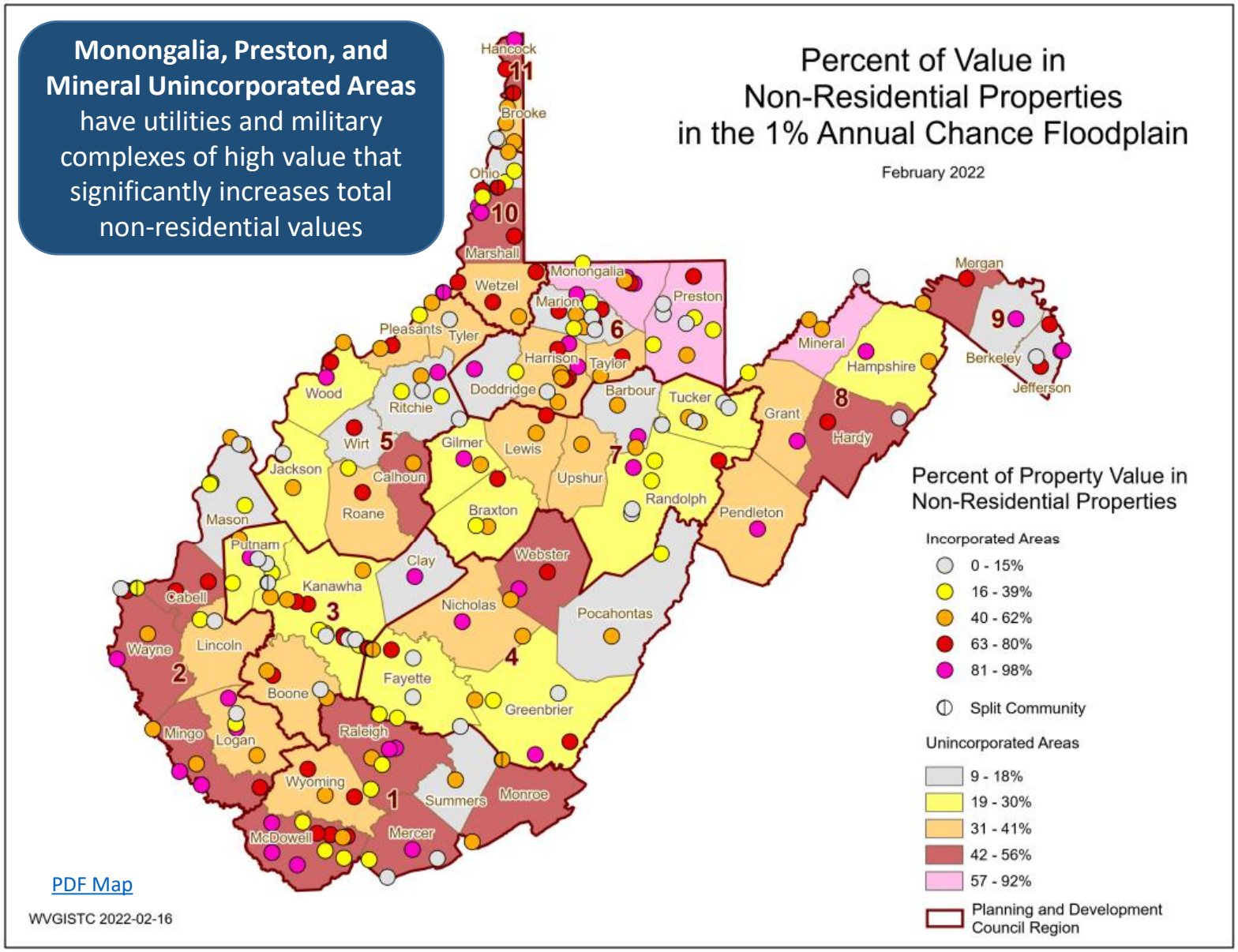
Non-Residential % of Building Stock

Majority of Building Stock is RESIDENTIAL. Incorporated Places typically have high non-residential building counts than Unincorporated Areas.

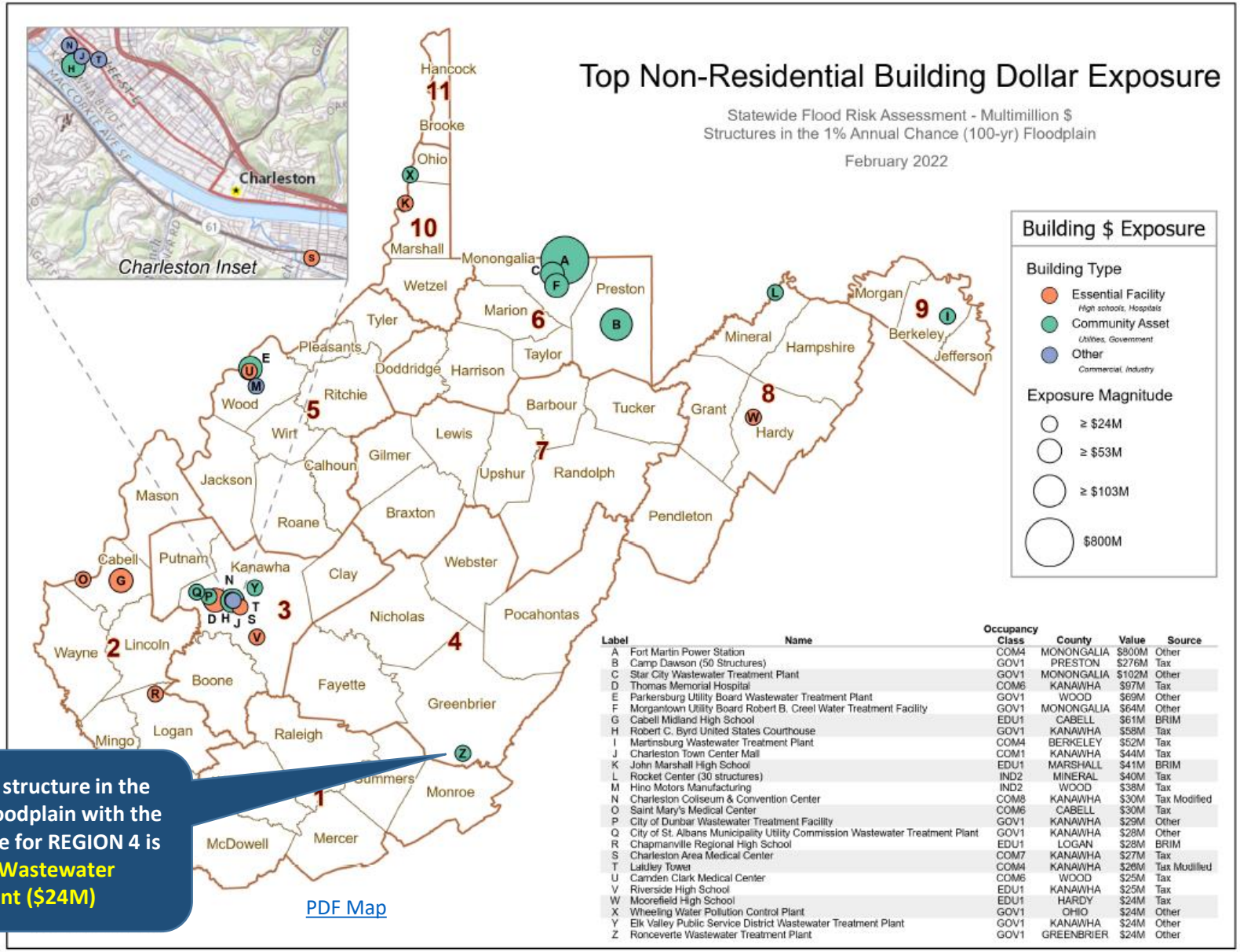


Non-Residential Value ($) of Building Stock

Monongalia, Preston, and Mineral Unincorporated Areas have utilities and military complexes of high value that significantly increases total non-residential values



Non-Residential Building Exposure



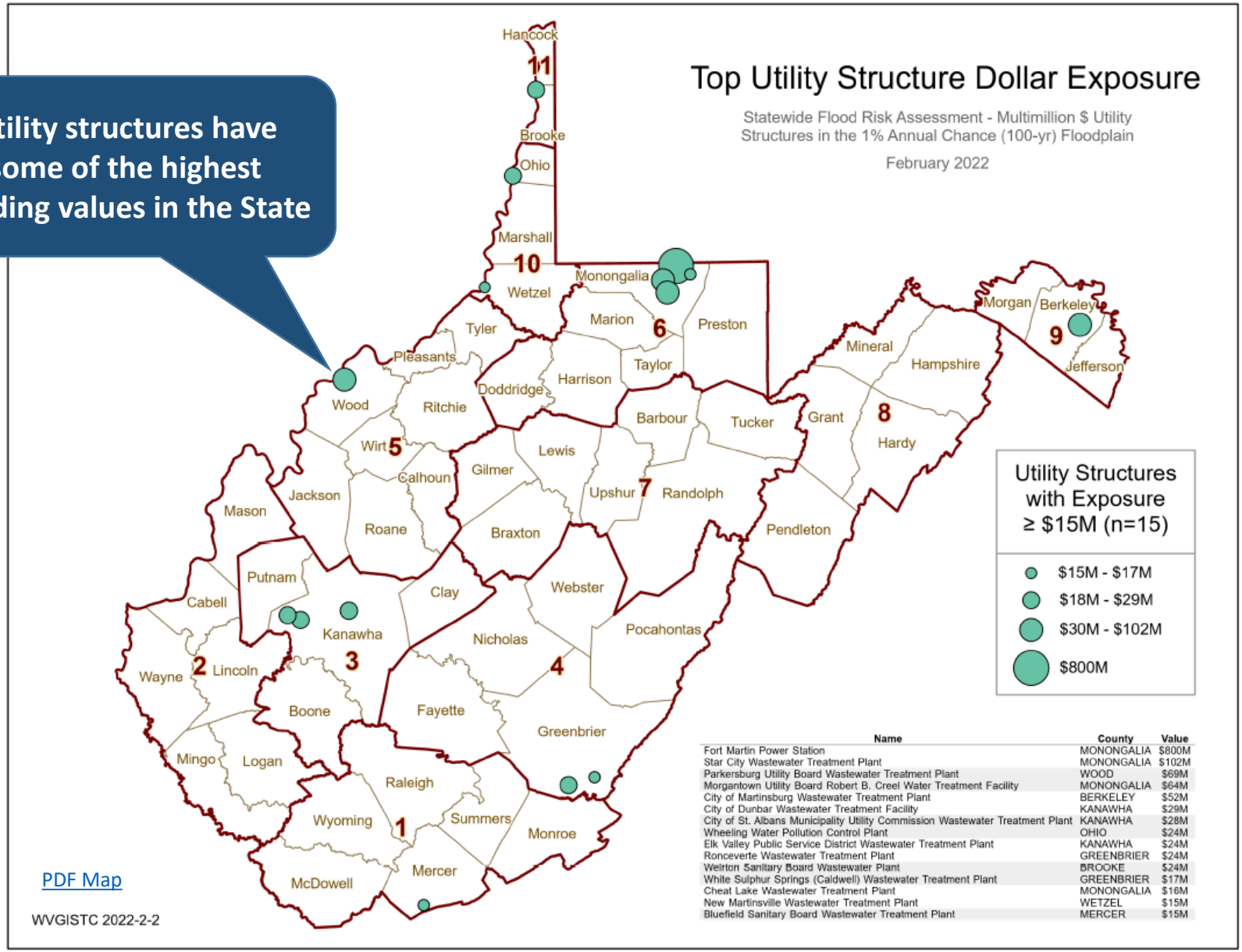
Label	Name	Occupancy Class	County	Value	Source
A	Fort Martin Power Station	COM4	MONONGALIA	$800M	Other
B	Camp Dawson (50 Structures)	GOV1	PRESTON	$276M	Tax
C	Star City Wastewater Treatment Plant	GOV1	MONONGALIA	$102M	Other
D	Thomas Memorial Hospital	COM6	KANAWHA	$97M	Tax
E	Parkersburg Utility Board Wastewater Treatment Plant	GOV1	WOOD	$69M	Other
F	Morgantown Utility Board Robert B. Creel Water Treatment Facility	GOV1	MONONGALIA	$64M	Other
G	Cabell Midland High School	EDU1	CABELL	$61M	BRIM
H	Robert C. Byrd United States Courthouse	GOV1	KANAWHA	$58M	Tax
I	Martinsburg Wastewater Treatment Plant	COM4	BERKELEY	$52M	Tax
J	Charleston Town Center Mall	COM1	KANAWHA	$44M	Tax
K	John Marshall High School	EDU1	MARSHALL	$41M	BRIM
L	Rocket Center (30 structures)	IND2	MINERAL	$40M	Tax
M	Hino Motors Manufacturing	IND2	WOOD	$38M	Tax
N	Charleston Coliseum & Convention Center	COM8	KANAWHA	$30M	Tax Modified
O	Saint Mary's Medical Center	COM6	CABELL	$30M	Tax
P	City of Dunbar Wastewater Treatment Facility	GOV1	KANAWHA	$29M	Other
Q	City of St. Albans Municipality Utility Commission Wastewater Treatment Plant	GOV1	KANAWHA	$28M	Other
R	Chapmanville Regional High School	EDU1	LOGAN	$28M	BRIM
S	Charleston Area Medical Center	COM7	KANAWHA	$27M	Tax
T	Laidley Tower	COM4	KANAWHA	$26M	Tax Modified
U	Camden Clark Medical Center	COM6	WOOD	$25M	Tax
V	Riverside High School	EDU1	KANAWHA	$25M	Tax
W	Moorefield High School	EDU1	HARDY	$24M	Tax
X	Wheeling Water Pollution Control Plant	GOV1	OHIO	$24M	Other
Y	Elk Valley Public Service District Wastewater Treatment Plant	GOV1	KANAWHA	$24M	Other
Z	Ronceverte Wastewater Treatment Plant	GOV1	GREENBRIER	$24M	Other

PDF Map

Top non-residential structure in the 1%-annual-chance floodplain with the highest building value for REGION 4 is the Ronceverte Wastewater Treatment Plant ($24M)

Non-Residential Utilities

Utility structures have some of the highest building values in the State



Name	County	Value
Fort Martin Power Station	MONONGALIA	$800M
Star City Wastewater Treatment Plant	MONONGALIA	$102M
Parkersburg Utility Board Wastewater Treatment Plant	WOOD	$69M
Morgantown Utility Board Robert B. Creel Water Treatment Facility	MONONGALIA	$64M
City of Martinsburg Wastewater Treatment Plant	BERKELEY	$52M
City of Dunbar Wastewater Treatment Facility	KANAWHA	$29M
City of St. Albans Municipality Utility Commission Wastewater Treatment Plant	KANAWHA	$28M
Wheeling Water Pollution Control Plant	OHIO	$24M
Elk Valley Public Service District Wastewater Treatment Plant	KANAWHA	$24M
Ronceverte Wastewater Treatment Plant	GREENBRIER	$24M
Weirton Sanitary Board Wastewater Plant	BROOKE	$24M
White Sulphur Springs (Caldwell) Wastewater Treatment Plant	GREENBRIER	$17M
Cheat Lake Wastewater Treatment Plant	MONONGALIA	$16M
New Martinsville Wastewater Treatment Plant	WETZEL	$15M
Bluefield Sanitary Board Wastewater Treatment Plant	MERCER	$15M

R4 Non-Residential: High Bldg. Values

Highly valued buildings in 1% Floodplain for **Fayette County**. Which high-valued-structures are vulnerable to riverine flooding?

FAYETTE COUNTY Community Name	WV Flood Tool Link	**FAYETTE COUNTY** Owner Name or Building ID	Hazard Occupancy Code	**General Occupancy**	**Building Appraisal**
Smithers**	FT	BOARD OF EDUCATION FAY CO	EDU1	Other	$ 17,343,724
Montgomery**	FT	LAIRD FOUNDATION INC	COM6	Commercial	$ 5,254,600
Smithers**	FT	BOARD OF EDUCATION FAY CO	EDU1	Other	$ 4,213,763
Fayette County*	FT	WHITE OAK PUBLIC SERVICE DIST	COM4	Commercial	$ 4,000,000
Fayette County*	FT	CITY OF MT HOPE	COM4	Commercial	$ 3,000,000
Montgomery**	FT	LIVING WATERS CHRISTIAN FELLOWSHIP (TRUSTEES)	REL1	Other	$ 2,214,940
Fayette County*	FT	ARMSTRONG PUB SERV DIST	COM4	Commercial	$ 2,000,000
Fayette County*	FT	CLONCH INDUSTRIES INC	IND1	Commercial	$ 1,285,200

- Unincorporated ** Split Community
  Region 4: Tabular Building-Level Report Link: https://data.wvgis.wvu.edu/pub/RA/State/BL/BLRA/R4_BLRA_Full_List/
  Region 4: Top 10% Data Extract of High Building Dollar Exposure: https://data.wvgis.wvu.edu/pub/RA/State/BL/Extract/HighBldgValue/
  State Top 100: Building Exposure: https://data.wvgis.wvu.edu/pub/RA/State/BL/Top-List/Top100/

Community Engagement and Verification: Region 4 has a total of 7,123 structures in the 1%-annual-chance floodplain valued at $525,285 million

Building-Level Verification: Verify the highly valued buildings using the building-level risk assessment (BLRA) table, Top 10% data extract high-building dollar exposure, statewide top building exposure listing, and Risk MAP View of the WV Flood Tool. For buildings inventoried in the 1% floodplains, review the most expensive residential and non-residential buildings located in the high-risk flood zones sorted on building appraisal value from largest to smallest value. Identify building-level mitigation and outreach strategies.

R4 Non-Residential: High Bldg. Values

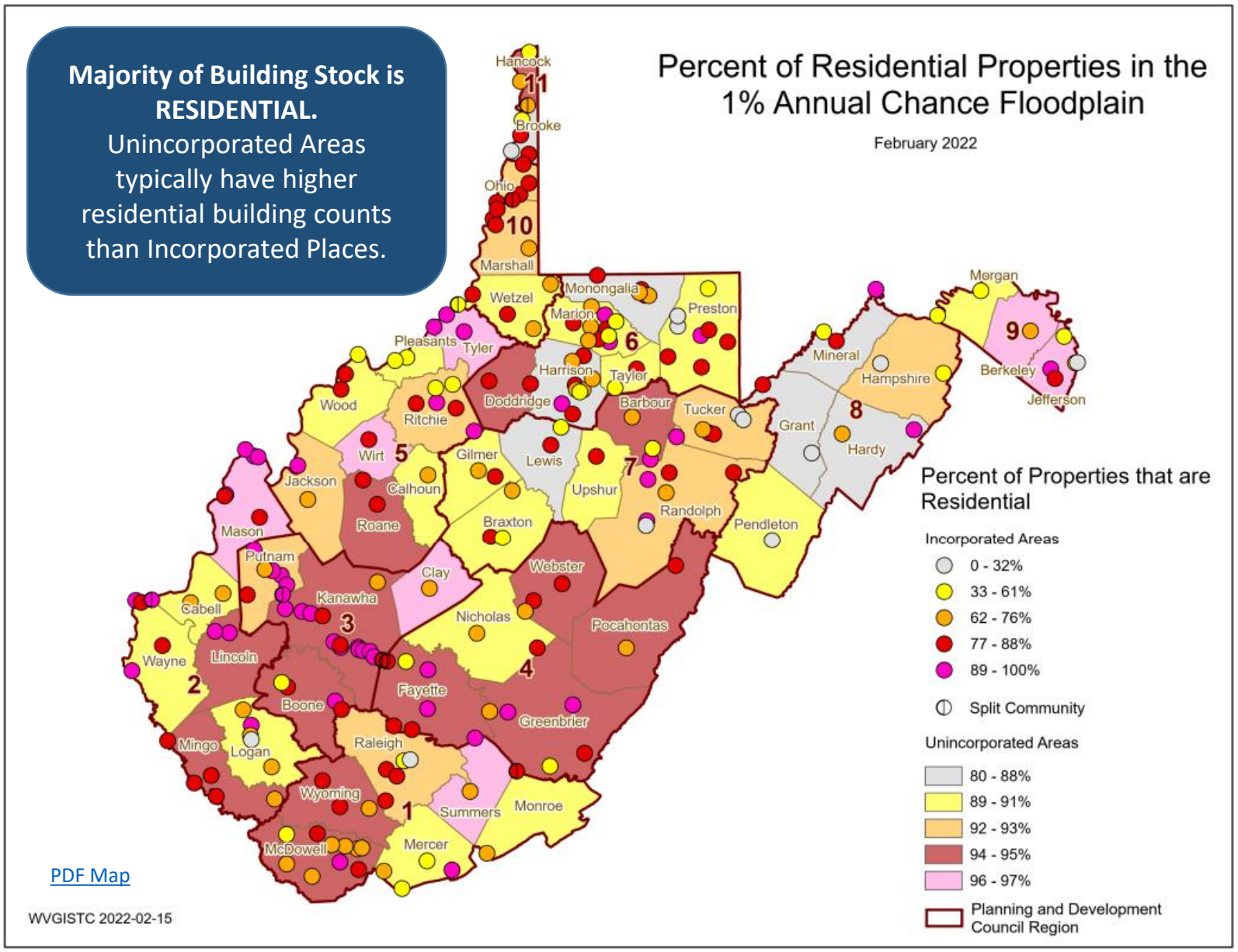
Highly valued buildings in 1% Floodplain for **Greenbrier County**. Which high-valued-structures are vulnerable to riverine flooding?

GREENBRIER COUNTY Community Name	WV Flood Tool Link	**GREENBRIER COUNTY** Owner Name or Building ID	Hazard Occupancy Code	**General Occupancy**	**Building Appraisal**
Ronceverte	FT	THE CITY OF RONCEVERTE WWP	GOV1	Other	$24,000,000
White Sulphur Springs	FT	GREENBRIER CO BD OF ED	EDU1	Other	$ 8,542,982
Greenbrier County*	FT	W V DEPARTMENT OF CORRECTION	GOV1	Other	$ 4,067,092
Alderson**	FT	BOARD OF EDUCATION	EDU1	Other	$ 3,508,927
Ronceverte	FT	B A MULLICAN LUMBER & MANUFACT URING CO L P	IND1	Commercial	$ 2,043,400
Rainelle	FT	PARK CENTER INC	COM1	Commercial	$ 1,443,900
White Sulphur Springs	FT	BANK OF WHITE SULPHUR SPRINGS	COM5	Commercial	$ 1,186,700
Greenbrier County*	FT	WHATCOAT UNITED METHODIST CHURCH	REL1	Other	$ 768,240

- Unincorporated ** Split Community
  Region 4: Tabular Building-Level Report Link: https://data.wvgis.wvu.edu/pub/RA/State/BL/BLRA/R4_BLRA_Full_List/
  Region 4: Top 10% Data Extract of High Building Dollar Exposure: https://data.wvgis.wvu.edu/pub/RA/State/BL/Extract/HighBldgValue/
  State Top 100: Building Exposure: https://data.wvgis.wvu.edu/pub/RA/State/BL/Top-List/Top100/

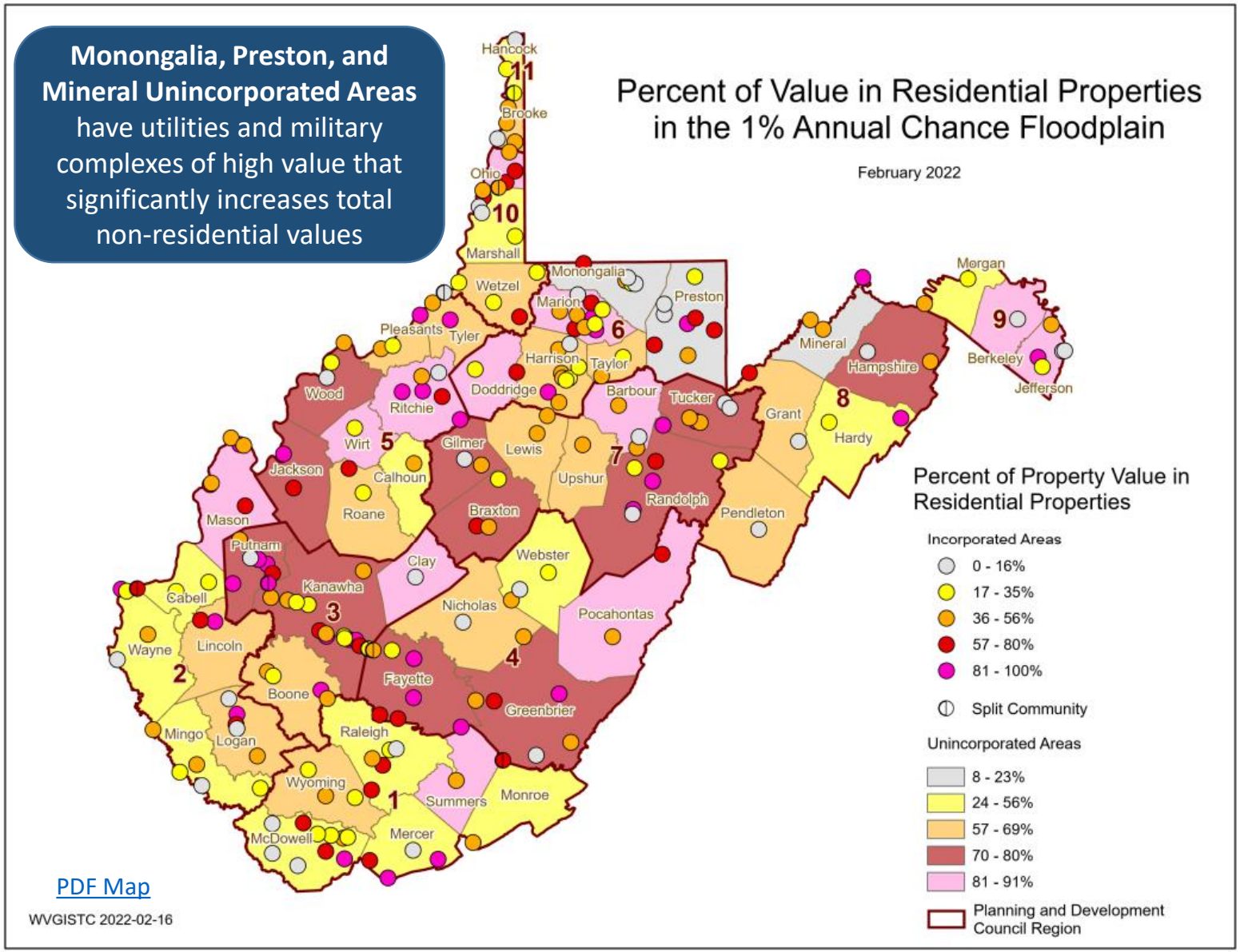
Residential % of Building Stock

Majority of Building Stock is RESIDENTIAL.
Unincorporated Areas typically have higher residential building counts than Incorporated Places.



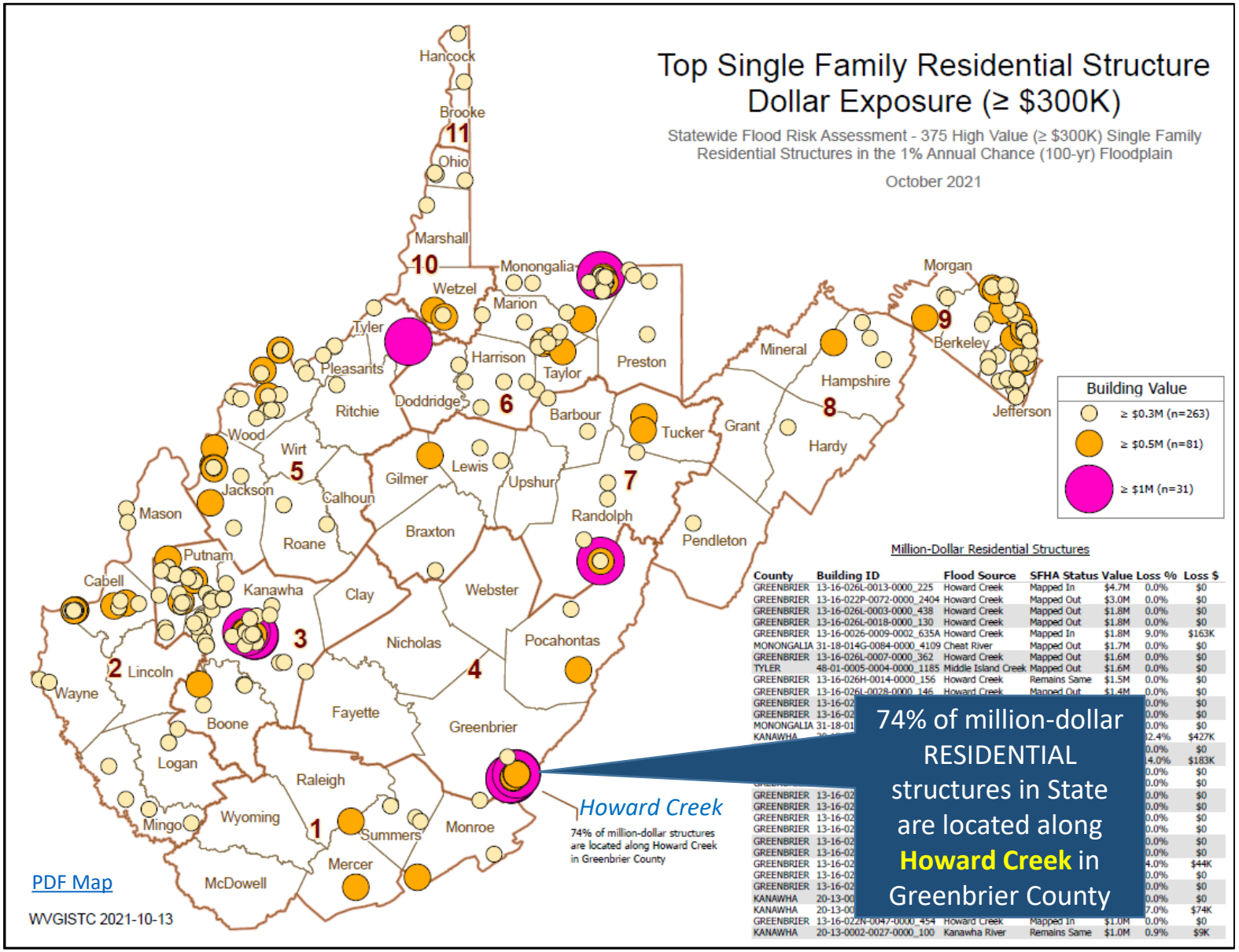
Residential Value ($) of Building Stock

Monongalia, Preston, and Mineral Unincorporated Areas have utilities and military complexes of high value that significantly increases total non-residential values



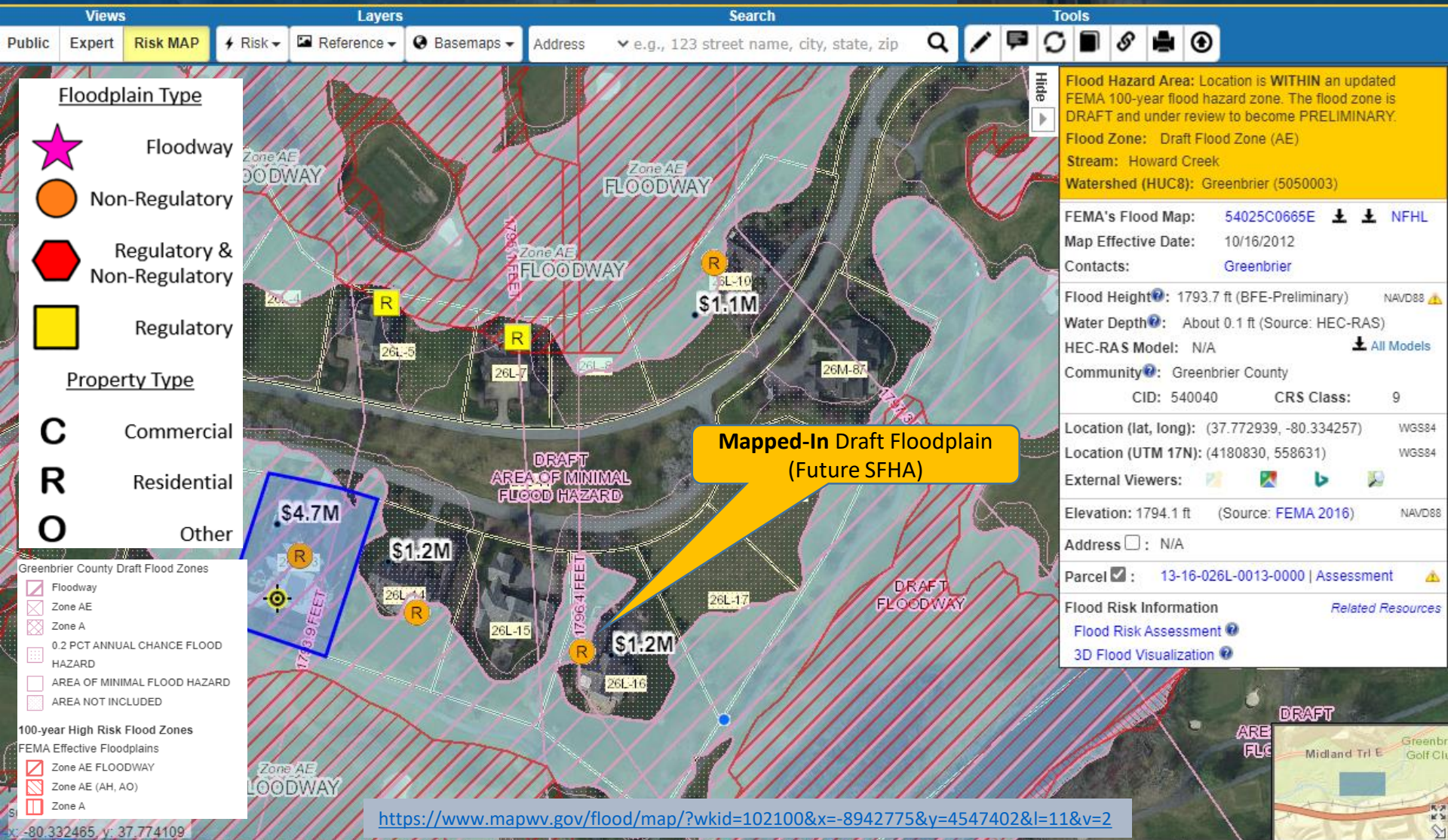
PDF Map

Residential: Top Single-Family $ Exposure



Residential: High Building $ Exposure

Four Homes along *Howard Creek* with Total Building Value of **$8.2 million** mapped into new *Draft Floodplain*. Building status changed when newer *Preliminary Floodplain* published in 2021.



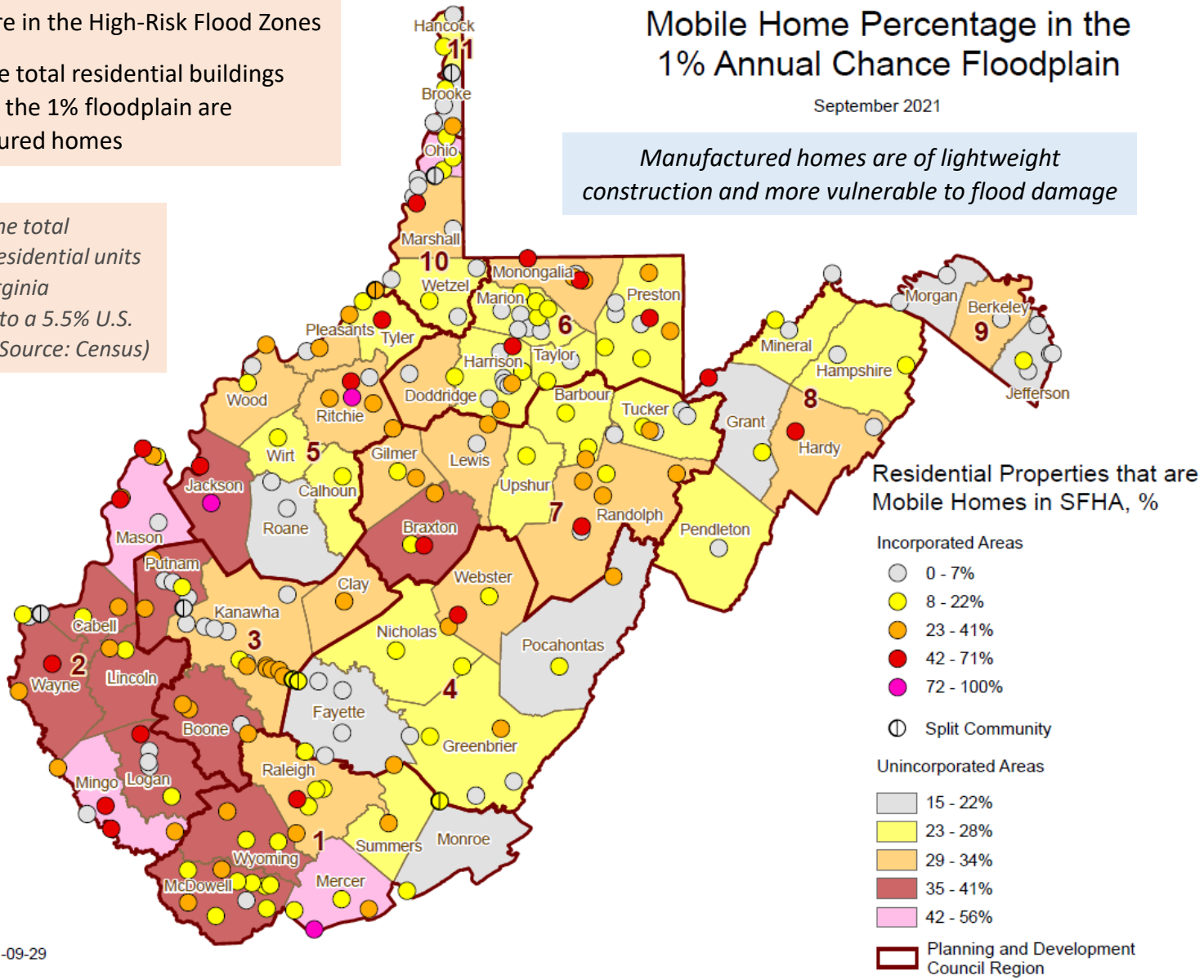
https://www.mapwv.gov/flood/map/?wkid=102100&x=-8942775&y=4547402&l=11&v=2

Residential: Mobile Home %

23% of the mobile homes in West Virginia are in the High-Risk Flood Zones

27% of the total residential buildings located in the 1% floodplain are manufactured homes

13.8% of the total occupied residential units in West Virginia compared to a 5.5% U.S. average. (Source: Census)



Permanent Structures?

Flood Exposure for Building: 02-08-0001-0030-0000_3458	
Building Replacement Cost	$42,400
Content Cost	$21,200
Building Info	Area: 840 sq ft | Stories: 1
Occupancy Class	RES2 (Mobile Home)
Year Built	2006 (Post-FIRM)
Foundation Type	Crawlspace
First Floor Height	4.0 ft above ground
Water Depth-in-Structure	11.8 ft (minus rated -12 ft)
Flood Damage Estimates for Building: 02-08-0001-0030-0000_3458	
Building Damage Pct	88% (Substantial Damage)
Building Loss USD	$37,168

https://www.mapwv.gov/flood/map/?wkid=102100&x=-8663702&y=4797889&l=11&v=2

Recreational Vehicles

Recreational Vehicles

In a Special Flood Hazard Area, a Recreational Vehicle (RV) must:

- Remain on site for fewer than 180 consecutive days, **or**
- Be fully licensed and ready for highway use; **or**
- Meet the permitting, elevation, and anchoring requirements for manufactured homes of the community's Flood Damage Prevention Ordinance.

A recreational vehicle is ready for highway use if it is on its wheels or jacking system, is attached to the site only by quick-disconnect type utilities and security devices, and has no permanently attached additions.

Important

Information

Camping near the water? Ask the campground or RV Park operator about flood warnings and plans for safe evacuations.

RVs that do not meet these conditions must be installed and elevated like a manufactured home, including a permanent foundation and tie-down (See pages 55 and 56).

<< WV Quick Guide resource >>
https://emd.wv.gov/MitigationRecovery/Documents/Floodplain%20Management%20in%20WV%20Quick%20Guide.pdf

Residential: Single Family Dwellings

Community		SINGLE FAMILY HOME		MANUFACTURED (MOBILE) HOME			SINGLE FAMILY TOTAL		
Community Name	County	Count	Value ($)	Count	% Count	Value ($)	Count	Value ($)	Group Rank[1]
Ansted	FAYETTE	1	$66K	0	0.0%	$0K	1	$66K	18
Fayette County*	FAYETTE	1165	$44,640K	239	17.0%	$4,131K	1404	$48,771K	2
Gauley Bridge	FAYETTE	17	$619K	1	5.6%	$10K	18	$629K	15
Meadow Bridge	FAYETTE	13	$551K	7	35.0%	$113K	20	$664K	13
Montgomery**	FAYETTE	11	$931K	1	8.3%	$15K	12	$945K	3
Mount Hope	FAYETTE	31	$771K	1	3.1%	$16K	32	$787K	12
Oak Hill	FAYETTE	47	$2,173K	2	4.1%	$39K	49	$2,212K	7
Pax	FAYETTE	28	$827K	4	12.5%	$97K	32	$925K	10
Smithers**	FAYETTE	54	$1,802K	6	10.0%	$77K	60	$1,879K	2
	FAYETTE	**1367**	**$52,379K**	**261**	**16.0%**	**$4,499K**	**1628**	**$56,877K**	**2**
Alderson**	GREENBRIER	107	$5,786K	10	8.5%	$248K	117	$6,034K	1
Falling Springs	GREENBRIER	2	$137K	1	33.3%	$20K	3	$157K	17
Greenbrier County*	GREENBRIER	822	$96,262K	264	24.3%	$6,626K	1086	$102,888K	1
Rainelle	GREENBRIER	229	$7,621K	16	6.5%	$579K	245	$8,200K	3
Ronceverte	GREENBRIER	29	$1,138K	0	0.0%	$0K	29	$1,138K	9
Rupert	GREENBRIER	45	$1,974K	11	19.6%	$329K	56	$2,302K	6
White Sulphur Springs	GREENBRIER	338	$15,856K	4	1.2%	$125K	342	$15,981K	1
	GREENBRIER	**1572**	**$128,774K**	**306**	**16.3%**	**$7,926K**	**1878**	**$136,699K**	**1**
Nicholas County*	NICHOLAS	455	$17,833K	165	26.6%	$2,939K	620	$20,772K	5
Richwood	NICHOLAS	217	$6,725K	42	16.2%	$630K	259	$7,356K	4
Summersville	NICHOLAS	19	$1,423K	3	13.6%	$55K	22	$1,478K	8
	NICHOLAS	**691**	**$25,981K**	**210**	**23.3%**	**$3,624K**	**901**	**$29,605K**	**5**
Durbin	POCAHONTAS	15	$499K	7	31.8%	$130K	22	$629K	14
Marlinton	POCAHONTAS	244	$8,263K	22	8.3%	$354K	266	$8,617K	2
Pocahontas County*	POCAHONTAS	400	$21,017K	90	18.4%	$1,504K	490	$22,521K	4
	POCAHONTAS	**659**	**$29,779K**	**119**	**15.3%**	**$1,988K**	**778**	**$31,767K**	**3**
Addison	WEBSTER	95	$3,434K	11	10.4%	$211K	106	$3,645K	5
Camden-On-Gauley	WEBSTER	9	$171K	4	30.8%	$92K	13	$263K	16
Cowen	WEBSTER	13	$423K	15	53.6%	$391K	28	$814K	11
Webster County*	WEBSTER	598	$20,815K	238	28.5%	$4,885K	836	$25,700K	3
	WEBSTER	**715**	**$24,842K**	**268**	**27.3%**	**$5,580K**	**983**	**$30,422K**	**4**
SUMMARY		**5,004**	**$261,756K**	**1,164**	**19.6%**	**$23,616K**	**6,168**	**$285,371K**	

Residential
Home

Residential
Manufactured Home

Building Dollar Exposure Report:
Single Family Dwellings

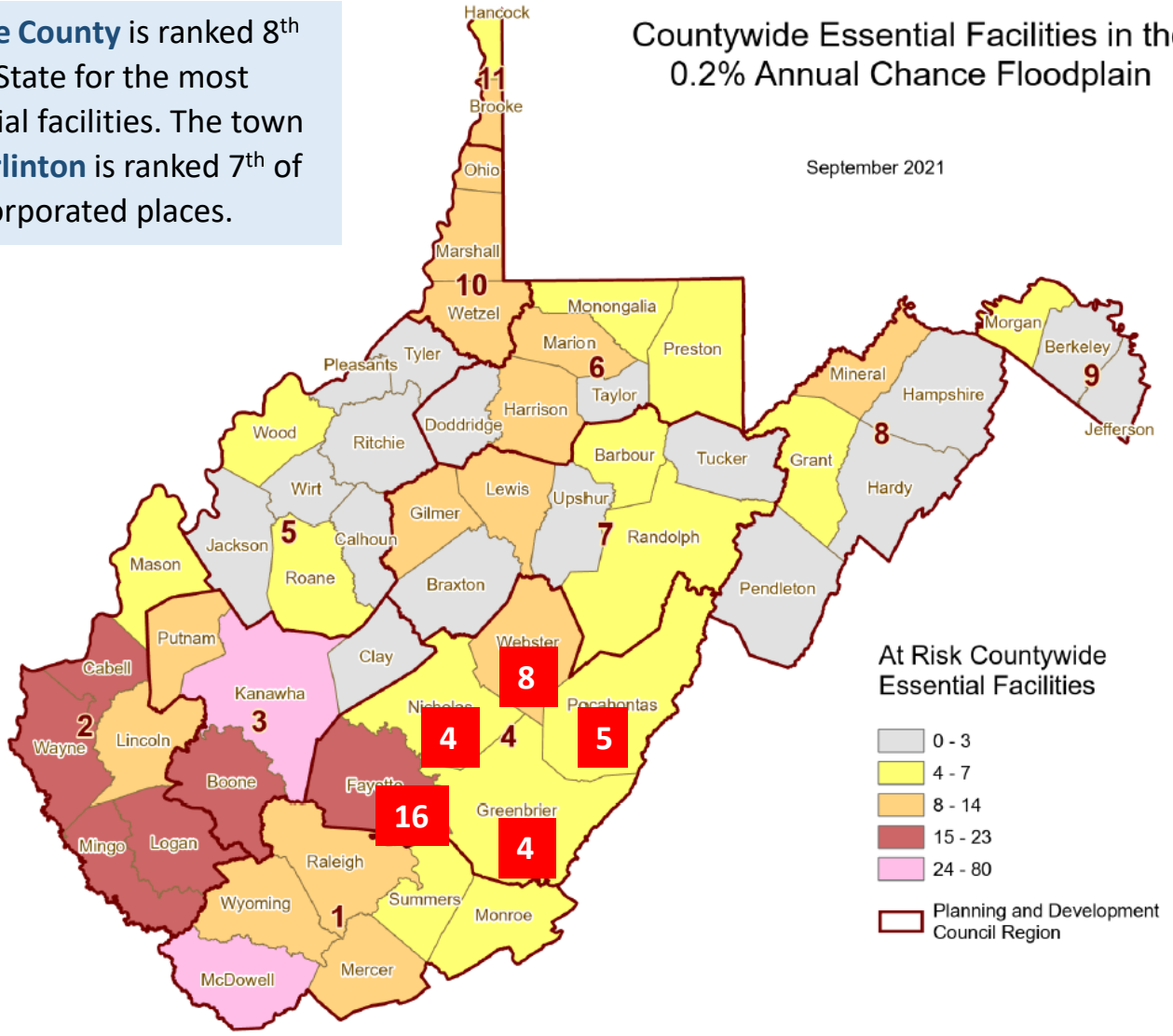
State Flood Risk Assessment

SIGNIFICANT STRUCTURES OF IMPORTANCE

What critical facilities are at risk?

Essential Facilities 0.2% Floodplain

Fayette County is ranked 8th in the State for the most essential facilities. The town of **Marlinton** is ranked 7th of all incorporated places.



Essential Facilities

Includes Schools, Hospitals, Nursing Homes, Police Stations, Fire Stations, and E-911 Dispatch Centers

Rank	Community Name	County	Community Type	WV RPDC Region	Essential Facilities in High & Moderate Risk Flood Zones
1	Kanawha County*	KANAWHA	Unincorporated	3	23
2	Charleston	KANAWHA	Incorporated	3	19
3	Huntington**	CABELL & WAYNE	Incorporated	2	16
4	Wayne County*	WAYNE	Unincorporated	2	12
5	Boone County*	BOONE	Unincorporated	3	12
6	Logan County*	LOGAN	Unincorporated	2	11
7	Mingo County*	MINGO	Unincorporated	2	10
8	South Charleston	KANAWHA	Incorporated	3	9
9	Raleigh County*	RALEIGH	Unincorporated	1	8
10	Wheeling**	MARSHALL & OHIO	Incorporated	10	8
11	McDowell County*	MCDOWELL	Unincorporated	1	7
12	Lincoln County*	LINCOLN	Unincorporated	2	6
13	Weston	LEWIS	Incorporated	7	6
14	New Martinsville	WETZEL	Incorporated	10	6
15	Welch	MCDOWELL	Incorporated	1	5
16	Cabell County*	CABELL	Unincorporated	2	5
17	Madison	BOONE	Incorporated	3	5
18	Dunbar	KANAWHA	Incorporated	3	5
19	Buffalo	PUTNAM	Incorporated	3	5
20	Fayette County*	FAYETTE	Unincorporated	4	5

Essential Facilities Table and Reports

R4 Essential Facilities

Police Station

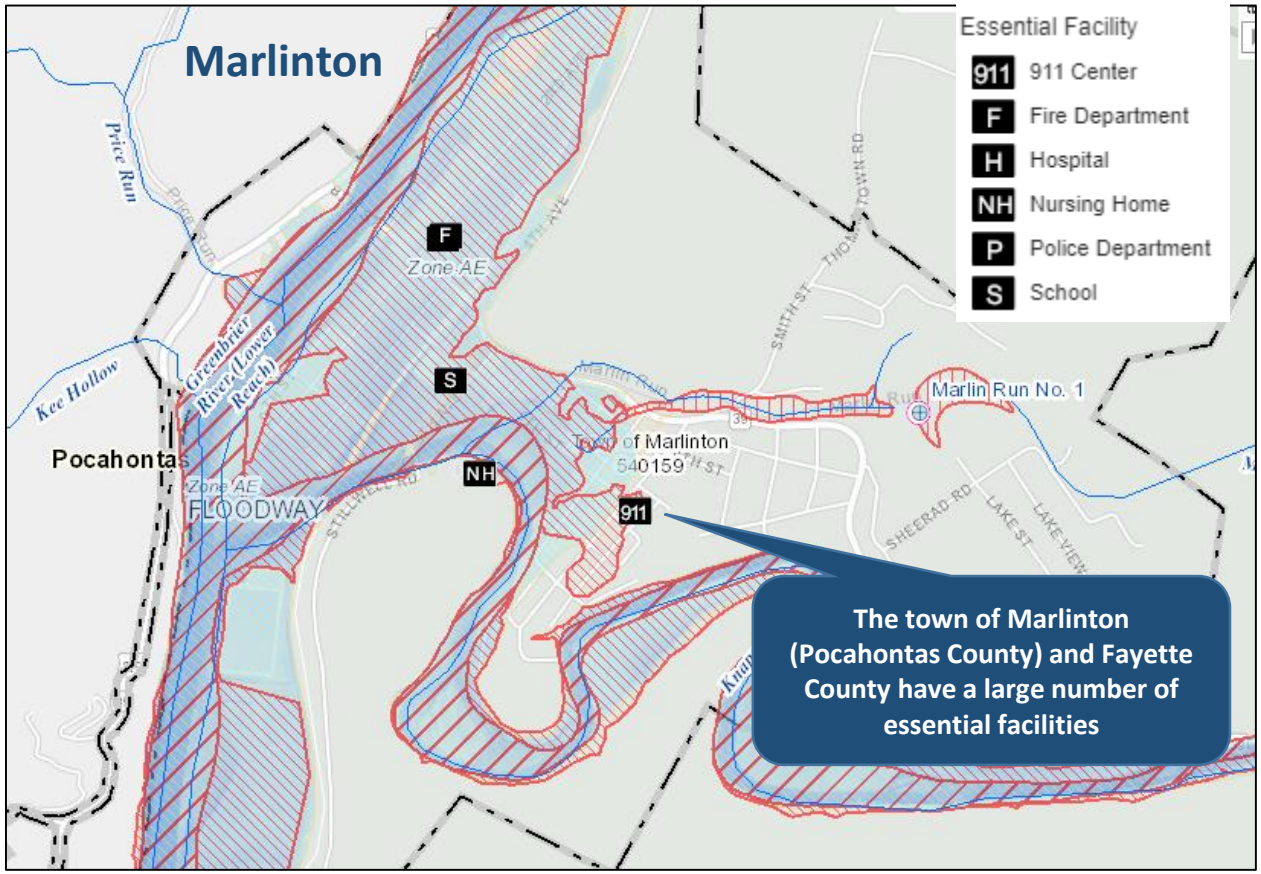

Fire Station


E-911 Dispatch


School


Hospital


Nursing Home



Risk Assessment

58% or 15 of the 26 flood-prone communities in **Region 4** have essential facilities vulnerable to flooding. The county with the most essential facilities is **Fayette County** (ranked 8th for all counties), while the incorporated town with the highest number of facilities is **Marlinton** (ranked 7th for all municipalities in State) in Pocahontas County. Hospitals and nursing homes with immobile patients or residents are particularly vulnerable to a flood disaster. Small towns situated mostly in the floodplain are more challenged than unincorporated areas or larger cities to identify suitable sites that provide a high level of protection from flooding.

WV Flood Tool Map Link: https://www.mapwv.gov/flood/map/?wkid=102100&x=-8915613&y=4610416&l=8&v=2

R4 Essential Facilities Report

R4 Essential Facilities

Police Station


Fire Station


E-911 Dispatch


School


Hospital


Nursing Home

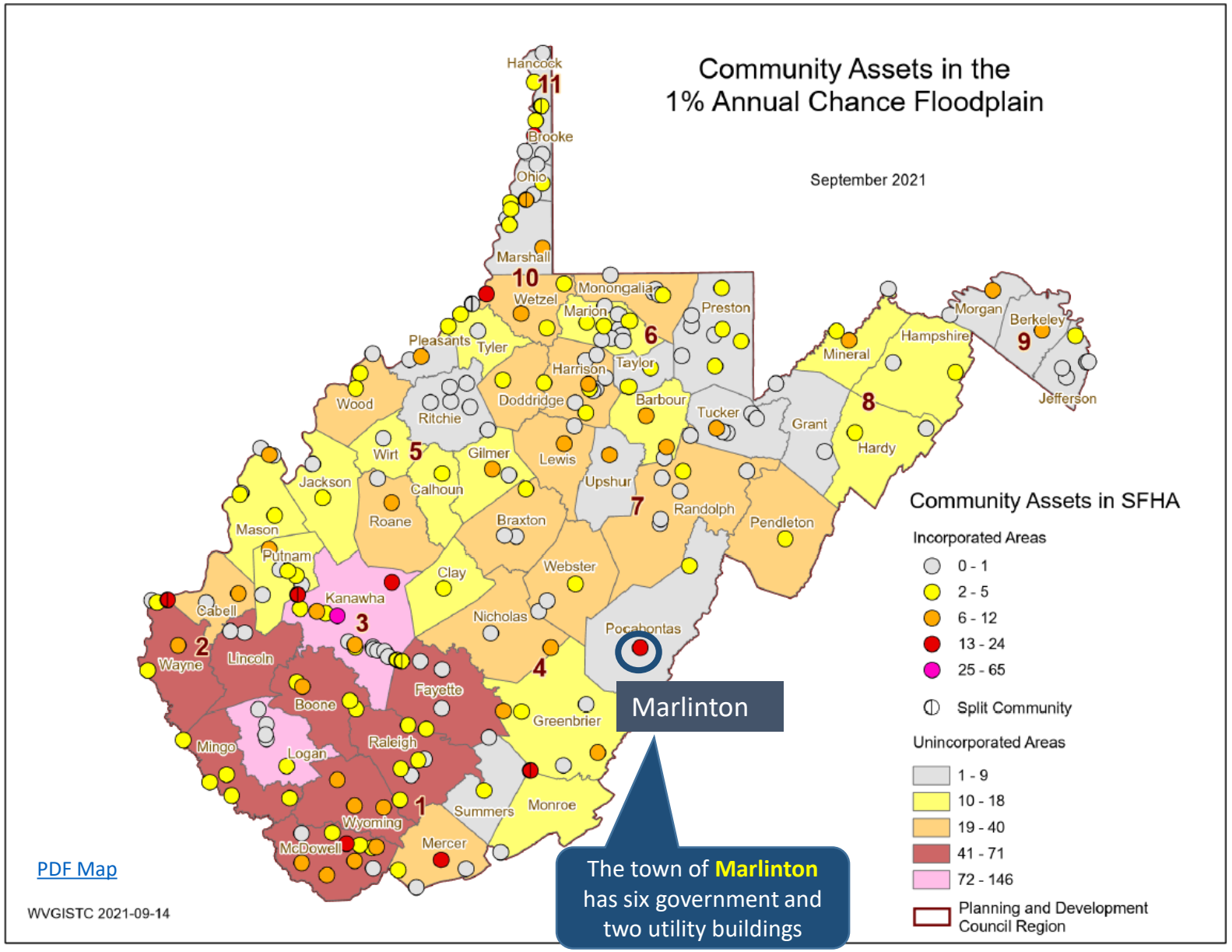
Community Name	County	Facility Name	Facility Type	Flood Tool Link	Flood Depth	Building Damage Percent
Alderson**	GREENBRIER	Alderson Elementary School	**School**	FT	3.5	8.0
Marlinton	POCAHONTAS	Marlinton Police Department	**Police Station**	FT	2.2	7.6
Marlinton	POCAHONTAS	Marlinton Volunteer Fire Department	**Fire Station**	FT	2.2	7.7
Fayette County*	FAYETTE	Loup Creek Volunteer Fire Department - Robson	**Fire Station**	FT	1.1	0.9

* Unincorporated Area
** Split Community

Community Engagement and Verification: There are 25 facilities in the high risk *effective* and *advisory* 1%-annual-chance (100-yr) flood level and 12 facilities in the moderate risk 0.2%-annual-chance (500-yr) flood level. No essential facilities exist in the Regulatory Floodway.

Review the accuracy and completeness of all *active* **essential facilities**. Report any facilities that are missing. Verify the facilities and location using the CL Report / Tables, BL Tables, and RiskMAP View of the WV Flood Tool.

Community Assets (Non-Historical)



Community Assets

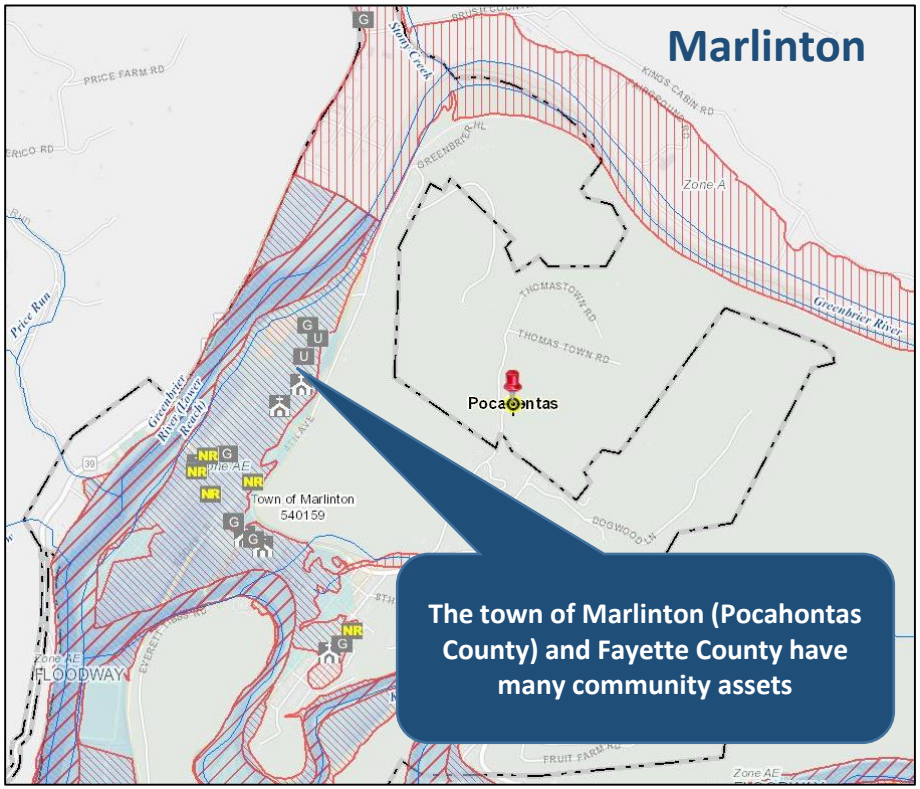
Religious Organization

Educational Building

Emergency Medical Services

Government Building

Utility



WV Flood Tool Map Link:
https://www.mapwv.gov/flood/map/?wkid=102100&x=-8914626&y=4611336&l=8&v=2

Risk Assessment

Community Assets: A total of 170 community assets (non-historical) were inventoried in the 1%-annual-chance floodplain for the **Region 4** Planning and Development Council. **Fayette County** has the largest number of inventoried community resources (n=53) of which the majority are *religious* buildings. The town of **Marlinton** (ranked 3rd of all incorporated areas) has six *government* and two *utility* buildings (ranked 5th) located in the floodplain.

R4 Community Assets Report

Community Assets

Religious Organization

Educational Building

Emergency Medical Services

Government Building

Utility

Community Name	County	Historical Place	**Facility Type**	Flood Tool Link	**Flood Depth**	Building Damage Percent
Ronceverte	GREENBRIER	**Ronceverte Water Treatment Plant**	**Utilities**	FT	9.6	21%
Fayette County*	FAYETTE	United States Postal Service Office	**Government**	FT	7.0	15%
Webster County*	WEBSTER	United States Postal Service	**Government**	FT	5.5	7%
Webster County*	WEBSTER	Craigsville Public Service District	**Utilities**	FT	5.1	29%
Fayette County*	FAYETTE	New River Gorge Visitor Contact Center	**Government**	FT	4.8	14%

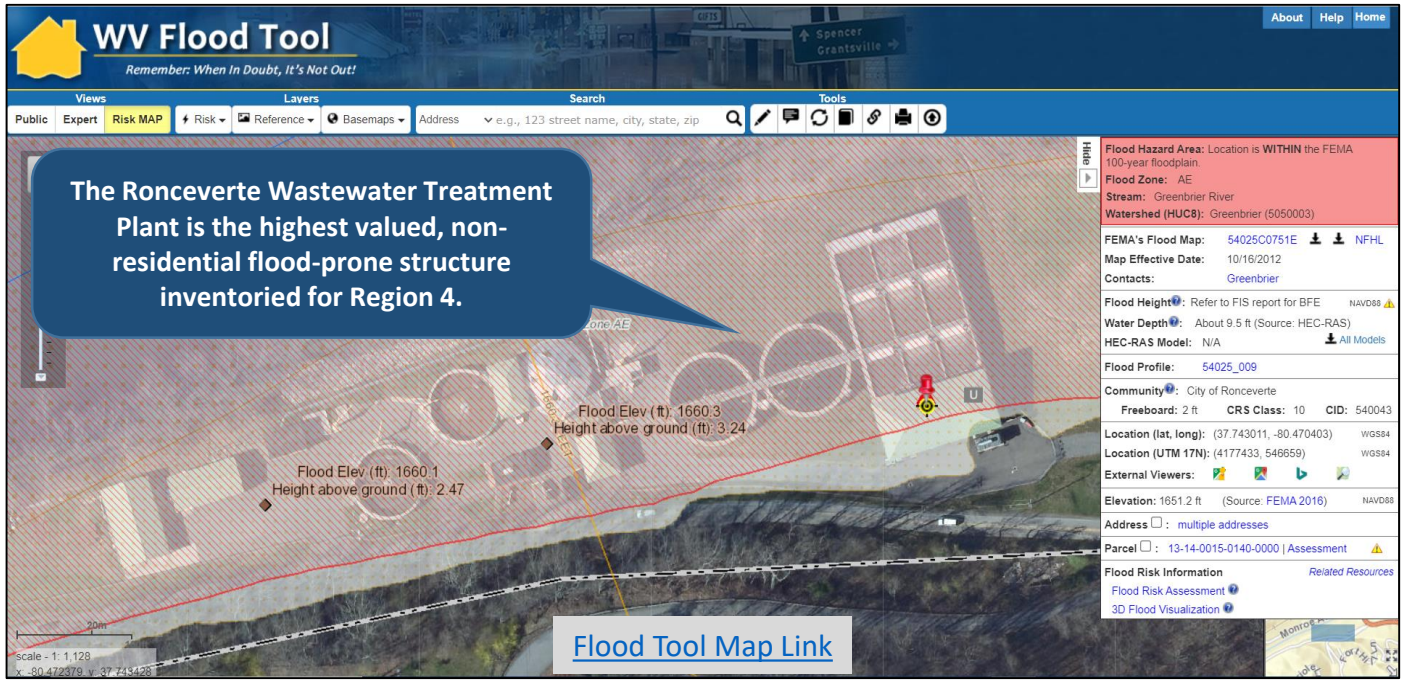
* Unincorporated Area
** Split Community

Community Engagement and Verification: A total of 170 community assets (non-historical) and 102 historical buildings were inventoried in the 1%-annual-chance floodplain for the **Region 4**

Review the accuracy and completeness of all *active* **community assets**. Report any structures that are missing. Verify the buildings and location using the CL Report / Tables, BL Tables, and Risk MAP View of the WV Flood Tool. Review and identify mitigation strategies for the community assets vulnerable to flooding.

Highly Valued ($) Utility

$24M Ronceverte Wastewater Treatment Plant (on the State's Top 100 List)



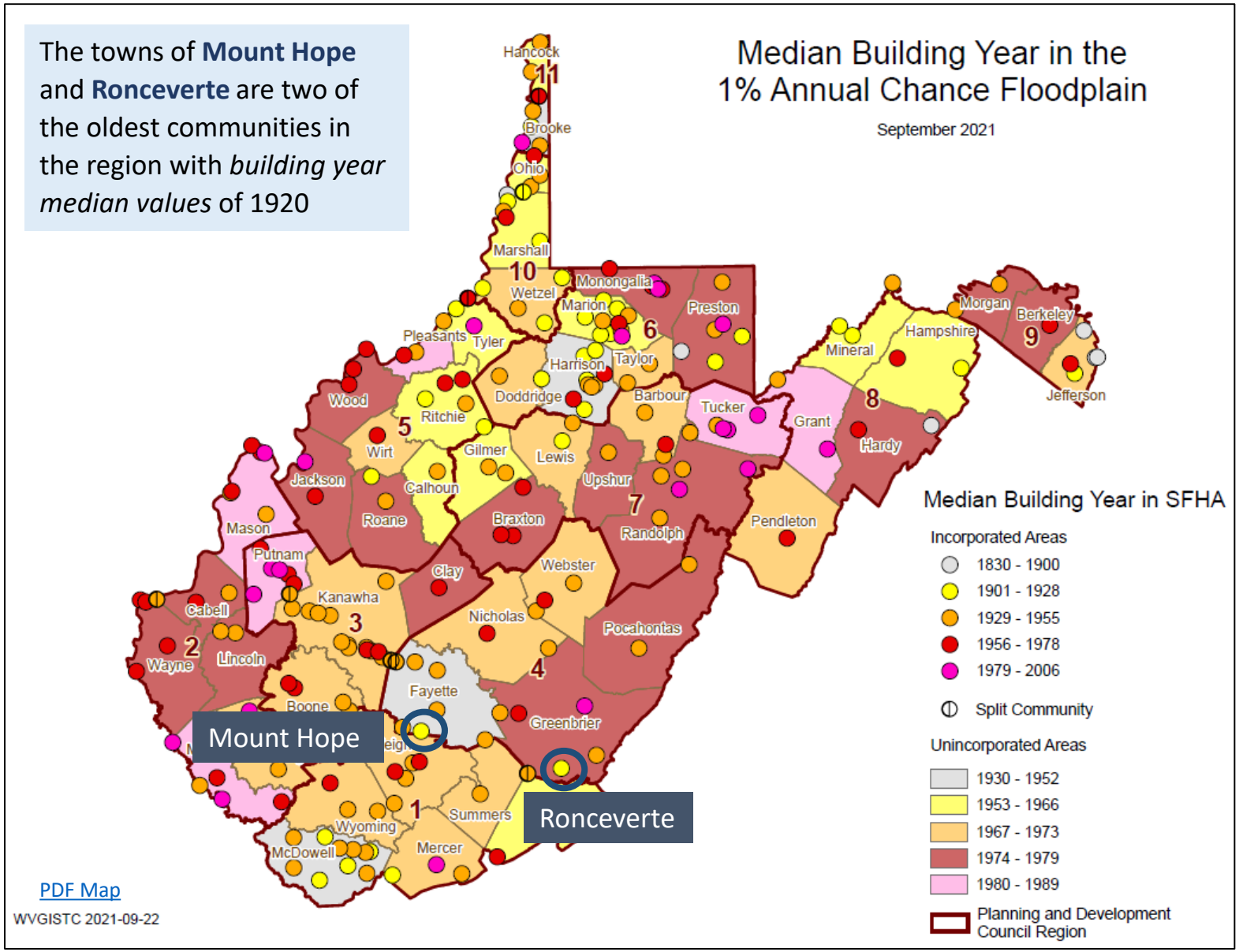
Mitigation: Examples of mitigation measures for *utilities* include:

- Emergency response plan
- Barriers around key assets
- Elevated electrical equipment
- Emergency generators
- Bolted down chemical tanks

Risk Assessment: In 2018, the new **Ronceverte's wastewater treatment plant** was constructed at a cost of $24 million. All structures of the wastewater treatment plant are in the effective high-risk floodplain at a 1% (100-year) estimated flood inundation depth of 9.5 feet. At the treatment plant location, the 0.2% (500-year) estimated flood inundation depth is about two feet higher than that of the 1% floodplain. The USGS high water marks show the maximum inundation of 3.24 feet above the ground at the facility site for the 2016 flood event. The structures are also located in a preliminary floodplain at a 1% (100-year) estimated inundation depth of 6.5 feet. The preliminary floodplain delineated based on the new flood study is under review to become effective.

Historical Structures (Building Year)

The towns of **Mount Hope** and **Ronceverte** are two of the oldest communities in the region with *building year median values* of 1920



Historical Community Assets

Historical Buildings (Region 4)

Community Name	County	Facility Name	**Facility Type**	Flood Tool Link	**Flood Depth**	Building Damage Percent
Mount Hope	FAYETTE	Mount Hope Historic District	**National Register**	FT	6.8	46%
Fayette County*	FAYETTE	Bank of Glen Jean	**National Register**	FT	4.8	14%
Alderson**	GREENBRIER	Alderson Historic District	**National Register**	FT	4.8	14%
Ronceverte	GREENBRIER	Ronceverte Historic District	**National Register**	FT	4.4	43%
Mount Hope	FAYETTE	Mount Hope Historic District	**National Register**	FT	4.3	13%
Alderson**	GREENBRIER	Alderson Historic District	**National Register**	FT	4.2	27%

Source Data: https://data.wvgis.wvu.edu/pub/RA/State/BL/CommunityAsset/
* Unincorporated Area
** Split Community

Risk Assessment: Buildings identified within National Register Areas or registered historic districts are older than 1930. **Greenbrier County** is ranked 7th in the State as having the most historical buildings (n=56) in the high-risk floodplain of which the majority are located in the city of **Ronceverte** (ranked 14th of all incorporated areas). The split community of **Alderson** and the city of **Mount Hope** also have significant numbers of historical buildings in the high-risk floodplain (18 and 16 rank respectively).

National Register Historical Structure

Mitigation: A designated historic structure can obtain the benefit of subsidized flood insurance through the NFIP even if it has been substantially improved or substantially damaged so long as the building maintains its historic designation.

National Register Areas

National Register Areas (Region 4)

Community Name	County	Historic Name	# Bldg. Points in NR Area (estimate)	Flood Tool Link
Alderson**	GREENBRIER	Alderson Historic District	45	FT
Ronceverte	GREENBRIER	Ronceverte Historic District	35	FT
Mount Hope	FAYETTE	Mount Hope Historic District	18	FT
Richwood	NICHOLAS	Downtown Richwood Historic District	10	FT

Risk Assessment: For communities with the most National Register Areas in the State that intersect the 1% floodplain, **Greenbrier County** (12 NR Areas) is ranked 4th and **Fayette County** (7 NR Areas) ranked 7th

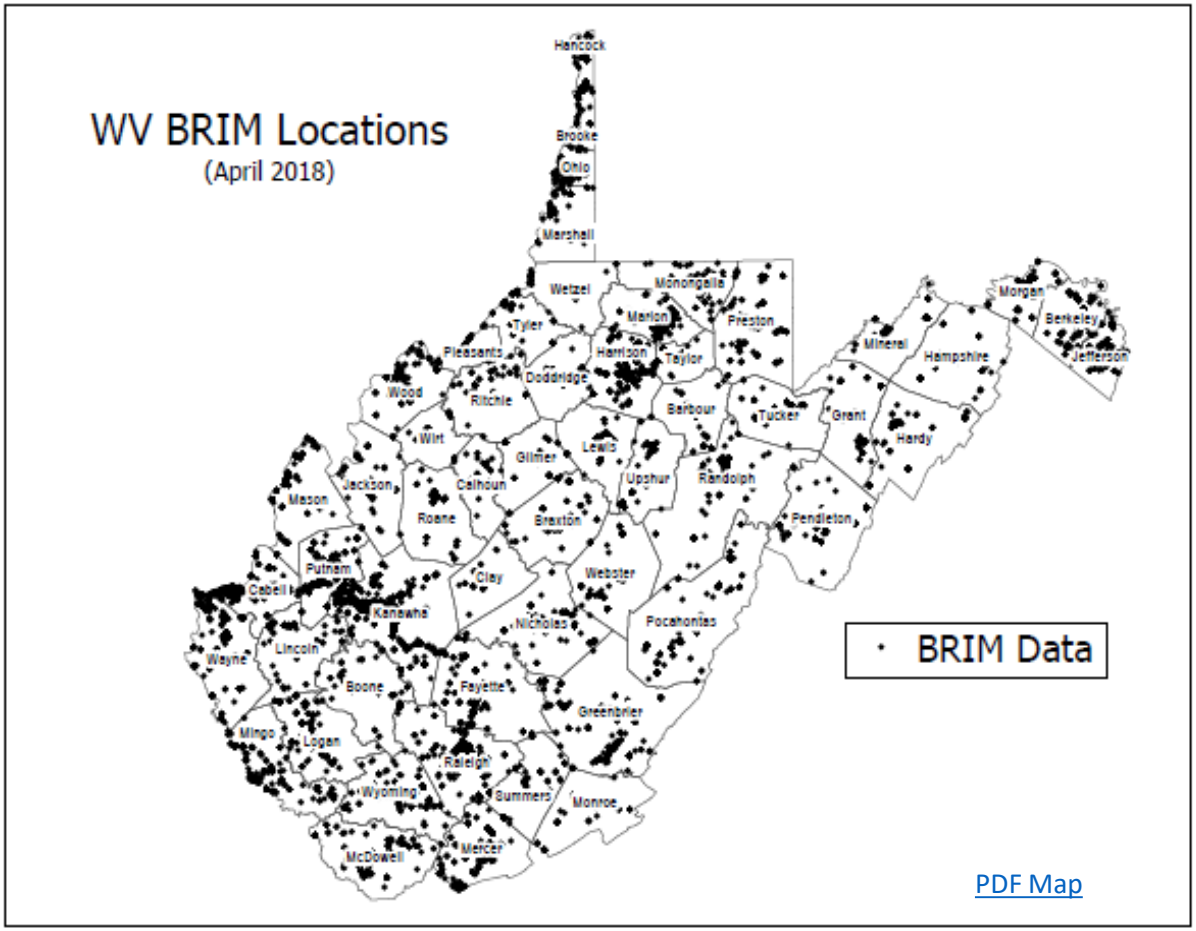
Alderson Historic District

Ronceverte Historic District

Board of Risk & Insurance Management (BRIM)

The BRIM database provides building values for schools and other tax-exempt state facilities

The WV **Board of Risk and Insurance Management (BRIM)** database according to the 2018 data extract stores facility and building value information for more than 150 West Virginia State agencies (e.g., State Capitol, DNR Park Buildings, DOH Facilities, DOE Schools, WVU Buildings) representing 15,111 records, The building values are important source for tax exempt buildings that have no or unreliable replacement values listed in the statewide tax assessment database. Only 48% (n=7,304) of the total records of the *non-spatial* BRIM database have city-style addresses, of which only 41% (n=6,273) of the records could be spatially geocoded to site or street address matches.

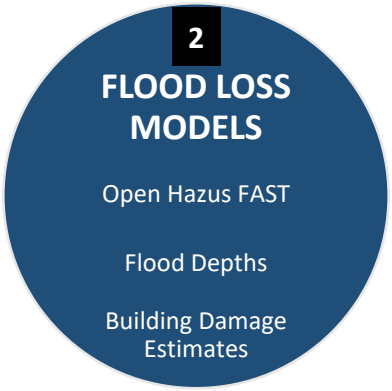


Upgrading and maintaining the Board of Risk and Insurance Management (BRIM) as a spatial database is a **Mitigation Action Goal** of the Statewide Hazard Mitigation Plan.

Flood Risk Assessment

Flood Damage Loss Models

What is the degree of damage or flood loss?



Other Flood Risk Indicators

FEMA Risk Indicators: Community Engagement Prioritization (CEP) 2019

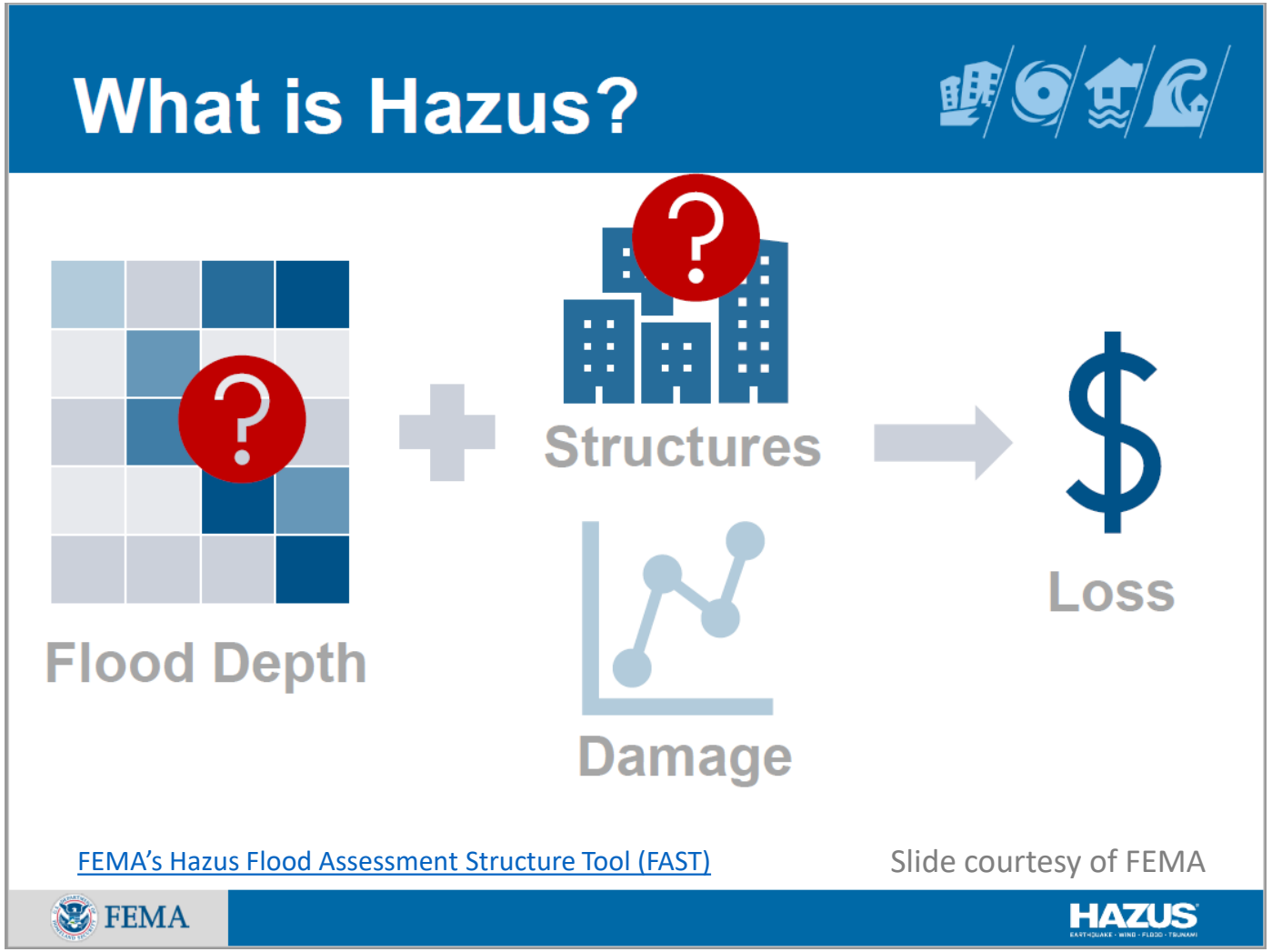
Disadvantaged Community Graphics

Hazus Flood Loss Estimation Program

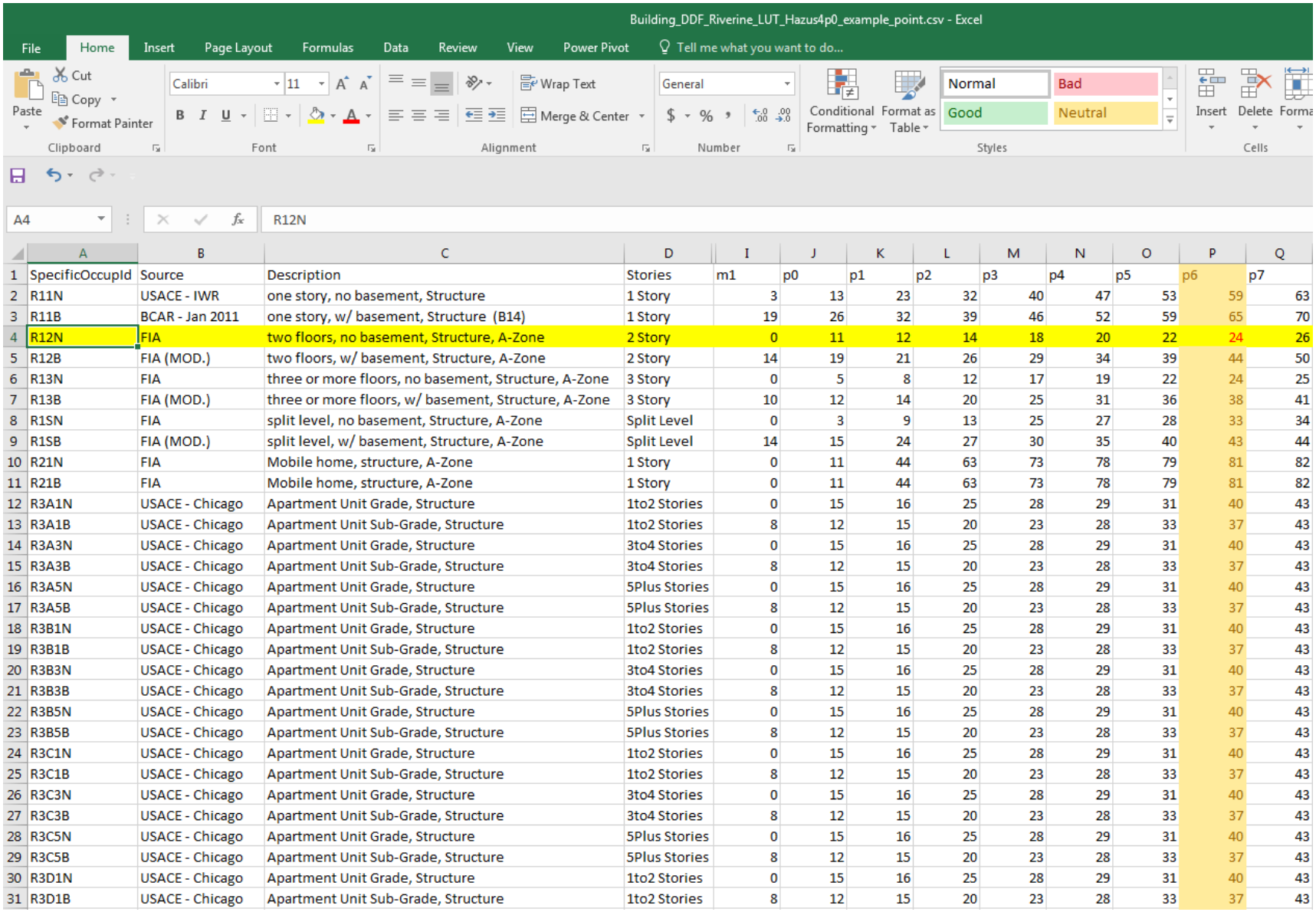
A GIS-based natural hazard analysis tool developed and freely distributed by FEMA

Riverine Hazus Level-2 Analysis

- 1% Annual Flood Event
- Python Programs



Depth-Damage Function (DDF) Values



	A	B	C	D	I	J	K	L	M	N	O	P	Q
1	SpecificOccupId	Source	Description	Stories	m1	p0	p1	p2	p3	p4	p5	p6	p7
2	R11N	USACE - IWR	one story, no basement, Structure	1 Story	3	13	23	32	40	47	53	59	63
3	R11B	BCAR - Jan 2011	one story, w/ basement, Structure (B14)	1 Story	19	26	32	39	46	52	59	65	70
4	R12N	FIA	two floors, no basement, Structure, A-Zone	2 Story	0	11	12	14	18	20	22	24	26
5	R12B	FIA (MOD.)	two floors, w/ basement, Structure, A-Zone	2 Story	14	19	21	26	29	34	39	44	50
6	R13N	FIA	three or more floors, no basement, Structure, A-Zone	3 Story	0	5	8	12	17	19	22	24	25
7	R13B	FIA (MOD.)	three or more floors, w/ basement, Structure, A-Zone	3 Story	10	12	14	20	25	31	36	38	41
8	R1SN	FIA	split level, no basement, Structure, A-Zone	Split Level	0	3	9	13	25	27	28	33	34
9	R1SB	FIA (MOD.)	split level, w/ basement, Structure, A-Zone	Split Level	14	15	24	27	30	35	40	43	44
10	R21N	FIA	Mobile home, structure, A-Zone	1 Story	0	11	44	63	73	78	79	81	82
11	R21B	FIA	Mobile home, structure, A-Zone	1 Story	0	11	44	63	73	78	79	81	82
12	R3A1N	USACE - Chicago	Apartment Unit Grade, Structure	1to2 Stories	0	15	16	25	28	29	31	40	43
13	R3A1B	USACE - Chicago	Apartment Unit Sub-Grade, Structure	1to2 Stories	8	12	15	20	23	28	33	37	43
14	R3A3N	USACE - Chicago	Apartment Unit Grade, Structure	3to4 Stories	0	15	16	25	28	29	31	40	43
15	R3A3B	USACE - Chicago	Apartment Unit Sub-Grade, Structure	3to4 Stories	8	12	15	20	23	28	33	37	43
16	R3A5N	USACE - Chicago	Apartment Unit Grade, Structure	5Plus Stories	0	15	16	25	28	29	31	40	43
17	R3A5B	USACE - Chicago	Apartment Unit Sub-Grade, Structure	5Plus Stories	8	12	15	20	23	28	33	37	43
18	R3B1N	USACE - Chicago	Apartment Unit Grade, Structure	1to2 Stories	0	15	16	25	28	29	31	40	43
19	R3B1B	USACE - Chicago	Apartment Unit Sub-Grade, Structure	1to2 Stories	8	12	15	20	23	28	33	37	43
20	R3B3N	USACE - Chicago	Apartment Unit Grade, Structure	3to4 Stories	0	15	16	25	28	29	31	40	43
21	R3B3B	USACE - Chicago	Apartment Unit Sub-Grade, Structure	3to4 Stories	8	12	15	20	23	28	33	37	43
22	R3B5N	USACE - Chicago	Apartment Unit Grade, Structure	5Plus Stories	0	15	16	25	28	29	31	40	43
23	R3B5B	USACE - Chicago	Apartment Unit Sub-Grade, Structure	5Plus Stories	8	12	15	20	23	28	33	37	43
24	R3C1N	USACE - Chicago	Apartment Unit Grade, Structure	1to2 Stories	0	15	16	25	28	29	31	40	43
25	R3C1B	USACE - Chicago	Apartment Unit Sub-Grade, Structure	1to2 Stories	8	12	15	20	23	28	33	37	43
26	R3C3N	USACE - Chicago	Apartment Unit Grade, Structure	3to4 Stories	0	15	16	25	28	29	31	40	43
27	R3C3B	USACE - Chicago	Apartment Unit Sub-Grade, Structure	3to4 Stories	8	12	15	20	23	28	33	37	43
28	R3C5N	USACE - Chicago	Apartment Unit Grade, Structure	5Plus Stories	0	15	16	25	28	29	31	40	43
29	R3C5B	USACE - Chicago	Apartment Unit Sub-Grade, Structure	5Plus Stories	8	12	15	20	23	28	33	37	43
30	R3D1N	USACE - Chicago	Apartment Unit Grade, Structure	1to2 Stories	0	15	16	25	28	29	31	40	43
31	R3D1B	USACE - Chicago	Apartment Unit Sub-Grade, Structure	1to2 Stories	8	12	15	20	23	28	33	37	43

Post-FIRM Structure in Floodway

Building ID	**19-06-009H-0019-0000_781**
Full E-911 Address	781 AVON BEND RD, CHARLES TOWN, WV, 25414
Full Owner Address	9299 ALL SAINTS RD, LAUREL, MD 20723
GIS Parcel ID	19-06-009H-0019-0000
Lat	39.218996
Long	-77.83151391
Plus Code	87F46599+H9X
WV Flood Tool Link	https://mapwv.gov/flood/map/?wkid=102100&x=-8664164.49652&y=4753089.59353&l=13&v=0
WV Parcel Assessment Link	https://mapwv.gov/Assessment/Detail/?PID=1906009H001900000000
CID	540065
Community Name	JEFFERSON COUNTY *
Stream Name	**Shenandoah River**
Watershed (HUC8)	Shenandoah (2070007)
Flood Zone Designation	Effective 100 yr Zone AE - Floodway
Floodway	**Yes**
Year Built	**2011**
FIRM Status	**Post-FIRM**
Hazard Occupancy Code	RES1
Stories	2
Basement Type	**Crawl**
First Floor Height	4.0
Building Appraisal	**$170,200**
Structure Area	2496
Flood Depth Value	**9.8**
Flood Depth Source	HEC-RAS
WSEL Value	376.0
WSEL Source	UAE
Ground Elevation	366.2
Ground Elevation Source	2012 FEMA Jefferson, Berkeley & Morgan Lidar
Grade	C+
Tax Class	2
Land Use Description	Residential 1 Family
Exterial Wall Type	Aluminum

Building Inputs

Water Depth Input

Building ID	**19-06-009H-0019-0000_781**
Full E-911 Address	781 AVON BEND RD, CHARLES TOWN, WV, 25414
GIS Parcel ID	19-06-009H-0019
Plus Code	87F46599+H9
WV Flood Tool Link	https://ma… 8664164.
WV Parcel Assessment Link	https://r… H001900
Full Owner Address	9299 ALL
Occ	RES1
Cost	170200
NumStories	2
FoundationType	5
FirstFloorHt	4
Area	2496
UserDefinedFltyId	453
Latitude	39.218996
Longitude	-77.83151391
Depth_Grid	**9.825653**
Depth_in_Struc	5.825653076
flExp	1
SOID	R12N
BDDF_ID	107
BldgDmgPct	**23.7**
BldgLossUSD	**$40,254**
ContentCostUSD	$85,100.00
CDDF_ID	23.00
ContDmgPct	37.95
ContentLossUSD	$32,299
DebrisID	RES1NBFT4
Debris_Tot	
Restor_Days_Min	270
Restor_Days_Max	450
GridName	AFH_wm.tif

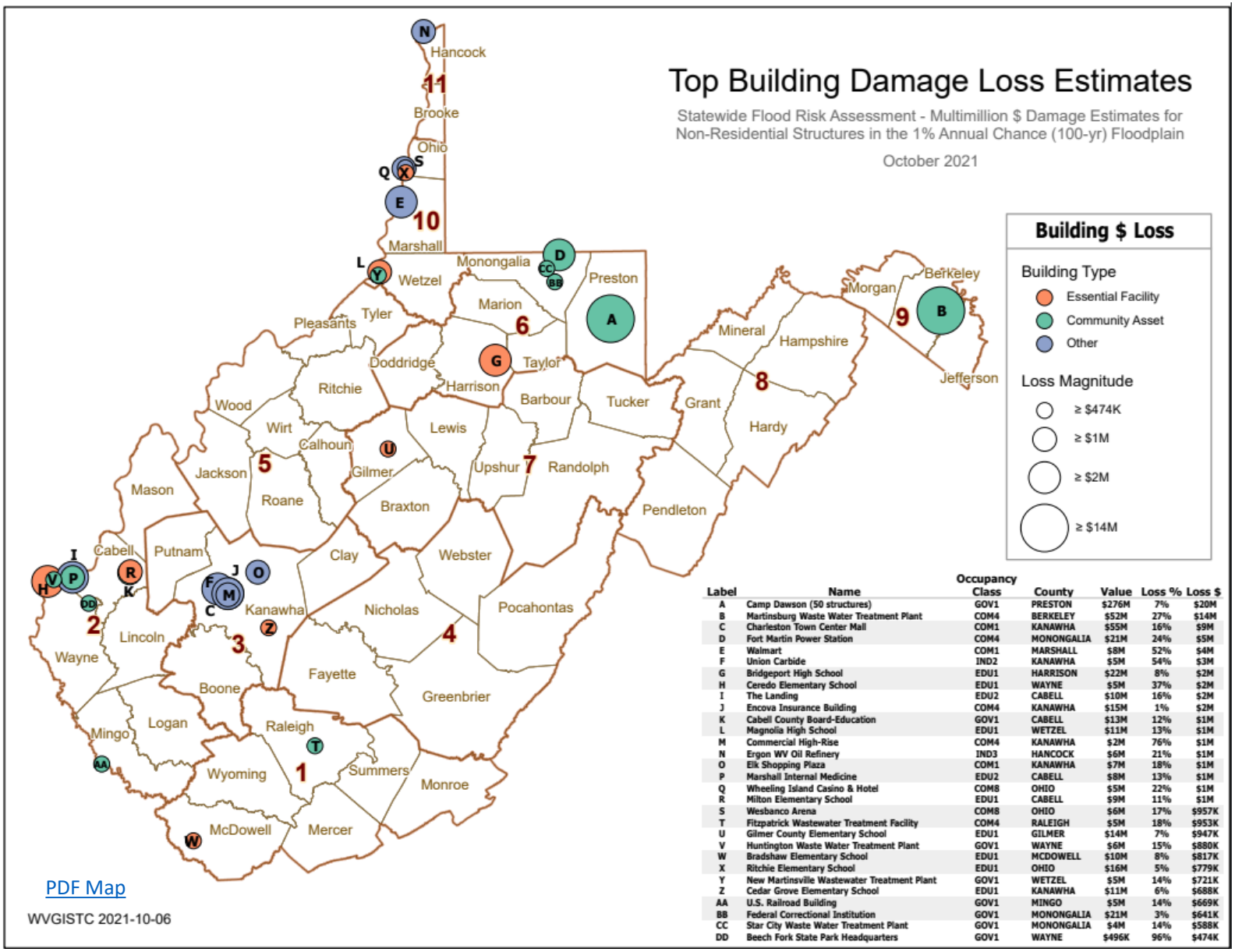
3

BLDG. LEVEL RISK ASSESSMENT (BLRA) DATABASE

Building Level & Community Level Outputs

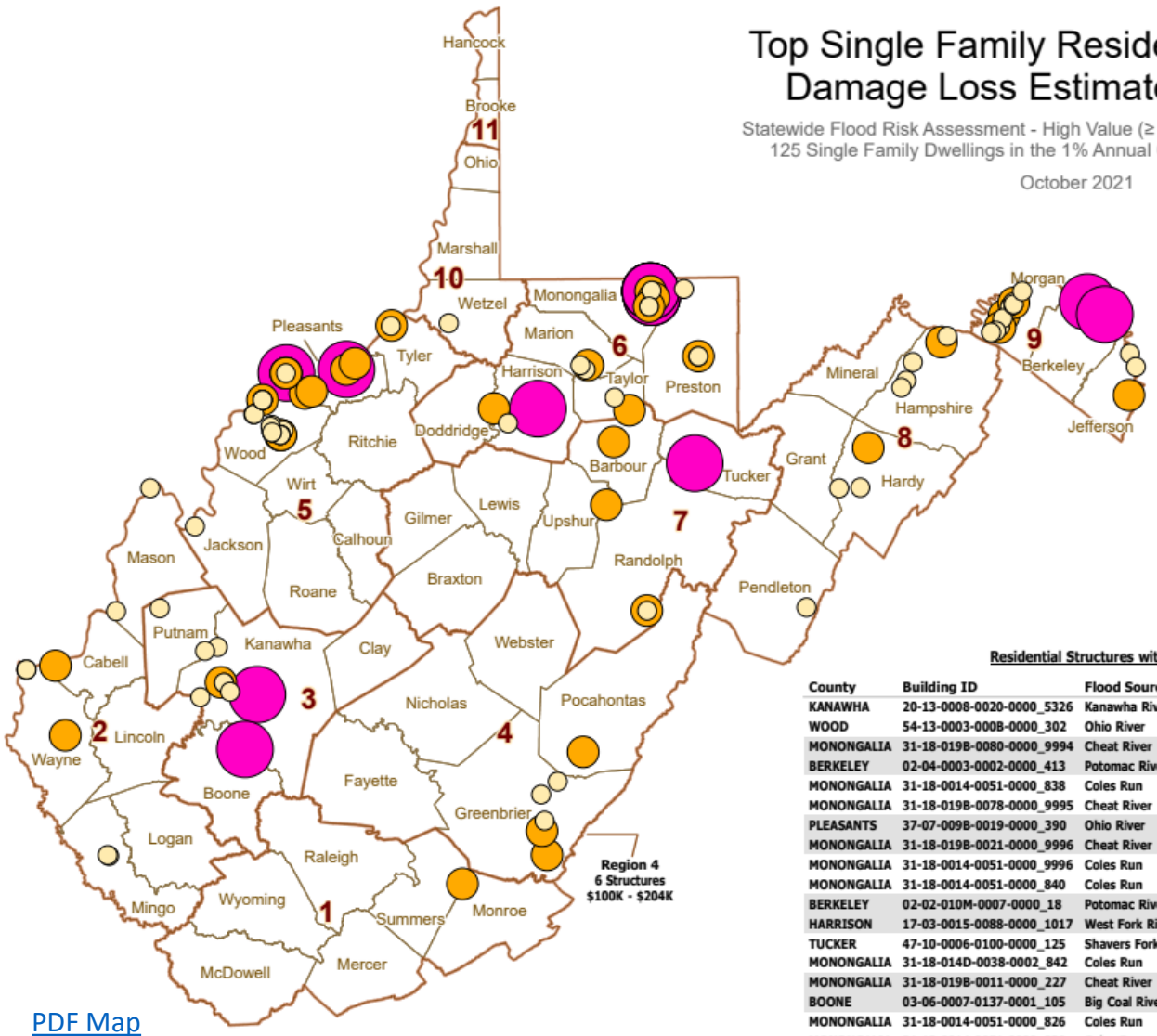
OpenHazus FAST Utility Building Impact Output

Top Non-Residential Loss Estimates



Label	Name	Occupancy Class	County	Value	Loss %	Loss $
A	Camp Dawson (50 structures)	GOV1	PRESTON	$276M	7%	$20M
B	Martinsburg Waste Water Treatment Plant	COM4	BERKELEY	$52M	27%	$14M
C	Charleston Town Center Mall	COM1	KANAWHA	$55M	16%	$9M
D	Fort Martin Power Station	COM4	MONONGALIA	$21M	24%	$5M
E	Walmart	COM1	MARSHALL	$8M	52%	$4M
F	Union Carbide	IND2	KANAWHA	$5M	54%	$3M
G	Bridgeport High School	EDU1	HARRISON	$22M	8%	$2M
H	Ceredo Elementary School	EDU1	WAYNE	$5M	37%	$2M
I	The Landing	EDU2	CABELL	$10M	16%	$2M
J	Encova Insurance Building	COM4	KANAWHA	$15M	1%	$2M
K	Cabell County Board-Education	GOV1	CABELL	$13M	12%	$1M
L	Magnolia High School	EDU1	WETZEL	$11M	13%	$1M
M	Commercial High-Rise	COM4	KANAWHA	$2M	76%	$1M
N	Ergon WV Oil Refinery	IND3	HANCOCK	$6M	21%	$1M
O	Elk Shopping Plaza	COM1	KANAWHA	$7M	18%	$1M
P	Marshall Internal Medicine	EDU2	CABELL	$8M	13%	$1M
Q	Wheeling Island Casino & Hotel	COM8	OHIO	$5M	22%	$1M
R	Milton Elementary School	EDU1	CABELL	$9M	11%	$1M
S	Wesbanco Arena	COM8	OHIO	$6M	17%	$957K
T	Fitzpatrick Wastewater Treatment Facility	COM4	RALEIGH	$5M	18%	$953K
U	Gilmer County Elementary School	EDU1	GILMER	$14M	7%	$947K
V	Huntington Waste Water Treatment Plant	GOV1	WAYNE	$6M	15%	$880K
W	Bradshaw Elementary School	EDU1	MCDOWELL	$10M	8%	$817K
X	Ritchie Elementary School	EDU1	OHIO	$16M	5%	$779K
Y	New Martinsville Wastewater Treatment Plant	GOV1	WETZEL	$5M	14%	$721K
Z	Cedar Grove Elementary School	EDU1	KANAWHA	$11M	6%	$688K
AA	U.S. Railroad Building	GOV1	MINGO	$5M	14%	$669K
BB	Federal Correctional Institution	GOV1	MONONGALIA	$21M	3%	$641K
CC	Star City Waste Water Treatment Plant	GOV1	MONONGALIA	$4M	14%	$588K
DD	Beech Fork State Park Headquarters	GOV1	WAYNE	$496K	96%	$474K

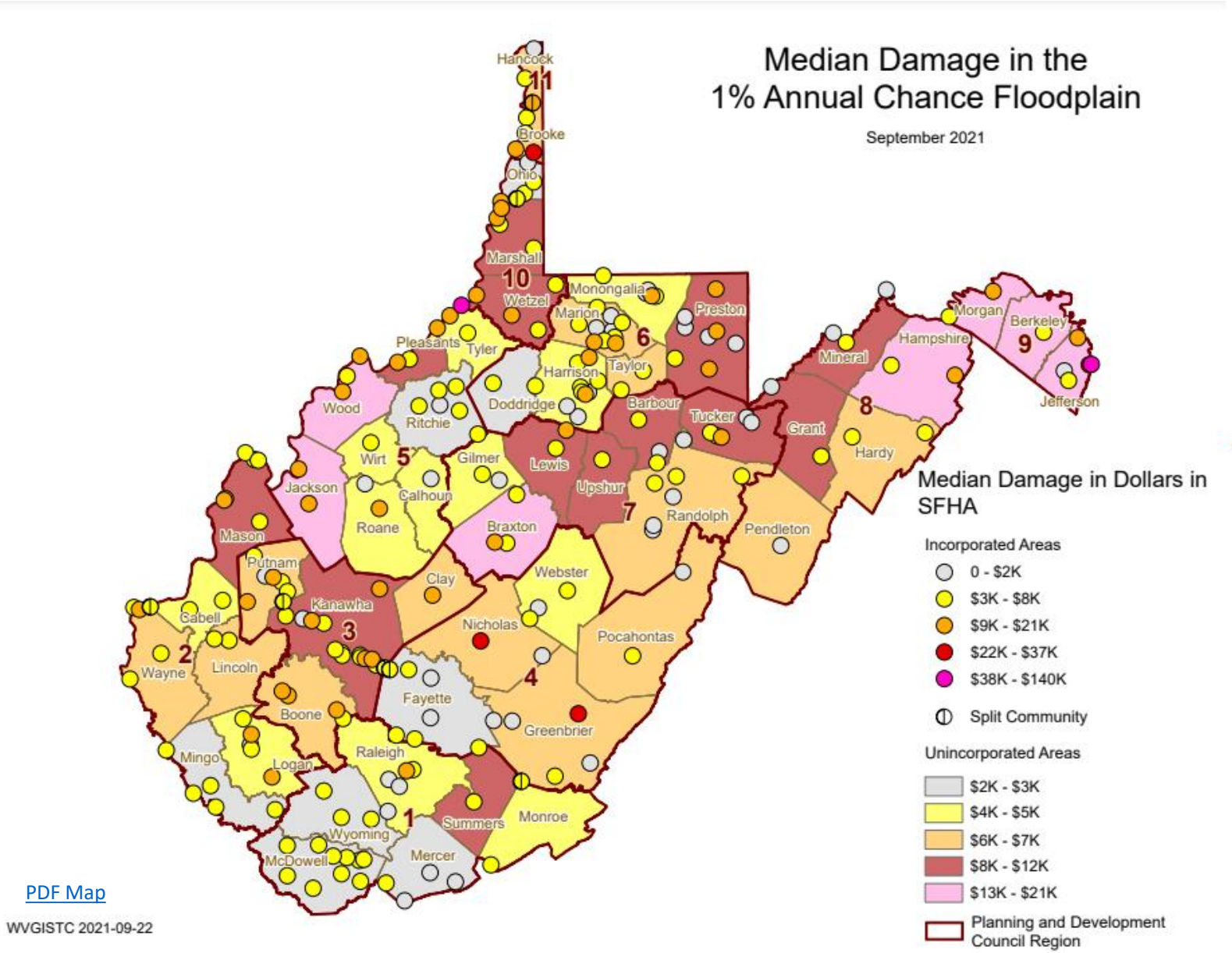
Top Residential Damage Loss ($)



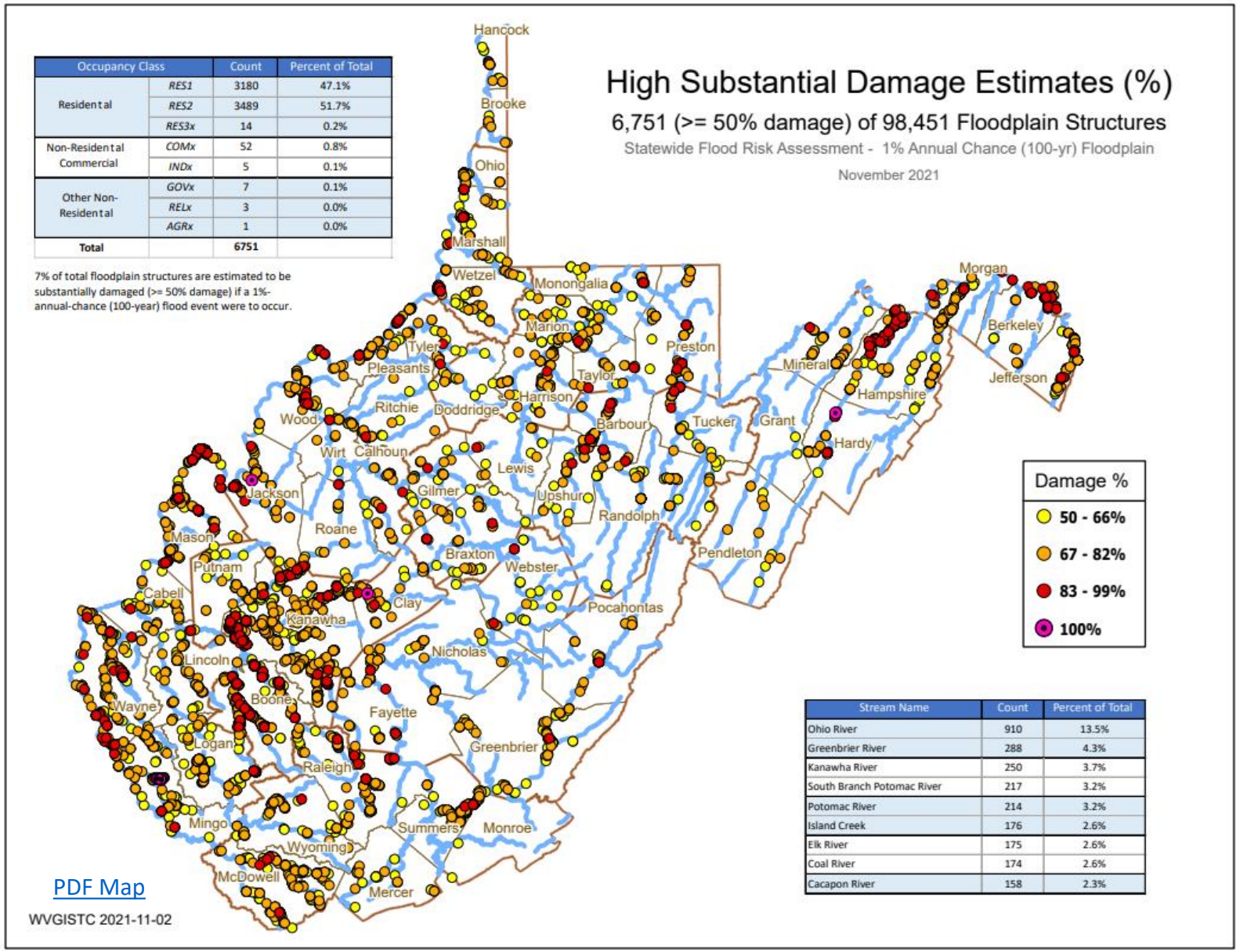
Residential Structures with Loss Over $200K

County	Building ID	Flood Source	SFHA Status	Value	Loss %	Loss $
KANAWHA	20-13-0008-0020-0000_5326	Kanawha River	Remains Same	$1.3M	32.4%	$427K
WOOD	54-13-0003-000B-0000_302	Ohio River	Remains Same	$400K	80.1%	$320K
MONONGALIA	31-18-019B-0080-0000_9994	Cheat River	Mapped In	$553K	57.4%	$317K
BERKELEY	02-04-0003-0002-0000_413	Potomac River	Remains Same	$400K	78.5%	$314K
MONONGALIA	31-18-0014-0051-0000_838	Coles Run	Remains Same	$417K	74.6%	$311K
MONONGALIA	31-18-019B-0078-0000_9995	Cheat River	Mapped In	$662K	45.4%	$300K
PLEASANTS	37-07-009B-0019-0000_390	Ohio River	Remains Same	$377K	73.8%	$278K
MONONGALIA	31-18-019B-0021-0000_9996	Cheat River	Mapped In	$503K	55.2%	$278K
MONONGALIA	31-18-0014-0051-0000_9996	Coles Run	Remains Same	$417K	65.3%	$272K
MONONGALIA	31-18-0014-0051-0000_840	Coles Run	Remains Same	$417K	64.5%	$268K
BERKELEY	02-02-010M-0007-0000_18	Potomac River	Remains Same	$303K	78.0%	$236K
HARRISON	17-03-0015-0088-0000_1017	West Fork River	Remains Same	$335K	70.2%	$235K
TUCKER	47-10-0006-0100-0000_125	Shavers Fork	Remains Same	$540K	42.7%	$230K
MONONGALIA	31-18-014D-0038-0002_842	Coles Run	Remains Same	$320K	70.9%	$227K
MONONGALIA	31-18-019B-0011-0000_227	Cheat River	Mapped In	$362K	60.8%	$220K
BOONE	03-06-0007-0137-0001_105	Big Coal River	Remains Same	$344K	63.5%	$218K
MONONGALIA	31-18-0014-0051-0000_826	Coles Run	Remains Same	$417K	52.1%	$217K
MONONGALIA	31-18-0014-0051-0000_830	Coles Run	Mapped in	$417K	51.8%	$216K
MONONGALIA	31-18-0014-0051-0000_9997	Coles Run	Remains Same	$417K	51.8%	$216K
MONONGALIA	31-18-0014-0051-0000_9998	Coles Run	Remains Same	$417K	49.2%	$205K

Median Damage Value



Substantial Damage Estimates



Occupancy Class		Count	Percent of Total
Residental	RES1	3180	47.1%
	RES2	3489	51.7%
	RES3x	14	0.2%
Non-Residental Commercial	COMx	52	0.8%
	INDx	5	0.1%
Other Non-Residental	GOVx	7	0.1%
	RELx	3	0.0%
	AGRx	1	0.0%
Total		6751	

Stream Name	Count	Percent of Total
Ohio River	910	13.5%
Greenbrier River	288	4.3%
Kanawha River	250	3.7%
South Branch Potomac River	217	3.2%
Potomac River	214	3.2%
Island Creek	176	2.6%
Elk River	175	2.6%
Coal River	174	2.6%
Cacapon River	158	2.3%

R9 Substantial Damage Estimates



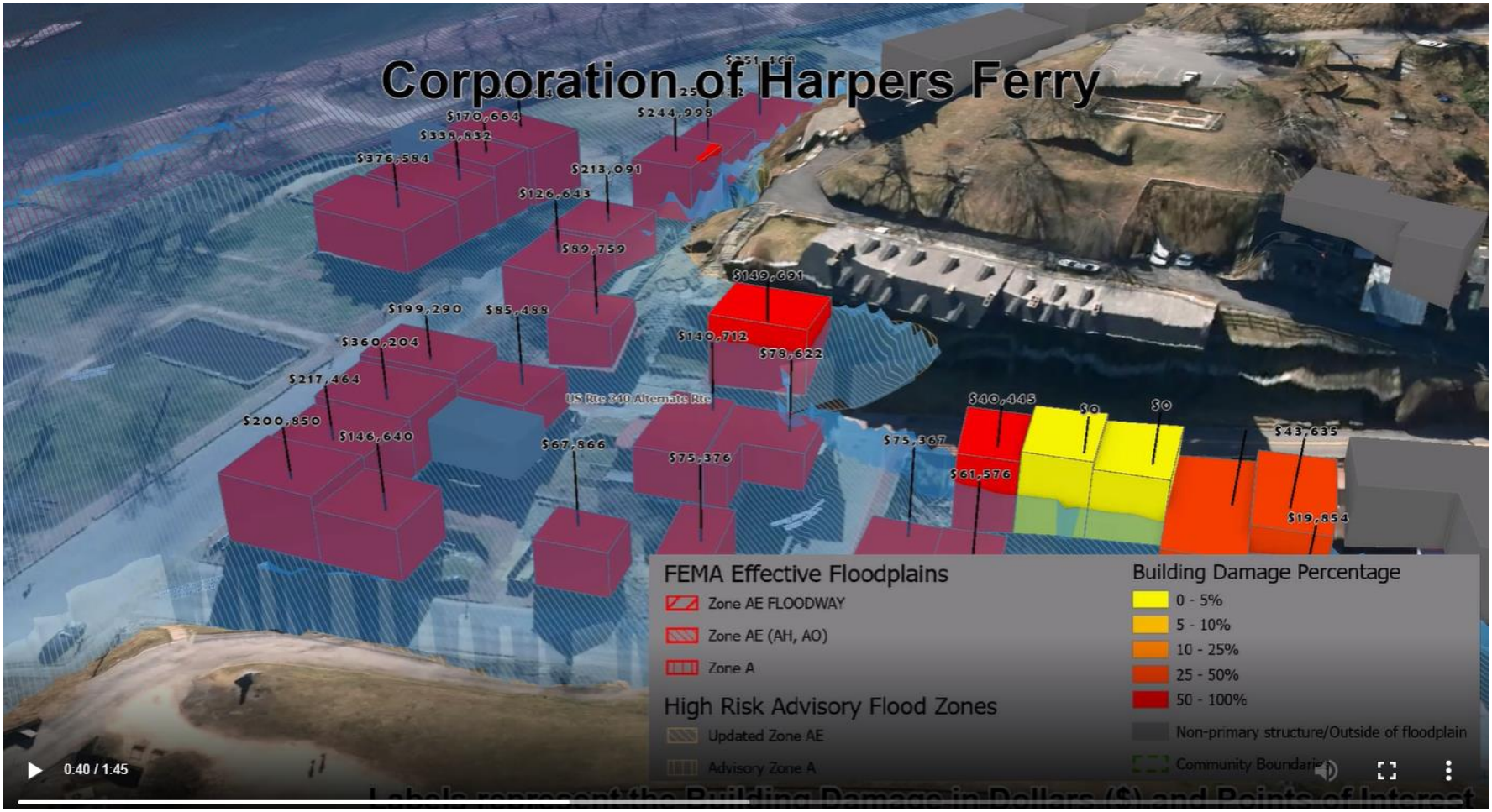

Community Name	County	Count Total	Value Total	TEIF Loss Total	TEIF Loss Ratio Total	Median Percent Damage	Median Dollar Damage	Debris Damage Total	High Damage Count (BldgDmgPct >= 50% OR BldgLossUSD > $10k)
Berkeley County*	BERKELEY	635	$52,931K	$5,729K	11%	65%	$15K	6,172	188
Martinsburg	BERKELEY	75	$62,324K	$14,105K	23%	9%	$4K	136	8
	BERKELEY	**710**	**$115,255K**	**$19,834K**	**17%**	**54%**	**$13K**	**6,308**	**196**
Jefferson County*	JEFFERSON	526	$70,260K	$6,047K	9%	39%	$21K	4,434	183
Bolivar	JEFFERSON	3	$251K	$118K	47%	48%	$37K	135	3
Charles Town	JEFFERSON	27	$3,180K	$27K	1%	4%	$3K	12	0
Harpers Ferry	JEFFERSON	31	$6,965K	$4,785K	69%	74%	$131K	4,683	30
Ranson	JEFFERSON	80	$5,305K	$16K	0.3%	4%	$2K	4	0
Shepherdstown	JEFFERSON	66	$18,724K	$1,058K	6%	8%	$14K	427	38
	JEFFERSON	**733**	**$104,685K**	**$12,052K**	**12%**	**30%**	**$21K**	**9,695**	**254**
Morgan County*	MORGAN	484	$69,867K	$7,057K	10%	41%	$16K	4,368	166
Bath	MORGAN	129	$35,224K	$2,621K	7%	10%	$11K	698	44
Paw Paw	MORGAN	30	$2,770K	$16K	1%	6%	$3K	19	0
	MORGAN	**643**	**$107,862K**	**$9,695K**	**9%**	**22%**	**$14K**	**5,085**	**210**
					Statewide	*17%*	*$6K*		

Damage Loss Tables

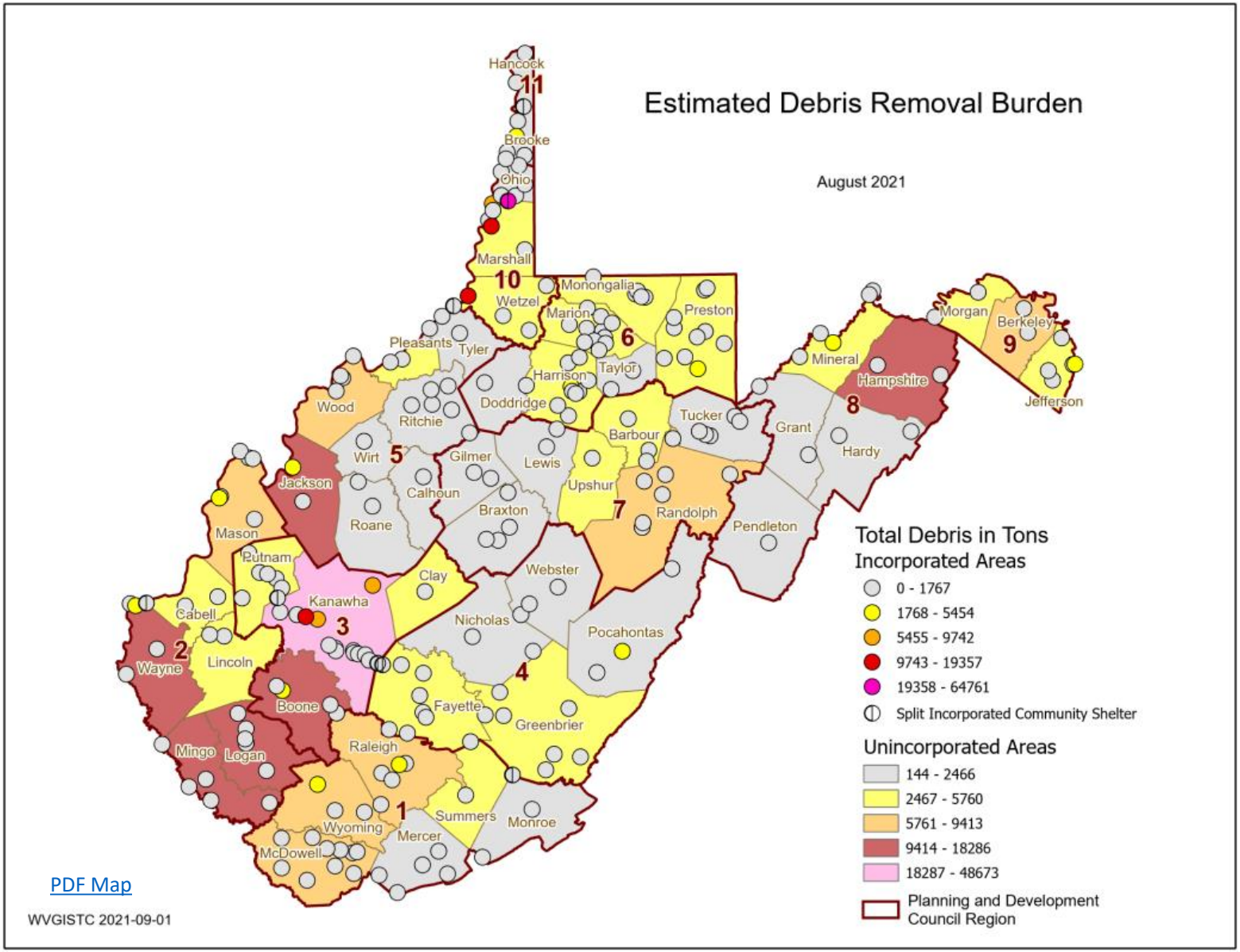
Generated using FEMA's Hazus flood loss software program for a 1%-annual-chance (100-yr) flood event

Flood Damage Visualizations

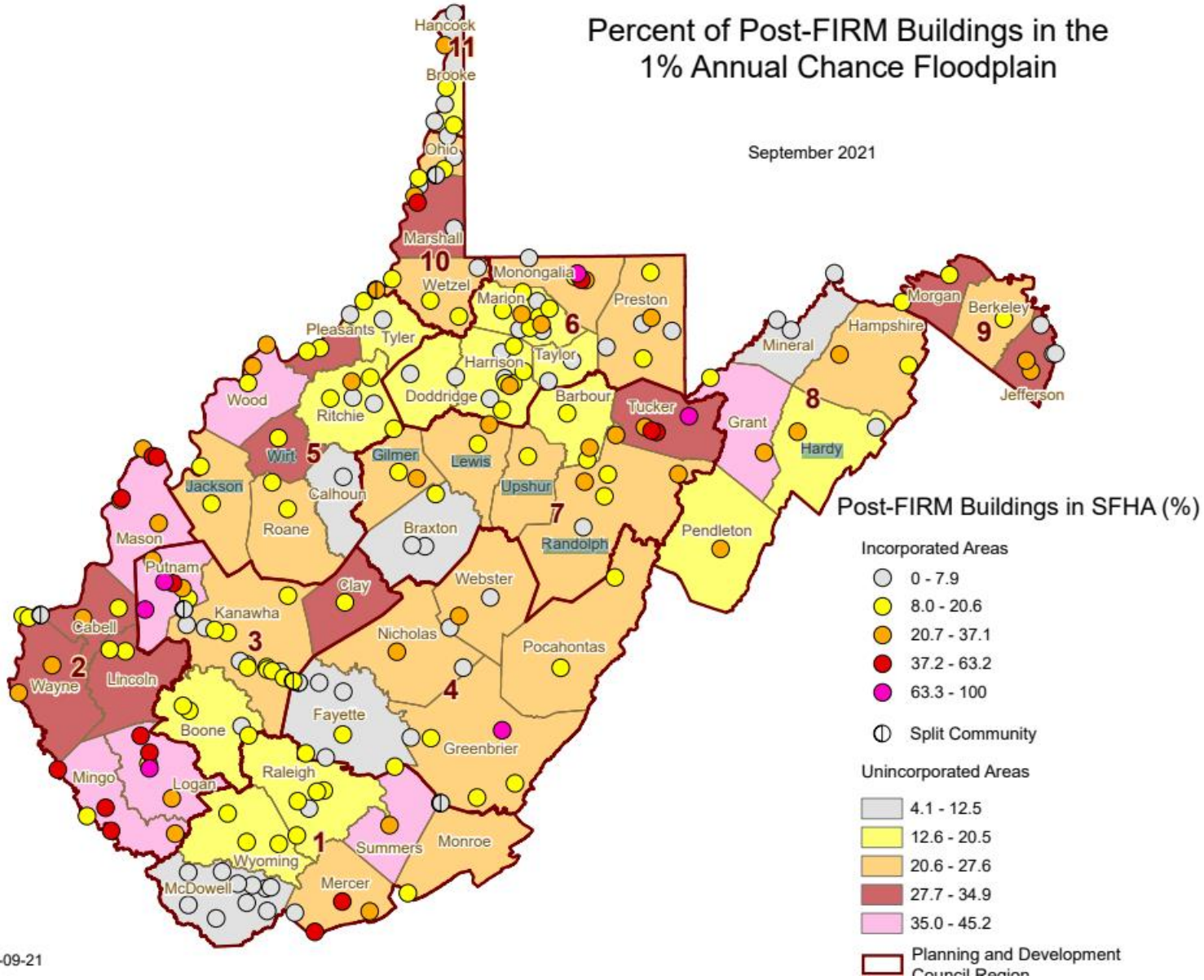
<< Harpers Ferry Flood Risk 3D Visualization Movie >>
https://data.wvgis.wvu.edu/pub/RA/_resources/3Dflood/HarpersFerry_Jefferson_3D_Flood_2020_mp4.mp4



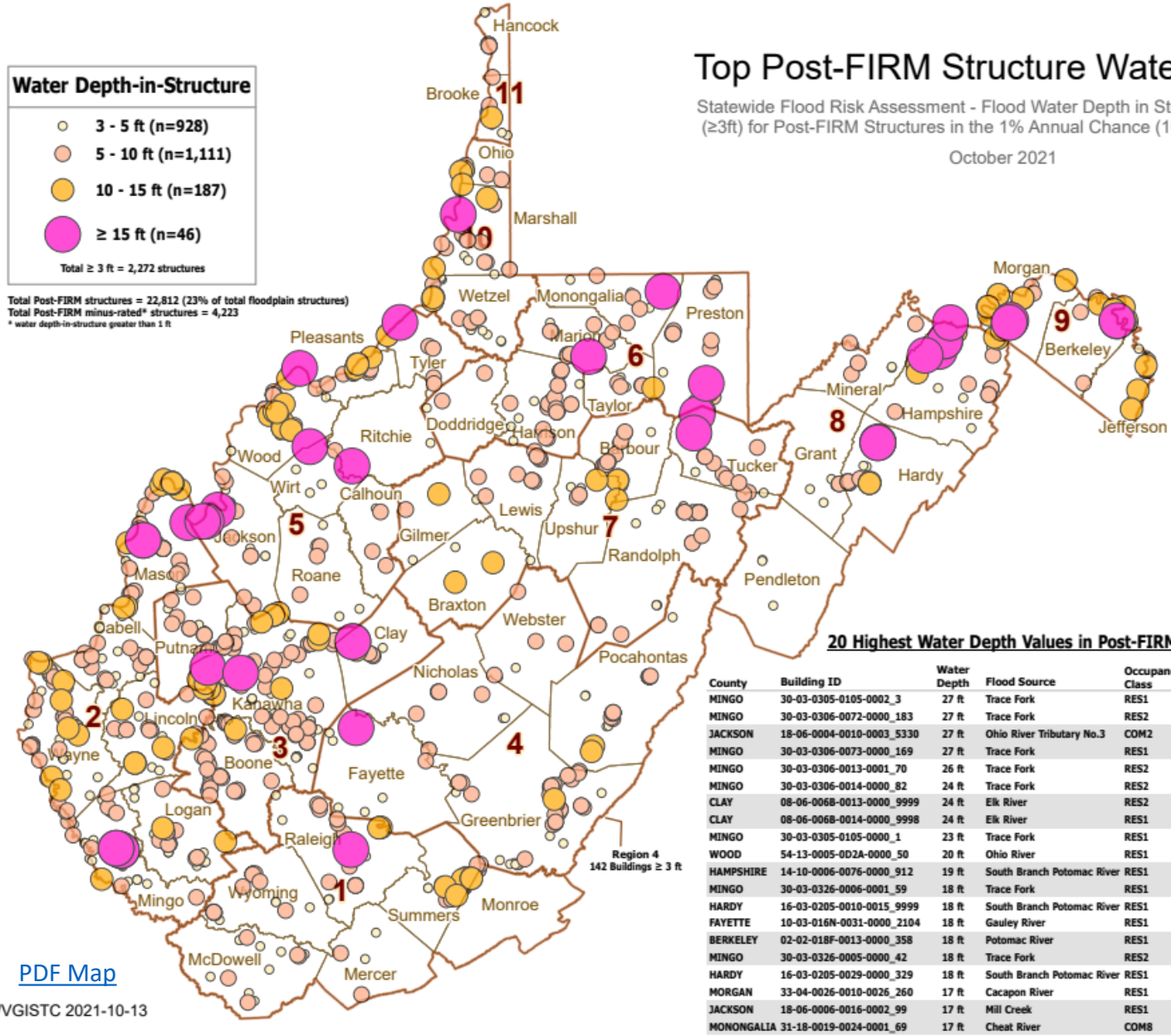
Debris Removal



Post-FIRM Structures (New Development)



Post-FIRM Minus-Rated Structures

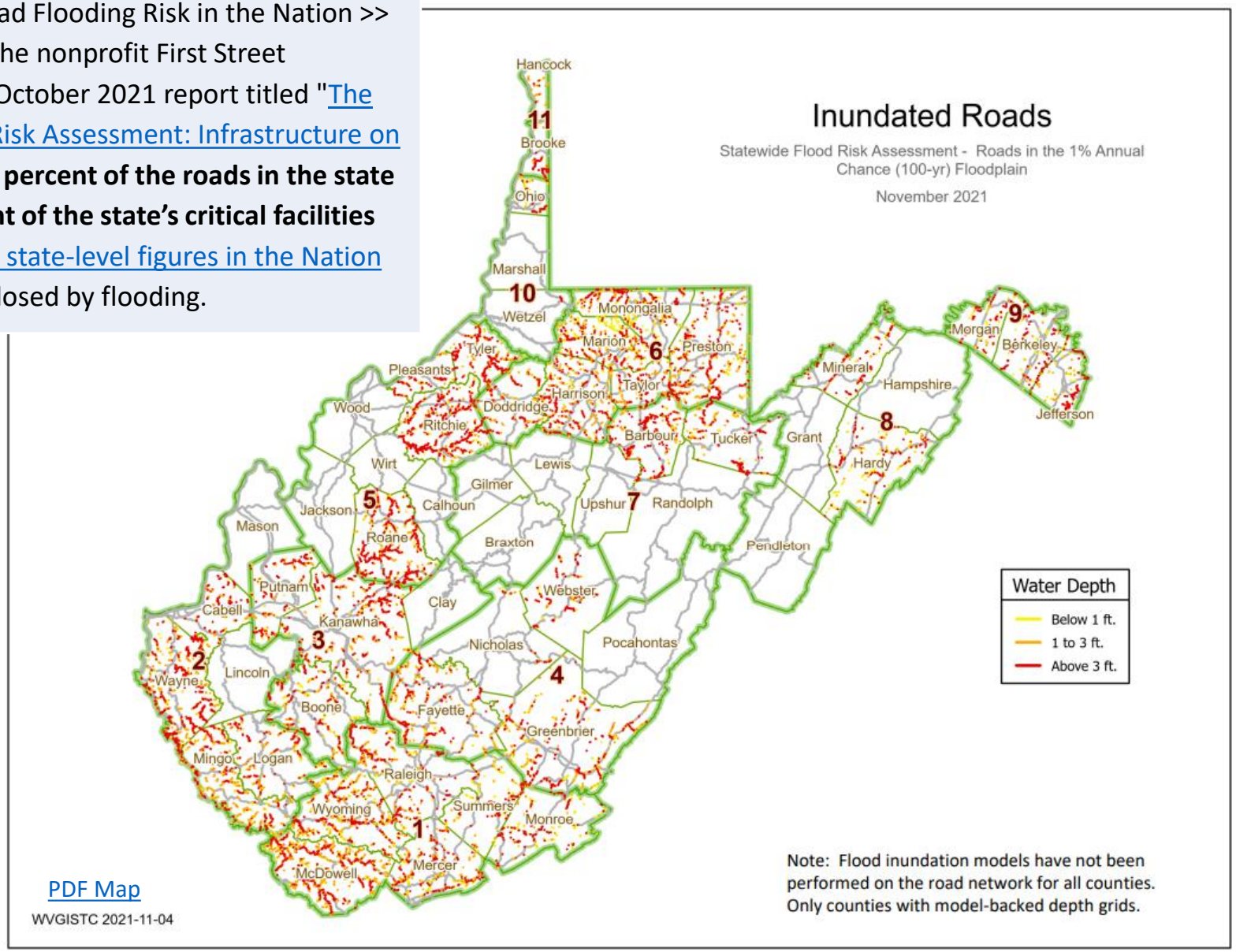


20 Highest Water Depth Values in Post-FIRM Structures

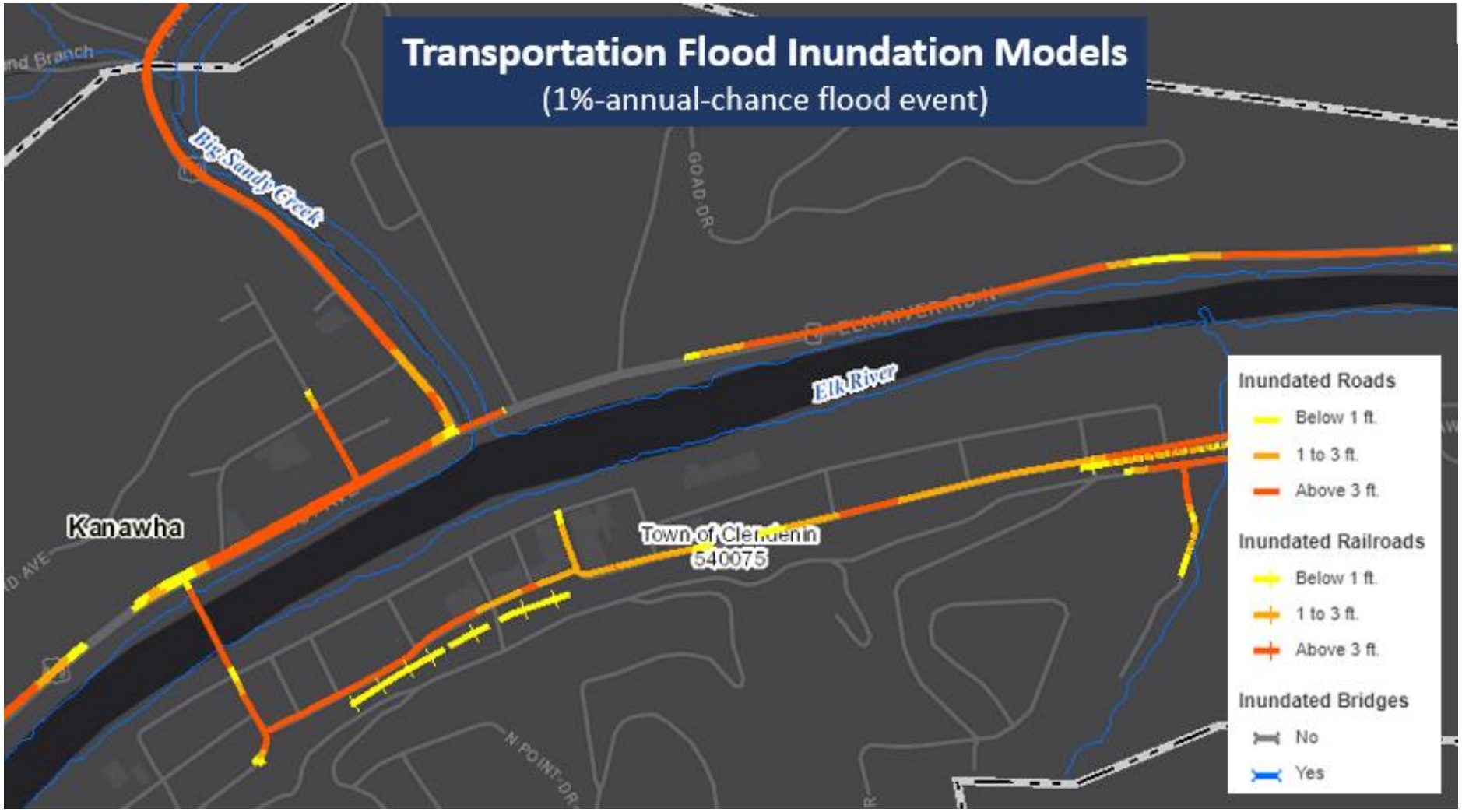
County	Building ID	Water Depth	Flood Source	Occupancy Class	Value	Loss %	Loss $
MINGO	30-03-0305-0105-0002_3	27 ft	Trace Fork	RES1	$132K	81%	$107K
MINGO	30-03-0306-0072-0000_183	27 ft	Trace Fork	RES2	$28K	100%	$28K
JACKSON	18-06-0004-0010-0003_5330	27 ft	Ohio River Tributary No.3	COM2	$1M	73%	$748K
MINGO	30-03-0306-0073-0000_169	27 ft	Trace Fork	RES1	$29K	84%	$24K
MINGO	30-03-0306-0013-0001_70	26 ft	Trace Fork	RES2	$14K	100%	$14K
MINGO	30-03-0306-0014-0000_82	24 ft	Trace Fork	RES2	$10K	100%	$10K
CLAY	08-06-006B-0013-0000_9999	24 ft	Elk River	RES2	$17K	100%	$17K
CLAY	08-06-006B-0014-0000_9998	24 ft	Elk River	RES1	$31K	84%	$26K
MINGO	30-03-0305-0105-0000_1	23 ft	Trace Fork	RES1	$62K	84%	$52K
WOOD	54-13-0005-0D2A-0000_50	20 ft	Ohio River	RES1	$62K	83%	$51K
HAMPSHIRE	14-10-0006-0076-0000_912	19 ft	South Branch Potomac River	RES1	$70K	83%	$58K
MINGO	30-03-0326-0006-0001_59	18 ft	Trace Fork	RES1	$73K	82%	$60K
HARDY	16-03-0205-0010-0015_9999	18 ft	South Branch Potomac River	RES1	$25K	82%	$20K
FAYETTE	10-03-016N-0031-0000_2104	18 ft	Gauley River	RES1	$49K	82%	$40K
BERKELEY	02-02-018F-0013-0000_358	18 ft	Potomac River	RES1	$68K	48%	$33K
MINGO	30-03-0326-0005-0000_42	18 ft	Trace Fork	RES2	$14K	95%	$13K
HARDY	16-03-0205-0029-0000_329	18 ft	South Branch Potomac River	RES1	$50K	82%	$41K
MORGAN	33-04-0026-0010-0026_260	17 ft	Cacapon River	RES1	$49K	82%	$40K
JACKSON	18-06-0006-0016-0002_99	17 ft	Mill Creek	RES1	$160K	82%	$131K
MONONGALIA	31-18-0019-0024-0001_69	17 ft	Cheat River	COM8	$896K	57%	$515K

Road Inundation: 1% Flood

<< Highest Road Flooding Risk in the Nation >>
According to the nonprofit First Street Foundation's October 2021 report titled "The 3rd National Risk Assessment: Infrastructure on the Brink," **46 percent of the roads in the state and 51 percent of the state's critical facilities** — the highest state-level figures in the Nation — would be closed by flooding.



Road Inundation: 1% Flood



Road Inundation Models

Community Name	County	Roads in Flood Plain (miles)	Roads Flooded (miles)	Roads Below 1ft (Ratio)	Roads 1 to 3ft (Ratio)	Roads Above 3ft (Ratio)
Berkeley County*	BERKELEY	25.7	17.0	21%	22%	57%
Martinsburg	BERKELEY	0.8	0.5	60%	20%	20%
	BERKELEY	**26.5**	**17.5**	**22%**	**22%**	**55%**
Bath	MORGAN	1.7	1.5	7%	47%	47%
Morgan County*	MORGAN	35.7	22.0	13%	17%	70%
Paw Paw	MORGAN	0.7	0.1	0%	0%	100%
	MORGAN	**38.1**	**23.6**	**13%**	**19%**	**69%**

1%-annual-chance (100-yr) flood event

US 522 *Warm Spring Run*

I-81 *Middle Creek*

Population in Floodplains

Unincorporated Areas

County Unincorporated	WV RPDC Region	% of Population Residing in High-Risk Flood Zone
Boone County*	3	42%
Logan County*	2	37%
McDowell County*	1	34%
Lincoln County*	2	33%
Mingo County*`	2	31%
Tyler County*	5	29%
Wetzel County*	10	29%
Doddridge County*	6	28%
Webster County*	4	28%
Clay County*	3	28%
Wyoming County*	1	25%
Pendleton County*	8	23%
Kanawha County*	3	23%
Wirt County*	5	21%
Tucker County*	7	20%
Summers County*	1	18%
Wayne County*	2	17%
Ritchie County*	5	17%
Pocahontas County*	4	16%
Calhoun County*	5	16%

Incorporated Places

Community Name	County	% of Population Residing in High-Risk Flood Zone
Keystone	MCDOWELL	100%
Northfork	MCDOWELL	100%
Rhodell	RALEIGH	100%
Henderson	MASON	100%
Friendly	TYLER	100%
Anawalt	MCDOWELL	87%
Kimball	MCDOWELL	86%
Sylvester	BOONE	86%
Gary	MCDOWELL	77%
Nitro**	KANAWHA & PUTNAM	70%
Hartford	MASON	66%
Marlinton	POCAHONTAS	65%
Valley Grove	OHIO	64%
Bruceton Mills	PRESTON	60%
Smithfield	WETZEL	60%
Harman	RANDOLPH	58%
Wellsburg	BROOKE	56%
Clendenin	KANAWHA	56%
Buffalo	PUTNAM	54%
Kermit	MINGO	52%

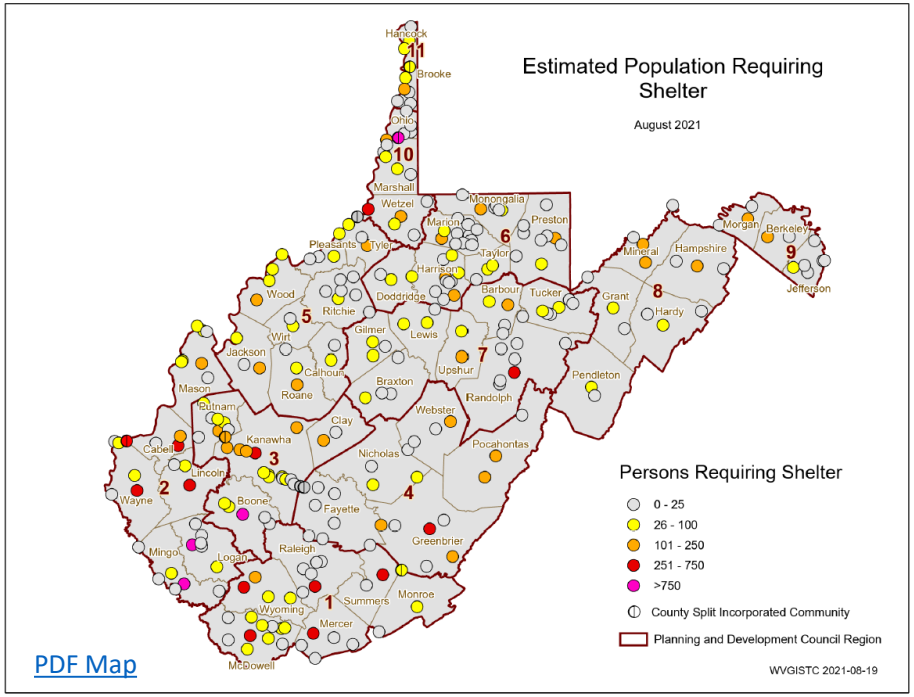
** Split Community

Data Source

12% of West Virginia's total population live in the high-risk flood zones

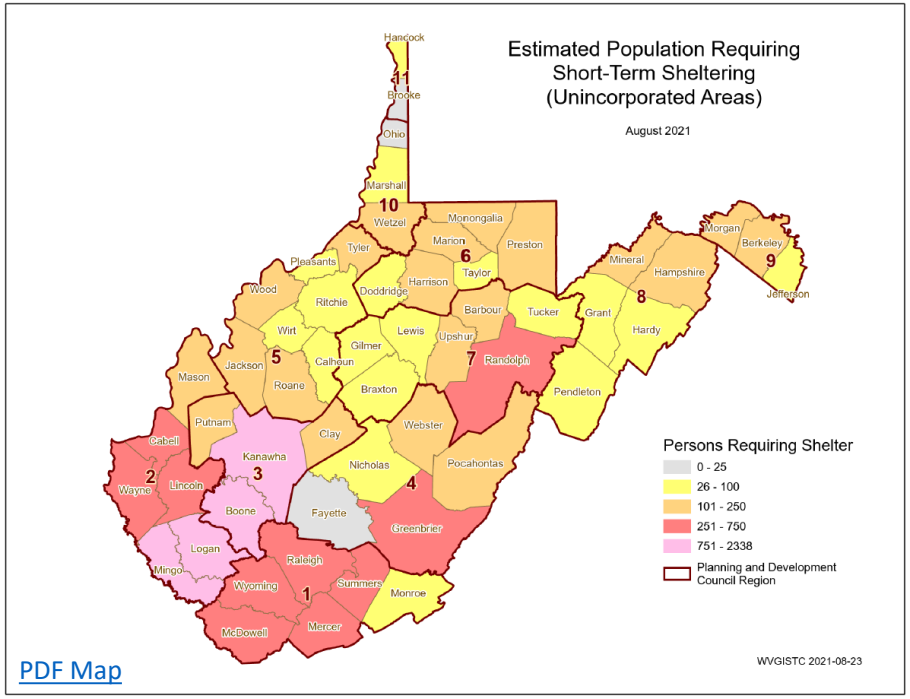
Short-Term Shelter Needs

Incorporated Areas



PDF Map

Unincorporated Areas



PDF Map

Generated using FEMA's Hazus flood loss guidelines for a 1%-annual-chance (100-yr) flood event

Population Change

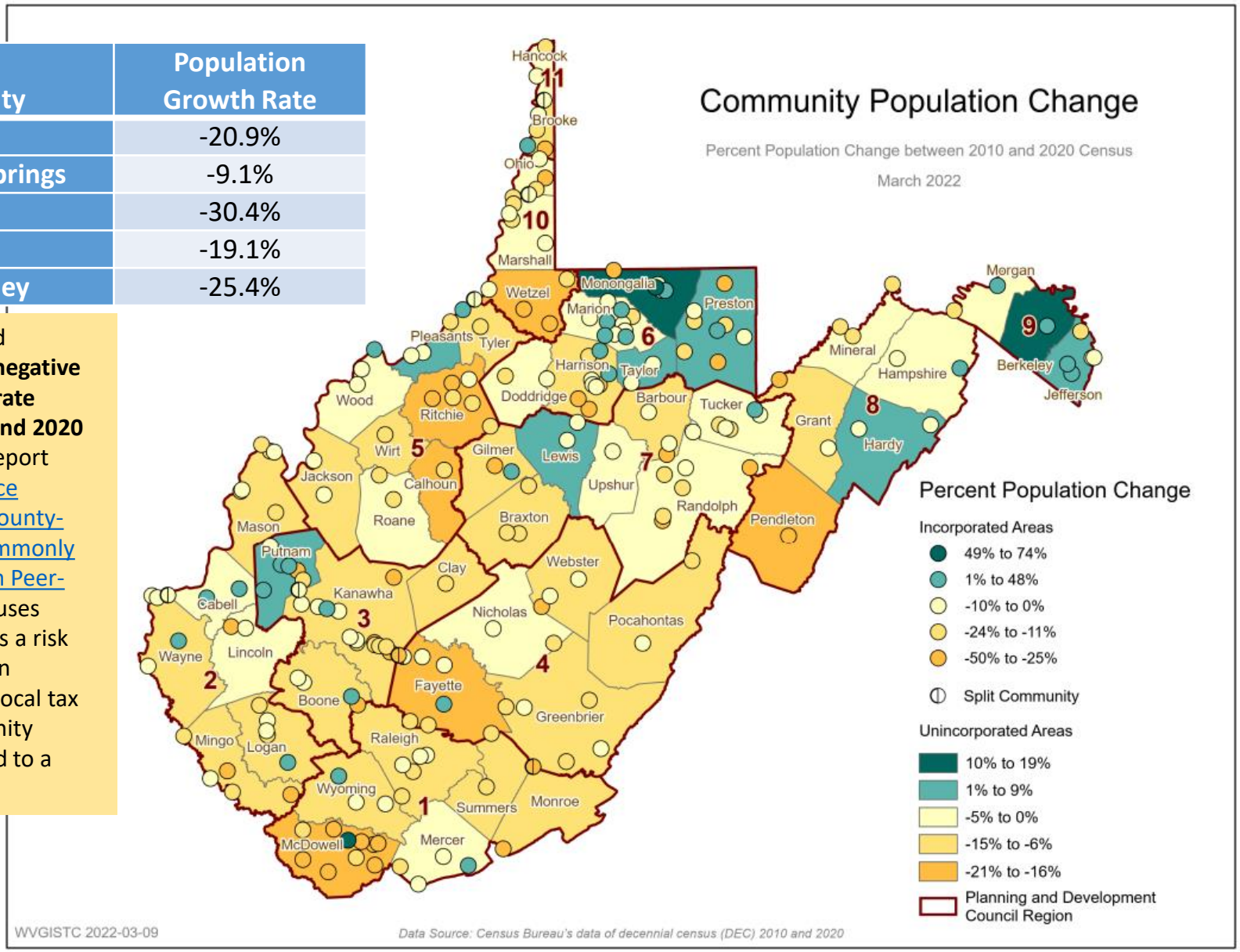
Municipality	Population Growth Rate
Rainelle	-20.9%
White Sulphur Springs	-9.1%
Clendenin	-30.4%
Richwood	-19.1%
Camden-on-Gauley	-25.4%

These disadvantaged communities had a **negative population growth rate between the 2010 and 2020 censuses.** FEMA's report Community Resilience Indicator Analysis: County-Level Analysis of Commonly Used Indicators from Peer-Reviewed Research uses population change as a risk factor. A reduction in population reduces local tax income and community resources to respond to a disaster.

Data Source

Community Map

County Map



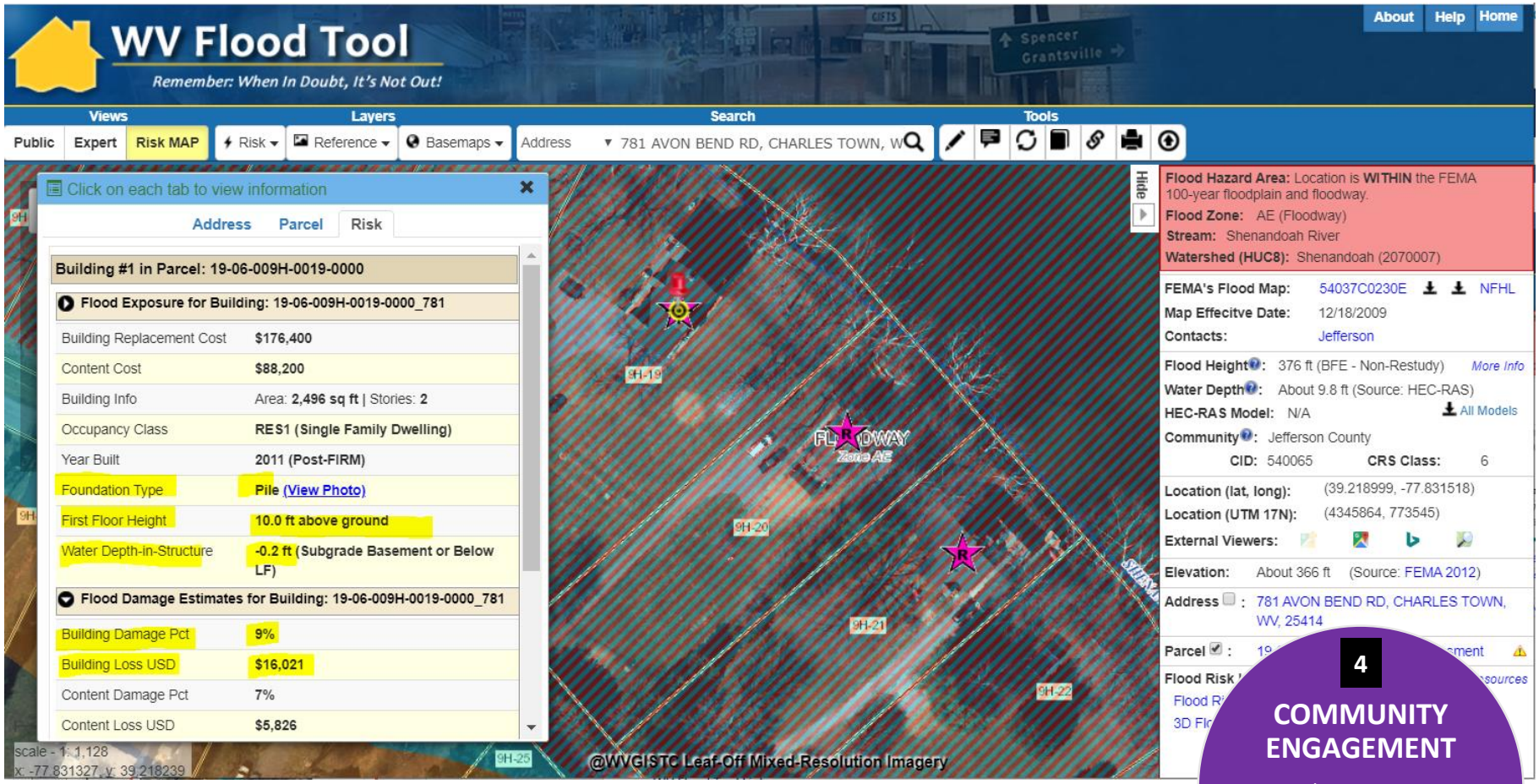
State Risk Assessment

- DATA FIELD VERIFICATION of MITIGATED PROPERTIES
- COMMUNITY ENGAGMENT
- IDENTIFY MITIGATED ACTIONS FOR HAZARD MITIGATION PLANS

What mitigation actions can be identified

Field Verification

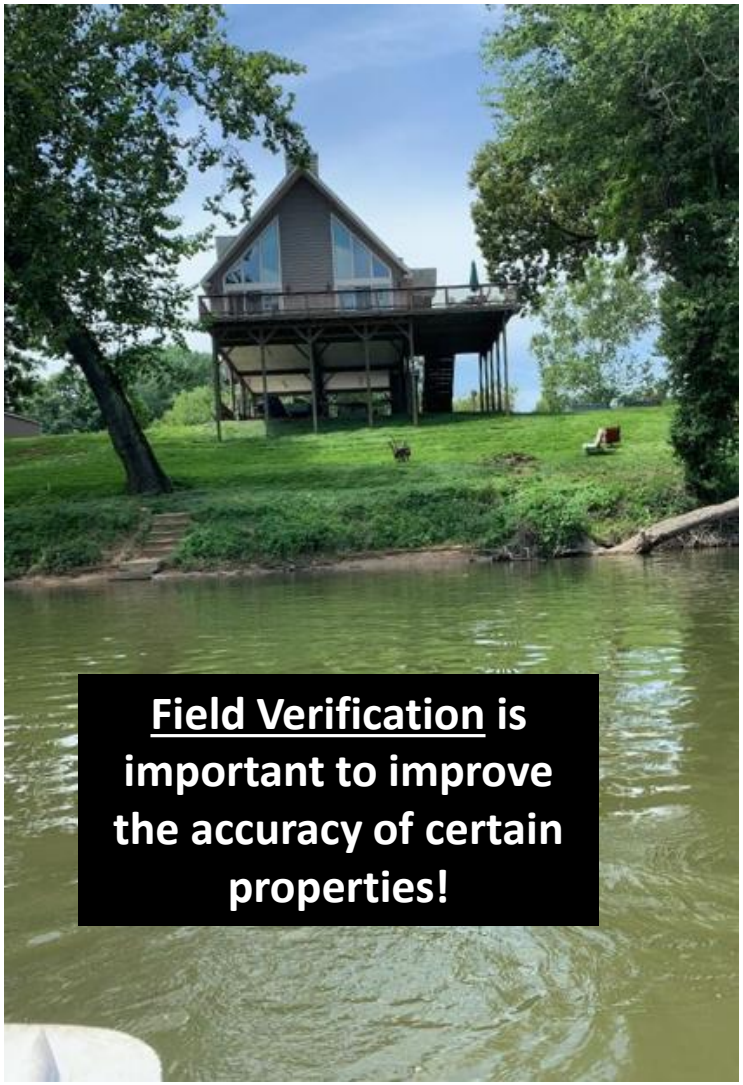
Modified Foundation Type and First Floor Height – Rerun Hazus Flood Loos Model



781 Avon Bend Road, Charles Town, WV 25414
Parcel ID: 19-06-009H-0019-0000
Building ID: 19-06-009H-0019-0000_781
WV Flood Tool Link:
https://mapwv.gov/flood/map/?wkid=102100&x=-8664165&y=4753090&l=13&v=1

4
COMMUNITY ENGAGEMENT
Risk Assessment
Data Verification
Mitigation Actions Identified

Field Verification



Field Verified from Shenandoah River

Field Verification of the structure located at 781 Avon Bend Road in Charles Town along the Shenandoah River in the **Regulatory Floodway** reveals that this **Post-FIRM** (2011) structure is built on a **piles foundation**. The Foundation Type/First Floor Height will be changed in the Building Inventory and the OpenHazus Flood Assessment Structure Tool (FAST) utility executed again for this structure.

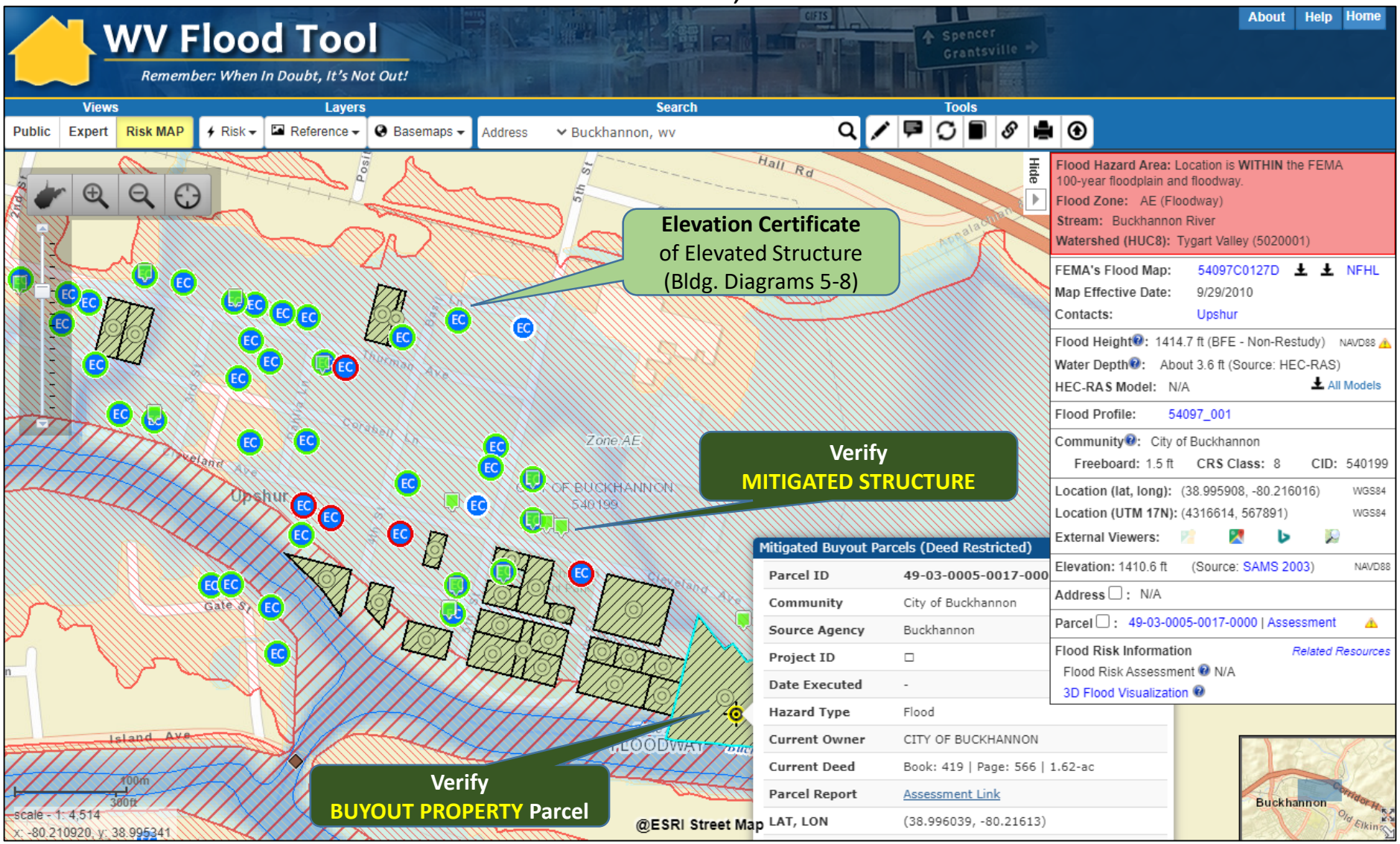
The estimated Base Flood Water Depth for this structure is 10 feet.

781 Avon Bend Road, Charles Town, WV 25414
Building ID 19-06-009H-0019-0000_781

WV Flood Tool Link:
https://mapwv.gov/flood/map/?wkid=102100&x=-8664165&y=4753090&l=13&v=1

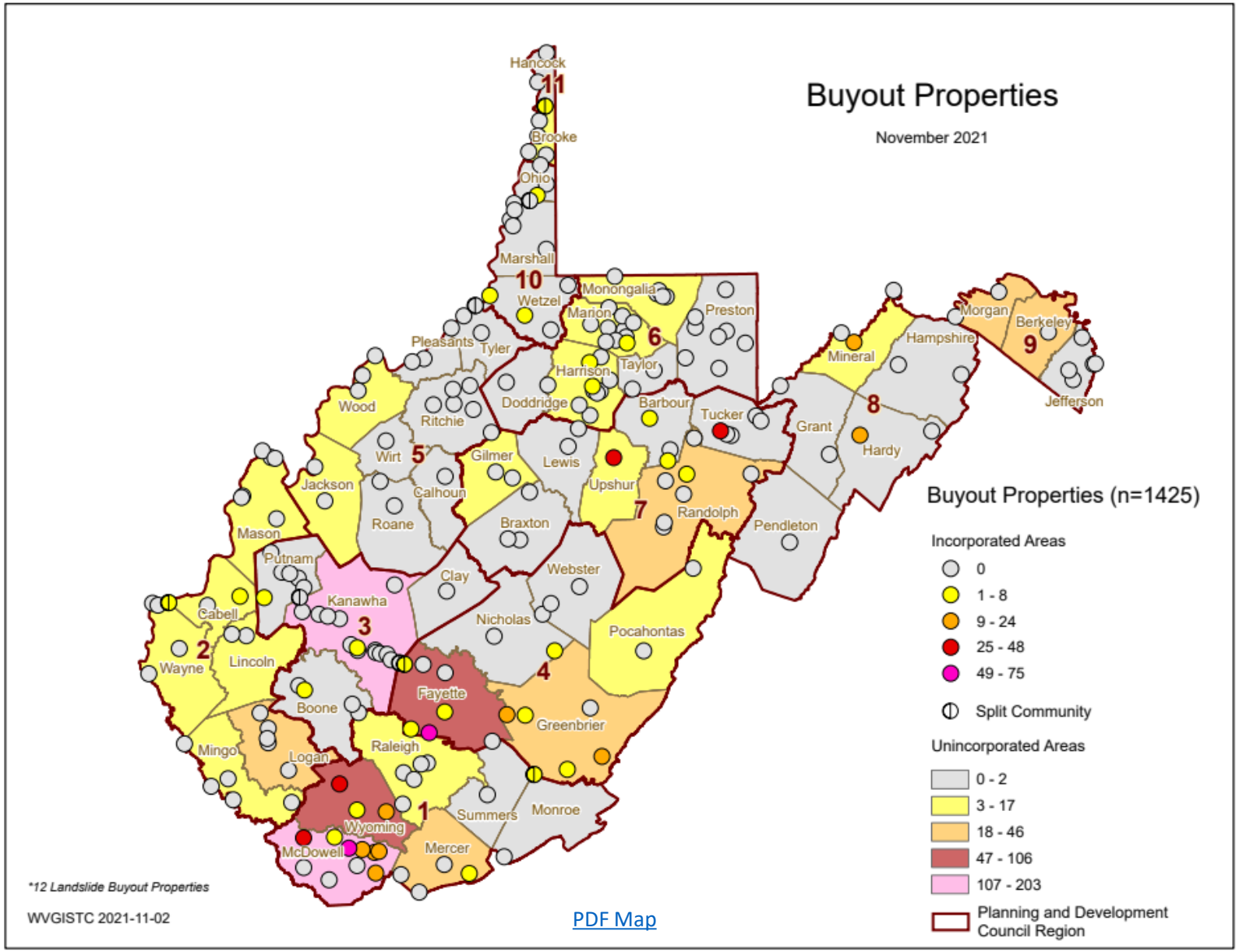
Mitigated Properties - Verification

Buckhannon, WV



https://mapwv.gov/flood/map/?wkid=102100&x=-8929946&y=4721378&l=10&v=2

Buyout Properties



Mitigated Structure – EC Bldg. #6

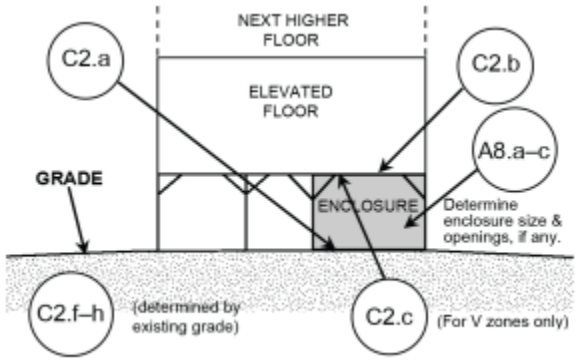
Building Diagram 6: Elevated Building with Enclosure (using piers, piles, posts)

Partial Enclosure

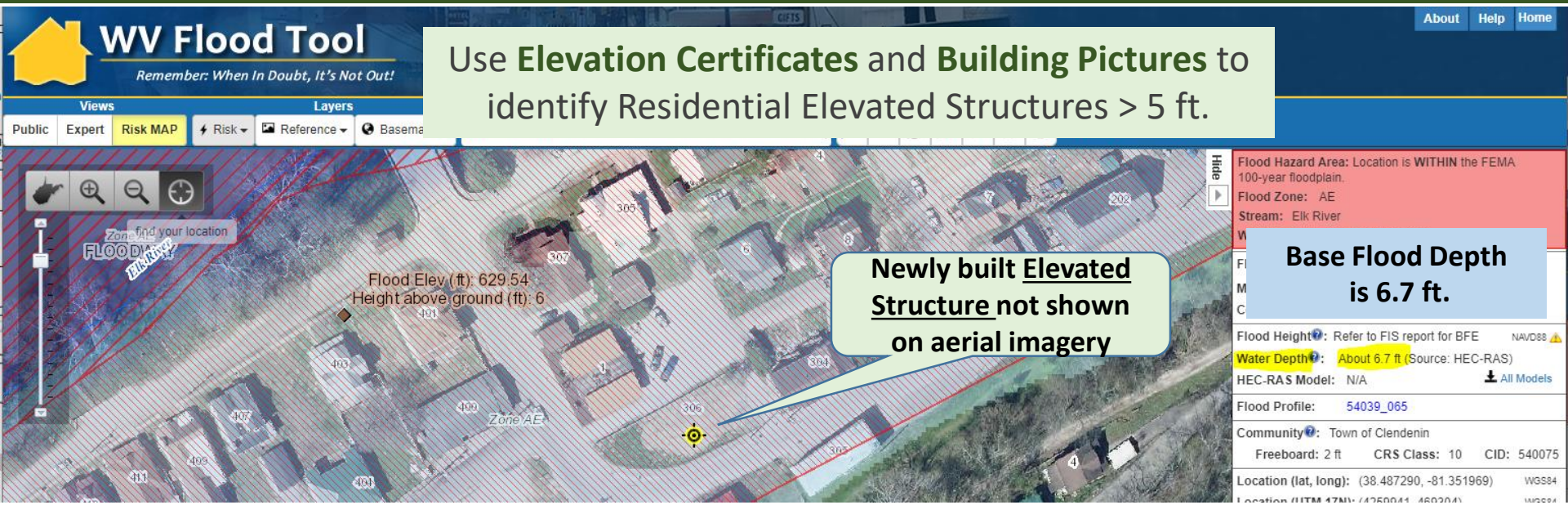
DIAGRAM 6

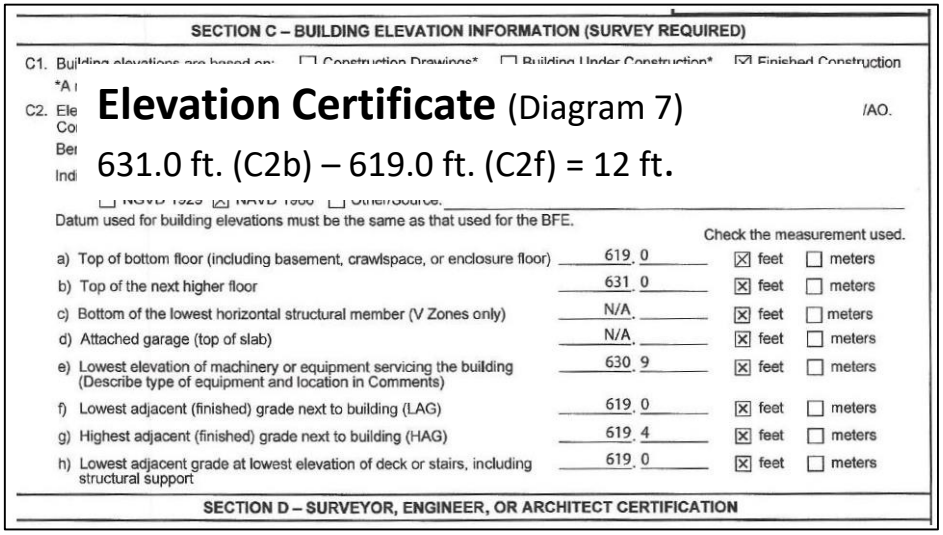
All buildings elevated on piers, posts, piles, columns, or parallel shear walls with full or partial enclosure below the elevated floor.

Distinguishing Feature – For all zones, the area below the elevated floor is enclosed, either partially or fully. In A Zones, the partially or fully enclosed area below the elevated floor is with or without openings** present in the walls of the enclosure. Indicate information about enclosure size and openings in Section A – Property Information.



Mitigated Structure – First Floor Height





Elevation Certificate (Diagram 7)

631.0 ft. (C2b) – 619.0 ft. (C2f) = 12 ft.

SECTION C – BUILDING ELEVATION INFORMATION (SURVEY REQUIRED)

C1. Building elevations are based on: ☐ Construction Drawings* ☐ Building Under Construction* ☒ Finished Construction

*A

C2. Ele
Co
Ber
Ind
/AO.

☐ NGVD 1929 ☒ NAVD 1988 ☐ Other/Source:

Datum used for building elevations must be the same as that used for the BFE.

		Check the measurement used.	
a) Top of bottom floor (including basement, crawlspace, or enclosure floor)	619.0	☒ feet	☐ meters
b) Top of the next higher floor	631.0	☒ feet	☐ meters
c) Bottom of the lowest horizontal structural member (V Zones only)	N/A	☒ feet	☐ meters
d) Attached garage (top of slab)	N/A	☒ feet	☐ meters
e) Lowest elevation of machinery or equipment servicing the building (Describe type of equipment and location in Comments)	630.9	☒ feet	☐ meters
f) Lowest adjacent (finished) grade next to building (LAG)	619.0	☒ feet	☐ meters
g) Highest adjacent (finished) grade next to building (HAG)	619.4	☒ feet	☐ meters
h) Lowest adjacent grade at lowest elevation of deck or stairs, including structural support	619.0	☒ feet	☐ meters

SECTION D – SURVEYOR, ENGINEER, OR ARCHITECT CERTIFICATION

https://www.mapwv.gov/flood/map/?wkid=102100&x=-9056061&y=4648497&l=12&v=1

Example Mitigated Structure

Elevated Building on Solid Foundation Walls (Full-Story)

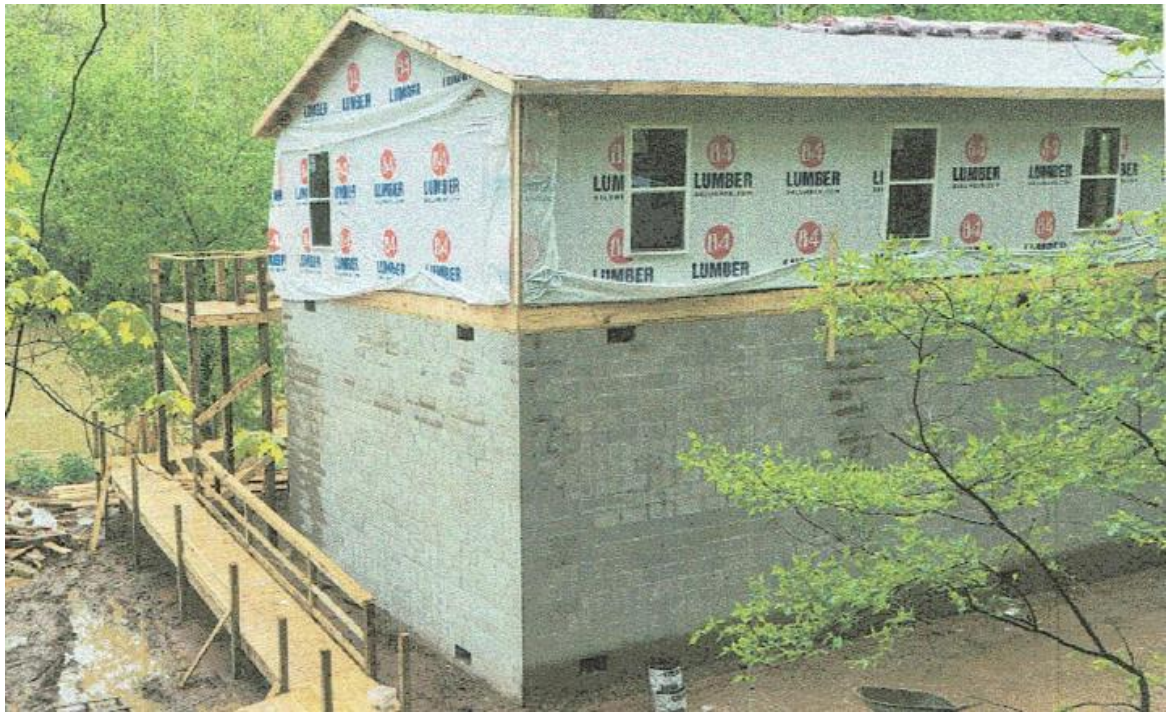
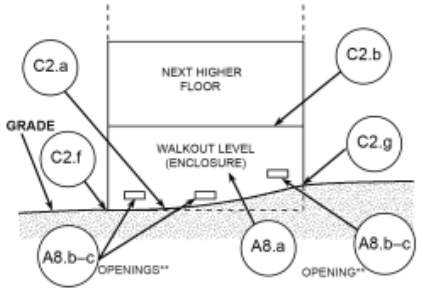


DIAGRAM 7

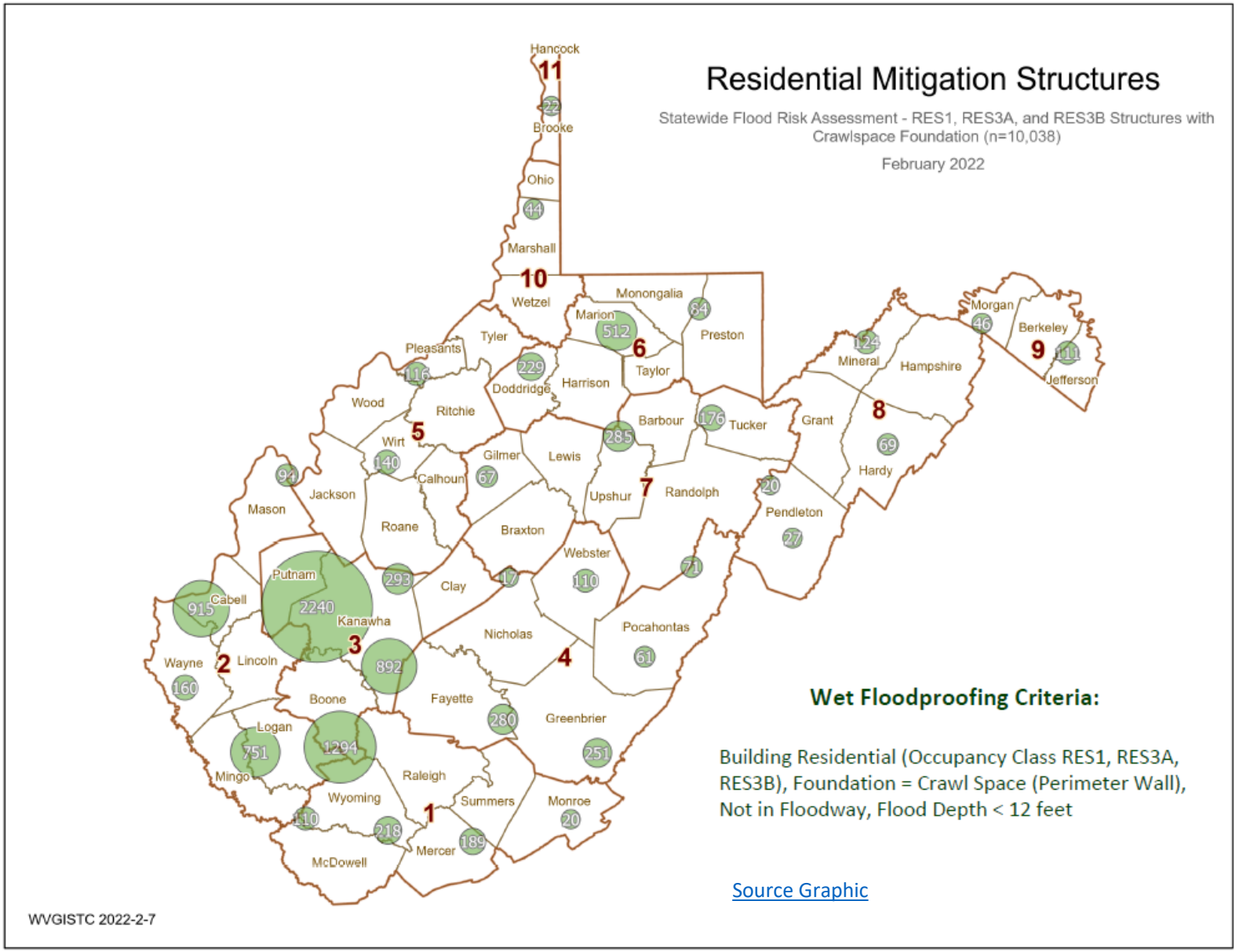
All buildings elevated on full-story foundation walls with a partially or fully enclosed area below the elevated floor. This includes walkout levels, where at least 1 side is at or above grade. The principal use of this building is located in the elevated floors of the building.

Distinguishing Feature – For all zones, the area below the elevated floor is enclosed, either partially or fully. In A Zones, the partially or fully enclosed area below the elevated floor is with or without openings** present in the walls of the enclosure. Indicate information about enclosure size and openings in Section A – Property Information.

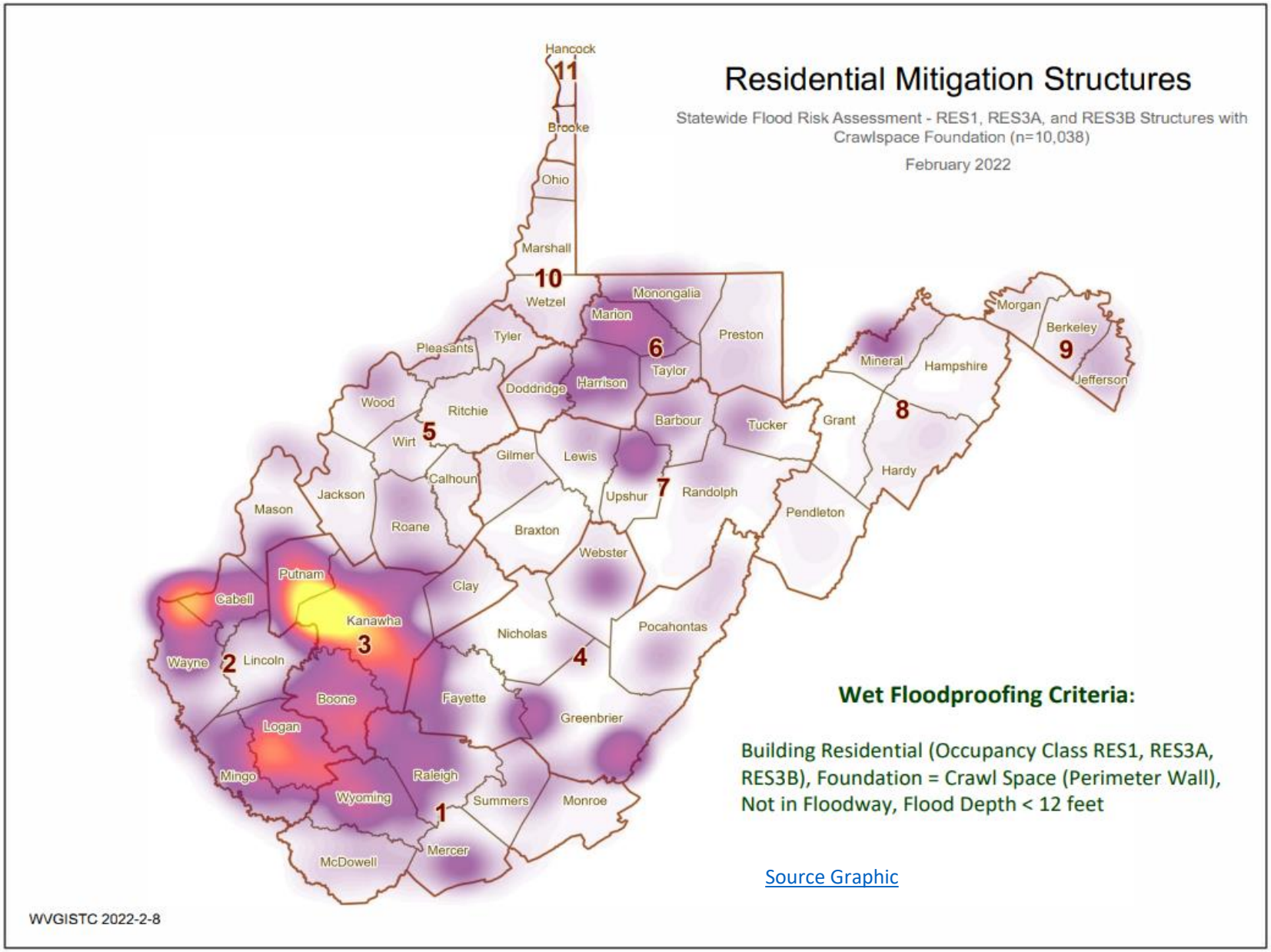


Building 08-06-0006-0058-0001 on the Elk River in Clay County

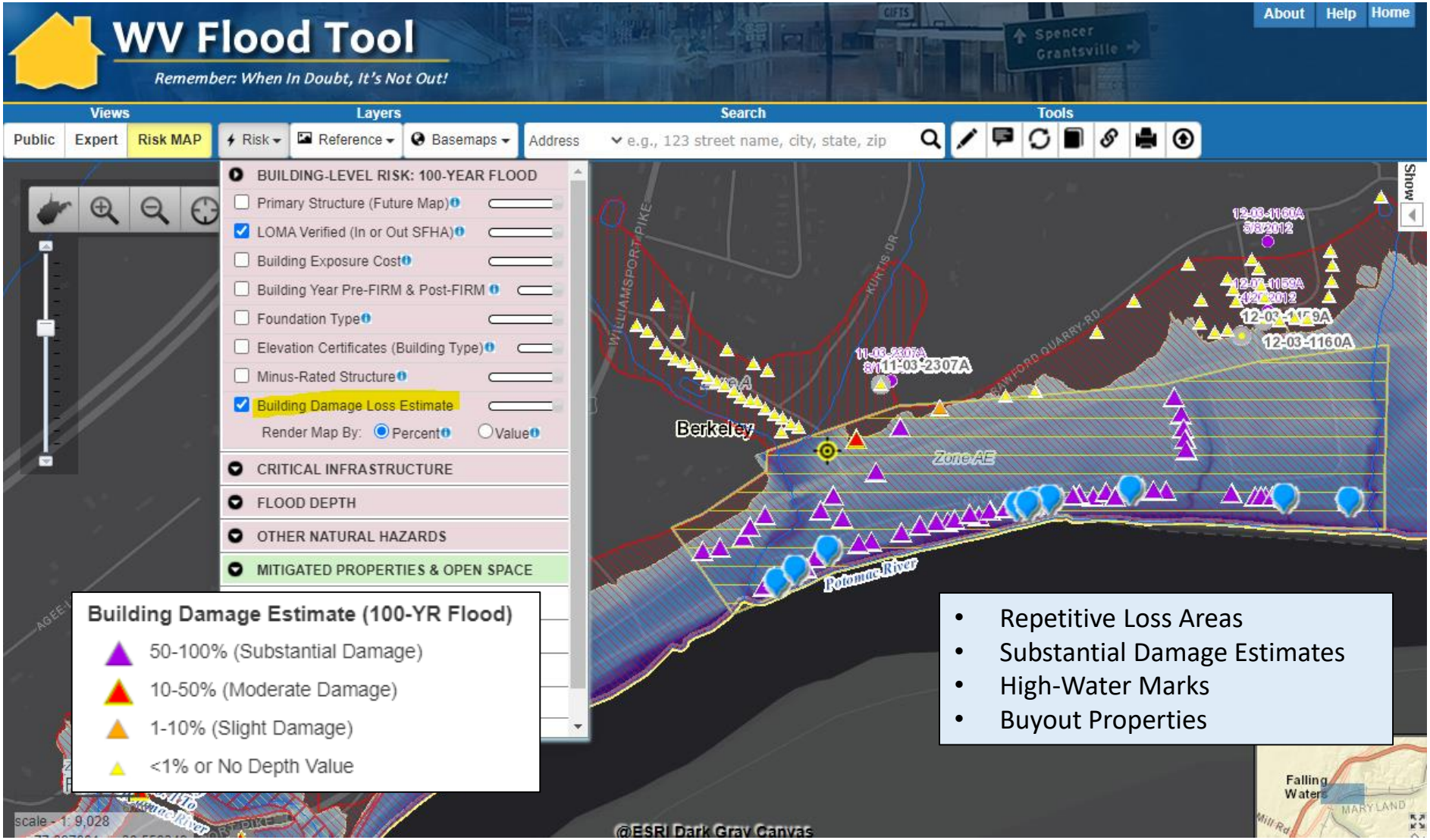
Potential Structures for Mitigation



Potential Structures for Wet Floodproofing



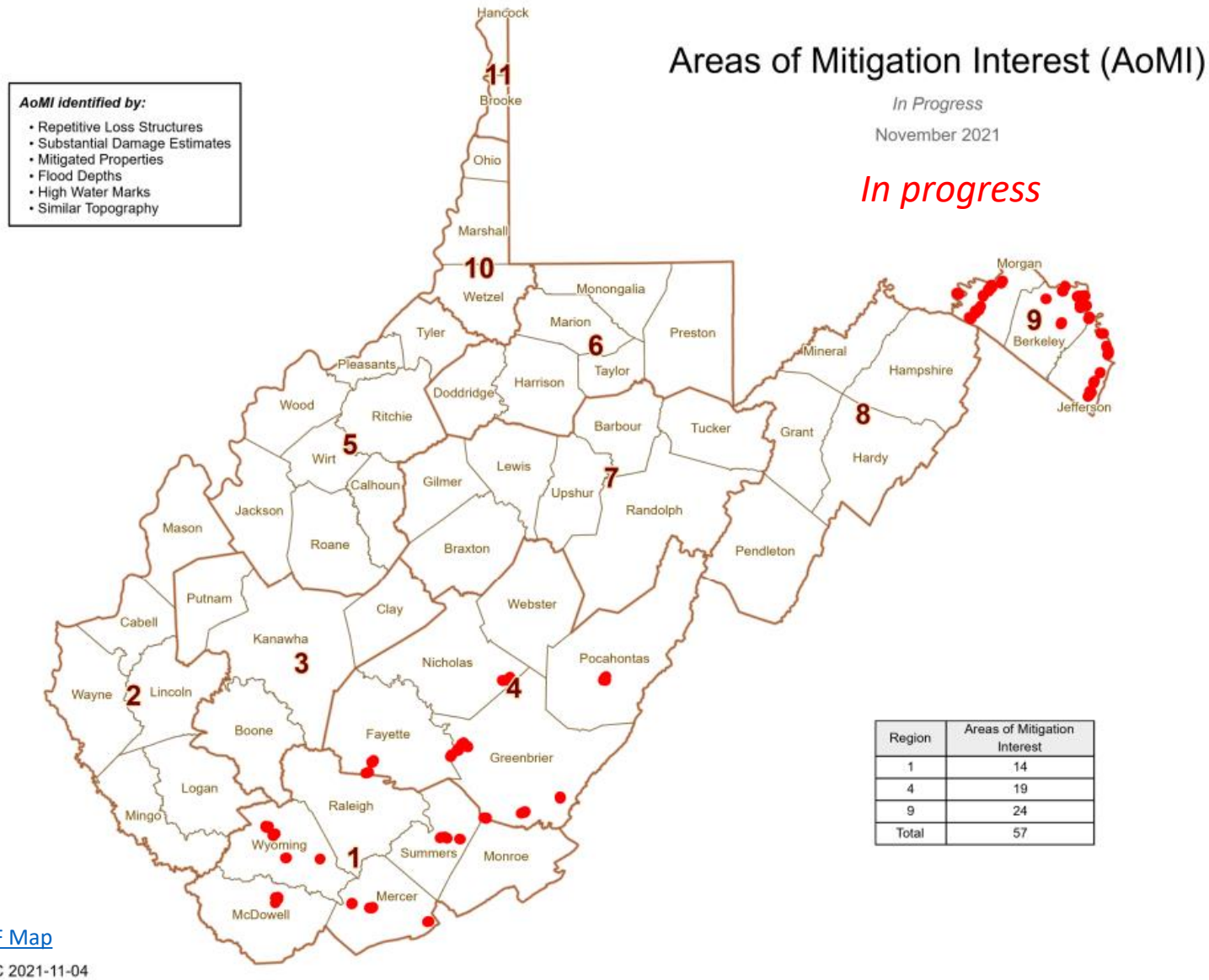
Areas of Mitigation Interests / Repetitive Loss Areas



- Repetitive Loss Areas
- Substantial Damage Estimates
- High-Water Marks
- Buyout Properties

https://www.mapwv.gov/flood/map/?wkid=102100&x=-8669471&y=4802931&l=9&v=2

Areas of Mitigation (AoMI) Interest

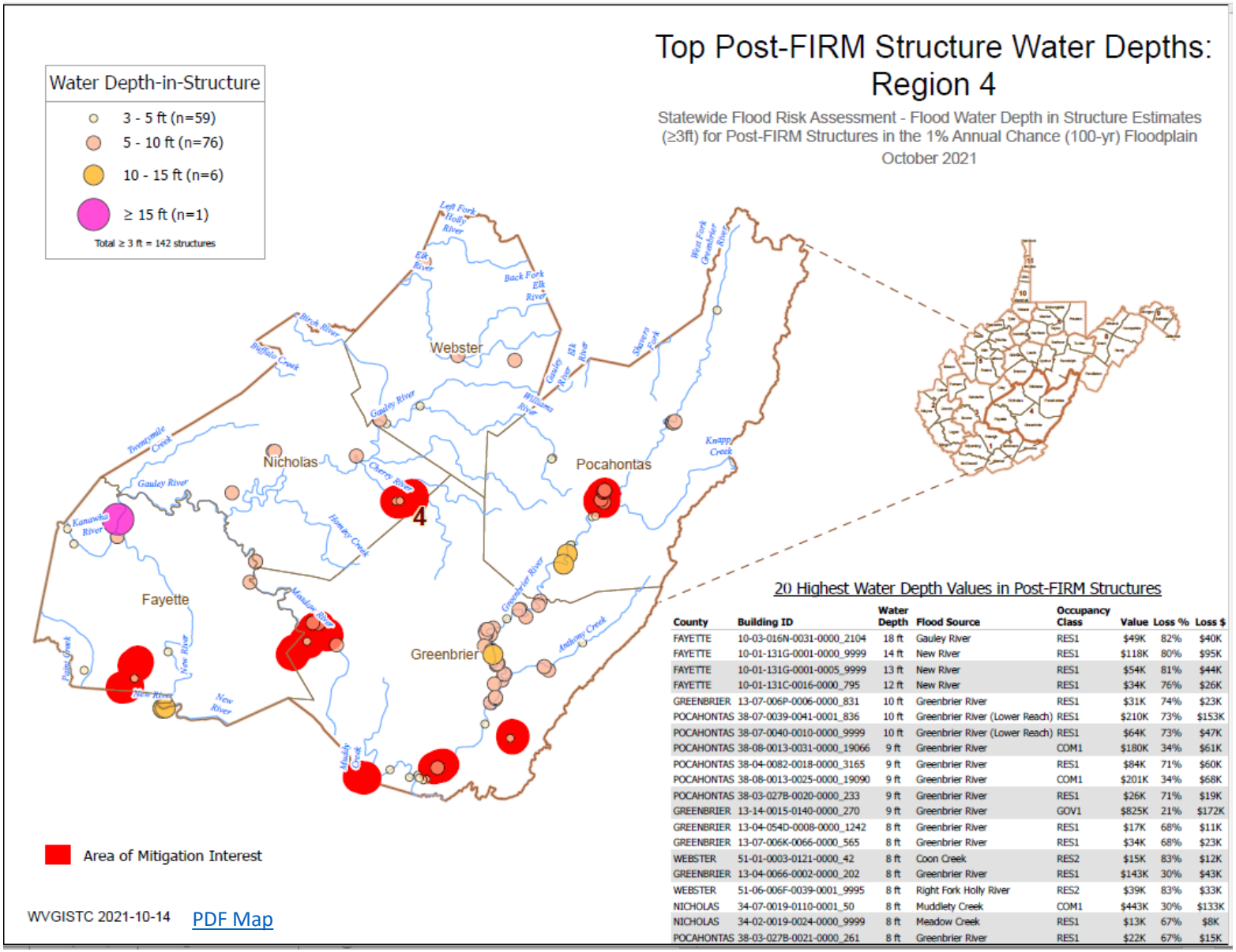


Region	Areas of Mitigation Interest
1	14
4	19
9	24
Total	57

PDF Map

WVGISTC 2021-11-04

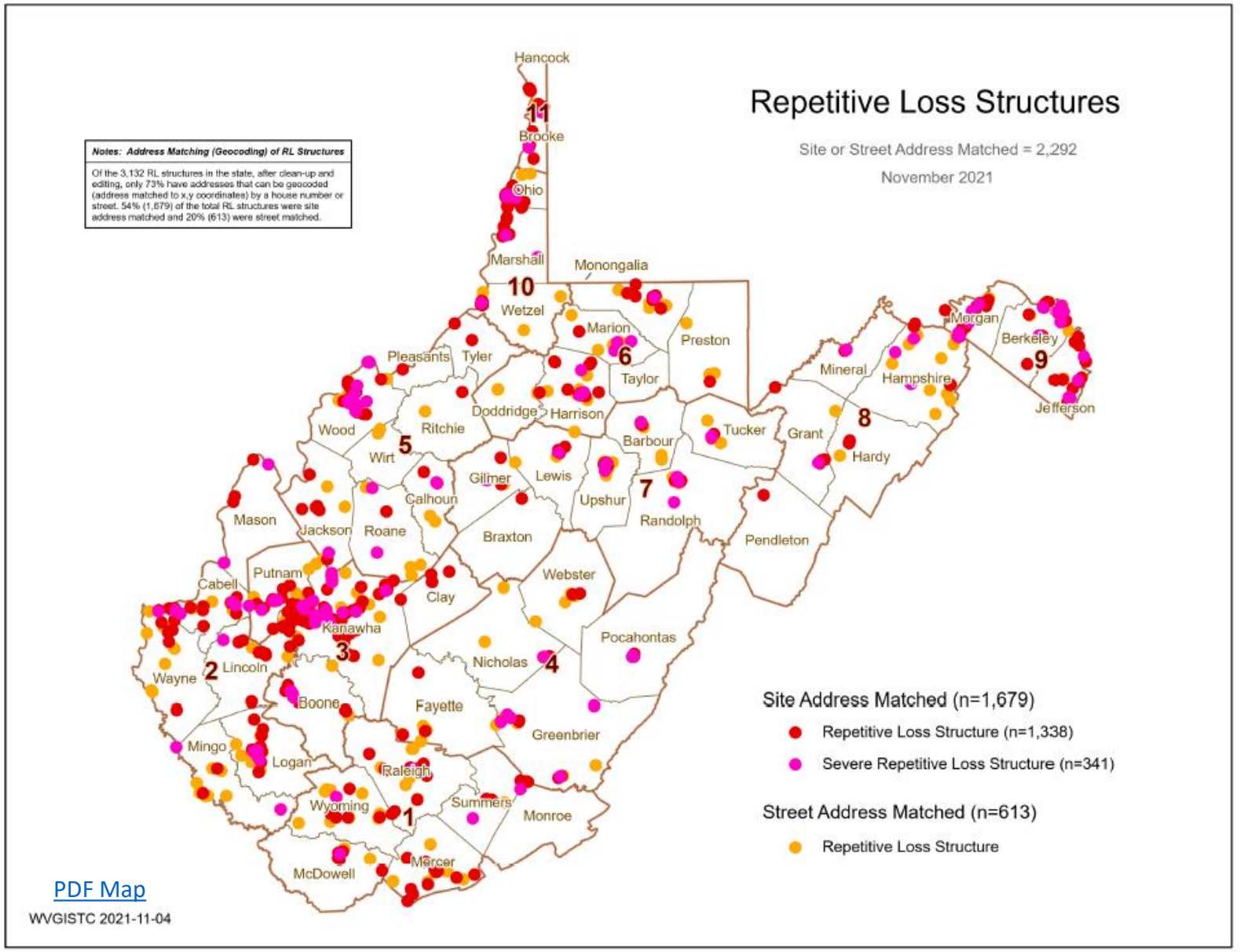
Areas of Mitigation (AoMI) Interest



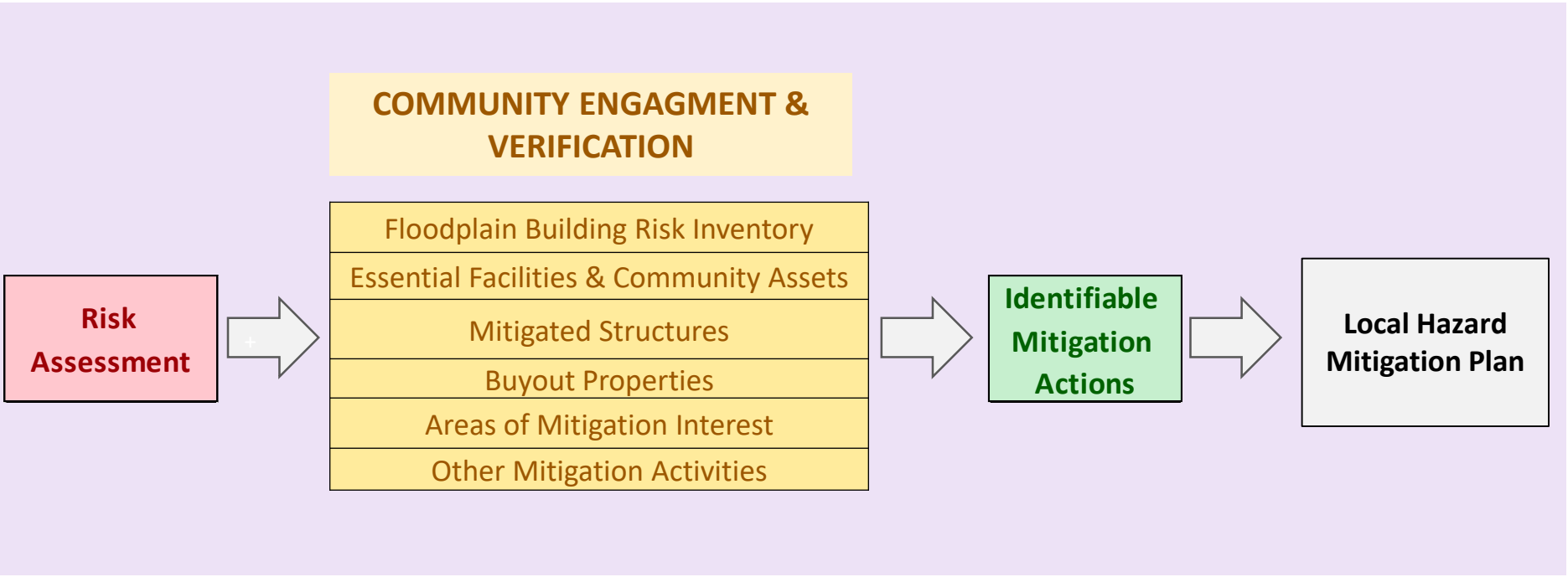
20 Highest Water Depth Values in Post-FIRM Structures

County	Building ID	Water Depth	Flood Source	Occupancy Class	Value	Loss %	Loss $
FAYETTE	10-03-016N-0031-0000_2104	18 ft	Gauley River	RES1	$49K	82%	$40K
FAYETTE	10-01-131G-0001-0000_9999	14 ft	New River	RES1	$118K	80%	$95K
FAYETTE	10-01-131G-0001-0005_9999	13 ft	New River	RES1	$54K	81%	$44K
FAYETTE	10-01-131C-0016-0000_795	12 ft	New River	RES1	$34K	76%	$26K
GREENBRIER	13-07-006P-0006-0000_831	10 ft	Greenbrier River	RES1	$31K	74%	$23K
POCAHONTAS	38-07-0039-0041-0001_836	10 ft	Greenbrier River (Lower Reach)	RES1	$210K	73%	$153K
POCAHONTAS	38-07-0040-0010-0000_9999	10 ft	Greenbrier River (Lower Reach)	RES1	$64K	73%	$47K
POCAHONTAS	38-08-0013-0031-0000_19066	9 ft	Greenbrier River	COM1	$180K	34%	$61K
POCAHONTAS	38-04-0082-0018-0000_3165	9 ft	Greenbrier River	RES1	$84K	71%	$60K
POCAHONTAS	38-08-0013-0025-0000_19090	9 ft	Greenbrier River	COM1	$201K	34%	$68K
POCAHONTAS	38-03-027B-0020-0000_233	9 ft	Greenbrier River	RES1	$26K	71%	$19K
GREENBRIER	13-14-0015-0140-0000_270	9 ft	Greenbrier River	GOV1	$825K	21%	$172K
GREENBRIER	13-04-054D-0008-0000_1242	8 ft	Greenbrier River	RES1	$17K	68%	$11K
GREENBRIER	13-07-006K-0066-0000_565	8 ft	Greenbrier River	RES1	$34K	68%	$23K
WEBSTER	51-01-0003-0121-0000_42	8 ft	Coon Creek	RES2	$15K	83%	$12K
GREENBRIER	13-04-0066-0002-0000_202	8 ft	Greenbrier River	RES1	$143K	30%	$43K
WEBSTER	51-06-006F-0039-0001_9995	8 ft	Right Fork Holly River	RES2	$39K	83%	$33K
NICHOLAS	34-07-0019-0110-0001_50	8 ft	Muddlety Creek	COM1	$443K	30%	$133K
NICHOLAS	34-02-0019-0024-0000_9999	8 ft	Meadow Creek	RES1	$13K	67%	$8K
POCAHONTAS	38-03-027B-0021-0000_261	8 ft	Greenbrier River	RES1	$22K	67%	$15K

Repetitive Loss Structures



Local Community Engagement



Risk Assessment Data for Community Engagement, Verification, and Identifiable Mitigation Actions incorporated into Local Hazard Plans

Primary Objective: Incorporating Mitigation Actions in Local Hazard Mitigation Planning

Community Engagement Focus 1-2

			Tables		Map	Report	
Primary Focus Areas of Statewide Risk Assessment	**Community Engagement**	**Specific Activities for Mitigation Plan**	**Com-munity Level (CL)**	**Bldg. (BL) or Feature (FL) Level**	**Flood Tool Risk MAP**	**Report**	**Include Answers to Questions below in Hazard Mitigation Plan**
Floodplain Building Risk Inventory	Incorporate 1% Annual Chance Floodplain Building Risk Assessment Inventory into Mitigation and NFIP/CRS Management Activities	For pre-disaster planning and emergency preparedness, preload floodplain structures into FEMA's Substantial Damage Estimator Tool		Yes			For each community, *quantify* the number and *type* of buildings structures at risk for a 1%-annual-chance flood event to include the *degree* of flood risk?
		Local outreach to property owners about SFHA changes from new flood studies		Yes			
		Include Community-Level Flood Risk Assessment Profile of Built Environment into Hazard Mitigation Plan	Yes	Yes	Yes	Yes	
Essential Facilities & Community Assets	Identify Mitigation Actions for Essential Facilities and Community Assets	Confirm essential facilities inventoried in high and moderate risk floodplains	Yes	Yes	Yes		Which *essential facilities* and *community assets* are most vulnerable to flooding? Which facilities can be mitigated?
		For mitigation plan, identify a minimum of two (2) mitigation actions for essential facilities and community assets for each county	Yes	Yes	Yes	Yes	
		Incorporate essential facility and community assessment risk assessment tables in hazard mitigation plan					

Local Community Engagement

Hazard Mitigation Plan Engagement

Floodplain Building Risk Assessment

Incorporate *Riverine* 1% Annual Chance Floodplain Building Inventory into **Mitigation** and **NFIP/CRS Management Activities**

A. ***Include Community-Level Flood Risk Assessment Profile of Built Environment into Hazard Mitigation Plan:*** *Incorporate into hazard mitigation plan community-level floodplain building counts, SFHA future map building conditions, building dollar exposure, building type (Residential/Non-Residential Occupancy Type, Building Year Pre/Post-FIRM), and building damage estimates (Minus Rated Structures, 1% Damage Loss Flood Models)*

B. ***Preload Flood Risk Structures into FEMA's Substantial Damage Estimator Tool:*** *Upload building inventory data into SDE. The entire statewide flood risk inventory of 98,000 1% floodplain structures can be preloaded into FEMA's SDE Tool.*

1) *SDE Assessments: Install FEMA's Substantial Damage Estimator Tool version 3.0. Preload 1% floodplain countywide residential/non-residential structures into FEMA's damage estimator software. Communities are eligible for CRS credit for preloaded structures in SDE. https://www.fema.gov/emergency-managers/risk-management/building-science/substantial-damage-estimator-tool*
2) *As part of pre-disaster planning and emergency readiness, each county should perform a residential and non-residential substantial damage assessment for potential high damage loss structures. Submit damage estimates and feedback for mitigation plan and maintenance.*
3) *Flood Map Restudy (if applicable). Prepare community outreach communications for flood restudies (mapped into SFHA, mapped out of SFHA). Restudied areas require updating floodplain management ordinance and an opportunity to review state model ordinance and incorporate higher standards.*

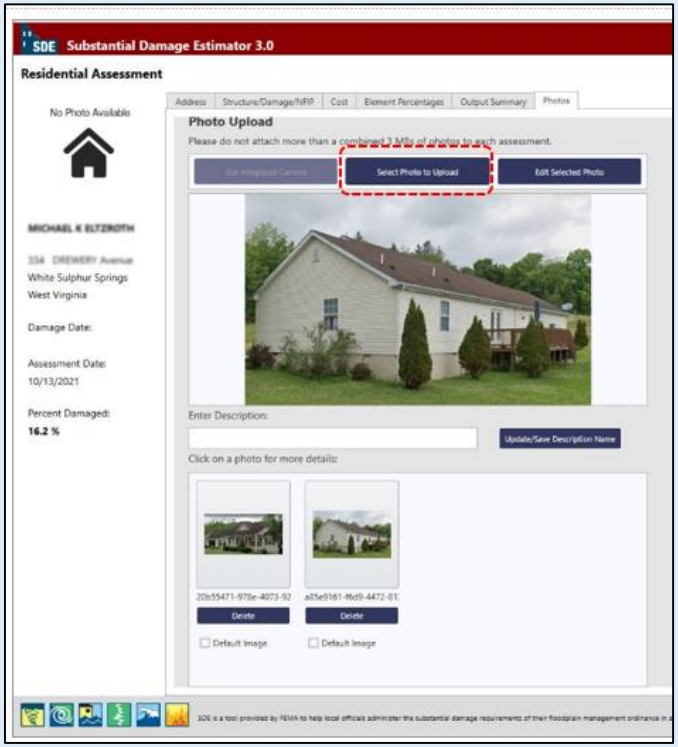
Preload Structures into SDE

*Incorporate 1% Floodplain Building Risk Assessment Inventory into **Mitigation** and **NFIP/CRS Management** Activities*

STEP 1: Community **preloads Floodplain Properties** into FEMA's Substantial Damage Estimator software

Greenbrier County has 2,225 Structures that can be uploaded

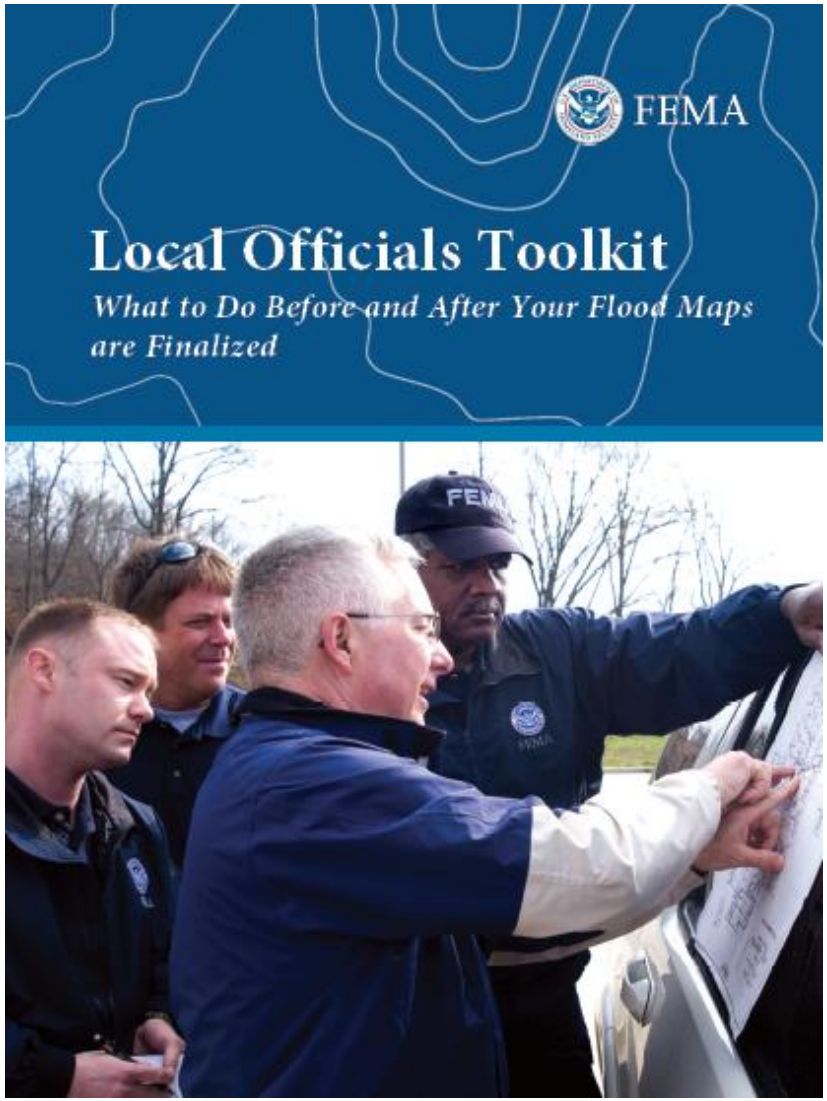
STEP 2: Community performs practice **Substantial Damage Assessments** for Residential and Non-Residential Properties



[SDE Upload Files and Instructions]

Flood Study Map Changes

*Incorporate 1% Floodplain Building Risk Assessment Inventory into **Mitigation** and **NFIP/CRS Management** Activities*



[FEMA Region 3 Toolkit for New Flood Studies]

City of White Sulphur Springs

Date: 10/14/2021

White Sulphur Springs has 68 buildings being mapped into the SFHA

Dear SMITH JOHN:

This letter is a test to show the use of mail merge a
copied the first two paragraphs from the Local Offic
two paragraphs for demonstration purposes.

A multi-year project to re-examine City of White Sulphur Springs's flood zones and develop detailed digital flood hazard maps has been completed. The new maps, also known as Flood Insurance Rate Maps (FIRMs), were just released for public view. The new maps reflect current flood risk based on the latest data and a more accurate understanding of our area's topography. As a result, you and other property owners throughout GREENBRIER COUNTY will have up-to-date, Internet-accessible information about flood risk to your property.

How will these changes affect you?

Based on the new maps, your property is being mapped into a higher risk flood zone, known as the Special Flood Hazard Area (SFHA). If you have a mortgage from a federally regulated lender and your property is in the SFHA, you are required by Federal law to carry flood insurance when these flood maps are put into effect. We recommend that you use this time to contact your insurance agent to get the most favorable rate and learn about options offered by the National Flood Insurance Program (NFIP) for properties being mapped into higher risk areas for the first time.

You can find your property on the WV Flood tool in one of two ways: first, you can go to the following link in a web browser: https://mapwv.gov/flood/map/?wkid=102100&x=-8939196.678447664&y=4550352.316266677&l=13&v=2. Or, you can go to https://mapwv.gov/ map and enter your address, 177 PATTERSON ST, WHITE SULPHUR SPRINGS, WV, 24986, in the search bar.

Your property is within the Howard Creek flood zone and has a flood depth of 1.0 feet. Its FIRM status is Pre-FIRM.

[Mail Merge Template for SFHA Mapped-in Structures]

Essential Facilities & Community Assets

*Identify **Mitigation Actions** for Essential Facilities and Community Assets*

For mitigation plan, incorporate a minimum of two (2) identifiable mitigation actions for essential facilities and community assets for each county.

1) *Compare existing essential facilities inventoried to previous plan update and denote any mitigation progress.*

2) *Review top statewide building listing of high-value dollar essential facilities/community assets exposure and substantial damage.*

3) *Identify socio-economic effects if key facilities are not restored to original function within days after flood event.*

4) *Review existing emergency action plans.*

5) *Incorporate into CRS Activity 510 Floodplain Management Planning (FMP)*

Community Engagement Focus 3-5

			Tables		Map	
Primary Focus Areas of Statewide Risk Assessment	**Community Engagement**	**Specific Activities for Mitigation Plan**	**Com-munity Level (CL)**	**Bldg. (BL) or Feature (FL) Level**	**Flood Tool Risk MAP**	**Include Answers to Questions below in Hazard Mitigation Plan**
Mitigated Structures	Validate Mitigated Structures and Post-FIRM Development	Determine if Post-FIRM minus-rated structures are mitigated	Yes	Yes	Yes	Which *Post-FIRM structures* in the 1% floodplain have been mitigated?
		In the mitigation plan, include a table that describes the number and types of mitigated structures for each flood prone community	Ongoing	Yes	Yes	
Buyout Properties	Confirm Mitigated Buyout Properties	Confirm buyout properties are allowable for open space purposes only	Yes	Yes	Yes	How many mitigated *buyout properties* in each community exist?
		In the mitigation plan, include a table that lists the number of verified and unverified mitigated buyout properties	Yes	Yes	Yes	
Areas of Mitigation Interest	Evaluate Areas of Mitigation Interest or Repetitive Loss Areas	Determine the mitigation status of Post-FIRM building construction, repetitive loss structures, substantial damage estimates, and buyout properties for designated Areas of Mitigation Interest.		Yes		What are the *Areas of Mitigation Interest* or Repetitive Loss Areas identified for mitigation?
		In the mitigation plan, include a table that lists and describes the areas of mitigation interest for each community	Ongoing	Yes		

Local Community Engagement

Hazard Mitigation Plan Engagement

Mitigated Structures

Validate **Mitigated Structures** and **Post-FIRM Development**

Mitigation Plan Cross Walk Requirements: For mitigation plan, verify Post-FIRM mitigated structures provided in minus-rated property tables.

1) Determine if Post-FIRM minus-rated structures are mitigated. Focus initially on structures with the highest minus ratings (or highest water-in-depth values) and high dollar loss estimates. For each structure of interest identify if a permit and elevation certificate are on file. Annotate permit and elevation certificate information on minus-rated table. Submit building pictures if no elevation certificates exist.

2) In the mitigation plan, include a table that describes the number and types of mitigated structures for each flood prone community.

3) Identify mitigation actions for specific structures, to include outreach/education to community/ homeowners about mitigation best practices, mitigation funding opportunities, NFIP office involvement for non-compliant structures).

Buyout Properties

Confirm Mitigated **Buyout Properties**

Mitigation Plan Cross Walk Requirements: For mitigation plan, validate verified and unverified properties.

1) *Confirm buyout properties are allowable for open space purposes only. Every three years communities are required to inspect and certify that buyout properties are uses only for allowable open space purposes. Source: https://www.fema.gov/sites/default/files/2020-07/fy15_hma_addendum.pdf*
   - *Verify all deed-restricted buyout properties are shown on the WV Flood Tool.*
   - *Unverified properties (possible buyout properties) are compiled from the statewide property tax database where the parcel intersects the high-risk 1% floodplain, maximum building value is $1000, and part of the owner name contains "commission" or "council" or "city" or "town."*

2) *In the mitigation plan, include a table that lists the number of verified and unverified mitigated buyout properties.*

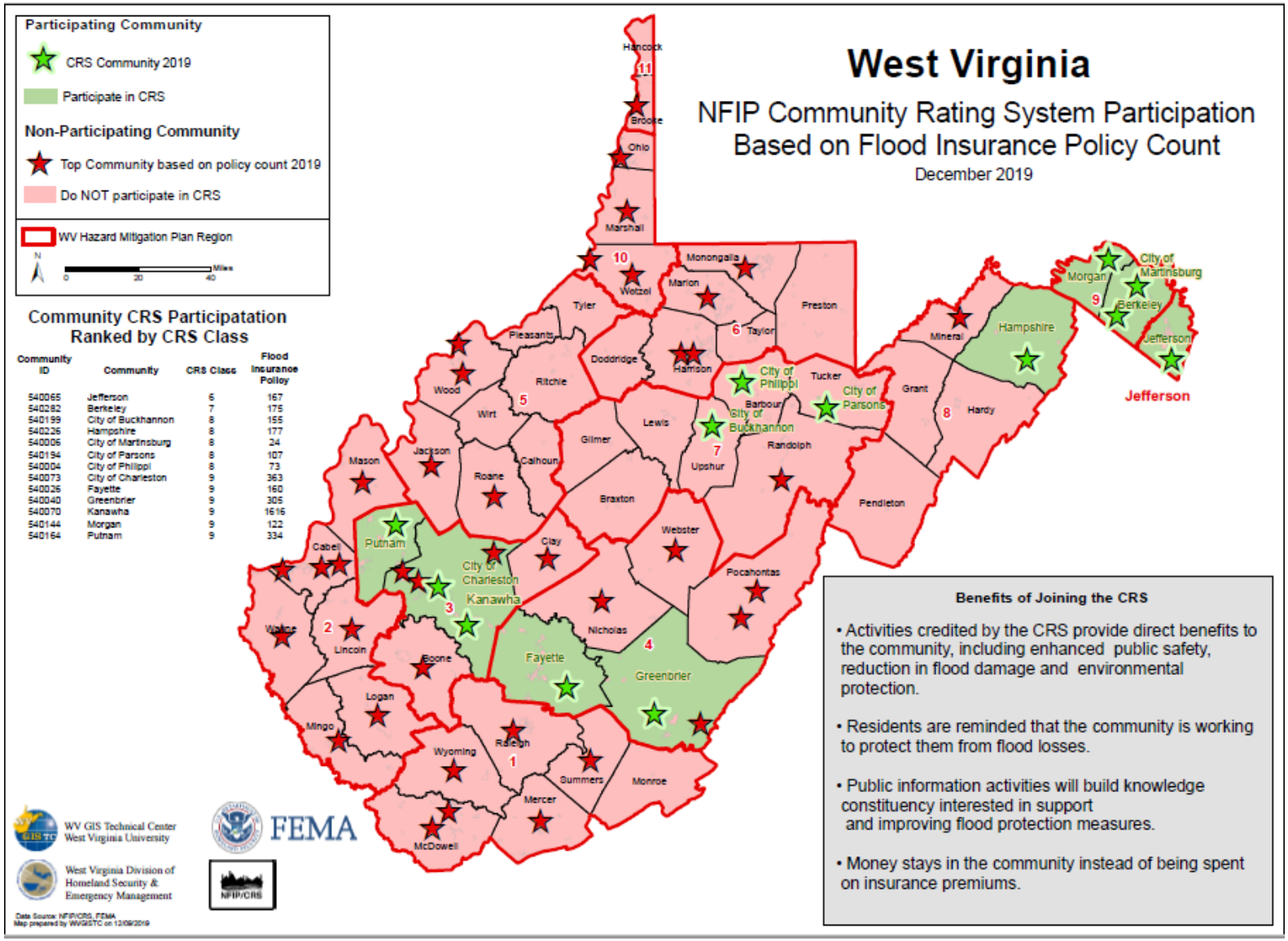
3) *List a minimum of two properties for each county that should be considered for buyout mitigation. Discuss potential properties in mitigation plan.*

Areas of Mitigation (AoMI) Interest

Areas of Mitigation (AoMI) are identified by Repetitive Loss structures, Substantial Damage Model Estimates, Mitigated Properties, Flood Depths, High-Water Marks, and Similar Topography. Graphics of reference data for AoMI determinations:

- Areas of Mitigation Interest (AoMI)
- Repetitive Loss Structures
- Buyout Properties
- High Flood Depths or Water Depths-in-Structure
- High-Water Marks
- Building Damage $ Non-Residential | Building Damage $ Residential
- Substantial Damage Estimates

Community Rating System



[8.5x11 PDF Graphic]

[11x17 PDF Graphic]