West Virginia Statewide Flood Risk Assessment

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September 11, 2019

Devastating 2016 June Flood

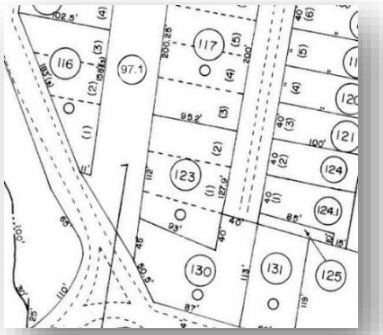
Hazard Mitigation Grant Project

A Statewide Approach to Risk Studies

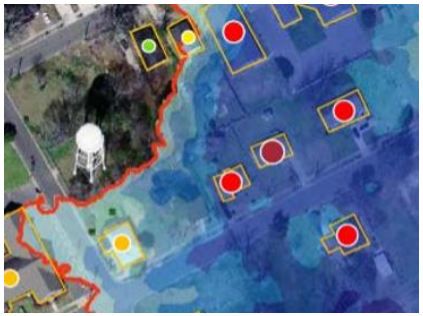
Multi-Hazard Risk Assessments

Flood Risk
#1 WV Hazard

Landslide Risk
#2 WV Hazard



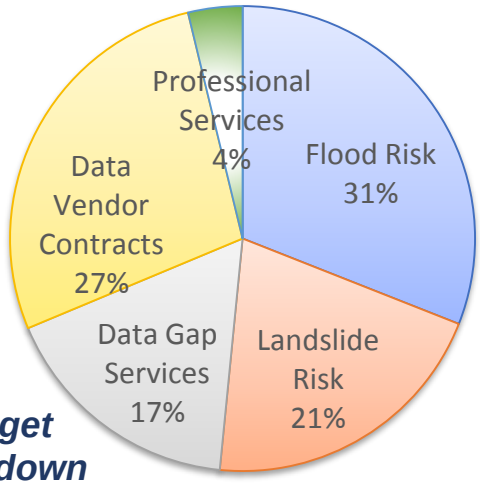
Reference Data Development



Inventory of Building-Level Flood-Risk Structures

Statewide

Budget Breakdown



Flood Risk Development Team

Full and Part-Time Staff

Kurt Donaldson
Manager

Xiannian Chen
GIS Programmer

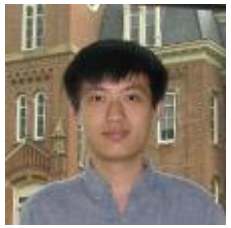
Jim Schindling
Database
Programmer

Kevin Kuhn
GIS Analyst /
Address-Parcel
Specialist

Frank LaFone
Systems
Administrator

WV GIS Technical Center
West Virginia University
Morgantown, WV
http://wvgis.wvu.edu

Maneesh Sharma
GIS Analyst /
Flood Risk
Specialist



Yibing Han
GIS Programmer

Eric Hopkins
GIS Analyst /
Flood Risk
Specialist

Behrang Bidadian
GRA
Shelter Models

Kevin Shrader
GRA
Building Inventory,
Flood Visualization

Flood Risk Projects & Contacts

Year	Activity	Contact	Organization
2003	DFIRM Map Preparation	Lee Brancheau	FEMA Region III
2006	WV Flood Tool - Genesis	Robert Perry	State NFIP Coordinator
2011	WV Flood Tool - Continued Development	Kevin Sneed	State NFIP Coordinator
2013	WV Flood Tool - Flood Mapping Development	Bob Pierson	Region III
2015	Hazus-MH Flood Model Building Inventory Tool	Cynthia McCoy Kevin Mickey	FEMA Region III (now Region X) The Polis Center, IUPUI
2016	Pilot County Risk Assessments published	Kevin Mickey	The Polis Center, IUPUI
2018	Statewide Multi-Hazard Risk Assessment Project (3-years) - HMPG Project	Brian Penix	WV State Mitigation Office
2018	Risk Assessment Project Coordination	Will Melville Matt McCullough	FEMA Region III
2018	ArcGIS Python Script Alternative to the Hazus-MH Flood Model for User-Defined Facilities	John Bauer	Oregon Geological Survey
2019	OpenHazus Flood Assessment Structure Tool	Jordan Burns Ujvala Sharma	NIYAMIT / FEMA Hazus Team
2019	Hazus Short-term Shelter Needs Methodology	John Harrald	George Washington University, Professor Emeritus

WV GIS Technical Center involved with FEMA Flood Risk Projects since 2003

Hazard Mitigation Grant

Multi-Agency Coordination

Federal Agencies

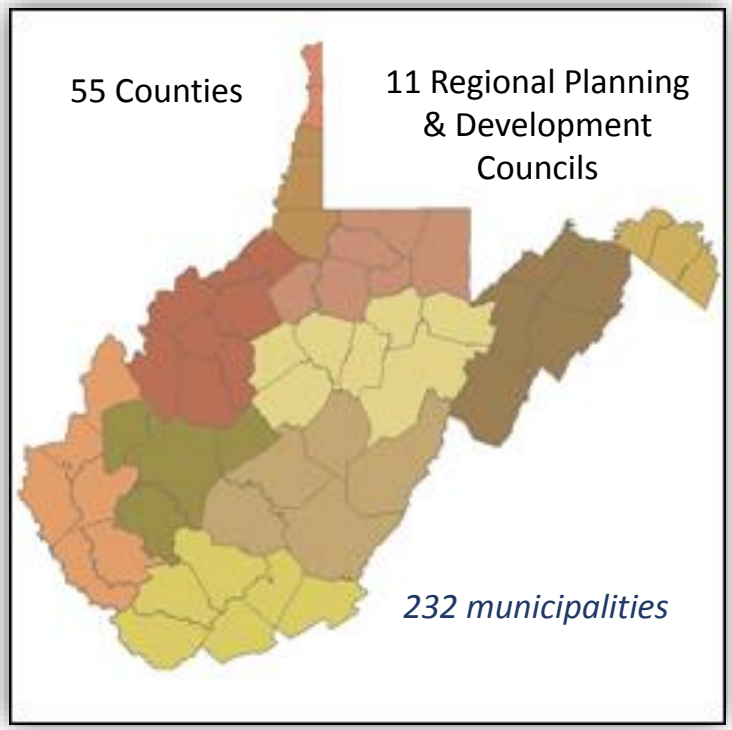
State Agencies

Universities

Regional Councils

Local Counties

Private Companies



FEMA ISO USGS science for a changing world USDA

West Virginia Division of Homeland Security and Emergency Management

WOOD GROUP

NIYAM IT

The Polis Center

WV GIS TC West Virginia GIS Technical Center

WV State GIS Data Clearinghouse

Statewide Flood Risk Assessment

- **Support for…**
  - Local/State Hazard Mitigation Plans
  - Floodplain Management Activities
  - Community Rating System (CRS) Activities
  - Community Assisted Visits
- **Flood Event Modeled**
  - Riverine 1% Annual Chance Flood Event for ALL Structures
    - Regulatory and Non-Regulatory High Risk Flood Zones
    - Estimate 100,000 structures in West Virginia
  - Riverine 0.2% Annual Event for Essential Facilities
- **Detailed Building Inventories**
  - Key Reference Layers: parcels, assessment attributes, E-911 address points, leaf-off imagery, building footprints, community boundaries
  - User Defined Facilities *Enhanced* for spatial and attribute accuracy
  - Flood Risk Assessment GIS (FRAGIS) Database
    - State-level integration
    - Identifies GIS Data Gaps or Deficiencies

WV Flood Risk Assessment

- **Statewide Depth Grid**
  - Composite Depth Grid of best available sources to include:
    - Model-Backed HEC-RAS Depth Grids or Statewide 2010 Hazus Level-1 Depth Grid
- **Flood Model Software and Programs**
  - FEMA's OpenHazus FAST (Flood Assessment Structure Tool) and other customized programming scripts.
  - Most model outputs at the Building Level: Damage Loss, Debris Removal, Population Displacement
- **Outputs: Analytics / Reports / Publish Online**
  - Community and Building-Level Reports/GIS Files
  - State GeoPlatform (WV Flood Tool - www.mapWV.gov/Flood)
  - 3D Flood Visualizations
- **Field Verification & Community Engagement**
  - Field verification of model inputs (building stock) and model outputs
  - Iterative process of improving Flood Risk Assessment GIS

Building-Level Flood Risk Assessments

Building-Level Flood Risk Assessments support:

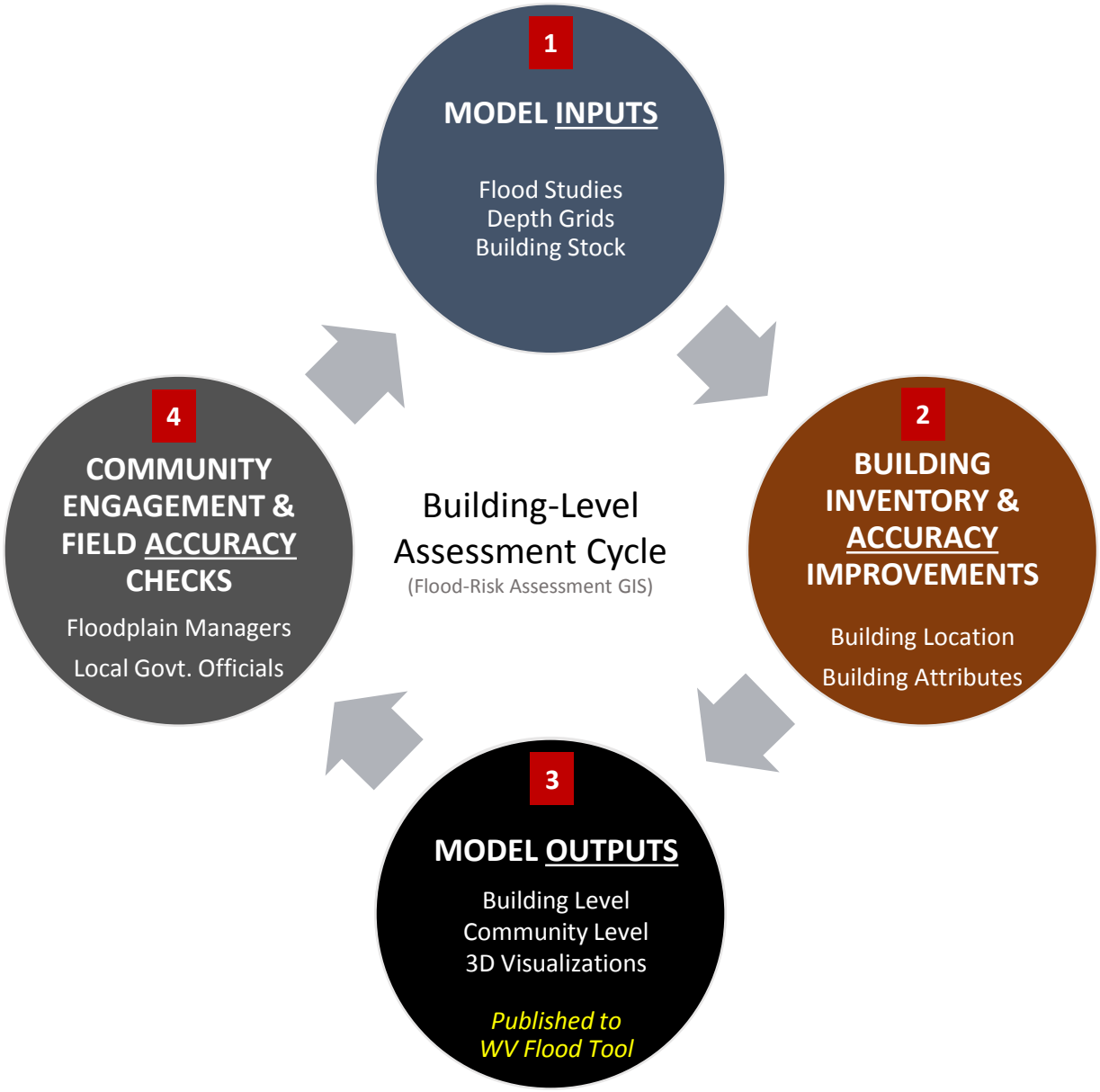
- Hazard Mitigation Plans
- Floodplain Management
- Community Assisted Visits
- Community Rating System

Benefits

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

Methodology

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

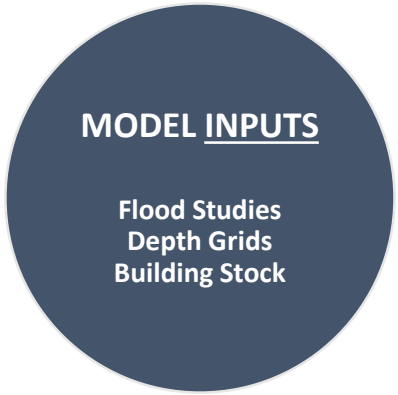


Statewide Flood Risk Assessment

Model Data Inputs

- GIS Reference Data
  - Community Boundaries
  - Parcels/Assessment Attributes (**Building Stock**)
  - E-911 Addresses (**Building Stock**)
  - Leaf-Off Aerial Imagery (**Building Stock**)

- New Elevation Data
  - Driver for **Flood Studies (new flood zone boundaries)**
  - **Depth Grids** and WSEL Grids
  - Ground Elevation: 1-ft contours, 1-m DEM

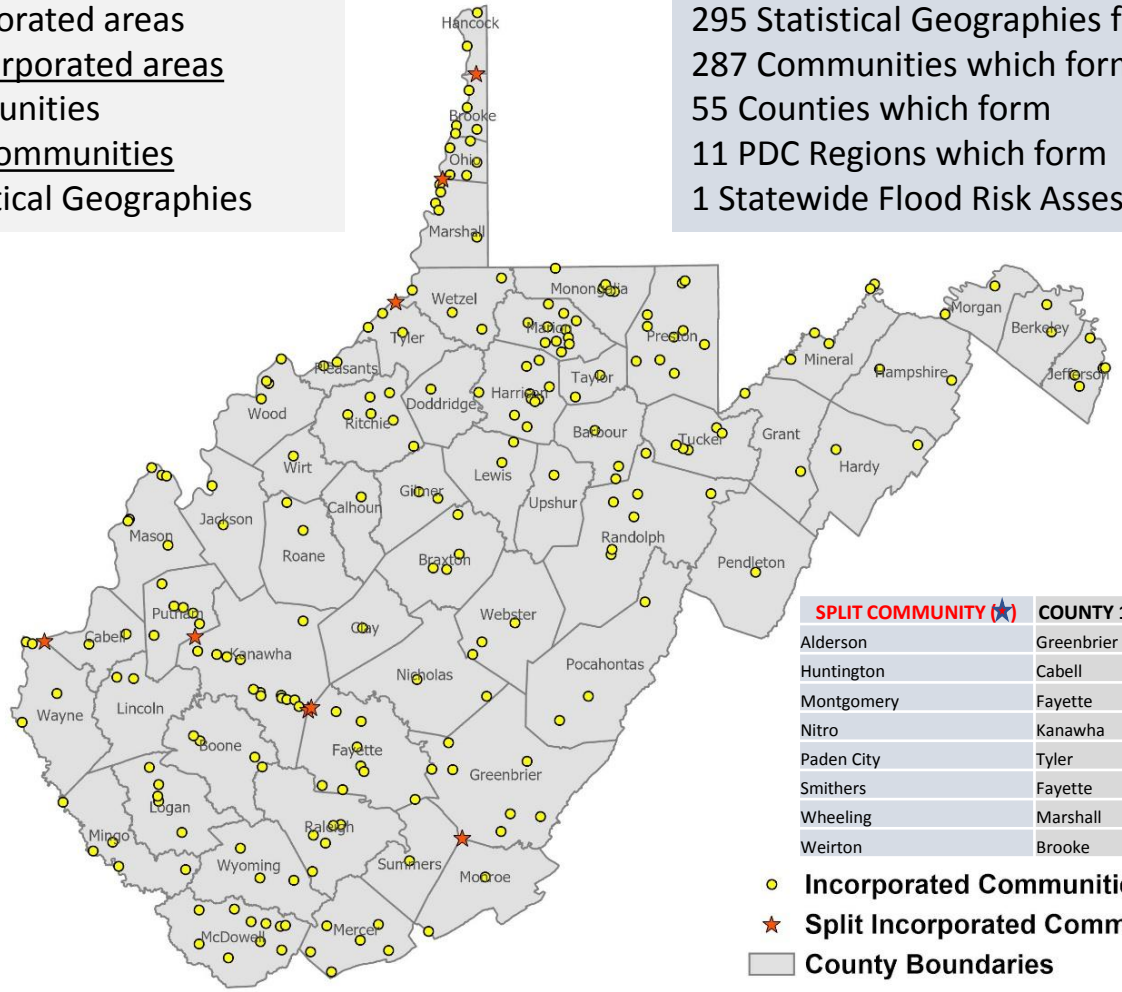


Community Boundaries / Statistical Units

Flood Risk Community Study Map

232 incorporated areas
+55 unincorporated areas
287 Communities
+ 8 split communities
295 Statistical Geographies

295 Statistical Geographies form
287 Communities which form
55 Counties which form
11 PDC Regions which form
1 Statewide Flood Risk Assessment



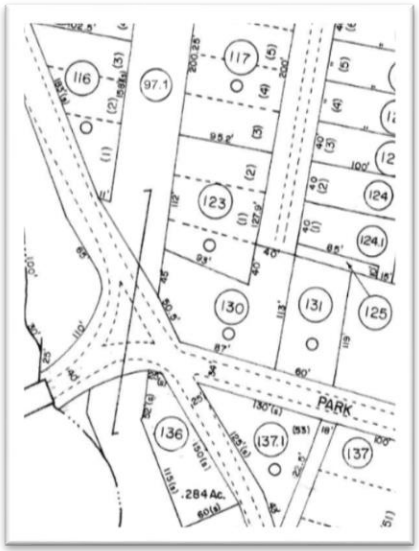
SPLIT COMMUNITY (★)	COUNTY 1	COUNTY 2
Alderson	Greenbrier	Monroe
Huntington	Cabell	Wayne
Montgomery	Fayette	Kanawha
Nitro	Kanawha	Putnam
Paden City	Tyler	Wetzel
Smithers	Fayette	Kanawha
Wheeling	Marshall	Ohio
Weirton	Brooke	Hancock

Incorporated Communities
Split Incorporated Communities
County Boundaries

95% of WV Municipalities have Special Flood Hazard Areas (SFHA)

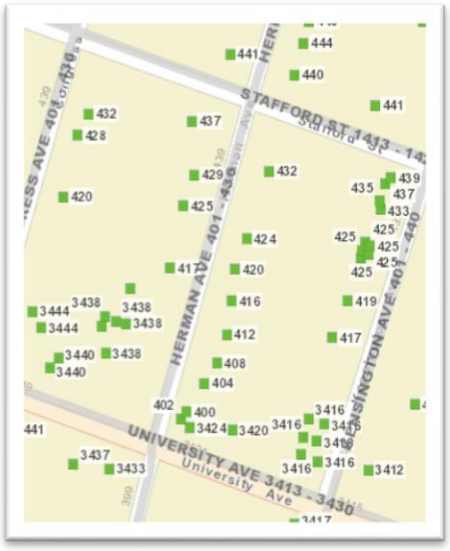
GIS Data Development

Parcels



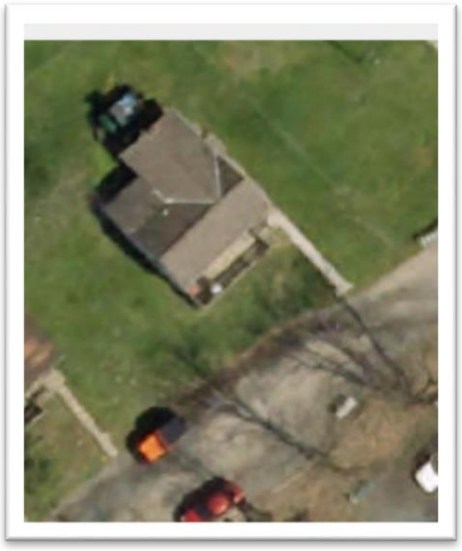
Migrate six counties from paper to digital parcels

Site Addresses



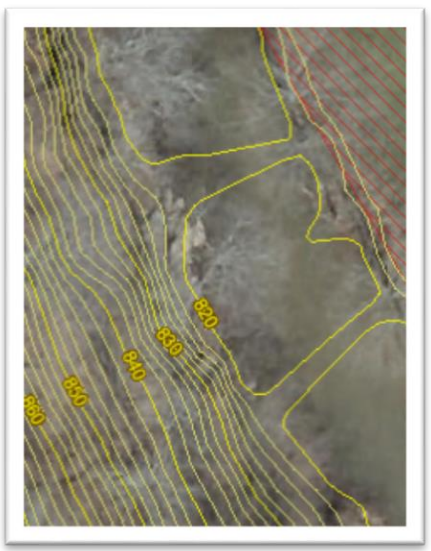
Flood-risk communities with missing or incorrect E-911 addresses

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

Improving State's Spatial Data Infrastructure

Statewide E-911 Addresses

Address Issues

Missing Address Site Numbers

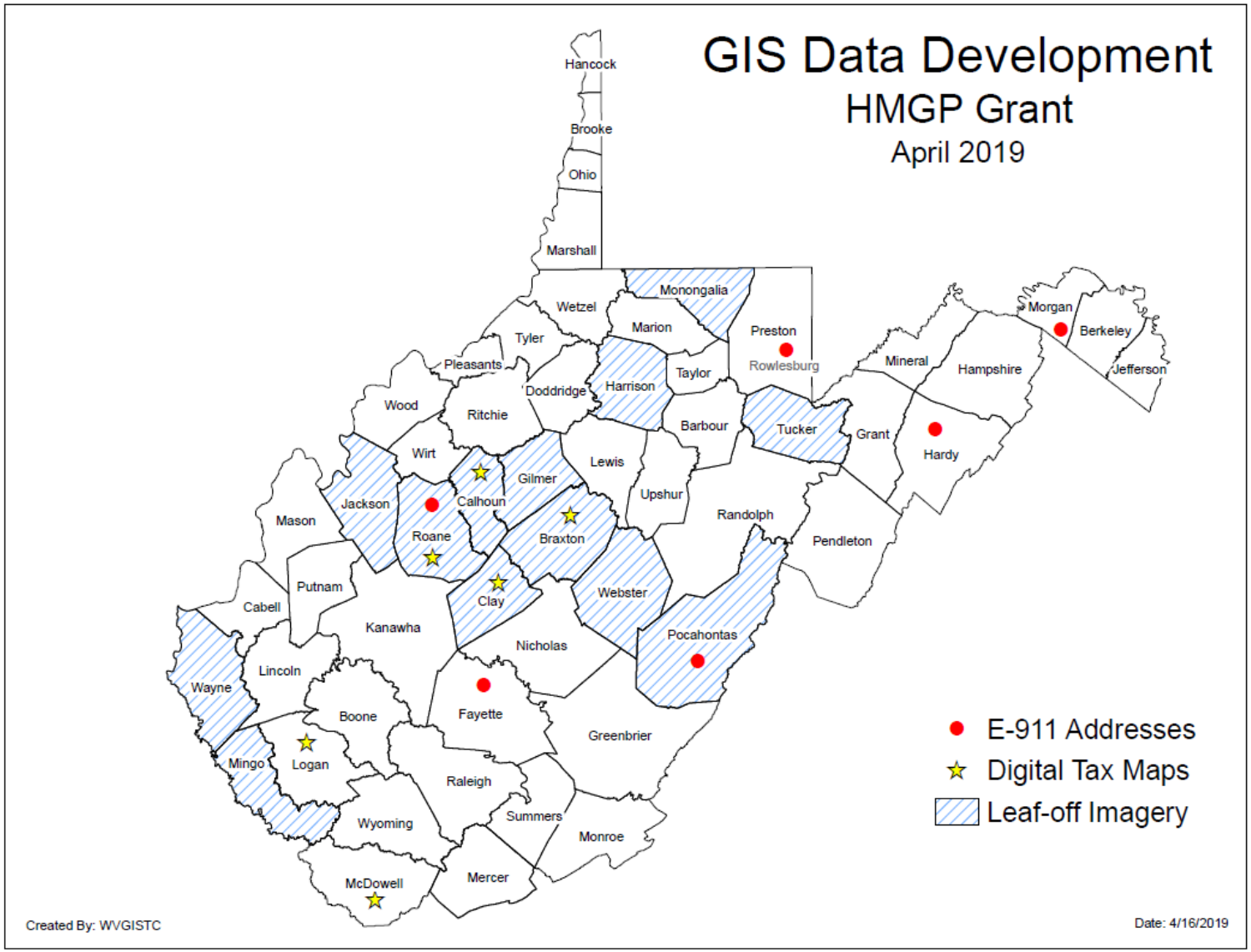
Fairmont, WV

Wrong Addresses

(98 Graham St. should be 315 Graham St.)

Elkins, WV

Counties benefiting from HMGP



Communities benefiting from HMGP

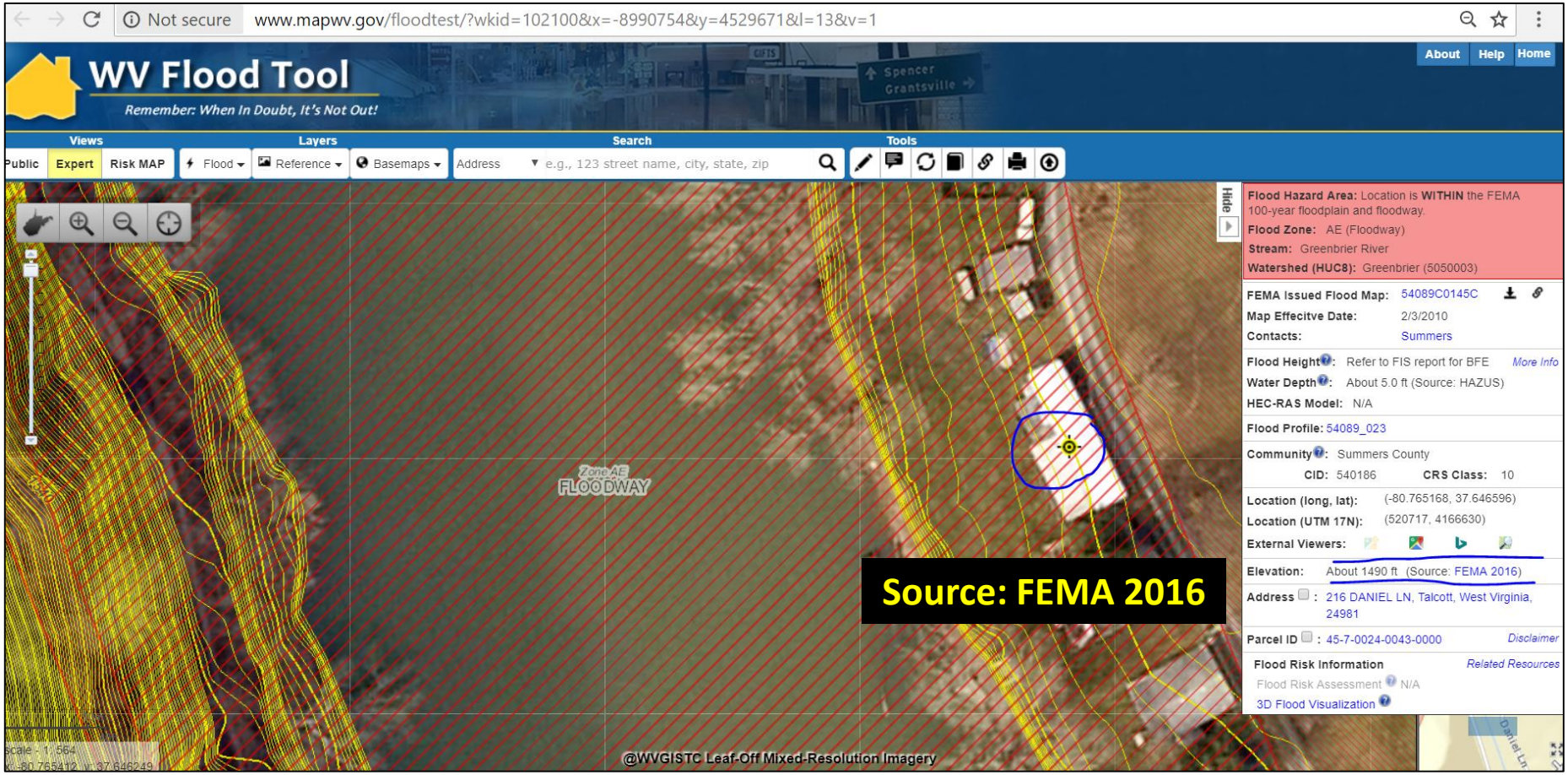
GIS Data Development Costs associated with Statewide Multi-Hazards Project

GIS Data Development Contracts	# Local Govt. Projects	# Signed MOUs	Vendor	Local Govt. Cost Share	Cost Share Type	FEMA Grant Dollars Obligated	TOTAL COST
E-911 Addresses	7	7	Atlas Geographic Data	$81,629	In-Kind (field validation)	$75,520	$156,149
Digital Tax Maps/Parcels	6	6	Atlas Geographic Data	$27,474	In-Kind (imagery)	$235,533	$263,007
Leaf-Off Imagery	13	13	Blue Mountain / Thrasher	$205,536	Dollars ($)	$56,958	$262,494
TOTAL	**26**	**26**		$314,639 (40%)		**$437,991**	$752,630

LiDAR-Derived 1-FT Contours

The WV Flood Tool Allows Users to View:

***Ground Elevation** 1-M DEM Value/1-Ft. Contour, **Water Depth**, and **Flood Height** (WSEL) if available*



FEMA-purchased elevation data can be accessed through State Data Clearinghouse www.mapwv.gov/lidar or the U.S. Geological Survey's The National Map

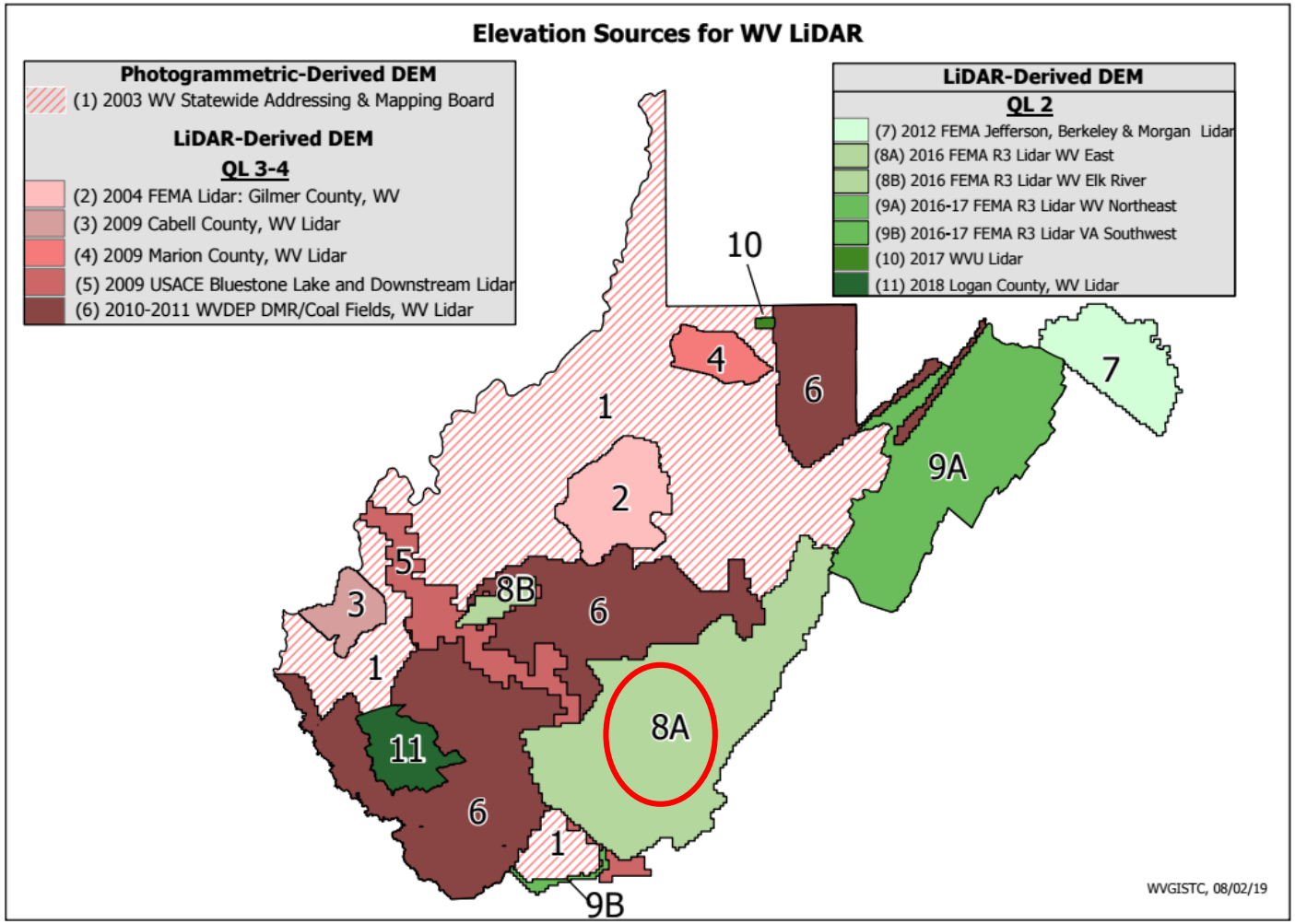
Elevation Source

Source: FEMA 2016

Source Table

#	8A
WV Project Name	2016 FEMA R3 WV East
Source	FEMA
Year	2016
Quality Level	2
Grid Resolution	1m
Horizontal Accuracy	Not Provided
Vertical Accuracy	6.7 cm
Coordinate Sytem	UTM Zone 17
Horizontal Datum	NAD83
Vertical Datum	NAVD88
Z-Units	Meters

Source Graphic



WV Elevation Source Listing and Graphic: https://www.mapwv.gov/floodtest/docs/WV_FloodTool_ElevationSource_Metadata.pdf

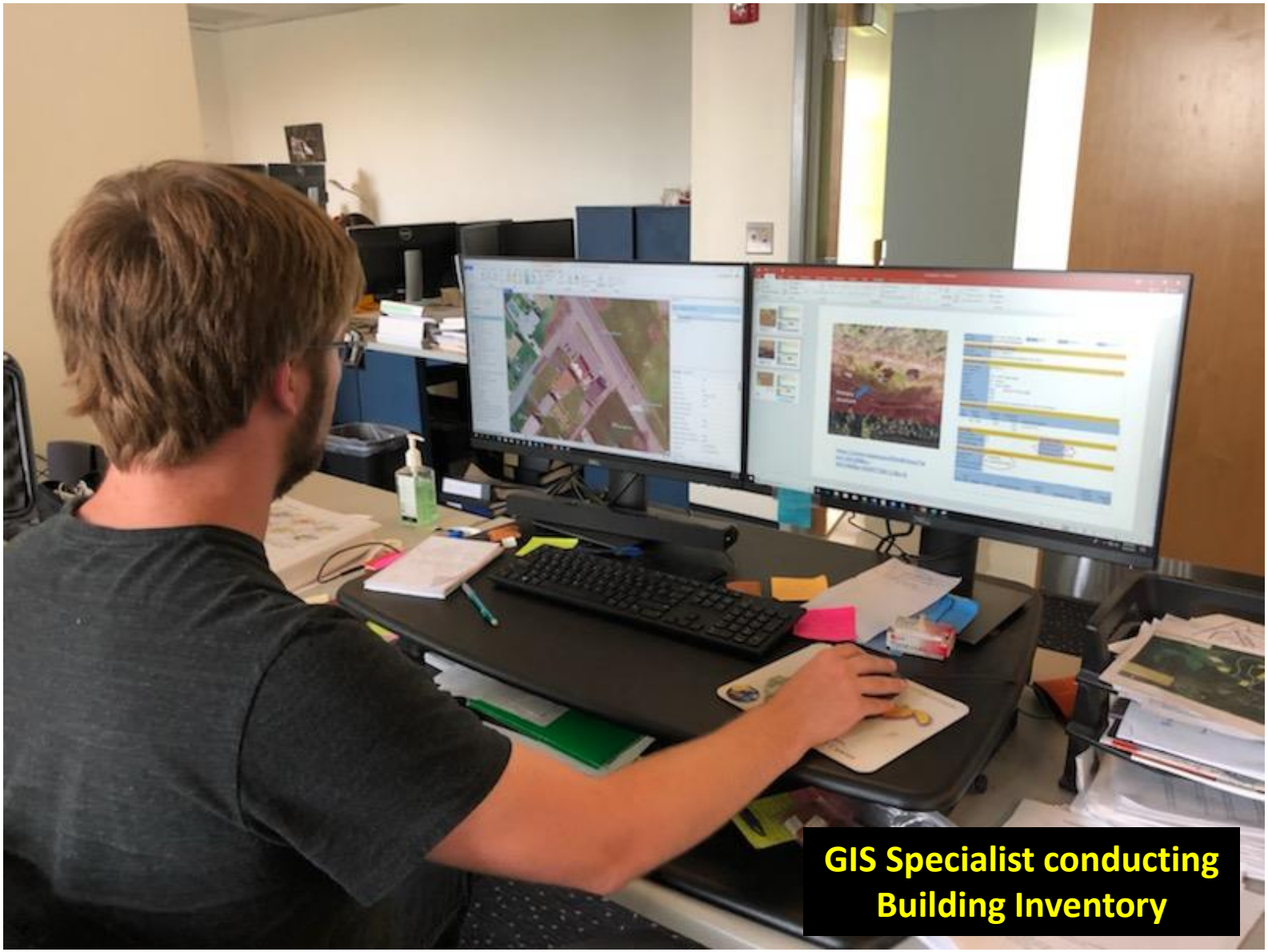
Statewide Flood Risk Assessment

Building Inventory & Accuracy Improvements

- **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 to make more accurate

- **Record Data Issues and Data Gaps**

Building Inventory



Primary Structure: Not a Building

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

"Not a Building"

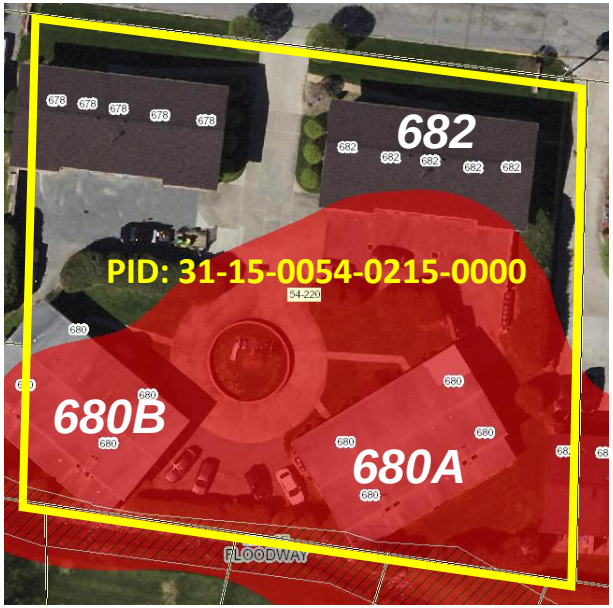
- ✓Open pavilions, carports, underground pump stations, trailers, etc. are not buildings
- ✓Accessory structures are not counted

*All **primary structures** in high-risk flood zones are inventoried.*
***Critical infrastructure** 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

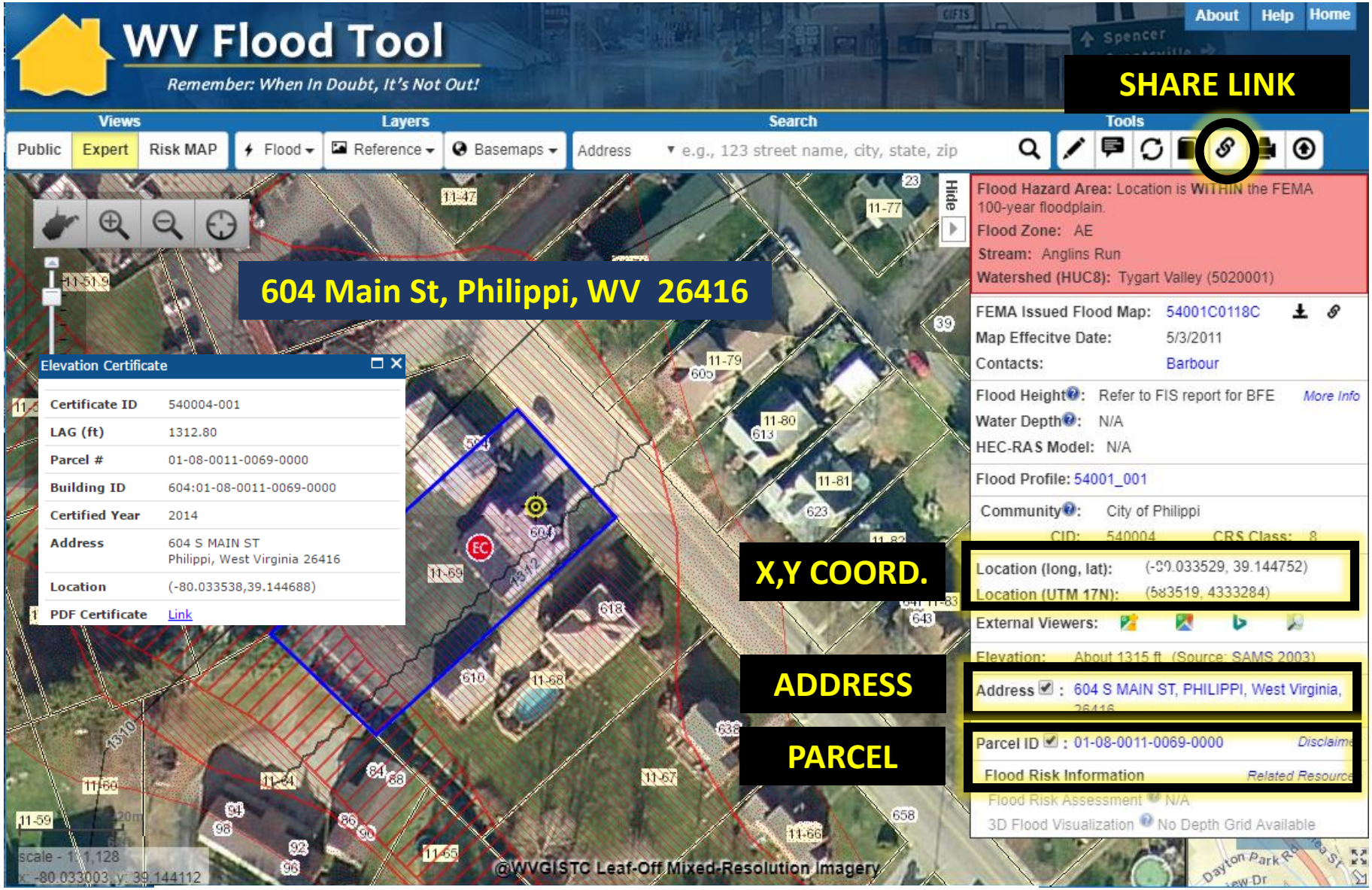
Building Information	
Property Class	A - Apartment
Land Use	211 - Apartment-Garden (1-3 stories)
Use Type	11-Apartment
Living Area	26,572
Cubic Feet	211,688
# of Buildings (Cards)	4
# of Units	

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

Building Identification



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

Building Identification

E-911 and County Assessor report location as 604 S Main Street

WV Real Estate Assessment Data

About | New Search

Parcel ID	01-08-0011-0069-0000	Tax Year	2017	County	Barbour	Date	5/29/2018
Root PID	01080011006900000000						

Property Owner and Mailing Address

Owner(s)	HAYHURST DOROTHY
Mailing Address	645 MAPLE AVE, PHILIPPI, WV 26416

Property Location

Property Parcel Address

E-911 Address

Physical Address	604 S MAIN ST
E-911 Address	604 S MAIN ST PHILIPPI WV 26416
Parcel ID	01-08-0011-0069-0000
County	1 - Barbour
District	8 - Philippi Corp
Map	0011 (Click for PDF tax map)
Parcel No.	0069
Parcel Suffix	0000
Map View Link	https://mapwv.gov/parcel/?pid=01-08-0011-0069-0000

Share Link: http://www.mapwv.gov/Assessment/?PID=01080011006900000000

Building Identification

Google Street View and House Number list location as 327 S Main Street

Building Identification

U.S. DEPARTMENT OF HOMELAND SECURITY
FEDERAL EMERGENCY MANAGEMENT AGENCY
National Flood Insurance Program

ELEVATION CERTIFICATE

Important: Read the instructions on pages 1–9.

SECTION A – PROPERTY INFORMATION

A1. Building Owner's Name Dorothy Hayhurst

A2. Building Street Address (including Apt., Unit, Suite, and/or Bldg. No.) or P.O. Route and Box No.
327 S. Main Street
City Philippi State WV ZIP Code 26416

A3. Property Description (Lot and Block Numbers, Tax Parcel Number, Legal Description, etc.)
327 S. Main Street

IMPORTANT: In these spaces, copy the corresponding information from Section A. FOR INSU

Building Street Address (including Apt., Unit, Suite, and/or Bldg. No.) or P.O. Route and Box No. Policy Nur
327 South Main
City Philippi State WV ZIP Code 26416 Company

If using the Elevation Certificate to obtain NFIP flood insurance, affix at least 2 building photographs below acco for Item A6. Identify all photographs with date taken; "Front View" and "Rear View"; and, if required, "Right Sic View." When applicable, photographs must show the foundation with representative examples of the flood indicated in Section A8. If submitting more photographs than will fit on this page, use the Continuation Page.

09/24/14 – Front/Right with Garage

Be Careful!

This E-911 street address listed in the Elevation Certificate and Google Maps is not correct!

FEMA's Elevation Certificate lists location as 327 S Main Street

Building Identifiers

Collect multiple spatial identifiers to verify location

Address	604 S Main St, Philippi, West Virginia, 26416
Parcel	01-08-0011-0069-0000

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

★ **Building Identifier**	604: 01-08-0011-0069-0000
★ **X,Y Coordinate**	39.144752, -80.033529
★ **Google Plus Code (11-digit)**	86FX4XV8+VHF
★ **Share MAP URL Link**	https://www.mapwv.gov/flood/map/?wkid=102100&x=-8909292&y=4742427&l=12&v=1
Share Parcel Assessment URL Link	http://www.mapwv.gov/Assessment/Detail/?PID=01080011006900000000

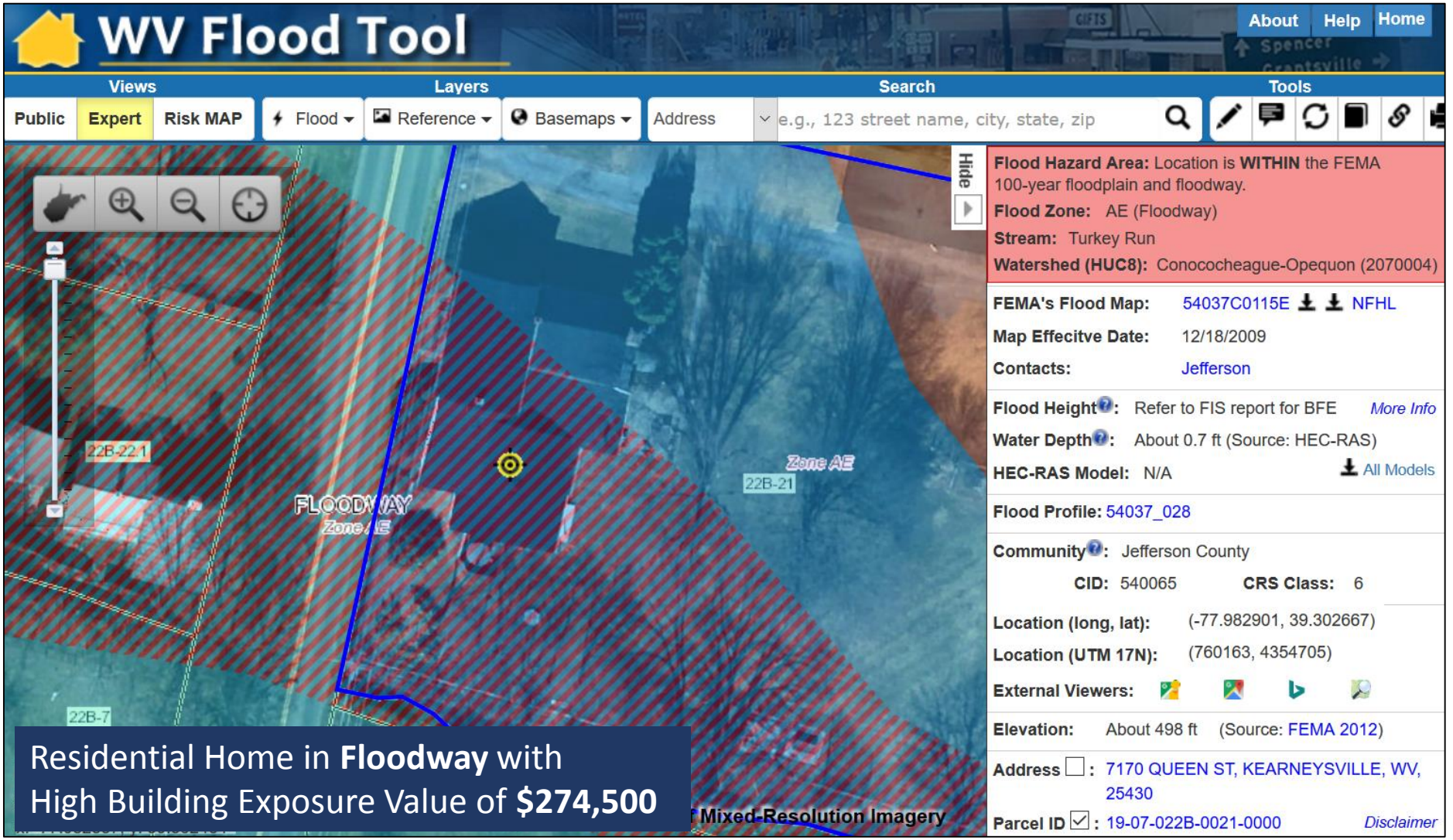
★ **= Unique Identifiers**

Notes: Owner Name from assessment records and Building Pictures (elevation certificates) can be helpful for property identification purposes

Proper Building and Property Identifiers are important for exchanging building-level data efficiently among local, state, and federal partners (including UDFs, LOMAs, Mitigated Buyout Properties, Elevation Certificates, Repetitive Loss Structures, etc.)

Building 7170:19-07-022B-0021-0000

Detailed Building Inventory Record



Residential Home in **Floodway** with High Building Exposure Value of **$274,500**

Building 7170:19-07-022B-0021-0000

Flood Tool External Link to Google **Street View**

Building 7170:19-07-022B-0021-0000

WV Real Estate Assessment Data

About | New Search | Structure Drawing

Parcel ID	19-07-022B-0021-0000	Tax Year	2018	County	Jefferson
Root PID	1907022B002100000000				

Property Owner and Mailing Address

Owner(s)	WHEATON TREVOR D & SHARON M
Mailing Address	7170 QUEEN ST, KEARNEYSVILLE, WV 25430

Owner and Property Location

Property Location

Physical Address	7170 QUEEN ST
E-911 Address	7170 QUEEN ST 25430
Parcel ID	19-07-022B-0021-0000
County	19 - Jefferson
District	7 - Middleway District
Map	022B (Click for PDF tax map)
Parcel No.	0021
Parcel Suffix	0000
Map View Link	https://mapwv.gov/parcel/?pid=19-07-022B-0021-0000

General Information

Legal Description

Tax Class	Book / Page	Deeded Acres	Calculated Acres	Legal Description
2	1192 / 126	0.700	0.82	7/10 AC REININGER
			0.82	

Cost Value

Dwelling Value	$269,300
Other Bldg/Yard Values	$5,160
Commercial Value	---

Cost Values

Appraisal Value

Land Appraisal	$36,500
Building Appraisal	$274,500
Total Appraisal	$311,000

Cost Value

Dwelling Value	$269,300
Other Bldg/Yard Values	$5,160
Commercial Value	---

Appraisal Value

Land Appraisal	$36,500
Building Appraisal	$274,500
Total Appraisal	$311,000

Building Information

Property Class	R - Residential
Land Use	101 - Residential 1 Family
Sum of Structure Areas	4,006
# of Buildings (Cards)	1

Main Building Information

Card	Year Built	Stories	Grade	Architectural Style	Exterior Wall	Basement Type	Square Footage (SFLA)	Building Value
1	1900	2	B+	Conventional	Frame	Part	4,006	$269,300
							4,006	$269,300

Card	Year Built	Attic	Fuel	Heat System	Heat/AC	Bedrooms	Full Baths	Half Baths	Total Rooms
1	1900	Unfinished	Oil	Hot Water	Central	5	2	1	9
						5	2	1	9

Other Building and Yard Improvements

Outbuildings

Bldg/ Card #	Line	Type	Year Built	Grade	Units	Size	Area	Replace Cost	Adjusted Replace Cost
1	1	Frame or CB Detached Garage	1984	C	1	10x20	200	$3,910	$3,400
1	2	Four Side Closed Wood Pole Barn	1981	C	1	28x20	560	$4,550	$1,760

Flood Zone Information

Learn more at WV Flood Tool

Acres (c.)	Risk	
0.82	High	This parcel appears to be in a HIGH RISK flood hazard zone.

Property Intersect Flood Zone

Sales History

Sale Date	Price	Sale Type			Book	Page
6/5/2017					2	123
6/5/2017					1192	123
6/2/2017	$343,250	Land and Buildings	4	0	1192	126

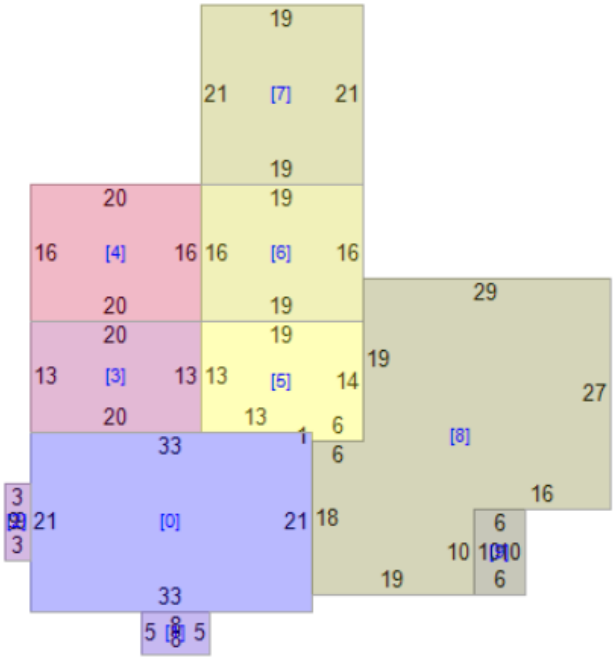
Web **Parcel Assessment Report**
for Building Identification, Building Characteristics, and Cost Values

Building 7170:19-07-022B-0021-0000

West Virginia
Real Estate Assessment - Building Sketch

Building Sketch Diagram (main area and additions)

Jefferson County, District 7, Map 22B, Parcel 21



Parcel ID: 1907022B002100000000
Building: 1 ▼ of 1

Additions

#	Lower	First	Second	Third	Area	Value
0	Refer to Base Area Description				693	$0
1	---	Masonry terrace	---	---	40	$530
2	---	Frame bay window	---	---	27	$1,040
3	---	One story frame	One half story frame	---	260	$14,460
4	Basement unfinished	One story brick	One half story frame	---	320	$21,260
5	---	One story frame	---	---	253	$9,730
6	---	One story frame	---	---	304	$11,690
7	---	Patio (concrete)	---	---	399	$1,140
8	---	One story frame	---	---	1,021	$39,250
9	---	Open frame porch	---	---	60	$1,230

☑ Show dimensions ☑ Show addition numbers

Building Sketches from parcel assessment records are available for all **Residential** and **Farm** properties. Very useful for Building Identification.

Building 7170:19-07-022B-0021-0000

Building ID	**7170:19-07-022B-0021-0000**
Full E-911 Address	7170 QUEEN ST, KEARNEYSVILLE, WV 25430
Full Owner Address	7170 QUEEN ST, KEARNEYSVILLE, WV 25430
GIS Parcel ID	19-07-022B-0021-0000
WV Flood Tool Link	https://mapwv.gov/assessment/detail/?pid=1907022B002100000000
WV Parcel Assessment Link	https://mapwv.gov/flood/map/?pid=19-07-022B-0021-0000
CID	540065
Community Name	JEFFERSON COUNTY *
County	JEFFERSON COUNTY
Incorporated/Unincorporated	Unincorporated
Flood Zone Designation	Effective 100 yr Zone AE - Floodway
Floodway	**Yes**
Regulatory Status	Regulatory
FIRM Status	Pre-FIRM
Flood Depth Value	0.5
Flood Depth Source	HEC-RAS
Ground Elevation	151.9
Ground Elevation Source	2012 FEMA Jefferson, Berkeley & Morgan Lidar
Year Built	1900
Grade	B+
Property Class Code	R
Property Class Description	Residential
Land Use Code	101 - Residential 1 Family
Land Use Description	101
Hazard Occupancy Code	RES1
Stories	2
Exterial Wall Type	Frame
Architectural Style	None
Structure Area	4006
Basement Type	Part
Dwelling Value	269300
OBY Value	5160
Building Appraisal	**$274,500**

Detailed Building Inventory Record

Building 7170:19-07-022B-0021-0000

Sample Records of **Modified Building Inventory** for Jefferson County

D	E	F	G	H	P	R	S	T	W	AA	AB	AH	AJ	AM	AN	AO	AP	AT
Building ID	Full E-911 Address	GIS Parcel ID	WV Flood Tool Link	Parcel Assessment Link	Floodway	FIRM Status	Flood Depth Value	Flood Depth Source	Ground Elevation	Year Built	Grade	Hazard Occupancy Code	Stories	Structure Area	Basement Type	Foundation Type	First Floor Height	Building Appraisal
7170:19-07-022B-0021-0000	7170 QUEEN ST	19-07-022B-0021-0000	https://m	https://m	Yes	Pre-FIRM	0.5	HEC-RAS	498.3	1900	B+	RES1	2	4006	Part	Basement	4.0	274500
9999:19-06-0022-0011-0001	9999 WESTSIDE	19-06-0022-0011-0001	https://m	https://m	No	Pre-FIRM	10.6	HEC-RAS	378.7	1800	A-	AGR1	2	970	Part	Slab-on-Grade	1.0	31900
9999:19-06-009B-0021-0000	9999 HAWTHOI	19-06-009B-0021-0000	https://m	https://m	No	Post-FIRM	0.0	HEC-RAS	372.9	1976	C+	RES1	1	3672	Crawl	Slab-on-Grade	1.0	66800
9999:19-02-0019-0035-0006	9999 JOHN RIS	19-02-0019-0035-0006	https://m	https://m	No	Pre-FIRM	3.6	HEC-RAS	355.0	1900	E	RES1	1	640	Full	Basement	4.0	3500
37:19-02-019A-0049-0000	37 RIVER EDGE	19-02-019A-0049-0000	https://m	https://m	No	Pre-FIRM	10.8	HEC-RAS	342.2	1945	D	RES1	1	720	Crawl	Crawlspace	3.0	26900
45:19-02-019A-0050-0000	45 RIVER EDGE	19-02-019A-0050-0000	https://m	https://m	No	Pre-FIRM	2.1	HEC-RAS	349.3	1935	D	RES1	1	676	Part	Crawlspace	3.0	16600
9999:19-09-0006-0004-0000	9999 BILLMYER	19-09-0006-0004-0000	https://m	https://m	No	Pre-FIRM	0.2	HEC-RAS	427.1	1841	B	RES1	2	3089	Full	Basement	4.0	36400
9999:19-07-0007-0005-0012	9999 BOWERS F	19-07-0007-0005-0012	https://m	https://m	No	Pre-FIRM	N/A	N/A	454.0	1971	D	AGR1	1	2200	Full	Basement	4.0	18000
9998:19-07-0007-0005-0020	9998 BOWERS F	19-07-0007-0005-0020	https://m	https://m	No	Post-FIRM	N/A	N/A	413.1	1985	C	RES1	2	3488	Full	Slab-on-Grade	1.0	18800
1273:19-07-007A-0012-0000	1273 BOWERS F	19-07-007A-0012-0000	https://m	https://m	No	Post-FIRM	0.8	HEC-RAS	407.1	1986	C	RES1	2	2024	Crawl	Crawlspace	4.0	82800
9999:19-09-0019-0011-0000	9999 GORDONS	19-09-0019-0011-0000	https://m	https://m	No	Pre-FIRM	7.0	HEC-RAS	295.9	1960	C	RES1	1	998	Full	Basement	4.0	39300
9999:19-04-0002-0013-0001	9999 BAKERTOI	19-04-0002-0013-0001	https://m	https://m	No	Pre-FIRM	9.5	HEC-RAS	293.5	1970	C+	RES1	1	1960	Part	Slab-on-Grade	1.0	27500
288:19-07-0018-0026-0000	288 OUR LN, KE	19-07-0018-0026-0000	https://m	https://m	No	Post-FIRM	1.8	HEC-RAS	434.8	2005	B	RES1	2	1882	Full	Basement	4.0	162600
7094:19-07-022B-0016-0000	7094 LEETOWN	19-07-022B-0016-0000	https://m	https://m	No	Pre-FIRM	1.0	HEC-RAS	498.8	1966	C+	RES1	1	1260	Crawl	Crawlspace	3.0	90100
9999:19-06-0003-0004-0000	9999 GREAT BA	19-06-0003-0004-0000	https://m	https://m	No	Pre-FIRM	N/A	N/A	514.3	1945	E	RES1	1	753	None	Slab-on-Grade	1.0	27000
9999:19-02-0020-0031-0000	9999 Memory L	19-02-0020-0031-0000	https://m	https://m	Yes	Unknown	12.2	HEC-RAS	340.0			RES2	1	1000		Slab-on-Grade	1.0	10000
9998:19-02-0020-0031-0000	9998 Memory L	19-02-0020-0031-0000	https://m	https://m	No	Unknown	3.6	HEC-RAS	348.1			RES2	1	1000		Slab-on-Grade	1.0	10000
9999:19-02-019A-0031-0000	9999 Millville R	19-02-019A-0031-0000	https://m	https://m	No	Pre-FIRM	8.8	HEC-RAS	344.8	1960	D-	RES1	1	540	None	Slab-on-Grade	1.0	12000
265:19-02-019A-0023-0000	265 Millville Rc	19-02-019A-0023-0000	https://m	https://m	No	Pre-FIRM	6.6	HEC-RAS	348.7	1965	E	RES1	1	1518	Part	Basement	4.0	16480
268:19-02-0019-0034-0000	268 JOHN RISS	19-02-0019-0034-0000	https://m	https://m	No	Unknown	0.5	HEC-RAS	359.5			RES2	1	1000		Slab-on-Grade	1.0	10000
457:19-06-008F-0007-0000	457 OLD SHENA	19-06-008F-0007-0000	https://m	https://m	No	Post-FIRM	14.8	HEC-RAS	371.1	1979	E	RES1	2	1488	Full	Basement	4.0	6400
76:19-02-011D-0044-0000	76 MOUNTAIN	19-02-011D-0044-0000	https://m	https://m	No	Post-FIRM	N/A	N/A	524.9	1990	B-	RES1	2	1536	Crawl	Basement	4.0	98300
33:19-04-010A-0002-0000	33 LOUISA BEA	19-04-010A-0002-0000	https://m	https://m	No	Post-FIRM	N/A	N/A	423.3	2007	A+	RES1	2	4815	Full	Basement	4.0	541300
9999:19-06-0006-0004-0003	9999 MISSION I	19-06-0006-0004-0003	https://m	https://m	No	Post-FIRM	15.7	HEC-RAS	350.9	2012	D	RES1	1	216	Crawl	Crawlspace	4.0	39000
662:19-09-008B-0084-0000	662 S CHURCH S	19-09-008B-0084-0000	https://m	https://m	No	Unknown	N/A	N/A	419.7			EDU1	1	22490		Slab-on-Grade	1.0	1428200
255:19-02-0002-0019-0000	255 GAP VIEW I	19-02-0002-0019-0000	https://m	https://m	No	Pre-FIRM	N/A	N/A	521.6	1760	B	AGR1	2	5864	Part	Basement	4.0	31400

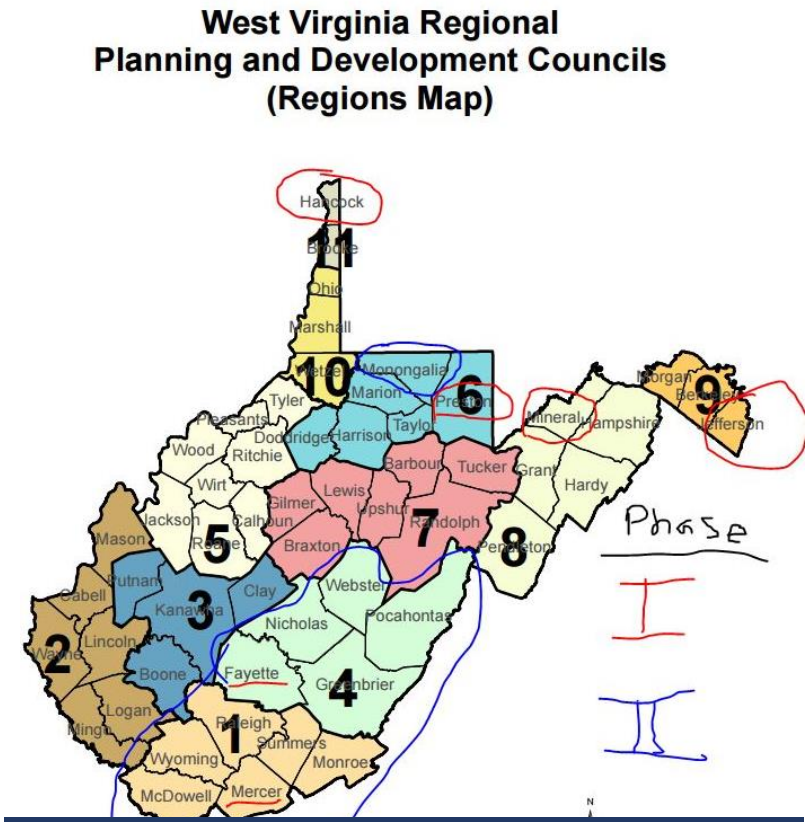
Black Text: Default E-911 Parcel/Assessment Values

Red Text: Modified Building Records (Identifiers, HazusOccCode, Cost, Area, etc.)

Blue Text: Map and Assessment Report Web Links to WV Flood Tool

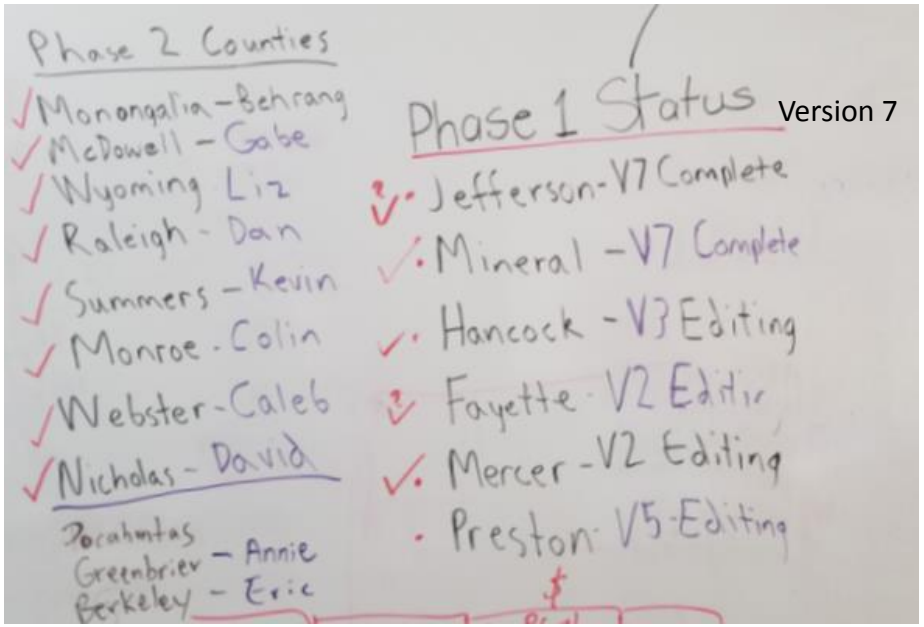
Building Inventory Status

Currently identifying flood-risk structures for 16 counties



Ongoing Building Inventory Counties

Building Inventory Versions of Accuracy Improvement



Building Inventory - Iterative Process & Versions

Statewide Flood Risk Assessment

Flood Model Outputs

- **Flood Models**
  - FEMA Open Hazus **Flood Assessment Structure Tool** (FAST)
    - Building Direct Economic Loss Estimates
    - Incorporate **Population Displacement** and **Short-Term Shelter Needs** in FEMA's Open Hazus script

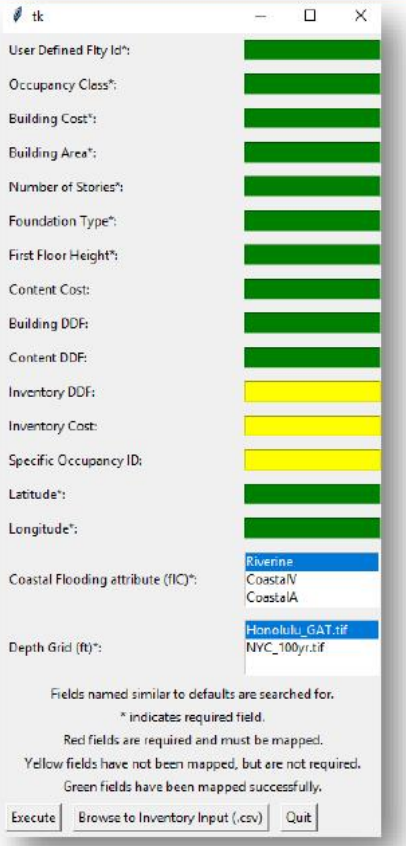
- **Model Data Outputs**
  - Community-Level
  - Building-Level
  - 3D Visualizations

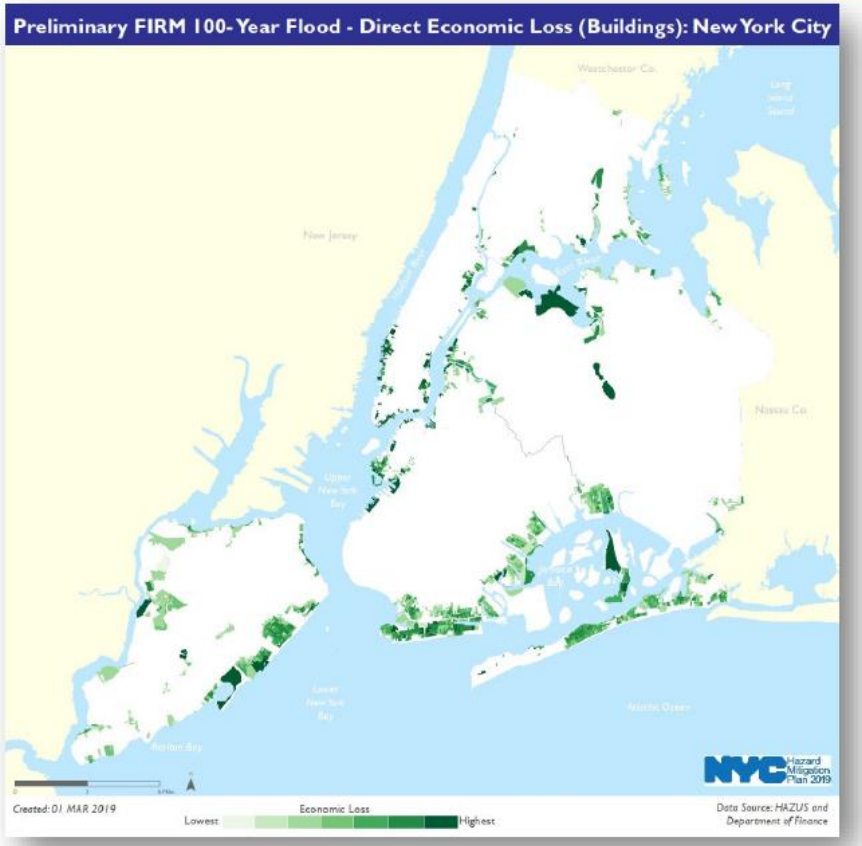
- **Risk Layers Published to RiskMAP View of WV Flood Tool** (www.mapwv.gov/Flood)

- **Community Flood Risk Assessments**
  - Submit flood risk assessments and data to communities, state, and federal partners
  - Identify potential mitigation actions and resources for stakeholders that correlate with risk assessment outputs/analytics

Hazus Flood Loss Estimation Program

Flood Loss Utility





FEMA's new OpenHazus Flood Loss Utility.

It works!

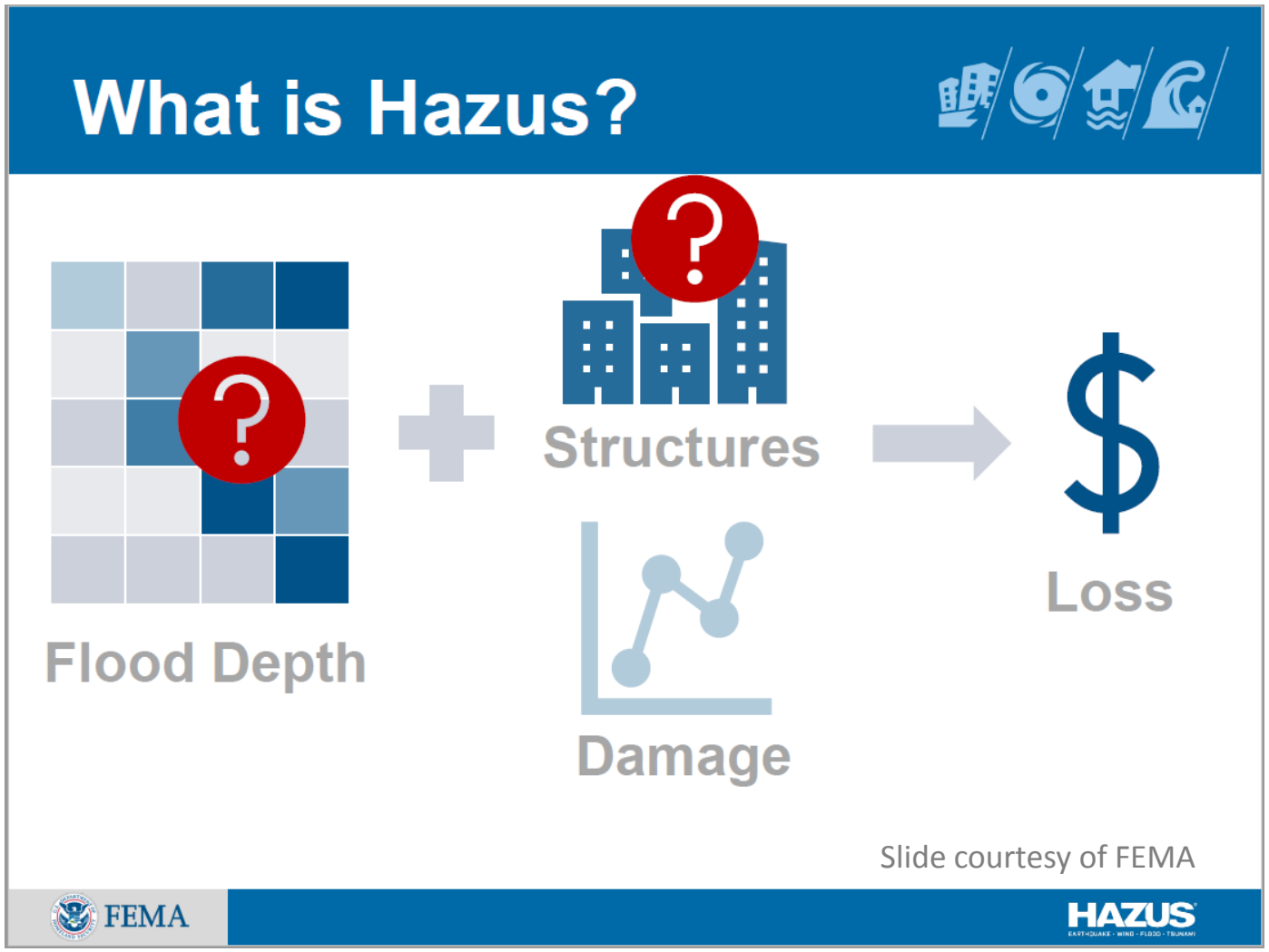
Very beneficial for project!

Slide courtesy of FEMA

FEMA HAZUS

Hazus Flood Loss Estimation Program

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



Goal: Add Shelter Model to Hazus FAST

ORIGINAL MODEL:

- The expert-based short-term shelter model developed by Harrald et al. (1989) at George Washington University for the earthquakes in Northern California in a contract with the American Red Cross

Reference:

- Harrald, J. R., Al-Hajj, S., Fouladi, B., & Jeong, D. (1994). Estimating the demand for sheltering in future earthquakes. Unpublished paper, Department of Engineering Management, the George Washington University, Washington, DC.

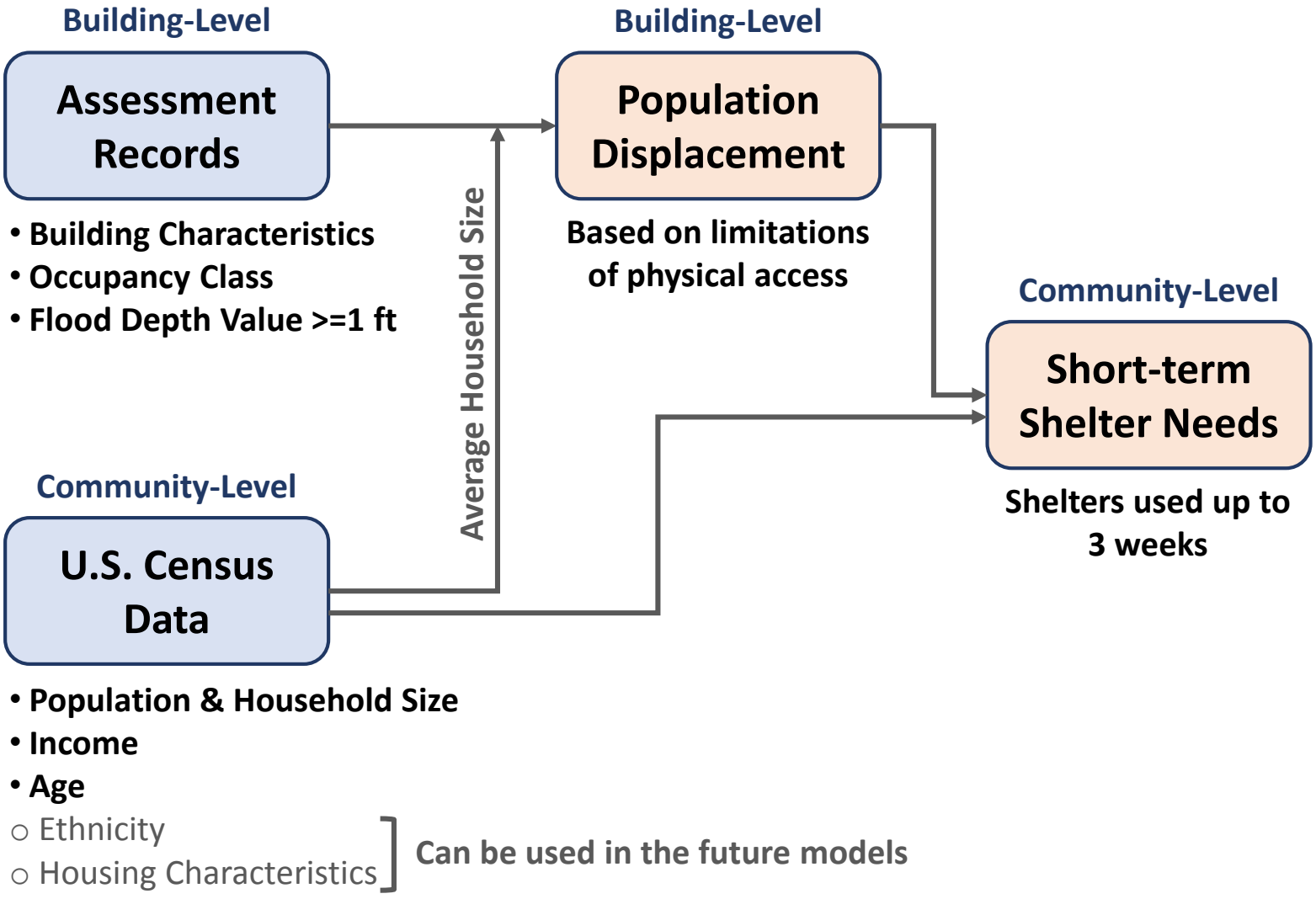
VARIABLES:

- Socio-economic variables for shelter model weighted by experts:
  - **Income** (In five classes from $10,000 to $35,000)
  - **Ethnicity** (White, African American, Hispanic, Asian/Other)
  - **Age** (Under or above 65)
  - **Residence Type** (Owned, Rental, Vacation)

- Modified and applied to floods in "Flood Model Hazus-MH Technical Manual", Chapter 13 **removing ethnicity and residence type**

*Objective: Incorporate **Population Displacement** and **Short-Term Shelter Needs** in FEMA's Open Hazus script*

Jefferson County– Proposed Shelter Model



Jefferson County– Displacement

BASE MODEL: Flood Model Hazus-MH Technical Manual
MODIFICATIONS: Scale of calculations changed to buildings

DATA:

- ***Hazard Occupancy Code*** and ***Flood Depth Value*** for Jefferson County at the scale of buildings (Building Inventory)
- ***Average Household Size*** of the communities from census data (2017 American Community Survey (ACS) 5-Year Estimates downloaded from "American Fact Finder“)

METHOD:

- Extraction of the ***buildings*** located in flood zones with the depth value of 1 ft or more
- Estimating the number of the ***residential units*** in each building using the occupancy code
- Calculation of the estimated ***residing population*** in each building using the average household size of the community
- Adding the population of the buildings in each community

Jefferson County– Displacement

DEFINED EQUATION:

$$\#\mathbf{DI_{IN}} = \sum_{\mathbf{j=1}}^{\mathbf{n}} (\mathbf{ResUNIT_{IN}} \times \mathbf{AveHHSize_{COMM}})$$

Where:

$\#\mathbf{DI_{IN}}$ = the number of displaced individuals as a result of inundation with the depth equal or more than 1 foot

$\mathbf{ResUNIT_{IN}}$= the number of residential units in each building located within the area of inundation with the depth equal or more than 1 foot

$\mathbf{AveHHSize_{COMM}}$= the average household size of the community where the building is located

$\mathbf{j}$= the number of residential buildings within the flooded area with the depth equal or more than 1 foot

OBJECTID	Lat	Long	Flood Depth Value	Hazard Occupancy Code	Residential Units FLD Zones	Ave HH Size	Residing Population	Displaced Population 1ft or More	TRACTCE10	Block Group ID	BLOCKCE10	GEOID10	NAME10
535	39.2876158	-77.86459387	1	RES1	1	2.49	2.49	2.49	972505	540379725051	1047	540379725051047	Block 1047
536	39.2875983	-77.86462745	1	RES1	1	2.49	2.49	2.49	972505	540379725051	1047	540379725051047	Block 1047
537	39.2876014	-77.8647403	1.1	RES1	1	2.49	2.49	2.49	972505	540379725051	1047	540379725051047	Block 1047
538	39.2875286	-77.8648382	1.1	RES3A	2	2.49	4.98	4.98	972505	540379725051	1047	540379725051047	Block 1047
539	39.2868605	-77.86563603	N/A	RES1	1	2.49	2.49	0.00	972501	540379725011	1089	540379725011089	Block 1089
540	39.2867933	-77.86543516	1.4	RES1	1	2.49	2.49	2.49	972501	540379725011	1089	540379725011089	Block 1089
541	39.2864864	-77.86500677	0.1	RES1	1	2.49	2.49	0.00	972501	540379725011	1089	540379725011089	Block 1089
542	39.2870223	-77.86477163	0.4	RES1	1	2.49	2.49	0.00	972501	540379725011	1089	540379725011089	Block 1089
543	39.2871321	-77.86495628	0.2	RES1	1	2.49	2.49	0.00	972501	540379725011	1089	540379725011089	Block 1089

A part of the population displacement table at building level

Jefferson County– Shelter Needs

BASE MODEL: Flood Model Hazus-MH Technical Manual

MODIFICATIONS: **Income classes updated based on the inflation rate**

DATA:

- ***Displaced Population*** estimated in the previous part
- ***Household Income*** and ***Age*** from census data (2017 American Community Survey (ACS) 5-Year Estimates downloaded from "American Fact Finder“)

METHOD: Based on "Flood Model Hazus-MH Technical Manual", Chapter 13, at the scale of communities:

- Calculation of the percentage of households in the ***income classes***:
  - IM1: **HH Income per year < $20,000**
  - IM2: **$20,000 <= HH Income per year < $30,000**
  - IM3: **$30,000 <= HH Income per year < $50,000**
  - IM4: **$50,000 <= HH Income per year < $60,000**
  - IM5: **$60,000 <= HH Income per year**
- Calculation of the percentage of individuals in the ***age classes***:
  - AM1: Less than **15** years
  - AM2: **15** to **64** years
  - AM3: **65** years or more

Jefferson County– Shelter Needs

MODIFICATIONS TO INCOME CLASSES:

- The inflation rate of 1990 to 2017 (1.87) was slightly changed while applying to make the intervals match the census data

Income Class	Original and Hazus Models	Modified Model
IM1	HH Income < $10,000	HH Income < $20,000
IM2	$10,000 <= HH Income < $15,000	$20,000 <= HH Income < $30,000
IM3	$15,000 <= HH Income < $25,000	$30,000 <= HH Income < $50,000
IM4	$25,000 <= HH Income < $35,000	$50,000 <= HH Income < $60,000
IM5	$35,000 <= HH Income	$60,000 <= HH Income

Jefferson County– Shelter Needs

USED EQUATIONS:

$$\#\mathbf{STP} = \sum_{\mathbf{k=1}}^{\mathbf{5}} \sum_{\mathbf{m=1}}^{\mathbf{3}} [\boldsymbol{\alpha}_{\mathbf{km}} \times \mathbf{DP} \times \mathbf{HI}_{\mathbf{k}} \times \mathbf{HA}_{\mathbf{m}}]$$

Where:

$\#\mathbf{STP}$ = Number of people using established shelters

$\boldsymbol{\alpha}_{\mathbf{km}}$ = a constant calculated as below

$\mathbf{DP}$ = Displaced population by inundation with equal or more than 1 foot depth (from the previous stage)

$\mathbf{HI}_{\mathbf{k}}$ = Percentage of population in the k^{th} income class

$\mathbf{HA}_{\mathbf{m}}$ = Percentage of population in m^{th} age class

$$\boldsymbol{\alpha}_{\mathbf{km}} = (\mathbf{IW} \times \mathbf{IM}_{\mathbf{k}}) + (\mathbf{AW} \times \mathbf{AM}_{\mathbf{k}})$$

Where:

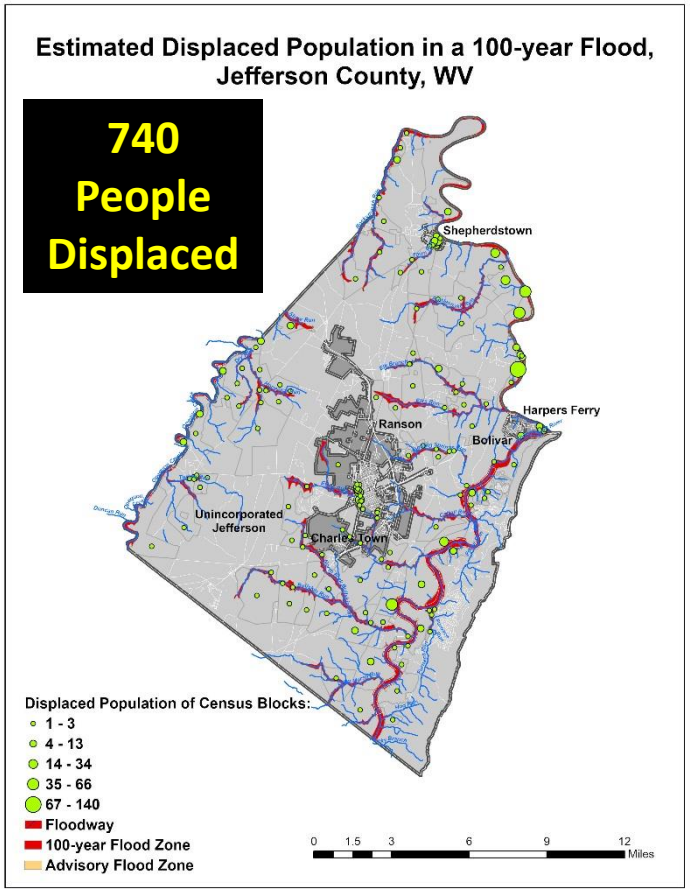
$\mathbf{IW}$ = Shelter category weight for income (0.8)

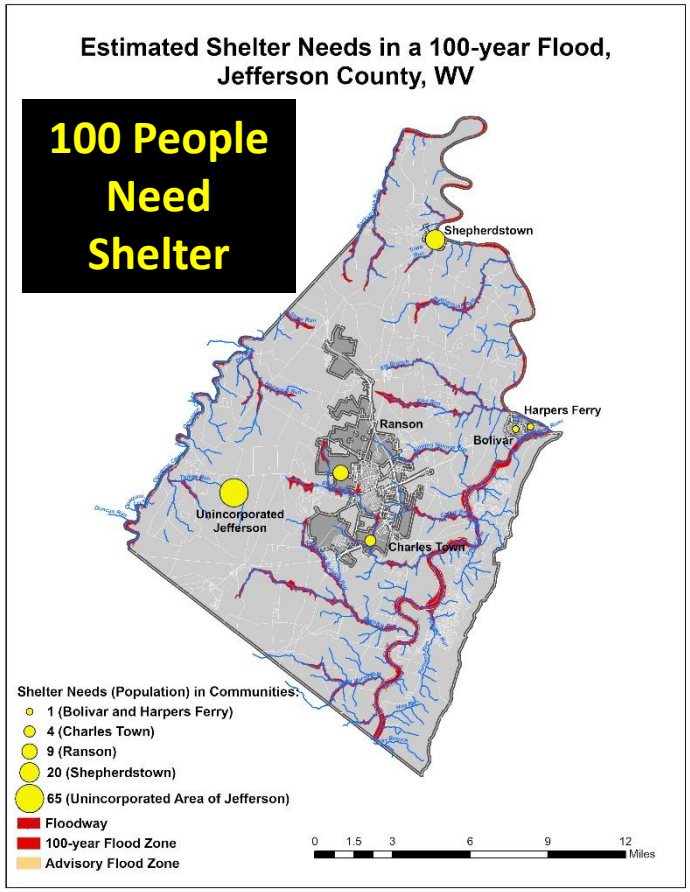
$\mathbf{AW}$ = Shelter category weight for age (0.2)

$\mathbf{IM}_{\mathbf{k}}$ = Relative modification factor for income (calculated using table 13.2 in the manual)

$\mathbf{AM}_{\mathbf{m}}$ = Relative modification factor for age (calculated using table 13.2 in the manual)

Jefferson County– Results





#	CID	Census ID	Community Name	County	Incorporated / Unincorporated	Total Population	Residential Units in Flood Zones	Average Household Size	Population Residing in Flood Zones	Percentage of Population Residing in Flood Zones	Estimated Displaced Population (Inundation >= 1 ft)	Percentage of Population in Flood Zones Displaced	Estimated Population in Need of Shelter (Inundation >= 1 ft)	Percentage of Population in Flood Zones in Need of Shelter
1	540065	_	JEFFERSON COUNTY *	JEFFERSON COUNTY	Unincorporated	41,907	501	2.6	1322	3.2%	549	41.5%	65	4.9%
2	540030	5408932	BOLIVAR, TOWN OF	JEFFERSON COUNTY	Incorporated	1,246	3	2.4	7	0.6%	7	100.0%	1	15.7%
3	540066	5414610	CHARLES TOWN, CITY OF	JEFFERSON COUNTY	Incorporated	5,766	24	2.5	60	1.0%	22	37.5%	4	6.1%
4	540067	5435284	HARPERS FERRY, TOWN OF	JEFFERSON COUNTY	Incorporated	236	6	2.1	13	5.3%	10	83.3%	1	10.1%
5	540068	5466988	RANSON, CITY OF	JEFFERSON COUNTY	Incorporated	4,945	81	2.7	215	4.4%	51	23.5%	9	4.3%
6	540069	5473468	SHEPHERDSTOWN, TOWN OF	JEFFERSON COUNTY	Incorporated	1,573	61	1.7	104	6.6%	100	96.7%	20	19.4%
7	**Total in county**			**Jefferson County**	_	**55,673**	**676**	_	**1721**	**3.1%**	**740**	**43.0%**	**100**	**5.8%**

Future Directions

- Include more variables relevant to housing characteristics in the shelter model such as:
  - Housing Ownership Type (Owned or Rental)
  - Occupancy Type (Single family, Multi-family, & Mobile Home)
  - Geography: Urban versus Rural
- Research and review the actual shelter data of floods provided by the American Red Cross to test the model
- Data preparation for unincorporated areas missing in the census data by subtracting the demographic data of the communities from those of the county
- Automate data processing of the required variables for displacement and shelter estimations
- Customize Open Hazus "FAST" Flood Assessment Structure Tool including population displacement and shelter needs

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"… the task of estimating and preparing for shelter demand is still very challenging." (Dr. John Harrald, 2019)

"The results of all modeling efforts should be interpreted with a degree of skepticism." (Harrald et al., 1994, p.13)

"Any model is a selective representation of reality." (Harrald et al., 1994, p.14)

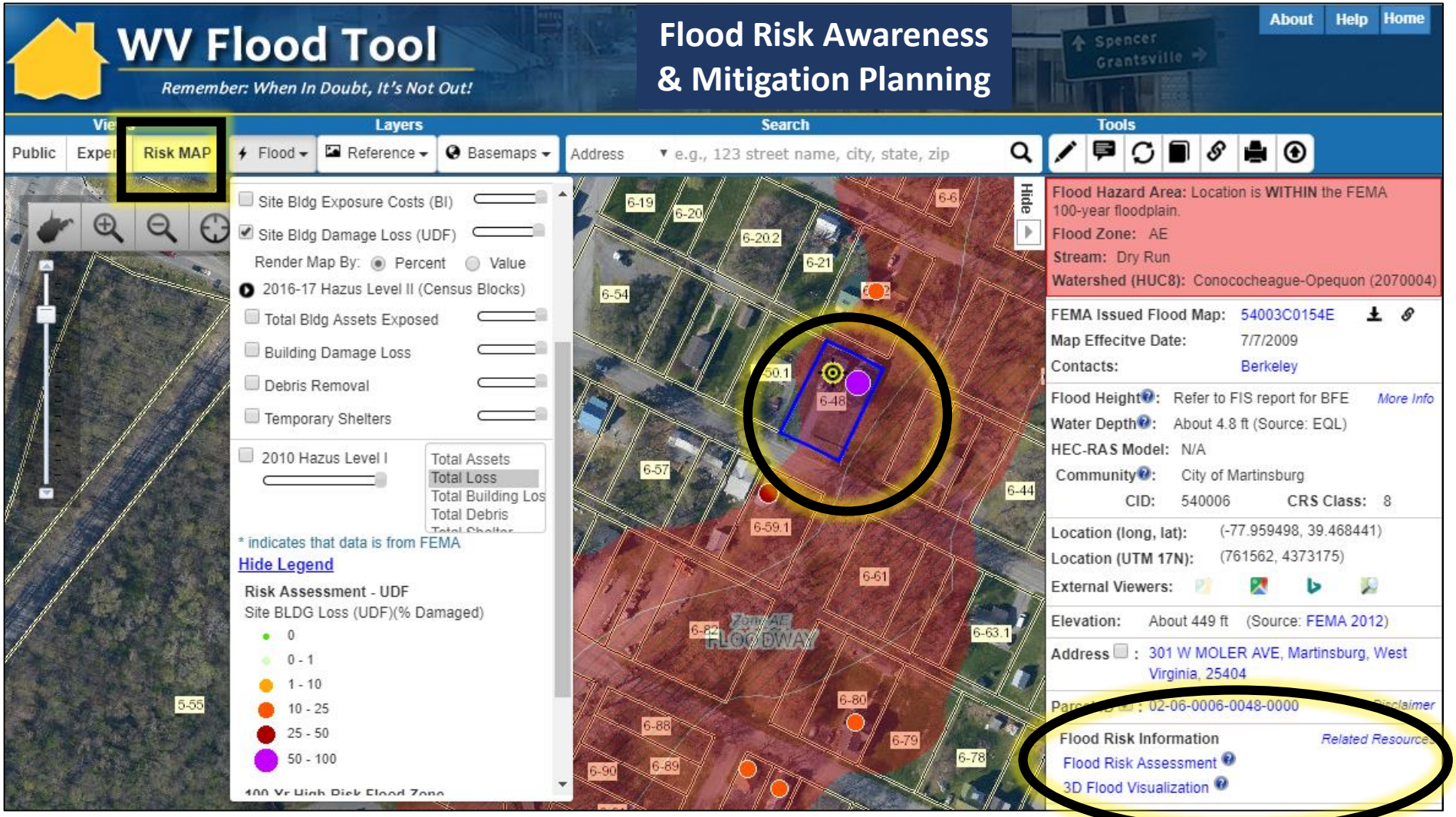
Statewide Flood Risk Assessment

Outputs Published

- **Model Data Outputs**
  - Community-Level
  - Building-Level
  - 3D Visualizations

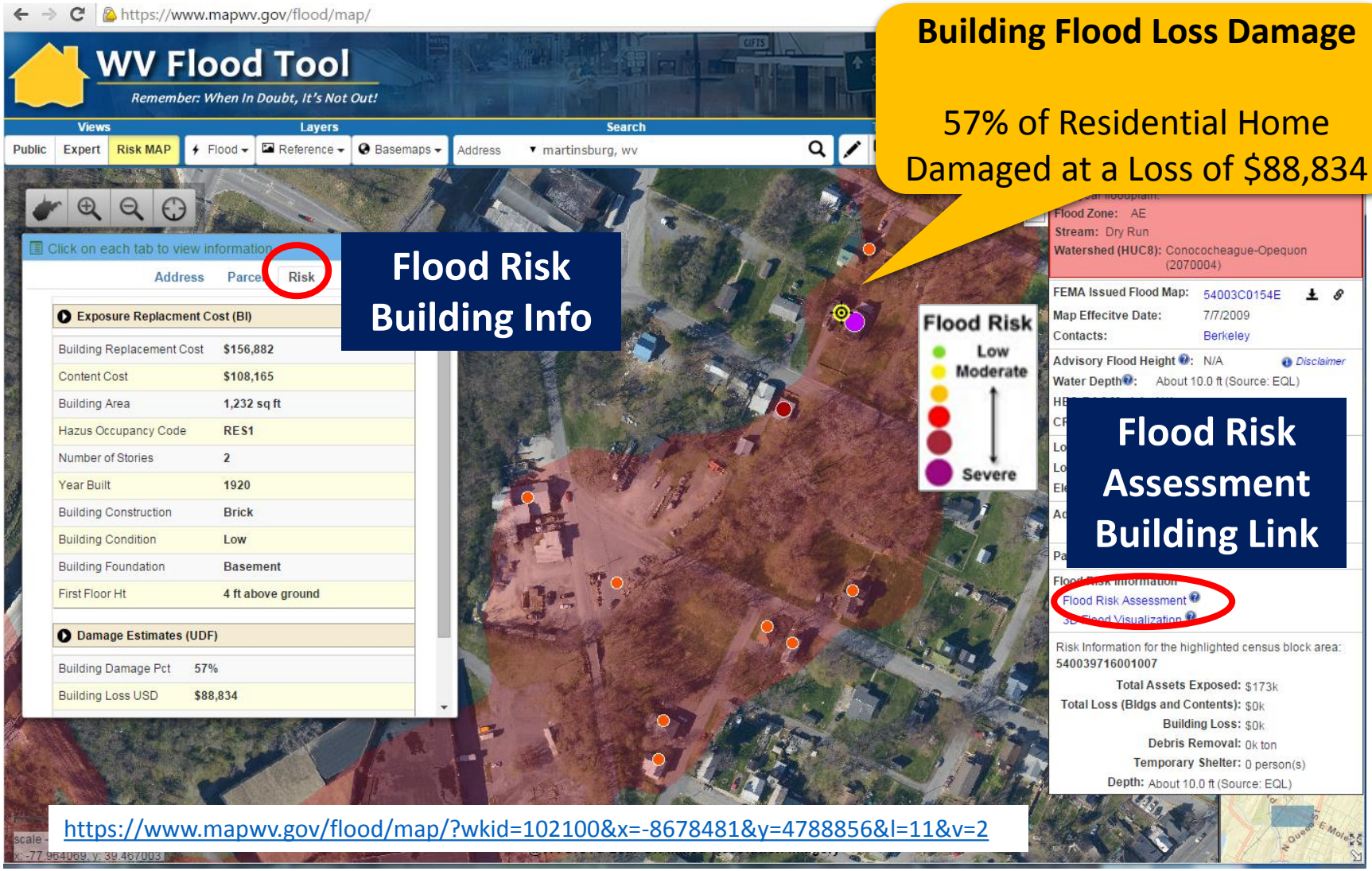
- **Risk Layers Published to RiskMAP View of WV Flood Tool** (www.mapwv.gov/Flood)

RiskMAP View – Martinsburg, WV



https://www.mapwv.gov/flood/map/?wkid=102100&x=-8678412&y=4788996&l=11&v=2

Flood Risk Structures of Martinsburg



The Risk MAP View allows for viewing flood loss estimates at the building or structure level for a 1%-annual-chance flood event

RiskMAP View – 3D Visualization

Click on each tab to view information

Address | Parcel | Risk

Exposure Replacment Cost (BI)

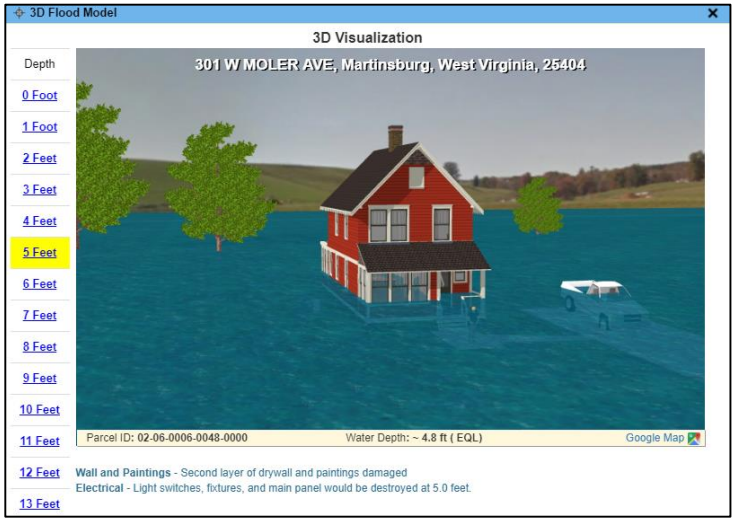
Building Replacement Cost	$156,882
Content Cost	$108,165
Building Area	1,232 sq ft
Hazus Occupancy Code	RES1
Number of Stories	2
Year Built	1920
Building Construction	Brick
Building Condition	Low
Building Foundation	Basement
First Floor Ht	4 ft above ground

Building Exposure

Damage Estimates (UDF)

Building Damage Pct	57%
Building Loss USD	$88,834
Content Damage Pct	54%
Content Loss USD	$42,701

HAZUS Loss Estimate

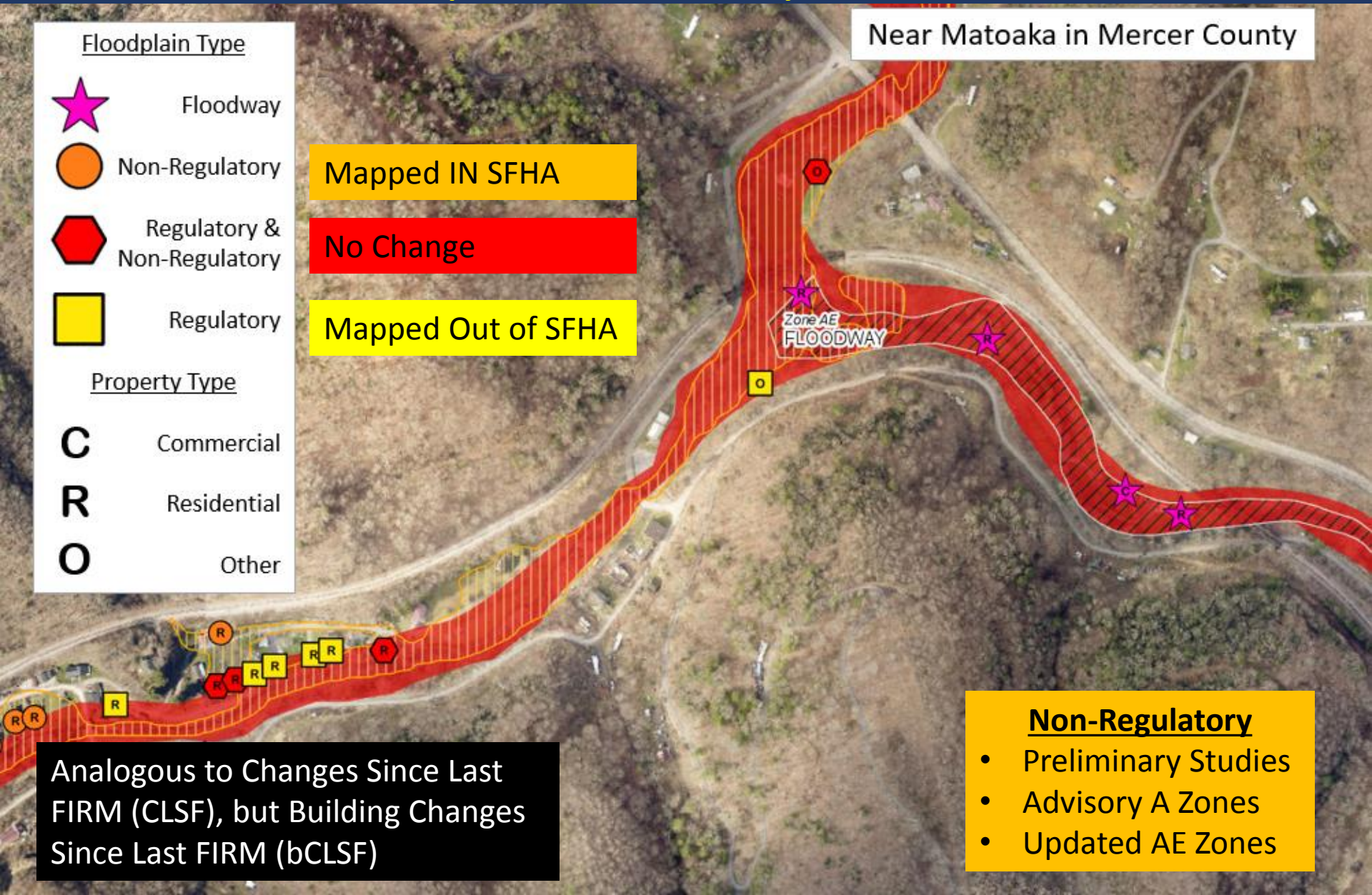


Flood Depth – 3D Visualization

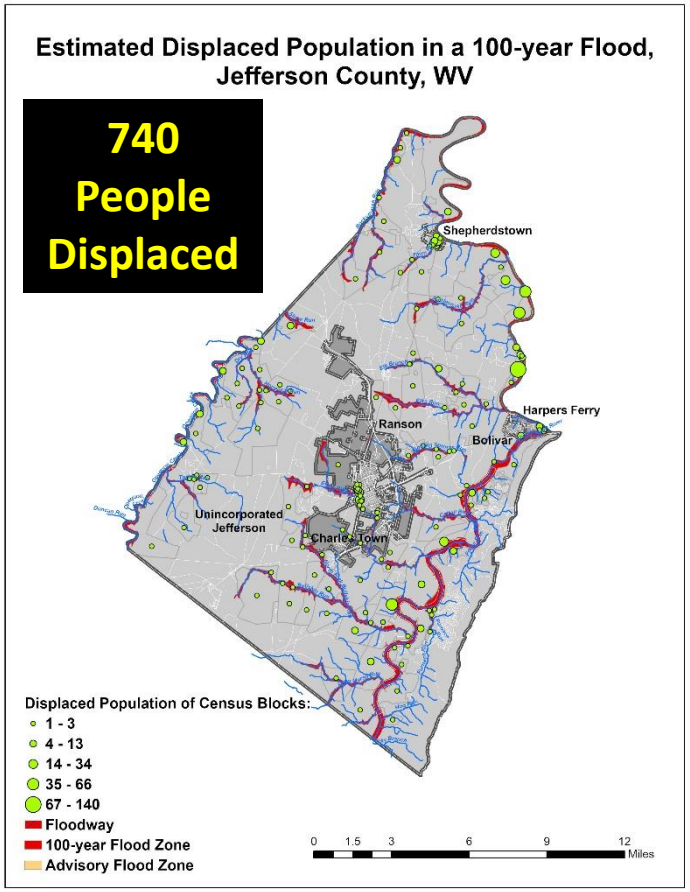
Street View Image

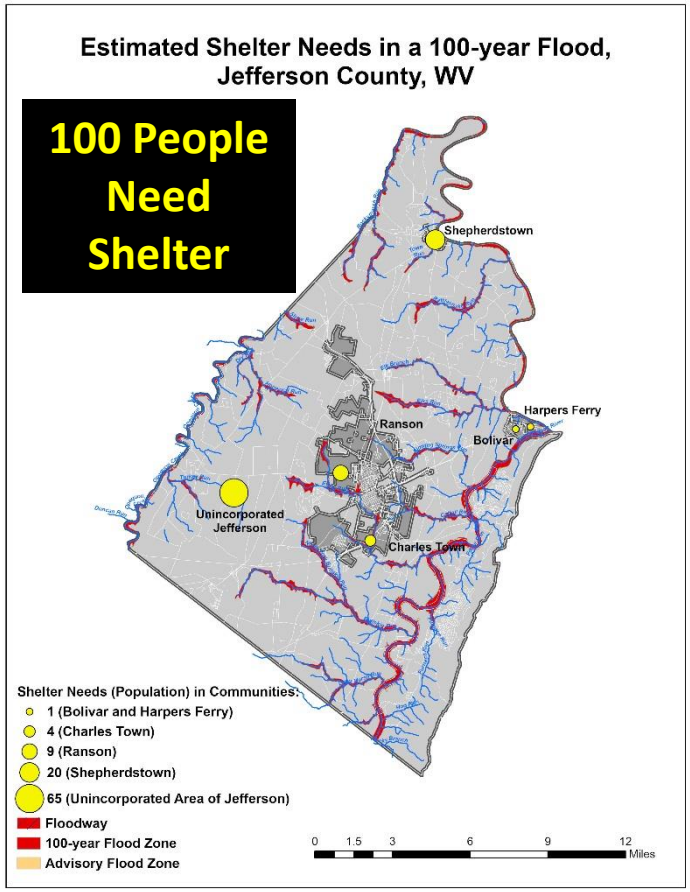
Building Changes Since Last FIRM

Concept Slide of Flood Risk Layer on Flood Tool



Jefferson County– Results

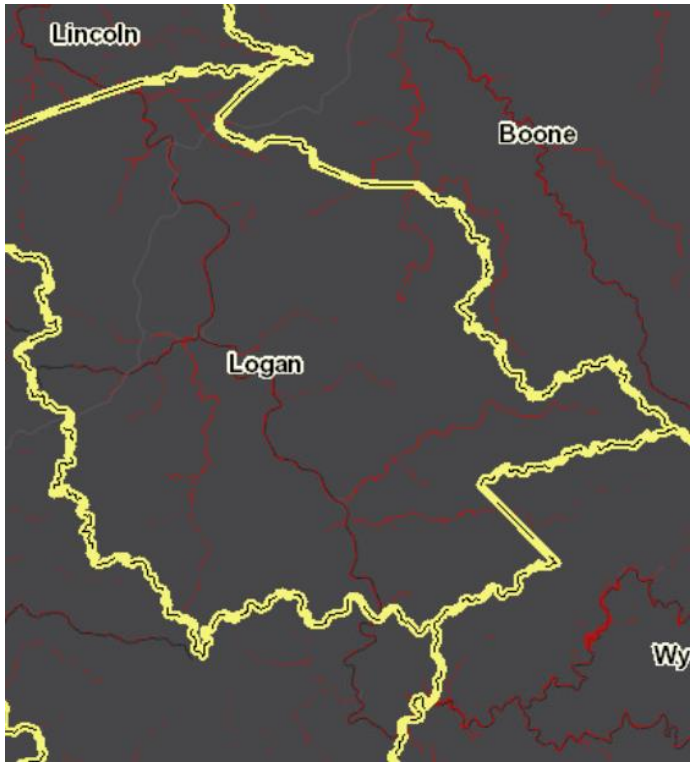




#	CID	Census ID	Community Name	County	Incorporated / Unincorporated	Total Population	Residential Units in Flood Zones	Average Household Size	Population Residing in Flood Zones	Percentage of Population Residing in Flood Zones	Estimated Displaced Population (Inundation >= 1 ft)	Percentage of Population in Flood Zones Displaced	Estimated Population in Need of Shelter (Inundation >= 1 ft)	Percentage of Population in Flood Zones in Need of Shelter
1	540065	_	JEFFERSON COUNTY *	JEFFERSON COUNTY	Unincorporated	41,907	501	2.6	1322	3.2%	549	41.5%	65	4.9%
2	540030	5408932	BOLIVAR, TOWN OF	JEFFERSON COUNTY	Incorporated	1,246	3	2.4	7	0.6%	7	100.0%	1	15.7%
3	540066	5414610	CHARLES TOWN, CITY OF	JEFFERSON COUNTY	Incorporated	5,766	24	2.5	60	1.0%	22	37.5%	4	6.1%
4	540067	5435284	HARPERS FERRY, TOWN OF	JEFFERSON COUNTY	Incorporated	236	6	2.1	13	5.3%	10	83.3%	1	10.1%
5	540068	5466988	RANSON, CITY OF	JEFFERSON COUNTY	Incorporated	4,945	81	2.7	215	4.4%	51	23.5%	9	4.3%
6	540069	5473468	SHEPHERDSTOWN, TOWN OF	JEFFERSON COUNTY	Incorporated	1,573	61	1.7	104	6.6%	100	96.7%	20	19.4%
7	**Total in county**			**Jefferson County**	_	**55,673**	**676**	_	**1721**	**3.1%**	**740**	**43.0%**	**100**	**5.8%**

Building Counts – Logan County

Community Name	Regulatory Floodway	Effective SFHA	Non-Regulatory High Risk
KANAWHA COUNTY *	1,216	8,230	234
LOGAN COUNTY *	**1,124**	**5,696**	**706**
HAMPSHIRE COUNTY*	613	1,501	0
BOONE COUNTY *	454	2,932	535
MINGO COUNTY *	398	3,295	258
WAYNE COUNTY*	332	3,102	232
MCDOWELL COUNTY *	331	2,369	928
SUMMERS COUNTY *	289	1,362	104
WYOMING COUNTY *	279	2,421	831
MINERAL COUNTY *	196	707	2
RICHWOOD, CITY OF	136	366	0
KEYSER, CITY OF	116	290	0
MORGAN COUNTY*	115	767	54
HANCOCK COUNTY *	110	307	21
WHEELING, CITY OF	110	2,658	1
NEW MARTINSVILLE	103	905	0
MASON COUNTY *	102	1,182	0
WHITE SULPHUR SPRINGS	99	470	0
PLEASANTS COUNTY *	93	481	66
PARSONS, CITY OF	91	356	0
WELCH, CITY OF	90	380	18
MERCER COUNTY*	84	1,907	69



Logan County has a significant number of structures in the SFHA, Floodway, and Non-Regulatory Advisory A Zones that are High Risk

Sample Community-Level Report

Acreage of the SFHA (Top 20)

Sample Community-Level Tabular Report

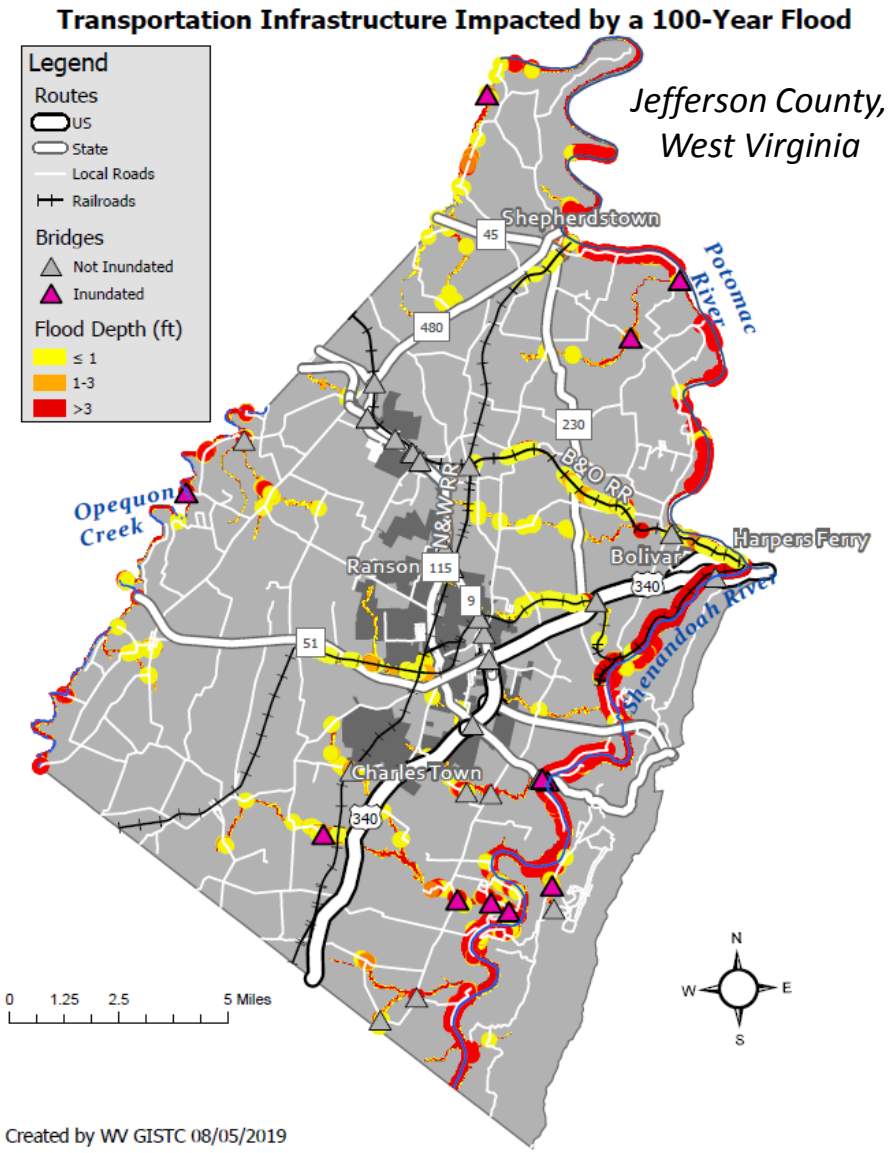
Top 20 Unincorporated / Incorporated Areas with Highest Acreage of SFHA (aSFHA)

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

Transportation Infrastructure



WATER DEPTH	VEHICLES
<= 1 foot	A foot of water will float many vehicles.
1 – 3 feet of water	Two feet of water will carry away most vehicles. Three feet of water will easily float a bus.
> 3 feet	All vehicles incur substantial water damage and can be carried away by flood waters.

WATER DEPTH	RESCUE RESPONSE
<= 1 foot	Response focused on those who need additional assistance.
1 – 3 feet of water	A high-water vehicle rescue limit is about 3 feet.
> 3 feet	Boats and helicopters are required to perform high water rescues when water depths exceed three feet. The risk to people increases with higher water velocities and flood depths.

Sample Flood Hazard Map on Transportation Infrastructure

Statewide Flood Risk Assessment

What is a Hazard Mitigation Action?

- Any sustained action taken to **reduce or eliminate the long-term risk** to human life and property from hazards
- Communities sustain action by building the **capacity**, **knowledge**, and **understanding** necessary to successfully advance action

Local Plans & Regulations

Structure & Infrastructure Projects

Natural Systems Protection

Education & Awareness Programs

Slide courtesy of FEMA

Identify Mitigation Actions derived from Risk Assessments

Statewide Flood Risk Assessment

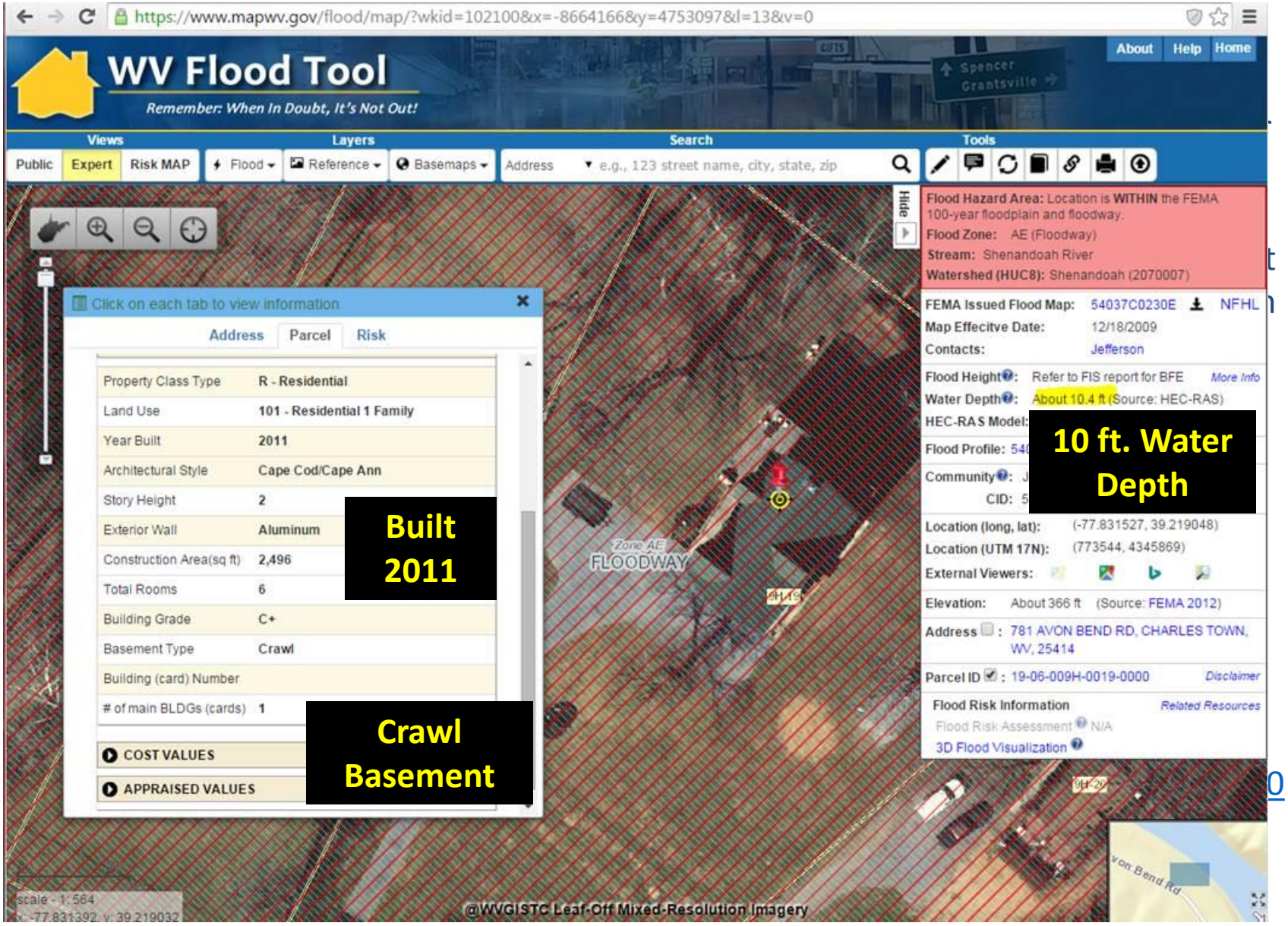
Community Engagement & Field Verification

- **Community Flood Risk Assessments**
  - Submit flood risk assessments and data to communities, state, and federal partners.
  - Review potential mitigation actions and resources with stakeholders that correlate with risk assessment outputs/analytics. Link to available FEMA and State Resource Guides:
    - *Reducing Damage from Localized Flooding: A Guide for Communities*
    - *Community Rating System Coordinators Manual*
    - *WV Floodplain Management Quick Guide*

- **Field Accuracy Checks**
  - Make necessary edits to Flood Risk Assessment GIS
  - Revisions serve as new Model Inputs for Building Inventory Cycle

- **Communities do not need mapping software since…**
  - Building-Level Flood-Risk Assessments can be viewed in a Spreadsheet Table with web links to WV Flood Tool

Field Verification – Post-FIRM Structure



Post-FIRM Structure in Floodway?

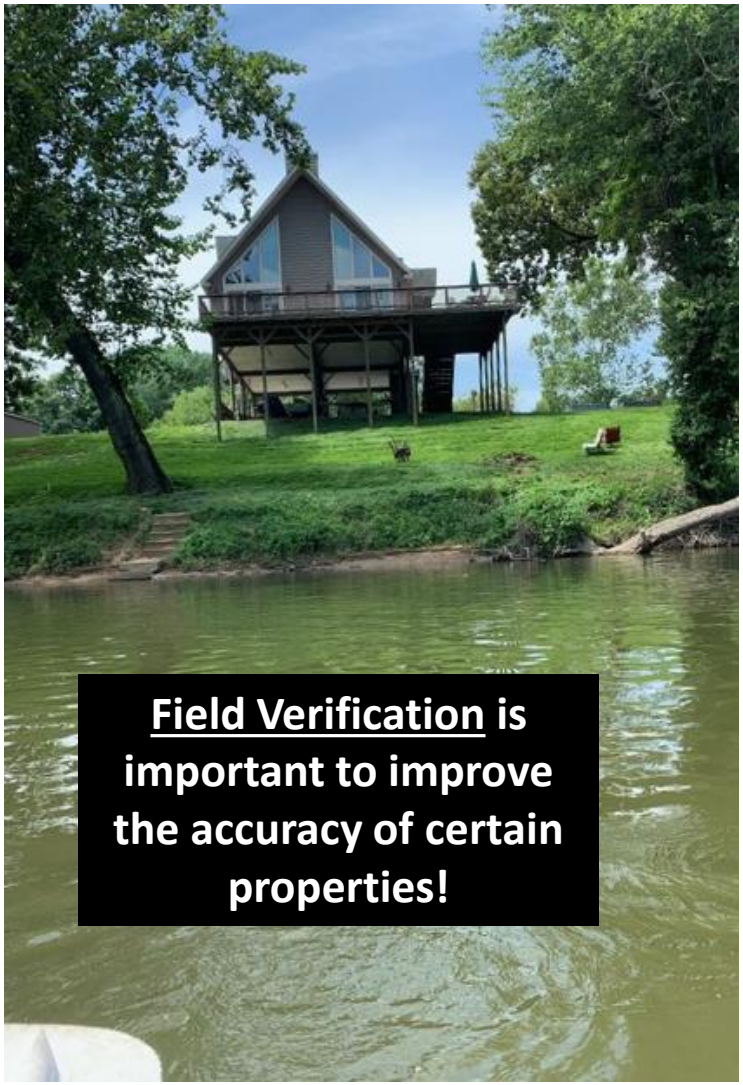
Building ID	**781:19-06-009H-0019-0000**
Full E-911 Address	781 AVON BEND RD, CHARLES TOWN, WV, 25414
Full Owner Address	9299 ALL SAINTS RD, LAUREL, MD 20723
GIS Parcel ID	19-06-009H-0019-0000
Lat	39.218996
Long	-77.83151391
Plus Code	87F46599+H9X
WV Flood Tool Link	https://mapwv.gov/flood/map/?wkid=102100&x=-8664164.49652&y=4753089.59353&l=13&v=0
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 Inventory

Building ID	**781:19-06-009H-0019-0000**
Full E-911 Address	781 AVON BEND RD, CHARLES TOWN, WV, 25414
GIS Parcel ID	19-06-009H-0019-0000
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
Full Owner Address	9299 ALL SAINTS RD, LAUREL, MD 20723
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	$32,298.78
DebrisID	RES1NBFT4
Debris_Tot	16.9728
Restor_Days_Min	270
Restor_Days_Max	450
GridName	AFH_wm.tif

FAST Utility Output

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 FAST Loss Estimate Utility executed again for this structure.

The estimated Base Flood Water Depth for this structure is 10 feet and with 2 feet of freeboard 12 feet.

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

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

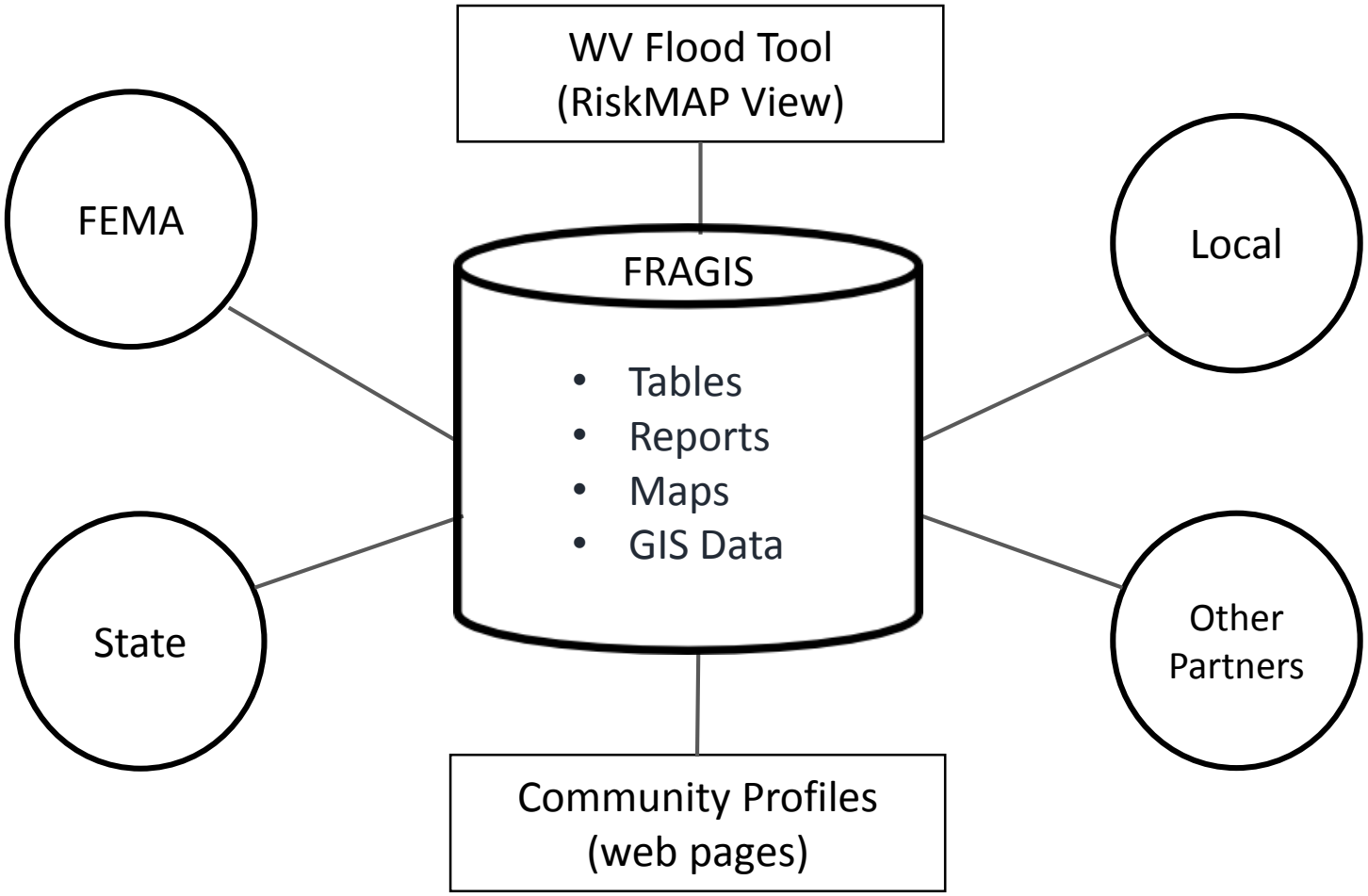
Statewide Flood Risk Assessment

Flood Risk Assessment GIS (FRAGIS)

- **All risk assessment data will be available to the communities, State, FEMA, and other partners**
  - Tables
  - Reports
  - Maps
  - GIS Data

- **Risk Layers will be published to RiskMAP View of the WV Flood Tool** (www.mapwv.gov/Flood)
  - A disclaimer will be written to state the limitations and proper use of the flood risk data models
  - Community profile web pages with risk assessment information can also be published. The community pages link to the WV Flood Tool.

Flood Risk Assessment GIS (FRAGIS)



Data sharing and publishing of Flood Risk Assessments

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