

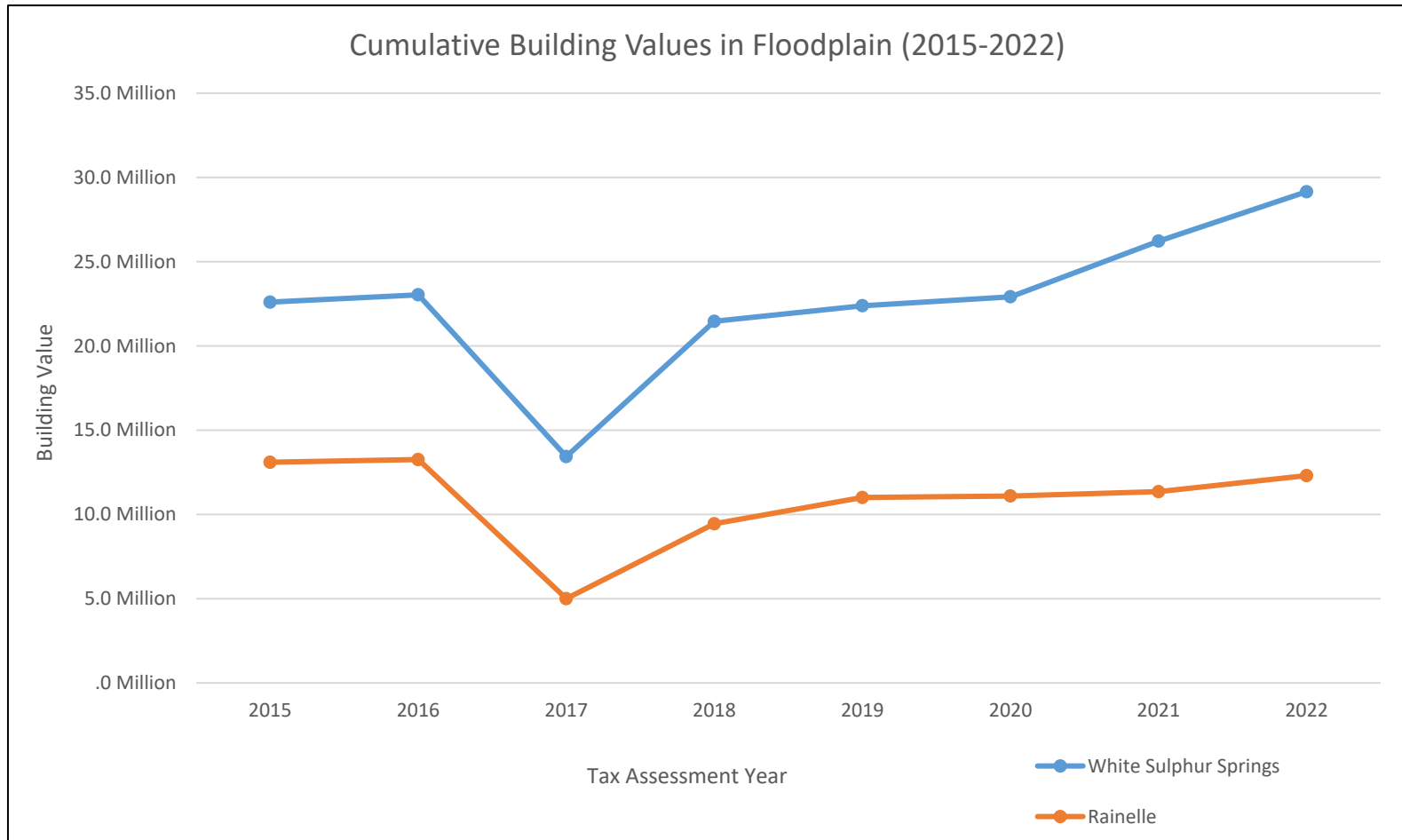
# Mitigation Measures

Category	Mitigation Indicator	White Sulphur Springs	Rainelle
Mitigated Structures	Elevated Structures to Design Flood Elevation (DFE)	217	87
	Rehabilitated/Repaired Structures	394	278
	Unmitigated Low Value Structures	14	47
	Structures Removed (vacant parcel)	49	41
Open Space Preservation	Buyout Parcels (Deed Restricted)	16	18
	Community-Owned Vacant Parcels	66	88
	Area of Open Space Preservation (OSP)	5 Acres	3 Acres
	Ratio of Open Space Preservation (OSP to SFHA)	2.6%	4.5%
Building Value Recovery	Net Value 2016-2022 Tax Assessment Value	+ \$6.1 Million	- \$1.0 Million
Loss Avoidance 100-year Flood	Loss Avoidance by Elevating or Removing Structures (preliminary results)	\$2.6 million	\$2.3 million

# Mitigation Measures (continued)

Category	Mitigation Indicator	White Sulphur Springs	Rainelle
Resiliency to Future Floods	Percent Residential Structures in 100-year floodplain elevated to Design Flood Elevation (DFE)	59%	35%
Floodplain Management	Freeboard (safety elevation factor above BFE)	2 ft.	2 ft.
	Community Rating System (above min. requirements)	No	No
	Incorporated Place a compacted floodplain management area to enforce floodplain ordinance	Yes	Yes
	Continuity of operations and immediate response to disasters	?	?
	Record keeping (permits, EC's, substantial damage)	Yes	?
Flood Insurance	Number of Policies 2023	67	36
Risk Communications	Flood Risk Disclosure Laws in West Virginia	F grade	F grade
	Outreach to property owners about changes to flood maps (mapped in/mapped out of SFHA)	Pending	Pending

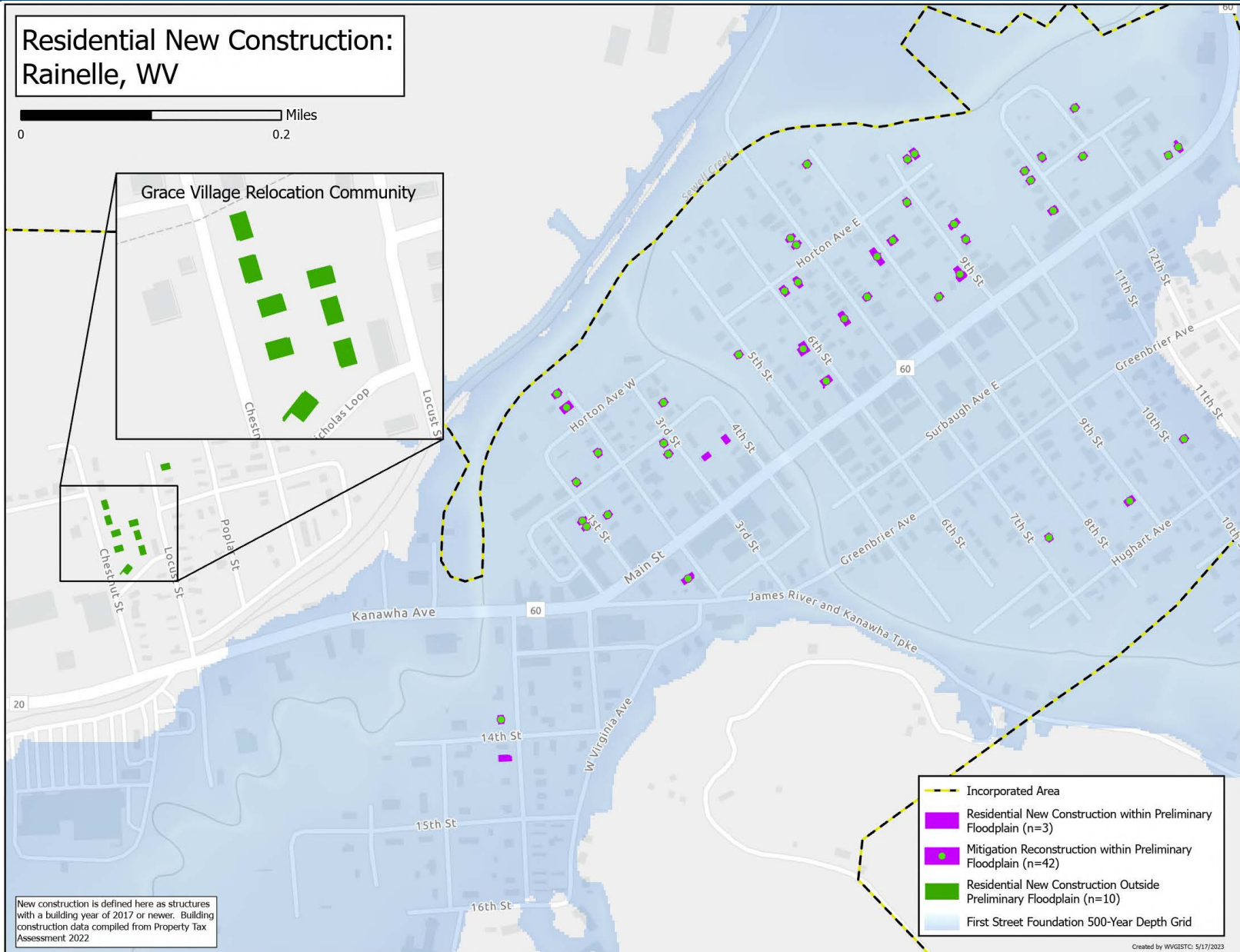
# Floodplain Building Value Recovery



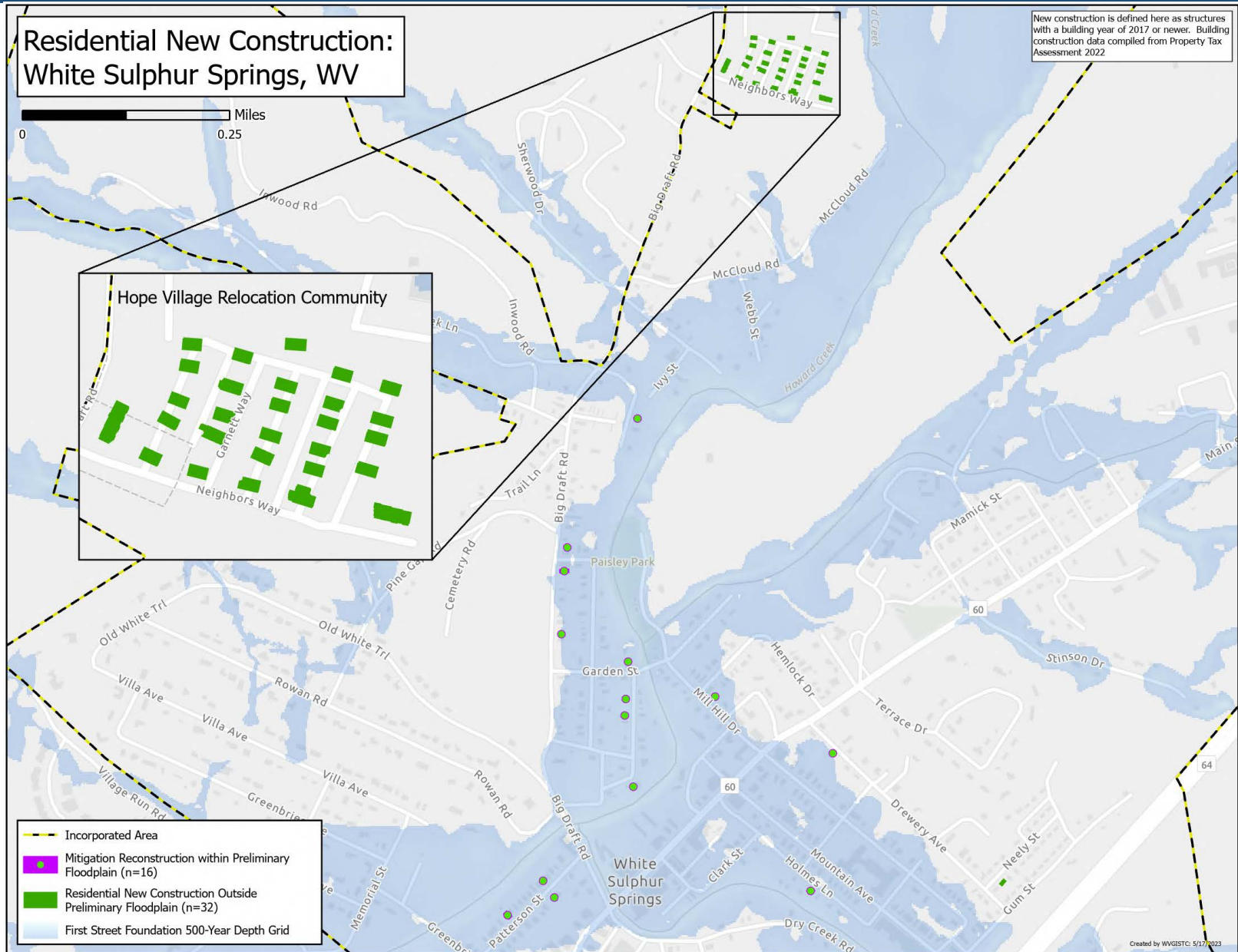
COMMUNITY	2015	2016	2017	2018	2019	2020	2021	2022
Rainelle (n=326)	13.1 Million	<b>13.3 Million</b>	5.0 Million	9.4 Million	11.0 Million	11.1 Million	11.3 Million	12.3 Million
White Sulphur Springs (n=409)	22.6 Million	<b>23.0 Million</b>	13.4 Million	21.5 Million	22.4 Million	22.9 Million	26.2 Million	29.2 Million

Source: Tax assessment database. May not include values for tax exempt properties.

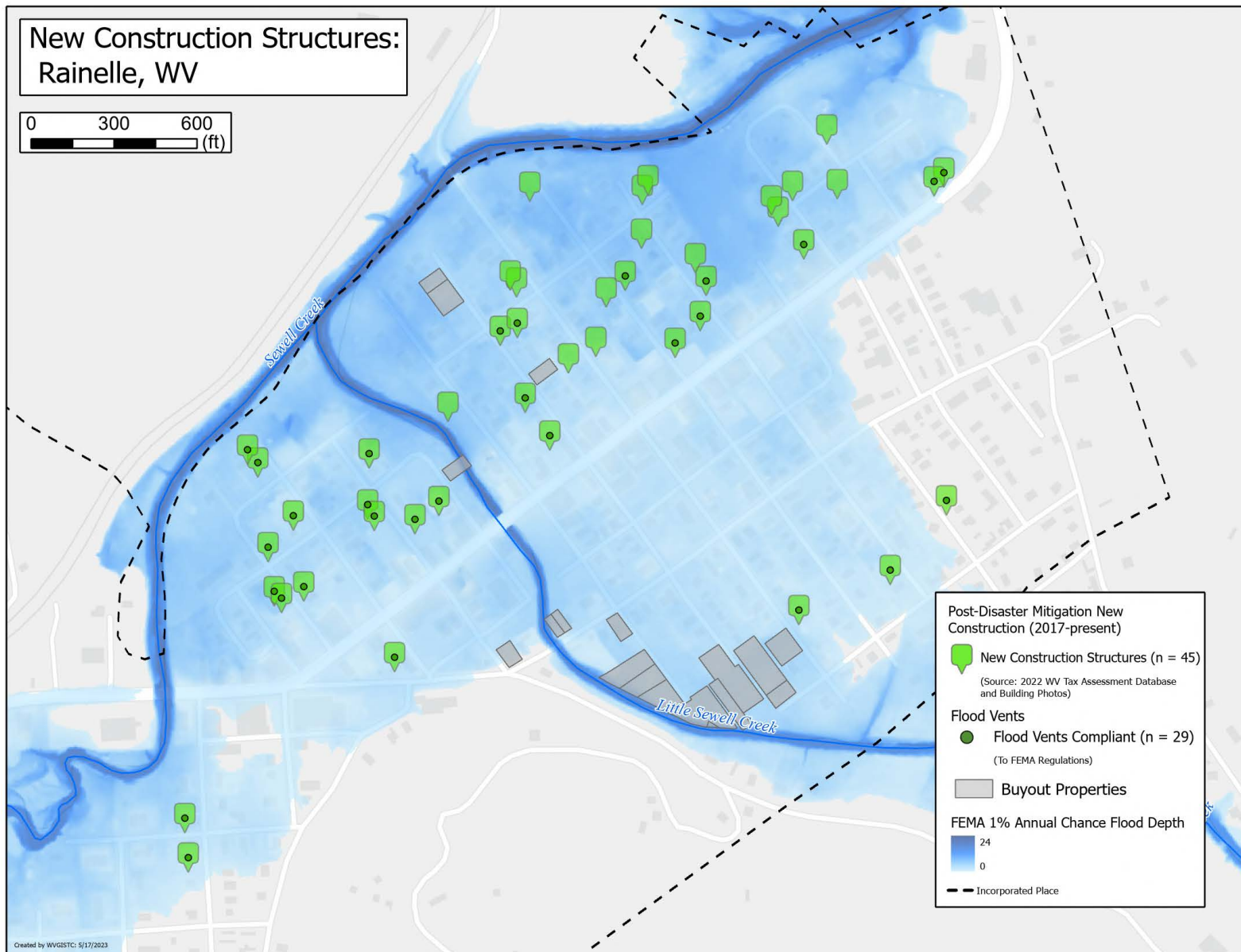
# Rainelle Relocation Community



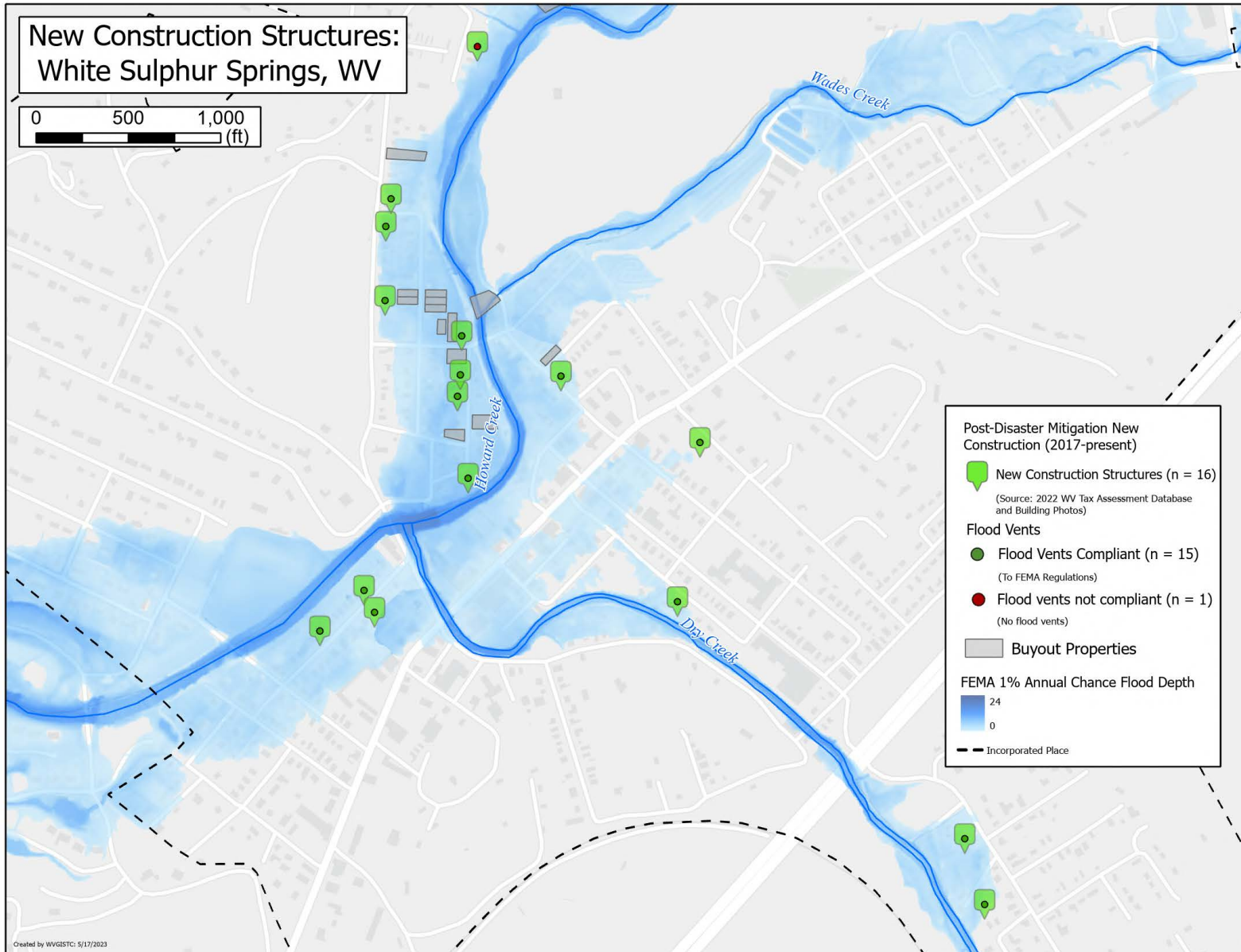
# WSS Relocation Community



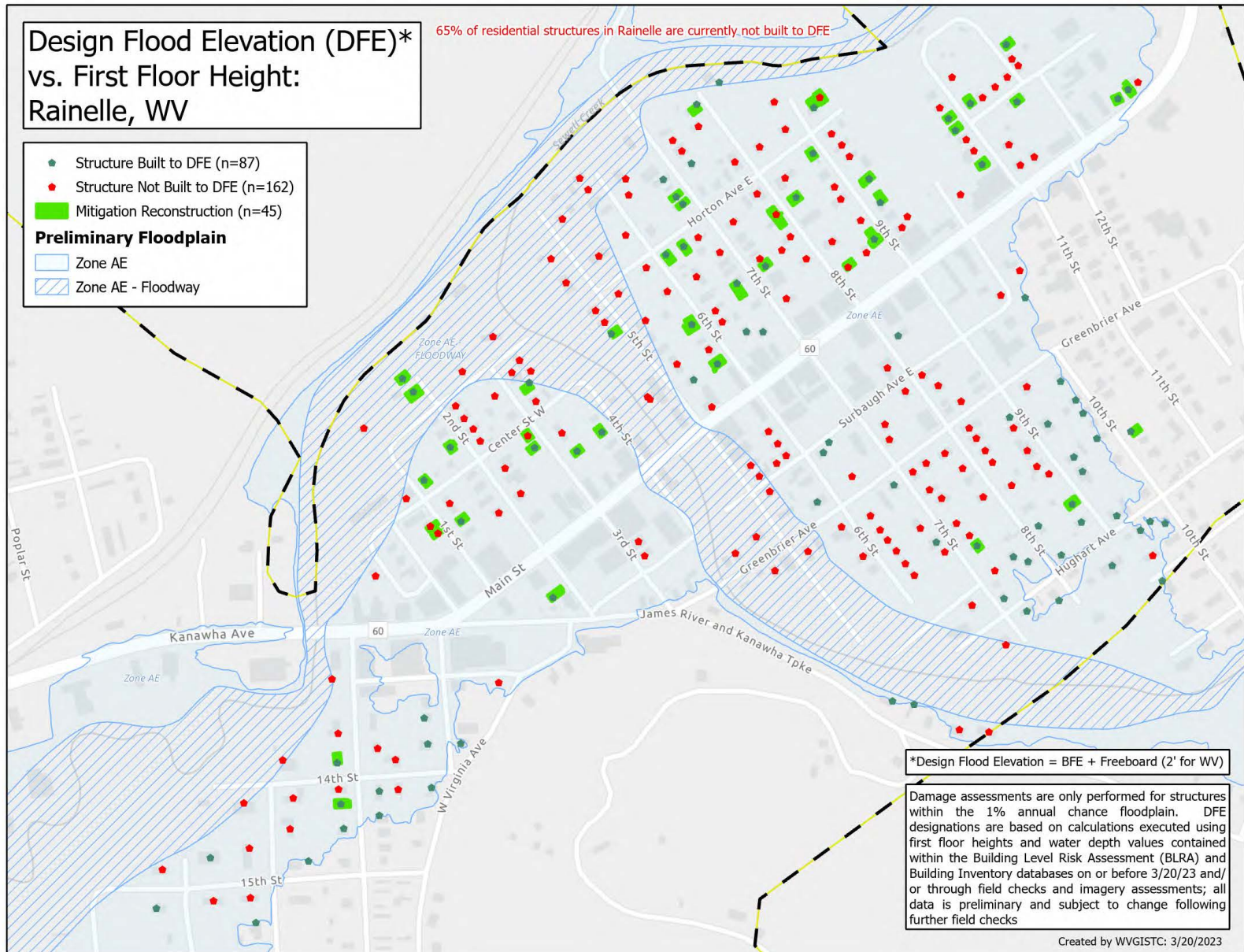
# Rainelle Mitigated Properties



# WSS Mitigated Properties

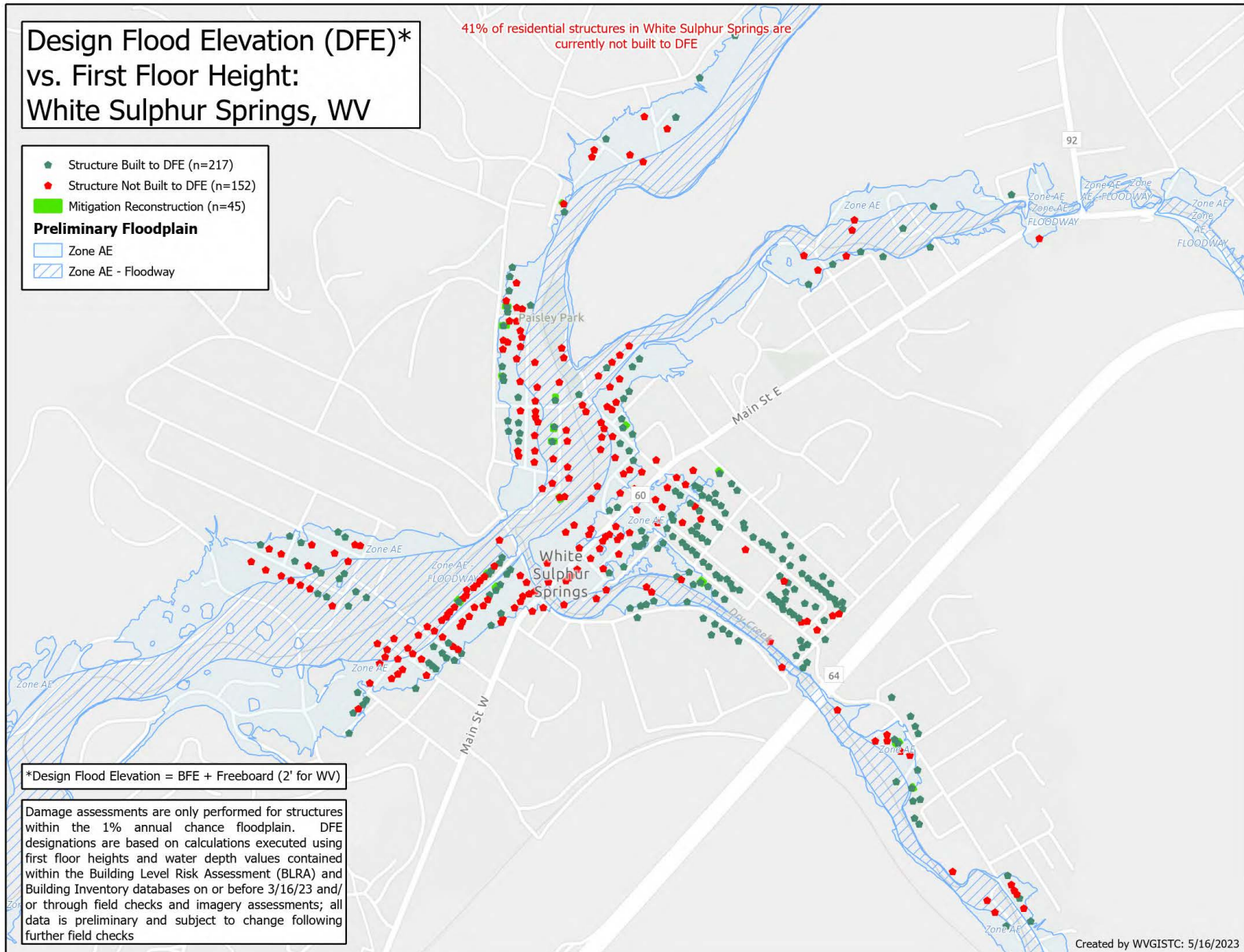


# Building Design Flood Elevation





# Building Design Flood Elevation



# Rainelle Mitigation Reconstruction

**First Floor Height ABOVE 2016 Flood HWM; 1-percent chance (100-yr) flood**

**First Floor Height BELOW 1%+, 0.2-percent chance (500-yr) floods**



FLOOD DEPTHS:

FEMA

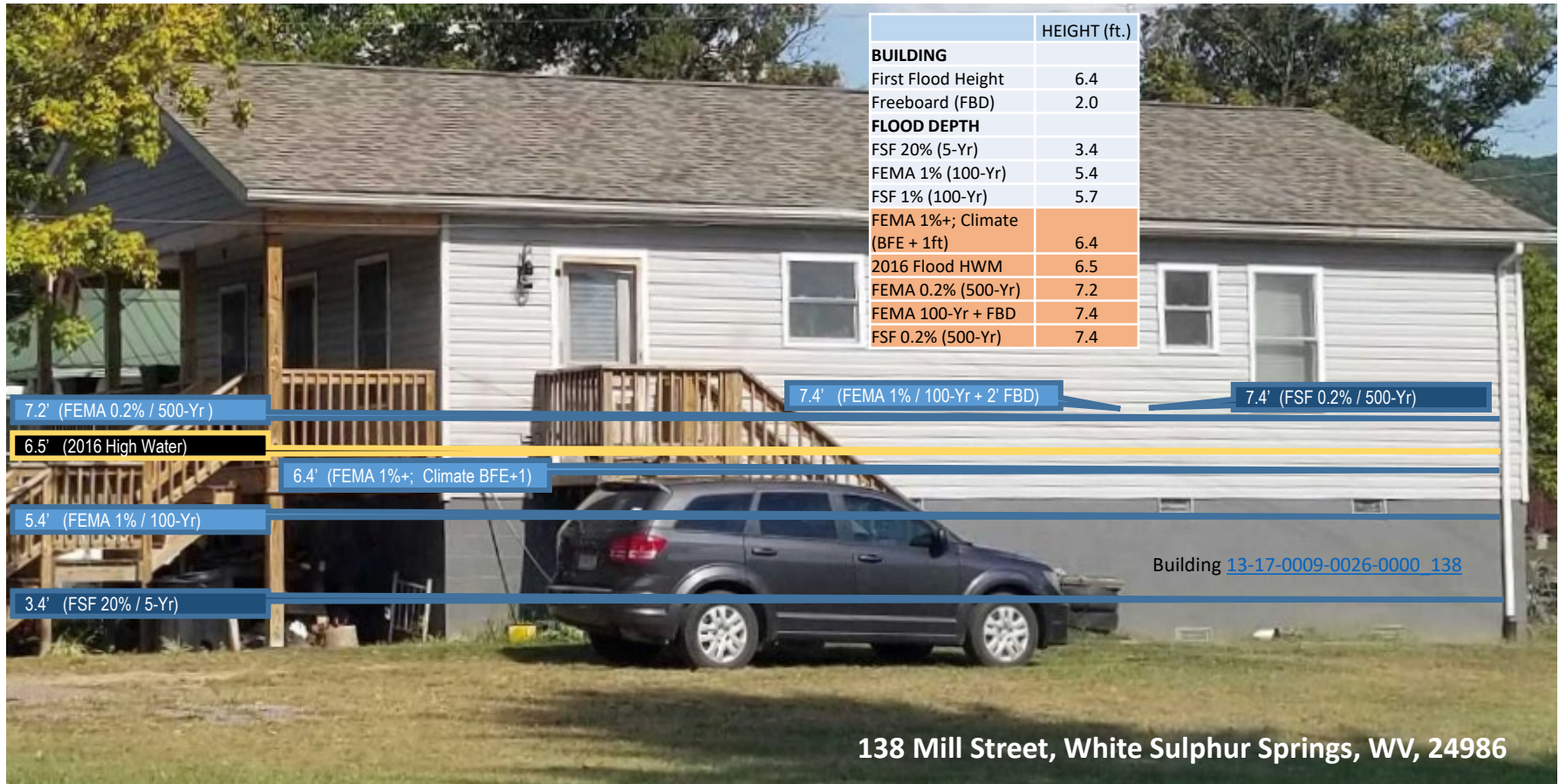
First Street Foundation (FSF)

USGS 2016 Flood High Water Mark

# WSS Mitigation Reconstruction

**First Floor Height (FFH) ABOVE 1-percent chance (100-yr) flood**

**First Floor BELOW 2016 HWM; 1%+,0.2-percent chance (500-yr) floods**



FLOOD DEPTHS:

FEMA

First Street Foundation (FSF)

USGS 2016 Flood High Water Mark

# New Streamgages in White Sulphur Springs



# New Streamgages in Rainelle



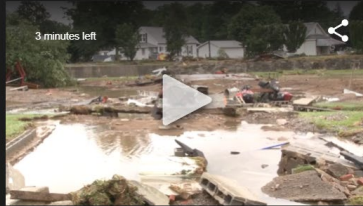
# Thousand Year Flood?

NEWS

## Former Mayor of White Sulphur Springs reflects on Thousand Year Flood as the five year anniversary approaches

by: [Claudia Sessa](#)  
Posted: May 5, 2021 / 04:13 PM EDT  
Updated: May 5, 2021 / 11:17 PM EDT

[WVNSTV 2021](#)



TOP STORIES BECKLEY

## White Sulphur Springs remembers 2016 as flooding strikes southern WV

by: [Rivers Upchurch](#)  
Posted: Jul 27, 2022 / 07:35 PM EDT  
Updated: Jul 27, 2022 / 07:35 PM EDT

[WVNSTV 2022](#)



Inside Appalachia: WV's 1,000 Year Flood

### “Inside Appalachia: WV’s 1000 Year Flood” – WV Public Broadcasting



Some websites like [MH3WV](#) clarify it as a 1,000-year rainfall event according to the NWS

“The National Weather Service called the June 2016 flooding in southern West Virginia an exceptional meteorological event, a vicious line-up of storms that came in simultaneously from the northeast and the southeast. Almost 8 inches of rain fell in some spots in just 12 to 18 hours. That amount of rain in such a short time period is something expected once in 1,000 years, according to the NWS.



# Damage (2016 Flood) and Mitigation Central Ave., White Sulphur Springs

Damage (2016 flood) and Mitigation:  
White Sulphur Springs, WV



# Damage (2016 Flood) and Mitigation Freeland Ave., White Sulphur Springs

Damage (2016 flood) and Mitigation:  
White Sulphur Springs, WV

-  Building REMOVED (Vacant Parcel)
-  Mitigation RECONSTRUCTION






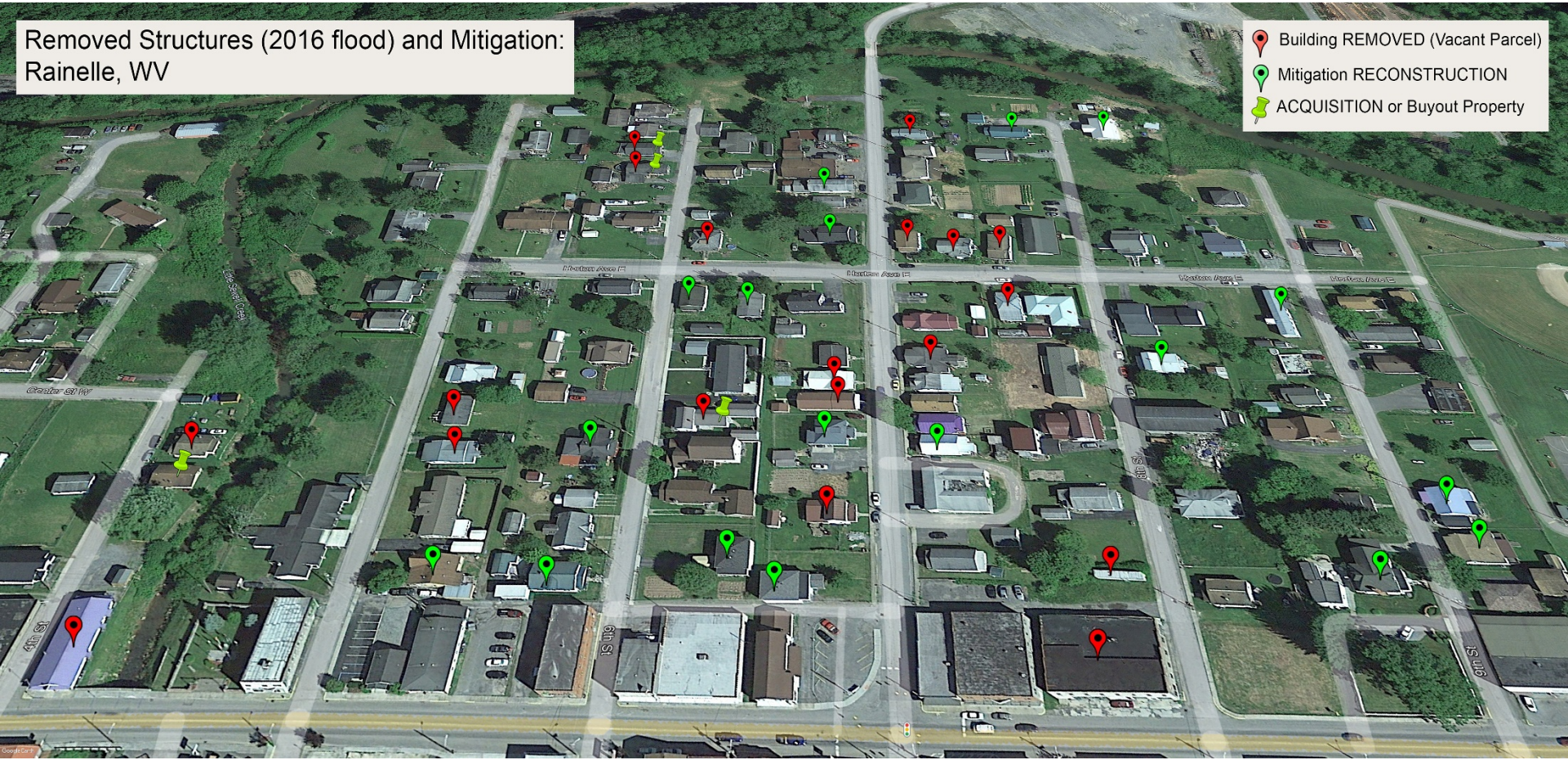


# Removed Structures (2016 Flood) and Mitigation

## 7<sup>th</sup> St, Rainelle




Removed Structures (2016 flood) and Mitigation:  
Rainelle, WV

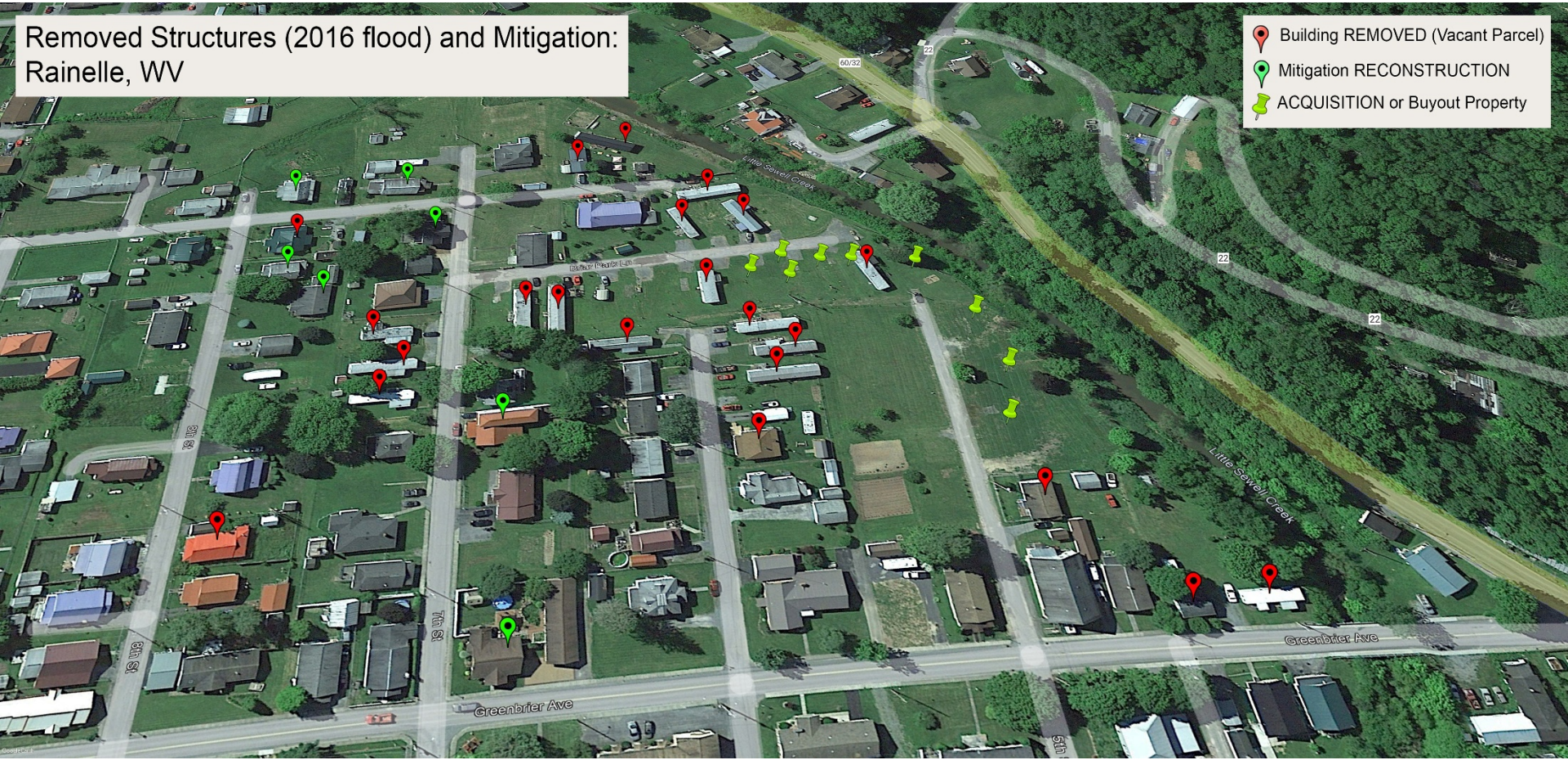
-  Building REMOVED (Vacant Parcel)
-  Mitigation RECONSTRUCTION
-  ACQUISITION or Buyout Property



# Removed Structures (2016 Flood) and Mitigation Greenbrier Ave., Rainelle

Removed Structures (2016 flood) and Mitigation:  
Rainelle, WV

-  Building REMOVED (Vacant Parcel)
-  Mitigation RECONSTRUCTION
-  ACQUISITION or Buyout Property



# Examples of Mitigation Reconstruction in White Sulphur Springs



Building ID: 13-17-0009-0009-0000\_148

[Flood Tool Link](#)



Building ID: 13-17-0009-0009-0000\_148

[Flood Tool Link](#)



Building ID: 13-17-0008-0152-0000\_195

[Flood Tool Link](#)

# Example of Mitigation Reconstruction in Rainelle



Building ID: 13-13-0005-0165-0000\_256

[Flood Tool Link](#)



Building ID: 13-13-0001-0069-0000\_108

[Flood Tool Link](#)



Building ID: 13-13-0001-0054-0000\_182

[Flood Tool Link](#)

# Unmitigated Example in White Sulphur Springs

**First Floor Height (FFH) BELOW FEMA 1-percent chance (100-yr) flood**

**First Floor BELOW 2016 HWM; 1%+,0.2-percent chance (500-yr) floods**



Building [13-17-0008-0139-0000](#) 220

FLOOD DEPTHS:

FEMA

First Street Foundation (FSF)

USGS 2016 Flood High Water Mark

# Unmitigated Example in Rainelle

**First Floor Height (FFH) BELOW FEMA 1-percent chance (100-yr) flood**

**First Floor BELOW 2016 HWM; 1%+,0.2-percent chance (500-yr) floods**

	HEIGHT (ft.)
<b>BUILDING</b>	
First Floor Height	0.0
Freeboard (FBD)	2.0
<b>FLOOD DEPTH</b>	
FSF 20% (5-Yr)	2.1
FEMA 1% (100-Yr)	4.0
FEMA 100-Yr + FBD	6.0
FSF 1% (100-Yr)	8.1
2016 Flood HWM	8.3
FEMA 0.2% (500-Yr)	9.9
FEMA 1%+ (Climate)	10.1
FSF 0.2% (500-Yr)	12.1



12.1' (FSF 0.2% / 500-Yr)

9.9' (FEMA 0.2% / 500-Yr)

10.1' (FEMA 1%+; Climate)

8.1' (FSF 1% / 100-Yr)

8.3' (2016 High Water)

6.0' (FEMA 1% / 100-Yr + 2' FBD)

4.0' (FEMA 1% / 100-Yr)

2.1' (FSF 1% / 100-Yr)


166 7<sup>th</sup> Street, Rainelle, WV, 25962

Building [13-13-0001-0047-0000](#) 166

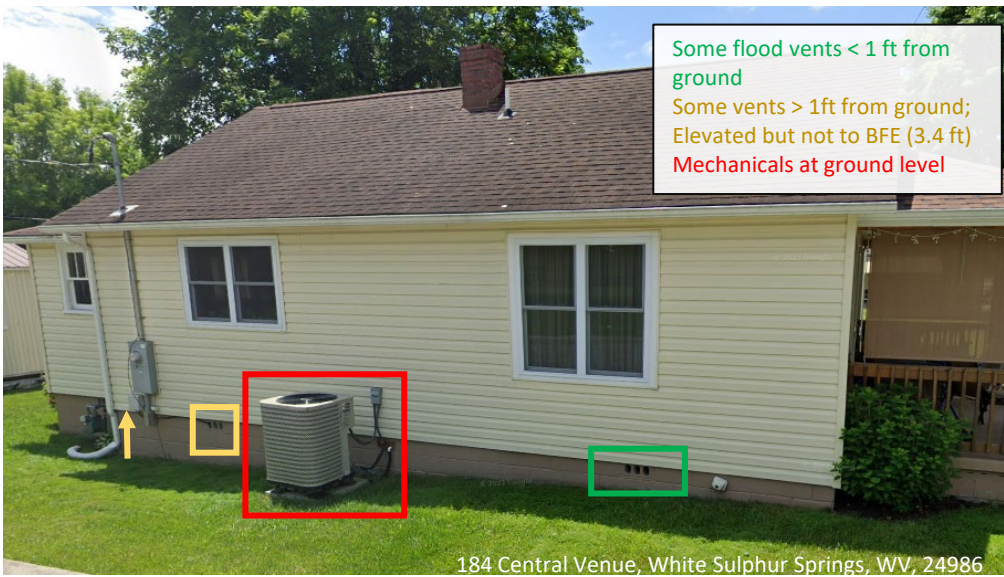
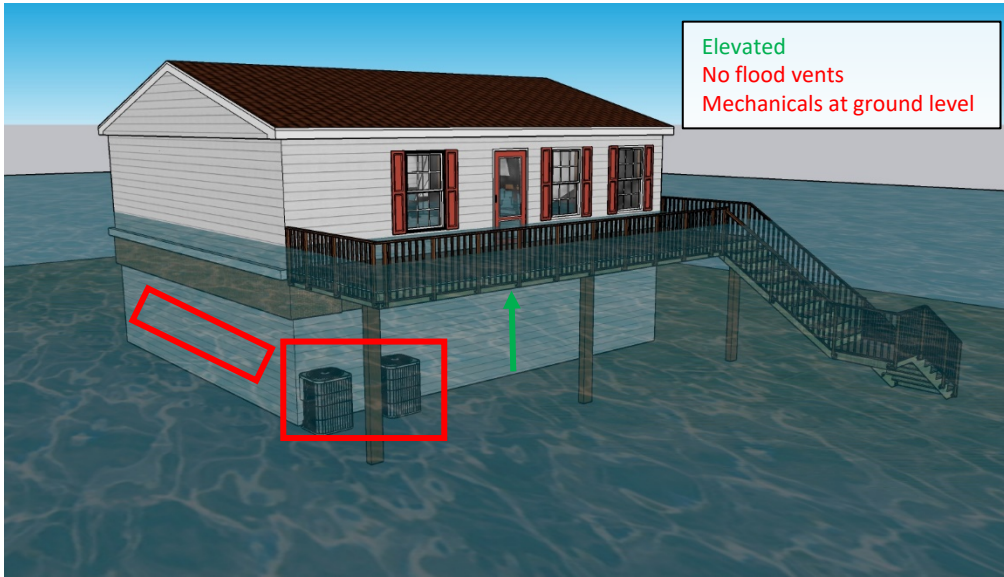
FLOOD DEPTHS:

 FEMA

 First Street Foundation (FSF)

 USGS 2016 Flood High Water Mark

# Partial Mitigation Examples



# Criteria, Rationale, and Data Sources

Mitigation Indicator	Criteria	Rationale	Data Source
<b>Elevated Structures to Design Flood Elevation (DFE)</b>	Number of newly Constructed or remodeled structures elevated to Design Flood Elevation (DFE) (2 ft above the BFE) on open or closed foundations	A comprehensive inventory of mitigated structures results in more accurate building level risk assessments and shows how communities have applied flood adaptive measures in response to major flood events.	Elevation certificates, building pictures (step 7" rise, cinder block 8"), and major post-disaster mitigation reconstruction projects (1977 and 2016 floods)
<b>Rehabilitated/Repaired Structures</b>			
<b>Unmitigated Low Value Structures</b>			
<b>Structures Removed (vacant parcel)</b>			
<b>Buyout Parcels</b>	Number of verified buyout land parcels located within floodplains that experience frequent flooding and damage due to flood events altered, purchased, or have deed restrictions placed upon them by FEMA or other agencies	Buyout properties can prevent loss of life and property damage. Property owners/communities with public lands in floodplains are compensated for their land, and the land usually becomes public green space or restored to its natural floodplain function.	Data of Natural Resources Conservation Service (NRCS) to identify the verified buyout parcels with floodplain easements
<b>Community-Owned Vacant Parcels</b>			
<b>Area of Open Space Preservation (OSP)</b>	Area of preserved open spaces with no existing buildings or structures, filling, large pavement, or other encroachment to flood flows located in the community's regulatory floodplains including the SFHA as shown on the community's Flood Insurance Rate Map (FIRM) attached with a signed statement by a public or creditable private owner or some regulations on the parcel preventing from construction, fillings, or other encroachments on flood flows in the future.	Open Space Preservation restores the floodplain to its natural function and provides opportunities for credits from FEMA's Community Rating System (CRS).	Data of Natural Resources Conservation Service (NRCS) for buyout properties & FEMA FIRM (2012 & 2022)
<b>Ratio of Open Space Preservation (OSP to SFHA)</b>	Ratio of the preserved open spaces in the impact adjusted Special Flood Hazard Area (SFHA) (after removing waterbodies larger than 10 acres in addition to the federally owned lands).		



# Criteria, Rationale, and Data Sources

Mitigation Indicator	Criteria	Rationale	Data Source
<b>Net Value 2016-2022 Tax Assessment Value</b>	Net cumulative tax assessment of floodplain building values pre- and post-disaster	Reflect the financial worth and investment in the properties. And influence insurance rates and financial considerations	Tax assessments
<b>Loss Avoidance by Elevating Structures</b>	Difference between loss estimates in communities using the Hazus model with the first floor height of 1 ft (not elevated) and elevated to DFE (2 ft above BFE) or removed	With significant investment being made in mitigation by elevating, demonstrating cost-effectiveness is crucial for continued support. Loss Avoidance Studies (LAS) quantify the losses avoided (also known as damage prevented or benefits) due to the implementation of the projects.	BLRA of 10/19/2022 (based on 2022 tax assessment), Total Exposure in Floodplain (TEIF), Building percent damage estimate values, Depth grids
<b>Percent Structures Elevated to DFE in Total Residential Buildings</b>	Percentage of the elevated structures in the total residential buildings in SFHA	A comprehensive inventory of mitigated structures results in more accurate building level risk assessments and shows how communities have applied flood adaptive measures in response to major flood events.	Elevation certificates, building pictures (step 7" rise, cinder block 8"), and major post-disaster mitigation reconstruction projects (1977 and 2016 floods)
<b>Freeboard (safety elevation factor above BFE)</b>	Considering an extra height margin over the BFE (Two feet above BFE in WV)	Create a buffer zone that allows for a greater tolerance to fluctuations in flood levels, allows for greater adaptability to changing conditions and reduces the need for costly retrofitting or reconstruction in the future.	Protect structures from waves, debris, miscalculations or lack of data, and changing weather patterns.
<b>Community Rating System (above min. requirements)</b>	If community is not currently participating in CRS, Overview Report were recorded as " in CRS" or if the community has an enrollment application, indication of a CRS Enrollment Application	Voluntarily willing to adopt higher standards indicates a community's interest in mitigation. Communities with a lower CRS class are ranked higher than those with a higher CRS class, or without a CRS class.	Community Information System (CIS)
<b>Incorporated Place a compacted floodplain management area to enforce floodplain ordinance</b>	Incorporated place should have a designated floodplain area, a comprehensive floodplain ordinance in place that outlines the regulations and requirements for development, construction, and land use within the floodplain, and a legal authority to enforce the floodplain ordinance.	Protecting the community, minimizing flood risks, promoting public safety, reducing property damage, and building long-term resilience.	Floodplain Maps, and Hydrological and Hydraulic Studies

# Criteria, Rationale, and Data Sources

Mitigation Indicator	Criteria	Rationale	Data Source
Continuity of operations and immediate response to disasters	Protect facilities, equipment and records, and facilitate a quickly and orderly recovery	Continuity Plan is the roadmap for the implementation and management of the Continuity Program. An effort within individual executive departments and agencies to ensure that Primary Mission Essential Functions (PMEFs) continue to be performed during a wide range of emergencies	FEMA & Federal Executive Branch Continuity of Operations
Record keeping (permits, EC's, substantial damage)	Obtaining certain documentation and maintaining complete permit records such as: The permit application form and all attachments, Documentation of the SI/SD determination, Community letter documenting the SI/SD determination, Floodway encroachment analyses, Records of inspections of the project while under construction, Designs for breakaway walls around enclosures, Variance proceedings, Record of final inspections, and Certification of the elevation.	Checklists are used during plan reviews to ensure that the necessary flood damage-resistant provisions have been thoroughly assessed. Also, inspection checklists enhance the consistency of inspections and aids in the verification of compliance with flood damage-resistant requirements. They are valuable tools to systematically assess the implementation of appropriate measures for mitigating flood damage.	Inspections?
Number of Policies	Number of flood insurance policies in force in the community	Although higher number of policies in force can equate to a riskier area, it can show more mitigation policies in force.	FEMA NFIP Policy Information by State 2023
Flood Risk Disclosure Laws in West Virginia	States have the ability to protect home buyers within their jurisdiction by enacting legislation and implementing practices that mandate the disclosure of flood risk. In fact, states with robust requirements for disclosing flood risk often observe higher rates of residential flood insurance adoption. When a larger number of individuals and families at risk are covered by flood insurance, communities can recover more expeditiously and comprehensively following flood events.	West Virginia is among the states that do not have any types of flood disclosure requirements, while it is a timely and effective way to enable homeowners to make better risk-informed investment decisions.	
Outreach to property owners about changes to flood maps (mapped in/mapped out of SFHA)	When flood maps are updated, some structures may be in higher or lower risk of flood than before. If they are newly identified as being in a high-risk flood area, then the NFIP offers a <b>cost-saving flood insurance rating option</b> called the <b>Newly Mapped Procedure</b>	This change may affect requirement and cost of flood insurance. NFIP offers a <b>cost-saving flood insurance rating option know as Grandfathering</b> . Grandfathering allows property owners to “lock in” the lower risk flood zone or PFE for future rating	