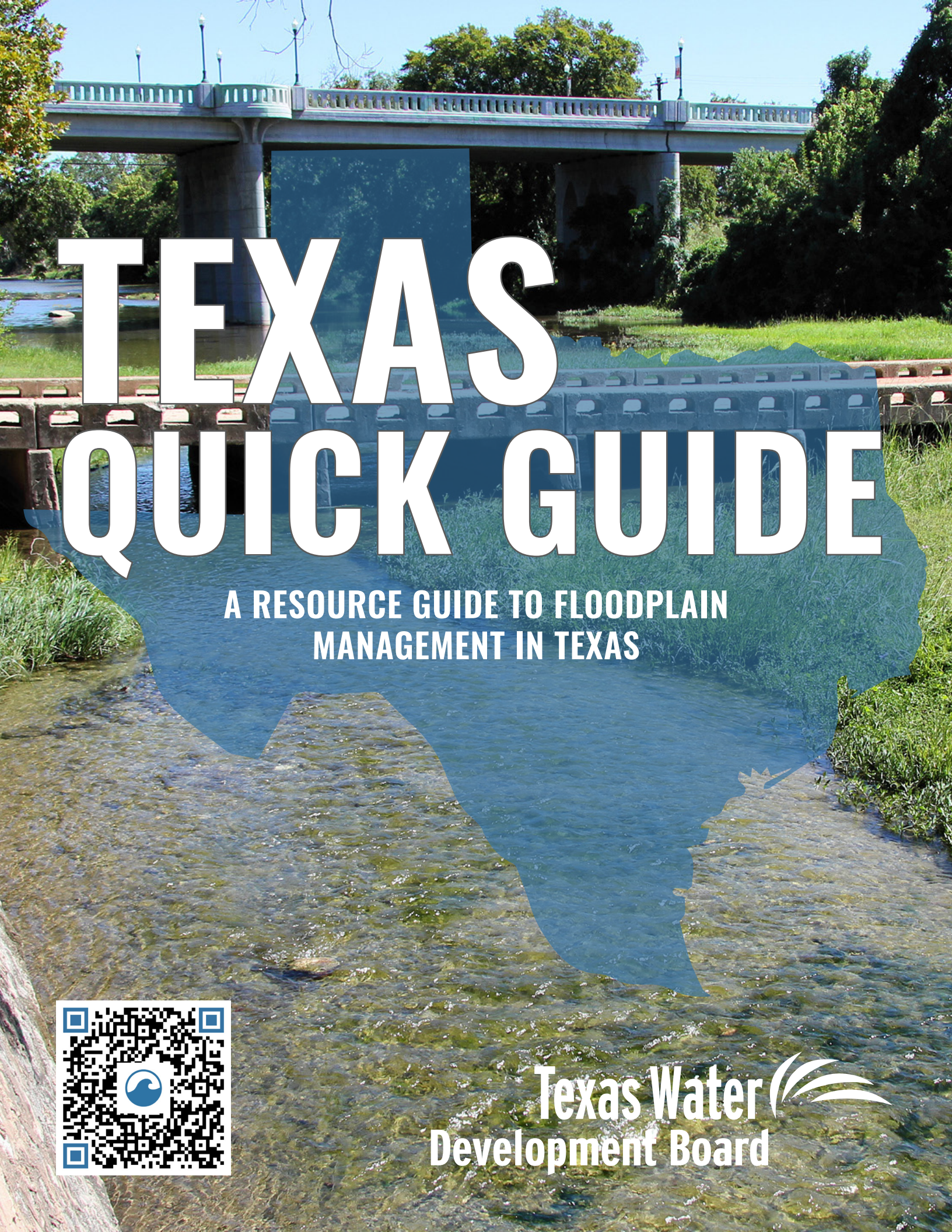


TEXAS QUICK GUIDE

A RESOURCE GUIDE TO FLOODPLAIN MANAGEMENT IN TEXAS

Texas Water Development Board





QUICK GUIDE

This document was created by the Texas Water Development Board (TWDB) as an educational tool about floodplain management. There are many resources available to floodplain managers and their communities. The intent of the **QUICK GUIDE** is to provide basic understanding of floodplain management, National Flood Insurance Program (NFIP), community resources available, and the role of your community. We hope this guide helps you make informed decisions to help protect your families, homes, and businesses against major flood-related damage.

ACKNOWLEDGMENTS

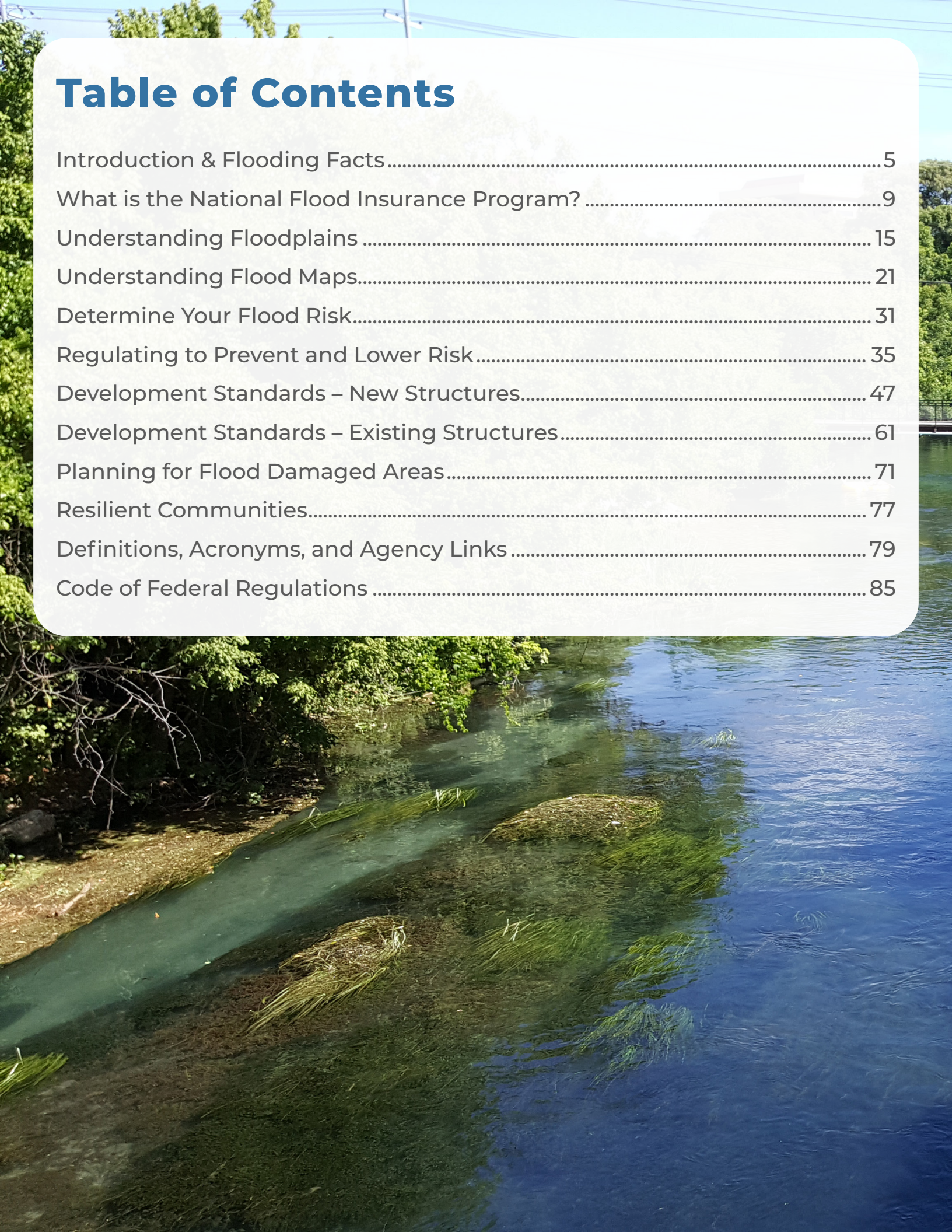
Thank you to the staff at the TWDB and its partners who assisted in updating this **QUICK GUIDE** to help citizens understand what floodplain management is, why floodplain development is regulated, and to connect you with the resources to better to protect people and property.

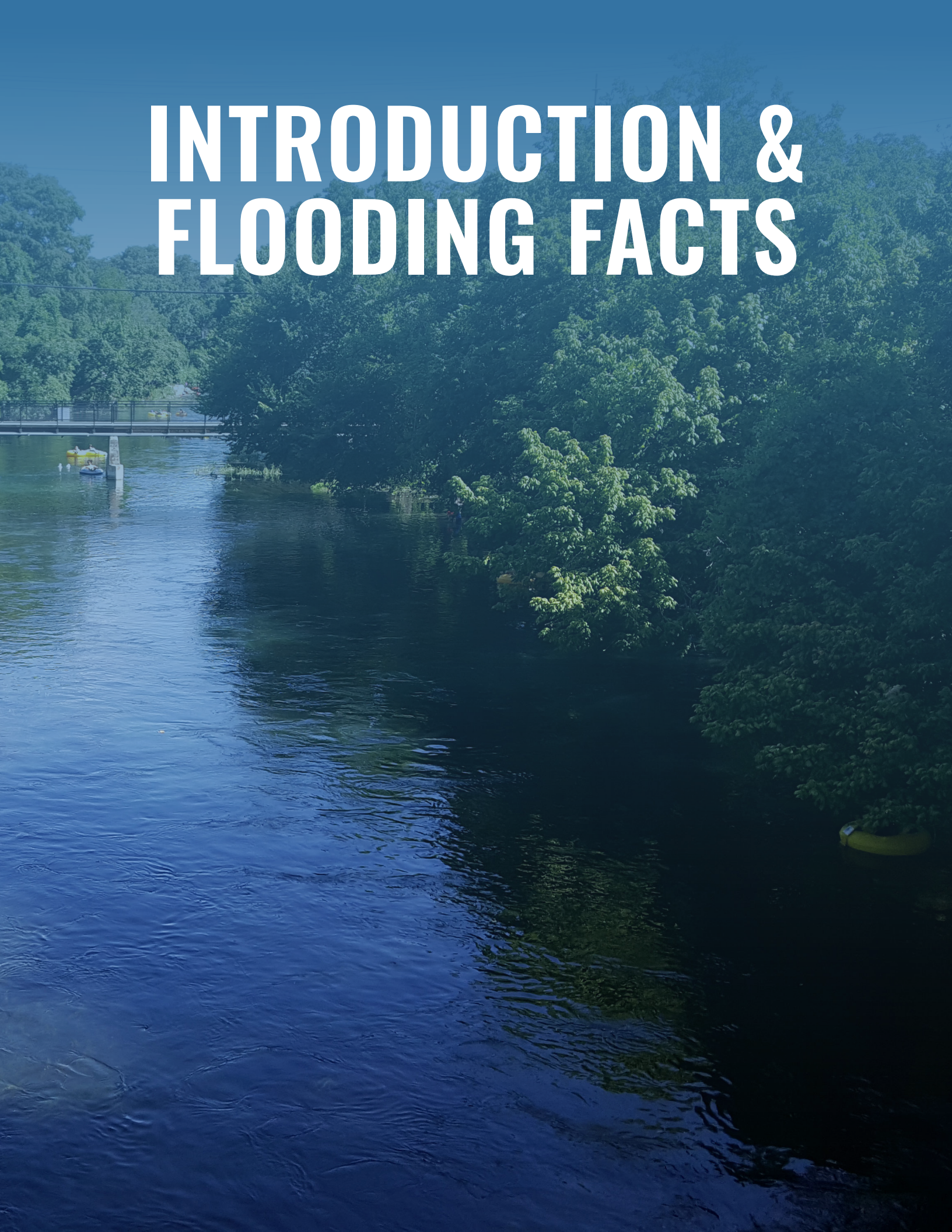
Assistance in the preparation of this quick guide update was prepared by Halff.

2023

Table of Contents

Introduction & Flooding Facts 5
What is the National Flood Insurance Program? 9
Understanding Floodplains 15
Understanding Flood Maps 21
Determine Your Flood Risk 31
Regulating to Prevent and Lower Risk 35
Development Standards – New Structures 47
Development Standards – Existing Structures 61
Planning for Flood Damaged Areas 71
Resilient Communities 77
Definitions, Acronyms, and Agency Links 79
Code of Federal Regulations 85





INTRODUCTION & FLOODING FACTS

INTRODUCTION

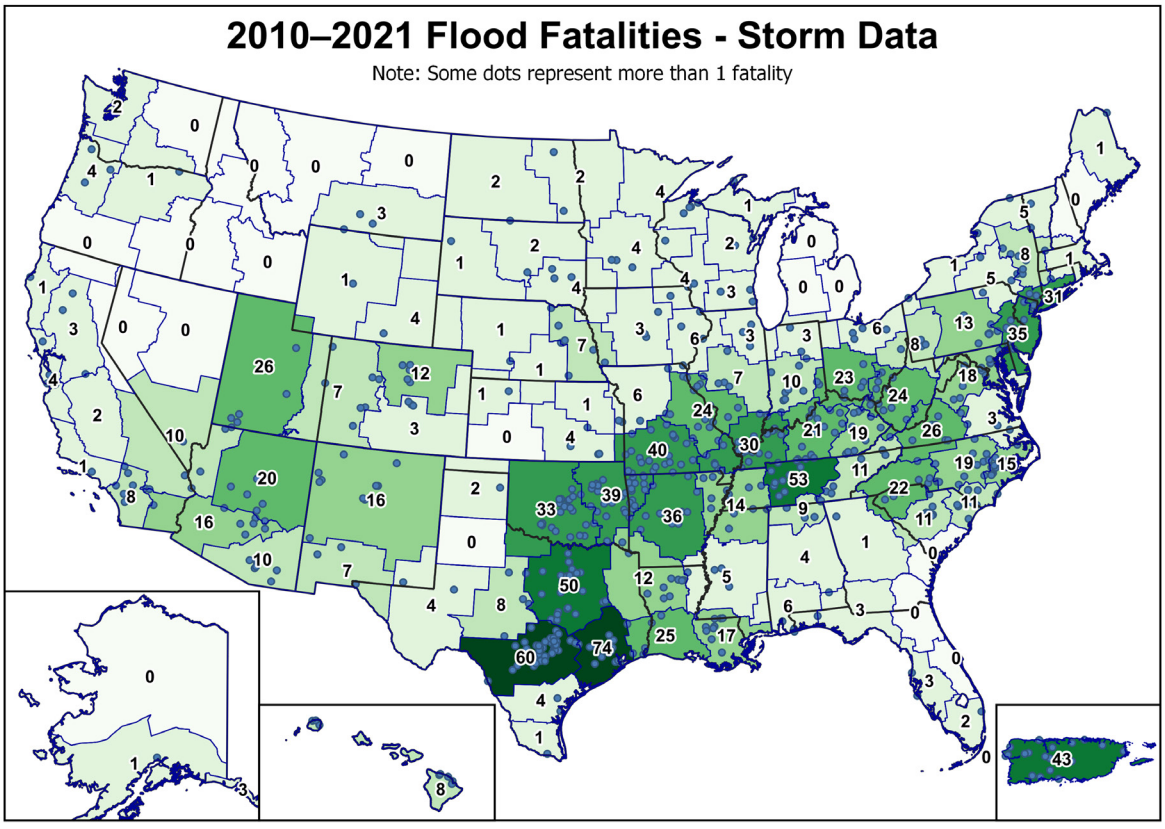
"All Texans are at risk for floods. No place is safe from flooding. If it can rain, it can flood. And nowhere is that truer than Texas."
Federal Emergency Management Agency (FEMA)

Floods are the most common natural disaster in the United States. From 1953 and 1968, there had been 182 disasters declared in the United States with increases in federal disaster assistance. In 1968, Congress enacted the National Flood Insurance Act in response to the lack of availability of private insurance for floods.

This legislation created a program that interlaces the roles of federal, state, and local agencies. Together, each play a role in providing floodplain management.

Floods affect communities in many ways including:

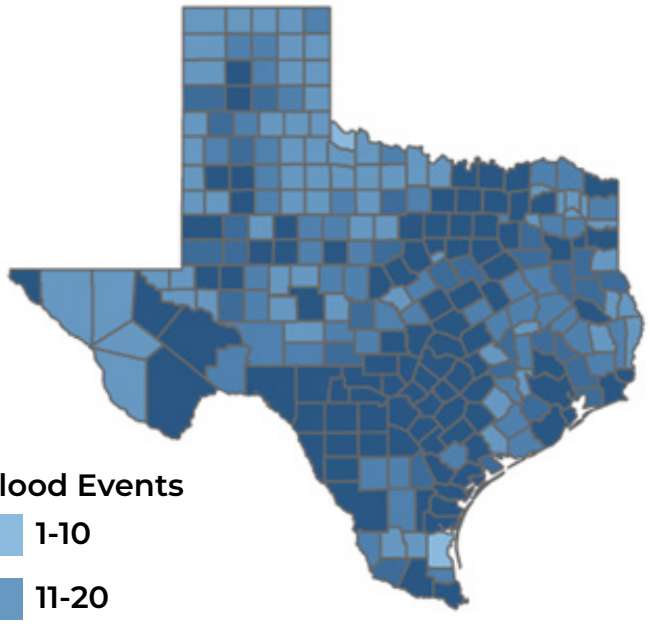
- Health and safety risks
- Loss of life
- Emotional hardships
- Property damage
- Economic loss



Source: Weather.gov

FLOODING FACTS

Flooding can happen anywhere, but Texas is especially prone to water-related damages from floods. Texas has a long history of floods which makes it the most common disaster in the state. Over the last 25 years (1998-2023) Texas had **66 disasters** declared related to floods, coastal storms, and hurricanes. Not all flood events are declared disasters, the National Oceanic and Atmospheric Administration **National Weather Service's (NOAA NWS) Storm Events Database** shows the numerous flood events by county from 1996-2019.



Source: FEMA.gov Historical Flood Risk and Costs

TEXAS SIGNIFICANT STORMS

1954 Hurricane Alice

1957 Pecos to the Sabine River Flood

1972 Guadalupe River Flood

1980 Hurricane Allen (Brownsville-South Padre Island)

1992 Tropical Storm Danielle (Galveston)

1998 San Marcos, Guadalupe and San Antonio rivers flood

2001 Tropical Storm Allison

2002 South Central Texas Floods

2005 Hurricane Rita

2008 Hurricane Ike

2010 Tropical Storm Hermine

2013 Halloween Flood - Onion Creek

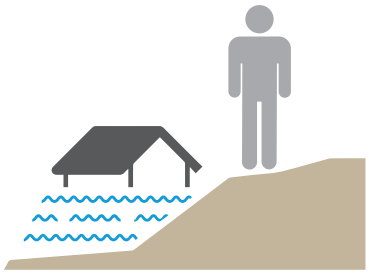
2015 Memorial Day Weekend Flood: Guadalupe-Blanco Rivers

2016 Houston Tax Day Flood

2017 Hurricane Harvey

2022 Dallas-Ft. Worth Flash Floods

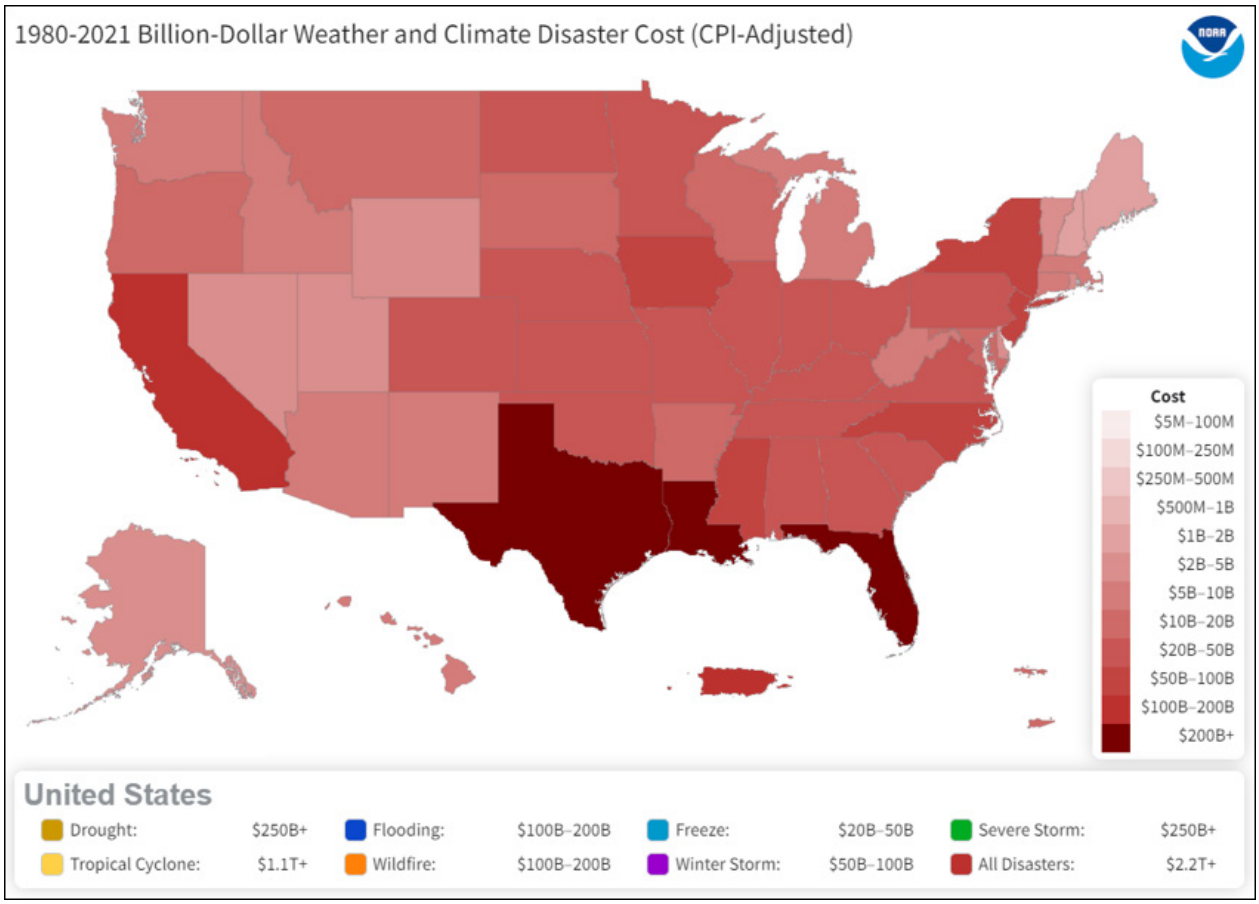
FLOODING STATISTICS



Flooding is the number one weather-related cause of death in Texas, claiming the lives of people, pets, livestock and wildlife.

More than 12% of the state's land area is subject to flooding. **According to FEMA, around 7% of the nearly 10 million housing units in Texas have a high risk of flooding.** There are about 5.3 million home insurance policies statewide, but only about 753,000 federal flood policies. That means only about 14% of Texas homeowners are covered by flood insurance.
(Source: Texas Department of Insurance)

The economic loss resulting from floods is exponential. NOAA reports, flooding events have an average cost of $4.7 billion per event.





WHAT IS THE NATIONAL FLOOD INSURANCE PROGRAM?

NATIONAL FLOOD INSURANCE PROGRAM

ABOUT NFIP

The **NFIP** was created by Congress and is managed by FEMA.

The NFIP has two main goals:

1. To provide access to flood insurance to property owners and renters in flood-prone areas who otherwise would not be able to obtain it.

2. To mitigate and reduce the nation's comprehensive flood risk through the development and implementation of floodplain management standards that will save lives, protect property, and reduce the government's costs after floods.

Participation in the NFIP is voluntary but communities must participate to receive access to the program's insurance. Statewide, over **1,260** communities participate in the NFIP.

Participation requires that the community adopts ordinances with effective enforcement provisions that regulate development in the floodplain.

The NFIP is based on a mutual agreement between the federal government and communities. The federal government provides technical support and insurance coverage. The local communities agree to regulate floodplain development according to certain criteria and standards. The partnership involves:

- **Flood Hazard Maps -** FEMA prepares maps that are used by communities, insurance agents and others to identify risk.

- **Flood Insurance -** Property owners and renters in participating communities are eligible to purchase federal flood insurance for buildings and contents.

- **Regulations -** Communities adopt and enforce floodplain management regulations so that development is undertaken in ways that reduce exposure to flooding.

To participate in the NFIP, a community must adopt floodplain management criteria that match the flood risk data that have been provided by FEMA. **These minimum criteria are set forth in 44 CFR 60.3(a)-(e).** By adopting a resolution and an appropriate level of ordinance or court order, a community can apply to FEMA for participation in the NFIP.



FEMA estimates that just a single inch of floodwater in a home causes $25,000 in damages.

STATE'S ROLE

FEMA requires each state to designate a State Coordinating Agency. The Texas Legislature designated the Texas Water Development Board (TWDB) as the State Coordinating Agency to coordinate NFIP activities in Texas. TWDB Community Assistance Program (CAP) assists interested communities in developing and adopting the necessary floodplain management measures required by the NFIP, as well as the measures necessary to reduce threats posed by flooding.

The TWDB CAP staff provides the following services:

- Flood ordinance or order assistance
- Community assistance visits and community assistance contacts
- Floodplain management workshops and training
- General technical assistance
- NFIP enrollment assistance
- Coordination with other state programs and agencies
- NFIP-related disaster assistance



COMMUNITY RESPONSIBILITIES

To participate in the NFIP, a community agrees to:

- Adopt and enforce a flood damage prevention ordinance/court order
- Require permits for all types of development in the floodplain (see page 36)
- Ensure that building sites are reasonably safe from flooding
- Estimate flood elevations that were not determined by FEMA
- Require other buildings to be elevated or flood-proofed
- Conduct field inspections and cite violations
- Require Elevation Certificates to document compliance (see pages 40 and 41)
- Carefully consider requests for variances
- Resolve non-compliance and violations
- Advise FEMA when updates to flood maps are needed
- Require new or substantially improved homes and manufactured homes to be elevated above the Base Flood Elevation (BFE)



For additional information about the NFIP, visit the FloodSmart website by clicking here.

NFIP Community Rating System

The **Community Rating System (CRS)** is a voluntary incentive program that provides discounts from 5% to 45% on insurance premiums in communities that engage in floodplain management practices that exceed the minimum requirements of the NFIP. The higher a community's classification the higher the discount. Classifications are based on the community's CRS credit points obtained in 19 creditable activities. The CRS activities are organized in four categories:

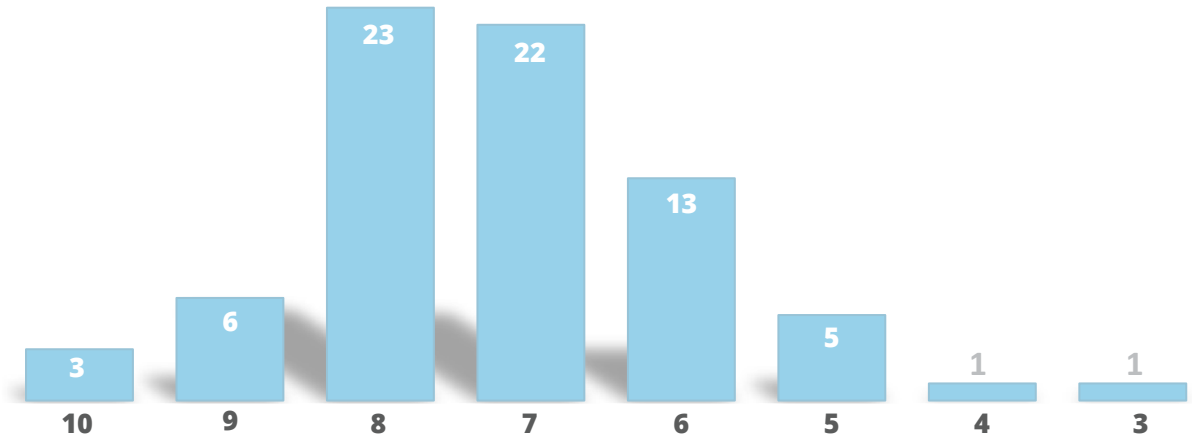
Public Information

Mapping & Regulations

Flood Damage Reduction

Warning & Response

Number of Texas CRS Communities



Community Class
Identifies the Percentage Discount on Insurance

To learn more about participating in CRS, read the brochure by clicking here.

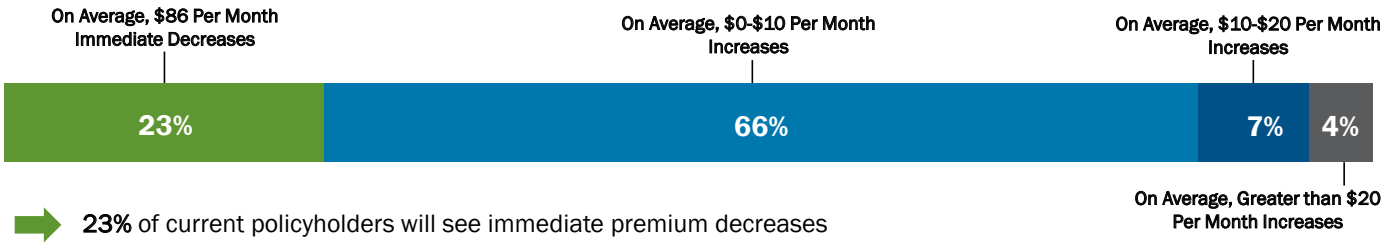
RISK RATING 2.0

FEMA updated the NFIP's pricing methodology to communicate flood risk more clearly. The new methodology, called Risk Rating 2.0—Equity in Action, changes the pricing methodology by using improved technology and FEMA's enhanced understanding of flood risk. Risk Rating 2.0 allows FEMA to equitably distribute premiums across all policyholders based on the value of their home and the unique flood risk of their property. Under Risk Rating 2.0, FEMA will be able to address rating disparities by including more flood risk variables, such as property characteristics, heavy rainfall and the cost to rebuild.

Watch this video on Risk Rating 2.0.

Risk Rating 2.0 – National Rate Analysis

Under the **current rating methodology**, every year at renewal, policyholders on average see premium **increases of $8 per month.**



- **23%** of current policyholders will see immediate premium decreases
- An additional **66%** of current policyholders will see, on average, **$0 - $10 per month** increases
- **7%** of current policyholders under Risk Rating 2.0 will see, on average, **$10 - $20 per month** increases
- And 4% of current policyholders under Risk Rating 2.0 will see, on average a **$20 or more per month** increase

FEMA

Federal Emergency Management Agency

UNDERSTANDING FLOODPLAINS

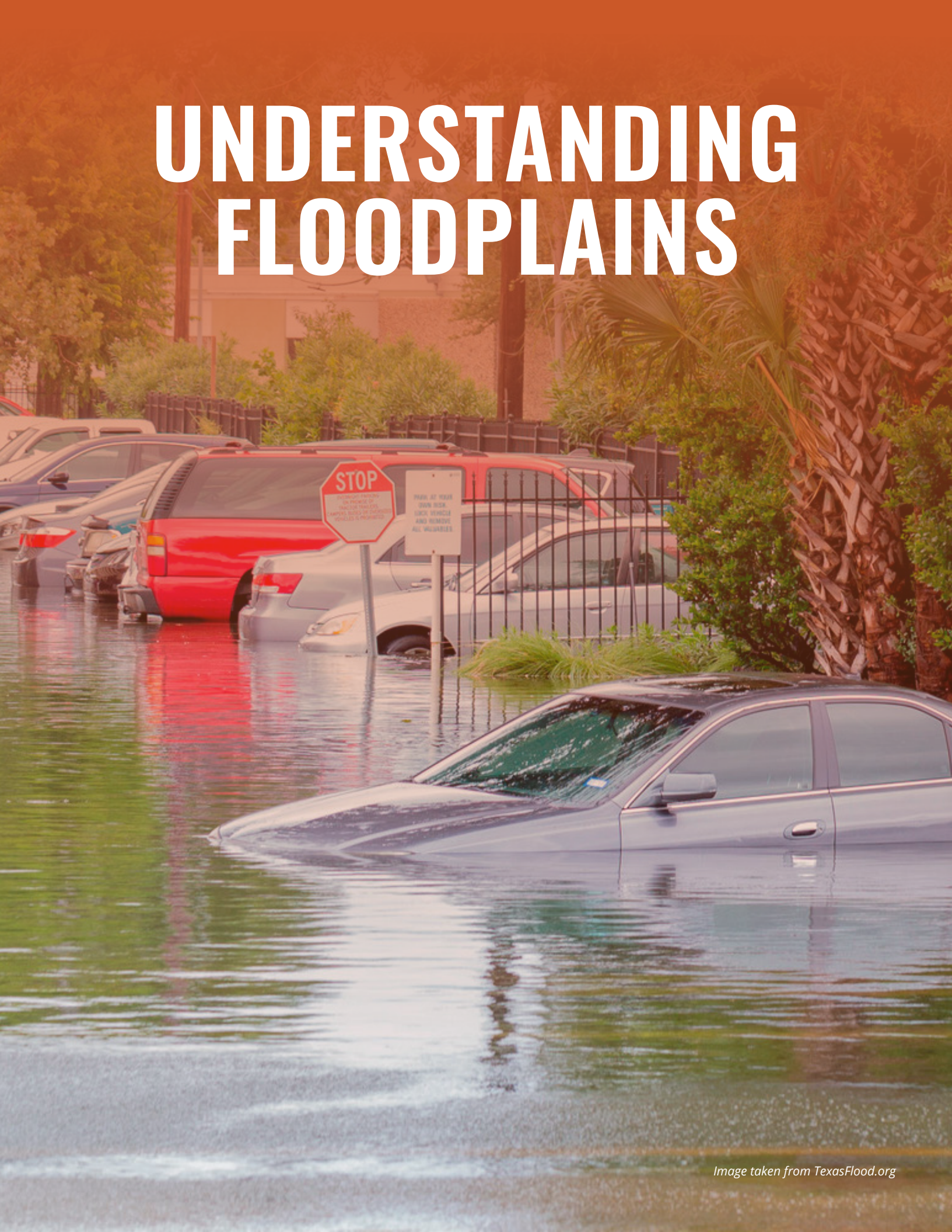


Image taken from TexasFlood.org

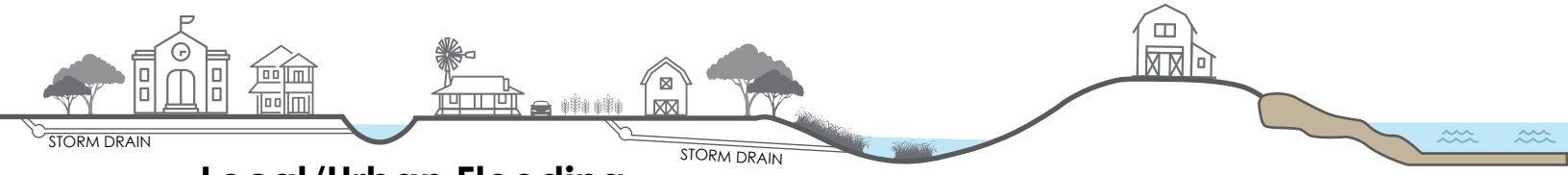
WHAT IS A FLOODPLAIN?

Every body of water from creeks, rivers, lakes, and oceans has a floodplain around it. A floodplain, as defined by FEMA, is any land area susceptible to being inundated by floodwaters from any source, including coastal areas impacted by storm surge, land along a river or bayou that is flooded when that waterway rises out of its banks, or low-lying land that fills with water when it rains. Flooding can occur in a wide range of landscapes due to rainfall or storm surge.

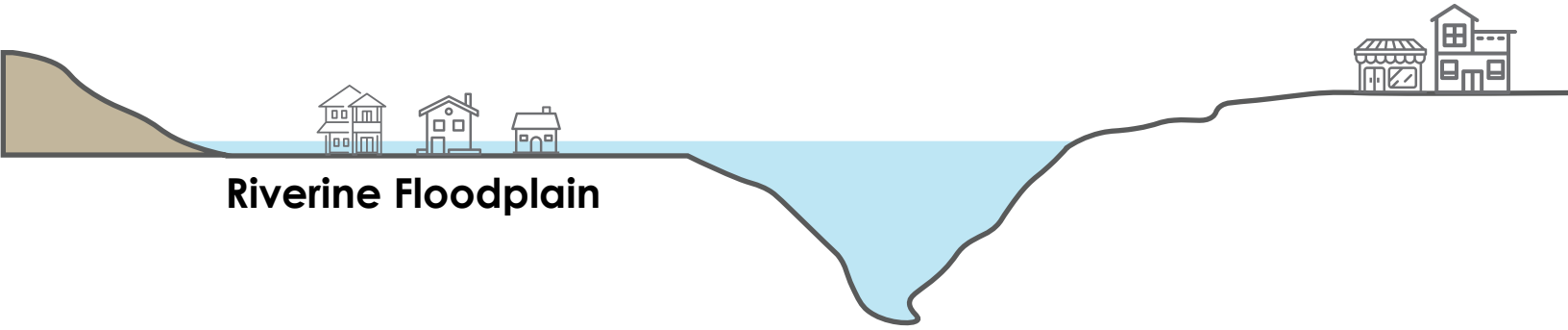
To understand flood risk, it is important to know the type of flood you are facing – **riverine, coastal and local.** A riverine floodplain is an area around a body of water, typically river or creek, that is prone to flooding from that body of water. Coastal flooding is when water inundates or covers normally dry coastal land as a result of high or rising tides or storm surges. Local flooding or urban flooding are those flood-prone areas located outside of mapped effective FEMA flood zones, designated Special Flood Hazard Areas, shown on FIRMs. Many FEMA products currently do not display areas at risk of local flooding.



Coastal Floodplain



Local/Urban Flooding



Riverine Floodplain

Learn more about riverine and coastal flooding here.

WHERE IT RAINS, IT CAN FLOOD

Many people don't understand just how risky the floodplain can be. There is a **26% chance** that non-elevated homes in the 1% annual chance floodplain will be damaged during a 30-year mortgage period.

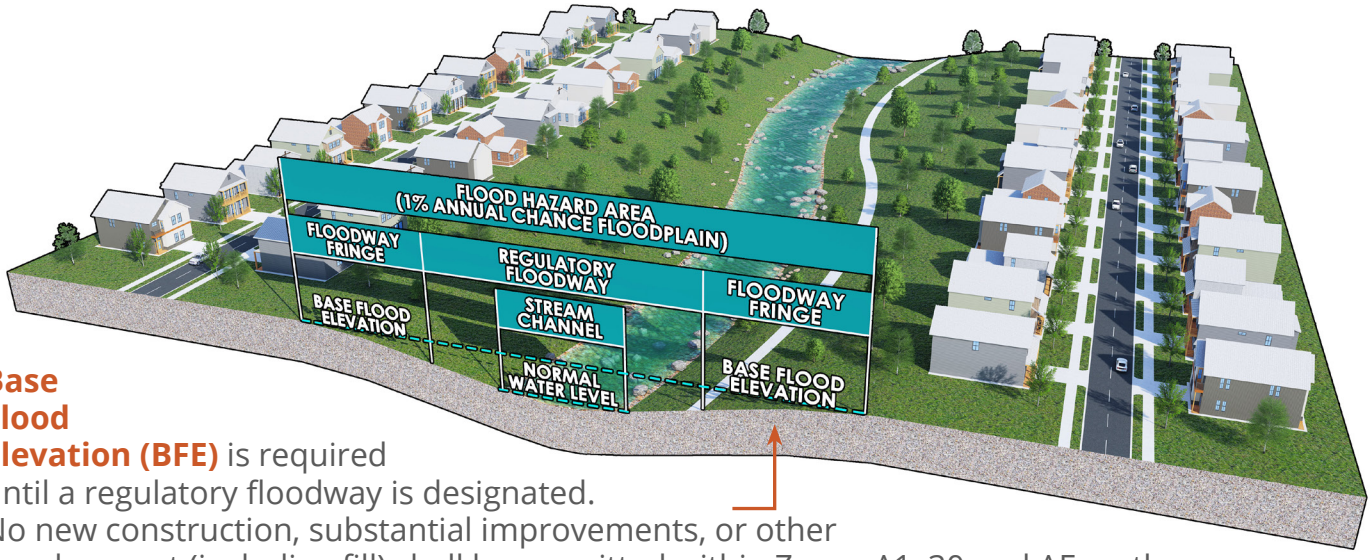
Flood risks change over time, based on new building and development, weather pattern changes, and other factors. The **FEMA Risk Mapping, Assessment and Planning (Risk MAP) program** will assist communities nationwide, assess flood risks, and encourage mitigation planning to avoid or minimize damage in the face of future disasters. Through more precise flood maps, risk assessment tools and outreach support, Risk MAP strengthens local ability to make informed decisions about reducing risk. Identifying the hazards and risk in communities, anticipating disaster recovery issues, and prioritizing hazard mitigation actions before a disaster will result in substantial long-term reduction of risk and future disaster damage. An effective hazard mitigation planning process is critical to make communities more disaster resistant.

During Risk MAP, FEMA will use the watershed boundaries to conduct future studies. This watershed approach will allow communities to come together to develop partnerships, combine resources, share flood risk information with FEMA, and identify broader opportunities for mitigation action. Groups such as local governments, county governments, tribes, commerce, and non-profit organizations will have opportunities to develop a vision for the watershed's future.



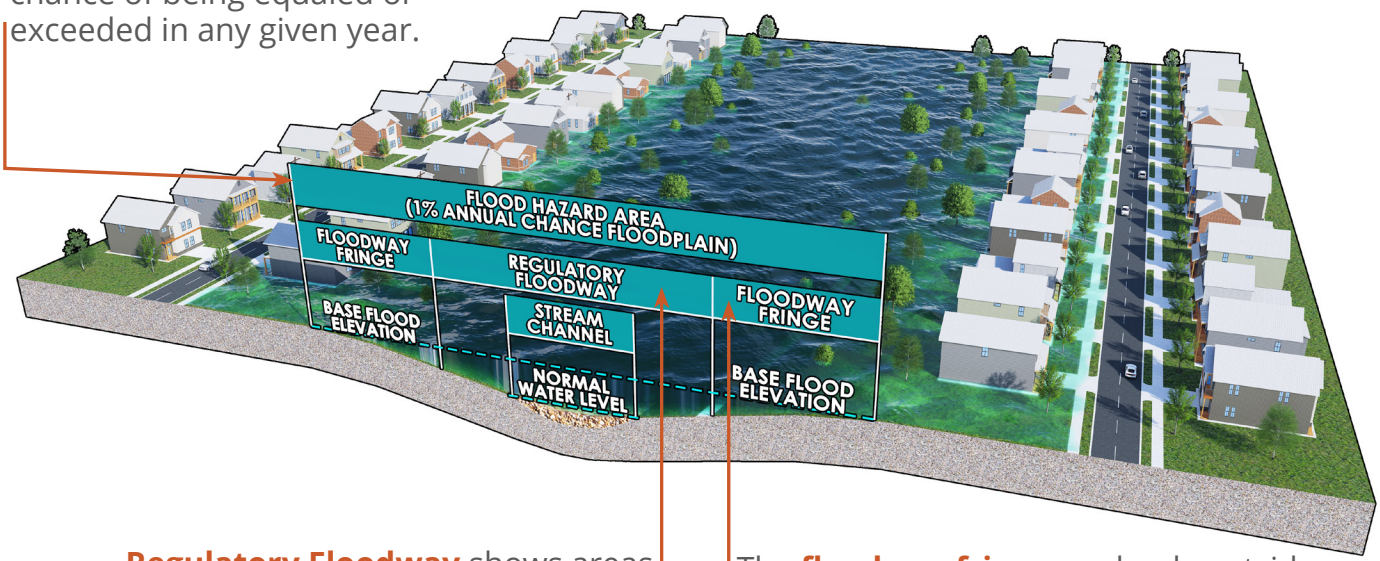
Image taken from Shutterstock

RIVERINE FLOODING



Base Flood Elevation (BFE) is required until a regulatory floodway is designated. No new construction, substantial improvements, or other development (including fill) shall be permitted within Zones A1–30 and AE on the community's FIRM, unless it is demonstrated that the cumulative effect of the proposed development will not increase the water surface elevation of the base flood more than one foot at any point within the community.

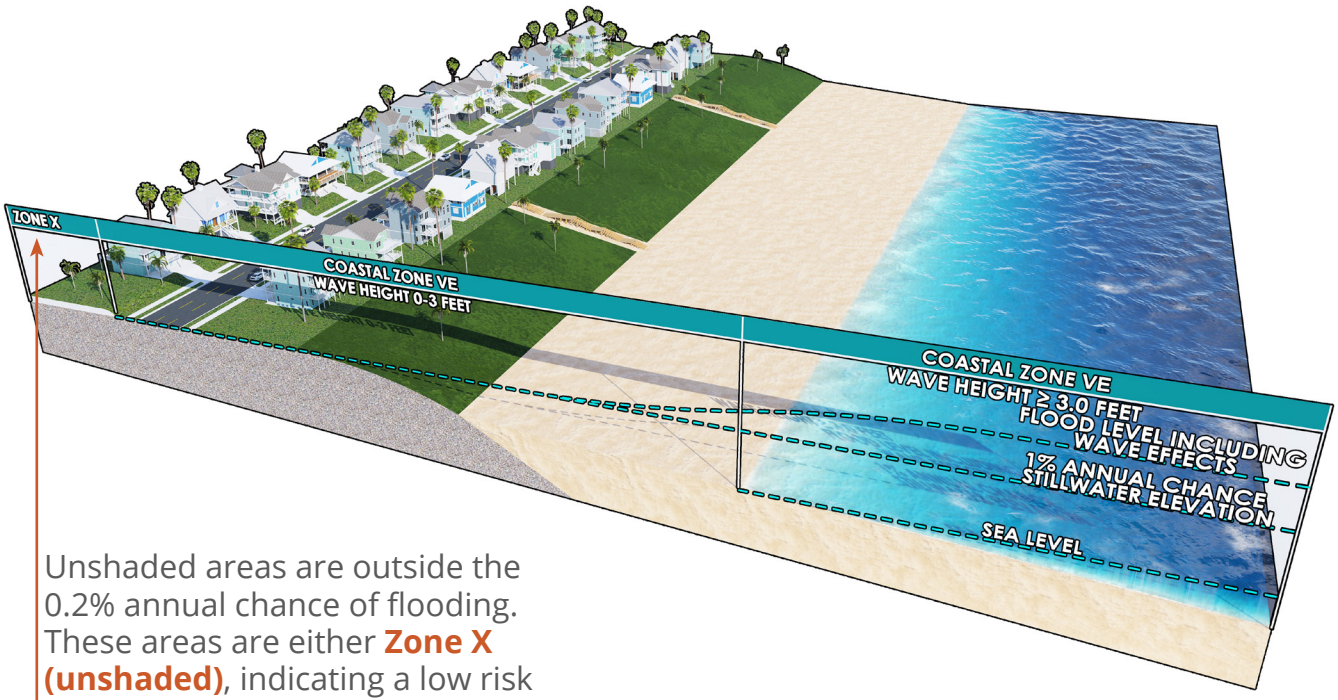
Special Flood Hazard Area is the area that will be inundated by the flood event having a 1% chance of being equaled or exceeded in any given year.



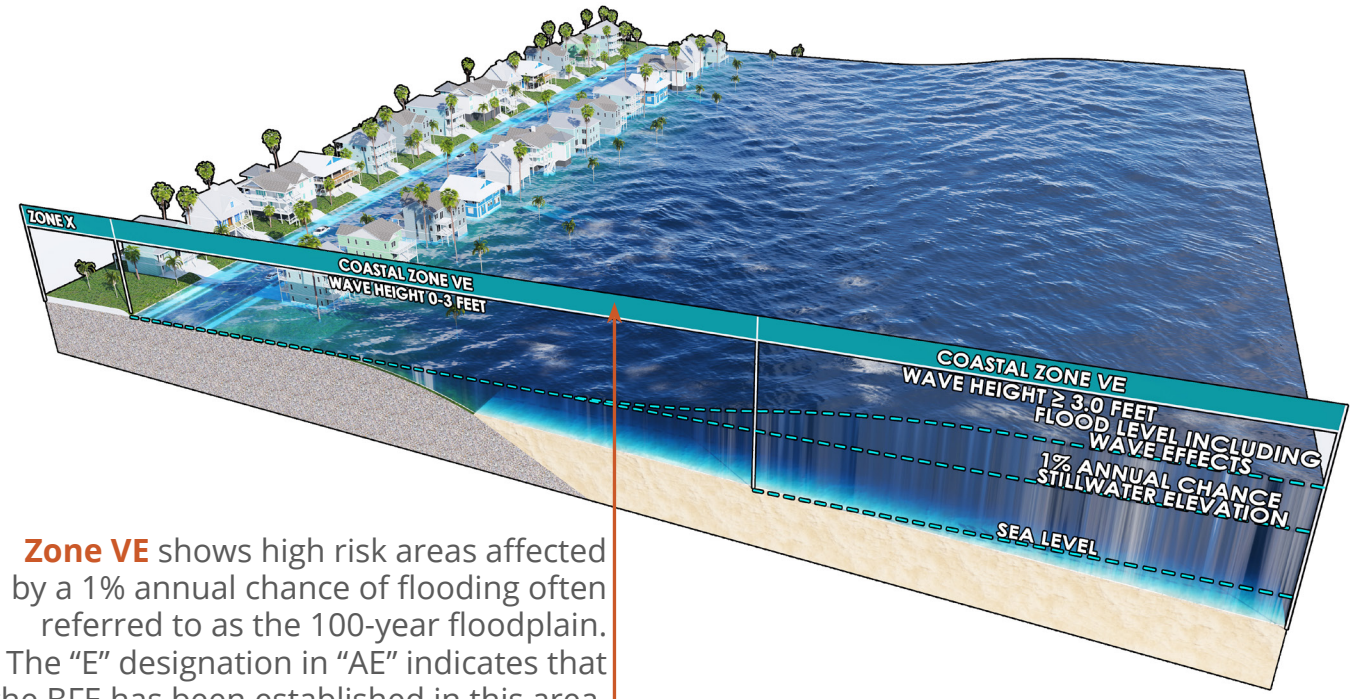
Regulatory Floodway shows areas within the 1% annual chance of flooding that will also have a velocity hazard (fast moving flood waters.)

The **floodway fringe** are lands outside the floodway, at or below the BFE, that store but do not effectively convey floodwaters.

COASTAL FLOODING



Unshaded areas are outside the 0.2% annual chance of flooding. These areas are either **Zone X (unshaded)**, indicating a low risk of flooding or **Zone D**, indicating an unknown risk.



Zone VE shows high risk areas affected by a 1% annual chance of flooding often referred to as the 100-year floodplain. The "E" designation in "AE" indicates that the BFE has been established in this area.

[This page left intentionally blank.]

UNDERSTANDING FLOOD MAPS

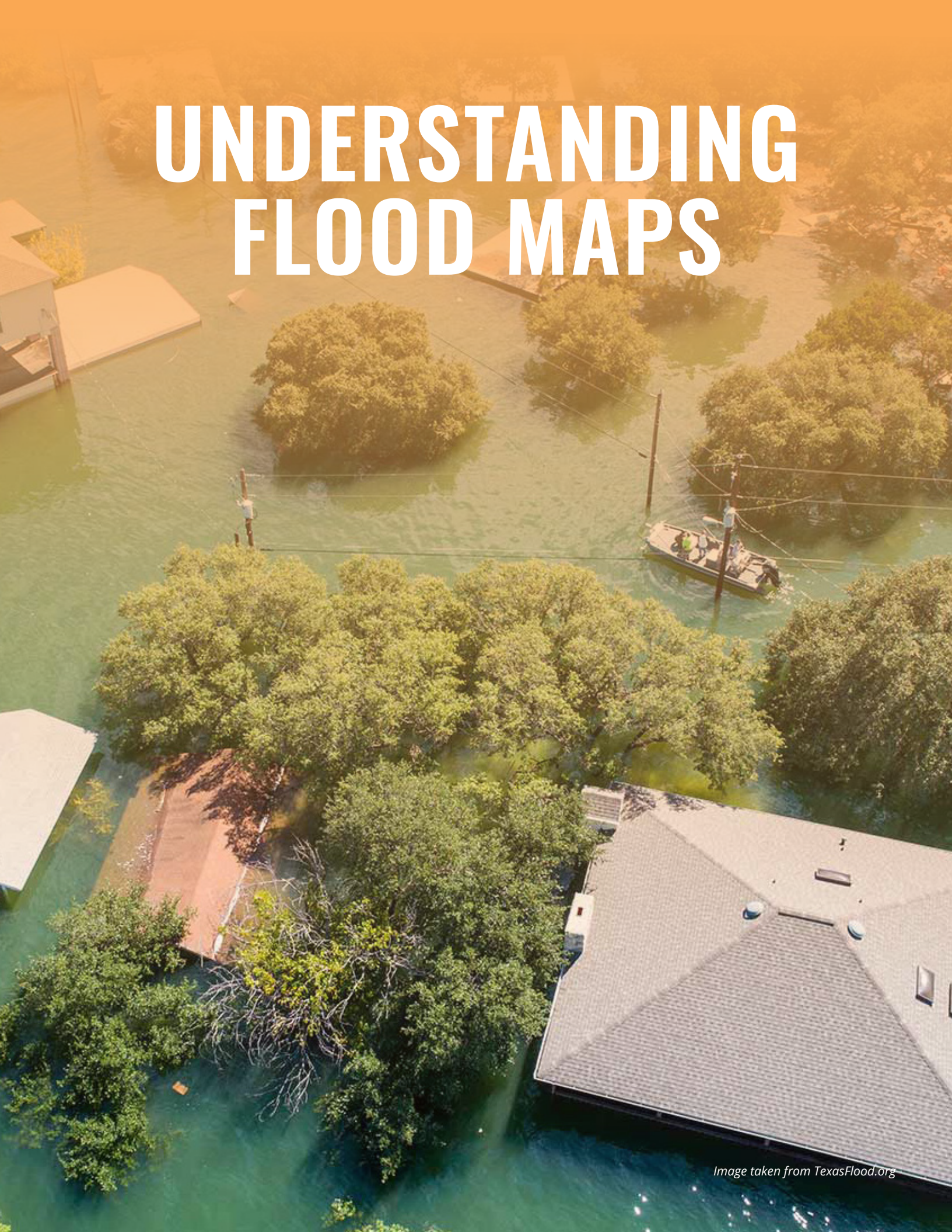


Image taken from TexasFlood.org

FLOOD HAZARD MAPS

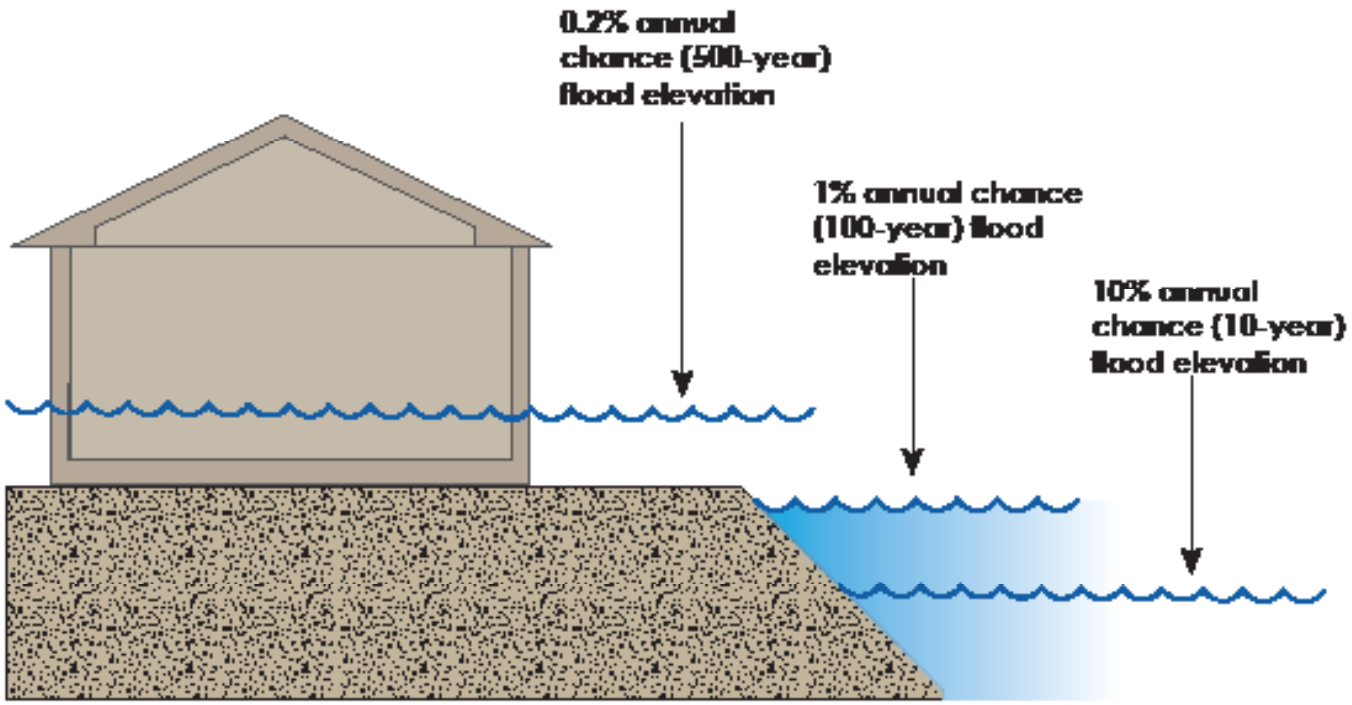
Flood maps, known officially as **Flood Insurance Rate Maps (FIRMs)**, are created by FEMA. The maps show the level of flood risk in an area including the flood zone designations, floodplain boundaries, roads and landmarks, and base flood elevation (BFE).

- Communities use FIRMs to understand flood risk and make more informed decisions about how to reduce or manage that risk.
- Lenders use FIRMs to determine flood insurance requirements.
- People use FIRMs to make informed decisions about where to live and what to build relative to flood risk.

FIRMs are available to the public free of charge through the **FEMA Flood Map Service Center.**

FIRMs show how likely it is for an area to flood. There is a 26% chance that non-elevated homes in the 1% annual chance floodplain will be damaged during a 30-year mortgage period. Those areas have at least a one-in-four chance of flooding during a 30-year mortgage.

Flood Events	Probability of Occurrence in ANY given year	Percent Chance of Occurrence in ANY given year	Percent Chance of Occurrence over a 30-year Mortgage
500-year	1 in 500	0.2%	6%
100-year	1 in 100	1%	26%
50-year	1 in 50	2%	45%
10-year	1 in 10	10%	96%



AREAS AND ZONES

- **Special Flood Hazard Areas (SFHAs)** are high-risk areas. They are shown on the flood maps as zones beginning with the letters 'A' or 'V.' These areas have a 1% annual chance of flooding. Flood insurance is available to all property owners and renters. Lenders require mandatory purchase of flood insurance.

- **Non-Special Flood Hazard Areas** are moderate-to-low risk areas. They are shown on flood maps as zones beginning with the letters 'B' or 'X-shaded'. These areas have a 0.2% annual chance of flooding. Lower cost flood insurance is available to all property owners and renters. Mandatory purchase of flood insurance does apply but lenders may still require it.

- Areas where there are possible but undetermined flood hazards can also be shown on FIRMs. These areas are shown on flood maps as zones beginning with the letter 'D.'



For more detailed information on the areas and zones, please refer to Determine Your Flood Risk, page 32.

Not All FIRMs Look the Same

- FIRMs can appear different based on the date they were created and the amount of information available.

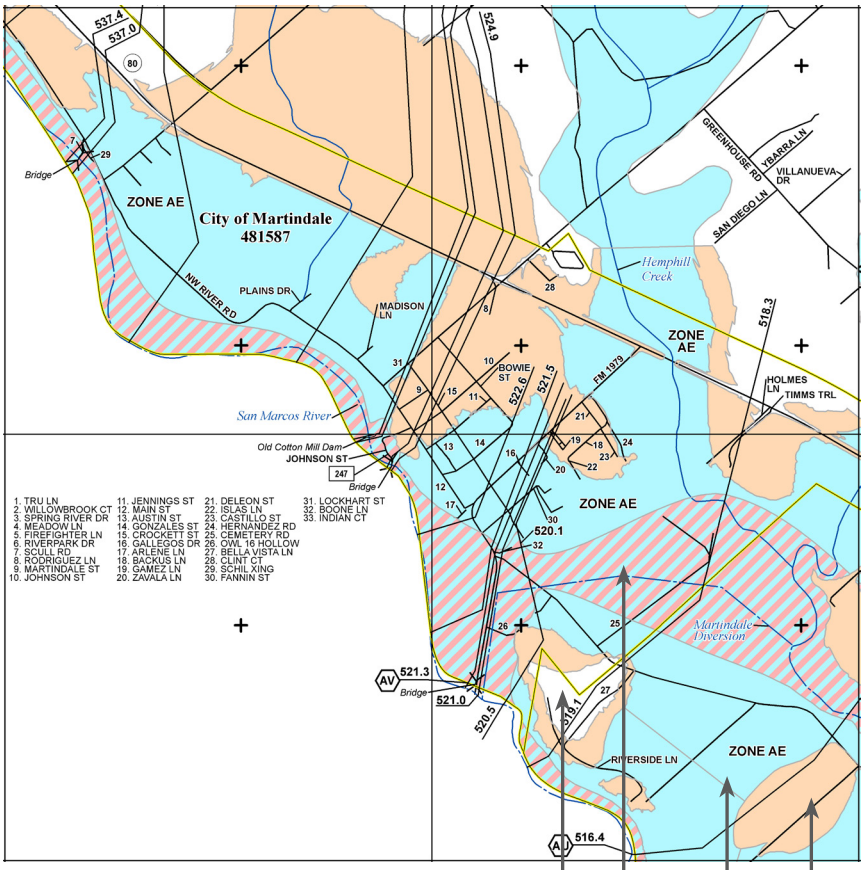
- FIRMs in riverine areas can have different information than FIRMs in coastal areas.
  - » Riverine maps will often show floodway hazards where water flows downstream at a steady rate.
  - » Coastal maps will often show velocity hazards caused by wave action from large bodies of water.

- On older FIRMs, Zone X is referred to as Zone C and Shaded Zone X is referred to as Zone B.

- Many FIRMs currently do not display areas at risk of local flooding, or urban flooding.

- Each FIRM will have a key or legend to explain the areas and features on the map.

FLOOD INSURANCE RATE MAP (RIVERINE)



FLOOD HAZARD INFORMATION

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

THE INFORMATION DEPICTED ON THIS MAP AND SUPPORTING DOCUMENTATION ARE ALSO AVAILABLE IN DIGITAL FORMAT AT HTTPS://MSC.FEMA.GOV

SPECIAL FLOOD HAZARD AREAS	Without Base Flood Elevation (BFE) *Zone A, V, A99*
	With BFE or Depth *Zone AE, AO, AH, VE, AR*
	Regulatory Floodway
OTHER AREAS OF FLOOD HAZARD	0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
	Future Conditions 1% Annual Chance Flood Hazard *Zone X*
	Area with Reduced Flood Risk due to Levee See Notes *Zone X*
OTHER AREAS	NO SCREEN Areas of Minimal Flood Hazard *Zone X*
	Area of Undetermined Flood Hazard *Zone D*
GENERAL STRUCTURES	Channel, Culvert or Storm Sewer
	Levee, Dike or Floodwall
OTHER FEATURES	18.2 / 17.5 Cross Sections with 1% Annual Chance Water Surface Elevation (BFE)
	Coastal Transect
	Coastal Transect Baseline
	Profile Baseline
	Hydrographic Feature
	513 Base Flood Elevation Line (BFE)
	Limit of Study
	Jurisdiction Boundary

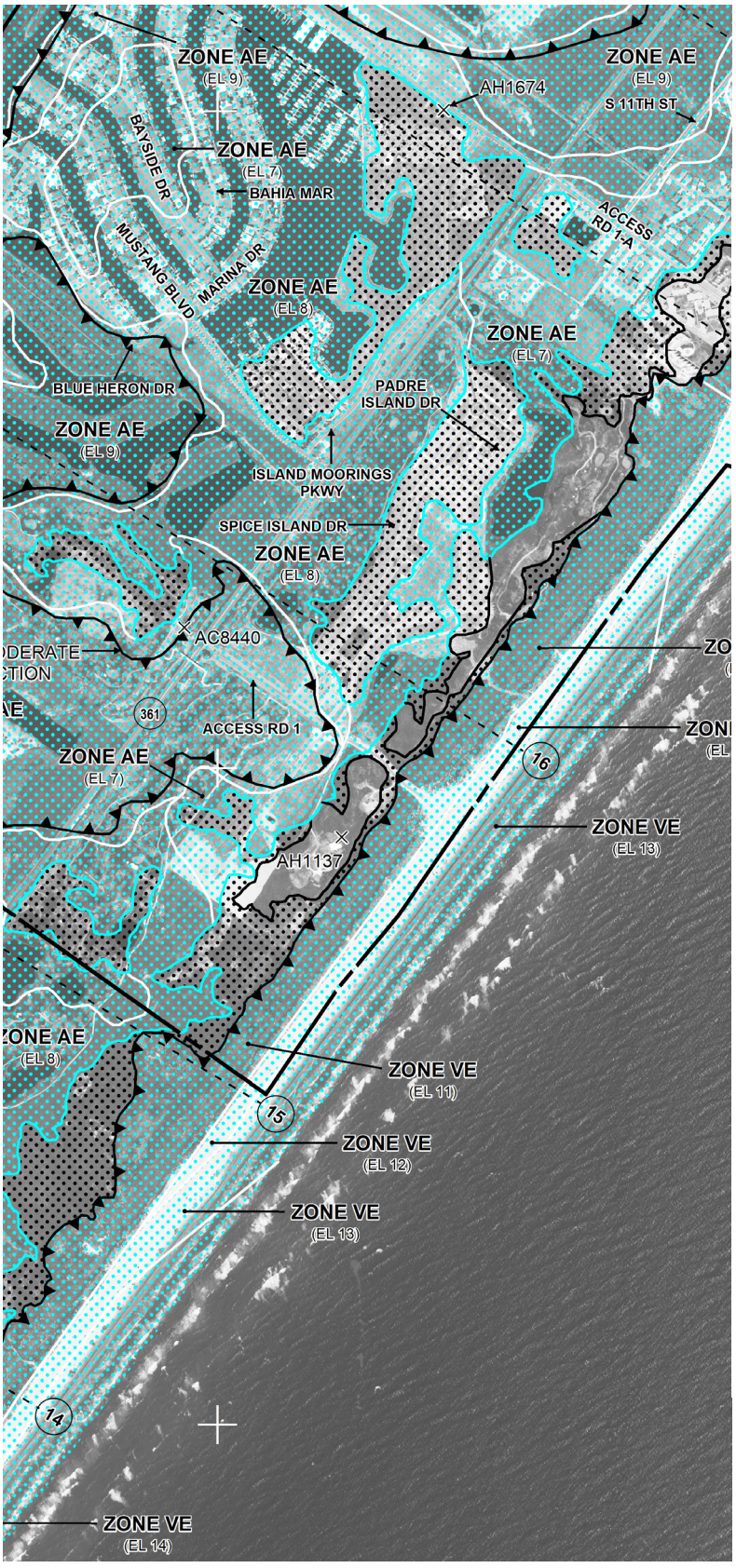
Unshaded areas are outside the 0.2% annual chance of flooding. These areas are either **Zone X (unshaded)**, indicating a low risk of flooding or **Zone D**, indicating an unknown risk.

Zone X (shaded) shows low risk areas affected by 0.2% annual chance of floodway often referred to as the 500-year floodplain.

Zone AE shows high risk areas affected by a 1% annual chance of flooding often referred to as the 100-year floodplain. The “E” designation in “AE” indicates that the BFE has been established in this area.

Regulatory Floodway shows areas within the 1% annual chance of flooding that will also have a velocity hazard (fast moving flood waters.)

FLOOD INSURANCE RATE MAP (COASTAL)



LEGEND

SPECIAL FLOOD HAZARD AREAS (SFHAs) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

ZONE A	No Base Flood Elevations determined.
ZONE AE	Base Flood Elevations determined.
ZONE AH	Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
ZONE AO	Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
ZONE AR	Special Flood Hazard Area formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
ZONE A99	Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.
ZONE VE	Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X	Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

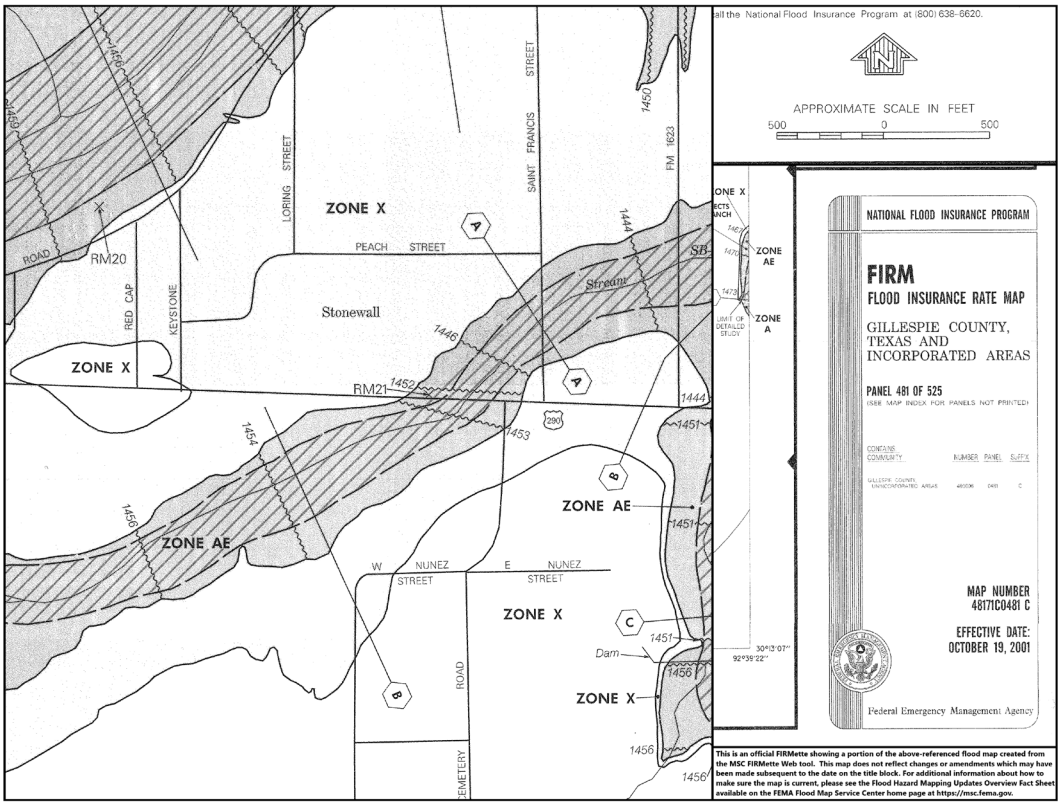
ZONE X	Areas determined to be outside the 0.2% annual chance floodplain.
ZONE D	Areas in which flood hazards are undetermined, but possible.

- 1% annual chance floodplain boundary
- 0.2% annual chance floodplain boundary
- Floodway boundary
- Zone D Boundary
- Limit of Moderate Wave Action
- Boundary dividing Special Flood Hazard Area Zones and boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities.
- 513 — Base Flood Elevation line and value; elevation in feet*
- (EL 987) — Base Flood Elevation value where uniform within zone; elevation in feet*

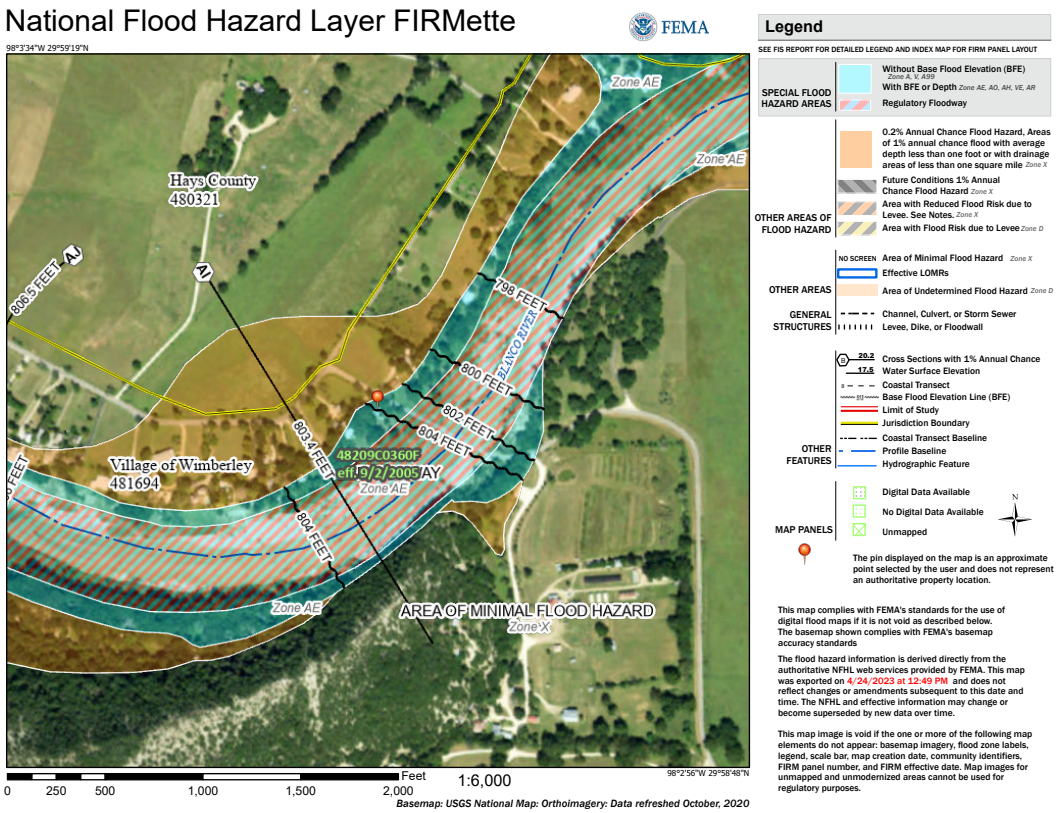
*Referenced to the North American Vertical Datum of 1988

- A — A — Cross section line
- 23 — 23 — Transect line
- 97° 07' 30", 32° 22' 30" — Geographic coordinates referenced to the North American Datum of 1983 (NAD 83), Western Hemisphere
- 42 76 000m E — 1000-meter Universal Transverse Mercator grid values, zone 14
- 600000 FT — 5000-foot grid ticks: Texas State Plane coordinate system, South zone (FIPSZONE 4205), Transverse Mercator
- DX5510 × — Bench mark (see explanation in Notes to Users section of this FIRM panel)
- ● M1.5 — River Mile

FIRMETTE MAPS



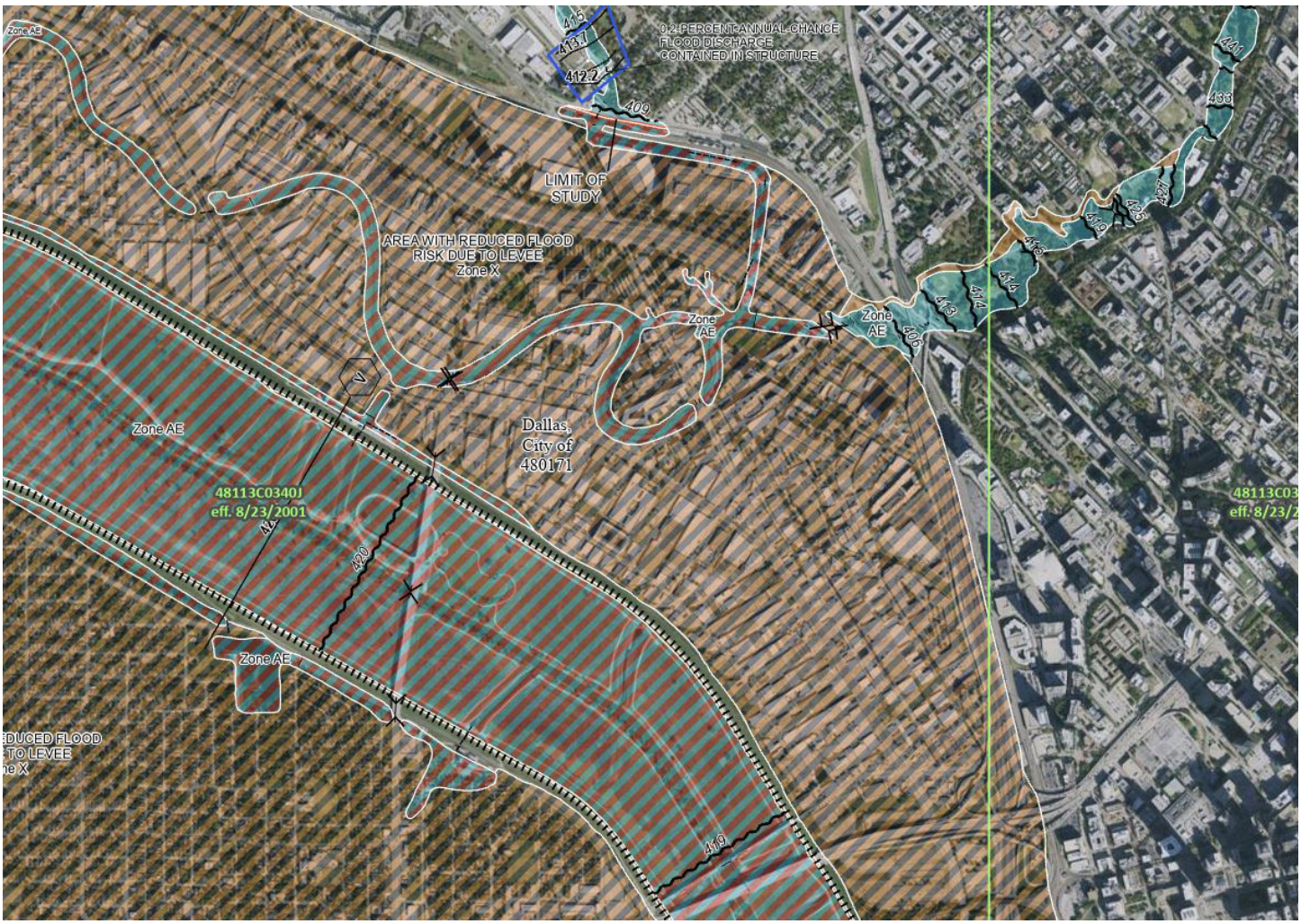
Older version of a FIRMette



Riverine Flood Hazard Map

NATIONAL FLOOD HAZARD LAYER

In areas with modernized data there is an “Interactive Map” option which will open FEMA’s NFHL in a Geoplatform (GIS). This is a fast way to view flood hazard data such as base flood elevations and flood hazard boundaries without the need to download a FIRM file.
FEMA’s National Flood Hazard Layer (NFHL) Viewer.



Note: Only about 50% of the counties in Texas have the modernized digital maps.

WHAT IS BASE LEVEL ENGINEERING?

Base Level Engineering (BLE) generates watershed-wide flood hazard information built from foundation level hydrologic and hydraulic engineering models – providing floodplain boundaries, flood depth and water surface elevation grids. BLE is developed using high resolution ground elevation, using the latest modeling software to create modeling in agreement with FEMA's Standards for Flood Risk Projects. These results agree with a Zone A mapping designation.

While this data does not immediately replace a community's FIRM, the analysis provides information to support local communities in determining BFEs for Zone A and newly identified flood prone areas identified by the BLE analysis. Communities may adopt BLE data for local development with an update to the ordinance language.

Local insights from these datasets can inform decisions of floodplain administrators, emergency managers, residents, business owners, insurance agents, and surveyors.



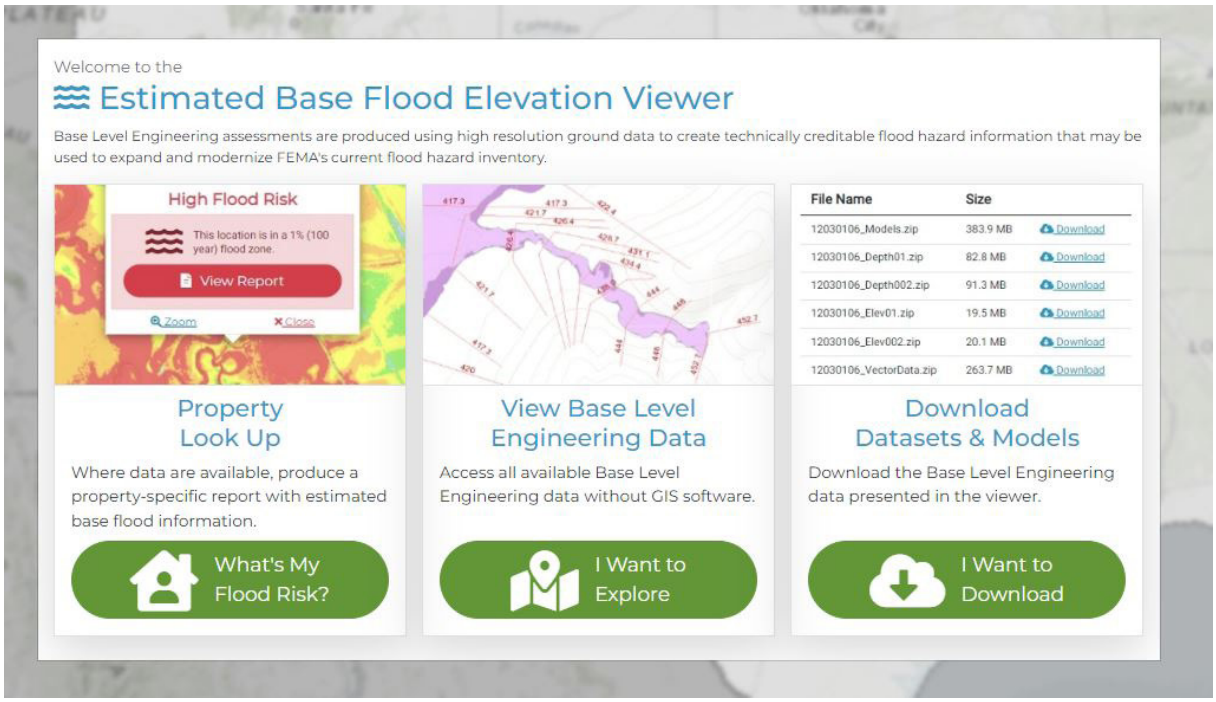
KEY BENEFITS

- **Comprehensive picture of flood risk across a watershed area.**
- **Provides modeling to support flood mitigation strategies and projects.**
- **Information to support local planning and development decisions for multiple community departments.**
- **Advises local and regional emergency planning and response operations**
- **Expand and enhance local flood risk communication initiatives.**

ACCESS BLE DATA & REPORTS

BLE data is freely available to the public on the **interactive viewer**. BLE datasets can be used to inform a host of planning decisions and activities that can lead to a stronger and more resilient community, including:

- **Hazard Mitigation Planning –** At the center of community mitigation planning is the Hazard Mitigation Plan. BLE can be an integral dataset for performing a risk assessment, developing a mitigation strategy, and identifying and prioritizing mitigation projects.
- **Floodplain Management, Development Review, and Permitting –** BLE data can be used as best available information in Zone A, and guide regulation in areas where no Special Flood Hazard Area was previously mapped. BLE-generated water surface elevation data can guide new building construction, substantial improvements, and repairs to substantially damaged buildings.
- **Community Planning, Land Use, and Zoning –** BLE can help identify and enact stricter land-use regulations and ordinances to prevent development in flood-prone areas. It can be used for transportation planning and critical and emergency facility siting, as well as access planning.
- **Emergency Management –** BLE can help inform emergency response/ recovery planning, such as: evacuation route mapping, signage, and locating emergency shelters.
- **Letter of Map Change (LOMC) –** The BFE generated from EstBFE Viewer can be used when applying for a Letter of Map Amendment (LOMA) and Letter of Map Revision Based on Fill (LOMR-F) in Zone A. Engineering models may be used to develop required modeling for Letters of Map Revision (LOMR) and Conditional Letters of Map Revision (CLOMR) for development projects that add crossings (bridges/culverts) or alter a flood source location.
- **Risk Communications –** BLE data enables better communication by making flood hazards more relatable to the public through production of flood depth grids and by making the data publicly available on a web viewer platform. **View BLE data here.**



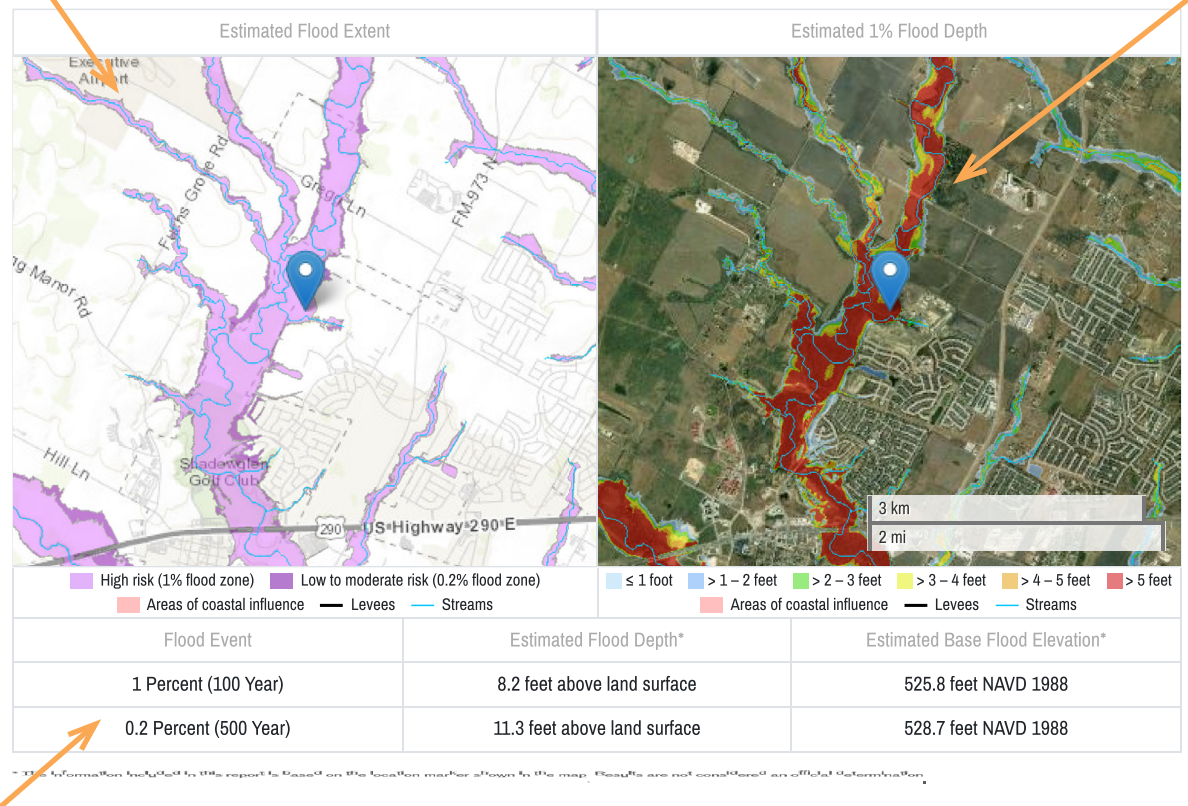
THE ESTBFE REPORT

When a site-specific report is produced by the **estBFE Viewer** a new page appears. Reports can be printed easily or emailed to others or bookmarked for easy access. The map's zoom function can be adjusted with the +/- buttons, it is recommended that you verify the location prior to printing or emailing.

Estimated Base Flood Elevation (BFE) Flood Risk Report (usgs.gov). Shown below is a few special features, created from an example estBFE Flood Risk Report. The first page provides detailed information about your property. On the second page, there are instructions on how to use the report to support a LOMA submittal.

Estimated flood extents for the 1% and 0.2% annual chance event.

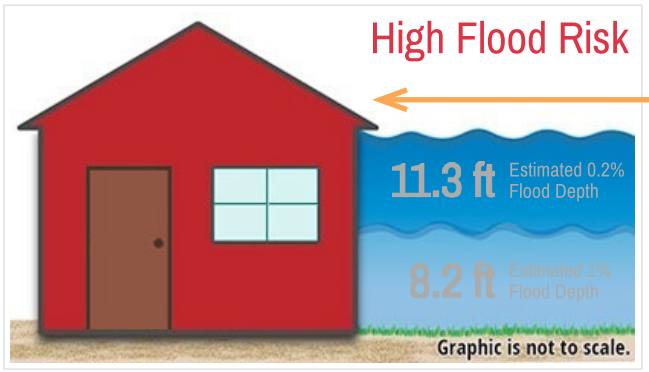
Estimated flood extents for the 1% and 0.2% annual chance event.



Flood Event	Estimated Flood Depth*	Estimated Base Flood Elevation*
1 Percent (100 Year)	8.2 feet above land surface	525.8 feet NAVD 1988
0.2 Percent (500 Year)	11.3 feet above land surface	528.7 feet NAVD 1988

*The information included in this report is based on the location marker shown in the map. Results are not considered an official determination.

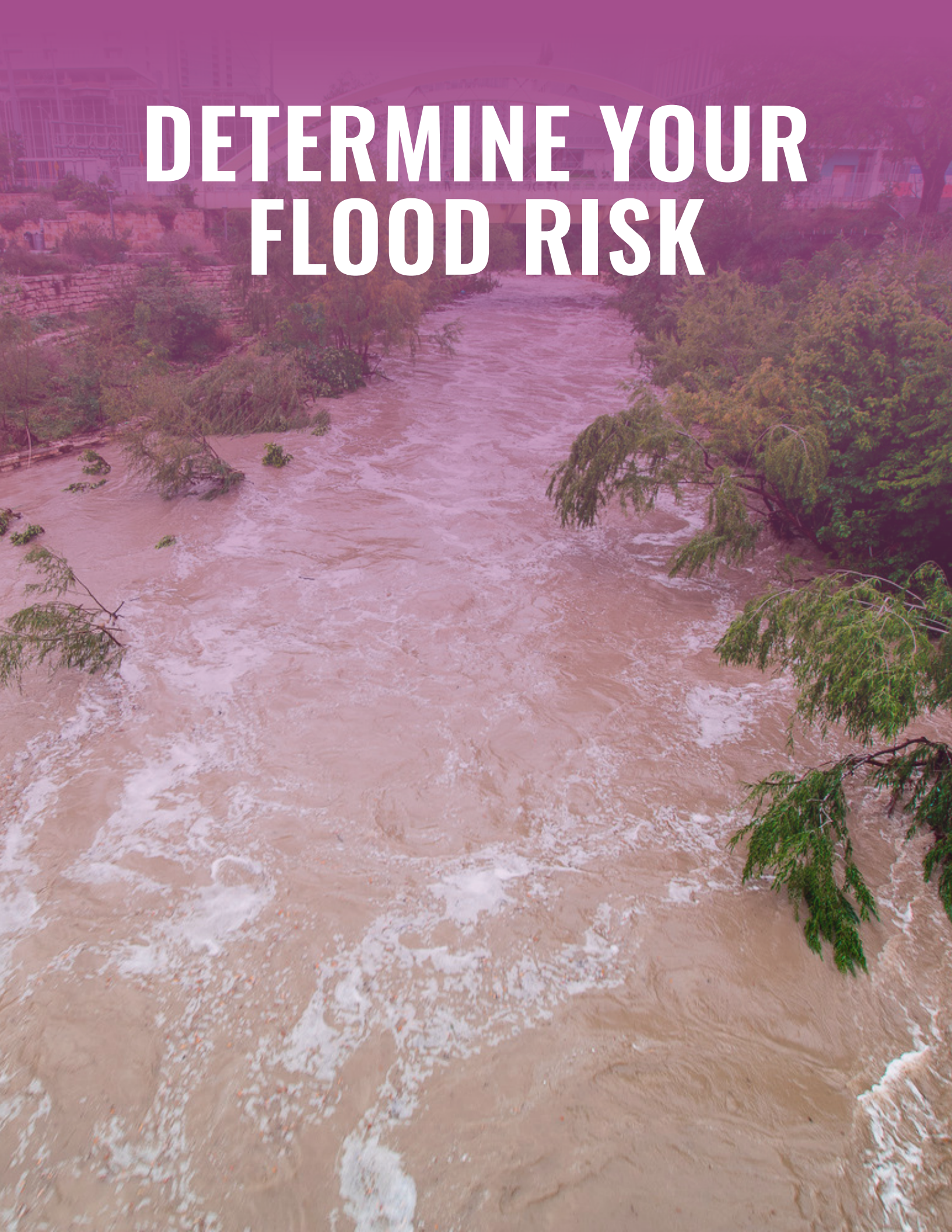
Estimated BFEs and flood depths for the 1% and 0.2%.



The red home indicates location is inside the estimated 1% annual chance floodplain.

Source: FEMA

DETERMINE YOUR FLOOD RISK

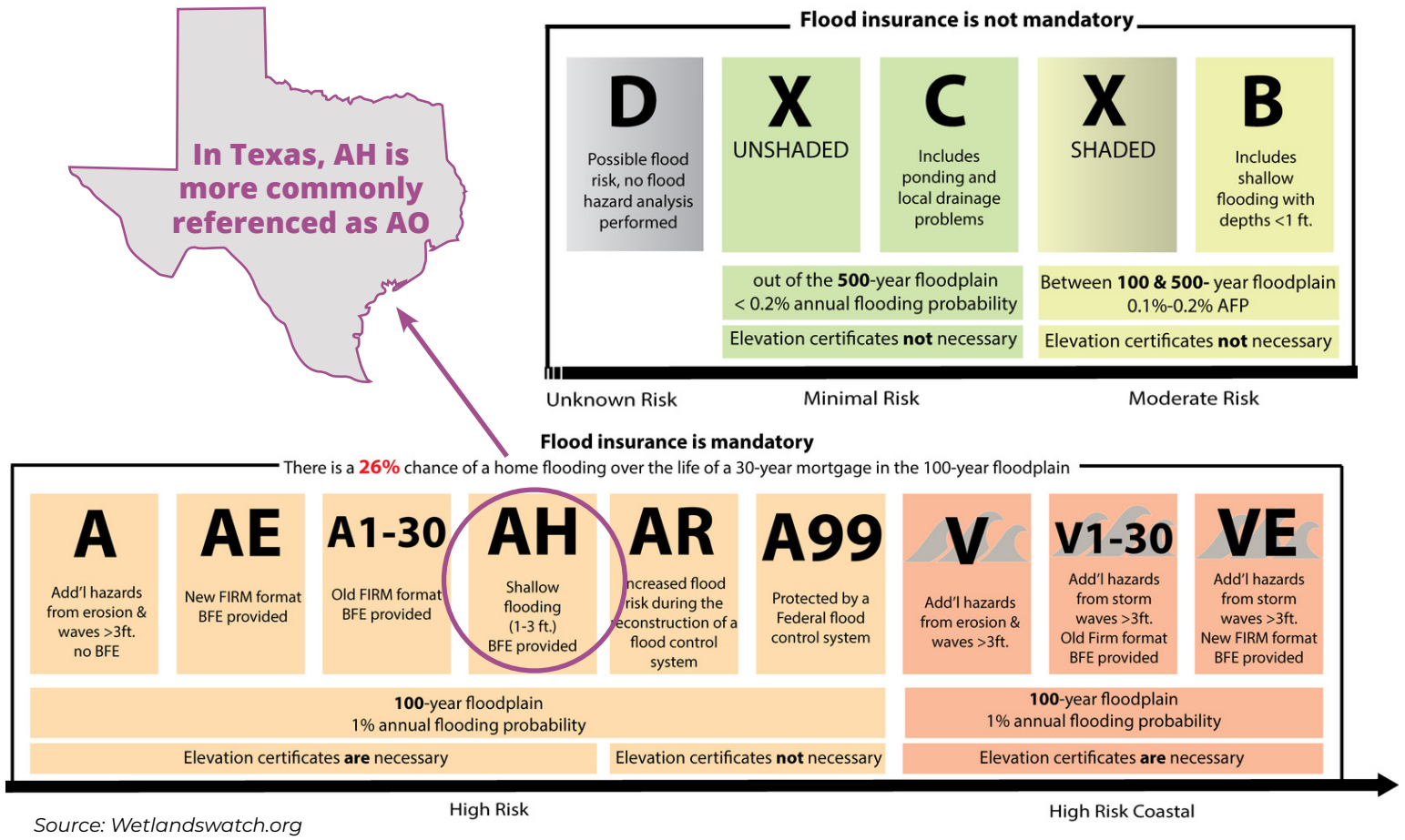


WHAT IS YOUR FLOOD RISK?

Everyone lives in an area with some flood risk—it's just a question of whether you live in a low, moderate, or high-risk flood area. Understanding FIRMs, or flood maps, can broaden your understanding, but knowing your flood zones will help you make more informed decisions to reduce risk. This section will provide more details about flood zones.

Flood hazard areas identified on the FIRMs are identified as a Special Flood Hazard Area (SFHA). SFHA are defined as the area that will be inundated by the flood event having a 1% chance of being equaled or exceeded in any given year. The 1% annual chance flood is also referred to as the base flood or 100-year flood. **SFHAs are labeled as Zone A, Zone AO, Zone AH, Zones A1-A30, Zone AE, Zone A99, Zone AR, Zone AR/AE, Zone AR/AO, Zone AR/A1-A30, Zone AR/A, Zone V, Zone VE, and Zones V1-V30.**

Moderate flood hazard areas, labeled Zone B or Zone X (shaded) are also shown on the FIRM, and are the areas between the limits of the base flood and the 0.2% annual chance, or 500-year flood. The areas of minimal flood hazard, which are the areas outside the SFHA and higher than the elevation of the 0.2% annual chance flood, are labeled Zone C or Zone X (unshaded).



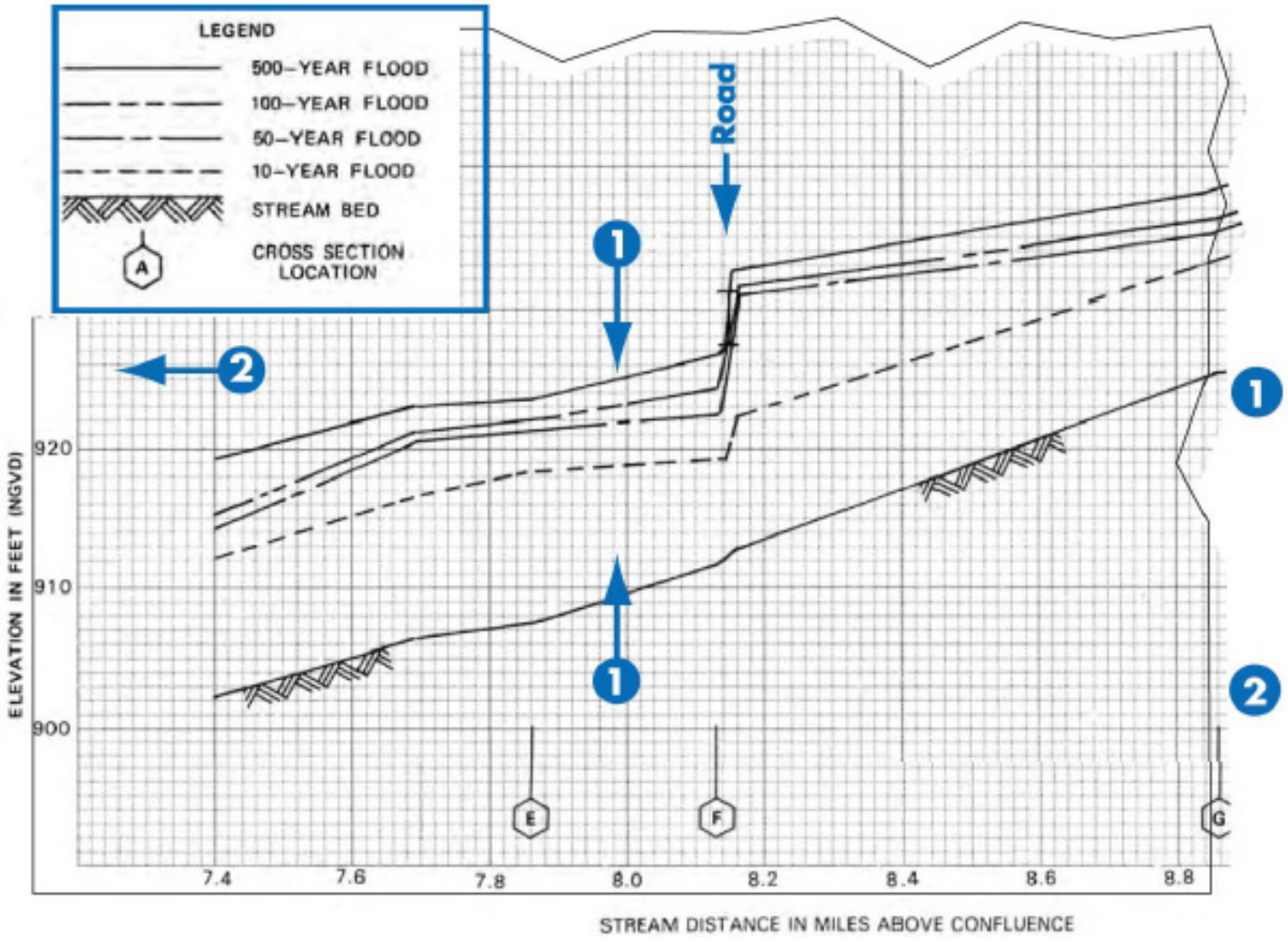
Source: Wetlandswatch.org

Note: Every homeowner, business owner, and renter in Texas communities that participate in the NFIP may purchase a flood insurance policy — regardless of the flood hazard designation. Lenders require mandatory purchase of flood insurance for federally-backed mortgages.

A base flood has a 1% chance of being equaled or exceeded in any given year. This is the regulatory standard also referred to as the **"100-year flood."** The base flood is the national standard used by the NFIP. The BFE is the elevation of surface water resulting from a flood that has a 1% chance of equaling or exceeding that level in any given year. **The BFE is shown on the FIRMs for zones AE, AH, A1–A30, AR, AR/A, AR/AE, AR/A1– A30, AR/AH, AR/AO, V1–V30 and VE.**

Flood Zone designations are geographic areas having different levels of flood risk. Each zone is represented differently on the flood map to convey low, moderate and high-risk flood zones. **Not all risk is shown on FIRMs.**

Flood profiles can be used to determine the BFE at a specific site. Profiles also show estimated water surface elevations for floods other than the 1% annual chance flood (100-year flood). The flood profiles are provided in the FIS, not the FIRM.





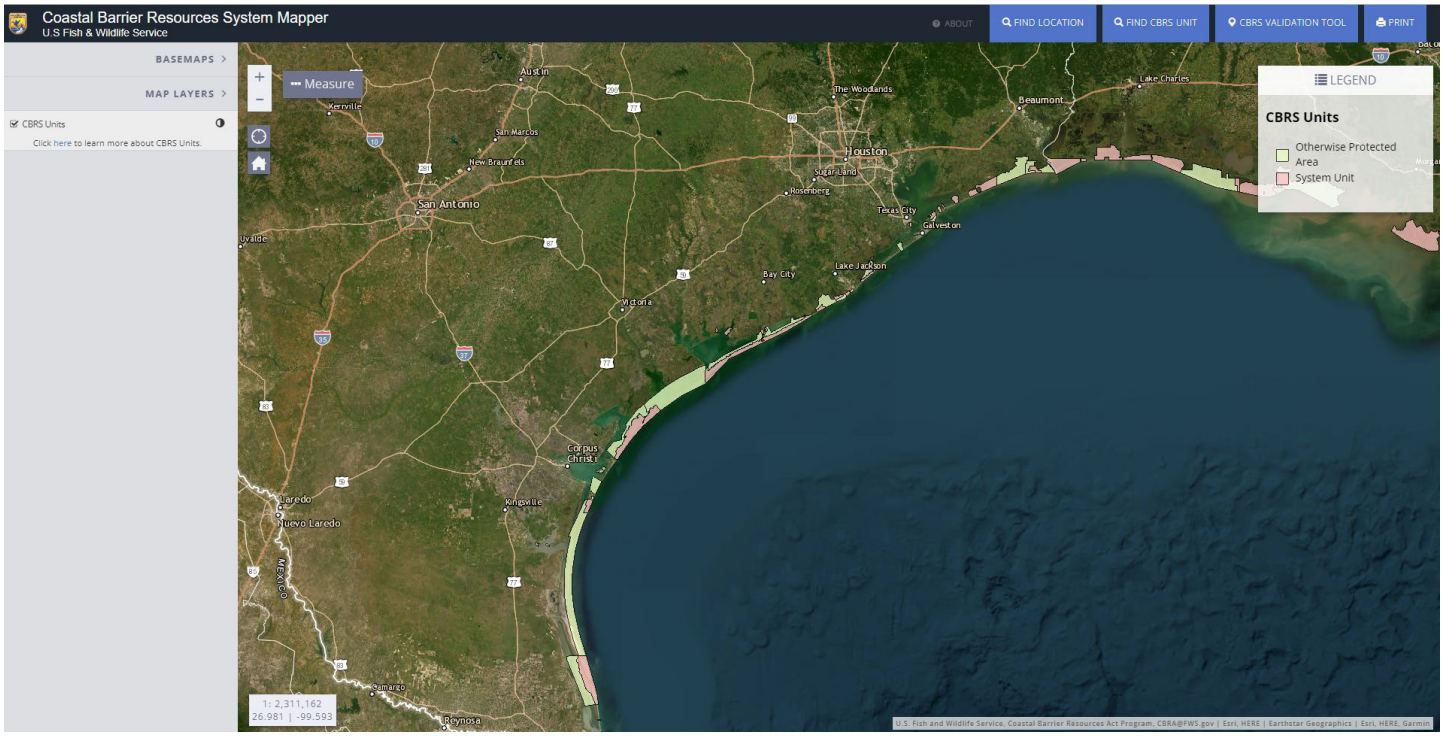
Refer to Floodplains page 18.

A **"regulatory floodway"** or floodway, means the channel of a river or other watercourse and the adjacent land areas that must be reserved to pass base flood discharge without increasing flood elevation more than a designated height---this is called a "no rise." Communities must regulate development in these floodways to ensure that there are no increases, or "no rise" in flood elevations.

BFE is required until a regulatory floodway is designated. This means that no new construction, substantial improvements, or other development (including fill) shall be permitted within Zones A1–30 and AE on the community's FIRM, unless it is demonstrated that the cumulative effect of the proposed development, when combined with all other existing and anticipated development, will not increase the water surface elevation of the base flood more than one foot at any point within the community.

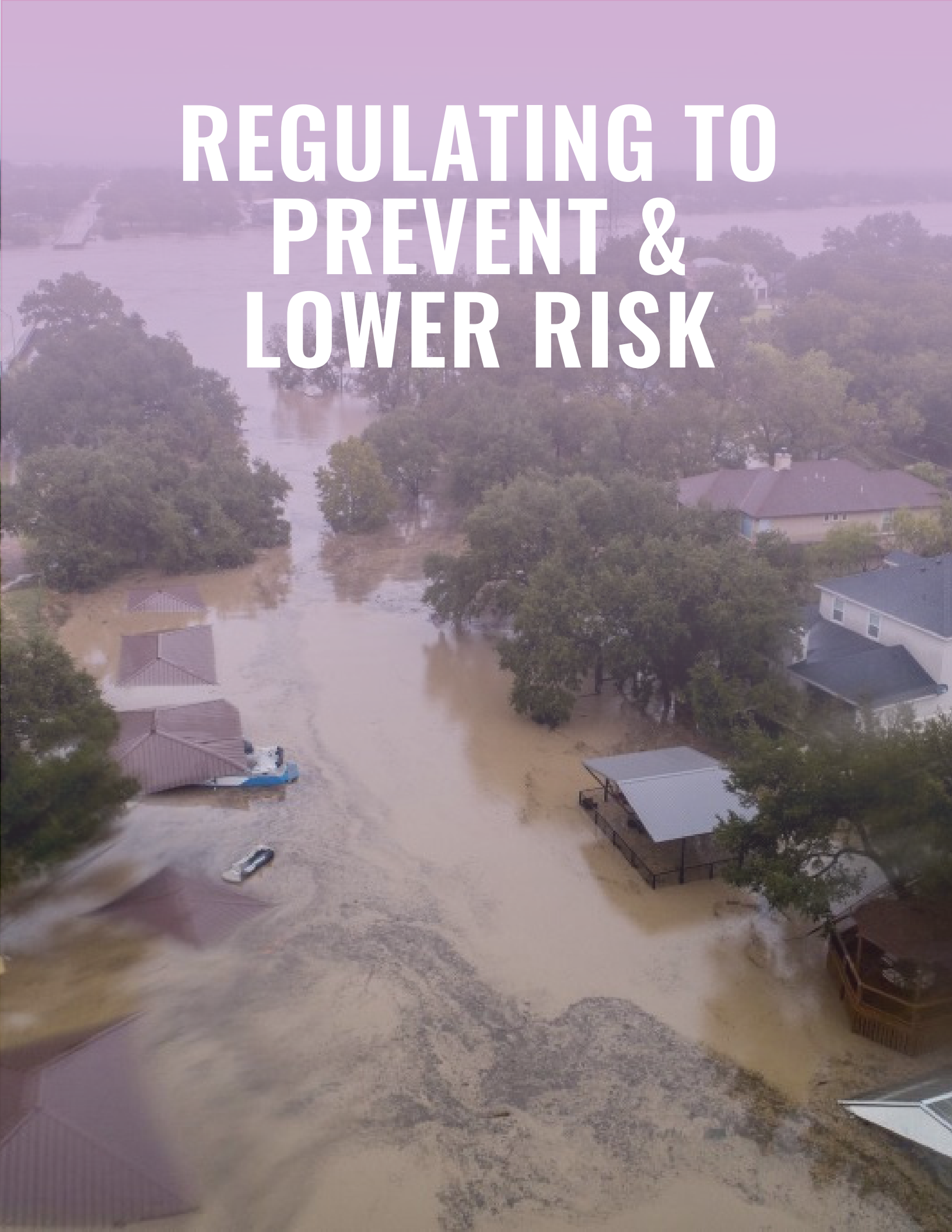
COASTAL BARRIER SYSTEM

The Coastal Barrier Resources Act (CBRA) of 1982 established the John H. Chafee Coastal Barrier Resources System (CBRS), a defined set of relatively undeveloped coastal barrier units located along the Atlantic, Gulf of Mexico, Great Lakes, U.S. Virgin Islands, and Puerto Rico coasts. CBRA prohibits most new federal expenditures that tend to encourage development or modification of coastal barriers. Therefore, most new or substantially improved residences, businesses, or other developments in the Coastal Barrier Resources System (CBRS) are not eligible for certain federal funding and financial assistance, including coverage under the NFIP. Development can still occur within the CBRS, as long as private developers or other non–federal parties bear the full cost.



Source: U.S. Fish and Wildlife Service Mapper

REGULATING TO PREVENT & LOWER RISK

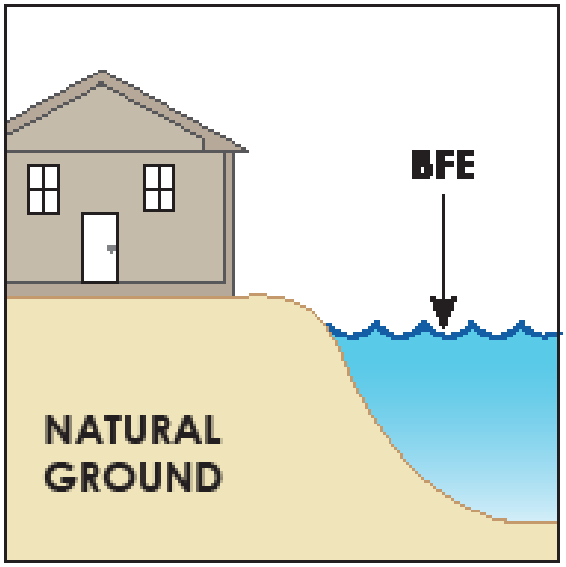


CHANGES TO FEMA FLOOD MAPS

FEMA uses the most accurate information available to make flood maps, including typographic base maps and detailed engineering methods or methods of approximation. **Remember flood risk can change and updates to flood maps provide a better picture of a property's risk.** Maps changes can occur in a few ways, FEMA-initiated map updates, community-initiated map revisions, and Cooperating Technical Partners (CTP)-initiated map revisions. Once these updates are completed and submitted, FEMA will review and issue a determination document, either approving or denying the map change. A **Letter of Map Change (LOMC)**, is a letter which reflects an official revision to a FIRM and is issued by FEMA.

Read more about how to use the online Letter of Map Change (eLOMC).

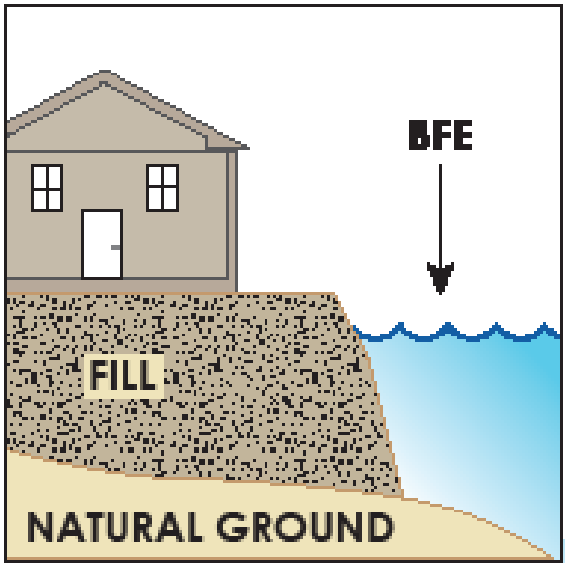
Stay current on community map updates—sign up for alerts now.



Types of Letter of Map Changes

FEMA provides administrative procedures to change the designation for properties in a FIRM. These processes are referred to as the Letter of Map Amendment (LOMA) process and the Letter of Map Revision-Based on Fill (LOMR-F) process. The types of map revisions include **MT-1** (LOMA, LOMR-F) then **MT-2** (CLOMR, LOMR).

To submit selected Letter of Map Amendment (LOMA) electronically, FEMA designed a web-based application, **eLOMA**, specifically for licensed land surveyors and professional engineers, and FEMA approved National Flood Determination Association (NFDA) Certified Professionals (CPs).



A Letter of Map Revision (LOMR) is an official revision to an effective FIRM that may be issued to change flood insurance risk zones, SFHAs and floodway boundary delineations, BFEs and/or other map features. Lenders may waive the insurance requirement if the approved map revision shows buildings to be outside of the SFHA.

A Conditional Letter of Map Revision (CLOMR) is a letter commenting on whether a proposed project, if built as shown on the submitted documentation, would meet the standards for a map revision. Communities may require this evidence prior to issuing a permit, and the Certificate of Occupancy/ Compliance should be withheld until receipt of the final LOMR based on "as-built" documentation and certification.

Physical Map Revision (PMR) may be issued for major floodplain changes that require engineering analyses, such as bridges, culverts, channel changes, flood control measures, and large fills that change the BFE or floodway. Physical Map Revisions are also issued when a new study updates or improves the FIRM.

Requests for map revisions MUST be coordinated through the local government.



**Keep in mind that the lender could still require insurance.*

Check out the online portal for LOMCs here.

PERMITS

Establishing regulations is an important strategy to reduce flood risk. Each community is different but local regulations typically include an elevation certificate and a permit. A permit will verify certain information about a property.



Source: Reuters

Most man-made changes to land in the floodplain require a permit, including:

- Constructing new buildings (including temporary or agricultural)
- Additions to existing buildings
- Substantial improvements to existing buildings (including interior renovation)
- Repair of substantially damaged buildings
- Placement of manufactured (mobile) homes
- Subdivision of land
- Parking or storage of recreational vehicles
- Storing materials, including gas/liquid tanks
- Construction of roads, bridges, and culverts
- Placement of fill, grading, excavation, mining, and dredging
- Alteration of stream channels
- Oil and gas drilling



DOES YOUR PERMIT ASK THE RIGHT QUESTIONS?

A permit reviewer should ask some of these key questions:

- Is the site in the mapped floodplain?
- Is the site in the mapped floodway?
- Have other local, state, and federal permits been obtained (septic, water quality, wetland)?
- Is the site reasonably safe from flooding?
- Does the site plan show the BFE, development location and the floodplain delineation?
- Is substantial improvement of an older building proposed?
- Is an addition proposed?
- Will new buildings and utilities be elevated properly?
- Will manufactured homes be properly elevated and anchored?
- Do the plans show an appropriate and safe foundation?
- Will an Elevation Certificate be required?

FLOODPLAIN DEVELOPMENT PERMIT *(partial)*

Owner _____

Address _____

PROJECT DESCRIPTION

___ Single Family Residential	___ New Construction	___ Channelization
___ Multi-Family Residential	___ Substantial Improvement (>50%)	___ Fill
___ Manufactured (Mobile) Home	___ Improvement (<50%)	___ Bridge/Culvert
___ Non-Residential	___ Rehabilitation	___ Levee

___ Other/Explanation _____

FLOOD HAZARD DATA

Watercourse Name _____

The project is proposed in the _____ Floodway _____ Floodway Fringe

Base (100-year) flood elevation(s) at project site _____

Elevation required for Lowest Flood _____ /Floodproofing _____

_____ _____

Floodplain Administrator's Signature Date

NATURAL HAZARD MITIGATION SAVES

Overall Findings

According to an analysis conducted by the National Institute of Building Sciences (NIBS), investing in natural hazard mitigation through federal grants yields an average savings of $6 for every $1 spent. In an earlier study from 2005, NIBS had determined a benefit-cost ratio (BCR) of 4:1.

This recent study goes further by projecting potential savings if buildings were constructed to surpass the minimum requirements of the 2015 International codes. Moreover, the study breaks down the BCRs for building resilience across various hazard types, recognizing that these ratios represent averages and can vary for specific mitigation projects. It's important to note that BCR is just one aspect, possibly a minor one, of a comprehensive mitigation decision.

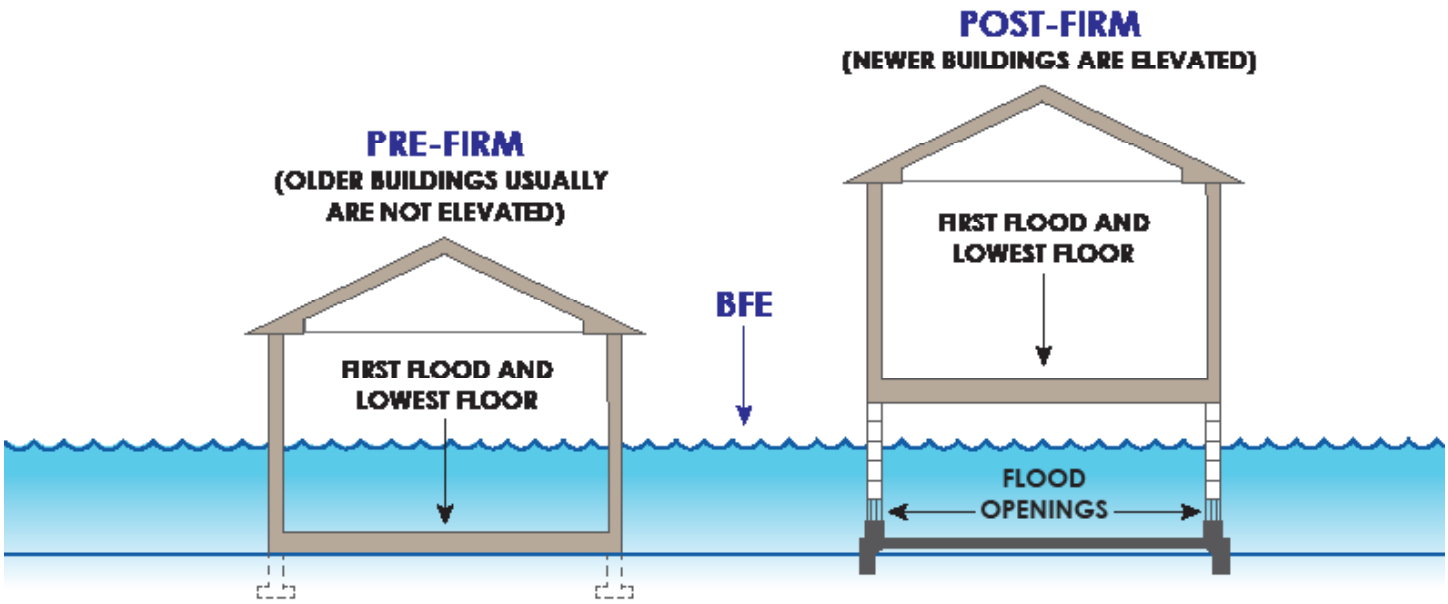
Certain advantages of mitigation, such as the intangible value of curbing domestic turmoil, safeguarding cherished belongings and photographs, and upholding community heritage and identity, pose significant challenges when it comes to quantification. Consequently, these aspects were not factored into the analyses, leading to a more cautious interpretation of the study's outcomes.

To learn more information, please refer to the interim report by FEMA here.

National Benefit-Cost Ratio (BCR) Per Peril *BCR numbers in this study have been rounded	Beyond Code Requirements	Federally Funded
Overall Hazard Benefit-Cost Ratio	$4:1	$6:1
Riverine Flood	$5:1	$7:1
Hurricane Surge	$7:1	Too few grants
Wind	$5:1	$5:1
Earthquake	$4:1	$3:1
Wildland-Urban Interface Fire	$4:1	$3:1

Source: FEMA Natural Hazard Mitigation Saves Interim Report

WHAT IS MEANT BY PRE-FIRM AND POST-FIRM STRUCTURES?



A building is **pre-FIRM** if it was built before the date of a community's first FIRM. If built or substantially improved after that date, a building is **post-FIRM**. Find the initial FIRM dates in the **Community Status Book Report.**

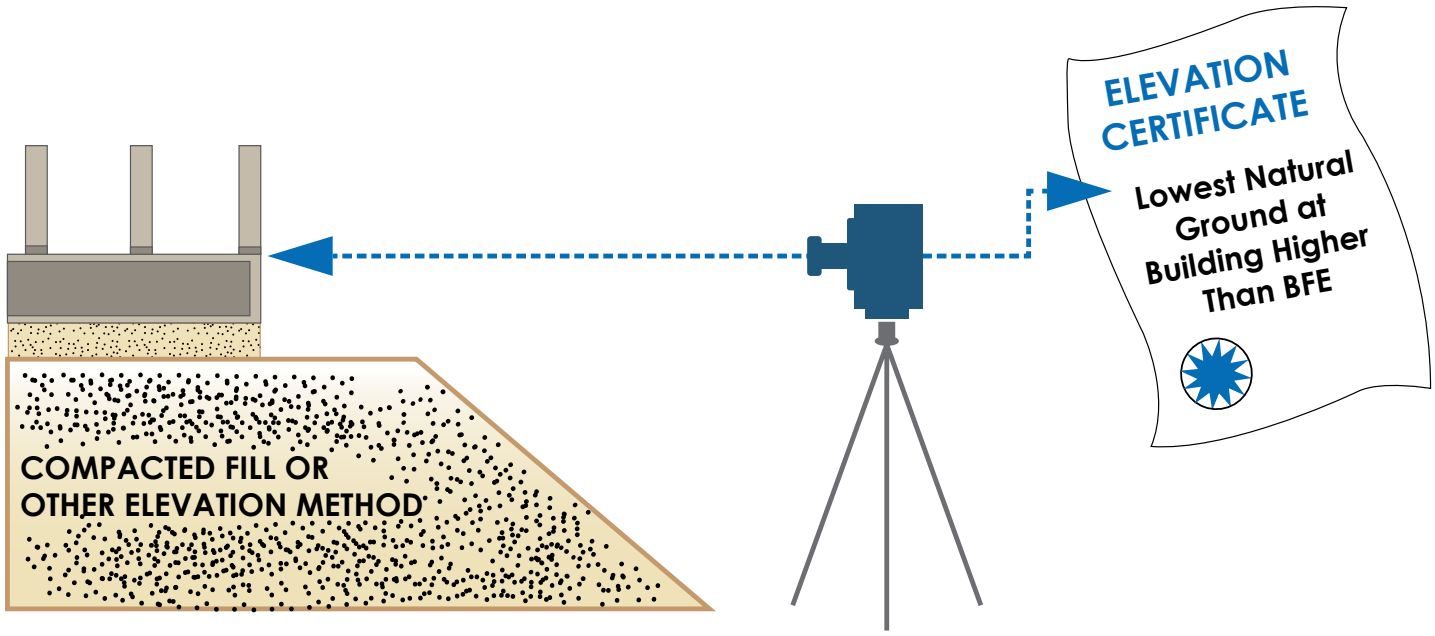
Permits are required for improvements or repairs to pre-firm buildings, which may have to be elevated to the current BFE and flood zone requirements. If you get a permit to build in the floodplain, it will be necessary for you to show that the building was built in compliance with the community's Flood Damage Prevention Ordinance. Use of the FEMA Elevation Certificate, which is certified by a licensed surveyor or engineer, will help document the compliance of the structure. It may prove that you built correctly, and it may help lower flood insurance costs.

ELEVATION CERTIFICATES

An **elevation certificate (EC)** is a document that measures your property's susceptibility to flood damage and is one factor used to calculate flood insurance premiums. This certificate is required if the property is in a high-risk flood zone.

The elevation certificate must be completed and sealed by a licensed surveyor, architect or engineer. A community official or property owner may complete the EC for sites in the approximate flood zones, AE, VE, and AO. The EC is used to show that the ground at a development is above the BFE and verify that buildings are elevated properly. Insurance agents use ECs to write and rate flood insurance policies.

By itself, the EC cannot be used to waive the requirement to purchase flood insurance. See page 36 to learn more about LOMAs.



COMPLETING THE ELEVATION CERTIFICATE

SECTION C – BUILDING ELEVATION INFORMATION (SURVEY REQUIRED)

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

*A new Elevation Certificate will be required when construction of the building is complete.

C2. Elevations – Zones A1–A30, AE, AH, A (with BFE), VE, V1–V30, V (with BFE), AR, AR/A, AR/AE, AR/A1–A30, AR/AH, AR/AO. Complete Items C2.a–h below according to the building diagram specified in Item A7. In Puerto Rico only, enter meters.

Benchmark Utilized: RM66 Vertical Datum: NAVD88

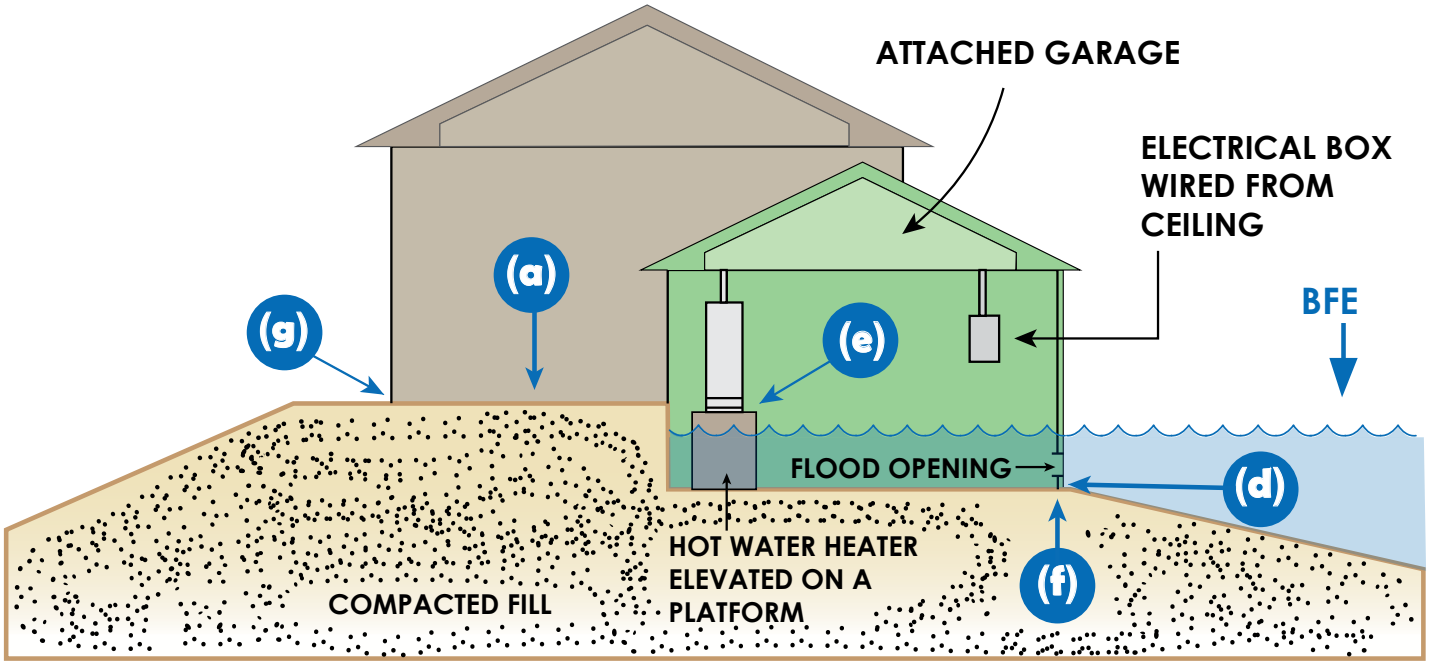
Indicate elevation datum used for the elevations in items a) through h) below.

☐ 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)	286.00	☑ feet	☐ meters
b) Top of the next higher floor	N/A	☐ feet	☐ meters
c) Bottom of the lowest horizontal structural member (V Zones only)	N/A	☐ feet	☐ meters
d) Attached garage (top of slab)	282.50	☑ feet	☐ meters
e) Lowest elevation of machinery or equipment servicing the building (Describe type of equipment and location in Comments)	286.00	☑ feet	☐ meters
f) Lowest adjacent (finished) grade next to building (LAG)	282.50	☑ feet	☐ meters
g) Highest adjacent (finished) grade next to building (HAG)	286.00	☑ feet	☐ meters
h) Lowest adjacent grade at lowest elevation of deck or stairs, including structural support	N/A	☑ feet	☐ meters

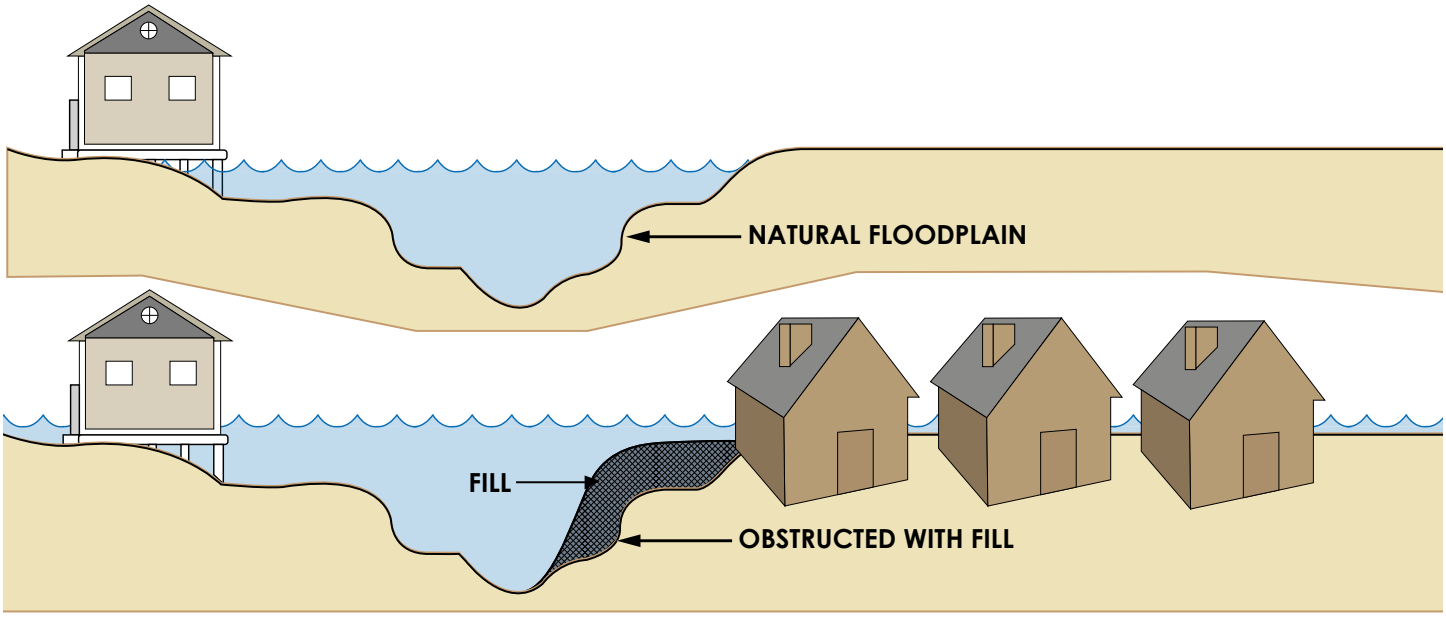
In this example, **the BFE is 285.** The slab-on-grade house was elevated on fill 1' above the BFE, and the vented garage is 2.5' below the BFE. **A blank elevation certificate can be found on FEMA's website.** You must have a licensed surveyor or engineer fill it out and seal it. The EC includes diagrams for 10 building types. Several points must be surveyed.



FLOODPLAIN FILL CAN MAKE THINGS WORSE!

Floodplains are supposed to store floodwaters. If storage space is filled with dirt and other material, future flooding may worsen! You are required to perform an engineering analysis to show how the floodplain fill will alter flooding. Floodplain fill can alter other functions beside backwater, including wildlife habitats and wetlands.

Make sure your floodplain fill project won't harm your neighbors. Floodway fill is allowed only if an engineering study and the Floodplain Administrator can determine if a "no rise/no impact" in the flood level will occur.



FLOODWAYS CAN BE DANGEROUS

44 CFR 60.3(d)(3) Prohibit encroachments, including fill, new construction, substantial improvements, and other development within the adopted regulatory floodway unless it has been demonstrated through hydrologic and hydraulic analyses performed in accordance with standard engineering practice that the proposed encroachment would not result in any increase in flood levels within the community during the occurrence of the base flood discharge.

Prior to issuing any development permits for activity in a regulatory floodway, a "no rise/no impact" certification is required. An engineer must evaluate the hydraulic impact of proposed development. The engineering analysis must be based on regulatory data from FEMA. Save time and money - don't build in the floodway!

ENGINEERING "NO IMPACT" CERTIFICATION *(example)*

NATIONAL FLOOD INSURANCE PROGRAM

This is to certify that I am a duly qualified engineer licensed to practice in the State of Texas. It is to further certify that the attached technical data supports the fact that the proposed ***(Name of Development)*** will not impact the Base Flood Elevations (100-year flood), floodway elevations, and the floodway widths on ***(Name of Stream)***.

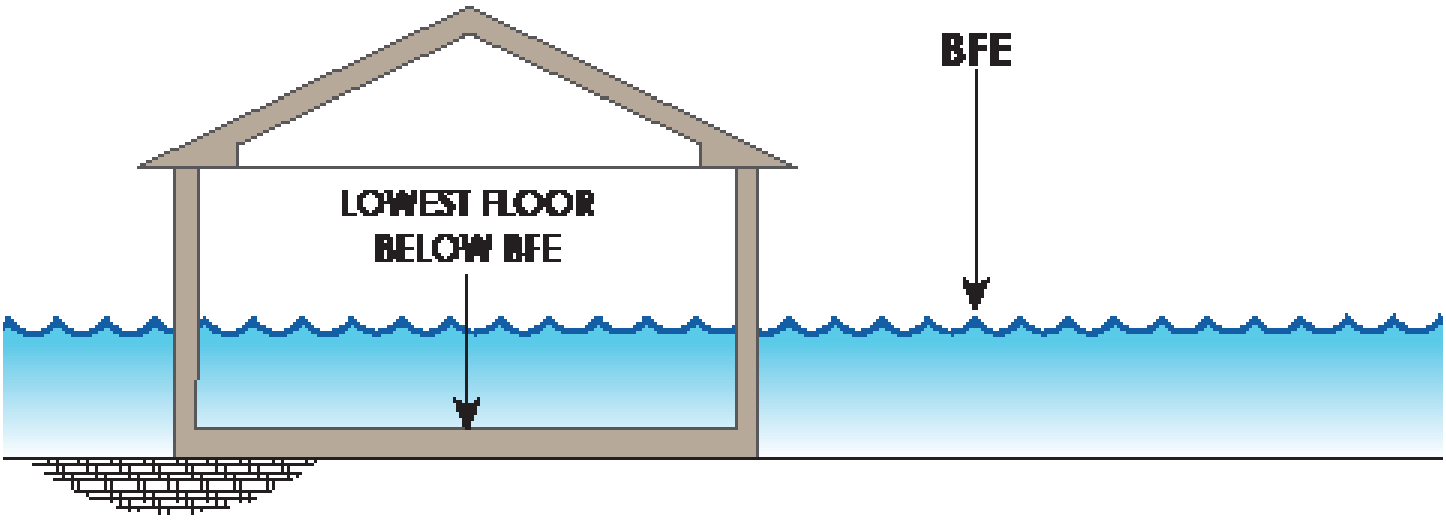
Signature_____ Seal _____

THINK CAREFULLY BEFORE YOU SEEK A VARIANCE

Very specific conditions related to the property not the owners actions or preferences must be satisfied to justify a variance:

- Good and sufficient cause
- Unique site conditions
- Individual non-economic hardship
- If in the floodway, no increase in flood level

Building below the BFE will more likely cause damage to property and insurance will be very costly. A variance that allows construction below the BFE does not waive your lender's flood insurance requirement; flood insurance will be very expensive and could also impact CRS credit.



DEVELOPMENT STANDARDS

NEW STRUCTURES



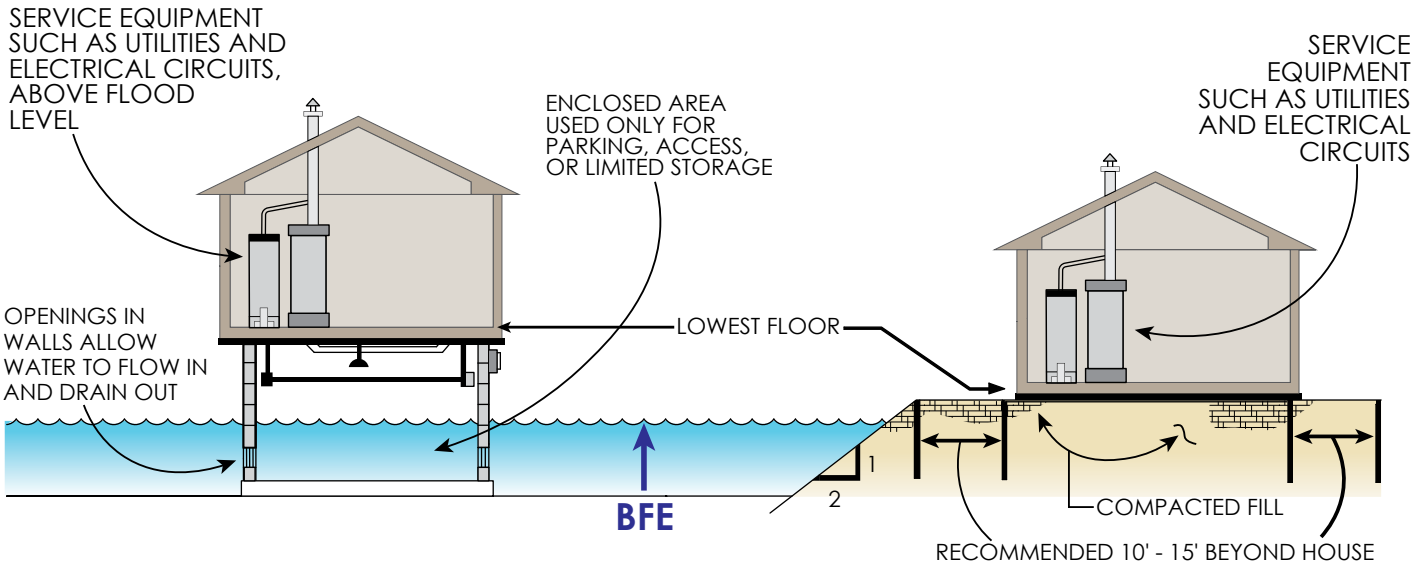
Image taken from Shutterstock

NEW CONSTRUCTION (RIVERINE)

Structures within the SFHA in a community participating in the NFIP are subject to floodplain management regulations that impact building standards and are designed to minimize flood risk. As a condition of NFIP participation, a community must adopt a floodplain management ordinance requiring that new and substantially improved residential buildings must be constructed with the lowest floor above the BFE. Non-residential buildings can either be elevated or floodproofed to the BFE. FEMA encourages communities to adopt regulations requiring at least a **one-foot freeboard**. Building at least one foot above the BFE significantly lowers flood insurance rates due to lower flood risk.

Floodplain Building Elevation Standards

There are basic standards that are provided by FEMA/NFIP. Earthen fill is sometimes placed in a SFHA to reduce flood risk to the filled area. The placement of fill is considered development and will require a permit under applicable federal, state and local laws, ordinances, and regulations. Fill is prohibited within the floodway unless it has been demonstrated that it will not result in **ANY** increase in flood levels.

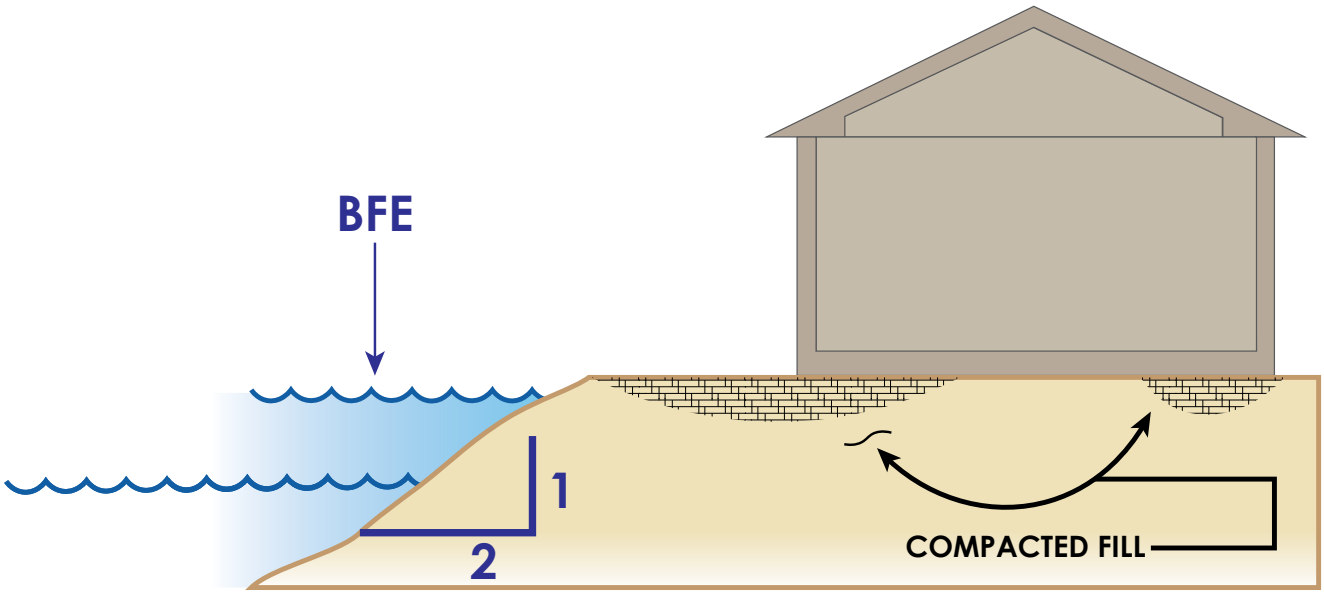


COMPACTION OF FLOODPLAIN FILL

Earthen fill used to raise the ground above the flood elevation must be placed properly so that it does not erode or slump when water rises. For safety and to meet floodplain requirements, floodplain fill should:

- Be good clean soil, free of large rocks, construction debris, and woody material (stumps, roots)
- Be machine-compacted to 95 percent of the maximum density (determined by a design professional)
- Extend 10 to 15 feet beyond the footprint of the structure
- Have graded side slopes that are not steeper than 2:1 (one-foot vertical rise for every 2 feet horizontal extent); flatter slopes are recommended
- Have slopes protected against erosion (vegetation for "low" velocities, durable materials for high velocities – determined by a design professional)

Communities may ask for a professional engineer to certify the fill elevation, compaction, slope, and slope protection materials in order to determine that the proposed structure will be "reasonably safe from flooding."

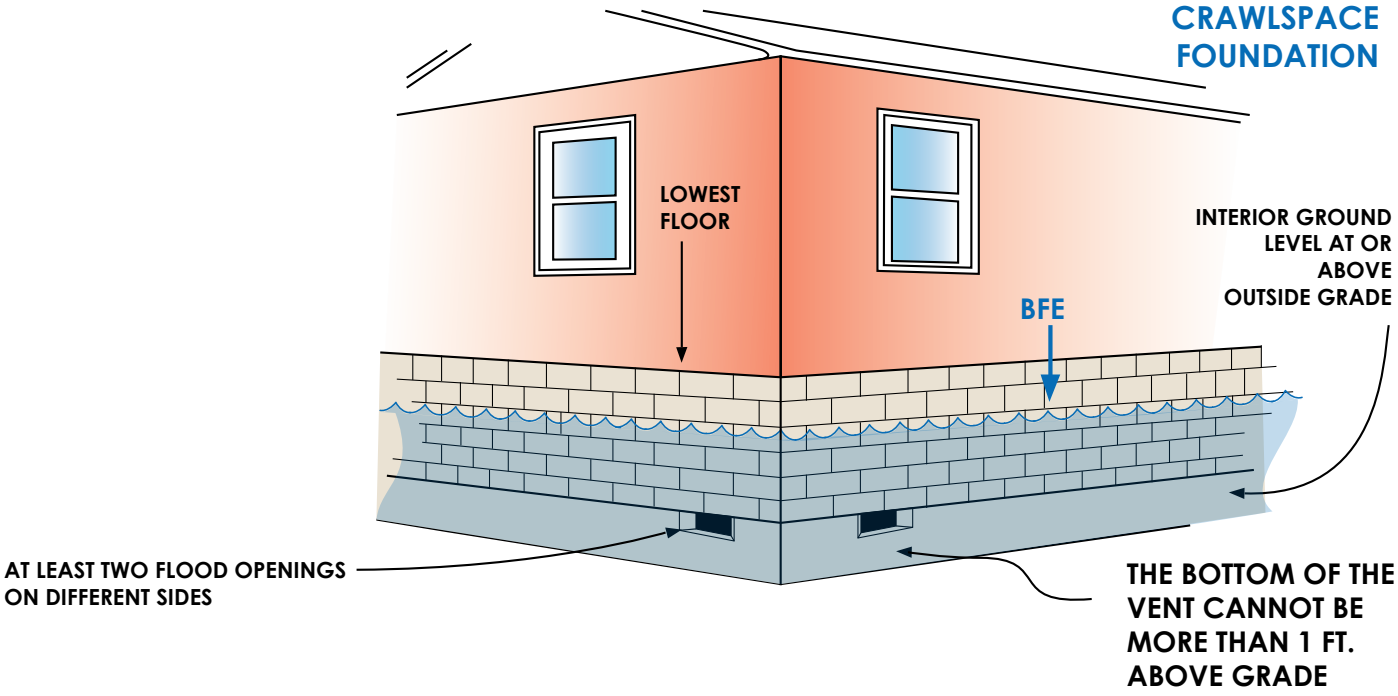


ENCLOSURES BELOW THE BFE (RIVERINE ONLY)

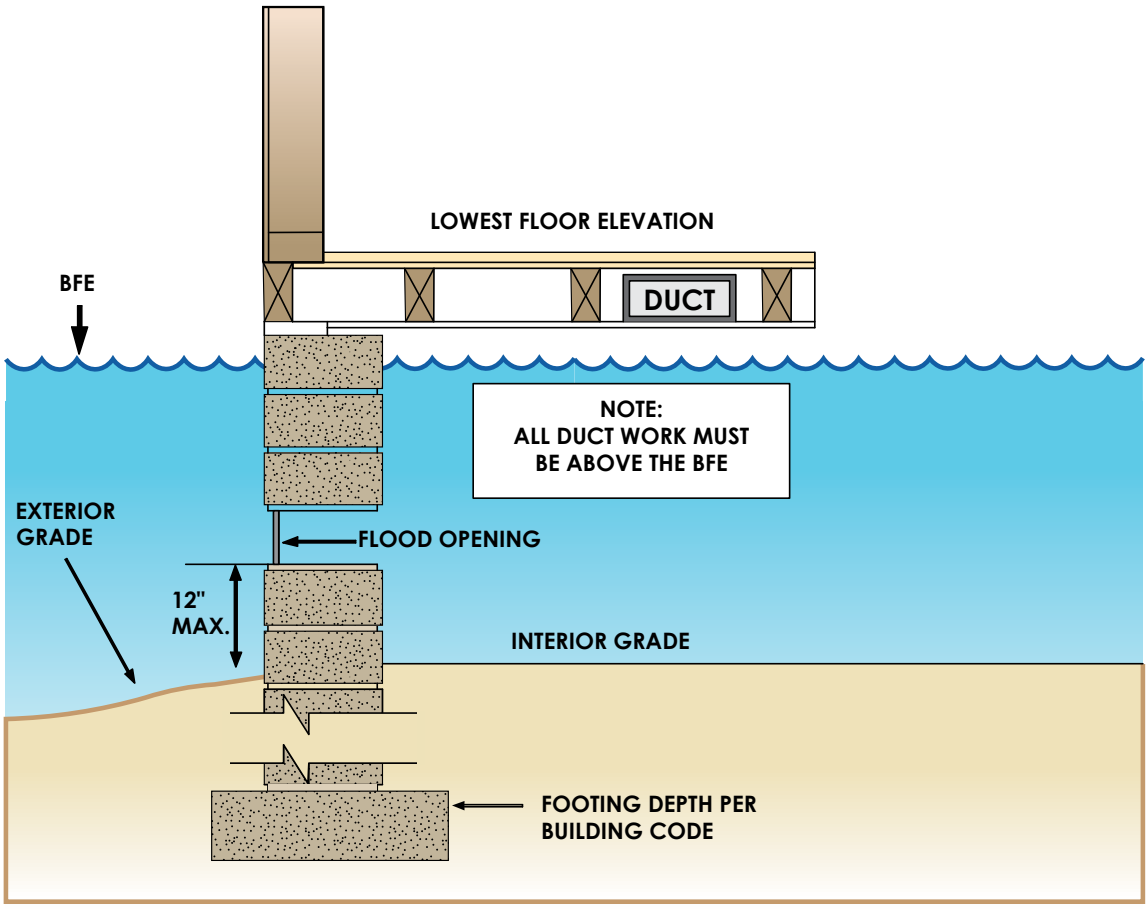
Crawlspace foundations are commonly used in some parts of the nation to elevate the lowest floors of residential buildings located in SFHAs above the BFE. Crawlspaces should be constructed so that the floor of the crawlspace is at or above the lowest adjacent grade (LAG) to the building.

Crawlspaces that have their floors below BFE must have openings to allow the equalization of flood forces. Crawlspaces generally have solid foundation walls to enclose flood-prone spaces. A crawlspace is a good way to elevate just a couple of feet. In all cases, the following are required: openings/vents, elevated utilities, flood resistant materials, and limitations on use, ***reference 44 CFR 60.3 C(5).***

- **Total net area of all total openings is 1 in.² Per ft.² of enclosed space.**
- **A 25' x 45' building needs 1125 in.² of openings (25 x 45 = 1125).**
- **Standard ventilation units used in block foundation walls must be disabled in the open position to allow water to flow in and out.**
- **A standard ventilation unit, with screen, provides 42 to 65 in.² of opening.**
- **Engineered openings are acceptable if certified to allow adequate automatic inflow and outflow of water.**



CRAWLSPACE DETAILS



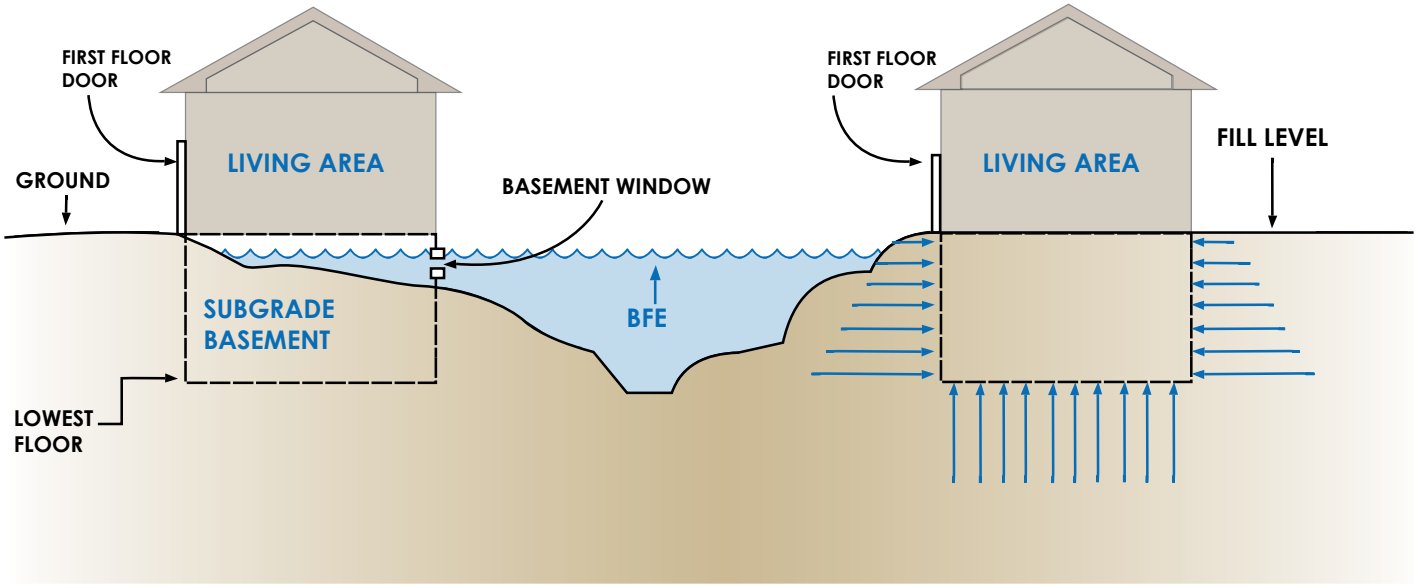
- The Lowest Floor Elevation must be at or above the BFE depending on the local code.
- All materials below the BFE must be flood resistant.
- The bottom of flood openings must be no more than 12 inches above grade.
- Standard air ventilation units must be disabled in the “open” position to allow water to flow in and out.
- Interior grade must be equal to or higher than exterior grade on at least one side.

Calculate Net Flood Opening:

A building that measures 30’ x 40’ has 1,200 square feet of enclosed crawlspace. **Flood openings must provide 1,200 in.^{2} of net open area** (or have certified engineered openings). If a standard air vent unit provides 60 in.^{2} of net open area, 20 vent units are required to satisfy the flood opening requirement (**1,200 divided by 60**). As an alternative, use certified engineered openings.

BASEMENTS ARE RISKY

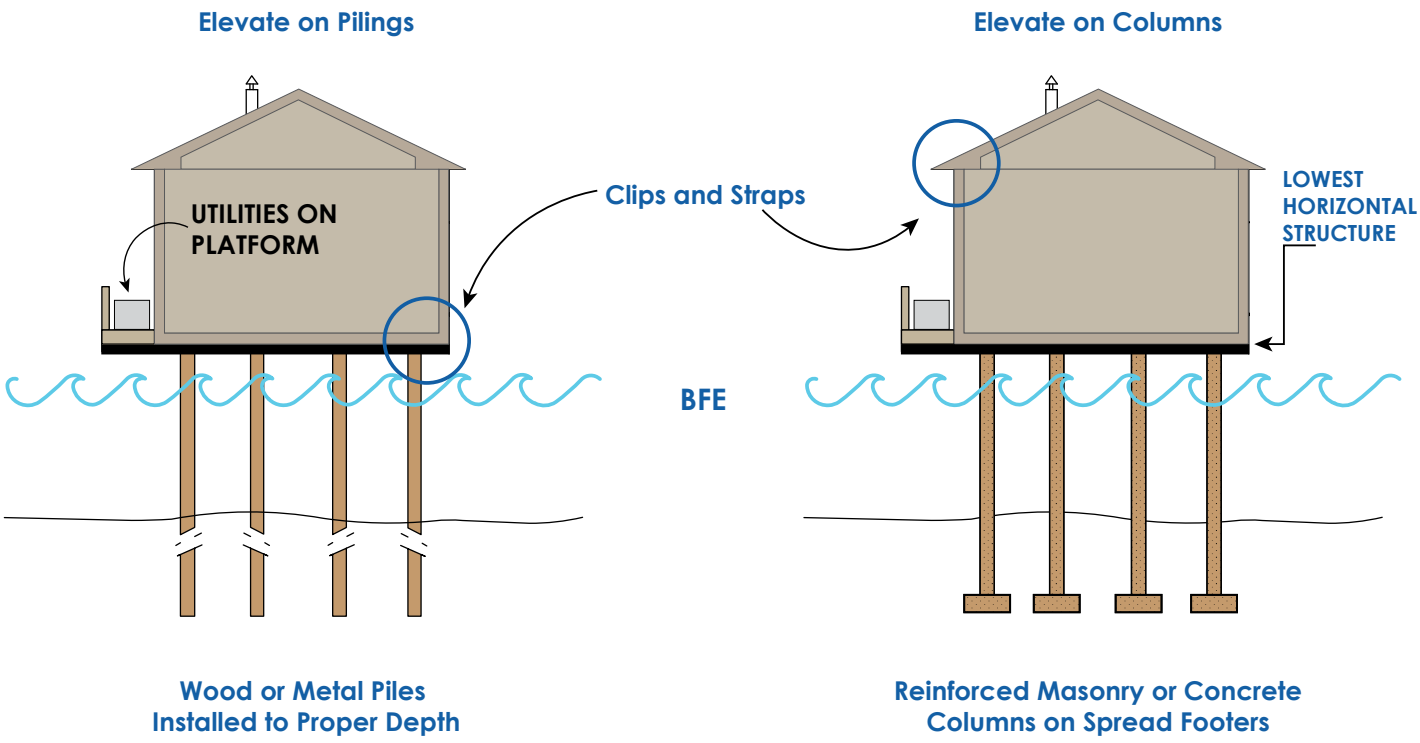
Basements below the BFE **are not** allowed in new development and flood insurance coverage is very limited in existing basements for a very good reason. It only takes an inch of water over the sill and the entire basement fills up. Excavating a basement into fill doesn't always make it safe because saturated groundwater can damage the wall.





TYPICAL ELEVATION METHODS FOR COASTAL BUILDINGS

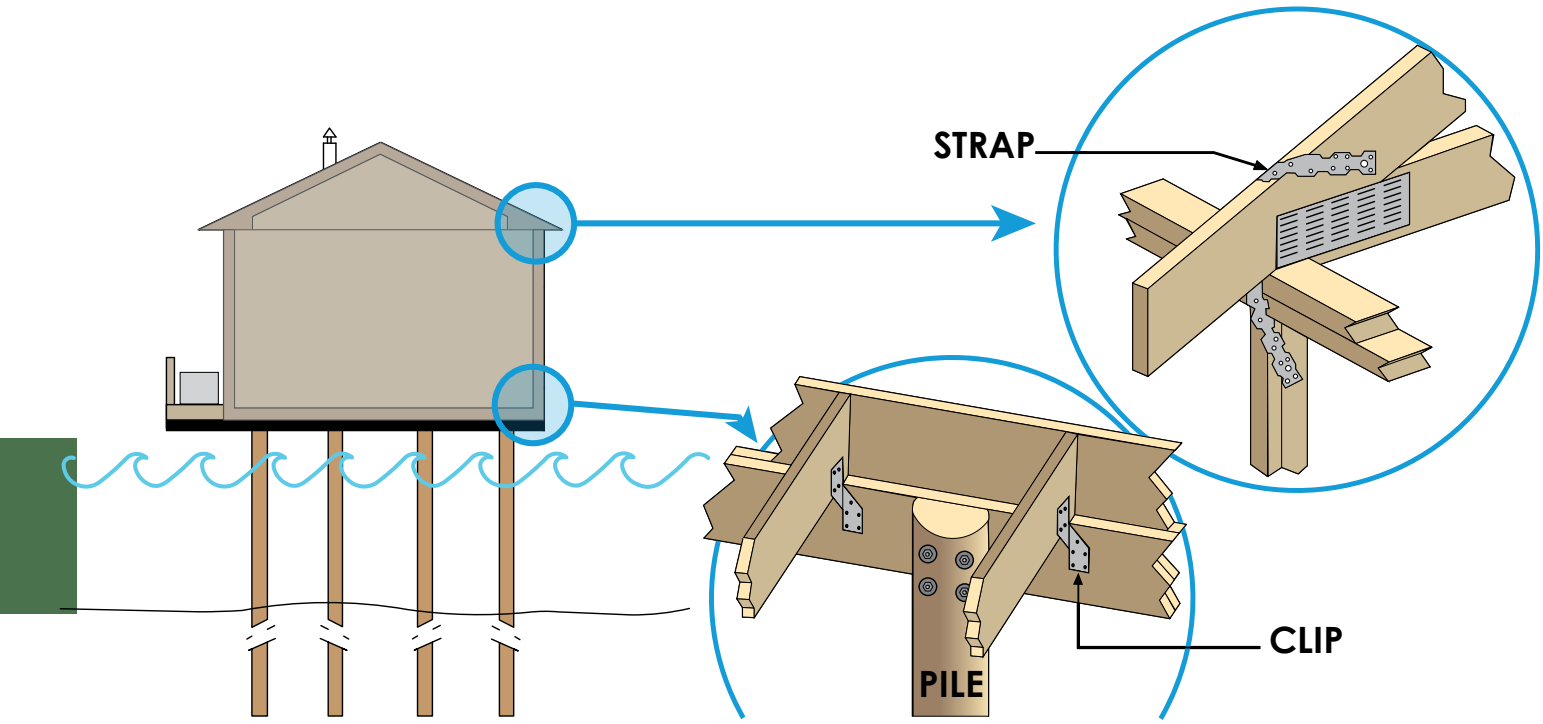
In V and VE Zones, the design specifics will be determined by your architect or engineer based on your site, including how your building will be elevated and how deep in the ground the foundation elements will extend. Your community will require certified building designs and plans. ***Click here for an example of a V-Zone Design Certificate.***





COASTAL HOUSES MUST RESIST WIND AND WATER FORCES

Coastal buildings may be exposed to both hurricane winds and floodwater, so they must be built to hold together during storms. These details are only examples. Your architect or engineer will decide the type of clips and straps to keep the roof and building connected to the foundation.



ENCLOSURES BELOW V-ZONE BUILDINGS

Avoid building an enclosure under your V Zone building. If you must enclose a small area, your community will require:

- Walls designed to collapse or “breakaway” under storm and flood conditions
- Flood resistant materials
- Utility wires and pipes should not go through or be attached to the breakaway walls
- Enclosed area is to be used only for parking, building access, or storage
- No bathrooms, utility rooms, or electric service below BFE
- Size limited to 300 square feet or less

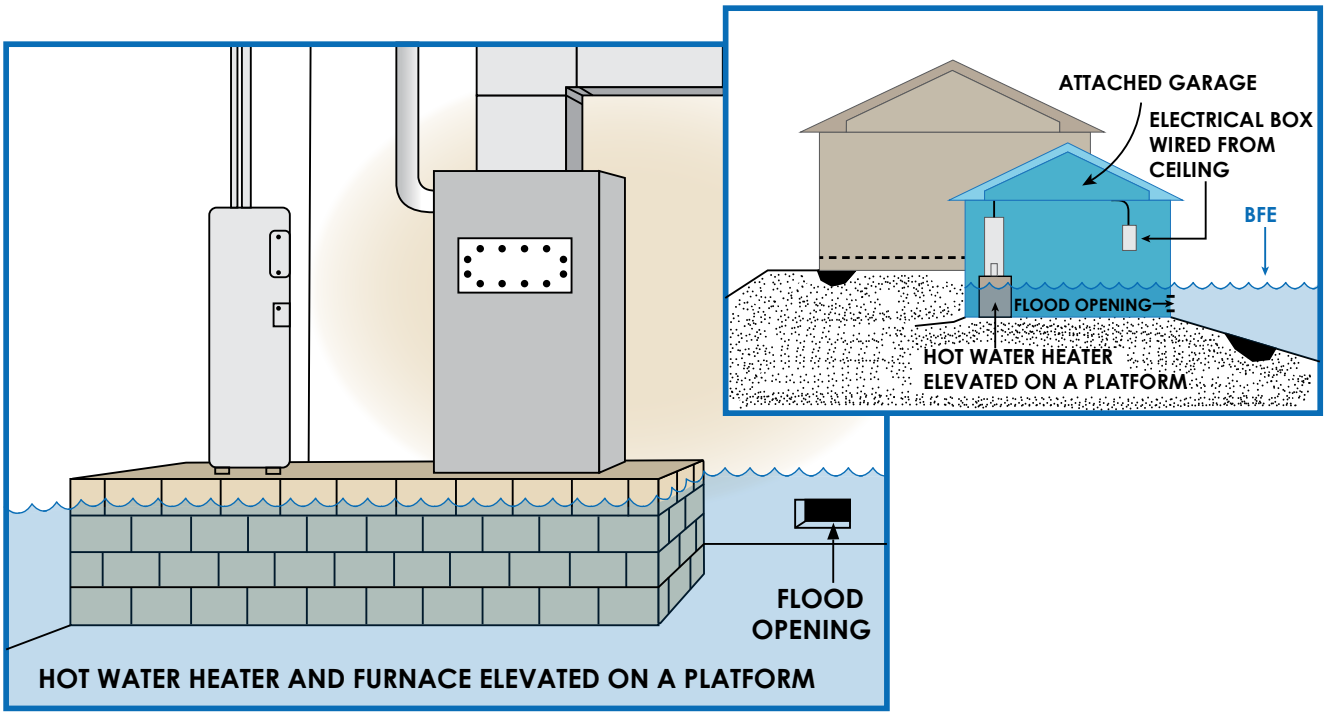


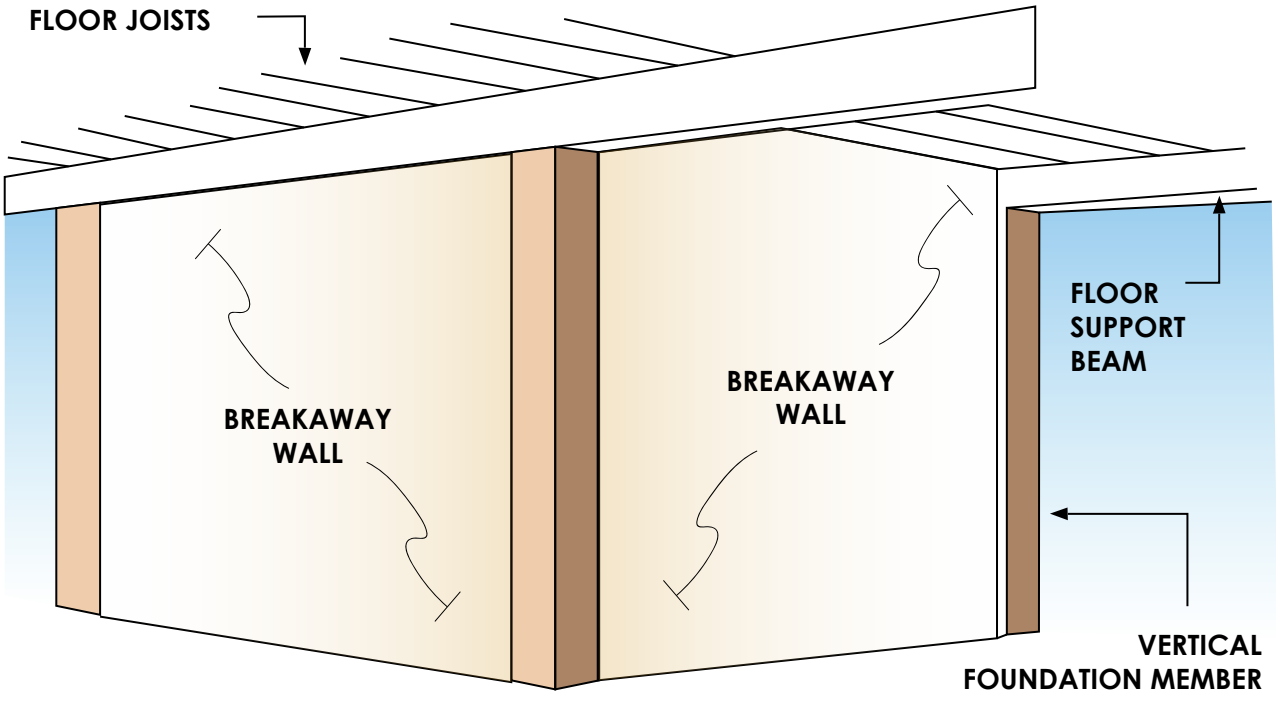
CAUTION!

Do not modify an enclosure below an elevated V Zone building (or any zone for that matter). It is a violation of your community’s regulations, and you may have increased damage when it floods. Plus, your flood insurance policy will cost a lot more. *See 44 CFR 60.3 E 5 for more information.*

UTILITY SERVICE INSIDE ENCLOSURES

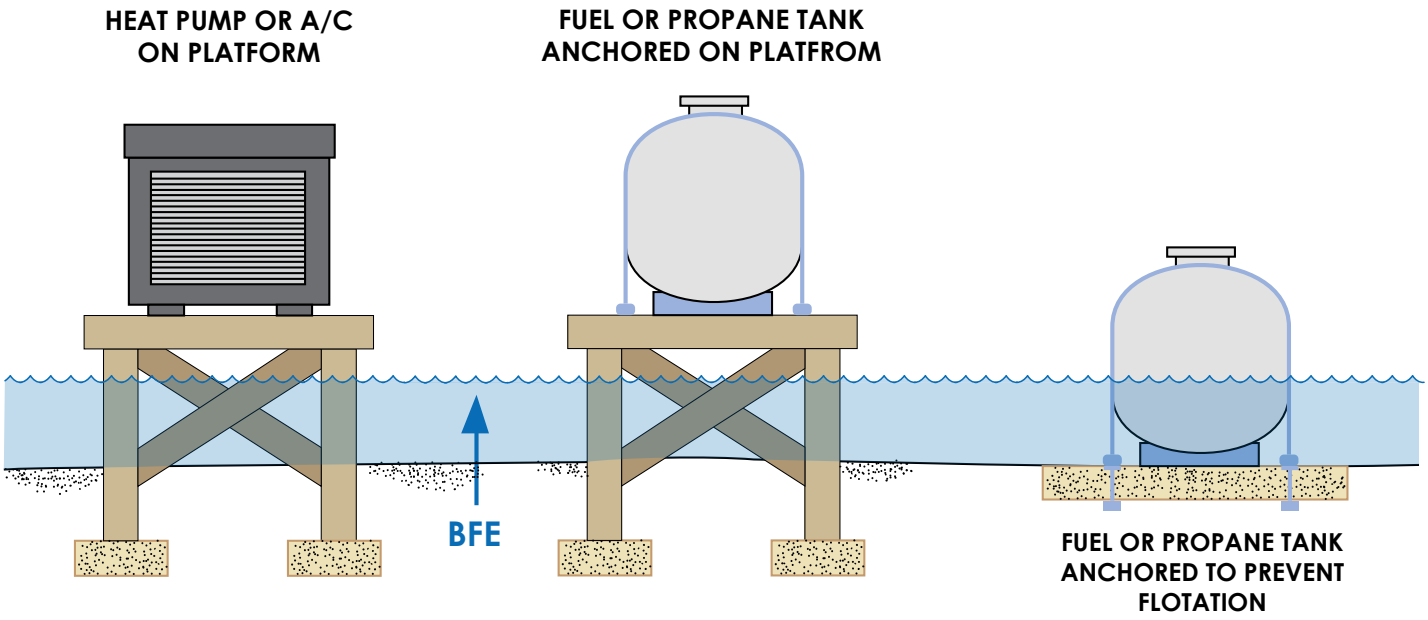
All utilities, appliances, and equipment must be elevated above the BFE or protected. Utilities include plumbing, electrical, gas lines, heating, and air conditioning. ***See 44 CFR 60.3(a)(3) (iv) for more information.***





UTILITY SERVICE OUTSIDE BUILDINGS

Whether inside an attached garage or outside the building, all utilities, appliances, and equipment must be elevated above the BFE or protected against flood damage. Utilities include plumbing, electrical, gas lines, fuel tanks, and heating and air conditioning equipment.

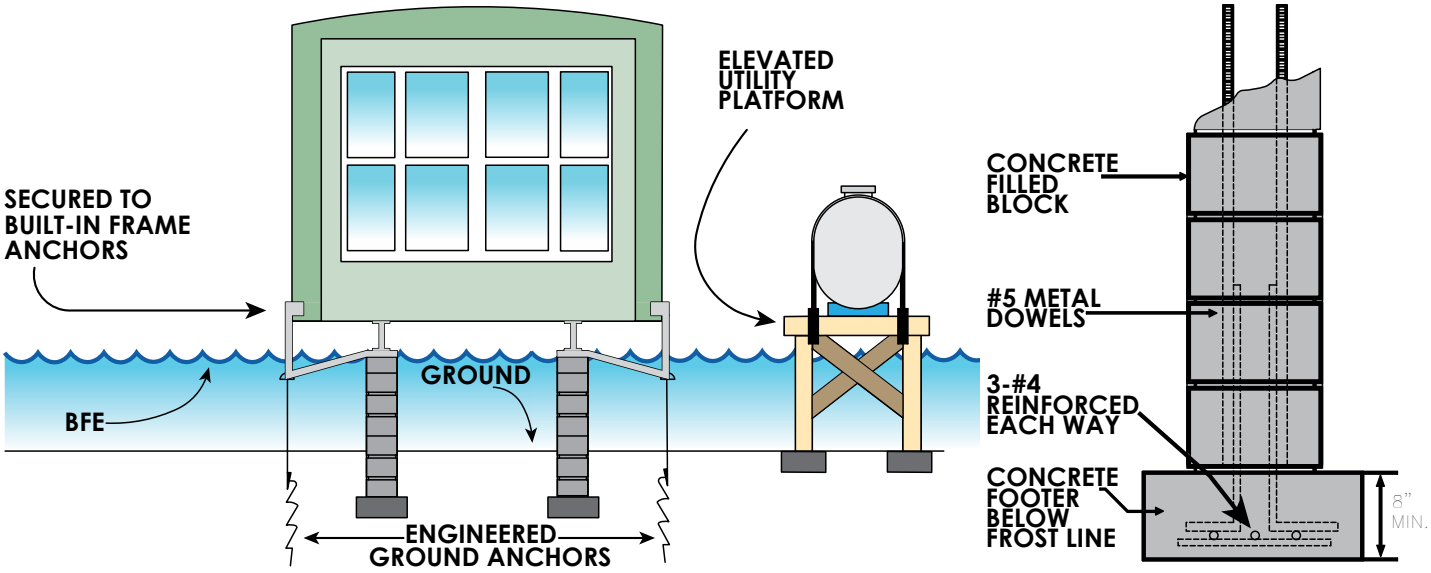


CAUTION!

Fuel and propane tanks may cause explosion and pollution risks during flood conditions. Even shallow water can create large buoyant force on tanks, so extra care must be taken to ensure that all tanks are anchored.

MANUFACTURED HOMES DESERVE SPECIAL ATTENTION

Experience shows that manufactured homes are easily damaged. As little as one inch of water can cause substantial damage. Dry stacked blocks are NOT acceptable — they will **NOT** withstand a flood.



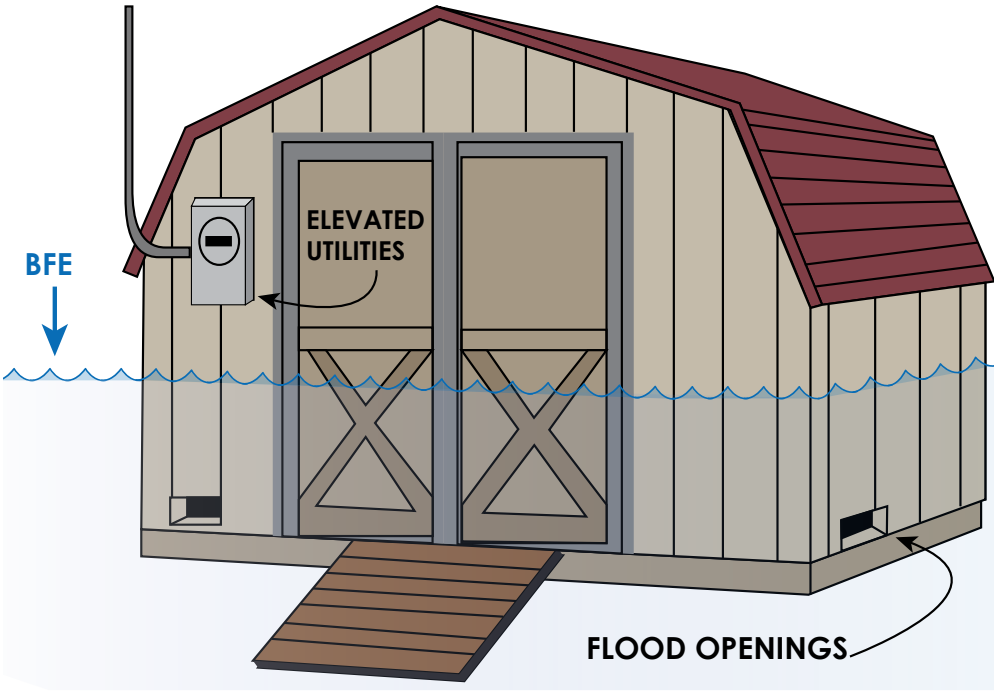
Manufactured homes must be anchored to resist flotation, collapse, or lateral movement by being tied down in accordance with your community's ordinance or the manufacturers' installation specifications. See FEMA's publication FEMA P-85 Protecting Manufactured Homes from Floods and Other Hazards.

Click here for the Overview of FEMA P-85, 2009 Edition Protecting Manufactured Homes from Floods and Other Hazards.

ACCESSORY STRUCTURES

In SFHAs, accessory structures must:

- Not be habitable and be used only for parking or storage (not pollutants or hazardous materials)
- Be anchored to resist floating
- Have flood openings
- Be built of flood-resistant materials
- Have elevated utilities
- Not be modified for different use in the future
- Have documented floor elevation



Even small buildings are "development" and permits or variances with noted conditions are required. They must be elevated or anchored and built to withstand flood damage.

CAUTION!
Remember, everything inside will get wet when flooding occurs.

RECREATIONAL VEHICLES

In a flood hazard area, an RV must:

- Be licensed and titled as an RV or park model (not as a permanent residence)
- Be built on a single chassis
- Have inflated tires and be self-propelled or towable by light truck
- Have no attached deck, porch, shed
- Be used for temporary recreational, camping, travel, or seasonal use (no more than 180 days)
- Be less than 400 ft.^{2} in area (measured at largest horizontal projection)

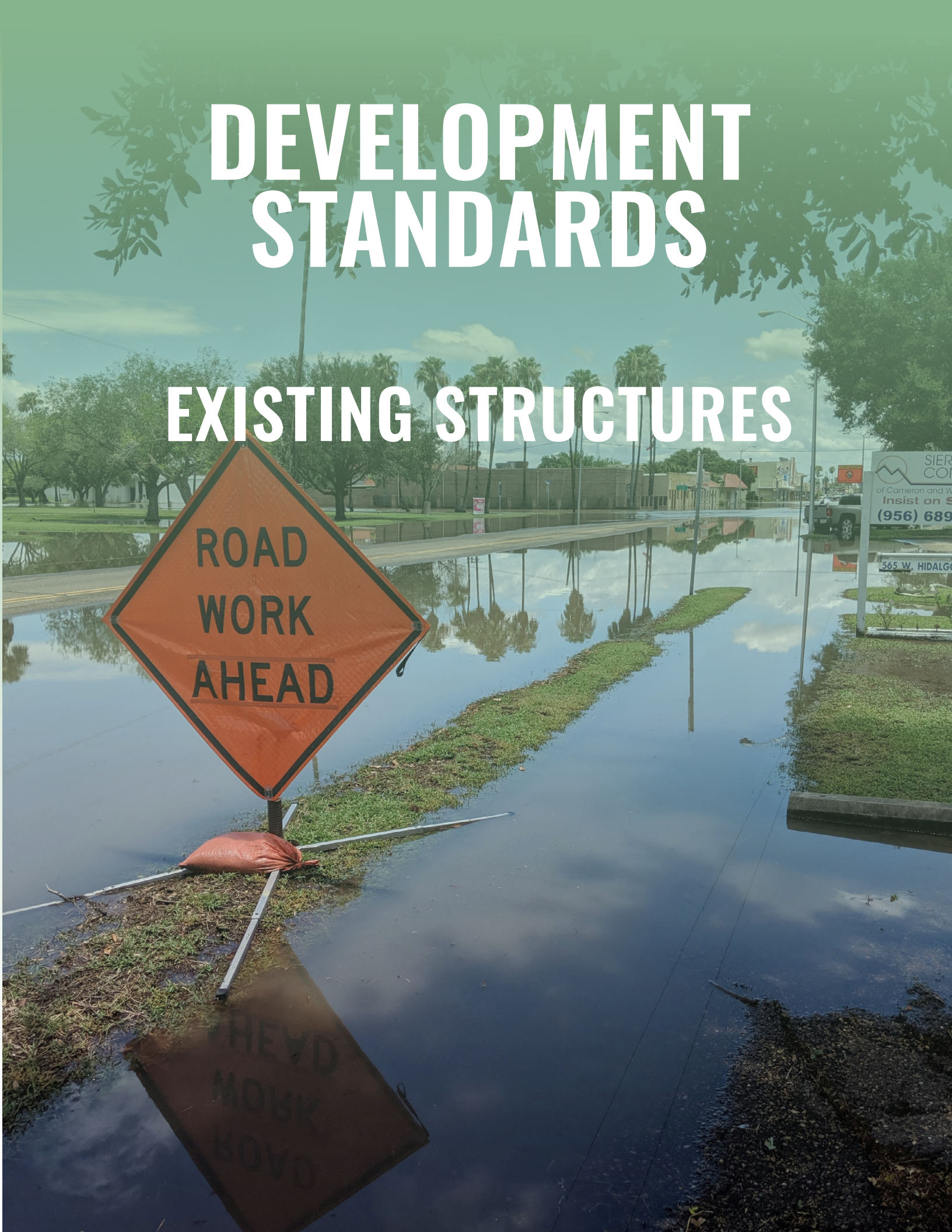
RVs that do not meet these conditions must be installed and elevated like Manufactured Homes, including permanent foundations and tie-downs and ***see 44 CFR 60.3 C 14 (i-iii).***

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



DEVELOPMENT STANDARDS

EXISTING STRUCTURES



PLANNING TO IMPROVE YOUR FLOODPLAIN BUILDING?

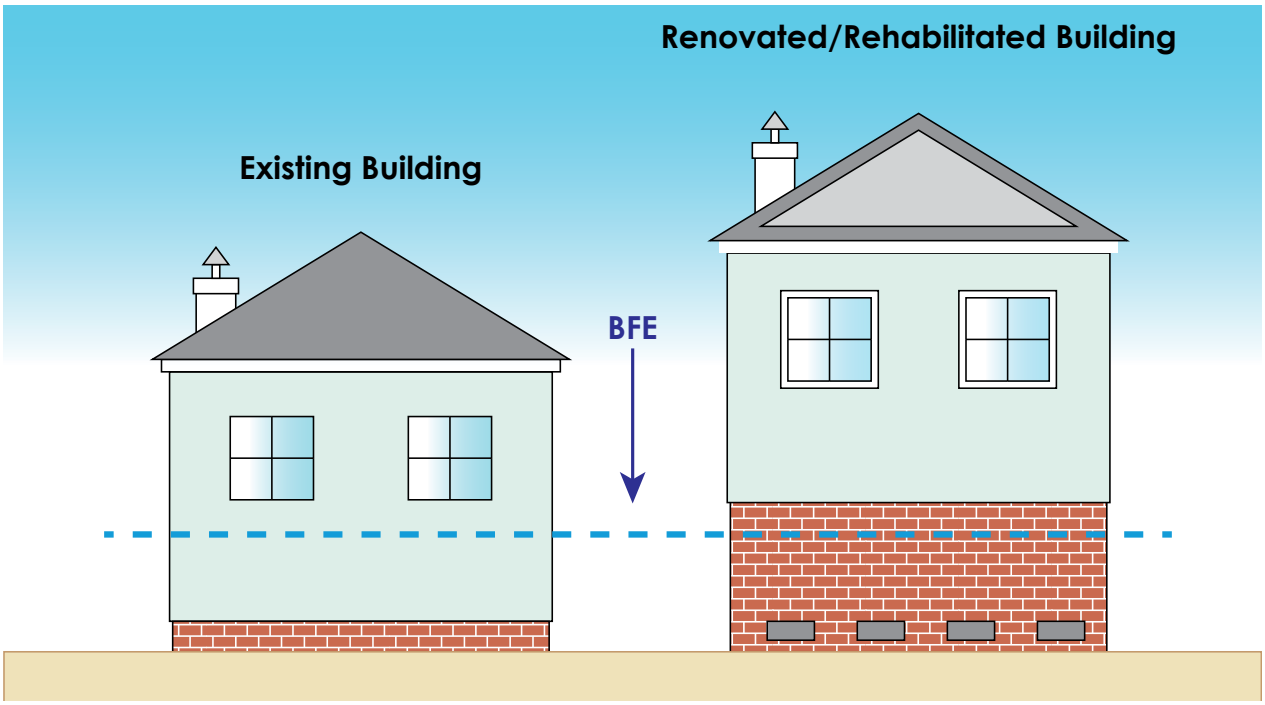
Any existing structure that is within a SFHA designated with an "A" or and "V" on a FIRM is required to be brought up to the same standards as new construction discussed in the previous section when substantial improvements are made, or substantial damage has occurred.

Substantial Improvement

- Any reconstruction, rehabilitation, addition or other improvement to a structure, the total cost of which equals or exceeds 50 percent of the market value of the structure before the start of construction of the improvement.
- Improvement costs are for all work that requires a permit.
- If there is an addition to the structure, only the addition is required to meet the new construction standards when there are no improvements (including interior) made to the existing structure.

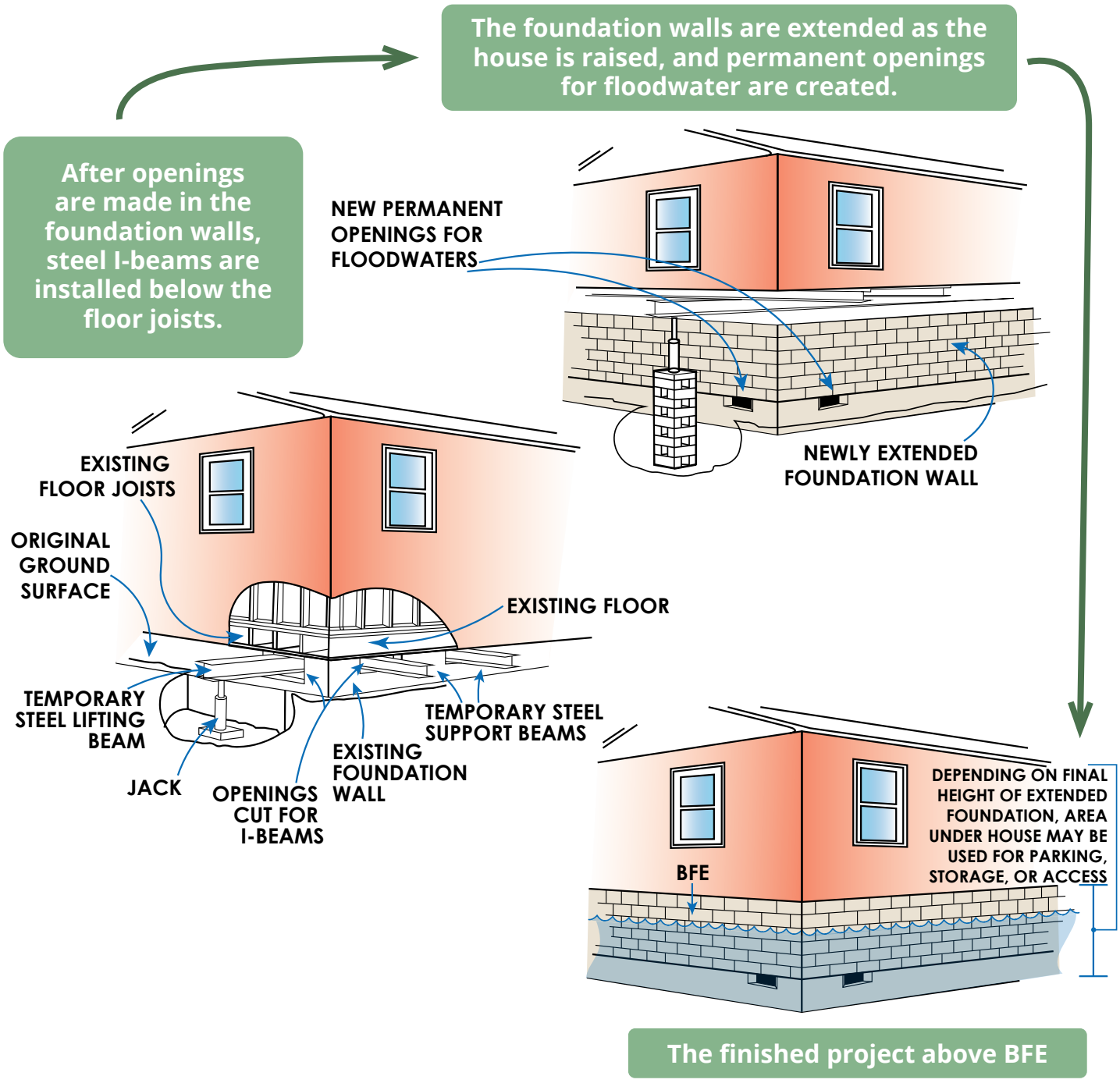
Floodplain buildings can be improved, renovated, rehabilitated or altered, but special rules apply. Check with your local permit office before you begin. It will be easier to do it right the first time.

The cost to correct previously cited violations of state or local health, sanitary, or safety codes to provide safe living conditions can be excluded from the cost of renovations. Alteration of a registered historic structure is allowed, by variance, as long as it will continue to meet the criteria for listing as a historic structure.



ELEVATING A PRE-FIRM BUILDING

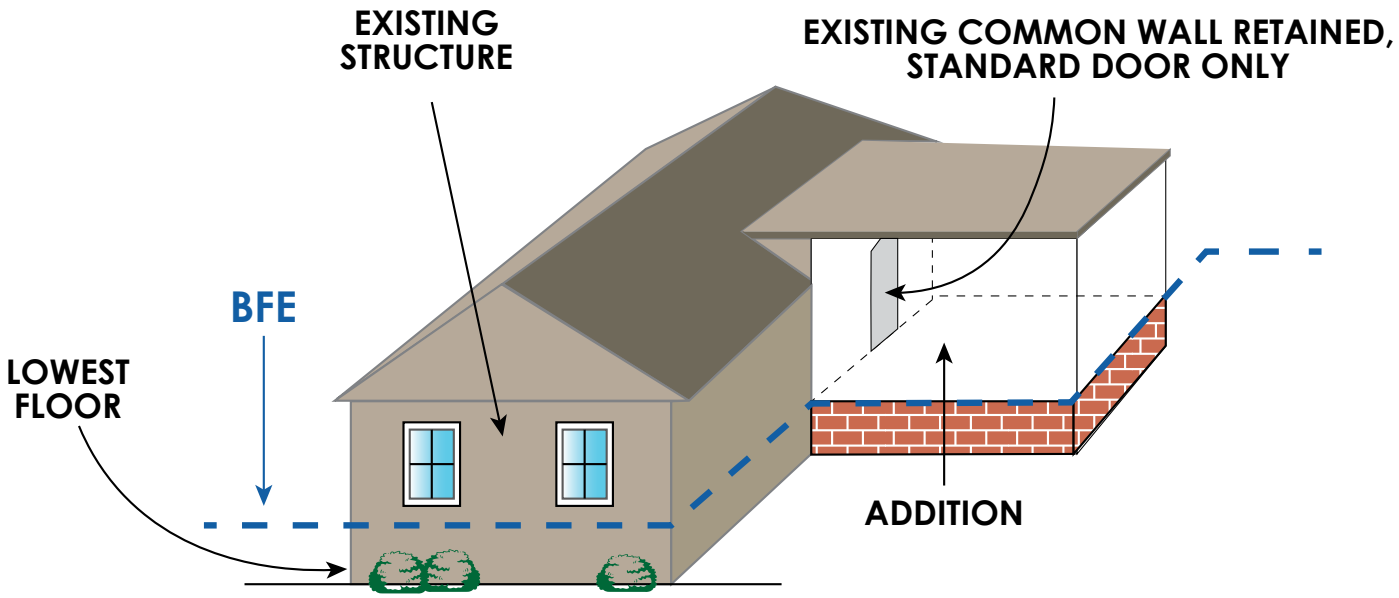
This is one way to elevate an existing building to comply with floodplain regulations. If your insured building is damaged by flood, you may be eligible for an Increased Cost of Compliance (ICC) payment. TWDB and FEMA can help with more information and options.



SUBSTANTIAL IMPROVEMENT: LATERAL ADDITION ONLY

You must get a permit from your community to build an addition to your building located in a floodplain. Only the addition must be built with the lowest floor at or above the BFE provided that:

- You make no interior modifications to the existing building; and
- You make no structural modifications to the existing common wall other than adding a standard 36-inch door

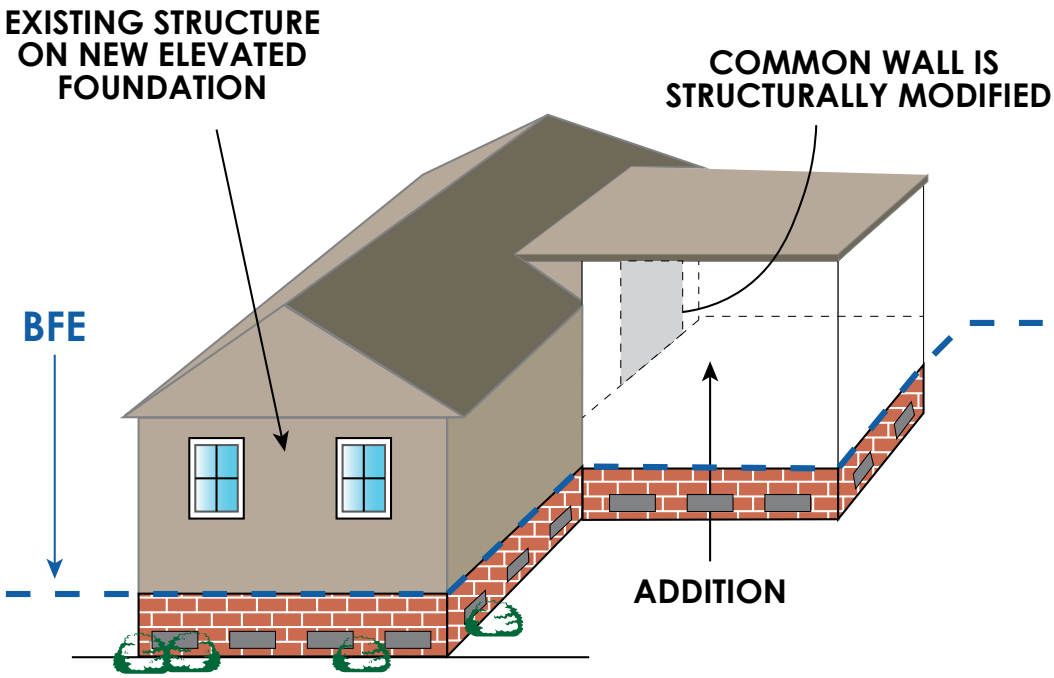


If your project has a lateral addition and also includes modifying the interior of the existing building or making structural modifications to the existing common wall, see page 65.

SUBSTANTIAL IMPROVEMENT: ADDITION PLUS OTHER WORK

Your community must prepare an evaluation to determine if all of your proposed work will trigger the **Substantial Improvement** requirement.

Substantial Improvement is triggered if, the work involves adding a new top floor, modifying the interior of the existing building, or structural modifications to the existing common wall (for lateral addition).



Your community's permit office can help you determine which requirements apply.

It is always a good idea to request a preliminary review before you get too far along with your plans.

EXCEPTIONS

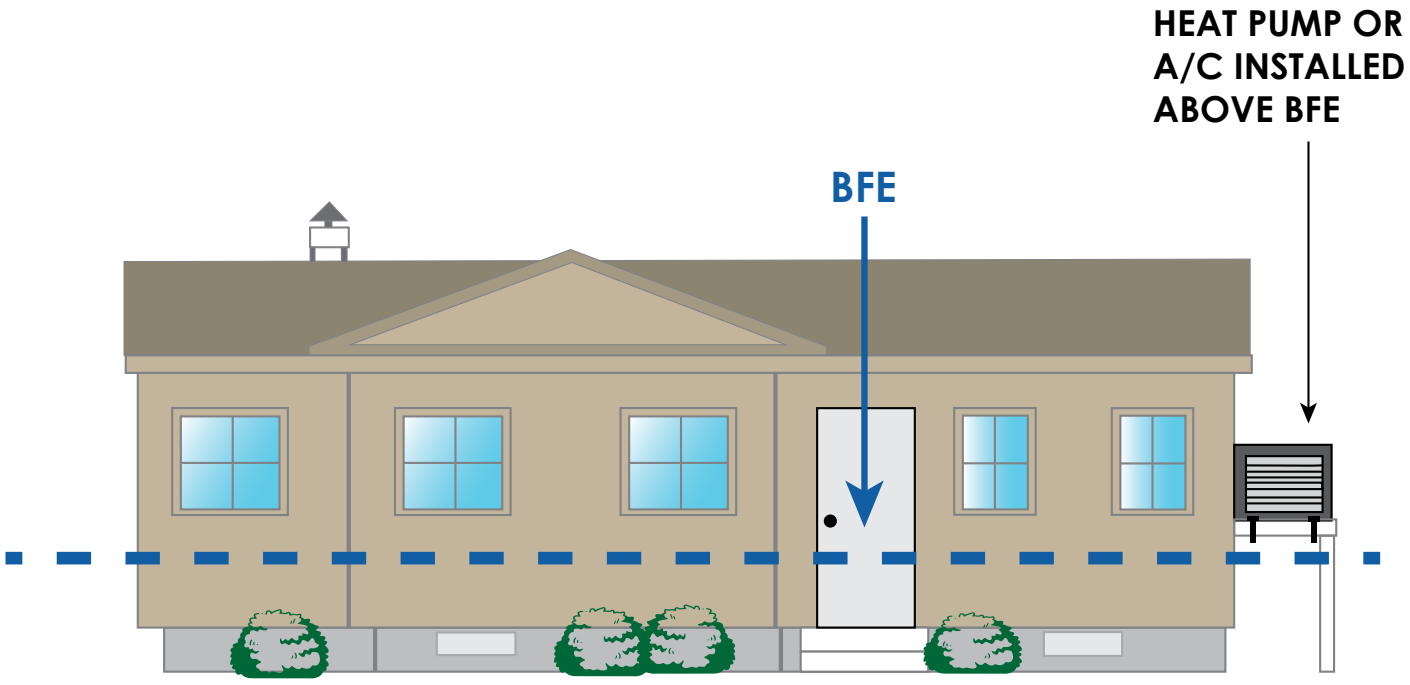
- Any project costs for the improvement of a structure to correct existing violations of state or local health, sanitary, or safety code specifications which have been identified by the local code enforcement official and which are the minimum necessary to assure safe living conditions are excluded from the cost calculation.

- Historic structures are exempted from the substantial improvement requirements subject to the criteria listed below:
  - The building must be a bona fide “historic structure.”
  - The project must maintain the historic status of the structure.
  - Take all possible flood damage reduction measures.

- Items to be excluded when calculating improvement or repair costs:
  - Plans and specifications
  - Survey costs
  - Permit fees
  - Post-storm debris removal and clean up
  - Demolition or emergency repairs made for health or safety reasons or to prevent further damage to the building.
  - Outside improvements including landscaping, sidewalks, fences, yard lights, swimming pools, screened pool enclosures, detached structures (including garages, sheds and gazebos), landscape irrigation systems, driveways, and fencing.

WHEN IMPROVEMENTS ARE NOT REQUIRED

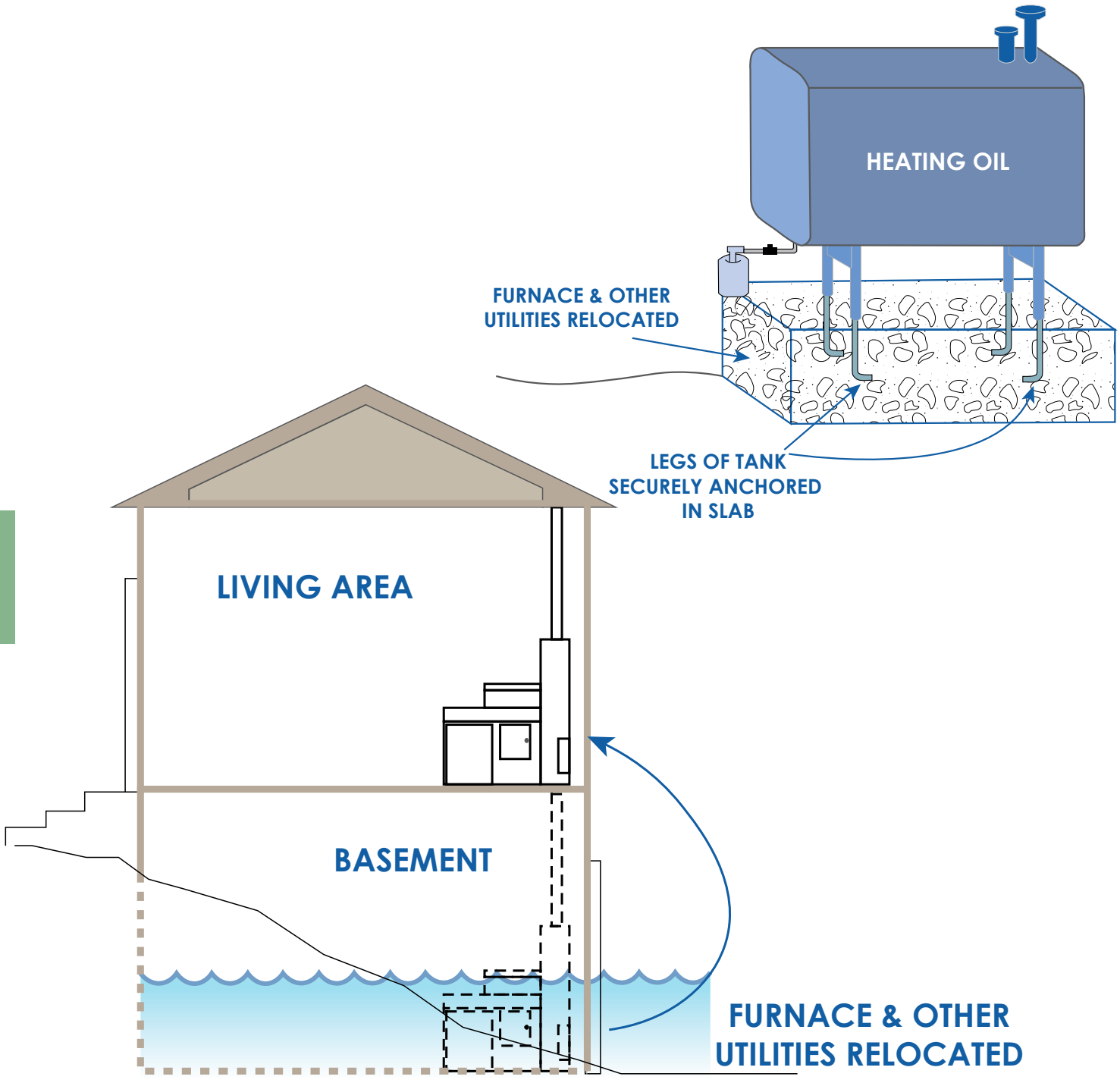
- If you are not required to bring the existing building into compliance, there are many things you can do to reduce future flood damage.
- Improvements are encouraged in Non-Special Flood Hazards Zones (shaded Zone X) as well.
- Find out the BFE at your location and consider the following:
  - » Use flood resistant materials, for example tile, closed-cell wall insulation, and polyvinyl wall coverings.
  - » Raise air conditioning equipment, heat pump, other appliances on platforms.
  - » Install electrical outlets above the BFE.
  - » Move ductwork out of crawlspaces.
  - » Retrofit crawlspaces with flood openings.
  - » Fill in below-grade crawlspaces/ utility space.



Be sure to include ALL proposed work in your initial permit application. If you add more work after the permit is issued, your community will make another evaluation for Substantial Improvement.

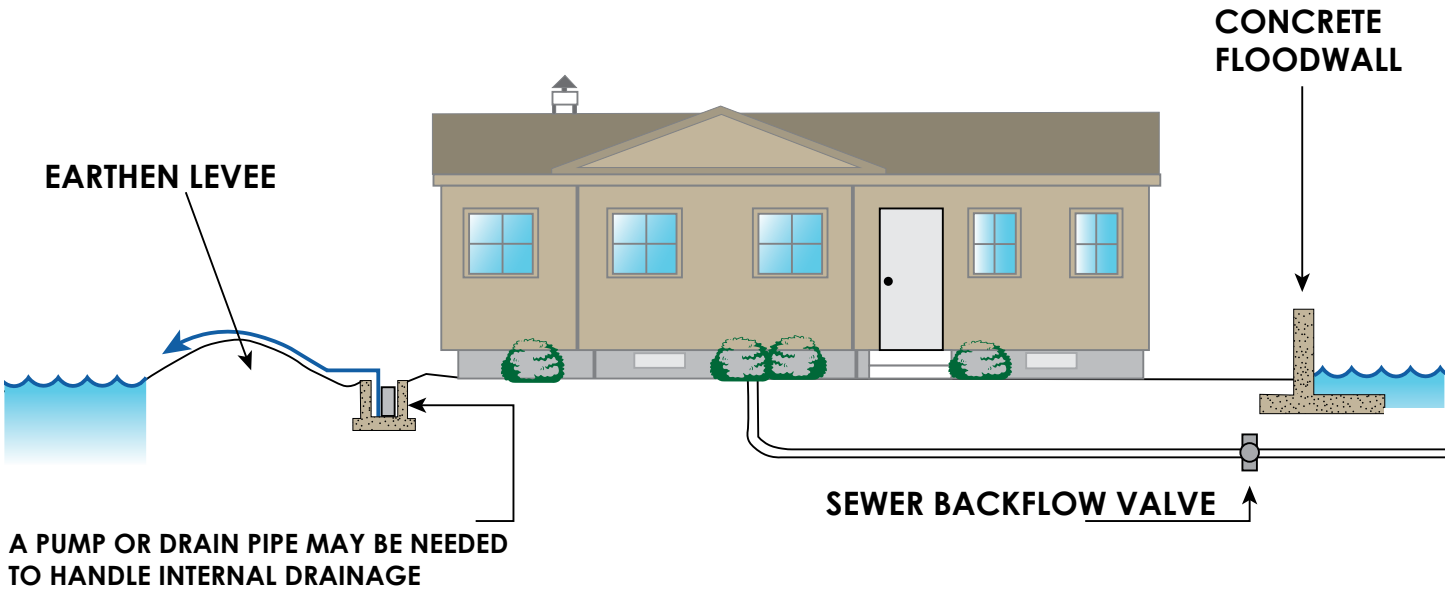
FLOOD PROTECTION CAN BE EASY AND LOW COST

Move your hot water heater, furnace and ductwork out of basements and crawlspaces or build small platforms for them above the BFE. Anchor heating oil and propane tanks to prevent flotation. Do not store valuables or hazardous material in a flood-prone basement or crawlspace. Use water-resistant materials when you repair.



SMALL LEVEES AND FLOODWALLS CAN PROTECT

In areas where floodwaters aren't expected to be deep, sometimes individual buildings can be protected by earthen levees or concrete floodwalls. You must get a permit for those protection measures, and extra care must be taken if the site is in a floodway. A levee or floodwall cannot be used to comply with floodplain regulations for a new or substantially improved building, or one that is repaired after substantial damage.



IMPORTANT:

These protective measures will *not* reduce your flood insurance premium.

GUIDES FOR HOMES IN A FLOOD ZONE

- **FEMA P-55, Coastal Construction Manual** (FEMA, 2011) is a two-volume publication that provides a comprehensive approach to planning, siting, designing, constructing, and maintaining homes in the coastal environment. Chapter 15 discusses retrofitting buildings for natural hazards.

- **FEMA P-259, Engineering Principles and Practices of Retrofitting Floodprone Residential Structures** (FEMA, 2012) provides guidance for elevating an existing home. Chapter 5E provides guidance to determine the appropriate parameters for elevation and includes procedures and alternatives that apply to elevating buildings with a variety of foundation types. Chapter 3 includes a checklist (Figure 3-1) to help determine homeowner preferences for retrofitting options and a checklist (Figure 3-10) that a design professional may use to assess the initial building condition and determine whether the house is a good candidate for elevation.

- **FEMA P-312, Homeowner's Guide to Retrofitting** (FEMA, 2014) is a guide for homeowners to help them make decisions when retrofitting their homes and it introduces flood protection methods and building construction techniques. Chapter 5, Elevating Your Home, includes important elevation considerations and techniques. Please refer to Section 5.2.3, Elevating on an Open Foundation.

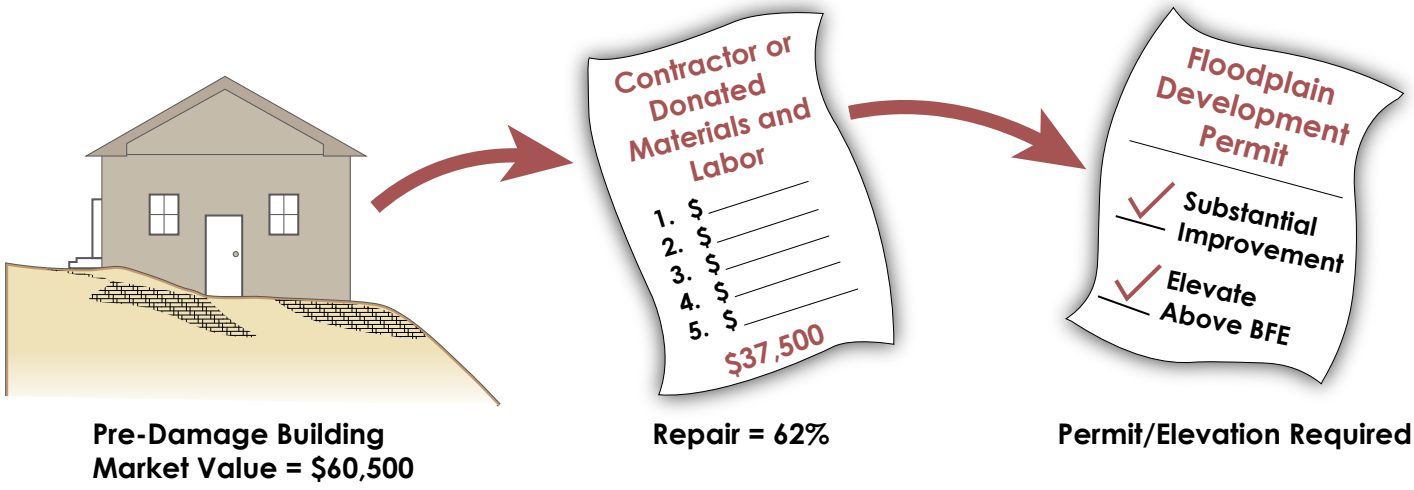
- **FEMA P-499, Home Builder's Guide to Coastal Construction** (FEMA, 2010) is a series of 37 fact sheets that provide technical guidance and recommendations concerning the construction of coastal residential buildings. Fact Sheet 9.1, Repairs, Remodeling, Additions, and Retrofitting – Flood, discusses requirements and recommendations when rebuilding or remodeling a property damaged by flood.

PLANNING FOR FLOOD DAMAGED AREAS



FLOOD DAMAGED AREAS

A local permit is required to begin construction or repair substantial damage from any cause—fire, flood, wind, or even a truck running into a building.



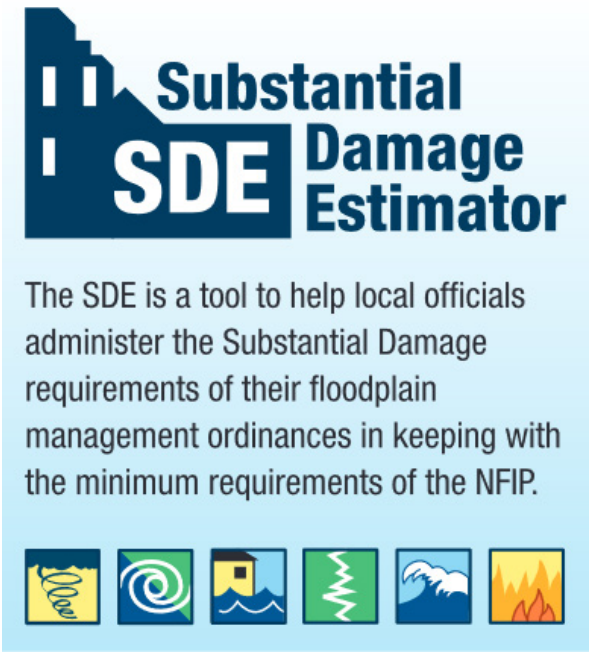
Pre-Damage Building Market Value = $60,500

Repair = 62%

Permit/Elevation Required

In order to be considered "substantially damaged" a building must meet a set of criteria to comply with certain requirements.

FEMA created a **Substantial Damage Estimator** to assist state and local officials in determining substantial damage for residential and non-residential structures in accordance with local floodplain management ordinances in the NFIP.



INCREASED COST OF COMPLIANCE (ICC)

Increased cost of compliance (ICC) coverage is one of many resources for flood insurance policyholders who need additional help rebuilding after flood damages. If eligible, you can collect up to $30,000 to help cover the cost of bringing your home or business into compliance with current flood damage prevention ordinances. You may file a claim for your ICC coverage in two instances:

- If your community determines that your home or business is damaged by flood to the point that repairs will cost 50% or more of the building's pre-damage market value. This is called substantial damage.
- If your community has a repetitive loss provision in its floodplain management ordinance and determines that your home or business was damaged by a flood two times in the past 10 years, where the cost of repairing the flood damage, on the average, equaled or exceeded 25% of its market value at the time of each flood. This is called repetitive damage. Additionally, there must have been flood insurance claim payments for each of the two flood losses.

ICC funding can be used to elevate or demolish homes, relocate them to higher ground, or floodproof non-residential structures. Also, when participating in a community-sponsored FEMA funded mitigation project, ICC funds may be used as part of the local match requirement.



REPETITIVE LOSS

A community's Flood Damage Prevention Ordinance must be amended to make Repetitive Loss insured structures eligible to receive ICC benefits up to $30,000. If a community has a "Repetitive Loss" definition in the Flood Damage Prevention Ordinance, ICC benefits will be paid when a flood-insured structure in the SFHA has paid flood damage claims two times within a 10-year period, where the cost of repairing the flood damage, on the average, equals or exceeds 25% of the structure's pre-damaged fair market value at the time of each flood. Repetitive Loss is not eligible under ICC unless Repetitive Loss is defined in the definitions section of the community's Flood Damage Prevention Ordinance.

To make "repetitive loss" structures eligible for ICC benefits:

Add a new definition to the Flood Damage Prevention Ordinance as shown below:

- **Repetitive Loss** means flood-related damages sustained by a structure on two separate occasions during a 10-year period for which the cost of repairs at the time of each such flood event, equals or exceeds 25 percent of the market value of the structure before the damage occurred.

Modify this definition in the Flood Damage Prevention Ordinance by adding the following text:

- **Substantial Damage** means damage of any origin sustained by a structure whereby the cost of restoring the structure to it's before-damaged condition would equal or exceed 50% of the market value of the structure before the damage occurred. The term includes buildings that are determined to be Repetitive Loss (see definition).

The term does not apply to:

- any project for improvement of a building required to comply with existing health, sanitary, or safety code specifications which have been identified by the Code Enforcement Official and which are the minimum necessary to assure safe living conditions, or
- any alteration of a "historic structure" provided that the alteration will not preclude the structure's continued designation as a "historic structure".

Modify this definition in the Flood Damage Prevention Ordinance by adding the text below:

- **Substantial Improvement** means any combination of reconstruction, alteration, or improvement to a building that equals or exceeds 50 percent of the fair market value of the building before the damage occurred. For the purposes of this definition, an improvement occurs when the first alteration of any wall, ceiling, floor, or other structural part of the building commences, whether or not that alteration affects the external dimensions of the building. This term includes structures, which have incurred "repetitive loss" or "substantial damage", regardless of the actual repair work done.

The term does not apply to:

- any project for improvement of a building required to comply with existing health, sanitary, or safety code specifications which have been identified by the Code Enforcement Official and which are solely necessary to assure safe living conditions, or
- any alteration of a "historic structure" provided that the alteration will not preclude the structure's continued designation as a "historic structure".

Substantially improved existing manufactured home parks or subdivisions is where the repair, reconstruction, rehabilitation or improvement of the streets, utilities and pads equals or exceeds 50 percent of the value of the streets, utilities and pads before the repair, reconstruction or improvement commenced.

It is recommended that communities develop and adopt written substantial improvement policies and procedures.

[This page left intentionally blank.]

RESILIENT COMMUNITIES



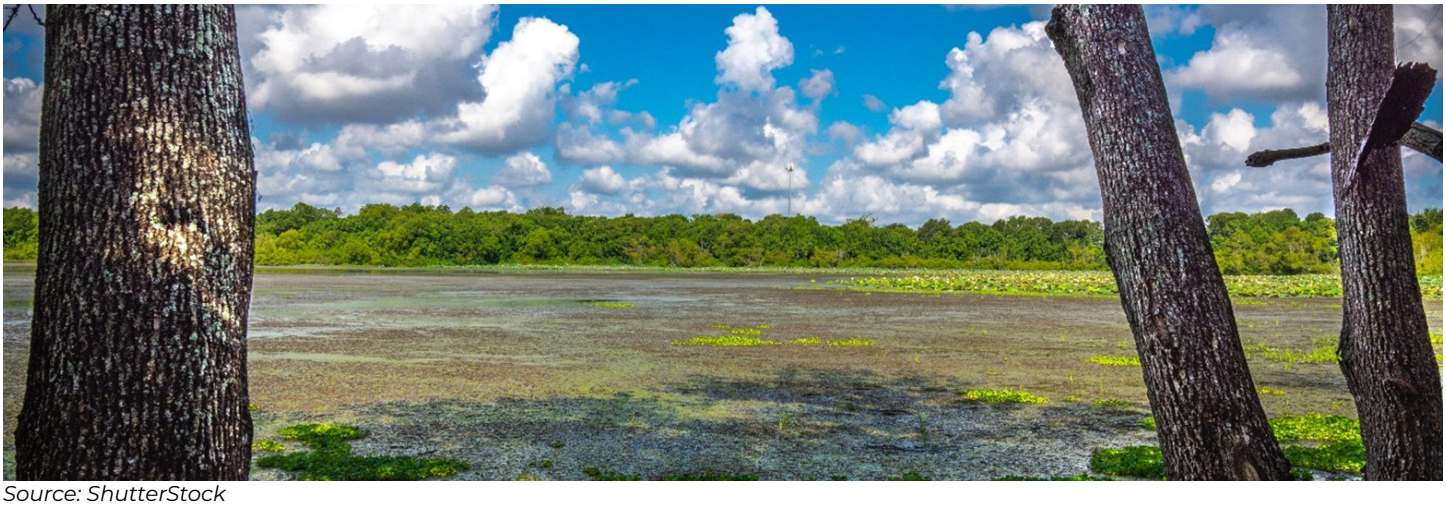
Image taken from Van Zandt Visual LLC

SAFE USE OF THE FLOODPLAIN

Resiliency can be measured in many ways, but a key goal of resiliency for communities is to minimize risks associated with environmental disaster-related events through resilient strategies that can quickly restore the environment to a safe condition.

Let the floodplain do its job!
If possible, keep it natural. Open spaces are natural floodplains and have benefits beyond reducing flood risk including new recreational areas, playgrounds, reforestation, parking, gardens, pasture, accessory structures, created wetlands, ecosystem restoration and wildlife management.

Some flood mitigation projects are more costly but give you more protection. After floods, some communities buy out and demolish homes that were severely damaged. The acquired land is dedicated to open space and can be used for recreation or to help restore wildlife habitat and wetlands. In other instances, homes have been raised up on higher foundations, and others have been moved to safer high ground. Communities can also receive CRS credit for these projects.



Source: ShutterStock



Source: FEMA

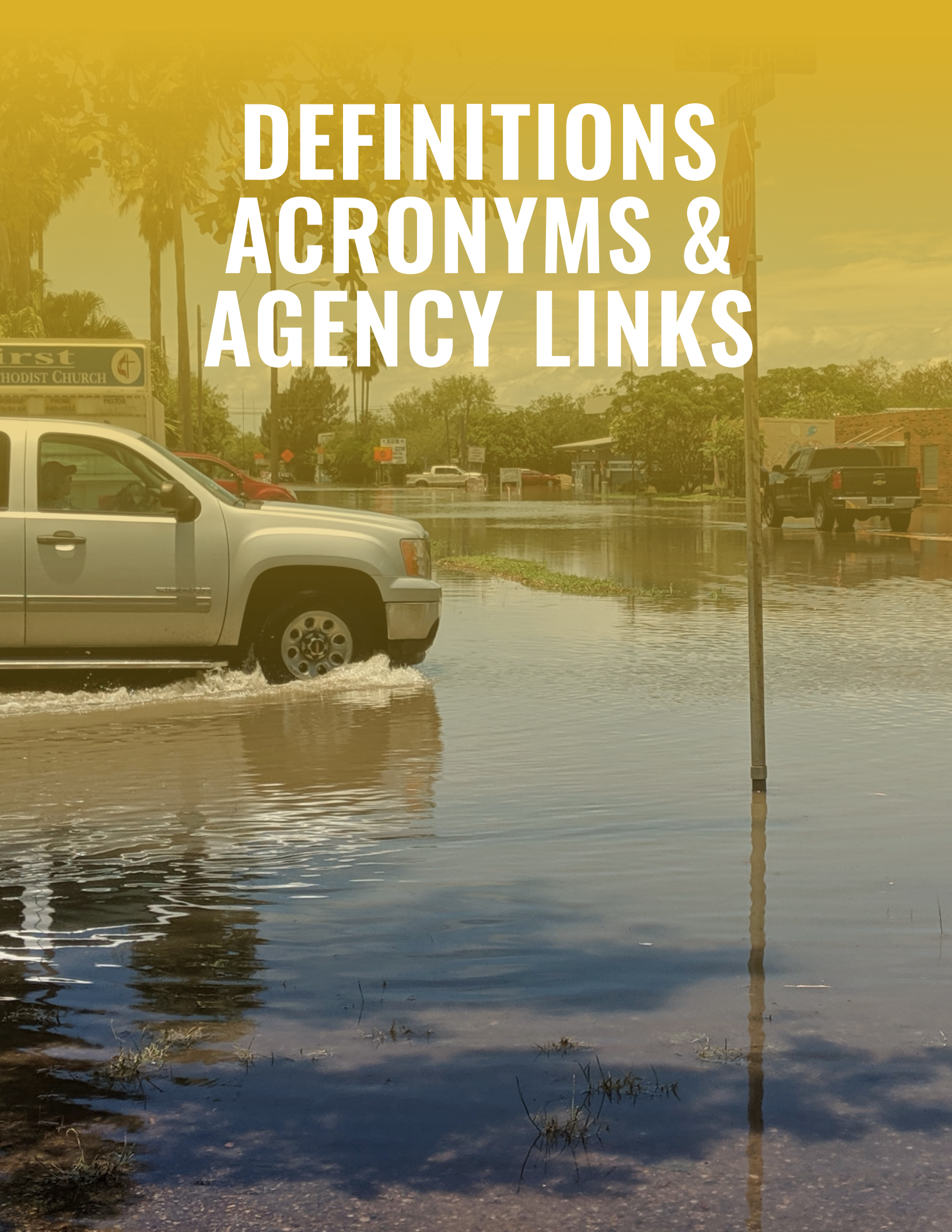
Resilient Building Codes Toolkit - This publication's intent is to bring transparency and clarity to building codes, especially with respect to resilience.

High Water Mark Initiative - As part of the NFIP, the High Water Mark (HWM) Initiative is a community-based awareness program that increases local communities' awareness of flood risk and encourages action to mitigate that risk.

As part of the program, communities:

- Host a high-profile High Water Mark sign unveiling event
- Develop continuous flood risk awareness and outreach activities around the signs
- Complete specific mitigation actions that the community will take to reduce flood risk for residents.

DEFINITIONS ACRONYMS & AGENCY LINKS



There are many state and federal resources ready to help, answer your questions and train your community

Federal Resources

- Federal Emergency Management Agency (FEMA)
- U.S. Army Corps of Engineers (USACE)
- National Weather Service (NWS)
- U.S. Fish and Wildlife (USFWS)
- National Park Service (NPS)
- Association of State Floodplain Managers (ASFPM)
- Environmental Protection Agency (EPA)
- National Resource Conservation Service (NRCS)
- National Highway Traffic Safety Administration (NHSTA)

State Agency Resources

- Texas Water Development Board (TWDB)
- Texas Division of Emergency Management (TDEM)
- Texas Department of Insurance (TDI)
- Texas Commission on Environmental Quality (TCEQ)
- Texas General Land Office (GLO)
- Texas Department Housing and Community Affairs (TDHCA)
- Texas Department of State Health Services (DSHS)
- Texas Parks and Wildlife Department (TPWD)

Common Acronyms

- BFE—Base Flood Elevation
- EC—Elevation Certificate
- FEMA—Federal Emergency Management Agency
- FIRM—Flood Insurance Rate Map
- NFIP—National Flood Insurance Program
- SFHA—Special Flood Hazard Area
- TWDB—Texas Water Development Board
- TFMA—Texas Floodplain Management Association

Glossary

Accessory Structure – A structure that is located on the same parcel of land as a principal structure and whose use is incidental to the use of the principal structure. Accessory structures may not be used for human habitation and must be designed to minimize flood damage. Examples: detached garages, carports, storage sheds, gazebos, pole barns, and hay sheds.

Base Flood – Means the flood having a 1% chance of being equaled or exceeded in any given year (also called the "100-year floodplain").

Base Flood Elevation – The base flood elevation means the water elevation caused by a 1% chance of being equaled or exceeded in any given year (also called "100-year flood elevation").

Basement – A portion of a building that has its floor sub-grade (below ground level) on all sides (44 CFR 59.1)

Coastal Barrier – A naturally occurring island, sandbar or other strip of land, including coastal mainland, that protects the coast from severe wave wash.

Coastal Flooding – When water inundates or covers normally dry coastal land as a result of high or rising tides or storm surges.

Community Rating System (CRS) – A program developed by FEMA to provide incentives for those communities in the Regular Program that have gone beyond the minimum floodplain management requirements to develop extra measures to provide protection from flooding.

The Code of Federal Regulations (CFR) – The codification of the general and permanent rules and regulations published in the Federal Register by the executive departments and agencies of the federal government.

Conditional Letter of Map Revision (CLOMR) – A letter commenting on whether a proposed project, if built as shown on the submitted documentation, would meet the standards for a map revision. Communities may require this evidence prior to issuing a permit, and the Certificate of Occupancy/ Compliance should be withheld until receipt of the final LOMR based on "as-built" documentation and certification.

Development – Development, as defined in 44 CFR 59.1, means any man-made change to improved or unimproved real estate, including but not limited to buildings or other structures, mining, dredging, filling, grading, paving, excavation or drilling operations or storage of equipment or materials.

Electronic Letter of Map Amendment (eLOMA) – A web-based application to submit simple LOMAs to FEMA.

Enclosure – Enclosures are enclosed walled in areas below the lowest floor of an elevated building. Enclosures below the Base Flood Elevation (BFE) may only be used for building access, vehicle parking, and storage. Enclosed areas below the lowest floor must be adequately anchored, built using flood resistant building material, and any utilities or service facilities must be designed and/or located to prevent flood damage. Flood insurance coverage for enclosures below the BFE is very limited.

Encroachment – Encroachments are activities or construction within the floodway including fill, new construction, substantial improvements, and other development. These activities are prohibited within the adopted regulatory floodway unless it has been demonstrated through hydrologic and hydraulic analyses that the proposed encroachment would not result in any increase in flood levels.

Elevation Certificate – A community's permit file must have an official record that shows new buildings and substantial improvements in all identified Special Flood Hazard Areas (SFHAs) are properly elevated. This elevation information is needed to show compliance with the floodplain management ordinance.

Federal Emergency Management Agency (FEMA) – An agency within the U.S. Department of Homeland Security charged with responding to Presidentially-declared disasters and the agency under which the NFIP is administered.

Flood – A general and temporary condition of partial or complete inundation of 2 or more acres of normally dry land area or of 2 or more properties (at least 1 of which is the policyholder's property) from: Overflow of inland or tidal waters; or Unusual and rapid accumulation or runoff of surface waters from any source; or Mudslides (i.e., mudflows) which are proximately caused by flooding and are akin to a river of liquid and flowing mud on the surfaces of normally dry land areas, as when earth is carried by a current of water and deposited along the path of the current.; or Collapse or subsidence of land along the shore of a lake or similar body of water as a result of erosion or undermining caused by waves or currents of water exceeding anticipated cyclical levels that result in a flood as defined above. A flood inundates a floodplain. Most floods fall into three major categories: riverine flooding, coastal flooding, and shallow flooding. Alluvial fan flooding is another type of flooding more common in the mountainous western states.

Flood Hazard Areas – Areas identified on the Flood Insurance Rate Map as a Special Flood Hazard Area (SFHA). SFHA are defined as the area that will be inundated by the flood event having a 1-percent chance of being equaled or exceeded in any given year.

Flood Insurance Rate Map (FIRM) – Official map of a community on which FEMA has delineated the Special Flood Hazard Areas (SFHAs), the Base Flood Elevations (BFEs) and the risk premium zones applicable to the community.

Flood Insurance Study (FIS) – A report that contains detailed flood elevation data in flood profiles and data tables. FIS flood profiles provide detailed information about BFEs, stream bed locations, and cross section locations. Flood profiles are available on the FEMA Map Service Center website, where users can look up site specific flood hazard information.

Floodplain Management – The operation of an overall program of corrective and preventive measures for reducing flood damage, including but not limited to, emergency preparedness plans, flood-control works and floodplain management regulations. Floodplain management is a decision-making process that aims to achieve the wise use of the nation's floodplains. "Wise use" means both reduced flood losses and protection of the natural resources and function of floodplains.

Flood Risk Map (FRM) – The FRM depicts flood risk data for a flood risk project area and is typically used to illustrate overall flood risk for the area. The content and format of individual FRMs may vary among project areas to best represent the local conditions. Typical maps might show the potential flood losses associated with the 1%-annual-chance flood event for each census block, areas planned for new or revised maps, key watershed features that affect local flood risk, and information about potential or successful past projects to reduce flood risk.

Floodway – The area of the floodplain where floodwaters usually flow faster and deeper.

Floodplain – Any land area susceptible to being inundated by floodwaters from any source.

Freeboard – A factor of safety when constructing a building in the Special Flood Hazard Area (SFHA), usually one, two, or even three feet above the Base Flood Elevation (BFE). Building higher than local NFIP requirements provides peace of mind and can save money. Freeboard can compensate for the many unknown factors that could contribute to flood heights greater than the BFE.

Local (Urban) Floods – Local floodplains are those flood-prone areas located outside of mapped effective FEMA flood zones, designated Special Flood Hazard Areas, shown on FIRMs. Typically, urban communities identify local flooding as problem areas affecting roadways, subsurface infrastructure, and areas that convey stormwater runoff upstream of storm drainage inlets. Nationwide, these flood zones have several names, including "urban floodplains," "residual floodplains," and "local floodplains," and are in developed or developing areas. Due to local drainage floodplains not being mapped on FIRMs, some communities have begun taking steps to better define and understand local flooding risks in their community by using strategies such as local knowledge, historical events, and approximate or detailed local flood modeling studies,drainage master planning, local neighborhood analysis, and large scale two-dimensional hydraulic modeling. Although not regulated by the FEMA criteria, these areas often represent a significant portion of known flood hazards within the city, accounting for a large share of federal flood insurance claims.

Lowest Floor – As defined by 44 CFR 59.1, means the lowest floor of the lowest enclosed area (including basement). An unfinished or flood resistant enclosure, usable solely for parking of vehicles, building access or storage in an area other than a basement area is not considered a building's lowest floor; Provided, that such enclosure is not built so as to render the structure in violation of the applicable non-elevation design requirements of 44 CFR §60.3.

Letter of Map Amendment (LOMA) – An official amendment to an effective FIRM that may be issued when a property owner provides additional technical information from a licensed land surveyor or engineer, such as ground elevation relative to the BFE, SFHA, and the building. Lenders may waive the flood insurance requirement if the LOMA documents that a building is on ground above mapped floodplain.

Letter of Map Revision (LOMR) – An official revision to an effective FIRM that may be issued to change flood insurance risk zones, special flood hazard area and floodway boundary delineations, BFEs and/or other map features. Lenders may waive the insurance requirement if the approved map revision shows buildings to be outside of the SFHA.

Letter of Map Revision Based on Fill (LOMR-F) – An official revision to an effective FIRM that is issued to document FEMA's determination that a structure or parcel of land has been elevated by fill above the BFE, and therefore is no longer in the SFHA. Lenders may waive the insurance requirement if the LOMR-F shows that a building on fill is above the BFE.

Physical Map Revision (PMR) – May be issued for major floodplain changes that require engineering analyses, such as bridges, culverts, channel changes, flood control measures, and large fills that change the BFE or Floodway. Physical map revisions are also issued when a new study updates or improves the FIRM.

Pre-FIRM Building – A building for which construction or substantial improvement occurred on or before December 31, 1974, or before the effective date of an initial Flood Insurance Rate Map (FIRM). Pre-FIRM buildings were built before the effective date of the first Flood Insurance Rate Map (FIRM) for a community. This means they were built before detailed flood hazard data and flood elevations were provided to the community and usually before the community enacted comprehensive regulations on floodplain regulation. Pre-FIRM buildings can be insured using "subsidized" rates. These rates are designed to help people afford flood insurance even though their buildings were not built with flood protection in mind.

Post-FIRM Building – A building for which construction or substantial improvement occurred after December 31, 1974, or on or after the effective date of an initial Flood Insurance Rate Map (FIRM), whichever is later. Post-Flood Insurance Rate Map (FIRM) buildings are new construction and those built after the effective date of the first FIRM for a community. Insurance rates for post-FIRM buildings are dependent on the elevation of the lowest floor in relation to the Base Flood Elevation (BFE) among other factors.

Riverine Floodplain – An area around a body of water, typically river or creek, that is prone to flooding from that body of water.

Special Flood Hazard Area – A SFHA is that portion of the floodplain subject to inundation by the base flood and/or flood-related erosion hazards. SFHAs are shown on Flood Insurance Rate Maps (FIRMs) as Zones A, AE, A1-A30, AH, AO, AR for riverine floodplain areas, and V, VE, V1-30 for coastal floodplain areas.

Substantial Improvement – Means any reconstruction, rehabilitation, addition, or other improvement of a structure, the cost of which equals or exceeds 50 percent of the market value of the structure before the "start of construction" of the improvement. The NFIP requires that substantially damaged or substantially improved structures must be brought into compliance with local floodplain management regulations and codes that meet or exceed the minimum requirements of the program.

CODE OF FEDERAL REGULATIONS (CFR)



CODE OF FEDERAL REGULATIONS (CFR)

The Code of Federal Regulations (CFR) is the codification of the general and permanent rules published in the Federal Register by the departments and agencies of the Federal Government. Title 44 refers to Emergency Management and Assistance, which guides the FEMA, Department of Homeland Security whose purview includes the oversight of the NFIP and other hazard mitigation programs. These codes are updated periodically and are most current in the **online version**. Below is the most recent version of Subpart A § 60.3 to which is most applicable to the QUICK GUIDE.

Subpart A—Requirements for Flood Plain Management Regulations.
§ 60.1 Purpose of subpart.
§ 60.2 Minimum compliance with flood plain management criteria.
§ 60.3 Flood plain management criteria for flood-prone areas.

The Federal Insurance Administrator will provide the data upon which flood plain management regulations shall be based. If the Federal Insurance Administrator has not provided sufficient data to furnish a basis for these regulations in a particular community, the community shall obtain, review and reasonably utilize data available from other Federal, State or other sources pending receipt of data from the Federal Insurance Administrator. However, when special flood hazard area designations and water surface elevations have been furnished by the Federal Insurance Administrator, they shall apply. The symbols defining such special flood hazard designations are set forth in **§ 64.3 of this subchapter.** In all cases the minimum requirements governing the adequacy of the flood plain management regulations for flood-prone areas adopted by a particular community depend on the amount of technical data formally provided to the community by the Federal Insurance Administrator. Minimum standards for communities are as follows:

a. When the Federal Insurance Administrator has not defined the special flood hazard areas within a community, has not provided water surface elevation data, and has not provided sufficient data to identify the floodway or coastal high hazard area, but the community has indicated the presence of such hazards by submitting an application to participate in the Program, the community shall:
   1. Require permits for all proposed construction or other development in the community, including the placement of manufactured homes, so that it may determine whether such construction or other development is proposed within flood-prone areas;
   2. Review proposed development to assure that all necessary permits have been received from those governmental agencies from which approval is required by Federal or State law, including section 404 of the Federal Water Pollution Control Act Amendments of 1972, **33 U.S.C. 1334;**
   3. Review all permit applications to determine whether proposed building sites will be reasonably safe from flooding. If a proposed building site is in a flood-prone area, all new construction and substantial improvements shall
      i. be designed (or modified) and adequately anchored to prevent flotation, collapse, or lateral movement of the structure resulting from hydrodynamic and hydrostatic loads, including the effects of buoyancy,

ii. be constructed with materials resistant to flood damage,
iii. be constructed by methods and practices that minimize flood damages, and
iv. be constructed with electrical, heating, ventilation, plumbing, and air conditioning equipment and other service facilities that are designed and/or located so as to prevent water from entering or accumulating within the components during conditions of flooding.

4. Review subdivision proposals and other proposed new development, including manufactured home parks or subdivisions, to determine whether such proposals will be reasonably safe from flooding. If a subdivision proposal or other proposed new development is in a flood-prone area, any such proposals shall be reviewed to assure that
   i. all such proposals are consistent with the need to minimize flood damage within the flood-prone area,
   ii. all public utilities and facilities, such as sewer, gas, electrical, and water systems are located and constructed to minimize or eliminate flood damage, and
   iii. adequate drainage is provided to reduce exposure to flood hazards;

5. Require within flood-prone areas new and replacement water supply systems to be designed to minimize or eliminate infiltration of flood waters into the systems; and
6. Require within flood-prone areas
   i. new and replacement sanitary sewage systems to be designed to minimize or eliminate infiltration of flood waters into the systems and discharges from the systems into flood waters and
   ii. onsite waste disposal systems to be located to avoid impairment to them or contamination from them during flooding.

b. When the Federal Insurance Administrator has designated areas of special flood hazards (A zones) by the publication of a community's FHBM or FIRM, but has neither produced water surface elevation data nor identified a floodway or coastal high hazard area, the community shall:
   1. Require permits for all proposed construction and other developments including the placement of manufactured homes, within Zone A on the community's FHBM or FIRM;
   2. Require the application of the standards in **paragraphs (a) (2)**, **(3)**, **(4)**, **(5)** and **(6)** of this section to development within Zone A on the community's FHBM or FIRM;
   3. Require that all new subdivision proposals and other proposed developments (including proposals for manufactured home parks and subdivisions) greater than 50 lots or 5 acres, whichever is the lesser, include within such proposals base flood elevation data;
   4. Obtain, review and reasonably utilize any base flood elevation and floodway data available from a Federal, State, or other source, including data developed pursuant to **paragraph (b)(3)** of this section, as criteria for requiring that new construction, substantial improvements, or other development in Zone A on the community's FHBM or FIRM meet the standards in **paragraphs (c)(2)**, **(c)(3)**, **(c)(5)**, **(c)(6)**, **(c)(12)**, **(c)(14)**, **(d)(2)** and **(d)(3)** of this section;
   5. Where base flood elevation data are utilized, within Zone A on the community's FHBM or FIRM:
      i. Obtain the elevation (in relation to mean sea level) of the lowest floor (including basement) of all new and substantially improved structures, and
      ii. Obtain, if the structure has been floodproofed in accordance with paragraph **(c)(3)(ii)** of this section, the elevation (in relation to mean sea level) to which the structure was floodproofed, and
      iii. Maintain a record of all such information with the official designated by the community

under § 59.22 (a)(9)(iii);

6. Notify, in riverine situations, adjacent communities and the State Coordinating Office prior to any alteration or relocation of a watercourse, and submit copies of such notifications to the Federal Insurance Administrator;
7. Assure that the flood carrying capacity within the altered or relocated portion of any watercourse is maintained;
8. Require that all manufactured homes to be placed within Zone A on a community's FHBM or FIRM shall be installed using methods and practices which minimize flood damage. For the purposes of this requirement, manufactured homes must be elevated and anchored to resist flotation, collapse, or lateral movement. Methods of anchoring may include, but are not to be limited to, use of over-the-top or frame ties to ground anchors. This requirement is in addition to applicable State and local anchoring requirements for resisting wind forces.

c. When the Federal Insurance Administrator has provided a notice of final flood elevations for one or more special flood hazard areas on the community's FIRM and, if appropriate, has designated other special flood hazard areas without base flood elevations on the community's FIRM, but has not identified a regulatory floodway or coastal high hazard area, the community shall:
   1. Require the standards of paragraph (b) of this section within all A1–30 zones, AE zones, A zones, AH zones, and AO zones, on the community's FIRM;
   2. Require that all new construction and substantial improvements of residential structures within Zones A1–30, AE and AH zones on the community's FIRM have the lowest floor (including basement) elevated to or above the base flood level, unless the community is granted an exception by the Federal Insurance Administrator for the allowance of basements in accordance with § 60.6 (b) or (c);
   3. Require that all new construction and substantial improvements of non-residential structures within Zones A1–30, AE and AH zones on the community's firm
      i. have the lowest floor (including basement) elevated to or above the base flood level or,
      ii. together with attendant utility and sanitary facilities, be designed so that below the base flood level the structure is watertight with walls substantially impermeable to the passage of water and with structural components having the capability of resisting hydrostatic and hydrodynamic loads and effects of buoyancy;
   4. Provide that where a non-residential structure is intended to be made watertight below the base flood level,
      i. a registered professional engineer or architect shall develop and/or review structural design, specifications, and plans for the construction, and shall certify that the design and methods of construction are in accordance with accepted standards of practice for meeting the applicable provisions of paragraph (c)(3)(ii) or (c)(8)(ii) of this section, and
      ii. a record of such certificates which includes the specific elevation (in relation to mean sea level) to which such structures are floodproofed shall be maintained with the official designated by the community under § 59.22(a)(9)(iii);
   5. Require, for all new construction and substantial improvements, that fully enclosed areas below the lowest floor that are usable solely for parking of vehicles, building access or storage in an area other than a basement and which are subject to flooding shall be designed to automatically equalize hydrostatic flood forces on exterior walls by allowing for the entry and exit of floodwaters. Designs for meeting this requirement must either be certified by a registered professional engineer or architect or meet or exceed the following minimum criteria: A minimum of two openings having a total net area of not

less than one square inch for every square foot of enclosed area subject to flooding shall be provided. The bottom of all openings shall be no higher than one foot above grade. Openings may be equipped with screens, louvers, valves, or other coverings or devices provided that they permit the automatic entry and exit of floodwaters.

6. Require that manufactured homes that are placed or substantially improved within Zones A1–30, AH, and AE on the community's FIRM on sites
   i. Outside of a manufactured home park or subdivision,
   ii. In a new manufactured home park or subdivision,
   iii. In an expansion to an existing manufactured home park or subdivision, or
   iv. In an existing manufactured home park or subdivision on which a manufactured home has incurred "substantial damage" as the result of a flood, be elevated on a permanent foundation such that the lowest floor of the manufactured home is elevated to or above the base flood elevation and be securely anchored to an adequately anchored foundation system to resist floatation collapse and lateral movement.
7. Require within any AO zone on the community's FIRM that all new construction and substantial improvements of residential structures have the lowest floor (including basement) elevated above the highest adjacent grade at least as high as the depth number specified in feet on the community's FIRM (at least two feet if no depth number is specified);
8. Require within any AO zone on the community's FIRM that all new construction and substantial improvements of nonresidential structures
   i. have the lowest floor (including basement) elevated above the highest adjacent grade at least as high as the depth number specified in feet on the community's FIRM (at least two feet if no depth number is specified), or
   ii. together with attendant utility and sanitary facilities be completely floodproofed to that level to meet the floodproofing standard specified in **§ 60.3(c)(3)(ii);**
9. Require within any A99 zones on a community's FIRM the standards of **paragraphs (a)(1)** through **(a)(4)(i)** and **(b)(5)** through **(b)(9)** of this section;
10. Require until a regulatory floodway is designated, that no new construction, substantial improvements, or other development (including fill) shall be permitted within Zones A1–30 and AE on the community's FIRM, unless it is demonstrated that the cumulative effect of the proposed development, when combined with all other existing and anticipated development, will not increase the water surface elevation of the base flood more than one foot at any point within the community.
11. Require within Zones AH and AO, adequate drainage paths around structures on slopes, to guide floodwaters around and away from proposed structures.
12. Require that manufactured homes to be placed or substantially improved on sites in an existing manufactured home park or subdivision within Zones A–1–30, AH, and AE on the community's FIRM that are not subject to the provisions of **paragraph (c)(6)** of this section be elevated so that either
   i. The lowest floor of the manufactured home is at or above the base flood elevation, or
   ii. The manufactured home chassis is supported by reinforced piers or other foundation elements of at least equivalent strength that are no less than 36 inches in height above grade and be securely anchored to an adequately anchored foundation system to resist floatation, collapse, and lateral movement.
13. Notwithstanding any other provisions of **§ 60.3**, a community may approve certain development in Zones Al–30, AE, and AH, on the community's FIRM which increase the water surface elevation of the base flood by more than one foot, provided that the community first applies for a conditional FIRM revision, fulfills the requirements for such a revision as established under the provisions of **§ 65.12**, and receives the approval of the

Federal Insurance Administrator.

14. Require that recreational vehicles placed on sites within Zones A1–30, AH, and AE on the community's FIRM either
    i. Be on the site for fewer than 180 consecutive days,
    ii. Be fully licensed and ready for highway use, or
    iii. Meet the permit requirements of **paragraph (b)(1)** of this section and the elevation and anchoring requirements for "manufactured homes" in **paragraph (c)(6)** of this section. 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.

d. When the Federal Insurance Administrator has provided a notice of final base flood elevations within Zones A1–30 and/or AE on the community's FIRM and, if appropriate, has designated AO zones, AH zones, A99 zones, and A zones on the community's FIRM, and has provided data from which the community shall designate its regulatory floodway, the community shall:
    1. Meet the requirements of **paragraphs (c)(1)** through **(14)** of this section;
    2. Select and adopt a regulatory floodway based on the principle that the area chosen for the regulatory floodway must be designed to carry the waters of the base flood, without increasing the water surface elevation of that flood more than one foot at any point;
    3. Prohibit encroachments, including fill, new construction, substantial improvements, and other development within the adopted regulatory floodway unless it has been demonstrated through hydrologic and hydraulic analyses performed in accordance with standard engineering practice that the proposed encroachment would not result in any increase in flood levels within the community during the occurrence of the base flood discharge;
    4. Notwithstanding any other provisions of **§ 60.3**, a community may permit encroachments within the adopted regulatory floodway that would result in an increase in base flood elevations, provided that the community first applies for a conditional FIRM and floodway revision, fulfills the requirements for such revisions as established under the provisions of **§ 65.12**, and receives the approval of the Federal Insurance Administrator.

e. When the Federal Insurance Administrator has provided a notice of final base flood elevations within Zones A1–30 and/or AE on the community's FIRM and, if appropriate, has designated AH zones, AO zones, A99 zones, and A zones on the community's FIRM, and has identified on the community's FIRM coastal high hazard areas by designating Zones V1–30, VE, and/or V, the community shall:
    1. Meet the requirements of **paragraphs (c)(1)** through **(14)** of this section;
    2. Within Zones V1–30, VE, and V on a community's FIRM,
        i. obtain the elevation (in relation to mean sea level) of the bottom of the lowest structural member of the lowest floor (excluding pilings and columns) of all new and substantially improved structures, and whether or not such structures contain a basement, and
        ii. maintain a record of all such information with the official designated by the community under **§ 59.22(a)(9)(iii);**
    3. Provide that all new construction within Zones V1–30, VE, and V on the community's FIRM is located landward of the reach of mean high tide;
    4. Provide that all new construction and substantial improvements in Zones V1–30 and VE, and also Zone V if base flood elevation data is available, on the community's FIRM, are elevated on pilings and columns so that
        i. the bottom of the lowest horizontal structural member of the lowest floor (excluding the pilings or columns) is elevated to or above the base flood level; and

ii. the pile or column foundation and structure attached thereto is anchored to resist flotation, collapse and lateral movement due to the effects of wind and water loads acting simultaneously on all building components. Water loading values used shall be those associated with the base flood. Wind loading values used shall be those required by applicable State or local building standards. A registered professional engineer or architect shall develop or review the structural design, specifications and plans for the construction, and shall certify that the design and methods of construction to be used are in accordance with accepted standards of practice for meeting the provisions of **paragraphs (e)(4) (i)** and **(ii)** of this section.

5. Provide that all new construction and substantial improvements within Zones V1–30, VE, and V on the community's FIRM have the space below the lowest floor either free of obstruction or constructed with non-supporting breakaway walls, open wood lattice-work, or insect screening intended to collapse under wind and water loads without causing collapse, displacement, or other structural damage to the elevated portion of the building or supporting foundation system. For the purposes of this section, a breakway wall shall have a design safe loading resistance of not less than 10 and no more than 20 pounds per square foot. Use of breakway walls which exceed a design safe loading resistance of 20 pounds per square foot (either by design or when so required by local or State codes) may be permitted only if a registered professional engineer or architect certifies that the designs proposed meet the following conditions:
   i. Breakaway wall collapse shall result from a water load less than that which would occur during the base flood; and,
   ii. The elevated portion of the building and supporting foundation system shall not be subject to collapse, displacement, or other structural damage due to the effects of wind and water loads acting simultaneously on all building components (structural and non-structural). Water loading values used shall be those associated with the base flood. Wind loading values used shall be those required by applicable State or local building standards.

Such enclosed space shall be useable solely for parking of vehicles, building access, or storage.

6. Prohibit the use of fill for structural support of buildings within Zones V1–30, VE, and V on the community's FIRM;
7. Prohibit man-made alteration of sand dunes and mangrove stands within Zones V1–30, VE, and V on the community's FIRM which would increase potential flood damage.
8. Require that manufactured homes placed or substantially improved within Zones V1–30, V, and VE on the community's FIRM on sites
   i. Outside of a manufactured home park or subdivision,
   ii. In a new manufactured home park or subdivision,
   iii. In an expansion to an existing manufactured home park or subdivision, or
   iv. In an existing manufactured home park or subdivision on which a manufactured home has incurred "substantial damage" as the result of a flood, meet the standards of **paragraphs (e)(2)** through **(7)** of this section and that manufactured homes placed or substantially improved on other sites in an existing manufactured home park or subdivision within Zones VI–30, V, and VE on the community's FIRM meet the requirements of **paragraph (c)(12)** of this section.
9. Require that recreational vehicles placed on sites within Zones V1–30, V, and VE on the community's FIRM either
   i. Be on the site for fewer than 180 consecutive days,
   ii. Be fully licensed and ready for highway use, or
   iii. Meet the requirements in **paragraphs (b)(1)** and **(e)(2)** through **(7)** of this section.

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.

f. When the Federal Insurance Administrator has provided a notice of final base flood elevations within Zones A1–30 or AE on the community's FIRM, and, if appropriate, has designated AH zones, AO zones, A99 zones, and A zones on the community's FIRM, and has identified flood protection restoration areas by designating Zones AR, AR/A1–30, AR/AE, AR/AH, AR/AO, or AR/A, the community shall:
   1. Meet the requirements of **paragraphs (c)(1)** through **(14)** and **(d)(1)** through **(4)** of this section.
   2. Adopt the official map or legal description of those areas within Zones AR, AR/A1–30, AR/AE, AR/AH, AR/A, or AR/AO that are designated developed areas as defined in **§ 59.1** in accordance with the eligibility procedures under **§ 65.14**.
   3. For all new construction of structures in areas within Zone AR that are designated as developed areas and in other areas within Zone AR where the AR flood depth is 5 feet or less:
      i. Determine the lower of either the AR base flood elevation or the elevation that is 3 feet above highest adjacent grade; and
      ii. Using this elevation, require the standards of **paragraphs (c)(1)** through **(14)** of this section.
   4. For all new construction of structures in those areas within Zone AR that are not designated as developed areas where the AR flood depth is greater than 5 feet:
      i. Determine the AR base flood elevation; and
      ii. Using this elevation, require the standards of **paragraphs (c)(1)** through **(14)** of this section.
   5. For all new construction of structures in areas within Zone AR/A1–30, AR/AE, AR/AH, AR/AO, and AR/A:
      i. Determine the applicable elevation for Zone AR from **paragraphs (a)(3)** and **(4)** of this section;
      ii. Determine the base flood elevation or flood depth for the underlying A1–30, AE, AH, AO and A Zone; and
      iii. Using the higher elevation from **paragraphs (a)(5)(i)** and **(ii)** of this section require the standards of paragraphs (c)(1) through (14) of this section.
   6. For all substantial improvements to existing construction within Zones AR/A1–30, AR/AE, AR/AH, AR/AO, and AR/A:
      i. Determine the A1–30 or AE, AH, AO, or A Zone base flood elevation; and
      ii. Using this elevation, require the standards of **paragraphs (c)(1)** through **(14)** of this section.
   7. Notify the permit applicant that the area has been designated as an AR, AR/A1–30, AR/AE, AR/AH, AR/AO, or AR/A Zone and whether the structure will be elevated or protected to or above the AR base flood elevation.

[41 FR 46975, Oct. 26, 1976]

§ 60.4 Flood plain management criteria for mudslide (i.e., mudflow)-prone areas.
§ 60.5 Flood plain management criteria for flood-related erosion-prone areas.
§ 60.6 Variances and exceptions.
§ 60.7 Revisions of criteria for flood plain management regulations.
§ 60.8 Definitions.



halff