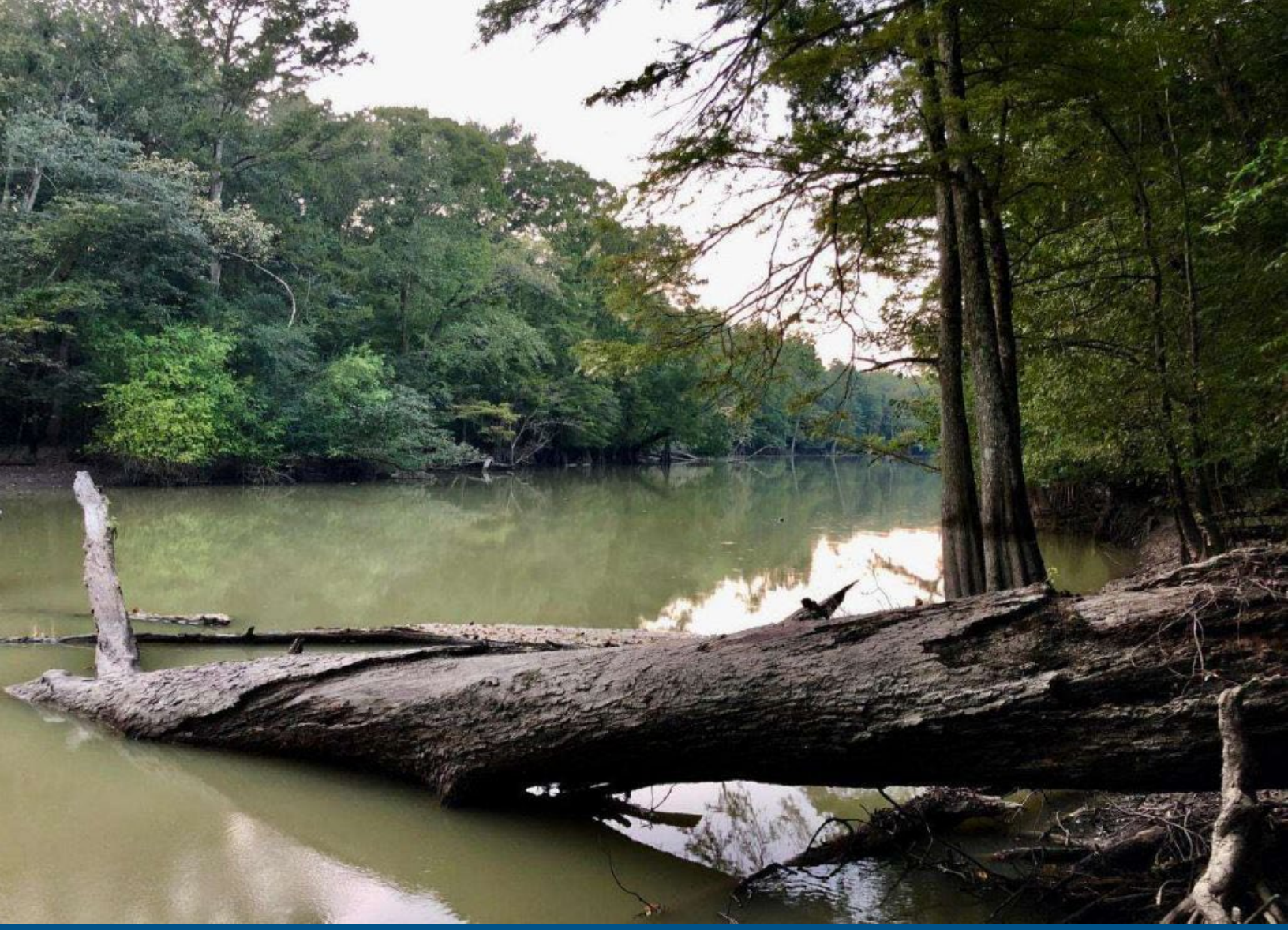


BLE-to-FIRM (B2F) Community Reference Guide

April 2024

FEMA
Region 6

Table of Contents

If you require assistance with complex images or information in this document, please contract FEMA Region 6 Mitigation Division at email fema-R6-mit-ra-team@fema.dhs.gov or call 940-297-5127.

FEMA

BLE-to-FIRM (B2F)

Flooding is the number one natural hazard in the United States. In many areas of the country, FEMA has not mapped flood hazards in detail. Base Level Engineering (BLE) helps communities in those areas better understand their flood risk. Communities can adopt and use BLE data to inform many floodplain management, mitigation, and planning activities.

This guide explains how BLE is used in your community's mapping project and will be provided at your BLE-to-FIRM (B2F) meeting. Each section is outlined to provide more background and information on what BLE data is, how you can use it, technical guidance, and tools. It also offers other ways your community can use BLE data to help understand local flood risk for large-scale community and site-specific planning.

1 Uses and Benefits of BLE

BLE uses the latest flood models with detailed ground elevation data, resulting in a more current and accurate assessment of local flood risk. While BLE data do not replace a community's Flood Insurance Rate Map (FIRM), they provide many benefits. Overall, BLE data boost local knowledge about flood risk and provide a solid foundation for decision-making.

1.1 Ways BLE Can Be Used to Increase Community Resilience

Communities can adopt and use BLE data to inform many floodplain management, mitigation, and planning activities. As changes in climate, demographics, and land use occur, communities can use BLE to plan for long term resilience. BLE data, models and property-specific reports are available through the estBFE Viewer at https://webapps.usgs.gov/infrm/estBFE/.

The following examples show how community officials can use BLE data to help reduce the risk of flooding.

Floodplain Management, Development Review and Permitting
▪ Use BLE data as the most current information in Zone A. Use the 1%-annual-chance flood elevations from BLE as Base Flood Elevations (BFEs). ▪ Regulate areas outside SFHAs. The BLE data can also be used where there is no FIRM. ▪ Plan and design new buildings. Define site-specific BFEs for various project types during local development reviews for permits. ▪ Adopt and enforce standards above the minimum elevation to better protect against future flood risks and uncertainty.

Community Planning, Land Use and Zoning

- Write stricter land-use regulations to prevent building in flood-prone areas.
- Plan for capital improvement. This includes planning for critical and emergency facilities.
- Plan for transportation. This way, future development of critical roads and transit infrastructure is not in flood-prone areas.
- Build resilience into community plans and policies. This saves communities time and money in the future. Resilient communities, built to higher flood mitigation standards, bounce back faster after a flood event with less overall impact.

Use BLE outside of SFHAs

In areas mapped as Zone A, X, B, C or D on the FIRM, BLE results may be the most current flood hazard data available. BLE analyses can also define BFEs in areas where they are not published. Communities can adopt and use BLE to guide future resilient development in areas without detailed studies.

Emergency Management

- Develop evacuation plans, reverse-911 services and other flood warning systems using BLE-based floodplain extents. They can also help place emergency shelters.
- Use BLE-based flood depth grids to map evacuation routes. These can also prepare routes for first responders and find areas that may isolate homeowners or cause evacuations.
- Create real-time estimates of flood heights and flooded areas. Do this by pairing BLE-based hydraulic models with flood forecast information like rainfall and streamflow. Work with floodplain managers and community planners to communicate how to use this data via outreach efforts, i.e., social media and local radio.
- Use BLE-based flood depth grids and/or Hazus results to locate areas with socially vulnerable populations that may need extra assistance. These groups may include the elderly, non-English speakers, the disabled, etc.

Hazard Mitigation Planning

- Assess flood risk using BLE-generated flood depth grids, depth-damage curves and structure values.
- Prioritize mitigation projects in areas with higher flood risk. These include projects in areas with greater flood depths or within the 10% floodplain.
- Link BLE analyses with social vulnerability data. Use this to assess what areas in your community may be at high risk of flooding and may have extra challenges or barriers to planning for hazards or considerations to keep in mind during recovery.
- Combine BLE analyses with different future conditions planning scenarios to assess future flood risk. These can include sea level rise or future rainfall projections.

Use BLE to meet grant application requirements

Some applicants to FEMA's Hazard Mitigation Grant Program must use a BFE for their projects. Water surface elevations from a BLE analysis can help if there is no BFE or FIRM data. Communities can use the Water Surface Elevations grid or the site-specific report on the estBFE Viewer.

Outreach to Property Owners

- Look up a property's current flood risk by selecting Property Look Up on the estBFE Viewer. Download and print a site-specific report.
- Use the report to find where best to build or relocate a building to reduce future flood risk.
- Use the report to learn how high to elevate a building or major equipment (like heating and air conditioning). This will reduce flood risk and possibly flood insurance costs.

BLE has many uses, from large-scale community planning to site-specific planning and design to planning for future flood hazards and conditions. For example, when community officials and leaders use BLE to inform planning efforts, it reduces risk to a community's critical assets and lifelines. Likewise, when property owners use BLE to learn about and address risks to their property, it reduces damage from future floods. Overall, the many uses of BLE work together to help a community prepare for and recover faster from future flood events.

2 BLE Data and the estBFE Viewer

FEMA is performing BLE analyses across the nation. By making this flood risk data locally available, the results give communities a better understanding of their flood hazards. The analyses combine detailed ground elevation data with the latest flood models to produce data that meet FEMA's standards for flood risk analysis and mapping. BLE data can supplement the effective Flood Insurance Rate Map (FIRM). BLE also provides data for unmapped areas and areas with outdated flood risk information. Local officials can use these data to make more informed decisions and work toward reducing flood risk.

In FEMA Region 6, BLE data and datasets are stored online in the free estBFE Viewer. It offers different ways to view and download BLE data, datasets and reports without any additional software.

Adopting BLE Data Helps Communities Stay Resilient to Current and Future Flood Risks

BLE can be adopted where flood risk data are outdated or unknown. Adopting BLE makes building and development decisions easier. It creates a clear, official source for permitting based on the latest flood risk data. BLE can be adopted at any time and also used to set higher standards that reflect anticipated future conditions.

2.1 Using the Viewer

The estBFE Viewer can be launched by typing https://webapps.usgs.gov/infrm/estBFE/ in an internet browser window. The first thing you will see is a disclaimer screen; click "OK" to clear this message. Next, the Quick Start screen (Figure 1) offers you different ways to explore BLE data and modeling results. You can choose between three options:

- Property Look Up.
- View Base Level Engineering Data.
- Download Datasets and Models.

After you've chosen one option, you can still explore the others. Click on the gray **"Quick Start"** button in the lower left corner to return to the Quick Start screen.

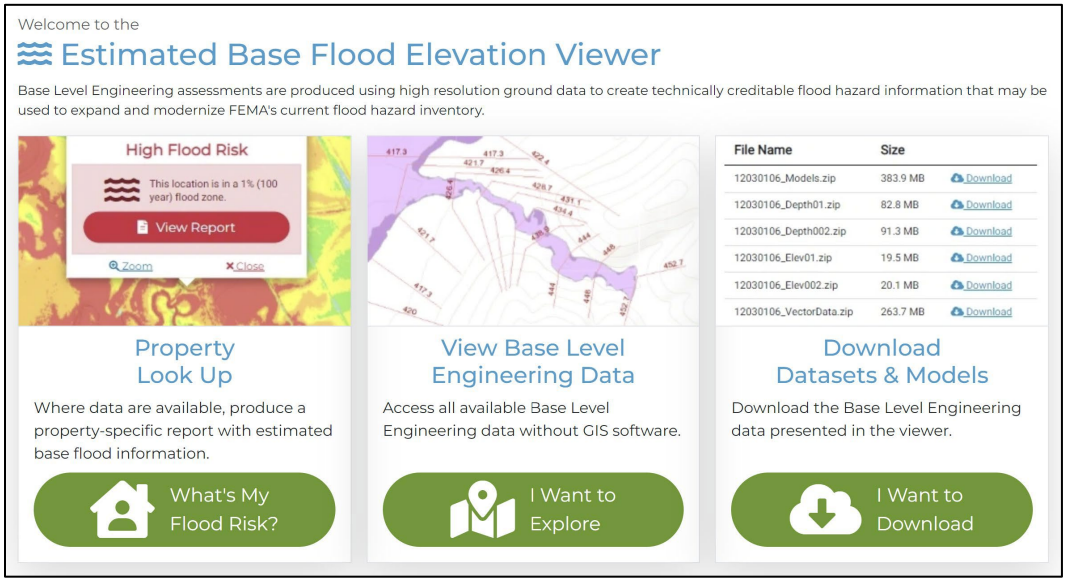


Figure 1. The EstBFE Viewer Quick Start gives users choices on what to do with the data.

Key Terms in the estBFE Viewer to Help Understand Local Flood Risk:

- **1% annual chance flood**: There is a 1 in 100 chance that a flood event of this size will occur in any given year. This is less common than an average rain event, but larger in magnitude. If a flood event of this size or bigger occurs, water will cover the indicated area.
- **0.2% annual chance flood**: This is a 1 in 500 chance that a flood event of this size will occur in any given year. This is a rare but possible rain event that is large in magnitude. If a flood event of this size or bigger occurs, water will cover the indicated area.
- **Estimated flood elevations**: These measure how high flood waters may reach during a flood event in terms of feet above sea level. Using sea level makes it possible to compare flood risk in two places, such as Little Rock, Arkansas versus Albuquerque, New Mexico.
- **Estimated flood depths**: These measure how deep flood waters may be during a flood event in feet. They are specific to the location and give an idea of how high above the ground flood waters could rise.

2.1.1 VIEW BASE LEVEL ENGINEERING DATA

Choosing **View Base Level Engineering Data** (Figure 2) displays a map showing floodplain extents color-coded by flood depth. Coastal influence areas are shown in pink on the map.

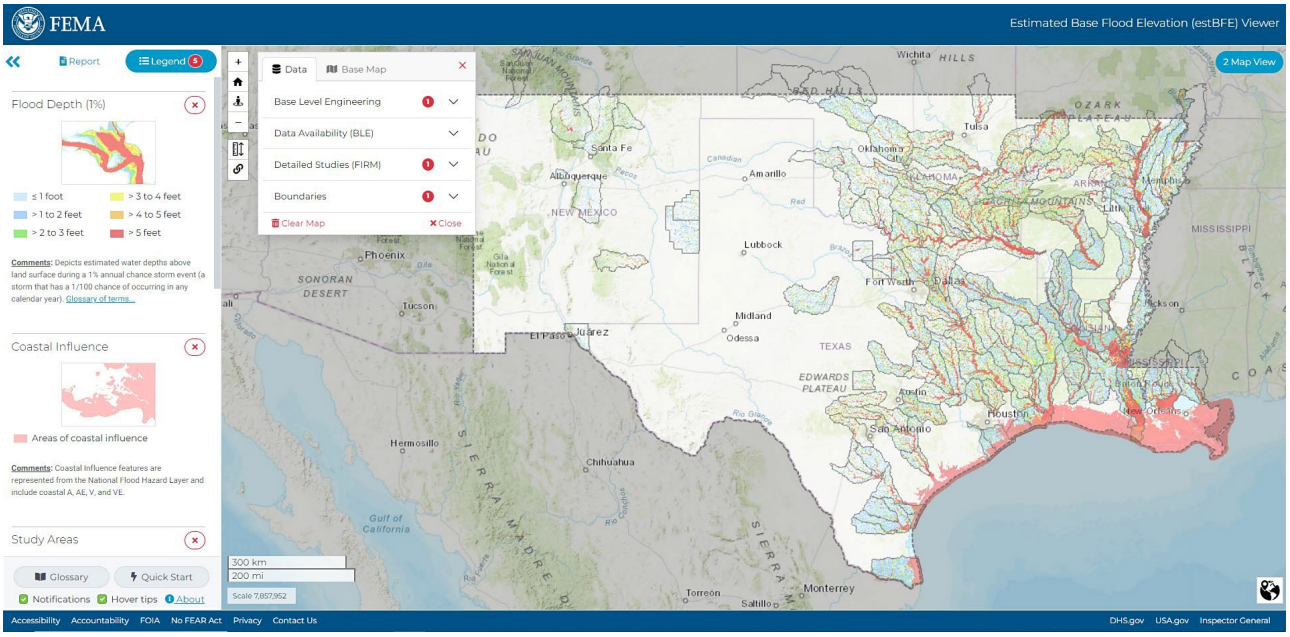


Figure 2. View BLE data like flood extent, depth, and elevations on the estBFE Viewer.

Features include:

- The blue **Legend** button on the left lets you choose what you want shown on the map, e.g., flood depth, coastal influence, study areas.
- The blue **Map Layers** button lets you choose what data you want shown and the type of base map you wish to use. Data choices include flood extent, flood depth, flood elevations and detailed study availability.
- The blue **Map View** button in the upper right corner will open a second map for side-by-side comparison. This lets you compare different data layers or base maps.
- Zoom in to see the floodplain extents with the + and – buttons at the top left of the screen.

2.1.2 DOWNLOAD DATASETS AND MODELS

This option in the viewer gives you access to the geospatial datasets and underlying engineering models. A color-coded map shows the study areas that have data ready for download (Figure 3). Areas in green have data ready for download. Areas in blue are studies still in progress with no available data to view. Datasets can easily be downloaded by hovering your mouse over the study area of interest and clicking. A pop-up will give you the option to download the datasets and models.

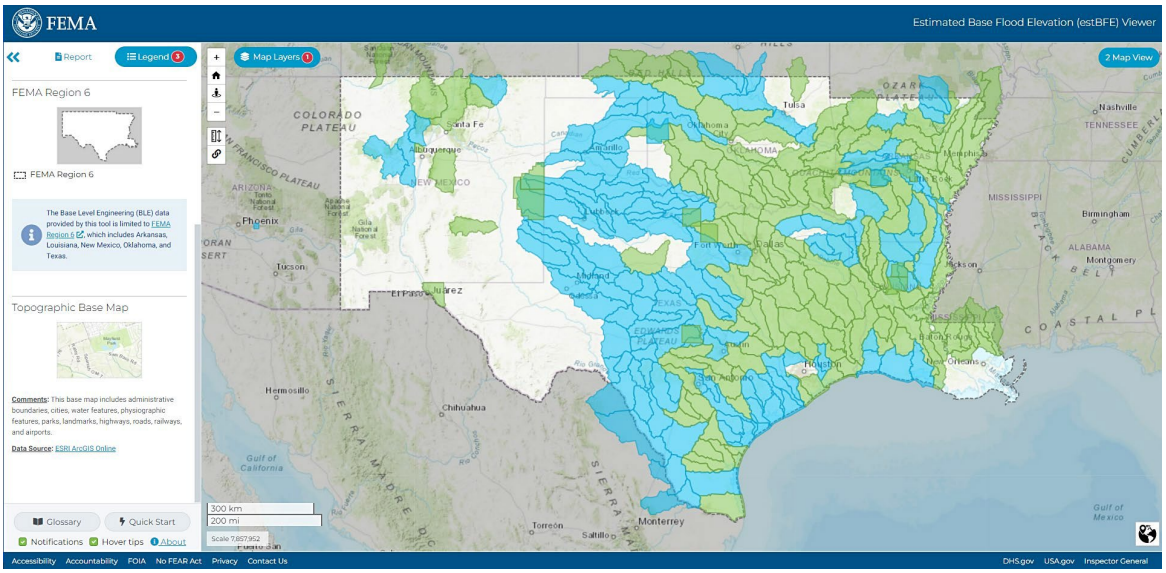


Figure 3. Download datasets and models for areas shown in green on the estBFE Viewer.

After you click on **Download Datasets and Models**, a table will pop up that lists the available items for download. You can also download the entire table. This creates an Excel spreadsheet for the user with hyperlinks to the datasets and models. You can use the data from the viewer to perform other local modeling, like assessing future rainfall scenarios.

The datasets and reports included in a BLE study are:

- ☐ **HEC-RAS models**: These are hydraulic models that all BLE studies use.
- ☐ **Vector and raster geographic information system data**: This database includes all of the raster data for water surface elevations and flood depth grids. The vector data represent stream center lines, flood hazard areas, and more.
- ☐ **Reports and documents**: These detail the modeling and mapping methodology for the study. They may also include work maps or other files created during the study.
- ☐ **Dataset reference guide**: This guide explains the different data piece by piece. This can help you navigate the data if you want to use them for your own local modeling and analysis.

2.1.3 PROPERTY LOOK UP

The **Property Look Up** option shows side-by-side maps. The left-hand map shows floodplains based on BLE (1% and 0.2% flood events). The right-hand map shows flood depths (Figure 4).

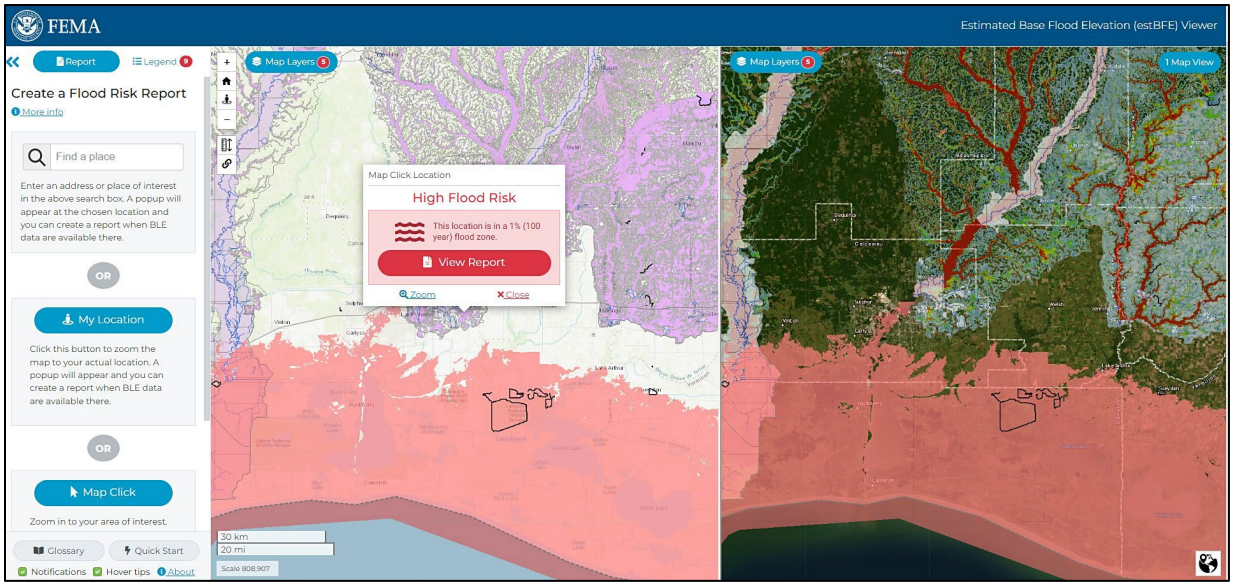


Figure 4. Search for a structure to look up your property's flood risk in the estBFE Viewer.

You have a few options to navigate to a property using the **Create a Flood Risk Report** menu on the far left:

- Search for a specific property by typing an address into the **Find a place** search bar.
- Click **My Location** to zoom in on the map to your actual location.
- Zoom in on your area of interest. Select **Map Click** and then click the property of interest where BLE data are available. A pop-up will appear describing its level of flood risk and an option to view a report.
- If the property is within the purple area on the map on the left, then BLE data are available for that location. Click on the center of the structure of interest. Click **View Report** to open the **Flood Risk Information Report** in a new window.

Using Property Look Up to View FEMA FIRMs

The viewer also identifies where community FIRMs show detailed study areas. If you click on an area that has detailed information available, a pop-up will ask you if you want to explore more detailed data in FEMA's National Flood Hazard Layer Viewer. This option leads to the most detailed flood data available. You can then print a FIRM for the area of interest, known as a FIRMette. If your home or business falls within a detailed study area, contact your local floodplain administrator to talk about your flood risk and ways to reduce it.

2.2 Site-Specific Flood Risk Information Reports

A site-specific **Flood Risk Information Report** (Figure 5) gives individual results based on available data for the chosen location. Results are shown with graphics, maps and tables. This report helps with visualizing and understanding your flood risk. It provides estimated elevations and depths of flooding for the 1% (high risk) and 0.2% (moderate risk) annual chance floods. Flood risk is also graphically shown. A red house means the property is in a high flood risk area. While a yellow house means the risk is low to moderate. Finally, a unique web address is generated for each report. This lets you share or bookmark the link to the report.

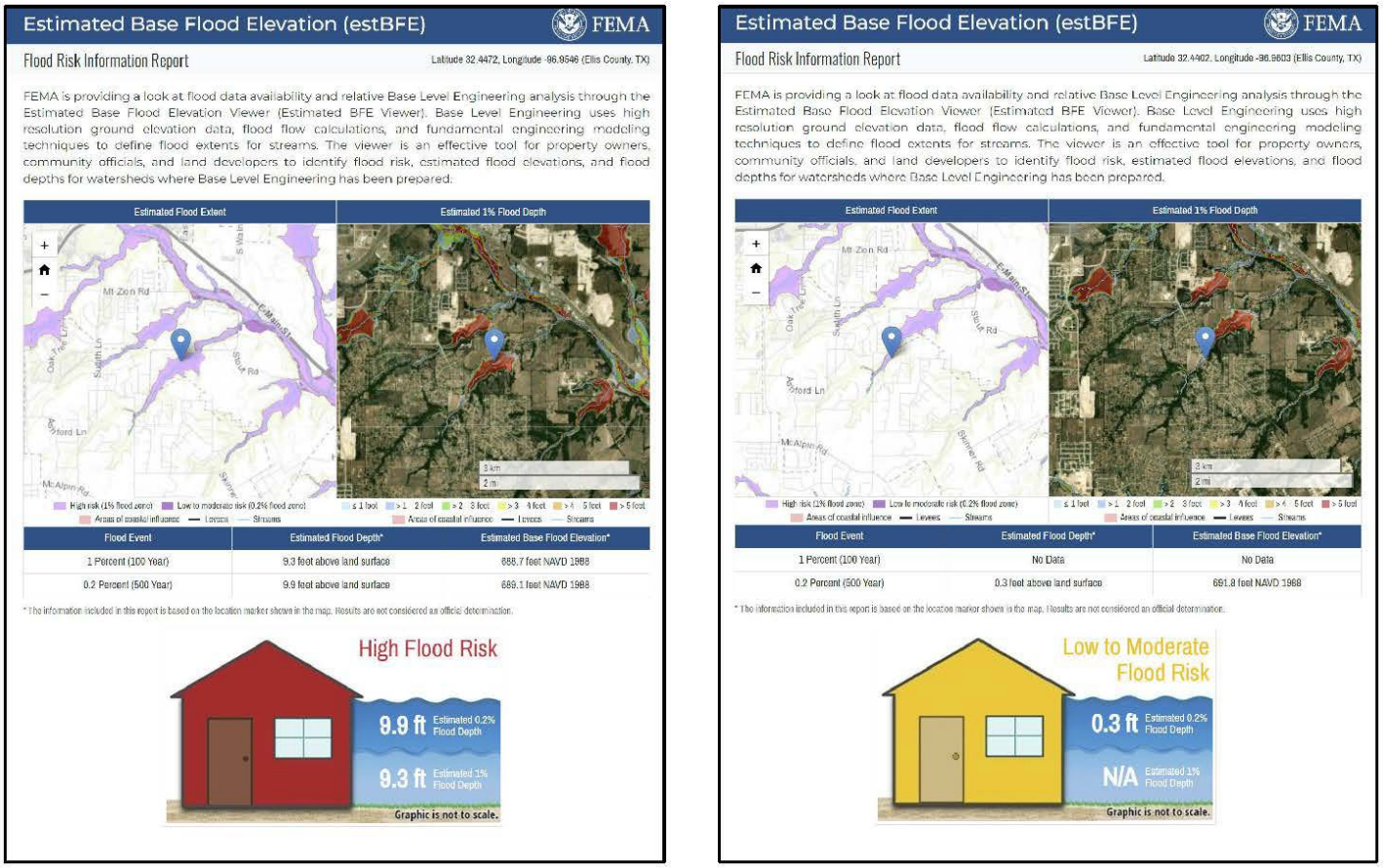


Figure 5. Download a Flood Risk Information Report for your property from the estBFE Viewer.

The second page of the report explains the information, how it can be used, and actions you can take to reduce your flood risk. For more information, visit FEMA Region 6's BLE Resource library at http://www.fema.gov/about/organization/region-6/base-level-engineering-ble-tools-and-resources. There you can learn how BLE can be used for floodplain management, emergency management, community planning, hazard mitigation planning and more.

Acknowledgements

The estBFE Viewer was a collaborative effort. The Data and Spatial Studies team of the U.S. Geological Survey's Texas Water Science Center brought it to life. The collaboration within the Region 6 Interagency Flood Risk Management (InFRM) team has allowed this vision to become a reality. The InFRM team strives to collaborate nationally and empower locally. Learn more at www.infrm.us.

3 Informed Land Development with BLE

Engineers and developers benefit from the availability of credible and comprehensive flood hazard information. Datasets showing the location of areas prone to flooding inform site planning decisions, like earthwork/grading, infrastructure location (bridge, culverts, drainage swales and ponds) and other development activities. With flood hazard data communities can make more informed decisions regarding local commercial and residential development activities.

A local permit should be applied for prior to development activities or construction begins near areas determined to be flood prone by the 1% annual chance storm event. Communities are required to permit all development activities to assure that any structure located in the vicinity of a floodplain is done in a manner to assure it is relatively safe from flooding.

Flood risk may be altered by land development activities and the permitting process allows communities to review these alterations prior to construction. Consult the local floodplain manager and building department in your community before making any building or land modifications. Local building and permitting requirements vary by community and are based on local decisions and ordinances. At a minimum, communities will require.

two engineering models (a) existing conditions and (b) proposed conditions be submitted for review. Local officials use the analysis and information provided by the development community to assess potential change in flood risk due to the project. The review determines the change in water surface elevation within the project area and identifies where adjacent property owners may be affected.

3.1 Flood Insurance Rate Maps (FIRMs)

FIRMs should always be consulted first; the current inventory of FIRMs provides regulatory flood hazard information for approximately 1.3 million of the nation's 4.0+ million miles of stream. The majority of flood zones shown on FIRMs are designated Zone A – depicting areas that are potentially flood prone during larger rain events with a shaded polygon, but not providing a published Base Flood Elevation (BFE). Since a large portion of the nation's streams do not have readily available flood hazard information, it is difficult for individuals, developers and communities to accurately assess and understand the potential for flooding in their area.

Development is defined as any man-made change to improved or unimproved real estate. This includes, but is not limited to, buildings or other structures, mining, dredging, filling, grading, paving, excavation, and drilling operations. Development also includes the storage of equipment or materials in the floodplain.

3.2 BLE provides additional coverage

Part 60.3 in the Code of Federal Regulations indicates when FIRMs do not provide sufficient data, the community shall "obtain, review and reasonably utilize data available from Federal, State or other sources… pending receipt of data" from FEMA. BLE assessments are performed for watersheds and river basins. Once an assessment is complete, hundreds of engineering models and a range of spatial information in GIS format is made available, expanding the accessibility of additional flood information for use. BLE data provides insight and mappable information to assist local consideration of development alternatives, assess project impacts, and ensure more resilient construction activities. While BLE flood information does not replace data shown on your community's current FIRM panels, the BLE data complements current FIRM Zone A areas and provides additional coverage where streams have not yet been included in the FIRM data coverage, expanding the coverage of available data for community and industry use.

3.3 BLE Models are Scalable

BLE watershed assessments are built on high resolution ground elevation and use freely available hydraulic modeling software, Hydrologic Engineering Center – River Analysis System (HEC- RAS). The effort results in the

preparation of Zone A modeling that may be refined. The BLE models are either produced using a one-dimensional (1D) or two-dimensional environment. One-dimensional (1D) analysis produces great results where the stream channels are well defined. Two- dimensional (2D) analysis allows better identification of flood prone areas where flooding doesn't necessarily follow a defined channel. These models are easily refined to include site-specific information and can serve as the base model for assessing project impacts, adhering to community development requirements for permitting and preparation of FEMA Letters of Map Change (LOMCs). A few refinement examples are shared below:

- Field survey may be included to better define the stream channel.
- 1D models use a default calculation approach to determine the volume of flow (hydrology) leveraging Regional Regression Equations. The sub-basins used in this analysis are available for further breakdown. The source of land use and impervious area may also be updated with a local dataset.
- 2D model's hydrology is based on readily available data that may benefit from refinement of land use information and hydrologic losses removed from the hydraulic model.
- 1D models can be updated with structures using local as-built or survey information. Overbank and channel spacing, and roughness coefficients (Manning's n) may also result in a more refined outcome.
- 2D models benefit from the addition of breaklines to define road embankments and levee features, indicating high points and refining the terrain. Breaklines also define the lowest drainage points, the stream channel.
- 2D models use hydro-connectors to define pathways for flow between grid cells. Using hydro connectors, culverts may be quickly added to enhance the complexity of modeling and upgrade the results quickly.

3.4 Implementing Local Use of BLE Information.

Where Base Level Engineering is available it can be used as a data source to supplement effective FIRMs with the following review and use procedure. Base Level Engineering may be used available information when:

- BLE coverage shows an area as flood prone that is NOT currently depicted on the FIRM
- BLE coverage is similar in width, shape and alignment to the Zone A depicted on FIRM
- BLE coverage is larger than Zone A areas shown on FIRM

Communities **should not** use Base Level Engineering information in the following instances:

- BLE coverage is smaller in width and shape than Zone A areas shown on FIRM

In areas where Zone AE is depicted and a BFE is available, communities should review both datasets and modeling to define a Base Flood Elevation.

4 FEMA Region 6 BLE-to-FIRM Viewer

FEMA Region 6 created a BLE-to-FIRM (B2F) Viewer to help community and county officials review effective flood hazard areas, which will be updated with BLE data. Officials will also be able to identify where BLE data may be adopted for floodplain management without an update to the Flood Insurance Rate Map (FIRM). In addition, it can be used to identify areas where local officials may want to refine risk information in the future through a Letter of Map Revision. The B2F Viewer lets local officials and floodplain managers engage with the data and work with FEMA and their mapping partner(s) at the community level. This can all be done before the draft FIRMs are made public on FEMA's Flood Hazard and Risk Data Viewer.

Communities and counties will be asked to review this information and give more input. Examples include:

- Does the community currently take part in the National Flood Insurance Program (NFIP)?
- Do the community officials want to adopt BLE in areas not shown on the FIRM?
- What changes need to be made in the community flood ordinance before these data go into effect?
- Is there other updated information such as community annexations, areas of expected growth, and areas affected by recent disasters?

This type of information will help as decisions are made to update the flood maps and community flood ordinance.

4.1 How Do I Use the B2F Viewer?

The B2F Viewer is available at: https://webapps.usgs.gov/fema/ble_firm/. The tool functions best in Google Chrome, Microsoft Edge, or Mozilla Firefox browsers on any computer. Follow these simple steps to look at proposed areas to be included in the updated FIRM.

BLE=Updated Flood Risk Data

Some counties in FEMA Region 6 only have older, paper-format FIRMs. Others may have a mixture of community-based paper maps and digital products, and some have no FIRMs at all. Outdated flood risk information that is only in paper format is not easy to use. It is also hard to update. FEMA and its mapping partners use BLE to help provide updated flood risk data. This allows communities to make informed decisions about where to make investments and plan development out of harm's way. FEMA can also use BLE when it decides to update or create a new FIRM.

Step 1. To launch the tool, enter https://webapps.usgs.gov/fema/ble_firm/ into your browser. You will see a window for selecting a study area. Select your county of interest.

Step 2. A map of the chosen county will appear. It will show the existing FIRM on top of a Google Imagery base map. If there is no countywide FIRM, only communities with FIRMs will appear. The FIRM is a digitized version of the paper FIRM. Three layers will be on top of the FIRM:

1. The county and community boundaries in orange.

2. BLE-derived floodplain boundaries. The high-risk area (1%-annual-chance flood) is in light blue, and the moderate-risk (0.2%-annual-chance flood) is in purple.

3. Concentration of buildings in the floodplain, ranging from low (dark blue) to high (red)

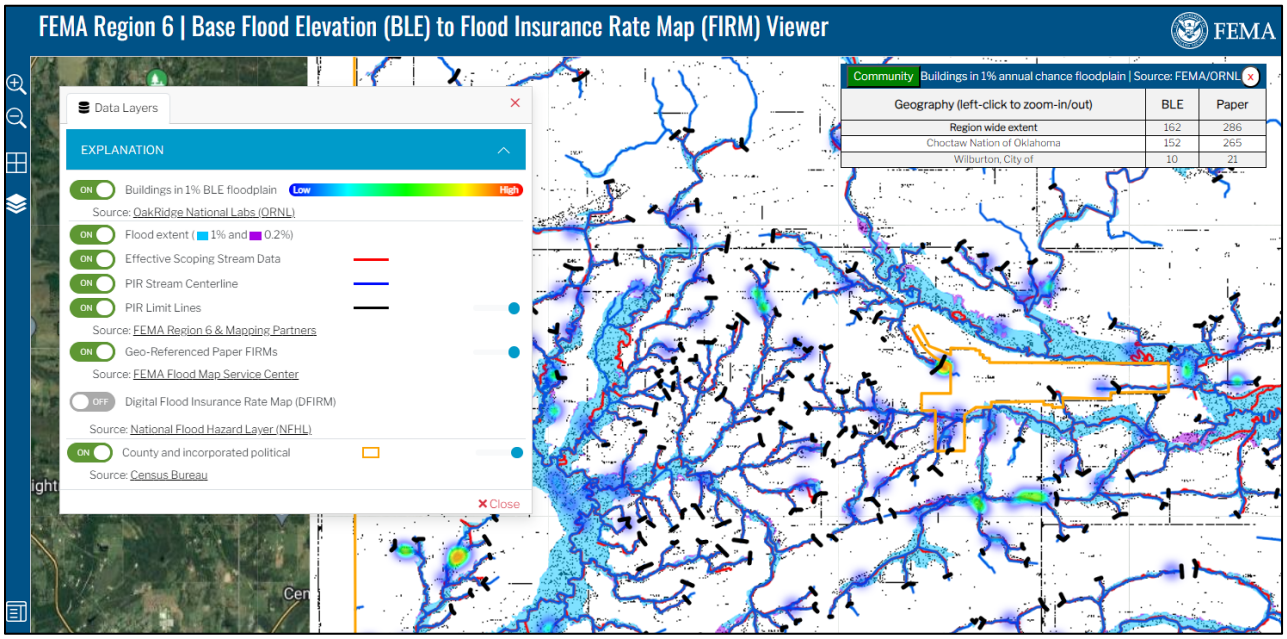


Figure 6. B2F Viewer-Select Layers

In addition, a table is shown in the top right corner that compares the number of buildings in the high-risk area using the BLE data versus the existing digitized paper flood map. Clicking on the table's green button, you can toggle from county totals to individual community totals. To minimize the table, click on the red "x" in the table's upper right corner.

Step 3. Using the scroll function on your computer mouse, zoom into your area of interest. You can also use the magnifying glasses in the upper lefthand corner to zoom in or out. As you zoom in, you will notice that the number of buildings in the table also changes, showing only the number within the current map extent. If you wish to change the base map, find the box with four squares under the magnifying glasses. Click on it to choose different imagery.

Step 4. Below the Base Map box is an icon showing three layers. Click on this to select what data layers you wish to see on the Base Map (Figure 6). You can turn a layer on or off by sliding the white button on (green) or off (gray). Blue buttons on the right control transparency. Your layer choices are:

- **Buildings in 1% BLE floodplain:** This visually identifies the concentration of buildings within an area, ranging from low (dark blue) to high (red).

- **Flood Extent**: This shows the high-risk areas (1%-annual-chance flood) in light blue and the moderate-risk area (0.2%-annual-chance flood) in purple. These are based on BLE data.

- **Effective Scoping Stream Data**: This shows the total stream miles (shown in red) that will be used for creating the updated FIRM. It includes streams identified from FEMA's Coordinated Needs Management Strategy

(CNMS). More information on CNMS can be found at www.fema.gov/flood-maps/tools-resources/risk-map/coordinated-needs-management-strategy.

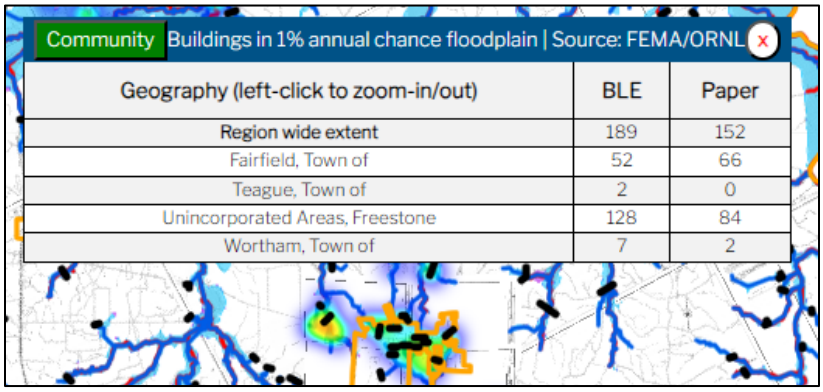
- **PIR Stream Centerline**: This identifies where stream data based on BLE is available. These are shown in dark blue. These may extend beyond the stream miles being used to create the updated FIRM.
- **PIR Limit Lines:** These indicate how far a stream's flood hazard will be included in the updated FIRM.
- **Geo-Referenced Paper FIRMs**: This overlays the current effective FIRM on the Base Map. You may wish to click this layer first and then click other layers. Otherwise, it may cover up other layers.
- **Digital Flood Insurance Rate Map (DFIRM):** This shows areas in light red that have existing digital FIRMs.
- **County and Incorporated Political Limits**: This shows the county and community boundaries in orange.

4.2 How Do I Apply the BLE-to-FIRM Viewer Results?

In developing the new FIRM, BLE streams shown in **red** will move forward to be incorporated into the new FIRM. BLE streams in **dark blue** will not be shown on the new FIRM. A community can still adopt them, and the areas identified in the BLE Special Flood Hazard Area (SFHA) data layer to manage development in the higher-risk areas.

To see how the flood risk has changed since the last FIRM, click on the **Geo-Referenced Paper FIRMs** layer and then the **Flood Extent** layer. Use this comparison to help manage new development, especially where the BLE data now shows higher risk. Adopting the BLE data in these areas to manage development near the floodplain will help your community to be more resilient to local flood hazards.

As you zoom out, you can see where there are increasing concentrations of **Buildings in the 1% BLE floodplain** in a county or community. The table (Figure 7) provides an estimated number of buildings. It also shows if there are more or fewer buildings in the floodplain based on the new BLE data versus the older paper FIRM. This information could be used to highlight potential areas for future mitigation.



Geography (left-click to zoom-in/out)	BLE	Paper
Region wide extent	189	152
Fairfield, Town of	52	66
Teague, Town of	2	0
Unincorporated Areas, Freestone	128	84
Wortham, Town of	7	2

Figure 7. Table showing the number of buildings in the 1% annual floodplain.

To identify an estimated Base Flood Elevation for a particular property within the BLE SFHA data layer, visit FEMA Region 6's Estimated Base Flood Elevation (estBFE) Viewer at https://webapps.usgs.gov/infrm/estBFE/. It is free and requires no additional software. Once there, click *Property Look Up*, enter your address, and generate a Flood

Risk Information Report for your property (Figure 8). You can also access the BLE data and download datasets and models from this site.

To learn more about how to use the estBFE Viewer, download the estBFE Viewer guide at www.fema.gov/sites/default/files/documents/fema_estimated-base-flood-elevation-viewer.pdf.

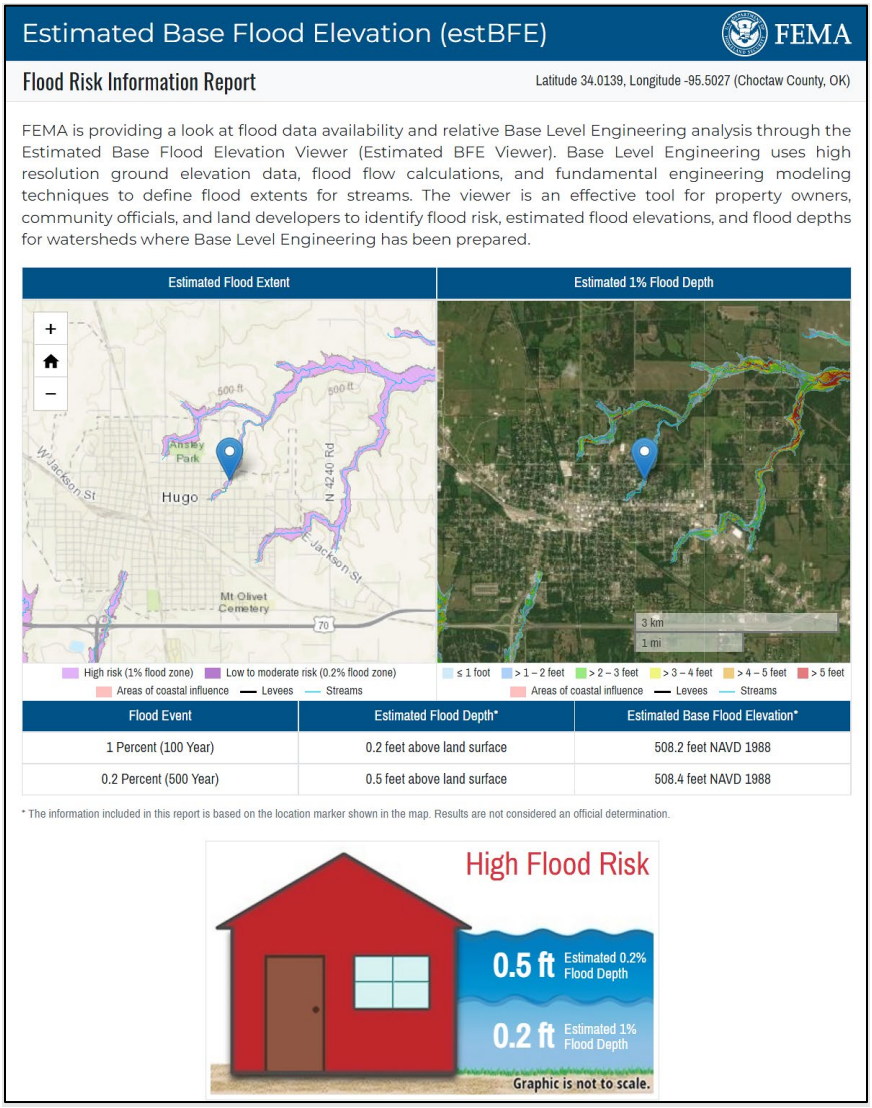


Figure 8. Flood Risk Information Report from the estBFE Viewer.

5 Why Your Community Should Adopt BLE

5.1 Adopting BLE where flood risk data is outdated or not assessed

Communities may adopt BLE if it is more restrictive than what is shown on the FIRM. That means it can be used as the most current information to manage local development in Zones A, B, C, D, and X. BFEs from BLE data can be used to define a height requirement for new buildings in those zones. BLE results are also a source for water surface elevations in unmapped areas. If the BLE data shows higher water surface elevations or wider floodplains than those on the effective FIRM in Zone AE, communities may use the BLE data as the most current information for regulations.

Adopting BLE data strengthens community resilience to current and future flood risks

- Adopting BLE into local ordinances and building codes allows community officials to apply BLE consistently. This helps build community-wide resilience rather than having neighborhoods built to different standards.
- BLE may show that a floodplain is wider, or a flood height is higher than on the FIRM. When BLE is adopted and enforced as the most current data, the higher standards help reduce the community's flood risk. Adoption sets the stricter requirements into ordinances and codes.
- BLE data may exist for areas that aren't included in the FIRM. When adopting BLE, include these areas in the floodplain regulations. These areas can then be managed to reduce their flood risk.
- Flood risk is dynamic. Climate impacts, for example, bring heavier and more unpredictable rainfall events, more powerful storms, and new weather patterns. These combine with rapid land use and demographic shifts in ways that increase the impact of disasters. However, if you manage your community's flood risk proactively, with methods like adopting BLE, you can reduce future flood impacts in your community.
- Adopting BLE data and using higher standards in local building codes is a long-term investment in your community. It helps community leaders to make decisions today that will reduce flood impacts for years to come. Adopting higher standards using BLE data increases a community's resilience. As a result, future flood events will have less of an impact on residents and the local economy.

5.2 Adopting BLE simplifies building and development decisions

Adopting BLE makes it easier to permit and regulate using up-to-date flood risk data. It creates a clear, official reference for residents or developers. This will make it easier to answer any questions about rules and permit requirements related to flood risk. Codifying BLE can create a consensus among local officials. They will know what data to use when for development in the floodplain. Residents and builders will understand the requirements more easily because they are applied consistently throughout the community.

Adopting BLE data guides future development. BLE is useful if a community's FIRM does not show flood hazard areas near a project site. BLE data can help the community plan a project to avoid flood-prone areas and reduce impacts downstream. Flood depth grids and floodplain boundaries can be used to see if the project or portions of it can be moved to a safer area.

5.3 Adopting BLE ensures projects are built to a height that reduces flood risk

A community can adopt BFEs derived from BLE data. These can define the lowest floor elevation requirement for new development. Estimated BFEs can be determined in Zones A, B, C, D, or X. BLE data are also a source for water surface elevations in unmapped areas. These areas may be prone to flooding during larger rain events, but the FIRM does not provide a published BFE to guide permitting proposed development. Because BLE provides these BFEs, they can be adopted and used to inform and permit safer development.

Communities should consider adopting higher standards for floodplain development and use. For example, new construction can be required to be one foot or more above the BLE-determined BFE. Adopting higher standards will provide a stronger built environment as future conditions evolve. This will enable communities to recover more quickly after a flood, now and in the future.

BLE can be adopted at any time

It may be several years before your community gets an updated FIRM. You don't have to wait to manage your flood risk! You can adopt BLE into your community's floodplain ordinance or court order at any time. You can also use it in other planning tools. Consider your comprehensive plan, land use regulations and other local policies. Adopt BLE to set higher standards in your floodplain ordinance. This will put your community one step ahead during the regulatory update part of the mapping process.

Some communities may require that BLE data is first adopted into the community's flood ordinance or another code. Then the data can be used to manage development. Check your community bylaws, ordinances, and codes to find the appropriate way to adopt BLE information.

6 Ordinance Language for Adopting BLE

Your community's floodplain management ordinance is what guides development in and around areas of flood risk. Adopting and implementing Base Level Engineering (BLE) can reduce the risk of flood damage to your community and its members. Plus, the higher standards your community adopts, the more the risk of flooding can be reduced. This helps your community plan for and adapt to changing risks, including future flood risks.

6.1 Steps for updating your local floodplain management ordinance to include BLE

When amending or updating your floodplain management ordinance, always coordinate with your National Flood Insurance Program (NFIP) State Coordinator. Consider these steps in the process:

6.1.1 REVIEW YOUR COMMUNITY'S EXISTING FLOODPLAIN MANAGEMENT ORDINANCE(S)

Local floodplain officials should use their expertise to decide where BLE best fits in the existing floodplain ordinance. Adding BLE can benefit development review and permitting, including planning for future growth in the context of changing flood risk. It can also assist in general floodplain decisions. Community officials can also review their ordinance to find ways to reduce its complexity and prevent confusion.

6.1.2 UPDATE YOUR FLOODPLAIN ORDINANCE TO REFLECT THE ADOPTION AND REGULATION OF BLE INFORMATION

Community officials use data from many sources when making development and floodplain management decisions. Adding a reference to BLE in the ordinance adds transparency to the data being used to make these decisions. FEMA has provided sample BLE language (see Table 1). Communities can also craft BLE language that best suits them. BLE data and regulatory requirements can be adopted into an ordinance for the entire community, or just part of it (defined by a stream, neighborhood, zoning, or other method).

6.1.3 CONSIDER ADOPTING HIGHER FLOODPLAIN DEVELOPMENT AND USE STANDARDS

Local floodplain management ordinances help communities regulate minimum standards for development and use within flood-prone areas. This is a requirement to join the National Flood Insurance Program. Communities with standards that exceed the minimum further decrease the effects of floods. Higher standards also help communities recover more quickly after a flood. This leads to a stronger built environment for the future as flooding conditions change.

Consider adopting higher standards, such as:

- Community-identified flood hazard areas: Expand the area regulated under the ordinance. Include larger, identified flood intervals (such as the 0.2%-annual-chance flood). You can also include areas known to flood but not shown on the Flood Insurance Rate Map (FIRM). This could include areas that may experience flooding during major and sudden rain events, known as pluvial flooding.
- Freeboard: Require new construction to be one or more feet above the Base Flood Elevation.
- Floodways: Prohibit new development in floodways.

Resources

- The Estimated Base Flood Elevation (estBFE) Viewer is available at https://webapps.usgs.gov/infrm/estBFE/.
- A full library of BLE materials is available at www.fema.gov/about/organization/region-6/base-level-engineering-ble-tools-and-resources.
- Floodplain ordinance basics can be found at www.fema.gov/glossary/floodplain-management-ordinances.
- Visit www.fema.gov/media-collection/model-code-coordinated-ordinances to see model code-coordinated ordinances. For specific questions about state requirements, contact your NFIP State Coordinator.

6.2 Example Ordinance Language with Base Level Engineering

Community officials can adopt BLE in different ways. They should first consider what goals they wish to achieve by adding BLE to their floodplain ordinance. Table 1 has examples your community can use as a starting point. They can be tailored to meet specific resilience goals. Before adopting any language, confirm it with your local floodplain administrator and NFIP State Coordinator.

Table 1: Example BLE Ordinance Language

When to Use	Sample Ordinance Language for Local Community Use
Defining BLE	***Base Level Engineering*** is an automated riverine hydrologic and hydraulic modeling approach that provides flood risk data that meet the technical mapping standards outlined in Federal Insurance and Mitigation Administration Policy 204-078-1 Standards for Flood Risk Analysis and Mapping. ***Base Level Engineering*** includes estimated floodplain extents, water surface elevation grids, and flood depth grids for Special Flood Hazard Areas.
	"***Base Level Engineering***" are flood risk datasets that meet the technical mapping standards outlined in FIMA Policy 204-078-1 Standards for Flood Risk Analysis and Mapping and include estimated floodplain extents (10%, 1% and 0.2% annual chance events), water surface elevation grids (1% and 0.2% annual change events), flood depth grids (1% and 0.2% annual chance events), and Hazus Flood Risk Assessment.
Statement of Purpose	The purpose of this ordinance is to promote the health, safety and general welfare of the public, to prevent adverse impacts from any floodplain development activities, and to minimize public and private losses due to flooding events in identified Special Flood Hazard Areas and additional areas identified in the ***Base Level Engineering*** data.
Lands to which the Ordinance Applies	The ordinance shall apply to all Special Flood Hazard Areas and additional areas identified in the ***Base Level Engineering*** data within the jurisdiction of [County, City, Town].
	Flood Risk Areas – Land areas that would be inundated by flood based on ***Base Level Engineering.*** This includes the expansions to the Special Flood Hazard Area as detailed in the Flood Risk Report.
	Special Flood Hazard Areas (SFHAs) – Geographical areas identified on FEMA Flood Insurance Rate Maps (FIRMs) as being at high-risk for flooding. The FIRMs show these areas as various flood risk zones [list SFHA zones, e.g., A1-30, AH, AO]. Any area outside the SFHA on the FIRM that is designated a **Flood Risk Area** shall also be considered an SFHA.
When BLE is to be used	Where ***Base Level Engineering*** is available, ▪ ***Base Level Engineering*** data shall be reviewed and reasonably used in FEMA-identified Special Flood Hazard Areas where base flood elevation and floodway data have not been identified and in areas where FEMA has not identified Special Flood Hazard Areas. ▪ Base flood elevations and designated floodway boundaries on FIRMs and in Flood Insurance Studies shall take precedence over base flood elevations and floodway boundaries delineated by ***Base Level Engineering*** if such source shows reduced floodway widths and/or lower base flood elevations. ***Base Level Engineering*** data shall be reasonably used if such source shows increased base flood elevations and/or larger floodway areas than are shown on FIRMs and in Flood Insurance Studies.
Identifying regulated floodplain areas using BLE	The regulated floodplain shall be any areas classified as Special Flood Hazard Areas (SFHAs) in the Flood Insurance Study (FIS) report and on the Flood Insurance Rate Map (FIRM) dated [effective map date] issued by the Federal Emergency Management Agency (FEMA), or the most recent revision thereof, including all digital supporting data. The regulated floodplain shall also include those areas determined to be flood prone through the reasonable and prudent use of other flood hazard information, including the results of a ***Base Level Engineering*** assessment.

When to Use	Sample Ordinance Language for Local Community Use
Zone A	***Base Level Engineering*** data will be reviewed and reasonably utilized in Zone A areas where Base Flood Elevations are not available. In the absence of ***Base Level Engineering*** information, elevation, floodplain and/or floodway information from Federal, State, or other sources or another method approved by [County, City, Town] shall be used.
	Base Level Engineering data shall be deemed the best available information in areas designated as Zone A on the FIRM where Base Flood Elevation are not available and in areas where FEMA has not identified Special Flood Hazard Areas.
Zone AE	Water surface elevations and floodplain boundaries resulting from a Base Level Engineering data or other source of approved flood hazard information shall take precedence over Base Flood Elevations and Special Flood Hazard Area boundaries on the effective FIRM and in the effective FIS report when the Base Level Engineering data or approved source flood hazard information are more conservative than the results from these sources.
Zone B, C, X, D	Where applicable, ***Base Level Engineering*** data shall be reviewed and utilized in areas where Special Flood Hazard Areas and Base Flood Elevations are not provided on the effective FIRM.
All zones	***Base Level Engineering*** data shall be deemed the best available information in areas where it is more conservative than the Base Flood Elevations or floodplain extents shown on the effective FIRM and in the effective FIS report.