



## **Hurricane Katrina Flood Recovery (Louisiana)**

### ***Questions and Answers about the Advisory Flood Elevations and the Katrina Recovery Maps***

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### **About the Advisory Base Flood Elevations (ABFEs)**

#### **WHAT IS AN "ADVISORY BASE FLOOD ELEVATION"?**

In many areas, the storm surges from Hurricane Katrina far exceeded the base flood elevations (BFEs) on the current effective Flood Insurance Rate Maps (FIRMs) for the Louisiana Gulf Coast. Even though Hurricane Katrina was a very large storm, it raised questions as to the validity of the current BFEs. FEMA has conducted a reassessment of those BFEs and determined they do not reflect the true risk. The Flood Recovery Guidance was developed to provide communities with Advisory Base Flood Elevations they can use in the reconstruction process until more detailed data become available.

#### **THE FLOOD RECOVERY GUIDANCE FOR MY COMMUNITY SHOWS ADVISORY BASE FLOOD ELEVATIONS BEING CALCULATED USING ADVISORY STILLWATER ELEVATIONS. HOW WERE THESE STILLWATER ELEVATIONS DERIVED?**

In response to Hurricanes Katrina and Rita, FEMA conducted a new flood frequency analysis which incorporates storm data from the past 35 years, including data from these storm events, long term tide gage records, and other engineering studies. The flood frequency analysis uses tide (water level) gage data, a collection of the water levels of the sea as it rises and falls, and observed high water marks in the impacted areas. The results of these analyses are Advisory Base Flood Elevations for coastal Louisiana parishes.

For certain parishes in Louisiana, the results of the flood frequency analysis determined the BFEs on the current FIRM may be underestimated. Current BFEs were found to be between 1 and 9 feet too low. In areas where elevations were only 1 to 2 feet too low, guidance has been provided in terms of applying a freeboard to current 1-percent-annual-chance BFE. Areas where current BFEs were found to be significantly low (3 feet or greater), alternative guidance is being provided which takes into consideration variations in ground elevation and estimated storm surge.

#### **WHAT IS A STORM SURGE STILLWATER ELEVATION (SWEL)?**

Storm Surge Stillwater Elevation (SWEL), is the flood level resulting from storm surge flooding during a projected 1-percent-annual-chance flood, or base flood. The SWEL does not include wind driven waves

which ride on top of the SWEL. The SWELs for Louisiana are referenced to National Geodetic Vertical Datum of 1929.

## THE FLOOD RECOVERY GUIDANCE FOR MY COMMUNITY SHOWS THE ADVISORY BASE FLOOD ELEVATIONS BEING CALCULATED USING FREEBOARD. WHAT IS FREEBOARD AND HOW WERE THE FREEBOARD ELEVATIONS DETERMINED?

Freeboard represents a safety factor expressed in feet above a known flood elevations and tends to compensate for the many unknown factors that could contribute to flood heights greater than the height calculated for a selected size flood.

As stated previously, FEMA conducted a new flood frequency analysis incorporating storm data from the past 35 years, including data from Katrina and Rita, tide gage records, and other engineering studies. The results of the analysis were advisory Stillwater elevations for coastal Louisiana Parishes.

The results of the flood frequency analysis suggests that current storm surge elevations are relatively unchanged; however, due to land subsidence and loss of protective coastal barrier over the last 10 to 20 years, higher storm surges and large waves can be expected to propagate further inland that previously estimated. For these reasons, FEMA expects BFEs to increase as it completes a more comprehensive storm surge modeling effort and is encouraging some communities adopt the freeboard elevation presented in their Flood Recovery Guidance. The Flood Recovery Guidance for these parishes provides a simplified methodology of using the current BFE on the effective FIRM and a freeboard elevation to calculate an Advisory Base Flood Elevation.

## WHY ARE THE ADVISORY BASE FLOOD ELEVATIONS HIGHER THAN THE ELEVATIONS SHOWN ON THE EFFECTIVE FLOOD INSURANCE RATE MAPS (FIRMS)?

For coastal areas, the flood elevations depicted on the effective FIRMs are based on studies that were performed more than 35 years ago. The Advisory Base Flood Elevations are higher than the elevations depicted on the effective FIRMs because they are based 35 additional years of flood data, including the effects of Hurricanes Katrina and Rita, in addition to accounting for the impacts of subsidence and the degradation of the coastal barriers.

## WHY ARE THE NEW ADVISORY BASE FLOOD ELEVATIONS LOWER THAN HURRICANES KATRINA AND RITA FLOOD ELEVATIONS?

The Advisory Base Flood Elevations are based on the 1-percent-annual-chance flood event, or 100-year flood. The Advisory Base Flood Elevations are lower than Hurricanes Katrina and Rita flood elevations because these were more extreme events than the base flood event. The elevations of the 1-percent-annual-chance flood are the Federal standard for floodplain management. Buildings constructed to this standard are still vulnerable to the effects of larger events like Hurricanes Katrina and Rita.

## HOW WILL THE ADVISORY ELEVATIONS COMPARE TO THE FINAL ELEVATIONS DEPICTED ON REVISED FIRMS?

In as early as 6 months from now, FEMA anticipates issuing preliminary FIRMs for many of the coastal Louisiana parishes however, these maps will not become effective until they have been through a formal appeals and adoption process. The final elevations to be depicted on revised FIRMs will be based on detailed

analyses of the coastal hazards and will include the data used for the Advisory Base Flood Elevations. The revised Flood Insurance Study and FIRM may show an increase of the SWELs, Special Flood Hazard Areas (SFHAs), and BFEs over existing flood data (including the storm data analysis and engineering studies used for this Flood Recovery Guidance), and may result in the coastal high hazard area (V Zone) moving further landward. Until detailed analyses are completed, the Advisory Base Flood Elevations should be used for floodplain management purposes as it is the best information we have available at this time.

## **About The Hurricane Katrina Surge Inundation And ABFE Maps**

### **WHAT ARE THE HURRICANE KATRINA SURGE INUNDATION AND ADVISORY BASE FLOOD ELEVATION MAPS?**

The Hurricane Katrina Surge Inundation and Advisory Base Flood Elevation Maps (also referred to as “Katrina Recovery Maps”) are a series of aerial photographs that show several kinds of coastal flood-related data for areas along the Louisiana coastline. They were developed by the Federal Emergency Management Agency (FEMA) in cooperation with other Federal and state agencies. To make the maps, FEMA used pre-existing data combined with information obtained immediately after Hurricane Katrina. The new information includes high water marks left behind by Hurricane Katrina, an estimate of Hurricane Katrina’s coastal flood limits, and advisory 1%-annual-chance (100-year) flood elevations (ABFEs) that can be used during reconstruction.

### **WHAT DO THE MAPS SHOW?**

The Katrina Recovery Maps provide the following information shown on aerial photographs:

- The estimated limits of the flooding, or surge inundation, caused by Hurricane Katrina. The Katrina Recovery Maps graphically show the approximate maximum extent of coastal floodwaters from Katrina.
- Preliminary storm surge elevations. Based on high water marks that were surveyed soon after Hurricane Katrina, FEMA developed a general schematic showing the height of the storm surge along the coastline. This information is shown as an estimated range of elevations on each map in the title block.
- Advisory Base Flood Elevations (ABFEs). These were developed to provide communities with recommendations on building elevations for use in the reconstruction process until more detailed data become available. ABFEs are based on a new flood frequency analysis that takes into account Hurricane Katrina, as well as additional tide and storm data from other events that have occurred since the existing Flood Insurance Rate Maps (FIRMs) were developed.

### **WHY WERE THE KATRINA RECOVERY MAPS DEVELOPED?**

The maps were developed to provide local governments and citizens with the best and most current information available about coastal flood hazards to assist in the rebuilding process.

### **HOW CAN I GET A COPY OF THE KATRINA RECOVERY MAPS?**

The maps can be found on FEMA's Katrina Recovery Map Web site. They can be viewed or downloaded from the site in a PDF format.

## HOW CAN I DETERMINE WHICH KATRINA RECOVERY MAP COVERS MY AREA?

The Katrina Recovery Mapping Web site includes general reference maps that show coastal areas in across the Louisiana parishes that were subject to severe, surge-related flooding by Hurricane Katrina (St. Tammany; Tangipahoa; portions of St. John the Baptist; portions of St. Charles; Jefferson; Orleans; St. Bernard; and Plaquemines). The Katrina Recovery Maps, which cover much smaller areas in greater detail, can be found by first clicking the mouse on the desired parish of interest. Then, users can click an individual Katrina Map panel (for example, "QQ42"), and the map will open in a separate browser window. The Katrina Recovery Maps can then be saved to a personal computer or printed. The individual Katrina Recovery Maps are 34 inches by 22 inches in size (ANSI D); all maps can be scaled to print on smaller sheets of paper using the printing options provided in the Adobe® Acrobat Reader software.

## Other Issues Surrounding the ABFEs

### WHAT IS LAND SUBSIDENCE?

Land subsidence is the lowering of the ground relative to a fixed reference point. The rate of subsidence varies from place to place but has been measured to be as high as 0.8 feet per decade in some parts of Louisiana. Subsidence increases flood risk by allowing storm surge and larger waves to propagate further inland.

### WHAT VERTICAL DATUM IS BEING USED FOR THE ELEVATION INFORMATION WITHIN LOUISIANA?

The vertical datum used within the effective Flood Insurance Studies for the coastal Louisiana parishes is National Geodetic Vertical Datum of 1929 (NGVD29). For the Flood Recovery Guidance, NGVD29 has also been utilized in determining the Advisory Base Flood Elevations. For additional information on NGVD29 and other vertical datum, please contact National Geodetic Survey.

### WHAT BENCH MARK INFORMATION SHOULD BE USED IN THE IMPACTED AREAS?

Bench mark information for the rebuild should be obtained from National Geodetic Survey. Updated bench mark elevation information is now available for coastal Louisiana, areas south of Interstate 10. This information should be incorporated into all recent, current, or planned surveying efforts in this region which are elevation sensitive. Contact National Geodetic Survey and the Louisiana Spatial Reference Center for updated or additional information on bench mark elevations and additional Global Positioning System sites in coastal Louisiana for the area south of Interstate 10. National Geodetic Survey has validated the heights of 85 existing bench marks using Global Positioning System, subsidence rates, and an improved geoid model. The data sheets for these Vertical Time-dependent positioning stations have been updated. Furthermore, these stations will be included in the re-adjustment of the National Spatial Reference System to be released in February 2007.

## Using Advisory Base Flood Elevations For Floodplain Management

### IS MY COMMUNITY REQUIRED TO USE THE ADVISORY BASE FLOOD ELEVATIONS

## DEVELOPED USING THE METHODS IN THE FLOOD RECOVERY GUIDANCE?

A community participating in the National Flood Insurance Program (NFIP) is not required however; they are urged to use the Advisory Base Flood Elevations. Ordinarily FEMA provides scientifically sound flood data to communities in accordance with a well defined regulatory process. This process involves providing preliminary data, affording an appeals procedure, finalizing the data and providing a six-month period of time for communities to adopt the data into their local ordinances and codes. FEMA cannot require a community to adopt new data unless it goes through this process. However, remapping and completing the entire regulatory process generally takes a minimum of two years from the inception of the restudy until new FIRMs become effective. The Flood Recovery Guidance is an interim product that will provide communities with a new estimate of the minimum flood elevations that they can use during reconstruction.

## WHAT ARE THE BENEFITS TO MY COMMUNITY OF ADOPTING THE ADVISORY BASE FLOOD ELEVATIONS?

Hurricanes Katrina and Rita demonstrated the BFEs and flood boundaries on the current FIRMs may not provide an appropriate level of protection for new buildings and repairs of substantially damaged buildings. FEMA has developed the Advisory Base Flood Elevations to provide communities with an interim product they can use during reconstruction to assure that new buildings and repairs of substantially damaged buildings are reasonably protected from future flood damage.

Although FEMA can not require communities to adopt the Advisory Base Flood Elevations, continued use of the flood data on the current FIRMs could result in residential and commercial buildings that will be vulnerable to flood damage because they will not be built high enough or have the structural integrity to resist flood forces that may be encountered in future large events.

## IF MY COMMUNITY WISHES TO USE THE ADVISORY BASE FLOOD ELEVATIONS, WILL IT NEED TO AMEND ITS FLOODPLAIN MANAGEMENT REGULATIONS TO INCORPORATE THE NEW DATA?

Generally yes. Your floodplain administrator will need the authority to require use of the Advisory Base Flood Elevations instead of the base flood elevations on your current effective FIRM. If your community chooses to use this information, FEMA advises that the community formally adopt the flood hazard data so that it is legally enforceable. When communities receive Advisory Base Flood hazard data or have evidence that there is an increased flood hazard risk, communities have a responsibility to evaluate and prudently use this information for actions in the floodplain to ensure that structures are not vulnerable to flood damage and the health and safety of citizens are protected.

## WHAT LANGUAGE SHOULD MY COMMUNITY USE TO ADOPT BASE FLOOD ELEVATIONS BASED ON THE METHODOLOGY IN THE FLOOD RECOVERY GUIDANCE?

FEMA recommends that your community amend its floodplain management regulations to adopt the still water elevation(s) and the method for calculating the Advisory Base Flood Elevation provided in the Flood Recovery Guidance for your county. Your community may want to consider adopting the following or similar language:

*The base flood elevations used for the purpose of administering this ordinance shall be established by the Building Official (or Floodplain Administrator) using Stillwater elevations*

*(SWEL) and methodology described in FEMA's Flood Recovery Guidance for \_\_\_\_\_ Parish, dated \_\_\_\_\_. The Flood Recovery Guidance shall also be used by the Building Official as the basis for determining the landward boundary of the floodplain.*

If your community chooses to adopt freeboard, you should incorporate the freeboard at the appropriate places in your ordinance.

#### WHAT IF MY COMMUNITY HAS ADOPTED THE INTERNATIONAL BUILDING CODE?

If your community has adopted the International Building Code, you should adopt the Advisory Base Flood Elevations based on the methodology described in the Flood Recovery Guidance in the same way. Your floodplain administrator may need to seek advice from the community's attorney on how to specifically reference the Flood Recovery Guidance in the community's floodplain management regulations.

#### WILL FEMA PROVIDE UPDATED INFORMATION BESIDES THE FLOOD RECOVERY GUIDANCE AND WILL MY COMMUNITY BE REQUIRED TO ADOPT THIS INFORMATION?

The Flood Recovery Guidance is interim data produced to help communities respond to the need to immediately process permits necessary to begin reconstruction. By the end of 2005, FEMA will issue maps showing the inundation area and measured height of Hurricanes Katrina and Rita. Advisory Base Flood Elevations will not be mapped for areas where FEMA is recommending the use of freeboard; however, in areas where Advisory Base Flood Elevations are calculated using advisory Stillwater elevations and ground elevation information, Advisory Base Flood Elevations will be mapped. All maps produced will be available on the FEMA website at [www.fema.gov/hazard/flood/recoverydata/](http://www.fema.gov/hazard/flood/recoverydata/).

In the as early as 6 months from now, FEMA anticipates completing a formal restudy of many of the coastal Louisiana parishes and will be producing preliminary FIRMs. Copies of these preliminary maps will become available for community review. Once released, the preliminary FIRM will go through a formal appeals and community adoption process. As a community participating in the NFIP you are required to adopt the revised maps on or before the effective date. Until that time, we strongly urge that your community utilize the Flood Recovery Guidance and any additional data we provide you in administering your floodplain management regulations during reconstruction. It will continue to be your choice whether or not to adopt this data.

#### ARE THERE ADDITIONAL REQUIREMENTS THAT COMMUNITIES SHOULD CONSIDER ADOPTING BESIDES THE ADVISORY BASE FLOOD ELEVATIONS?

Yes. NFIP floodplain management requirements have special provisions that apply in coastal high hazard areas or V zones. Because these areas are subject to wave impacts and high velocity floodwaters, buildings must be elevated on piles or columns so the bottom of the lowest horizontal structural member (usually a floor beam) is above the BFE. This allows waves to pass under the building. Recent experience has shown that wave impacts and debris are a problem in many coastal areas which are currently designated as A zones or even as B, C, and X zones. To adequately protect buildings from wave impacts, communities should consider requiring V-zone construction methods in any zones where waves were experienced during Hurricanes Katrina and Rita. These areas can be determined using the same calculation used to calculate the wave height. Communities should consider requiring V zone type construction in any area where the wave height is greater than one foot. This could include areas designated as B, C, and X when there are storms greater than the base flood event. Guidance on construction in coastal A zones can be found in FEMA's Coastal Construction Manual (FEMA 55) (PDF 216 KB) and ASCE 24: Flood Resistant Design and Construction.

IN AREAS WHERE THE SURGE ELEVATIONS FROM HURRICANES KATRINA AND RITA ARE WELL ABOVE THE ADVISORY BASE FLOOD ELEVATIONS FEMA HAS RECOMMENDED, HOW CAN COMMUNITIES PROVIDE ADDITIONAL LEVELS OF PROTECTION TO PROTECT BUILDINGS FROM LARGER EVENTS SUCH AS HURRICANES KATRINA AND RITA?

The Advisory Base Flood Elevations are FEMA's best estimate at this time of the 1-percent annual chance or 100-year elevations along the Louisiana Gulf Coast. Even though they are higher than the BFEs on the current FIRMs, they may still be well below the flood elevations from Hurricanes Katrina and Rita experienced in most areas. Future Category 4 and 5 hurricanes could create similar flood elevations. Although the NFIP uses the base flood as its standard level of protection, nothing in NFIP minimum standards prevents communities from adopting higher standards if the situation warrants and they are encouraged to do so. Some things communities and property owners could do to provide additional protection include:

- Adopt or use freeboard on top of the Advisory Base Flood Elevations. Adding freeboard to the Advisory Base Flood Elevation would provide significant additional protection.
- Require the use of pile or column foundations to elevate residential buildings a full story above ground even in those areas where the Advisory Base Flood Elevations indicate shallow flooding. These foundations can be designed to withstand wave impacts.
- Put parking levels below commercial and multi-family residential buildings to raise the first floor of the building above ground level.

MY COMMUNITY'S ADVISORY BASE FLOOD ELEVATIONS ARE DETERMINED USING ADVISORY STILLWATER ELEVATIONS, CAN MY COMMUNITY ADOPT A FREEBOARD REQUIREMENT ON TOP OF ITS CURRENT BFES AS AN ALTERNATIVE TO ADOPTING THE ADVISORY BASE FLOOD ELEVATIONS?

Yes. One way that has been identified to protect buildings from increased flood hazards is to require freeboard on top of the current effective BFEs on the FIRM. Freeboard is an added safety factor expressed in feet that many communities add to their BFEs to account for uncertainty or provide an increased level of protection. Communities can use the Advisory Base Flood Elevations to help determine the amount of freeboard that would provide a reasonable level of protection and adopt that level of freeboard into their ordinance. For example if the current BFE at a location is 14 feet above sea level and the community adopts a 3 foot freeboard, new and substantially improved and damaged buildings would have to have their lowest floods elevated to 17 feet above sea level. One issue with this approach is that there are no current effective BFEs in B, C, and X zones. Communities who choose the freeboard approach should consider adding the freeboard to the SWEL or current BFE for that area and using that elevation to determine the landward boundary of their floodplain.

WILL NFIP INCREASED COST OF COMPLIANCE (ICC) FLOOD INSURANCE COVERAGE PAY TO ELEVATE BUILDINGS TO THE ADVISORY BASE FLOOD ELEVATIONS?

Yes. If your community adopts and enforces the Advisory Base Flood Elevations and requires a substantially damaged building to be elevated to that elevation, that building would qualify for ICC coverage provided that it met the other requirements in the policy. ICC would pay the cost of elevating the building to the Advisory Base Flood Elevation and the adopted freeboard up to the \$30,000 limit for ICC coverage. Coverage would also be available if your ordinance applies those elevations to areas that are currently mapped as B, C, or X zones or applies V zone construction standards to areas currently mapped as A zones.

## CAN MY COMMUNITY GET CREDIT UNDER THE NFIP COMMUNITY RATING SYSTEM (CRS) FOR ADOPTING ADVISORY BASE FLOOD ELEVATIONS OR FREEBOARD?

Yes. A number of communities on the Louisiana Gulf Coast participate in the NFIP's CRS. Policyholders in these communities receive discounts on their flood insurance premiums because their communities are implementing floodplain management programs that go beyond the minimum requirements of the NFIP. Communities could receive CRS credit for adopting and enforcing the Advisory Base Flood Elevations or for adopting and enforcing freeboard requirements. Credits for adopting the Advisory Base Flood Elevations would be in effect until a revised FIRM became effective.

### **Insurance Implications**

#### IF COMMUNITIES ADOPT AND UTILIZE THE ADVISORY BASE FLOOD ELEVATIONS, HOW WILL IT AFFECT THEIR CITIZENS' FLOOD INSURANCE POLICIES?

Since the remapping process generally takes a minimum of two years from the inception of the restudy until new FIRMs become effective, the flood insurance policies in your community will continue to be rated using the zones and flood elevations on the current effective FIRM.

Additionally, communities that participate in the NFIP's CRS can apply for more credit points based on their adoption of standards higher than the NFIP's minimum requirements. This can result in additional premium discounts for all policyholders in the community.

#### IF BUILDINGS ARE CONSTRUCTED IN COMPLIANCE WITH THE ADVISORY BASE FLOOD ELEVATIONS, HOW WILL THAT AFFECT THEIR PREMIUMS?

If the Advisory Base Flood Elevations are higher than the BFE on the existing FIRM, the flood insurance premiums for buildings constructed to those new elevations will be much lower.

#### WHAT HAPPENS TO EXISTING FLOOD INSURANCE POLICIES IF THE FIRMS ARE REVISED IN THE FUTURE TO REFLECT NEW HIGHER BFES?

Existing policies can continue using the same zone and BFE on the FIRM that was in effect at the time the building was constructed, as long as it is to their advantage and the building was constructed in compliance with local floodplain management ordinances.