

## **Levee Related:**

**1. *How does FEMA's levee policy reflect specific levee failure locations?***

When mapping areas protected by non-certified (by the Army Corps of Engineers - USACE) levees, FEMA considers a potential levee failure into account. Because we cannot predict exactly where a levee will fail, we must consider the effects of a failure at any point along the structure. By using computer models, we simulate what would happen if a levee failed on one side of the river while the levee on the other side held. We follow the same procedure for both sides of the river and map the resulting flood conditions. We also model a scenario where both levees fail for additional comparisons. In some instances, base flood elevations can be higher on one side of the river than the other due to natural differences in terrain or filling that has occurred in the floodplain.

**2. *Why does FEMA use calculated levee failures to determine the 100-year flood elevation?***

FEMA takes all of the results from the levee failure scenarios and maps the highest resulting base flood elevation. While this may seem overly conservative, we cannot predict exactly where a levee will fail so we must show the potential risk equally. Combining all three levee scenarios allows us to determine how high the 100-year flood would be in the event of a left bank levee failure, a right bank failure, or a simultaneous levee failure on both sides of the river. Our maps reflect base flood elevations and floodplain boundaries that account for these possibilities so that the public can be aware of the risk of living behind levees and take appropriate steps to elevate their structures and have appropriate flood insurance coverage.

**3. *Are there other floodplains in the country that are similar to those in the Skagit Delta where FEMA's levee policy was determined to be not applicable?***

Throughout the United States, communities are taking steps to work with FEMA and the Army Corps of Engineers to re-evaluate their flood control structures and better map the flood risk in areas protected by levees. In Eureka, Utah (FEMA Region 8), a private engineering firm is also using the Flo-2D model to map their floodplains. While the river systems may not be identical to the Skagit, citizens in UT also have concerns that floodplain maps are accurate. Following a nation-wide standard approach to floodplain mapping and data analysis, study contractors around the country are required to follow FEMA's guidelines and specifications for studying and creating updated Flood Insurance Rate Maps.

**4. *What does it take to certify existing levees to meet FEMA standards?***

In order for FEMA to certify that a riverine levee is capable of providing protection during a 100-year flood, the system must be able to meet the standards outlined in Section 65.10 of 44 Code of Federal Regulations. Certification for existing levees includes, but is not limited to, an evaluation of the levee's freeboard, design criteria, embankment protection, interior drainage, and its operations and maintenance plan. A detailed levee analysis can be done by a community (through a registered professional engineer) or in coordination with the Army Corps of Engineers. The national standards are rigorous; however, if certified, the area protected by the levee may be removed from the special flood hazard area making flood insurance optional to property owners.

## **BFE Related**

**5. *There have only been 26 flood insurance claims since the 1985 maps were issued for Burlington. Don't the levees provide enough protection?***

Levees in Burlington offer great flood protection, even though they do not protect against the 100-year flood. With the high level of protection offered by the Burlington levees, only the largest floods will impact the City. More frequent flooding in the range of roughly the 10 to 50-year flood will generally be contained within the levees. Of the 12 floods that have occurred in the last 32 years, none has been greater than a 40-year flood in the Burlington-Mount Vernon area. So even though there have been relatively few flood claims in Burlington since 1985, a major flood exceeding those that have been seen to date could cause catastrophic damages. The 100-year flood is the flood that is required by law to be depicted on the FEMA maps. In order for FEMA to show the levees as providing protection, they must be able to contain and protect against the 100-year flood.

**6. *What is the difference between the 100 year flood and lesser floods along the Skagit River?***

Statistically, there is a 46% chance of having a 50-year flood during a 30 year period. FEMA routinely evaluates the 10, 50, 100, and 500-year flood elevations during detailed re-studies. Calculating the 50-year flood event provides another way to evaluate surface water elevations during more frequently recurring floods. FEMA's new re-study uses a USACE projected 100-year flood discharge of 226,600 cubic feet per second (cfs) and a 50-year discharge of 185,000 cfs. When we compared the difference in water surface elevations between these two flood events, we found (on average) that the 50-year flood elevation was only 1'-1.5' lower than the 100-year flood.

**7. *FEMA did a similar study in 1984 using the same 100 year flow and came up with lower Base Flood Elevations. Why are things different now?***

Our ability to more accurately model complex river systems has improved remarkably over the last 30 years. The computational and processing power in today's computers can easily calculate complex equations that better approximate the real physical flooding process. Today's models can factor conditions that could not be easily evaluated 30 years ago. New models, like Flo-2D, can consider factors such as water lost from the river due to off site storage, the effects of time and severity of the storm on the river in multiple locations, simultaneous movement of water in multiple directions, and more. The model also considers how various levee failures would affect the depth of the 100-year flood in various locations. This level of detailed analysis was not performed in previous studies. This fact is most evident in the Fir Island area. When we compared the water surface elevations that were witnessed during recent flood disasters, we noted that the observed flood elevations exceeded the old study's 100-year flood height by several feet in many locations. This confirms that previous models did not include the conditions of a failed levee. Although the expected amount of water in the river during a 100-year flood is similar to the original study, our ability to better model the complexities of the river system as well as levee failures, in addition to documented flood disasters, indicates that the effects of 100-year flood could be more severe than previously stated.

## **Floodway**

**8. *Would a floodway be centered on the river or could it be located in overflow (bypass) areas?***

FEMA may initially produce a floodway map that shows equal amount of land on both sides of the channel being reserved to pass the 100-year flood without causing more than a 1 foot increase in water surface elevation. This is commonly known as an “equal conveyance floodway” because it shares development restrictions linked to floodways with communities on both sides of the river. However, the floodway is a development tool that is adopted by local governments. Thus, local governments can work with FEMA to configure its floodway in a variety of different locations as long as it meets FEMA’s conveyance requirements.

**9. *How will the State prohibition on residences in the floodway be dealt with when determining a floodway?***

State law specifies that there can be no new construction of residences in the floodway, nor can an existing residential structure be substantially improved (improved over 50 percent of the market value of the structure). The law is based on life-safety issues that recognize more severe conditions in the floodway than in the remainder of the floodplain. Certainly when determining a floodway, heavily residential areas should be avoided wherever possible. While there are serious ramifications wherever a floodway is located, there is greater flexibility regarding nonresidential uses than there are for residential uses.

**10. *Is there any chance FEMA will not use a floodway (like the current maps)?***

A floodway is essentially a planning tool that communities adopt that allows them to preserve an open area adjacent to the river large enough to allow the 100-year flood to pass without increasing water surface elevations greater than 1 foot in any location. The Skagit River Delta does not currently have any mapped dedicated locations like a floodway. Since 1984, FEMA has relied on local community ordinances to strictly regulate development in areas considered to be the most hazardous (i.e. deep and fast flowing overflow channels). Without a dedicated floodway, it is difficult to uniformly monitor the floodplain and preserve this critical flow area. As conveyance space is blocked, base flood elevations raise. Over time, this can result in worse flooding, higher base flood elevations, and reduced map accuracy. As such, FEMA intends to add a floodway to the Skagit County maps in the future, but we have not yet begun a floodway identification process.

## **Model & Mapping**

**11. *Did FEMA consider sticking with its methodology of using 3 flow paths to delineate flooding in the Delta as it did in preparing its 1985 maps?***

The decision to use 3 separate flow paths in 1985 was, in part, due to limitations of the available computer models. In order to accommodate the river and match observed flooding, it was necessary to make several assumptions about where the water would go. The original modeling estimated that a certain quantity of water would exit the river (and not return) at various points. It also assumed a certain amount would stay in the channel. The new model does not necessarily rely on these simplified assumptions.

**12. *Why did the Corps of Engineers and FEMA choose to use a different computer model to map the Skagit River?***

Computer models used to map floodplains use hydrologic and topographic information to determine where flooding could occur. A model called “Flo-2D” was used for this study because of its ability to factor in complex river conditions that affect flooding. It is a “2-dimensional unsteady-state model,” meaning, it considers the amount of water entering *or exiting* the river system (2-dimensions) as the river rises, crests, and falls over time (unsteady-state). Flo2D evaluates multiple flood peaks occurring at different time intervals and locations, flooding associated with ponding in areas outside of the river, and water lost from the main channel that does not necessarily re-enter the river. This type of advanced modeling requires significant computer capacity that was not widely available 30 years ago.

The existing flood insurance study, conducted in the early 1980s, used a “1-dimensional steady-state model.” This type of model uses a single estimated maximum amount of water that could enter the river (steady-state) and routes it in a uniform direction downstream (1-dimension). 1-dimensional models rely on a variety of simplified engineering assumptions. As hydraulic conditions become more complicated, this type of model becomes less accurate.

**13. *What alternatives did FEMA evaluate for mapping the 100-year floodplain?***

FEMA evaluated as many as 9 different possible scenarios that could occur at any site along the river. We evaluated what would happen if there were no levees and the river were allowed to flood the entire valley. The results of this model suggested that the 100-year flood elevations would be drastically lower than observed flooding that has occurred in multiple locations during different floods. The results of this model were skewed by many factors and the results, while informative, do not reflect the 100-year flood. We also evaluated what would happen if the entire river system was contained within levees. This result removed the floodplain from the entire County, but was purely hypothetical. The results of this model help FEMA and interested communities understand how high levees would need to be in order to meet FEMA standards for 100-year certifiable levees. The other 6 runs contained scenarios where discreet levee sections were “failed” in the model to show what the resulting flood would look like. Each scenario provided a glimpse of how deep water would be when a given levee failed. By aggregating the different levee failure scenarios, we were able to determine what the floodplain could look like during a 100-year flood. FEMA uses this multi-scenario process to map the floodplain because it most appropriately accounts for possible levee failures (which have historically occurred throughout Skagit County). The 100-year flood elevations shown on the new maps reflect what would occur if a levee failed near your house, but remained intact on the other side of the river.

**Insurance**

**14. *How expensive will my flood insurance be if the interior grade of my crawlspace is below the exterior grade?***

FEMA refers to this as a below-grade crawlspace. FEMA regulations allow crawlspaces, but prohibit crawlspaces that are below-grade (below the exterior ground level) on all sides. However, a Technical Bulletin was issued in 2001 that does allow below-grade crawlspaces, as long as the community adopts regulations specifically allowing the below-grade crawlspaces and the interior grade of the below-grade crawlspace is no more than 2 feet

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below the lowest exterior grade. If this and a couple of other measures are met, flood insurance will cost more but the cost will not be excessive; generally the additional cost will be between \$75 and \$125 on an annual premium. However, if the below-grade crawlspace is more than 2 feet below the lowest exterior grade, flood insurance costs can increase greatly.

**15. *Of the cases FEMA is aware of that have had to be “special rated,” how many of these involved crawlspaces that are greater than two feet below the lowest exterior grade?***

Most of the cases needing special rating that FEMA has reviewed from Skagit Valley communities involve below-grade crawlspaces. Cases that are special rated cannot be rated using the FEMA insurance manual that is used for normal cases, and the process often results in higher rates and premiums. In a recent summary of special-rated cases, FEMA found that of 44 Skagit Delta cases, fully 35 were special rated because they had below-grade crawlspaces. Most of these were in Burlington. However, of the 35, only one case had its crawlspace elevation greater than 2 feet below the exterior grade; this was the only case where insurance rates were far above the average case that had a below-grade crawlspace. The other 34 cases were rated higher than normal, but within the \$75-\$125 range cited in Question No. 14 above.

**16. *How will the new maps affect my flood insurance premiums?***

FEMA has always had, and continues to have, a policy that allows grandfathering of flood insurance. The policy specifies that buildings built in compliance with the floodplain management regulations in effect at the time the building was built, will usually continue to be rated in accordance with rates in effect at the time of construction, even though higher flood elevations or more restrictive flood zones result from map revisions. A property owner must have adequate documentation, which usually consists of a photocopy of the map in effect when the building was built, together with an Elevation Certificate indicating that the building was built in compliance. Thus, there should be little impact on existing flood insurance premiums with the higher elevations. New buildings will have to be constructed to meet the new elevations, but being built in compliance will mean that these buildings, too, will not pay excessive rates.

**17. *Will my flood insurance rating always be grandfathered?***

FEMA's grandfathering policy has been maintained throughout the Program's 39-year history; however, one could not say for certain that the policy will not be changed in the future. Currently, there are no efforts to change it. Even if it were to be changed, there would probably be a cap on rates that would assure that property owners would not have to pay excessive costs for their flood insurance.

**18. *My home was built to minimize flood insurance costs under current NFIP rules. What will happen to my insurance rates?***

Based on FEMA's policy of grandfathering flood insurance, rating for a structure such as this should not change, assuming there is adequate documentation from the property owner (a copy of the original map and an Elevation Certificate showing the building was built in compliance with the map and regulations). If grandfathering that has been in effect for 39 years is ever discontinued, it would be hard to speculate what would happen to the rates, but

there is a good likelihood that any increases would be capped to assure that property owners would not be subject to excessive costs.

## **Building Standards**

### ***19. How can I fix the problem of having a crawlspace that does not meet the FEMA requirement to be only 2 feet below exterior grade?***

If a building exceeds the FEMA criterion that a below-grade crawlspace can be no greater than 2 feet below the exterior grade, there are a couple of remedies. First, the property owner could import fill to the crawlspace in order to bring the interior grade within the 2-foot criterion or, better, that brings the interior grade level with the exterior grade. When the interior and exterior grades are the same, there is no extra charge for flood insurance; when the interior grade is within two feet of the exterior grade, the modest additional charge is applied (usually \$75-\$125). Crawlspace that exceed the 2-foot criterion will incur very high insurance rates. Another possible remedy is to lower the exterior grade on at least one side of the structure, so that the lowest exterior grade is equal to the interior grade. Either of these remedies will result in lower insurance rating.

### ***20. What will result from people continuing to bring in fill to elevate structures as a result of higher Base Flood Elevations (BFEs)? Will the result be even higher BFEs in the future because floodplain storage will be lost?***

While fill is an accepted method of elevating structures above flood levels, fills can have detrimental effects. FEMA's maps usually depict a floodway, which is a zone where fills and other encroachments cannot be allowed. Encroachments are allowed in the remainder of the floodplain, called the flood fringe. However, even here fills can be harmful by removing floodwater storage areas thereby altering the natural hydrology and causing increased flood levels. In the Skagit Delta, FEMA has not yet provided a floodway, so the issue of increased fills is even more critical. Here, it is possible that increased fills will further increase BFEs over time. A floodway delineation will help to minimize increases from fills, but only a flood control project will completely solve this issue.

## **Public Process & General Information**

### ***21. What is the difference between a "work map" and a "preliminary map"?***

Maps that resemble our typical Flood Insurance Rate Maps (FIRM) are shared with the general public once the data has undergone several levels of independent and internal review. These maps fall under two categories: a "work map" and a "Preliminary FIRM." A *work map* is produced by the Study Contractor and contains the results of their study. This map is provided to FEMA, the County, and City officials once it is at an acceptable level of completion. Once FEMA receives the map and supporting study data, it is subjected to multiple internal reviews of the information by thoroughly examining the model and other technical aspects of the study. This rigorous review period can take several months to conduct. If the information meets FEMA's quality standards, then it is converted into a conventional Flood Insurance Rate Map product.

These "preliminary" maps will also be shared with the public and each community. FEMA solicits comments on the preliminary maps. Preliminary maps are transmitted to community

officials for their review and use. Within 30 days of receipt, FEMA will arrange to meet with local staffs to go over the maps and discuss various assumptions and technical considerations that were made during production. The Study Contractor will also attend these meetings. Multiple evening public meetings are often arranged, in coordination with the affected community officials, to share the maps and discuss the public comment and appeal period. Appeals and protests to the maps are collected and considered during a final technical review period. This is done to assure that the maps contain the most accurate data available as provided by the study contractor and local interested parties. Once these redundant reviews are completed, the maps become regulatory with a new effective date assigned.

**22. *Has Hurricane Katrina influenced FEMA's approach to floodplain mapping?***

This is a myth. The Flood Insurance Study process and the rates established to determine an annual flood insurance premium have not changed as a result of the hurricane. FEMA and the U.S. Army Corps of Engineers were charged with re-evaluating and re-certifying the nation's levee systems before Hurricane Katrina occurred. Flood insurance premiums and rates, established annually by FEMA, have not been artificially raised due to any single disaster or hurricane.

**23. *What is the timeline and appeal process should someone disagree with the maps?***

During the study process, the maps undergo many iterations and changes as new information is provided by communities, citizens, or the study contractor. FEMA assembles all of these data and produces a Preliminary Flood Insurance Rate Map (FIRM). Once we provide this map to community officials, FEMA will conduct several meetings. The official 90-day appeal process begins on the date of the second newspaper publication noting that new maps have been released that contain new base flood elevations. Communities can expect to see two publications in local newspapers after a series of meetings conducted between FEMA and NFIP participating communities. These meetings also include public meetings where FEMA staff will be available to explain, in detail, the results of the study (as shown on the Preliminary FIRM). While this appeal period runs for 90 days, FEMA maps can always be revised (based on better technical data) by way of a Letter of Map Revision.

**24. *Where can I get my questions answered should I have more informational needs?***

FEMA recommends that citizens contact their local government as the best source of information regarding the NFIP. In unincorporated Skagit County, contact should be made with either the Natural Resources Management Division of Public Works or the Building Services Division of Planning and Development Services. In the Cities, contact should be made with the city planning departments. These contacts can provide you with information on flood maps and on their regulations that pertain to building restrictions in floodplains. Additional information can be obtained from the FEMA website ([www.fema.gov](http://www.fema.gov)); this includes information on the status of communities in the NFIP and also includes flood map information. Individuals can find flood maps that include their property by clicking on the FEMA "Map Service Center." They can even print portions of maps pertaining to their area of interest from this source. Another FEMA website that is also very helpful is [www.floodsmart.gov](http://www.floodsmart.gov). Here, people can get information on their flood risk (by address), estimates of premiums for flood insurance on their property, agents serving their area, specific costs of repairing flood-damaged structures, definitions of FEMA flood zones, flood

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facts, statistics and frequently asked questions, and much more. Additional contacts may include the FEMA Region X Office in Bothell, and the State Department of Ecology office in Bellevue.

### **25. Common definitions in the NFIP...**

Following are some definitions that are commonly used in the NFIP.

**Area of Special Flood Hazard:** is the land in the flood plain within a community subject to a one percent or greater chance of flooding in any given year. Designation on maps always includes the letters A or V.

**Base Flood:** the flood having a 1% chance of being equaled or exceeded in any given year (also referred to as the “100-year flood”). Designated on Flood Insurance Rate Maps by the letters A or V. The FEMA **floodplain** is the base, or 100-year, floodplain.

**Base Flood Elevations (BFEs)** are the wavy lines on the maps that depict the 100-year flood elevations at various places in the floodplain.

**Basement:** means any area of the building having its floor sub-grade (below ground level) on all sides.

**Community Rating System (CRS):** a voluntary element of the NFIP that rewards communities for exceeding minimum requirements of the NFIP by reducing flood insurance costs by 5 to 45 percent. Credit points are given for 18 floodplain mitigation elements; the more credit points a community gets, the lower the flood insurance costs for residents of the community. Similar to fire rating in communities.

**Development:** 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 located within the area of special flood hazard.

**Elevation Certificate:** means the official form (FEMA Form 81-31) used to track development, provide elevation information necessary to ensure compliance with community floodplain management ordinances, and determine the proper insurance premium rate with Section B completed by Community Officials.

**Flood Insurance Rate Map (FIRM):** means the official map on which the Federal Insurance Administration has delineated both the areas of special flood hazards and the risk premium zones applicable to the community.

**Flood Insurance Study (FIS):** means the official report provided by the Federal Insurance Administration that includes flood profiles, the Flood Insurance Rate Maps, and the water surface elevation of the base flood.

**Floodway:** means the channel of a river or other watercourse and the adjacent land areas that must be reserved in order to discharge the base flood without cumulatively increasing the water surface elevation more than one foot.

**Flood Insurance “Grandfathering”:** see questions 17 and 18 above.

**Increased Cost of Compliance (ICC):** additional coverage in the Standard Flood Insurance Policy that provides up to \$30,000 to elevate, relocate or demolish a structure that has been cited



to be substantially damaged due to flooding. Damages must be cited by the local building official.

**Lowest Floor:** 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 the floodplain development ordinance.

**Structure:** a walled and roofed building, including a gas or liquid storage tank that is principally above ground.

**Substantial Improvement:** means any repair, reconstruction, or improvement of a structure, the cost of which equals or exceeds 50 percent of the market value of the structure either:

- 1) Before the improvement or repair is started; or
- 2) If the structure has been damaged and is being restored, before the damage occurred. For the purposes of this definition "substantial improvement" is considered to occur 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 structure.

**26. *Why change at all? Is FEMA required to update their maps?***

The NFIP is a partnership program. In return for adopting an ordinance and regulating development in the floodplain, flood insurance is made available to residents and FEMA agrees to identify and publish information about areas subject to flooding. As conditions evolve within a basin or change along a river, the study must be updated to reflect the changes.

**27. *When will the new maps replace the old ones?***

All FEMA Flood Insurance Rate Maps (FIRM) contain a date. Some maps, like the Preliminary maps, are still considered subject to change. As such, these maps do not affect insurance rates nor do they trigger mandatory purchase requirements for lending/banking institutions. However, after the 90 day appeal period occurs, and all submitted appeals have been addressed, FEMA will re-issue the maps in conjunction with a "Letter of Final Base Flood Elevation Determination." This document is an official notice to communities, homeowners, insurance companies, banks, and lenders that the base flood elevations shown on the maps are legally binding and that the communities must adopt the information within 6 months (or by the effective date printed in the determination letter). The Determination letter and the re-issued final maps will contain an "effective date" after which the maps will be used by all stakeholders.

**28. *Why will the AO Zones change?***

The AO Zones that appear on the existing maps were used because areas adjacent to the levees were not part of the hydraulic flow paths, given limitations of earlier study methods. Instead, these areas would be flooded through levee overtopping. This would produce sheet flow, with high velocities, that were best characterized using the AO Zone FEMA criteria. These initial high velocities were developed through separate equations, and range up to 9 feet per second; they would occur over a short distance until they merge with the flow paths

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of lower velocity. With newer and much improved modeling techniques, areas adjacent to the levees can now be modeled as part of the riverine flow path, thus negating the need for separate equations and the AO Zone designation. This is a plus for residents currently in the AO Zone, because AO Zone rating does not recognize the axiom in the NFIP that “the higher you build, the lower the rate.” The AO Zone rate is fixed, in that a reasonable rate is provided if a building is at the required depth, but buildings built higher cannot get reduced rates, as in other zones.