Certified Floodplain Management Home Study Guide

1998

Federal Emergency Management Agency - FEMA

CFM Sample Exam

Home Study Course Final Examination

Shade in the appropriate letters on the answer sheet. There is only one correct answer for each question. When you have finished, send it to the Emergency Management Institute Home Study office as indicated in your materials.

Questions 1 - 20 are true or false statements. Mark "a" for true and "b" for false.

1) True or false: A good floodplain management program must regulate construction outside of the floodplain to ensure that watershed development does not increase flood problems.

2) True or false: Most communities joined the NFIP after the 1973 Flood Disaster Protection Act mandated the purchase of flood insurance as a condition of federal aid or federally-insured loans.

3) True or false: As you go inland on a coastal floodplain, the difference between the 100-year stillwater elevation and the regulatory flood elevation gets larger and larger.

4) True or false: The mandatory flood insurance purchase requirement only affects buildings in the Special Flood Hazard Area mapped by FEMA.

5) True or false: Flood insurance premiums can be lower for new buildings built to standards higher than the minimum NFIP requirements.

6) True or false: The Q3 is more accurate than the paper FIRM and should be used for floodplain management purposes.

7) True or false: The rules for subdivisions also apply to other large projects like manufactured home parks, apartment complexes and planned unit developments.

8) True or false: The best time to verify a construction project's setbacks and floodway encroachment is before construction starts.

9) True or false: The best time to verify the lowest floor elevation is when the house is finished.

10) True or false: After an elevated building has received a certificate of use or occupancy, you should still periodically check it to see if it is compliant with the requirements of your floodplain ordinance.

11) True or false: The base flood elevation is two feet above the floor on a one-story pre-FIRM house. It is OK to add a second story without modifying the house because the entire addition will be above the BFE.

12) True or false: The NFIP can provide financial assistance to help property owners bring their flooded homes into compliance with the substantial damage requirements.

13) True or false: A flood insurance policy does not cover cracks in the walls of the basement of a publicly owned building, even if the cracks were caused by a flood.

14) True or false: Once a LOMA is issued to remove a building from the SFHA, a bank cannot require flood insurance as a condition of a federally-insured loan.

15) True or false: Property owners are not allowed to make any repairs to flood damaged properties until the permit office has determined whether the buildings are substantially damaged.

16) True or false: A Presidential disaster declaration allows local officials to vary from the Federal floodplain management regulations in order to expedite recovery operations.

17) True or false: The NFIP recommends that communities adopt additional, more restrictive regulatory standards

18) True or false: Requiring freeboard means more flood protection AND lower flood insurance premiums.

19) True or false: FEMA's mitigation assistance programs are provided only after your community has received a disaster declaration.

Questions 21 - 100 are multiple choice. There is only one right answer for each question.

20) What type of flooding has caused the most deaths?

a) Riverine
b) Flash
c) Hurricanes
d) Alluvial fan

21) Coastal erosion

a) Only occurs during storms
b) Is caused by tsunamis
c) Is cause by storm surge
d) Can be aggravated by human development

22) Which of the following are beneficial functions provided by floodplains?

a) Reduction in flood flows
b) Recharging of drinking water supplies

c) Recreation and aesthetic benefits
d) All of the above

23) Unregulated development in a floodplain can

a) Increase flood heights upstream
b) Increase flood heights downstream
c) Increase flood velocities
d) All of the above

24) Hydrostatic pressure on a building

a) Increases was the water gets deeper
b) Increases as the water moves faster
c) Increases the longer the water stays up
d) All of the above

25) Under the Unified National Program for Floodplain Management, which of the following can be appropriate floodplain management strategies?

a) Structural flood control projects
b) Flood insurance
c) Wetlands preservation
d) All of the above

26) Why was the NFIP created?

a) To stop development in floodplains
b) To provide financial assistance to insurance companies struggling to help flood victims
c) To shift the cost of disaster assistance to floodplain residents
d) All of the above

27) If a community does not regulate new construction to the minimum requirements of the NFIP,

a) The community can be suspended from the NFIP
b) Flood insurance premiums can be increased for ALL properties in the community
c) New buildings may suffer flood damage
d) All of the above

28) Which of the following agencies are responsible for enforcing the sanctions for non-participation in the NFIP?

a) Federal Emergency Management Agency
b) U.S. Environmental Protection Agency
c) Federal Deposit Insurance Corporation
d) All of the above

29) When it joins the NFIP, a community promises to

a) Regulate new development in the floodplain
b) Help prepare and revise NFIP maps
c) Help residents learn about flood insurance
d) All of the above

30) Which of the following best describes the base flood?

a) BFE
b) 500-year flood
c) One percent annual chance flood
d) Flood of record

31) Which of the following best describes the Special Flood Hazard Area?

a) Floodway
b) A, B, and C Zones
c) Base floodplain
d) BFE

32) What does an elevation reference mark tell you?

a) The elevation of the ground at the reference mark
b) The elevation of the ground at the building site
c) The base flood elevation
d) The local NGVD

33) Which of the following is used to describe the amount of water that comes downstream during a flood?

a) Hydrology
b) Hydraulics
c) Cross section
d) Discharge

34) What is the best source of base flood elevations for any location along a stream?

a) Profile
b) FIRM
c) Floodway data table
d) Flood Boundary Floodway Map

35) What is the best source of base flood elevations for any location along the ocean shoreline?

a) Profile
b) FIRM
c) Floodway data table

d) Flood Boundary Floodway Map

36) V Zones are floodplains where:

a) Waves are more than 3 feet above the stillwater flood elevation
b) Waves are less than 3 feet above the stillwater flood elevation
c) The stillwater flood elevation is outside the 100-year floodplain
d) Floodways have been mapped for coastal areas

37) A floodplain map that does not show base flood elevations was prepared by:

a) A detailed study
b) An approximate study
c) A hydrologic study
d) A flood insurance restudy

38) Under the minimum NFIP requirements, how much can flood heights be raised by filling or other development in the flood fringe?

a) 0
b) 1/10th of a foot
c) One foot
d) There is no restriction

39) Under the minimum NFIP requirements, how much can flood heights be raised by filling or other development in the regulatory floodway?

a) 0
b) 1/10th of a foot
c) One foot
d) There is no restriction

40) Ponding areas are usually designated on a FIRM as:

a) AO Zone
b) AH Zone
c) AR Zone
d) All of the above

41) How is the floodway shown on the new format Flood Insurance Rate Map?

a) It's a white area
b) It's a dark blue/dark grey area
c) It's a dark blue/dark grey area with diagonal lines
d) The new FIRM doesn't show floodways, they're on the Floodway Map.

42) A FIRM shows an area as "Zone AO (depth 3')." This means that:

a) The base flood elevation is three feet above ground level
b) The base flood elevation is three feet above sea level
c) The base flood elevation is three feet above NGVD
d) A seawall, berm or other feature keeps the water from flowing back into the ocean.

43) Which of the following areas can be considered a "basement" under the NFIP?

a) A "walkout basement" that is below grade on three sides
b) A crawlspace with a floor that is below ground level on all sides
c) An enclosed area above grade that is used solely for utilities and storage
d) All of the above

44) A developer's engineer conducted a study that showed that because of recent bridge replacement and channel improvement work, the base flood elevation for the development site is really two feet lower than shown on the FIRM. The developer wants the official FIRM to reflect this information. What form does he use to request a map change?

a) MT-1
b) MT-2
c) MT-EZ
d) Elevation Certificate

45) A two foot high floodwall is proposed to protect a house in the regulatory floodway. It will surround the house, 5 - 10 feet out from the house's foundation. The permit applicant says that the house is already an obstruction in the floodway, so the wall won't create a new problem. Do you need a no rise certification?

a) Yes, all development projects in the floodplain need a no rise certification
b) Yes, the floodwall will make the existing obstruction larger
c) No, this is a minor project, too small to warrant an engineering study
d) No, walls are not insurable buildings and therefore not subject to the NFIP permit requirements

46) A nursing home is proposed to be constructed on fill in the flood fringe.

a) The lowest floor must be at or above the BFE
b) The basement floor can be below the BFE if an engineer certifies that it is floodproofed
c) It does not matter where the lowest floor will be if the owner applies for a LOMA after it is built
d) Nursing homes are critical facilities and NFIP regulations prohibit them in the floodplain

47) A 40 unit residential condominium will be elevated on pilings in an AE Zone. The floor with the condo units will be on beams, one foot thick. The top of this floor will be 5 feet above the BFE. The area below the condo units will be at grade, 4 feet below the BFE. This lower area will be used only for parking, storage, a condo office and a recreation room. The office and rec room will be insulated, finished and carpeted. The base flood elevation is 10 feet, NGVD. What is the elevation of the lowest floor?

a) 6 feet, NGVD
b) 10 feet, NGVD
c) 14 feet, NGVD
d) 15 feet, NGVD

48) A new beach house will be built 8 feet above grade in an AE Zone. The owner, Mr. Warbucks, wants to enclose a part of the lower area to protect his Rolls Royce from theft and vandalism. Which of the following materials can be used on the enclosure?

a) Concrete block
b) Gypsum wallboard
c) All of the above
d) None of the above, enclosures are not allowed in coastal A Zones

49) We now find that Mr. Warbucks' house is in the V Zone. How large can his enclosed garage be?

a) No more than 300 square feet
b) It doesn't matter if it is enclosed only with lattice or insect screening
c) It doesn't matter as long as the solid walls have enough openings
d) None of the above, enclosures are not allowed in V Zones

50) A new nonresidential building in a V Zone can be built

a) Elevated on fill
b) Elevated on pilings
c) Elevated on solid walls with proper vents
d) All of the above

51) How much fill is allowed in a V Zone?

a) A limited amount if needed to get a LOMA
b) A limited amount if needed to replace or rebuild sand dunes affected by construction
c) A limited amount if needed for landscaping and local drainage
d) None

52) What agencies need to be notified before a proposal to modify or move a stream channel is approved?

a) FEMA
b) State NFIP Coordinator
c) Adjacent communities
d) All of the above

53) The avoid a challenge of taking, a community should

a) Base the regulatory standards on the hazard
b) Not exceed the required state regulatory standards
c) Not regulate development outside the mapped floodplain
d) Pay for properties adversely affected by the regulations

54) Kismet City has just been hit by a tornado, wiping out several blocks of a residential neighborhood in the floodplain. People want to rebuild their lives and their homes as quickly as possible. The mayor says he wants to stop reconstruction and construction of new homes in the affected area until the City can find the money to buy them out and convert the area to a park. You tell the mayor that what he wants to do is called

a) Planned unit development
b) Taking
c) Inverse condemnation
d) Temporary moratorium

55) Boomtown is a rapidly growing suburb on several small streams. Boomtown's city council wants to prevent flood damage as much as possible. What regulatory standard would help Boomtown?

a) Low density zoning
b) Stormwater detention
c) Stormwater retention
d) All of the above

56) Which of the following requires Federal agencies to meet floodplain development standards similar to the NFIP's?

a) NEPA
b) EO 11988
c) Section 404 of the Clean Water Act
d) Nothing - Federal agencies are exempt from floodplain regulations

57) Which of the following requires regulation of development in wetlands?

a) NEPA
b) EO 11988
c) Section 404 of the Clean Water Act
d) Nothing - unless the wetland is in a mapped floodplain

58) Which of the following is not a responsibility of the local floodplain ordinance administrator?

a) Keep the community's FIRMs up to date
b) Apply for LOMAs for new developments
c) Coordinate permit review with other departments
d) Tell people to apply for permits

59) An application is submitted for a permit for a new house in the floodway. Which of the following is needed with the application?

a) No rise certification
b) Non-conversion agreement
c) Elevation certificate
d) All of the above

60) Which of the following should be required after the second inspection but before a certificate of use or occupancy is issued?

a) Elevation certificate
b) Non-conversion agreement
c) Floodway encroachment certification
d) All of the above

61) The most common type of variance requested is to build or rebuild a house without elevating it to or above the base flood elevation. When would such a variance be justified?

a) If the project would destroy the historic characteristics of a building on a state register of historic structures
b) If the cost of meeting the ordinance requirement is unreasonably high
c) If the occupants are disabled and cannot climb stairs
d) All of the above

62) A post-FIRM house was built to the BFE in effect at the time. A restudy has since raised the BFE by three feet. The house was worth $100,000 last month. Last week it had a fire. It will cost $60,000 to repair everything. How high must you require the lowest floor to be?

a) At grade because it was damaged by a fire, not a flood
b) At or above the old BFE
c) At or above the new BFE
d) None of the above

63) After a flood, a church group came in and helped uninsured homeowners repair the damage. Which of the following is correct?

a) The repairs are not affected by the substantial damage rule. All of the work is free, so there is no dollar figure for the substantial damage formula.
b) The repairs are exempt from the substantial damage rule because the work is being done by a church group and churches are exempt from zoning regulations.
c) All of the above
d) None of the above

64) Which costs the most for $10,000 of flood insurance coverage on a post-FIRM building built to the BFE?

a) Building coverage in the AE Zone
b) Building coverage in the VE Zone
c) Contents coverage in the AE Zone
d) Contents coverage in the VE Zone

65) What can a community do to lower the flood insurance premiums for new construction in approximate A Zones?

a) Join the Community Rating System
b) Require developers to calculate a base flood elevation as a condition of a permit
c) Prepare a detailed flood study for the area
d) All of the above

66) Flatville's floodplain is up to one-half mile wide and has low velocity flooding. Flatville's city council is worried that floodplain development will increase flood heights and affect even more properties. What regulatory standard would help prevent this?

a) Setbacks
b) Freeboard
c) Compensatory storage
d) None of the above

67) Flatville has an AO Zone, but the FIRM does not specify a flood depth. What is the minimum elevation for the lowest floor of a new house?

a) 1 foot above grade
b) 2 feet above grade
c) 3 feet above grade
d) There is no minimum elevation requirement

Questions 68 - 85 relate to Floodtown.
You are the local permit administrator for Floodtown.

68) Floodtown has a FIRM with base flood elevations, but no floodway or coastal high hazard area. What NFIP regulations must Floodtown follow?

a) 44 CFR 60.3(a)
b) 44 CFR 60.3(b)
c) 44 CFR 60.3(c)
d) All of the above

69) The Floodtown Town Engineer gives you information that shows the ground to be higher than the BFE. Can you allow a new building at that site without requiring an elevation certificate?

a) Yes
b) No
c) Only if a LOMA is issued
d) Only if a LOMR is issued

70) A developer wants to build a four acre shopping center in an unnumbered A Zone in Floodtown. Which of the following would be acceptable sources of base flood elevations?

a) A study conducted by the developer and approved by the Town Engineer.
b) A study prepared by the State Flood Insurance Coordinator's office
c) The FEMA Regional Office says that two feet above the flood of record approximates the 100-year flood
d) All of the above

71) A developer obtains a CLOMR that shows that when the project is completed, a building site will be above the BFE. When reviewing the application for a permit to build a home on that site,

a) You can exempt the house from the elevation requirements
b) You can exempt the house from the elevation requirements, but require an elevation certificate when it is completed
c) You require the house to meet all the regular floodplain ordinance requirements
d) You can tell the applicant he won't need flood insurance

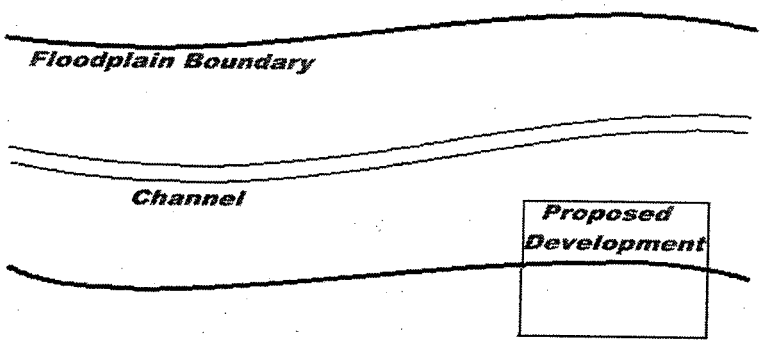
72) Which of the following floodplain projects will need a permit?

a) Replacing an old mobile home with a new one on the same site in an existing mobile home park
b) Paving a dirt street
c) Adding a second story to a house in a shallow AO Zone
d) All of the above

73) A developer plans to build in an area that includes a wetland. What work can you permit the developer to do while he waits for the Corps of Engineers' 404 permit?

a) All work on the project that complies with the NFIP requirements
b) All compliant work that does not affect the wetland
c) Nothing until the 404 permit is issued
d) Nothing, unless the Corps tells you that the permit will eventually be issued

74) Floodtown does not have any floodways mapped for its riverine floodplains. A developer applies for a permit to fill in the area shown on the map. The developer's engineer's study shows that his filling will cause a 0.7 foot rise in flood heights.



Can you permit the development project?

a) Yes, the rise is less than the allowable 1 foot rise
b) Yes, with no floodway mapped, there are no requirements on increasing flood heights
c) No, no increase in flood heights are allowed when there is no mapped floodway
d) No, unless the developer shows that his project, when combined with all other existing and anticipated development, will not increase the base flood elevation by more than 1 foot

75) Mrs. Robinson wants to build a 1,600 square foot one-story home on a crawlspace in an AE Zone. How many standard 8" x 16" crawlspace vents will be needed?

1600

a) 10
b) 11
c) 12
d) 13

76) Where will the crawlspace vents need to be in Mrs. Robinson's house?

a) No more than one foot above the ground
b) As close to the floor joists as possible
c) At least one on each wall
d) It doesn't matter, as long as there are enough of them

77) Mrs. Robinson wants to put her furnace in the crawlspace. Can she?

a) Yes
b) Yes, as long as it is above the BFE
c) No, nothing is allowed below the lowest floor
d) No, unless it is an electric furnace on a ground fault interrupter circuit

78) The owner of an 800 square foot mobile home located in a pre-FIRM mobile home park wants to replace it with a 750 square foot mobile home. Are there any floodplain management requirements?

a) Yes, the new mobile home must be properly anchored
b) Yes, the new mobile home must be properly elevated and anchored
c) No, there are no requirements in pre-FIRM mobile home parks
d) No, as long as the new mobile home does not present a larger obstruction to flood flows

79) What's the best way for you to avoid being sued by a developer?

a) Know the regulations and enforce them fully
b) Make sure the ordinance does not exceed the NFIP and state standards
c) Have sufficient liability insurance coverage
d) Adjust the regulatory requirements where appropriate for special situations

80) Before you accept a permit application as complete, it must include:

a) Site plan
b) Elevation certificate
c) All necessary permits issued by state and federal agencies
d) All of the above

81) An application is submitted to you for a new house on a crawlspace in an AO Zone (depth 2'). Which of the following do you need to make the application complete?

a) Elevation certificate
b) Proposed height of the lowest floor above grade
c) Non-conversion agreement
d) All of the above

82) A homeowner has substantially improved his house and has steadfastly refused to even apply for a floodplain development permit. Can FEMA help you bring this building into compliance with your ordinance?

a) Yes - FEMA can deny flood insurance coverage on the building
b) Yes - FEMA can take the violator to court on your behalf
c) No - FEMA expects the community to enforce its own ordinance
d) No - FEMA has no standing in cases involving local ordinance enforcement

83) Granting a variance to build a new house below the BFE will result in:

a) Increased potential for flood damage
b) Increased flood insurance rates
c) Increased pressure from others to grant them variances
d) All of the above

84) A surveyor brings a FEMA Elevation Certificate to you and asks for help in filling it out. The building is on a crawlspace in an AO Zone (depth 2'). Your inspection showed that it was properly elevated and has all the required vents. The surveyor asks what number he should enter in Section C, item 1. You tell him:

a) 5
b) 6
c) 7
d) 8

85) Dr. Quinn bought her pre-FIRM property in the AE Zone last month for $150,000. She wants to add a doctor's office and make other improvements to the building. Her contractor estimates that the project will cost $70,000. You tell her:

a) It is a substantial improvement, the office must be elevated
b) It's not a substantial improvement, so she can build the office at grade.
c) You need more information to separate the value of the building from the value of the land and outbuildings.
d) The NFIP prohibits medical offices and other critical facilities in the floodplain.

86) Dr. Quinn forgot what you told her last week. She updates her estimated costs to add the doctor's office to her home. What is the dollar amount you would use in the substantial improvement formula?

Site survey	$500
Architect's plans	6,000
Building contractor	60,000
Building contractor's profit	6,000
Demolition of shed on parking lot site	500
Parking lot contractor	6,000
Permit fees	500

a) $66,000
b) $72,000
c) $72,500
d) $78,000

Questions 87 - 100 refer to Flood County

87) What is the NFIP community number for Floodville?

a) 0098
b) 990098
c) 990098 0025-040
d) 990099 0025

88) What happened to Panel 0030 of Flood County's FIRM?

a) There are no mapped floodplains, so it was not printed.
b) It is outside the corporate limits, so it was not printed.
c) It is out of print, so it was not included with this course.
d) It is all in the COBRA zone, so it was not printed.

89) What cross section is upstream of Site B on the Flood County Panel 038?

a) A
b) Glebe Way
c) RM3
d) B

90) How wide is the floodway on the Rocky River Tributary just downstream of the Glebe Way?

a) Can't tell from the available data
b) 90 feet
c) It's coincident with the channel banks
d) 111 feet

91) Ms. Isler has a building site that is near Site D on Panel 40. The building official located it on the FIRM 300 feet east of the intersection of Little Drive and Axel Drive. What is the base flood elevation at this site?

a) There is no base flood elevation; the site is in a C Zone.
b) There is no base flood elevation; the site is in a B Zone.
c) 14 feet
d) 13.5 feet

92.) Once Ms. Isler builds her house, can she receive Federal disaster assistance to rebuild?

a) Yes

b) Yes, as long as she buys a flood insurance policy
c) Yes, if the local permit office states in writing that the house was not substantially damaged.
d) No

93) Caghey Drive is near Site F on the Flood County FIRM panel 40. Just east of Cagney Drive, there is a black line running parallel to the road in the SFHA. What does this black line mean?

a) It's a cross section across the Rocky River.
b) It means the top of Cagney Drive is high enough to be a C Zone.
c) It designates the base flood elevation at that point.
d) It separates the AE Zone from the VE Zone.

94) Mr. Wilson wants to build a new house near Site B in Flood County. The site is 400 feet upstream of the Diehl Road crossing. What is the base flood elevation at this site?

a) 13.3
b) 10.2
c) 9.9
d) 11.0

95) A permit applicant tells you that his site is 1000 feet from an intersection. You try to locate the site on the Flood County FIRM, Panel 38. How many inches from the intersection is the site?

a) 1
b) 2
c) 3
d) Cannot tell from the data available

96) A building was built in Floodville in the Rocky River floodplain in 1983. What kind of building is it?

a) Noncompliant
b) Uninsurable
c) Pre-FIRM
d) Post-FIRM

97) RM 38-1 is located near Site A in Floodville. If you wanted to find RM 38-1 on the ground, what would you look for?

a) A fire hydrant
b) Cross section C
c) A chiseled square
d) A marker similar to the one pictured on page 3-13 of the course notebook

98) Mr. McDonald wants to build a farm house near site E in Flood County. The site is 1,100 feet North off the west end of Cedar Hill Road. What is the base flood elevation for this site?

a) 11.5
b) 19.0
c) 18.5
d) Unknown - it is in an un-numbered A zone.

99) Mr. McDonald has a survey that shows that his ground is higher than the base flood elevation at his site. You advise Mr. McDonald that if he wants to avoid the mandatory flood insurance purchase requirement, he will need to submit a request for a:

a) Restudy
b) Limited map maintenance project
c) Map revision
d) Map amendment

100) Ms. Lovewater's proposed homesite is near Site C in Floodville. It is 150 feet east of the intersection of Barclay Lane and Good Place on the FIRM. The site is:

a) In the SFHA
b) In the floodway
c) In a designated undeveloped coastal barrier
e) All of the above

Be sure to send in your course evaluation form.

You can send the answer sheet and the evaluation in the same envelope.

Home Study Course

March, 1998

Pilot Prepared by French & Associates, Ltd., Park Forest, Illinois

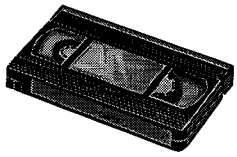
ORIENTATION

In this unit

This orientation presents a summary of the home study course:

- Its goals and objectives,
- How it is organized,
- The materials used, and
- Where to get help.

Materials used in this unit



- Videotape segment, *Welcome to the Course*
- Videocassette player.

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A. INTRODUCTION

Responsibility for flood loss reduction is shared by all units of government—local, state and federal—and the private sector.

Fulfilling this responsibility depends on having the knowledge and skills to plan and implement needed floodplain management measures. The fundamental floodplain management program that most others are built on is the National Flood Insurance Program (NFIP).

The NFIP provides the maps and regulatory basis for local floodplain management. It is also the primary source of insurance protection for floodprone properties. Its success depends on the people responsible for administering its mapping, regulatory and insurance aspects.

The purpose of this home study course is to enhance the knowledge and skills of local officials responsible for administering and enforcing local floodplain management regulations. It is also intended to broaden their understanding of floodplain management strategies that can be applied at the local level.

While any interested person may take this course, it is written specifically for the local official who is responsible for administering his or her community's floodplain management regulations. Thus, references to "you," the person taking the course, assume that you are that local official.

COURSE OBJECTIVES

Upon completing the course, you should:

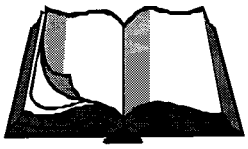
1. Be familiar with flood hazards and how human development interacts with the natural process of flooding.
2. Understand the purpose of the NFIP and your community's role in it.
3. Understand the basis for flood maps and data.
4. Be able to use floodplain studies and maps to support your floodplain management program.
5. Be able to explain the minimum regulatory requirements of the NFIP.
6. Be familiar with additional regulatory standards that your community could adopt.
7. Understand your responsibilities in administering your community's floodplain regulations for new construction.
8. Understand how to administer your community's floodplain regulations for repairs and improvements to existing buildings.

9. Be familiar with how flood insurance policies are written and how they relate to your community's regulations.
10. Be prepared to administer your floodplain regulations following a disaster.

These 10 objectives are the topics of the 10 units in this course.

B. COURSE MATERIALS

This is a multimedia course, using a notebook, videotapes and tools such as maps and an engineer's scale.



NOTEBOOK

The loose-leaf notebook holds the primary instructional material —ten units—and seven appendices.

In **Units 1 and 2**, you'll be introduced to the kinds of floods common to communities in the United States, the concepts behind floodplain management and the NFIP.

In **Unit 3**, you'll learn about the various types of flood data needed to administer a floodplain management program.

Unit 4 discusses how to use the data provided in NFIP studies and maps.

Unit 5 is the first of four units about administering floodplain management regulations. In Unit 5, you'll find out about the minimum regulatory requirements communities must enforce under the NFIP. **Unit 6** contains additional measures recommended to help make your regulations more effective and more appropriate to your local flood conditions and community needs.

Unit 7 discusses the steps needed to administer a floodplain management ordinance, and **Unit 8** goes into detail on the special situations of dealing with changes to existing buildings.

In **Unit 9**, the relationship between flood insurance and your floodplain management program is reviewed.

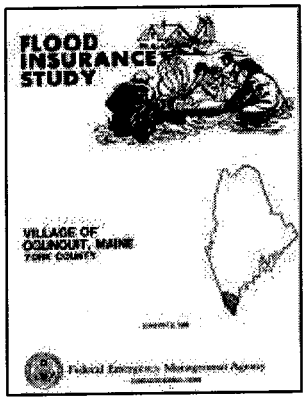
Unit 10, the last in the course, reviews the things you need to be ready for following a disaster and how you can make your community's program more effective in reducing flood losses.

The seven appendices provide contacts for assistance, references, technical terms, and NFIP materials.

VIDEO SEGMENTS

Two videotapes, with four segments each, provide detailed information about several topics. They will assist you in understanding the materials, as well as provide examples of practical situations.

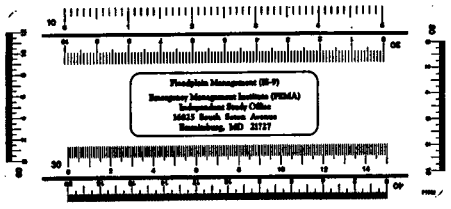
To help you plan when and where to study, the cover page of each unit indicates whether it includes one or more video segments.



FLOOD INSURANCE STUDY AND MAPS

The fictitious community of Flood County, USA, has been selected as a sample community for the purposes of this course.

The Flood Insurance Study and Flood Insurance Rate Map for Flood County provide opportunities to read and interpret the data in a typical flood insurance study and maps. This town provides examples of both coastal and riverine data and maps.

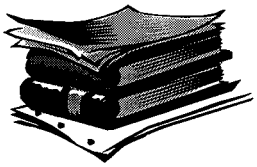


ENGINEER'S SCALE

The clear plastic engineer's scale is included for use in some of the exercises in this course. It helps relate distances on the ground to measurement on a map.

LEARNING CHECKS

Learning checks and unit learning exercises appear throughout the text. Answers to learning checks and exercises are at the end of each unit.



SUPPLEMENTARY READING MATERIALS

Most units include a list of references for supplementary reading to reinforce the text materials or to provide additional information related to a specific topic.

This course includes two booklets that can be very helpful to you:

- *Answers to Questions About the National Flood Insurance Program* (FIA-2, 1997) provides more details on the NFIP, flood insurance coverage, and flood insurance maps. It is used to help explain some of the material in Units 2 and 9.
- *Repairing Your Flooded Home* (FEMA 234, 1992) explains the steps building owners should follow after a flood. It is discussed more in Unit 10.

The appendices provide a list of acronyms, definitions of floodplain management terms and other reference materials.

C. TAKING THE COURSE

To administer a floodplain management program, you need to know about regulations and procedures under the National Flood Insurance Program. This course is designed to prepare you to serve as administrator.

As you can tell by the size of this volume and accompanying materials, you need to acquire a daunting amount of information. Most of it is covered in these pages, as this course is a comprehensive guide to the NFIP and your role as administrator.

At the outset, you may be discouraged by your grasp of flood insurance and floodplain management—and the size of this course. That's to be expected; there's a lot to know. But there's also ample time to learn, as this course is meant to be completed at your pace, not a predetermined rate.

By design, this course will help you learn. Key words and phrases appear with underlines and they are listed in the glossary in Appendix D. Maps and videos are provided to illustrate certain points. Each unit has frequent learning checks and a comprehensive review at the end. Be sure to do all of these – you learn best when you practice using the materials.

So, sit back, relax—and study as little or as much as you can handle in one sitting. There's a lot, but if you proceed at your own pace, you'll do well.

COURSE COMPLETION

Your final step is to submit and pass the final examination. *[For the pilot students only:]* When you are ready for it, call 708/747-5273 and ask for it. The exam is designed to test how well you learned the material presented in the course.

An answer sheet to use in taking the exam is supplied.

Mail the completed answer sheet to the address on the form. Your results will be mailed to you within a few weeks. Score seventy five percent or higher, and you will be sent a certificate of completion.

CONTINUING EDUCATION CREDIT

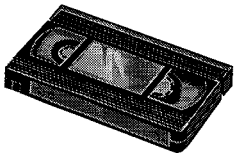
Using the International Association of Continuing Education Training Guidelines, continuing education credits may be awarded for completion of this course. Interested students may also apply for one semester hour of college credit through Lewis and Clark Community College, in association with the Federal Emergency Management Agency's Emergency Management Institute (EMI).

WHERE TO GET HELP

For help in understanding any of the course content, contact your FEMA Regional Office or state flood insurance coordinator.

These offices are listed in Appendices A and B.

For help in obtaining course materials and submitting the final examination, call EMI in Emmitsburg, Maryland, *[For the pilot students only: call French & Associates at 708/747-5273]*



VIDEO: *WELCOME TO THE COURSE*

This is a good time to review the first video segment, "Introduction to the Course," by Mike Armstrong, Associate Director of FEMA for Mitigation.

After viewing, stop the tape and return to the text. Do not rewind.

D. ACKNOWLEDGMENTS

This home-study course is based on a resident course offered at the Emergency Management Institute, course E-273, *Managing Floodplain Development through the National Flood Insurance Program.*

French & Associates, Ltd., of Park Forest, Illinois, prepared this course under FEMA order EME-97-SA-0424. It is adapted from a home study course created by FEMA Region IV for North Carolina, which was prepared by James M. Wright, Nancy B. Sidell, Christy King and Steven Randolph.

Many individuals and organizations helped create this course, particularly:

- Tom Boven and Tom Hirt, FEMA, EMI—project management.
- Katie Hayden and Elizabeth Lemersal, FEMA Mitigation Directorate, Washington, D.C.—review, guidance and technical assistance.
- Prairie Wordsmiths, Urbana, Illinois—editing and design.
- The state NFIP coordinating agencies for the following states whose handbooks and publications proved very helpful: Delaware, Illinois, Maine, Michigan, Minnesota, Missouri, North Carolina, Oklahoma, South Carolina, Washington, Wisconsin, and the Association of State Floodplain Managers.
- The Pennsylvania Department of Community Affairs, which prepared several of the original videos that are used in this course.
- The Town of Ogunquit, Maine, for its help with the maps.

Illustrations

Except as noted here, all illustrations are from FEMA or French & Associates. Special thanks to Dewberry & Davis for its support in preparing many of the figures.

Figure credits: 1-6: Managing Coastal Erosion, p. 31; 1-10: Landslide Loss Reduction, Colorado Geological Survey, 1989, p. 15; 1-14: Striking a Balance – A Guide to Coastal Processes and Beach Management in Delaware, Delaware Department of Natural Resources and Environmental Control, 1985; 1-17: Roanoke Times and World News; 5-17 Berry A. Williams & Associates, Inc.; 6-3: Subdivision Design in Flood Hazard Areas, p. 19; 6-5: Planning for Hillside Development, p. 4; 6-6: Environmental Management: A Guide for Town Officials, Maine Department of Environmental Protection, 1992, p. 4.

UNIT 1: FLOODS AND FLOODPLAIN MANAGEMENT

In this unit

Unit 1 lays the groundwork for the course by explaining:

- The more common types of floods and floodplains,
- How floods affect floodplain development,
- The strategies and tools for floodplain management, and
- Basic terms used throughout the course.

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INTRODUCTION

Throughout time, floods have altered the floodplain landscape. These areas are continuously shaped by the forces of water—either eroded or built up through deposit of sediment. More recently, the landscape has been altered by human development, affecting both the immediate floodplain and events downstream.

Historically, people have been attracted to bodies of water as places for living, industry, commerce and recreation. During the early settlement of the United States, locations near water provided necessary access to transportation, a water supply and water power. In addition, these areas had fertile soils, making them prime agricultural lands.

This pattern of development continued as communities grew. In recent decades, development along waterways and shorelines has been spurred by the aesthetic and recreational value of these sites.

The result has been an increasing level of damage and destruction wrought by the natural forces of flooding on human development. It is probable that you are taking this course because your community has experienced some of this. You, yourself, or someone you know may have suffered through a flood and a long, painful and expensive repair and recovery process.

The purpose of this course is to familiarize you with how this problem can be curbed through proper management of how your floodplains are developed. Communities that guide development following the standards of the National Flood Insurance Program have seen the results – their new buildings and neighborhoods have had less damage and suffering from flooding.

To start this course, we need an orientation into the natural processes of flooding. That is the focus of Section A. Many terms are introduced in this section, such as watershed and coastal erosion, that are used throughout the course.

Next, we review of the other part of the equation – human development in the path of that flooding. The final section in this unit discusses the Federal government's overall floodplain management effort and the other strategies and tools that help prevent and reduce flood damage.

A. FLOODS AND FLOODPLAINS

Floods are part of the Earth's natural hydrologic cycle.

The cycle circulates water throughout the environment (Figure 1-1). This process maintains an overall balance between water in the air, on the surface and in the ground.

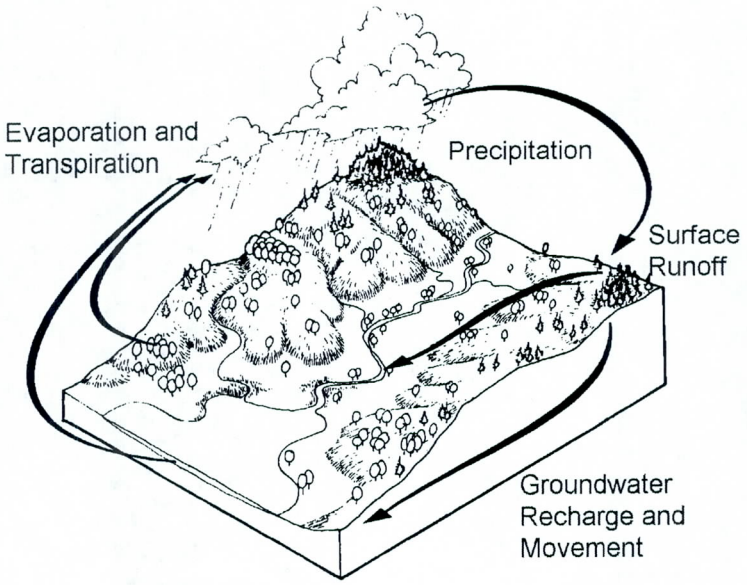


Figure 1-1. The Hydrologic cycle

Sometimes the hydrologic cycle gets outs of balance, sending more water to an area than it can normally handle.

The result is a flood.

A flood inundates a floodplain. There are different types of floodplains and they are based on they type of flooding that forms them.

Most floods fall into one of three major categories:

- Riverine flooding
- Coastal flooding
- Shallow flooding

RIVERINE FLOODING

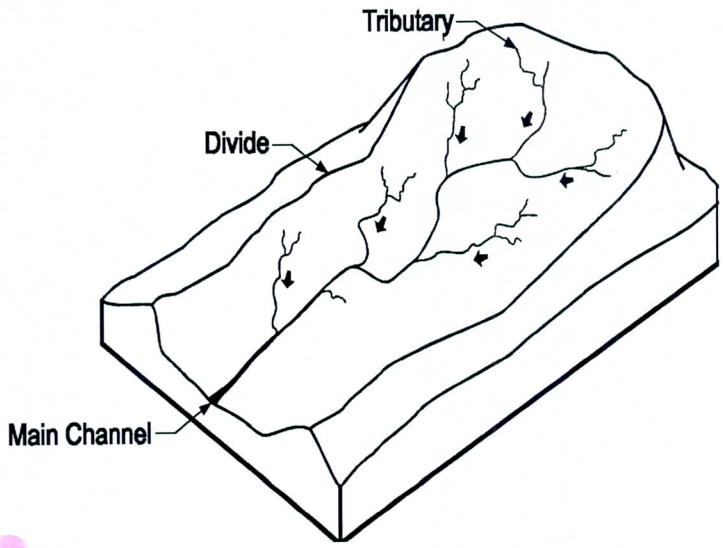
A watershed is an area that drains into a lake, stream or other body of water. Other names for it are basin or catchment area.

Watersheds vary in size. Larger ones can be divided into sub-watersheds.

Figure 1-2 shows a watershed and some of the key terms. The boundary of a watershed is a ridge or divide. Water from rain and snowmelt are collected by the smaller channels (tributaries) which send the water to larger ones and eventually to the lowest body of water in the watershed (main channel).

Channels are defined features on the ground that carry water through and out of a watershed. They may be called rivers, creeks, streams or ditches. They can be wet all the time or dry most of the time.

When a channel receives too much water, the excess flows over its banks and into the adjacent floodplain. Flooding that occurs along a channel is called river-



ine flooding.

Figure 1-2. Riverine Watershed and Floodplain

What happens in a watershed will affect events and conditions downstream. Terrain helps determine the dynamics of riverine flooding. In relatively flat areas, shallow, slow-moving floodwater may cover the land for days or even weeks.

In hilly and mountainous areas, a flood may come scant minutes after a heavy rain. Such a flash flood gives short notice and moves so fast that it is particularly dangerous to people and property in its path.

Overbank flooding

The most common type of flooding in the United States is called overbank flooding (Figure 1-3).

Overbank flooding occurs when downstream channels receive more rain or snowmelt from their watershed than normal, or a channel is blocked by an ice jam or debris. For either reason, excess water overloads the channels and flows out onto the floodplain.

Overbank flooding varies with the watershed's size and terrain. One measure of a flood is the speed of its moving water, which is called velocity. Velocity is measured in feet per second.

Hilly and mountainous areas have faster moving water, so velocity can pose a serious hazard. In flat areas, the flood may move slowly, making its velocity less of a hazard.

Terrain may affect how much warning people have that a flood is building. Conditions on a river that drains a large watershed may warn of a pending flood hours or even days before actual flooding. On the other hand, streams in hilly areas may give no warning that a flash flood is about to strike.

Flood depths vary, as do flood durations. Generally, the larger the river, the deeper the flood and the longer it will last. However, in hilly or mountainous areas with narrow valleys, flooding can be very deep in small watersheds.

Depending on the size of the river and terrain of its floodplain, flooding can last for days and cover wide areas.

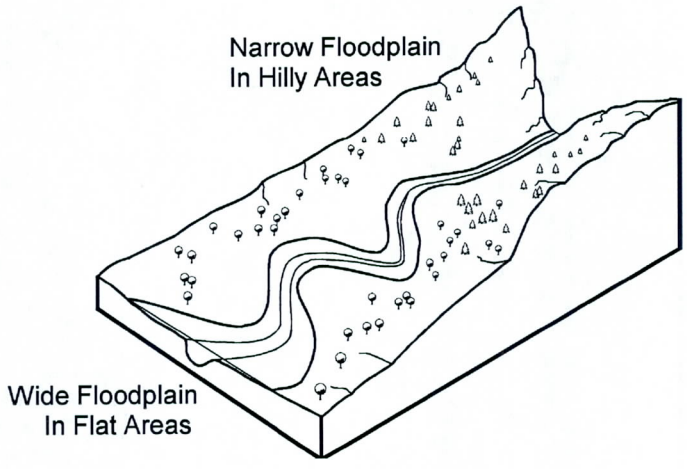


Figure 1-3. Riverine floodplain

Flash flooding

A severe storm that drops much rainfall in a short time can generate a flash flood. All flash floods strike quickly and end swiftly.

While flash floods occur in all fifty states, areas with steep slopes and narrow stream valleys are particularly vulnerable, as are the banks of small tributary streams. In hilly areas, the high-velocity flows and short warning time make flash floods hazardous and very destructive.

In urban areas, flash flooding can occur where impervious surfaces, gutters and storm sewers speed runoff. Flash floods also can be caused by dam failure, the release of ice-jam flooding, or collapse of debris dams.

Flash floods rank first as the cause of flood-related deaths in the United States. In the 1970s, four flash floods in a five-year period killed 570 people. Death tolls associated with the 1993 Mississippi River flood or hurricanes are in another category because such events build over several days, giving people enough time to evacuate safely.

- In 1972, 118 people died along Buffalo Creek in West Virginia when an embankment made of coal refuse washed out, destroying 546 houses and damaging as many more.
- Weeks later, 236 people died when heavy rain and a dam failure inundated the area near Rapid City, South Dakota. Property damage exceeded $100 million.
- In 1976, heavy rains spawned floods in Colorado's Big Thompson Canyon, killing 139 people.
- The next year, 77 people died in Johnstown, Pennsylvania, when heavy rain overwhelmed a dam, causing $200 million in damage.

Riverine erosion

River channels change as water moves downstream, acting on the channel banks and on the channel bottom (the thalweg). This force is made more potent during a flood, when the river's velocity increases.

Several features along a river are affected by this flow of water in different ways. A meander is a curve in a channel. On the outside of a meander, the banks are subject to erosion as the water scours against them (Figure 1-4). On the other hand, areas on the inside of meanders receive deposits of sand and sediment transferred from the eroded sites.

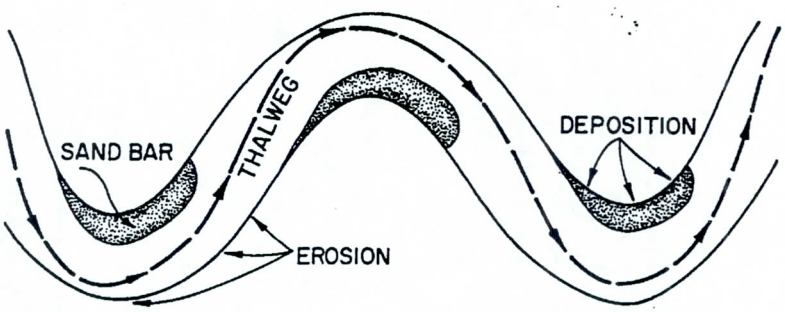


Figure 1- 4. Erosion changes the shape of channels

Properties on the outside of curves face a double threat of inundation and undercutting from riverine erosion during floods (Figure 1- 5).

In addition, meanders do not stay in the same place—they migrate slowly downstream and across the floodplain, reworking the shape of the channel within the floodplain.

Figure 1-5. Riverine erosion can undercut structures

COASTAL FLOODING

Development along the coasts of the oceans, the Gulf of Mexico, and large lakes can be exposed to two types of flood problems not found in riverine areas: coastal storms and coastal erosion. The Pacific and Caribbean coasts face a third hazard: tsunamis.

Coastal storms

Hurricanes and severe storms cause most coastal flooding. These include "Nor'easters," which are severe storms on the Atlantic coast with winds out of the northeast.

Persistent high wind and changes in air pressure push water toward the shore, causing a storm surge which can raise the level of a large body of water by several feet. Waves can be highly destructive as they move inland, battering structures in their path.

On open coasts, the magnitude of a flood varies with the tides. An increase in the level of the ocean during high tide will flood larger areas than a storm that strikes during low tide.

Major coastal storms can significantly change the shape of shoreline landforms, making sandy coastal floodplains particularly unstable places for development.

Wind and waves shape sand dunes, bluffs and barrier islands. Because these landforms provide natural buffers from the effects of a storm, their preservation is important to the protection of inland development.

Coastal erosion

Long-term coastal erosion is another natural process that shapes shorelines. It is a complex process that involves natural and human-induced factors. The natural factors include sand sources, sand size and density, changes in water level, and the effects of waves, currents, tides and wind. These factors determine whether a shoreline will recede or accrete.

Human activity—such as construction of groins or seawalls, the dredging of channels and placement of sandbags—also can contribute to coastal erosion by altering the natural systems that transport sand.

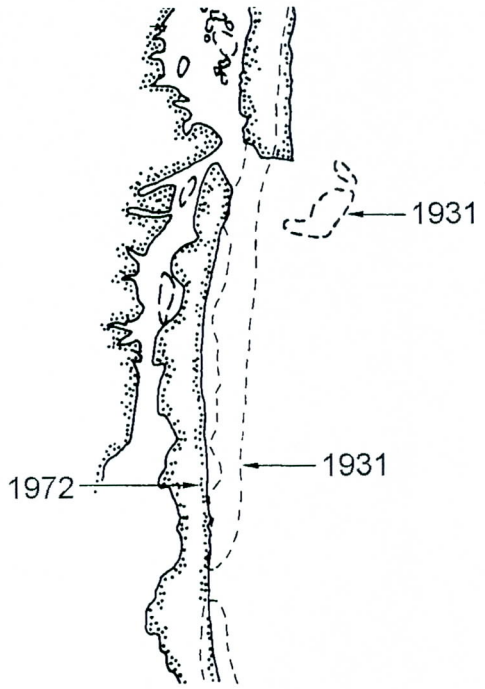


Figure 1-6. This area of the Maryland shore shows how erosion can move or remove entire islands over a period as short as 40 years.

Tsunamis

Another hazard along the coast is a tsunami, a large wave often called a "tidal wave" even though tides and tsunamis are not related. Caused by an underwater earthquake or volcano, a tsunami is a pressure wave that can raise water levels as much as 15 feet.

In the open ocean, a tsunami's wave may be only a few feet high. Because the wave's energy extends from the surface to the bottom, that energy is compressed as the wave approaches shallow water, creating higher, more life-threatening waves (Figure 1-7).

Tsunamis usually occur in the Pacific Ocean, but they have caused floods in the Caribbean. Because they can happen on a clear day and are not related to storms, they can catch many people unawares.

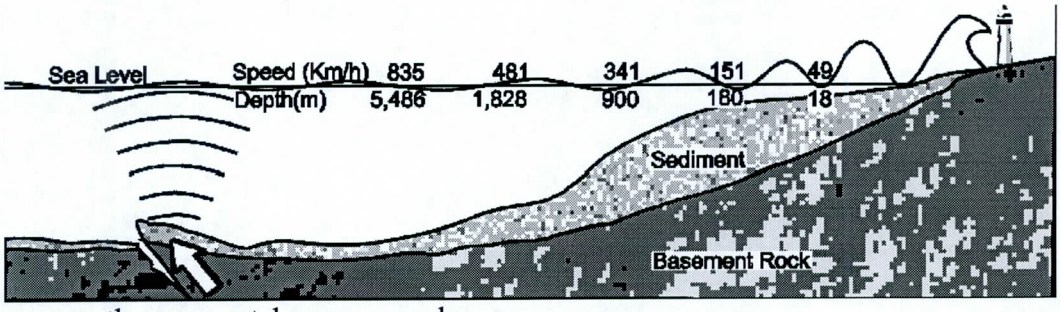


Figure 1- 7. Tsunami waves increase in shallower water.

Lake flooding

Lake shores can flood in ways similar to ocean coasts. Along the Great Lakes, severe storms can produce waves and cause shoreline erosion. FEMA is starting to map Great Lakes flooding with the same techniques it uses for ocean coastal flooding.

SHALLOW FLOODING

Shallow flooding occurs in flat areas where a lack of channels means water cannot drain away easily. Shallow flood problems fall into three categories: sheet flow, ponding and urban drainage.

Sheet flow

Where there are inadequate or no defined channels, floodwater spreads out over a large area at a somewhat uniform depth in what's called sheet flow.

Sheet flows occur after an intense or prolonged rainfall during which the rain cannot soak into the ground. During sheet flow, the floodwaters move downhill and cover a wide area.

Ponding

In some flat areas, runoff collects in depressions and cannot drain out, creating a ponding effect. Ponding floodwaters do not move or flow away. Floodwaters will remain in the temporary ponds until they infiltrate into the soil, evaporate or are pumped out.

AKA Retention Basin

Ponding is especially a problem in glaciated areas, where glaciers carved out depressions; in areas where caves and sinkholes are common, and in other areas where man-made features, such as roads and railroad embankments, have blocked outlets.

Urban drainage

An urban drainage system comprises the ditches, storm sewers, retention ponds and other facilities constructed to store runoff or carry it to a receiving stream, lake or the ocean. Other man-made features in such a system include yards and swales that collect runoff and direct it to the sewers and ditches.

When most of these systems were built, they were typically designed to handle the amount of water expected during a 10-year storm. Larger storms overload them, and the resulting backed-up sewers and overloaded ditches produce shallow flooding.

Another urban drainage problem occurs in the areas protected by levees. Being in floodplains, they are flat and don't drain naturally, especially when a levee blocks the flow to the river.

To drain these areas, channels have been built and pumps installed to mechanically move the water past the levee. Often, these man-made systems do not have the capacity to handle heavy rains or intense storms.

SPECIAL FLOOD HAZARDS

The flooding types described so far are the more common types found in the United States. There are many special local situations in which flooding or flood-related problems do not fit the national norm.

This section discusses five of those special flood hazards:

- Closed basin lakes
- Uncertain flow paths.
- Dam breaks.

- Ice jams.
- Mudflows.

Closed basin lakes

There are two types of closed basin lake:

- Lakes with no outlets, like the Great Salt Lake, Utah, Devil's Lake, North Dakota, and the Salton Sea, California; and
- Lakes with inadequate, regulated or elevated outlets, such as the Great Lakes and many glacial lakes.

Seasonal increases in rainfall cause a closed basin lake's level to rise faster than it can drain. As a result, they are subject to large fluctuations in water surface elevation. Floodwaters in closed basin lakes may stay up for weeks, months or even years.

The long periods of high water make closed basin lake flooding particularly problematic. Properties may not be heavily damaged, but they are unusable for long periods because they are surrounded by—or under—water. Buildings are isolated and septic fields are unusable. Properties are exposed to waves (and sometimes ice) that add to the hazard.

Uncertain flow paths

The section on riverine erosion explained that stream channels change their locations gradually or only after very large and rare floods. However, in some areas of the country, *every* flood may change channels.

For example, in mountainous areas, high-velocity floodwater picks up sediment and rock. At the base of the valley where the slope flattens out, the floodwater decreases in speed and spreads out, as in a sheet flow, dropping sediment and rock over a fan-shaped area called an alluvial fan.

Figure 1-8 shows how an alluvial fan can have numerous channels. During the next flood, the channels may be in different locations.

Alluvial fan flooding is more common in the mountainous western states, where there is less ground cover and more opportunity for erosion.

Alluvial fan floods are not as predictable as riverine floods—one never knows where the floodwaters will spread out across the fan. Thus, they pose three hazards:

- Velocity of floodwaters and the debris they carry.
- Sediment and debris deposited by the floodwaters.
- The potential for the channel to move across the fan during the flood.

Figure 1-8. This alluvial fan flood caused over $7 million in damage and one death

The arid west is subject to another type of flooding that features uncertain flow paths, known as movable bed streams.

When a high-velocity flood runs through an area with sand or loose soil, the erosion and sedimentation can occur so fast that the stream channel can be lowered, filled in or relocated through processes known as degradation, aggradation and migration. In some cases, these processes may occur simultaneously, or one process may occur in one flood and another process in a later event.

Dam breaks

A break in a dam can produce an extremely dangerous flood situation because of the high velocities and large volumes of water released by such a break. Sometimes they can occur with little or no warning on clear days when people are not expecting rain, much less a flood.

Breaching often occurs within hours after the first visible signs of dam failure, leaving little or no time for evacuation. (As noted in the earlier section on flash flooding, three of the four top killer floods in the 1970s were related to the failure of a dam or dam-like structure.)

Dam breaks occur for one of three reasons:

- The foundation fails due to seepage, settling or earthquake.
- The design, construction, materials or operation were deficient.

- Flooding exceeds the capacity of the dam's spillway.

Proper design can prevent dam breaks. While dam safety programs can ensure that new dams are properly designed, there are still many private or locally built dams that were poorly designed and maintained.

Ice jams

Ice jam flooding generally occurs when warm weather and rain break up frozen rivers or any time there is a rapid cycle of freezing and thawing.

The broken ice floats downriver until it is blocked by an obstruction such as a bridge or shallow area (Figure 1-9). An ice dam forms, blocking the channel and causing flooding upstream.

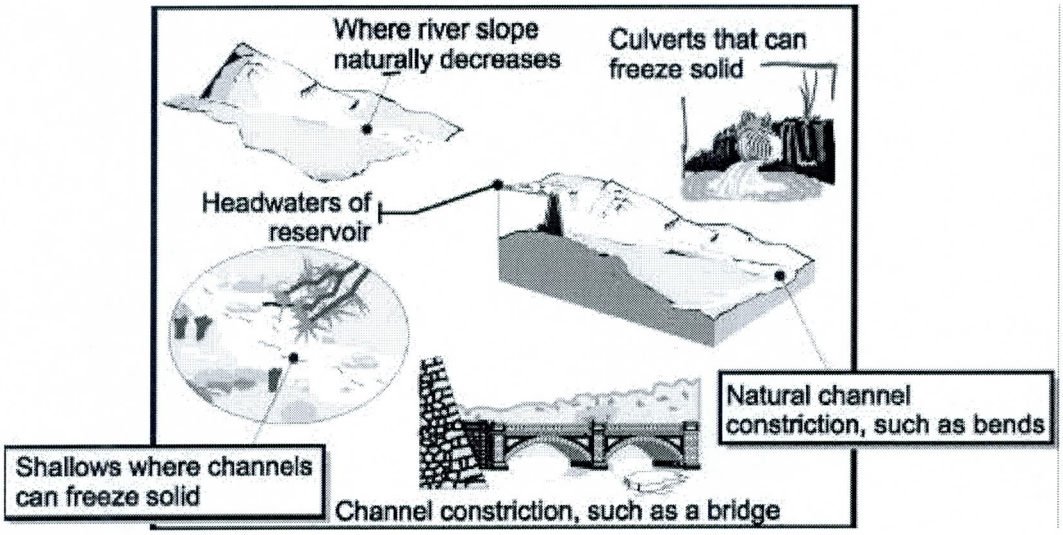


Figure 1-9. Likely Ice Jam Areas

Ice jams present three hazards:

- Sudden flooding of areas upstream from the jam, often on clear days with little or no warning.
- Movement of ice chunks (floes) that can push over trees and crush buildings (see Figure 1-18).
- Sudden flooding of areas downstream when an ice jam breaks. The impact is similar to a dam break, damaging or destroying buildings and structures.

Mudflow

A mudflow is a type of landslide that occurs when runoff saturates the ground. Soil that is dry during dry weather turns into a liquid solution that slides downhill. They typically cause more damage than clear-water flooding due to the combination of debris and sediment, and the force of the debris-filled water.

FEMA officially defines a "mudslide (i.e. mudflow)" as "a condition where there is a river, flow or inundation of liquid mud down a hillside usually as a result of a dual condition of loss of brush cover, and the subsequent accumulation of water on the ground preceded by a period of unusually heavy or sustained rain."

FEMA does not map or have any management or regulatory standards for "mudslides (i.e. mudflows)." What many people view as mudfloods are technically landslides and are not addressed by the NFIP.

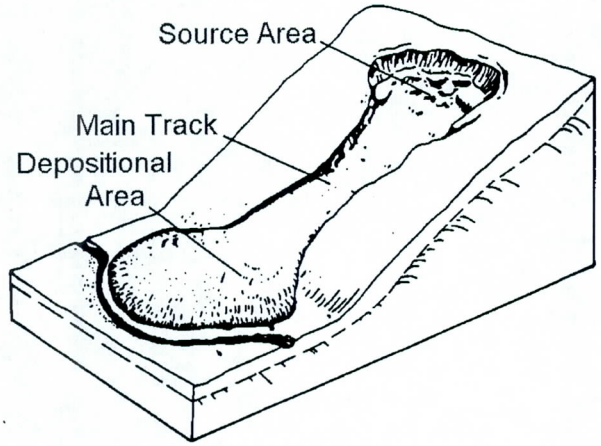


Figure 1-10. Mudflows are caused by saturated soil

NATURAL AND BENEFICIAL FLOODPLAIN FUNCTIONS

Floodplain lands and adjacent waters combine to form a complex, dynamic physical and biological system found nowhere else. When portions of floodplains are preserved in their natural state, or restored to it, they provide many benefits to both human and natural systems.

Some are static conditions—such as providing aesthetic pleasure—and some are active processes, such as reducing the number and severity of floods, helping handle stormwater runoff and minimizing non-point water pollution. For example, by allowing floodwater to slow down, sediments settle out, thus maintaining water quality. The natural vegetation filters out impurities and uses excess nutrients.

Such natural processes cost far less money than it would take to build facilities to correct flood, stormwater, water quality and other community problems.

Natural resources of floodplains fall into three categories: water resources, living resources and societal resources. The following sections describe each category's natural and beneficial functions.

Natural flood and erosion control

Over the years, floodplains develop their own ways to handle flooding and erosion with natural features that provide floodwater storage and conveyance, reduce flood velocities and flood peaks, and curb sedimentation.

Natural controls on flooding and erosion help to maintain water quality by filtering nutrients and impurities from runoff, processing organic wastes and moderating temperature fluctuations.

These natural controls also contribute to recharging groundwater by promoting infiltration and refreshing aquifers, and by reducing the frequency and duration of low surface flows.

Biologic resources and functions

Floodplains enhance biological productivity by supporting a high rate of plant growth. This helps to maintain biodiversity and the integrity of ecosystems.

Floodplains also provide excellent habitats for fish and wildlife by serving as breeding and feeding grounds. They also create and enhance waterfowl habitats, and help to protect habitats for rare and endangered species.

Societal resources and functions

People benefit from floodplains through the food they provide, the recreational opportunities they afford and the scientific knowledge gained in studying them.

Wild and cultivated products are harvested in floodplains, which are enhanced agricultural land made rich by sediment deposits. They provide open space, which may be used to restore and enhance forest lands, or for recreational opportunities or simple enjoyment of their aesthetic beauty.

Floodplains provide areas for scientific study and outdoor education. They contain cultural resources such as historic or archaeological sites, and thus provide opportunities for environmental and other kinds of studies.

These natural resources and functions can increase a community's overall quality of life, a role that often has been undervalued. By transforming stream and river floodplains from problem areas into value-added assets, the community can improve its quality of life.

Parks, bike paths, open spaces, wildlife conservation areas and aesthetic features are important to citizens. Assets like these make the community more appealing to potential employers, investors, residents, property owners and tourists.

Figure 1-11 Floodplains offer recreation and aesthetic benefits.

LEARNING CHECK #1

1. This unit describes a number of types of floods. Which types occur in your community?
   Riverine, Shallow flooding, Flash floods, overbank urban drainage, ponding

2. What are the three most common types of flooding?
   Riverine, coastal, shallow

3. Which type of flooding has accounted for the most flood-related deaths in recent history? Flash Floods

4. What is a "meander?" A curve in a channel

5. What's the major cause of coastal flooding? Storm Surge

6. What causes a tsunami? earthquakes underwater volcanos

7. List the five types of special flood hazards covered in this course. Does your community have any of these? closed basin lakes, uncertain flood paths, Dam Breaks, ice jams, mud flow
   yes

8. List at least three benefits that floodplains, in a relatively undisturbed condition, actually contribute or could contribute to your community.
   (1) natural control of flooding + erosion help maintain (water quality) processing organic waste
   (2) FP enhance biological productivity by High rate plant growth
   (3) flood, scientific knowledge.

B. FLOODPLAIN DEVELOPMENT

Throughout time, floods have altered the floodplain landscape. These areas are continuously shaped by the forces of water—either eroded or built up through deposit of sediment. More recently, the landscape has been altered by human development, affecting both the immediate floodplain and events downstream.

Historically, people have been attracted to bodies of water as places for living, industry, commerce and recreation. During the early settlement of the United States, locations near water provided necessary access to transportation, a water supply and water power. In addition, these areas had fertile soils, making them prime agricultural lands.

This pattern of development continued as communities grew. In recent decades, development along waterways and shorelines has been spurred by the aesthetic and recreational value of these sites.

Because floodplains have attracted people and industry, a substantial portion of this country's development is now subject to flooding. Floodplains account for only seven percent of the nation's total land area. However, they contain a tremendous amount property value. It is estimated that there are 8 – 12 million homes in our floodplains.

Two problems result from floodplain development:

- Development alters the floodplain and the dynamics of flooding.
- Buildings and infrastructure are damaged by periodic flooding.

FLOODPLAIN DEVELOPMENT DYNAMICS

Human development can have an adverse impact on floods and floodplains. Three types of problems are reviewed here.

Riverine floodplains

The most obvious impact of development on riverine flooding comes with moving or altering channels or constructing bridges and culverts with small openings. Construction and regrading of the floodplain can obstruct or divert water to other areas. Levees and dikes are the best known examples of this, but even small construction projects have an impact (Figure 1-12).

Filling obstructs flood flows, backing up floodwaters onto upstream and adjacent properties. It also reduces the floodplain's ability to store excess water, sending more water downstream and causing floods to rise to higher levels. This also increases floodwater velocity.

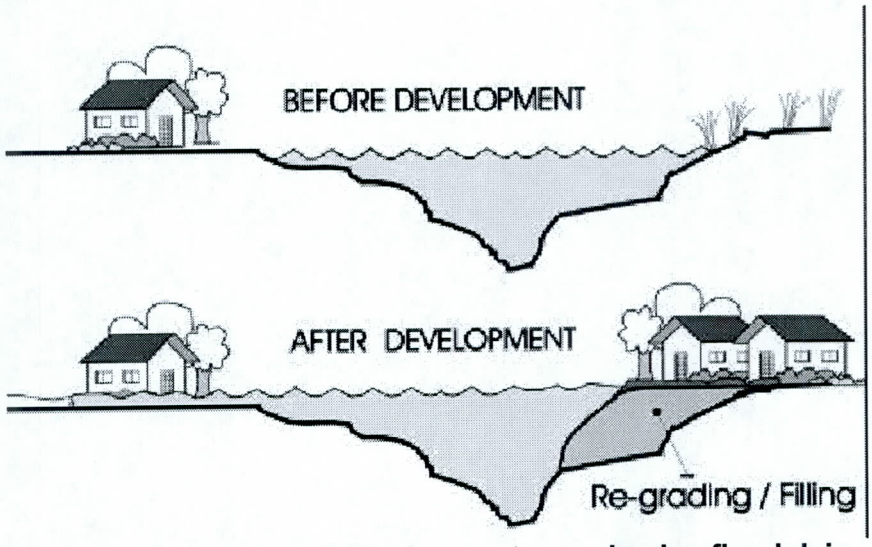


Figure 1-12. Effects of development on a riverine floodplain

Watersheds

Development in riverine watersheds affects the runoff of stormwater and snowmelt. Buildings and parking lots replace the natural vegetation which used to absorb water. When rain falls in a natural setting, as much as ninety percent of it will infiltrate the ground; in an urbanized area, as much as ninety percent of it will run off (Figure 1-13).

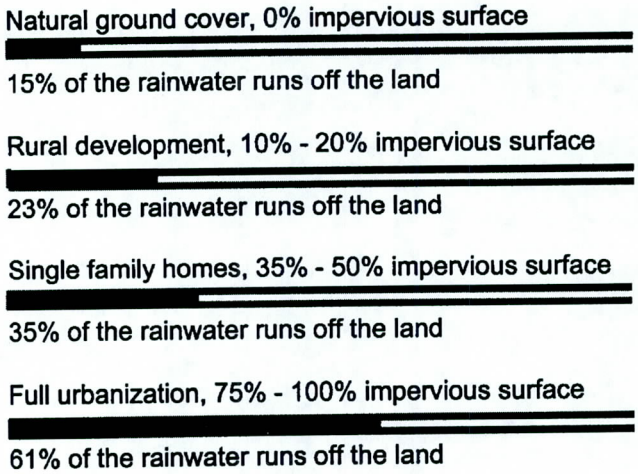


Figure 1-13. Effects of development on stormwater runoff. (Data for Northeastern Illinois)

Urban features alter flood dynamics as well. Storm sewers and more efficient ditches that come with urban drainage systems speed flood flows. The result of urbanization is that there is more runoff in the watershed and it moves faster, increasing flooding downstream. Thus, a 10-year storm may produce the runoff equivalent of a 25-year storm, overloading the man-made drainage system.

Urbanization also changes the timing of flows along the tributaries. If one subwatershed develops faster than another, the flood will leave sooner than it used to, possibly arriving at the main channel at the same time as the peak arrives from another tributary, causing increased flooding downstream.

Coasts

Coastal development similarly affects the dynamics of coastal flooding. Removing the sand from beaches and dunes removes the natural barrier built up by flood forces over the years and exposes inland areas to increased risk of flooding.

Coastal erosion is affected by construction of navigation channels, breakwaters, and jetties, and mining of sand. Often construction of barriers, seawalls, or even sandbag walls to protect buildings from flooding or erosion has an adverse affect on properties at the end of the walls where erosion is accelerated.

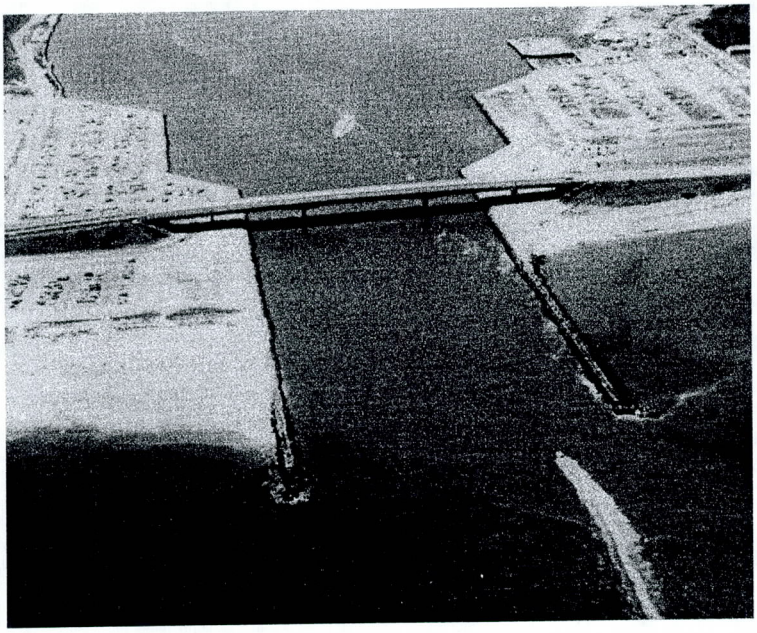


Figure 1-14. Jetties to protect a navigation inlet affect sand accumulation and erosion.

FLOOD DAMAGE

Floodplains are home to nearly 10 million households. In an average year, floods kill 150 people and cause over $3 billion in property damage. Nationally, average annual flood losses continue to increase.

Floods can hurt or kill people, and damage property, in several ways. Knowing the impact of a potential hazard—and guarding against it—is integral to administering a floodplain management program.

As a floodplain management administrator, you need to be knowledgeable about the five main causes of flood damage:

- Hydrodynamic forces
- Debris impact
- Hydrostatic forces
- Soaking
- Sediment and contaminants

Hydrodynamic forces

Moving water creates a hydrodynamic force which can damage a building's walls in three ways (see Figure 1-15):

- Frontal impact, as water strikes the structure.
- Drag effect, as water runs along the sides of a structure.
- Eddies or negative pressures, created as water passes the downstream side.

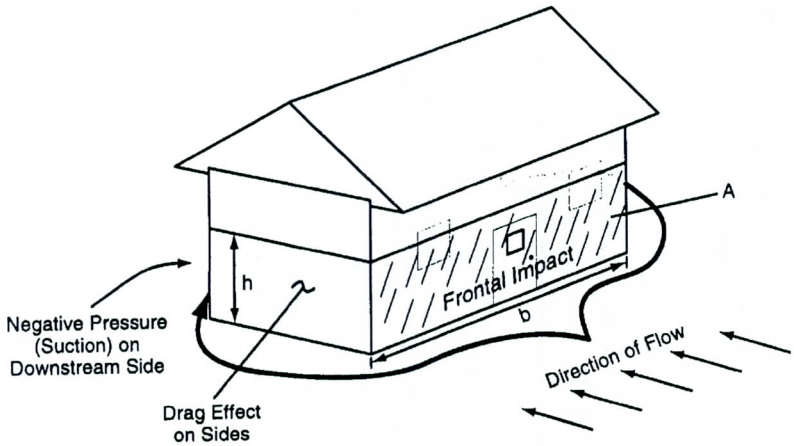


Figure 1-15. Hydrodynamic forces on a building.

The speed of moving water is called velocity, a force that is measured in feet per second. The faster water moves, the more pressure it puts on a structure and the more it will erode stream banks and scour the earth around a building's foundation.

Floodwaters moving faster than 5 feet per second comprise a high-velocity flood, requiring special design considerations for buildings, roads, bridges and other manmade structures in its path.

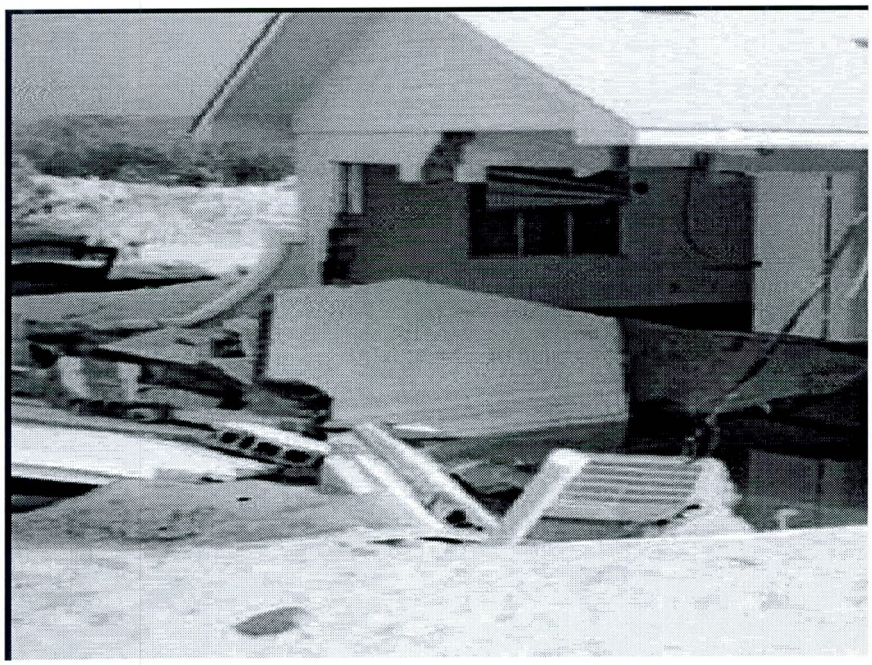


Figure 1-16. Beaches are particularly susceptible to undermining of foundations due to velocity flows.

While velocity is one factor in determining the potential harm of a flood, the total impact of moving water is related to the depth of the flooding. Studies have shown that deep water and low velocities can cause as much damage as shallow water and high velocities.

People are more susceptible to damage than buildings: Studies have shown that it doesn't take much depth or velocity to knock a person over. Thus, no areas with moving floodwater can be considered safe for walking (Figure 1-17).

A car will float in only two feet of moving water, which is one reason floods kill more people trapped in vehicles than anywhere else. Often victims put themselves in perilous situations by ignoring warnings about travel or mistakenly thinking that a washed-out bridge is still open.

Figure 1-17. Even shallow floodwaters can stop cars and wash people off their feet

Debris impact

Debris also increases the hazard posed by moving water. Floodwaters can and will pick up anything that will float—logs, lumber, ice, even propane tanks and vehicles (Figure 1-18). Moving water will also drag or roll objects that don't float. All of this debris acts as battering rams that can knock holes in walls.

Figure 1-18. Ice floes and other large items of debris can crush a house

Hydrostatic forces

The weight of standing water puts hydrostatic pressure on a structure. The deeper the water, the more it weighs and the greater the hydrostatic pressure.

Because water is fluid, it exerts the same amount of pressure sideways (lateral pressure) as it does downward. As water gets deeper, it exerts more lateral pressure than shallow water.

Most walls are not built to withstand lateral pressure. Studies and tests have shown that the lateral force presented by three feet of standing water can be enough to collapse the walls of a typical frame house.

Basement walls and floors are particularly susceptible to damage by hydrostatic pressure. Not only is the water deeper, a basement is subjected to the combined weight of water and saturated earth. Water in the ground underneath a flooded building will seek its own level – resulting in uplift forces that can break a concrete basement floor (Figure 1-19).

Figure 1-19. This basement floor broke from hydrostatic pressure

Soaking

When soaked, many materials change their composition or shape.

Wet wood will swell, and if it is dried too fast it will crack, split or warp. Plywood can come apart. Gypsum wallboard will fall apart if it is bumped before it dries out. The longer these materials are wet, the more moisture they will absorb.

Soaking can cause extensive damage to household goods. Wooden furniture may get so badly warped that it can't be used. Other furnishings, such as upholstery, carpeting, mattresses and books, usually are not worth drying out and restoring. Electrical appliances and gasoline engines won't work safely until they are professionally dried and cleaned.

Sediment and contaminants

Many materials, including wood and fiberglass or cellulose insulation, absorb floodwater and its sediment. Even if allowed to dry out, the materials will still hold the sediment, salt and contaminants brought by the flood. Simply letting a flooded house dry out will not render it clean—and it certainly will not be as healthy a place as it was before the flood.

Few floods, especially those that strike inland, have clear floodwater, and so they leave a mess made of natural and man-made debris. Stormwater, snowmelt and river water pick up whatever was on the ground, such as soil, road oil, and farm and lawn chemicals. If a wastewater treatment plant upstream was inundated, the floodwaters will likely include untreated sewage.

Especially in the arid west and coastal areas, flooding can leave large amounts of sand, sediment and debris (Figure 1-20) that require major cleanup efforts. After the water recedes or evaporates, these sediments are left on and in a building, and its contents.

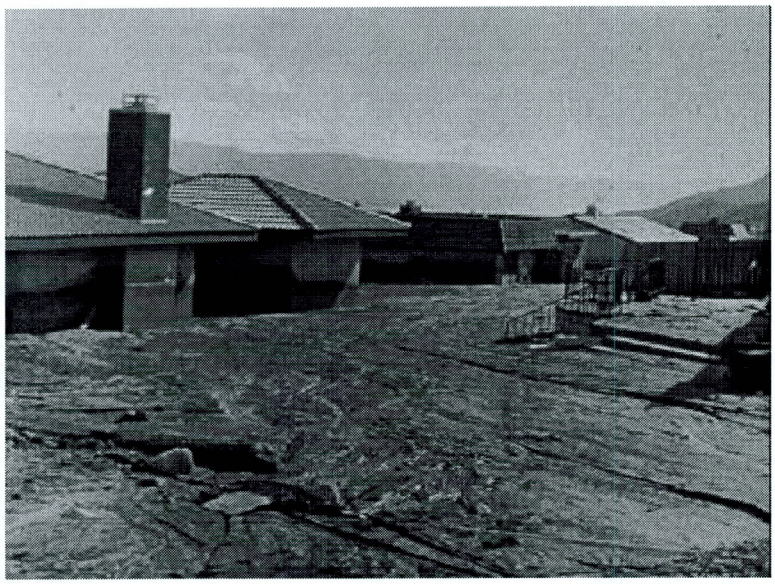


Figure 1-20. Debris flows can completely fill a house with sediment

SAFETY AND HEALTH HAZARDS

Floods pose a variety of hazards as they build, crest and subside. At different points in the life of a flood, people are displaced, damage occurs and finally a cleanup can begin. Disruption of normal public utilities and the presence of flood debris and damage can produce safety and health hazards.

When utilities are damaged, hazards arise. Electrocution is the second most frequent cause of flood deaths, claiming lives in a flooded area that is carrying a live current created when electrical components short. Floods also can damage gas lines, floors and stairs, creating secondary hazards such gas leaks and unsafe structures. If the water system loses pressure, a boil order may be issued to protect people and animals from contaminated water.

Electrocution 2nd most flood death

Fire can be a result of too much water: floods can break gas lines, extinguish pilot lights, and short circuit electrical wiring – causing conditions ripe for a fire. Fire equipment may not be able reach a burning building during high water.

Floods bring and leave health hazards in the form of animal carcasses, garbage and ponds that can become breeding grounds for germs and mosquitoes. Any flooded items that come in close contact with people must be thrown out, including such things as food, cosmetics, medicines, stuffed animals and baby toys. Clothes and dishes need to be washed thoroughly.

Mold, mildew and bacteria grow in damp, flooded areas. One health hazard occurs when heating ducts in a forced-air system are not properly cleaned following inundation. When the furnace or air conditioner is turned on, the sediments left in the ducts are circulated throughout the building and breathed in by the occupants.

Flooding, especially repetitive flooding, takes a toll on people's mental health. Stress comes from facing the loss of time, money, property and personal possessions such as heirlooms. This is aggravated by fatigue during cleanup and anxiety over lost income, health risks and damage to irreplaceable items.

Children and the elderly are especially susceptible to stress from the disruption of their daily routines.

C. FLOODPLAIN MANAGEMENT

The strategies and tools available to prevent problems and protect people and development from flooding have been developed over many years. A short history of U.S. policy on floodplain management will help explain their evolution.

EVOLUTION

The federal government got involved in floodplain management in the 1800s, when it had an interest in maintaining the navigability of rivers to facilitate interstate commerce. The great Mississippi River flood of 1927 led the federal government to become a major player in flood control.

As defined by the Flood Control Acts of 1928 and 1936, the role of government agencies was to build massive flood control structures to control the great rivers, protect coastal areas and prevent flash flooding. The 1936 act alone authorized construction of some 250 projects for both flood control and relief work.

Until the 1960's, such structural flood control projects were seen as the primary way to reduce flood losses. Public policy emphasized that flood losses could be curbed by controlling floodwater with structures, such as dams, levees and floodwalls. But people began to question the effectiveness of this single solution. Disaster relief expenses were going up, making all taxpayers pay more to provide relief to those with property in floodplains. Studies during the 1960s concluded that flood losses were increasing, in spite of the number of flood control structures that had been built.

One of the main reasons structural flood control projects failed to reduce flood losses was that people continued to build in floodplains. In response, federal, state and local agencies began to develop policies and programs with a "non-structural" emphasis, ones that did not prescribe projects to control or redirect the path of floods. Since the 1960s, floodplain management has evolved from heavy reliance on flood control, or structural measures, to one using a combination of many tools.

The creation of the National Flood Insurance Program in 1968 was a landmark step in this evolution. The NFIP:

- Established an insurance program as an alternative to disaster relief.
- Distributed responsibility for floodplain management to all levels of government and the private sector.
- Set a national standard for regulating new development in floodplains.
- Began a comprehensive floodplain mapping program.

Also during the 1960s and 1970s, interest increased in protecting and restoring the environment, including the natural resources and functions of floodplains. Coordinating flood-loss reduction programs with environmental protection and watershed management programs has since become a major goal of federal, state and local programs.

As a result of this evolution, we no longer depend solely on structural projects to control floodwater. U.S. floodplain policies are now multi-purpose and result in a mix of solutions to suit many situations. Consequently, administrators like you have several non-structural flood protection measures at their disposal. They include:

- Regulations to prohibit development in high-hazard areas.
- Building codes requiring flood-resistant construction for new buildings in floodprone areas.
- Acquisition and relocation of buildings in high hazard areas.
- Modifying or retrofitting existing buildings.
- Installing flood warning systems.
- Controlling stormwater runoff.
- Providing self-help advice to property owners.

THE UNIFIED NATIONAL PROGRAM FOR FLOODPLAIN MANAGEMENT

To coordinate the efforts of the many government programs that can affect flooding or floodplain development, Congress created the Unified National Program for Floodplain Management under the National Flood Insurance Act of 1968.

The Unified National Program sets forth a conceptual framework for coordinating the floodplain management efforts of federal, state and local agencies as well as private parties.

The program is coordinated by a Federal Interagency Floodplain Management Task Force made up of federal agencies that are involved in flooding, or with development that can be affected by flooding.

The Task Force defines "floodplain management" as "a decision-making process that aims to achieve the wise use of the nation's floodplains." "Wise use" means both reduced flood losses *and* protection of the natural resources and functions of floodplains.

Where floodplain development is permitted, floodplain management results in development and construction measures that minimize the risk to life and property from floods and the risk to the floodplain's natural functions posed by human development.

Strategies and tools

The Task Force has identified four floodplain management strategies for reducing the human economic losses from flooding as well as minimizing the losses of natural and beneficial floodplain resources. Each strategy is supported by an array of tools which are summarized in the rest of this section.

Many of the tools can be used in more than one strategy.

In most cases, a combination of these tools is needed to reduce risks and protect natural resources and functions. Because floodplain management is a process, there is no one "best" set of tools or one single "wise use" of the floodplain.

The important message from this definition of floodplain management is to consider all the options and account for both the hazard and the natural values before developing or implementing any action that will change the floodplain.

FLOODPLAIN MANAGEMENT STRATEGIES

Strategy 1: Modify human susceptibility to flood damage

Reduce disruption by avoiding hazardous, uneconomic or unwise use of floodplains.

Tools include:

- Regulating floodplain use by using zoning codes to steer development away from hazardous areas or natural areas deserving preservation, establishing rules for developing subdivisions, and rigorously following building, health and sanitary codes.
- Establishing development and redevelopment policies on the design and location of public services, utilities and critical facilities.
- Acquiring land in a floodplain in order to preserve open space and permanently relocate buildings.
- Elevating or floodproofing new buildings and retrofitting existing ones.
- Preparing people and property for flooding through forecasting, warning systems and emergency plans.
- Restoring and preserving the natural resources and functions of floodplains.

Strategy 2: Modify the impact of flooding

Assist individuals and communities to prepare for, respond to and recover from a flood.

Tools include:

- Providing information and education to assist self-help and protection measures.
- Following flood emergency measures during a flood to protect people and property.
- Reducing the financial impact of flooding through disaster assistance, flood insurance and tax adjustments.
- Preparing post-flood recovery plans and programs to help people rebuild and implement mitigation measures to protect against future floods

Strategy 3: Modify flooding itself

Develop projects that control floodwater.

Tools include:

- Building dams and reservoirs that store excess water upstream from developed areas.
- Building dikes, levees and floodwalls to keep water away from developed areas.
- Altering channels to make them more efficient, so overbank flooding will be less frequent.
- Diverting high flows around developed areas.
- Treating land to hold as much rain as possible where it falls, so it can infiltrate the soil instead of running off.
- Storing excess runoff with on-site detention measures.
- Protecting inland development with shoreline protection measures that account for the natural movement of shoreline features.
- Controlling runoff from areas under development outside the floodplain.

Strategy 4: Preserve and restore natural resources

Renew the vitality and purpose of floodplains by reestablishing and maintaining floodplain environments in their natural state.

Tools include:

- Floodplain, wetlands and coastal barrier resources or land use regulations, such as zoning, can be used to steer development away from sensitive or natural areas.
- Development and redevelopment policies on the design and location of public services, utilities and critical facilities.
- Land acquisition; open space preservation; permanent relocation of buildings; restoration of floodplains and wetlands, and preservation of natural functions and habitats.
- Information and education to make people aware of natural floodplain resources and functions and how to protect them.
- Tax adjustments to provide a financial initiative for preserving lands or restoring lands to their natural state.
- Beach nourishment and dune building to protect inland development by maintaining the natural flood protection features.

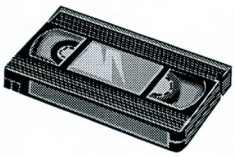
UNIT 4:
USING NFIP STUDIES AND MAPS

In this unit

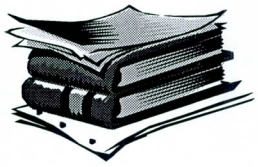
This unit covers how to use the materials introduced in Unit 3:

- How to find and use the data provided in a Flood Insurance Study
- How to find a site on a flood map
- How to obtain flood elevations from a profile
- How to keep the maps and data up-to-date over the years

Materials needed for this unit



- Videotape segment: *How to Use NFIP Data*
- Video cassette player
- Flood Insurance Study, Flood County, USA, and Incorporated Areas
- Flood Insurance Rate Map, Flood County, USA, and Incorporated Areas
- Engineer's scale



Additional information can be found in *Answers to Questions About the National Flood Insurance Program*, questions 81 – 95.

UNIT 4:
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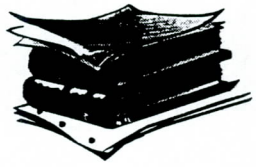
- How to keep the maps and data up to date over the years.

Materials needed for this unit

- Videotape segment: *How to Use NFIP Data*
- Video cassette player.
- *Flood Insurance Study, Town of Ogunquit, Maine*
- Flood Boundary and Floodway Map, Town of Ogunquit, Maine
- Flood Insurance Rate Map, Town of Ogunquit, Maine
- Street map of Ogunquit, Maine.
- Engineer's scale.



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A. USING FIS REPORTS

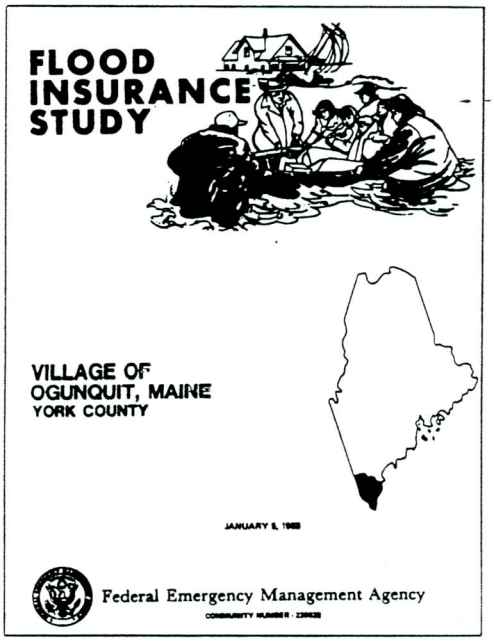
The majority of Flood Insurance Study (FIS) reports use the same outline and numbering system. In this section we will highlight the report's contents, explore the report's data, tables and profiles and describe how they are related to the FIRM and Floodway Map.

The most important reason for using an FIS and flood map is to determine whether or not a site is located in a Special Flood Hazard Area (SFHA), a V Zone and/or a floodway, and to determine the Base Flood Elevation (BFE).

Important: Because the elevation determinations for riverine or coastal floodplains are typically used to establish flood elevations for construction in SFHAs and other purposes, accuracy is critical. You should have another person double check your determinations before using them in the permit application process.

FIS REPORT CONTENTS

The Ogunquit FIS report cover has an outline map of Maine. Note that the location of the county and community are pinpointed on the outline map. The date of the FIS and the community identification number are also indicated on the cover page.



Section 1 of all FIS reports states the purpose of the FIS, authority of and acknowledgments by its authors, and coordination steps taken during the preparation of the study.

Section 2 provides background information on the community, its flood problems, which areas were studied and what flood protection measures are in effect.

Section 3 discusses the engineering methods used. Section 3.1 covers the hydrologic analysis — how much water will flow through the floodplain during peak floods. Section 3.2 describes the hydraulic analysis — how high the water will get. Development of this information was described in Unit 3.

Section 4 discusses how the flood map was prepared from flood data for floodplain management applications. Section 4.1 covers mapping the floodplain boundaries — where the water will go. If the study included a floodway determination, Section 4.2 describes the floodway study and mapping. Section 4 also includes the floodway data table. How to interpret and use these and other data is covered later in this unit.

Section 5 covers data related to flood insurance, some of which you will not need to use. This section can be a useful reference, as it describes the flood insurance zones identified on the map.

Completing the FIS report are three self-explanatory sections: Section 6, Other Studies, Section 7, Location of Data, and Section 8, Bibliography and References. Newer FIS reports have a section on the FIRM.

Most riverine FIS reports include flood profiles as an exhibit at the end of the document. Coastal studies include a map of transect locations and a table with stillwater and base flood elevations along each transect. Ogunquit's FIS report has both.

USING FLOOD DATA AND TABLES

Flood discharges

Turn to Table 1, *Summary of Discharges*, in Section 3 on page 8 of the Ogunquit FIS report. An excerpt from that table is shown below (Figure 4-1).

TABLE 1 - SUMMARY OF DISCHARGES

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (sq. miles)	PEAK DISCHARGES (cfs) 10-YEAR	50-YEAR	100-YEAR	500-YEAR
JOSIAS RIVER					
At confluence with The Basin	7.31	546	930	1,140	1,760
Upstream of Shore Road	6.65	506	862	1,057	1,632
OGUNQUIT RIVER					
At breached dam	14.60	933	1,551	1,882	2,845
Downstream of Maine Turnpike	13.16	859	1,427	1,732	2,618
Upstream of Maine Turnpike	12.94	847	1,408	1,709	2,583
Upstream of North Village Road	11.94	794	1,321	1,602	2,422
OGUNQUIT RIVER TRIBUTARY					
At confluence with Ogunquit River	1.01	110	182	221	334

Figure 4-1: Ogunquit, Maine, FIS Table 1 - Summary of Discharges

Table 1 summarizes the peak amount of water discharge for various flood frequencies at locations within the study area. The hydrologic study procedures for arriving at these amounts were discussed in Unit 3, Section B. The sizes of the drainage areas (watersheds) contributing to the water runoff producing the floods are also shown in the table.

The 100-year flood discharge for the Josias River at its confluence with The Basin is 1,140 cubic feet per second (cfs). This means that during the peak of the base or 100-year flood 1,140 cubic feet of water will pass this point each second.

Those administering the local ordinance may never have a need for these data. They are, however, important in making subsequent calculations of flood elevations as part of the hydraulic engineering study.

Floodway data table

The floodway data table in Section 4 of the FIS report presents data from the hydraulic analysis (Table 3, pages 17-19 in the report). The first page of the table is reproduced below (Figure 4-2).

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREAS
						(FEET NGVD)		
Josias River								
A	0.04[1]	25	106	10.7	15.4	15.4	15.4	0.0
B	0.07[1]	29	305	3.7	17.6	17.6	18.1	0.5
C	0.10[1]	82	467	2.4	18.6	18.6	19.2	0.6
D	0.19[1]	23	228	5.0	19.3	19.3	19.9	0.6
E	0.21[1]	98	646	1.8	20.0	20.0	20.9	0.9
F	0.26[1]	75	553	2.1	20.3	20.3	21.1	0.8

Figure 4-2: Ogunquit, Maine, FIS Table 3 - Floodway Data

To interpret the floodway data table, follow these steps:

All numbers in the table are calculated at each floodplain cross section. The first two columns under "Flooding Source" identify the cross sections used in the FIS and their distance from some reference point, usually the mouth of a river or the point where a stream reaches a river or other stream. The footnotes at the bottom of the floodway data table identify this reference point.

The locations of these cross sections are shown on the accompanying Floodway Map. Cross section A of the Josias River is 0.04 miles above (or upstream) of the confluence with The Basin. You can find cross section A on Panel 3 of the Floodway Map. It is the line that crosses the Josias River that has the letter "A" in a hexagon at each end.

Remember that a floodway's width usually is not symmetrical; it varies with the topography at each cross section. The next three columns ("Floodway") provide data at each cross section. At cross section A, on the Josias River, the floodway is 25 feet wide. That means from the floodway boundary on one side of the stream of this cross section to the floodway boundary on the other side of the stream is 25 feet. This is useful for double-checking the width of the floodway portrayed on the FIRM or Floodway Map.

Figure 4-3 is a representation of the description of cross section A given in Table 3.

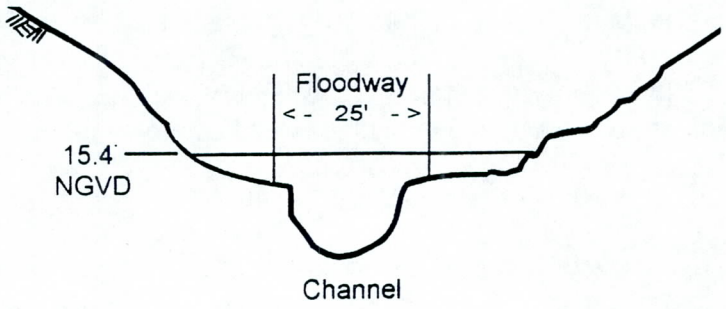


Figure 4-3: Representation of cross section A of the Josias River

The area of the floodway here is 106 square feet. This is the cross sectional area of the floodway below the elevation of the base flood at this location (Figure 4-3). It is used to determine water velocity. The average or mean velocity of the base flood in the floodway is 10.7 feet per second (a hazardous condition).

Similar data are provided at each of the other cross sections. As you look down the mean velocity column, you can see that velocity is highest at cross section A. If you look at the flood profile for the Josias River, you can see that the river is steepest at cross section A, so it will be fastest here, too.

Of the last four columns under "Base Flood Water Surface Elevation," you should be concerned only with the first one, "Regulatory," which provides the regulatory flood elevation. The other columns tell engineers what happened to the water surface elevation when the floodway study was run through the computer model. Notice that at no cross section is the increase more than 1.0 foot, in accordance with NFIP standards.

COASTAL AND LAKE ELEVATIONS

Coastal flood elevations. Table 2, *Summary of Coastal Elevations,* on page 9 in the FIS report for Ogunquit shows the surge stillwater elevations and the maximum wave crest elevations of selected flood events along the coast.

On the ocean and Great Lakes coasts, the regulatory flood elevation includes the wave height component. Therefore, use the BFE from the FIRM, not the stillwater elevations in the table.

The BFEs on the FIRM are rounded to the nearest foot, which means that if a BFE was actually 8.3 feet, it would show as 8 feet on the FIRM. To correct for this, the recommended rule of thumb is to add 0.4 foot to the rounded BFE on the FIRM. This makes sure that the regulatory elevation you use will be high enough.

For the ocean coast, *use the BFE from the FIRM (plus 0.4 foot), not the table.*

Lake flood elevations. On inland lakes and reservoirs, the FIS generally does not include the effects of waves. For these areas, information on BFEs is contained in Section 3 of the FIS report, and data will be presented in a table titled *Summary of Stillwater Elevations*. Note that in these tables the BFE is rounded to one-tenth of a foot, but the BFE is shown in parentheses in *whole* numbers on the FIRM (Figure 3-14).

For lakes and reservoirs, *use the BFE from the table, not the FIRM.*

RELATING REPORT DATA TO MAPS AND PROFILES

Unit 3 described the data that are developed and used in preparing an FIS for a community. Each set of data is used for calculations needed to produce additional data for the FIS.

The data contained in the FIS report are consistent with those found on the accompanying profiles and FIRM. For example, the base flood water surface elevations at each identified cross section can be found in the floodway data table, read from the flood profiles and interpolated from the FIRM. Within the limits of map accuracy, you should obtain the same answer regardless which source you use.

In the same way, the distances between cross sections, or their distance from some reference, can be found using any or all of the above data sources. Again, the answers should be about the same.

The elevations of the computed profiles contained in the FIS report are used with ground elevation data to determine the limits of the various zones shown on the FIRM. Again, flood elevations can be determined at any location along the studied stream using either the flood profiles or the FIRM. All the data fit one another. If obvious mistakes are found, please advise the FEMA Regional Office.

Note: Due to the limited detail and large scale of the base maps used for most FIRMs, much interpolation between contour lines is done in mapping the floodplain boundaries. This is why you may find discrepancies when actual ground elevations are surveyed: the maps are just the best available graphic representations of the BFEs.

Here's the order of precedence for identifying the BFE at a particular location

- The most accurate BFEs are found in the Floodway Data Table (for a riverine floodplain) and the Summary of Stillwater Elevations table (for a lake). These BFEs are listed to 0.1 foot. However, the Floodway Data Table is only good for sites on or next to a cross section.
- The next most accurate source of elevation data is the profile. This is a plot of the cross section data and it is hard to read accurately.
- The least accurate source of elevation data for a riverine floodplain is the FIRM. BFEs are rounded to the nearest foot. However, the FIRM is the only source of base flood elevations for coastal floodplains and AO and AH Zones.

BFEs take precedence if there is a dispute between the BFE and the boundaries of the SFHA shown on the maps. As a local permit administrator, you can make your decisions based on the most accurate source of data..

It must be noted that banks (and others who must read the FIRM to determine if flood insurance is required) must go by the map. They cannot make on-site interpretations based on data other than the FIRM. However, they may recommend that the property owner submit a letter of map revision or map amendment so the map can be officially changed to reflect the more accurate data (see Unit 4, Section D).

Again, only FEMA can amend or correct the maps. Discrepancies should be brought to FEMA's attention through a request for a map change, such as a Letter of Map Amendment (LOMA) (see the last section in this unit).

Reading and using flood profiles, the last set of data contained in a Flood Insurance Study report, will be covered in section C of this unit.

LEARNING CHECK #1

1. What is the base flood discharge on the Ogunquit River downstream of the Maine Turnpike?

2. What is the 10-year peak discharge for the Ogunquit River Tributary?

3. How many cross sections were surveyed for the Josias River in Ogunquit?

4. What is the width of the floodway for Josias River at cross section G?

5. What is the flood elevation at cross section G of the Josias River that you would use for regulating new construction?

6. What is the best source of base flood elevation data for regulatory purposes for a coastal floodplain?

7. What FIRM Zone is Site L in?

8. What is the regulatory base flood elevation at Site L?

9. The Basin (Site S) is not a river. Why are the flood elevations different from one end to the other?

B. USING THE FLOOD MAPS

VIDEO: *HOW TO USE NFIP DATA*

Before proceeding, view the third video segment, *How to use NFIP Data*. About 18 minutes long, this segment introduces material contained in subsequent sections of this unit.

The segment is part of a series produced by the Commonwealth of Pennsylvania. There are some references to Pennsylvania agencies and governmental units, but they should not detract from the information's usefulness elsewhere.

When done, do not rewind the tape unless you want to review the material.

The video segment provides instructions for:

- Locating a site
- Determining mileage or stationing
- Identifying the BFE on the map
- Locating the floodway boundary

This information will allow you to use the flood profiles printed in the FIS report to make a determination of the BFE to within one-tenth of a foot. (Remember that the flood profiles printed in the FIS report provide the BFE of a site to the tenth of a foot, while the maps provide the BFE rounded to a whole foot.)

We will use examples from the Ogunquit flood maps to illustrate these map-reading steps.

LOCATING A SITE

How easily you can locate a site on an NFIP map will depend on your familiarity with properties in the community and with the scale of the flood maps.

To locate a site, follow these steps:

> *The steps for a site in Ogunquit are shown in italics. The general location of the sites are shown on the Ogunquit Street Map. Site "O" is on U.S. Route 1, six lots south of Bournes Lane. (Remember to check your north arrow. The top of the map is not always north.)*

- If your community has more than one map panel, use the map index to determine which panel to use. Use map landmarks —highways, streets or streams —to find the site on the index.

  The Map Index for Ogunquit shows that most of U.S. Route 1 is in panel 0003.

- Find the map panel for the area containing the site. Be sure the map panel is the most recent one — compare its suffix letter with the suffix letter for that panel on the current map index. Remember, in many communities, panels will have different effective dates due to revisions that do not affect the whole community.

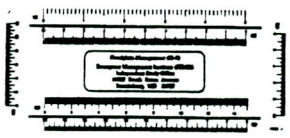
  Bournes Lane intersects U.S. Route 1 near the left edge of panel 0003.

- If there is an asterisk on the panel number, either no flood hazard has been identified in that area or it is entirely one flood zone and the panel was not printed.

- Locate the site as accurately as possible. Use a detailed street or road map as well as the tax appraiser's plat map to identify the property boundaries, if necessary. You will probably have to obtain the distance on the ground between the site and one or more identifiable points, such as the centerline of a road or street, a bridge, or some other feature on the map. Locate these points on the flood map.

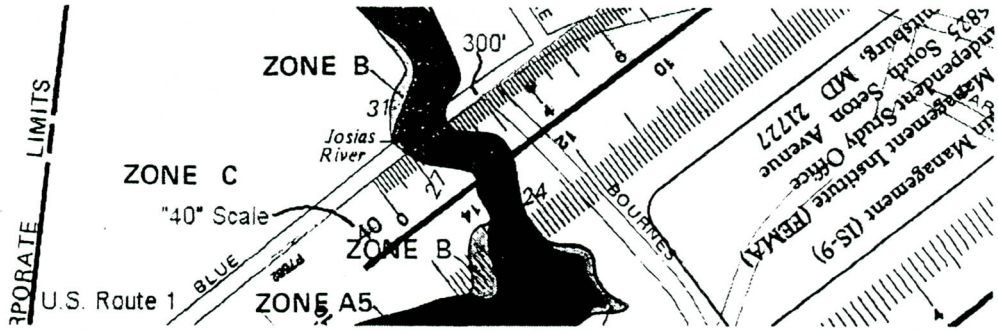
  Each lot in this area is 60' wide. The lot of interest is the sixth one in from Bournes Lane, so it is five lots (300 feet) from the Bournes Lane right of way.

- Convert the distances to the map scale and plot the site on the map. (The video explains this process in more detail. If necessary, go back and review this segment again.)



Ogunquit's FIRM has a scale of 1 inch = 400 feet. This means you should use the "40" scale on the engineer's scale provided with this course. Measure 300 feet along U.S. Route 1 from the Bournes Lane right of way line (see Figure 4-4). In this example, Site "O" is outside of the SFHA for the Josias River.

Figure 4-4. Using the map scale to locate a site on the FIRM



DETERMINING MILEAGE (STATIONING)

In order to identify the BFE at a development site, the stream mileage — or stationing — for the site must be determined. The stationing of a site will allow us to read the flood profiles.

- Locate your site on the Floodway Map or the newer version of the FIRM, that shows cross sections. Identify which labeled cross sections are nearest to your site, both upstream and downstream.

  The site of interest, Site "P", is on Bournes Lane, 500 feet east of U.S. Route 1, where the Josias River takes a sharp turn. Follow the steps in the previous discussion to locate this site on the Ogunquit Floodway Map. It is across the street from the name "Bournes," approximately where the letter "E" is.

- Check the map scale used for the panel. The scale is in the map legend or key.

  For all Ogunquit maps, the map scale is 1 inch = 400 feet.

Use an engineer's scale to measure the distance from the site to the nearest cross section, *following all bends and curves*. It would be worthwhile to measure the distances to both cross sections to check accuracy.

This site is 275 feet downstream (east) of cross section J and 300 feet upstream (north) of cross section I.

- Convert these distances to miles by dividing by 5,280.

  When converting to miles, we lose a little accuracy. Rounding the numbers, our site is 0.05 miles downstream of cross section J and 0.05 miles upstream of cross section I.

Keep these numbers in mind; they will be used shortly. This approach will also work by measuring from another point that shows up on the profile, such as a bridge or confluence with another stream.

BASE FLOOD ELEVATIONS FROM MAPS

BFEs are shown on the FIRMs as whole numbers. For A1-30 and AE Zones for coastal and lake floodplains, use the BFE printed in parentheses below the flood zone designation. *No interpolation is necessary.* The same holds true for AH Zones with whole number base flood elevations.

The base flood elevation for properties on The Basin at the mouth of the Josias River is 9 feet (above sea level or NGVD).

For other numbered A Zones, read the BFE from the nearest wavy "base flood elevation line." Refer to the map legend or key if you are unsure of the line markings.

For our Site "O" example, the BFE from the FIRM is between 27 and 31 feet while for our Site "P" example, the BFE is between 22 and 24 feet. In Site "P", we could interpolate since the site is roughly half way between the wavy lines for "22" and "24." Or we could play it safe and use the higher BFE to ensure better protection from flooding.

There are no base flood elevations in AO Zones with base flood depths. Instead, the equivalent flood protection level is the number of feet shown in parentheses after the "Zone AO." This is not an elevation above sea level, it is the depth of flooding measured above ground level.

North of The Basin is a small Zone AO (Depth 2). The "BFE" for a site in this zone would be two feet above the grade adjacent to the building.

LOCATING THE FLOODWAY BOUNDARY

If the site is at a surveyed cross section, floodway width data from the floodway data table may be used as a more accurate measure than field and map measurements. Remember that the width listed in the table is the distance from the floodway boundary on one side of the stream to the floodway boundary on the other side of the stream.

If the floodway width measured on the map at that site is not comparable to that shown in the table, the map should be used because that is the floodway officially adopted by the community. If there is a significant difference, contact the FEMA Regional Office for an interpretation.

Most sites won't fall conveniently on a cross section, so here are the steps using the map as shown in the video:

- Locate the site on the map and select the correct engineer's scale for the map scale.

  Locate Site "P" on Bournes Lane.

Using the engineer's scale, measure the distance from the floodway boundary to a nearby feature on the ground. For streets, use the center of the street, both on the map and on the ground.

The floodway boundary is approximately 150 feet from Bournes Lane.

- Run the same measurement on the ground to locate the floodway boundary at the site.
- If any portion of the building site, proposed grading, fill, bridge or other obstruction is determined to be within the floodway, then the floodway provisions of your ordinance also apply.

LEARNING CHECK #2

1. How many feet does one inch on Ogunquit's FIRM represent?

2. How many feet does one inch on Ogunquit's Floodway Map represent?

3. Using the Floodway Map Panel 0003 and the engineer's scale, what is the width of the floodway at cross section H, near Site Q, on the Josias River?

4. Using the Floodway Data Table, what is the floodway width at cross section G on the Josias River?

5. Using the Floodway Map Panel 0003 and the engineer's scale, what is the distance between cross sections E and F on the Josias River?

6. What is the distance between cross sections E and F on the Josias River according to the Floodway Data Table?

7. Site U is on the corporate limits at the southeast corner of Ogunquit. How high is the base flood elevation on the Atlantic coast at Site U?

8. What is regulatory base flood elevation at Site U?

9. RM 7 is located near Site K. How far is RM 7 from the closest SFHA?

10. Site C is on the Ogunquit River Tributary just upstream of the Maine Turnpike? What is the BFE at Site C?

11. Site B is 75' north of the center of the "x" in RM 3. Is it in the floodway?

C. USING PROFILES

As discussed in Unit 3, Section B, a flood profile is a graph of computed flood elevations at the floodplain cross sections. It can be used to determine elevations of floods of various frequencies at any location along the studied stream.

A profile also contains other useful information, such as location data for bridges, stream beds, stream crossings and cross sections.

PROFILE FEATURES

Four flood levels are typically shown on the flood profile fold-out sheets at the back of the FIS report: the 10-, 50-, 100- and 500-year floods. Only the 100- and 500-year floods are used for compliance with NFIP standards; the others are useful for other floodplain management applications, such as septic system design and location, bridge and culvert design, urban stormwater management and selecting sites for critical facilities.

In addition to the flood elevation lines, FIS profiles sheets contain:

- a plot of the stream bed,
- the locations of the cross sections used in the FIS (a letter within a hexagon), and
- stream crossings (usually depicted as a large "I").

The data are plotted on a grid to facilitate their interpretation. With few exceptions, the large grid squares are one inch on each side and are divided into 10 squares in both directions. This greatly aids in making measurements.

Refer to the profile for the Josias River, "01P" at the back of the Ogunquit FIS report. The bottom or X-axis shows the distance along the river. To be consistent with other data in the FIS report, distance is measured above the mouth of the river or its confluence with another river. For this profile, each large square is 0.1 mile and each little square is 0.01 mile.

The left side or Y-axis shows elevation in NGVD. Each large square represents five feet and each small square is 0.5 foot. Again, profiles in other FIS may have a different scale.

Figure 4-5 shows a sample of the data that are on the profile shown for Ogunquit's Josias River. Before you look at it, see what you get for the stream distance (in miles) and base flood elevations for cross sections A, B, C and D.

Cross section	Miles above mouth	Flood elevation
A	0.04	15.4
B	0.07	17.6
C	0.10	18.6
D	1.9	19.3

Figure 4-5: Plotted Data, Ogunquit Profile 01P, Josias River

DETERMINING BASE FLOOD ELEVATIONS

Profiles

Here are the steps used in the video to determine the BFE for a site using the flood profiles in the FIS report:

- Using the Floodway Map (or new FIRM), locate features near the site that appear on the profile, such as a bridge or cross section.

  We'll work with Site "P" on Bournes Lane.

- Follow the stationing procedures described in the previous section to determine the site's distance (in stream miles) from a cross section or other feature that appears on the profile.

  Site "P" is 0.05 miles downstream of cross section J and 0.05 miles upstream of cross section I.

- Find the feature(s) on the flood profile for that stream.

  Cross sections J and I are in the middle of the profile, at stream miles 0.6 and 0.7.

- Check the scale used for the profile and using the engineer's scale, measure the distance from the feature(s) to the site.

You can use the "10" scale on the engineer's scale or you can count squares. At this scale, each little square is 0.01 miles, so Site "P" is 5 little squares upstream (right) of cross section I and 5 little squares downstream (left) of cross section J.

- Find the site's location on the appropriate flood profile line and read the elevation on the Y axis. You can count squares or use the engineer's scale. Don't forget, the scale on the Y axis is different than the scale for the X axis.

  For the Josias River profile, you may find it easiest to use the "50" scale on the Y axis because it is five feet to the inch.

- Find where the site intersects the profile. Draw a straight line to the left or right edge of the graph..

  The second line down is the base (100-year) flood profile. Read the flood elevation off either the left or right edge of the page. At Site "P", the base flood elevation is 22.6 feet. Check the 10-, 50-, and 500- year elevations and see if you get: 20.8, 22.0 and 24.3, respectively.

  Note how this produces a more accurate number than interpolating between the two wavy lines on the FIRM. Instead of guessing that it is between 22 and 24, we can tell that it is 22.6.

- A surveyor can establish the flood elevation at the site so the owner or builder will know how high the base flood elevation is predicted to be.

  A surveyor can either shoot 22.6 feet at the site or shoot any elevation and tell the owner how high the base flood is in relation to the mark.

Be sure to check each profile's scale before you use it. In the Ogunquit River's profile 02P, the X axis scale is 1 inch = 0.2 miles and the Y axis scale is 1 inch = 5 feet. Profiles 03P-05P cover steeper terrain and the Y axis is 1 inch = 10 feet (each square represents one foot).

Other types of floodplains

In coastal floodplains, AH Zones and other areas where the BFE is listed in parentheses below the zone designation on the FIRM, use that elevation. There is no profile for these zones. Except for lake floodplains with stillwater elevation tables to 0.1 foot, the FIRM is the most accurate source for BFEs.

Relating flood elevations to the ground

If the site is clearly outside the boundary of the base floodplain, as with Site "O", no floodplain regulations apply unless the site adjoins the SFHA and surveyed ground elevations are *below* BFE.

If it cannot be determined whether the site is in or out of the floodplain, then additional information and/or investigation will be needed. In this instance, ground elevation and lowest floor elevations of any structures will be needed for the site, so the applicant will have to hire a surveyor.

A field visit by the local administrator or designee and measurements on the ground may also be required. The actual site elevations are compared to the base flood elevation, read from the FIS flood profiles, for that location.

If the site elevations are above the BFE, the site is outside the floodplain and the applicant should be advised about the map amendment/revision process. If they are lower, it is within the floodplain and subject to the provisions of the ordinance.

It must be noted that banks (and others who must read the FIRM to determine if flood insurance is required) must go by the map. They cannot make on-site interpretations based on data other than the FIRM. However, they may recommend that the property owner submit a letter of map revision or map amendment so the map can be officially changed to reflect the more accurate data (see Unit 4, Section D).

RELATING PROFILES TO MAPS

Elevation data shown on the flood profiles are directly related to the BFEs shown on the FIRM. Within the limits of map accuracy, you should obtain the same elevation whether you use the map or profile.

However, the flood profiles should always be used to determine flood elevations along rivers and streams.

If you find obvious mistakes or discrepancies between the tables, profiles and FIRM, contact the FEMA Regional Office.

From reading the FIRM in Section B of this Unit, we knew that the BFE for Site "P" should be between 22 and 24 feet. From reading the profile in Section C of this Unit, *Determining Base Flood Elevations for Profiles*, we determined the BFE to be 22.6 feet.

These computations show that the FIRM and the FIS report profile are consistent and provide a double check to make you comfortable with your determination.

Common reasons why a map may need to be changed include:

1. **To correct non-flood-related features,** such as a change in the community's corporate limits. The local government should send the correct information to its FEMA Regional Office. However, the community does not need a new map if it has annexed an area that is shown on the county's FIRM. It can regulate floodplain development using the county's FIRM and flood data.

   Since it is expensive to reprint and redistribute flood maps, corporate boundary changes are usually made only when maps are revised for new or better flood data. One way to minimize the need for such changes is for a municipality to adopt the county's FIRM. This would clarify the regulatory flood data for newly annexed properties and areas in the community's extraterritorial jurisdiction.

2. **To include better ground elevation data.** As noted earlier, maps do not always represent site-specific ground elevations. If there is better information on natural ground elevations, the applicant may apply to have the map reflect the better topographic information.

3. **To reflect changes in ground elevations in the floodplain.** If there has been a substantial change in ground elevation — for example, fill is placed in the floodplain in order to raise building sites above the base flood elevation — the applicant may request a map change to reflect the new ground information.

4. **To revise flood data.** A request may be made to revise the existing study, based on a new flood study. The applicant must demonstrate that the original study was in error or that the new study is based on more accurate or better technical data.

5. **To submit new flood data.** When a flood study is prepared for a development in an unnumbered A Zone, the data can be submitted to FEMA for later incorporation into the FIS or revised FIRM.

6. **To reflect a flood control project.** If a new levee, reservoir or channel modification affects the flow of the base flood, the community must request that the map be revised to reflect the new conditions or new (lower) base flood elevations. The map cannot be changed until the project is constructed and/or operating.

It is important to note that many small projects, such as channel clearing or retention basins in new subdivisions, do not have a measurable effect on the base flood and therefore, do not warrant a map change. The request for a change needs to be carefully prepared by an engineer who knows FEMA's flood study guidelines.

It must be remembered that a community participating in the NFIP is obligated by its agreement with FEMA to submit new or revised map information when it becomes available. Section 65.3 of the NFIP regulations states

A community's base flood elevations may increase or decrease resulting from physical changes affecting flooding conditions. As soon as practicable, but not later than six months after the date such information becomes available, a community shall notify [FEMA] of the changes by submitting technical or scientific data...

Another point to keep in mind is that lenders, insurance agents, and communities must use the published flood maps. Lenders are affected by changes in a FIRM as they enforce the mandatory flood insurance purchase requirements. Communities are affected by changes in a FIRM and a Floodway Map as they enforce floodplain management regulations.

Consequently, uniform procedures have been established for requesting and administering map changes.

TYPES OF CHANGES

FEMA has four approaches to changing NFIP maps: restudies, limited map maintenance projects, amendments and revisions. Any request for a restudy, amendment or revision must be approved or made by the community, since they affect the local floodplain management program.

A restudy is a new Flood Insurance Study for some or all of the community. For example, FEMA may decide to conduct a restudy where development in a small watershed has substantially changed stormwater runoff conditions over the 15 or 20 years since the original FIS was completed. Or a restudy may be needed where growth is occurring along streams without BFEs.

A limited map maintenance project (LMMP) is like a small-scale restudy but is limited in size and cost. It is frequently used for studies in unnumbered A Zones.

A map revision is used for other cases, including:

- challenges to the flood elevations
- to incorporate new data that become effective after a flood control project
- to reflect fill placed in the floodplain after the flood study currently in effect was completed
- to change the floodplain or floodway boundaries
- to include new flood data

An amendment is used to remove an area that was inadvertently included in the SFHA. Often the ground is higher than depicted on the base map used for the FIRM. This typically happens because of the problem of accurately locating the floodplain boundary on a topographic map. For example, more detailed ground elevation data can be used to amend a FIRM to show a property that is higher than the BFE to be outside the SFHA.

LEARNING CHECK #3

1. What is the base flood elevation for the Ogunquit River at cross section D?
   a. Using the Flood Profiles in the report?

   b. Using the Floodway Data Table?

   c. If these numbers are different, which BFE should you use?

2. An "I" symbol is plotted at mile 1.85 on the Ogunquit River profile 03P. What does this symbol represent?

3. Is Kings Highway upstream or downstream from U.S. Route 1?

4. Using the flood profile 03P, determine the BFE on the Ogunquit River for Site G. Site G is 520 feet (0.1 mile) downstream of the Kings Highway bridge

5. How far is the U.S. Route 1 bridge from cross section D on the Ogunquit River?

6. A developer proposes to place a structure at Site R, 625 feet (0.12) miles upstream from the Shore Road Bridge on Josias River. Using the Flood Profiles, tell the developer how high the structure would have to be elevated to be protected to the base flood level and to the 500-year flood level.

7. Site A is 750 feet upstream of North Village Road. What is the BFE here?

D. MAINTAINING AND REVISING NFIP MAPS

NFIP maps are vital to effective enforcement of your floodplain management responsibilities. They are also key to accurate flood insurance rating and fair determinations of the flood insurance purchase requirement.

As the primary repository for NFIP maps, it is important that the community maintain adequate copies and keep them updated. You should have at least one master map that includes all the changes, annexations, map revisions, etc.

It is also important that you keep copies of old, revised maps. They provide a historical record of what was known and the basis of what was required in the past. For example, a property may not have been shown in the SFHA on an old FIRM, so there were no building requirements. If that property is later flooded, you would need to show the old map as the basis for the community's action.

Similarly, people who purchased flood insurance based on the FIRM zone in effect at the time are entitled to keep that FIRM zone as the basis for their rates. You would be doing your citizens a valuable service if you were able to have a copy of an old FIRM.

ORDERING MAPS

Additional copies of your community's FIS report, FIRM and Floodway Map can be ordered by calling **1-800-358-9616**. The toll-free map distribution center number is staffed Monday through Friday from 8 a.m. to 8 p.m. Eastern time,.

Requests may be faxed to 1-800-358-9620, or mailed to:

Map Service Center
P.O. Box 1038
Jessup, MD 20794-1038

Maps are provided at no charge to local government officials. The FIS report and Floodway Maps must be specifically requested, or only the FIRMs will be sent.

Be prepared to give your Community Identification Number.

CHANGING NFIP MAPS

No map is perfect and no flood situation is static. From time to time, FEMA, communities or individuals may find it necessary for a FIRM or Floodway Map to be updated, corrected or changed.

FEMA will make map amendments based on the information submitted by the applicant. Unlike the three other types of changes, an amendment doesn't challenge the FIS or FIRM; it simply removes certain areas or buildings from the SFHA because they are higher than the base flood elevation.

MAPS AND LETTERS

FEMA uses two methods to make flood map changes.

The first is to actually change the map and publish new copies. Here the effective date of a map is changed. A restudy or limited map maintenance project will generally result in a new map. Sometimes revisions and amendments result in a reprinted map. However, this can be expensive and is done only if the change affects a large area.

The other method is to issue a letter that describes the map change. FEMA does this when the revision can be adequately described in writing or through use of a small annotated map panel, such as when only one lot or building is affected.

There are two types of Letters of Map Change (LOMC): a Letter of Map Revision or LOMR and a Letter of Map Amendment or LOMA. The terms relate to the map changes described above. A "LOMR-F" refers to a LOMR based on new fill in the floodplain.

Because such a letter officially amends or revises the effective NFIP map, it is a public record the community must maintain. Any LOMC should be noted on the community's master flood maps and filed by panel number in an accessible location.

If provided with a legal description of the land area above the BFE, FEMA can issue a LOMC for only a portion of the parcel. Or, a LOMC might state that only the immediate building site is removed from the SFHA, but that portions of the rest of the property remain within the SFHA, subject to all floodplain management regulations.

NFIP maps are not changed based on *proposed* projects. However, an applicant may request a Conditional Letter of Map Revision or CLOMR based on proposed plans. A Conditional Letter of Map Amendment or CLOMA can be requested for a vacant lot. These conditional letters inform the builder and others (such as the bank financing the project), than when the project is completed, it will qualify for a LOMR or LOMA.

A processing fee is charged for LOMRs, CLOMRs and CLOMAs. There is no fee for requesting a LOMA.

An example of a LOMA is in Figure 4-6. For this site, the owner supplied the survey data needed to show that the lowest grade adjacent to his house was higher than the BFE shown on the FIRM. Because the request affects only one property, a letter can be issued that describes the property and the type of map change ("this letter amends the map for the Village...to remove this structure from the SFHA").

REQUESTING MAP CHANGES

If you want a restudy or a limited map maintenance project, call your FEMA Regional Office or state NFIP coordinator and ask about the procedures.

If you want a map changed to reflect a new study that has already been done or to reflect better ground elevation data, use one of the following FEMA forms.

MT-1: Letter of Map Amendment (LOMA)
Conditional Letter of Map Amendment (CLOMA)
Letter of Map Revision (Based on Fill) (LOMR-F)
Conditional Letter of Map Revision (Based on Fill) (CLOMR-F)

MT-2: Letter of Map Revision (LOMR)
Conditional Letter of Map Revision (CLOMR)
Physical Map Revision

MT-EZ: Letter of Map Amendment (LOMA) for a single lot
Letter of Map Revision (Based on Fill) (LOMR-F) for a single lot

The MT-EZ is the shortest and simplest of the three forms. A copy is included in Appendix F. This is the form that would be used to request a LOMA like the one in Figure 4-6. A land surveyor is needed to certify the elevation data. Appendix F also includes a handout that explains the map change policies to property owners.

The building elevation certification requires some information not normally required on a FEMA Elevation Certificate, specifically, the lowest elevation on the parcel. This requirement is in addition to the lowest grade adjacent to the structure (including attached decks) and the lowest floor elevation (including the garage, crawlspace or basement, if there are no openings).

If the garage, crawlspace or basement floor is below BFE and the building was built on fill, FEMA cannot issue a LOMA or LOMR.

Except for the MT-EZ, requests for map changes should be completed by a qualified engineer. The most common reason a map change request is denied is that the applicant did not submit adequate technical data to validate the change.

Note that a bank still has the prerogative to require the purchase of a flood insurance policy on a building that has been removed from the SFHA.

Additional information on map changes can be found in *Answers to Questions about the National Flood Insurance Program*, questions 81 – 95.

Federal Emergency Management Agency

Washington, D.C. 20472

DEC 1 1 1995

IN REPLY REFER TO:
Case No.: 95-05-2462A
Community: Village of Orland Hills, Cook County, Illinois
Community No.: 170172
Map Panel Affected: Village of Westhaven, Cook County, Illinois
Panel No. 0001 B

T-218-70-RS

Mr. William Karalis
17000 Westwood Court
Orland Hills, Illinois 60477

Dear Mr. Karalis:

This is in response to your request dated August 18, 1995, requesting that the Federal Emergency Management Agency determine whether the following property is located in a Special Flood Hazard Area (SFHA), an area that would be inundated by the 1% annual chance flood. This property is located in the Village of Orland Hills, Illinois, formerly known as the Village of Westhaven, Illinois, and is shown on the National Flood Insurance Program (NFIP) maps for the Village of Westhaven.

Property Description:	Lot 85, Westwood Phase II, as recorded on Warranty Deed No. 92798676, dated October 27, 1992, filed in the Cook County Recorder's Office
Street Address:	17000 Westwood Court
Community:	Village of Orland Hills, Cook County
State:	Illinois

On October 26, 1995, we received all information necessary to process your request. After comparing this information with the NFIP map for the community referenced above, we determined that although portions of the property would be inundated by a 1% annual chance flood, the existing structure would not. Therefore, this letter amends the map for the Village of Westhaven, Cook County, Illinois (NFIP Map Number 170172, Panel 0001 B, dated March 15, 1982) to remove this structure from the SFHA. The structure is located in Zone C, where flood insurance is available at low rates. Because portions of the property are in the SFHA, any future construction or substantial improvement on this property remains subject to Federal, State, and local regulations for floodplain management.

It should be noted that this property could be inundated by a flood greater than the 1% annual chance flood or by local flooding conditions not shown on the NFIP map. Also, this determination is based on the flood data presently available. However, we are currently revising the NFIP maps for the Village of Orland Hills as part of the countywide study for Cook County. New flood data could be generated that may affect this property. When the new NFIP maps are issued, they will supersede this letter. The Federal requirement for purchasing flood insurance will then be based on the newly-issued NFIP maps.

Figure 4-6: First page from a Letter of Map Amendment

LEARNING CHECK #4

1. What office is the primary repository for your FIS, FIRM and Floodway Map?

2. How do you get more copies of your FIRM?

3. What are the four types of map changes?

4. Mrs. Murphy says she has a survey that shows that her house is higher than the flood level. What type of map change should she request?

5. What locations on her property will Mrs. Murphy need elevation data for?

6. A builder wants to get a bank loan to develop an area. His plans are to fill some low spots and get all the building sites out of the floodplain. His banker will not grant a loan for the project unless she is reassured that the FIRM will be changed when the project is finished. What type of map change should the builder request?

UNIT LEARNING EXERCISE

1. For the Flood Insurance Study for the Town of Ogunquit, Maine:
   a. What is the community number?
   b. What is the best map to use to determine if a property is in the SFHA?
   c. What is the best map to use to determine if a property is in a floodway?
2. What is the effective date of:
   a. Ogunquit's Floodway Map?
   b. Ogunquit's FIRM?
   c. Why are the dates different?
3. Is Ogunquit's FIRM in the old format or new format?
4. Look at Ogunquit's FIRM Index. Why is there no FIRM panel for the extreme western part of the Town?

5. If you measured a distance on the ground as 500 feet, how many inches would it be on Ogunquit's FIRM?

6. If you measured a distance between two cross sections as 1,050 feet, how many miles of stationing would that be?

7. Marge's house is located near Site L, where the "Y" in "Marginal Way" is on the FIRM. How far is her house from the boundary of the nearest protected coastal barrier?

8. Examining the Atlantic Coastline, what is the highest wave crest elevation shown on the FIRM?

9. RM 7 is at Site K. What FIRM zone is RM 7 in?

10. What is the base flood elevation at Site K?

11. If a surveyor wanted to locate RM 7 on the ground, what would he or she look for?

12. How high above sea level is RM 7?

13. Site I is the point of the "V" formed by the intersection of Tern and Ocean Streets.
    a. What FIRM panel is Site I in?
    b. What FIRM zone is Site I in?
    c. What is the base flood elevation at Site I?
    d. The property is in which of the following? (Check those that apply)
       ____ 100-year floodplain
       ____ 100-year floodway
       ____ 500-year floodplain
       ____ Coastal High Hazard Area
       ____ Designated undeveloped coastal barrier

14. Site D is on the banks of the Ogunquit River Tributary, 50 feet southwest of the Captain Thomas Road bridge.
    a. What FIRM panel is Site D in?
    b. What FIRM zone is Site D in?
    c. What is the base flood elevation at Site D using the FIRM?
    d. What is the base flood elevation at Site D using the profile

15. A vacant lot near Site D was recently purchased. The new owners ask for your help in locating the best spot to build a new house. The FIRM shows the entire property in the SFHA. You are handy with a transit, so you survey the proposed building site during a visit to the property. You find that the building site is above the BFE. The owners want you to inform their bank so they won't have to buy flood insurance. What do you say?

16. When the Ogunquit FIS was done, the watershed of the Ogunquit River Tributary was relatively undeveloped. Over the last 15 years, there has been a lot of new construction throughout this small watershed. The Town Engineer says that the base flood elevations are probably out of date and underestimate the true flood hazard. What can you do to get your FIRM updated?

LEARNING CHECK #2

1. What two problems result from floodplain development?
   ALTers Flood plains & dynamics of flooding
   Building & infrastructure DAMAged by dynamics of flooding

2. What does watershed development do to flooding?
   increase in impervious, causes higher run-off and higher flood levels.

3. What is one of the problems with constructing seawalls to protect buildings from flooding or erosion?
   They tend to cause erosion @ the terminus of the Sea Wall

4. What are the five main causes of flood damage?
   hydrodynamic forces
   hydro STATIC forces
   Debris impact
   SOAKing
   Sediment & Contaminate

5. Standing water as little as 3 feet deep can collapse the walls of a frame house.

6. What are some of the safety and health hazards that accompany floods?
   Disruption of public utilities, electrocution, contamination of H_2O Supplies
   fire, animal carcus garbage that breed mosquitos & germs.
   mold/mildew, contaminated Heating ducts, stress and mental health problem.

7. Prior to the 1960's what was the primary way to reduce flood losses?
   STRUCTural Flood Control projects.

8. What is the Unified National Program for Floodplain Management's definition of "floodplain management?" A decision making process that ~~aims~~ AIMS TO Achive the wise use of the Nations floodplains.

9. What are the two primary goals of floodplain management?
   TO reduce the LOSS of life, disruption and damage caused by Floods
   TO preserve & restore the natural resources and functions of Floodplains

UNIT LEARNING EXERCISE

1. What areas are conducive to flash flooding?
   ① Hilly Areas w/ NARROW VAlleys w/ STEEP HILLSIDE
   ② Urban areas w/ LARGE AMOUNT of IMPERVIOUS SURFACES & STORM DRAIN
   ③ AREAS DOWN STREAM of DAMS ~~ALT~~ ~~HC~~ SUBJECT TO ICE JAMS.
2. Is erosion only a threat in coastal areas?
   NO - RIVERINE EROSION can move stream channels and undercut STRUCTURES
3. What is "ponding?"
   When storm water collects in depression and cannot drain off.
4. Are plants and animals the only beneficiaries of the "natural and beneficial functions" of floodplains? NO - People Benefit Thru food they provide, recreational, scientific knowledge, recharge ground water supplies.
5. What does filling in a floodplain do? Filling reduces TH FP ABILITY TO STORE EXCESS H_2O, sending more ↓ STREAM, CAUSING Floods TO RISE TO Higher levels
6. Does moving sand and sand dunes affect flooding?
   yes, it remove the Natural BARRIERS That protect inland properties
7. Hydrodynamic forces are caused by MOVING water and hydrostatic forces are caused by STANDING water.
8. List three materials or household items that are particularly susceptible to flood damage by soaking. Wood, gypsum Board, CARPET MATTRESSES, ~~forced~~ AIR VENTS.
9. What are examples of non-structural flood protection measures?
   Regulations, Building Codes, flood WARNING System
10. What are the Unified National Program for Floodplain Management's four main floodplain management strategies?
    ① Modify Human SUSCEPTIBILITY TO FLOOD DAMAGE
    ② " IMPACT of Flooding
    ③ " Flooding ITSELF
    ④ preserve & restore natural resources.

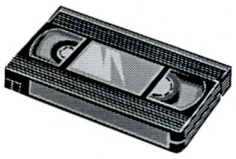
UNIT 2:
THE NATIONAL FLOOD INSURANCE PROGRAM

In this unit

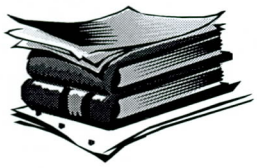
Unit 2 introduces the National Flood Insurance Program:

- How it evolved,
- How it works,
- The roles of the state and local partners participating in the NFIP
- The community's obligations to the program.

Materials needed for this unit



- Videotape segment, *Regulating Floodplain Development*
- Videocassette player



Additional information can be found in *Answers to Questions about the National Flood Insurance Program*, questions 1 – 20.

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A. HISTORY

Historically, people at risk from flooding could only hope for help from their neighbors and charitable organizations in the event of a flood.

Government assistance varied from community to community, and flood insurance was scarce. During the 1920s, the insurance industry concluded that flood insurance could not be a profitable venture because the only people who would want flood coverage would be those who lived in floodplains.

Since they were sure to be flooded, the rates would be too high to attract customers.

During the 1960s, Congress became concerned with problems related to the traditional methods of dealing with floods and flood damage—construction of structural projects and federal disaster assistance. Both were proving to be quite expensive, with no end in sight.

Congress concluded that:

- Although Federal flood programs were funded by all taxpayers, they primarily helped only residents of floodplains.
- Flood protection structures were expensive and could not protect everyone.
- People continued to build and live in floodplains, thus still risking disaster.
- Disaster relief was both inadequate and expensive.
- The private insurance industry could not sell affordable flood insurance because only those at high risk would buy it.

In 1968, Congress passed the National Flood Insurance Act to correct some of the shortcomings of the traditional flood control and flood relief programs. The act created the National Flood Insurance Program (NFIP) to:

- Transfer the costs of private property flood losses from the taxpayers to floodplain property owners through flood insurance premiums.
- Provide floodplain residents and property owners with financial aid after floods, especially smaller floods that do not warrant federal disaster aid.
- Guide development away from flood hazard areas.
- Require that new and substantially improved buildings be constructed in ways that would minimize or prevent damage in a flood.

Congress charged the Federal Insurance Administration (which at that time was in the Department of Housing and Urban Development) with responsibility for the program.

Participation in the NFIP grew slowly. In 1972, Hurricane Agnes devastated a wide area of the eastern United States. Disaster assistance costs were the highest ever, leading Congress to examine why the NFIP was so little used. Investigators found that few communities had joined the NFIP—there were fewer than 100,000 flood insurance policies in force nationwide.

To remedy this, the Flood Disaster Protection Act was passed in 1973, requiring that buildings located in identified flood hazard areas have flood insurance coverage as a condition of federal aid or loans from federally-insured banks and savings and loans, and as a condition for receiving federal disaster assistance. These "sanctions" for non-participation, which are detailed later in this unit, make it hard for any community that wants federal assistance for properties in floodplains to avoid joining the NFIP.

The 1973 Act spurred participation in the program dramatically. By the end of the decade, more than 15,000 communities had signed on and about two million flood insurance policies were in effect.

In 1979, the Federal Insurance Administration (FIA) and the NFIP were transferred to the newly created Federal Emergency Management Agency (FEMA). During the early 1980's, FIA worked to reduce the program's dependence on its authority to borrow from the Federal Treasury. Through a series of rate increases and other adjustments, the program has been self-supporting since 1986. The NFIP is funded primarily through premium income, which pays all administrative and mapping costs as well as claims.

Since 1973, the program has been amended several times. The most important changes came under the National Flood Insurance Reform Act of 1994 which fine tuned various aspects of the program, such as authorizing the Community Rating System, increasing the maximum amount of flood insurance coverage, and establishing a grant program for mitigation plans and projects.

The Reform Act and the initiation of a flood insurance advertising campaign known as "Cover America" boosted sales of flood insurance policies again. By the end of 1997, there were 3.8 million flood insurance policies in force.

Also by the end of 1997, the number of participating communities exceeded 19,000 out of 22,000 with identified floodplains. As shown in Figure 2-1, the greatest growth occurred in the late 1970's, after the provisions of the 1973 amendments took effect.

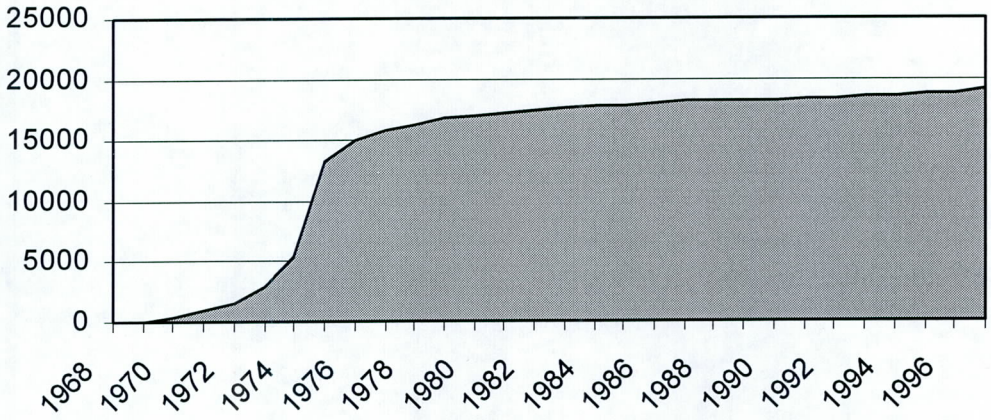

Figure 2-1. NFIP community participation

B. How the NFIP Works

The NFIP is based on a mutual agreement between the Federal Government and the community. Federally guaranteed flood insurance is made available in those communities that agree to regulate development in their mapped floodplains. If the communities do their part in making sure future floodplain development meets certain criteria, FEMA will provide flood insurance for properties in the community.

Because most communities with a known flood problem are in the NFIP, this course does not cover how a community applies to join. However, it does explain the three basic parts to the NFIP—mapping, insurance, and regulations. As discussed below, these three parts are interconnected and mutually supportive.

Mapping

FEMA has prepared a floodplain map and developed flood hazard data for most communities in the country. The maps and data are used for several purposes:

- Communities, states and Federal agencies use them as the basis for the regulating new floodprone construction,
- Insurance agents use the when rating flood insurance policies, and
- Lenders and Federal agencies used them to determine when flood insurance must be purchased as a condition of a loan or financial assistance.

FEMA has issued two kinds of maps:

- The first map received for most communities was called a Flood Hazard Boundary Map (FHBM). This just showed the boundaries of the floodplain using approximate methods.
- Most communities have had their FHBMs replaced by a Flood Insurance Rate Map, or FIRM. A FIRM usually includes a Flood Insurance Study with flood elevations and other hazard information needed to better protect new construction from flood damage.

Buildings that pre-date the FIRM are treated differently than buildings built after the flood hazard was made public on the FIRM. These existing structures are called "pre-FIRM" buildings, while new construction is called "post-FIRM."

The flood insurance rates for post-FIRM buildings are based on how protected they are from the mapped hazard. Therefore, both the NFIP's regulations and insurance coverage depend on the accuracy and utility of the maps.

The NFIP's maps and flood studies are covered in depth in Units 3 and 4.

INSURANCE

Every building located in a participating community may be covered by a flood insurance policy—even buildings not located in a mapped floodplain. Coverage is for damage by a "flood."

A flood is defined by the NFIP as

> A "general and temporary condition of partial or complete inundation of normally dry land areas from:
>
> (1) "The overflow of inland or tidal waters or
>
> (2) "The unusual and rapid accumulation or runoff of surface waters from any source."

The official definition also includes additional technical terms for mudflows and erosion.

Flood insurance premiums for post-FIRM buildings are based on the degree of flood protection they are provided. Therefore, it is very important for communities to ensure that new buildings in the floodplain are constructed properly.

The flood insurance premium rates for pre-FIRM buildings are subsidized by the NFIP. Owners of these policies do not pay "actuarial" rates, i.e., rates based on the true risk the building is exposed to.

No matter whether a building is pre-FIRM or post-FIRM, with flood insurance, owners of floodprone properties pay more of their share toward flood relief. And, they get claims paid when needed.

The NFIP has paid out over $8 billion in flood insurance claim payments for big and small floods (see Figure 2-2). Insurance provides relief for all floods, including those not large enough or severe enough to warrant federal disaster aid.

LOUISIANA STORM	5/95	$582 MILLION
HURRICANE HUGO	9/89	$374 MILLION
NOR'EASTER	2/92	$338 MILLION
MIDWEST FLOOD	6/93	$260 MILLION
MARCH STORM	3/93	$208 MILLION
HOUSTON FLOODS	10/94	$192 MILLION
HURRICANE ANDREW	8/92	$163 MILLION

Figure 2-2. Largest claims paid by the NFIP

Flood insurance and its relation to construction regulations are discussed in more detail in Unit 9.

REGULATIONS

The NFIP underwrites flood insurance coverage only in those communities that adopt and enforce floodplain regulations that meet or exceed NFIP criteria. Buildings built in accordance with these regulations have a lower risk of flooding and can be insured at lower rates.

The community's floodplain regulations are designed to ensure that new buildings will be protected from the flood levels shown on the FIRM and that development will not make the flood hazard worse. Over time, exposure to flood damage should be reduced, as the stock of older pre-FIRM buildings is replaced by post-FIRM buildings. Eventually a community should have only post-FIRM building's subject to little or no flood damage.

The NFIP construction regulations focus on protecting insurable buildings, but they also provide a degree of protection to other types of development. These criteria are detailed in Unit 5.

Floodplain regulations are often controversial and difficult to enforce. Many people want the freedom to build what they want without government controls. In some areas, they may not be aware they need a local permit to build.

As a result of public opposition, a community may be inclined to not fully enforce all of the provisions of its ordinance, which puts its participation in the NFIP in peril. If the community does not fulfill its NFIP obligations to the federal government and allows construction in violation of its regulations, three things can happen:

- New buildings will be built subject to flood damage
- Insurance on an improperly constructed building may be very expensive.
- FEMA can impose sanctions on the community, to encourage it to correct its floodplain management program. The sanctions are discussed in Section D.

Community Does NOT Comply w/ FEMA
① New buildings built subject To Flood Damage
② Insurance Very Expensive
③ Fema Sanction

LEARNING CHECK #1

1. What are the objectives of the NFIP?
   Transfer cost of private property flood losses from TAX-payers TO FP property owners THRU flood insurance program
   Provide financial AID
   guide development AWAY from F.H.A. (Flood HAZARD AREAS

2. What are the three basic parts of the NFIP?
   MAPPING
   INSURANCE
   Regulation

3. Who uses NFIP maps? Communities, STATE, Federal AS BASIS for Regulating Flood Plain.
   Insurance agents use when Rating Flood INSURANCE Rates
   Lenders and Federal agencies TO determine when FLOOD INSURANCE MUST be purchased AS CONDITION for Loan approval

4. What should happen to buildings in NFIP communities over time?
   They will all become POST FIRM buildings AS pre-building ARE Replaced

C. ROLES AND RESPONSIBILITIES

The National Flood Insurance Program is founded on a mutual agreement between the federal government and each participating community. Local, state and federal governments, and private insurance companies must share roles and responsibilities to meet the goals and objectives of the NFIP.

The community's role is of paramount importance. Residents and property owners can get flood insurance only if the community carries out its responsibilities.

THE COMMUNITY ROLE

A community is a governmental body with the statutory authority to enact and enforce development regulations. These governmental bodies vary form state to state, but can include cities, towns, villages, townships, counties, parishes, special districts, states and Indian nations.

The community enacts and implements the floodplain regulations required for participation in the NFIP. The community's measures must meet regulations set by its state, as well as NFIP criteria. The NFIP requirements are covered in Unit 5.

A participating community commits itself to:

- Issuing or denying floodplain development/building permits.
- Inspecting all development to assure compliance with the local ordinance.
- Maintaining records of floodplain development.
- Assisting in the preparation and revision of floodplain maps.
- Helping residents obtain information on flood hazards, floodplain map data, flood insurance and proper construction measures.

VIDEO: *REGULATING FLOODPLAIN DEVELOPMENT*

Before proceeding, view the second video segment, *Regulating Floodplain Development*. About 10 minutes long, this segment provides an overview of community responsibilities under the NFIP.

The segment is part of a series produced by the Commonwealth of Pennsylvania. There are some references to Pennsylvania agencies and governmental units, but they should not detract from the information's usefulness elsewhere.

When done, do not rewind the tape unless you want to review the material.

THE STATE ROLE

Each governor has selected a state coordinating agency for the NFIP. While the role of this agency varies from state to state, it usually includes:

- Ensuring that communities have the legal authorities necessary to adopt and enforce floodplain management regulations.
- Establishing minimum state regulatory requirements consistent with the NFIP.
- Providing technical and specialized assistance to local governments.
- Coordinating the activities of various state agencies that affect the NFIP.

Most states participate in the Community Assistance Program (CAP). Under CAP, NFIP funds are available on a 75 percent / 25 percent cost share to help the state coordinating agency provide technical assistance to communities and to monitor and evaluate their work. The telephone numbers of the state coordinating agencies are listed in Appendix B.

States also participate in the NFIP by establishing and enforcing floodplain management regulations for state-owned properties. This can be done through legislation, but more often has been done through a governor's executive order.

THE FEDERAL ROLE

The Federal Emergency Management Agency (FEMA) administers the NFIP through its Regional Offices, Mitigation Directorate and Federal Insurance Administration.

The ten FEMA *Regional Offices* each have a Mitigation Division which coordinates the NFIP with states and communities. Each FEMA regional office covers four to eight states and territories. Together they work with more than 19,000 participating communities. A list of the regional offices, their addresses and the states they cover appears in Appendix A.

The Regional Offices are responsible for:

- Assisting the state NFIP coordinating agencies.
- Assessing community compliance with the minimum NFIP criteria.
- Advising local officials responsible for administering the ordinance.

- Answering questions from design professionals and the public.
- Helping review and adopt new maps and data.
- Providing information and training on the flood insurance purchase requirements.

FIA Federal Insurance Agency

The *Mitigation Directorate* in Washington, D.C., sets national policy for floodplain regulations, researches floodplain construction practices and administers the flood hazard mapping program. The Directorate has mapped more than 100 million acres of flood hazard areas nationwide and designated some six million acres of floodways along 40,000 stream and river miles.

The Federal Insurance Administration (FIA), located in Washington, D.C., administers the insurance portion of the program. It sets flood insurance rates, establishes coverage, monitors applications and claims, and markets flood insurance.

The FIA has established the NFIP as a self-supporting program. All NFIP expenses, including mapping and administrative costs, are paid through insurance premiums and fees from map revision requests.

Most applications and claims are processed by private insurance companies through an arrangement with the FIA called the Write-Your-Own Program. The FIA also contracts for agent training and other assistance through regional insurance offices. They can be reached through the FEMA Regional Offices.

D. COMMUNITY PARTICIPATION

The NFIP is based on a cooperative agreement between the community and FEMA. FEMA can only make flood insurance available in those communities that agree to regulate future development in the floodplain.

JOINING THE NFIP

Participation in the NFIP is voluntary. There is no Federal law that requires a community to join, although some states have requirements. However, as discussed later in this section, a nonparticipating community faces sanctions, such as loss of Federal aid for insurable buildings in the floodplain. These make participation a very important decision for many communities.

To join, a community must adopt a resolution of intent to participate and cooperate with FEMA. The community agrees to "maintain in force...adequate land use and control measures consistent with the [NFIP] criteria" and to:

> (i) Assist the Administrator in the delineation of the floodplain,
>
> (ii) Provide information concerning present uses and occupancy of the flood plain,
>
> (iii) Maintain for public inspection and furnish upon request, for the determination of applicable flood insurance risk premium rates within all areas having special flood hazards, elevation and floodproofing records on new construction,
>
> (iv) Cooperate with agencies and firms which undertake to study, survey, map, and identify flood plain areas, and cooperate with neighboring communities with respect to the management of adjoining flood plain areas in order to prevent aggravation of existing hazards;
>
> (v) Notify the Administrator whenever the boundaries of the community have been modified by annexation or the community has otherwise assumed or no longer has authority to adopt and enforce flood plain management regulations for a particular area.

The community must also adopt and submit a floodplain management ordinance that meets or exceeds the minimum NFIP criteria. These criteria are explained in Unit 5 of this course.

As shown in Figure 2-1, most communities joined in the 1970's. At that time they were provided with a Flood Hazard Boundary Map which showed only the approximate boundaries of the floodplain. Generally, they entered the "Emergency Phase" whereby their regulatory responsibilities were limited because of the limited flood hazard data provided on the map.

Participating communities receive a Flood Insurance Rate Map (FIRM) and most get a Flood Insurance Study with more detailed flood hazard data. After a period to review and appeal the draft map and study, the community is given six months to adopt the new data in a more comprehensive ordinance.

The FIRM takes effect at the end of the six month period. If the ordinance has been adopted in time, the community is converted to the "Regular Phase" on that date. That is also the date that differentiates "pre-FIRM" buildings from "post-FIRM buildings."

If the ordinance is not adopted in time, the community is suspended from the NFIP. The FIRM still goes into effect on the same date and is used by lenders and Federal agencies for determining where loans can be issued and federal assistance can be provided.

As of the end of 1997, 99% of the NFIP communities were in the Regular Phase.

COMPLIANCE

The community's floodplain management program and permit records are reviewed periodically by the FEMA Regional Office or state NFIP coordinating agency. Either agency may inspect records as part of a community assistance visit (CAV) or community assistance contact (CAC).

If a community doesn't uphold its part of the agreement and fails to adequately enforce its floodplain management regulations, FEMA has recourse through three approaches:

- Reclassification under the Community Rating System
- Probation
- Suspension from the program

Reclassification under the Community Rating System

The Community Rating System (CRS) provides a discount in the flood insurance premiums for properties in communities that participate in the CRS. The CRS is explained in Unit 9, Section C.

CRS Communities that are deemed to no longer be in full compliance with the NFIP requirements can be reclassified to Class 10. Should that happen, residents would lose their CRS flood insurance premium discounts.

Probation

Probation represents formal notification to the community that FEMA regards the community's floodplain management program as non-compliant with the NFIP criteria.

Prior to imposing probation, FEMA provides the community a 90-day written notice and lists specific deficiencies and violations. It also notifies all policy holders of the impending probation, telling them that an additional $50 premium will be charged on policies sold or renewed during the probation period. The objective of this surcharge is to bring the policy holders' attention to the fact that their community is not compliant and failure to correct the problems may lead to suspension.

The community has 90 days to avoid this sanction by correcting deficiencies and remedying identified violations. Probation may be continued for up to one year after the community corrects all program deficiencies. This ensures that the community has truly changed its ways and become compliant and that all policies holders are advised of the situation when their policies are renewed.

Suspension

If, after a period of probation, a community fails to remedy its program deficiencies, it will be suspended from the NFIP. Suspension means the community is no longer in the NFIP. It is subject to the sanctions for non-participation that are explained in the next section.

FEMA grants a community 30 days to show why it should not be suspended and then gives it a 30-day suspension letter. FEMA may also conduct a written or oral hearing before suspension takes effect.

A community can automatically be suspended if, following due notice, it failed to adopt revisions to its floodplain ordinance in response to flood map revisions or amended minimum NFIP criteria.

A community suspended under the NFIP may apply to the FEMA Regional Office for reinstatement by submitting the following:

- A local legislative or executive measure reaffirming the community's intent to comply with the NFIP criteria.
- Evidence that all program deficiencies have been corrected.
- Evidence that any violations have been remedied to the maximum extent possible.

FEMA may reinstate the community to full program status, bring it to a probationary status, or withhold reinstatement for up to one year after a satisfactory submission from the community.

SANCTIONS FOR NON-PARTICIPATION

A community that does not join the NFIP, has withdrawn from the program, or is suspended from it faces the following sanctions:

- Flood insurance will not be available. No resident will be able to purchase a flood insurance policy.
- If the community withdraws or is suspended, existing flood insurance policies will not be renewed.
- No Federal grants or loans for development may be made in identified flood hazard areas under programs administered by Federal agencies such as HUD, EPA, and SBA.
- No Federal disaster assistance may be provided to repair insurable buildings located in identified flood hazard areas for damage caused by a flood.
- No Federal mortgage insurance or loan guarantees may be provided in identified flood hazard areas. This includes policies written by FHA, VA, and others.
- Federally insured or regulated lending institutions, such as banks and credit unions, must notify applicants seeking loans for insurable buildings in flood hazard areas that:
  - -- There is a flood hazard and
  - -- The property is not eligible for Federal disaster relief.

These sanctions can be severe on any community with a substantial number of buildings in the floodplain. Most communities with a flood problem have joined the NFIP and are in full compliance with their regulatory obligations.

LEARNING CHECK #2

1. What types of governmental bodies are considered to be "communities" by the NFIP? STATE, CITY, COUNTIES, INDIAN RESERVATION

2. What office is the sate coordinating agency for your community?
   ADEQ

3. Which FEMA office works directly with communities?
   Ten Regional offices

4. What is the Write Your Own Program? AN ARRANGEMENT WHEREBY PRIVATE INSURANCE COMPANIES WRITE NATIONAL FLOOD INSURANCE POLICIES

5. When a community applies to join the NFIP, what must it submit?
   A RESOLUTION OF INTENT TO "MAINTAIN FORCE" ADEQUATE LAND USE AND CONTROL MEASURES TO COMPLY W/ FEMA'S ITS ADOPTED FPM ORDINANCE

6. What are the sanctions if a community does not participate in the NFIP?
   NO FLOOD INSURANCE AVAILABLE, NO CITIZEN WILL BE ABLE TO BUY FLOOD INSURANCE THRU-NFIP.

UNIT LEARNING EXERCISE

1. Where does most of the money come from to pay the expenses of the NFIP?
premium income, NFIP self supporting Since 1986

2. How many communities currently participate in the NFIP?
19,000 +

3. What is a "pre-FIRM" building.
one that was built before the effective date of the Communities Flood Ins. Rate Map (FIRM)

4. Is there any relation between how a community regulates new construction and flood insurance rates? yes, Building Built in accordance w/ the Community regs have a lower Risk of Flooding and can be insured @ a lower Rate

5. List two things your community committed itself to when it joined the NFIP.
Issuing or denying FP development/Building permits
Inspecting all development to insure Compliance w/ Local ordinance
MAINTAINING Records of FP Development
ASSIST w/ preparation and revisions of Floodplain MAPS.

6. Insurance companies set flood insurance rates and coverage rules. True or false? False Rules & Rates are set by Fema's Federal Insurance agency

7. What can FEMA do to encourage a community to adequately enforce its floodplain management regulations? –
If in CRS it can be reclassified to Class 10.
Put on probation
Suspended

8. What are the sanctions if a community is suspended from the NFIP?
Same as non participation, Community no longer in NFIP

UNIT 3:
NFIP FLOOD STUDIES AND MAPS

In this unit

This unit describes the flood data, studies, and maps that the National Flood Insurance Program provides to communities to assist them in carrying out their floodplain management program. It reviews:

- Flood study and map terminology,
- How flood studies are prepared along riverine floodplains,
- How flood studies are prepared on coastal floodplains, and
- How the NFIP maps display the study data.

Materials needed for this unit

- Flood Insurance Study, Flood County, USA and Incorporated Areas
- Flood Insurance Rate Map, Flood County, USA and Incorporated Areas

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A. NFIP FLOOD STUDIES

FLOOD STUDY TERMINOLOGY

Before describing how flood studies are developed, we first need to introduce some of the common terms used in floodplain analysis and in the National Flood Insurance Program (NFIP). The following terms are integral for understanding the basis for flood studies and flood maps:

- The base flood,
- The 100-year flood,
- Special Flood Hazard Area, and
- Base Flood Elevation.

The base flood

Floods come in many sizes — with varying degrees of magnitude and frequency.

Rivers and coastlines are expected to flood, as all bodies of water have floodplains. But rivers and coastlines are different, as well; each has its own probability of flooding. Probability is a statistical term having to do with the size of a flood and the odds of that size of flood occurring in any year.

For each river, engineers assign statistical probabilities to different size floods. This is done to understand what might be a common or ordinary flood for a particular river versus a less likely or a severe flood for that same river.

In order to have common standards, the NFIP adopted a baseline probability called the base flood. The base flood is the one-percent annual chance flood. The one-percent annual chance flood is the flood that has a one-percent (one out of 100) chance of occurring in any given year. The base flood, which is also informally referred to as the 100-year flood, is the national standard used by the NFIP and all Federal agencies for the purposes of requiring the purchase of flood insurance and regulating new development

The one-percent annual chance flood was chosen as a compromise between a more frequent flood (such as a 10-percent chance flood), which would permit excessive exposure to flood risk, and a more infrequent flood (say, a 0.1-percent chance flood), which would be considered an excessive and unreasonable standard.

The 100-year flood

The one-percent annual chance flood is also called the 100-year flood because the inverse of one percent (one divided by one percent or 0.01) equals 100. This calculation gives us the flood's recurrence interval, in terms of probability, which is 100 years.

The term "100-year flood" is often misconstrued. Commonly, people interpret the 100-year flood definition to mean "once every 100 years." This is wrong. You could experience a 100-year flood two times in the same year, two years in a row, or four times over the course of 100 years. You could also not experience a 100-year flood over the course of 200 or more years.

To avoid confusion (and because probabilities and statistics can be confusing), the NFIP uses the term "base flood." A 100-year base flood is defined as having a one-percent chance of being reached or exceeded in any single year. Thus, the 100-year flood also is called the "one-percent annual chance flood."

To restate, "100-year flood" and "base flood" both refer to a flood that has a one-percent chance of occurring in any given year. The terms "base flood," "100-year flood," and "one-percent annual chance flood" are often used interchangeably.

Special Flood Hazard Area and Base Flood Elevation

The land area covered by the floodwaters of the base flood is the base floodplain. On NFIP maps, the base floodplain is called the Special Flood Hazard Area (SFHA).

The SFHA is the area where the NFIP's floodplain management regulations must be enforced by the community as a condition of participation in the NFIP and the area where the mandatory flood insurance purchase requirement applies.

The computed elevation to which floodwater is anticipated to rise during the base flood is the Base Flood Elevation (BFE).

WHAT ARE THE ODDS OF BEING FLOODED?

The term "100-year flood" has caused much confusion for people not familiar with statistics. Another way to look at flood risk is to think of the odds that a 100-year flood will happen sometime during the life of a 30-year mortgage—a 26% chance for a structure located in the SFHA.

Chance of Flooding over a Period of Years

Time Period	Flood Size 10-year	25-year	50-year	100-year
1 year	10%	4%	2%	1%
10 years	65%	34%	18%	10%
20 years	88%	56%	33%	18%
30 years	96%	71%	45%	26%
50 years	99%	87%	64%	39%

Even these numbers do not convey the true flood risk because they focus on the larger, less frequent, floods. If a house is low enough, it may be subject to the 10- or 25-year flood. During a 30-year mortgage, it may have a 26% chance of being hit by the 100-year flood, but the odds are 96% (nearly guaranteed) that it will be hit by a 10-year flood. Compare those odds to the only 1-2% chance that the house will catch fire during the same 30-year mortgage.

IDENTIFYING FLOODPRONE AREAS

The National Flood Insurance Act of 1968 directed the Federal Insurance Administration (FIA) to:

- Identify all floodprone areas within the United States.
- Establish flood-risk zones within floodprone areas.

Today, the Federal Emergency Management Agency (FEMA) is responsible for implementing this directive. FEMA has conducted flood studies and produced various forms of maps. The flood studies analyze the terrain and the factors that affect flood hazards. This information is used to draw the maps that delineate floodplain boundaries.

The maps and flood studies also show projected flood elevations, flood velocities, floodway dimensions, insurance rating zones, and descriptions of how the study was

conducted and how the maps were prepared. This information is needed for flood insurance and floodplain management purposes.

All of this information is referred to as a community's Flood Insurance Study (FIS), which is conducted under standards set by FEMA for the NFIP. FEMA has prepared flood insurance studies for more than 19,000 communities.

In keeping with the directive of the National Flood Insurance Act of 1968, initial flood study and mapping efforts of the NFIP were focused on identifying all floodprone areas within the United States. Flood data and floodplain information from many sources — such as soils mapping, actual high water profiles, aerial photographs of previous floods, topographic maps, etc. — were used to overlay the *approximate* outline of the base (100-year) floodplain for specific stream reaches on available community maps, usually U. S. Geological Survey topographic quadrangle maps.

These documents were referred to as Flood Hazard Boundary Maps and were based on approximate studies. Most communities used a Flood Hazard Boundary Map when they first joined the NFIP.

As money was appropriated by Congress, FEMA performed more detailed studies for many communities, resulting in the publication of Flood Insurance Study reports and Flood Insurance Rate Maps (FIRMs). These studies provide communities with data needed to adopt and implement more comprehensive floodplain management measures and to enter the Regular Phase of the NFIP.

FISs, also referred to as detailed studies, were carried out for developed communities and for those areas experiencing rapid growth. FISs contain guidance on understanding the FIRM as well as information needed for new construction allowed in developing and developed areas.

Today, almost every community in the NFIP has a FIRM, which may contain approximate and/or detailed flood hazard analyses. The areas mapped with approximate studies are areas where, originally, there was little or no development or expectation of development. However, recent development may have created a need for future detailed studies in these areas.

Flood maps are one of the most vital parts of a floodplain management program, so it is important to understand how the maps were created and to be familiar with the information that is available within the accompanying flood study.

FLOOD INSURANCE STUDY

When a flood study is completed for the NFIP, the information and maps are assembled into a Flood Insurance Study (FIS). A FIS is a compilation and presentation of flood risk data for specific watercourses, lakes, and coastal flood hazard areas within a community.

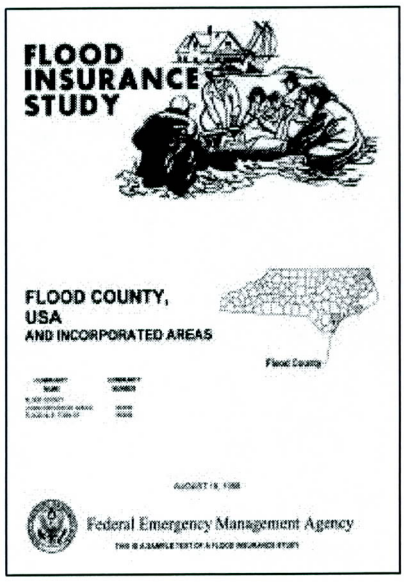
The FIS report and associated maps delineate the SFHA, designate flood risk zones and establish base flood elevations. They serve as the basis for rating flood insurance and for regulating floodplain development and carrying out other floodplain management measures.

The study has three components:

- The FIS — Flood Insurance Study report
- The FIRM — Flood Insurance Rate Map
- Prior to 1986, a separate Flood Boundary and Floodway Map (FBFM) was issued as a component of the FIS for each community studied.

The FIS report includes:

- An appraisal of the community's flood problems in a narrative that describes:
  - -- the purpose of the study,
  - -- historic floods,
  - -- the area and flooding sources studied, and
  - -- the engineering methods employed.
- A vicinity map of the community and, occasionally, photographs of historic floods.
- Tables summarizing various flood hazard data.
- Computed flood profiles for various recurrence probabilities, usually the 10-, 50-, 100-, and/or 500-year floods.



FLOOD COUNTY, USA AND INCORPORATED AREAS

Included in the course materials are the FIS report and maps for Flood County, USA and Incorporated Areas. This fictitious community was developed to illustrate examples of both riverine and coastal flood hazards.

This unit uses these documents for Flood County, USA and Incorporated Areas:

- The FIS report, and
- The FIRM, accompanying Map Index, and panels 25, 38, and 40.

Flood County is subject to flooding from several flooding sources; however, this unit concentrates on the following three sources:

- The Rocky River, which drains from the west, and flows through the Town of Floodville to the Atlantic Ocean.
- Cobb Brook, which flows from the west to the Rocky River.
- The Atlantic Ocean.

As you look at Flood County, you may find that some street names do not appear on the FIRM. This is because flood hazard maps are created to show details related to identified floodplains. If your community flood maps lack street names, use a supplementary street map to assist you in locating properties accurately.

As you work through this unit, we recommend that you locate similar sections in your community's FIS and see how this information pertains to your situation. The outline is similar for all FISs, so you should be able to locate the same tables and exhibits in the table of contents.

LEARNING CHECK #1

1. As directed by the National Flood Insurance Act of 1968, FEMA conducts flood studies in order to determine Flood prone Areas and Flood Risk Areas

2. The base flood is a flood that has a 1% chance of occurring in any year.

3. The base flood is also called the 100 - year flood.

4. Determine whether the following statements are true or false. Circle T for True and F for False.

A 100-year flood will occur only once every 100 years.	T	(F)
A 100-year flood could occur two times in one year.	(T)	F
The 100-year flood might not occur in a 200-year period.	(T)	F
The base flood could occur in two consecutive years in a row.	(T)	F

5. On NFIP maps, the base floodplain is called the Special Flood Hazard Area. (4 words)

6. BFE is the acronym for Base Flood Elevation.

7. What are the components of a Flood Insurance Study?

The FIS Flood Insurance Study

The FIRM Flood Insurance Rate MAP

The Flood Boundary & Floodway MAP

B. RIVERINE STUDIES

Detailed flood studies are conducted differently for different types of flooding, which are:

- Riverine flooding of rivers, streams or other waterways,
- Lacustrine flooding of lakes and ponds,
- Coastal flooding caused by hurricanes or severe storms, and
- Shallow flooding, ponding, and sheet flow.

As you recall from Unit 1, there are other types of flooding, such as alluvial fans, ice jams, and mudflows. This unit does not cover how these areas are studied because each situation is unique. If your community has these unique hazards, Appendix C lists some reference materials that may be of assistance.

Riverine flooding occurs in rivers, streams, ditches or other waterways that are subject to overbank flooding, flash floods, and urban drainage system flooding. Riverine studies involve, among other factors, the collection and analysis of information about the river's watershed, the topography or the lay of the land along the river, precipitation, and the characteristics of the river itself.

HYDROLOGY

In order to determine the depth of flood waters and to determine the size or width of floodplains, engineers must first examine the watershed to determine the amount of water that will reach a stream and be carried by the stream during a flood event.

Hydrology, a science dealing with the distribution and circulation of water in the atmosphere, on land surfaces, and underground, is used to determine flood flow frequencies. The study of a watershed's behavior during and after a rainstorm is, therefore, hydrology. A hydrologic analysis determines the amount of rainfall that will stay within a watershed — absorbed by the soil, trapped in puddles, *etc.* — and the rate at which the remaining amount of rainfall will reach the stream.

The rainfall that reaches the stream is called runoff. Increased runoff will, in turn, increase flood discharge. Discharge is the amount of water flowing down a stream channel. Discharges are measured in cubic feet per second or cfs. (A cubic foot of water is about 7.5 gallons.) Data for this measurement is taken by stream gauges at specified locations along a given stream also known as gaging stations.

Significant development or other changes in the watershed (both within a community and any upstream communities) can significantly change the flood discharges. Often, the increase in impervious areas associated with urbanization causes increase in stream discharges. In addition, new technical data such as new regional equations, new design storms, and in some circumstance, increase in the length of gage records, might significantly affect the base discharge estimation.

Runoff amounts and discharge rates vary depending on soil type, ground slope, land use, and the presence of storm sewers. In general, more runoff occurs on non-vegetated land, on paved and built-on urban land, and on steeper slopes.

Discharges are estimated by using rainfall and snowmelt data and historical stream records or by using regional equations that represent such data. Computer models allow engineers to incorporate numerous watershed characteristics into the hydrologic analyses. Discharge rates also generally increase as the size of a watershed increases.

Upon completion of the hydrologic analysis, engineers have flood discharges for various size rainstorms that are measured at different points along a stream, such as at the confluence with another stream and at the mouth of a tributary stream.

CROSS SECTIONS

All detailed flood studies examine the areas through which floodwater will flow. This requires a determination of ground elevations and obstructions to flow (such as vegetation, buildings, bridges, and other development) for these areas. Accurate data on the channel geometry and changes in the floodplain are obtained from ground surveys, aerial photography, or topographic maps.

To locate the true elevations at a site, surveyors have established elevation reference marks or bench marks that are referenced to a common vertical elevation reference called a datum. The use of a datum ensures uniformity of references to land elevations and avoids misinterpretation of flood elevations.

Established reference marks and bench marks with a recorded elevation allow surveyors to describe the changes in the ground levels or stream characteristics as elevations relative to the referenced datum. They are also used by surveyors to determine the elevations of buildings that are at risk of flooding.

A cross section is a graphical depiction of the stream and the floodplain at a particular point along the stream. It is taken at right angles to the flow of the stream. At each cross section, the engineer has accurate information on the size and geometry of the channel, the shape of the floodplain, and the changes in the elevation of the ground. A typical surveyed cross section is shown in Figure 3-1.

Cross sections are taken of the floodplain at locations along the stream that are representative of local conditions. Cross sections are taken at each bridge or other major obstruction and at other locations, depending on how much the stream or adjacent floodplain conditions change (Figure 3-2). The more changes there are in topography (perhaps steep riverbanks changing to large flat overbank areas), the more cross sections are needed to define the floodplain accurately.

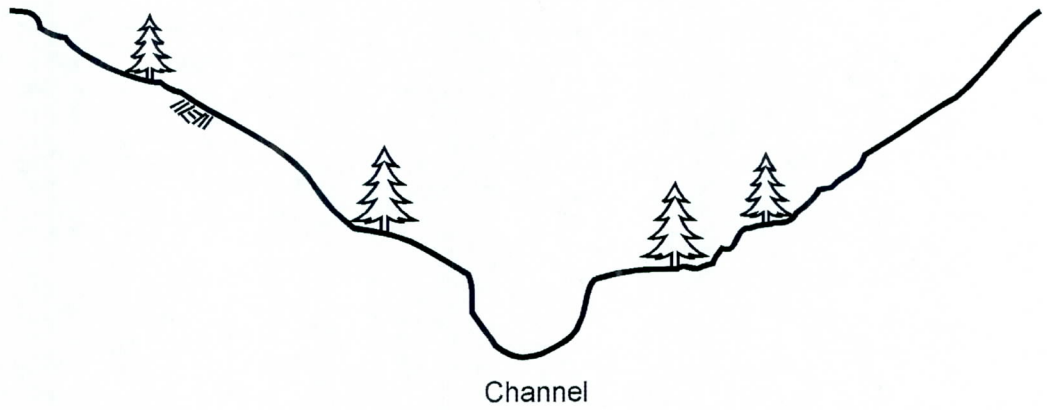


Figure 3-1: Surveyed cross section

About Datums and Elevations

During the 1920s, the U.S. government created a network of 21 tidal gages in the U.S. and five in Canada to provide a fixed continental datum that would bring a consistent relationship to all vertical elevation determinations in the U.S. This new datum was known as the Mean Sea Level (MSL) Datum of 1929 and is the base elevation to which all relief features and elevation data are referenced in the contiguous United States. In 1973, to avoid confusion in many communities that used a local mean sea level datum, the name was changed to the National Geodetic Vertical Datum (NGVD) of 1929. NGVD is also the datum of reference for the vast majority of FISs.

Most permanent elevation reference marks (or bench marks) are referenced to the NGVD (see example). Reference marks are not always brass caps; they can be chiseled squares or other designated markers left by surveyors. The city or county surveyor or engineer's office should have a list of bench marks in the community. An ultimate goal of the NFIP is to convert all FISs to a newer standard called the North American Vertical Datum (NAVD) of 1988. This latest standard will eliminate inconsistencies caused when the NGVD is not consistent at all 26 tidal stations.

When reporting elevations for structures, cross sections, or topographic mapping, it is very important to note the datum to which the survey is referenced. Differences between NAVD 88 and NGVD 29 vary by as much as –1.5 feet along the east coast of southern Florida to + 4.9 feet in the Rocky Mountains of Colorado. Software for converting between NAVD 88 and NGVD 29 is available from the National Geodetic Survey.

There are now 600,000 permanent benchmarks associated with the NAVD of 1988. See *Flood Insurance Study: Guidelines and Specifications for Study Contractors,* FEMA-37 (1995), for further information.

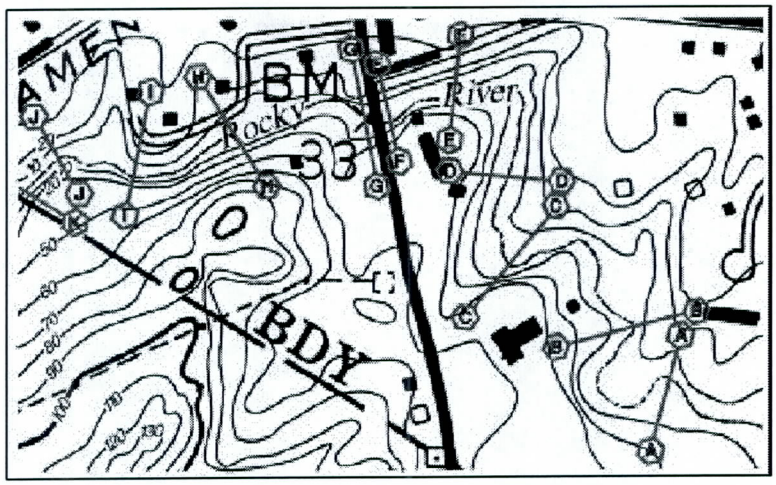


Figure 3-2: Typical cross section locations

The surveyors and engineers also estimate the roughness factor along the floodplain to determine how fast floodwater will flow through the area. Roughness factors are related to ground surface conditions, and they reflect changes in floodwater velocity due to ground friction. For example, water will flow faster over mowed grass and pavement than it will over an area covered in bushes and trees, or planted in tall crops.

A portion of the collected survey information is used in the hydrologic analysis, but the surveyed cross sections and other survey information are the building blocks of the hydraulic analysis and mapping efforts.

HYDRAULICS

Hydraulics, a science that deals with fluids in motion, is used to determine how a quantity of water will flow through a channel or floodplain. For purposes of floodplain analysis, hydraulics is the study of floodwaters moving through the stream and the floodplain. Hydraulic analysis combines:

- Flood hydrology, or discharges,
- The cross section data on how much area there is to carry the flood, and
- Stream characteristics — roughness, slope, locations and sizes of structures.

The data are usually processed using a computer model, most commonly HEC-2 or HEC-RAS, which were developed by the U.S. Army Corps of Engineers' Hydrologic Engineering Center.

Changes in hydraulic conditions of a stream usually occur when new bridges, culverts and road crossings are constructed, and when there are changes in the physical characteristics of the stream. If a bridge or culvert is not properly sized, it can cause flood waters to back-up, which increases flood levels upstream. Although most bridge openings and culverts are designed to allow stream flows associated with frequent storm events to pass without such backwater effects, they may still cause increase in the base flood

elevation. Therefore, any bridges, culverts, or other road crossings that have been constructed since the analyses for the effective FIS and FIRM were completed should be evaluated for their potential effect on the base flood and the associated floodway. In addition, any significant changes in the stream channel or floodplain geometry could affect the floodplain and floodway. One should always ask the questions: 1) has any portion of the floodplain been filled? 2) has the stream channel migrated or changed location because of significant erosion and/or depositions? 3) have any portions of the stream been channelized, widened, or dredged? 4) have there been significant changes in the vegetation in the floodplain? Aerial photographs are useful tools in evaluating changes in stream channels and floodplains.

The hydraulic study produces determinations of flood elevations, velocities, and floodplain widths at each cross section for a range of flood flow frequencies (Figure 3-3). These elevations are the primary source of data used by engineers to map the floodplain.

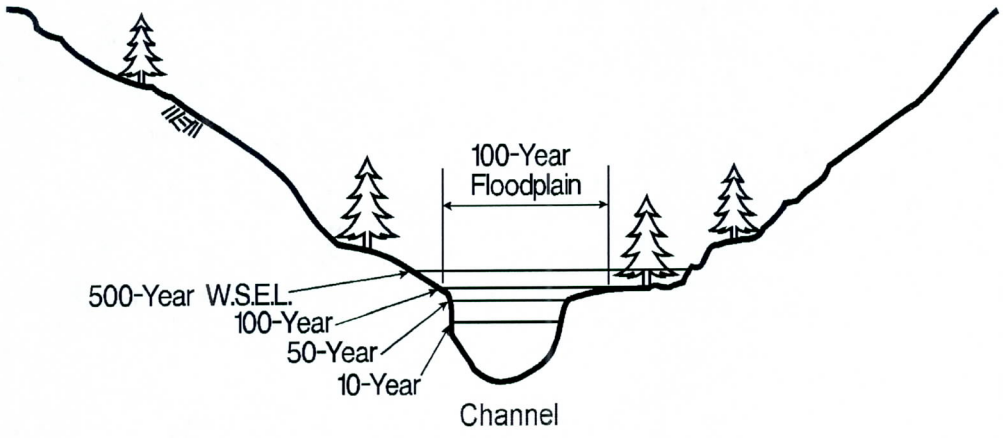


Figure 3-3: Cross section with flood elevations

A FIS typically produces elevations for the 10-, 50-, 100-, and 500-year floods. Water-Surface Elevations (WSEL) for the 10-, 50-, and 500-year floods are typically used for other floodplain management purposes. For example, the 10-year flood data may be used for locating septic systems, the 50-year flood for placing bridges and culverts, and the 500-year for siting critical facilities, such as hospitals or emergency operation facilities.

FLOOD PROFILE

The hydraulic computer program generates potential flood elevations at each cross section, but flood elevations at locations between the cross sections need to be

determined as well. This is done by plotting the elevations at the cross sections on a graph and connecting the plotted points. Such a graph is called a flood profile.

Figure 3-4 shows a portion of the flood profile for the Rocky River. The entire profile is found in the back of the Flood County FIS report.

The bottom of the graph (the horizontal axis or x-axis) shows the distance along the stream, which is commonly called stationing. For stationing, you start at the mouth of a stream (its point of discharge into a larger body of water) and look upstream. Generally, when profiles are plotted, the slope of the streambed will rise as you read the graph from left to right.

River distances are measured in either feet or miles (1mile=5280 feet), or meters and kilometers (1 kilometer=1000 meters). For most profiles, the distance is measured above the mouth of the stream or above its confluence (where it meets with another stream). In the case of Flood County, the stream distances for the Rocky River are measured above the County Boundary.

The left and right sides of the graph (the vertical axis or y-axis) show elevations in feet (NGVD). The legend at the bottom right corner shows the symbol for each flood profile plotted. Bridges are indicated with an "I" shaped symbol. The bottom of the "I" represents the bridge's low chord (lowest beam) and the top of the "I" represents the top of the roadway or the top of a solid bridge railing.

Additional information is provided on the profiles, such as corporate limits and confluences of smaller streams. Profiles also provide a picture of stream characteristics, such as steep sections of the streambed and where restrictive bridge openings cause floodwaters to back up (see the footbridge in Figure 3-4).

By reading a profile, you can determine the flood elevation at any point along the stream. Reading profiles is covered in Unit 4.

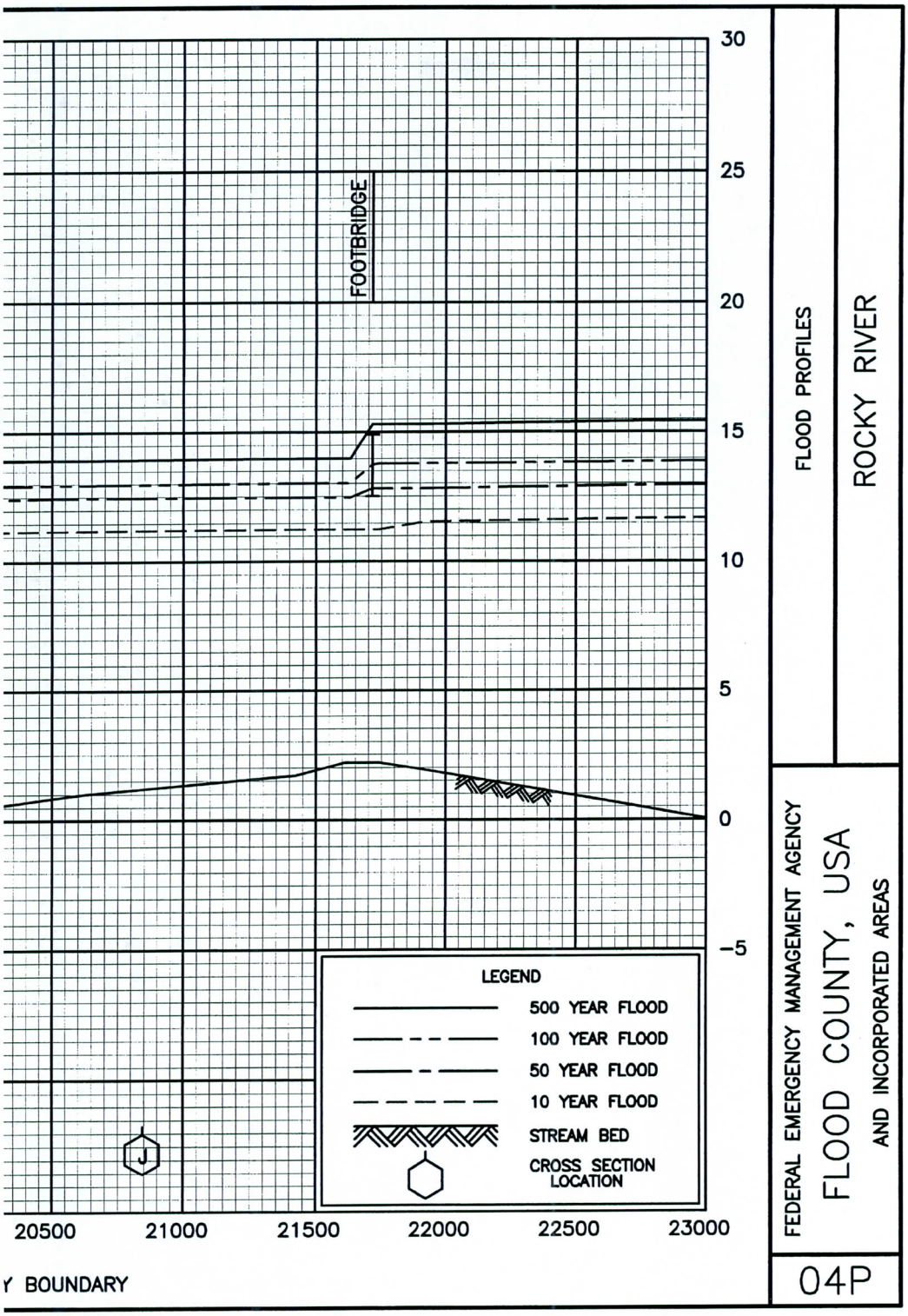


Figure 3-4: Rocky River flood profile

FLOODPLAIN MAP

The next step in the mapping process is to transfer the flood elevation data onto a map showing ground elevation data. This is called a topographic map or contour map because points with the same elevation are connected by a contour line. The topographic or contour map is often referred to as the base map.

The most common topographic maps used are produced by the U.S. Geological Survey. Some communities have prepared their own topographic maps and provided them to FEMA during the study process to improve the accuracy of their floodplain maps.

The base flood elevations from the cross sections and profiles are plotted on the topographic map. Floodplain boundary lines are drawn connecting these plotted points using the contour lines as a guide. The completed map illustrates the SFHA (Figure 3-5).

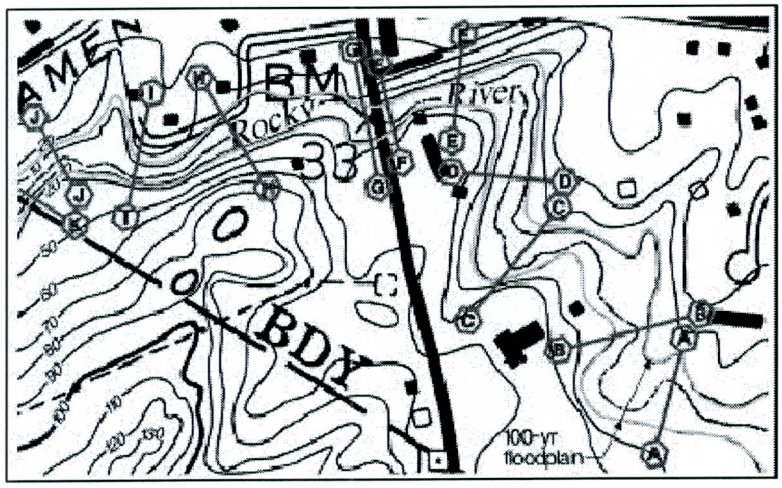


Figure 3-5: The BFEs at the cross sections from the Rocky River profile are used to plot the BFEs on the contour map.
Lines are connected to show the floodplain boundary on a map.

It is important to remember that floodplain map boundaries are only as accurate as the topographic map on which they are drawn. Since the U.S. Geological Survey topographic quadrangle maps have so small a scale, the SFHA boundaries cannot be precisely mapped. This is important to remember when determining if a building is in or out of the floodplain, and, therefore, the use of other relevant measurements may be required and is recommended.

Correlating map features with ground features requires care, because maps do not always represent exact conditions on the ground. Where there is an apparent discrepancy between floodplain boundaries shown on a map and actual ground conditions, as the local administrator, you can use elevation data to resolve the matter by locating the flood elevation on the ground via an elevation survey. This elevation represents the actual extent of flooding for that particular flood.

Note: Banks, lending institutions and others who must read the FIRM to detemine if flood insurance is required must go by the map. They cannot make on-site interpretations based on data other than the FIRM. However, they may recommend that the property owner submit a request for a map revision or map amendment so the map can be officially changed to reflect the more accurate data (see Unit 4, Section D).

FLOODWAY ANALYSIS

The final step in preparing most riverine flood studies is to produce the floodway analysis, which identifies where encroachment by development will increase flood elevations significantly and worsen flood conditions.

The floodway is the stream channel and that portion of the adjacent floodplain that must remain open to permit passage of the base flood. Floodwaters generally are deepest and swiftest in the floodway, and anything in this area is in the greatest danger during a flood. FEMA has mapped designated floodways in more than 8,000 communities.

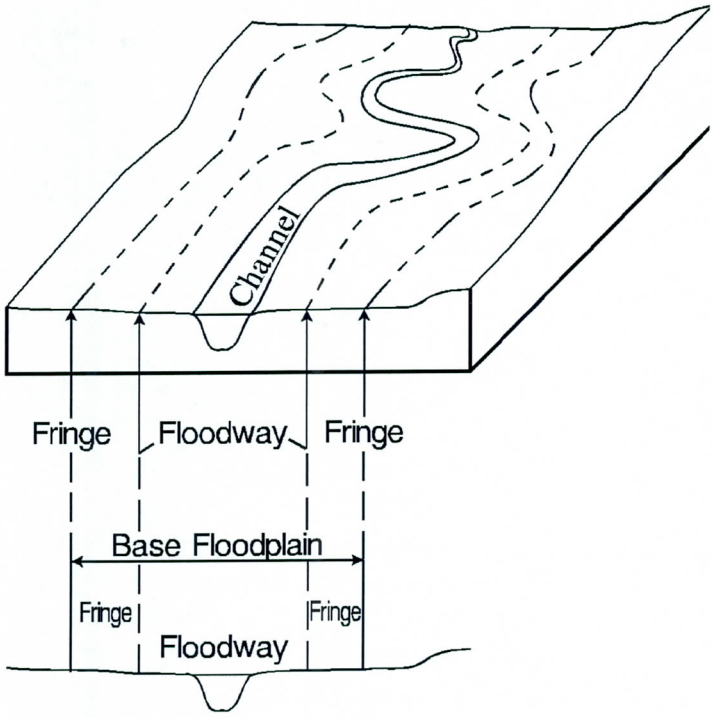


Figure 3-6: Floodway cross section and map

The remainder of the floodplain is called the flood fringe (Figure 3-6), where water may be shallower and slower. NFIP minimum standards provide that other areas outside the boundaries of the floodway can be developed without further analysis. Consequently, most communities permit development in the flood fringe if the development is elevated or otherwise protected to the base flood level (or any higher state or local standards). Development in the floodway is allowed if it can be demonstrated that no rise in the base flood elevation will occur. It is recommended, however, that floodway development be discouraged or even prohibited because of the hazardous nature of this area.

A floodway analysis determines the boundaries of the floodway using these floodplain management concepts:

- Continued development in the floodplain will likely further obstruct flood flows, which will back water up or divert it to other properties.
- Properties on both sides of a river or stream should be treated equitably. The degree of obstruction permitted now for one should be permitted in the future for the other.
- Property owners should be allowed to develop their land, provided they do not obstruct flood flows, cause damage or create a nuisance to others. (A community may allow development in the flood fringe that cumulatively increases the BFE, but NFIP regulations specify that such total increases cannot exceed one foot at any point along the stream. Some states or communities have more restrictive standards that must be met.)

A floodway analysis is done with a computer program that can make the necessary calculations of the effects of further development. Beginning at both edges of the floodplain, the computer model starts "filling" the floodplain. This "squeezes" the floodwater toward the channel and causes the flood level to rise. At the point where this process reaches a one foot rise, the floodway boundaries are drawn (Figure 3-7).

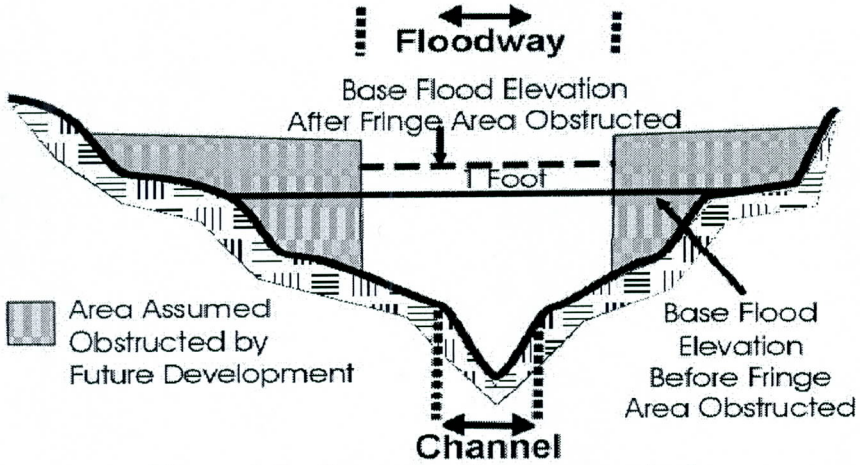


Figure 3-7: Computer floodway analysis

The floodway boundaries at each cross section are transferred to the topographic or contour map that shows the SFHA boundaries. The plotted points are connected to show the floodway and flood fringe on the floodplain map.

Not every cross section will show an exact one-foot rise. Topographic conditions and the need to "smooth out" the floodway line will result in some cross sections having increases of less than one foot.

Allowing flood heights to rise up to one foot is a compromise standard. Prohibiting any rise in flood heights would prohibit most types of new development or

redevelopment. On the other hand, allowing development to cause significant increases in flood heights can cause great problems for others.

States and communities may use a more restrictive standard for delineating a floodway. Some may allow only a 0.5-foot or 0.1-foot rise in the base flood elevation in the floodway analysis. This results in wider floodways and less area in the flood fringe.

A floodway analysis should be prepared with close coordination between the modeling engineer and those who are responsible for community planning and floodplain management.

The number of possible floodway configurations is almost limitless. Therefore, in choosing a regulatory configuration, the interests of individual property owners and the community as a whole must be weighed.

LEARNING CHECK #2

1. For purposes of a riverine flood study, Hydrology is the study of the distribution and circulation of water in the environment, and Hydraulic is the study of fluids in motion and how water will flow through the channel.

2. The rate at which runoff (an amount of water) flows downstream is called the flood discharge.

3. What probable effect does increase in urbanization within a community or upstream of it have on the stream discharges within that community? The usually will increase

4. What consequence on flood water level of a stream would usually occur when a bridge is constructed over a stream? would be considered an obstruction and may increase Flood waterlevels upstream

5. To locate the true elevations at a site, surveyors have established elevation Veterans marks also known as Bench marks.

6. Cross sections describe the Shape of the floodplain.

7. What is the datum used for your FIS, FIRM, and profiles? Depend on The Community check The Firm for details

8. Flood profiles are developed by plotting the flood elevations at the Cross Sections and connecting the plotted points.

9. To make a floodplain map, the base flood elevations are plotted on a Topographical map or a Contour map.

10. The Floodway is defined as the stream channel and that portion of the adjacent floodplain that must remain open to permit passage of the base flood.

11. A floodway analysis conducted to the minimum NFIP standard allows the fringe to be obstructed until the base flood level is increased by how much? One foot

C. COASTAL FLOOD STUDIES

Coastal flood studies are conducted for communities along the Atlantic and Pacific Oceans, the Gulf of Mexico, the Great Lakes, and the Caribbean Sea. Coastal studies are used to establish a base flood and an SFHA, but they may also designate a coastal high hazard area (V Zone).

Note that coastal communities, particularly counties, may also have riverine floodplains with designated floodways.

STORM SURGE

Most coastal floods are caused by coastal storms, usually hurricanes and northeasters. Such storms bring air pressure changes and strong winds that "pile" water up against the shore in what is called a storm surge.

A computer simulation of a coastal storm is developed based on data from past storms. Such data include wind speeds, wind direction, and air pressure from historical hurricanes and northeasters. The resulting surge elevations are then calibrated using historical information so the probabilities for each event can be determined.

The coastal storm surge computer program produces stillwater flood elevations — the elevations of various coastal floods, not including waves. The computer model is calibrated by reproducing the observed historical stillwater elevations. The program determines the stillwater elevation from these historical data.

WAVES

In addition to storm surge, wave action is an important aspect of coastal storms. Wind-driven waves produce velocities and impacts that may cause significant structural damage. The coastal flood study analyzes how high the wave crest elevation will be above the stillwater elevation as water is driven onshore.

When waves hit the shore, water is moving with such force that it keeps traveling inland. This is called wave runup, when land areas that are higher than the stillwater elevation are flooded (Figure 3-8). Wave setup is defined as the additional elevation of the water surface over normal surge elevation caused by onshore mass transport of the water by wave action. Wave set-up is a function of deepwater wave height and duration.

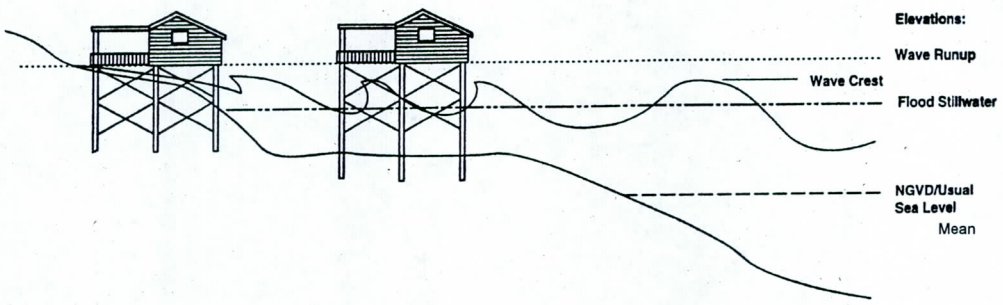


Figure 3-8: Wave runup

HYDRAULIC ANALYSIS

As with riverine studies, a coastal hydraulic analysis determines where moving water goes. Using similar surveying techniques as in a riverine study, the coastal flood engineer surveys transects instead of cross sections.

A transect shows the elevation of the ground both onshore and offshore. The ground elevation data are used by computer programs to determine the expected height of the wave crests and runup above the storm surge.

A transect schematic is shown in Figure 3-9. A transect location map appears on page 11 of Flood County's FIS report. This map shows where the transects were measured.

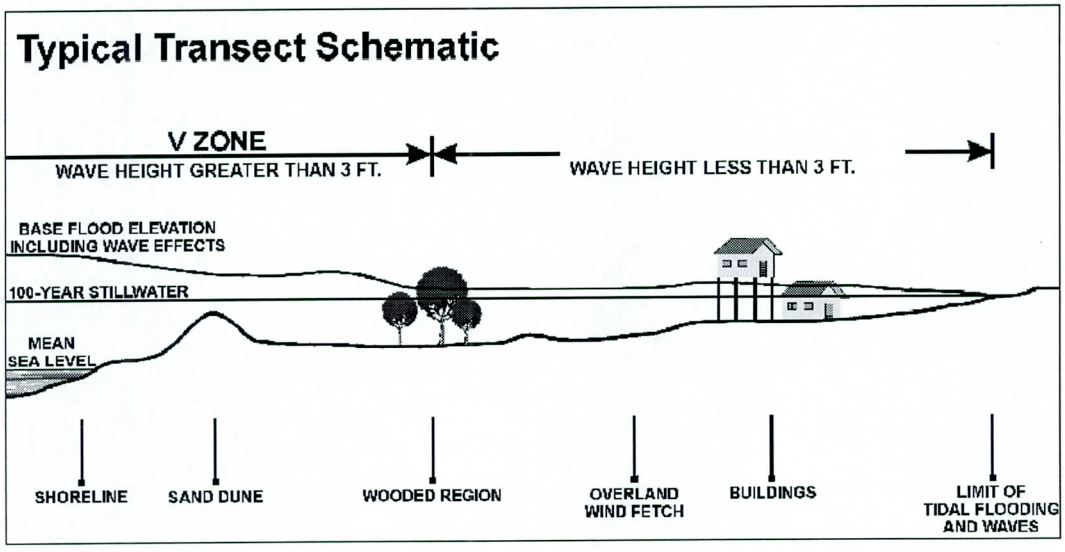


Figure 3-9. Transect schematic

Underwater topography, called bathymetry, and the shapes and locations of coastal islands, headlands, estuaries, harbors, and other coastal features are also taken into consideration in determining flood elevations.

The official BFE is the stillwater elevation plus wave runup, or the wave crest elevation, whichever is greater. The resulting BFE can be many feet higher than the stillwater elevation.

Obstructions such as dunes or buildings break the waves, dissipating wave energy so that wave height and BFEs are reduced as you go inland. Figure 3-9 shows that as water moves inland, the waves break and the base flood elevation (including wave effects) is reduced while the stillwater elevation stays the same.

COASTAL HIGH HAZARD AREA

Waves pack a lot of power. Much more destructive than standing or slow-moving water, their power increases dramatically with their height. For the purposes of the NFIP, the flood study identifies the coastal high hazard area as that most hazardous part of the coastal floodplain, due to its exposure to wave effects. This is typically the area between the shoreline and the most landward of the following points:

- where the computed wave heights for the base flood are three feet or more,
- the inland limit of the primary frontal dune, or
- where the eroded ground profile is three feet below the computed runup elevation.

The three-foot wave height threshold was selected because a three-foot wave generally carries enough energy to break a wall panel away from a floor to which it has been nailed.

These areas are designated as V Zones, where the "V" stands for "velocity wave action." V Zones are subject to more stringent regulatory requirements and a different flood insurance rate structure because they are exposed to an increased degree of risk. Coastal flood areas not within the coastal high hazard area are mapped as A Zones (see Figure 3-9).

COASTAL FLOODPLAIN MAP

After gathering stillwater elevation and wave height data at the transects, the coastal flood engineer then transfers the elevation data to the best available topographic map. Flood elevations between transects are interpolated, taking local topography into consideration.

Flood County FIRM number 99009C, Panel 0040 D, shows a coastal floodplain for the Atlantic Ocean coastline. Note that south of Flower Street, the V Zone boundaries meander along the shoreline, and the BFEs decrease over a relatively wide space from 14 feet to 12 feet (above NGVD, or roughly sea level). Landward of the Zone VE (EL 12) boundary, the zones change to Zone AE, with BFEs decreasing from 11 feet to 10 feet NGVD. These wider flood zones are typical of gradually varying topography on barrier island beaches or marshland.

In contrast, the V Zone boundaries between Flower Street and Public Way are narrower and roughly parallel to the shoreline, with BFEs decreasing rapidly from 14 feet to 13 feet NGVD. Note also that the area directly landward of the Zone VE (EL 13) is designated Zone AO (Depth 2'), signifying shallow flooding of 2 feet NGVD or less. This situation often occurs when a substantial dune line or flood protection structure exists along the shoreline.

D. SHALLOW FLOODING STUDIES

For the NFIP, shallow flooding is defined as flooding with an average depth of one to three feet in areas where a clearly defined channel does not exist. Shallow flooding can exist in any of the following situations:

- *Ponding:* In flat areas, water collects or "ponds" in depressions.
- *Sheet flow:* In steeper areas where there are no defined channels or on flat plains, water will spread out over the land surface.
- *Urban drainage:* Local drainage problems can be caused where runoff collects in yards or swales or when storm sewers back up.
- *Coastal flooding:* Wave runup will send water inland over flat areas or over dunes. Often it may collect or pond behind an obstruction which keeps it from draining back into the ocean.

For the purposes of the NFIP, shallow flooding is distinguishable from riverine or coastal flooding because it occurs in areas where there is no channel or identifiable flow path.

Shallow flooding is mapped based on historic flood experiences and a study of the topography. In some areas, the techniques used for riverine studies are used. The result will either be a BFE or a base flood depth (in feet above the ground). A shallow flooding study usually produces data for the base flood, but not for the 10-year or other floods.

On Flood County's FIRM, there is a small area upstream of Argyle Way, on Panel 0038, that is shown as "Zone AO (Depth 2')," indicating that the base flood depth is two feet above the ground. Therefore, it is a sheet flow area. Sheet flow areas (which usually have depths established) are AO Zones, and ponding areas (which have BFEs established) are usually designated AH Zones on a FIRM.

E. Approximate Studies

Detailed studies are expensive — a riverine study typically costs $5,000 to $10,000 per mile of stream that is to be mapped — so it is not cost effective to perform a detailed study in watersheds where there is little or no development and none is anticipated, such as in rural areas.

Therefore, some NFIP maps show floodplains that were mapped using approximate study methods. Flood data and floodplain information from a variety of sources — such as soils mapping, actual high water profiles, aerial photographs of previous floods, and topographic maps — were used to overlay the approximate outline of the base floodplain for specific stream reaches on available community maps, usually U.S. Geological Survey topographic quadrangle maps.

In addition, many flooding sources have been studied by other Federal, State, or local agencies. Some of these studies do not meet the NFIP standards for a FIS, but often contain valuable flood hazard information, which may be incorporated into the NFIP maps as approximate studies. Those types of studies typically cover developed or developing areas. They often contain flood elevation profiles that can be used as "best available data" for floodplain management purposes.

LEARNING CHECK #3

1. What causes storm surge? Storms That Bring Air pressure change and strong wind. That pile H2O up against the shore

2. What is wave runup? when wave hits shore, H2O moves w/ such force That it keeps Traveling inland - Higher Than the stillwater flood level

3. Instead of cross sections, coastal flood engineers survey Transects.

4. The BFEs for coastal studies are the stillwater elev plus the wave Rump.

5. The most hazardous part of the coastal floodplain is the Coastal High hazard area, which is shown on the map as a V Zone.

6. What differentiates shallow flooding from riverine flooding? - shallow flooding has ~~no~~ def in the channel or flow path

7. Flood studies that do not identify BFEs are called Approx studies.

F. NFIP MAPS

This section will explain how flood hazards and flood insurance zones are depicted on NFIP maps. The Flood County, USA and Incorporated Areas maps will be referenced wherever possible. As this information is presented, look for similar types of maps or map features on your community's maps.

Maps published with an FIS are:

- The Flood Insurance Rate Map (the FIRM), which is published in an old format in studies prepared before 1986 and a new format in studies prepared after 1986.
- The Flood Boundary and Floodway Map (the FBFM or Floodway Map), which was included in studies prepared before 1986.

Again, since 1986, the Flood Boundary and Floodway Map information has been incorporated into the Flood Insurance Rate Map.

The maps allow you to identify SFHAs, determine the location of a specific property in relation to the SFHA, determine the BFE at a specific site, locate regulatory floodways, and identify undeveloped coastal barriers where flood insurance is not available.

The flood maps, particularly the FIRMs, come in many formats because of the mapping of additional hazards, the need for more regional flood maps, and the increased use of computer generated maps. Several general features are included on all maps.

Originally, the FIRMs were designed for use by insurance agents and lenders. The Floodway Maps were created for use by local floodplain managers and administrators. For all studies conducted since 1986, the FIRM contains both the flood insurance rate zones and floodways.

GENERAL MAP FEATURES

Flood maps are either flat or Z-fold. Flat maps are on 11-inch-by-17-inch "ledger" size paper. Z-fold maps are on larger pages and get their name from the way they are folded.

Your student packet includes the FIRM panels for Flood County, USA and Incorporated Areas, which are Z-fold maps.

All flood maps are prepared with general features or elements that may include an index, a legend (or key to map), a title block, community name and number information, panel or map number information, an arrow pointing north on the map, and effective date or revision date information.

Many communities, especially counties, are geographically too large to fit on one map or panel at a usable scale. Maps for these communities are divided into two or more

panels with unique panel numbers. Whenever a community requires more than one panel, a Map Index for both the FIRM and Floodway Map is prepared.

In this section, we will discuss the Map Index, elevation reference marks, and map scales and direction. Other map features will be presented as we discuss FIRMs and Floodway Maps.

MAP INDEX

The Map Index shows the community's boundaries, highlighting prominent features such as major highways, railroads, and streams. The map index shows how the community is displayed on the various panels.

Flood County's Map Index shows that the county's FIRM has three panels, 0025, 0038, and 0040. In cases where panels have no identified flood hazard areas (or no floodways on a Floodway Map), they are not printed. Note that panel 0030 D was not printed, as is indicated on the index by an asterisk (*).

The number of panels that have been printed for a particular community appears in the title block ("Panels Printed: 25, 38, 40).

Title block

The title block is the lower right portion of the opened map for both the Map Index and the FIRM panels. The FIRM panel title block includes:

- the community's name -- Flood County, USA and Incorporated Areas,
- the six-digit community identification number or map number -- 99009C,
- the panel number, such as "0025," "0038," or "0040,"
- a map panel suffix – "D," which indicates the number of revisions that have been made (e.g., "D" is the fourth publishing of that panel), and
- a map effective or revision date – "August 19, 1998."

Map revision date

The date in the title block shows the map's most recent revision. As changes occur within a community that result in a change in flood elevations or floodplain delineations, FEMA republishes *only the Map Index and the changed map panels*. Any revised panels are given a new map revision date and a new suffix letter.

Once the panels are issued to the community, the date on the panel is referred to as the *effective date*. Some communities have map panels with different effective dates. The Map Index lists the current effective date for the most recently revised panel of a FIRM or of the FIRM itself, if all panels were revised.

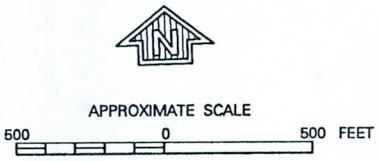
With each revision comes a new panel suffix. Note that Flood County's panels were last revised in 1998 and have the suffix "D."

Map scales and north direction

Different scales may be used for a single community with more than one panel. As an example, the map scale on the Flood County FIRM Panel 0038 is 1 inch = 500 feet (one inch equals 500 feet), and the scale of panel 40 is 1 inch = 1,000 feet.

Different scales are used on FIRM and Floodway Maps, depending on the size of the mapped area for a community and the base map that is used.

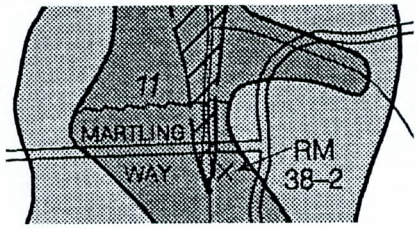
An arrow pointing north is shown on all maps, including the map index. For FIRMs and Floodway Maps, the north direction arrow is located near the map scale. The north direction on the maps may be "turned" to maximize the mapped area that can be shown on a panel and to minimize the number of panels. To ensure correct orientation and accurate use of the FIRM, it is very important to pay attention to the direction of the north arrow on the panel.



Elevation reference marks

Elevation reference marks are located on FIRMs and Floodway Maps. For these two types of maps, locations are identified with a small "x" and the designation "ERM" or "RM" simply followed by a reference mark number. For the newer Digital FIRMs (DFIRMs), locations are identified with a small "x" and the designation "ERM" or "RM" followed by the panel number and the number of the reference mark. Descriptions of the marks, including their elevations, appear either on FIRM panels, on Floodway Maps, or in the FIS text. Note that some ERM and RM descriptions may appear on a different map panel than the mark itself due to space limitations.

ERMs and RMs are important sites. They provide a ground elevation reference for surveyors to start from when they determine the elevation of a building, a cross, section, or topography for a site. Occasionally, an ERM cannot be found as described on the FIRM or Floodway Map because new construction or other change in the area has obliterated the monument. In these instances, the next closest ERM may be used. Alternatively, some USGS, USC&GS, or NGS bench marks, which are marked on most USGS 7.5 minute series topographic maps, may be used.



FIRM Zones

FIRMs show different floodplains with different zone designations. These are primarily for insurance rating purposes, but the zone differentiation can be very helpful for other floodplain management purposes. The more common zones are listed in Figure 3-10.

Zone A	The 100-year or base floodplain. There are six types of A Zones: **A** The base floodplain mapped by approximate methods, *i.e.,* BFEs are not determined. This is often called an unnumbered A Zone or an approximate A Zone. **A1-30** These are known as numbered A Zones (*e.g.,* A7 or A14). This is the base floodplain where the FIRM shows a BFE (old format). **AE** The base floodplain where base flood elevations are provided. AE Zones are now used on new format FIRMs instead of A1-A30 Zones. **AO** The base floodplain with sheet flow, ponding, or shallow flooding. Base flood depths (feet above ground) are provided. **AH** Shallow flooding base floodplain. BFEs are provided. **A99** Area to be protected from base flood by levees or Federal Flood Protection Systems under construction. BFEs are not determined. **AR** The base floodplain that results from the decertification of a previously accredited flood protection system that is in the process of being restored to provide a 100-year or greater level of flood protection.
Zone V and VE	**V** The coastal area subject to a velocity hazard (wave action) where BFEs are not determined on the FIRM. **VE** The coastal area subject to a velocity hazard (wave action) where BFEs are provided on the FIRM.
Zone B and Zone X (shaded)	Area of moderate flood hazard, usually the area between the limits of the 100-year and 500-year floods. B Zones are also used to designate base floodplains of lesser hazards, such as areas protected by levees from the 100-year flood, or shallow flooding areas with average depths of less than one foot or drainage areas less than 1 square mile.
Zone C and Zone X (unshaded)	Area of minimal flood hazard, usually depicted on FIRMs as above the 500-year flood level. Zone C may have ponding and local drainage problems that don't warrant a detailed study or designation as base floodplain. Zone X is the area determined to be outside the 500-year flood and protected by levee from 100-year flood.
Zone D	Area of undetermined but possible flood hazards.

Figure 3-10: Flood Insurance Rate Map Zones

Note that the special Flood Hazard Area (SFHA) includes only A and V Zones.

FLOOD HAZARD BOUNDARY MAP (FHBM)

FHBMs (Figure 3-18) were initially prepared to provide flood maps to many communities in a short period of time. They were made in the 1970s and early 1980s without benefit of detailed studies or hydraulic analyses for nearly all floodprone communities in the nation (over 21,000). They were intended for interim use in most communities until more detailed studies could be carried out.

FHBMs are still being used where detailed Flood Insurance Studies have not been prepared or cannot be justified. They are to be used for floodplain management, in conjunction with other local studies and other available data.

On the FHBM, the SFHA is designated as a shaded area labeled "Zone A," and no base flood elevations are given (see Figure 3-18).

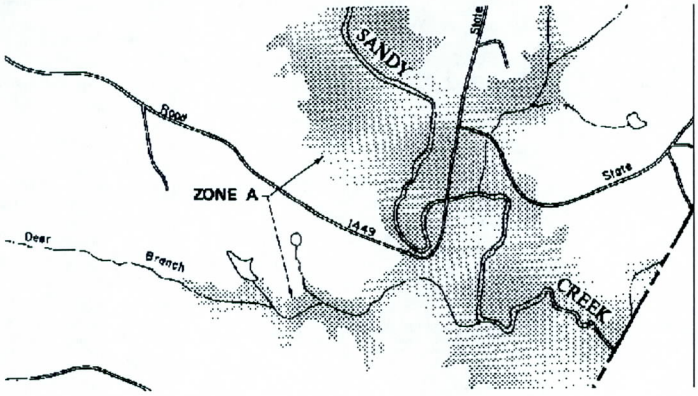


Figure 3-18: Flood Hazard Boundary Map

In some cases, FEMA simply converted the FHBM to a FIRM by issuing a letter to the community stating that the FHBM shall be considered a FIRM. In those cases, the community was instructed to line out FHBM on the map's title box and write in FIRM.

FLOOD INSURANCE RATE MAP (FIRM) — OLD FORMAT (PRE 1986)

The FIRM is used to generally determine:

- Whether a property is in the floodplain.
- The flood insurance zone that applies to the property.
- The approximate base flood elevation (BFE) at the site.

Date: Several dates may be listed in the FIRM legend, including:

- Initial Identification — date of the first Flood Hazard Boundary Map (FHBM).
- Any dates of revisions to the FHBM that have occurred since the initial identification.
- Flood Insurance Rate Map Effective — the date of the initial or first FIRM. This is the date used to determine whether a building is "pre-FIRM" or "post-FIRM."
- Flood Insurance Rate Map Revisions — dates of subsequent revisions to the FIRM.

The FIRM also will show:

Base (100-year) floodplain or SFHA: Designated by the dark-shaded areas (Insurance Zones A, A1–A30, A99, AO, AH, AR, V, V1–V30).

500-year floodplain: Designated by the lighter-shaded areas (Insurance Zone B).

Base Flood Elevation (BFE): The water surface elevation of the base flood at that point of the stream is denoted in whole numbers by wavy lines running across the floodplain. Coastal Zones within the area of 100-year tidal flooding, as well as some AH Zones, may have BFE lines, and some lake AE Zones have the base flood elevation noted in parentheses beneath the zone designations.

Zone break line: The thin white line separates flood insurance rate zones within the 100-year floodplain.

Approximate floodplain areas: The 100-year floodplain areas are delineated using approximate methods. No BFEs are shown in approximate floodplain areas; these areas are classified as (unnumbered) A Zones.

An example of an approximate floodplain may be found in the upper left corner of Flood County FIRM Panel 0040, on Rocky River. The detailed study does not extend upstream of cross section K. Note that there are no cross sections or BFEs shown in this A Zone, which extends onto Panel 0025.

FLOOD BOUNDARY AND FLOODWAY MAP (FLOODWAY MAP) – OLD FORMAT (PRE 1986)

The Flood Boundary and Floodway Map is also known as the FBFM or, simply, the Floodway Map. The Floodway Map shows how the floodplain is divided into the floodway and flood fringe where streams are studied in detail. They also show general floodplain areas where floodplains have been studied by approximate methods.

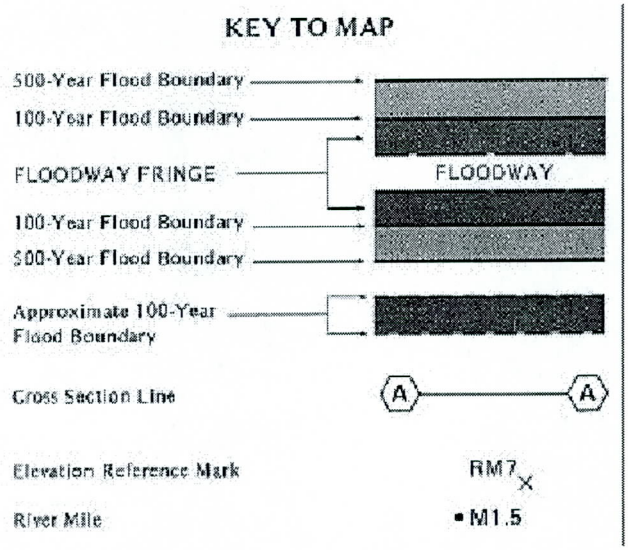
Floodway Maps have these features:

Title block: Includes the community name, county name, panel number, community number, and the map date. The panel numbers may be different from the FIRM panel numbers.

Map scale: The Floodway Map may have the same or a different scale than the FIRM for the same community.

Cross section line: These lines represent the location of some of the surveyed cross sections used in the computer model of the stream for calculating 100-year flood elevations. These cross sections can be used to relate a specific point on the Floodway Map to the flood profile and floodway data table.

Floodway: The 100-year floodplain has been divided into two areas, the floodway and the flood fringe. The white area adjacent to and including the channel is the floodway. The shaded area is the fringe.



One problem with this method of delineating floodways is that sometimes people confuse the white floodway with the white area representing land that is free from flooding. Also, because the floodway is mapped separately, often property owners, lenders, real estate agents, and others do not have easy access to the Floodway Maps and do not know of the severe flood hazard associated with the floodway.

FISs published since 1986 have corrected this problem — they do not have separate FIRM and Floodway Maps. Floodways are delineated on the newer FIRMs as a diagonally hatched area (see Figures 3-11 and 3-12).

Note that no BFEs or flood zone names are shown on the Floodway Map.

The floodway is usually wider in flatter, wider floodplains and narrower in steeper areas where floodplains are narrower.

If a map panel area does not include any detailed study streams or floodways, a Floodway Map will not be printed; only a FIRM panel will be printed. Because coastal studies do not have floodways, all of the data needed are shown in the FIS report and on the FIRM.

Flood fringe: The fringe is shown as a shaded area outside of the floodway but still within the 100-year floodplain.

500-year floodplain: More lightly shaded areas adjacent to, but outside of, the 100-year floodplain delineate the 500-year floodplain for streams studied in detail.

Approximate floodplain areas: The 100-year floodplain areas are determined using approximate methods. The boundaries of the approximate floodplain on the Floodway Map are shown as dashed lines.

FLOOD INSURANCE RATE MAP — NEW FORMAT (SINCE 1986)

Flood maps have been redesigned over the years since the first FISs were prepared in the late 1960s, making them easier to use. A new format for FIRMs was introduced in 1986 that includes:

- Floodways and other floodplain management information, such as cross sections, that were previously provided on separate Flood Boundary and Floodway Maps (Floodway Maps). (Except in a few instances, Floodway Maps are no longer being prepared.)
- Simplified flood insurance zone designations. The previous Zones A1-A30 and V1-V30 were replaced by the designations AE and VE; Zones B and C were replaced by Zone X. The 500-year floodplain is still shown as "shaded" portions of Zone X.

Figure 3-11 shows the legend for the new FIRM format. Figure 3-12 is an example of a new format FIRM with a floodway. With these changes, the FIRMs are more easily used by community officials for floodplain management, by lenders to determine the need for flood insurance, by insurance agents to rate policy applications, and by land surveyors, engineers, property owners and others to determine flood hazards in a given location. The Flood County, USA and Incorporated Areas map uses the newer format.

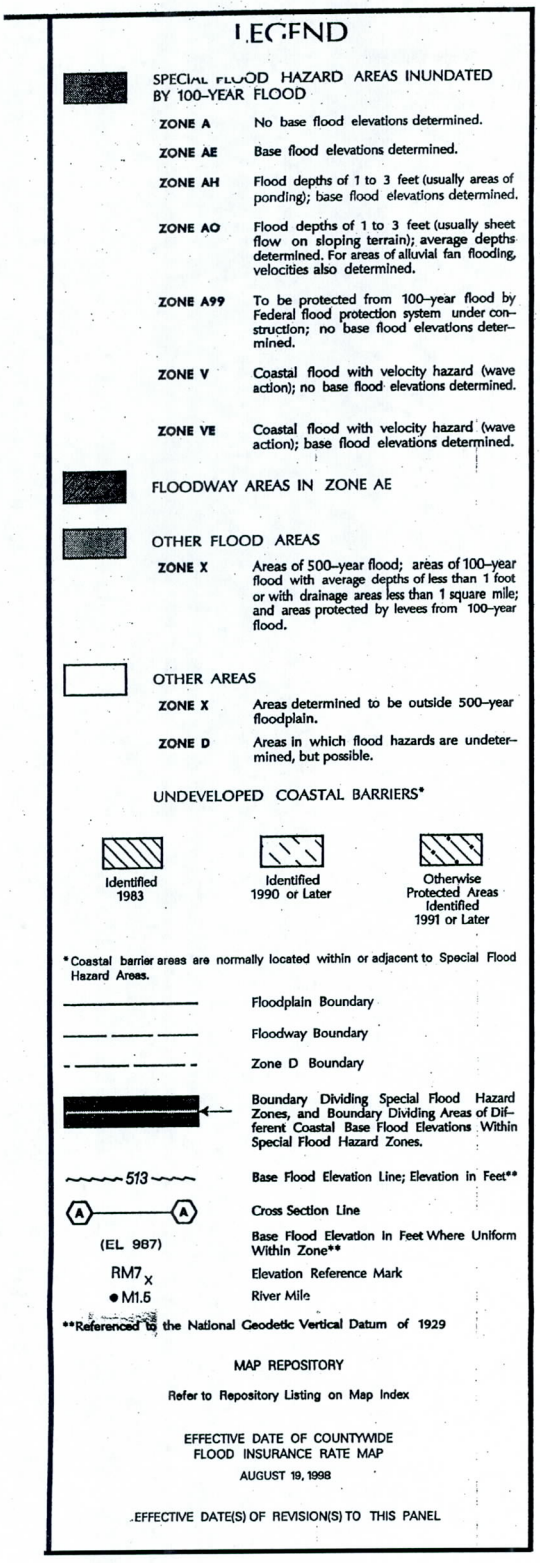


Figure 3-11: New format FIRM legend

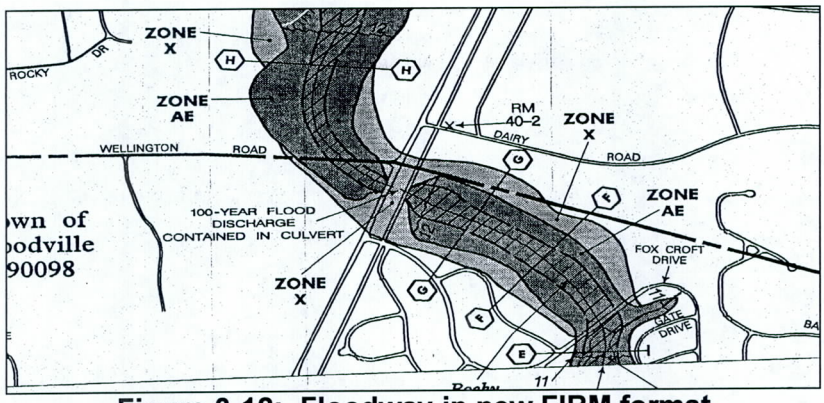


Figure 3-12: Floodway in new FIRM format

Partial Map Initiatives FIRM

In some cases, it is more cost efficient for FEMA to update and print only a portion of the total FIRM and FBFM panels for a community in the new format. This is referred to as Partial Map Initiatives FIRM. Here, instead of printing the entire set of separate FIRM and FBFM panels for the community, only those panels affected by the revision elements are combined into the new format FIRM panel. To clarify this for the community, the FBFM index would show that those FBFM panels were no longer printed and that the floodway mapping information would appear on the new format FIRM showing that same area. The FIS report would also indicate on the Notice to User Page the combination of FIRM and FBFM panels and the differentiation between the old and new format zone labeling.

FIRMs WITH COASTAL AND LAKE FLOODPLAINS

Coastal FIRMs

Coastal areas include the shores of the Atlantic and Pacific Oceans, the Gulf of Mexico and the Caribbean Sea, and inlets subject to tides. They also include the shorelines of the Great Lakes.

Coastal high hazard areas subject to flooding *and* wave action of three feet or more are designated as V Zones. The number in parentheses after or below the V Zone designation is the BFE. There are several V Zones on Panel 0040 of Flood County FIRM.

Coastal Barrier Resources System

Undeveloped portions of coastal barrier islands and similar land forms in the Coastal Barrier Resources System (CBRS) — such as coastal mainland along the shore of the Great Lakes, along bays, inlets, or estuaries — have been identified and included on applicable map panels. They are called COBRA areas, established by the Coastal Barrier Resources Act of 1982 and the Coastal Barrier Improvement Act of 1990.

The Acts provide protection to COBRA areas by prohibiting most expenditures of federal funds including the provision of flood insurance or new and substantially improved buildings in the mapped area. The restrictions are covered in more detail in Unit 9, Section D.

The designations for these undeveloped coastal barriers depend on when they were designated by the acts; therefore, not all COBRA areas have the same date of designation. Examples of the three different screens used on the FIRM are shown in the legend for Flood County FIRM Panel 0040. The prohibition date is indicated for each COBRA zone on the FIRM. It should be noted that although FEMA shows COBRA areas on its FIRMs, only Congress can authorize a revision to their boundaries.

Flood County has an extensive COBRA area, which appears on FIRM Panels 0038 and 0040. Note that the designation and delineation of CBRS units are not directly related to the floodplain.

Lakes

Most lakes have a BFE, shown in parentheses below the flood zone, that has been rounded off to the nearest whole number (see Figure 3-13). The actual BFE, to the nearest tenth of a foot, can be obtained from the FIS report. However, many long lakes, especially reservoirs, have a higher BFE at the upstream end than at the outfall. These types of lakes and reservoirs have BFEs shown with wavy lines, the same as riverine BFEs. They also appear on the stream profiles in the FIS report.

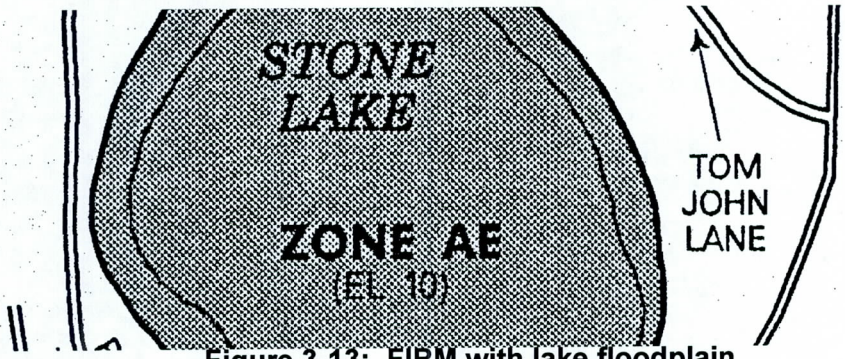


Figure 3-13: FIRM with lake floodplain

Where studies have been carried out for lakes and reservoirs, information on BFEs is contained in Section 3.0 of the FIS report. A *Summary of Stillwater Elevations* table is provided in the FIS report (Figure 3-14). Note that the actual BFEs to the nearest one-tenth of a foot appear in the table, but the BFE on the FIRM is shown in parentheses rounded to the nearest whole number. For the most accurate BFE, use the "100-year flood elevation" from the table, not the FIRM. For a shortcut method, you can add 0.4 foot to the elevation shown on the FIRM. This will get you an elevation at least as high as the number shown in the table.

FLOODING SOURCE AND LOCATION	ELEVATION (ft. NGVD)			
	10-YEAR	50-YEAR	100-YEAR	500-YEAR
STONE LAKE Entire shoreline within Flood County	7.0	9.0	10.2	12.8

Figure 3-14: Summary of stillwater elevations for a lake

SHALLOW FLOODING FIRMS

Under the NFIP, ponding or sheet flow constitutes shallow flooding, which is mapped based on historic flood experiences and study of the topography.

An example of a shallow flooding area is on the Flood County FIRM, panel 0038, upstream of Argyle Way, in an area marked "Zone AO (Depth 2')." Also, Panel 0040 shows an area where wave runup overtops and ponds behind a seawall, berm, or other feature that keeps the water from flowing back to the ocean.

We don't know how high the base flood is in relation to sea level in Flood County "Zone AO (Depth 2')." However, we do know that the base flood should be no deeper than two feet above the ground.

FIRMS WITH FLOOD PROTECTION PROJECTS

Some FIRMs may show areas protected from flooding by the 100-year flood because of the presence of a levee, concrete dike, floodwall, seawall, or other structure. These areas are usually designated as shaded Zone X and marked with the following note:

THIS AREA PROTECTED FROM THE 100-YEAR FLOOD FROM (Flooding Source Name) BY LEVEE, DIKE, OR OTHER STRUCTURE SUBJECT TO FAILURE OR OVERTOPPING DURING LARGER FLOODS.

This is an indication that the flood protection structure has either been evaluated and found to meet all of the NFIP requirements for flood control structures, or has been certified by a Federal agency with levee design responsibility as having been adequately designed and constructed to provide protection from the 100-year flood.

Floodways will be delineated at the landside toe of a levee that is recognized as providing 100-year flood protection.

A levee that provides a lower level of protection, and that is not certified or does not meet the requirements for levees, may be shown on the FIRM, and flood elevations are computed as if the levee did not exist.

COUNTYWIDE FIRMS

The Flood County FIS report and FIRM covers the unincorporated areas of Flood County and all incorporated areas within Flood County. Therefore, it is referred to as a *countywide FIRM*. Countywide FIRMs show flood hazard information for all geographic areas of the county, including other jurisdictions such as villages, towns, and cities.

Previously, FHBM, FIRM and FBFM maps were prepared separately for each jurisdiction. County FIRMs, for example, showed the flood hazards identified only in the unincorporated areas of the county and did not show any flood information inside the corporate limits of a municipality. In countywide mapping, once the countywide map is produced, all of the identified flood hazard areas within the boundaries of the county are shown on one set of maps along with all floodway information maps (see section titled Flood Insurance Rate Map—New Format).

The countywide FIRM format has a number of advantages, and one in particular is that the user can see the relationship and simultaneous effect of each floodplain on a number of communities. In addition, FIRMs do not need to be updated when municipal boundaries change. Although boundaries might change, communities will continue to find the flood hazard information they need on the same countywide FIRM.

Figure 3-15 shows the title block of a countywide FIRM panel. The title block lists the communities mapped on that panel and their six-digit NFIP community ID numbers. The FIRM panel has a map number with five digits consisting of the NFIP-assigned state number as the first two digits and the NFIP-assigned county number as the next three digits followed by the letter "C," which stands for "countywide," and then the four digit panel number and suffix. Do not confuse the map panel number with the community number.

All previous map dates for each floodprone community in a countywide FIS are located on the community map history Table (Figure).The initial FIRM date for each community is shown on the FIRM index. These are the "post-FIRM" dates for insurance rating. Don't confuse them with the effective date of the latest FIRM panel, which is shown in the title block.

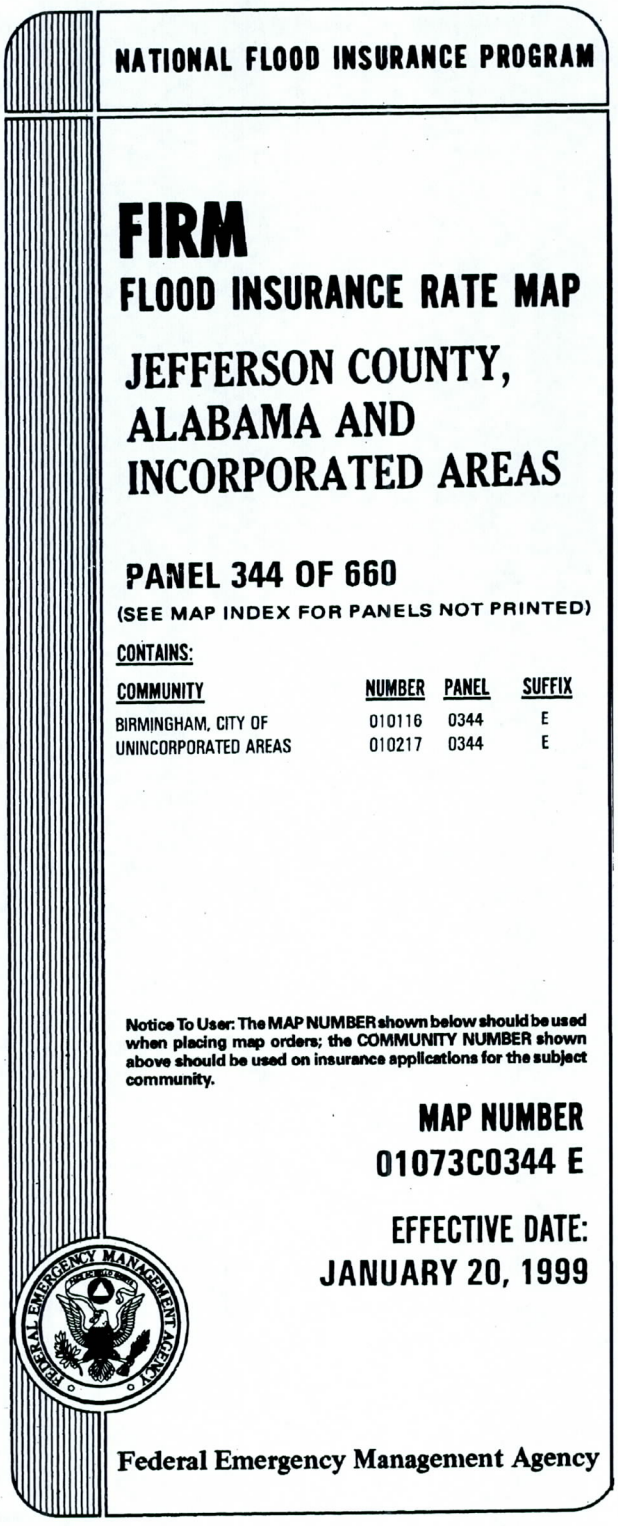


Figure 3-15: Title block of countywide FIRM panel

DIGITAL FIRMS

The conversion of FIRMs to a digital format has many benefits. For example, they can be revised and updated easily with just a few keystrokes, and they can be incorporated in the community's mapping system and tied in with other geographic information systems, such as the zoning map.

Users must bear in mind that the simple conversion of FIRMs to a digital format does not inherently improve the engineering quality of the product. Many of the same difficulties with interpretation of flood risk data — and the requirement that users apply sound judgment in methods selected for decision making and map interpretation — remain unchanged.

FEMA charges a fee for all digital FIRM data products. Any questions regarding these products may be directed to:

Federal Emergency Management Agency
Map Service Center
P.O. Box 1038
Jessup, Maryland 20794-1038

Phone: 800/358-9616
Fax: 800/358-9620
Internet: http://www.fema.gov

Digital Flood Insurance Rate Map (DFIRM)

The FIRM for Flood County, USA and Incorporated Areas is actually a Digital Flood Insurance Rate Map, or DFIRM. This is because it is a more recent publication, created with new digital methods; however, whether the maps are new DFIRMs or conventional FIRMs, they are still generally referred to as FIRMs. The DFIRM is comprised of all digital data required to create the hardcopy FIRM. These data include base map information, graphics, text, shading, and other geographic and graphic data. An example of a hardcopy paper DFIRM is shown in Figure 3-16.

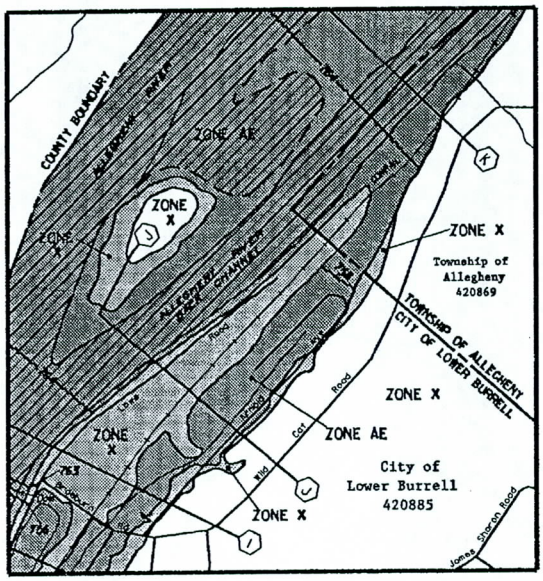


Figure 3-16: Hardcopy DFIRM

The majority of DFIRMs are produced in a countywide format, where all flood hazards for the county and incorporated communities are shown on one set of maps. It can be used for floodplain management purposes in a manner similar to other flood maps, but it can also be combined with other digital map information to create new information for planning purposes. DFIRMs are also produced for single jurisdictions when producing a countywide map would not be cost effective.

DFIRMs are subject to community review and approval. They are, therefore, the official basis for implementing the community's NFIP regulations. This, in essence, can be said of all FIRMS.

Digital Flood Insurance Rate Map – Digital Line Graph

The Digital Flood Insurance Rate Map - Digital Line Graph (DFIRM-DLG) is intended to be the primary means of transferring flood-risk data depicted on FIRMs to Geographic Information Systems (GIS). GISs are computer-based map systems that allow the user to keep a map updated easily and to correlate geographic information with other data, such as tax records on properties.

The Digital Flood Insurance Rate Map - Digital Line Graph (DFIRM-DLG) is a database created by extracting certain flood risk data from the DFIRM. The DFIRM-DLG does not include base map information, nor does it include graphic data required to create a hardcopy FIRM.

Communities whose digital base mapping files were used as the base map for the DFIRM will find that they may easily use the DFIRM-DLG files for determination of flood zones and for enforcement of regulations. A graphic image of a DFIRM-DLG is shown in Figure 3-17.

The digital data captured from the hardcopy DFIRM consists of FEMA hydrography (location of water bodies), flood hazard zones, BFEs, cross-section locations, and elevation reference marks.

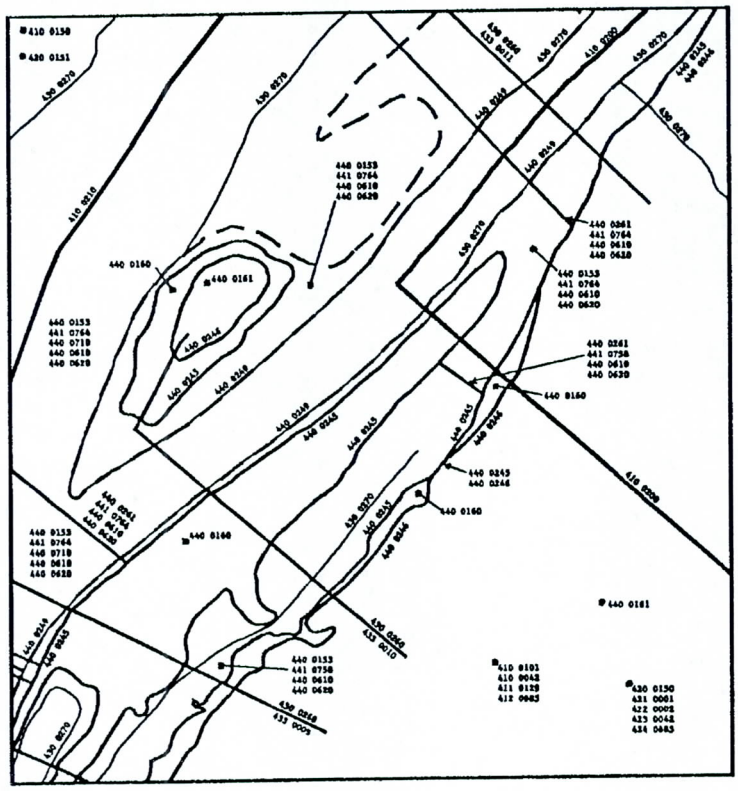


Figure 3-17: Graphic image of a DFIRM-DLG

All lines and area features in DLG files are encoded with one or more seven-digit attribute codes that provide the user with detailed information about the features. FEMA intends to make the DFIRM-DLG available on CD-ROM compatible with Insurance Services Office (ISO) 9660 standards.

With many commercially available GIS software packages, DLG data can be directly converted into vector data usable within the GIS environment. Third-party conversion software is also available that will convert DLG data to other proprietary GIS formats.

The DFIRM-DLG, when coupled with digital base map files or the local community digital base, can be used in a GIS to determine whether a structure is located within an SFHA. It should be noted that if a GIS is used to determine that a structure is within or near an SFHA, and a different base map source was used to generate the hardcopy DFIRM, the determination should be confirmed by referencing the printed hardcopy DFIRM.

Q3 Flood Data

In the Q3 Flood Data Product, FEMA has developed a graphical representation of certain features of the FIRM. The Q3 Flood Data are in three formats that are usable with desktop mapping and GIS software packages. These formats are:

- Digital Line Graph
- ARC/INFO
- MapInfo

Q3 Flood Data are created by digitally capturing certain key features from the current effective paper FIRMs. These features are converted into area features in one countywide data layer. The following vectorized (lines and areas) data features are included:

- SFHA and 500-year floodplain,
- Flood insurance zone designations,
- Floodway boundaries (if available),
- COBRA zones,
- Political boundaries,
- Community/map panel identification numbers,
- Boundaries between FIRM panels, and
- U.S. Geological Survey 7.5 minute (1:24,000 scale) quadrangle neatlines.

Several features are *not* included. They are:

- Hydrographic features,
- Base flood elevations,

- Cross section lines,
- Roads, road names or address ranges, and
- Elevation reference mark locations and elevations.

Q3s were developed to support insurance-related activities and are designed to provide guidance and a general proximity of the location of SFHAs. Unlike DFIRMs, Q3s do not replace paper FIRMs as the legal document.

The data are not suitable for applications such as detailed site design and development plans or flood risk determinations. They cannot be used to determine absolute delineations of floodplain boundaries, but instead should be seen as portraying zones of uncertainty and possible risks associated with flooding.

Q3 Flood Data incorporate map revisions and letters of map revision and amendment. However, they do not correct for edge-matching errors, overlaps, etc., that were in the original paper FIRMs.

FEMA has produced Q3s for almost 900 counties nationwide. They are organized by county and contain data from all existing paper FIRM panels for the incorporated and unincorporated areas of the county.

Q3 Flood Data are available on CD-ROM from the FEMA Map Service Center. You can access the list of Q3 counties on the Internet and download sample data, data standards, and other Q3 information (http://www.fema.gov).

LEARNING CHECK #4

1. Prior to 1986, the maps published with an FIS were the Old Format FIRM and the Floodway Map

2. Since 1986, the map published with an FIS is the new format Firm.

3. Is your community's FIRM a flat or Z-fold map?
   2

4. How many panels does your FIRM have?

5. What is the map scale of your FIRM? 1" = 1000'

6. What does an elevation reference mark look like on a FIRM? RM FEM. R. followed by A Number

7. What is an AO Zone? Area Subject To sheetflow, ponding, or shallow flooding

8. What is the FIRM effective date for your community?
   9/30/95

9. How is a floodway shown on the Flood Boundary and Floodway Map?
   The white area adjacent To and including The channel

10. How is a floodway shown on the new format FIRM? Shaded Area w/ Diagonal lines including The channel

11. A Zone C on an old format FIRM is shown as a Zone X on the new format FIRM.

12. COBRA stands for Coastal Barriers Resource Act.

13. What communities' floodplains are shown on a countywide FIRM? All even Those Not in NFIP

14. Floodways are shown along the Landside toe of a levee on the FIRM.

15 Areas behind recognized levees are designated as Shaded Zone X.

UNIT LEARNING EXERCISE

1. The base flood elevation is the elevation of the 100 - year flood or the 1 % annual chance flood.

2. The Special Flood Hazard Area or SFHA is what the base flood floodplain is called on FEMA maps.

3. The SFHA is shown on a FIRM as a Zone that begins with the letter A or V.

4. What are the components of a Flood Insurance Study?
   FIS
   Firm
   FW + FW MAP

5. List three things that a FIRM is used to determine.
   (1) Base Flood elevation
   (2) elevation RM
   (3) FP + FW Boundaries
   (4) ~~CF Estimate~~ CCs
   (5) Depth of Flooding

6. Hydrology is the study of a watershed's behavior during and after a storm.

7. Surveyors reference elevation to a common datum.

8. Most permanent FIS elevation reference marks are referenced to what datum? NGVD

9. A hydraulic study uses the hydrology, cross section information, and stream characteristics to determine the flood elevations.

12. Cross sections are shown on which map? ~~old~~ Floodway Map + New format

13. Flood profiles are used to determine what? Flood elevation along the channel

14. In riverine situations, the floodplain is divided into two separate parts for floodplain management purposes. These parts are the Floodway and the fringe.

15. Based on the minimum NFIP standard, if the flood fringe were completely filled, how high could the base flood elevation go up? 1'

16. What FIRM zone has wave heights greater than three feet? V Zone

17. Instead of using a base flood elevation, some shallow flooding areas are defined using a base flood depth.

18. An approximate study shows the base Floodplain but does not show the base flood elevation.

19. How many digits are there in the NFIP community identification number? 6

20. What is an AH Zone? Shallow flooding base FP w/ Base Flood elevation

21. What was the problem with the way the floodway was shown on the old format Flood Boundary and Floodway Maps? Did not show elevations

22. The new format FIRMs include:
    a. Floodways or Floodplain MAT info
    b. Simplified flood insur zones

23. Do Q3 Flood Data show base flood elevations if they are available? NO, They are used to determain if A property is in or out of SFHA.

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A. USING FIS REPORTS

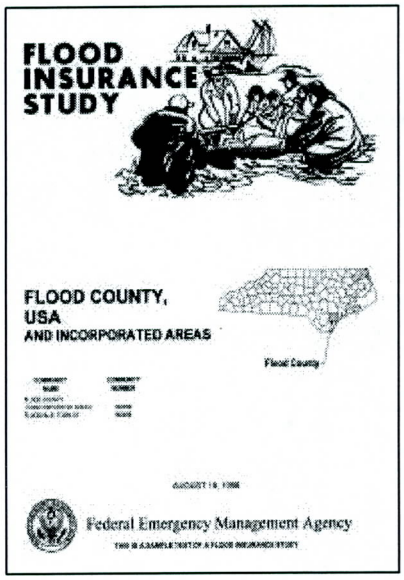
The majority of Flood Insurance Study (FIS) reports use the same outline and numbering system. In this section, we will highlight the report's contents; explore the report's data, tables, and profiles; and describe how they are related to the Flood Insurance Rate Map (FIRM) and Floodway Map.

The most important reason for using a FIS report, in conjunction with a Floodway Map and/or a FIRM, is to determine whether or not a site is located in a Special Flood Hazard Area (SFHA), a V Zone, and/or a floodway, and to determine the Base Flood Elevation (BFE).

Important: Because the elevation determinations for riverine or coastal floodplains are typically used to establish flood elevations for construction in SFHAs and other purposes, accuracy is critical. You may want to have another person double check your determinations before using them in the permit application process.

FIS REPORT CONTENTS

The Flood County FIS report cover has an outline map. Note that the location of Flood County is pinpointed on the outline map. The date of the FIS and the community identification numbers are also indicated on the cover page.



Section 1.0 of all FIS reports states the purpose of the FIS, authority of and acknowledgments by its authors, and coordination steps taken during the preparation of the study.

Section 2.0 provides background information on the community, its flood problems, which areas were studied, and what flood protection measures are in effect.

Section 3.0 discusses the engineering methods used. Section 3.1 covers the hydrologic analysis — how much water will flow through the floodplain during peak floods. Section 3.2 describes the hydraulic analysis — how high the water will get. Development of this information was described in Unit 3.

Section 4.0 discusses how the flood map was prepared from flood data for floodplain management applications. Section 4.1 covers mapping the floodplain boundaries — where the water will go. If the study included a floodway determination, Section 4.2 describes the floodway study and mapping. Section 4.0 also includes the Floodway Data Table. How to interpret and use these and other data is covered later in this unit.

Section 5.0 covers data related to flood insurance, some of which you will not need to use. This section can be a useful reference, as it describes the flood insurance zones identified on the map.

Completing the FIS report are the following four sections: Section 6.0, Flood Insurance Rate Map; Section 7.0, Other Studies; Section 8.0, Location of Data; and, Section 8.0, Bibliography and References.

Most riverine FIS reports include flood profiles as an exhibit at the end of the document. Coastal analyses include a map of transect locations and tables containing data relating the transects to the stillwater and base flood elevations. The Flood County FIS report has both.

USING FLOOD DATA AND TABLES

Flood discharges

Turn to Table 3, *Summary of Discharges*, in Section 3.1 on page 9 of the Flood County FIS report. An excerpt from that table is shown below (Figure 4-1).

TABLE 3 - SUMMARY OF DISCHARGES

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (sq. miles)	PEAK DISCHARGES (cfs) 10-YEAR	50-YEAR	100-YEAR	500-YEAR
COBB BROOK					
At the confluence with the Rocky River	4.2	560	910	1,080	1,550

Figure 4-1: Flood County, FIS Report Table 3 - Summary of Discharges

Figure 4-1 (*Table 3 – Summary of Discharges*) summarizes the peak amount of water discharge for various flood frequencies at locations within the study area. The hydrologic study procedures for arriving at these amounts were discussed in Unit 3, Section B. The sizes of the drainage areas (watersheds) contributing to the water runoff producing the floods are also shown in the table.

The 100-year flood discharge for Cobb Brook at its confluence with the Rocky River is 1,080 cubic feet per second (cfs). This means that during the peak of the base or 100-year flood 1,080 cubic feet of water will pass this point each second.

Those administering the local ordinance may never have a need for these data. They are, however, important in making subsequent calculations of flood elevations as part of the hydraulic engineering study.

Floodway Data Table

The Floodway Data Table in Section 4.2 of the FIS report presents data from the hydraulic analysis (Table 6, page 17 in the report). Part of this table is reproduced below (Figure 4-2).

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION (FEET NGVD)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Rocky River								
A	4,395	115	1,233	6.1	9.9	9.9	10.0	0.1
B	5,537	13	142	9.2	10.4	10.4	10.5	0.1
C	9,610	100	323	8.4	10.9	10.9	11.1	0.2
D	10,995	85	861	7.2	11.2	11.2	11.3	0.1
E	12,695	245	1,887	5.1	11.3	11.3	11.4	0.1
F	13,845	270	2,403	4.5	11.5	11.5	11.5	0.0
G	14,513	230	2,553	3.7	11.6	11.6	11.6	0.0
H	16,625	180	2,000	4.2	11.7	11.7	11.7	0.0

[1]Feet above county boundary

Figure 4-2: Flood County, USA, FIS Report Table 6 - Floodway Data

All numbers in the table are calculated at each floodplain cross section. The first two columns under "Flooding Source" identify the stream name and the cross sections used in the FIS, and the distance of the given cross section from some reference point, usually the mouth of the flooding source, a corporate limit, or a county boundary. The footnotes at the bottom of the Floodway Data Table identify this reference point.

The locations of these cross sections are shown on the accompanying FIRM and Flood Profile (unless otherwise indicated on the Floodway Data Table). Cross-section A of the Rocky River is approximately 500 feet below (or downstream of) Glebe Way. You can find cross-section A on FIRM panel 38. It is the line that crosses the Rocky River and has the letter "A" in a hexagon at each end.

Remember that a floodway's width usually is not symmetrical; it varies with the topography at each cross section. The next three columns ("Floodway") provide data at each cross section. At cross-section A, on the Rocky River, the floodway is 115 feet wide. This means that from the floodway boundary on one side of the stream of this cross section to the floodway boundary on the other side of the stream is 115 feet. This is useful for double-checking the width of the floodway portrayed on the FIRM.

Figure 4-3 is a representation of the description of cross-section A given in Table 6.

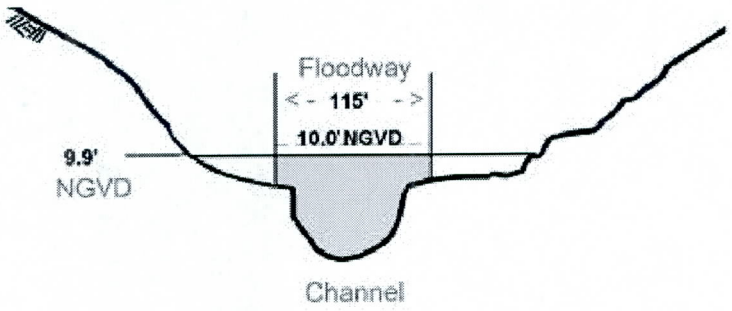


Figure 4-3: Representation of cross-section A of the Rocky River

The area of the floodway here is 1,233 square feet. This is the cross sectional area of the floodway below the elevation of the base flood at this location (the shaded area of Figure 4-3). It is used to determine water velocity. The average or mean velocity of the base flood in the floodway is 6.1 feet per second.

Of the last four columns under "Base Flood Water Surface Elevation," you should be concerned only with the first one, "Regulatory," which provides the regulatory flood elevation. This is equivalent to the 100-year flood elevation or BFE. The other columns depict the increase in water-surface elevation if the floodplain is encroached upon so that the water-surface elevation is increased no more than 1 foot. This amount of encroachment is used to define the floodway width. Notice that at no cross section is the increase more than 1.0 foot, in accordance with NFIP standards.

COASTAL AND LAKE ELEVATIONS

Coastal flood elevations. Table 4, *Transect Descriptions,* on page 12 in the FIS report for Flood County, shows the stillwater elevations and the maximum wave crest elevations of 100-year flood events along the coast.

Coastal regulatory flood elevations include the increase due to wave height. Therefore, use the BFE from the FIRM, not the stillwater elevations in the table.

The base flood elevations on the FIRM are rounded to the nearest foot, which means that if a base flood elevation was actually 8.3 feet, it would show as 8 feet on the FIRM. To correct for this, the recommended rule of thumb is to add 0.4 foot to the rounded BFE on the FIRM. This makes sure that the regulatory elevation you use will be high enough.

For the coast, *use the base flood elevation from the FIRM (plus 0.4 foot), not the table.*

Lake flood elevations. On inland lakes and reservoirs, the FIS generally does not include the effects of waves. For these areas, information on base flood elevations is contained in Section 3.0 of the FIS report, and data is presented in a table titled *Summary of Stillwater Elevations*. Note that in this table the BFE is shown to the nearest one-tenth

of a foot, but the BFE shown in parentheses on the FIRM is rounded to the nearest *whole* number (Figure 3-13).

For lakes and reservoirs, *use the base flood elevation from the table, not the FIRM.*

RELATING REPORT DATA TO MAPS AND PROFILES

Unit 3 described the data that are developed and used in preparing an FIS for a community. Each set of data is used for calculations needed to produce additional data for the FIS.

The data contained in the FIS report are consistent with those found on the accompanying profiles and FIRM. For example, the base flood water-surface elevations at each identified cross section can be found in the Floodway Data Table, read from the flood profiles, and interpolated from the FIRM. Within the limits of map accuracy, you should obtain the same answer regardless of which source you use.

In the same way, the distances between cross sections, or their distance from some reference, can be found using any or all of the above data sources. Again, the answers should be about the same.

The elevations of the computed profiles contained in the FIS report are used with ground elevation data to determine the limits of the various zones shown on the FIRM. Again, flood elevations can be determined at any location along the studied stream using either the flood profiles or the FIRM. All the data fit one another. If obvious mistakes are found, please advise the FEMA Regional Office.

Note: Due to the limited detail and large scale of the base maps used for most FIRMs, much interpolation between contour lines is done in mapping the floodplain boundaries. This is why you may find discrepancies when actual ground elevations are surveyed: the maps are just the best available graphic representations of the BFEs.

Here's the order of precedence for identifying the BFE at a particular location:

- The most accurate BFEs are found in the Floodway Data Table (for a riverine floodplain) and the Summary of Stillwater Elevations table (for a lake). These BFEs are listed to 0.1 foot. However, the Floodway Data Table is only good for sites on or next to a cross section.
- The next most accurate source of elevation data is the profile. This plot of the cross-section data is difficult to read accurately.
- The least accurate source of elevation data for a riverine floodplain is the FIRM. BFEs are rounded to the nearest whole foot. However, the FIRM is the only source of base flood elevations for coastal floodplains and AO and AH Zones.

BFEs take precedence if there is a dispute between the BFE and the boundaries of the SFHA shown on the maps. As a local permit administrator, you can make your decisions based on the most accurate source of data.

It must be noted that banks (and others who must read the FIRM to determine if flood insurance is required) must go by the map. They cannot make on-site interpretations based on data other than the FIRM. However, they may recommend that the property owner submit a request for a Letter of Map Revision based on Fill (LOMR-F) or a Letter of Map Amendment (LOMA) so the map can be officially changed to reflect the more accurate data (see Unit 4, Section D).

Again, only FEMA can amend or correct the maps. Discrepancies should be brought to FEMA's attention through a request for a map change, such as a Letter of Map Amendment (LOMA) (see Section D in this unit).

Reading and using flood profiles, the last set of data contained in a Flood Insurance Study report, will be covered in Section C of this unit.

LEARNING CHECK #1

Using what you have learned so far, use the FIS report and FIRM for Flood County, USA to answer the following questions.

1. What is the base flood discharge on the Rocky River just upstream of Wellington Road?

2. What is the 10-year peak discharge for Cobb Brook?

3. How many cross sections were surveyed for Cobb Brook?

4. What is the width of the floodway for the Rocky River at cross-section G?

5. What is the flood elevation at cross-section G of the Rocky River that you would use for regulating new construction?

6. What is the best source of base flood elevation data for regulatory purposes for a coastal floodplain?

7. In which FIRM Zone is Site F located?

8. What is the regulatory base flood elevation at Site F?

B. USING THE FLOOD MAPS

VIDEO: *HOW TO USE NFIP DATA*

Before proceeding, view the third video segment, *How to Use NFIP Data*. About 18 minutes long, this segment introduces material contained in subsequent sections of this unit.

The segment is part of a series produced by the Commonwealth of Pennsylvania. There are some references to Pennsylvania agencies and governmental units, but they should not detract from the information's usefulness elsewhere.

When done, do not rewind the tape unless you want to review the material.

The video segment provides instructions for:

- Locating a site
- Determining mileage or stationing
- Identifying the BFE on the map
- Locating the floodway boundary

This information will allow you to use the flood profiles printed in the FIS report to make a determination of the BFE to within one-tenth of a foot. (Remember that the flood profiles printed in the FIS report provide the BFE of a site to the tenth of a foot, while the maps provide the BFE rounded to a whole foot.)

We will use examples from the Flood County flood maps to illustrate these steps used to read maps and profiles.

LOCATING A SITE

How easily you can locate a site on an NFIP map will depend on your familiarity with properties in the community and with the scale of the flood maps.

For our exercise purposes here, the general location of the sites are shown on the Flood County Map Index. The site is adjacent to the Rocky River, just downstream of the corporate limits of Floodville. (Remember to check your north arrow. The top of the map is not always north.)

To locate a site, follow these steps:

The steps for a site in Flood County are shown in italics. The general location of the sites are shown on the Flood County Map Index. Site A is close to Floodville Lake.

- If your community has more than one map panel, use the map index to determine which panel to use. Use map landmarks —highways, streets, or streams —to find the site on the index.

  The Map Index for Flood County shows the site adjacent to Floodville Lake on panel 38.

- Find the area containing Floodville Lake on the map panel. Be sure the map panel is the most recent one — compare its suffix letter with the suffix letter for that panel on the current Map Index. Remember, in many communities, panels will have different effective dates due to revisions that do not affect the whole community.

  Floodville Lake is shown at the top right side of panel 38.

- If there is an asterisk on the panel number, either no flood hazard has been identified in that area or it is entirely one flood zone and the panel was not printed.

  See panel 30 on the Map Index for Flood County as an example.

- Locate the site as accurately as possible. Use a detailed street or road map as well as the tax appraiser's plat map to identify the property boundaries, if necessary. You will probably have to obtain the distance on the ground between the site and one or more identifiable points, such as the centerline of a road or street, a bridge, or some other feature on the map. Locate these points on the flood map.

  Site A is bounded to the north by Good Place, to the south by Kalef Lane, beginning 200 feet west of Barclay Lane and extending west for 200 feet.

- Convert the distances to the map scale and plot the site on the map. (The video explains this process in more detail. If necessary, go back and review this segment again.)

  Flood County FIRM panel 38 has a scale of 1 inch = 500 feet. This means you should use the "50" scale on the engineer's scale provided with this course. Example: If you read a length of 5 on the scale, this would be equivalent to 500 feet on the map.

DETERMINING STATIONING

In order to identify the BFE at a development site, the stream stationing for the site must be determined. The stationing of a site will allow us to read the flood profiles. In some cases stationing may be referred to as mileage.

- Locate Site B on the Flood County FIRM that shows cross sections. Identify which labeled cross sections are nearest to your site, both upstream and downstream.

  Site B is near Glebe Way adjacent to the Rocky River. It is located approximately 100' south of the southern portion of Glebe Way and approximately 350' west of the intersection of Foley Drive and Chris

Drive. Follow the steps in the previous discussion to locate this site on the Flood County FIRM.

- Check the map scale used for the panel. The scale is in the map legend or key.

  For Flood County panel 38 the map scale is 1 inch = 500 feet.

Use an engineer's scale to measure the distance along the stream from the site to the nearest cross section, *following all bends and curves of the stream.* It would be worthwhile to measure the distances to both cross sections to check accuracy.

Site B is approximately 650' downstream of cross-section B and approximately 300' upstream (north) of cross-section A, East of the Rocky River.

- If the stationing is based on mileage, convert these distances to miles by dividing by 5,280. In the case of Flood County, the stationing is based on feet.

  When converting to miles, we lose a little accuracy. Rounding the numbers, our site is 0.12 mile downstream of cross-section B and 0.06 mile upstream of cross-section A.

Keep these numbers in mind; they will be used shortly. This approach will also work by measuring from another point that shows up on the profile, such as a bridge or confluence with another stream.

BASE FLOOD ELEVATIONS FROM MAPS

BFEs are shown on the FIRMs as whole numbers. For AE Zones, or coastal and lake floodplains, use the BFE printed in parentheses below the flood zone designation. *No interpolation is necessary.* The same holds true for AH Zones with whole number base flood elevations.

The base flood elevation for properties in the vicinity of the Rocky River at the confluence of Cobb Brook is 10 feet (NGVD or above mean sea level).

For other numbered AE Zones, read the BFE from the nearest wavy "base flood elevation line." Refer to the map legend or key if you are unsure of the line markings.

For the Site B example, the base flood elevations on the FIRM, are marked "10," above and below the site. If the site fell between the base flood elevations of 10 and 11, such as the area north of Site B between Glebe Way and Martling Way along the Rocky River, we could interpolate to find a correct base flood elevation based on the distance of the site from the base flood elevation lines. We could also locate the site on the profile based on how far upstream or downstream it is from cross-section A or B. Lastly, we could

*chose the higher base flood elevation, (*e.g., *11) to best ensure protection from flooding.*

Zone A areas indicate approximate floodplain boundaries. No detailed study has been performed to determine base flood elevations in these areas.

There are no base flood elevations in AO Zones with base flood depths. Instead, the equivalent flood protection level is the number of feet shown in parentheses after the "Zone AO." This is not an elevation above sea level, it is the depth of flooding measured above ground level. The zones are also described in the Flood County FIS report Section 5.0, page 18, *Insurance Applications.*

West of the intersection between Barclay Lane and Argyle Way on FIRM panel 38 is a small Zone AO (Depth 2 feet). The base flood elevation for a site in this zone would be two feet above the grade of any adjacent building.

LOCATING THE FLOODWAY BOUNDARY

If the site is at a surveyed cross section, floodway width data from the Floodway Data Table may be used as a more accurate measure than field and map measurements. Remember that the width listed in the table is the distance from the floodway boundary on one side of the stream to the floodway boundary on the other side of the stream.

If the floodway width measured on the map at that site is at a cross section, the map should be used because it is the floodway officially adopted by the community. If there is a significant difference between the map width at the site and the closest cross section width in the Floodway Data Table, contact the FEMA Regional Office for an interpretation.

Most sites won't fall conveniently on a cross section, so here are the steps using the map as shown in the video:

- Locate Site C on the map and select the correct engineer's scale for the map scale.

Site C is located between Floodville Lake and Barclay Lane on Flood County FIRM panel 38. It is approximately 1,130 feet upstream of Argyle Way, and approximately 230 feet east of the intersection of Good Place and Barclay Lane.

Using the engineer's scale, measure the distance from the floodway boundary to a nearby feature on the ground. For streets, use the center of the street, both on the map and on the ground.

The floodway boundary is approximately 105 feet from the intersection of Barclay Lane and Good Place.

- If any portion of the building site, proposed grading, fill, bridge, or other obstruction is determined to be within the floodway, the floodway provisions of your ordinance also apply.
- Site C falls inside of the floodway.

LEARNING CHECK #2

1. How many feet does one inch on Flood County FIRM panel 38 represent?

2. How many feet does one inch on Flood County FIRM panel 25 represent?

3. Using Flood County FIRM panel 40 and the engineer's scale, what is the width of the floodway at cross-section F on the Rocky River?

4. Using the Floodway Data Table, what is the floodway width at cross-section F on the Rocky River?

5. Using FIRM panel 40 and the engineer's scale, what is the distance between cross-sections F and G on the Rocky River?

6. What is the distance between cross-sections F and G on the Rocky River according to the Floodway Data Table?

7. Site C is within the Town of Floodville. How high is the base flood elevation at Site C?

8. What is the regulatory base flood elevation at cross-section D on the Rocky River?

9. RM 40-2 is located on panel 40 near the intersection of South Road and Dairy Road. How far is RM 40-2 from the closest SFHA?

10. Site E is on panel 25 at the western limit of Cedar Hill Road just north of Dean Lake. What is the base flood elevation at Site E?

11. A 50' x 50' building is located 200 feet south of RM 40-2 on panel 40. Is it in the floodway?

C. USING PROFILES

As discussed in Unit 3, Section B, a flood profile is a graph of computed flood elevations at the floodplain cross sections. It can be used to determine elevations of floods of various frequencies at any location along the studied stream.

PROFILE FEATURES

Four flood levels are typically shown on the flood profile fold-out sheets at the back of the FIS report: the 10-, 50-, 100-, and 500-year (10%, 2%, 1%, and 0.2%) floods. Only the 100- and 500-year floods are used for compliance with NFIP standards; the others are useful for other floodplain management applications, such as septic system design and location, bridge and culvert design, urban stormwater management, and selecting sites for critical facilities.

In addition to the flood elevation lines, FIS profile sheets contain:

- a plot of the stream bed elevation,
- the locations of the cross sections used in the FIS and shown on the FIRM (a letter within a hexagon),
- the locations of roads, and
- culverts and bridges (usually depicted as a large "I").

The data are plotted on a grid to facilitate their interpretation. With few exceptions, the large grid squares are one inch on each side and are divided into 10 squares in both directions. This grid pattern makes taking measurements much easier.

Refer to the profile for Cobb Brook at the back of the Flood County FIS report. The bottom, or x-axis, shows the distance along the river in feet upstream of the confluence with the Rocky River. For this profile, each large square is 200 feet and each little square is 20 feet.

The left side, or y-axis, shows the elevation in feet NGVD. Each large square represents 10 feet and each small square is 1.0 foot. Be aware that profiles in other FIS reports may have different scales.

Figure 4-5 shows a sample of the data that are plotted on the profile shown for Cobb Brook in Flood County. Before you look at it, measure the distance (in feet) and base flood elevations from the profile for cross-sections A, B, and C.

Cross section	Feet above confluence with Rocky River	100-Year Flood elevation
A	1,080	10.14
B	1,880	23.8
C	2,600	31.1

Figure 4-5: Plotted Data, Flood Profile 01P, Cobb Brook

DETERMINING BASE FLOOD ELEVATIONS

Profiles

Here are the steps shown in the video to determine the BFE for a site using the flood profiles in the FIS report:

- Using the FIRM, locate features near the site that appear on the profile, such as a bridge or cross section.

  We'll work with the Rocky River profile at Site D, just south of the footbridge. The footbridge is located on Flood Profile 04P, at a point approximately 21,700 feet above the county boundary.

- Follow the stationing procedures described in the previous section to determine the site's distance from a cross section or other feature that appears on the profile.

  Site D is north of the Rocky River, approximately 850 feet upstream of cross-section J and approximately 3,600 feet downstream of cross-section K. The footbridge also appears on the profile.

- Find the feature(s) on the flood profile for that stream.

  The footbridge is located between cross-sections J and K. These cross sections are shown on Flood Profiles 04P and 05P at stream distances of 20,850 and 25,360.

- Check the scale used for the profile, and, using the engineer's scale, measure the distance from the feature(s) to the site.

You can use the "50" scale on the engineer's scale, or you can count squares. At this scale, each little square is 50 feet, so Site D is approximately 17 little squares upstream (right) of cross-section J.

- Find the site's location on the appropriate flood profile line and read the elevation on the y-axis. You can count squares or use the engineer's scale. Don't forget, the scale on the y-axis is different from the x-axis scale.

For the Rocky River profile, you may find it easiest to use the "50" scale on the y-axis because it is five feet to the inch.

- Find where the site intersects the profile. Draw a straight line to the left or right edge of the graph.

  The second line down is the base (100-year) flood profile. Read the flood elevation off either the left or right edge of the page. At Site D, the base flood elevation is 13.8 feet. Check the 10-, 50-, and 500- year elevations and see if you get: 11.3, 12.7 and 15.3, respectively.

  Note how this produces a more accurate number than interpolating between the two wavy lines on the FIRM. Instead of guessing the elevation of the site between the BFE lines, we can tell that it is 13.8.

- A surveyor can establish the flood elevation at the site so the owner or builder will know how high the base flood elevation is predicted to be.

  A surveyor can either shoot 13.8 feet at the site or shoot any elevation and tell the owner how high the base flood is in relation to the mark.

Be sure to check each profile's scale before you use it. On Flood Profile 02P in the FIS report for Flood County, the x-axis scale is 1 inch = 500 feet and the y-axis scale is 1 inch = 5 feet. Flood Profile 01P covers steeper terrain and the y-axis is at a scale of (1 inch = 10) feet (each little square represents one foot).

Other types of floodplains

In coastal floodplains (AH Zones) and areas of sheet flow (AO Zones), the base flood elevation is listed in parentheses below the zone designation on the FIRM. Use that elevation because there is no profile for these zones. Except for lake floodplains with stillwater elevation tables to 0.1 foot, the FIRM is the most accurate source for base flood elevations.

Relating flood elevations to the ground

If the site is clearly outside the boundary of the base floodplain, as with Site A, no floodplain regulations apply unless the site adjoins the SFHA and surveyed ground elevations are *below* the base flood elevation.

If it cannot be determined whether the site is in or out of the floodplain, additional information and/or investigation will be needed. In this instance, ground elevation and lowest floor elevations of any structures will be needed for the site, so one who wishes to apply for a Letter of Map Amendment (LOMA) of Letter of Map Revision based on Fill (LOMR-F) may need to hire a surveyor.

A field visit by the local administrator or designee and measurements on the ground may also be required. The actual site elevations are compared to the base flood elevation, read from the FIS flood profiles, for that location.

If the site elevations are above the base flood elevation, the site is outside the floodplain and the applicant should be advised about the map amendment/revision process. If they are lower, it is within the floodplain and subject to the provisions of the ordinance.

It must be noted that banks (and others who must read the FIRM to determine if flood insurance is required) must go by the map. They cannot make on-site interpretations based on data other than the FIRM. However, they may recommend that the property owner submit a request for a LOMR-F or LOMA so the map can be officially changed to reflect the more accurate data (see Unit 4, Section D).

RELATING PROFILES TO MAPS

Base flood elevations shown on the FIRM are directly related to elevation data shown on the flood profiles. Within the limits of map accuracy, you should obtain the same elevation whether you use the map or profile.

However, the flood profiles should always be used to determine flood elevations along rivers and streams.

If you find obvious mistakes or discrepancies between the tables, profiles, and FIRM, contact the FEMA Regional Office.

From reading the profile in Section C of this Unit, *Determining Base Flood Elevations*, we determined the base flood elevation to be 13.8 feet. From reading the FIRM, we can only establish that the base flood elevation for Site D should be between 13 and 14 feet.

These computations show that the FIRM and the FIS report profile are consistent and provide a double check to make you comfortable with your determination.

LEARNING CHECK #3

1. What is the base flood elevation for the Rocky River at cross-section C:

   a. Using the flood profiles in the FIS report?
   b. Using the Floodway Data Table?
   c. If these numbers are different, which BFE should you use?

2. An "I" symbol is plotted 1,910 feet upstream of the confluence with the Rocky River on Flood Profile 01P. What does this symbol represent?

3. Is the footbridge upstream or downstream from the limit of detailed study?

4. Using Flood Profile 03P, determine the BFE on the Rocky River for a site that is 520 feet downstream of Fox Croft Drive.

5. How far is the Fox Croft Drive bridge from cross-section D on the Rocky River?

6. A developer proposes to place a structure 625 feet (0.12) miles upstream from the Martling Way Bridge adjacent to the Rocky River (FIRM panel 38). Using the flood profiles, tell the developer how high the structure would have to be elevated to be above the base flood elevation as well as the 500-year flood elevation.

7. A particular site is 750 feet upstream of Argyle Way adjacent to the Rocky River (FIRM panel 38). What is the base flood elevation here?

D. Maintaining and Revising NFIP Maps

NFIP maps are vital to effective enforcement of your floodplain management responsibilities. They are also key to accurate flood insurance rating and fair determinations of the flood insurance purchase requirement.

As the primary repository for NFIP maps, it is important that the community maintain adequate copies and keep them updated. You should have at least one master map that includes all the changes, annexations, map revisions, etc.

It is also important that you keep copies of old, revised maps. They provide a historical record of what was known and the basis of what was required in the past. For example, a property may not have been shown in the SFHA on an old FIRM, so there were no building requirements. If that property is later flooded, you will need to show the old map as the basis for the community's action.

Similarly, people who purchased flood insurance based on the FIRM zone in effect at the time are entitled to keep that FIRM zone as the basis for their rates. You will be doing your citizens a valuable service if you have a copy of an old FIRM.

Ordering Maps

Additional copies of your community's FIS report, FIRM, and Floodway Map can be ordered by calling **1-800-358-9616**. The toll-free map distribution center number is staffed Monday through Friday from 8 a.m. to 8 p.m. Eastern Standard Time.

Requests may be faxed to 1-800-358-9620, or mailed to:

Map Service Center
P.O. Box 1038
Jessup, MD 20794-1038

Maps are provided at no charge to local government officials. The FIS report and Floodway Maps must be specifically requested, or only the FIRMs will be sent.

Be prepared to give your Community Identification Number.

Changing NFIP Maps

No map is perfect and no flood situation is static. From time to time, FEMA, communities, or individuals may find it necessary for a FIRM or Floodway Map to be updated, corrected, or changed.

Common reasons why a map may need to be changed include:

To correct non-flood-related features, such as a change in the community's corporate limits. The local government should send the correct information to its FEMA Regional Office. However, the community does not need a new map if it has annexed an area that is shown on an adjacent community's FIRM. It can regulate floodplain development using that FIRM and flood data.

Since it is expensive to reprint and redistribute flood maps, corporate boundary changes are usually made only when maps are revised for new or better flood data. One way to minimize the need for such changes is for a municipality to adopt the adjacent community's FIRM. This would clarify the regulatory flood data for newly annexed properties and areas in the community's extraterritorial jurisdiction.

To include better ground elevation data. As noted earlier, maps do not always represent site-specific ground elevations. If there is better information on natural ground elevations, the applicant may apply to have the map reflect the better topographic information.

To reflect changes in ground elevations in the floodplain. If there has been a substantial change in ground elevation — for example, fill has been placed in the floodplain to raise building sites above the base flood elevation — the applicant may request a map change to reflect the new ground information.

To revise flood data. A request may be made to revise the existing study, based on a new flood study. The applicant must demonstrate that the original study was in error or that the new study is based on more accurate or better technical data.

To submit new flood data. When a flood study is prepared for a development in an unnumbered A Zone, the data can be submitted to FEMA for later incorporation into the FIS or revised FIRM.

To reflect a flood control project. If a new levee, reservoir, or channel modification affects the flow of the base flood, the community must request that the map be revised to reflect the new conditions or new (lower) base flood elevations. The map cannot be changed until the project is constructed and/or operating.

It is important to note that many small projects, such as channel clearing or retention basins in new subdivisions, do not have a measurable effect on the base flood and, therefore, do not warrant a map change. The request for a change needs to be carefully prepared by an engineer who knows FEMA's flood study guidelines.

It must be remembered that a community participating in the NFIP is obligated by its agreement with FEMA to submit new or revised map information when it becomes available. Section 65.3 of the NFIP regulations states:

A community's base flood elevations may increase or decrease resulting from physical changes affecting flooding conditions. As soon as practicable, but not later than six months after the date such information becomes available, a community shall notify [FEMA] of the changes by submitting technical or scientific data…

Another point to keep in mind is that lenders, insurance agents, and communities must use the published flood maps. Lenders are affected by changes in a FIRM as they enforce the mandatory flood insurance purchase requirements. Communities are affected by changes in a FIRM and a Floodway Map as they enforce floodplain management regulations.

Consequently, uniform procedures have been established for requesting and administering map changes.

TYPES OF CHANGES

FEMA has four approaches to changing NFIP maps: restudies, limited map maintenance projects, amendments, and revisions. Requests for a restudy, amendment, or revision must be approved or made by the community, since they affect the local floodplain management program.

A restudy is a new Flood Insurance Study for some or all of the community. For example, FEMA may decide to conduct a restudy where development in a small watershed has substantially changed stormwater runoff conditions over the 15 or 20 years since the original FIS was completed. Or a restudy may be needed where growth is occurring along streams without base flood elevations.

A limited map maintenance project (LMMP) is a small-scale restudy that is limited in size and cost. It is frequently used for studies in unnumbered A Zones.

A map revision is used for other cases, including:

- scientifically based challenges to the flood elevations
- to incorporate new data that become effective after the construction of a flood control project
- to reflect fill placed in the floodplain after the flood study currently in effect was completed
- to change the floodplain or floodway boundaries
- to include new flood data

An amendment is used to remove an area that was inadvertently included in the SFHA. Often the ground is higher than depicted on the base map used for the FIRM. This typically happens because of the problem of accurately locating the floodplain boundary

on a topographic map. For example, more detailed ground elevation data can be used to amend a FIRM to show a property that is higher than the BFE to be outside the SFHA.

FEMA will make map amendments based on the information submitted by the applicant. Unlike the three other types of changes, an amendment doesn't challenge the FIS or FIRM; it simply removes certain areas or buildings from the SFHA because they are higher than the base flood elevation.

MAPS AND LETTERS

FEMA uses two methods to make flood map changes.

The first is to actually change the map and publish new copies. Here the effective date of a map is changed. A restudy or limited map maintenance project will generally result in a new map. Sometimes revisions and amendments result in a reprinted map. However, republishing the map can be expensive and is done only if the change affects a large area.

The other method is to issue a letter that describes the map change. FEMA does this when the revision can be adequately described in writing or through use of a small, annotated map panel, such as when only one lot or building is affected.

There are two types of Letters of Map Change (LOMC): a Letter of Map Revision, or LOMR, and a Letter of Map Amendment, or LOMA. The terms relate to the map changes described in the previous section. A "LOMR-F" refers to a LOMR based on new fill in the floodplain.

Because such a letter officially amends or revises the effective NFIP map, it is a public record that the community must maintain. Any LOMC should be noted on the community's master flood maps and filed by panel number in an accessible location.

If provided with a legal description of the land area above the BFE, FEMA can issue a LOMC for only a portion of the parcel. Or, a LOMC might state that only a specifically described portion (i.e. the front 70 feet with the exception of any recorded easements), is removed from the SFHA. However, the LOMC might then also state that portions of the rest of the property remain within the SFHA, subject to all floodplain management regulations.

NFIP maps are not changed based on *proposed* projects. However, an applicant may request a Conditional Letter of Map Revision (CLOMR) or a Conditional Letter of Map Revision based on Fill (CLOMR-F) based on proposed plans. A Conditional Letter of Map Amendment (CLOMA) can be requested for a vacant lot. These conditional letters inform the builder and others (such as the bank financing the project) that when the project is completed, it will qualify for a LOMR, LOMR-F, or LOMA. A LOMR, LOMR-F, or LOMA will still be required to officially change the NFIP map.

A processing fee is charged for LOMRs, CLOMRs , LOMR-Fs, and CLOMR-Fs and CLOMAs. There is no fee for requesting a LOMA.

An example of a LOMA is in Figure 4-6. For this site, the owner supplied the survey data needed to show that the lowest grade adjacent to his house was higher than the base flood elevation shown on the FIRM. Because the request affects only one property, a letter can be issued that describes the property and the type of map change ("This letter amends the above-referenced NFIP map to remove the structure from the SFHA.").

Federal Emergency Management Agency

Washington, D.C. 20472

FEB 23 1999

LETTER OF MAP AMENDMENT
218-70-RS

IN REPLY REFER TO CASE NO.: 99-04-1816A

Community: Town of Plymouth,
Washington County, North Carolina
Community No.: 370249
Map Panel Affected: 0003 C
Map Effective Date: May 2, 1995

We reviewed a request dated January 4, 1999, for a Letter of Map Amendment (LOMA). All required information for this request was received on February 1, 1999. Using the information submitted and the effective National Flood Insurance Program (NFIP) map, we determined that a portion of the property described below is located in the Special Flood Hazard Area (SFHA), an area that would be inundated by the flood having a 1-percent chance of being equaled or exceeded in any given year (base flood); however, the structure on the property is not in the SFHA.

Property Description:	Lot 103, Liverman Heights, as described and recorded in a General Warranty Deed, Book 274, Pages 513 and 514, on August 21, 1979, by the Washington County Register of Deeds
Street Address:	109 Ida Street
Flooding Source:	Conaby Creek

This letter amends the above-referenced NFIP map to remove the structure from the SFHA. The structure is now located in Zone X (unshaded), an area above the 0.2-percent-annual-chance flood level. Flood insurance coverage for the structure may be available under a low-cost policy (see enclosed document). Because portions of the property remain in the SFHA, any future construction or substantial improvement on the property remains subject to Federal, State, and local regulations for floodplain management.

An additional enclosed document provides information about LOMAs. If you have any questions about this letter, please contact Helen Cohn of our staff in Washington, D.C., either by telephone at (202) 646-3457 or by facsimile at (202) 646-4596.

Sincerely,

Matthew B. Miller

Matthew B. Miller, P.E., Chief
Hazards Study Branch
Mitigation Directorate

Enclosures

cc: State Coordinator (w/o enclosures)
Region (w/o enclosures)
Community Map Repository

Figure 4-6: First page from a Letter of Map Amendment

REQUESTING MAP CHANGES

If you want a restudy or a limited map maintenance project, call your FEMA Regional Office or State NFIP coordinator and ask about the procedures.

If you want a map changed to reflect a new study that has already been done or to reflect better ground elevation data, use one of the following FEMA forms.

MT-1: Letter of Map Amendment (LOMA)
Conditional Letter of Map Amendment (CLOMA)
Letter of Map Revision (Based on Fill) (LOMR-F)
Conditional Letter of Map Revision (Based on Fill) (CLOMR-F)

MT-2: Letter of Map Revision (LOMR)
Conditional Letter of Map Revision (CLOMR)
Physical Map Revision

MT-EZ: Letter of Map Amendment (LOMA) for a single lot
Letter of Map Revision (Based on Fill) (LOMR-F) for a single lot

The MT-EZ is the shortest and simplest of the three forms. A copy is included in Appendix F. This is the form that would be used to request a LOMA like the one in Figure 4-6. A land surveyor is needed to certify the elevation data. Appendix F also includes a handout that explains the map change policies to property owners.

The building elevation certification requires some information not normally required on a FEMA Elevation Certificate, specifically, the lowest elevation on the parcel. This requirement is in addition to the lowest grade adjacent to the structure (including attached decks) and the lowest floor elevation (including the garage, crawlspace, or basement).

If the garage, crawlspace, or basement floor is below the base flood elevation and the building was built on fill that was placed in an identified SFHA, FEMA cannot issue a LOMA or LOMR.

Except for the MT-EZ, requests for map changes should be completed by a qualified engineer or surveyor. The most common reason that a map change request is not completed is that the applicant did not submit adequate technical data to validate the change.

Note that a bank still has the prerogative to require the purchase of a flood insurance policy on a building that has been removed from the SFHA. The bank can require flood insurance as a condition of the loan in order to protect its investment in the property. For example, lenders in Florida typically still require flood insurance coverage for structures determined to be in shaded Zone X or Zone B.

Filled, umimproved land can be removed from SFHA on only the basis of the filled elevation, if no construction of a structure has begun when the request is submitted to FEMA.

Additional information on map changes can be found in *Answers to Questions About the National Flood Insurance Program*, questions 81 – 95.

LEARNING CHECK #4

1. What office is the primary repository for your FIS, FIRM, or Floodway Map?

2. How do you get more copies of your FIRM?

3. What are the four types of map changes?

4. Mrs. Murphy says she has a survey that shows that her house is higher than the flood level. What type of map change should she request?

5. For what locations on her property will Mrs. Murphy need elevation data?

6. A builder wants to get a bank loan to develop an area. His plans are to fill some low spots and get all the building sites out of the floodplain. His banker will not grant a loan for the project unless she is reassured that the FIRM will be changed when the project is finished. What type of map change should the builder request?

7. When can filled land be removed from the SFHA?

UNIT LEARNING EXERCISE

1. Using the Flood Insurance Study for Flood County, USA and Incorporated Areas:

2. What is the community number for the unincorporated areas of Flood County?

3. What is the best map to use to determine if a property is in the SFHA?

4. What is the best map to use to determine if a property is in a floodway?

5. What is the effective date of the Flood County FIRM?

6. Is the Flood County FIRM in the old format or new format?

7. Look at the Flood County FIRM Index. Why is there no FIRM panel for the northwest corner of the county?

8. If you measured a distance on the ground as 500 feet, how many inches would it be on the Flood County FIRM panel 25?

9. How many miles of stationing would there be if you measured a distance between two cross sections as 1,050 feet?

10. Marge's house is located at Site F on Flood County FIRM panel 40. How far is her house from the boundary of the nearest coastal barrier?

11. Examining the Atlantic Coastline, what is the highest wave crest elevation shown on the FIRM?

12. What FIRM panel is RM 38-1 on?

13. What is the base flood elevation at the location given orally?

14. If a surveyor wanted to locate RM 38-1 on the ground, what would he or she look for?

15. How high above sea level is RM 40-1?

16. A site is located at the point formed by the intersection of Glebe Way and Foley Drive between Foley Drive and the Rocky River.

17. On which FIRM panel is the site?

18. In which FIRM zone is the site?

19. What is the base flood elevation at the site?

20. The property is in which of the following? (Check those that apply.)
    ____ 100-year floodplain
    ____ 100-year floodway
    ____ 500-year floodplain
    ____ Coastal High Hazard Area
    ____ Designated coastal barrier

21. A site is on the banks of Cobb Brook, 100 feet west of Tullamore Lane bridge.

    a. On which FIRM panel is the site?
    b. In which FIRM zone is the site?
    c. What is the base flood elevation at the site using the FIRM?
    d. What is the base flood elevation at the site using the profile?

22. A vacant lot near Site D was recently purchased. The new owners ask for your help in locating the best spot to build a new house. The FIRM shows the entire property in the SFHA. You are handy with a transit, so you survey the proposed building site during a visit to the property. You find that the building site is above the BFE. The owners want you to inform their bank so they won't have to buy flood insurance. What do you say?

23. When the Flood County FIS was completed, the watershed of the Rocky River was relatively undeveloped. Over the last 15 years, there has been a lot of new construction throughout this small watershed. The Town Engineer says that the base flood elevations are probably out of date and underestimate the true flood hazard. What can you do to attempt to get your FIRM updated?

UNIT 5:
THE NFIP FLOODPLAIN MANAGEMENT REQUIREMENTS

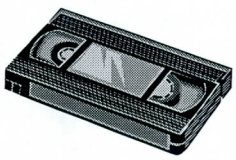
In this unit

Unit 6 reviews more restrictive standards that may be required or recommended for your community. Units 7 through 10 provide guidance on how to administer a program that fulfills the requirements spelled out in this unit.

This unit reviews the NFIP standards for floodplain development, including:

- What maps, base flood elevations and other flood data must be used,
- When permits are required,
- Ensuring that new development does not cause increased flooding elsewhere,
- Standards to ensure that new buildings will be protected from the base flood, and
- Additional requirements for certain types of development.

Materials used in this unit



- Videotape segments: *Federal and State Floodplain Management Requirements* and two of the *Best Build* series
- Video cassette player

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A. THE NFIP'S REGULATIONS

For a community to participate in the National Flood Insurance Program, it must adopt and enforce floodplain management regulations that meet or exceed the minimum NFIP standards and requirements. These standards are intended to prevent loss of life and property, as well as economic and social hardships, that result from flooding.

The NFIP standards work – as witnessed during floods in areas where buildings and other developments are in compliance with them. Nationwide each year, NFIP-based floodplain management regulations help prevent more than $700 million in structural damage.

This unit focuses on the minimum NFIP criteria. In some instances, more restrictive state standards may exist, and they must also be met by communities in the NFIP. They are the subject of the next unit.

44 CFR

The NFIP requirements can be found in Chapter 44 of the *Code of Federal Regulations* (44 CFR). Revisions to these requirements are first published in the *Federal Register*, a publication the Federal Government uses to disseminate rules, regulations and announcements.

Most of the requirements relative to your community's ordinance are in Parts 59 and 60. These are included in Appendix E along with the mapping regulations of Parts 65 and 70.

Figure 5-1 shows how the regulations are organized. The sections are referred to in shorthand, such as 44 CFR 60.1—Chapter 44, *Code of Federal Regulations*, Part 60, Section 1. In this course, excerpts are shown in boxes:

> ***44 CFR 59.2(b)*** *To qualify for the sale of federally-subsidized flood insurance a community must adopt and submit to the Administrator as part of its application, flood plain management regulations, satisfying at a minimum the criteria set forth at Part 60 of this subchapter, designed to reduce or avoid future flood, mudslide (i.e., mudflow) or flood-related erosion damages. These regulations must include effective enforcement provisions.*

As noted in Unit 2, when your community joined the NFIP, it agreed to abide by these regulations. When your community's FIRM was published, it had to submit its ordinance to FEMA to ensure that it met these requirements.

Part 59—General Provisions

Subpart A—General

59.1 Definitions
59.2 Description of program
59.3 Emergency program
59.4 References

Subpart B—Eligibility Requirements

59.21 Purpose of subpart
59.22 Prerequisites for the sale of flood insurance
59.23 Priorities for the sale of flood insurance under the regular program
59.24 Suspension of community eligibility

Part 60—Criteria for Land Management and Use

Subpart A—Requirements for Flood Plain Management Regulations

60.1 Purpose of subpart
60.2 Minimum compliance with flood plain management criteria
60.3 Flood plain management criteria for floodprone areas
(a) When there is no floodplain map
(b) When there is a map, but not flood elevations
(c) When there are flood elevations
(d) When there is a floodway mapped
(e) When there is a map with coastal high hazard areas
60.4 Flood plain management criteria for mudslide (i.e., mudflow)-prone areas
60.5 Variances and exceptions
60.6 Revisions of criteria for flood plain management regulations
60.7 Definitions

Subpart B—Requirements for State Flood Plain Management Regulations

Subpart C—Additional Considerations in Managing Flood-Prone, Mudslide (i.e., Mudflow)-Prone, and Flood-Related Erosion-Prone Areas

Figure 5-1. 44 CFR Parts 59 and 60

Many state NFIP coordinators have prepared model flood damage prevention ordinances to assist communities in meeting the NFIP requirements, so it is likely that your community adopted an ordinance based on the state model.

NOTE: Periodically, the NFIP regulations are revised to incorporate new requirements or clarify old ones. These changes are published in the *Federal Register*. Some revisions require local ordinance amendments. Your community may or may not have made the amendments needed to stay updated. Before you complete this unit, you should check with your state NFIP coordinator or FEMA Regional Office to verify that your ordinance is currently in full compliance with the latest NFIP requirements.

COMMUNITY TYPES

NFIP regulations identify minimum requirements that communities must fulfill to join and stay in the program. The requirements that apply to a particular community depend on its flood hazard and the level of detail of the data FEMA provides to the community. The specific requirements are in Section 60.3, and apply to communities as follows:

- 60.3(a) FEMA has not provided any maps or data.
- 60.3(b) FEMA has provided a map with approximate A Zones
- 60.3(c) FEMA has provided a FIRM with base flood elevations
- 60.3(d) FEMA has provided a FIRM with base flood elevations and a map that shows a floodway
- 60.3(e) FEMA has provided a FIRM that shows coastal high hazard areas (V Zones)

Two important notes:

The NFIP requirements are minimums. As noted in 44 CFR 60.1(d), "Any floodplain management regulations adopted by a State or a community which are more restrictive than the criteria set forth in this part are encouraged and shall take precedence."

These requirements are cumulative. A 60.3(c) community must comply with all appropriate requirements of sections 60.3(a) and (b). For example, 60.3(a) includes basic requirements for subdivisions and utilities that are not repeated in the later sections. *All* communities in the NFIP must comply with these subdivision and utility requirements.

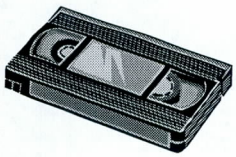
For example, a 60.3(c) community must use the base flood elevations provided on the FIRM. If that community has an approximate A Zone without a BFE, it must comply with the requirements of 60.3(b) for that area.

The rest of this unit explores the requirements of 44 CFR 60.3. It is organized by subject matter, so it will not correspond with the sections in 44 CFR. Where appropriate, the specific section numbers are referenced.

You should be able to identify where the requirements discussed in this unit appear in your ordinance. If you cannot find a specific reference or if you are not comfortable with your ordinance's regulatory language, contact your state NFIP coordinator or FEMA Regional Office. FEMA and your state will expect you to enforce these minimum requirements as agreed to. If you don't think your ordinance language is clear or up to date, you should consider an amendment to remove any doubt.

This unit covers the minimum requirements for participation in the NFIP. As noted, communities are encouraged to enact regulatory standards that exceed these minimums and that are more appropriate for local conditions.

The Community Rating System (CRS) is a part of the NFIP that rewards communities that implement programs that exceed the minimums. It is explained in more detail in Unit 9, Section C. Where provisions that can receive CRS credit are mentioned in this course, they are highlighted with the CRS logo.



VIDEO: *FEDERAL AND STATE FLOODPLAIN MANAGEMENT REQUIREMENTS*

This 19 minute segment summarizes much of the material contained in this unit. Some of the items discussed, such as substantial improvements and variances, are discussed in later units.

The segment is part of a series produced by the Commonwealth of Pennsylvania. There are some references to Pennsylvania agencies and governmental units, but they should not detract from the information's usefulness in other jurisdictions.

After viewing the segment, return to the text. You may rewind the tape.

B. MAPS AND DATA

Flood maps and flood data were discussed in Units 3 and 4. This section builds on that information, covering the NFIP requirements as to when and how a community must use those maps and data.

Basic rule #1: You must use the latest maps and flood data published by FEMA.

NFIP MAPS AND DATA

A community must adopt and enforce floodplain management regulations based on data provided by FEMA (44 CFR 60.2(h)). This includes the floodplain boundaries, base flood elevations, FIRM zones and floodway boundaries shown on your current Flood Insurance Rate Map, Flood Boundary Floodway Map and/or Flood Insurance Study.

> ***44 CFR 60.2(h):*** *The community shall adopt and enforce flood plain management regulations based on data provided by the [Federal Insurance] Administrator. Without prior approval of the Administrator, the community shall not adopt and enforce flood plain management regulations based upon modified data reflecting natural or man-made physical changes.*

This requirement does not prevent a community from adopting and enforcing regulations based on data more restrictive than that provided by FEMA. For example, a community may want to regulate to an historical flood which was higher than the BFEs shown on the FIRM. However, such data must be approved by the FEMA Regional Office before it is used.

This requirement also does not prevent a community from using other technical data to identify and regulate floodprone areas not shown on FEMA maps. For example, many cities and urban counties map and regulate areas on small tributary streams that are not shown on the FIRM.

The community always has a say in what the latest maps and data should be. FEMA will send you proposed revisions to the official FIRM and you will have time to review them and submit your comments to FEMA before they are published. If you disagree with the FEMA data, then you should submit a request for a map revision as noted in Unit 4, Section D, *Maintaining and Revising NFIP Maps.*

Annexations: If a property is in a recently annexed area that does not show up on your community's map, use the county's map and base flood elevations (BFEs) to determine the flood protection requirements. In fact, you should formally adopt the county's FIRM in your ordinance to strengthen your basis for regulating areas not currently shown on your FIRM.

Exceptions: The basic rule does not cover every situation. Four occasions where a community may vary from the data provided by FEMA are:

- When the FEMA data disagree with ground elevations.
- When the FEMA data are insufficient. This occurs in approximate A Zones where base flood elevations and floodway boundaries are not provided with the FIRM.
- When FEMA has provided draft revised data.
- When FEMA provides "advisory" flood hazard data.

These situations are discussed below.

Note: these situations only apply to the use of flood data for floodplain management purposes. Insurance agents and lenders must use the current FIRM when setting insurance rates and determining whether flood insurance is required. If a person wants to vary from the current FIRM to obtain different premium rates or to not have to purchase a flood insurance policy, the FIRM must be officially revised or amended.

WHEN FIRM AND GROUND DATA DISAGREE

The BFEs published in the Flood Insurance Study set the level for flood protection purposes. The maps are a graphic portrayal of that information.

Since FEMA usually does not have detailed topographic mapping to use in preparing the flood maps, the flood boundaries are interpolated. This can result in inaccuracies in drawing the boundaries on the map.

The BFE in relation to the actual ground elevation sets the floodplain limits for regulatory purposes. When ground surveys show that a development site is above the BFE, you should record the data and issue the permit. Then, if the developer or owner wants the property removed from the Special Flood Hazard Area designation, he or she can request a Letter of Map Amendment.

It is up to them to apply for a map change, not you. The procedure is discussed in Unit 4, Section D.

Conversely, if site surveys show that areas considered outside the 100-year floodplain on published maps are in fact below the BFE, you should require protection of new buildings to the BFE. Even though a site may be technically outside the mapped SFHA, you are not doing future occupants any favors by ignoring the known flood hazard.

REGULATING APPROXIMATE A ZONES

The second occasion where you may vary from the data provided by FEMA is in approximate A Zones. Approximate A Zones are those areas not studied by the detailed hydrologic/hydraulic methods. These areas are shown as "unnumbered A zones" on the FIRM and "approximate 100-year flood zones" on the Flood Boundary Floodway Map. The FIS will not contain specific base flood elevations for approximate study areas nor will there be a floodway/fringe designation on the FBFM.

> ***44 CFR 60.3(b)*** *When the Administrator has designated areas of special flood hazards (A zones) by the publication of a community's FHBM or FIRM, but has neither produced water surface elevation data nor identified a floodway or coastal high hazard area, the community shall:…*
>
> ***(3)*** *Require that all new subdivision proposals and other proposed developments (including proposals for manufactured home parks and subdivisions) greater than 50 lots or 5 acres, whichever is the lesser, include within such proposals base flood elevation data;*
>
> ***(4)*** *Obtain, review and reasonably utilize any base flood elevation and floodway data available from a Federal, State, or other source, including data developed pursuant to paragraph (b)(3) of this section, as criteria for requiring that new construction, substantial improvements, or other development in Zone A on the community's FHBM or FIRM meet the standards …*

Regulating development in approximate or unnumbered A Zones is one of the tougher jobs you'll face, especially in counties that have large areas of such zones. 44 CFR Section 60.3(b)(4) requires that you make every effort to use any flood data available in order to achieve a reasonable measure of flood protection. Further, many states and local ordinances require a base flood elevation before a permit can be issued for any development.

Here are some tips in obtaining data needed for unnumbered A Zones. Whichever method you use, be sure to record on the permit records where the flood elevation came from. This will help you be consistent with future development in the same area.

- Check with your state NFIP coordinator. Some states have regulations or guidance on how to obtain regulatory data. Some have repositories of data or may help conduct a new study.
- Check with local flood control, sanitary or watershed districts. Like state agencies, they may have their own programs for developing new flood data.
- If a body of water forms a boundary between two communities, the community on the other side may have a detailed study. Such base flood data are valid for both sides of a body of water.

- Ask the U.S. Army Corps of Engineers, U.S. Department of Agriculture/Natural Resources Conservation Service, or U.S. Geological Survey if they have knowledge of any flood studies, unpublished reports, or any data that may pertain to the area in question.
- If the property is along a stream that is near state highway structures such as bridges or culverts, the state highway department may have done a flood study to properly size the structure.
- If the property is on a river with a power-generating dam, the dam owner may have had to conduct a study for federal licensing.
- See if your engineer or the developer will conduct a study to calculate BFEs.

Data obtained from one of these other sources should be used as long as they:

- Reasonably reflect flooding conditions expected during the base flood,
- Are not known to be technically incorrect, and
- Represent the best data available.

The FEMA publication *Managing Floodplain Development in Approximate Zone A Areas: A Guide for Obtaining and Developing Base (100-Year) Flood Elevations* provides information on a number of methodologies for developing BFEs in approximate A zones. These methodologies range from detailed methods that produce BFEs and perform floodway analyses similar to those developed for a Flood Insurance Study to simplified methods that can be used in isolated areas where more costly studies cannot be justified.

If your community has approximate A Zones that are likely to be developed, you should get a copy of this document and have your engineer review it. (The guide includes the Quick-2 software for computing flood elevations.)

Small developments

If the project is an isolated building, such as a single-family home in an undeveloped area, it may not make economic sense to conduct a study to determine the BFE. In these cases, you may want to use a less expensive alternative to determine the flood protection level.

There are two possibilities:

- Use historical records or the flood of record (the highest known flood level for the area). It may be that a recent flood was close to the base flood. If records of the recent flood can be used, base your regulatory flood elevations on them (or add a foot or two to the historical flood levels to provide a margin of error). Before you do this, get a second opinion from your state NFIP coordinator, FEMA Regional Office or other agency that is familiar with the flood data you want to use.

- Require protection to at least five feet above grade.

These methods are not as good as requiring protection to a BFE. However, they may be more appropriate for small projects. The second approach will result in lower flood insurance rates than if the building had no protection, but the rates are not as favorable as they would be if a BFE were calculated. Examples of the possible rates are discussed in Unit 9, Section B.

Larger developments

You are encouraged to discuss the flood hazard as early as possible in discussions with subdividers and developers of large areas. If a subdivision of planned unit development will be partially in the floodplain, there may be ways to avoid building in the flood hazard area, which can save the developer the cost of a flood study.

> ***44 CFR 60.3(b)(3):*** *[Communities must] Require that all new subdivision proposals and other proposed development (including proposals for manufactured home parks and subdivisions) greater than 50 lots or 5 acres, whichever is the lesser, include within such proposals BFE data.*

Any subdivision that meets this threshold must be evaluated to determine if the proposed site is in an approximate A Zone and whether BFEs are required. If BFEs are required, the developer must conduct the required study (the community, state or other agency may provide assistance). While the study must provide BFEs, you may want to require a floodway delineation and inclusion of other data needed to ensure that the building sites will be reasonably safe from flooding.

BFE data are required for the affected lots in the subdivisions shown in Figure 5-2 and Figure 5-3. Figure 5-2 shows a 76-lot subdivision with several lots clearly affected by an approximate Zone A area. The subdivision depicted in Figure 5-3 is only 12 lots, but BFEs are required because the subdivision covers more than five acres and clearly shows buildable sites affected by an approximate Zone A area.

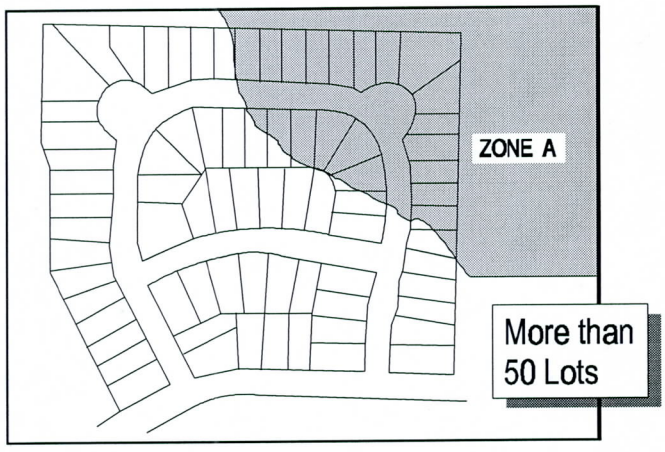


Figure 5-2: Proposed 76-lot subdivision

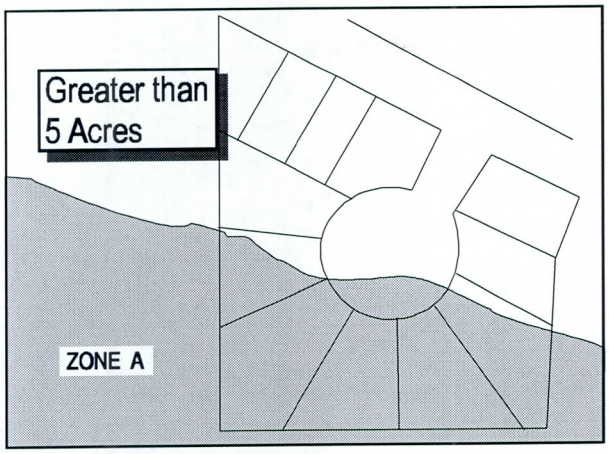


Figure 5-3: Proposed 6.7-acre subdivision

In Figure 5-4, the entire approximate Zone A area is to be left as open space. If the planned subdivision shows the floodplain is contained entirely within an open space lot, it may not be necessary to conduct a detailed engineering analysis to develop BFE data.

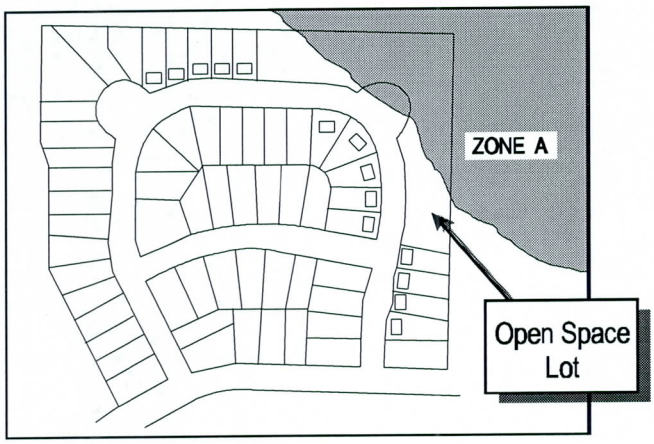


Figure 5-4: Proposed 76-lot subdivision

> ***44 CFR 65.3**: As soon as practicable, but not later than six months after the date such information becomes available, a community shall notify the Administrator of [map] changes by submitting technical or scientific data in accordance with this part.*

When a developer prepares a detailed flood study in an approximate A Zone, you must submit the new flood information to FEMA within six months. The community can pass that cost on to the developer by requiring that he or she submit of a Letter of Map Revision as a condition of approving the development.

CRS credit is provided if BFEs, floodways and related regulatory data are provided in areas not mapped by the NFIP. This credit can be found in Activity 410, Section 411, of the *CRS Coordinator's Manual* or the *CRS Application*.

DRAFT REVISED NFIP DATA

The third situation where a community may vary from the official FEMA data is when FEMA has sent some preliminary data to the community for review. Communities are required to "reasonably utilize" the data from a draft or preliminary FIRM or flood insurance study.

Four scenarios are possible:

- Where the original FIRM shows an A or V Zone with *no* BFEs: Use the draft information. In the absence of other elevation or floodway data, the draft information is presumed to be the best available.
- Where the original FIRM shows an AE or VE Zone *with* a BFE or floodway and the revision *increases* the BFE or *widens* the floodway: The draft revised data should be used. However, if the community disagrees with the data and intends to appeal, the existing data can be presumed to be valid and may still be used until the appeal is resolved.
- Where the original FIRM shows an AE or VE Zone *with* a base flood elevation or floodway and the revision *decreases* the BFE or *shrinks* the floodway: The existing data should be used. Because appeals may change the draft data, the final BFE may be higher than the draft. If you were to allow new construction at the lower level as shown in the draft, the owners will have to pay higher flood insurance premiums.
- Where the original FIRM shows a B, C or X Zone: NFIP regulations do not require that the draft revised data be used. However, you are encouraged to use the draft data to regulate development, since these areas are subject to a flood hazard.

If the community intends to appeal preliminary data, it must be done during the official appeals period. Otherwise, you will have to wait for the new map to become official and submit a request for a map amendment or revision.

For more information on this issue, see *Use of Flood Insurance Study (FIS) Data As Available Data*, FEMA Floodplain Management Bulletin 1-98.

CLOMRs: The above four scenarios are also relevant for a Conditional Letter of Map Revision or CLOMR. Note the *conditional* part of a CLOMR. A CLOMR provides that *if* a project is constructed as designed, the BFEs can be revised or modified (or the property in question can be removed from the SFHA) *AFTER* the as-built specifications are submitted *AND* the final LOMR is issued.

A permit should not be based on a lower BFE proposed by a CLOMR until the final LOMR is issued. However, you can issue a permit for that part of the work not dependent on the changes that will result from the LOMR and condition the full permit upon receipt of the final LOMR.

ADVISORY FLOOD HAZARD DATA

Sometimes FEMA issues advisory data after a major flood where it was found that the FIRM and/or flood insurance study underestimated the hazard. This information is provided so communities can ensure that reconstructed buildings are protected from the true hazard, not the one shown on the FIRM.

When you receive such advisory information, you should "reasonably utilize" it. If your community agrees with the information, the ordinance should be revised to adopt it. If it disagrees with the data, you should be ready to explain why the community is not requiring construction and reconstruction to be protected. You and your community are not helping residents if you allow them to rebuild without protection from a known hazard.

For more information on this issue, see *Use of Flood Insurance Study (FIS) Data As Available Data*, FEMA Floodplain Management Bulletin 1-98.

LEARNING CHECK #1

1. What publication has the NFIP requirements for communities?
   Chapter 44 of the Code of Federal Regulations

2. Most of the requirements relative to your community's ordinance are in 44 CFR Parts 59 and 60 .

3. Does your ordinance comply with the latest NFIP requirements?
   Yes

4. Which part of 44 CFR 60.3 covers the requirements for areas with a FIRM, but no base flood elevations? 44 CFR 60.3 b

5. What is "Basic rule #1" for using maps and data? Must use the latest maps and flood data published by FEMA

6. What map do you use if recently annexed areas do not show up on your community's FIRM? The Community's County Firm that the annexed area came from.

7. If you find information that shows the ground to be higher than the BFE, can a bank use that data when determining whether a flood insurance policy must be purchased? NO, Must use current Firm Coore, Local H20 dist Coord Engineer, is a New bridge on the stream, Dam, Town Eng or Developer Eng will provide study

8. Site E is in the approximate A Zone of Dean Lake. A developer wants to build a small commercial building on a 3 acre site. Where do you get a base flood elevation for Site E? w/ STATE NFIP

9. A developer downstream of Dean Lake wants to build a 40 acre subdivision that crosses Ireland Creek. You need a base flood elevation before you review the plans. What options do you tell the developer he has?
   He can produce a flood study @ his cost, He can set the A Zone Apart and NOT Conduct @ study

10. A restudy was performed on the Josias River. The preliminary study will not be final for another five months. It shows a new BFE at Site N that is two feet higher than the BFE in your current FIS. Which one do you use to determine the flood protection level for a new home at Site N? The new one

C. PERMIT REQUIREMENTS

Permits are required to ensure that proposed development projects meet the requirements of the NFIP and your ordinance. Once a person applies for a permit, you can review the plans and make sure the project complies.

Basic rule #2: A permit is required for all development in the SFHA shown on your FIRM.

The first step, therefore, is to get people to apply for a permit.

DEVELOPMENT PERMIT

44 CFR 59. *Definitions: "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.*

The NFIP requirements are keyed to "development" in the floodplain. "Development" means "any man-made change to improved or unimproved real estate." This includes, but is not limited to:

- Construction of new structures
- Modifications or improvements to existing structures
- Excavation
- Filling
- Paving
- Drilling
- Driving of piles
- Mining
- Dredging
- Land clearing
- Grading
- Permanent storage of materials and/or equipment
-

> ***44 CFR 60.3(a)(1)*** *["60.3(a) communities" that do not have a FIRM must] Require permits for all proposed construction or other development in the community, including the placement of manufactured homes, so that it may determine whether such construction or other development is proposed within flood-prone areas;*

If you are a 60.3(a) community, you do not have a FIRM. Consequently, you must require a permit for all development projects throughout your community.

You must review each project's location to determine if it has a flood risk. If it does, the best way to protect a new building from flood damage is to obtain a BFE for the site and require that the building be elevated or protected to or above that BFE.

Building permits

Most communities have long had a system for issuing building permits, but few have a permit system for "development." Regulating all development in floodplains is essential because fill or other material can obstruct flood flows just as structures can.

Because a "building permit" often covers only construction or modifications of buildings, this course uses the term "development permit." You should check your permit system to ensure that in the floodplain, permits are being required for *ALL* projects that meet the definition of development, not just "building" projects. Make sure you regulate the following in addition to the tradition building projects:

- Filling and grading.
- Excavation, mining and drilling.
- Storage of materials.
- Repairs to a damaged building that do not affect structural members.
- Temporary stream crossings
- Activities by other government agencies, such as roads, bridges and school buildings

If your building permit system does not require permits for these activities, you need to revise your system, enact a new type of "development permit" or otherwise ensure that people apply for a permit for these non-building projects.

Small projects

You have some discretion to exempt obviously insignificant activities from the permit requirement, such as planting a garden, farming, putting up a mailbox or erecting a flagpole. You may also want to exempt routine maintenance, such as painting or reroofing.

The key is whether the project will present a new obstruction to flood flows, alter drainage or have the potential to be a substantial improvement. These determinations can only be made by the permit official, not the builder, so make sure your exemptions are clear. There should be no possibility of a misunderstanding resulting in construction of a flood flow obstruction or a substantial improvement without a permit.

Some communities specifically exempt small projects in their ordinances. This is the recommended approach, as it avoids challenges that the permit official arbitrarily decides what projects need permits. Check with your state coordinating agency and/or FEMA Regional Office before you do this. You may be able to exempt projects (other than filling, grading or excavating) valued at less than, say, $500.

PERMITS FROM OTHER AGENCIES

44 CFR 60.3(a)(2) requires all NFIP communities to ensure that other federal and state permits have been obtained. You should not issue your local permit until you are certain that the other agencies' requirements are met.

Some communities allow their permit officials to issue the local permit on the condition that other required permits are obtained. However, this is not as effective as holding the local permit until the applicant can show that the other agencies have issued or will issue their permits.

Otherwise, the project may get under way before you are sure that it meets all legal requirements.

To implement this requirement, you're encouraged to develop a list of what permits are required in your jurisdiction. Your state NFIP coordinator should be able to help.

These development activities may require a state permit:

- Construction in the coastal zone.
- Construction in floodways or other designated areas.
- Stream crossings or projects that affect navigable rivers.
- Installation of septic systems.
- Subdivision standards or subdivision plat or lot filing requirements.
- Manufactured housing (mobile home) park or tie-down requirements.
- Public health facilities, such as hospitals and nursing homes.
- Alteration of sand dunes.
- Operating a landfill or hazardous materials storage facility.

The more common federal regulations that may require a permit include:

- U.S. Army Corps of Engineers Section 404—permits for wetlands filling
- U.S. Army Corps of Engineers Section 10—permits for work in navigable waterways
- U.S. Coast Guard—permits for bridges and causeways that may affect navigation.
- U.S. Fish and Wildlife Service—consultations required under Sections 7 and 10 of the Endangered Species Act of 1973.

You should also check with your county; sewer, sanitary or flood control district; water management district; and any other local or regional agency that may regulate certain types of development in the floodplain.

D. ENCROACHMENTS

Once a permit application is received and the proposed project is ready for review, the next job is to ensure that the project will not impose flood problems on other properties.

Basic rule #3: Development must not increase the flood hazard on other properties.

This is more of a concern in riverine situations where a project may dam or divert flowing water onto other properties or increase flood flows downstream. To prevent this, communities adopt floodways to designate those areas where flood flows are most sensitive to changes brought by development.

Communities must regulate development in these floodways to ensure that there are no increases in upstream flood elevations. For streams and other watercourses where FEMA has provided BFEs, but no floodway has been designated, the community must review developments on a case-by-case basis to ensure that these increases do not occur.

REGULATORY FLOODWAYS

44 CFR 59.1 *Definitions: "Regulatory 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 a designated height.*

As explained in Unit 3, Section B, the floodway is the central portion of a riverine floodplain needed to carry the deeper, faster moving water. Buildings, structures and other development activities—such as fill—placed within the floodway are more likely to obstruct flood flows, causing the water to slow down and back up, resulting in higher flood elevations.

A floodway map is included with most riverine Flood Insurance Studies. The community officially adopts its "regulatory floodway" in its floodplain management ordinance.

ENCROACHMENT REVIEW

All projects in the regulatory floodway must undergo an encroachment review to determine their effect on flood flows and ensure that they do not cause problems. Development projects in the flood fringe by definition do not increase flood heights above the allowable level, so encroachment reviews are not needed.

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

The objective of this requirement and the floodplain management ordinance to ensure that the floodway is reserved to do its natural job: carrying floodwater. The preferred approach is to avoid all development there.

Once your community adopts its floodway, you must fulfill the requirements of 44 CFR 60.3(d). The key concern is that each project in the floodway must receive an encroachment review, i.e., an analysis to determine if the project will increase flood heights or cause increased flooding downstream. Note that the regulations call for preventing ANY increase in flood heights. This doesn't mean you can allow a foot or a tenth of a foot – it means zero increase.

Projects, such as filling, grading or construction of a new building, must be reviewed to determine whether they will obstruct flood flows and cause an increase in flood heights upstream or adjacent to the project site.

Projects, such as such as grading, large excavations, channel improvements, and bridge and culvert replacements, should also be reviewed to determine whether they will remove an existing obstruction, resulting in increases in flood flows downstream.

Your community may conduct the encroachment review, or you may require the developer to conduct it. Most local permit officials are not qualified to make an encroachment review, so most require that this be done by an engineer at the developer's expense.

As the permit reviewer, it is the community's job to ensure that an activity will not cause a problem. You have two options for doing this: For every project you could require the applicant's engineer to certify that there will be no rise in flood heights or you can make the determination for minor projects.

Encroachment certification: To ensure that the encroachment review is done right, you may want to require the developer to provide an encroachment certification. This is often called a "no-rise" certification because it certifies that the development project will not affect flood heights. An example of a form developed by the North Carolina state coordinating agency is shown in Figure 5-5.

The certification must be supported by technical data, which should be based on the same computer model used to develop the floodway shown on the community's map.

"NO-RISE" CERTIFICATION

This is to certify that I am a duly qualified registered professional engineer licensed to practice in the State of _____

It is further to certify that the attached technical data supports the fact that proposed _____ (Name of Development) will not impact the 100-year flood elevations, floodway elevations, or floodway widths on _____ ___ (Name of Stream) at published sections in the Flood Insurance Study for ___ _____ (Name of Community) dated _____ (Study Date) and will not impact the 100-year flood elevations, floodway elevations, or floodway widths at unpublished cross-sections in the vicinity of the proposed development.

Attached are the following documents that support my findings:

_____

_____

Date: _____

Signature: _____

Title:_____ {SEAL}

Figure 5-5: Example no-rise certification

Although your community is required to review and approve the encroachment review, you may request technical assistance and review from the FEMA Regional Office or state NFIP Coordinator. If this alternative is chosen, you must review the technical submittal package and verify that all supporting data are included in the package before sending it to FEMA.

Minor projects: Some projects are too small to warrant an engineering study and the certification. Many of these can be determined with logic: a sign post or telephone pole will not block flood flows. A driveway, road or parking lot at grade (without any filling) won't cause a problem, either.

Building additions, accessory buildings, and similar small projects can be located in the conveyance shadow. This is the area upstream and downstream of an existing building or other obstruction to flood flows. Flood water is already flowing around the larger obstruction, so the addition of a new structure will not change existing flood flow.

Determining the limits of the conveyance shadow is illustrated in Figure 5-6. Small structures located completely within the shadow can be permitted without the engineering analysis needed for a no-rise certification.

Note: Just because a small structure can be located in the conveyance shadow, it is still preferable to keep all development out of the floodway. Don't forget: all buildings must be elevated or otherwise protected from the base flood.

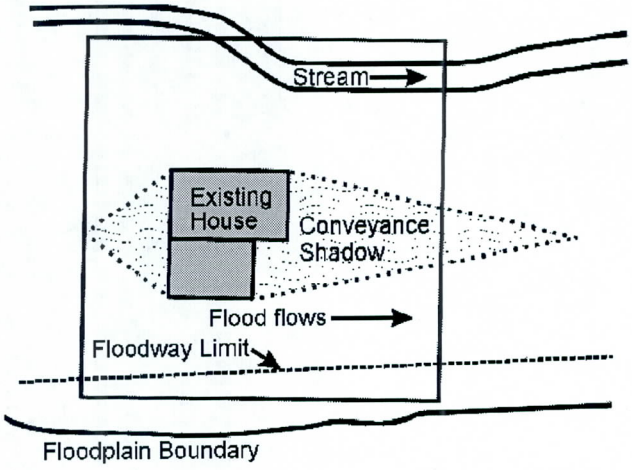


Figure 5-6. Determining the conveyance shadow

STREAMS WITHOUT FLOODWAY MAPS

If your community is subject to 44 CFR Section 60.3(c), you have a FIRM with base flood elevations but no mapped floodway. The following applies to you.

44 CFR 60.3(c)(10): *[Communities must] Require until a regulatory floodway is designated, that no new construction, substantial improvements, or other development (including fill) shall be permitted within Zones A1-30 and AE on the community's FIRM, unless it is demonstrated that the cumulative effect of the proposed development, when combined with all other existing and anticipated development, will not increase the water surface elevation of the base flood more than one foot at any point within the community.*

For the purposes of administering your ordinance, you should treat the entire riverine floodplain as a floodway. You should require the same encroachment certification to ensure that a development project will not obstruct flood flows and cause increased flooding on other property. This approach is recommended for all other riverine floodplains without a mapped floodway.

In riverine floodplains where no floodway has been designated, the review must demonstrate that the *cumulative* effect of the proposed development, when combined with all other existing and anticipated development:

- Will not increase the water surface elevation of the base flood more than one foot at any point within the community, and
- Is consistent with the technical criteria contained in Chapter 5 (Hydraulic Analyses) of the Flood Insurance Study: Guidelines and Specifications for Study Contractors, FEMA-37, 1995.

This review must be required for all development projects that may create a one-foot increase in flood flows, such as bridges, road embankments, buildings and large fills.

Note: In some states, floodways are mapped based on allowing flood heights to increase by less than one foot. In those states, the encroachment certification must be based on that more restrictive state standard, not the FEMA standard that allows a one-foot rise.

ALLOWABLE INCREASES IN FLOOD HEIGHTS

In some situations, it may be in the public interest to allow increase in flood heights greater than those allowed under the NFIP regulations.

For example, it would be hard to build a flood control reservoir without affecting flood heights. Because a dam would have a major impact on flood heights, there needs to be a way to permit such projects, especially those that are intended to reduce flooding.

However, when the project will change the flood level, maps must be changed to reflect the new hazard.

> ***44 CFR 60.3(d)(4)*** *Notwithstanding any other provisions of § 60.3, a community may permit encroachments within the adopted regulatory floodway that would result in an increase in base flood elevations, provided that the community first applies for a conditional FIRM and floodway revision, fulfills the requirements for such revisions as established under the provisions of § 65.12, and receives the approval of the Administrator.*

If your community proposes to permit an encroachment in the floodway or the floodplain that will cause increases in the BFE in excess of the allowable level, you're required to apply to the FEMA Regional Office for *conditional* approval of such action prior to permitting the project to occur.

As part of your application for conditional approval, you must submit:

- A complete application and letter of request for conditional approval of a change in the FIRM or a Conditional Letter of Map Revision (CLOMR), along with the appropriate fee for the change (contact the FEMA Regional Office for the fee amount).

- An evaluation of alternatives which, if carried out, would not result in an increase in the BFE more than allowed, along with documentation as to why these alternatives are not feasible.
- Documentation of individual legal notice to all affected property owners (anyone affected by the increased flood elevations, within and outside of the community) explaining the impact of the proposed action on their properties.
- Concurrence, in writing, from the chief executive officer of any other communities affected by the proposed actions.
- Certification that no structures are located in areas which would be affected by the increased BFE (unless they have been purchased for relocation or demolition).
- A request for revision of BFE determinations in accordance with the provisions of 44 CFR 65.6 of the FEMA regulations.

Upon receipt of the FEMA conditional approval of the map change and prior to approving the proposed encroachments, you must provide evidence to FEMA that your community's floodplain management ordinance incorporates the post-project condition BFEs.

LEARNING CHECK #2

1. What is basic rule #2 on what needs a permit in the floodplain?
   A permit is required for ALL Development in a SFHA shown on your FIRM.
2. Define "development" as the term is used in your ordinance. any MAN-made change TO improved or unimproved REAL ESTATE, including BUT NOT limited to buildings or other structures, mining, dredging, grading, filling, PAVING
3. Does your community only require building permits? If so, does someone who wants to fill a vacant lot need a permit from the community?
   yes
4. The State in which Flood County is situated requires a permit from the state Department of Environmental Protection for development on primary sand dunes. A permit applicant wants to build on one near Site F. Department staff informs you that based on the plans they have seen, they will have to deny the state permit. Should the Flood County permit officer issue a floodplain development permit? NO
5. What is Basic rule #3 as it relates to encroachments in riverine floodplains?
   Development must not increase the flood hazard on other properties.
6. An encroachment review should review projects in a floodway for what two things? whether the project will obstruct floodflows, and cause an increase in flood heights upstream or adjacent to project site and will the project remove an existing obstruction, resulting in an increase in flood flows downstream
7. A farmer wants to build a dairy barn in the floodway. Will he need to provide you with a "no-rise" certification before you can issue the permit?
8. The same farmer wants to build a small addition onto his farmhouse (also in the floodway). Can this be designed so he won't have to pay for an engineer's encroachment review? yes
9. In a riverine AE Zone with a base flood elevation, what must a developer show in order to demonstrate that he is meeting Basic Rule #3?
   He must conduct an encroachment review, that indicates that the cumulative effect of the project will not
10. Does your state have a more restrictive standard than allowing flood heights to increase by one foot?

E. NEW BUILDINGS IN A ZONES

VIDEO: *BEST BUILD: CONSTRUCTING IN A RIVERINE FLOODPLAIN*

Before continuing, please view the 23-minute video segment on construction techniques along rivers and streams. Called *Best Build II: Constructing in a Riverine Floodplain*, it is on the second videotape included in the course materials. Do not rewind the tape.

Note: The NFIP rules have changed since this video was made. It shows a garage door being used as an opening to allow water under the elevated building. This is no longer allowed – all openings must be permanent or automatic. Allowable openings could include vents in garage doors, but cannot include doors that need a person present to open them.

Basic rule #4: New, substantially improved or substantially damaged buildings must be protected from damage by the base flood.

BUILDINGS

In this course, the term "building" is the same as the term "structure" in the NFIP regulations. Your ordinance may use either term.

> ***44 CFR 59.1*** *Definitions: "Structure" means, for flood plain management purposes, a walled and roofed building, including a gas or liquid storage tank, that is principally above ground, as well as a manufactured home.*

The term "building" or "structure" does not include open pavilions, bleachers, carports and similar structures that do not have at least two rigid walls and a roof.

How to determine if a building is substantially improved or substantially damaged is discussed in Unit 8. In this unit, consider the term "building" as an all-encompassing term that includes substantial improvements and repairs of substantial damage to a building.

Residential and nonresidential buildings are treated differently. A residential buildings must have a higher level of protection—if it is to be built in the floodplain, it must be elevated above the BFE. Nonresidential buildings, on the other hand, may be elevated or floodproofed.

ELEVATION

> ***44 CFR 60.3(c)(2)*** *[Communities must] Require that all new construction and substantial improvements of residential structures within Zones A1-30, AE and AH zones on the community's FIRM have the lowest floor (including basement) elevated to or above the base flood level…*

In Zones A1-A30, AE and AH, all new construction and substantial improvements of residential structures must be elevated so that the lowest floor (including the basement) is elevated to or above the BFE. This can be done in one of three ways:

- Elevation on fill.
- Elevation on piles, posts, piers or columns.
- Elevation on walls or a crawlspace.

Fill

NFIP regulations allow fill to be used, but restrictions apply in floodways where fill would cause an increase in flood heights.

Many communities also limit the use of fill in the flood fringe to protect flood storage capacity or require compensatory storage, which is discussed in Unit 6, Section C.

Where fill is the method of choice, it should be properly designed, installed in layers and compacted. Simply adding dirt to the building site may result in differential settling over time.

The fill should also be properly sloped and protected from erosion and scour during flooding. To provide a factor of safety for the building and its residents, it is recommended that the fill extend 10 – 15 feet beyond the walls before it drops below the BFE.

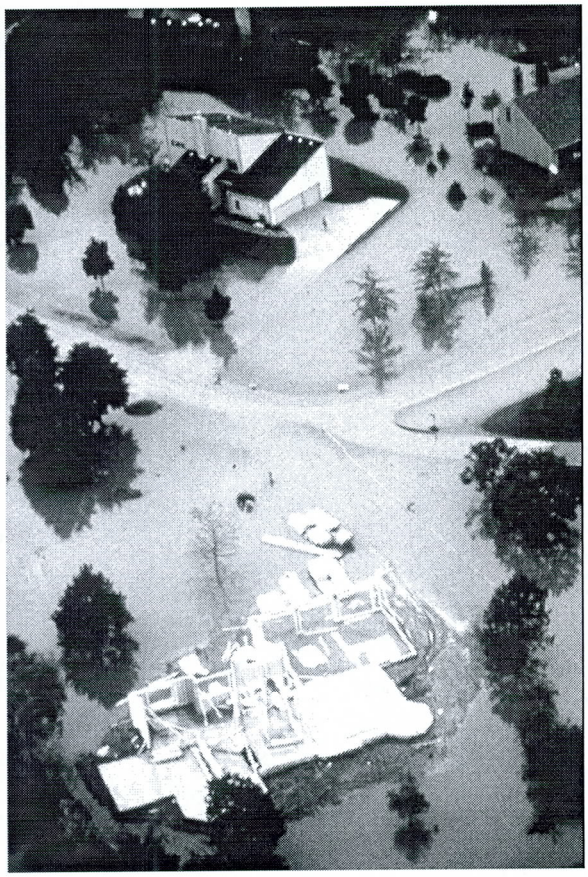


Figure 5-7. These two new buildings elevated on fill were not damaged by this 100-year flood.

Piles, posts, piers or columns

Piles, piers, posts or columns are appropriate where there is deeper flooding and fill is not feasible. Where flooding is likely to have high velocities or to create waves, elevation with no lower area enclosure is preferred. As illustrated in Figure 5-8, this permits unrestricted flow of floodwater under buildings and causes little, if any, impact on flood heights.

Figure 5-8. Elevation on piers

Walls or crawlspace

The third elevation technique is to build on solid walls. In shallower flooding areas, this elevation technique is the same as creating a crawlspace—a foundation of solid walls that puts the lowest floor above the flood level.

When solid walls are used, care must be taken to ensure that hydrostatic or hydrodynamic pressure does not damage the walls. As discussed in Unit 1, Section B, these water pressures can break a solid wall.

There are two ways to prevent this:

- Stem walls can be used on two sides parallel to the flow of water. The other two sides are kept open (Figure 5-9). This minimizes the obstruction to floodwaters and lessens pressure on the foundation.
- The walls can have openings large enough to allow floodwaters to flow in and out, preventing differential pressures on the walls. This is discussed in more detail in the later section on enclosures.

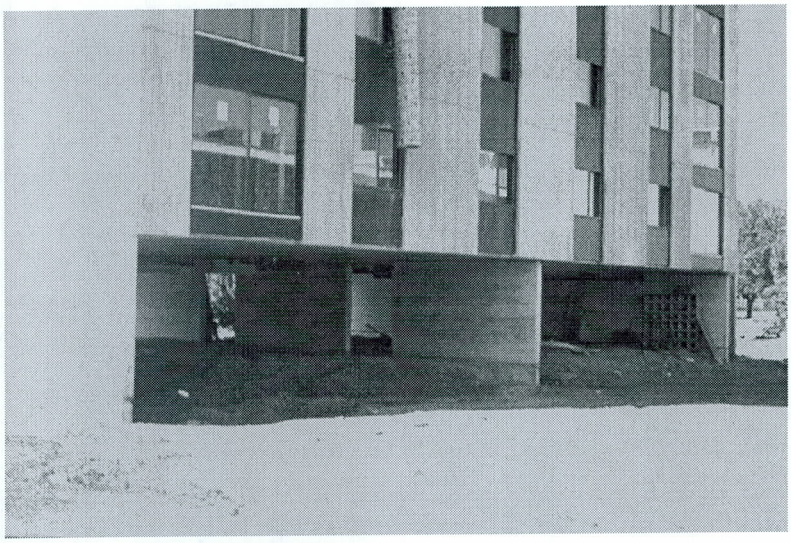


Figure 5-9: Building elevated on parallel stem walls.

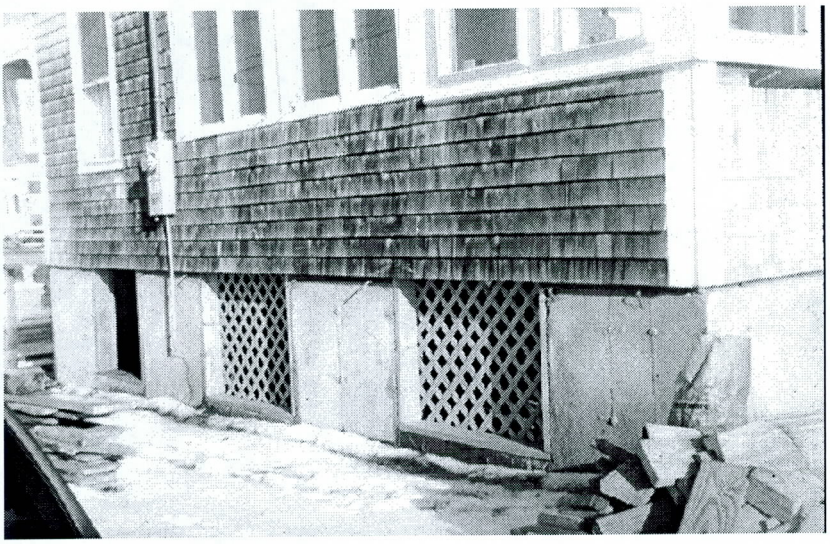


Figure 5-10: Building elevated on crawlspace with openings.

How high?

NFIP regulations require that the lowest floor of a building must be elevated above the BFE. Note three things about this minimum requirement:

1. The term "lowest floor" includes a basement because all usable portions of a building must be protected from flood damage.

44 CFR 59.1. *Definitions: "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 section 60.3.*

2. The minimum requirement is to elevate to the BFE. In the next unit, we will discuss freeboard, an extra margin of protection that requires the lowest floors to be one or more feet above the BFE.

3. In A Zones, under the minimum NFIP requirement, the lowest floor is measured from the top of the floor (Figure 5-11). However, it is recommended that buildings on elevated foundations, such as piles or a crawlspace, have supporting beams or floor joists above the BFE to protect them from flood damage.

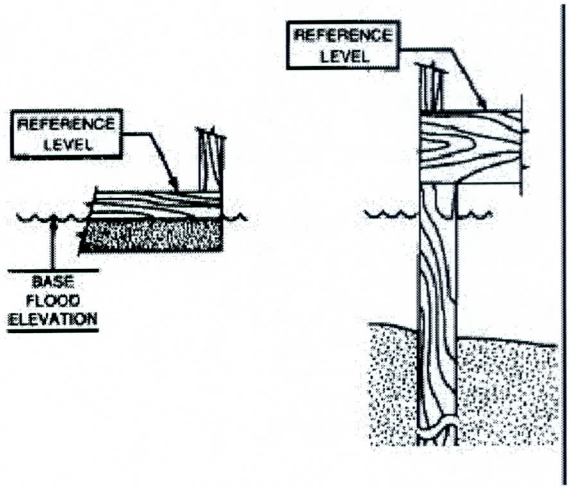


Figure 5-11. In A Zones: the top of the floor is the reference level

Elevation Certificate

Because most new buildings built in the floodplain are residences, elevating them is one of the most important requirements of the NFIP. To ensure that a building is elevated above the BFE, the lowest floor is surveyed and a surveyor's elevation certificate is obtained and kept by the local permit office. This is discussed in more detail in Unit 7, Section G.

ENCLOSURES

Enclosures are areas created by a crawlspace or solid walls below the BFE. They deserve special attention for two reasons:

- The walls of enclosed areas are subject to flood damage from hydrostatic and hydrodynamic forces.
- People are tempted to convert floodable enclosures into areas that can sustain damage in a flood.

Does an enclosure under an elevated floor just go to waste? It need not.

NFIP regulations allow certain uses in enclosures below the BFE because they are subject to minimal flood damage. Three uses are allowed:

- building access
- vehicle parking
- storage.

The floodplain regulation requirements can be easier to accept if owners and builders are encouraged to think about the enclosed lower areas as usable space. If a building has to be elevated, say, five feet above grade, the owner should be encouraged to go up eight feet. This allows the lower area to be used for parking—and provides three extra feet of flood protection.

However, if the lower area is enclosed, there is a tendency for the owner to forget about the flood hazard and convert the enclosure to a bedroom or other finished room. This must be prevented.

The lower area on an elevated building must be floodable—it must be built of flood-resistant materials (see the next section on what materials are acceptable). Not allowed are finishings such as carpeting, paneling, insulation (both cellulose and fiberglass) and gypsum wallboard (also known as drywall and sheet rock).

Utilities that serve the upper level also must be protected from flood damage. Consequently, a furnace cannot be put in an enclosure unless it is above the BFE. This is explained in more detail in *Engineering Principles and Practices for Flood Damage-Resistant Building Support Utility Systems*, which is due to be published in late 1998.

The lower area must provide access to the upper level. A stairway can easily be designed that provides access yet is resistant to flood damage. Installing an elevator is tricky, but there are ways to design and install an elevator that will face minimal flood damage, as explained in *Elevator Installation for Buildings Located in Special Flood Hazard Areas*, FIA-TB-4, FEMA 1993.

Openings

As noted in Unit 1, solid walls can collapse if floodwaters get too deep. To prevent this, the enclosure must have openings to allow floodwaters to enter and leave, thus automatically equalizing hydrostatic flood forces on the walls.

You can be sure the openings are adequate by using one of two methods.

The first method is to require the builder to have the design certified by a registered professional engineer or architect.

44 CFR 60.3(c)(5) *[Communities must] Require, for all new construction and substantial improvements, that fully enclosed areas below the lowest floor that are usable solely for parking of vehicles, building access or storage in an area other than a basement and which are subject to flooding shall be designed to automatically equalize hydrostatic flood forces on exterior walls by allowing for the entry and exit of floodwaters. Designs for meeting this requirement must either be certified by a registered professional engineer or architect or meet or exceed the following minimum criteria: A minimum of two openings having a total net area of not less than one square inch for every square foot of enclosed area subject to flooding shall be provided. The bottom of all openings shall be no higher than one foot above grade. Openings may be equipped with screens, louvers, valves, or other coverings or devices provided that they permit the automatic entry and exit of floodwaters.*

The second method is to have the design meet or exceed the following three criteria:

1. The bottom of the openings must be no higher than one foot above grade (see Figure 5-12).

2. The openings should be installed on at least two walls of the enclosure to ensure that at least one will work if others get blocked or plugged.

3. Provide a minimum of two openings having a net area of not less than one square inch for every square foot of enclosed area that is subject to flooding. If the area of the enclosure is 1,000 square feet, the area of the openings combined must total at least 1,000 square inches.

   A standard crawlspace vent for block walls is 8" x 16" or 128 square inches (see Figure 5-12). To determine how many would be needed, divide the square footage of the floor area by 128.

   Example 1: $\frac{\text{1,280 square foot house}}{\text{128 square inches/vent}} = 10$ 10 vents will be needed

   Example 2: $\frac{\text{2,000 square foot house}}{\text{128 square inches/vent}} = 15.62$ 16 vents will be needed

Openings may be equipped with screens, louvers, valves or other coverings or devices to keep animals out of the enclosure. However, any covering must permit the automatic flow of floodwater in both directions.

The opening sizes in the previous examples and in Figure 5-12 are based on standard crawlspace vents, which most building codes require to be installed in a crawlspace for ventilation purposes. Often these are located close to the floor in order to circulate air around the floor joists.

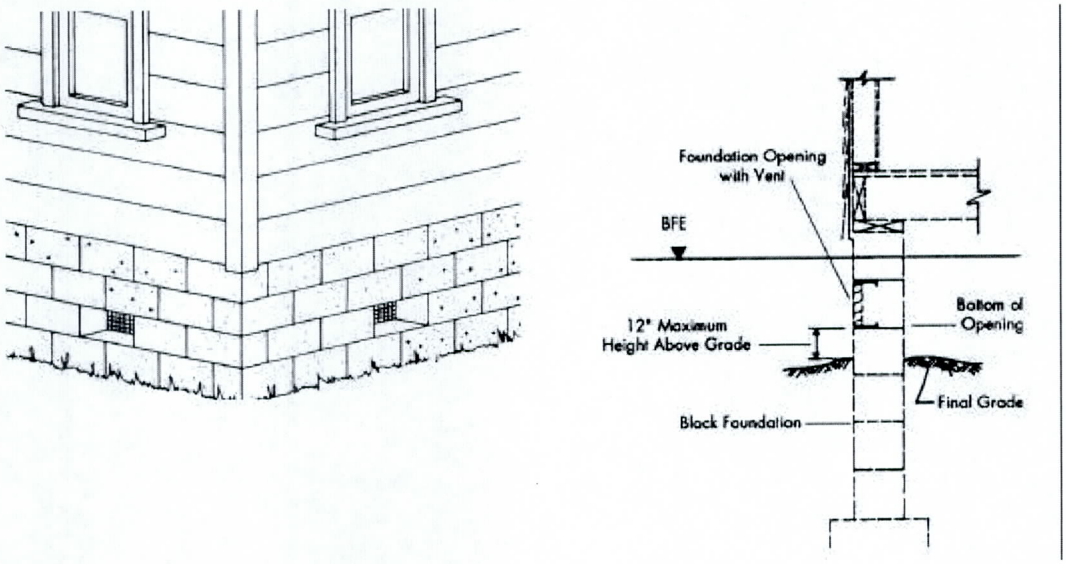


Figure 5-12. Opening location in solid foundation wall

Such vents are well above the ground in an elevated house and would not meet the NFIP requirement that the bottom of the opening be within one foot of grade. However, NFIP requirements and building codes can be satisfied by the same vents if they meet the three criteria listed above.

Garage doors cannot be used to satisfy this requirement because they do not permit the automatic flow of floodwaters. However, garage doors may have vents in them that meet the above criteria.

Openings are not required for stem wall foundations that have been backfilled for pouring of a concrete floor slab.

For further guidance, refer to *Openings in Foundation Walls*, FIA-TB-1 (FEMA 1993).

Use

Enclosed areas must be floodable and used only for parking vehicles, storage or entry to a living area—uses that are subject to little flood damage.

The type of storage permitted in an enclosed lower area should be limited to that which is incidental and accessory to the principal use of the structure. For instance, if the structure is a residence, the enclosure should be limited to storage of lawn and garden equipment, snow tires, and other low damage items which can be conveniently moved to the elevated part of the building.

The interior portion of an enclosed area should not be partitioned or finished into separate rooms, except to enclose storage areas.

If a building is elevated eight feet or more, regulating the use of the enclosure presents special problems. Over time, the owner may forget the flood hazard and want to convert the floodable area into a finished room. Such an action would increase the flood damage potential for the building and violate the conditions of the building permit.

However, because the room is hidden behind walls, it can be very hard for the permit office to catch such a conversion. You should carefully check new building plans for signs, such as roughed in plumbing and sliding glass doors, that indicate that the owner may expect to finish the area in the future.

One way to help prevent conversions is to have the owner sign a nonconversion agreement. An example developed by the North Carolina State NFIP Coordinator is in Figure 5-13.

FLOODPROOFING

Nonresidential buildings must be elevated or floodproofed. If they are elevated, they must meet the same standards as for residential buildings that were just reviewed. Elevation is the preferred method because it is more dependable. Elevated commercial and industrial buildings can often be designed so that they can continue to operate during a flood reducing or eliminating business disruptions.

> ***44 CFR 59.1.*** *Definitions: "Flood proofing" means any combination of structural and non-structural additions, changes, or adjustments to structures which reduce or eliminate flood damage to real estate or improved real property, water and sanitary facilities, structures and their contents.*
>
> ***44 CFR 60.3(c)(3)*** *[Communities must] Require that all new construction and substantial improvements of non-residential structures within Zones A1-30, AE and AH zones on the community's firm (i) have the lowest floor (including basement) elevated to or above the base flood level or, (ii) together with attendant utility and sanitary facilities, be designed so that below the base flood level the structure is watertight with walls substantially impermeable to the passage of water and with structural components having the capability of resisting hydrostatic and hydrodynamic loads and effects of buoyancy;*
>
> ***44 CFR 60.3(c)(4)*** *[Communities must] Provide that where a non-residential structure is intended to be made watertight below the base flood level, (i) a registered professional engineer or architect shall develop and/or review structural design, specifications, and plans for the construction, and shall certify that the design and methods of construction are in accordance with accepted standards of practice for meeting the applicable provisions of paragraph (c)(3)(ii) or (c)(8)(ii) of this section, and (ii) a record of such certificates which includes the specific elevation (in relation to mean sea level) to which such structures are floodproofed shall be maintained with the official designated by the community under §59.22(a)(9)(iii);*

This DECLARATION made this ___ day of _____, 19__, by _____ _____ ("Owner") having an address at _____ .

WITNESSETH:

WHEREAS, the Owner is the record owner of all that real property located at _____ in the City of _____ in the County of _____, designated in the Tax Records as _____.

WHEREAS, the Owner has applied for a permit or variance to place a structure on that property that either (I) does not conform, or (2) may be noncompliant by later conversion, to the strict elevation requirements of Article _____ Section _____ of the Floodplain Management Ordinance of _____ ("Ordinance") and under Permit Number _____ ("Permit").

WHEREAS, the Owner agrees to record this DECLARATION and certifies and declares that the following covenants, conditions and restrictions are placed on the affected property as a condition of granting the Permit, and affects rights and obligations of the Owner and shall be binding on the Owner, his heirs, personal representatives, successors and assigns.

UPON THE TERMS AND SUBJECT TO THE CONDITIONS, as follows:

1. The structure or part thereof to which these conditions apply is: _____ _____ .

2. At this site, the Base Flood Elevation is _____ feet above mean sea level, National Geodetic Vertical Datum.

3. Enclosed areas below the Base Flood Elevation shall be used solely for parking of vehicles, limited storage, or access to the building. All interior walls, ceilings and floors below the Base Flood Elevation shall be unfinished or constructed of flood resistant materials. Mechanical, electrical or plumbing devices shall not be installed below the Base Flood Elevation.

4. The walls of the enclosed areas below the Base Flood Elevation shall be equipped and remain equipped with vents as shown on the Permit.

5. Any alterations or changes from these conditions constitute a violation of the Permit and may render the structure uninsurable or increase the cost for flood insurance. The jurisdiction issuing the Permit and enforcing the Ordinance may take any appropriate legal action to correct any violation.

6. Other conditions: _____

_____

In witness whereof the undersigned set their hands and seals this _____ day of _____, 19 __.

_____ _____ (Seal)
Owner

_____ _____ (Seal)
Witness

Figure 5-13: Example Nonconversion agreement

For the purposes of regulating new construction, floodproofing is defined measures incorporated in the design of the building so that below the BFE:

- Walls are watertight (substantially impermeable to the passage of water),
- Structural components can resist hydrostatic and hydrodynamic loads and effects of buoyancy, and
- Utilities are protected from flood damage.

Most floodproofing is appropriate only where floodwaters are less than three feet deep, since walls and floors may collapse under higher water levels.

A registered professional engineer or architect must prepare the building plans and certify the floodproofing measures, preferably using the FEMA Floodproofing Certificate form. This is discussed in more detail in Unit 7, Section G.

Floodproofing techniques that require human intervention are allowed but should be discouraged. Human intervention means that a person has to take some action before the floodwater arrives, such as turn a valve, close an opening or switch on a pump. There are many potential causes of failure for these techniques, including inadequate warning time, no person on duty when the warning is issued, the responsible person can't find the right parts or tools, the person is too excited or too weak to install things correctly, and/or the electricity fails.

Before you approve plans for a building that relies on human intervention to be floodproofed, you should make sure that there are plans and precautions to keep such problems from occurring. Techniques that rely on human intervention should only be allowed in areas with adequate warning time and in situations where there will be someone present who is capable of implementing or installing the required measures.

More information on floodproofing can be found in FEMA's Technical Bulletin 3-93, *Non-Residential Floodproofing Requirements and Certification for Buildings Located in Special Flood Hazard Areas* (FIA-TB-3. 1993)

How high?

The minimum NFIP requirement is to floodproof a building *to the BFE*. However, when it is rated for flood insurance, one foot is subtracted from the floodproofed elevation. Therefore, a building has to be floodproofed *to one foot above the BFE* to receive the same favorable insurance rates as a building elevated to the BFE. Unit 9, Section B, discusses this in more detail.

BASEMENTS

The definition of the "lowest floor" includes basements and the definition of "basement" includes any floor level below grade.

> ***44 CFR 59.1** Definitions: "Basement" means any area of the building having its floor subgrade (below ground level) on all sides.*

Note that "walkout basements," "daylight basements" or "terrace levels" are usually subgrade on only three sides, with the downhill side at or above grade. Thus, they are not considered basements for either floodplain management or flood insurance rating purposes (but they are still the lowest floor of a building for floodplain management and insurance rating purposes). If these areas are used only for parking, access, or storage and they meet other ordinance requirements, they can be regulated as enclosures below an elevated building and not be considered the lowest floor of the building.

On the other hand, cellars, the lower level of a split-level or bi-level house, garden apartments and other finished floors below grade are considered basements under NFIP regulations.

Since the lowest floor of a residential building must be above the BFE, the only way to build a residential basement in the floodplain is if it is elevated and surrounded by fill. Floodproofed non-residential basement are allowed, though.

A few communities have obtained exceptions to the NFIP regulations that allow them to permit floodproofed residential basements. The soil types and flooding conditions in these communities allow construction of floodproofed basements that are not subject to damage by hydrostatic or hydrodynamic forces.

A community may apply for an exception to allow floodproofed residential basements if it can demonstrate flood depths are less than five feet, velocities are less than five feet per second, there is adequate warning time for the site and it has appropriate construction requirements. This exception is explained in 44 CFR 60.6(c).

Buildings with floodproofed basements must have their design certified by a registered engineer or architect and are more difficult to construct than buildings elevated above the BFE. Improperly designed or constructed basements can collapse or otherwise fail resulting in major damage to the structure.

ANCHORING

> ***44 CFR 60.3(a)(3)*** *...If a proposed building site is in a flood-prone area, all new construction and substantial improvements shall (i) be designed (or modified) and adequately anchored to prevent flotation, collapse, or lateral movement of the structure resulting from hydrodynamic and hydrostatic loads, including the effects of buoyancy...*

Both elevated and floodproofed buildings must be properly anchored to stabilize them against flood forces. This means anchoring the building to its foundation and ensuring that the foundation won't move. Therefore, you need to make sure there is adequate protection against hydrostatic and hydrodynamic forces and erosion and scour that can undercut the foundation.

In areas of shallow flooding and low flood velocities, normal construction practices suffice. Additional anchoring measures, such as using extra bolts to connect the sill to the foundation or installing rods to connect the cap to the sill, should be required in three situations:

- Where the flood flows faster than five feet per second.
- In coastal areas subject to waves and high winds.
- In manufactured or mobile homes.

In some areas it may be necessary to use foundations such as piles or piers which provide less resistance to floodwaters.

If your community has any of these conditions, you should see if there are state standards that take these into account, such as state coastal construction or manufactured housing (mobile home) tie-down regulations. If not, it is recommended that the builder's architect or engineer sign a statement saying the design of the building includes "anchoring adequate to prevent flotation, collapse and lateral movement" during the base flood.

FLOOD-RESISTANT MATERIAL

Whether a building is elevated or floodproofed, it is important that all parts exposed to floodwaters be made of flood-resistant materials (Figure 5-14).

> ***44 CFR 60.3(a) (3)*** *...If a proposed building site is in a flood-prone area, all new construction and substantial improvements shall (ii) be constructed with materials resistant to flood damage...*

"Flood-resistant materials" include any building product capable of withstanding direct and prolonged contact with floodwaters without sustaining significant damage. "Prolonged contact" means at least 72 hours, and "significant damage" is any damage requiring more than low-cost cosmetic repair (such as painting).

- Concrete, concrete block or glazed brick
- Clay, concrete or ceramic tile
- Galvanized or stainless steel nails, hurricane clips and connectors (in areas subject to saltwater flooding)
- Indoor-outdoor carpeting with synthetic backing (do not fasten down)
- Vinyl, terrazzo, rubber or vinyl floor covering with waterproof adhesives.
- Metal doors and window frames.
- Polyester-epoxy paint (do not use mildew-resistant paint indoors, especially on cribs, playpens or toys because it contains an ingredient that is toxic)
- Stone, slate or cast stone (with waterproof mortar)
- Mastic, silicone or polyurethane formed-in-place flooring. Styrofoam insulation
- Water-resistant glue
- Pressure treated (.40 CCA minimum) or naturally decay resistant lumber, marine grade plywood

Figure 5-14: Flood-resistant materials

For further details on flood-resistant material requirements, refer to FEMA Technical Bulletin 2-93, *Flood-Resistant Materials Requirements for Buildings Located in Special Flood Hazard Areas*.

ACCESSORY STRUCTURES

Certain accessory structures may not qualify as "buildings." For example, open structures, such as gazebos and picnic pavilions that do not have at least two rigid walls, are not "buildings" and do not have to be elevated or floodproofed.

In some cases, low-cost accessory buildings may not have to be elevated or dry floodproofed. These structures would include detached garages, boathouses, small pole barns and storage sheds. Such structures must meet these three requirements:

- The owner must obtain a variance (contact your FEMA Regional Office on procedures for this type of variance),
- The building has the required openings to allow floodwaters in, and
- The building is wet floodproofed.

Wet floodproofing involves using flood-resistant materials below the BFE and elevating things subject to flood damage above the BFE. Items that can be in-

stalled above the BFE include electrical boxes, switches and outlets. Only the minimum amount of electrical equipment required by code may be located below the BFE, and that equipment must be flood damage resistant.

For additional guidance, see *Wet Floodproofing Requirements*, FIA-TB-7, FEMA 1994, and *Engineering Principles and Practices for Flood Damage-Resistant Building Support Utility Systems*, (due to be published in late 1998).

MANUFACTURED HOMES

> ***44 CFR 59.1*** *Definitions: "Manufactured home" means a structure, transportable in one or more sections, which is built on a permanent chassis and is designed for use with or without a permanent foundation when attached to the required utilities. The term "manufactured home" does not include a "recreational vehicle".*

A manufactured home includes a building that is transportable, a mobile home or a "double wide" under the NFIP regulations.

Elevation

Generally, manufactured homes must meet the same flood protection requirement as "stick built" or conventional housing. Since they are usually residential buildings, they must be elevated so the lowest floor is above the BFE.

> ***44 CFR 59.1*** *Definitions: "Manufactured home park or subdivision" means a parcel (or contiguous parcels) of land divided into two or more manufactured home lots for rent or sale.*
>
> ***44 CFR 60.3(c)(12)*** *Require that manufactured homes to be placed or substantially improved on sites in an existing manufactured home park or subdivision within Zones A-1-30, AH, and AE on the community's FIRM that are not subject to the provisions of paragraph (c)(6) of this section be elevated so that either (I) the lowest floor of the manufactured home is at or above the base flood elevation, or (ii) the manufactured home chassis is supported by reinforced piers or other foundation elements of at least equivalent strength that are no less than 36 inches in height above grade and be securely anchored to an adequately anchored foundation system to resist floatation, collapse, and lateral movement.*

44 CFR Section 60.3(c)(12) allows for a limited exemption to elevating to the BFE in pre-FIRM manufactured housing (mobile home) parks. In such older parks, a newly placed manufactured home chassis may be elevated only three feet above grade provided it "is supported by reinforced piers or other foundation elements of at least equivalent strength."

This exemption does not apply to new manufactured housing (mobile home) parks, expansions to existing parks, to manufactured housing located outside a pre-FIRM park, or to repairing or replacing a manufactured home in a pre-FIRM park substantially damaged by a flood.

This exemption is a compromise that tries to balance the flood hazard against the severe economic impacts on some manufactured home park owners that would result if elevation to the BFE were required. The exemption may not be necessary or appropriate for your community, especially if manufactured home parks are able to meet the requirement to elevate to the BFE. In other areas, the flood hazard may be so severe that the exemption may put lives and property at too great a risk. Many states have not included this exemption in their model ordinances and it may not be in your regulations.

Anchoring

> *44 CFR 60.3(c)(6) ...[Manufactured homes must] be elevated on a permanent foundation ... and be securely anchored to an adequately anchored foundation system to resist flotation, collapse and lateral movement.*

A "permanent foundation" means more than a stack of concrete blocks. It should include a below-grade footing capable of resisting overturning, the depth needs to account for frost depth and expected scour, the footing must be sized appropriately for the site's soil bearing capacity, and the design needs to account for seismic and other hazards.

The following types of permanent foundations should be used:

- Reinforced piers,
- Posts,
- Piles,
- Poured concrete walls,
- Reinforced block walls, or
- Compacted fill.

"Adequately anchored" means a system of ties, anchors and anchoring equipment that will withstand flood and wind forces. The system must work in saturated soil conditions. Usually this means over-the-top or frame tie-downs in addition to standard connections to the foundation.

Most states have manufactured home tie-down regulations. Check with your state NFIP coordinator to see if your state's regulations also meet the NFIP anchoring standard. If so, you need only make sure that the state requirement is met for each new manufactured home installed in your floodplain.

If not, see FEMA's *Manufactured Home Installation in Flood Hazard Areas*, FEMA-85, for additional guidance on anchoring.

The anchoring requirement does apply in an existing (pre-FIRM) manufactured housing or mobile home park. Even if not elevated above the BFE, the owner must still certify that the anchoring system will still withstand the forces of a flood over the first floor.

Evacuation: In some areas, there is adequate warning time to remove a manufactured home from harm's way. Protecting such property should not be discouraged, so FEMA allows an evacuated manufactured home to be put back on the original site without having to meet the requirements for siting a new building. An existing manufactured home can be returned after an evacuation without being elevated provided it is not enlarged or altered.

RECREATIONAL VEHICLES

> ***44 CFR 59.1** Definitions: "Recreational vehicle" means a vehicle which is:*
>
> *(a) built on a single chassis;*
>
> *(b) 400 square feet or less when measured at the largest horizontal projection;*
>
> *(c) designed to be self-propelled or permanently towable by a light duty truck; and*
>
> *(d) designed primarily not for use as a permanent dwelling but as temporary living quarters for recreational, camping, travel, or seasonal use.*

A recreational vehicle placed on a site in an SFHA must:

- Meet the elevation and anchoring requirements for manufactured homes,
- Be on the site for fewer than 180 consecutive days, OR
- Be fully licensed and ready for highway use. "Ready for highway use" means that it is on its wheels or jacking system, is attached to the site only by quick disconnect type utilities and has no permanently attached additions.

The purpose of this requirement is to prevent recreational vehicles from being permanently placed in the floodplain unless they are as well protected from flooding as a manufactured home.

AO AND AH ZONES

AO Zones are shallow flooding areas where FEMA provides a base flood depth. Since there is no BFE, the rules read a little differently.

All new construction and substantial improvements of residential structures shall have the lowest floor (including basement) elevated above the highest adjacent grade:

- At least as high as the depth number specified in feet on the community's FIRM, or
- At least two feet if no depth number is specified.

All new construction or substantial improvements of nonresidential structures shall meet the above requirements or, together with attendant utility and sanitary facilities, be floodproofed to the same elevation.

AH Zones are sheet flow areas. In AO and AH Zones, adequate drainage paths are required around structures on slopes to guide floodwater around and away from proposed structures. (Requiring this throughout the community is a good idea, as it will prevent local drainage problems from causing surface flooding.)

A99 AND AR ZONES

An A99 Zone is an SFHA that will be protected by a Federal flood control project that is currently under construction and which meets specified conditions.

An AR Zone is an SFHA that used to be a B, C or X Zone that used to be protected by an accredited flood control system. The system has been decertified but is in the process of being restored to provide protection to the base flood level.

When the flood control systems are completed or restored, the areas in A99 and AR Zones are expected to be remapped and taken out of the SFHA. Until then, they are treated as SFHA for insurance purposes and there are some floodplain management requirements.

A99 and AR Zones are special situations—few exist. If you have one, you should contact your state NFIP coordinating agency or FEMA Regional Office for guidance on regulatory requirements for you situation.

LEARNING CHECK #3

1. What does Basic rule #4 say about new buildings in A Zones?

2. Where would elevation on piles or columns be preferred?

3. Can a basement be considered the "lowest floor?"

4. If a residence is elevated above the BFE in an A Zone, where do you measure how high the building is?

5. What can be allowed under the lowest floor of an elevated building?

6. Mr. Jones shows you plans for a house elevated on a concrete block crawlspace. The area of the crawlspace will be 1,750 square feet.

   a. How many standard 8" x 16" vents will be needed?

   b. How high can they be above ground level?

   c. Can Mr. Jones put his hot water heater in the crawlspace?

7. Mrs. Smith is elevating a house in the AE Zone 8' above grade. How can you make sure that the area below the lowest floor won't be improved, finished or otherwise turned into living space?

8. What three things do you need to check for to ensure that a building is floodproofed?

9. Can a new home in the flood fringe be floodproofed?

10. What's the NFIP definition of "basement?"

11. If a building is proposed to be located in a riverine floodplain with flood velocities of 12 –15 feet per second, what should you ask the builder to provide to assure you that the building won't get washed away during a flood?

12. The builder of a house to be elevated on concrete columns wants to use wood for the stairway. He is concerned that wood will swell and warp if it gets wet during a flood. Can a portion of the house below the BFE be built of wood?

13. How is a manufactured home outside of a manufactured housing park treated differently from a conventional "stick built" home?

14. How is a 600 square foot motor home that is permanently attached to a reinforced block wall foundation treated differently from a manufactured home?

F. New Buildings in V Zones

Zones V1-30, VE and/or V identified on FIRMs designate high hazard areas along coastlines that are subject to high water levels and wave action from strong storms and hurricanes. The winds, waves and tidal surges associated with these storms cause water of high velocity to sweep over nearby land. Many V Zones are also subject to erosion and scour which can undercut building foundations.

Basic rule #5: V Zones have special building protection standards in addition to the requirements for A Zones.

This section identifies only those building protection requirements that differ from the A Zone criteria. Unless mentioned in this section, all A Zone standards apply for new and substantially improved buildings in V Zones.

Video: *Best Build: Constructing a Sound Coastal Home*

Before continuing, please view the 20-minute video segment on construction techniques in coastal areas. Called *Best Build I: Constructing a Sound Coastal Home*, it is on the second videotape included in the course materials. Do not rewind the tape.

Building Location

New or substantially improved buildings in V Zones cannot be over water. They must be located landward of mean high tide. In fact, it's best to be as far back from the shore as possible in order to avoid the more dangerous areas subject to waves and erosion.

Avoid areas of sand dunes and mangroves. Human alteration of sand dunes and mangrove stands within V Zones is prohibited unless it can be demonstrated that such alterations will not increase potential flood damage.

Both of these natural features are protected against alteration because they are important first lines of defense against coastal storms and can do much to reduce losses to inland coastal development.

Generally, you can assume that any removal or other alteration of a sand dune will increase flood damage. The burden should be placed on the permit applicant to demonstrate that this will not occur. This will require a report by a coastal engineer or geologist.

ELEVATION ON PILES OR COLUMNS

All new construction and substantial improvements to buildings in V Zones must be elevated on pilings, posts, piers or columns.

> ***44 CFR 60.3(e)(4)*** *[The community must] Provide that all new construction and substantial improvements in Zones V1-30 and VE, and also Zone V if base flood elevation data is available, on the community's FIRM, are elevated on pilings and columns so that (i) the bottom of the lowest horizontal structural member of the lowest floor (excluding the pilings or columns) is elevated to or above the base flood level…*

Elevation—on fill, solid walls or crawlspaces—and floodproofing are prohibited because these techniques present obstructions to wave action. The force of a breaking wave is so great that these types of foundations would be severely damaged, resulting in collapse of the building.

Construction on piles or columns allows waves to pass under the building without transmitting the full force of the waves to the building's foundation. A special case is made for installing breakaway walls between the pilings or columns, but such walls are not supporting foundation walls.

While fill is not allowed for structural support for buildings within V Zones because of the severe erosion potential of such locations, limited fill is allowed for landscaping, local drainage needs, and to smooth out a site for an unreinforced concrete pad.

How high? Within V Zones, the controlling elevation is the bottom of the lowest horizontal structural member of the lowest floor. (In comparison, within A Zones, the controlling elevation is the *top* of the lowest floor.) This is to keep the entire building above the anticipated breaking wave height of a base flood storm surge.

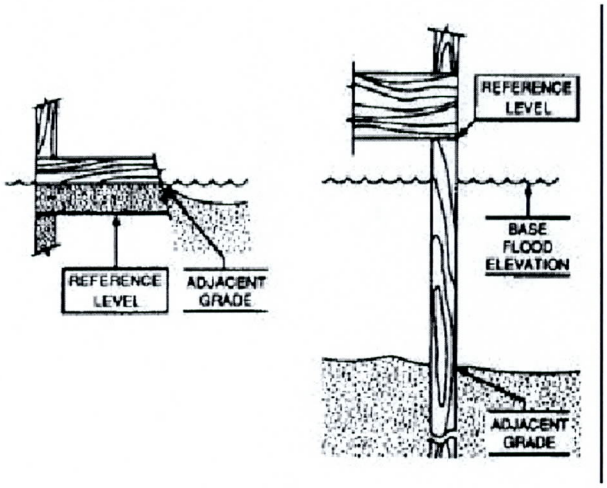


Figure 5-15: In V Zones, the lowest floor is measured from the bottom of the lowest horizontal structural member

Wind and water loads

The design of the supporting foundation must account for wind loads in combination with the forces that accompany the base flood. As noted in the video, cross bracing and proper connections are key to this.

> ***44 CFR 60.3(e)(4)*** *...(ii) [The community must ensure that] the pile or column foundation and structure attached thereto is anchored to resist flotation, collapse and lateral movement due to the effects of wind and water loads acting simultaneously on all building components. Water loading values used shall be those associated with the base flood. Wind loading values used shall be those required by applicable State or local building standards. A registered professional engineer or architect shall develop or review the structural design, specifications and plans for the construction, and shall certify that the design and methods of construction to be used are in accordance with accepted standards of practice for meeting the provisions of (e)(4)(i) and (ii) of this section.*

Posts of wood, steel, or pre-cast concrete are preferred over block columns and similar foundations that are less resistant to lateral forces. Pilings are preferred in areas subject to erosion and scour, but it is critical that they be embedded deep enough (Figure 5-16).

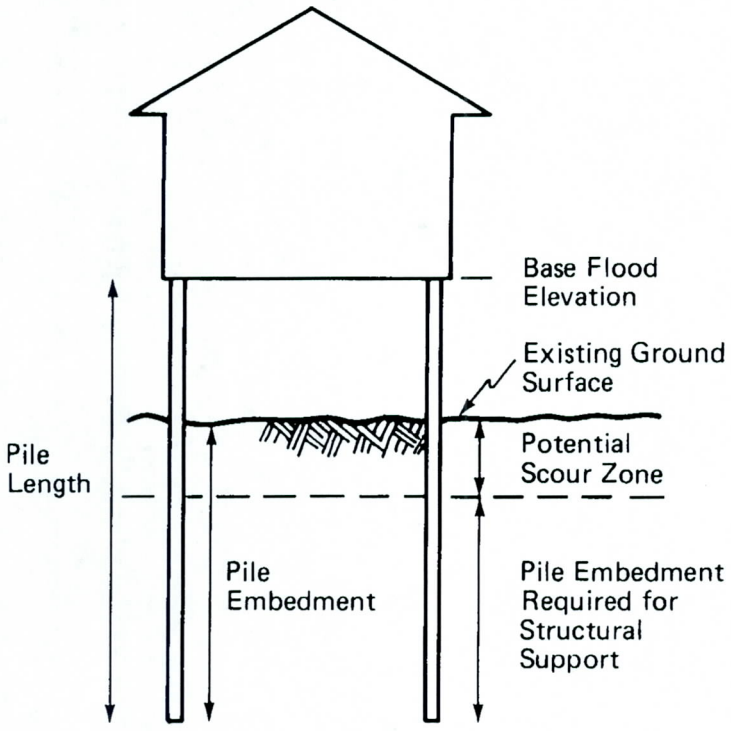


Figure 5-16: Piles must be embedded well below the scour depth

Figure 5-17: This house had inadequate pile embedment and cross bracing

Certification

A registered professional engineer or architect must develop or review the structural design, specifications and plans for the construction, and certify that the design and planned methods of construction are in accordance with accepted standards of practice for meeting the above provisions.

You must maintain a copy of the engineer's or architect's certification in the permit file for all structures built or substantially improved in the V Zone.

The North Carolina Division of Emergency Management has prepared a V-Zone certification form (Figure 5-18) to ensure that these requirements are met. This is provided as an example. Check with your state NFIP coordinator to see if your state has developed a V Zone certification form.

BREAKAWAY WALLS

Any walls below the lowest floor in a building in a V Zone should give way under wind and water loads without causing collapse, displacement or other damage to the elevated portion of the building or the supporting pilings or columns.

Any enclosed space below the lowest floor must be free of obstruction, or constructed with nonsupporting breakaway materials such as open wood latticework or insect screening. Just as in A Zones, this space is to be used solely for parking of vehicles, building access or storage, and must be constructed of flood-resistant material.

44 CFR 60.3(e)(5) *[The community must] Provide that all new construction and substantial improvements within Zones V1-30, VE, and V on the community's FIRM have the space below the lowest floor either free of obstruction or constructed with non-supporting breakaway walls, open wood lattice-work, or insect screening intended to collapse under wind and water loads without causing collapse, displacement, or other structural damage to the elevated portion of the building or supporting foundation system. For the purposes of this section, a breakaway wall shall have a design safe loading resistance of not less than 10 and no more than 20 pounds per square foot. Use of breakaway walls which exceed a design safe loading resistance of 20 pounds per square foot (either by design or when so required by local or State codes) may be permitted only if a registered professional engineer or architect certifies that the designs proposed meet the following conditions:*

Solid breakaway wall panels are allowed, as are garage doors that meet the same breakaway requirements.

The area enclosed by solid breakaway walls should be limited to less than 300 square feet because:

- Flood insurance rates increase dramatically for enclosures larger than 300 square feet.
- Larger areas encourage conversion to habitable living areas, which are difficult to detect and enforce as violations.

For further information see *Coastal Construction Manual*, FEMA-55 (1986), and *Free-of-Obstruction Requirements for Buildings Located in Coastal High Hazard Areas*, FIA-TB-5 (FEMA 1993).

V-Zone Certification

Property Information	For Insurance Company Use
Name of Building Owner	Policy Number
Building Address or Other Description	
City	State Zip Code

SECTION I: FLOOD INSURANCE RATE MAP (FIRM) INFORMATION

Note: to be obtained from appropriate FIRMs

Community Number	Panel Number	Suffix	Date of FIRM Index	FIRM Zone

SECTION II: ELEVATION INFORMATION

Note: This form is not a substitute for an Elevation Certificate. Elevations should be rounded to nearest tenth of a foot.

1. Elevation of the Bottom of Lowest Horizontal Structure Member ..... _____feet
2. Base Flood Elevation ..... _____feet
3. Elevation of Lowest Adjacent Grade ..... _____feet
4. Approximate Depth of Anticipated Scour/Erosion Used for Foundation Design ..... _____feet
5. Embedment Depth of Pilings or Foundation Below Lowest Adjacent Grade ..... _____feet
6. Datum Used: _____ NGVD '29 _____NAVD '88 _____Other

SECTION III: FLOOD INSURANCE RATE MAP (FIRM) INFORMATION

Note: This section must be certified by a registered professional engineer or architect

I certify that I have developed or reviewed the structural design, plans and specifications for construction and that the methods of construction to be used are in accordance with accepted standards of practice for meeting the following provisions:

a) The bottom of the lowest horizontal structure member of the lowest floor (excluding the pilings or columns) is elevated to or above the BFE; and,

b) The pile or column foundation and structure attached thereto is anchored to resist flotation, collapse and lateral movement due to the effects of the wind and water loads acting simultaneously on all building components. Water loading values used are those associated with the base flood including wave action. Wind loading values used are those required by the applicable State or local building code. The potential for scour and erosion at the foundation has been anticipated for conditions associated with the flood, including wave action.

SECTION IV: FLOOD INSURANCE RATE MAP (FIRM) INFORMATION

Note: This section must be certified by a registered professional engineer or architect

I certify that I have developed or reviewed the structural design, plans and specifications for construction and that the design and methods of construction to be used for the breakaway walls are in accordance with accepted standards of practice for meeting the following provisions:

c) Breakaway collapse shall result from water load less than that which would occur during the base flood; and,

d) The elevated portion of the building and supporting foundation system shall not be subject to collapse, displacement, or other structural damage due to the effects of wind and water loads acting simultaneously on all building components (wind and water loading values defined in Section III)..

SECTION V: CERTIFICATION

(Check: Section III _____ and/or Section IV _____)

Name of Certifier	Title	
Firm Name		License Number
Street Address		Phone Number ( )
City	State	Zip Code
Signature		Date

Figure 5-18: Sample V Zone certification

G. OTHER REQUIREMENTS

The primary thrust of the NFIP regulations is to protect insurable buildings and reduce future exposure to flood hazards. However, there are some additional requirements that help ensure that the buildings stay habitable and additional flood problems are not created.

SUBDIVISIONS

As noted in Section B of this unit, once you obtain base flood elevations for a subdivision or other large development, new buildings must be properly elevated or floodproofed. These developments must also be reviewed to ensure their infrastructure is reasonably safe from flood damage.

> ***44 CFR 60.3(a)(4)*** *[The community must] Review subdivision proposals and other proposed new development including manufactured home parks or subdivisions, to determine whether such proposals will be reasonably safe from flooding. If a subdivision proposal or other proposed new development is in a flood-prone area, any such proposals shall be reviewed to assure that (i) all such proposals are consistent with the need to minimize flood damage within the flood-prone area, (ii) all public utilities and facilities, such as sewer, gas, electrical, and water systems are located and constructed to minimize or eliminate flood damage, and (iii) adequate drainage is provided to reduce exposure to flood hazards;*

This review applies to subdivisions and other development, such as apartments, parks, shopping centers, schools and other projects.

If one is floodprone, the builder should:

- Minimize flood damage by locating structures on the highest ground.
- Have public utilities and facilities located and constructed so as to minimize flood damage.
- Provide adequate drainage for each building site.

The site plans of new development and proposed plats for subdivisions can usually be designed to minimize the potential for flood damage while still achieving the economic goals of the project. For example, lot size could be reduced and the lots clustered on high ground, with homesites having views of the floodplain.

WATER AND SEWER SYSTEMS

> ***44 CFR 60.3(a)(5)*** *[The community must] Require within flood-prone areas new and replacement water supply systems to be designed to minimize or eliminate infiltration of flood waters into the systems; and*

> ***44 CFR 60.3(a)(6)*** *[The community must] Require within flood-prone areas (i) new and replacement sanitary sewage systems to be designed to minimize or eliminate infiltration of flood waters into the systems and discharges from the systems into flood waters and (ii) onsite waste disposal systems to be located to avoid impairment to them or contamination from them during flooding.*

The objective of these requirements is to ensure that a building that is protected from flood damage can still be used after the flood recedes.

In most instances, these criteria can be met through careful system design. Manholes should be raised above the 100-year flood level or equipped with seals to prevent leakage. Pumping stations should have electrical panels elevated above the BFE.

On-site waste disposal systems should be located to ensure they are accessible during a flood, and that they will not release contamination in a flood. The first objective should be to locate the system outside the flood hazard area, if that is feasible. At a minimum, an automatic backflow valve should be installed to prevent sewage from backing up into the building during flooding.

WATERCOURSE ALTERATIONS

> ***44 CFR 60.3(b)(6)*** *[The community must] Notify, in riverine situations, adjacent communities and the State Coordinating Office prior to any alteration or relocation of a watercourse, and submit copies of such notifications to the [Federal Insurance] Administrator;*

The community must notify adjacent communities and the appropriate state agency prior to altering or relocating any river or stream within its jurisdiction. Copies of such notifications must be submitted to the FEMA Regional Office.

> ***44 CFR 60.3(b)(7)*** *[The community must] Assure that the flood carrying capacity within the altered or relocated portion of any watercourse is maintained;*

Any alteration or relocation of a watercourse should not increase the community's flood risks or those of any adjacent community. This could happen if the watercourse's capacity to carry flood flow is reduced because a smaller or less-efficient channel is created, or by modifications to the floodway as a result of the project.

After altering a watercourse, the developer has created an artificial situation and must assume responsibility for maintaining the capacity of the modified channel. Otherwise, flooding is likely to increase as the channel silts in, meanders or tries to go back to its old location.

For any significant alteration or relocation, you should consider requiring the applicant to have an engineer certify that the flood-flow carrying capacity is maintained and that there will be no increase in flood flows downstream.

Federal and state permits may be required for any alteration or relocation activity. It is recommended that the community require the submittal and approval of a CLOMR from FEMA for large-scale proposals (see CLOMR procedures discussion in Unit 4, Section D).

LEARNING CHECK #4

1. What does Basic rule #5 say about new buildings in V Zones?

2. Can a new building be built in the V Zone elevated on a crawlspace?

3. Where is the lowest floor measured in a V Zone?

4. What's the best way for a permit official to be sure that a V Zone building will be adequate to resist the wind and water loads?

5. What's the best way to deal with those pesky sand dunes in a V Zone development site?

6. If a subdivider makes sure that all building sites are above the BFE, does he need to do anything more to meet the NFIP requirements?

7. How can you protect a sewer system from flooding?

UNIT LEARNING EXERCISE

1. In what part of the Code of Federal Regulations would you find the definition for "development.?"

2. Where do I find the NFIP requirements for areas mapped with V Zones?

3. If a community has a FIRM that shows floodways and V Zones, which parts of 44 CFR 60.3 must it abide by?

4. If your community follows the requirements of 44 CFR 60.3(d), does it have to worry about what's in 44 CFR 60.3(b)?

5. A building officials finds it easier to read an old flood map prepared on an aerial photograph by the Corps of Engineers. He doesn't want to use the current FIRM because it doesn't show all the buildings and features that the photograph does. Can he make permit decisions based on the Corps map instead of the FIRM?

6. A developer wants to build in an area mapped as an approximate A Zone on Ireland Creek. He conducts a detailed flood study which is approved by the Town Engineer. It shows that several lots in the A Zone are actually higher than the BFE calculated in the study.

   a. Can you issue permits for building on those sites and treat them as C Zone sites?

   b. Will the buyers of the properties have to buy flood insurance policies?

7. Joe Deerslayer wants to build a small hunting cabin on a lake in an approximate A Zone. It will be the only building within two miles. There are no known sources of a base flood elevation. The cabin will cost less than $10,000 and he does not want to pay $2,000 for an engineering study to develop a BFE. What can you do to make sure the property is protected from flooding?

8. Will a developer in an approximate A Zone have to prepare a detailed study to calculate base flood elevations if the development is:

   a. 4 acres?

   b. 60 lots?

   c. Reserving all the SFHA as open space?

9. A restudy was performed on the Rocky River. The preliminary study will not be final for another five months. It shows a new BFE at Site B that is two feet lower than the BFE in your current FIS. Which one do you use to determine the flood protection level for a new home at Site A?

10. Does dredging a creek to make it deeper to reduce flood levels need a floodplain permit?

11. Does replacing an old manufactured home with a new one on the same foundation need a permit?

12. If an old manufactured home is replaced with a new one on the same foundation, will the new one have to be elevated above the BFE?

13. If a project will involve filling a wetland, is it likely that a federal or state permit will be needed?

14. A builder wants to put a house in the floodway. How much can his project increase the base flood elevation (in feet)?

15. Will paving a dirt street in the floodway need an engineer's "no-rise" certification?

16. A city councilman complains that the NFIP floodway regulations prevent construction of a flood control dam that will protect people from flooding. What can you tell him?

17. Does a substantial improvement to an existing building have to meet the same requirements as construction of a new building?

18. Can a new nonresidential building be built:

    a. On fill in the flood fringe?

    b. On fill in the floodway?

    c. On fill in the V Zone?

    d. At grade, but floodproofed in the flood fringe?

    e. At grade, but floodproofed in the V Zone?

19. A builder wants to build an apartment building on stem walls parallel to the flow of water with the lowest floor 8' above grade. Can the lower area be used as a parking lot?

20. What's the best record to keep to be sure that a house was elevated high enough?

21. How many standard 8" x 16" vents are needed for a building that will have a 2,250 square foot crawlspace?

22. Can the owner store garden tools in a floodable crawlspace?

23. A business on the Mississippi River wants to build a floodproofed warehouse in the flood fringe. The plans are to have the walls built of reinforced concrete up to the BFE. Several garage doors will be open at grade to allow trucks in and out, but the design includes movable shields that can be put in place before floodwaters arrive. There would be no other openings below the BFE. The warehouse will have a 24-hour security force that will be trained on how to install the shields. The design engineer will certify that the building will be floodproofed (with human intervention) up to the base flood elevation. Can you approve these plans?

24. A builder wants to build a "bi-level" house where the lowest floor is three feet below grade. The lowest floor has large windows and includes three bedrooms and a bathroom. Because it is habitable space, the owner does not consider this a "basement." Does the NFIP consider this a "basement?"

25. The area below a planned elevated house in the V Zone will have a 260 square foot enclosure to house the entryway and storage closets. The builder wants to insulate the area and finish it with wallboard, wallpaper and carpeting. He says it's OK because the area is under 300 square feet. What do you tell him?

26. Where can you find standards for tying down manufactured homes?

27. A new house is planned to be built in an SFHA marked "Zone AO (depth 3 feet)." How high should the lowest floor be?

28. Why are pilings and posts preferred in V Zones?

FR 46331, Aug. 30, 1996; 61 FR 54566, 54568, Oct. 21, 1996; 61 FR 60035, Nov. 26, 1996; 61 FR 60038, Nov. 26, 1996;

§ 65.5 Revision to special flood hazard area boundaries with no change to base flood elevation determinations.

(a) Data requirements for topographic changes. In many areas of special flood hazard (excluding V zones and floodways) it may be feasible to elevate areas with earth fill above the base flood elevation. Scientific and technical information to support a request to gain exclusion from an area of special flood hazard of a structure or parcel of land that has been elevated by the placement of fill shall include the following:

(1) A copy of the recorded deed indicating the legal description of the property and the official recordation information (deed book volume and page number) and bearing the seal of the appropriate recordation official (e.g., County Clerk or Recorder of Deeds).

(2) If the property is recorded on a plat map, a copy of the recorded plat indicating both the location of the property and the official recordation information (plat book volume and page number) and bearing the seal of the appropriate recordation official. If the property is not recorded on a plat map, copies of the tax map or other suitable maps are required to aid FEMA in accurately locating the property.

(3) If a legally defined parcel of land is involved, a topographic map indicating present ground elevations and date of fill. FEMA's determination as to whether a legally defined parcel of land is to be excluded from the area of special flood hazard shall be based upon a comparison of the ground elevations of the parcel with the elevations of the base flood. If the ground elevations of the entire legally defined parcel of land are at or above the elevations of the base flood, the parcel may be excluded from the area of special flood hazard.

(4) If a structure is involved, a topographic map indicating structure location and ground elevations including the elevations of the lowest floor (including basement) and the lowest adjacent grade to the structure. FEMA's determination as to whether a structure is to be excluded from the area of special flood hazard shall be based upon a comparison of the elevation of the lowest floor (including basement) and the elevation of the lowest adjacent grade with the elevation of the base flood. If the entire structure and the lowest adjacent grade are at or above the elevation of the base flood, the structure may be excluded from the area of special flood hazard.

(5) Data to substantiate the base flood elevation. If FEMA has completed a Flood Insurance Study (FIS), that data will be used to substantiate the base flood. Otherwise, data provided by an authoritative source, such as the U.S. Army Corps of Engineers, U.S. Geological Survey, U.S. Soil Conservation Service, state and local water resource departments, or technical data prepared and certified by a registered professional engineer may be submitted. If base flood elevations have not previously been established, hydraulic calculations may also be requested.

(6) Where fill has been placed to raise the ground surface to or above the base flood elevation and the request to gain exclusion from an area of special flood hazard includes more than a single structure or a single lot, it must be demonstrated that fill will not settle below the elevation of the base flood, and that the fill is adequately protected from the forces of erosion, scour, or differential settlement as described below:

(i) Fill must be compacted to 95 percent of the maximum density obtainable with the Standard Proctor Test method issued by the American Society for Testing and Materials (ASTM Standard D-698). This requirement applies to fill pads prepared for residential or commercial structure foundations and does not apply to filled areas intended for other uses.

(ii) Fill slopes for granular materials are not steeper than one vertical on one-and-one-half horizontal unless substantiating data justifying steeper slopes is submitted.

(iii) Adequate protection is provided fill slopes exposed to flood waters with expected velocities during the occurrence of the base flood of five feet per second or less by covering them with grass, vines, weeds, or similar vegetation undergrowth.

(iv) Adequate protection is provided fill slopes exposed to flood waters with velocities during the occurrence of the base flood of greater than five feet per second by armoring them with stone or rock slope protection.

(7) A revision of flood plain delineations based on fill must demonstrate that any such fill has not resulted in a floodway encroachment.

(b) New topographic data. The procedures described in paragraphs (a) (1) through (5) of this section may be also followed to request a map revision when no physical changes have occurred in the area of special flood hazard, when no fill has been placed, and when the natural ground elevations, as evidenced by new topographic maps, more detailed or more accurate than those used to prepare the map to be revised, are shown

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FR 46331, Aug. 30, 1996; 61 FR 54566, 54568, Oct. 21, 1996; 61 FR 60035, Nov. 26, 1996; 61 FR 60038, Nov. 26, 1996;

§ 65.5 Revision to special flood hazard area boundaries with no change to base flood elevation determinations.

(a) Data requirements for topographic changes. In many areas of special flood hazard (excluding V zones and floodways) it may be feasible to elevate areas with earth fill above the base flood elevation. Scientific and technical information to support a request to gain exclusion from an area of special flood hazard of a structure or parcel of land that has been elevated by the placement of fill shall include the following:

(1) A copy of the recorded deed indicating the legal description of the property and the official recordation information (deed book volume and page number) and bearing the seal of the appropriate recordation official (e.g., County Clerk or Recorder of Deeds).

(2) If the property is recorded on a plat map, a copy of the recorded plat indicating both the location of the property and the official recordation information (plat book volume and page number) and bearing the seal of the appropriate recordation official. If the property is not recorded on a plat map, copies of the tax map or other suitable maps are required to aid FEMA in accurately locating the property.

(3) If a legally defined parcel of land is involved, a topographic map indicating present ground elevations and date of fill. FEMA's determination as to whether a legally defined parcel of land is to be excluded from the area of special flood hazard shall be based upon a comparison of the ground elevations of the parcel with the elevations of the base flood. If the ground elevations of the entire legally defined parcel of land are at or above the elevations of the base flood, the parcel may be excluded from the area of special flood hazard.

(4) If a structure is involved, a topographic map indicating structure location and ground elevations including the elevations of the lowest floor (including basement) and the lowest adjacent grade to the structure. FEMA's determination as to whether a structure is to be excluded from the area of special flood hazard shall be based upon a comparison of the elevation of the lowest floor (including basement) and the elevation of the lowest adjacent grade with the elevation of the base flood. If the entire structure and the lowest adjacent grade are at or above the elevation of the base flood, the structure may be excluded from the area of special flood hazard.

(5) Data to substantiate the base flood elevation. If FEMA has completed a Flood Insurance Study (FIS), that data will be used to substantiate the base flood. Otherwise, data provided by an authoritative source, such as the U.S. Army Corps of Engineers, U.S. Geological Survey, U.S. Soil Conservation Service, state and local water resource departments, or technical data prepared and certified by a registered professional engineer may be submitted. If base flood elevations have not previously been established, hydraulic calculations may also be requested.

(6) Where fill has been placed to raise the ground surface to or above the base flood elevation and the request to gain exclusion from an area of special flood hazard includes more than a single structure or a single lot, it must be demonstrated that fill will not settle below the elevation of the base flood, and that the fill is adequately protected from the forces of erosion, scour, or differential settlement as described below:

(i) Fill must be compacted to 95 percent of the maximum density obtainable with the Standard Proctor Test method issued by the American Society for Testing and Materials (ASTM Standard D-698). This requirement applies to fill pads prepared for residential or commercial structure foundations and does not apply to filled areas intended for other uses.

(ii) Fill slopes for granular materials are not steeper than one vertical on one-and-one-half horizontal unless substantiating data justifying steeper slopes is submitted.

(iii) Adequate protection is provided fill slopes exposed to flood waters with expected velocities during the occurrence of the base flood of five feet per second or less by covering them with grass, vines, weeds, or similar vegetation undergrowth.

(iv) Adequate protection is provided fill slopes exposed to flood waters with velocities during the occurrence of the base flood of greater than five feet per second by armoring them with stone or rock slope protection.

(7) A revision of flood plain delineations based on fill must demonstrate that any such fill has not resulted in a floodway encroachment.

(b) New topographic data. The procedures described in paragraphs (a) (1) through (5) of this section may be also followed to request a map revision when no physical changes have occurred in the area of special flood hazard, when no fill has been placed, and when the natural ground elevations, as evidenced by new topographic maps, more detailed or more accurate than those used to prepare the map to be revised, are shown to be above the elevation of the base flood.

(c) Certification requirements. The items required in paragraphs (a) (3) and (4) and (b) of this section shall be certified by a registered professional engineer or licensed land surveyor. Items required in paragraph (a)(6) of this section shall be certified by the community's NFIP permit official, a registered professional engineer, or an accredited soils engineer. Such certifications are subject to the provisions of § 65.2 of this subchapter.

(d) Submission procedures. All requests shall be submitted to the FEMA Regional Office servicing the community's geographic area or to the FEMA Headquarters Office in Washington, DC, and shall be accompanied by the appropriate payment, in accordance with 44 CFR part 72.
[51 FR 30313, Aug. 25, 1986; 61 FR 46331, Aug. 30, 1996; 62 FR 5736, Feb. 6, 1997]

§ 65.6 Revision of base flood elevation determinations.

(a) General conditions and data requirements.
(1) The supporting data must include all the information FEMA needs to review and evaluate the request. This may involve the requestor's performing new hydrologic and hydraulic analysis and delineation of new flood plain boundaries and floodways, as necessary.
(2) To avoid discontinuities between the revised and unrevised flood data, the necessary hydrologic and hydraulic analyses submitted by the map revision requestor must be extensive enough to ensure that a logical transition can be shown between the revised flood elevations, flood plain boundaries, and floodways and those developed previously for areas not affected by the revision. Unless it is demonstrated that it would not be appropriate, the revised and unrevised base flood elevations must match within one-half foot where such transitions occur.
(3) Revisions cannot be made based on the effects of proposed projects or future conditions. Section 65.8 of this subchapter contains provisions for obtaining conditional approval of proposed projects that may effect map changes when they are completed.
(4) The datum and date of releveling of benchmarks, if any, to which the elevations are referenced must be indicated.
(5) Maps will not be revised when discharges change as a result of the use of an alternative methodology or data for computing flood discharges unless the change is statistically significant as measured by a confidence limits analysis of the new discharge estimates.
(6) Any computer program used to perform hydrologic or hydraulic analyses in support of a flood insurance map revision must meet all of the following criteria:
(i) It must have been reviewed and accepted by a governmental agency responsible for the implementation of programs for flood control and/or the regulation of flood plain lands. For computer programs adopted by non-Federal agencies, certification by a responsible agency official must be provided which states that the program has been reviewed, tested, and accepted by that agency for purposes of design of flood control structures or flood plain land use regulation.
(ii) It must be well-documented including source codes and user's manuals.
(iii) It must be available to FEMA and all present and future parties impacted by flood insurance mapping developed or amended through the use of the program. For programs not generally available from a Federal agency, the source code and user's manuals must be sent to FEMA free of charge, with fully-documented permission from the owner that FEMA may release the code and user's manuals to such impacted parties.
(7) A revised hydrologic analysis for flooding sources with established base flood elevations must include evaluation of the same recurrence interval(s) studied in the effective FIS, such as the 10-, 50-, 100-, and 500-year flood discharges.
(8) A revised hydraulic analysis for a flooding source with established base flood elevations must include evaluation of the same recurrence interval(s) studied in the effective FIS, such as the 10-, 50-, 100-, and 500-year flood elevations, and of the floodway. Unless the basis of the request is the use of an alternative hydraulic methodology or the requestor can demonstrate that the data of the original hydraulic computer model is unavailable or its use is inappropriate, the analysis shall be made using the same hydraulic computer model used to develop the base flood elevations shown on the effective Flood Insurance Rate Map and updated to show present conditions in the flood plain. Copies of the input and output data from the original and revised hydraulic analyses shall be submitted.
(9) A hydrologic or hydraulic analysis for a flooding source without established base flood elevations may be performed for only the 100-year flood.
(10) A revision of flood plain delineations based on topographic changes must demonstrate that any topographic changes have not resulted in a floodway encroachment.
(11) Delineations of flood plain boundaries for a flooding source with established base flood elevations must provide both the 100- and 500-year flood plain boundaries. For flooding sources without established base flood elevations, only 100-year flood plain boundaries need be submitted. These boundaries should be shown on a topographic map of suitable scale and contour interval.
(12) If a community or other party seeks recognition from FEMA, on its FHBM or FIRM, that an altered or relocated portion of a watercourse provides protection from, or mitigates potential hazards of, the base flood, the Administrator may request specific documentation from the community certifying that, and describing how, the provisions of § 60.3(b)(7) of this subchapter will be met for the particular watercourse involved. This documentation, which may be in the form of a written statement from the Community Chief Executive Officer, an ordinance, or other legislative action, shall describe the nature of the maintenance activities to be performed, the frequency with which they will be per-

formed, and the title of the local community official who will be responsible for assuring that the maintenance activities are accomplished.
(13) Notwithstanding any other provisions of § 65.6, a community may submit, in lieu of the documentation specified in § 65.6(a)(12), certification by a registered professional engineer that the project has been designed to retain its flood carrying capacity without periodic maintenance.
(b) Data requirements for correcting map errors. To correct errors in the original flood analysis, technical data submissions shall include the following:
(1) Data identifying mathematical errors.
(2) Data identifying measurement errors and providing correct measurements.
(c) Data requirements for changed physical conditions. Revisions based on the effects of physical changes that have occurred in the flood plain shall include:
(1) Changes affecting hydrologic conditions. The following data must be submitted:
(i) General description of the changes (e.g., dam, diversion channel, or detention basin).
(ii) Construction plans for as-built conditions, if applicable.
(iii) New hydrologic analysis accounting for the effects of the changes.
(iv) New hydraulic analysis and profiles using the new flood discharge values resulting from the hydrologic analysis.
(v) Revised delineations of the flood plain boundaries and floodway.
(2) Changes affecting hydraulic conditions. The following data shall be submitted:
(i) General description of the changes (e.g., channelization or new bridge, culvert, or levee).
(ii) Construction plans for as-built conditions.
(iii) New hydraulic analysis and flood elevation profiles accounting for the effects of the changes and using the original flood discharge values upon which the original map is based.
(iv) Revised delineations of the flood plain boundaries and floodway.
(3) Changes involving topographic conditions. The following data shall be submitted:
(i) General description of the changes (e.g., grading or filling).
(ii) New topographic information, such as spot elevations, cross sections grading plans, or contour maps.
(iii) Revised delineations of the flood plain boundaries and, if necessary, floodway.
(d) Data requirements for incorporating improved data. Requests for revisions based on the use of improved hydrologic, hydraulic, or topographic data shall include the following data:
(1) Data that are believed to be better than those used in the original analysis (such as additional years of stream gage data).
(2) Documentation of the source of the data.
(3) Explanation as to why the use of the new data will improve the results of the original analysis.
(4) Revised hydrologic analysis where hydrologic data are being incorporated.
(5) Revised hydraulic analysis and flood elevation profiles where new hydrologic or hydraulic data are being incorporated.
(6) Revised delineations of the flood plain boundaries and floodway where new hydrologic, hydraulic, or topographic data are being incorporated.
(e) Data requirements for incorporating improved methods. Requests for revisions based on the use of improved hydrologic or hydraulic methodology shall include the following data:
(1) New hydrologic analysis when an alternative hydrologic methodology is being proposed.
(2) New hydraulic analysis and flood elevation profiles when an alternative hyrologic or hydraulic methodology is being proposed.
(3) Explanation as to why the alternative methodologies are superior to the original methodologies.
(4) Revised delineations of the flood plain boundaries and floodway based on the new analysis(es).
(f) Certification requirements. All analysis and data submitted by the requester shall be certified by a registered professional engineer or licensed land surveyor, as appropriate, subject to the definition of "certification" given at § 65.2 of this subchapter.
(g) Submission procedures. All requests shall be submitted to the FEMA Regional Office servicing the community's geographic area or to the FEMA Headquarters Office in Washington, DC, and shall be accompanied by the appropriate payment, in accordance with 44 CFR part 72.
[51 FR 30314, Aug. 25, 1986; 53 FR 16279, May 6, 1988; 54 FR 33550, Aug. 15, 1989; 61 FR 46331, Aug. 30, 1996; 62 FR 5736, Feb. 6, 1997]

§ 65.7 Floodway revisions.
(a) General. Floodway data is developed as part of FEMA Flood Insurance Studies and is utilized by communities to select and adopt floodways as part of the flood plain management program required by § 60.3 of this subchapter. When it has been determined by a community that no practicable alternatives exist to revising the boundaries of its previously adopted floodway, the procedures below shall be followed.
(b) Data requirements when base flood elevation changes are requested. When a floodway revision is requested in association with a change to base flood elevations, the data requirements of § 65.6 shall also be

applicable. In addition, the following documentation shall be submitted:
(1) Copy of a public notice distributed by the community stating the community's intent to revise the floodway or a statement by the community that it has notified all affected property owners and affected adjacent jurisdictions.
(2) Copy of a letter notifying the appropriate State agency of the floodway revision when the State has jurisdiction over the floodway or its adoption by communities participating in the NFIP.
(3) Documentation of the approval of the revised floodway by the appropriate State agency (for communities where the State has jurisdiction over the floodway or its adoption by communities participating in the NFIP).
(4) Engineering analysis for the revised floodway, as described below:
(i) The floodway analysis must be performed using the hydraulic computer model used to determine the proposed base flood elevations.
(ii) The floodway limits must be set so that neither the effective base flood elevations nor the proposed base flood elevations if less than the effective base flood elevations, are increased by more than the amount specified under § 60.3 (d)(2). Copies of the input and output data from the original and modified computer models must be submitted.
(5) Delineation of the revised floodway on the same topographic map used for the delineation of the revised flood boundaries.
(c) Data requirements for changes not associated with base flood elevation changes. The following data shall be submitted:
(1) Items described in paragraphs (b) (1) through (3) of this section must be submitted.
(2) Engineering analysis for the revised floodway, as described below:
(i) The original hydraulic computer model used to develop the established base flood elevations must be modified to include all encroachments that have occurred in the flood plain since the existing floodway was developed. If the original hydraulic computer model is not available, an alternate hydraulic computer model may be used provided the alternate model has been calibrated so as to reproduce the original water surface profile of the original hydraulic computer model. The alternate model must be then modified to include all encroachments that have occurred since the existing floodway was developed.
(ii) The floodway analysis must be performed with the modified computer model using the desired floodway limits.
(iii) The floodway limits must be set so that combined effects of the past encroachments and the new floodway limits do not increase the effective base flood elevations by more than the amount specified in § 60.3(d)(2). Copies of the input and output data from the original and modified computer models must be submitted.
(3) Delineation of the revised floodway on a copy of the effective NFIP map and a suitable topographic map.
(d) Certification requirements. All analyses submitted shall be certified by a registered professional engineer. All topographic data shall be certified by a registered professional engineer or licensed land surveyor. Certifications are subject to the definition given at § 65.2 of this subchapter.
(e) Submission procedures. All requests that involve changes to floodways shall be submitted to the appropriate FEMA Regional Office servicing the community's geographic area.
[51 FR 30315, Aug. 25, 1986]

§ 65.8 Review of proposed projects.

A community, or an individual through the community, may request FEMA's comments on whether a proposed project, if built as proposed, would justify a map revision. FEMA's comments will be issued in the form of a letter, termed a Conditional Letter of Map Revision, in accordance with 44 CFR part 72. The data required to support such requests are the same as those required for final revisions under §§ 65.5, 65.6, and 65.7, except as-built certification is not required. All such requests shall be submitted to the FEMA Headquarters Office in Washington, DC, and shall be accompanied by the appropriate payment, in accordance with 44 CFR part 72.
[51 FR 30315, Aug. 25, 1986; 61 FR 46331, Aug. 30, 1996; 62 FR 5736, Feb. 6, 1997]

§ 65.9 Review and response by the Administrator.

If any questions or problems arise during review, FEMA will consult the Chief Executive Officer of the community (CEO), the community official designated by the CEO, and/or the requester for resolution. Upon receipt of a revision request, the Administrator shall mail an acknowledgment of receipt of such request to the CEO. Within 90 days of receiving the request with all necessary information, the Administrator shall notify the CEO of one or more of the following:
(a) The effective map(s) shall not be modified;
(b) The base flood elevations on the effective FIRM shall be modified and new base flood elevations shall be established under the provisions of Part 67 of this subchapter;
(c) The changes requested are approved and the map(s) amended by Letter of Map Revision (LOMR);
(d) The changes requested are approved and a revised map(s) will be printed and distributed;

(e) The changes requested are not of such a significant nature as to warrant a reissuance or revision of the flood insurance study or maps and will be deferred until such time as a significant change occurs;
(f) An additional 90 days is required to evaluate the scientific or technical data submitted; or
(g) Additional data are required to support the revision request.
(h) The required payment has not been submitted in accordance with 44 CFR part 72, no review will be conducted and no determination will be issued until payment is received.
[51 FR 30315, Aug. 25, 1986; 61 FR 46331, Aug. 30, 1996; 62 FR 5736, Feb. 6, 1997]

§ 65.10 Mapping of areas protected by levee systems.

(a) General. For purposes of the NFIP, FEMA will only recognize in its flood hazard and risk mapping effort those levee systems that meet, and continue to meet, minimum design, operation, and maintenance standards that are consistent with the level of protection sought through the comprehensive flood plain management criteria established by § 60.3 of this subchapter. Accordingly, this section describes the types of information FEMA needs to recognize, on NFIP maps, that a levee system provides protection from the base flood. This information must be supplied to FEMA by the community or other party seeking recognition of such a levee system at the time a flood risk study or restudy is conducted, when a map revision under the provisions of Part 65 of this subchapter is sought based on a levee system, and upon request by the Administrator during the review of previously recognized structures. The FEMA review will be for the sole purpose of establishing appropriate risk zone determinations for NFIP maps and shall not constitute a determination by FEMA as to how a structure or system will perform in a flood event.
(b) Design criteria. For levees to be recognized by FEMA, evidence that adequate design and operation and maintenance systems are in place to provide reasonable assurance that protection from the base flood exists must be provided. The following requirements must be met:
(1) Freeboard.
(i) Riverine levees must provide a minimum freeboard of three feet above the water-surface level of the base flood. An additional one foot above the minimum is required within 100 feet in either side of structures (such as bridges) riverward of the levee or wherever the flow is constricted. An additional one-half foot above the minimum at the upstream end of the levee, tapering to not less than the minimum at the downstream end of the levee, is also required.
(ii) Occasionally, exceptions to the minimum riverine freeboard requirement described in (b)(1)(i) of this section may be approved. Appropriate engineering analyses demonstrating adequate protection with a lesser freeboard must be submitted to support a request for such an exception. The material presented must evaluate the uncertainty in the estimated base flood elevation profile and include, but not necessarily be limited to an assessment of statistical confidence limits of the 100-year discharge; changes in stage-discharge relationships; and the sources, potential, and magnitude of debris, sediment, and ice accumulation. It must be also shown that the levee will remain structurally stable during the base flood when such additional loading considerations are imposed. Under no circumstances will freeboard of less than two feet be accepted.
(iii) For coastal levees, the freeboard must be established at one foot above the height of the one percent wave or the maximum wave runup (whichever is greater) associated with the 100-year stillwater surge elevation at the site.
(iv) Occasionally, exceptions to the minimum coastal levee freeboard requirement described in paragraph (b)(1)(iii) of this section, may be approved. Appropriate engineering analyses demonstrating adequate protection with a lesser freeboard must be submitted to support a request for such an exception. The material presented must evaluate the uncertainty in the estimated base flood loading conditions. Particular emphasis must be placed on the effects of wave attack and overtopping on the stability of the levee. Under no circumstances, however, will a freeboard of less than two feet above the 100-year stillwater surge elevation be accepted.
(2) Closures. All openings must be provided with closure devices that are structural parts of the system during operation and design according to sound engineering practice.
(3) Embankment protection. Engineering analyses must be submitted that demonstrate that no appreciable erosion of the levee embankment can be expected during the base flood, as a result of either currents or waves, and that anticipated erosion will not result in failure of the levee embankment or foundation directly or indirectly through reduction of the seepage path and subsequent instability. The factors to be addressed in such analyses include, but are not limited to: Expected flow velocities (especially in constricted areas); expected wind and wave action; ice loading; impact of debris; slope protection techniques; duration of flooding at various stages and velocities; embankment and foundation materials; levee alignment, bends, and transitions; and levee side slopes.
(4) Embankment and foundation stability. Engineering analyses that evaluate levee embankment stability must be submitted. The analyses provided shall evaluate

expected seepage during loading conditions associated with the base flood and shall demonstrate that seepage into or through the levee foundation and embankment will not jeopardize embankment or foundation stability. An alternative analysis demonstrating that the levee is designed and constructed for stability against loading conditions for Case IV as defined in the U.S. Army Corps of Engineers (COE) manual, "Design and Construction of Levees" (EM 1110-2-1913, Chapter 6, Section II), may be used. The factors that shall be addressed in the analyses include: Depth of flooding, duration of flooding, embankment geometry and length of seepage path at critical locations, embankment and foundation materials, embankment compaction, penetrations, other design factors affecting seepage (such as drainage layers), and other design factors affecting embankment and foundation stability (such as berms).

(5) Settlement. Engineering analyses must be submitted that assess the potential and magnitude of future losses of freeboard as a result of levee settlement and demonstrate that freeboard will be maintained within the minimum standards set forth in paragraph (b)(1) of this section. This analysis must address embankment loads, compressibility of embankment soils, compressibility of foundation soils, age of the levee system, and construction compaction methods. In addition, detailed settlement analysis using procedures such as those described in the COE manual, "Soil Mechanics Design. Settlement Analysis" (EM 1100-2-1904) must be submitted.

(6) Interior drainage. An analysis must be submitted that identifies the source(s) of such flooding, the extent of the flooded area, and, if the average depth is greater than one foot, the water-surface elevation(s) of the base flood. This analysis must be based on the joint probability of interior and exterior flooding and the capacity of facilities (such as drainage lines and pumps) for evacuating interior floodwaters.

(7) Other design criteria. In unique situations, such as those where the levee system has relatively high vulnerability, FEMA may require that other design criteria and analyses be submitted to show that the levees provide adequate protection. In such situations, sound engineering practice will be the standard on which FEMA will base its determinations. FEMA will also provide the rationale for requiring this additional information.

(c) Operation plans and criteria. For a levee system to be recognized, the operational criteria must be as described below. All closure devices or mechanical systems for internal drainage, whether manual or automatic, must be operated in accordance with an officially adopted operation manual, a copy of which must be provided to FEMA by the operator when levee or drainage system recognition is being sought or when the manual for a previously recognized system is revised in any manner. All operations must be under the jurisdiction of a Federal or State agency, an agency created by Federal or State law, or an agency of a community participating in the NFIP.

(1) Closures. Operation plans for closures must include the following:

(i) Documentation of the flood warning system, under the jurisdiction of Federal, State, or community officials, that will be used to trigger emergency operation activities and demonstration that sufficient flood warning time exists for the completed operation of all closure structures, including necessary sealing, before floodwaters reach the base of the closure.

(ii) A formal plan of operation including specific actions and assignments of responsibility by individual name or title.

(iii) Provisions for periodic operation, at not less than one-year intervals, of the closure structure for testing and training purposes.

(2) Interior drainage systems. Interior drainage systems associated with levee systems usually include storage areas, gravity outlets, pumping stations, or a combination thereof. These drainage systems will be recognized by FEMA on NFIP maps for flood protection purposes only if the following minimum criteria are included in the operation plan:

(i) Documentation of the flood warning system, under the jurisdiction of Federal, State, or community officials, that will be used to trigger emergency operation activities and demonstration that sufficient flood warning time exists to permit activation of mechanized portions of the drainage system.

(ii) A formal plan of operation including specific actions and assignments of responsibility by individual name or title.

(iii) Provision for manual backup for the activation of automatic systems.

(iv) Provisions for periodic inspection of interior drainage systems and periodic operation of any mechanized portions for testing and training purposes. No more than one year shall elapse between either the inspections or the operations.

(3) Other operation plans and criteria. Other operating plans and criteria may be required by FEMA to ensure that adequate protection is provided in specific situations. In such cases, sound emergency management practice will be the standard upon which FEMA determinations will be based.

(d) Maintenance plans and criteria. For levee systems to be recognized as providing protection from the base flood, the maintenance criteria must be as described herein. Levee systems must be maintained in accordance with an officially adopted maintenance plan, and a copy of this plan must be provided to FEMA by the owner of the levee system when recognition is being sought or when the plan for a previously recognized

system is revised in any manner. All maintenance activities must be under the jurisdiction of a Federal or State agency, an agency created by Federal or State law, or an agency of a community participating in the NFIP that must assume ultimate responsibility for maintenance. This plan must document the formal procedure that ensures that the stability, height, and overall integrity of the levee and its associated structures and systems are maintained. At a minimum, maintenance plans shall specify the maintenance activities to be performed, the frequency of their performance, and the person by name or title responsible for their performance.

(e) Certification requirements. Data submitted to support that a given levee system complies with the structural requirements set forth in paragraphs (b)(1) through (7) of this section must be certified by a registered professional engineer. Also, certified as-built plans of the levee must be submitted. Certifications are subject to the definition given at § 65.2 of this subchapter. In lieu of these structural requirements, a Federal agency with responsibility for levee design may certify that the levee has been adequately designed and constructed to provide protection against the base flood.

[51 FR 30316, Aug. 25, 1986]

§ 65.11 Evaluation of sand dunes in mapping coastal flood hazard areas.

(a) General conditions. For purposes of the NFIP, FEMA will consider storm-induced dune erosion potential in its determination of coastal flood hazards and risk mapping efforts. The criterion to be used in the evaluation of dune erosion will apply to primary frontal dunes as defined in § 59.1, but does not apply to artificially designed and constructed dunes that are not well-established with long-standing vegetative cover, such as the placement of sand materials in a dune-like formation.

(b) Evaluation criterion. Primary frontal dunes will not be considered as effective barriers to base flood storm surges and associated wave action where the cross-sectional area of the primary frontal dune, as measured perpendicular to the shoreline and above the 100-year stillwater flood elevation and seaward of the dune crest, is equal to, or less than, 540 square feet.

(c) Exceptions. Exceptions to the evaluation criterion may be granted where it can be demonstrated through authoritative historical documentation that the primary frontal dunes at a specific site withstood previous base flood storm surges and associated wave action.

[53 FR 16279, May 6, 1988]

§ 65.12 Revision of flood insurance rate maps to reflect base flood elevations caused by proposed encroachments.

(a) When a community proposes to permit encroachments upon the flood plain when a regulatory floodway has not been adopted or to permit encroachments upon an adopted regulatory floodway which will cause base flood elevation increases in excess of those permitted under paragraphs (c)(10) or (d)(3) of § 60.3 of this subchapter, the community shall apply to the Administrator for conditional approval of such action prior to permitting the encroachments to occur and shall submit the following as part of its application:

(1) A request for conditional approval of map change and the appropriate initial fee as specified by § 72.3 of this subchapter or a request for exemption from fees as specified by § 72.5 of this subchapter, whichever is appropriate;

(2) An evaluation of alternatives which would not result in a base flood elevation increase above that permitted under paragraphs (c)(10) or (d)(3) of § 60.3 of this subchapter demonstrating why these alternatives are not feasible;

(3) Documentation of individual legal notice to all impacted property owners within and outside of the community, explaining the impact of the proposed action on their property.

(4) Concurrence of the Chief Executive Officer of any other communities impacted by the proposed actions;

(5) Certification that no structures are located in areas which would be impacted by the increased base flood elevation;

(6) A request for revision of base flood elevation determination according to the provisions of § 65.6 of this part;

(7) A request for floodway revision in accordance with the provisions of § 65.7 of this part;

(b) Upon receipt of the Administrator's conditional approval of map change and prior to approving the proposed encroachments, a community shall provide evidence to the Administrator of the adoption of flood plain management ordinances incorporating the increased base flood elevations and/or revised floodway reflecting the post-project condition.

(c) Upon completion of the proposed encroachments, a community shall provide as-built certifications in accordance with the provisions of § 65.3 of this part. The Administrator will initiate a final map revision upon receipt of such certifications in accordance with Part 67 of this subchapter.

[53 FR 16279, May 6, 1988]

§ 65.13 Mapping and map revisions for areas subject to alluvial fan flooding.

This section describes the procedures to be followed and the types of information FEMA needs to recognize on a NFIP map that a structural flood control measure provides protection from the base flood in an area subject to alluvial fan flooding. This information must be supplied to FEMA by the community or other party seeking recognition of such a flood control measure at the time a flood risk study or restudy is conducted, when a map revision under the provisions of part 65 of this subchapter is sought, and upon request by the Administrator during the review of previously recognized flood control measures. The FEMA review will be for the sole purpose of establishing appropriate risk zone determinations for NFIP maps and shall not constitute a determination by FEMA as to how the flood control measure will perform in a flood event.

(a) The applicable provisions of §§ 65.2, 65.3, 65.4, 65.6, 65.8 and 65.10 shall also apply to FIRM revisions involving alluvial fan flooding.

(b) The provisions of § 65.5 regarding map revisions based on fill and the provisions of part 70 of this chapter shall not apply to FIRM revisions involving alluvial fan flooding. In general, elevations of a parcel of land or a structure by fill or other means, will not serve as a basis for removing areas subject to alluvial fan flooding from an area of special food hazards.

(c) FEMA will credit on NFIP maps only major structural flood control measures whose design and construction are supported by sound engineering analyses which demonstrate that the measures will effectively eliminate alluvial fan flood hazards from the area protected by such measures. The provided analyses must include, but are not necessarily limited to, the following:

(1) Engineering analyses that quantify the discharges and volumes of water, debris, and sediment movement associated with the flood that has a one-percent probability of being exceeded in any year at the apex under current watershed conditions and under potential adverse conditions (e.g., deforestation of the watershed by fire). The potential for debris flow and sediment movement must be assessed using an engineering method acceptable to FEMA. The assessment should consider the characteristics and availability of sediment in the drainage basin above the apex and on the alluvial fan.

(2) Engineering analyses showing that the measures will accommodate the estimated peak discharges and volumes of water, debris, and sediment, as determined in accordance with paragraph (c)(1) of this section, and will withstand the associated hydrodynamic and hydrostatic forces.

(3) Engineering analyses showing that the measures have been designed to withstand the potential erosion and scour associated with estimated discharges.

(4) Engineering analyses or evidence showing that the measures will provide protection from hazards associated with the possible relocation of flow paths from other parts of the fan.

(5) Engineering analyses that assess the effect of the project on flood hazards, including depth and velocity of floodwaters and scour and sediment deposition, on other areas of the fan.

(6) Engineering analyses demonstrating that flooding from sources other than the fan apex, including local runoff, is either insignificant or has been accounted for in the design.

(d) Coordination. FEMA will recognize measures that are adequately designed and constructed, provided that: evidence is submitted to show that the impact of the measures on flood hazards in all areas of the fan (including those not protected by the flood control measures), and the design and maintenance requirements of the measures, were reviewed and approved by the impacted communities, and also by State and local agencies that have jurisdiction over flood control activities.

(e) Operation and Maintenance Plans and Criteria. The requirements for operation and maintenance of flood control measures on areas subject to alluvial fan flooding shall be those specified under § 65.10, paragraphs (c) and (d), when applicable.

(f) Certification Requirements. Data submitted to support that a given flood control measure complies with the requirements set forth in paragraphs (c) (1) through (6) of this section must be certified by a registered professional engineer. Also, certified as-built plans of the flood control measures must be submitted. Certifications are subject to the definition given at § 65.2.

(Approved by the Office of Management and Budget under control number 3067-0147.)

[54 FR 33551, Aug. 15, 1989]

§ 65.14 Remapping of areas for which local flood protection systems no longer provide base flood protection.

(a) General.

(1) This section describes the procedures to follow and the types of information FEMA requires to designate flood control restoration zones. A community may be eligible to apply for this zone designation if the Administrator determines that it is engaged in the process of restoring a flood protection system that was:

(i) Constructed using Federal funds;

(ii) Recognized as providing base flood protection on the community's effective FIRM; and

(iii) Decertified by a Federal agency responsible for flood protection design or construction.
(2) Where the Administrator determines that a community is in the process of restoring its flood protection system to provide base flood protection, a FIRM will be prepared that designates the temporary flood hazard areas as a flood control restoration zone (Zone AR). Existing special flood hazard areas shown on the community's effective FIRM that are further inundated by Zone AR flooding shall be designated as a "dual" flood insurance rate zone, Zone AR/AE or AR/AH with Zone AR base flood elevations, and AE or AH with base flood elevations and Zone AR/AO with Zone AR base flood elevations and Zone AO with flood depths, or Zone AR/A with Zone AR base flood elevations and Zone A without base flood elevations.
(b) Limitations. A community may have a flood control restoration zone designation only once while restoring a flood protection system. This limitation does not preclude future flood control restoration zone designations should a fully restored, certified, and accredited system become decertified for a second or subsequent time.
(1) A community that receives Federal funds for the purpose of designing or constructing, or both, the restoration project must complete restoration or meet the requirements of 44 CFR 61.12 within a specified period, not to exceed a maximum of 10 years from the date of submittal of the community's application for designation of a flood control restoration zone.
(2) A community that does not receive Federal funds for the purpose of constructing the restoration project must complete restoration within a specified period, not to exceed a maximum of 5 years from the date of submittal of the community's application for designation of a flood control restoration zone. Such a community is not eligible for the provisions of § 61.12. The designated restoration period may not be extended beyond the maximum allowable under this limitation.
(c) Exclusions. The provisions of these regulations do not apply in a coastal high hazard area as defined in 44 CFR 59.1, including areas that would be subject to coastal high hazards as a result of the decertification of a flood protection system shown on the community's effective FIRM as providing base flood protection.
(d) Effective date for risk premium rates. The effective date for any risk premium rates established for Zone AR shall be the effective date of the revised FIRM showing Zone AR designations.
(e) Application and submittal requirements for designation of a flood control restoration zone. A community must submit a written request to the Administrator, signed by the community's Chief Executive Officer, for a flood plain designation as a flood control restoration zone. The request must include a legislative action by the community requesting the designation. The Administrator will not initiate any action to designate flood control restoration zones without receipt of the formal request from the community that complies with all requirements of this section. The Administrator reserves the right to request additional information from the community to support or further document the community's formal request for designation of a flood control restoration zone, if deemed necessary.
(1) At a minimum, the request from a community that receives Federal funds for the purpose of designing, constructing, or both, the restoration project must include:
(i) A statement whether, to the best of the knowledge of the community's Chief Executive Officer, the flood protection system is currently the subject matter of litigation before any Federal, State or local court or administrative agency, and if so, the purpose of that litigation;
(ii) A statement whether the community has previously requested a determination with respect to the same subject matter from the Administrator, and if so, a statement that details the disposition of such previous request;
(iii) A statement from the community and certification by a Federal agency responsible for flood protection design or construction that the existing flood control system shown on the effective FIRM was originally built using Federal funds, that it no longer provides base flood protection, but that it continues to provide protection from the flood having at least a 3-percent chance of occurrence during any given year;
(iv) An official map of the community or legal description, with supporting documentation, that the community will adopt as part of its flood plain management measures, which designates developed areas as defined in § 59.1 and as further defined in § 60.3(f).
(v) A restoration plan to return the system to a level of base flood protection. At a minimum, this plan must:
(A) List all important project elements, such as acquisition of permits, approvals, and contracts and construction schedules of planned features;
(B) Identify anticipated start and completion dates for each element, as well as significant milestones and dates;
(C) Identify the date on which "as built" drawings and certification for the completed restoration project will be submitted. This date must provide for a restoration period not to exceed the maximum allowable restoration period for the flood protection system, or;
(D) Identify the date on which the community will submit a request for a finding of adequate progress that meets all requirements of § 61.12. This date may not exceed the maximum allowable restoration period for the flood protection system;

(vi) A statement identifying the local project sponsor responsible for restoration of the flood protection system;
(vii) A copy of a study, performed by a Federal agency responsible for flood protection design or construction in consultation with the local project sponsor, which demonstrates a Federal interest in restoration of the system and which deems that the flood protection system is restorable to a level of base flood protection.
(viii) A joint statement from the Federal agency responsible for flood protection design or construction involved in restoration of the flood protection system and the local project sponsor certifying that the design and construction of the flood control system involves Federal funds, and that the restoration of the flood protection system will provide base flood protection;
(2) At a minimum, the request from a community that receives no Federal funds for the purpose of constructing the restoration project must:
(i) Meet the requirements of § 65.14(e)(1)(i) through (iv);
(ii) Include a restoration plan to return the system to a level of base flood protection. At a minimum, this plan must:
(A) List all important project elements, such as acquisition of permits, approvals, and contracts and construction schedules of planned features;
(B) Identify anticipated start and completion dates for each element, as well as significant milestones and dates; and
(C) Identify the date on which "as built" drawings and certification for the completed restoration project will be submitted. This date must provide for a restoration period not to exceed the maximum allowable restoration period for the flood protection system;
(iii) Include a statement identifying the local agency responsible for restoration of the flood protection system;
(iv) Include a copy of a study, certified by registered Professional Engineer, that demonstrates that the flood protection system is restorable to provide protection from the base flood;
(v) Include a statement from the local agency responsible for restoration of the flood protection system certifying that the restored flood protection system will meet the applicable requirements of Part 65; and
(vi) Include a statement from the local agency responsible for restoration of the flood protection system that identifies the source of funds for the purpose of constructing the restoration project and a percentage of the total funds contributed by each source. The statement must demonstrate, at a minimum, that 100 percent of the total financial project cost of the completed flood protection system has been appropriated.
(f) Review and response by the Administrator. The review and response by the Administrator shall be in accordance with procedures specified in § 65.9.
(g) Requirements for maintaining designation of a flood control restoration zone. During the restoration period, the community and the cost-sharing Federal agency, if any, must certify annually to the FEMA Regional Office having jurisdiction that the restoration will be completed in accordance with the restoration plan within the time period specified by the plan. In addition, the community and the cost-sharing Federal agency, if any, will update the restoration plan and will identify any permitting or construction problems that will delay the project completion from the restoration plan previously submitted to the Administrator. The FEMA Regional Office having jurisdiction will make an annual assessment and recommendation to the Administrator as to the viability of the restoration plan and will conduct periodic on-site inspections of the flood protection system under restoration.
(h) Procedures for removing flood control restoration zone designation due to adequate progress or complete restoration of the flood protection system. At any time during the restoration period:
(1) A community that receives Federal funds for the purpose of designing, constructing, or both, the restoration project shall provide written evidence of certification from a Federal agency having flood protection design or construction responsibility that the necessary improvements have been completed and that the system has been restored to provide protection from the base flood, or submit a request for a finding of adequate progress that meets all requirements of § 61.12. If the Administrator determines that adequate progress has been made, FEMA will revise the zone designation from a flood control restoration zone designation to Zone A99.
(2) After the improvements have been completed, certified by a Federal agency as providing base flood protection, and reviewed by FEMA, FEMA will revise the FIRM to reflect the completed flood control system.
(3) A community that receives no Federal funds for the purpose of constructing the restoration project must provide written evidence that the restored flood protection system meets the requirements of Part 65. A community that receives no Federal funds for the purpose of constructing the restoration project is not eligible for a finding of adequate progress under § 61.12.
(4) After the improvements have been completed and reviewed by FEMA, FEMA will revise the FIRM to reflect the completed flood protection system.
(i) Procedures for removing flood control restoration zone designation due to non-compliance with the restoration schedule or as a result of a finding that satisfactory progress is not being made to complete the

restoration. At any time during the restoration period, should the Administrator determine that the restoration will not be completed in accordance with the time frame specified in the restoration plan, or that satisfactory progress is not being made to restore the flood protection system to provide complete flood protection in accordance with the restoration plan, the Administrator shall notify the community and the responsible Federal agency, in writing, of the determination, the reasons for that determination, and that the FIRM will be revised to remove the flood control restoration zone designation. Within thirty (30) days of such notice, the community may submit written information that provides assurance that the restoration will be completed in accordance with the time frame specified in the restoration plan, or that satisfactory progress is being made to restore complete protection in accordance with the restoration plan, or that, with reasonable certainty, the restoration will be completed within the maximum allowable restoration period. On the basis of this information the Administrator may suspend the decision to revise the FIRM to remove the flood control restoration zone designation. If the community does not submit any information, or if, based on a review of the information submitted, there is sufficient cause to find that the restoration will not be completed as provided for in the restoration plan, the Administrator shall revise the FIRM, in accordance with 44 CFR Part 67, and shall remove the flood control restoration zone designations and shall redesignate those areas as Zone A1-30, AE, AH, AO, or A.

[59 FR 53599, Oct. 25, 1994; 62 FR 55717, Oct. 27,]

§ 65.15 Remapping of areas for which local flood protection systems no longer provide 100-year flood protection.

(a) General.

(1) This section describes the procedures to follow and the types of information FEMA requires to designate flood control restoration zones. A community may be eligible to apply for this zone designation if the Director determines that it is engaged in the process of restoring a flood protection system that was:

(i) Constructed using Federal funds;

(ii) Recognized as providing 100-year flood protection on the community's effective Flood Insurance Rate Map; and

(iii) Decertified by a Federal agency responsible for flood protection design or construction.

(2) Where the Director determines that a community is in the process of restoring its flood protection system to provide 100-year minimum flood protection, a Flood Insurance Rate Map will be prepared that designates the temporary flood hazard areas as a flood control restoration zone (Zone AR). Existing Special Flood Hazard Areas shown on the community's effective Flood Insurance Rate Map that are further inundated by Zone AR flooding shall be designated as a "dual" flood insurance rate zone, Zone AR/AE or AR/AH with Zone AR base flood elevations, and AE or AH with base flood elevations and Zone AR/AO with Zone AR base flood elevations and Zone AO with flood depths, or Zone AR/A with Zone AR base flood elevations and Zone A without base flood elevations.

(b) Limitations. A community may have a flood control restoration zone designation only once for the purposes of restoring a given flood protection system and must complete restoration of the system or meet the requirements of 44 CFR 61.12 within a specified period, not to exceed ten (10) years from the date of submittal of the community's application for designation of a flood control restoration zone. The community may not extend this period. The information specified in this section must be supplied to FEMA by the community as part of its request for designation of a flood control restoration zone.

(c) Exclusions. The provisions of these regulations do not apply in a coastal high hazard area as defined in 44 CFR 59.1, including areas that would be subject to coastal high hazards as a result of the decertification of a flood protection system shown on the community's effective Flood Insurance Rate Map (FIRM) as providing 100-year protection.

(d) Effective date for risk premium rates. The effective date for any risk premium rates established for Zone AR shall be the effective date of the revised Flood Insurance Rate Map showing AR Zone designations.

(e) Application and submittal requirements for designation of a flood control restoration zone. A community must submit a written request to the Director, signed by the community's Chief Executive Officer, for a flood plain designation as a flood control restoration zone. The request must include a legislative action by the community requesting the designation. The Director will not initiate any action to designate flood control restoration zones without receipt of the formal request from the community that complies with all requirements of this section. The Director reserves the right to request additional information from the community to support or further document the community's formal request for designation of a flood control restoration zone, if deemed necessary. At a minimum, each request must include the following:

(1) A statement whether, to the best of the knowledge of the community's Chief Executive Officer, the flood protection system is currently the subject matter of litigation before any Federal, State or local court or administrative agency, and if so, the purpose of that litigation;

(2) A statement whether the community has previously requested a determination with respect to the same

subject matter from the Director, and if so, a statement that details the disposition of such previous request;
(3) A statement from the community and certification by a Federal agency responsible for flood protection design or construction that the existing flood control system shown on the effective Flood Insurance Rate Map was built using Federal funds, that it no longer provides 100-year flood protection, but that it continues to provide at least a 35-year level of protection;
(4) A statement identifying the local project sponsor responsible for restoration of the flood protection system to the 100-year or greater level of flood protection;
(5) a copy of a study, performed by a Federal agency responsible for flood protection design or construction in consultation with the local project sponsor, which demonstrates a Federal interest in restoration of the system and which deems that the flood protection system is restorable to a 100-year or greater level of flood protection.
(6) A joint statement from the Federal agency responsible for flood protection design or construction involved in restoration of the flood protection system and the local project sponsor certifying that the design and construction of the flood control system involves Federal funds, and that the restoration of the flood protection system will provide 100-year or greater flood protection;
(7) A restoration plan to return the system to a 100-year or greater level of protection. At a minimum, this plan must:
(i) List all important project elements, such as acquisition of permits, approvals, and contracts and construction schedules of planned features;
(ii) Identify anticipated start and completion dates for each element, as well as significant milestones and dates;
(iii) Identify the date on which "as built" drawings and certification for the completed restoration project will be submitted. This date must provide for a restoration period not to exceed, ten (10) years from the date of submittal of the community's application for designation as a flood control restoration zone, or;
(iv) Identify the date on which the community will submit a request for a finding of adequate progress that meets all requirements of § 61.12. This date may not exceed ten (10) years from the date of submittal of the community's application for designation as a flood control restoration zone;
(8) An official map of the community or legal description, with supporting documentation, that the community will adopt as part of its floodplain management measures, which designates developed areas as defined in § 59.1 and as further defined in § 60.3(f).
(f) Review and response by the Director. The review and response by the Director shall be in accordance with procedures specified in § 65.9.
(g) Requirements for maintaining designation of a flood control restoration zone. During the restoration period, the community and the cost-sharing Federal agency must certify annually to the FEMA Regional Office having jurisdiction that the restoration will be completed in accordance with the restoration plan within the time period specified by the plan. In addition, the community and the Federal agency will update the restoration plan and will identify any permitting or construction problems that will delay the project completion from the restoration plan previously submitted to the Director. The FEMA Regional Office having jurisdiction will make an annual assessment and recommendation to the Director as to the viability of the restoration plan and will conduct periodic on-site inspections of the flood protection system under restoration.
(h) Procedures for removing flood control restoration zone designation due to adequate progress or complete restoration of the flood protection system. At any time during the restoration period, the community may provide written evidence of certification from a Federal agency having flood protection design or construction responsibility that the necessary improvements have been completed and that the system has been restored to provide a minimum 100-year level of protection, or may submit a request for a finding of adequate progress that meets all requirements of section 61.12. If the Director determines that adequate progress has been made, FEMA will revise the zone designation from a flood control restoration zone designation to Zone A99. After the improvements have been completed and certified by a Federal agency as providing a minimum 100-year level of protection, FEMA will revise the Flood Insurance Rate Map to reflect the completed flood control system.
(i) Procedures for removing flood control restoration zone designation due to non-compliance with the restoration schedule or as a result of a finding that satisfactory progress is not being made to complete the restoration. At any time during the restoration period, should the Director determine that the restoration will not be completed in accordance with the time frame specified in the restoration plan, or that satisfactory progress is not being made to restore the flood protection system to provide complete flood protection in accordance with the restoration plan, the Director shall notify the community and the responsible Federal agency, in writing, of the determination, the reasons for that determination, and that the Flood Insurance Rate Map will be revised to remove the flood control restoration zone designation. Within thirty (30) days of such notice, the community may submit written information that provides assurance that the restoration will be completed in accordance with the time frame specified in the restoration plan, or that satisfactory progress

is being made to restore complete protection in accordance with the restoration plan, or that, with reasonable certainty, the restoration will be completed within the maximum restoration period, which may not exceed ten (10) years from the date of submittal of the community's application for designation of a flood control restoration zone. On the basis of this information the Director may suspend the decision to revise the Flood Insurance Rate Map to remove the flood control restoration zone designation. If the community does not submit any information, or if, based on a review of the information submitted, there is sufficient cause to find that the restoration will not be completed as provided for in the restoration plan, the Director shall revise the Flood Insurance Rate Map, in accordance with 44 CFR Part 67, and shall remove the flood control restoration zone designations and shall redesignate those areas as Zone A1-30, AE, AH, AO, or A.
[59 FR 53599, Oct. 25, 1994; 62 FR 55717, Oct. 27, 1997]

§ 65.16 Standard Flood Hazard Determination Form and Instructions.

Section 528 of the National Flood Insurance Reform Act of 1994 (42 U.S.C. 1365(a)) directs that FEMA shall develop a standard form for determining, in the case of a loan secured by improved real estate or a mobile home, whether the building or mobile home is located in an area identified by the Director as an area having special flood hazards and in which flood insurance under this title is available. The purpose of the form is to determine whether a building or mobile home is located within an identified Special Flood Hazard Area (SFHA), whether flood insurance is required, and whether federal flood insurance is available. Use of this form will ensure that required flood insurance coverage is purchased for structures located in an SFHA, and will assist federal entities for lending regulation in assuring compliance with these purchase requirements. The Standard Flood Hazard Determination Form and accompanying instructions are found in Appendix A to this Part.
[60 FR 35281, July 6, 1995]

§ 65.17 Review of determinations.

This section describes the procedures that shall be followed and the types of information required by FEMA to review a determination of whether a building or manufactured home is located within an identified Special Flood Hazard Area (SFHA).
(a) General conditions. The borrower and lender of a loan secured by improved real estate or a manufactured home may jointly request that FEMA review a determination that the building or manufactured home is located in an identified SFHA. Such a request must be submitted within 45 days of the lender's notification to the borrower that the building or manufactured home is in the SFHA and that flood insurance is required. Such a request must be submitted jointly by the lender and the borrower and shall include the required fee and technical information related to the building or manufactured home. Elevation data will not be considered under the procedures described in this section.
(b) Data and other requirements. Items required for FEMA's review of a determination shall include the following:
(1) Payment of the required fee by check or money order, in U.S. funds, payable to the National Flood Insurance Program;
(2) A request for FEMA's review of the determination, signed by both the borrower and the lender;
(3) A copy of the lender's notification to the borrower that the building or manufactured home is in an SFHA and that flood insurance is required (the request for review of the determination must be postmarked within 45 days of borrower notification);
(4) A completed Standard Flood Hazard Determination Form for the building or manufactured home, together with a legible hard copy of all technical data used in making the determination; and
(5) A copy of the effective NFIP map (Flood Hazard Boundary Map (FHBM) or Flood Insurance Rate Map (FIRM)) panel for the community in which the building or manufactured home is located, with the building or manufactured home location indicated. Portions of the map panel may be submitted but shall include the area of the building or manufactured home in question together with the map panel title block, including effective date, bar scale, and north arrow.
(c) Review and response by FEMA. Within 45 days after receipt of a request to review a determination, FEMA will notify the applicants in writing of one of the following:
(1) Request submitted more than 45 days after borrower notification; no review will be performed and all materials are being returned;
(2) Insufficient information was received to review the determination; therefore, the determination stands until a complete submittal is received; or
(3) The results of FEMA's review of the determination, which shall include the following:
(i) The name of the NFIP community in which the building or manufactured home is located;
(ii) The property address or other identification of the building or manufactured home to which the determination applies;
(iii) The NFIP map panel number and effective date upon which the determination is based;
(iv) A statement indicating whether the building or manufactured home is within the Special Flood Hazard Area;

(v) The time frame during which the determination is effective.
[60 FR 62218, Dec. 5, 1995]

PART 70 -- PROCEDURE FOR MAP CORRECTION

Authority: 42 U.S.C. 4001 et seq.; Reorganization Plan No. 3 of 1978, 43 FR 41943, 3 CFR, 1978 Comp., p. 329; E.O. 12127 of March 31, 1979, 44 FR 19367, 3 CFR, 1979 Comp., p. 376.
Source: 41 FR 46991, Oct. 26, 1976. Redesignated at 44 FR 31177, May 31, 1979; 50 FR 36028, Sept. 4, 1985; 59 FR 53600, Oct. 25, 1994; 61 FR 46331, Aug. 30, 1996; 62 FR 5736, Feb. 6, 1997; 62 FR 55718, Oct. 27, 1997, unless otherwise noted.

§ 70.1 Purpose of part.

The purpose of this part is to provide an administrative procedure whereby the Administrator will review the scientific or technical submissions of an owner or lessee of property who believes his property has been inadvertently included in designated A, AO, A1-30, AE, AH, A99, AR, AR/A1-30, AR/AE, AR/AO, AR/AH, AR/A, VO, V1-30, VE, and V Zones, as a result of the transposition of the curvilinear line to either street or to other readily identifiable features. The necessity for this part is due in part to the technical difficulty of accurately delineating the curvilinear line on either an FHBM or FIRM. These procedures shall not apply when there has been any alteration of topography since the effective date of the first NFIP map (i.e., FHBM or FIRM) showing the property within an area of special flood hazard. Appeals in such circumstances are subject to the provisions of part 65 of this subchapter.
[41 FR 46991, Oct. 26, 1976. Redesignated at 44 FR 31177, May 31, 1979, and amended at 48 FR 44553, Sept. 29, 1983; 49 FR 4751, Feb. 8, 1984; 50 FR 36028, Sept. 4, 1985; 51 FR 30317, Aug. 25, 1986; 59 FR 53600, Oct. 25, 1994; 62 FR 55718, Oct. 27, 1997]

§ 70.2 Definitions.

The definitions set forth in Part 59 of this subchapter are applicable to this part.

§ 70.3 Right to submit technical information.

(a) Any owner or lessee of property (applicant) who believes his property has been inadvertently included in a designated A, AO, A1-30, AE, AH, A99, AR, AR/A1-30, AR/AE, AR/AO, AR/AH, AR/A, VO, V1-30, VE, and V Zones on a FHBM or a FIRM, may submit scientific or technical information to the Administrator for the Administrator's review.

(b) Scientific and technical information for the purpose of this Part may include, but is not limited to the following:
(1) An actual copy of the recorded plat map bearing the seal of the appropriate recordation official (e.g. County Clerk, or Recorder of Deeds) indicating the official recordation and proper citation (Deed or Plat Book Volume and Page Numbers), or an equivalent identification where annotation of the deed or plat book is not the practice.
(2) A topographical map showing (i) ground elevation contours in relation to the National Geodetic Vertical Datum (NVGD) of 1929, (ii) the total area of the property in question, (iii) the location of the structure or structures located on the property in question, (iv) the elevation of the lowest adjacent grade to a structure or structures and (v) an indication of the curvilinear line which represents the area subject to inundation by a base flood. The curvilinear line should be based upon information provided by any appropriate authoritative source, such as a Federal Agency, the appropriate state agency (e.g. Department of Water Resources), a County Water Control District, a County or City Engineer, a Federal Emergency Management Agency Flood Insurance Study, or a determination by a Registered Professional Engineer;
(3) A copy of the FHBM or FIRM indicating the location of the property in question;
(4) A certification by a Registered Professional Engineer or Licensed Land Surveyor that the lowest grade adjacent to the structure is above the base flood elevation.
[41 FR 46991, Oct. 26, 1976. Redesignated at 44 FR 31177, May 31, 1979, and amended at 48 FR 44544 and 44553, Sept. 29, 1983; 49 FR 4751, Feb. 8, 1984; 50 FR 36028, Sept. 4, 1985; 51 FR 30317, Aug. 25, 1986; 53 FR 16280, May 6, 1988; 59 FR 53601, Oct. 25, 1994; 62 FR 55719, Oct. 27, 1997]

§ 70.4 Review by the Director.

The Administrator, after reviewing the scientific or technical information submitted under the provisions of § 70.3, shall notify the applicant in writing of his/her determination within 60 days from the date of receipt of the applicant's scientific or technical information that either the ground elevations of an entire legally defined parcel of land or the elevation of the lowest adjacent grade to a structure have been compared with the elevation of the base flood and that:
(a) The property is within a designated A, AO, A1-30, AE, AH, A99, AR, AR/A1-30, AR/AE, AR/AO, AR/AH, AR/A, VO, V1-30, VE, or V Zone, and shall set forth the basis of such determination; or
(b) The property should not be included within a designated A, AO, A1-30, AE, AH, A99, AR, AR/A1-30, AR/AE, AR/AO, AR/AH, AR/A, VO, V1-30, VE, or V

Zone and that the FHBM or FIRM will be modified accordingly; or
(c) An additional 60 days is required to make a determination.
[41 FR 46991, Oct. 26, 1976. Redesignated at 44 FR 31177, May 31, 1979, and amended at 48 FR 44553, Sept. 29, 1983; 49 FR 4751, Feb. 8, 1984; 50 FR 36028, Sept. 4, 1985; 51 FR 30317, Aug. 25, 1986; 59 FR 53601, Oct. 25, 1994; 62 FR 55719, Oct. 27, 1997]

§ 70.5 Letter of Map Amendment.
Upon determining from available scientific or technical information that a FHBM or a FIRM requires modification under the provisions of § 70.4(b), the Administrator shall issue a Letter of Map Amendment which shall state:
(a) The name of the Community to which the map to be amended was issued;
(b) The number of the map;
(c) The identification of the property to be excluded from a designated A, AO, A1-30, AE, AH, A99, AR, AR/A1-30, AR/AE, AR/AO, AR/AH, AR/A, VO, V1-30, VE, or V Zone.
[41 FR 46991, Oct. 26, 1976. Redesignated at 44 FR 31177, May 31, 1979, and amended at 48 FR 44553, Sept. 29, 1983; 49 FR 4751, Feb. 8, 1984; 50 FR 36028, Sept. 4, 1985; 59 FR 53601, Oct. 25, 1994; 62 FR 55719, Oct. 27, 1997]

§ 70.6 Distribution of Letter of Map Amendment.
(a) A copy of the Letter of Map Amendment shall be sent to the applicant who submitted scientific or technical data to the Administrator.
(b) A copy of the Letter of Map Amendment shall be sent to the local map repository with instructions that it be attached to the map which the Letter of Map Amendment is amending.
(c) A copy of the Letter of Map Amendment shall be sent to the map repository in the state with instructions that it be attached to the map which it is amending.
(d) A copy of the Letter of Map Amendment will be sent to any community or governmental unit that requests such Letter of Map Amendment.
(e) [Reserved]
(f) A copy of the Letter of Map Amendment will be maintained by the Agency in its community case file.
[41 FR 46991, Oct. 26, 1976. Redesignated at 44 FR 31177, May 31, 1979, and amended at 48 FR 44544 and 44553, Sept. 29, 1983; 49 FR 4751, Feb. 8, 1984]

§ 70.7 Notice of Letter of Map Amendment.
(a) The Administrator, shall not publish a notice in the FEDERAL REGISTER that the FIRM for a particular community has been amended by letter determination pursuant to this part unless such amendment includes alteration or change of base flood elevations established pursuant to Part 67. Where no change of base flood elevations has occurred, the Letter of Map Amendment provided under §§ 70.5 and 70.6 serves to inform the parties affected.
[42 FR 56953, Oct. 31, 1977. Redesignated at 44 FR 31177, May 31, 1979; 48 FR 28278, June 21, 1983; 48 FR 44544, Sept. 29, 1983; 49 FR 4751, Feb. 8, 1984]

§ 70.8 Premium refund after Letter of Map Amendment.
A Standard Flood Insurance Policyholder whose property has become the subject of a Letter of Map Amendment under this part may cancel the policy within the current policy year and receive a premium refund under the conditions set forth in § 62.5 of this subchapter.

§ 70.9 Review of proposed projects.
An individual who proposes to build one or more structures on a portion of property that may be included inadvertently in a Special Flood Hazard Area (SFHA) may request FEMA's comments on whether the proposed structure(s), if built as proposed, will be in the SFHA. FEMA's comments will be issued in the form of a letter, termed a Conditional Letter of Map Amendment. The data required to support such requests are the same as those required for final Letters of Map Amendment in accordance with § 70.3, except as-built certification is not required and the requests shall be accompanied by the appropriate payment, in accordance with 44 CFR part 72. All such requests for CLOMAs shall be submitted to the FEMA Regional Office servicing the community's geographic area or to the FEMA Headquarters Office in Washington, DC.
[51 FR 30318, Aug. 25, 1986; 61 FR 46331, Aug. 30, 1996; 62 FR 5736, Feb. 6, 1997]

UNIT 6: ADDITIONAL REGULATORY MEASURES

In this unit

This unit begins with a discussion of the problem that arises when regulations are so restrictive they effectively "take" people's freedom to use their properties.

It then describes some of the more common regulatory approaches that exceed the NFIP's minimum standards which result in a better and more appropriate local floodplain management program. These include:

- State required regulatory standards,
- Higher local standards,
- Regulations that address special flood hazards, and
- Environmental protection regulations.

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INTRODUCTION

> ***44 CFR 60.1(d)*** *The criteria set forth in this subpart are minimum standards for the adoption of flood plain management regulations by flood-prone... communities. Any community may exceed the minimum criteria under this Part by adopting more comprehensive flood plain management regulations utilizing the standards such as contained in Subpart C of this part. In some instances, community officials may have access to information or knowledge of conditions that require, particularly for human safety, higher standards than the minimum criteria set forth in Subpart A of this part. Therefore, any flood plain management regulations adopted by a State or a community which are more restrictive than the criteria set forth in this part are encouraged and shall take precedence.*

The NFIP regulatory standards are minimums. They may not be appropriate for every local situation or unique circumstances.

Therefore, states and communities are encouraged to enact more restrictive requirements where needed to better protect people and properties from the local flood hazard.

This unit reviews the more common approaches to this.

Many of these more restrictive requirements are eligible for credit under the Community Rating System (CRS), a program which provides insurance premium discounts to policyholders in communities with more restrictive floodplain management programs (see Unit 9, Section C). Where CRS credit is provided, it is highlighted with this CRS logo.

A. TAKING

Why not simply tell people that they can't build in the floodplain? If we did, we wouldn't have to worry about new buildings getting flooded and the regulations would be simple to administer: Just say "No."

While this regulatory standard appears desirable, it has one fatal legal problem: It could be a "taking."

The Fifth Amendment to the Constitution states, "Nor shall property be taken for public use without just compensation." The Constitution contains this provision because in England, the king could take property and use it for his own purpose—such as quartering troops or hunting— without compensation.

The term "taking" has come to mean any action by a government agency that relieves a person of his or her property without payment.

Government agencies possess the authority to acquire privately owned land. Under the power of eminent domain, they can acquire land without the owner's agreement provided the acquisition clearly is for a demonstrably public purpose and official condemnation proceedings are followed. Some common examples of eminent domain actions are:

- Purchase of land for roads and public works projects.
- The development of public park land.
- Utility acquisition of rights of way for transmission lines, etc.

Courts have ruled that a taking may occur when the government enacts a law, standard or regulation that limits the use of the land to the extent that the owner has been deprived of all of his or her economic interest in using the property. Thus, the government has "taken" the property under a legal provision known as inverse condemnation.

In cases where a court has found a taking, the governmental body has been required to compensate the property owner. Often, though, the regulations are retracted as applied to that property.

Usually, courts undertake a complicated balancing of public and private interests in deciding a taking issue. The courts will consider such factors as:

- Regulatory objectives.
- The harm posed by uncontrollable development.
- Reasonableness of the regulations.
- Severity of the economic impact upon the private property owner

Case	Issue	Decision/Impact
Village of Euclid v. Ambler Realty Company (1926)	The use of police power to regulate land use	The court upheld the basic concept of zoning.
Turnpike Realty Co. v. Town of Dedham (1972)	Challenge to the constitutionality of the NFIP	The court upheld the floodplain management regulations.
Just v. Marienette (1972)	A wetland regulatory case	The court decided that a landowner does not have the unlimited right to use the land for a purpose which is unsuited to its natural state or that will injure the rights of others.
Texas Landowners Association v. Harris (1978)	Challenge to the validity of the NFIP and its mitigation requirements	The courts held that the NFIP was reasonable. A community could not claim a taking if insurance or disaster relief was denied for failure to comply with NFIP standards, because they are benefits, not rights.
First Evangelical Lutheran Church of Glendale v. Los Angeles County, LA (1987)	Whether a temporary building moratorium that was deemed a taking would require compensation	The U.S. Supreme Court held that temporary regulatory takings could require compensation. This case was sent back to the state to decide if a taking had occurred. The state endorsed the floodplain regulations and held that the regulations were not a taking.
Adolph v. FEMA (1988)	Whether the parish floodplain management regulations adopted constituted a taking	The court upheld that the NFIP as a whole is not a taking, nor are the parish regulations.
April v. City of Broken Arrow (1989)	Whether two Oklahoma floodplain ordinances constituted a taking (requirement for elevation of new homes to 1 foot above the 100-year flood elevation)	The courts accepted the general proposition that local public officials must be afforded reasonable *elasticity* in planning and implementing legitimate state interests and held that regulations were valid.
Lucas v. South Carolina Coastal Council (1992)	South Carolina Supreme Court—whether the South Carolina Beachfront Management Act constituted a taking. U.S. Supreme Court—whether the property owner was entitled to compensation for his alleged "total loss of value" attributed to the Beachfront Management Act	The South Carolina Supreme Court ruled that the Act did not constitute a taking and reversed the trial court's award of $1.2 million to Lucas. The U.S. Supreme Court ruled that where the value of a property is essentially "destroyed" by regulation, compensation should be paid.
Dolan v. Tigard (1994)	Imposition of a floodplain bike path as a condition of a permit to expand commercial structures	The U.S. Supreme Court found that the business owners should not be required to construct a bike path to obtain the permit.

Figure 6-1. Selected cases of challenges to land use regulations

Very restrictive floodplain regulations and the regulatory standards of the NFIP have been challenged as a taking in a number of cases. Figure 6-1 summarizes important cases challenging the legality or constitutionality of NFIP regulations.

Most NFIP criteria are performance standards that do not prohibit development of a floodplain site provided the performance standards are met. For example, development in the floodway is prohibited only if it increases flood heights. Permit applicants who can find a way to develop in the floodway without increasing the flood problem are permitted to do so. These performance-oriented standards of the NFIP have never been ruled as a taking. This is highly significant, given that more than 19,000 communities administer floodplain management ordinances.

Although it may be more costly to build according to the NFIP standards and, in some instances, it may not be economical to develop a property, the performance standard is a valid exercise of the police power because it is based on a legitimate public purpose: preventing flood damage. Floodway requirements in particular are defensible because they prevent the actions of one property owner from increasing flood damage to his or her neighbors.

The NFIP regulatory criteria have not lost a taking case because they allow any floodprone site to be built on as long as precautions are taken to protect new structures and neighboring property from flood damage. The owners are not denied all economic uses of their properties as long as their construction accounts for the level of hazard.

Some courts have supported regulatory standards that are more restrictive than NFIP regulations, such as complete prohibitions of new buildings or new residences in the floodway. These cases tied the prohibition to the hazard and the need to protect the public from hazards created by the development.

Things need to be reasonable. For example, a complete prohibition of development in a shallow flooding area where there is no velocity may not be considered as "reasonable" by a court.

The rationale does not always have to be tied to property damage. For example, in upholding the State's prohibition of new buildings in the floodway, the Illinois Supreme Court noted that while buildings could be protected, the residents would be surrounded by moving water during floods, preventing access by emergency vehicles.

> "The prohibition takes into consideration not only the concern about preventing further flooding, but also the concern about the need to provide disaster relief services and the need for the expenditure of state funds on shelters and rescue services for victims of flooding." (Beverly Bank v. Illinois Department of Transportation, September 19, 1991).

The lesson is that before your community enacts a regulatory provision that severely restricts the use of property, your community's attorney should review the provision to be sure it will not be overturned as a taking. Regulatory standards that are reasonable, tied to the hazard and support public objectives should be upheld.

B. STATE REGULATORY STANDARDS

All states now allow communities to regulate development to the NFIP standards. Some states also require that their communities regulate to a higher standard for certain aspects of floodplain management.

This section reviews the more common state requirements. If your ordinance was based on a state model, you should be compliant with all state requirements as well as the NFIP standards.

According to a 1995 survey by the Association of State Floodplain Managers (ASFPM), 24 states have some kind of riverine standards more restrictive than those of the NFIP. Of those, 10 require that communities regulate to the higher standard; three states have opted to implement and enforce the higher standard directly; and 10 states use a combination of both approaches.

Eight states prohibit buildings or residences from their floodways at least in some areas. Twelve states allow less than the NFIP's one-foot rise in the floodway. States are more likely to regulate some or all of the floodways than the flood fringes, because they require more technical expertise than those that apply to the fringe and because the impacts of floodway development are more extensive, often going beyond local corporate limits.

The ASFPM survey found that 32 states have enacted some regulations governing shoreline development. For states with ocean or bay coasts, this regulatory authority is usually implemented under the state's coastal zone management program. All the Great Lakes states have lakeshore regulatory standards or permit programs, usually administered as part of state shoreland management programs.

Twenty-three states now have standards for their coastal high hazard areas that exceed those of the NFIP. Sixteen states regulate areas subject to coastal erosion. Sixteen states have regulations or standards to preserve or protect sand dunes and 16 states regulate or set higher standards for lakeshore areas.

Nineteen states have stricter building construction requirements than does the NFIP. The most common additional standard is freeboard (requiring new buildings to be elevated higher than the base (100-year) flood level). This standard may apply to all buildings in the floodplain or only to certain types, such as new jails, hospitals, nursing homes, mobile home parks, or hazardous materials facilities.

- Here are some other common state regulatory requirements:
- 25 states either directly regulate the handling and storage of stormwater in their jurisdictions or establish standards that communities must meet.
- 30 states have regulations or standards for the control of erosion and sediment.

- 23 have either direct regulations or state standards to restrict or prohibit some or all development within a certain distance from bodies of water.
- 16 of those have setbacks for coastal and/or lakeshore areas.
- 14 states have special rules for areas that lie below dams or are protected by levees.
- 30 states have adopted measures to regulate hazardous materials in floodplains
- 29 states have special public health standards that apply to floodplains

Twenty-four state governors have issued a directive to their state agencies on floodplain management. Most of these were implemented to meet the minimum NFIP requirements but many go beyond them. Five states have wetlands policy set by executive order, five have orders on hazard mitigation or disaster recovery, and two states have other resource protection executive orders that affect floodplains.

For more information on which states have which requirements, see Floodplain Management 1995: State and Local Programs, Association of State Floodplain Managers, 1995.

C. HIGHER REGULATORY STANDARDS

FEMA has established minimum floodplain management requirements for communities participating in the NFIP. Communities must also enforce more restrictive State requirements. However, communities should seriously consider enacting regulations that exceed the minimum state and federal criteria.

In fact, the NFIP requires communities to at least consider additional measures which are found in 44 CFR 60.22, Planning Considerations for Floodprone Areas. They are summarized in Figure 6-2.

(a) The floodplain management regulations adopted by a community for floodprone areas should:
  (1) Permit only that development of floodprone areas which
    (i) is appropriate in light of the probability of flood damage
    (ii) is an acceptable social and economic use of the land in relation to the hazards involved
    (iii) does not increase the danger to human life
  (2) Prohibit nonessential or improper installation of public utilities and public facilities.

(b) In formulating community development goals after a flood, each community shall consider:
  (1) Preservation of the floodprone areas for open space purposes
  (2) Relocation of occupants away from floodprone areas
  (3) Acquisition of land or land development rights for public purposes
  (4) Acquisition of frequently flood-damaged structures.

(c) In formulating community development goals and in adopting floodplain management regulations, each community shall consider at least the following factors:
  (1) Human safety
  (2) Diversion of development to areas safe from flooding
  (3) Full disclosure to all prospective and interested parties
  (4) Adverse effects of floodplain development on existing development
  (5) Encouragement of floodproofing to reduce flood damage
  (6) Flood warning and emergency preparedness plans
  (7) Provision for alternative vehicular access and escape routes
  (8) Minimum retrofitting requirements for critical facilities
  (9) Improvement of local drainage to control increased runoff
  (10) Coordination of plans with neighboring community's floodplain management programs
  (11) Requirements for new construction in areas subject to subsidence
  (12) Requiring subdividers to furnish delineations for floodways
  (13) Prohibition of any alteration or relocation of a watercourse
  (14) Requirement of setbacks for new construction within V Zones
  (15) Freeboard requirements
  (16) Requirement of consistency between state, regional and local comprehensive plans
  (17) Requirement of pilings or columns rather than fill to maintain storage capacity
  (18) Prohibition of manufacturing plants or facilities with hazardous substances
  (19) Requirements for evacuation plans

Figure 6-2: NFIP planning considerations (44 CFR 60.22)

Some of the more common approaches taken by communities to better regulate floodplain development are explained in this section.

LOCATION RESTRICTIONS

Where the hazard is so severe that certain types of development should be prohibited, a location restriction provision may be appropriate. Some communities prohibit some or all development in all or parts of their floodplains. A common approach is to prohibit particular structures in the floodway or areas exceeding certain flood depths or velocities.

Because this is the most restrictive higher regulatory provision, location restriction language has to be drafted carefully to avoid a taking challenge. Sometimes, a community can tie transfers of development rights or other benefits to a development that avoids the flood hazard area. These types of "win – win" situations benefit everyone and reduce the potential for challenging the ordinance.

Highly hazardous areas

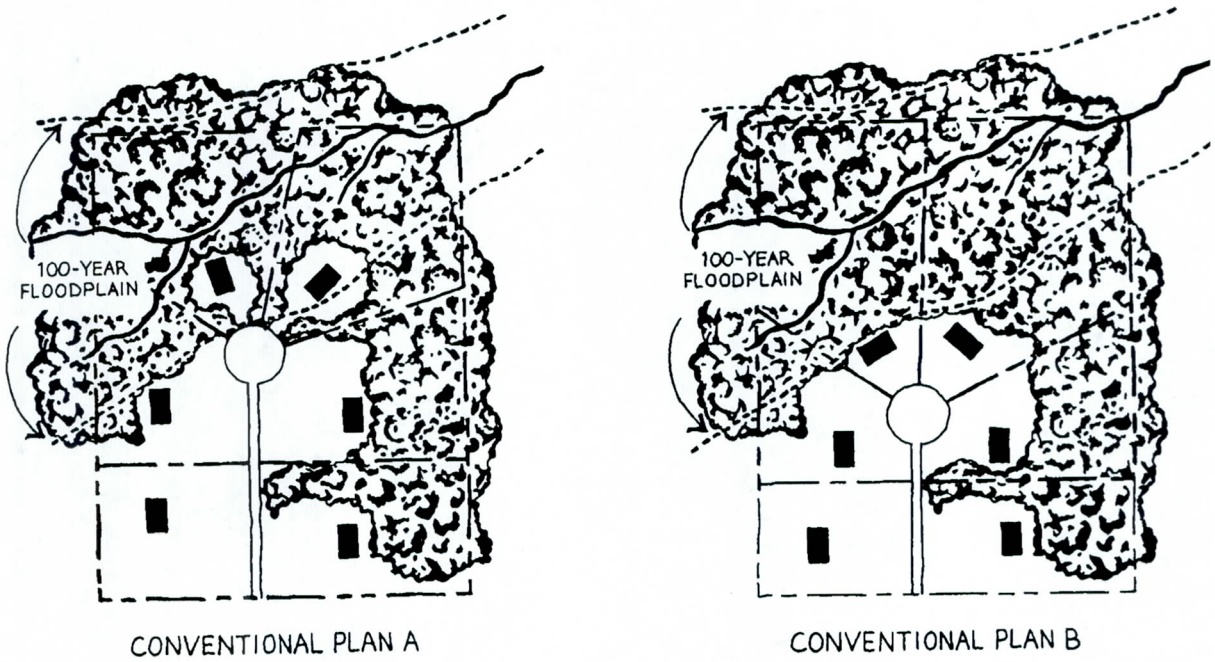
Prohibiting development makes sense in high hazard areas, where people are exposed to a life-threatening situation even though buildings could be protected from flood damage. For example, it would be appropriate to prohibit development at the apex of an alluvial fan or along a narrow floodplain in a stream valley that is susceptible to flash flooding.

Subdivision design

Undeveloped land, still in large tracts, offers the best opportunity to limit where certain types of development will be located. When a developer wants to subdivide the land, communities have many tools to arrange the development so that buildings are kept out of the floodplain. This has two advantages over simply requiring the buildings to be protected from flooding:

- Buildings aren't isolated by floodwaters, putting a strain on local emergency services to guard them or evacuate or rescue their occupants, and
- The neighborhood will have waterfront open space and recreation areas – a valuable amenity in most communities.

A housing development can be clustered, as shown in Figure 6-3, so the developer can sell the same number of homesites as a conventional subdivision. Check your state laws on whether cluster development can be mandated or just encouraged during the subdivision review process.

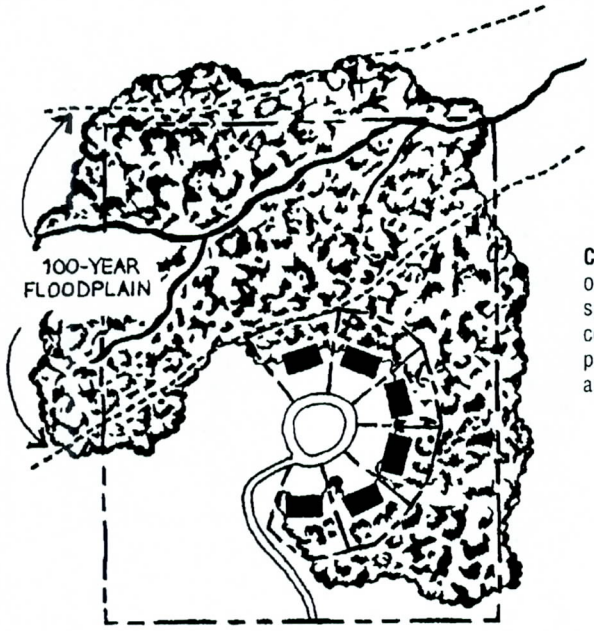


CONVENTIONAL PLAN A

CONVENTIONAL PLAN B

Conventional Plan A: All land on site is subdivided into lots; some lots partially or entirely in floodplain; some homesites in floodplain.

Conventional Plan B: All land on site is subdivided into lots; some lots partially in floodplain; homesites restricted to natural high ground; setbacks and sideyard restrictions modified to accommodate structures out of floodplain.



CLUSTER PLAN

Cluster Plan: All floodplain lands and other sensitive lands kept as open space; net density remains equal to conventional plans; lot sizes reduced to protect natural features; all homesites are on natural high ground.

Figure 6-3. Clustering can keep buildings out of smaller floodplains
(Source: *Subdivision Design in Flood Hazard Areas*)

As explained in pages 17-25 of the American Planning Association's *Subdivision Design in Flood Hazard Areas*, the planner's toolbox contains other tools for encouraging developers to avoid floodplains. A density transfer can be used to, say, trade development rights with a flood-free site. Credits or bonuses can be given to increase the allowable density if the developer puts building sites on high ground or does not disturb a wetland.

The planned unit development (PUD) approach offers developers flexibility in planning the entire area. For example, a PUD may have a cluster development with houses closer together than allowed under normal zoning lot line setbacks.

Subdivision and planning regulations also can mandate that a certain portion of a development be set aside as open space for recreation or stormwater management purposes. Developers find that it is cheaper to put the open space in the floodplain than to put buildings there that have to incorporate the more expensive floodplain requirements. Linear parks and greenways that connect the open space areas through a community are becoming more and more popular and help sell new developments.

Setbacks

Setbacks may be used to keep development out of harm's way. Setback standards establish minimum distances that structures must be positioned—set back—from river channels and coastal shorelines. Setbacks can be defined by vertical heights or horizontal distances.

While floodplain boundaries are defined by vertical measures, horizontal setbacks also provide protection from flood damage, especially in coastal areas where the effects of waves decrease further inland.

For coastal shorelines, setback distances act as buffer zones against beach erosion. In riverine situations, setbacks prevent disruption to the channel banks and protect riparian habitat. Such setbacks are frequently created to serve as isolation distances to protect water quality, and stream and wetland resources.

Setbacks from watercourses have been used to minimize the effect of nonpoint sources of pollution caused by land development activities, timber harvesting and agricultural activities. Solid waste landfills and on-site sewage disposal systems often are restricted within certain distances of a body of water.

The Community Rating System credits setbacks that prevent disruption to shorelines, stream channels and their banks under Activity 430, Section 431.g.2 in the *CRS Coordinator's Manual* and the *CRS Application*. See also *CRS Credit for Higher Regulatory Standards* for example regulatory language.

Manufactured homes

Many communities have adopted provisions prohibiting the placement of manufactured (mobile) homes in the floodway. Check your ordinance. This used to be a minimum requirement of the NFIP and may still be on your books.

Natural areas

The natural functions and values of floodplains coupled with their hazardous nature have led communities to promote and guide the less intensive use and development of floodplains. More and more municipalities are requiring that important natural attributes such as wetlands, drainage ways and floodplain areas be set aside as open space as a condition to approving subdivision proposals.

The Community Rating System provides substantial credit for preserving floodplain areas as open space. If buildings and filling are prohibited, credit is found under Activity 420 Open Space Preservation, Section 421.a in the *CRS Coordinator's Manual* and the *CRS Application*. If the area has been kept in or restored to its natural state, more credit is provided under Section 421.c.

Low-density zoning

When a community prepares its land use plan and zoning ordinance, it should consider what uses and densities are appropriate for floodplains. If buildings are not prohibited entirely, the community should zone its floodplains for agricultural or other low-density use to reduce the number of new structures.

For example, it's better to have a floodplain zoned for agricultural or conservation use with a minimum lot size of 20 or 40 acres than to allow four single-family homes to every acre. In some areas, "residential estate" zones with minimum lot sizes of two to five acres provide lots large enough that homes can be built out of the floodplain.

Some states have land use planning laws that require local plans before enacting a zoning ordinance. Some—including Oregon, Florida, New Hampshire and Hawaii—mandate that local plans account for floods and other natural hazards.

The Community Rating System provides substantial credit for zoning floodplains with low-density uses under Activity 430LZ Low Density Zoning in the *CRS Coordinator's Manual* and the *CRS Application*.

BUILDING REQUIREMENTS

Freeboard

Freeboard is an additional height requirement above the base flood elevation (BFE) that provides a margin of safety against extraordinary or unknown risks. This reduces the risk of flooding and makes the structure eligible for a lower flood insurance rate.

While not required by the NFIP standards, your community is encouraged to adopt at least a one-foot freeboard to account for the one-foot rise built into the concept of designating a regulatory floodway and the encroachment requirements where floodways are not identified.

Other reasons for considering a freeboard are that it:

- Accounts for future increases in flood stages if additional development occurs in the floodplain.
- Accounts for future flood increases due to upstream watershed development.
- Acts as a hedge against backwater conditions caused by ice jams and debris dams.
- Reflects uncertainties inherent in flood hazard modeling, topography, mapping limitations and floodplain encroachments.
- Provides an added measure of safety against flooding.
- Results in significantly lower flood insurance rates due to lower flood risk.

Freeboard safety factors are common in the design of flood control projects and floodplain development. Many communities have incorporated freeboard requirements into the elevation and floodproofing requirements stipulated by the NFIP. Freeboard requirements adopted by communities range from six inches to four feet.

When constructing a new elevated building, the additional cost of going up another foot or two is usually negligible. Elevating buildings above the flood level also reduces flood insurance costs for current and future owners.

Figure 9-3 shows the insurance rates for a post-FIRM single-family dwelling. Note that the higher the building is above the BFE, the lower the rate. These rates are based on the true or actuarial cost of insuring a building in the floodplain. By adding one foot of freeboard above the BFE, the cost for the first layer of coverage is reduced from 45 cents per $100 of coverage to 26 cents. This shows how the extra foot reduces the potential for flood damage.

The Community Rating System credits freeboard under Activity 430, Section 431.a in the *CRS Coordinator's Manual* and the *CRS Application*. See also *CRS Credit for Higher Regulatory Standards* for example regulatory language.

Foundation standards

Without a safe and sound foundation, an elevated building can suffer damage from a flood due to erosion, scour or settling. The NFIP regulations provide performance standards for anchoring new buildings and foundation and fill placement standards for floodproofed buildings and V Zones.

However, the NFIP performance standards do not specify how a buildings' foundations are to be constructed. Especially in areas where an engineer's certificate is not required by the NFIP regulations, more specific foundation construction standards would help protect buildings from flood damage.

One option is to require that a registered professional engineer or architect certify the adequacy of elevated building foundations and the proper placement, compaction and protection of fill when it is used in building elevation. This is an ordinance requirement in the New Orleans area where subsidence threatens so many buildings.

The national model building codes address building foundations and the proper placement, compaction and protection of fill. You and your building department should review how these standards are enforced.

An alternative is to require a specific construction standard, such as requiring the V Zone standard for new structures in coastal AE and AH Zones. Coastal AE Zones are of particular concern, since they are subject to wave action of up to three feet in height and the NFIP A Zone construction standards do not address this hazard.

The Community Rating System credits foundation protection under Activity 430, Section 431.b in the *CRS Coordinator's Manual* and the *CRS Application*. See also *CRS Credit for Higher Regulatory Standards* for example regulatory language.

SAFETY REQUIREMENTS

Critical facilities

For some activities and facilities, even a slight chance of flooding poses too great a threat. These should be given special consideration when formulating regulatory alternatives and floodplain management plans.

FEMA defines four kinds of critical facilities:

- Structures or facilities that produce, use or store highly volatile, flammable, explosive, toxic and/or water-reactive materials.
- Hospitals, nursing homes and housing likely to have occupants who may not be sufficiently mobile to avoid injury or death during a flood.
- Police stations, fire stations, vehicle and equipment storage facilities, and emergency operations centers that are needed for flood response activities before, during and after a flood.
- Public and private utility facilities that are vital to maintaining or restoring normal services to flooded areas before, during and after a flood.

A critical facility should not be located in a floodplain. Communities often prohibit critical or hazardous facilities or uses from the floodway, the V Zone, or the entire floodplain. While a building may be considered protected from the base flood, a higher flood or an error on the builder's or operator's part could result in a greater risk than the community is willing to accept.

If a critical facility must be located in a floodplain, then it should be designed to higher protection standards and have flood evacuation plans. The more common standards—freeboard, elevation above the 500-year floodplain and elevated access ramps—should be required.

According to Executive Order 11988, federal agencies must meet rigorous alternative site evaluations and design standards before funding, leasing or building critical facilities in the 500-year floodplain. Executive Order 11988 is discussed further in Section E of this unit.

The Community Rating System credits prohibiting critical facilities or requiring them to be protected from damage by the 500-year flood in Activity 430, Section 431.e in the *CRS Coordinator's Manual* and the *CRS Application.* See *CRS Credit for Higher Regulatory Standards* for example regulatory language.

Hazardous materials

While prohibiting or protecting hazardous materials makes sense, it would be wise to have specific standards in your ordinance. The following lists were taken from the Corps of Engineers' Flood Proofing Regulations. The first is of items that are extremely hazardous or vulnerable to flood conditions so they should be prohibited from the SFHA or even the 500-year floodplain:

Acetone
Ammonia
Benzene
Calcium carbide
Carbon disulfide
Celluloid
Chlorine
Hydrochloric acid
Prussic acid
Magnesium
Nitric acid
Oxides of nitrogen
Phosphorus
Potassium
Sodium
Sulfur

The following items are sufficiently hazardous that larger quantities they should be prohibited in any space below the base flood elevation

Acetylene gas containers
Storage tanks
Lumber /buoyant items
Gasoline
Charcoal/coal dust
Petroleum products

Larger quantities of the following items should be prohibited in any space below the base flood elevation

Drugs
Food products
Matches/sulfur products
Soaps/detergents
Tires

Dry land access

Fire prevention, evacuation and rescue operations are common emergency response activities associated with flooding. The effectiveness and success of these efforts greatly depend on readily available access. However, streets and roads are usually the first things to be inundated in the event of a flood.

To ensure access, some communities have enacted ordinance provisions requiring that all roads and other access facilities be elevated to or above the BFE. Some require elevation to within one foot of the BFE so at least fire and rescue equipment can travel on them during a flood.

While some local officials may feel that this approach is too restrictive, it is important to note that emergency response personnel die every year attempting to rescue flood-stranded citizens. Also, others may die or be seriously injured because they cannot be rescued in time.

Figure 6-4: Four people died in a 1978 flood in this critical facility.
This nursing home in Rochester, Minnesota, was isolated by high velocity floodwaters. Because there was no dry land access, firefighters could not rescue the occupants.

Naturally, there are some areas with floodplains so extensive that a developer cannot be expected to connect his development to high ground. As with all regulatory standards, you must carefully weigh the local hazard, the regulation's objectives, and the costs and benefits of meeting the standard before you draft new ordinance language.

NFIP/CRS

The Community Rating System has credited dry land access provisions under Activity 430, Section 431.i in the *CRS Coordinator's Manual* and the *CRS Application.*

ENCROACHMENT STANDARDS

Some states and communities are not comfortable with allowing development in the flood fringe to increase flood heights by up to a foot. A one-foot increase in flood heights will increase the potential for flood damage to floodprone buildings and affect properties that were otherwise not threatened by the base flood. This is especially true in flat areas where a one-foot increase can extend the floodplain boundary by blocks.

These states and communities require floodway mapping and encroachment studies to allow a smaller surcharge, usually 0.5 or 0.1 foot. Twelve states require that regulatory maps use a smaller floodway mapping surcharge than the NFIP's one-foot minimum standard. This results in a wider floodway, but less potential for increased flood losses due to future development.

In Minnesota, one watershed district took another regulatory approach, enacting regulations that restricted encroachments in the flood fringe to 20 percent of the total floodplain area. In Washington State, some communities treat higher velocity and deeper flood fringe areas as floodways and make development in those areas comply with the floodway construction standards.

The Community Rating System credits more restrictive floodway mapping standards under Activity 410 Additional Flood Data, Section 411.c in the *CRS Coordinator's Manual* and the *CRS Application.*

COMPENSATORY STORAGE

The NFIP floodway standard in 44 CFR 60.3(d) restricts new development from obstructing the flow of water and increasing flood heights. However, this provision does not address the need to maintain flood storage. Especially in flat areas, the floodplain provides a valuable function by storing floodwaters. When fill or buildings are placed in the flood fringe, the flood storage areas are lost and flood heights will go up because there is less room for the floodwaters. This is particularly important in smaller watersheds which respond sooner to changes in the topography.

For this reason, some communities adopt more restrictive standards that regulate the amount of fill or buildings that can displace floodwater in the flood fringe. One simple approach is to prohibit filling and buildings on fill—all new buildings must be elevated on columns or flow-through crawlspaces.

Check your statutory authority, because in some states buildings are allowed only if they are on fill. Some communities prefer buildings on fill because it provides a safe spot above flood levels outside the building walls.

Another approach is to require compensatory storage to offset any loss of flood storage capacity. The developer is required to offset new fill put in the floodplain by excavating an additional floodable area to replace the lost flood storage area. This should be done at "hydraulically equivalent" sites—fill put in below the 10-year flood elevation should be compensated by removal of soil below that elevation elsewhere in the floodplain.

The Community Rating System credits prohibition of fill and compensatory storage under Activity 430, Section 431.f in the *CRS Coordinator's Manual* and the *CRS Application.* See *CRS Credit for Higher Regulatory Standards* for example regulatory language.

STORMWATER MANAGEMENT

A floodplain management program in an urbanizing area must confront the increase in flood flows caused by development within the watershed. As forests, fields and farms are covered by impermeable surfaces like streets, rooftops and parking lots, more rain runs off at a faster rate. In an urbanized area, the rate of runoff can increase fivefold or more.

Changes in the surface drainage system compound this problem. Stormwater runoff travels faster on streets and in storm drains than it did under pre-development conditions. As a result, flooding is more frequent and more severe (Figure 1-13). Efforts to reduce the impact of increased runoff that results from new development in a watershed are known as stormwater management.

One way to reduce the impact of stormwater from new development is to require the developer to restrict the rate at which the increased runoff leaves the property. The developer must build a facility to store stormwater runoff on the site.

Under stormwater detention, the stored water is held for release at a restricted rate after the storm subsides. Under stormwater retention, stormwater runoff is held for later use in irrigation or groundwater recharge, or to reduce pollution.

As an alternative to using a uniform standard for all areas, many communities regulate development according to a master plan that analyzes the combined effects of existing and expected development on stormwater and flood flows in the watershed. Such watershed-specific regulations may allow different amounts of runoff for different areas in order to control the timing of increased flows into the receiving streams.

Instead of requiring developers to build stormwater facilities on-site, a plan may require them to contribute funds for a regional facility. By planning the runoff from entire watersheds, this approach can be more effective in reducing increases in downstream flooding.

Stormwater management also has water quality aspects, and includes efforts to reduce erosion and the entry of sediment and pollutants into receiving streams.

The Community Rating System credits both water quantity and water quality stormwater management regulations and plans under Activity 450 in the *CRS Coordinator's Manual* and the *CRS Application*. See also *CRS Credit for Stormwater Management* for example regulatory language.

TEMPORARY MORATORIUM

Following a flood, a number of communities have imposed moratoriums on rebuilding in the damaged area, effectively prohibiting floodplain development. Often, temporary measures are put in place after a flood to allow time to plan for acquisition, relocation, or redevelopment of the area, or to install flood control projects.

A temporary moratorium should specify when it will be lifted, such as "within three months or when the plan is completed, whichever is sooner." An open ended moratorium may be viewed by a court as a taking, since the owner has no idea when he or she will be allowed to build or rebuild.

LEARNING CHECK #1

1. What NFIP program recognizes local regulatory standards that are more restrictive than the minimum NFIP regulations?

2. If a regulatory requirement prohibits an owner from any use of his land, it is referred to by the legal term _____ .

3. In how many court cases have the NFIP regulations been overruled as unconstitutional?

4. If a state requirement is more restrictive than the NFIP requirements, which set of rules must a community follow?

5. Does your community's ordinance have any provisions that are more restrictive than the minimum NFIP requirements?

6. Name two higher regulatory standards that can be used to encourage building sites completely out of the floodplain?

7. What is freeboard?

8. What is the preferred flood protection approach for critical facilities?

9. How does compensatory storage work?

10. What is "stormwater management?"

D. Flood Hazards of Special Concern

The mapping and regulatory standards of the NFIP do not completely address every flood problem in the United States. Certain floodplains and flood-related hazards are more destructive and harder to map than riverine, coastal and shallow flooding.

Unit 1 introduced these flood hazards, so we won't discuss them in detail here. This section reviews the more common regulatory standards appropriate to each hazard.

In addition to regulations, communities should address these special hazards in their planning, public information, hazard disclosure and flood warning programs.

More information on these hazards and the Community Rating System credit for mapping and managing them is found in *CRS Credit for Special Hazard Areas.*

Coastal Erosion

Coastal erosion occurs to properties in the coastal floodplain and to properties on bluffs above the floodplain. Estimates are that 24 percent of the Atlantic, Pacific, Gulf of Mexico and Great Lakes coasts face significant erosion.

Special erosion rate maps are needed to regulate new construction to protect it from coastal erosion. Normally, 30-, 60- or 100-year erosion zones are used. Erosion zones are generally calculated by multiplying the annual rate of erosion times the number of years of protection to be provided.

The 30-year erosion zone is the area that will likely erode over the next 30 years. It is measured inland from a known point, such as the dune or vegetation line. Erosion zones are "moving targets." They can change each year as the dune or vegetation line moves inland (or seaward). Erosion rates also vary over the years, moving at a faster or slower rate than the annual average.

Regulatory standards

There are NFIP regulatory performance standards and planning considerations for erosion-prone areas in 44 CFR 60.5 and 60.24, respectively. As with 44 CFR 60.3, the NFIP requirements are keyed to the type of hazard data provided by FEMA. Since there are no FEMA erosion-prone maps published yet, there are no NFIP requirements for managing erosion-prone areas. Therefore, Sections 60.5 and 60.24 should be viewed as advisory.

Several states have erosion management requirements. Their typical regulatory standards include:

- All new buildings must be located landward of the 30-year erosion zone
- All larger buildings must be located landward of the 60-year zone
- Deeper pilings and special foundation provisions
- Traffic restricted on sand dunes and other protective features

For more information, contact your state's coastal zone management office. See also FEMA's Coastal Construction Manual.

TSUNAMIS

A tsunami is a wave or series of waves generated at sea or near shore by an earthquake, volcano or landslide. Tsunamis can move as fast as 1,000 kilometers per hour from their point of origin, usually in the Pacific Ocean.

Tsunamis pose two special hazards: a short warning time and very deep flooding.

Tsunamis are hard to recognize at sea but when they reach shallow water, a wave builds up. The effect is more like a rise in sea level than a breaking wave. In narrow areas, where water is concentrated, the resulting water level can be very high, in some areas as much as 20 or 30 feet above normal tides.

Tsunami inundation areas generally are not mapped by FEMA because they are not considered a normal condition of flooding. However, recent federal-state efforts have improved the availability of maps and data for the Pacific states. For more information on tsunami maps, contact your state's emergency management or coastal zone management office.

Regulatory standards

The best regulatory approach is to use an estimated tsunami flood level or the BFE, whichever is higher. Keeping new buildings out of the area that lies below that elevation, or protecting them from flood damage below that elevation, would be appropriate. If not all new buildings can be prohibited, at least critical facilities and/or high-occupancy buildings should be prevented from locating in the area that will have little advance warning of a flood.

A community should also tie development of a tsunami-prone area to the availability of a warning system. Without adequate warning, occupying such an area can be deadly.

See also *CRS Credit for Management of Pacific and Caribbean Tsunami Hazards.*

CLOSED BASIN LAKES

Two types of lakes pose special hazards to adjacent development:

- Lakes with no outlets, like the Great Salt Lake, Utah, Devil's Lake, North Dakota, and the Salton Sea, California; and
- Lakes with inadequate, regulated or elevated outlets, such as the Great Lakes and many glacial lakes.

These are referred to as "closed basin lakes." Closed basin lakes are subject to large fluctuations in elevation which can persist for weeks, months or years.

Closed basin lakes were formed in almost every part of the United States:

- Glaciers scoured out lakes in the northern tier of states and Alaska.
- Tectonic action created lakes with no outlets (playas) in the western U.S.
- Channel migration formed oxbow lakes along the Mississippi and other large rivers.
- Sinkhole lakes formed where there are large limestone deposits at or near the surface and adequate surface water and rainfall to dissolve the limestone.

Regulatory standards

As with tsunamis, the key to regulating these areas is to determine the appropriate regulatory flood elevation which will likely be higher than the BFE. The elevation can be determined by studying historical or geological records, or identifying the elevation of the lowest point where water can leave.

Areas lower than the regulatory elevation should have construction standards that protect buildings and their occupants from prolonged flooding. Other than prohibiting new buildings entirely, the best approach is to require:

- Construction of new buildings on fill above the regulatory elevation. The fill should be engineered and placed to resist wave action.
- Protection of utilities
- Access from dry land.
- Alternatives to septic systems, which won't work under water.
- Alternatives to on-site wells, which would be polluted when floodwater mixes with ground water.

For more information, see *CRS Credit for Management of Areas Adjacent to Closed Basin Lakes* and *Reducing Losses in High Risk Flood Hazard Areas: A Guidebook for Local Officials*.

UNCERTAIN FLOW PATHS

This hazard includes alluvial fans and moveable bed streams. They occur in hilly or mountainous areas rich in sediments and where precipitation is not sufficient to carry the sediments downstream as rapidly as they accumulate. In the United States, these conditions exist primarily in the arid and semi-arid regions west of the Great Plains, although there are alluvial fans in Alaska and Appalachia.

Both types of uncertain flow path floodwaters carry large amounts of sediment which can fill in a channel or move it to a new location. Regulatory standards must address the three components of the hazard: velocity of the water, sediment and debris; the volume and movement of sediment and debris during floods; and the potential for channel migration during a flood.

Regulatory standards

A good study may be able to identify the limits of channel migration and require new buildings to be set back from that area. A permit applicant can be required to prepare such a study.

Otherwise, because the characteristics of the hazard is site-specific, many ordinances simply require the builder to have an engineer certify that the project will be protected. In alluvial fans, a subdivider can be required to install debris basins, channels and walls to keep debris and velocity flows away from houses.

For more information, see *CRS Credit for Management of Areas with Uncertain Flow Paths* and *Reducing Losses in High Risk Flood Hazard Areas: A Guidebook for Local Officials*.

DAM BREAKS

Almost every state has a dam safety office that has identified high hazard dams. The designation is based on both the height of the dam and the amount of development at risk downstream.

Should a dam give way, the area covered by the resulting flood downstream is called the dam breach inundation area. Dam breach analyses may have been done for some of the dams upstream of your community, in which case you can obtain a map of the area subject to inundation. (Check with your state dam safety office that the map was prepared using an approved method.)

Close to the dam, the dam breach inundation area is likely to be larger than the base floodplain. A regulatory program should encompass such areas outside the base floodplain. It should also take into account the lack of warning time a dam break would pose.

Regulatory standards

Typical measures include:

- Prohibiting construction of buildings in the dam breach inundation area.
- Prohibiting siting of critical facilities in the dam breach inundation area.
- Requiring new buildings to be elevated above the BFE or the dam breach elevation, whichever is higher.
- Requiring dam owners to maintain their facilities.
- Requiring dam owners to establish warning systems if their dams are in danger of failing.

For more information, contact your state dam safety office or the Association of State Dam Safety Officials, Lexington, Kentucky.

CRS credit for dam failure regulations is provided in Activity 630 Dam Safety, Section 631.b of the *CRS Coordinator's Manual* and the *CRS Application.*

ICE JAMS

Ice jams form in several ways and at different times in winter and early spring. Damage from ice jam flooding often exceeds that of clear water flooding because of higher surface elevations, rapid increases in flood elevations and physical damage caused by moving ice floes.

Regulatory standards

FEMA and the Corps of Engineers have developed an ice jam flood study methodology (see Appendix 3 of Flood Insurance Study Guidelines and Specifications for Study Contractors). If your community has a study done following this methodology, you should adopt the results as your regulatory flood elevation.

In the absence of such a detailed study, you should use the historic ice jam flood of record plus a foot or two of freeboard as your building protection level. Other standards should include requiring new buildings to be elevated on engineered fill or pilings, and prohibiting new buildings (or at least requiring them to be on fill) in the floodway or other defined area subject to ice floes.

For more information, contact the Corps of Engineers, which has ice jam expertise in its district offices and its Cold Regions Research and Engineering Laboratory in Hanover, New Hampshire.

See also *CRS Credit for Management of Areas Subject to Ice Jam Floods.*

MUDFLOWS

Because mudflows may not occur in mapped floodplains, additional mapping may be required. This requirement can be keyed to steeper slopes or areas with known unstable soils.

In addition to regulations, communities can undertake public information, fire control and other programs to prevent mudflow conditions from developing.

Regulatory standards

If the hazard is not already mapped, developers in the identified areas of steeper slopes or unstable soils should be required to prepare flow hazard studies. Here are regulatory measures appropriate for areas with mudflow hazards or potential:

- Require designs that work with natural flow channels, not cut across them.
- Require engineered foundations on compacted fill or pilings.
- Avoid locating buildings on or below steep slopes.
- Require debris basins, channels and walls to keep the debris away from houses.
- Require design, construction and drainage practices that direct runoff and debris away from unstable areas.
- Enforce grading and cut and fill standards that minimize disruption of natural drainage ways (Figure 6-5).

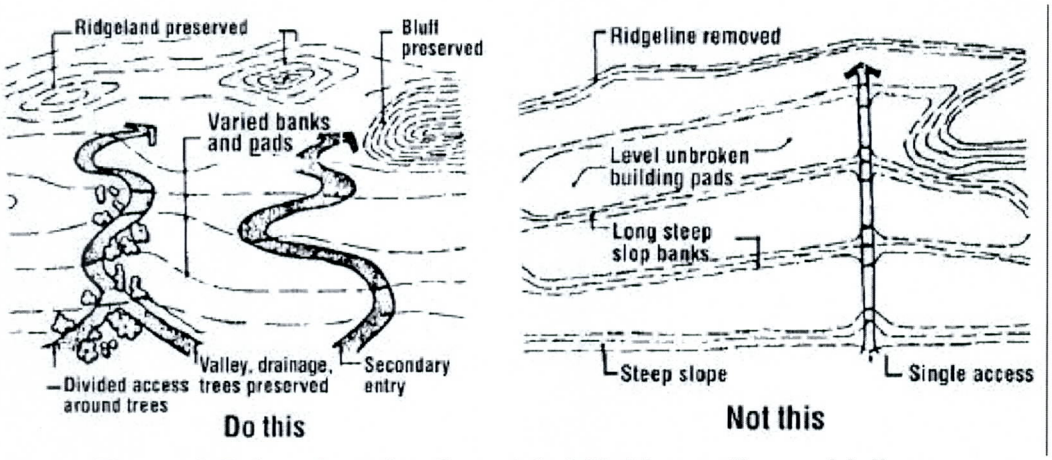


Figure 6-5. Los Angeles County's hillside grading guidelines.
For more information, see *Planning for Hillside Development.*

E. Environmental Protection Measures

Flooding may not occur often enough in your area to be viewed as a problem in need of a solution, making it difficult to obtain the public and political support needed to carry out local floodplain management measures designed solely to reduce future flood losses.

Support often can be gained by associating flood loss reduction with broader community concerns and goals. A larger constituency for managing the community's floodplains can be built if other interests realize that their needs can be met through their involvement and support in flood protection. This, in turn, brings more resources and expertise into play.

Then, too, designing and packaging funding proposals to meet a number of community goals can boost your chances of obtaining outside resources. One approach is to tie the need to manage the floodplain to protect your community's economic well-being with the need to protect and maintain the natural resources and functions of the floodplain. These resources and functions can be of considerable benefit to the community, a benefit often unrealized or underestimated.

Strategies

Preservation and restoration are the two basic approaches to protecting a floodplain's natural resources. Preservation strategies focus on strict control or prohibition of development in sensitive or highly hazardous areas. Restoration strategies focus on actions to improve the quality or functioning of degraded floodplains.

It is not always possible—or necessary—to make a distinction between the two strategies.

Unit 1 contained an overview of the tools that can be used to preserve and protect a floodplain's natural and cultural resources. They include:

- Floodplain, wetland and coastal barrier regulations.
- Development and redevelopment policies.
- Land acquisition and preservation.
- Information and education.
- Tax adjustments.

This section focuses on the development controls and regulatory standards you can use to protect natural resources or minimize harm to them. These measures, used by all levels of government, are among the most effective means available for protecting natural resources of floodplains and reducing flood damage.

FEDERAL REGULATIONS

Federal regulations and those in many states protect resources by limiting the ways, location and extent to which these resources may be modified. Two federal regulations can have far-reaching impact:

- NEPA: When a federal agency proposes to fund a project located in a flood hazard area, the National Environmental Policy Act (NEPA) requires an evaluation of the project's environmental impact as part of the decision-making process. The evaluation should include the impact on flooding as well as water and air quality.
- EO 11988: Executive Order 11988 Floodplain Management requires federal agencies to check NFIP maps to see if a proposed project will be in a floodplain. If one is, the agency must follow an eight-step process to determine whether there is a feasible alternative to location in the floodplain. If not, the project must include flood damage reduction measures.

In short, Federal agencies must meet the same or more restrictive development standards as do private property owners under the community's NFIP regulations.

WETLAND PROTECTION

The federal regulation that local permit officials see most often is the program established by Section 404 of the Clean Water Act. Jointly administered by the Corps of Engineers and the U.S. Environmental Protection Agency, the Section 404 program regulates the discharge of dredged or fill material into U.S. waters, including adjacent wetlands.

The Section 404(b)(1) guidelines provide extensive environmental criteria for judging permit applications while emphasizing the need to prevent avoidable losses of aquatic resources, as well as the need to minimize adverse environmental impacts.

All coastal states and many inland states have their own wetlands regulations. Because inland wetlands generally receive less protection than coastal or "tidal" wetlands, many communities establish regulations that are more restrictive than the Federal or state programs.

The desire to reduce the cumulative impacts of wetland losses has led many jurisdictions to adopt a "no net loss of wetlands" policy. No net loss is addressed either in terms of acreage or the functional value of the wetlands. Despite these programs and other such efforts, as recent as 1989 it was estimated that the country was losing 300,000 – 450,000 acres of wetlands each year.

RARE AND ENDANGERED SPECIES

Undeveloped floodplains may contain habitat for rare and endangered species of plants and animals. On the federal level, the Endangered Species Act of 1973 directs federal agencies not to undertake or assist projects that would adversely affect any endangered species.

The Act also requires an "incidental take permit" when it appears that the habitat of a rare or endangered species will be "taken" or impacted by a non-federal activity. Communities should coordinate their permit review with this program which is administered by the U.S. Fish and Wildlife Service.

Many states have programs to identify rare and endangered species and to acquire or regulate tracts that are home to them. Some states and communities have sensitive areas regulations or a similar approach that protects such habitats.

ON-SITE SEWAGE DISPOSAL

Most states and municipalities regulate the design, location and placement of on-site sewage systems. Because the objective of such programs is to prevent surface and subsurface contamination, there are many requirements to selecting a proper site and designing a system that will work in a flood.

Less than desirable locations for on-site systems include areas with high groundwater tables, impervious soils, certain types of porous soils, and the potential for flooding. These characteristics often coincide with floodplains.

Regulations that restrict where septic systems can go often mean that a property owner cannot build in or near the floodplain.

FACILITIES SITING

Stringent government regulations restrict the siting of critical facilities —hazardous waste facilities, nuclear power plants, hospitals, police and fire stations — in a floodplain area.

States and your community also may have siting regulations that discourage or prevent dangerous or hazardous development in floodplain areas. These include storage of hazardous materials, sanitary landfills and related activities.

WATER QUALITY REGULATIONS

Since the enactment of the Clean Water Act in 1972 and related state legislation, more care is being given to the regulation of direct discharges of pollutants into waterways. Federal and state point source regulations focus on wastewater treatment plants and industrial sites where polluted water is piped to a stream or lake at a single point.

Non-point sources of pollutants are harder to regulate. If stormwater is not collected and sent to a wastewater treatment plant, it flows directly into a body of water. On its way, stormwater collects sediments from soil erosion as well as road oil, pesticides, lawn treatment chemicals and other pollutants. There is no treatment facility to clean this runoff water.

Regulatory approaches for non-point sources include buffer zones or stream setbacks where there are on-site disposal systems, timber harvesting, tilling of soil, mining, or development in general. These requirements are often part of, or complement, state or local stormwater management regulations.

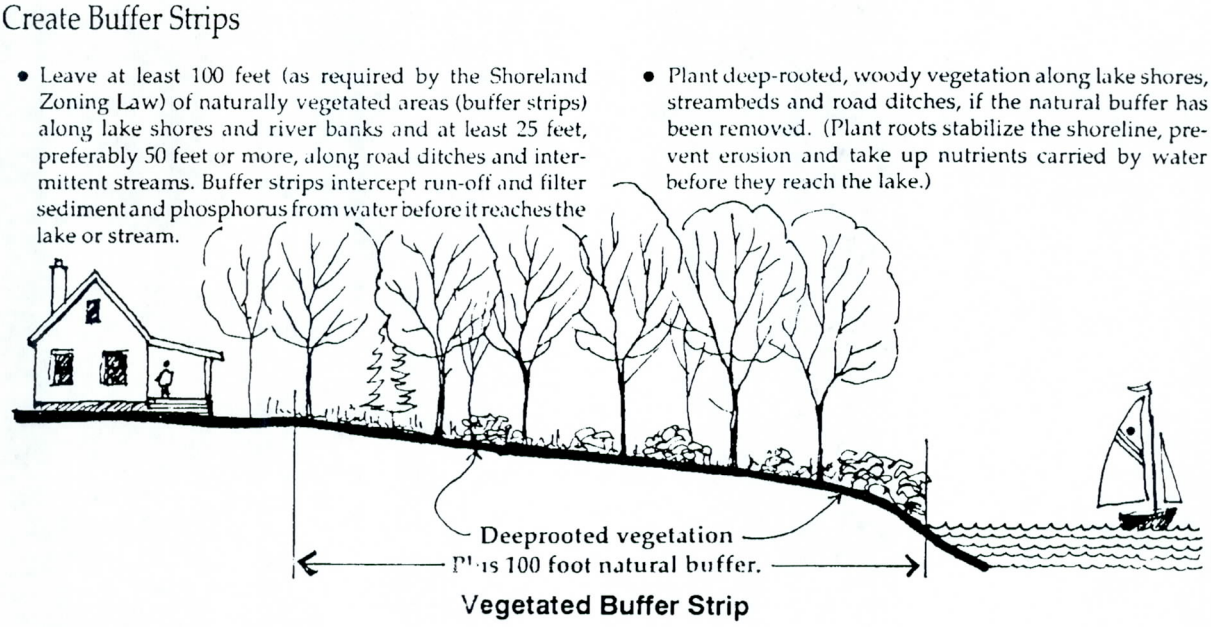


Figure 6-6: Buffer strips.
Source: *Environmental Management: A Guide for Town Officials*, Maine Department of Environmental Protection, 1992

SPECIAL DESIGNATIONS

Stream corridors often possess special value for an area, region or state. These corridors are given special designations—such as a wild or scenic river—and are afforded an extra level of recognition and protection.

While such programs are not necessarily regulatory in nature, they do encourage proper planning and land use control, discourage unwanted development, and guide federal and state actions.

The Community Rating System credits preserving areas for their natural functions under Activity 420 Open Space Preservation, Section 421.c. Credit for prohibiting critical facilities in floodplains and for prohibiting on-site sewage treatment, landfills and other hazardous use or threats to public health, is provided in Activity 430 Higher Regulatory Standards, Sections 431.e and 431.g, respectively. Water quality regulations are credited in Activity 450 Stormwater management, Sections 451e. and f.

LEARNING CHECK #2

1. Is your community subject to any of the following flood hazards of special concern?
   - — Coastal erosion
   - — Tsunamis
   - — Closed basin lakes
   - — Uncertain flow paths or alluvial fans
   - — Upstream dams
   - — Ice jams
   - — Mudflows

2. If so, have you enacted any additional regulatory provisions to better protect future development from damage?

3. Since there are several federal agencies that regulate wetland development, protect rare and endangered species, etc., is there any need for your community to consider any additional environmental protection measures?

4. Name three types of regulations that can protect natural resources in your floodplains.

UNIT LEARNING EXERCISE

1. Does the NFIP allow communities to enact more restrictive regulatory standards?

2. Can a floodplain regulation ever prohibit new buildings from a portion of the floodplain?

3. Name two types of floodprone areas where many communities prohibit development.

4. What's the advantage of requiring dry land access if buildings are protected from flooding?

5. How could a developer of an 80-acre subdivision reduce the amount of runoff that leaves the property during a storm?

6. Do Federal agencies have to meet any floodplain development rules similar to the NFIP requirements?

UNIT 7:
ORDINANCE ADMINISTRATION

In this unit

This unit covers things you need to know to effectively administer your floodplain management ordinance, including

- The legal basis for your ordinance,
- The duties and qualifications of the person who administers it,
- How to process permits,
- Conducting inspections,
- Enforcement tools,
- Appeals and variances, and
- Record keeping.

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INTRODUCTION

Generally, the NFIP does not have specific requirements on how local ordinances should be administered.

The NFIP does require that the local ordinance be legally enforceable and enforced uniformly throughout the community (44 CFR 60.1(b)). There are also some record keeping requirements that assist in verifying community and building compliance with the regulations.

If FEMA finds that a community's program is not in full compliance with its NFIP obligation, then it may require certain administrative adjustments to the program. How the program is administered, though, is dependent on the enabling legislation and the community.

This unit, therefore, is primarily a series of recommended administrative procedures. Those items that are NFIP requirements are highlighted in the "44 CFR" regulation boxes.

A. THE ORDINANCE

This course assumes that your community has a floodplain regulation ordinance in effect. While the course does not provide a model ordinance or ordinance language, it does describe the significance of your ordinance, and how to enforce some of its provisions.

If you need to enact or revise your floodplain regulations, contact your state NFIP coordinator to see if there is a model appropriate to your state laws and flooding conditions that you could use as a foundation for your local ordinance.

Statutory authority

As used in this course, ordinance is the generic term for a law passed by a local government. In some states it is called a "by-law" or some other name.

In all states, the authority to enact an ordinance comes from state law.

Communities are created by their state. Their powers are granted by and limited by state law or statutory authority, which is also known as enabling legislation. Your state has a specific law or set of laws authorizing your community to enact and enforce floodplain regulations. That law probably sets these parameters:

- The purpose and limits of the regulatory authority—for example, your community may not be able to regulate development projects undertaken by state agencies or public utilities.
- Minimum regulatory standards—many states mandate a certain building code or floodway encroachment standard.
- Prerequisites for enacting or amending the ordinance—a zoning ordinance may have to be based on a comprehensive plan or be adopted only after a public hearing.
- Requirements for issuing variances or allowing special uses.
- Prerequisites for the administering official—the community may have to have a certified building official enforce its building code.

Some state laws provide for state oversight of local regulations. In some cases, developers must apply to the state for a permit. In other cases, they may appeal to the state if they feel the community has not interpreted the regulations correctly.

In most states, local laws are subject to "Dillon's rule," named after a judge named Dillon who ruled in the 19th Century that because local governments are created by state government, they can do only what state laws specifically authorize.

If an action is not authorized by statute, a community cannot do it.

At one time, some communities did not have the statutory authority to implement the minimum NFIP regulatory requirements. FEMA worked with those states, so now all communities (cities and counties) should have all the authority they need to fulfill their NFIP obligations.

In some states, larger communities may be granted home rule. A home rule community is authorized to do anything that is not prohibited by statute. However, zoning and building laws are usually specific enough that even home rule communities must follow their provisions.

TYPES OF ORDINANCES

Floodplain regulations are usually found in one of four types of rules: zoning ordinances, building codes, subdivision regulations, sanitary regulations, and "stand alone" ordinances. Each is explained below.

Zoning ordinance

A zoning ordinance regulates development by dividing the community into zones or districts and setting development criteria for each district. Two approaches address development in floodprone areas: separate districts and overlay zoning.

In a separate district, the floodplain can be designated as one or more separate zoning districts that only allow development that is not susceptible to damage by flooding. Appropriate districts include public use, conservation, agriculture, and cluster or planned unit developments that keep buildings out of the floodplain, wetlands and other areas that are not appropriate for intensive development.

Overlay zoning adds special requirements in areas subject to flooding. The areas can be developed in accordance with the underlying zone, provided the flood protection requirements are met. As illustrated in Figure 7-1, there may also be setbacks or buffers to protect stream banks and shorelines or to preserve the natural functions of the channels and adjacent areas.

Building codes

A building code establishes construction standards for new buildings. The code may or may not set site or location requirements as a zoning ordinance does.

Many communities have adopted one of these national model building codes:

- The National Building Code of the Building Officials and Code Administrators (BOCA) has its flood resistant design and construction standards in Chapter 31.
- The Standard Building Code of the Southern Building Code Congress International (SBCCI) has a separate standard for flood resistant design and construction which is referenced in Chapter 31 and automatically adopted with the code.
- The Uniform Building Code of the International Conference of Building Officials (ICBO) has a separate appendix that must be specifically adopted by reference.

- The One and Two Family Dwelling Code of the Code Administrators and Building Officials (CABO) has no flood resistant design and construction standards but does have drainage provisions.

Many, but not all, NFIP regulatory requirements appear in parts of these codes. The Standard Building Code has a separate section devoted to floodplain management standards.

You should not assume that since your community uses one of these codes that all your regulatory requirements are covered.

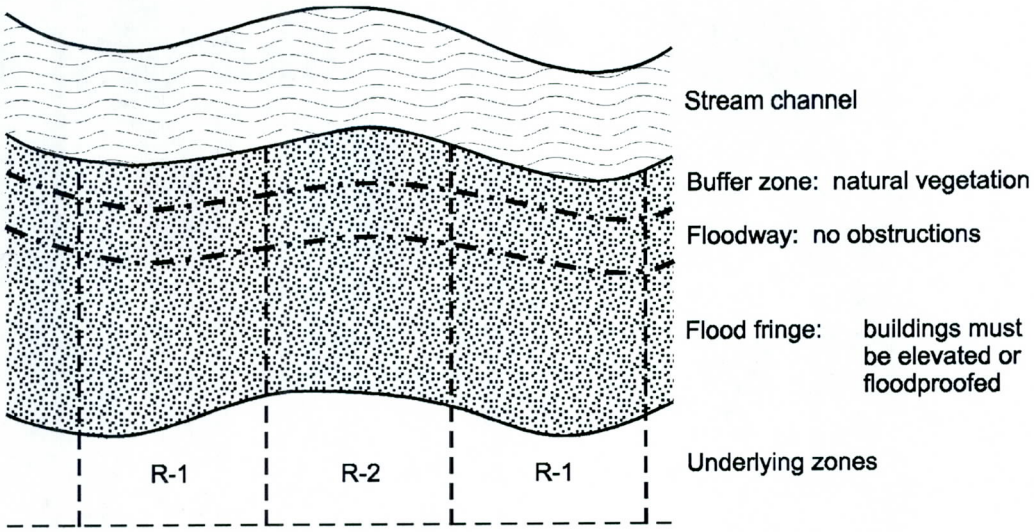

Figure 7-1. Example of overlay zoning

Subdivision regulations

Subdivision regulations govern how land will be divided into single lots. They set construction and location standards for the infrastructure the developer will provide, including roads, sidewalks, utility lines, storm sewers and drainageways.

As noted in Unit 6, Section C, subdivision regulations offer an opportunity to keep buildings out of the floodplain entirely with cluster developments.

They can also require that every lot have a buildable area above the BFE, include dry land access and meet other standards that provide more flood protection than a building code can.

Sanitary regulations

The NFIP's requirements for water and sewer system protection are sometimes best located with the regulations that set the construction standards for these systems.

"Stand alone" ordinance

Many, if not most, communities in the NFIP have enacted a separate ordinance that includes all the NFIP regulatory requirements, usually based on a FEMA or state model.

The advantage of doing this is that one ordinance contains all floodplain development standards. Developers can easily see what is required of them, and FEMA and the state can easily see if your community has adopted the latest requirements.

The disadvantage to a separate ordinance is that it may not be coordinated with other building, zoning or subdivision regulations. Some communities have found that by adopting a stand alone model, they adopt standards that are inconsistent or even contrary to the standards in the other regulations. For example, your building code may require crawlspace vents to be high, near the floor joists, while the floodplain ordinance requires them to be no more than one foot above grade.

If you have a stand alone ordinance, you should review its provisions with all other offices and ordinances that regulate land development and building construction. Make sure that others know the floodplain regulations and that there are no internal inconsistencies. For example, a floodplain ordinance administered by the city engineer may not be coordinated with the permit process conducted by the building department.

CONTENTS

Whether your floodplain regulations are in one ordinance or several, they should have these provisions:

- Purpose: Why was the ordinance adopted? What are its objectives? This provision helps set the tone for regulatory standards. For example, if the only purpose of the ordinance is to meet the NFIP minimum building requirements, a court may rule that it should not have higher regulatory standards that protect life safety.
- Definitions: What technical terms are needed? Most ordinances have to define terms like "development," "building," "base flood elevation" and "lowest floor" in order for the regulations to be clearly understood.
- Adoption of flood data: Your community needs to adopt the flood maps, profiles and other regulatory flood data. This provision may need to be amended when new studies are published or new areas are annexed.
- Requirement for a development permit: Your ordinance must have a development permit process. Relying on your community's building code or zoning ordinance permit process may not be sufficient because those programs may not require permits for all development, including fill, mining, etc.
- Construction standards: This is the meat of the ordinance. It should cover all of the NFIP standards discussed in Unit 5 and additional regulatory standards required by the state or that the community deems appropriate. The standards should include provisions for:
- Building protection standards (elevation, floodproofing, anchoring)
- Standards for manufactured (mobile) homes and manufactured home parks
- Construction standards peculiar to the flood zones in your community, such as V, AO, AH and A99
- Construction in the floodway and standards for encroachments where floodways are not mapped
- Standards for subdivisions
- Standards for water and sewer service
- Rules on water course alterations
- Designation of administrator: The community must officially designate one person responsible for administering the ordinance. This provision may list that person's duties, as detailed in the next section.
- Appeals process: The regulations need to provide a way for people to appeal or request a variance when they feel that the construction standards are overly harsh or inappropriate. This process should be handled by a separate body, such as a board of appeals or plan-

ning commission; it should not be left up to the decision of a single person, such as the administrator.

- Enforcement: The ordinance must have enforcement procedures clarifying penalties for violations. These are usually fines and orders to correct the violation.
- Abrogation and greater restriction: This is a legal provision that specifies that the ordinance take precedence over less restrictive requirements.
- Severability: This is a statement that the individual provisions are separable and if any one is ruled invalid, it does not affect the rest of the ordinance.

B. THE ADMINISTRATOR

The state grants communities the police powers to adopt, administer and enforce local codes and regulations, including floodplain regulations. Generally, elected officials delegate authority for ordinance administration and enforcement to a subordinate officer.

A local floodplain administrator might be an existing local staff person, such as the building inspector, community zoning official, engineer or planner. The community also might contract to have the job done by the county, regional planning agency, another jurisdiction or authority, or a private firm.

Throughout this course, the person designated as responsible for administering the floodplain management ordinance is called "the administrator." This course also assumes that you are the administrator, so the terms "you" and "the administrator" are used interchangeably.

DUTIES

In general, the administrator is responsible for ensuring that development activities comply with the floodplain management regulations and other applicable codes and ordinances.

Duties of the administrator vary depending on the kind, size and characteristics of the community. However, certain responsibilities are common to all ordinance administrators. Here is a list of such duties:

Understand the regulations: This is the most important of all of your duties and is the main subject of this course. A sound working knowledge of the general and technical provisions of various federal, state and local regulations is essential. You must be able to explain them to others, to review permit applications for compliance, and to provide adequate interpretations.

Ensure that permits are applied for: Often people do not realize that they need to apply for a permit for a project in the floodplain. You need to ensure that the public is informed as to when permits are needed and how they are obtained. Anyone engaged in a development project without a permit must be told to stop and apply for one.

Correct violations: You must evaluate complaints, conduct investigations and use legal recourse when necessary to correct violations.

Process permit applications: Your primary role is to review permit applications for compliance with applicable local regulations. This involves:

- Collecting permit fees, where applicable.
- Assessing the accuracy and completeness of the application.
- Evaluating site plans, topographic data, building design plans and other technical data.
- Identifying deficiencies and devising ways to correct them.

- Issuing or denying the permit.
- Helping applicants pursue appeals or requests for variances.

Coordinate with other programs: Responsibility for permit review may reside in or be shared with other offices, such as public works, planning and zoning, code enforcement or housing departments. Depending on your duties, your may be involved in coordinating permit reviews.

You must advise the applicant of any need for additional local, state or federal permits for the proposed development. Your office could have copies of the permit application forms or advise applicants whom to contact.

One of your NFIP responsibilities is to notify adjacent communities and the state NFIP coordinating agency prior to any alteration or relocation of a watercourse. You must submit evidence of such notification to the FEMA Regional Office.

You should also notify adjacent communities of plans for a substantial commercial development or large subdivision that could affect their flood hazard areas.

Ensure projects are built according to approved permits: You or your staff must perform periodic and timely on-site inspections to confirm visually that development is following the approved plans. The best way to do this is with a series of inspections at appropriate stages in the construction process, as discussed later in this unit. A certificate of use or occupancy is a final permit that allows the owner to use the building. It should not be given until a final inspection confirms that everything was done according to the approved plans.

Take enforcement actions: When noncompliant activities are uncovered, you must act to resolve the situation. This may involve issuing stop-work orders or other violation notices, coordinating enforcement procedures with the community's attorney, or appearing in court.

Keep records: You should have on hand a sufficient supply of current permit applications, variance requests and other administrative forms. A project file should be kept for each development permit application.

Maintain and update flood data and maps: As noted in Unit 4, Section D, your community should maintain an adequate supply of maps showing the regulatory floodplain for your office and the public to use. All map corrections and notices of map revisions should be recorded and denoted on administrative maps, with the details kept in an indexed file.

You should also cooperate with federal, state and local agencies, and private firms, undertaking flood studies. You must submit any new floodplain data to the FEMA Regional Office within six months of their development. Community staff should review revisions to maps (including Conditional Letters of Map Revision and Letters of Map Revision) to ensure they meet your regulations.

You must notify the FEMA Regional Office and the state within one year of an annexation or when your community has assumed or relinquished authority to adopt or enforce floodplain management regulations for a particular area.

> ***44 CFR 59.22(a)(9)(v)*** *Upon occurrence, [the community must] notify the Administrator in writing whenever the boundaries of the community have been modified by annexation or the community has otherwise assumed or no longer has authority to adopt and enforce flood plain management regulations for a particular area. In order that all FHBMs and FIRMs accurately represent the community's boundaries, include within such notification a copy of a map of the community suitable for reproduction, clearly delineating the new corporate limits or new area for which the community has assumed or relinquished flood plain management regulatory authority.*

You must notify the FEMA Regional Office and the state within six months of physical changes that can affect flooding conditions, such as channel modifications or upstream detention.

> ***44 CFR 65.3.*** *A community's base flood elevations may increase or decrease resulting from physical changes affecting flooding conditions. As soon as practicable, but not later than six months after the date such information becomes available, a community shall notify the Administrator of the changes by submitting technical or scientific data in accordance with this part. Such a submission is necessary so that upon confirmation of those physical changes affecting flooding conditions, risk premium rates and flood plain management requirements will be based upon current data.*

Update the ordinance: If your community is notified of changes in federal or state laws and/or regulations that would require changing your floodplain management ordinance, you must revise your ordinance within six months.

> ***44 CFR 60.7.*** *From time to time Part 60 may be revised as experience is acquired under the Program and new information becomes available. Communities will be given six months from the effective date of any new regulation to revise their flood plain management regulations to comply with any such changes.*

Similarly, if you are given new flood data by FEMA, you have six months to update your ordinance to adopt the data and the regulatory requirements appropriate for that level of data (Unit 5, Section A, Community Types relates the level of data to the regulatory requirements).

> ***44 CFR 60.2(a)*** *A flood-prone community ... will be given a period of six months from the date the Administrator provides the data set forth in § 60.3(b), (c), (d), (e) or (f), in which to meet the requirements of the applicable paragraph.*

A certified copy of any ordinance revision should be submitted to the FEMA Regional Office and to the state NFIP coordinating agency promptly after adoption.

QUALIFICATIONS

Your state may set minimum requirements for the person who administers the floodplain management ordinance, such as stipulating that the post be held by a certified building official. A

few states are encouraging or requiring that the ordinance be administered by a "certified floodplain manager," a new certification that may be conferred by your state or the floodplain management association in your state.

In most instances, there are no specific qualifications or prerequisites. This does not mean just anyone can do any part of the job of administering the ordinance. One of your jobs is to make sure that the person with the right qualifications helps you. You will probably need help from three other professions:

- Some tasks should be conducted by an engineer experienced in hydrologic and hydraulic studies, such as reviewing a developer's flood study before you accept new flood elevations.
- While the NFIP allows any properly appointed local administrator to complete an elevation certificate, some states require that such work only be done by registered land surveyors.
- You should always consult your community's attorney before you initiate an enforcement action.

TRAINING

In many cases, only you will have the expertise needed to administer your ordinance. As the administrator, you will probably be your community's primary source of information on:

- The basic NFIP requirements.
- Additional requirements of your ordinance.
- How to use the NFIP maps and regulatory flood data.
- How maps are reviewed and revised.
- When permits are needed.
- Whether a proposed project meets the ordinance's standards.
- Whether a completed project complies with the approved plans.
- What records are needed.
- How to deal with citizens and builders.
- How to deal with violations.
- How floodplain development regulations and flood insurance rating are related.
- Where citizens and builders can get more information or help.

These topics are not taught at any high school or college. To learn these things you will need additional training. Here are some ways to get it:

- Complete this home study course.
- Spend time with the floodplain administrator in a neighboring community.

- Check with the FEMA Regional Office and/or the state NFIP coordinator before you issue your first few permits or certificates of occupancy.
- Request a Community Assistance Visit whereby a FEMA or state person will visit you and review your procedures.
- Attend a workshop put on by your state NFIP coordinator.
- Attend a meeting or conference of your state or national floodplain management association (contact the state coordinator for information about these associations).
- If available before you take a certification test, attend a recommended training or refresher course.
- Attend the Emergency Management Institute.
- Visit FEMA's web site periodically (http://www.fema.gov).
- Order and review the publications listed in Appendix C.

The Emergency Management Institute (EMI) in Emmitsburg, Maryland, provides several courses related to the administrator's job. While you would not need to take the resident course that has the same name as this one, EMI offers three others that would be helpful:

- National Flood Insurance Program/Community Rating System
- Digital Hazard Data (how to use digital FIRMs and other data)
- Retrofitting Floodprone Residential Buildings

These courses are designed to give you step-by-step practical knowledge and experience. In addition, by attending an EMI course you meet other local administrators from around the country from whom you also can learn the ins and outs of floodplain management administration.

EMI courses run Monday through Friday, two to four times a year. They are free for state and local officials. Generally FEMA will pay transportation to Emmitsburg and will house you in dormitories on campus. For more information, See Appendix G, ask your local emergency manager, or call EMI at 800/238-3358.

LIABILITY

Ordinance administrators naturally fear they could be sued if a person gets flooded or a building is damaged by a flood. Debated nationally for some time, this issue has been studied extensively by Dr. Jon Kusler, a nationally known attorney in floodplain management law.

Dr. Kusler summarized his most recent findings in *Floodplain Management in the United States: An Assessment Report*, Volume 2, prepared for the Federal Interagency Floodplain Management Task Force, 1992.

Excerpts from that report are quoted here. However, your community's legal department should provide more specific guidance.

- Government agencies are generally not liable for flood damage unless the flood was caused by a government action. "Except in a few instances, governments are not liable for naturally occurring flood damages. Government has, in general, no duty to construct dams, adopt regulations, or carry out other hazard reduction activities unless required to do so by a statute. It is only where a government unit causes flood damages or increases natural flood damages that liability may arise." (*Floodplain Management in the United States: An Assessment Report*, Volume 2, *Page 1012*)

- Liability is based on negligence; a community is well defended by a properly administered program. "In general, government units are not 'strictly or absolutely' responsible for increased flood damages. Liability usually results only where there is a lack of reasonable care. ... Where the standard of reasonable care is judicially applied to an activity, the seriousness of foreseeable threat to life or economic damage is an important factor in determining reasonableness of conduct. In general, the more serious the anticipated threat, the greater the care the government entity must exercise. (*Floodplain Management in the United States: An Assessment Report*, Volume 2, *Page 1013*)

- Policy or discretionary actions are more defensible than nondiscretionary, ministerial actions. It is better to have clear standards spelled out in the ordinance adopted by your governing board than to leave a lot of interpretation up to the administrator. "As a general rule, courts do not hold legislative bodies or administrative agencies liable for policy decisions or errors in judgment where the legislature or agency exercises policymaking or discretionary powers. But they often hold agencies responsible for failure to carry out nondiscretionary duties or for negligence in carrying out ministerial actions." (*Floodplain Management in the United States: An Assessment Report*, Volume 2, *Page 1013*)

- "... from a legal perspective it may be desirable to submit proposed standards ... to a community's legislative body (e.g., community council) for debate and approval. Due to the special way legislative decisions are treated by the courts, legislative judgments, particularly those of a discretionary nature, are less likely to result in a successful liability suit than are agency decisions. Courts generally defer to legislative judgment." (*Floodplain Management in the United States: An Assessment Report*, Volume 2, *Page 1017*)

- Government employees are usually protected from liability suits. "Although governments may be liable for increased flood or drainage losses in a broad range of contexts, government employees are usually not personally liable for planning, permit issuance, operation of dams, adoption of regulations or other activities. ... No personal liability results where a government employee acts in good faith, within the scope of his or her job, and without malice. Successful lawsuits for hazard-related damages against government employees under common law theories or pursuant to Section 1983 of the Civil Rights Act are apparently nonexistent." (*Floodplain Management in the United States: An Assessment Report*, Volume 2, *Pages 1013 - 1014*)

Based on these findings, you can protect yourself from lawsuits by:

- Adopting sound and appropriate flood protection standards: Remember, NFIP standards are minimums. Buildings should not be allowed in a mountainous floodplain with no warning time and very high velocities, even though the NFIP minimums would allow it. If you know flooding could be or has been higher than the BFE shown on the FIRM, you

are not doing your residents any favors by allowing them to build buildings exposed to a known hazard.

- Becoming technically competent in the field: You won't be sued if you have ensured that the project was properly constructed. There is no grounds for a suit if no one is damaged by flooding: "... 'liability can be avoided if flood damages are avoided.' From a legal perspective, this is a sound philosophy." (*Floodplain Management in the United States: An Assessment Report*, Volume 2, *Page 1017*)
- Insuring the community: Your community may want to purchase liability insurance or establish a self-insurance pool or plan to protect itself.
- Encouraging property owners to buy flood insurance coverage. If people are compensated for any flood losses, they are less likely to file a lawsuit.
- Adopting an ordinance provision that exempts the community from liability. Several states' model ordinances have language like the following:

Disclaimer of Liability:

(i) The degree of flood protection required by this ordinance is considered reasonable for regulatory purposes and is based on available information derived from engineering and scientific methods of study.

(ii) Larger floods may occur or flood heights may be increased by man-made or natural causes.

(iii) This ordinance does not imply that development either inside or outside the SFHA will be free from flooding or damage.

(iv) This ordinance does not create liability on the part of the City or any officer or employee therefore for any flood damage that results from reliance on this ordinance or any administrative decision made lawfully thereunder. (*Floodplain Management in Northeastern Illinois*, Illinois Department of Natural Resources, 1996, p. 56)

LEARNING CHECK #1

1. Review your floodplain regulations and identify where the following provisions are found.

- Purpose statement
- Definitions of
  - — base flood elevation
  - — building or structure
  - — development
  - — floodway
  - — lowest floor
  - — substantial improvement
  - — substantial damage
- Adoption of the FIRM or other floodplain map
- Adoption of the Flood Insurance Study
- Requirement for a permit for all development in the floodplain
- Construction standards:
  - — floodway construction (if applicable)
  - — encroachment analysis where floodways are not mapped
  - — building elevation criteria
  - — floodproofing criteria
  - — anchoring requirements
  - — standards for manufactured (mobile) homes
  - — standards for manufactured home parks
  - — construction standards in V Zones
  - — construction standards peculiar to the zones in your community
  - — standards for subdivisions
  - — standards for water and sewer service
  - — rules on water course alterations
- Designation of administrator
- Duties of the administrator
- Appeals process

- Enforcement procedures and penalties
- Abrogation and greater restriction
- Severability

2. Check your community's other regulatory ordinances to determine if there are any inconsistencies between them and your floodplain construction standards.

C. DEVELOPMENT PERMITS

Once the ordinance is in force, any development or change in land use requires authorization, generally in the form of a permit from the local administrator or agency. This section of Unit 7 discusses the permit review process that leads to approval or denial of an application.

This discussion reviews a standard process. It is not a mandatory process, but it does ensure that all of your NFIP requirements will be met. If your community has a permit process that has proven successful, you should review this section to see if there are things you would want to add to your process.

Figure 7-2 shows the permit process that forms the organization for this section. To facilitate your work, you may want to develop your own checklist. An example developed by the State of South Carolina is at the end of this section in Figure 7-3.

WHEN A PERMIT IS REQUIRED

A permit is required for almost any development-related change to the floodplain, including but not limited to:

- Construction of new structures
- Modifications or improvements to existing structures
- Excavation
- Filling
- Paving
- Drilling
- Driving of piles
- Mining
- Dredging
- Land clearing
- Grading
- Permanent storage of materials and/or equipment

While most communities have issued building permits for some time, most usually don't have a permit system for such a wide range of activities as "development" Regulation of all development in floodplains is essential because fill or other material can obstruct flood flows just as structures can.

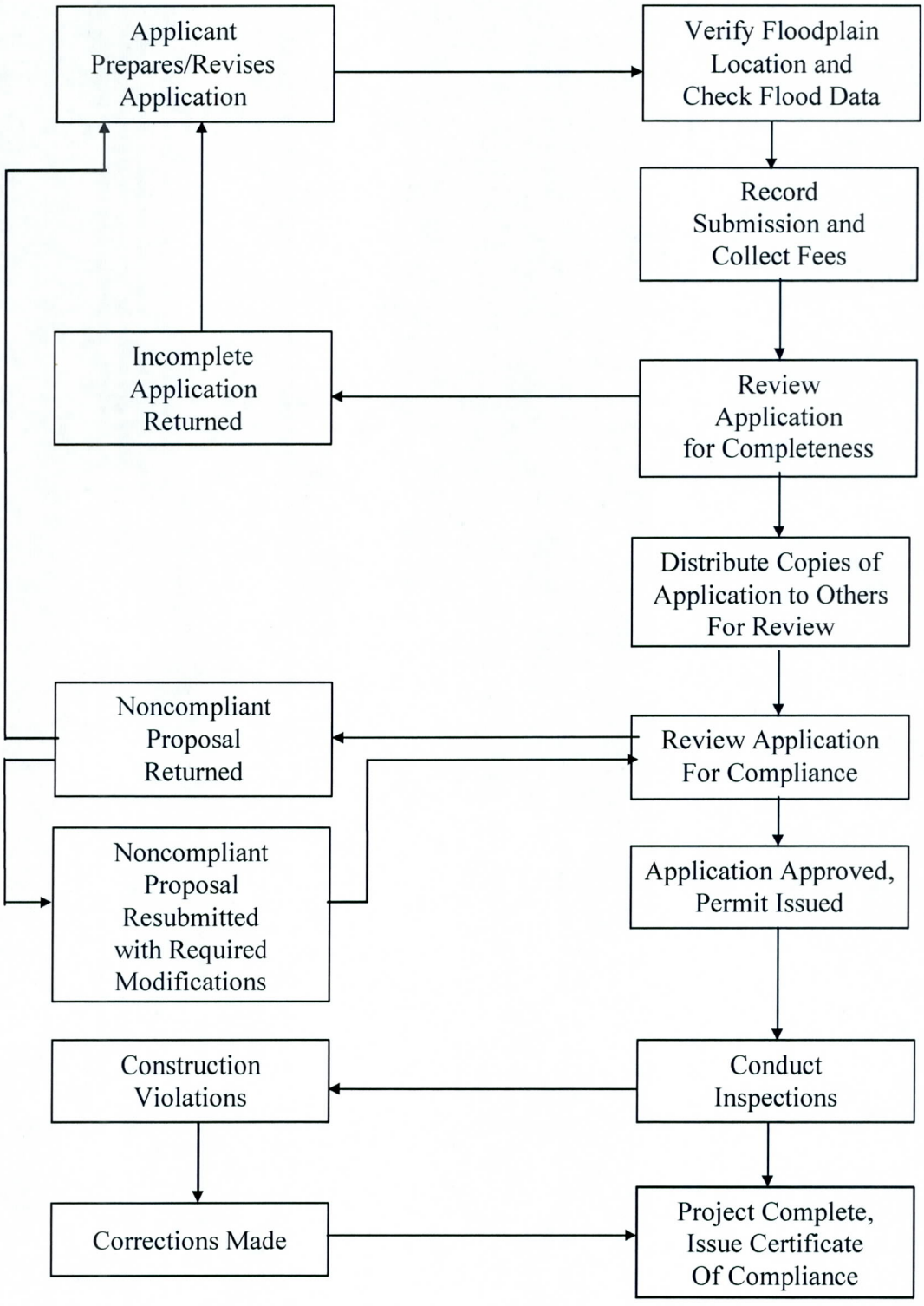

Figure 7-2. Permit process flow chart

EXEMPTIONS

Your statutory authority may limit your community's ability to regulate some development. The most common limitation is over activities by federal agencies, tribal lands, state agencies, other local governments, and public utilities. Check with your state NFIP coordinator to determine what is exempt from a local ordinance.

> ***44 CFR 60.1(b)*** *These regulations must be legally-enforceable, applied uniformly throughout the community to all privately and publicly owned land within flood-prone ... areas, and the community must provide that the regulations take precedence over any less restrictive conflicting local laws, ordinances or codes.*

You cannot exempt activities by your own community government. Just because the public works department doesn't get a permit from the building department does not mean that it doesn't have to follow the NFIP rules that govern all development within your statutory authority.

If State actions are exempt from your permit authority, your state should have adopted floodplain management requirements that are comparable to your ordinance. This is usually in the form of a governor's executive order. Similarly, Federal agency activities are subject to the provisions of Executive Order 11988 Floodplain Management.

You do have some discretion to exempt obviously insignificant activities from the permit requirement—such as planting a garden, farming, putting up a mailbox or erecting a flagpole. Other projects, such as reroofing and replacing siding, will not affect flood flows or be labeled substantial improvements See also the discussion on the NFIP's development permit requirements in Unit 5, Section C.

Some communities specify exempt projects in their ordinances. Check with your state coordinating agency and/or FEMA Regional Office before you do this, because you don't want to exempt projects that could be considered floodway violations or substantial improvements.

PERMIT APPLICATION FORM

A good administrative form can serve as a checklist for identifying the kinds of information that should accompany a permit application.

Your community should have its own permit application form. Figure 7-4, at the end of this section, is the model form developed by the state of North Carolina. It contains all the required information for a floodplain development permit application. Your form may be different, but the review process is the same.

Note: If you use the form in Figure 7-4 to develop your own permit application program, be sure to include all other state and local requirements. You may want to include checklists of items you will need to look at.

Where a particular activity that is required by the NFIP regulations is mentioned in this unit's text, the reference to 44 CFR Part 60 is included in brackets (e.g. [44 CFR 60.3(c)(5)]). These

activities must be included in the permit process in order for the community to remain in full compliance with the NFIP.

Forms are a valuable and necessary tool in reviewing development proposals for regulatory compliance. When designed properly, they can be the most efficient way to get information that is essential to conducting an effective and thorough review. The forms should be revised periodically to remain current with changes in the floodplain management ordinance and to include pertinent information.

APPLICATION REVIEW

Submission of a development permit application starts the permit process.

Before submitting an application, the prospective applicant often will contact you to obtain a copy of the regulations, locate the proposed site in relation to the NFIP maps, determine flood elevations, or gather procedural and technical information needed to complete the application.

This informal part of the permit process can be important in guiding the applicant to locate and design the development in compliance with local regulations. It also can help the applicant to prepare a complete application, avoiding unnecessary delays at the outset.

Some communities ensure that the permit process will go smoothly by having a formal pre-application meeting with a developer to review a preliminary plan.

REVIEW FOR COMPLETENESS

The application package should contain all the administrative forms, plans, blueprints and technical documentation required for you to review the proposed project for regulatory compliance. If the application package is incomplete, the review can't go forward. The applicant should be advised of missing documents and told that the review will not start until the missing documents are submitted.

Some states and communities require that a permit be issued within so many days of receipt of the application. You should not officially "receive" the application or log it in until it has been reviewed and determined to be complete.

You should review the package in a timely manner. The review should include the following procedures:

1. Make sure all administrative forms are completed satisfactorily and properly signed. Scan the administrative forms to ensure that all questions have been answered. If important items are left blank or not addressed completely, bring them to the attention of the applicant for completion.

Inaccurate information also should be brought to the attention of the applicant. Your review should be halted until deficiencies are corrected.

2. Briefly review site plans, grading and excavation plans, and building design plans for completeness. Depending on the specificity or detail of the administrative forms, the various plans that accompany the application will provide the technical data needed for a thorough review.

The site plan is a critical component of floodplain development proposals. Such a plan should show:

- Location of property lines.
- Required set backs lines and easements.
- Topographic information, such as contour lines or spot elevations.
- Streets.
- Watercourses.
- Existing and proposed structures.
- Proposed building elevations of all new construction and the existing lowest floor for substantially improved or substantially damaged structures.
- All clearing, filling and other proposed changes to the ground.
- Floodway and floodplain boundaries.
- Base flood elevations.
- In V zones, the line of the mean high tide and Zone V/Zone A boundary; if there is more than one Zone on the lot, the BFE and boundary locations should be depicted on the plans.

When a plan is prepared by a registered professional architect, engineer or land surveyor, it should be stamped with the license seal to certify technical accuracy.

3. Ensure that all necessary certifications are included and properly signed. The applicant must provide all completed certifications needed for the permit review.

Based on the minimum NFIP requirements, four situations would require the filing of certified documents with the permit application:

- Floodway encroachment: If any part of the proposed project is to be located in a designated floodway, the applicant must submit an engineering certification and documentation demonstrating that the proposed encroachment would not result in any increase in base flood heights. If the project is in a riverine floodplain where no floodway has been adopted, the certification would show that there the project will not exceed the allowable increase a flood heights. This certification could be the same as the No-Rise Certification shown in Figure 5-5. [44 CFR 60.3(c)(10) and (d)(3)]
- Floodproofed building: In the event a nonresidential structure is to be floodproofed, the applicant must submit a statement from a registered professional engineer or architect

certifying that the design and methods of construction meet these standards [44 CFR 60.3(c)(4)]. A second, as-built, certificate is also required to be submitted later.

- Enclosures below the lowest floor. Unit 5, Section E covered the requirements for openings in enclosures. If an applicant designs an enclosure below the lowest floor using an alternative to the NFIP standard, a registered professional architect or engineer must certify the design [44 CFR 60.3(c)(5)]. If a full-story enclosure is planned below the elevated lowest floor, you should require the applicant to sign a non-conversion agreement such as the one in Figure 5-13.
- V Zone construction. An applicant proposing to construct a building in a V zone must supply a statement from a registered professional architect or engineer certifying the design and method of construction of the elevated building and the design of breakaway walls [44 CFR 60.3(e)(4)]. See Figure 5-18 for an example. An as-built certificate is also recommended to be submitted later

4. Ensure that all necessary federal and state permits are being obtained. You must review the application package to determine whether federal and state permits are necessary [44 CFR 60.3(a)(2)]. To help you and the applicant, you might include the agency or program names as a checklist on your permit application form.

When obtaining federal and state approval takes a long time, you may condition issuance of your permit on the applicant's obtaining such permits later. The applicant should provide documentation to the administrator stating that the required federal and state permits have been applied for, and that portion of the project affected by needed permits will not proceed until those permits are issued.

For example, getting a Section 404 wetlands permit from the Corps of Engineers may take several months. Under such circumstances, you may issue a local permit with the stipulation that the applicant must have submitted all required permits before beginning construction. You can verify this at your first inspection.

5. Submit copies of appropriate parts of the application package to other departments for review. Depending on the type and size of the proposed development and on the regulatory responsibilities of other departments or offices in your community, the applicant should submit a sufficient number of copies to allow for others' review.

Here are some departments and agencies who might need to review a portion of the application:

- Building department.
- Zoning department.
- Engineer's office.
- Health department (septic system approval).
- FEMA Regional Office (for assistance in evaluating a no-rise floodway application, change to a floodway delineation or other activity that will result in a map revision).

- State NFIP coordinating agency (state permit requirements, alteration or relocation of a watercourse).
- U.S. Army Corps of Engineers (404 permit, technical assistance).
- Environmental Protection Agency.
- State public health agency (permits for hospitals, nursing homes, etc.).
- Natural Resources Conservation Service (impact of subdivisions and other large development on the natural resources of the area).
- Adjacent communities (alteration or relocation of a watercourse).

If your office hasn't done this already, you should contact these agencies, determine what, if anything, they need to review, and prepare a checklist for permit applicants that advises them of the other approvals that will be needed.

REVIEW FOR COMPLIANCE

Now that you have a complete application package, follow these recommended procedures to verify that the project will meet all of your ordinance requirements.

1. Examine site information. Check the site plan to ensure the that plotted floodplain, floodway, and V Zone boundaries appear accurately plotted. Look for possible obstructions in the floodway and other potential violations.

Inspect the plan carefully and compare it with the FIRM, floodway map and profile. In coastal areas, you should determine if the site is in a COBRA zone and so advise the applicant/property owner (COBRA zones are explained in Unit 3, Section F and Unit 9, Section D).

Some project sites may be located close to the boundaries of the SFHA. Because the map scale is small, or it is difficult to pinpoint the project site, you may have trouble determining whether the project will be in or out of the SFHA. See Unit 4, Section B, on making floodplain and floodway boundary determinations.

Remember, a floodplain development permit is required only if the planned structure is located within the SFHA. For example, while the applicant's property may be located partially in the SFHA, the proposed structure would be built on land outside the SFHA. In this case, floodplain regulations would not apply and no special floodplain development permit is needed. However, if clearing, grading, filling, or road or bridge construction associated with erecting the structure is within the SFHA, a permit is necessary.

Note that while you can use better ground elevation data to determine that a building location is above the BFE (and therefore outside the SFHA), the property will remain in the SFHA on the FIRM. That means that it is still subject to the flood insurance purchase requirement and the rates will be set at SFHA rates. It is the owner's responsibility to submit a request for a Letter of

Map Amendment (LOMA) in order to have the FIRM reflect the better data (see Unit 4, Section D for more information on LOMAs).

2. Review building plans. If a building site is in the SFHA, all buildings must be protected to the BFE or higher.

In this course, the term "building" is the same as the term "structure" in the NFIP regulations. Your ordinance may use either term. The terms are reviewed in more detail in Unit 5, Section E.

The application package must include building design plans that show:

- The kind and potential use of the structure.
- The elevation of the lowest floor.
- The type of foundation system.
- The existence of any enclosure below the lowest floor, along with electrical and plumbing plans for the area, location of openings and materials proposed for use in an enclosure below the BFE.
- The height to which a nonresidential structure is to be floodproofed and the complete list of floodproofing techniques to be used, with detailed drawings

Any conflict or inconsistency with applicable regulations will require adjustments to the building plans.

3. Have the community's engineer review engineering documents. As listed previously, depending on the type and location of the structure being proposed, as many as four engineering documents or certifications are needed to show compliance with NFIP requirements concerning floodway encroachment, floodproofing, enclosures below the lowest floor and V Zone construction.

All engineering documents should be examined by your community's staff engineer, or a consulting engineer available to perform reviews, to ensure that acceptable technical standards were used and that calculations are correct. If your community does not have a staff engineer, the state NFIP coordinating agency or FEMA Regional Office may be able to help review the data.

APPLICATION APPROVAL OR DENIAL

Once you complete your review of the permit application papers for completeness and technical compliance with the ordinance, a decision on the application is due.

If the proposed development is in compliance with regulations, issue a permit. The permit becomes the official authorization from the community allowing the applicant to proceed, based on the information submitted in the application package. A sample permit developed by the North Carolina state NFIP coordinator is shown in Figure 7-5.

Somewhere in the permit record, such as the approved plans, the application form or the permit form itself, a record should be kept of the base flood elevation and the required floor

elevation. There should also be a general statement that all construction will be in accordance with all codes and ordinances (see Section 1, item 6 in Figure 7-4).

The day a permit is issued is the date of the "start of construction," provided construction begins within 180 days. Used for insurance rating purposes, this date determines what FIRM was in effect when the building was built, regardless when ground was broken or construction was finished.

For regulatory purposes, a permit may be effective or valid for a certain period of time, according to the standard used in your other regulations. If at the end of this period the project is not complete, the permit technically expires. However, ordinances routinely provide for the permit officer to issue written extensions to allow completion of the development under the conditions of the original permit.

If the application is not in compliance with local regulations, the permit should be denied. The applicant then can choose to:

- Withdraw the permit application.
- Redesign the project to bring it into compliance with regulations.
- Appeal to the Board of Appeals.
- Ask for a variance to the regulations.

While you may not be formally required to disclose the reasons for denying an application, it is good policy to do so in writing. This tells the applicant what areas are noncompliant so that if he or she wishes to resubmit the application, appropriate corrections can be made.

Appeals and variances are covered in Section F of this unit. Clarifying the deficiencies for the applicant also can help reduce the number of appeals of administrative and regulatory decisions you make

Building Permit Number: _____

Applicant's Name:	Owner's Name:
Site Address, Tax #, Parcel #:	Address:
Telephone:	Telephone:

I. All development - Base Flood Elevation Data provided.

A. The as-built elevation certification from a registered land surveyor or professional engineer has been submitted? Yes No

B. The lowest floor elevation is at or above the required lowest floor elevation? Yes No

C. Electrical, heating, ventilation, plumbing, air conditioning equipment (including duct work) and other service facilities are located above BFE or floodproofed? Yes No

II. Development in Zones A, AE, A1-A30 and AH.

A. Solid foundation perimeter walls located below BFE.:

1. There are at least two (2) openings? Yes No
2. Square footage of enclosed area subject to flooding _____
3. Square inches of venting required _____
4. Square inches per opening (multiply l by w) _____
5. Number of required vents (3 above divided by 4 above) _____
6. Foundation contains the minimum number of vents? Yes No
7. The bottom of each opening is no higher than one (1) foot above grade? Yes No
8. Any cover on openings will permit the automatic flow of floodwaters in both directions? Yes No

B. Base flood elevation and/or floodway data not available or AO Zones:

1. The lowest floor is at least three (3) feet above the highest adjacent grade? Yes No
2. The development meets the setback requirements of the ordinance? Yes No
3. If 2 above was "no", has a No-Rise Certification been submitted? Yes No
   Reviewer's Name: _____ Date reviewed: _____

C. Floodway data is provided.

1. Did this development encroach in the floodway? Yes No
2. Do the actual field conditions meet the proposed actions and technical data requirements? Yes No
3. If C1 was "yes", has a No-Rise Certification been submitted? Yes No
   Reviewer's Name: _____ Date reviewed: _____

III. Development in Zones V, VE, and V!-V30, VO (Coastal High Hazard Areas).

A. Development location complies with all coastal setback requirements? Yes No

B. Structure is securely anchored to pilings or columns and certification by a registered, professional architect or engineer has been submitted? Yes No
   Reviewer's Name: _____ Date reviewed: _____

C. Walls permitted below the base flood elevation consist of decorative lattice work or, where permitted, are breakaway and have been certified by a registered, professional architect or engineer? Yes No
   Reviewer's Name: _____ Date reviewed: _____

Local Administrator's Signature: _____ Date : _____

Figure 7-3. Sample permit review checklist
(Developed by the South Carolina Department of Natural Resources)

Application #____
Page 1 of 4

SAMPLE
FLOODPLAIN DEVELOPMENT PERMIT APPLICATION

This form is to be filled out in duplicate.

SECTION 1: General Provisions (APPLICANT to read and sign):

1. No work of any kind may start until a permit is issued.
2. The permit may be revoked if any false statements are made herein.
3. If revoked, all work must cease until permit is re-issued.
4. Development shall not be used or occupied until a Certificate of Compliance is issued.
5. The permit will expire if no work is commenced within six months of issuance.
6. Applicant is hereby informed that other permits may be required to fulfill local, state, and federal regulatory requirements.
7. Applicant hereby gives consent to the Local Administrator or his/her representative to make reasonable inspections required to verify compliance.
8. THE APPLICANT, CERTIFY THAT ALL STATEMENTS HEREIN AND IN ATTACHMENTS TO THIS APPLICATION ARE, TO THE BEST OF MY KNOWLEDGE, TRUE AND ACCURATE.

(APPLICANT'S SIGNATURE) _____ DATE _____

SECTION 2: Proposed Development (To be completed by **APPLICANT**)

NAME ADDRESS TELEPHONE

APPLICANT _____

BUILDER _____

ENGINEER _____

PROJECT LOCATION:

To avoid delay in processing the application, please provide enough information to easily identify the project location. Provide the street address, lot number or legal description (attach) and, outside urban areas, the distance to the nearest intersecting road or well-known landmark. A sketch attached to this application showing the project location would be helpful.

_____

_____

_____

Figure 7-4a. Sample floodplain development permit application form
(Developed by the North Carolina Division of Emergency Management)

DESCRIPTION OF WORK (Check all applicable boxes): Application # _____

A. STRUCTURAL DEVELOPMENT

ACTIVITY	STRUCTURE TYPE
❑ New Structure	❑ Residential (1-4 Family)
❑ Addition	❑ Residential (More than 4 Family)
❑ Alteration	❑ Non-residential (Floodproofing? ❑ Yes)
❑ Relocation	❑ Combined Use (Residential & Commercial)
❑ Demolition	❑ Manufactured (Mobile) Home (In Manufactured
❑ Replacement	Home Park? ❑ Yes)

ESTIMATED COST OF PROJECT $ _____

B. OTHER DEVELOPMENT ACTIVITIES

❑ Clearing ❑ Fill ❑ Mining ❑ Drilling ❑ Grading
❑ Excavation (Except for Structural Development Checked Above)
❑ Watercourse Alteration (Including Dredging and Channel Modifications)
❑ Drainage Improvements (Including Culvert Work)
❑ Road, Street or Bridge Construction
❑ Subdivision (New or Expansion)
❑ Individual Water or Sewer System
❑ Other (Please specify)_____

After completing SECTION 2, APPLICANT should submit form to the Local Administrator for review.

SECTION 3: Floodplain Determination (To be completed by the Administrator)

The proposed development is located on FIRM Panel No. _____, Dated _____.

The Proposed Development:

❑ Is NOT located in a Special Flood Hazard Area (Notify the applicant that the application review is complete and NO FLOODPLAIN DEVELOPMENT PERMIT IS REQUIRED).

❑ Is partially located in the SFHA, but building/development is not.

❑ Is located in a Special Flood Hazard Area
FIRM zone designation is _____.
"100-Year" flood elevation at the site is: _____ft. NGVD (MSL)
❑ Unavailable

❑ Is located in the floodway.
FBFM Panel No. _____ Dated _____
(if different from the FIRM panel and date)

❑ See Section 4 for additional instructions.

SIGNED _____ DATE _____

Figure 7-4b. Sample floodplain development permit application form
(Developed by the North Carolina Division of Emergency Management)

Application # _____

SECTION 4: Additional Information Required (To be completed by Local Administrator)
The applicant must submit the documents checked below before the application can be processed:

- ❑ A site plan showing the location of all existing structures, water bodies, adjacent roads, lot dimensions, and proposed development.
- ❑ Development plans, drawn to scale, and specifications, including where applicable: details for anchoring structures, proposed elevation of lowest floor (including basement), types of water-resistant materials used below the first floor, details of floodproofing of utilities located below the first floor, and details of enclosures below the first floor.

Also,_____

- ❑ Subdivision or other development plans. (If the subdivision or other development exceeds 50 lots or 5 acres, whichever is the lesser, the applicant must provide "100-year" flood elevations if they are not otherwise available).
- ❑ Plans showing the extent of watercourse relocation and/or landform alterations.
- ❑ Change in water elevation (in feet) _____ ❑ Meets ordinance limits on elevation increases ❑ YES ❑ NO
- ❑ Top of new compacted fill elevation _____ ft. NGVD (MSL).
- ❑ Floodproofing protection level (non-residential only) _____ ft. NGVD (MSL). For floodproofed structures, applicant must attach certification from registered engineer or architect.
- ❑ Certification from a registered engineer that the proposed activity in a regulatory floodway will not result in any increase in the height of the "100-year" flood. A copy of all data and hydraulic/hydrologic calculations supporting this finding must also be submitted.
- ❑ Other: _____

_____

SECTION 5: PERMIT DETERMINATION (To be completed by **LOCAL ADMINISTRATOR**)

I have determined that the proposed activity: A. ❑ Is
B. ❑ Is not

in conformance with provisions of Local Law # _____, 19___. The permit is issued subject to the conditions attached to and made part of this permit.

SIGNED_____DATE_____

If Box A is checked, the Local Administrator may issue a Development Permit upon payment of designated fee.
If Box B is checked, the Local Administrator will provide a written summary of deficiencies. Applicant may revise and resubmit an application to the Local Administrator or may request a hearing from Board of Appeals.

Application # _____

Figure 7-4c. Sample floodplain development permit application form
(Developed by the North Carolina Division of Emergency Management)

APPEALS: Appealed to Board of Appeals? ❑ Yes ❑ No
Hearing date:_____
Appeals Board Decision - Approved? ❑ Yes ❑ No

Reasons/Conditions:_____

_____

_____

SECTION 6: AS-BUILT ELEVATIONS (To be submitted by **APPLICANT** before Certification of Compliance is issued)

The following information must be provided for structures that are part of this application. This section must be completed by a registered professional engineer or a licensed land surveyor (or attach a certification to this application). Complete 1 and 2 below.

1. Actual (As-Built) Elevation of the top of the lowest floor, including basement (in Coastal High Hazard Areas, bottom of lowest horizontal structural member of the lowest floor, excluding piling(s) and columns) is: _____ ft. NGVD (MSL).

2. Actual (As-Built) Elevation of floodproofing protection is _____ft. NGVD (MSL).

SECTION 7: COMPLIANCE ACTION (To be completed by **LOCAL ADMINISTRATOR**)

The **LOCAL ADMINISTRATOR** will complete this section as applicable based on inspection of the project to ensure compliance with the community's local law for flood damage prevention.

INSPECTIONS DATE: _____ BY_____ DEFICIENCIES? ❑ Yes ❑ No
DATE_____ BY_____ DEFICIENCIES? ❑ Yes ❑ No
DATE_____ BY_____ DEFICIENCIES? ❑ Yes ❑ No

SECTION 8: CERTIFICATE OF COMPLIANCE (To be completed by **LOCAL ADMINISTRATOR**)

Certificate of Compliance issued: DATE_____BY_____

Figure 7-4d. Sample floodplain development permit application form
(Developed by the North Carolina Division of Emergency Management)

No._____

FLOODPLAIN DEVELOPMENT PERMIT

Specify for what purpose the permit is issued—
New construction, alterations, fill, excavation, other

ISSUED TO:_____

ADDRESS:_____

PROJECT ADDRESS:_____
(if different from permittee's address)

ISSUED BY:_____
Floodplain Management Administrator

DATE:_____
(This permit expires 180 days from this date)

THIS PERMIT MUST BE POSTED ON THE PREMISES IN A CONSPICUOUS PLACE SO AS TO BE CLEARLY VISIBLE FROM THE STREET.

Figure 7-5. Sample permit form

LEARNING CHECK #2

1. What activities are exempt from regulation under your floodplain ordinance?

2. Does your community have a permit application form that makes sure things like a floodway encroachment analysis or V Zone certification are not missed?
3. What five items need to be checked to ensure an application for a permit is complete?

4. What departments or offices in your community should review a permit application before it is approved?

5. During your permit review, you find that the applicant's site plan shows that the ground is currently higher than the BFE. Should you continue to treat this as a floodplain development permit?
6. What's the best way to make sure the applicant's engineering certifications are sufficient?

7. What are the key items you need to check when reviewing the plans for a new house to be built on pilings in the V Zone?

8. Match the list of proposed projects with the documents that will be needed in order to determine if the project should be built in the floodplain.

   — New shopping center parking lot in the floodway
   — New house in the fringe
   — New business in the V Zone
   — Reconstruction of a state highway bridge
   — New house built over a floodable, but enclosed garage

   a. Floodplain development permit application
   b. Site and/or building plans
   c. Floodway encroachment analysis
   d. Floodproofing certification
   e. Non-conversion agreement
   f. V Zone certification

D. INSPECTIONS

You can't assume that construction and development will proceed as spelled out in the permit you've approved. Follow-up conversations and inspections are vital to ensure that the applicant adheres to the permit's requirements.

Taking a hands-off attitude toward construction can create many problems for both the project's owners and your community.

The most effective way to ensure compliance is to inspect the site frequently during construction. This is particularly important in the early phases of work on a building because that's when errors in relocation or elevation of the lowest floor can be found and corrected. An inspection program also puts builders, developers and property owners on notice that the community will insist that projects are completed in compliance with regulations.

We recommend a series of three inspections for every project, especially any project that involves construction of a building.

FIRST INSPECTION

Do this inspection before ground is broken. Ideally, this site visit should be after the site is staked out to allow you to check the plans in relation to the ground and lot boundaries. With plans in hand, you should determine that the site as identified on the proposed plans is consistent with actual ground conditions.

Check the following:

- The location of the floodplain and floodway boundaries.
- Setbacks from lot lines, channel banks, etc.
- Floodway encroachments, if applicable.

If the building, filling, etc., as staked out are in violation of the approved plans or of the ordinance requirements, you must tell the developer to make revisions.

The project must not be allowed to proceed until you have gone back and verified that it is in compliance.

SECOND INSPECTION

Schedule your second inspection of a project involving a new building or addition to a building just before installation of the lowest floor. You need to ensure that the lowest floor will be built at the height stipulated in the permit application, and that the foundation is the type specified in the plans.

The type of foundation dictates your schedule:

- If the building is on a slab foundation, the inspection is best done when the forms are placed. You can check the proposed floor elevation by checking the elevation of the top of the forms. If the forms are high enough, you can approve the pouring the slab.
- If the building is on an elevated foundation (crawlspace, piles, etc.), the inspection is best done when the foundation is completed. If the top of the foundation is high enough, you can approve placement of the floor.
- If the building is to be floodproofed and the floodproofing technique is easy to identify—such as a reinforced concrete stem wall up to the BFE plus freeboard—this inspection should be conducted when that portion of the project is completed.

Making sure a structure is properly elevated is the key to the entire regulatory process. If this doesn't happen, the permit process is pretty much for naught. Therefore, an inspection at the point of initial construction, where changes to the height of the foundation can be made without major difficulty, is best. Once the foundation is poured or laid, it can be very expensive for the property owner to changes the building location or the elevation of the lowest floor.

Checking elevations

You can confirm the floor elevation at this stage in one of two ways. First, you can have the builder certify the floor elevation. This must be done by a surveyor or engineer.

The alternative approach is to check for yourself:

- Before construction or sometimes as part of the first inspection, the developer's surveyor or your engineer can shoot an elevation reference mark to a nearby stationary object such as a tree or telephone pole. The mark should be at the same elevation as the height to which the lowest floor should be elevated.
- During the second inspection, you can use a hand level to determine whether the lowest floor will be as high as the reference mark.
- This will give you a rough estimate that the building will be close to the correct elevation . A hand level will not give accurate elevations.

Note: Neither approach relieves the builder of having to provide an as-built elevation or floodproofing certificate when the project is done. It simply verifies that the building will be elevated or floodproofed to the proper elevation before it is too late to make changes.

During your second inspection, also check:

- Whether any fill meets the necessary compaction, slope and protection standards contained in your regulations.
- The building's location matches the permit application plans.

- The number and size of crawlspace or enclosure openings.
- Whether any part of the project encroaches into the floodway.
- In V Zones, get an as-built foundation certification at this time, such as the V Zone certification in Figure 5-18.

THIRD INSPECTION

The third and last inspection is conducted as the project nears completion. The purpose of this "final" inspection is to:

- Ensure that the foundation and floor elevation has not been altered since the second inspection.
- Obtain an as-built elevation or floodproofing certificate.
- Verify that enclosures below the lowest floors have adequate openings.
- Ensure that nothing subject to flood damage, such as a furnace or air conditioning unit, has been located below the lowest floor.
- Check breakaway walls in V Zones.
- Check for floodway encroachments.
- Check the anchoring system used in securing manufactured homes.

Certificate of occupancy

After the project passes final inspection, many communities issue a document called a certificate of occupancy, certificate of compliance or use permit.

This certificate allows the owner to move in to the newly constructed building or addition. Usually a new building cannot be sold until the seller has this certificate; some utility companies will not start service until the certificate is presented.

Before a certificate is completed, you must make sure that all needed documents are received and checked. You must have an elevation certificate and the other forms noted in the later section on record keeping.

LATER INSPECTIONS

Certifying a structure for occupancy is the final step in the permit process. However, the property must remain in compliance with your ordinance and the conditions under which the permit was issued.

Your office should periodically check to ensure that the property continues to remain in compliance over time. Later inspections are particularly important when a structure contains an enclosure below the lowest floor. Such areas can be easily modified and made into habitable spaces in violation of regulations.

In some states, communities do not have the statutory authority to go onto private property to look for violations. This can make it hard, if not impossible, to verify whether an enclosed area has been modified. If this is true in your community, your ordinance should prohibit enclosures or limit their allowable size to less than 300 square feet. Allow larger enclosures only if they have wood lattice or screening so you can tell from the street if changes have been made.

LEARNING CHECK #3

1. When is the best time to make the first site inspection?

2. When should you make the second inspection of a building on a slab foundation?

3. What are your two options for making sure a new building is high enough before you allow construction to proceed after the second inspection?

4. What should you check for during the third inspection?

5. If a project meets all of the ordinance requirements and is built according to the approved plans, what does the owner get after the final inspection?

E. ENFORCEMENT

Adequate, uniform and fair enforcement means two things:

- All development in a floodplain must have a permit.
- All development with a permit must be built according to the approved plans.

In order to ensure that development is meeting these requirements, you must monitor the floodplain, and where necessary, conduct an inspection of a property. Some permit officials have statutory limits on where they can go to inspect a potential violation. Be sure to review your authority to access onto private property with your attorney.

If you discover development activities without permits or contrary to the approved plans, you must enforce your ordinance. You have several methods for enforcing your ordinance. This section explores these methods.

VOLUNTARY COMPLIANCE

The best approach is to convince the developer that complying with the ordinance is in his or her own best interest. This may take some explanation of the flood hazard and how the rules protect the property (or neighboring properties) from that hazard.

If the issue is protection of a building, the flood insurance rate table in Figure 9-3 can show how expensive insurance could be. Even if the developer is not interested in flood insurance, future owners may want it and probably will be required to purchase it as a condition of a mortgage or loan.

Should voluntary efforts not work, here are the other compliance tools you have.

ADMINISTRATIVE STEPS

Your first steps in enforcement involve what you can do as an ordinance administrator. Be sure to review these with your community's attorney before you start:

- Contact the property owner or building contractor in person or by telephone to explain your concerns.
- Notify the property owner (in writing) of the nature of the violations and what to do to correct them.
- Post a violation notice on the property.

If a problem is found during construction of a permitted project, you have additional tools:

- If the violation is a serious one, or if the problem still exists after a follow-up inspection, you can issue a stop-work order or revoke the permit.

- You can withhold the certificate of occupancy until the problem is corrected. Usually utilities will not be turned on or a bank loan will not be closed until the certificate of occupancy is issued.

LEGAL RECOURSES

If your administrative measures do not bring results, go back to your community's attorney and discuss the next steps. Your attorney can take the case to court and request two additional enforcement measures be brought to bear.

You can help the attorney by having complete records of all correspondence and meetings with the person accused of the violation. You should also identify what section of the ordinance was violated, when and how, and what was specifically allowed in the approved permit.

You should advise the attorney about what actions can be taken that will bring the project into compliance. Depending on the violation, these actions could include removing the building (or other project), retrofitting the building to protect it, applying for a variance, or revising the maps to remove the problem from the floodplain, floodway, V Zone, etc.

Fine. Your ordinance should establish a maximum fine per offense. Usually each day a violation continues is considered a separate offense. This approach encourages a quick remedy to the problem.

A per-day fine for a summary offense from a local district justice or magistrate can be difficult to get because many courts would believe that such a severe financial penalty does not fit the infraction. However, the threat of seeking the fine may be sufficient to persuade a property owner to remedy the violation.

Recordation. Depending on your statutory authority, you may be able to record the violation in the property's deed records. This will inform potential purchasers as well as "cloud the deed," making it hard for the owner to sell the property or the buyer to obtain title insurance. This approach is more appropriate for new developments that are likely to be sold in the near future.

Injunction. An injunction is a court order to stop further noncompliant conduct. A temporary restraining order will be issued if the activity can be shown to be a danger to the public and that immediate irreparable harm can occur.

Housing court. Dealing with your state or county's judicial system can be expensive and difficult. Your case has to wait its turn and compete with many cases for attention.

To speed up the enforcement process, some communities enact special enforcement ordinances to create a municipal housing court or a building court. This is a local judicial body that has several advantages:

- The judge or administrative judge will be familiar with housing or building code law.
- The community has more control over when cases will be heard.

- Such courts usually are less formal. For example, the defendant may not have to have an attorney present.

The establishment of these courts varies by state law. Your attorney or state department of local government affairs or housing can provide more information on how it can work in your community.

SECTION 1316

Section 1316 of the National Flood Insurance Act authorizes FEMA to deny flood insurance to a property declared in violation of the community's ordinance.

Section 1316 is used when all other legal means to remedy the violation have been exhausted and the structure is still noncompliant. Check with your state NFIP coordinator or FEMA Regional Office on how 1316 works in your state.

If invoked under Section 1316, denying flood insurance means:

- The property may be difficult or impossible to sell.
- The market value of the property may fall.
- The cost of suffering flood damage without insurance may be too great a risk for the property owner.
- Lending institutions holding the property's mortgage may threaten to foreclose.
- Any permanent reconstruction will be denied disaster assistance.

In some cases a Section 1316 insurance denial will be sufficient to convince the property owner to correct the violation. Section 1316 also has the advantage of limiting any taxpayer liability if the building is damaged by a flood, as the owner will be ineligible for an insurance claim and disaster assistance.

F. Appeals, Special Uses and Variances

Generally, procedures for Appeals, special uses and variances are specified by state law. They require judgment calls involving several people, as ordinances typically do not allow only one person to decide these issues. Here is when they can occur and how they are usually handled.

Appeals

Ambiguous language or differing interpretations can lead the applicant and permit office to disagree. Your ordinance should have a process for referring these disagreements to a board of appeals or adjustment which will interpret the ordinance and settle the dispute.

Special uses

Some regulations require that certain situations be given a special review to determine if they should be allowed and, if so, whether conditions should be attached to the permit. While the NFIP sets construction standards for all buildings, your community may have decided that residences should not be allowed in a floodway and that nonresidential buildings should be allowed only if certain conditions are met. Some official body needs to determine if a special use permit or if a conditional permit should be issued.

Variances

Zoning ordinances, building codes and floodplain management regulations cannot be written to anticipate every imaginable situation. A process for issuing variances gives a builder a way to seek permission to vary from the letter of the rules because of a special situation.

A variance can mean that the minimum standards of the NFIP may not be met by a project due to a special local circumstance. Because of this, most of this section is devoted to variances.

Boards

In all three cases, the applicant submits a request to a knowledgeable board of arbiters. Typically, variances and special or conditional use permits are handled by the planning commission or other body that is responsible for writing and amending the ordinance. Appeals are usually handled by a separate board of appeals or board of adjustments. Sometimes all three processes are handled by the same body and sometimes, especially in smaller communities, that body is the city council or governing board.

These boards do not have authority to change the ordinance, just to apply or interpret the ordinance's provisions. They may or may not have authority to make a final decision. If not, they make recommendations to the governing board which makes the final decision.

Variances

A variance is a grant of relief by a community from the terms of a land use, zoning or building code regulation. Because a variance can create an increased risk to life and property, variances from flood elevation or other requirements in the flood ordinance should be rare.

Granting variances is a local decision that must be based on not only NFIP criteria, but also on state law and other provisions the community may wish to require. Your community's review board must consider the fact that every newly constructed building adds to the local government's responsibilities and remains a part of the community for the indefinite future.

Variances are based on the general principal of zoning law that they pertain to a piece of property and are not personal in nature. Though standards vary from state to state, in general a variance is granted for a parcel with physical characteristics so unusual that complying with the ordinance would create an exceptional hardship to the applicant or surrounding property owners. Those characteristics must:

- Be unique to that property and not shared by adjacent parcels.
- Pertain to the land, not to any structure, its inhabitants or the property owners.

Characteristics that might justify a variance include an irregularly shaped lot, a parcel with unsuitable soils, or a parcel with an unusual geologic condition below ground level. It is difficult, however, to imagine any physical characteristic that would give rise to a hardship sufficient to justify issuing a variance to a flood elevation requirement.

Your community should grant variances based only on a structure-by-structure review. Never grant variances for multiple lots, phases of subdivisions or entire subdivisions.

NFIP requirements

NFIP regulations do not address appeals, special uses or conditional permits. Follow the procedures used in your zoning ordinance or building code as these are usually prescribed by state law.

Because variances may expose insurable property to a higher flood risk, NFIP regulations set guidelines for granting them. The guidelines, which are designed to screen out situations in which alternatives other than a variance are most appropriate, appear in 44 CFR 60.6(a). They are summarized in Figure 7-6.

A review board hearing a variance request must not only follow procedures given in the NFIP criteria, it must consider the NFIP criteria in making its decision. When the NFIP guidelines are followed, few situations qualify for a variance.

Good and sufficient cause. The applicant must show good and sufficient cause for a variance. Remember, the variance must pertain to the land, not its owners or residents. Here are some common complaints about floodplain rules that are NOT good and sufficient cause for a variance:

- The value of the property will drop somewhat.
- It will be inconvenient for the property owner.
- The owner doesn't have enough money to comply.
- The property will look different from others in the neighborhood.
- The owner started building without a permit and now it will cost a lot to bring the building into compliance

Hardship. The concept of unnecessary hardship is the cornerstone of all variance standards. Strict adherence to this concept across the country has limited the granting of variances.

The applicant has the burden of proving unnecessary hardship. Reasons for granting the variance must be substantial; the proof must be compelling. The claimed hardship must be exceptional, unusual and peculiar to the property involved. Financial hardship, inconvenience, aesthetic considerations, physical handicaps, personal preferences or the disapproval of one's neighbors do not qualify as exceptional hardships.

The local board must weigh the applicant's plea of hardship against the purpose of the ordinance. Given a request for a variance from floodplain elevation requirements, the board must decide whether the hardship the applicant claims outweighs the long-term risk to the owners and occupants of the building would face, as well as the community's need for strictly enforced regulations that protect its citizens from flood danger and damage.

When considering variances to flood protection ordinances, local boards continually face the difficult task of frequently having to deny requests from applicants whose personal circumstances evoke compassion, but whose hardships are simply not sufficient to justify deviation from community-wide flood damage prevention requirements.

1. Variances shall not be issued by a community within any designated regulatory floodway if any increase in flood levels during the base flood discharge would result;

2. Variances may be issued by a community for new construction and substantial improvements to be erected on a lot of one-half acre or less in size contiguous to and surrounded by lots with existing structures constructed below the base flood level, in conformance with the procedures of paragraphs (a) (3), (4), (5) and (6) of this section;

3. Variances shall only be issued by a community upon...

(i) a showing of good and sufficient cause,

(ii) a determination that failure to grant the variance would result in exceptional hardship to the applicant, and

(iii) a determination that the granting of a variance will not result in increased flood height, additional threat to public safety, extraordinary public expense, create nuisances, cause fraud on or victimization of the public, or conflict with existing local laws or ordinances;

4. Variances shall only be issued upon a determination that the variance is the minimum necessary, considering the flood hazard, to afford relief;

5. A community shall notify the applicant in writing over the signature of a community official that...

(i) the issuance of a variance to construct a structure below the base flood level will result in increased premium rates for flood insurance up to amounts as high as $25 for $100 of insurance coverage and;

(ii) such construction below the base flood level increases risks to life and property. Such notification shall be maintained with a record of all variance actions as required in paragraph (a) (6) of this section.

6. A community shall...

(i) maintain a record of all variance actions, including justification for their issuance, and

(ii) report such variances issued in its annual or biennial report submitted to the [Federal Insurance] Administrator.

7. Variances may be issued by a community for new construction and substantial improvements and for other development necessary for the conduct of a functionally dependent use provided that...

(i) the criteria of paragraphs (a) (1) through (a) (4) of this section are met, and

(ii) the structure or other development is protected by methods that minimize flood damages during the base flood and create no additional threats to public safety.

Figure 7-6: NFIP variance criteria (44 CFR 60.6(a))

These problems can be resolved through other means, even if the alternatives to a variance are more expensive or complicated than building with a variance, or if they require the property owner to put the parcel to a different use than originally intended, or to build elsewhere.

Here are two examples:

Example 1. A small undeveloped lot is surrounded by lots on which buildings have been constructed at grade. The ordinance requires new buildings to be constructed at a level several feet above grade.

If the owner were to build a new house, it would look different, Potential buyers would ask questions and find out about the flood problem in the area. If it were built on fill, the lot might drain onto the neighbors' property.

This situation probably would not warrant a variance because the owner does not face an exceptional hardship. Appearance is not a hardship and no action should be taken to hide the hazard from others. There are ways to elevate a building without creating a drainage problem, such as elevating the building on pilings or a crawlspace, or grading the fill to drain away from adjoining properties.

Example 2. A property owner seeks a variance because he or she would have to spend several thousand dollars to elevate a house to comply with the ordinance, and several thousand more to build a wheelchair ramp or an elevator to provide access for a handicapped member of the family.

While financial considerations are important to property owners and the needs of a handicapped person must be accommodated, these difficulties do not put this situation in the category of "exceptional hardships" because:

- The characteristics that result in the claimed hardship do not pertain to the property but are personal.
- A variance is not needed to provide day-to-day access to the building, which can be provided by building a ramp or elevator.
- Having a handicapped person occupy a floodprone dwelling raises a critical public safety concern.

If a variance is granted and the building is constructed at grade, the handicapped or infirm person must leave when floodwaters begin to rise, yet he or she may need help to do so. This poses an unnecessary danger to the handicapped person and places an extra demand on the community's emergency services personnel, who may be called upon to rescue the resident in the event of a flood.

On the other hand, if the building is properly elevated, the handicapped person either can be evacuated or can survive the flood simply by remaining at home safely above the floodwaters.

In effect, the variance would not relieve the property owner of his or her difficulty, but likely only postpone and perhaps ultimately increase it. It would not help the community, either, as the building will be susceptible to damage long after the current owners are gone.

It would be more prudent for both the owner and the community if the variance were denied and the home built at the proper elevation with handicapped access. This would ensure the safety

of all family members when floodwaters rise, as well as protect the property owner's and the community's investment in the property.

Public safety and expense. Flood damage prevention ordinances are intended to help protect the health, safety, well-being and property of the local citizens. Variances must not create threats to public safety or nuisances.

Because it would increase damage to other property owners, no variance may be issued within a regulatory floodway that will result in any increase in 100-year flood levels (44 CFR 60.6(a)(1)).

Fraud and victimization. Variances must not defraud or victimize the public. Any buildings permitted below the BFE face increased risk of damage from floods, and future owners of the property—and the community—are subject to all the costs, inconvenience, danger and suffering that those increased flood damages may bring.

Future owners may purchase the property, unaware that because of a variance, it is subject to potential flood damages and can be insured only at high rates.

Minimum variation necessary. A variance is a request to vary from the rules, not to ignore them. Any variance should allow only minimum deviation from the local requirements.

For example, even if an applicant can justify not elevating a building above the BFE, the review board should not automatically allow the building to be built at grade. The board should still require as much elevation as possible, to provide some flood protection without causing exceptional hardship.

In some instances it may be possible to vary individual provisions of the ordinance without reducing the overall level of protection. For example, a well-engineered building might be constructed in a V Zone on a foundation other than piles or columns.

In considering variances, the review board should use local technical staff expertise and recommendations from the building, planning, zoning or engineering departments. The local technical staff should consider varying other requirements in order to provide the needed flood protection. For example, it may be more appropriate to issue a variance to the front yard setback requirement in order to get the building out of the floodway.

Flood insurance rates. While a variance may allow deviation from building standards specified in a local ordinance, flood insurance rates and the flood insurance purchase requirement—which must be enforced by lending institutions—cannot be waived.

This can create severe financial consequences for a property owner, as insurance rates for a building built below BFE can be substantially higher than those for elevated buildings. A variance from elevation requirements—the most common kind of variance requested—increases the risk to a building, and that increased risk is reflected in higher annual insurance premiums (Figure 9-3).

If a variance is requested to construct a building below the BFE, you must notify the applicant (in writing) that granting the variance will result in increased flood insurance premium rates, up to $25 per $100 of coverage. In many instances, the variance-induced rates will be so high as to make the building essentially uninsurable because the owners cannot afford the premium. (In one case, a marine supply store on the Gulf Coast was built 14 feet below BFE in a V zone. The annual flood insurance premium was $25,000—on a $100,000 building.)

The original owner who applied for a variance may not care, but if approved, the variance's impact may matter a great deal to subsequent potential owners who cannot afford the property's high insurance rates. The result may be owner abandonment; your community could be left with a vacant, flood-damaged and essentially uninsurable building.

Figures 7-7 through 7-12 illustrate the premiums for a single-family home protected to different levels. They provide a clear picture of the cost of actuarial post-FIRM flood insurance rates and, therefore, the true risk to which the building is being exposed.

You should give these two pages of illustrations to anyone considering seeking a variance to save construction costs. A variance may save money in the short term, but over the long run, the owner will pay much more in insurance premiums or, if uninsured, in flood losses.

Note: These premiums are for the purposes of this example. Insurance rates vary, based on location, date of construction and lowest floor elevation, and must be computed case-by-case. The premiums shown for the next series of illustrations were computed based on $100,000 in building coverage.

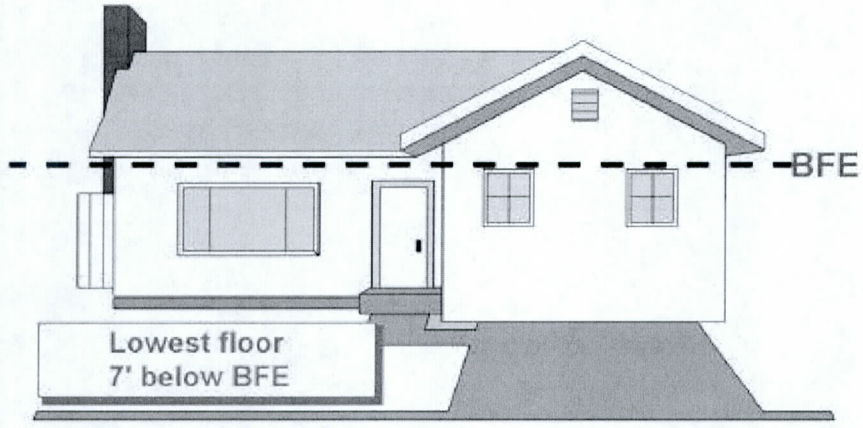

Figure 7-7. Pre-FIRM building—1995 insurance rate: $595

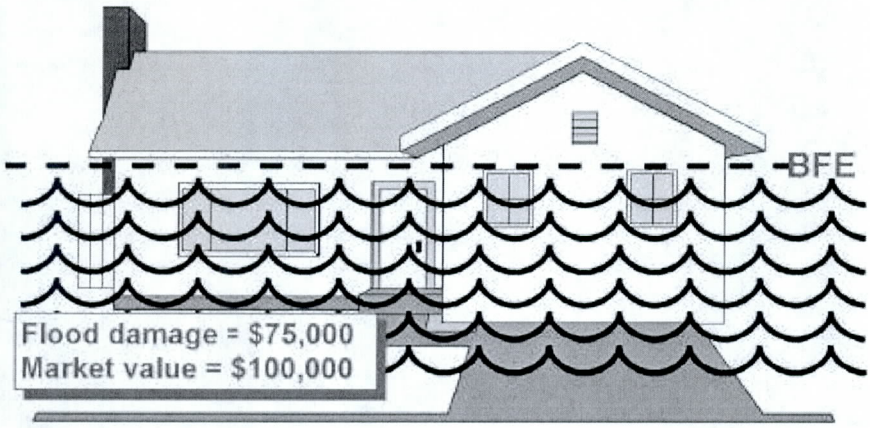

Figure 7-8. Pre-FIRM building—substantially damaged by 1997 flood

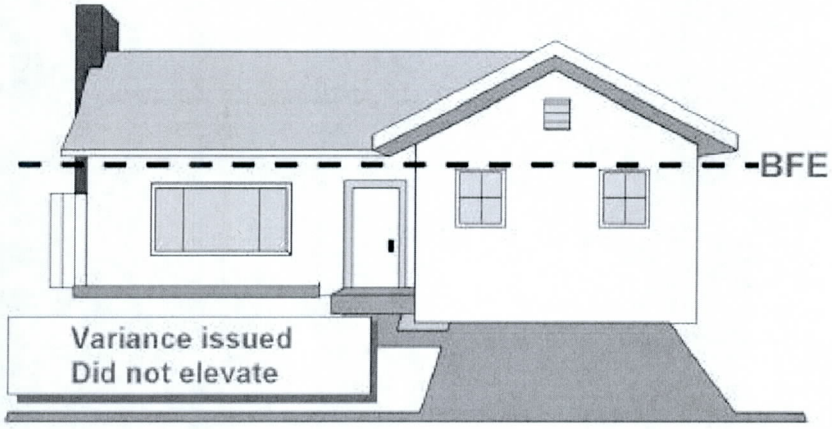

Figure 7-9. Repaired—variance allowed
With no elevation (7 feet below BFE); actuarial rate: $3,090

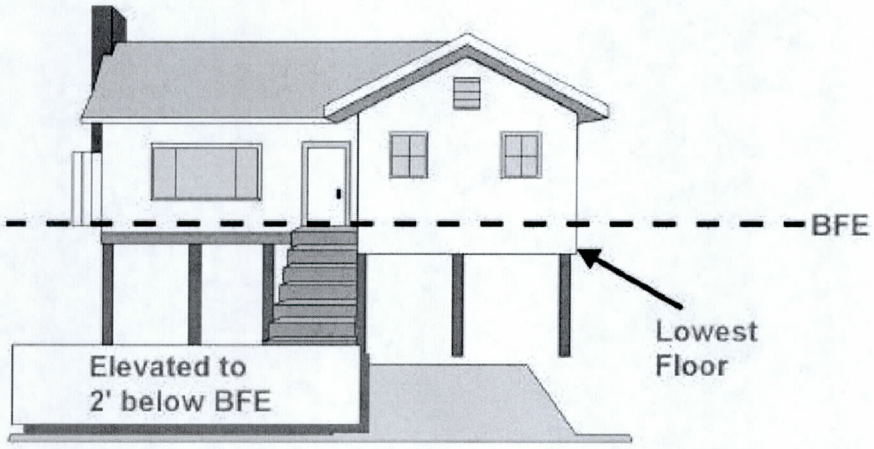

Figure 7-10. Repaired—variance allowed
Elevated to 2' below BFE; actuarial rate: $1,140

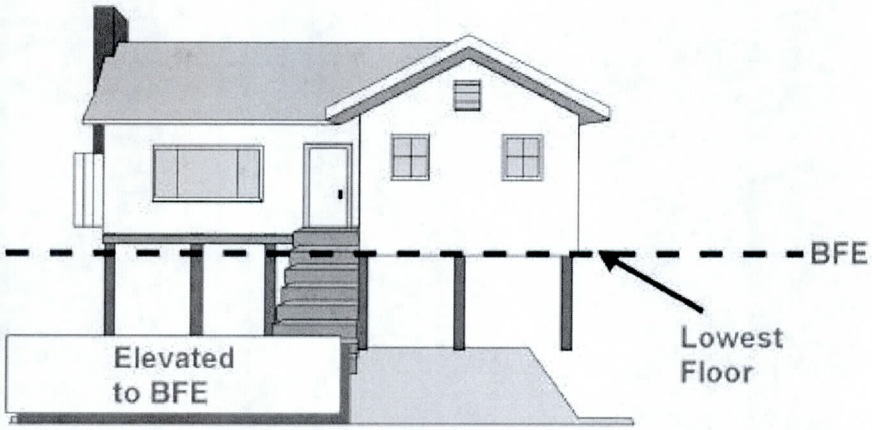

Figure 7-11. Repaired—elevated to BFE; actuarial rate: $351

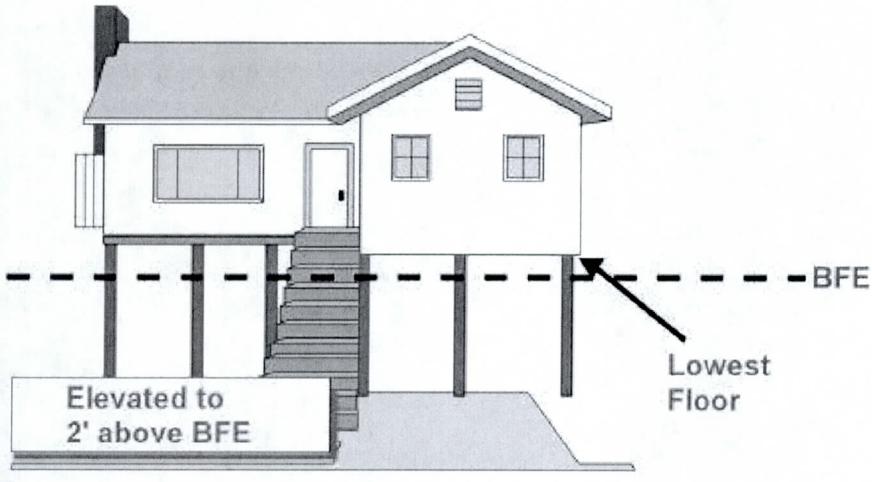

Figure 7-12. Repaired—elevated 2 feet above BFE; actuarial rate: $216

Historic buildings

A variance may be issued for the reconstruction, rehabilitation or restoration of historic structures if the variance is the minimum necessary to preserve the historic character and design of the structure. "Historic structures" are those listed in the National Register of Historic Places or the State Inventory of Historic Places, or that contribute to a historic district.

Changes to the structure must not destroy or alter the characteristics that made it an historic building. A certified local historic board or the state historic preservation officer must review and approve remodeling, renovations and additions before granting a variance. Whatever mitigative measures can be taken to reduce future flood damage must be required—such as elevating an air conditioner or using flood-resistant materials.

Many older buildings are not considered historic, so the first thing to check is whether the structure proposed for an exemption is historic. Look for it on a list maintained by:

-- The National Register of Historic Places.

-- Federally-certified state programs operated through a state historic preservation officer.

-- A federally-certified local historic preservation board.

Structures are listed in the National Register or on a federally-recognized state or local inventory in one of two ways: as an individual building, or as a primary, secondary, or other contributing building in a designated historic district.

Structures are either listed or may be eligible to be listed. Only a federally-certified state or local historic preservation program can make such determinations. Either the state historic preservation office or federally-certified local historic preservation board should be consulted to determine if a structure proposed for the historic exemption is indeed historic.

Figure 7 – 13. Definition of "historic building"

Functionally dependent use

A variance may be issued for new construction, substantial improvements and other development necessary for the conduct of a functionally dependent use. A functionally dependent use is one that must be located or carried out close to water—such as a docking or port facility necessary for the unloading of cargo or passengers, shipbuilding and ship repair.

A functionally dependent use variance could be issued provided that:

- There is good and sufficient cause for providing relief from the regulations.
- The variance will be the minimum necessary to provide relief.

- The variance does not cause a rise in the 100-year flood level within a regulatory floodway.

The structure or other development must be protected by methods that minimize flood damage, such as elevating mechanical equipment, locating offices above the BFE or using ground fault interrupt electrical circuits.

Records

The community must keep a record of all variances and the rationale for granting them. These are subject to review by FEMA or the state NFIP coordinator during a Community Assistance Visit.

The records must include a copy of the written notification to the applicant that the issuance of a variance to construct a building below the BFE will result in increased flood insurance premium rates as high as $25 per $100 of coverage, and such construction below the BFE increases risk to life and property.

It is recommended that the variance findings, conditions and authorization be recorded in the county deed records. This provides a means of permanently notifying future or prospective owners about the terms and conditions of the variance.

LEARNING CHECK #4

1. If a FEMA staff person finds a project in violation of the FEMA NFIP requirements in your community, who is responsible for correcting the violation?

2. You discover that Mrs. Murphy has ordered five truckloads of fill to raise her back yard in the floodway. She never asked for a permit. What is the recommended first step to dealing with this situation?

3. If a project is found underway in the floodplain, what is the first step you should take?

4. What legal recourses do you and your attorney have to bring a violation into compliance?

5. What are the NFIP procedures for submitting an appeal to your Board of Appeals?

6. Mr. Wilson wants to build a new house at grade instead of to the BFE, six feet above grade. You tell him he will need a variance. Which of the following are good and sufficient causes for granting him a variance?
   - — An elevated house will look bad
   - — Mrs. Wilson is old and has trouble with stairs
   - — It will cost more money than the builder can afford
   - — The builder has a contract with the bank to have it completed and sold in four months and changing plans will prevent meeting that deadline.
   - — No one has ever seen a flood on that site.
7. Mr. Wilson is applying for a variance to build his house below the BFE. What two things must you tell him (in writing)?

G. RECORDS

Records show what you approved and what you told the developer, forming a "paper trail" needed for administrative or legal proceedings related to development projects. Such records are vital if the project violates your ordinance. They also give future owners information about the property.

Records are also checked by FEMA or the state to determine if your community is in full compliance with the NFIP.

This section reviews what records you must—or should—keep to meet your community's obligation to the NFIP.

PERMIT FILE

Your community should have a permit record system that is keyed to a geographical identifier (not just a building permit number) such as: street address, lot and block number, township, section and range, or county appraiser's property ID number.

You should have a file for each permit application. The files should have some indicator on the folder to show that it is a floodplain permit, such as a different color file folder or file label.

Permit files should contain copies of these items, as appropriate:

- The permit application form and all attachments, including the site plan.
- All correspondence pertinent to the project.
- Flood and floodway data prepared by the developer.
- Engineering analyses of floodway encroachments and watercourse alterations.
- Special engineering designs for enclosures below the BFE.
- In coastal high hazard areas, engineering certifications of designs and construction methods of new and substantially improved buildings.
- In coastal high hazard areas, certification of specially designed breakaway walls.
- Any variances or appeals proceedings.
- Records of inspections of the project while under construction.
- Documentation of the "as-built" lowest floor elevation of all new and substantially improved buildings.
- Certification of the elevation to which any nonresidential building has been floodproofed.
- Certificates of compliance or occupancy.

Keeping these records is a requirement to participate in the NFIP; there is no statute of limitations as to how long they should be kept. You may want to keep a separate log or record of

floodplain permits so you can readily retrieve those floodplain projects to show FEMA or the state NFIP coordinator.

It is not necessary to keep the entire building plans and other documents longer than is required for local code purposes. However, if you allow below-BFE enclosures, your files should include the ground floor plan of those buildings in case of a future violation issue.

ELEVATION CERTIFICATE

Your permit file needs an official record that shows how high new buildings and substantial improvements were elevated. This is needed both to show compliance with the ordinance and for the owner to obtain a flood insurance policy.

There is no mandated form for keeping building elevation records, but we strongly recommend that you use FEMA's Elevation Certificate Form (FEMA Form 81-31). A blank copy is in Appendix F. *Note: this form is being revised. A new version is expected by October 1998.*

If your community is participating in the Community Rating System, the FEMA form must be used for new construction and substantial improvements to existing buildings. Insurance agents writing flood insurance policies also must use the form to properly rate many types of buildings. Accordingly, FEMA encourages communities to use the form to help their residents obtain flood insurance.

The FEMA form is an eight-page packet. It includes the two-page FEMA Form 81-31, Elevation Certificate, and instructions on how to complete it. Additional copies of the packet are available in bulk at no cost by calling 800/638-6620, ext. 2 (customer service).

The current version of Form 81-31 is dated August 1996 and has an Office of Management and Budget (OMB) expiration date of July 31, 1999. Except for the date, it is the same as the 1990 and 1993 versions, which can still be used.

There is a software version of the FEMA Elevation Certificate. It can be ordered at no charge by calling the CRS order number, 317/848-2898. If you use the software version, or keep elevation records on a computer database, you also need to keep the original signed "hard copy" of the surveyor's certification.

The responsibility for obtaining and filing an elevation certificate rests on the local permit official. Part or all of the form may be completed by a land surveyor, engineer, architect, or local official authorized by ordinance to provide floodplain management information. (Depending on state law, if you are comfortable with using a transit or level you, as the floodplain ordinance administrator, can check the finished elevations and certify them for the record.)

You may give property owners or surveyors blank forms and expect them to complete the entire form. This practice does not relieve local officials in CRS communities from the requirement to ensure that the forms are complete and accurate. In non-CRS communities, the permit

official should at least double-check the form to ensure that it is complete and that Sections A, B and D (on property, map and community information) are correct.

Annexations. The FEMA Elevation Certificate form is self-explanatory. One problem arises when a community annexes or extends its planning or regulatory jurisdiction over Special Flood Hazard Areas for the unincorporated areas of a county or an adjacent community. Some communities enroll in the NFIP before a Flood Hazard Boundary Map or FIRM has been issued for them.

Both situations lead to considerable confusion as to flood zone determination, as well as knowing which community number and panel numbers should be used on Elevation Certificates and other NFIP documents.

Flood zone determination: If the subject property is located within areas annexed from the county or within an area of extraterritorial planning jurisdiction, use the county flood maps to determine the appropriate flood zone.

Community Identification Number: In item 1 of Section B of the FEMA form ("Community Number"), use the municipality's NFIP ID number once a property is annexed or included in an extraterritorial planning jurisdiction.

Flood Map Panel Number: For property located in annexed areas or in the extraterritorial jurisdiction, for item 2 of Section B ("Panel Number"), use the entire county ID and panel number— "370087 0005," not just "0005." For sites within the "area not included," state "No NFIP Map."

FLOODPROOFING CERTIFICATE

Floodproofing means making a building watertight, or substantially impermeable to floodwaters. It is an option only allowed for nonresidential buildings.

Designs for a floodproofed building must account for flood warning time, uses of the building, mode of entry to and exit from the building and the site, floodwater velocities, flood depths, debris impact potential and flood frequency.

FEMA's Technical Bulletin 3-93, *Non-Residential Floodproofing Requirements and Certification for Buildings Located in Special Flood Hazard Areas*, has a detailed discussion on each of these considerations.

For insurance rating purposes, the building's floodproofed design elevation must be at least one foot above the BFE to receive rating credit. If floodproofed only to the BFE, the floodproofing credit cannot be used, resulting in higher flood insurance rates.

44 CFR Sections 60.3(B)(5) and (c)(4) require the community to obtain and maintain a registered professional engineer's certification that a nonresidential building was properly floodproofed. You are encouraged to use the one-page FEMA certification form included in Appendix F because it fulfills NFIP insurance rating needs as well as floodplain management requirements.

V ZONE CERTIFICATION

Buildings in coastal high hazard areas or V Zones are subject to a greater hazard than buildings built in other types of floodplains. Not only do they have to be elevated above the base flood level, they must be protected from the impact of waves, hurricane-force winds and erosion.

The NFIP regulations require coastal communities to ensure that buildings built in the V Zone are anchored to resist these wind and water loads acting simultaneously.

> ***44 CFR 60.3(e)(4)*** *[The community must] Provide that all new construction and substantial improvements in Zones V1-30 and VE ... are elevated on pilings and columns so that (i) the bottom of the lowest horizontal structural member of the lowest floor (excluding the pilings or columns) is elevated to or above the base flood level; and (ii) the pile or column foundation and structure attached thereto is anchored to resist flotation, collapse and lateral movement due to the effects of wind and water loads acting simultaneously on all building components. Water loading values used shall be those associated with the base flood. Wind loading values used shall be those required by applicable State or local building standards. A registered professional engineer or architect shall develop or review the structural design, specifications and plans for the construction, and shall certify that the design and methods of construction to be used are in accordance with accepted standards of practice for meeting the provisions of (e)(4)(i) and (ii) of this section.*

While FEMA does not provide a V Zone certification form, Figure 5-18 shows the form developed by the state of North Carolina. Be sure to check with your FEMA Regional Office before you use your own version of it.

NO-RISE CERTIFICATION

As discussed in Unit 5, Section D, your ordinance requires that riverine floodplains be free of encroachments that will cause an increase in flood levels.. Where a floodway has been mapped, construction in the flood fringe is assumed to not be a problem.

You need to document that a project in the floodway—or in a riverine floodplain where the floodway hasn't been mapped—will not cause in increase in flood heights. An engineering analysis must be conducted before you can issue a permit. Your permit file needs a record of the results of this analysis, usually in the form of a no-rise certification or an equivalent document.

The engineering or no-rise certification must be supported by technical data and signed by a registered professional engineer. The supporting technical data should be based on the standard step-backwater computer model used to develop the 100-year floodway shown on your FIRM or Flood Boundary and Floodway Map and the results tabulated in your Flood Insurance Study.

Although communities are required to review and approve the no-rise submittal, they may request technical assistance and review from the FEMA Regional Office. However, if this alter-

native is chosen, you must review the technical package and verify that all supporting data, listed in succeeding paragraphs, are included in the package before forwarding it to FEMA.

Figure 5-5 is a sample no-rise certification form developed by the North Carolina NFIP coordinating agency . Before using it, check with your state NFIP coordinating agency or FEMA Regional Office for additional guidance or requirements.

BIENNIAL REPORT

Every two years, participating communities must complete a form describing the community's progress in the previous two years in implementing floodplain management measures [44 CFR 59.22]. A copy of a biennial report appears in Figure 7-14.

FEMA sends the one-page form to your chief elected official. It must be completed and returned to FEMA within 30 days.

The only way you can complete the biennial report is to have complete and accessible permit records. You need to keep track of:

- Changes in community boundaries.
- Physical or topographical changes that affect flood hazard areas.
- Amendments to your floodplain ordinance.
- The number of building permits issued in the floodplain.
- The number of variances issued.

You also need to be able to tell FEMA:

- The number of people and number of buildings in the floodplain.
- Whether you would like any floodplain management assistance.

O.M.B. No. 3067-0018
Expires

See reverse side for Paperwork Burden Notice

FEDERAL EMERGENCY MANAGEMENT AGENCY
NATIONAL FLOOD INSURANCE PROGRAM
Biennial Report for
Calendar Year _____

EMERGENCY AND REGULAR PROGRAM
(With Base Flood Elevations)

RETURN TO:
Federal Emergency Management Agency
P.O. Box 2012
Jessup, Md. 20794-2012

SAMPLE

(Please make necessary corrections to the address above.)

Instructions

1. This report should be completed by the locally designated Floodplain Management Administrator (e.g., your City Manager, City Planner, Building Inspector, etc.)
2. Please answer every question.
3. PLEASE RETURN THIS REPORT WITHIN 30 DAYS OF ITS RECEIPT, TO THE ADDRESS ABOVE.

SECTION I - Changes and activities in your designated flood hazard area during the last TWO years.
(If you answer "yes" to any question in this section, please provide explanatory information and/or technical data including, when appropriate, your own community map or a copy of the Flood Hazard Map showing the areas affected.)

	YES	NO
A. Does your community have any changes to the base data on your floodplain maps, such as (1) adding/correcting streets, (2) adding elevation reference marks, (3) aligning map panels, (4) adding LOMRs, or (5) annexation/corporate limit changes?	☐	☐
B. Have the characteristics of flooding in your community changed to the extent that your floodplain needs to be restudied?	☐	☐
C. Does your community have information that may be incorporated in a Flood Insurance Boundary Map or Flood Insurance Rate Map? (example: water shed studies or base flood elevations established by developers)	☐	☐
D. Was there a significant man-made change affecting your designated flood hazard areas? (examples: levees, bridges, extensive filling, excavation or stream channalization)	☐	☐
E. Is your community in need of assistance in improving local floodplain management, such as regulation interpretation, planning, enforcement procedures, floodproofing, or a community visit?	☐	☐

SECTION II - Community Floodplain Management Data

A. If there has been a change to your floodplain management ordinance, please send a certified copy of the new law.

B. How many building **PERMITS** were granted within the last two calendar years for new structures *(including substantial improvements to existing structures)* in the designated flood hazard areas shown on your community's Flood Hazard Map? ☐

C. How many VARIANCES to your local floodplain management ordinance were granted within the last two calendar years for new structures or substantial improvements to existing structures? Please provide only the number of variances granted for structures with the lowest flood below the Base Flood Elevation. ☐

D. Please update the demographic information on your community that was provided FEMA when your community last reported to the National Flood Insurance Program. **If any numbers are NOT correct or a "0" appears, please provide the revised number.** If precise data is not available, please give us your best estimate.

	Permanent Year-Round Population	1-4 Family Structures	All Other Structures
1. In your entire community (including flood hazard areas) →			
2. In your flood hazard areas only. →			

NAME, TITLE, AND SIGNATURE	PHONE NO. *(include area code)*	DATE MONTH	DATE YEAR

Keep the last copy. Return the other 4 copies to the address listed above.

FEMA Form 81-29, OCT 97 REPLACES ALL PREVIOUS EDITIONS

Figure 7-14. Example Biennial Report

LEARNING CHECK #5

1. Why should you keep permit records?

2. What records should be kept in your permit file?

3. Who is responsible for ensuring that the elevation certificate is completed correctly?

4. What are the four situations when a record of an engineer's or surveyor's certification is needed?

5. A property has been annexed from the county into your city, but the FIRM has not been revised to reflect the annexation. What is the NFIP community number that is recorded in Item 1, Section B of the FEMA Elevation Certificate?

6. Is a V Zone Certification needed for a residential building?

7. Where do you get a Biennial Report to send in to FEMA?

UNIT LEARNING EXERCISE

1. Does your community have formal written permit review procedures to ensure that a development proposal is properly reviewed and inspected?

2. What are the four situations where a certification will be needed before a floodplain development permit can be issued?

3. A development plan proposes to fill and regrade an area of the fringe to give most of the lots building sites that are above the BFE. The developer says "then we won't have the banks telling people my subdivision is in the floodplain." What do you tell the developer?

4. What are the key items you need to check when reviewing the plans for a new house to be built on a slab foundation on fill in the fringe?

5. You deny an application to build a house in the floodplain because the plans show a proposed basement 6' below the BFE. What recourses does the applicant have now?

6. What should you check for during the first site inspection?

7. When should you make the second inspection for a building to be elevated on a crawlspace or columns?

8. If you use a level to verify the elevation of a building during the second inspection, will the builder still need to provide an as-built elevation certificate?

9. When is the best time to see if a crawlspace has adequate openings?

10. During the second inspection, you find that the builder wants to build the lowest floor three feet below the BFE in order to save on construction costs. What repercussions would the owner face if the community issued a certificate of occupancy for the building and did not pursue any enforcement action?

11. If the third inspection reveals that the builder of an apartment house has made a change to the structure that results in a major violation of your floodplain regulations, what can you do?

12. How can Section 1316 help a local permit official faced with a subdivider who refuses to build houses in compliance with the floodplain regulations?

13. Can a community grant a variance to allow a project in the floodway that will cause a ½ foot increase in flood heights.

14. Name two situations where special exceptions may be granted for a variance.

15. Permit records should be kept systematically. Your system should be keyed so you can retrieve permit files by:

16. What are the advantages of using the FEMA Elevation Certificate as a record of a building's lowest floor elevation?

17. Can a surveyor sign a Floodproofing Certificate?

18. What is needed to support a No-rise certification?

UNIT 8:
SUBSTANTIAL IMPROVEMENT AND SUBSTANTIAL DAMAGE

In this unit

This unit covers:

- The substantial improvement rule – how to regulate major additions and other improvements to buildings in the floodplain.
- The substantial damage rule – how to regulate reconstruction and repairs to buildings that have been severely damaged.
- Exceptions to the basic rule for some special cases.

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INTRODUCTION

In previous units we focused on the rules and regulations that prevent or reduce damage from floods to new buildings. But what happens when the owner wishes to make an improvement, such as an addition, to an existing building? What if a building is damaged by a fire, flood or other cause?

Basic rule: If the cost of improvements or the cost to repair the damage exceeds 50 percent of the market value of the building, it must be brought up to current floodplain management standards.

That means an existing building must meet the requirements for new construction.

People who own existing buildings that are being substantially improved will be required to make a major investment in them in order to bring them into compliance with the law. They will not be happy. If the buildings have just been damaged, they will be financially strapped and your elected officials will want to help them, not make life harder for them.

For these reasons, it is easy to see that this basic rule can be difficult to administer. It is also the one time when your regulatory program can reduce flood damage to existing buildings. That's why this course devotes this unit to administering the substantial improvements and substantial damage regulations.

In this course, the term "building" is the same as the term "structure" in the NFIP regulations. Your ordinance may use either term. The terms are reviewed in more detail in Unit 5, Section E.

A. SUBSTANTIAL IMPROVEMENT

> ***44 CFR 59.1.*** *Definitions: "Substantial improvement" means any reconstruction, rehabilitation, addition or other improvement to a structure, the total cost of which equals or exceeds 50 percent of the market value of the structure before the start of construction of the improvement.*

This section addresses many clarifications and a few exceptions related to substantial improvements.

PROJECTS AFFECTED

All building improvement projects worthy of a permit must be considered. These include:

- Remodeling projects.
- Rehabilitation projects.
- Building additions.
- Repair and reconstruction projects (these are addressed in more detail in Section B on substantial damage)

If your community does not require permits for, say, reroofing, minor maintenance or projects under a certain dollar amount, then such projects are not subject to the substantial improvement requirements. However, if you have a larger project that includes reroofing, etc., then it must include the entire cost of the project.

One problem you may face is a builder trying to sneak through a loophole by applying for a permit for only part of the job and then later applying for another permit to finish the work. If both applications are together worth more than 50% of the value of the building, the combined project should be considered a substantial improvement and subject to the rules.

FEMA requires that the entire improvement project be counted as one. In order to help you enforce this, you may want to count all applications submitted over, say, one year as one project. Check with your attorney on whether your ordinance clearly gives you the authority to do this and be sure to spell it out in the permit papers given to the applicant.

Some communities require that improvements be calculated cumulatively over several years. All improvement and repair projects undertaken over a period of five years, 10 years or the life of the structure are added up. When they total 50 percent, the building must be brought into compliance as if it were new construction.

The Community Rating System credits keeping track of improvements to enforce a cumulative substantial improvement requirement. It also credits using a lower threshold than 50 percent. These credits are found under Activity 430, Section 431.c and d in the *CRS Coordinator's Manual* and the *CRS Application*. See also *CRS Credit for Higher Regulatory Standards* for example regulatory language.

Post-FIRM buildings

The rules do not address only pre-FIRM buildings—they cover *all* buildings, post-FIRM ones included.

In most cases, a post-FIRM building will be properly elevated or otherwise compliant with regulations for new construction. However, sometimes a map change results in a higher BFE or change in FIRM zone. A substantial improvement to a post-FIRM building may require that the building be elevated to protect it from the new, higher, regulatory BFE.

It should be remembered that all additions to a post-FIRM building must be elevated at least as high as the BFE in effect when the building was built. (You can't allow a compliant building to become noncompliant by allowing additions at grade.) If a new, higher BFE has been adopted since the building was built, additions that are substantial improvements must be elevated to the new BFE.

THE FORMULA

A project is a substantial improvement if:

$$\frac{\text{Cost of improvement project}}{\text{Market value of the building}} \geq 50 \text{ percent}$$

For example, if a proposed improvement project will cost $30,000 and the value of the building is $50,000:

$$\frac{\$30{,}000}{\$50{,}000} = 0.6 \text{ (60 percent)}$$

The cost of the project exceeds 50 percent of the building's value, so it is a substantial improvement. The floodplain regulations for new construction apply and the building must meet the post-FIRM construction requirements. If the project is an addition, only the addition has to be elevated (see the examples later in this section).

The formula is based on the cost of the project and the value of the building. These two numbers must be reviewed in detail.

Project cost

The cost of the project means all structural costs, including

- all materials
- labor
- built-in appliances
- overhead
- profit
- repairs made to damaged parts of the building worked on at the same time

A more detailed list is included in Figure 8-1.

To determine substantial improvement, you need a detailed cost estimate for the project, prepared by a licensed general contractor, professional construction estimator or your office.

Your office must review the estimate submitted by the permit applicant. To verify it, you can use your professional judgment and knowledge of local and regional construction costs, or you can use building code valuation tables published by the major building code groups. These tables can be used for determining estimates for particular replacement items if the type of structure in question is listed in the tables.

There are two exemptions to calculating the cost of an improvement or repair project: 1) improvements to correct code violations and 2) historic buildings. These are explained in more detail later on.

Market value

In common parlance, market value is the price a willing buyer and seller agree upon. The market value of a structure reflects its original quality, subsequent improvements, physical age of building components and current condition.

However, market value for property can be different than that of the building itself. Market value of developed property varies widely due to the desirability of its location. For example, two houses of similar size, quality and condition will have far different prices if one is on the coast, or in the best school district, or closer to town than the other—but the value of the building materials and labor that went into both houses will be nearly the same.

For the purposes of determining substantial improvement, market value pertains only to the structure in question. It does not pertain to the land, landscaping or detached accessory structures on the property. Any value resulting from the location of the property should be attributed to the value of the land, not the building.

Items to be included

- All structural elements, including:
  - Spread or continuous foundation footings and pilings
  - Monolithic or other types of concrete slabs
  - Bearing walls, tie beams and trusses
  - Floors and ceilings
  - Attached decks and porches
  - Interior partition walls
  - Exterior wall finishes (brick, stucco, siding) including painting and moldings
  - Windows and doors
  - Reshingling or retiling a roof
  - Hardware
- All interior finishing elements, including:
  - Tiling, linoleum, stone, or carpet over subflooring
  - Bathroom tiling and fixtures
  - Wall finishes (drywall, painting, stucco, plaster, paneling, marble, etc.)
  - Kitchen, utility and bathroom cabinets
  - Built-in bookcases, cabinets, and furniture
  - Hardware
- All utility and service equipment, including:
  - HVAC equipment
  - Plumbing and electrical services
  - Light fixtures and ceiling fans
  - Security systems
  - Built-in kitchen appliances
  - Central vacuum systems
  - Water filtration, conditioning, or recirculation systems
- Cost to demolish storm-damaged building components
- --- Labor and other costs associated with moving or altering undamaged building components to accommodate improvements or additions
- --- Overhead and profits

Items to be excluded

- Plans and specifications
- Survey costs
- Permit fees
- Post-storm debris removal and clean up
- Outside improvements, including:
  - Landscaping
  - Sidewalks
  - Fences
  - Yard lights
  - Swimming pools
  - Screened pool enclosures
  - Detached structures (including garages, sheds and gazebos)
  - Landscape irrigation systems

Figure 8-1. Items included in calculating cost of the project

Acceptable estimates of market value can be obtained from these sources:

- An independent appraisal by a professional appraiser. The appraisal must exclude the value of the land and not use the "income capitalization approach" which bases value on the use of the property, not the structure.
- Detailed estimates of the structure's actual cash value—the replacement cost for a building, minus a depreciation percentage based on age and condition. For most situations, the building's actual cash value should approximate its market value. Your community may prefer to use actual cash value as a substitute for market value, especially where there is not sufficient data or enough comparable sales.
- Property appraisals used for tax assessment purposes with an adjustment recommended by the tax appraiser to reflect market conditions (adjusted assessed value).
- The value of buildings taken from NFIP claims data (usually actual cash value).
- Qualified estimates based on sound professional judgment made by the staff of the local building department or tax assessor's office.

Some market value estimates are often used only as screening tools (i.e., NFIP claims data and property appraisals for tax assessment purposes) to identify those structures where the substantial improvement ratios are obviously less than or greater than 50 percent (i.e., less than 40 percent or greater than 60 percent). For structures that fall in the 40 percent to 60 percent range, more precise market value estimates are sometimes necessary.

SUBSTANTIAL IMPROVEMENT EXAMPLES

Example 1. Minor rehabilitation

A rehabilitation is defined as an improvement made to an existing structure which does not affect the external dimensions of the structure.

If the cost of the rehabilitation is less than 50 percent of the structure's market value, the building does not have to be elevated or otherwise protected. However, it is advisable to incorporate methods to reduce flood damage, such as use of flood-resistant materials and installation of electrical, heating and air conditioning units above the BFE.

Figure 8-2 shows a building that had a small rehabilitation project. Central air conditioning was installed and the electrical system was upgraded. The value of the building before the project was $60,000. The value of the project was $12,000:

$12,000 = 0.2 (20 percent) The project costs less than 50 percent of the $60,000 building, so this is not a substantial improvement.

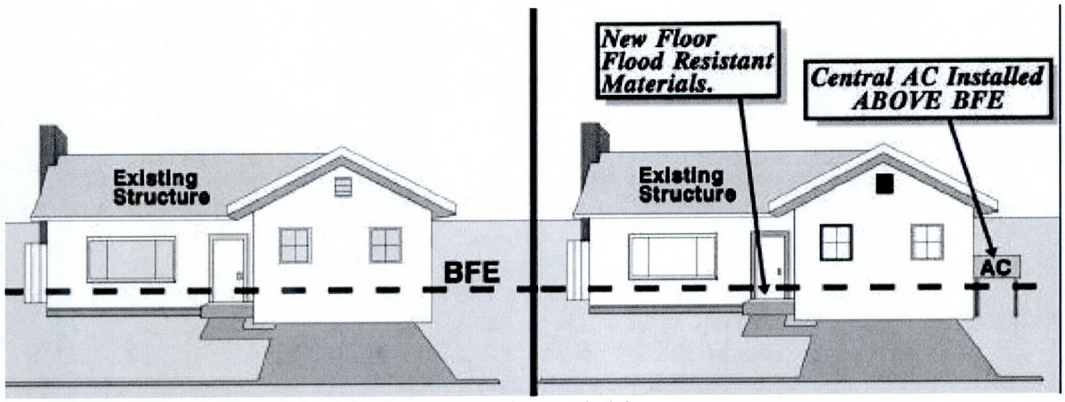


Figure 8-2. Minor rehabilitations use flood-resistant methods and materials. Neither structure would benefit from post-FIRM flood insurance rates because they are not elevated.

Note: To gauge what happens to flood insurance premiums if a substantially improved building is not brought up to post-FIRM standards, see Figures 7-7 through 7-12.

Example 2. Substantial rehabilitation

If the rehab costs more than 50 percent of the value of the building, your ordinance requires that an existing structure be elevated and/or the basement filled to meet the elevation standard.

Figure 8-3 shows a building that has been allowed to run down. It's market value is $35,000. To rehab it will require gutting the interior and replacing all wallboard, built-in cabinets, bathroom fixtures and furnace. The interior doors and flooring will be repaired. The house will get new siding and a new roof. The cost of this rehab will be $25,000:

$\frac{\$25,000}{\$35,000} = 71.4$ percent Because total cost of the project is greater than 50 %the rehab is a substantial improvement

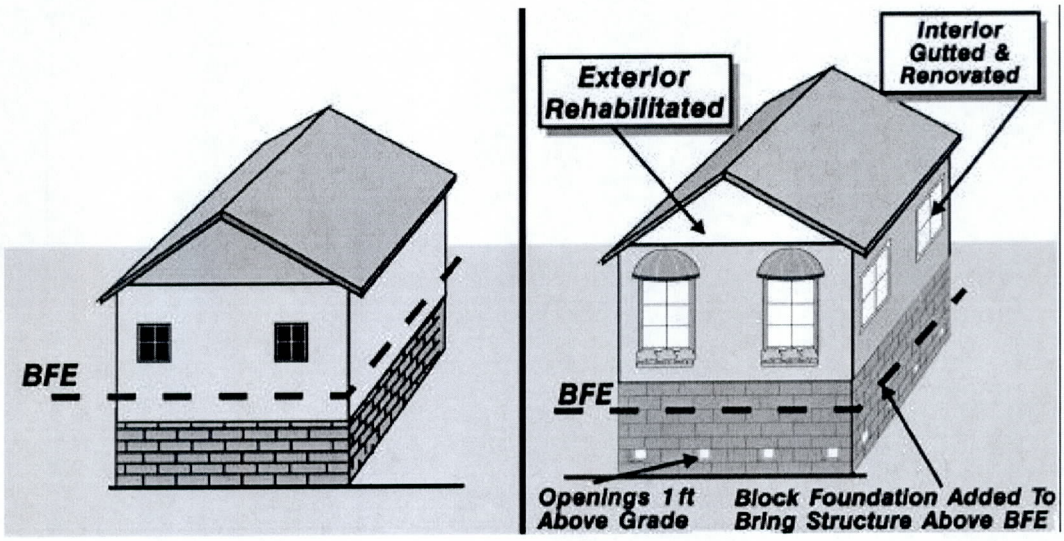


Figure 8-3. substantially rehabilitated building elevated above the BFE.
In A Zones, elevation may be on fill, crawlspace, columns, etc. In V Zones, only pilings, columns or other open foundations are allowed. The new structure would benefit from post-FIRM flood insurance rates.

Example 3. Lateral addition—residential

Additions are improvements that increase the square footage of a structure. Commonly, this includes the structural attachment of a bedroom, den, recreational room garage or other type of addition to an existing structure.

When an addition is a substantial improvement, the addition must be elevated or floodproofed, providing that improvements to the *existing* structure are minimal. Figures 8-4 and 8-5 illustrate lateral additions that are compliant.

Depending on the flood zone and details of the project, the existing building may not have to be elevated. The determining factors are the common wall and what improvements are made to the existing structure. If the common wall is demolished as part of the project, then the entire structure must be elevated. If only a doorway is knocked through it and only minimal finishing is done, then only the addition has to be elevated.

In A Zones only, if significant improvements are made to the existing structure (such as a kitchen makeover), both it and the addition must be elevated and otherwise brought into compliance. Some states and many communities require that both the existing structure and lateral additions be elevated in all cases.

In V Zones, the existing structure always has to be elevated, placed on an engineered foundation system, etc., when an addition is proposed that constitutes a substantial improvement. This is due to the "free-of obstruction" standard whereby the lower existing structure would obstruct the storm surge, causing damage to the addition.

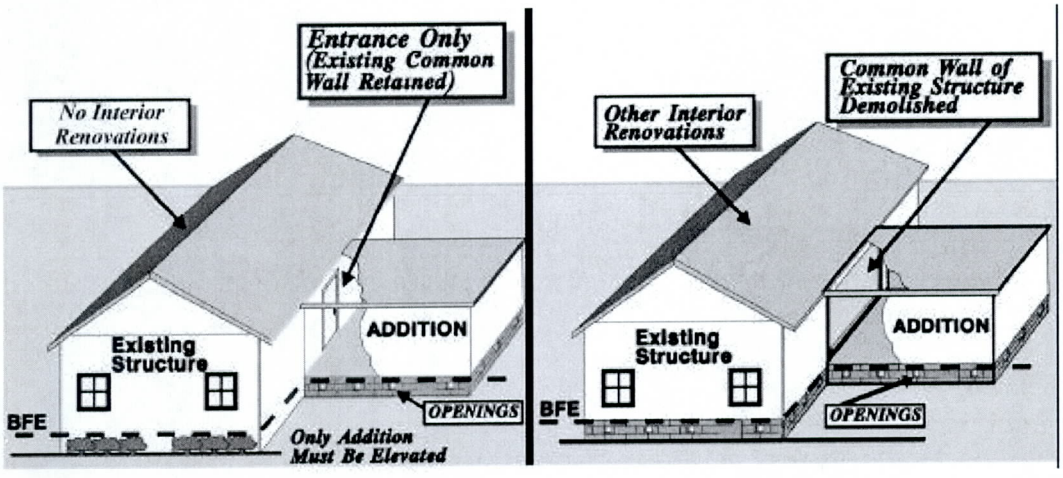


Figure 8-4. Lateral additions to a residential building in an A Zone.
In V Zones, the entire building must be elevated on pilings, columns or other open foundations. The structure on the left would not benefit from post-FIRM flood insurance rates because it was not elevated.

Example 4. Lateral addition—nonresidential

A substantial improvement addition to a nonresidential building may be either elevated or floodproofed. Otherwise, all the criteria for residential buildings reviewed in Example 3 must be met.

If floodproofing is used, the builder must ensure that the wall between the addition and the original building is floodproofed. Floodproofing is not allowed as a construction measure in V Zones.

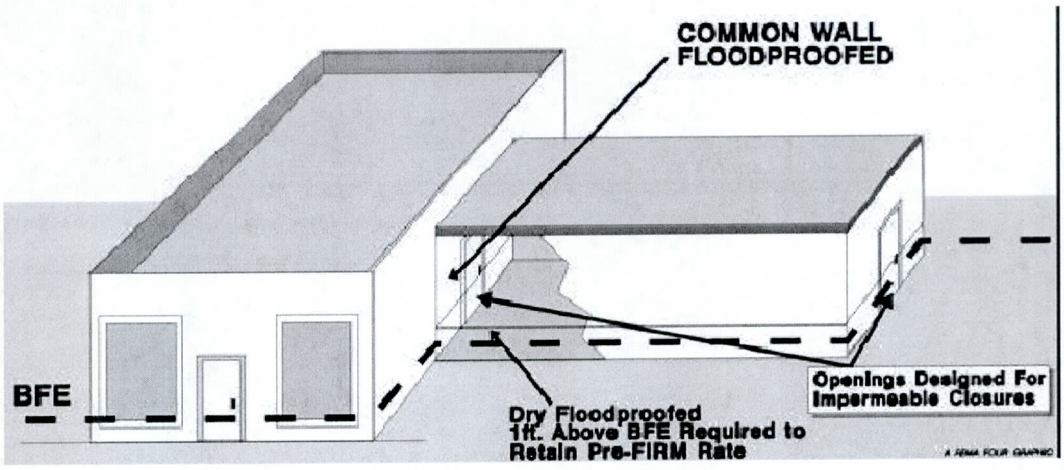


Figure 8-5. Lateral addition to a nonresidential building in an A Zone.
This approach is not allowed in V Zones. The structure would *not* benefit from post-FIRM flood insurance rates because the original building was not elevated or floodproofed.

Example 5. Vertical addition—residential

When the proposed substantial improvement is a full or partial second floor, the entire structure must be elevated (Figure 8-6). In this instance, the existing building provides the foundation for the addition. Failure of the existing building would result in failure of the addition, too.

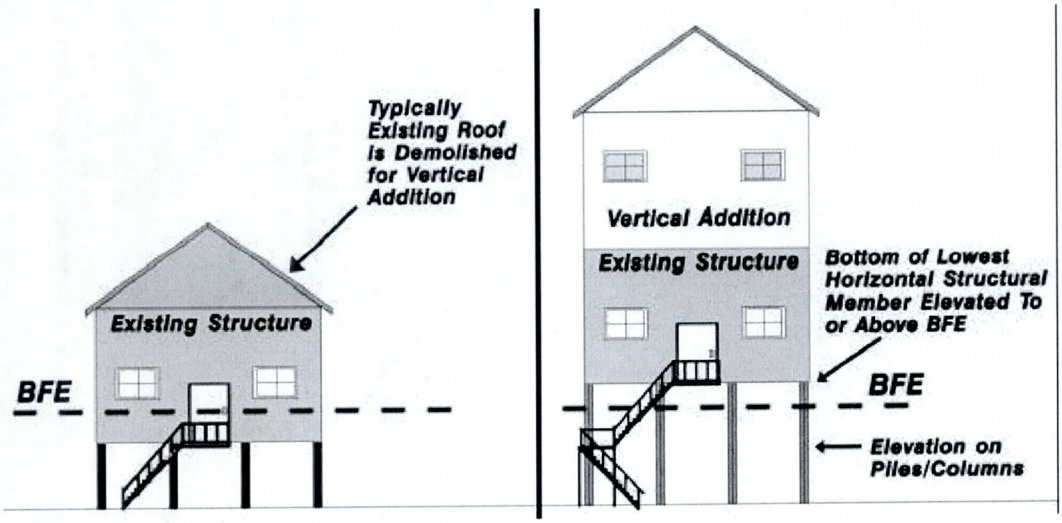


Figure 8-6. Vertical addition to a residential building in a V Zone.
The new structure would benefit from post-FIRM flood insurance rates.

Example 6. Vertical addition—nonresidential

When the proposed substantial improvement is a full or partial second floor, the entire structure must be elevated or floodproofed (Figure 8-7).

The owner could obtain post-FIRM rates on the building if it is floodproofed to one foot above the BFE and he has a floodproofing certificate signed by a registered engineer. An optional approach is to elevate the entire building and obtain an elevation certificate.

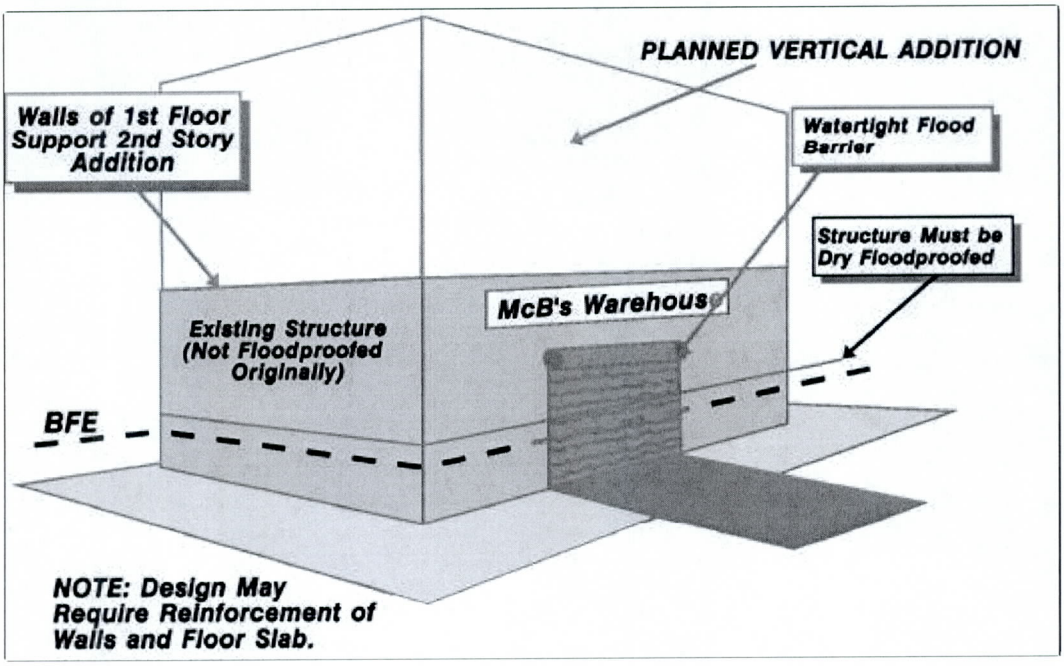


Figure 8-7. Vertical addition to a nonresidential building in an A Zone.
The new floodproofed structure would benefit from post-FIRM flood insurance rates.

Example 7. Post-FIRM building—minor addition

ALL additions to post-FIRM buildings are defined as new construction and must meet the requirements of your floodplain management ordinance regardless of the size or cost of the addition (Figure 8-8). A small addition to a residential structure must be elevated at least as high as the BFE in effect when the building was built.

If a map revision has taken place and the BFE has increased, only additions that are substantial improvements have to be elevated to the new BFE.

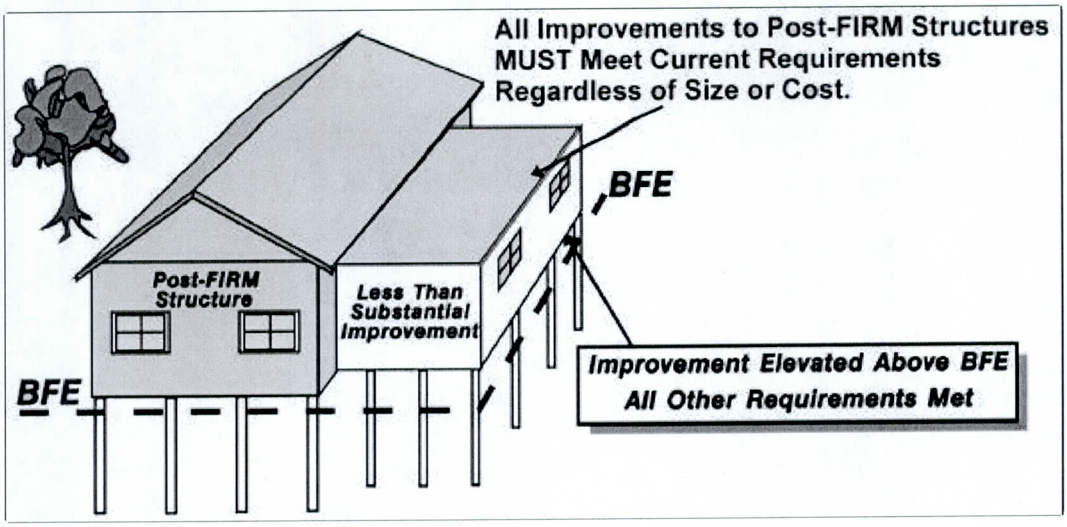


Figure 8-8. Small additions to post-FIRM buildings must be elevated.

Example 8. Post-FIRM building—substantial improvement

Substantial improvements made to a post-FIRM structure must meet the requirements of the current ordinance. Figure 8-9 shows a lateral addition made after a map revision took place and the BFE was increased.

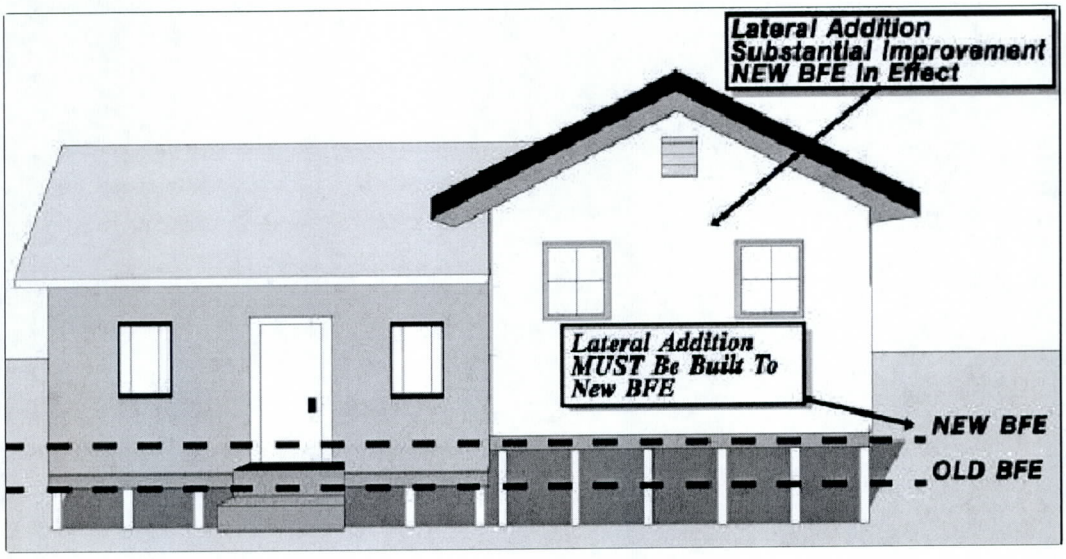


Figure 8-9. Substantial improvements to post-FIRM buildings must be elevated above the new BFE. Nonresidential buildings may be floodproofed

LEARNING CHECK #1

1. What is the basic rule on improvements and repairs to existing buildings in the floodplain?

2. Mrs. Murphy got a permit two months ago to remodel her living room and kitchen. Now she wants a permit to remodel three bedrooms and two bathrooms. Should you check each of these separately to determine if each project is a substantial improvement?

3. What is the substantial improvement formula?

4. Which of the following items must be included when calculating the cost of an improvement project?
   - — Attached deck
   - — Plumbing
   - — Permit fees
   - — Contractor's overhead and profit
   - — Architect's plans
   - — Landscaping
   - — Built-in bookcases

5. What factors are considered when determining market value?

6. What are three good sources for obtaining the market value of a house?

7. Mr. Jones proposes a $50,000 addition to his $80,000 home in the floodplain. Is this a substantial improvement?

8. If Mr. Jones' project will be a substantial improvement, what do you need to check to see if the whole house has to be elevated or just the addition?

B. SUBSTANTIAL DAMAGE

> ***44 CFR 59.1.*** *Definitions: "Substantial damage" means damage of any origin sustained by a structure whereby the cost of restoring the structure to its before damaged condition would equal or exceed 50 percent of the market value of the structure before the damage occurred.*

Two key points:

- The damage can be from any cause—flood, fire, earthquake, wind, rain, or other natural or human-induced hazard.
- The substantial damage rule applies to all buildings in a flood hazard area, regardless of whether the building was covered by flood insurance.

The formula is essentially the same as for substantial improvements:

$$\frac{\text{Cost to repair}}{\text{Market value of the building}} \geq 50 \text{ percent}$$

Market value is calculated in the same way as for substantial improvements. Use the pre-damage market value.

COST TO REPAIR

Notice that the formula uses "cost *to* repair," not "cost *of* repairs." The cost to repair the structure must be calculated for full repair to the building's before-damage condition, even if the owner elects to do less. It must also include the cost of any improvements that the owner has opted to include during the repair project.

The total cost to repair includes the same items listed in Figure 8-1. As shown in Example 2 below, properly repairing a flooded building can be more expensive than people realize. The owner may opt not to pay for all of the items needed. The owner may:

- Do some of the work, such as removing and discarding wallboard.
- Obtain some of the materials free.
- Have a volunteer organization, such as the Mennonites, do some of the work.
- Decide not to do some repairs, such as choosing to nail down warped flooring rather than replace it.

Basic rule: Substantial damage is determined regardless of the actual cost to the owner. You must figure the true cost of bringing the building back to its pre-damage condition using qualified labor and materials obtained at market prices.

The permit office and the owner may have serious disagreements over the total list of needed repairs and their cost, as the owner has a great incentive to show less damage than actually occurred in order to avoid the cost of bringing the building into compliance. Here are four things that can help you:

- Get the cost to repair from an objective third-party or undebatable source, such as:

  -- A licensed general contractor.

  -- A professional construction estimator.

  -- Insurance adjustment papers (exclude damage to contents).

  -- Damage assessment field surveys conducted by building inspection, emergency management or tax assessment agencies after a disaster.

  -- Your office.

  Even if your office does not prepare the cost estimate, it needs to review the estimate submitted by the permit applicant. You can use your professional judgment and knowledge of local and regional construction costs. Or, you can use building code valuation tables published by the major building code groups.

- Use an objective system that does not rely on varying estimates of market value or different opinions of what needs to be repaired. The Substantial Damage Estimator Program discussed later in this section will do this.

- Publicize the need for the regulations and the benefits of protecting buildings from future flooding. A well-educated public won't argue as much as one that sees no need for the requirement.

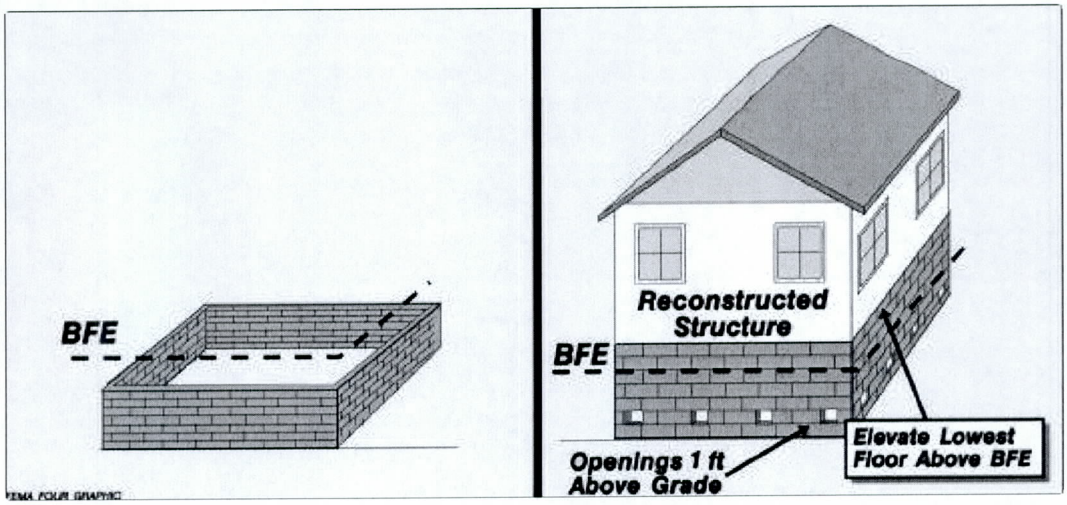
- Help the owner find financial assistance to meet the extra cost of complying with the code. If there was a disaster declaration, there may be sources of financial assistance as discussed in the next unit. If the owner had flood insurance and the building was substantially damaged by a flood, the new Increased Cost of Compliance coverage will help (see next section).

SUBSTANTIAL DAMAGE EXAMPLES

Example 1. Reconstruction of a destroyed building

Reconstructions are cases where an entire structure is destroyed, damaged, purposefully demolished or razed, and a new structure is built on the old foundation or slab. The term also applies when an existing structure is moved to a new site.

Reconstructions are, quite simply, "new construction." They must be treated as new buildings.



Razed or "totaled" building with remaining foundation

Reconstruction on existing foundation

Figure 8-10. A reconstructed house is new construction.
This example is for A Zones only. A new building in the V Zone must be elevated on piles or columns.

Example 2. Substantially damaged structure

To determine if a damaged structure meets the threshold for substantial damage, the cost of repairing the structure to its before-damaged condition is compared to the market value of the structure prior to the damage. The estimated cost of the repairs must include all costs necessary to fully repair the structure to its before-damaged condition.

If equal to or greater than 50 percent of that structure's market value before damage, then the structure must be elevated (or floodproofed if it is nonresidential) to or above the level of the base flood, and meet other applicable local ordinance requirements. This is the basic requirement for substantial damage.

Figure 8-11 graphically illustrates the amount of damage that can occur to a building flooded only four feet deep. Even though the structure appears sound and there are no cracks or breaks in the foundation, the total cost of repair can be significant.

The cost of repair after a flood that simply soaked the building will typically include the following structural items:

- Remove all wallboard and insulation.
- Install new wallboard and insulation.
- Tape and paint.
- Remove carpeting and vinyl flooring.
- Dry floor, replace warped flooring.
- Replace cabinets in the kitchen and bathroom.
- Replace built-in appliances.
- Replace hollow-core interior doors.
- Replace furnace and water heater.
- Clean and disinfect duct work.
- Repair porch flooring and front steps.
- Clean and test plumbing (licensed plumber may be required).
- Replace outlets and switches, clean and test wiring (licensed electrician may be required).

Note: See also Figures 7-7 through 7-12 for what happens to flood insurance premiums if a substantially damaged building is granted a variance and is not brought up to post-FIRM standards.

Figure 8-11. Even slow moving floodwater can cause substantial damage.

SUBSTANTIAL DAMAGE SOFTWARE

FEMA has developed a software program to help local officials make substantial damage determinations. The software is Windows-based and will work on Microsoft Windows 3.1 and Windows 95. While it is based on Microsoft Access, the software is self-contained and does not require any software in addition to Windows.

The software comes with a manual, *Guide on Estimating Substantial Damage Using the NFIP Residential Substantial Damage Estimator*, FEMA 311. This includes a user's manual and worksheets that allow the calculations to be done manually.

Contact your FEMA Regional Office for a copy of the software package and help in using it. Following a major disaster declaration, training sessions and technical assistance may be available.

INCREASED COST OF COMPLIANCE

On June 1, 1997, the NFIP began offering additional coverage to all holders of structural flood insurance policies. This coverage is called Increased Cost of Compliance or ICC.

The name refers to cases where the local floodplain management ordinance requires elevation or retrofitting of a substantially damaged building. Under ICC, the flood insurance policy will not only pay for repairs to the flooded building, it will pay up to $15,000 to help cover the additional cost of complying with the ordinance. This is available for any flood insurance claim and, therefore, is not dependent on the community receiving a disaster declaration.

There are some limitations to ICC:

- It's only available if there was a flood insurance policy on the building before the flood.
- It covers only damage caused by a flood.
- Claims are limited to $15,000 per structure.
- Claims must be accompanied by a substantial damage determination by the floodplain ordinance administrator.

It should also be mentioned that a portion of the rest of the claim payment may help meet the cost of bringing the building up to code. For example, if there was foundation damage, the regular claim will pay for the cost of repairing or replacing the foundation. The ICC funds would only be needed for the extra costs of raising the foundation higher than it was before.

In certain cases, an ICC claim can be filed if the building is repetitively flooded, sustaining losses of less than 50 percent of the market value each time and if the total cost of the losses is 50 percent or more during a certain period of time, provided the community has language in the flood damage ordinance that implements the substantial damage rule in these cases.

Figure 8-12 has example ordinance language. This language exceeds the minimum NFIP requirements, but would be needed if you wanted to trigger the ICC provision for repetitively damaged buildings.

The Community Rating System credits keeping track of improvements to enforce a cumulative substantial improvement requirement. The 1999 *CRS Coordinator's Manual* credits the ordinance language in Figure 8-12. These credits are found under Activity 430, Section 431.c in the *CRS Coordinator's Manual* and the *CRS Application.*

Option 1

A. Adopt the Following Definition:

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

B. And modify the "substantial improvement" definition as follows:

"Substantial Improvement" means any reconstruction, rehabilitation, addition, or other improvement of a structure, the cost of which equals or exceeds 50 percent of the market value of the structure before the "start of construction" of the improvement. This term includes structures which have incurred "repetitive loss" or "substantial damage", regardless of the actual repair work performed.

Option 2

Modify the Asubstantial damage@ definition as follows:

"Substantial Damage" means damage of any origin sustained by a structure whereby the cost of restoring the structure to its before damaged condition would equal or exceed 50 percent of the market value of the structure before the damage occurred. Substantial damage also means flood-related damage sustained by a structure on two separate occasions during a 10-year period for which the cost of repairs at the time of each such flood event, on the average, equals or exceeds 25 percent of the market value of the structure before the damage occurred.

NOTE 1: Communities need to make sure that these definitions are tied to the floodplain management requirements for new construction and substantial improvements and to any other requirements of the ordinance, such as the permit requirements, in order to enforce this provision.

NOTE 2: An ICC Claim Payment is ONLY made for flood-related damage. The substantial damage part of the definition must still include "damage of any origin" to be compliant with the minimum NFIP Floodplain Management Regulations.

Figure 8-12. Sample ordinance language for ICC repetitive loss definitions
Source: *Interim Guidance for State and Local Officials -- Increased Cost of Compliance Coverage*, FEMA, 1997. This language is only needed to trigger an ICC payment for a repetitive loss. No ordinance changes are needed for the ICC coverage for substantial damage.

C. EXCEPTIONS

As explained in previous sections, the substantial improvement and substantial damage requirements affect all buildings regardless of the reason for the improvement or the cause of the damage. There are three exceptions to this: exempt activities, historic buildings and projects required by code.

EXEMPT ACTIVITIES

Certain activities related to making improvements or repairing damaged buildings do not have to be counted toward the cost of the improvement or repairs. These include:

- Plans and specifications.
- Surveying.
- Permit fees.
- Demolition or emergency repairs made for health or safety reasons or to prevent further damage to the building.
- Improvements or repairs to items outside the building, such as the driveway, fencing, landscaping and detached structures.

HISTORIC STRUCTURES

Historic structures are exempted from the substantial improvement requirements subject to the criteria listed below. The exemption can be granted administratively if the current NFIP definitions of substantial improvement and historic structure are included in your ordinance, or they can be granted through a variance procedure.

In either case, they are usually granted subject to conditions.

If the improvements to a historic structure meet the following three criteria and are approved by the community, the building will not have to be elevated or floodproofed. It can also retain its pre-FIRM flood insurance rating status.

1. The building must be a bona-fide "historic structure." Figure 7-13 has the definition that must be followed.

2. The project must maintain the historic status of the structure. If the proposed improvements to the structure will result in it being removed from or ineligible for the National Register or federally-certified state or local inventory, then the proposal cannot be granted an exemption from the substantial improvement rule.

The best way to make such determinations is to seek written review and approval of proposed plans by the local historic preservation board, if it is federally-certified, or by the state historic preservation office. If the plans are approved, you can grant the exemption. If not, no exemption can be permitted.

3. Take all possible flood damage reduction measures. Even though the exemption to the substantial improvement rule means the building does not have to be elevated to or above BFE, or be renovated with flood-resistant materials that are not historically sensitive, many things can and should be done to reduce the flood damage potential. Examples include:

- Locating mechanical and electrical equipment above the BFE or flood-proofing it.
- Elevating the lowest floor of an addition to or above the BFE with the change in floor elevation disguised externally.
- Building the lowest floor of an addition with flood-resistant materials and providing hydrostatic openings.

CODE VIOLATIONS

The NFIP definition of substantial improvement includes another exemption:

> ***44 CFR 59.1 Definitions:*** *"Substantial improvement" means .... The term does not, however, include ... Any project for improvement of a structure to correct existing violations of state or local health, sanitary, or safety code specifications which have been identified by the local code enforcement official and which are the minimum necessary to assure safe living conditions*

Note the key words in this exemption: *correct* existing violations, *identified* by the local official, and *minimum* necessary to assure safe conditions. This language was included in order to avoid penalizing property owners *who had no choice* but to make improvements to their buildings or face condemnation or revocation of a business license.

This exemption was intended for *involuntary* improvements or violations that existed before the improvement permit was applied for or before the damage occurred—for example, a restaurant owner who must remodel and enlarge the kitchen in order to meet current local and state health and safety codes.

You can only exempt the items specifically required by code. For example, if a single stair tread was defective and had to be replaced, do not exempt the cost of rebuilding the entire stairway. Similarly, count only replacement in like kind and what is minimally necessary. If the owner chooses to upgrade the quality of a code-required item, the extra cost is not exempt from the formula—it's added to the true cost of the improvement or repairs.

Unfortunately, many property owners and builders pressure local building official to exclude "code violation corrections" from their voluntary improvement proposals. There are "code violations" in all structures built before the current code was enacted. In many cases, those elements must be brought up to code as part of an improvement project.

This is very different from a code violation citation that forces a property owner to correct those violations and make improvements that were otherwise not planned. The building official must know about and document the violations before or at the time the permit is issued.

Example

A small business in a 40-year old building was damaged by a fire. The building's pre-fire market value was $100,000. The insurance adjuster and the permit office concluded that the total cost to repair would be $45,000.

However, the community's building code states that whenever an applicant applies for a permit to modify or improve a building, the building must be brought up to code. This building would need the following additional work:

- Replace unsafe electrical wiring.
- Install missing fire exit signs, smoke detectors and emergency lighting.
- Widen the front door and install a ramp to make the business accessible to handicapped and mobility-impaired people.

The total cost of these code requirements would be $8,000. However, since these were required by the code before the fire occurred, they would not have to be counted toward the cost to repair. Based on the basic formula:

$\frac{\$45{,}000}{\$100{,}000} = 0.45 \text{ or } 45\%$ The building is not declared. substantially damaged

In this example, the building can be repaired without elevating or floodproofing. However, the permit office should strongly recommend incorporating flood protection measures and flood resistant materials in the repair project (as in the example in Figure 8-2).

LEARNING CHECK #2

1. What is the formula for determining substantial damage?

2. What is the basic rule on calculating the cost of the damage?

3. A tornado swept through town and substantially damaged 25 buildings in the floodplain. How can you help the property owners comply with the floodplain ordinance's substantial damage regulations?

4. Mr. Johnson prepared a list of everything he has to do to repair his flooded home. Which of the following items are counted toward the cost of repairs when determining substantial damage? What is the dollar amount that should be counted?
   - — Clearing broken trees and debris away from the house ($2,500)
   - — Replacing the warped flooring ($3,000)
   - — New doors ($1,000) to replace old ones (worth $500)
   - — Replacing the old kitchen cabinets (valued at $5,000) with custom hard-wood cabinets valued at $15,000.
   - — New wall to wall carpeting ($1,800)
   - — New furniture ($12,000)
   - — New wiring ($2,000) to bring the building up to current code (This is a standard requirement of the community. The building was not cited as having a code violation.)
   - — Permit fee ($500)
   - — Clean out and test the furnace (done free as a public service by the utility company, but otherwise worth $250 if done by a private contractor)
   - — New bushes and replacement fence ($1,500)
5. What's the best way to determine if a building is "historic" and eligible for exemption from the substantial improvement requirement?

UNIT LEARNING EXERCISE

1. What kind of projects need a permit so you can check to see if they would be substantial improvements?

2. A home was built to post-FIRM standards in 1990. The lowest floor was elevated four feet above grade, to the BFE in effect at that time. In 1995, a new FIRM went into effect. The new BFE is now six feet above grade at that site.

   a. How high would a small (less than substantial) addition have to be elevated?

   b. How high would a large (substantial) addition have to be elevated?

3. Mrs. Murphy bought her property for $100,000 last year. Is this a good basis for determining its market value?

4. Based on tax assessor's records, the market value of 123 Main Street is $75,000. The owner wants to replace the HVAC and plumbing, remodel the kitchen and both bathrooms and convert his basement to a finished family room. His total cost is $20,000 for supplies. If a contractor were to do the job, the total cost would be $45,000. However, since he is a handyman and will do all the work himself, the total cost of his project is $20,000. What is your response?

5. Mrs. Smith wants a new second story that will double the size and value of her house. The floor of the new story will be above the BFE. Will the old first floor have to be elevated?

6. The substantial damage regulations only apply if the building was damaged by a flood. True or false?

7. A flooded property owner has a brother who is a plumbing contractor. His brother's repair estimate shows the damage at 48% of the building's value. You think it should be higher. What can you do to prevent an argument over who's numbers are right?

8. Mrs. McGillicudy is on a fixed income. Her home was flooded and substantially damaged. Her flood insurance policy will pay for the repairs. When told that she will also have to elevate her house, she thinks she should apply for a variance due to the financial hardship. What do you tell her?

9. Before the flood, Mr. Johnson had been cited by the community for a code violation. The paint on his garage door had been peeling, which was a violation of the local housing maintenance code. Since the flood left mud up to the high water line, he decided to repaint the whole house. Can he claim exemption of the cost of the painting because it had been cited as a code violation?

UNIT 9:
FLOOD INSURANCE AND FLOODPLAIN MANAGEMENT

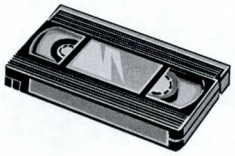
In this unit

While you are probably not an insurance agent, you should be aware of the close relationship between floodplain management and flood insurance.

This Unit reviews:

- What a flood insurance policy covers,
- When a policy must be purchased,
- How flood insurance rates are determined,
- How the Community Rating System can reduce flood insurance premiums in communities that doe more than the minimum NFIP regulations, and
- The special rules that apply in the Coastal Barriers Resources System

Materials needed for this unit



- Videotape segment, *Community Rating System*
- Video cassette player

Additional information can be found in *Answers to Questions about the National Flood Insurance Program*, questions 21 - 66.

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not impact flood plain or floodway delineations or base flood elevations, such as community boundary changes, labeling, or planimetric details. Such a submission shall include appropriate supporting documentation in accordance with this part and may be submitted at any time.

(b) All requests for changes to effective maps, other than those initiated by FEMA, must be made in writing by the Chief Executive Officer of the community (CEO) or an official designated by the CEO. Should the CEO refuse to submit such a request on behalf of another party, FEMA will agree to review it only if written evidence is provided indicating the CEO or designee has been requested to do so.

(c) Requests for changes to effective Flood Insurance Rate Maps (FIRMs) and Flood Boundary and Floodway Maps (FBFMs) are subject to the cost recovery procedures described in 44 CFR part 72. As indicated in part 72, revisions requested to correct mapping errors or errors in the Flood Insurance Study analysis are not to be subject to the cost-recovery procedures.

[42 FR 9110, Feb. 14, 1977. Redesignated at 44 FR 31177, May 31, 1979; 48 FR 40891, Sept. 12, 1983; 48 FR 46991, Oct. 17, 1983; 48 FR 48233, Oct. 18, 1983; 49 FR 1702, Jan. 13, 1984; 49 FR 3468, Jan. 27, 1984; 49 FR 6495, Feb. 22, 1984; 49 FR 7125, Feb. 27, 1984; 49 FR 7382, Feb. 29, 1984; 49 FR 28832, July 17, 1984; 49 FR 35775, Sept. 12, 1984; 49 FR 45135, 45136, Nov. 15, 1984; 50 FR 5071, 5072, Feb. 6, 1985; 50 FR 32570, Aug. 13, 1985; 50 FR 32702, Aug. 14, 1985; 50 FR 43707, Oct. 29, 1985; 50 FR 46045, Nov. 6, 1985; 50 FR 50789, 50790, Dec. 12, 1985; 51 FR 4345, 4346, Feb. 4, 1986; 51 FR 12154, 12155, April 9, 1986; 51 FR 17485, May 13, 1986; 51 FR 26548, 26549, July 24, 1986; 51 FR 31635, Sept. 4, 1986; 51 FR 31951, Sept. 8, 1986; 51 FR 37276, 37277, Oct. 21, 1986; 51 FR 40331, Nov. 6, 1986; 52 FR 3239, 3241, Feb. 3, 1987; 52 FR 22323, 22325, June 11, 1987; 52 FR 29014, 29015, Aug. 5, 1987; 52 FR 37953, 37955, Oct. 13, 1987; 52 FR 46474, 46475, Dec. 8, 1987; 53 FR 5179, 5180, Feb. 22, 1988; 53 FR 28389, 28390, July 28, 1988; 53 FR 31869, Aug. 22, 1988; 53 FR 36278, 36279, Sept. 19, 1988; 53 FR 40730, 40731, Oct. 18, 1988; 53 FR 47813, Nov. 28, 1988; 53 FR 49883, Dec. 12, 1988; 53 FR 51552, 51553, Dec. 22, 1988; 54 FR 5239, 5240, Feb. 2, 1989; 54 FR 8332, Feb. 28, 1989; 54 FR 8541, March 1, 1989; 54 FR 12451, March 27, 1989; 54 FR 15409, April 18, 1989; 54 FR 22898, May 30, 1989; 54 FR 26746-26748, June 26, 1989; 54 FR 31186, 31187, July 27, 1989; 54 FR 33897, Aug. 17, 1989; 54 FR 38858, 38859, Sept. 21, 1989; 54 FR 43179, Oct. 23, 1989; 54 FR 46249, Nov. 2, 1989; 54 FR 47359, 47360, Nov. 14, 1989; 54 FR 52940, 52941, Dec. 26, 1989; 55 FR 2839, 2840, Jan. 29, 1990; 55 FR 6988, Feb. 28, 1990; 55 FR 8950, March 9, 1990; 55 FR 11915, 11917, March 30, 1990; 55 FR 11816, 11817, May 1, 1990; 55 FR 24088, 24090, June 14, 1990; 55 FR 31836, 31837, Aug. 6, 1990; 55 FR 35633, Aug. 31, 1990; 55 FR 41083, 41084, Oct. 9, 1990; 55 FR 46210, Nov. 2, 1990; 55 FR 51420, 51421, Dec. 14, 1990; 56 FR 2859, 2860, Jan. 25, 1991; 56 FR 7307, Feb. 22, 1991; 56 FR 14649, 14651, April 11, 1991; 56 FR 22654, 22656, May 16, 1991; 56 FR 28092, 28094, June 19, 1991; 56 FR 32329, July 16, 1991; 56 FR 32330, July 16, 1991; 56 FR 34026, 34027, July 25, 1991; 56 FR 41297, 41298, Aug. 20, 1991; 56 FR 46992, 46994, Sept. 17, 1991; 56 FR 51336, 51338, Oct. 11, 1991; 57 FR 360, 362, Jan. 6, 1992; 57 FR 9056, 9057, March 16, 1992; 57 FR 19380, 19382, May 6, 1992; 57 FR 27357, 27359, June 19, 1992; 57 FR 29038, June 30, 1992; 57 FR 32900, 32901, July 24, 1992; 57 FR 37716, 37717, Aug. 20, 1992; 57 FR 41877, 41879, Sept. 14, 1992; 57 FR 47788, 47789, Oct. 20, 1992; 57 FR 54306, 54307, Nov. 18, 1992; 57 FR 59304, 59305, Dec. 15, 1992; 58 FR 8552, 8553, Feb. 16, 1993; 58 FR 11541, 11543, Feb. 26, 1993; 58 FR 14324, March 17, 1993; 58 FR 15092, March 19, 1993; 58 FR 19617, 19619, April 15, 1993; 58 FR 29122, May 19, 1993; 58 FR 30124, May 26, 1993; 58 FR 32858, 32860, June 14, 1993; 58 FR 38304, 38306, July 16, 1993; 58 FR 43804, 43805, Aug. 18, 1993; 58 FR 51016, 51017, Sept. 30, 1993; 58 FR 68040, 68042, 68044, 68045, Dec. 23, 1993; 59 FR 5728-5730 Feb. 8, 1994; 59 FR 12184, 12186, 12187, March 16, 1994; 59 FR 17713, 17715-17717, April 14, 1994; 59 FR 28485, 28486, June 2, 1994; 59 FR 32128, 32129, June 22, 1994; 59 FR 33440, 33441, June 29, 1994; 59 FR 39973, Aug. 5, 1994; 59 FR 40829, Aug. 10, 1994; 59 FR 43054, Aug. 22, 1994; 59 FR 44337, 44338, Aug. 29, 1994; 59 FR 49582, Sept. 29, 1994; 59 FR 52437, 52439, Oct. 18, 1994; 59 FR 56004, Nov. 10, 1994; 59 FR 60720, Nov. 28, 1994; 59 FR 64157, 64158, Dec. 13, 1994; 60 FR 4100, 4102, Jan. 20, 1995; 60 FR 5586, 5588, Jan. 30, 1995; 60 FR 6403, 6404, Feb. 2, 1995; 60 FR 17006, 17007, 17010, 17012, 17013, April 4, 1995; 60 FR 26364-26367, May 17, 1995; 60 FR 29993, 29996, June 7, 1995; 60 FR 34889, 34890, July 5, 1995; 60 FR 38275, July 26, 1995; 60 FR 39865, 39868, Aug. 4, 1995; 60 FR 44765, 44768, Aug. 29, 1995; 60 FR 46039, 46041-46043, Sept. 5, 1995; 60 FR 54036, 54039, Oct. 19, 1995; 60 FR 55467, 55470, Nov. 1, 1995; 60 FR 62333, 62335, Dec. 6, 1995; 60 FR 56250, 56252, 56253, Nov. 8, 1995; 61 FR 6559, 6560, 6562, 6565, 6566, 6567, Feb. 21, 1996; 61 FR 10469, 10473, March 14, 1996; 61 FR 11316, 11317, March 20, 1996; 61 FR 14659, 14662, April 3, 1996; 61 FR 16875, April 18, 1996; 61 FR 17251, April 19, 1996; 61 FR 25400, 25403, 25404, May 21, 1996; 61 FR 29488, 29489, June 11, 1996; 61 FR 33852, 33855, July 1, 1996; 61 FR 38092, 38093, July 23, 1996; 61 FR 40528, Aug. 5, 1996; 61 FR 43678, Aug. 26, 1996; 61 FR 43680, Aug. 26, 1996; 61