400 MAPPING AND REGULATIONS

The Community Rating System (CRS) provides credit to communities that enact and enforce regulations that exceed the National Flood Insurance Program's (NFIP's) minimum standards, so that more flood protection is provided for new and existing development.

The activities in this series affect only certain portions of the community and, in some cases, only portions of the delineated Special Flood Hazard Area (SFHA). Therefore, the credit points are adjusted to reflect the area affected. These activities are also adjusted to reflect the community's growth rate as explained in Section 710.

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401 Special Flood-related Hazard Areas

The Federal Emergency Management Agency (FEMA) and many communities in the United States have long recognized that the mapping and regulatory standards of the NFIP do not adequately address all of the flood problems in the country. There are many special localized situations in which flooding or flood-related problems do not fit the national norm for riverine and coastal floodplain management. Therefore, there are situations in which the minimum NFIP requirements do not adequately protect property from flood damage.

To encourage communities to address these hazards, the CRS provides credit throughout the *CRS Coordinator's Manual* for mapping, preserving open space, and regulating new development in areas subject to seven special flood-related hazards:

1. Uncertain flow paths: alluvial fans, moveable bed streams, channel migration, and other floodplains where the channel shifts during a flood.
2. Closed basin lakes: lakes that have a small or no outlet that may stay above flood stage for weeks, months, or years.
3. Ice jams: flooding caused when warm weather and rain break up a frozen river. The broken ice floats down river until it is blocked by an obstruction, such as a bridge or shallow area, creating a dam.
4. Land subsidence: lowering of the land surface caused by withdrawal of subsurface water or minerals or by compaction of organic soils.
5. Mudflow hazards: 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.
6. Coastal erosion: areas subject to the wearing away of land masses caused primarily by waves on the oceans, Gulf of Mexico, and the Great Lakes.
7. Tsunamis: large ocean waves typically caused by an earthquake, landslide, or underwater volcano.

These special flood-related hazards are addressed in separate publications that discuss credit points and impact adjustment and credit calculation formulae for each hazard (see Appendix C or www.CRSresources.org).

The credit points for mapping, preserving open space, and regulating new development in the areas affected by these hazards are calculated separately and added to the other elements in each regular activity.

402 Impact Adjustment for Areas

Many CRS activities are not implemented the same way throughout the floodplain. Therefore, their credit points need to be adjusted to reflect how much of the floodplain they do cover. In CRS credit calculations, this is called the "impact adjustment" (see Section 222).

Some activities are adjusted based on the number of buildings that are affected and some are adjusted based on the size of the area affected. This section reviews how the activity and element credits are adjusted to reflect their impact on the area affected. Section 301 covers impact adjustments based on the number of buildings affected.

Most elements in the activities listed in Table 403-1 (see below) do not affect all of the buildings that could benefit from them. For example, freeboard is often enforced only in areas for which base flood elevations have been determined. A community's credit for freeboard and other elements is adjusted based on how much of the SFHA is affected. In order to measure the impact of these activities, the community must determine the area affected by each element and the area of the SFHA.

Some activities and elements do not have the impact adjustment step as part of calculating the total credit points. These activities and elements are assumed to be effective throughout the community. In some cases, credit is provided ONLY if they are implemented everywhere within the community. For example, in Activity 450 (Stormwater Management) there is no credit for ESC (erosion and sediment control regulations), or WQ (water quality) unless those measures are enforced throughout the entire community.

402.a. Impact Adjustment Ratio

Impact adjustments are calculated by multiplying the points for an element by a ratio that represents how much of the flood problem within the community is being addressed by the element. Impact adjustment ratios are variables with a lower case "r" preceding the acronym for the element.

The value of an impact adjustment ratio is determined by dividing the number of buildings or the total area affected by an element (the numerator) by the appropriate denominator. The number of buildings is designated by a lower case "b," and the area affected is designated by a lower case "a."

The denominator for the elements in each activity is specified in the Impact Adjustment section for the element. In most cases, it is the area of the community's Special Flood Hazard Area or "aSFHA."

NOTE: *The community's aSFHA should be reviewed and updated each year for the Program Data Table that is included in the annual recertification (see Section 213.a).*

Example 402.a-1.

In Activity 420 (Open Space Preservation), the credit for preserving open space is adjusted based on its impact, i.e., how much of the SFHA is preserved as open space. This is calculated by multiplying the credit by the impact adjustment. The acronym for open space preservation is "OSP." The impact adjustment ratio for OSP is rOSP.

rOSP is the total area of the parcels that qualify for OSP credit (aOSP) divided by the area of the community's SFHA (aSFHA). The formula is

$$rOSP = \frac{aOSP}{aSFHA}$$

For example, in a community with several parks and other properties that qualify as preserved open space:

The total area of the qualifying parcels is 154 acres. aOSP = 154

The total area of the SFHA is 598 acres. aSFHA = 598

$$rOSP = \frac{154}{598} = 0.26$$

The community receives 26% of the maximum possible credit for OSP because 26% of its SFHA is preserved as open space.

In some elements in Activities 410, 420, and 430, it is possible to receive an impact adjustment ratio of up to 1.5. An example would be a community that enforces a higher regulatory standard throughout its "regulatory floodplain" (see Section 120 (Glossary)) that includes the SFHA and flood-prone areas outside the SFHA. Another example is the case in which a community enforces the freeboard requirement throughout the SFHA and on parcels that are partially within the SFHA. These communities may have numerators that are larger than the area of the SFHA, so their impact adjustment ratios would be greater than 1.0.

402.b. Optional Minimum Value

Some elements and activities have an optional minimum value that can be used in place of a calculated impact adjustment ratio. In most cases the value is 0.1 or 10% of the maximum possible. Using this minimum value is optional. It is normally used if

- The community does not want to develop the data needed to determine the numerator or denominator in the impact adjustment ratio, or
- The calculated impact adjustment ratio is less than 0.1. In this case, the community will receive more credit by using the optional minimum.

The activities that use areas for their impact adjustments and the optional minimum value that can be used are listed in Table 403-1, below.

402.c. Regulating Areas Preserved as Open Space

If a community applies for credit for Activity 420 (Open Space Preservation), it means that certain areas are preserved from development. Higher regulatory standards have no impact in those open space areas. Therefore, the impact adjustment ratios for the elements in Activity 430 (Higher Regulatory Standards) cannot be 1.0 if the community regulates only the SFHA and receives credit for open space preservation in Activity 420.

In other words, a community that applies for credit in both Activities 420 and 430 cannot have the maximum impact adjustment ratio for either activity. The numerator in the impact adjustment ratio formula for Activity 430 elements must account for this by excluding the area of preserved open space (aOSP).

Example 402.c-1.

The community in Example 402.a-1 has a freeboard requirement (FRB) for development throughout its SFHA. It can only receive FRB credit for the areas where development may occur, i.e., areas that are not counted toward preserved open space (OSP).

$$rFRB = \frac{aFRB}{aSFHA} = \frac{aSFHA - aOSP}{aSFHA} = \frac{598 - 154}{598} = \frac{444}{598} = 0.74$$

The community receives 74% of the maximum possible credit for freeboard because there will be no new buildings in the areas preserved as open space. The freeboard regulation has no impact in the 26% of the SFHA that is preserved as open space, which is reflected in the impact adjustment.

403 Impact Adjustment Map

An "impact adjustment map" is needed to document and calculate the numerators and denominators in the community's impact adjustment ratios for certain CRS activities. All appropriate areas for numerators and denominators for impact adjustment ratios must be included with the impact adjustment map. The denominator is usually aSFHA (Table 403-1), and the numerator is the area where each element is effective. For the 600 series of warning and response activities, impact adjustment maps delineate the areas affected by the elements, but the impact adjustments are based on the number of buildings in those areas.

Table 403-1. Impact adjustment maps.			
Activity	**Affected Elements**	**Denominator**	**Optional Minimum**
320 (Map Information Service)	MI3 – MI7	aSFHA	0.10
410 (Floodplain Mapping)	NS, SR, HSS, FWS	aSFT	0.10
420 (Open Space Preservation)	OSP, DR, NFOS, LZ	aSFHA	none
	OSI	aSFHA	0.10
	NSP	total length of shoreline	0.10
430 (Higher Regulatory Standards)	DL, FRB, FDN, CSI, LSI, PCF, ENL, OHS	aSFHA	0.10
	CAZ	aSFHA	0.5 / 0.1
440 (Flood Data Maintenance)	AMD	aSFHA	0.10
450 (Stormwater Management)	SMR, WMP	area of the watershed	0.15
540 (Drainage System Maintenance)	CDR, PSM, CIP	number of drainage components	0.10
	SBM	number of storage basins	0.10
610 (Flood Warning and Response)	FTR, EWD, FRO	number of buildings in the SFHA (bSF)	none
620 (Levees)	LM, LFR, LFW, LFO	number of buildings affected by a levee failure (bLF)	none
630 (Dams)	DFR, DFW, DFO	number of buildings affected by a dam failure (bDF)	none

aSFT is the area of the SFHA for the community at the time of adoption of a study.

Elements not listed do not have an impact adjustment calculation.

There is no optional minimum value for an impact adjustment for preserved open spaces or for impact adjustments based on building counts.

An impact adjustment map may be prepared on any convenient base map or in a geographic information system (GIS), as long as the scale is suitable for the determination of the areas. If the FIRM or other floodplain map is not used as the base map, the boundaries of the SFHA and the areas covered by each element must be drawn on the map with sufficient accuracy that the area calculations can be verified.

No new studies are required to produce an impact adjustment map. The areas are identified and marked on the map based upon the areas under the jurisdiction of the community's regulatory programs. Many communities have produced maps that do this for their own management purposes.

Some communities have found the impact adjustment map they developed for CRS credit helpful as a visual presentation of their floodplain management programs. It identifies

where the problems are and where the community is dealing with those problems. If the community completed the CRS Community Self Assessment (see Section 240), the impact adjustment map should be compared to the map(s) developed during the Self Assessment.

403.a. Selecting a Base Map

Selection of an appropriate base map for an impact adjustment map depends on the size of the community and the elements for which it is requesting credit.

- If a community is relatively small, a copy of the FIRM may be the best base map.
- If a community is large in geographic area and its FIRM includes many panels, it may use a base map that fits on one sheet. The SFHAs may already be drawn on the base map (e.g., a zoning map with the regulated areas shown), or they may have to be shown on the base map.
- If the community is requesting credit for mapping or regulating areas outside the SFHA shown on its FIRM, these areas must be shown on the impact adjustment map.
- If a community has a GIS that includes its flood data, it is encouraged to produce maps and calculate areas using that system. Many communities now use their GIS to store the data, perform the calculations, and prepare the maps necessary for credit calculation.
- If a community is large and has different standards for urban and rural areas, maps of differing scales may be needed.
- A community applying for credit under a number of different elements may choose to use overlays or GIS layers to display the elements separately.

If a GIS is not used, choosing base maps depends upon the detail required and the overall bulk of the maps. If maps other than the FIRM are used as bases, all appropriate NFIP zones should be transferred from the FIRM to the base maps.

All base maps must include the scale of the map and a legend for all information provided on the map.

403.b. Mapping aSFHA

The impact adjustment map must show the SFHA. If the FIRM or other floodplain map is not used as the base map, the boundaries of the SFHA must be drawn on the map with sufficient accuracy that the area calculations can be verified.

In general, it is to the community's advantage to have a smaller denominator, or aSFHA, for the impact adjustment calculation (the impact adjustment ratio will be bigger if the denominator is smaller). Although the area of a community's SFHA is a specific area (i.e., acres or square miles), some areas may be excluded from the aSFHA calculation.

Three types of areas may excluded from the mapped and regulated areas, even if they are within the SFHA shown on the FIRM.

1. Open waters larger than 10 acres, such as lakes, bays, and large rivers may be excluded. To determine the extent of large water bodies, the shoreline shown on the FIRM may be used. For large rivers, reaches where the average bank-to-bank width shown on the FIRM exceeds 500 feet may be excluded.
2. Lands larger than 10 acres that are either owned by the federal government (e.g., military installations or national parks) or where development is prohibited by the federal government, may be excluded. Federal land leased to private property owners with the stipulation that the lessees obtain all required local permits are not excluded.
3. At the community's option, areas beyond the community's regulatory jurisdiction may be excluded. The community may include or exclude non-federal areas it does not have the authority to regulate, including land owned by the state or another community, and Indian reservations. These lands must be treated consistently. If they are included in the SFHA for open space credit, they must be included in the SFHA for all activities. If they are open space, the community usually will receive more credit if they are included.

The impact adjustment map must show the areas of the SFHA that the community has excluded from its impact adjustment calculations. These areas should be identified with a distinctive shading or color.

Excluding water bodies and land over which the community has no regulatory control usually will increase the community's CRS credit because the denominator will be reduced. However, if a community can document that non-federal land over which it has no regulatory jurisdiction is eligible for CRS credit, it may include such areas. An example of this would be a state park eligible for credit under Activity 420 (Open Space Preservation).

Large areas of federal lands and some Indian tribal lands are usually shown on a FIRM as "Areas Not Included." If these areas are shown with mapped SFHAs, and if they are larger than 10 acres, they may be excluded from the impact adjustment map. Smaller parcels need not be excluded—it is the community's option, but the extra work probably will not significantly affect the measurements or the credits.

Example 403.b-1.

West Bay is a fictitious community used for CRS examples. It is a coastal town on the west side of Biloxi Bay. It is 100% flood-prone. The County GIS office provides each community with a digital map that shows streets and FIRM zones (see Figure 400-1).

West Bay's corporate limits go to the middle of Biloxi Bay. Because that area is larger than 10 acres, the Bay shoreline is used as the

eastern limit of the SFHA for impact adjustment purposes. A note to that effect is put on the impact adjustment map.

There is also a small state park with a beach in the town. The CRS Coordinator concluded that there would be more credit if the state park were counted as preserved open space than if it were excluded from the area calculated as SFHA. Therefore, it is considered in the SFHA for impact adjustment purposes.

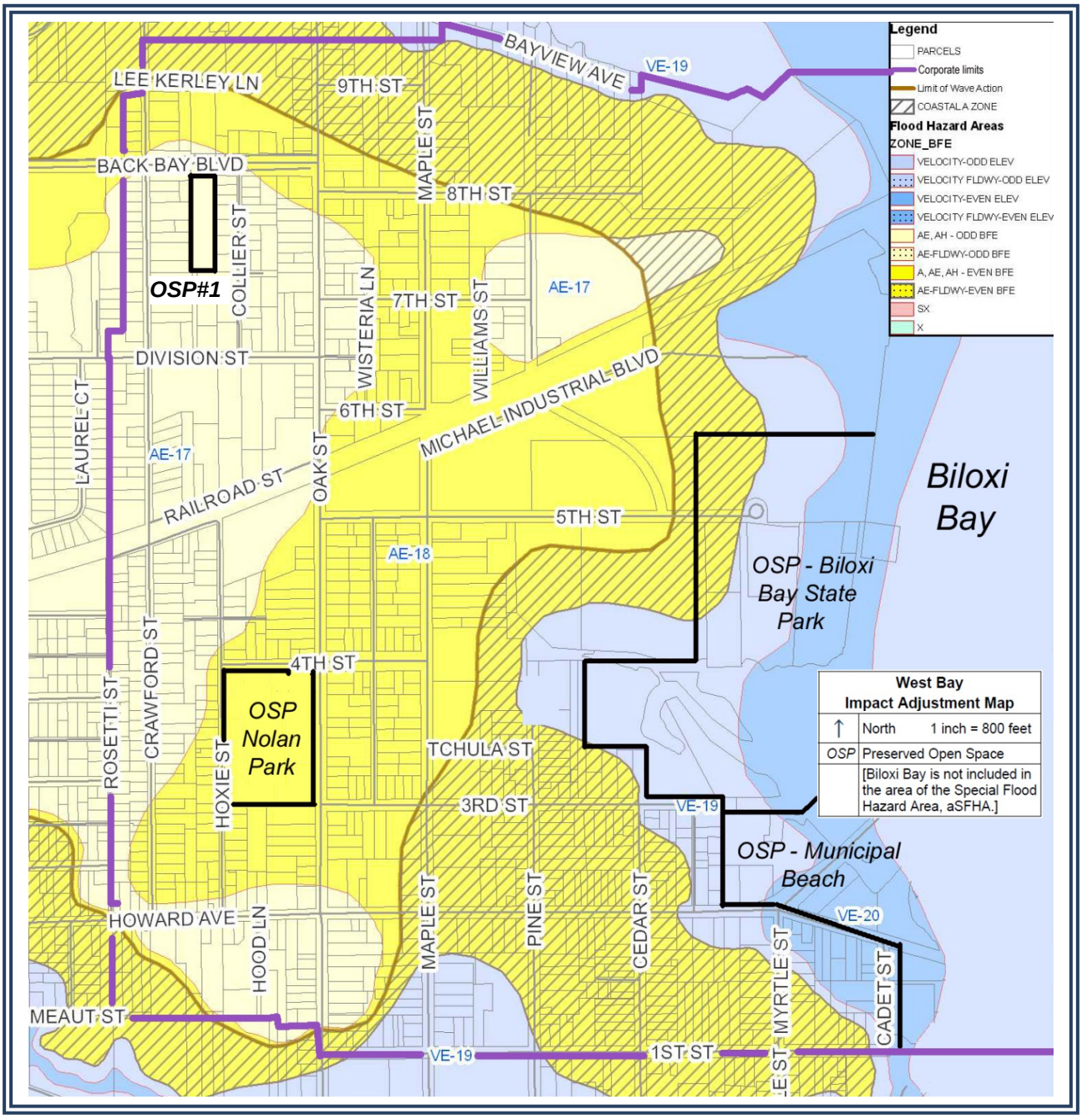


Figure 400-1. West Bay's impact adjustment map.

403.c. Marking an Impact Adjustment Map

An impact adjustment map must show the areas affected by each element for which CRS credit is requested. These are areas to be included in the numerator of the impact adjustment calculations. Each area should be outlined or shaded, and labeled (e.g., with the acronym for that element). However, in some cases, a note on the map or in the legend may be simpler and clearer than shading. For example, if a community regulates all of its SFHA for freeboard (FRB), it could use the note "aFRB = aSFHA."

For many communities, the SFHA is the regulatory floodplain. Communities that regulate other flood-prone areas outside the SFHA, in addition to the SFHA, should delineate the area of the regulatory floodplain on the impact adjustment map.

Example 403.c-1.

See Figure 400-1 for an example of an impact adjustment map that is marked to show areas of preserved open space (credited under Activity 420 (Open Space Preservation)) and areas subject to coastal A-Zone regulations (credited under Activity 430 (Higher Regulatory Standards)). It also has a note that the Biloxi Bay portion of the SFHA shown on the FIRM is not counted as part of the town's SFHA for impact adjustment purposes.

403.d. Watershed Impact Adjustment Map

For credit for stormwater management regulations (SMR) and watershed master plan (WMP), under Activity 450 (Stormwater Management), a watershed impact adjustment map must be prepared. This map shows the area affected by the stormwater management program and the watersheds that affect the community. This map and the information needed to develop it are discussed in Section 452.a.

403.e. Calculating Areas

The size of areas delineated on the impact adjustment map(s) may be determined by any method that yields reasonably accurate measurements. The community must document the method or methods it used to determine the areas.

The areas will be recalculated at each cycle verification visit because the numbers can change when there is a new map or if the community annexes land mapped as SFHA. This is done in conjunction with updating the floodplain data table (see Section 214.a).

Calculation Approaches: The community should not spend an inordinate amount of time measuring areas solely for determination of CRS impact adjustment ratios. The following approaches are acceptable:

- Geographic information systems;
- Mechanical or computerized planimetry;
- Areas computed by HEC-2 or other standardized step-backwater methods;
- Known property dimensions, such as those for a city park; or
- Use of a grid overlay. This is technique whereby a transparent grid is placed on the map, the grid squares within an area are counted, and the map scale is used to determine the actual area. Instructions on this approach can be found at www.CRSresources.org/400.

Units of Measure: All area calculations must use the same units, either acres or square miles.

Smaller communities will probably find it easier to measure in acres, while a larger community, such as a county, may prefer to use square miles. The following formulae may be helpful:

- To convert acres to square miles, divide the number of acres by 640.
- To convert square miles to acres, multiply the number of square miles by 640.
- To convert square feet to acres, divide the number of square feet by 43,560.
- To convert square feet to square miles, divide the number of square feet by 27,878,400 (that is, $5{,}280^2$).

Example 403.e-1.

$$32 \text{ acres} = \frac{32}{640} = 0.05 \text{ square miles}$$

2.2 square miles = 2.2 x 640 = 1,408 acres

2,500 feet x 3,600 feet = 9,000,000 square feet

$$\frac{9{,}000{,}000}{43{,}560} = 206.61 \text{ acres}$$

1,000 feet x 2,142.5 feet = 2,142,500 square feet =

$$\frac{2{,}142{,}500}{27{,}878{,}400} = 0.077 \text{ or } 0.08 \text{ square miles}$$

403.f. Example Impact Adjustment Map

The following example discusses how the fictitious community of West Bay developed its impact adjustment map for Activity 420 (Open Space Preservation). It shows how the community selected a base map and used various methods to determine the areas affected by the activity.

Example 403.f-1.

West Bay is a fictitious community used for CRS examples. It is a coastal town on the west side of Biloxi Bay. The county GIS office provides each community with a digital map that shows streets and FIRM zones (see Figure 400-1).

The CRS Coordinator makes sure that the base map shows the corporate limits and the SFHA. Because the town is applying for credit for open space preservation and coastal A-Zone regulations, the impact adjustment map shows the areas that qualify for preserved open space and the coastal A Zone.

The CRS Coordinator used a grid overlay to calculate the area of SFHA within the city (aSFHA, excluding Biloxi Bay) and the area of the coastal A Zone, delineated by the slanted lines on the map in Figure 400-1.

aSFHA = 395.3 and area of the coastal A Zone = 116.6

The CRS Coordinator obtained the acreage of the four open space areas from the town parks department and the state park. Because they are all entirely in the SFHA, their areas all qualify for OSP. These figures are recorded in the table below.

Area	Acreage
OSP#1: open area preserved by the developer	1.2
Nolan Park	6.9
Biloxi Bay State Park	33.1
Municipal Beach	11.4
Total area of OSP (aOSP)	**52.6**

When the impact adjustment for open space preservation is calculated for Activity 420 (Open Space Preservation), the area of preserved open space (aOSP) is divided by the area of the SFHA (aSFHA). For West Bay, the formula would be

$$rOSP = \frac{aOSP}{aSFHA} = \frac{52.6}{395.3} = 0.13$$

The resulting ratio (represented by the lower case "r") means that 13% of West Bay's SFHA is preserved as open space. This impact adjustment ratio is used in the final step of calculating the credit.

Coastal A Zone regulations (CAZ) have no impact in areas preserved as open space where no new buildings are allowed (see Section 402.c). Therefore, the area where CAZ regulations have an impact is the area of the coastal A Zone minus the area of open space (OSP) in the coastal A Zone. A portion of Bay State Park (4.7 acres) is in the coastal A Zone, so for credit purposes, aCAZ = 116.6 – 4.7 = 111.9 acres.

When the impact adjustment for coastal A Zone regulations (CAZ) is calculated for credit under Activity 430 (Higher Regulatory Standards), the regulated area (aCAZ) is divided by the area of the SFHA (aSFHA). For West Bay, the formula would be

$$rCAZ = \frac{aCAZ}{aSFHA} = \frac{111.9}{395.3} = 0.28$$

410 Floodplain Mapping—Summary

Maximum credit: 802 points

412 Elements

Floodplain mapping (MAP) credit is based on

a. **New study (NS)**: Up to 290 points for new flood studies that produce base flood elevations or floodways.

b. **Leverage (LEV):** The points for NS are multiplied by a ratio that reflects how much of the study was financed by non-Federal Emergency Management Agency (FEMA) funds.

c. **State review (SR):** Up to 60 points for flood studies reviewed and approved by a state or regional agency.

d. **Higher study standards (HSS)**: Up to 160 points if the new study was done to one or more standards higher than the FEMA mapping criteria.

e. **More restrictive floodway standard (FWS)**: Up to 110 points, based on the allowable floodway surcharge used in the study.

f. **Floodplain mapping of special flood-related hazards (MAPSH)**: Up to 50 points if the community maps and regulates areas of special flood-related hazards.

g. **Cooperating Technical Partner (CTP)**: Up to 132 points if the community, appropriate regional agency, or state has a signed, qualifying Cooperating Technical Partner agreement with FEMA.

Credit Criteria

Credit criteria for this activity are described in Section 411.b. Each element has additional criteria specific to that element.

a. The area to be credited must be displayed on a map.

b. The community must use the new floodplain map or data in its floodplain development regulations.

c. The study must be based on a technique approved by FEMA or specifically approved by the ISO/CRS Technical Reviewer.

d. A study or data that affects a length of stream or shoreline must be submitted to FEMA so that the local FIRM may be revised.

Impact Adjustment

The impact adjustment for this activity is described in Section 413.

Documentation Provided by the Community

Each element has a separate section describing needed documentation.

410 FLOODPLAIN MAPPING

The OBJECTIVE of this activity is to improve the quality of the mapping that is used to identify and regulate floodplain development.

411 Background

Development regulations need thorough and accurate mapping of Special Flood Hazard Areas (SFHAs) and related flood hazard data. Most communities in the National Flood Insurance Program (NFIP) have a Flood Insurance Rate Map (FIRM) provided by the Federal Emergency Management Agency (FEMA). Most FIRMs have detailed data but some communities still have flood problem areas for which detailed data were not provided by FEMA. As a result, new development in those areas is often not well-protected from flood damage.

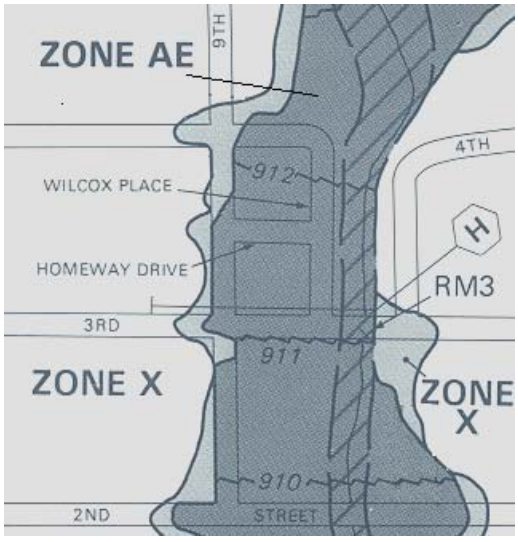
Other communities have data not shown on their FIRM, want to prepare new maps for unmapped areas or to a higher standard, or want to replace maps that no longer show the current hazard. This activity encourages these communities to prepare new maps and/or enter into cooperative mapping agreements with FEMA for the production of new maps.

411.a. Activity Description

This activity provides credit for developing regulatory maps and flood data for floodplain management purposes in areas where FEMA did not provide such data, or for mapping to a higher standard than that required by FEMA, as well as credit for regulating areas based on flood data not provided with the community's FIRM or for a flood study conducted to a higher standard than FEMA's Flood Insurance Study criteria. Credit is also provided if the community shared in the cost of a Flood Insurance Study.

Three types of areas are shown on FIRMs:

- Areas with detailed mapping of the SFHA (shown as AE, VE, etc., Zones)
- Areas with approximate mapping of the SFHA (shown as A Zones), and
- Areas shown as being outside the SFHA (depicted as B, C, D and X Zones).



A FIRM with a detailed flood study shows the SFHA as Zone AE or VE. The map includes base flood elevations and a floodway (shown with the slanted lines). X Zones designate areas outside the SFHA.

Figure 410-1. FIRM terminology.

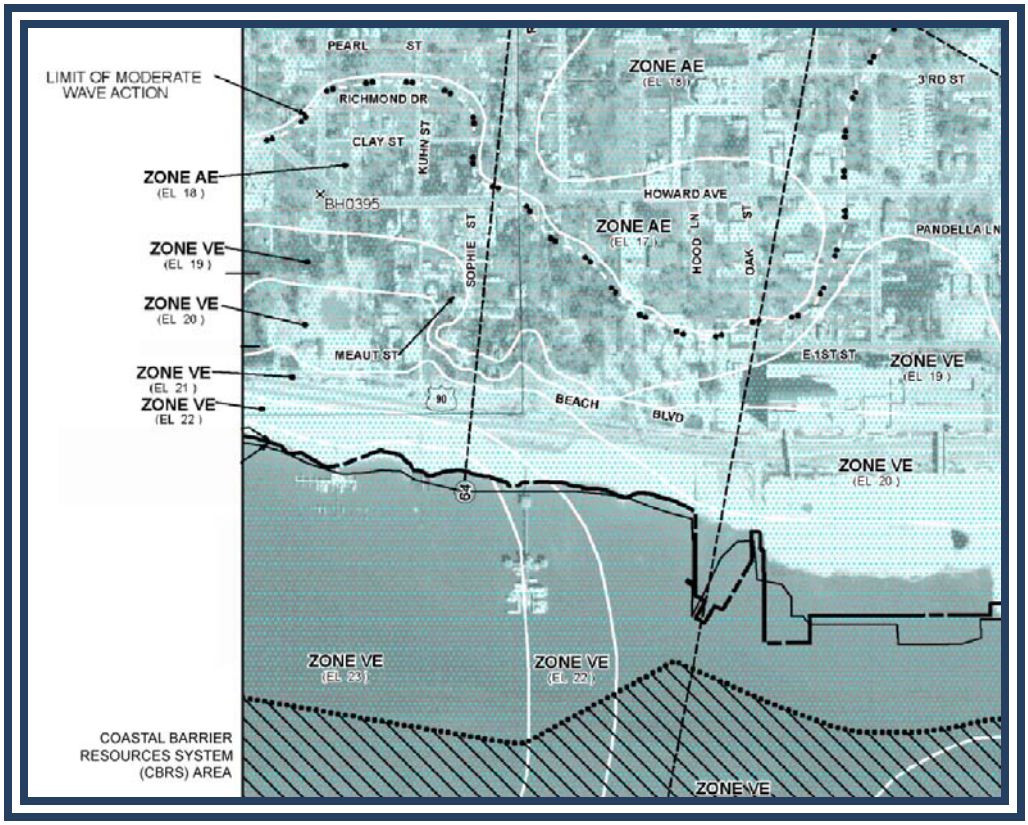


Figure 410-2. An example of a coastal FIRM.

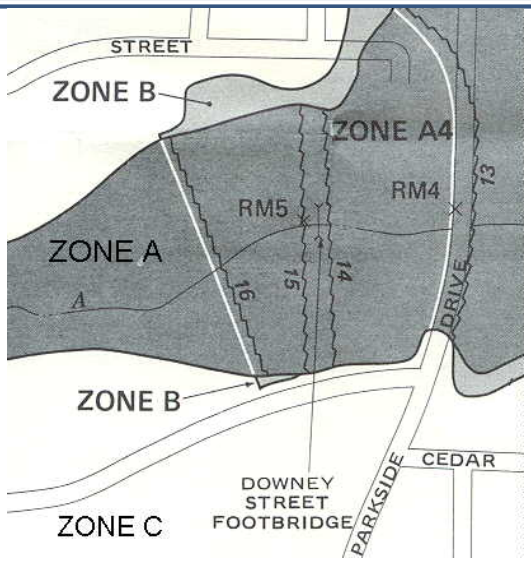
The difference between detailed mapping and approximate mapping for FIRMs is that detailed maps include the base flood elevations needed to set minimum protection levels for new buildings. In most riverine situations, NFIP detailed mapping also includes floodway delineations (Figure 410-1). In coastal areas, detailed mapping may include delineation of a velocity or VE Zone (Figure 410-2). The maps in Figures 410-2 and 410-4 provide examples of detailed, digital FIRMs (DFIRMs).

The NFIP's regulations for areas with approximate mapping, also known as "unnumbered A Zones" (44 *Code of Federal Regulations (CFR) §*60.3(b)), are not as effective in reducing flood damage as the regulations for areas with detailed map data (Figure 410-3). Because no base flood elevations have been developed for areas with approximate mapping, many of the regulatory requirements are left to the judgment of community officials. Flood elevations are required only for large subdivisions or in areas for which a flood study has already been done. These areas are often on the urban fringe and therefore can be subject to development before FEMA can provide the needed data.

Flood hazard areas that were not mapped as SFHAs during the preparation of the community's FIRM (i.e., B, C, D, and X Zones) have no floodplain management requirements under the NFIP. Additional mapping may have been prepared by or for the community for several reasons:

- New delineations were necessary because conditions changed since the Flood Insurance Study was done; or
- The community wanted to regulate areas that were not mapped by FEMA because they did not meet the NFIP mapping criteria (e.g., the drainage area was less than 1 square mile); or
- Areas that may or may not have been mapped as part of the Flood Insurance Study have hazards that were not adequately mapped (e.g., alluvial fans or areas subject to subsidence).

This activity credits the adoption of new maps or floodplain data that are not provided under the normal activities of the NFIP. This activity neither credits nor supplants the minimum requirement of the NFIP that a participating community submit new or revised map information to FEMA when it becomes available (such as for a bridge replacement), as required by 44 *CFR* §65.3.



FIRMs do not provide base flood elevations in B, C, D, X and approximate or "unnumbered" A Zones. This CRS activity provides credit to encourage communities to obtain flood elevations in those areas and ensure that new development is protected from the base flood.

Figure 410-3. FIRM terms for areas without base flood elevations.

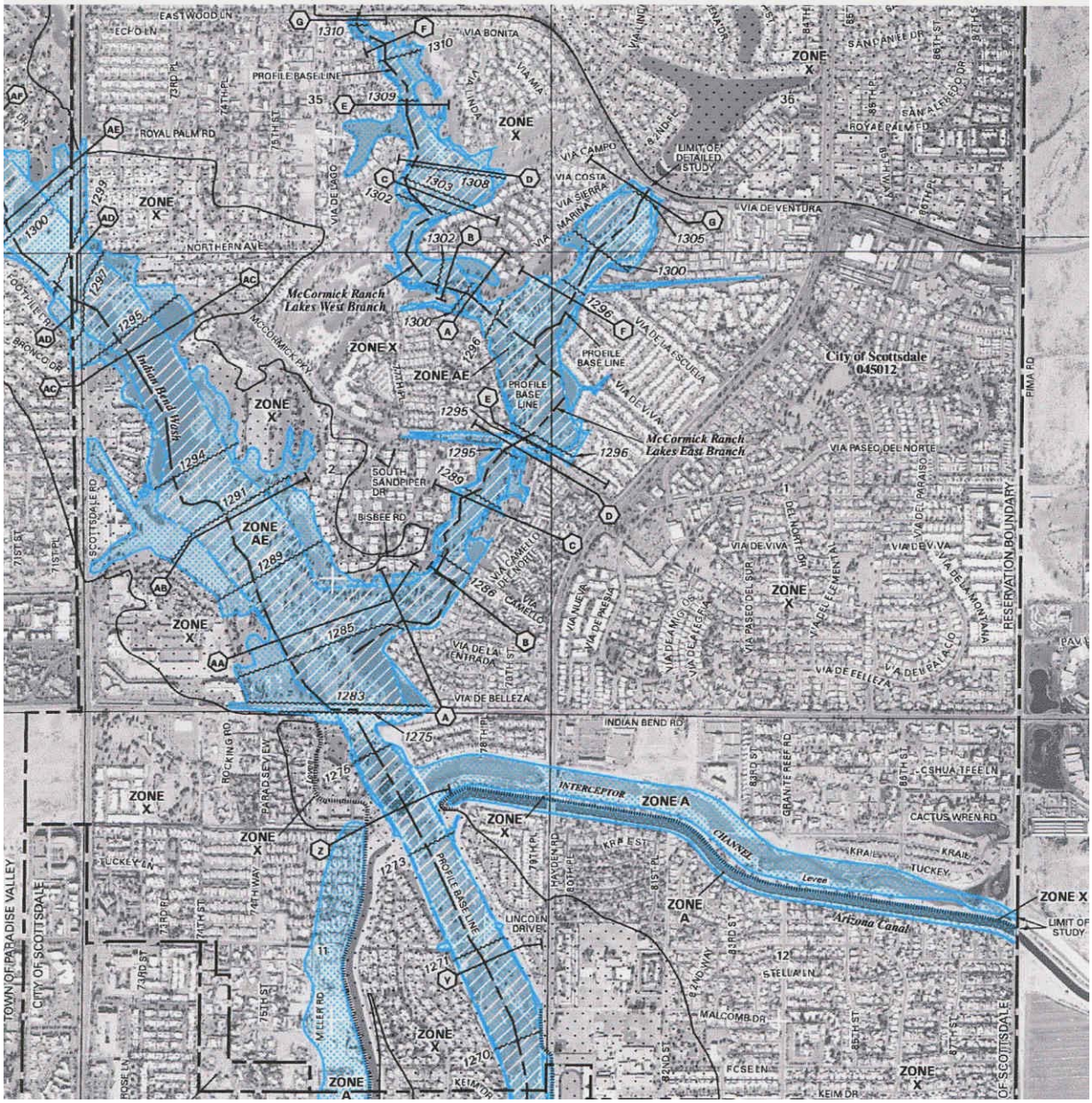
The regulation at 44 *CFR* §65.3 requires a community to submit a Letter of Map Revision (LOMR) any time it undertakes or permits a project that changes the limits of the SFHA, the base flood elevations, or the floodway limits. Therefore, a LOMR submitted to comply with the above requirement (e.g., bridge replacements or channel modifications) is not credited under this activity.

All higher-standard mapping receives credit, even if it is included in the community's FIRM. For example, several states require that floodway regulations be based on criteria more restrictive than the NFIP mapping standard. In those states, any Flood Insurance Study that meets the state requirements and the higher-standard mapping can be credited under this activity (see Section 411.d).

Credit is calculated for this activity based on the areas of the SFHA that are mapped and managed to higher standards than those required by the NFIP. Each floodplain mapping (MAP) area that receives Activity 410 credit is marked on an impact adjustment map and designated "MAP#1," "MAP#2," etc. This is explained more fully in Sections 402 and 412.

The regulation at 44 *CFR* §65.3 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 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.



South Scottsdale is a fictitious community used for CRS examples. There are no mapped floodplains in the north, so this map only shows the southern part of the city. The DFIRM shows four different Special Flood Hazard Areas (SFHAs):

AE Zone: Indian Bend Wash flows from the northwest to the south corporate limits
AE Zone: McCormick Creek flows from the northeast to Indian Bend Wash
A Zone: Tributary A flows from the southeast to Indian Bend Wash
A Zone: Tributary B flows from the south to Indian Bend Wash

The aerial photo base map is helpful for locating and counting buildings and other features. However, to simplify the presentation, the CRS Coordinator uses a GIS-based map that shows the SFHA and street layers for the rest of the South Scottsdale mapping examples (see Figure 410-5).

Figure 410-4. South Scottsdale's DFIRM.

Credit is provided as long as the community regulates based on the study's data until the study is superceded by a more up-to-date analysis. If a new FEMA-funded study produces a lower base flood elevation, the community has the option of adopting it or keeping its higher regulatory flood elevations. If it adopts the new study, it loses its 410 credit. If it keeps enforcing its own higher elevations, it keeps the credit.

Example 411.a-1.

Examples of areas that could be identified on the impact adjustment map and marked "MAP#1," "MAP#2," etc. include the following.

- Unnumbered A or V Zones for which the community has base flood elevations and regulates new construction using those elevations.
- A riverine SFHA where FEMA did not define a floodway, but the community has mapped and adopted one.
- Unnumbered A or V Zones within which the community calculates or requires developers to calculate base flood elevations and/or floodways for their sites as a condition for all floodplain permit approvals.
- A special flood hazard area in a B, C, D, or X Zone that the community has mapped and regulates using base flood elevations.
- Areas covered by studies that have been reviewed and approved by the state.
- A floodplain mapped on the FIRM with a technique that exceeds FEMA's guidelines, e.g., using future-conditions hydrology.
- Any flood hazard data that are based on a technique that results in regulations more restrictive than FEMA's minimum standards, e.g., a floodway based on a smaller surcharge than FEMA's one-foot standard, or a regulatory flood elevation based on high-water marks from the flood of record where it is higher than the base flood elevation shown on the FIRM.
- An SFHA mapped on the FIRM, if the community helped pay for the mapping.
- An area for which additional flood mapping was done to account for one of the special flood-related hazards, listed in Section 401, such as migrating stream beds.

MAP is the sum of the points for the elements in Activity 410. The points are based on

- The scope of the new study (element NS, scored in Section 412.a),
- The original FIRM zone where the new study was conducted (element NS, scored in Section 412.a),
- Whether a riverine study included a floodway delineation or a coastal study included a velocity zone (element NS, scored in Section 412.a),
- How much of the study costs were provided by non-FEMA funding sources (element LEV, scored in Section 412.b),
- Whether the study received an independent quality control review by a state agency (element SR, scored in Section 412.c),
- Whether the study was conducted using a higher study standard than required by FEMA (element HSS, scored in Section 412.d),
- The floodway mapping standard used (element FWS, scored in Section 412.e),
- Whether the study mapped one of the special flood-related hazards, such as coastal erosion or subsidence (element MAPSH, scored in Section 412.f),
- Whether the community or its state or a regional agency is a Cooperating Technical Partner (element CTP, scored in Section 412.g), and
- How much of the community's SFHA is affected by the new study (scored in Section 412, Impact Adjustment).

411.b. Activity Credit Criteria

To receive any credit under this activity, the community must meet the following credit criteria. These criteria ensure that the Community Rating System (CRS) credits floodplain maps and data that are properly prepared and are used in the community's regulatory program.

(1) All studies and data that the community requests for credit must be displayed on a map. This map may be either digital or paper. This criterion does not apply to studies done for a single site at the time of development.

(2) The community must use the floodplain map or data for which credit is requested in its floodplain development regulations. The community either must have

(a) Amended its floodplain regulations to adopt the new floodplain map or data, or

(b) Authorized a local official, such as the community's engineer, to approve new maps or data in unstudied areas. There must be a record showing that the new study has been approved and utilized by the official.

A study that has no impact on floodplain development is not credited. The CRS does not credit studies conducted for drainage improvements or the design of a flood control project if they are not used for regulatory purposes.

(3) The study must be based on a FEMA-approved technique or specifically approved by the ISO/CRS Technical Reviewer.

(4) If the study affects a length of stream or shoreline, it must be SUBMITTED to FEMA to revise the community's FIRM. This criterion can be met even if FEMA does not immediately publish the map revision.

The criterion does not apply to studies done for a single site at the time of development and similar small-scale studies. However, studies that would revise existing base flood elevations, floodways, or FIRM zone boundaries must be submitted for a FIRM revision as required by 44 *CFR* §65.3.

412 Elements

There are seven elements in this activity. Some elements have impact adjustments, so each floodplain mapping (MAP) area for which the community requests credit must be marked on an impact adjustment map and designated "MAP#1," "MAP#2," etc. MAP is the sum of the points for each designated MAP area. The points depend upon how the map was prepared and the community's level of participation in the map preparation.

412.a. New studies (NS)

The maximum credit for this element is 290 points.

The total NS credit varies according to two factors: the study scope and the previous flood zone as shown on the community's FIRM in effect at the time the new study was adopted (see the table in the Credit Points section, below). Different levels of credit are provided for each of four levels of detail in a flood study.

(1) The first level is for delineating an approximate A or V Zone in a B, C, D, or X Zone. This would designate a regulatory floodplain where the FIRM does not show one. For approximate A and V Zones, base flood elevations are not provided. Credit is also provided if an approximate A or V Zone is remapped without the publication of base flood elevations.

(2) More points are provided if the community ensures that flood elevations are obtained for a single site at the time of development for all development. Many SFHAs without base flood elevations have low development potential and do not warrant extensive, detailed studies. Many communities regulate these areas by requiring developers to perform an engineering analysis to calculate a flood elevation for the site at the time of application for a development permit. Simplified techniques, such as contour interpolation as described in FEMA-265, are not acceptable for credit in this activity.

Some communities will require a new regulatory flood elevation to be determined using higher standards for areas that already have a base flood elevation provided by FEMA.

These requirements are also eligible for HSS credit, provided that the new flood elevations are higher than the elevations on the FIRM.

NS credit for flood elevations at the time of development is based upon the regulatory requirement. If the appropriate language is in the community's ordinance, the credit is provided, even if the areas have not yet been studied. What counts is that a regulatory flood elevation will be provided before the areas are developed. Additional credit is available if the community's ordinance requires a floodway analysis to be performed in addition to the determination of flood elevations at the time of development.

The calculations may be done by the community, another agency, or the developer, as long as a regulatory flood elevation becomes available in time to have new buildings protected to a level at or above the base flood elevation. In some cases the community has the developer provide some data, such as a topographical survey, and then a municipal engineer or other person calculates the base flood elevation for the site. This is a creditable approach.

There is no credit for meeting the minimum NFIP requirements to ". . . obtain, review and reasonably utilize available data . . ." or for requiring developers of subdivisions larger than 5 acres or 50 lots to provide flood elevation data. These are minimum requirements of the NFIP (44 *CFR §*60.3(b)(3) and (4)). To receive credit for NS, the ordinance must require the data for all development permits to build or substantially improve buildings in the regulated floodplain.

(3) More points are obtained if the elevations are provided for a large area in advance of development. Typically this provision would be in the form of a profile prepared for a relatively long reach of a stream, elevations for a length of shoreline, depths for AO Zones, and elevations for AH Zones. For this credit, the area is studied before an application for a development permit and the study covers a larger area.

To receive this higher credit, the community must adopt the study and regulate development to the same standards as in an SFHA for which FEMA provided base flood elevations (e.g., as if the area were an AE or VE Zone, or numbered A, V, or AO Zone) and provide the data to FEMA.

(4) There is approximately a 30% increase in the credit for the development of a profile when the study includes the delineation of a floodway. If the floodway delineation is based on a higher standard than the NFIP's one-foot allowable surcharge, then additional credit is provided in Section 412.e. There is a similar increase in credit if a coastal study includes a coastal high hazard area, similar to a V Zone or LiMWA.

Studies not credited. The following studies are not eligible for credit under NS:

- Studies done to meet the minimum requirements of the NFIP, even if they result in a LOMR or map revision, including
    - When required for developments greater than 50 lots or 5 acres;

  - When done in response to the requirement to "obtain, review and reasonably utilize" available base flood elevation and floodway data; or
  - When done to prepare a certificate of no-rise or maximum one-foot cumulative rise.

- When the base flood elevations or floodway are not adopted for regulatory purposes;
- When there is no engineering study to include an area as regulatory floodplain. For example, "the regulated floodplain includes the SFHA and all adjacent lands lower than two feet above the base flood elevation." In these cases, credit can be provided for OHS under Activity 430; and
- When a new study produces a base flood elevation lower than the base flood elevation shown on the FIRM (see credit criterion (2), below).

Credit Criteria

(1) The activity credit criteria in Section 411.b must be met.

(2) If the credit is for a small-scale study (such as for a single lot) at the time of development, the study must be based on a FEMA-approved technique or specifically approved by the ISO/CRS Technical Reviewer and it must produce regulatory flood elevations where there are none, or elevations higher than those shown on the FIRM in effect at the time of the study.

(3) In order to receive NS credit, studies must

(a) Produce a base flood elevation in a B, C, D, X, or approximate A Zone where there was no elevation shown on the FIRM at the time of the study; or

(b) In AE and VE Zones and numbered A and V Zones, produce a base flood elevation higher than that shown on the FIRM in effect at the time of the study.

This criterion prevents the duplication of flood insurance premium reductions that can result from new flood studies that lower the base flood elevation. Properties in areas that are remapped so the new FIRM shows them outside the SFHA benefit twice from the flood insurance rating system. First, they do not have a mandatory NFIP insurance purchase requirement. Further, if the owners choose to purchase NFIP insurance, the premiums are based on the lower X-Zone rates. Therefore, the CRS does not provide a duplicate premium reduction.

The new study must either provide flood elevations where there are none shown on the FIRM or provide higher regulatory flood elevations than shown on the FIRM. There may be cases in which a new profile is higher than the old base flood elevations in some areas and lower in others. In such cases, the reaches that qualify for credit must be identified on the impact adjustment map and scored accordingly. The reaches with new base flood elevations that are lower than the old ones are not credited under NS or SR.

Credit Points

NS = as shown in the following table, based on the study scope and the original FIRM zone, not to exceed the maximum of 290 points for this element

Study Scope	Original FIRM Zone		
	B, C, D, or X	A or V	AE, VE, A#
1. Delineation of an approximate A Zone	70	60	–
2. a. Flood elevations for a site at time of development	100	80	45
b. Flood elevations and floodway for a site at time of development	130	105	65
3. New profile or length of shoreline, base flood elevations/depths in AH and AO Zones.	225	175	110
4. New profile with floodway, length of shoreline with coastal velocity zone delineation, or converting coastal A Zones to V Zones	290	230	140

Example 412.a-1.

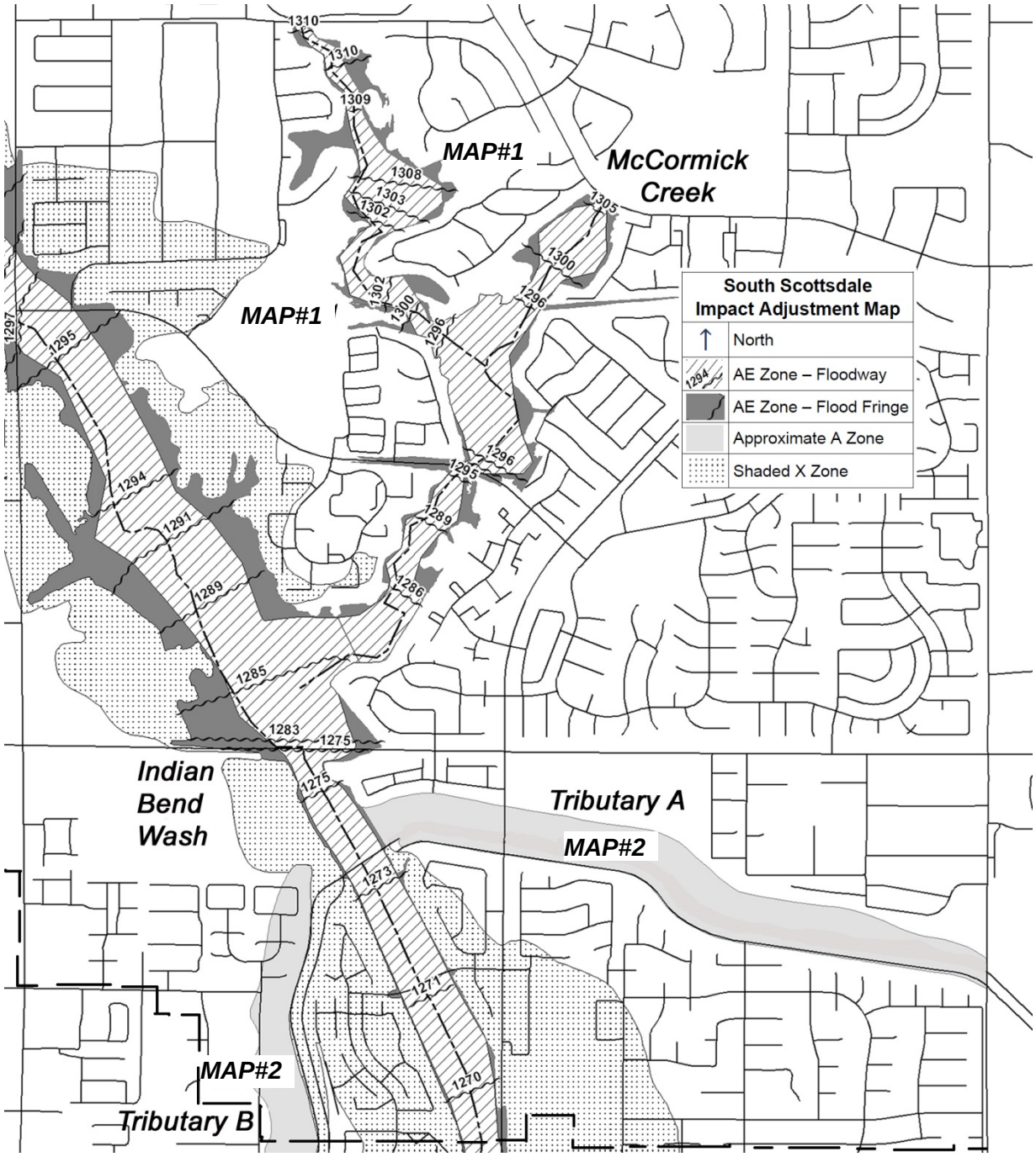
South Scottsdale is a fictitious community used for CRS examples (see Figure 410-5). The City received its first FIRM in 1978. At that time only the largest stream, Indian Bend Wash, had a detailed study, with base flood elevations and a floodway delineation. Because the Indian Bend Wash study was funded by FEMA, there is no CRS credit.

The City knew it had flooding problems along McCormick Creek. With funding support from the state, it conducted a detailed study of that area. The resulting floodplain and floodway delineation were used by FEMA when the FIRM was revised in 2004. That study is marked as MAP#1 in Figure 410-5 and is designated as New Study #1 for 410 credit.

> NS#1: New study, with base flood elevations and floodway delineation, when the original FIRM zone was an X Zone. NS#1 = 290

There are two approximate A-Zone areas known as Tributaries A and B. In these areas, the City requires applicants for permits to conduct a study to develop a base flood elevation. Since both tributary areas have the same study standard, they are both marked as MAP#2 in Figure 410-5. They are both designated NS#2 for 410 credit.

> NS#2: Flood elevations for a site at time of development when the original FIRM zone was an approximate A Zone. NS#2 = 80



Regulated Area	Credit	Size (acres)
Indian Bend Wash (AE Zone)		277.6
McCormick Creek (AE Zone)	MAP#1	129.6
Tributary A (A Zone)	MAP#2	68.9
Tributary B (A Zone)	MAP#2	28.3
Total area of the SFHA (aSFHA)		504.4

Figure 410-5. South Scottsdale's impact adjustment map for Activity 410.

Impact Adjustment

The impact adjustment is calculated based on the size of the area to which the MAP study applies as a percentage of the area of the SFHA in the community at the time of adoption of the study. The impact adjustment for this activity is described in Section 413.

Documentation Provided by the Community

(1) At each verification visit,

(a) A copy of the study and the study's floodplain map. The ISO/CRS Specialist should be advised whether these are available online or in a published Flood Insurance Study or FIRM.

(b) The local law or ordinance that adopts the flood study for regulatory purposes or that requires site-specific flood elevation or floodway studies to be conducted at the time of the permit application.

(c) Development permit records showing how the new data are used.

(d) The map showing the area covered by each NS study with the appropriate MAP acronym ("MAP#1," "MAP#2," etc.) marking the area affected by the new study. The impact adjustment map is explained in Section 413. Different areas mapped to the same standards may all be marked with the same acronym.

(e) [For Credit Points lines 1, 3, and 4] Evidence that the study, if done for a length of stream or shoreline, has been submitted to FEMA or FEMA is aware that the study is available. This may be a copy of the Flood Insurance Study, a LOMR, or a letter from FEMA.

(f) [For Credit Points line 2a and 2b, flood elevations and floodway delineation for a site at time of development] A statement that the technique used in the study or the ordinance language is listed as acceptable in *Guidelines and Specifications for Flood Hazard Mapping Partners*. As an alternative to this statement, the community may submit a description of the technique for the ISO/CRS Technical Reviewer to determine whether it is equivalent to an acceptable technique.

(g) Documentation showing how the area of the SFHA at the time of adoption of the study (aSFT) and the areas of NS were calculated.

The ISO/CRS Specialist may review a sample of permit records and visit some new building sites to verify use of the new study data in the floodplain management regulations.

412.b. Leverage (LEV)

To determine the community's cost share or level of participation in the flood study, a multiplier known as "LEV" is used.

LEV is a ratio with a range of 0 to 1.0. If the study was funded entirely by non-FEMA resources, LEV = 1.0. Non-FEMA resources include the community, the state, a regional agency, the property owner, a developer, the U.S. Army Corps of Engineers, the Natural Resources Conservation Service, or any agency or organization other than FEMA or a FEMA-funded program.

If the community is a Cooperating Technical Partner, there should be readily available figures on what the study cost and what amounts were paid by FEMA, the community, and other involved agencies. If the Cooperating Technical Partner agreement is for the community to contribute 30% of the cost of a new study, then LEV = 0.3 for the new study if appropriate documentation is provided.

If the community, state, or other agency made an in-kind contribution, such as an old but still valid study, or base maps, it can be converted to a dollar value on the Cooperating Technical Partner Mapping Activity Statement using FEMA "Blue Book" values. If the effort cannot be converted to dollars, then LEV = 0.27 for better topography or 0.22 for other significant contributions. If the documented dollar value results in a ratio lower than the above, then the pertinent value above can be used.

Flood Insurance Studies or restudies cost shared with a state agency, the Corps, the Tennessee Valley Authority, the Natural Resources Conservation Service, or other federal agency are credited, provided that FEMA did not pay the agency for the work. However, many studies are conducted by a state or federal agency under contract to FEMA, and in such cases LEV = 0, and there is no credit for NS.

Credit Criteria

(1) To receive LEV, the community must receive NS credit.

Credit Points

This element is a multiplier of the new study credit (NS) to determine the community's share of the floodplain mapping study.

LEV = EITHER

0, if the study was fully funded by FEMA

OR

$$\text{LEV} = \frac{\text{Non-FEMA share of the study cost}}{\text{Total cost of the study}},$$

provided that the community has data on the study costs

OR

LEV = the total of the following:

(a) 0.27, if a better topographic map was contributed to the study effort

(b) 0.22, if other significant contributions were made to the study effort, if the community does not have financial data on the study costs

Communities do not receive NS or LEV credit for Flood Insurance Studies and FIRMs that are fully funded by FEMA.

Better topographic mapping can be LiDAR or contour maps with a smaller contour interval than used by FEMA in the previous study or required to meet FEMA standards at the time of the new study. There are two ways a community can use better topographic mapping.

- If the study used the better topographic mapping in the hydraulic analysis, then both LEV and HSS credit is provided.
- If the study used the better topographic mapping only to plot more accurate floodplain boundaries using flood elevations or a profile from an earlier study, then only HSS credit is provided. There is no new study (NS) for LEV to modify.

Example 412.b-1.

One-half of the cost of the McCormick Creek study was paid by South Scottsdale and one half was cost shared with the state. There were no FEMA funds involved in the study.

LEV#1 = 1.0 because there was no FEMA funding involved

Developers pay for calculating base flood elevations in the A Zones along Tributaries A and B.

LEV#2 = 1.0

Example 412.b-2.

A community signed a Cooperating Technical Partner agreement with FEMA to restudy a river. The agreement states that the community is funding $50,000 toward the study and contributing its GIS contour

map. These contributions are calculated to equal $300,000. The total cost of the study is $500,000.

$$LEV = \frac{\$\ 300{,}000}{\$\ 500{,}000} = 0.6$$

The community's efforts equate to 60% of the cost of the river restudy. The values for NS for this study are multiplied by 0.6, resulting in 60% of the credit for those elements. Note that the community will not receive this credit for the restudy until it is completed and adopted in the community's floodplain management regulations.

Impact Adjustment

The impact adjustment for this activity is described in Section 413.

Documentation Provided by the Community

(1) At each verification visit,

(a) A copy of the community's determination of how LEV was determined. This may be a Cooperating Technical Partner agreement and documentation that the agreement has been completed. Note that many flood insurance studies and restudies were conducted by federal agencies and private consulting firms under contract to FEMA. LEV credits only the share of a study that FEMA did not fund.

412.c. State review (SR)

The maximum credit for this element is 60 points.

Under SR, a study receives additional credit when an independent quality assurance review, typically by a state agency as required by a state law, has been completed.

The types of reviews that qualify for SR credit include a review by a state or regional organization whose review program has been designated as qualifying for CRS credit. Note that the existence of an approved review program does not mean the community will automatically receive this credit. Each study credited must have been reviewed and approved by the review program, and the review must not be paid for by FEMA. There may be studies that were conducted before the program began and there may be some types of studies that the state or regional agency does not review.

Some states already have review procedures that are eligible for SR credit.

New Jersey—Full credit for riverine studies, partial for coastal

Indiana —Full credit for riverine studies, partial for coastal

Michigan—Full credit for riverine studies, partial for coastal

Minnesota—Full credit for all studies

Wisconsin—Full credit for all studies

Illinois—The northeast portion of the state receives full credit for river and partial for coastal, and the rest of the state receives partial credit.

To obtain credit if elevations are provided for a single site at the time of development, either each study must be reviewed and approved or the study technique must have been reviewed and approved.

There are three possible quality assurance/quality control reviews: hydrology, hydraulics, and mapping. As shown in the table below, the credit for a study that has passed all of these reviews is approximately 20% of the credit for a new study. If only part of the study process was reviewed (e.g., the state review only approves the hydrology), the credit for SR is prorated.

Credit Criteria

The activity credit criteria in Section 411.b must be met. There are no additional credit criteria for this element.

Credit Points

SR = as shown in the following table, based on the study scope and the original FIRM zone, not to exceed the maximum of 60 points for this element

Study Scope	Original FIRM Zone		
	B, C, D, or X	A or V	AE, VE, A#
1. Delineation of an approximate A Zone	–	–	–
2. Flood elevations for a site at time of development	20	20	10
3. New profile or length of shoreline, base flood elevations/depths in AH and AO Zones.	45	35	20
4. New profile with floodway, length of shoreline with coastal velocity zone delineation, or converting coastal A Zones to V Zones	60	45	25

Impact Adjustment

The impact adjustment for this activity is described in Section 413.

Documentation Provided by the Community

(1) At each verification visit,

(a) Documentation that the state or other agency reviewed and accepted the study or analysis techniques for which credit is being requested. This will usually be a letter from the responsible agency, stating that the review was done and/or that the data were approved.

412.d Higher study standards (HSS)

The maximum credit for HSS is 160 points.

HSS credits the use of study standards higher than those required by FEMA at the time of the study. A community may receive credit for HSS in areas where it does not receive credit for NS. For example, credit can be provided if the FIRM (or a later map adopted for regulatory purposes) was based on future-conditions hydrology, provided that the community's floodplain development regulations use base flood elevations based on future conditions.

HSS credit is provided for the following higher study standards:

- Using a factor of safety when calculating the 100-year discharge,
- Using better topographic data,
- Using future-conditions hydrology (including sea level rise), and
- Showing 500-year flood elevations and the boundaries of the 500-year floodplain.

Additional higher study standards may be submitted by the community. The ISO/CRS Technical Reviewer will determine if they warrant credit for HSS.

The use of unsteady or two-dimensional flow models is not credited because these are commonly used by FEMA when warranted. Some of the higher standards are discussed below.

Using a factor of safety when calculating the 100-year discharge: Hydrologic studies produce "estimates" of peak flows. The estimates used are the "best" estimates, meaning they are high 50% of the time and low 50% of the time. Using a factor of safety means that the estimates will be too high more often and too low less often. To receive this credit, the predicted 100-year discharge used in the study must be increased by a minimum factor of safety of 25%.

For example, the State of New Jersey requires all riverine flood studies to use a factor of safety of 25%. Communities in New Jersey need to show that their studies were completed using that standard in order to receive this credit.

Using better topographic data: This credit is for providing a base map that has better topographic data than what are available from the U.S. Geological Survey or that exceed the NFIP standards in effect at the time.

Using future-conditions hydrology: Future-conditions hydrology means that flood discharges associated with a fully developed watershed are used. These discharges are created without consideration of projected future construction of flood detention structures or hydraulic modifications within a stream or other waterway, such as bridge and culvert construction, fill, or excavation. When the hydrologic study is based on future land use

conditions, discharges will be higher than those from a study based on current development conditions.

To receive this credit for coastal studies, the community must use an estimate of the sea level rise anticipated by the year 2100 or later. The study used to determine the sea level rise must have been developed by FEMA, the Corps, the U.S. Geological Survey, the National Oceanic and Atmospheric Administration, or through a regional study that produced higher base flood elevations. Regional studies may be submitted to the ISO/CRS Technical Reviewer for consideration if the estimates were not provided by a federal agency. In all cases where a high and low estimate were developed, the mean estimate or higher must be used to obtain credit.

Credit Criteria

(1) HSS credit is provided for the following higher study standards:

(a) Using a factor of safety when calculating the 100-year discharge,

(b) Using better topographic data,

(c) Using future-conditions hydrology (including sea level rise), and

(d) Showing 500-year flood elevations and the boundaries of the 500-year floodplain.

The use of unsteady or two-dimensional flow models is not credited because these are commonly used by FEMA when warranted.

(2) Additional higher study standards may be submitted by the community. The ISO/CRS Technical Reviewer will determine if they warrant credit for HSS.

Credit Points

HSS = as shown in the following table, based on the study scope and the original FIRM zone. Credit is cumulative for each applicable higher study standard (credit criterion (2)), not to exceed the maximum of 160 points for this element

Study scope	Original FIRM Zone			Max per Study
	B, C, D, or X	A or V	AE, VE, A#, V#	
1. Delineation of an approximate A Zone	20	15	–	60
2. Flood elevations for a site at time of development	30	20	15	90
3. New profile or length of shoreline	80	60	40	160

The points for HSS are cumulative for up to three higher study standards, provided that the maximum credit in the "Max per Study" column for the study scope is not exceeded.

For example, a new profile (line 3) in an X Zone that used future-conditions hydrology and better topographic data would receive 80 + 80 = 160 points for HSS. If the study also developed and mapped boundaries for the 500-year event, the total for HSS would exceed the maximum allowed per study and the points would be capped at 160. However, where flood elevations are currently provided, if a new profile were developed using future-conditions hydrology, better topographic data, and providing a map of the boundaries of the 500-year flood, the community would receive 40 + 40 + 40 = 120 points, because it performed three eligible activities and did not exceed the maximum credit allowed per study.

Example 412.d-1.

(See Figure 410-5.) Because South Scottsdale expected that a large proportion of its drainage areas would be urbanized, its McCormick Creek study (MAP#1) used a base flood discharge based on full watershed development (future-conditions hydrology). Credit is based on line 3 and the original FIRM zone was "X." HSS#1 = 80 points.

The City's floodplain management ordinance requires developers in approximate A Zones (MAP#2) to use future-conditions hydrology. Credit is based on line 2 and the original FIRM zone was "A." HSS#2 = 20 points

Impact Adjustment

The impact adjustment for HSS is calculated based on the size of the area to which the MAP study applies as a percentage of the area of the SFHA at the time of adoption of the study. The impact adjustment for this activity is described in Section 413.

Documentation Provided by the Community

(1) At each verification visit,

(a) EITHER a copy of the relevant text from the community's Flood Insurance Study describing the higher study standard if the information was utilized by FEMA, OR the ordinance adopting the higher standard and examples of the data created by using the higher standard.

(b) The map showing the area covered by the HSS study with the appropriate MAP acronyms marking the areas affected by the higher study standard. The impact adjustment map is explained in Section 413. Separate areas mapped to the same standards may all be marked with the same acronym.

412.e. More restrictive floodway standard (FWS)

The maximum credit for this element is 110 points.

> ***NOTE:*** *Credit for FWS should not be confused with the minimum NFIP requirement that new development in the floodway may not result in any increase in flood heights. The FWS credit is for using a more restrictive standard to delineate and map the floodway.*

Figure 410-6 shows the standard approach to determining the mapping limits of a floodway. Many times a floodway study prepared according to the minimum NFIP guidelines produces a floodway surcharge of less than 1.0 foot at some cross sections. The fact that the average floodway surcharge is less than one foot does not qualify the community for FWS credit. The floodway surcharge must be reduced by a mapping standard that can be documented by the community. In most cases this will be a state-mandated standard.

If the floodway was based on the FEMA surcharge standard of 1.0 foot, then there is no credit for this element no matter what increase is shown on the floodway data table. If a floodway map is based on some other standard (such as a limitation on velocity or a change in velocity) to determine more restrictive floodways, the community must determine the actual reduction in floodway surcharge that results. Since floodway analysis is almost always performed by the step-backwater method, the data provided for each cross section should be used to determine the actual average floodway surcharge.

Because the entire SFHA benefits from the implementation of a more restrictive floodway surcharge, aFWS includes the entire width of that reach of the SFHA, not just the area of the floodway. A higher floodway standard helps prevent development within the SFHA, thereby reducing increases in flood elevations on existing structures. FWS credit is only provided for a floodway that has been mapped and adopted.

"No rise" floodways: FWS credit is only provided for a floodway that has been mapped and adopted. If the mapping standard was zero rise, then FWS = 110. FWS credit is not provided for an ordinance requiring each development to conduct a no-rise floodway analysis as a condition of receiving a permit.

Credit Criteria

The activity credit criteria in Section 411.b must be met.

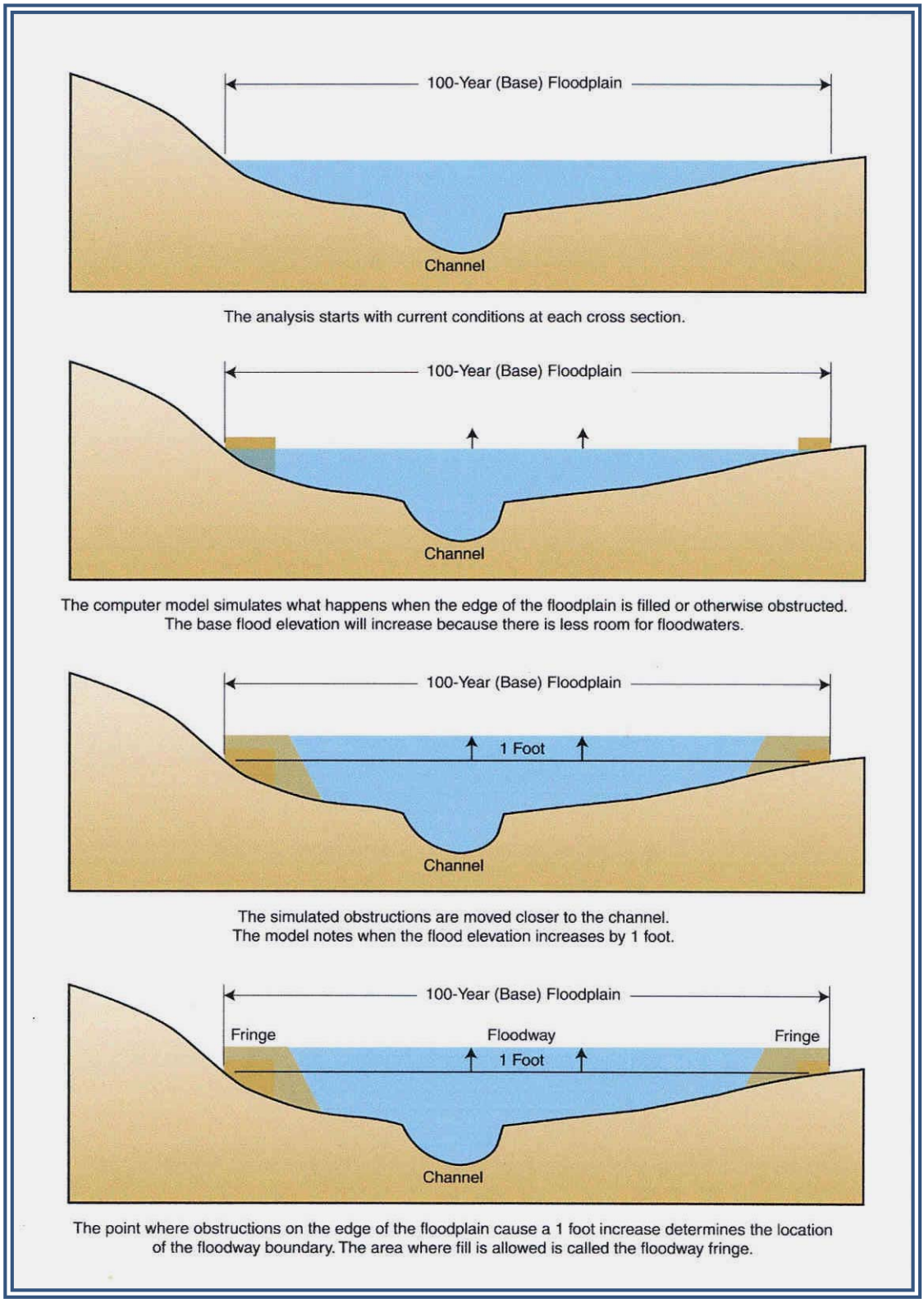


Figure 410-6. The standard approach to floodway determination.

Credit Points

FWS = 110, if the floodway delineation was based on less than 0.11 feet of rise in the base flood elevation, OR

FWS = 90, if the allowable rise was from 0.11 to 0.25 feet, OR

FWS = 50, if the allowable rise was from 0.26 to 0.5 feet, OR

FWS = 25, if the allowable rise was from 0.51 to 0.99 feet

FWS credit is based on the allowable floodway surcharge used to prepare the floodway map. Currently eight states have floodway standards more restrictive than those of the NFIP. In these states, riverine studies in which floodways were delineated to the state standards are eligible for this CRS credit:

Ohio, Montana, New Jersey, and Colorado	50 points
Indiana	90 points
Illinois, Michigan, Minnesota, and Wisconsin	110 points

Studies done in other states may be eligible for credit and should be submitted so that the ISO/CRS Technical Reviewer can assess them.

Example 412.e-1.

Wisconsin's state law requires that all floodway delineations be based on a 0.01-foot allowable floodway surcharge. In areas with floodways delineated according to this standard, FWS = 110.

This standard was used in the study for the Rock River in Janesville (MAP#1). FWS#1 = 110

Example 412.e-2.

(See Figure 410-5.) South Scottsdale's ordinance requires site-specific analyses to calculate base flood elevations in approximate A Zones (MAP#2). The permit applicant must also conduct an encroachment study to see if the applicant's project (and all similar projects) will increase flood heights more than 0.10 foot. FWS#1 = 110

Impact Adjustment
The impact adjustment for this activity is described in Section 413.

Documentation Provided by the Community
(1) At each verification visit,

(a) A copy of the appropriate floodway data table and text from the community's current Flood Insurance Study or other regulatory floodplain study describing the standards used for delineating the floodway.

If the study and map used for regulation are not included in the current Flood Insurance Study, the community must provide the map, the standard, the ordinance establishing the standard, and the ordinance adopting the standard.

412.f. Mapping for special flood-related hazards (MAPSH)

The maximum credit for MAPSH is 50 points**.**

MAPSH credit is provided for mapping and regulating any of the special flood-related hazards listed in Section 401 as described in *Special Flood-related Hazards Supplement to the CRS Coordinator's Manual, CRS Credit for Managing Tsunami Hazards*, and *CRS Credit for Managing Coastal Erosion*. These publications can be downloaded free from www.CRSresources.org or can be requested from the ISO/CRS Specialist. The credit points for mapping these areas are calculated separately. The resulting credit points, MAPSH, are then transferred to this activity.

Credit Criteria
The activity credit criteria in Section 411.b must be met.

Credit Points
The calculation for scoring the mapping of areas subject to the special flood-related hazards is described in the separate CRS publications on special flood-related hazards listed in Appendix C.

Impact Adjustment
The impact adjustment for MAPSH is described in the special flood-related hazards supplements listed in Appendix C.

Documentation Provided by the Community
(1) At each verification visit,

(a) A map of the special flood-related hazards,

(b) A copy of the ordinance adopting the map for regulating the special flood-related hazard, and

(c) An engineer's statement that that the community's special flood-related hazard area maps and related data still reflect current conditions.

Example 412.f-1.

Appropriate adoption language could read:

> The areas of mudflow hazard subject to the management requirements of this ordinance shall be as shown on the Geologic Hazard Maps produced by the State Geological Survey and dated July 17, 2010.

412.g. Cooperating Technical Partner (CTP)

The maximum credit for this element is 132 points.

CTP credit is provided to communities that enter into a Cooperating Technical Partner agreement with FEMA that formalizes their contribution and commitment to flood mapping. The objective of the Cooperating Technical Partners program is to maximize limited funding by combining resources and also to help maintain consistent national standards.

Cooperating Technical Partners are communities, tribes, regional agencies, or states that have the interest and capability to be active partners in FEMA's flood mapping program. Regional agencies active in floodplain mapping, such as regional or county drainage, water management, or flood control districts could also qualify. However, there is no credit for the community if the agreement does not affect a regulated floodplain in that community.

Each Cooperating Technical Partner enters into an agreement with FEMA, specifying what mapping activities it will implement. These could be as varied as

- Refinement of approximate A-Zone boundaries,
- Hydrologic and hydraulic modeling and floodplain mapping,
- DFIRM preparation,
- Redelineation of detailed flood hazard information using updated topographic data,
- Digital base map data sharing, or
- Provision of new topographic data.

CTP1 provides credit for participating in the Cooperating Technical Partners program. When the program produces new studies or revises mapping standards, the community

should receive credit under the other elements of Activity 410. CTP1 credit is for signing a meaningful agreement. Credit can be provided even if the mapping activity has not been completed and the community receives no other credit under Activity 410.

CTP2 increases the credit received for NS, SR, and FWS by 18% to recognize the extra benefits of the Cooperating Technical Partner program. CTP2 is a multiplier of the total points for each study or standard (MAP). If the study or standard was not done pursuant to a Cooperating Technical Partner agreement, then the score is multiplied by 1.0 and does not change.

Credit Criteria

(1) The activity credit criteria in Section 411.b must be met.

(2) EITHER: The community must have signed a Cooperating Technical Partner agreement with FEMA that identifies shared mapping responsibilities and costs, OR

> The community is in a regional agency or state that has signed a Cooperating Technical Partner agreement with FEMA that identifies the community or one of its flood problem areas as being studied.

(3) CTP1 credit is provided only for Cooperating Technical Partner agreements that relate to new studies or study standards for floodplains in the community. No credit is provided for agreements that only provide information on existing studies and data.

Credit Points

CTP1 = the total of the following

10 points, if the community is a Cooperating Technical Partner,

and

10 points, if the community is in a regional agency or state that has signed a Cooperating Technical Partner agreement with FEMA that mentions the community

CTP2 = EITHER 1.18, if the study was prepared pursuant to the Cooperating Technical Partner program

OR

1.0, if the study was not prepared pursuant to the Cooperating Technical Partner program or if it was prepared before the community, regional agency, or state signed the Cooperating Technical Partner agreement

Impact Adjustment

(1) There is no impact adjustment for CTP1.

(2) The impact adjustment for this activity and for CTP2 is described in Section 413.

Documentation Provided by the Community

(1) At each verification visit,

(a) A copy of the Cooperating Technical Partner agreement, if not on the FEMA website. A list of creditable Cooperating Technical Partner communities can be seen at www.floodmaps.fema.gov/fhm/scripts/ctp_list.asp.

Example 411.g-1.

Yakima County, Washington, signed a Cooperating Technical Partner agreement with FEMA to restudy the Naches River. The state NFIP coordinating agency also signed a Cooperating Technical Partner agreement to update the DFIRM for the entire county.

CTP1 = 10 + 10 = 20

Yakima County can receive CTP1 credit now. After the restudy for the Naches River is completed and adopted in the County's floodplain management regulations, CTP2 = 1.18. Yakima County's points for the restudy will then receive an 18% credit bonus.

413 Impact Adjustment

Credit for floodplain mapping (MAP) is adjusted according to the portion of the SFHA at the time of the adoption of the study covered by each element (aSFT).

$$rMAPi = \frac{aMAPi}{aSFT}, \text{ where}$$

aMAPi = the size of the area to which the MAPi study applies,

and

aSFT = the area of the SFHA for the community at the time of adoption of the study

The impact adjustment is the ratio of aMAP to the area of the SFHA (aSFT) before the development of the new data.

If the total calculated impact adjustment is less than 0.10, then 0.10 may be used to calculate the credit, but only for one area. If there is more than one set of standards for MAP, the community should choose the area with the highest value if it does not want to take the time to prepare an impact adjustment map or if it estimates that it would receive more points by using the optional minimum value of 0.10.

Preparing an impact adjustment map is explained in Section 403. If there is more than one area, each done to a different mapping standard, each area is marked separately, i.e., MAP#1, MAP#2, etc. If several areas were mapped or studied to identical standards, they are marked with the same acronym and number (see Figures 410-4 and 410-5).

The area of the SFHA at the time of the adoption of the study (aSFT) is calculated based on the SFHA of the FIRM in effect at the time the study was adopted. aSFT may be different for different credits. For example, MAP#1 may be for a study conducted in 1995. aSFT#1 would be the area of the SFHA on the FIRM in effect in 1995. If FEMA used the new study in the next FIRM revision, the impact adjustment for next new study (e.g., MAP#2) would be based on the area of the SFHA in effect on the revised FIRM (aSFT#2).

The maximum value for the sum of all rMAPi = 1.5. ΣrMAPi stands for the sum of all of the impact adjustment ratios for MAP (i.e., rMAP#1 + rMAP#2 + rMAP#3 + . . .). The sum of all rMAPi cannot be greater than 1.5. In this activity, an impact adjustment ratio greater than 1.0 reflects the fact that the community has mapped and is regulating floodplain development areas not identified on the FIRM. It is presumed that this will provide significant savings in future flood damage and NFIP claims, so the impact adjustment ratio for this activity may go up to 1.5.

NOTE: *All areas marked MAPi must be mutually exclusive. If the community does not regulate outside of the SFHA in effect at the time of adoption of the study, then ΣrMAPi cannot be greater than 1.0.*

Example 413-1.

The SFHA for the McCormick Creek flood study is marked as "MAP#1" on the city's impact adjustment map shown in Figure 410-5.

The approximate A Zones for Tributaries A and B are marked as "MAP#2."

South Scottsdale's CRS Coordinator used the community's GIS to determine the areas affected (in acres):

aMAP#1 = 129.6 aMAP#2 = 97.2

The denominator for the impact adjustment is based on the SFHA at the time of the study (aSFT). When the McCormick Creek flood study was conducted, the area was mapped as X Zone. The SFHA at the time consisted only of the floodplains of Tributary A, Tributary B, and Indian Bend Wash.

aSFT1 = 97.2 + 277.6 = 374.8 acres

The studies for MAP#2 are conducted when a person applies for a permit. Therefore, the denominator, aSFT2 is the current SFHA.

aSFT2 = aSFHA = 504.4

The impact adjustment ratios are calculated by dividing the area affected (aMAP) by the area of the SFHA at the time of the study (aSFT).

$$rMAP\#1 = \frac{aMAP\#1}{aSFT1} = \frac{129.6}{374.8} = 0.35$$

$$rMAP\#2 = \frac{aMAP\#2}{aSFT2} = \frac{97.2}{504.4} = 0.19$$

The total of the impact adjustment ratios cannot exceed 1.5.

$\sum rMAPi = rMAP\#1 + rMAP\#2 = 0.35 + 0.19 = 0.54$

414 Credit Calculation

$c410 = \Sigma MAPi + (MAPSH \times CTP2i) + CTP1$, where

$MAPi = ((NSi \times LEVi) + SRi + HSSi + FWSi) \times rMAPi \times CTP2i$

Example 414-1.

(See Figure 410-5.) As seen in earlier examples, South Scottsdale receives credit for the new study on McCormick Creek (MAP#1) and for requiring base flood elevations in the approximate A Zones of Tributaries A and B (MAP#2). The new studies are scored as NS#1 and NS#2.

NS#1 = 290 NS#2 = 80

The NS#1 new study was funded by the City and the state and the NS#2 studies are funded by permit applicants. Because FEMA funds were not involved, LEV#1 = 1.0 LEV#2 = 1.0

Both new studies receive credit for future-conditions hydrology. The values are different because the study scope and original FIRM zones are different. HSS#1 = 80 HSS#2 = 20

The MAP#1 McCormick Creek study used FEMA's floodway encroachment standard of 1.0 foot, so there is no FWS credit for MAP#1. The MAP#2 studies must use a higher encroachment standard, 0.1 foot. FWS#2 = 110

The impact adjustment ratios were calculated in Example 413-1.

rMAP#1 = 0.35 rMAP#2 = 0.19

Neither study receives credit for state review (SR), and no Cooperating Technical Partners were involved (CTP). The first step in the final credit calculation is to compute the total value for each study.

MAP#1

= ((NS#1 x LEV#1) + SR#1 + HSS#1 + FWS#1) x rMAP#1 x CTP2#1

= ((290 x 1.0) + 0 + 80 + 0) x 0.35 x 1.0

= 370 x 0.35 x 1.0 = 129.5

MAP#2

= ((NS#2 x LEV#2) + SR#2 + HSS#2 + FWS#2) x rMAP#2 x CTP2#2

= ((80 x 1.0) + 0 + 20 + 110) x 0.19 x 1.0

= 210 x 0.19 x 1.0 = 39.9

The second step is to add the totals for each MAP and the remaining credited elements. South Scottsdale does not have credit for any special flood-related hazards (MAPSH).

c410 = ΣMAPi + MAPSH + CTP1

= MAP#1 + MAP#2 + MAPSH + CTP1

= 129.5 + 39.9 + 0 + 0 = 169.4

415 For More Information

a. Additional information, reference materials, and examples can be found at www.CRSresources.org/400.

b. The following publications are available free. See Appendix C or www.CRSresources.org.

- *Special Flood-related Hazards Supplement to the CRS Coordinator's Manual*
- *CRS Credit for Management of Coastal Erosion Hazards*
- *CRS Credit for Management of Tsunami Hazards*.

c. More information on FEMA mapping criteria can be found on the FEMA website, www.fema.gov/national-flood-insurance-program-flood-hazard-mapping.

d. More information on the Cooperating Technical Partner program can be obtained from the FEMA Regional Office and from the website at www.fema.gov/cooperating-technical-partners-ctp-program.

e. The following publications may be obtained from FEMA:

Guidelines and Specifications for Flood Hazard Mapping Partners, Federal Emergency Management Agency (2003). (Also available from FEMA's website at www.fema.gov/library/viewRecord.do?id=2206.)

Use of Flood Insurance Study (FIS) Data as Available Data, FEMA Floodplain Management Bulletin 1-98 (1998). (Also available from FEMA's website at www.fema.gov/library/viewRecord.do?id=2231.)

Estimating the Value of Partner Contributions to Flood Mapping Projects "Blue Book," Federal Emergency Management Agency. (Also available from FEMA's website at www.fema.gov/library/viewRecord.do?id=2473.)

FEMA's "Numerical Models Meeting the Minimum Requirement of the NFIP" can be found at http://www.fema.gov/national-flood-insurance-program-flood-hazard-mapping/numerical-models-meeting-minimum-requirement-0.

The following can provide guidance on technical standards for studies in areas where base flood elevations were not provided with the FIRM:

Managing Floodplain Development in Approximate Zone A Areas, FEMA-265 (1995). (Also available from FEMA's website at www.fema.gov/library/viewRecord.do?id=1526.)

f. Communities may check on past FIRMs and obtain background data by calling 1-877-FEMA MAP. They can also submit a written inquiry through this link: https://msc.fema.gov.

g. Rural communities can request help on this activity from the U.S. Natural Resources Conservation Service. Requests should be submitted to the local soil and water conservation district, which is usually located in the county seat.

416 Related Activities under the Community Rating System

- If a community maps other flood-related special hazards and receives credit in Activity 410, it should also be receiving credit under Activity 420 (Open Space Preservation) and/or Activity 430 (Higher Regulatory Standards). The maps must be adopted and the area regulated in order for the community to get the MAPSH credits.
- If a community uses future-conditions flood flows to map its flood hazard, it may be eligible for credit under Activity 450 for managing stormwater if it prepared a watershed management plan, or under Activity 430 for regulating areas outside of the adopted SFHA.

- Maps credited in this activity should be available for credit in Activity 440, and can be used for outreach in Activity 330. These maps are commonly used in Activity 510 and Activity 610 for planning purposes. In addition, they can be useful for determining credit for the entire 600 series.
- If a flood control project results in lower base flood elevations in an AE or VE Zone, there is no Activity 410 credit. However, the community may be eligible for credit for reducing the flood hazard under Activity 530 (Flood Protection).

420 Open Space Preservation—Summary

Maximum credit: 2,020 points

Note that OSI and LZ are not counted toward the maximum credit because these two elements and OSP are mutually exclusive.

422 Elements

a. **Open space preservation (OSP)**: Up to 1,450 points for keeping land vacant through ownership or regulations.

b. **Deed restrictions (DR):** Up to 50 points extra credit for legal restrictions that ensure that parcels credited for OPS will never be developed.

c. **Natural functions open space (NFOS):** Up to 350 points extra credit for OPS-credited parcels that are preserved in or restored to their natural state.

d. **Special flood-related hazards open space (SHOS)**: Up to 50 points if the OPS-credited parcels are subject to one of the special flood-related hazards or if areas of special flood-related hazard are covered by low-density zoning regulations.

e. **Open space incentives (OSI)**: Up to 250 points for local requirements and incentives that keep flood-prone portions of new development open.

f. **Low-density zoning (LZ)**: Up to 600 points for zoning districts that require lot sizes of 5 acres or larger.

g. **Natural shoreline protection (NSP)**: Up to 120 points for programs that protect natural channels and shorelines.

Credit Criteria

Each element has a separate section discussing credit criteria.

Impact Adjustment

Each element has a separate section describing the impact adjustment.

Documentation Provided by the Community

Each element has a separate section describing needed documentation.

420 OPEN SPACE PRESERVATION

The OBJECTIVES of this activity are to

(1) Prevent flood damage by keeping flood-prone lands free of development, and

(2) Protect and enhance the natural functions of floodplains.

421 Background

Floods are natural processes and floodplains are necessary to every river and coastal system. A floodplain has been defined as any land susceptible to being inundated by flood waters. Floodplains can also be regarded as the land needed by a river or stream to convey and store flood waters.

Preserving the floodplain as open space allows it to serve these primary natural functions and many other important functions. Keeping the floodplain free of development—free of buildings and infrastructure—means that there will be no flood insurance claims, no closed businesses, no homeless residents, and that the community can return to normal quickly after flooding occurs.

421.a. Activity Description

The maximum credit for Activity 420 is 1,970 points (excluding the credit for special flood-related hazards open space described under Section 422.d).

Credit is given for areas in a regulated floodplain that are permanently preserved as open space. Additional credit is given for parcels of open space that are protected by deed restrictions or that have been preserved in or restored to their natural state. Credit is also given for measures that require or encourage less development in floodplains.

The first four elements provide credit for parcels that qualify as preserved open space. The credit can be based on development restrictions placed by the property owners or those found in local regulations.

(1) Open space preservation (OSP) provides credit for keeping vacant lands vacant through ownership by a public agency, non-profit organization (such as a church camp), or restrictive regulations. To qualify, a property must be open, meaning there are no buildings, filling, or storage of materials.

(2) Deed restrictions (DR) provides extra credit for ensuring that parcels credited for OSP will never be developed. This is done via a legal restriction that prevents subsequent owners from changing the use of the property.

(3) Natural functions open space (NFOS) provides extra credit for parcels credited for OSP that are preserved in or restored to their natural state. There are bonus credits for additional attributes of the parcel.

(4) Special flood-related hazard open space (SHOS) credits the preservation of open space (OSP) parcels in areas subject to a special flood-related hazard. Special flood-related hazards credits and points are described in separate publications, as noted below.

The next two elements credit local regulations that encourage minimal floodplain development.

(5) Open space incentives (OSI) credits a community for having requirements and/or incentives that keep flood-prone portions of new developments open through techniques such as density transfers.

(6) Low-density zoning (LZ) provides credit for zoning districts that require lot sizes of 5 acres or larger, resulting in fewer buildings constructed in the floodplain.

(7) Natural shoreline protection (NSP) credits programs that protect natural channels and shorelines, the areas most valuable for protecting the natural functions of floodplains. The programs can be local policies that are adhered to on public lands and/or regulations that govern development on private lands.

The seventh element credits programs that protect natural channels and shorelines. As with the first four elements, this credit can be based on shoreline protection practices put in place by property owners or on protection requirements embodied in local regulations.

At the time of the verification visit, the ISO/CRS Specialist will review the documentation and visit a sample of the parcels in the field.

422 Elements

422.a. Open space preservation (OSP)

The maximum credit for this element is 1,450 points.

OSP credits preserved open space in the floodplain. The objective of open space preservation is to prevent or minimize development in the regulatory floodplain that obstructs floodwaters; exposes insurable buildings to damage; or adversely affects water quality, water quantity, or other floodplain functions.

Several different methods of preserving floodplain lands as open space (OSP) are recognized. To be termed "open space," the land must be free from buildings, filling, or other encroachment to flood flows. To be considered "preserved," there must be a signed statement from a public or creditable private owner or regulations that prohibit buildings, filling, or other encroachments on flood flows.

NOTE: *A community does not need to prohibit all use of private property to obtain CRS credit. Communities are advised to have their attorneys or corporation counsels ensure that their regulations that prevent construction of buildings or the placement of fill in hazardous areas do not constitute a taking of private property.*

Each parcel that qualifies as preserved open space is plotted on a map. The area of the regulatory floodplain portion of the parcel is calculated. The total area of preserved open space is divided by the total area of the Special Flood Hazard Area (SFHA) in the impact adjustment step. The result is a ratio that is used to determine the total credit for OSP.

Credit Criteria

(1) The parcel must be located in the community's regulatory floodplain, which means that the parcel is located in either

(a) The SFHA as shown on the community's Flood Insurance Rate Map (FIRM), or

(b) A floodplain outside the SFHA where the community enforces development regulations similar to those enforced for new development in the SFHA. The community must map the area and document its floodplain management regulations.

(2) The parcel must be "open space," meaning there are no buildings, storage, filling, or other encroachment to flood flows. Simply having vacant land in the floodplain does not qualify for open space credit. Six types of properties in particular are NOT counted for this activity:

(a) Properties not counted in any calculations for the 400 series of Community Rating System (CRS) activities. This includes large bodies of water, federal lands, and other types of property as explained in Section 403. When plotting open space lands, these excluded areas should be marked on the impact adjustment map to ensure that they are not mistakenly included in the calculations. See Section 403 for more information.

(b) Areas with impervious surfaces. Parking lots and streets do not qualify. For example, if a parcel such as a park has a parking lot, a paved tennis court, and a paved road, those areas must be excluded from the area calculations in the impact adjustment. Minor areas, such as sidewalks, trails, or pervious pavements, do not need to be excluded.

(c) Areas with buildings on them. See Section 301 for a discussion of "buildings." Insurable buildings on parcels larger than 10 acres will not disqualify a lot, provided that the building is "a necessary appurtenance" of the open space use. Open pavilions and similar structures are not insurable buildings as defined in Section 301 and they do not disqualify a parcel for this credit. However, their roofs are impervious surfaces and their area must be deducted from the parcel's area calculations.

Example 422.a-1.

1. If a large city park has a swimming pool, the park can be counted as open space even though it may have a building with restrooms, lockers, and clothes-changing areas. If it has a paved parking lot, however, the area of that impervious surface must be deducted from the credited area of open space.

2. A 12-acre park that includes the first settler's home or other historical building that is an integral part of the park can still be considered OSP.

3. A ranger's cabin will not disqualify a state forest for OSP credit.

4. A school playing field can be credited if there are no insurable buildings on it. Structures like bleachers or fences are not "buildings" as defined in Section 301. The areas of any impervious surfaces, such as a basketball court and parking lot, are deducted from the total area of creditable open space.

(d) Parcels on which fill or other encroachments may be placed. One of the objectives for preserving open space is to prevent increased flood damage from future development. Even though insurable buildings may not be allowed, filling, dumping, or storage on a lot still can aggravate flood problems on other properties.

For example, an open area that is used for temporary storage of rock or construction materials does not qualify as open space. Plowing and other alterations of the ground are not counted as filling, provided that they do not create obstructions to the flow or loss of storage of flood waters.

Certain types of fill related to flood protection can be allowed without losing the OSP credit. Examples include construction of sand dunes, beach nourishment, and repairing or strengthening flood control levees. However, the properties on which these activities take place would not be eligible for natural functions open space credit (NFOS).

(e) Streets, pavement, parkway, railroad, levee, canal, ditch, and channel rights of way. Such narrow, linear strips of utility easements or publicly owned property are excluded from consideration as open space because they are necessary to serve the development or use of an area.

Such properties with pervious surfaces may be included in the open space calculation if they are an integral part of a larger open space area or a designated public greenway. Narrow greenways that parallel a river or shoreline may be counted as open space provided that they allow public access, even if they are recorded or considered as drainage easements or channel rights of way. The CRS encourages programs that bring people closer to the water so they learn to appreciate floodplains and their natural functions.

(f) Publicly owned property that is not intended for open space use, such as a vacant lot in an industrial park. One of the keys to the open space credit is the fact that the area will remain open space, not just that it is owned by a public agency. Therefore, areas set aside by a developer or a public agency only until future economic or other conditions allow it to be developed, are excluded.

(3) The parcel must be "preserved" as open space. This criterion may be met in one of three ways:

(a) Public land, such as state and local parks and easements, can qualify if the owning agency states in writing that the lands are intended to be kept as open space. As noted in Section 403, there is no open space credit for federal lands. Examples of such creditable open space parcels include, but are not limited to

- City and county parks and forest preserves,
- State parks and state forests,
- Publicly owned beaches or natural areas,
- School playing fields, and
- Floodplain easements dedicated to the community by developers.

(b) Private wildlife or nature preserves that are maintained for open space purposes can qualify if the owner states in writing that they are intended to be kept as open space. Examples of such creditable open space parcels include, but are not limited to

- Church retreats,
- Hunting club lands,
- Golf courses owned by nonprofit associations,
- Audubon Society preserves, and
- Boy Scout or Girl Scout camping areas.

A parcel set aside by a developer as a temporary "preserve" until the area develops is not considered preserved open space.

(c) Open space areas subject to land development regulations that prohibit buildings and filling can qualify for OSP. The credit criteria are the following:

- The regulations must prohibit construction of new buildings;
- The regulations must prohibit filling, grading, or other activities that obstruct flood flows or remove flood storage in areas subject to riverine flooding;
- The area where the regulations are in effect must be mapped or defined by lots or a legal description so it can be mapped. For example, a wetlands regulation that is dependent upon site analysis to define whether a property is a wetland is not acceptable;
- The maintenance of existing levees and engineered dune and beach nourishment programs within the area is permissible;
- Credit is only given for such regulated lands that are vacant at the time of application for CRS credit; and
- If an ordinance prohibits residential development in the V Zone, floodway, or other portion of the floodplain, the community may request OSP credit for all floodplain areas that are zoned for residential use only.

Examples of such regulations include, but are not limited to

- State or local regulations that prohibit buildings and filling in the floodway,
- State or local regulations that prohibit buildings and filling in wetlands or other designated natural areas,
- Coastal construction setback lines that prohibit buildings, and
- Streamside buffers and setback regulations (provided that they prohibit buildings and filling).

Below are some examples of regulations that would NOT qualify for credit. This is not a comprehensive list.

- The Coastal Barrier Resources Act is not acceptable because it does not prevent construction of buildings; it only denies federal support for new development.
- Florida's Coastal Construction Control Line does not qualify because it does not prohibit buildings, it only requires a state permit for buildings. However, more restrictive local regulations could qualify.
- Ordinance language prohibiting structures that may cause obstructions in the floodway is not credited because such a prohibition is a requirement of the National Flood Insurance Program (NFIP). Most floodway regulations allow buildings in the floodway if the applicants can show that they cause no obstruction.

Open space subdivision design, cluster development, transfers of development rights, and planned unit developments are regulatory approaches that can require or encourage developers to set aside floodplains and other areas as dedicated open space. Unless the regulations specifically identify certain undeveloped floodplains and mandate that they be set aside, there is no OSP credit for these regulations because there is no assurance that the developer will set aside specific areas. However, such regulations are credited under Section 421.e, open space incentives (OSI). Once the parcel is set aside and preserved as open space, it may qualify for OSP credit as publicly owned land.

Example 422.a-2.

In a strip of single-family lots along a stream, each lot has a house situated in the floodplain fringe. There are no buildings in the floodway, and the community's regulations prohibit fill and the placement of new buildings in the floodway. The open space area, the floodway, is currently vacant and the regulations will keep it vacant, so it can be credited.

Credit Points

OSP = 1,450 points, based on the amount of the SFHA that is preserved as open space

Impact Adjustment

OSP credit is adjusted based on the ratio of preserved open space areas in the regulatory floodplain to the area of the SFHA. Section 403 has additional information on impact adjustments for areas. The areas qualifying for OSP need to be marked on an impact adjustment map.

$$rOSP = \frac{aOSP}{aSFHA}$$, where

aOSP = the size of the area(s) preserved as open space (OSP) in the regulatory floodplain, and

aSFHA = the size of the community's SFHA shown on its FIRM

Since OSP can include areas of the community's regulatory floodplain outside the SFHA, it is possible that aOSP can be greater than aSFHA. In those cases, rOSP can be as large as 1.5. Note that studies done to delineate those regulated floodplains outside the SFHA can generally be credited under Activity 410 (Floodplain Mapping).

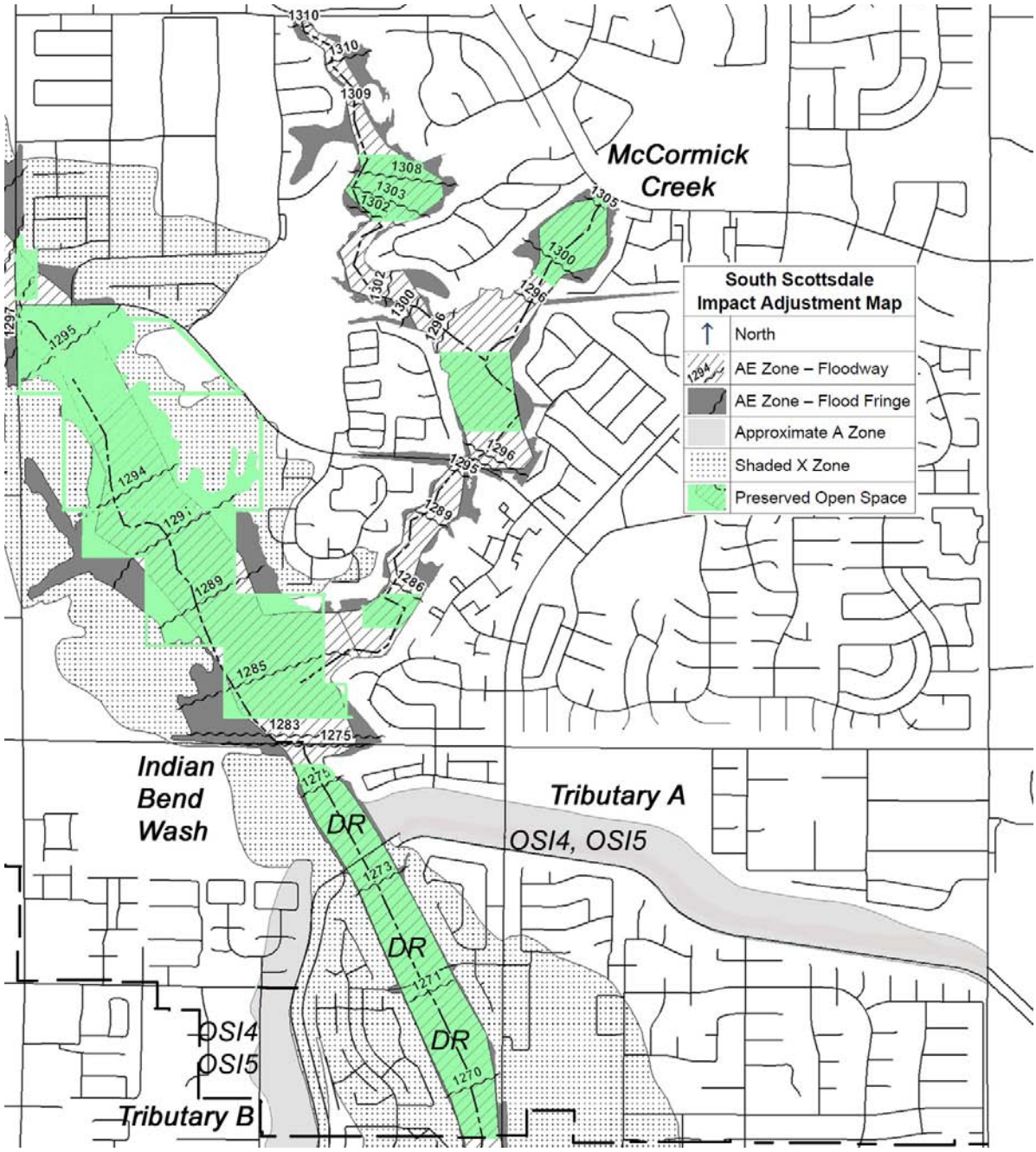
NOTE: *The community's aSFHA should be reviewed and updated each year for the Program Data Table that is included in the annual recertification (see Section 213.a).*

Example 422.a-3.

South Scottsdale is a fictitious community used for CRS examples (see Figure 420-1). The City has three areas that qualify for OSP:

1. Much of the north part of the Indian Bend Wash floodplain has been purchased and cleared to form a string of parks. The property boundaries of the park have been outlined in green and the areas in the floodway and flood fringe are shaded in green on the map in Figure 420-1.

2. The area along the south part of Indian Bend Wash was owned by a large development corporation. When the corporation wanted to develop a 640-acre tract in another part of the City, the City offered to allow a higher density of development on that tract if the corporation set aside its Indian Bend Wash holdings. The corporation agreed. It deeded the floodplain portion to the country club to which most of the board members belonged. There is a



Preserved Open Spaces	Credit	Size (acres)
Indian Bend Wash Parks	OSP	143.2
South Scottsdale Country Club	OSP, DR	55.3
Undeveloped floodway parcels	OSP	44.4
Total areas preserved as open space	aOSP	242.9
Vacant areas subject to incentives	OSI4, OSI5	88.7

Figure 420-1. South Scottsdale's impact adjustment map for Activity 420.

deed restriction that the area must forever remain as a golf course. The corporation then developed the areas to the east and west and received a higher price for the lots that backed up on the golf course than it could have received for lots if the floodplain had been developed.

3. Ten years ago, the City amended its floodplain management regulations to prohibit new buildings, critical facilities, filling, or storage of materials in the regulatory floodway. The areas that were not developed at the time of the amendment are shaded in green on the map in Figure 420-1. Most of these areas are along McCormick Creek.

All three types of preserved open space qualify for OSP credit.

OSP = 1,450 (before the impact adjustment)

The areas of these open spaces are shown in Figure 420-1.

aOSP = 143.2 + 55.3 + 44.4 = 242.9 acres

aSFHA = 504.4 acres (see Figure 410-5)

$$rOSP = \frac{aOSP}{aSFHA} = \frac{242.9}{504.4} = 0.48$$

The formula in Section 423, Credit Calculation, calls for multiplying the value for preserving open space (1,450) by the ratio for rOSP, 0.48. The credit for South Scottsdale's open space, cOSP, is 48% of 1,450.

Note that if South Scottsdale enforced floodplain management regulations throughout the SFHA and the shaded X Zone, then the area calculations for the parks would include the X-Zone portions. This would provide a larger numerator (aOSP), but the denominator (aSFHA), would not change. The result would be a larger ratio and, therefore, more points.

Documentation Provided by the Community

(1) At each verification visit,

(a) A description of the parcels preserved as open space. This could be a map or list that notes which parcels also qualify for DR, NFOS, or SHOS credit.

(b) For each parcel that is preserved as open space because of ownership (Section 422.a, credit criterion (3)(a) or (b)), documentation that the owner will keep the parcel open.

(c) For each parcel that is preserved as open space because of a regulatory requirement (Section 422.a, credit criterion (3)(c)), the ordinance language that prohibits structures and fill in part or all of the regulatory floodplain. See also Sections 231.b and c on documenting regulatory language.

(d) For each parcel that is preserved as open space outside the SFHA, documentation showing that floodplain regulations are in effect in the area.

(e) An impact adjustment map.

The ISO/CRS Specialist may visit a sample of the sites to verify that they meet the element's credit criteria.

Documentation can be hard copy or digital.

422.b. Deed restrictions (DR)

The maximum credit for this element is 50 points.

Just because an open space parcel is a city park today, that does not necessarily mean that there is any legal restriction that keeps a city council from building on it or selling it for development. This element provides additional credit for areas of the regulatory floodplain that have the assurance that the parcel will always remain open: a deed restriction (DR).

Credit Criteria

(1) All parcels to be credited for DR must first qualify for OSP credit.

(2) There must be language attached to the deed for the parcel that prohibits new buildings. The exact language for a legal arrangement or deed restriction will vary from state to state and should be prepared by a local attorney. It should include three features:

(a) No new buildings may be allowed on the property;

(b) The restriction runs with the land; and

(c) The restriction cannot be changed by a future owner; rather, it can only be amended by a court for just cause.

More common examples of deed restrictions include, but are not limited to

- Property donated by a person or family for park purposes often has the stipulation that it be used only for public recreation;
- Properties purchased with funds from the Federal Emergency Management Agency's (FEMA's) mitigation grant programs qualify for this credit because the titles have a deed restriction that prohibits construction of buildings on the parcel in the future;
- Public lands that were improved with assistance from a state or federal open space or recreational program often have a deed restriction requirement as a condition of funding; and
- A community, other agency, organization, or owner may attach such a restriction to its existing parks and other public open areas in order to receive the deed restriction credit.

Regulatory requirements for easements or other dedications do not qualify for DR credit. DR credit is a requirement that is filed or recorded with the deed, and cannot be removed by ordinance or other action except by a court order. Although a subdivision ordinance requirement may qualify for OSI, to be eligible for DR credit, the parcel must have been platted and the restrictions on developing it recorded.

After a subdivision is platted, some parcels may be set aside as a park, an easement, retention basin, or other open space purpose. This does not automatically receive DR credit. Documentation is needed that shows that the community or property owner (e.g., the homeowners association) is not free to sell or build on the property.

Credit Points

DR = 50 points

Up to 50 points are provided for this element, based on the amount of the SFHA that is preserved as open space with deed restrictions. Note that every parcel for DR credit must have already qualified for OSP credit.

Impact Adjustment

DR credit is adjusted based on the ratio of preserved open space areas with deed restrictions to the area of the SFHA. The areas qualifying for DR need to be marked on the impact adjustment map prepared for OSP. Note that every parcel for DR credit must already qualify for OSP credit.

$$rDR = \frac{aDR}{aSFHA}, \text{ where}$$

aDR = the size of the area(s) that qualify for deed restriction credit (DR), and

aSFHA = the size of the community's SFHA shown on its FIRM

rDR cannot be greater than rOSP

Example 422.b-1.

The South Scottsdale Country Club was deeded floodplain property owned by a large development corporation. There is a deed restriction specifying that the area must forever remain as a golf course. The area qualifies for both OSP and DR.

DR = 50 (before the impact adjustment)

The area of the floodplain portion of the South Scottsdale Country Club is

aDR = 55.3 acres

aSFHA = 504.4 acres (see Figure 410-5)

$$rDR = \frac{aDR}{aSFHA} = \frac{55.3}{504.4} = 11.0$$

According to Section 423, Credit Calculation, the value for deed restrictions (50) is multiplied by the ratio for rDR, 0.11.

Documentation Provided by the Community

(1) At each verification visit,

(a) For each parcel that has a qualifying deed restriction, a copy of the deed. The language that qualifies must be marked. DR credit can only be documented with a copy of the actual deed restriction. An ordinance requiring deed restrictions or dedication of easements is not adequate documentation that there is a permanent legal restriction that prevents future owners from developing that property.

(b) The impact adjustment map used for OSP credit, with "DR" marked on the qualifying areas.

422.c. Natural functions open space (NFOS)

The maximum credit for this element is 350 points.

The more commonly considered natural floodplain functions are listed in the box. There are three reasons why preserving open spaces that support these functions warrant the additional credit available under this element.

Some Natural Functions of Floodplains

WATER RESOURCES

Natural Flood and Erosion Control

- Provide flood storage and conveyance
- Reduce flood velocities
- Reduce peak flows
- Reduce sedimentation

Water Quality Maintenance

- Filter nutrients and impurities from runoff
- Process organic wastes
- Moderate temperature fluctuations

Groundwater Recharge

- Promote infiltration and aquifer recharge
- Reduce frequency and duration of low surface flows

BIOLOGICAL RESOURCES

Biological Productivity

- Promote vegetative growth through rich alluvial soils
- Maintain biodiversity
- Maintain integrity of ecosystems

Fish and Wildlife Habitats

- Provide breeding and feeding grounds
- Create and enhance waterfowl habitat
- Protect habitats for rare and endangered species

– *A Unified National Program for Floodplain Management* FEMA-248 (1994)

(1) More and more studies are showing that natural open space can be more effective at controlling or attenuating flooding and can be less expensive over the long run than traditional manmade flood control structures.

(2) Local officials and their constituents who are aware of the benefits that naturally functioning floodplains provide to their communities want to protect them. This can generate a continuous level of interest to protect floodplains in order to support local economies or improve recreational opportunities. This interest level persist between infrequent floods, adding to the attention and resources available for flood loss reduction efforts.

(3) Disrupting natural features has adverse impacts on the flooding regime.

Accordingly, NFOS credits areas preserved as open space (OSP) where the natural floodplain functions are also preserved or restored. NFOS is credit in addition to OSP. Note that other programs to support natural floodplain functions in the watershed (outside the floodplain), such as low impact development and preserving natural flood storage areas, such as wetlands, are credited under Activity 450 (Stormwater Management).

Credit Criteria

(1) For all NFOS credit:

(a) All parcels to be credited for NFOS must first qualify for OSP credit;

(b) Credit for NFOS1 is a prerequisite for the rest of the credits;

(c) The property must be managed to stay in the natural state or otherwise managed to keep its designation; and

(d) The areas qualifying for each credit need to be marked on the impact adjustment map prepared for Activity 420 .

(2) NFOS1: Credit is provided if parcels with OSP credit are in an undeveloped natural state or have been restored to a natural state.

The following types of open space in a community's regulatory floodplain can receive NFOS1 credit.

- Areas in their undeveloped natural state (i.e., areas that have not been built on, graded, or farmed).
- Areas that have been farmed or otherwise developed but have been restored to a state approximating their natural, pre-development conditions. This includes restoration work, such bioengineered channel stabilization,

> Surface waters, their floodplains, and watersheds are parts of a broader, single system. This interaction of land and water exists in a state of dynamic equilibrium. If a component of the natural system is disturbed, the entire system works to readjust towards a new equilibrium. This is true of riverine and coastal systems alike. The effects of a system's readjustment are often felt far from the original site of the disturbance and can last for decades.
>
> —*The Natural and Beneficial Functions of Floodplains: Reducing Flood Losses by Protecting and Restoring the Floodplain Environment*, FEMA-409 (2002)

removal of seawalls to allow beach erosion, wetland or riparian habitat restoration, and moving levees back to allow channel meandering.

- Areas designated as worthy of preservation for their natural functions by a federal, state, or nationally recognized private program. Examples of such programs include, but are not limited to
    - State sensitive-areas programs that place development restrictions on designated properties;
    - The Nature Conservancy's Heritage Program Inventory; and
    - The U.S. Fish and Wildlife Service's Threatened and Endangered Species' Critical Habitat Designations (some designations may also qualify the parcel for credit under NFOS3).

The following types of open space usually would NOT receive NFOS1 credit, unless additional information was supplied that showed that the above criteria are met.

- Areas designated only as "scenic," as historically significant, or as outstanding canoeing or boating streams.
- Areas developed and maintained for recreational uses, such as golf courses, groomed beaches, and zoos.
- Forests where unrestricted commercial clear cutting is allowed (sustainable forestry practices that preserve natural functions could be recognized).
- Dune and beach nourishment projects that involve filling, snow fences, or other artificial constraints on natural dune migration or beach erosion.

(3) NFOS2: Credit is provided if parcels credited as NFOS1 are also designated in a plan to protect natural functions. The plan must meet the criteria for a natural floodplain functions plan (NFP) credited in Activity 510 (Floodplain Management Planning).

(4) NFOS3: Credit is provided if parcels credited as NFOS1 are designated as critical habitat for threatened or endangered species or if the species is present. "Threatened or endangered species" include those already on a federal or state list and those on an official federal or state list of "species of concern" or "pending listing."

(5) NFOS4: Credit is provided if parcels credited as NFOS1 are also in a designated open space corridor or connected network. This credits a designated open space corridor or connected network of wetlands, woodlands, wildlife habitats, wilderness, and other areas that support native species, maintain natural ecological processes, and sustain air and water resources. "Designated open space corridor" means the property has been identified for its corridor or network value in an approved plan. Such a network sometimes is called "green infrastructure."

(6) NFOS5: Credit is provided if parcels credited as NFOS1 also provide educational material on the site's natural functions. This credit can be up to 20 points if the

information is covered in the community's Program for Public Information, credited under Activity 330. Examples of such materials include, but are not limited to

- A brochure that describes the property and its natural floodplain functions. Copies of the brochure could be available in a box at the entrance to the site;
- Signs along trails that describe natural floodplain functions (signs that simply identify the trees and plants would not qualify); and
- Conducting school field trips that explain the natural floodplain functions.

Credit Points

NFOS = the sum of the following

NFOS1 = 170 points, for having parcels that qualify as OSP in or restored to their undeveloped natural state

NFOS2 = 50 points, for having parcels that qualify as NFOS1 designated in a natural floodplain functions protection plan

NFOS3 = 50 points, for having parcels that qualify as NFOS1 designated as critical habitat for threatened or endangered species

NFOS4 = 60 points, for having parcels that qualify as NFOS1 also in a designated open space corridor

NFOS5 = the sum of NFOS5(a) + NFOS5(b), below

NFOS5(a) = the sum of the following public information and/or education activities, up to a maximum of 15 points. The activities must describe one or more of the property's natural floodplain functions and the parcel must qualify for credit under NFOS1.

5 points, for having free written materials about the site available to visitors

5 points, for having visitor signs posted on the property, such as along trails

5 points, for having presentations to visitors, organizations, field trips, etc.

5 points, for activities that involve the public in protecting one or more natural floodplain functions, such as stream cleanup day

NFOS5(b) = 5 points, if any of the NFOS5(a) informational and/or educational activities is included in the community's

Program for Public Information, credit under Activity 330 (Outreach Projects)

Communities may submit alternative public information activities that are not listed under NFOS5(a).

Impact Adjustment

NFOS credit is adjusted based on the ratio of preserved open space areas that qualify for each sub-element (NFOS1, NFOS2, etc.) to the area of the SFHA.

$$rNFOS\# = \frac{aNFOS\#}{aSFHA}$$, where

aNFOS# = the size of the area(s) that qualifies for NFOS credit (aNFOS1 is the area of all parcels that qualify for NFOS1 credit, etc.) and

aSFHA = the size of the community's SFHA shown on its FIRM

rNFOS# cannot be greater than rOSP

Documentation Provided by the Community

(1) At each verification visit,

(a) For each parcel, documentation that supports credit under NFOS1 and any additional credit requested. The document must describe the natural floodplain functions of the parcel. The document can be

(i) A report or plan prepared by a qualified agency, such as a habitat conservation plan, a natural areas inventory, green infrastructure plan, etc., that includes the property to be credited, or

(ii) A memo or letter signed by a professional in a natural science such as botany, biology, forestry, or landscape architecture. The sample natural floodplain functions form shown in Figure 420-2 can also be used.

(iii) [For NFOS5] A copy or photograph of the educational material is sufficient.

(b) [For NFOS2] A copy of the plan and the resolution or other formal adoption action. This is not needed if the plan is submitted for NFP credit under Activity 510 (Floodplain Management Planning).

(c) The impact adjustment map used for OSP credit, with "NFOS#" marked on the qualifying areas.

The ISO/CRS Specialist may visit a sample of the sites to verify that they meet the element's credit criteria.

Natural Floodplain Functions Form	
Property name	Pettaway County Park
Property location	1 mile northeast of Frenchford, on the Pettaway River
Summary of the habitat or natural benefits provided at this property	Pettaway Park was created in 1954 in order to protect the area from the booming logging industry. The area has never been developed or farmed. It lies at the headwaters of the Pettaway River and consists of bottomlands, ravines, white-oak forest interspersed with marsh and meadows. It is a stop on the Mississippi Flyway for migrating birds, including sandhill cranes. In 2002, a white winged wood duck (*Cairina scutulata*), an endangered species, was spotted in the park. The park's Nature Center houses a variety of exhibits, nature displays, maps, photographic studies, and a research library. The Nature Center also offers a variety of nature-oriented programs for families and adults such as owl prowls and astronomy programs.
Name of person completing this form	Jonathon Richards, ASLA
Signature	*Jonathon Richards*
Degree or other qualifications	Bachelor of arts from Wall State University in landscape architecture, 1990. Registered landscape architect. Planner and then Director of natural area programs for Delaware County since 1994.

Figure 420-2. An example of a form to inventory natural floodplain functions.

422.d. Special flood-related hazards open space (SHOS)

The maximum credit f in Section 423, Credit Calculation, or this element is 50 points.

Credit for open space preservation and low-density zoning in areas subject to special flood-related hazards is described in the appropriate CRS publications on special flood-related hazards (see Appendix C to order copies). The credit points, cSHOS, are then transferred to this activity. The publications are

- *CRS Credit for Management of Coastal Erosion Hazards,*
- *CRS Credit for Management of Tsunami Hazards,* and
- *Special Flood-related Hazards Supplement to the CRS Coordinator's Manual.*

The *Special Flood-related Hazards Supplement* covers credit for the inland hazards of uncertain flow paths (alluvial fans, moveable bed streams, channel migration), closed basin lakes, ice jams, land subsidence, and mudflows.

Credit Criteria

(1) All parcels to be credited for SHOS must first qualify for OSP or LZ credit.

(2) The community's special flood-related hazards credits must meet the credit criteria described in the separate publications on those hazards. The special hazard must be mapped and the area must be subject to development regulations that will help protect future development from damage from that hazard, or meet other criteria specified in the separate supplement.

Credit Points

The credit points for open space preservation and low-density zoning in areas subject to the different special flood-related hazards are detailed in the separate publications.

Impact Adjustment

The impact adjustments for open space preservation and low-density zoning in areas subject to the different special flood-related hazards are detailed in the separate publications.

Documentation Provided by the Community

The documentation needed for crediting open space preservation and low-density zoning in areas subject to the different special flood-related hazards is detailed in the separate publications.

422.e. Open space incentives (OSI)

The maximum credit for this element is 250 points.

Most communities have undeveloped areas that are not preserved as open space through one of the means recognized under OSP. The CRS recognizes that there are many tools that can encourage the owners to keep the floodplain open when a site is developed. These can include

- Density transfers,
- Transfers of development rights (TDRs),
- Bonuses for avoiding the floodplain or other sensitive areas,
- Planned unit developments (PUDs),
- Cluster development,
- Greenway and setback rules, and
- Open space ratio credits for open space in the floodplain.

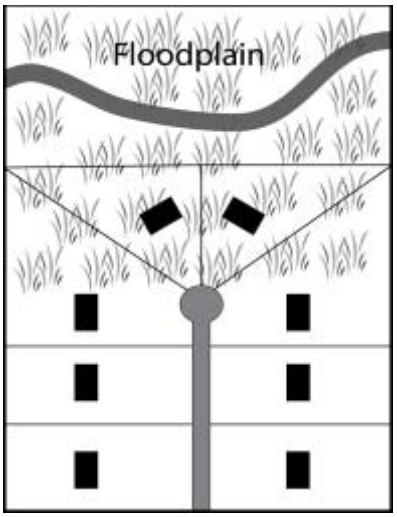
The end results of these different approaches are similar. Examples are shown in Figure 420-3.

A community can receive OSI credit for regulations that encourage developers to set aside flood-prone areas as flowage easements and then, once a parcel is appropriately deeded, the community can receive credit under OSP (or possibly DR) for that site.

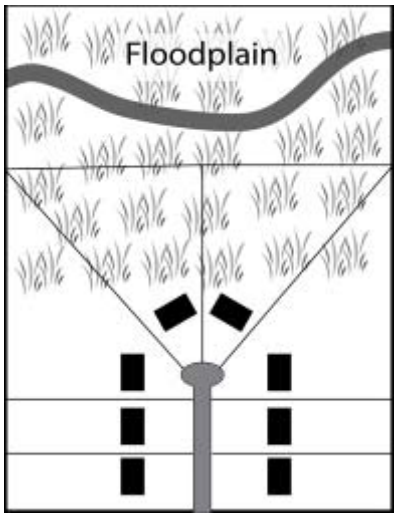
These regulations do not have to be enacted for floodplain management purposes. Many communities have adopted them for farmland preservation, protection of sensitive areas, and even for economic reasons. For example, developments such as the example cluster plan in Figure 420-3 have shorter streets, resulting in lower maintenance, cleaning, and snow plowing costs for the community.

If a community's program uses an approach to minimize development or disturbance in the floodplain that is not described here, it should be submitted for scoring in accordance with Section 113.d.

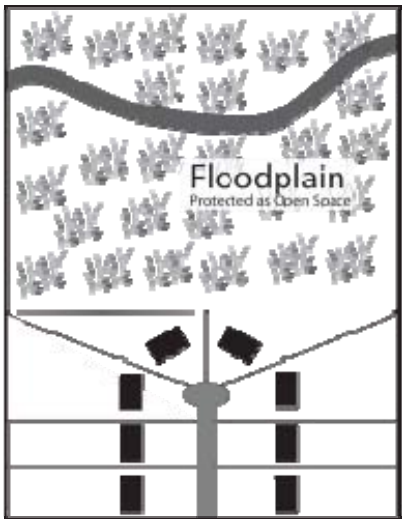
Most of the regulations credited for OSI address subdivisions and larger developments, where the developer has the option of leaving some of the land vacant. If a community's regulatory program effectively prohibits all new buildings from the floodplain, the community should apply for open space preservation credit under OSP.



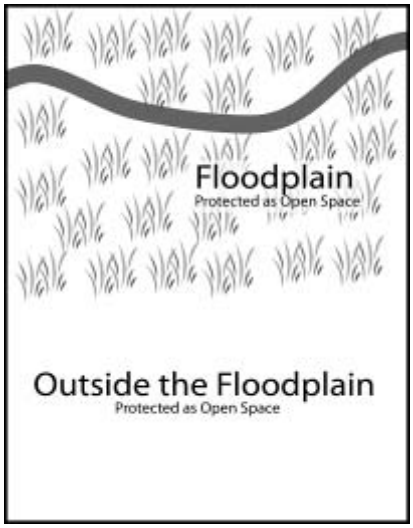
Traditional approach: Some new lots and house sites are within the regulatory floodplain.



Building protection: All buildings are on high ground, outside of the regulatory floodplain. Portions of some lots are within the floodplain and therefore still may be subject to development, filling, and grading that reduce natural floodplain functions and increase flood risk.



Clustering: All buildings and lots are clustered outside of the regulatory floodplain. The development has the same density as the first two graphics, but with smaller lot sizes. All of the land in the regulatory floodplain is preserved as open space.



Transfer of development rights: The community provides the developer an incentive to dedicate the entire parcel for open space, such as allowing a higher density development at another location, well away from the flood hazard area.

Figure 420-3. Alternative ways to develop a property that is partially flood-prone.

Credit Criteria

(1) OSI1: Credit is provided if the regulations set aside all of the regulatory floodplain in a subdivision as open space (such as drainage or flowage easements or back yards) or otherwise keep them free from development. Regulations that meet OSI1 criteria do not qualify for OSP credit, because building still could take place on unsubdivided flood-prone lands could still be built on. However, after a subdivision's final plat is recorded, the areas set aside could qualify for OSP credit.

Some variations to this credit include

- The credit can be prorated if smaller areas are set aside.
- If the community requires that 50% of the floodplain be kept open, then 50% of the credit is provided.
- If the requirement is limited to one or two zoning districts, the credit can be prorated accordingly.

(2) OSI2: Credit is provided if the regulations require that each lot in a new subdivision provide a building site that is on natural high ground, out of the regulatory floodplain. This credit is not provided if filling the floodplain (or cutting and filling) is allowed to meet the building site requirement or if a Letter of Map Revision based on Fill (LOMR-F) is required.

Example 422.e-1.

Ordinance language might read:

> If a parcel has a buildable site outside the Regulatory Floodplain, it shall not be subdivided to create a new lot, tract, or parcel with a building site plan that does not have a buildable site outside the Regulatory Floodplain. This provision does not apply to lots set aside from development and preserved as open space.

(3) OSI3: Credit is provided if the regulations state that TO THE EXTENT POSSIBLE, each lot in a new subdivision must provide a building site that is on natural high ground, out of the regulatory floodplain. If a lot does not have a buildable site out of the regulatory floodplain, all new structures, pavement, and other development must be sited where they have the least impact on habitat. This can be done by locating the structures as far from the water body as possible or placing the structures on the highest land on the lot.

(4) OSI4: Credit is provided if the regulations include transfer of development rights language or a density bonus to encourage staying away from the floodplain. Fewer points are provided for transfer of development rights or a density bonus within the same development.

Example 422.e-2.

Ordinance language might read:

> The proposed subdivision should have one or more new lots in the Regulatory Floodplain set aside for open space use through deed restriction, easement, subdivision covenant, or donation to a public agency. The density of the development in the portion of the development outside the Regulatory Floodplain may be increased to compensate for the amount of land in the Regulatory Floodplain preserved as open space in accordance with _____(section of the community's zoning or other development ordinance that allows PUDs and/or transfers of development rights).

(5) OSI5: Credit is provided for regulations that allow cluster development through a planned unit development (PUD) or otherwise.

(6) OSI6: Credit is provided for a program that provides tax incentives to keep land open, such as keeping farmland tax rates low when the owner signs an agreement to not develop it or not to sell it for development. If the program results in permanent preservation of open space, each qualifying parcel should be credited under OSP and, if appropriate, DR.

(7) OSI7: Credit is provided if the community's land use plan recommends open space use or low-density development of flood-prone areas.

Credit Points

OSI1 = 250 points, for regulations that set aside all of the regulatory floodplain in a subdivision as open space

OSI2 = 150 points, for regulations that REQUIRE each lot in a new subdivision to provide a building site that is on natural high ground, out of the regulatory floodplain

OSI3 = 65 points, for regulations that require that, TO THE EXTENT POSSIBLE, each lot in a new subdivision provide a building site that is on natural high ground, out of the regulatory floodplain, or that otherwise does not adversely affect natural floodplain functions

OSI4 = 70 points, for having regulations that provide for transfers of development rights or density bonuses to encourage staying out of the regulatory floodplain. This credit can be up to 50 points if the bonus allows increased density within the same development

OSI5 = 25 points, for regulations that allow cluster development through PUDs or other means

OSI6 = 25 points, for a program that provides tax incentives to keep land open

OSI7 = 10 points, if the community's land use plan recommends open space use or low-density development of flood-prone areas

Impact Adjustment

OSI credit is adjusted based on the ratio of the area affected by the OSI regulation to the area of the SFHA.

(1) The areas covered by the regulation(s) need to be marked on the impact adjustment map prepared for OSP.

(2) The first four sub-elements (OSI1 through OSI4) are mutually exclusive. That is, a community can only receive one of these credits for an area. However, a community could receive credit for one of these four plus OSI5, OSI6, and/or OSI7 in the same area.

(3) There is no impact adjustment for OSI7.

$$rOSI\# = \frac{aOSI\#}{aSFHA}, \text{ where}$$

aOSI# = the size of the area(s) that qualify for OSI# credit (aOSI1 is the size of the area that qualifies for OSI1 credit, etc.), and

aSFHA = the size of the community's SFHA shown on its FIRM

Note that aOSI cannot include areas that are developed or are credited under OSP.

Example 422.e-3.

A coastal county's OSI4 regulations allowing the transfer of development rights only affect inland riverine floodplains. This area is

calculated to be 14.64 square miles. The total area of the County's SFHA is 17.42 square miles.

$$rOSI4 = \frac{aOSI4}{aSFHA} = \frac{14.64}{17.42} = 0.84$$

If the county receives credit for a provision under OSI5 or OSI6, the impact adjustment is calculated separately.

Example 422.e-4.

South Scottsdale has a provision to transfer development rights in order to preserve natural, sensitive, and flood-prone areas. This provision proved very successful when developable land was set aside as the South Scottsdale Country Club (see Examples 422.a-3 and 422.b-1).

OSI4 = 70

The City's code also authorizes cluster development.

OSI5 = 25

The city's comprehensive plan calls for preserving all flood-prone areas as open space, to the extent possible with a minimum of City funding.

OSI7 = 10

The application of OSI4 and OSI5 is limited to undeveloped lands that are not already preserved as open space. There are only two such areas left in South Scottsdale—the floodplain for Tributary A and the southern portion of Tributary B's floodplain. They are so marked on the impact adjustment map in Figure 420-1.

Area of Tributary A floodplain: 68.9 acres

Area of south part of Tributary B floodplain: 19.8 acres

aOSI4 = aOSI5 = 68.9 + 19.8 = 88.7 acres

aSFHA = 504.4 acres (see Figure 410-5)

$$rOSI4 = \frac{aOSI4}{aSFHA} = \frac{88.7}{504.4} = 0.18$$

$$rOSI5 = \frac{aOSI5}{aSFHA} = \frac{88.7}{504.4} = 0.18$$

According to Section 423, Credit Calculation, the values for OSI4 and OSI5 are multiplied by their ratios, 0.18.

There is no impact adjustment for OSI7.

Documentation Provided by the Community

(1) At each verification visit,

(a) For each regulatory requirement, the ordinance language. See also Section 231.c on submitting ordinance language as documentation.

(b) The impact adjustment map used for OSP credit, with "OSI" marked on the qualifying areas. It must show areas that are currently vacant and areas that are credited for open space preservation (OSP).

(c) For extra credit for regulating flood-prone areas outside the SFHA, documentation showing that floodplain regulations are in effect in these areas.

(d) During the verification visit, the ISO/CRS Specialist will need to see site plans and final plats that will document how the regulation has been applied.

The ISO/CRS Specialist may visit a sample of new developments to verify that they have been constructed in accordance with the approved plans.

422.f. Low-density zoning (LZ)

The maximum credit for this element is 600 points. There is additional credit for low-density zoning in areas subject to special flood-related hazards, as explained in Section 422.d.

Credit is provided for zoning areas of the regulatory floodplain to keep them substantially open. Zoning an area for agriculture, conservation, or large residential lots preserves more open space than allowing more intensive development.

LZ credit is available for undeveloped land within low-density zoning districts, as well as for areas developed in accordance with the density requirements within the regulatory floodplain. "Low-density" means that that size of the lots is at least 5 acres. For this element, it does not matter why an area is zoned for low density; what counts is the minimum lot size and lot coverage allowed in the zoning district.

The credit for low-density zoning is based upon the traditional zoning approach of setting minimum lot sizes for different zoning districts. The bigger the lot size, the less dense the floodplain development and the more credit provided. The credit also factors in lot coverage for non-residential zones.

Credit Criteria

(1) The community must have a zoning ordinance that identifies different development criteria and densities for different areas. Other types of regulations are not credited. For example, a health ordinance that requires a minimum lot size to accommodate a septic field is not credited. The area may be developed to a higher density if a sanitary sewer is installed in the future.

(2) The lands to be credited for LZ must not qualify for OSP credit.

Credit Points

LZ = up to 600 points, for zoning regulations

LZ#s = 60 points x s, where

s = the minimum lot size in acres

(1) For the credit calculation, density is measured in terms of acres per building. A zoning district with a minimum lot size of 5 acres allows a density of 5 acres per building. For this area, s = 5, and the area would be designated "LZ#5" on the impact adjustment map used for OSP credit.

"s" may have any value from 5.0 to 10.0. The highest allowable density is a five-acre lot (s = 5.0), and minimum lot sizes larger than 10 acres are credited as 10 acres (s = 10.0).

Example 422.f-1.

In a "rural estates" zoning district, the density is one unit per 5 acres.

s = 5, LZ#5 = 60 x 5 = 300 points (before the impact adjustment)

(2) For residential zones, density is based on the minimum lot size for one unit. Where multi-family residential buildings are allowed, "s" is based on the number of units allowed per parcel. For example, if duplexes are allowed in a district with a minimum lot size of 10 acres, the density is credited as one unit per 5 acres, or s = 5.0.

(3) For non-residential zones, density is also based on the lot coverage allowed. For five-acre lots, the maximum allowable lot coverage credited is 10%. For 10-acre or larger lots, the maximum allowable lot coverage credited is 5%. Credited lot coverage is prorated for other lot sizes.

(4) Different zoning districts with the same density requirement can be counted together as one LZ#s.

(5) Where minimum lot sizes are in units other than acres, they must be converted to acres to calculate the credit for this element.

Impact Adjustment

LZ credit is adjusted based on the ratio of the area affected by the zoning district within the regulatory floodplain to the area of the SFHA. The areas covered by each low-density zoning district need to be marked on the impact adjustment map prepared for OSP. Note that all areas for which LZ credit is requested must not qualify for OSP credit.

rLZ # = $\frac{\text{aLZ\#}}{\text{aSFHA}}$, where

aLZ# = the size of the area(s) that qualify for LZ# credit within the regulatory floodplain (aLZ#5 is the size of the area that qualifies for LZ#5 credit, etc.), and

aSFHA = the size of the community's SFHA shown on its FIRM

Note that aLZ cannot include areas credited under OSP

Documentation Provided by the Community

(1) At each verification visit,

(a) For each LZ value, the zoning ordinance language that explains the density requirement.

(b) The impact adjustment map used for OSP credit, with "LZ#" marked on the qualifying areas. It must show the areas to be credited for LZ, areas that are credited for open space preservation (OSP), and the SFHA. Only the portion that covers the SFHA is needed.

(c) For extra credit for low-density zoning in flood-prone areas outside the SFHA, documentation showing that floodplain regulations are in effect in these areas.

The ISO/CRS Specialist may visit a sample of new developments to verify that they have been developed in accordance with the required density.

422.g. Natural shoreline protection (NSP)

The maximum credit for this element is 120 points.

Natural channels and shorelines are the areas most valuable for protecting natural floodplain functions. They are important places for aquatic and riparian habitat. NSP credit is for allowing these areas to follow their natural processes, such as channel meandering and beach erosion, and to encourage natural shorelines that provide water quality benefits for runoff.

Note that a setback or buffer that prohibits buildings and filling can also qualify as OSP, subject to the OSP impact adjustment. The larger the buffer zone, the greater the OSP credit.

Two types of programs are credited in NSP.

(1) Programs to protect channels and shorelines in their natural state. These include

- Regulations that govern development and construction, such as an ordinance or regulation that governs public and private construction activities; and

- Local policies followed on public lands, such as a written community policy that covers shorelines in city parks.

Protection credit is only available for channels or shorelines that are currently in their approximate natural state, i.e., there is no concrete, rip rap, levees, armoring, beach nourishment, dams, or other human intervention that constrains the natural processes of the shoreline of the river, stream, lake, or ocean.

(2) Programs that restore channels or shorelines to their approximate natural state or to a state that supports natural floodplain functions. Examples of the latter would be a "soft" or "green" bank stabilization project for a stream channel. Regulations to require restoration activities, such as mandating that a developer set aside a habitat corridor, are credited under OSI.

Credit Criteria

(1) The regulation or program to protect natural shorelines must prohibit

- In channels and channel banks in riverine areas: Rip rap or armoring, channel alterations, dredging, filling, grubbing, and removal of vegetation; and
- On shorelines of lakes or oceans: Filling or other alterations to a beach, including beach nourishment projects; alterations to sand dunes; and construction of seawalls, bulkheads, armoring, or other shoreline stabilization structures.

(2) The regulation or program may allow human alterations that benefit natural floodplain functions, such as removing a levee, restoring habitat, reducing bank erosion with bio-engineering techniques, or planting to preserve sand dunes, provided that the projects do not prevent channel or shoreline movement or reduce other natural floodplain functions.

Credit Points

NSP = up to 120 points, based on the length of the community's shorelines that are affected by the natural shoreline protection regulations or programs

Impact Adjustment

(1) The impact adjustment is not related to the areas of the SFHA or channels in the SFHA. It is based on the length of protected shorelines divided by the total length of all the shorelines in the community. A channel has two shorelines, one on each side. It is possible that only one side would qualify for NSP credit, so they are measured and counted separately.

(2) Credit is provided in developed areas, undeveloped areas, and areas credited as preserved open space (OSP). Communities are encouraged to take steps to protect shorelines in parks and other public lands. Credit is provided even if the only creditable activity is a community policy for parks and other public lands.

(3) The community must prepare an impact adjustment map showing all streams, ditches, and ocean or lake shorelines in the community. The length of these features is the value for aSL. Armored or concrete channels, manmade ditches, hardened shorelines, etc., are counted toward aSL, but not toward aNSP.

The map must be consistent with the impact adjustment map used for channel debris removal (CDR) under Activity 540 (Drainage System Maintenance). Unlike the map for CDR, however, the impact adjustment map prepared for NSP must show all streams in both developed and undeveloped areas.

$$rNSP = \frac{aNSP}{aSL}, \text{ where}$$

aNSP = the length of shoreline affected by the program, and

aSL = the total length of shoreline in the community's SFHA

If less than 10% of all the community's shorelines are affected by the regulations or programs or the community does not prepare an impact adjustment map, the value of rNSP = 0.1 can be used.

Documentation Provided by the Community

(1) At each verification visit,

(a) [For credit for protection of natural shorelines] A copy of the regulations or policy on which the credit is based.

(b) [For restoration credit] A description of the restoration program or projects.

(c) An impact adjustment map (not needed if the community is using the optional minimum impact adjustment value of 0.1).

The ISO/CRS Specialist may visit a sample of shoreline sites to verify that they qualify for the credit.

423 Credit Calculation

c420 = (OSP x rOSP) + (DR x rDR) + cNFOS +
cSHOS + cOSI + cLZ + (NSP x rNSP), where

cNFOS = (NFOS1 x rNFOS1) + (NFOS2 x rNFOS2) +
(NFOS3 x rNFOS3) + (NFOS4 x rNFOS4) +
(NFOS5 x rNFOS5), and

cOSI = (OSI1 x rOSI1) + (OSI2 x rOSI2) + (OSI3 x rOSI3) +
(OSI4 x rOSI4) + (OSI5 x rOSI5) +
(OSI6 x rOSI6) + OSI7, and

cLZ = ∑(LZ#s x rLZ#s)

Example 423-1.

South Scottsdale calculates its credit for Activity 420.

OSP = 1,540 rOSP = 0.48

DR = 50 rDR = 0. 11

OSI4 = 70 rOSI4 = 0.18

OSI5 = 25 rOSI5 = 0.18

OSI7 = 10

cOSI = (OSI4 x rOSI4) + (OSI5 x rOSI5) + OSI7
= (70 x 0.18) + (25 x 0.18) + 10 = 12.6 + 4.5 + 10
= 27.1

cSHOS = 0, cLZ = 0, cNSP = 0

c420 = (OSP x rOSP) + (DR x rDR) + cNFOS + cSHOS + cOSI +
cLZ (NSP x rNSP)

c420 = (1,450 x 0.48) + (50 x 0.11) + 0 + 0 + 27.1 + 0 + 0
= 696.0 + 5.5 + 27.1 = 728.6

This is rounded to the nearest whole number. c420 = 729

424 For More Information

a. Additional information, reference materials, and examples can be found at www.CRSresources.org.

b. Additional credit for open space in special hazard areas and coastal areas is discussed in the appropriate publications. These free publications are needed to apply for CRS credit for managing special flood-related hazards. See Appendix C or www.CRSresources.org.

Special Flood-related Hazards Supplement to the CRS Coordinator's Manual

CRS Credit for Management of Coastal Erosion Hazards

CRS Credit for Management of Tsunami Hazards.

c. More information on planning and regulatory techniques to preserve floodplain open space can be found in *Subdivision Design in Flood Hazard Areas*, Planning Advisory Service Report #473. Copies can be ordered for $32 ($16 for APA members) from the American Planning Association's website at www.planning.org/apastore/.

425 Related Activities under the Community Rating System

- Activity 320 (Map Information Service) credits providing information about natural and sensitive areas (MI7) and Activity 440 (Flood Data Maintenance) credits having a data base or GIS layer of such areas. These should include the areas credited for NFOS.
- The credit for educational materials for natural areas (NFOS5) is higher if the materials are included in a Program for Public Information credited under Activity 330 (Outreach Projects).
- Activity 410 (Floodplain Mapping) provides credit for regulating areas outside the SFHA. If such areas include parks or other qualifying preserved open space, those areas can be credited in this activity.
- The first element under Activity 430 (Higher Regulatory Standards), development limitations (DL), provides credit for regulations that prohibit filling, buildings, and/or storage of materials. If a community's regulations do not qualify for OSP, they may qualify for DL credit.
- A prerequisite for Activity 520 (Acquisition and Relocation) credit is that the property that has been cleared must meet the OSP criteria for preserved open space. All such properties should receive OSP credit. If the properties were cleared with FEMA mitigation funds, they should also qualify for deed restriction (DR) credit. Many other federal and state funding programs have similar deed restriction requirements.

430 Higher Regulatory Standards—Summary

Maximum credit: 2,042 points

Credit for FRB, FDN, ENL, and CAZ are not counted toward this total because those elements and DL credit are mutually exclusive.

432 Elements

a. **Development limitations (DL)**: Up to 1,330 points for prohibiting fill, buildings, and/or storage of materials in the SFHA.
b. **Freeboard (FRB):** Up to 500 points for a freeboard requirement.
c. **Foundation protection (FDN)**: Up to 80 points for engineered foundations.
d. **Cumulative substantial improvements (CSI)**: Up to 90 points for counting improvements cumulatively.
e. **Lower substantial improvements (LSI)**: Up to 20 points for a substantial improvement threshold lower than 50%.
f. **Protection of critical facilities (PCF):** Up to 80 points for protecting facilities that are critical to the community.
g. **Enclosure limits (ENL)**: 240 points for prohibiting first-floor enclosures.
h. **Building code (BC)**: Up to 100 points for adopting and enforcing the International Code Series.
i. **Local drainage protection (LDP)**: Up to 120 points for ensuring that new buildings are protected from shallow flooding.
j. **Manufactured home parks (MHP)**: Up to 15 points for removing the elevation exemption for manufactured homes placed in existing manufactured home parks.
k. **Coastal A Zones (CAZ)**: Up to 650 points for enforcing V-Zone rules and/or ENL enclosure limits inland from the V-Zone boundary.
l. **Special flood-related hazards regulations (SHR)**: Up to 100 points for enforcing appropriate construction standards in areas subject to a special flood-related hazard.
m. **Other higher standard (OHS)**: Up to 100 points for other regulations.
n. **State-mandated regulatory standards (SMS)**: Up to 20 bonus points if a regulatory standard is required by the state.
o. **Regulations administration (RA)**: Up to 67 points for having trained staff and administrative procedures that meet specified standards.

Credit Criteria

Credit criteria for this activity are described in Section 431.b. Each element has additional criteria specific to that element.

Impact Adjustment

There is no impact adjustment for BC, LDP, MHP, SMS, or RA. The credit for all other elements is adjusted and explained in Section 431.c. For some elements, additional details are described in separate sections.

Documentation Provided by the Community

Each element has a separate section describing needed documentation.

430 HIGHER REGULATORY STANDARDS

The OBJECTIVE of this activity is to credit regulations to protect existing and future development and natural floodplain functions that exceed the minimum criteria of the National Flood Insurance Program (NFIP).

431 Background

Current NFIP standards for regulation of development in riverine areas require that new residential buildings in the Special Flood Hazard Area (SFHA) have their lowest floor at or above the base flood elevation. Non-residential buildings may be floodproofed to the base flood elevation. NFIP coastal rules require that new buildings be above the base flood elevation and, in V (velocity) Zones, be built on engineered piles or columns. If an existing building is improved or reconstructed and the value of the project exceeds 50% of the building's value, the building must be brought up to the same standards applied to new construction.

A separate publication, *CRS Credit for Higher Regulatory Standards*, provides additional information on the elements credited here, including example ordinance language and documentation. Communities are encouraged to obtain and read the document before applying for this activity.

To order a free copy, see Appendix C or www.CRSresources.org/400.

Although the NFIP minimum standards provide a great deal of flood protection, damage can still result for many reasons:

- Estimates of flood heights are subject to various errors and may be low, especially in areas without long-term flood and rainfall records;
- Buildings may be damaged by floods that exceed the predicted 100-year flood;
- Urbanization and other changes in the watershed can increase the flood hazard and flood frequency;
- Filling and other development in the floodplain can reduce storage and conveyance capacity; and
- Filling and construction practices can damage or destroy valuable natural floodplain functions.

For these reasons, and the fact that local situations vary, many communities adopt development standards that are higher than or supplement the minimum NFIP criteria. This activity provides credit for those regulatory standards.

431.a. Activity Description

Under this activity, numerous higher regulatory approaches are credited that provide more protection to new development, redevelopment, and existing development. Examples of higher standards and the benefits that they can provide include

- Prohibiting fill and other ground-altering measures can protect existing development and habitat, improve water quality, and maintain the flood attenuating benefits of natural areas (credited under DL1a);
- Requiring compensatory storage preserves areas of the floodplain that can store flood water and minimizes increases in flood heights due to development (credited under DL1b);
- Requiring the lowest floors of residences to be higher than the base flood elevation protects buildings from higher floods (credited under FRB);
- Protecting foundations reduces damage that results from scour and settling (credited under FDN);
- Requiring full compliance with floodplain management regulations when proposed improvements or repairs are less than 50% of a building's value brings more nonconforming buildings up to current flood protection standards (credited under CSI and LSI);
- Protecting critical facilities to higher levels reduces damage to those facilities and improves the community's ability to respond to the needs of citizens during a disaster (credited under PCF);
- Adopting and enforcing a building code improves the quality of construction of new buildings and provides more staff support for floodplain management regulations (credited under BC);
- Standards for protecting buildings from local drainage problems reduce flood losses and flood insurance claims, especially outside the floodplain (credited under LDP);
- Requiring new manufactured housing in existing manufactured housing parks to meet the same level of protection as is required for other new buildings reduces flood losses and flood insurance claims (credited under MHP);
- Requiring new construction in the coastal A Zone to meet the same standards as V-Zone buildings protects it from a known, but unmapped, breaking wave hazard (credited under CAZ);
- Adopting and enforcing construction rules tailored to special flood-related hazards, such as coastal erosion and alluvial fan flooding, provides protection in ways that the NFIP's national minimum criteria cannot do (credited under SHR); and
- Having Certified Floodplain Managers (CFM®) and high-quality administrative procedures and inspections can reduce errors and minimize problems during construction (credited under RA).

The element OHS (other higher standards), provides credit for regulations not listed in this or other activities. As noted in Section 113.d, communities are invited and encouraged to submit other regulatory provisions that are not part of the NFIP's minimum criteria and/or alternative approaches to the credits listed here.

NOTE: *A community should not amend its ordinances solely to earn Community Rating System (CRS) credit points, nor should it necessarily adopt the examples used in the* ***CRS Coordinator's Manual****. Ordinance language should be carefully written to support the community's own goals and the purposes of its regulatory program. All such language should be reviewed by the community's legal counsel before it is adopted.*

431.b. Activity Credit Criteria

For all the elements except RA (regulations administration, Section 431.o), the community must provide a legally enforceable regulation. In most cases, this will be in the form of an ordinance adopted by the community's governing body.

(1) Regulations adopted by a county, regional agency, or state that are enforced within the community can be credited. Their implementation is verified in the same manner as a community regulation and it is expected that the community will assist in the verification. See also Section 231.d on uniform minimum credit.

(2) Regulations must have the force of law and meet the requirement of Section 231.b.

(3) If the legal authority for the regulatory language is not clear, the ISO/CRS Specialist may request a letter from the community's legal counsel that confirms that he/she will defend the regulation in court if it is challenged.

(4) For CRS credit, the regulatory language must be adopted and in full force at the time CRS credit is requested, e.g., at the verification visit.

(5) Credit for any element is prorated if the sampling done during verification finds instances in which the element is not fully implemented. It does not matter why it is not fully implemented. For example, if a review of Elevation Certificates finds that some new buildings did not have the required freeboard because of legally issued variances, the credit is still prorated.

See also Section 231 on documentation of regulations for CRS credit.

431.c. Activity Impact Adjustment

Impact adjustment ratios are part of the calculations for all elements in Activity 430 except BC, LDP, MHP, SMS, and RA. They are explained in Sections 402–403.

(1) An impact adjustment map must be prepared when

  (a) The acreage or square mileage of the areas qualifying for Activity 430 credit needs to be determined for the impact adjustment ratio, or

(b) The regulations are enforced outside the SFHA so that the impact adjustment ratio can be greater than 1.0. If the impact adjustment ratio is greater than 1.0, the community will receive more points than the maximum listed for the element. The maximum ratio for this is 1.5 (i.e., the area regulated is 50% (or more) larger than the SFHA).

(2) The areas affected by the regulation(s) must be marked on an impact adjustment map. Marking each area with the appropriate acronym is a convenient shorthand. Section 402 has additional information about determining impact adjustments for areas.

(3) Areas to be credited for a higher regulatory standard must not include areas preserved as open space (OSP) in Activity 420 (Open Space Preservation). Therefore, OSP credited areas must be shown on the impact adjustment map used for Activity 430. There is no Activity 430 credit for higher standards for fill or buildings in areas where fill and buildings are not allowed (i.e., areas preserved as open space). This is explained in Section 402.c.

(4) An impact adjustment map does not need to be prepared when a regulatory standard is enforced throughout the entire SFHA. The impact adjustment ratio in that case is 1.0. However, the community must be certain that a regulation is enforced throughout the regulatory floodplain. For example, the ordinance may say that all new buildings must be built to a freeboard level, but that rule may only apply in flood zones where a base flood elevation is provided. In such cases, an impact adjustment map would be needed to delineate and calculate the areas affected by the freeboard standard.

(5) An impact adjustment map does not need to be prepared when a regulatory standard is enforced throughout the entire SFHA, but the community is receiving credit for preserving open space (OSP) in Activity 420 (Open Space Preservation). If the only adjustment to the impact of an element is for OSP, the impact adjustment ratio for the 430 element is the complement of the impact adjustment for OSP.

Example 431.c-1.

A community has 22% of its SFHA preserved as open space. rOSP = 0.22. The community enforces its freeboard requirement throughout the rest of the SFHA.

$$rFRB = 1 - rOSP = 1 - 0.22 = 0.78$$

There is no need for a separate impact adjustment map for Activity 430 in this instance.

(6) If less than 10% of the community's SFHA is affected by the regulations or if the community does not prepare an impact adjustment map, an impact adjustment ratio of 0.1 can be used (up to 0.5 for CAZ).

Sections 402–403 provide guidance on impact adjustments and impact adjustment maps. Additional criteria and clarifications may be included under each activity's impact adjustment section.

The community's aSFHA should be reviewed and updated each year for the Program Data Table that is included in the annual recertification (see Section 213.a).

431.d. Activity Documentation Provided by the Community

Most elements in this activity have the same documentation needs at the verification visit:

(1) The state or local law or ordinance language that adopts the regulatory standard. See also Sections 231.b and 231.c on documenting regulatory language.

(2) The impact adjustment map. See Section 431.c.

(3) [For credit for regulating flood-prone areas outside the SFHA] Documentation that shows that regulations are in effect outside the SFHA (i.e., the regulatory floodplain).

(4) Development plans and/or permit records that document how the regulation has been applied.

The ISO/CRS Specialist may visit a sample of sites in the field to verify that the land has been developed and/or buildings have been constructed in accordance with the approved plans.

Some elements have additional or different documentation requirements, as noted in the separate documentation sections, below.

432 Elements

432.a. Development limitations (DL)

The maximum credit for this element is 1,330 points.

This element has three parts, crediting different aspects of the regulation of floodplain development:

(1) Prohibition of fill (DL1) (maximum credit: 280 points). The use of fill to elevate buildings has advantages that make it desirable for developers and homeowners. However, there are problems with using fill: it reduces floodplain storage capacity and it has an adverse impact on native vegetation, wetlands, drainage, and water quality.

All of the benefits of using fill accrue to the developer and to the property owner. Conversely, all of the problems accrue to neighbors, taxpayers, the community, the NFIP, or the environment. Because filling is therefore not a desirable floodplain management activity, this element credits communities that prohibit fill.

One method to offset the impacts of the use of fill is to require compensatory storage, but compensatory storage does not compensate for the adverse impact on other natural floodplain functions. Therefore, it is worth approximately half the credit. This credit is for regulations that require new developments to provide compensatory storage at hydraulically equivalent sites up to a ratio of 1.5 to 1.

(2) Prohibition of buildings (DL2) (maximum credit: 1,000 points). If the regulations prohibit only certain types of buildings, such as residences, the points can be prorated.

(3) Prohibition of outdoor storage of materials (DL3) (maximum credit: 50 points). Credit can be received under three sub-elements:

(a) Prohibition of all materials (DL3a): Full credit for DL3 is for prohibiting outdoor storage of all materials in the SFHA.

(b) Prohibition of hazardous materials (DL3b): Partial credit is provided if only hazardous materials are prohibited (indoors or outdoors).

(c) Storage of hazardous materials (DL3c): Credit is provided if hazardous materials are allowed to be stored indoors in the floodplain, but must be elevated above the base flood elevation.

If all three items (DL1, DL2, and DL3) are included in the community's regulations and there are still vacant areas in the regulatory floodplain, those areas would be effectively preserved as open space. The community should submit those areas for the higher credit for OSP in Activity 420 (Open Space Preservation). See Section 422.a(3)(c).

These regulations have their full impact in undeveloped areas. Therefore, the impact adjustment map must identify areas credited for open space preservation (OSP) and areas that are undeveloped, i.e., where there are no buildings on the parcels or the area is zoned for conservation or agriculture with a minimum lot size of 10 acres or larger.

Credit Criteria

(1) Prohibition of fill (DL1):

(a) Prohibition of all fill (DL1a): This credit is for prohibiting all filling in the regulatory floodplain.

This includes not approving Conditional Letters or Letters of Map Revision based on Fill (CLOMR-F or LOMR-F). When a CLOMR-F or LOMR-F is applied for, the community is required by the Federal Emergency Management Agency (FEMA) to sign a Community Acknowledgment Form that states, in part, "the completed or proposed project meets or is designed to meet all of the community floodplain management requirements . . ." If a CLOMR-F or LOMR-F is issued for a property in the community, then DL1 credit will be denied. This applies to CLOMRs and LOMRs that include filling as part of the reason for requesting a map change.

Filling may be allowed where needed to protect or restore natural floodplain functions, such as a part of a channel restoration project.

The following regulatory approaches do not warrant credit for DL1:

- Regulations that prohibit loss of storage only if it adversely affects flood heights on other properties. This credit is for prohibiting all filling, particularly because of its adverse effect on natural floodplain functions.
- Subdivision regulations that do not apply to all new development.
- Regulations that apply to buildings or private development, but not to bridges, highways, parking lots, and other floodplain uses.
- The standard NFIP language that prohibits increases in flood heights in floodways. That standard does not prohibit fill—it allows filling that can be shown by an engineering study not to increase flood levels. It reads

> Prohibit encroachments, including fill, new construction, substantial improvements and other developments unless certification (with supporting technical data) by a registered professional engineer is provided demonstrating that encroachments shall not result in any increase in flood levels during occurrence of the base flood discharge; . . .

(b) Compensatory storage (DL1b): This credit is for regulations that require new development to provide compensatory storage at hydraulically equivalent sites up to a ratio of 1.5:1. Credit is not provided for

- Compensatory storage requirements in floodways only or in V Zones only, or
- Stormwater management regulations that require a developer to compensate for any increase in runoff created by the development.

(2) Prohibition of buildings (DL2): Full credit for DL2 is for prohibiting all new buildings in the SFHA. If the regulations only prohibit certain types of buildings, such as residences, the points will be prorated. If buildings are prohibited in parts of the SFHA, such as the floodway, the impact adjustment will adjust the points. Prohibiting critical facilities is credited in Section 432.f, Protection of critical facilities, not under DL2.

(3) Prohibitions on storage of materials (DL3) has no additional criteria.

Credit Points

(1) DL1 = EITHER:

(a) 280 points, for regulations that prohibit fill within floodplains, including construction of buildings on fill,

OR

(b) 130 points x the ratio of compensation, for regulations that require new development to provide compensatory storage at hydraulically equivalent sites up to a maximum of 195 for a ratio of 1.5:1 or greater

Example 432.a-1.

A community requires that for each cubic foot of fill placed in the regulatory floodplain, the builder must remove a cubic foot of fill from a hydraulically equivalent location. The compensation ratio is 1:1, so DL1b = 130 x 1 = 130.

Gulf Beach County requires that for each cubic foot of fill placed in the regulatory floodplain, the builder must remove 1.25 cubic feet of fill from a hydraulically equivalent location. The compensation ratio is 1.25:1, so DL1b = 130 x 1.25 = 162.5.

(2) DL2 = 1,000 points, for regulations that prohibit buildings within the regulatory floodplain

If the regulations only prohibit certain types of buildings, such as residences, the points will be prorated.

(3) DL3 = one of the following:

(a) 50 points, for regulations that prohibit outdoor storage of materials within the regulatory floodplain,

OR

(b) 20 points, for regulations that prohibit storage of hazardous materials anywhere in the floodplain,

OR

(c) 10 points, for regulations that require hazardous materials to be stored indoors, above the base flood elevation

DL3 credit is not cumulative. If the regulations govern storage of only certain kinds of materials, the points will be prorated.

Impact Adjustment

DL credit is adjusted based on the ratio of the area affected by the DL regulation to the area of the SFHA. See Section 431.c on calculating an impact adjustment. The following additional criteria apply:

(1) The areas affected by the DL regulation(s) must be marked on an impact adjustment map that meets the criteria in Section 431.c. In addition to showing areas credited under OSP, the map must also show developed and undeveloped areas. "Undeveloped" means

that there are no buildings on the parcels or that the area is zoned for conservation or agriculture with a minimum lot size of 10 acres (these areas may also qualify for LZ credit).

(2) Areas credited for DL credit must exclude areas credited for OSP. However, if the DL regulations are sufficient, vacant areas may qualify for OSP and the community should receive the higher points under OSP (see Section 422.a(3)(c)).

(3) Only undeveloped areas are eligible for DL1a and DL2 credit, unless the regulations clearly state that they apply to developed areas. For example, if DL2 regulations are enforced in areas already developed and a building is substantially damaged, it cannot be replaced and the site must be cleared and kept vacant. Note that if a DL2 regulation prohibits all new buildings except farm structures, the value for DL2 can be prorated and the credit can be applied to areas with farm structures.

(4) DL1b, compensatory storage, and DL3, prohibitions on storage of materials, can be credited in developed areas.

$$rDL\# = \frac{aDL\#}{aSFHA}, \text{ where}$$

aDL# = the size of the area(s) that qualify for DL# credit (aDL1a is the size of the area that qualifies for DL1a credit, etc.), and

aSFHA = the size of the community's SFHA

$$cDL = (DL1 \times rDL1) + (DL2 \times rDL2) + (DL3 \times rDL3)$$

Documentation Provided by the Community

(1) The activity documentation requirements listed in Section 431.d must be met.

432.b. Freeboard (FRB)

The maximum credit for this element is 500 points.

The NFIP requires that the lowest floor of residential structures be elevated to or above the base flood elevation and that non-residential structures be elevated or floodproofed to or above the base flood elevation. Attached garages and utilities (including electrical, heating, ductwork, ventilating, plumbing, and air conditioning equipment) must also be protected to the base flood elevation (44 *Code of Federal Regulations (CFR)* §60.3(a)(3)). This can be done by elevating them or using flood-resistant materials during construction.

A freeboard requirement adds height above the base flood elevation to provide an extra margin of protection to account for waves, debris, miscalculations, or lack of data. A freeboard requirement of one foot means that the level of protection for the lowest floor, machinery and equipment, etc. is one foot above the base flood elevation.

Credit Criteria

(1) Lowest floor, utilities, and garages: For FRB credit, freeboard must be applied to the elevation of the lowest floor of the building or to the elevation to which a non-residential building is dry floodproofed, and to all components of the building, including all utilities, ductwork, and attached garages. All portions of the building below the freeboard level must be constructed using flood-damage-resistant materials. If the garage floor is below the freeboard level, the garage must meet the opening and wet floodproofing requirements for enclosures.

Two references on these requirements are *Protecting Building Utilities from Flood Damage,* FEMA-348, and *Flood Damage-Resistant Materials Requirements*, Technical Bulletin 2 (2008).

(2) The amount of freeboard is measured according to the following criteria:

(a) In A Zones, freeboard is measured from the top of the lowest floor. In V Zones, it is measured from the bottom of the lowest horizontal structural member. If the ordinance uses "lowest horizontal structural member" or similar language instead of "lowest floor" in areas outside of the V Zone or coastal A Zones where CAZ credit applies, 1 foot is added to the amount of freeboard credited. For example, if the community's ordinance requires that buildings in the A Zones be elevated so the bottom of the floor joists is at least 1.0 feet above the base flood elevation, the ordinance is scored as requiring 2.0 feet of freeboard.

(b) For the purpose of calculating CRS credit, the 500-year flood elevation is considered to be one foot higher than the base flood elevation, unless the community demonstrates that it is higher. For example, if the community's ordinance requires that the building be protected to at least the 500-year flood elevation, the ordinance is scored as requiring 1.0 feet of freeboard.

(c) In AO Zones, base flood depths are provided instead of base flood elevations. Where depths are not provided, the NFIP regulations require new buildings to be elevated 2 feet above the highest adjacent grade. Some communities misinterpret this requirement as two feet of freeboard. Elevating 2 feet above the highest adjacent grade in an AO Zone where no base flood depth is provided is a minimum requirement of the NFIP and is not eligible for credit.

However, in AO Zones with depth numbers, the NFIP requires elevation above that depth. Going higher than the specified depth warrants FRB credit, which is scored the same as in an AE Zone.

(d) "Stem wall" construction involves constructing the foundation walls above grade, filling the interior area, and pouring a slab over the fill. From the outside, the building looks as though it is elevated on a crawlspace, but openings are not required. Such buildings are categorized as Diagram 1.b in the FEMA Elevation Certificate. This construction practice does not prohibit fill, but it limits the amount of fill to the building footprint. If the regulations prohibit fill for new buildings, but allow for stem wall construction, the credit is the average of the values in the "No

filling restrictions" and "Compensatory storage required" columns in the table in the Credit Points section, below.

(e) If the ordinance uses the encroached elevation using FEMA's standard allowable maximum rise of one foot, add 0.5 feet to the amount of freeboard. Detailed riverine flood studies that produce a floodway provide a flood elevation based upon the floodway encroachment. In a Flood Insurance Study, these elevations are listed in the "With Floodway" column in the Floodway Data Table. They are generally higher than the "Without Floodway" or "Regulatory" flood elevations. For example, if the community's ordinance requires that the building be protected to at least one foot above this encroached elevation, the ordinance is scored as requiring 1.5 feet of freeboard.

(f) Many communities have focused on elevating the top of the lowest floor, but have allowed utilities (especially ductwork) to hang below the floor joists, where it can be flooded. Flooded ductwork can add thousands of dollars to an insurance claim. This is primarily a concern for buildings on crawlspaces. Buildings on slab foundations, on pilings, and in V Zones typically have the utility facilities waterproofed or elevated to a sufficient height.

To receive full credit for this element, electrical, heating, ventilation, plumbing, and air conditioning equipment and other service facilities (including ductwork) must be elevated or waterproofed to the base flood elevation plus freeboard. If the community requires that electrical, heating, ventilation, plumbing, and air conditioning equipment and other service facilities (including ductwork) be elevated or made of flood-resistant materials above the base flood elevation, but does not require these facilities to be elevated or protected to the freeboard level, then the value for freeboard in the table is considered to be 75% of the elevation requirement.

If the utilities and ductwork are not required to be elevated, floodproofed, or otherwise protected to the base flood elevation, there is no credit for FRB.

Credit Points

FRB = as shown below, based on the required freeboard

Freeboard	No filling restrictions	Compensatory storage required	Fill prohibited
1 foot	100	110	120
2 feet	225	250	280
3 feet	375	440	500

(1) More points are provided if the community prohibits buildings on fill (e.g., they must be constructed on piers, pilings, or flow-through crawlspaces) or requires compensatory storage if filling is used.

(2) The values for freeboard levels not shown are extrapolated from the credit points table. For example, the value for 1.5 feet of freeboard where compensatory storage is required is the average of the values for 1.0 foot and 2.0 feet: (110 + 250) ÷ 2 = 180 points.

(3) If a community has more than three feet of freeboard, the regulations will be reviewed for special credit higher than the points shown in the credit points table, above. The community will need to provide additional information to warrant the higher credit, such as a demonstrated expectation of new growth in the area.

(4) Other adjustments to the scoring are explained in the section on credit criteria, above.

Impact Adjustment

FRB credit is adjusted based on the ratio of the area affected by the freeboard requirement to the area of the SFHA. See Section 431.c on calculating an impact adjustment. The following additional criteria apply.

(1) Areas requested for FRB credit must exclude areas credited for OSP or DL2.

(2) There are instances in which a community may have different freeboard requirements in different areas, such as

- The community does not require freeboard where there are no base flood elevations, such as in approximate A Zones and AO Zones;
- Freeboard is only required for elevated buildings (non-residential buildings may be floodproofed to the base flood elevation without freeboard);
- Manufactured homes have a different elevation requirement; or
- There is higher freeboard in a V Zone or a floodplain subject to deeper flooding.

In these cases, the formulae should use FRB#1, FRB#2, etc. to calculate the appropriate values for the different areas.

$$rFRB = \frac{aFRB}{aSFHA}, \text{ where}$$

aFRB = the size of the area(s) that qualifies for FRB credit, and

aSFHA = the size of the community's SFHA

Example 432.b-1.

South Scottsdale is a fictitious community used for CRS examples (see Figure 430-1). The City requires that all new buildings and substantial improvements be elevated two feet above the base flood elevation. To minimize floodplain encroachments, the City also requires that all new buildings be constructed either (1) without fill on

flow-through foundations, such as piers or crawlspaces with sufficient openings, or (2) on slab foundations with compensatory storage required for any filling.

FRB = 250

These regulations apply throughout the SFHA. In the approximate A Zones of Tributaries A and B, buildings must be elevated two feet above the base flood elevation calculated by the permit applicant (which is credited in Activity 410 (Floodplain Mapping)).

These regulations only have an impact where new buildings and substantial improvements can be constructed. As noted in Section 431.c(4), areas set aside from development as preserved open space are excluded from the impact adjustment calculations.

aFRB = the size of the area(s) that qualify for FRB credit, i.e., the SFHA not credited for OSP under Activity 420 (Open Space Preservation)

aSFHA = 504.4

aOSP = 242.9

aFRB = aSFHA – aOSP = 504.4 – 242.9 = 261.5

$$rFRB = \frac{aFRB}{aSFHA} = \frac{261.5}{504.4} = 0.52$$

According to Section 433, Credit Calculation, the value for two feet of freeboard with compensatory storage (250) is multiplied by the ratio for rFRB, 0.52. The total credit for South Scottsdale's freeboard requirement, cFRB, is 52% of 250.

Documentation Provided by the Community

(1) The activity documentation requirements in Section 431.d must be met.

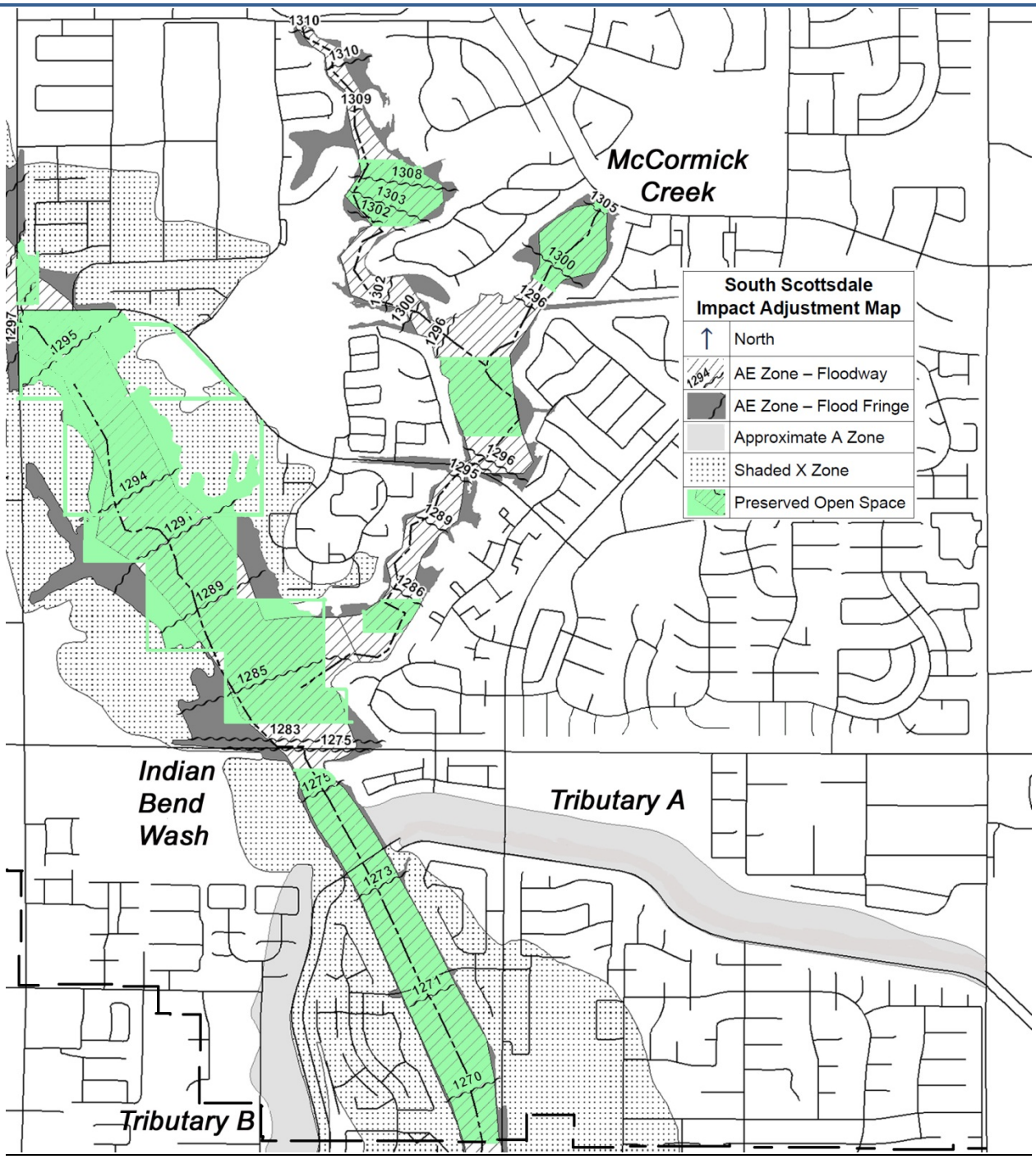


Figure 430-1. South Scottsdale's impact adjustment map for Activity 430.

432.c. Foundation protection (FDN)

The maximum credit for this element is 80 points.

The element FDN credits protection against differential settling as well as scour and erosion.

See also *Ensuring that Structures Built on Fill in or near Flood Hazard Areas are Reasonably Safe from Flooding*, FIA-TB-10, 2001 (also available at www.fema.gov/library/viewRecord.do?id=1723).

Credit Criteria

(1) For FDN1 credit, ALL new buildings in the regulatory floodplain

(a) Must be constructed on foundations that are designed and sealed by a registered design professional as complying with the requirements of the International Building Code, the International Residential Code, or ASCE 24, and

(b) Must not be constructed on fill.

(2) For FDN2 credit, ALL new buildings constructed on fill in the regulatory floodplain

(a) Must be constructed on properly designed and compacted fill (e.g., fill that meets the criteria of (1) Section 1803.5.8 and Section 1804.4 of the International Building Code, (2) Section 2.4 of ASCE 24, or (3) their equivalent);

(b) Must be on fill that has appropriate protection from erosion and scour; and

(c) Must meet a compensatory storage requirement (for the building and fill) that meets the credit criteria of Section 432.a., Development Limitations (DL1a).

(3) For FDN3 credit, all new buildings built on fill in the regulatory floodplain

(a) Must be constructed on properly designed and compacted fill (e.g., fill that meets the criteria of (1) Section 1803.5.8 and Section 1804.4 of the International Building Code, (2) Section 2.4 of ASCE 24, or (3) their equivalent), and

(b) Must be on fill that has appropriate protection from erosion and scour.

FDN1 requires foundations to be "designed and sealed by a registered design professional." This is a higher standard than that specified in the minimum NFIP criteria.

Many ordinances have language like the following, which are minimum NFIP criteria and DO NOT qualify for FDN credit:

"Certificate from a registered design professional that the non-residential floodproofed building will meet the ordinance's floodproofing criteria"

"Requirements for an engineering certificate for foundations in V Zones"

"Having an engineer certify opening standards that differ from the one square inch per one square foot of floor area."

Credit Points

FDN = one of the following. These points are not cumulative.

(a) FDN1 = 80 points, for engineered foundations and no buildings on fill

OR

(b) FDN2 = 60 points, for buildings on compacted fill, protected from erosion and scour, with compensatory storage

OR

(c) FDN3 = 35 points, for buildings on compacted fill, protected from erosion and scour, but no compensatory storage

Impact Adjustment

FDN credit is adjusted based on the ratio of the area affected by the foundation protection regulation to the area of the SFHA. See Section 431.c on calculating an impact adjustment. The following additional criteria apply:

(1) Areas delineated for FDN credit must exclude areas credited for OSP or DL2.

(2) There is no credit for FDN in V Zones because the NFIP requires all new buildings in V Zones to have engineered foundations (44 *CFR* §60.3(e)(4)) and prohibits fill from being used for structural support (see §60.3(e)(6)). Therefore V Zones must be excluded from aFDN unless the community has higher foundation protection standards than those in §60.3(e).

$$rFDN = \frac{aFDN}{aSFHA}, \text{ where}$$

aFDN = the size of the area(s) that qualify for FDN credit, and

aSFHA = the size of the community's SFHA

Documentation Provided by the Community

(1) The activity documentation requirements in Section 431.d must be met.

432.d. Cumulative substantial improvements (CSI)

The maximum credit for this element is 90 points.

The NFIP allows improvements valued at up to 50% of the building's pre-improvement value to be permitted without meeting the flood protection requirements for buildings located in the SFHA. Over the years, a community may issue a succession of permits for different repairs or improvements to the same structure. This can greatly increase the overall flood damage potential to that building as well as the insurance liability to FEMA.

CSI provides credit to a community that ensures that the total value of all improvements or repairs permitted OVER TIME does not exceed 50% of the value of the structure. When the total value does exceed 50%, the original building must be protected according to the ordinance requirements for new buildings.

Under some circumstances the NFIP flood insurance policy may pay a portion of the cost of bringing a substantially flood-damaged building into compliance with the community's floodplain management ordinance. If the community has a more restrictive definition of substantial damage, the provision may still apply. More information on Increased Cost of Compliance coverage can be found at www.CRSresources.org/400.

If a community does not regulate for cumulative substantial improvements, it may still receive credit for regulation of additions. Additions within the footprint of the original building would have to be to a floor above the base flood elevation. Additions outside the footprint of the original building would have to be elevated (non-residential structures could be floodproofed) above the base flood elevation.

Credit Points

Up to 90 points are provided for tracking improvements cumulatively.

CSI = the total of the following points, not to exceed 90 points

(1) EITHER:

(a) 40 points, if the regulations require that improvements, modifications, and additions to existing buildings are counted cumulatively for at least 10 years

OR

(b) 20 points, if the regulations require that improvements, modifications, and additions to existing buildings are counted cumulatively for at least 5 years

(2) EITHER:

(a) 40 points, if the regulations require that reconstruction and repairs to damaged buildings are counted cumulatively for at least 10 years

OR

(b) 20 points, if the regulations require that reconstruction and repairs to damaged buildings are counted cumulatively for at least five years

(3) 20 points, if the community adopts regulatory language that qualifies properties for Increased Cost of Compliance insurance coverage for repetitive losses

(4) 20 points, if the regulations require that any addition to a building be protected from damage from the base flood

Impact Adjustment

CSI credit is adjusted based on the ratio of the area affected by the cumulative substantial improvement regulation to the area of the SFHA. See Section 431.c on calculating an impact adjustment.

$$rCSI = \frac{aCSI}{aSFHA}$$, where

aCSI = the size of the area(s) that qualify for CSI credit, and

aSFHA = the size of the community's SFHA

Documentation Provided by the Community

(1) The activity documentation requirements in Section 431.d must be met.

(2) At each verification visit,

(a) A list of all permits for building improvements or repairs in the regulatory floodplain that have been issued since the last visit. The list must include both substantial improvements and permitted projects that were not substantial improvements.

The ISO/CRS Specialist will review permit records that document how the regulation has been applied. The records need to track permits by parcel number or address, so that the history of improvements or repairs to a particular structure is checked before the next permit is issued.

432.e. Lower substantial improvements threshold (LSI)

The maximum credit for this element is 20 points.

The NFIP allows improvements valued at up to 50% of the building's pre-improvement value to be permitted without meeting the flood protection requirements for buildings located in the SFHA. LSI credits having a threshold that is lower than 50%.

LSI has the effect of requiring more structures to come into compliance if the owners want to improve them or if they are damaged. Since any community that participates in the NFIP already has a threshold (50%), it is only necessary for the community to change the number

specified in its ordinance or regulations. A community must be sure that a minimum threshold is not set by state law before it adopts a different standard.

There are alternative ways to receive credit under item (2) in Credit Points, below:

(a) Instead of basing the substantial improvement determination on the value of the building and the cost of the project, half credit is provided for limiting expansions of the building to no more than 25% of the square footage of the lowest floor.

(b) Half credit is provided if the lower threshold applies to either improvements or to repairs to damaged buildings, but not both. Full credit is provided under (1) for both.

Under some circumstances the NFIP flood insurance policy may pay a portion of the cost of bringing a substantially flood-damaged building into compliance with the community's floodplain management ordinance. If the community has a more restrictive definition of substantial damage, the provision may still apply. More information on Increased Cost of Compliance coverage can be found at www.CRSresources.org/400.

Credit Points

LSI = EITHER:

(1) 20 points, if the regulatory threshold for determining if a building is substantially improved or substantially damaged is less than 50%

OR

(2) 10 points, if EITHER

(a) The regulatory threshold is no more than 25% of the square footage of the building's lowest floor, OR

(b) The regulatory threshold applies to either improvements, modifications, and additions or reconstruction and repairs, but not both

Impact Adjustment

LSI credit is adjusted based on the ratio of the area affected by the lower substantial improvement threshold to the area of the SFHA. See Section 431.c on calculating an impact adjustment.

$$rLSI = \frac{aLSI}{aSFHA}$$, where

aLSI = the size of the area(s) that qualify for LSI credit, and

aSFHA = the size of the community's SFHA

Documentation Provided by the Community

(1) The activity documentation requirements in Section 431.d must be met.

(2) At each verification visit,

(a) A list of all permits for building improvements or repairs in the regulatory floodplain that have been issued since the last visit. The list must include both substantial improvements and permitted projects that were not substantial improvements.

The ISO/CRS Specialist will review permit records that document how the regulation has been applied.

432.f. Protection of critical facilities (PCF)

The maximum credit for this element is 80 points.

For CRS credit purposes, critical facilities are defined in Section 120. There are usually two kinds of critical facilities that a community should address:

- Facilities that are vital to flood response activities or critical to the health and safety of the public before, during, and after a flood, such as a hospital, emergency operations center, electric substation, police station, fire station, nursing home, school, vehicle and equipment storage facility, or shelter.
- Facilities that, if flooded, would make the flood problem and its impacts much worse, such as a hazardous materials facility, power generation facility, water utility, or wastewater treatment plant.

PCF credit is provided for regulations that either prohibit critical facilities or set higher standards for protecting them from flood damage. Full credit is for a prohibition on new critical facilities in the 500-year floodplain.

It may not be feasible for some communities to locate critical facilities outside the 500-year floodplain, but they may be able to take some steps towards reducing future risk to these facilities, so partial credit is provided for regulations that allow new facilities in the floodplain, but set higher protection standards for them. If the standards only apply to some facilities or some parts of facilities, the credit will be prorated. For example, partial credit would be provided if the regulations addressed only one type of critical facility, such as hazardous materials sites or critical facilities owned and managed by the community.

Credit Criteria

(1) Credit is provided only if there is regulatory language that protects critical facilities. The fact that there are currently no critical facilities in the regulated floodplain may indicate community policy, but adopted regulations are required for PCF credit.

(2) To receive full credit for this element, the regulations must be enforced in the 500-year floodplain (note that the 500-year floodplain includes the entire SFHA plus other land that is lower than the 500-flood elevation). On newer Flood Insurance Rate Maps (FIRMs) with AE and X Zones, the 500-year floodplain is shown as the SFHA plus the shaded X Zone.

(3) The impact adjustment is based on the 500-year floodplain rather than aSFHA, the area of the SFHA.

Credit Points

(1) PCF = 80 points, where new critical facilities are prohibited from the 500-year floodplain

OR

(2) PCF = 40 points, where new critical facilities are protected to at least one foot above the 500-year flood level

Partial credit for PCF is provided for regulations that allow new facilities in the 500-year floodplain, but set higher protection standards. If the standards only apply to some facilities or some parts of facilities, the credit will be prorated.

Impact Adjustment

PCF credit is adjusted based on the ratio of the area affected by the PCF regulation to the area of the 500-YEAR FLOODPLAIN. See Section 431.c on calculating an impact adjustment.

$$rPCF = \frac{aPCF}{a500}$$, where

aPCF = the size of the area(s) that qualifies for PCF credit, and

a500 = the size of the community's 500-year floodplain

If there is no available map that shows the 500-year floodplain, the SFHA is considered to be 70% of the 500-year floodplain. Therefore, if the regulation credited under PCF is enforced throughout the SFHA, rPCF = 0.7.

Example 432.f-1.

South Scottsdale prohibits new buildings, critical facilities, and substantial improvements in the floodway. The ordinance specifically includes critical facilities so facilities other than buildings, like pumping stations, cell towers, and electrical substations, are also prohibited.

PCF = 80

Full credit for PCF is dependent on enforcement throughout the 500-year floodplain. South Scottsdale's regulation is only enforced in the floodway. Credit is limited to those portions of the floodway that are not credited as preserved open space (OSP) (see Section 431.c(4)).

The area affected by the critical facilities prohibition, aPCF, is the area of the floodway minus the areas credited as OSP. The City's GIS office provided the area calculations. The area of the floodway is 287.2 acres, of which 208.3 are credited as OSP. Therefore

aPCF = 287.2 – 208.3 = 78.9

The area of the 500-year floodplain is the area of the SFHA (504.4 acres) plus the area of the shaded X Zone (440.3 acres).

a500 = 504.4 + 440.3 = 944.7

$$rPCF = \frac{aPCF}{a500} = \frac{78.9}{944.7} = 0.08$$

According to Section 433, Credit Calculation, the value for prohibiting critical facilities (80) is multiplied by the ratio for rPCF, 0.08. The total credit for South Scottsdale's requirement, cPCF, is 8% of 80. In other words, only 8% of the 500-year floodplain is affected by this regulation. The regulation is limited to the mapped floodway and most of that is already preserved as open space.

Documentation Provided by the Community

(1) The activity documentation requirements in Section 431.d must be met.

(2) At each verification visit,

(a) An impact adjustment map, showing the 500-year floodplain.

(b) [For extra credit for regulating floodprone areas outside the 500-year floodplain] Documentation that shows that floodplain regulations are in effect in these areas.

432.g. Enclosure limits (ENL)

The maximum credit for this element is 240 points.

Regulations to limit enclosures below the base flood elevation have two objectives. First, they protect the structural integrity of the building from wave action or hydrostatic pressure. Second, they discourage property owners from finishing the area below the base flood elevation and storing valuable or hazardous items in that area.

These regulations are particularly useful in V Zones and other coastal areas subject to wave damage and in places where projected flood depths result in lowest floors constructed 8 feet or more above grade. For the second objective, over time there is a tendency on the part of property owners to enclose the lower areas and convert them to bedrooms, family rooms, or other finished areas, in violation of floodplain management regulations.

ENL credits regulatory standards that prohibit the enclosure of the building's area that lies below the base flood elevation. Credit is also available for communities that execute

nonconversion agreements, whereby owners agree not to modify the enclosed area to make it more susceptible to flood damage.

Credit Criteria

(1) Breakaway walls are enclosures and must be prohibited in order to receive full credit. Screening and open lattice-work are not considered enclosures. Some communities have language to require that there be "no obstruction" in the lower level of a building. Such language might allow breakaway walls or slanted louvers. This does not qualify for ENL credit. What counts for ENL credit is whether one can SEE THROUGH the lower part of the structure from the street. Lattice-work and insect screening are permitted, as long as the line of sight is not blocked.

(2) The community may opt to enforce these enclosure limits only where the lowest floor is more than four feet high. Where the lowest floor is less than four feet high, a crawlspace with the proper openings may be more appropriate than an open area elevated on columns or piles. With less than four feet of height, the lower area is not likely to be improved or modified into a livable space, so the enclosure limits are not needed.

(3) Partial credit is provided for a nonconversion agreement whereby the owner agrees not to modify the enclosed area in a way that would make it more susceptible to flood damage. Because this area is not visible from the street, the full credit of 90 points (under credit points (3), below) is provided only if the agreement allows the community the right to enter the property and inspect the inside of the enclosure periodically.

The nonconversion agreement must be filed with the deed and other property records, so that it will be effective as ownership of the property changes in the future. A sample nonconversion agreement is posted at www.CRSresources.org/400. As with all legal documents, the community should have such an agreement approved by its attorney before it is used.

Credit Points

ENL = EITHER (1) OR the total of (2) + (3)

(1) 240 points, if regulations prohibit any building enclosures, including breakaway walls, below the base flood elevation,

OR

(2) 100 points, if regulations prohibit breakaway walls and enclosures of areas of greater than 299 square feet below the base flood elevation, and

(3) If regulations require that the owner of a building sign a nonconversion agreement that is filed with the deed and other property records, then

(a) 90 points, if the community will inspect the enclosed area at least once a year, OR

(b) 60 points, if the community is granted the right to inspect the enclosed area at any time, OR

(c) 30 points, if the agreement does not mention inspections

Impact Adjustment

ENL credit is adjusted based on the ratio of the area affected by the enclosure limitation to the area of the SFHA. See Section 431.c on calculating an impact adjustment. The following additional criterion applies:

(1) Areas requested for ENL credit must exclude areas credited for OSP or DL2.

$$rENL = \frac{aENL}{aSFHA}$$, where

aENL = the size of the area(s) that qualify for ENL credit, and

aSFHA = the size of the community's SFHA

Documentation Provided by the Community

(1) The activity documentation requirements in Section 431.d must be met.

(2) At each verification visit,

(a) Elevation certificates, copies of nonconversion agreements, and other permit records that document how the regulation has been applied.

(b) [For credit for (3)(a) and (3)(b)] Copies of inspection records.

432.h. Building code (BC)

The maximum credit for this element is 100 points.

Many communities meet their NFIP obligations through a stand-alone floodplain management ordinance that may be administered by the zoning, planning, engineering, or other office, separate from the building department and the building code. A floodplain management program can work without a building code, but implementation of the construction requirements may not be as effective.

The International Code Series (I-Codes) includes provisions that incorporate all NFIP minimum floodplain construction requirements and a number of provisions that exceed the NFIP minimum requirements. The NFIP requirements related to the actual construction of buildings are contained in the bodies of the International Building Code and International Residential Code. Requirements related to building utilities are contained in these codes

and in the International Plumbing Code, International Mechanical Code, International Fuel Gas Code, and International Private Sewage Disposal Code.

The other NFIP requirements, such as administrative provisions and requirements that apply to floodways, subdivisions, and manufactured homes, are contained in Appendix G of the International Building Code. Communities that adopt the I-Codes have the option of either adopting Appendix G or addressing these other requirements through a companion ordinance or regulation. Note that floodplain land use regulations (e.g., avoiding construction in the regulatory floodplain) are not included in the I-Codes, therefore it is important that community floodplain managers and the building officials coordinate their efforts.

Coordinating floodplain management with a local building code has several advantages. Some, but not all, of those are listed below.

- There is better coordination with permitting the construction of new buildings and repairs and improvements to existing buildings;
- More staff and more knowledgeable staff can better enforce floodplain building construction standards, such as foundation protection and placement of mechanical equipment;
- Experienced inspectors can check compliance in the field; and
- There is more frequent observation of construction progress and quality of construction.

Building codes help reduce losses from other natural hazards, which is one of FEMA's prime objectives. For more information on the links between the I-Codes, the NFIP, other natural hazards, and CRS credit, see *Reducing Flood Losses Through the International Code Series*.

Because of these advantages, the CRS provides credit for building codes in two ways:

- BC1 recognizes those communities that have adopted the current editions of the appropriate codes, and
- BC2 credits the community's Building Code Effectiveness Grading Schedule (BCEGS) classification.

BCEGS was initiated by the insurance industry after determining that the catastrophic losses from Hurricane Andrew were compounded by poor building code enforcement. It was developed by the Institute for Building and Home Safety, the three legacy code groups, the insurance industry, and the Insurance Services Offices, Inc. (ISO). The program is administered by ISO.

BCEGS assesses the building codes in effect in a community and how a community enforces them, with special emphasis on mitigation of losses from natural disasters. The insurance goal is that the prospect of lessening catastrophe-related damage (and ultimately lower insurance costs) provides an incentive for communities to enforce their building codes more rigorously.

In BCEGS, each community is assigned a grade of 1 (best) to 10. A class of 99 indicates that the community does not qualify for the BCEGS program. Ratings are based on community answers to an extensive mailed questionnaire and a follow-up community verification visit with the building department by an ISO-trained field representative.

More information on BCEGS can be obtained from the ISO/CRS Specialists.

Credit Criteria

(1) The building code must be enforced throughout the community, not just the SFHA.

(2) I-Codes (BC1):

(a) To receive full credit, the entire I-Code must be adopted by the community. If the following sections are not adopted or are adopted with amendments, the language will be reviewed to determine the credit:

- International Building Code: Chapters 3−7, 14−18, and 21−24.
- International Residential Code: Chapters 3−6, 8, and 9.

(b) The version of the I-Code series must be no more than six years old.

(c) In some states, communities are required to adopt state codes or state versions of the I-Codes. In those cases, the provisions of the mandated code will be compared to the I-Codes and scored appropriately. The same provisions apply to the National Fire Protection Association (NFPA) codes. If they are adopted with amendments, the language will be reviewed to determine the credit.

(3) BCEGS (BC2): The credit for BC2 is based on the community's BCEGS classification.

There are two BCEGS ratings for each jurisdiction: personal (residential) and commercial. If they are different, the CRS prerequisite and this element's credit are based on the higher number of the two ratings. For example, if a community has a class 6 residential BCEGS rating and a class 5 commercial rating, the CRS considers it a class 6 BCEGS community.

BCEGS ratings are provided for all communities that do code enforcement, whether it be for themselves or for smaller jurisdictions. When a community's code enforcement program is administered by another jurisdiction or a third-party agency, the serviced community will receive the provider's classification.

If a community is in a state that has does not have a formal BCEGS program, a courtesy review may be conducted to obtain an equivalent BCEGS class for CRS purposes.

Note that a community must have a BCEGS classification of 5/5 or better to qualify for a CRS class 6 or better (see Sections 211.b and c).

Credit Points

BC = BC1 + BC2

(1) BC1 = the sum of the following:

(a) 20 points, for adoption and enforcement of the International Building Code or its equivalent

(b) 20 points, for adoption and enforcement of the International Residential Code or its equivalent

(c) 3 points, for adoption and enforcement of the International Plumbing Code or its equivalent

(d) 3 points, for adoption and enforcement of the International Mechanical Code or its equivalent

(e) 2 points, for adoption and enforcement of the International Fuel Gas Code or its equivalent

(f) 2 points, for adoption and enforcement of the International Private Sewage Disposal Code or its equivalent. If the community is fully sewered, it can still receive this credit because a sewered community is healthier than one dependent on septic systems.

(2) BC2 = one of the following. These points are not cumulative.

(a) 10 points, for a BCEGS classification of 5/5, OR

(b) 20 points, for a BCEGS classification of 4/4, OR

(c) 30 points, for a BCEGS classification of 3/3, OR

(d) 40 points, for a BCEGS classification of 2/2, OR

(e) 50 points, for a BCEGS classification of 1/1

If a community has two different BCEGS classes, the higher number is used to calculate the credit.

Example 432.h-1.

South Scottsdale has adopted of all the International Codes (BC1 = 50) and has a BCEGS class of 3/3 (BC2 = 30).

BC = 50 + 30 = 80

Impact Adjustment

There is no impact adjustment for BC. The building codes must be enforced throughout the community.

Documentation Provided by the Community

(1) The activity documentation requirements in Section 431.d must be met.

(2) At each verification visit,

(a) [For BC1 credit]

(i) The state or local law or ordinance language that adopts the building code. See also Sections 231.b and c on documenting regulatory language.

(ii) Permit records that will document that the code is being enforced.

(b) [For BC2 credit] No documentation is required. The ISO/CRS Specialist will obtain the community's BCEGS classification directly from the ISO BCEGS office.

432.i. Local drainage protection (LDP)

The maximum credit for this element is 120 points.

Approximately 20% of NFIP claims are for properties located outside the SFHA. Some of these claims are from flooding caused by local drainage problems. LDP credit is for ensuring that new buildings are well above the street level or otherwise protected from shallow drainage flooding.

The regulatory language is usually found in the building code, rather than in the floodplain or stormwater management regulations. Sections 1803.3 and 1805 of the International Building Code, for example, have a positive-drainage requirement that would receive some credit.

Credit Criteria

(1) Credit is for regulations that ensure that every new building will be built so that it is protected from local drainage flooding.

(2) A regulation that only addresses drainage plans in new subdivisions is not credited. The key to this credit is that every building will meet some drainage protection standard at the time of construction.

Credit Points

LDP = (LDP1 or LDP2 or LDP3) + LDP4, up to the maximum of 120 points

Items 1, 2, and 3 are not cumulative. Item 4 can be credited alone or added to the points for items 1, 2, or 3, not to exceed the maximum points.

(1) LDP1 = 40 x the number of feet that the lowest floor (including basement) must be above the crown of the nearest street or the highest grade adjacent to the building

For example, if the community requires the lowest floor to be 18 inches above the crown of the street, LDP = 40 x 1.5 = 60. The highest adjacent grade or other datum may be used as an alternative to the crown of the nearest street. If the street gutter is used, 0.5 feet is subtracted from the elevation requirement.

(2) LDP2 = 40 points, if the regulations require that, as a condition of receiving a building permit, the applicant must prepare a site plan that (a) accounts for street flooding and local drainage from and onto adjoining properties, and (b) protects the building from local drainage flows

(3) LDP3 = EITHER:

20 points, if the regulations require the applicant to provide positive drainage away from the building site to an approved point of collection that does not create a hazard or problem on neighboring properties

OR

10 points, if the regulations require that the applicant provide positive drainage away from the building site

The 10-point credit noted above is provided for enforcing the positive drainage provision of the International Building Code, provided that the community can document of its enforcement.

(4) LDP4 = 20 points, if the regulations require that the increased volume of runoff due to the development (from the 100-year storm) is kept on site, such as via a low-impact development measure

LDP4 credit is prorated if the regulations are limited to smaller storms.

Impact Adjustment

There is no impact adjustment for LDP because it must be enforced throughout either the entire community or throughout all the B, C, D, and X Zones.

Documentation Provided by the Community

(1) The activity documentation requirements in Section 431.d must be met.

432.j. Manufactured home parks (MHP)

The maximum credit for this element is 15 points.

An "existing manufactured home park or subdivision" is a park or subdivision that was established before the community adopted floodplain management regulations. The NFIP regulations (44 *CFR* §60.3(c)(12)) allow communities to site manufactured homes in existing manufactured home parks or subdivisions on reinforced piers or other foundation elements that are not less than 36 inches above grade. In some cases this results in manufactured homes' being elevated above the base flood elevation, but where flooding is deeper than three feet, it exposes them to substantial damage.

MHP credits regulations that do not differentiate between manufactured homes and conventional "stick built" buildings or between existing and new manufactured home parks and subdivisions. However, this credit is limited to those communities that have existing manufactured home parks where the base flood is GREATER than three feet deep. In other words, the credit is limited to those communities where these regulations will have an impact. Because of this, there is no impact adjustment for this element.

This ordinance language was a requirement of the NFIP before 1989. When communities were given the option of the 36-inch standard, many kept the higher standard and did not revise their regulations. The creditable language is also included in the new I-Codes. Therefore, it is possible that a community's current ordinance already has the language that is credited by this element.

Credit Criteria

(1) The community must have regulatory language that is enforced in manufactured home parks or subdivisions.

(2) The community must have one or more existing manufactured home parks or subdivisions in its regulatory floodplain where the base flood elevation is more than three feet above grade.

Credit Points

MHP = 15 points, for mobile home park regulations

Impact Adjustment

There is no impact adjustment for MHP.

Documentation Provided by the Community

(1) The activity documentation requirements in Section 431.d must be met.

(2) At each verification visit,

(a) Elevation certificates and anchoring records that document how the regulation has been applied.

(b) Documentation that shows that at least one manufactured home park has a regulatory flood depth greater than three feet above grade (Section 432.j, credit criterion (2)).

432.k. Coastal A Zones (CAZ)

The maximum credit for this element is 650 points.

FEMA has concluded that its criteria for construction in A Zones do not provide adequate protection in coastal A Zones, which are subject to wave effects, velocity flows, erosion, scour, or combinations of these forces. Wave tank studies have shown that breaking waves lower than the three-foot criterion used to designate VE Zones can cause considerable damage. Post-disaster evaluations and insurance claims data also support this conclusion, particularly for those buildings with enclosures below the elevated floor.

The term "coastal A Zone" refers to that portion of the coastal SFHA located landward of the V Zone and seaward of the line known as the Limit of Moderate Wave Action (LiMWA). The LiMWA is determined based on the landward limit of the 1% annual chance coastal flood that can support a 1.5-foot wave. New coastal FIRMs will show the LiMWA as an informational layer on the FIRM. CAZ credit is provided to a coastal community that designates a coastal A Zone and enforces V-Zone and/or enclosure limitation regulations in the designated area.

Additional technical guidance on mapping coastal A Zones can be found in *Design and Construction in Coastal A Zones,* found at www.fema.gov/pdf/rebuild/mat/coastal_a_zones.pdf. Guidance on construction standards can be found in *Coastal Construction Manual* (FEMA-55) and *Home Builder's Guide to Coastal Construction* (FEMA-P-499). These references can be found at www.fema.gov/residential-coastal-construction.

Credit Criteria

(1) The community must have a coastal floodplain on the Atlantic Ocean, Gulf of Mexico, Pacific Ocean, Bering Sea, or Great Lakes.

(2) To receive CAZ1 credit a community must map or otherwise delineate its coastal A Zone. The coastal A Zone is the coastal SFHA that is not mapped as V Zone. A community may declare all of its coastal SFHA inland from the V Zone as coastal A Zone (as may be the case for a barrier island) or it may use some other standard, such as identifying all areas where breaking waves are higher than one foot.

(3) Credit for CAZ2, prohibiting enclosures, is in addition to credit for enclosure limitations (ENL).

(4) The credit criteria for CAZ1 are V-Zone requirements. These credits are not available in a V Zone because they are minimum NFIP requirements in V Zones. A community can still receive credit for CAZ2 in a V Zone in addition to credit for enclosure limitations (ENL).

Credit Points

CAZ = CAZ1 + CAZ2

CAZ1 = 500 points, if all new buildings in the coastal A Zone must meet the requirements for buildings in V Zones and for openings in A Zones (44 *CFR* §60.3(e) and §60.3(c)(5))

If only some of the V-Zone regulations are enforced in the coastal A Zone, the points are prorated as follows:

(a) 225 points, if all of the following V-Zone foundation standards (found in 44 *CFR* §60.3(e)) are required by the community:

- New construction and substantial improvements are elevated on piles and columns (§60.3(e)(4));
- The pile or column foundation and the structure attached thereto are anchored to resist floatation, collapse, and lateral movement due to the effects of wind and water loads (§60.3(e)(4)(ii));
- New construction and substantial improvements have the space below the lowest floor free of obstruction or enclosed with non-supporting breakaway walls, open wood lattice-work, or insect screening (§60.3(e)(5)), and have openings (§60.3(c)(5)); and
- Use of fill for structural support is prohibited (§60.3(e)(6)).

(b) 100 points, if the bottom of the lowest horizontal structural member and the electrical and mechanical equipment servicing the building must be elevated to or above the base flood elevation (§60.3(e)(4)(i))

(c) 125 points, if a registered design professional must develop or review the structural design, specifications, and plans and certify that the designs and methods of construction to be used meet accepted standards of practice for meeting the provisions of §60.3(e)(4)(ii) and breakaway walls (§60.3(e)(5))

(d) 25 points, provided all new construction is located landward of the reach of mean high tide (§60.3(e)(3)). These points are available only if the designated area includes shoreline.

(e) 25 points, if the community prohibits human alteration of any sand dunes or mangroves that would increase flood damage (§60.3(e)(7)). These points are available only if the designated areas include sand dunes or mangroves

CAZ2 = EITHER:

(a) 150 points, if regulations prohibit any building enclosures, including solid breakaway walls, below the base flood elevation

OR

(b) 50 points, if regulations prohibit breakaway walls and enclosures of areas of greater than 299 square feet that are below the base flood elevation. The area enclosed must still meet all NFIP requirements for openings, anchoring, and flood-resistant materials

Impact Adjustment

CAZ credit is adjusted based on the ratio of the area affected by the CAZ regulation to the area of the SFHA. See Section 431.c on calculating an impact adjustment. The following additional criteria apply:

(1) Areas requested for CAZ credit must exclude areas credited for OSP or DL2.

(2) The credit criteria for CAZ1 are minimum NFIP requirements in V Zones. Therefore, these credits are not available in a V Zone.

(3) A community can receive credit for CAZ2, in addition to credit for enclosure limitations (ENL), in a V Zone.

(4) If the community has a LiMWA on its FIRM or has mapped an area using the same mapping criteria and 100% of that area is covered by CAZ regulations, an impact adjustment ratio of 0.5 may be used in lieu of the formula below.

(5) If the regulations apply to a community-defined "coastal A Zone" that does not meet FEMA's LiMWA mapping criteria, an impact adjustment ratio of 0.1 may be used.

$$rCAZ = \frac{aCAZ}{aSFHA}, \text{ where}$$

aCAZ = the size of the area(s) that qualifies for CAZ credit, and

aSFHA = the size of the community's SFHA

Example 432.k-1.

West Bay is a fictitious coastal community used for CRS examples. Its DFIRM has a LiMWA delineated and the GIS map in Figure 430-2 shows the coastal A Zone, i.e., the area between the LiMWA and the V Zone.

West Bay has opted to enforce all V-Zone regulatory standards (and the A-Zone opening requirement) in the delineated coastal A Zone.

CAZ = 500

West Bay's CRS Coordinator calculates the area of the coastal A Zone, minus the portion that is in the Biloxi Bay State Park (there is no credit for CAZ standards for new construction in areas preserved as open space, i.e., where new construction is prohibited). This area is calculated to be 111.9 acres. The calculation of aSFHA is discussed in Example 403.f-1 in Section 403.

$$rCAZ = \frac{aCAZ}{aSFHA} = \frac{111.9}{395.3} = 0.28$$

Because it is using the FEMA-delineated LiMWA, West Bay opts to use 0.5 instead of the lower value from the formula.

rCAZ = 0.5

According to Section 433, Credit Calculation, the value for West Bay's CAZ regulations (500 points) is multiplied by the ratio for rCAZ, 0.5. The total credit for West Bay's regulation, cCAZ, is 50% of 500, or 250 points.

Documentation Provided by the Community

(1) The activity documentation requirements in Section 431.d must be met.

(2) At each verification visit,

(a) An impact adjustment map. The map is not needed if the community uses the impact adjustment approach listed under Impact Adjustment items (4) or (5), above. If a community-derived LiMWA is used, the data supporting the delineation must be supplied to the ISO/CRS Technical Reviewer for approval.

432.l. Special flood-related hazards regulations (SHR)

The maximum credit for this element depends on the hazard. The maximum SHR credit for higher regulatory standards in areas subject to coastal erosion is 370 points and 70 points for tsunami hazard regulations. The maximum SHR credit for higher regulatory standards in areas subject to the other credited special flood-related hazards is 100 points.

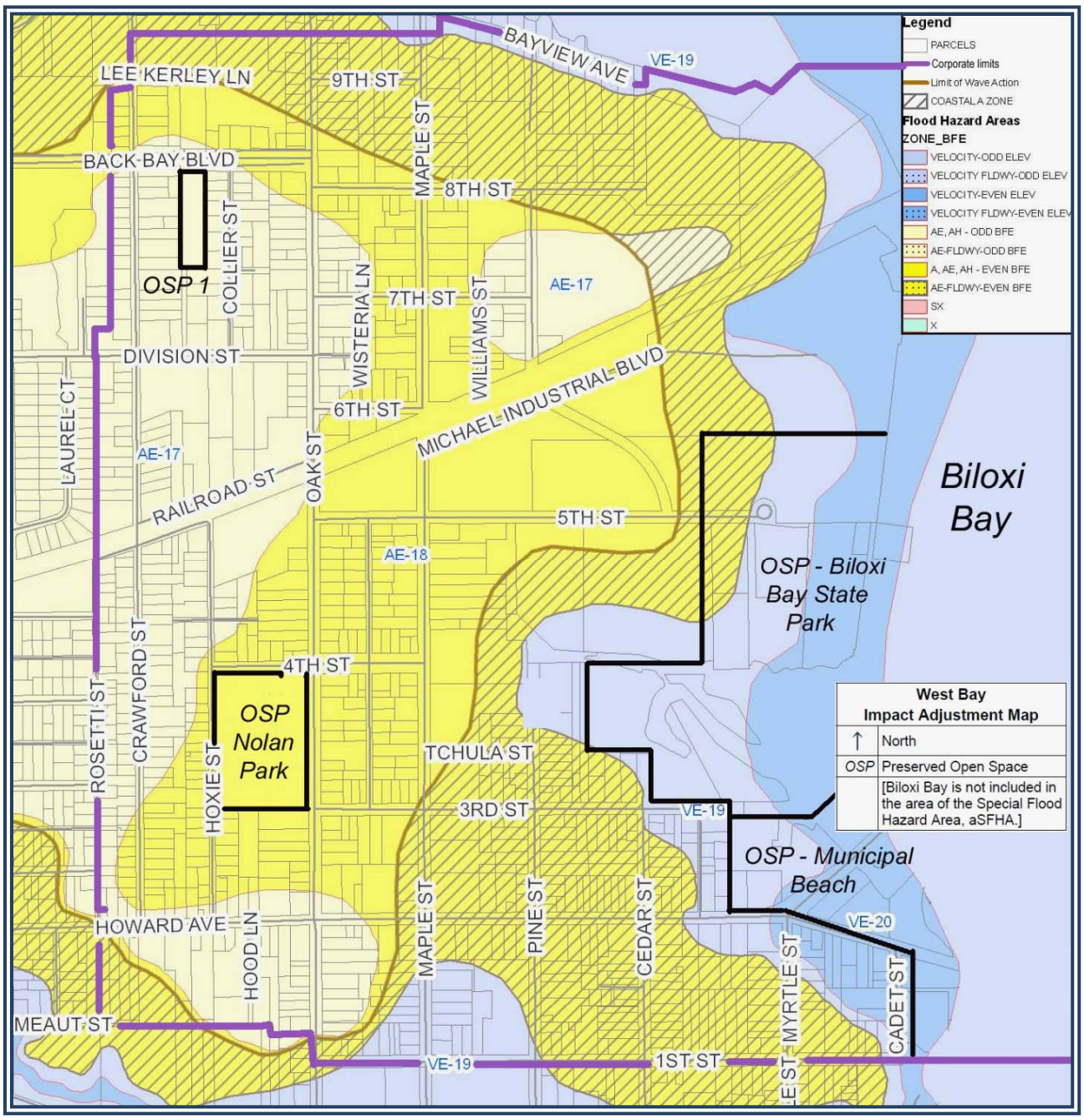


Figure 430-2. West Bay's impact adjustment map.

SHR credit for higher regulatory standards in areas subject to special flood-related hazards is described in the appropriate CRS publications on these hazards (see Appendix C or www.CRSresources.org). The credit points, SHR, are then transferred to this activity. The publications are

- *CRS Credit for Management of Coastal Erosion Hazards*,
- *CRS Credit for Management of Tsunami Hazards*, and
- *Special Flood-related Hazards Supplement to the CRS Coordinator's Manual*.

The *Special Flood-related Hazards Supplement* covers credit for the hazards of uncertain flow paths (alluvial fans, moveable bed streams, and channel migration), closed basin lakes, ice jams, land subsidence, and mudflows.

Credit Criteria

The community's special flood-related hazards activities must meet the credit criteria described in the separate publications. Most require that the special hazard be mapped and the area be subject to development regulations that will help protect future development from damage due to that hazard.

Credit Points

The SHR credit points for higher regulatory standards in areas subject to the different special flood-related hazards are detailed in the separate publications.

Impact Adjustment

The impact adjustments for higher regulatory standards in areas subject to the different special flood-related hazards are detailed in the separate publications.

Documentation Provided by the Community

The documentation needed for crediting higher regulatory standards in areas subject to the different special flood-related hazards is detailed in the separate publications.

432.m. Other higher standards (OHS)

The maximum credit for this element is 100 points.

OHS provides CRS credit for regulatory approaches and standards that are not addressed in the other elements of this or other activities. Each submittal for credit is individually reviewed and scored. Examples of past credits include, but are not limited to

- Prohibiting floodproofing as a flood protection measure for any new building (i.e., requiring all new buildings, including non-residential buildings, to be elevated);
- Prohibiting installation of new septic systems in the floodplain;
- Requiring new streets in the floodplain to be at or above the base flood elevation to provide access for emergency vehicles during a flood;

- Requiring all new multi-family and commercial buildings to provide access to dry land; and
- Requiring an evacuation plan for new residential subdivisions that exceed a certain number of units.

Credit Criteria

Each regulation that has a higher standard than the NFIP criteria and that is not credited elsewhere is submitted for review. The actual determination of the credit provided is made by FEMA.

Credit Points

OHS = up to 100 points for higher regulatory standards that prevent flood losses or protect natural and beneficial floodplain functions that are not otherwise credited in another element. Communities have received from 5 points to 100 points.

Impact Adjustment

OHS credit is adjusted based on the ratio of the area affected by the OHS regulation to the area of the SFHA. See Section 431.c on calculating an impact adjustment.

$$rOHS = \frac{aOHS}{aSFHA}$$, where

aOHS = the size of the area(s) that qualify for OHS credit, and

aSFHA = the size of the community's SFHA

Documentation Provided by the Community

(1) The activity documentation requirements in Section 431.d must be met.

432.n State-mandated regulatory standards (SMS)

The maximum credit for this element is 20 points.

This element recognizes the benefit received by the NFIP for a state-required measure that is implemented in both CRS and non-CRS communities in that state. State-mandated regulations also benefit from better staff training and state oversight than other regulatory provisions.

A community should contact the ISO/CRS Specialist to obtain its SMS credit. The credit may apply differently to different communities within a state, depending on the requirement. For example, only coastal communities receive SMS credit for a state requirement for a coastal setback line. See also Section 231.d on uniform minimum credit.

Examples of past credits include, but are not limited to

- State floodway mapping standards (additional credit for FWS under Activity 410 (Floodplain Mapping));
- State coastal setback regulations (additional credit for OSP under Activity 420 (Open Space Preservation));
- State-mandated freeboard (additional credit for FRB);
- State-mandated building code (additional credit for BC1); and
- State-mandated erosion and sedimentation control regulations (additional credit for ESC under Activity 450 (Stormwater Management)).

Credit Criteria

(1) Credit is added to the community's credit for a regulation credited in the 400 series.

(2) The community's credited element is verified locally and the community must receive credit for the element before it gets the SMS bonus points. For example, if there is state-mandated freeboard, but a review of the community's Elevation Certificates shows that the community does not get freeboard credit, then it does not receive the 10% SMS bonus for the state-mandated freeboard.

(3) SMS credit for state-mandated erosion and sedimentation control regulations (ESC) or water quality regulations (WQ) under Activity 450 (Stormwater Management) is provided only if the state mandate exceeds the requirements for a NPDES permit.

Credit Points

The credit is 10% of the credit for an element credited in the 400 series, up to a maximum of 20 points.

SMS =	0.1 x the equivalent credit for each state-mandated regulation credited in the 400 series of CRS activities. The credit is calculated before the impact and growth adjustments. The maximum value for SMS is 20 points.

Impact Adjustment

There is no impact adjustment for SMS.

Documentation Provided by the Community

No documentation is needed from the community. The ISO/CRS Specialist works with the State NFIP Coordinator to identify credited standards. Once they are confirmed and the community's credit for the element is verified, the SMS bonus credit is provided.

432.o. Regulations administration (RA)

The maximum credit for this element is 67 points.

This element provides credit for the community's procedures for administering its floodplain management regulations. Credit can be provided even if the community receives no other credit under Activity 430. There are five elements.

Credit Criteria

(1) Staff training (RA1) provides credit for trained regulatory staff members.

(a) Credit for training is provided for each

- Certified Floodplain Manager (CFM®);
- Graduate of an approved four-day class conducted at, or field deployed by, FEMA's Emergency Management Institute (EMI). The credited classes are listed in the box; and
- Graduate of a home study version or other equivalent training.

EMI Classes Credited for RA1 Credit

E273—Managing Floodplain Development through the NFIP

E194—Advanced Floodplain Management Concepts I

E282—Advanced Floodplain Management Concepts II

E284—Advanced Floodplain Management Concepts III

E278—The Community Rating System

E386—Residential Coastal Construction

For more information, see http://www.training.fema.gov/emi

(b) Regulatory staff members may be employees or contract permit officials who administer the community's floodplain management permits. An exception is that credit for graduating from the CRS class (E278) is provided for any community employee, regardless of the office in which he or she works.

(c) The credit for training is based on the number of courses taken. If two people take the "Managing Floodplain Development" course, it is counted two times. The same credit is provided if one person took both the "Managing Floodplain Development" and "Coastal Construction" courses. If a CFM® took the Coastal Construction course, it is counted two times.

(d) There is no double credit for being both a CFM® and a graduate from the basic NFIP course (E273). This is counted once.

(e) This credit is removed if the staff person leaves the community or does not maintain his or her certification.

(2) IAS accreditation (RA2): IAS is the International Accreditation Service, an arm of the International Code Council. It has a program that reviews and accredits building departments. The program is explained at www.iasonline.org/Building_Department_Program.

A BCEGS classification of 5/5 or better is a prerequisite for RA2 credit. This ensures that the community's building department has a program that addresses natural hazards.

(3) Detailed inspections (RA3): Credit is for conducting three detailed inspections for each new building in the regulatory floodplain. Figure 430-3 explains what is needed for this credit. There is no partial credit for two inspections or for doing less than what is listed.

(4) Reinspections (RA4), i.e., inspecting buildings when they are sold or rented to a new tenant or application is made for a home improvement permit. For CRS credit, the regulations must clearly state that the community's inspector has the right to enter the building at the designated occurrences (e.g., sale of the property) and will inspect for compliance with the floodplain management permit that was previously issued. Documentation of the inspections is needed at verification.

(5) Off-site record storage (RA5): In the past, hurricanes, fires, floods, and other disasters have destroyed local permit offices and their files. This credit encourages communities to safeguard their floodplain management permit records. Credit is given if copies of such documents (in digital, scanned, or paper format) are stored at a site out of the floodplain and at least one mile away. The records must be transferred or copied to the off-site storage location at least once each year.

A "secure location" means a site protected from fire, theft, and natural hazards (including a category 5 hurricane). The site must not be subject to a flood hazard, i.e., it cannot be in a mapped SFHA, an X-Zone location subject to local drainage problems, or a basement with a known sewer backup problem. The community may submit a site that does not meet all of these criteria (e.g., it is less than one mile away) if it can demonstrate that the site is secure from fire, theft, flood, and other natural hazards (including a category 5 hurricane).

Credit Points

RA = the total of the following

(1) RA1 = EITHER

(a) 5 points, for each CFM® or graduate of an approved EMI class (up to 25 points for each CFM® and/or class graduate), OR

(b) 25 points, if all proposed development projects in the floodplain and all final inspections and project approvals are reviewed and approved by a CFM®. The credit is provided as long as no new floodplain development project is used or occupied without the review and approval of a CFM®

(2) RA2 = 5 points, if the community's building department has been accredited by the IAS

(3) RA3 = 16 points, if the community conducts inspections in accordance with the criteria in Figure 430-3

Credit for Inspections under Regulations Administration (RA3)

There is no partial credit for two inspections or for doing less than what is listed here.

For credit, the community must conduct at least three inspections for each permitted development project in the regulatory floodplain according to the following criteria:

1. The permit application records must include a site plan that shows
   a. The site plan's scale and north orientation arrow;
   b. The parcel boundaries and the location and names of adjacent streets;
   c. All watercourses on the parcel;
   d. All floodplain, V-Zone, coastal A-Zone, and floodway boundaries that run through the parcel;
   e. All required buffer or setback lines from shorelines or channel banks;
   f. All drainage and utility easements;
   g. All areas to be cleared, cut, graded, or filled; and
   h. The location of all existing and proposed fences, walls, and other structures.

2. If the permit includes a new building or an expansion of an existing building,
   a. The site plan must show the footprint of all existing and proposed buildings and building additions.
   b. The permit application papers must include
      - The elevation of the lowest floor of the building (or addition) and of an attached garage, including the elevation of the interior grade or floor of a crawlspace;
      - The location and elevation of all mechanical and utility equipment servicing the building; and
      - For buildings with solid foundation walls and buildings with enclosures below the base flood elevation, the total area of each enclosed area (in square feet) measured on the outside, the location and specifications of all flood openings, and either the total net open area (in square inches) of flood openings below the base flood elevation, accounting for screens, louvers, faceplates, and grilles; or a statement of certification if engineered openings are specified (see NFIP Technical Bulletin #1).

3. The first inspection is conducted when the site is staked out or otherwise marked. The inspector checks that areas subject to special requirements are clearly marked on the ground. For example, if the floodway, coastal A-Zone, or V-Zone line goes through the parcel or there is a natural area that is not to be disturbed, it could be staked out. If there are no such areas, then this inspection does not need to be conducted for CRS credit (however, it is still a good idea to place stakes or other markings to show the building footprint in order to verify setbacks and other code requirements).

4. The second inspection is conducted when the lowest floor is built for a building or building addition. The builder provides the community with documentation of the surveyed lowest floor elevation. The inspector checks that
   a. The foundation or forms for the structure are correctly located on the site;

[continued on next page]

Figure 430-3. Credit for inspections under regulations administration (RA3).

b. Where buildings have foundation walls or other enclosures below the base flood elevation, the location and size of the openings are as specified on the approved plans; and

c. In coastal high hazard areas (V Zones) and coastal A Zones, slabs placed under the building are not connected to the foundation.

The inspection records must include a record that the elevation of the lowest floor was surveyed and found to be compliant. This could be, but does not have to be, a FEMA Elevation Certificate. At this point the inspector verifies that the lowest floor will be at or above the required elevation. This inspection is not needed if the project does not involve construction of a new building or a substantial improvement.

5. The third inspection is conducted when the project is finished, the Elevation Certificate is submitted, and before or during the final building inspection. The inspector checks that
   a. The foundation and floor elevation have not been altered since the second inspection;
   b. All areas below the required elevation are constructed with materials resistant to flood damage;
   c. All required manufactured home tie downs are in place;
   d. Where buildings have foundation walls or other enclosures below the base flood elevation, the location and size of the openings are as specified on the approved plans and recorded on the Elevation Certificate;
   e. All electrical, heating, ventilation, plumbing, air conditioning, ductwork, and other equipment is located, elevated, or protected as specified on the approved plans and recorded on the Elevation Certificate;
   f. There has been no alteration of the ground since the second inspection OR the ground has been graded according to the approved plans (e.g., the lowest floor is at the correct height above the highest adjacent grade);
   g. V-Zone and breakaway wall certificates have been obtained, as appropriate, for new and substantially improved buildings in V-Zone and coastal A Zone areas; and
   h. Buildings with enclosures in coastal A Zones meet the A-Zone vent requirements.
6. The inspection records must include
   a. A completed FEMA Elevation or Floodproofing Certificate, as appropriate, that has been checked by the community for completeness and accuracy;
   b. Photographs of all sides of the structure;
   c. Close-up photographs of typical openings; and
   d. Photographs of all mechanical and utility equipment located outside the building showing (1) its relation to the building and ground and (2) its required anchoring.

Figure 430-3 (cont.). Credit for inspections under RA3.

(4) RA4 = 16 points, if the community conducts reinspections of buildings to ensure that they still comply with the floodplain management requirements of their earlier permits

(5) RA5 = 5 points, for storing key floodplain management permit records at a safe and secure site

Example 431.n-1.

A small town has one person handling all floodplain management activities. That person becomes and stays certified. RA1 = 25

Example 431.n-2.

A coastal county has five people involved in building and development permitting. Two are certified. One CFM® has been to the EMI coastal construction course. A third employee has been to the EMI Managing Floodplain Development class. Any of the five people can issue floodplain permits. RA1 = 5 x 4 = 20

Example 431.n-3.

All floodplain permits in South Scottsdale are reviewed, inspected, and permitted by a CFM®. (RA1 = 25), the City conducts all the inspections needed for RA3 credit (RA3 = 16), and the City scans all permit records and backs them up weekly (RA5 = 5). RA = 25 + 16 + 5 = 46

Impact Adjustment

There is no impact adjustment for RA.

Documentation Provided by the Community

(1) At each verification visit,

(a) [For RA1 credit for having a graduate from an EMI class] A copy of the certificate of course attendance.

(b) [For credit for RA3 or RA4] Inspection records that show how each item was checked. For RA3, the records must include copies of the photographs and elevation surveys.

(c) [For CFM® and IAS accreditation] No documentation is needed from the community. The status is verified by checking the names on the websites of the Association of State Floodplain Managers and of the IAS.

433 Credit Calculation

c430 = cDL + (FRB x rFRB) + (FDN x rFDN) + (CSI x rCSI)
+ (LSI x rLSI) + (PCF x rPCF) + (ENL x rENL)
+ BC + LDP + MHP + (CAZ x rCAZ) + cSHR
+ (OHS x rOHS) + SMS + RA, where

cDL = (DL1 x rDL1) + (DL2 x rDL2) + (DL3 x rDL3)

NOTE: *The total points for FRB, FDN, ENL, and CAZ (after the impact adjustment) cannot exceed 1,000 points, the value for DL2. The CRS does not provide more points for applying higher standards to new buildings than it does for prohibiting buildings in the floodplain.*

Example 433-1.

South Scottsdale has the following credits:

Two feet of freeboard:

FRB = 250, rFRB = 0.52

Prohibition of critical facilities in the floodway:

PCF = 80, rPCF = 0.08

Adoption of all the I-Codes (BC1 = 50) and a BCEGS class of 3/3 (BC2 = 30)

BC = 50 + 30 = 80

All floodplain permits are reviewed, inspected, and permitted by a CFM® (RA1 = 25), the City conducts all the inspections needed for RA3 credit (RA3 = 16), and the City scans all permit records and backs them up weekly (RA5 = 5).

RA = 25 + 16 + 5 = 46

c430 = cDL + (FRB x rFRB) + (FDN x rFDN) + (CSI x rCSI)
+ (LSI x rLSI) + (PCF x rPCF) + (ENL x rENL)
+ BC + LDP + MHP + (CAZ x rCAZ) + cSHR
+ (OHS x rOHS) + SMS + RA

= 0 + (250 x 0.52) + 0 + 0 + 0 + (80 x 0.08) + 0 + 80 + 0 + 0
+ 0 + 0 + 0 + 0 + 46

= 130.0 + 6.4 + 80 + 46 = 262.4

This value is rounded to the nearest whole number, so c430 = 262

434 For More Information

a. Additional information, reference materials, and examples can be found at www.CRSresources.org/400.

b. Most state NFIP coordinating offices have prepared model ordinances with provisions that exceed the minimum NFIP standards. Additional help on regulatory provisions may be available from state planning or community affairs agencies and regional planning commissions.

c. A separate publication, *CRS Credit for Higher Regulatory Standards*, provides additional information on the elements credited here, including sample ordinance language and documentation. Communities are encouraged to obtain and read this document before applying for this activity. It will improve the quality of the application and reduce the need to provide additional documentation later. For a free copy, see Appendix C or www.CRSresources.org/400.

d. To order free copies of the following publications, see Appendix C or www.CRSresources.org:

- *Special Flood-related Hazards Supplement to the CRS Coordinator's Manual,*
- *CRS Credit for Management of Coastal Erosion Hazards,* and
- *CRS Credit for Management of Tsunami Hazards*.

e. FEMA has numerous publications on regulatory standards and administering floodplain management regulations. See http://www.fema.gov/floodplain-management.

f. The Emergency Management Institute (EMI) is a FEMA training center located in Emmitsburg, Maryland. Stipends to cover local officials' travel, registration, and rooms are usually available from FEMA. EMI also sponsors field-deployed and home-study or "independent study" courses. For more information, call EMI at 1-800-238-3358 or the state emergency management agency's training office or visit the EMI website at http://training.fema.gov/emi/.

g. More information on the I-Codes can be obtained from the International Code Council at www.iccsafe.org.

   Reducing Flood Losses Through the International Code Series (2006 I-Codes with 2007 Supplement), 2000, was published jointly by the model code organizations, FEMA, the Association of State Floodplain Managers, and the American Society of Civil Engineers. See www.fema.gov/library/viewRecord.do?id=2094.

h. For more information on floodplain manager certification, contact the Association of State Floodplain Managers at (608) 828-3000 or see www.floods.org.

435 Related Activities under the Community Rating System

- If certain areas are subject to special regulations (such as the coastal A Zone), people should be advised of the regulations when they make map information inquiries (Activity 320 (Map Information Service)).
- Explaining permit requirements and regulatory standards is a credited topic for outreach projects (OP and FRP) under Activity 330 (Outreach Projects) and for website pages (Activity 350 (Flood Protection Information)).
- Requirements that are filed with a property's records, such as a nonconversion agreement (ENL), are eligible for credit as other disclosure requirements (ODR) in Activity 340 (Hazard Disclosure).
- Regulatory requirements should be part of any discussion of property protection measures (Activity 360 (Flood Protection Assistance)). For example, the community's substantial improvement rules should be explained, especially when Increased Cost of Compliance is discussed.
- If regulations are enforced in the regulatory floodplain outside the SFHA, there may be some credit available under Activity 410 (Floodplain Mapping).
- If the standards for development limitations (DL) are restrictive enough, the areas affected could qualify for preserved open space (OSP) under Activity 420 (Open Space Preservation).

440 FLOOD DATA MAINTENANCE—Summary

Maximum credit: 222 points (not including credit for special flood-related hazards)

442 Elements

a. **Additional map data (AMD):** Up to 160 points for implementing digital or paper systems that improve access, quality, and/or ease of updating flood data within the community.

b. **FIRM maintenance (FM):** Up to 15 points for maintaining copies of all Flood Insurance Rate Maps (FIRMs) that have been issued for the community.

c. **Benchmark maintenance (BMM):** Up to 27 points for a program that maintains benchmarks so surveyors can find them and can depend on them to be accurate.

d. **Erosion data maintenance (EDM):** Up to 20 points for maintaining coastal erosion data as described in *CRS Credit for Management of Coastal Erosion Hazards*.

Credit Criteria

Each element has a separate section discussing credit criteria.

Impact Adjustment

The impact adjustment for AMD is discussed in Section 442.a, and the impact adjustment for BMM is discussed in Section 442.c. There are no impact adjustments for FM or EDM.

Documentation Provided by the Community

Each element has a separate section describing needed documentation.

440 FLOOD DATA MAINTENANCE

The OBJECTIVE of this activity is to make community floodplain data more accessible, current, useful, and/or accurate so that the information contributes to the improvement of local regulations, insurance rating, planning, disclosure, and property appraisals.

441 Background

Outdated mapping hinders sound floodplain management. The map a community uses for floodplain management can and should be updated frequently to account for annexations, new subdivisions, site-by-site analyses, better ground elevation data, and incorporation of new hazard data. To make the map more useful and easier to use, it should include detailed topography, building footprints, natural features, and other data that can help relate the floodplain information to conditions on the ground and to other programs.

The most important map to the National Flood Insurance Program (NFIP) is the Flood Insurance Rate Map (FIRM). Many communities dispose of old FIRMs when new ones are issued. However, old FIRMs, if they are made available, can enable some communities and floodplain residents to review the history of the property (e.g., whether it was identified as floodprone when it was purchased) and to verify whether a building had to meet flood protection criteria when it was built.

Maintenance of benchmarks and support of global positioning system (GPS) surveying techniques makes it easier and less expensive for developers and property owners to determine ground, floor, and base flood elevations for construction and flood insurance purposes. Maintenance of erosion data improves the implementation of coastal floodplain management regulations.

441.a. Activity Description

Under this activity, credit is provided for putting the FIRM and Flood Boundary and Floodway Map delineations on a digitized mapping system or other method that allows for quick revision, review, and reprinting of a flood map (Section 442.a, AMD). This activity also includes credit for adding or overlaying additional data, such as sensitive areas, zoning districts, assessor data, and other map layers used regularly by the community's staff.

A computerized parcel system or geographic information system (GIS) is often easier to use than a paper map. With a computerized system, a building official, real estate agent, or anyone interested in the flood hazard can quickly find information such as the

Note that this activity only credits maintenance of the community's special flood hazard data. The FIRM published by FEMA is still the document used for flood insurance rates and the mandatory purchase requirement. However, if the community's flood data maintenance program finds an error in the FIRM, it should be reported to FEMA so it can be included in the next map revision. If the error would remove a property from the SFHA, it is assumed that the owner will be motivated to request a map amendment.

flood zone, flood elevations, or the lowest floor elevation for parcels or buildings within or near the floodplain.

Credit is also provided in this activity for

- Keeping old FIRMs and making them available (Section 442.b, FM),
- Maintaining accurate ground elevation data (Section 442.c, BMM),
- Replacing damaged or moved benchmarks (Section 442.c, BMM),
- Supporting GPS surveying systems (Section 442.c, BMM), and
- Erosion data maintenance in coastal areas (Section 442.d, EDM).

442 Elements

442.a. Additional map data (AMD)

The maximum credit for this element is 160 points.

AMD credits digital or other systems that improve access, quality, and/or ease of updating flood and FIRM data.

Three different types of flood data maintenance systems are usually eligible for credit:

- A GIS, computer-aided design (CAD), or other digitized system that updates information electronically and can display or print a current map.
- A data base management program for parcel records that maintains the appropriate flood data for each property. Some communities have master parcel record systems that can be accessed for building permit records, property tax information, FIRM data, and other purposes. Sometimes these systems are tied into a GIS. Credit is given if parcels in this system are designated as "in" or "out" of the floodplain.
- Map overlays, such as overlaying the SFHA on the zoning map, aerial photograph, or more detailed street map; or using clear plastic sheets over the FIRM to record map changes.

Data available from any of these three systems improve the community's administration of its floodplain management program.

Most of the credited items are important to provide the regulatory staff with the latest flood hazard data and other information for a property. Users of the community's system, including tax assessors and property appraisers, should be encouraged to access the data to be more aware of the flood hazard.

Credit Criteria

(1) AMD1 credit is a prerequisite for any other AMD credit.

(2) The map or data base must be used regularly by the community's regulatory staff. There is no credit for a map system that is used only for planning drainage projects or other non-regulatory purposes. Using the system to provide map determinations for the permit office is considered a regulatory purpose.

(3) New data, including annexations, new subdivision maps, flood insurance restudies, Letters of Map Revision, Letters of Map Amendment, and studies performed for site-specific analyses must be added at least annually to the data base or overlay map.

(4) Data from a digitized mapping or parcel system must be made available annually to the Federal Emergency Management Agency (FEMA) at no cost (if requested). A fee may be charged to other requestors based on the actual cost of retrieval or reproduction.

The Privacy Act

Flood insurance data on private property, including repetitive loss properties, are subject to the Privacy Act. Information such as the names of people and addresses of properties that have received flood insurance claims and the amounts of such claims MAY NOT be released to the public or used for solicitation or other purposes. Such information should be marked "For internal use only. Protected by the Privacy Act of 1974."

Generic information, such as total claim payments for an area or other data that are not connected to a particular property, MAY be made public.

Credit Points

AMD = the total of the following, based on the types of data included in the data maintenance system

AMD1 = 20 points, for showing the SFHA boundaries, corporate limits, streets, and parcel or lot boundaries (a data base management program must show whether a parcel is in the SFHA)

AMD2 = 26 points, for a GIS layer that shows buildings, building outlines, or building footprints (a data base management program must show whether the primary building on the lot is in the SFHA), and the building information is kept up to date to reflect new construction

AMD3 = 12 points, for showing floodways or coastal high hazard areas (a data base management program must show whether either the parcel or the primary building is in the floodway or coastal high hazard area)

AMD4 = 12 points, for showing base flood elevations

AMD5 = 10 points, for including FIRM zone attributes (e.g., A3, VE, etc.)

AMD6 = 10 points, for showing the 500-year floodplain elevations or boundaries (a database management program would show whether the parcel is in the 500-year floodplain)

AMD7 = 12 points, for showing areas of the community subject to other natural hazards, such as landslides, subsidence, stream migration, and soils unsuitable for septic fields (a data base management program would show whether the parcel is subject to another hazard)

AMD8 = EITHER:

(a) 8 points, if the community's GIS includes topographic contour lines,

OR

(b) 10 points, if the system includes topographic contour lines at a smaller contour interval than that provided on available U.S. Geological Survey digital orthophoto quarter quads (DOQQ). In those areas where there are no DOQQs, the credit is provided if the contour interval is smaller than that on the area's USGS quadrangle maps

AMD9 = 6 points, for including updated floodplain data in the tax assessment data base

AMD10 = 6 points, for including overlays or layers for all FIRMs in effect after the date of the community's application to the Community Rating System (CRS)

AMD11 = 8 points, for other overlays or data bases used for regulation or mitigation programs, including incorporating and maintaining layers from Hazus-MH (see Figure 510-2) and the community's repetitive loss areas (see Section 503)

AMD12 = 14 points, for areas with natural floodplain functions (e.g., wetlands, designated riparian habitat, flood water storage areas)

AMD13 = 14 points, for including building elevation data. The data must be in digital format, not scanned pictures of Elevation Certificates. The points are prorated in the same manner as Elevation Certificates are prorated in WEB4 (Section 352.c)

Example 442.a-1.

Pierce County, Washington, has a GIS that is used for regulatory, development, and building permit purposes. The GIS contains numerous layers for land development, zoning, critical areas, shoreline review, and other data sets. They include the following information, which can be credited:

(1) The SFHA boundaries, corporate limits, streets, and parcel boundaries (AMD1);

(2) Building footprints (AMD2);

(3) Floodways and coastal high hazard areas (AMD3);

(4) Base flood elevations (AMD4);

(5) FIRM zone attributes (e.g., A3, VE, etc.) (AMD5);

(6) The 500-year floodplain elevations and boundaries (AMD6);

(7) Channel migration zones, landslides, and lahars (AMD7);

(8) Contour lines created from a LiDAR data base (AMD8);

(10) All FIRMs in effect after the date of the community's application to the CRS (AMD10); and

(12) Fish and wildlife areas and wetlands (AMD12).

All of the above items are used by the County for various floodplain management and other community development programs.

AMD = 20 + 26 + 12 + 12 + 10 + 10 + 12 + 10 + 0 + 6 + 0 + 14 + 0
= 132

Impact Adjustment

The impact adjustment is calculated by dividing the area of the community's SFHA for which data have been entered into the computer (or added to the overlay map) by the total area of the community's SFHA (aSFHA):

$$rAMD = \frac{aAMD}{aSFHA}, \text{ where}$$

aAMD = the area within the SFHA that is covered by the additional map data, and

aSFHA = the area of the community's SFHA

The areas for aAMD and aSFHA must be in the same measurement—acres or square miles. If the calculated value of rAMD is less than 0.10, then 0.10 may be used for rAMD.

NOTE: *The community's aSFHA should be reviewed and updated each year for the Program Data Table that is included in the annual recertification (see Section 213.a).*

Example 442.a-2.

Pierce County's GIS covers the entire county and all its floodplains.

rAMD = 1.0

If a community has different digital mapping or data base systems for different areas of the community, it should designate and score each one separately and the total credit points will be corrected through the impact adjustment.

Example 442.a-3.

Gulf Beach County has a GIS for the developed area along the coast. For inland rural areas, the staff refers to map overlays. The GIS would be designated "AMD1" and the area not covered by the GIS would be "AMD2." The two systems would be scored and, if together they covered the entire county, rAMD1 plus rAMD2 would equal 1.0.

Documentation Provided by the Community

(1) At each verification visit,

(a) Copies of the maps or data base that clearly show the items to be credited. For example, printouts of some GIS screens could show all the attributes to be credited.

(b) [If the community calculates impact adjustment ratios for element AMD] The impact adjustment map discussed in Section 403. Each area listed in Section 442.a for which credit is being requested must be shown on the impact adjustment map.

442.b. FIRM maintenance (FM)

The maximum credit for this element is 15 points.

Having old FIRMs on hand can help with tracking substantial improvement requirements, compliance, and eligibility for grandfathered flood insurance premiums. Old maps can be hard to obtain, so a community that keeps them provides a valuable service to its residents.

FM credit is provided for maintaining earlier editions of flood insurance maps. The maps must be readily available and the community must allow inquirers access to them. Copies of old FIRMs and Flood Boundary and Floodway Maps may be available from the FEMA Map Service Center (https://msc.fema.gov/).

Credit Criteria

(1) Copies of the maps produced by the NFIP must be maintained. Under this element, credit is provided for maintaining copies of ALL FIRMs, Flood Insurance Studies, and Flood Boundary Floodway Maps. "All FIRMs" means every FIRM that appears on the list of FIRM revisions in the legend of each FIRM. If the community has only been issued one FIRM, no credit is available under this element, because keeping the community's current FIRM is a minimum requirement of the NFIP. Note also that maintaining copies of old FIRMs that have been in effect since 1999 (under Activity 320 (Map Information Service)), is a prerequisite to participating in the CRS. The FM credit is for maintaining ALL FIRMs, not just those that are required by the NFIP or the CRS.

(2) Additional credit is provided for maintaining copies of the Flood Hazard Boundary Maps, i.e., the FEMA maps published before the community received its first FIRM.

(3) The maps and documents can be maintained in paper, microfilm, or electronic format. They do not have to be part of the system credited under Section 442.a (AMD), but they must be in the possession of the community and made available to the public when asked.

Credit Points

FM = the total of the following:

(1) 12 points, for maintaining copies of all FIRMs, Flood Insurance Studies, and Flood Boundary Floodway Maps that have been issued for the community

(2) 3 points, for maintaining copies of all Flood Hazard Boundary Maps that were issued for the community

There is no credit if the FIRM has never been revised.

Impact Adjustment
There is no impact adjustment for FM.

Documentation Provided by the Community
(1) At each verification visit,

(a) The indexes from all past FIRMs and Flood Boundary and Floodway Maps, and the cover of each past Flood Insurance Study.

442.c. Benchmark maintenance (BMM)

The maximum credit for this element is 27 points.

BMM1 credits a program that maintains benchmarks so surveyors can find them and can depend on them to be accurate. BMM2 credits a program that maintains a network of stations that support GPS surveying.

Benchmarks: Accurate benchmarks are critical to surveyors when they are completing Elevation Certificates or performing land surveys before a new structure is built. If the benchmarks are not accurate, structures can be built too low, or perhaps even in the wrong location.

The National Spatial Reference System (NSRS) is maintained by the National Geodetic Survey (NGS) in the U.S. Department of Commerce. It is a compendium of vertical and horizontal benchmarks for the country. This element provides credit if the community has a sufficient number and density of benchmarks the meet the NSRS prerequisites. If the community does not, it is encouraged to either survey new ones or submit the data necessary to add qualifying existing benchmarks to the national system.

Any surveyor can create a NSRS benchmark. Surveyors must follow the guidelines of the NGS for the type of monument set and the accuracy of the survey that establishes the monument. After review by the NGS, these benchmarks are added to the NSRS data base, which is available to surveyors and the public at www.ngs.noaa.gov/cgi-bin/datasheet.prl.

GPS support: The NGS manages a network of Continuously Operating Reference Stations (CORS) that provide Global Navigation Satellite System data in support of three-dimensional positioning and geophysical applications throughout the United States.

Surveyors, GIS users, engineers, scientists, and others who collect GPS data can use CORS data to improve the precision of their positions. CORS-enhanced, post-processed coordinates are accurate to within a few centimeters relative to NSRS coordinates, both horizontally and vertically.

The CORS sites are independently owned and operated. Each agency shares its data with the NGS, and the NGS in turn analyzes and distributes the data free of charge. As of November 2011, the CORS network contained over 1,800 stations, contributed by over 200 different organizations, and the network continues to expand.

Having at least three CORS within 30 miles enables surveyors with portable GPS stations to obtain elevations accurate enough for FEMA Elevation Certificates in near-real time. The NGS provides a current map of CORS on its website (www.ngs.noaa.gov/CORS). This map provides the distance to the three nearest CORS from any point on the map. A community can use this map to see if it qualifies for BMM credit.

Credit Criteria

(1) There must be a list of the benchmarks and/or CORS and a description of the benchmark and/or CORS locations.

(2) To receive credit, each benchmark must meet all of the following criteria:

(a) It must be a benchmark that is either in the NSRS data base, or a permanent monument with key data posted in a reference system readily available to local surveyors, such as a published book or the community's website. The local system must include key data, such as the location and description of the benchmark, the elevation and datum, and when the benchmark was last recovered.

Some areas may not have any NSRS benchmarks. If the community has a network of quality benchmarks that are permanent monuments but are not entered into the NSRS, it must provide a statement, signed by a licensed surveyor, that each benchmark for which credit is requested is a monument that would qualify for addition to the NSRS if it were submitted to the NGS.

Permanent Monuments

"Permanent monuments" are engraved metal discs at least 2 inches in diameter or similar markers that are recognizable, durable, and immovable, and set in concrete or on steel rods driven to resistance. Chiseled squares in sidewalks, parts of fire hydrants, nails in telephone poles, "PK nails" in pavement, etc., are NOT "permanent monuments."

(b) There must be a note that the benchmark has been recovered within the last five years. "Recovered" means that the benchmark has been located and that it appears to be undisturbed. If a benchmark has not been recovered in the last five years, a local official or surveyor can locate the monument and report that it has been recovered. A recovery note must be filed in the NSRS or where it can be accessed by local surveyors.

In some cases, the community or local surveyors may need to recover all credited benchmarks to maintain this credit at each cycle verification visit. Recovery can be reported by any local official—it does not have to be a licensed surveyor. Recovery can also be reported by surveyors in the private sector if the community maintains the recovery notes. The NSRS website explains the process to report recovery.

(c) The benchmark must be a first- or second-order vertical control benchmark. The "order" tells how close the results were when the surveyor who set the benchmark completed a circuit back to the starting point. Lower-order vertical benchmarks are not as precise in elevation.

(d) It must have a stability rating of A or B. The NSRS describes whether a benchmark is likely to move over time with the following system:

A = most reliable and expected to hold an elevation (e.g., bedrock);

B = probably will hold an elevation well (e.g., a massive bridge pier);

C = may hold, but of a type commonly subject to ground movement (e.g., a building foundation); and

D = mark of questionable or unknown stability.

Some areas may not have any benchmarks rated A or B. If the community has an alternative way to provide dependable elevation data, it may submit a description of its alternative. An example would be a program that resurveys benchmarks every few years. The community must demonstrate that its alternative method achieves consistently accurate elevations over time.

(e) It must be within one mile of some part of the community's SFHA. The community must submit a map showing the location of the qualifying benchmarks and the portion of the SFHA within one mile of a qualifying benchmark. Areas mapped as approximate A Zones without elevations do not need to be included as part of the SFHA unless the community is asking for credit under Activity 410 for flood elevations for a site at the time of development.

(3) Credit can be provided for CORS as an alternative or in addition to the benchmarks that meet credit criterion (2). There must be at least three CORS within 30 miles of the credited portion of the SFHA. There is no credit for areas covered by only one or two CORS.

(4) An impact adjustment map is required that shows the community's SFHA, the locations of the listed benchmarks or CORS, and the portion of the SFHA that is within one mile of a qualifying benchmark or within 30 miles of a qualifying CORS.

Credit Points

BMM = BMM1 + BMM2, provided that the areas covered do not overlap

BMM1 = 27 points, if the community has one or more benchmarks that meet credit criterion (2)

BMM2 = 27 points, if there are three CORS within 30 miles (50 km) of any portion of the SFHA

If a community has benchmarks for some areas of the community and CORS for others, it should designate and score each one separately and the total credit points will be calculated through the impact adjustment and credit calculation formula (Section 443).

Impact Adjustment

The impact adjustment for BMM1 is based on the area of the community's SFHA that is within one mile of the benchmarks and the total area of the community's SFHA.

$$rBMM1 = \frac{aBMM1}{aSFHA}, \text{ where}$$

aBMM1 = the area of the SFHA within one mile of a qualifying benchmark and not counted as a part of aBMM2, and

aSFHA = the area of the community's SFHA, in square miles

The impact adjustment for BMM2 is based on the area of the community's SFHA that is within 30 miles of at least three CORS and the total area of the community's SFHA.

$$rBMM2 = \frac{aBMM2}{aSFHA}, \text{ where}$$

aBMM2 = the area of the SFHA within 30 miles of at least three CORS and not counted as a part of aBMM1, and

aSFHA = the area of the community's SFHA, in square miles

Documentation Provided by the Community

(1) At each verification visit,

(a) The list of the benchmarks and/or CORS.

(b) The data for the creditable benchmarks that are in the NSRS or the community's publicly accessible data base. This must include key data, such as the location and description of the benchmarks, their order and stability, the elevation and datum, and when the benchmarks were last recovered.

The documentation can be in the form of either

(i) A printout of the NSRS datasheets, a photocopy of the relevant pages of the community's benchmark book, or the URL for the website data base, or

(ii) For those benchmarks that are not in the NSRS, a statement signed by a licensed surveyor that states that they meet all five of this element's prerequisites. The surveyor's statement does not need to be certified or sealed, but does need to include the signatory's license number.

(c) An impact adjustment map (see credit criterion (4)). See Section 403 on impact adjustment maps. The BMM impact adjustment must show those SFHAs where base

flood elevations are available, the locations of the benchmarks (for BMM1 credit), or the locations of the CORS (for BMM2 credit). The NSRS retrieval maps do not qualify because they do not show or name a sufficient number of features.

Example 442.b-1.

A small community has two vertical control benchmarks that meet the prerequisites. One is listed in the NSRS and the other is posted on the city engineering department's website. All parts of the SFHA are within one mile of one or the other benchmark.

The area of its SFHA is 396 acres or 0.62 square miles.

$$\text{rBMM 1} = \frac{\text{aBMM}}{\text{aSFHA}} = \frac{0.62}{0.62} = 1.0$$

442.d. Erosion data maintenance (EDM)

The maximum credit for element EDM is 20 points.

EDM credit is for updating the rate of coastal erosion and the rates used for regulating building setbacks. More information and credit point calculations can be found in *CRS Credit for Management of Coastal Erosion Hazards* (see Appendix C or www.CRSresources.org).

Credit Criteria

The credit criteria are described in *CRS Credit for Management of Coastal Erosion Hazards*.

Credit Points

The credit points for EDM are calculated separately and transferred to this activity.

Impact Adjustment

There is no impact adjustment for element EDM.

Documentation Provided by the Community

Documentation is described in *CRS Credit for Management of Coastal Erosion Hazards*.

443 Credit Calculation

c440 = cAMD + FM + cBMM + EDM, where

cAMD = AMD x rAMD, and

cBMM = (BMM1 x rBMM1) + (BMM2 x rBMM2)

444 For More Information

a. Additional information, reference materials, and examples can be found at www.CRSresources.org/400.

b. The following documents are available from

FEMA Distribution Center
P.O. Box 2010
Jessup, MD 20794-2012
1-800-480-2520
Fax: (301)-362-5335

Guidance for Preparing Draft Digital Data and DFIRM Databases (2003). Available at www.fema.gov/library/viewRecord.do?id=2206

Flood Insurance Study Guidelines and Specifications for Flood Hazard Mapping Partners, (2003). Available at www.fema.gov/library/viewRecord.do?id=2206.

c. Rural communities can request help on this activity from the U.S. Natural Resources Conservation Service. Requests should be submitted to the local soil and water conservation district, which usually is located in the county seat.

d. The U.S. Army Corps of Engineers can provide assistance with benchmarks and mapping issues. Requests for assistance should be submitted to the Flood Plain Management Services Coordinator at the appropriate District Office of the Corps.

e. Communities may check on past FIRMs and obtain background data by calling 1-877-FEMA MAP. They can also find many of their old maps through https://msc.fema.gov, under Product Catalog and Historic Flood Maps.

f. Information on the National Spatial Reference System (NSRS) can be found at www.ngs.noaa.gov. Benchmarks entered into the system are recorded on data sheets at www.ngs.noaa.gov/cgi-bin/datasheet.prl.

445 Related Activities under the Community Rating System

This activity directly supports floodplain management to comply with the minimum NFIP requirements, but it also supports a number of CRS activities.

- Activity 320 (Map Information Service)—Having copies of existing and old FIRMs in an easily accessible format can facilitate credit under this activity. If more layers are available, then information can also be provided for additional hazards.
- Activity 330 (Outreach Projects)—Maps of the existing SFHA, showing all the additional detail credited in Activity 440, allow for a higher-quality outreach program that addresses the specific issues in each neighborhood. Additional hazard data and information on natural functions also help inform the outreach process and help educate the public. If the community has a GIS or a data base management program for parcel records, it should be able to prepare a printout or a disk with the addresses of all the properties in the floodplain. This will facilitate mailing an outreach project to floodplain residents.
- Activity 340 (Hazard Disclosure)—Provision of good map data to insurance agents and others allows them to better and more easily inform their clients about existing hazards and natural resources and functions.
- Activity 360 (Flood Protection Assistance)—The more information the community has in its system, the more support the community can offer quickly and easily.
- Activity 370 (Flood Insurance Promotion)—Digital copies of maps, particularly containing parcel and structure data, can help the community target its program to promote the purchase of flood insurance by its residents. Structures for which insurance is required can be identified and, if first-floor information is available, estimates of the cost of flood insurance can be developed for the owners. If repetitive loss areas are included, then they can be targeted for additional outreach or prioritized within the program.
- Activity 410 (Floodplain Mapping)—Integration of floodplain map information provided by the community with FIRM map information and LOMRs can be facilitated by having all of the information in a single data system, like a GIS.
- Activity 420 (Open Space Preservation)—Creating all the overlays or data bases for a GIS can provide the information necessary to identify and calculate credit for open space, including the bonus credit for natural functions.
- Activity 430 (Higher Regulatory Standards)—Having map and parcel data in one system can facilitate rapid and accurate decisions regarding a number of community regulations, including freeboard, enclosure limits, coastal A-Zone standards and others. Having first-floor elevations available and mapped for credit can help verify that the community is properly implementing its freeboard requirements. The maps also can be used to determine the impact adjustment required for each element within this activity and Activity 420. Benchmarks are necessary for ensuring that structures

are properly elevated and having the location of the benchmarks easily available is important.

- Activity 450 (Stormwater Management)—Having accurate topography available is important for determining watershed boundaries and flow paths to ensure that new developments are properly implementing stormwater management requirements. Mapping of other sensitive areas can be credited under watershed master planning and additional credit can be obtained if the maps are part of the system used for regulation under this activity.
- Activity 510 (Floodplain Management Planning)—Planning requires good data. Having all the data in an easily visible format is critical to good planning. Data credited in 440 should be used during development of a community's flood hazard management plan, and any additional data developed during the process could add to the credit in 440 if the layer was not previously available.
- Activity 520 (Acquisition and Relocation)—Having older maps showing parcel and structure data can help target structures for acquisition or relocation and also contribute to documenting completion of the project.
- Activity 530 (Flood Protection)—Having first-floor data available is important for grant opportunities. When a community has all or most of the information credited in this activity, it can identify which structures are of highest priority for retrofitting or elevation. Once a project is completed, the maps can be used to verify the activity.
- Activity 540 (Drainage System Maintenance)—Mapping of natural functions and structures can help a community decide where to target its channel maintenance activities. Having all drainage facilities incorporated as part of its data base allows for better planning for new development, better maintenance, and a way to determine what maintenance standards should be required.
- Activity 610 (Flood Warning and Response)—Maps of the SFHA, structures, evacuation routes, other natural hazards, building elevations, and ground elevations help the community determine how it will respond during a flood.
- Activity 620 (Levees)—Maps of areas that can be inundated after a levee fails are crucial to planning how to respond. Maps of the SFHA, the 500-year inundation boundaries, buildings and their first floors, and topography all help with this planning.
- Activity 630 (Dams)—A community needs maps of areas that can be inundated after a dam fails in order to plan how to respond. Maps of the SFHA, the 500-year inundation boundaries, structures and their first floors, and topography all help with this planning.

450 STORMWATER MANAGEMENT—Summary

Maximum credit: 755 points

452 Elements

a. **Stormwater management regulations (SMR):** Up to 380 points for regulating development on a case-by-case basis to ensure that the peak flow of stormwater runoff from each site will not exceed the pre-development runoff. SMR credit is the sum of four sub-elements:

   (1) Size of development regulated (SZ): Up to 110 points.

   (2) Design storms used in regulations (DS): Up to 225 points.

   (3) Low-impact development (LID): Up to 25 points.

   (4) Public maintenance of required facilities (PUB): Up to 20 points.

b. **Watershed master plan (WMP):** Up to 315 points for regulating development according to a watershed management master plan. WMP is the total of eight sub-elements.

c. **Erosion and sedimentation control regulations (ESC):** Up to 40 points for regulations to minimize erosion from land disturbed due to construction or farming.

d. **Water quality regulations (WQ):** 20 points for regulations that improve the quality of stormwater runoff.

Credit Criteria

Each element has a separate section discussing credit criteria.

Impact Adjustment

The credit points for SMR and WMP are adjusted by ratios reflecting the proportion of the watersheds affected by the regulations or the plan. There is no impact adjustment for elements ESC or WQ.

Documentation Provided by the Community

Each element has a separate section describing needed documentation.

450 STORMWATER MANAGEMENT

The OBJECTIVE of this activity is to prevent future development from increasing flood hazards to existing development and to maintain and improve water quality.

451 Background

When unmanaged, stormwater runoff from new development throughout a watershed can affect floodplains by causing more frequent flooding, greater flood depths, and longer-lasting floods. As forests, fields, and farms are covered by impermeable surfaces, such as streets, rooftops, and parking lots, more of the rain runs off and it runs off at a faster rate. When an area is urbanized, the rate of runoff and the volume of runoff can increase five-fold or more.

More Help on Stormwater Management Credit

A separate publication, ***CRS Credit for Stormwater Management***, provides an example of a community program and appropriate documentation. Communities are encouraged to obtain and read this document before applying for this activity. It will improve the quality of the application and reduce the need to provide additional documentation later.

To order a free copy, see Appendix C or www.CRSresources.org/400.

This problem is compounded by

- Changes in the surface drainage system. Stormwater runoff travels faster on streets and in storm drains than it did under pre-development conditions;
- Armoring of channels, which can increase the velocity of flows and remove habitat that is essential to many riparian species; and
- Sediment from disturbed ground, which can reduce the capacity of the drainage system, adversely affect water quality, and destroy habitat for many species of insects and the fish that depend on them.

People, buildings, and infrastructure are affected by these changed conditions. Communities are affected by development that takes place upstream in their watershed, and the community's own development in turn can have an impact on downstream communities. Consequently, watershed-based agencies have been created around the country to address these issues on a broader scale. Communities are encouraged to cooperate with adjacent communities to manage stormwater.

It is very important to regulate new development to ensure that the peak flow and volume of stormwater runoff that leaves a development site will be no greater than the runoff from the site before it was developed. Restrictions on individual developments can address many watershed development problems, but to prevent unwanted consequences from development as a whole, communities need to plan on a watershed-wide basis.

By completing watershed master plans, communities can examine the potential impact of unmitigated development on streams and structures throughout the watershed. Once these impacts are known, a comprehensive program, including more specific development

regulations, can be created to prevent adverse impacts. This will prevent an increase in flood damage or stream erosion, reductions in groundwater recharge or water quality, and loss of habitat.

451.a. Activity Description

This activity credits four approaches to managing new development in the watershed.

(1) **Stormwater management regulations (SMR):** Regulating development on a case-by-case basis to ensure that the peak flow and volume of stormwater runoff from each site will be no greater than the runoff from the site before it was developed. Other development regulations requiring developers to maximize a site's ability to absorb site runoff can be credited.

(2) **Watershed master planning (WMP):** Regulating development according to a watershed management master plan that analyzes the combined effects of existing and expected development on drainage throughout the watershed. A stormwater management regulation credited under Section 452.a (SMR) helps to manage increased runoff from a developing watershed, but it does not solve the problem entirely. The flood peak at a point downstream in a watershed is a result of both the quantity of upstream runoff and the time it takes for water to travel down the watershed. Development within the watershed usually has an impact on both of these characteristics.

The objective of watershed master planning under Section 452.b (WMP) is to provide the community with a tool it can use to make decisions that will reduce the increased flooding from development on a watershed-wide basis. Most communities have some way of dealing with drainage problems, through a capital improvement plan, planned flood control structures, or perhaps just by responding to complaints as they arise. A watershed master plan, like other community plans, allows communities within the watershed to consider future development as they work on current problems.

(3) **Erosion and sediment control (ESC):** Regulating activities throughout the watershed to minimize erosion on construction sites that result could in sedimentation and water pollution.

(4) **Water quality (WQ)**: Requiring new developments' stormwater management facilities to improve the quality of stormwater runoff.

452 Elements

452.a. Stormwater management regulations (SMR)

The maximum credit for this element is 380 points.

SMR credits the regulations used by the community and its neighbors in the watershed to manage runoff from future development. SMR credit is provided if new development is required to prevent or reduce the increase in runoff that results from urbanization. SMR credit is only provided for regulation of runoff from a 10-year storm or larger. Additional credit is available if the community addresses larger storms, and controls the total volume of runoff from new development.

Because development typically results in an increase in the amount of runoff, stormwater management usually requires that a volume of flood water be stored during the storm to prevent increased frequency and severity of flooding. It is released after the runoff subsides (stormwater DETENTION). A developer may store this excess runoff for a short time so that it may be used for irrigation or groundwater recharge or to reduce pollution (stormwater RETENTION). When retention is used for stormwater management, the retained runoff is not discharged to the stream system.

Detention does not reduce the amount of water flowing downstream; rather, it simply lets it out over a longer period of time to reduce the peak flow. This can still cause flooding problems farther downstream and the extra flows can destabilize channel banks and cause other problems. Therefore, stormwater retention or extended detention is preferable to simple detention for peak flows. If stormwater retention is used, the community must ensure that adequate storage is again available within a reasonable time in case another storm occurs.

Other approaches, such as low-impact development regulations, can be used to reduce the runoff that leaves a site. These techniques help preserve a site's ability to absorb its runoff. Credit may be provided for other approaches to managing the impact of development on runoff, if the community can show that there is no increase in flood damage downstream.

Maintenance of these facilities is vital—if they silt in or become clogged, they provide no flood protection benefits. Therefore, there are separate credits for maintaining storage facilities.

SMR credit is the sum of the credit for four sub-elements:

- Size of development (Section 452.a(1), SZ),
- Design storm used (Section 452.a(2), DS),
- Low-impact development regulations (Section 452.a(3), LID), and
- Requirements for public inspection and maintenance of all facilities constructed to comply with the ordinance (Section 452.a(4), PUB).

Communities are encouraged to check with their state or regional stormwater management agency to see if they can apply for "uniform minimum credit," i.e., credit based on the stormwater management program implemented by the state or regional agency.

Credit Criteria

(1) The watershed must be subject to a regulation that requires the peak runoff from new development to be no greater than the runoff from the site in its pre-development condition.

(2) A community must have credit for size of development (SZ) and design storm (DS) in order to receive credit for SMR.

(3) For SZ credit, the community must, at a minimum, regulate parcels of 5 acres or more or increases in impervious area of 20,000 square feet or more.

(4) For DS credit, the community must require management of at least a 10-year storm. A regulation designed to retain or detain only the "first flush," the first inch of rainfall, or less than a 10-year storm, is not credited under SMR. However, it may qualify as a water quality regulation (WQ) and be credited under Section 452.d.

(5) For DS credit, the community's regulations must require pre- and post-development hydrology calculations and post-development runoff must be limited to pre-development levels.

Sub-elements

(1) **Size of development (SZ)**:

The maximum credit for this sub-element is 110 points.

Maximum credit for SZ is provided if the regulations clearly state that all development, including single-family residences, is subject to the regulations. However, some SZ credit can be provided for different types of development; for example, if the community regulates commercial developments that are larger than one-half acre (SZ1 = 60 points) and residential developments larger than 5 acres (SZ2 = 15 points). An impact adjustment must be used to reflect the percentage of land in each category.

Credit Points

(1) SZ = one of the following, based upon the minimum size of areas regulated:

(a) SZ = 110 points, if all development is regulated, or

(b) SZ = 90 points, if all development is regulated except for single-family residences, parcels of one-half acre or less, or increases in impervious area of 5,000 square feet or less, or

(c) SZ = 60 points, if all development is regulated except for parcels of 1 acre or less or increases in impervious area of 10,000 square feet or less, or

(d) SZ = 15 points, if all development is regulated except for parcels of 5 acres or less or increases in impervious area of 20,000 square feet or less

If the regulations only affect development of parcels LARGER than 5 acres (e.g., 10-acre developments) or increases in impervious area of more than 20,000 square feet, there is no credit for SZ or credit for SMR.

Credit may be provided for requiring developers to pay fees in lieu of constructing facilities, if the fees collected go toward construction of the necessary facilities.

Example 452.a-1.

As a condition of subdivision, planned-unit development, or other permit approval, the community requires that all developments larger than 1 acre ensure that the post-development stormwater discharge will not exceed the amount of runoff under pre-development conditions.

SZ = 60

(2) **Design storms used in regulations (DS):**

The maximum credit for this sub-element is 225 points, including the bonus for control of volume.

Although the 100-year flood is the typical basis for floodplain management, many communities use a lesser standard for stormwater management. A lower standard may meet many community needs, but management of smaller storms does not necessarily result in reduced peak flows or volume from a major storm. DS credit is based on the size of the storm that is managed by the community's program—more points are provided for managing larger storms.

The maximum DS credit is provided if the regulation clearly states that all discharges up to and including that from the 100-year storm must be released at rates not exceeding the pre-development peak discharge. Bonus credit for controlling the volume of runoff is provided (up to 75 more points) when the regulations require retention of all runoff. The additional credit is also provided if the total volume of water released, measured above half of the 2-year flow rate is no more than the pre-development condition.

As an alternative to such a performance standard, the language may be based on criteria designed to produce the same result on a regional basis (e.g., a standard allowable discharge per acre based on a regional study). If such language is used, the community must provide an estimate of the design storm controlled and a comparison of the pre-development runoff and the permitted discharge. Note that if this is based on a regional study, this may already have been documented by the regional agency or another Community Rating System (CRS) community in the region.

Example 441.a-2.

Language for a volume control ordinance could read:

> All new development within the Little River watershed shall be designed to prevent any increase in peak flow, velocity, or total runoff volume during the 5-year and 100-year rainfall events. Before development, the developer must submit hydrologic and hydraulic studies showing the nature and extent of runoff under present conditions and with the proposed development for those two rainfall events.

Credit Points

(2) DS = the total of the following for the storms used to measure the impact of new development:

(a) DS1 = EITHER 14 points, if detention is designed for a 10-year storm, OR

21 points, if the volume is also controlled

(b) DS2 = EITHER 36 points, if detention is designed for a storm larger than the 10-year but smaller than the 100-year storm, OR

54 points, if the volume is also controlled

(c) DS3 = EITHER 100 points, if detention is designed for the peak flow of the 100-year storm, OR

150 points, if the volume is also controlled

The regulations must require pre- and post-development hydrology calculations and post-development runoff must be limited to pre-development levels (credit criterion (5)). The standard used may be peak flow, volume, or a combination of the two. If the volume of runoff is controlled by retaining the runoff on site, infiltrating the runoff, or ensuring that the volume of runoff during all storms greater than half of the 2-year event remains constant, the credit is increased by 50%.

Example 452.a-2.

A community's stormwater management ordinance used to require regulation of the 2- and 10-year storms to prevent increases in runoff. Under that ordinance, DS1 = 14, DS2 = 0, and DS3 = 0. Similarly, if the ordinance had been based on the 25- and 50-year storms, DS1 would be 0, DS2 = 36 and DS3 = 0.

The community adopted an ordinance that requires determination of a proposed development's effects on the 10- and the 100-year storms to ensure that downstream peak flows are not increased. Now, DS1 = 14, DS2 = 0 and DS3 = 100.

DS = DS1 + DS2 + DS3 = 14 + 0 + 100 = 114

Example 452.a-3.

A Florida county has sandy soils and requires all new development within closed basins of concern to retain on site the runoff from all storms up to and including the 100-year storm.

DS = DS1 + DS2 + DS3 = 21 + 54 + 150 = 225

(3) **Low-impact development (LID):**

The maximum credit for this sub-element is 25 points.

LID credits the community's regulatory language that requires the implementation of LID techniques when new development occurs. LID techniques can significantly reduce or eliminate the increase in stormwater runoff created by traditional development, encourage aquifer recharge, and promote better water quality. Communities are encouraged to use these techniques to minimize the need for more traditional stormwater management.

Low-impact Development (LID)

"By implementing LID principles and practices, water can be managed in a way that reduces the impact of built areas and promotes the natural movement of water within an ecosystem or watershed. Applied on a broad scale, LID can maintain or restore a watershed's hydrologic and ecological functions.

LID can be applied to new development, redevelopment, or as retrofits to existing development. LID has been adapted to a range of land uses from high density ultra-urban settings to low-density development." (www.epa.gov/owow/NPS/lid/)

The U.S. Environmental Protection Agency (EPA) defines LID as

> . . . an approach to land development (or re-development) that works with nature to manage stormwater as close to its source as possible. LID employs principles such as preserving and recreating natural landscape features and minimizing effective imperviousness to create functional and appealing site drainage that treats stormwater as a resource rather than a waste product.
>
> Many practices have been used to adhere to these principles, such as bioretention facilities, rain gardens, vegetated rooftops, rain barrels, and permeable pavements. By implementing LID principles and practices, water can be managed in a way that reduces the impact of built areas and promotes the natural movement of water within an ecosystem or watershed. Applied on a broad scale, LID can maintain or restore a watershed's hydrologic and ecological functions.

Communities that require new development and redevelopment to implement LID in all cases can receive 25 points.

Credit for LID is also provided if the community's stormwater management ordinance requires the use of "soft" techniques to reduce runoff to the maximum extent possible before using detention. This can be thought of as a requirement to mimic natural hydrologic runoff and minimize the impact of land development on water resources to the maximum extent possible. The developers are required to control the runoff, but detention ponds are discouraged in favor of on-site infiltration.

A community can receive partial LID credit for a stormwater management ordinance that requires that all development (except a single-family residence) minimize runoff using these techniques.

Credit Points

(3) LID = up to 25 points, if all development is required to give preference to the use of low-impact development techniques (instead of pipes, channels, or detention) to control the impacts of development on runoff

Example 452.a-4.

The following language is from Section 4.2 of the Stormwater Management and Sediment and Erosion Control Ordinance for Berkeley County, West Virginia, and would receive LID credit.

> Small scale stormwater management practices, non-structural techniques, and better site planning to mimic natural hydrologic runoff characteristics and minimize the impact of land development on water resources must be implemented. Only when it is absolutely necessary is the use of a structural BMP warranted.

LID = 25

The full ordinance can be found at www.berkeleycountycomm.org/pdf/planning/swmdraft.pdf.

(4) **Public maintenance of required facilities (PUB)**:

The maximum credit for this sub-element is 20 points.

PUB credit is provided for establishing maintenance procedures and requiring that owners of the new facilities abide by them. A community can receive PUB credit in one of three ways.

(a) If the community requires that, at least once each year, the owners of all stormwater management facilities constructed after the date of adoption of the regulation have the facilities inspected by a licensed professional engineer and perform any maintenance recommended by the engineer.

The owners must provide to the community a copy of the engineers' annual inspection reports and documentation of the maintenance performed. If the owner fails to do the inspection or perform the maintenance required by the inspections, the community (or agency) must have the authority to perform the inspection, order the maintenance to be done by the owner, or perform the maintenance and bill the owner for the work performed.

(b) If the community requires the owners of all new facilities to allow the community to inspect their facilities. If problems are found, the owners must perform the necessary maintenance. If the owner fails to perform the required maintenance, the community (or agency) must have the authority to perform the maintenance and bill the owner for the work performed.

(c) All stormwater management facilities constructed after the date of adoption of the regulation (including basins built by private developers) are required to be deeded to the community (or other stormwater management agency).

Whichever approach is used, it must be supported by an ordinance or other regulatory authority. For example, holding the owner responsible for maintenance must be based on clear legal authority, such as the subdivision ordinance, that was known to the developer at the time of construction of the stormwater facility. Credit is not provided for a policy or a statement that the community "has been able to get compliance in the past" if there is no clear legal authority.

Credit Points

(4) PUB = 20 points, for requiring the inspection and maintenance of stormwater management facilities

Impact Adjustment

The impact adjustment for SMR is based on the area of the watershed that is regulated by the SMR regulations (aSMR) and the total area of the watershed (aW). See Sections 402 and 403 on calculating an impact adjustment.

In order to determine aSMR the community must prepare a watershed impact adjustment map (see Section 403.d). The base map for the watershed impact adjustment map should be a small-scale map that shows all of the watersheds affecting the community. The entire watershed for each watercourse draining into or through the community should be shown on the map (except those with drainage areas over 50 square miles, if they are excluded from the calculations). The total area of these watersheds is represented by aW.

Many communities are part of very large watersheds, which can mean they account for only a tiny portion of it. With appropriate documentation, aW may be reduced in three ways.

(1) If the area of a watershed exceeds 50 square miles at the point where it enters the community, the community may choose to exclude the upstream portion. If such large watersheds are outside the community's jurisdiction, or are not regulated, the community will receive more credit by excluding them. If they are regulated, the community will receive more credit by including them. The extent of the applicability of each set of regulations enforced within each watershed, if there is more than one, must be shown and the area calculated.

(2) If upstream watersheds are effectively reduced by flood control structures that control the base flood, the size of aW is reduced accordingly. Only structures designed to

control the base flood and credited as such by the Federal Emergency Management Agency (FEMA) can be used for this type of adjustment to aW.

(3) If, because of their ownership, portions of the watersheds are unlikely to be developed, those portions may be excluded from aW. Areas that could be excluded are national forests, state parks, or privately owned land dedicated to open space use.

Communities are encouraged to cooperate with adjacent communities to manage stormwater. If a community only has regulatory jurisdiction over a portion of its watersheds, it cannot ensure that properties will be safe from increased runoff in the future, because of upstream development. However, if upstream communities also manage future development, either independently or through county-wide or watershed regulations, all communities can benefit. Therefore, if a community can demonstrate that upstream communities have similar watershed management programs for the upper portions of their watersheds, it can include those areas in aSMR.

If the community does not regulate development within all of the watersheds that affect it and wants an impact adjustment ratio greater than 0.15, it needs to develop a watershed impact adjustment map to determine the areas required to calculate rSMR for each area with different and creditable regulations.

$$rSMR = \frac{aSMR}{aW}, \text{ where}$$

aSMR = the area subject to stormwater management regulation, and

aW = the area of all watersheds affecting the community

If the total calculated impact adjustment is less than 0.15, or the community does not prepare a watershed impact adjustment map, then rSMR = 0.15.

Example 452.a-5.

A community regulates all watersheds within its corporate limits. However, areas outside the corporate limits are not regulated. The staff calculates that the area of the community's jurisdiction is 13% of all the land within the watersheds that drain to the community. Therefore, 0.15 is used for rSMR, since it is greater than the value calculated by the community.

Documentation Provided by the Community

(1) At each verification visit,

(a) The needed documentation is assembled by the ISO/CRS Specialist and provided to the technical reviewer for this activity. There is a checklist to help the stormwater manager identify all the needed documentation, available at www.CRSresources.org/400.

(b) A copy of the ordinance or legal language that regulates surface water runoff from new development in the watershed. For SMR credit, the language must require that peak runoff from new development be no greater than the runoff from the site in its pre-development condition. The margin next to where this appears in the ordinance must be marked, e.g., "SMR."

The language submitted must include those factors that are credited: size of development regulated, design storms to be used, low impact development criteria, and how the maintenance of required facilities is handled.

For CRS credit, the regulations must be legally enforceable. Policies and guidelines are not acceptable unless the community's legal counsel states that they are enforceable.

(c) Development and building permit records that demonstrate enforcement of the regulations. The ISO/CRS Specialist determines how many records are needed to obtain a representative sample.

(d) [If the community determines the area covered by stormwater management regulations (aSMR) to include watershed areas regulated by other communities] Documentation that watersheds outside the jurisdiction of the community are regulated to standards similar to those within the community.

(e) An impact adjustment map showing watershed boundaries and stormwater management jurisdictions.

The ISO/CRS Specialist may visit a sample of sites in the field to verify that stormwater management facilities have been constructed in accordance with the approved plans.

Credit Calculation

SMR = SZ + DS + LID + PUB

cSMR = SMR x rSMR

452.b. Watershed master plan (WMP)

The maximum credit for this element is 315 points.

WMP credit is provided if the community implements stormwater management regulations through an adopted watershed master plan. Credit is also provided for watershed master plans that

- Evaluate future conditions and long-duration storms,
- Identify wetlands and natural areas,
- Address the protection of natural channels, and
- Provide a dedicated funding source for implementing the plan.

The objective of watershed master planning is to provide the community with a tool it can use to make decisions that will reduce the increased flooding from development on a watershed-wide basis. Although there is no doubt that stormwater management regulations reduce the future flood threat from a developing area, a watershed master plan goes much further in predicting the rainfall/runoff relationships within the watershed, and in locating and dealing with existing problems and identifying potential future problems. An understanding of the watershed's behavior is necessary to ensure that established stormwater management regulations will prevent flood damage due to future development.

The only way to completely understand watershed behavior (how a watershed responds to rainfall) is to do a relatively detailed study of runoff under both present and future conditions. Hydrologic models simulate various rainstorms over a watershed and, based on the nature of the watershed's land cover, soils, and topography, determine the timing and total volume of peak flows. Hydrologic studies can be used to determine the appropriate amount of detention or retention necessary to prevent an increase in runoff as development occurs.

In addition to the present- and future-conditions hydrology studies, a watershed master plan should include mitigation recommendations that are appropriate for the community. These recommendations should include the entire range of mitigation activities—regulations, public information, structural control of runoff, non-structural programs (including stormwater management regulations), protection of sensitive natural areas, and acquisition of flood-prone properties.

For CRS credit, a watershed master plan must, at a minimum, address the regulatory standards for new development. The modeling may show that different standards are needed for different watersheds, or for different parts of the watershed. Communities may also find as a result of their modeling that their existing stormwater management regulations are adequate or they may decide to make them more stringent to prevent development from increasing the frequency and severity of existing problems.

One of the prerequisites for a CRS Class 4 (see Section 211.c) is that the community receive credit for watershed master planning based on the 100-year storm. Most

communities use various return frequencies for different design and management purposes. Development of a watershed master plan does not have to change that, but it is important to understand the impact of development on runoff from the 100-year storm.

For example, a community could require that the 5-year storm be contained in storm sewers, the 10-year storm be contained in streets below the curb, the elevation of the 25-year storm be at least 12 inches below the floors of new buildings, and the 100-year storm level be below the floor elevations. If the community uses future-conditions hydrology to develop 5-, 10-, 25- and 100-year storms in the plan, it can use the results to effectively reduce future flood damage without revising the nominal requirements.

For CRS credit, development of a watershed master plan does not imply that a community must immediately address its future problems through capital drainage projects. The plan should be considered a tool to help the community identify opportunities to address problems before and as they arise.

Communities are encouraged to check with their state or regional stormwater management agency to see if they can apply for "uniform minimum credit," i.e., credit based on the stormwater management program implemented by the regional agency.

Credit Criteria

(1) The community must have adopted a watershed master plan for one or more of the watersheds that drain into the community, and the plan must identify the natural drainage system and constructed channels.

(2) The community must have adopted regulatory standards that are based on the plan and that receive credit under SMR in Section 452.a.

(3) The plan's regulatory standards must manage future peak flows so that they do not increase over present values.

(4) The plan's regulatory standards must require management of runoff from all storms up to and including the 25-year event.

(5) For any plan that is more than five years old, the community must evaluate the plan to ensure that it remains applicable to current conditions. The evaluation must address whether the data used for the plan are still appropriate and whether the plan effectively manages stormwater runoff. The community must update a watershed master plan that become obsolete, or the WMP credit will be revised accordingly.

(6) WMP1 credit must be received in order to receive credit for any of the other items.

Credit Points

WMP = the total of the following:

WMP1 = 90 points, if the watershed master plan meets all of the criteria listed in Section 452.b

WMP2 = 30 points, if the plan and the community's regulations manage the runoff from all storms up to and including the 100-year event

"All storms" includes at a minimum the 10-year storm, a storm greater than the 10-year but less than the 100-year storm, and the 100-year storm.

WMP3 = 55 points, if the plan provides management of future peak flows and volumes so that they do not increase over present values

If the plan's regulatory standards prevent all increases in downstream flood peaks AND VOLUMES, regardless of their location within the watershed, it will receive this credit. A community can receive the maximum credit if it retains runoff from a 100-year or larger storm and discharges it to groundwater or irrigation or if it detains the runoff long enough to discharge it after the peak flow in the receiving body has subsided, so that the discharge will not increase downstream peak flows anywhere in the receiving stream.

Communities with watersheds that discharge into large lakes or rivers may receive this credit if they demonstrate that their discharges will not increase flood elevations in the lake or anywhere downstream in the receiving river.

WMP4 = 35 points, if the plan manages the runoff from all storms up to and including the 5-day event

If a community can demonstrate that an event shorter than five days is the locally appropriate "worst-case" runoff event for stormwater management, it may receive this credit if it uses that event for its regulatory standard. In some areas this may require continuous-simulation modeling. If a community, regional, state, or federal agency can demonstrate that, for example, the 72-hour event provides the "worst case" runoff for a watershed, the 72-hour event would be credited for communities in that area.

The following three credits recognize communities that preserve their remaining "natural" channels, floodplains, or upland wetlands for stormwater conveyance or storage. "Soft" or "green" approaches are encouraged, rather then "hard" or concrete measures.

WMP5 = 30 points, if the plan identifies existing wetlands or other natural open space areas to be preserved from development so that natural attenuation, retention, or detention of runoff is provided

WMP6 = 25 points, if the plan prohibits development, alteration, or modification of existing natural channels

WMP7 = 25 points, if the plan requires that channel improvement projects use natural or "soft" approaches rather than gabions, rip rap, concrete, or other "hard" techniques

WMP8 = 25 points, if the community has a dedicated funding source to implement the recommendations in the plan

A community with a local funding source dedicated to implementation of the adopted watershed master plan is more likely to complete the projects and can receive additional credit. Common sources of funding include a real estate excise tax, stormwater utilities, drainage district fees, or other dedicated taxes. Developer impact fees are an uncertain source of funding and are not credited here.

Impact Adjustment

The watershed impact adjustment map for WMP is prepared, and the affected areas are calculated, in the same manner as for SMR in Section 452.a. The area covered by the credited watershed master plan (aWMP) must be the same or smaller than the area covered by the SMR regulations (aSMR).

$$rWMP = \frac{aWMP}{aW}, \quad \text{where}$$

aWMP = the area covered by a watershed master plan

If the total calculated impact adjustment is less than 0.15 or the community does not prepare a watershed impact adjustment map, then rWMP = 0.15.

Documentation Provided by the Community

(1) At each verification visit,

(a) The needed documentation is assembled by the ISO/CRS Specialist and provided to the technical reviewer for this activity. There is a checklist is to help the stormwater manager identify all the needed documentation, available at www.CRSresources.org/400.

(i) Documentation that the plan has been adopted by the community. "Adopted by the community" means either formal approval by the community's governing

body or formal approval by another body or office of the community that has the authority and funding to implement the plan, such as a flood control district.

(ii) Copies of the pages of the watershed master plan that show it meets the minimum criteria and the items to be credited. This can be an electronic copy of the plan with a description of the items to be credited and where they can be found in the plan.

(iii) The ordinance pages credited under SMR in Section 452.a, showing the regulatory standards that are based on the plan (Section 452.b, credit criterion (2)).

(iv) [For WMP8] A copy of the ordinance adopting the dedicated funding source and a budget describing how the money was spent during the past fiscal year.

(v) If the plan(s) is more than five years old, an evaluation report that addresses whether the plan(s) is still based on appropriate data and effectively manages stormwater runoff. In lieu of a formal report, the community may submit a letter signed by a licensed professional engineer that addresses the following issues:

- The "future conditions" at the time the plan was completed: Do these conditions still reasonably reflect the actual watershed conditions today?
- The precipitation data used for the plan's hydrology: Does the community or agency still use the same precipitation data that were used in the report?
- Method used for the plan(s): Is the method used to develop the plan(s) considered appropriate by the agency today?
- Construction: Has construction of stormwater infrastructure altered actual conditions in ways that make the plan(s) obsolete?
- Other factors: Are there other aspects of the plan(s) that make it obsolete or otherwise of questionable applicability?

(vi) The watershed impact adjustment map.

(vii) [If the community determines the area covered by the watershed master plan (aWMP) to include watershed areas regulated by other communities] Documentation that watersheds outside the jurisdiction of the community are regulated to similar standards or are subject to the same plan as those within the community.

452.c. Erosion and sedimentation control regulations (ESC)

The maximum credit for this element is 40 points.

ESC credit is provided if the community requires that erosion and sediment control measures be taken on land that is disturbed during development. ESC credit is based upon the size of the areas subject to the regulation. Drainage systems cannot perform to their design standards if they are choked with eroded soil that has been captured in stormwater. Sediment control is especially important in watersheds where land is being disturbed by

construction. Sedimentation has been called the largest source of water pollution in the country.

Credit Criteria

(1) To receive ESC credit, the community's regulations must apply to all construction sites within the community. An erosion and sedimentation control regulation that is part of a floodplain ordinance or a building code and does not affect ALL construction sites in the community does not receive credit under this element.

"All construction sites" in the subsections below means all sites in the community subject to construction of buildings, roads, etc., regrading, or other non-agricultural land-disturbing activity.

Credit Points

ESC = one of the following:

(1) 40 points, if regulations control erosion and soil loss from any disturbed land greater than 1,000 square feet; OR

(2) 30 points, if regulations control erosion and soil loss from any disturbed land greater than 0.5 acre; OR

(3) 10 points, if regulations control erosion and soil loss from any disturbed land greater than 1 acre.

Impact Adjustment

There is no impact adjustment for element ESC. These rules must be enforced throughout the entire community.

Documentation Provided by the Community

(1) At each verification visit,

(a) The needed documentation is assembled by the ISO/CRS Specialist and provided to the technical reviewer for this activity. There is a checklist to help the stormwater manager identify all the needed documentation, available at www.CRSresources.org/400.

(i) The ordinance or law language that requires developers or property owners to use techniques that prevent erosion and soil loss from exposed land. The ordinance(s) or law must designate an office or official responsible for receiving complaints and monitoring compliance and it must include enforcement and abatement provisions.

(ii) Development and building permit records that demonstrate enforcement of the regulation. The ISO/CRS Specialist determines how many records are needed to obtain a representative sample.

The ISO/CRS Specialist may visit a sample of sites in the field to verify that stormwater management facilities have been constructed in accordance with the approved plans.

Example 452.c-1.

Appropriate ordinance language might read:

> Before any grading or other earthwork that affects a land area larger than 500 square feet, the person performing such earthwork shall submit an erosion control plan. The plan shall be designed to prevent sediment from leaving the site during storms up to and including the 100-year storm and recover the ground after construction or other work to prevent or minimize erosion. ESC = 40

or

> Application for any grading and/or building permit (except for single-family dwellings on existing platted lots) must include an erosion control plan designed to prevent sediment from leaving the site during all storms up to and including the 100-year storm and recover the ground after construction to prevent or minimize erosion. ESC = 30

452.d. Water quality regulations (WQ)

The maximum credit for this element is 20 points.

WQ credit is provided for implementing best management practices to protect water quality within the community. Stormwater runoff picks up dirt, road oil, salt, farm chemicals, and other substances. Unlike sewage, stormwater is not treated before it enters rivers, lakes, estuaries, and other receiving bodies of water. Regulations that require developers to install or implement measures that improve the quality of stormwater are credited.

Most states' environmental protection or pollution control offices have recommended best management practices (BMPs) appropriate for that state. Best management practices may include grass filter strips at retention basin inlets or outlets, velocity dissipators and baffles, basin dimensions that encourage settling of suspended solids, aeration, infiltration trenches, skimmers, vegetated swales, and other techniques that clean stormwater. It should be noted that this credit is not for BMPs required during the course of construction, but rather for measures that are permanently incorporated in the development's stormwater management facilities.

Credit Criteria

(1) To receive WQ credit, the community's stormwater management regulations must either specify one or more measures or refer to BMPs as published in an official government reference. A mention of water quality or reduction of nonpoint sources of pollution in the "purpose" section of the regulations is not sufficient for credit.

Credit Points

WQ = 20 points, if regulations require new developments of one acre or more to include in the design of their stormwater management facilities appropriate "best management practices" that will improve the quality of surface water

Example 452.d-1.

Falls Church, Virginia, lies within the Chesapeake Bay watershed. Because of its location within the watershed, the city requires all development to provide permanent water quality facilities. WQ = 20

Impact Adjustment

There is no impact adjustment for element WQ. The requirements must be enforced throughout the entire community.

Documentation Provided by the Community

(1) At each verification visit,

(a) The needed documentation is assembled by the ISO/CRS Specialist and provided to the technical reviewer for this activity. There is a checklist is to help the stormwater manager identify all the needed documentation, available at www.CRSresources.org/400.

(i) The ordinance or law language that requires new development to implement appropriate best management practices to improve water quality.

(ii) Development and building permit records that demonstrate enforcement of the regulation. The ISO/CRS Specialist determines how many records are needed to obtain a representative sample.

453 Credit Calculation

c450 = cSMR + cWMP + ESC + WQ , where

cWMP = WMP x rWMP

454 For More Information

a. Additional information, reference materials, and examples can be found at www.CRSresources.org/400.

b. *CRS Credit for Stormwater Management* can be found at www.CRSresources.org/400 or ordered using the form in Appendix C.

c. Rural communities can request help on this activity from the U.S. Natural Resources Conservation Service. Requests should be submitted to the local soil and water conservation district, which usually is located in the county seat.

d. Most states' environmental protection or pollution control offices have recommended best management practices (BMPs) appropriate for that state. The U.S. Environmental Protection Agency has developed BMPs for coastal areas that are appropriate throughout the country.

   Guidance Specifying Management Measures for Sources of Nonpoint Pollution in Coastal Waters, 840-B-92-002, 1993, can be found at http://water.epa.gov/polwaste/nps/czara/index.cfm.

e. References on low-impact development are available from EPA and many states. Two are listed below.

   "Low Impact Development Design Strategies (An Integrated Design Approach)" prepared by Prince George's County, Maryland Department of Environmental Resources (1999). Available from the EPA at www.epa.gov/owow/NPS/lidnatl.pdf.

   "Low Impact Development Technical Guidance Manual for Puget Sound," Puget Sound Action Team and Washington State University Pierce County Extension (2005). Available at www.psp.wa.gov/downloads/LID/LID_manual2005.pdf.

455 Related Activities under the Community Rating System

- Activity 330 (Outreach Projects) can be used to promote the benefits of WQ and ESC for both flood protection and preservation of water quality and habitat.
- The element MAP under Activity 410 credits the provision of maps that identify future-conditions floodplains. SMR and WMP can reduce the need for these kinds of maps.

- Activity 420 (Open Space) reduces the need for channel hardening. In addition, watershed master plans can identify those areas within the watershed that provide benefits to the drainage system in their natural state and therefore should be preserved. Additional credit may be granted in Activity 420 if they are preserved.
- Having Activity 440 (Additional Map Data) mapping of sensitive areas and maintaining them on the community's data base can result in credit and be useful in both watershed and floodplain planning.
- Activity 540, element SBM, is dependent upon receiving credit in Activity 450 for PUB.