

Chapter 5. Floodplain

5.0 Introduction

Nature has claimed a prescriptive easement for floods, via its floodplains, that cannot be denied without public and private cost (White 1945). Flooding can result in loss of life, increased threats to public health and safety, damage to public and private property, damage to public infrastructure and utilities, and economic impacts to the residents of the City. In contrast, natural floodplains provide many benefits to the citizens of the City, including natural attenuation of flood peaks, water quality enhancement, groundwater recharge, wildlife habitat and movement corridors, and opportunities for recreation.

5.1 Applicability

The SEMSWA floodplain management regulations defined in this manual shall apply to all areas of special flood hazard within the City. Some of these special flood hazard areas have been identified with hydrologic and hydraulic studies and mapping efforts by FEMA, the Urban Drainage and Flood Control District, and other sources. These areas have been clearly designated as Floodplain. There are channels and streams in Centennial that do not have FEMA designated Special Flood Hazard Areas. SEMSWA will regulate these unstudied areas or special flood hazard areas in the same manner as those which have been mapped. These regulations define a regulatory floodplain as any drainageway with a drainage tributary area of 130 acres or more, consistent with the UDFCD's definition of a major drainageway. The floodplain management requirements in these Criteria shall apply to all properties that meet this definition, whether or not they have been mapped by FEMA, the UDFCD, or others, and whether or not they have been designated by an F zone.

5.2 Floodplain Management and Regulation

These Criteria, together with the Land Development Code, is the governing regulation for Floodplain Development Standards within the City.

5.2.1 Floodplain Management. Floodplain management is a comprehensive program of preventative and corrective measures to reduce losses associated with flooding. Floodplain management measures may include, but are not limited to, land use regulations (including new development and construction policy), construction of flood control projects, flood-proofing, floodplain preservation, acquisition of flood prone properties, education, and implementation of early warning systems.

5.2.2 National Flood Insurance Program (NFIP). The NFIP is a federal program enabling property owners to purchase insurance protection against losses from flooding. Participation in the NFIP is based on an agreement between local communities and the federal government, which states that if a community will implement and enforce measures to reduce future flood risks to new construction in Special Flood Hazard Areas or designated floodplains, the federal government will make flood insurance available within the community.

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- 5.2.3 Colorado Water Conservation Board.** The Colorado Water Conservation Board is the State Coordinating Agency of the National Flood Insurance Program. The Flood Protection Program of the CWCB assists in the prevention of and recovery from flood disasters. The CWCB is responsible for technical review and approval of all reports and maps that are normally used by local governments for regulatory, floodplain administration, and insurance purposes. Technical information used for regulation of floodprone areas must be designated and approved by the CWCB.
- 5.2.4 Floodplain Development Standards.** SEMSWA has adopted the minimum NFIP requirements, and has chosen to impose additional requirements in order to provide consistency with the CWCB, the District, and to provide a higher level of floodplain management for its citizens.

The Floodplain Administrator administers and implements the Floodplain Development Permit process, provides review of technical information that is required to ensure compliance with the regulations, and makes determinations regarding the boundaries of the Floodplain. The Floodplain Administrator will evaluate the application and submittal information and approve the permit, approve the permit with conditions or deny the permit.

5.3 Standard Level of Protection

- 5.3.1 Standard Level of Protection.** The standard of practice, as defined by FEMA, the District, and SEMSWA, requires implementation of floodplain management criteria within the 100-year floodplain. The 100-year floodplain is the land area that will be inundated or flooded, based on the stormwater runoff produced by the 100-year storm event. The 100-year storm event is defined as the rainfall event that has a 1% probability of being equaled or exceeded in any given year. Discharge flow rates in excess of the 100-year estimate will occur, but with lower probability. In those instances, typically the depth of flow and floodplain width would be greater than indicated on the floodplain maps provided by FEMA and the District.
- 5.3.2 Higher Level of Protection.** In some cases, consideration should be given to providing protection from flooding events that are produced by storm events in excess of the 100-year storm event. Consideration should be given to a higher level of protection for facilities and access routes that are critical for the protection of public health, safety, and welfare, or where flooding in excess of the 100-year storm event could result in loss of life, significant damage to utilities and infrastructure, or result in hazardous materials being transported in flood waters.

5.4 Sources of and Use of Existing Floodplain Information

5.4.1 FEMA Flood Insurance Rate Maps (FIRMs) and Flood Insurance Study (FIS).

The FIRM maps are the official regulatory maps published by FEMA, and must be used when determining limits of the Special Flood Hazard Area, and for complying with the floodplain regulations.

1. Detailed Studies. The FIRM maps contain Special Flood Hazard Area designations that were developed through a detailed study or by approximate methods. For drainageways that have a detailed study, Base Flood Elevations (BFEs) are provided on the maps and information is available in the FIS regarding floodplain and floodway widths, drainage areas, and peak discharges at select locations. In most cases, the BFEs can be used in conjunction with detailed topographic information to produce a reasonable estimate of the floodplain limits on a particular site, as long as it can be verified that the topographic information and the BFEs are referenced to the same vertical datum.
2. Approximate Zones. Special Flood Hazard Area (Zone A) designations that were developed by approximate methods are generally less accurate and BFEs are not provided. Typically, there is no published information regarding peak flow rates. As a result, making floodplain determinations and correctly delineating the floodplain on a specific property is more difficult. Floodplain limits must be developed using topographic mapping and an acceptable level of hydrologic and hydraulic analysis. The level of analysis required may vary depending on the proposed activity or land use proposal and SEMSWA should be consulted as to what level of analysis is acceptable. FEMA has published guidance that can be utilized to help determine elevation information in SFHAs developed by approximate methods. Procedures for making floodplain estimations in Zone A areas are outlined in the FEMA publication *Managing Floodplain Development in Approximate Zone A Areas*, however, the applicant's engineer should consult with the Land Use Services Department prior to selection of methodology or level of detail to confirm that they are reasonable and appropriate.
3. Map Revisions. FIRM maps are often updated due to development or construction projects, changes in hydrology, the use of better topographic information, or other factors that affect the accuracy of the current Special Flood Hazard Area limits. In most cases, the updates occur through a process called a Letter of Map Revision (LOMR). A LOMR provides revised floodplain information for a particular area, which supercedes the previous information and becomes the effective Special Flood Hazard Area designation. However, the LOMR is a separate document and the FIRM maps are not re-published with the changes resulting from every revision. When reviewing FIRM maps, it is important to determine whether any LOMRs have been completed for the area in question.

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4. Map Availability. Current copies of the FIRM maps and LOMR information are available for review at the office of SEMSWA.. Maps can also be acquired through the FEMA Region 8 Office in Denver, or on-line at www.fema.gov.

5.4.2 UDFCD Flood Hazard Area Delineation (FHAD) Studies. The UDFCD's FHAD studies and maps are prepared by the District and participating local governments. Mapping used to define flooding limits is typically developed using aerial photogrammetric methods from aerial photography and the contour interval for the mapping is generally 2 feet. FHAD studies provide relatively accurate representations of the floodplain limits. In many cases, FHAD studies have been used as the basis for updating the FIRM maps.

1. Existing and Future Watershed Conditions. The FHADs contain floodplain information for the projected future land use conditions. The future conditions are based on the projected land use and associated impervious percentages within the basin.
2. Verify Assumptions. When relying on FHAD information, it is important to verify that the current land use conditions and projections are consistent with the assumptions made in the FHAD study. Existing topographic conditions must also be compared to mapping used to define the floodplain limits in the FHAD study. Topography can change through natural erosive processes, grading, or construction of physical improvements. The construction of improvements upstream or downstream of a particular site or channel reach can also impact the floodplain limits and elevations that were previously defined.
3. FHAD Revision. The process to revise a FHAD study generally consists of the District and the local jurisdictions participating in a project to update the FHAD, when necessary, due to significant changes in development or other assumptions, on which the original FHAD study was based. Modifications to the floodplain, resulting from adjacent development, construction of road crossings or improvements, should be documented in drainage reports, floodplain studies, or construction drawings, which are submitted to SEMSWA during the development process. SEMSWA or UDFCD should be consulted when questions arise.
4. FHAD Availability. FHAD studies are generally available for purchase or review through the UDFCD. FHAD studies are also available for review at SEMSWA.

5.4.3 Other Floodplain Information. Floodplain data may be obtained from other sources, including the Colorado Water Conservation Board, Special Districts that have completed floodplain studies and mapping for their respective districts, County or other local government initiated studies, and studies that have been prepared by private property owners or developers. In some cases, the information may be used as a basis for floodplain delineation for permitting and

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land development purposes, but the accuracy of all such information will be required to be verified and the use of the information approved by the Floodplain Administrator.

- 5.4.4 Confirmation of Floodplain Data.** Prior to using any published floodplain information for design or planning purposes, the source of the data, accuracy, modeling methodology, assumptions, etc. must be investigated and validated. The applicant is solely responsible for acquiring or developing accurate floodplain information for design and planning purposes.

5.5 Floodplain Information Unavailable

Where floodplain information is unavailable, the applicant will be responsible for delineating the floodplain, based on fully developed conditions in the watershed, consistent with the requirements outlined in Chapter 6 of these Criteria. It is understood that the resources available for providing this information are varied, and the methodology and level of detail may also vary, depending on the proposed activity and the need for accurate representations of the floodplain limits. If discrepancies or questions regarding the level of effort arise, the Floodplain Administrator will be responsible for determining the level of effort necessary for delineating the floodplain on a specific property. The determination will be made based on SEMSWA, UDFCD, FEMA, and Colorado Water Conservation Board requirements, as applicable, as well as potential impacts and type of development or activity proposed. For floodplain determination regarding individual structures, consideration will be given to the proximity of the structure to the drainageway, the topography of the land between the drainageway and the structure, and the height of the finished floor (including basement) with respect to the adjacent topography and drainage channel.

5.6 Floodplain Development Permit

- 5.6.1 Required for all Activities within the Floodplain.** A Floodplain Development Permit is required for any development proposed in the Floodplain. FEMA defines development as “any man-made change to improved or un-improved real estate, including but not limited to buildings or other structures, mining, dredging, filling, grading, paving, excavation or drilling operations, or storage of equipment and materials”. The Floodplain Development Permit is required prior to issuance of a building permit, issuance of a street cut or right-of-way use permit, issuance of a grading permit, issuance of a public improvements permit, and any other development, use or change of the use of land located in the Floodplain. The Floodplain Development Permit is required in addition to other permits or review processes, which may be associated with the underlying zone district. All activities, regardless of impact, need to be permitted. Even when it is apparent that there are no adverse impacts to the floodplain, a permit is required for administrative purposes to ensure that SEMSWA is aware of the activities within the floodplain and that they have been evaluated for compliance with SEMSWA requirements.

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The following are common floodplain development activities that must be permitted:

- floodplain modifications – including fringe filling, grading, channel improvements
- floodway modifications – when approved in conformance with these Criteria
- floodplain improvements – drop structures, rip rap, bank protection
- installation or maintenance of bridges, culverts, other conveyances
- minor improvements (non-substantial) to structures within the floodplain
- landscaping – including grading, clearing, re-vegetation, planting, etc.
- trenching operations associated with utility construction or maintenance
- installation and maintenance of storm sewer outfall structures
- fencing, when approved in conformance with these Criteria
- trail construction or rehabilitation
- construction and maintenance of master planned on-line detention or water quality facilities
- installation and maintenance of park and recreation facilities

5.6.2 Floodplain Development Permit Application. The standard Floodplain Development Permit application, as well as a checklist of the supporting information required to be submitted with the application can be found on SEMSWA's website at www.semswa.org. If the proposed improvements include modifications to the floodplain, a Floodplain Modification Study or exemption is required as outlined below. The Floodplain Development Permit application, including the submittal requirements and application procedures can be obtained from SEMSWA. The property owner is required to obtain the Floodplain Development Permit. If someone other than the property owner applies for the permit, it must be acknowledged and signed by the property owner.

5.6.3 Floodplain Development Permit Requirements. Sufficient information must be provided with a floodplain development permit application to determine the impact of the proposed activities within the floodplain. At a minimum, the following will be required:

1. Floodplain Delineation and Mapping. Accurate mapping, showing all of the applicable floodplain delineations that affect the property. All known floodplain delineations must be shown. Base flood elevation information, if available must be shown. For floodplains that do not have base flood information available, it may be necessary to provide a hydraulic analysis.
2. Description and Drawings of Activities. The permit application should provide a complete description and applicable drawings of the activities that are proposed. The drawings should include an accurate representation of the location and extent of the proposed floodplain activities. Construction drawings, or other representation of the work to be completed, must be provided. If activities include grading and/or other earthwork operations, a GESC (Grading Erosion and Sediment Control) plan will be required.

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3. Engineer's Certification of Impact. The application must provide a Professional Engineer's Certification of the impact of the proposed activity with regard to the floodplain and the base flood elevation. For activities where it is obvious that there is no resulting adverse impact, the Floodplain Administrator may waive this requirement.
4. Floodplain Easement. Evidence that the property is contained within a floodplain easement must be provided. If the property is not within a designated floodplain easement, one may be required to be dedicated prior to final approval of the floodplain permit. If the proposed activity modifies the existing floodplain and results in additional property being placed within the floodplain, additional easements will be required. It will be the applicant's responsibility to provide this easement, and to obtain this easement from other property owners when affected.
5. Floodplain Modification Study (when applicable). If it is determined that the proposed activities will modify the existing floodplain, a floodplain modification study will be required prior to approval of the Floodplain Development Permit. The scope and extent of the study will be in accordance with the mapping designation of the floodplain and determined by the Floodplain Administrator. For floodplain modifications that require FEMA approval, an approved CLOMR will be required prior to issuance of the floodplain permit.
6. GESC Report and Plan. For floodplain activities that involve grading or land disturbances, an approved GESC (Grading, Erosion and Sedimentation Control) report and plan will be required prior to approval of the Floodplain Development Permit.
7. Permanent BMP Plan (if applicable). Activities which disturb one (1) acre of land or more are required to provide Permanent Water Quality Best Management Practices (BMPs) in accordance with Chapter 14. Permanent BMPs shall be designed, approved and constructed in accordance with SEMSWA requirements, including the submittal of a drainage report and plan and construction drawings for approval.
8. Improvement Agreement/Collateral. For projects where there is a significant floodplain modification, and/or public improvement requirements, and there is not a Subdivision Improvement Agreement in place to guarantee the completion of the project, SEMSWA will require that a Floodplain Improvement Agreement be completed. Collateral in the appropriate amount to guarantee the applicant's performance of the permit will be required.

5.6.4 Floodplain Permit Inspections. SEMSWA or its designee will complete periodic inspections of the activities in the floodplain. Any problems or deficiencies discovered in these inspections shall be corrected by the applicant/permittee immediately or the floodplain permit will be suspended. A final inspection will be completed prior to release of collateral or other guarantees.

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5.7 Floodplain Uses and Restrictions

Floodplains must be preserved for the primary function of conveying unobstructed floodwaters. Land within the floodplain may be used for other purposes so long as the primary conveyance and storage function of the floodplain is preserved, the use is not a detriment to water quality, and the use is consistent with the Land Development Code. The Floodplain Administrator shall have the final determination of whether a particular use or proposed improvement is in conformance with SEMSWA's floodplain regulations and management program.

5.7.1 Use Factors. In general, any use that has the potential for the following to occur shall be prohibited in the floodplain:

- a. Obstruction of the flood water flow so that the floodplain is altered in elevation in excess of the allowable criteria (unless approved through a floodplain modification study)
- b. Reduction in the carrying capacity of the channel (unless approved through a floodplain modification study)
- c. Potential for material, equipment, or facilities to become dislodged or displaced and to be deposited downstream causing culvert or bridge blockage, channel degradation, or damages to other properties
- d. Potential for negatively impacting water quality

5.7.2 Prohibited Uses. SEMSWA has determined that the following uses are prohibited within the 100-year floodplain:

- a. All structures including residential, non-residential, recreational or temporary.
- b. Substantial improvement to existing structures, as defined in Section 5.8.
- c. Additions to or placement of manufactured homes.
- d. Fencing, including solid or perforated wood; split rail; chain link; stone, brick or other.
- e. Streets (local collector streets may be approved on a case by case basis provided alternate access is available and street depth criteria are met).
- f. Storage or processing of materials, which are buoyant, flammable, explosive, or could cause injury to humans, animals, or plants.
- g. Storage, processing of materials, or any other activity that may have an adverse impact on water quality.
- h. Permanent toilet facilities.
- i. Structures, ponds, or appurtenances related to water and wastewater treatment facilities.
- j. Vehicle parking lots not associated with an approved floodplain use.

5.7.3 Storage of Materials. Storage of hazardous or floatable materials in the floodplain and floodway is prohibited. These materials represent a significant potential public health, environmental or safety risk. Floatable materials can also become lodged in culverts, bridges and channels resulting in increased damages resulting from increased flood depths or diversion of flood waters.

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Temporary storage of construction-related vehicles and materials may be permitted, depending upon location and type of material storage, as long as the material can be relocated in accordance with an emergency action plan that has been approved by the Floodplain Administrator.

Storage of any material in the **floodway** is prohibited unless permitted by the Floodplain Administrator.

5.7.4 Uses Not Specifically Prohibited. Uses that are not specifically prohibited above are not to be construed as allowable by exclusion. Uses that are not defined in these Criteria must be evaluated by the Floodplain Administrator, who shall make the final determination on whether the use is allowable. Because detention ponds and water quality ponds and facilities are not specifically prohibited above, it does not mean that such uses or facilities are expressly permitted under these Criteria.

5.7.5 Variances. Variances to the prohibited floodplain will be managed according to the process and criteria stated in Chapter 1 of these regulations

5.7.6 Allowable Uses and Improvements to be Considered. SEMSWA has determined that the following uses and improvements may be considered within a floodplain if it is determined that the proposed use or improvement is in conformance with the floodplain regulations and floodplain management goals. It must be demonstrated that none of the conditions identified in 5.7.1 will occur as a result of the proposed use or improvement.

- a. Playground Equipment/Tot lots – Property owners will be required to accept legal liability for flooding potential and hazards.
- b. Ball fields – Use of backstops and other ancillary structures shall be evaluated on a case-by-case basis.
- c. Landscaping in conformance with uses allowed in drainage easements
- d. Parks and Recreation facilities, including trails.
- e. On-line regional detention and water quality facilities associated with SEMSWA and District approved master plans.
- f. Local streets – if street depth criteria are not exceeded and alternative access outside of floodplain is available.
- g. Underground utilities, with adequate cover.
- h. Parking lots for active park facilities.
- i. Others, as permitted.

5.8 Existing Structures in the Floodplain

5.8.1 Improvements. Substantial improvements (as defined in 44CFR Part 60 and the Land Development Code) to existing buildings in the 100-year floodplain are prohibited. Improvements that may be allowed in accordance with 44 CFR Part 60 and the Land Development Code must obtain a Floodplain Development Permit from the Floodplain Administrator. Building additions will be subject to the

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provisions of the Zoning Regulations with respect to finished floor elevations and flood protection requirements.

5.8.2 Floodproofing. Floodproofing of existing structures will be subject to a Floodplain Development Permit and must be designed in accordance with the Land Development Code.

5.8.3 Floodproofing Certification. A floodproofing certificate may be required as a condition of permit approval to demonstrate that the approved floodproofing method has been completed in accordance with the approved plans and FEMA certification requirements. This certificate may also be required by the insurance agent for adjustment of flood insurance rates.

5.8.4 Elevation Certificate. An elevation certificate will be required as a condition of permit approval to demonstrate that the finished floor elevation or elevation of the lowest structural member have been constructed in accordance with the approved elevations. This certificate may also be required by the insurance agent for adjustment of flood insurance rates.

5.9 Floodplain Zoning, Ownership and Easements

Floodplain property must be preserved for the conveyance and storage of floodwaters, and therefore has significant limitations on the use of the land. Floodplain property also has unique maintenance responsibilities, and has a higher potential for flood related hazards and liabilities. SEMSWA and the City, through zoning, ownership and easements have established requirements to ensure that floodplain properties are properly preserved and maintained. The requirements outlined below shall be followed when developing properties either contain or are adjacent to floodplain property.

5.9.1 Floodplain Zoning. All property which is defined as a 100 year floodplain should be Zoned as F, Floodplain. The floodplain zoning designation ensures that the floodplain property is regulated as floodplain, and allows only those uses that are compatible within the floodplain restrictions.

In some cases, it may not be feasible or practicable to rezone a portion of property to an F-zone designation. SEMSWA and the City may determine that the property shall not be required to be rezoned, but instead shall be placed within an easement, with uses and restrictions subject to the F zone.

5.9.2 Floodplain Easements. All floodplain property must be contained within a floodplain easement. A copy of SEMSWA's standard floodplain easement language is provided on SEMSWA's website at www.semswa.org. The easement will ensure that the property is restricted to allow only those uses permitted in a floodplain. The easement will also allow SEMSWA or its designee access to the property for inspection and, in the event the floodplain is not being properly maintained, to perform maintenance necessary to ensure the proper function of the floodplain. Such maintenance costs will be charged to the persons or entities responsible for maintenance.

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1. New Development. SEMSWA will require that all new development, expansion and redevelopment containing property within the 100-year floodplain be contained within a floodplain easement.
2. Existing Development. It is SEMSWA's intent to have floodplain easements provided for all 100-year floodplains in the City. SEMSWA will require a floodplain easement prior to issuing a floodplain permit for any activity in the floodplain.
3. Property Put into Floodplain via CLOMR or LOMR. Prior to issuing a Community Acknowledgement Letter for a CLOMR or LOMR request, the applicant shall provide an easement for the existing floodplain, plus any additional property that may be put into floodplain by the CLOMR or LOMR process. This includes any property that may become floodplain as a result of filling in the floodplain fringe.

5.10 Subdivision Platting Considerations

In general, platted lots should be located outside of the 100-year floodplain limits. An exception is made for zoning districts where residential lot sizes exceed 2.5 acres, in which case lots may be platted within the 100 year floodplain limits, provided an easement and building envelopes are established. That being the minimum criteria, subdivision layout should also consider the size of the tributary watershed and higher degrees of protection where 500-year floodplains have been identified, the stability of the drainageway and anticipated improvements in the floodplain, access and trail requirements adjacent to the floodplain, the proximity of steep or vertical banks relative to the location of lot lines, the potential for the channel to migrate horizontally over time, topography of the proposed lots, and the differences in elevation between the flooding elevation and potential structure locations.

5.10.1 Actual Floodplain Limits. The floodplain limits used for subdivision layout must be based on existing or proposed floodplain information that has been verified for accuracy or floodplain limits must be developed through detailed hydrologic and hydraulic analyses, based on fully developed conditions in the upstream watershed.

5.10.2 FEMA Special Flood Hazard Areas. FEMA designated Special Flood Hazard Area (SFHA) boundaries must be considered in subdivision layout, where applicable. When the SFHA boundary accurately represents the proposed floodplain limits, lots can be platted as discussed in the previous sections. There are many cases, however, where the SFHA is much wider than the actual or proposed floodplain. This situation frequently arises in locations where the SFHA was delineated using approximate methods or where improvements are proposed to confine the floodplain. In this case, platted lots must be outside of the SFHA and the actual floodplain, whichever is more restrictive.

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Alternatively, subdivision layout can be based on the actual or proposed floodplain, with the other considerations outlined in Section 5.10 and the lots that are affected by the SFHA will be restricted on the plat. The restriction will not allow Building Permits to be issued for those lots until a Letter of Map Revision (LOMR) has been issued by FEMA and the LOMR appeal period has expired. An approved Conditional Letter of Map Revision (CLOMR) will be required prior to acceptance of the final plat, to ensure that FEMA will issue a LOMR after improvements are constructed. The Developer will be required to provide a FEMA LOMR that specifically identifies all affected lots outside of the SFHA prior to building permit approval for those lots. The LOMR and other FEMA map revision processes are discussed in further detail in Section 5.12.

When subdivision layout proposes lots outside of, but adjacent to a SFHA, SEMSWA will require that the Developer provide a LOMA or LOMR that identifies the platted lots outside of the SFHA prior to building permit approval. Building permits on the affected lots will be restricted as described above, until the LOMA or LOMR is provided.

5.10.3 Freeboard Requirements. A minimum clearance or freeboard shall be provided between the 100-year base flood elevation and structures and other applicable facilities which may be impacted by the floodplain. Freeboard is required to allow for uncertainty in the floodplain modeling, changes to the drainageway (i.e. increased invert due to sedimentation), and to provide an additional factor of safety for structures and facilities which would result in damages or hazards during inundation. A minimum of 2-ft of freeboard shall be provided between the 100-year base flood elevation and the lowest finished floor elevation of all structures (this includes basements). For facilities which are not structures (typically not requiring a building permit) such as roadways, utility cabinets, parks and trails improvements, etc., a minimum of 1 ft. of freeboard is acceptable. Where possible the required freeboard should be contained within the floodplain tract and/or easement.

5.11 Floodway and Floodplain Fringe Encroachments

5.11.1 General. Construction and development related activities within the floodplain are regulated through the Land Development Code and these Criteria.

5.11.2 Floodway. The floodway is defined as the stream channel and that portion of the floodplain that must be reserved in order to discharge the base flood without cumulatively increasing the water surface more than a designated height. In Centennial, the floodway is based on a maximum increase in the flood elevation of 0.5 feet. The floodway limits are typically generated through hydraulic modeling by assuming equal encroachment on both sides of the floodplain. It should not be assumed that there is an inherent right to fill in the flood fringe if a floodway has been defined.

5.11.3 Floodplain Fringe. The floodplain fringe is the portion of the 100-year floodplain that is not within the floodway, and in which development and other forms of

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encroachment may be considered. The 0.5 foot floodway filling restriction is cumulative, and therefore all proposals considering filling in the fringe, must consider the total cumulative impact, based on historical and future filling on both sides of the drainageway.

5.11.4 Floodplain Fringe Encroachment (Filling). In some cases, it can be demonstrated that encroachment of the floodplain fringe has little or no impact on the base flood elevations at a specific location, because the filling is occurring in a backwater or ineffective flow area. Encroachment in the floodplain fringe is strongly discouraged, and will only be considered on a case-by-case basis. When considering requests involving floodplain fringe encroachment, SEMSWA shall consider, at a minimum, the following:

1. Impacts to Adjacent Properties. If the encroachment creates a rise in the Base Flood Elevation on properties other than that of the applicant, the applicant will be required to obtain floodplain easements for the additional floodplain property.
2. Channel Hydraulics and Design. If the encroachment creates a significantly narrow channel, with steep side slopes and undesirable velocities, SEMSWA may require mitigating channel improvements, or not support the floodplain filling.
3. Channel Aesthetics and Land Use. If the encroachment significantly impacts the aesthetics of the natural drainageway, and the resulting channel improvements create a drainageway that is not deemed compatible with the surrounding land uses, SEMSWA may not support the floodplain fringe encroachment.

When floodplain encroachment is allowed, a floodplain modification study consistent with the scope of the work must be provided.

5.12 Floodplain Modification Study

5.12.1 Requirement. A Floodplain Modification Study is required when development or other activities are proposed that require modification of, or construction in, the existing floodplain, the FEMA SFHA, or when proposals involve use of property within the floodplain limits. Activities or projects that may potentially affect floodplains are not limited to new development. Some other activities include, but are not limited to, bridge or culvert construction, utility installation, channel stabilization projects, trail crossing construction, and proposed storage of equipment or materials. This requirement applies to all major drainageway floodplains within the City.

5.12.2 Incorporation into Other Submittals. The Floodplain Modification Study will be required in support of Floodplain Development Permit applications and in some cases it will be an independent document. Often, the Floodplain Modification Study requirements could be incorporated into the Phase II or Phase III Drainage

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Reports for development projects, or form the basis for CLOMR or LOMR submittals to FEMA.

5.12.3 Floodplain Modification Study Outline. The floodplain modification study must be certified by a professional engineer, registered in the State of Colorado and it must address the following items through detailed analysis or through reference to adopted drainage master plans:

1. A description of the site consistent with the outline for a Phase III Drainage Report.
2. A description of the major drainage basin in accordance with the outline for a Phase III Drainage Report.
3. The identification of drainage master plan reports, FHAD studies, or Flood Insurance Studies with a discussion of the applicability of published information or data to the proposed activity or modification and the Floodplain Modification Study.
4. Hydrologic analysis. This section should include a narrative on the source of peak flow rates used for design. The flow rates used should be those generated by the 100-year event under future development conditions for the entire watershed. For CLOMR/LOMR applications, the FIS discharges should be used. There will be cases where both scenarios apply to a project, and therefore, both analyses will be required.
5. Characteristics of the proposed channel including, but not limited to, slope, roughness, depth, velocity, Froude Number, centerline alignment and stationing, and cross sections. Existing topographic mapping may be utilized if it has been field verified to determine if changes have occurred. The profile and plan shall be given for existing condition and for the proposed channel alignment including the cross section locations.
6. A description of the method of hydraulic analysis (HEC-2 or HEC-RAS) and its application in the study.
7. Identification and discussion of all input parameters and basis for input parameters.
8. Discussion of the results and conclusions of the hydraulic analysis. This shall include a narrative summary of the results, printed comprehensive output file free of modeling errors, and an electronic file of the modeling effort for SEMSWA review.
9. The delineation of the existing and proposed 100-year floodplain and water surface profiles for both conditions, including cross-section locations.

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10. A description of potential impacts to other properties, in the vicinity of the modification or activity, and to downstream properties adjacent to the floodplain.
11. A description of measures proposed to mitigate potential impacts
12. A conceptual design for the channel including bank protection, drop structures, culverts, bridges, and hardened trickle channel or low flow channel.
13. If appropriate, an analysis of sediment transport and fluvial morphology.

The report should be prepared using the drawing size, map scale, and engineer certification requirements that are outlined in Chapter 4 for a Phase III Drainage Report.

5.12.4 Schedule for Submittal of Floodplain Modification Studies. Changes to the floodplain must be reviewed, and, if approved, accurately reflected on proposed land use plans and subdivision plats. It is therefore necessary that the floodplain modification study be completed and submitted as far in advance of a proposed land action as possible. SEMSWA shall use the following guidelines for scheduling development cases that involve a floodplain modification study.

1. Schedule for Non-FEMA Related Floodplain Modification Studies. Floodplain modifications that do not require FEMA review and approval shall follow the review schedules and approval requirements that are consistent with the Phase II and Phase III drainage reports.
2. Floodplain Studies Requiring FEMA Action. The schedule for completing floodplain studies that require FEMA review and approval shall be as follows:
 - a. *Preliminary Development Plan.* Floodplain modification studies that affect the F-Zone should be submitted and approved prior to final City approval of the Preliminary Development Plan. In some cases, it may be permitted to place the proposed floodplain property in a floodplain easement to allow approval of the PDP, and follow up with a separate F-zoning action on the floodplain property.
 - b. *Preliminary Plat.* Preliminary Plat proposals which modify the SFHA are required to submit a CLOMR. The CLOMR must be approved by the SEMSWA, UDFCD and CWCB prior to City approval of the preliminary plat.
 - c. *Final Development Plan/Final Plat (SFHA modifications).* Final Development Plan and Final Plat proposals which modify the SFHA are required to provide an approved CLOMR. The CLOMR must be approved by FEMA (including all CLOMR comments addressed) prior to City approval of the Final Development Plan or Final Plat. All lots that are

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affected by the CLOMR (those within or adjacent to the SFHA) will be placed under a restriction. The restriction will not allow Building Permits to be issued for those lots until a Letter of Map Revision (LOMR) has been issued by FEMA and the LOMR appeal period has expired.

- d. *Final Development Plan/Final Plat (Lots adjacent to SFHA).* Final Development Plans and Final Plats which involve lots adjacent to the FEMA SFHA must provide a FEMA LOMA to verify that the lot is outside the SFHA. All lots that are affected by the LOMA (those within or adjacent to the SFHA) will be placed under a restriction. The restriction will not allow Building Permits to be issued for those lots until a Letter of Map Amendment (LOMA) has been issued by FEMA which verifies that the Lot is not within the SFHA.

5.12.5 Agency Review Requirements. Requests to modify the floodplain must be reviewed by several agencies, depending on the existing mapping of the flood hazard area and the extent of the modifications proposed, but in general conformance with the following:

1. SEMSWA. The City has land use control and authority and has delegated responsibility for regulating use of or modification of floodplain areas. SEMSWA will review all floodplain modification submittals and determine requirements regarding review or approval of the proposed modification or activity by the other agencies. The initial submittal of any Floodplain Modification Study shall be to SEMSWA.
2. Urban Drainage and Flood Control District. The UDFCD develops FHAD studies for major drainageways within the district boundaries. The UDFCD is involved in the review of all the floodplain modifications in the City that fall within their boundaries. Within the UDFCD, all floodplain modifications to major drainageways, that have or have not been mapped with FHAD studies, will be submitted to the UDFCD for review and approval.
3. Colorado Water Conservation Board. As discussed in Section 5.2.3, the Colorado Water Conservation Board (CWCB) is the State Coordinating Agency for the National Flood Insurance Program. The CWCB is responsible for technical review and approval of all reports and maps that are normally used by local governments for regulatory, floodplain, administration, and insurance purposes. SEMSWA will look for CWCB approval on any proposal to modify the floodway.
4. FEMA. This agency administers the NFIP. FEMA publishes Flood Hazard Boundary Maps and Flood Insurance Rate Maps that show floodplain boundaries for major drainageways. FEMA reviews applications to modify these FEMA designated floodplains. SEMSWA will require that all floodplain modifications that impact a FEMA-designated floodplain be submitted to FEMA for review and approval via a CLOMR/LOMR process.

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5.12.6 Conceptual Approval. Floodplain modifications must be permitted by SEMSWA and approved by the agencies listed previously, depending on the proposed modification and site location. All projects or proposed modifications should be discussed with SEMSWA, in concept, prior to commencement of efforts required to produce the Floodplain Modification Study.