Henrico County
Department of
Public Works

Technical Guidance Manual for Floodplain Management

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PREPARED BY

This document was prepared by the Henrico County Department of Public Works, Design Division. For additional information on the Design Division or the Floodplain Management Program, please visit www.henrico.gov/works/design. For questions about this Manual, please contact the Floodplain Management Program or email flood@henrico.gov.

ACKNOWLEDGEMENTS

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1. INTRODUCTION AND PURPOSE

1.1. NFIP Participation

The National Flood Insurance Program (NFIP) was created in 1968 and is managed by the Federal Emergency Management Agency (FEMA). The NFIP makes federal flood insurance available to homeowners, renters, and businesses in NFIP participating communities.

Henrico County has participated in the NFIP since February 4, 1981, making NFIP flood insurance coverage available to all county residents, as well as certain federal and state grants, loans, and disaster assistance. As part of this participation, Henrico County is required to adopt and enforce a floodplain ordinance that regulates development in the mapped Special Flood Hazard Area (SFHA), also known as the 100-year floodplain.

These mapped SFHAs make up approximately 15% of the county's land area.

1.2. Purpose of the Floodplain Technical Guidance Manual

This Floodplain Technical Guidance Manual (Manual) supports the Floodplain Ordinance and helps explain the applicability of the Floodplain Ordinance. The Manual also provides guidance for meeting the technical requirements outlined in the Floodplain Ordinance, as well as provides additional detail on the permitting process and submittal requirements. Although anyone may use this Manual, it is intended to be used by individuals proposing development in the county's SFHA.

If there is any discrepancy between this Manual and the Floodplain Ordinance, the Floodplain Ordinance requirements shall take precedent.

1.3. Amendments to the Manual

The Floodplain Administrator may revise this Manual from time to time. Revisions may be based on changes to the Floodplain Ordinance, feedback from users, application form updates, etc. Any changes will be clearly identified in the Manual and shall take effect at the time they are made publicly available on the Henrico County website.

1.4. Applicability

The Floodplain Ordinance and this Manual apply to all lands within the areas designated as SFHA, and some areas adjacent to SFHAs as defined in the Floodplain Ordinance, shown on the county's current Floodplain Maps. The SFHA is the land subject to a one percent or greater chance of flooding in any given year, or the 100-year floodplain. Areas adjacent to the SFHA include land within the 0.2% annual chance floodplain, or the 500-year floodplain, and land within 40 feet of the SFHA.

1.5. Contact Information

Henrico County's Floodplain Management Program is in the Department of Public Works, Design Division. Current contact information for the Floodplain Administrator and program staff is available on the county's website here: https://henrico.gov/works/design/design-contacts/.

1.6. Definitions

Below are some definitions from the Floodplain Ordinance that are important for understanding the information in this Manual. Additional definitions are included in Sec. 10-3 of the Floodplain Ordinance.

500-year Floodplain: The land at risk for flooding from a 0.2 percent (500-year) flood in any given year. This area may be identified as a Shaded X Zone or Shaded X5 Zone on the Floodplain Maps.

Accessory or Appurtenant Structure: A structure which is on the same parcel of property as the principal structure and the use of which is incidental to the use of the principal structure. An accessory structure is considered nonresidential for the purposes of [the Floodplain Ordinance] and may include detached garages, sheds, barns, or greenhouses.

Agricultural Structure: A structure that is used exclusively in connection with the production, harvesting, storage, raising, or drying of agricultural commodities and livestock, including aquatic animals or plants associated with aquaculture activities. An agricultural structure does not include any structure used for human habitation.

Base Flood Elevation (BFE): The water surface elevation of the base flood as shown either on (1) the most recent Federal Emergency Management Agency Flood Insurance Rate Map or Flood Insurance Study or (2) the county's most recent Comprehensive Drainage Map, whichever is higher. For areas without mapped base flood elevations, the developer shall use the 100-year flood elevations and floodway information from federal and state sources when available or, if such information is not available, flood elevations derived from sufficiently detailed hydrologic and hydraulic computations by a professional engineer who certifies the correct use of currently accepted technical concepts.

Community Special Flood Hazard Area: Also referred to as the Community SFHA, the land subject to a one percent or greater chance of flooding in any given year, based on 100-acre drainage areas or less, as identified on the county's current Comprehensive Drainage Maps. These areas do not include and are in addition to FEMA Special Flood Hazard Areas.

Conditional Letter of Map Revision (CLOMR): Either (1) a formal review and comment from FEMA stating that a proposed project complies with the minimum NFIP requirements for the project with respect to delineation of FEMA SFHAs or (2) a letter from the county engineer that provides conditional approval of a study, based on as-built conditions, that changes the location of the Community SFHA. A CLOMR does not revise the Floodplain Maps.

County Comprehensive Drainage Map. The most recent map approved by and maintained by the county engineer on the county's GIS designating the 100-year floodplain in the county. The county engineer may amend the County Comprehensive Drainage Map at any time upon review of additional engineering studies of floodplain areas.

Critical Facility: A structure or other improvement that, because of its function, size, service area, or uniqueness, has the potential to result in serious bodily harm, extensive property damage, or disruption of vital socioeconomic activities if it is destroyed or damaged or if its functionality is impaired. Critical facilities include health and safety facilities, utilities, government facilities, and hazardous materials facilities.

Development: Any man-made change to improved or unimproved real estate, including buildings or other structures, as well as mining, dredging, filling, grading, paving, excavation or drilling operations, and storage of equipment or materials.

FEMA Special Flood Hazard Area: Also referred to as the FEMA SFHA, the land in the floodplain within a community subject to a one percent or greater chance of flooding in any given year as designated by FEMA. The area may be designated on a Flood Insurance Rate Map as Zones A, AO, AH, A1-30, AE, A99, AR, AR/A1-30, AR/AE, AR/AO, AR/AH, AR/A, VO, or V1-30, VE, or V.

Flood Damage-Resistant Materials: Any construction materials capable of withstanding direct and prolonged contact with floodwaters without sustaining any damage that requires more than cosmetic repair.

Flood Insurance Rate Map (FIRM): An official map of a community, on which the Federal Insurance Administrator has delineated both the FEMA SFHAs and the risk premium zones applicable to the community. A FIRM that has been made available digitally is called a Digital Flood Insurance Rate Map (DFIRM).

Flood Insurance Study (FIS): An examination, evaluation, and determination of flood hazards and, if appropriate, corresponding water surface elevations, or an examination, evaluation, and determination of mudslide (i.e., mudflow) and/or flood-related erosion hazards.

Floodplain Administrator: The person appointed to administer, implement, and enforce the provisions of [the Floodplain Ordinance]. This person is also known as the Floodplain and Dam Safety Manager.

Floodplain Maps: The current Flood Insurance Rate Maps and Flood Insurance Study for Henrico County prepared by the Federal Emergency Management Agency, Federal Insurance Administration, effective April 25, 2024, and the current County Comprehensive Drainage Map, effective December 18, 2007, and subsequent revisions or amendments thereto.

Floodway: The channel of a river or other watercourse and the adjacent land areas that must be reserved to discharge the base flood without cumulatively increasing the water surface elevation. The Floodway is part of the SFHA. This may also be referred to as the Regulatory Floodway.

Hydrologic and Hydraulic Engineering Analysis: Analyses performed by a licensed professional engineer in accordance with standard engineering practices to determine the base flood, other frequency floods, flood elevations, floodway information and boundaries, and flood profiles.

Letter of Map Change (LOMC): A Letter of Map Change is (1) an official FEMA letter that amends or revises an effective Flood Insurance Rate Map or Flood Insurance Study or (2) an official county letter that amends or revises the most recent County Comprehensive Drainage Map.

Letter of Map Revision (LOMR): A revision to the Floodplain Maps based on technical data that shows a change or changes to flood zones or flood elevations or floodplain and floodway delineations or planimetric features. This includes (1) a revision approved by FEMA to revise a FEMA SFHA on a Flood Insurance Rate Map or Flood Insurance Study or (2) a revision approved by the county engineer to revise a Community SFHA on the most recent County Comprehensive Drainage Map.

Lowest Floor: The lowest floor of the lowest enclosed area (including basement). An unfinished or flood resistant enclosure, usable solely for parking of vehicles, building access, or storage in an area other than a basement area is not considered a building's lowest floor if such enclosure does not violate the applicable enclosure requirements in Sec. 10-10(b) of [the Floodplain Ordinance].

Mechanical Equipment: Includes electrical, heating, ventilation, plumbing, and air conditioning equipment, and other service facilities.

Non-Residential Building: A building or accessory structure where the primary use is commercial or not for human habitation.

No-Rise Certification: A certification statement signed by a professional engineer licensed to practice in the Commonwealth of Virginia certifying that a proposed project will not increase the base flood elevations in the community.

Residential Building: A non-commercial building designed for habitation by one or more families or a mixed-use building, including any building or portion of a building occupied or designed to be occupied exclusively for residential purposes. The term includes guesthouses, cabins, and sleeping units but does not include a tent, recreational vehicle, hotel or motel, boardinghouse, hospital, or other accommodation used for transient occupancy.

Special Flood Hazard Area (SFHA): Land subject to a one percent or greater chance of flooding in any given year. This area includes both FEMA Special Flood Hazard Areas and Community Special Flood Hazard Areas and may also be referred to as the 100-year floodplain.

Structure: A walled and roofed building that is principally above ground. Walled is considered “two or more outside rigid walls” and roofed is “a fully secured roof.” This may also be referred to as a building.

Substantial Damage: Damage of any origin sustained by a structure whereby the cost of restoring the structure to its before damaged condition would equal or exceed 50 percent of the market value of the structure before the damage occurred.

Substantial Improvement: Any reconstruction, rehabilitation, addition, or other improvement of a structure, the cost of which equals or exceeds 50 percent of the market value of the structure before the Start of Construction of the improvement. This term includes improvements to structures which have incurred Substantial Damage, regardless of the amount of the actual repair work performed. For the purposes of [the Floodplain Ordinance], the relocation of a residential structure within the SFHA is deemed a substantial improvement. This term does not, however, include any improvement of a structure to correct existing violations of state or local health, sanitary, or safety code specifications which have been identified by the local code enforcement official and which are the minimum improvements necessary to assure safe living conditions.

Variance: A grant of relief from any requirement of [the Floodplain Ordinance]. Variances may only be granted in compliance with the provisions of Division 5 of [the Floodplain Ordinance].

Water Surface Elevation (WSE): The height of floods of various magnitudes and frequencies in the floodplains of coastal or riverine areas. These heights are shown on maps by reference to the National Geodetic Vertical Datum (NGVD) of 1929 (or other datum, where specified).

2. SPECIAL FLOOD HAZARD AREAS

Henrico County defines the Special Flood Hazard Area (SFHA) as the land subject to a one percent or greater chance of flooding in any given year and may also be referred to as the 100-year floodplain. The SFHA is shown on the county's Floodplain Maps and includes both FEMA Special Flood Hazard Areas and Community Special Flood Hazard Areas. The county Floodplain Maps can be viewed using the Henrico County Flood Zone and Dam Safety Information map on the county's online GIS. Structures, fill, and vegetation that are situated on land that lies below the flood hazard area base flood elevation are considered to be within the SFHA. The SFHA and adjacent areas are regulated by the county's Floodplain Ordinance.

The SFHA in Henrico County has been mapped as either A or AE Zones. All flood zones were modeled in HEC-RAS, so Base Flood Elevations (BFEs) are available for the entire SFHA in Henrico County. The methods used to create these models include approximate, limited detailed, and detailed studies, which vary in both complexity and accuracy. The county has copies of both FEMA and county HEC-RAS models available for property owners and developers, which can be accessed through the county's Flood Model Repository, available on the county's online GIS. Because the county provides all current and archived models, it is important to use the most current and highest detailed models available for any floodplain analysis.

Figure 1: Special Flood Hazard Areas

2.1. Flood Zone Descriptions

A. A Zones

A Zones are modeled using approximate methods. Approximate methods do not typically utilize field survey data and leverage automated procedures for input parameters. These models generally use lower resolution topographic data obtained with remote measurements, like aerial photogrammetry, and obstructions (e.g., culverts) are generally not modeled. Approximate methods provide the lowest accuracy in floodplain modeling. Because detailed hydraulic analyses have not been performed, no BFEs are shown on FEMA FIRMs. However, Water Surface Elevation (WSE) data is available for all A Zones in the county and will be utilized as the best available data for the BFE. The Estimated BFE Excel Template, found in Appendix 8, can be used to help estimate the BFE at a specific location using the cross-sections from the current effective Floodplain Maps.

B. AE Zones (without a floodway designation)

AE Zones can be modeled using limited detailed methods or detailed methods. Limited detailed methods do not utilize field survey data but do generally include field data collection from sketches and photos to show major obstructions like culverts, buildings, and encroachments, as well as better information about site land cover conditions. Detailed methods include field survey data that provide detailed topographic information about a site. Detailed methods provide the highest accuracy in floodplain modeling. BFEs are available for all AE Zones in the county.

C. AE Zones (with a floodway designation)

AE Zones can also be modeled using detailed methods to identify a regulatory floodway. When this is done, an AE Zone is comprised of two parts: the inner portion called the floodway, and the outer portion called the flood fringe. Floodways are critical to floodplain management as they contain the channel of a river or other watercourse, and the adjacent land areas that must be reserved as this area provides the most flood water conveyance.

The NFIP typically identifies the flood fringe as an area designated for development if certain standards are met and restricts development in the floodway unless it can demonstrate it will not increase the BFE. Henrico County requires that all development in all flood zones demonstrate that it will not increase the BFE, so the county does not typically use the “flood fringe” and “floodway” terminology when describing its floodplains.

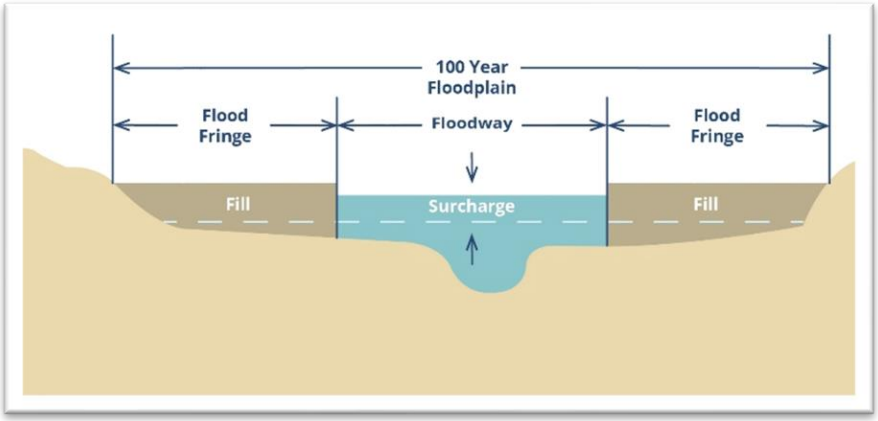


Figure 2: Floodway cross-section

D. Shaded X or X5 Zones (500-year floodplain)

Shaded X Zones or X5 Zones are used to identify the 500-year floodplain, or a moderate risk area. If mapped by FEMA, these areas are identified as Shaded X Zones, and if mapped by Henrico County, these areas are identified as X5 Zones on the Floodplain Maps. This area is not considered part of the SFHA. Although risk is lower in these areas, it is not completely removed. Because of this, some requirements of the Floodplain Ordinance apply to this area, including elevating buildings and protecting critical facilities.

2.2. Establishing SFHA Limits and Elevations

The SFHA limits and Base Flood Elevations (BFEs) are based on the county's Floodplain Maps, which include the current effective FEMA FIRMs and the current effective County Comprehensive Drainage Maps. The Floodplain Administrator shall make interpretations, where needed, as to the exact location of SFHAs, floodplain boundaries, floodway boundaries, and BFEs.

Sec. 10-6 of the Floodplain Ordinance outlines requirements for the use and interpretation of floodplain maps and data.

A. FEMA SFHAs

The Federal government, through FEMA, has mapped the floodplain in many places in Henrico County for drainage areas that are one square mile and larger. FEMA SFHAs are shown on the Henrico County Flood Zone and Dam Safety Information map on the county's online GIS, but the official map viewer for FEMA SFHAs is the National Flood Hazard Layer (NFHL). Additionally, the Flood Insurance Rate Map (FIRM) panels and Flood Insurance Study (FIS) report should also be used for flood hazard data.

1) Preliminary SFHAs

When FEMA conducts a community-wide map update, the revised floodplains will first be released as Preliminary SFHAs. Preliminary data includes the FIRM, FIS, and NFHL GIS data. Sec. 10-6(d) of the Floodplain Ordinance requires that preliminary data be used as the best available data if it is more restrictive than the current effective floodplain. When available, Preliminary SFHAs will be shown on the Henrico County Flood Zone and Dam Safety Information map.

B. Community SFHAs

FEMA FIRMs only map the SFHA for drainage areas that are one square mile or larger. To account for this lack of data, Henrico County created Community SFHAs to map the additional flood hazard for drainage areas that are generally between 100-acres and one square mile in size, but smaller drainage areas may be mapped. The Community SFHA begins where FEMA's modeling stops, and they do not overlap. These areas combined make up the regulated SFHA in Henrico County. In general, the FEMA SFHA and Community SFHA are treated the same except in how floodplain map changes are processed. Additional information on floodplain map changes is in Section 5.2 of this Manual.

The Community SFHAs are identified on the county's current Comprehensive Drainage Maps. These are available on the Henrico County Flood Zone and Dam Safety Information map on the county's online GIS. The county does not have paper flood maps or Flood Insurance Study (FIS) booklets for Community SFHAs at this time.

C. Overlapping FEMA and Community SFHAs

In general, FEMA SFHAs and Community SFHAs will not overlap. If FEMA SFHAs are updated and encroach into where Community SFHAs are currently mapped, the Community SFHA will be replaced. However, if a Community SFHA is updated and the model encroaches into a FEMA SFHA, the Community SFHA will not replace the FEMA SFHA. Instead, the model will be submitted through a Letter of Map Revision through FEMA to update the FEMA SFHA portion of the study area, and the remaining Community SFHA will also be updated.

There may be a situation when mapping data overlaps, at least temporarily, such as when a map change is in process. When this occurs, all maps must be compared. The most restrictive flood elevation and flood hazard boundary must be used. Information from all maps must be combined to yield the higher flood elevation, wider floodway limit, and more restrictive flood zone designation.

D. Downloading Flood Data

1) FEMA Data

FIRM panels and the FIS, including associated GIS data, can be downloaded from FEMA's Map Service Center. This data is maintained by FEMA. GIS data can be downloaded by expanding the "NFHL Data-County" option.

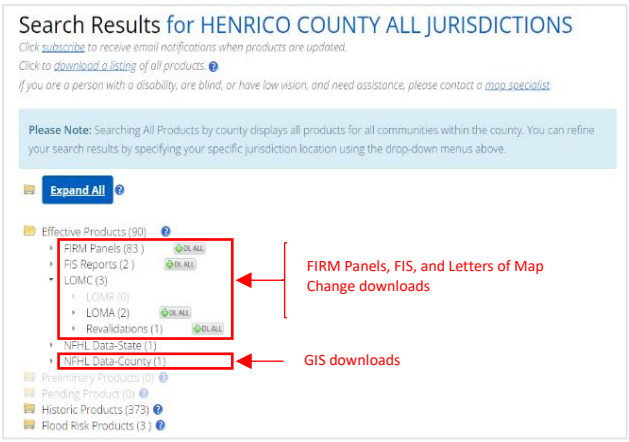


Figure 3: FEMA Map Service Center data download view.

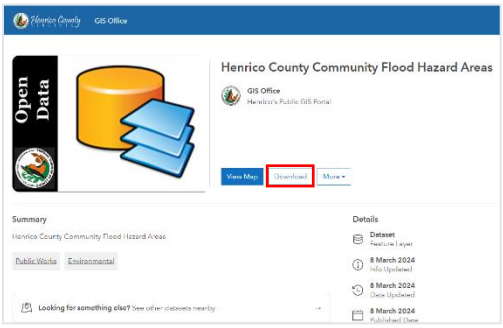


Figure 4: Henrico County data download view.

2) County Data

Community SFHA data can be downloaded from the County's GIS Open Data portal. Search for "Community Flood Hazard Areas" to find the Community SFHA shapefiles.

2.3. Boundary Interpretations

In many cases, boundary interpretations are required to appropriately determine flood stages and their footprint. It is not uncommon for there to be discrepancies in the SFHA floodplain limit when comparing a flood model's reported BFEs to current and surveyed data. These discrepancies can be attributed to several reasons but typically occur due to data resolution/accuracy improvements, natural causes, or manmade alterations. Sediment transport is an example of a natural reason for topographic changes that can account for higher or lower than expected ground surface elevations due to deposition or erosion. Manmade changes can lower or raise expected elevations from examples like trenching or placing fill. As a result of these unaccounted-for changes, it is always important to follow the methods below to ensure that the SFHA is appropriately mapped on site.

The Floodplain Administrator may require field survey information for any development to verify adjacent ground elevations from a licensed land surveyor or professional engineer. Where BFE and floodway data have not been identified, including in areas where SFHAs have not been identified, the Floodplain Administrator is authorized to require the applicant to determine the BFE and/or floodway in accordance with accepted hydrologic and hydraulic engineering practices, and the determination must be made by a licensed professional engineer.

A. Newer Topographic Data is Available

The county's current Floodplain Maps (effective 2007) are based on models that derived their elevations using 1998 aerial photogrammetry. As maps are updated, models will utilize available Virginia Geographic Information Network (VGIN) Light Detection and Ranging (LiDAR) data to derive elevations. The county typically strives to update their models so that they reflect the best possible available data. However, due to the staggered release of LiDAR datasets and infrequency of model updates, there could be newer topographic data available that is not reflected in the newest flood models. With newer topographic data typically comes higher resolution and better accuracy, so the newest data should always be used if available.

When new LiDAR data is available, the water surface elevations as reported in the flood models must be maintained and mapped to the newer LiDAR topography. In doing this, it is likely that the limits of the floodplain can change, but the limit that results in the largest floodplain footprint must be used unless a Letter of Map Revision has been approved to officially change the SFHA boundaries.

B. Field Survey is Available

In cases where a project is accompanied by field survey data, this must be incorporated into the SFHA interpretation. Field survey data typically provides higher accuracy data than that of LiDAR and gives more site-specific information that improves flood limit determinations within the survey limits.

When field survey is available, the water surface elevations as reported in the flood models must be maintained and mapped to the field survey topography. In doing this, it is likely that the limits of the floodplain can change, but the limit that results in the largest floodplain footprint must be used.

C. Site Adjacent to a Model Limit of Study

In some instances, a site may be located just beyond of a model's defined limit of study. For these cases, three options are available for adequate establishment of the SFHA boundary. The first option is to utilize existing data available from federal, state, or other sources. Typically, if additional data was available, a Letter of Map Revision (LOMR) would have been processed, so this option may not be common.

Another option is to extend the hydraulic model by adding additional cross-sections and extending the model stream centerline. This process follows similar procedures to those mentioned in Section 5.4.

Finally, the county recognizes that updating models is an intensive process and allows for an alternative method for projects just beyond the study limits, up to 500 feet. This method is consistent with FEMA's Data Extrapolation process outlined in FEMA 265: Management Floodplain Development in Approximate Zone A Areas. It states that if a development occurs within 500 feet upstream of the end of a floodplain model, data extrapolation can be used.

The best approach to determining a development's 100-year floodplain elevation is to measure the

distance along the streamline between the development and the last cross-section in the model. Then, indicate the development's distance from the last cross-section on the hydraulic model profile plot. This plot must also include the extension of the BFE to the location of the development while maintaining the slope on the water surface from the last cross-section in the model.

For Community SFHAs, the profile plot must be obtained using the HEC-RAS model, and for FEMA SFHAs, the profile plot can be obtained from the FIS. This method is only applicable to areas that are not affected by downstream hydraulic controls or contain any obstructions. If the SFHA is subject to any of these within the reach between the development and the last cross-section of the model, the county reserves the right to require the model to be updated with a floodplain study.

D. Local Low Spots

If there is a local low spot adjacent to a floodplain, meaning the ground elevation is below the BFE, this area must be carefully considered to determine if it is inside or outside the SFHA. For features that are hydraulically disconnected from the floodplain, local low spots can remain outside of the floodplain; if there is a break in topography or infrastructure providing conveyance to the low spot, this portion must be included in the SFHA. If a low spot is found to be hydraulically connected to the floodplain, the BFE for this area can be determined by linear interpolation between cross-sections. If the local low spot is significant in size, the county may require updates to the hydraulic models using better topographic data or additional cross-sections.

E. Ridgeline or Local High Spots

If a ridge line or local high spot is found within the floodplain and its ground elevation is above the BFE, it is considered in the SFHA until a LOMR has been approved to officially remove the area from the floodplain.

F. Unpermitted Development

In very few cases, topographic discrepancy can be attributed to unpermitted development, such as grading activity, within the SFHA. Unpermitted development in the SFHA is a violation of the Floodplain Ordinance and will be addressed as outlined in Division 6: Enforcement of the Floodplain Ordinance. If this is identified as part of the boundary interpretation, the issue must be rectified before the permitting process can move forward. Any corrections made in this respect do not qualify as compensatory storage to be counted as added flood storage volume as part of a proposed project.

2.4. Mandatory Flood Insurance Purchase Requirements

Flood insurance is made available through the National Flood Insurance Program (NFIP) and may also be available through some private entities. Homeowners and renters insurance policies do not typically cover flood damages. Federal mandatory flood insurance purchase requirements applies in FEMA SFHAs only. Any structure, home, or business with a federally backed mortgage or loan in a FEMA SFHA is required to carry flood insurance. This requirement does not apply to Community SFHAs. However, flood insurance coverage is strongly recommended in these areas and outside of the SFHA. According to FEMA, over 40% of NFIP flood insurance claims were from outside of the FEMA SFHA. Learn more about flood insurance and the NFIP at www.FloodSmart.gov.

3. SPECIFIC DEVELOPMENT STANDARDS

As an NFIP participating community, Henrico County is required to regulate all development in the SFHA. These requirements are found in the Floodplain Ordinance. However, additional requirements in the Zoning Ordinance, Subdivision Ordinance, Building Code, or others may also apply to development in the SFHA.

The information included in this Manual is based on the Floodplain Ordinance only. Applicants must contact the appropriate department or agency for any other requirements that may apply.

3.1. Floodplain Ordinance

The Floodplain Ordinance outlines the regulatory requirements for development in the SFHA and can be found in Chapter 10, Article 1 of the Henrico County Code. The purpose of the Floodplain Ordinance is to promote and protect the health, safety, and general welfare of the citizens of Henrico County and to minimize losses due to flood hazards.

The county's Floodplain Ordinance exceeds the NFIP minimum floodplain management standards to reduce vulnerability to flooding and promote extra preparedness among Henrico County citizens. Because a property in the SFHA is periodically inundated by floodwaters, a certain volume of floodwater will naturally occupy that property during a flood. This volume of floodwater is known as flood storage and is accounted for in the modeling that creates a floodplain map. However, flood storage on a site can be reduced by new development, which can force floodwater that would have occupied the site onto neighboring upstream and downstream properties, potentially worsening flood conditions on those properties. For this reason, the Floodplain Ordinance includes higher standards that address flood volume.

Additionally, we know that floodwaters do not always follow boundaries on a map. For example, sediment may naturally build up in a stream over time and reduce its carrying capacity, or culverts or bridges may become blocked by debris during a flood event, which could result in flooding that differs from the floodplain map. Flood events greater than the 100-year event could also occur, so these higher standards help reduce the risk of property damage and loss of life from flooding.

Below is a summary of some of the higher standards adopted in the Floodplain Ordinance. The specific requirements are outlined in the Floodplain Ordinance, and some of these are addressed in more detail in this Manual.

- New development may not increase the base flood elevation, and a No-Rise Certificate must be provided
- Compensatory storage may be used to meet the No-Rise requirement
- Fill in the SFHA is prohibited
- New residential buildings are prohibited in the SFHA and within a 15' setback from the SFHA
- New residential buildings within a 40' setback from the SFHA or within the 500-year floodplain must be elevated
- Nonresidential buildings may be permitted in the SFHA, but they must be elevated
- Dryland access is required for new roads, driveways, and parking areas to allow for safer access

during a flood event
- ❖ Critical facilities are prohibited in the SFHA and must be elevated if located in the 500-year floodplain
- ❖ Stormwater management facilities are prohibited in the SFHA
- ❖ Storage of hazardous materials is prohibited in the SFHA

For Floodplain Ordinance questions, please contact the county's Floodplain Administrator in the Department of Public Works, Design Division.

3.2. Zoning Ordinance

The Zoning Ordinance applies to the use and development of all lands within the county and can be found in Chapter 24 of the Henrico County Code. The purpose of the Zoning Ordinance is to promote the health, safety, and general welfare of the present and future residents, businesses, and landowners of the county, while also ensuring all development within the county's jurisdiction is consistent with the goals and policies of the adopted comprehensive plan.

All development in the SFHA must also comply with all applicable requirements in the Zoning Ordinance. Below is a summary of some of the requirements in the Zoning Ordinance that may apply to development in the SFHA:

- ❖ The SFHA cannot be used to calculate lot area (Sec. 24-8302.A) or residential density (Sec. 24-8303).
- ❖ The C-1 Conservation District may be used to preserve and protect the SFHA (Sec. 24-3203).
- ❖ Development within dam break inundation zones must meet certain requirements (Sec. 24-2314). Although dam break inundation zones are not the same as the SFHA, they often overlap.

For Zoning Ordinance questions, please contact the Planning Department.

3.3. Subdivision Ordinance

The Subdivision Ordinance applies to any subdivision of land that is situated wholly or partly within the county and can be found in Chapter 19 of the Henrico County Code. The purpose of the Subdivision Ordinance is to promote the health, safety, and general welfare of the present and future residents, businesses, and landowners of the county and to establish procedures and standards relating to the subdivision of land within the county and to establish standards for access, circulation, streets, and other infrastructure provided as part of subdivisions in order to assure the orderly subdivision of land and its development.

All subdivision of land in the SFHA must also comply with all applicable requirements in the Subdivision Ordinance. Below is a summary of some of the requirements in the Subdivision Ordinance that may apply to development in the SFHA:

- ❖ Subdivisions must comply with the Floodplain Ordinance and the limits and elevation of SFHA must be conspicuously noted and labeled on the plat and the construction plans, and a variable width drainage and utilities easement within the SFHA must be granted (Sec. 19-3601, Sec. 19-3502).
- ❖ The SFHA is considered a primary conservation area for Cluster Subdivisions (Sec. 19-5303).
- ❖ Development within dam break inundation zones must meet certain requirements (Sec. 19-2302).

Although dam break inundation zones are not the same as the SFHA, they often overlap.

For Subdivision Ordinance questions, please contact the Planning Department.

3.4. Building Code

The Virginia Uniform Statewide Building Code (USBC) establishes minimum regulations to govern the construction and maintenance of buildings and structures and is adopted and maintained by the Virginia Board of Housing and Community Development. Additional requirements can be found in Chapter 6 of the Henrico County Code.

All buildings or structures in the SFHA must also comply with all applicable requirements in the USBC. Please note that the USBC does not supersede the county's Floodplain Ordinance (USBC, Sec. 102.2), some USBC requirements may not be applicable if the Floodplain Ordinance includes a more restrictive standard. The 2021 USBC is the current edition of the building code, effective January 18, 2024. The 2021 USBC includes a provision to allow permits filed no later than January 17, 2025 to remain subject to the previous edition, the 2018 USBC.

Below is a summary of some of the locations where requirements can be found in both the 2021 and 2018 USBC that may apply to buildings or structures in the SFHA:

- The building official may require a permit for activities generally exempt from the building permit requirement if located in the SFHA (Sec. 108.2).
- After placement of the lowest floor and prior to further vertical construction, an elevation certificate must be submitted to the building official (Sec. 113.3.2).
- Moved buildings or structures shall not be occupied or used until flood hazard documentation has been approved by the building official (Sec. 117.2)
- Sections 1603 and 1612 of the Virginia Construction Code.
- Section R322 of the Virginia Residential Code
- Requirements are also located in other books of the USBC collection (e.g., Virginia Existing Building Code, Virginia Mechanical Code, etc.)

For Building Code questions, please contact the Building Inspections Department.

3.5. Other Standards

In addition to the standards listed above, there may be other county or state requirements that apply to development in the SFHA, such as water quality standards.

The Stormwater Management Ordinance applies to certain land disturbing activities and can be found in Chapter 10, Article II of the Henrico County Code. The purpose of the Stormwater Management Ordinance is to promote and protect the health, safety, and general welfare of the citizens of Henrico County and to protect state waters, stream channels, and other natural resources from the potential impacts of development. This ordinance also addresses Chesapeake Bay Preservation Area (CBPA). Additional CBPA requirements can also be found in the Zoning Ordinance, Chapter 24, Division 8 of the Henrico County Code.

Development in the SFHA must also comply with all applicable Stormwater Management and CBPA requirements. The SFHA is considered a CBPA Resource Management Area.

For Stormwater Management or CBPA questions, please contact the Department of Public Works, Environmental Services Division.

4. SPECIFIC DEVELOPMENT ACTIVITIES AND REQUIREMENTS

This section is intended to provide additional guidance on specific development activities and requirements outlined in the Floodplain Ordinance. This **does not** include all types of development, nor does it include all ordinance requirements that apply within the SFHA.

Development activities that are located partially in the SFHA will be treated as if the entire development is in the SFHA and must comply with the ordinance requirements. For example, a nonresidential building that has a small portion of the building located in the SFHA and the rest of the building located outside the SFHA must have the lowest floor of the entire structure elevated.

4.1. Buildings and Structures

New construction and substantial improvements, including manufactured homes, must be built in accordance with the Floodplain Ordinance and the USBC, and anchored to prevent flotation, collapse, or lateral movement of the structure, constructed with materials and utility equipment resistant to flood damage, and constructed with methods and practices that minimize flood damage. Manufactured homes may be considered a Residential or Non-Residential Building depending on their use. For the purposes of the Floodplain Ordinance and this Manual, mixed use buildings are considered residential.

A. Residential Structures

New or substantially improved residential structures are prohibited in the SFHA and within 15 feet of the SFHA. New or substantially improved residential structures located in the 500-year floodplain or that are closer to the SFHA than 40 feet may be permitted if the lowest floor, including mechanical equipment, is elevated a minimum of one foot above the BFE.

Figure 5: Example elevated residential structure adjacent to the SFHA.

The 15-foot and 40-foot distances are measured from the edge of the floodplain to the structure. These must be measured horizontally showing the shortest distance between the floodplain and nearest structure corner.

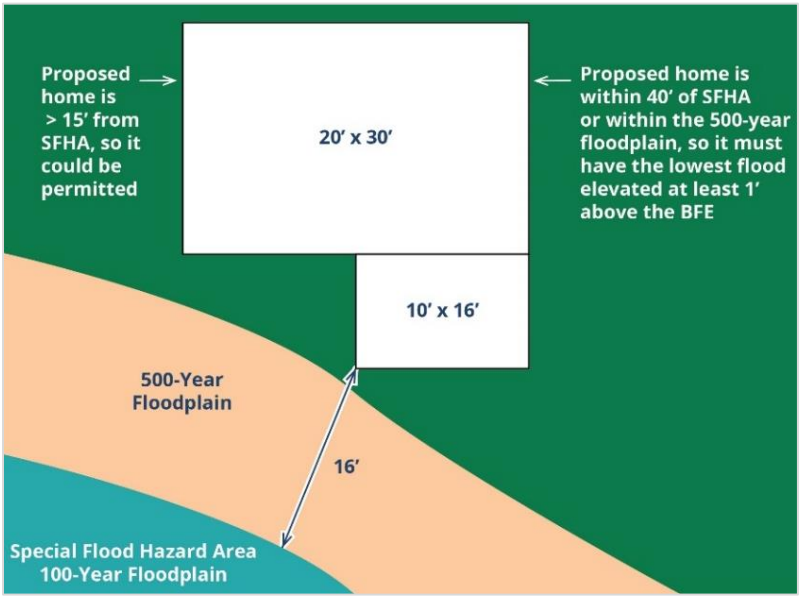


Figure 6: Example site plan with floodplain setback drawn to the nearest structure corner.

B. Nonresidential Structures

New or substantially improved nonresidential structures may be permitted in the SFHA if the lowest floor, including mechanical equipment, is elevated a minimum of two feet above the BFE. New or substantially improved nonresidential structures located in the 500-year floodplain or that are closer to the SFHA than 40 feet may be permitted if the lowest floor, including mechanical equipment, is elevated a minimum of one foot above the BFE of the adjacent SFHA.

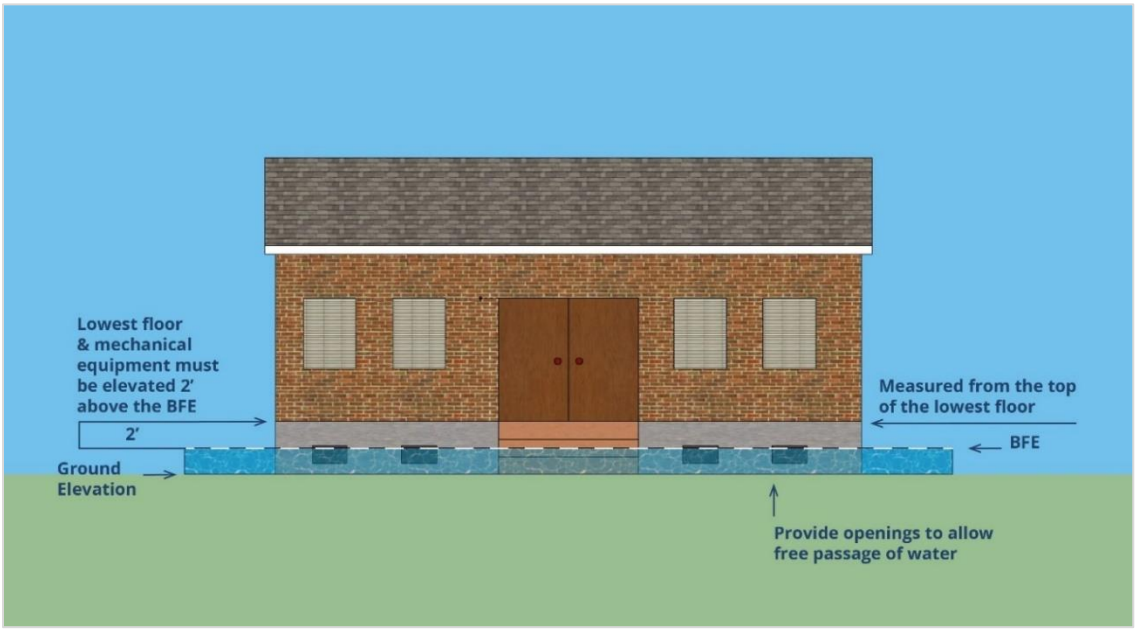


Figure 7: Example elevated nonresidential structure within the SFHA.

Figure 8: Example elevated nonresidential structure adjacent to the SFHA.

The 40-foot distance must be measured horizontally showing the shortest distance between the floodplain and nearest structure corner.

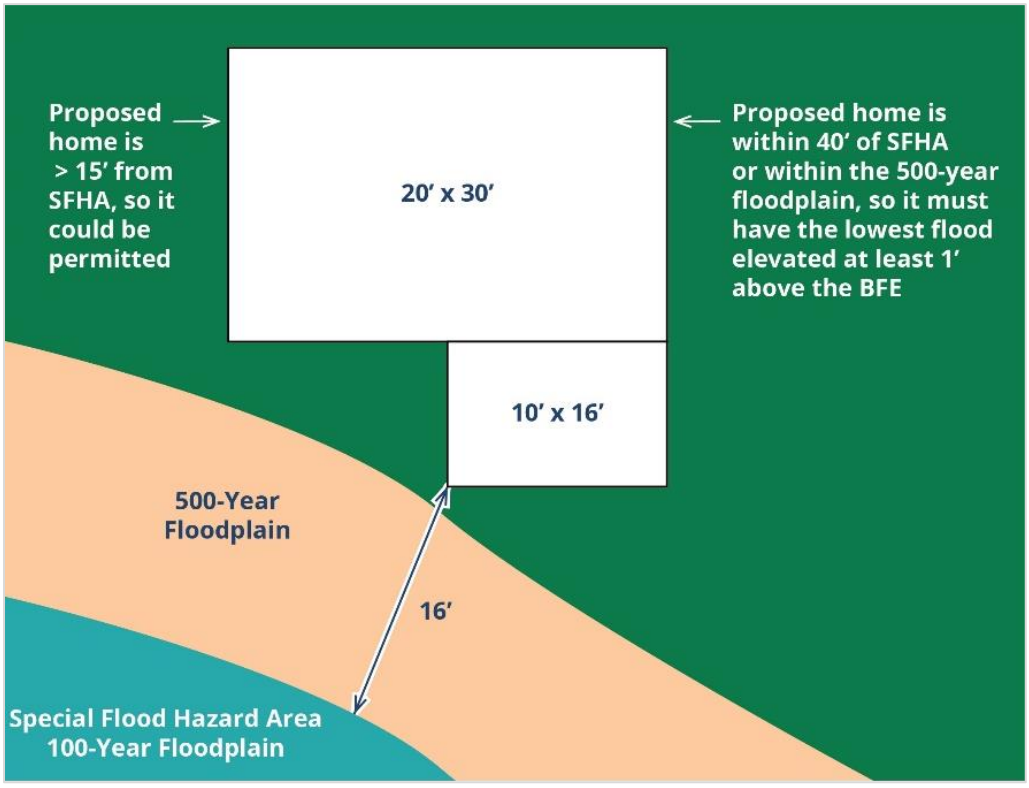


Figure 9: Example site plan with floodplain setback drawn to the nearest structure corner.

1) Accessory Structures

For the purposes of the Floodplain Ordinance and this Manual, accessory structures are considered nonresidential even if their use may be considered residential in nature by other ordinances (e.g., detached garage, backyard shed, greenhouse, etc.). Accessory structures must meet the requirements of nonresidential structures above. However, detached accessory structures used only for parking of vehicles and/or storage may be permitted with the lowest floor below the BFE if the following conditions are met:

- The structure is not larger than 600 square feet - approximately the size of a one-story two-car garage and walls.
- The structure has flood openings that meet the requirements for Enclosures Below the Lowest Floor
- The structure is anchored to resist flotation, collapse, and lateral movement.
- Flood damage-resistant materials are used below the BFE.
- Mechanical, electrical, and utility equipment is elevated or dry-floodproofed to or above the BFE. Dry-floodproofing must be certified by a licensed professional engineer or architect.

1) Agricultural Structures

For the purposes of the Floodplain Ordinance and this Manual, agricultural structures are considered nonresidential and must meet the requirements of nonresidential structures above.

2) Dry Floodproofing

Dry Floodproofing is the combination of measures that results in a structure and its attendant utilities and equipment being watertight with all elements substantially impermeable and with structural components having the capacity to resist flood loads. Dry floodproofing generally includes making the building watertight through sealing openings, installing waterproof doors and windows, or sealing walls with waterproof coatings, impermeable membranes, and/or a supplementary layer of masonry or concrete. Dry floodproofing is appropriate only for certain nonresidential buildings.

New nonresidential structures in the SFHA must have their lowest floor elevated above the BFE and may not use dry floodproofing. However, there may be situations when elevation of a nonresidential structure is not feasible because of the nature of the lot and/or the building use. If this occurs, an Administrative Variance may be issued to allow dry floodproofing.

If an Administrative Variance is approved, all areas of the building components below the BFE plus three feet must be watertight with walls substantially impermeable to the passage of water. Structural components must be used that have the capability of resisting hydrostatic and hydrodynamic loads and the effect of buoyancy; this must be designed and constructed in accordance with the USBC and ASCE 24, as well as be certified by a professional engineer or architect.

A Floodproofing Certificate (Appendix 7) with supporting data and an inspection and operational plan that includes, but is not limited to, installation, exercise, and maintenance of floodproofing measures must be provided. This certification, operational plan, and inspection and maintenance plan shall be prepared by or under the direct supervision of a professional engineer or architect and certified by same. Additional information and requirements for dry floodproofing can be found in the NFIP Technical Bulletin 3: Requirements for the Design and Certification of Dry Floodproofed Non-Residential and Mixed Use Buildings, ASCE 24, and ASCE 7.

C. Existing Structures

Although Henrico County has prohibited dwellings in the SFHA since 1989, many were built prior to that prohibition being adopted or prior to being mapped in the SFHA. There are approximately 1,200 existing residential structures and approximately 200 existing nonresidential structures in the SFHA. A structure or use that lawfully existed before the adoption of the Floodplain Ordinance but does not satisfy the current requirements of Floodplain Ordinance may continue.

1) Ordinance Requirements for Existing Structures

The following items are from Sec. 10-13 of the Floodplain Ordinance:

a) An existing structure in the floodway may not be expanded or enlarged if the proposed expansion or enlargement would result in an increase in the BFE.
b) If a modification, alteration, repair, reconstruction, or improvement to a structure in a floodplain would cost less than 50 percent of the market value of the structure, the modification, alteration, repair, reconstruction, or improvement must be designed to minimize flood damage. If such structure does not comply with the current requirements of the Floodplain Ordinance, the modification, alteration, repair, reconstruction, or improvement must not increase the amount of nonconformity.
c) A substantial improvement must meet the requirements of [the Floodplain Ordinance] for new construction, and the entire structure must conform with the current USBC after the substantial improvement is completed. If a substantial improvement will be located in the 500-year floodplain or will be between 15 and 40 feet from the SFHA, the lowest floor of the substantial improvement, including mechanical equipment, must be elevated a minimum of one foot above the BFE.
d) An existing residential structure may not be enlarged if any part of the enlarged structure will be in, or within 15 feet of, the SFHA.
e) A residential structure may be relocated only if the new location of the structure is entirely outside the SFHA, and the new location does not violate the provisions of the Floodplain Ordinance.

2) Substantial Improvements and Substantial Damages

Substantial damages and substantial improvements require that structures be brought into compliance with the current requirements for new construction under both the Floodplain Ordinance and the USBC.

Substantial Improvement is any improvement to a structure where the cost of the improvements is greater than or equal to 50% of the market value of the structure before the start of construction of the improvement. A Substantial Damage is damage to a structure from any origin, not just flooding, where the cost to repair the structure to the pre-damaged value equals or exceeds 50% of the market value of the structure before the damage occurred. By definition, a substantial damage is also considered a substantial improvement. Additional information is available in FEMA's Substantial Improvement/ Substantial Damage Desk Reference.

If existing violations of state or local health, sanitary, or safety codes were identified through the county's code enforcement process before a substantial damage or substantial improvement occurs, the costs to address the violation may not be incorporated into the substantial damage or substantial improvement determination. However, the violation must have been documented in writing and must be the minimum improvements necessary to assure safe living conditions.

The tax assessed value for a structure will be used as the market value for making substantial damage and

substantial improvement determinations. However, property owners may choose to have an independent appraisal of the structure done by a professional appraiser for this determination. If an independent appraisal is done, this may be used to update the tax assessment.

The Floodplain Administrator is responsible for making Substantial Improvement or Substantial Damage determinations. As part of this process, FEMA has identified several costs that must be included in this calculation, as well as some costs that may be excluded. When applying for a Floodplain Development Permit for an existing structure, a cost breakdown must be submitted with the permit application so this determination can be made.

FEMA has identified specific items that must be included and excluded from the cost determination for Substantial Damages and Substantial Improvements. Items that must be included in the costs of improvement and the costs to repair are those directly associated with the building. Items that can be excluded are those that are not directly associated with the building. Figure 10 provides a list of all the items that must be included and excluded from the cost determination. Appendix 4 may be used to track costs as part of a permit application.

COSTS INCLUDED

in SI/SD Determination

- **Materials and labor**, including the estimated value of donated or discounted materials and owner or volunteer labor
- **Site preparation related to the improvement or repair** (e.g., foundation excavation or filling in basements)
- **Demolition and construction debris disposal**
- **Labor and other costs associated with demolishing, moving, or altering building components** to accommodate improvements, additions, and making repairs
- **Costs associated with elevating a structure** when the proposed elevation is lower than the BFE
- **Costs associated with complying with any other regulations or code requirement** that is triggered by the work, including costs to comply with the requirements of the Americans with Disabilities Act (ADA)
- **Construction management and supervision**
- **Contractor's overhead and profit**
- **Sales taxes on materials**
- **Structural elements and exterior finishes**, including: *Foundations (e.g., spread or continuous foundation footings, perimeter walls, chain- walls, pilings, columns, posts, etc.); Monolithic or other types of concrete slabs; Bearing walls, tie beams, trusses; Joists, beams, subflooring, framing, ceilings; Interior non-bearing walls; Exterior finishes (e.g., brick, stucco, siding, painting, and trim); Windows and exterior doors; Roofing, gutters, and downspouts; Hardware; Attached decks and porches.*
- **Interior finish elements**, including: *Floor finishes (e.g., hardwood, ceramic, vinyl, linoleum, stone, and wall-to-wall carpet over subflooring); Bathroom tiling and fixtures; Wall finishes (e.g., drywall, paint, stucco, plaster, paneling, and marble); Built-in cabinets (e.g., kitchen, utility, entertainment, storage, and bathroom); Interior doors; Interior finish carpentry; Built-in bookcases and furniture; Hardware; Insulation.*
- **Utility and service equipment**, including: *Heating, ventilation, and air conditioning (HVAC) equipment; Plumbing fixtures and piping; Electrical wiring, outlets, and switches; Light fixtures and ceiling fans; Security systems; Built-in appliances; Central vacuum systems; Water filtration, conditioning, and recirculation systems.*

COSTS EXCLUDED

in SI/SD Determination

- **Clean-up and trash removal**
- **Costs to temporarily stabilize a building** so that it is safe to enter to evaluate and identify required repairs
- **Costs to obtain or prepare plans and specifications**
- **Land survey costs**
- **Permit fees and inspection fees**
- **Carpeting and recarpeting** installed over finished flooring such as wood or tiling
- **Outside improvements**, including landscaping, irrigation, sidewalks, driveways, fences, yard lights, swimming pools, pool enclosures, and detached accessory structures (e.g., garages, sheds, and gazebos)
- **Costs required for the minimum necessary work to correct existing violations** of health, safety, and sanitary codes
- **Plug-in appliances** such as washing machines, dryers, and stoves

Figure 10: Costs that must be included and excluded in SI/SD determinations

3) Historic Structures

A historic structure may be considered a Residential or Non-Residential Building depending on its use. Historic structure is defined as any structure that is:

1) listed individually in the National Register of Historic Places maintained by the U. S. Department of Interior or preliminarily determined by the U. S. Secretary of the Interior as meeting the requirements for individual listing on the National Register, or
2) certified or preliminarily determined by the U. S. Secretary of the Interior as contributing to the historical significance of a registered historic district or a district preliminarily determined by the Secretary to qualify as a registered historic district, or
3) individually listed on a state inventory of historic places in states with historic preservation programs which have been approved by the U. S. Secretary of the Interior, or
4) individually listed on a local inventory of historic places in communities with historic preservation programs that have been certified either:
    a. by an approved state program as determined by the U. S. Secretary of the Interior or
    b. directly by the U. S. Secretary of the Interior in states without approved programs.

Henrico County is not currently a Certified Local Government through the Virginia Department of Historic Resources, so (d) is not applicable.

Variances for the repair or rehabilitation of historic structures may be granted upon a determination that the proposed repair or rehabilitation will not preclude the structure's continued designation as a historic structure and the variance is the minimum necessary to preserve the historic character and design of the structure. Documentation from a historic preservationist or the Virginia Department of Historic Resources must be provided that clearly demonstrates meeting the requirements of the Floodplain Ordinance would jeopardize the structure's historic designation.

D. Determining the Lowest Floor

The lowest floor of a structure is measured from the lowest enclosed area (including crawlspace or basement). An unfinished or flood resistant enclosure, usable solely for parking of vehicles, building access, or storage in an area other than a basement area may not be considered a building's lowest floor if it meets the requirements below for enclosures below the lowest floor. An Elevation Certificate must be submitted to document the lowest floor elevation. More information on Elevation Certificates is in Section 6.3.D.1.

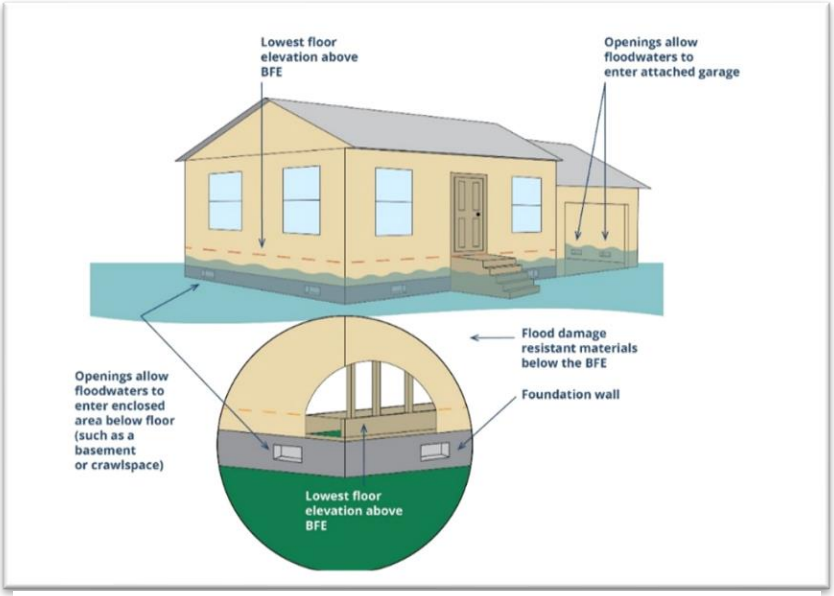


Figure 11: Example lowest floor of a structure within or adjacent to the SFHA

E. Enclosures Below the Lowest Floor

Enclosed areas below the lowest floor in new or substantially improved structures must be designed to allow flood water to automatically enter and exit the space by installing flood openings. This is also referred to as wet floodproofing. Enclosures must meet the following requirements to not be treated as the lowest floor:

- not be designed or used for human habitation,
- be used solely for parking of vehicles, building access, or limited storage of maintenance equipment for the premises. Access to the enclosed area shall be the minimum necessary to allow for parking of vehicles (garage door) or limited storage of maintenance equipment (standard exterior door), or entry to the living area (stairway or elevator),
- be constructed entirely of flood damage-resistant materials,
- include measures to automatically equalize hydrostatic flood forces on walls by allowing for the entry and exit of floodwaters. To meet this requirement, flood openings must meet the following minimum design criteria:
    - there must be a minimum of two openings on different sides of each enclosed area subject to flooding.
    - the total net area of all openings must be at least one square inch for each square foot of enclosed area subject to flooding or be certified by a professional engineer or architect.
    - there must be openings to allow floodwaters to automatically enter and exit each enclosed area if a building has more than one enclosed area.
    - the bottom of all required openings shall be no higher than one foot above the adjacent grade.
    - openings may be equipped with screens, louvers, or other opening coverings or devices that permit the automatic flow of floodwaters in both directions without manual operation or human intervention.

Existing structures with enclosures below the lowest floor that do not meet the requirements listed above may have high flood insurance premiums if the bottom of the enclosure is below the BFE. Property owners of these structures may wish to renovate the existing enclosure to incorporate flood openings to reduce their flood insurance premiums. In some situations, this could result in hundreds or even thousands of dollars in flood insurance premium savings.

4.2. Critical Facilities

A Critical Facility is a structure or other improvement that, because of its function, size, service area, or uniqueness, has the potential to result in serious bodily harm, extensive property damage, or disruption of vital socioeconomic activities if it is destroyed or damaged or if its functionality is impaired. Critical facilities include health and safety facilities, utilities, government facilities, and hazardous materials facilities.

New or substantially improved critical facilities may not be located in the SFHA. Critical facilities located in the 500-year floodplain may be permitted, but buildings or structures must have their lowest floor elevated to the BFE plus two feet, or the 500-year flood elevation plus one foot, whichever is greater.

If a Critical Facility must be located in the SFHA, a variance by the County Engineer may be possible.

1) Example

A sewer pump station would be considered a critical facility and could not be located in the SFHA. However, underground sewer lines that connect structures to the pump station would not be considered a critical facility and could be located in the SFHA if all applicable requirements have been met.

4.3. Roads, Bridges, and Culverts

New roads, bridges, and culverts in the SFHA must be modeled to determine their impacts and ensure they meet the ordinance requirements. The HEC-RAS Manuals should be consulted for additional details on how to accurately model these in a flood study. If a new road, bridge, or culvert is proposed, the applicant will need to work closely with the county to determine all applicable design standards.

A. Dryland Access

New roads, driveways, and parking areas located in the SFHA must be designed and constructed so that they will not be overtopped by more than six inches of water during the 100-year flood. A hydrologic and hydraulic analysis may be necessary to demonstrate this, but this may also be demonstrated through a grading plan that shows the top of the road, driveway, or parking area is no more than six inches below the BFE. All applicable requirements in the Henrico County Design Manual must be met for new roads, driveways, and parking areas. It is important to consider all requirements to determine that the most restrictive criteria are met, and all applicable requirements are satisfied.

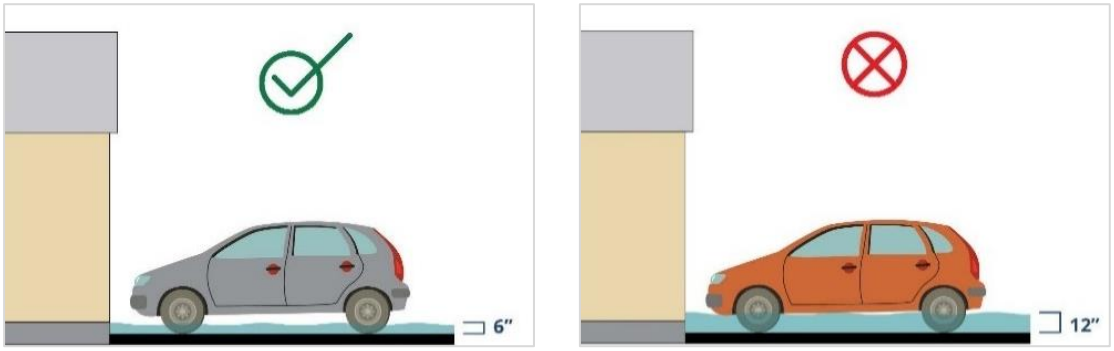


Figure 12: Example new driveway designs that do and do not meet the dryland access requirement.

4.4. Other Development

A. Fill in the Floodplain

Fill is a deposit of materials placed by artificial means in the SFHA. Fill may not be placed in the SFHA, including the placement of fill to remove a lot from the SFHA in order to construct a building or structure.

An Administrative Variance may be approved for minor filling in the SFHA necessary to protect or restore natural floodplain functions or to stabilize stream banks to protect public roads and utilities.

B. Environmental Protection and Restoration Projects

Natural floodplains help reduce flood risk by slowing down runoff and storing flood water. Natural floodplains can add value to the community through socioeconomic and environmental benefits, such as improving water quality, groundwater recharge, fish and wildlife habitat, and recreational opportunities. Development and vegetation removal can degrade natural floodplains causing issues like erosion or

sedimentation, so environmental protection and restoration projects may be implemented to restore these areas. These types of projects are encouraged in the SFHA.

1) Example

Stream restorations are a common project implemented in Henrico County to restore natural floodplains. These projects achieve stability by raising the stream bed to reconnect with the floodplain while also providing additional flow capacity. As a result, it is common to have fill material in the channel. Usually, fill within the SFHA is prohibited; however, minor filling that is necessary to protect or restore natural floodplain functions, such as stream restoration projects, may be allowed with an Administrative Variance.

C. Stormwater Management Facilities

New stormwater management facilities designed specifically to address stormwater quantity may not be constructed in the SFHA, as they can restrict or remove floodplain storage. This does not include facilities designed to exclusively address water quality. The Virginia Stormwater BMP Clearinghouse provides guidance and design specifications for 15 different practices. For Floodplain Management purposes, some of these practices are not considered a "stormwater management facility" and as such could be permitted in the SFHA. Although some practices may be allowed in the SFHA, some practices may be discouraged due to potential maintenance concerns caused by regular flooding. Table 1 below outlines each practice, whether it is considered a stormwater management facility for floodplain purposes, if it is allowed in the SFHA, as well as additional comments that may be relevant.

Table 1 - Stormwater Management Facilities in the SFHA

Practice Description	Stormwater Management Facility (for Floodplain Management Purposes Only)	Allowed in SFHA?
Sheet Flow	Yes	No
Bioretention	Yes	No
Dry Swales	Yes	No
Extended Detention	Yes	No
Soil Compost Amendment	No	Yes, but discouraged
Infiltration Practices	No	Yes, but discouraged
Rooftop Disconnect	No	Yes
Grass Channel	No	Yes
Vegetative Roof	No	Yes
Rainwater Harvesting	No	Yes
Permeable Pavement	No	Yes
Wet Swales	No	Yes
Filtering Practices	No	Yes
Constructed Wetlands	No	Yes
Wet Ponds	No	Yes

All practices listed above that are allowed in the SFHA must comply with all applicable requirements in the Floodplain Ordinance (e.g., No-Rise, no fill, etc.). Stormwater Management Facilities may be allowed in the SFHA if a variance is granted. For practices using sheet flow, the conserved open space area or vegetative filter strip can be within the SFHA, but the actual outfall structure (level spreader, pipe, etc.) cannot be in the SFHA. For soil compost amendments and infiltration practices, flooding could impact maintenance requirements and must be carefully considered in the service life of the BMP.

If locating a stormwater management facility outside of the SFHA is not feasible, a variance may be possible. An Administrative Variance may be issued to allow the stormwater management facility to be in the SFHA. For new facilities that receive this variance, they must meet the No-Rise requirement, no fill requirement, and provide engineering data shows that the proposed stormwater management facility will operate effectively for its intended purpose during a 10-year flood event or the required design storm for the project, whichever is greater, and will have structure stability during a 100-year flood event. If the requirements of the Administrative Variance cannot be met, a County Engineer Variance may be requested. A variance may only be approved if all applicable variance requirements have been met.

1) Example

A pond in the SFHA that was not designed to hold stormwater could be retrofitted to improve water quality; the pond may collect stormwater because water naturally flows into it, but the pond is not designed specifically for that purpose. However, a detention basin designed specifically to hold stormwater runoff would not be allowed in the SFHA because it is designed specifically to manage stormwater quantity, it would be considered a stormwater management facility.

2) When a No-Rise Certificate is Required

No-Rise Certificates for stormwater discharge will only be required if the stormwater discharge is outfalling directly into the SFHA, meaning the point of discharge or any portion of the outfall (including any existing or proposed stormwater conveyance features) is on or within the SFHA boundary. For floodplain management purposes, outfall means any man-made component or land disturbing activity associated with the point of discharge (e.g. pipe, spillway, outfall protection, level spreader, etc.), except for vegetated ditches and vegetated swales.

Stormwater Discharge No-Rise Scenarios

There are six general scenarios explaining how stormwater discharges to the SFHA. Each scenario is outlined below, with a description of the scenario, a graphic depicting the scenario, if a No-Rise Certificate is required, and which No-Rise Narrative Report template should be used.

Please note that these scenarios are intended to summarize the general requirements, but there may be cases where more and/or different technical data is required to support a No-Rise Certificate than what is outlined below. If this occurs, this will be communicated through the review process with an explanation for why something additional and/or different is required. For example, there may be a situation where the post-condition peak flow values are less than the pre-condition peak flow values, in which case those calculations may be provided in lieu of conducting a peak offset analysis.

If stormwater discharges directly into a Floodway, the No-Rise Certificate must be supported by a Flood Study.

Scenario 1: Discharging to a Natural Channel, Vegetated Ditch or Swale, or Overland Flow Where Not Mapped as SFHA

For floodplain management purposes, discharging to a natural channel, vegetated ditch or swale, or through overland flow is not considered a direct discharge to the floodplain, as long as where the outfall is located is not currently mapped as SFHA. In this situation, a No-Rise Certificate is not required for this type of stormwater discharge. If stormwater discharges into a natural channel, vegetated ditch or swale, or through overland flow where the outfall is mapped as SFHA, a No-Rise Certificate would be required.

No-Rise Certificate Required?	Narrative Report Type
No	Not Applicable

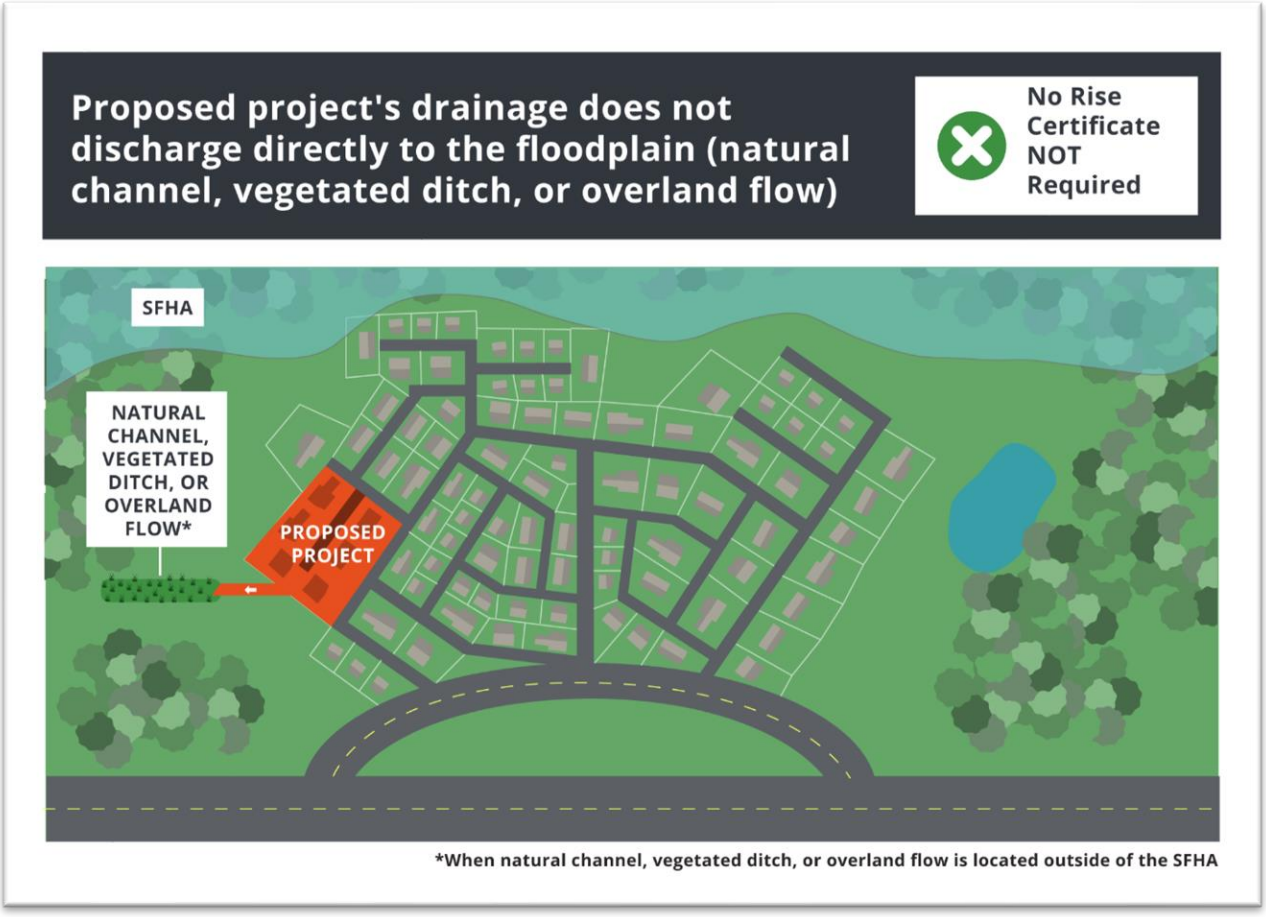


Figure 13: No-Rise Certificate requirements when discharging stormwater to a natural channel, vegetated ditch, or overland flow.

Scenario 2: Discharging Through a Pipe or Concrete Channel that Outfalls in the SFHA

For floodplain management purposes, discharging through a pipe or concrete channel that outfalls in the SFHA is considered a direct discharge to the floodplain. This discharge is considered development, and a No-Rise Certificate is required for this type of stormwater discharge.

No-Rise Certificate Required?	Narrative Report Type
YES	Peak Offset Analysis

Figure 14: No-Rise Certificate requirements when discharging stormwater through a pipe or concrete channel that outfalls in the SFHA.

Scenario 3: Discharging Through a Pipe or Concrete Channel that Outfalls in the SFHA, with an In-Line BMP

For floodplain management purposes, discharging into a stormwater BMP (in-line BMP) that discharges into a pipe or concrete channel that outfalls in the SFHA is considered a direct discharge to the floodplain. This discharge is considered development, and a No-Rise Certificate is required for this type of stormwater discharge. This may include discharging to an existing in-line BMP or proposing to construct a new in-line BMP as part of the proposed project.

No-Rise Certificate Required?	Narrative Report Type
YES ✓	Proposed: Peak Offset Analysis Existing: General Engineering Analysis

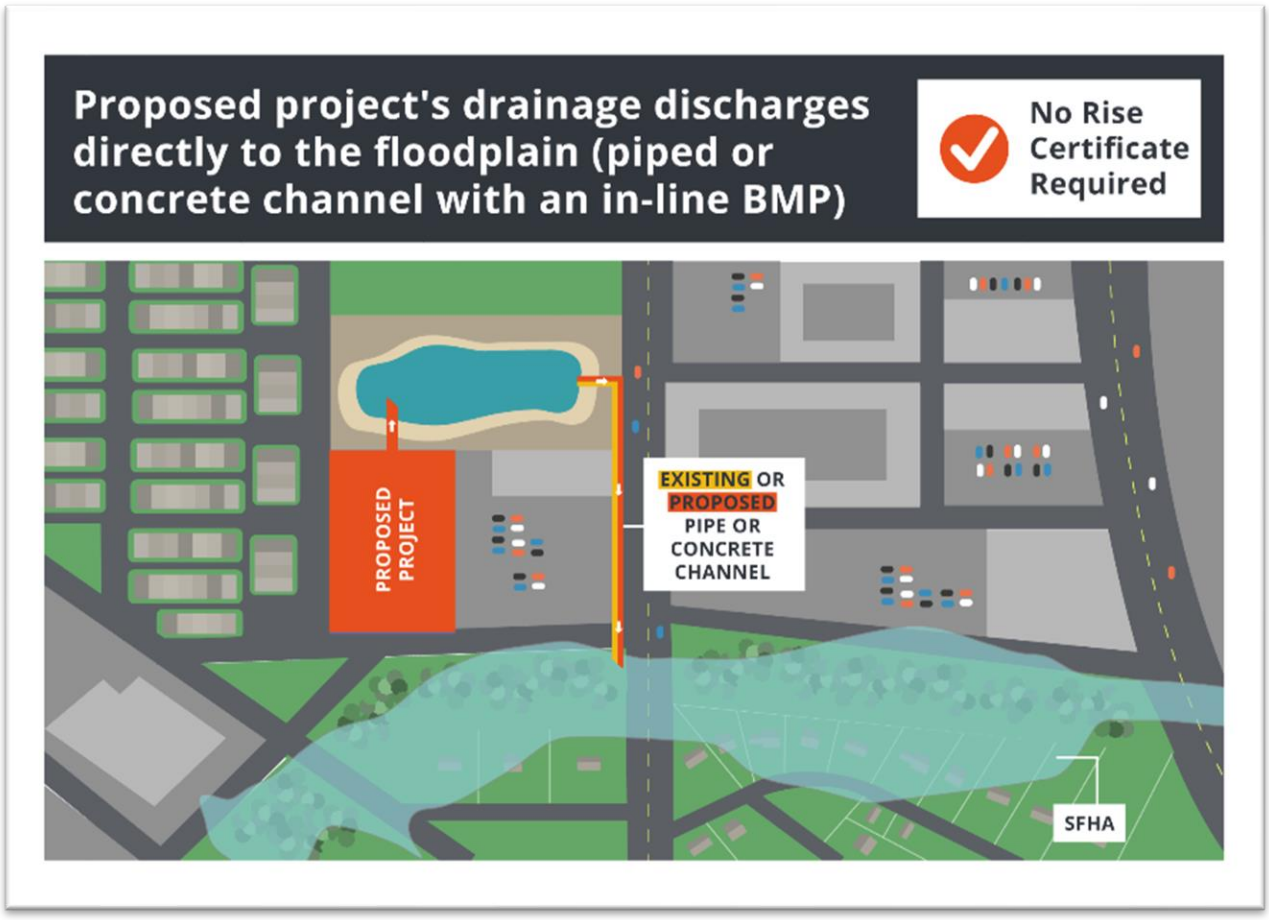


Figure 15: No-Rise Certificate requirements when discharging stormwater through a pipe or concrete channel that outfalls in the SFHA, with an in-line BMP.

Scenario 4: Discharging Through an Existing Pipe or Concrete Channel Network that Outfalls in the SFHA

For floodplain management purposes, discharging into an existing pipe or concrete channel network that outfalls in the SFHA is considered a direct discharge to the floodplain. This discharge is considered development, and a No-Rise Certificate is required for this type of stormwater discharge.

No-Rise Certificate Required?	Narrative Report Type
YES ✓	General Engineering Analysis

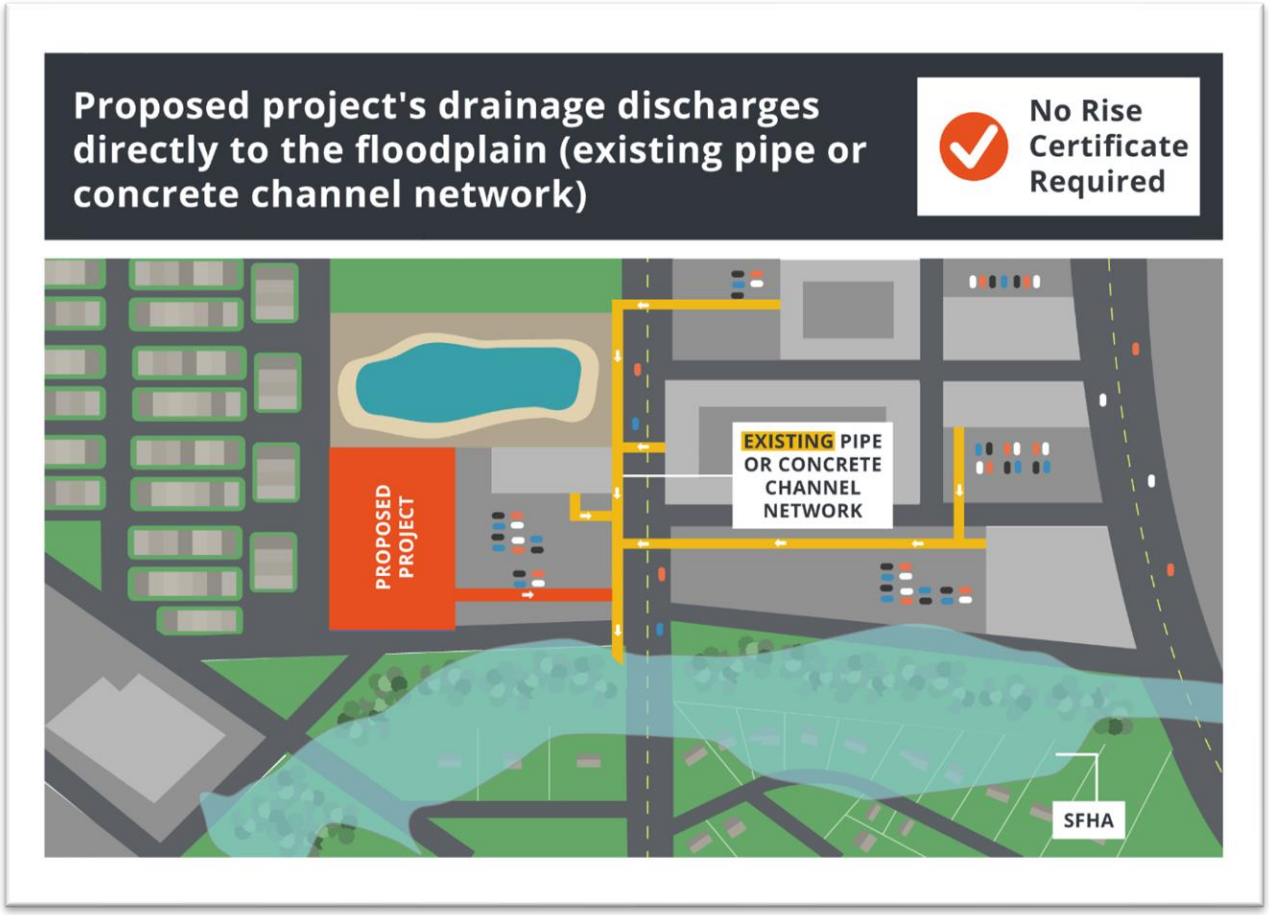


Figure 16: No-Rise Certificate requirements when discharging stormwater through a pipe or concrete channel network that outfalls in the SFHA

Scenario 5: Discharging Through a Level Spreader Without a Detention Facility That Outfalls in the SFHA

For floodplain management purposes, discharging through a level spreader without a detention facility that outfalls in the SFHA is considered a direct discharge to the floodplain. This discharge is considered development, and a No-Rise Certificate is required for this type of stormwater discharge. This may include discharging to an existing level spreader or proposing to construct a new level spreader as part of the proposed project.

No-Rise Certificate Required?	Narrative Report Type
YES ✓	Peak Offset Analysis

Figure 17: No-Rise Certificate requirements when discharging stormwater through a level spreader without a detention facility that outfalls in the SFHA.

Scenario 6: Discharging Through a Level Spreader With a Detention Facility That Outfalls in the SFHA

For floodplain management purposes, discharging through a level spreader with a detention facility that outfalls in the SFHA is considered a direct discharge to the floodplain. This discharge is considered development, and a No-Rise Certificate is required for this type of stormwater discharge. This may include discharging to an existing level spreader or proposing to construct a new level spreader as part of the proposed project.

No-Rise Certificate Required?	Narrative Report Type
YES	Proposed: Peak Offset Analysis Existing: General Engineering Analysis

Figure 18: No-Rise Certificate requirements when discharging stormwater through a level spreader without a detention facility that outfalls in the SFHA.

3) Tips for Meeting the No-Rise Requirement

- If retrofitting an existing stormwater management facility within the SFHA, the hydraulic function for the 100-year must either be maintained or provide smaller outflows.
- For new stormwater management facilities that discharge directly into the SFHA, the 100-year flows should be attenuated to the site's existing condition's peak. An alternative to providing attenuation for the 100-year flows is to conduct a Peak Offset Analysis.
- For new stormwater management facilities located entirely in the SFHA (variance approval required), a hydrologic and hydraulic analysis is required. For new stormwater management facilities located partially in the SFHA (variance approval required), a hydrologic and hydraulic analysis may be required. Compensatory storage may also be required for these facilities.
- If stormwater is discharging directly to the SFHA after passing through an in-line BMP, documentation showing that the in-line BMP completely detains the discharge or results in a reduction of flows can be provided as technical data to support the No-Rise Certificate.
- If stormwater discharges directly into a Floodway, the No-Rise Certificate must be supported by a Flood Study.
- See Sec. 5.1 for more information on the No-Rise Certification.

D. Decks and Porches

A deck, porch, or similar feature added to a new or existing structure is a floodplain obstruction and must be evaluated to determine its impacts. Adding a deck to an existing structure is considered enlarging that structure, and all requirements for existing structures would apply. If an attached deck is located in or adjacent to the SFHA, the deck must comply with the requirements for that type of structure (e.g., top of deck elevated above the BFE, constructed entirely of flood damage-resistant materials, meet enclosure requirements, if applicable, etc.).

For Floodplain Management purposes, a deck is considered attached to a structure if it is directly connected to the structure (e.g., bracket connection, roof with attached supports, electrical connection, etc.) or if it is located within one foot of the structure.

A No-Rise Certificate (No Impact Statement) may be used for decks that do not have enclosures or have enclosures with less than 50% obstruction.

E. Fences

Fences may be permitted in the SFHA depending on the type and location of the fence. The type of fence will determine whether the fence will qualify as a minor project or a floodplain obstruction. Fences considered minor do not require a hydraulic study and can be permitted under a General Permit. Fences considered a floodplain obstruction will require a hydraulic study and can only be permitted under an Individual Permit.

Table 2 below outlines the fence types that may be permitted in the SFHA. Case by case reviews may be conducted by the Floodplain Administrator for fence types not listed below, including collapsible or breakaway fencing and fences requiring post spacing shorter than the typical 6-8 foot. Fences installed around swimming pools must be approved under an Individual Permit, and a building permit may also be required.

Table 2 - Fence Types and Requirements in the SFHA

Fence Type	Hydraulic Study Required?	Hydraulic Analysis Modeling Requirements	Permit Type Required
	Open wire, welded wire, chain link, pipe, or wood rail fencing (field fence, post and rail)		
	No	N/A	General Permit
	Wood, metal, or vinyl picket fencing with equivalent board width and spacing (roughly 50% obstruction) AND fence line is parallel to direction of flow and in a location that should have minimal impact to the flow.		
	No	N/A	General Permit
	Wood, metal, or vinyl picket fencing with equivalent board width and spacing (roughly 50% obstruction) AND fence line is designed in a way that has potential to block the direction of flow.		
	Yes	Model fencing using increased Manning's friction.	Individual Permit
	Wood, metal, or vinyl fencing with narrow spacing (greater than 50% obstruction).		
	Yes	Model fence as an obstruction.	Individual Permit
	Wood, metal, or vinyl solid board fencing (privacy fencing).		
	Yes	Model fence as an obstruction.	Individual Permit
	Any fence type installed around a swimming pool.		
	Determined by applicable fence type above.		Individual Permit

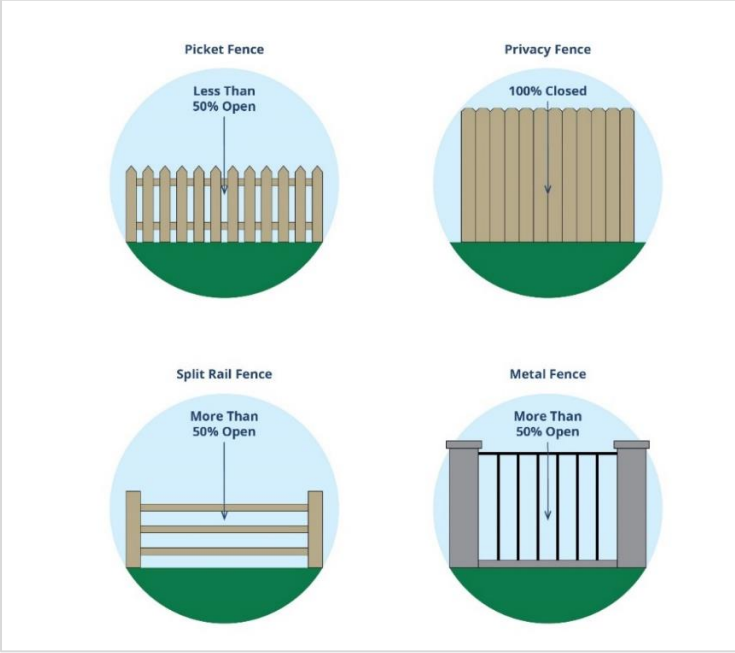


Figure 19: Example fences with and without proper openings.

F. Utility Systems

Additional information on protection utilities is available in FEMA P-348: Protecting Building Utility Systems from Flood Damage.

- Mechanical equipment shall be designed and/or located to prevent water from entering or accumulating within its components during conditions of flooding. Mechanical equipment associated with a building must be elevated to the same requirement as the building's lowest floor.
- New and replacement water supply systems shall be designed to minimize or eliminate infiltration of flood waters into the system.
- New and replacement sanitary sewage systems shall be designed to minimize or eliminate infiltration of flood waters into the system and discharges from the system into flood waters.
- On-site waste disposal systems shall be located and constructed to avoid their impairment or contamination during flooding.

G. Maintenance Activities

Some maintenance activities have been approved under a General Permit. Those activities are listed below. All other maintenance activities must be evaluated for floodplain impacts. Activities listed below that are located in a Floodway must be evaluated for floodplain impacts.

- Road maintenance involving painting, repaving, or patching an existing road, driveway, or parking area. This may also include repairs to existing guardrails/barriers. This may not involve replacement with larger or additional above ground infrastructure.
- General maintenance work to existing culverts, bridges, or dams such as repairs to concrete or other materials, cleaning out debris or sediment, or something similar. This may not involve replacement with larger or additional above ground infrastructure.
- Drainage ditch maintenance involving mowing, cleaning out debris or sediment from existing drainage ditches.
- Poles for signs, overhead utilities, billboards, and alike that are no larger than 2 feet in diameter and are not located within the stream channel.
- Underground utilities or repairs to existing underground utilities that do not permanently alter the topography.

H. Temporary Development

1) Temporary Structures

Temporary structures may be permitted in the SFHA if the requirements of Sec. 10-10(k) of the Floodplain Ordinance have been met, which are outlined below.

All applicants must submit a plan for removal of the structure in the event of a flood-related severe weather notification (hurricane, tropical storm, flood, flash flood, etc.) which includes the following information:

- Certification that the requirements of Sec. 10-9(a) and Sec. 10-9(b) [of the Floodplain Ordinance] have been met;
- A specified time period for the temporary use. The time period may not exceed three months and is renewable for up to one additional year;

- The name, address, and phone number of the individual responsible for the removal of the structure;
- The amount of time prior to the event when the structure will be removed;
- A copy of a contract with a trucking company to ensure the availability of removal equipment when needed or evidence of removal equipment on the property if a trucking company will not be used. In either case, the owner must provide a written designation of a location outside the SFHA to which the structure will be removed.

2) Temporary Encroachments

Temporary encroachments may be permitted in the SFHA if the requirements of Sec. 10-10(l) of the Floodplain Ordinance have been met, which are outlined below.

Temporary encroachments include sediment control devices, temporary stream crossings, haul roads and construction entrances, storage of equipment, and soil stockpiling. The following conditions must be met to qualify for the exemption:

- The proposed temporary encroachment shall not be in place more than three months and is renewable for up to one year with written approval from the Floodplain Administrator. Temporary sediment control devices may be kept in place longer than one year if required by the appropriate regulatory agency, and,
- Supporting documentation, including a hydrologic and hydraulic analysis (if required by the Floodplain Administrator) must be submitted by a licensed professional engineer indicating that the proposed project will not impact any existing buildings or overtop any roadway surfaces.

Temporary encroachments may be exempt from the No-Rise requirements of Sec. 10-9(a) and the no fill requirements of Sec. 10-9(b). In general, the No-Rise requirement must be met for all temporary development. However, temporary activities that qualify as minor development under the General Permit in Section 6.1.A.1 may not be required to provide additional documentation. Minor fill may be allowed only if the fill will be removed at the end of the temporary project and returned to the pre-development condition. Documentation, such as engineered plans and field survey, comparing the pre-development and post-development conditions will be required to confirm this has been met. Close coordination with the Floodplain Administrator will be necessary for any temporary encroachment prior to permit approval.

I. State Projects and State-Owned Property

In accordance with § 10.1-603 of the Code of Virginia, all state agencies and departments undertaking development in a floodplain must adhere to local floodplain regulations or receive formal approval through the Department of Conservation and Recreation. Chapter 777 of the 2023 Acts of Assembly states that DCR, in cooperation with others, must establish state standards for development in the floodplain no later than September 30, 2023. Draft standards were released by the state in 2023, but at the time of this manual update, the standards were not finalized.

For state projects with development impacting the floodplain in Henrico County, an Individual Floodplain Development Permit application must be submitting following the process in Sec. 6.2.B.

4.5. Subdivisions

Sec. 10-12(a) of the Henrico County Code requires that any subdivision that exceeds 50 lots or five acres, whichever is less, in an area where BFE data is not available or the SFHA has not been delineated shall

include data using detailed methodologies, including a hydraulic and hydrologic analysis. Because most streams have already been mapped as SFHA in Henrico County, additional flood mapping is not usually required for subdivision applications. However, there are some areas where a watercourse has not been mapped as SFHA, so when a subdivision is proposed, additional flood mapping is required.

A. When is Flood Mapping Required?

Henrico County uses the stream data provided by FEMA as part of the County's FIRMs to determine if a watercourse is present on a site and if it has been mapped as SFHA. This stream data is based on the National Hydrography Dataset (NHD), created by the U.S. Geological Survey (USGS), and the stream centerlines used in the effective flood models. When using this GIS data, the "S_Profl_Basln" layer should be used for the streamline. See Sec. 2.2.D to learn more about downloading this data.

Note: Due to stream naming issues with the latest dataset provided with the April 25, 2024 FEMA FIRMs, Henrico County is currently working to create a new streamline layer that corrects the issues and will be used moving forward as the official streamline layer. This manual and all Henrico County online maps will be updated to reflect that new layer when it is completed.

Additional information on flood studies and map changes can be found in Sec. 5.

5. Modeling Procedures

The following section outlines the procedures for completing an engineering analysis of floodplain impacts. It includes two main paths to conducting an analysis: (1) verification of no adverse impacts to a floodplain and (2) verification of known adverse impacts and the subsequent map and model updates. At the end of the section are detailed descriptions of all the expected deliverables that are needed to facilitate county review for approval.

All available HEC-RAS models for the county's SFHAs are available online through the county's Flood Model Repository (Repository). The Repository is designed to be a tool developers and engineers can use to easily identify the correct models for an analysis by identifying its location in a county-wide map. Typical application is to provide a nearby address of the site, and users can select the nearby receiving stream to download .ZIP files of all nearby flood models. Additional resources and training on how to effectively use the Repository can be found on the county's Floodplain Management webpage here.

5.1. No-Rise Certification

This section includes the best practices and county preferred methods for addressing the No-Rise requirement for development in the SFHA. The objective of a No-Rise Certification is to confirm that a project's impacts do not cause adverse impacts to the floodplain or increase the BFE. If a project does not meet the criteria of a minor project under a General Permit, an engineering investigation must be conducted.

No-Rise Certifications are required on a per project basis. No-Rise Certificates may not be submitted for a master plan or multiple phases or sections for planned developments. When required, an individual No-Rise Certificate must be submitted for each section or phase that is being reviewed for construction plan approval. There may be a situation where No-Rise Certificates may be combined for multiple phases or sections of a planned development, such as if multiple phases or sections are being reviewed for

construction plan approval at the same time and are utilizing the same modeling. However, this must be pre-approved by the Floodplain Administrator to be permitted.

A No-Rise Certification (Appendix 9) must be prepared by a Professional Engineer licensed in the Commonwealth of Virginia, and it must be supported by technical data. There are three distinct types of technical data that may support a No-Rise Certificate: a No Impact Statement, providing Compensatory Storage, or a Flood Study.

Technical data supporting a No-Rise Certificate must be submitted and accompanied by a narrative report that summarizes the results of the analysis, details the methodology used, and outlines any other relevant information. Template narrative reports are available as appendices to this Manual and should be used for No-Rise Certificate Submitted.

- Appendix 10: No Impact Statement Report Template (General Engineering Analysis)
- Appendix 11: No Impact Statement Report Template (Peak Offset Analysis)
- Appendix 12: No Impact Statement Report Template (Conveyance Shadow)
- Appendix 13: Compensatory Storage Report Template
- Appendix 14: Flood Study Report Template

A No-Rise has been achieved when it has been shown that there is a 0.00 difference in the corrected effective water surface elevation and the proposed conditions water surface elevation. If this value is 0.004 or less, it may be rounded down to 0.00, which is considered a No-Rise. If this value is 0.005 or greater, it must be rounded up to 0.01, which is not considered a No-Rise.

For No-Rise Certificate submittal requirements, see Sec. 6.3.G.

A. No Impact Statement

The No Impact Statement is a short narrative document for projects too small to warrant a detailed flood study that outlines logical and common-sense engineering calculations and approaches. Examples of these types of projects include at grade improvements like driveway, sidewalk, entryways, and parking area installation/replacement. Projects may include deck replacement/installation, if they are elevated above the BFE. Examples of calculations may include but not limited to single section analysis, volumetric calculations, land cover/land use breakdown, and time of concentration calculations.

1) General Engineering Analysis

For some projects, such as at grade improvements or deck replacement/installation, a general engineering analysis may be done to document that the project will not increase the BFE. For projects like at grade improvements, technical data must be provided to support the No Impact Statement including but not limited to existing and proposed topographic surveys that demonstrates there will not be a grade change.

For projects that involve replacement work, such as deck replacements to repair damaged materials, documentation must be provided that demonstrates the replacement is in-kind and will not result in a change, including but not limited to construction drawings showing existing and proposed conditions (location, dimensions, elevations, materials, etc.).

For stormwater discharge that does not require a Peak Offset Analysis, technical data must be provided to demonstrate the discharge will not impact the SFHA. Examples of this include but are not limited to calculations that show the post-condition peak flows are less than or equal to the pre-condition peak

flows, design specifications for in-line BMPs that demonstrate the BMP can hold the additional discharge and flows out of the BMP will not be increased, and design specifications for an existing storm sewer system that demonstrates that the capacity of that system will not be increased by the proposed project's discharge being added to the system.

2) Peak Offset Analysis (Stormwater Discharge)

For new stormwater management facilities that discharge directly into the SFHA, the 100-year flows should be attenuated to the site's existing condition's peak. An alternative to providing attenuation for the 100-year flows is to conduct a hydrologic analysis for the receiving channel and facility to determine if coincident peaks are occurring. The study must show there is no impact to the mapped floodplain due to increased flows by showing that the facility hydrograph does not overlap the receiving channel hydrograph in a way that results in an increased peak. The analysis must show that the rising limb of the floodplain's peak is not impacted by the falling limb of the proposed discharge's peak.

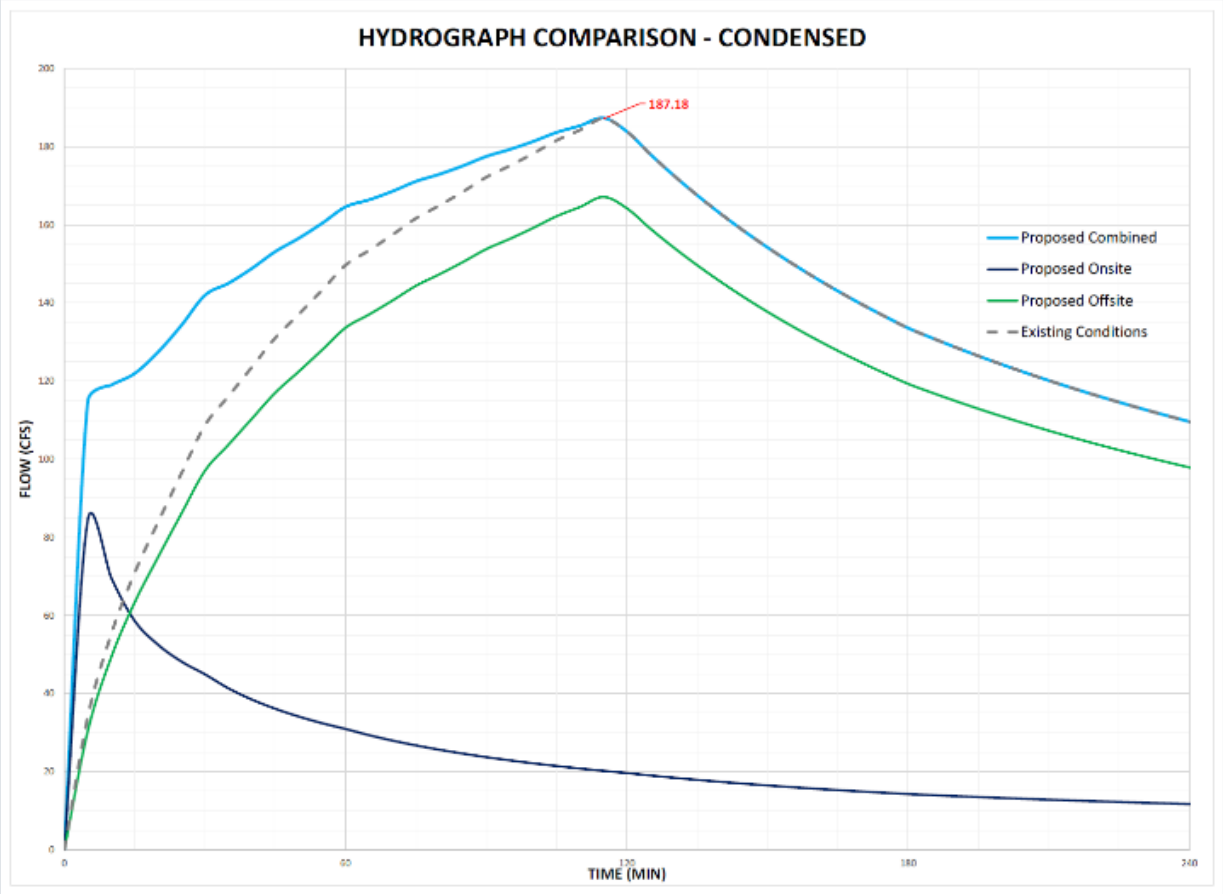


Figure 20: Example hydrograph demonstrating a No-Rise using the Peak Offset method. The gray dashed line represents the floodplain, and the dark blue solid line represents the proposed discharge.

3) Conveyance Shadow

Locations of projects within the conveyance shadow of other structures are also covered as part of this section. If the project is located immediately upstream and downstream perpendicular to an existing flow obstruction, this project can be considered within the conveyance shadow. The reasoning behind this is that flood water is already flowing around the larger obstruction, so the addition of a new structure will

not change existing flood flow. Determining the limits of the conveyance shadow is illustrated in the figure below. The proposed project footprint must be entirely contained within the conveyance shadow area for this determination to be accepted by the county. The conveyance shadow is defined by extending lines at 45 degrees from each structure edge using the flood flow direction as the axis. Documentation must be provided that demonstrates the proposed project is located in the conveyance shadow, such as the example in the figure below.

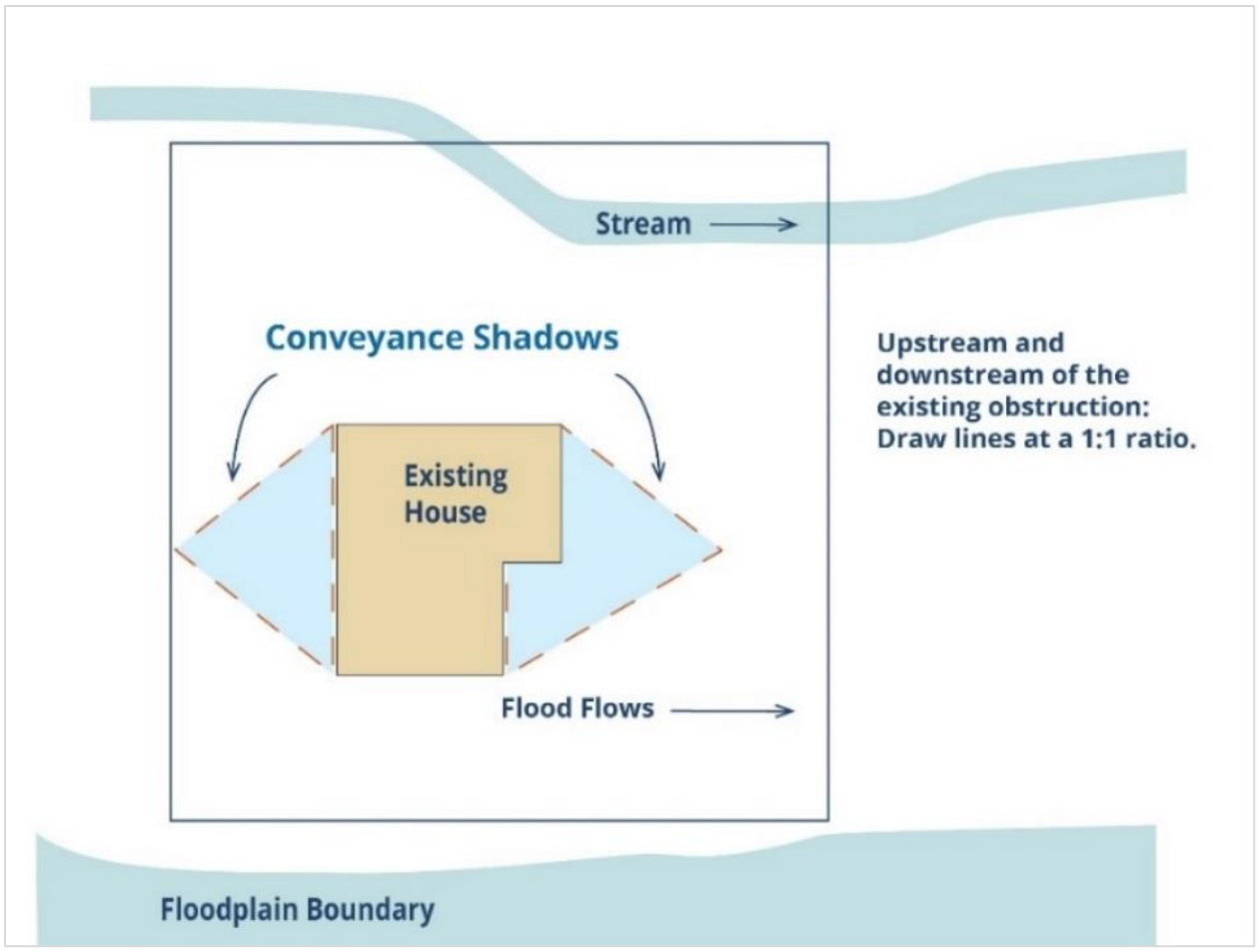


Figure 21: Example of a conveyance shadow around a structure in the SFHA.

B. Compensatory Storage

When significant topographical and geometrical changes to the floodplain are part of a project, the designer is allowed to provide compensatory storage to ensure that the flood storage and conveyance of the site is maintained. Removing any unpermitted development, such as fill or structures, does not constitute adequate compensation. Removing unlawful development as compensation for additional proposed flood storage volume displacement does not address the original, illegal loss of flood storage volume. As a result, such compensation cannot be credited toward the new development.

Compensatory storage must be designed in a way that floodwaters are allowed to freely enter and exit the area without restriction. A few examples of features that create restrictions include embankments, depressed topography, stormwater basins, etc.

Compensatory storage should be located onsite and adjacent to or opposite the areas of new floodplain development. If such placement is not feasible, analysis must show that the proposed location is a hydraulically equivalent site and will not result in an adverse impact to adjacent properties or development. Compensatory storage located on a hydraulically equivalent site provides additional flood conveyance area, so that flood elevations are not increased. All excavations should be constructed to drain freely to the adjacent watercourse and not pond water in the area as flood levels recede. No area below the waterline of a pond or other body of water can be credited as a compensating storage. An alternatives analysis may be required to identify a location for compensatory storage that minimizes the impact to other resources (i.e., riparian buffers, wetlands, fisheries habitat, etc.). Additionally, test pits may be required to demonstrate that the proposed compensatory storage will not intercept the seasonal high groundwater table.

During wetter months, typically January through April, the groundwater table is at its highest elevation. If a compensation area were situated below the elevation of the seasonal high groundwater table, groundwater would enter the compensatory storage areas during the wet times of year, and consequently, those areas would not be available for the storage of floodwaters because they would already be occupied by groundwater. This negates the required functionality of the compensatory storage area and is therefore not permitted.

The compensatory storage area is required to be hydrologically connected to the SFHA. If it is situated below the normal water surface elevation, the compensatory storage area would immediately fill with water during floods and therefore would not be available to store floodwaters from either the 10-year or 100-year flood hazard events.

There are three methods accepted by the county for demonstrating compliance with the compensatory storage requirements. The methods include the Average End Area Method, GRID method, and TIN method. The TIN method provides the most accurate cut and fill volume estimates but is the most computationally intensive. If this method is used, surface files must be provided to the county in the most current CAD format for review.

Proposed development in the SFHA that requires compensatory storage must be compensated with excavation of at least one times the volume of the displaced storage volume (1:1 compensatory storage ratio requirement).

Any compensatory storage calculations or modeling must, at a minimum, be based upon at least one-foot contours that have been field surveyed. All proposed development and compensatory storage must be clearly identified on the site plans. A comparison of storage volumes impacted at all elevations up to the BFE (100-year flood event) must be summarized to quantify the impacts from the development. This information is best presented as a summary table within the engineering report.

All compensatory calculations must show that cut fill volumes are balanced at one-foot elevation increments up to the BFE. This is required as it prevents events smaller than the 100-year from experiencing water surface elevation increases. Without this requirement, compensatory storage can be graded in a way where the majority of the cut volume is found in the higher elevations, causing smaller event's water surface elevations to be increased and push the problem offsite. Due to certain types of projects and site constraints, balancing cut and fill volumes at one-foot intervals may not be possible. In these instances, this requirement can be waived but must be closely coordinated with the county Floodplain Administrator. If this occurs, additional analysis may be required for smaller rainfall events.

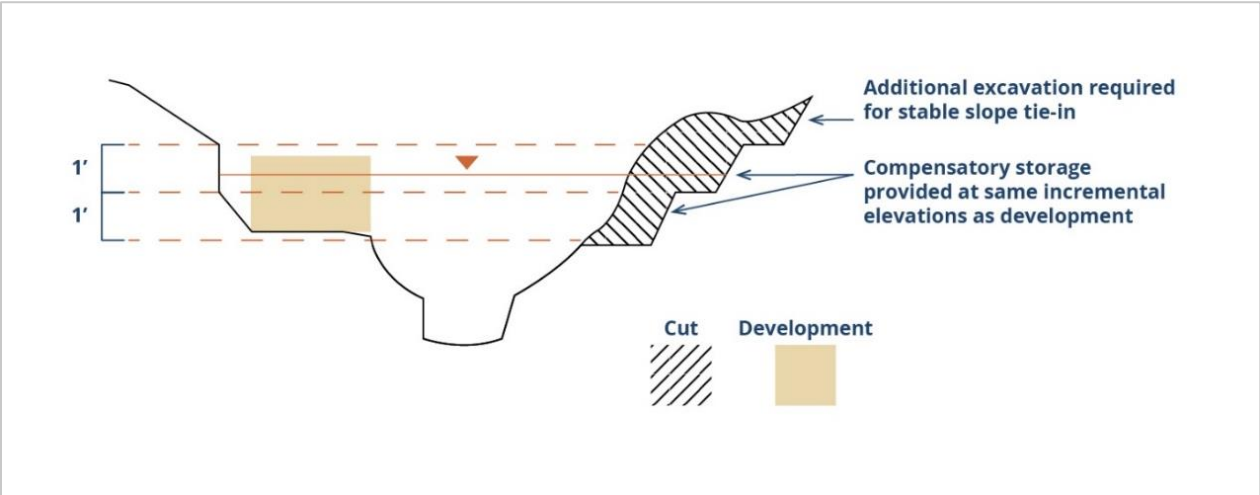


Figure** 22**: Compensatory storage example for a development in the SFHA, such as buildings

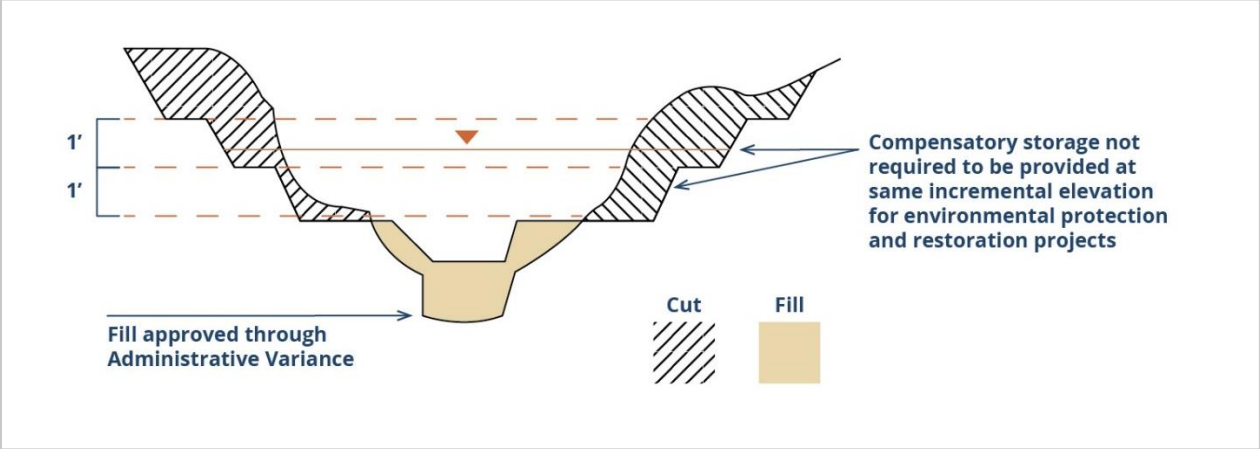


Figure 23: Compensatory storage example with fill in the SFHA, such as a stream restoration

Topographic data derived from field survey including digital elevations models (DEM), triangulated irregular networks (TIN), digital terrain models (DTM), and contours may be used to compare existing and proposed ground surface elevations. This data can be used in computer programs including Geographical Information Systems (GIS) and Computer Aided Design (CAD) to calculate volumes. One method in a GIS would be to overlay a polygon of the SFHA with elevation contours, then split the polygon feature into elevation intervals by tracing the contours. The area of these new polygons can then be multiplied by the depth to BFE to calculate flood storage volume. The depth to BFE should be calculated as the BFE minus the average elevation between two contours. This approach is appropriate for use on most sites, including those with more complex terrain or hydraulic conditions.

1) Average End Area Method

The average end area method is a common approach to estimating earthwork volumes. In this method, the areas at each end of a cross-section are averaged over the length between them. The results are volumetric estimations of proposed fill or compensatory storage in each cross-section.

The volume between two cross-sections is computed by the formula:

$$Vol = \frac{(A_1 + A_2) * L}{2}$$

where, A_1 represents the fill (or compensatory storage) area of the first cross-section, A_2 represents the fill (or compensatory storage) area of the second cross-section, L represents the length between the two cross-sections, and *Vol* is the fill (or compensatory storage) volume between the two sections.

Fill and compensatory storage should be accounted separately for each 1-foot interval and for each pair of cross-sections. The volumes between cross-sections are then tabulated and summed to obtain total estimated fill and compensatory storage volumes. This method is suitable for either level or sloped BFEs across a site. Table 3 below provides an example of a cross-section providing an approvable approach to compensatory storage.

Table 3 - Example volumetric calculations using average end area method

Parameter	Elevation	Width	Length	Cross Section 1		Cross Section 2		Volume
				Distance	Area	Distance	Area	
Unit	ft	ft	ft	ft	ft^2	ft	ft^2	ft^3
Calculation	-	-	-	-	(W*D1)	-	W*D2	A1+A2*(L/2)
Segment								
A	566-567.3	1.3	100	42	54.6	57	74.1	6,435
B	565-566	1	100	39	39	52	52	4,450
C	564-565	1	100	37	37	47	47	4,200
D	563-564	1	100	35	35	45	35	3,500
E	562-563	1	100	34	34	41	41	3,750
							Total Fill (ft^3):	**22,435**
							Total Fill (yd^3):	**831**

An as-built survey showing compensatory storage should be provided to verify final storage volumes and to facilitate the prevention of future encroachment. Site conditions should meet the approved design volumes. Future development within compensatory storage areas shall be prohibited in all cases. This may be achieved through permit conditions and/or deed restrictions.

2) Grid Method

Under the Grid Method, a grid is superimposed over a grading plan, effectively dividing the site into a series of cells. The spot elevations of all cell corners are averaged and designated at the centroid of the cell, and the average elevation is subtracted from each of the 1-foot intervals up to the base flood elevation. Each of these measured depths is then multiplied by the area of the cell to determine the volume of the floodwaters in that cell. The process is repeated for each cell in the grid. Then, the volumes of each cell are summed to determine the total volume of the flood storage on the project site.

Care must be taken in selecting an appropriate cell size as sizes too small results in excessive computations and sizes too large result in poor average depths that make the approximations much less accurate. It is recommended to adjust cell sizes near very steep topographic changes to better approximate average depths.

3) TIN Method

The TIN Method provides the highest-level accuracy volume calculations by leveraging CAD software to compute cut and fill volumes. The accuracy of the Average End Area Method and the Grid Method is a function of how many cross-sections or cells are utilized and as a result, these methods can be labor intensive. In the TIN Method, the flood storage volume of a site, or a portion thereof, is calculated by comparing an existing and proposed surface generated using a large number of points and connected triangles. If TIN surface files are to be provided to the county, the preferred format is AutoCAD. However, other formats can be used as long as adequate reporting is provided.

C. Flood Study

For some development projects, it may be necessary to provide a flood study to demonstrate No-Rise. Generally, this is the county's preferred method as any changes are permanently documented within the hydraulic models so that future developments have access to the models with the most current topography and structures. The methods in this approach should follow the same procedures as outlined in Sections 5.2, 5.3, and 5.4. The main distinction between a flood study for No-Rise and for map changes is that for No-Rise studies, the numeric and visual depictions of water surface in the reports and cross-sections for the existing and proposed conditions should be identical.

For full studies that incorporate a compensatory storage component, selecting the appropriate locations and number of additional cross-sections must be consistent with practices outlined in Section 5.4.B. Reporting and submittal documents must also be consistent with flood study methods as the revisions to the floodplain geometrics must be adopted into the county's regulatory models for studies and/or developments for future projects.

The Repository should be used to download the current effective model(s) before beginning any modeling. The downloaded model should act as the Duplicate Effective Model. The Duplicate Effective Model should then be updated with existing floodplain conditions (e.g. field survey data, culvert locations and dimensions, Manning's "n" values, etc.) to create the Corrected Effective Model. The Corrected Effective Model should be updated to incorporate the proposed development to create the Proposed Conditions Model. The Corrected Effective Model and Proposed Conditions Model should be compared when determining if a No-Rise has been achieved.

5.2. Map Changes

Some development projects require map changes that involve updating floodplain limits and the associated hydraulic models. A Letter of Map Change (LOMC) may be issued by FEMA for FEMA SFHAs or by the county engineer for Community SFHAs. The process is similar for each, but map updates for the county generally require less documentation and as a result, have a less rigorous submittal process than FEMA map changes. The two types are outlined further in the following sections.

As part of the map change process, Henrico County requires that any water surface elevation (WSE) grids and depth grids, if available, be updated for the study area. This applies to both FEMA SFHAs and Community SFHAs. Current WSE grid and depth grid data for FEMA SFHAs is available through the FEMA Map Service Center. When updating a WSE or depth grid, the resolution must be equivalent or better than what is provided in the existing dataset. To request this data for Community SFHAs, please contact the county's Floodplain Administrator. If there is no existing WSE or depth grid data, the WSE or depth grid as provided as part of a map change must use cells no larger than 10x10 feet.

A. FEMA Letter of Map Changes

FEMA provides an online portal for Letter of Map Amendment (LOMA) and Letter of Map Revision (LOMR) submittals. Alternatively, FEMA provides a means to submit map change reviews by standard mail with the use of paper forms: MT-EZ, MT-1, and MT-2. For projects that propose a significant change in the floodplain elevations and geometrics, submittals will be broken into two parts, a Conditional Letter of Map Revision (CLOMR) prior to development, followed by a LOMR after development. Additional information on FEMA LOMCs is available the FEMA website here.

As part of the FEMA LOMC process, some projects may require a Community Acknowledgement Form (also known as Form 3). In these cases, the applicant must submit a copy of the Community Acknowledgement Form, with the complete LOMC application that will be submitted to FEMA, to the county Floodplain Administrator for review. The Floodplain Administrator will only sign the Community Acknowledgement Form if the project complies with the Floodplain Ordinance.

B. County Letters of Map Change

For map changes within a Community SFHA, applicants must submit documentation and modeling outlined in Section 5.2 and Section 6.3.J. This documentation and modeling must be supervised and submitted by a Professional Engineer licensed in Virginia. A flood study report, HEC-RAS model, and export files, as outlined in Section 5 and Section 6.3.H must be submitted digitally to the Floodplain Administrator. GIS shapefiles for the revised SFHA boundaries, cross-sections, stream centerline, and any other attributes must be submitted, including a polygon that identifies the entire revision area.

C. Property Owner Notifications

Some FEMA and all County CLOMRs and LOMRs require notification letters to be mailed to all impacted property owners. Property owner notifications and associated postage fees are the responsibility of the applicant. Applicants must submit the draft notification letter (in Microsoft Word format) and an address list of impacted properties (in Microsoft Excel format) to the Floodplain Administrator for review. Once final versions of the letter and address list have been approved, the applicant must mail out by first class mail, at a minimum, to property owners.

For County CLOMRs and LOMRs, a map of the map revision must be provided with the property owner letter. Template are available as appendices to this Manual:

- Appendix 17: County LOMR Property Owner Notification Letter Template
- Appendix 18: County CLOMR Property Owner Notification Letter Template
- Appendix 19: County LOMR Impacted Property Owners Map Example
- Appendix 20: County CLOMR Impacted Property Owners Map Example

5.3. Hydrology

A. Using Established Flow Rates

Flow rates for all study reaches have already been established from previously adopted and published studies for all SFHAs. Explanations for how to determine flow rates are provided below along with a discussion of how to utilize incomplete published data sets.

When already established flow rates are to be used, it is strongly recommended to provide a verification of the established flow rates in order to identify any potential changes that may have occurred since those

flows were established. Land use changes or significant drainage projects are two examples of occurrences that could significantly impact flow rates in the model. A simple statement indicating that established flow rates are being used must be included in the study report.

A delineation does not typically compute peak flow rates at every point along a watercourse. Instead, peak flow rates are computed at only a few locations. Often a site will be located along a reach of a watercourse in between two such locations. In these instances, the flow rate established in the model should be used for that reach of the watercourse, and it is not necessary to interpolate between the two locations because interpolation may not accurately reflect how flow in the watercourse changes.

B. Updating Flow Rates

Updating model flow rates may be required for a variety of reasons. Some of the more common reasons are significant changes to the watershed and missing storm event data. The HEC-RAS models typically contain all appropriate storm events including the 10-, 50-, 100- and 500-year events. However, there may be cases where certain models only contain the 100-year event. In these cases, the missing storm events must be included in the updated model. Some projects may require the determination of events smaller than 10-year events for design purposes, but these are not required as part of an analysis for floodplain impacts.

The county generally does not prefer attenuation to be included as part of a hydrologic analysis. Due to the scale of watersheds being regulated and the inability to verify that Best Management Practices (BMPs) are maintained and functioning correctly, the county prefers this conservative approach. At the watershed level, storage factors should not be utilized to establish flow rates. For smaller, offline BMPs, attenuation should not be considered. In some instances, large impoundment structures, like dams, may be found along the floodplain watercourse. In these cases, considerable attenuation occurs and can be considered with close coordination with the county.

To fill out missing storm events, engineers must first establish a baseline model that generally replicates the available established flow rates. This is easiest to achieve by replicating the methods and parameters that can be obtained from the hydrologic analysis reports provided by the county. In some instances, these reports may not be available. The engineer will need to approximate the methods and parameters used and calibrate these terms until a reasonable output is consistent with established flows. For an SCS Curve number method calibration, this can include adjustment of Curve Number or Time of Concentration numbers. Once an appropriate model is created, it can be used to generate flows for the missing storm events. This hydrologic model, and an explanation of its development, must be included for review as part of the engineering report submitted to the county.

Forecasting land use should generally not be included as part of developing watershed hydrology for existing conditions. Hydrology should be based on readily available data. It is important to note that there can be a significant difference between the results of different hydrologic models. This may require the engineer to establish multiple peak flow values for the existing and proposed conditions, as no one method is all encompassing. When updates to hydrology are done by changing the methodology, all assumptions and rational for this change must be documented in the engineering report. When comparing existing to proposed conditions, the methodologies in both scenarios must be consistent. For example, existing conditions flow values derived from the Regression Equation cannot be compared to proposed condition flow values derived using Rational Equation.

C. Required Storm Events

- **10-year event**: provides additional detail, and storm sewer and drainage projects are designed for this event; also required as part of a compensatory storage analysis as outlined in Section 5.1.B
- **50-year event**: utilized for stormwater management design; also required as part of a compensatory storage analysis as outlined in Section 5.1.B
- **100-year event**: utilized for floodplain management, and determines the regulatory SFHAs
- **500-year event**: utilized for floodplain management, particularly in providing a more stringent requirements for critical infrastructure and structure elevations

D. Preferred Hydrologic Methods

1) USGS Regression Equations

All flood models in Henrico County that became effective in 2007, including the models for the FEMA SFHAs and Community SFHAs, utilized USGS Regression Equation to establish flows. Regression equations are best suited for large watersheds where changes are not expected in the hydrologic conditions that existed at the time stream flow measurements were conducted. Because urbanization of watersheds alters the hydrologic conditions over time, the Regression Equation is not suited to forecast peak flow rates due to significant land use changes; however, the county does not allow forecasting land use in establishing hydrology.

With the Regression Equation, designers can estimate peak flow rates for each of the 2-, 5-, 10-, 25-, 50-, 100-, and 500-year storms in ungauged and non-tidal watercourses. However, the county does not currently recommend the sole use of the Regression Equation for flood hazard calculations on smaller watersheds. Designers should include the SCS Curve Number Method as it provides a more rigorous calculation of peak flow rates and calculates an entire hydrograph, which is essential for analysis when offsite flooding impacts become a concern.

USGS provides literature to compute Regression Equation peak flow estimates based on a location's physiographic region. Another option is StreamStats, which is a web-based program with a map user interface that facilitates delineating drainage areas and computing hydrology using the Regression Equation. StreamStats does this through the use of GIS analytical tools.

2) SCS Curve Number Method

The Soil Conservation Service (SCS) Curve Number Method is the preferred procedure for smaller watersheds to be submitted for review, as described in the USDA Natural Resources Conservation Service (NRCS) publication Technical Release 55 (TR-55), Urban Hydrology for Small Watersheds. The methodology described in TR-55 is derived from the NRCS's Technical Release 20 (TR-20). TR-55 describes procedures to calculate storm runoff volumes, peak discharge rates, and hydrographs required for flood analyses and delineations. It uses a hypothetical design storm and an empirical nonlinear runoff equation to compute runoff volumes and a dimensionless unit hydrograph to convert those volumes into runoff hydrographs. This method is recommended for drainage areas no greater than 25 square miles (16,000 acres). For larger drainage areas, the SCS curve number method tends to over predict flows, so the USGS regression equations are more appropriate.

It is important to note that several different software packages provide TR-55 calculations; however, it's best to reference FEMA's approved hydrologic models list because some software, like WinTR-55, have discontinued support or have not been reviewed by FEMA for accuracy and are not accepted. A complete

description of the NRCS methodology can be found in the NRCS National Engineering Handbook, "Part 630-Hydrology". A detailed discussion of TR-55 is also available from the NRCS. Refer to these resources for more detailed information concerning the basis of the SCS Curve Number Method.

3) Other Methods

As mentioned in the previous section, there are a number of hydrologic methods and models that can be used to estimate peak flow values. The county approved methods are consistent with those approved by FEMA, which can be found on the FEMA website here. FEMA also provides a list of previously approved software that is no longer accepted, which can be found on the FEMA website here. Consult with the Floodplain Administrator in advance for any questions about hydrologic methods and modeling.

E. Approved Software

Henrico County generally follows the FEMA list of approved hydrologic modeling software. This acceptable software list can be found on FEMA's website: https://www.fema.gov/flood-maps/products-tools/numerical-models/hydrologic. There may be exceptions to this list. Please contact Henrico County prior to design to determine if software that is not on this list is acceptable.

5.4. Hydraulics

A. Approved data sets and data collection procedures

1) Topographic Data

The most important data product in any hydraulic study is a detailed topographic dataset. At the time of this manual, the Virginia Geographic Information Network (VGIN) provides the highest resolution, readily available topographic data. These products use Light Detection and Ranging (LiDAR) technology and are provided to the user in two formats: Digital Elevation Models (DEM) and Point Clouds. The DEMs are preprocessed derived products created by VGIN that are provided as an easy-to-use topographic product. The Point Clouds are QAQC data comprised of raw elevation point data. Point clouds provide the engineer with more flexibility and information; however, care must be taken as deriving land surface product in a usable format becomes more error prone due to the many preprocessing steps needed. LiDAR data can be downloaded from the VGIN website here.

2) Web Soil Survey

The USDA NRCS Web Soil Survey is a valuable resource for determining watershed soil characteristics. This tool provides detailed information about soils including permeability, erosivity, and hydrological soil group (HSG) classifications that can help aid in the identification of frequently wet areas. This data also helps to identify a watershed's susceptibility to increased runoff due to poor infiltration and lack of flood storage potential.

3) Land Use/Land Cover Product

VGIN also provides a Land Use/Land Cover dataset derived through use of spectral imagery. This data provides detailed maps that delineate different land use/land cover types that include forested, impervious, open, water, etc. This dataset also utilizes locally derived impervious areas which improves accuracy on hardscape features like building edges and edge of pavement. Land Use/Land Cover products can be found on the VGIN website here.

4) Aerial Photography

A review of historic aerial photography is critical and can help understanding the origin of a water feature. Google Earth is one software that can be used to view historic imagery to identify natural and manmade features as well as previous land cover characteristics. Historical imagery is only available for Google Earth Pro (desktop and not the web-based) version, which can be downloaded from Google here. It is important to consider the date when reviewing historical images, as the season can have a bearing on some of the input parameters required in the hydrologic and hydraulic models.

5) Field Survey

The datasets mentioned above provide a great level of detail for cursory and offsite analysis, including watersheds. For onsite considerations, it is always best to conduct on-site visits and data acquisition to verify or adjust assumptions made during the initial data gathering phase. Types of information critical to accurate floodplain analysis can include, but are not limited to, vegetative cover for channel and overbank, field survey level topography, bridge/culvert information, and identification of any unexpected obstructions.

When considering vegetative cover, it is always good to denote the density and condition of the vegetation found on site and the time of year. Full summer growth conditions are generally preferred assumptions in hydraulic models.

New field surveys must meet or exceed the National Map Accuracy Standards for the scale of 1 inch to 50 feet. The horizontal accuracy of survey points and measurements shall not be less than 1.5 feet and the vertical accuracy shall be no less than 0.5 feet. A minimum of three permanent markers (property corners, etc.) shall be referenced as part of the field survey. The field survey points shall consist of coordinates in the Virginia State Plane Coordinate System according to the parameters defined in the county's Geodetic Control Network. The surveys are to be supervised by a land surveyor licensed in Virginia, sealed, signed, and submitted on paper as well as in a digital format, such as AutoCAD or ArcMap. The detailed field survey shall be used to develop cross-section locations and layouts. The location and spacing of the field survey data shall ensure that the data used in hydraulic modeling is representative of the geometry of the stream between and around the cross-section locations.

B. Best Practices

1) Study Reach

To establish flood elevations along a watercourse using HEC-RAS, the limits of the study area must first be defined. Flood studies must typically extend at a minimum of 500-feet upstream and downstream of the project limits. By extending the study area to 500-feet offsite or more, the effects of any inaccuracies in starting water surface elevation are dampened by the time the standard step calculation is made on the site. Should the applicant believe that a shorter reach is sufficient, a consultation with the county is strongly recommended prior to submitting an application.

In many situations, study reaches longer than 500-feet offsite will be required. For example, a structure located more than 500-feet downstream of the site may cause backwater that impacts flood elevations at the project site. In this case, the study reach must be extended in the downstream direction to analyze the impact of those conditions. Another example is a bridge or culvert replacement that causes decreases in upstream water surface elevations. In this case, the HEC-RAS model must be extended upstream to where the existing and proposed flood profiles converge for every flood event analyzed to accurately

determine impacts. Please note that the study reach must be at least 500 feet upstream, even if the existing and proposed flood profiles converge less than 500 feet from the site for every flood event analyzed.

When determining the study reach, it is recommended that all major structures within 1-mile of the site be considered for determining possible upstream and downstream influences and impacts from the project. Published floodplain elevations and supporting data can be used to help determine if the study reach needs to be extended, and consultation with the county to confirm assumptions may be beneficial in those cases.

2) Stream Centerline

Henrico County uses the stream data provided by FEMA as part of the County's FIRMs to determine if a watercourse is present on a site and if it has been mapped as SFHA. This stream data is based on the National Hydrography Dataset (NHD), created by the U.S. Geological Survey (USGS), and the stream centerlines used in the effective flood models. When using this GIS data, the "S_Profl_Basln" layer should be used for the streamline. See Sec. 2.2.D to learn more about downloading this data.

Note: Due to stream naming issues with the latest dataset provided with the April 25, 2024 FEMA FIRMs, Henrico County is currently working to create a new streamline layer that corrects the issues and will be used moving forward as the official streamline layer. This manual and all Henrico County online maps will be updated to reflect that new layer when it is completed.

HEC-RAS Stream Centerlines

The centerlines in HEC-RAS representing the river, creek, or stream flow path are called "Rivers" within the software. Each "River" could be comprised of more than one "Reach". For simplicity's sake, most Henrico County Repository models have only one "River" and one "Reach". However, a project may demand multiple "Rivers" and more than one "Reach" to confirm the No-Rise. This should be determined at the start of the project design by the certifying engineer to best represent any given project submitted for No-Rise review.

Most, if not all, Henrico County Repository models are georeferenced, meaning the input data (i.e., stream centerline, cross-sections, structures, etc.) are all located in horizontal and vertical datum much like CAD drafting software. The applicant is expected to maintain this georeferencing nature of the HEC-RAS input data for all submitted HEC-RAS models. For graphical and tabular comparisons between the duplicate effective, corrected effective, and proposed conditions models, the georeferenced stream centerline is critical to efficiently perform these comparisons by the certifying engineer and Henrico County. If the stream centerline is redrawn for each model progression, the cross-sections will be assigned a differing river station that may not correlate spatially to the other models. The comparisons within the HEC-RAS environment will many times result in an error. For this reason, the stream centerline should not be changed or redrawn unless in a situation where there are unique circumstances or it is unavoidable.

3) Cross-Section Placement

Once the study reach is defined, a hydraulic analysis requires that field-surveyed cross-sections be obtained. These cross-sections will represent the watercourse and its floodplains associated with various flood events, the flood hazard area, and the floodway. In general, cross-sections must be placed where there are:

- Significant geometric changes in the channel or floodplain
- Changes in channel slope
- Changes in Manning's roughness in the channel or floodplain
- Changes in flow rate
- Bridges, culverts, or other water control structures

By convention, HEC-RAS cross-sections are taken looking in the downstream direction, not the upstream direction. However, engineering judgment and HEC-RAS modeling experience must be used in determining how cross-sections should be oriented, the number and location of the cross- sections, and the amount of space between each cross-section.

Cross-sections should span the entire flood hazard area. However, in cases where the flood hazard area is significantly wider than the channel itself, such that obtaining field-surveyed cross-sections is not feasible, the field-surveyed cross-sections may be supplemented with other data sources, such as LiDAR data. Cross-sections must be georeferenced.

Caution should be used whenever using information other than field surveyed data. For example, in cases where LiDAR data is used, elevations below a normal water elevation of a perennial stream will not be included in the LiDAR data set because LiDAR cannot penetrate water to collect bathymetric data. Similarly, it is unknown what precipitation events may have occurred during the time the data was measured. In any situations where field surveyed data is not used, the applicant may want to contact the county to avoid unnecessary delays in the permitting process. A good measure to verify LiDAR accuracy is to provide a limited analysis comparing existing HEC-RAS cross-sections and LiDAR derived cross-sections to field survey data along the same cross-section alignment. If the cross-sections all show good agreement, it can be easier to determine that the LiDAR is of sufficient accuracy.

Cross-sections must encompass the entirety of the 100-year floodplain at minimum. If there are cases where a cross-section does not extend far enough, HEC-RAS will assume a vertical wall at the cross-section edge, resulting in higher water surface elevations than is expected.

Cross-sections must always be taken perpendicular to the direction of flow when near the channel and perpendicular to contours as it moves up through the topography. As a result, cross-sections can appear as faceted curves or angled lines in order for both criteria to be met due to the randomness of natural topography. Cross-sections must not intersect because each cross-section represents flow at a separate location in the floodplain and flood hazard area.

A floodplain work map should be developed to show the study reach and each one of the cross-sections used in the model overlaid on topographic data that will be used to delineate the floodplain.

4) Boundary Conditions

Generally, hydraulic models use normal depth as a water surface elevation for the downstream boundary condition. Because it is unlikely that peaks will be coincident, using a known starting water surface elevation associated with a downstream, larger watercourse may not be appropriate in some situations, even if that larger watercourse is located in the study area of the floodplain in question. Using a starting water surface elevation based on a known peak from the downstream watercourse can mask the hydraulic impact of the proposed bridge or culvert. In situations like this, engineering judgement is crucial, and it is best to consult with the county if there is any concern in selecting starting water surface elevations. In some cases, a mixed or supercritical flow regime is also required, and the upstream boundary condition

in this case is typically supercritical depth for the starting water surface elevation upstream. Consult with the county if there are questions about a hydraulic model for mixed or supercritical flow in a flood study.

5) Polygon Edge Smoothing and Removing Holes

Because HEC-RAS's terrain data is a raster format, the creation and display of output layers can have a pixelated or angular edge in appearance. There are several methods that can be used to smooth these edges to the floodplain limits, ranging from manual edits to CAD/GIS smoothing tools. The county accepts any approach if the following items are considered:

- The smoothed floodplain limit does not deviate from the unsmoothed limit at the cross-sections in the hydraulic model
- The resulting smoothing process follows the outer most edges and the unsmoothed shape is fully contained in the smoothed shape's footprint
- There are no significant deviations from the model output unless consulted with the county
- The starting terrain file has adequate initial resolution
- Holes within the boundary can be remove creating a contiguous shape and significant sized holes are documented in the engineering report

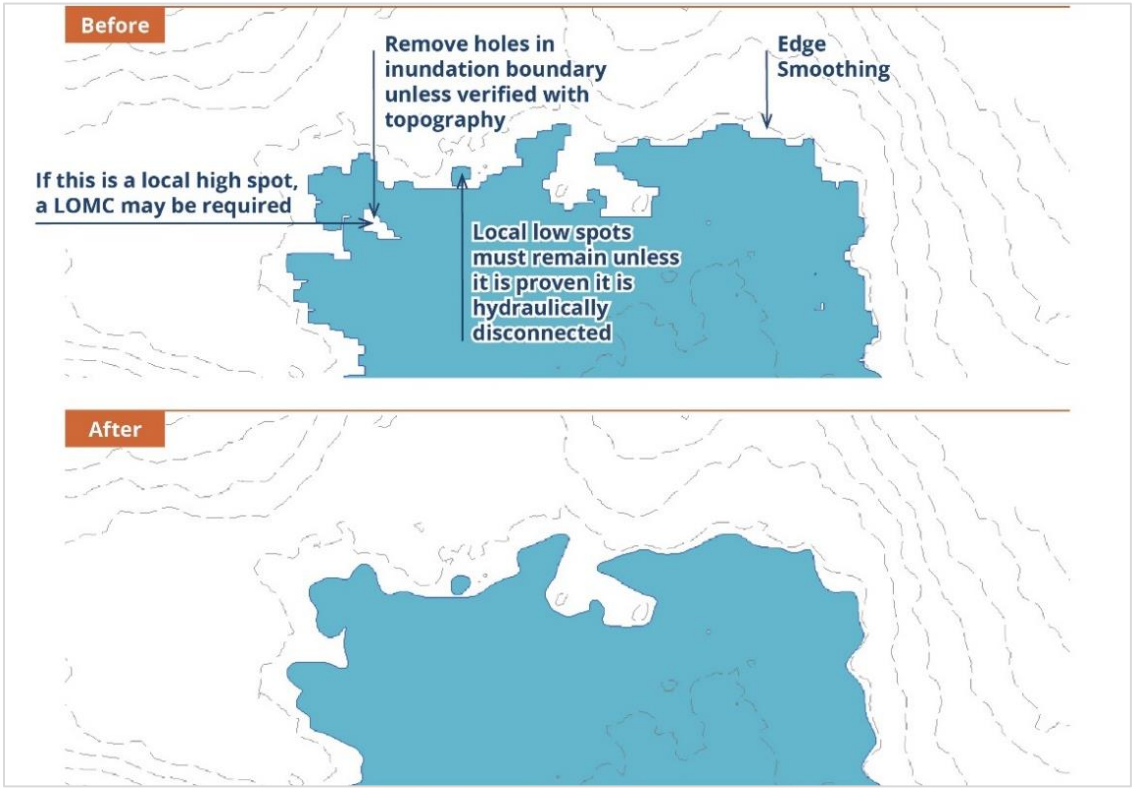


Figure 24: Example of polygon smoothing and removing holes when mapping the floodplain.

C. Floodway Determination

Because the county prohibits placement of fill and structures for the entire floodplain, determining a floodway is only required for floodplains that already have a delineated floodway. In all cases, these floodways are established using FEMA Zone AE hydraulic models. The computation of the floodway uses the same standard step backwater analysis as the 100-year flood but includes the encroachment function

built into HEC-RAS's Run options. Typically, floodway limits are calculated assuming equal conveyance reduction on both sides of the watercourse with a maximum rise in the 100-year water surface elevation of 1.0 foot at any cross-sections. Five different methods for computing the floodway are available and additional information on these methods are available in the HEC-RAS User's Manual. Floodway analysis should almost always use Method 4 to determine the encroachment stations and then provided to the county using Method 1. If another method is deemed appropriate by the engineer, the floodway delineation should be done in close coordination with the county.

D. Approved Software

Once the desired flow rates are calculated along a watercourse, a hydraulic analysis to determine flood elevations at the site in question is required. A hydraulic analysis is also necessary to determine the difference in flood elevations between existing and proposed conditions. Such projects may include the construction or reconstruction of bridges or culverts, channel modifications, and other projects that would alter the hydraulic capacity of the channel or floodway.

Henrico County generally follows the FEMA list of approved hydraulic modeling software. This acceptable software list can be found on FEMA's website: https://www.fema.gov/flood-maps/products-tools/numerical-models/hydraulic. There may be exceptions to this list. Please contact Henrico County prior to design to determine if software that is not on this list is acceptable.

As was the case for flow rates, the regulatory flood elevation may be determined from published data, such as county delineations or FEMA mapping. Alternatively, calculations may be performed via the following methodologies:

1) HEC-RAS

The most common hydraulic analysis received by the county for the purposes of a floodplain permit is the standard step backwater analysis as executed through HEC-RAS, which is available for download through the U.S. Army Corps of Engineers. This program was developed by the Hydrologic Engineering Center (HEC), U.S. Army Corps of Engineers, to calculate water surface elevations in natural and manmade channels under subcritical, supercritical, and mixed flow conditions. It allows for consideration of the effects of tailwater, changes in channel and overbank shape, slope, and roughness, and hydraulic structures, such as bridges, culverts, weirs, embankments, and dams.

The accuracy of a HEC-RAS model will reflect not only the accuracy of the input data but also the level of effort devoted to the development of the model. Both the input and output data must be reviewed by the county to ensure that the results returned by the model are reasonable.

Therefore, the county recommends full understanding of the assumptions, data requirements, capabilities, methodologies, and limitations of both the software and the hydraulic theory behind the software prior to using HEC-RAS. Such information, including the HEC-RAS User's Manual, should be well understood by the user. In addition, discussions of some of the data collection considerations and important input variables are provided below.

It is important to note that most HEC-RAS-based hydraulic analyses that are accepted by the county rely on steady flow computations. The use of unsteady flow models for the purposes of establishing flood hazard areas is not typically recommended because these models include storage areas that serve to attenuate peak flow rates, the sustained existence of which is uncertain as mentioned in Section 5.3. An unsteady flow analysis will only be accepted to establish the BFE after an applicant demonstrates to the

county that it is the most appropriate modeling approach and received county approval. However, unsteady flow analyses may be accepted for bridge and culvert replacement projects because the primary hydraulic concern is the relative impact of a proposed structure, as opposed to the absolute flood elevation. For bridge or culvert replacements, analysis of existing storage areas becomes crucial, in part because any loss of storage associated with a more hydraulically efficient proposed structure must be accounted for accurately in the design so that existing structures downstream of the existing bridge or culvert do not inadvertently become subject to additional flooding because of the replacement structure.

2) Alternative Software

For nearly all applications related to SFHA mapping and analysis, 1D modeling is the county's preferred approach. Because most of the floodplains in Henrico County have uni-directional flow with well-defined channel and overbanks, 1D modeling is the most appropriate approach. Every floodplain in Henrico County is modeled using HEC-RAS 1D procedure at this time, and any analysis using this same approach will be easier to conduct and review. Due to the complexity of 2D models, modeling efforts and review become much more intensive without providing much additional benefit to the model accuracy for the purposes of a floodplain delineation.

The county does acknowledge that there may be a case where 2D would provide a more accurate model, such as the case described above for unsteady flow modeling. In selecting an appropriate software, the county recommends using HEC-RAS's 2D procedures as a first choice and if need be, FEMA provides a list of acceptable software packages available on the FEMA website here. Any 2D analysis will require close coordination with the county and may require additional deliverables not covered in this manual.

6. Permit Requirements

As part of the county's participation in the NFIP, the county's Floodplain Ordinance must regulate all development in the Special Flood Hazard Area (SFHA), and all development must be permitted. Additionally, the county's Floodplain Ordinance regulates some types of development adjacent to the SFHA.

For the purpose of floodplain management, "development" is defined as any man-made change to improved or unimproved real estate, including buildings or other structures, as well as mining, dredging, filling, grading, paving, excavation or drilling operations, and storage of equipment or materials. This definition is very broad and means that very minor activities like typical landscaping, such as adding mulch to flowerbeds, installing a mailbox, or even painting a structure are considered "development" that must be permitted. In order to ease the burden on country residents, while also maintaining compliance with the NFIP, some minor development activities may be permitted through a General Permit. However, all other activities must receive an individual Floodplain Development Permit.

The Specific Development Activities and Requirements section of this Manual includes additional information on Buildings and Structures, Critical Facilities, Roads, Bridges, and Culverts, and Other Development such as environmental protection and restoration projects, stormwater management facilities, and fences.

The specific type of permit necessary for a given activity depends on the size, scope, location, and/or nature of the activity. Section 6.1 describes authorizations and permits, including an explanation of each

type of authorization and permit available under the rules. The Floodplain Technical Review Determination Flowchart (Appendix 15) can be used to help determine if a No-Rise Certificate or Map Revision may be required.

A floodplain permit application is required to be submitted for most permits, authorizations, and verifications. Additional information on the permitting process and submission requirements is included in Section 6.2 and Section 6.3. Information is also available on the county's Floodplain Management website, and applicants may also reach out to the Floodplain Administrator with questions.

The permit requirements outlined in this Manual are based on the Floodplain Ordinance only. Other permit requirements through the Planning Department, Building Inspections, Public Works, or others may apply.

6.1. Types of Floodplain Development Permits

A. General Permit

A General Permit (Appendix 1) may be used to allow development in or adjacent to the SFHA that will inherently not increase the base flood elevation (BFE) or would result in no technically measurable increase to the BFE. Below is a list of development activities that are considered compliant with the Floodplain Ordinance requirements and are allowed under a General Permit. An Individual Permit form is not required to be submitted for the activities listed below. Unless specified below, the development activities listed under the General Permit may occur without contacting the Floodplain Administrator. All other development activities **must** apply for an Individual Permit.

Development that is considered compliant under a General Permit requires county review if located in a floodway or when improvements, taken together, may exceed 40% of the assessed value of the improved structure, not including the land.

1) Applicability

The following activities are considered minor and are approved under a General Permit.

- Interior or exterior renovations, with a value less than $10,000, to a structure if the renovations do not constitute an enlargement or structurally alter the building. This includes:
  - Finishes (flooring, paint, wallpaper, etc.).
  - Cabinetry/trim.
  - Replacement windows, doors, plumbing fixtures, electrical fixtures, roofing, siding, or mechanical appliances not fueled by gas or oil.
- Mailboxes.
- Swing sets/Play equipment.
- General farming that does not involve earthwork that permanently alters the topography.
- Gardening that does not involve earthwork that results in permanently altered topography.
- Lawns and lawn maintenance activities.
- Routine maintenance of easement and utility corridors.
- Landscaping that involves "soft scaping" such as plantings, landscaping beds, or mulching. This does not include "hardscaping" that permanently alters the topography such as retaining walls, terraces, or pools.
- New or replacement, non-solid fences that meet the requirements in Section 4.4.E.
- Road maintenance involving pavement marking, repaving, patching, or similar work to an existing

road, driveway, parking area, sidewalk, bike path, etc. This may also include repairs to existing guardrails/barriers or traffic control devices such as signs. This may not involve replacement with larger or new above ground infrastructure.

- Path or trail maintenance involving painting, repaving, patching, or similar work to an existing path or trail. This may also include repairs to existing guardrails/barriers. This may not involve replacement with larger or new above ground infrastructure.
- General maintenance work to existing culverts, bridges, dams, or stormwater management facilities such as repairs to concrete or other materials, cleaning out debris or sediment, or something similar. This may not involve replacement with larger or new above ground infrastructure.
- Drainage ditch maintenance involving mowing, cleaning out debris or sediment from existing drainage ditches.
- Poles for signs, overhead utilities, billboards, and alike that are no larger than 2 feet in diameter and are not located within the stream channel.
- Underground utilities or repairs to existing underground utilities that do not permanently alter the topography.

B. Individual Permit

An Individual Floodplain Development Permit is required for all development in the SFHA that does not meet the requirements of the General Permit, as well as certain types of development adjacent to the SFHA. For construction activities approved through the Plan Review process, such as Plans of Development and Subdivision Plats, the construction plans will serve as the Individual Floodplain Development Permit application for the proposed development. However, buildings proposed with Plan Review submittals will not be approved as part of the construction plans and must submit an Individual Floodplain Development Permit for approval.

1) Applicability

In addition to all development in the SFHA, an Individual Permit is also required for:

- New or substantially improved structures within 40’ of the SFHA or within the 500-year floodplain
- Critical facilities within the 500-year floodplain
- Stormwater management facilities outside of the SFHA that discharge directly into the SFHA

2) Permit-Specific Conditions

The following conditions apply to all Floodplain Development Permits:

- The permit applies to the parcel(s) of land listed on the application;
- The permit does not change the Floodplain Maps;
- The permit is for compliance with the Floodplain Ordinance only, and other permit approvals may be required before construction may begin;
- No work may begin in the SFHA or adjacent areas until the permit has been issued;
- The development may not be used or occupied until it has been approved by the Floodplain Administrator for compliance with the Floodplain Ordinance;
- By submitting the permit application, the applicant gives consent to the Henrico County Floodplain Administrator or his/her representative to make reasonable inspections required to verify compliance with the Floodplain Ordinance; and
- The permit may be revoked, and a stop work order may be issued if any false information is

provided in the permit application.

Project-specific conditions may apply to any activity authorized under an Individual Permit. These are conditions that the county may include to ensure full compliance with the Floodplain Ordinance. For example, some types of development are required to submit documentation after the permit has been issued, such as Elevation Certificates to verify the lowest floor elevation for new structures. Submittal of an Elevation Certificate after the lowest floor has been constructed and when final construction is complete may be a permit condition, so everyone involved in the project understands this requirement.

C. Emergency Authorization

In some cases, development must be conducted immediately to protect the environment and/or public health, safety, or welfare, and the applicant does not have time to first submit an application for an Individual Permit. In such cases, the applicant may request an Emergency Authorization. If the Floodplain Administrator issues an Emergency Authorization, the applicant must still apply for an Individual Permit and ensure that all development complies with the Floodplain Ordinance after the Emergency Authorization is granted.

6.2. Permitting Process

A. Pre-Application Meeting

A pre-application meeting may be requested with the Floodplain Administrator to discuss the proposed development, ordinance requirements, and the application procedures that will apply to that project. While pre-application meetings are not mandatory, they are recommended for large and/or complicated projects. Discussions or guidance offered by the Floodplain Administrator during a pre-application meeting do not constitute a commitment to approve or deny an application.

B. Application Submittal

All application submittals, including Floodplain Development Permits, Plan Review applications (Plan of Development (POD), Subdivision (SUB), Clearing, Grading, and Grubbing (CGG), etc.), and Floodplain Variances, must be submitted through Build Henrico.

At this time, Floodplain Variances do not have their own application type in Build Henrico, so variance applications must be submitted through the Build Henrico site as an attachment to the associated Floodplain Development Permit or Plan Review Submittal. When uploading the attachment, select “DPW – Floodplain Documentation” as the “Document Type” and then fill in the “Comments” section to identify the document as a variance application.

Apply for, amend permits, and check the status of applications online at the Build Henrico Customer Portal. Learn more about Build Henrico, including how to set up a user account, at www.henrico.gov/build.

C. Permit Expiration

If an Individual Permit is approved, the permit will be issued and sent to the applicant. The permit is invalid if no work is commenced within 180 days of issuance and expires two years from date of issuance.

D. Inspections

The Floodplain Administrator, or designee, is authorized to conduct inspections and conduct other

investigations to determine whether the property and the use thereof conforms to the requirements of the Floodplain Ordinance. Inspections will comply with constitutional search and seizure requirements.

A final inspection may be required for all development to confirm compliance with the Floodplain Ordinance. Additional inspections may be required for certain types of development, such as structures. For example, a lowest floor inspection is required for all new buildings before vertical construction may continue. As part of the permit application process, the applicant provides consent to the Floodplain Administrator, or designee, to make these required inspections to verify compliance.

E. Variances

A variance is a grant of relief from any requirement of the Floodplain Ordinance. Variances are typically reserved for situations when meeting the ordinance requirements would effectively prohibit or unreasonably restrict the use of the subject property. Variances may also be issued for a functionally dependent use or repair or rehabilitation of a historic structure. There are two types of variances for floodplain development: a County Engineer Variance and an Administrative Variance. The sections below provide a summary of the variance criteria; however, Division 5 of the Floodplain Ordinance should be consulted to determine all applicable requirements.

1) Minimum Criteria

No variance shall be granted unless the following minimum requirements are met:

- A showing of good and sufficient cause;
- A determination that failure to grant the variance would result in exceptional hardship to the applicant;
- A determination that such variance will not create or result in:
  - Unacceptable or prohibited increases in flood heights;
  - Additional threats to public safety;
  - Extraordinary public expense;
  - Nuisances;
  - Fraud or victimization of the public; or
  - Conflicts with other existing laws or ordinances;
- The granting of the variance will not be detrimental to other property in the vicinity;
- The circumstances giving rise to the variance application are not of a general or recurring nature;
- The need for the variance arises from the physical character of the property or from the use or development of adjacent property and not from the personal or financial situation of the applicant: and,
- The variance shall be the minimum necessary to provide relief.

2) County Engineer Variance

County Engineer Variances are approved by the County Engineer. An application (Appendix 2) must be submitted to the Floodplain Administrator to request this variance. The Floodplain Administrator will review the application and make a recommendation to the County Engineer, who will then approve or deny the variance request based on the ordinance requirements.

Additional Criteria

In addition to the minimum criteria listed above, the county engineer must also consider the following

additional factors when granting a variance:

- the danger to life and property due to increased flood heights or velocities caused by encroachments.
- the risk of injury to others if materials are swept onto other lands or transported in floods.
- the water supply and sanitation system proposed for the development and their ability to prevent disease, contamination, and unsanitary conditions.
- the susceptibility of the proposed facility to flood damage and the effect of such damage on individual owners.
- the importance to the community of the services that will be provided by the proposed facility.
- the availability of alternative locations for the proposed use that are not subject to flooding.
- the compatibility of the proposed use with existing reasonably anticipated development.
- the compatibility of the proposed use with the comprehensive plan and county floodplain management program.
- vehicular access to the property during floods.
- the expected heights, velocity, duration, rate of rise, and sediment transport of foreseeable flood waters on the property.
- any other factors particularly relevant to the purposes of [the Floodplain Ordinance].

3) Administrative Variance

Administrative Variances are approved by the Floodplain Administrator and are limited to certain activities. An application (Appendix 3) must be submitted to the Floodplain Administrator to request this variance. The Floodplain Administrator will review the application and approve or deny the request based on the ordinance requirements.

Eligible Activities

- Minor filling in the SFHA necessary to protect or restore natural floodplain functions, such as stream restoration projects or stabilization of stream banks to protect public roads or utilities
- Dry-floodproofing of nonresidential structures in lieu of requiring higher elevation of the structure
- Rebuilding of a residential structure within the SFHA or setback area that has been substantially damaged by some cause other than flooding if there is no site outside of the SFHA or setback area for relocation of the structure
- Locating stormwater management facilities in the SFHA if a location outside of the SFHA is not feasible

6.3. Permit Application Submission Requirements

In addition to the Individual Permit application form, there are several documents that must be submitted for review to confirm compliance with the Floodplain Ordinance. Below is a summary of the documentation that must be submitted with a permit application. Please note that some of these items may only be applicable for certain types of development.

Some of the documentation required for Floodplain Development Permits may be similar to requirements for other permit applications, such as providing a site plan. In these situations, one site plan could be used to satisfy multiple permit applications if all applicable requirements have been included, or separate site plans could be prepared for each application. However, a separate copy of that site plan must be provided with each permit application type. Additionally, an Elevation Certificate for new buildings will be required

for Floodplain Development Permits and Building Permits. Separate Elevation Certificates should not be created for each application because the information will be the same, but a copy of the Elevation Certificate should be included with both applications.

A. State and Federal Permits

State and federal permits may be required for some types of development, such as compliance with Endangered Species Act requirements or permits through the U.S. Army Corps of Engineers or the Virginia Department of Environmental Quality for working within Waters of the United States. If required, all applicable state and federal permits must be submitted prior to the Floodplain Development Permit being approved. Permit numbers for other locally required permits (e.g., building permit) must also be provided.

B. Project Cost Breakdowns

Any development proposed to an existing structure must provide a detailed cost breakdown to determine substantial improvement/substantial damage implications. This cost breakdown must include all required costs listed here at a minimum. An Excel spreadsheet template, found in Appendix 4, may be used to document this cost breakdown as part of the Floodplain Development Permit application.

C. Site Plan

A site plan must be provided for all proposed development in and adjacent to the SFHA. The site plan must show the SFHA including floodway (if available), 500-year floodplain (if available), setback distances from the floodplain to the building(s) (if applicable), footprint of proposed development, scale bar, north arrow, property information (e.g., address, GPIN), existing land use/land cover, and topography data matching what was used in the floodplain analysis.

D. Construction Documents for Buildings

For all new buildings, construction drawings that show the plans for the building, including foundation type, enclosures, flood openings, floor locations and elevations, flood resistance materials, etc. must be provided.

1) Elevation Certificates

For all buildings, an Elevation Certificate must be submitted. New buildings are required to submit three Elevation Certificates:

- One with the permit application indicating the proposed lowest floor based on drawings,
- One after the lowest floor has been constructed, which must be approved before vertical construction may continue, and
- One after final construction has been completed prior to the Certificate of Occupancy being issued.

On July 7, 2023, FEMA released the 2023 Edition of the Elevation Certificate (FF-206-FY-22-152 (formerly 086-0-33); Expiration Date: 06/30/2026). An updated version was then released on August 9, 2023. This is the current Elevation Certificate form and must be used for all Elevation Certificates that are signed and dated as of November 1, 2023, or later. Additional information is available in FEMA's August 9, 2023 Memo.

The current Elevation Certificate can be found in Appendix 5, and tips for completing an Elevation

Certificate can be found in Appendix 6.

NOTE: If you get a "Please Wait" error when trying to download the Elevation Certificate form, it is due to some incompatibility issues with Adobe PDFs and the alternative PDF viewer used by certain browsers. To view the document, download the file to your computer and open it using your system viewer. You may need to install the free Adobe Reader to view the document if you use a different PDF viewer and still experience issues.

2) Floodproofing Certificates

For buildings that will be dry-floodproofed (variance approval required), a Floodproofing Certificate must be submitted. On July 7, 2023, FEMA released the 2023 Edition of the Floodproofing Certificate (FEMA Form FF-206-FY-22-153 (formerly 086-0-34); Expiration Date: 06/30/2026). An updated version was then released on August 9, 2023. This is the current Floodproofing Certificate form and must be used for all Floodproofing Certificates that are signed and dated as of November 1, 2023, or later. Additional information is available in FEMA's August 9, 2023 Memo.

A copy of the current Floodproofing Certificate can be found in Appendix 7.

E. Flood Damage-Resistant Materials Documentation

Certain types of development are required to use flood damage-resistant materials. If this is required, documentation from the manufacturer must be provided that clearly indicates the materials are flood resistant. Alternatively, materials listed in FEMA's Technical Bulletin 2: Flood Damage-Resistant Materials Requirements may be used.

F. Anchoring Documentation

Certain types of development are required to be anchored to prevent flotation and lateral movement. If this is required, documentation from a professional engineer must be provided that clearly demonstrates the development will be anchored to meet this requirement.

G. No-Rise Certification

For all development in the SFHA, a No-Rise Certificate is required. The No-Rise Certificate must be signed and sealed by a professional engineer licensed in Virginia. The No-Rise Certificate must be supported by technical data, as outlined in the No-Rise Analysis section. A No-Rise Certificate template can be found in Appendix 9.

Submittal Process

For No-Rise Certificates that are submitted with an Individual Floodplain Development Permit or Plan Review applications, the certificate and technical data must be submitted as an attachment to the permit application form following through Build Henrico.

For No-Rise Certificate submittals must follow the process outlined below.

- The No-Rise Certificate and supporting technical documentation must be submitted electronically in **one complete package** using the Build Henrico site. **Files must be in a compressed folder (.zip) and submitted through Build Henrico as "DPW - Floodplain Documentation" with the "Comments" section completed to designate it as a "No-Rise Packet".**

- A complete No-Rise Review submittal package includes but is not limited to:
  - Latest plan set (.pdf) – The latest plan set should be submitted in Build Henrico as its own document and does not have to be included in the .zip folder with the other No-Rise documents.
  - Signed and sealed No-Rise Certificate (.pdf)
  - Signed and sealed Narrative Report (.pdf)
  - Associated technical data (e.g.: HEC-RAS model files, hydrologic model files (HydroCAD, PondPack, etc.), compensatory storage volumetric calculations, pre-/post-topographic surveys, etc.).
  - Response to Comments, when applicable (.xlsx)

No-Rise Certificates submitted outside of this process may not be reviewed.

H. Engineering Models

Digital copies of any engineering models used must be submitted with an application submittal for review, with all digital hydrologic and hydraulic model input files necessary for the County to open and run on the appropriate software platform. Applicants should confirm that the model(s) run without error prior to submission. Relative file paths and directories can be important for the model to run without error. Logical file naming conventions should be used, so that it is plainly evident which digital model represents what computations were made, or an explanation of each file with file name should be provided. All model input files must be compressed in a .ZIP file for submittal.

For HEC RAS specifically, the applicant is expected to submit the duplicate effective, corrected effective and proposed conditions models (if appropriate for the project submission) as individual “plans” under a single HEC RAS “project”. It is also expected that extraneous geometry, plan and flow files are removed from the “project”, so that it is clear for any reviewer what is to be reviewed when the model is opened.

I. Engineering Narrative Report

The Engineering Report is a concise statement of the study including the general location, purpose, objectives, a brief history, any observations or engineering judgments, and property documentation. The report must show all relevant calculations associated with the proposed development. This may include compensatory storage and displacement calculations, structural stability calculations for dry floodproofing techniques, and/or calculations that determine the number and size of proposed flood openings. The report must also contain one copy of the flood study and all flood zone determinations. All hydrologic and hydraulic analyses shall be signed and sealed by a Professional Engineer licensed in the Commonwealth of Virginia, and all topographic maps, grading plans, and construction drawings shall be signed and sealed by a licensed professional.

Hydrology should be based on prior studies by FEMA or the county; however, if revisions are needed, computations must include the following:

- Narrative description outlining the necessity for the revision and hydrology methods used.
- Maps showing the delineated watershed area and watershed characteristics used in the peak discharge estimates such as land use, soil types, flow path, and watershed response times.
- Hardcopy results for the hydrologic computations for the estimated peak discharge for all storm events contained in the FIS study or county provided peak discharges
- Digital copies of the computer models used to generate the revised estimated peak discharge values

- ESRI compatible shapefiles for the watershed and any sub-watersheds

Hydraulic calculations must be provided in a HEC-RAS report that includes the following:

- The Duplicate Effective Model including hydraulic analyses which duplicate the hydraulic analyses contained in the Flood Insurance Study or county models with a comparison to published peak stages or elevations for the study reach.
- The Corrected Effective Model (Existing Conditions Model) including hydraulic analyses updating the Duplicate Effective Model with existing floodplain conditions observed in the field at the time of study, including but not limited to, updated field survey information, channel geometry, culvert/bridge locations and dimensions, Manning's "n" values, etc.
  - A written description of all changes from the Duplicate Effective Model must be included.
  - Any modifications made to cross-sections must be noted with a revision date in the Description field within the Cross-Section Data editor and Culvert/Bridge Data editor.
- The Proposed Conditions Model including hydraulic analyses incorporating the proposed improvements for the project including, but not limited to, proposed changes to topography, channel geometry, culvert/bridge locations and dimensions, Manning's "n" values, etc.
  - A written description of all changes from the Corrected Effective Model must be included.
  - Any modifications and proposed changes must be noted with a revision date in the Description field within the Cross-Section Data editor and Culvert/Bridge Data editor.
- A standard profile summary table for the entire model reach should be submitted that is formatted to show the differences between each model's water surface elevation at each cross-section for each flood event analyzed.
- All HEC-RAS cross-sections for the entire model reach with both the Corrected Effective Model and Proposed Conditions Model ground surfaces with any applicable obstructions or impedances.
  - The Duplicate Effective Model cross-sections do not need to be provided. However, the changes made to the cross-sections for establishing the Corrected Effective Model must be documented within the report; an appendix may be needed to show the specific cross-sectional comparison in HEC-RAS between the two models to illustrate the changes.
- A digital copy of the HEC-RAS model used to perform the hydraulic computations including all storm events and geometries used.
  - Site photos for Manning's n determinations must be included in the HEC-RAS Model by attaching pictures to cross-sections using the Picture Viewer function within HEC-RAS. Full summer growth conditions are preferred in the photos.
  - Name of lead hydraulic engineer or modeler, company name, and date of modeling report should be included in the comments for the model and preliminary models or alternative models should be deleted from what is submitted to the county for review
- If a project requires a map change, the Map Change Procedures in this manual must be followed. In addition, shapefiles of the new floodplain delineations and floodways (if applicable) must be submitted in an ESRI compatible format for all map changes.

For any analysis comprised of compensatory storage that is not done as part of a flood study, the following is required:

- Cross-sections at least every 25 feet throughout and bounding the limits of the limits of disturbance showing the existing and proposed surfaces or elevation spots consistent with the Grid and Tin surface locations as mentioned in Section 5.1.B.
- Cut and fill volume calculations as reported by CAD software or calculations and an outline of the

method used
- A narrative describing required versus provided compensatory storage volumes for each flood stage calculated.

Narrative report templates are available as appendices to this Manul:

- Appendix 10: No Impact Statement Report Template (General Engineering Analysis)
- Appendix 11: No Impact Statement Report Template (Peak Offset Analysis)
- Appendix 12: No Impact Statement Report Template (Conveyance Shadow)
- Appendix 13: Compensatory Storage Report Template
- Appendix 14: Flood Study Report Template

J. Engineering Drawings

For any hydraulic analysis, field surveyed cross-sections must be submitted on signed and sealed engineering drawings with a title block and a true scale. A cross-section location plan showing topography, extent, and orientation of each cross-section is also required and must meet the following:

- Existing and proposed topography of a suitable scale and contour interval
- Effective FEMA SFHA (including floodway) boundary lines for all available storm events
- Effective Community SFHA (including floodway) boundary lines for all available storm events
- Proposed SFHA lines for all available storm events
- Stream centerline, thalweg, and reach name along full extent of the project
- Cross-sections labeled with river station from HEC-RAS models on the drawing showing the proposed improvements.
- Depth raster showing water surface elevations along the project extent.
- Label the cross-sections with the respective water surface elevations as reported from the HEC-RAS model.
- Planimetric features and labels such as roads, buildings, ponds, etc.
- Reference to NAVD 88 as the vertical datum with appropriate benchmark
- Basic property location information (when applicable) such as street address, legal description, parcel identification number
- Limits of development activity (limits of disturbance) including compensatory storage
- Channel modification projects must include detail drawings showing accessory structures such as rock cross vanes, J-hooks, energy dissipaters, channel linings, etc.

For bridges and culverts, the following additional drawings that show:

- Dimensions of both the existing and proposed bridge(s) or culvert(s), including length, the presence of any headwall or wingwalls, the orientation of any wingwalls, the number of spans, width of each span, low chord elevation(s), high chord elevation(s), the dimensions of any parapets, foundations, and watercourse invert elevations.
- Structural detail drawings showing the shape, material, beveling or rounding of inlets, countersinking of culverts, wing wall skew, etc.
- Drawings showing the upstream and downstream structure or channel inverts, overtopping elevations, and stream elevations
- Slope stabilization measures including riprap in the vicinity of the structure

For buildings or structures:

- The proposed footprint, including the footprint of any impacts as a result of the construction.
  - Note that it is not sufficient to show a maximum footprint of a conceptual design. Without a detailed design, the county cannot verify that the proposed development meets applicable standards. Substituting notes on a plan in lieu of a design cannot be accepted as notes do not enable a review for compliance.
- Proposed topography or grading, and erosion control measures.
- The proposed lowest floor elevation for each part of the building. An Elevation Certificate must also be submitted based on building drawings.
- The elevation and proposed use of all enclosed areas below the lowest floor elevation. This information must also be included on the Elevation Certificate.
- Where wet floodproofing is proposed (enclosures below the lowest floor and accessory structures only), the size, location, and number of proposed flood openings must be shown. A detail of the openings must also be provided on the plans. The detail must be drawn to scale and must show the elevation of the proposed flood openings in relation to the adjacent grade.
- The elevation and extent of any proposed driveways, access roads, parking areas, and/or accessory structures and access routes.
- Where dry floodproofing is proposed, the plan view must show every location where dry floodproofing techniques (flood barriers, etc.) are proposed. A detail must also be provided for each dry floodproofing technique, and it must show the elevation to which the technique is proposed in relation to the lowest floor elevation and the BFE. Dry floodproofing is only allowed if a variance has been granted; structures must be dry floodproofed to three feet above the BFE.

K. Map Change Submittals

When a map change is required for a project, the procedures outlined in the Map Changes section above must be followed, and the flood study requirements must be met.

- A Map Revision must be supported by technical data though a flood study. In addition to this technical data, property owner notification letters, a list of impacted property owners, and a map depicting the revised area must be provided. This information must be submitted electronically in **one complete package**.
  - If part of a project being permitted, this information must be submitted using the Build Henrico site. **Files must be in a compressed folder (.zip) and submitted through Build Henrico as "DPW - Floodplain Documentation" with the "Comments" section completed to designate it as a "Map Revision".**
  - If not part of a project being permitted, this information must be emailed to the Floodplain Administrator. F**iles must be in a compressed folder (.zip) and sent with the subject like "County Map Revision – [insert project or stream name]".**
- A complete Map Revision submittal package includes but is not limited to:
  - Signed and sealed Flood Study Narrative Report (.pdf)
  - Associated technical data (e.g.: HEC-RAS model files, hydrologic model files (HydroCAD, PondPack, etc.), pre-/post-topographic surveys, etc.).
  - Impacted property owner list (.xlsx)
  - Property Owner Notification Letters, Mail Merge ready (.docx)
  - Response to Comments, when applicable (.xlsx)

L. Response to Comments

When projects are submitted for review, County reviewers will provide comments if revisions are required. For Plan Review projects, the standard comment sheet in Appendix 16 will be used. For second submittals or later, a response to review comments must be provided as part of the submittal package.

APPENDIX 1:

General Floodplain Development Permit

General Floodplain Development Permit

County of Henrico, Virginia
Department of Public Works, Design Engineering Division
P.O. Box 90775, Henrico, VA 23273-0775 | 4305 E. Parham Rd., Henrico, VA 23228
Phone: (804) 501-4393 | Email: flood@henrico.gov | https://henrico.gov/works/design/

Section 1: General Information

- As outlined in the Henrico County Code, Chapter 10, Article 1: Floodplain Management, a Floodplain Development Permit is required for any development in or adjacent to a Special Flood Hazard Area (SFHA).
- A General Permit may be used to allow development in the SFHA that will inherently not increase the base flood elevation (BFE) or would result in no technically measurable increase to the BFE.
- Development that is considered compliant under a General Permit requires county review if located in a floodway or when improvements, taken together, may exceed 40% of the assessed value of the improved structure, not including the land.

Section 2: Approved Development Activities Under this General Permit

Below is a list of development activities that are considered compliant with the Floodplain Ordinance requirements and are allowed under a General Permit. An Individual Permit form is not required to be submitted for the activities listed below. **Unless specified below, the development activities listed under the General Permit may occur without contacting the Floodplain Administrator. All other development activities, including activities listed below that are located in a Floodway, must apply for an Individual Permit.**

- Interior or exterior renovations, with a value less than $10,000, to a structure if the renovations do not constitute an enlargement or structurally alter the building. This includes:
  - Finishes (flooring, paint, wallpaper, etc.).
  - Cabinetry/trim.
  - Replacement windows, doors, plumbing fixtures, electrical fixtures, roofing, siding, or mechanical appliances not fueled by gas or oil.
- Mailboxes.
- Swing sets/Play equipment.
- General farming that does not involve earthwork that permanently alters the topography.
- Gardening that does not involve earthwork that results in permanently altered topography.
- Lawns and lawn maintenance activities.
- Routine maintenance of easement and utility corridors.
- Landscaping that involves “soft scaping” such as plantings, landscaping beds, or mulching. This does not include “hardscaping” that permanently alters the topography such as retaining walls, terraces, or pools.
- New or replacement, non-solid fences that meet the requirements in Section 4.4.E of the Floodplain Technical Guidance Manual (also included in Section 3 below).
- Road maintenance involving pavement marking, repaving, patching, or similar work to an existing road, driveway, parking area, sidewalk, bike path, etc. This may also include repairs to existing guardrails/barriers or traffic control devices such as signs. This may not involve replacement with larger or new above ground infrastructure.

- Path or trail maintenance involving painting, repaving, patching, or similar work to an existing path or trail. This may also include repairs to existing guardrails/barriers. This may not involve replacement with larger or new above ground infrastructure.
- General maintenance work to existing culverts, bridges, dams, or stormwater management facilities such as repairs to concrete or other materials, cleaning out debris or sediment, or something similar. This may not involve replacement with larger or new above ground infrastructure.
- Drainage ditch maintenance involving mowing, cleaning out debris or sediment from existing drainage ditches.
- Poles for signs, overhead utilities, billboards, and alike that are no larger than 2 feet in diameter and are not located within the stream channel.
- Underground utilities or repairs to existing underground utilities that do not permanently alter the topography.

Section 3: Additional Fence Types and Requirements

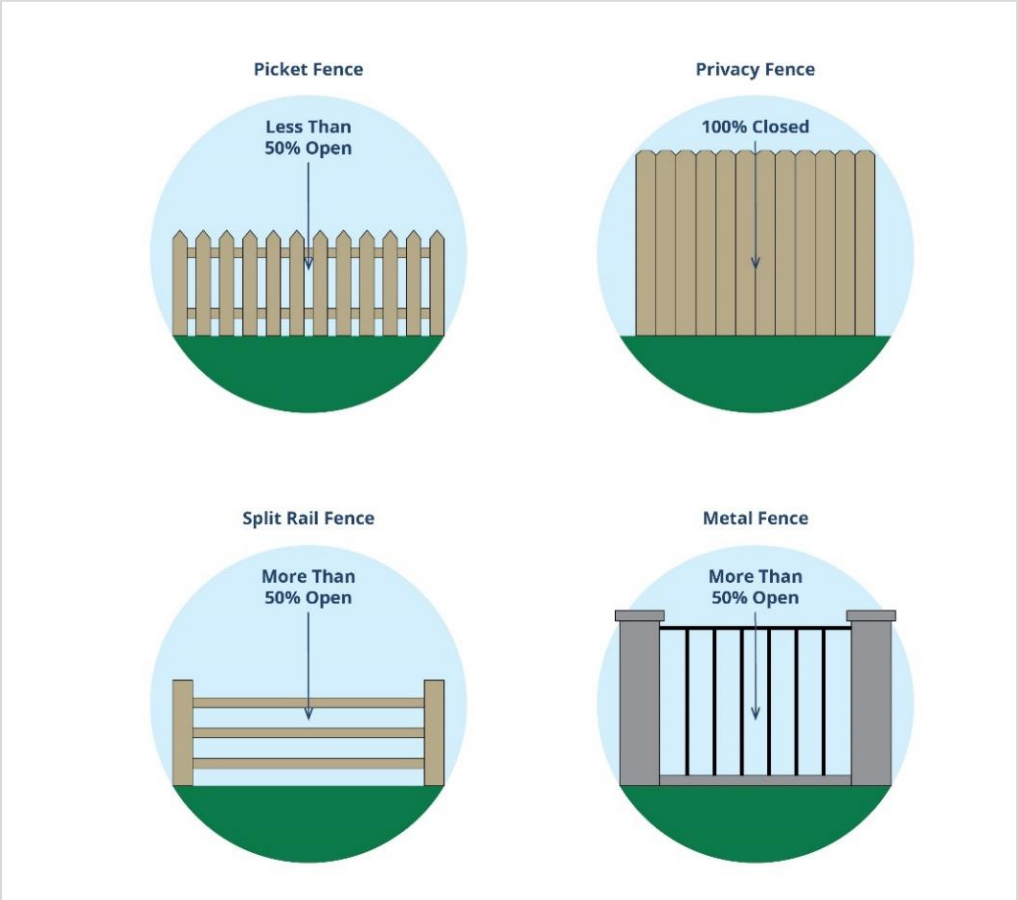
Fences may be permitted in the SFHA depending on the type and location of the fence. The type of fence will determine whether the fence will qualify as a minor project or a floodplain obstruction. Fences considered minor do not require a hydraulic study and can be permitted under a General Permit. **Fences considered a floodplain obstruction will require a hydraulic study and can only be permitted under an Individual Permit.**

The table below outlines the fence types that may be permitted in the SFHA. Case by case reviews may be conducted by the Floodplain Administrator for fence types not listed below, including collapsible or breakaway fencing and fences requiring post spacing shorter than the typical 6-8 foot. **Fences installed around swimming pools must be approved under an Individual Permit, and a building permit may also be required.**

Fence Types and Requirements in the SFHA

Fence Type	Hydraulic Study Required?	Hydraulic Analysis Modeling Requirements	Permit Type Required
Open wire, welded wire, chain link, pipe, or wood rail fencing (field fence, post and rail)			
	No	N/A	General Permit
Wood, metal, or vinyl picket fencing with equivalent board width and spacing (roughly 50% obstruction) AND fence line is parallel to direction of flow and in a location that should have minimal impact to the flow.			
	No	N/A	General Permit
Wood, metal, or vinyl picket fencing with equivalent board width and spacing (roughly 50% obstruction) AND fence line is designed in a way that has potential to block the direction of flow.			
	Yes	Model fencing using increased Manning's friction.	Individual Permit

Fence Type	Hydraulic Study Required?	Hydraulic Analysis Modeling Requirements	Permit Type Required
	Wood, metal, or vinyl fencing with narrow spacing (greater than 50% obstruction).		
	Yes	Model fence as an obstruction.	Individual Permit
	Wood, metal, or vinyl solid board fencing (privacy fencing).		
	Yes	Model fence as an obstruction.	Individual Permit
	Any fence type installed around a swimming pool.		
	Determined by applicable fence type above.		Individual Permit



Example fences with and without proper openings.

APPENDIX 2:

County Engineer Variance Application Form

OFFICE USE ONLY
Application #: _____

Floodplain Variance Request Application: County Engineer Variance

County of Henrico, Virginia
Department of Public Works, Design Engineering Division
P.O. Box 90775, Henrico, VA 23273-0775 | 4305 E. Parham Rd., Henrico, VA 23228
Phone: (804) 501-4393 | Email: flood@henrico.gov | https://henrico.gov/works/design

Section 1: General Information

A. General Conditions of this Variance Application

1. A variance is a grant of relief from any requirement of the Henrico County Floodplain Ordinance. Variances may only be granted in compliance with the provisions of Division 5 of the Floodplain Ordinance found at Henrico County Code Sec. 10-14, et seq.
2. No work may begin in a Special Flood Hazard Area (SFHA) or areas adjacent until a floodplain development permit has been issued.
3. The issuance of a variance does not guarantee that a floodplain development permit will be issued for the project.
4. By signing and submitting this application, the applicant certifies that all statements contained herein, and any additional documents submitted with the application are true and accurate.
5. Applicant is hereby informed that other permits may be required to fulfill local, state, or federal regulatory requirements.

Items in gray boxes are for Office Use Only and will be completed by DPW staff when reviewing the permit.

B. Pre-Application Meeting

A pre-application meeting may be requested with the Floodplain Administrator to discuss the proposed development, ordinance requirements, and the application procedures that will apply to that project. While pre-application meetings are not mandatory, they are recommended for large and/or complicated projects. Discussions or guidance offered by the Floodplain Administrator during a pre-application meeting do not constitute a commitment to approve or deny an application.

Applicants are strongly encouraged to review the Henrico County Technical Guidance Manual for Floodplain Management to learn more about floodplain development requirements, as well as additional guidance for meeting technical requirements.

C. Application Submittal

All application submittals, including Floodplain Development Permits, Plan Review applications (Plan of Development (POD), Subdivision (SUB), Clearing, Grading, and Grubbing (CGG), etc.), and Floodplain Variances, must be submitted through Build Henrico.

At this time, Floodplain Variances do not have their own application type in Build Henrico, so variance applications must be submitted through the Build Henrico site as an attachment to the associated Floodplain Development Permit or Plan Review Submittal. When uploading the attachment, select “DPW – Floodplain Documentation” as the “Document Type” and then fill in the “Comments” section to identify the document as a variance application.

OFFICE USE ONLY
Application #: _____

Section 2: Owner, Applicant, and Property Information

A. Owner of Record: (if more than one owner, attach additional sheets)

Name: _____

Street Address: _____

Mailing Address: _____

Phone Number: _____ Email Address: _____

Signature: _____ Print Name: _____ Date: _____

B. Applicant Information:

Name: _____

Street Address: _____

Mailing Address: _____

Phone Number: _____ Email Address: _____

Signature: _____ Print Name: _____ Date: _____

C. Property Information:

Property Address: _____

Parcel Number (GPIN): _____ Tax Assessed Value (structure only): _____

Subdivision: _____ Section: _____ Block: _____ Lot: _____

D. Floodplain Determination

Flood Zone(s): ☐ A ☐ AE ☐ Floodway ☐ Shaded X | ☐ Community SFHA ☐ FEMA SFHA
☐ Project is adjacent to floodplain (within required setbacks, low spot, next to end of study)
Base Flood Elevation (BFE): _____ (based on NAVD 88)
Floodplain Map Effective Date: _____ FIRM Panel (if applicable): _____

Section 3: Variance Request Information

A. Project Description

Description must include project description, ordinance requirements, explanation of what requirements are being requested to be waived, and explanation of why the ordinance requirements cannot be met (i.e., need for the variance request). Please be specific as possible and attach additional pages if needed.

Project Cost: _____

Is the project a substantial improvement/damage? ☐ Yes ☐ No

OFFICE USE ONLY
Application #: _____

B. Ordinance Requirement(s) Requesting to be Waived

Please identify the specific section of the Henrico County Floodplain Ordinance (example: Henrico County Code Sec. 10-9(b)).

C. Variance Criteria

All floodplain variance requests must meet the requirements of Sec. 10-15 of the Henrico County Code. Please answer the questions below related to those requirements. Additional pages may be attached to this form if additional space is needed.

1. Please provide an explanation of how this variance request has provided a showing of good and sufficient cause.

2. Please provide an explanation of how the failure to grant the variance request would result in exceptional hardship to the applicant.

3. Please provide an explanation of how this variance request will not create or result in:
    a. Unacceptable or prohibited increases in flood heights.

    b. Additional threats to public safety.

    c. Extraordinary public expense.

    d. Nuisances.

    e. Fraud or victimization of the public.

    f. Conflicts with other existing laws or ordinances.

4. Please provide an explanation of how this variance request will not be detrimental to other property in the vicinity.

5. Please provide an explanation of how the circumstances giving rise to the variance request are not of a general or recurring nature.

6. Please provide an explanation of how the need for the variance arises from the physical character of the property or from the use or development of adjacent property and not from the personal or financial situation of the applicant.

7. Please provide an explanation of how this variance request is for only the minimum necessary to provide relief.

D. Additional Variance Criteria

In addition to the requirements listed above, all County Engineer floodplain variance requests must meet the requirements of Sec. 10-16 of the Henrico County Code. Please answer the questions below related to those requirements. Additional pages may be attached to this form if additional space is needed.

1. Please provide an explanation of how this variance request will not increase the danger to life and property due to increased flood heights or velocities caused by encroachments.

2. Please provide an explanation of how this variance request will not increase the risk of injury to others if materials are swept onto other lands or transported in floods.

3. Please provide an explanation demonstrating the water supply and sanitation system proposed for the development and their ability to prevent disease, contamination, and unsanitary conditions will not be impacted.

OFFICE USE ONLY
Application #: _____

4. Please provide an explanation of how the variance request will affect the susceptibility of the proposed facility to flood damage and the effect of such damage on individual owners.

5. Please provide an explanation of the importance of the variance request to the community of the services that will be provided by the proposed facility.

6. Please identify available alternative locations for the proposed use that are not subject to flooding.

7. Please provide an explanation of the compatibility of the proposed use with existing or reasonably anticipated development.

8. Please provide an explanation of the compatibility of the proposed use with the comprehensive plan and county floodplain management program.

9. Please provide a description of existing and proposed vehicular access to the property during floods.

10. Please provide a description of the expected heights, velocity, duration, rate of rise, and sediment transport of foreseeable flood waters on the property. Technical data to support this information must be provided.

The County Engineer may consider any other factors particularly relevant to the purposes of the Floodplain Ordinance when reviewing this variance request (Sec. 10-16(k) of the Henrico County Code).

OFFICE USE ONLY
Application #: _____

Section 4: Documentation

The following documentation is required to complete this application. Check all that are applicable to the proposed development and attach documentation to the application form.

A. Documentation Required for All Development

- □ Site Plan (must clearly identify floodplain boundaries (100-yr and 500-yr), existing development, proposed development, and distance from floodplain to proposed/existing structures).
- □ No-Rise Certificate with supporting technical data (required only if located within the SFHA).

B. Additional Documentation That May Be Required for Development

Additional documentation may be required to support this variance application. This will be dependent on the proposed development and variance request. Applicants should coordinate with the Floodplain Administrator to determine what documentation may be necessary to support this application prior to submittal.

Examples of Additional Documentation:

- □ Construction Documents for Building (must clearly identify elevations for the lowest floor and mechanical equipment and if applicable, the location, size, and height above grade for all flood openings).
- □ Dry Floodproofing Certificate.
- □ Itemized Cost Breakdown (for additions/alterations to existing structures only).
- □ Historic Structure Documentation.
- □ Flood-Damage Resistant Material Documentation.
- □ Letter of Map Change Documentation.
- □ Property Owner Notification Documentation (for alteration of a watercourse only).

Section 5: Certification

I, the applicant, certify that to the best of my knowledge the information contained in this application is true and accurate. I understand that the granting of a floodplain variance may result in increased risk to life and property and increased flood insurance premiums on this property.

Signature: _____ Print Name: _____ Date: _____

OFFICE USE ONLY
Application #: _____

OFFICE USE ONLY

Section 6: Variance Request Review and Determination

DPW-Floodplain Management

Date Received: _____ Received By: _____

Application Determined Complete: ☐ Yes ☐ No Date: _____ Initials: _____

If no, application returned to applicant for corrections. Date: _____ Initials: _____

Resubmitted Application Date Received: _____ Received By: _____

Resubmitted Application Determined Complete: Date: _____ Initials: _____

Floodplain Administrator Recommendation:

Application Sent to County Engineer: ☐ Yes ☐ No Date: _____ Initials: _____

☐ **Variance Request Approved.** The information submitted for the proposed project was reviewed and determined to be in compliance with the variance requirements in the Henrico County Floodplain Ordinance and determined to be the minimum necessary to provide relief. The granting of this variance may result in increased risk to life and property and increased flood insurance premiums on this property

☐ **Variance Request Approved with Conditions.** The information submitted for the proposed project was reviewed and approved with the conditions outlined below. The granting of this variance may result in increased risk to life and property and increased flood insurance premiums on this property.

☐ **Variance Request Denied.** The proposed project is not in compliance with the Henrico County Floodplain Ordinance, as outlined below:

County Engineer or Authorized Designee:

Signature: _____ Print Name: _____ Date: _____

APPENDIX 3:

Administrative Variance Application Form

OFFICE USE ONLY
Application #: _____

Floodplain Variance Request Application: Administrative Variance

County of Henrico, Virginia
Department of Public Works, Design Engineering Division
P.O. Box 90775, Henrico, VA 23273-0775 | 4305 E. Parham Rd., Henrico, VA 23228
Phone: (804) 501-4393 | Email: flood@henrico.us | https://henrico.gov/works/design

Section 1: General Information

A. General Conditions of this Variance Application

1. A variance is a grant of relief from any requirement of the Henrico County Floodplain Ordinance. Variances may only be granted in compliance with the provisions of Division 5 of the Floodplain Ordinance found at Henrico County Code Sec. 10-14, et seq.
2. No work may begin in a Special Flood Hazard Area (SFHA) or areas adjacent until a floodplain development permit has been issued.
3. The issuance of a variance does not guarantee that a floodplain development permit will be issued for the project.
4. By signing and submitting this application, the applicant certifies that all statements contained herein, and any additional documents submitted with the application are true and accurate.
5. Applicant is hereby informed that other permits may be required to fulfill local, state, or federal regulatory requirements.

Items in gray boxes are for Office Use Only and will be completed by DPW staff when reviewing the permit.

B. Pre-Application Meeting

A pre-application meeting may be requested with the Floodplain Administrator to discuss the proposed development, ordinance requirements, and the application procedures that will apply to that project. While pre-application meetings are not mandatory, they are recommended for large and/or complicated projects. Discussions or guidance offered by the Floodplain Administrator during a pre-application meeting do not constitute a commitment to approve or deny an application.

Applicants are strongly encouraged to review the Henrico County Technical Guidance Manual for Floodplain Management to learn more about floodplain development requirements, as well as additional guidance for meeting technical requirements.

C. Application Submittal

All application submittals, including Floodplain Development Permits, Plan Review applications (Plan of Development (POD), Subdivision (SUB), Clearing, Grading, and Grubbing (CGG), etc.), and Floodplain Variances, must be submitted through Build Henrico.

At this time, Floodplain Variances do not have their own application type in Build Henrico, so variance applications must be submitted through the Build Henrico site as an attachment to the associated Floodplain Development Permit or Plan Review Submittal. When uploading the attachment, select “DPW – Floodplain Documentation” as the “Document Type” and then fill in the “Comments” section to identify the document as a variance application.

OFFICE USE ONLY
Application #: _____

Section 2: Owner, Applicant, and Property Information

A. Owner of Record: (if more than one owner, attach additional sheets)

Name: _____

Street Address: _____

Mailing Address: _____

Phone Number: _____ Email Address: _____

Signature: _____ Print Name: _____ Date: _____

B. Applicant Information:

Name: _____

Street Address: _____

Mailing Address: _____

Phone Number: _____ Email Address: _____

Signature: _____ Print Name: _____ Date: _____

C. Property Information:

Property Address: _____

Parcel Number (GPIN): _____ Tax Assessed Value (structure only): _____

Subdivision: _____ Section: _____ Block: _____ Lot: _____

D. Floodplain Determination

Flood Zone(s): ☐ A ☐ AE ☐ Floodway ☐ Shaded X | ☐ Community SFHA ☐ FEMA SFHA
☐ Project is adjacent to floodplain (within required setbacks, low spot, next to end of study)
Base Flood Elevation (BFE): _____ (based on NAVD 88)
Floodplain Map Effective Date: _____ FIRM Panel (if applicable): _____

Section 3: Variance Request Information

A. Project Description

Description must include project description, ordinance requirements, explanation of what requirements are being requested to be waived, and explanation of why the ordinance requirements cannot be met (i.e., need for the variance request). Please be specific as possible and attach additional pages if needed.

Project Cost: _____

Is the project a substantial improvement/damage? ☐ Yes ☐ No

OFFICE USE ONLY
Application #: _____

B. Ordinance Requirement(s) Requesting to be Waived

Please identify the specific section of the Henrico County Floodplain Ordinance (example: Henrico County Code Sec. 10-9(b)).

C. Variance Eligibility

Administrative Variances are only applicable to specific activities. Please check the applicable item(s) below and answer the associated question(s) to demonstrate this variance request meets the Administrative Variance eligibility requirements. Additional pages may be attached to this form if additional space is needed.

□ **Minor filling in the SFHA necessary to protect or restore natural floodplain functions or to stabilize stream banks to protect public roads and utilities.**
Please provide an explanation of how the project is protecting or restoring natural floodplain functions or stabilizing stream banks to protect public roads and utilities.

□ Documentation must be attached to this variance request application demonstrating that the requirements in Henrico County Code Sec. 10-9, excluding 10-9(b), have been met.

□ **Dry-floodproofing of nonresidential structures in lieu of requiring higher elevation of the structure.**
Please provide an explanation of how elevating the structure is not reasonably feasible because of the nature of the lot and/or the use of the structure.

Please provide an explanation of how all areas of the building components below the elevation corresponding to the BFE plus three feet will be dry floodproofed. This must be designed and constructed in accordance with the VA USBC and ASCE 24 and be certified by a professional engineer or architect.

□ Documentation must be attached to this variance request application, including a Floodproofing Certificate (FEMA Form 086-0-34) with supporting data and an inspection and operational plan that includes, but is not limited to, installation, exercise, and maintenance of floodproofing measures. Said certification, operational plan, and inspection and maintenance plan shall be prepared by or under the direct supervision of a professional engineer or architect and certified by same.

□ **Rebuilding of a residential structure within the SFHA or setback area that has been substantially damaged by some cause other than flooding.**
Please provide an explanation, including a site plan, demonstrating there is no site outside of the SFHA or setback area for relocation of the structure.

□ Documentation must be attached to this variance request application that demonstrates the proposed structure will have the lowest floor, including mechanical equipment, elevated to the BFE plus two feet, as well as flood opening requirements in any enclosures below the BFE, as applicable.

□ **Locating stormwater management facilities in the SFHA.**
Please provide an explanation, including a site plan, demonstrating that a location outside of the SFHA is not feasible.

□ Documentation must be attached to this variance request application that demonstrates the no rise and no fill requirements in Henrico County Code Secs. 10-9(a) and (b) have been met.

□ Documentation must be attached to this variance request application demonstrating that engineering data shows that the proposed stormwater management facility will operate effectively for its intended purpose during a 10-year flood event or the required design storm for the project, whichever is greater, and will have structure stability during a 100-year flood event.

D. Variance Criteria

In addition to the eligibility requirements listed above, all floodplain variance requests must meet the requirements of Henrico County Code Sec. 10-15. Please answer the questions below related to those requirements. Additional pages may be attached to this form if additional space is needed.

1. Please provide an explanation of how this variance request has provided a showing of good and sufficient cause.

2. Please provide an explanation of how the failure to grant the variance request would result in exceptional hardship to the applicant.

OFFICE USE ONLY
Application #: _____

3. Please provide an explanation of how this variance request will not create or result in:
    a. Unacceptable or prohibited increases in flood heights.

    b. Additional threats to public safety.

    c. Extraordinary public expense.

    d. Nuisances.

    e. Fraud or victimization of the public.

    f. Conflicts with other existing laws or ordinances.

4. Please provide an explanation of how this variance request will not be detrimental to other property in the vicinity.

5. Please provide an explanation of how the circumstances giving rise to the variance request are not of a general or recurring nature.

6. Please provide an explanation of how the need for the variance arises from the physical character of the property or from the use or development of adjacent property and not from the personal or financial situation of the applicant.

7. Please provide an explanation of how this variance request is for only the minimum necessary to provide relief.

OFFICE USE ONLY
Application #: _____

Section 4: Documentation

The following documentation is required to complete this application. Check all that are applicable to the proposed development and attach documentation to the application form.

A. Documentation Required for All Development

- □ Site Plan (must clearly identify floodplain boundaries (100-yr and 500-yr), existing development, proposed development, and distance from floodplain to proposed/existing structures).
- □ All applicable documents identified in Section 3 above.
- □ No-Rise Certificate with supporting technical data (required only if located within the SFHA).

B. Additional Documentation That May Be Required for Development

Additional documentation may be required to support this variance application. This will be dependent on the proposed development and variance request. Applicants should coordinate with the Floodplain Administrator to determine what documentation may be necessary to support this application prior to submittal.

Examples of Additional Documentation:

- □ Construction Documents for Building (must clearly identify elevations for the lowest floor and mechanical equipment and if applicable, the location, size, and height above grade for all flood openings).
- □ Dry Floodproofing Certificate.
- □ Itemized Cost Breakdown (for additions/alterations to existing structures only).
- □ Historic Structure Documentation.
- □ Flood-Damage Resistant Material Documentation.
- □ Letter of Map Change Documentation.
- □ Property Owner Notification Documentation (for alteration of a watercourse only).

Section 5: Certification

I, the applicant, certify that to the best of my knowledge the information contained in this application is true and accurate. I understand that the granting of a floodplain variance may result in increased risk to life and property and increased flood insurance premiums on this property.

Signature: _____ Print Name: _____ Date: _____

OFFICE USE ONLY
Application #: _____

OFFICE USE ONLY

Section 6: Variance Request Review and Determination

DPW-Floodplain Management

Date Received: _____ Received By: _____

Application Determined Complete: ☐ Yes ☐ No Date: _____ Initials: _____

If no, application returned to applicant for corrections. Date: _____ Initials: _____

Resubmitted Application Date Received: _____ Received By: _____

Resubmitted Application Determined Complete: Date: _____ Initials: _____

☐ **Variance Request Approved.** The information submitted for the proposed project was reviewed and determined to be in compliance with the variance requirements in the Henrico County Floodplain Ordinance and determined to be the minimum necessary to provide relief. The granting of this variance may result in increased risk to life and property and increased flood insurance premiums on this property.

☐ **Variance Request Approved with Conditions.** The information submitted for the proposed project was reviewed and approved with conditions outlined below. The granting of this variance may result in increased risk to life and property and increased flood insurance premiums on this property.

☐ **Variance Request Denied.** The proposed project is not in compliance with the Henrico County Floodplain Ordinance, as outlined below:

Floodplain Administrator or Authorized Designee:

Signature: _____ Print Name: _____ Date: _____

APPENDIX 4:

SI/SD Cost Breakdown Excel Template

Henrico County

Cost Breakdown Sheet for Substantial Improvement/Substantial Damage Estimations

Directions: Fill in each blue cell below and submit the completed version with your Floodplain Development Permit application. The Total Costs Included + Total Costs Excluded must equel the Total Project Cost. Additional documentation, such as cost estimates from a contractor or receipts, may be required as part of your permit application.

Property Address	
GPIN	
Total Project Cost	

= required input data

Costs that Must be Included	
Item	**Cost ($)**
Materials and labor, including the estimated value of donated or discounted materials and	
Site preparation related to the improvement or repair (e.g., foundation excavation or filling in basements)	
Demolition and construction debris disposal	
Labor and other costs associated with demolishing, moving, or altering building components to accommodate improvements, additions, and making repairs	
Costs associated with elevating a structure when the proposed elevation is lower than the BFE	
Costs associated with complying with any other regulations or code requirement that is triggered by the work, including costs to comply with the requirements of the Americans with Disabilities Act (ADA)	
Construction management and supervision	
Contractor's overhead and profit	
Sales taxes on materials	
Structural elements and exterior finishes, including: *Foundations (e.g., spread or continuous foundation footings, perimeter walls, chain- walls, pilings, columns, posts, etc.); Monolithic or other types of concrete slabs; Bearing walls, tie beams, trusses; Joists, beams, subflooring, framing, ceilings; Interior non-bearing walls; Exterior finishes (e.g., brick, stucco, siding, painting, and trim); Windows and exterior doors; Roofing, gutters, and downspouts; Hardware; Attached decks and porches.*	
Interior finish elements, including: *Floor finishes (e.g., hardwood, ceramic, vinyl, linoleum, stone, and wall-to-wall carpet over subflooring); Bathroom tiling and fixtures; Wall finishes (e.g., drywall, paint, stucco, plaster, paneling, and marble); Built-in cabinets (e.g., kitchen, utility, entertainment, storage, and bathroom); Interior doors; Interior finish carpentry; Built-in bookcases and furniture; Hardware; Insulation.*	
Utility and service equipment, including: *Heating, ventilation, and air conditioning (HVAC) equipment; Plumbing fixtures and piping; Electrical wiring, outlets, and switches; Light fixtures and ceiling fans; Security systems; Built-in appliances; Central vacuum systems; Water filtration, conditioning, and recirculation systems.*	
Total Costs Included	$ -

Substantial Improvement/Damage Estimation Determination	
Tax Assessed Value of Structure (without land)	
Costs of Improvement/Damage	$ -
Improvement/Damage %	#DIV/0!

Costs to be Excluded	
Item	**Cost ($)**
Clean-up and trash removal	
Costs to temporarily stabilize a building so that it is safe to enter to evaluate and identify required repairs	
Costs to obtain or prepare plans and specifications	
Land survey costs	
Permit fees and inspection fees	
Carpeting and recarpeting installed over finished flooring such as wood or tiling	
Outside improvements, including landscaping, irrigation, sidewalks, driveways, fences, yard lights, swimming pools, pool enclosures, and detached accessory structures (e.g., garages, sheds, and gazebos)	
Costs required for the minimum necessary work to correct existing violations of health, safety, and sanitary codes	
Plug-in appliances such as washing machines, dryers, and stoves	
Total Costs Excluded	$ -

APPENDIX 5:

FEMA Elevation Certificate Form

National Flood Insurance Program

Elevation Certificate

and Instructions

2023 EDITION

FEMA

U.S. DEPARTMENT OF HOMELAND SECURITY
Federal Emergency Management Agency
National Flood Insurance Program

OMB Control No. 1660-0008
Expiration Date: 06/30/2026

ELEVATION CERTIFICATE AND INSTRUCTIONS

PAPERWORK REDUCTION ACT NOTICE

Public reporting burden for this data collection is estimated to average 3.75 hours per response. The burden estimate includes the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and submitting this form. You are not required to respond to this collection of information unless a valid OMB control number is displayed on this form. Send comments regarding the accuracy of the burden estimate and any suggestions for reducing the burden to: Information Collections Management, Department of Homeland Security, Federal Emergency Management Agency, 500 C Street SW, Washington, DC 20742, Paperwork Reduction Project (1660-0008). **NOTE: Do not send your completed form to this address.**

PRIVACY ACT STATEMENT

Authority: Title 44 CFR § 61.7 and 61.8.

Principal Purpose(s): This information is being collected for the primary purpose of documenting compliance with National Flood Insurance Program (NFIP) floodplain management ordinances for new or substantially improved structures in designated Special Flood Hazard Areas. This form may also be used as an optional tool for a Letter of Map Amendment (LOMA), Conditional LOMA (CLOMA), Letter of Map Revision Based on Fill (LOMR-F), or Conditional LOMR-F (CLOMR-F), or for flood insurance rating purposes in any flood zone.

Routine Use(s): The information on this form may be disclosed as generally permitted under 5 U.S.C. § 552a(b) of the Privacy Act of 1974, as amended. This includes using this information as necessary and authorized by the routine uses published in DHS/ FEMA-003 – *National Flood Insurance Program Files System of Records Notice* 79 Fed. Reg. 28747 (May 19, 2014) and upon written request, written consent, by agreement, or as required by law.

Disclosure: The disclosure of information on this form is voluntary; however, failure to provide the information requested may impact the flood insurance premium through the NFIP. Information will only be released as permitted by law.

PURPOSE OF THE ELEVATION CERTIFICATE

The Elevation Certificate is an important administrative tool of the NFIP. It can be used to provide elevation information necessary to ensure compliance with community floodplain management ordinances, to inform the proper insurance premium, and to support a request for a LOMA, CLOMA, LOMR-F, or CLOMR-F.

The Elevation Certificate is used to document floodplain management compliance for Post-Flood Insurance Rate Map (FIRM) buildings, which are buildings constructed after publication of the FIRM, located in flood Zones A1–A30, AE, AH, AO, A (with Base Flood Elevation (BFE)), VE, V1–V30, V (with BFE), AR, AR/A, AR/AE, AR/A1–A30, AR/AH, AR/AO, and A99. It may also be used to provide elevation information for Pre-FIRM buildings or buildings in any flood zone.

As part of the agreement for making flood insurance available in a community, the NFIP requires the community to adopt floodplain management regulations that specify minimum requirements for reducing flood losses. One such requirement is for the community to obtain the elevation of the lowest floor (including basement) of all new and substantially improved buildings, and maintain a record of such information. The Elevation Certificate provides a way for a community to document compliance with the community's floodplain management ordinance.

Use of this certificate does not provide a waiver of the flood insurance purchase requirement. Only a LOMA or LOMR-F from the Federal Emergency Management Agency (FEMA) can amend the FIRM and remove the federal mandate for a lending institution to require the purchase of flood insurance. However, the lending institution has the option of requiring flood insurance even if a LOMA/LOMR-F has been issued by FEMA. The Elevation Certificate may be used to support a LOMA, CLOMA, LOMR-F, or CLOMR-F request. Lowest Adjacent Grade (LAG) elevations certified by a land surveyor, engineer, or architect, as authorized by state law, will be required if the certificate is used to support a LOMA, CLOMA, LOMR-F, or CLOMR-F request. A LOMA, CLOMA, LOMR-F, or CLOMR-F request must be submitted with either a completed FEMA MT-EZ or MT-1 application package, whichever is appropriate. If the certificate will only be completed to support a LOMA, CLOMA, LOMR-F, or CLOMR-F request, there is an option to document the certified LAG elevation on the Elevation Form included in the MT-EZ and MT-1 application.

This certificate is used only to certify building elevations. A separate certificate is required for floodproofing. Under the NFIP, non-residential buildings can be floodproofed up to or above the BFE. A floodproofed building is a building that has been designed and constructed to be watertight (substantially impermeable to floodwaters) below the BFE. Floodproofing of residential buildings is not permitted under the NFIP unless FEMA has granted the community an exception for residential floodproofed basements. The community must adopt standards for design and construction of floodproofed basements before FEMA will grant a basement exception. For both floodproofed non-residential buildings and residential floodproofed basements in communities that have been granted an exception by FEMA, a floodproofing certificate is required.

The expiration date on the form herein does not apply to certified and completed Elevation Certificates, as a completed Elevation Certificate does not expire, unless there is a physical change to the building that invalidates information in Section A Items A8 or A9, Section C, Section E, or Section H. In addition, this form is intended for the specific building referenced in Section A and is not invalidated by the transfer of building ownership.

Additional guidance can be found in FEMA Publication 467-1, *Floodplain Management Bulletin: Elevation Certificate*.

Form Instructions

U.S. DEPARTMENT OF HOMELAND SECURITY
Federal Emergency Management Agency
National Flood Insurance Program

OMB Control No. 1660-0008
Expiration Date: 06/30/2026

ELEVATION CERTIFICATE

IMPORTANT: MUST FOLLOW THE INSTRUCTIONS ON INSTRUCTION PAGES 1-11

Copy all pages of this Elevation Certificate and all attachments for (1) community official, (2) insurance agent/company, and (3) building owner.

SECTION A – PROPERTY INFORMATION

FOR INSURANCE COMPANY USE

Policy Number:

Company NAIC Number:

A1. Building Owner's Name:

A2. Building Street Address (including Apt., Unit, Suite, and/or Bldg. No.) or P.O. Route and Box No.:

City: State: ZIP Code:

A3. Property Description (e.g., Lot and Block Numbers or Legal Description) and/or Tax Parcel Number:

A4. Building Use (e.g., Residential, Non-Residential, Addition, Accessory, etc.):

A5. Latitude/Longitude: Lat. Long. Horiz. Datum: ☐ NAD 1927 ☐ NAD 1983 ☐ WGS 84

A6. Attach at least two and when possible four clear color photographs (one for each side) of the building (see Form pages 7 and 8).

A7. Building Diagram Number:

A8. For a building with a crawlspace or enclosure(s):

a) Square footage of crawlspace or enclosure(s): sq. ft.

b) Is there at least one permanent flood opening on two different sides of each enclosed area? ☐ Yes ☐ No ☐ N/A

c) Enter number of permanent flood openings in the crawlspace or enclosure(s) within 1.0 foot above adjacent grade:
Non-engineered flood openings: Engineered flood openings:

d) Total net open area of non-engineered flood openings in A8.c: sq. in.

e) Total rated area of engineered flood openings in A8.c (attach documentation – see Instructions): sq. ft.

f) Sum of A8.d and A8.e rated area (if applicable – see Instructions): sq. ft.

A9. For a building with an attached garage:

a) Square footage of attached garage: sq. ft.

b) Is there at least one permanent flood opening on two different sides of the attached garage? ☐ Yes ☐ No ☐ N/A

c) Enter number of permanent flood openings in the attached garage within 1.0 foot above adjacent grade:
Non-engineered flood openings: Engineered flood openings:

d) Total net open area of non-engineered flood openings in A9.c: sq. in.

e) Total rated area of engineered flood openings in A9.c (attach documentation – see Instructions): sq. ft.

f) Sum of A9.d and A9.e rated area (if applicable – see Instructions): sq. ft.

SECTION B – FLOOD INSURANCE RATE MAP (FIRM) INFORMATION

B1.a. NFIP Community Name: B1.b. NFIP Community Identification Number:

B2. County Name: B3. State: B4. Map/Panel No.: B5. Suffix:

B6. FIRM Index Date: B7. FIRM Panel Effective/Revised Date:

B8. Flood Zone(s): B9. Base Flood Elevation(s) (BFE) (Zone AO, use Base Flood Depth):

B10. Indicate the source of the BFE data or Base Flood Depth entered in Item B9:
☐ FIS ☐ FIRM ☐ Community Determined ☐ Other:

B11. Indicate elevation datum used for BFE in Item B9: ☐ NGVD 1929 ☐ NAVD 1988 ☐ Other/Source:

B12. Is the building located in a Coastal Barrier Resources System (CBRS) area or Otherwise Protected Area (OPA)? ☐ Yes ☐ No
Designation Date: ☐ CBRS ☐ OPA

B13. Is the building located seaward of the Limit of Moderate Wave Action (LiMWA)? ☐ Yes ☐ No

Form Instructions

ELEVATION CERTIFICATE

IMPORTANT: MUST FOLLOW THE INSTRUCTIONS ON INSTRUCTION PAGES 1-11

Building Street Address (including Apt., Unit, Suite, and/or Bldg. No.) or P.O. Route and Box No.:

City: _____ State: _____ ZIP Code: _____

FOR INSURANCE COMPANY USE

Policy Number: _____

Company NAIC Number: _____

SECTION C – BUILDING ELEVATION INFORMATION (SURVEY REQUIRED)

C1. Building elevations are based on: ☐ Construction Drawings* ☐ Building Under Construction* ☐ Finished Construction
*A new Elevation Certificate will be required when construction of the building is complete.

C2. Elevations – Zones A1–A30, AE, AH, AO, A (with BFE), VE, V1–V30, V (with BFE), AR, AR/A, AR/AE, AR/A1–A30, AR/AH, AR/AO, A99. Complete Items C2.a–h below according to the Building Diagram specified in Item A7. In Puerto Rico only, enter meters.
Benchmark Utilized: _____ Vertical Datum: _____

Indicate elevation datum used for the elevations in items a) through h) below.
☐ NGVD 1929 ☐ NAVD 1988 ☐ Other: _____

Datum used for building elevations must be the same as that used for the BFE. Conversion factor used? ☐ Yes ☐ No
If Yes, describe the source of the conversion factor in the Section D Comments area.

		Check the measurement used:
a) Top of bottom floor (including basement, crawlspace, or enclosure floor):		☐ feet ☐ meters
b) Top of the next higher floor (see Instructions):		☐ feet ☐ meters
c) Bottom of the lowest horizontal structural member (see Instructions):		☐ feet ☐ meters
d) Attached garage (top of slab):		☐ feet ☐ meters
e) Lowest elevation of Machinery and Equipment (M&E) servicing the building (describe type of M&E and location in Section D Comments area):		☐ feet ☐ meters
f) Lowest Adjacent Grade (LAG) next to building: ☐ Natural ☐ Finished		☐ feet ☐ meters
g) Highest Adjacent Grade (HAG) next to building: ☐ Natural ☐ Finished		☐ feet ☐ meters
h) Finished LAG at lowest elevation of attached deck or stairs, including structural support:		☐ feet ☐ meters

SECTION D – SURVEYOR, ENGINEER, OR ARCHITECT CERTIFICATION

This certification is to be signed and sealed by a land surveyor, engineer, or architect authorized by state law to certify elevation information. *I certify that the information on this Certificate represents my best efforts to interpret the data available. I understand that any false statement may be punishable by fine or imprisonment under 18 U.S. Code, Section 1001.*

Were latitude and longitude in Section A provided by a licensed land surveyor? ☐ Yes ☐ No

☐ Check here if attachments and describe in the Comments area.

Certifier's Name: _____ License Number: _____

Title: _____

Company Name: _____

Address: _____

City: _____ State: _____ ZIP Code: _____

Telephone: _____ Ext.: _____ Email: _____

Signature: _____ Date: _____

Place Seal Here

Copy all pages of this Elevation Certificate and all attachments for (1) community official, (2) insurance agent/company, and (3) building owner.

Comments (including source of conversion factor in C2; type of equipment and location per C2.e; and description of any attachments):

Form Instructions

ELEVATION CERTIFICATE

IMPORTANT: MUST FOLLOW THE INSTRUCTIONS ON INSTRUCTION PAGES 1-11

Building Street Address (including Apt., Unit, Suite, and/or Bldg. No.) or P.O. Route and Box No.:	**FOR INSURANCE COMPANY USE**
City: _____ State: _____ ZIP Code: _____	Policy Number: _____
	Company NAIC Number: _____

SECTION E – BUILDING MEASUREMENT INFORMATION (SURVEY NOT REQUIRED) FOR ZONE AO, ZONE AR/AO, AND ZONE A (WITHOUT BFE)

For Zones AO, AR/AO, and A (without BFE), complete Items E1–E5. For Items E1–E4, use natural grade, if available. If the Certificate is intended to support a Letter of Map Change request, complete Sections A, B, and C. Check the measurement used. In Puerto Rico only, enter meters.

Building measurements are based on: ☐ Construction Drawings* ☐ Building Under Construction* ☐ Finished Construction
*A new Elevation Certificate will be required when construction of the building is complete.

E1. Provide measurements (C.2.a in applicable Building Diagram) for the following and check the appropriate boxes to show whether the measurement is above or below the natural HAG and the LAG.

a) Top of bottom floor (including basement, crawlspace, or enclosure) is: _____ ☐ feet ☐ meters ☐ above or ☐ below the HAG.

b) Top of bottom floor (including basement, crawlspace, or enclosure) is: _____ ☐ feet ☐ meters ☐ above or ☐ below the LAG.

E2. For Building Diagrams 6–9 with permanent flood openings provided in Section A Items 8 and/or 9 (see pages 1–2 of Instructions), the next higher floor (C2.b in applicable Building Diagram) of the building is: _____ ☐ feet ☐ meters ☐ above or ☐ below the HAG.

E3. Attached garage (top of slab) is: _____ ☐ feet ☐ meters ☐ above or ☐ below the HAG.

E4. Top of platform of machinery and/or equipment servicing the building is: _____ ☐ feet ☐ meters ☐ above or ☐ below the HAG.

E5. Zone AO only: If no flood depth number is available, is the top of the bottom floor elevated in accordance with the community's floodplain management ordinance? ☐ Yes ☐ No ☐ Unknown The local official must certify this information in Section G.

SECTION F – PROPERTY OWNER (OR OWNER'S AUTHORIZED REPRESENTATIVE) CERTIFICATION

The property owner or owner's authorized representative who completes Sections A, B, and E for Zone A (without BFE) or Zone AO must sign here. *The statements in Sections A, B, and E are correct to the best of my knowledge*

☐ Check here if attachments and describe in the Comments area.

Property Owner or Owner's Authorized Representative Name:

Address:

City: State: ZIP Code:

Telephone: Ext.: Email:

Signature: Date:

Comments:

Form Instructions

ELEVATION CERTIFICATE

IMPORTANT: MUST FOLLOW THE INSTRUCTIONS ON INSTRUCTION PAGES 1-11

Building Street Address (including Apt., Unit, Suite, and/or Bldg. No.) or P.O. Route and Box No.:	**FOR INSURANCE COMPANY USE**
City: _____ State: _____ ZIP Code: _____	Policy Number: _____
	Company NAIC Number: _____

SECTION G – COMMUNITY INFORMATION (RECOMMENDED FOR COMMUNITY OFFICIAL COMPLETION)

The local official who is authorized by law or ordinance to administer the community's floodplain management ordinance can complete Section A, B, C, E, G, or H of this Elevation Certificate. Complete the applicable item(s) and sign below when:

G1. ☐ The information in Section C was taken from other documentation that has been signed and sealed by a licensed surveyor, engineer, or architect who is authorized by state law to certify elevation information. (Indicate the source and date of the elevation data in the Comments area below.)

G2.a. ☐ A local official completed Section E for a building located in Zone A (without a BFE), Zone AO, or Zone AR/AO, or when item E5 is completed for a building located in Zone AO.

G2.b. ☐ A local official completed Section H for insurance purposes.

G3. ☐ In the Comments area of Section G, the local official describes specific corrections to the information in Sections A, B, E and H.

G4. ☐ The following information (Items G5–G11) is provided for community floodplain management purposes.

G5. Permit Number: G6. Date Permit Issued:

G7. Date Certificate of Compliance/Occupancy Issued:

G8. This permit has been issued for: ☐ New Construction ☐ Substantial Improvement

G9.a. Elevation of as-built lowest floor (including basement) of the building: ☐ feet ☐ meters Datum:

G9.b. Elevation of bottom of as-built lowest horizontal structural member: ☐ feet ☐ meters Datum:

G10.a. BFE (or depth in Zone AO) of flooding at the building site: ☐ feet ☐ meters Datum:

G10.b. Community's minimum elevation (or depth in Zone AO) requirement for the lowest floor or lowest horizontal structural member: ☐ feet ☐ meters Datum:

G11. Variance issued? ☐ Yes ☐ No If yes, attach documentation and describe in the Comments area.

The local official who provides information in Section G must sign here. *I have completed the information in Section G and certify that it is correct to the best of my knowledge. If applicable, I have also provided specific corrections in the Comments area of this section.*

Local Official's Name: Title:

NFIP Community Name:

Telephone: Ext.: Email:

Address:

City: State: ZIP Code:

Signature: Date:

Comments (including type of equipment and location, per C2.e; description of any attachments; and corrections to specific information in Sections A, B, D, E, or H):

Form Instructions

ELEVATION CERTIFICATE

IMPORTANT: MUST FOLLOW THE INSTRUCTIONS ON INSTRUCTION PAGES 1-11

Building Street Address (including Apt., Unit, Suite, and/or Bldg. No.) or P.O. Route and Box No.:	**FOR INSURANCE COMPANY USE**
City: _____ State: _____ ZIP Code: _____	Policy Number: _____
	Company NAIC Number: _____

SECTION H – BUILDING'S FIRST FLOOR HEIGHT INFORMATION FOR ALL ZONES (SURVEY NOT REQUIRED) (FOR INSURANCE PURPOSES ONLY)

The property owner, owner's authorized representative, or local floodplain management official may complete Section H for all flood zones to determine the building's first floor height for insurance purposes. Sections A, B, and I must also be completed. Enter heights to the nearest tenth of a foot (nearest tenth of a meter in Puerto Rico). ***Reference the Foundation Type Diagrams (at the end of Section H Instructions) and the appropriate Building Diagrams (at the end of Section I Instructions) to complete this section.***

H1. Provide the height of the top of the floor (as indicated in Foundation Type Diagrams) above the Lowest Adjacent Grade (LAG):

a) **For Building Diagrams 1A, 1B, 3, and 5–8.** Top of bottom floor (include above-grade floors only for buildings with crawlspaces or enclosure floors) is: ☐ feet ☐ meters ☐ above the LAG

b) **For Building Diagrams 2A, 2B, 4, and 6–9.** Top of next higher floor (i.e., the floor above basement, crawlspace, or enclosure floor) is: ☐ feet ☐ meters ☐ above the LAG

H2. Is **all** Machinery and Equipment servicing the building (as listed in Item H2 instructions) elevated to or above the floor indicated by the H2 arrow (shown in the Foundation Type Diagrams at end of Section H instructions) for the appropriate Building Diagram?

☐ Yes ☐ No

SECTION I – PROPERTY OWNER (OR OWNER'S AUTHORIZED REPRESENTATIVE) CERTIFICATION

The property owner or owner's authorized representative who completes Sections A, B, and H must sign here. *The statements in Sections A, B, and H are correct to the best of my knowledge.* **Note:** If the local floodplain management official completed Section H, they should indicate in Item G2.b and sign Section G.

☐ Check here if attachments are provided (including required photos) and describe each attachment in the Comments area.

Property Owner or Owner's Authorized Representative Name:

Address:

City: State: ZIP Code:

Telephone: Ext.: Email:

Signature: Date:

Comments:

Form Instructions

ELEVATION CERTIFICATE

IMPORTANT: MUST FOLLOW THE INSTRUCTIONS ON INSTRUCTION PAGES 1-11

BUILDING PHOTOGRAPHS

See Instructions for Item A6.

Building Street Address (including Apt., Unit, Suite, and/or Bldg. No.) or P.O. Route and Box No.:

City: _____ State: _____ ZIP Code: _____

FOR INSURANCE COMPANY USE

Policy Number: _____

Company NAIC Number: _____

Instructions: Insert below at least two and when possible four photographs showing each side of the building (for example, may only be able to take front and back pictures of townhouses/rowhouses). Identify all photographs with the date taken and "Front View," "Rear View," "Right Side View," or "Left Side View." Photographs must show the foundation. When flood openings are present, include at least one close-up photograph of representative flood openings or vents, as indicated in Sections A8 and A9.

Photo One

Photo One Caption:

Clear Photo One

Photo Two

Photo Two Caption:

Clear Photo Two

Form Instructions

ELEVATION CERTIFICATE

IMPORTANT: MUST FOLLOW THE INSTRUCTIONS ON INSTRUCTION PAGES 1-11

BUILDING PHOTOGRAPHS

Continuation Page

Building Street Address (including Apt., Unit, Suite, and/or Bldg. No.) or P.O. Route and Box No.:

City: _____ State: _____ ZIP Code: _____

FOR INSURANCE COMPANY USE

Policy Number: _____

Company NAIC Number: _____

Insert the third and fourth photographs below. Identify all photographs with the date taken and "Front View," "Rear View," "Right Side View," or "Left Side View." When flood openings are present, include at least one close-up photograph of representative flood openings or vents, as indicated in Sections A8 and A9.

Photo Three

Photo Three Caption: Clear Photo Three

Photo Four

Photo Four Caption: Clear Photo Four

Return to Form

DEPARTMENT OF HOMELAND SECURITY
Federal Emergency Management Agency

INSTRUCTIONS FOR COMPLETING THE ELEVATION CERTIFICATE

The Elevation Certificate is to be completed by a land surveyor, engineer, or architect who is authorized by state law to certify elevation information when elevation information is required or used for Zones A1–A30, AE, AH, AO, A (with Base Flood Elevation (BFE)), VE, V1–V30, V (with BFE), AR, AR/A, AR/AE, AR/A1–A30, AR/AH, AR/AO, or A99.

Community officials who are authorized by law or ordinance to provide floodplain management information (herein referred to as "local floodplain management official") may also complete this form. For Zones AO, AR/AO, and A (without BFE), a local floodplain management official, a property owner, or an owner's authorized representative may provide floodplain management compliance information on this certificate in Section E, unless the elevations are intended for use in supporting a request for a LOMA, CLOMA, LOMR-F, or CLOMR-F. Certified elevations must be included if the purpose of completing the Elevation Certificate is to obtain a LOMA, CLOMA, LOMR-F, or CLOMR-F.

The property owner, the owner's authorized representative, or local floodplain management official can complete Section A and Section B. The partially completed form can then be given to the land surveyor, engineer, or architect to complete Section C. The land surveyor, engineer, or architect should verify the information provided by the property owner or owner's representative to ensure that this certificate is complete.

For insurance purposes only, a local floodplain management official, a property owner, or an owner's authorized representative may provide First Floor Height details in Section H for any zone.

In Puerto Rico only, elevations for building information and flood hazard information may be entered in meters.

Note: Section C can be used for insurance and compliance in any zone; however, Section E can be used only for compliance in Zone AO and Zone A.

SECTION A – PROPERTY INFORMATION

Items A1–A4. This section identifies the building, its location, and its owner. Enter the name(s) of the building owner(s), the building's complete street address or property description (e.g., lot and block numbers or legal description), and/or tax parcel number. If the building's address is different from the owner's address, enter the address of the building being certified. If the address is a rural route or a Post Office box number, enter the lot and block numbers, the tax parcel number, the legal description, or an abbreviated location description based on distance and direction from a fixed point of reference. For the purposes of this certificate, "building" means both a building and a manufactured (mobile) home. For properties with multiple buildings, include a description for the specific building.

A map may be attached to this certificate to show the location of the building on the property. A tax map, Flood Insurance Rate Map (FIRM), or detailed community map is appropriate. If no map is available, provide a sketch of the property location, and the location of the building on the property. Include appropriate landmarks such as nearby roads, intersections, and bodies of water. For building use, indicate whether the building is residential, non-residential, an addition to an existing residential or non- residential building, an accessory building (e.g., garage), or other type of structure. Use the Comments area of the appropriate section if needed, or attach additional comments.

Item A5. Provide latitude and longitude coordinates for the center of the front of the building. Use either decimal degrees (e.g., 39.504322°, −110.758522°) or degrees, minutes, seconds (e.g., 39° 30' 15.56", −110° 45' 30.68") format. If decimal degrees are used, provide coordinates to at least six decimal places or better. When using degrees, minutes, seconds, provide seconds to at least two decimal places or better. Provide the datum of the latitude and longitude coordinates (FEMA prefers the use of NAD 1983). Indicate the method or source used to determine the latitude and longitude in the Comments area of the appropriate section. When the latitude and longitude are provided by a land surveyor, check the "Yes" box in Section D.

Item A6. The certifier must provide at least two and when possible four photographs showing each side of the building taken within 90 days from the date of certification. The photographs must be taken with views confirming the building description and Building Diagram number provided in Item A7. To the extent possible, these photographs should show the entire building including foundation. In addition, when applicable, provide a photograph of the foundation showing a representative example of the flood openings or vents. All photographs must be in color and measure at least 3"×3". Digital photographs are acceptable. Additional photographs may be requested by local floodplain management officials or for insurance purposes to show additional detail regarding the building characteristics or features.

Item A7. Select the Building Diagram (shown on pages 17-19) that best represents the building. Then enter the diagram number and use the diagram to identify and determine the appropriate elevations requested in Items C2.a–h. If you are unsure of the correct diagram, select the diagram that most closely resembles the building being certified.

Item A8.a. Provide the square footage of the crawlspace or enclosure(s) below the lowest elevated floor of an elevated building with or without permanent flood openings. Take the measurement from the outside of the crawlspace or enclosure(s). Examples of elevated buildings constructed with crawlspace and enclosure(s) are shown in Diagrams 6-9 on pages 18-19. Diagram 2A, 2B, 4, or 9 should be used for a building constructed with a crawlspace floor that is below the exterior grade on all sides. If there is no crawlspace or enclosure, enter "N/A" for Items A8.a-f.

Item A8.b. Indicate if there is at least one permanent flood opening within 1.0 foot of the adjacent grade on at least two exterior walls of each enclosed area identified in A8.a. A permanent flood opening is a flood vent or other opening that allows the free passage of water automatically in both directions without human intervention. If the crawlspace or enclosure(s) have no permanent flood openings, or if none of the openings are within 1.0 foot above adjacent grade, enter "0" (zero) in Item A8.c-f. If there is no crawlspace or enclosure, enter "N/A".

SECTION A – PROPERTY INFORMATION *(Continued)*

Item A8.c. Enter the total number of permanent non-engineered and/or engineered flood openings in the crawlspace or enclosure(s) that are no higher than 1.0 foot above the higher of the exterior or interior grade or floor immediately below the opening. If the interior grade elevation is used, note this in the Comments area of Section D.

Item A8.d. Enter the total measured net open area of permanent non-engineered flood openings indicated in A8.c in square inches, excluding any bars, louvers, or other covers of the permanent flood openings. Non-engineered openings that meet the requirements of NFIP Technical Bulletin 1 are assumed to provide one square foot of rated area for each square inch of net open area. If the net open area cannot be measured, provide in the Comments area of the appropriate section the size of the flood openings without consideration of any covers and indicate the type of cover that exists in the flood openings.

Item A8.e. Enter the total rated area of the permanent engineered flood openings indicated in A8.c, in square feet. Attach a copy of the Individual Engineered Flood Openings Certification for a specific building or an Evaluation Report issued by the International Code Council Evaluation Service (ICC ES) for all engineered openings, and indicate the manufacturer's name and model number in the Comments area of the appropriate section, if applicable. Flood openings cannot be considered engineered flood openings without documentation. If no documentation is available/ provided, enter the net open (unobstructed) area of the flood openings in A8.d instead.

Item A8.f. Complete only if permanent engineered and permanent non-engineered flood openings are both present. Enter the sum of A8.d (net open area of all non-engineered openings) and A8.e (total rated area of all engineered openings). Non-engineered openings that meet the requirements of NFIP Technical Bulletin 1 are assumed to provide one square foot of rated area for each square inch of net open area. For example, a non-engineered opening with 140 sq. in. of net open area (i.e., rated for 140 sq. ft. of enclosure area), combined with two (2) engineered openings rated for 200 sq. ft. each, would yield 140 + 400 = 540 sq. ft. rated area. If either A8.d or A8.e is "0", then enter "N/A" for A8.f.

Item A9.a. Provide the square footage of the attached garage with or without permanent flood openings. Take the measurement from the outside of the garage. If there is no attached garage, enter "N/A" for items A9.a-f.

Item A9.b. Indicate if there is at least one permanent flood opening within 1.0 foot of the adjacent grade on at least two exterior walls of the attached garage identified in A9.a. If the attached garage has no permanent flood openings, or if none of the openings are within 1.0 foot above adjacent grade, enter "0" (zero) in Items A9.c-f. If there is no attached garage, enter "N/A".

Item A9.c. Enter the total number of permanent non-engineered and/or engineered flood openings in the attached garage that are no higher than 1.0 foot above the higher of the exterior or interior grade or floor immediately below the opening. This includes any openings that are in the garage door that are no higher than 1.0 foot above the adjacent grade. If the interior grade elevation is used, note this in the Comments area of Section D.

Item A9.d. Enter the total measured net open area of permanent non-engineered flood openings indicated in A9.c in square inches, excluding any bars, louvers, or other covers of the permanent flood openings, and enter the total in Item A9.d. Non-engineered openings that meet the requirements of NFIP Technical Bulletin 1 are assumed to provide one square foot of rated area for each square inch of net open area. If the net open area cannot be measured, provide in the Comments area of the appropriate section the size of the flood openings without consideration of any covers and indicate the type of cover that exists in the flood openings.

Item A9.e. Enter the total rated area of the permanent engineered flood openings indicated in A9.c in square feet. Attach a copy of the Individual Engineered Flood Openings Certification for a specific building or an Evaluation Report issued by the ICC ES for all engineered openings, and indicate the manufacturer's name and model number in the Comments area of the appropriate section, if applicable. Flood openings cannot be considered engineered flood openings without documentation. If no documentation is available/provided, enter the net open (unobstructed) area of the flood openings in A9.d instead.

Item A9.f. Complete only if permanent engineered and permanent non-engineered flood openings are both present. Enter the sum of A9.d (net open area of all non-engineered openings) and A9.e (total rated area of all engineered openings). Non-engineered openings that meet the requirements of NFIP Technical Bulletin 1 are assumed to provide one square foot of rated area for each square inch of net open area. For example, a non-engineered opening with 140 sq. in. of net open area (i.e., rated for 140 sq. ft. of enclosure area), combined with two (2) engineered openings rated for 200 sq. ft. each, would yield 140 + 400 = 540 sq. ft. rated area. If either A9.d or A9.e is "0", then enter "N/A" for A9.f.

SECTION B – FLOOD INSURANCE RATE MAP (FIRM) INFORMATION

Complete the Elevation Certificate using the Flood Insurance Study (FIS) and FIRM in effect at the time of the certification.

The information for Section B is obtained by reviewing the FIS and the FIRM panel that includes the building's location. Information about the current FIS and FIRM is available from FEMA by visiting msc.fema.gov or contacting the local floodplain management official. If a Letter of Map Amendment (LOMA), Letter of Map Revision Based on Fill (LOMR-F), or Letter of Map Revision (LOMR) has been issued by FEMA, please provide the letter date and case number in the Comments area of Section D or Section G, as appropriate.

For a building in an area that was mapped in one community but is now in another community due to annexation or dissolution, enter the community name and six-digit Community Identification Number of the community in which the building is now located in Items B1.a and B1.b; the name of the county or new county, if necessary, in Item B2; and the FIRM index date for the community identified in B1.a, in Item B6. Enter information from the actual FIRM panel that shows the building location, even if it is the FIRM for the previous jurisdiction, in Items B4, B5, B7, B8, and B9.

If the map in effect at the time of the building's construction was other than the current FIRM, and you have the past map information pertaining to the building, provide the information in the Comments area of Section D.

Note: Indicate in the Comments area of Section D if using information based on best available data, such as base-level engineering or advisory flood hazard data (contact the local floodplain management official to confirm).

SECTION B – FLOOD INSURANCE RATE MAP (FIRM) INFORMATION *(Continued)*

Items B1.a–b NFIP Community Name and Community Identification Number. Enter the complete name of the community in which the building is located in B1.a, and the associated six-digit Community Identification Number in B1.b. For an unincorporated area of a county, enter the county name and "unincorporated area", and the six-digit number of the county. For a newly incorporated community, use the name and six-digit number of the new community. Under the NFIP, a "community" is any state or area or political subdivision thereof, or any Indian tribe or authorized native organization which has authority to adopt and enforce floodplain management regulations for the areas within its jurisdiction. To determine the current community number, see the NFIP *Community Status Book*, available on FEMA's website at www.fema.gov/national-flood-insurance-program-community-status-book.

Item B2. County Name. Enter the name of the county or counties in which the community is located. For an unincorporated area of a county, enter the county name. For an independent city, enter "independent city."

Item B3. State. Enter the two-letter state abbreviation (for example, VA, TX, CA).

Items B4–B5. Map/Panel Number and Suffix. Enter the 10-character "Map Number" or "Community Panel Number" shown on the FIRM where the building or manufactured (mobile) home is located. For maps in a county-wide format, the sixth character of the "Map Number" is the letter "C" followed by a four-digit map number. For maps not in a county-wide format, enter the "Community Panel Number" shown on the FIRM.

Item B6. FIRM Index Date. Enter the effective date or the map revised date shown on the FIRM Index.

Item B7. FIRM Panel Effective/Revised Date. Enter the effective date shown on the current FIRM panel. The current FIRM panel effective date can be determined by visiting msc.fema.gov or contacting the local floodplain management official. If the area where the building is located was revised by a LOMR, include the LOMR effective date and the LOMR case number in the comments area of Section D.

Item B8. Flood Zone(s). Enter the flood zone, or flood zones, in which the building is located. All flood zones containing the letter "A" or "V" are considered Special Flood Hazard Areas (SFHAs). Each flood zone is defined in the legend of the FIRM panel on which it appears. If the area where the building is located was revised by a LOMA, CLOMA, LOMR-F, or CLOMR-F, include the flood zone shown on the LOMA, CLOMA, LOMR-F, or CLOMR-F, and add the effective date and case number in the comments area of Section D.

Item B9. Base Flood Elevation(s) (BFE). Using the appropriate Flood Insurance Study (FIS) Profile, FIS Data Table (e.g. Transect, Floodway, etc.), or FIRM panel, locate the property and enter the BFE (or base flood depth) of the building site to the nearest tenth of a foot (nearest tenth of a meter, in Puerto Rico). If the building is located in more than one flood zone in Item B8, list all appropriate BFEs in Item B9.

BFEs are shown in the FIS or on a FIRM for Zones A1–A30, AE, AH, V1–V30, VE, AR, AR/A, AR/AE, AR/A1–A30, and AR/AH; base flood depths are shown for Zones AO and AR/AO. Use the AR BFE (or base flood depth) if the building is located in any of these zones: AR/A, AR/AE, AR/A1–A30, AR/AH, or AR/AO.

In A or V zones where BFEs are not provided in the FIS or on the FIRM, BFEs may be available from another source. For example, the community may have established BFEs or obtained BFE data from other sources (e.g., Base Level Engineering) for the building site. For subdivisions and other developments of more than 50 lots or 5 acres in Zone A, establishment of BFEs is required by the community's floodplain management ordinance. If a BFE is obtained from another source, enter the BFE in Item B9. The BFE entered in Item B9 must be based on hydrologic and hydraulic analyses. In an A Zone where BFEs are not obtained from another source, enter N/A in Item B9 and complete Section E.

Item B10. Indicate the source of the BFE or base flood depth that you entered in Item B9. If the BFE is from a source other than the FIS, FIRM, or community, include the name of the study, the agency or company that produced it, and the date when the study was completed. Visit msc.fema.gov or contact the local floodplain management official to access the current FIS and FIRM.

Item B11. Indicate the elevation datum to which the elevations on the applicable FIRM are referenced as shown on the map legend. The vertical datum is shown in the Map Legend and/or the Notes to Users on the FIRM.

Item B12. Indicate whether the building is located in a Coastal Barrier Resources System (CBRS) area or Otherwise Protected Area (OPA). OPAs are portions of coastal barriers that are owned by Federal, State, or local governments or by certain non-profit organizations and used primarily for natural resources protection. CBRS areas and OPAs are no longer shown on the FIRM; please use the maps available at www.fws.gov/cbra/maps/index.html to complete Item B12. Federal flood insurance is prohibited in designated CBRS areas or OPAs for buildings or manufactured (mobile) homes built or substantially improved after the date of the CBRS or OPA designation. For the first CBRS designations, that date is October 1, 1983. Information about CBRS areas and OPAs may be obtained on the FEMA website at www.fema.gov/national-flood-insurance-program/coastal-barrier-resources-system.

Item B13. Indicate whether the building is located seaward of the Limit of Moderate Wave Action (LiMWA). If the LiMWA is not shown on the FIRM, check the "No" box. Information about the LiMWA and other coastal flood zones may be obtained on the FEMA website at www.fema.gov/flood-maps/coastal/insurance-rate-maps.

SECTION C – BUILDING ELEVATION INFORMATION (SURVEY REQUIRED)

Complete Section C if the building is located in any of Zones A1–A30, AE, AH, A (with BFE), VE, V1–V30, V (with BFE), AR, AR/A, AR/AE, AR/A1–A30, AR/AH, or A99. If the Certificate is being completed to demonstrate compliance with local floodplain management requirements, contact the local floodplain management official to find out any additional requirements. Section C may also be completed for insurance purposes to determine the building's First Floor Height in any flood zone (including Zones AO, AR/AO, B, C, X and D). In addition, complete Section C if this certificate is being used to support a request for a LOMA, CLOMA, LOMR-F, or CLOMR-F.

To ensure that all required elevations are obtained, it may be necessary to physically enter the building (for instance, if the building has a basement or sunken living room, split-level construction, or Machinery and Equipment (M&E)).

SECTION C – BUILDING ELEVATION INFORMATION (SURVEY REQUIRED) *(Continued)*

Land surveyors may not be able to gain access to some crawlspaces to shoot the elevation of the crawlspace floor. If access to the crawlspace is limited or cannot be gained, follow one of these procedures.

- Use a yardstick or tape measure to measure the height from the floor of the crawlspace to the "next higher floor," and then subtract the crawlspace height from the elevation of the "next higher floor." If there is no access to the crawlspace, use the exterior grade next to the structure to measure the height of the crawlspace to the "next higher floor."
- Contact the local floodplain management official of the community in which the building is located. The community may have documentation of the elevation of the crawlspace floor as part of the permit issued for the building.
- If the property owner has documentation or knows the height of the crawlspace floor to the next higher floor, try to verify this by looking inside the crawlspace through any openings or vents.

In all three cases, use the Comments area of Section D to provide the elevation and a brief description of how the elevation was obtained.

Note: If any item does not apply to the building, enter "N/A" for not applicable.

Item C1. Indicate whether the elevations to be entered in this section are based on construction drawings, a building under construction, or finished construction. For either of the first two choices, a post-construction Elevation Certificate will be required when construction is complete. If the building is under construction, include only those elevations that can be surveyed in Items C2.a–h. Use the Comments area of Section D to provide elevations obtained from the construction plans or drawings. Select "Finished Construction" only when all M&E such as furnaces, water heaters, heat pumps, air conditioners, and elevators and their associated equipment have been installed and the grading around the building is completed.

Item C2. A field survey is required for Items C2.a–h. Most control networks will assign a unique identifier for each benchmark. For example, the National Geodetic Survey uses the Permanent Identifier (PID). For the benchmark utilized, provide the PID or other unique identifier assigned by the maintainer of the benchmark. For GPS survey, indicate the benchmark used for the base station, the Continuously Operating Reference Stations (CORS) sites used for an Online Positioning User Service (OPUS) solution (also attach the OPUS report), or the name of the Real Time Network used.

Also provide the vertical datum for the benchmark elevation. All elevations for the certificate, including the elevations for Items C2.a–h, must use the same datum on which the BFE is based. Show the conversion from the field survey datum used if it differs from the datum used for the BFE entered in Item B9 and indicate the conversion software used. Show the datum conversion, if applicable, in the Comments area of Section D.

For property experiencing ground subsidence, the most recent reference mark elevations must be used for determining building elevations. However, when subsidence is involved, the BFE should not be adjusted.

Note: Enter elevations in Items C2.a–h to the nearest tenth of a foot (nearest tenth of a meter, in Puerto Rico); if data is surveyed to the nearest hundredth, round to the nearest tenth.

Item C2.a. Enter the elevation measured at the top of the bottom floor (excluding the attached garage) indicated by the selected Building Diagram (Item A7). For buildings elevated on a crawlspace, Building Diagrams 8 and 9, enter the lowest elevation of the top of the crawlspace floor in Item C2.a, whether or not the crawlspace has permanent flood openings (flood vents).

Item C2.b. For Building Diagrams 2A through 9 in any flood zone, including Zones B, C, X, and D, enter the elevation measured at the top of the next higher floor (excluding the attached garage) indicated by the selected Building Diagram (Item A7). For buildings requiring more than two floors or levels to be surveyed, such as those with multiple floors or multi-level enclosures, enter the additional surveyed elevations and floor descriptions in the Section D Comments, and clarify which floors are entered as Item C2.a and C2.b.

Item C2.c. For floodplain management compliance, this elevation is required for all Building Diagrams 5 and 6 in V Zones in areas seaward of the LiMWA, and in other areas regulated for coastal flooding hazards. Enter the elevation measured at the bottom of the lowest horizontal structural member of the floor indicated by the selected Building Diagram (Item A7) or the figure below. This elevation can be entered for Building Diagrams 5 and 6 in any flood zone, including Zones B, C, X, and D. For Building Diagrams other than 5 and 6 (if applicable), enter the C2.c elevation as indicated in the figure below. *If this item does not apply to the building, enter "N/A" for not applicable.*

Item C2.d. If there is an attached garage, enter the lowest elevation for top of attached garage slab. (Because elevation for top of attached garage slab is self-explanatory, attached garages are not illustrated in the Building Diagrams.)

Item C2.e. Enter the lowest platform, floor, or ground elevation supporting the lowest electrical, heating, ventilation, plumbing, and air conditioning M&E and other utilities servicing the building, which may be located in an attached garage or enclosure or on an open utility platform. Note that elevations for the M&E items are required regardless of their location. Local floodplain management officials are required to ensure that ***all*** new M&E servicing the building are protected from flooding. Thus, local officials may require that elevation information for all M&E, including ductwork, be documented on the Elevation Certificate. If the M&E is mounted to a wall, pile, etc., enter the platform elevation of the M&E. Indicate the lowest M&E type and its general location (e.g., on floor inside garage, on platform affixed to exterior wall) in the Comments area of Section D or Section G, as appropriate.

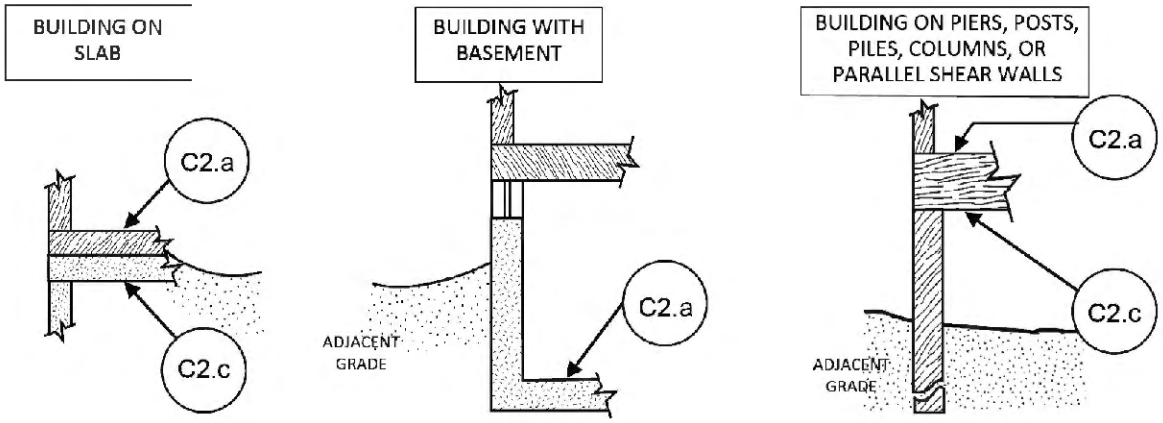
Note: For more guidance on floodplain management compliance for utilities, including M&E, refer to FEMA P-348, *Protecting Building Utility Systems from Flood Damage*. The list of M&E and the elevation requirements for documenting floodplain management compliance are different than the NFIP insurance M&E discount eligibility considerations. See Section H Instructions for additional information.

SECTION C – BUILDING ELEVATION INFORMATION (SURVEY REQUIRED) *(Continued)*

Item C2.f. Enter the finished Lowest Adjacent Grade (LAG) elevation of the ground, sidewalk, or patio slab next to and in direct contact with the building. For a building in Zone AO, use the natural grade elevation, if available. Indicate whether the natural or finished grade was used. If natural grade was used, attach the source of the information (e.g., a grading plan). For buildings under construction in any flood zone, enter the LAG elevation at the time of the survey. **Note:** Natural grade means the undisturbed natural surface of the ground prior to any excavation or fill.

Item C2.g. Enter the finished Highest Adjacent Grade (HAG) elevation of the ground, sidewalk, or patio slab next to and in direct contact with the building. For a building in Zone AO, use the natural grade elevation if available. Indicate whether the natural or finished grade was used. If natural grade was used, attach the source of the information (e.g., a grading plan). For buildings under construction in any flood zone, enter the HAG elevation at the time of the survey.

Item C2.h. Enter the finished LAG elevation of the lowest ground, sidewalk, or patio slab next to and in direct contact with the structurally-attached-deck supports or stairs structurally attached to the building. For buildings under construction in any flood zone, enter the lowest LAG at the time of the survey.



Figures for use in determining Item C2.c

SECTION D – SURVEYOR, ENGINEER, OR ARCHITECT CERTIFICATION

This section of the Elevation Certificate may be signed by only a land surveyor, engineer, or architect who is authorized by state law to certify elevation information. Complete as indicated and place your license number, your seal (as allowed by the state licensing board), your signature, and the date in Section D. You are certifying that the information on this certificate represents your best efforts to interpret the data available and that you understand that any false statement may be punishable by fine or imprisonment under 18 U.S. Code, Section 1001. Use the Comments area of Section D to provide relevant and clarifying information not specified elsewhere on the certificate, including supporting information for latitude/longitude source for A5; openings for A8/A9; LOMR data for Section B; BFE and BFE source data for B9/B10; datum conversion for C2; grading plan for natural grade used in C2.f-g; machinery type and location for C2.e; and any other relevant information identified in the instructions or needed for clarification. If attachments are included, check the attachments box and describe the attachments in the Comments area. Attach separate sheet if additional space is needed for comments.

SECTION E – BUILDING MEASUREMENT INFORMATION (SURVEY NOT REQUIRED) FOR ZONE AO, ZONE AR/AO, AND ZONE A (WITHOUT BFE)

Complete Section E if the building is located in Zone AO, Zone AR/AO, or Zone A (without BFE) and the Certificate is being completed for the purpose of documenting compliance with local floodplain management requirements. If the Certificate is being completed to document compliance in other flood zones, including Zone A (with BFE), to support a LOMA, CLOMA, LOMR-F, or CLOMR-F request, or to provide a ground elevation for flood insurance rating, complete Section C instead of Section E. Explain in the Section F Comments area if the measurement provided under Items E1–E4 is not based on the "natural grade." Natural grade means the undisturbed natural surface of the ground prior to any excavation or fill.

Indicate whether the measurements to be entered in this section are based on construction drawings, a building under construction, or finished construction. For either of the first two choices, a post-construction Elevation Certificate will be required when construction is complete. If the building is under construction, include only those measurements that can be determined in Items E1–E4. Use the Comments area of Section F to provide measurements obtained from the construction plans or drawings. Select "Finished Construction" only when all Machinery and Equipment (M&E) such as furnaces, water heaters, heat pumps, air conditioners, and elevators and their associated equipment have been installed and the grading around the building is completed.

Note: Enter heights in Items E1–E4 to the nearest tenth of a foot (nearest tenth of a meter, in Puerto Rico).

Items E1.a and b. Enter in Item E1.a the height of the top of the bottom floor (as indicated by C2.a in the selected Building Diagram, Item A7) above or below the natural HAG. Enter in Item E1.b the height of the top of the bottom floor (as indicated by C2.a in the selected Building Diagram, Item A7) above or below the natural LAG. For buildings in Zone AO, the community's floodplain management ordinance requires the lowest floor of the building be elevated above the HAG at least as high as the base flood depth on the FIRM.

SECTION E – BUILDING MEASUREMENT INFORMATION (SURVEY NOT REQUIRED) FOR ZONE AO AND ZONE A (WITHOUT BFE) *(Continued)*

Item E2. For Building Diagrams 6–9 with permanent flood openings (see pages 18–19), enter the height of the next higher floor or elevated floor (as indicated by C2.b in the selected Building Diagram, Item A7) above or below the HAG.

Item E3. Enter the height, in relation to the HAG next to the building, for the top of attached garage slab. (Because elevation for top of attached garage slab is self-explanatory, attached garages are not illustrated in the diagrams.) *If this item does not apply to the building, enter "N/A" for not applicable.*

Item E4. Enter the height, in relation to the HAG next to the building, of the platform elevation that supports the M&E servicing the building. See Item C2.e for additional details on M&E. Indicate the M&E type in the Comments area of Section F.

Item E5. For those communities where this base flood depth is not available, the community will need to determine whether the top of the bottom floor is elevated in accordance with the community's floodplain management ordinance.

SECTION F – PROPERTY OWNER (OR OWNER'S AUTHORIZED REPRESENTATIVE) CERTIFICATION

Complete as indicated. This section is provided for certification of measurements when completing Sections A, B, and E. If Section E is completed by a property owner or property owner's authorized representative in Zone AO, AR/AO, or A (without BFE), then the community should confirm the heights in Section E to ensure compliance with community floodplain management ordinances. If Section E is completed by a local floodplain management official, then complete Item G2.a and Section G instead of Section F. The address entered in this section must be the actual mailing address of the individual who provided the information on the certificate. Check the box as indicated if including attachments and describe in the Comments area.

SECTION G – COMMUNITY INFORMATION (RECOMMENDED FOR COMMUNITY OFFICIAL COMPLETION)

The community official who is authorized by law or ordinance to administer the community's floodplain management ordinance can complete Sections A, B, C, E, G or H of this Elevation Certificate and sign this section. Section C may be completed by the local official per the instructions below for Item G1.

Item G1. Check if Section C is completed with elevation data from other documentation that has been signed and sealed by a licensed land surveyor, engineer, or architect who is authorized by state law to certify elevation information. Indicate the source of the elevation data and the date obtained in the Comments area of Section G. If you are both a community official and a licensed land surveyor, engineer, or architect authorized by state law to certify elevation information, and you performed the actual survey for a building in any flood zones (including Zones A99, B, C, X and D), you must also complete Section D.

Item G2.a. Check if information is entered in Section E by the community for a building in Zone A (without a BFE), Zone AO, or Zone AR/AO, or when the community certifies Item E5 for a building in Zone AO.

Item G2.b. Check if information is entered in Section H by the community for insurance purposes.

Item G3. Check if the community official is correcting information provided in Sections A, B, E and H. Describe corrections in the Comments area of Section G.

Item G4. Check if the information in Items G5–G11 has been completed for community floodplain management purposes to document the as-built lowest floor elevation of the building. Section C of the Elevation Certificate records the elevation of various building components but does not determine the lowest floor of the building or whether the building, as constructed, complies with the community's floodplain management ordinance. This must be done by the community. Items G5–G11 provide a way to document these determinations.

Item G5. Permit Number. Enter the permit number or other identifier to key the Elevation Certificate to the permit issued for the building.

Item G6. Date Permit Issued. Enter the date the permit was issued for the building.

Item G7. Date Certificate of Compliance/Occupancy Issued. Enter the date that the Certificate of Compliance or Occupancy or similar written official documentation of as-built lowest floor elevation was issued by the community as evidence that all work authorized by the floodplain development permit has been completed in accordance with the community's floodplain management laws or ordinances.

Item G8. New Construction or Substantial Improvement. Check the applicable box. "Substantial Improvement" means any reconstruction, rehabilitation, addition, or other improvement of a building, the cost of which equals or exceeds 50 percent of the market value of the building before the start of construction of the improvement (or meets the community's more restrictive standards, if applicable). The term includes buildings that have incurred substantial damage, regardless of the actual repair work performed.

Item G9.a. As-built lowest floor elevation. Enter the elevation of the lowest floor (including basement) when the construction of the building is completed and a final inspection has been made to confirm that the building is built in accordance with the permit, the approved plans, and the community's floodplain management laws or ordinances. Indicate the elevation datum used.

Item G9.b. As-built lowest horizontal structural member. Enter the elevation measured at the bottom of the lowest horizontal structural member of the floor indicated by the selected Building Diagram (Item A7) or in the figure at the end of the instructions for Section C. Indicate the elevation datum used.

SECTION G – COMMUNITY INFORMATION (RECOMMENDED FOR COMMUNITY OFFICIAL COMPLETION) *(Continued)*

Item G10.a. BFE. Using the appropriate FIRM panel, FIS, or other data source, locate the property and enter the BFE (or base flood depth) of the building site. Indicate the elevation datum used.

Item G10.b. Community's minimum elevation or depth requirement. Enter the elevation (including freeboard above the BFE) to which the community requires the lowest floor or the lowest horizontal structural member to be elevated. Indicate the elevation datum used.

Item G11. Indicate Yes if a variance from the floodplain management regulations (Title 44 CFR § 60.6) has been issued for the building, attach the supporting documentation, and describe the attachment in the Comments area of this section. If no such variance has been issued, indicate No.

Enter your name, title, and telephone number, and the name of the community and add any comments. Sign and enter the date in the appropriate blanks.

SECTION H – BUILDING'S FIRST FLOOR HEIGHT INFORMATION FOR ALL ZONES (SURVEY NOT REQUIRED) (FOR INSURANCE PURPOSES ONLY)

In any flood zone the property owner, owner's authorized representative, or local floodplain management official may complete this certificate for rating purposes to determine the building's first floor height and identify the elevation of Machinery and Equipment (M&E) servicing the building. Sections A, B, and I must also be completed.

Note: If Sections C and/or E and H are all completed, then information in Section C will prevail for insurance purposes and for compliance.

Item H1.a. For Building Diagrams 1A, 1B, 3, and 5–8 shown on pages 17–19, enter in Item H1.a the height to the nearest tenth of a foot (tenth of a meter in Puerto Rico) of the top of the bottom floor (as indicated in the selected Building Diagram, Item A7) above the LAG. Refer to the arrows on the Foundation Type Diagrams on page 16 that indicate which floor to use to determine the height for Item H1.a.

Item H1.b. For Building Diagrams 2A, 2B, 4, and 6–9 shown on pages 17–19, enter in Item H1.b the height to the nearest tenth of a foot (tenth of a meter in Puerto Rico) of the top of the next higher floor or elevated floor (as indicated in the selected Building Diagram, Item A7) above the LAG. Refer to the arrows on the Foundation Type Diagrams on page 16 that indicate which floor to use to determine the height for Item H1.b.

Note: The LAG is the lowest point of the ground level immediately next to a building.

Item H2. Indicate "Yes" if ***all*** of the following M&E servicing the building, inside or outside the building, are elevated to at least the height of the location shown by the H2 arrow in the Foundation Type Diagrams on page 16: central air conditioner (including exterior compressor), furnace, heat pump (including exterior compressor), water heater, and elevator M&E. For contents-only insurance coverage, ***all*** of the following appliances will need to be elevated to at least the height of the location shown by the H2 arrow in the Foundation Type Diagrams below: clothes washers and dryers and food freezers.

Note: For both building and contents coverage, ***all*** of the M&E and appliances listed above must be elevated per the Foundation Type Diagrams on page 16 to be considered for the M&E mitigation discount.

Indicate "No" if any of the M&E listed above is not elevated to at least the height of the location shown by the H2 arrow in the Foundation Type Diagrams on page 16.

The diagrams on the following page illustrate the six NFIP Foundation Type Diagrams. Each foundation type corresponds with one or more of the eleven Building Diagrams shown at the end of this Elevation Certificate. The arrows on the diagrams indicate which floor to use to determine H1.a and H1.b The arrows marked as H2 show the minimum elevation required to be eligible for the M&E mitigation discount.

SECTION I – PROPERTY OWNER (OR OWNER'S AUTHORIZED REPRESENTATIVE) CERTIFICATION

Complete as indicated. This section is provided for certification of measurements when completing Sections A, B, and H. If Section H is completed by a local floodplain management official, then complete Item G2.b and Section G instead of Section I. The address entered in this section must be the actual mailing address of the individual who provided the information on the certificate.

Check the box as indicated if including attachments (e.g., required photos) and describe in the Comments area.

Foundation Type Diagrams (for use in Section H):

Slab on Grade (Non-Elevated)

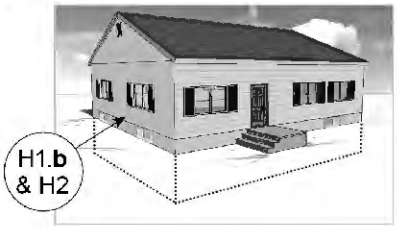
Corresponds to EC Diagrams 1A, 1B and 3

Note: If the building has more than one floor, the Machinery and Equipment should be on the second floor or higher.

Elevated without Enclosure on Posts, Piles, or Piers

Corresponds to EC Diagram 5

Basement (Non-Elevated)



Corresponds to EC Diagrams 2A, 2B and 4

Elevated with Enclosure on Posts, Piles, or Piers

Corresponds to EC Diagram 6

Crawlspace (Elevated, including Non-Elevated Sub-Grade Crawlspace)

Corresponds to EC Diagrams 8 and 9

Elevated with Enclosure Not on Posts, Piles, or Piers (Solid Foundation Walls)

Corresponds to EC Diagram 7

BUILDING DIAGRAMS

The following diagrams illustrate various types of buildings. Compare the features of the building being certified with the features shown in the diagrams and select the diagram most applicable. Enter the diagram number in Item A7, the square footage of crawlspace or enclosure(s) and the area of flood openings as indicated in Items A8.a–f, the square footage of attached garage and the area of flood openings as indicated in Items A9.a–f, and the elevations in Items C2.a–h.

In A, B, C, X and D zones, the floor elevation is taken at the top finished surface of the floor indicated; in V zones, areas seaward of the LiMWA, and in other areas regulated for coastal flooding hazards, the floor elevation is taken at the bottom of the lowest horizontal structural member (see figure at end of instructions for Section C).

DIAGRAM 1A:

All slab-on-grade single- and multiple-floor buildings (other than split-level) and high-rise buildings, either detached or row type (e.g., townhouses); with or without attached garage.

Distinguishing Feature – The bottom floor is at or above ground level (grade) on at least one side.*

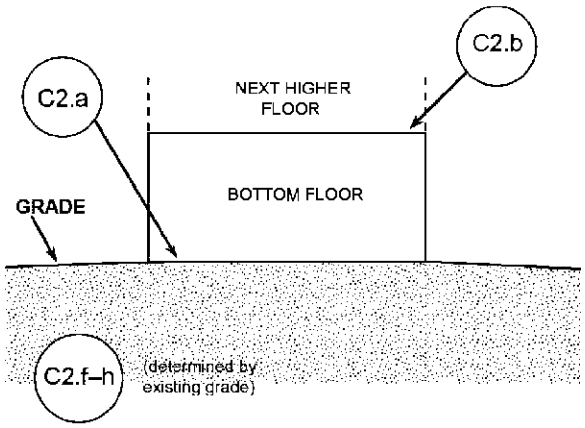


DIAGRAM 1B:

All raised-slab-on-grade or slab-on-stem-wall-with-fill single- and multiple-floor buildings (other than split- level), either detached or row type (e.g., townhouses); with or without attached garage.

Distinguishing Feature – The bottom floor is at or above ground level (grade) on at least one side.*

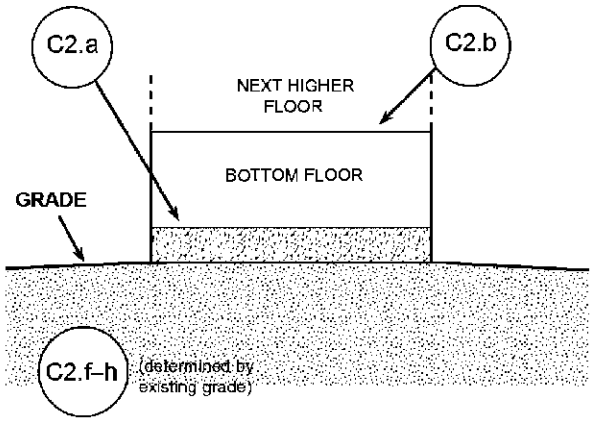


DIAGRAM 2A:

All single- and multiple-floor buildings with basement (other than split-level) and high-rise buildings with basement, either detached or row type (e.g., townhouses); with or without attached garage.

Distinguishing Feature – The bottom floor (basement or underground garage) is below ground level (grade) on all sides.*

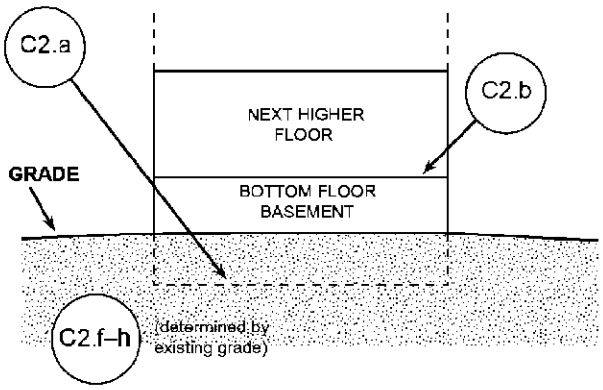
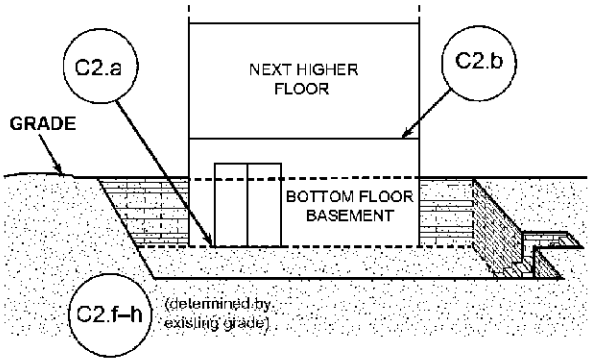


DIAGRAM 2B:

All single- and multiple-floor buildings with basement (other than split-level) and high-rise buildings with basement, either detached or row type (e.g., townhouses); with or without attached garage.

Distinguishing Feature – The bottom floor (basement or underground garage) is below ground level (grade) on all sides; most of the height of the walls is below ground level on all sides; and the door and area of egress are also below ground level on all sides.*



* A floor that is below ground level (grade) on all sides is considered a basement even if the floor is used for living purposes, or as an office, garage, workshop, etc.

BUILDING DIAGRAMS

DIAGRAM 3:

All split-level buildings that are slab-on-grade, either detached or row type (e.g., townhouses); with or without attached garage.

Distinguishing Feature – The bottom floor (excluding garage) is at or above ground level (grade) on at least one side.*

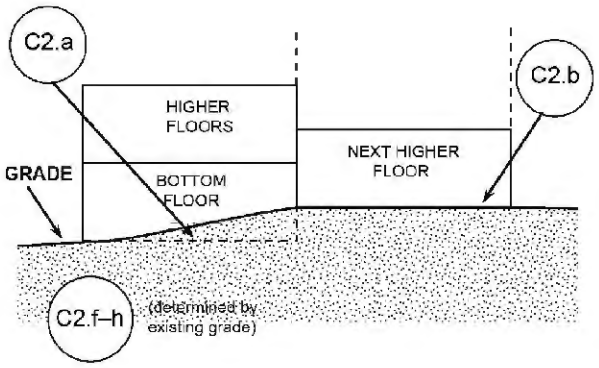


DIAGRAM 4:

All split-level buildings (other than slab-on-grade), either detached or row type (e.g., townhouses); with or without attached garage.

Distinguishing Feature – The bottom floor (basement or underground garage) is below ground level (grade) on all sides.*

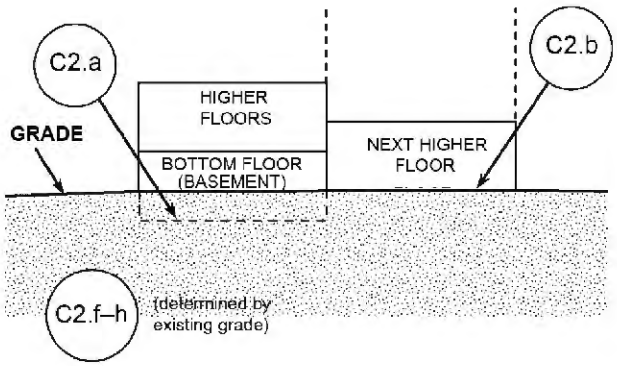


DIAGRAM 5:

All buildings elevated on piers, posts, piles, columns, or parallel shear walls. No obstructions below the elevated floor.

Distinguishing Feature – For all zones, the area below the elevated floor is open, with no obstruction to flow of floodwaters (open lattice work and/or insect screening is permissible).

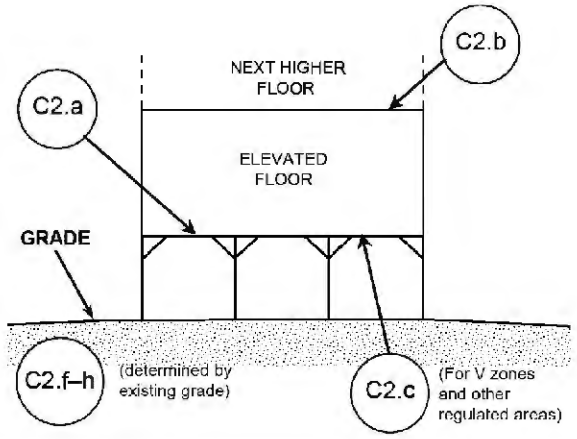
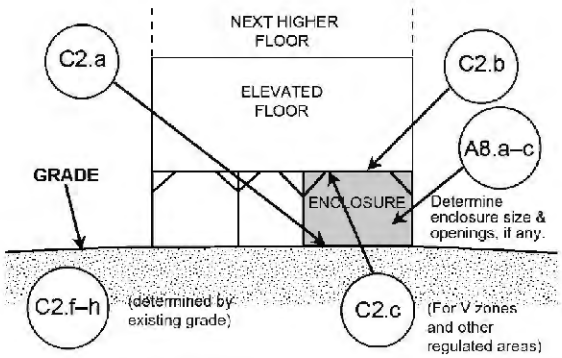


DIAGRAM 6:

All buildings elevated on piers, posts, piles, columns, or parallel shear walls with full or partial enclosure below the elevated floor.

Distinguishing Feature – For all zones, the area below the elevated floor is enclosed, either partially or fully. In A Zones, the partially or fully enclosed area below the elevated floor is with or without openings** present in the walls of the enclosure. Indicate information about enclosure size and openings in Section A - Property Information.



* A floor that is below ground level (grade) on all sides is considered a basement even if the floor is used for living purposes, or as an office, garage, workshop, etc.

** An "opening" is a permanent opening that allows for the free passage of water automatically in both directions without human intervention. Under the NFIP, a minimum of two openings is required for enclosures or crawlspaces. The openings shall provide a total net area of not less than one square inch for every square foot of area enclosed, excluding any bars, louvers, or other covers of the opening. Alternatively, an Individual Engineered Flood Openings Certification or an Evaluation Report issued by the ICC ES must be submitted to document that the design of the openings will allow for the automatic equalization of hydrostatic flood forces on exterior walls. A window, a door, or a garage door is not considered an opening; openings may be installed in doors. Openings shall be on at least two sides of the enclosed area. If a building has more than one enclosed area, each area must have openings to allow floodwater to directly enter. The bottom of the openings must be no higher than 1.0 foot above the higher of the exterior or interior grade or floor immediately below the opening. For more guidance on openings, see NFIP Technical Bulletin 1.

BUILDING DIAGRAMS

DIAGRAM 7:

All buildings elevated on full-story foundation walls with a partially or fully enclosed area below the elevated floor. This includes walkout levels, where at least one side is at or above grade. The principal use of this building is located in the elevated floors of the building.

Distinguishing Feature – For all zones, the area below the elevated floor is enclosed, either partially or fully. In A Zones, the partially or fully enclosed area below the elevated floor is with or without openings** present in the walls of the enclosure. Indicate information about enclosure size and openings in Section A - Property Information.

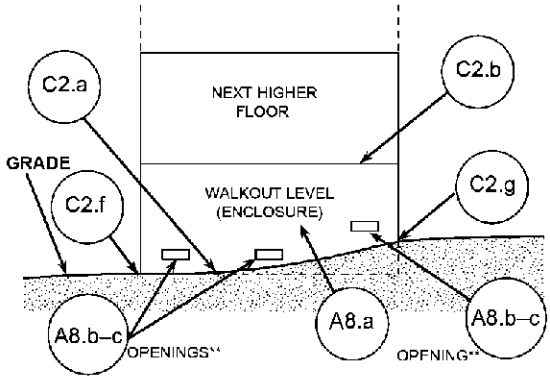


DIAGRAM 8:

All buildings elevated on a crawlspace with the floor of the crawlspace at or above grade on at least one side, with or without an attached garage.

Distinguishing Feature – For all zones, the area below the first floor is enclosed by solid or partial perimeter walls. In all A zones, the crawlspace is with or without openings** present in the walls of the crawlspace. Indicate information about crawlspace size and openings in Section A - Property Information. (If the distance from the crawlspace floor to the top of the next higher floor is more than 5 feet, use Diagram 7.)

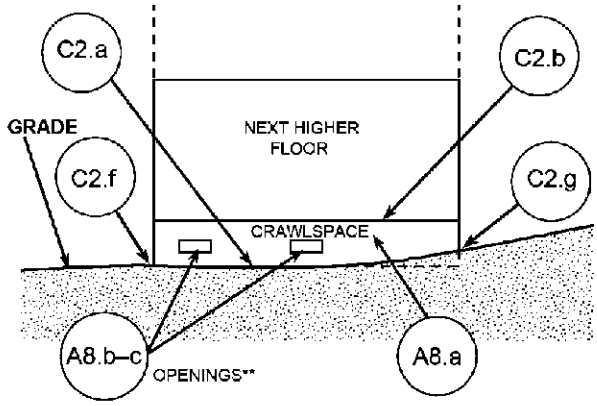
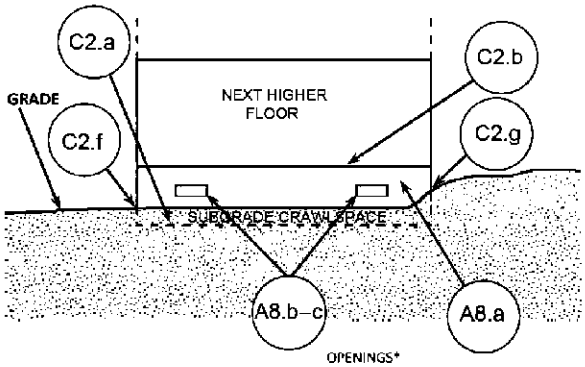


DIAGRAM 9:

All buildings (other than split-level) elevated on a sub-grade crawlspace, with or without attached garage.

Distinguishing Feature – The bottom (crawlspace) floor is below ground level (grade) on all sides.* (If the distance from the crawlspace floor to the top of the next higher floor is more than five feet, or the crawlspace floor is more than two feet below the grade [LAG] on all sides, use Diagram 2A or 2B.)



* A floor that is below ground level (grade) on all sides is considered a basement even if the floor is used for living purposes, or as an office, garage, workshop, etc.

** An "opening" is a permanent opening that allows for the free passage of water automatically in both directions without human intervention. Under the NFIP, a minimum of two openings is required for enclosures or crawlspaces. The openings shall provide a total net area of not less than one square inch for every square foot of area enclosed, excluding any bars, louvers, or other covers of the opening. Alternatively, an Individual Engineered Flood Openings Certification or an Evaluation Report issued by the ICC ES must be submitted to document that the design of the openings will allow for the automatic equalization of hydrostatic flood forces on exterior walls. A window, a door, or a garage door is not considered an opening; openings may be installed in doors. Openings shall be on at least two sides of the enclosed area. If a building has more than one enclosed area, each area must have openings to allow floodwater to directly enter. The bottom of the openings must be no higher than 1.0 foot above the higher of the exterior or interior grade or floor immediately below the opening. For more guidance on openings, see NFIP Technical Bulletin 1.

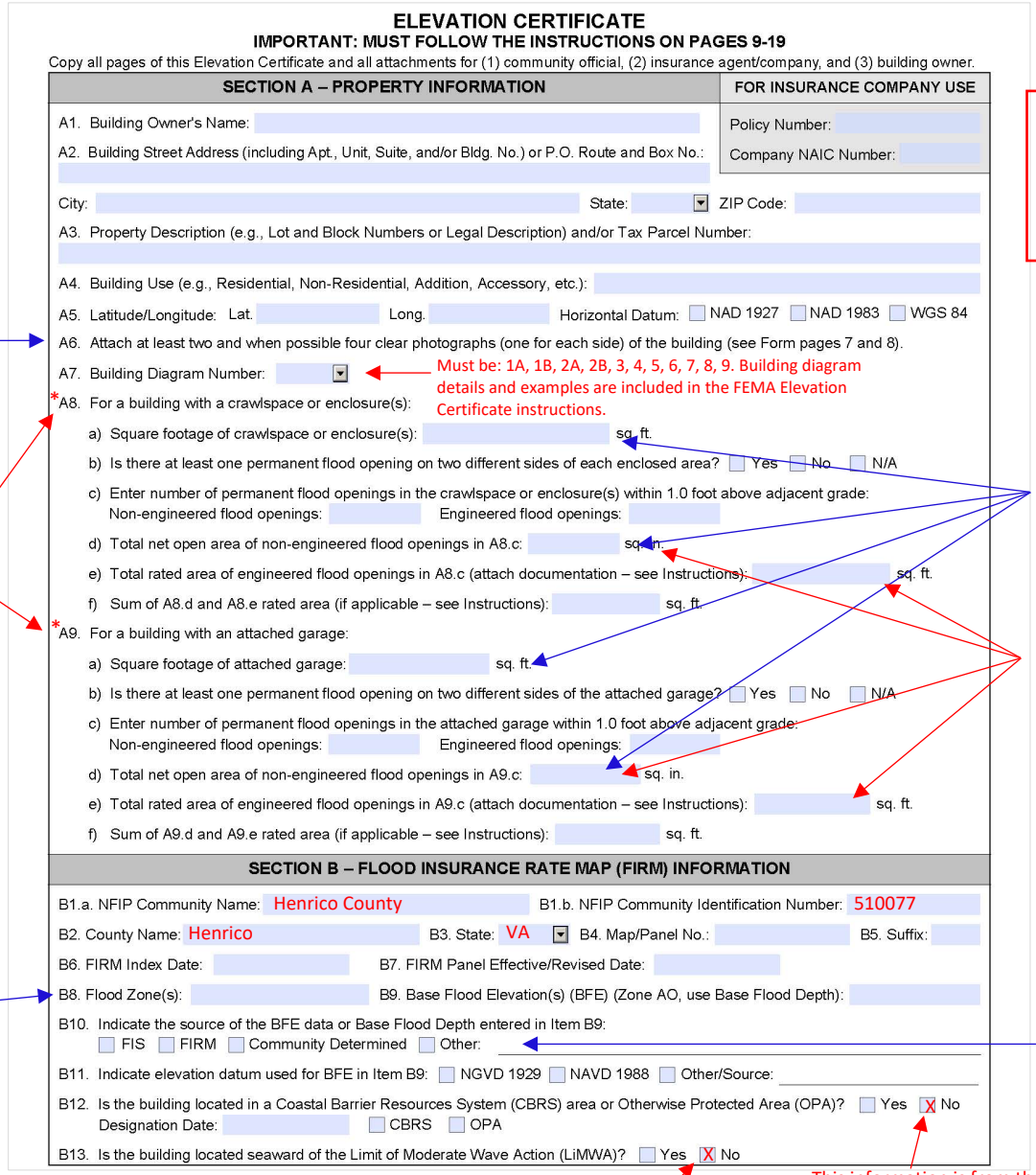
APPENDIX 6:

Tips for Completing an Elevation Certificate

Henrico County
Department of Public Works

October 1, 2021
Revised August 9, 2023

Henrico County Tips for Completing an Elevation Certificate Form



ELEVATION CERTIFICATE
IMPORTANT: MUST FOLLOW THE INSTRUCTIONS ON PAGES 9-19
Copy all pages of this Elevation Certificate and all attachments for (1) community official, (2) insurance agent/company, and (3) building owner.

SECTION A – PROPERTY INFORMATION | **FOR INSURANCE COMPANY USE**

A1. Building Owner's Name:
A2. Building Street Address (including Apt., Unit, Suite, and/or Bldg. No.) or P.O. Route and Box No.:
City: State: ZIP Code:
Policy Number:
Company NAIC Number:
A3. Property Description (e.g., Lot and Block Numbers or Legal Description) and/or Tax Parcel Number:
A4. Building Use (e.g., Residential, Non-Residential, Addition, Accessory, etc.):
A5. Latitude/Longitude: Lat. Long. Horizontal Datum: ☐ NAD 1927 ☐ NAD 1983 ☐ WGS 84
A6. Attach at least two and when possible four clear photographs (one for each side) of the building (see Form pages 7 and 8).
A7. Building Diagram Number:
*A8. For a building with a crawlspace or enclosure(s):
a) Square footage of crawlspace or enclosure(s): sq. ft.
b) Is there at least one permanent flood opening on two different sides of each enclosed area? ☐ Yes ☐ No ☐ N/A
c) Enter number of permanent flood openings in the crawlspace or enclosure(s) within 1.0 foot above adjacent grade:
Non-engineered flood openings: Engineered flood openings:
d) Total net open area of non-engineered flood openings in A8.c: sq. in.
e) Total rated area of engineered flood openings in A8.c (attach documentation – see Instructions): sq. ft.
f) Sum of A8.d and A8.e rated area (if applicable – see Instructions): sq. ft.
*A9. For a building with an attached garage:
a) Square footage of attached garage: sq. ft.
b) Is there at least one permanent flood opening on two different sides of the attached garage? ☐ Yes ☐ No ☐ N/A
c) Enter number of permanent flood openings in the attached garage within 1.0 foot above adjacent grade:
Non-engineered flood openings: Engineered flood openings:
d) Total net open area of non-engineered flood openings in A9.c: sq. in.
e) Total rated area of engineered flood openings in A9.c (attach documentation – see Instructions): sq. ft.
f) Sum of A9.d and A9.e rated area (if applicable – see Instructions): sq. ft.

SECTION B – FLOOD INSURANCE RATE MAP (FIRM) INFORMATION

B1.a. NFIP Community Name: Henrico County B1.b. NFIP Community Identification Number: 510077
B2. County Name: Henrico B3. State: VA B4. Map/Panel No.: B5. Suffix:
B6. FIRM Index Date: B7. FIRM Panel Effective/Revised Date:
B8. Flood Zone(s): B9. Base Flood Elevation(s) (BFE) (Zone AO, use Base Flood Depth):
B10. Indicate the source of the BFE data or Base Flood Depth entered in Item B9:
☐ FIS ☐ FIRM ☐ Community Determined ☐ Other:
B11. Indicate elevation datum used for BFE in Item B9: ☐ NGVD 1929 ☐ NAVD 1988 ☐ Other/Source:
B12. Is the building located in a Coastal Barrier Resources System (CBRS) area or Otherwise Protected Area (OPA)? ☐ Yes ☒ No
Designation Date: ☐ CBRS ☐ OPA
B13. Is the building located seaward of the Limit of Moderate Wave Action (LiMWA)? ☐ Yes ☒ No

All items in Sections A-F must be completed. If an item is not applicable, instead of leaving it blank, it must be completed with "NA".

Don't forget to add photos at the end of the document. **There must be at least 2.**

Must be: 1A, 1B, 2A, 2B, 3, 4, 5, 6, 7, 8, 9. Building diagram details and examples are included in the FEMA Elevation Certificate instructions.

*If a garage is located below the finished floor (e.g., garage with apartment above), A8 should be used. If a garage is attached to the side of a structure (e.g., ranch style home with garage at end), A9 should be used.

The values in (d) must be greater than or equal to the values in (a), even if engineered flood openings are used, as per Sec. 10-10(b)(4) of the Henrico County Code.

If engineered flood openings are used, use (d) for the actual opening size and (e) for the engineered size. Certification documentation must be attached to the Elevation Certificate.

If located in a Community SFHA, complete the appropriate FIRM information in B4-B7. In B8, list "X, County [A or AE]". In B9, list the County BFE. *You may have to call DPW to obtain this value.*

BFE source for B10 should never be "FIRM" because it is rounded. Henrico has model backed BFEs for all flood zones. "FIS Profile" should be used for FEMA AE zones, "Community Determined" or "Other" should be used for all other flood zones.

There is currently no LiMWA in Henrico.

This information is from the US Fish and Wildlife Service. There are currently no CBRS or OPA in Henrico.

Sections C and D must be completed by a Licensed Architect (construction drawings only), Licensed Land Surveyor, or Professional Engineer.

ELEVATION CERTIFICATE

IMPORTANT: MUST FOLLOW THE INSTRUCTIONS ON PAGES 9-19

Building Street Address (including Apt., Unit, Suite, and/or Bldg. No.) or P.O. Route and Box No.:

City: _____ State: _____ ZIP Code: _____

FOR INSURANCE COMPANY USE

Policy Number: _____

Company NAIC Number: _____

SECTION C – BUILDING ELEVATION INFORMATION (SURVEY REQUIRED)

C1. Building elevations are based on: 1 ☐ Construction Drawings* 2 ☐ Building Under Construction* 3 ☐ Finished Construction
*A new Elevation Certificate will be required when construction of the building is complete.

C2. Elevations – Zones A1–A30, AE, AH, AO, A (with BFE), VE, V1–V30, V (with BFE), AR, AR/A, AR/AE, AR/A1–A30, AR/AH, AR/AO, A99. Complete Items C2.a–h below according to the Building Diagram specified in Item A7. In Puerto Rico only, enter meters.

Benchmark Utilized: _____ Vertical Datum: _____

Indicate elevation datum used for the elevations in items a) through h) below.

☐ NGVD 1929 ☐ NAVD 1988 ☐ Other: _____

Datum used for building elevations must be the same as that used for the BFE. Conversion factor used? ☐ Yes ☐ No
If Yes, describe the source of the conversion factor in the Section D Comments area.

		Check the measurement used:
a) Top of bottom floor (including basement, crawlspace, or enclosure floor):		☐ feet ☐ meters
b) Top of the next higher floor (see Instructions):		☐ feet ☐ meters
c) Bottom of the lowest horizontal structural member (see Instructions):	NA	☐ feet ☐ meters
d) Attached garage (top of slab):		☐ feet ☐ meters
e) Lowest elevation of Machinery and Equipment (M&E) servicing the building (describe type of M&E and location in Section D Comments area):		☐ feet ☐ meters
f) Lowest Adjacent Grade (LAG) next to building: ☐ Natural ☐ Finished		☐ feet ☐ meters
g) Highest Adjacent Grade (HAG) next to building: ☐ Natural ☐ Finished		☐ feet ☐ meters
h) Finished LAG at lowest elevation of attached deck or stairs, including structural support:		☐ feet ☐ meters

SECTION D – SURVEYOR, ENGINEER, OR ARCHITECT CERTIFICATION

This certification is to be signed and sealed by a land surveyor, engineer, or architect authorized by state law to certify elevation information. *I certify that the information on this Certificate represents my best efforts to interpret the data available. I understand that any false statement may be punishable by fine or imprisonment under 18 U.S. Code, Section 1001.*

Were latitude and longitude in Section A provided by a licensed land surveyor? ☐ Yes ☐ No

☐ Check here if attachments and describe in the Comments area.

Certifier's Name: _____ License Number: _____

Title: _____

Company Name: _____

Address: _____

City: _____ State: _____ ZIP Code: _____

Signature: _____ Date: _____

Telephone: _____ Ext.: _____ Email: _____

Place Seal Here

Copy all pages of this Elevation Certificate and all attachments for (1) community official, (2) insurance agent/company, and (3) building owner.

Comments (including source of conversion factor in C2; type of equipment and location per C2.e; and description of any attachments):

This comment section must include information about the mechanical equipment measured in C2(e) and a list of any attachments included with the Elevation Certificate. If datum conversions were used, include here or attach. Other information may be relevant or helpful in the comments, such as whether access inside of the structure was available or where the measurements were taken for C2(a) and C2(b).

There are no V Zones in Henrico, so C2(c) is always "NA".

Items (a), (f), and (g) must always be completed.

Remember to check this box if attachments are included

1. "Construction Drawings" should be selected when completing an Elevation Certificate as part of a permit application for a new structure.

2. "Building Under Construction" should be selected when completing an Elevation Certificate for the lowest floor confirmation, which is required after the lowest floor of a new structure has been completed and before further construction has begun.

3. "Finished Construction" should be selected when completing an Elevation Certificate to submit for a final compliance check, prior to receiving a Certificate of Occupancy. For the purposes of an Elevation Certificate, "Finished Construction" is when all machinery and/or equipment have been installed and the grading around the building is completed.

Measurements should be taken in feet.

The Elevation Certificate must be signed and sealed to be accepted/ approved.

ELEVATION CERTIFICATE

IMPORTANT: MUST FOLLOW THE INSTRUCTIONS ON PAGES 9-19

Building Street Address (including Apt., Unit, Suite, and/or Bldg. No.) or P.O. Route and Box No.:	FOR INSURANCE COMPANY USE
City: _____ State: _____ ZIP Code: _____	Policy Number: _____ Company NAIC Number: _____

SECTION E – BUILDING MEASUREMENT INFORMATION (SURVEY NOT REQUIRED) FOR ZONE AO, ZONE AR/AO, AND ZONE A (WITHOUT BFE)

For Zones AO, AR/AO, and A (without BFE), complete Items E1–E5. For Items E1–E4, use natural grade, if available. If the Certificate is intended to support a Letter of Map Change request, complete Sections A, B, and C. Check the measurement used. In Puerto Rico only, enter meters.

Building measurements are based on: ☐ Construction Drawings* ☐ Building Under Construction* ☐ Finished Construction
*A new Elevation Certificate will be required when construction of the building is complete.

E1. Provide measurements (C.2.a in applicable Building Diagram) for the following and check the appropriate boxes to show whether the measurement is above or below the natural HAG and the LAG.

a) Top of bottom floor (including basement, crawlspace, or enclosure) is: _____ ☐ feet ☐ meters ☐ above or ☐ below the HAG.

b) Top of bottom floor (including basement, crawlspace, or enclosure) is: _____ ☐ feet ☐ meters ☐ above or ☐ below the LAG.

E2. For Building Diagrams 6–9 with permanent flood openings provided in Section A Items 8 and/or 9 (see pages 1–2 of Instructions), the next higher floor (C2.b in applicable Building Diagram) of the building is: _____ ☐ feet ☐ meters ☐ above or ☐ below the HAG.

E3. Attached garage (top of slab) is: _____ ☐ feet ☐ meters ☐ above or ☐ below the HAG.

E4. Top of platform of machinery and/or equipment servicing the building is: _____ ☐ feet ☐ meters ☐ above or ☐ below the HAG.

E5. Zone AO only: If no flood depth number is available, is the top of the bottom floor elevated in accordance with the community's floodplain management ordinance? ☐ Yes ☐ No ☐ Unknown The local official must certify this information in Section G.

SECTION F – PROPERTY OWNER (OR OWNER'S AUTHORIZED REPRESENTATIVE) CERTIFICATION

The property owner or owner's authorized representative who completes Sections A, B, and E for Zone A (without BFE) or Zone AO must sign here. *The statements in Sections A, B, and E are correct to the best of my knowledge*

☐ Check here if attachments and describe in the Comments area.

Property Owner or Owner's Authorized Representative Name:

Address:

City: State: ZIP Code:

Signature: Date:

Telephone: Ext.: Email:

Comments:

Section E should not be used because all A Zones in Henrico County have model backed data for a BFE, and there are currently no AO Zones mapped. Section C should be used for all structures.

Section F is used to certify the information in Section E. This should only be completed if Section E is completed.

ELEVATION CERTIFICATE

IMPORTANT: MUST FOLLOW THE INSTRUCTIONS ON PAGES 9-19

Building Street Address (including Apt., Unit, Suite, and/or Bldg. No.) or P.O. Route and Box No.:

City: _____ State: _____ ZIP Code: _____

FOR INSURANCE COMPANY USE

Policy Number: _____

Company NAIC Number: _____

SECTION G – COMMUNITY INFORMATION (RECOMMENDED FOR COMMUNITY OFFICIAL COMPLETION)

The local official who is authorized by law or ordinance to administer the community's floodplain management ordinance can complete Section A, B, C, E, G, or H of this Elevation Certificate. Complete the applicable item(s) and sign below when:

G1. ☐ The information in Section C was taken from other documentation that has been signed and sealed by a licensed surveyor, engineer, or architect who is authorized by state law to certify elevation information. (Indicate the source and date of the elevation data in the Comments area below.)

G2.a. ☐ A local official completed Section E for a building located in Zone A (without a BFE), Zone AO, or Zone AR/AO, or when item E5 is completed for a building located in Zone AO.

G2.b. ☐ A local official completed Section H for insurance purposes.

G3. ☐ In the Comments area of Section G, the local official describes specific corrections to the information in Sections A, B, E and H.

G4. ☐ The following information (Items G5–G11) is provided for community floodplain management purposes.

G5. Permit Number: _____ G6. Date Permit Issued: _____

G7. Date Certificate of Compliance/Occupancy Issued: _____

G8. This permit has been issued for: ☐ New Construction ☐ Substantial Improvement

G9.a. Elevation of as-built lowest floor (including basement) of the building: _____ ☐ feet ☐ meters Datum: _____

G9.b. Elevation of bottom of as-built lowest horizontal structural member: _____ ☐ feet ☐ meters Datum: _____

G10.a. BFE (or depth in Zone AO) of flooding at the building site: _____ ☐ feet ☐ meters Datum: _____

G10.b. Community's minimum elevation (or depth in Zone AO) requirement for the lowest floor or lowest horizontal structural member: _____ ☐ feet ☐ meters Datum: _____

G11. Variance issued? ☐ Yes ☐ No If yes, attach documentation and describe in the Comments area.

The local official who provides information in Section G must sign here. *I have completed the information in Section G and certify that it is correct to the best of my knowledge. If applicable, I have also provided specific corrections in the Comments area of this section.*

Local Official's Name: _____ Title: _____

NFIP Community Name: _____

Telephone: _____ Ext.: _____ Email: _____

Address: _____

City: _____ State: _____ ZIP Code: _____

Signature: _____ Date: _____

Comments (including type of equipment and location, per C2.e; description of any attachments; and corrections to specific information in Sections A, B, D, E, or H):

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Section G must be completed by DPW staff and should be left blank.

At a minimum, DPW staff will complete G8 and G11 on all approved ECs.

ELEVATION CERTIFICATE

IMPORTANT: MUST FOLLOW THE INSTRUCTIONS ON PAGES 9-19

Building Street Address (including Apt., Unit, Suite, and/or Bldg. No.) or P.O. Route and Box No.:

City: _____ State: _____ ZIP Code: _____

FOR INSURANCE COMPANY USE

Policy Number: _____

Company NAIC Number: _____

SECTION H – BUILDING'S FIRST FLOOR HEIGHT INFORMATION FOR ALL ZONES (SURVEY NOT REQUIRED) (FOR INSURANCE PURPOSES ONLY)

The property owner, owner's authorized representative, or local floodplain management official may complete Section H for all flood zones to determine the building's first floor height for insurance purposes. Sections A, B, and I must also be completed. Enter heights to the nearest tenth of a foot (nearest tenth of a meter in Puerto Rico). ***Reference the Foundation Type Diagrams (at the end of Section H Instructions) and the appropriate Building Diagrams (at the end of Section I Instructions) to complete this section.***

H1. Provide the height of the top of the floor (as indicated in Foundation Type Diagrams) above the Lowest Adjacent Grade (LAG):

a) **For Building Diagrams 1A, 1B, 3, and 5–9.** Top of bottom floor (include above-grade floors only for buildings with subgrade crawlspaces or enclosure floors) is: ☐ feet ☐ meters ☐ above the LAG

b) **For Building Diagrams 2A, 2B, 4, and 6–9.** Top of next higher floor (i.e., the floor above basement, crawlspace, or enclosure floor) is: ☐ feet ☐ meters ☐ above the LAG

H2. Is **all** Machinery and Equipment servicing the building (as listed in Item H2 instructions) elevated to or above the floor indicated by the H2 arrow (shown in the Foundation Type Diagrams at end of Section H instructions) for the appropriate Building Diagram?

☐ Yes ☐ No

SECTION I – PROPERTY OWNER (OR OWNER'S AUTHORIZED REPRESENTATIVE) CERTIFICATION

The property owner or owner's authorized representative who completes Sections A, B, and H must sign here. *The statements in Sections A, B, and H are correct to the best of my knowledge.* **Note:** If the local floodplain management official completed Section H, they should indicate in Item G2.b and sign Section G.

☐ Check here if attachments are provided (including required photos) and describe each attachment in the Comments area.

Property Owner or Owner's Authorized Representative Name:

Address:

City: State: ZIP Code:

Signature: Date:

Telephone: Ext.: Email:

Comments:

Section H is for insurance purposes only and does not need to be completed for permit approval.

Section I should be completed to certify the information in Sections A, B, and H. This should only be completed if Section H is completed.

ELEVATION CERTIFICATE

IMPORTANT: MUST FOLLOW THE INSTRUCTIONS ON PAGES 9-19

BUILDING PHOTOGRAPHS

Continuation Page

Building Street Address (including Apt., Unit, Suite, and/or Bldg. No.) or P.O. Route and Box No.:

City: State: ZIP Code:

FOR INSURANCE COMPANY USE

Policy Number:

Company NAIC Number:

Insert the third and fourth photographs below. Identify all photographs with the date taken and "Front View," "Rear View," "Right Side View," or "Left Side View." When flood openings are present, include at least one close-up photograph of representative flood openings or vents, as indicated in Sections A8 and A9.

Photo Three

Photo Three Caption:

Photo Four

Photo Four Caption:

Clear Photo Four

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Page 8 of 19

At least 2 photos are required, with dates . Front view and rear-view photos of the structure are required. However, it is highly recommended that photos of all sides of the structure be included.

Henrico County requires that flood openings be located on at least 2 different walls. If flood openings are not located on both the front and rear sides of the structure, additional photos must be provided so DPW can confirm this requirement has been met.

Photos should be taken in such a way that the entire structure can be seen from that view. For example, the front view of a home should show the entire front side of the home (ground to roof, side to side), not just the front door.

Photos are not required for ECs that are based on Construction Drawings. However, architectural drawings and construction plans must be submitted with the permit application.

ELEVATION CERTIFICATE

IMPORTANT: MUST FOLLOW THE INSTRUCTIONS ON PAGES 9-19

BUILDING PHOTOGRAPHS

See Instructions for Item A6.

Building Street Address (including Apt., Unit, Suite, and/or Bldg. No.) or P.O. Route and Box No.:

City: _____ State: _____ ZIP Code: _____

FOR INSURANCE COMPANY USE

Policy Number: _____

Company NAIC Number: _____

Instructions: Insert below at least two and when possible four photographs showing each side of the building (for example, may only be able to take front and back pictures of townhouses/rowhouses). Identify all photographs with the date taken and "Front View," "Rear View," "Right Side View," or "Left Side View." Photographs must show the foundation. When flood openings are present, include at least one close-up photograph of representative flood openings or vents, as indicated in Sections A8 and A9.

Photo One

Photo One Caption:

Photo Two

Photo Two Caption: Clear Photo Two

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At least 2 photos are required, with dates . Front view and rear-view photos of the structure are required. However, it is highly recommended that photos of all sides of the structure be included.

Henrico County requires that flood openings be located on at least 2 different walls. If flood openings are not located on both the front and rear sides of the structure, additional photos must be provided so DPW can confirm this requirement has been met.

Photos should be taken in such a way that the entire structure can be seen from that view. For example, the front view of a home should show the entire front side of the home (ground to roof, side to side), not just the front door.

Photos are not required for ECs that are based on Construction Drawings. However, architectural drawings and construction plans must be submitted with the permit application.

APPENDIX 7:

FEMA Floodproofing Certificate Form

DEPARTMENT OF HOMELAND SECURITY
Federal Emergency Management Agency
National Flood Insurance Program

OMB Control No. 1660-0008
Expiration Date: 06/30/2026

DRY FLOODPROOFING CERTIFICATE FOR NON-RESIDENTIAL STRUCTURES

PAPERWORK BURDEN DISCLOSURE NOTICE

Public reporting burden for this data collection is estimated to average 3.25 hours per response. The burden estimate includes the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and submitting this form. You are not required to respond to this collection of information unless a valid OMB control number is displayed on this form. Send comments regarding the accuracy of the burden estimate and any suggestions for reducing the burden to: Information Collections Management, Department of Homeland Security, Federal Emergency Management Agency, 500 C Street SW, Washington, DC 20742, Paperwork Reduction Project (1660-0008). **NOTE: Do not send your completed form to this address.**

General: This information is provided pursuant to Public Law 96-511 (the Paperwork Reduction Act of 1980, as amended), dated December 11, 1980, to allow the public to participate more fully and meaningfully in the Federal paperwork review process.

Authority: Public Law 96-511, amended; 44 U.S.C. 3507; and 5 CFR 1320.

PRIVACY ACT STATEMENT

Authority: Title 44 CFR § 60.3, 61.7 and 61.8.

Principal Purpose(s): This information is being collected for the primary purpose of estimating the risk premium rates necessary to provide flood insurance for new or substantially improved structures in designated Special Flood Hazard Areas.

Routine Use(s): The information on this form may be disclosed as generally permitted under 5 U.S.C. § 552a(b) of the Privacy Act of 1974, as amended. This includes using this information as necessary and authorized by the routine uses published in DHS/FEMA-003 – National Flood Insurance Program Files System or Records Notice 79 Fed. Reg. 28747 (May 19, 2014), and upon written request, written consent, by agreement, or as required by law.

Disclosure: The disclosure of information on this form is voluntary; however, failure to provide the information requested may result in the inability to obtain flood insurance through the National Flood Insurance Program or being subject to higher premium rates for flood insurance. Information will only be released as permitted by law.

PURPOSE OF THE DRY FLOODPROOFING CERTIFICATE FOR NON-RESIDENTIAL STRUCTURES

Under the National Flood Insurance Program (NFIP), the dry floodproofing of non-residential buildings may be permitted as an alternative to elevating to or above the Base Flood Elevation (BFE) or for certain flood zones, the natural Highest Adjacent Grade (HAG). A dry floodproofing design certification is required for non-residential structures that are dry floodproofed and the dry floodproofed non-residential portions of mixed-use buildings. This form is to be used for that certification. FEMA Form 206-FY-21-122 NFIP Residential Basement Floodproofing Certificate is required for the residential portions of mixed-use buildings.

A dry floodproofed building is a building that has been designed and constructed to be watertight (substantially impermeable to floodwaters) below the BFE and with structural components having the capability of resisting hydrostatic and hydrodynamic loads and effects of buoyancy. Before a dry floodproofed building is designed, numerous planning considerations, including flood warning time, uses of the building, mode of entry to and exit from the building and the site in general, floodwater velocities, flood depths, debris impact potential, flood frequency, and any other State and local requirements must be addressed to ensure that dry floodproofing will be a viable floodplain management measure.

The minimum NFIP requirement is to dry floodproof a building to the BFE. However, to be in compliance with the requirements of American Society of Civil Engineers (ASCE) 24, *Flood Resistant Design and Construction*, one foot is subtracted from the dry floodproofed elevation. Therefore, a building must be dry floodproofed to one foot above the BFE to be considered for floodproofing credit. For B, C, or X flood zones, the building's dry floodproofed design elevation must be at least two feet above the natural HAG to be considered for floodproofing credit.

Additional guidance can be found in FEMA Publication 936, *Floodproofing Non-Residential Buildings* (2013), and NFIP Technical Bulletin 3, *Requirements for the Design and Certification of Dry Floodproofed Non-Residential and Mixed-Use Buildings* (2021), available on FEMA's Building Science Resource Library website at www.fema.gov/ar/emergency-managers/risk-management/building-science/publications.

Copy all pages of this Dry Floodproofing Certificate and all attachments for 1) community official, 2) insurance agent/company, and 3) building owner. The dry floodproofing of non-residential buildings and the non-residential portions of mixed-use buildings may be permitted as an alternative to elevating to or above the Base Flood Elevation (BFE); however, a dry floodproofing design certification is required. This form is to be used for that certification. Dry floodproofing of a residential building does not alter a community's floodplain management elevation requirements or affect the insurance rating unless the community has been issued an exception by FEMA to allow dry floodproofed residential basements. The permitting of a dry floodproofed residential basement requires a separate certification specifying that the design complies with the local floodplain management ordinance.

PROPERTY INFORMATION

Building Owner's Name: _____

Building Street Address (Including Apt., Unit, Suite, and/or Bldg. No.) or P.O. Route and Box No.:

_____

City: _____ State: _____ ZIP Code: _____

Property Description (e.g., Lot and Block Numbers, or Legal Description) and/or Tax Parcel Number:

_____

Building Use (e.g., Non-Residential, Mixed Use, Addition, Accessory, etc.): _____

Latitude/Longitude: Lat. _____ Long. _____ Horizontal Datum: ☐ NAD 1927 ☐ NAD 1983 ☐ WGS 84

FOR INSURANCE COMPANY USE

Policy Number: _____

Company NAIC Number: _____

SECTION I – FLOOD INSURANCE RATE MAP (FIRM) INFORMATION

NFIP Community Name: _____ NFIP Community Identification Number: _____

County Name: _____ State: _____ Map/Panel Number: _____ Suffix: _____

FIRM Index Date: _____ FIRM Panel Effective/Revised Date: _____ Flood Zone(s): _____

BFE(s) (Zone AO, use Base Flood Depth (BFD)): _____

Indicate the source of the BFE data or BFD entered above: ☐ Flood Insurance Study (FIS) ☐ FIRM

☐ Community Determined ☐ Other: _____

Indicate elevation datum used for BFE shown above: ☐ NGVD 1929 ☐ NAVD 1988 ☐ Other/Source: _____

Is a Limit of Moderate Wave Action (LiMWA) shown on the FIRM? ☐ Yes ☐ No

If Yes, is the property located in the Coastal A Zone [area between the LiMWA and Zone V boundary (or shoreline)]? ☐ Yes ☐ No

Is the property located in a floodway? ☐ Yes ☐ No If Yes, provide the velocity at the building location: _____

Is the property located in an alluvial fan? ☐ Yes ☐ No

If Yes, provide the depth at the building location: _____ and velocity: _____

SECTION II – DRY FLOODPROOFED DESIGN CERTIFICATION

(By a Registered Professional Engineer or Architect licensed in the State where the building is located)

(**Note**: For insurance rating purposes in all zones except for B, C or X, the building's dry floodproofed design elevation must be at least one foot above the BFE to be considered for floodproofing credit. For B, C, or X Zones, the building's dry floodproofed design elevation must be at least two feet above the natural HAG to be considered for floodproofing credit. If the building is not dry floodproofed to the above-mentioned standards, then the building will be ineligible for floodproofing credit. See the Instructions section for information on documentation that must accompany this certificate if being submitted for flood insurance rating purposes.)

Briefly list measures incorporated into the design to meet the performance criteria for dry floodproofing and attach calculations showing the structure is designed with structural components that have the capability of resisting hydrostatic and hydrodynamic loads and the effects of buoyancy and will be watertight and substantially impermeable to the passage of water.

Building Street Address (including Apt., Unit, Suite, and/or Bldg. No.) or P.O. Route and Box No.:	**FOR INSURANCE COMPANY USE**
City: _____ State: _____ ZIP Code: _____	Policy Number: _____ Company NAIC Number: _____

SECTION II – DRY FLOODPROOFED DESIGN CERTIFICATION *(Continued)*

(By a Registered Professional Engineer or Architect licensed in the State where the building is located)

Provide elevations used in design, specifications and construction drawings. In Puerto Rico only, enter meters.

Indicate elevation datum used for the elevations in this section. ☐ NGVD 1929 ☐ NAVD 1988 ☐ Other/Source: _____

Elevation datum used for building elevations must be the same as that used for the BFE. Conversion factor used? ☐ Yes ☐ No
If Yes, describe the source of the conversion factor in the Comments area of this Section.

A. Dry Floodproofed Design Elevation:		_____	☐ feet	☐ meters
B. Lowest Adjacent Grade (LAG) next to the building:	☐ Natural ☐ Finished	_____	☐ feet	☐ meters
C. Highest Adjacent Grade (HAG) next to the building:	☐ Natural ☐ Finished	_____	☐ feet	☐ meters

Non-Residential Dry Floodproofed Design Certification:

I certify the structure, based upon development and/or review of the design and specifications for construction, has been designed in accordance with the accepted standards of practice (ASCE 24-05, ASCE 24-14 or their equivalent) and the following provisions.

- *The structure, together with attendant utilities and sanitary facilities will be watertight to the dry floodproofed design elevation indicated above, will be substantially impermeable to the passage of water, and shall perform in accordance with the 44 Code of Federal Regulations (44 CFR 60.3(c)(3)).*
- *All structural components are capable of resisting hydrostatic and hydrodynamic flood forces, including the effects of buoyancy, and anticipated debris impact forces up to the dry floodproofed design elevation. Flood damage-resistant materials are used for all areas where seepage is intended to collect inside the dry floodproofed areas up to at least 4 inches above the floor.*

I certify that the information in Section II on this certificate represents a true and accurate determination by the undersigned using the available information and data. I understand that any false statement may be punishable by fine or imprisonment under 18 U.S. Code, Section 1001.

Certifier's Name: _____ License Number (or Affix Seal): _____

Title: _____ Company Name: _____

Mailing Address: _____

City: _____ State: _____ ZIP Code: _____

Phone #1: _____ Ext.: _____ Phone #2: _____ Ext.: _____

Email: _____

Place Seal Here

Signature: _____ Date: _____

Comments (including source of conversion factor and description of any attachments):

Building Street Address (including Apt., Unit, Suite, and/or Bldg. No.) or P.O. Route and Box No.:

City: _____ State: _____ ZIP Code: _____

FOR INSURANCE COMPANY USE

Policy Number: _____

Company NAIC Number: _____

SECTION III – DRY FLOODPROOFED ELEVATION CERTIFICATION

(By a Registered Professional Land Surveyor, Engineer or Architect licensed in the State where the building is located)

Benchmark Utilized: _____ Vertical Datum: _____

Indicate elevation datum used for the elevations provided in this section:

☐ NGVD 1929 ☐ NAVD 1988 ☐ Other/Source: _____

Elevation datum used for building elevations must be the same as that used for the BFE. Conversion factor used? ☐ Yes ☐ No
If Yes, describe the source of the conversion factor in the Comments area of this section.

A. Dry floodproofed elevation (must be based on finished construction): _____ ☐ feet ☐ meters

B. Lowest Adjacent Grade (LAG) next to the building: ☐ Natural ☐ Finished _____ ☐ feet ☐ meters

C. Natural Highest Adjacent Grade (HAG) next to the building: _____ ☐ feet ☐ meters

Height of floodproofing on the building above the natural or finished LAG is _____ feet.
(In Puerto Rico only: _____ meters.)

(**Note**: For insurance rating purposes in all eligible zones inside the SFHA, the building's dry floodproofed design elevation must be at least one foot above the BFE to be considered for floodproofing credit. For B, C, D, or X Zones, the building's dry floodproofed design elevation must be at least two feet above the natural HAG. If the building is not dry floodproofed to the above-mentioned standards, then the building will not be considered for floodproofing credit. See the Instructions section for information on documentation that must accompany this certificate if being submitted for flood insurance rating purposes.)

Non-Residential Dry Floodproofed Elevation Information Certification:

Section III certification is to be signed and sealed by a land surveyor, engineer, or architect authorized by law to certify elevation information.

I certify that the information in Section III on this Certificate represents a true and accurate interpretation and determination by the undersigned using the available information and data. I understand that any false statement may be punishable by fine or imprisonment under 18 U.S. Code, Section 1001.

Certifier's Name: _____ License Number (or Affix Seal): _____

Title: _____ Company Name: _____

Mailing Address: _____

City: _____ State: _____ ZIP Code: _____

Phone #1: _____ Ext.: _____ Phone #2: _____ Ext.: _____

Email: _____

Place Seal Here

Signature: _____ Date: _____

Comments (including source of conversion factor and description of any attachments):

Building Street Address (including Apt., Unit, Suite, and/or Bldg. No.) or P.O. Route and Box No.:	**FOR INSURANCE COMPANY USE**
City: _____ State: _____ ZIP Code: _____	Policy Number: _____ Company NAIC Number: _____

SECTION IV – DRY FLOODPROOFED CONSTRUCTION CERTIFICATION
(By a Registered Professional Engineer or Architect licensed in the State where the building is located)

Non-Residential Dry Floodproofed Construction Certification:

I certify the structure, based upon development and/or review of the design, specifications, as-built drawings for construction and physical inspection, has been designed and constructed in accordance with the accepted standards of practice (ASCE 24-05, ASCE 24-14 or their equivalent) and any alterations also meet those standards and the following provisions.

- *The structure, together with attendant utilities and sanitary facilities is watertight to the dry floodproofed design elevation indicated above, is substantially impermeable to the passage of water, and shall perform in accordance with the 44 Code of Federal Regulations (44 CFR 60.3(c)(3)).*
- *All structural components are capable of resisting hydrostatic and hydrodynamic flood forces, including the effects of buoyancy, and anticipated debris impact forces up to the dry floodproofed design elevation.*
- *The floodproofed elevation is in accordance with the design and any alteration(s) to the design.*
- *Flood damage-resistant materials have been incorporated/used in all areas where seepage would collect inside the dry floodproofed areas up to at least 4 inches above the floor.*

I certify that the information in Section IV on this certificate represents a true and accurate determination by the undersigned using the available information and data. I understand that any false statement may be punishable by fine or imprisonment under 18 U.S. Code, Section 1001.

Certifier's Name: _____ License Number (or Affix Seal): _____

Title: _____ Company Name: _____

Mailing Address: _____

City: _____ State: _____ ZIP Code: _____

Phone #1: _____ Ext.: _____ Phone #2: _____ Ext.: _____

Email: _____

Place Seal Here

Signature: _____ Date: _____

Copy all pages of this Dry Floodproofing Certificate and all attachments for: 1) community official, 2) insurance agent/company, and 3) building owner.

REQUIRED DOCUMENTATION

In order to ensure compliance and provide reasonable assurance that due diligence had been applied in designing and constructing dry floodproofing measures, the following information must be provided with the completed Dry Floodproofing Certificate:

1. **Photographs.** All photographs must be clear, identified and include the date taken. Where the building is in the course of construction, provide clear descriptions of any other dry floodproofed components and attachments to be incorporated.
   a. Photographs of all sides and aspects of the floodproofed building.
   b. Photographs of all components used to provide dry floodproofing protections (shields, gates, barriers, sump pumps, backflow (non-return) valves or shutoff valves, etc.).
   c. Photographs of the installed barriers/shields and corresponding clear photographs of openings areas where barriers and shields are deployed without the barriers/shields installed (doors, windows, ventilation intakes, etc.).
   d. Photographs of penetrations through dry floodproofed envelopes (utilities, mechanical).
   e. Photographs of backup power source for sump pumps.

2. **Comprehensive Flood Emergency Operations Plan** for the entire structure to include but not limited to:
   a. The personnel, equipment, tools, and supplies needed to deploy all dry floodproofing system components with sufficient time prior to the onset of flooding or conditions such as high winds that could interfere with efficient deployment of measures.
   b. Clearly defined chain of command and assigned responsibilities for personnel involved in the installation of dry floodproofing measures.
   c. Procedure for notifying personnel responsible for installing dry floodproofing measures, along with a list of duty requirements.
   d. Decision tree that identifies the sequence, timeline, and responsible parties for installing the dry floodproofing components, including the triggers or benchmarks that will initiate procedures.
   e. Written description and map of the storage locations and types of dry floodproofing measures to be installed or deployed (shields, gates, barriers, and components as well as all associated hardware), along with any equipment, tools, and materials required for installation.
   f. Conditions that require the deployment of active dry floodproofing measures (e.g., installation of flood shields, closing of flood doors, closing of manual valves, staging of pumps).
   g. Instructions for installing or deploying each dry floodproofing measure and the order of installation if important for effectiveness.
   h. Instructions for connecting standby (emergency) power source (e.g., generator) for critical equipment such as sump pumps and egress lighting
   i. Contact information for the manufacturer and designer to expedite obtaining replacement parts and support as needed
   j. Evacuation plans for all personnel
   k. Requirements for installation and deployment drills and training program (at least once a year)
   l. Requirement for regular review and update of the plan procedures

3. **Comprehensive Inspection and Maintenance Plan** for the entire structure to include but not limited to:
   a. Exterior envelope of the structure, such as wall and foundation systems, to identify possible structural and waterproofing deficiencies such as cracks, water staining, and penetrations.
   b. All penetrations to the exterior of the structure.
   c. Slabs and wall/slab joints, including structural and drainage deficiencies.
   d. Flood shields, gates, panels, doors, glazing, barriers, and other components designed to provide dry floodproofing protection, including all seals, gaskets, fasteners, and mounting hardware and tools.
   e. Sump pumps (or self-priming pumps) and interior drain system.
   f. Emergency power systems.
   g. Testing of emergency generators, sump pumps, and other drainage measures.
   h. Backflow (non-return) valves or shutoff valves.
   i. Location of all flood shields, gates, panels, and other components including all hardware along with any materials or tools needed to seal the dry floodproofed area.
   j. Contact information for the manufacturer of the shields and other components to determine the availability of replacement gaskets, seals, and other parts and to ask questions.
   k. Cadence of inspection and maintenance plan.

4. **Building owner** acknowledgment that verifies that the owner is aware of the criteria for when the dry floodproofing measures must be installed and that they know how to install all the measures. This would be signed by the owner. Additionally, if the measures are to be installed by a third-party, then the third-party contractor must sign that they know how to install the measures.

DEPARTMENT OF HOMELAND SECURITY
Federal Emergency Management Agency

INSTRUCTIONS FOR COMPLETING THE DRY FLOODPROOFING CERTIFICATE FOR NON-RESIDENTIAL STRUCTURES

To receive credit for dry floodproofing, a completed Dry Floodproofing Certificate for Non-Residential Structures is required for non-residential buildings and the non-residential portions of mixed-use buildings in the Regular Program communities, located in all flood zones, including Zone X. For certification of finished construction, this form is invalid without Sections I through IV.

PROPERTY INFORMATION

This section identifies the building, its location, and its owner. Enter the name(s) of the building owner(s), the building's complete street address, and/or property description. If the building's address is different from the owner's address, enter the address of the building being certified. If the address is a rural route or a Post Office box number, enter the lot and block numbers, the tax parcel number, the legal description, or an abbreviated location description based on distance and direction from a fixed point of reference.

A map may be attached to this certificate to show the location of the building on the property. A tax map, FIRM, or detailed community map is appropriate. If no map is available, provide a sketch of the property location, and the location of the building on the property. Include appropriate landmarks such as nearby roads, intersections, and bodies of water. For building use, indicate whether the building is residential, non-residential, an addition to an existing residential or non-residential building, an accessory building (e.g., garage), or other type of structure. Use the Comments area of the appropriate section if needed or attach additional comments.

Provide latitude and longitude coordinates for the center of the front of the building. Use either decimal degrees (e.g., 39.504322°, −110.758522°) or degrees, minutes, seconds (e.g., 39° 30' 15.52", −110° 45' 30.72") format. If decimal degrees are used, provide coordinates to at least 6 decimal places or better. When using degrees, minutes, seconds, provide seconds to at least 2 decimal places or better. Provide the datum of the latitude and longitude coordinates (FEMA prefers the use of NAD 1983). Indicate the method or source used to determine the latitude and longitude in the Comments area.

SECTION I – FLOOD INSURANCE RATE MAP (FIRM) INFORMATION

Complete the Dry Floodproofing Certificate using the Flood Insurance Study (FIS) and FIRM in effect at the time of the certification.

The information for Section I is obtained by reviewing the FIS and the FIRM panel that includes the building's location. Information about the current FIS and FIRM is available from FEMA by visiting msc.fema.gov or contacting the local floodplain administrator. If a Letter of Map Amendment (LOMA), Letter of Map Revision (LOMR), or LOMR Based on Fill (LOMR-F) has been issued by FEMA, please provide the letter date and case number in the Comments area, as appropriate.

For a building in an area that was mapped in one community but is now in another community due to annexation or dissolution, enter the community name and 6-digit number of the community in which the building is now located in the name of the county or new county, if necessary; and the FIRM index date for the community the building is now located in. Enter information from the actual FIRM panel that shows the building location, even if it is the FIRM for the previous jurisdiction. If the map in effect at the time of the building's construction was other than the current FIRM, and you have the past map information pertaining to the building, provide the information in the Comments area.

Note: Indicate in the Comments Section, if using information based on best available data, such as base-level engineering or advisory flood hazard data (contact the local floodplain administrator to confirm).

NFIP Community Name & Community Identification Number. Enter the complete name of the community in which the building is located, and the associated 6-digit Community Identification Number. For a newly incorporated community, use the name and 6-digit number of the new community. Under the NFIP, a "community" is any State or area or political subdivision thereof, or any Indian tribe or authorized native organization which has authority to adopt and enforce floodplain management regulations for the areas within its jurisdiction. To determine the current community number, see the NFIP *Community Status Book*, available on FEMA's web site at www.fema.gov/national-flood-insurance-program-community-status-book.

County Name. Enter the name of the county or counties in which the community is located. For an unincorporated area of a county, enter the county name and "unincorporated area." For an independent city, enter "independent city."

State. Enter the 2-letter state abbreviation (for example, VA, TX, CA).

Map/Panel Number and Suffix. Enter the 10-character "Map Number" or "Community Panel Number" shown on the FIRM where the building or manufactured (mobile) home is located. For maps in a county-wide format, the sixth character of the "Map Number" is the letter "C" followed by a 4-digit map number. For maps not in a county-wide format, enter the "Community Panel Number" shown on the FIRM.

FIRM Index Date. Enter the effective date or the map revised date shown on the FIRM Index.

FIRM Panel Effective/Revised Date. Enter the effective date shown on the current FIRM panel. The current FIRM panel effective date can be determined by visiting **msc.fema.gov** or contacting the local floodplain administrator. In addition, if the area where the building is located was revised by a LOMR, include the LOMR effective date.

Flood Zone(s). Enter the flood zone, or flood zones, in which the building is located. All flood zones containing the letter "A" or "V" are considered Special Flood Hazard Areas. The flood zones are A, AE, A1–A30, V, VE, V1–V30, AH, AO, AR, AR/A, AR/AE, AR/A1–A30, AR/AH, AR/AO. Each flood zone is defined in the legend of the FIRM panel on which it appears.

BFE(s). Using the appropriate Flood Insurance Study (FIS) Profile, FIS Data Table (e.g., Transect, Floodway, etc.), or FIRM panel, locate the property and enter the BFE (or base flood depth) of the building site to the nearest tenth of a foot (nearest tenth of a meter, in Puerto Rico). If the building is located in more than one flood zone, list all appropriate BFEs.

BFEs are shown in the FIS or on a FIRM for Zones A1–A30, AE, AH, V1–V30, VE, AR, AR/A, AR/AE, AR/A1–A30, AR/AH, and AR/AO; flood depth numbers are shown for Zone AO. Use the AR BFE if the building is located in any of Zones AR/A, AR/AE, AR/A1–A30, AR/AH, or AR/AO.

In unnumbered A or V zones where BFEs are not provided in the FIS or on the FIRM, BFEs may be available from another source. For example, the community may have established BFEs or obtained BFE data from other sources (e.g., Base Level Engineering) for the building site. For subdivisions and other developments of more than 50 lots or 5 acres in Zone A, establishment of BFEs is required per Floodplain Management requirements 44 CFR 60.3(b)(3). If a BFE is obtained from another source, enter the BFE. The BFE entered must be based on hydrologic and hydraulic analyses. In an unnumbered A Zone where BFEs are not obtained from another source, enter N/A.

For areas in which BFEs have not been established, designers can refer to FEMA 265 *Zone A Manual: Managing Floodplain Development in Approximate Zone A Areas* (FEMA 1995), https://www.fema.gov/sites/default/files/documents/fema_approx-zone-a-guide.pdf?id=2215. This guide provides information on obtaining and developing BFEs.

Source of BFE. Indicate the source of the BFE or flood depth that you entered. If the BFE is from a source other than FIS Profile, FIRM, or community, include the name of the study, the agency or company that produced it, and the date when the study was completed. Visit **msc.fema.gov** or contact the local floodplain administrator to access the current FIS and FIRM.

Elevation Datum. Indicate the elevation datum to which the elevations on the applicable FIRM are referenced as shown on the map legend. The vertical datum is shown in the Map Legend and/or the Notes to Users on the FIRM.

Limit of Moderate Wave Action (LiMWA). Indicate if a LiMWA is shown on the FIRM and the location of the building in relation to the LiMWA.

Floodway. Indicate if building is in a floodway and if applicable, the velocity in the area of the building. See FEMA P-936, *Floodproofing Nonresidential Buildings* for more information on determining the velocity.

Alluvial Fan. Indicate if building is in an alluvial fan and if applicable, the depth and velocity in the area of the building.

SECTION II – DRY FLOODPROOFED DESIGN CERTIFICATION

Section II is to be completed by a Registered Professional Engineer or Architect licensed in the State where the building is located to certify the design of the dry floodproofing measures as required by 44 CFR 60.3(c)(4).

SECTION III – DRY FLOODPROOFED ELEVATION CERTIFICATION

Section III is to be completed by a Registered Professional Land Surveyor, Engineer, or Architect licensed in the State where the building is located to provide the surveyed elevations of the as-built construction. To ensure that all required elevations are obtained, it will be necessary to physically enter the building.

SECTION IV – DRY FLOODPROOFED CONSTRUCTION CERTIFICATION

Section IV is to be completed by a Registered Professional Engineer or Architect licensed in the state where the building is located to certify the structure, based upon development and/or review of the design, specifications, as-built drawings for construction and physical inspection, has been designed and constructed in accordance with the accepted standards of practice (ASCE 24-05, ASCE 24-14 or their equivalent) and any alterations also meet those standards and the provisions listed in Section IV.

APPENDIX 8:

BFE Interpolation Excel Template

Henrico County
Base Flood Elevation (BFE) Interpolation

July 14, 2023

Directions: Fill in each blue cell below and submit the completed version with your Floodplain Development Permit application. This is an approximate BFE. The Floodplain Administrator may determine that the BFE is different than what this form indicates. The Floodplain Administrator may require a flood study be conducted or updated to determine a more accurate BFE.

= required input data

Property Address	
GPIN	

NOTE: If you get an error message about this sheet being protected when trying to select between Yes or No, just select OK. When the message goes away, you will be able to adjust the values based on the selection you made.

Upstream Cross-Section Elevation	**Downstream Cross-Section Elevation**

Total Distance Between Cross-Sections

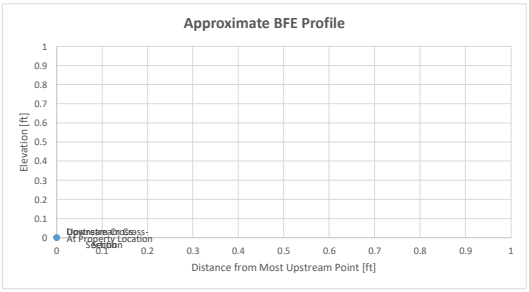
Is the project location beyond the limit of the study?

☐ Yes ☑ No

Distance from Upstream Cross-Section

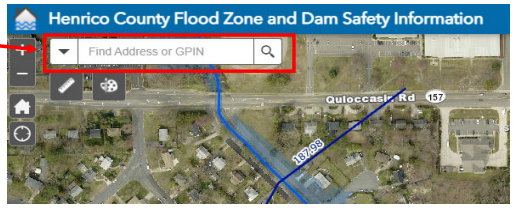
Approximate BFE at Project Location

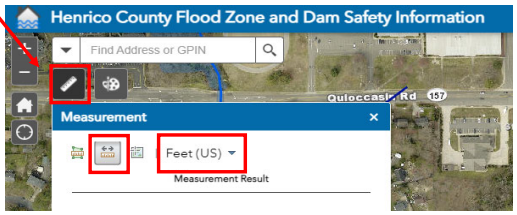
#DIV/0!

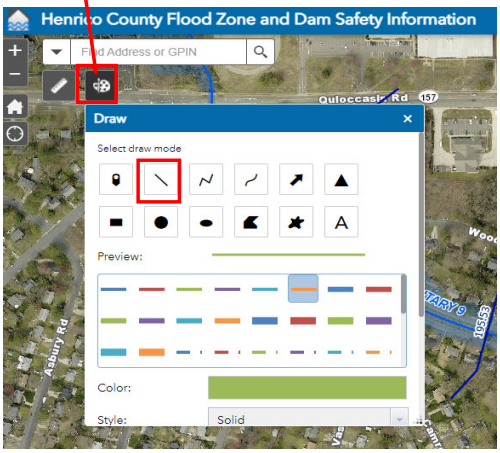


Directions Continued:

1. Locate the property on the Henrico County Flood Zone and Dam Safety Information Map using the Search Tool. Search can be done using the property address or GPIN.
2. Identify the nearest upstream cross-section from the site and insert the elevation value identified on the map above. *In general, the upstream cross-section will have a higher elevation.*
3. Identify the nearest downstream cross-section from the site and insert the elevation value identified on the map above. *In general, the downstream cross-section will have a lower elevation.*
4. Use the Measure Tool to measure the distance (in feet) between the two cross-sections, following the stream line as closely as possible. Insert measured value above. *This should* ***not*** *be a straight line between cross-sections unless the stream line is straight.*
5. Using the Draw Tool, draw a line through the proposed development site to the stream line, perpendicular to the stream. Measure the distance between that line and the upstream cross-section, following the stream line as closely as possible. Insert measured value above. *This should* ***not*** *be a straight line unless the stream line is straight.*







APPENDIX 9:

No-Rise Certificate Template

Henrico County
No-Rise Certificate Template and Instructions

APPLICANT'S GUIDE TO A NO-RISE CERTIFICATION

Regulatory Authority

Per the Henrico County Floodplain Ordinance, Section 10-9(a), a no-rise certification is required for all development within a designated floodplain, in accordance with the stated requirements shown below:

> *Development shall not cause an increase in the BFE, reduce the flood-carrying capacity of any watercourse, drainage ditch, or other drainage facility or system, or similar adverse impacts. The applicant shall submit a No-Rise Certificate, signed, and sealed by a licensed professional engineer with sufficient supporting technical data such as a hydrologic and hydraulic analysis, as determined by the Floodplain Administrator. Compensatory storage may be utilized to satisfy the no-rise requirement for any type of development if engineering data shows the site is hydraulically equivalent and the Floodplain Administrator approves the plans for each compensatory storage area.*

No-Rise Certification Templates

(1) No-Rise Certificate - Internal Renovations Only

A no-rise certification template is included at the end of this section for consideration and use by the certifying engineer for a development project that includes only internal renovations to an existing building. If external renovations are proposed to an existing building, the general No-Rise Certificate template should be used.

Supporting Documents and Technical Data

Supporting documentation for this specific No-Rise Certificate must include the construction plans for the proposed building renovations that clearly demonstrate all renovations are internal to the existing footprint. If construction plans were submitted as part of a building permit application, the building permit number may be listed in lieu of attaching a copy of the construction plans to this document.

(2) No-Rise Certificate – General

A No-Rise Certificate template is included at the end of this section for consideration and use by the certifying engineer for development projects. This template should be used for all projects that require a No-Rise Certificate except those that are for internal renovations only to an existing building.

THIS PAGE SHOULD BE DELETED PRIOR TO SUBMISSION

Supporting Documents and Technical Data

Certifying engineers should review the Henrico County Floodplain Technical Guidance Manual, specifically Section 5, to determine the required supporting documents and technical data specific to a project type, which may include the following three types of supporting documentation and technical data for a no-rise certificate, including: (1) No Impact Statement, (2) Compensatory Storage, and (3) Flood Study. A brief description of each type of supporting documentation generally required is summarized below.

(1) No Impact Statement

The No Impact Statement is a short narrative document for projects too small to warrant an engineering study and it should outline logical and common-sense engineering approaches. Types of No Impact Statements include a General Engineering Analysis, Conveyance Shadow, and Peak Offset Analysis. Examples of these projects that could use a No Impact Statement are listed in the Henrico County Floodplain Technical Guidance Manual.

(2) Compensatory Storage

When significant topographic and geometric changes to the floodplain are part of a development project, the project is required to provide compensatory storage to ensure that the flood storage and conveyance of the site is maintained. Removing any unpermitted development, such as fill or structures, does not constitute adequate compensation, since removing unlawful development does not address the original, illegal loss of flood storage volume. Compensatory storage must instead be designed in a way that floodwaters are allowed to freely enter and exit the compensatory storage area without restriction. It should be located onsite and adjacent to or opposite the areas of new floodplain development to be hydraulically equivalent and should be hydrologically connected to the floodplain.

Proposed development in the floodplain must be compensated with excavation of at least one times the volume of the displaced storage volume (1:1 compensatory storage ratio requirement). It must also show that cut/fill volumes are balanced at 1-foot elevation increments up to the BFE. Without this requirement, compensatory storage can be graded in a way where the majority of the cut volume is found in the higher elevations, causing smaller event water surface elevations to increase.

An alternatives analysis may also be required to identify a location for compensatory storage that minimizes the impact to other resources (i.e., riparian buffers, wetlands, fisheries habitat, etc.). Additionally, test pits may be required to demonstrate that the proposed compensatory storage will not intercept the seasonal high groundwater table which would negate the required functionality of the compensation area. For more information about acceptable methods of compensatory storage calculations or for more details about map changes, please consult the Henrico County Floodplain Technical Guidance Manual.

THIS PAGE SHOULD BE DELETED PRIOR TO SUBMISSION

Flood Study

For larger or more complex development projects, it may be necessary to provide a flood study to demonstrate no-rise. Generally, this is the County's preferred method for most project types, as any floodplain changes are permanently documented within the hydraulic models so that future developments have access to the models with the most current topography and structures. The methods and reporting requirements in a flood study should follow the procedures outlined in the Henrico County Floodplain Technical Guidance Manual and revisions to the floodplain geometrics must be adopted into the County's regulatory models and maps for consideration on future projects.

THIS PAGE SHOULD BE DELETED PRIOR TO SUBMISSION

NO RISE CERTIFICATION

Internal Building Renovations Only

This is to certify that I am a duly qualified, registered professional engineer licensed to practice in the Commonwealth of Virginia.

It is to further certify that the attached technical data supports the fact that (**briefly explain the proposed project or development**) at (**insert physical address**) will not impact the 100-year flood elevations, floodway elevations, or floodway widths on (**name the waterway, floodplain, or floodway**) as presented on the current effective Henrico County Floodplain Maps in the vicinity of the proposed development.

It is to further certify that all proposed improvements are internal to the building's existing footprint and will not result in any encroachments within the Special Flood Hazard Area.

Attached are the documents and technical data that support my findings:

☐ Building Construction Plans (Building Permit #_____)

Submitted By:

Date: _____

Name: _____

Title: _____

[Insert PE Seal & Signature]

NO RISE CERTIFICATION

General

This is to certify that I am a duly qualified, registered professional engineer licensed to practice in the Commonwealth of Virginia.

It is to further certify that the attached technical data supports the fact that **(briefly explain the proposed project or development)** at **(insert physical address)** will not impact the 100-year flood elevations, floodway elevations, or floodway widths on **(name the waterway, floodplain, or floodway)** as presented on the current effective Henrico County Floodplain Maps in the vicinity of the proposed development.

Attached are the documents and technical data that support my findings:

- ☐ No Impact Statement
- ☐ Compensatory Storage
- ☐ Flood Study
- ☐ Other: _____

Submitted By:

Date: _____

Name: _____

Title: _____

[Insert PE Seal & Signature]

APPENDIX 10:

No Impact Statement: General Engineer Analysis Template

Henrico County
No Impact Statement: General Engineering Analysis Template and Instructions

(to support a No-Rise Certification)

A No-Rise Certification is required for all development in Henrico County floodplains. No-Rise Certifications must be supported by technical data, and for some projects, a No Impact Statement may be used as this technical data. A No Impact Statement uses commonsense engineering approaches and high level calculations as justification of no impact to the floodplain. In some instances, no calculations may be needed for projects with obvious impact avoidance and adequate narratives.

No Impact Statement Template

A No Impact Statement template for a General Engineering Analysis is included at the end of this section for consideration and use by the certifying engineer for a development project.

No Impact Statement Template Directions

- The No Impact Statement template includes all sections that must be included in a report for review. This template can be incorporated into a different format that uses your company name, logo, design, etc., but the headings and general layout should remain the same.
- Some sections may not be applicable to all project types. These items have been labeled with "if applicable" and should be removed from the report if they are not applicable to the project.
- The Table of Contents for the template is linked to the headings. This table must be updated when the report is complete, so the table accurately reflects the final headings and page numbers.
- Appendix titles have been included in the template report. Several of the appendices will be large documents from other programs. These do not need to be added to the Word document. Instead, they should be added to the final PDF version of the report.

Applicable Project Types

Certifying engineers should review the **Henrico County Floodplain Technical Guidance Manual, specifically Section 5.1.A.1 and Section 6.3.G**, to determine if the proposed project may be eligible to use a No Impact Statement to support the No-Rise Certificate.

DO NOT INCLUDE THIS PAGE IN YOUR SUBMISSION

No Impact Statement: General Engineering Analysis for: [Project Name]

[Stream Name(s)]
Henrico County, VA

[Report Date]
[Report Revision Date (if applicable)]

Prepared By:
[Engineer(s)'s Name]
[Engineer(s)'s Email Address]
[Engineer(s)'s Phone Number]
[Company Name]
[Company Address]

[Insert PE Seal & Signature]

Table of Contents

1. Project Description

[**INSERT -** The project description provides a brief overview of the project scope with supporting information to help easily reference the extent and location of the project.]

1.1. Narrative Statement

[**INSERT** This section expands on the project description by providing detailed information, project design, and the impacts to the floodplain. If additional design requirements are including as part of the project to meet county floodplain requirements, these should be commented on in this section. This section should reference any relevant certified topographic maps, grading plans, and construction drawings. The grading plans must provide existing and proposed contours. The supporting drawings must include relevant waterway data including the stream centerline and thalweg location. Planimetric features must also be identified including; roads, buildings, ponds, etc.]

1.2. Determination of Floodplains

[**INSERT** This section provides detailed information about any existing or adjacent floodplains that are in proximity to the proposed project. This must include the name of the associated stream, the associated floodplain classifications (Zone A or AE), and identify if it is a community SFHA or FEMA SFHA. A map from the Henrico County Flood Zone and Dam Safety Information viewer displaying the floodplain must be provided. If a FEMA SFHA, a FIRMette map may also be included]

1.3. No Rise / Project Impact Statement

[**INSERT** This section should plainly state how a project has no impact on the floodplain. This section should summarize supporting information found in the supporting calculations sections and how they support these statements (if calculations are provided).]

2. Supporting Documentation

[**INSERT** This section provides an overview of documentation and calculations to be provided to support the narrative that the project has no adverse impact on the floodplains.]

2.1. Plan Sheets

[**INSERT** Plan sheets showing the proposed project location and extent in relation to the regulatory floodplain. The plan sheets should include the regulatory floodplain limit as found on the county GIS viewer. This is required to confirm statements in the narrative and verify project extents.]

2.2. [Insert Calculation Type] (if applicable)

[**INSERT** Depending on the type of project, different calculations are necessary to support the No-Rise Certificate, such as stormwater BMP design information. A summary of the calculation results and methodology used should be included here, and any calculations and any supporting documentation (e.g. spreadsheets, drawings, models, etc.) must be included.]

APPENDIX 11:

No Impact Statement: Conveyance Shadow Template

Henrico County
No Impact Statement: Conveyance Shadow Template and Instructions

(to support a No-Rise Certification)

A No-Rise Certification is required for all development in Henrico County floodplains. No-Rise Certifications must be supported by technical data, and for some projects, a No Impact Statement may be used as this technical data. A No Impact Statement uses commonsense engineering approaches and high level calculations as justification of no impact to the floodplain.

No Impact Statement Template

A No Impact Statement template for a Conveyance Shadow analysis is included at the end of this section for consideration and use by the certifying engineer for a development project.

No Impact Statement Template Directions

- The No Impact Statement (Conveyance Shadow) template includes all sections that must be included in a report for review. This template can be incorporated into a different format that uses your company name, logo, design, etc., but the headings and general layout should remain the same.
- The Table of Contents for the template is linked to the headings. This table must be updated when the report is complete, so the table accurately reflects the final headings and page numbers.
- Appendix titles have been included in the template report. Several of the appendices will be large documents from other programs. These do not need to be added to the Word document. Instead, they should be added to the final PDF version of the report.

Applicable Project Types

Certifying engineers should review the **Henrico County Floodplain Technical Guidance Manual, specifically Section 5.1.A.3 and Section 6.3.G**, to determine if the proposed project may be eligible to use a No Impact Statement to support the No-Rise Certificate.

THIS PAGE SHOULD BE DELETED PRIOR TO SUBMISSION

No Impact Statement: Conveyance Shadow for: [Project Name]

[Stream Name(s)]
Henrico County, VA

[Report Date]
[Report Revision Date (if applicable)]

Prepared By:
[Engineer(s)'s Name]
[Engineer(s)'s Email Address]
[Engineer(s)'s Phone Number]
[Company Name]
[Company Address]

[Insert PE Seal & Signature]

Table of Contents

1. Project Description

[**INSERT** – The project description provides a brief overview of the project scope with supporting information to help easily reference the extent and location of the project.]

1.1. Narrative Statement

[**INSERT** This section expands on the project description by providing detailed information, project design, and the impacts to the floodplain. If additional design requirements are including as part of the project to meet county floodplain requirements, these should be commented on in this section. This section should reference any relevant certified topographic maps, grading plans, construction drawings, or other applicable documents. The grading plans must provide existing and proposed contours. The supporting drawings must include relevant waterway data including the stream centerline and thalweg location. Planimetric features must also be identified including; roads, buildings, ponds, etc.]

1.2. Determination of Floodplains

[**INSERT** This section provides detailed information about any existing or adjacent floodplains that are in proximity to the proposed project. This must include the name of the associated stream, the associated floodplain classifications (Zone A or AE), and identify if it is a community SFHA or FEMA SFHA. A map from the Henrico County Flood Zone and Dam Safety Information viewer displaying the floodplain must be provided. If a FEMA SFHA, a FIRMette map may also be included.]

1.3. No Rise / Project Impact Statement

[**INSERT** This section should plainly state how a project has no impact on the floodplain. This section should summarize supporting information found in the supporting calculations sections and how they support these statements (if calculations are provided).]

2. Supporting Documentation

[**INSERT** This section provides an overview of documentation and calculations to be provided to support the narrative that the project has no adverse impact on the floodplains.]

2.1. Plan Sheets

[**INSERT** Plan sheets showing the proposed project location and extent in relation to the regulatory floodplain. The plan sheets should include the regulatory floodplain limit as found on the county GIS viewer. This is required to confirm statements in the narrative and verify project extents.]

2.2. Conveyance Shadow Calculations

[**INSERT** Drawings that calculate they conveyance shadow that the proposed project falls in. Drawings must clearly show the proposed development within the conveyance shadow. Conveyance shadows must be drawn in accordance with Sec. 5.1.A.3 of the Floodplain Technical Guidance Manual.]

APPENDIX 12:

No Impact Statement: Peak Offset Analysis Template

Henrico County
No Impact Statement: Peak Offset Analysis
Template and Instructions

(to support a No-Rise Certification)

A No-Rise Certification is required for all development in Henrico County floodplains. No-Rise Certifications must be supported by technical data, and for some projects, a No Impact Statement may be used as this technical data. A No Impact Statement uses commonsense engineering approaches and high level calculations as justification of no impact to the floodplain.

No Impact Statement Template

A No Impact Statement template for a Peak Offset Analysis is included at the end of this section for consideration and use by the certifying engineer for a development project.

No Impact Statement Template Directions

- The No Impact Statement (Peak Offset Analysis) template includes all sections that must be included in a report for review. This template can be incorporated into a different format that uses your company name, logo, design, etc., but the headings and general layout should remain the same.
- Some sections may not be applicable to all project types. These items have been labeled with "if applicable" and should be removed from the report if they are not applicable to the project.
- The Table of Contents for the template is linked to the headings. This table must be updated when the report is complete, so the table accurately reflects the final headings and page numbers.
- Appendix titles have been included in the template report. Several of the appendices will be large documents from other programs. These do not need to be added to the Word document. Instead, they should be added to the final PDF version of the report.

Applicable Project Types

Certifying engineers should review the **Henrico County Floodplain Technical Guidance Manual, specifically Section 5.A.2 and Section 6.3.G**, to determine if the proposed project may be eligible to use a No Impact Statement (Peak Offset Analysis) to support the No-Rise Certificate.

THIS PAGE SHOULD BE DELETED PRIOR TO SUBMISSION

No Impact Statement: Peak Offset Analysis for: [Project Name]

[Stream Name(s)]
Henrico County, VA

[Report Date]
[Report Revision Date (if applicable)]

Prepared By:
[Engineer(s)'s Name]
[Engineer(s)'s Email Address]
[Engineer(s)'s Phone Number]
[Company Name]
[Company Address]

[Insert PE Seal & Signature]

Table of Contents

1. Project Description

[**INSERT** – The project description provides a brief overview of the project scope with supporting information to help easily reference the extent and location of the project.]

1.1. Narrative Statement

[**INSERT** This section expands on the project description by providing detailed information, project design, and the impacts to the floodplain. If additional design requirements are including as part of the project to meet county floodplain requirements, these should be commented on in this section. This section should reference any relevant certified topographic maps, grading plans, construction drawings, or other applicable documents. The grading plans must provide existing and proposed contours. The supporting drawings must include relevant waterway data including the stream centerline and thalweg location. Planimetric features must also be identified including; roads, buildings, ponds, etc.]

1.2. Determination of Floodplains

[**INSERT** This section provides detailed information about any existing or adjacent floodplains that are in proximity to the proposed project. This must include the name of the associated stream, the associated floodplain classifications (Zone A or AE), and identify if it is a community SFHA or FEMA SFHA. A map from the Henrico County Flood Zone and Dam Safety Information viewer displaying the floodplain must be provided. If a FEMA SFHA, a FIRMette map may also be included.]

1.3. No Rise / Project Impact Statement

[**INSERT** This section should plainly state how a project has no impact on the floodplain. This section should summarize supporting information found in the supporting calculations sections and how they support these statements.]

2. Supporting Documentation

[**INSERT** This section provides an overview of documentation and calculations to be provided to support the narrative that the project has no adverse impact on the floodplains.]

2.1. Plan Sheets

[**INSERT** Plan sheets showing the proposed project location and extent in relation to the regulatory floodplain. The plan sheets must include the regulatory floodplain limit as found on the county GIS viewer. This is required to confirm statements in the narrative and verify project extents.]

2.2. Peak Flow Calculations

[**INSERT** Peak flow values for the existing and proposed conditions must be provided. Typically, projects that involve alterations to the existing drainage patterns, whether natural or manmade, will require more supporting documentation.]

2.2.1. Hydrologic Model Output

[**INSERT** This section should include a copy of the from hydrologic model output used in estimating peak flows, as well as a summary explaining the methodology used and results.]

2.3. Maps

2.3.1. Existing and Proposed Drainage Area Maps

[**INSERT** Include copies of the existing and proposed drainage area maps, as well as an explanation of any changes or unique circumstances that may relate to the drainage area(s).]

2.3.2. Existing and Proposed Land Use Maps

[**INSERT** Include copies of the existing and proposed land use maps, as well as an explanation of any changes or unique circumstances that may relate to the land use changes proposed.]

2.4. Detail or Cross-Section Drawings (if applicable)

[**INSERT** Detail or cross-section drawings may be required in conjunction with plan sheets to identify the exact location of development in the floodplain. These drawings should show elevation spots for the floodplain and relevant development. The floodplain elevation must be determined using the methods outlined in the Floodplain Technical Guidance Manual.]

APPENDIX 13:

Compensatory Storage Plan Template

Henrico County
Compensatory Storage Report Template and Instructions

(to support a No-Rise Certification)

A No-Rise Certification is required for all development in Henrico County floodplains. No-Rise Certifications must be supported by technical data. Compensatory Storage may be used to support a No-Rise Certificate by providing computations that compare existing and proposed topography. When development is confirmed to result in net cut within the floodplain, this indicates there is an overall increase in flood storage which would maintain or lower water surface elevations. If compensatory storage is used, a Compensatory Storage Report must be provided with the No-Rise Certificate.

Compensatory Storage Report Template

A Compensatory Storage Report template is included at the end of this section for consideration and use by the certifying engineer for a development project.

Compensatory Storage Report Template Directions

- The Compensatory Storage Report template includes all sections that must be included in a report for review. This template can be incorporated into a different format that uses your company name, logo, design, etc., but the headings and general layout should remain the same.
- Some sections, such as Compensatory Storage Requirements, may not be applicable to all project types. These items have been labeled with “if applicable” and should be removed from the report if they are not applicable to the project.
- The Table of Contents for the template is linked to the headings. This table must be updated when the report is complete, so the table accurately reflects the final headings and page numbers.
- Appendix titles have been included in the template report. Several of the appendices will be large documents from other programs. These do not need to be added to the Word document. Instead, they should be added to the final PDF version of the report.

Supporting Documents and Technical Data

Certifying engineers should review the Henrico County Floodplain Technical Guidance Manual, specifically Section 5, for additional information on Compensatory Storage requirements.

THIS PAGE SHOULD BE DELETED PRIOR TO SUBMISSION

Compensatory Storage Report for:
[Project Name]

[Stream Name(s)]
Henrico County, VA

[Report Date]
[Report Revision Date (if applicable)]

Prepared By:
[Engineer(s)'s Name]
[Engineer(s)'s Email Address]
[Engineer(s)'s Phone Number]
[Company Name]
[Company Address]

[Insert PE Seal & Signature]

Table of Contents

1. Project Description

[**INSERT** - The project description provides a brief overview of the project scope with supporting information to help easily reference the extent and location of the project.]

1.1. Narrative Statement

[**INSERT** - This section expands on the project description by providing detailed information, project design, and the impacts to the floodplain. If additional design requirements are including as part of the project to meet county floodplain requirements, these should be commented on in this section. This section should reference any relevant certified topographic maps, grading plans, and construction drawings. The grading plans must provide existing and proposed contours. The supporting drawings must include relevant waterway data including the stream centerline and thalweg location. Planimetric features must also be identified including; roads, buildings, ponds, etc.]

1.2. Determination of Floodplains

[**INSERT** - This section provides detailed information about any existing or adjacent floodplains that are in proximity to the proposed project. This must include the name of the associated stream, the associated floodplain classifications (Zone A or AE), and identify if it is a community SFHA or FEMA SFHA. A map from the Henrico County Flood Zone and Dam Safety Information viewer displaying the floodplain must be provided. If a FEMA SFHA, a FIRMette map may also be included.]

1.3. No Rise / Project Impact Statement

[**INSERT** - This section should plainly state how a project has no impact on the floodplain. This section should summarize supporting information found in the supporting calculations sections and how they support these statements. This section must be provided and contain a summary of the cut and fill (development) volumes between the existing and proposed topography. The method used to compute cut and fill (development) volumes should be explained, and procedures and software used to derive these volumes.]

2. Supporting Documentation

[**INSERT** - This section provides an overview of documentation and calculations to be provided to support the narrative that the project has no adverse impact on the floodplains.]

2.1. Plan Sheets

[**INSERT** - Plan sheets showing the proposed project location and extent in relation to the regulatory floodplain. The plan sheets should include the regulatory floodplain limit as found on the county GIS viewer. This is required to confirm statements in the narrative and verify project extents. To support the volumetric calculations, the area within the floodplain where the calculations were executed should be denoted with a hatched polygon to verify that cut and fill (development) volumes are computed only for development within the floodplain.]

2.2. Volumetric Cut/Fill Calculations

[**INSERT** - A summary of the resultant net cut must be provided here and supported with output from the designer choice of software. A detailed report from the software should be provided in the appendix and referenced in this section. Any assumptions and parameters used to complete this calculation must be elaborated on in this section. If the average end area method is used, the plan sheets should also include a callout to the location of the cross-sections used. If the grid method is used, the plan sheets must include the gridded spot shots on an existing or separate sheet to identify changes in elevation.]

2.3. Peak Flow Calculations (if applicable)

[**INSERT** - Peak flow values for the existing and proposed conditions must be provided if changes are expected as part of the development. Typically, projects that involve alterations to the existing drainage patterns, whether natural or manmade, will require more supporting documentation. The goal of the program ensures additional stormwater runoff, through land use change or outfall routing, is considered before being released into the floodplain.]

2.3.1. Existing and Proposed Drainage Area Maps (if applicable)

[**INSERT** Include copies of the existing and proposed drainage area maps, as well as an explanation of any changes or unique circumstances that may relate to the drainage area(s).]

2.3.2. Existing and Proposed Land Use Maps (if applicable)

[**INSERT** Include copies of the existing and proposed land use maps, as well as an explanation of any changes or unique circumstances that may relate to the land use changes proposed.]

2.3.3. Hydrologic Model Output (if applicable)

[**INSERT** This section should include a copy of the from hydrologic model output used in estimating peak flows, as well as a summary explaining the methodology used and results.]

2.4. Detail or Cross-Section Drawings (if applicable)

[**INSERT** - Details or cross-section drawings may be required in conjunction with plan sheets to identify the exact location of development in the floodplain. These drawings should show elevation spots for the floodplain and relevant development. The floodplain elevation must be determined using the methods outlined in the Floodplain Technical Guidance Manual.]

APPENDIX 14:

Flood Study Report Template

Henrico County
Flood Study Report Template and Instructions

(to support a No-Rise Certification)

A No-Rise Certification is required for all development in Henrico County floodplains. No-Rise Certifications must be supported by technical data. Some projects require a flood study, or hydrologic and hydraulic analysis, be provided as this technical data. Larger developments generally require a flood study, but complicated projects or sites located in sensitive areas may also merit a flood study. All development located in a floodway must conduct a flood study as per Sec. 10-9(j) of the Henrico County Floodplain Ordinance. Additionally, the Floodplain Administrator is authorized to require an applicant to conduct a flood study to determine BFE and/or floodway data where it has not previously been identified, including in areas where SFHAs have not been identified, as per Sec. 10-6(b) of the Henrico County Floodplain Ordinance. If a flood study is required, a Flood Study Report must be provided with the No-Rise Certificate.

Flood Study Report Template

A Flood Study Report template is included at the end of this section for consideration and use by the certifying engineer for a development project.

Flood Study Report Template Directions

- The Flood Study Report template includes all sections that must be included in a flood study for review. This template can be incorporated into a different format that uses your company name, logo, design, etc., but the headings and general layout should remain the same.
- Some sections, such as Compensatory Storage Requirements, may not be applicable to all project types. These items have been labeled with “if applicable” and should be removed from the report if they are not applicable to the project.
- The Table of Contents for the template is linked to the headings. This table must be updated when the report is complete, so the table accurately reflects the final headings and page numbers.
- Appendix titles have been included in the template report. Several of the appendices will be large documents from other programs. These do not need to be added to the Word document. Instead, they should be added to the final PDF version of the report.

Supporting Documents and Technical Data

Certifying engineers should review the Henrico County Floodplain Technical Guidance Manual, specifically Section 5, for additional information on Flood Study requirements, including methods for determining hydrology and HEC-RAS model requirements.

THIS PAGE SHOULD BE DELETED PRIOR TO SUBMISSION

Flood Study Report for:
[Project Name]

[Stream Name(s)]
Henrico County, VA

[Report Date]
[Report Revision Date (if applicable)]

Prepared By:
[Engineer(s)'s Name]
[Engineer(s)'s Email Address]
[Engineer(s)'s Phone Number]
[Company Name]
[Company Address]

[Insert PE Seal & Signature]

Table of Contents

1. Project Description

[**INSERT -** The project description provides a brief overview of the project scope with supporting information to help easily reference the extent and location of the project.]

1.1. Narrative Statement

[**INSERT -** This section expands on the project description by providing detailed information, project design, and the impacts to the floodplain. If additional design requirements are including as part of the project to meet county floodplain requirements, these should be commented on in this section. This section should reference any relevant certified topographic maps, grading plans, and construction drawings. The grading plans must provide existing and proposed contours. The supporting drawings must include relevant waterway data including the stream centerline and thalweg location. Planimetric features must also be identified including; roads, buildings, ponds, etc.]

1.2. Determination of Floodplains

[**INSERT -** This section provides detailed information about any existing or adjacent floodplains that are in proximity to the proposed project. This must include the name of the associated stream, the associated floodplain classifications (Zone A or AE), and identify if it is a community SFHA or FEMA SFHA. A map from the Henrico County Flood Zone and Dam Safety Information viewer displaying the floodplain must be provided. If a FEMA SFHA, a FIRMette map may also be included.]

1.3. No Rise / Project Impact Statement

[**INSERT -** This section should plainly state what impacts, if any, the project has on the floodplain. This section should summarize supporting information found in the following sections.]

1.4. Compensatory Storage Requirements (if applicable)

[**INSERT -** If compensatory storage is provided as part of a project, this section must be provided and contain a summary of the cut and fill (development) volumes between the existing and proposed topography. The method used to compute cut and fill (development) volumes should be explained, and procedures and software used to derive these volumes.]

2. Hydrologic Summary

[**INSERT -** This section provides and overview of the analysis done on the hydrologic data for the project. If the project utilizes existing hydrology, a short narrative and Section 2.1 is sufficient. If hydrology is updated, Section 2.2 must also be provided.]

2.1. Prior Studies by FEMA / Henrico County

[**INSERT -** This section identifies the existing hydrology as reported from the floodplain models. If this is a FEMA SFHA, a reference to the FIS is required.]

2.2. New Hydrology (if applicable)

[**INSERT -** The following items must be provided if peak flow values are updated from those provided in the floodplain models. Relevant mapping should be referenced in this section used to derive

parameters for updated hydrology, including but not limited to drainage area maps, land use maps, soils maps, etc.]

2.2.1. Purpose for Doing New Hydrology

[**INSERT -** This section is to provide a brief narrative description as to the reason behind updating the existing model.]

2.2.2. Hydrologic Modeling Approach

[**INSERT -** This section should outline hydrologic methods used and detail parameters used to derive peak flow values. Any changes to existing parameters must be documented and justified.]

2.2.3. Summary of Peak Discharges / Comparison Table

[**INSERT -** A table of peak discharges to compare the changes in peak flows between the existing and proposed peak flows. This must include all flow change locations and any flows that are shifted to different cross-sections. It also must include peak flows for all events.]

3. Hydraulic Summary

[**INSERT -** This section provides and overview of the analysis done on the hydraulics data for the project. If the project utilizes existing hydraulics, a short narrative and Section 2.1 is sufficient. If hydraulics date is updated, Section 2.2 must also be provided.]

3.1. Prior Studies by FEMA / Henrico County

[**INSERT -** This section identifies the existing hydraulics as shown in the floodplain models. If this is a FEMA floodplain, a reference to the FIS is required.]

3.2. New Hydraulics

[**INSERT -** This section is to provide a brief narrative description as to the reason behind updating the existing model.]

3.2.1. Floodplain Description

[**INSERT -** This section should provide characteristic details about the floodplain. This can include detail about things like slope, sediment transport, sinuosity, and overall flow impediments.]

3.2.2. Hydraulic Modeling Approach

[**INSERT -** This section should be used to outline information about the HEC-RAS version and internal tools used to complete the hydraulic analysis. This can include any periphery software used to assist with analysis.]

3.2.2.1. Duplicate Effective

[**INSERT -** This section provides a description of the existing parameters and geometrics contained in the existing hydraulic model. This model should be the exact model as found on the Henrico County Flood Model Repository.]

3.2.2.2. Corrected Effective / Existing Conditions

[**INSERT -** This section outlines any alterations made to the existing conditions model. This model should be compared for accuracy versus the duplicate effective model. Any deviations from the duplicate effective must be explained and justified, which can include, but is not limited to; updated field survey information, channel geometry, culvert/bridge dimensions, Manning's' "n" values, etc. Any modifications made to cross-sections must be noted with a revision date in the Description field within the Cross-Section Data Editor. Depending on the project, the corrected effective model could be identical to the duplicate effective, in which case, a short statement to the effect is sufficient.]

3.2.2.3. Proposed Conditions

[**INSERT -** This section describes the changes found in the model as part of the proposed conditions. All identified cross-sections and profile stations should be provided to reference areas that the proposed alterations are found. These changes can include but are not limited to: changes to topography, channel geometry, culvert/bridge dimensions, Manning's' "n" values, etc. The proposed conditions model must include all proposed development within the SFHA.]

3.2.3. Summary Tables of Water Surface Elevations

[**INSERT -** A table should be provided following the hydraulic model sections to summarize the HEC-RAS output for all models. This must include the water surface elevations for all cross-sections in all models (duplicate, corrected effective/existing conditions, and proposed conditions), as well as water surface elevations for all storm events included in the models.]

3.3. Map Change Summary (if applicable)

[**INSERT -** This section summarizes the justification for the project requiring a map change. The type of floodplain (community or FEMA) must be identified.]

3.3.1. Proposed Floodplain / Floodway Changes

[**INSERT -** This section identifies cross-sections or portions of a profile that result in water surface, velocity, or spatial extent changes as part of a floodplain change. Any features near these changes, like structures, infrastructure, habitat, etc. must be identified and justification provided that shows they are not negatively impacted.]

3.3.2. FEMA or County Map Revisions

[**INSERT -** Detail relevant to the type of floodplain (community or FEMA) revision must be elaborated in this section. This also includes explanation of the associated forms. If a FEMA SFHA, the FEMA Letter of Map Change process must be followed. If a community SFHA, a Letter of Map Revision from the County Engineer is required.]

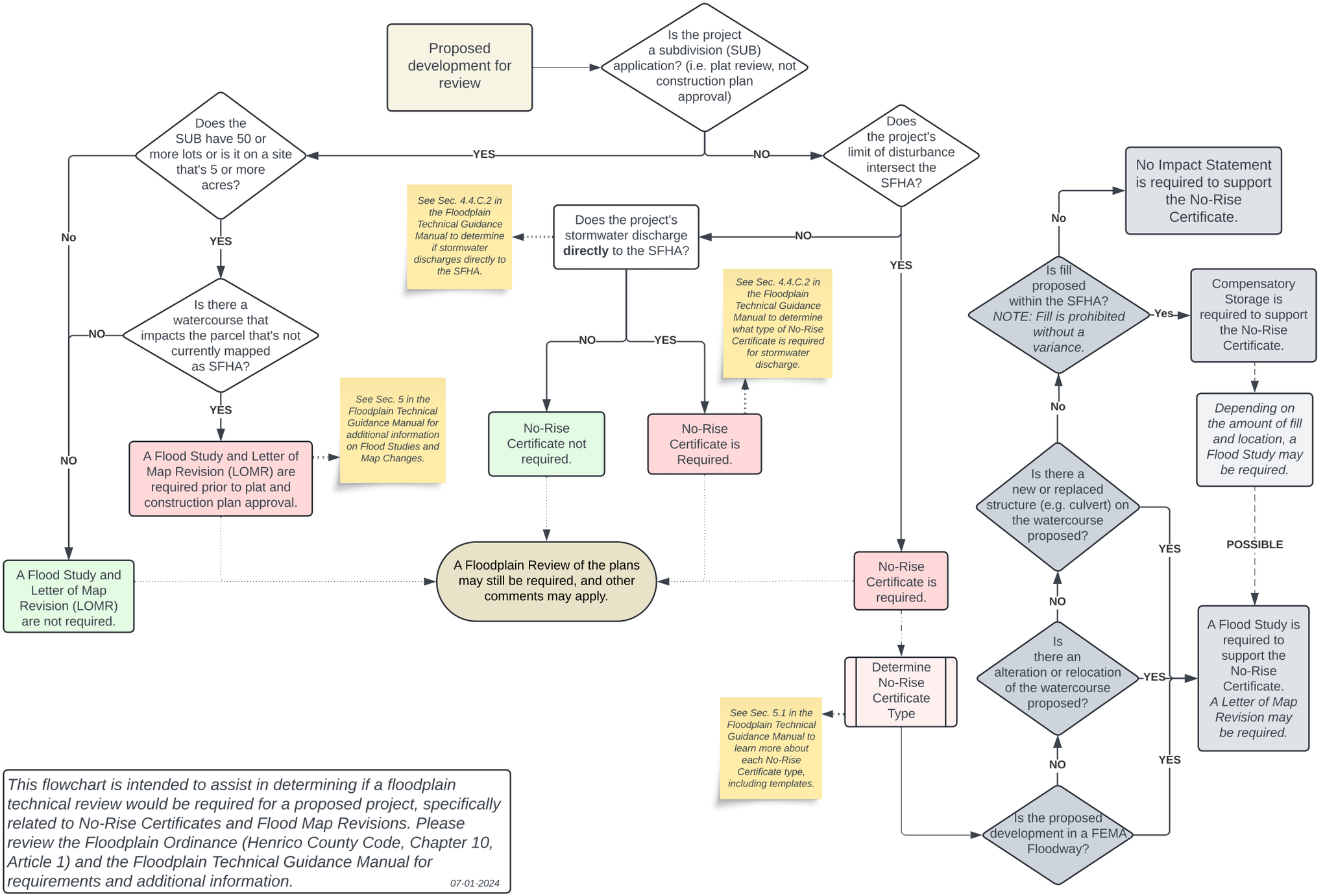
4. Conclusions

[**INSERT -** This section should provide a summary of all findings as part of the flood study.]

APPENDIX 15:

Floodplain Technical Review Determination Flowchart

Floodplain Technical Review Determination Flowchart



This flowchart is intended to assist in determining if a floodplain technical review would be required for a proposed project, specifically related to No-Rise Certificates and Flood Map Revisions. Please review the Floodplain Ordinance (Henrico County Code, Chapter 10, Article 1) and the Floodplain Technical Guidance Manual for requirements and additional information.

07-01-2024

APPENDIX 16:

Plan Review Floodplain Comment Sheet

DEPARTMENT OF PUBLIC WORKS
DESIGN DIVISION
FLOODPLAIN PLAN REVIEW COMMENTS

FLOODPLAIN

Project Name: .....[insert name]
POD/SUB #: .....[insert POD/SUB #]
GPIN(S) #: .....[insert GPIN#]
Date Received by Public Works: .....[insert date]

If the project has proposed development that is within or adjacent to a mapped floodplain, all County code requirements shall be followed which may result in limited to no proposed development within this area. Please review all comments provided within this document and modify the design to meet all Henrico County Code, Chapter 10, Article 1 requirements, as applicable, before resubmitting this project for further review and approval.

For Floodplain Management purposes, "development" is defined as any man-made change to improved or unimproved real estate, including buildings or other structures, as well as mining, dredging, filling, grading, paving, excavation or drilling operations, and storage of equipment of materials. This includes stormwater discharge impacting the floodplain even if the stormwater facility is located outside of the Special Flood Hazard Area (SFHA). "Adjacent to the SFHA" means being located within the 500-year floodplain (0.2% Annual Chance Floodplain) or within 40' of the SFHA.

Comments are applicable to the proposed project when the box (☒) has been checked. ***Blue text*** *indicates a new comment or a comment that has not been addressed.* ***Black text*** *indicates a comment that has been addressed or may be for information purposes only. Comment clarification will be provided in ADDITIONAL COMMENTS at the bottom of each section.*

REVIEWER AND CONTACT INFORMATION

If you have specific questions concerning this review, please contact the Floodplain Review Engineer, Marie Benavides, by e-mail at ben071@henrico.gov or by telephone at (804) 501-7240.

Reviewed by: .....
Date Reviewed: .....

☐ **Revisions Required** ☐ **All Comments Addressed** ☐ **No Comments**

FLOODPLAIN ON PARCEL(S) AND/OR IMPACTED BY PROPOSED DEVELOPMENT (check all that apply)

☐ Community SFHA ☐ FEMA SFHA ☐ Adjacent to SFHA (within 40' setback or 500-year floodplain)

☐ No SFHA – Subdivision proposal, Sec. 10-12 applies ☐ No SFHA – Floodplain ord. not applicable

Flood Zone(s):
☐ A ☐ AE ☐ Floodway ☐ X500 (500-year)

FEMA Flood Insurance Rate Map (FIRM) Panel(s) (if applicable): _____

Watercourse(s) Impacted: _____

Base Flood Elevation(s): _____

DEPARTMENT OF PUBLIC WORKS
DESIGN DIVISION
FLOODPLAIN PLAN REVIEW COMMENTS

FLOODPLAIN

Project Name: .....[insert name]
POD/SUB #: .....[insert POD/SUB #]
GPIN(S) #: .....[insert GPIN#]
Date Received by Public Works: .....[insert date]

DESCRIPTION OF PROPOSED DEVELOPMENT IMPACTING SFHA OR ADJACENT AREAS

_____

FLOODPLAIN BOUNDARY INTERPRETATION AND MAPPING REQUIREMENTS

*Please note: Floodplain boundaries must be shown on **all** applicable plan pages.*

1. ☐ Flood zone information ("Floodplain Type, Zone Designation") must be noted on the plan cover sheet. This includes the 500-year floodplain and floodway, when applicable (e.g., "FEMA SFHA, AE Zone", "Community SFHA, A Zone", "FEMA 500-yr floodplain").
2. ☐ The floodplain boundaries are not shown on the plan. Clearly delineate and label the boundaries, including flood zone (e.g. "FEMA SFHA, A Zone").
3. ☐ The floodplain boundaries on the plan are not correctly labeled. Clearly delineate and label the boundaries, including flood zone (e.g. "FEMA SFHA, A Zone").
4. ☐ The floodplain boundaries on the plan are difficult to see. Clearly delineate using a line style that is easily distinguishable from other lines on the plans.
5. ☐ The floodplain boundaries on the plan do not reflect the current effective floodplain boundaries as shown on the Henrico County Floodplain Maps. Update to use effective floodplain.
6. ☐ Based on the topography, there are areas of the site adjacent the floodplain that are below the BFE but are not currently mapped within the floodplain. According to Sec. 10-6(a) of the Henrico County Code, the area shall be considered SFHA and is subject to the requirements of the Henrico County Code. Revise the floodplain boundaries to include these areas.
7. ☐ A map change is required:

   CLOMR approval is required prior to construction plan approval. LOMR approval may be required prior to construction plan approval. See additional comments below.

   - ☐ Conditional Letter of Map Revision (CLOMR):
     - ☐ County (Community SFHA only)
     - ☐ FEMA (FEMA SFHA only)
   - ☐ Letter of Map Revision (LOMR):
     - ☐ County (Community SFHA only)
     - ☐ FEMA (FEMA SFHA only)

ADDITIONAL COMMENTS:

- _____

MAP REVISION SUBMITTAL REQUIREMENTS

- *A Map Revision must be supported by technical data though a flood study. In addition to this technical data, property owner notification letters, a list of impacted property owners, and a map depicting the revised area must be provided. This information must be submitted electronically in **one complete package** using the Build Henrico site. **Files must be in a compressed folder (.zip) and submitted through Build Henrico as "DPW - Floodplain Documentation".***
- *A complete Map Revision submittal package includes but is not limited to:*

Project Name: ..... **[insert name]**
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- *Signed and sealed Flood Study Narrative Report (.pdf)*
- *Associated technical data (e.g.: HEC-RAS model files, hydrologic model files (HydroCAD, PondPack, etc.), pre-/post-topographic surveys, etc.).*
- *Impacted property owner list (.xlsx)*
- *Property Owner Notification Letters, Mail Merge ready (.docx)*
- *Response to Comments, when applicable (.xlsx)*

Additional information and templates for flood studies, narrative reports, and map revision documents are available online in the Floodplain Technical Guidance Manual, Sec. 5.2 and Sec. 6.3.K.

NO-RISE CERTIFICATE REQUIREMENTS

8. ☐ **A *No-Rise Certificate*, signed and sealed by a professional engineer licensed in the Commonwealth of Virginia, is required** in accordance with Sec. 10-9(a) of the Henrico County Code with the following supporting technical data:
   - ☐ No Impact Statement
     - ☐ General Engineering Analysis
     - ☐ Peak Offset
     - ☐ Conveyance Shadow
   - ☐ Compensatory Storage
   - ☐ Flood Study
   - ☐ Other: _____
9. ☐ Development is proposed in a floodway. The No-Rise Certificate for this proposed development must be supported by a hydrologic and hydraulic analysis, as per Sec. 10-9(j) of the Henrico County Code. A CLOMR and/or LOMR may be required.
10. ☐ The submitted No-Rise Certificate documentation is incomplete:
    - ☐ The No-Rise Certificate is not signed and sealed by a professional engineer licensed in the Commonwealth of Virginia.
    - ☐ The supporting narrative report is not included, or the incorrect narrative template was used.
    - ☐ The supporting narrative report is not signed and sealed by a professional engineer licensed in the Commonwealth of Virginia.
    - ☐ The supporting technical data has not been provided.
    - ☐ The Response to Comments document has not been provided.

ADDITIONAL COMMENTS:

- *No-Rise Certificate technical review comments will be provided as a separate comment document.*
- _____

Project Name: ..... **[insert name]**
POD/SUB #: ..... **[insert POD/SUB #]**
GPIN(S) #: ..... **[insert GPIN#]**
Date Received by Public Works: ..... **[insert date]**

NO-RISE SUBMITTAL REQUIREMENTS

- *The No-Rise Certificate and supporting technical documentation must be submitted electronically in **one complete package** using the Build Henrico site. **Files must be in a compressed folder (.zip) and submitted through Build Henrico as "DPW - Floodplain Documentation".***
- *A complete No-Rise Review submittal package includes but is not limited to:*
  - *Latest plan set (.pdf) – The latest plan set should be submitted in Build Henrico as its own document and does not have to be included in the .zip folder with the other No-Rise documents.*
  - *Signed and sealed No-Rise Certificate (.pdf)*
  - *Signed and sealed Narrative Report (.pdf)*
  - *Associated technical data (e.g.: HEC-RAS model files, hydrologic model files (HydroCAD, PondPack, etc.), compensatory storage volumetric calculations, pre-/post-topographic surveys, etc.).*
  - *Response to Comments, when applicable (.xlsx)*
- *Additional information and templates for the No-Rise Certificate and narrative reports are available online in the Floodplain Technical Guidance Manual, Sec. 5.1.*

FILL AND WATERCOURSE ALTERATION REQUIREMENTS

11. ☐ Based on the plan, the watercourse (_____) is proposed to be ☐ altered, ☐ relocated, or ☐ removed:
    - ☐ A permit from the U.S. Corps of Engineers, the Virginia Department of Environmental Quality, and the Virginia Marine Resources Commission (as applicable) must be obtained prior to the proposed alteration or relocation of any channel or watercourse within Henrico County in accordance with Sec. 10-9(h) of the Henrico County Code.
    - ☐ All affected adjacent jurisdictions, the Virginia Department of Conservation and Recreation (Division of Dam Safety and Floodplain Management), and FEMA must be notified when altering or relocating any channel or watercourse mapped in a FEMA SFHA. Copies of this notification must be provided.
12. ☐ Fill is proposed within the SFHA. Fill is not permitted in the SFHA as per Sec. 10-9(b) of the Henrico County Code and must be removed.
    - ☐ Proposed fill is minor and necessary to protect or restore natural floodplain functions or to stabilize stream banks to protect public roads and utilities. An Administrative Variance in accordance with Sec. 10-17(a) of the Henrico County Code must be approved by DPW prior to construction plan approval.

ADDITIONAL COMMENTS:

- _____

SUBDIVISION PROPOSAL REQUIREMENTS

13. ☐ A narrative must be provided that documents how the proposed subdivision complies with Sec. 10-12(b)-(d) of the Henrico County Code, including measures to reduce flood damage, ensure that public utilities and facilities are located and constructed to minimum flood damage, and adequate drainage has been provided to reduce exposure to flood hazards.
14. ☐ The proposed subdivision has greater than 5 acres or 50 lots:
    - ☐ There is a watercourse on or adjacent to the site that does not currently have a mapped floodplain. In accordance with Sec. 10-12(a) of the Henrico County Code, a hydraulic and hydrologic analysis

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must be provided, using detailed methodologies, to establish a Community SFHA and BFE for this site. Once identified, those areas shall be subject to the requirements of the Floodplain Ordinance.

☐ There is an existing SFHA, or no watercourse that could be mapped as floodplain, on or adjacent to the site. The requirements of Sec. 10-12(a) of the Henrico County Code are not applicable.

ADDITIONAL COMMENTS:

- _____

STRUCTURES/BUILDINGS AND CRITICAL FACILITIES

Plan approval is not approval for any structures within or adjacent to the SFHA. A **Floodplain Development Permit** is required as per Sec. 10-8 of the Henrico County Code and must be submitted to DPW for approval. A Building Permit will not be issued until an approved Floodplain Development Permit has been issued. See Sec. 10-3 of the Henrico County Code for definitions of structure types.

15. ☐ A residential structure(s) is proposed:
    - ☐ The proposed residential structure(s) is located within the SFHA or within 15' of the SFHA. Residential structures are prohibited in accordance with Sec. 10-9(k) and Sec. 10-9(m) of the Henrico County Code, so the proposed residential structure(s) must be removed or relocated.
    - ☐ The proposed residential structure(s) is located between 15' and 40' of the SFHA or within the 500-year floodplain. Residential structures may be permitted in accordance with Sec. 10-9(o) of the Henrico County Code if the lowest floor, including mechanical equipment, of the structure(s) is elevated 1' above the BFE.
        - ☐ The proposed lowest floor of the structure(s) must be noted.
    - ☐ The proposed residential structure is not located within or adjacent to the SFHA.

16. ☐ A non-residential structure(s) is proposed:
    - ☐ The proposed non-residential structure(s) is located within the SFHA. Non-residential structures may be permitted in the SFHA if the lowest floor, including mechanical equipment, is elevated 2' above the BFE in accordance with Sec. 10-9(n) of the Henrico County Code.
        - ☐ The proposed lowest floor of the structure(s) must be noted.
    - ☐ The proposed non-residential structure(s) is located within 40' of the SFHA or within the 500-year floodplain. Non-residential structures may be permitted if the lowest floor, including mechanical equipment, is elevated 1' above the BFE in accordance with Sec. 10-9(o) of the Henrico County Code.
        - ☐ The proposed lowest floor of the structure(s) must be noted.
    - ☐ Dry floodproofing has been proposed. An Administrative Variance in accordance with Sec. 10-17(b) of the Henrico County Code must be approved by DPW prior to construction plans being signed.
    - ☐ The proposed non-residential structure(s) is not located within or adjacent to the SFHA.

17. ☐ A critical facility is proposed:

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- ☐ The proposed critical facility is located within the SFHA. Critical facilities are prohibited in the SFHA in accordance with Sec. 10-9(k) of the Henrico County Code, so the proposed critical facility must be removed or relocated.
- ☐ The proposed critical facility is a building and is located within the 500-year floodplain. Critical facilities may be permitted in the 500-year floodplain in accordance with Sec. 10-9(l) of the Henrico County Code if the lowest floor is elevated to either the BFE plus 2' or the 500-year flood elevation plus 1', whichever is greater.
  - ☐ The proposed lowest floor of the structure(s) must be noted.
- ☐ The proposed critical facility is not located within or adjacent to the SFHA.

18. ☐ An existing structure is proposed to be modified within or adjacent to the SFHA:
    - ☐ An existing structure in the floodway may not be expanded or enlarged if the proposed expansion or enlargement would result in an increase in the BFE, as outlined in Sec. 10-13(b) of the Henrico County Code.
    - ☐ An existing residential structure may not be enlarged if any part of the enlarged structure will be within the SHFA or within 15' of the SFHA, as outlined in Sec. 10-13(e) of the Henrico County Code.
    - ☐ A detailed cost breakdown for the proposed improvements to the existing structure must be provided to determine if the proposed improvements constitute a Substantial Improvement. *Henrico County will use the tax assessed value for the market value of the structure unless a current appraisal is provided. See the Floodplain Technical Guidance Manual for additional information on what costs must be included/excluded.*
    - ☐ The proposed work is considered a Substantial Improvement. The entire structure must meet the requirements of Sec. 10-13(d) of the Henrico County Code.
    - ☐ The proposed work is <u>not</u> considered a Substantial Improvement. The proposed improvements must be designed to minimize flood damage in accordance with Sec. 10-13(c) of the Henrico County Code.
    - ☐ A residential structure may be relocated only if the new location of the structure is entirely outside the SFHA and the new location complies with Sec. 10-13(f) of the Henrico County Code.

19. ☐ An accessory structure(s) is proposed within or adjacent to the SFHA:
    - ☐ The structure is 600 ft^2 or less in size. It may be constructed below the BFE if the following have been met:
      - ☐ Flood openings, in accordance with Section 10-10(b) of the Henrico County Code .
      - ☐ Anchored to resist flotation, collapse, and lateral movement.
      - ☐ Flood damage-resistant materials must be used for components below BFE.
      - ☐ Mechanical, electrical, and utility equipment must be elevated or dry floodproofed to or above the BFE.
    - ☐ The structure is larger than 600 ft^2 in size. It is considered a non-residential structure and must meet the requirements of comment #16 above.

20. ☐ A historic structure is proposed to be modified within or adjacent to the SFHA and must comply with the requirements for its structure type (residential, non-residential, etc.) unless:

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☐ A County Engineer Variance in accordance with Sec. 10-16 of the Henrico County Code must be approved by DPW prior to construction plans being signed.

21. ☐ A temporary structure is proposed. A plan for removal of the structure in the event of a flood-related severe weather notification (hurricane, tropical storm, flood, flash flood, etc.) in accordance with Sec. 10-10(k) of the Henrico County Code is required prior to Floodplain Development Permit approval.

ADDITIONAL COMMENTS:

- _____

DEFINITIONS Related to Structures (expand to view)

- **Accessory or Appurtenant Structure:** A structure which is on the same parcel of property as the principal structure and the use of which is incidental to the use of the principal structure. An accessory structure is considered nonresidential for the purposes of this article and may include detached garages, sheds, barns, or greenhouses.
- **Agricultural Structure:** A structure that is used exclusively in connection with the production, harvesting, storage, raising, or drying of agricultural commodities and livestock, including aquatic animals or plants associated with aquaculture activities. An agricultural structure does not include any structure used for human habitation.
- **Basement:** Any area of the building having its floor subgrade (below ground level) on all sides.
- **Critical Facility:** A structure or other improvement that, because of its function, size, service area, or uniqueness, has the potential to result in serious bodily harm, extensive property damage, or disruption of vital socioeconomic activities if it is destroyed or damaged or if its functionality is impaired. Critical facilities include health and safety facilities, utilities, government facilities, and hazardous materials facilities.
- **Dry Floodproofing:** A combination of measures that results in a structure and its attendant utilities and equipment being watertight with all elements substantially impermeable and with structural components having the capacity to resist flood loads.
- **Freeboard:** A factor of safety usually expressed in feet above a flood level for purposes of floodplain management. Freeboard tends to compensate for the many unknown factors that could contribute to flood heights greater than the height calculated for a selected size flood and floodway conditions, such as wave action, bridge openings, and the hydrological effect of urbanization of the watershed.
- **Historic Structure:** Any structure that is: (a) listed individually in the National Register of Historic Places maintained by the U. S. Department of Interior or preliminarily determined by the U. S. Secretary of the Interior as meeting the requirements for individual listing on the National Register, or (b) certified or preliminarily determined by the U. S. Secretary of the Interior as contributing to the historical significance of a registered historic district or a district preliminarily determined by the Secretary to qualify as a registered historic district, or (c) individually listed on a state inventory of historic places in states with historic preservation programs which have been approved by the U. S. Secretary of the Interior, or (d) individually listed on a local inventory of historic places in communities with historic preservation programs that have been certified either: (1) by an approved state program as determined by the U. S. Secretary of the Interior or (2) directly by the U. S. Secretary of the Interior in states without approved programs.
- **Lowest Floor:** The lowest floor of the lowest enclosed area (including basement). An unfinished or flood resistant enclosure, usable solely for parking of vehicles, building access, or storage in an area other than a basement area is not considered a building's lowest floor if such enclosure does not violate the applicable enclosure requirements in Sec. 10-10(c) of this article.
- **Manufactured Home:** A structure, transportable in one or more sections, which is built on a permanent chassis and is designed for use with or without a permanent foundation when attached to the required utilities. The term Manufactured Home does not include a recreational vehicle. A Manufactured Home may be considered a Residential or Non-Residential Building depending on its use.
- **Mechanical Equipment:** Includes electrical, heating, ventilation, plumbing, and air conditioning equipment, and other service facilities.

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- **Mixed-Use Building:** A building that has both residential and non-residential uses
- **New Construction:** For the purposes of determining insurance rates, structures for which the "start of construction" commenced on or after the effective date of an initial FIRM or after December 31, 1974, whichever is later, and includes any subsequent improvements to such structures. For floodplain management purposes, new construction means structures for which the start of construction commenced on or after the effective date of a floodplain management regulation adopted by a community and includes any subsequent improvements to such structures.
- **Non-Residential Building:** A building or accessory structure where the primary use is commercial or not for human habitation.
- **Residential Building:** A non-commercial building designed for habitation by one or more families or a mixed-use building, including any building or portion of a building occupied or designed to be occupied exclusively for residential purposes. The term includes guesthouses, cabins, and sleeping units but does not include a tent, recreational vehicle, hotel or motel, boardinghouse, hospital, or other accommodation used for transient occupancy.
- **Structure:** A walled and roofed building that is principally above ground. Walled is considered "two or more outside rigid walls" and roofed is "a fully secured roof." This may also be referred to as a building.
- **Substantial Damage:** Damage of any origin sustained by a structure whereby the cost of restoring the structure to its before damaged condition would equal or exceed 50 percent of the market value of the structure before the damage occurred.
- **Substantial Improvement:** Any reconstruction, rehabilitation, addition, or other improvement of a structure, the cost of which equals or exceeds 50 percent of the market value of the structure before the Start of Construction of the improvement. This term includes improvements to structures which have incurred Substantial Damage, regardless of the amount of the actual repair work performed. For the purposes of this article, the relocation of a residential structure within the SFHA is deemed a substantial improvement. This term does not, however, include any improvement of a structure to correct existing violations of state or local health, sanitary, or safety code specifications which have been identified by the local code enforcement official and which are the minimum improvements necessary to assure safe living conditions.
- **Wet Floodproofing:** Floodproofing method that relies on the use of flood damage-resistant materials and construction techniques in areas of a structure that are below the elevation required by this article and are intentionally allowed to flood.

DRIVEWAYS, ROADS, AND PARKING AREAS

22. ☐ The proposed ☐ roadway, ☐ parking area, and/or ☐ driveway meets the dryland access requirements outlined in Sec. 10-10(g) of the Henrico County Code.
23. ☐ The proposed ☐ roadway, ☐ parking area, and/or ☐ driveway appear(s) to be located more than 6" below the BFE. The improvements must be relocated or redesigned, so it will not be overtopped by more than 6" of water during the 100-yr storm event.

ADDITIONAL COMMENTS:

- _____

WATER, SEWER, AND WASTEWATER SYSTEMS

24. ☐ A narrative, including any supporting data, must be provided that demonstrates that the proposed water supply system is designed to minimize or eliminate infiltration of floodwaters into the systems, as per Sec. 10-9(d) of the Henrico County Code.
25. ☐ A narrative, including any supporting data, must be provided that demonstrates that the proposed sanitary sewage system is designed to minimize or eliminate infiltration of floodwaters into the systems and discharges from the systems into floodwaters, as per Sec. 10-9(e) of the Henrico County Code.

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26. ☐ A narrative, including any supporting data, must be provided that demonstrates that the proposed onsite waste disposal system is located to avoid impairment to them or contamination during flooding, as per Sec. 10-9(f) of the Henrico County Code.

ADDITIONAL COMMENTS:

- _____

TEMPORARY ENCROACHMENTS

Temporary encroachments include sediment control devices, temporary stream crossings, haul roads and construction entrances, storage of equipment, and soil stockpiling. A temporary encroachment shall not be in place for more than 3 months and is renewable for up to 1 year with written approval from the Floodplain Administrator.

27. ☐ A temporary encroachment(s) is proposed in the SFHA and must comply with the No-Rise Certificate and no fill requirements mentioned above.

28. ☐ A temporary encroachment(s) is proposed in the SFHA, and the no fill requirement is not being met and approval from the Floodplain Administrator has been granted in accordance with Sec. 10-10(l) of the Henrico County Code.

    ☐ The following note must be shown on the plan cover sheet and the E&S Sequence of Construction:

    "The temporary encroachment of [insert encroachment type] shall not be in place more than 3 months and is renewable for up to 1 year with written approval from the Floodplain Administrator in accordance with Sec. 10-10(l) of the Henrico County Code. The 3 months begins on the date of the pre-construction meeting."

ADDITIONAL COMMENTS:

- _____

STORMWATER MANAGEMENT FACILITIES

29. ☐ A Stormwater Management Facility (_____) is proposed in the SFHA, which is prohibited as per Sec. 10-10(j) of the Henrico County Code. The proposed Stormwater Management Facility must be removed or relocated. Sec. 4.4.C of the Floodplain Technical Guidance Manual outlines what is considered a Stormwater Management Facility for floodplain management purposes.

ADDITIONAL COMMENTS:

- _____

STORAGE OF MATERIALS

30. ☐ Storage of hazardous materials is proposed in the SFHA and is prohibited as per Sec. 10-10(f) of the Henrico County Code. Storage of hazard materials must be removed or relocated.

31. ☐ Storage of other materials is proposed in the SFHA and documentation must be provided demonstrating that at least one of the options below been met to ensure the materials and equipment will not become debris during a flood as per Sec. 10-10(f) of the Henrico County Code:

    ☐ Materials and equipment elevated to or above the BFE.

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- ☐ Materials and equipment anchored to resist flotation.
- ☐ Materials and equipment located in an enclosure.
- ☐ Materials and equipment designed to be removable from the site prior to a flood. The following must be provided:
  - ☐ A written designation of a location outside the SFHA to which the materials or equipment will be removed, AND
  - ☐ A copy of the contract with a trucking company to ensure the availability of removal equipment when needed, OR
  - ☐ Evidence of removal equipment on the property if a trucking company will not be used.

ADDITIONAL COMMENTS:

- _____

OTHER COMMENTS

- _____

APPENDIX 17:

County LOMR Property Owner Notification Letter Template

Insert date of letter

Insert property owner name
Insert property owner mailing address

RE: Notification of Flood Map Revision

Dear property owner name,

The Henrico County Flood Hazard and Dam Safety Information Map is the County's official map for displaying the Special Flood Hazard Area (SFHA), the area which has been determined to be subject to a 1% (100-year) or greater chance of flooding in any given year. This map includes both FEMA SFHA and Community SFHA and serves as the County's Comprehensive Drainage Map. This map is used when regulating development in and adjacent to the floodplain, as outlined in Chapter 10, Article 1, of the Henrico County Code. The County's Comprehensive Drainage Map may be accessed through the Henrico County Flood Zone and Dam Safety Information GIS map viewer, available online at henrico.gov/works.

This letter is to inform you that the County Comprehensive Drainage Map has been revised through an approved Letter of Map Revision (LOMR), effective insert LOMR approval date, for insert stream name(s), as indicated on the attached map. This LOMR affects the Community SFHA boundary and/or the regulatory setbacks from the SFHA boundary on your property at insert property address.

Approximate Latitude & Longitude

Upstream Lat/Long:	Insert decimal degrees (at least 4 decimal places)	Downstream Lat/Long:	Insert decimal degrees (at least 4 decimal places)

Flooding Source and Revised Reach Description

Insert stream name(s) and description of impacted area along reach (e.g. Gillies Creek Tributary 2: approximately 130 feet upstream of a culvert crossing along East Foxhill Road to the downstream confluence of Gilles Creek)

Summary of Revisions

The effective hydraulic models were updated as part of this map revision insert changes to model. The effective flood zone for this area was a Community SFHA, insert flood zone. The revised flood zone is a Community SFHA, insert flood zone. This LOMR results in insert one of the following: increases, decreases, or both increases and decreases in the flood zone boundary along this stream reach.

If you have any questions regarding this LOMR, the Community SFHA, or flood mapping issues in general, please contact Kristin Owen, Floodplain & Dam Safety Manager, at owe042@henrico.gov or 804-396-1156.

Sincerely,
Insert applicant name
Insert applicant contact information

attach: Revised Floodplain Map
cc: Kristin Owen, Floodplain & Dam Safety Manager

APPENDIX 18:

County CLOMR Property Owner Notification Letter Template

Insert date of letter

Insert property owner name
Insert property owner mailing address

RE: Notification of Conditional Flood Map Revision

Dear property owner name,

The Henrico County Flood Hazard and Dam Safety Information Map is the County's official map for displaying the Special Flood Hazard Area (SFHA), the area which has been determined to be subject to a 1% (100-year) or greater chance of flooding in any given year. This map includes both FEMA SFHA and Community SFHA and serves as the County's Comprehensive Drainage Map. This map is used when regulating development in and adjacent to the floodplain, as outlined in Chapter 10, Article 1, of the Henrico County Code. The County's Comprehensive Drainage Map may be accessed through the Henrico County Flood Zone and Dam Safety Information GIS map viewer, available online at henrico.gov/works.

This letter is to inform you that the County Comprehensive Drainage Map will be revised through an approved Conditional Letter of Map Revision (CLOMR), effective insert CLOMR approval date, for insert stream name(s), as indicated on the attached map. This CLOMR is the result of a proposed insert project type/name, and the map revision will not become effective until the project has been completed. This CLOMR will affect the Community SFHA boundary and/or the regulatory setbacks from the SFHA boundary on your property at insert property address.

Approximate Latitude & Longitude

Upstream Lat/Long:	Insert decimal degrees (at least 4 decimal places)	Downstream Lat/Long:	Insert decimal degrees (at least 4 decimal places)

Flooding Source and Revised Reach Description

Insert stream name(s) and description of impacted area along reach (e.g. Gillies Creek Tributary 2: approximately 130 feet upstream of a culvert crossing along East Foxhill Road to the downstream confluence of Gilles Creek)

Summary of Revisions

The effective hydraulic models were updated as part of this map revision to incorporate the proposed insert project type/name design, including proposed insert description of impacts to floodplain (e.g. realignment of stream channel). The effective flood zone for this area was a Community SFHA, insert flood zone. The revised flood zone is a Community SFHA, insert flood zone. This CLOMR results in insert one of the following: increases, decreases, or both increases and decreases in the flood zone boundary long this stream reach.

If you have any questions regarding this CLOMR, the Community SFHA, or flood mapping issues in general, please contact Kristin Owen, Floodplain & Dam Safety Manager, at owe042@henrico.gov or 804-396-1156.

Sincerely,
Insert applicant name
Insert applicant contact information

attach: Revised Floodplain Map
cc: Kristin Owen, Floodplain & Dam Safety Manager

APPENDIX 19:

County LOMR Impacted Property Owners Map Example

Henrico County Flood Map Revision
[Insert Project Name]
[Insert Date]

Upham Brook Tributary 7

137.59'
137.59'
135.01'
136.32'
136.32'
136.32'
136.32'
136.32'
136.32'
132.80'
136.31'
120.29'
114.68'
113.50'
110.12'
109.40'

Wilkinson Rd
Tamarind Dr
Tamarind Pl
Capistrano Dr
Amalfi Ct
Amalfi Dr
Kahlua Dr
Damascus Dr
Oster Dr
Norman Dr
Antionette Dr
Bonneau Rd
Sausiluta Dr

Legend

xxx.xx' Existing Water Surface Elevation
xxx.xx' New Existing Water Surface Elevation

- Existing Cross-Section
- New Existing Cross-Section
- Existing Stream Centerline
- New Existing Stream Centerline
- Existing Henrico County Zone A
- New Existing Henrico County Zone A
- Impacted Parcels
- Parcels

Topographic Contours

- 2'

N

0 125 250 500 Feet

1 inch = 200 feet

Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

APPENDIX 20:

County CLOMR Impacted Property Owners Map Example

Henrico County Conditional Flood Map Revision

[Insert Project Name]

[Insert Date]

Upham Brook Tributary 7

Wilkinson Rd
Tamarind Dr
Tamarind Pl
Kahlua Dr
Capistrano Dr
Amalfi Ct
Amalfi Dr
Damascus Dr
Oster Dr
Norman Dr
Antionette Dr
Bonneau Rd
Sausiluta Dr

137.59'
137.59'

136.32'
133.12'

136.32'
132.98'

136.32'
132.82'

136.32'
131.99'

136.32'
131.98'

136.32'
131.97'

136.31'
131.94'

114.68'
114.68'

113.50'
113.50'

109.40'
109.40'

Legend

xxx.xx' New Existing Water Surface Elevation
xxx.xx' Proposed Water Surface Elevation

- New Existing Cross-Section
- Proposed Cross-Section
- New Existing Stream Centerline
- Proposed Stream Centerline
- New Existing Henrico County Zone A
- Proposed Henrico County Zone A
- Impacted Parcels
- Parcels

Topographic Contours

- 2'

N

0 125 250 500 Feet

1 inch = 200 feet

Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community