**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.

**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]***

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# Project Description

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.

## Narrative Statement

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.

## Determination of Floodplains

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](https://henrico.maps.arcgis.com/apps/webappviewer/index.html?id=e940e72a32244bf3ae9a8098766f2bdd) displaying the floodplain must be provided. If a FEMA SFHA, a FIRMette map may also be included.

## No Rise / Project Impact Statement

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.

## Compensatory Storage Requirements (if applicable)

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.

# Hydrologic Summary

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.

## Prior Studies by FEMA / Henrico County

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.

## New Hydrology (if applicable)

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.

### Purpose for Doing New Hydrology

This section is to provide a brief narrative description as to the reason behind updating the existing model.

### Hydrologic Modeling Approach

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.

### Summary of Peak Discharges / Comparison Table

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.

# Hydraulic Summary

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.

## Prior Studies by FEMA / Henrico County

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.

## New Hydraulics

This section is to provide a brief narrative description as to the reason behind updating the existing model.

### Floodplain Description

This section should provide characteristic details about the floodplain. This can include detail about things like slope, sediment transport, sinuosity, and overall flow impediments.

### Hydraulic Modeling Approach

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.

#### Duplicate Effective

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](https://henrico.maps.arcgis.com/apps/webappviewer/index.html?id=39371084312d4c2dbc1d205a96d41ef3).

#### Corrected Effective / Existing Conditions

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.

#### Proposed Conditions

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.

### Summary Tables of Water Surface Elevations

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.

## Map Change Summary (if applicable)

This section summarizes the justification for the project requiring a map change. The type of floodplain (community or FEMA) must be identified.

### Proposed Floodplain / Floodway Changes

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.

### FEMA or County Map Revisions

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.

# Conclusions

This section should provide a summary of all findings as part of the flood study.

1. No Rise Certification
2. Compensatory Storage Calculations (if applicable)
3. FEMA or County Map Change Approval (if applicable)
4. Location Map
5. Site Photos with Captions
6. Published FEMA / County Data
7. Hydrologic Modeling Documentation

Mapping of the Watershed (GIS Deliverable)

Model Results

1. Hydraulic Modeling Documentation

Duplicate Effective Model

Corrected Effective / Existing Conditions Model

Proposed Conditions Model

1. Stream Stability / Scour Analysis (if applicable)
2. Annotated Floodplain (FIRM) Map
3. Certified Topographic Map(s) / Work Map(s)
4. Construction Drawing(s)
5. Electronic Submission (Metadata)