



Department of Public Works and Environmental Services

Technical Bulletin

Subject: Impact of National Oceanic and Atmospheric Administration (NOAA) Atlas 14 Rainfall Data on Use of Existing Floodplain Studies

Date: May 20, 2016

No.: 16-02

Summary: NOAA Atlas 14 updates and replaces the rainfall data used for prior floodplain studies. The Public Facilities Manual (PFM) has been amended to incorporate NOAA Atlas 14 rainfall data. Previously approved floodplain studies performed in conjunction with development projects that did not utilize NOAA Atlas 14 rainfall data remain valid and may be used for all plan submissions with the following exception: Previously approved floodplain studies based on Natural Resources Conservation Service (NRCS) hydrology must be checked to verify that peak flows computed using NOAA Atlas 14 rainfall data are not increased above previously computed peak flows. If there is an increase in flow, further evaluation is required to determine if associated 100-year flood elevations increase more than 0.1 feet. If associated 100-year flood elevations increase more than 0.1 feet, a new floodplain study may be needed to demonstrate compliance with County floodplain regulations. Note that all floodplain studies used for the County's Federal Emergency Management Agency (FEMA) Flood Insurance Study (FIS), regardless of the hydrologic method used, remain valid. The validity of previously approved floodplain studies is summarized in the table below:

Hydrologic Method	Floodplain Study
Rational Formula	Valid
Anderson Formula	Valid
NRCS no increase in flow using NOAA Atlas 14 rainfall data	Valid
NRCS increase in flow using NOAA Atlas 14 rainfall data	Valid estimated increase in flood elevation ≤ 0.1 feet
NRCS increase in flow using NOAA Atlas 14 rainfall data	Not Valid estimated increase in flood elevation > 0.1 feet
Various FEMA floodplain studies	Valid

All plans, including Resource Protection Area (RPA) boundary delineation studies, using elevations and floodplain boundaries from previously approved floodplain studies are required to include a statement identifying the hydrologic method used and an opinion by the submitting engineer as to the validity of the existing study. This policy does not preclude or affect the use of certain other County floodplain studies for delineating estimated floodplains on residential infill development.



Effective Date: Immediately.

Background: NOAA Atlas 14 updates rainfall data for the United States and replaces data in TP-40 and Hydro-35 rainfall atlases which were published in 1961 and 1977 respectively. The PFM has been updated to incorporate NOAA Atlas 14 rainfall data. Use of NOAA Atlas 14 rainfall data was initially required with adoption of the Stormwater Management Ordinance (effective July 1, 2014). A concern has been raised as to how this might impact previously approved floodplain studies that were performed using the older data and if they may still be used for design and regulatory purposes. If use of Atlas 14 rainfall data would result in equal or lower 100-year flood elevations than the previously approved studies, such studies are still valid and may be used for design and regulatory purposes without being revised. If use of Atlas 14 rainfall data would result in lower flood elevations, new studies may be performed and submitted for review and approval at the option of the developer.

The impact of using NOAA Atlas 14 rainfall data depends on the hydrologic method used to determine the 100-year peak flows used in the original floodplain study. The PFM provides for the use of three specific hydrologic methods for floodplain studies: the Rational Formula, the Anderson Formula, and NRCS hydrology. The three methods are discussed below.

Rational Formula. The Rational Formula is acceptable for use with watersheds having drainage areas of 200 acres or less. Rainfall intensities used in the formula are based on the duration of the design storm which is set at the time of concentration of the watershed. For times of concentration and storm durations used for watersheds of 200 acres or less, NOAA Atlas 14 rainfall intensities are less than prior values. Therefore, the 100-year flows and associated flood elevations computed using NOAA Atlas 14 data will be less than those in the existing floodplain studies. All previously approved floodplain studies performed using Rational Formula hydrology remain valid.

Anderson Formula. The Anderson Formula is acceptable for use with watersheds having drainage areas over 200 acres. The formula is a regression equation developed by the United States Geological Survey based on an analysis of stream gage data. The equation does not use rainfall intensity or volume as a variable. Therefore, NOAA Atlas 14 has no impact on floodplain studies performed using Anderson Formula hydrology. All previously approved floodplain studies performed using the Anderson Formula hydrology remain valid.

NRCS Hydrology. NRCS hydrology is acceptable for use with watersheds having drainage areas of any size. The method uses the total rainfall amount for a 24-hour storm and a specific 24-hour rainfall distribution to determine flood flows. NOAA Atlas 14 increases the total rainfall amount for the 24-hour 100-year storm from 7.30 inches to 8.41 inches, for the Vienna/Tysons station. A significant increase in computed flows would be expected from this increase in the rainfall amount. However, with the adoption of NOAA Atlas 14, the old NRCS Type II rainfall distribution used in the Mid-Atlantic Region has been replaced by the NOAA_C rainfall distribution, which has a different shape, time to peak, and lower peak rainfall intensity that modifies the effect of the increase in total rainfall amount. The combination of a higher NOAA Atlas 14 rainfall amount and the NOAA_C rainfall distribution may or may not result in higher computed flows depending on the size of the contributing drainage area, time of concentration,

and runoff curve number. Therefore, all previously approved floodplain studies performed using NRCS hydrology that did not use NOAA Atlas 14 rainfall data must be reviewed to determine possible impacts on flood elevations prior to using flood elevations and boundaries from those studies for design and regulatory purposes. The review consists of computing new 100-year peak flows using NOAA atlas 14 rainfall data, determining if any increase in peak flow is large enough to raise flood elevations, and evaluating regulatory issues.

Process for Evaluating Prior Approved Floodplain Studies Using NRCS Hydrology:

Step 1: Recreate the original hydrologic model using the drainage areas, times of concentration, and runoff curve numbers from the approved floodplain study. Run this model using the original rainfall amount with the NRCS Type II rainfall distribution and compare the peak flow to that of the approved floodplain study to confirm that the model has been accurately recreated. Next, run the model using the new NOAA Atlas 14 rainfall value of 8.41 inches with the NOAA_C rainfall distribution. If this peak flow is equal to or less than the peak flow used in the approved floodplain study, the existing floodplain study is valid. If not, go to Step 2.

Step 2: When there is an increase in flow based on NOAA Atlas 14 rainfall data, it is necessary to determine if the higher flows result in increases in 100-year flood elevations exceeding some predetermined limit. Identify the cross-sections in the approved floodplain study with the widest and narrowest flood widths and all cross-sections with proposed encroachments into the floodplain. Divide the increase in flow by the product of the flood width and the velocity from the approved floodplain study at each cross-section to determine an estimated increase in flood elevation. If the submitting engineer performed or has access to the original floodplain study computer modeling, it should be used to compute the increase in flood elevation(s) instead of the estimating procedure. If the increase in flood elevation(s) is less than or equal to 0.1 feet, prior to rounding, the study is valid. If not, go to Step 3.

Note that even though the study is valid and acceptable for use with the current construction plan, if the elevation of the lowest part of the lowest floor of any proposed structure is at the minimum 18 inches freeboard, it should be raised by at least 0.1 feet to assure compliance with County floodplain regulations.

Step 3: Consult with a County stormwater reviewer to determine if a new floodplain study is necessary to demonstrate compliance with County floodplain regulations.

Certification Statement on Plans: All plans, including RPA boundary delineation studies, using elevations and floodplain boundaries from previously approved floodplain studies must include a certification statement by the submitting engineer identifying the hydrologic method used and an opinion, with a rationale for the opinion as to the validity of the existing study. For plans utilizing previously approved floodplain studies based on NRCS hydrology, the certification statement must be accompanied by: a) the hydrologic computations described above; b) additional computations as needed to estimate the increase in flood elevations as described above; c) the increase in 100-year peak flow and estimated increase(s) in 100-year flood elevation(s) and d) horizontal setbacks for all existing and proposed structures and freeboard for

the lowest floor of all existing and proposed residential structures bordering the floodplain if the estimated increase in flood elevation is greater than 0.1 feet, prior to rounding.

If you have any questions, please contact the Site Code Research and Development Branch at **703-324-1780, TTY 711** for general questions or a stormwater reviewer in the Site Development and Inspections Division at **703-324-1720, TTY 711** for questions regarding a specific floodplain study or plan.

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