



FEMA

Operating Guidance No. 10-13

For use by FEMA staff and Flood Hazard Mapping Partners

Title: Operating Guidance for Selection of Wave Runup Methods

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Approval: 
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Operating guidance documents provide best practices for the Federal Emergency Management Agency's (FEMA's) Risk MAP program. These guidance documents are intended to support current FEMA standards and facilitate effective and efficient implementation of these standards. However, nothing in Operating Guidance is mandatory, other than program standards that are defined elsewhere and reiterated in the operating guidance document. Alternate approaches that comply with program standards that effectively and efficiently support program objectives are also acceptable.

Background: Wave runup is the maximum vertical extent of wave uprush on a beach or structure above the stillwater level. Since the early 1980s, runup has been recognized by the National Flood Insurance Program as an important component of the flood hazard in coastal floodplains.

Coastal flood study guidelines are published in Appendix D of FEMA's *Guidelines and Specifications for Flood Hazard Mapping Partners (Guidelines)*. The *Guidelines* recognize various applicable engineering methods for the estimation of wave runup. The recommended methods differ based on shoreline characteristics, such as the presence of a coastal shore protection structure. Runup methodologies also differ to account for the physical processes that contribute to the wave runup hazard. For instance, Pacific Coast methodologies include the assessment of dynamic wave setup, while dynamic setup is considered to be an insignificant component of the flood hazard along the Atlantic and Gulf coasts.

Many of the runup methods recommended for use in the *Guidelines* are empirical formulae developed for specific ranges of environmental parameters (e.g., profile slope and wave conditions). Knowledge of the applicable ranges of these values is important when selecting an

appropriate method for a given study site, since using a method for conditions that are outside of the range of acceptable values may return unreliable results.

Issues: Proper implementation of a wave runup methodology requires an understanding of the range in environmental conditions for which a method is valid. Because these ranges are not always clearly and consistently presented in the *Guidelines*, it is difficult for a Mapping Partner to select among the recommended methods.

Of the many runup methods and models available and recommended in the *Guidelines*, some have overlapping ranges of environmental parameters. The *Guidelines* do not always clearly indicate a preference for one method over another when multiple methods are technically suitable for a study site. This is particularly true for the *Atlantic Ocean and Gulf of Mexico Coastal Guidelines Update*. The ambiguity of FEMA's preferred methods has led to inconsistencies in method selection among studies. Differences in study approaches can result in mismatches at study borders and difficulties in replicating effective study methodology by requests for Letters of Map Revision.

Actions Taken: A decision tree for the selection of wave runup methods for studies on the Atlantic and Gulf coasts was developed to clarify FEMA's preferred approach for a specific set of environmental conditions. For all new detailed Atlantic and Gulf coastal studies started in Fiscal Year 2011 or later, the determination of the applicable wave runup method should be based on the decision tree, which is provided as an attachment to this operating guidance memorandum. Use of a method other than the one specified by the decision tree will require approval by the FEMA Study Representative. For studies on the Pacific coast or the Great Lakes, the Mapping Partner should use the methods recommended in the effective *Guidelines*.

Supersedes/Amends: Section D.4.5 of the *Final Draft Guidelines for Coastal Flood Hazard Analysis and Mapping for the Pacific Coast of the United States*, January 2005, and Section D.2.8 of the *Atlantic Ocean and Gulf of Mexico Coastal Guidelines Update, Final Draft*, February 2007.

Attachment: Decision tree for the selection of wave runup methods for studies on the Atlantic Ocean and Gulf of Mexico coasts.

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Attachment: Wave Runup Methods for Studies on the Atlantic Ocean and Gulf of Mexico Coasts

