



FEMA

# RiskMAP

Increasing Resilience Together



# Fall 2016 – Hydraulics Updates Guidance Updates

## ■ General Hydraulics Guidance:

- Originally transformed in May 2016
- Provides additional clarity on levels of study such as Base Level Engineering and Detailed Study
- Held for release to correspond with 1-D and 2-D Analysis Guidance release

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General Hydraulics Considerations  
Guidance Document S2

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Option	Cross Sections	Flow Paths (Left, Right and Channel)	Manning's "n" Values	Structures	Flood Zone
A	Auto-placed; may be unnaturally straight with computerized look to them adjusted or auto-placed by "intelligent" methods.	Reach lengths are assumed equal.	Single value for each cross section.	Not included; cross sections placed as if structures don't exist or cross sections placed appropriately for structure modeling.	A
B	Auto-placed and hand adjusted or auto-placed by "intelligent" methods.	Reach lengths computed by offsetting stream centerline.	Overbanks from Land Use Land Cover (LULC) data, channel value estimated separately.	Not included; but cross sections placed appropriately for structure modeling.	A
C	Each section reviewed by engineers.	Reach lengths adjusted based on draft floodplain.	Overbanks LULC data, channel value estimated separately.	Included; structure data from national, state or other data source. Estimated base on topography and aerial photos for those not available.	A
D	Each section reviewed by engineers.	Reach lengths adjusted based on draft floodplain.	Overbanks from LULC data, channel value estimated separately and calibrated where possible.	Included; structure data from as-builts, design plans, "measured" in the field, or other community datasets with opening information.	A or AE
E	Each section reviewed by engineers, Channel bathymetry included in sections.	Reach lengths adjusted based on draft floodplain.	Overbanks from LULC data and field data, channel value estimated separately from field data and calibrated where possible.	Included; structure data from field survey, as-builts, design plans, "measured" in the field.	AE

# Fall 2016 – Guidance Transformation Hydraulics – One Dimensional Analysis

## Notes:

- Mostly minor edits to existing information.
- Added information on how to select between steady and unsteady modeling techniques. Tied to General Hydraulics Considerations

## New or Significant Changes:

- None

*“The approach used for the hydraulic analyses can generally be categorized as one of three types: one-dimensional steady flow, one-dimensional unsteady flow, and two-dimensional steady and unsteady flow analyses. The approaches require different level of effort. For more information about selecting the appropriate modeling analysis see the [General Hydraulic Considerations Guidance](#). For more information about two-dimensional analysis see the [Hydraulics: Two-Dimensional Analysis Guidance](#).”*

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# Fall 2016 – Guidance Transformation Hydraulics – Two Dimensional Analysis

## Notes:

- This transformation also addressed some TMAC recommendations about when to use 2-D models

## New or Significant Changes:

- New content from recently developed whitepapers and other technical documents
- Guidance to assist modelers when selecting between 1-D and 2-D models, discuss appropriate use for 2-D models
- Better defining data sources,
- Information about model verification and maintenance.

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# Fall 2016 – Guidance Transformation

## Hydraulics – Two Dimensional Analysis

### 1.2.1 Decision Process

Standard Engineering practice should be followed and in general, technical modeling factors to be considered include but are not limited to:

1. Topographic data availability and resolution
2. Cell size and computation time
3. Etc....

Additional factors that may more closely impact the FEMA products that should be considered include:

1. Population density
2. Level of expertise in community
3. Etc....

When deciding whether a 2-D model would be appropriate the following questions should be asked:

A. Technical (qualitative or quantitative assessment):

1. Will a 2-D analysis (as oppose to 1-D analysis) result in more accurate flood elevations on NFIP maps given the conditions on the ground?
2. Etc....

B. Cost (qualitative or quantitative assessment):

1. Does the model need to be purchased and what is the cost to FEMA or the user, ensuring it adheres to requirements set forth in 44 CFR 65.6(a)(6)?
2. Etc....

A. Programmatic (qualitative or quantitative assessment):

1. What are the benefits to the community and property owners from a 2-D analysis?
2. How many structures and how many people will be impacted?
3. Etc....

# Fall 2016 – Guidance Transformation Floodway Analysis Mapping

## Notes:

- Transformation of existing guidance with no major changes

## New or Significant Changes:

- None

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# Fall 2016 – Guidance Transformation Flood Profiles

## New or Significant Changes:

- New guidance added to address drawdowns, overprints, and profiles for 2D modeling

## Notes:

- Transformation of existing guidance

*“When efforts to correct drawdowns and crossing profiles within the model have been exhausted or the profile has been determined to be hydraulically accurate as-is (with accuracy emphasis to the 1.0%-annual-chance profile), then the removal of these features occurs in the course of profile production. In the case of a drawdown, the lower upstream inflection point should be raised until it equals the elevation of the next inflection point downstream for that recurrence interval.”*

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# Fall 2016 – Guidance Transformation Shallow Flooding

## Notes:

- Transformation of existing guidance
- Revisions to some language to reflect current program terminology and evolving methods of analysis since Appendix E was originally written.

## New or Significant Changes:

- None

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# Fall 2016 – Guidance Transformation

## Shallow Flooding

Flood Hazard Zone	Shallow Flooding Description
Zone A	<p>Area of special flood hazards without water surface elevations determined.<sup>1</sup></p> <p>Zone A is the flood hazard zone that corresponds to the 1-percent-annual-chance floodplains that are determined by Zone A study methods in shallow flooding areas. No 1-percent-annual-chance flood elevations or average depths are shown within this zone on the FIRM.</p>
Zone AO	<p>Area of special flood hazards having shallow water depths and/or unpredictable flow paths between (1) and (3) ft.<sup>1</sup></p> <p>In other words, Zone AO corresponds to the areas of the 1-percent-annual-chance flooding (usually sheet flow on undulating terrain) where average depths are between 1.0 and 3.0 feet. Average whole-foot depths derived from the hydraulic analysis are shown within this zone on the FIRM.</p>
Zone AH	<p>Areas of special flood hazards having shallow water depths and/or unpredictable flow paths between (1) and (3) feet, and with water surface elevations determined.<sup>1</sup></p> <p>In other words, Zone AH corresponds to the areas of 1-percent-annual-chance shallow flooding (usually ponding or sheet flow on uniformly sloping terrain) where average depths are between 1.0 and 3.0 feet. Base Flood Elevations (BFEs) derived from the hydraulic analysis are shown within this zone on the FIRM.</p>
Zone X (shaded)	<p>Area of moderate flood hazards.<sup>1</sup></p> <p>In the case of shallow flooding areas, Zone X (shaded refers to those areas of the 1-percent-annual-chance flooding where average depths are less than 1.0 foot.</p>

# Fall 2016 – Guidance Transformation Alluvial Fan Guidance

## Notes:

- Transformation / update of existing guidance (extracted from Appendices G, L, M and Volume 1)
- Removed content that was no longer relevant
- On-going discussions about further refinements for future update cycles

## New or Significant Changes:

- None

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