FEMA

Levee Analysis and Mapping Procedures for Non-accredited Levees

Congressional Briefing

July 2013

RiskMAP

Increasing Resilience Together

Topics To Be Covered

- **Levee Definitions**
- **The Former Levee Analysis and Mapping Approach**
- **The New Levee Analysis and Mapping Process for Non-accredited Levees**
- **How the Approach Will Continue To Evolve**

FEMA's Risk MAP Program

- **Background of Risk MAP**
  - Through collaboration with State, local, and Tribal entities, Risk MAP will deliver **quality data** that increases **public awareness** and leads to **action** that reduces risk to life and property

  - http://www.fema.gov/risk-mapping-assessment-planning

The Focus is still on Flood Risk

- FEMA understands levee systems that do not meet the regulatory accreditation requirements (44 CFR 65.10) may still provide a measure of flood risk reduction.
- With developing the new approach and ongoing NFIP reform, FEMA's Risk MAP program is continuing to help communities understand their flood risk.
- The following flood risk themes (from the March 2013 NAS report) are addressed by FEMA's Risk MAP program and the new approach:
  - Moving towards a modern risk-based analysis
  - Improving flood risk awareness
  - Recognizing uncertainty in flood risk
  - Supporting local risk management strategies
  - Communicating flood risk behind levees
  - Synchronizing methodologies with USACE
  - Developing a consistent federal message

Definitions To Remember

Levee

- Manmade structure, usually an earthen embankment, designed and constructed in accordance with sound engineering practices to contain, control, or divert the flow of water so as to provide protection from temporary flooding.

Levee System

- Flood protection system that consists of a levee, or floodwalls levees, and associated structures (closure and drainage devices), which are constructed and operated in accordance with sound engineering practices to reduce the likelihood of flooding due to an adjacent flooding source (river, lake, ocean or other body of water).

Accredited Levee System

- Levee system that meets ALL the requirements of outlined by 44 CFR 65.10; therefore, is shown on the Flood Insurance Rate Maps (FIRM) as providing protection from the base (one-percent-annual-chance) flood.

Definitions To Remember (Continued)

Non-Accredited Levee System

- Levee system that does not meet the requirements of 44 CFR 65.10; therefore, the levee system is shown on the FIRM as not providing protection from the one-percent-annual-chance flood. Reasons for non-accredited status include inadequate freeboard, lack of maintenance and/or operational plans, documented structural issues within system, or lack of documentation.

"Without Levee" Analysis

- Levee system that does not meet the requirements of 44 CFR 65.10; therefore, analyzed and mapped flood hazards as if the levee had no effect on the landward side of the levee system.

How Levee Systems Look

Sizes, Shapes, & Locations Vary:

How Flooding Occurs with Levees

- **Most Common Causes of Levee Failure include:**
  - Overtopping
  - Erosion
  - Structural Instability
  - Piping / Underseepage
  - Settlement
  - Seismic Activity

- **Aging and poorly maintained levees and flood control structures (locks, gates and pumps) contribute to a levee failure**

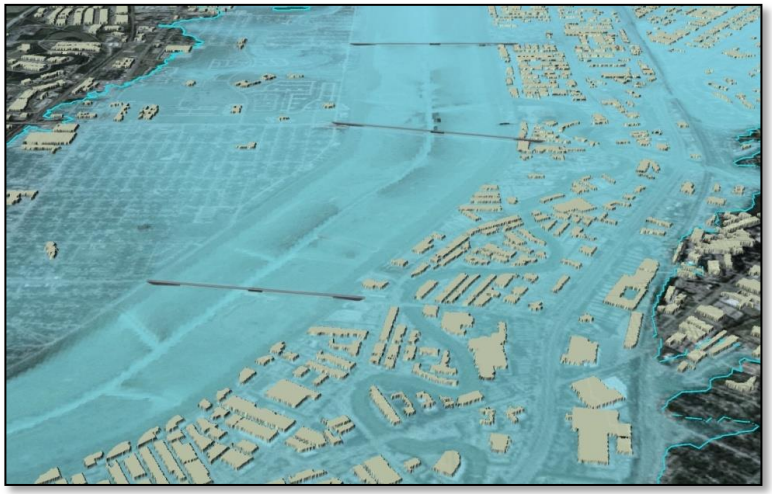
Flood Hazard Mapping and Former Approach

Accredited levee system

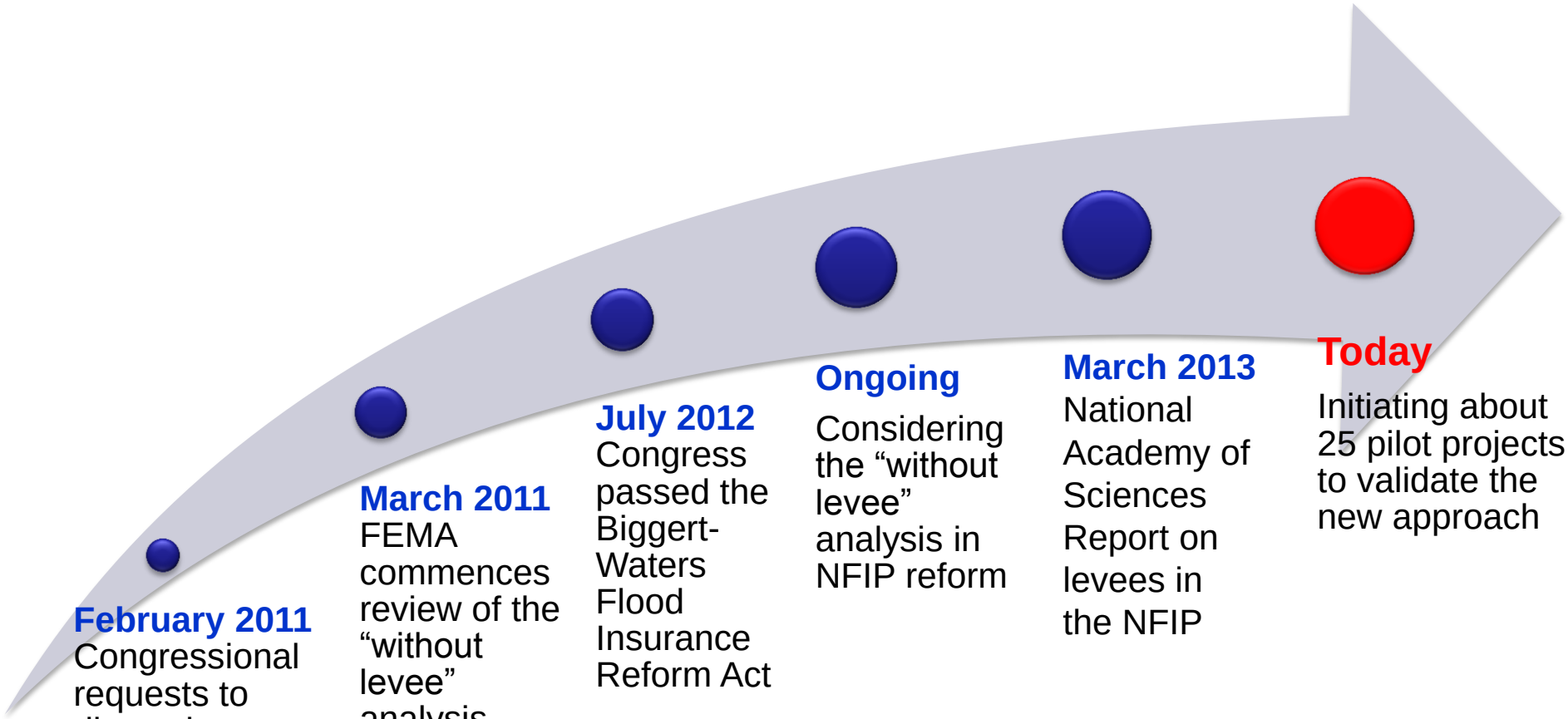
When a levee was found to be in compliance with 44 CFR 65.10, the flood hazard was mapped to be contained within the levee system.

Non-accredited levee system

However, areas with non-accredited levees were mapped as if the levee system provided no flood hazard reduction ("without levee" analysis).



Developing the New Approach for Non-accredited Levees



How Did FEMA Develop the New Approach?

1. **Suspended in-progress studies and revisions of non-accredited levee systems**
2. **Sought an approach that would:**
   - Comply with statutory and regulatory requirements
   - Be cost-effective, repeatable, and flexible
   - Leverage local input, knowledge, and data
   - Align available resources
3. **Convened a multidisciplinary project team to evaluate technical options for non-accredited levee systems**
4. **Sought and implemented feedback**
   - Independent Scientific Body and Community Roundtable
   - Public Review
   - National Academy of Sciences (NAS)

Multidisciplinary Project Team

- **FEMA convened a multidisciplinary project team to evaluate technical options for non-accredited levee systems – members represented:**
  - FEMA
  - U.S. Army Corps of Engineers (USACE)
  - Experts from academia and Engineering Industry

- **The FEMA-led team:**
  - Explored possible approaches
  - Conducted proof of concept case studies
  - Assessed the feasibility of each procedure
  - Sought feedback from various stakeholders

Independent Scientific Body (ISB) & Community Roundtable

FEMA presented the procedures to an Independent Scientific Body (ISB) and a Community Roundtable

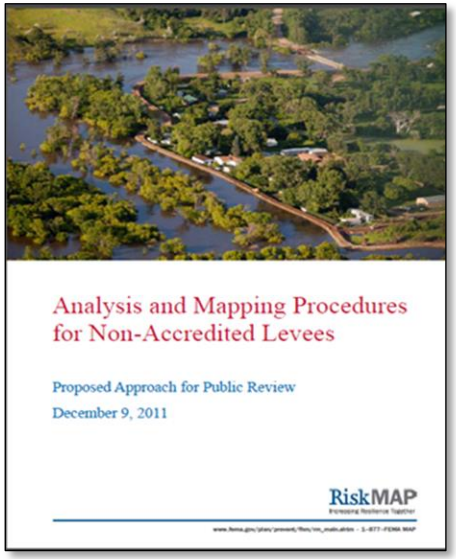
1. **The ISB review was conducted by:**
   - National Institute of Building Science (NIBS) – a non-governmental organization authorized by the U.S. Congress.
   - Composed of recognized subject matter experts and registered professional engineers.
2. **Community Roundtable**
   - Worked through a case study
   - Identified potential improvements and additions
   - Comprised various community stakeholders including
     - Levee owners
     - Community officials

Public Review

1. **FEMA Posted a public review document** to the *Federal Register Notice*, (76 FR 78015) from December 15, 2011, until January 30, 2012 to generate feedback

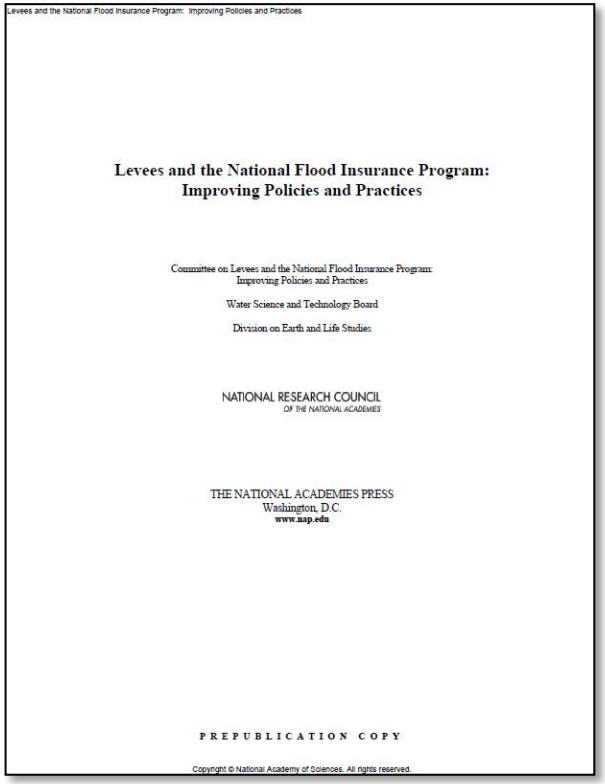
2. **Held three public online forums to:**
   - Walk participants through the public review document
   - Provide clarification
   - Answer questions

3. **Received 1,400+ comments from 160 individual submittals. These comments influenced the approach in various ways, including:**
   - Applicability of the new process
   - Definition of a levee and non-levee
   - Embankment issues
   - Local input
   - Levee reaches
   - Document structure



National Academy of Sciences

- **In March 2013, the National Research Council of the National Academy of Sciences released the *Levees and the National Flood Insurance Program: Improving Policies and Practices.***
- **Key themes from the report that are addressed by FEMA's Risk MAP program and highlighted in the new approach include:**
  - Moving towards a risk-based analysis
  - Improved flood risk awareness
  - Recognition of uncertainty in flood risk
  - Locally-tailored risk management
  - Improved risk communication
  - Synchronizing methodologies with USACE
  - Developing a consistent federal message


Levees and the National Flood Insurance Program: Improving Policies and Practices

Levees and the National Flood Insurance Program:
Improving Policies and Practices

Committee on Levees and the National Flood Insurance Program:
Improving Policies and Practices

Water Science and Technology Board

Division on Earth and Life Studies

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Overview of the New Levee Analysis and Mapping Approach

FEMA is replacing the former levee analysis and mapping approach with a suite of alternative procedures created to:

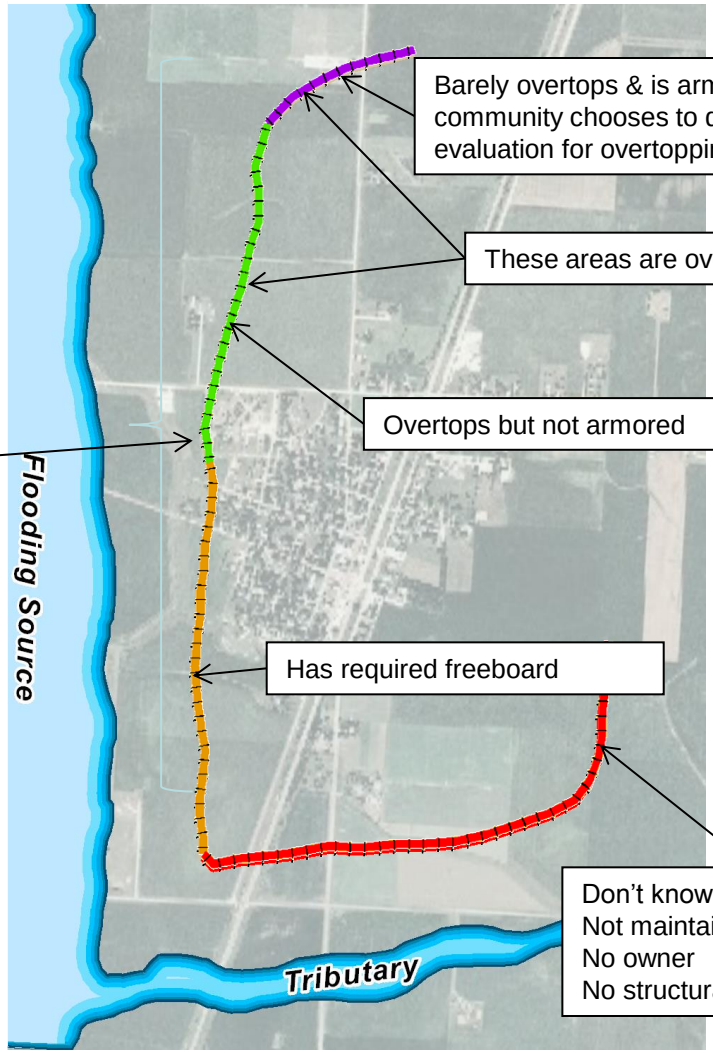
- Comply with all current statutory and regulatory requirements governing the NFIP
- Be a cost-effective, repeatable, and flexible approach
- Leverage local input, knowledge, and data through proactive stakeholder engagement
- Align available resources for engineering analysis and mapping
- Consider unique levee and flooding characteristics

Overview of the New Levee Analysis and Mapping Approach

The first step to creating this new approach was to divide a levee system into reaches to more precisely evaluate the flood hazard. The following suite of new procedures have undergone an extensive process of scientific review and public input:

- Sound Reach
- Freeboard Deficient
- Overtopping
- Structural-Based Inundation
- Natural Valley

Definition of Reach



Barely overtops & is armored: community chooses to do extra evaluation for overtopping

These areas are overtopped

Overtops but not armored

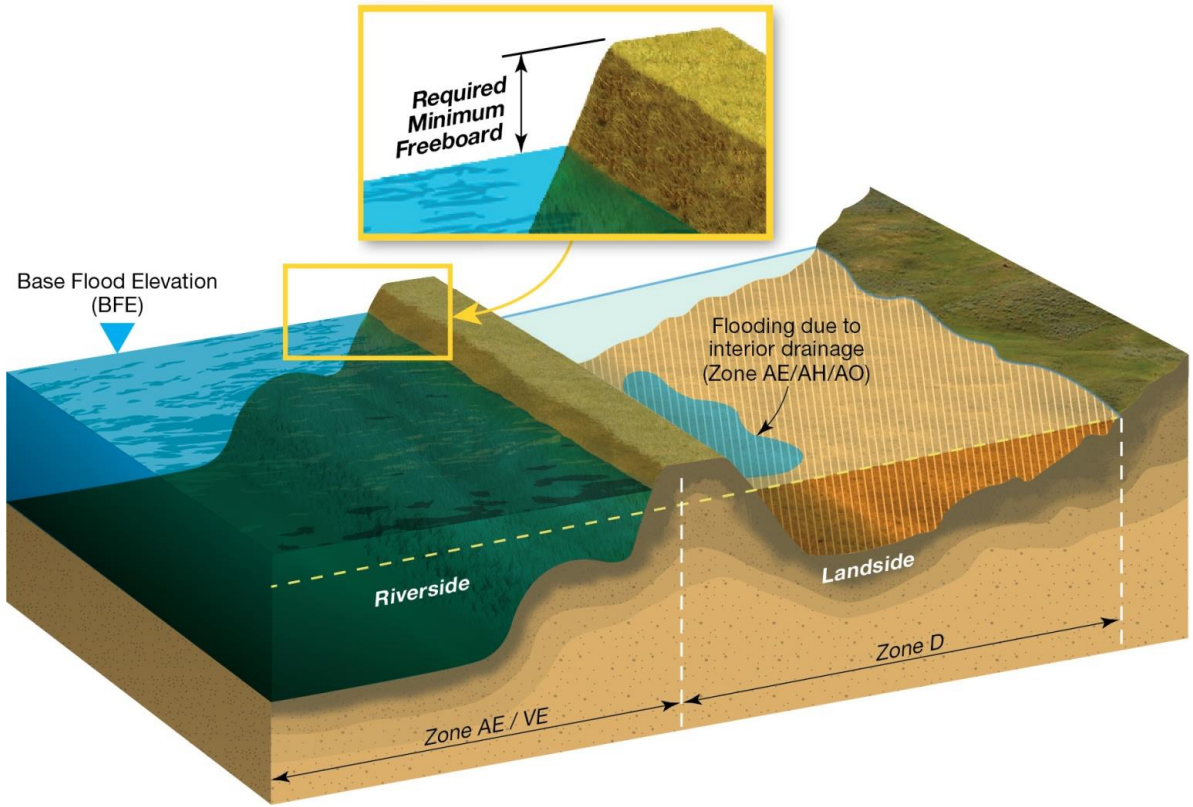
Recent structural analysis completed
Operated and Maintained
Good Survey Information

Has required freeboard

Don't know anything about
Not maintained
No owner
No structural analysis

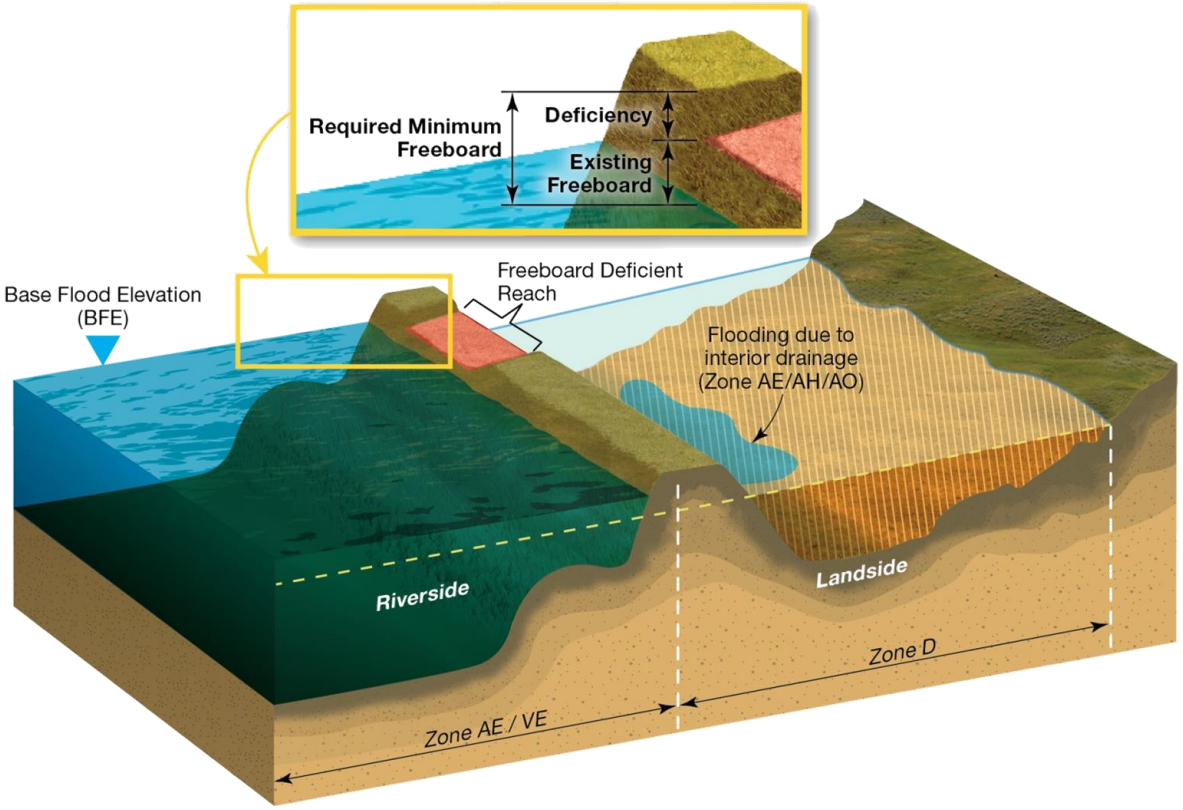
Sound Reach Procedure

- For a levee **reach** designed, constructed, and maintained to withstand and reduce the flood hazard posed by the base (one-percent-annual-chance) flood.



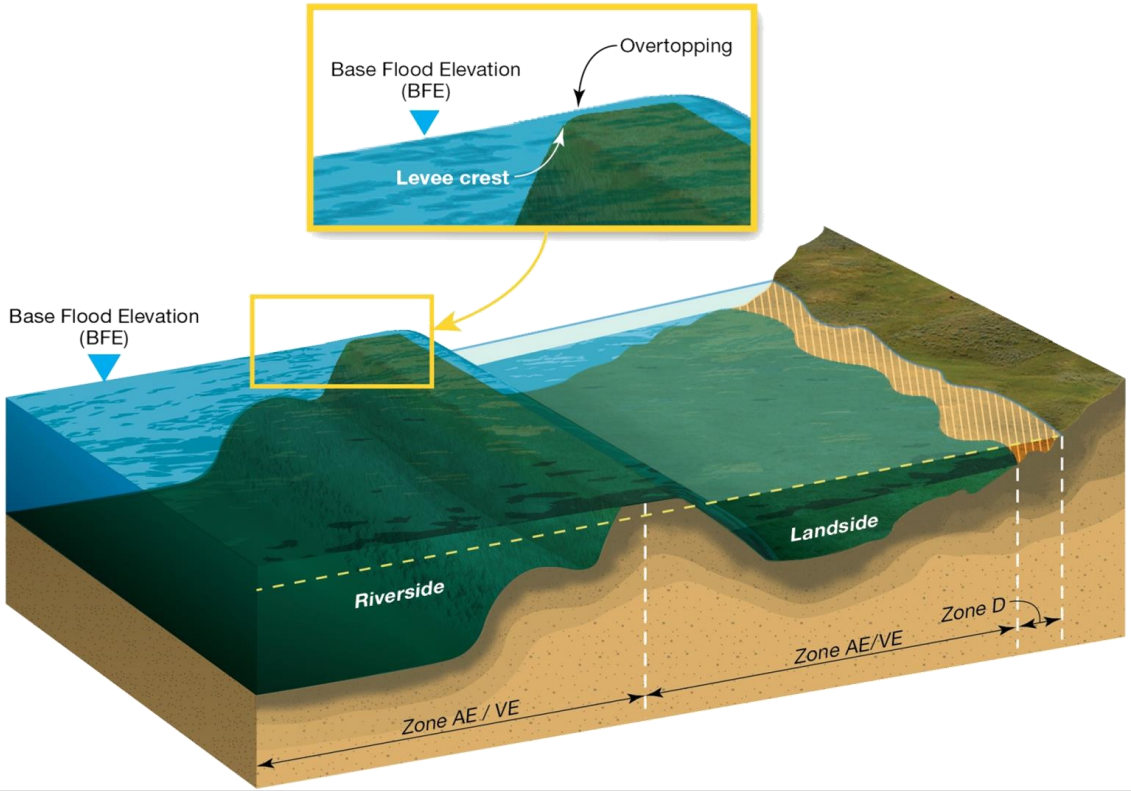
Freeboard Deficient Procedure

- For levee **reaches** that cannot meet the freeboard regulatory requirements in 44 CFR 65.10 (freeboard helps to account for uncertainty in design and the base flood).



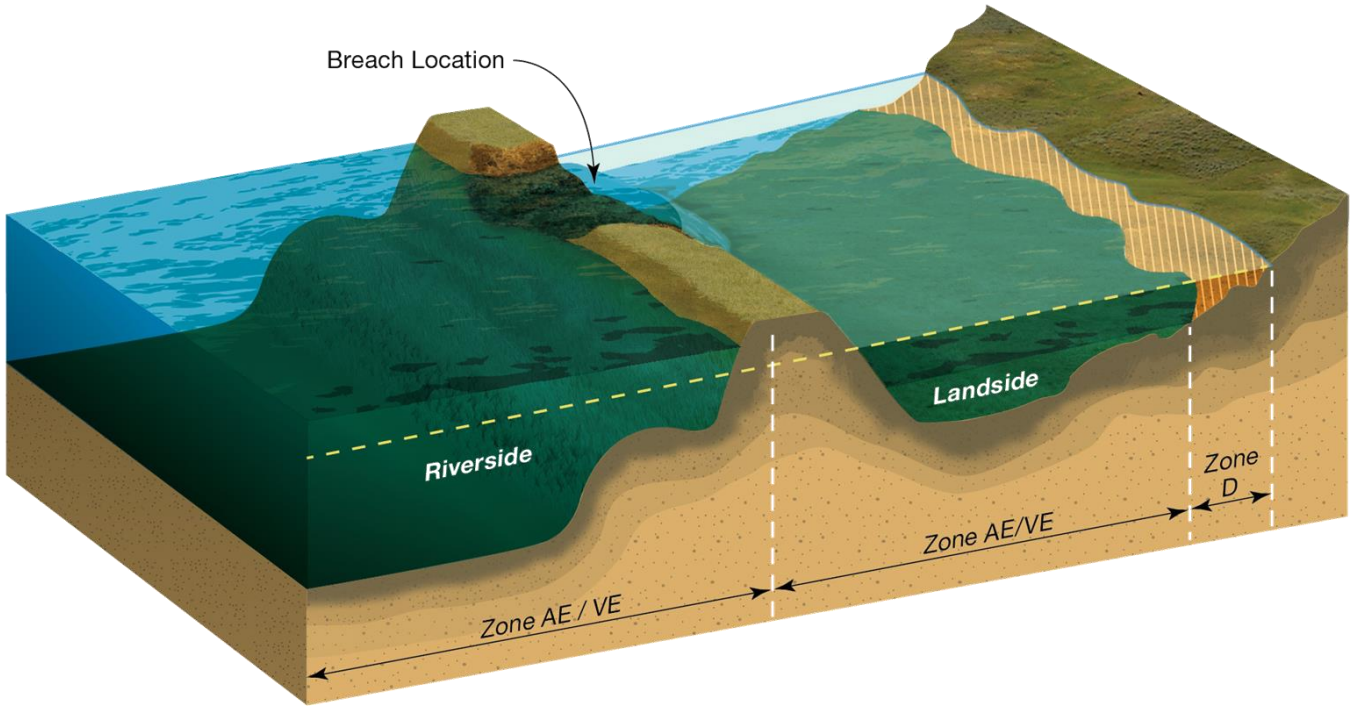
Overtopping Procedure

- Appropriate for levee reaches that are known to overtop during the one-percent-annual chance flood.
- The BFE is calculated to exceed the height of the levee crest at a minimum of one location along the levee's reach length).



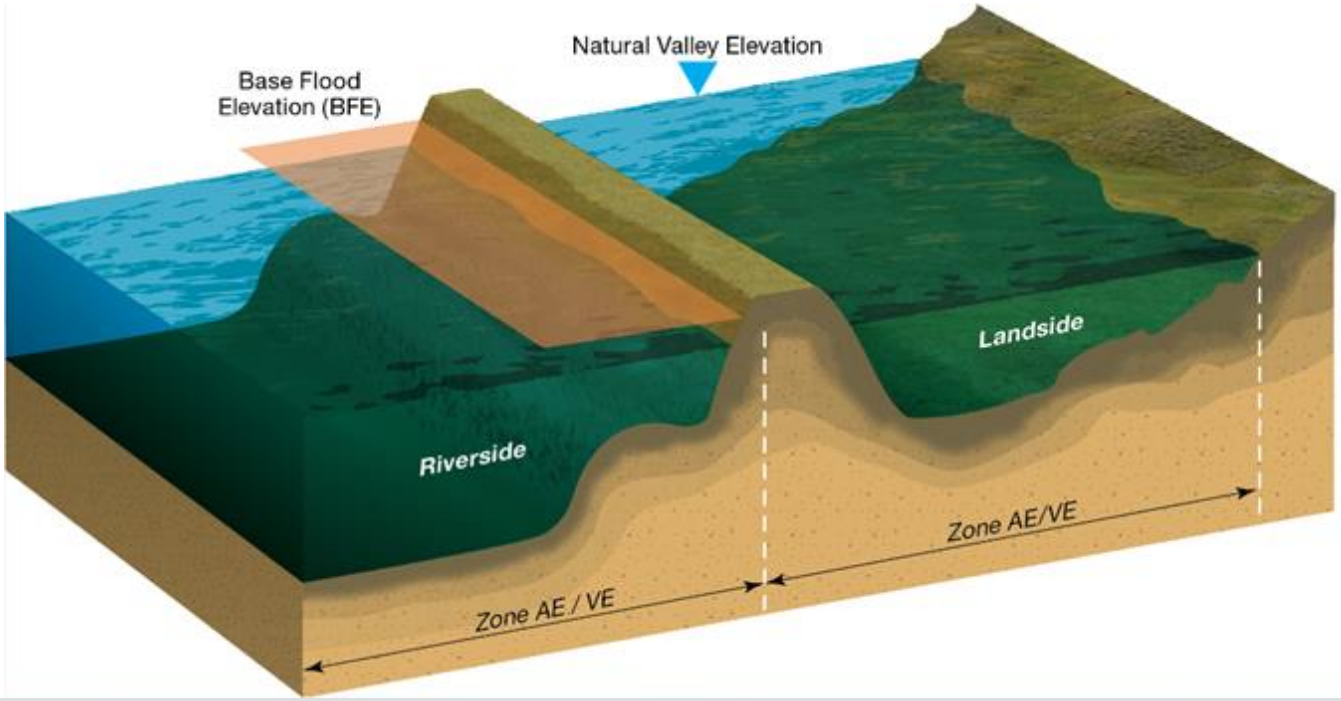
Structural-Based Inundation Procedure

- For a levee **reach** where evaluation reports and/or historic performance indicate structural issues.

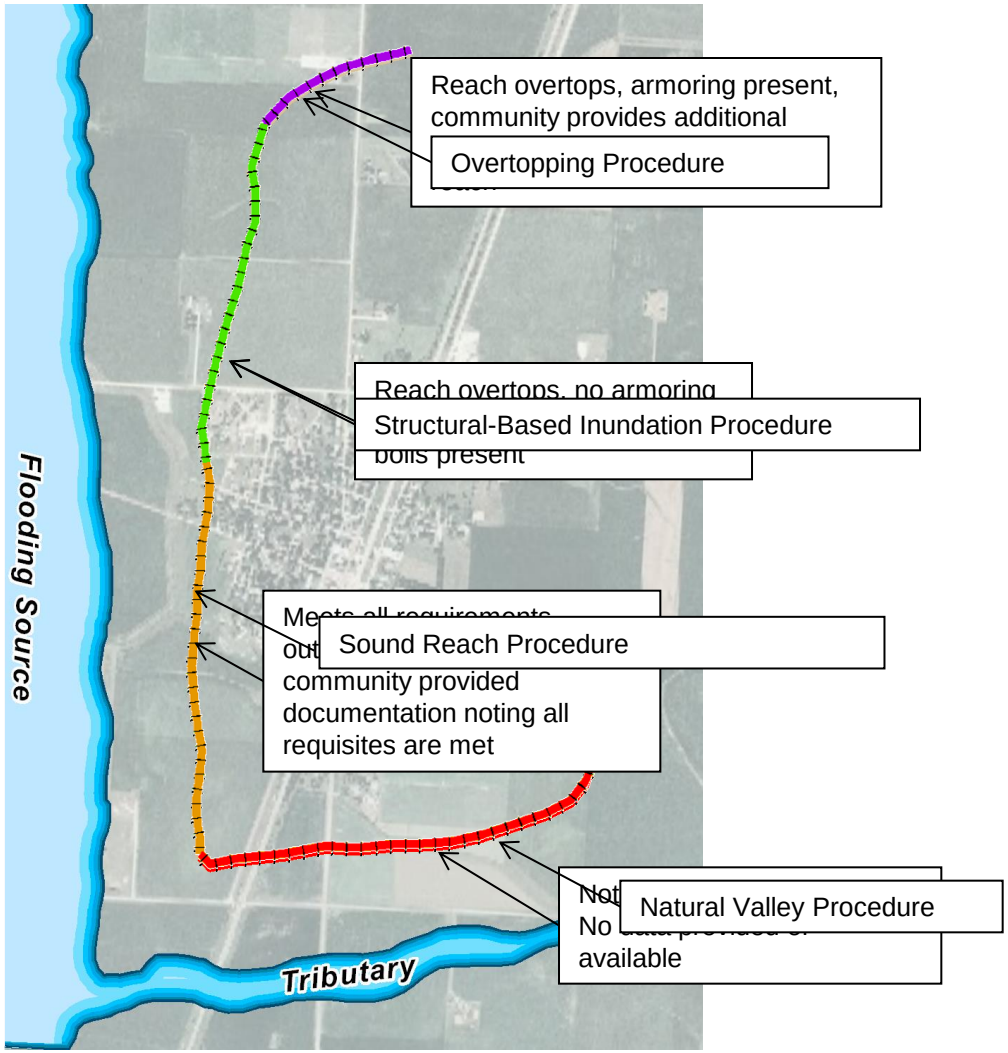


Natural Valley Procedure

- Basic analysis to be applied to all levee systems, and/or individual **reaches** (procedure possible with minimal data).
- This procedure refers to the river channel and floodplain of a river system, or coastal area, prior to the addition of flood control structures (e.g. levees).



Resultant Floodplain Mapping



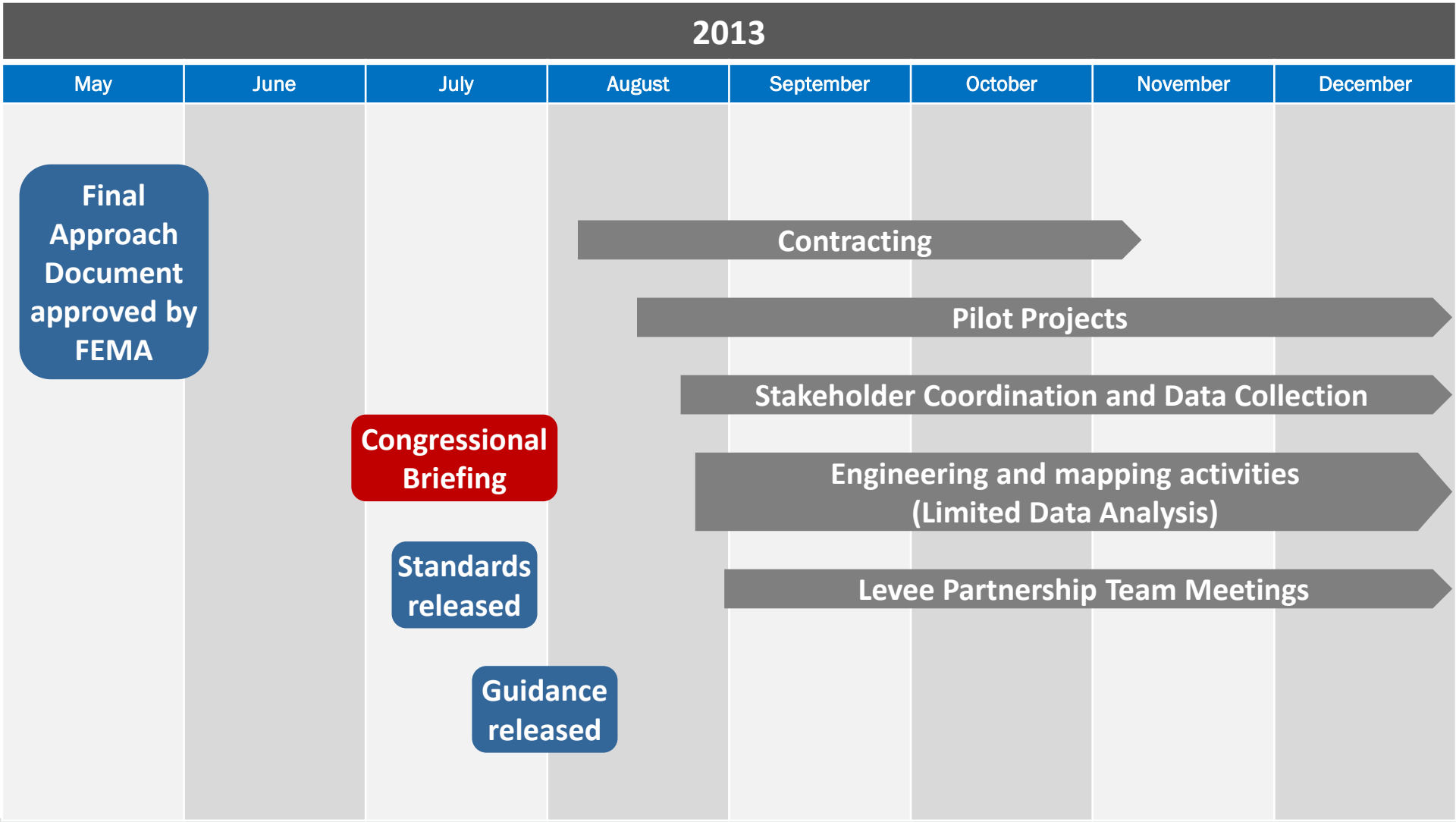
4 Hallmarks of the New Approach

- **Interactive Stakeholder Engagement Process (Local Levee Partnership Team)**
- **More Robust Levee Analysis and Mapping Procedures**
- **Recognition of the Uncertainty Associated with Levee Systems**
- **Analysis of Levee Reaches**

FEMA will use the new approach to produce:

- FIRMs
- Flood Insurance Study (FIS) reports
- Related products for communities and Tribes impacted by non-accredited levee systems

Implementation Timeline



25 Pilot Projects, by FEMA Region

- **Region III (2 pilots):**
  - Grant County
  - Hardy County, WV
- **Region IV (3 pilots):**
  - Upper Tombigbee Watershed, MS
  - Union County, KY
  - Richland and Lexington Counties, SC
- **Region V (6 pilots):**
  - Dearborn County, IN
  - Rock island County, IL
  - Ross County, OH
  - Tazewell County, IL
  - Kent County, MI
  - Morgan County, IN
- **Region VI (8 pilots):**
  - Plaquemines Parish, LA
  - St. Charles Parish, LA
  - St. Tammany Parish, LA
  - Lafourche Parish, LA
  - Terrebonne Parish, LA
  - Brazoria County, TX
  - Nueces County, TX
  - Victoria County, TX
- **Region VII (3 pilots):**
  - Franklin County, MO
  - Miami County, KS
  - Marion County, KS
- **Region VIII (1 pilot):** Ward County, ND
- **Region IX (1 pilot):** Maui County, HI
- **Region X (1 pilot):** Bannock County, ID

Pilot Projects, FEMA Regions in Contact with Communities

- **How were the pilot communities selected?**
  - FEMA considered a number of factors to select the pilot projects, including:
    - Needed to select projects having a range of levee procedures, to properly pilot the new approach;
    - Data availability; and/or
    - Need for continued flood risk communication.
- **What is the purpose of conducting a pilot project?**
  - Validate the new approach and demonstrate its merit
  - Evaluate technical procedures in a variety of flooding conditions
  - Evaluate whether the application/implementation of new procedure meets FEMA's objectives and commitment to Congress
  - Determine baseline costs for major components of the new process
  - Document and compile "lessons learned"
  - Prepare educational and training materials for future communities, as LAMP is implemented nationwide

Continued Evolution

Work on longer term levee issues

Provide communities with a clearer idea of their role

Periodically issue operating guidance and standards

Emerging information and guidance will affect the future of the approach

FEMA Levee Webpage

- **Visit the following webpage to access additional information regarding FEMA's revised Levee Analysis and Mapping Procedures:**

http://www.fema.gov/final-levee-analysis-and-mapping-approach

Questions or Comments?

FEMA