

AWSE Conference Omaha, Nebraska 25 September 2012

Levee Investigation, Design and Certification Michael K. Sotak, P.E.



Presentation Overview

Levee Certification

Federal Nexus
Stakeholder Agencies
Requirements

Levee Investigation

Current Trends
Preliminary Findings

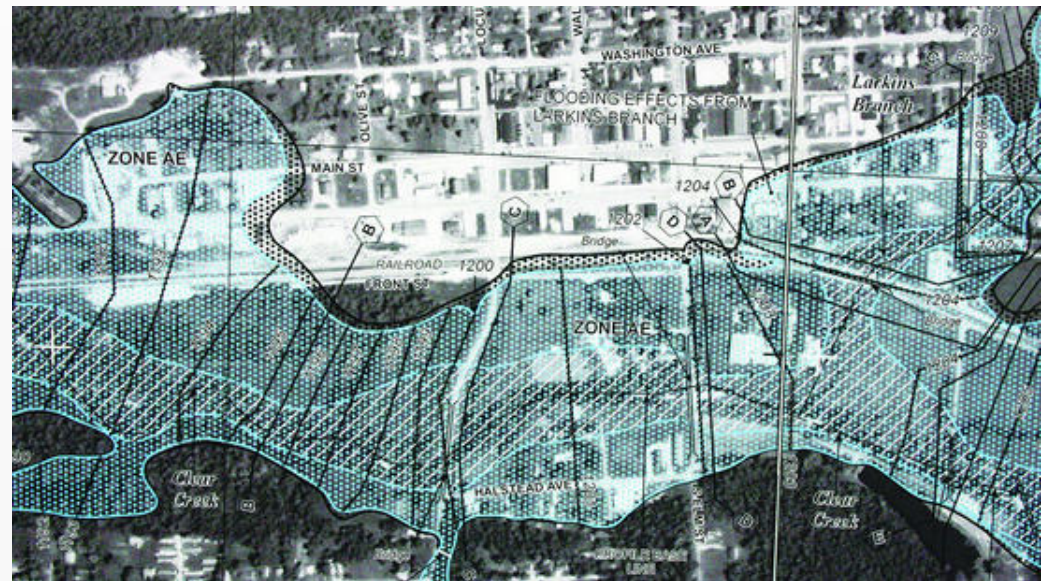
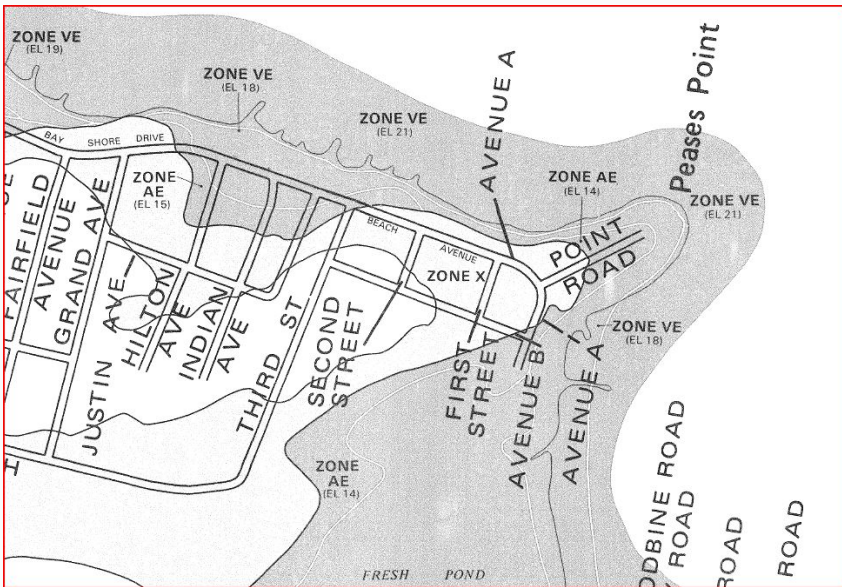
Levee Design

New Design Requirements
Other Considerations



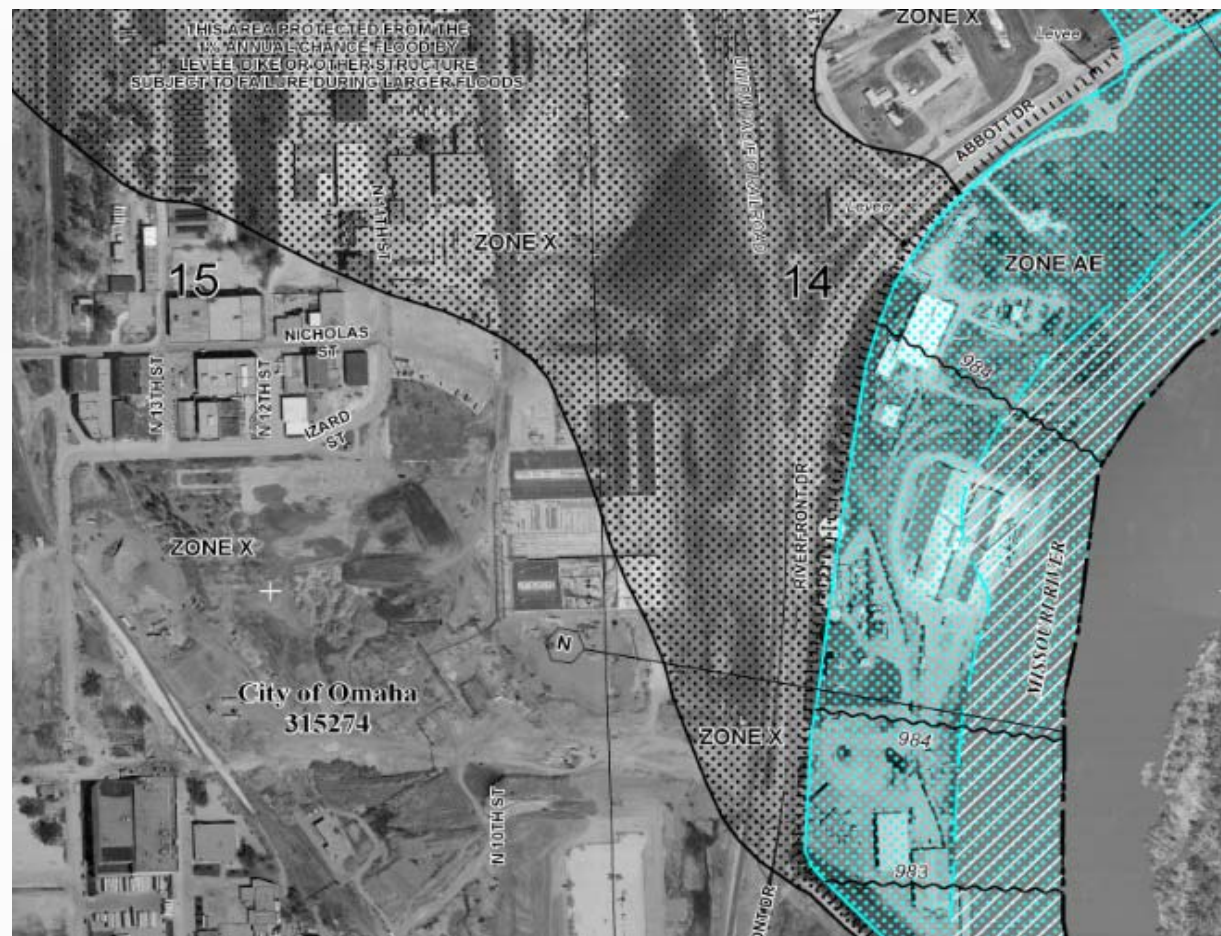
Levee Certification

FEMA Map Modernization (NFIP)



Levee Certification

FEMA Map Modernization (NFIP)



Map Modernization

Mid-Course Adjustment

More “Accurate” Flood Data

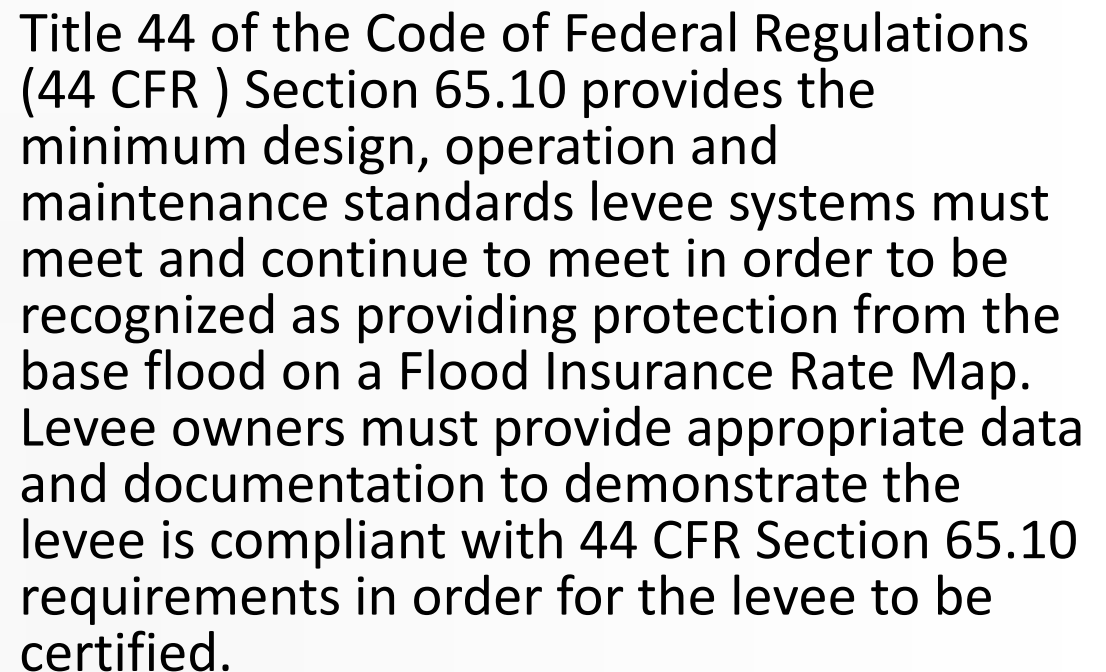
No Sacrifice in Quality for Quantity

Will Provide New Flood Zones

When Complete, Map Mod Will Provide:

- Digital Flood Map Products for 92% of the Nation’s Population**
- 30% of Stream Miles Mapped Will be Based on New Analyses**
- DFIRMs Cover 65% of Land Area in U.S.**

44 CFR 65.10



Levee Certification

Stakeholder Agencies



FEMA

Responsible for Administering NFIP Including Levee Accreditation. Does not Provide Technical Guidance for Levee Design.

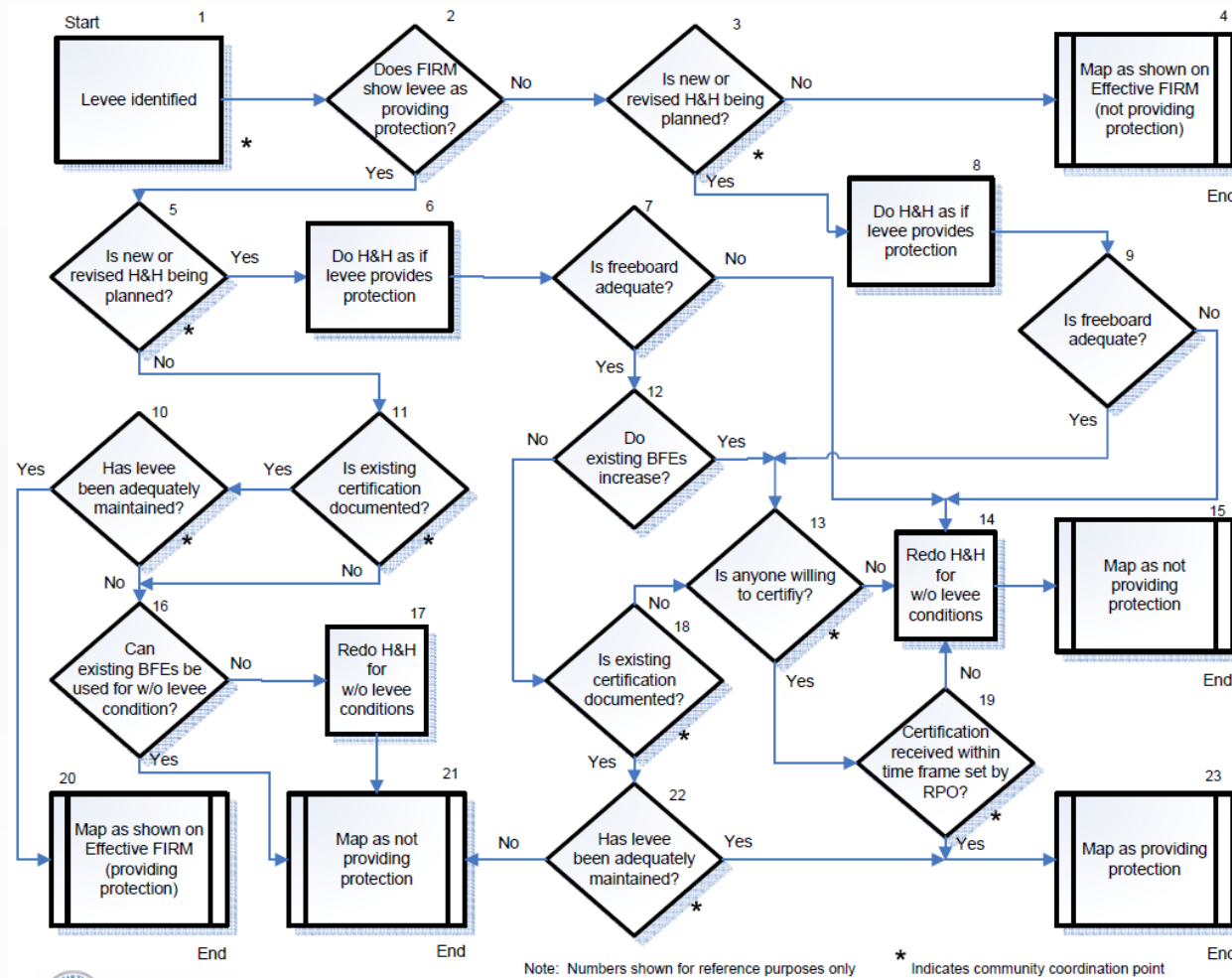


**US Army Corps
of Engineers®**

Designed and Constructed Many of the Levees in the U.S. Provides Technical Guidance for Levee Design and Requires Section 408 Permitting.



Levee Certification



Levee Certification

1. **Levee Investigation**
2. **Analysis and Design**
3. **Levee Deficiency Design**
4. **Construction**
5. **FEMA Accreditation/Re-Mapping**

Historical Review

[illegible]

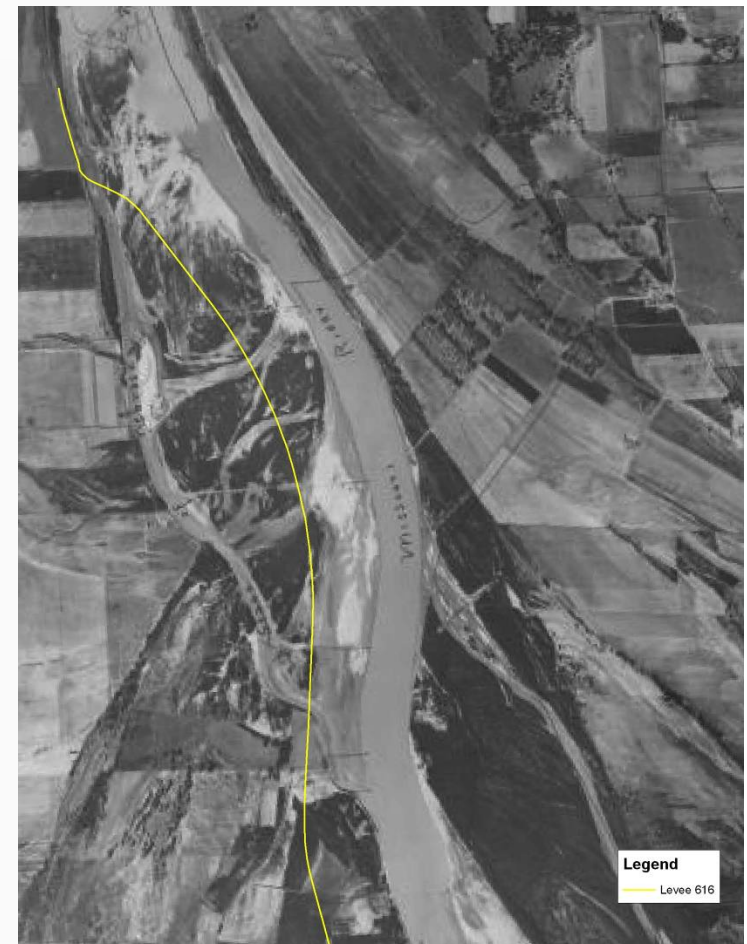
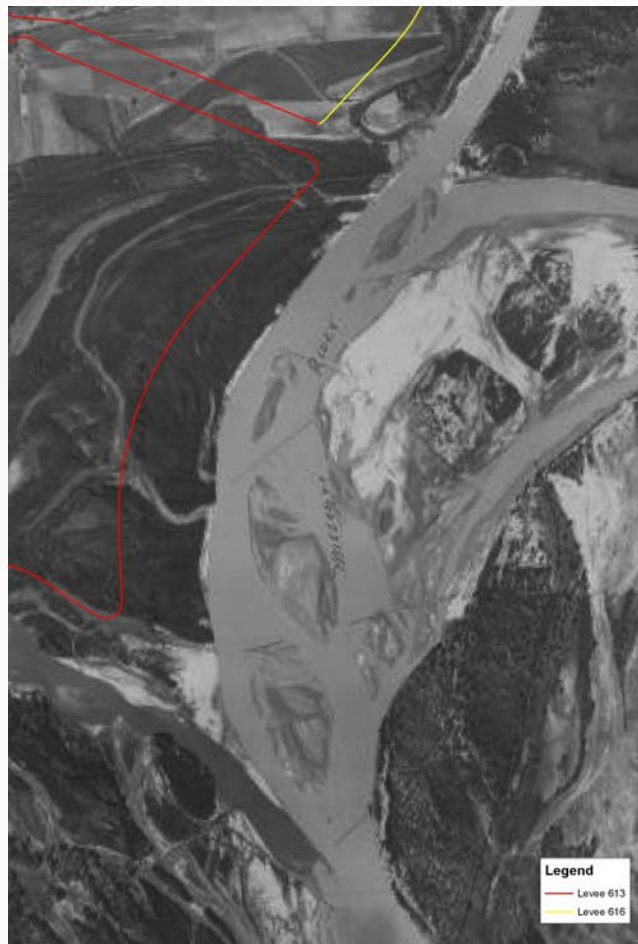
Levee Investigation

Inspection



Levee Investigation

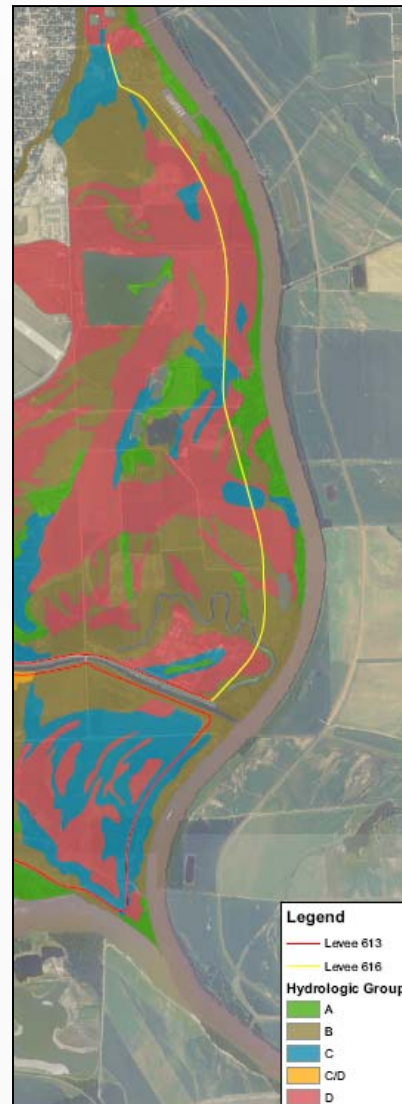
Sub-Surface Investigation



Levee Investigation

Sub-Surface Investigation

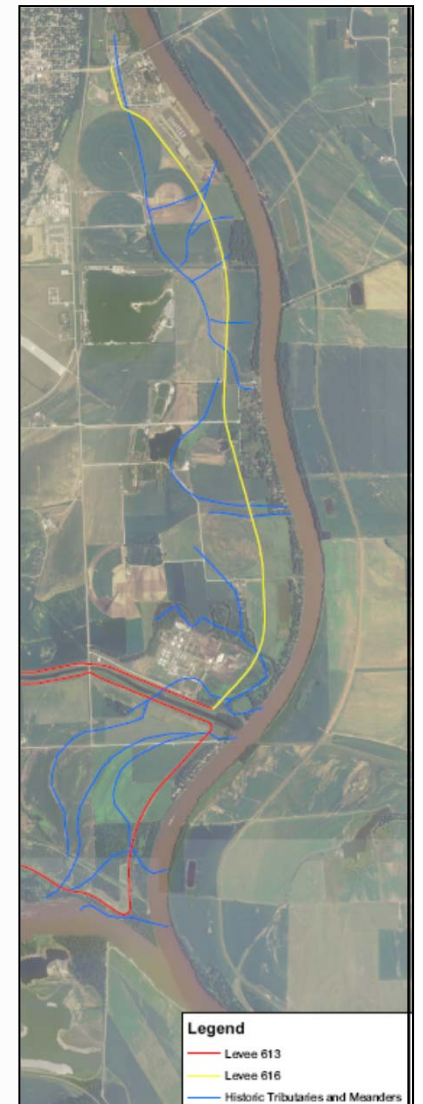
Infiltration Rates



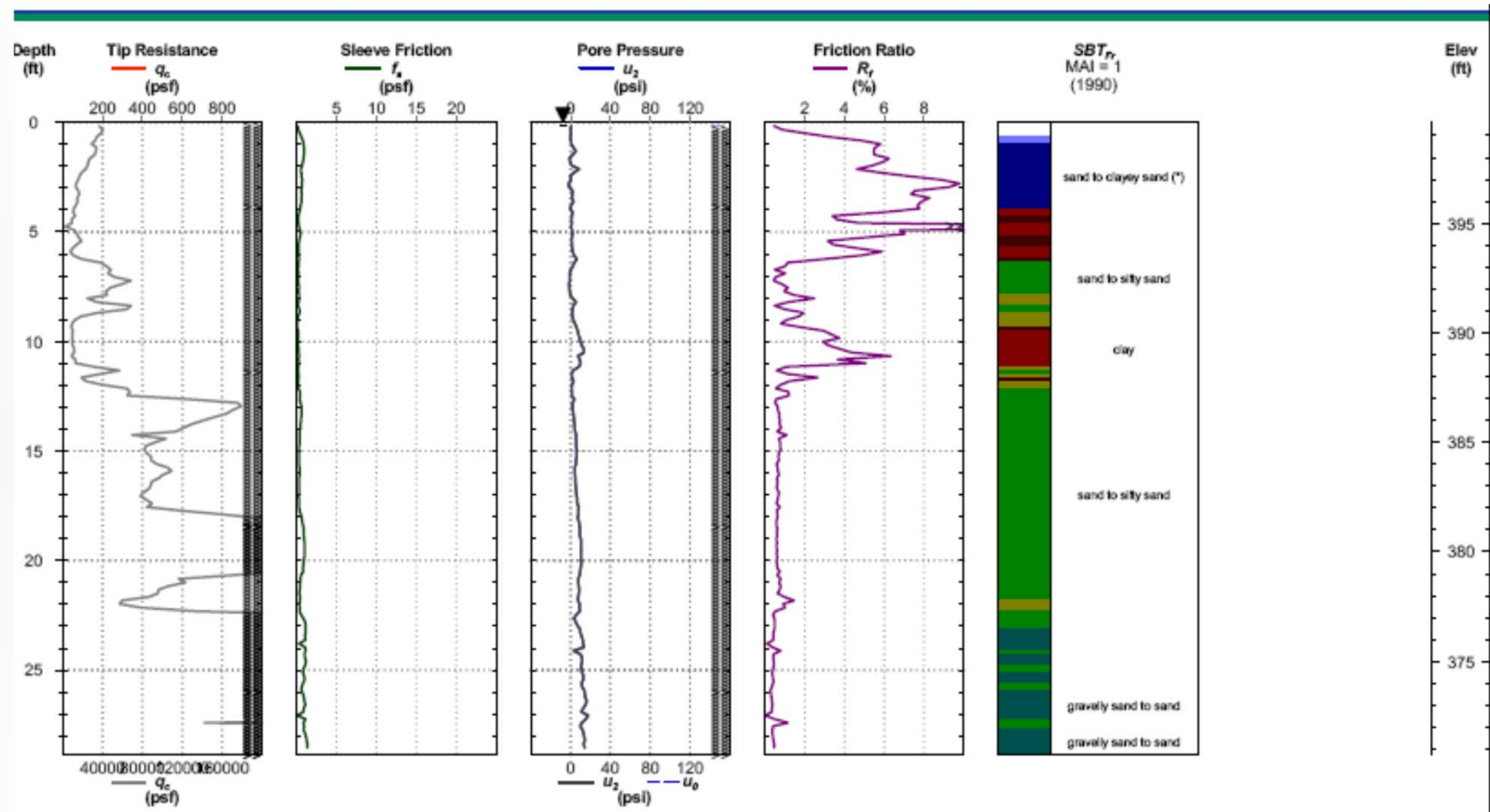
Sand Content



Historic Tributaries/Meanders

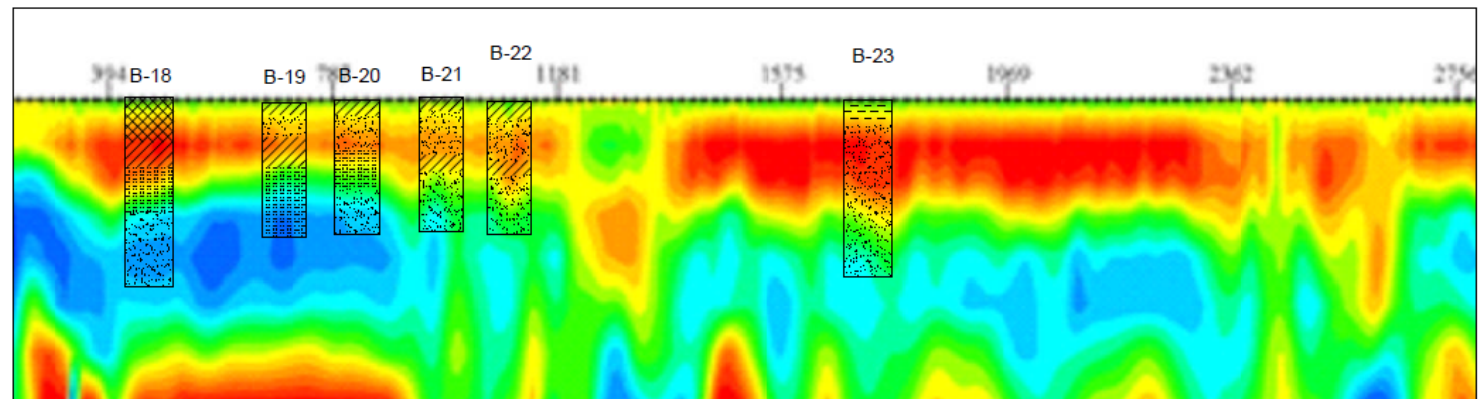


Levee Investigation



Levee Investigation

Geophysics



LEGEND

Clay		Sand	
Silt		Clayey Sand	
Fill			



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Papio-Missouri River NRD

Missouri River Levee System

Soil Boring Profile
Geophysics Line 3

Project No.: 114-182131X

Date:

Designed By: JSD

Figure 1

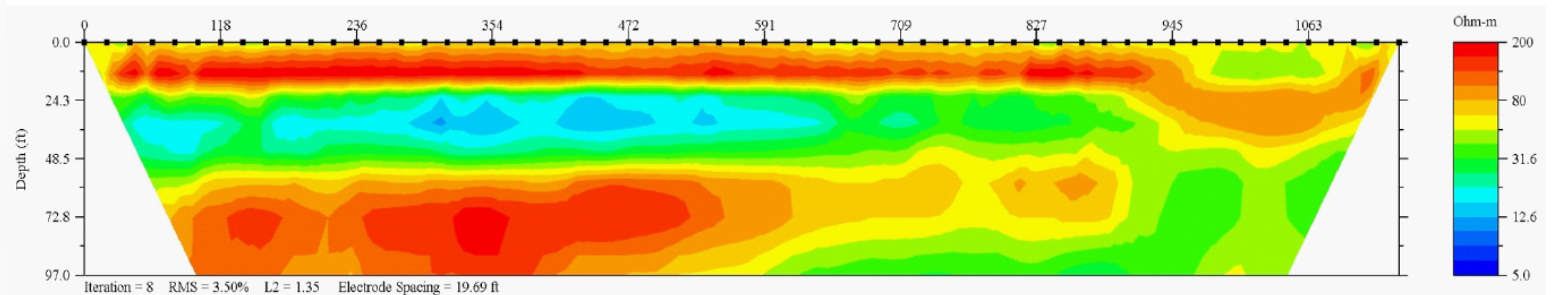
Levee Investigation

Geophysics

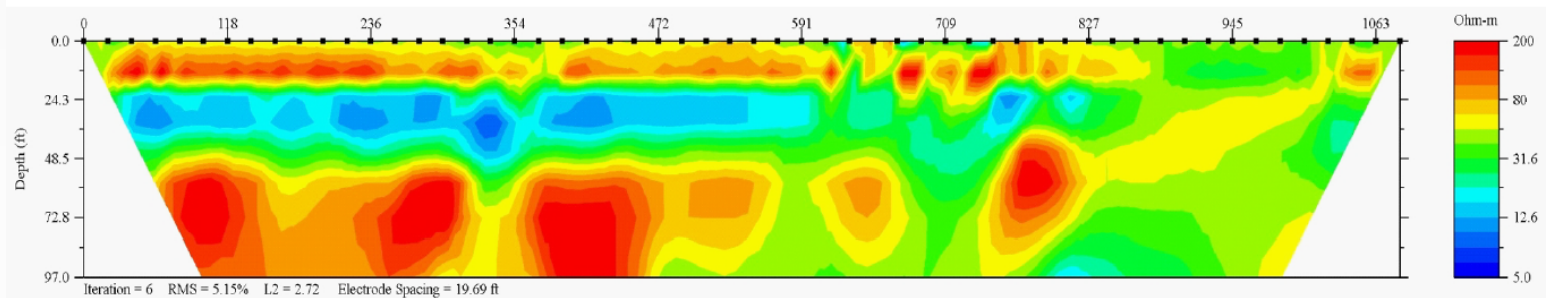
A- NorthWest

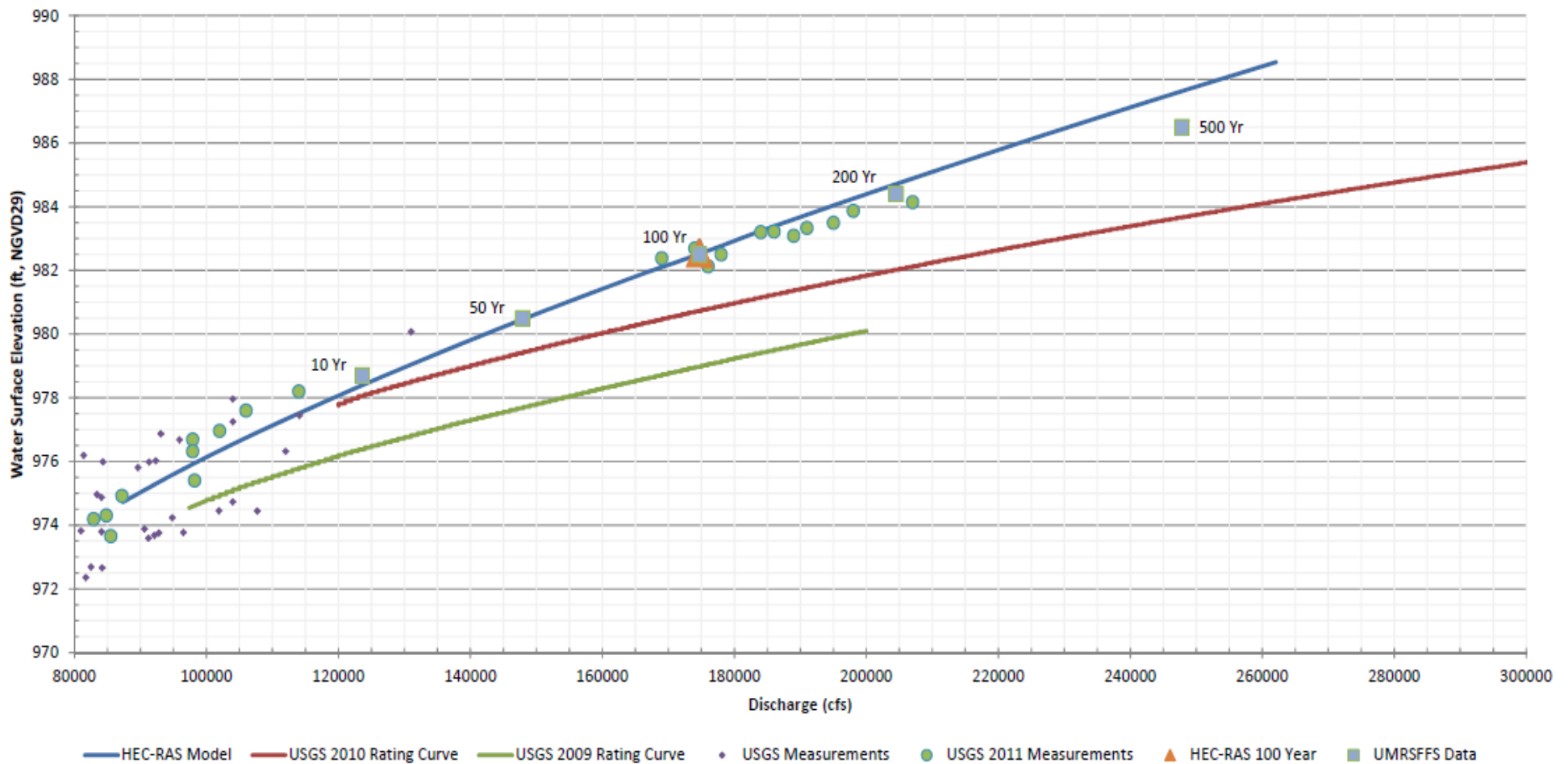
A' - SouthEast (~210+00)

Base Survey Line ONE (Inverted Resistivity Section)

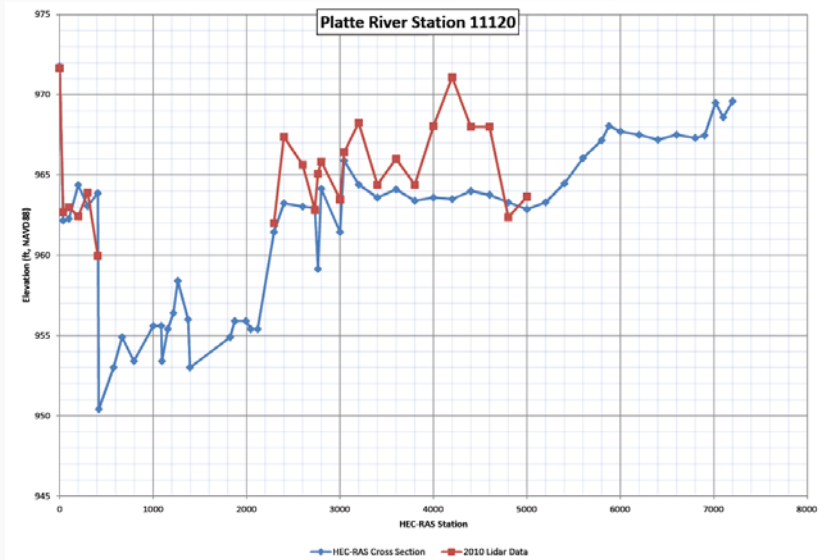
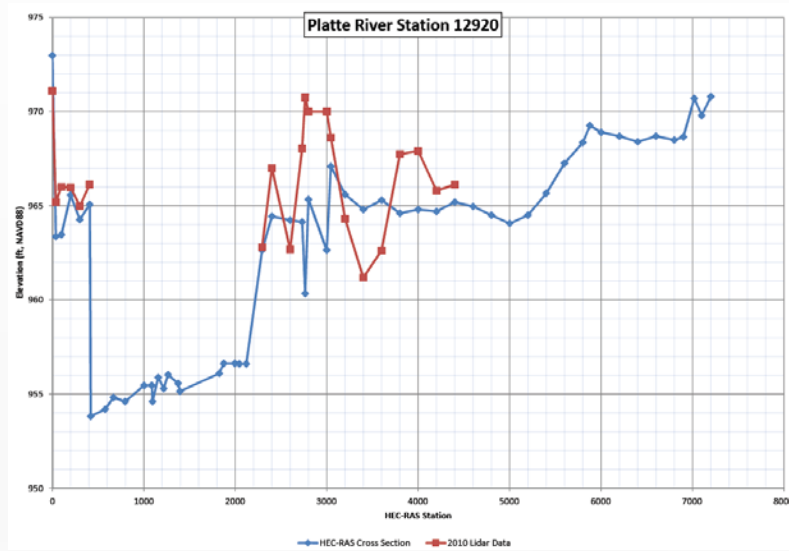


Re-Survey 11-3-2011 (Inverted Resistivity Section)

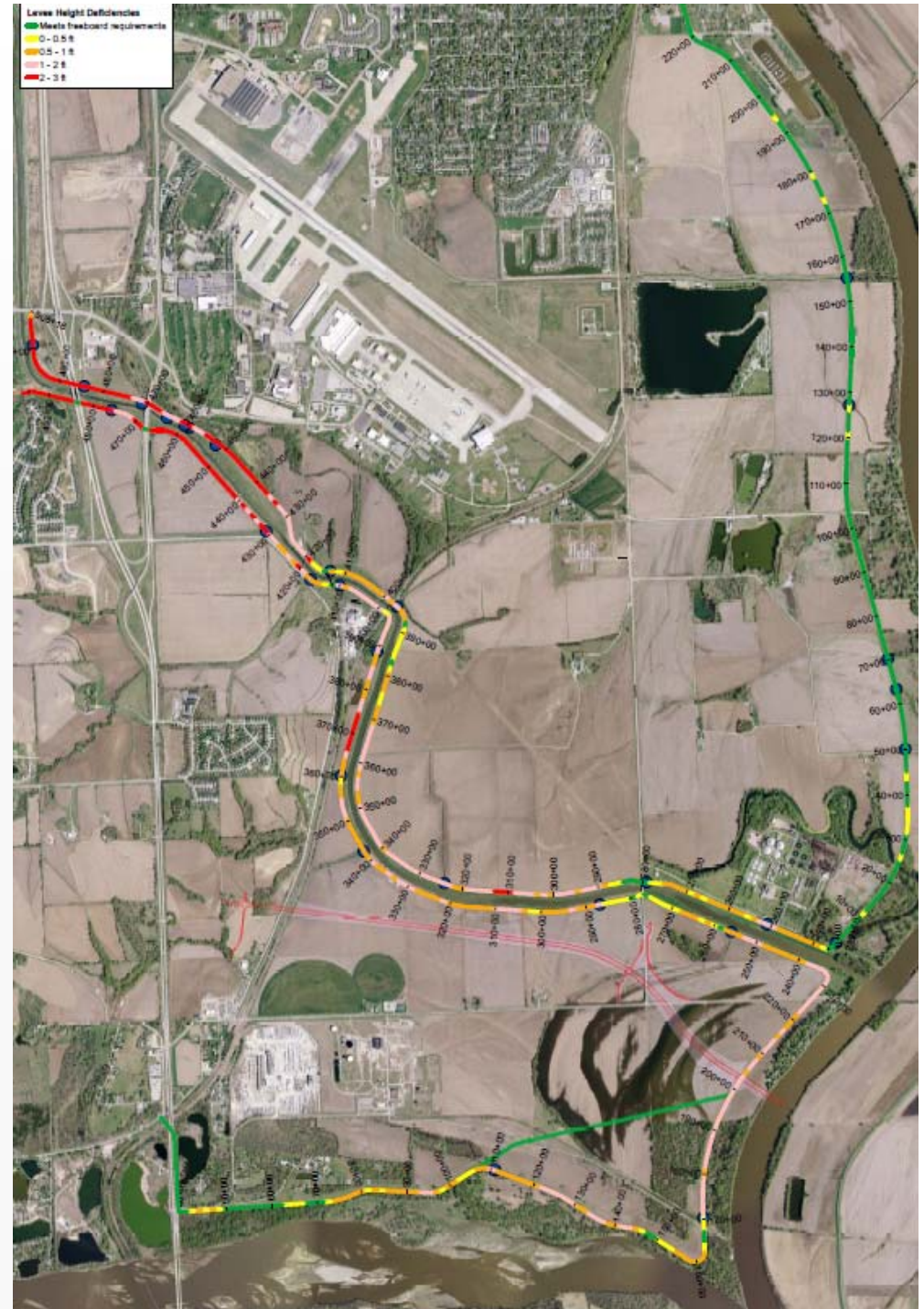




Levee Investigation

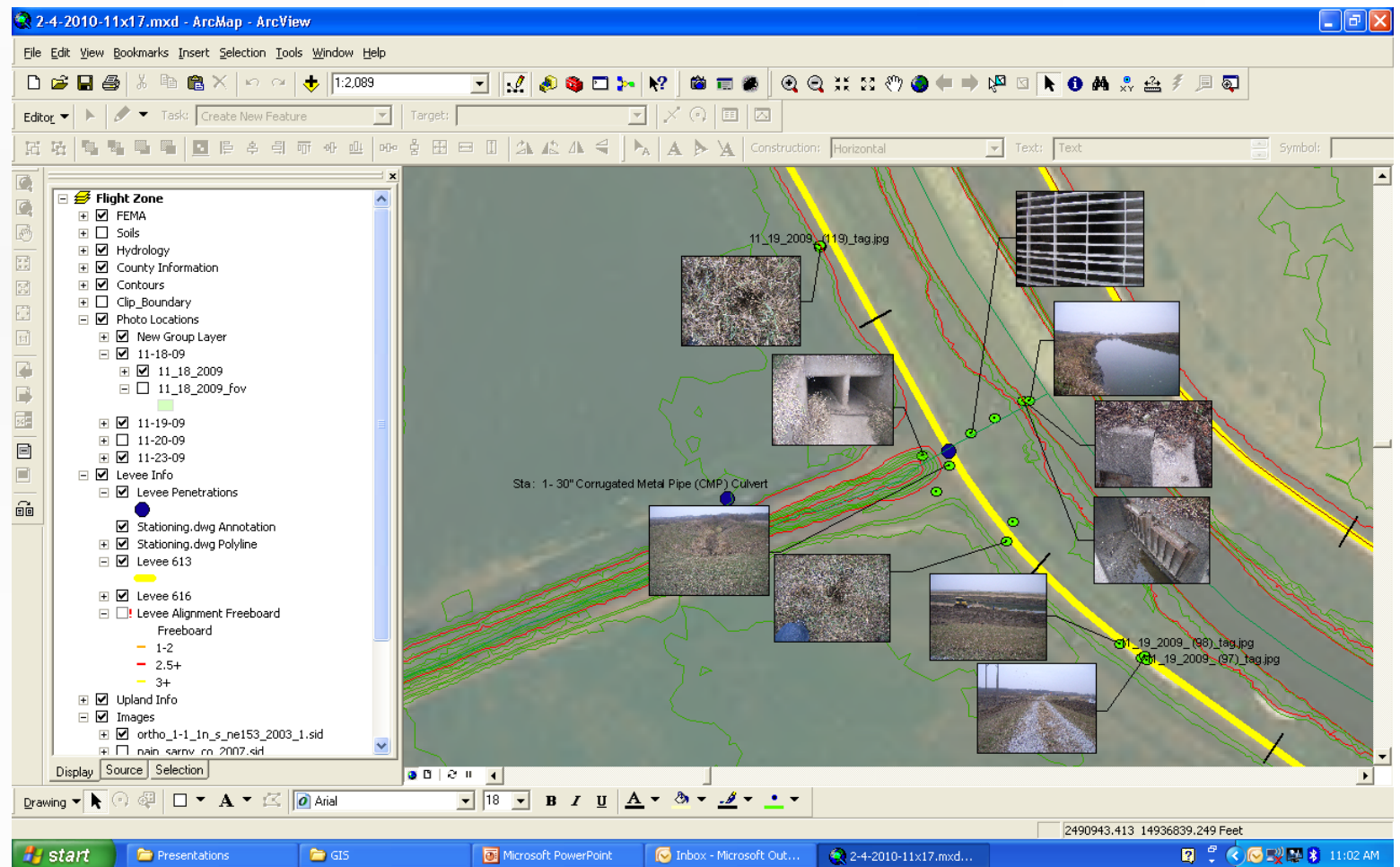


Levee Investigation



Levee Investigation

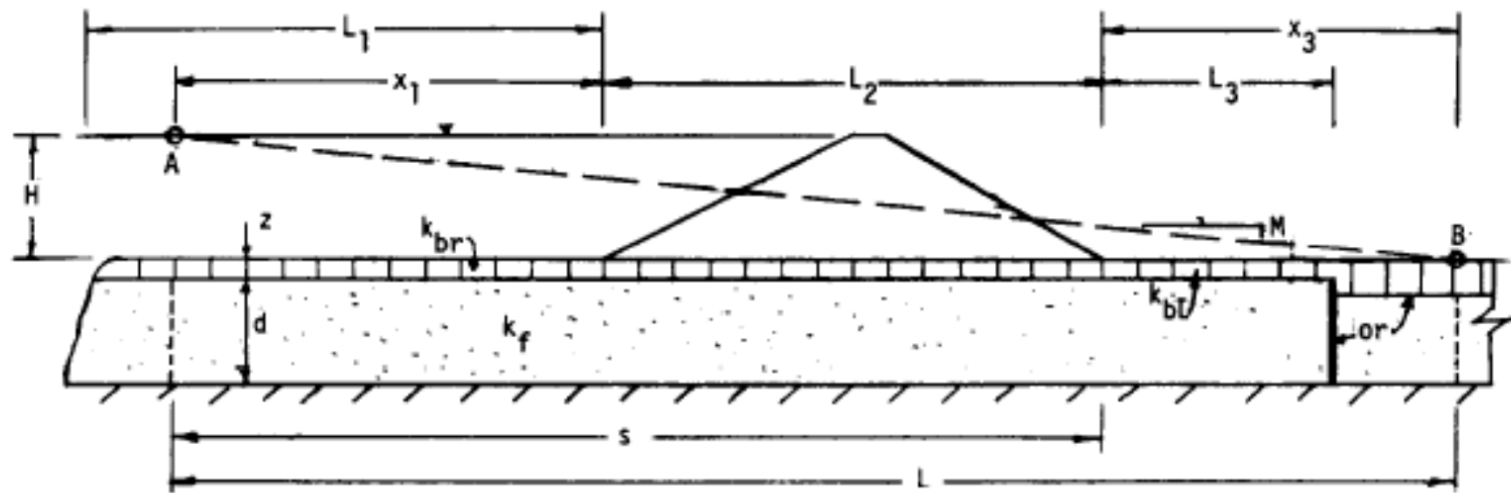
Inventory



Levee Design

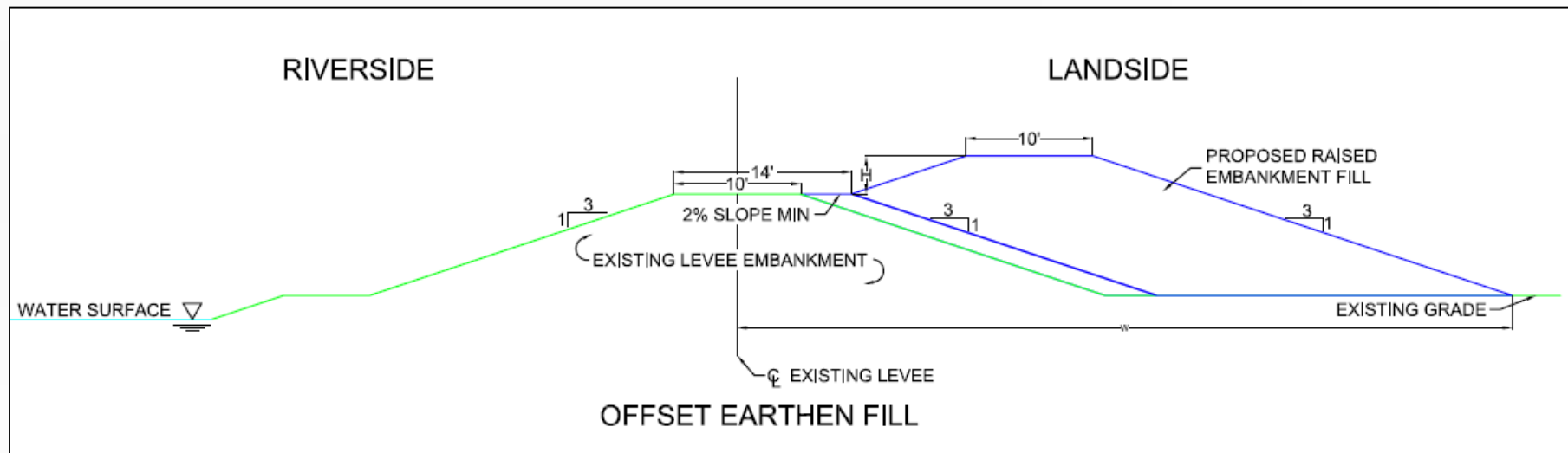
New Design Criteria

A - POINT OF EFFECTIVE SEEPAGE ENTRY
B - POINT OF EFFECTIVE SEEPAGE EXIT



Levee Design

Common Levee Deficiencies - Freeboard



Levee Design

Common Levee Deficiencies

- Freeboard
- Channel Section Stability



Levee Design

Common Levee Deficiencies

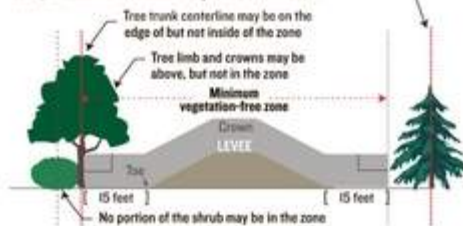
- Freeboard
- Channel Section Stability
- Maintenance

Levee vegetation-free zone

A vegetation-free zone can be only grass, no taller than 12 inches; the zone expands 15 feet from the toe on each side of the levee.

A. Mature trees and shrubs

Trees with low limbs or crown, such as a coniferous tree, must have trunk centerline sufficiently distant from the zone that no part of the tree is in the zone. If this tree were to grow into the zone, it would have to either be pruned or removed.



B. Newly planted trees and shrubs

These limbs and crown are acceptable as temporary intrusions into the zone. As the tree develops, it shall grow, or be pruned, clear of the zone. However, during development, if emergency access is required, the tree may have to be removed.



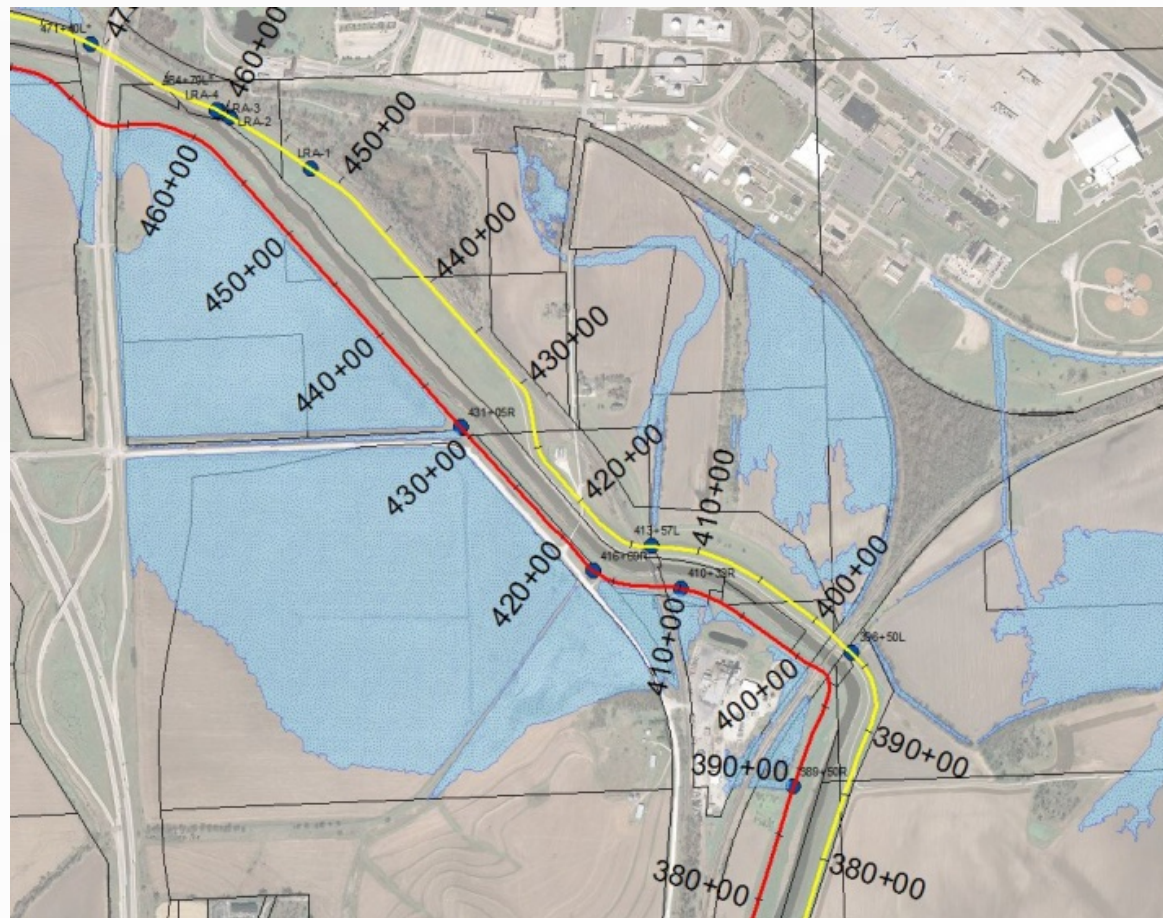
Source: U.S. Army Corps of Engineers

K. FIRTH/The Record



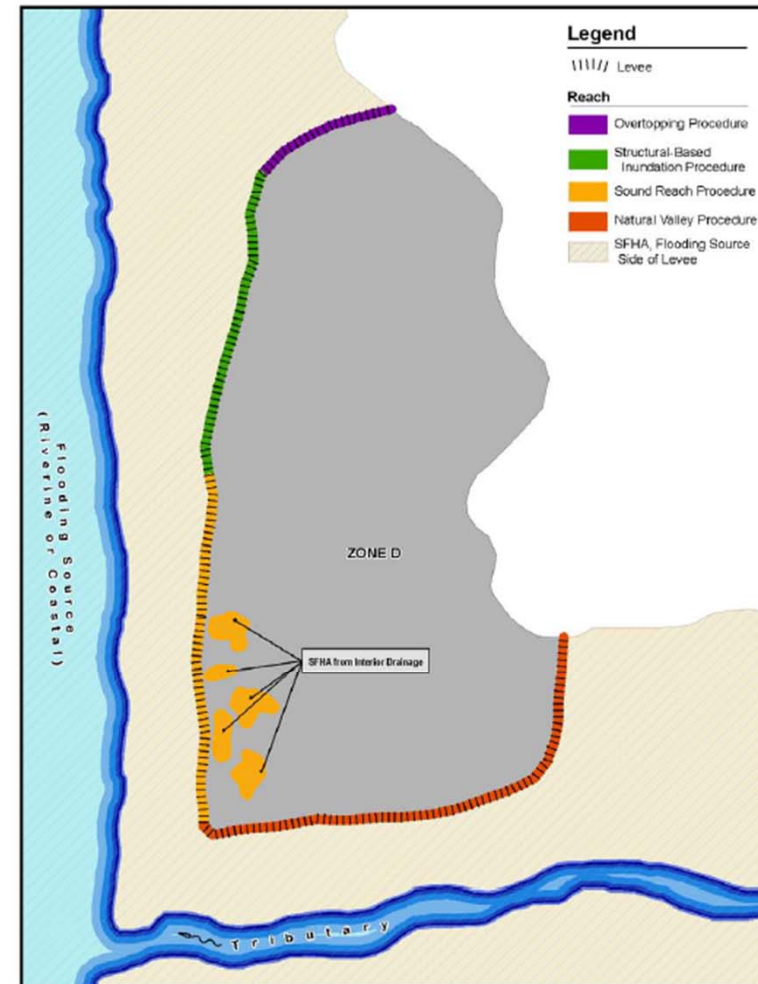
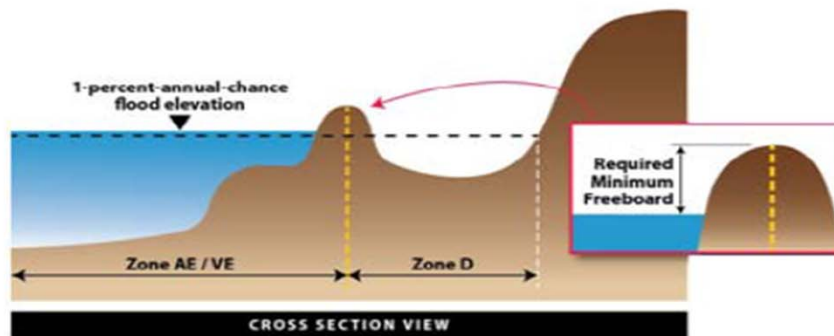
Levee Re-Mapping

Interior Drainage



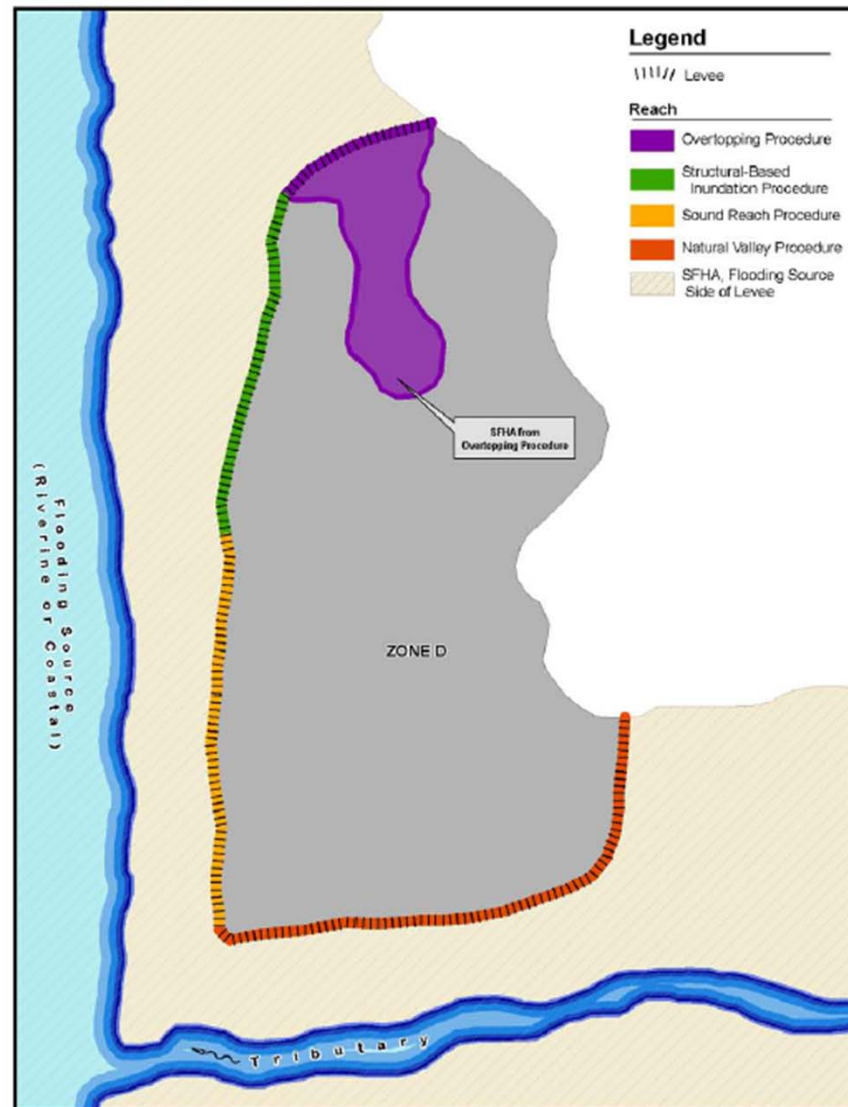
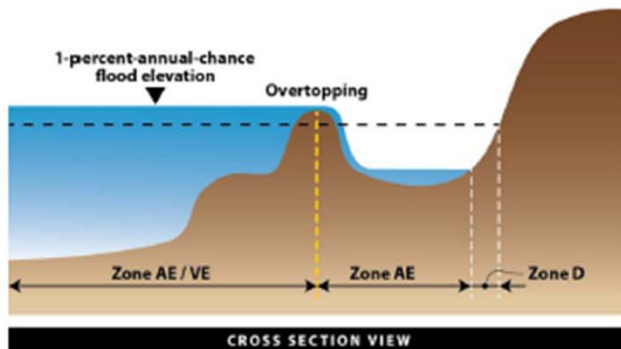
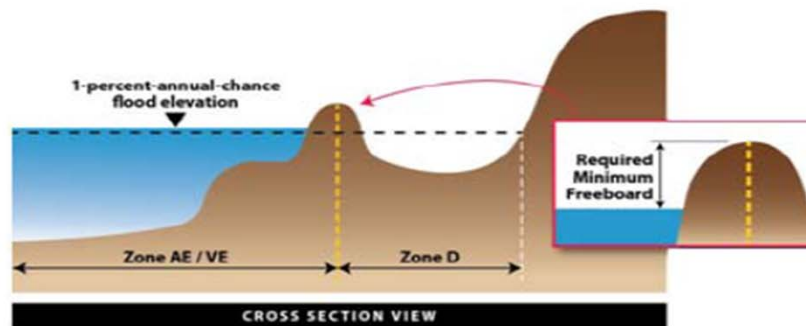
Levee Re-Mapping

Sound Reach Section



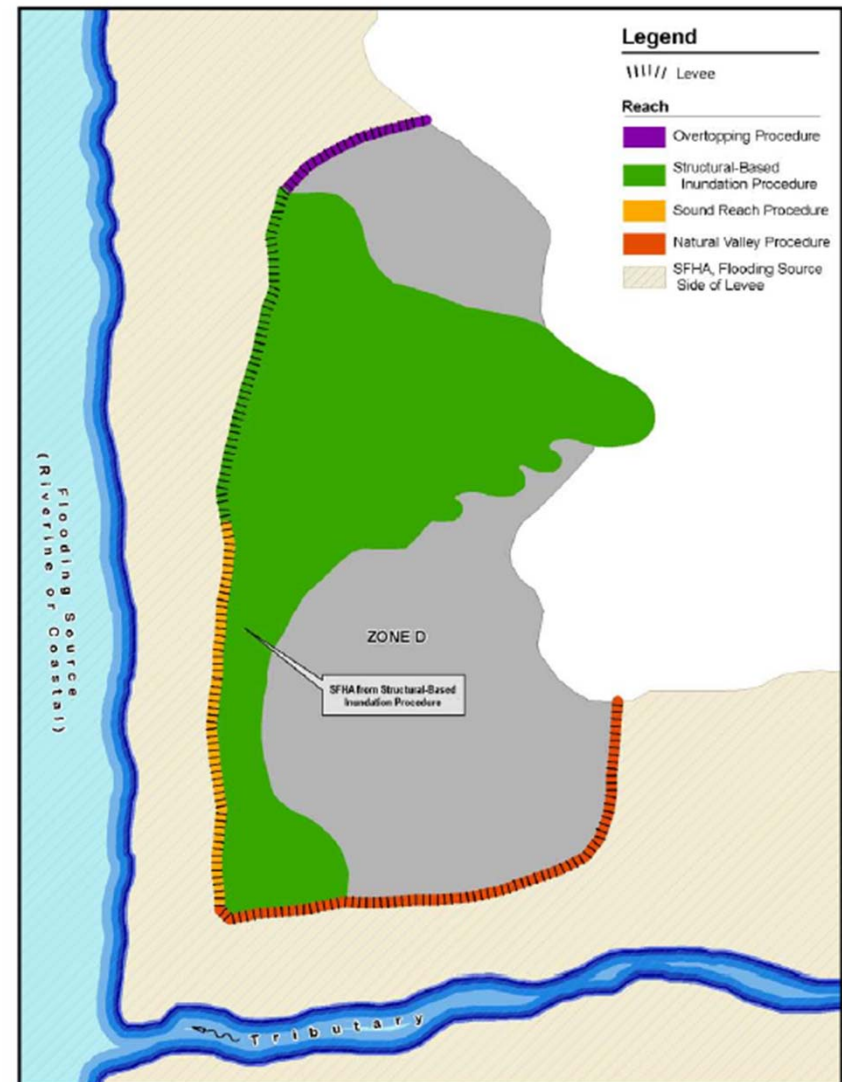
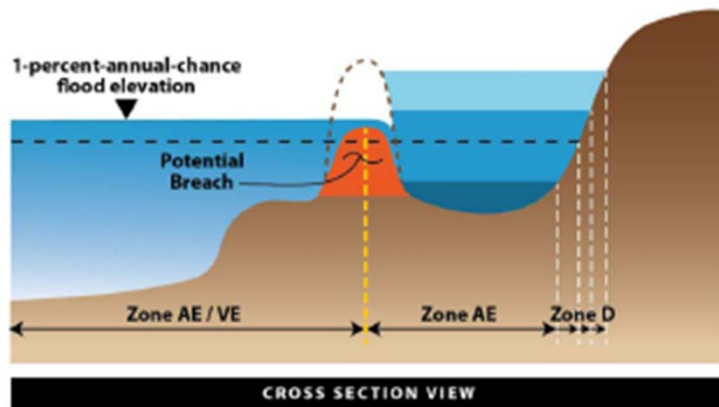
Levee Re-Mapping

Freeboard Deficient



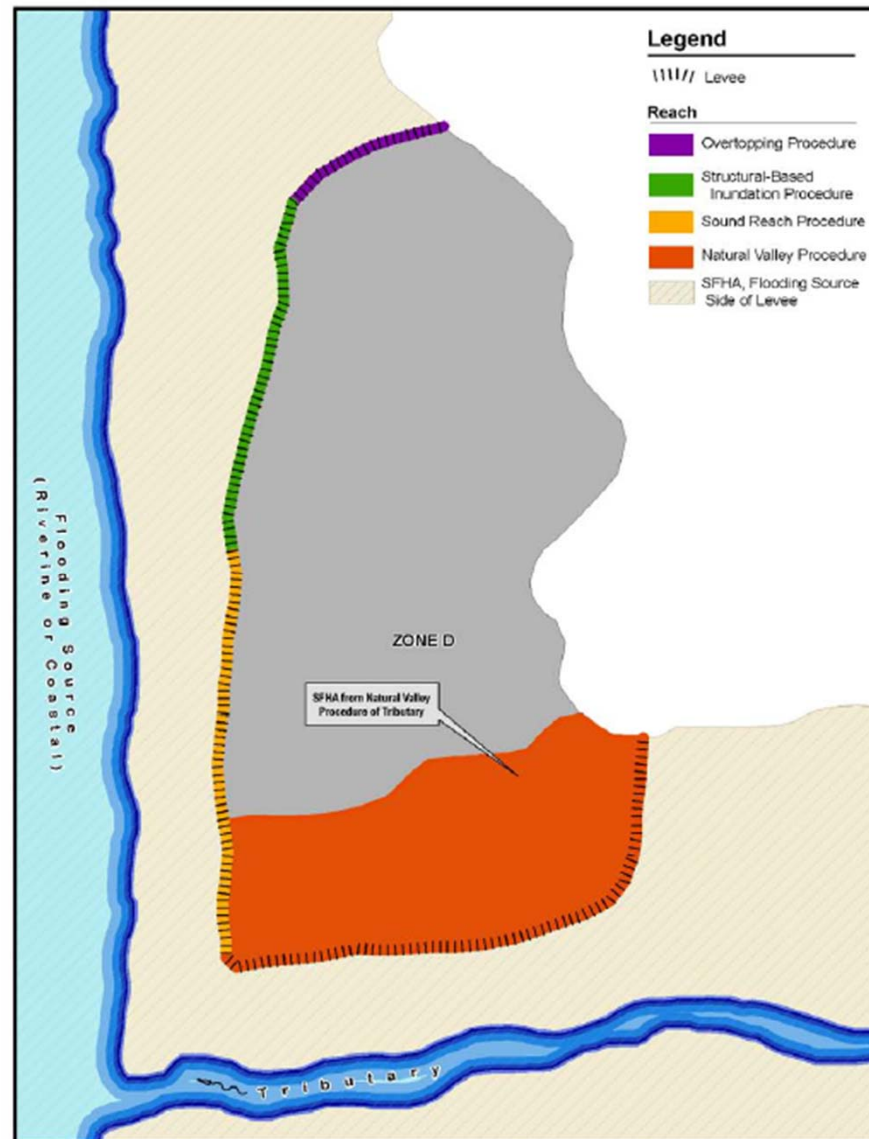
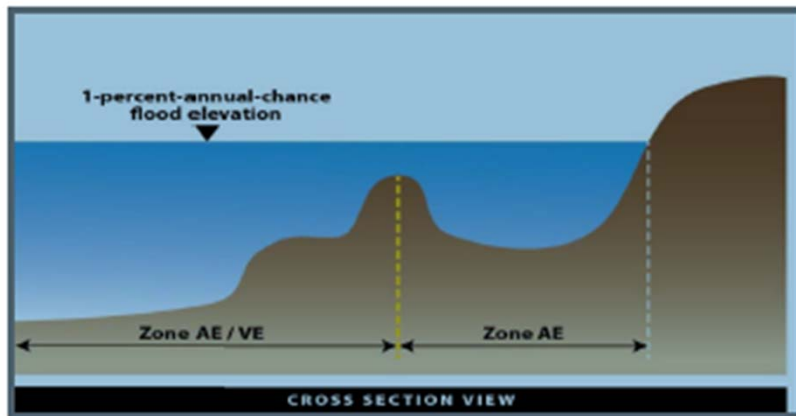
Levee Re-Mapping

Structural-Based Levee Failure



Levee Re-Mapping

Natural Valley Section



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