Non-Levee / Non-Dam Embankments

Questions but few answers…

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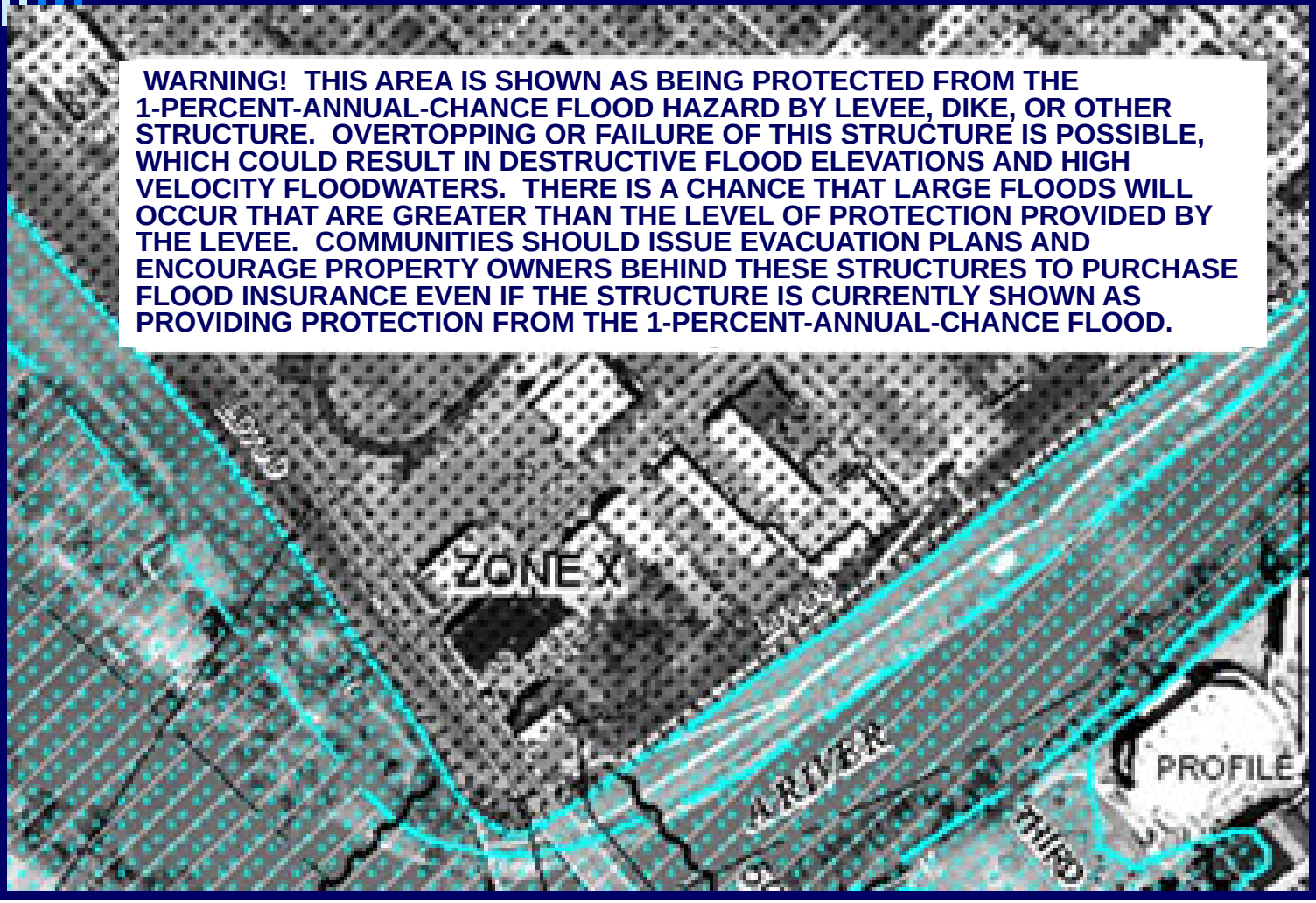
Presentation topics

- Why is there concern about non-levee/ non-dam embankments?
- What is a levee?
- What is an accredited levee?
- What is a dam?
- What is a non-levee / non-dam embankment?
- What guidance is available?

Why is there concern about non-levee/ non-dam embankments?

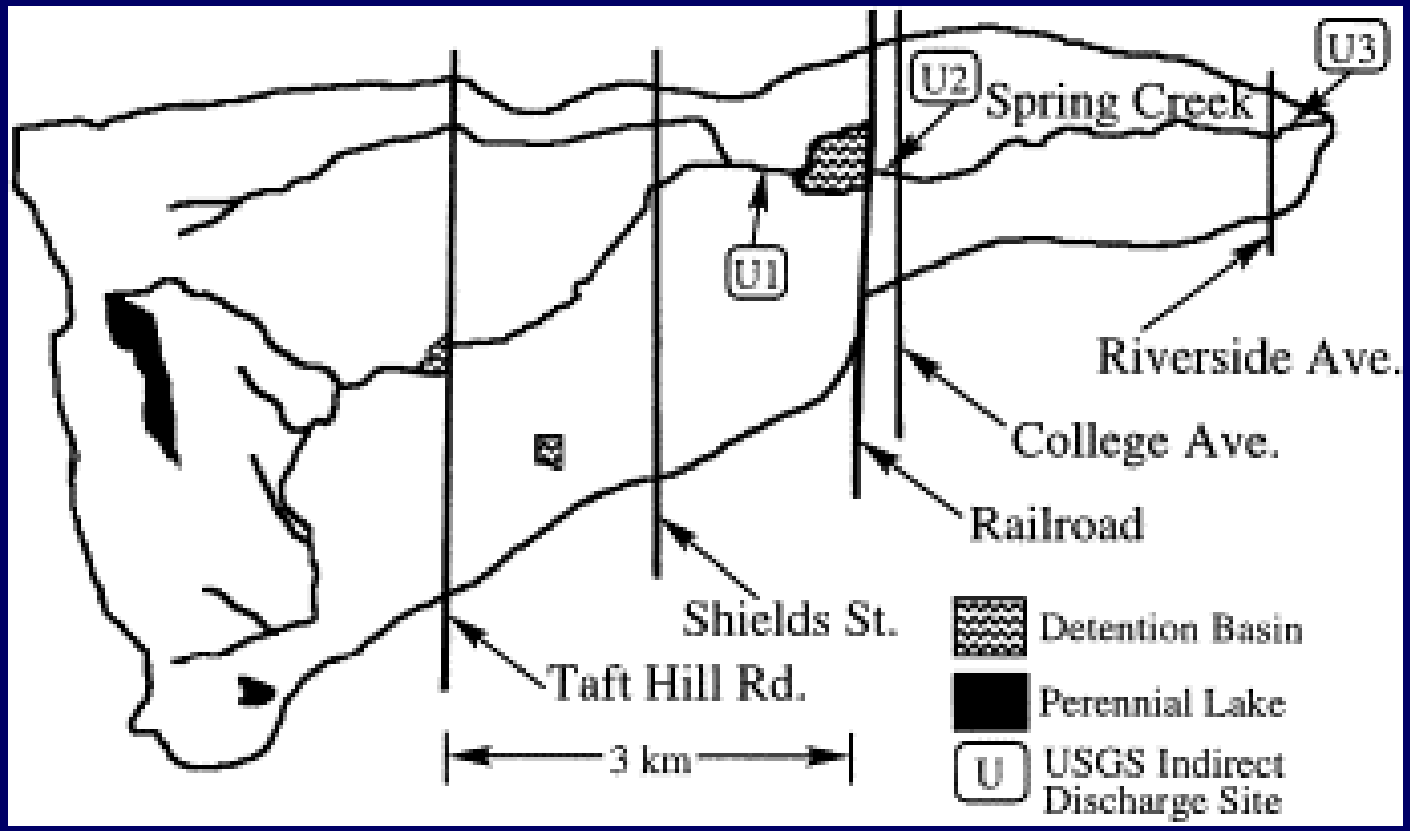
- De- accredited levees
- Embankment failures
- Accurate flood hazard identification

Accredited Levee on Map



De-Accredited/Non-Accredited Levee on Map

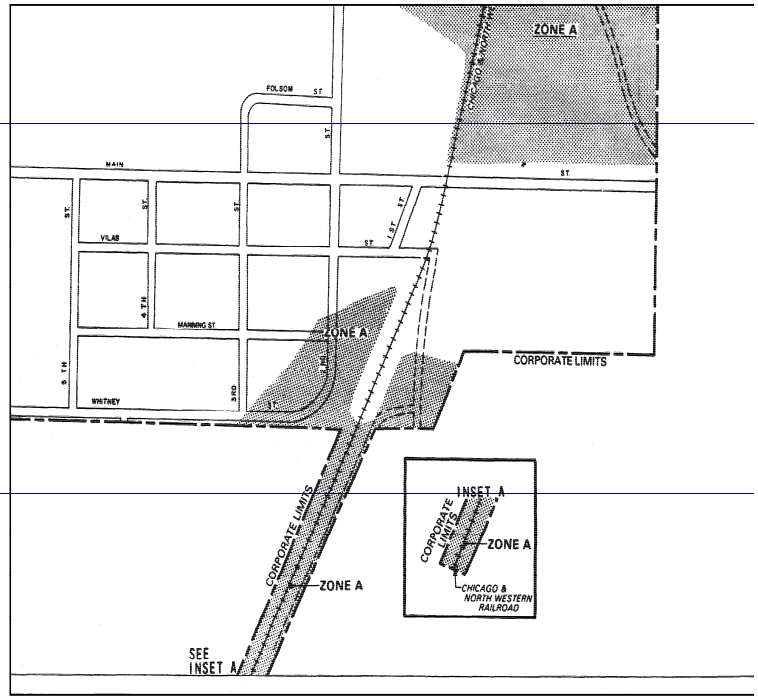
Fort Collins CO
July 2, 1997 flood

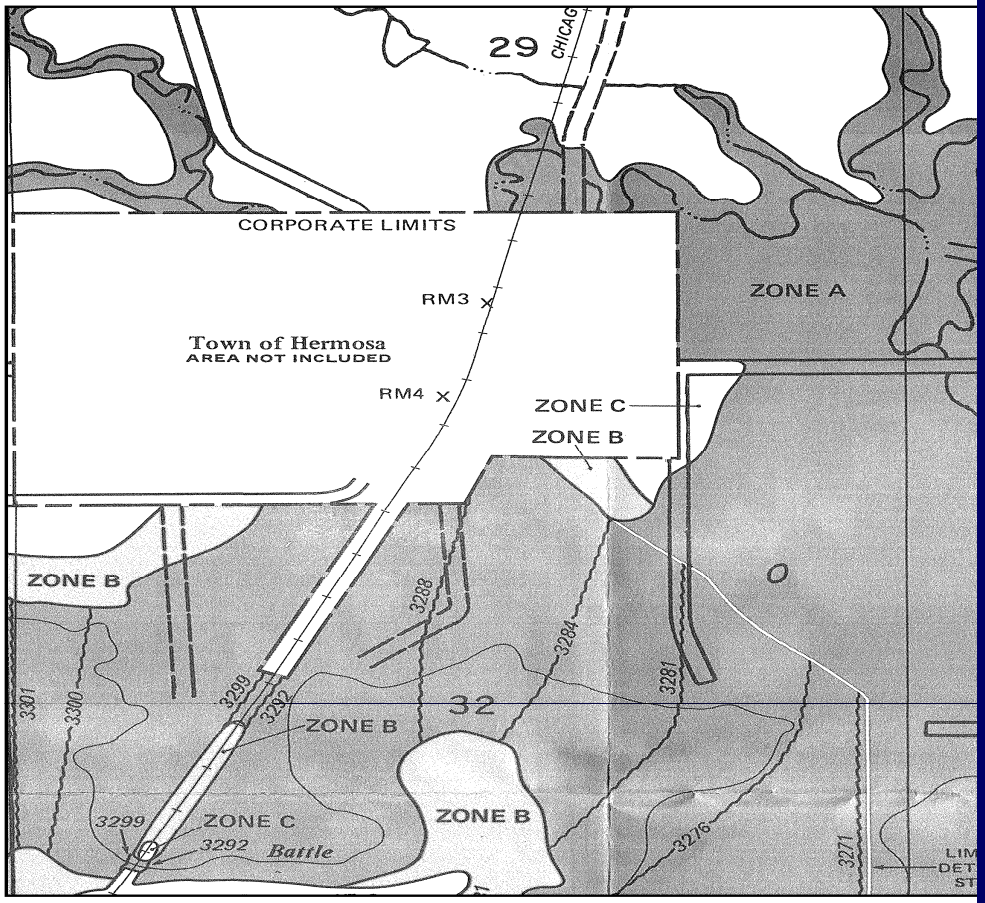


Hermosa, Custer County, SD August 17, 2007

Flood waters from Battle Creek flowed over this railroad berm onto the Ferguson Subdivision

Hermosa, Custer County, CO





Charlotte-Mecklenburg

What is a levee?

Text book definition:

> Levee are small, long earth dams that protect low areas of cities and towns, industrial plants, and expensive farmland from flooding during periods of high water.
>
> George F. Sowers, 1979. *Introductory Soil Mechanics and Foundations: Geotechnical Engineering 4th Edition*, Macmillan Publishing Co., Inc. New York.

National Committee on Levee Safety

http://www.iwr.usace.army.mil/ncls/index.cfm

Levee.-

IN GENERAL. – The term “levee” means an embankment, including floodwalls-

(i) the primary purpose of which is to provide hurricane, storm, and flood protection relating to seasonal high water, storm surges, precipitation, and other weather events; and

(ii) that normally is subject to water loading for only a few days or weeks during a year.

(B) INCLUSION – The term includes structures along canals that constrain water flows and are subject to more frequent water loading but that do not constitute a barrier across a watercourse.

What is an accredited levee?

FEMA definition:

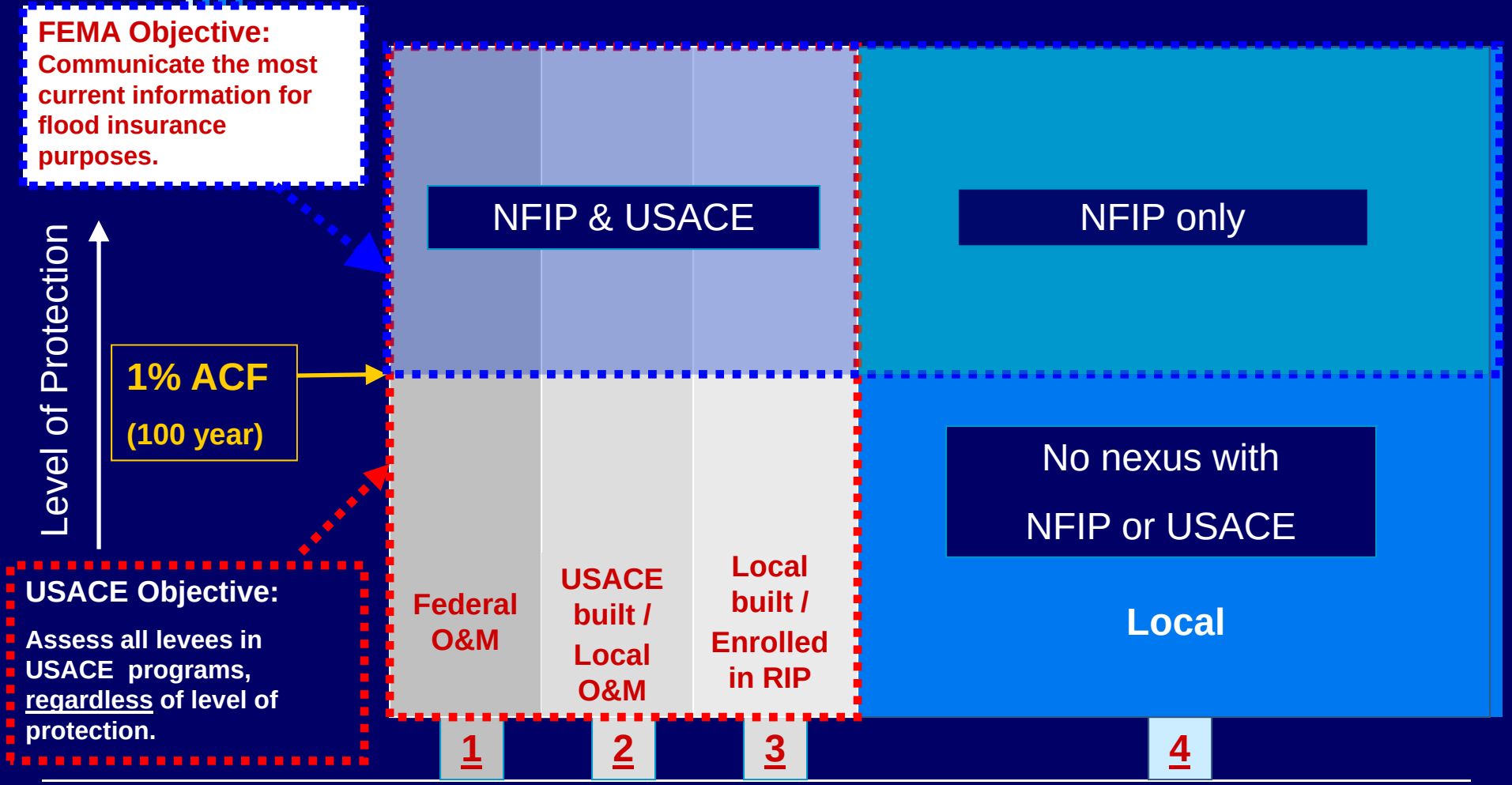
Meets all the requirements of Code of Federal Regulation (CFR) Section 65.10

Such as:

- Adequate freeboard above the 1% annual chance flood
- Meets design specifications
- Maintenance plan in place
- Owners take responsibility

Universe of Levees

FEMA Objective:
Communicate the most current information for flood insurance purposes.



USACE Objective:

Assess all levees in USACE programs, regardless of level of protection.

What is a dam?

Text book definition:

> Earth and rock-fill dams are special embankments designed to impound water more or less permanently. Dams are the most critical of all engineering structures for their failure can cause property damage and loss of life for great distances downstream, involving people who may not be aware of the dam's existence. (Sowers, 1979)

National Dam Safety Program

DAM – The term "dam"

(A) means any artificial barrier that has the ability to impound water, wastewater, or any liquid-borne material, for the purpose of storage or control of water, that –

(i) is 25 feet or more in height from -

(I) the natural bed of the stream channel or watercourse measured at the downstream toe of the barrier; or

(II) if the barrier is not across a stream channel or watercourse, from the lowest elevation of the outside limit of the barrier; to the maximum water storage elevation;; or

ii) has an impounding capacity for maximum storage elevation of 50 acre-feet or more; but

(B) does not include –

(i) a levee; or

(ii) a barrier described in subparagraph (A) that –

(I) is 6 fee or less in height regardless of storage capacity or

(II) has a storage capacity at the maximum water storage elevation that is 15 acre-feet or less regardless of height; unless the barrier, because of the location of the barrier or another physical characteristic of the barrier, is likely to pose a significant threat to human life of property if the barrier fails (as determined by the Director).

DIRECTOR. – The term "Director" means the Director of FEMA.

Illinois Dam Safety Program

Illinois rules identify those dams that are under the jurisdiction of the state. All Class I and II dams are regulated due to probable life and property consequences should they fail. Class III dams are regulated if they meet the following criteria:

- The drainage area of the dam is 6400 acres or more in a rural area, or 640 acres in an urban area, or
- The dam is 25 feet or more in height provided that the impounding capacity is greater than 15 acre-feet, or (not a dam if impounds less than 15 acre feet)
- The dam has an impounding capacity of 50 acre-feet or more provided that the dam height is greater than 6 feet. (not a dam if less than 6 feet or less than 50 acre-feet of impounding capacity)

What is an embankment (that is not a levee or a dam)?

Textbook definition:

An embankment is an artificial mound of soil or broken rock that supports railroads, highways, airfields, and large industrial sites in low areas, or impounds water. (Sowers, 1979)

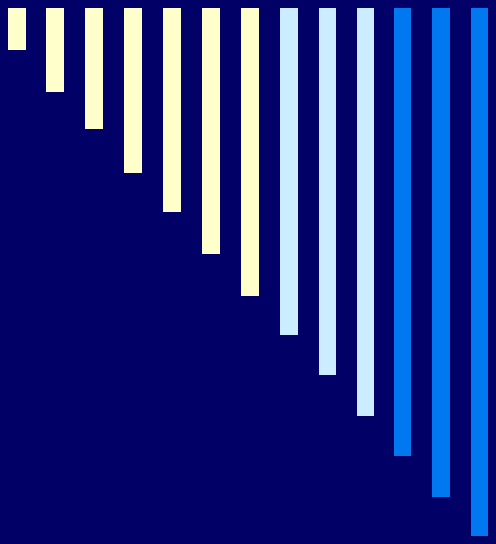
FEMA description of an embankment

In PM 51 "non-levee embankments" are described as embankments that were not designed or constructed as flood-control structures, such as those for highways and railroads. “Because such embankments are not "levees" as defined in Section 59.1 of the NFIP regulations (44 CFR 59.1), they cannot be accredited with providing flood protection in accordance with Section 65.10 (44 CFR 65.10) of the NFIP regulations.”

Two kinds of “embankments”

- 1) embankments parallel to the direction of flow and thus tend to impose lateral constraints on flood flows, these are often highways or railroads built on fill in low lying areas; embankments constructed as levees but not meeting the criteria set for in 44CFS Section 65.10 may have similar issues. (non-levee)

- 2) embankments perpendicular to the direction of flow, and may impede flow, attenuate peaks downstream, and temporarily cause storage of water upstream, these typically would be associated with bridges and culverts. (non-dam)



What guidance is available?

Non-levee embankments
(parallel to flow)

- USDOT, Federal Highway Administration has definitely said that highway embankments are not designed as flood control structures.
- Federal Railroad Administration an agency within USDOT focused on train safety
- FEMA Guidelines and Specifications Appendix H and PM52 describe the protocol to evaluate flood elevations riverward & landward of de-accredited “levees.”
- Die is cast for floodplain mapping and attendant flood insurance & management

Non-dam embankments
(perpendicular to flow)

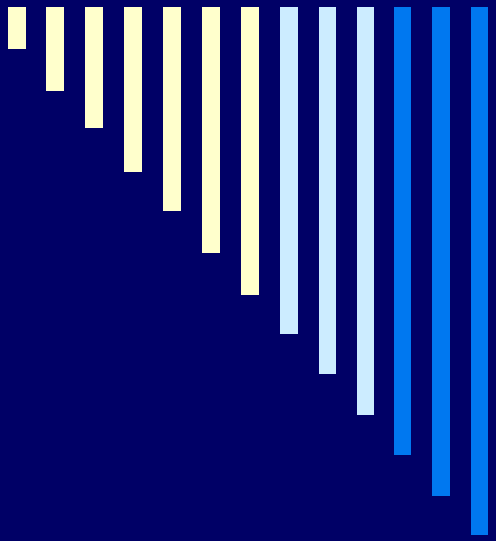
- USDOT, Federal Highway Administration has definitely said that highway embankments are not designed as flood control structures.
- FEMA Guidelines and Specifications Appendix C *allows* for attenuation of flood peaks due to restrictive openings in high embankments and the use of reservoir routing procedures.
- FEMA Hazard Mitigation Handbook describes mitigation of restrictive crossings

Illinois' Permit Programs

- IDNR Division of Water Resource Management
- Administrative Code Parts 3700, 3702, 3704 3706, 3708 have oversight and permit authority for construction in floodways, dams, and within floodplains
- Good floodplain management in place in Illinois for new and replacement structures

Why is there concern about non-levee/ non-dam embankments?

- Flood insurance and floodplain management regulations in areas once thought protected from 1%ACF
- New studies required to map flood hazards
- Questions of liability
- What is appropriate study methodology
- Public safety issues



Answers?

National Dam Safety Program, synopsis of Illinois Rules
http://www.damsafety.org/media/Documents/PDF/IL.pdf

National Committee on Levee Safety
http://www.iwr.usace.army.mil/ncls/index.cfm

The Federal Highways Administration (FHWA) memorandum dated September 10, 2008 (http://www.fhwa.dot.gov/engineering/hydraulics/policymemo/20080910.cfm)

FEMA Guidelines & Specifications for Flood Hazard Mapping Partners
http://www.fema.gov/plan/prevent/fhm/gs_main.shtm