



# Memorandum

Subject: **ACTION:** Highway Embankments versus Levees  
and other Flood Control Structures

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From: */s/ Original Signed by*  
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In Reply Refer To: HIBT-20

To: Associate Administrator for Federal Lands  
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This memorandum provides guidance to our field offices on the distinctions between highway embankments, levees, and other flood control structures. The memorandum also provides background of why these distinctions are important and recommendations in the event that the FHWA encounters questions or issues in this area.

## **Background:**

The Federal Emergency Management Agency (FEMA), primarily through the National Flood Insurance Program (NFIP), works with communities to determine floodplain areas threatened by flood damages and sets appropriate insurance rates for property owners within those areas. The primary means to determine the locations of these flood prone areas are through flood insurance studies (FIS) and associated flood insurance rate maps. By the time the FEMA and the communities began conducting these FIS, much of our Nation's highway system had already been constructed, including embankments within some floodplains.

Recent FEMA map modernization and levee certification initiatives have revealed that for many years some highway embankments may have been either inadvertently or incorrectly designated as levees or other flood control structures. Also, some NFIP communities incorrectly assumed that these embankments provided some level of protection. Until recently, the FHWA was unaware of such assumptions.

Furthermore, there have been recent instances where the FEMA, other floodplain regulators, and communities (hereafter referred to as 'entities') have approached State departments of transportation (DOTs) to request DOT certification of these highway embankments as levees or flood control structures. Some entities have suggested that DOTs need to retrofit these embankments into levees and do so using Federal-aid highway funds, thus allowing for certification. Many times these entities cite significant economic hardship for the community should the DOT not take such actions.

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## **The FHWA, Floodplains, and Flood Control**

For over 50 years, the FHWA has been involved in the planning, design, and construction of the Interstate and other portions of the National Highway System. At times, this required placing highway embankments adjacent to or within floodplains. While the FHWA long recognized that the highway system would cross and interact with floodplains, the system was not designed or intended to serve in a flood control role.

As a consequence, the FHWA does not have flood control standards for highway embankments. However, the FHWA does have regulations and design standards that relate to the interaction of highways and bridges with floodplains. These regulations are found in 23 CFR 650 Subpart A: "Location and Hydraulic Design of Encroachments on Flood Plains."

### **Design of Highway Embankments**

Both new and existing highway embankments reflect the following typical design philosophy and approach:

- Highway embankments do not include design features, such as an internal impervious core and freeboard, required for a levee or other flood control structures;
- The fill material used in the construction of a typical highway embankment is not a sufficient barrier against water; therefore, a highway embankment is subject to piping, seepage, and infiltration; and
- Typical highway embankment construction does not require the same level of geotechnical engineering analysis as required for flood control structures.

### **Role of FHWA Floodplain Regulations**

The FHWA floodplain policies and regulations (23 CFR 650 Subpart A) attempt to keep encroachments (embankments) entirely out of floodplains. Where this was not feasible, regulations and practice required most Interstate embankments to be sufficiently elevated to avoid overtopping by a flood with a 2 percent chance of being exceeded in any given year. This requirement does not imply an embankment provides an additional flood control role. Instead, the intent is to prevent loss of the embankment as a result of overtopping flows associated with smaller floods.

Further differentiating how the FHWA's floodplain interaction function is distinct from a flood control role, the FHWA floodplain regulations require highway project design flows to consider potential effects on any existing flood control channels, levees, and reservoirs. In doing so, the FHWA recognizes the importance of flood control missions performed by other entities, but clearly avoids undertaking and involvement in such a mission. Typically, the Federal Agencies with such a flood control and mitigation mission and authority are the FEMA and the U.S. Army Corps of Engineers.



### **Risk of Failure**

In developing the floodplain regulations, the FHWA did not intend that highway embankments act as a flood control structure. To the contrary, the FHWA believes that assuming such a role poses a significant risk of embankment failure.

An additional concern is that highway engineers cannot quantify the risk of failure of these embankments during a flood event. There are no cost effective means to ascertain the potential of failure associated with any given highway embankment or even relative to similarly designed highway embankments in different areas. Nor does a history of some individual embankment acting in a “flood protection” mode imply that the design is adequate for a flood control role.

### **Embankments and Permanent Dams**

The FHWA floodplain regulations do recognize that there are times when embankments may interact with or function as permanent dams. In these cases, the FHWA has no design standards. Instead the FHWA regulations require the design have the approval of the State or Federal Agency responsible for the safety of dams or like structures within the State. Even in this case, the FHWA floodplain regulations distinguish between permanent structures and those affected during floods.

### **Guidance on Highway Embankments**

Staff from the FHWA’s Office of Bridge Technology have carefully studied the points discussed in this memorandum and believe that certifying or otherwise designating highway embankments as levees is not an acceptable practice and should be opposed for the following reasons:

- Most existing highway embankments were not designed and constructed for (and thus are ill-suited to) performing as a levee or other flood control facility;
- In such a role, highway embankments could pose a significant and unacceptable risk to the public; and subject a DOT and FHWA to an untenable position with respect to costs, liability and damages;
- Certification requires conducting a thorough engineering evaluation by groups with experience in analysis and design of flood control structures and applying standards and obtaining approval of agencies responsible for flood control structures; and
- This situation indirectly places the FHWA into a flood control role for its Federal-aid highway program. For nearly all projects, the FHWA does not have the authority to engage in flood control activities.

Therefore, the FHWA discourages DOTs in certifying highway embankments as levees or allowing any such certification by any entity. Additionally, the FHWA discourages any type of retrofit efforts as DOTs and the FHWA are not in a position to assume such a role for statutory, financial, liability, and engineering reasons.

We recommend that you and your corresponding DOT decline any certification request from any entity that may contact you on this subject. Additionally, we recommend informing the FHWA's Office of Bridge Technology, Hydraulics and Geotechnical Team (HIBT-20) of the request. The HIBT-20 staff will be available to serve as the FHWA's lead in providing assistance and guidance to your office in resolving such requests. The HIBT-20 staff has also met with FEMA headquarters staff on this issue and can provide liaison services as needed.

Please share this memorandum with your appropriate staff and with all appropriate DOT and local transportation management officials within your State.

If you have any questions or need additional information, please contact Mr. Joe Krolak at (202) 366-4611 ([joe.krolak@dot.gov](mailto:joe.krolak@dot.gov)) or Mr. Jorge Pagán-Ortiz at (202) 366-4604 ([jorge.pagan@dot.gov](mailto:jorge.pagan@dot.gov)).