

**ABSTRACT**  
**THE LEVEES OF DALLAS COUNTY**

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Beginning in 2004 with the flood Map Modernization program initiated by FEMA and intensifying after the Katrina levee failures in New Orleans, levee systems in Dallas and all over the US have become subject to intense scrutiny. Dallas County is one of the most levee'd of Texas counties, with over 20 separate levee systems along the Trinity River and its tributaries. These range from small, inactive agricultural levees to the 20+ foot tall levees of the Dallas Floodway. These, like all levee systems, are required to be "certified" by their owner/operators in order to be shown as providing 1 % ACE (100-year) flood protection on FEMA's updated Flood Insurance Rate Maps (FIRM's) for Dallas County. This paper discusses the challenges faced and problems overcome by the levee owner/operators, FEMA, the US Army Corps of Engineers and the Flood Map contractors in the certification of the many levee systems in Dallas County.

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## Introduction

In 2004, the Federal Emergency Management Agency (FEMA) began the 5-year \$1 Billion Dollar Map Modernization Program (MapMod), initiating Flood Map updates throughout the US. FEMA regulations require that levees shown as providing flood protection must be re-certified as a part of the re-study process. So far in Texas, eighty-six counties are in some phase of being updated. Twenty-six of these counties have known levee protection systems including Dallas County.

## FEMA Levee Certification Requirements

FEMA levee certification requirements have existed since 1986 and can be found in the Code of Federal Regulations Section 65.10 (CFR 65.10). The requirements are provided for levee owners/operators to perform the certification. FEMA does not certify levee systems; FEMA only accredits the certification information provided if it meets CFR 65.10. Otherwise, the area the levee would otherwise provide protection for would be mapped as floodplain (Zone AE).

The certification requirements address three areas of a levee system:

- Design criteria
  - Levee height and freeboard
  - Closures at all openings
  - Embankment protection from erosion
  - Embankment and foundation stability
  - Settlement
  - Interior drainage
  - Other design criteria
- Operation plans and criteria
- Maintenance plans and criteria

All operations and maintenance (O&M) plans must be under the jurisdiction of a Federal or State Agency, an agency created by federal or state law or an agency of a community participating in the National Flood Insurance Program (NFIP). Levee certification is the requirement of the levee owner/operator and the design requirements must be certified by a registered professional engineer. In lieu of the individual design certification requirements, a Federal Agency such as the US Army Corps of Engineers (USACE) may certify that the levee has been adequately designed and constructed to provide protection against the Base Flood.

## Dallas County Levees

The first levees in Dallas County were likely constructed to facilitate the use of fertile floodplain areas for farm use by agricultural interests. As the city grew and damaging floods occurred, flood control districts were created by state legislation and levees were constructed to provide a level of flood protection along the Trinity River. In the 1950's the USACE stepped in and strengthened Trinity River flood protection levees and related facilities created the federal flood control project known as the Dallas Floodway. Since

that time, many levee projects have been constructed to reclaim floodplain lands for land development purposes, protect public facilities such as wastewater treatment plants and solid waste landfills and provide a level of flood protection to existing low-lying development in several communities. Currently, Dallas County is second only to Fort Bend County in the number of levee systems located in the county.

In 2004, the Dallas County Digital Flood Insurance Rate Map (DFIRM) update project was assigned by FEMA to Halff Associates, one of five Region 6 Study Contractors. Early in the study, Halff compiled a list of levees in the county that were candidates for recertification. The initial list included approximately 20 levees as can be seen in Table 1. Of the levees shown, nine are municipal owned/operated, eight were state chartered flood control districts with taxing authority and four of the levees are federal.

**TABLE 1**  
**DALLAS COUNTY LEVEES**

<b>LEVEE DISTRICT</b>	<b>CITY</b>	<b>OWNER/OPERATOR</b>	<b>LENGTH</b>	<b>CERTIFIED</b>
<b>Trinity River</b>				
▪ Dallas Floodway	Dallas	Dallas/USACE	22.3	Yes
▪ Central WWTP	Dallas	Dallas Water Utilities/USACE	2.6	Yes
▪ Southside WWTP	Dallas	Dallas	6.7	Yes
▪ Rochester Park	Dallas	Dallas/USACE	2.7	Yes
▪ McCommas Bluff Landfill	Dallas	Dallas Sanitation Dept	4.3	Yes
▪ Ag. Levee Districts	Various			
o Bois D'Arc	Various	Unknown	Unknown	No
o Trinity/Tenmile Creek	Various	Unknown	Unknown	No
<b>West Fork-Trinity River</b>				
▪ Dallas Floodway	Dallas	Dallas/USACE	Inc. above	Yes
▪ TRA WWTP	Grand Prairie	TRA	2.7	Yes
▪ City of Grand Prairie Landfill	Grand Prairie	Grand Prairie		N/A
▪ GPMURD	Grand Prairie	GPMURD	1.9	Yes
▪ Dorchester Levee	Grand Prairie	Grand Prairie	0.9	Yes
▪ Grand Prairie Gun Club	Grand Prairie	Grand Prairie		No
▪ Dallas County FCD #1 (Bear Creek)	Irving	DCFCD #1	1.4	Yes

▪ Running Bear Park Levee	Irving	Irving		No
▪ Irving Landfill	Irving	Irving	2.2	Yes
<b>Elm Fork-Trinity River</b>				
▪ Dallas Floodway	Dallas	Dallas/USACE	Inc. above	Yes
▪ IFCD #1 (Northwest Levee)	Irving	IFCD#1/USACE	2.8	Yes, by PAL
▪ IFCD #3 (Valley Ranch)	Irving	IFCD#3	3.5	Yes
▪ Valwood Improvement Authority	Farmers Branch / Carrollton	VIA	8.9	Yes
▪ DCURD (Las Colinas)	Irving	DCURD	3.4	Yes

### FEMA Levee Certification Guidance

From the beginning of the MapMod program, FEMA stated their intentions to supplement CFR 65.10 with additional guidance as far as Levee Certification is concerned. In August of 2005, Procedure Memorandum 35 was issued, providing interim guidance for DFIRM Study Updates that Included levees. The guidance basically followed CFR 65.10, with provisions for floodplain mapping in situations where levees could not be certified. FEMA also indicated that additional guidance was forthcoming. As a result, responsible entities were slow to proceed with certification of their levee systems, possibly hoping for more detailed and specific guidance, thinking that some level of effort, short of the full blown effort required by CFR 65.10, might be allowed.

Consequently, levees in Dallas County and most other areas were slow to be certified. Preliminary flood maps were being held by FEMA and the MapMod process was being delayed. Therefore, FEMA developed the Provisionally Accredited Levee (PAL) process in October 2006 (revised in 2007) to identify levees that had not completed the certification process but were thought to meet the requirements for certification. This process would grant more time (2 to 3 years) for levee owners/operators to complete certification while allowing the Preliminary DFIRM to be published and the review, appeals and adoption procedure to proceed. The preliminary maps were published with a PAL note in the levee protected areas. The note indicates the provisional nature of the flood map in the levee area based on previous maps and subject to the levee owner or community successfully completing the certification process in accordance with CFR 65.10.

The Region 6 Regional Management Center (RMC) compiled the guidance information into a FEMA Region VI Levee Certification Process document. Version 1.0 was published in December of 2006. Checklists were also developed to aid in the certification process.

In addition to this guidance, FEMA Region 6 sent letters to community mayors with copies to elected officials stressing the importance of certification and the consequences of failing to certify, namely levee protected areas being shown as floodplain on the new maps. This letter, along with the additional guidance, seemed to accelerate the certification process.

### Certification Results

At the time that Halff completed and submitted the preliminary DFIRMs to FEMA Region 6 for review, only five levee systems had submitted certification to FEMA for accreditation. Of the remaining systems, two were of insufficient height to provide Base Flood protection, three levees were insufficient in freeboard, one flood control district had no levees and another flood control district had no levees in Dallas County. Certification for the remaining levees had not been submitted at that time. Prior to the Preliminary Dallas County DFIRMs being published in June 2007, a total of 14 levees had been accredited certification by FEMA. One district was granted PAL status and 1 levee was de-accredited.

### Case Study: Dallas Floodway

The Dallas Floodway is a Federal Flood Control facility. The levee design was certified by the USACE in July of 2006. The levee system is maintained and operated by the City of Dallas Flood Control Branch (Street Services Department). Flood Control updated the O&M manuals and certified the operations and maintenance plans for the district.

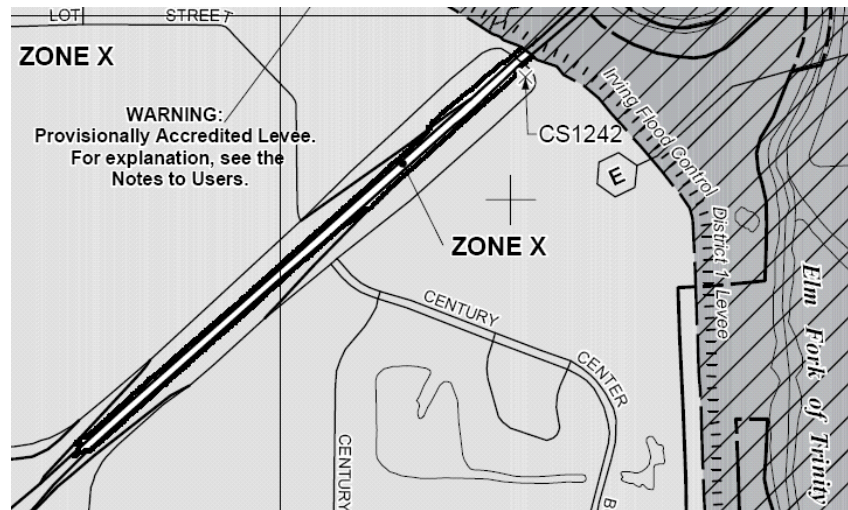
### Case Study: Irving Flood Control District – Section 1

The Irving Flood Control District – Section 1 (IFCD-1) is a unique case. IFCD-1, also known as the Northwest Levee, is a Federal flood control project under the jurisdiction of the US Army Corps of Engineers. Originally, this area was part of the Dallas County Levee Improvement District No. 5 as shown on the Dallas County Flood Control District Map (undated). This district was formed in 1919 contemplating the flood protection of some 4,500 acres of land owned primarily by the Trinityfarms Company, adjacent to what is now the Elm Fork of the Trinity River. In 1926, this District joined with the City and County of Dallas Levee Improvement District along the West Fork and Main Stem of the Trinity to develop a plan of reclamation for a combined 10,533 acres, soon to become known as the Dallas County Flood Control District. Reclamation construction commenced in 1928 and was declared complete in 1932.

In the period from 1953 to 1960, the US Army Corps of Engineers strengthened the levees, enlarged the channels and improved the interior drainage facilities of the Dallas County Flood Control District, creating the Dallas Floodway Federal flood control project. Minimal, if any, improvements were made to the Northwest Levee at this time. In 1968, operation and maintenance of these flood control facilities was transferred to the cities of Dallas and Irving.

In 1971, the Irving Flood Control District No. 1 was created by the State of Texas (H. B. 564). The members of the district's Board of Directors are appointed by the City of Irving. The levees, storm water pump station and related facilities, as they exist today, were constructed by the District in 1974. Since that time, the facilities have been owned and maintained by the District, with expansion and improvements made periodically. For example, a second storm water pump station was added in the 1980's.

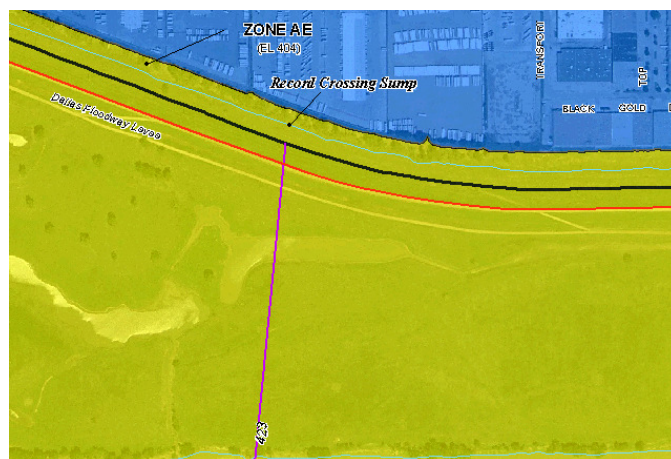
The Corps of Engineers rated the district as in fair condition in their update of Federal levee inventory. This was due to some insufficient freeboard at two road crossings of the levee system. The IFCD-1, with the assistance of the city of Irving, undertook emergency repairs to correct the freeboard deficiencies and the district subsequently become



eligible for PAL status. The district and city requested PAL status promising to correct deficiencies and pursue levee certification within the two years allowed. The Dallas County Preliminary DFIRMs released in June 2007 show the area protected by the IFCD-1 with a warning note, describing that the levee is a Provisionally Accredited Levee. Once the certification is submitted and accepted, the Warning note will be removed from the Effective DFIRM panel.

### Levee Flood Mapping

Another MapMod change regarding levees is related to floodplain mapping. Traditionally, FEMA's FIRMs map the regulatory floodplain at the Base Flood Elevation (BFE) intersection with the riverside levee slope. New FEMA Guidelines require the Floodway and therefore the floodplain, to be mapped at the inside (dry) toe of the levee. Therefore the entire levee is placed within the regulatory floodway. Where sumps are present adjacent to the levee, the river BFE will end at the inside toe and the sump BFE will be immediately adjacent as shown in the example below. In areas where the inside (dry) toe is not well defined, floodway limit locations were estimated based on expected levee footprints.



## Conclusions and Future Changes in FEMA Levee Criteria

All in all, levee certification in Dallas County should be considered a success. Dallas County is second only to Fort Bend County in number of levees systems, but suffered only one de-accredited levee in the current DFIRM update process, with one levee district continuing to pursue certification thru the PAL process.

In the aftermath of Katrina, the worst disaster in US history, changes are being proposed to FEMA's levee regulations. The Association of State FloodPlain Managers (ASFPM) has published a white paper titled National Flood Policy Challenges, Levees: The Double-edged Sword. Some of the recommendations in that white paper include:

- Increasing the design standard for new or repaired levees from the 1-percent-annual-chance (100-year) to the 0.2-percent-annual-chance (500-year) flood event. Currently, certified levees could be grandfathered.
- Mandatory purchase of flood insurance in areas protected by levees
- Incorporate failure resistant features such as overtopping resistant spillways into the design process
- Development of a comprehensive inventory of federal and non-federal levees by the USACE
- Establish a state-administered national levee safety program