

# 2024 Bond Flood Protection & Storm Drainage Subcommittee

## Flood Protection & Storm Drainage Drainage 101

The logo of the City of Dallas, featuring a stylized white 'D' with a three-lobed leaf inside, set against a dark blue background with a fine white grid pattern.

**City of Dallas**

Eduardo Valerio, P.E., Assistant Director  
Matt Penk, P.E., Assistant Director

Dallas Water Utilities

# Overview



- Purpose
- What is stormwater? Why does flooding occur?
- Texas Drainage Watersheds
- Drainage System Background
- Stormwater Drainage Management
- Needs and Example Projects
- Questions



# Purpose



- Explain stormwater, flooding, and importance of managing.
- Obtain understanding of Dallas stormwater drainage system and its operation.
- Obtain understanding of the health and safety benefits obtained from flood protection and drainage improvements.
- Introduce types of projects and needs.





# What is stormwater?

- Stormwater is runoff from precipitation that flows over surfaces into the drainage system (inlets, pipes, channels) and is carried to creeks, rivers, and water bodies.
- Impervious surfaces like roofs and pavement don't allow stormwater to soak into the soil and cause runoff that has to be carried by the drainage system (urbanization).
- Stormwater runoff must be managed to prevent flooding, reduce erosion, and protect the quality of water bodies.

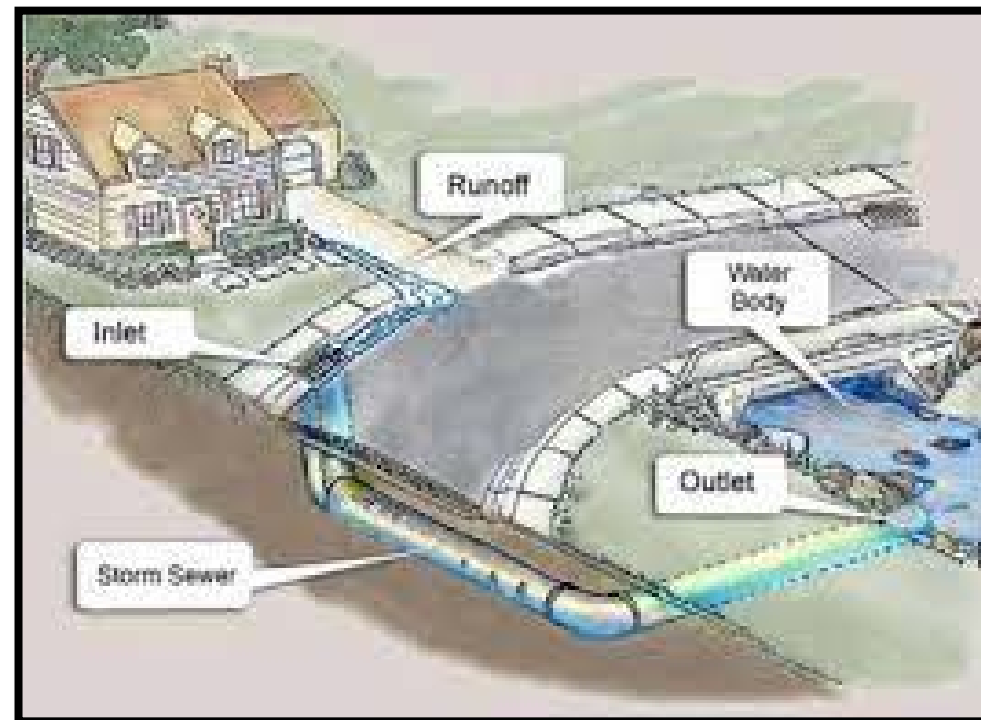


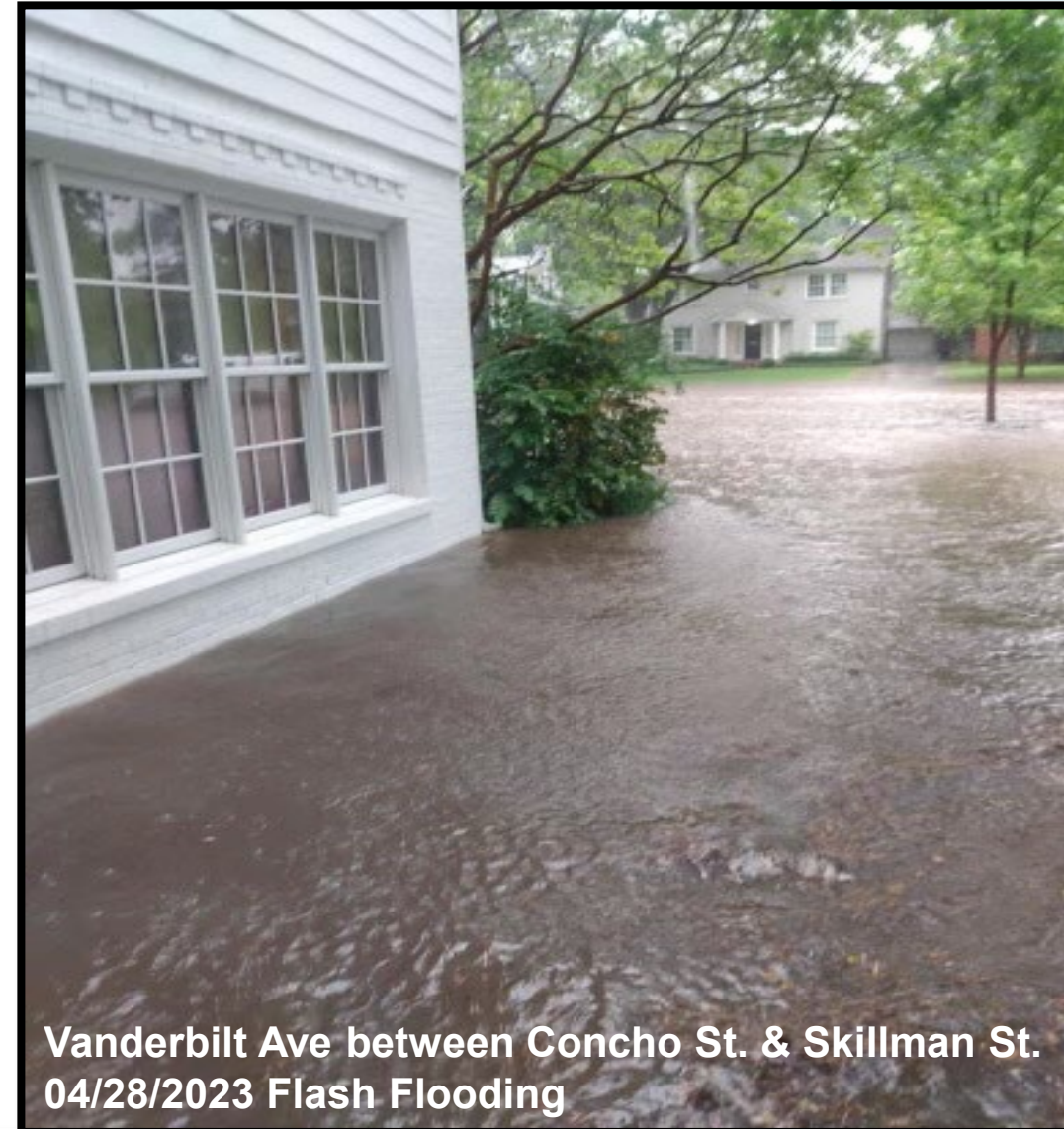
Image courtesy of City of Lubbock



# Why does flooding occur?



- Rainfall, upstream reservoir releases, blockages in pipes/creeks, undersized infrastructure, and stream overflow are examples of types of flooding.
- Most common reports are street flooding and house flooding.
- Can occur anywhere, regardless of “in a floodplain or not.”



Vanderbilt Ave between Concho St. & Skillman St.  
04/28/2023 Flash Flooding



# Flood Protection & Drainage Saves Lives



**People's lives are at risk because of inadequate drainage infrastructure**



# Flood Protection & Drainage Saves Lives



**DALLAS**

**FOX WEATHER LIVE**

**HUNDREDS RESCUED, ONE KILLED IN DALLAS FLOODS**

SCAN WITH PHONE

AMERICA RECOVERS

PHOENIX WED 101° 81° THU 101° 83° FRI 103° 83°

While water recedes, Texans begin to recover after historic rainfall

Prior to Monday's storms, Dallas was sitting 10.32" below average in terms of rain this year. That deficit has nearly been erased. It is now 1.28." But this is of little comfort to the Texans who lost their possessions in the flooding.

**BREAKING NEWS**

**HISTORIC FLOODING EMERGENCY IN DALLAS**

NBC NEWS

**Aug 23, 2022 - Heavy rain led to flash flooding in Dallas, leaving some drivers stranded and others fleeing their cars as high water swept them off the road.**



# Flood Protection & Drainage Prevents Property Loss



**WxChasing- Brandon Clement @bclemms**

Massive problems for n Dallas. Everything is flooding. #flashfloods #dallas #flooding



2:32 AM · Aug 22, 2022



**Aug 23, 2022 — Few homes along the stretch of Alcalde Street between Victor and Elm streets were spared from floodwater, which rose to heights of 4 feet or more.**





# Flood Protection & Drainage Prevents Property Loss



Spring Grove Ave. 05/2019



Vanderbilt Ave. 9/2022



Monticello Ave. 4/2023

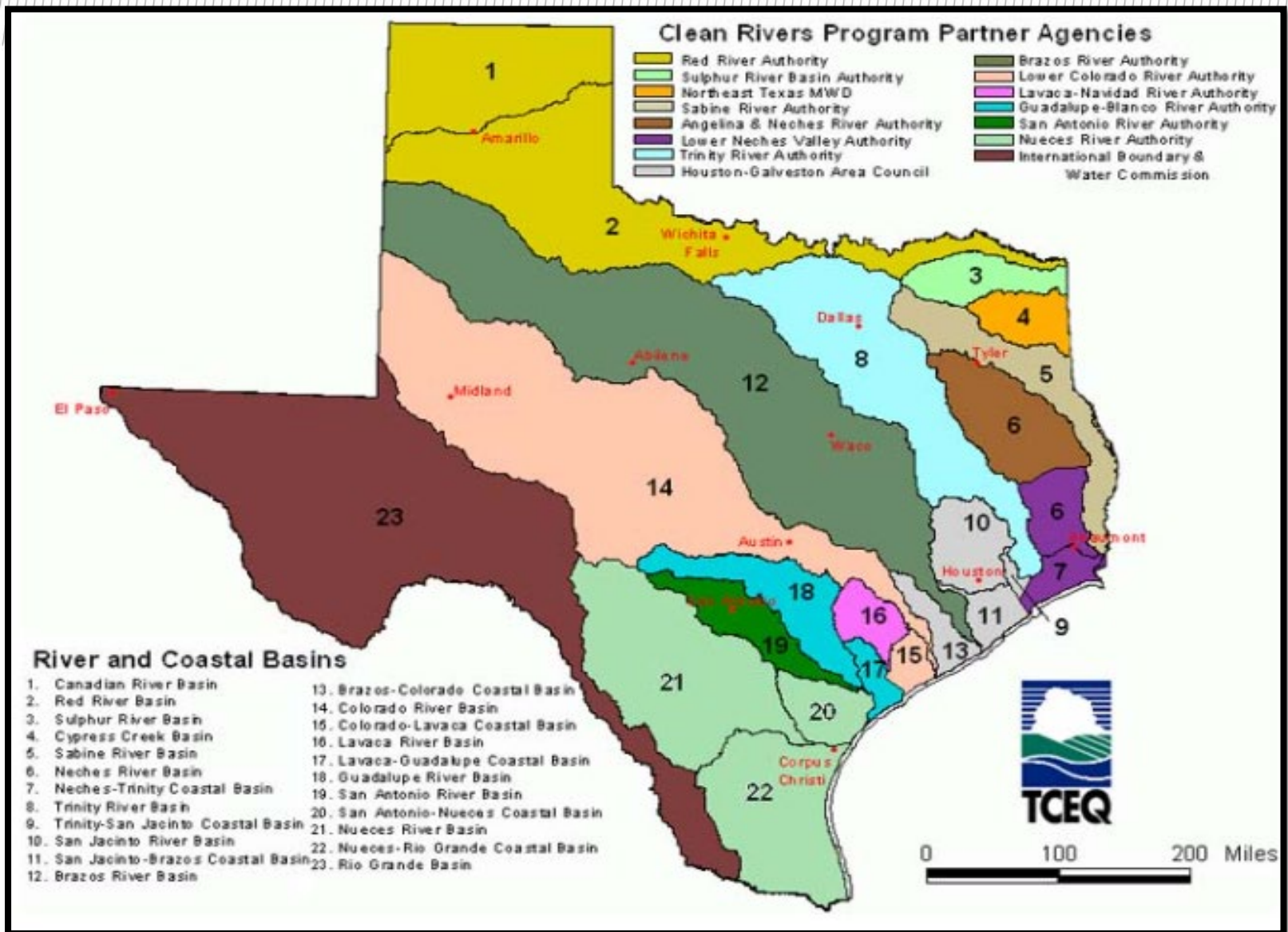




# Texas Drainage Watersheds



# Trinity River Basin (No. 8)



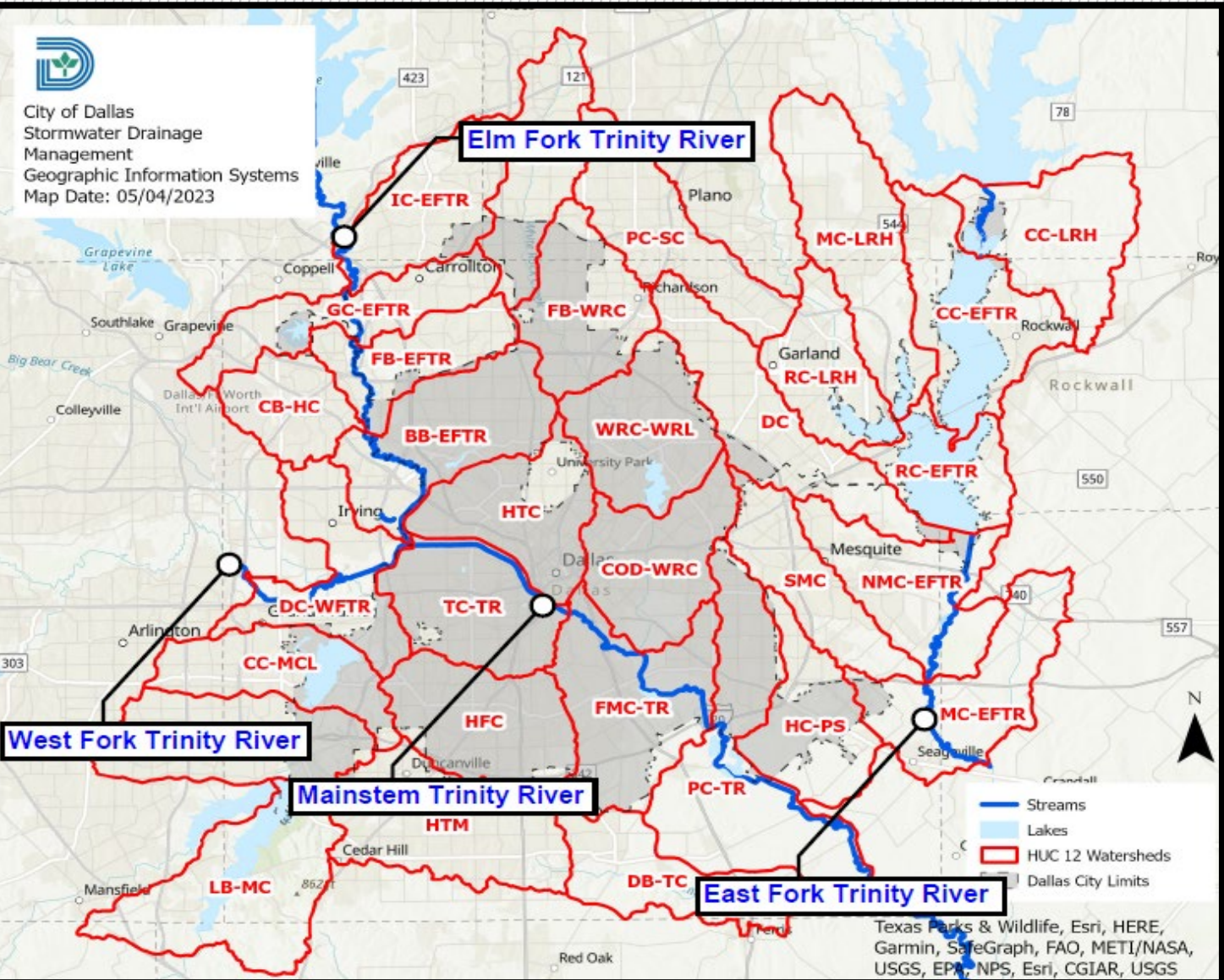
- One of 23 Major Texas Watersheds.
- Extends from Oklahoma to Gulf of Mexico.
- Approximately 6,050 sq.mi. above Dallas.



# Trinity River System in Dallas



City of Dallas  
Stormwater Drainage  
Management  
Geographic Information Systems  
Map Date: 05/04/2023



- Four major Trinity watersheds (>6,050 sq.mi.) called Hydrologic Unit Codes (HUC).
- Elm Fork Trinity River
- West Fork Trinity River
- Mainstem Trinity River
- East Fork Trinity River
- 32 HUC-12 defined sub-watersheds in Dallas (385 sq.mi.).





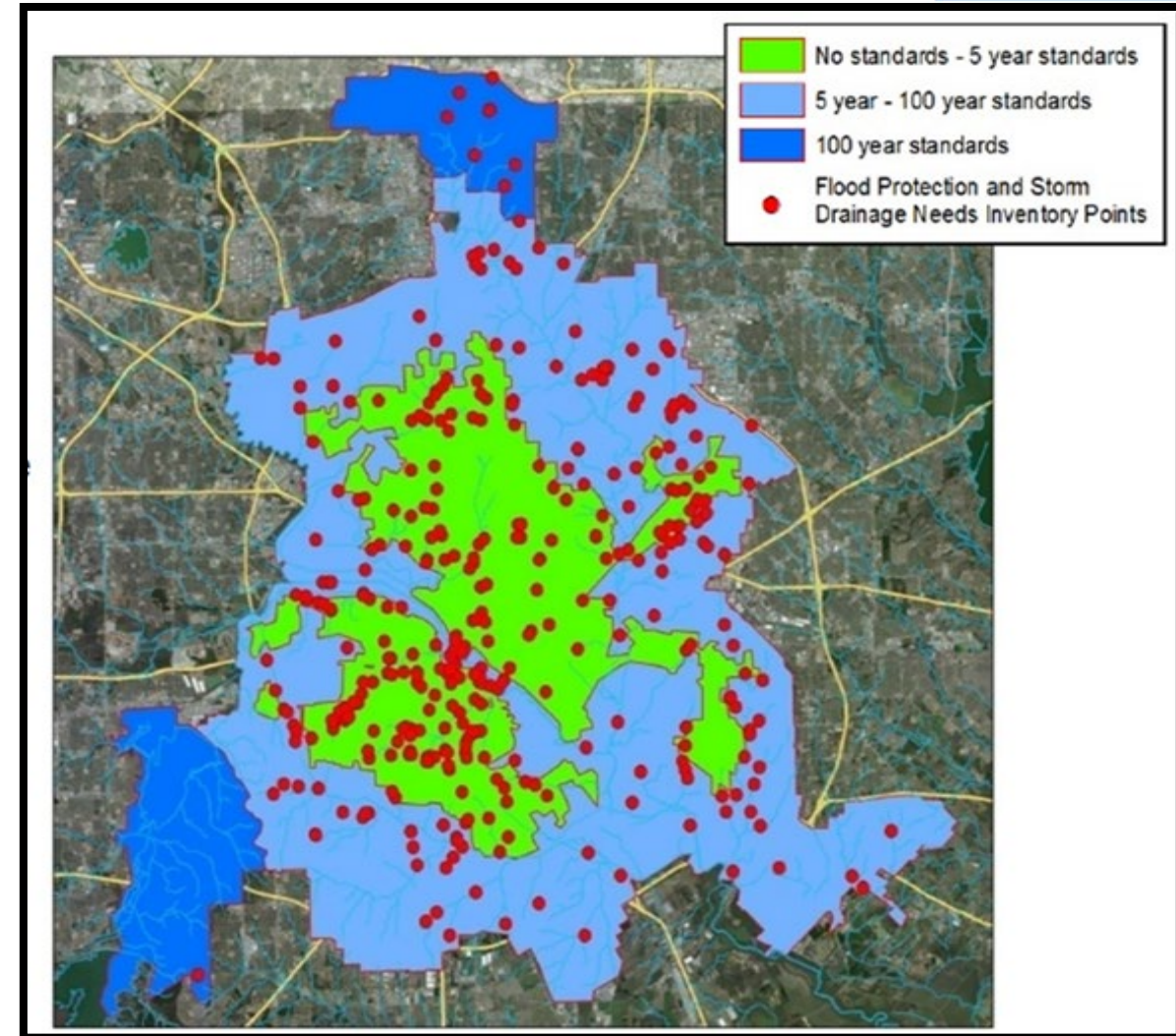
# Drainage System Background



# History of Urbanization in Dallas



- Majority of drainage needs are associated with areas developed prior to current drainage standards.
- City of Dallas currently uses 100-year standards.
- What are 100-year standards?
  - Provisions and design able to address a 100-year storm.
  - A rainfall event with a 1% probability of occurring in any given year.
  - For comparison, a 5-year storm has a 20% chance of occurring in any given year.

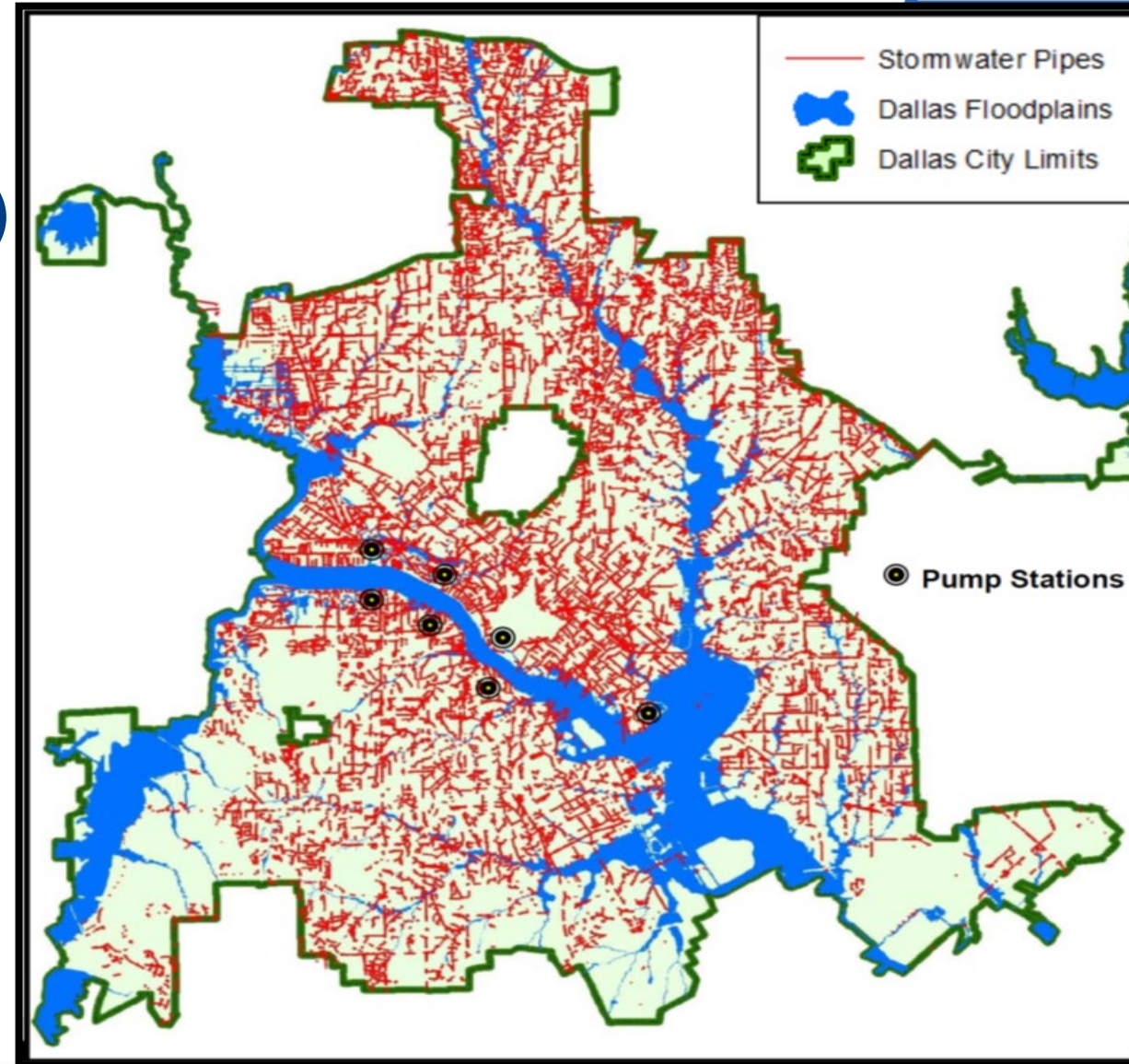


# Drainage System



- 1,963 miles of storm sewers.
- 8 major pump stations (5.7 BGD)
- 661 miles creeks & channels\*.
- 39,000 acres floodplain.
- 6 pressure sewers.
- 30 miles of levee system.

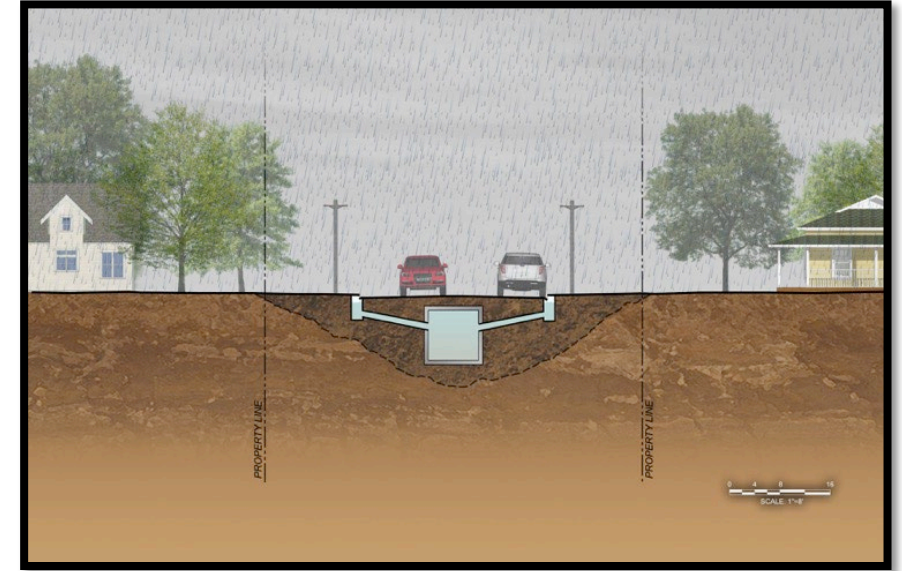
\* Includes both public and private channels



# Purpose/Components of Drainage System



- Collects and contains runoff from rain/storm events.
- Reduces flooding, protects property and infrastructure.
- Hierarchy of drainage components:
  - Local inlets and systems
  - Larger systems, channels, basins and water bodies for detention and storage
  - Creeks and storm water pump stations
  - Trinity River







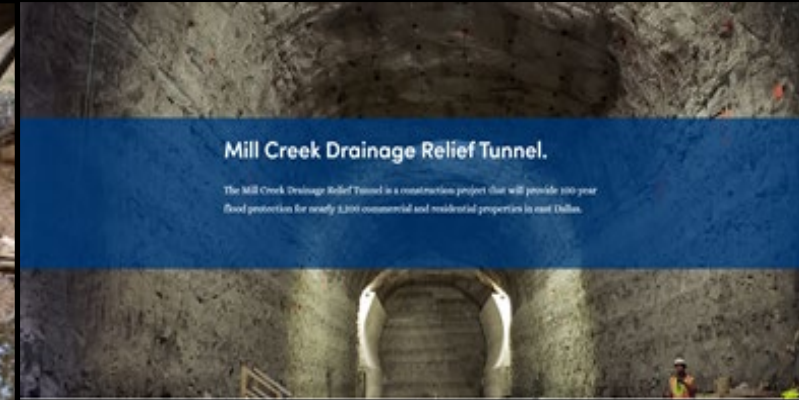
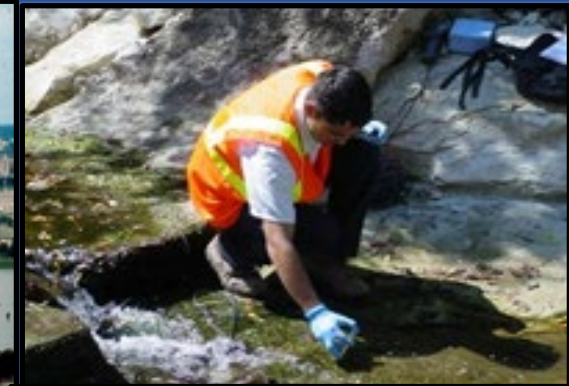
# Stormwater Drainage Management



# Stormwater Drainage Management



- Floodway Operations
- Neighborhood Drainage Services
- Floodplain Management
- Capital Improvement Program
- State & Federal Regulatory Compliance





# Floodway Operations

- Responsible for Flood Control Operations:
  - Flood Control SCADA system
  - Rainfall Gauges
  - Flooded Roadway Warning Systems



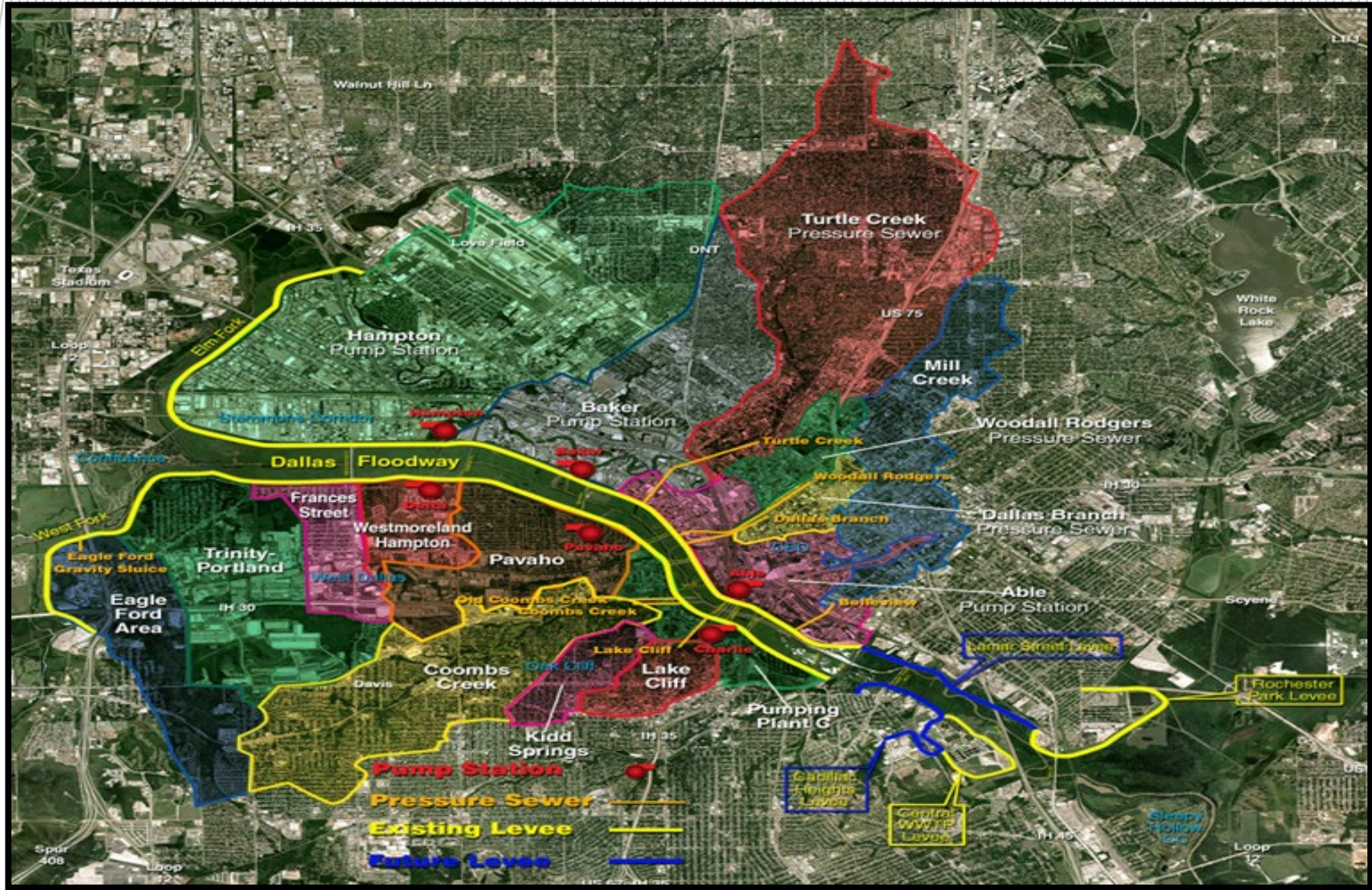
# Floodway Operations



- Maintain Dallas Floodway / Floodway Extension along Trinity River:
  - Interior Drainage System: Major Pump Stations, Levee and Sump Systems.
  - Conveys drainage from 6,000 sq.mi. through Central Business District/west Dallas.



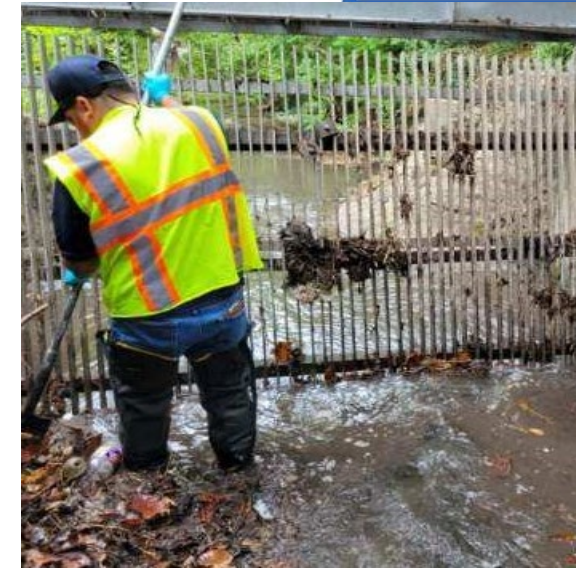
# Dallas Floodway Levee & Interior Drainage Systems



# Neighborhood Drainage Services



- Responsible to inspect, maintain, and repair City-Wide storm drainage systems, creeks/channels, and FMAs.
- Respond to service calls related to daily and emergency drainage system and flooding inquiries.
- Ensure compliance of City's MS4 permit through citywide programs addressing regulation, enforcement and education activities.



# Floodplain Management



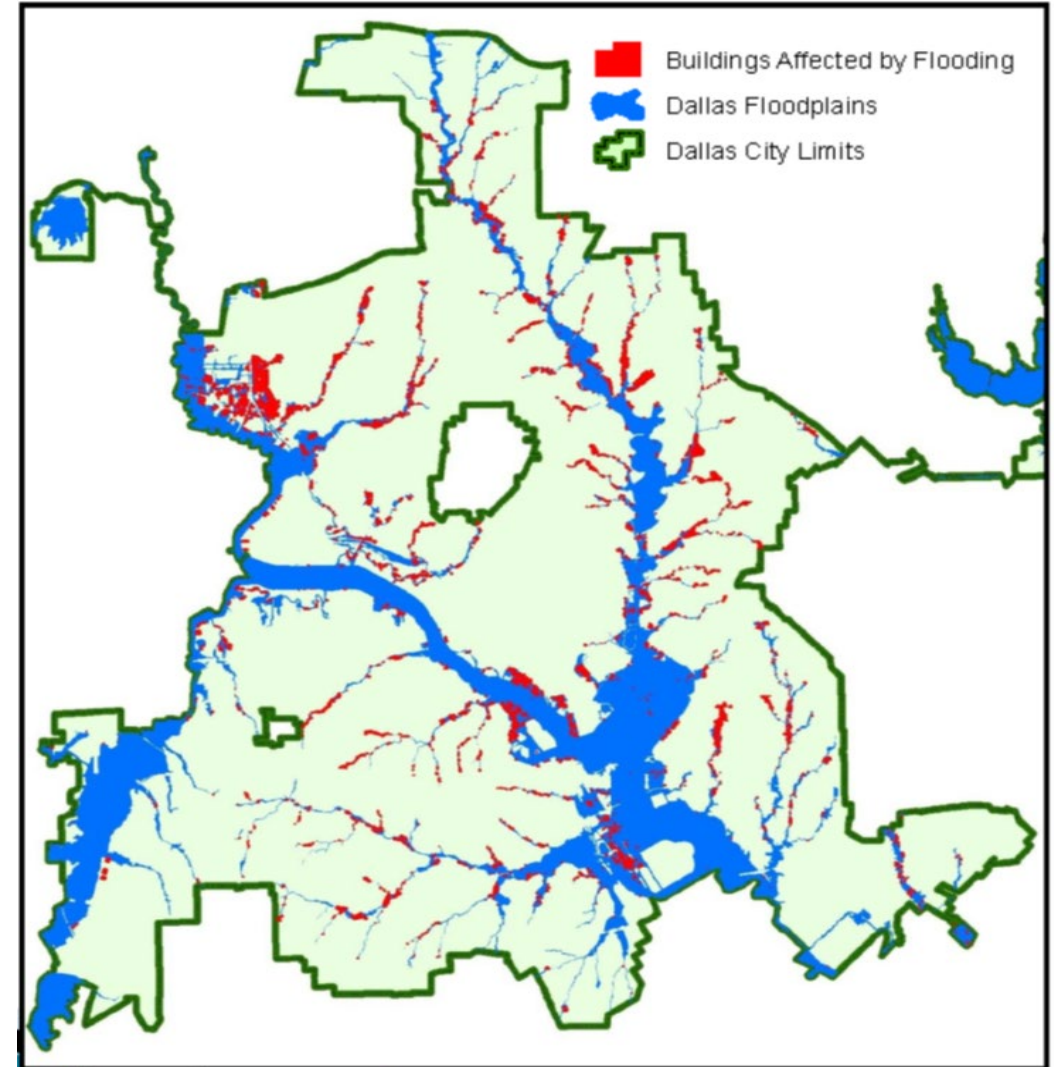
- Provide support to private and public sectors for development in and around floodplain for local, state, and federal regulatory compliance (permits/applications)
- Maintain needs inventory for storm drainage system
- Manage City of Dallas participation in NFIP and CRMS
- Manage dam and safety compliance



# Floodplain in City of Dallas



- Floodplain is approximately 39,000 acres
- 600 structures affected by flooding
- 3,550 Floodplain Insurance policies
- 62 Unmitigated repetitive loss properties
- ~30,000 annual floodplain risk letters provided





# Capital Improvement Program



- Purpose/benefit of capital improvements:
  - Property Loss Prevention
  - Flood Response Cost Reduction
  - Aging/undersized Infrastructure Upgrades
  - FEMA Community Rating System
- Projects engineered and constructed from needs inventory based on priority and available budget
- Funded by rates and bond programs
- Types of Projects:
  - Flood Management
  - Storm Drainage Relief
  - Erosion Control



# State & Federal Regulatory Compliance



- Assure all TCEQ, EPA, USACE and all other local, state and federal regulatory agency's requirements are met to a high standard.
- Support successful internal and external programs including audits by FEMA, USEPA and TCEQ.
- Implementing systemic levee and Dam improvements in response to USACE and TCEQ's review and inspections.
- Maintain and enhance partnerships with USACE, FEMA, FHWA, EPA, TCEQ, TXDOT, NCTCOG, NTTA, various non-profit and community organizations.



**US Army Corps  
of Engineers®**



**FEMA**



**TEXAS COMMISSION ON  
ENVIRONMENTAL QUALITY**





# Flood Protection and Drainage Needs and Example Projects

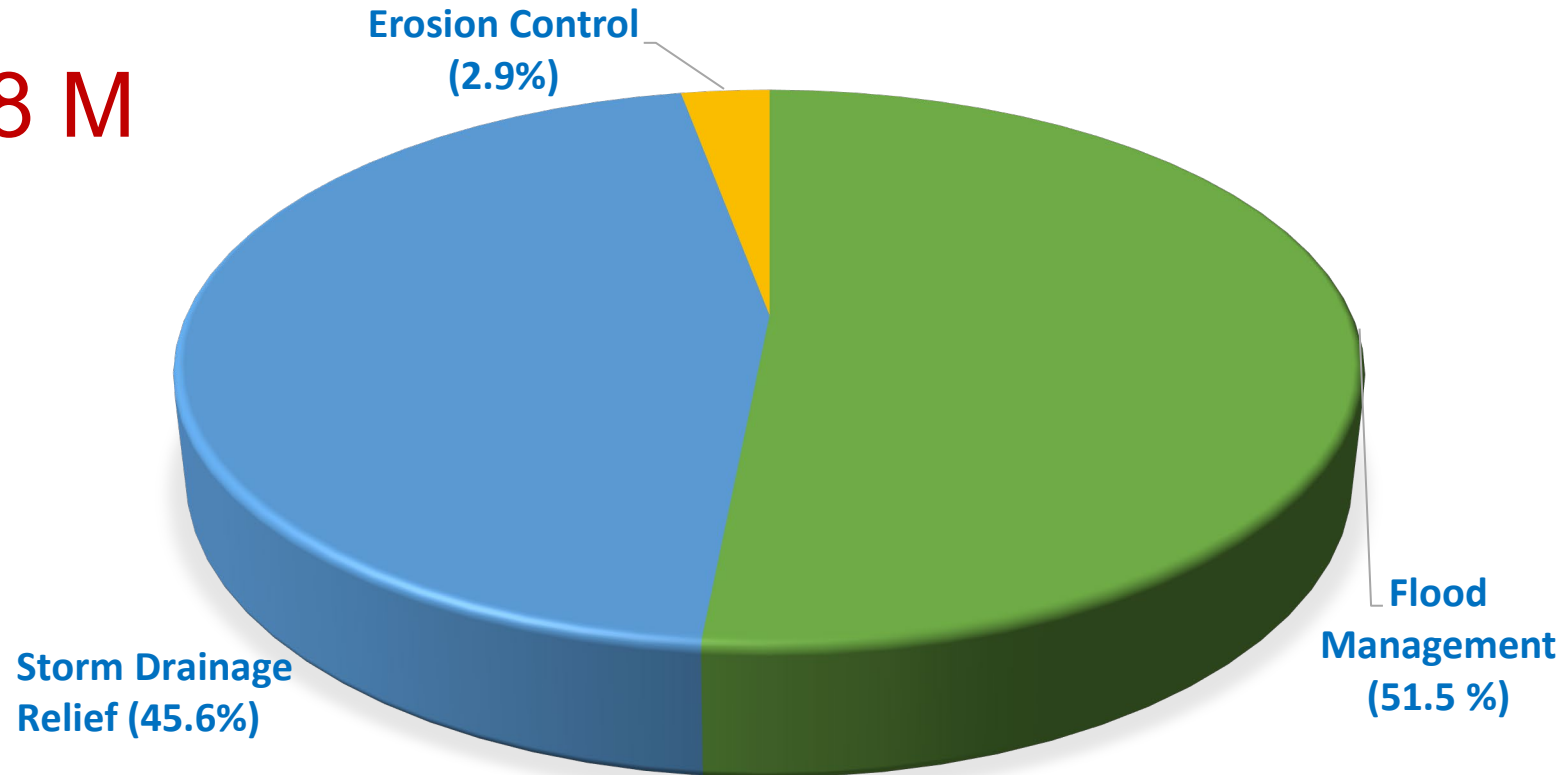


# Flood Protection & Drainage Needs Inventory



- Flood Management: **\$1.3 B**
- Storm Drainage Relief Systems: **\$1.15 B**
- Erosion Control: **\$72.8 M**
- Total: **\$2.5 B**

As of 5/4/23



# Example: Flood Management Project



**Elam Creek Phase I  
Providing 100-yr storm protection  
Before and during construction (2008)**



**Elam Creek Phase I  
After construction (2012)**



# Example: Storm Drainage Relief Project



***Ledbetter Storm Drainage Project  
Upsizing a failed 48" Metal Pipe to 60"  
Reinforced Concrete Pipe (2016)***



# Example: Erosion Control Project



**3330/3334 Shady Hollow Ct. Before Construction (2021)**



**3033/3334 Shady Hollow Ct. Construction Completed (2022)**





# Questions?





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