



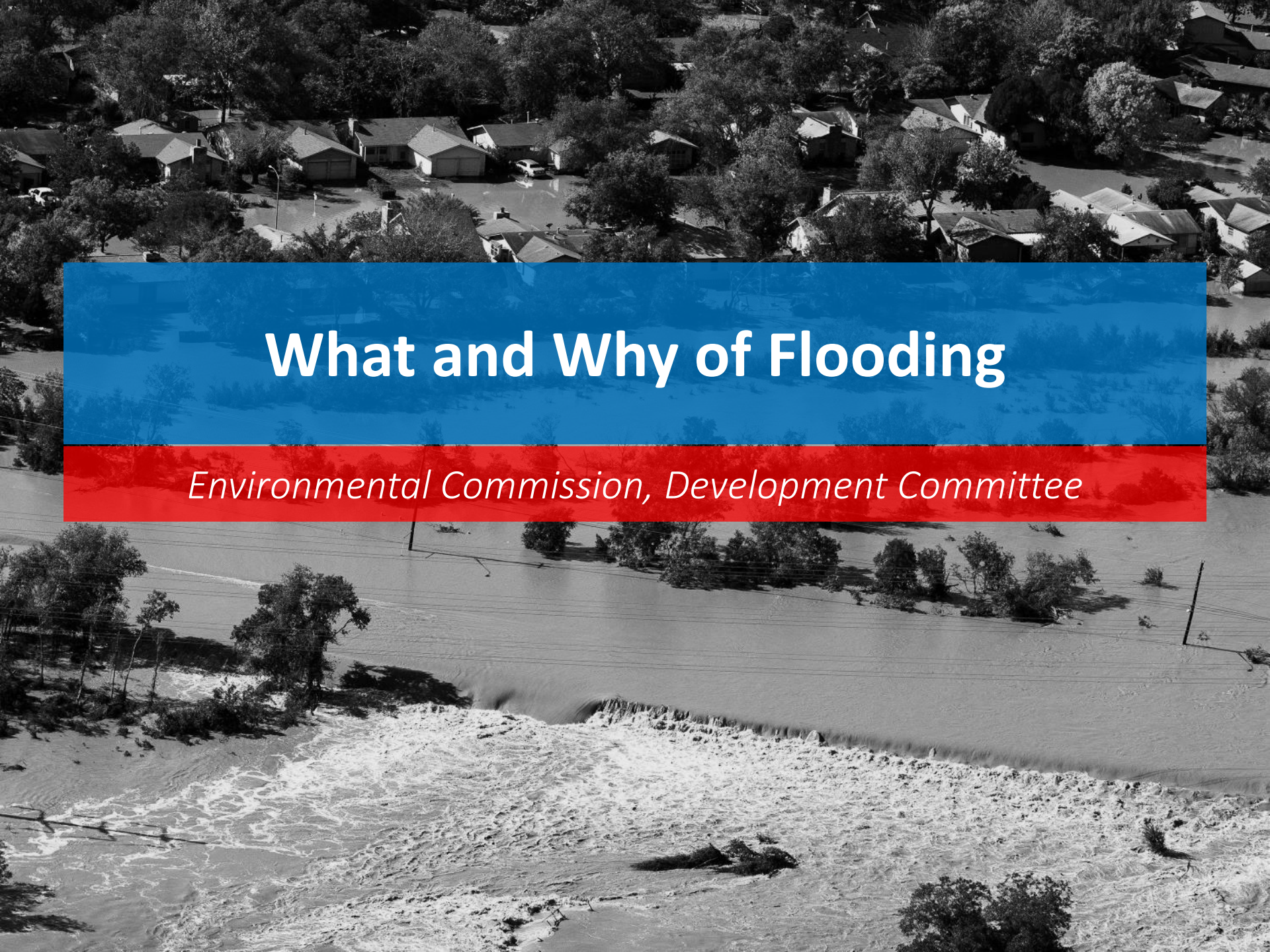
Environmental Commission, Development Committee

Austin Flood Mitigation Basics

November 2, 2016

Presentation Overview

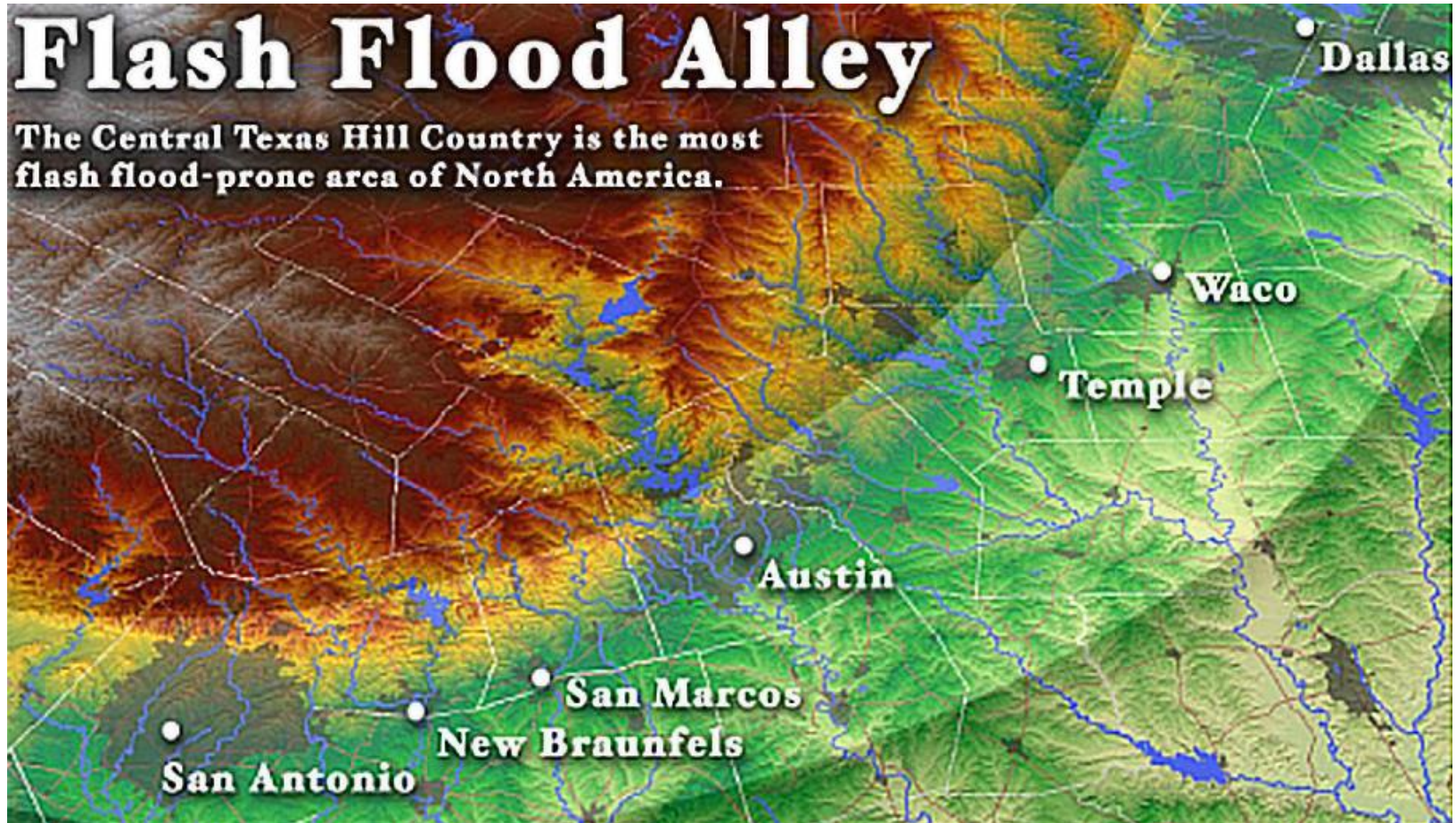
- What and Why of Flooding
- Flood Risk
- Flood Mitigation Strategies
- Flood Prevention Strategies
- Master Planning Process
 - Creek Flood Problem Identification and Prioritization
 - Local Flood Problem Identification and Prioritization



What and Why of Flooding

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Need for Flood Mitigation Services



Need for Flood Mitigation Services

- Flooding is Austin's most common weather-related emergency
- Floods can occur any time—even during a drought (e.g., Oct. 2013)



Why Does Flooding Occur?

Flooding occurs as a result of **overloads of the primary drainage system, the creeks**, “CREEK FLOODING” or the secondary drainage system, **the storm drains**, “LOCAL FLOODING”.

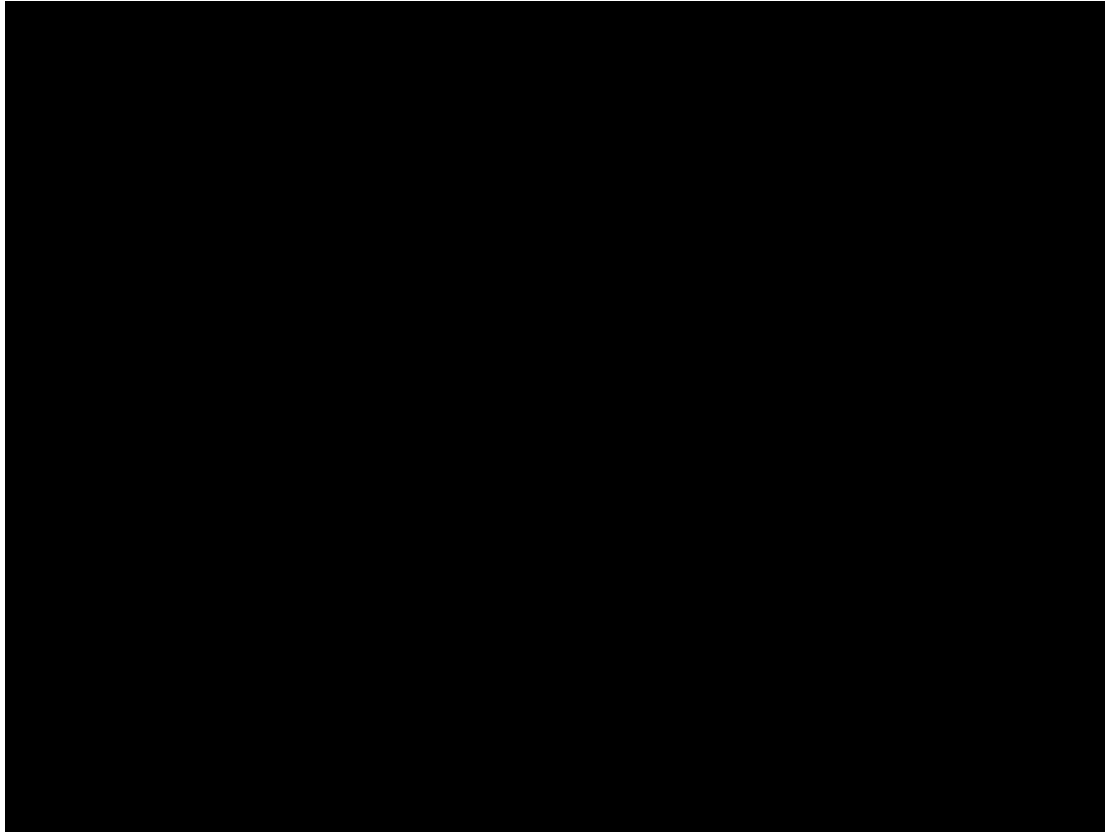


Local Flooding



Creek Flooding

What is a Floodplain?



The floodplain is the area of land that is likely to be under water when the creek overtops its banks. In a sense, the floodplain is the full extension of the creek.

Austin's Flood History

Major Austin Floods

1832

1833

1836

1843

1852

1869

1870

1900

1913

1915

1921

1932

1935

1936

1938

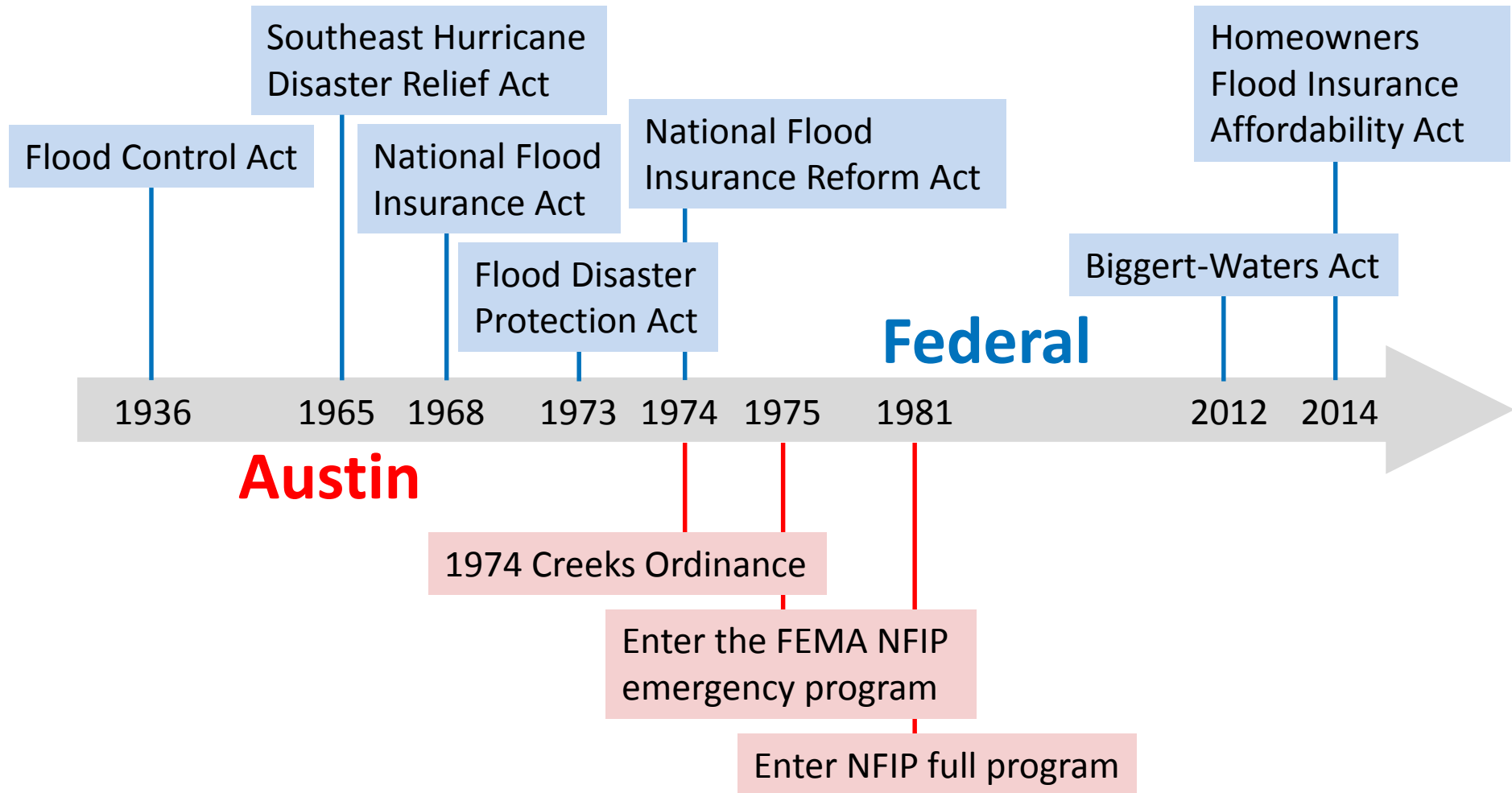


1915 - Sabine Street near Waller Creek



1961 1975 1991 **2001** 2007 **2013**
1960 1974 **1981** **1998** 2004 2010 **2015**

Drainage and Floodplain Regulation History





Flood Risk

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What is a 100-year flood?

- 1% annual chance flood (i.e. it has a 1% chance of happening every year)
- Has a 26% chance of happening over a 30 year mortgage
- Can occur multiple times per year
- Does *not* mean that it will be another 99 years before it happens again
- What are the 2-year (50%), 10-year (10%), 25-year (4%), 500-year (0.2%) floods?

What level of risk does FEMA require in the NFIP?

- The standard is the 100-year flood
- Currently 22,100 communities in the NFIP nationwide



FEMA

What level of risk do we currently accept in Austin?

- **Storm drains:** 25-year inside the pipe; 100-year in the roadway right-of-way/drainage easement
- **Ditches/Channels/Creeks/Rivers:** 100-year
- **Roadway crossings:** 100-year; max. 0 – 12 inches over the roadway (depending on road class)
- **Floodplain regulations:** fully developed 100-year, no adverse impact, freeboard, safe access

Why would a community strive for less risk than other communities?

- Increased protection for lives and property
- Location in Flash Flood Alley
- **Community Rating System** – NFIP program that rewards communities that surpass minimum requirements with flood insurance discounts

Community Decisions Regarding Flood Risk

*What is an acceptable
level of risk?*



Flood Mitigation Strategies

Environmental Commission, Development Committee

Flood Mitigation Strategies

- How do we minimize or eliminate existing flood risk for development that occurred before the establishment of drainage and floodplain regulations or for newly annexed areas?
 - Flood mitigation projects
 - Regulations for redevelopment projects

Flood Mitigation Projects: Capital Solutions

- Low-water crossing upgrades
- Detention and retention ponds
- Conveyance improvements
- Diversion
- Barriers
- Structure elevating/floodproofing
- Nonstructural

Flood Mitigation Projects

Structural

Before



After



David Moore Roadway Improvements

Low-water crossing upgrades:
culverts, bridges

Flood Mitigation Projects

Structural

Main
Creek
Channel



Overflow
Detention
Storage

Northwest Park detention facility

Detention and retention ponds: *Online, offline*

Flood Mitigation Projects

Structural

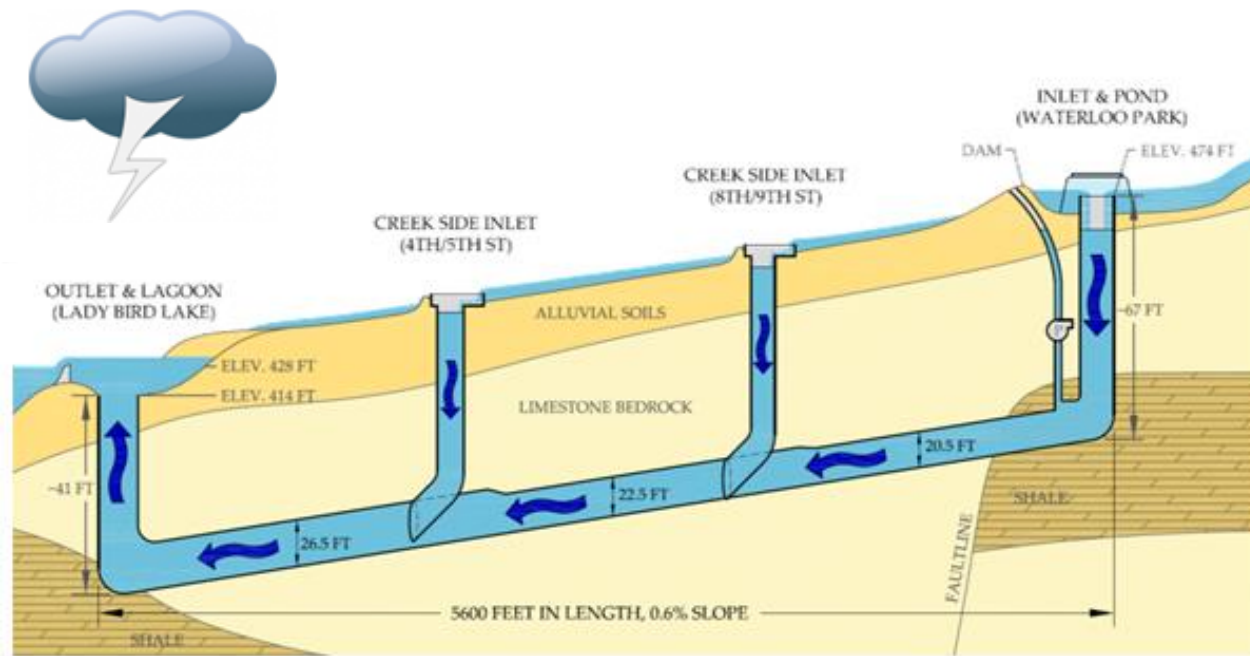
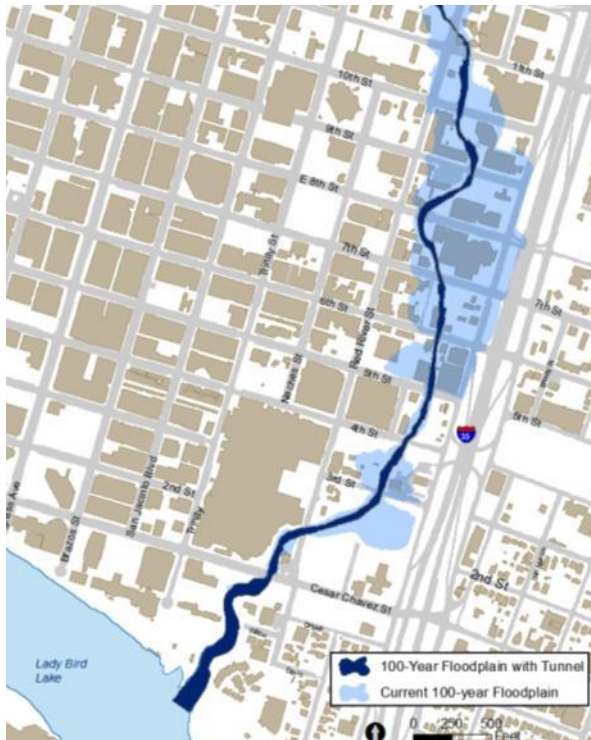


Conveyance:

channel modifications, pipes, inlets, ditches

Flood Mitigation Projects

Structural



Waller Creek Tunnel

Diversion: *tunnels*

Flood Mitigation Projects

Structural



Crystalbrook Floodwall

Barriers: *floodwalls, levees*

Flood Mitigation Projects

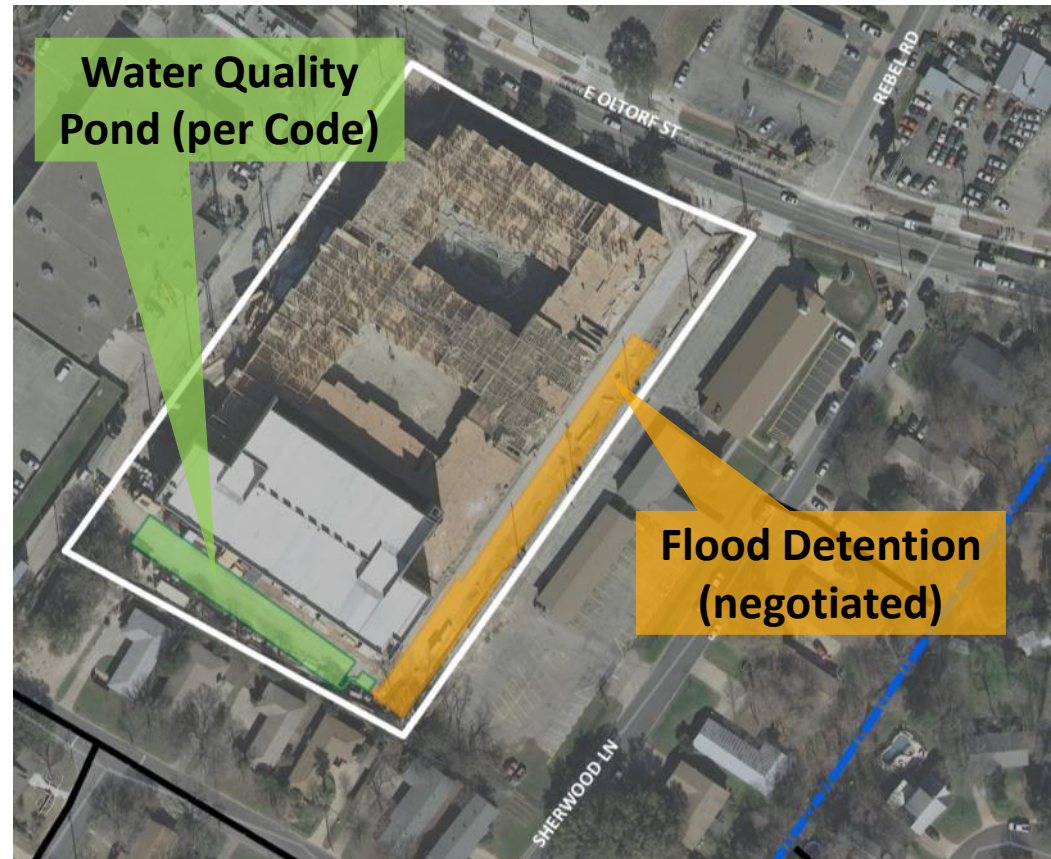
Nonstructural



Bayton Loop Property Buyouts

Nonstructural projects:
buyouts, permanent road closures

Regulations for Redevelopment Projects



CodeNEXT is considering requirements that redevelopment mitigate its share of downstream flooding.



Flood Prevention Strategies

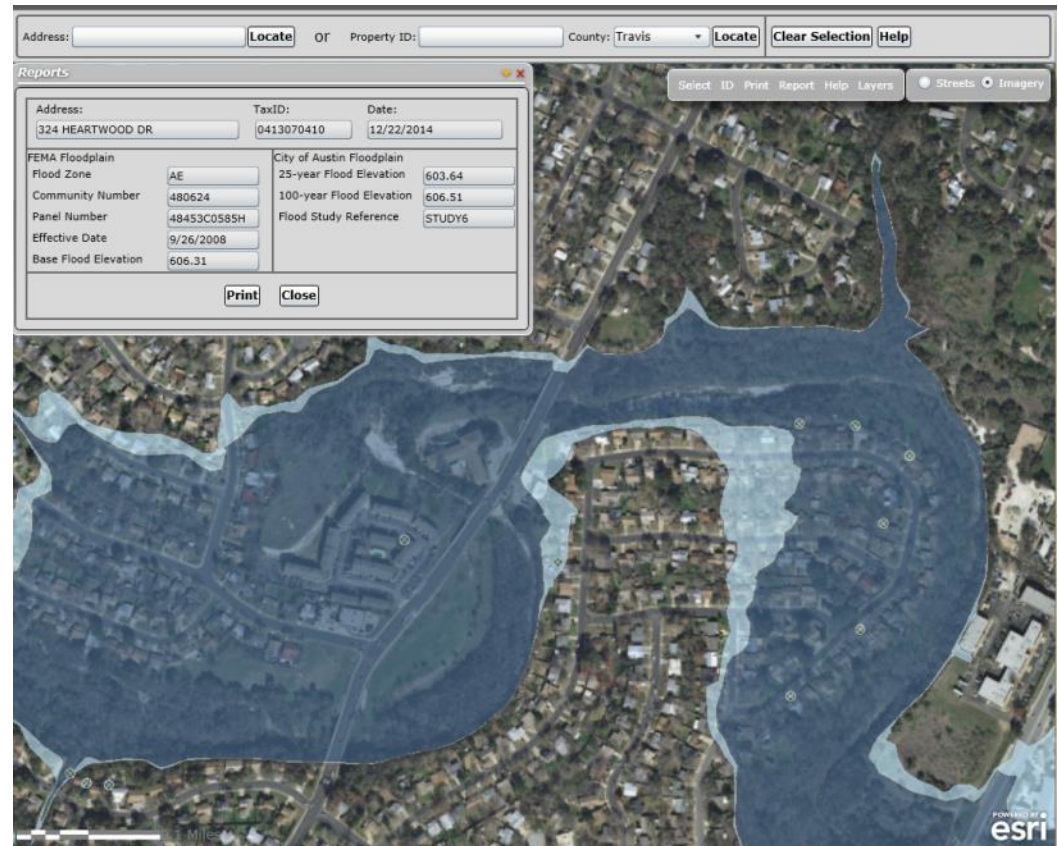
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Flood Prevention Strategies

- How do we ensure that new development minimizes its flood risk and the risk to others?
 - Drainage criteria and floodplain regulations
 - FEMA floodplain regulations vs. Austin floodplain regulations
 - Austin floodplain regulations

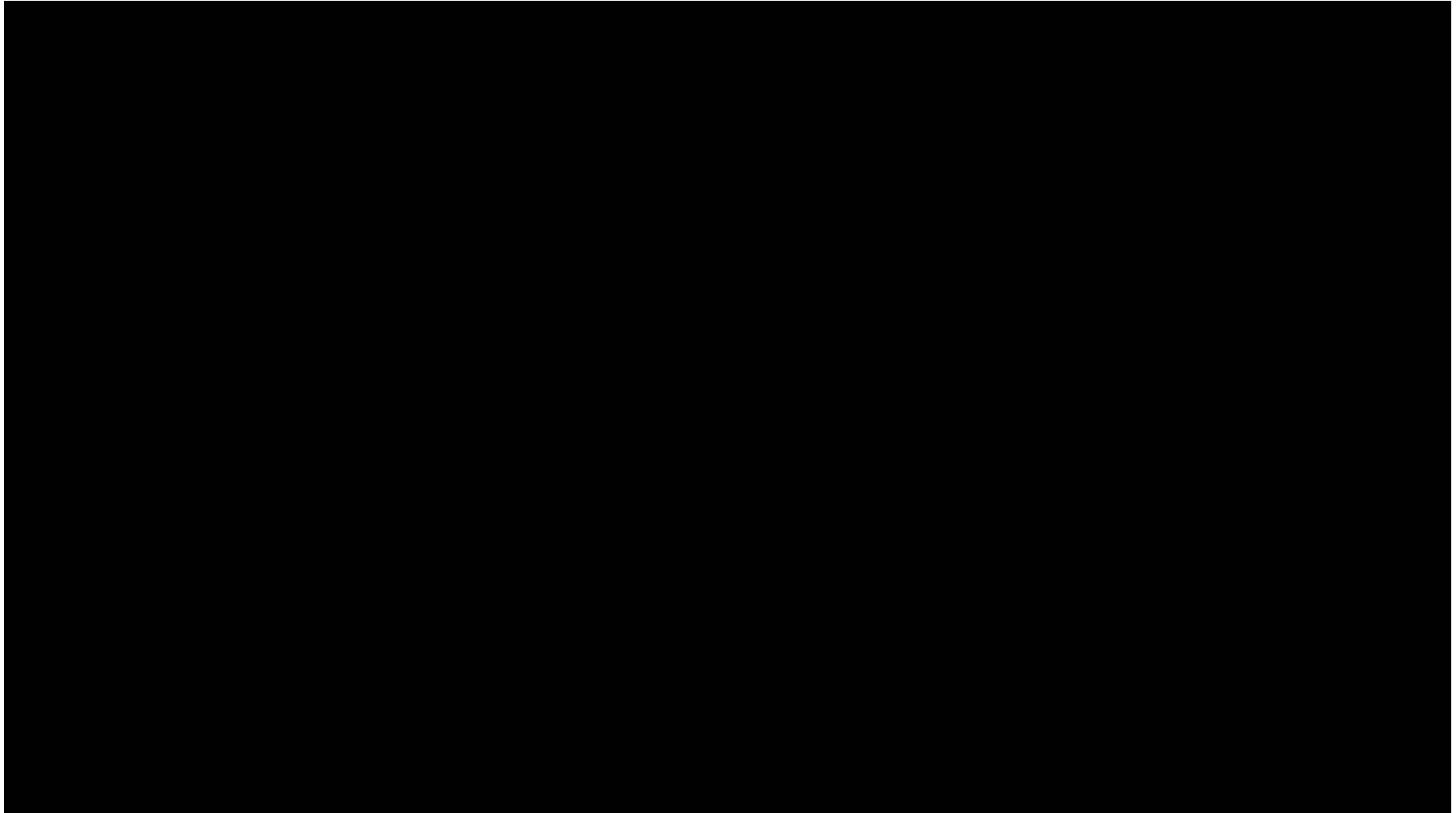
Austin Floodplain Regulations

- Existing conditions vs. fully developed conditions
- No adverse impact
- Freeboard
- Safe access



Floodplain Variances: Safe Access Concerns

Video shot from a home that obtained a variance to
construct in the 100-year floodplain ordinance



Flood Insurance

National Flood Insurance Program (NFIP)

- NFIP gives Austin's citizens the ability to purchase federally backed flood insurance for their properties
- FEMA's Community Rating System program rewards communities that go above and beyond minimum NFIP requirements
- Because several city regulations surpass these minimum requirements, citizens receive up to a 20% discount on flood insurance premiums



Master Planning Process

Problem Identification, Prioritization, Solution
Identification, & Solution Implementation

Environmental Commission, Development Committee

2001 Master Plan and Watershed Protection Department Mission

Flooding



Public Safety

Erosion



Property Protection

Water Quality Degradation



Environmental Protection

“Protect the lives, property, and environment of our community by reducing the impact of flooding, erosion, and water pollution.”

Master Plan: Primary Mission Goals

1. **Flood Mitigation:** Protect lives and property by reducing the impact of flood events.
2. **Erosion Control:** Protect channel integrity and prevent property damage resulting from erosion.
3. **Water Quality Protection:** Protect and improve Austin's waterways and aquifers for citizen use and the support of aquatic life.

Master Plan Common Goals

- **Public Use & Natural Character:** Improve the urban environment by fostering additional beneficial uses of waterways and drainage facilities.
- **Regulatory Compliance:** Meet or exceed all local, state & federal permit and regulatory requirements
- **Assets Maintenance:** Maintain the integrity and function of Utility Assets
- **Optimization/Mission Integration:** Optimize City resources by integrating flood, erosion, and water quality control measures.

Master Plan

Flood Mitigation Objectives

1. Reduce the depth and frequency of flooding for all 100-year floodplain structures.
2. Reduce the depth and frequency of flooding on all roads in the 100-year floodplain.
3. Reduce the danger at road crossings subject to any flooding by the 100-year flood.
4. Provide mitigation for flood damage.
5. Prevent the creation of future flood hazards to human life and property.

(Continued next slide) ³⁵

Master Plan

Flood Mitigation Objectives

(Continued from previous)

6. Reduce the depth and frequency of local flooding for buildings.
7. Reduce the depth and frequency of local flooding for yards.
8. Reduce the danger of street flooding created by substandard storm drains.
9. Reduce standing water in public rights-of-way and drainage easements outside the 100-year floodplain.

Master Planning Process

- Identify the problem
- Prioritize the problem
- Identify the solution
- Implement the solution





Master Planning Process

Problem Identification

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Identifying Flood Risk in Austin

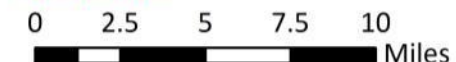
- Flood risk identification through known flood damages vs. theoretical determination
- Flooding knowledge
- Engineering models
- Citizen complaints
- Creek Flood vs. Local Flood

[illegible]

- Updated Models with Problem Scores
- Updated Models Only
- LCRA Models / Scores 2016
- Future Models / Scores 2016-20
- Future Models Only
- Full Purpose Jurisdiction
- Watershed Boundary
- Lakes & Rivers
- Creeks



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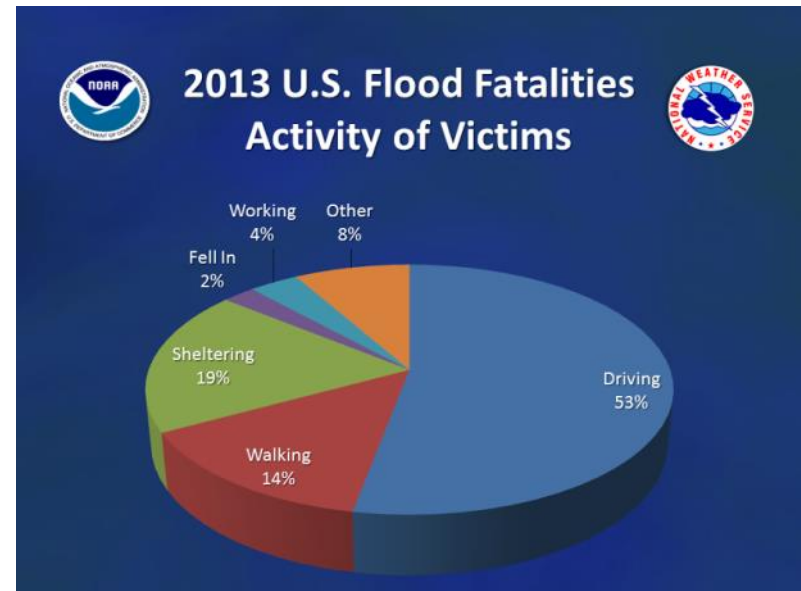


Determining the Level of Risk

- Storm events (2-, 5-, 10-, 25-, 100-year)
- Building flood depths
- Roadway flood depths & velocity
- Resource values

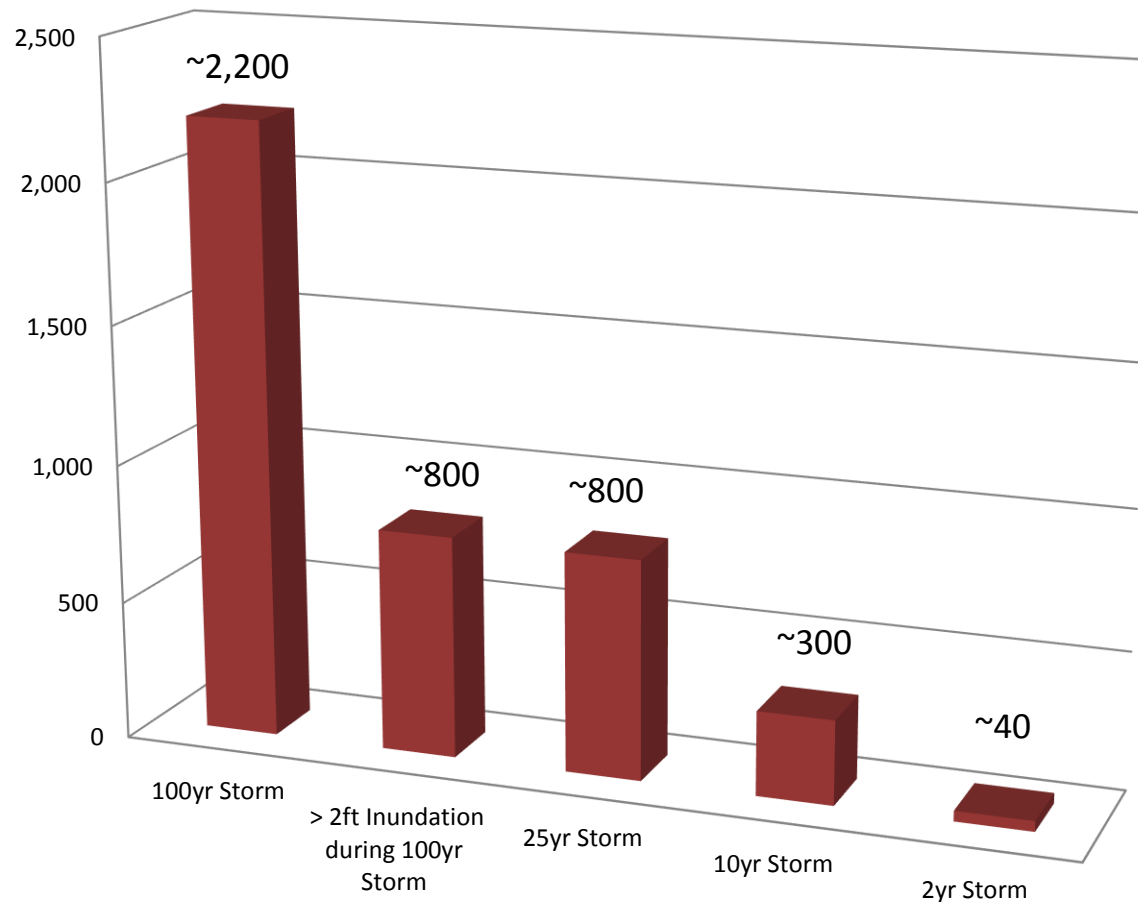
Creek Flood Risk

- **Building Flooding Risk**
 - ~ 5,100 buildings in 100-year floodplain
- **Roadway Crossing Flooding Risk**
 - Greatest threat to public safety
 - ~400 roadway crossings in 100-year floodplain



Creek Flood Risk

Buildings at Risk of 100-year Inundation



~5,100 total buildings in 100-year floodplain

Local Flood Risk

Local Flood Complaints

- ~2,100 building complaints
- ~2,600 yard complaints
- ~1,450 street complaints
- ~6,150 **TOTAL**

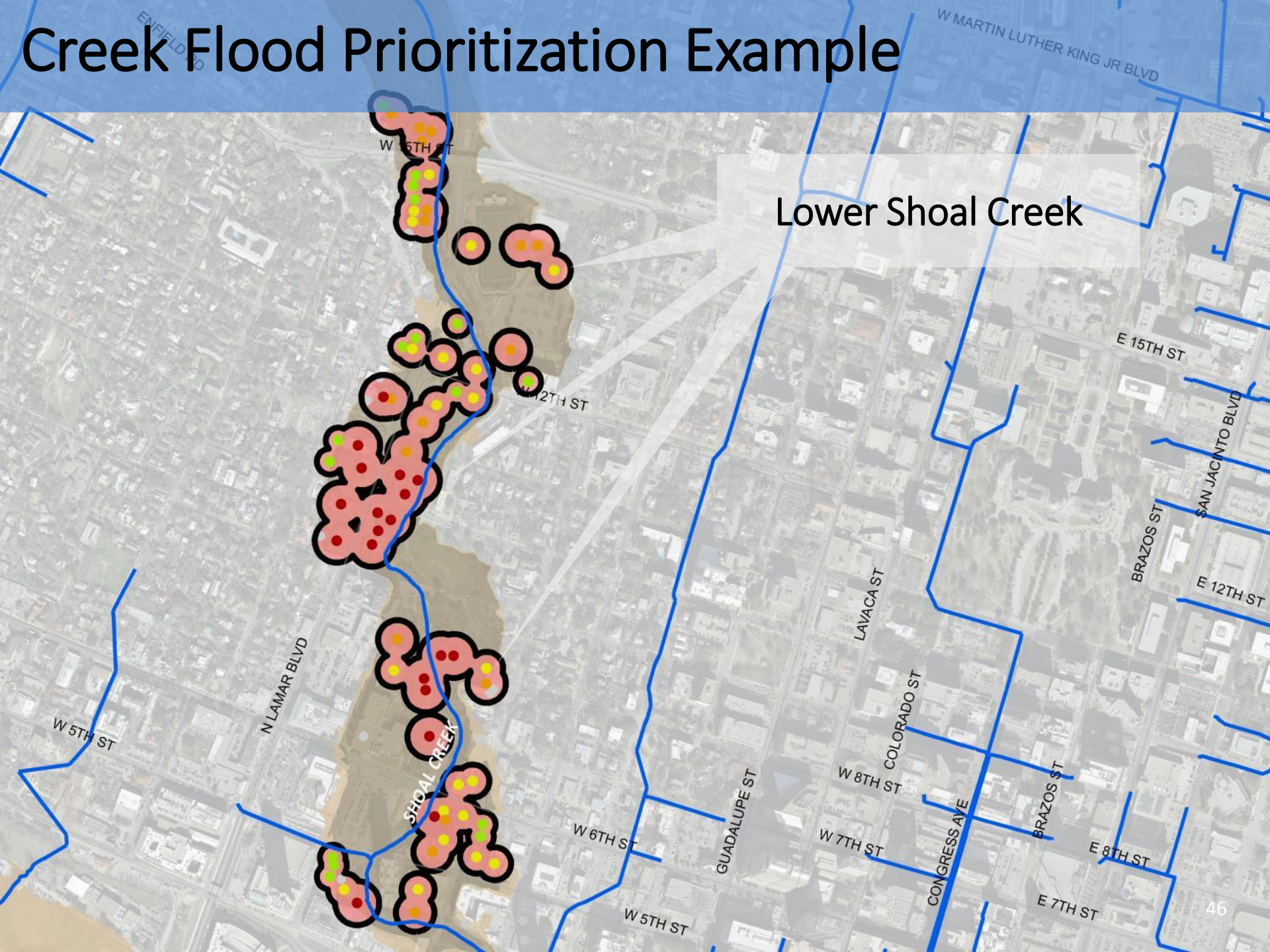


Master Planning Process

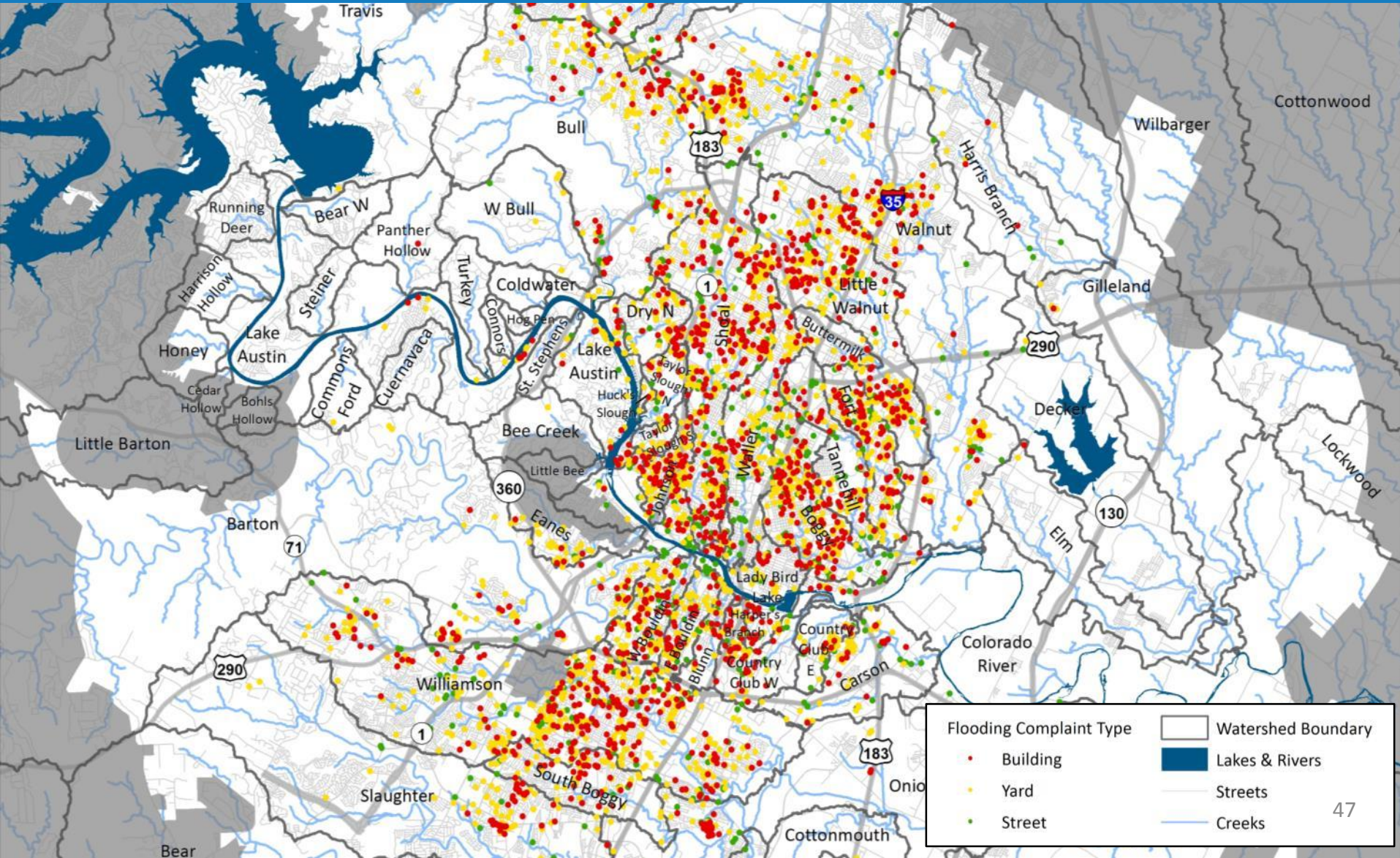
Prioritization of Problems

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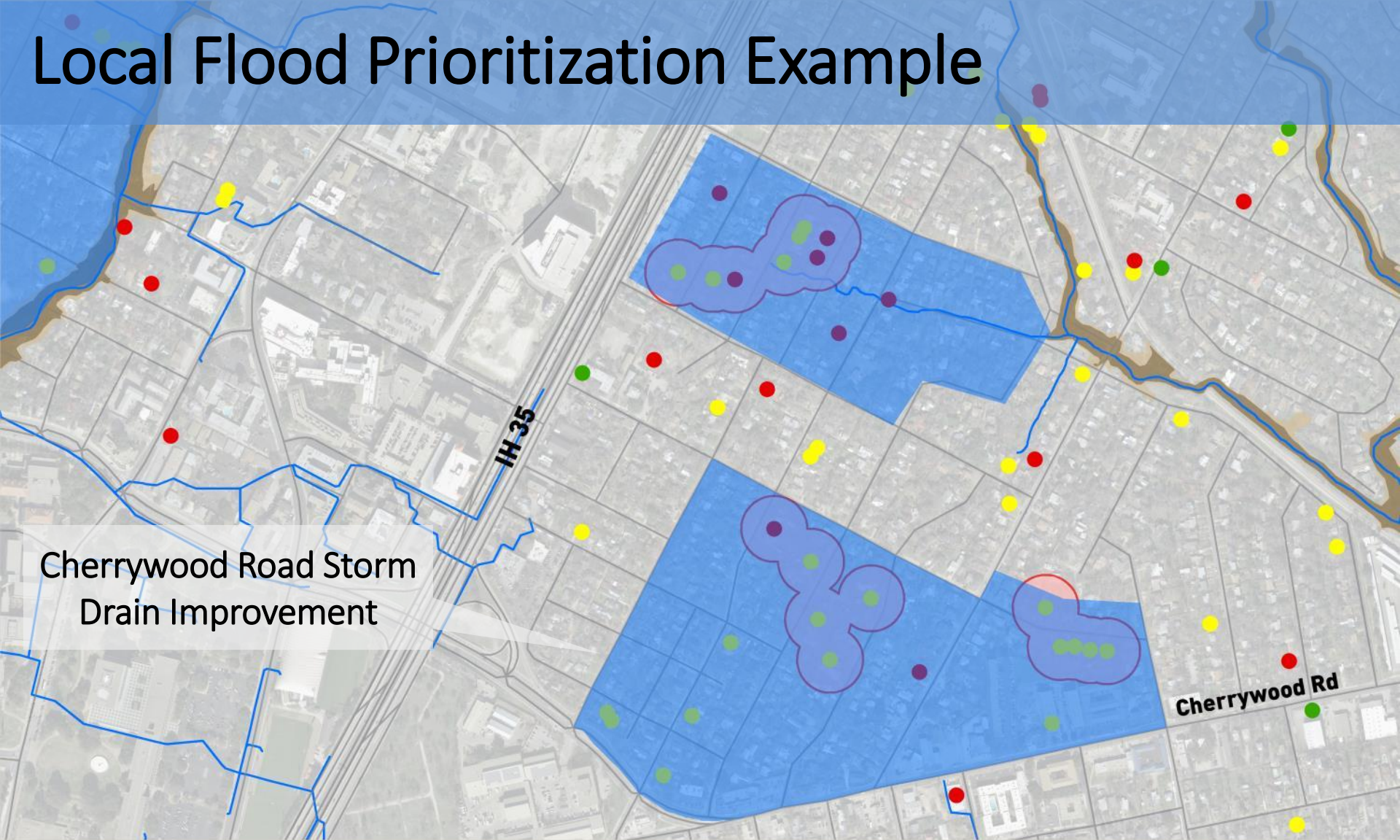
Creek Flood Prioritization Example



Citizen Complaints (3-1-1)



Local Flood Prioritization Example



Cherrywood Road Storm
Drain Improvement

Local Flood Complaint Points by Type

- Building
- Yard
- Street

- Clusters of Five or More Complaints
- Identified Problem Areas
- 25-Year Floodplain
- 100-Year Floodplain

- Streets
- Creeks



0 300 600
Feet



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Master Planning Process

Solution Identification

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Flood Solution Identification

- Feasibility studies
 - Detailed evaluation of the elevation and expected inundation depths
 - Evaluations of potential solutions (structural, buyout, elevation, etc.),
 - Preliminary cost estimates
 - Partnership/integration opportunities
- Preliminary Engineering Study
 - Preliminary design for alternatives
- Funding Plan/Schedule

Funding Sources

- Drainage Utility Fund
 - Used for operations, maintenance, and small-scale projects
- Regional Stormwater Management Program
 - Supplements DUF
 - Partnerships
- Certificates of Obligation
 - Used for Lower Onion Creek and Williamson Creek buyouts
 - Backed by general revenue or DUF
- Partnerships
 - Private, State, Federal, grants
- General Obligation Bonds



Master Planning Process

Solution Implementation

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Capital Improvement Solution Implementation

- Final Design
 - Funding appropriation
- Permitting
- Construction



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