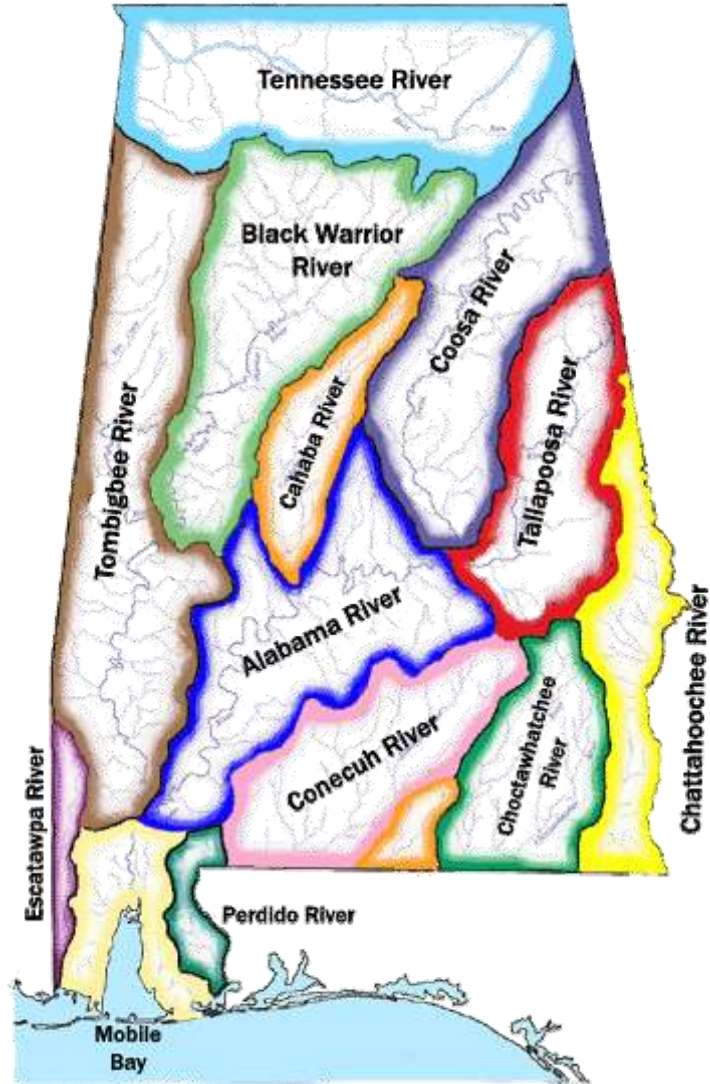




Urban Flood Mitigation in Huntsville

W. Byron Hinchey, PE, CFM

Alabama Watersheds



- ❖ 14 Watersheds
- ❖ 13 Flow Directly to Gulf
- ❖ 1 Takes the Scenic Route



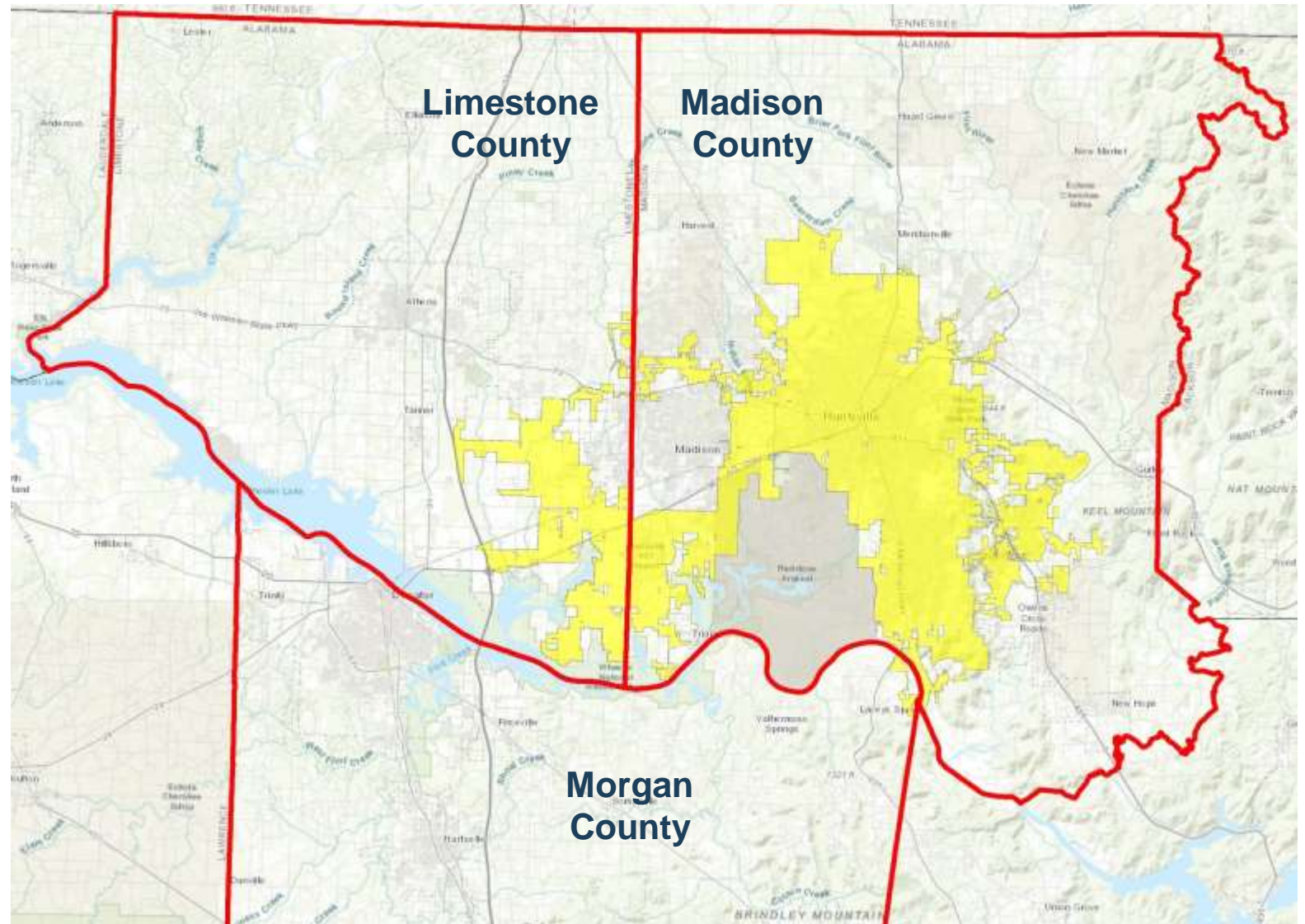
A Modern High-Tech City

- ❖ Redstone Arsenal
 - NASA Marshall Space Flight Center
 - U.S. Army Aviation and Missile Command
 - Missile Defense Agency
 - Federal Bureau of Investigation
- ❖ Toyota-Mazda Automotive Plant Under Construction
- ❖ #1 Highest Concentration of Engineers (U.S.)
- ❖ #2 Largest Research Park (U.S.)
- ❖ #1 Best City for STEM Workers (Livability, 2019)
- ❖ #3 Best Places to Live (U.S. News, 2021)



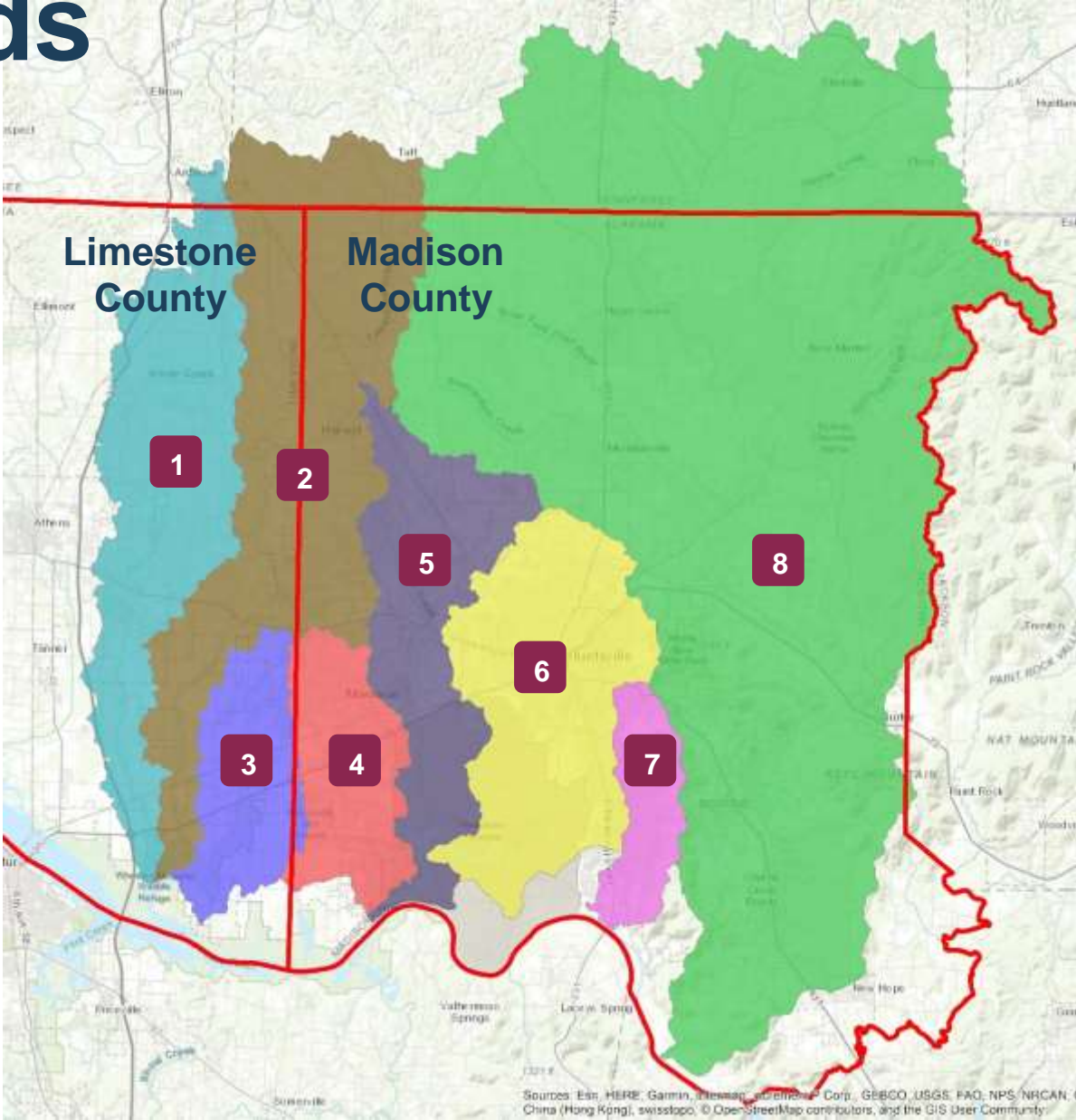
Huntsville, AL

- ❖ Area of 222 mi²
- ❖ 3 Counties
- ❖ Entered NFIP 1979
- ❖ Effective FIRMs 2018
- ❖ Entered CRS 1991
- ❖ CRS Rating 8
- ❖ MS4 Phase I



Huntsville Watersheds

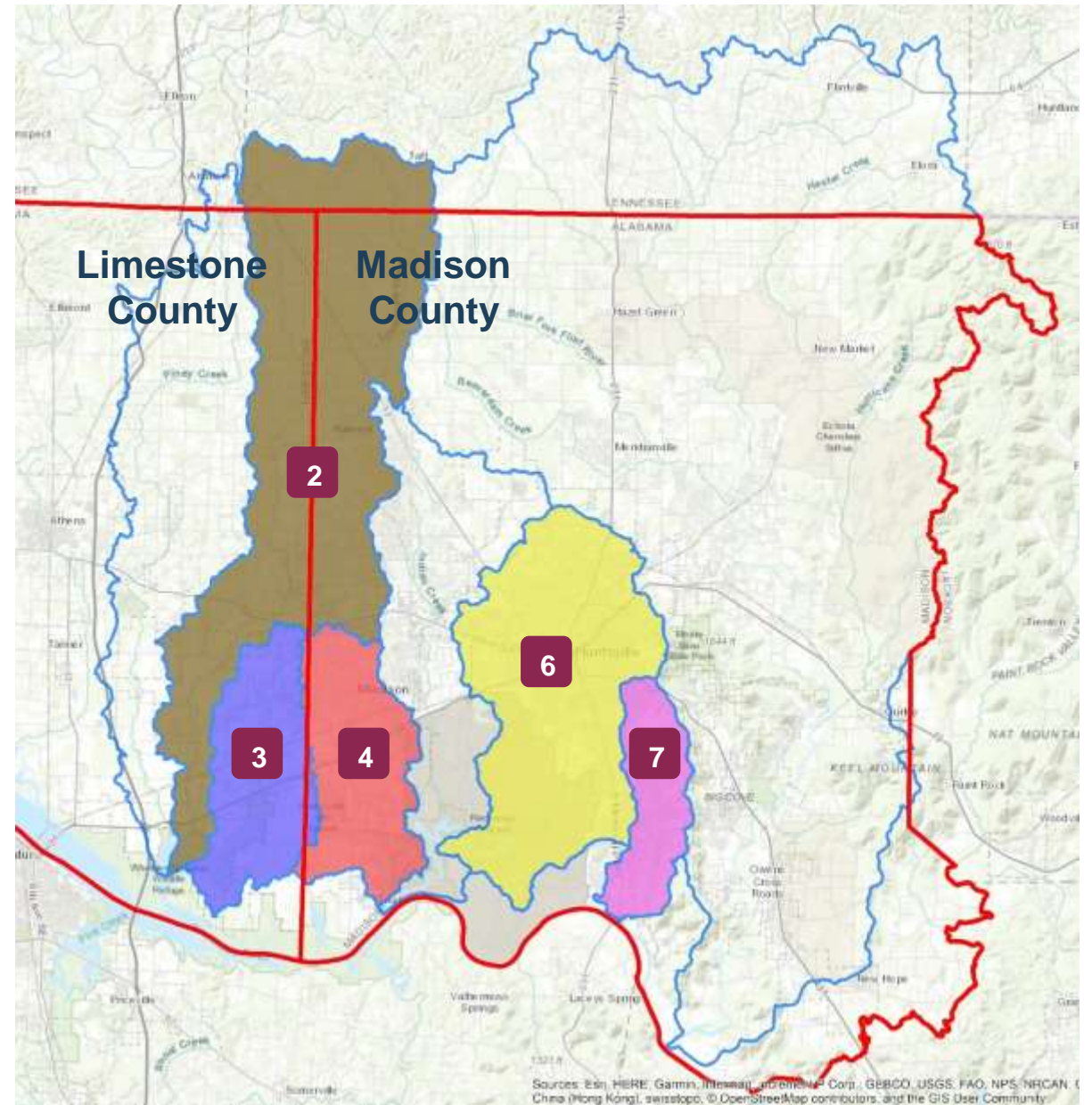
#	Watershed	Area (mi ²)
1	Piney Creek	96
2	Limestone Creek	146
3	Beaverdam Creek 2	39
4	Barren Fork Creek	40
5	Indian Creek	69
6	Huntsville Spring Branch	90
7	Aldridge Creek	23
8	Flint River	568



Sources: Esri, HERE, Garmin, DeLorme, GeoEye, GEBCO, USGS, FAO, NPS, NRCAN, China (Hong Kong), swisstopo, © OpenStreetMap contributors, and the GIS User Community

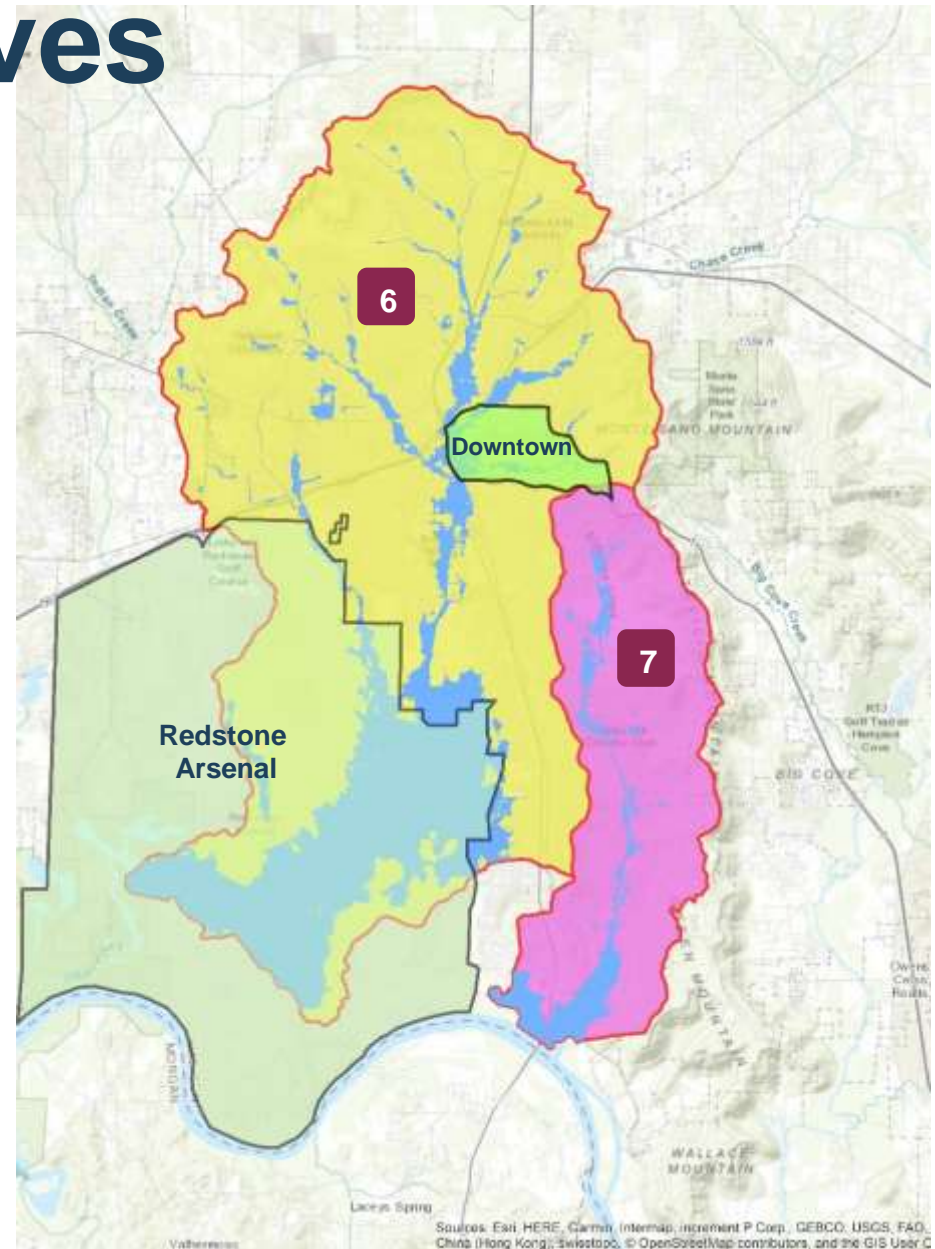
Watershed Studies

#	Watershed	Date
1	Piney Creek	----
2	Limestone Creek	2007 2012
3	Beaverdam Creek 2	2013
4	Barren Fork Creek	2009
5	Indian Creek	----
6	Huntsville Spring Branch	2004
7	Aldridge Creek	1999 2007
8	Flint River	---

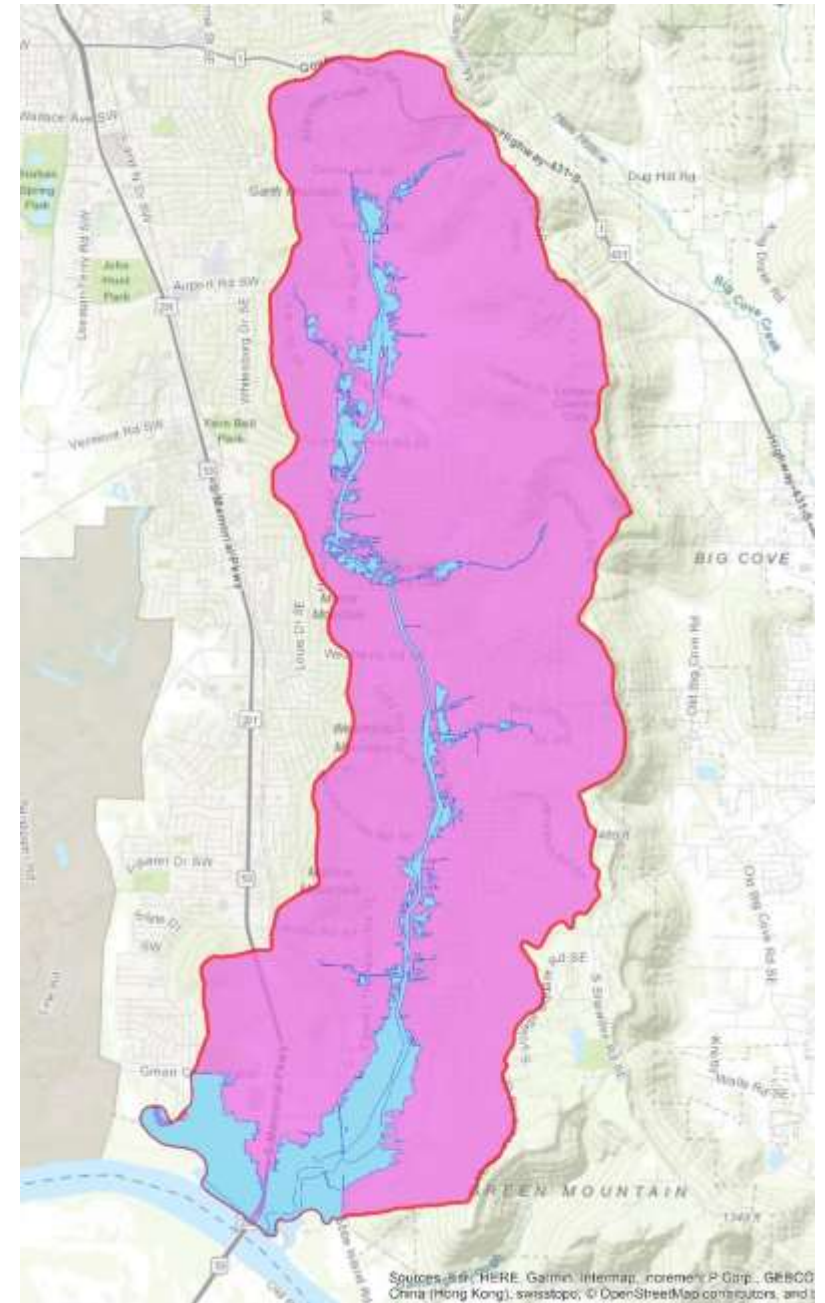


Flood Mitigation Initiatives

#	Watershed	Area (mi ²)
1	Piney Creek	96
2	Limestone Creek	146
3	Beaverdam Creek 2	39
4	Barren Fork Creek	40
5	Indian Creek	69
6	Huntsville Spring Branch	90
7	Aldridge Creek	23
8	Flint River	568



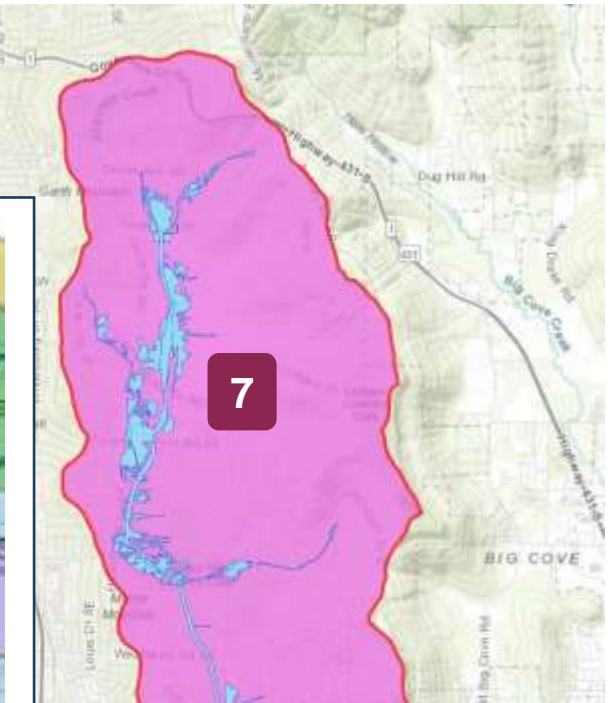
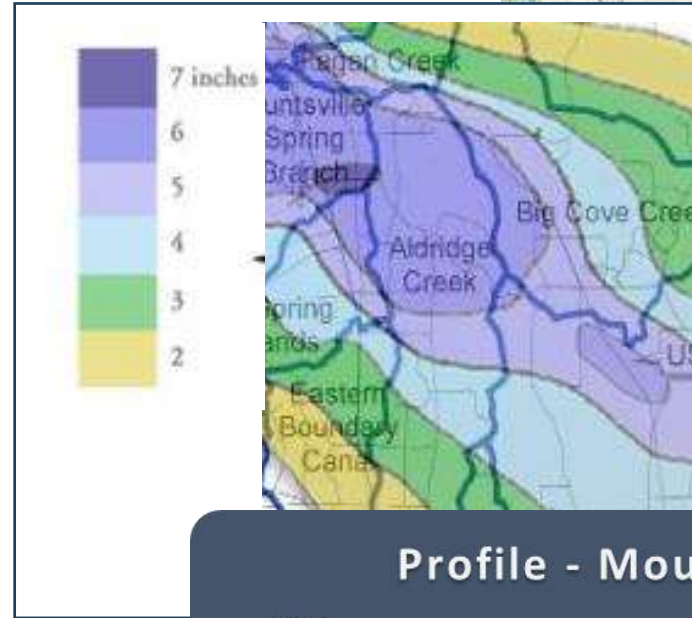
Aldridge Creek Flood Mitigation



Sources: HERE, HERE, Garmin, Intermap, increment P Corp., GEBCO, China (Hong Kong), swisstopo, © OpenStreetMap contributors, and

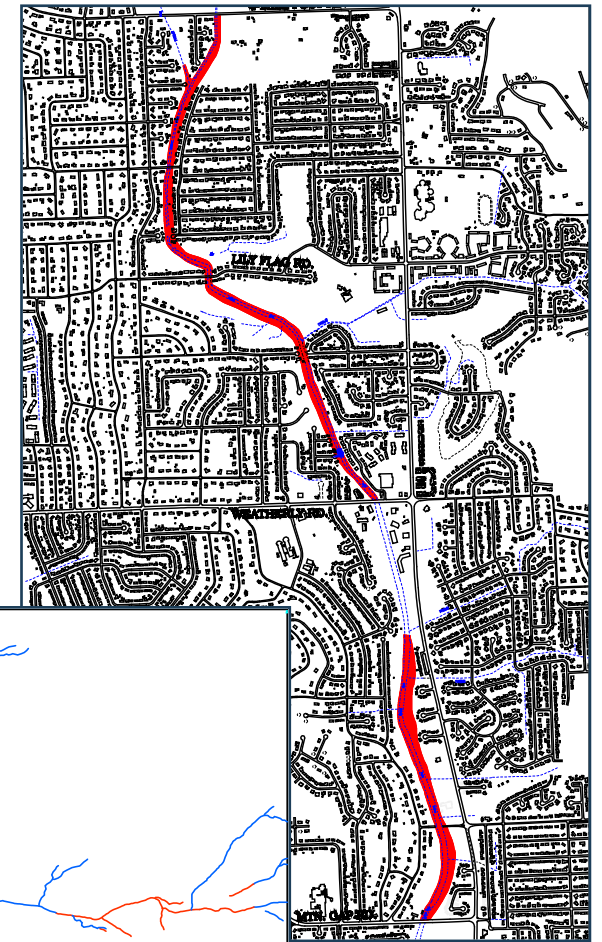
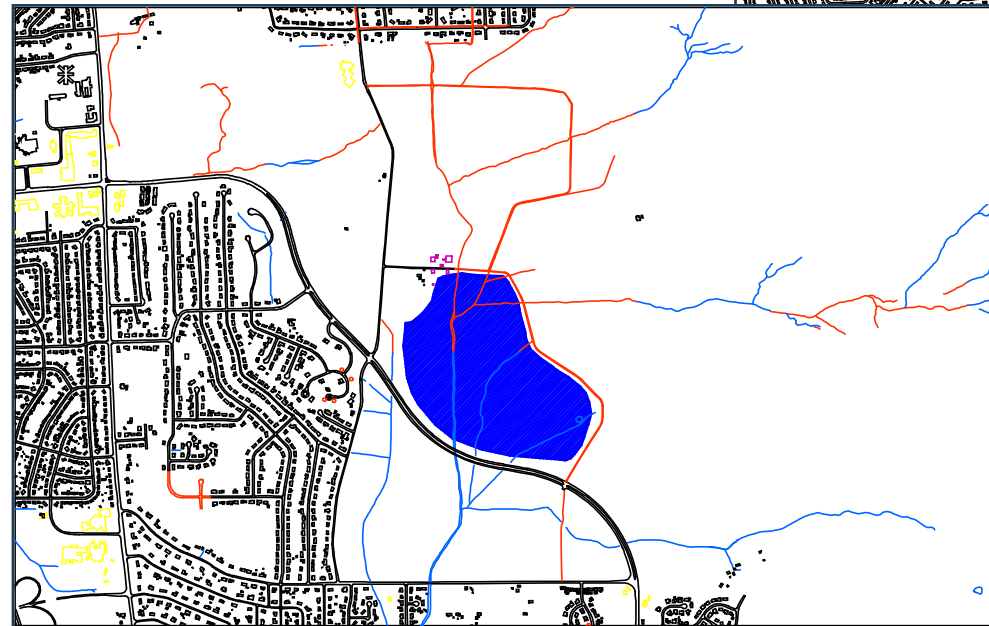
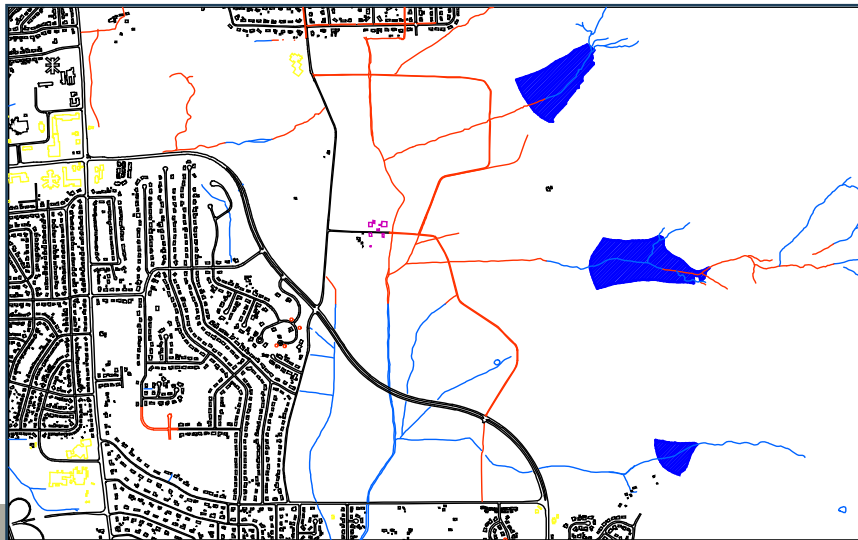
Aldridge Creek Flooding

- ❖ 7" inch rainfall
- ❖ 2 hours
- ❖ >500-yr Rainfall Frequency
- ❖ >100-yr Flood Frequency
- ❖ About 300 homes flooded



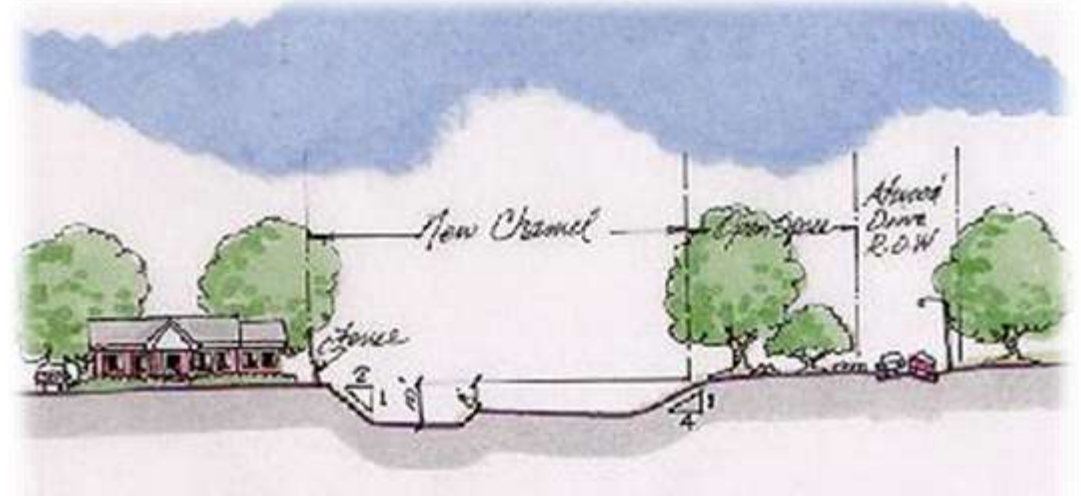
Flood Mitigation Analysis

- ❖ Offline Detention
- ❖ Inline Detention (150 acres)
- ❖ Stream Crossing Modifications
- ❖ Stream Channel Modifications
- ❖ Home Removal
- ❖ Diversion Channels

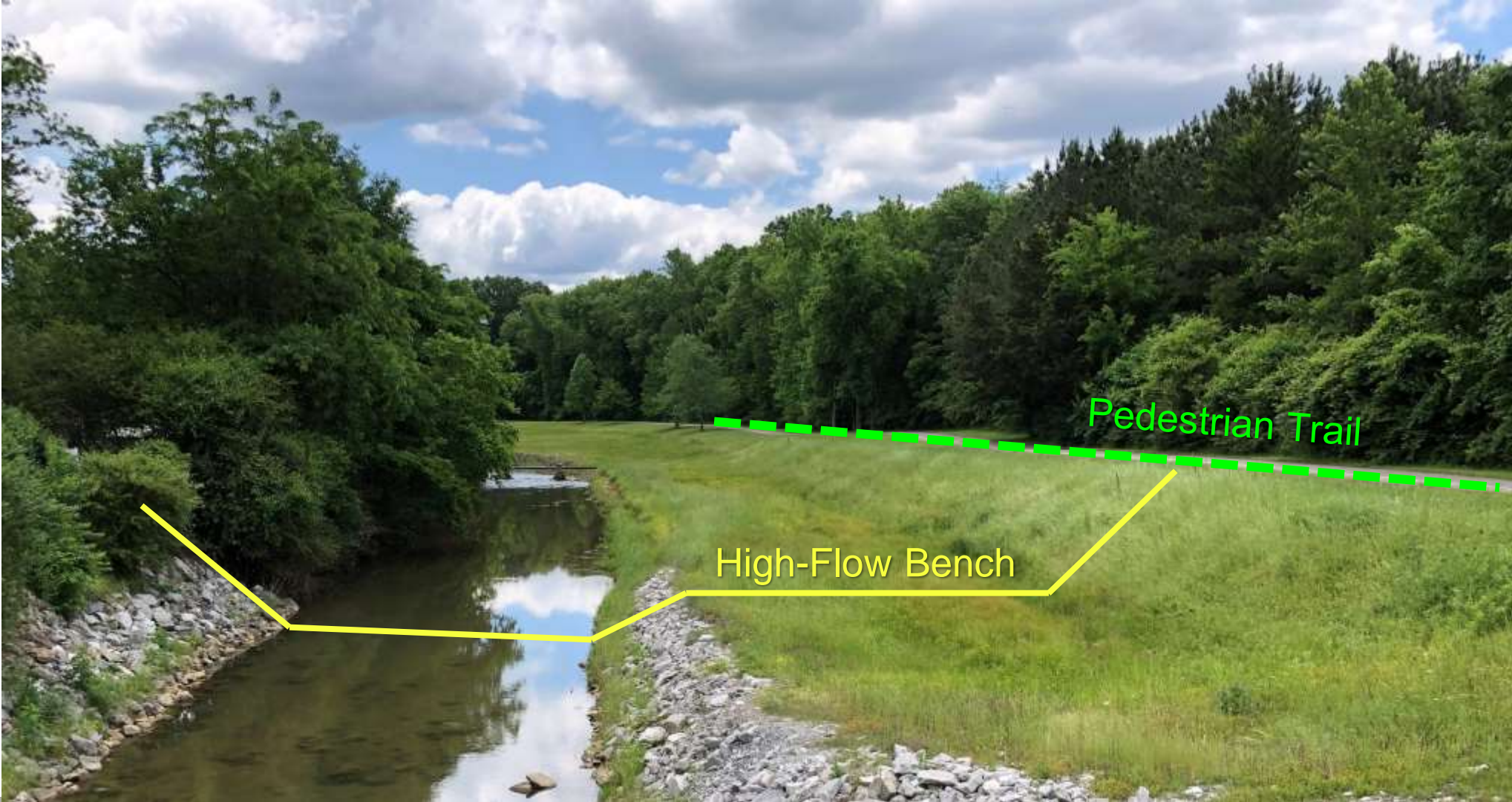


Selected Mitigation Strategy

- ❖ Excavated high-flow bench (4.5 mi)
 - ❖ Expanded Bridges (3)
 - ❖ Acquired homes in FW (34)
- HMGP Unmet Needs 1261
- ❖ Project Financing
 - \$4.5M HMGP funds
 - \$4.8M local funds



Mitigation Implementation



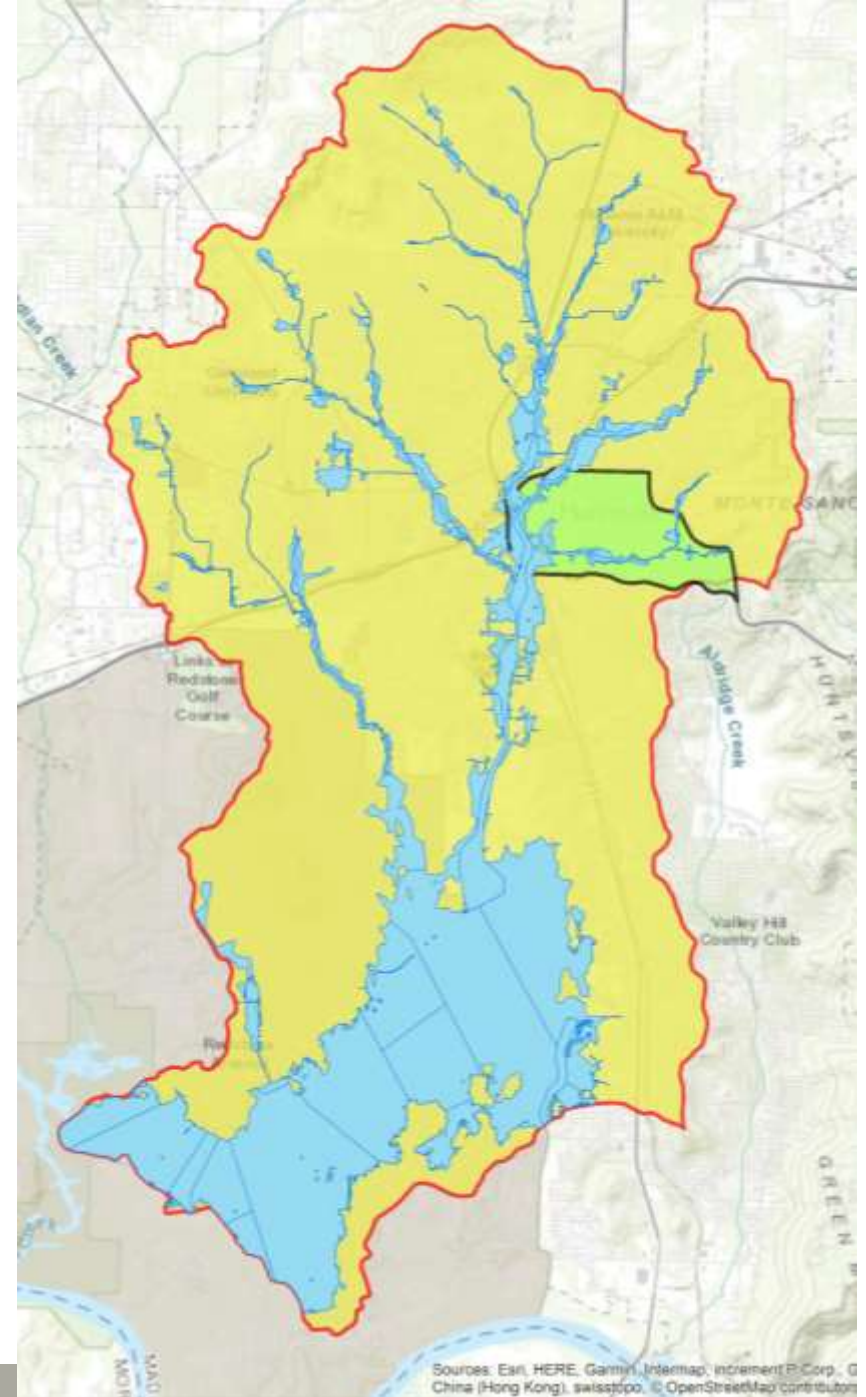
Mitigation Implementation



Mitigation Implementation

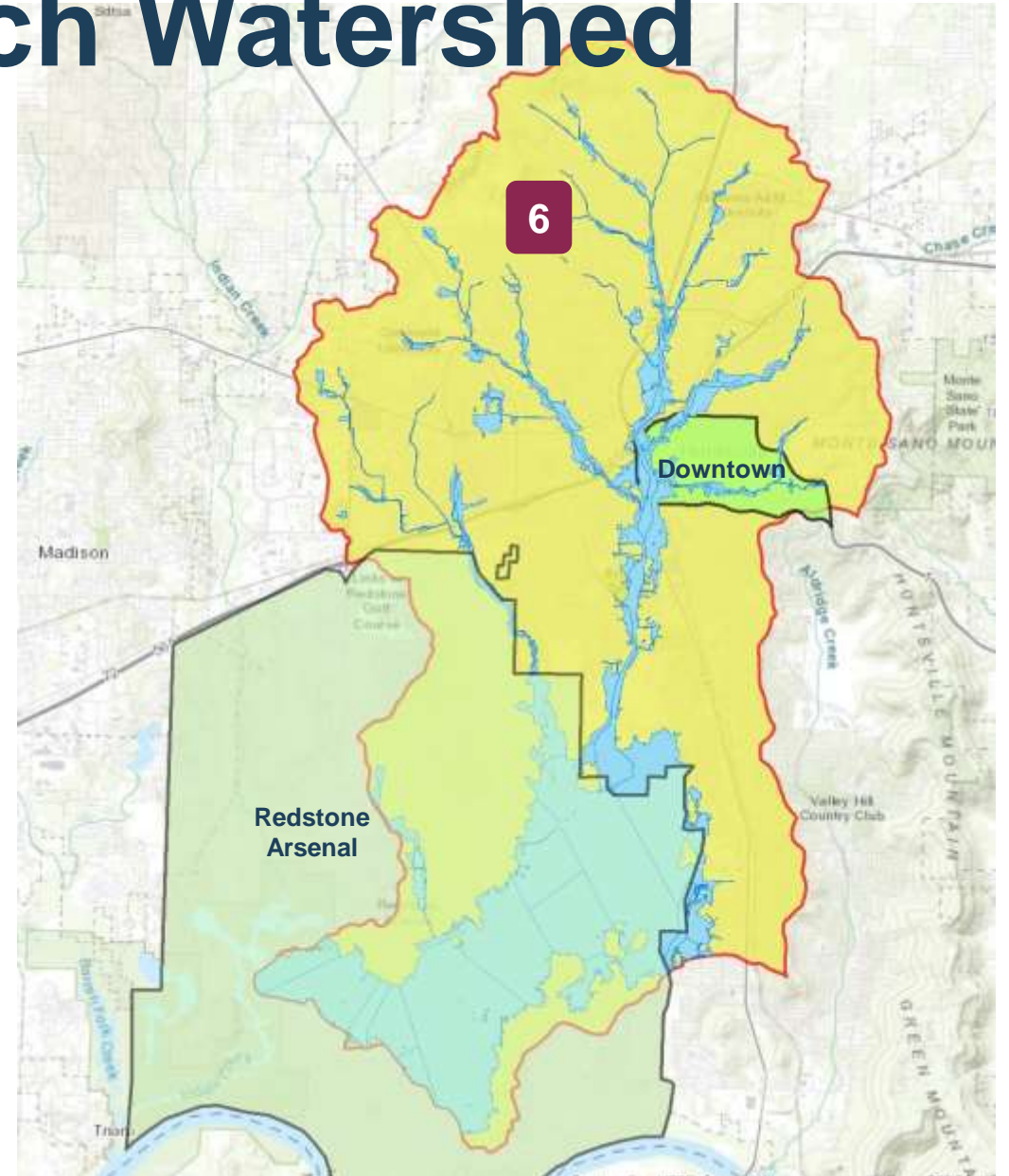


HSV Spring Branch Flood Mitigation #1



Huntsville Spring Branch Watershed

- ❖ Watershed Area 90 mi²
- ❖ Lots of Zone AE Streams
- ❖ Heart of the City
- ❖ Largely Urbanized
- ❖ Altered Channels



HSB Flooding

- ❖ 1912
- ❖ 1963
- ❖ 1973
- ❖ 1990
- ❖ 2003
- ❖ 2005

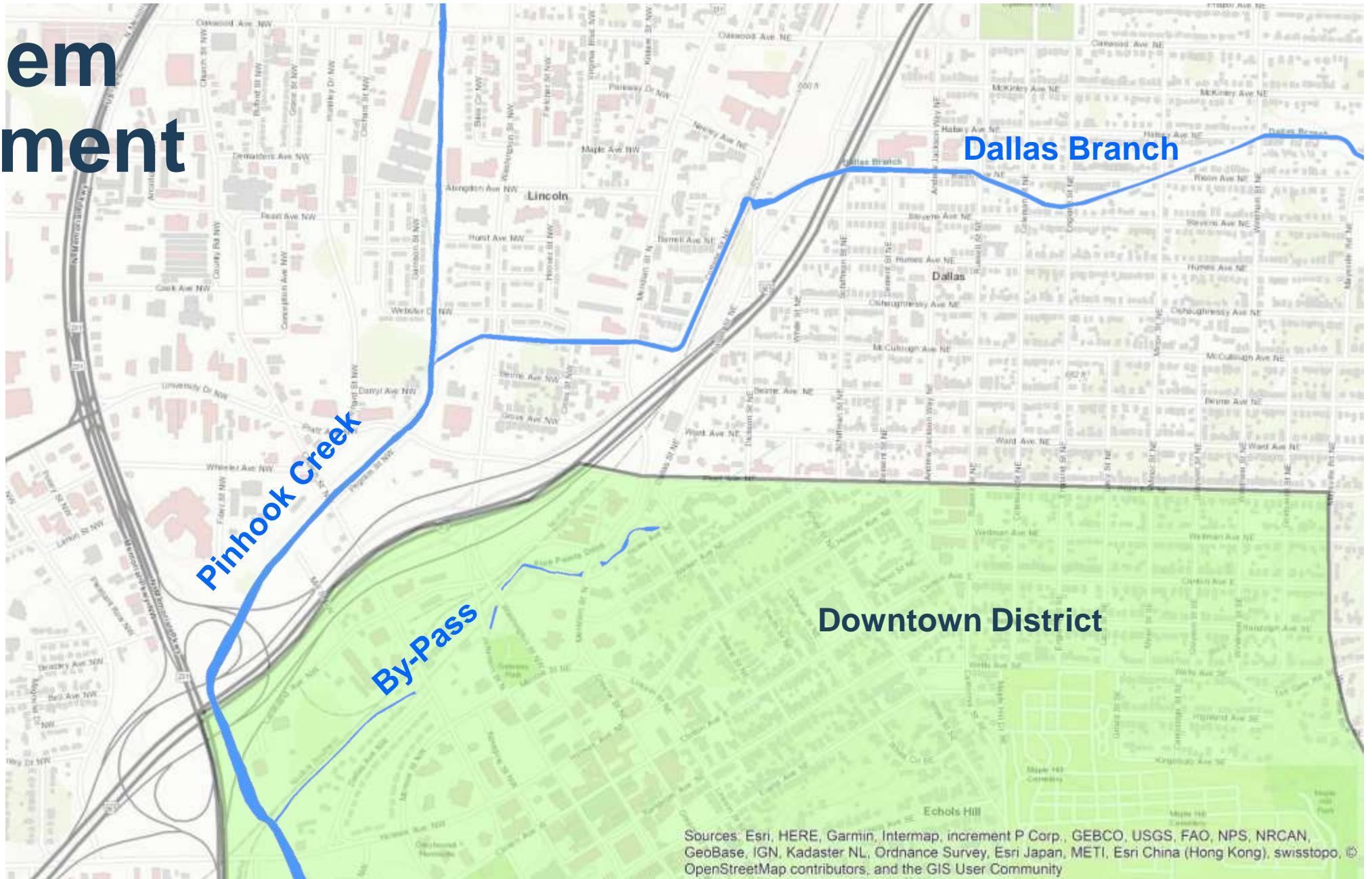


Activities

- ▶ 1990's USACE Studies
- ▶ 2000 Watershed Study
- ▶ 2003 USACE Feasibility Project
- ▶ 2006 DB / PC Flood Mitigation
- ▶ 2013 HSB Flood Mitigation
- ▶ 2016 HSB Flood Mitigation

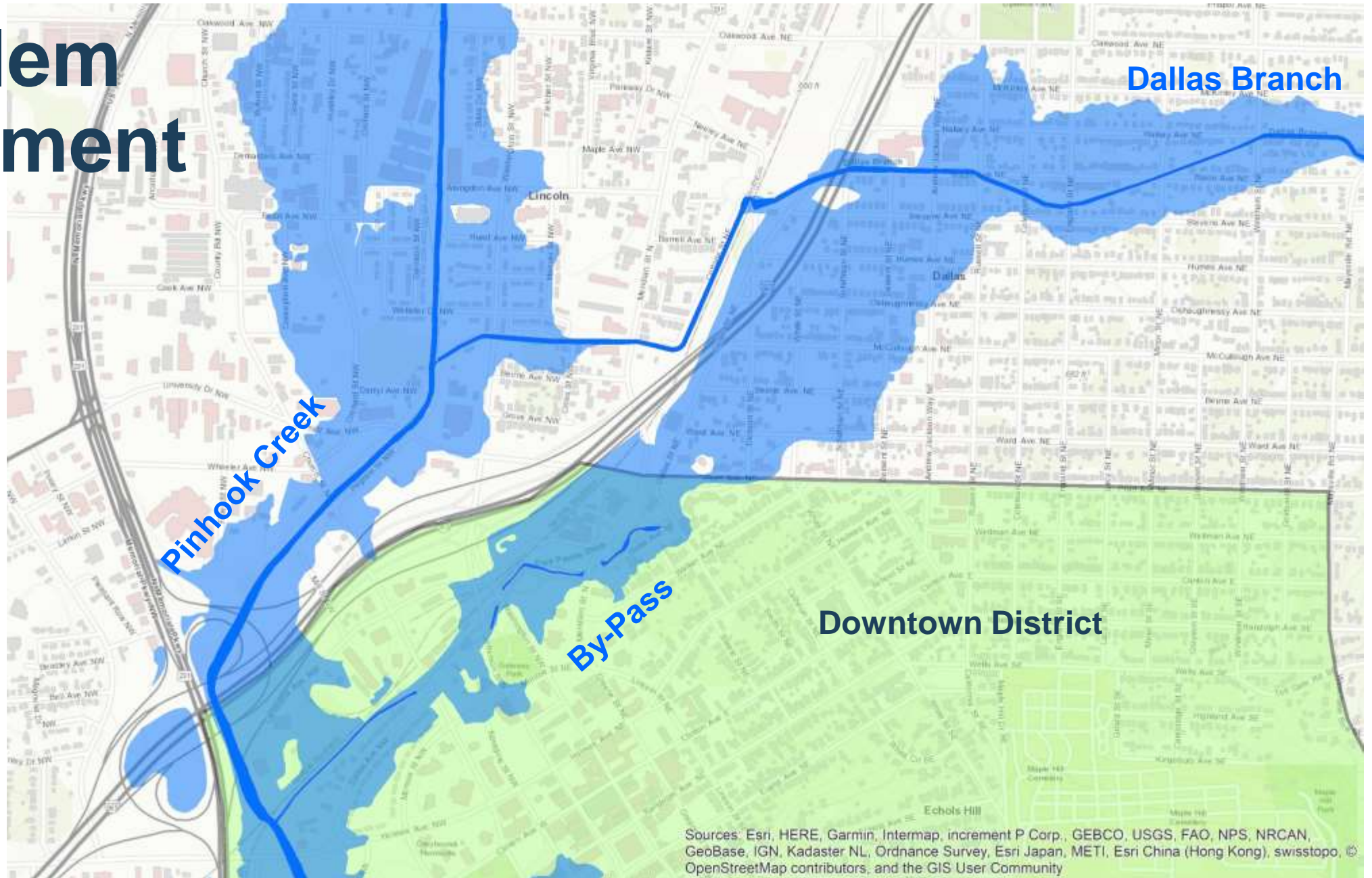


Problem Statement



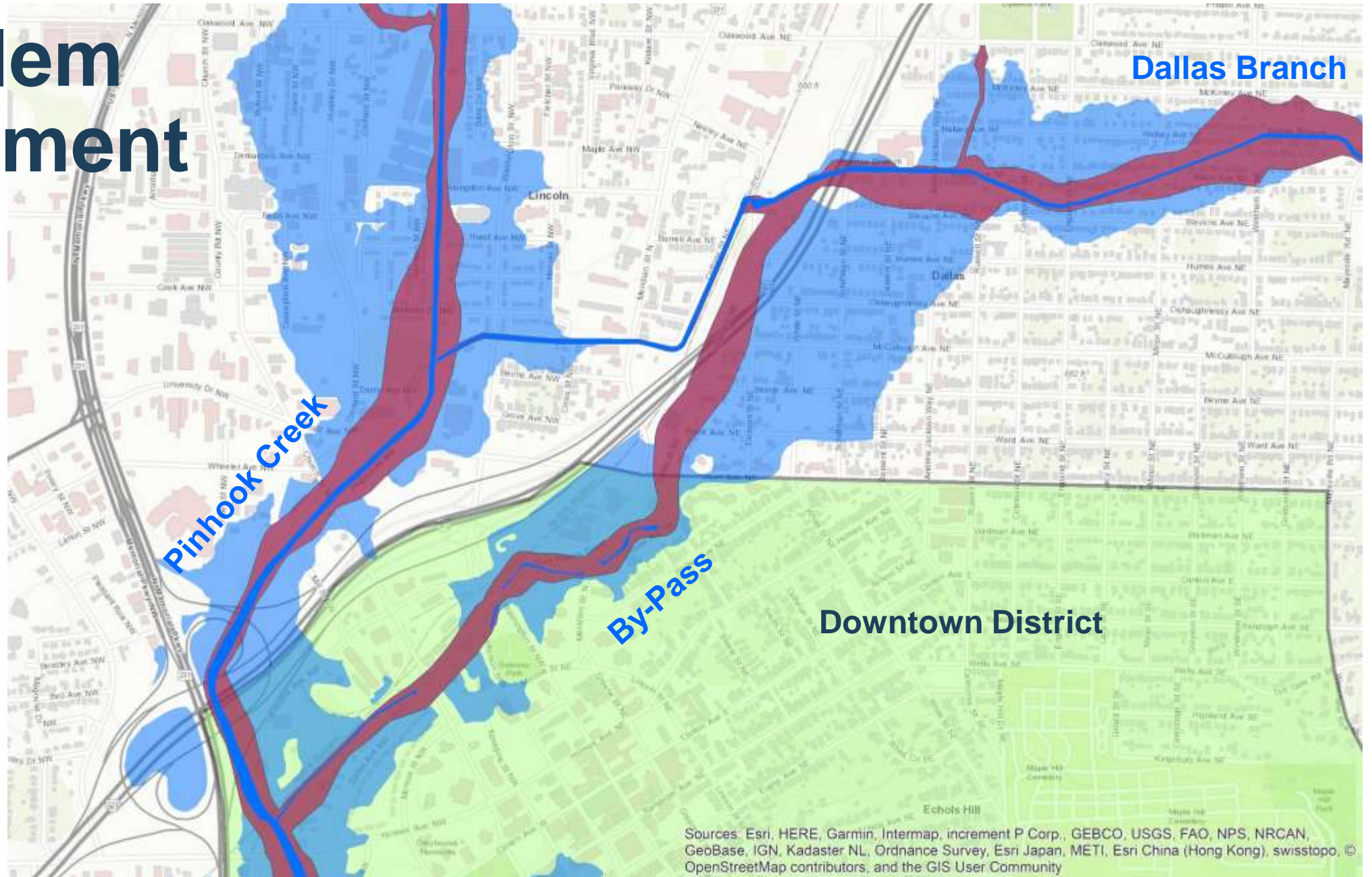
Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, © OpenStreetMap contributors, and the GIS User Community

Problem Statement

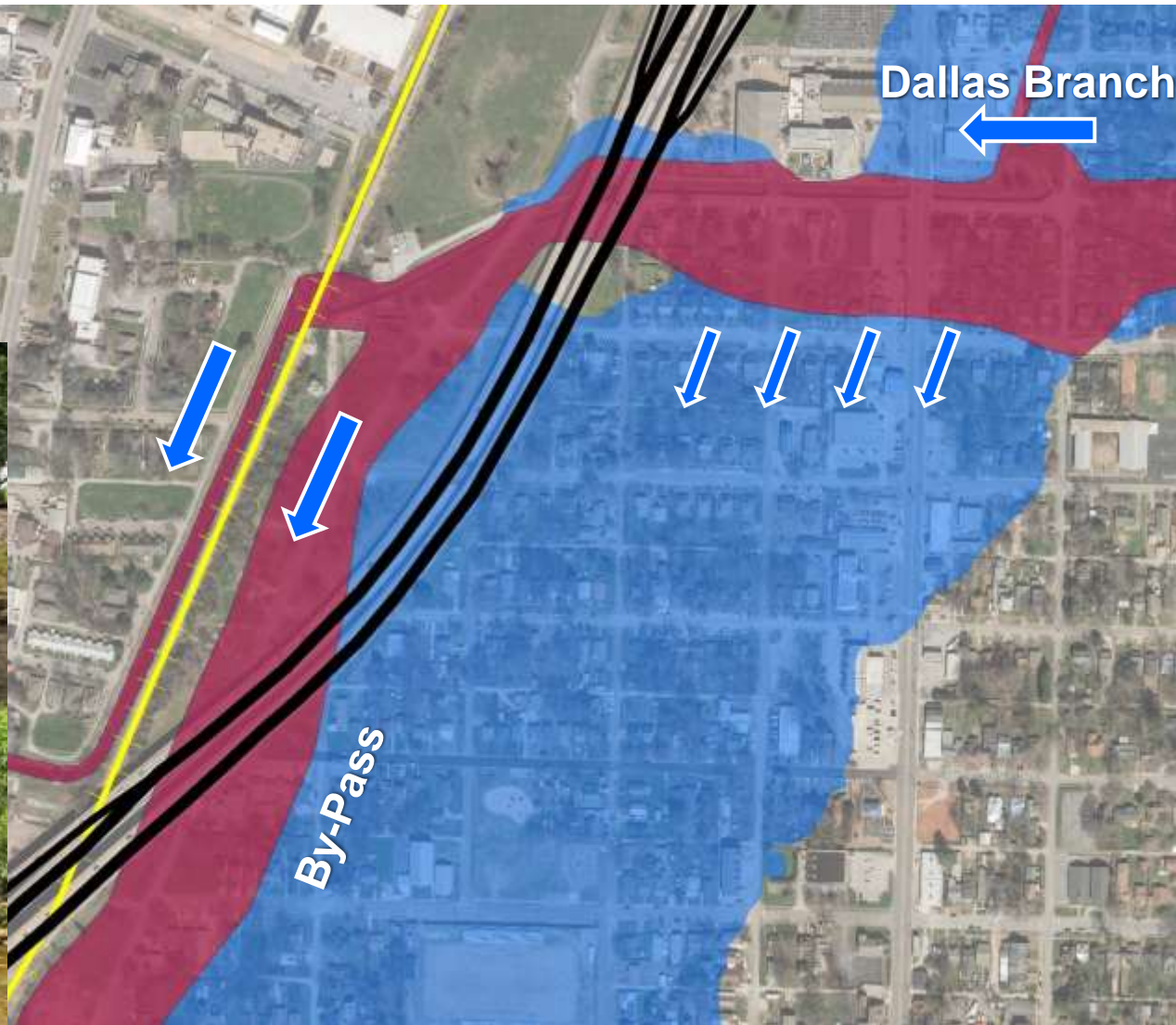


Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, © OpenStreetMap contributors, and the GIS User Community

Problem Statement

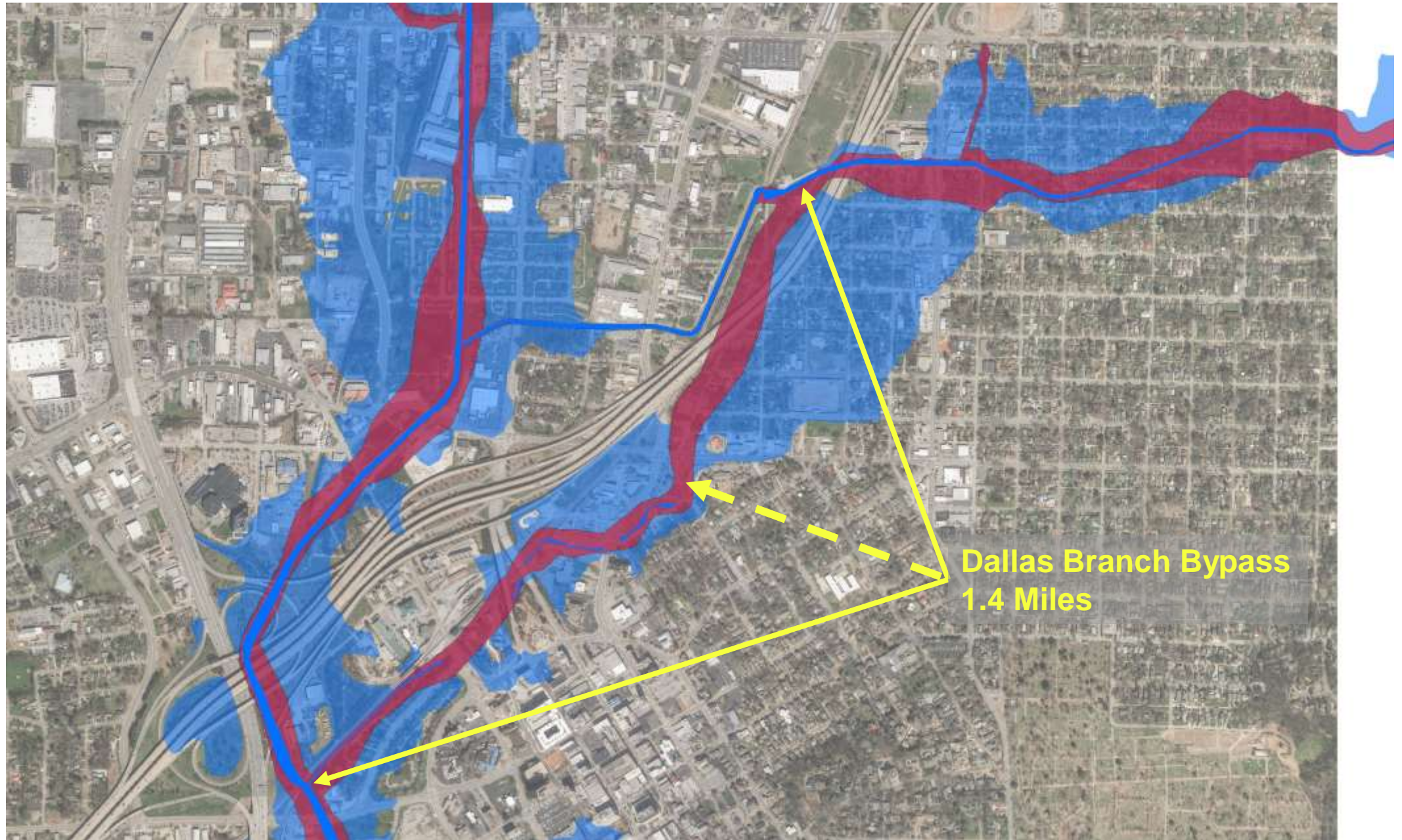


Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, OpenStreetMap contributors, and the GIS User Community



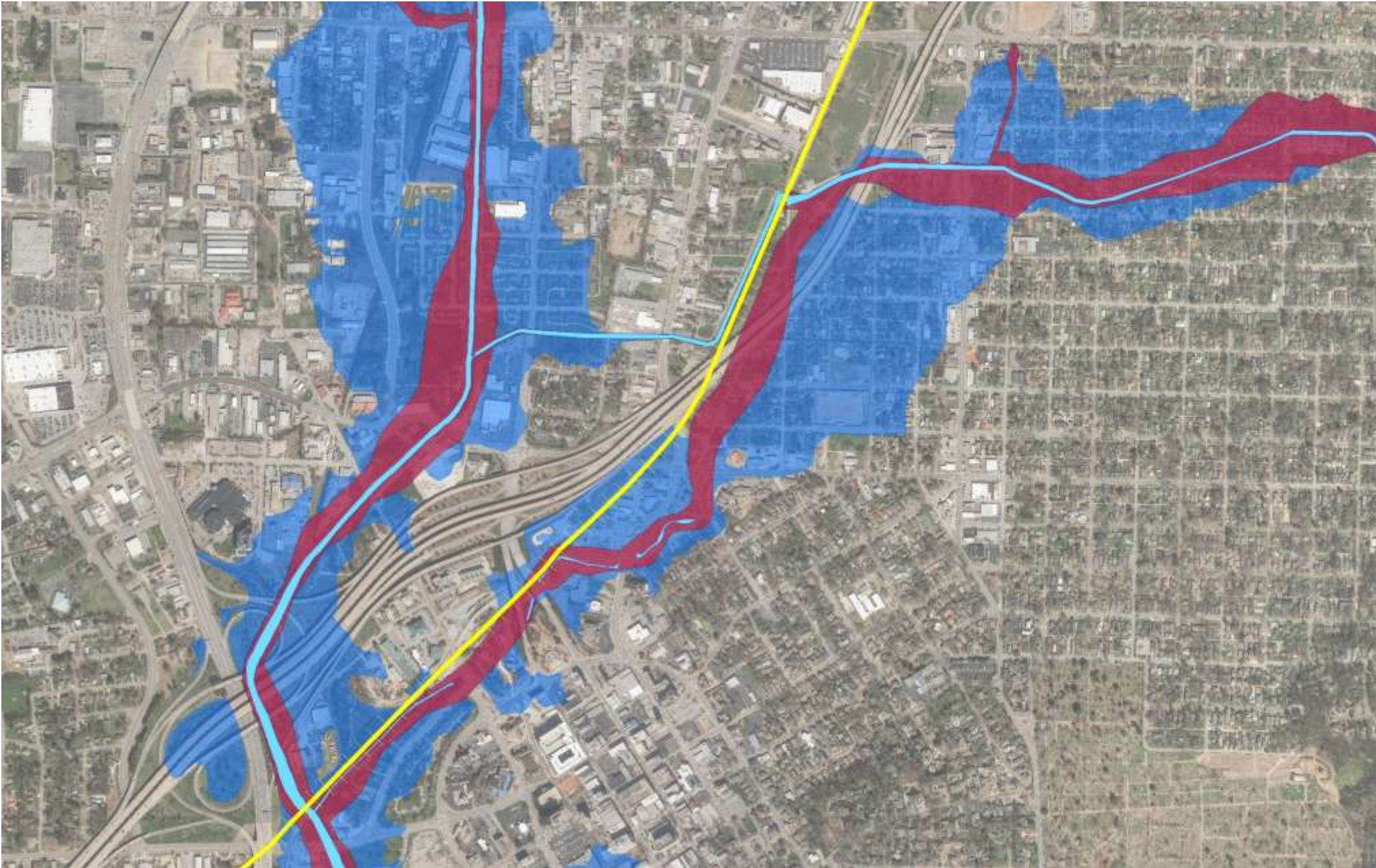
**Dallas Branch Bypass
Floodway**



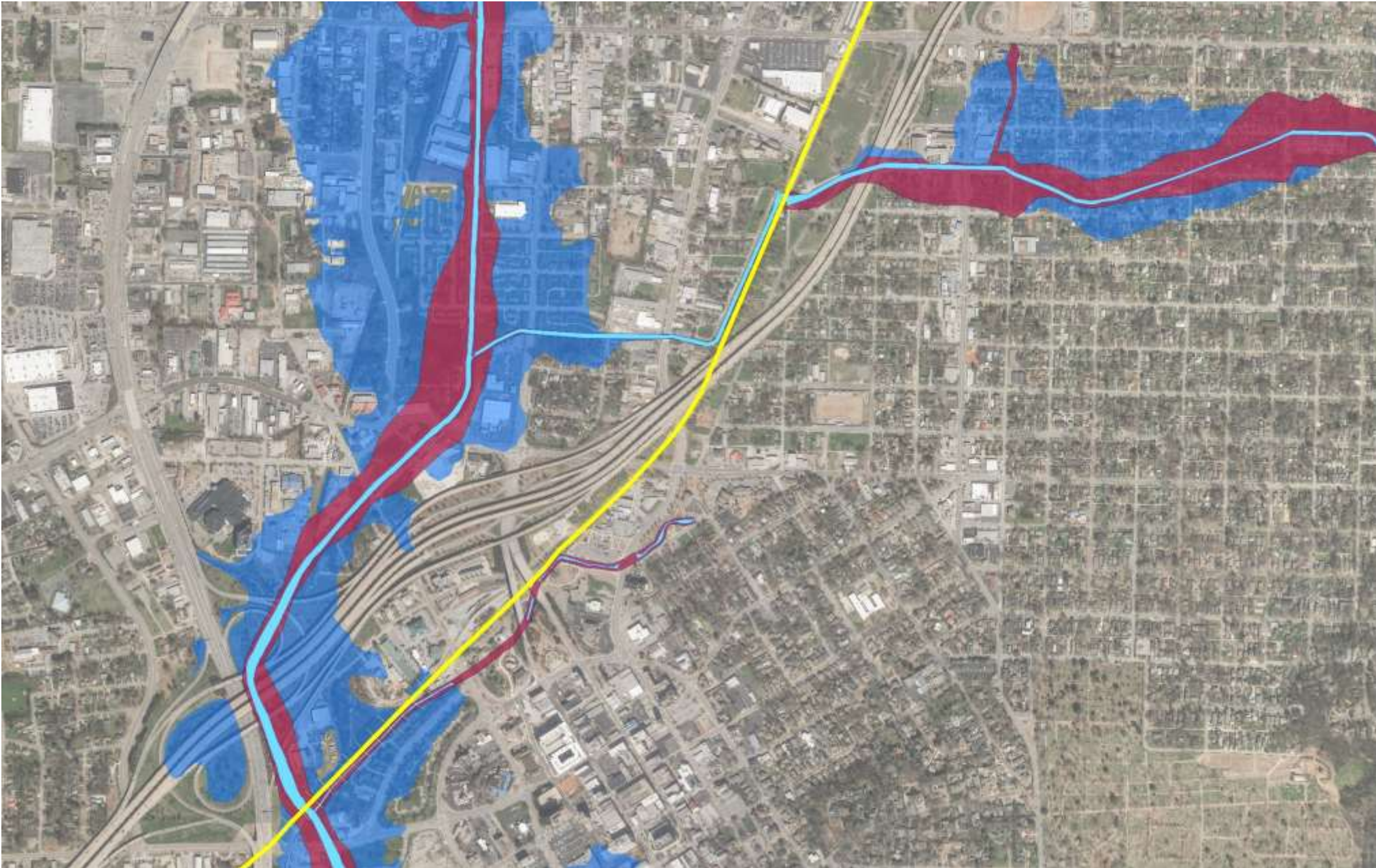




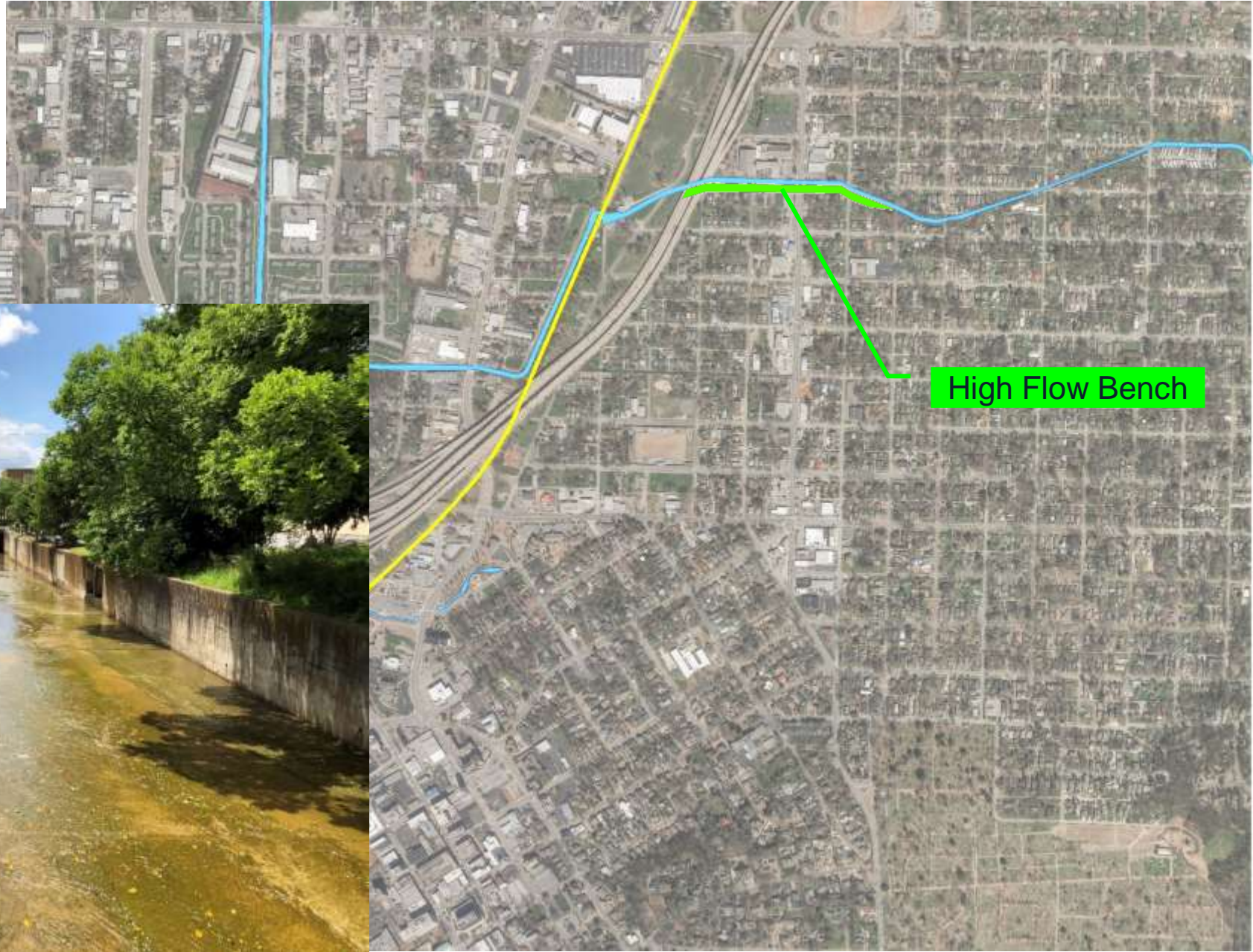
The Goal



The Goal



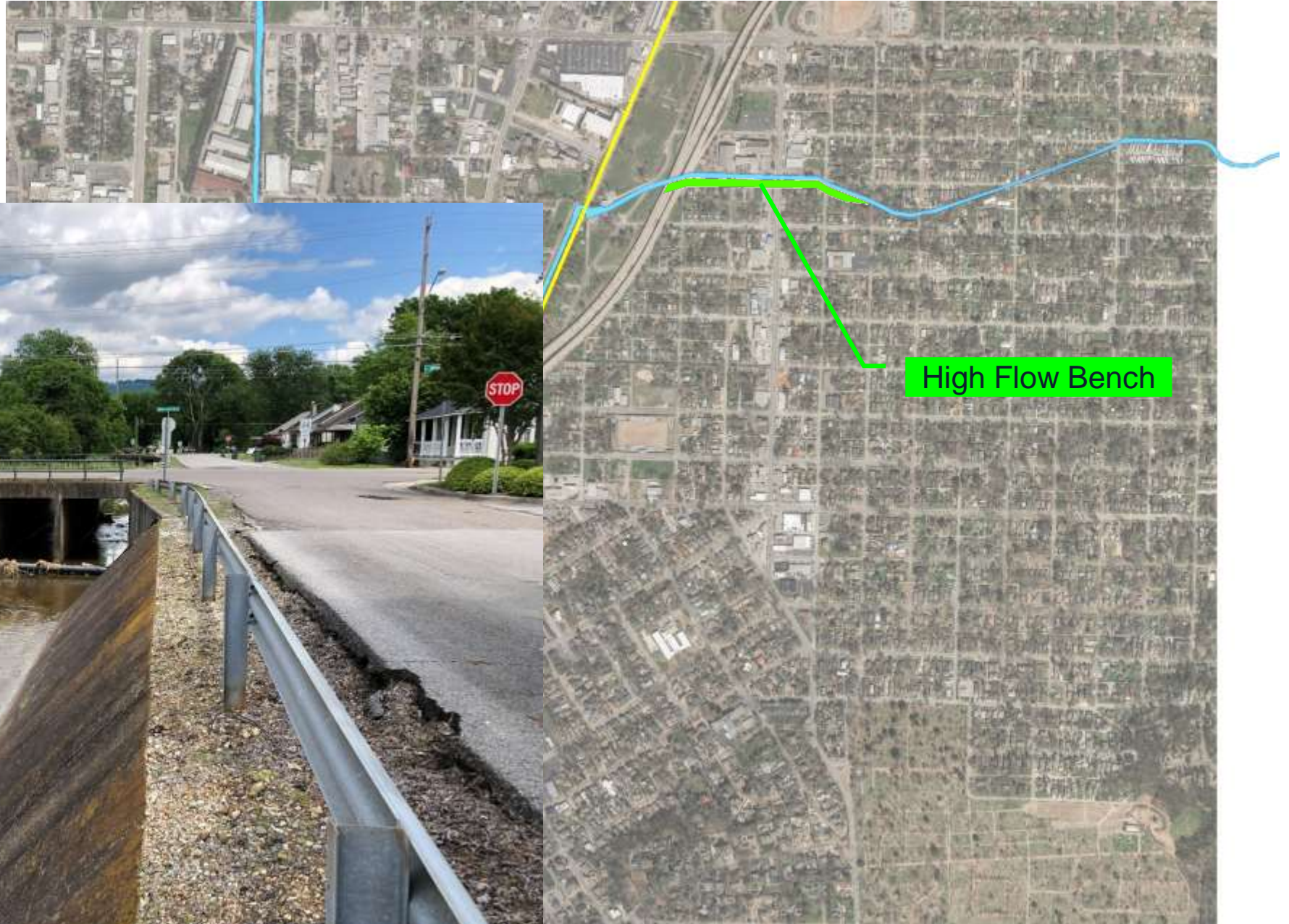
Selected Alternative



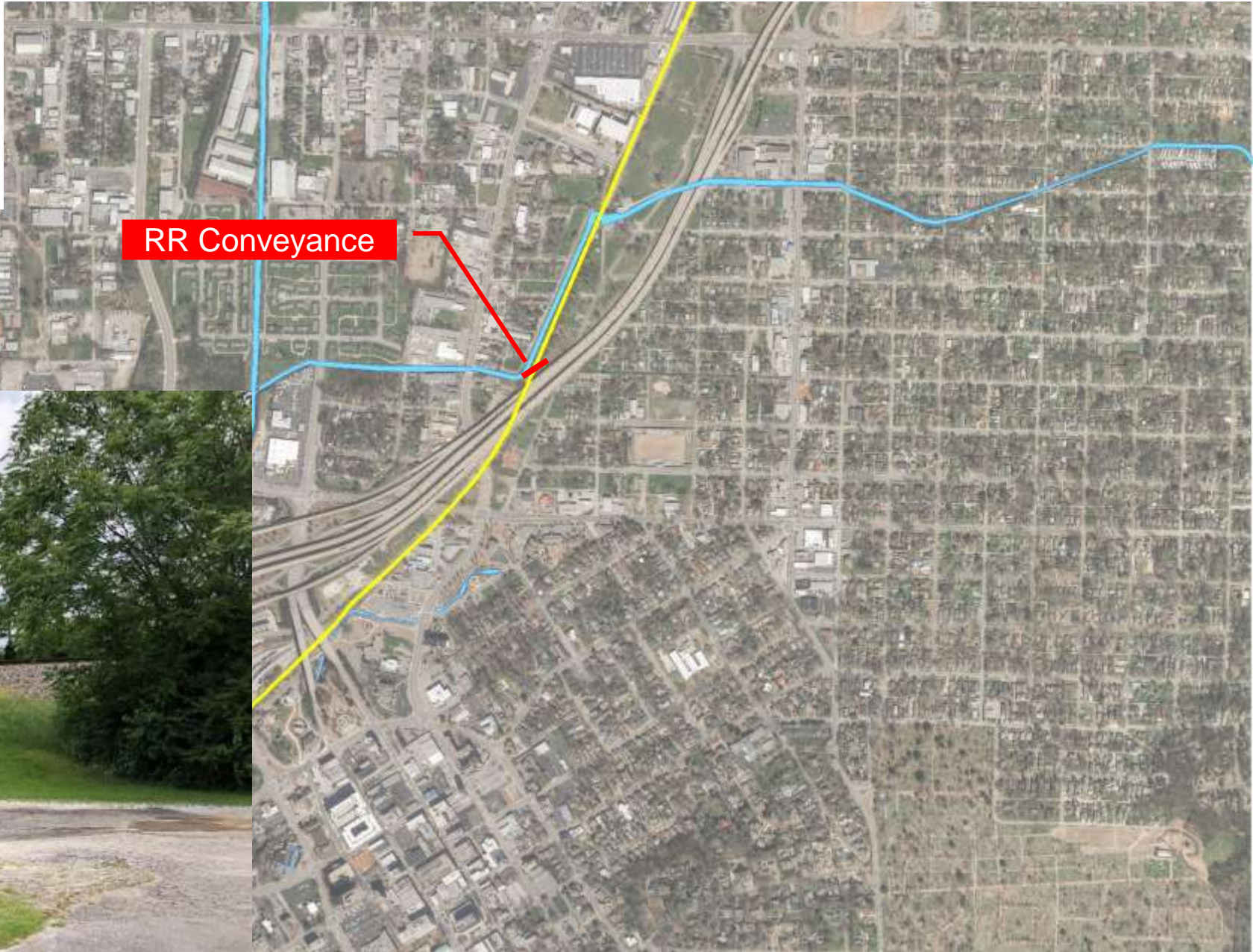
High Flow Bench



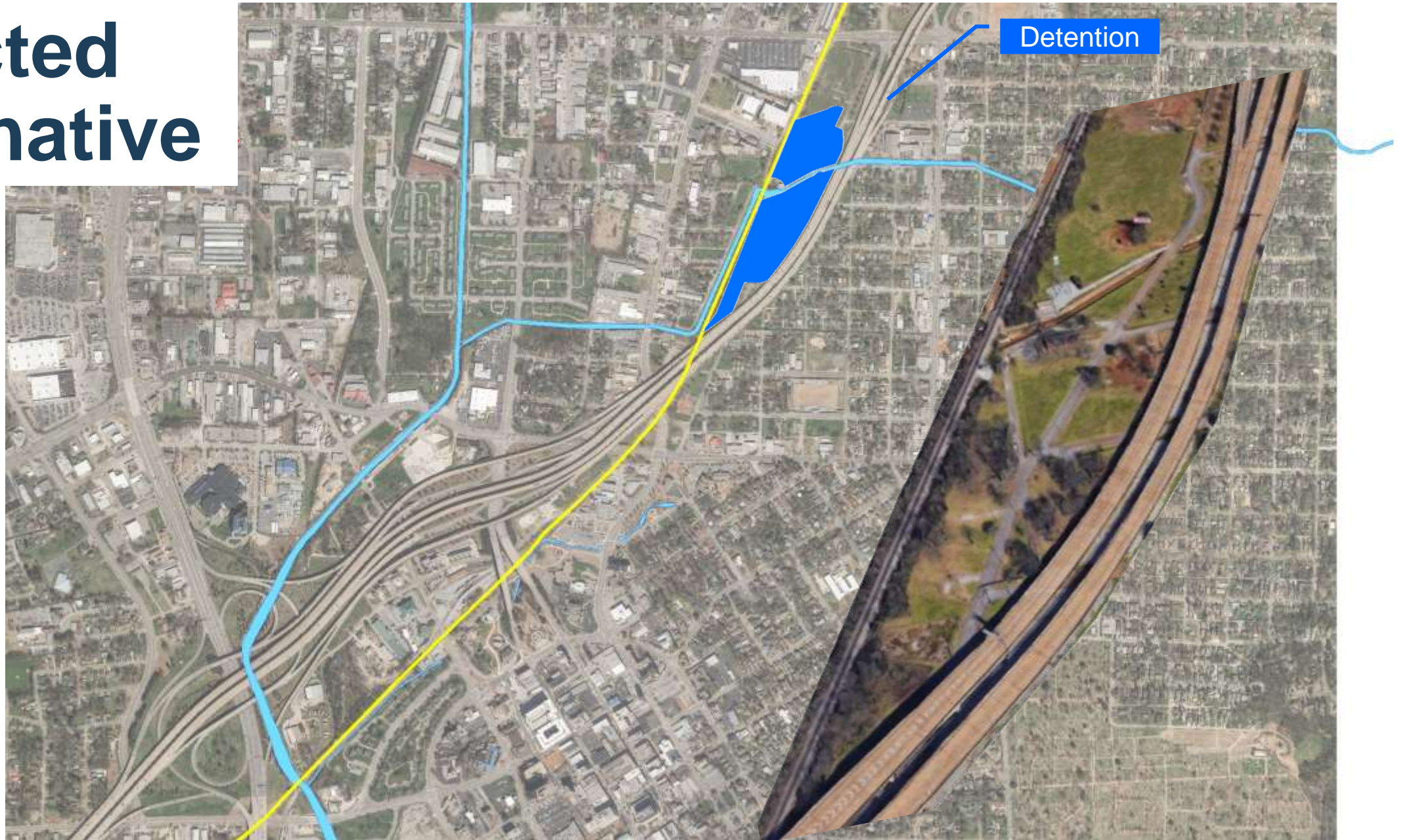
Selected Alternative



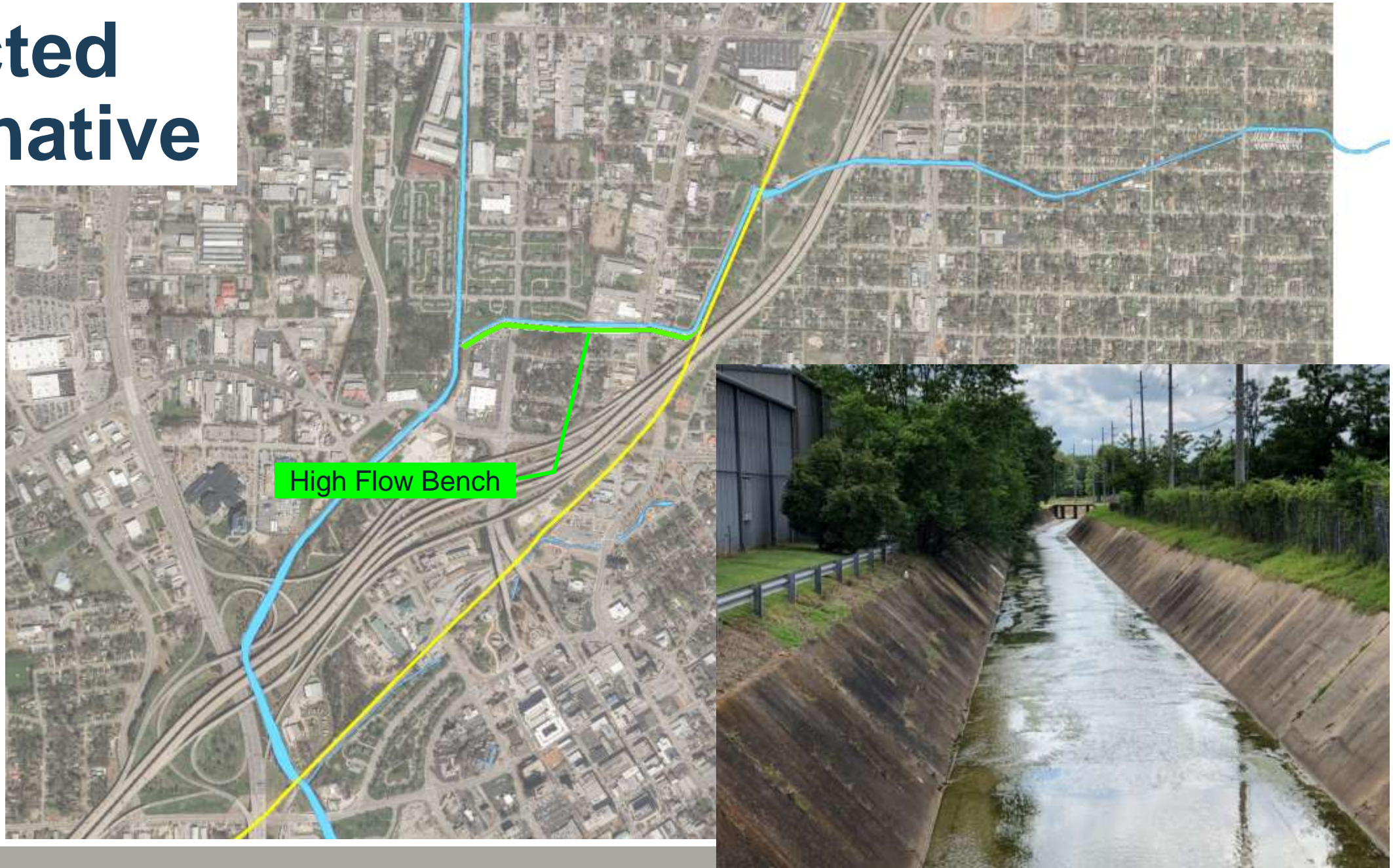
Selected Alternative



Selected Alternative



Selected Alternative



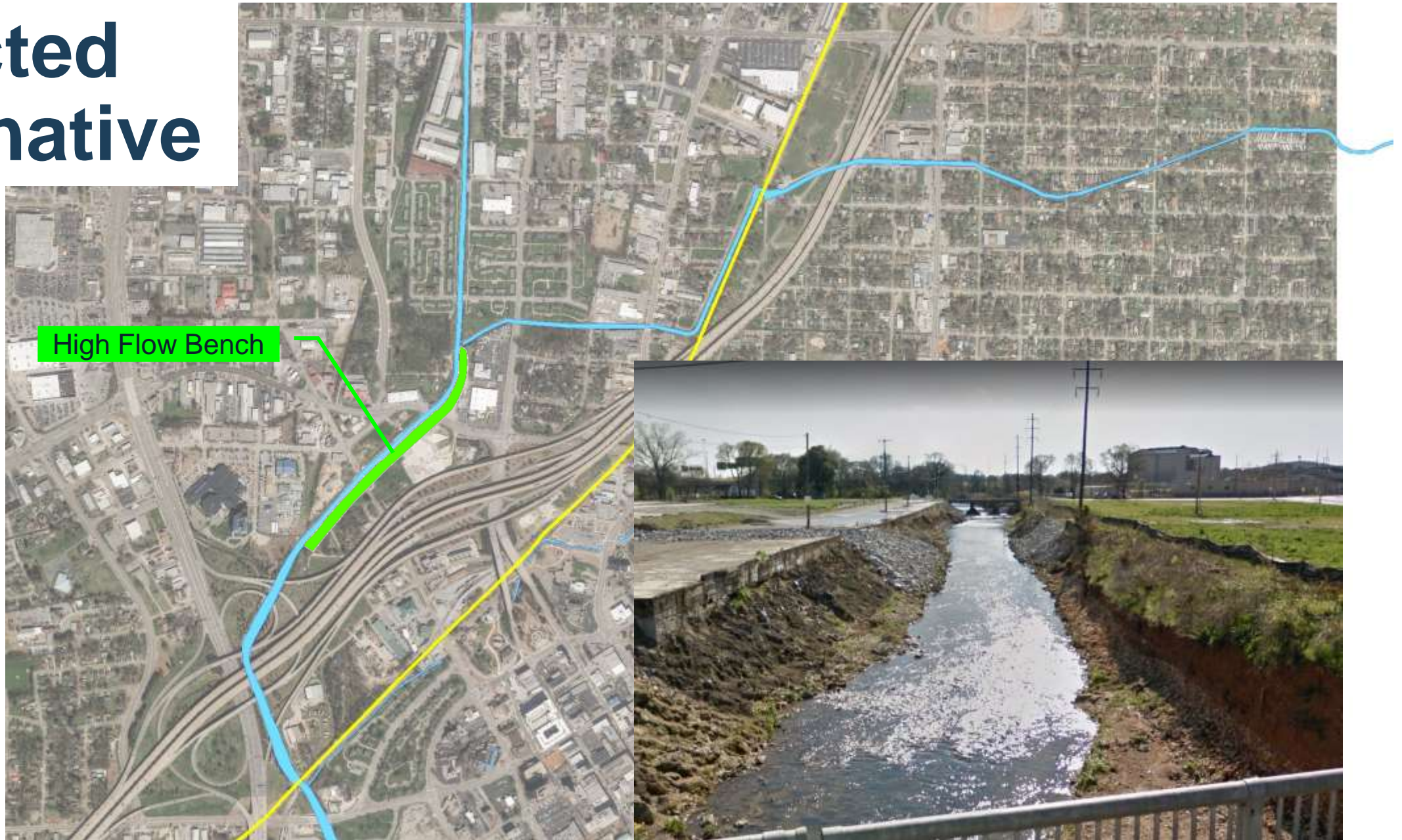
Selected Alternative



High Flow Bench



Selected Alternative



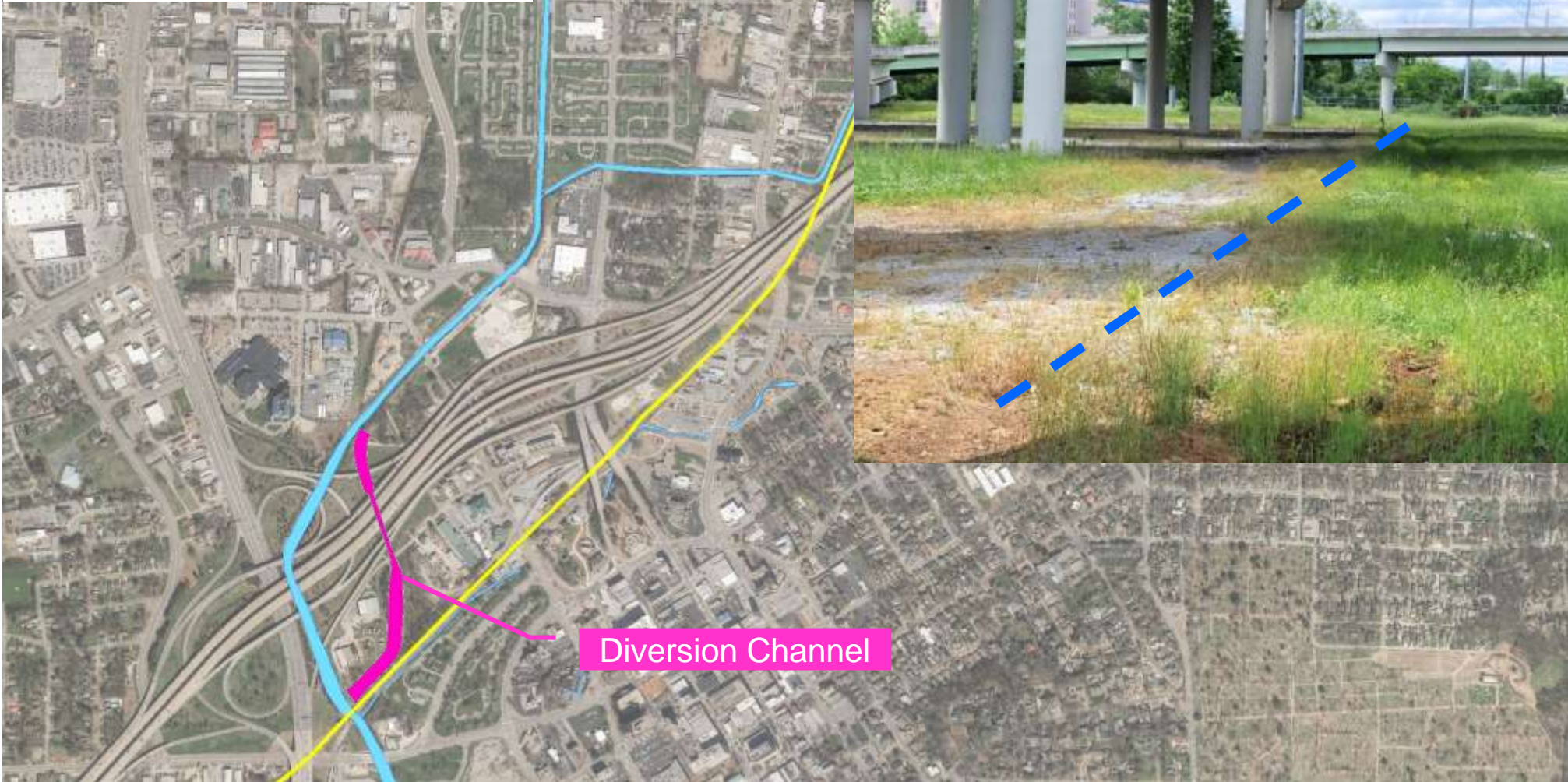
High Flow Bench



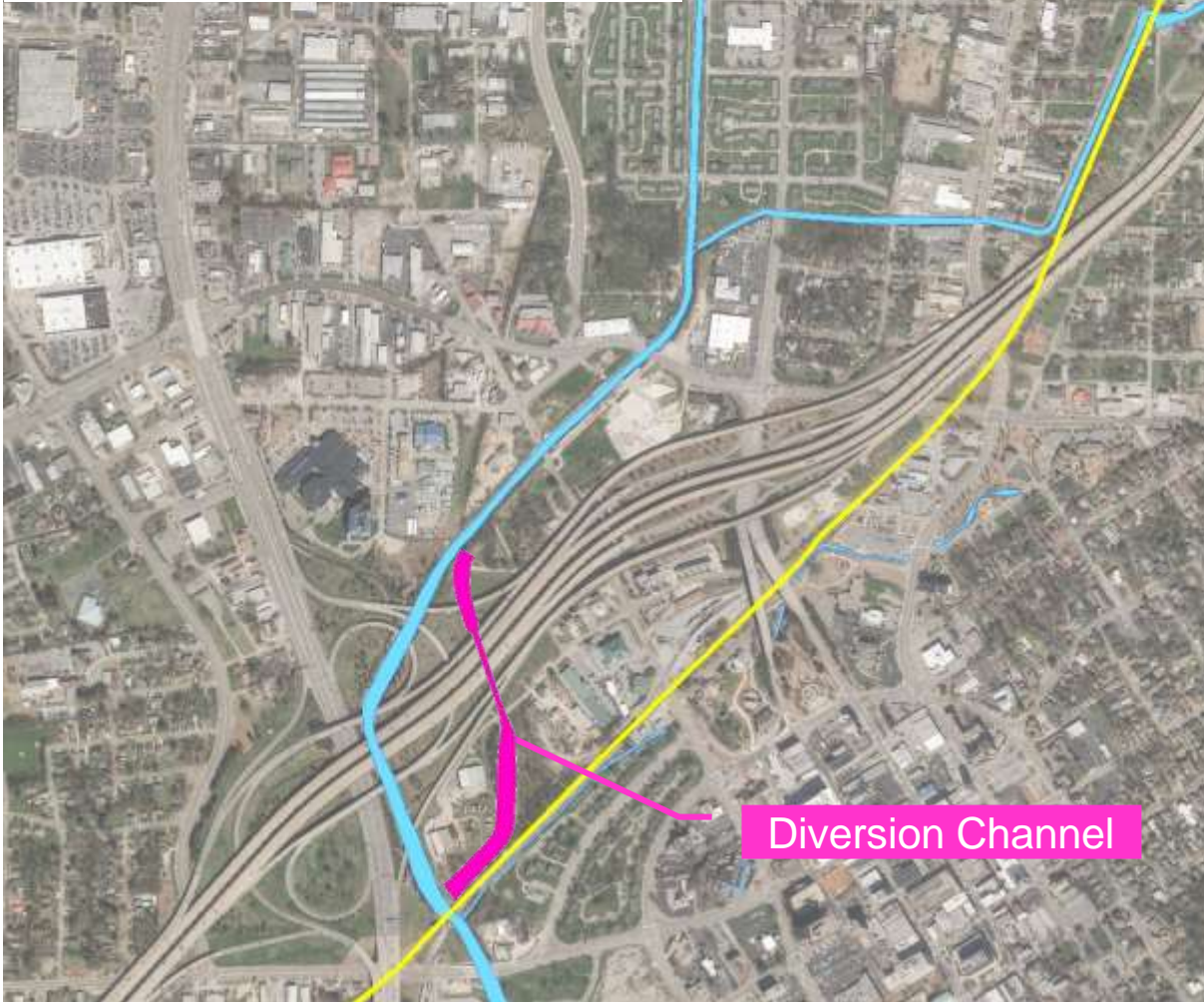
Selected Alternative



Selected Alternative



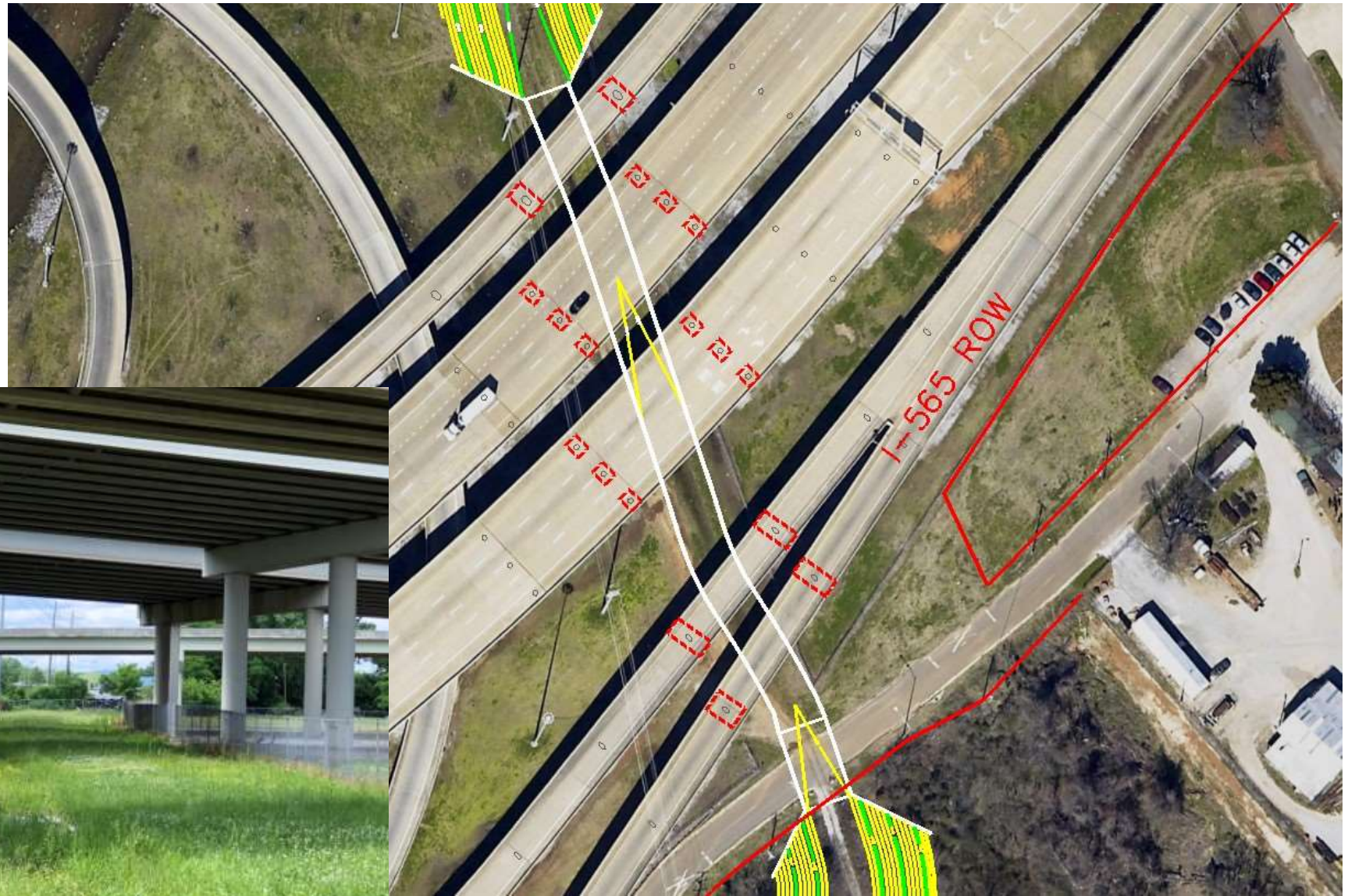
Selected Alternative



Diversion Channel

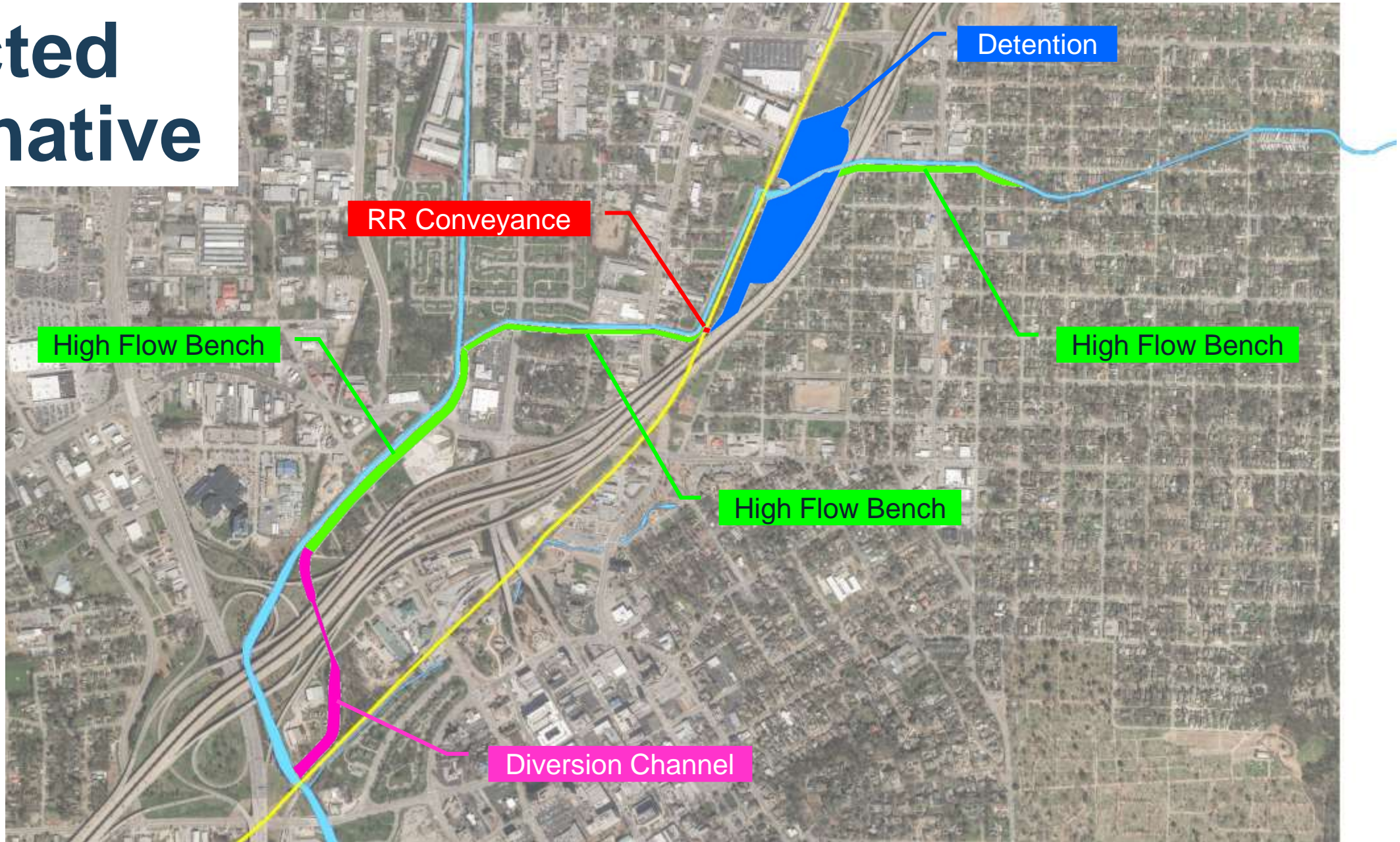


Selected Alternative



Selected Alternative

Original Cost
\$21M



Project Benefits

- ❖ Lower BFE up to 3 feet on Dallas Branch
- ❖ Eliminate Dallas Branch Overflow to the Bypass
 - Eliminates Inadvertent Floodway & Floodplain
- ❖ Reduce flow in Bypass by 78%
 - 4500 cfs to 1000 cfs
 - Reduces Residual Floodway & Floodplain
- ❖ Reduce Flood Risk for 600 Structures
- ❖ Reduce Average Annual Damages
 - \$7 million to \$4 million

Flood Damage Assessment Output Analysis		
Storm Frequency	# of Structures Damaged Existing Conditions	# of Structures Totally Protected Under ALT D3
2	217	182
5	359	215
10	469	210
25	534	132
50	572	118
100	594	99
250	647	75
500	664	63

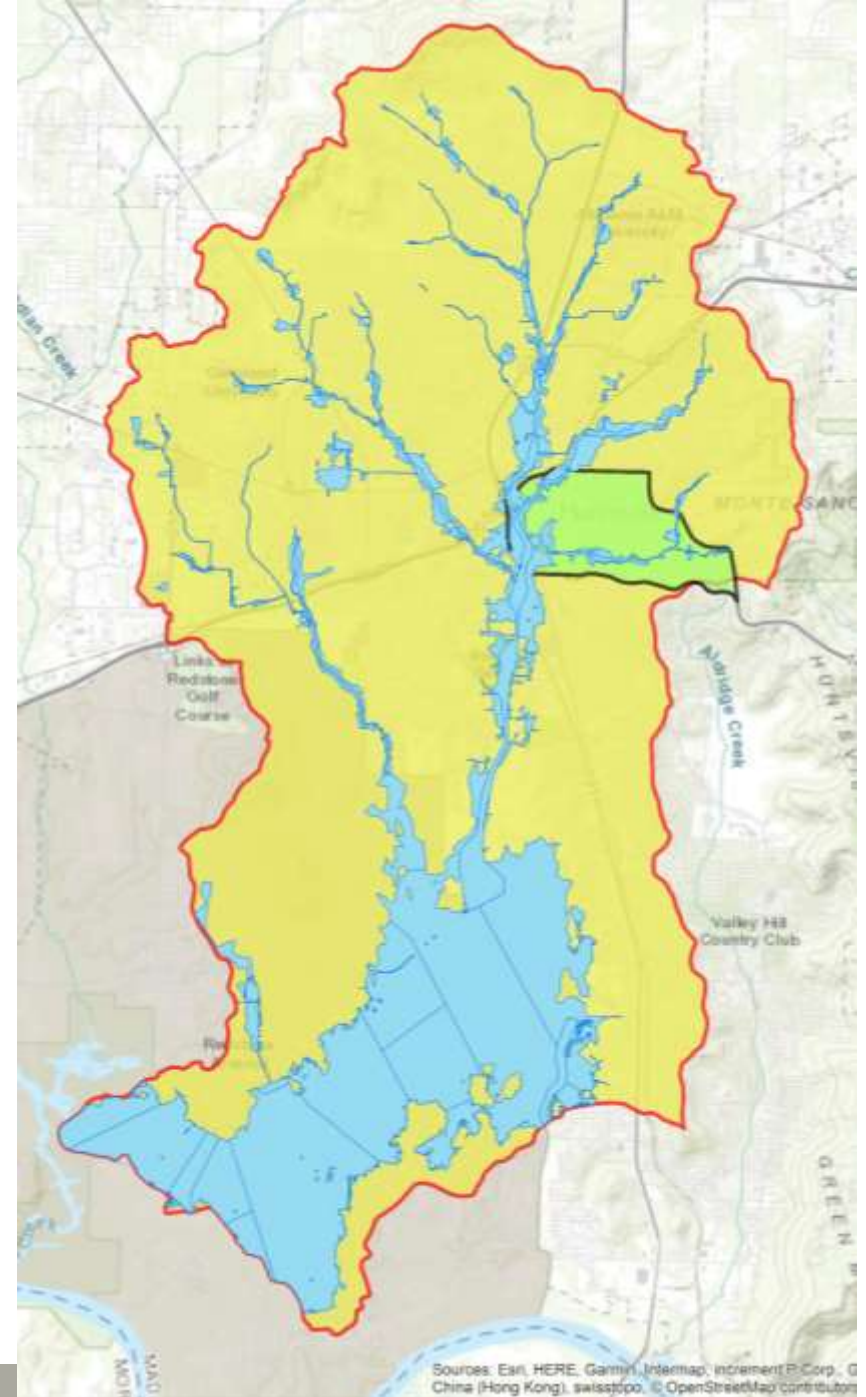
Project Timeline



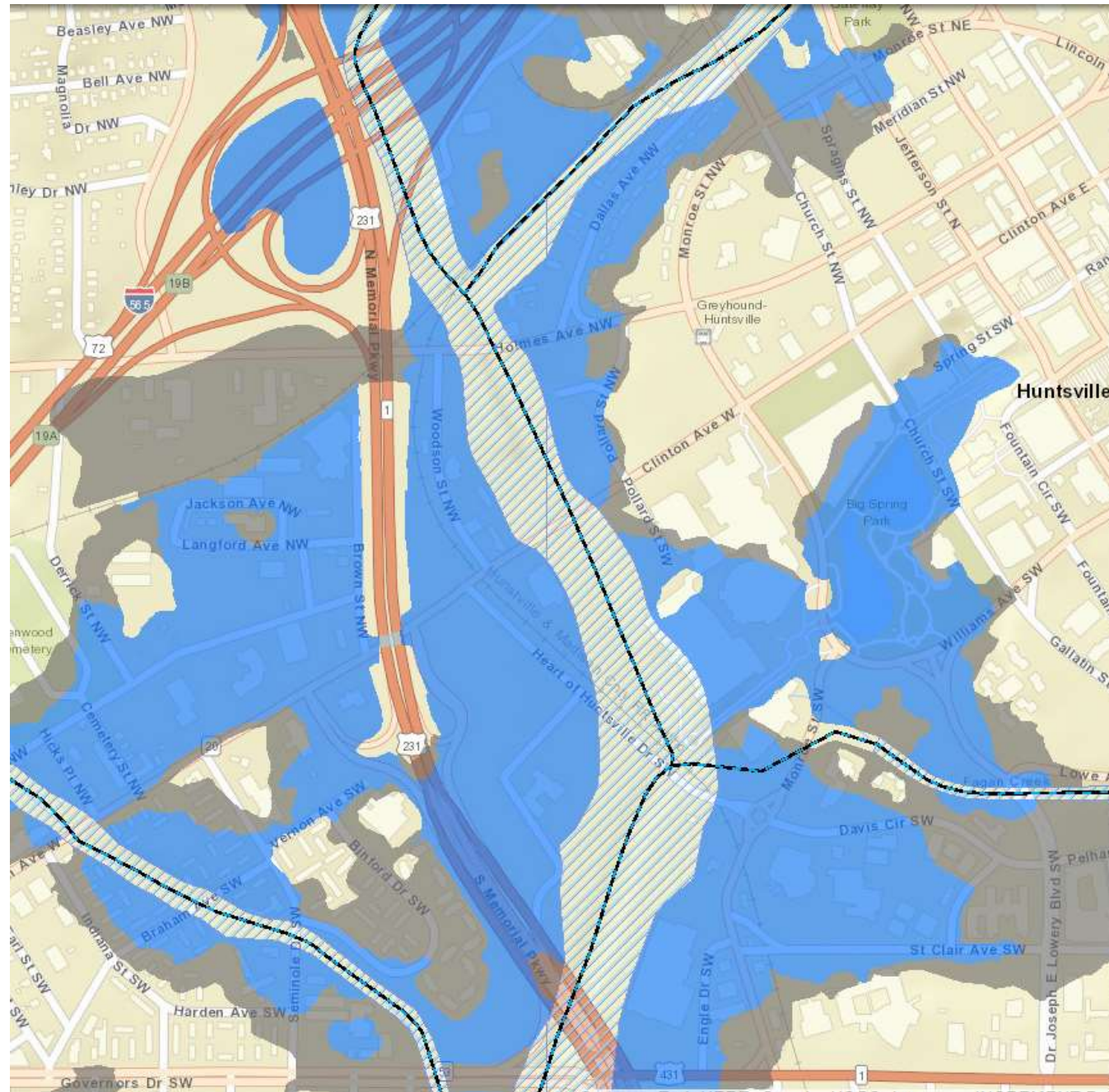
- ❖ 2005 - Hurricane Katrina (DR-AL-1605-0217)
- ❖ 2006 - Phased HMGP App. (Design/Construction)
- ❖ 2008 - Phase 1 Funding Approved
- ❖ 2010 - Phase 2 Funding Denied (appeal filed)
- ❖ 2011 - Phase 2 Funding Denied (final appeal filed)
- ❖ 2013 - Complete 100% Design (local funds)
- ❖ 2016...Election
- ❖ 2017...Hurricanes Harvey & Irma
- ❖ 2018 - Phase 2 Funding Awarded (\$15.9 million)
- ❖ 2020 - Funding Agreement Stalled
- ❖ 2021 - New Grant Application(s) Likely



HSV Spring Branch Flood Mitigation #2



Project Concept



Typical Channels



Beautiful Unaltered Stream



Typical Channels



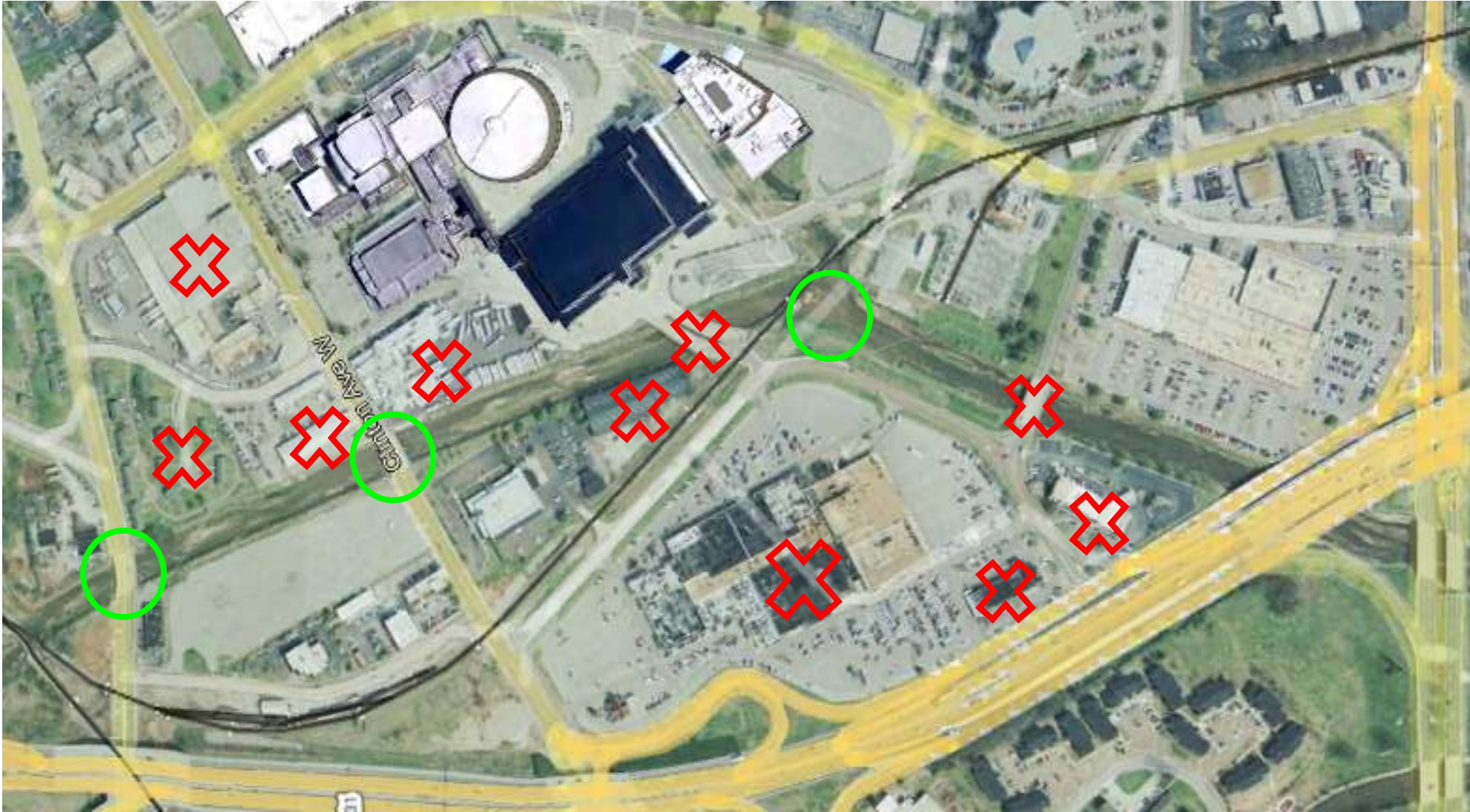
Natural Channel Sinuosity
Abundant Tree Canopy



Initial Project Concept (2003)



Pecking Away



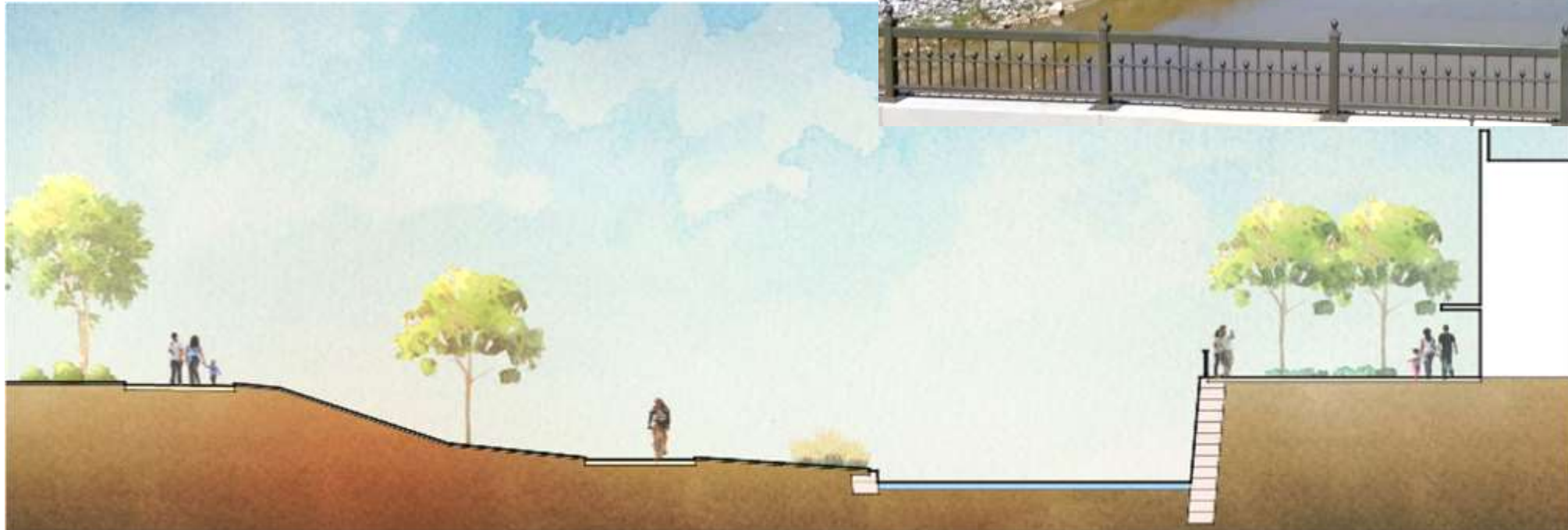
Current Project

- ❖ 1.2 mile riverine corridor
- ❖ 5600 LF excavated high flow bench
- ❖ 3200 LF constructed low flow channel
- ❖ 6000 LF greenway trails
- ❖ 3 new pedestrian bridges
- ❖ RR bridge replacement
- ❖ New 1400' cable-suspended ped bridge



Flood Control Template

- ❖ MSE retaining walls
- ❖ Excavated high-flow bench for flood control
- ❖ Facilitate Greenway Trails and a Riverwalk Atmosphere



Riverwalk Section



Project Cost

❖ OPCC

- Curved Suspension Bridge \$29 million
- Pre-engineered Ped Bridges (3) \$2 million
- Railroad Bridge \$5 million
- Channel Work \$14 million
- Parks & Trails \$5 million
- Real Estate \$2 million

❖ Total \$56 million





Urban Flood Mitigation in Huntsville

Byron Hinchey, PE, CFM

bhinchey@smeinc.com

615-944-9012