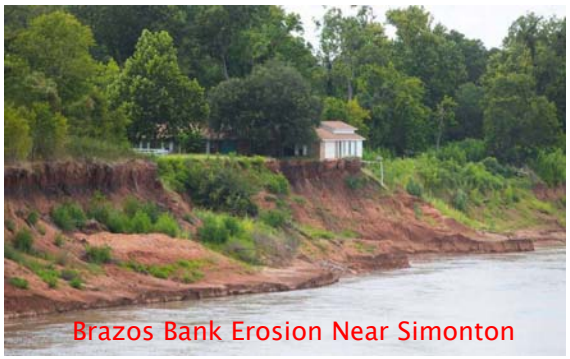
BACKGROUND

- 2011 City took a more detailed approach to riverine flooding
  - Developed an Emergency Action Plan (EAP)
- Plan was coordinated with all LID's and Fort Bend County
- Utilized the FEMA model for flow and base flood elevations
- Tied LID outfall elevations to critical river elevations and USGS gage data at the Richmond location
- 2015 rain event and flood
  - Local rainfall ~ 11 inches of rain in 8 hours
  - Greater than a 1% chance event
  - River crest elevation June 2, 2015 – 49.73 ft (USGS)
  - River Flow ~ 72,000 cfs

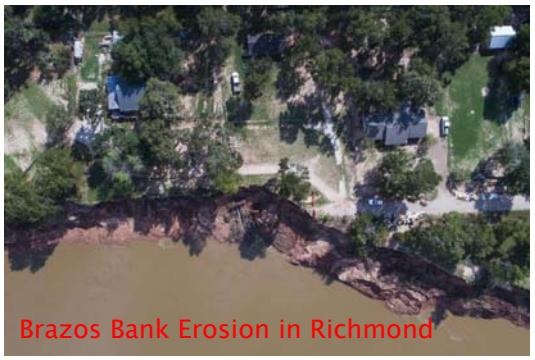
BACKGROUND

- 2016 rain event and flood
  - Rainfall north of SL ~ 20 in. (Washington County, Brenham)
  - Local rainfall – 3.8 inches that week
  - River crest elevation on June 2, 2016 – 54.73 ft (USGS)
  - River flow ~ 102,000 cfs
- City initiates first contract to start river evaluation
- 2017 Hurricane Harvey
  - Local rainfall – Varies from 32 to 35 inches (3+ days)
  - River crest elevation on August 31, 2017 – 55.19 ft (USGS)
  - River flow ~ 124,000 cfs

PROJECT BACKGROUND



Brazos Bank Erosion Near Simonton



Brazos Bank Erosion in Richmond

TXDOT US 59 Turn Around

Property Damage due to
Brazos Bank Erosion in Simonton

Property Damage in Richmond

Brazos Bank Erosion at Jodie Stavinoha
(Grand Parkway Bridge

PROJECT BACKGROUND

Brazos River Bridge Erosion Project

PROJECT BACKGROUND VIDEO

WHY IS THIS PROJECT NECESSARY

- **Develop a pro-active approach to the river erosion**
- **Improve our knowledge regarding the river geomorphology from the City perspective**
- **Bring together stakeholders with interests along the river to share its findings and future projected movements of the river**

WHY IS THIS PROJECT NECESSARY

- **Have a good understanding of the following and how they are impacted:**
  - **City Infrastructure**
  - **Stability of Levees**
  - **City Parks facilities**
  - **TxDOT Infrastructure**
- **Take proactive approach in partnership with Fort Bend County, LIDs, TxDOT and other stakeholders**
- **Supplement information from the Lower Brazos River Floodplain Study**

PROJECT UPDATE

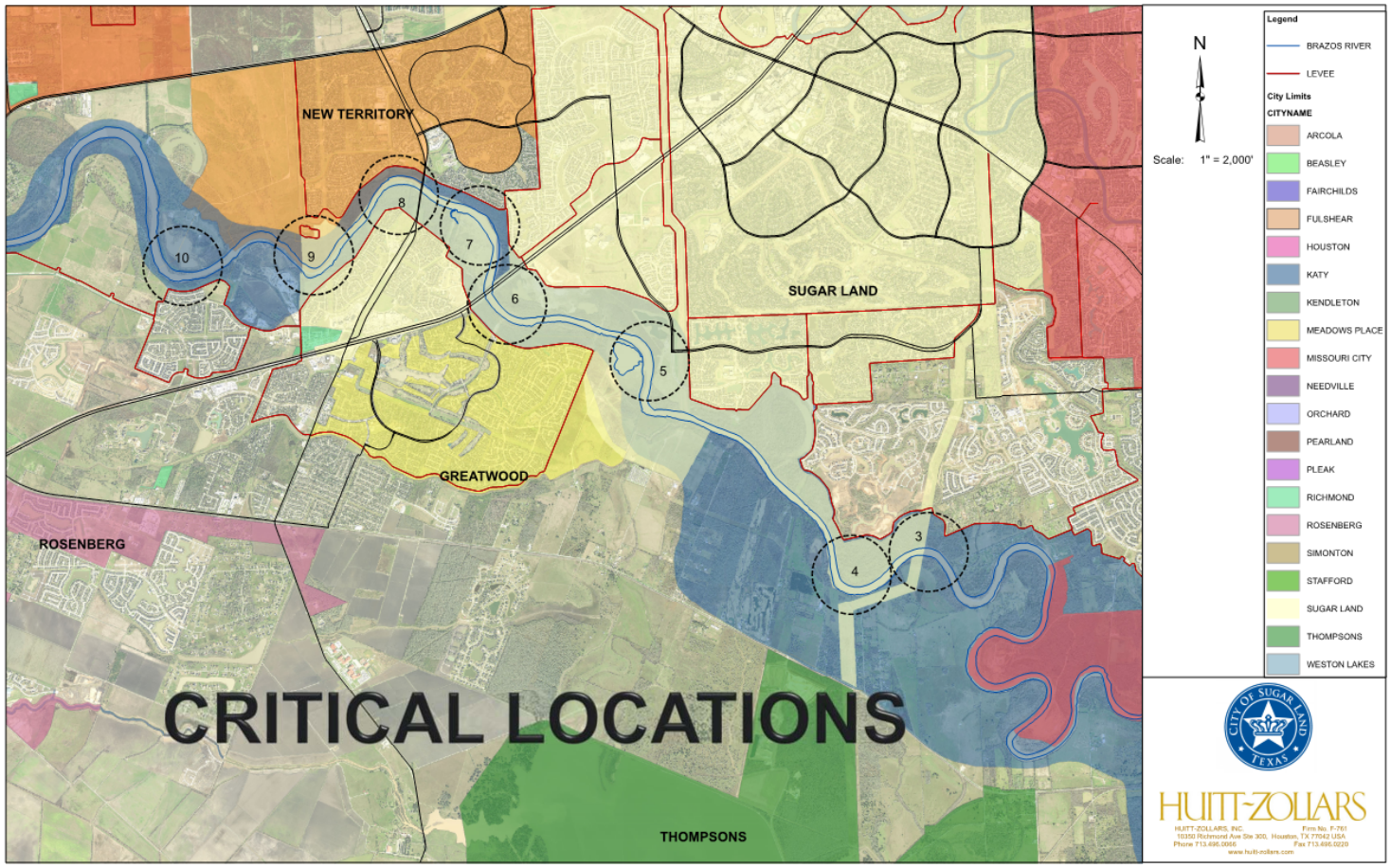
- **City Council approved a professional Service contract with Huitt-Zollars on November 2017 to perform the Brazos River Erosion Study along the 9 miles of River within City limits**
  - **Dr. Briaud, PhD – Texas A&M University Geotech Professor**
- **Engineering Department issued NTP on November 17, 2017**
- **Huitt-Zollars initiated the Study in December 2017**

PROJECT SCOPE

- Analysis of the Brazos River erosion and geomorphology (with Texas A&M University)
- Hydraulic and hydrologic model analyses
- Prediction of projected bank erosion based on historical data
- Survey of critical erosion areas within the City
  - Aerial survey and Geotechnical investigation
- Develop a Risk and Consequences Methodology Analysis
- Communications with stakeholders
- Presentation of results to CoSL and Stakeholders

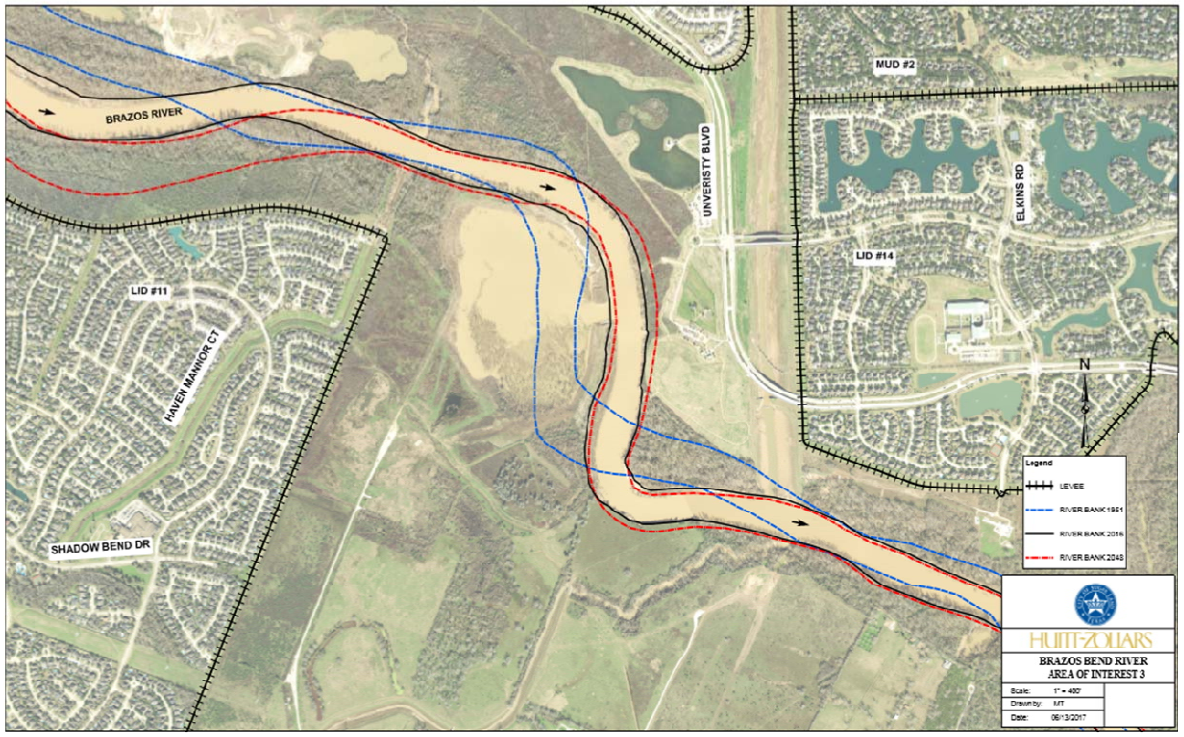
ACTIVITIES COMPLETED

- **Determined eight (8) critical locations to perform the erosion assessment within the CoSL**
- **Held Meetings and a Workshop with Texas A&M University:**
  - **evaluate work completed to date**
  - **develop future work associated with probabilities, risks and consequences**
  - **select analysis methodology**
  - **define geotechnical Investigation and testing**



CRITICAL LOCATIONS

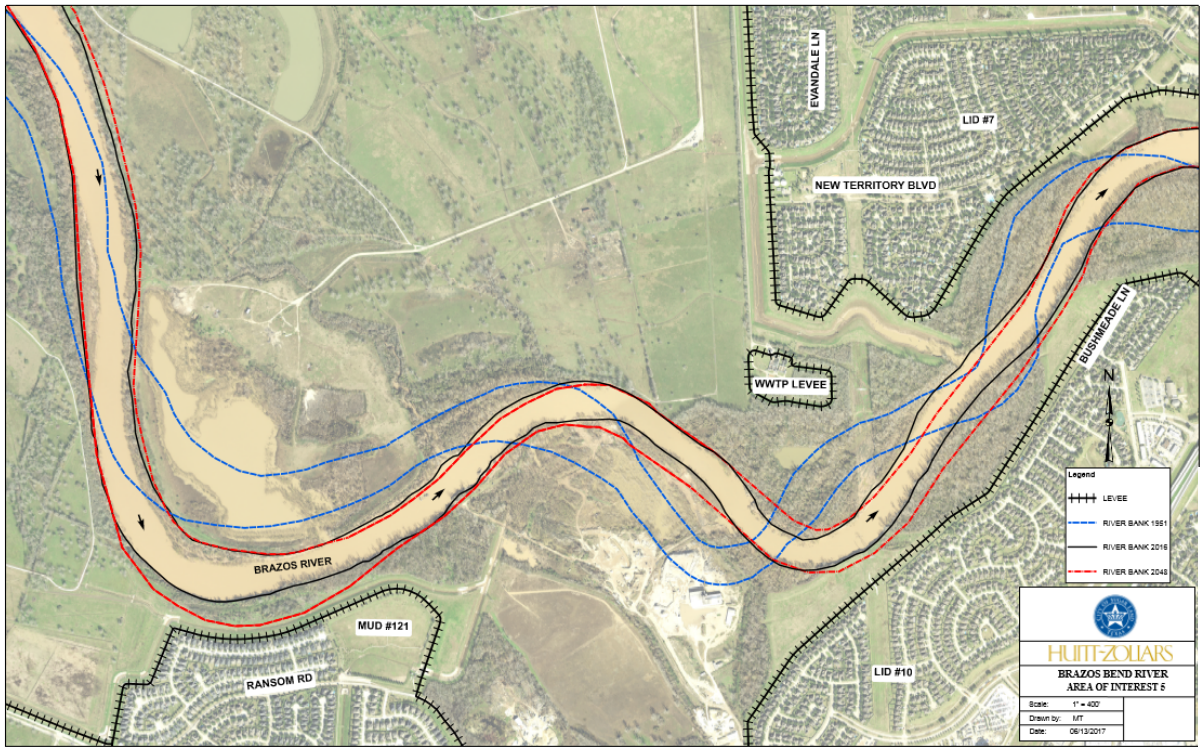
CRITICAL LOCATIONS EXAMPLE



LEGEND

- Levee
- River Bank 1951
- River Bank 2016
- Time Sequence Math & Extrapolation Method

CRITICAL LOCATIONS EXAMPLE



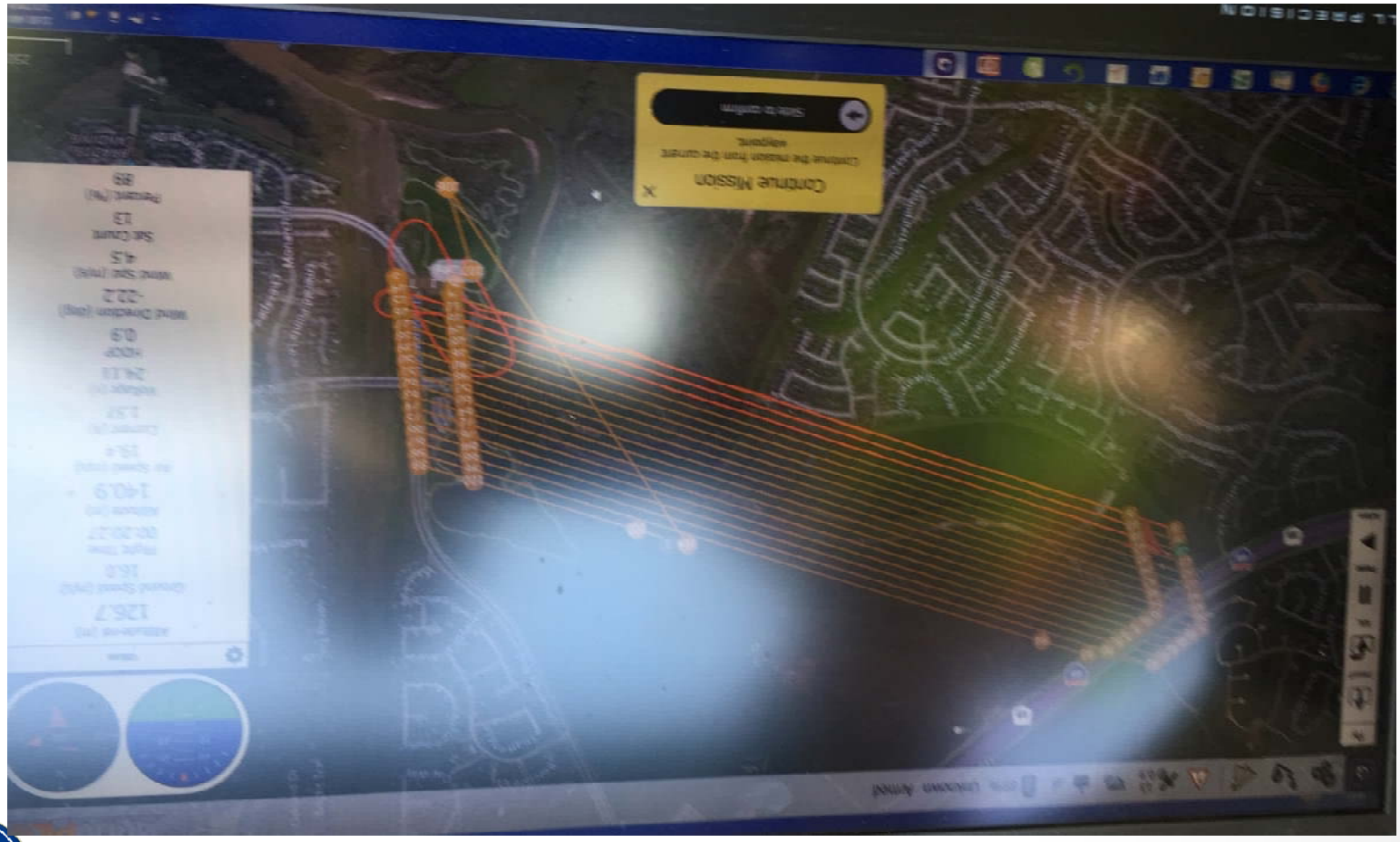
LEGEND

- Levee
- River Bank 1951
- River Bank 2016
- Time Sequence Math & Extrapolation Method

OTHER ACTIVITIES COMPLETED

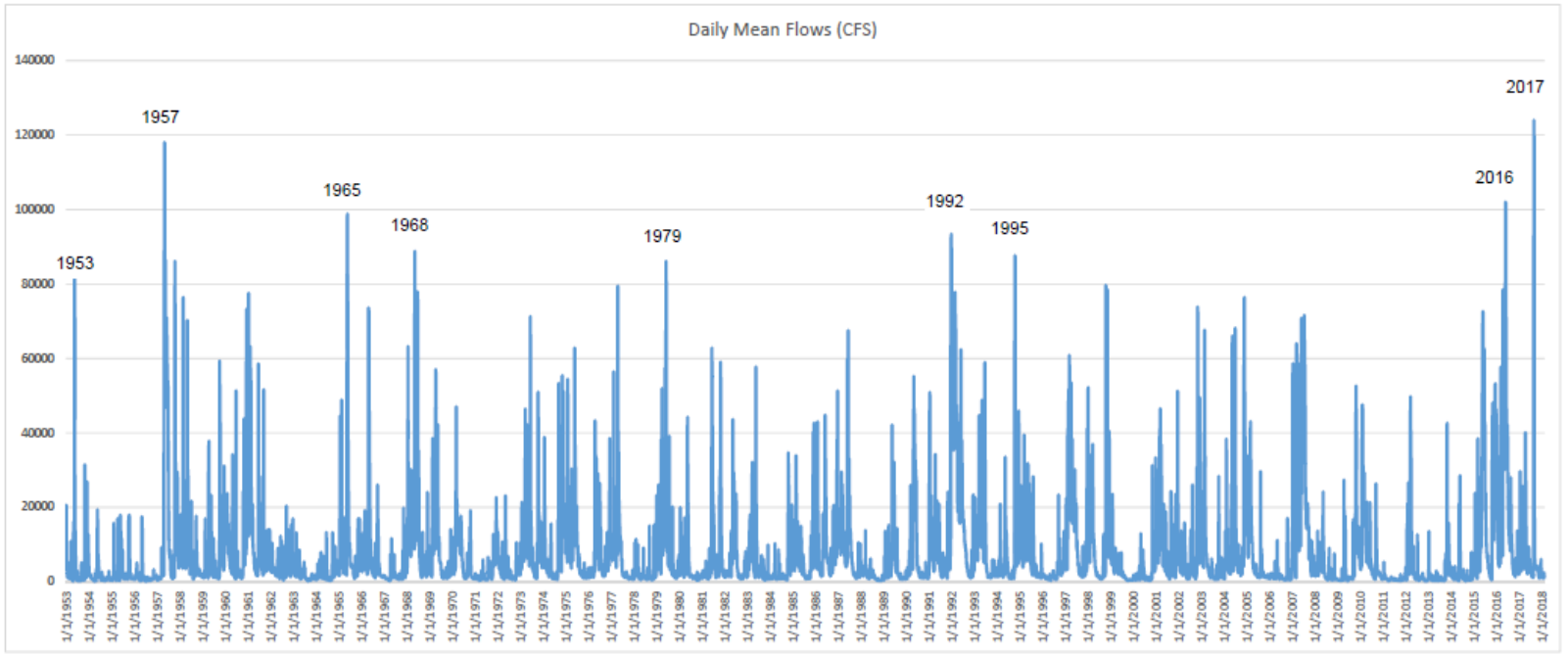
- **Obtained FAA approval to fly drone for the aerial survey of river banks**
- **Completed aerial survey along the river**
- **Completed Geotechnical investigation at Memorial Park**
- **Researched potential funding sources**
- **Met with LID 7 representative concerning their plans to address bank erosion**

AERIAL DRONE SURVEY OF RIVER

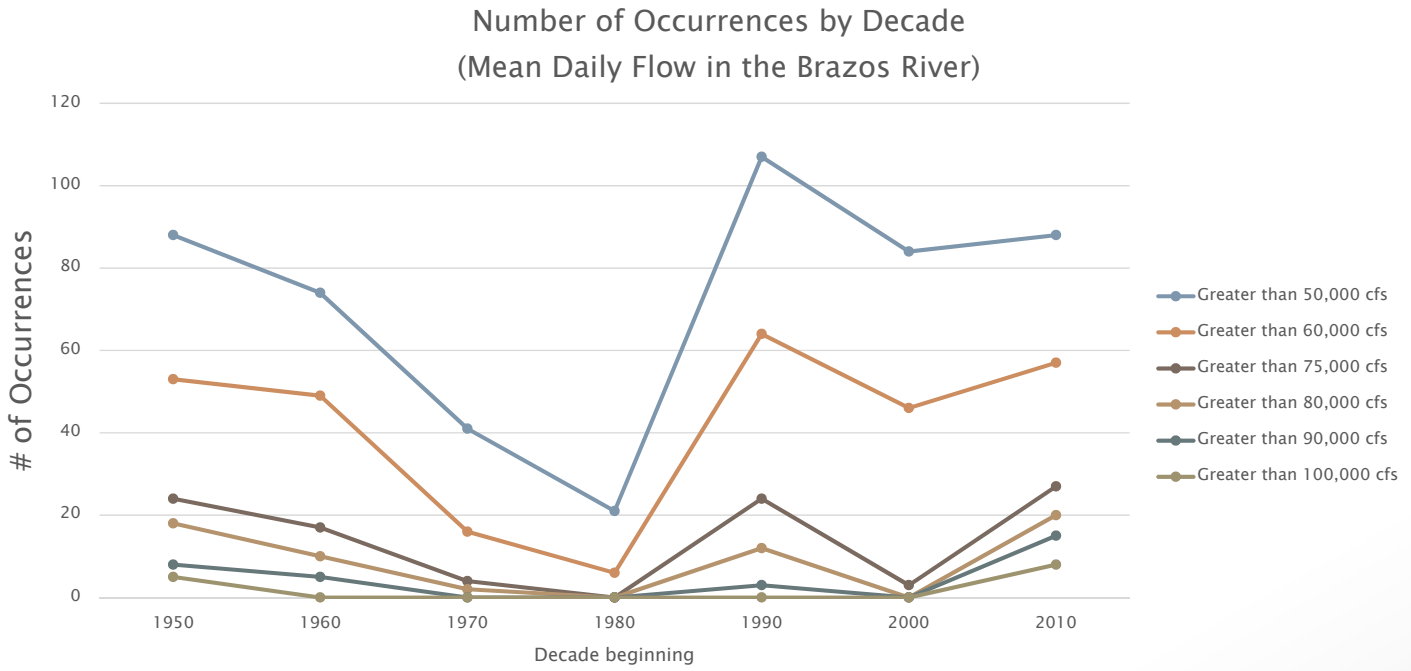

Continue Mission

GEOTECHNICAL INVESTIGATION

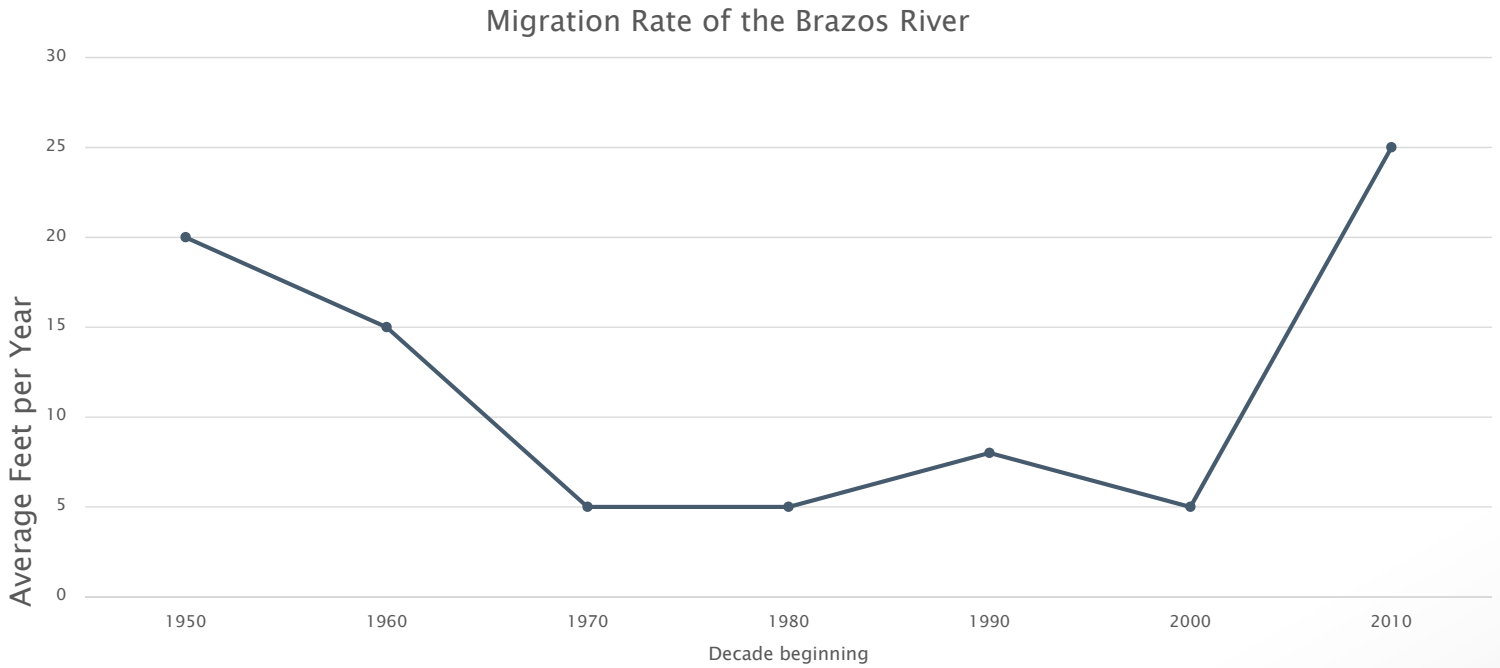
FLOW HISTORY OF THE BRAZOS RIVER



FLOW HISTORY OF THE BRAZOS RIVER



FLOW HISTORY OF THE BRAZOS RIVER



ON GOING ACTIVITIES

- **Perform Geotechnical testing of samples obtained at Memorial Park**
  - **Identify geotechnical characteristics of soils**
  - **To determine erosion rates**

- **Perform analysis using proposed methodology:**
  - **Determine critical velocities at the river bank**
  - **Determine probability, risk and consequences of failure**

Correlating Flows to Velocity

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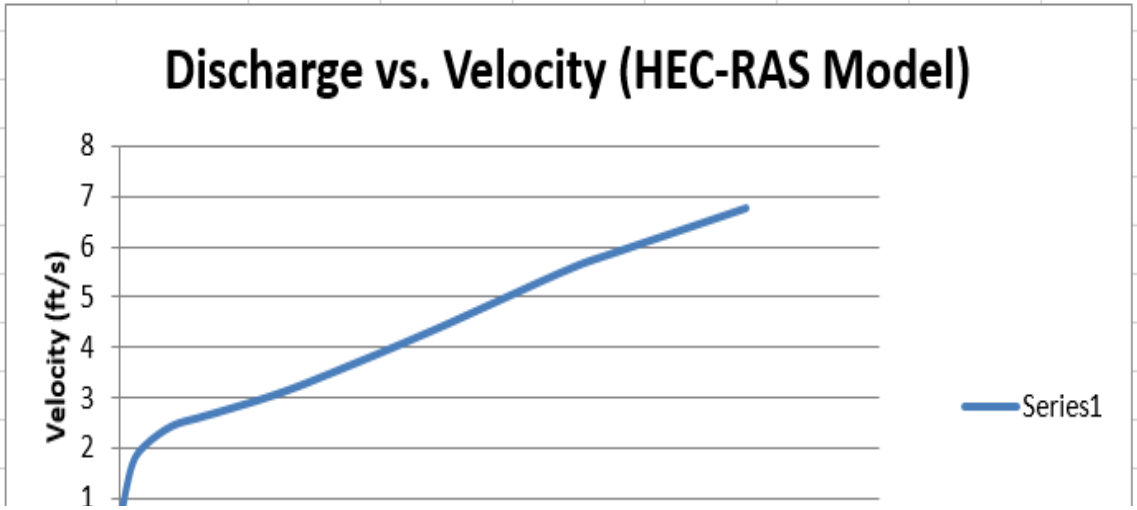
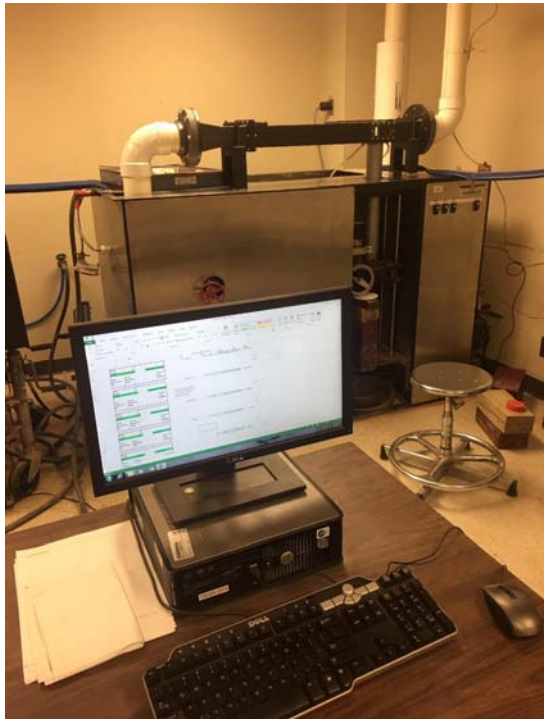
HEC-RAS Modeled Velocities	
Flow (cfs)	Velocity (ft/s)
206000	6.77
164000	5.91
147000	5.54
103000	4.34
68667	3.47
51500	3.07
34333	2.75
25750	2.6
17167	2.44

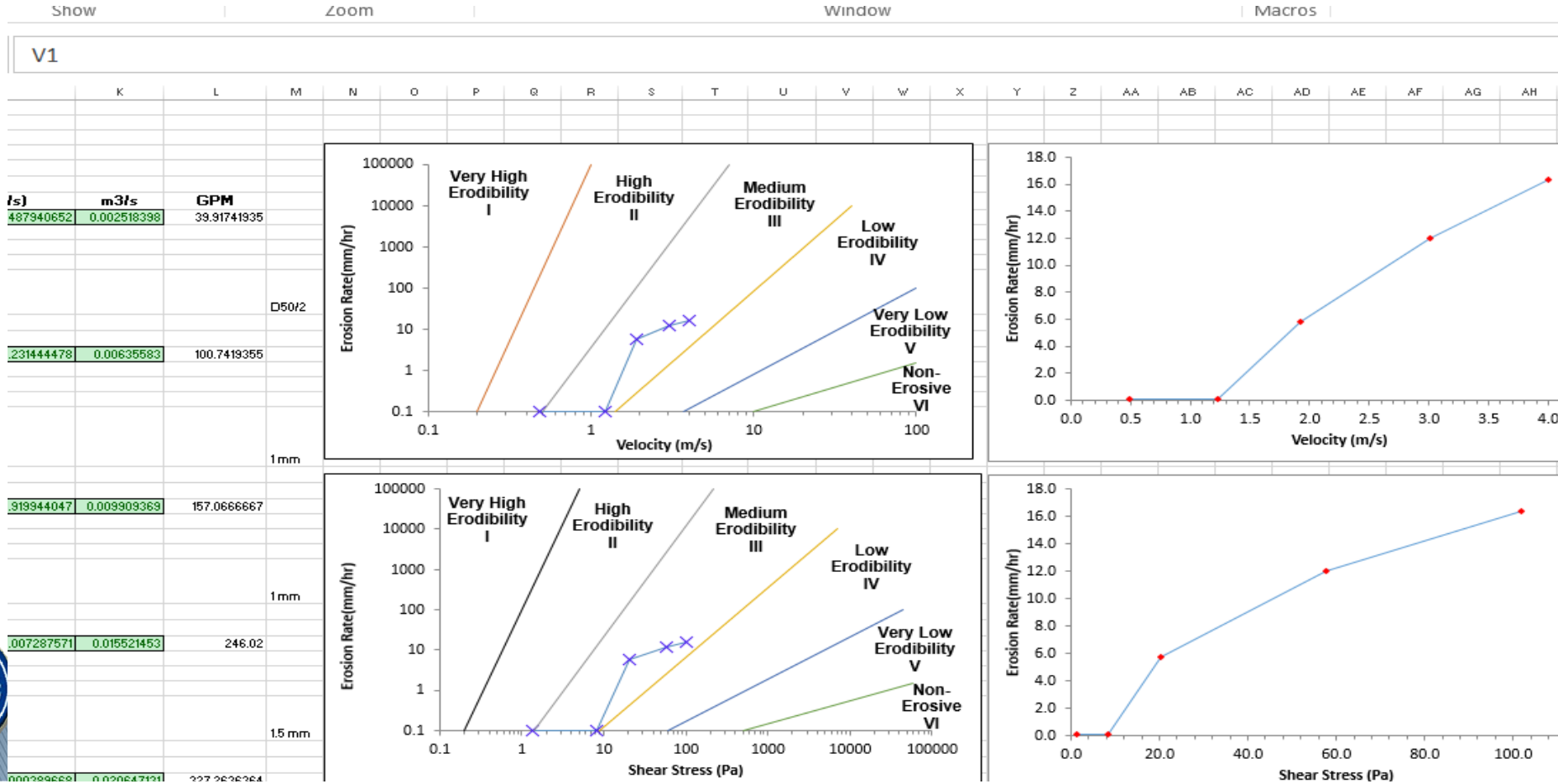


Soil Erodibility Testing at Texas A&M University

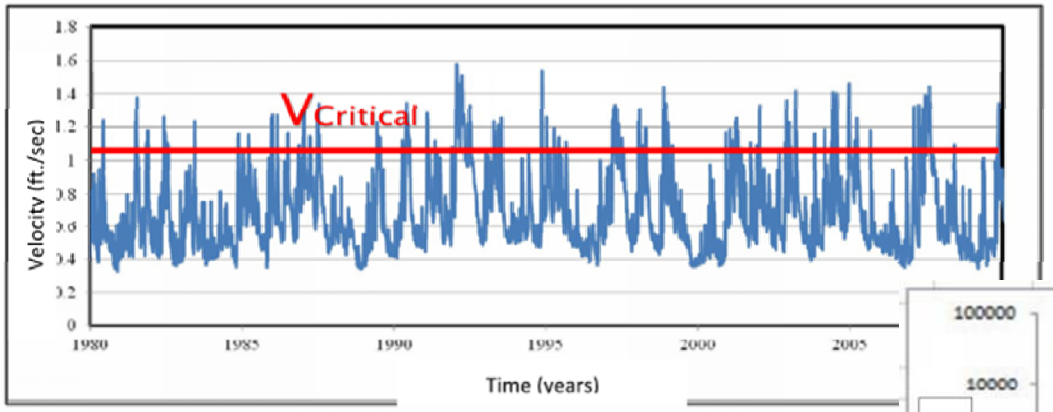
Soil Erodibility Testing at Texas A&M University

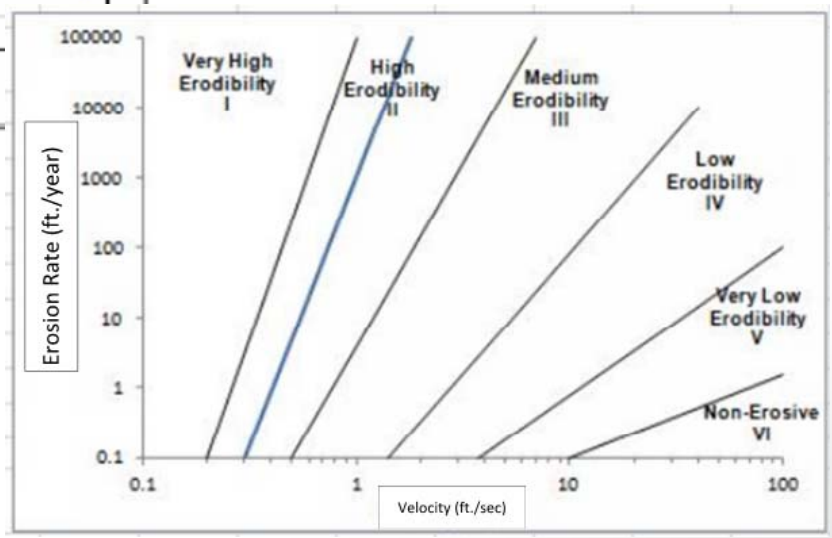


Soil Erodibility Testing at Texas A&M University



PROPOSED METHODOLOGY





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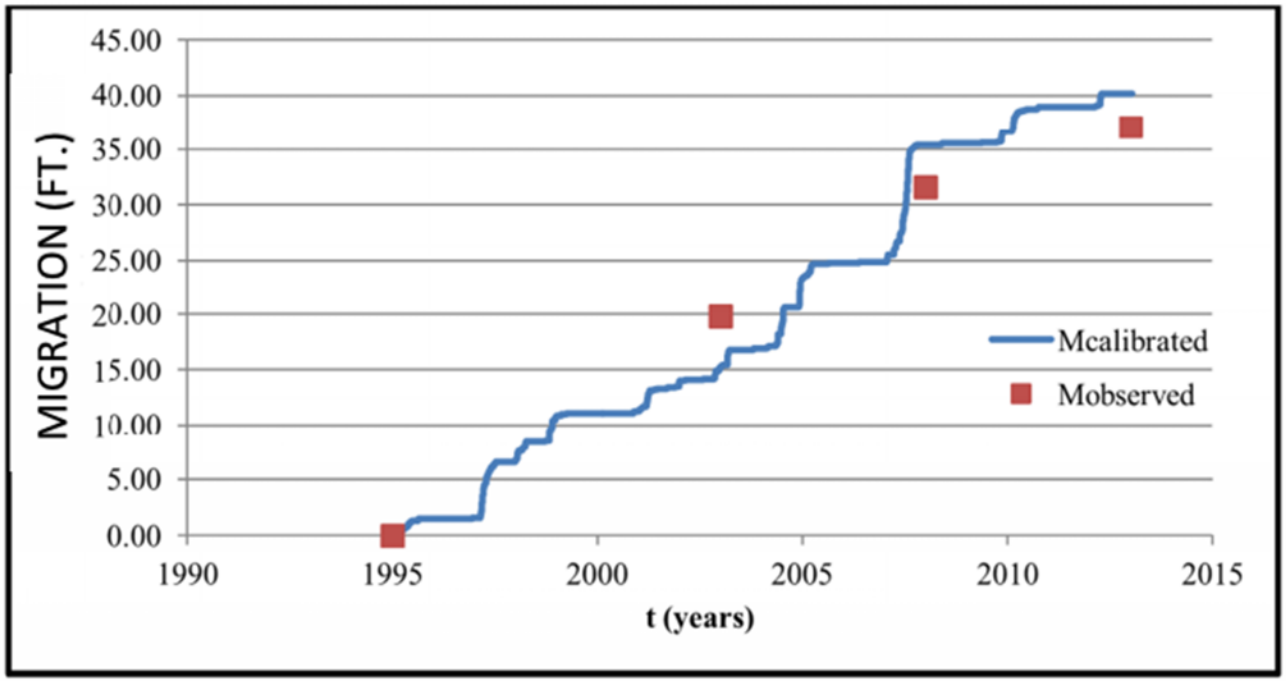

REMAINING TASKS

- **Conduct a Stakeholder Workshop with Fort Bend County, LIDs, TxDOT and other stakeholders (April/May 2018)**
- **Issue Final Report with Recommendation (May/June 2018)**
- **Workshop to City Council (June 2018)**

QUESTIONS / DISCUSSIONS