# BROWNSVILLE TO PORT ISABEL HUC-10 WATERSHED STUDY

*LOWER RIO GRANDE VALLEY 24TH ANNUAL WATER QUALITY MANAGEMENT & PLANNING CONFERENCE*

**JUNE 10, 2022**

HALFF

Texas Water Development Board

City of BROWNSVILLE Texas
On the Border By the Sea

# PROJECT TEAM

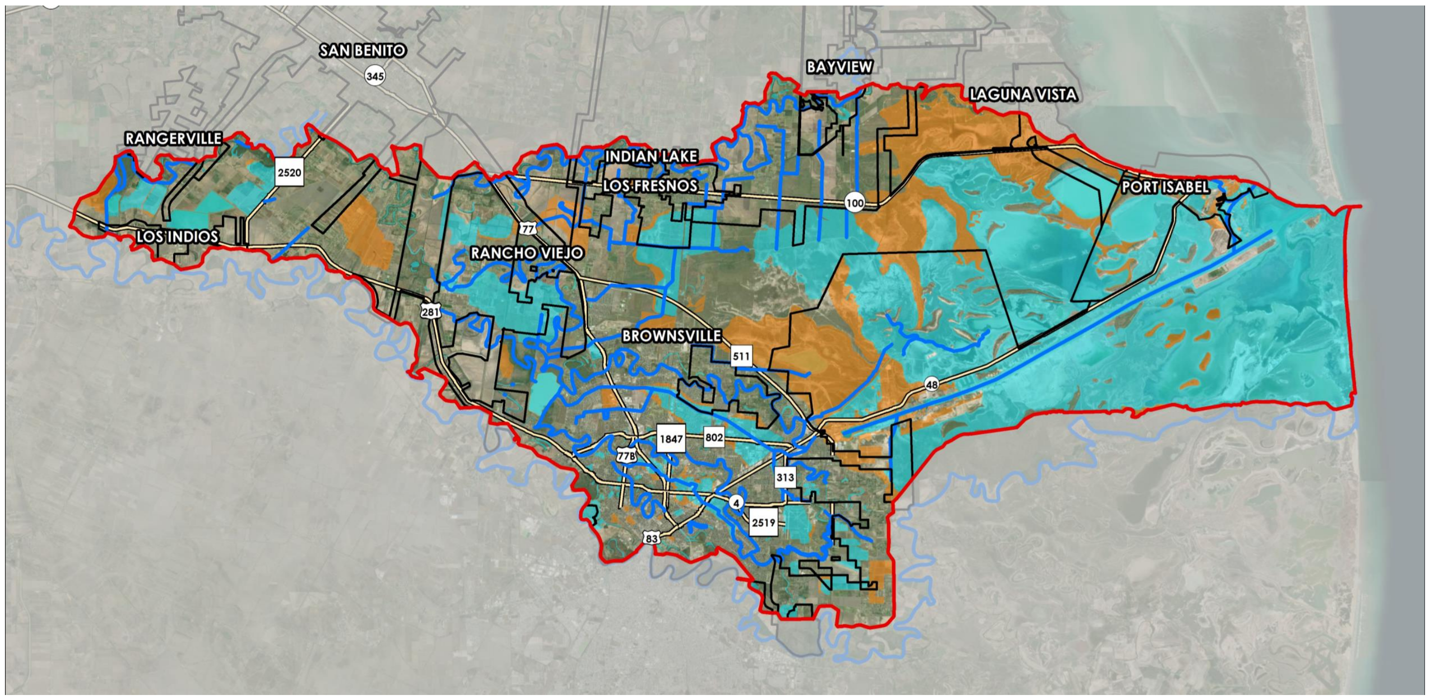
- ❑ Technical Consultant (Halff Associates)
  - Anne Whitko – Sponsor Liaison
  - John Clint, PE – Sponsor Liaison
  - Ryan Londeen, PE, CFM – Project Manager
  - Andrew Moore, PE, CFM – Technical Consultant
  - Elmer Hinojosa, EIT – Production Staff
  - Grimaldo Carrillo – Production Staff

- ❑ Sponsor (City of Brownsville)
  - Doroteo Garcia, PE – City Engineer
  - Luis Alonso, PE – Assistant City Engineer

- ❑ TWDB
  - Malcolm Hamilton – TWDB Representative

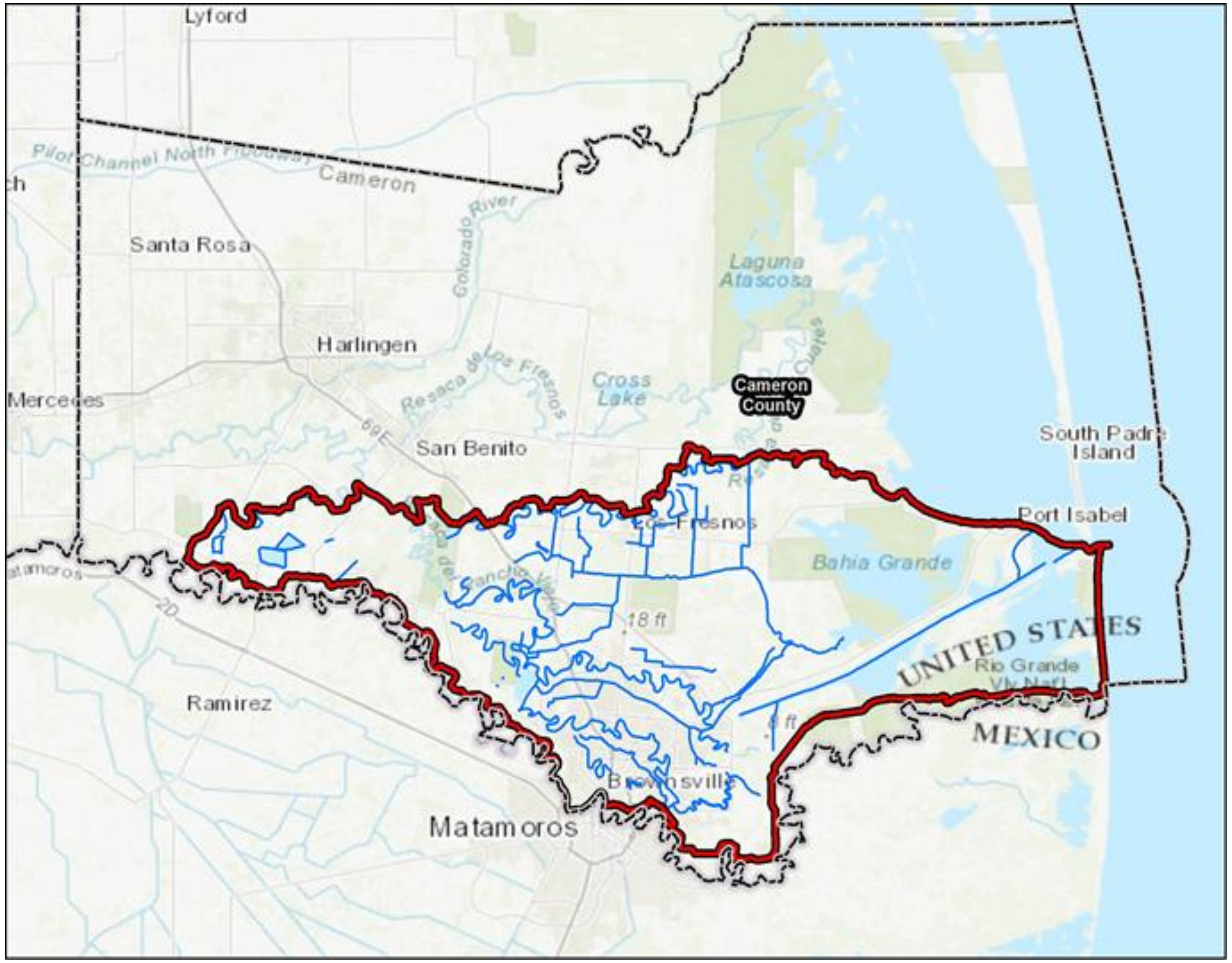
# OVERVIEW

- ❑ Study Area
- ❑ Study Goals and Scope
- ❑ Project Schedule
- ❑ Data Collection
- ❑ Flood Modeling
- ❑ Next Steps
- ❑ Questions



# STUDY AREA

- Encompasses 366 square miles of Cameron County's southern region.
- Major Stakeholders:
    - Los Fresnos
    - Rancho Viejo
    - Olmito
    - Brownsville
    - Port Isabel
- Approx. Population within study area = 290,000
- Over 250 miles of Drainage Ditches/Resacas
- Effective Floodplain = 190 square miles
- Region drains east through a series of natural and man-made channels to the Bahia Grande and ultimately to the Gulf of Mexico

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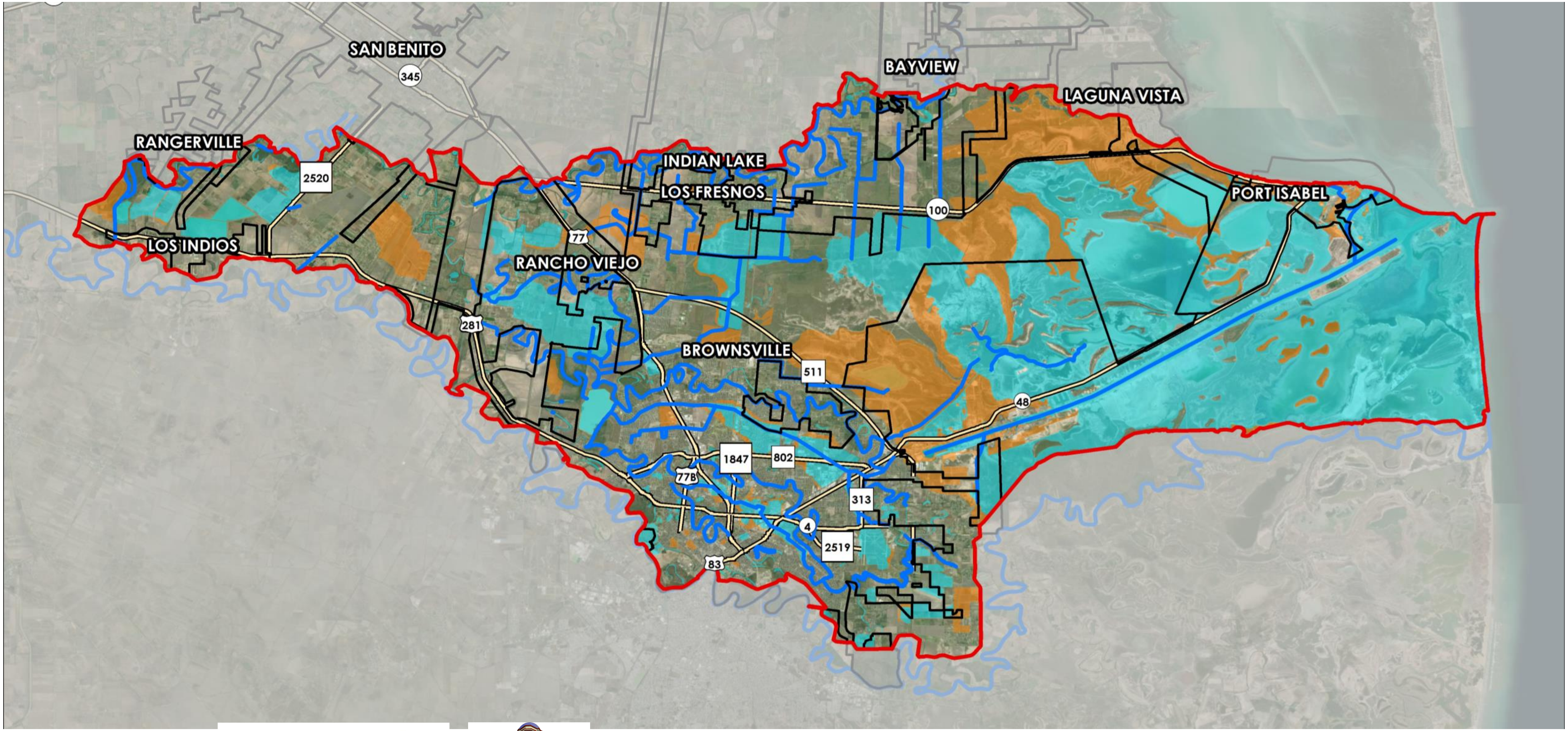
# STUDY AREA OVERVIEW

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# STUDY GOALS AND SCOPE

- ❑ Public and Stakeholder Engagement
  - ❑ Feedback
  - ❑ Education
- ❑ Develop up-to-date flood **models**
- ❑ Identify areas of high flood risk
- ❑ Identify and evaluate 10 mitigation **projects**
  - ❑ Scope
  - ❑ Benefit
  - ❑ Cost
  - ❑ Impacts
- ❑ Create flood risk **mapping**
- ❑ Drainage Master Plan and CIP

Rapid Assessment Model (RAS 2D)

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Identify 10 Problem Areas

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Detailed Modeling of Problem Areas

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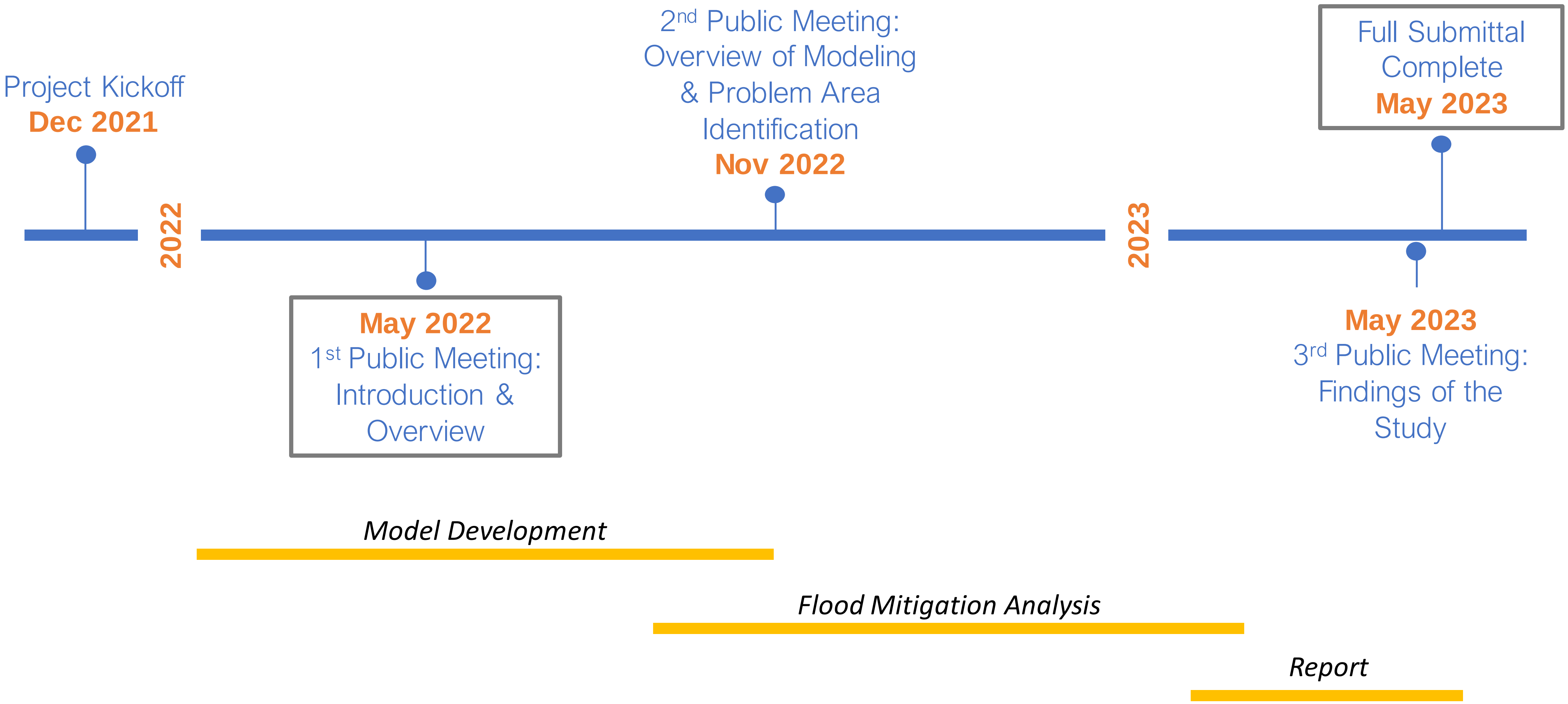
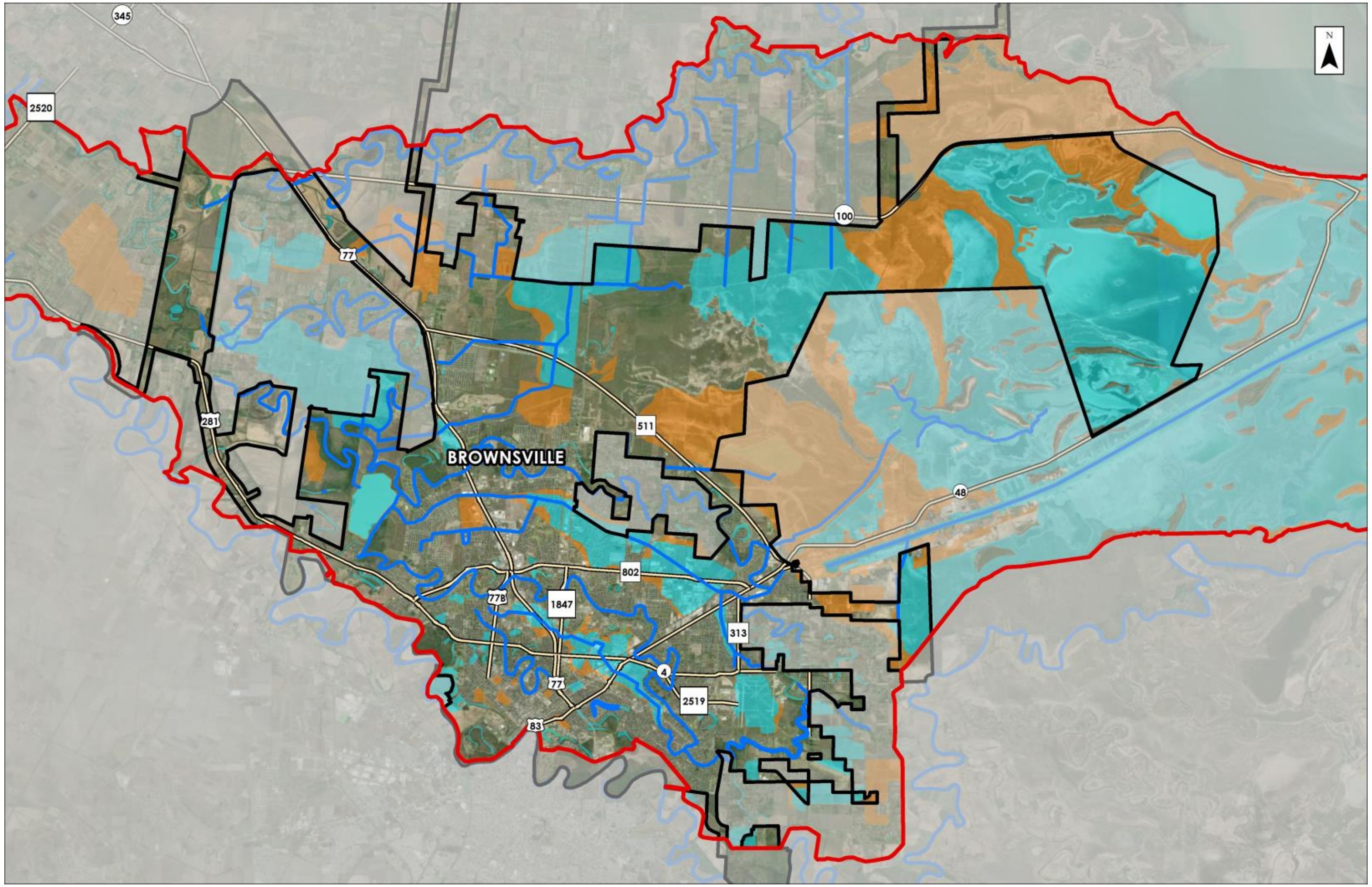
Recommend 10 Structural Mitigation Projects

# SCHEDULE


Project Kickoff
Dec 2021
2022
May 2022
1st Public Meeting: Introduction & Overview
2nd Public Meeting: Overview of Modeling & Problem Area Identification
Nov 2022
2023
Full Submittal Complete
May 2023
May 2023
3rd Public Meeting: Findings of the Study
Model Development
Flood Mitigation Analysis
Report

# DATA COLLECTION - OVERVIEW

- ❑ Repetitive Loss Data
- ❑ ID Known flooding issues
- ❑ Major Flood Complaints
- ❑ Previous Drainage Studies
- ❑ GIS Data (storm sewer, etc)
- ❑ Previous models
- ❑ As-Builts of Drainage Structures
- ❑ Bid Tabs for Recent Drainage Projects
- ❑ Other information

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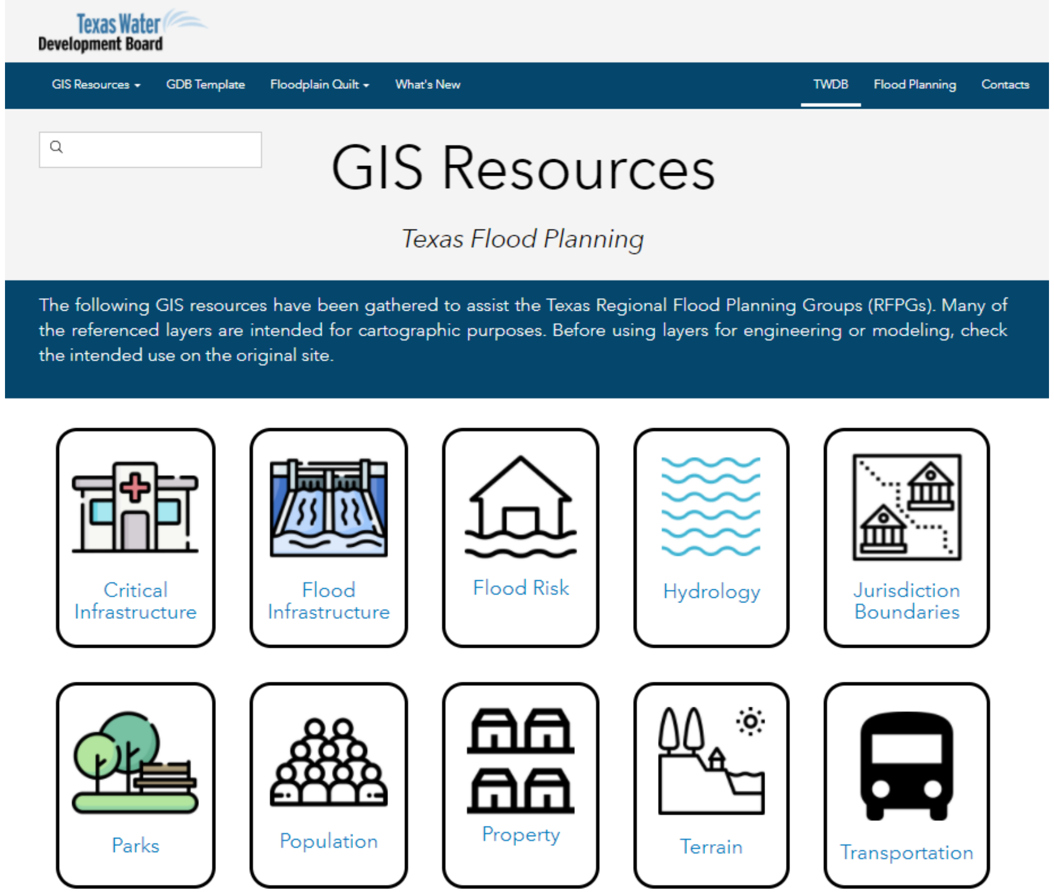
# DATA COLLECTION - RESOURCES

## TWDB




## OTHER DATA SOURCES

City of Brownsville Texas
US Army Corps of Engineers
Town of Rancho Viejo Texas
Los Fresnos Texas – Community with Opportunity
U.S. Department of Homeland Security – FEMA
Texas Parks & Wildlife
National Oceanic and Atmospheric Administration – NOAA – U.S. Department of Commerce
Texas Department of Transportation
National Weather Service
USGS science for a changing world
USDA

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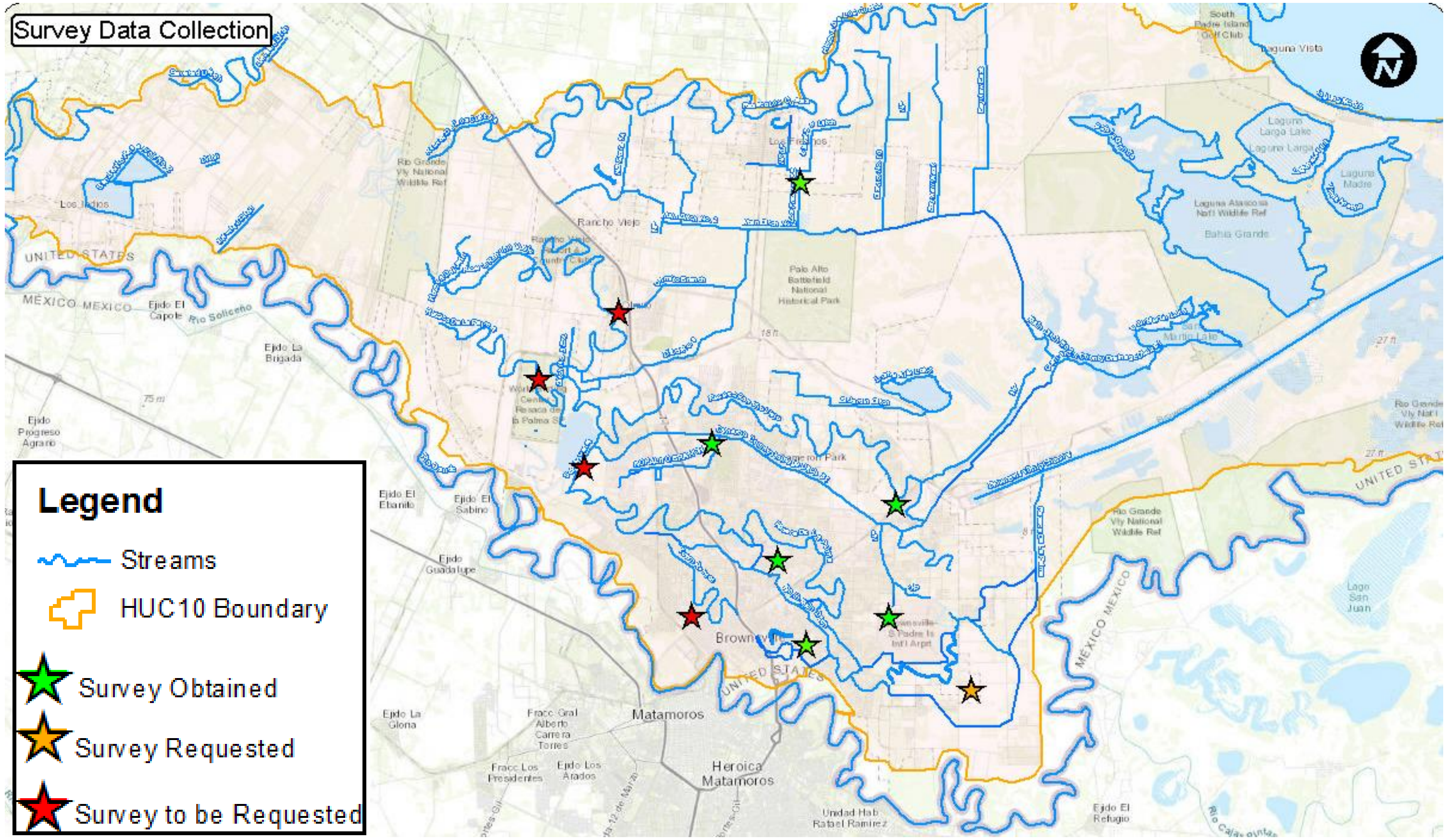
# DATA COLLECTION - SURVEY

## Survey Data Collection

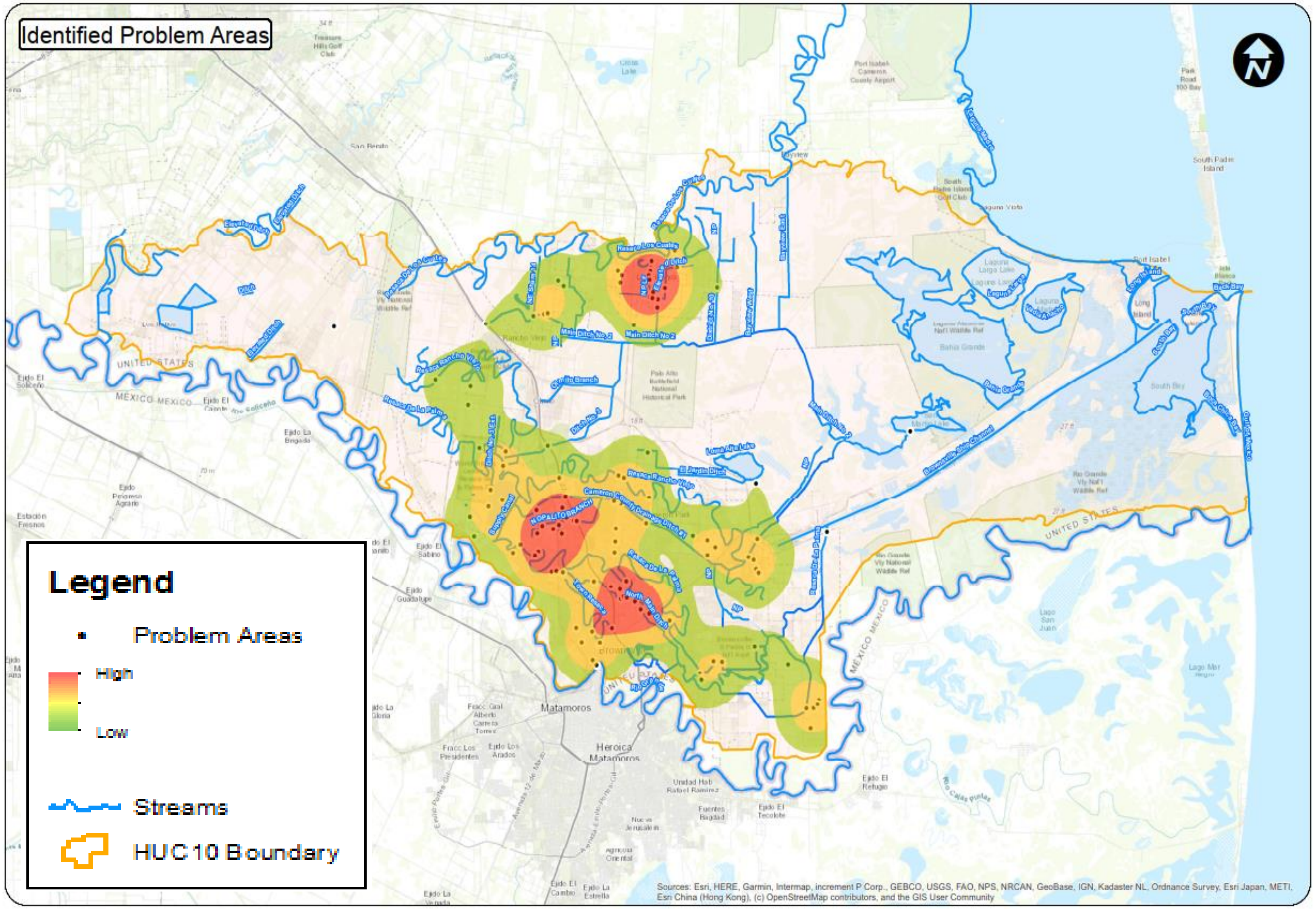
- ❑ Focusing on areas with current data gaps
- ❑ Stars represent areas where we have obtained survey or waiting to get survey
- ❑ Will continue to identify areas where topographic data is needed
- ❑ Survey Data Requested
    - ❑ Over 100 Crossing Structures (Culverts, Bridges)
    - ❑ Over 350 Channel Cross-Sections
- ❑ Channel survey is being converted to TINs to be burned into base Lidar.



# DATA COLLECTION – PRELIMINARY HOT SPOT ANALYSIS

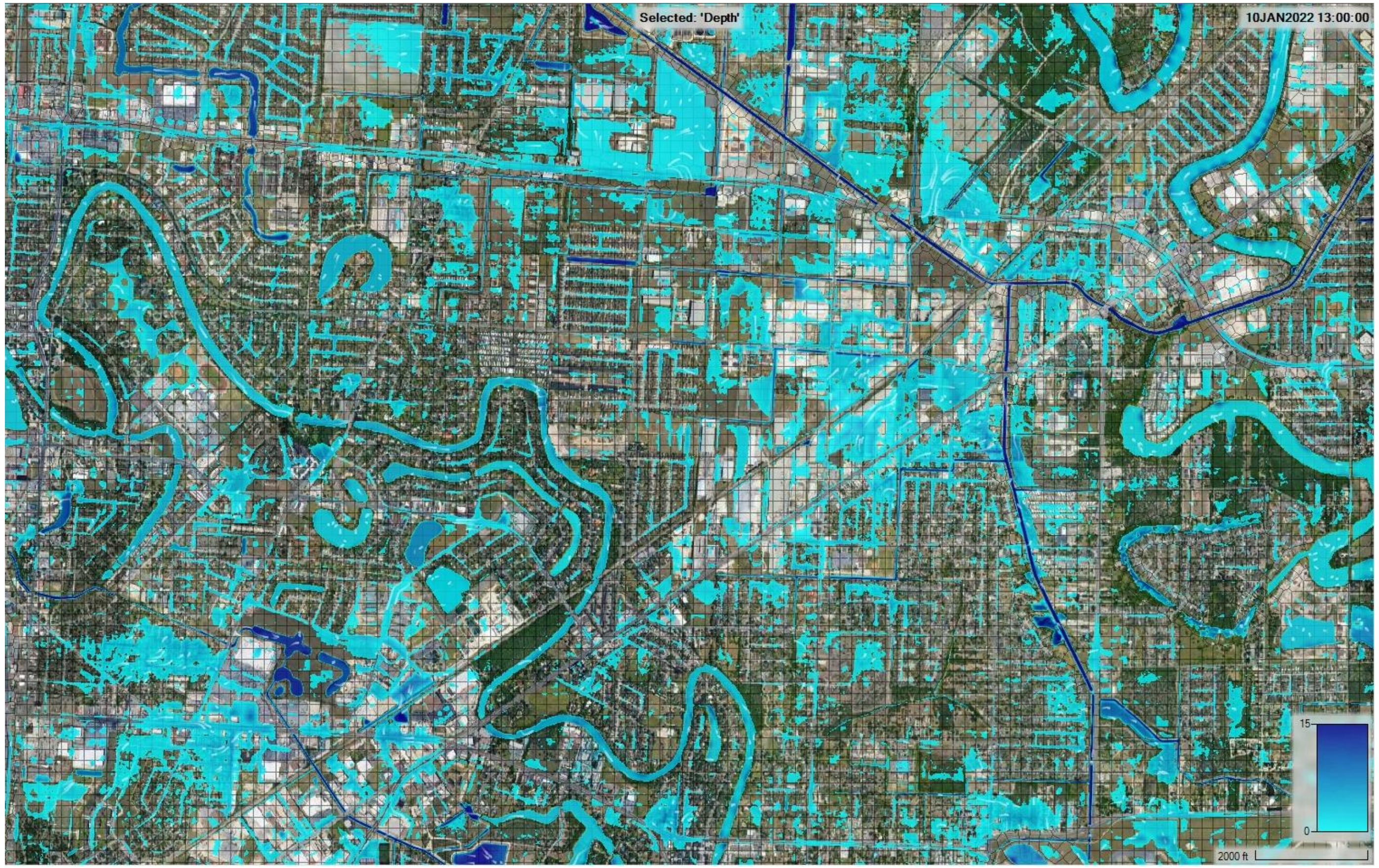
### Community Stakeholders Meetings

- ❑ Met with various stakeholder representatives to get feedback
- ❑ Got input / feedback on
  - ❑ Local drainage issues
  - ❑ Drainage patterns
  - ❑ Past drainage projects
  - ❑ Past drainage studies
  - ❑ Locations of anticipated development

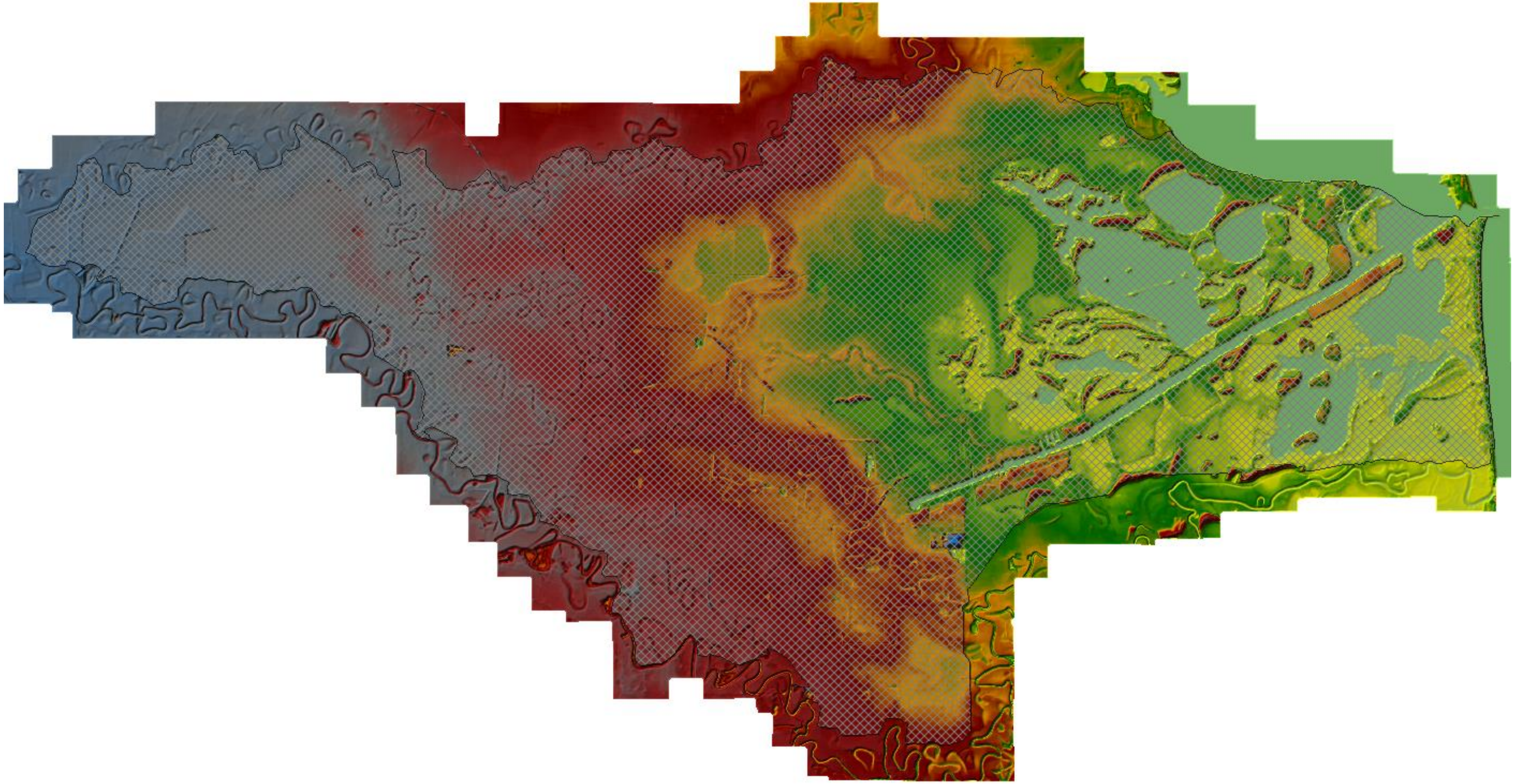


# FLOOD MODELING

- ❑ Developing detailed 2D flood model for entire 366 square mile area
- ❑ Using latest modeling technology
- ❑ Using latest statistical rainfall – Atlas 14
- ❑ “Synthetic” rainfall used to simulate storms

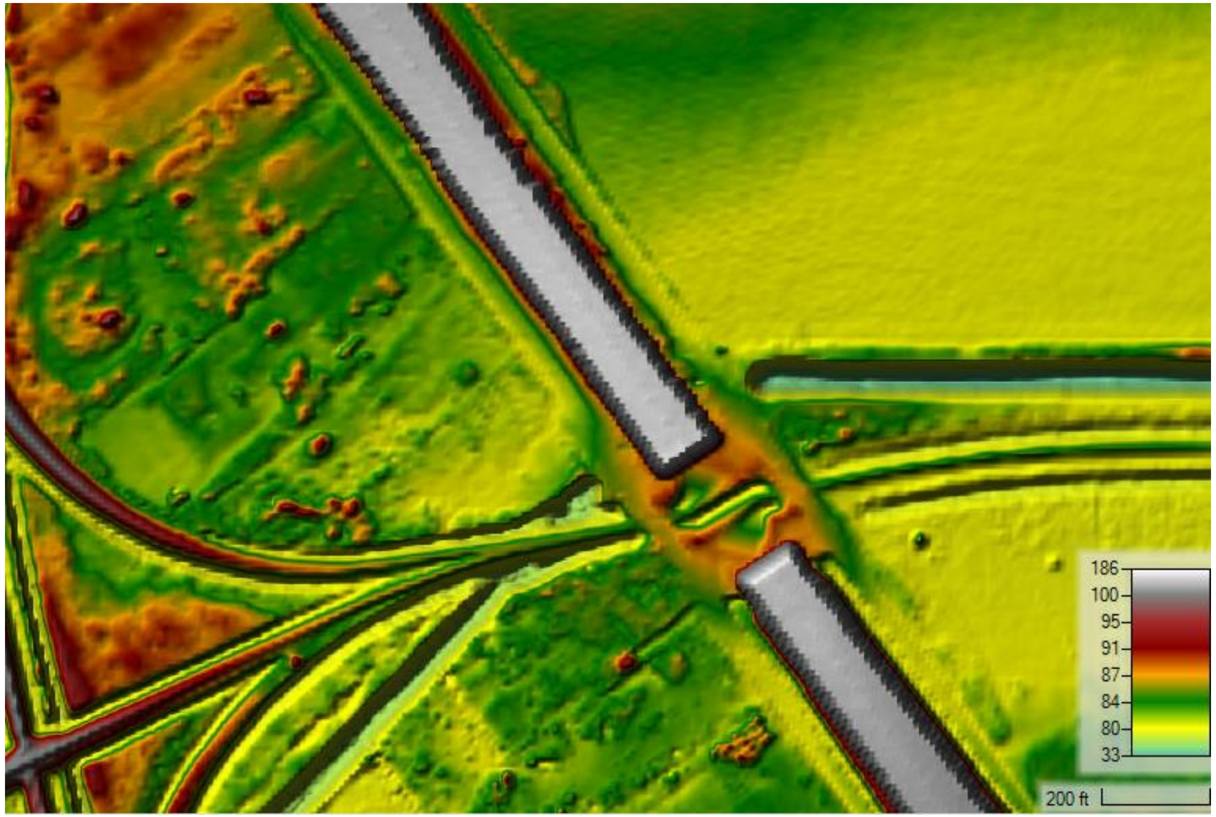


# FLOOD MODELING - DRAFT RAIN-ON-MESH MODEL (TERRAIN)

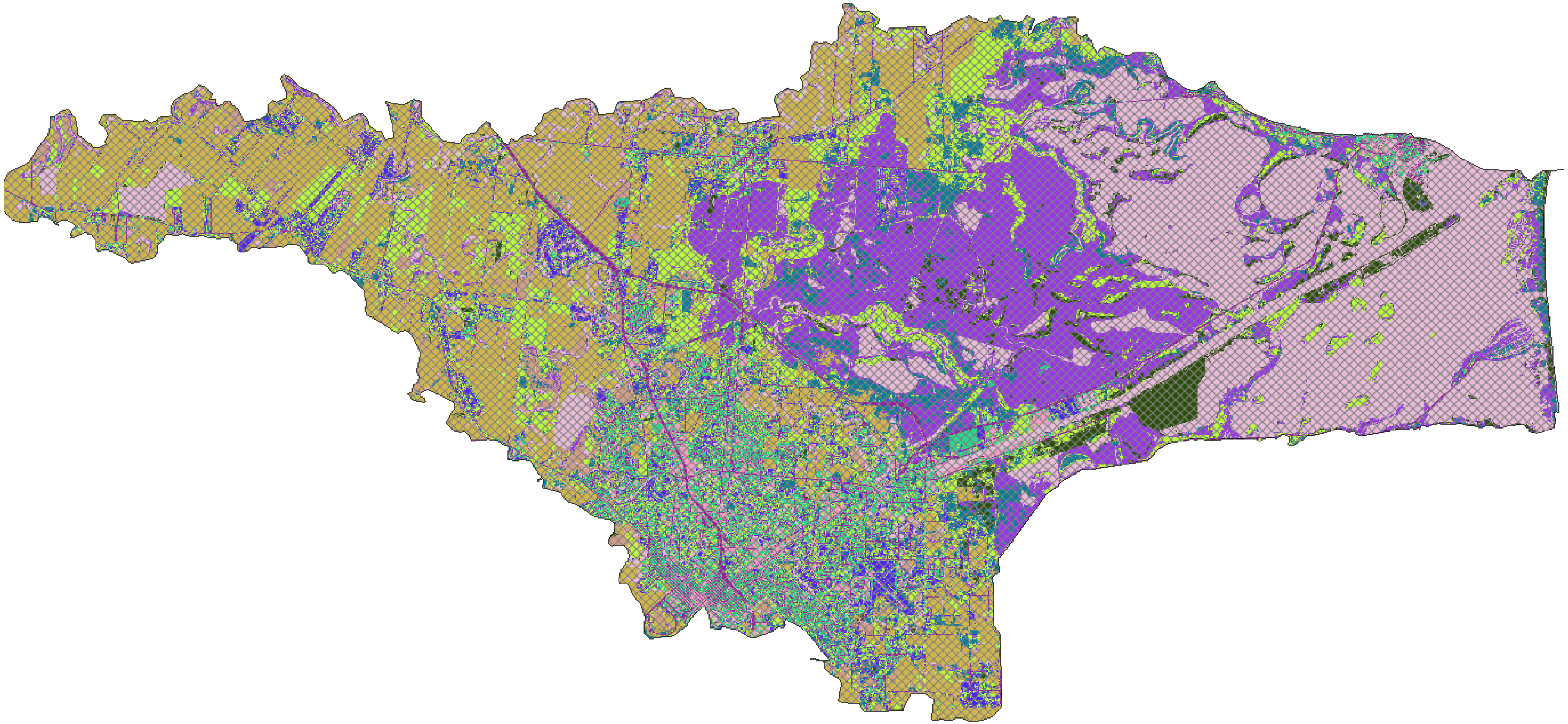


*Source: TNRIS*

# FLOOD MODELING - TERRAIN CONDITIONING

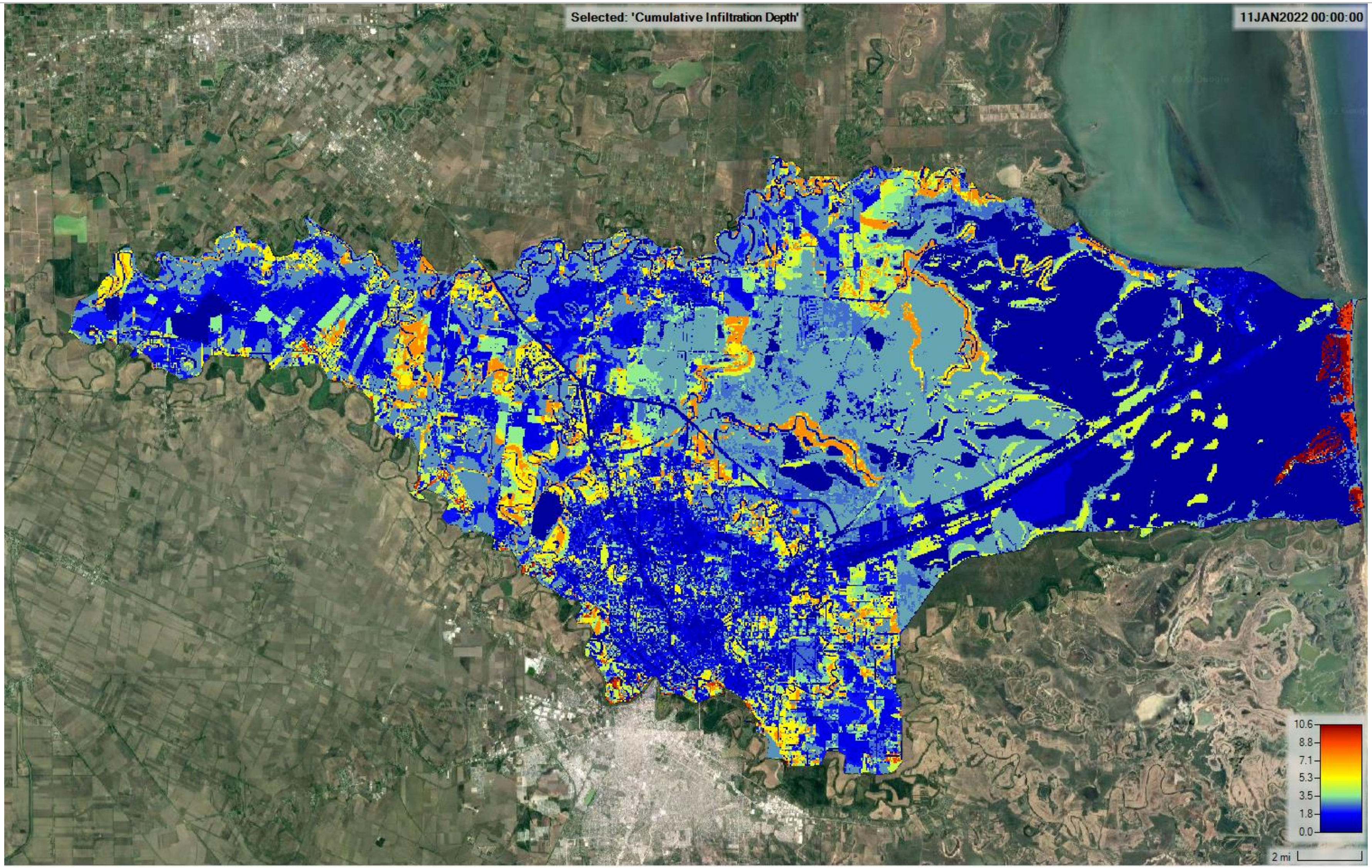



# FLOOD MODELING - MANNING'S N



*Source: Multi-Resolution Land Characteristics (MRLC) Consortium*

# FLOOD MODELING - INFILTRATION

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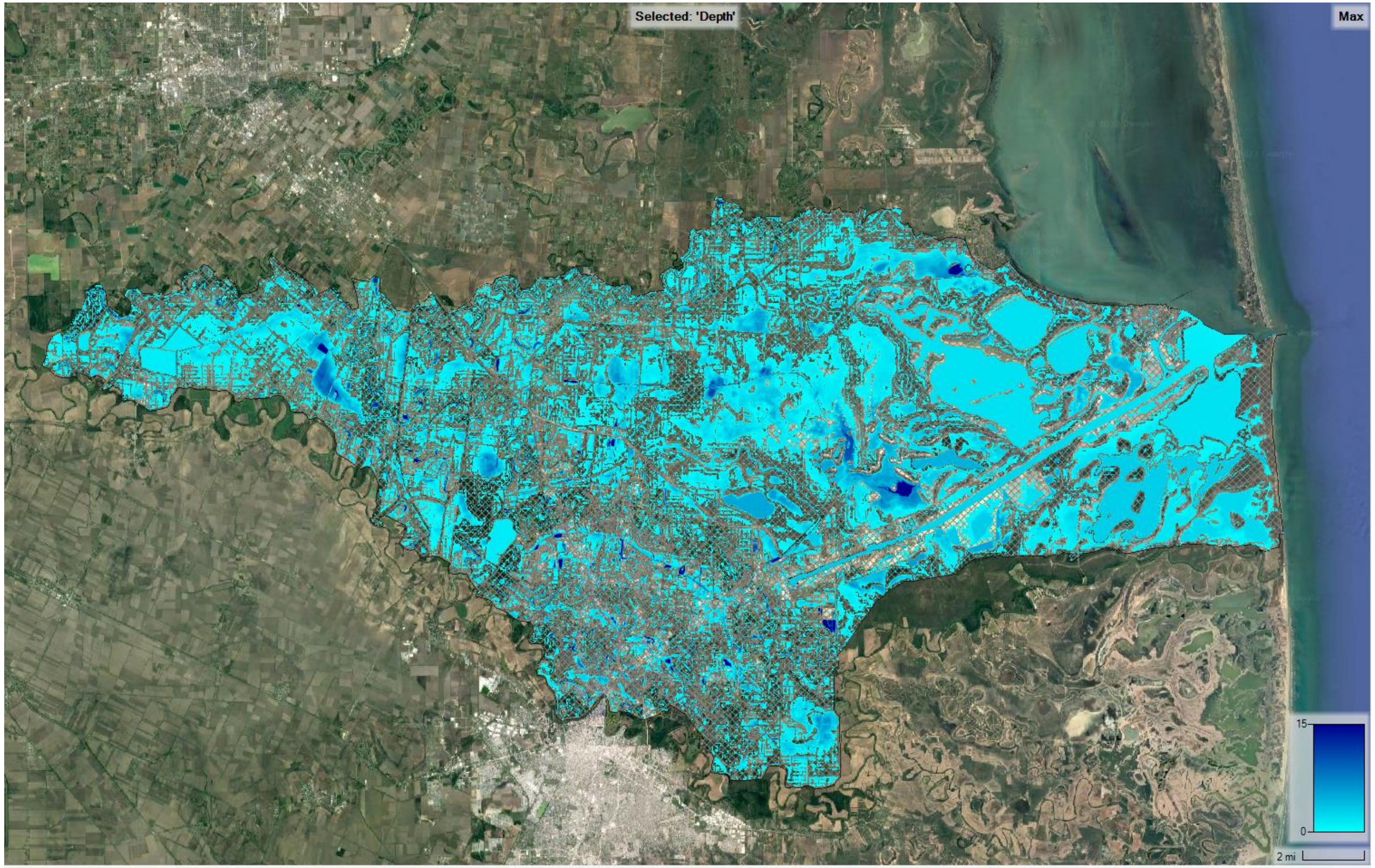
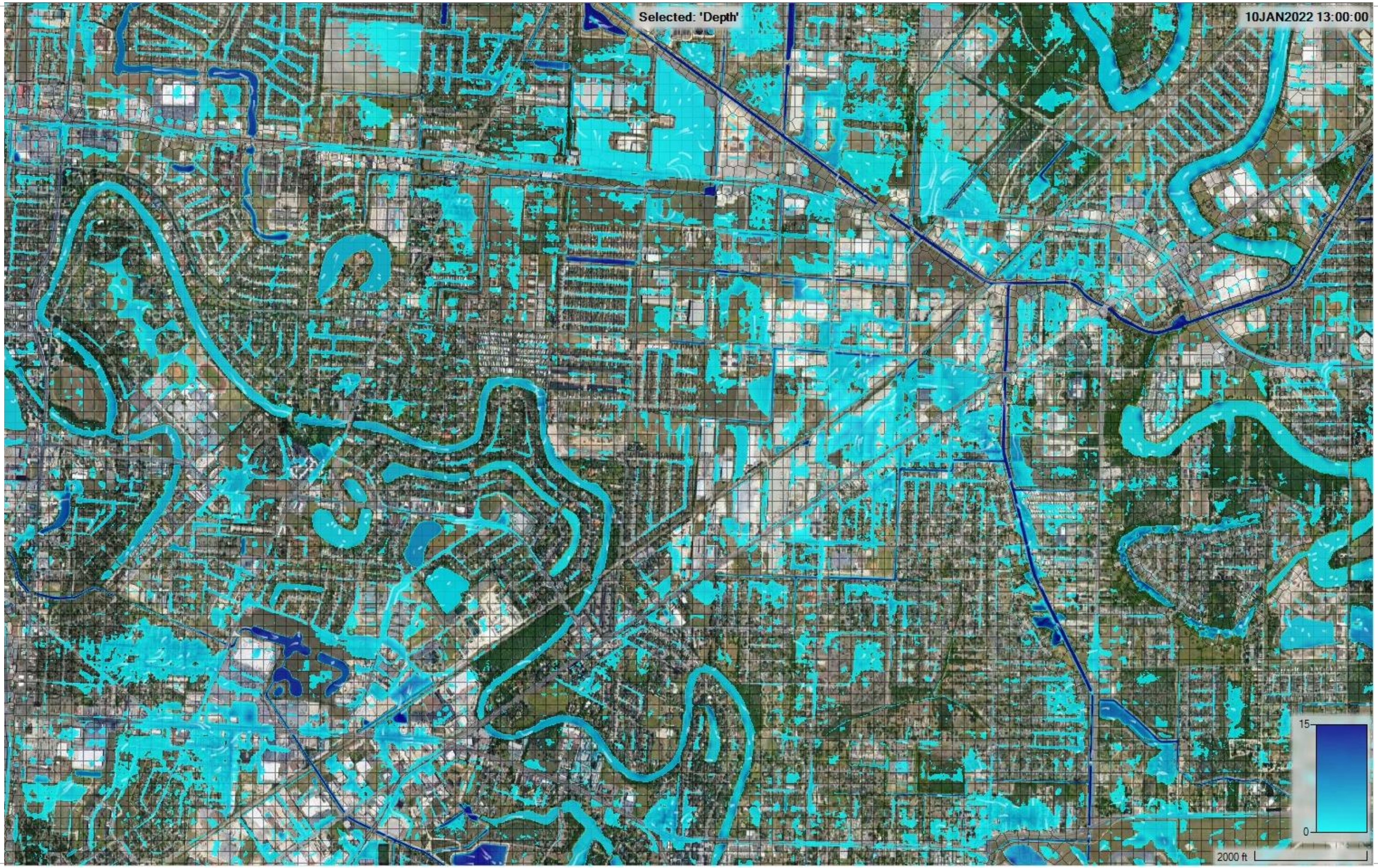
# FLOOD MODELING - DRAFT RAIN-ON-MESH MODEL

- Rapidly Developed Rain-On-Mesh Results (Preliminary)
  - Pure 2D hydraulic model
  - No crossing structures
  - Precipitation applied directly to cells
  - Infiltration and routing done within the hydraulic model
- Used to facilitate model development strategy
- Will be used as a basis for future detailed modeling

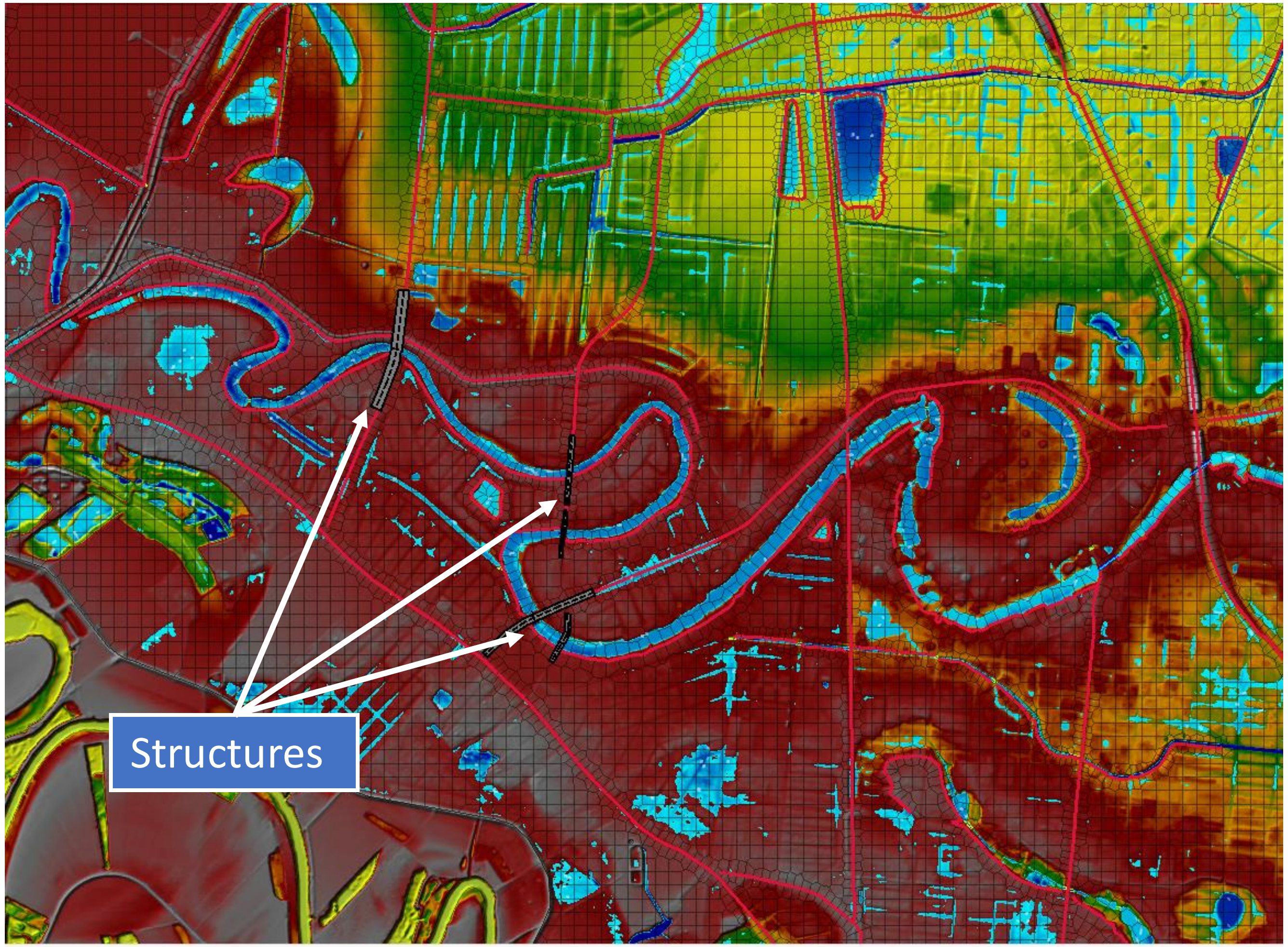


# FLOOD MODELING - DRAFT RAIN-ON-MESH MODEL (PONDING)



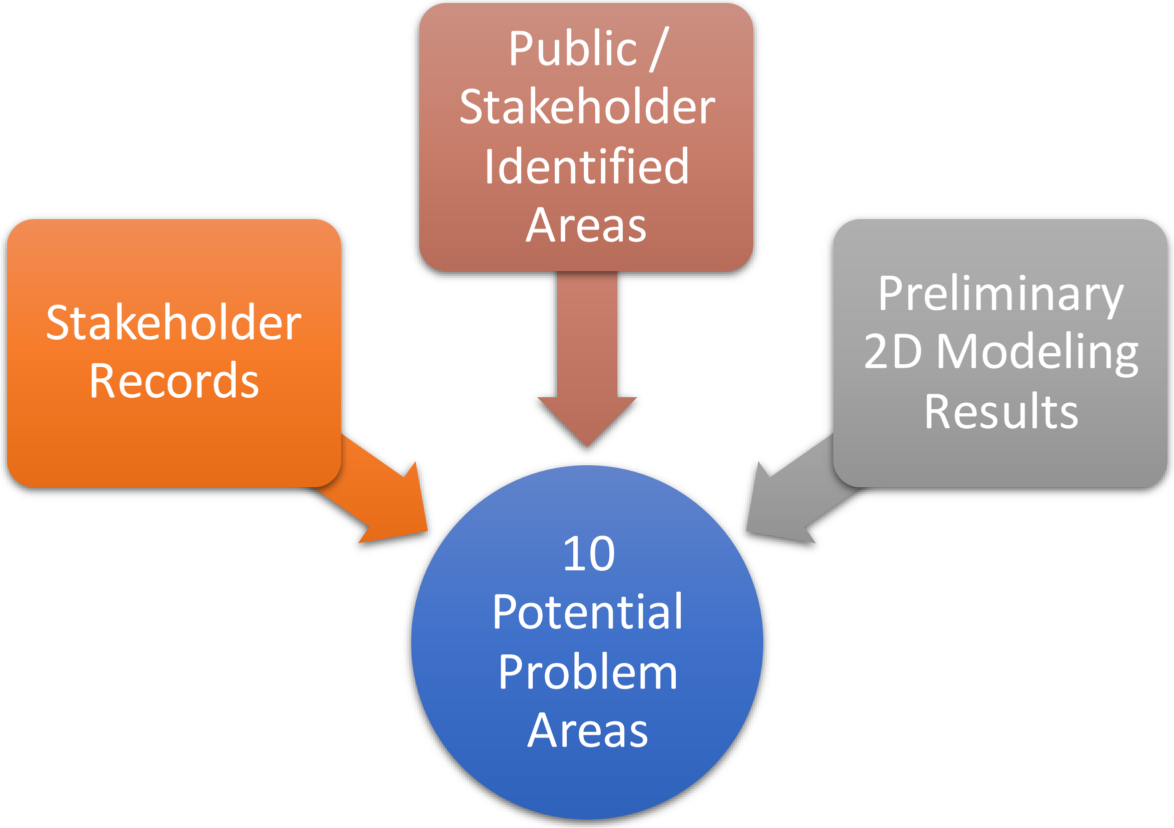
# FLOOD MODELING – IN PROGRESS

- Traditional Hydrology
  - 4 Basins with different terrain characteristics being analyzed to compare against 2D modeling results
- Incorporating structures into Hydraulic Model
  - Currently adding structures obtained from previous models.
  - Focusing on main drainage channels right now
  - Will input structures from survey requests where data is missing.
- Lidar will be updated with TINs generated from surveyed channel cross-sections.
- Identifying areas where model can be split in case runtimes get too long



# NEXT STEPS

- ❑ Calibrate model
  - ❑ Based on gage locations and records, determine if any calibration data is available
  - ❑ Run historic rain events (if available) and begin calibration efforts
- ❑ Validate model
  - ❑ Pictures
  - ❑ Feedback we got from stakeholders
  - ❑ Flooding complaint records
- ❑ Identify areas of high flood risk
  - ❑ Stakeholder records
  - ❑ Input received from public and stakeholder meetings
  - ❑ Modeling results



# NEXT STEPS - MITIGATION PROJECTS

- ❑ Utilizing modeling results and community feedback to identify high flood risk areas
- ❑ Models will also be used to develop and evaluate flood mitigation projects
- ❑ Types of projects to be considered
  - ❑ Channels (e.g., Widening )
  - ❑ Channel Benching
  - ❑ Culvert Replacement
  - ❑ Bridge Widening
  - ❑ Detention Ponds

# QUESTIONS?

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