EAST BATON ROUGE

STORMWATER MASTER PLAN

UNDERSTAND. PLAN. IMPLEMENT.

NUMERICAL MODELING

Claycut Bayou HEC-RAS and PCSWMM Models

EAST BATON ROUGE
STORMWATER MASTER PLAN
UNDERSTAND. PLAN. IMPLEMENT.

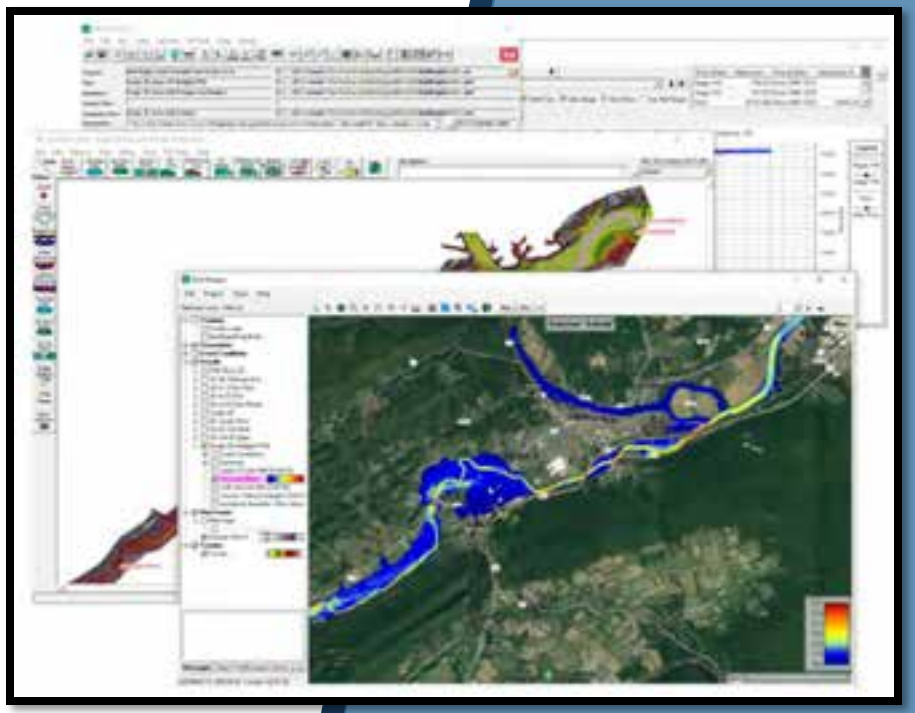
What is numerical modeling?

- Mathematical or numerical model is solving an equation or set of equations that describes the behavior of the real-world system.
- Computer simulation is the process of mathematical modeling, performed on a computer, which is designed to predict the behavior of or the outcome of a real-world or physical system.
- Models are essential in performing complex analyses and in making informed predictions.

Numerical Modeling

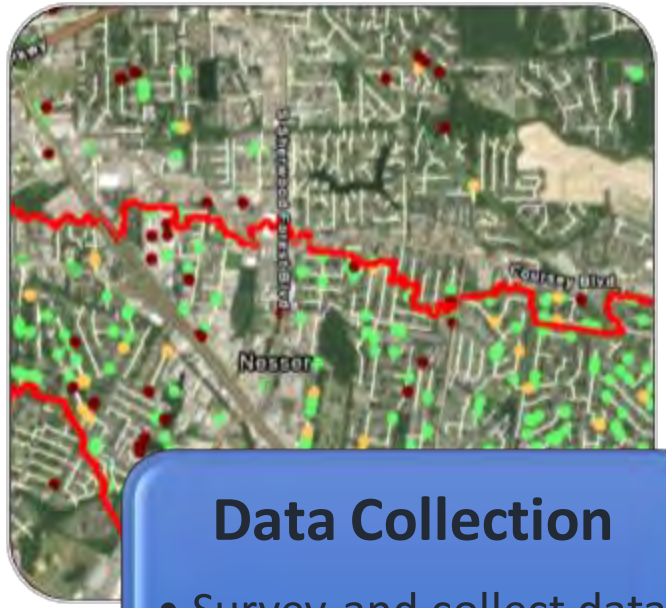
- Numerical models are mathematical models that use some sort of numerical time-stepping procedure to obtain the system behavior over time.

- Numerical models of hydraulic flows are computer programs designed to solve the basic fluid mechanics equations.
  - The Hydrologic Engineering Center's (HEC) River Analysis System (HEC-RAS) software allows you to perform one-dimensional(1D) steady state and 1D and two-dimensional (2D) unsteady flow river hydraulics calculations.
  - Personal Computer Storm Water Management Model (PCSWMM) is advanced modeling software for stormwater, wastewater, and water distribution systems.



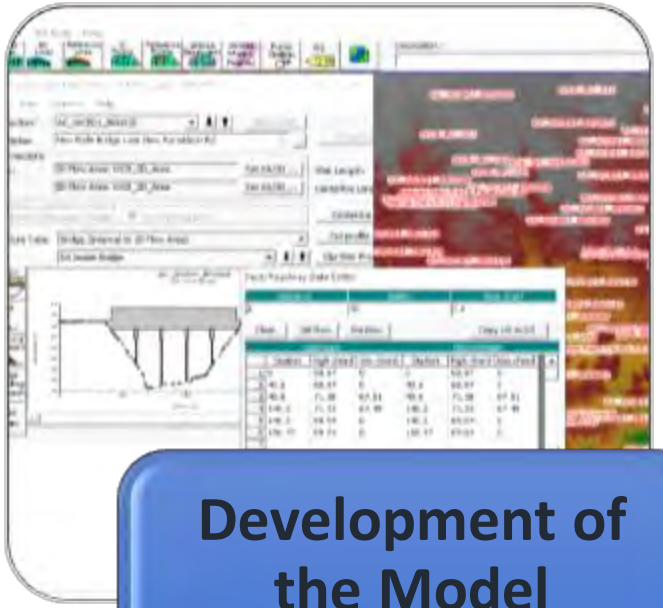
PCSWMM

Process



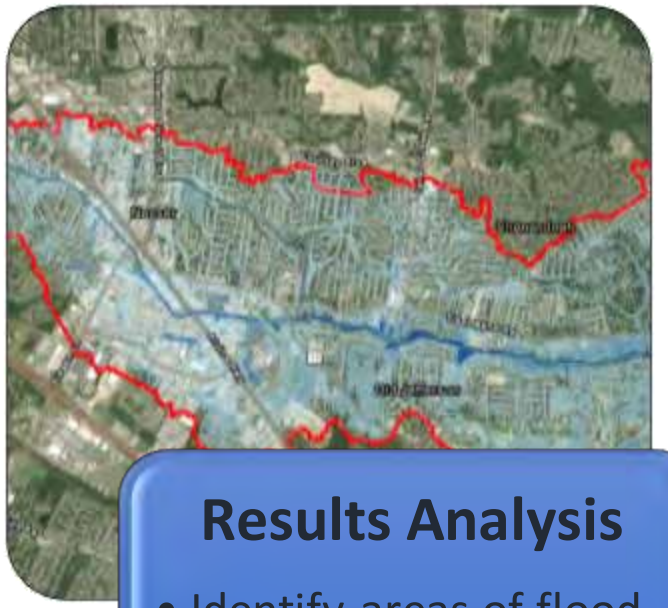
Data Collection

- Survey and collect data
- Open channel
- Subsurface drainage systems



Development of the Model

- Input data into the model
- Calibrate and Validate the Model

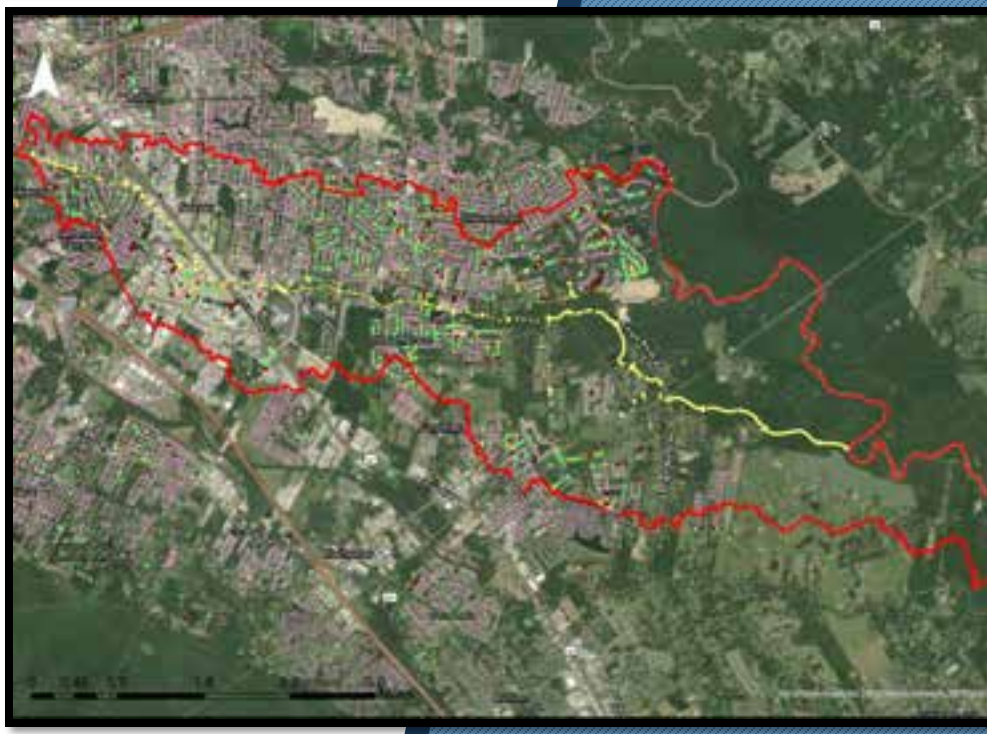


Results Analysis

- Identify areas of flood risk
- Identify projects that mitigate flooding

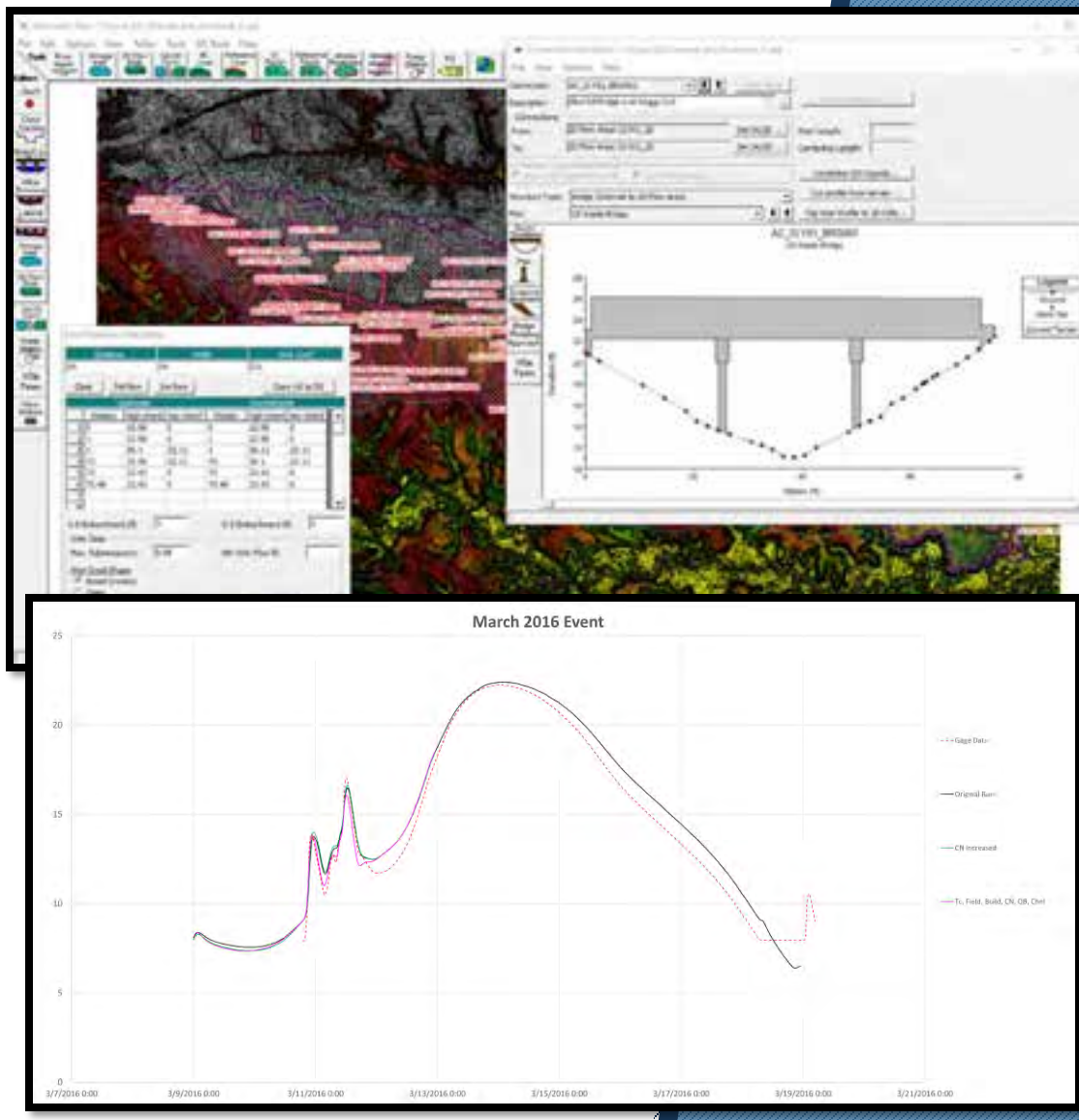
Data Collection

- One of the most critical components in the development of the models includes the surface and subsurface stormwater system data.
- Nearly 460 miles of channels were collected, including over 1,000 channel cross sections and 300 bridge and culvert crossings.
- Using the Esri ArcGIS platform, the HNTB team documented over 65,000 subsurface features (assets), including but not limited to manholes, inlet structures, outfalls, pipes and culverts.

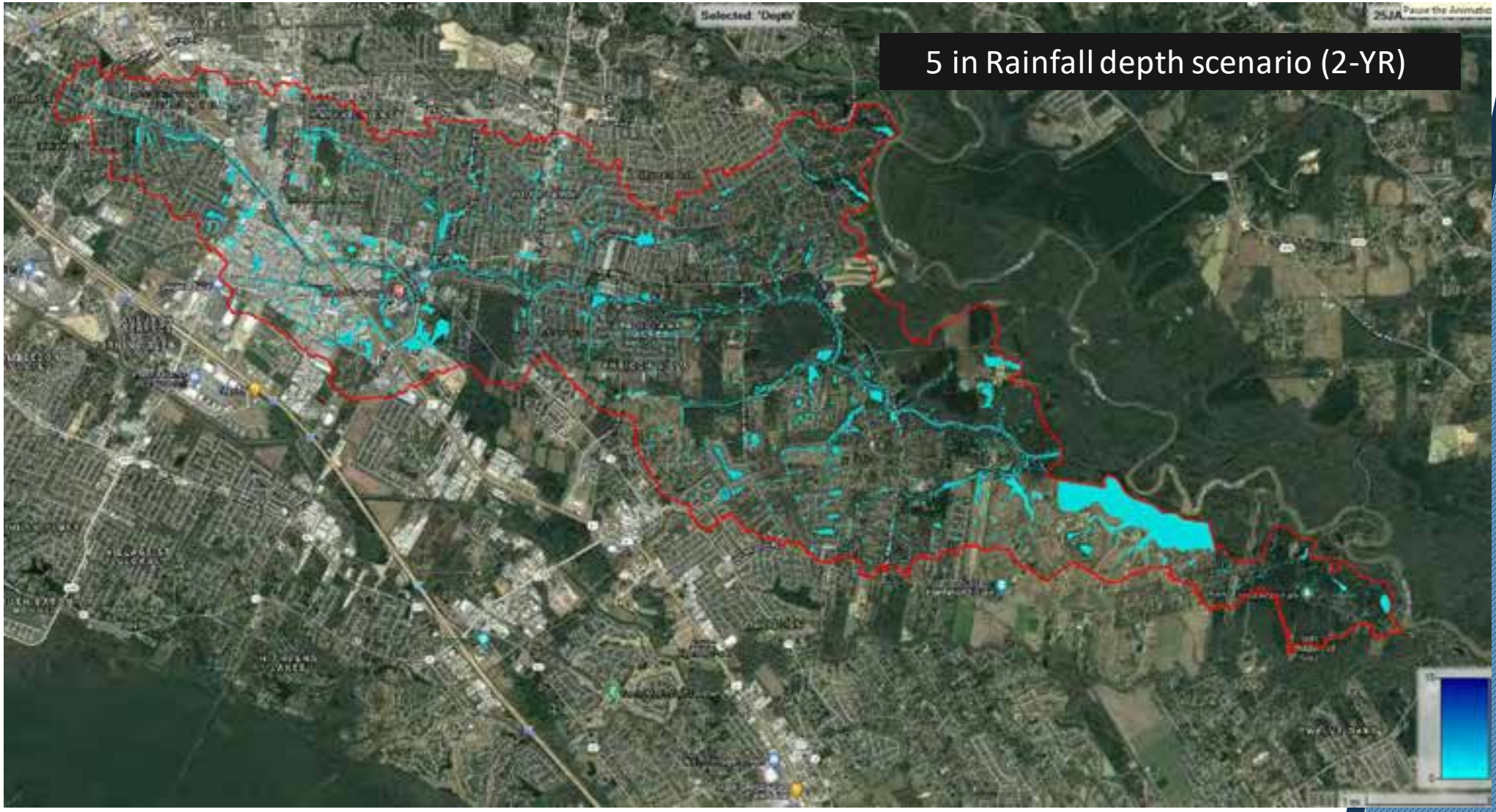


Development of the Model

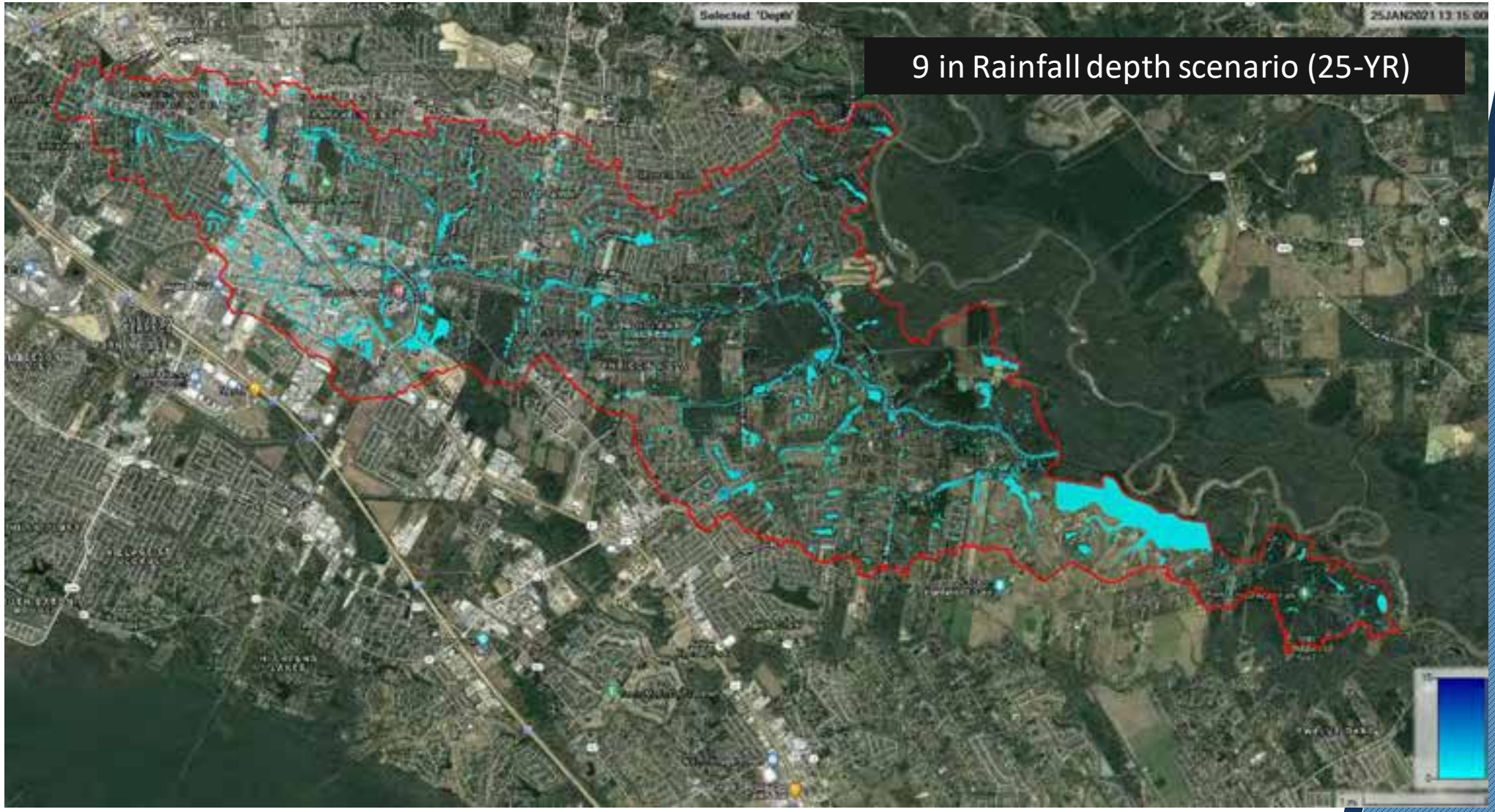
- There are four main steps in creating a hydraulic models:
  - Entering Geometric Data –data that was collected in survey
  - Entering flow data and boundary conditions – putting water into the model
  - Performing the hydraulic calculations – running the model
  - Calibration – Correlate the model to an actual storm event typically with gages and high-water marks.
  - Validation – Confirm that the calibrated model is matching real life through correlation to another actual storm event.



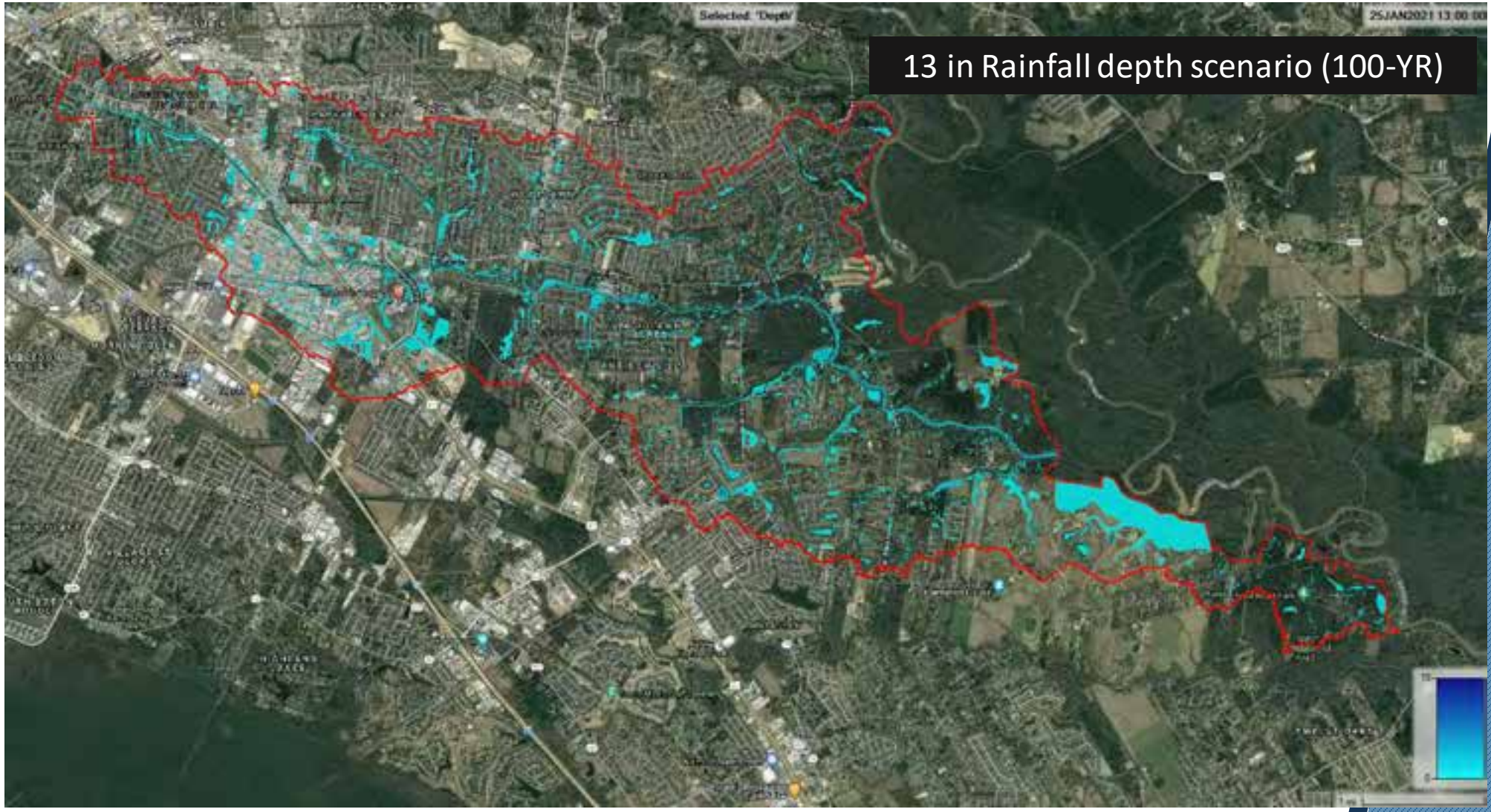
HEC-RAS Model Results – Flooding Extents



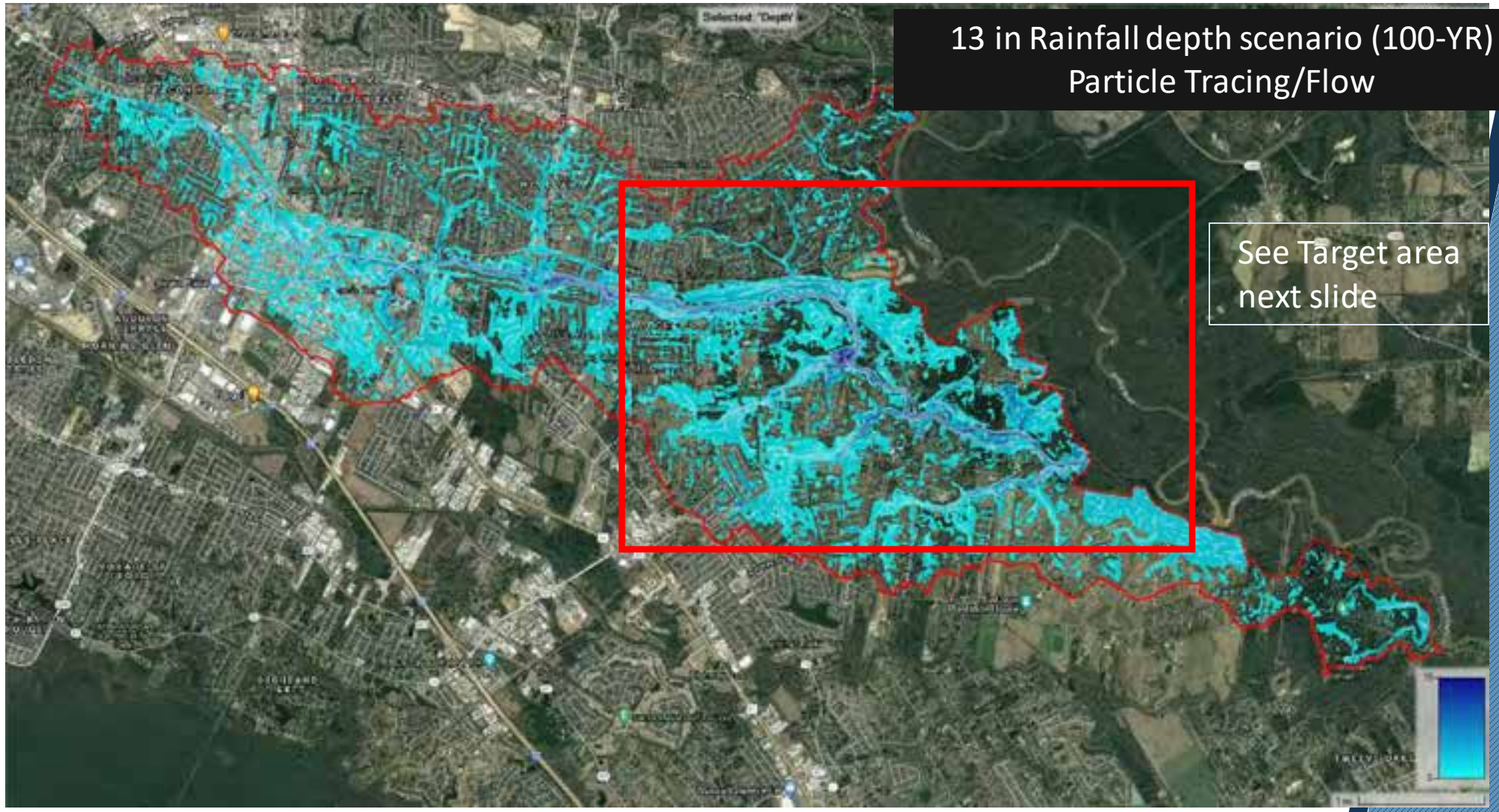
HEC-RAS Model Results – Flooding Extents



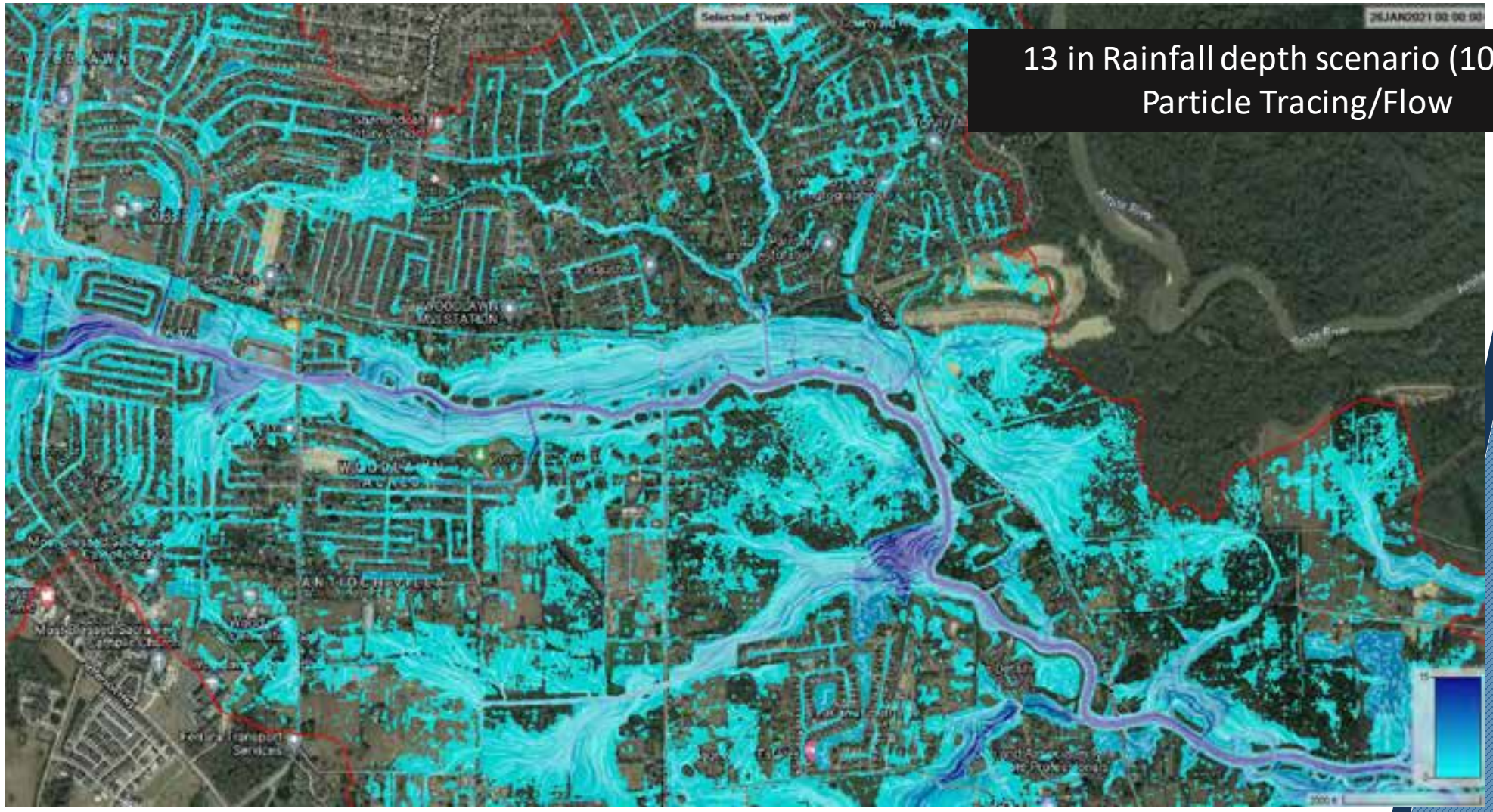
HEC-RAS Model Results – Flooding Extents



HEC-RAS Model Results – Flow

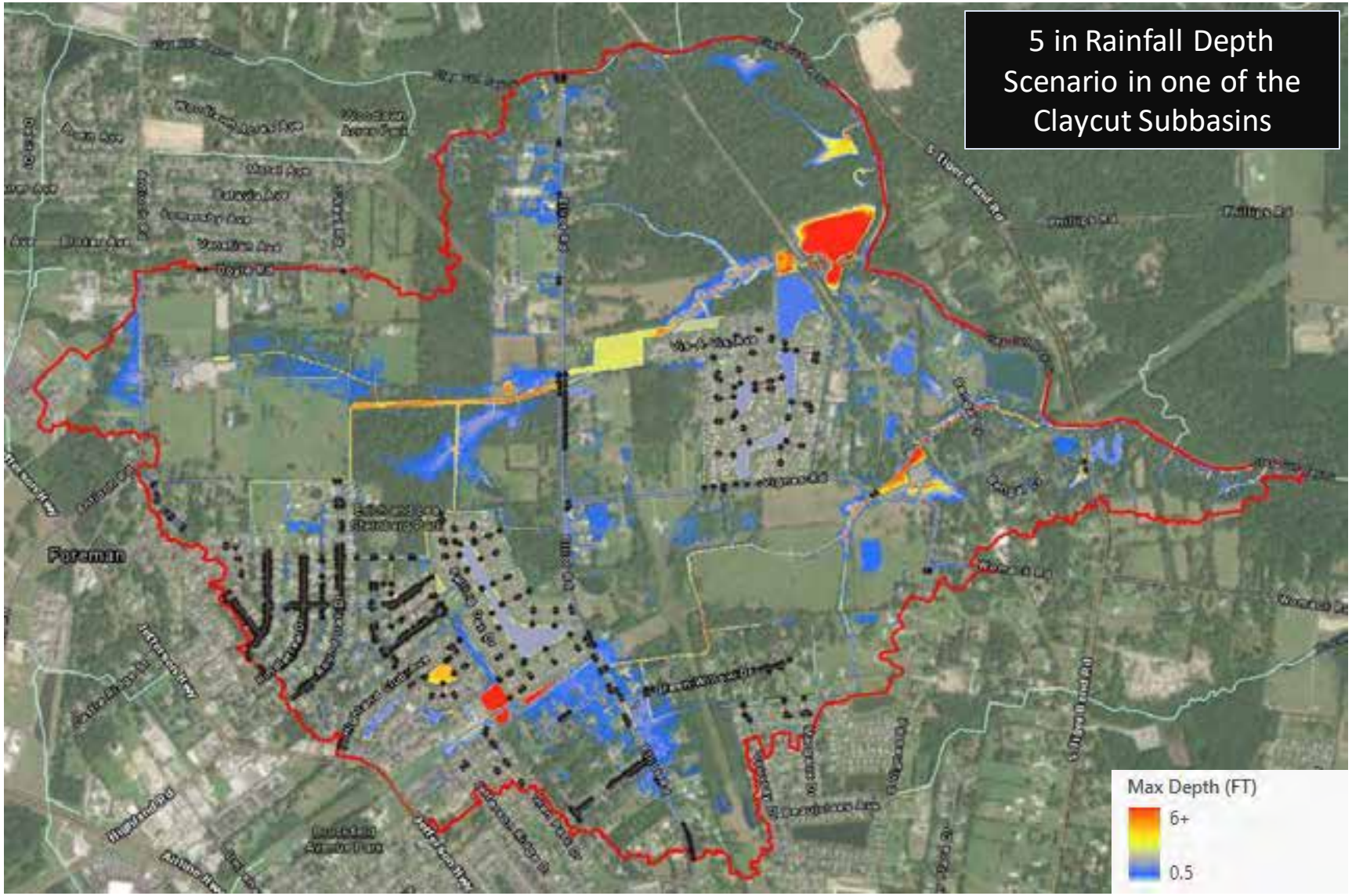


HEC-RAS Model Results – Flow (Zoomed In)

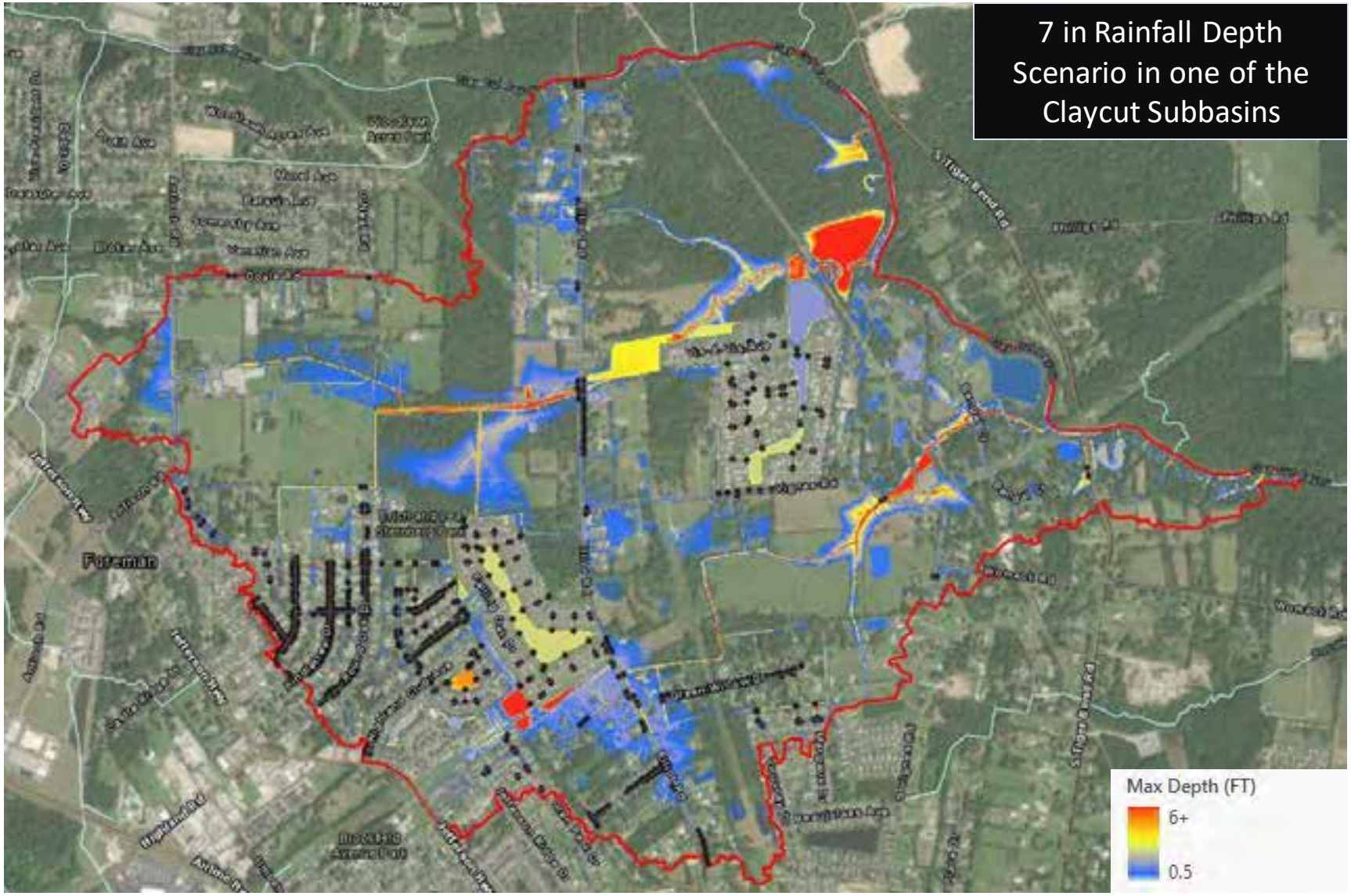


PCSWMM Model Basins

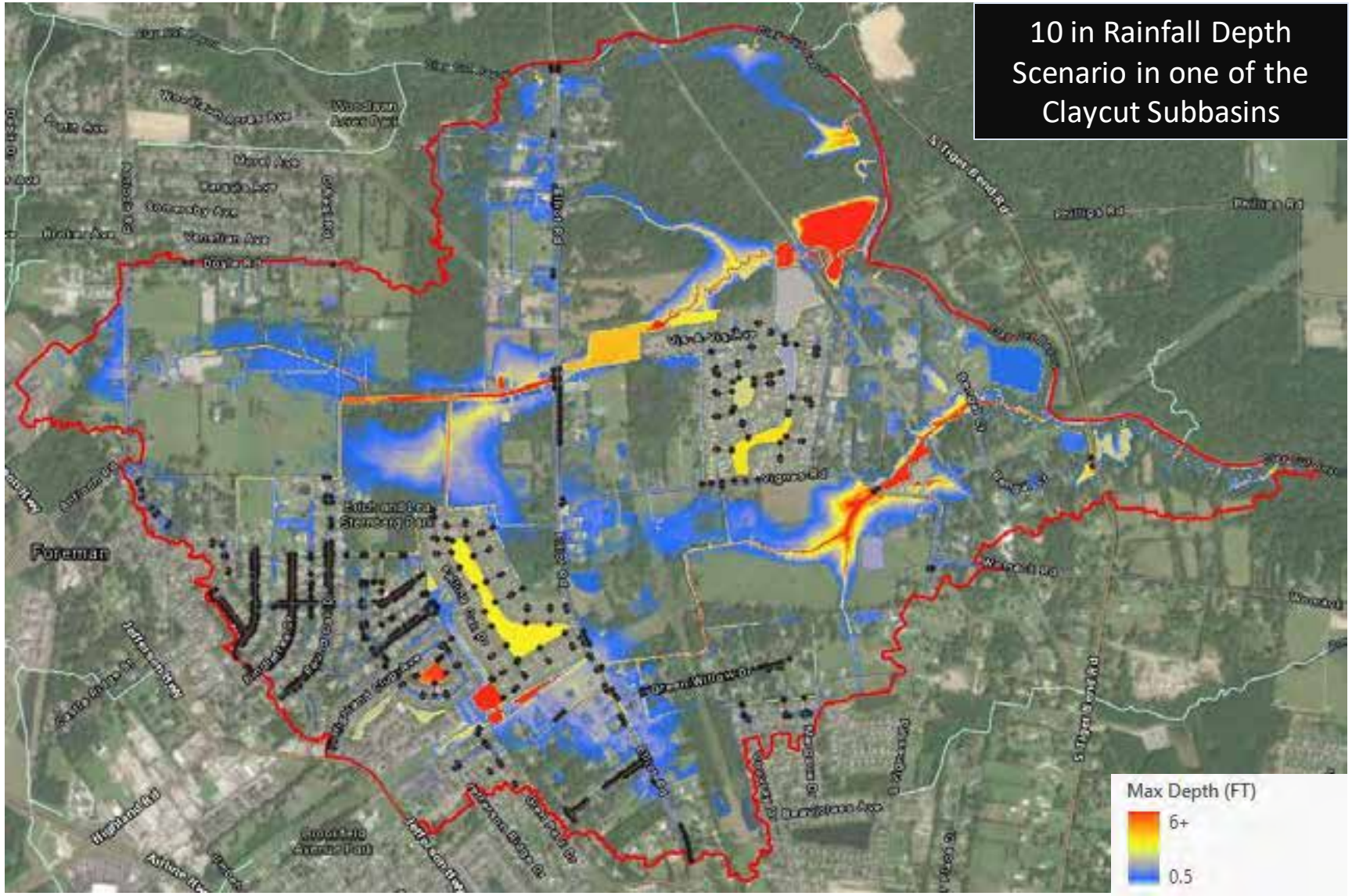
PCSWMM Model Results



PCSWMM Model Results



PCSWMM Model Results

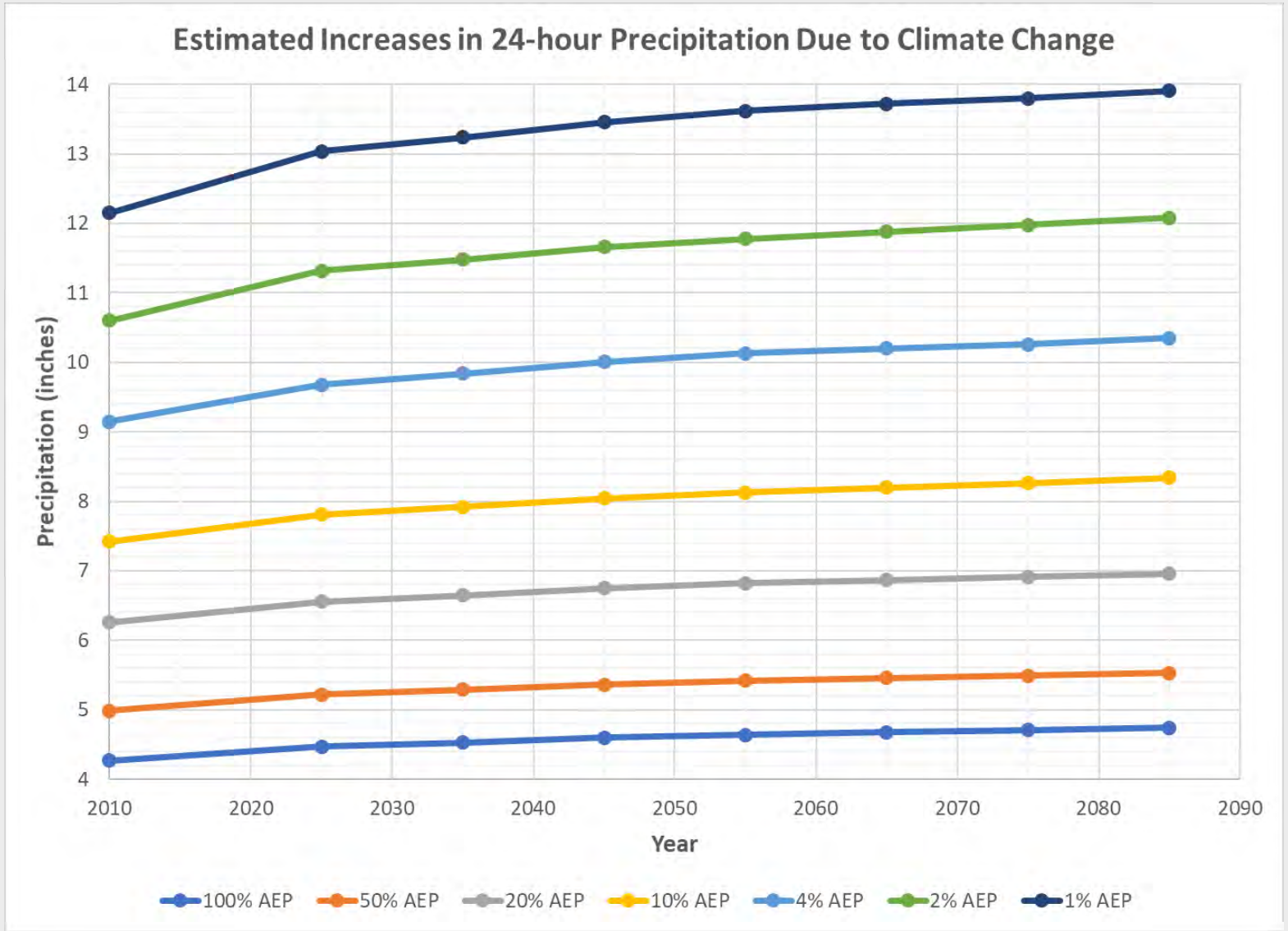


Rainfall Depths

- A broad range of incremental rainfall depths were evaluated for each model.
- PCSWMM used duration of 6-hrs
- HEC-RAS watershed level models used 24-hr duration and regional level model used 72-hr and 96-hr durations

Incorporation of Climate Change

- We utilized work done by Dr. Kenneth Kunkel on how the changes in climate affect precipitation rates.
- Warmer air holds more water resulting in more rainfall.
- Table to the right shows how current rainfall depths expected to change over time.



How do models help?

- With well developed model we can replicate the existing conditions of storm events and the related impacts.
- Produce flood-maps for various events.
- Identify the hazard areas and calculate damages.
- Evaluate solutions to help mitigate flooding.
- Evaluate future scenarios.

Contact Us

- Email
  info@stormwater.brla.gov
- Website
  www.stormwater.brla.gov
- Social media
  @stormwaterebr

EAST BATON ROUGE
STORMWATER MASTER PLAN
UNDERSTAND. PLAN. IMPLEMENT.