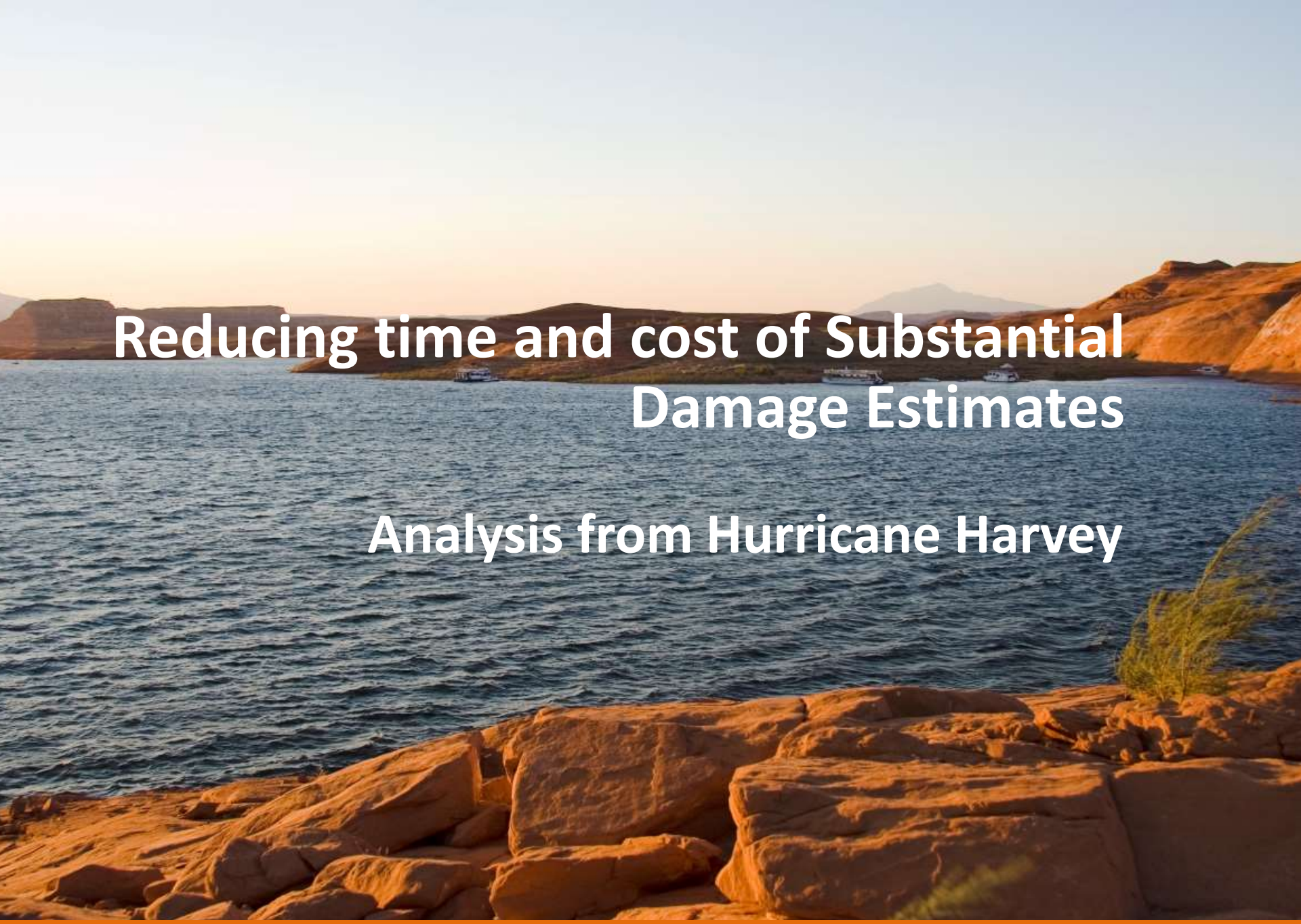


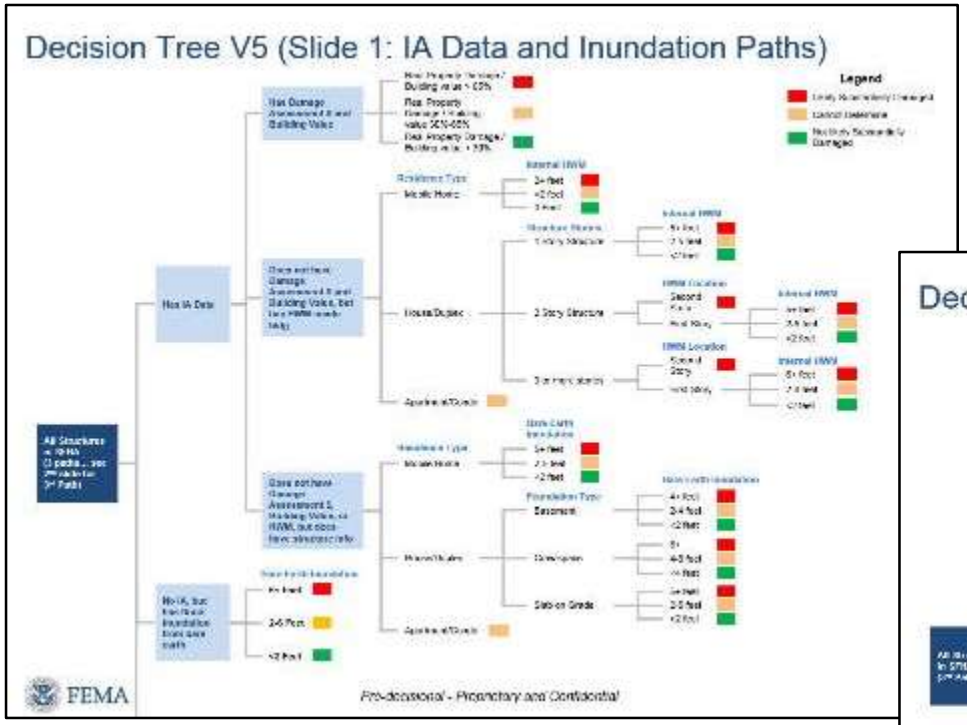
Reducing time and cost of Substantial Damage Estimates

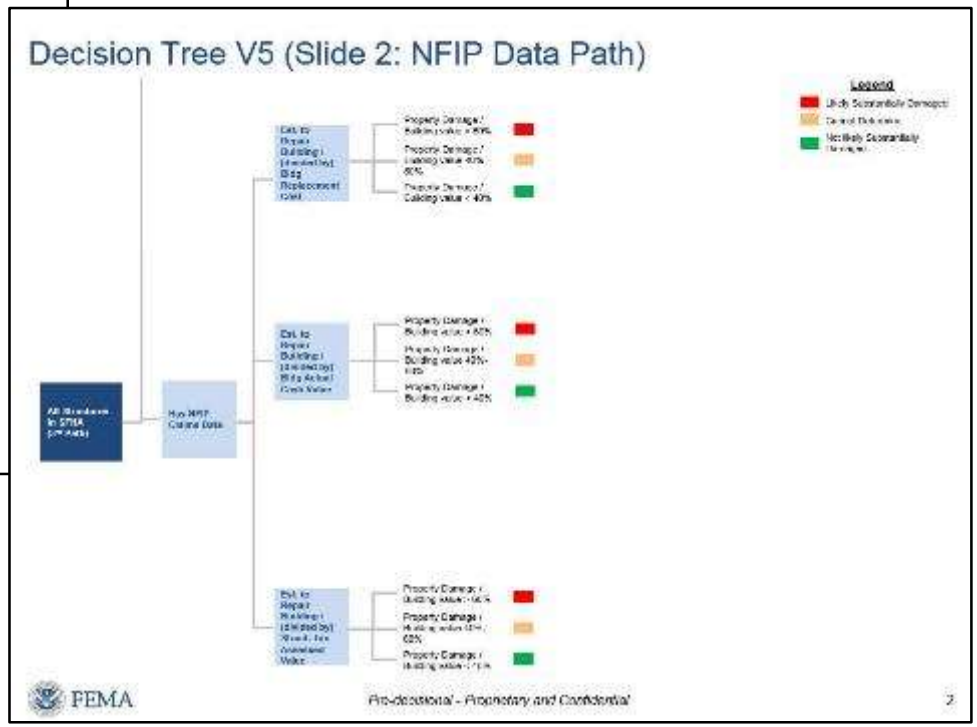
Analysis from Hurricane Harvey

PROJECT BACKGROUND

V5 Decision Tree

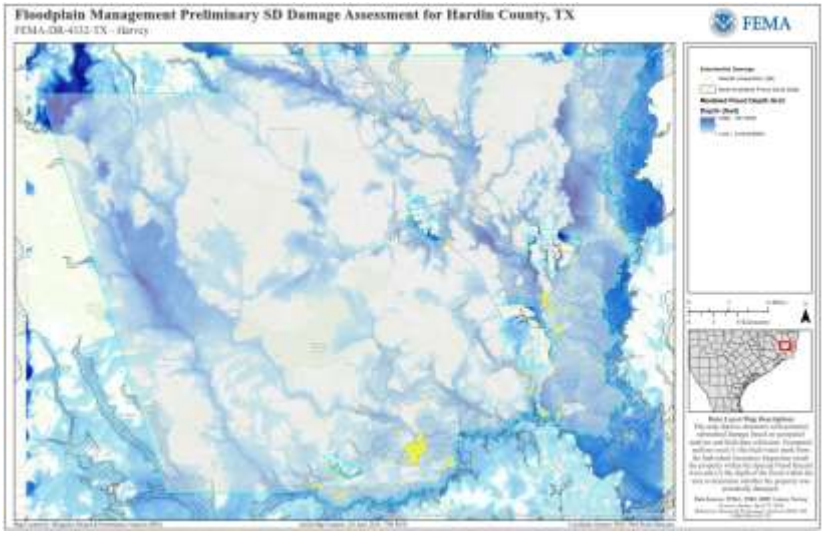
- Decisions made based on flood depth and engineering assumptions



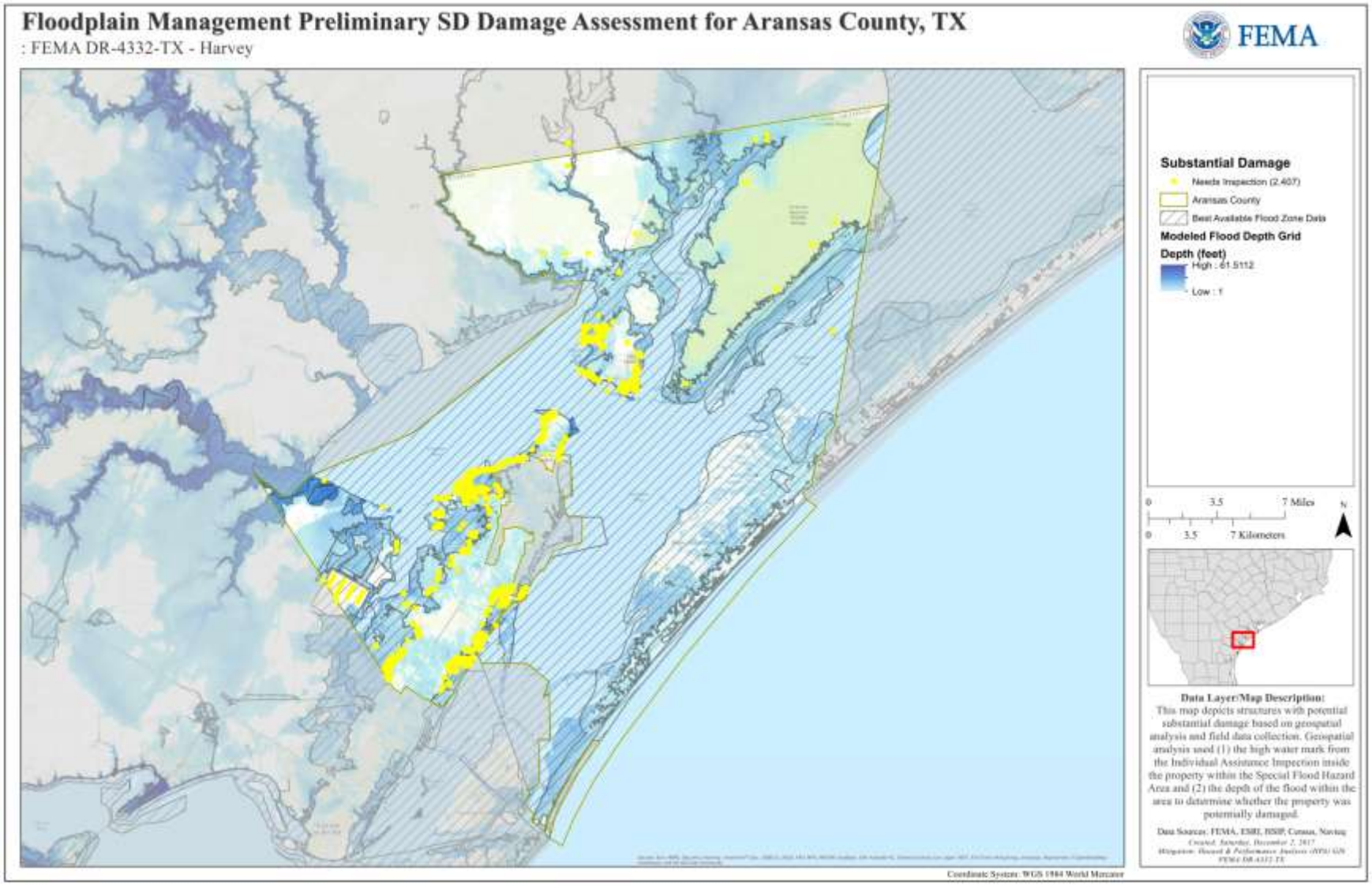


SDE Point Location Maps

- Point location maps are built from Model output Polygons.
- Points are created from Parcel output
- Points are sorted and symbolized by Substantial Damage:
  - Likely (Red)
  - Not Likely (Green)
  - **Needs Inspection (Yellow)**

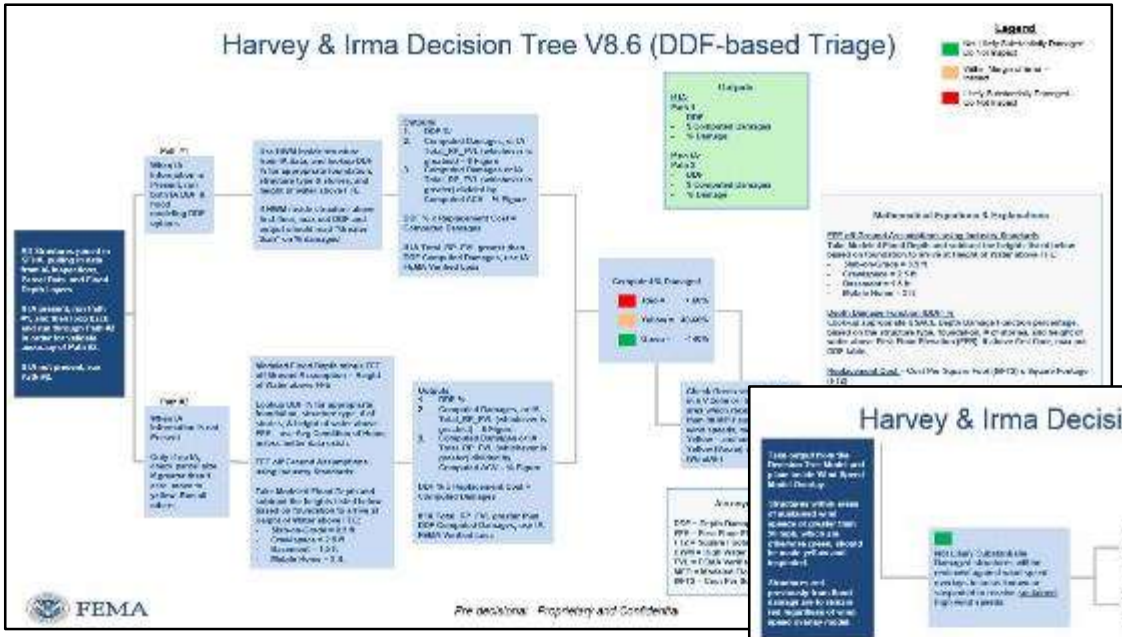


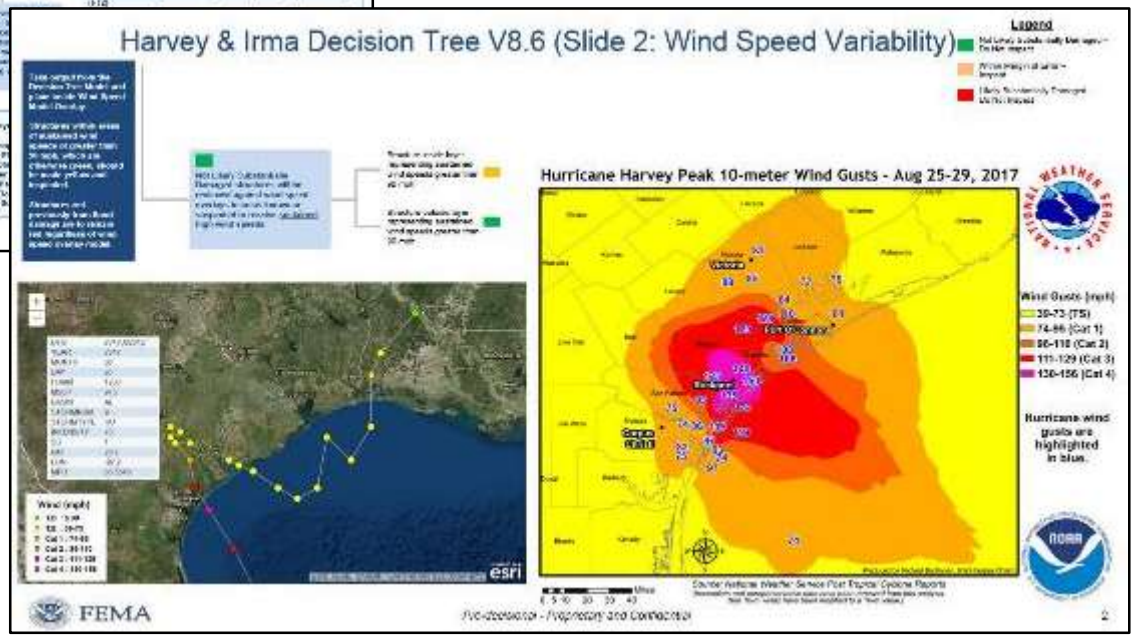
SDE Point Location Maps



V8 Decision Tree

- Introduced Depth Damage Function (DDF)





Assumptions and Limitations

- Damage is a result of flooding and does not consider other hazards (e.g., wind, hydrodynamics).
- A property that was determined to not be substantially damaged by the Depth Damage Function but was found in an area that sustained 90 mph wind speeds, should be inspected.
- Pre-disaster structural condition is Average Condition with a rating of 4 that equates to a depreciation value of 24.2%.
- Riverine/non-coastal, flooding conditions.
- It may be used for 1-story and 2+ story residential structures found on slab-on-grade, piles/piers over crawl space or with basement.
- It may be used for manufactured/mobile homes found on slab-on-grade, piles/piers over crawl space.

Reports

- Reports are generated from the output parcels
- Non-Inspected Properties
  - Red – Likely
  - Green – Not Likely
- Each property is an individual page
  - Grouped by community
- Disaster Specific Data
  - Imagery should be sourced to show close to post-disaster conditions
  - PII Data / Disclaimers customized per regional preference

Hurricane Harvey Property Damage Assessment for Substantial Damage Estimation

Subdivision

Subdivision	BEL AIR
Parcel #	1125485109
Lot #	1

Community

NFIP Community Name	City of Beaumont		
NFIP Community ID #	485457		
Latitude	30.150837	**Longitude**	-94.189269

Structure Address

Street Address	7820 SAN ANSELMO ST
City	BEAUMONT
County/Parish	Jefferson
State	TX
Zip	777081609
Square Feet	1,398

NFIP Information

FIRM Panel#	485457 0045C	**Static BFE**	Not Applicable
Date of FIRM Panel	8/6/2002	**Regulatory Floodway**	NO
FIRM Zone	A		

Percent Damage

$$\frac{\text{Cost of Repairs}}{\text{Square Footage x Cost per Square Foot x Avg. Depreciation}} = \text{Computed Damage \%}$$

Computed Damage	38%
Cost of Repairs	$ 40125.3

Property Boundary | BFE | SFHA | Floodway | 0 450 900 1,350 Feet

Best Available NOAA Post Disaster Imagery where available, all others 2014/2015 Texas Orthoimagery Program

Authorized Local Official: _____ (Signature)

Authorized Local Official: _____ (Printed Name)

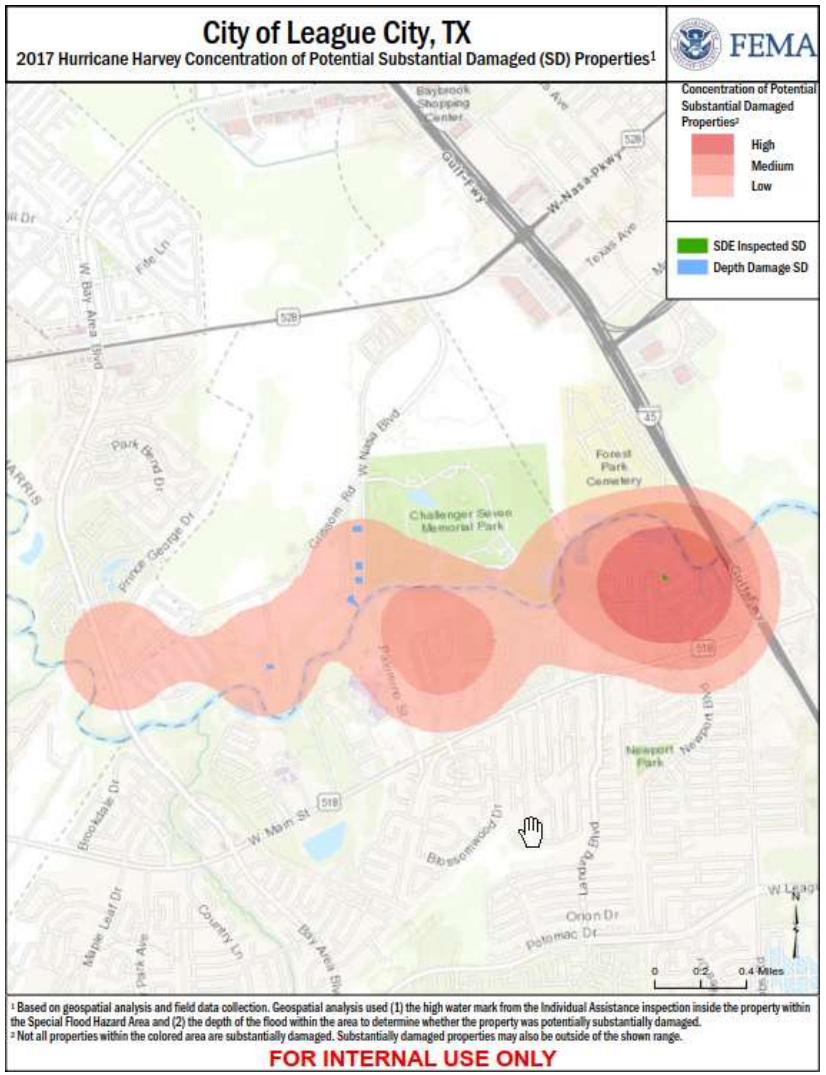
Disclaimer:

- Rebuilding after a flood provides an opportunity to make buildings stronger and safer. Structures that are determined to be substantially damaged are required to rebuild in compliance with the NFIP and local floodplain ordinances. Available sources of flood hazard information may be the effective and/or preliminary FIRM and FIS. If more than one source of information is available then the source that provides the more restrictive flood hazard zone, the highest base flood elevation and/or the greatest discharge should be used. This information can be found at http://riskmap6.com/documents/resource/DR4332_TX_BestAvailableData.pdf

- If the estimated cost to repair the structure is 50% or greater than its market value prior to the flood damage, then the structure is estimated to be substantially damaged. A property owner may appeal the local official's determination based on updated information on the cost to repair (e.g. contractor's estimate) and/or the structure's market value. Please contact your local floodplain administrator to learn more about your communities appeal process.

Hot Spot Maps

- Harvey Estimated Hot Spot tool can be run for an individual community or for each community in the input Task 1 dataset.
- Per community, the tool converts XY values from tabular Field Survey and Task 1 data to a point feature class.
- The point feature class is converted to a raster dataset to portray the density of Substantially Damaged points within the community.
- The raster dataset is symbolized to display a relative scale of damage
  - High / Med / Low



Decision Tree V8 Validation Findings

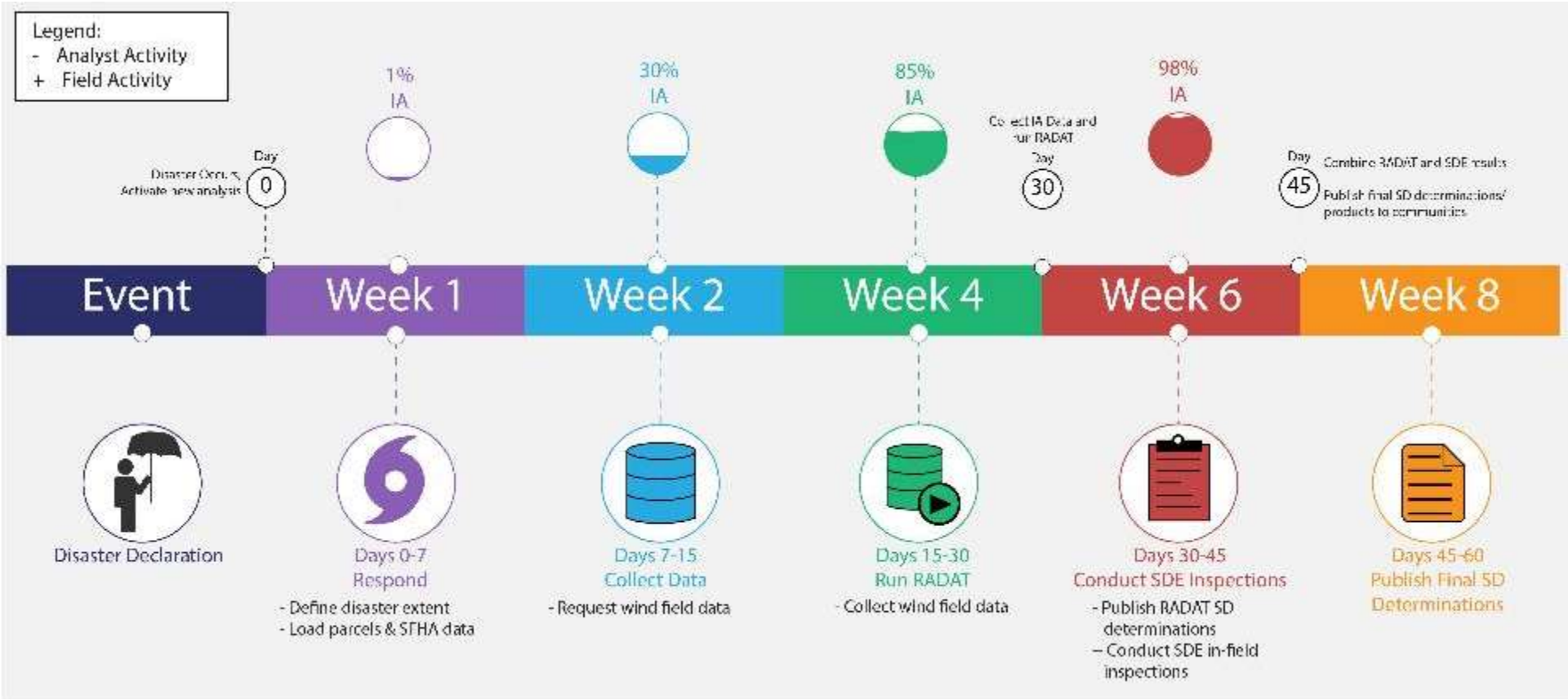
- IA-based (path 1) predictions were meaningfully correlated with actual SD determinations
- Without IA (path 2) predictions were not correlated with actual SD determinations

New Screening Tool | RADAT

- Includes all validated components of the existing FEMA process
- Deploys machine learning artificial intelligence (AI) tools to provide additional predictive capacity when structure-specific inspection findings from the IA process are not available
- Provides an adaptable framework for the future

RADAT
Rapid AI Damage Triage BETA

Post-Disaster Timeline



DATA IDENTIFICATION & PRIMACY

Data Requirements

- **Data requirements** to successfully run the SD model include:
  - IA data
  - Depth grid raster and bounding polygon
  - Polygon parcel data
  - Polygon wind speed data
  - NFHL data
    - SFHA
    - BFE
  - Disaster Declared Community Boundaries
  - County data

Dataset	Type
Disaster Declared Community Boundaries	Shapefile
County Data	Shapefile
SFHA Data	Shapefile
IA Data	.xlsx spreadsheet
Polygon Parcel Data	Shapefile
Depth Grid Raster & Bounding Polygon	Raster
Polygon Wind Field Data	Shapefile
BFE Data from NFHL	Shapefile

IA & FIDA Data

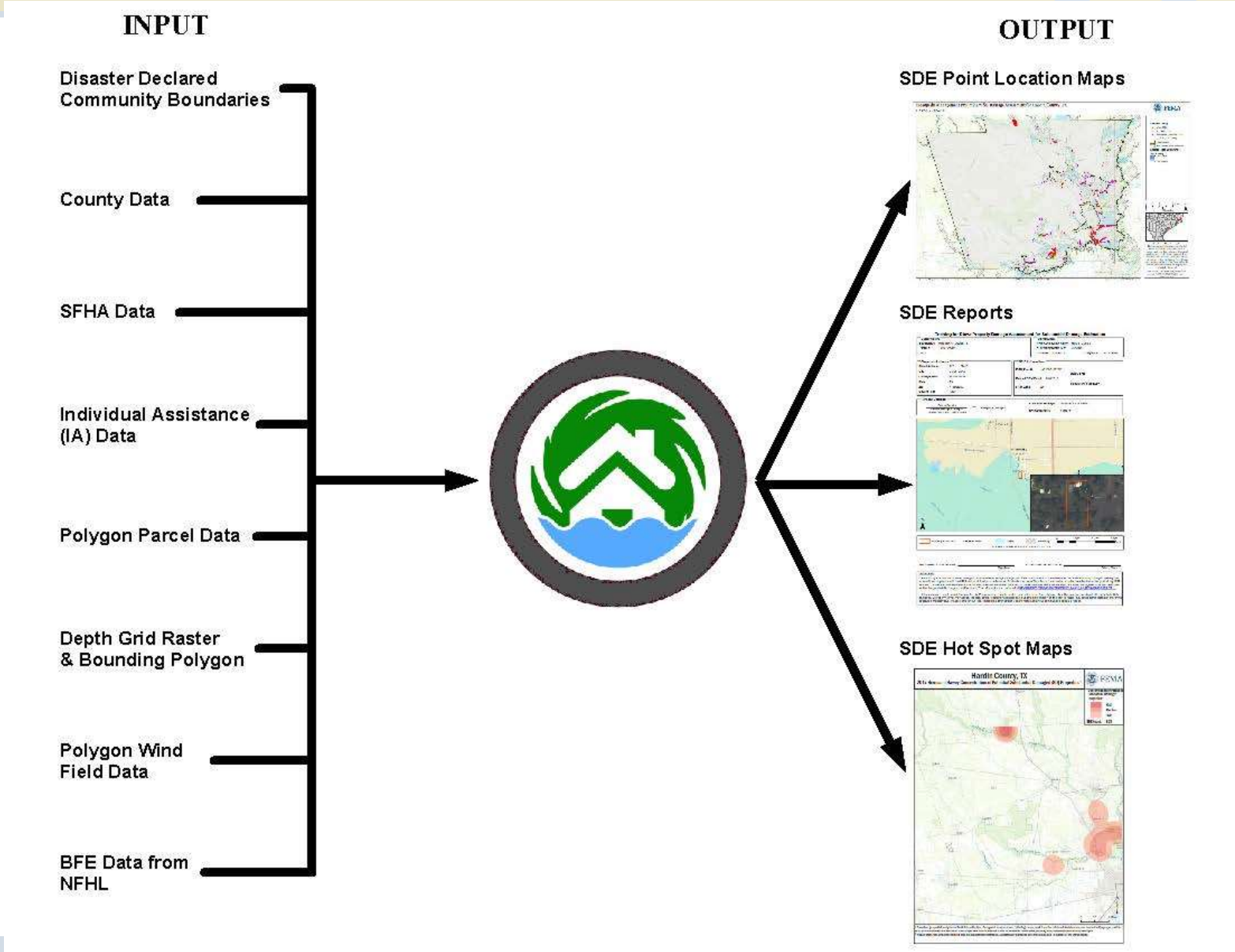
- **Individual Assistance (IA) Data:**
  - Collected from FEMA-contracted inspectors in immediate aftermath of disasters
  - In-person inspections performed to collect data on:
    - Structural descriptions
    - Address
    - Square footage
    - Number of floors within structure
    - Foundation type
    - Post-disaster state of structure
    - High Water Mark
    - Interior Water Mark
  - Serves as primary data input source for RADAT tool
- **FEMA Information & Data Analysis (FIDA) Report 29405**

DATA PREPARATION

Overview

- The Standard Operating Procedure (SOP) document outlines the step-by-step process
- Process results in a disaster-wide parcel data layer containing specific data fields necessary for developing SDE Point Feature Class
- **Steps include:**
  - (1) Select parcels that intersect the disaster area SFHA
  - (2) Remove vacant parcels or parcels without structures
  - (3) Inspect and prepare depth grids
  - (4) Create a Mean Water Depth Grid
  - (5) Join mean water depth values from depth grid to SFHA parcels
  - (6) Join wind speed values to SFHA parcels
  - (7) Join associated counties to SFHA parcels

New SD Tool | RADAT



What it does | RADAT

- Model calculates substantial damage estimate and makes SD, NSD determinations in the following cases:
  - IA data exists for structure
  - Estimate plus confidence interval from model is <50%
- Selects paths that *maximize accuracy* & *minimize false positives* on SD determinations

Intended Uses | RADAT

- Assist Floodplain Administrators in making SD designations on structures within their associated SFHA zones in an way that is:
  - Rapid
  - Automated
  - Consistent
  - Defendable
  - Accurate
- Identify data gaps or areas where additional, in-person SDE inspections are required
- Inform Repetitive Loss (RL) or Severe Repetitive Loss (SRL) concepts


THANK YOU!
Eric.Stephens@aecom.com
David.Hiegel@fema.dhs.gov