

HARRIS-GALVESTON



SUBSIDENCE
DISTRICT



FORT BEND
SUBSIDENCE DISTRICT

JOINT REGULATORY PLAN REVIEW

Harris-Galveston Subsidence District

June 11, 2025

PROJECT SPONSORS AND COLLABORATORS

HARRIS-GALVESTON



SUBSIDENCE
DISTRICT



FORT BEND
SUBSIDENCE DISTRICT

Texas Water
Development Board



1

Develop Population and Demand Projections

Develop projections of population and water demand over a ten-county area through the year 2100.



2

Conduct Alternative Water Supply Assessment

Review alternative water supplies for the capability of reducing future groundwater demand.



3

Develop the Gulf Coast Land Subsidence and Groundwater Flow Model

Development of the GULF-2023 model for simulating regional groundwater flow and subsidence in the Gulf Coast Aquifer.



4

Evaluate Regulatory Scenarios

Evaluate the performance of the HGSD and FBSD regulatory plans and consider refinements to the regulatory plan framework to accommodate future growth, alternative water supplies, and the most recent aquifer science.



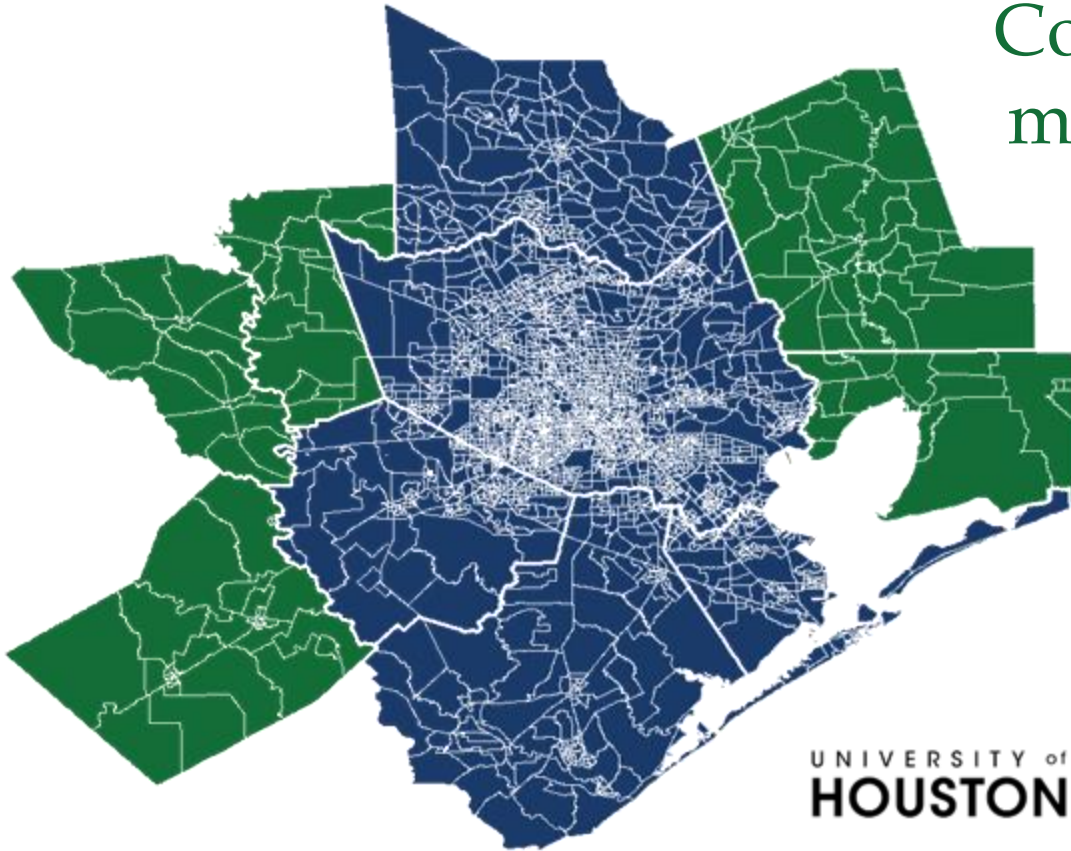


POPULATION DEMANDS AND PROJECTIONS

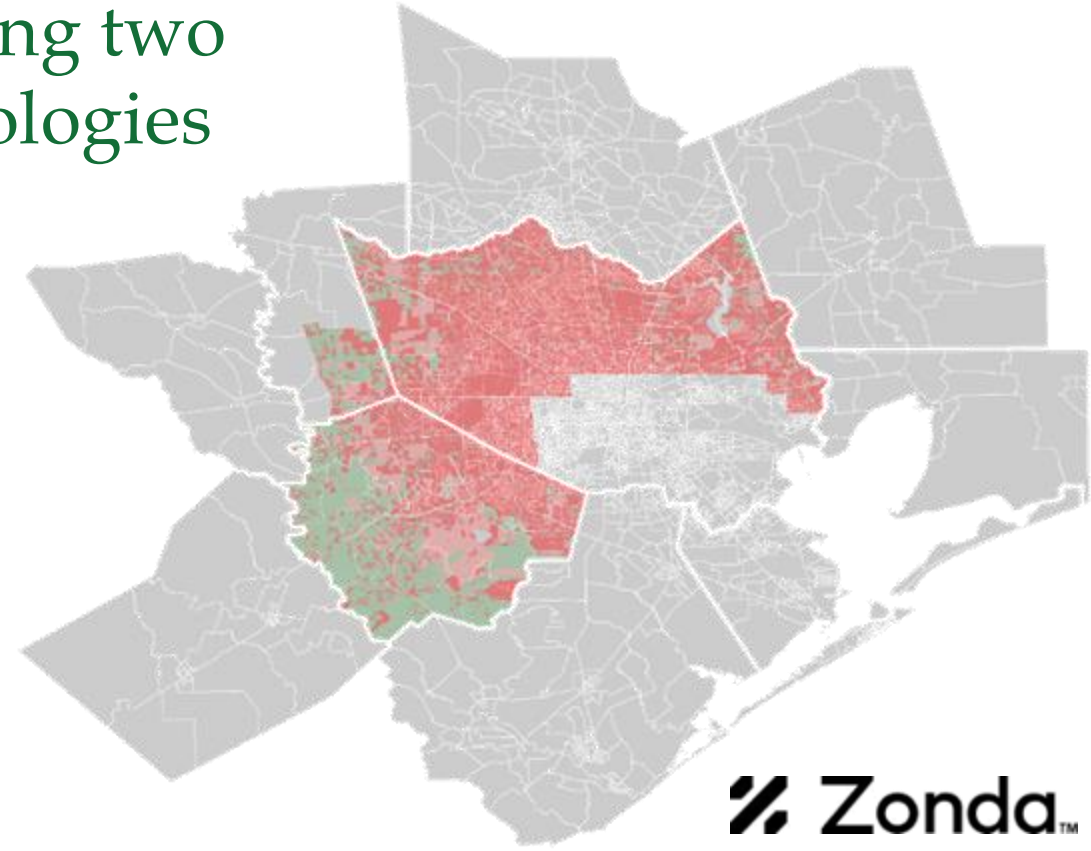
Population and water demands drive the total demand for water and, therefore, projects the future demands that may be placed upon groundwater

POPULATION PROJECTION METHODOLOGY

Combining two methodologies

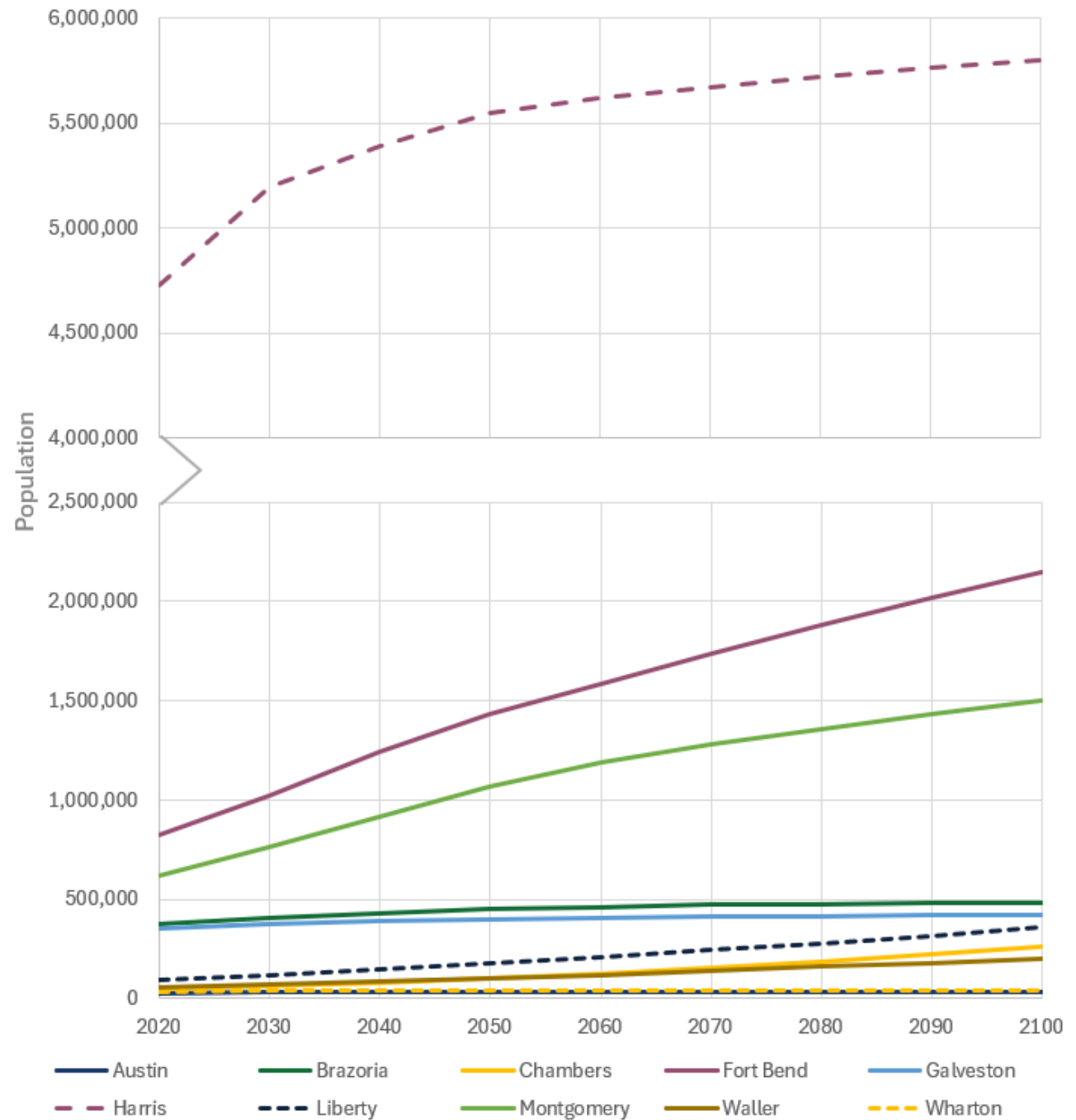


Small Area Model Houston (SAM-Houston)
Long-range, wide-area projections



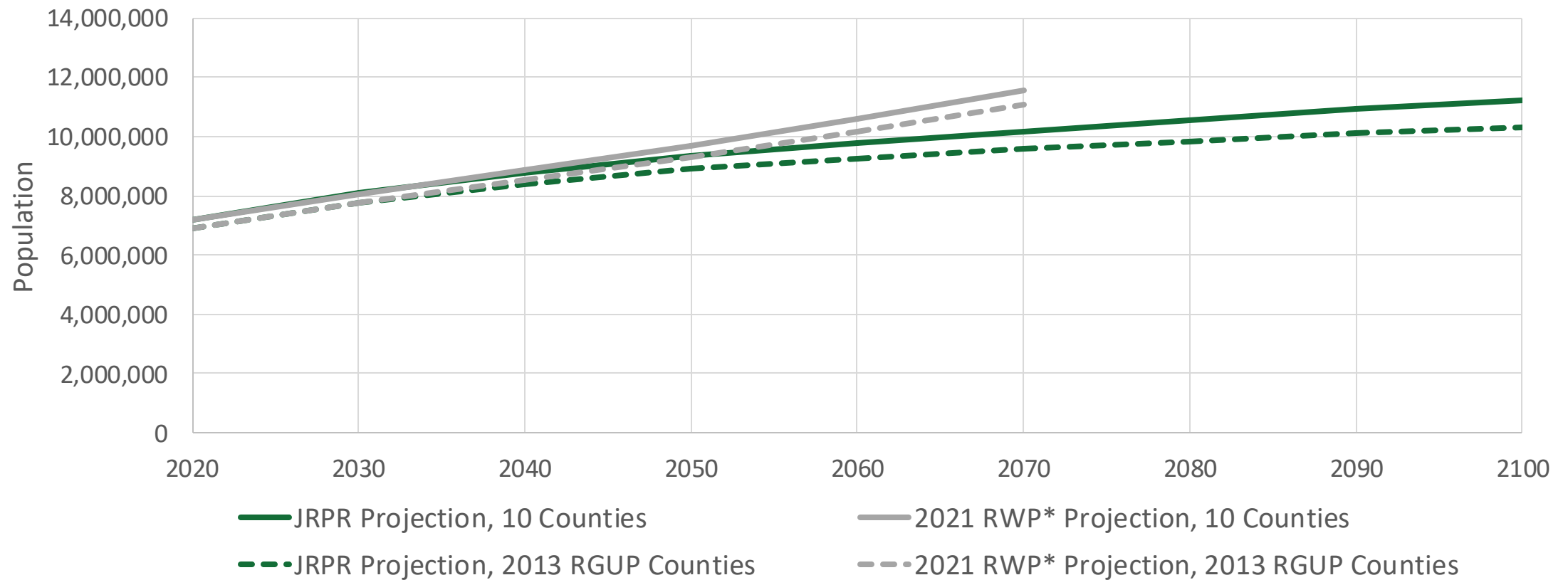
Projected Development Methodology
Short-range, detailed projections

POPULATION PROJECTIONS



POPULATION PROJECTIONS

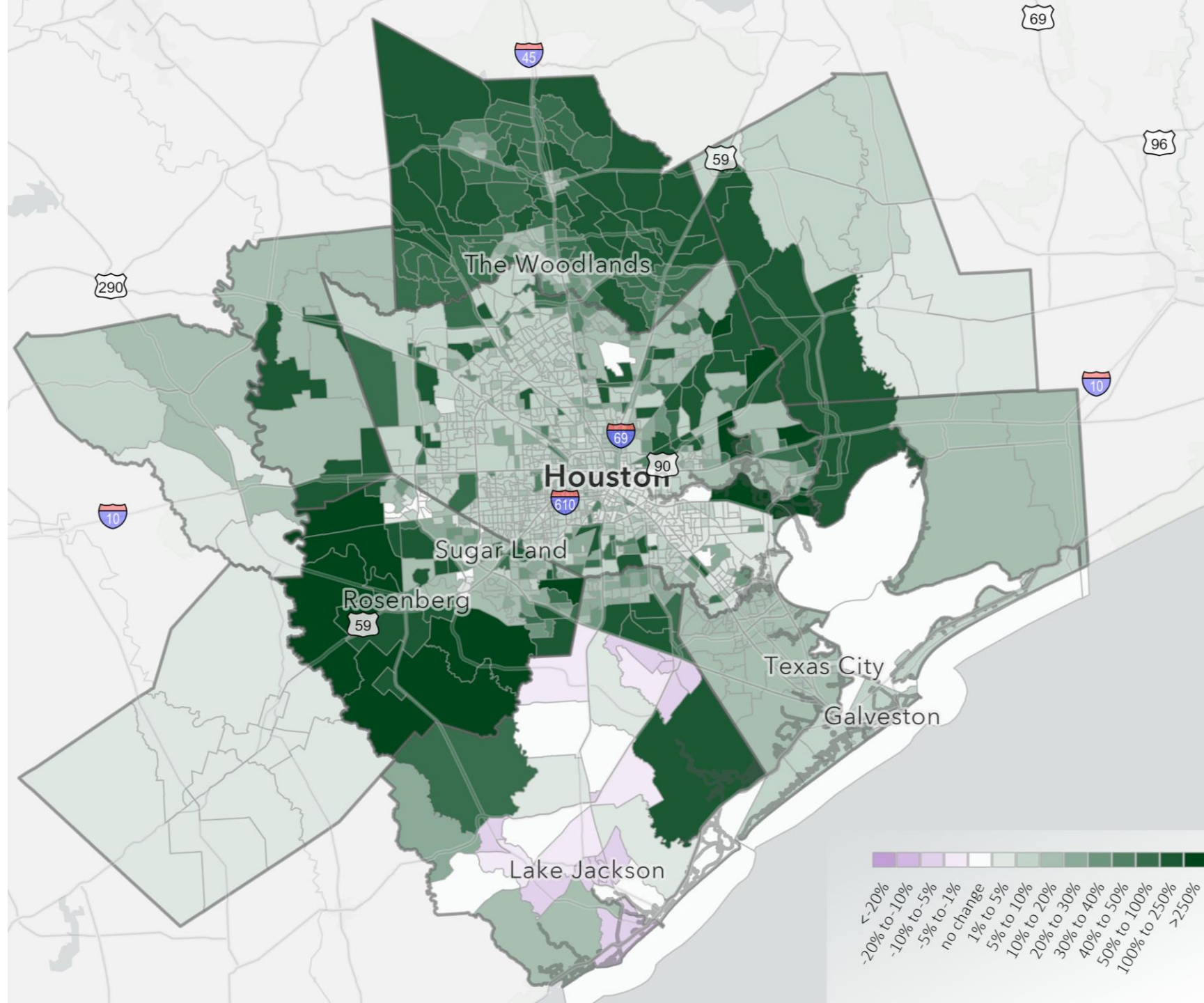
Comparison to Previous Projections



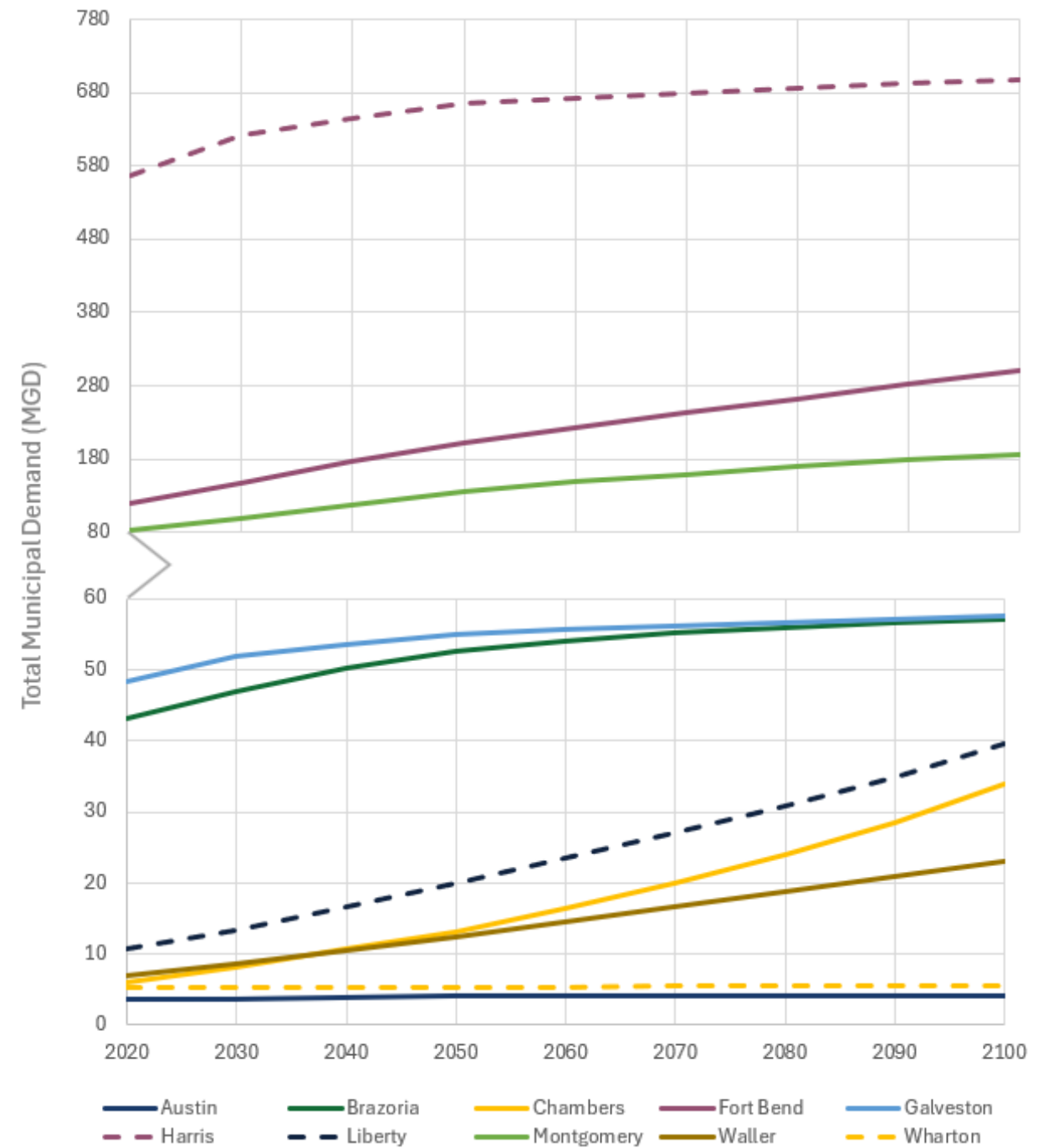
**2021 RWP and 2016 RWP used projections developed in 2013 RGUP for Brazoria, Harris, Galveston, Montgomery, and Fort Bend Counties, with only slight modifications (<0.01%).*

POPULATION GROWTH FORECAST (2020 TO 2050)

percent change
by Census tract



MUNICIPAL DEMAND PROJECTIONS



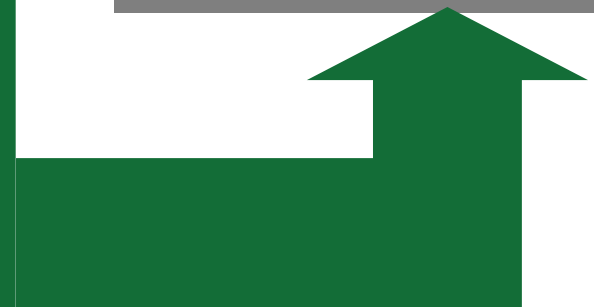
PROJECTIONS
AT VARYING
SPATIAL
SCALES

Census Tracts

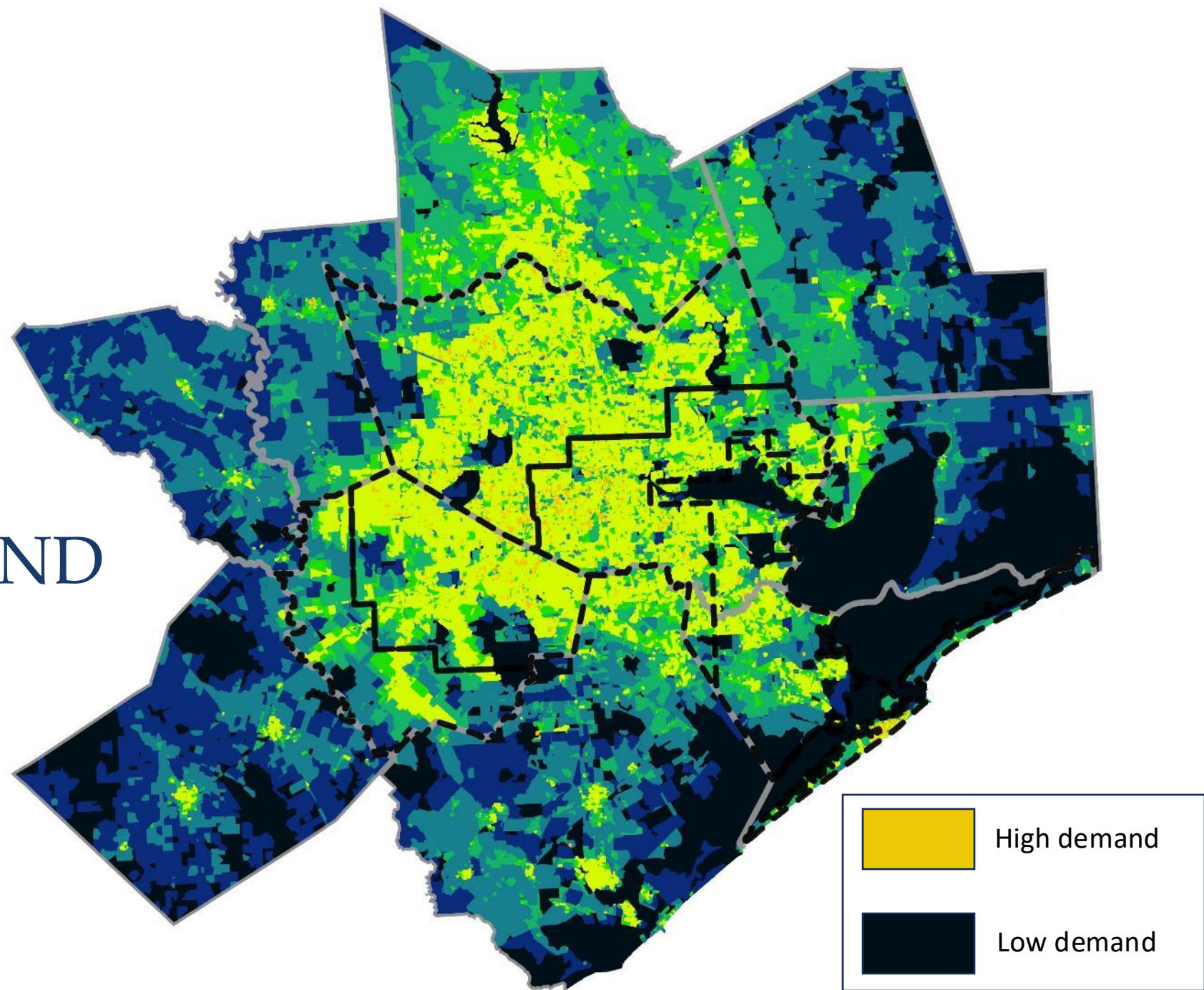


Census Blocks

Utilities



PROJECTED MUNICIPAL WATER DEMAND (2050)



NON-MUNICIPAL DEMANDS

Industrial

- TWDB Projections
- Historical groundwater percentage

Mining

- TWDB Projections
- Historical groundwater percentage

Agricultural

- Irrigation and livestock use
- Historical data
- Continued decline in Fort Bend County

ALTERNATIVE
WATER
SUPPLY
ASSESSMENT

*The availability of alternative
water supplies provides a means
to achieve the adopted
Regulatory Plan*

AWS OPTIONS

Identified 20+ Options

NW - New Water
SS – Storage Solution

RS - Reclaimed Supply
DM - Demand Management

Surface Water Development

SS

NW

New Reservoirs

Off Channel Reservoirs

Inter-Basin Transfers

Appropriated but Undeveloped Water

Reclaimed Water

RS

Purple Pipe Network

Direct Potable Reuse

Indirect Potable Reuse

Satellite Plants / Onsite Reuse

Industrial Process Water

Seawater Desalination

NW

Onshore Facility Desalination

Offshore Facility Desalination

Brackish Groundwater Desalination

NW

Brackish Groundwater Wells and Treatment

Aquifer Storage and Recovery

SS

ASR w/ Surface Water

ASR w/ Stormwater

ASR w/ Reclaimed Water

Stormwater Capture and Reuse

NW

Rainwater Harvesting

Detention Basins

Amenity Lake Filling

Water Demand Management

DM

Baseline Conservation

Basic Conservation

Advanced Conservation

Water Loss Control / Advanced Metering Infrastructure

SHORTLISTED OPTIONS



CHARACTERIZATION OF SHORTLISTED OPTIONS

*Develop
Narrative
Descriptions*



*Estimate
Magnitude of
Supplies*



*Prepare Planning
Level Cost
Estimates*



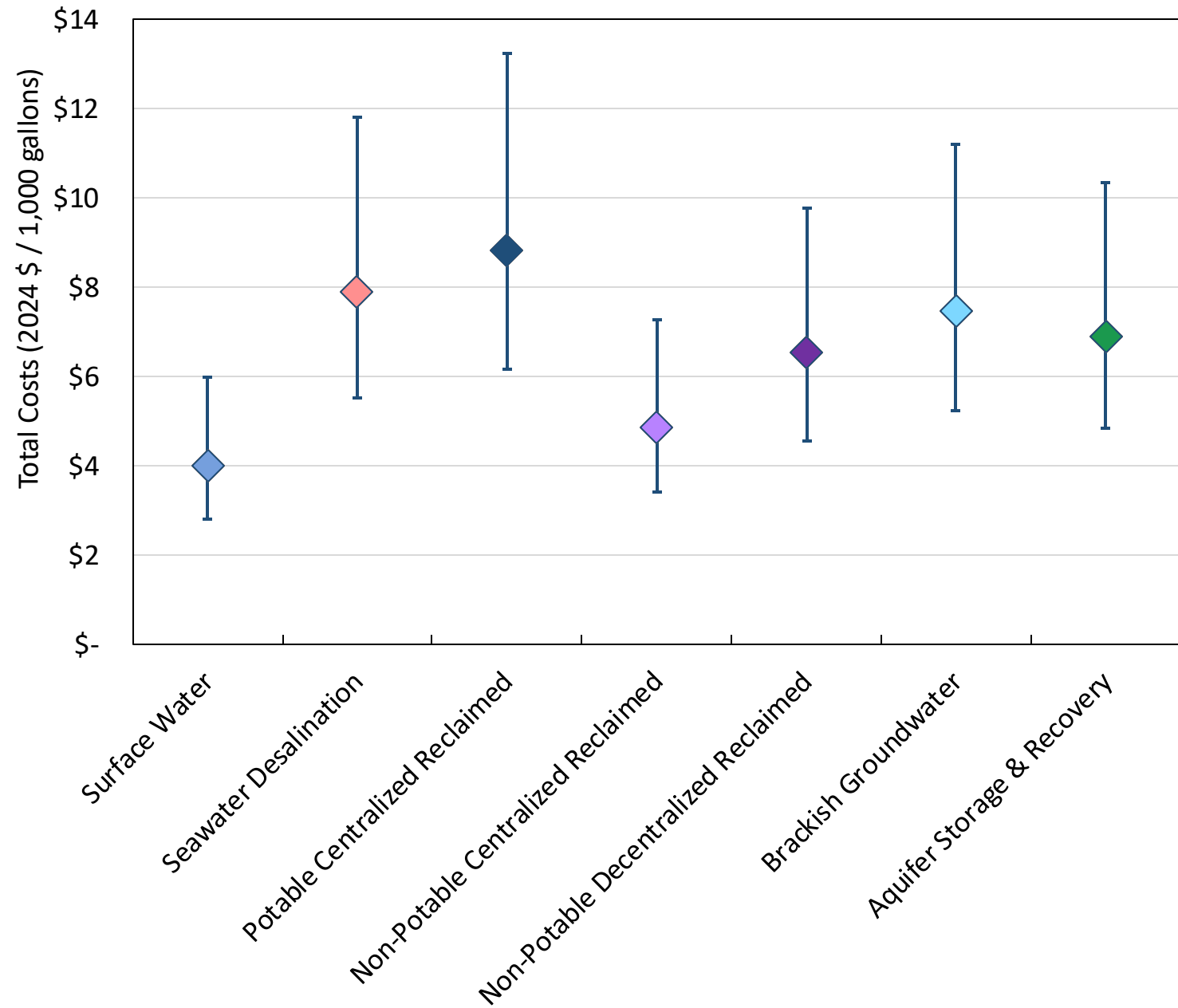
*Identify
Implementation
Timelines*



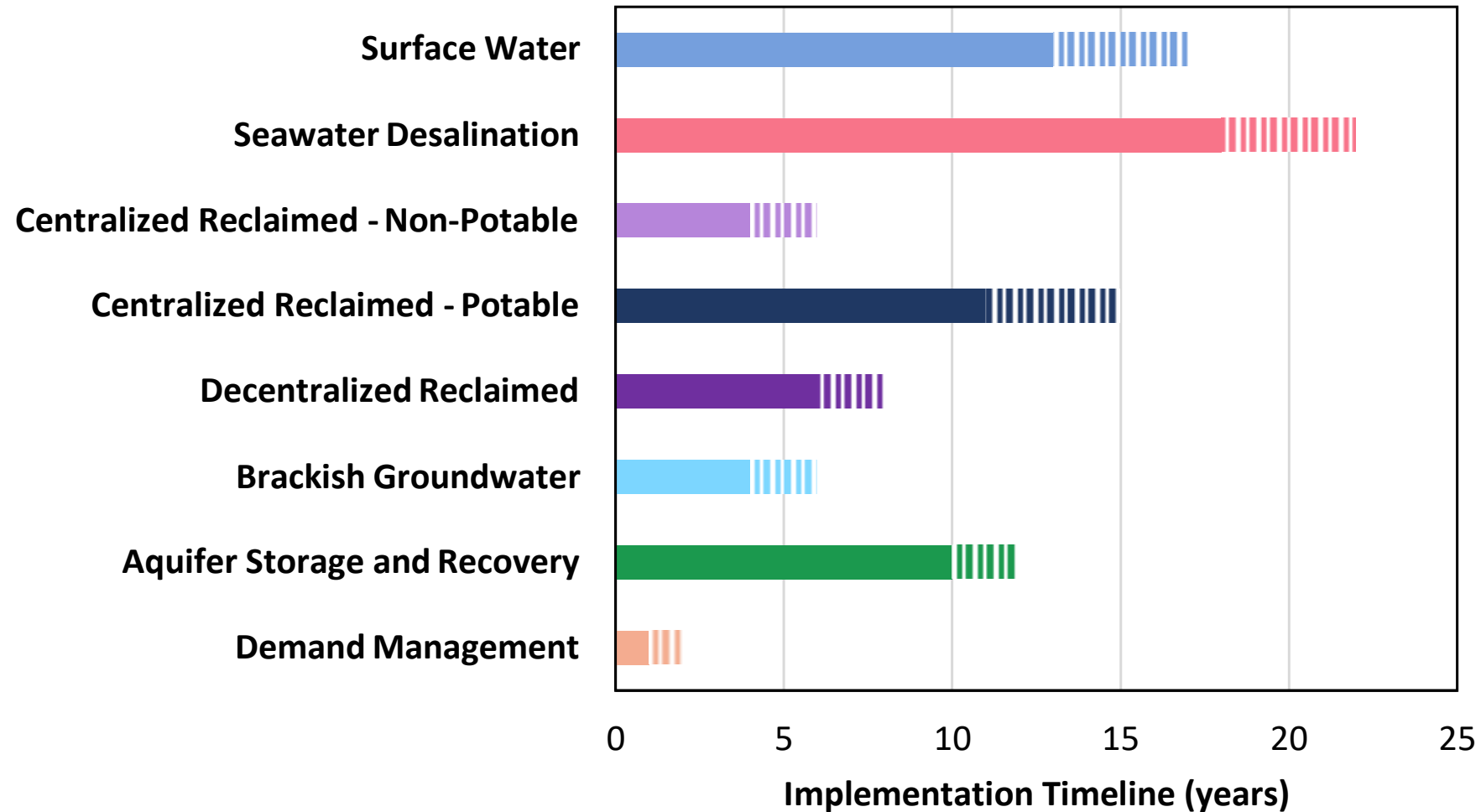
*Assess
Vulnerability to
Climate Change*



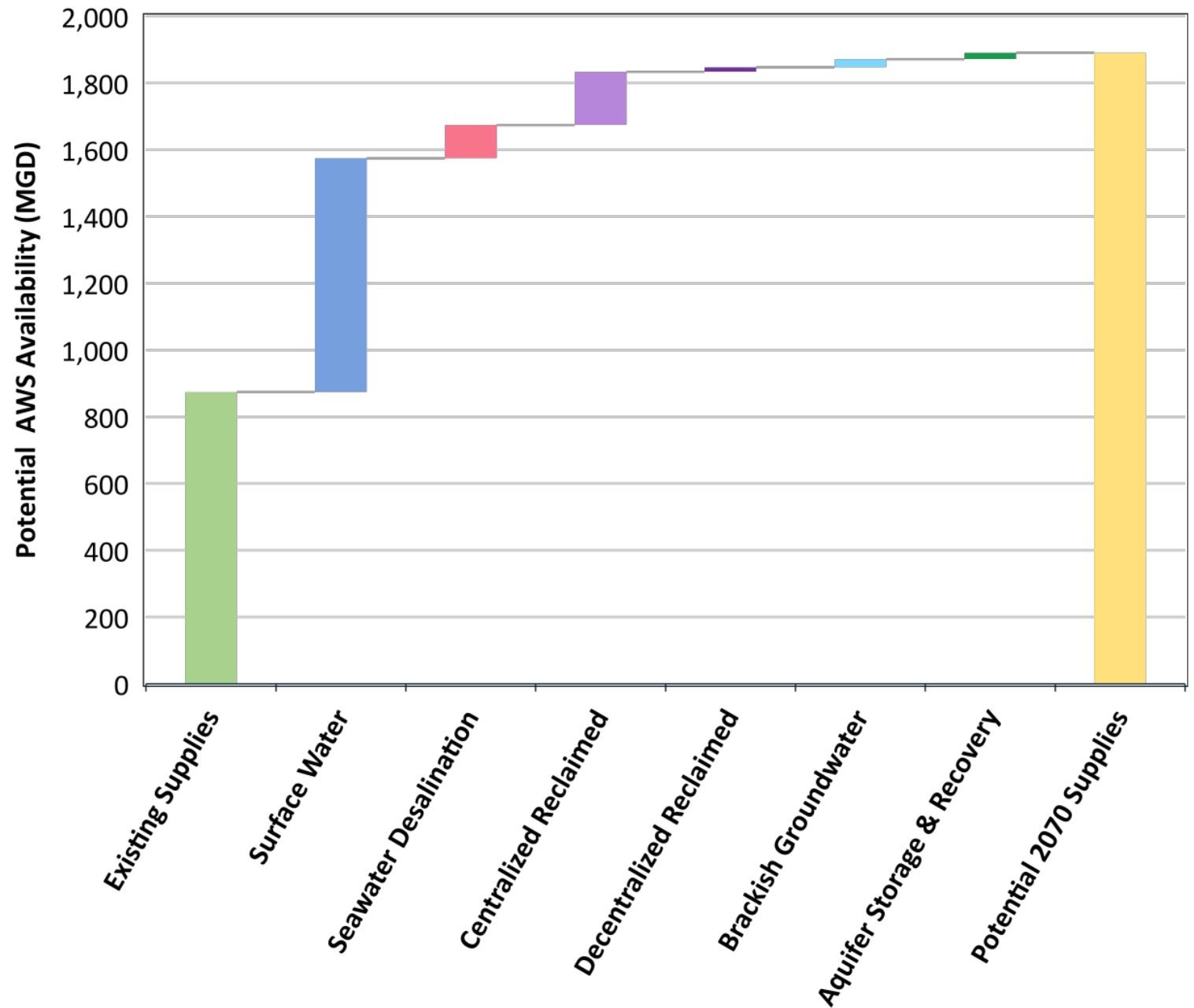
ESTIMATED COSTS



IMPLEMENTATION TIMELINES



BALANCE OF AVAILABLE ALTERNATIVE SUPPLIES



STUDY CONCLUSIONS

Adequate alternative water supplies are available to meet future demands in the regulatory areas

Surface water will continue to be the predominant alternative water supply

Reclaimed water will become a prominent supply for non-potable use and diversification of supplies

Regional coordination is needed to develop sea water supply and inter-basin transfer of surface water

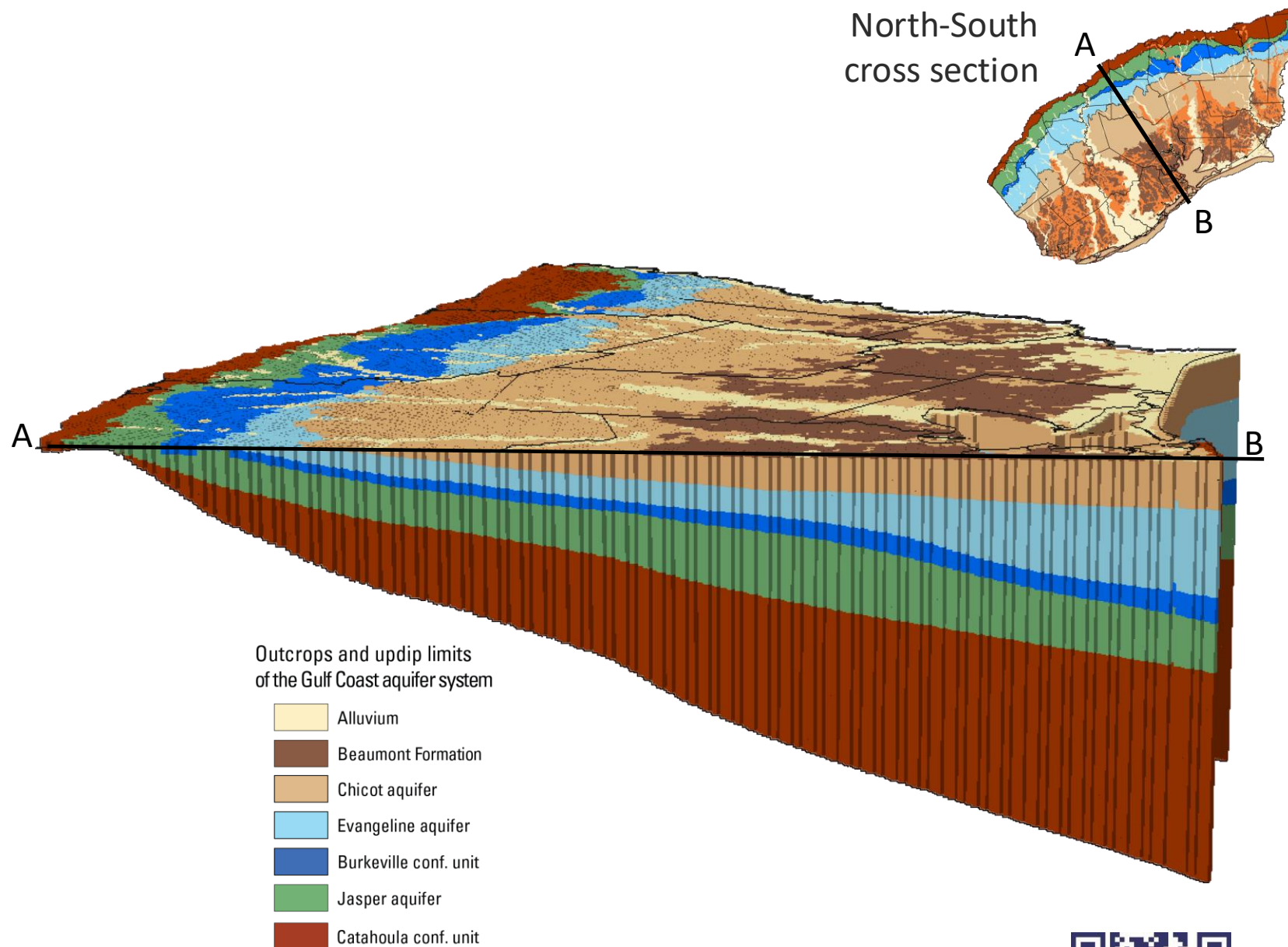


GULF COAST
LAND
SUBSIDENCE
AND
GROUNDWATER
FLOW MODEL

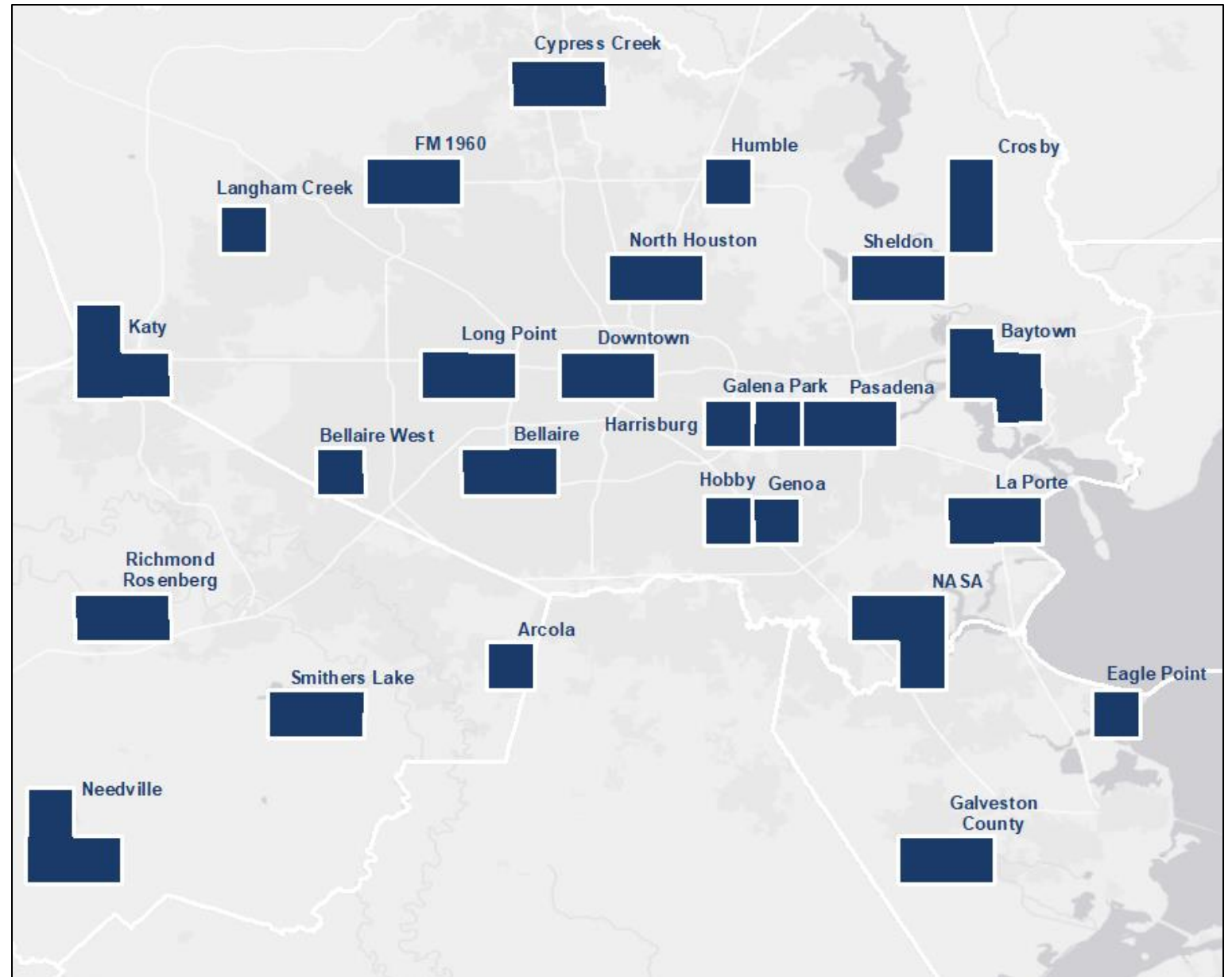
An updated model provides a more robust tool for evaluating future subsidence based on projected groundwater demands

GULF 2023

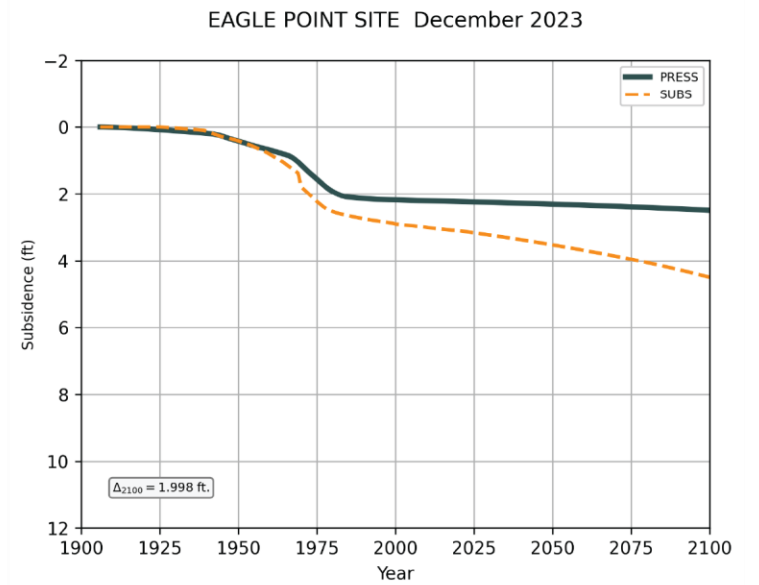
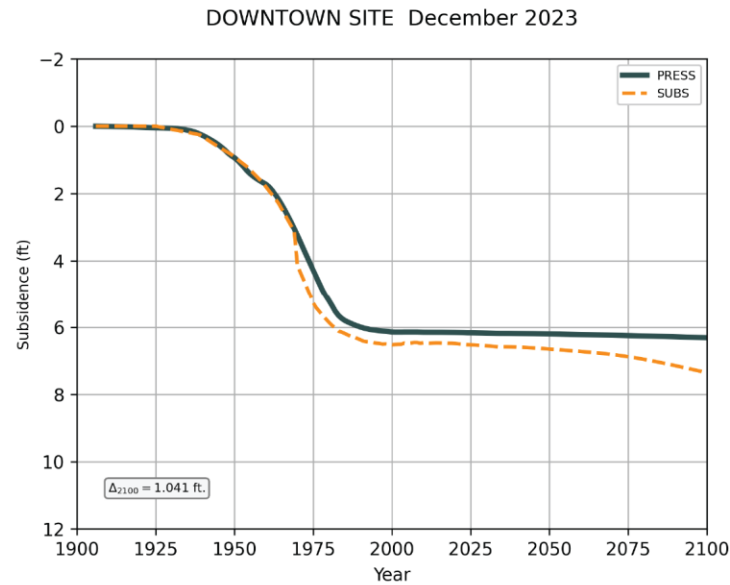
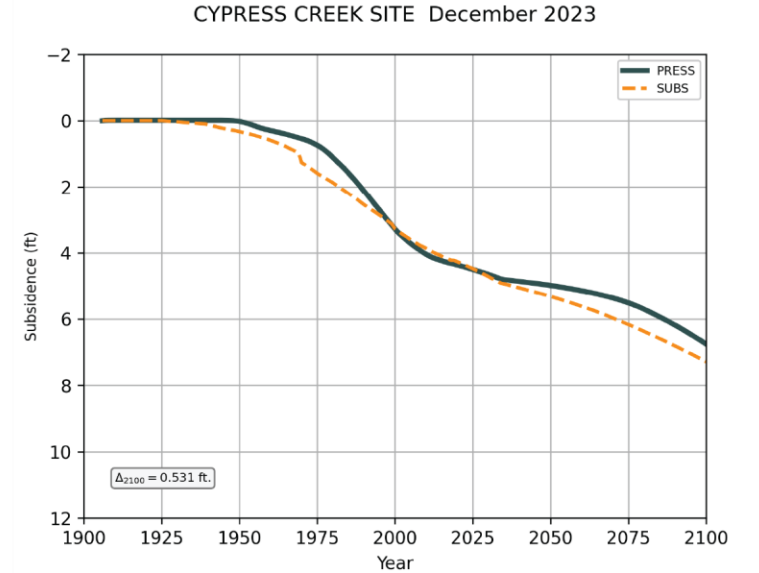
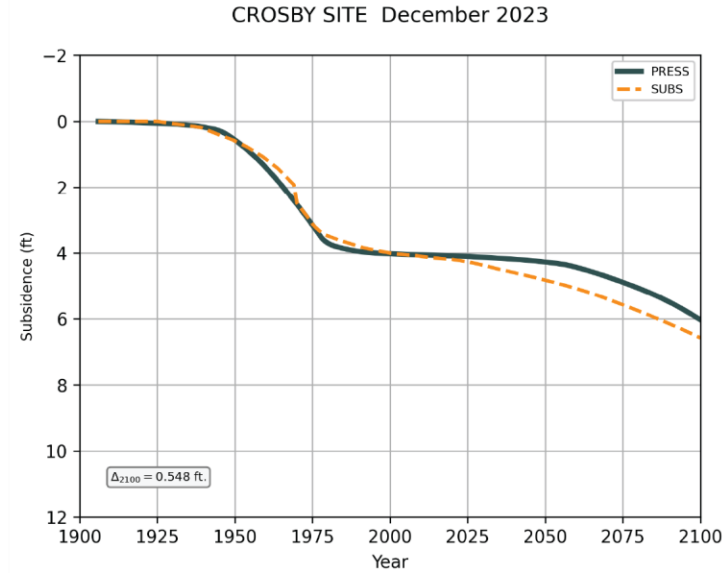
- Included 115 years of water level and subsidence data.
- Updated model packages and parameters.
- Incorporated full Gulf Coast Aquifer System.
- Enhanced calibration and uncertainty ensembles.
- Adopted as the model of record and groundwater availability model (GAM) for GMA-14 on February 23, 2024.
- Presented to HGSD Board of Directors on March 13, 2024.



PRESS MODEL CALIBRATION VERIFICATION

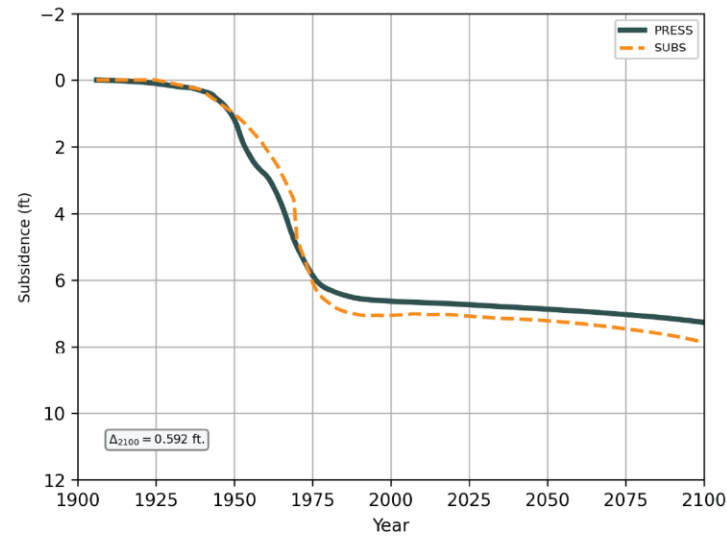


PRESS MODEL CALIBRATION VERIFICATION

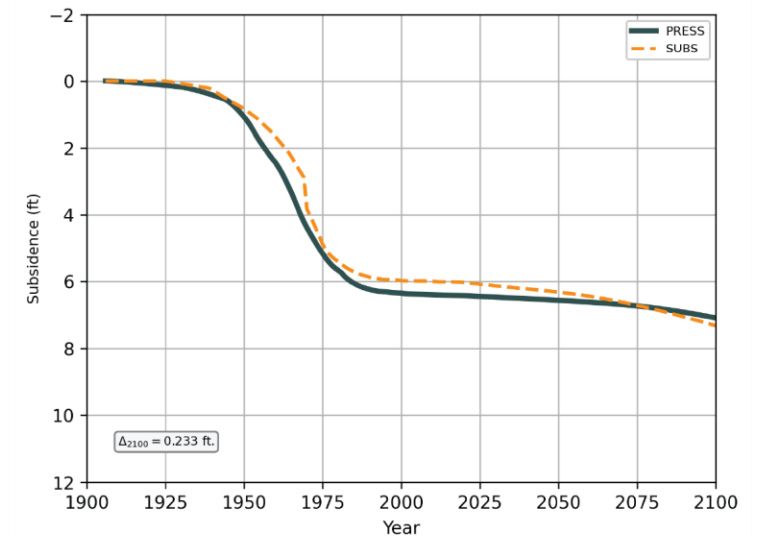


PRESS MODEL CALIBRATION VERIFICATION

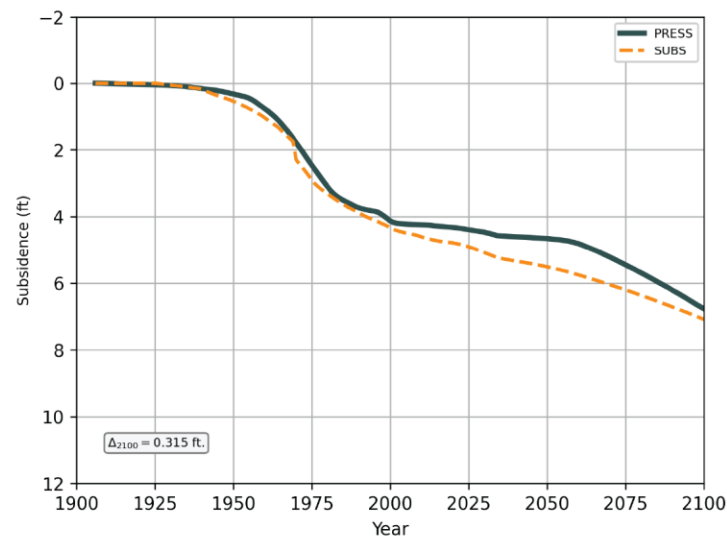
HARRISBURG SITE December 2023



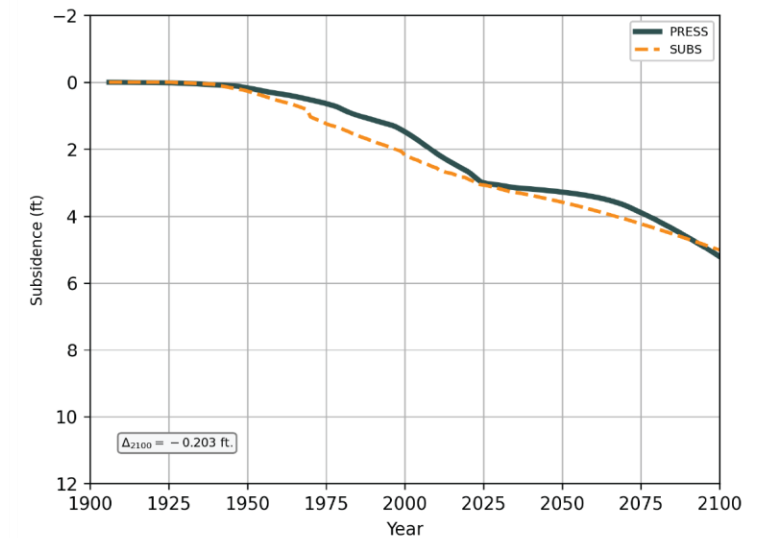
HOBBY AIRPORT SITE December 2023



HUMBLE SITE December 2023



KATY SITE December 2023



EVALUATE
GROUNDWATER
SCENARIOS

*Groundwater demand
projections, alternative supply
availability, and an updated
model allow for the evaluation of
the current Regulatory Plan and
future scenarios*

GROUNDWATER SCENARIO DEVELOPMENT

Baseline (B6)

- Current regulatory plans
- Current usage patterns

Maximum Allowable (M3)

- Maximum use allowed under regulatory plans

Drought Scenario (D1)

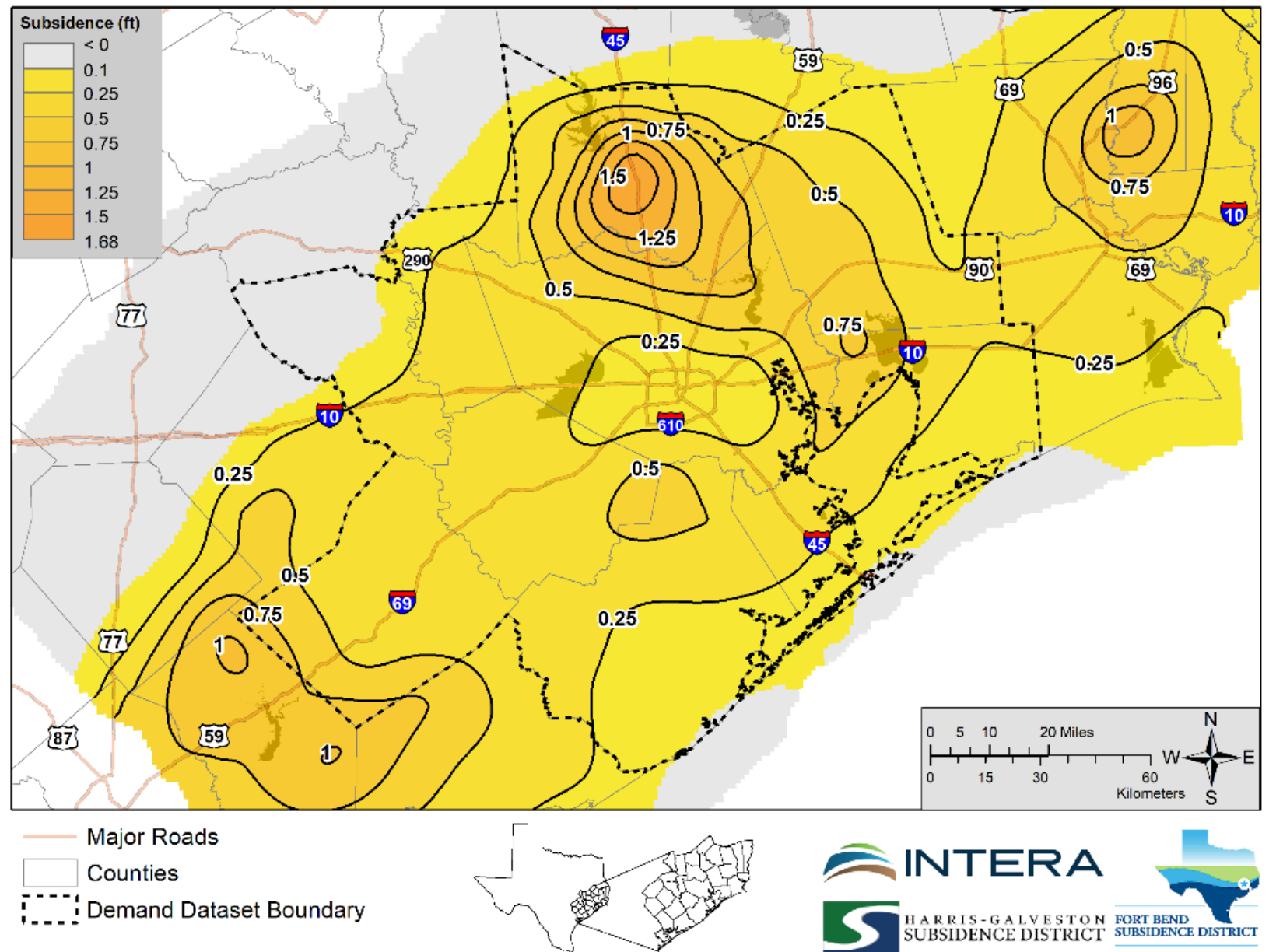
- Increased demand during drought periods
- Based on historical

GRP Five-Year Delay (E21)

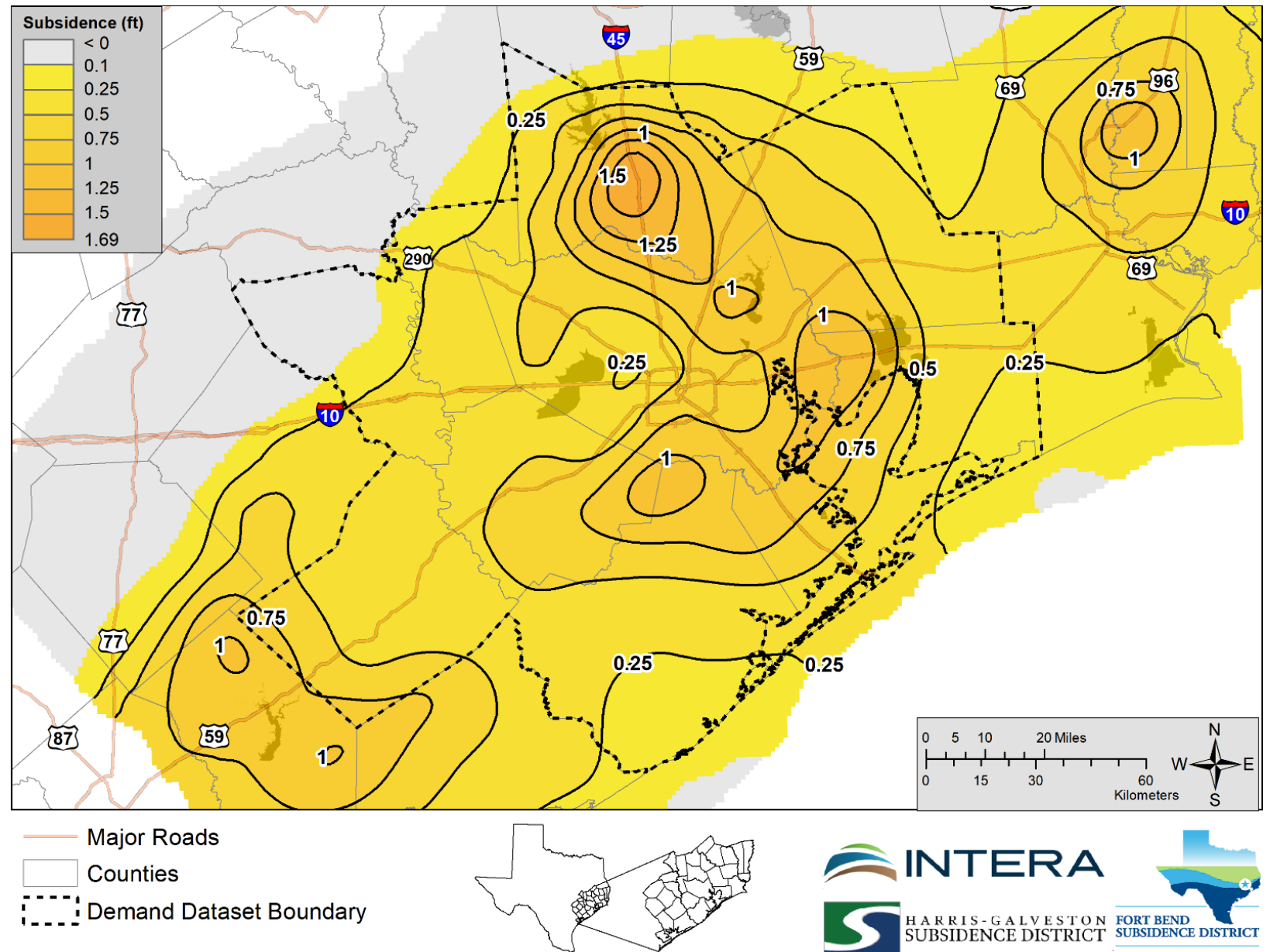
- Delay of 2025 conversion by 5 years
- NHCRWA credits for additional 5 years



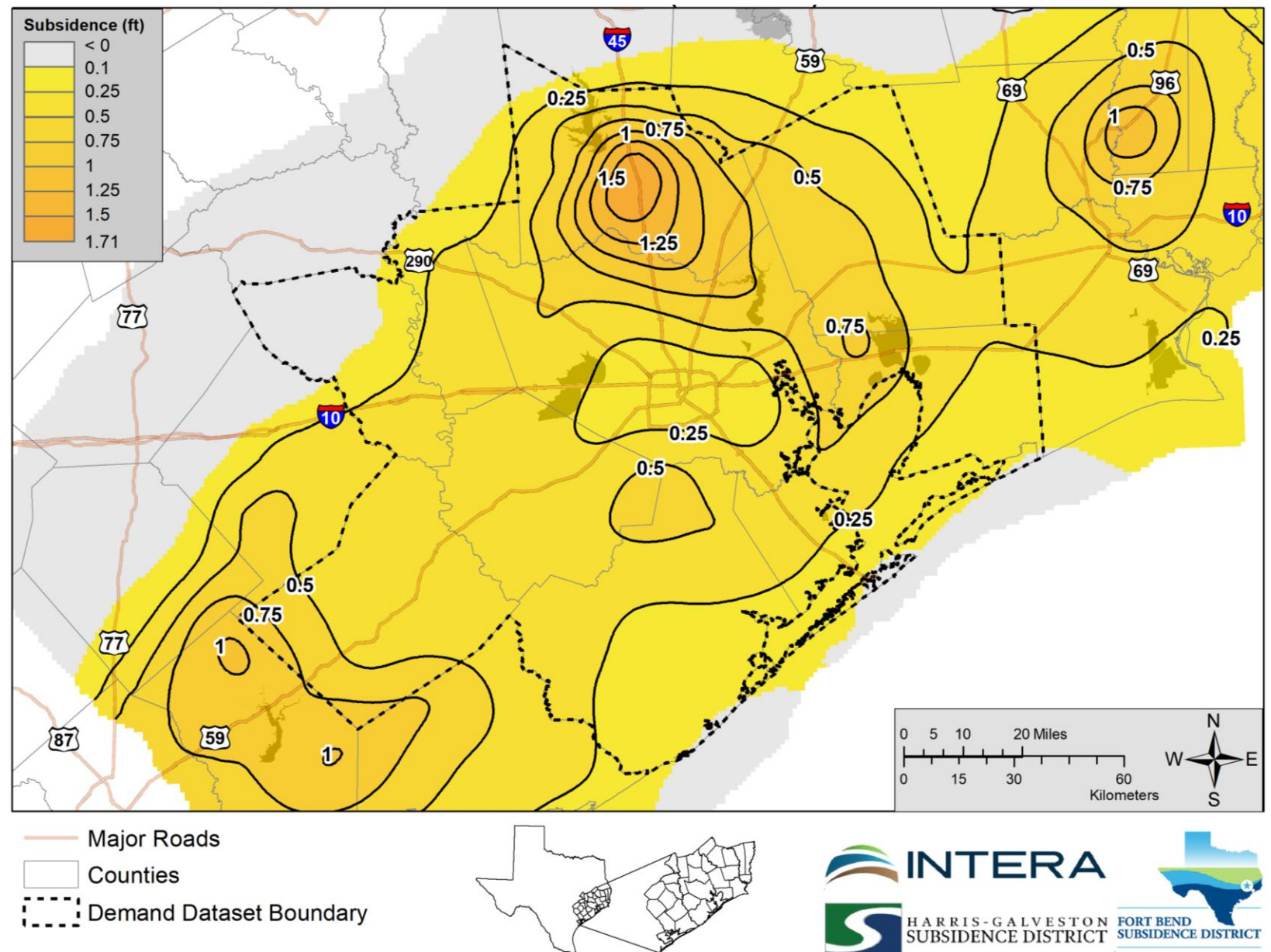
BASELINE 2025-2050



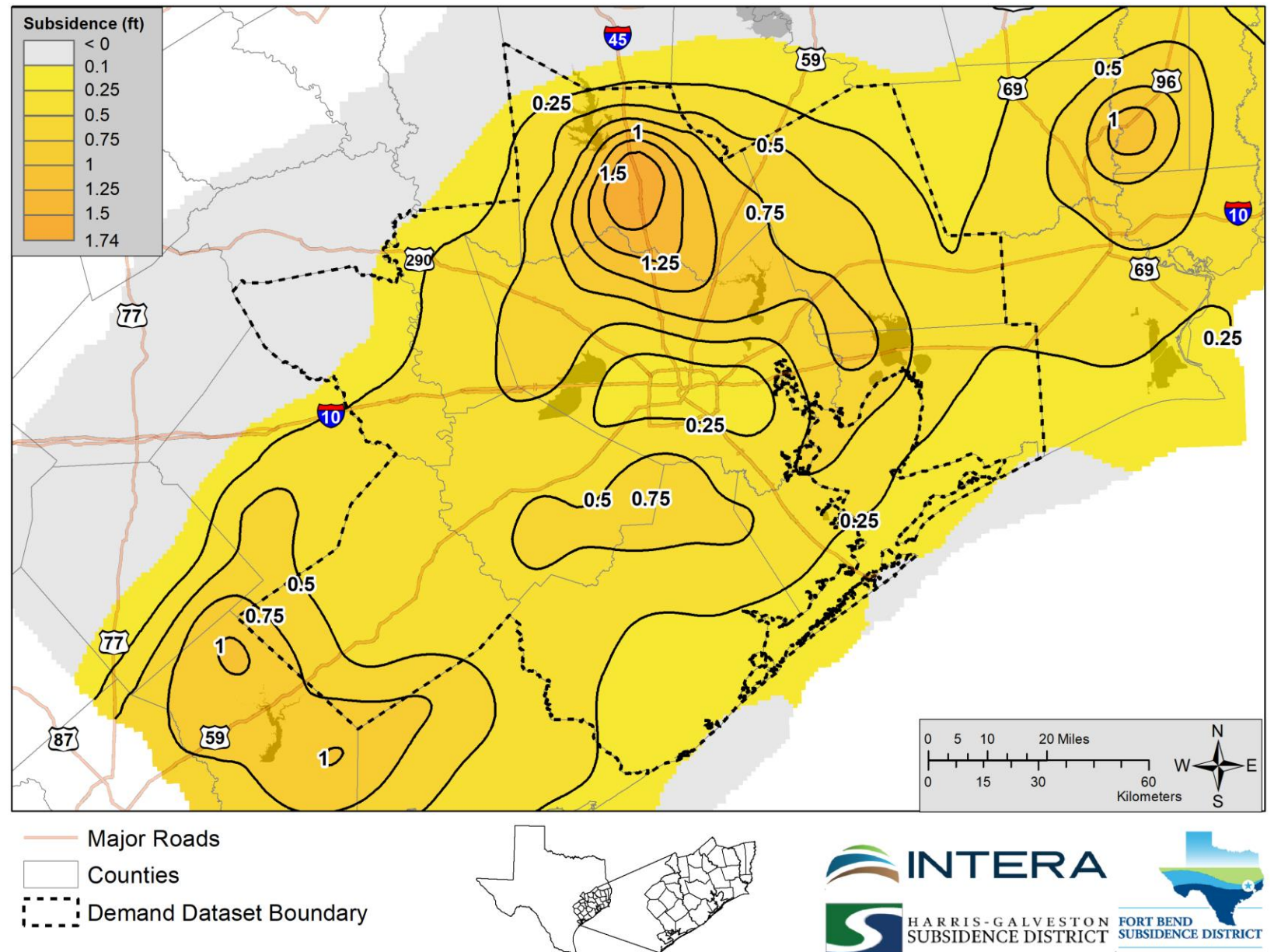
MAXIMUM ALLOWABLE 2025-2050



DROUGHT SCENARIO 2025-2050



GRP FIVE- YEAR DELAY 2025-2050



SUMMARY OF GROUNDWATER SCENARIOS CURRENT REGULATORY PLAN

Modeled
Subsidence
2025-2050



Up to 12 inches within HGSD (northern Harris County)



Up to 9 inches in western Liberty and Chambers Counties



Up to 18 inches in Montgomery County



POTENTIAL FUTURE STUDIES

Evaluation of subsidence impacts associated with the groundwater credit programs administered by each District

Investigation of options for users in historically under-converted areas to meet regulatory requirements

Investigation of alternative water sources for northeastern Harris County

Evaluation of the economic benefits of groundwater reduction versus the cost of infrastructure to develop alternative water supplies