

HARRIS-GALVESTON



SUBSIDENCE  
DISTRICT



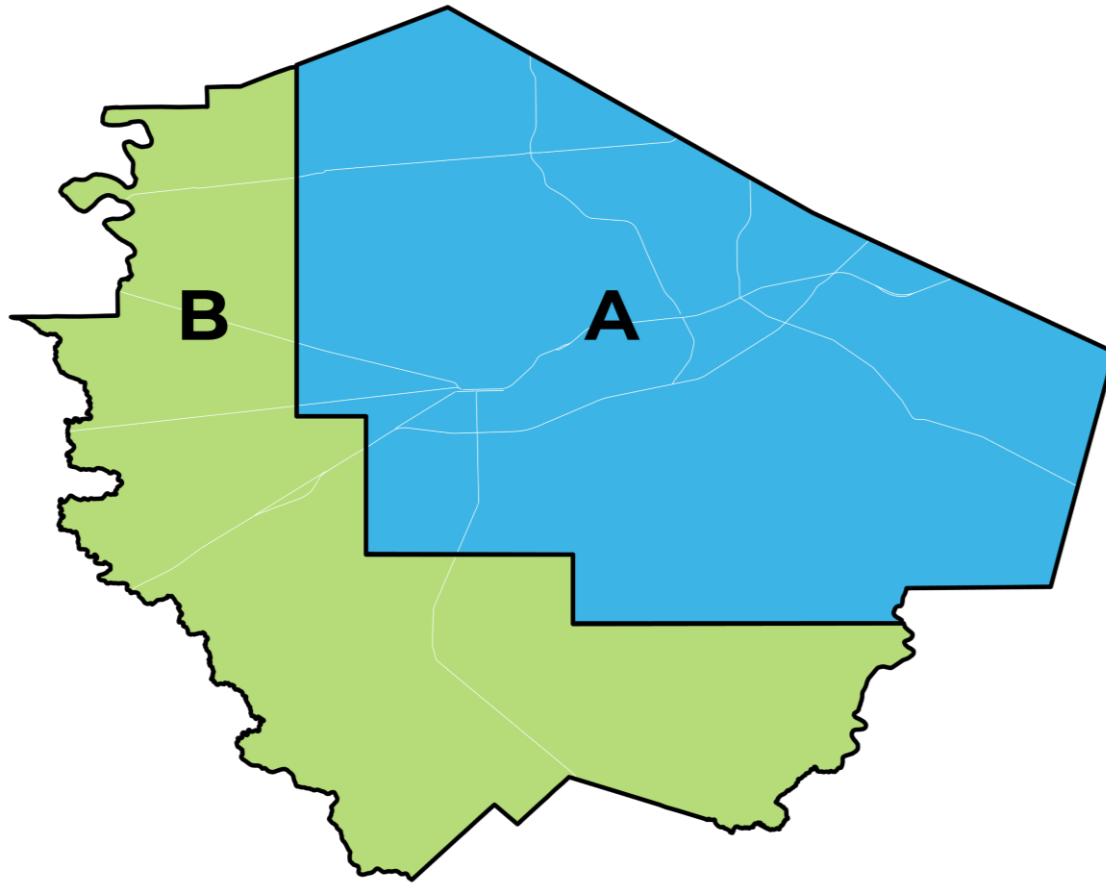
FORT BEND  
SUBSIDENCE DISTRICT

# JOINT REGULATORY PLAN REVIEW

**Fort Bend Subsidence District  
Board of Directors' Workshop**

October 10, 2024

# FBSD Regulatory Areas



**Area A:** no more than 40% of Total Water Demand (TWD) may be sourced from groundwater.

- Permittees operating within an approved Groundwater Reduction Plan have the following requirements:
  - 2013 – no more than 70% of TWD from groundwater
  - 2027 – no more than 40% of TWD from groundwater

**Area B:** not subject to groundwater reduction requirements.

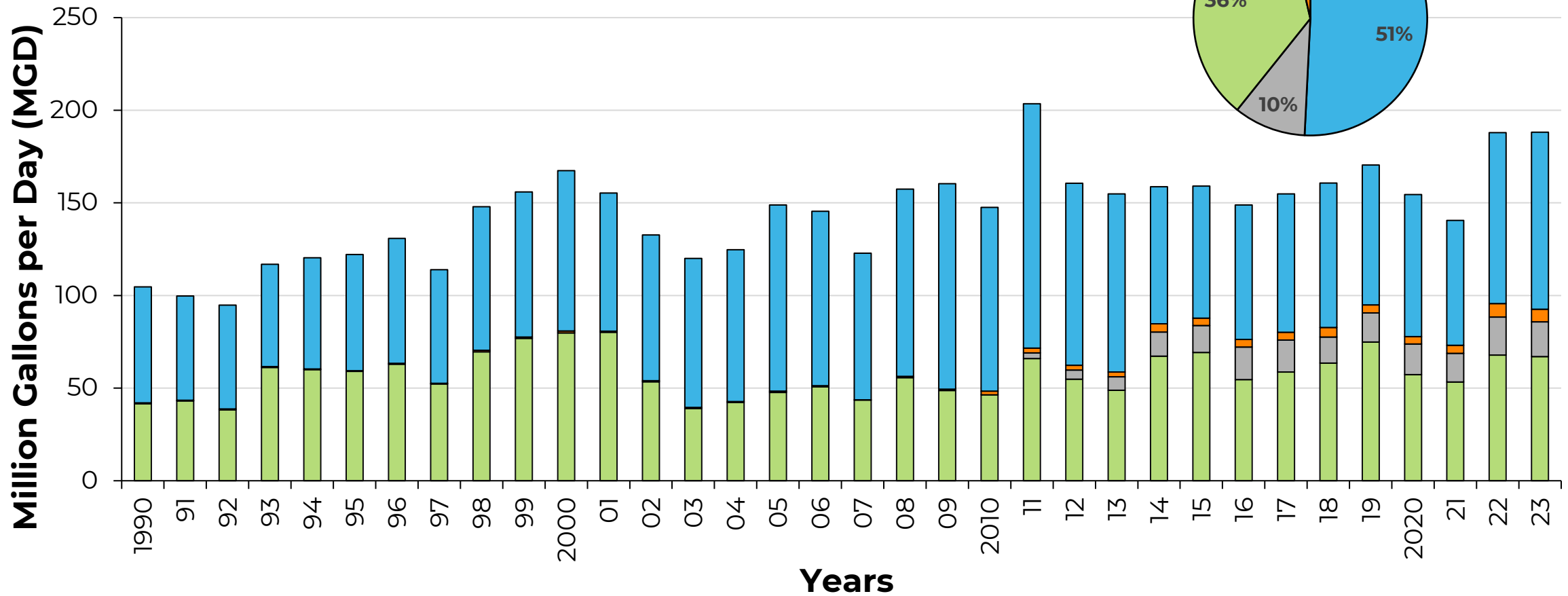
# Total Water Demand



**2023: 188.1 MGD**

Grouped by Source for Entire District

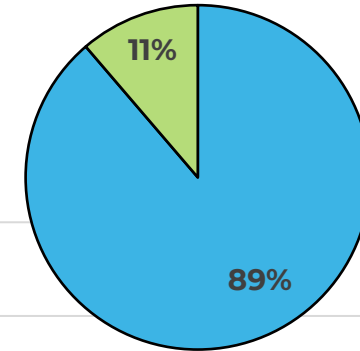
■ Brazos   
 ■ San Jacinto/Trinity   
 ■ Reclaimed   
 ■ Groundwater



# Groundwater Use Data

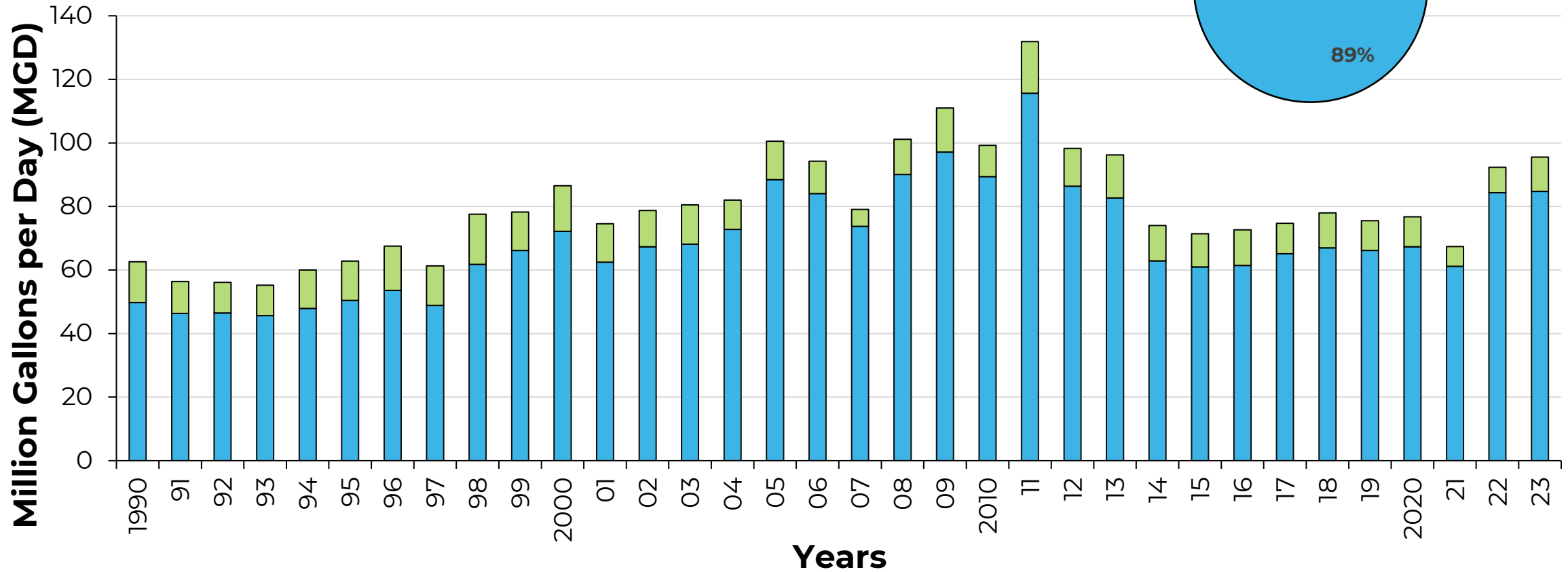


**2023: 95.5 MGD**



Groundwater Withdrawals Grouped by Area

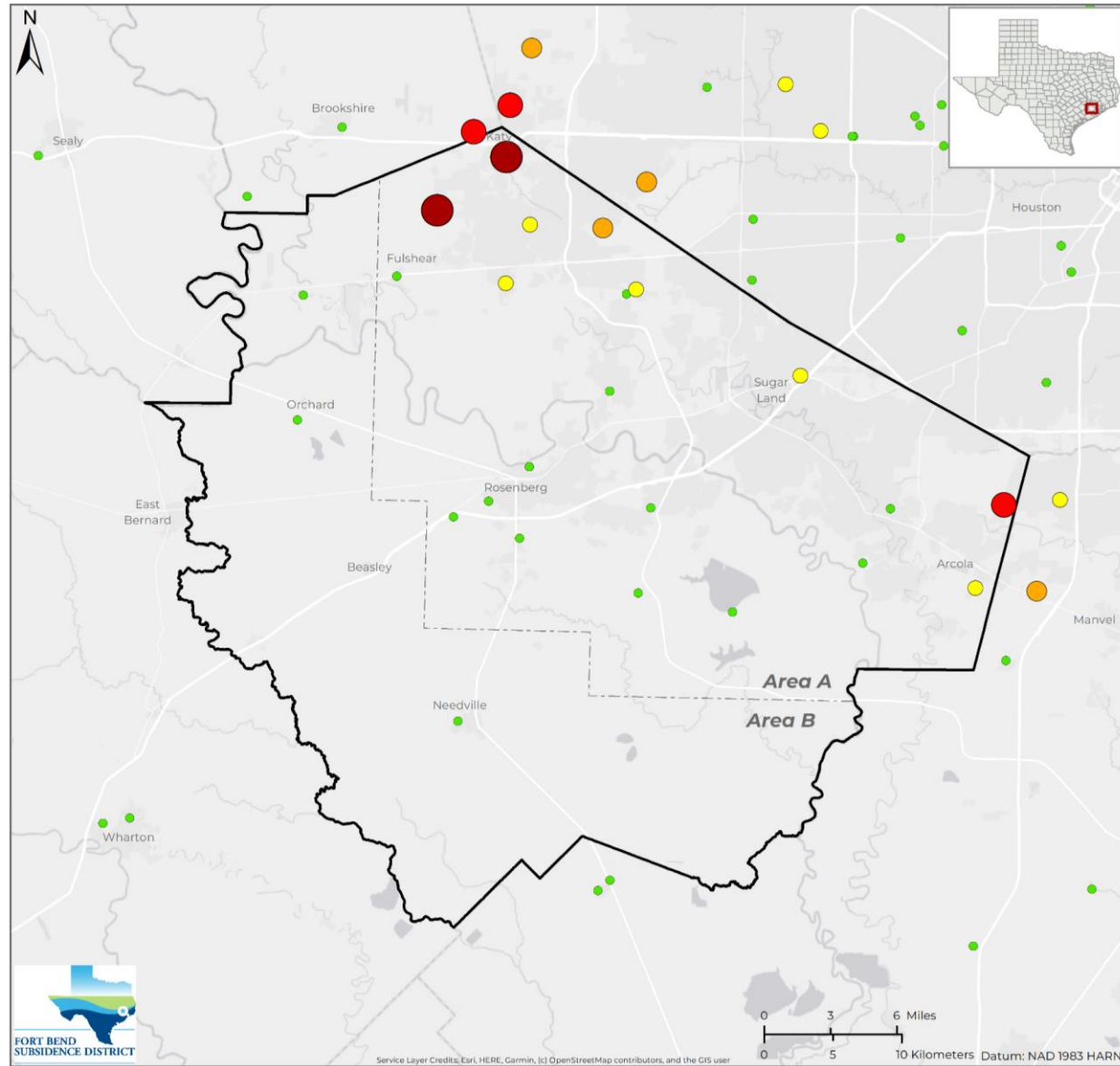
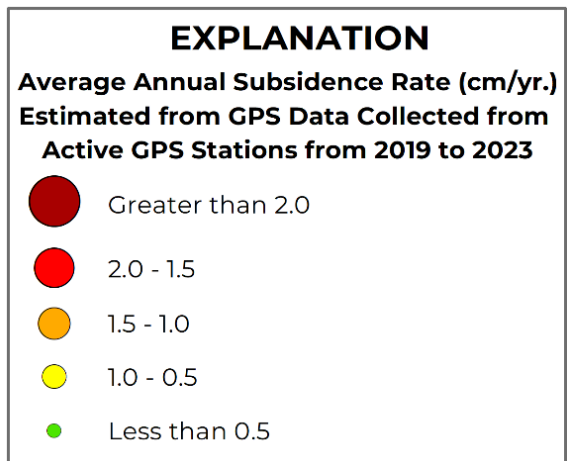
■ Area A ■ Area B



# Current Subsidence Rates



Average annual subsidence rate in centimeters per year (cm/yr.), estimated from GPS data collected at active stations with three or more years of data averaged from 2019 to 2023.



# JRPR Findings | Subsidence



The **District's Regulatory Plan** sets a reasonable and attainable target for groundwater use within the District and has shown positive results in reducing subsidence rates.



**Short-term projections** (2025-2050) show the effectiveness of the current Regulatory Plan in minimizing subsidence within Fort Bend County.



**Long-term projections** (2050-2100) reveal additional subsidence in Area B and in the southern portion of Area A as well as along the border with adjacent counties to the south and north.

# JRPR Findings | Future Planning



- Most of Fort Bend County will continue to experience rapid population growth, with the largest areas of growth in Regulatory Area B and south of the Brazos River.
- Alternative water supplies are available in sufficient quantities to support projected growth, though the source and time-to-delivery will vary within the District.
- Additional resources will need to be dedicated to research and monitor the impact of groundwater use on subsidence in the areas of current and future growth.

# PROJECT SPONSORS AND COLLABORATORS



**FORT BEND  
SUBSIDENCE DISTRICT**

HARRIS-GALVESTON



**SUBSIDENCE  
DISTRICT**

**Texas Water  
Development Board**

 **USGS**  
*science for a changing world*



# 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.



# TODAY'S SPEAKERS



**Jason Afinowicz**

Principal  
Freese and Nichols



**Justin Bartlett,  
PhD, PE**

Associate  
Civitas Engineering



**Sunil Kommineni,  
PhD, PE**


President  
Civitas Engineering



**Wade Oliver, PG**

Director, Principal Scientist  
INTERA



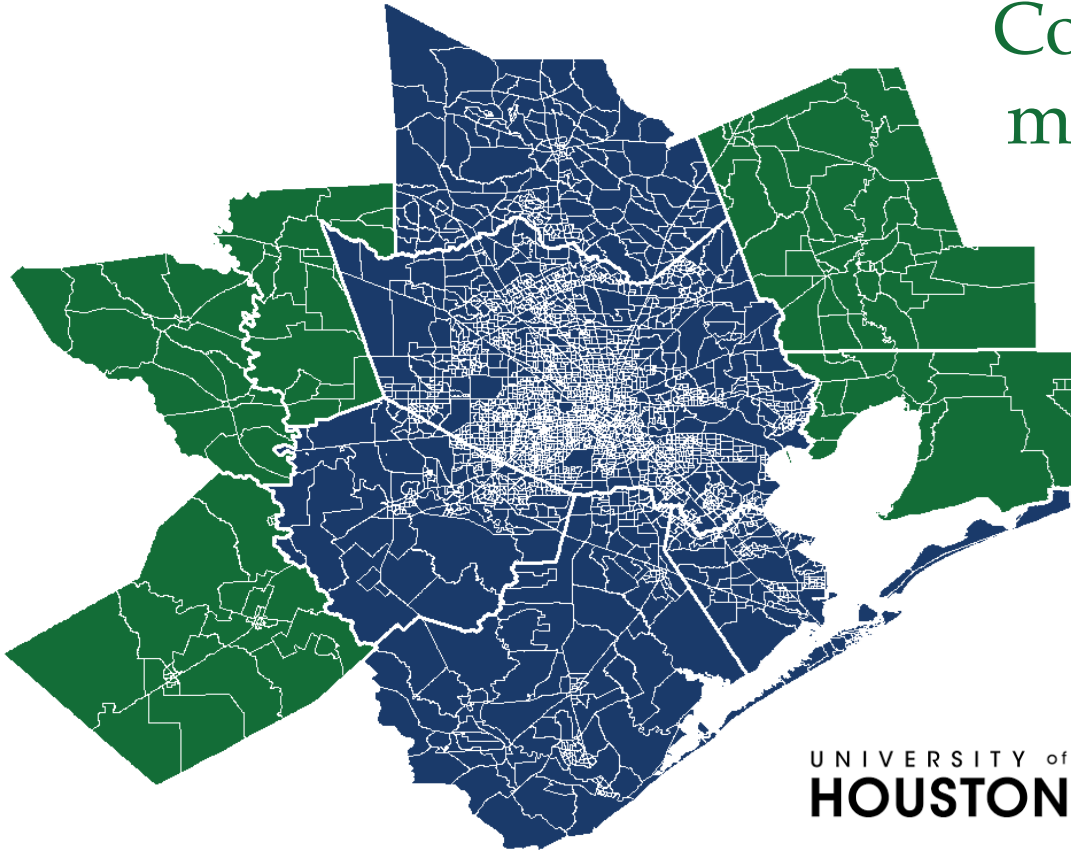


# POPULATION DEMANDS AND PROJECTIONS

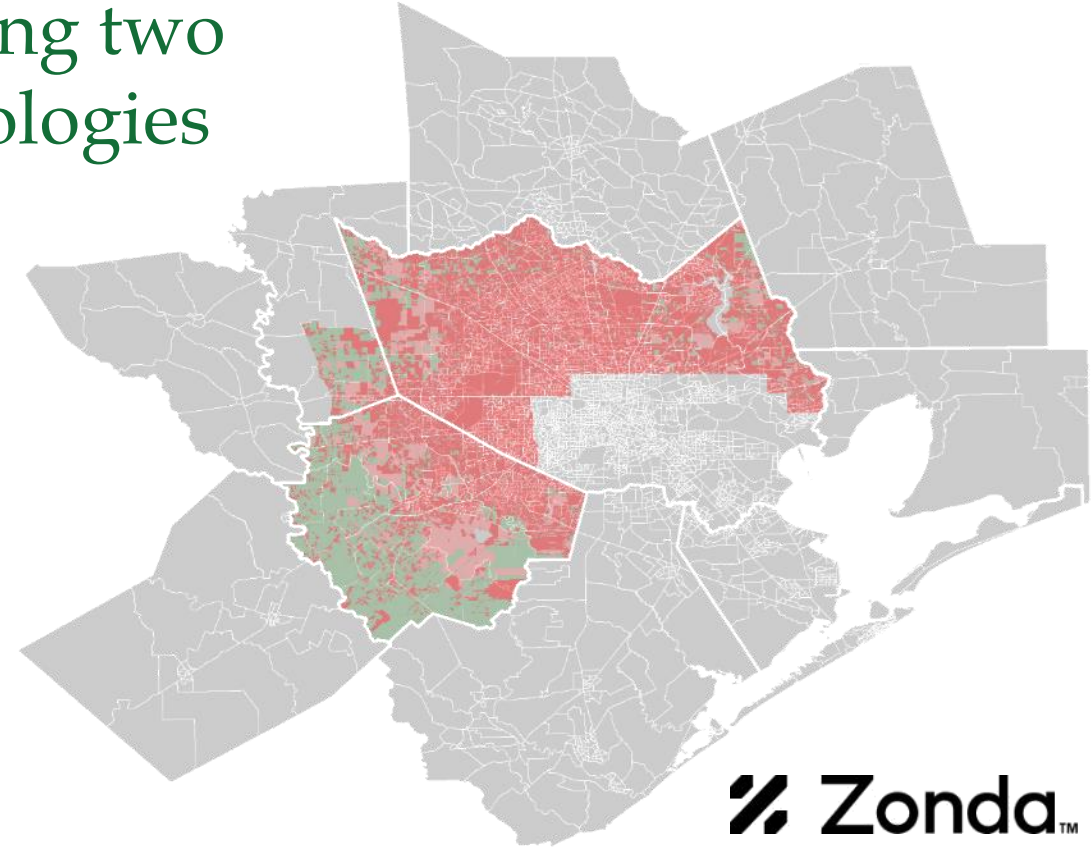
Population and water demands drive the total demand for water and, therefore, projects the future demands that may be placed upon groundwater

# POPULATION PROJECTION METHODOLOGY

Combining two methodologies



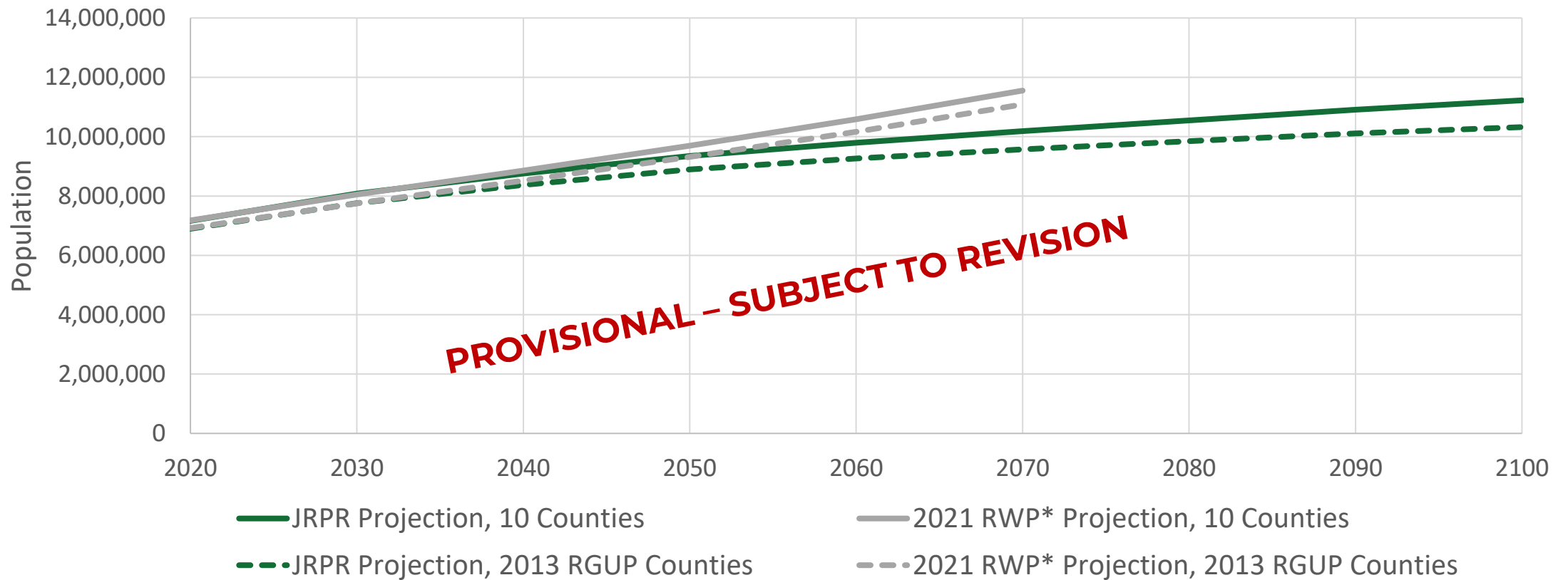
Small Area Model Houston (SAM-Houston)  
Long-range, wide-area projections



Projected Development Methodology  
Short-range, detailed projections

# POPULATION PROJECTIONS

## Comparison to Previous Projections



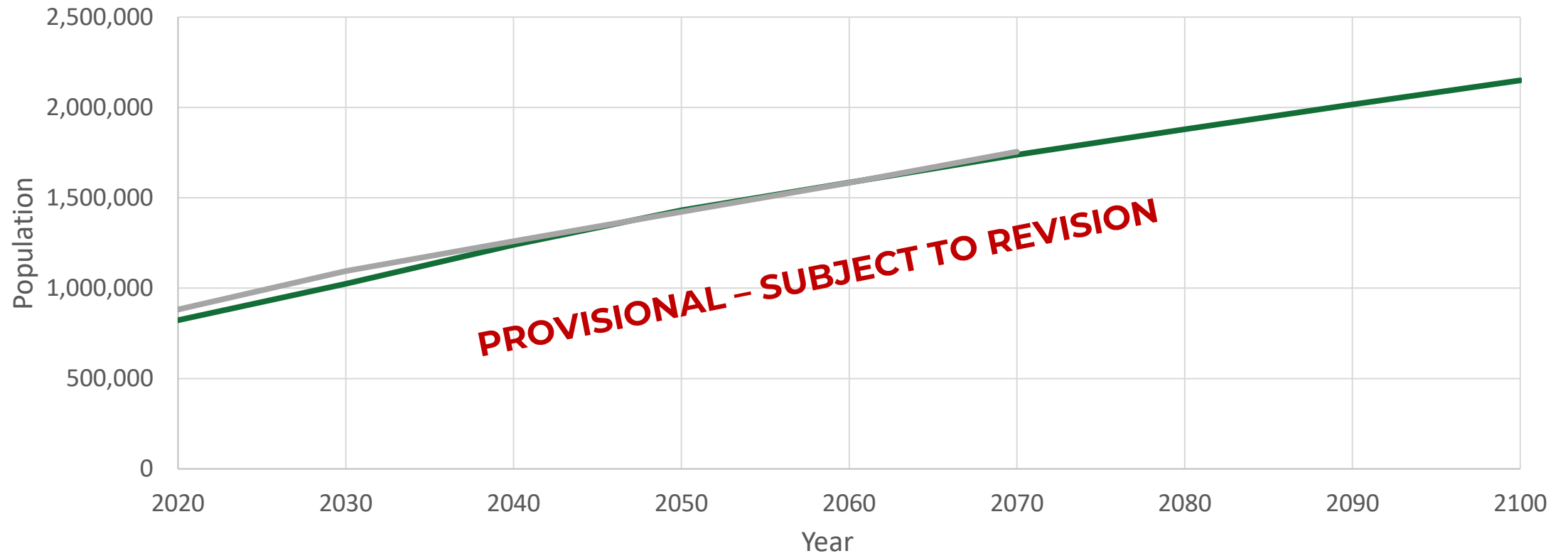
*\*2021 RWP and 2016 RWP used projections developed in 2013 RGUP for Brazoria, Harris, Galveston, Montgomery, and Fort Bend Counties, with only slight modifications (<0.01%).*

# POPULATION PROJECTIONS

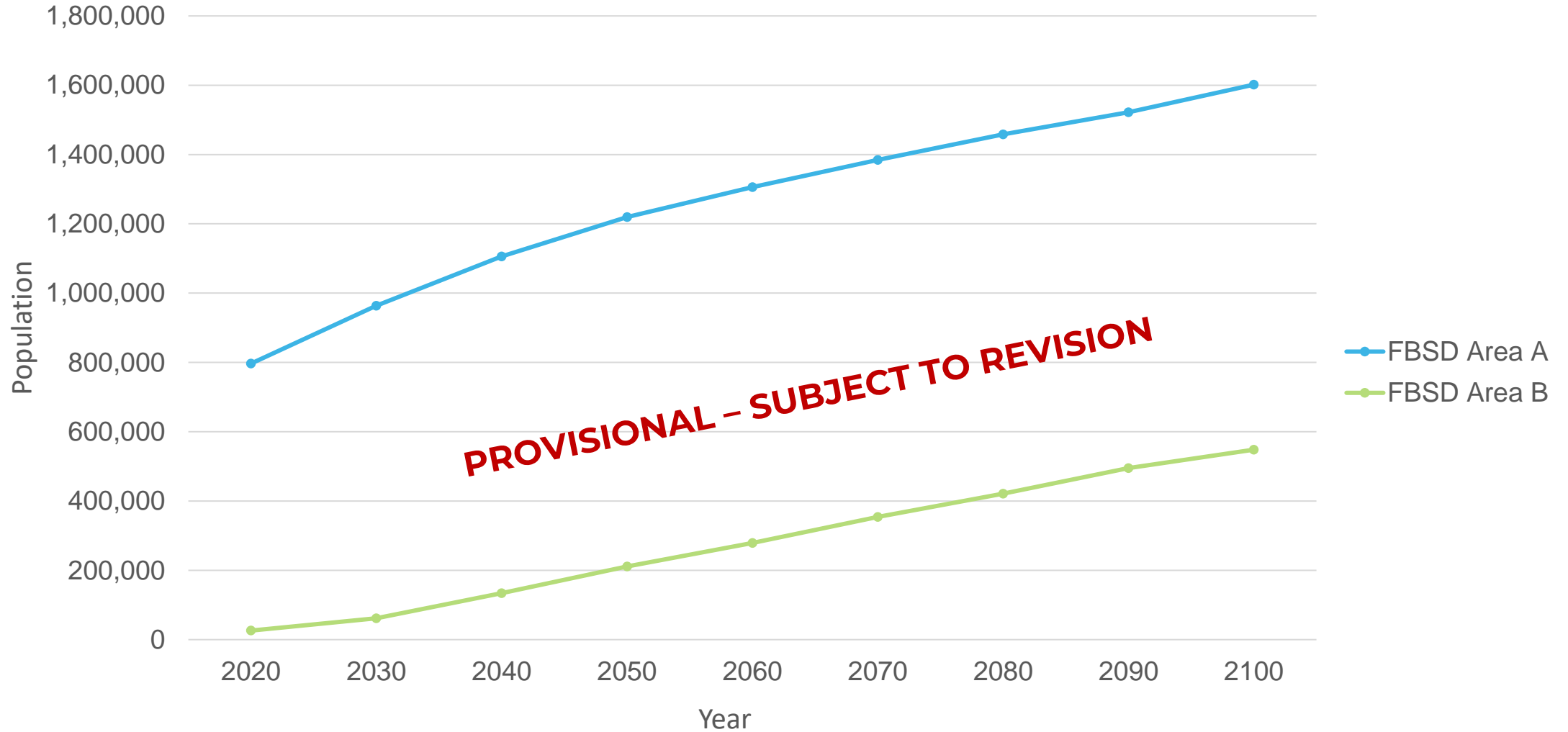
## COMPARISON TO PREVIOUS PROJECTIONS

Fort Bend County

— 2023 JRPR — 2021 RWP\*



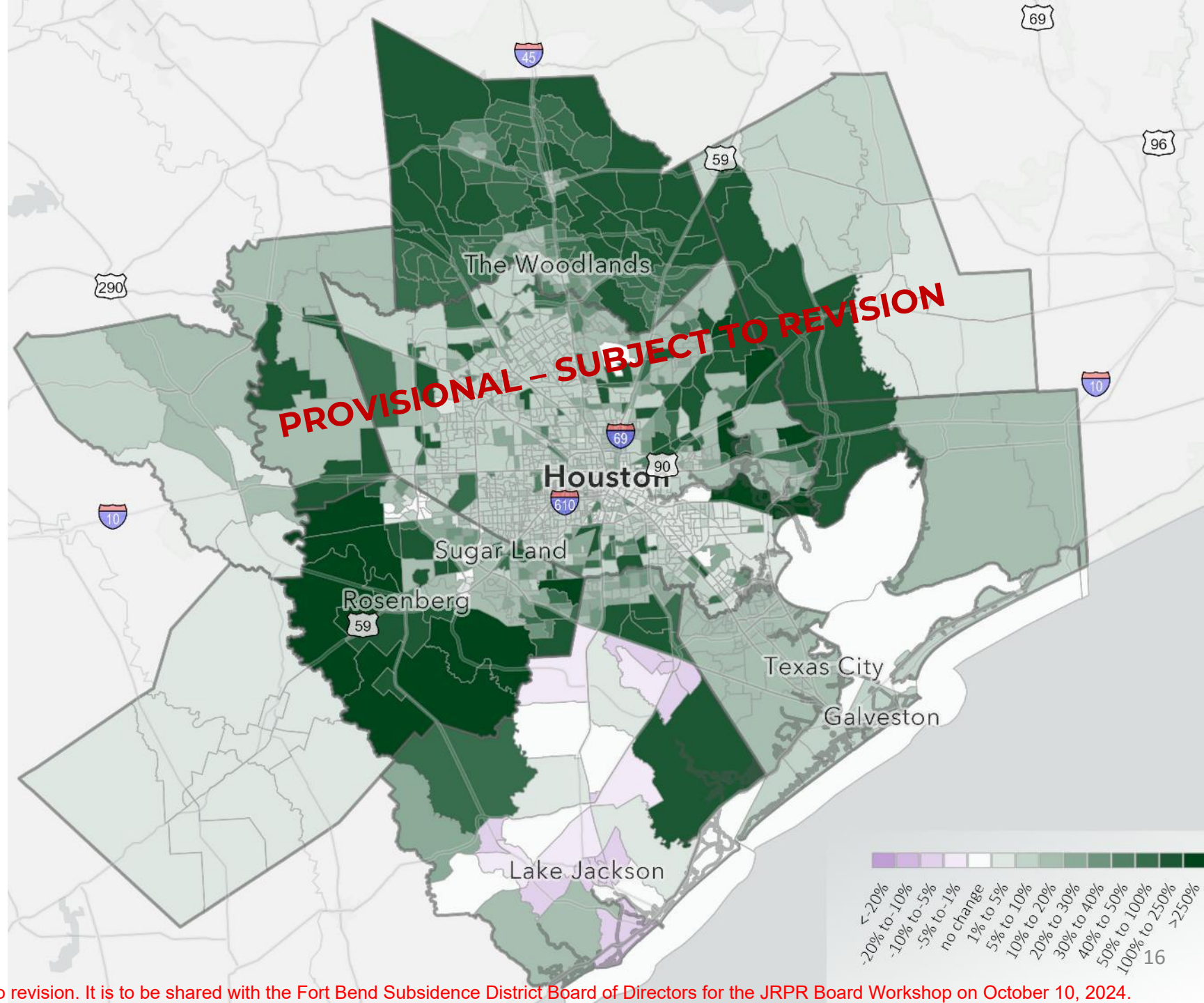
# POPULATION FORECAST | FORT BEND COUNTY





# POPULATION GROWTH FORECAST (2020 TO 2050)

percent change  
by Census tract





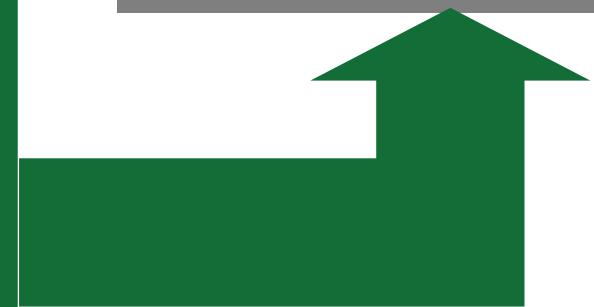
PROJECTIONS  
AT VARYING  
SPATIAL  
SCALES

Census Tracts



Census Blocks

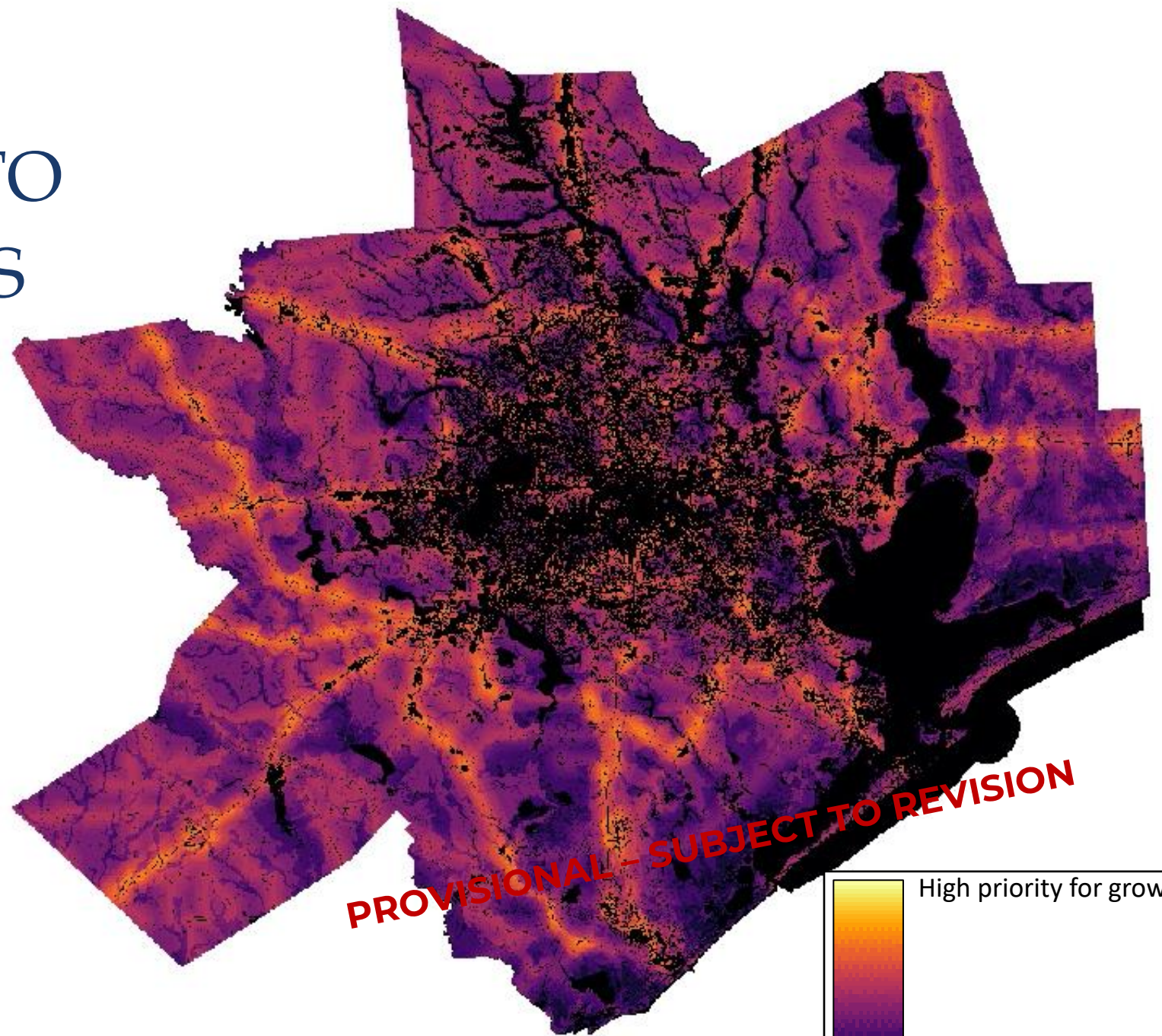
Utilities



# DISTRIBUTION TO CENSUS BLOCKS

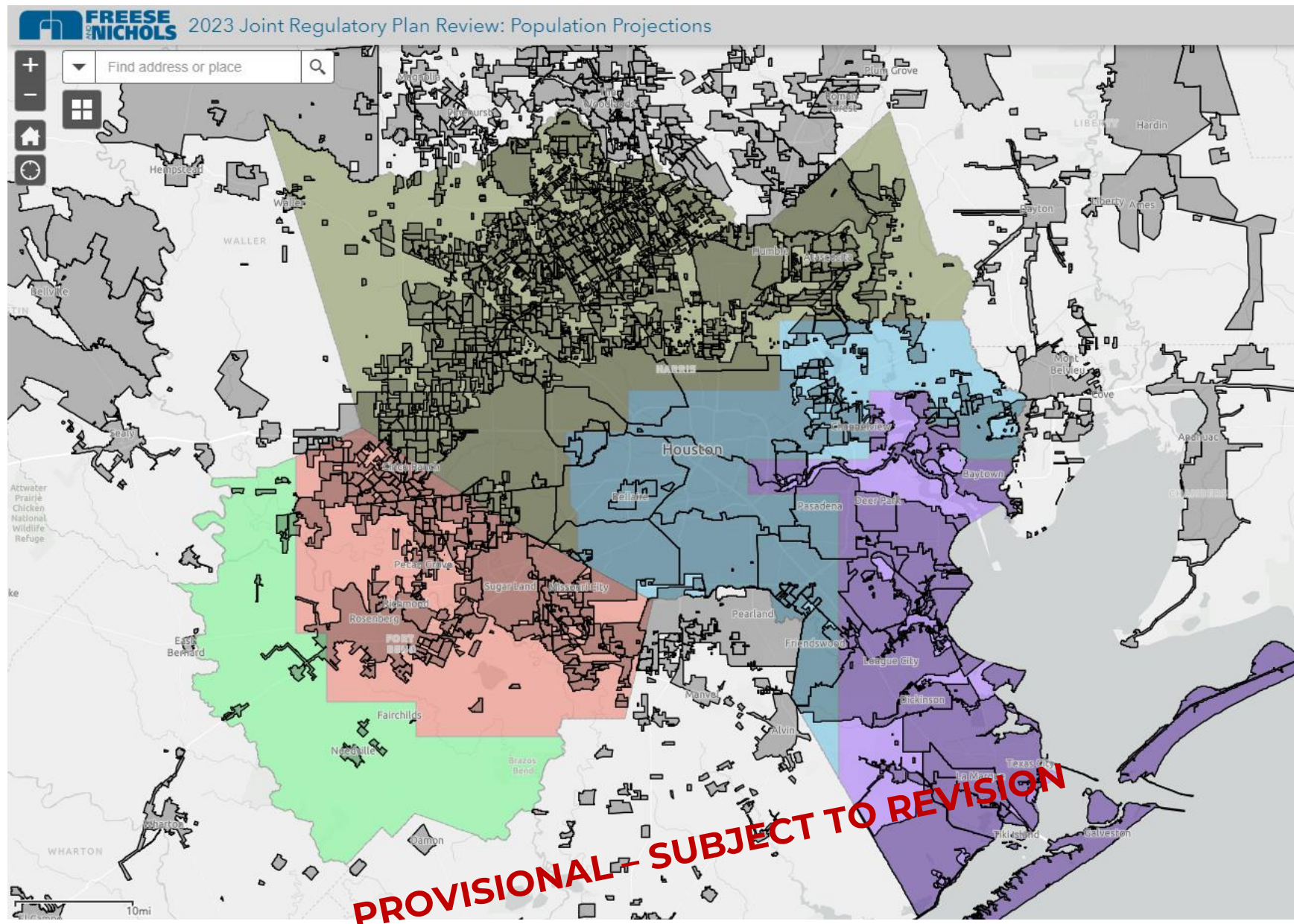
Within tracts, growth is distributed based on:

- Existing and recent development
  - Data from Zonda
- Interstate and highway proximity
  - Future expansions
- Wetlands
- Floodplains
  - Potential changes

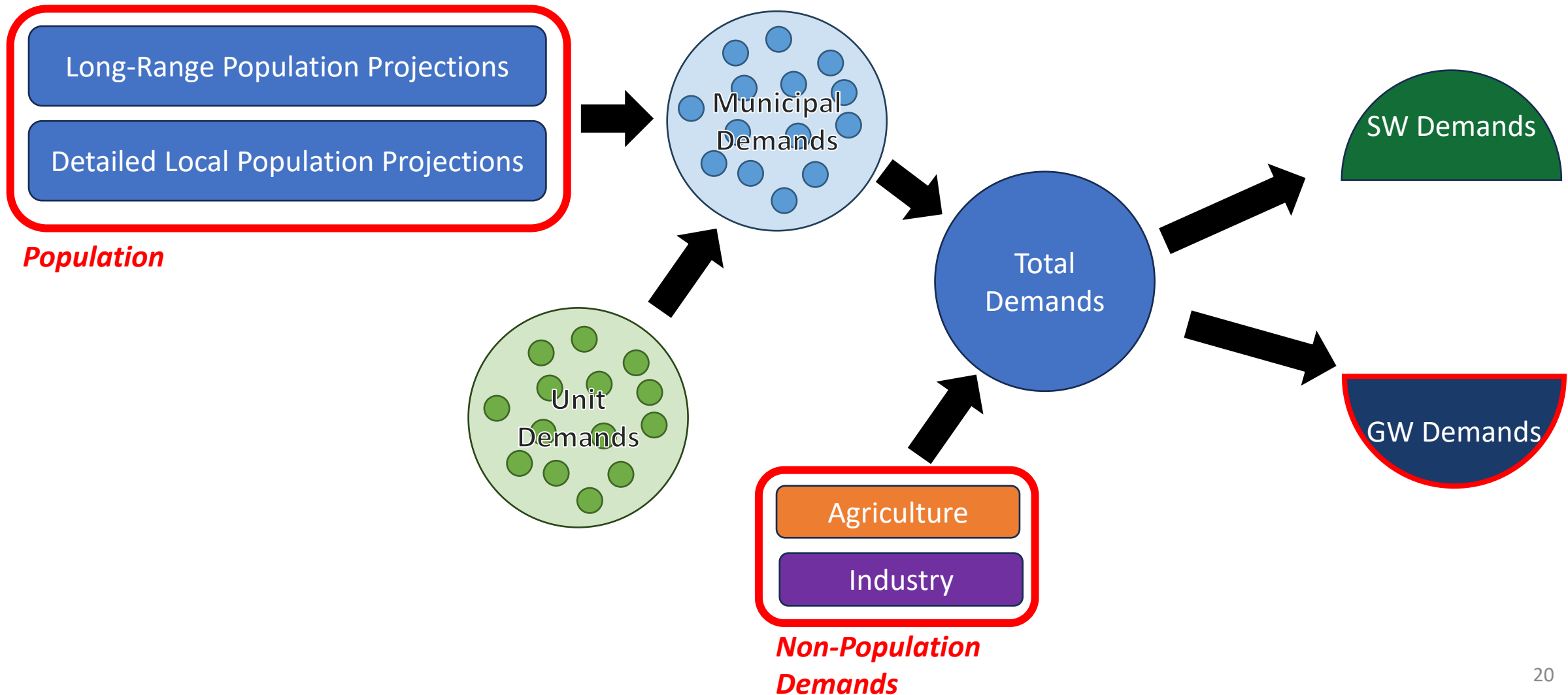




# STAKEHOLDER ENGAGEMENT

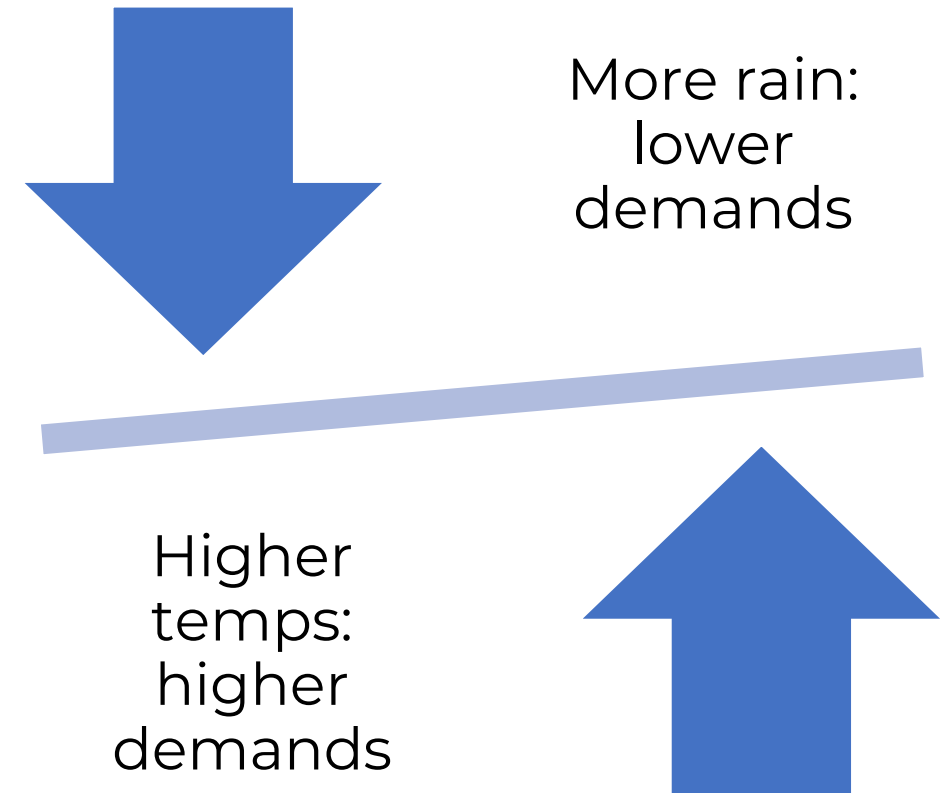


# DEMAND PROJECTION OVERVIEW



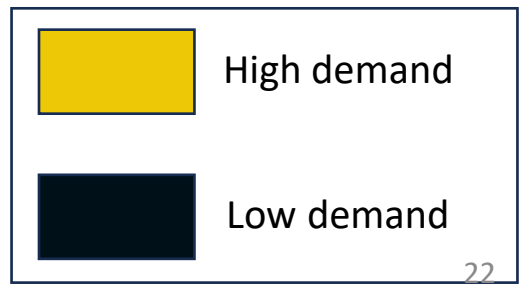
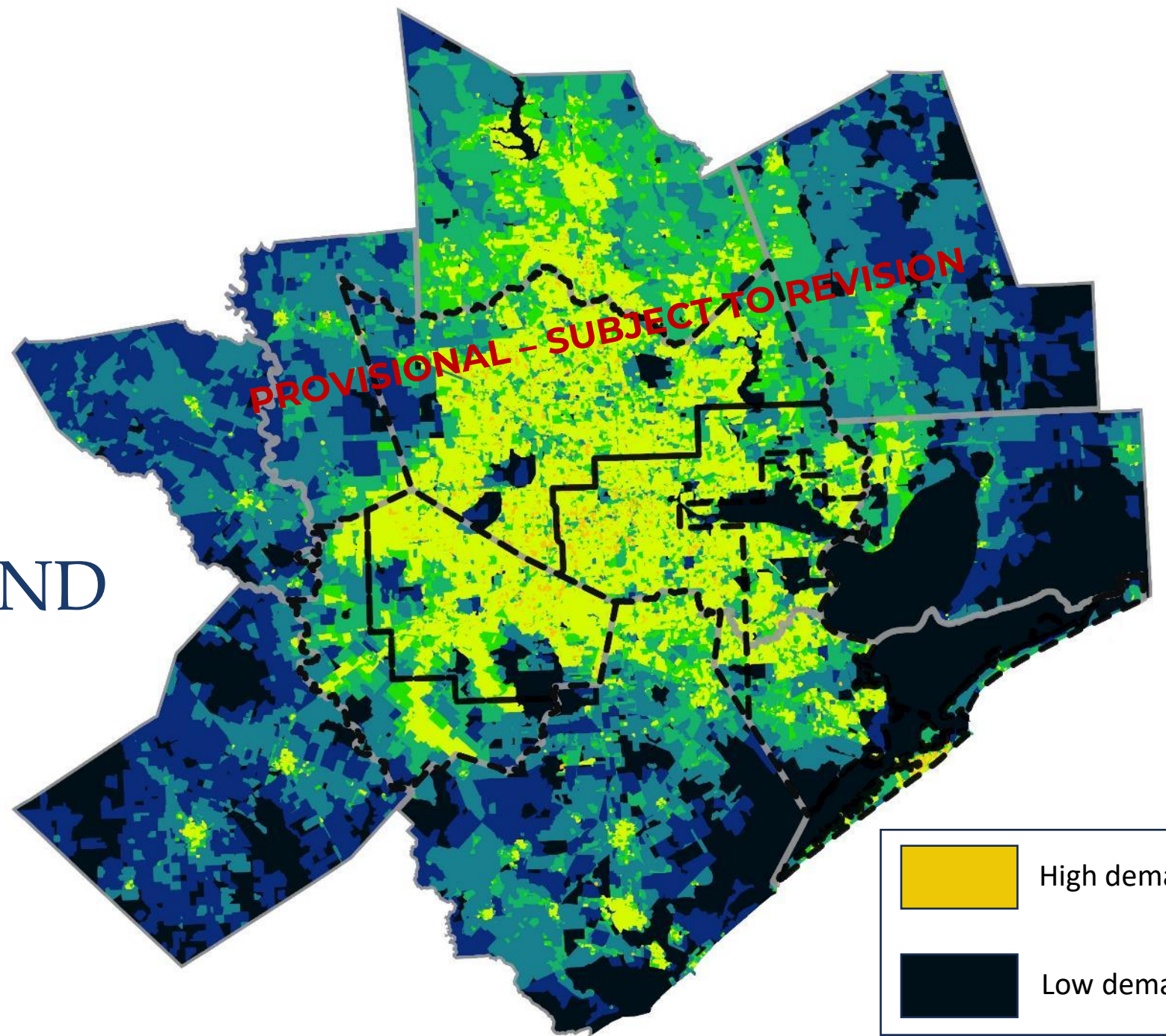
# UNIT DEMANDS

- Unit demands developed by utility
- Based on:
  - Per-person water usage
  - Climate trends
- Develop average demand conditions for long-term projection
- Can be adjusted for drought scenarios



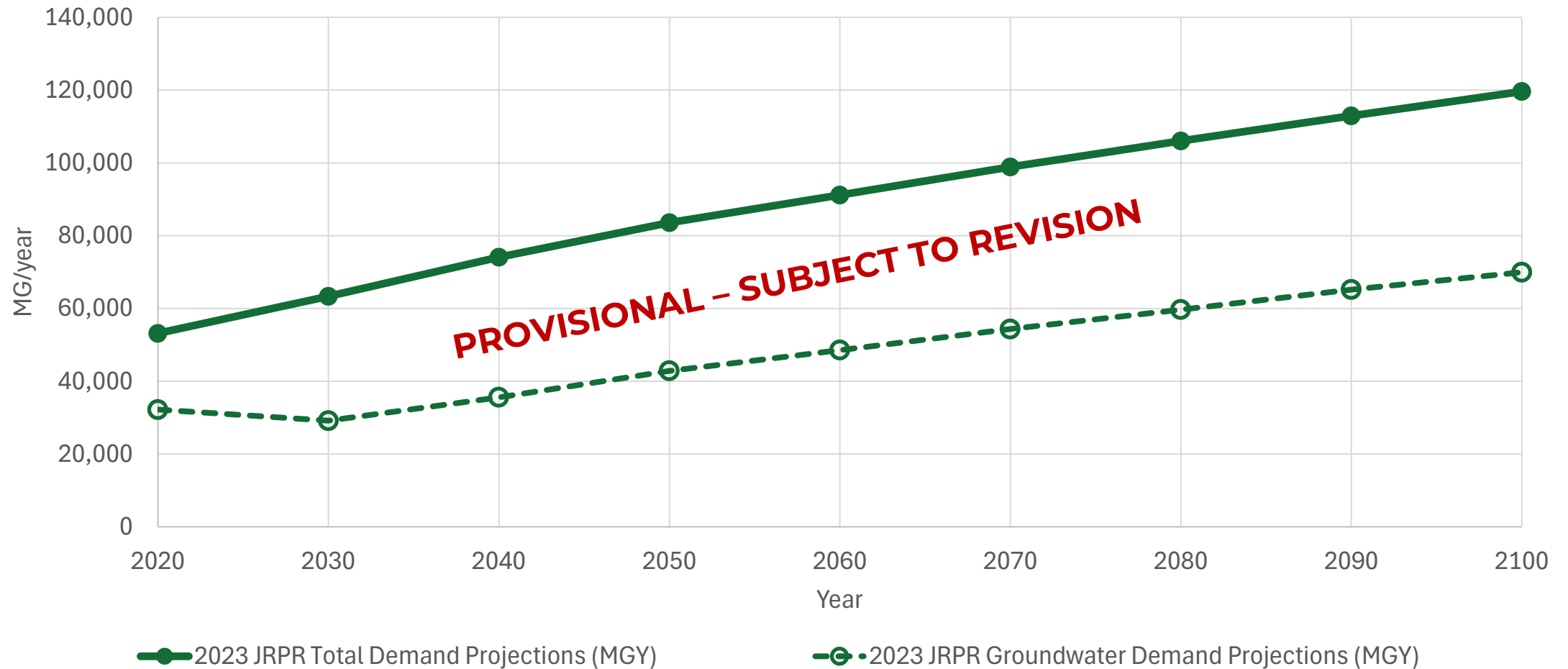


# PROJECTED MUNICIPAL WATER DEMAND (2050)



# WATER DEMAND PROJECTIONS

Fort Bend County-Level Demand Forecast





ALTERNATIVE  
WATER  
SUPPLY  
ASSESSMENT

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



# ALTERNATIVE WATER SUPPLY STUDY

## OBJECTIVES

- Confirm adequate alternate water supplies are available to meet the regulatory intent.
- Compile and characterize alternative water supplies and their availability for use by systems in the regulatory areas.

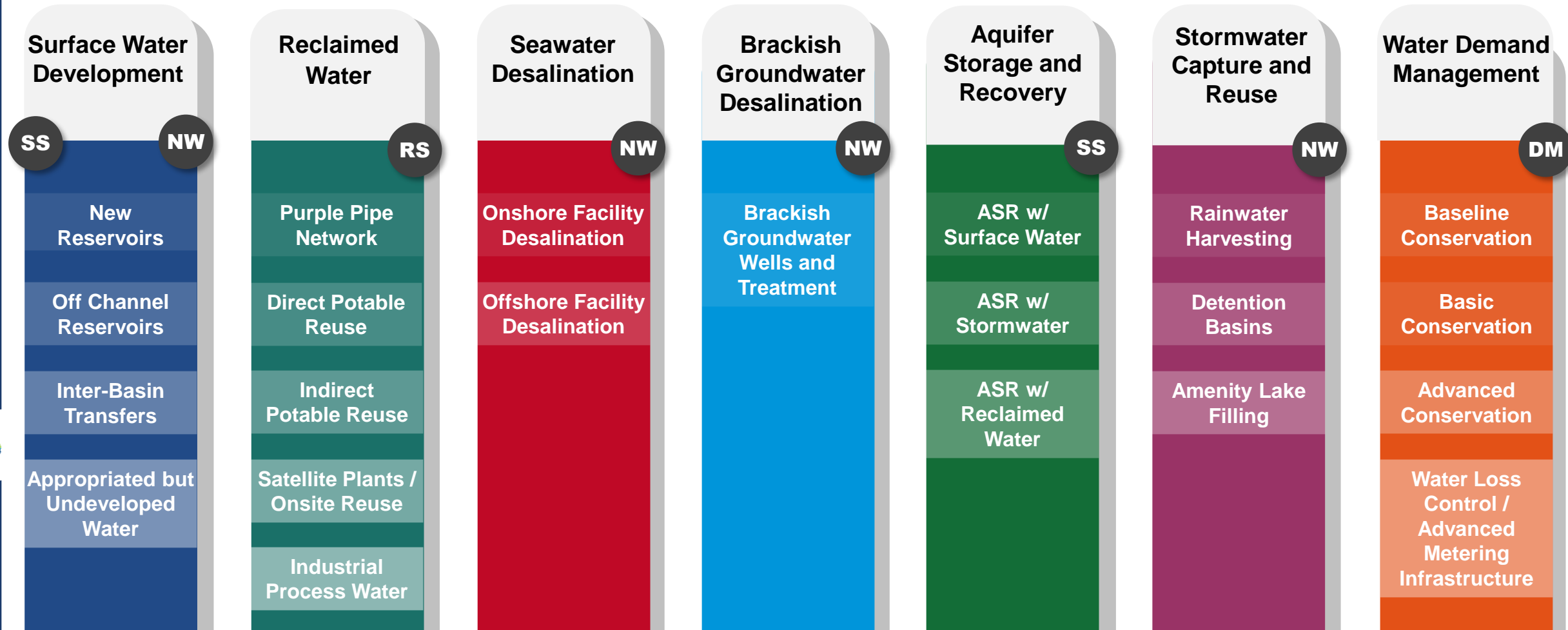


# AWS OPTIONS

## Identified 20+ Options

NW - New Water  
SS - Storage Solution

RS - Reclaimed Supply  
DM - Demand Management



# SHORTLISTED OPTIONS

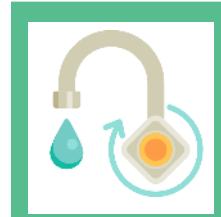


# CHARACTERIZATION OF SHORTLISTED OPTIONS

*Develop  
Narrative  
Descriptions*



*Estimate  
Magnitude of  
Supplies*



*Prepare Planning  
Level Cost  
Estimates*



*Identify  
Implementation  
Timelines*

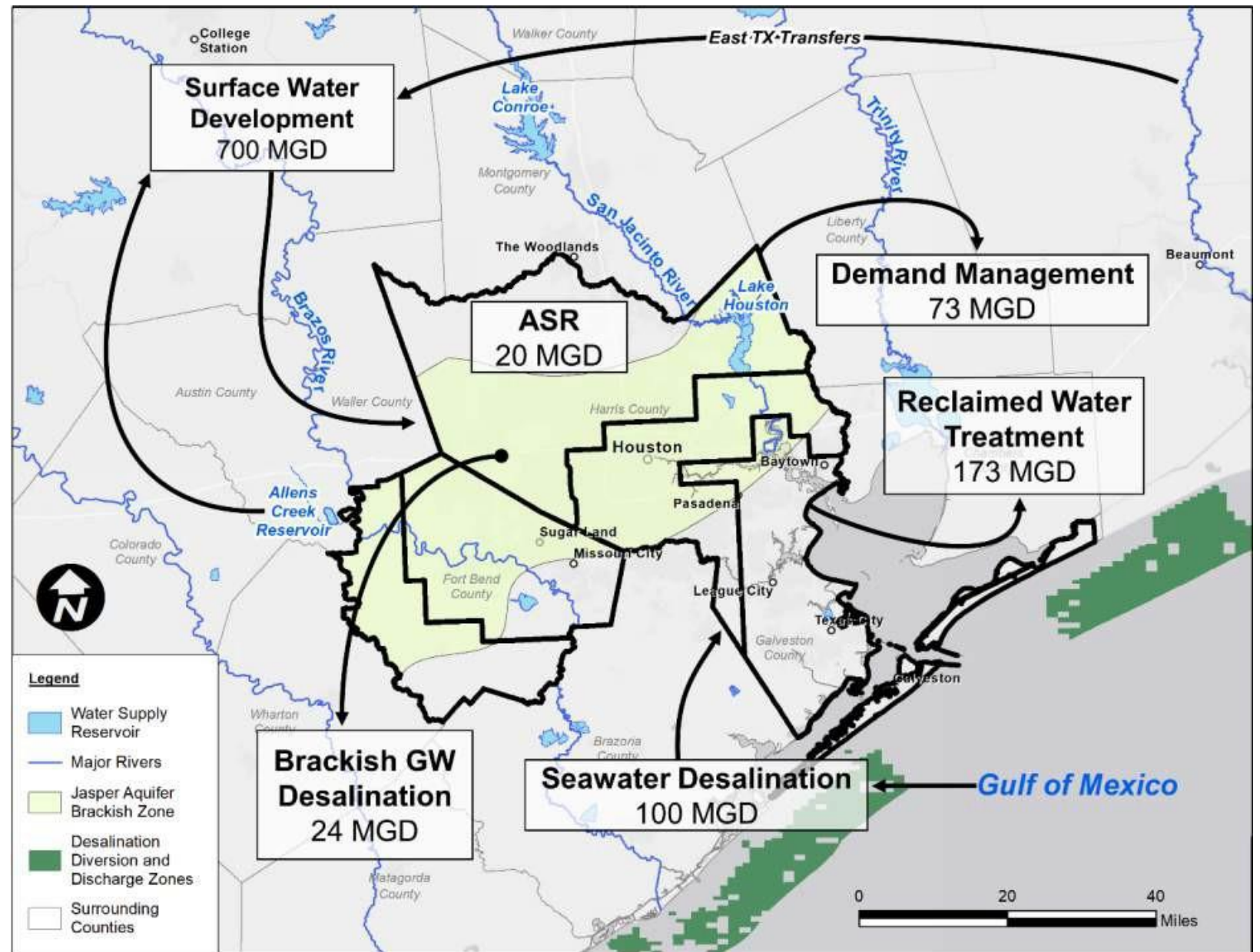


*Assess  
Vulnerability to  
Climate Change*

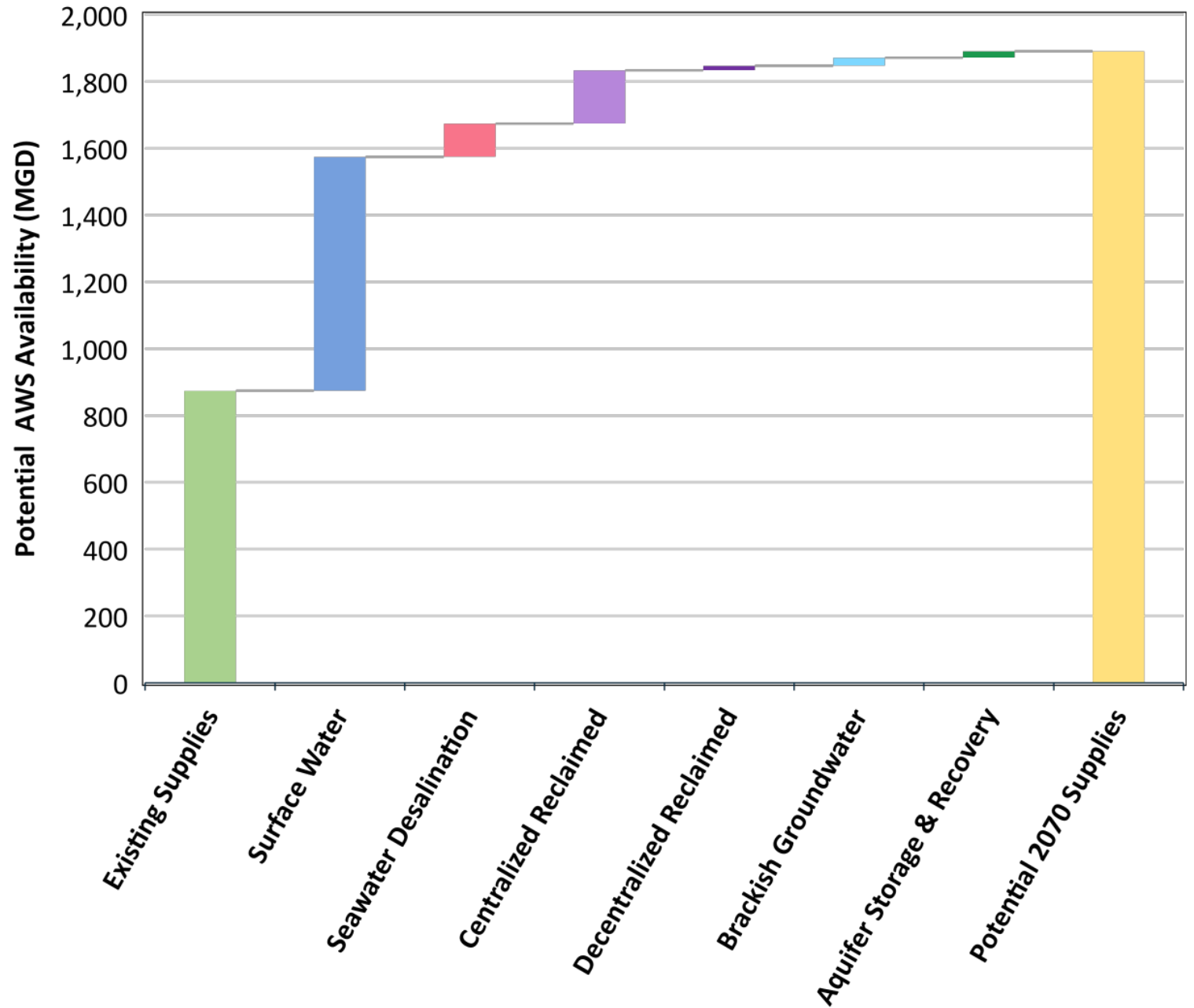




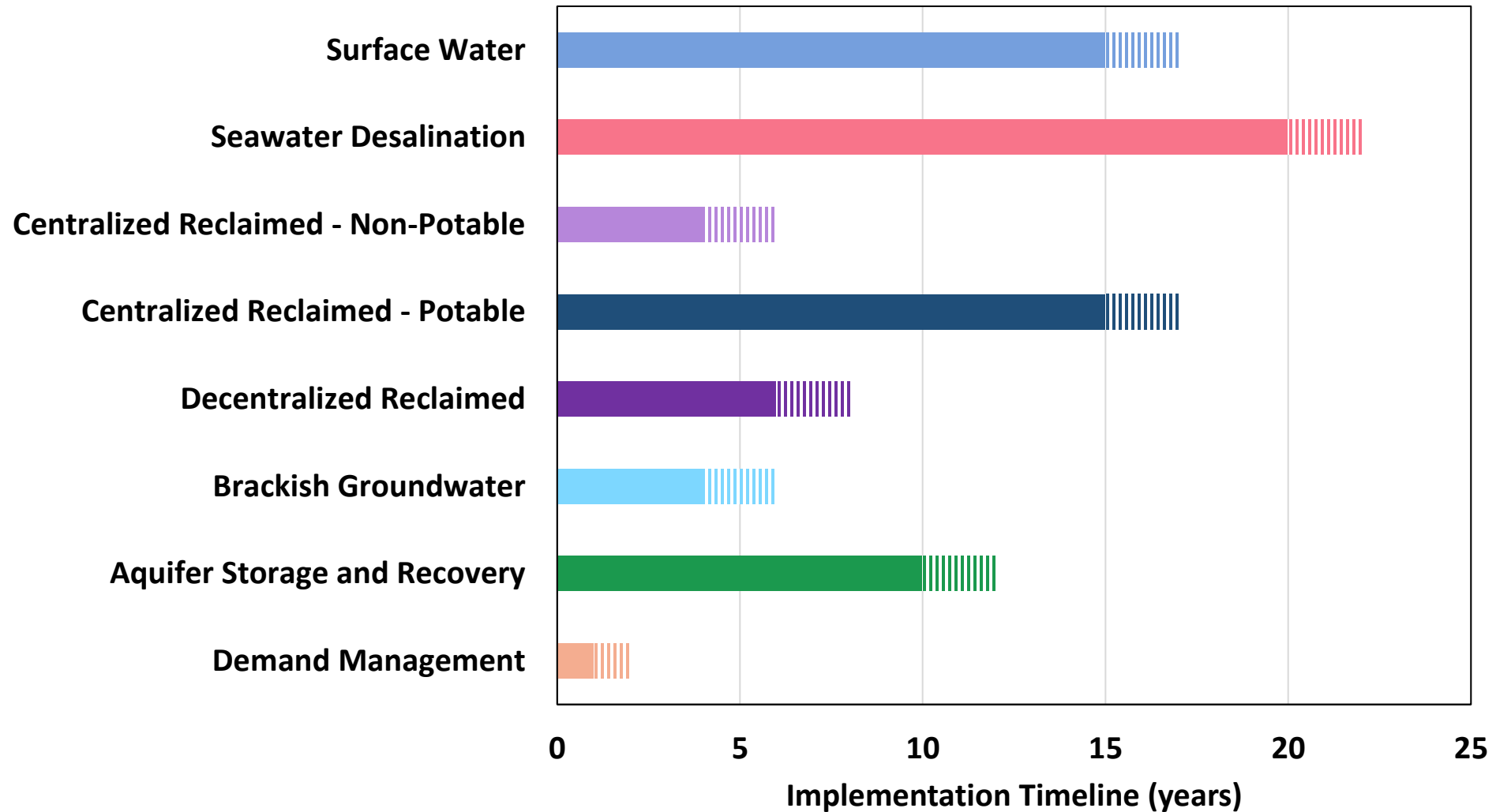
# POTENTIAL 2070 ALTERNATIVE WATER SUPPLY AVAILABILITY



# BALANCE OF AVAILABLE ALTERNATIVE SUPPLIES



# IMPLEMENTATION TIMELINES



# STAKEHOLDER OUTREACH



City of Houston



Marathon Petroleum



Gulf Coast Water Authority

Gulf Coast WA



Missouri City



North Harris CRWA



League City



West Harris CRWA



City of Baytown



North Fort Bend WA



Texas City



City of Sugar Land



Cinco Ranch MUD 1



City of Richmond



San Jacinto River Authority



# STAKEHOLDER PREFERENCES

## Strong Interest

- Surface Water Development
- Centralized and Decentralized Reclaimed Water
- Demand Management (Water Conservation)

## Limited Interest

- Brackish Groundwater Desalination
- Aquifer Storage & Recovery (ASR)

## Conditional Interest

- Seawater Desalination

# 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



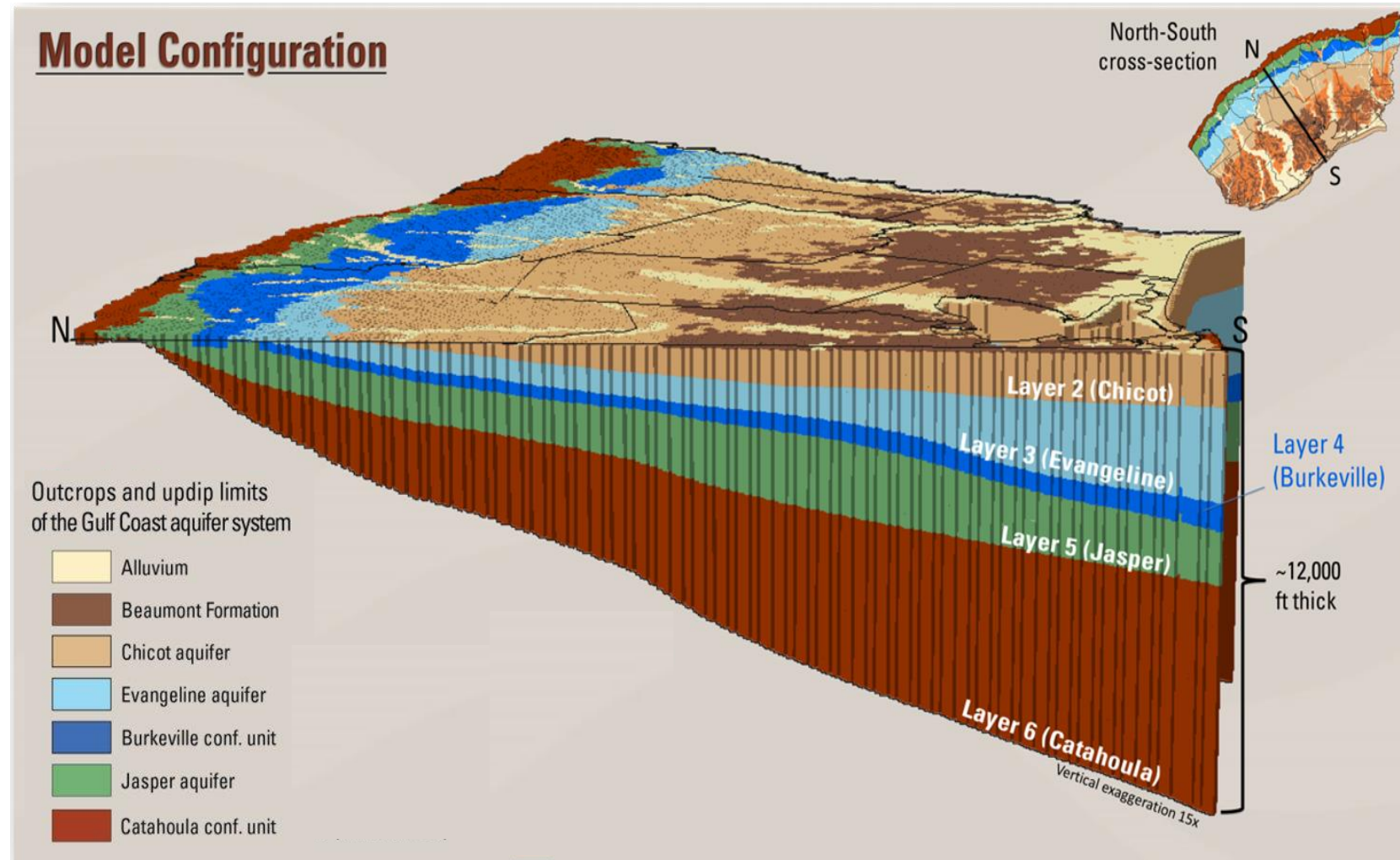



GULF COAST  
LAND  
SUBSIDENCE  
AND  
GROUNDWATER  
FLOW MODEL

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.





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

## Non-Municipal

- Historical groundwater vs alternative sources

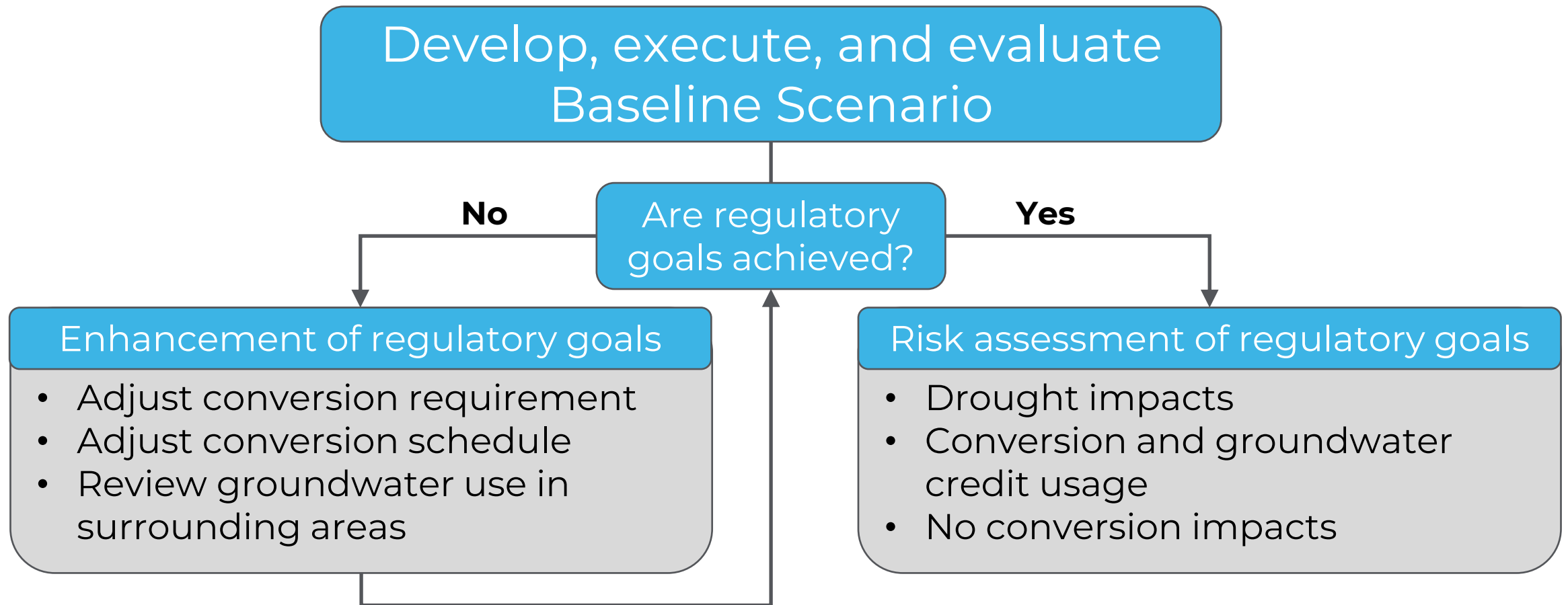
## Domestic and New Municipal

- 100% groundwater
- Includes single-family domestic
- Includes future municipal growth outside existing GRPs, ETJ, or other known developments

## Municipal

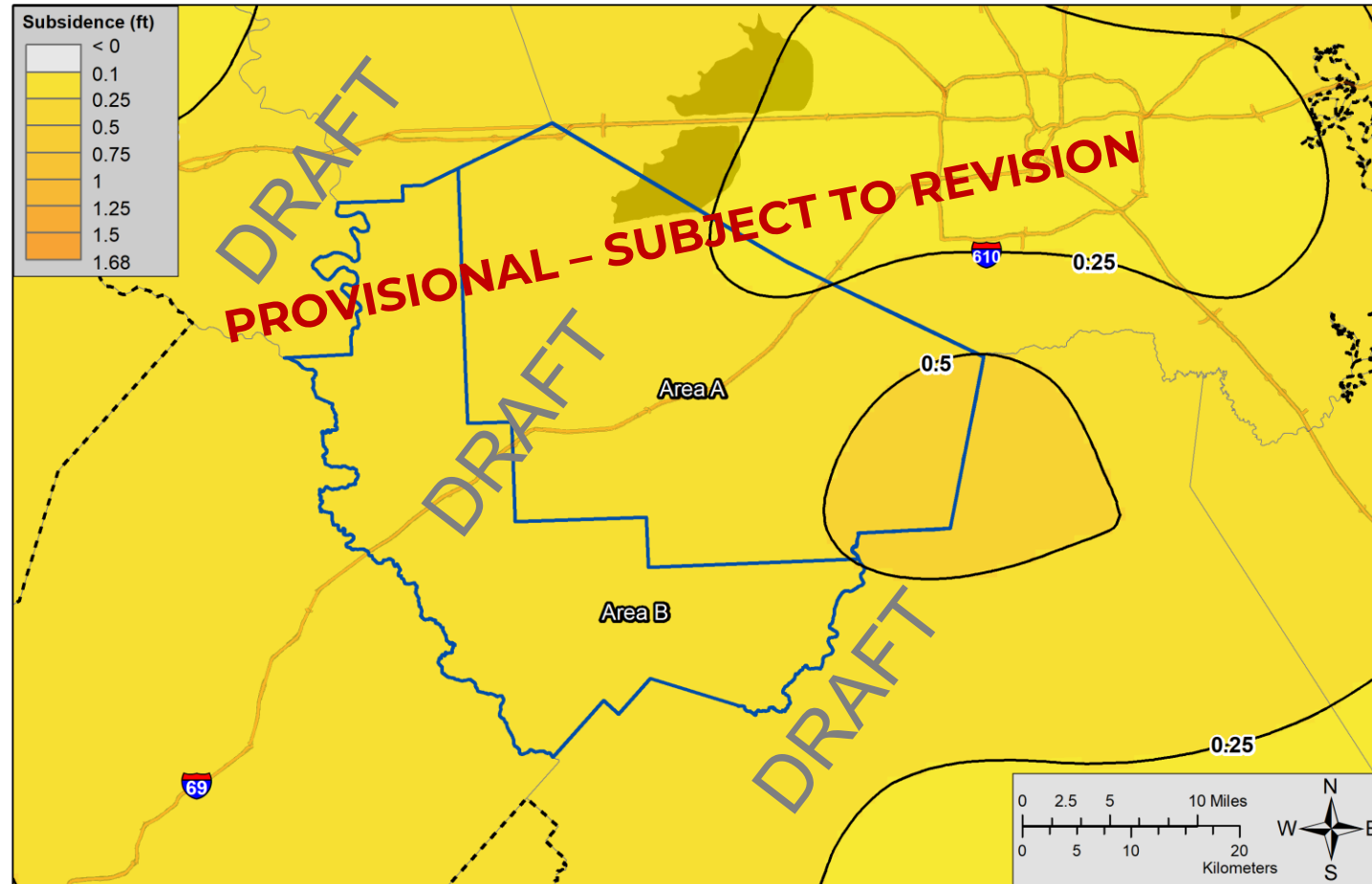
- Entities within GRPs
- Assumed to meet regulations at the aggregate GRP level
- Individual PWS convert based on GRP schedules

# SCENARIO METHODOLOGY



# BASELINE SCENARIO RESULT

Baseline: Total Subsidence (2025 - 2050)



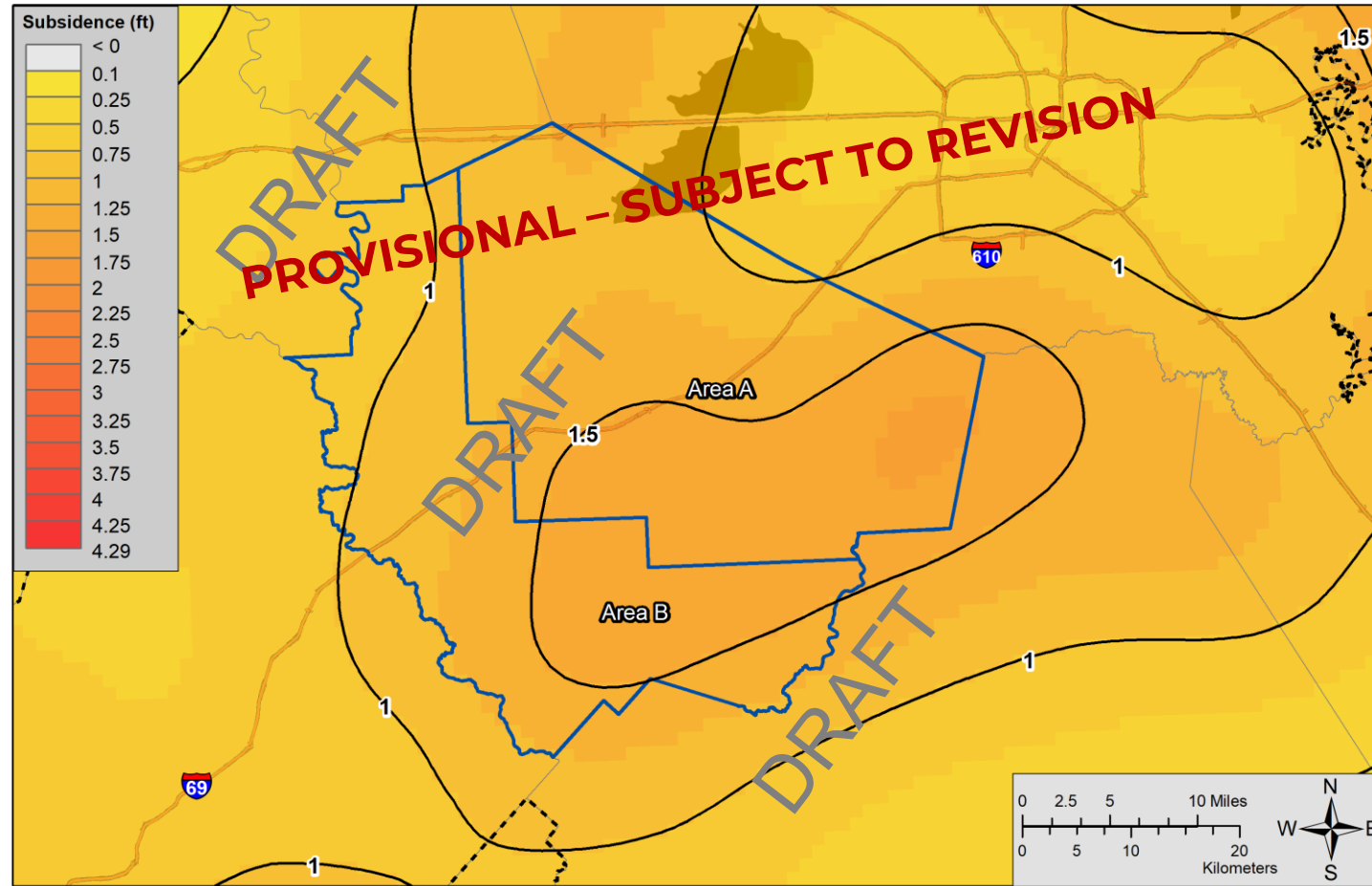
- Major Roads
- Counties
- Demand Dataset Boundary
- Regulatory Areas





# BASELINE SCENARIO RESULT

Baseline: Total Subsidence (2050 - 2100)



- Major Roads
- Counties
- Demand Dataset Boundary
- Regulatory Areas





# Thank you for attending the Joint Regulatory Plan Review Board Workshop



Please email questions to [fbinfo@subsidence.org](mailto:fbinfo@subsidence.org) with JRPR in the Subject line by Thursday, October 17<sup>th</sup>.

Scan QR code to access the JRPR website and content.

