



Refined Water Supply and Demand Gap Analysis

Integrated Resources Plan Special Committee

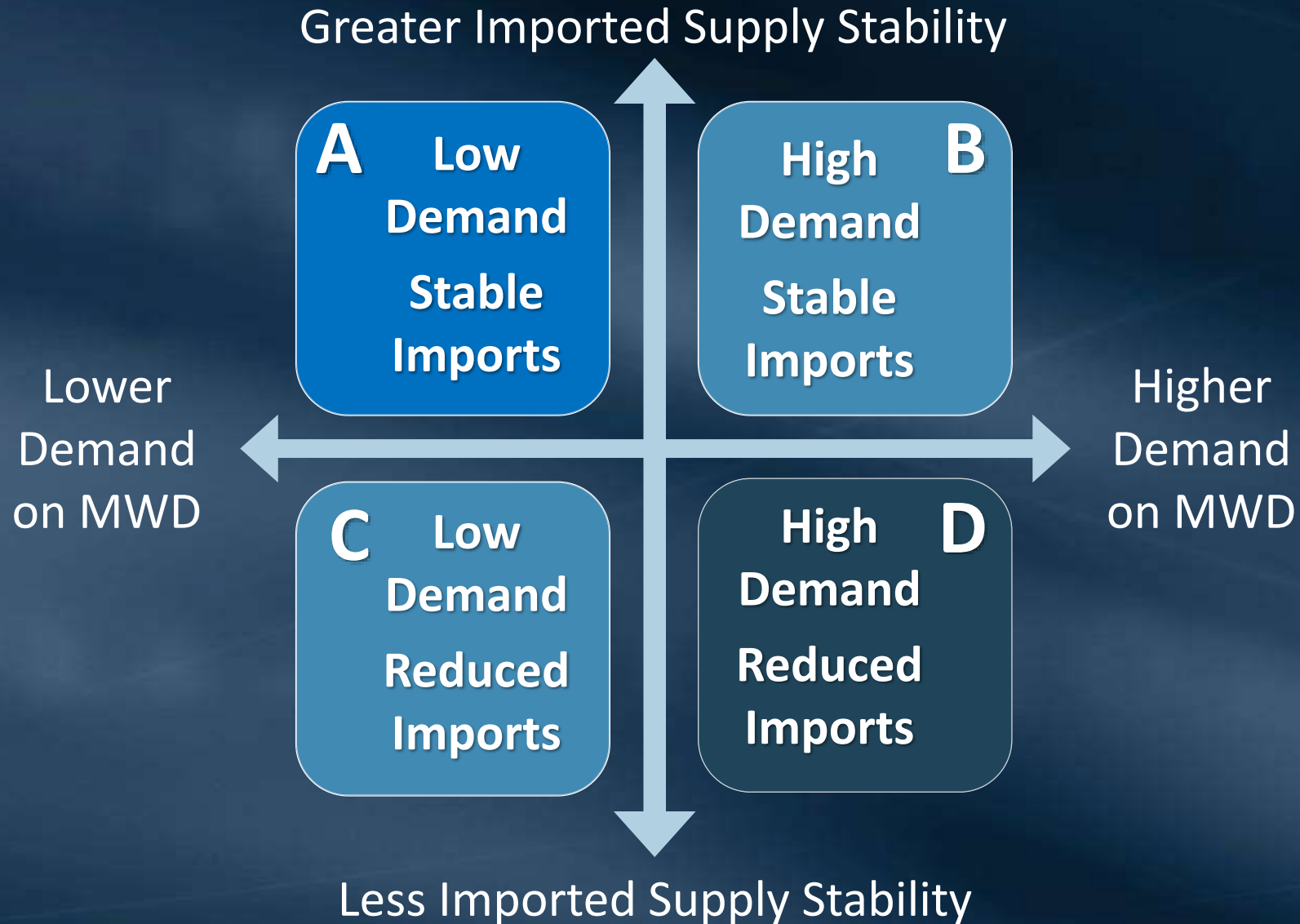
Item 6a

June 22, 2021

Outline

- Refined Gap Analysis and insights
- Refinement details and examples
- Description of modeling technique (IRPSIM)
- Next steps

Scenario Recap

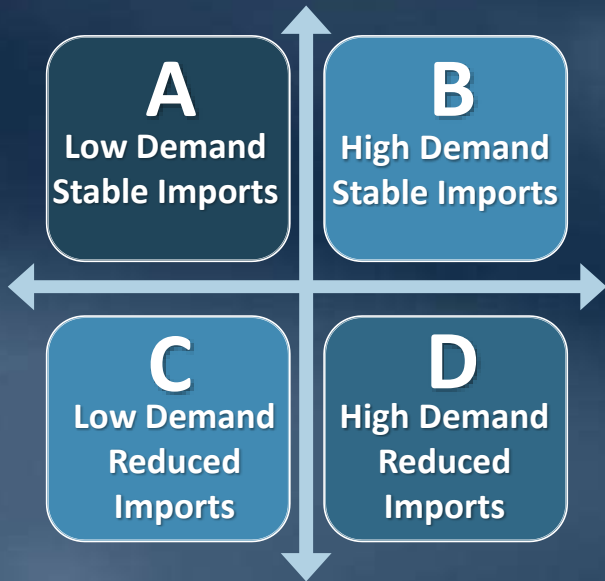


Benefits of the 2020 IRP Scenario Approach

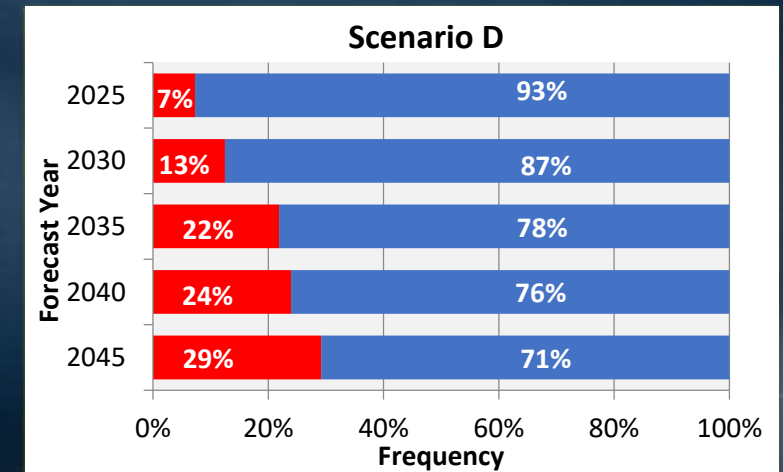
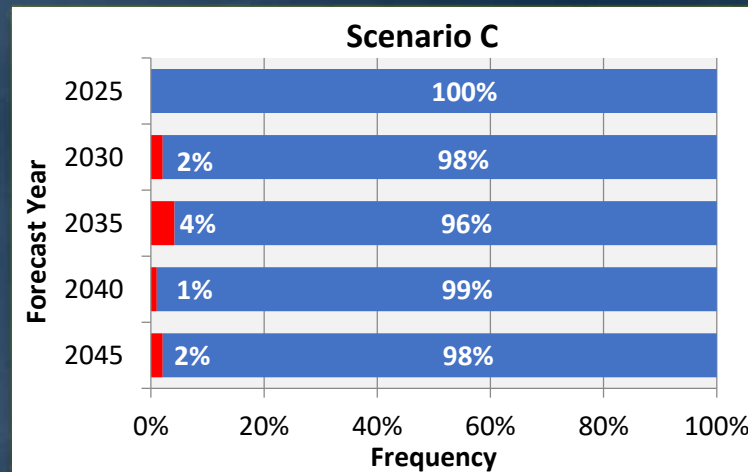
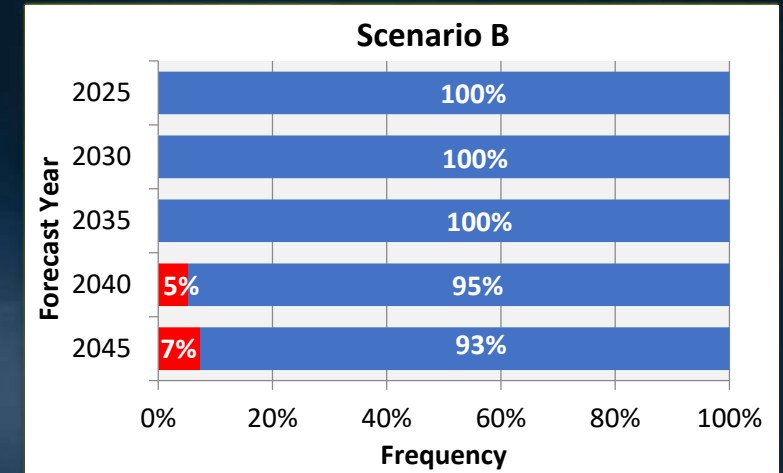
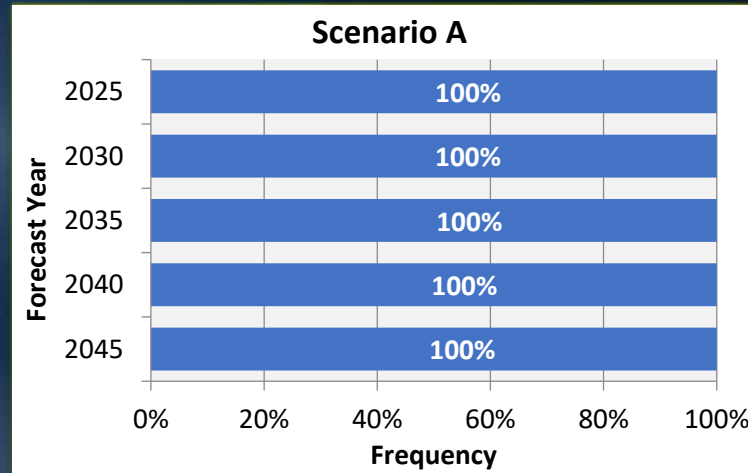
- Provides and evaluates a broader view of potential outcomes instead of trying to “get it right” and predict THE future
 - **Departs from single-line forecasting**
- Prepares us in planning for an uncertain future
 - **Expands our thinking of what may occur and explores a range of potential actions to achieve 100% reliability**
- Establishes an Adaptive Management Strategy
 - **Tracking the significant elements that inform decision-making through time**

Results of the Refined “Gap” Analysis

When to expect a gap and how often it occurs



Shortage: running out of accessible water somewhere in MWD’s service area



Insights from the Refined Analysis

- Refined scenario analyses reveal that high growth in demand and erosion of existing supplies create challenges to water reliability
- Major risk factors that contribute to increased needs for MWD supplies include high demographic growth, less efficient water use behavior, and loss of local supplies
- Addressing the risk factors that lead to greater demand on MWD can mitigate reliability issues identified by the scenario analyses
 - For example, actions to increase efficient water use behavior reduces future risk to reliability

Insights from the Refined Analysis

- Adaptive interventions may involve demand management (conservation programs) as well as approaches to help preserve and maintain existing local supplies and development of new supplies
- Stable imported supplies help to leverage the region's storage portfolio
- Significant shortage risks are attributable to geographic challenges of meeting demands in the State Water Project exclusive areas of the distribution system
 - **Decreased stability of State Water Project supplies increases this shortage risk**

Areas Served Primarily by SWP Supplies



**System Analysis Study
to follow IRP to
investigate ways to
eliminate
exclusive area issues**

Refinement Details and Examples

Refinement is a Collaborative Process

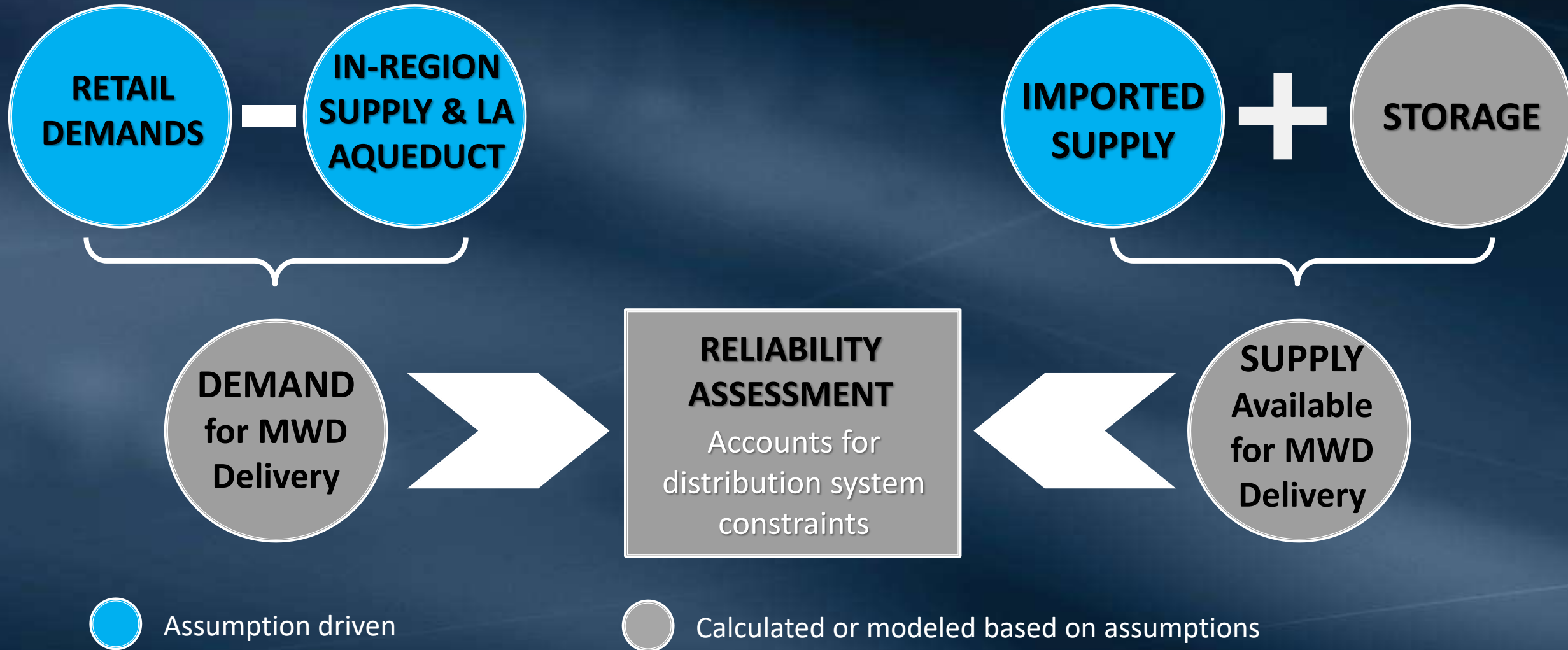
- Engagement with the Board, member agencies, and other stakeholders
 - Identified drivers of change
 - Decided on a scenario framework – supply and demand focus
 - Prepared a preliminary gap analysis for each scenario
- Continued and focused engagement to refine the gap analysis
 - Demand and climate panel expert workshops
 - Groundwater basin manager workshops
 - Member Agencies engagement

Areas Examined in the Refinement Process

- Drivers for continued low demands in order to inform demand rebound assumptions
- Plausible higher/lower population growth
- Agricultural demand patterns
- Correlation between economy and local supply production development
- Climate change and regulatory impacts on local supply production
- Determine plausible levels of groundwater production

Reliability Assessment Components

“Gap Analysis”



Refining Reliability Assessment Components



Retail Demands

- *Municipal and Industrial*
- *Agricultural*
- *Seawater Barrier*
- *Replenishment*



Local Supply

- *Groundwater*
- *Recycled Water*
- *Seawater Desalination*
- *Surface Water*
- *Los Angeles Aqueduct*



Imported Supply

- *Colorado River*
- *State Water Project*

Retail Demand Assumption Refinements



How we Incorporated Feedback - Examples



- Demographic forecast range provided by Center for Continuing Study of the California Economy
 - Lower demographic forecast for low growth Scenarios A & C
 - Higher demographic forecast for high growth Scenarios B & D

How we Incorporated Feedback - Examples

Retail Demands



Water Use Behavior

- Rebound is reflected in behavioral water use changes
 - **Structural components of the observed demand reduction continues into the future**
- Assume efficient water use behavior retention for low growth scenarios and moderate behavior retention for high growth scenarios
 - **Represents a reasonable range of rebound in behavioral responses**

How we Incorporated Feedback - Examples

Retail Demands



Regulations/
Permitting

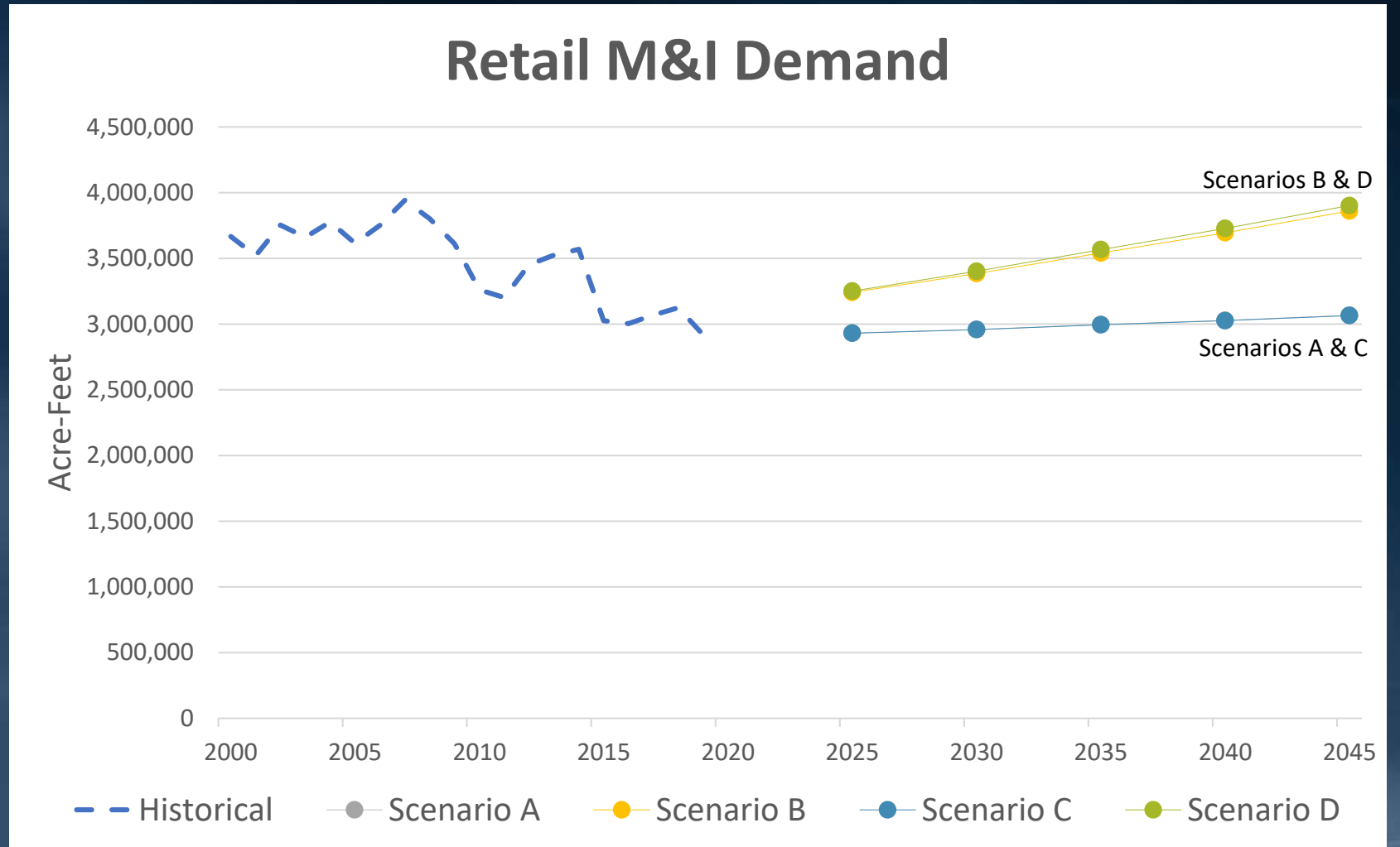
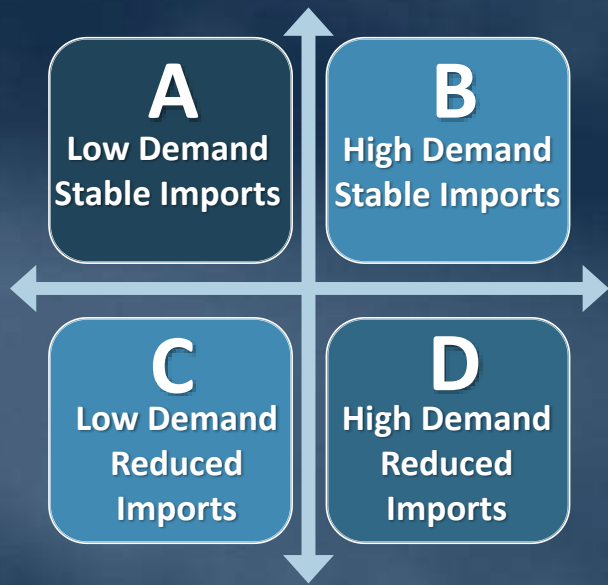
- New households reflect efficiency and smaller size homes
 - New households includes single family, multi family, and Accessory Dwelling Units
 - Assume smaller median lot size for new households to approximate reduced/efficient outdoor water use

How we Incorporated Feedback - Examples

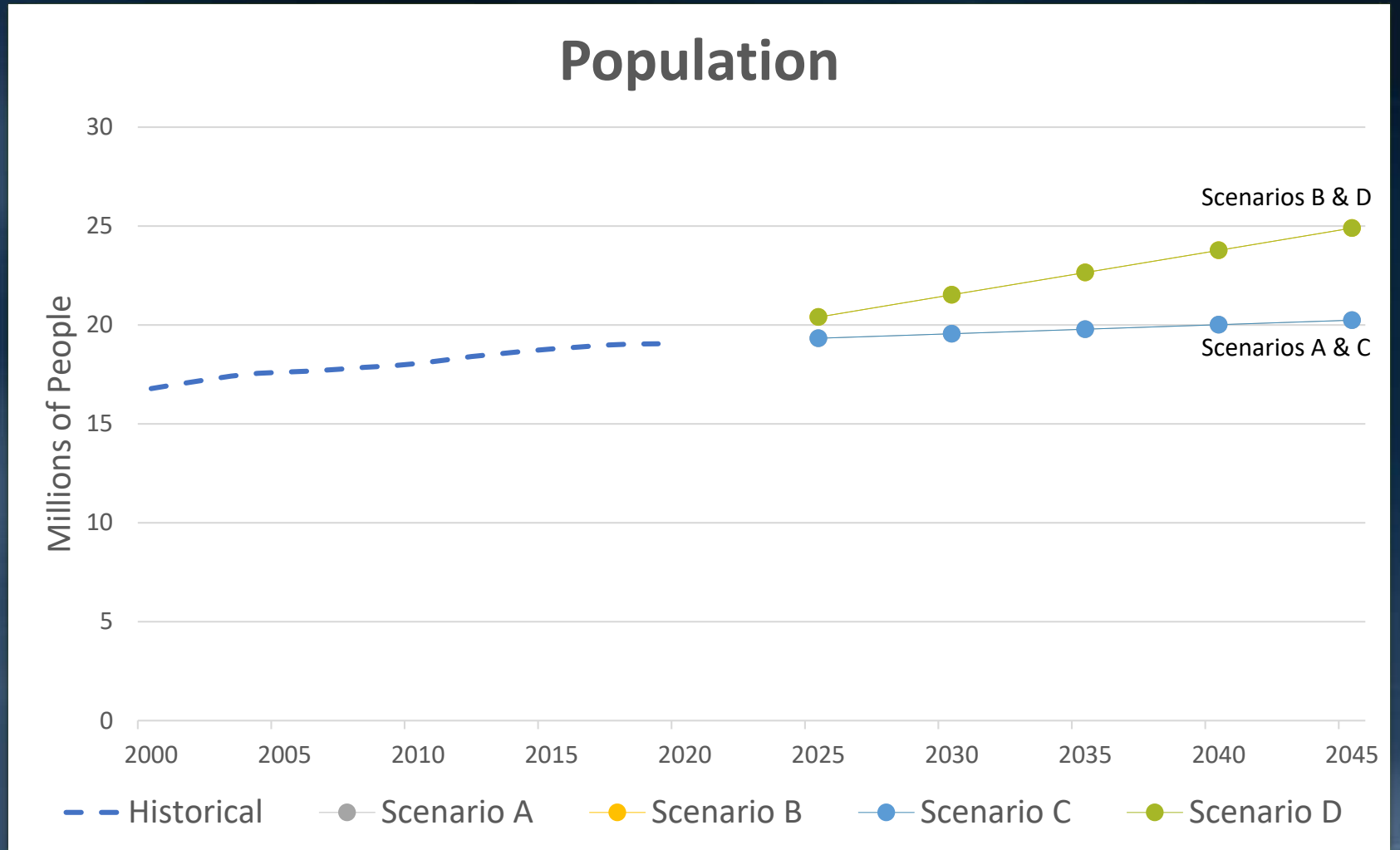
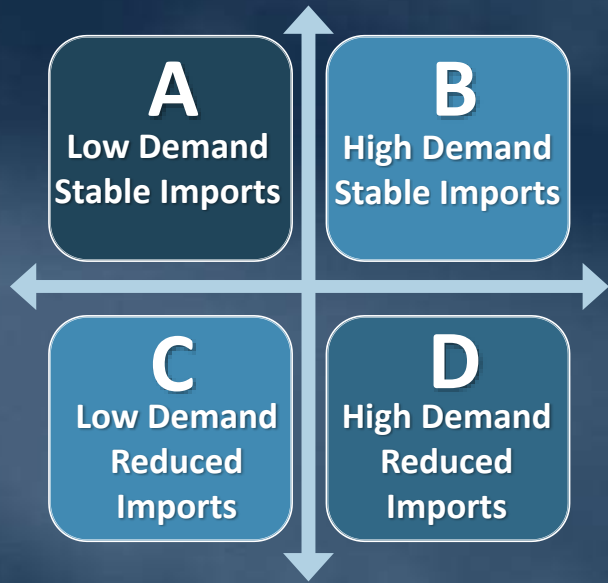


- Population Forecast
 - No basis to change population forecast or Southern California's regional share of national growth due to climate impacts at this time
- Climate Migration
 - Considered climate impacts on international immigration and migration to California

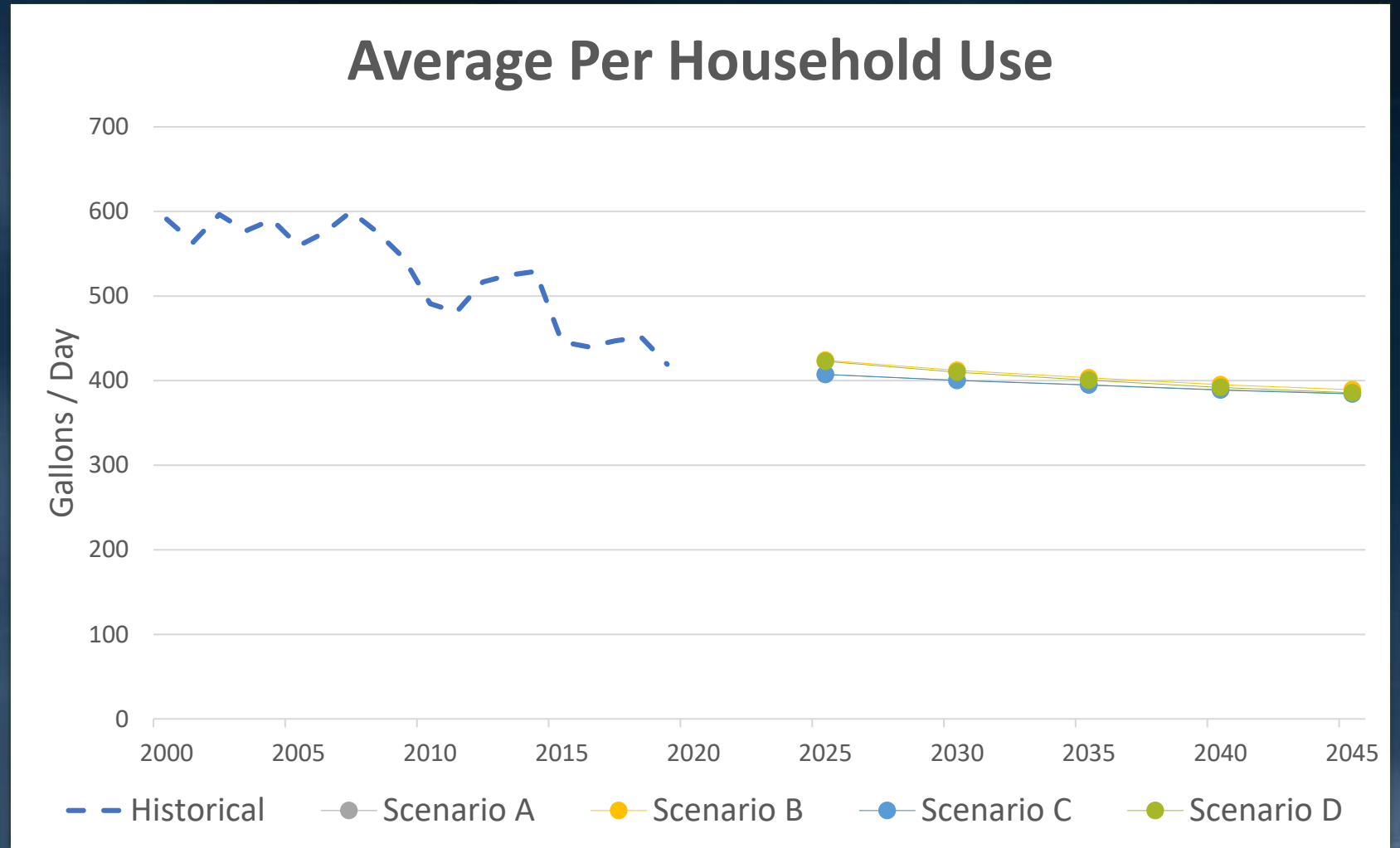
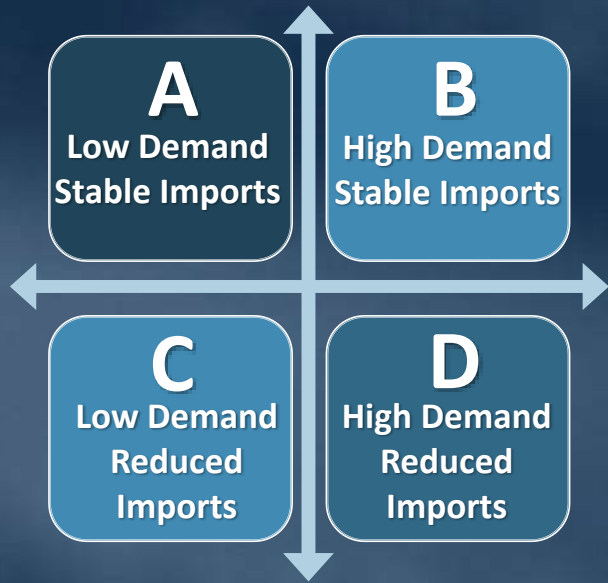
Refined Retail Municipal & Industrial Demand



Refined Total Population



Refined Average Per Household Use



Refining Reliability Assessment Components



Retail Demands

- *Municipal and Industrial*
- *Agricultural*
- *Seawater Barrier*
- *Replenishment*



Local Supply

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- *Los Angeles Aqueduct*



Imported Supply

- *Colorado River*
- *State Water Project*

Local Supply Assumption Refinements



- Existing Local Projects
 - Engaged with member agencies to confirm yield of projects currently in operation for each scenario
- Future Local Projects
 - Engaged with member agencies to identify the potential timing and implementation of planned projects appropriate for each scenario

How we Incorporated Feedback - Examples



- Volume and timing of precipitation
 - Used historical variation in precipitation for Scenarios A & B
 - Modified historic variation in precipitation to reflect more extreme events for Scenarios C & D
- Impact to GW production yield
 - Reduced yield in Scenarios C & D reflecting decline in natural and incidental replenishment

How we Incorporated Feedback - Examples



- Correlation between the economy and local projects
- No adjustments made to the ability to develop projects based on the economic conditions

How we Incorporated Feedback - Examples



Local Supply



Regulations/
Permitting

- Recycled Projects

- Ultimate yield reduced in Scenario C to reflect the impacts of reduced wastewater availability caused by increased conservation legislation

- Groundwater Projects

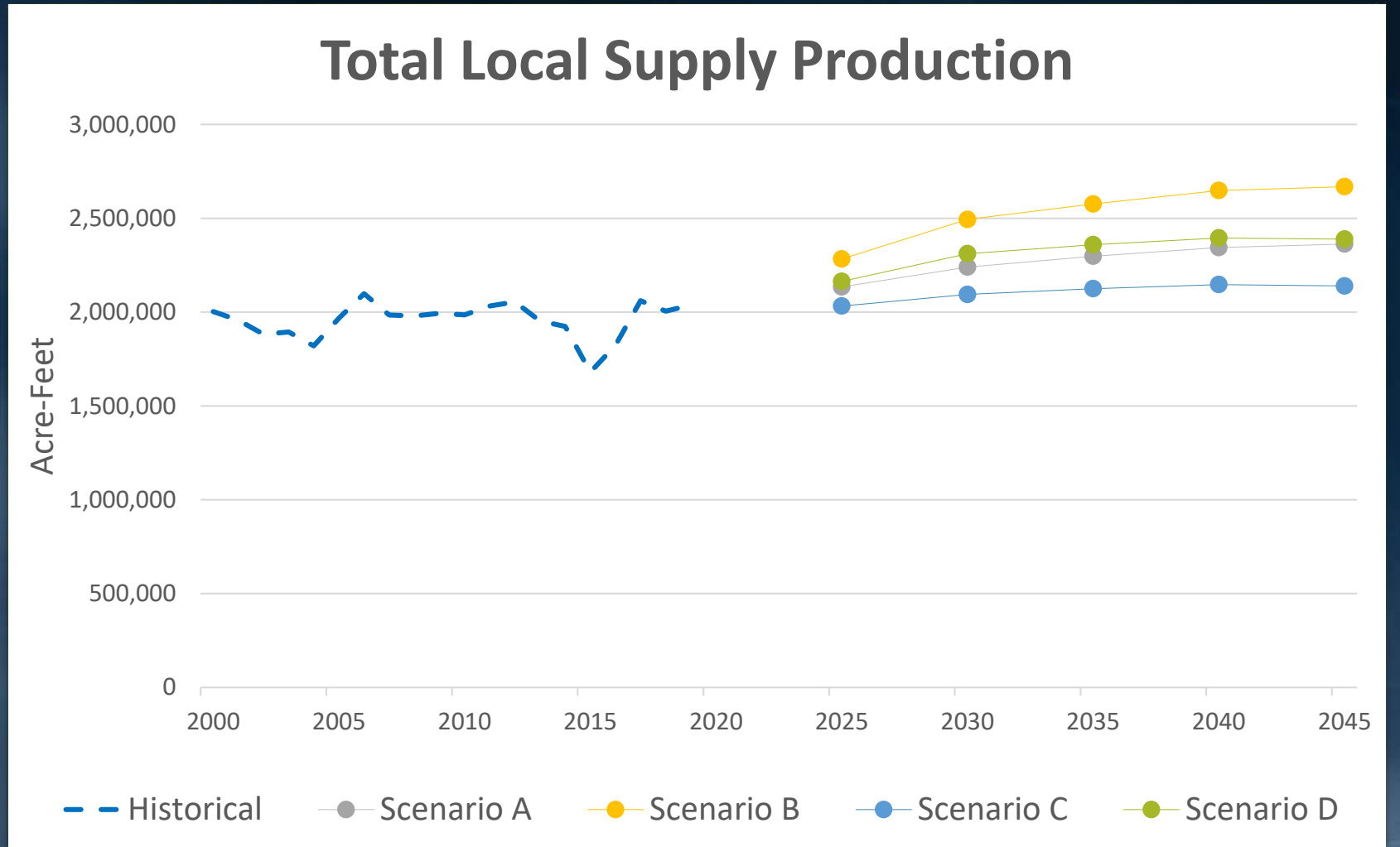
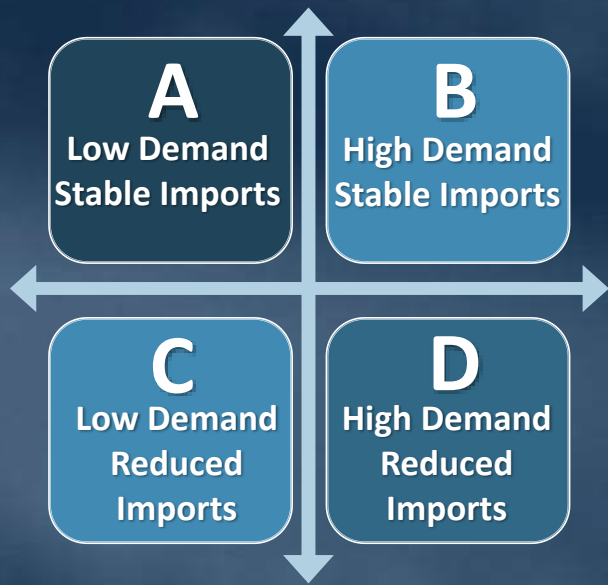
- No reduction to ultimate yield made in Scenarios C & D as higher regulatory requirements have short-term impacts and are localized

How we Incorporated Feedback - Examples

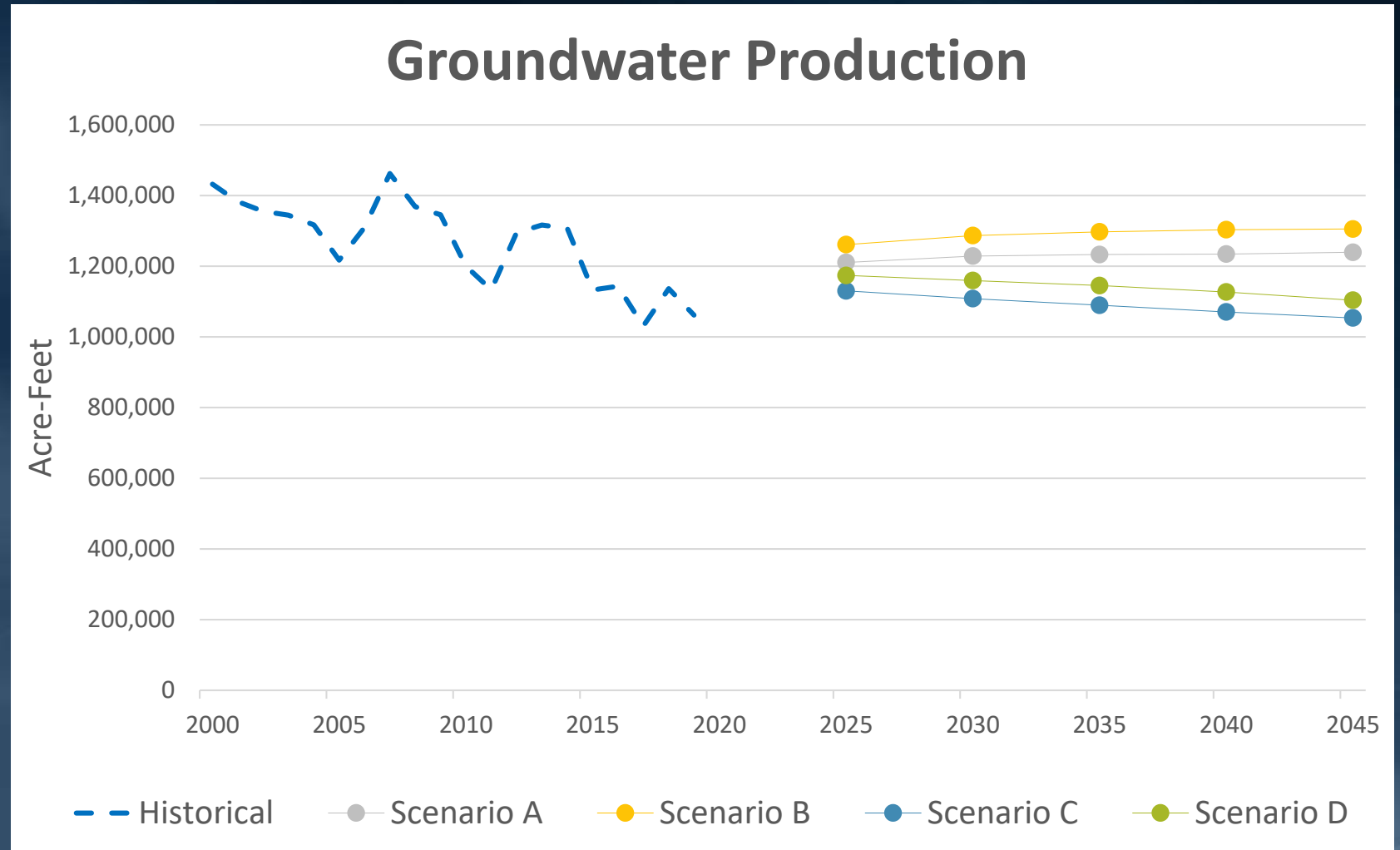
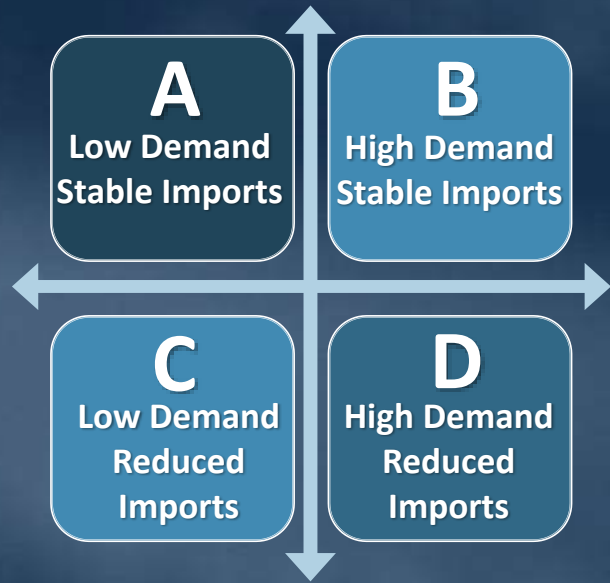


- Recycled Projects
 - Reduced the ultimate yield in Scenarios A & C to reflect lower demands that limit the availability of wastewater

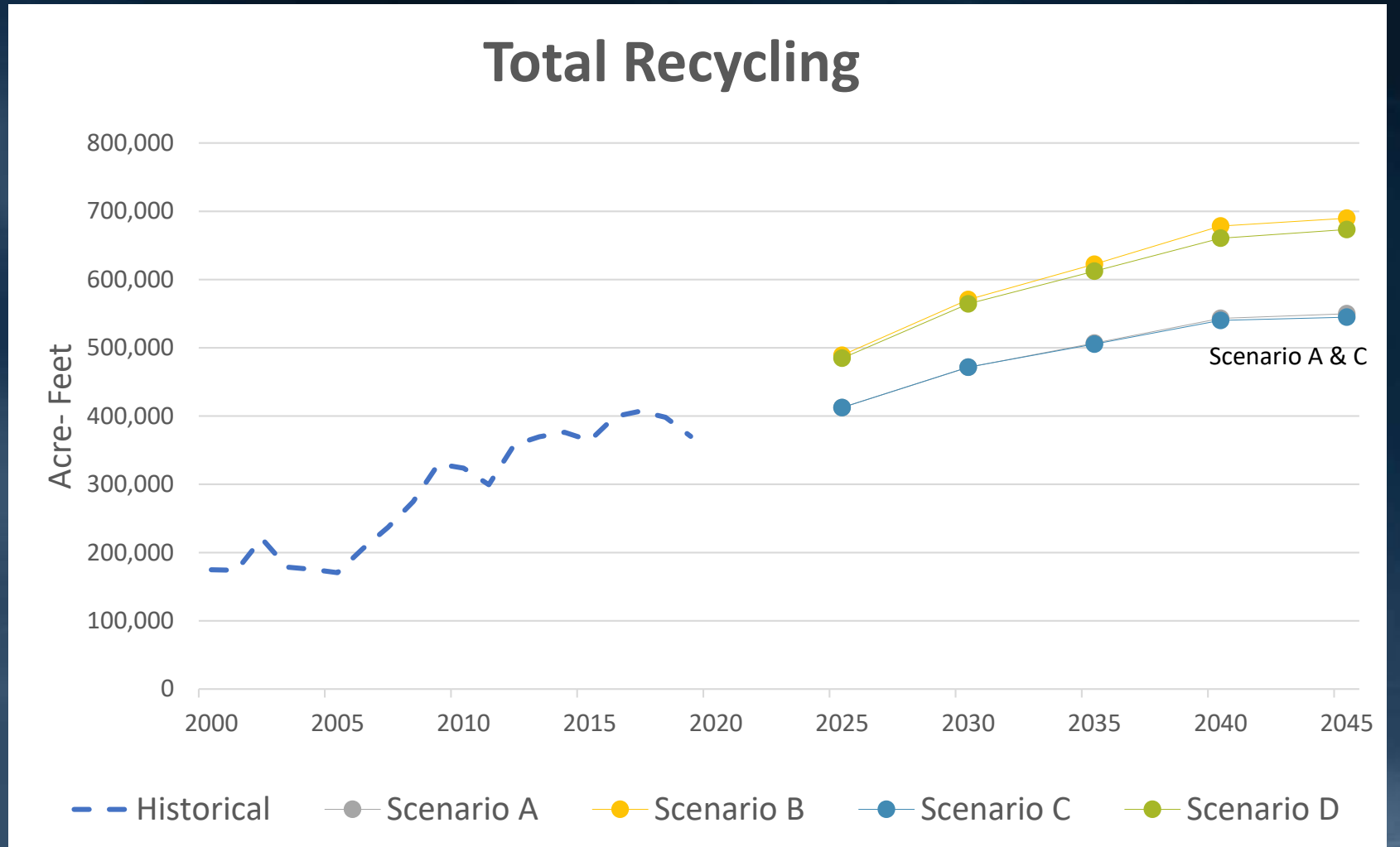
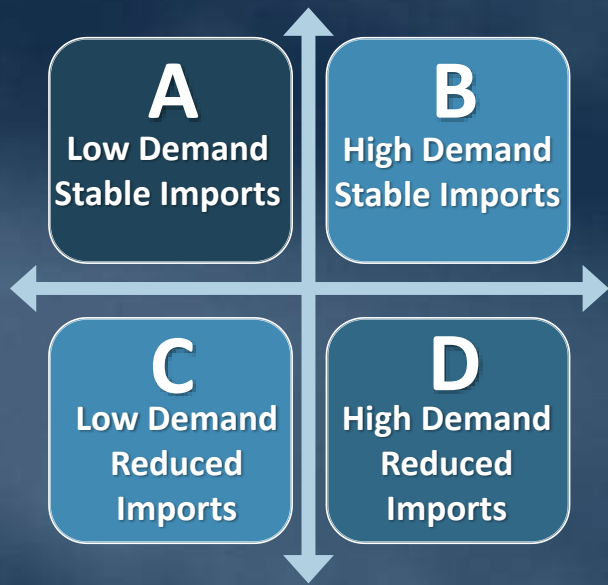
Total Local Supply Production



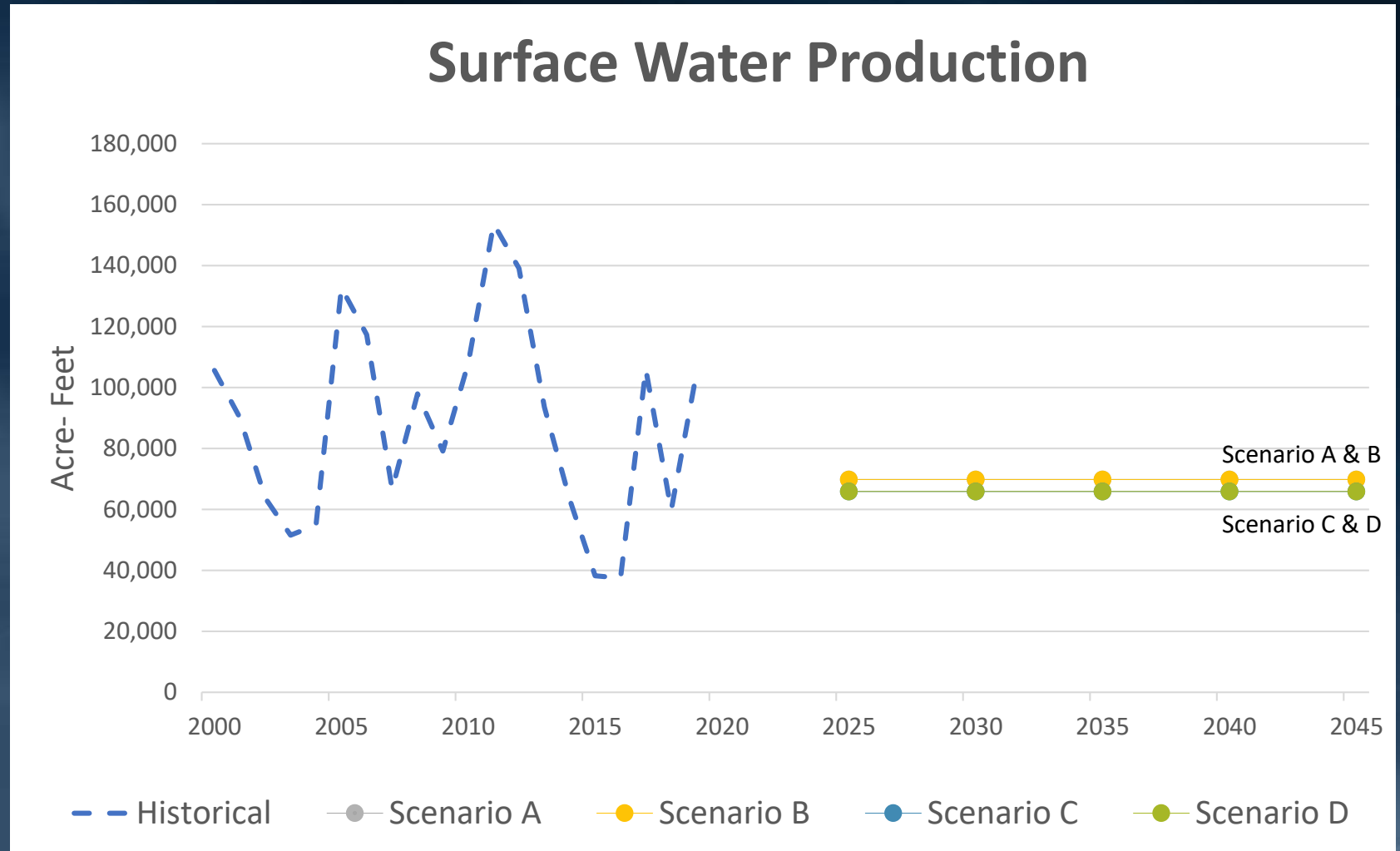
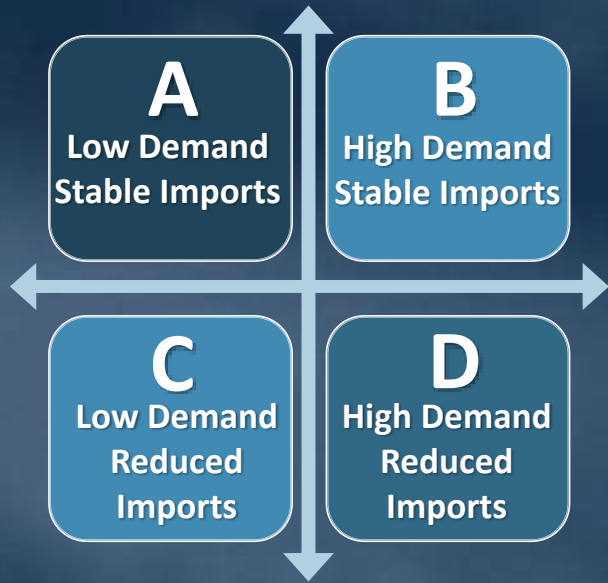
Groundwater Production



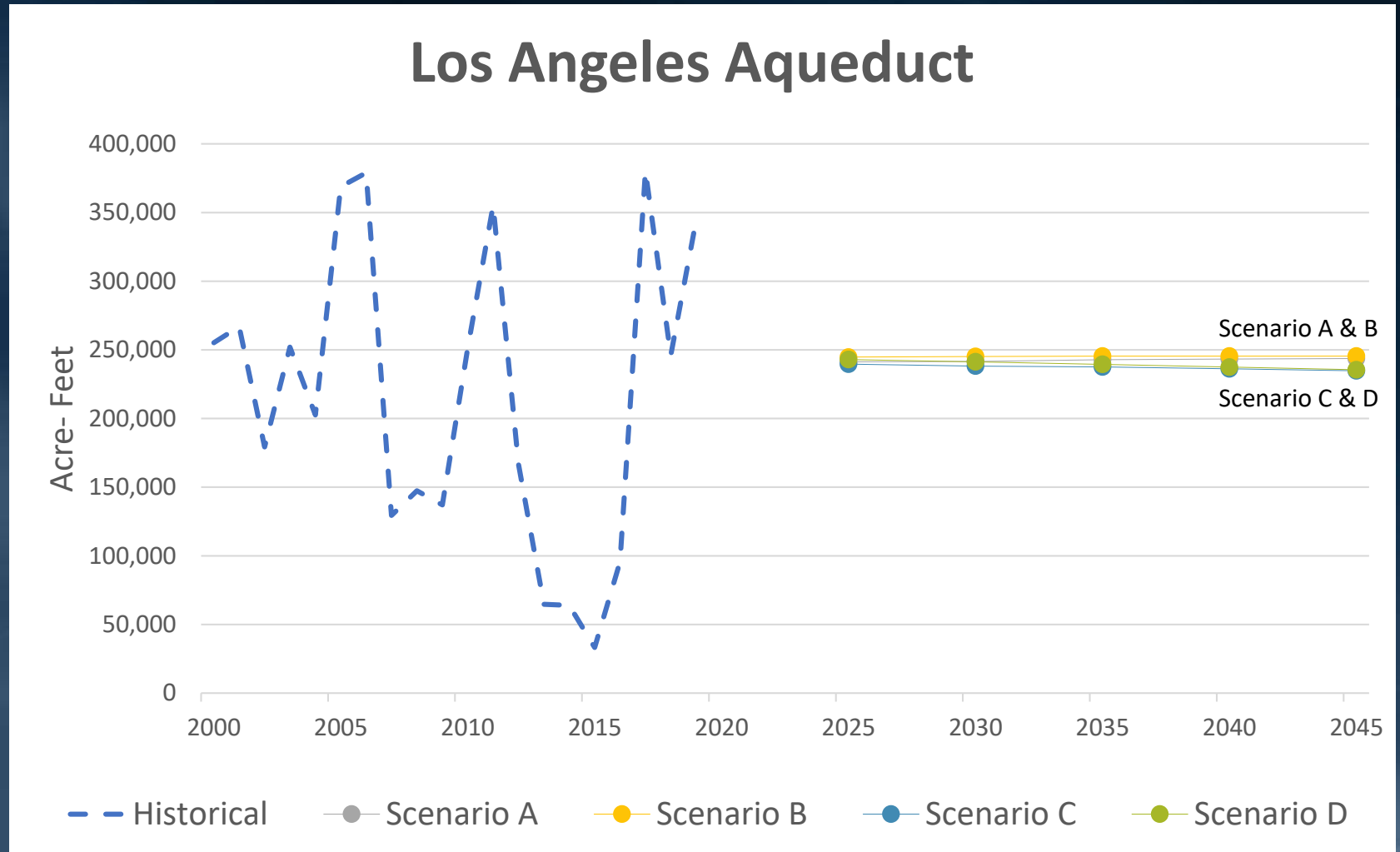
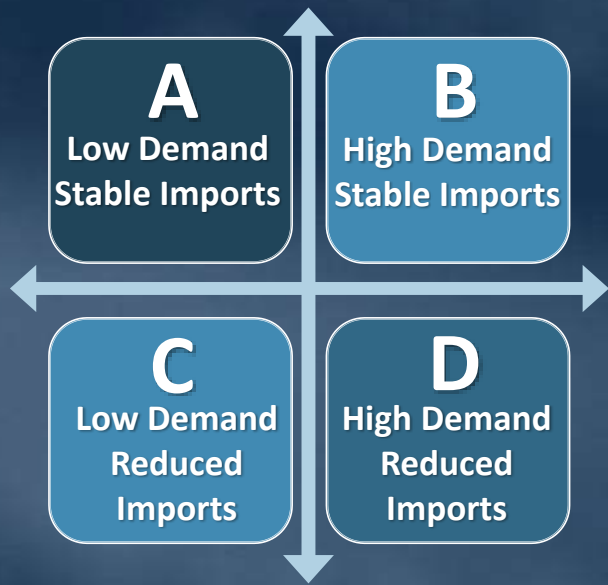
Total Recycling



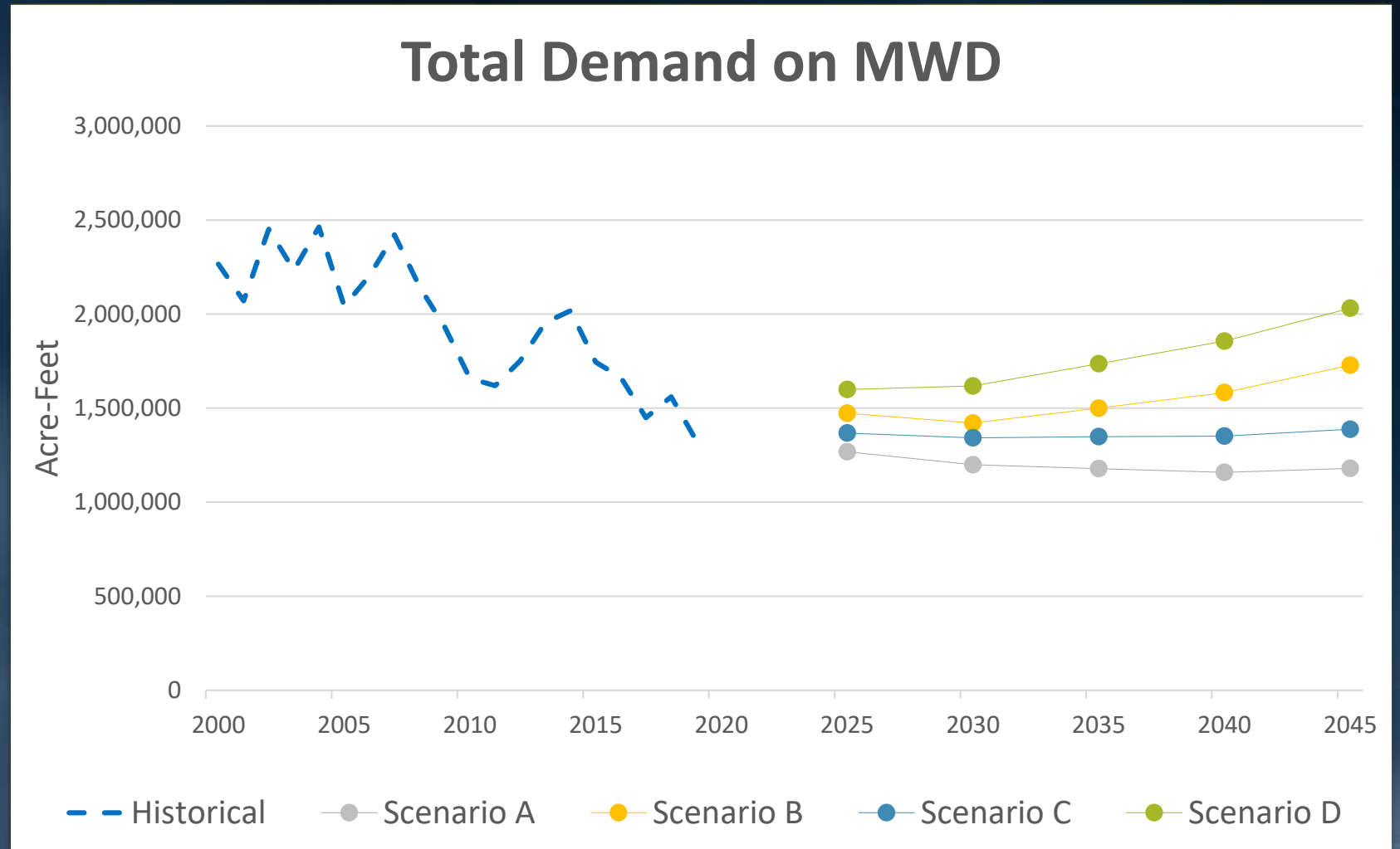
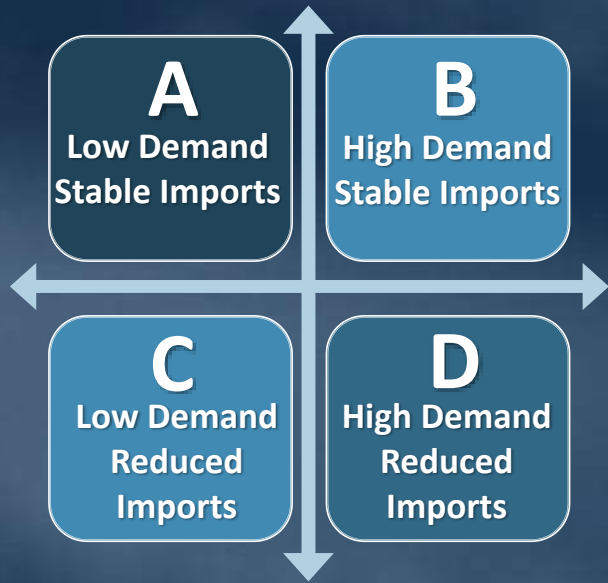
Surface Water Production



Los Angeles Aqueduct



Total Net Demand on MWD



Refining Reliability Assessment Components



Retail Demands

- *Municipal and Industrial*
- *Agricultural*
- *Seawater Barrier*
- *Replenishment*



Local Supply

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Imported Supply

- *Colorado River*
- *State Water Project*

Imported Water Supply Assumption Refinements



How we Incorporated Feedback - Examples



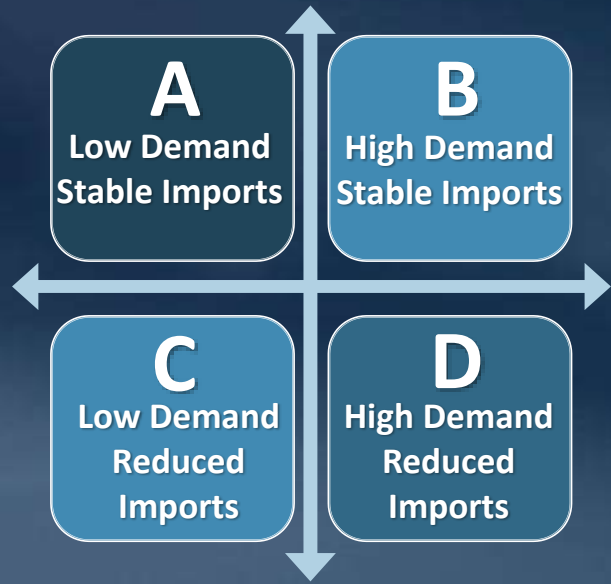
- State Water Project
 - Used DWR's Delivery Capability Report (DCR) "Future Condition" with additional degradation to reflect severe climate change for Scenarios C & D and "Existing Condition" to reflect moderate climate change for Scenarios A & B
- Colorado River Aqueduct
 - Decreased runoff (Powell and Mead inflows) by 25.6% in Scenarios C & D and 15.6% in Scenarios A & B based on climate expert input
 - Increased Powell and Mead evaporation by 4.5% in all scenarios based on climate expert input

How we Incorporated Feedback - Examples

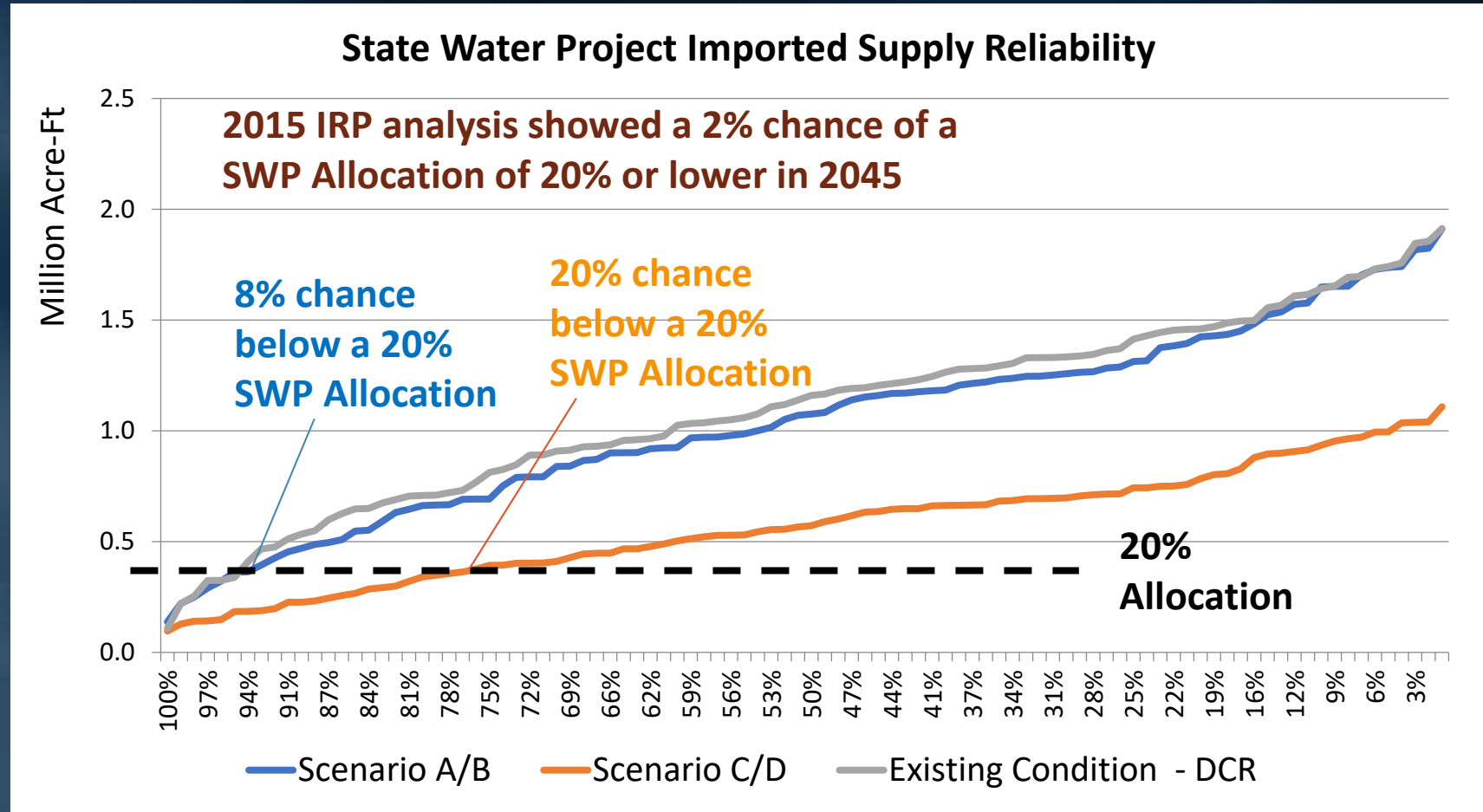


- State Water Project
 - An additional degradation was applied to the DCR output for Scenarios C & D to reflect future unknown regulations

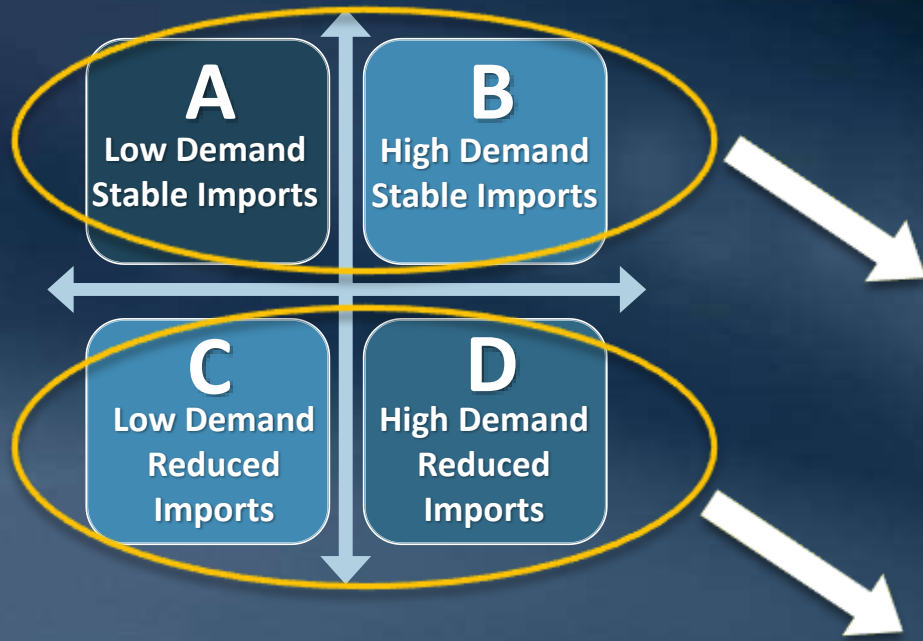
Refined SWP Imported Supply



	2019 Existing Conditions	A B	C D
Average SWP Allocation	57%	54%	30%



Refined CRA Imported Supply

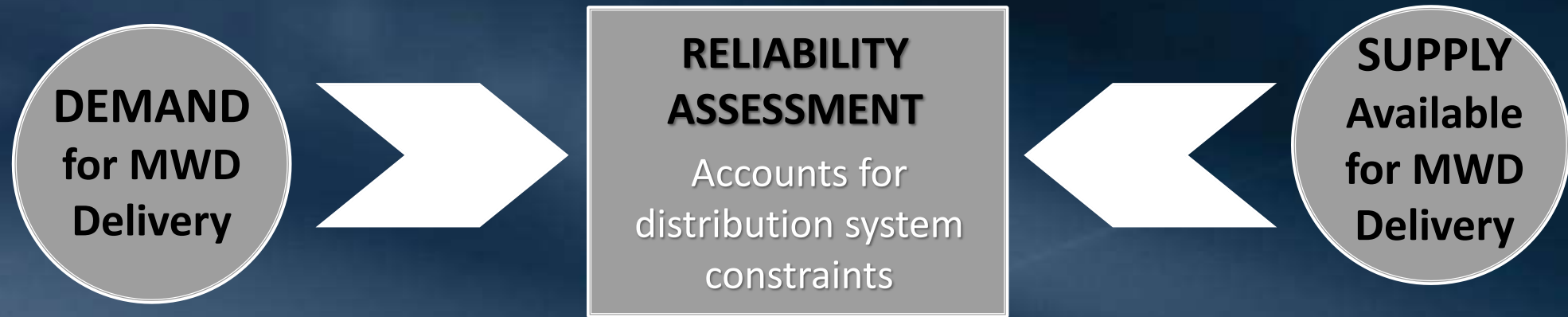


Shortage Condition¹	2025	2030	2035	2040	2045
January 2021 CRSS (Moderate Condition)	75%	75%	71%	79%	84%
Shortage Condition¹	2025	2030	2035	2040	2045
January 2021 CRSS (Severe Condition)	79%	77%	83%	88%	95%

¹ Probability of shortage conditions on the Colorado River (Mead \leq 1,075 ft.)

IRPSIM

Components of Reliability Assessment



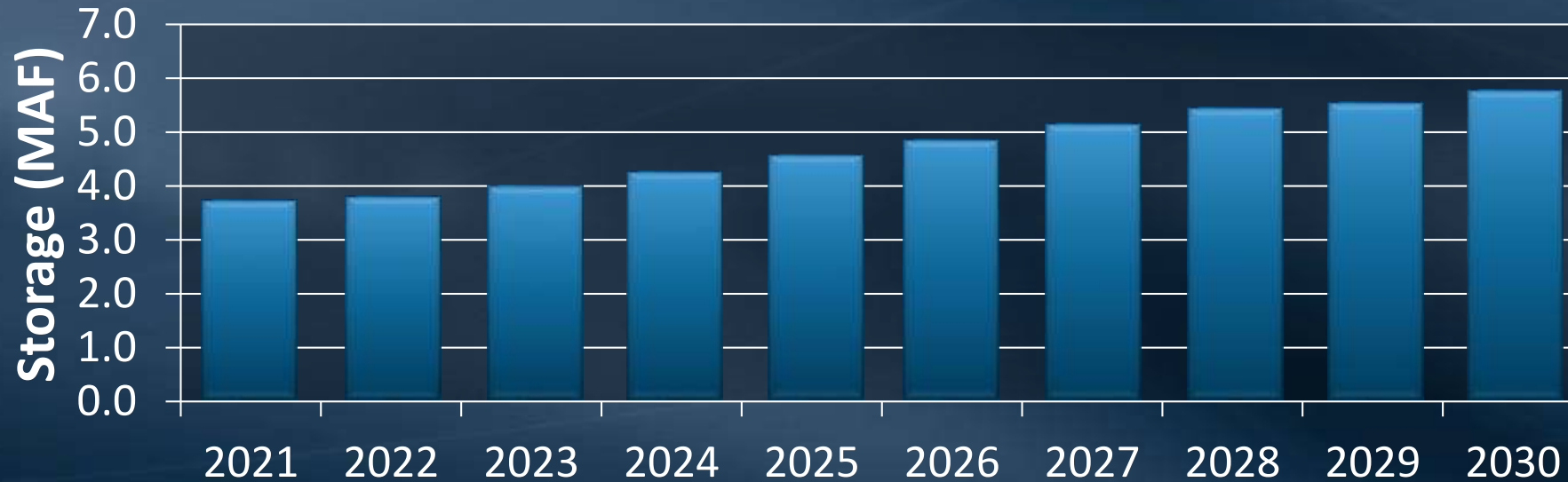
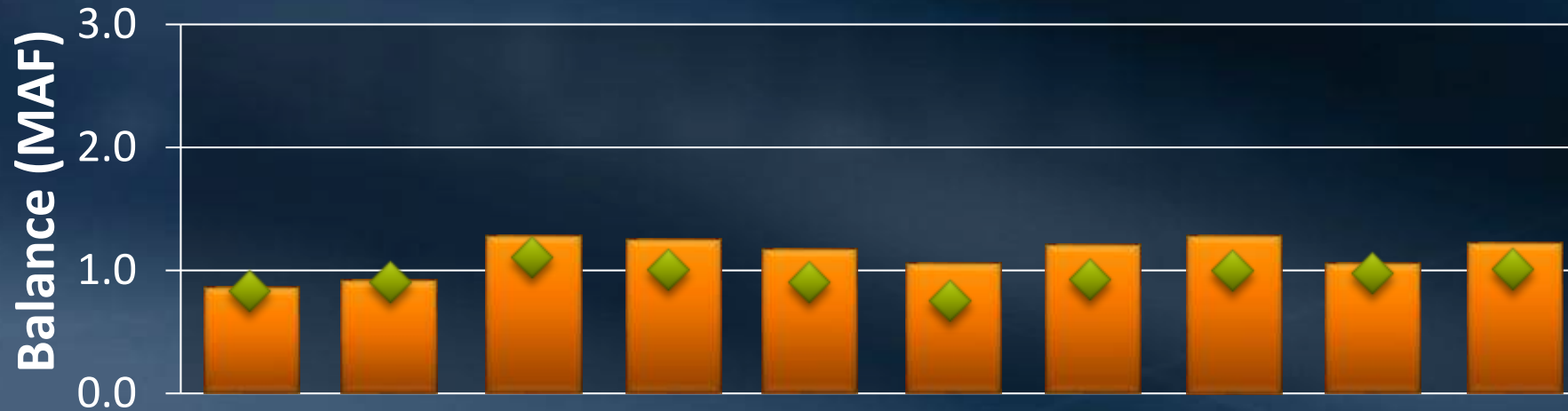
- We've looked at retail demands and local supplies to determine demands on Metropolitan
- We've looked at imported supplies plus storage to assess our supply

Quantifying Reliability Assessment with IRPSIM

- IRPSIM integrates projections of demands, conservation, imported supplies and storage to determine future reliability
- Mass balance simulation model
 - Evaluates supplies and demands; balances any differences between the two using Metropolitan's resource portfolio
- Indexed Sequential Methodology
 - Projections of demands and imported supplies are evaluated including range of future hydrologic conditions
 - IRPSIM cycles through 96 sequential years of historical hydrology (or modified for climate change impacts) generating 96 different reliability outcomes for each forecast year
 - Allows the evaluation of the probability of being in shortage or surplus for each forecast year

Example: Scenario A

Trace	1922	1923	1924	1925	1926	1927	1928	1929	1930	1931
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IRPSIM balances supplies and demands in forecast years for each trace series of historical hydrology

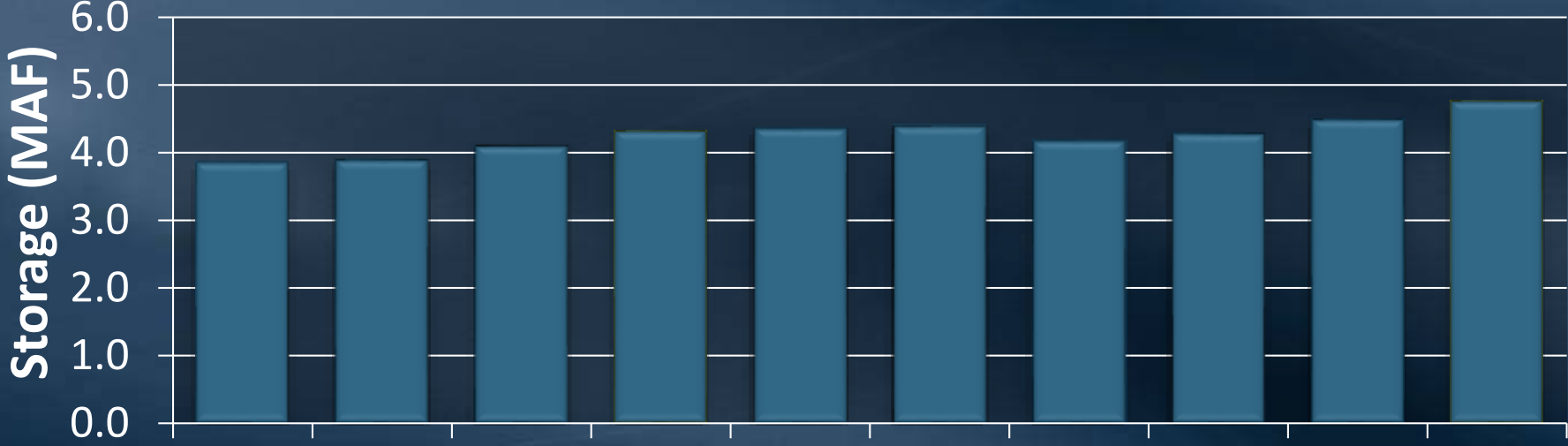
Demands 
Supplies 

If surplus exists, IRPSIM puts water in Metropolitan's available storage

If shortage exists, IRPSIM draws from available storage

Example: Scenario D

Trace	1922	1923	1924	1925	1926	1927	1928	1929	1930	1931
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IRPSIM balances supplies and demands in forecast years for each trace series of historical hydrology

Demands 

Supplies 

If surplus exists, IRPSIM puts water in Metropolitan's available storage

If shortage exists, IRPSIM draws from available storage

How IRPSIM Uses Hydrology

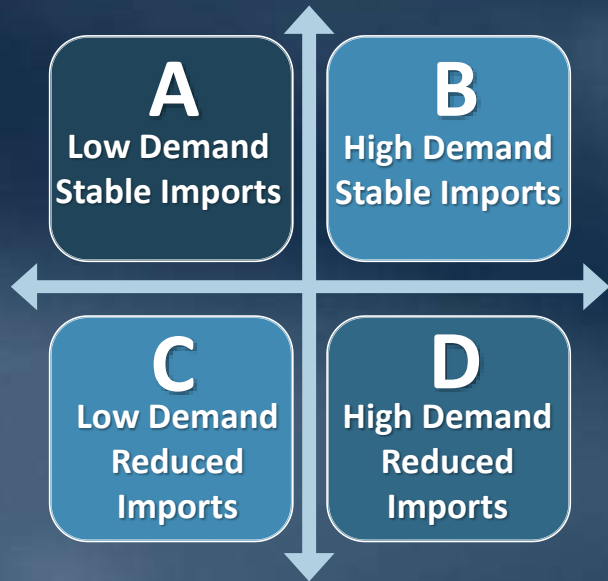
Forecast Year

Hydrology

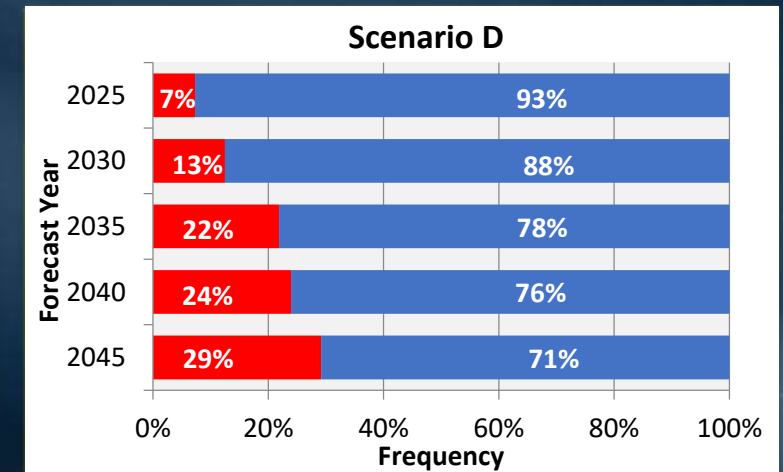
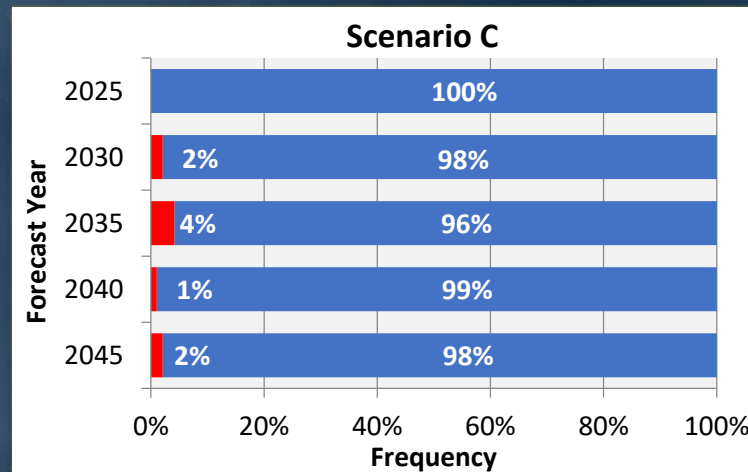
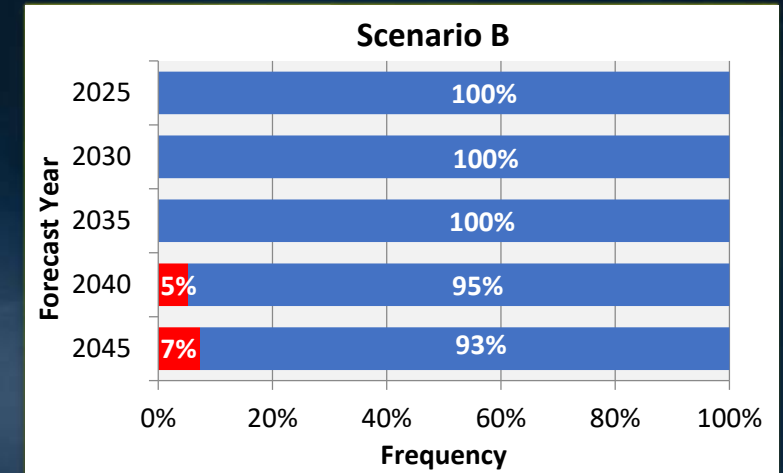
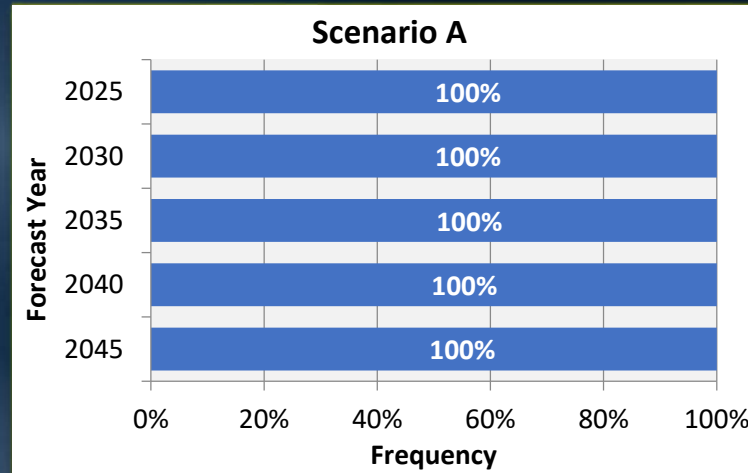
	2020	2021	2022	2023	2024	2025	→	2045
	1922	1923	1924	Trace/Trial	1926	1927	→	1947
	1923	1924	1925	Trace/Trial	1927	1928	→	1948
	1924	1925	1926	Trace/Trial	1928	1929	→	1949
	1925	1926	1927	1928	1929	1930	→	1950
	1926	1927	1928	1929	1930	1931	→	1951
	1927	1928	1929	1930	1931	1932	→	1952
	↓	↓	↓	↓	↓	↓		↓
	2017	1922	1923	1924	1925	1926	→	1946

Results of the Refined “Gap” Analysis

When to expect a gap and how often it occurs



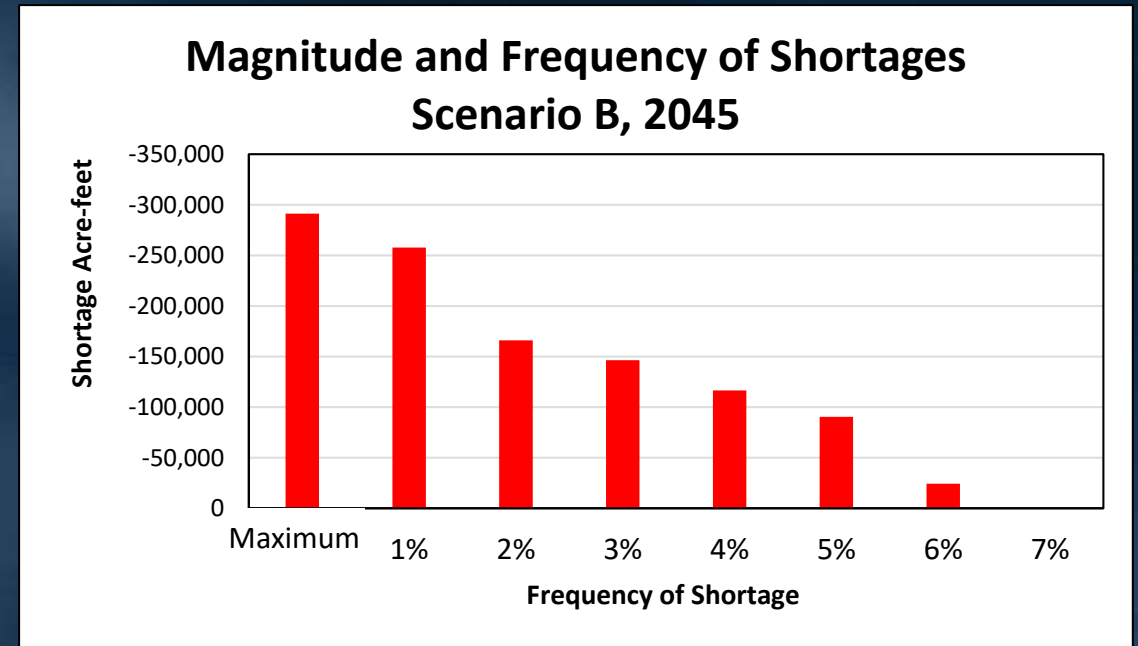
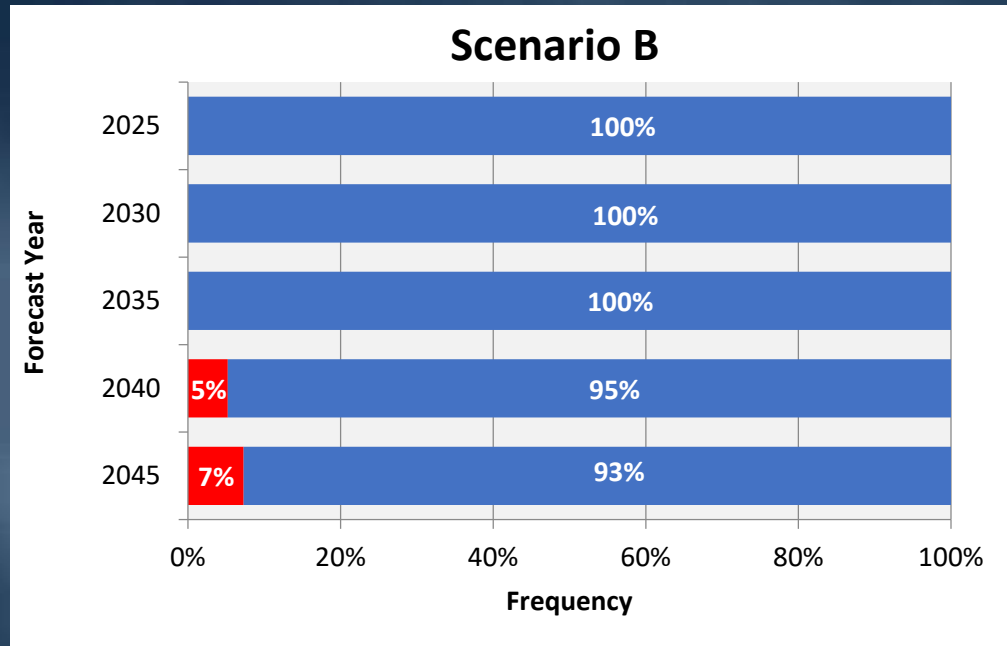
Shortage: running out of accessible water somewhere in MWD’s service area



Results of the Refined “Gap” Analysis

When to expect a gap, how often it occurs and how large

Shortage: running out of accessible water somewhere in MWD’s service area

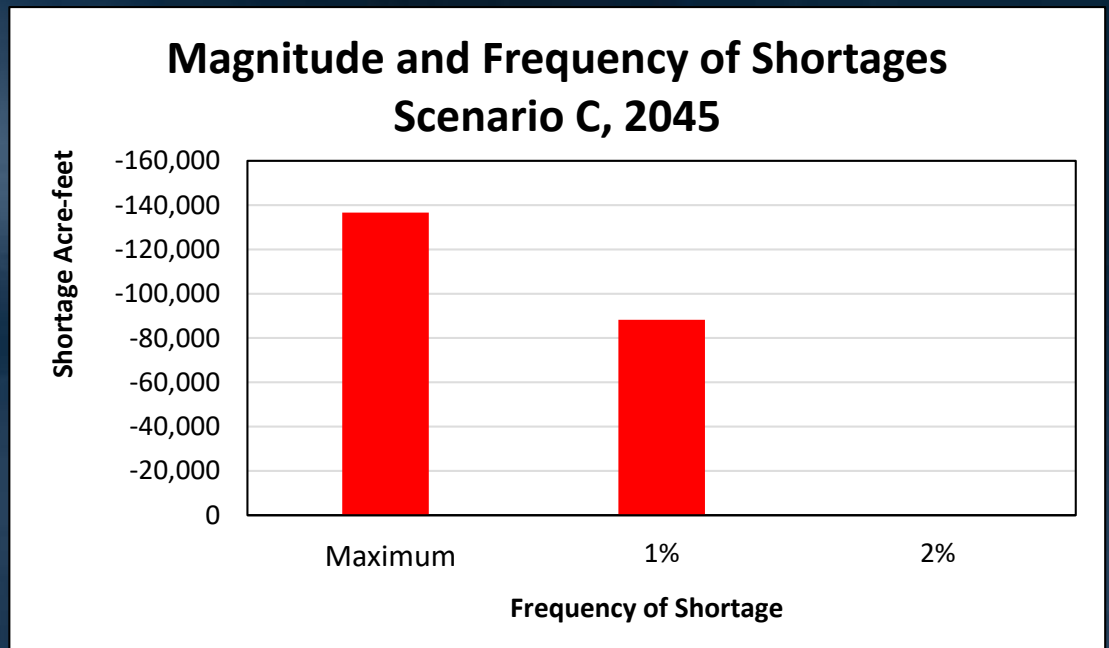
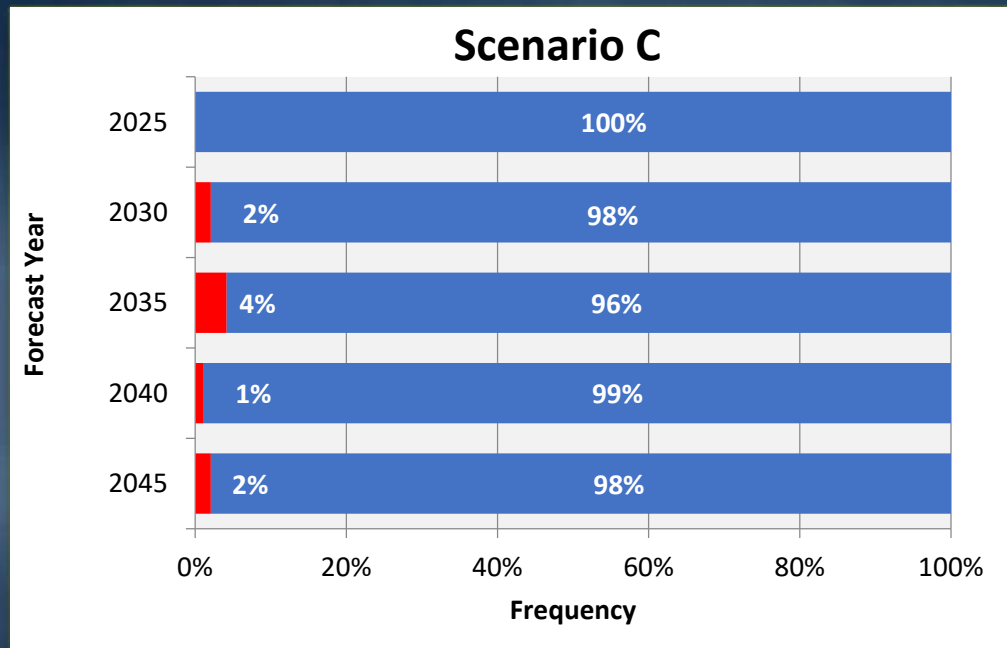


Findings indicate that the shortages are attributable to the spatial distribution of storage and supply availability

Results of the Refined “Gap” Analysis

When to expect a gap, how often it occurs and how large

Shortage: running out of accessible water somewhere in MWD’s service area

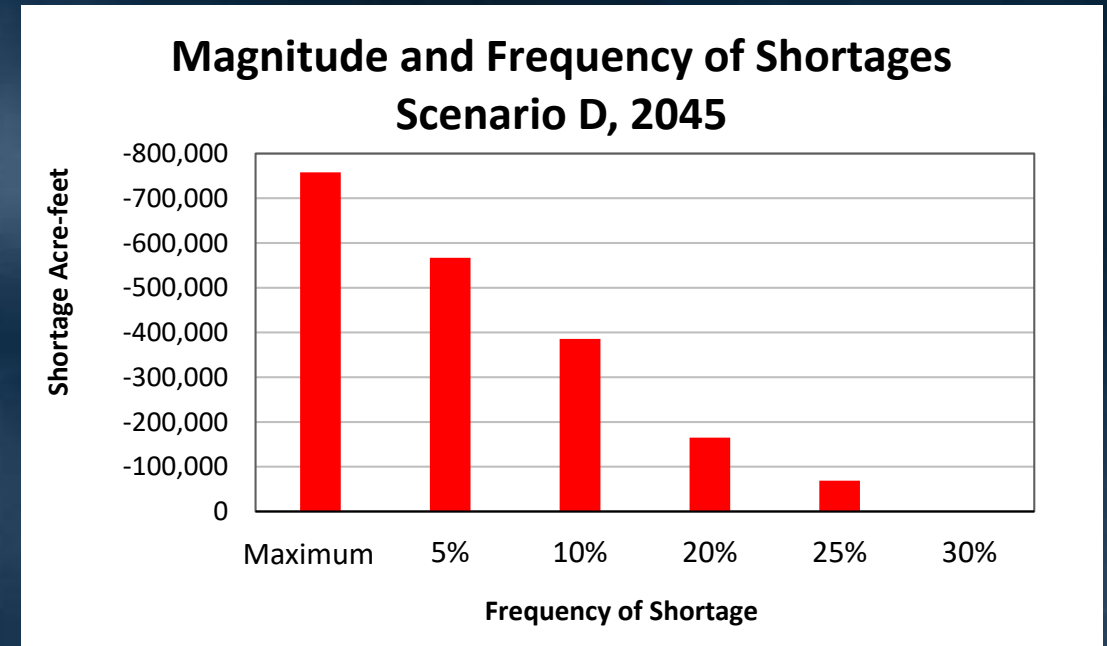
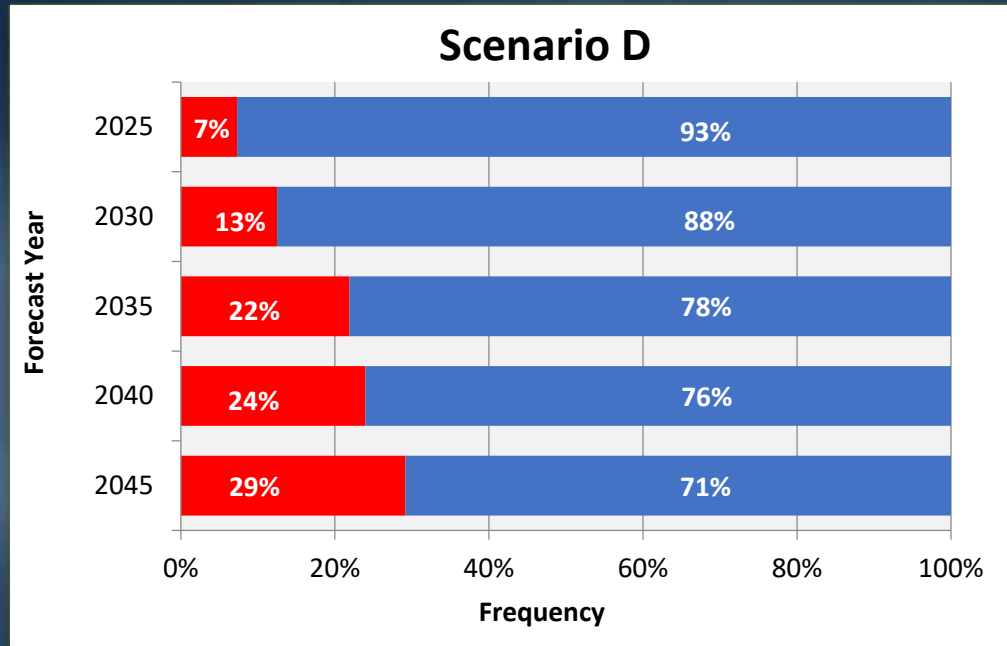


Findings indicate that the shortages are attributable to the spatial distribution of storage and supply availability

Results of the Refined “Gap” Analysis

When to expect a gap, how often it occurs and how large

Shortage: running out of accessible water somewhere in MWD’s service area



Findings indicate that the shortages are attributable to the spatial distribution of storage and supply availability

Shifting our Focus to Portfolio Actions and Adaptive Management Strategy

- Portfolio Actions

- Identify sets of actions and investments to address the risk of shortages
- Identify robust or no-regret actions to be implemented

- Adaptive Management Strategy

- Identify key items for tracking and monitoring
- Provide a framework for improving decision support through time
- Balance reducing the risk of shortage and the risk of overinvesting

Next Steps

- Continue refining analysis and provide updates to the Board
- Engage with the member agencies
 - Initiate process with member agencies to identify portfolio actions needed to achieve the reliability goal and report to the board

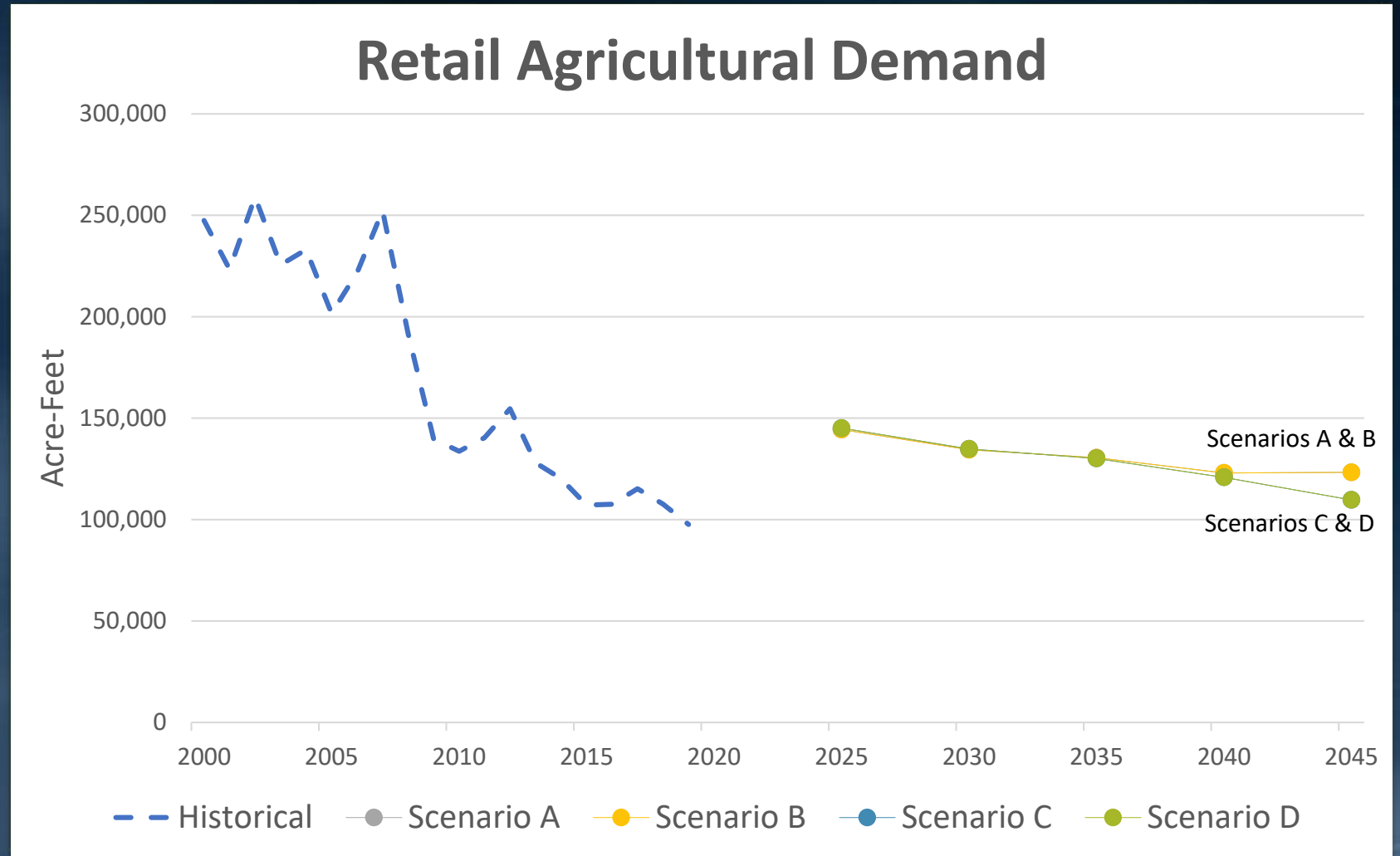
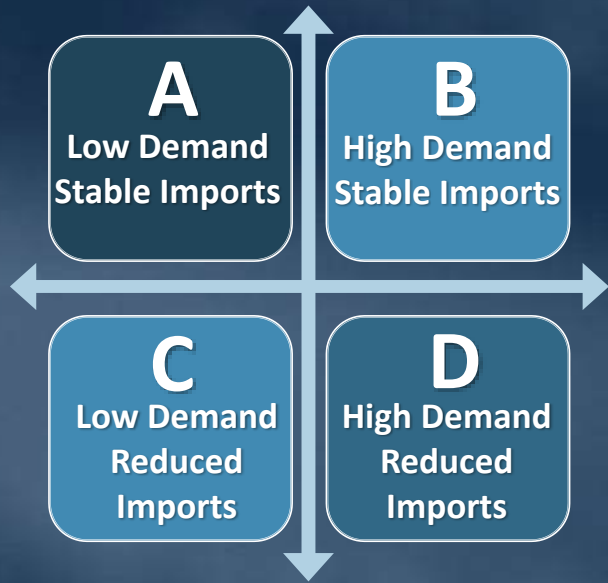


REFINED ANALYSIS

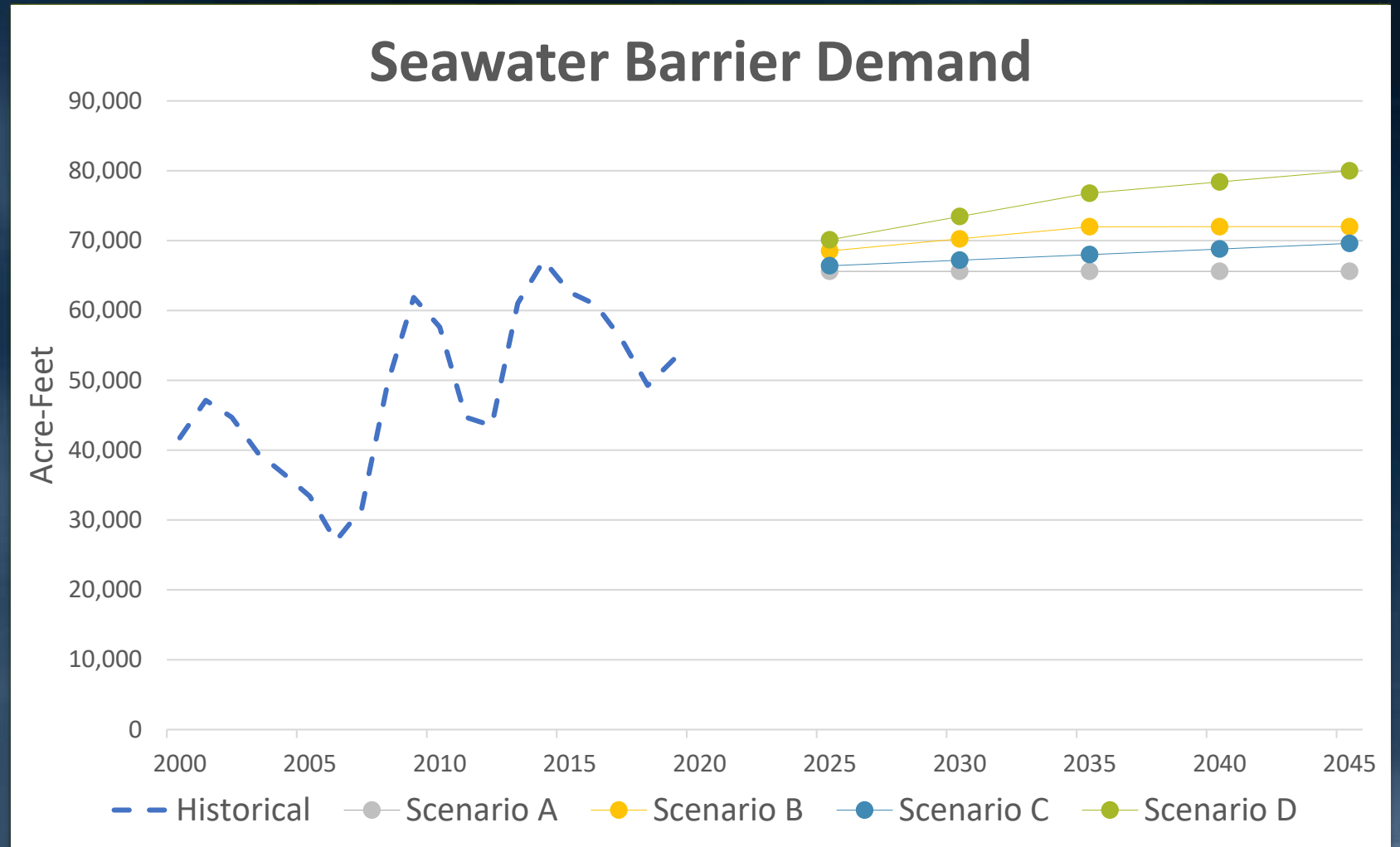
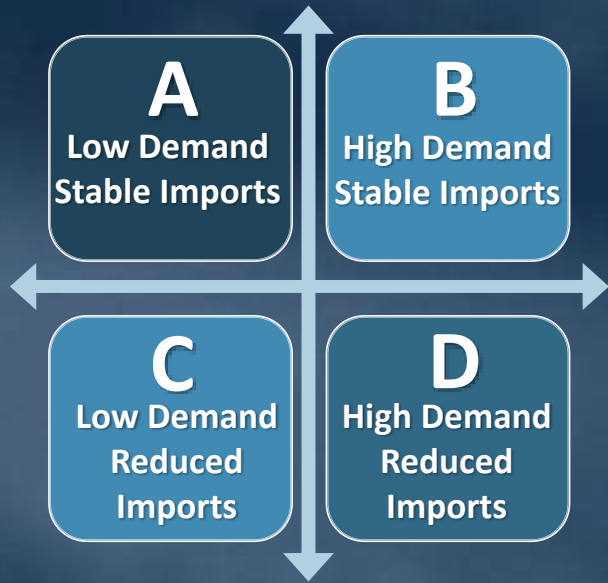
Additional Charts

CHARTS

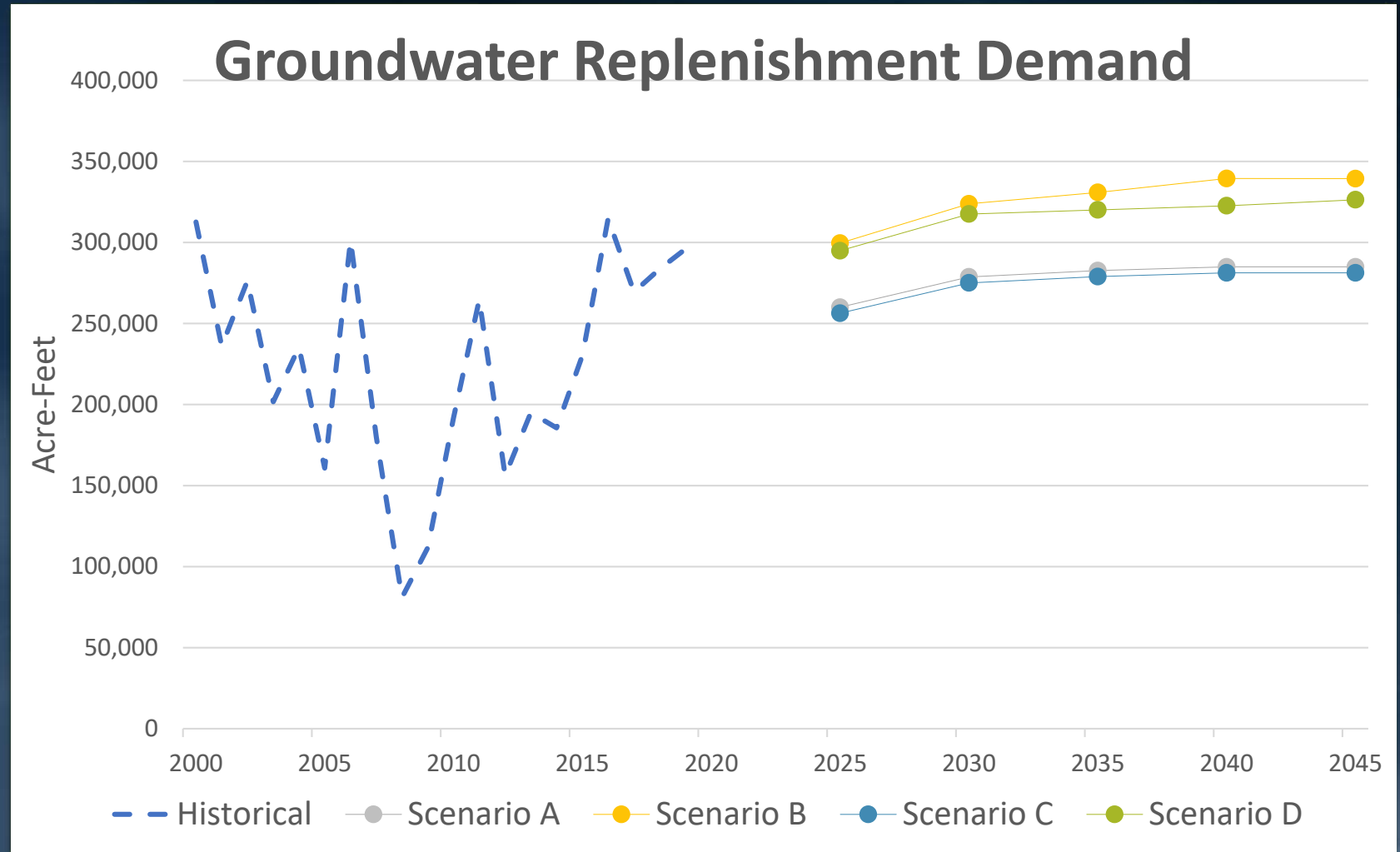
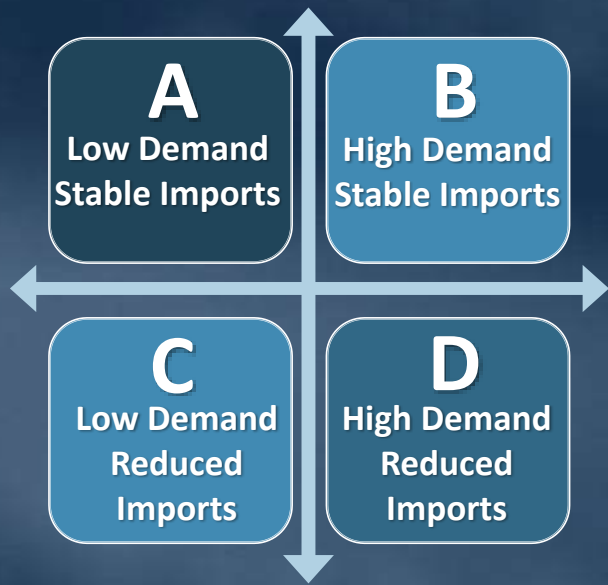
Refined Agricultural Demand



Refined Seawater Barrier Demand

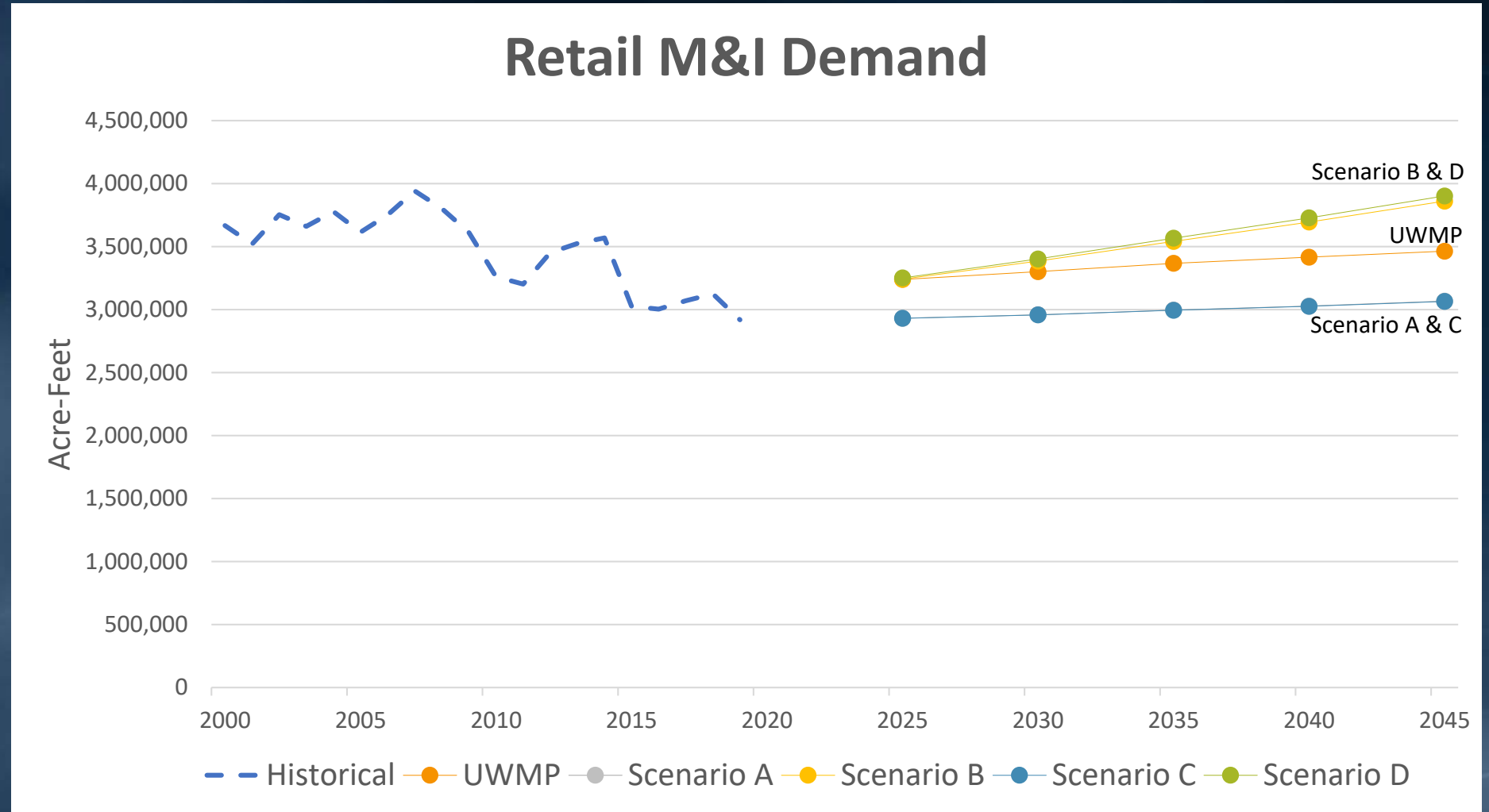
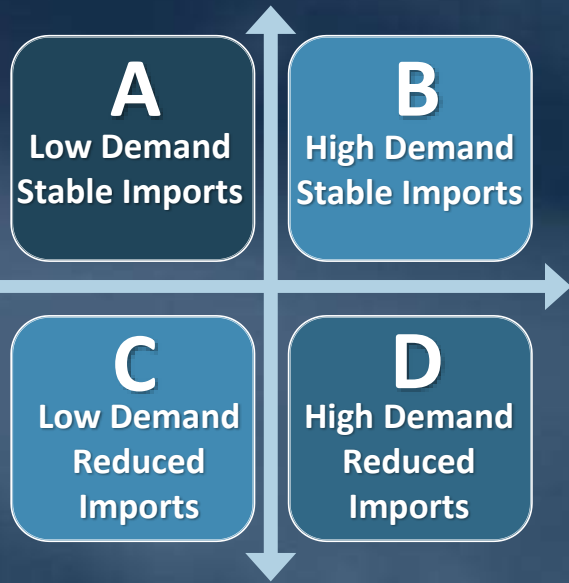


Refined Groundwater Replenishment Demand

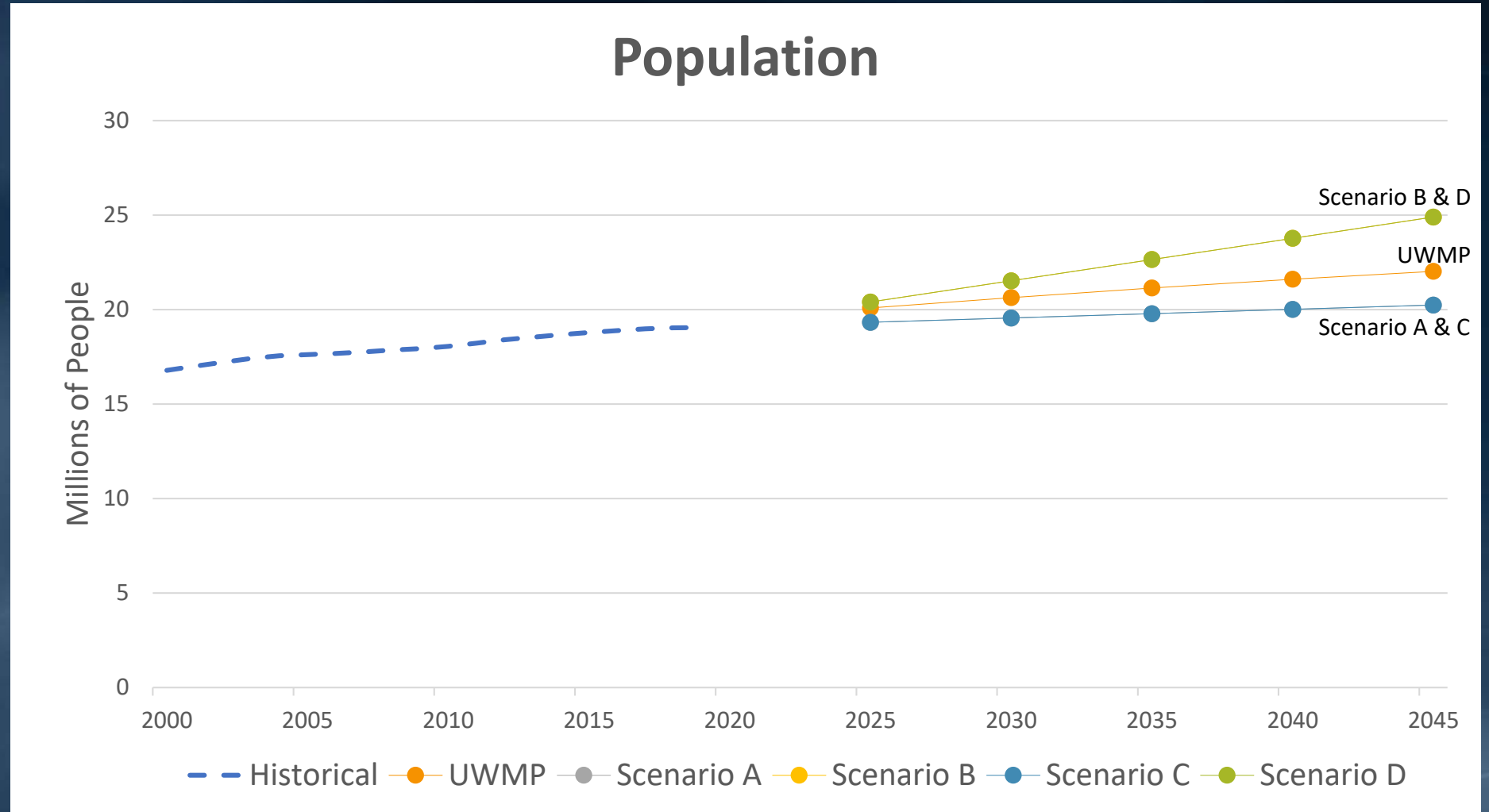
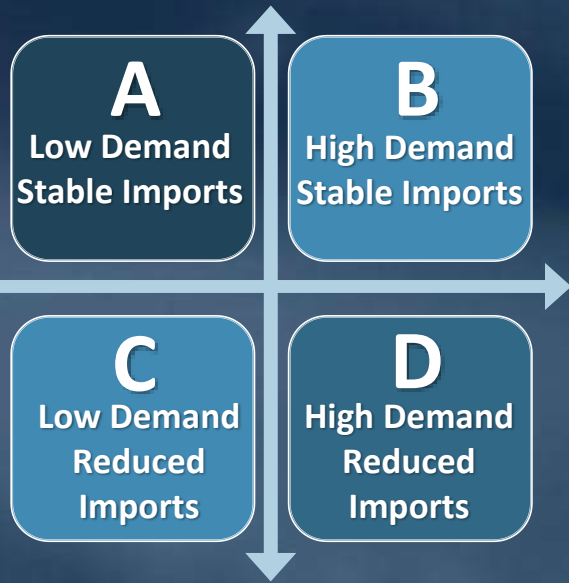


REFINED ANALYSIS COMPARISON WITH 2020 UWMP CHARTS

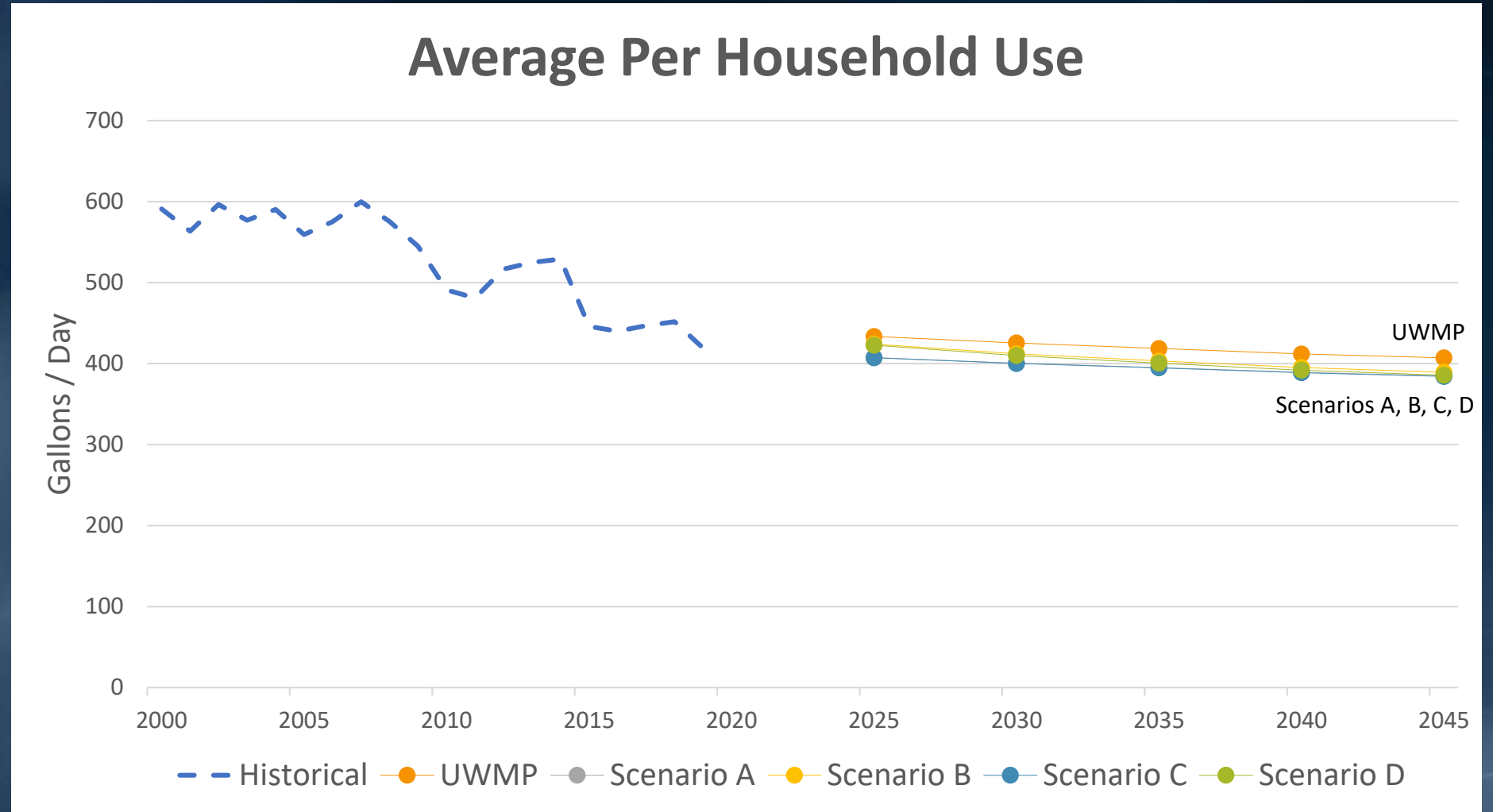
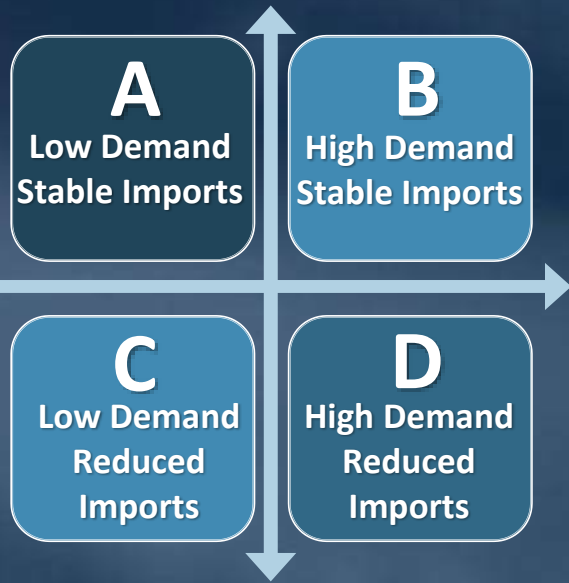
Refined Retail M&I Demand with UWMP



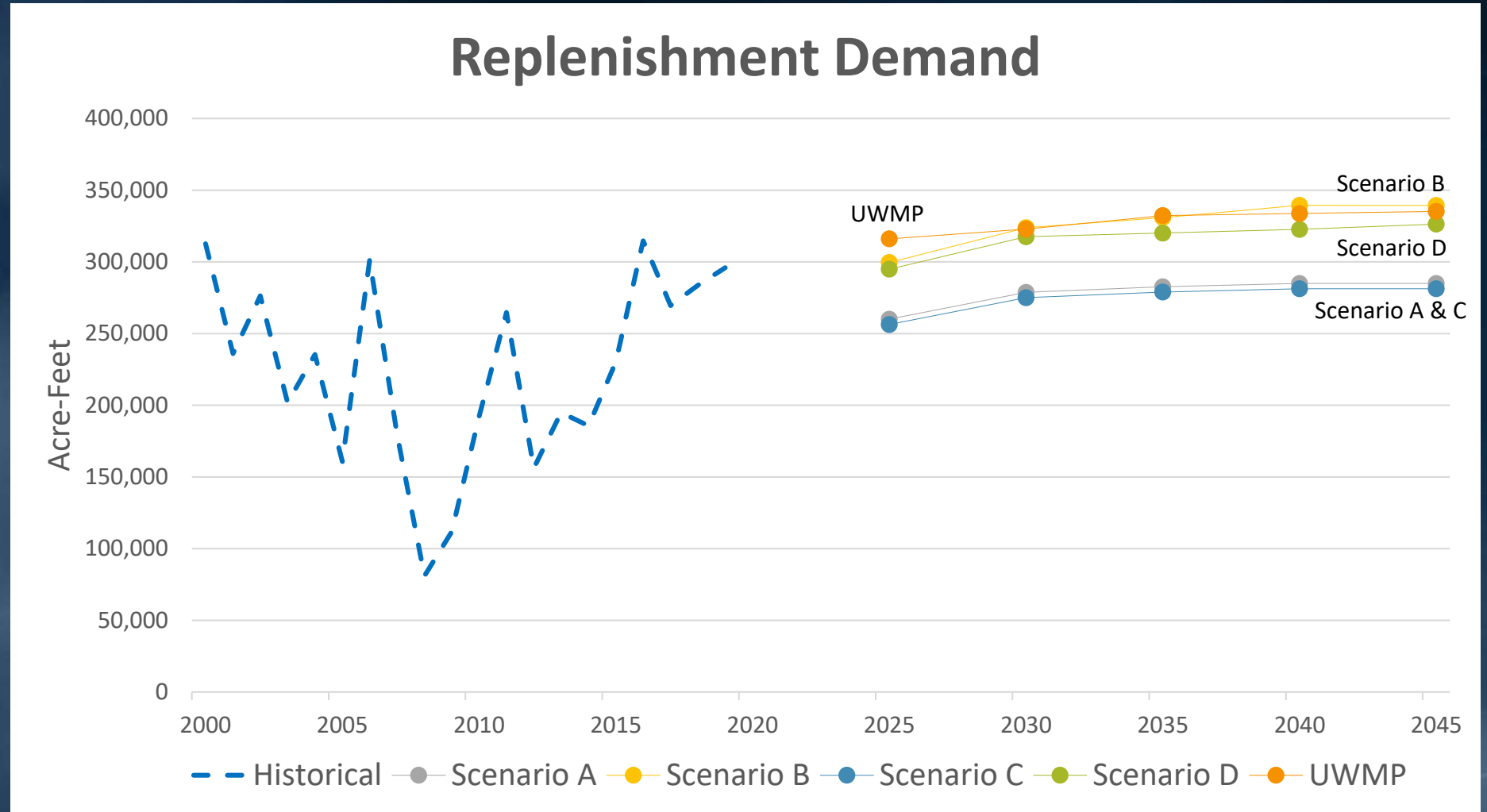
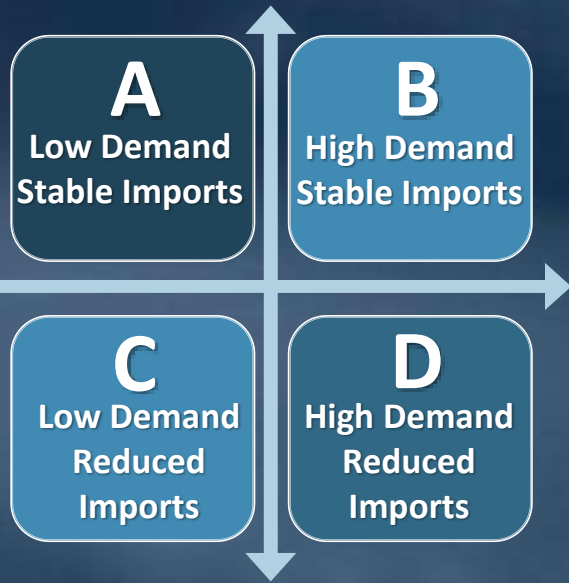
Refined Total Population with UWMP



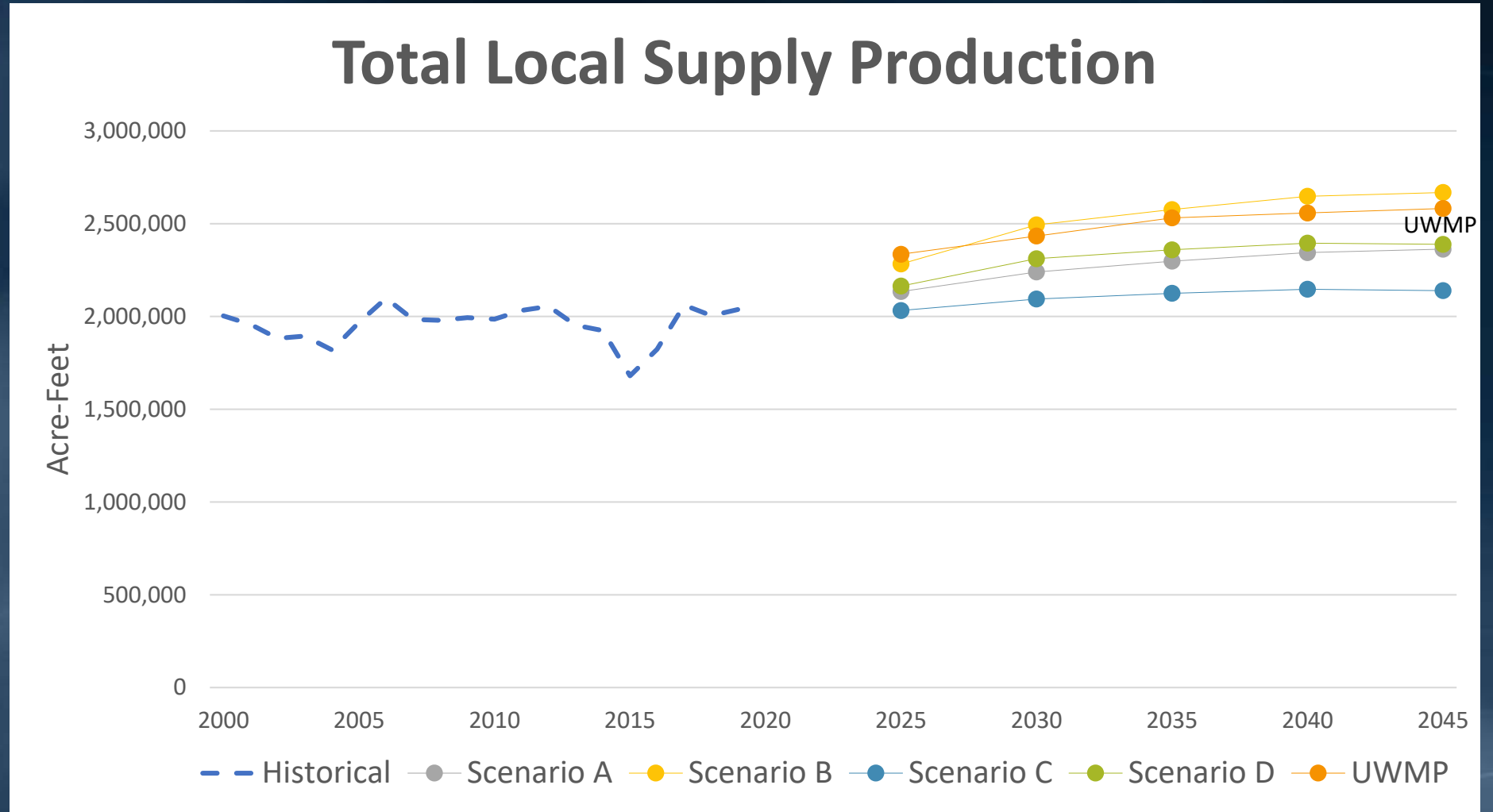
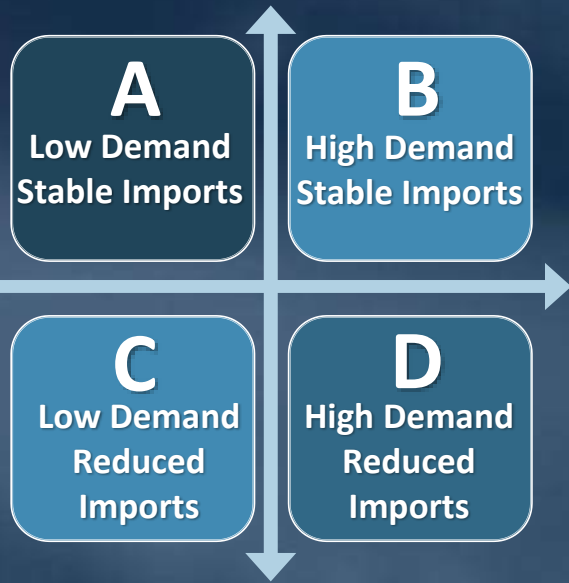
Refined Average Per Household Use with UWMP



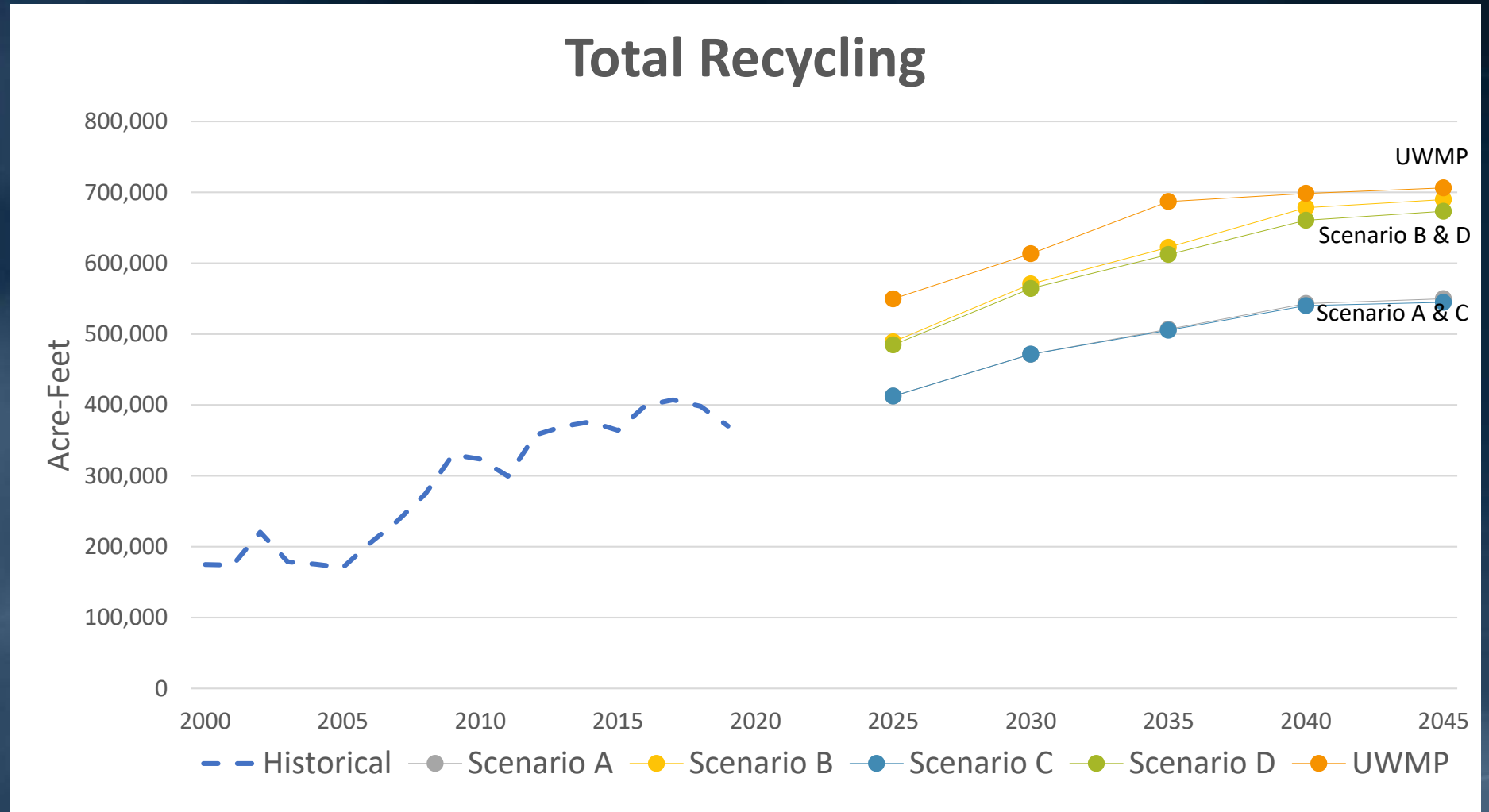
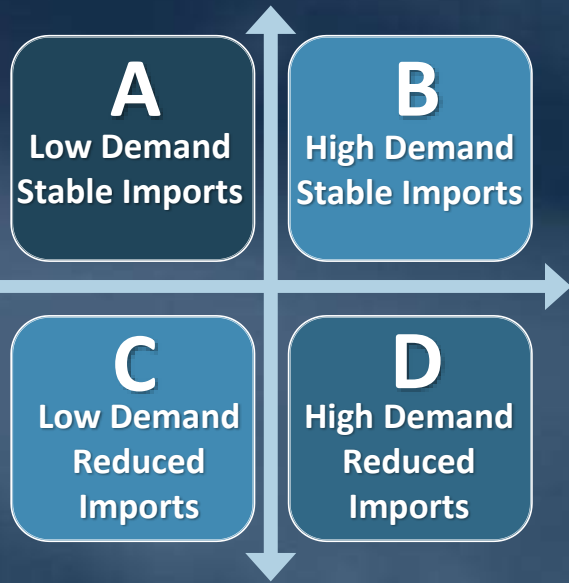
GW Replenishment Demand with UWMP



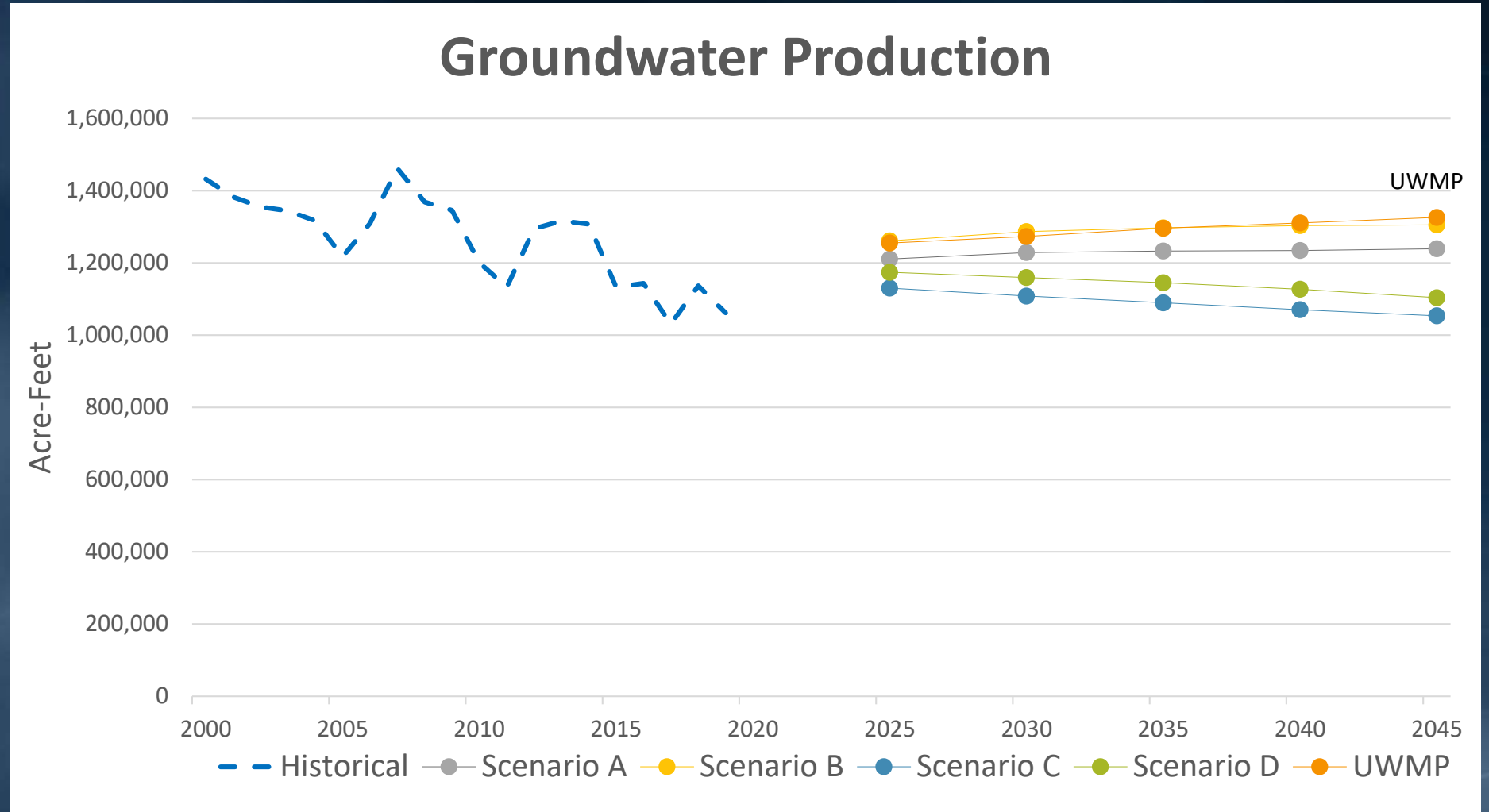
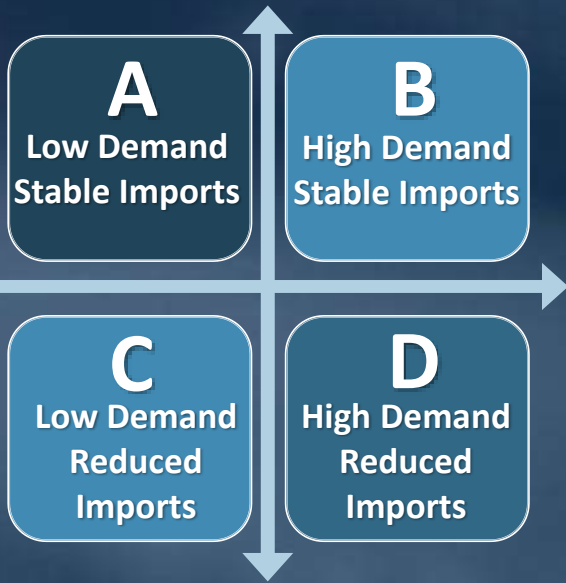
Total Local Supply Production with UWMP



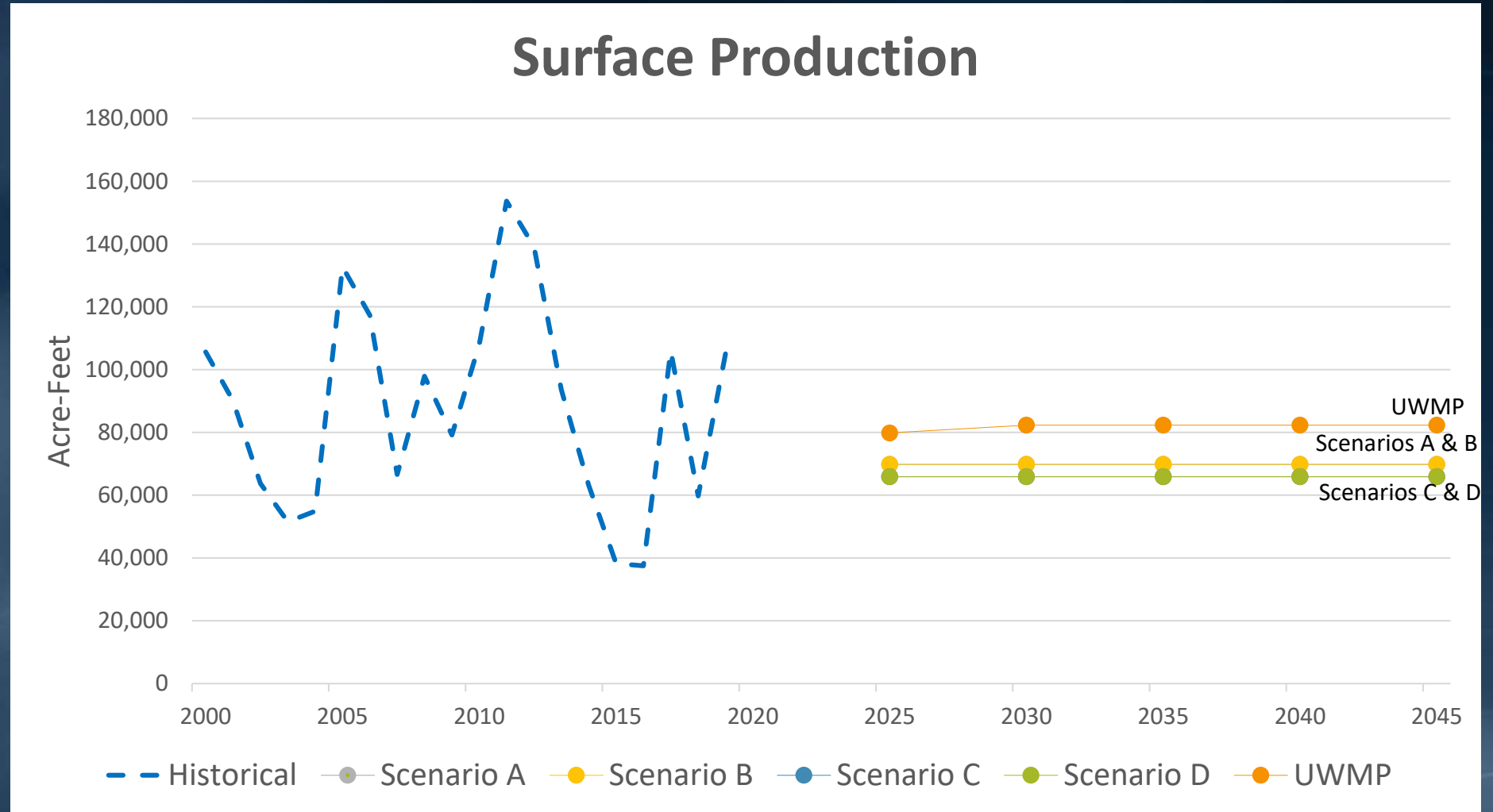
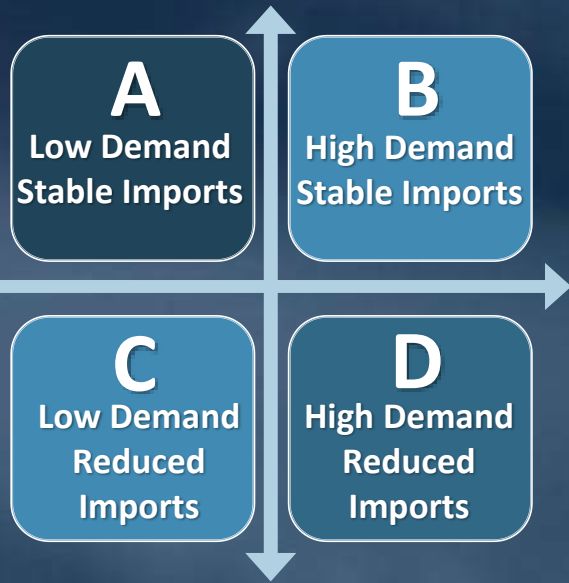
Total Recycling with UWMP



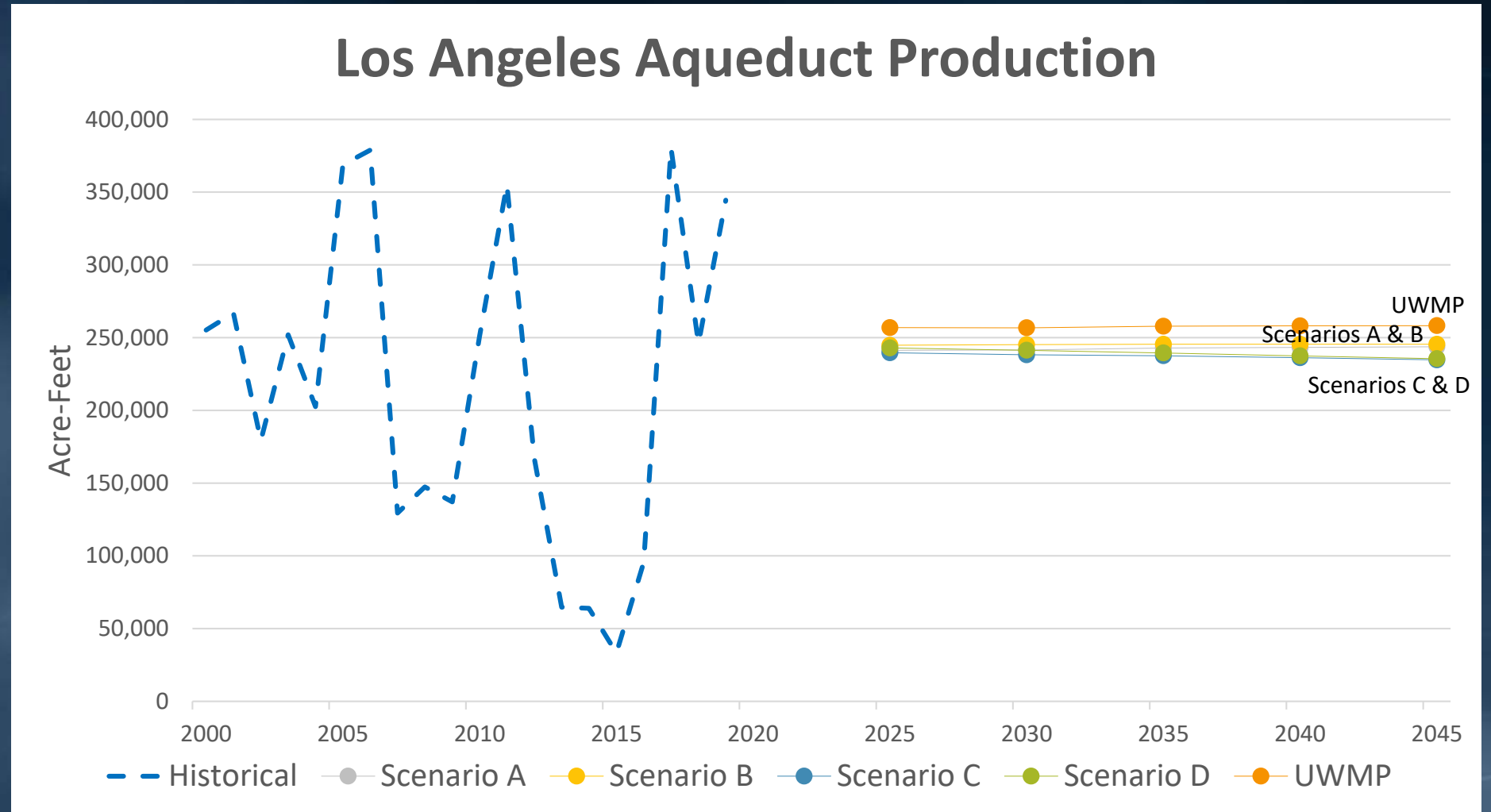
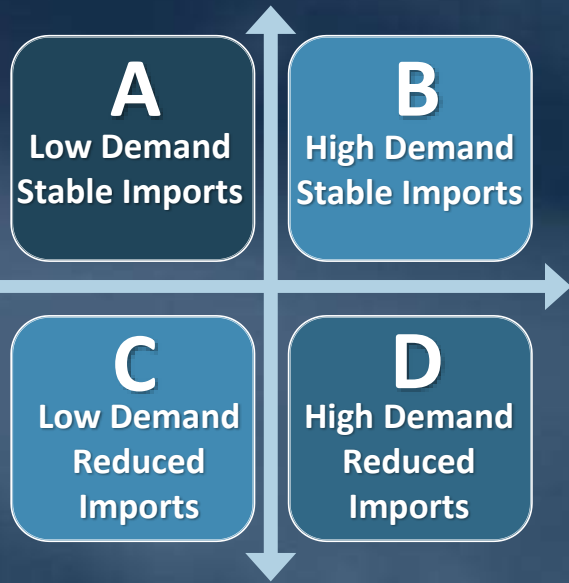
Groundwater Production with UWMP



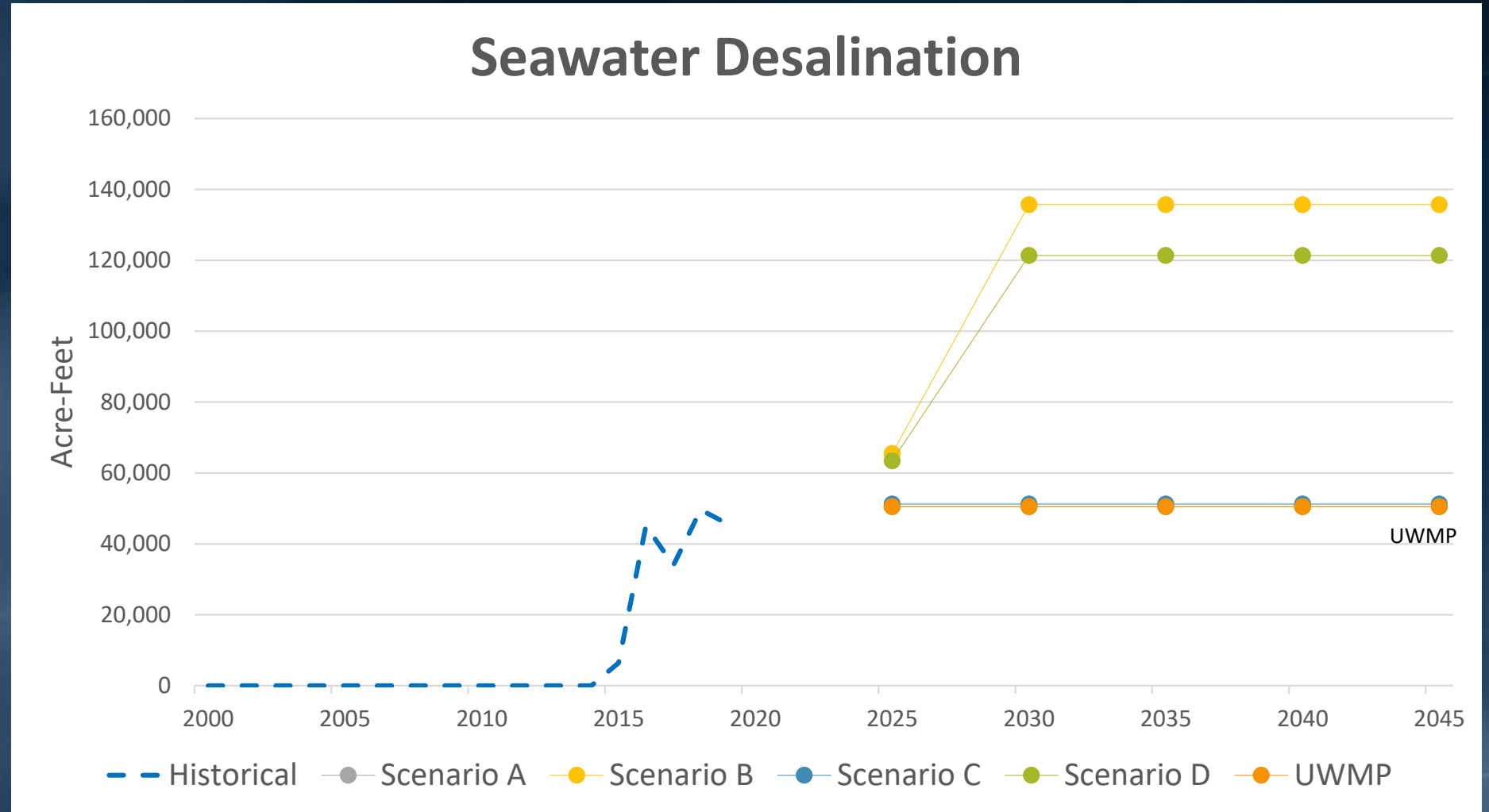
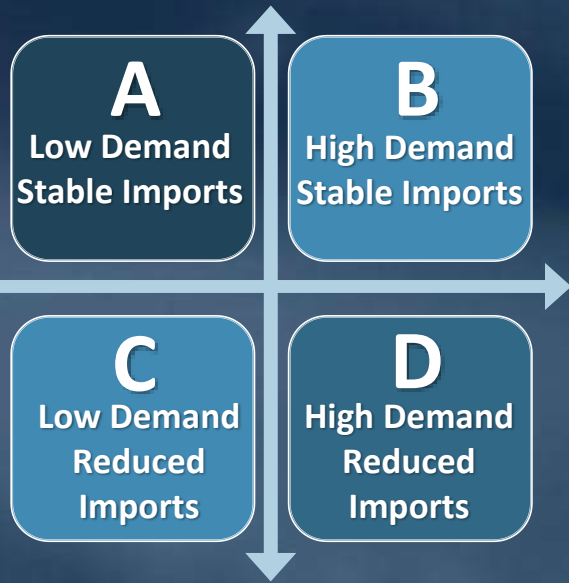
Surface Production with UWMP



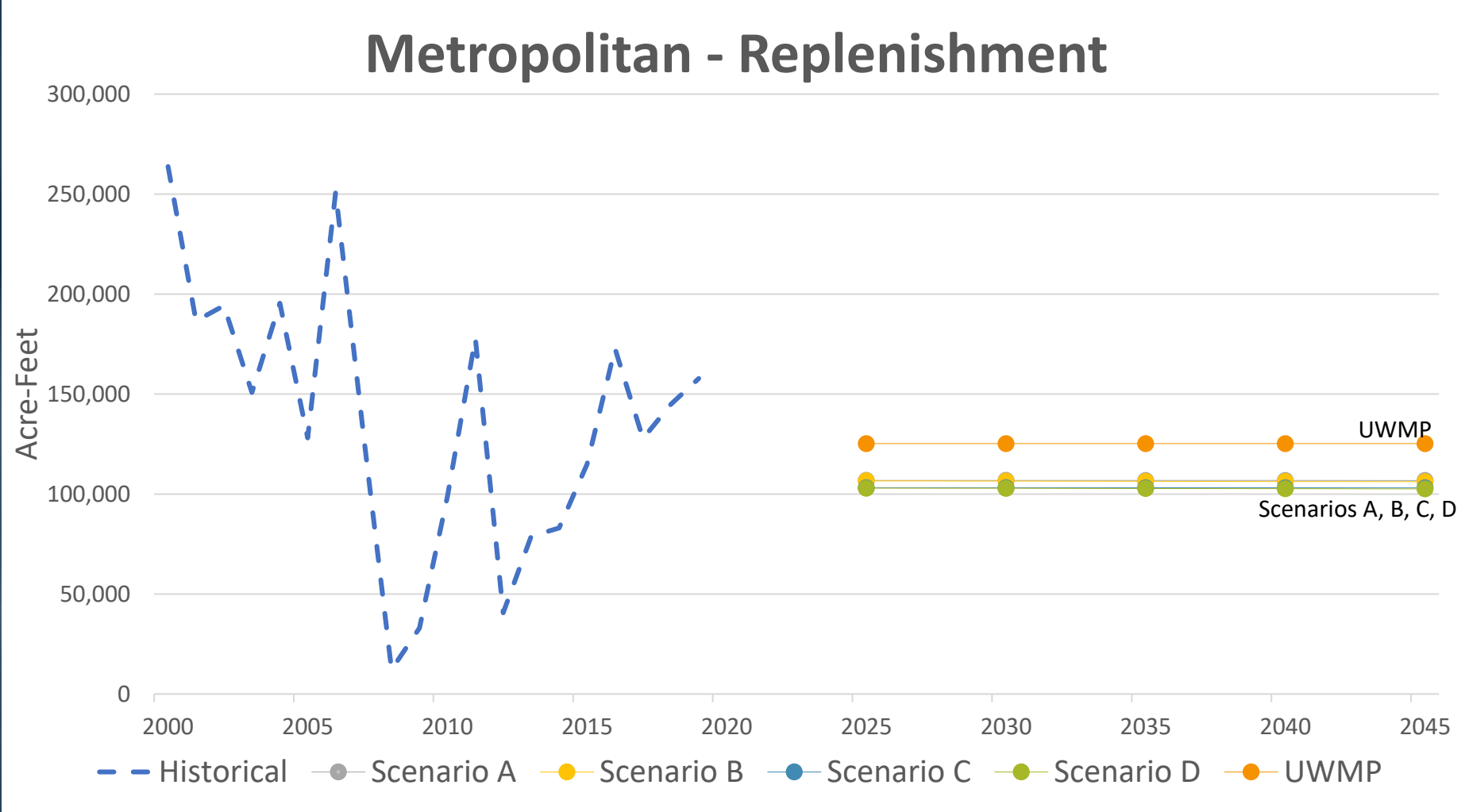
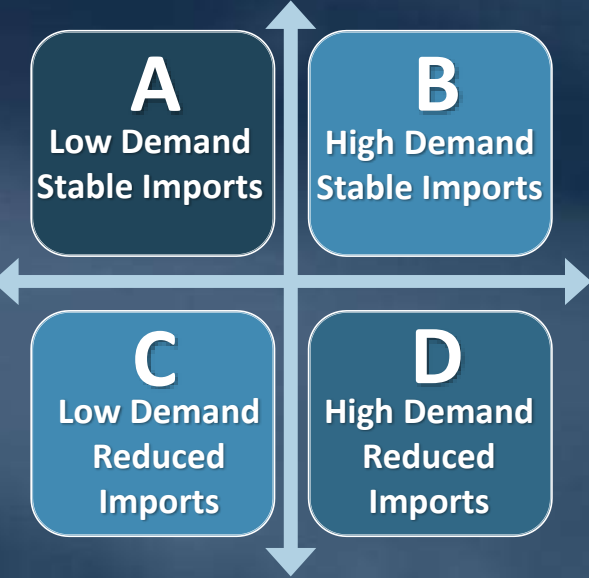
Los Angeles Aqueduct with UWMP



Seawater Desalination with UWMP



Metropolitan Replenishment with UWMP



Total Net Demand on MWD with UWMP

