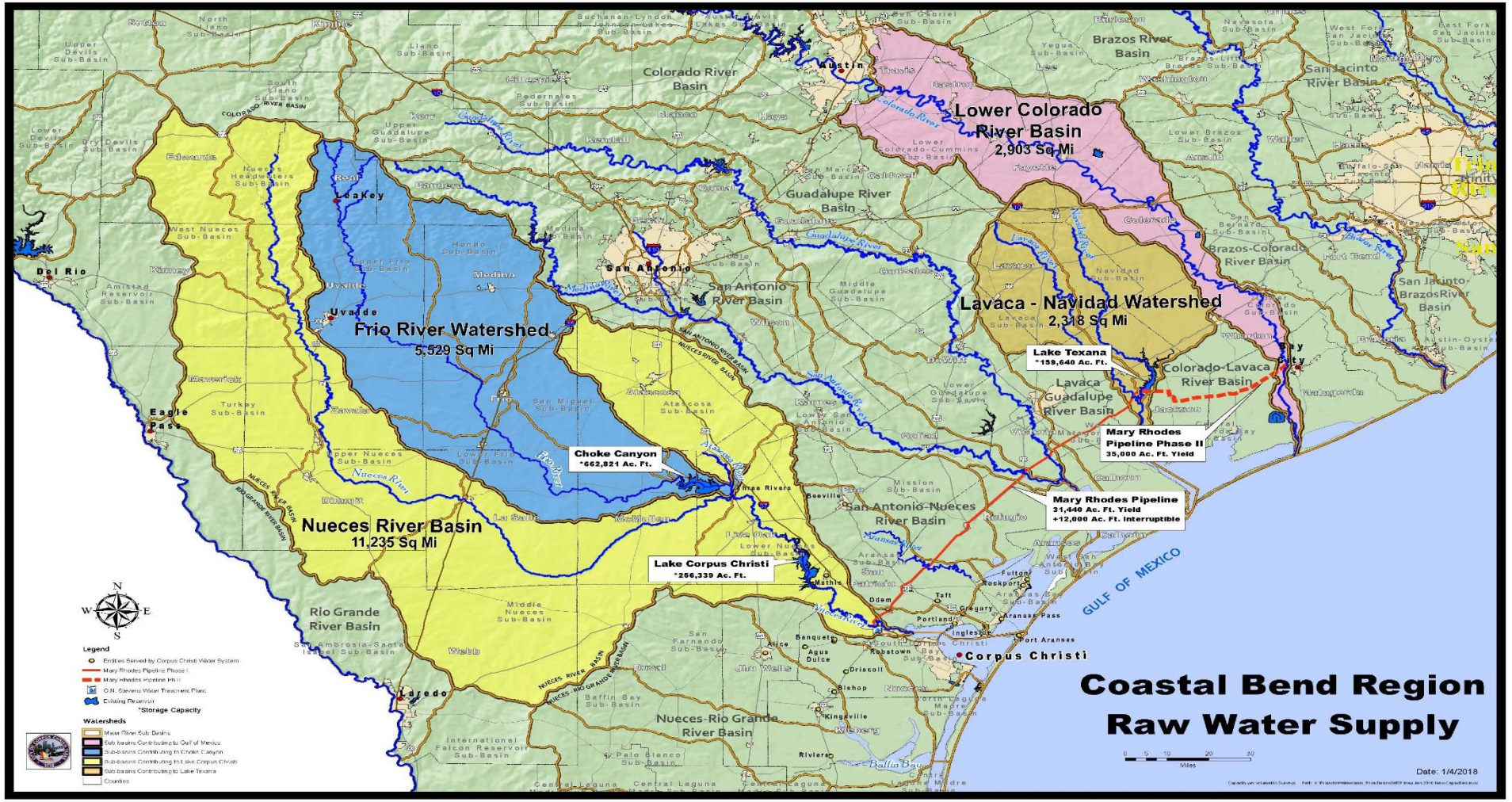
City of Corpus Christi

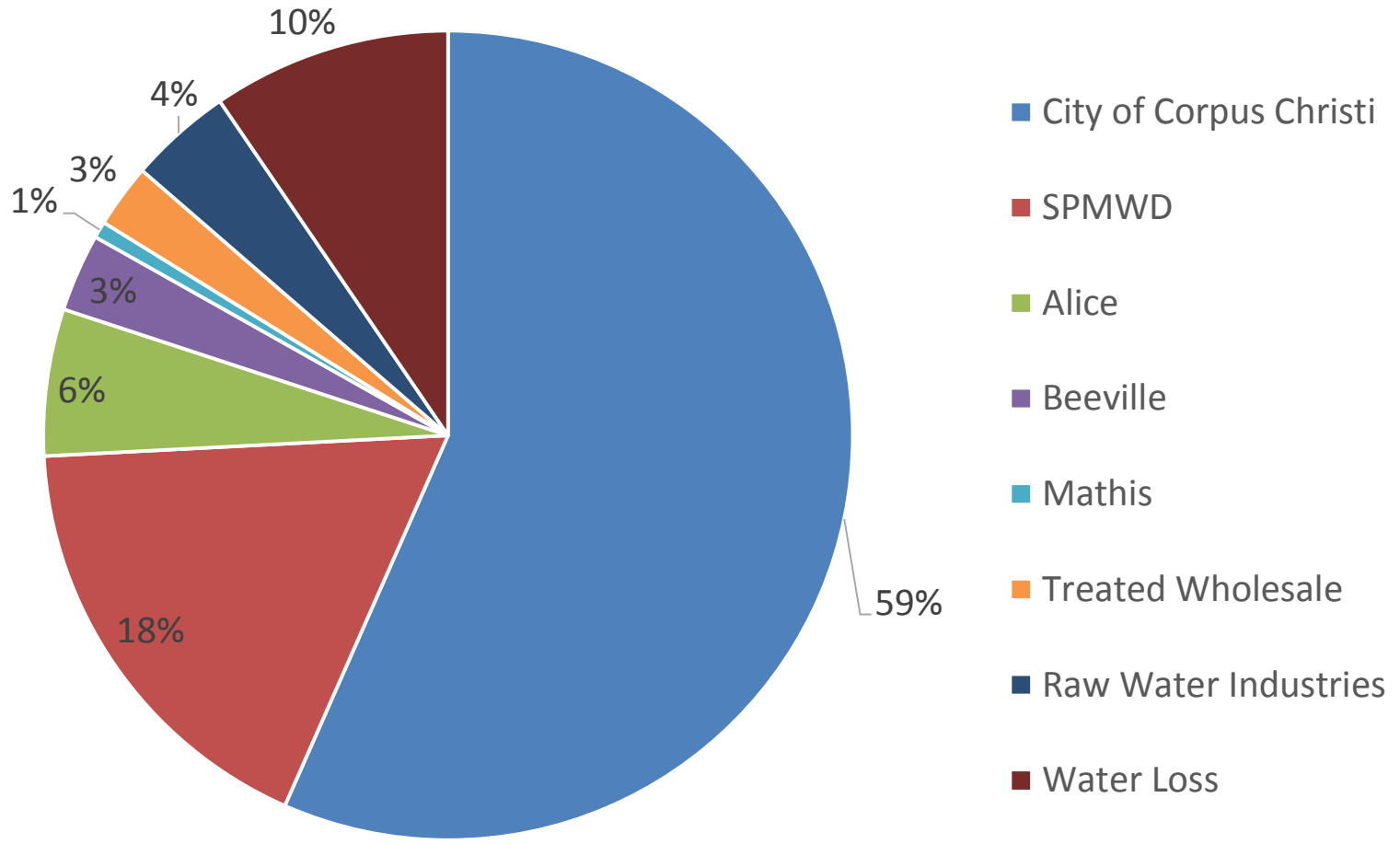
Raw Water Supply Strategies

Council Presentation
July 24, 2018

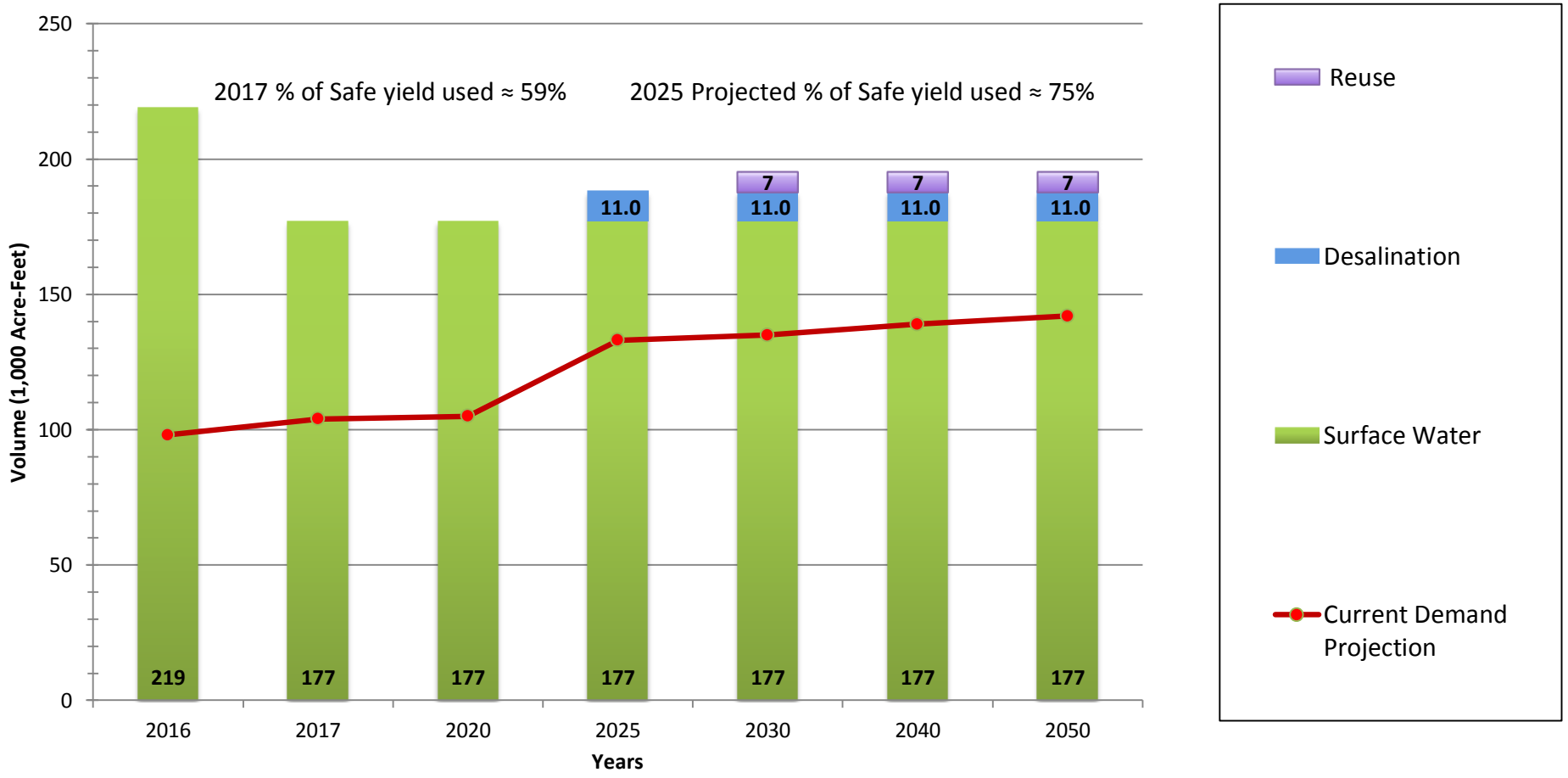
Current Water Supply



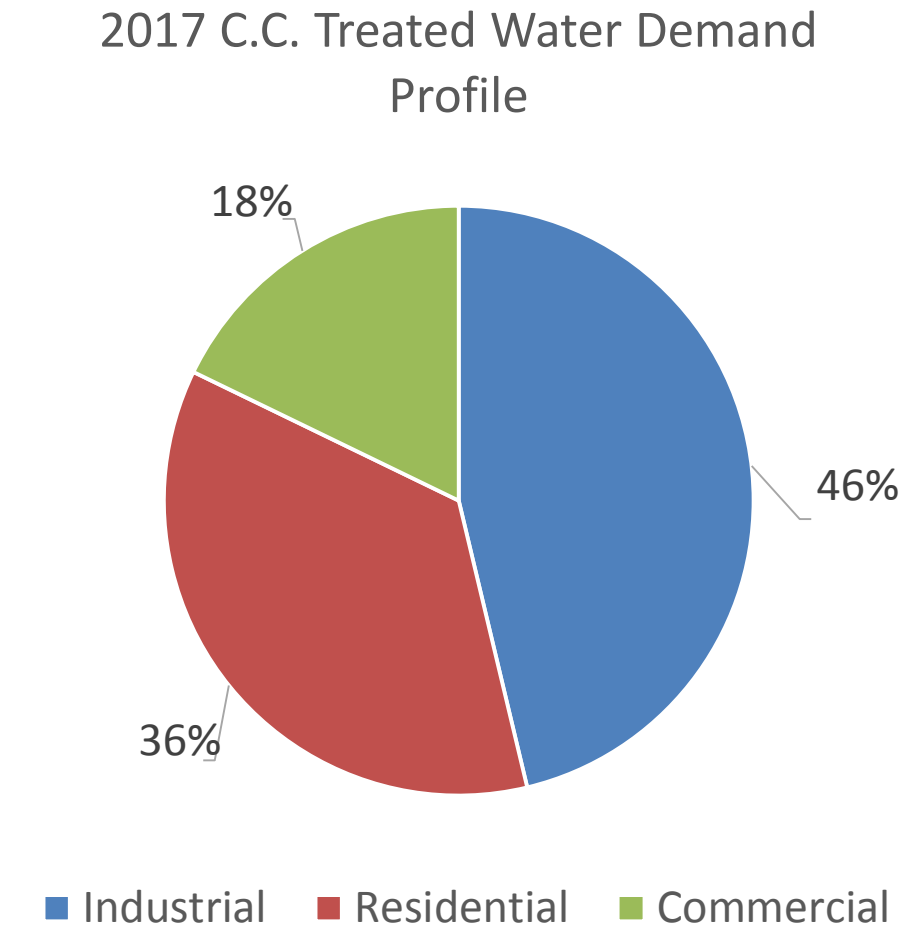
2017 Corpus Christi Regional Customer Water Demand

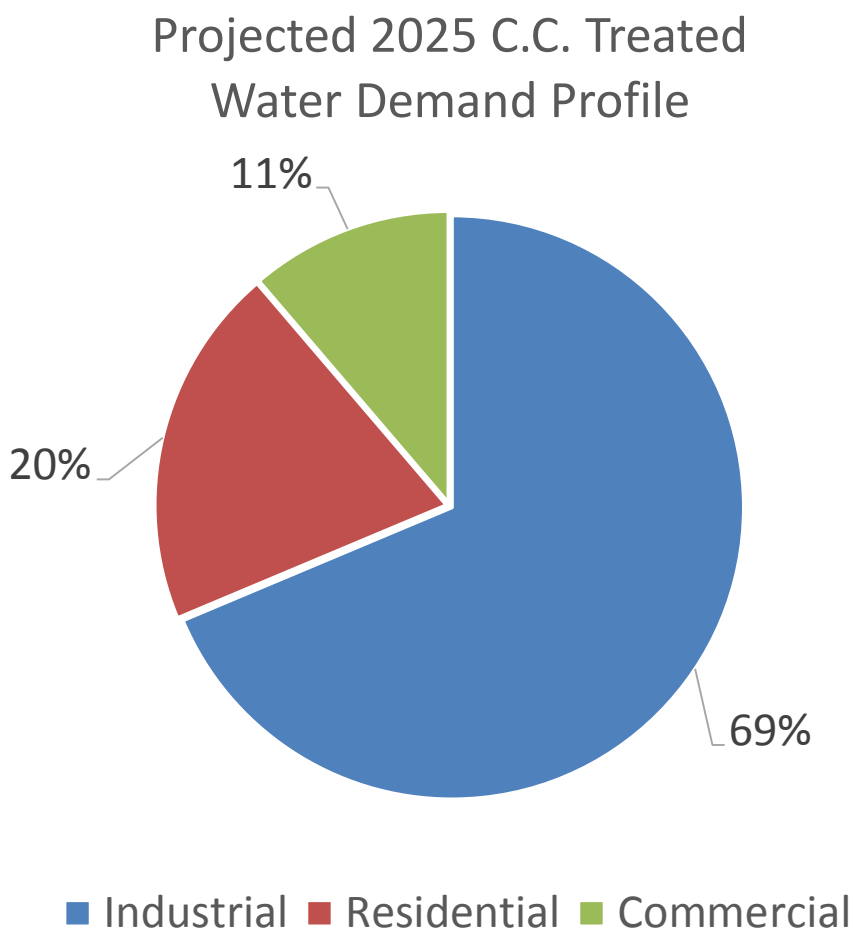


2017 Corpus Christi Raw Water Customer Demand & Projection



2017 and Projected 2025 Corpus Christi Treated Water Demand Profile





Regional Water Supply Strategies

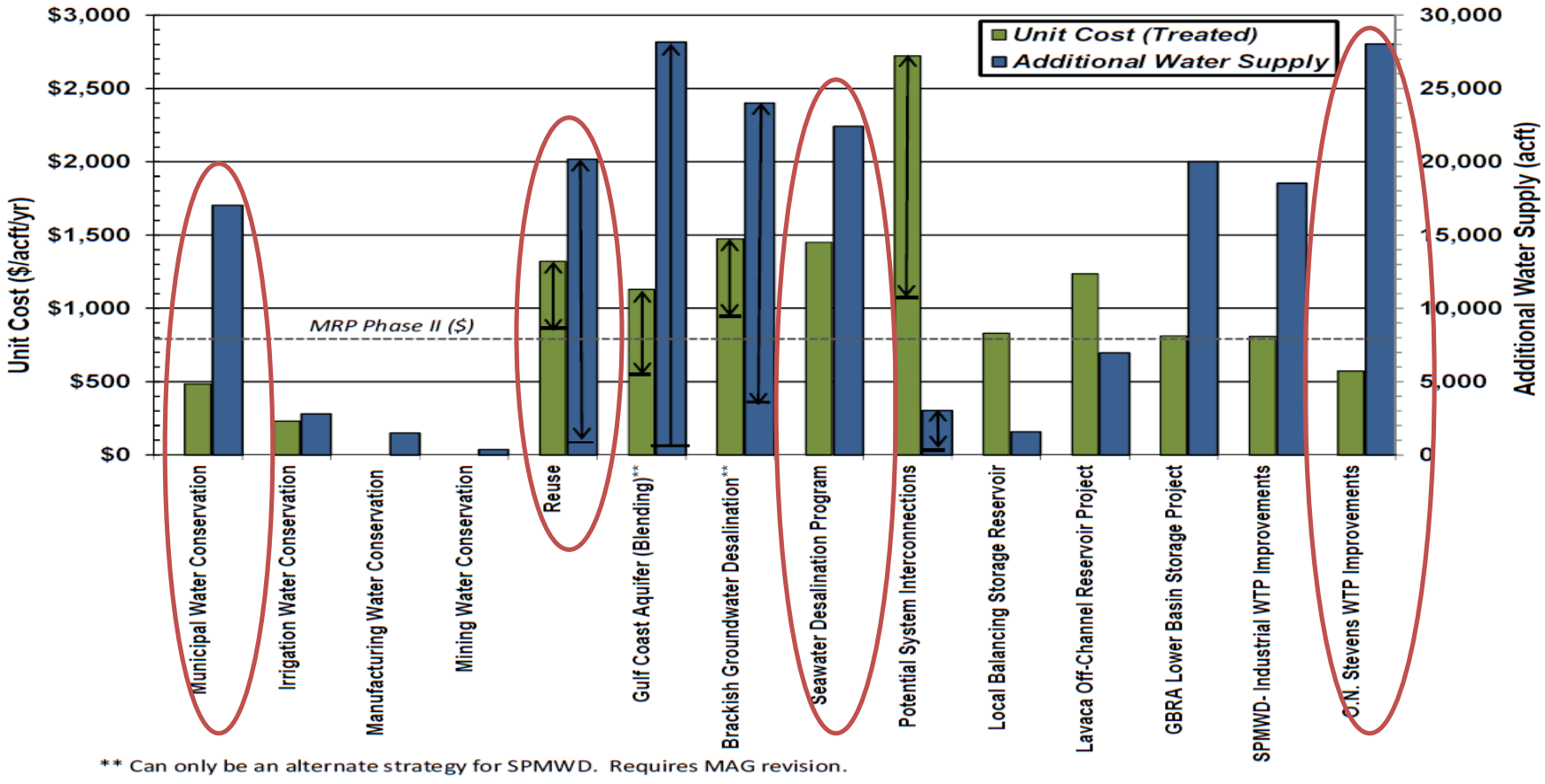
Regional Water

- Irrigation Water Conservation
- Manufacturing Water Conservation
- Mining Water Conservation
- Brackish Groundwater Desalination
- Potential Water System Interconnections
- Local Balancing Storage Reservoir
- Lavaca Off-Channel Reservoir Project
- GBRA Lower Basin Storage Project
- SPMWD Industrial WTP Improvements

City of Corpus Christi

- Municipal Water Conservation
- Reclaimed Wastewater Supplies and Reuse
- Gulf Coast Aquifer Supplies
- Seawater Desalination & Variable Salinity Program
- O.N. Stevens WTP Improvements

2016 Region N Water Management Strategies



** Can only be an alternate strategy for SPMWD. Requires MAG revision.

Figure 5B.1.1.
Unit Cost and Water Supply Comparison for Selected Water Management Strategies

Water Conservation

- Water Conservation:
  - *Year-round management* strategy,
  - *Sustainable Water Supply* – by reducing per capita use;
  - *Defers Capital Costs* – Reductions in demand delay the need for new supplies;
- San Antonio Water System:
  - San Antonio's Cheapest source of water is conservation – 2070 Goal Residential Gallons Per Capita Per Day ≈ 55;
  - *Reduces Peak Demand* – less stress on Water operations;
  - *Reduces Energy Costs* – Reduces the amount of water pumped, thus reducing electric costs.
  - The City of Corpus Christi's – Current Residential Gallons Per Capita Per Day ≈ 63

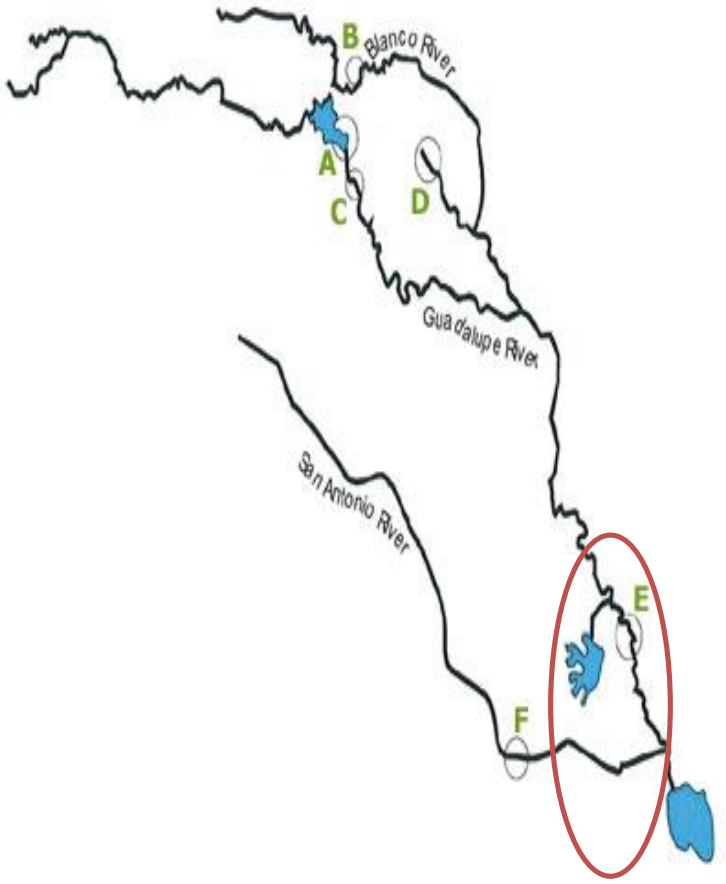
Reuse

- Current use:
  - Approx. 5-7 mil gal/month
- Reuse - Water Quality
  - Type II discharge
  - High Chlorides – Industrial customers have concerns

- Studies have been conducted to see if supply could meet Industrial needs

Surface Water

- Guadalupe Blanco River Authority, Lower Basin Storage Project



Desalination

- Projected Desalination: 11,000 to 22,000 Acre Feet a Year

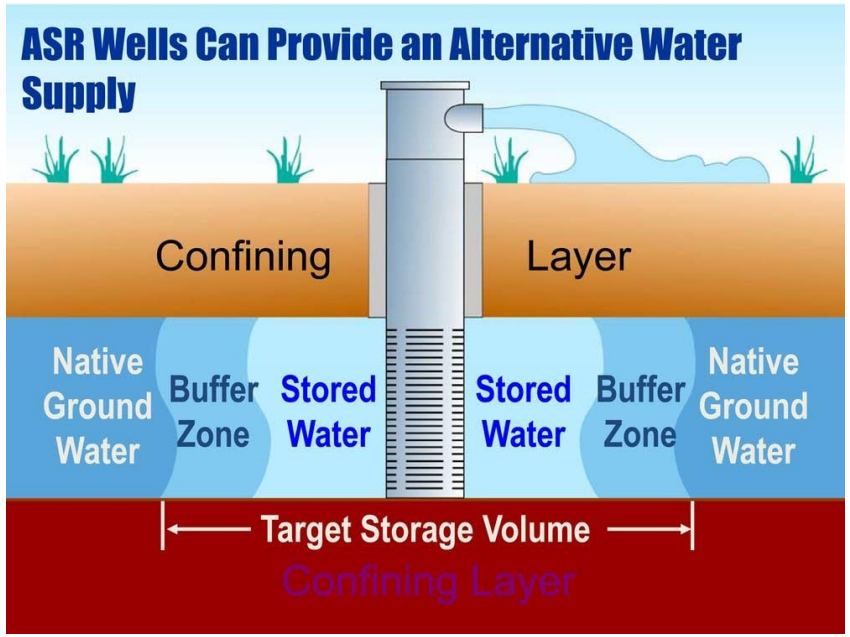
- Corpus Christi Projects:
  - Brackish
  - Seawater Desalination
- Other projects within the Area:
  - The Port of Corpus Christi
  - M&G

- Objectives:
  - Permitting
  - Site Location
  - Drought-proof Water Supply

Groundwater / Aquifer Storage & Recovery

- Each method varies according to:
  - Location
  - Aquifer size,
  - Water Quality, and
  - land ownership

- Aquifer Storage & Recovery:
  - The City is currently evaluating the feasibility within City limits



Groundwater / Aquifer Storage & Recovery

- Groundwater Request For Information is being developed
  - What is the Modeled Available Groundwater, in the project area?
  - What is the production volume per day of the well Field?
  - Who are the principal owners of the land that the well field?
  - Have samples of the groundwater been tested for chemistry, radiological, and metals?

Groundwater or Desalination?

Diversification of Water Supply

Frank C. Brogan, P.E.

Groundwater or Desalination?

Meeting with San Antonio Water System (SAWS)

July 12, 2018

Purpose:

1. Vista Ridge Groundwater Project – *Lessons Learned*

2. Brackish Groundwater Desalination Project

3. Aquifer Storage and Recharge

San Antonio Water System (SAWS)

One of the nation's largest municipally owned utilities

- Created in 1992
  - Merger of three city departments
  - Separate Board of Trustees appointed by City Council
- Serve 1.8 million people) ***(236,000 Ac Ft/Yr = 211 MGD)***
- 12,000+ miles of pipe
- $2 billion 5-year capital program
- 1,700 employees
- AA+ credit rating

Historical View

Challenges

San Antonio Express-News

Serving South Texas since 1865

SATURDAY, August 24, 1996 ★ Final Edition 50c

Bunton orders pumping limits

City leaders react angrily, plan to file appeal Monday

KEN DILANIAN
EXPRESS-NEWS STAFF WRITER

Flanked by local leaders at a dramatic City Hall news conference, Mayor Bill Thornton vowed Friday to appeal a federal judge's order that he decried as favoring animals over people.

"Today I think it's time we draw a line in the sand to fight for consideration of humans and human rights," Thornton said. "Quite frankly, the court is jacking us around."

Thornton's sentiments were echoed by a variety of city officials who protested an order by Senior U.S. District Judge Lucius D. Bunton III that may require San Antonians to stop watering their lawns in an effort to save five federally protected species at Comal and San Marcos springs.

After years of warnings, threats and voluntary plans, Bunton finally imposed a legally binding court order in response to allegations from the non-profit Sierra Club that San Antonio's Edwards Aquifer water use is violating the Endangered Species Act.

Governments at all levels have failed to properly preserve the Edwards, Bunton wrote, and that failure is killing species in violation

■ See THORNTON/8A

"Today I think it's time we draw a line in the sand to fight for consideration of humans and human rights. Quite frankly, the court is jacking us around."
— Mayor Bill Thornton

"The Edwards Aquifer region has finally reached the point where the aquifer is unable to provide for the needs of all those who depend upon it during dry years."
— Senior U.S. District Judge Lucius D. Bunton III

SAWS chief foresees ban on lawn watering by Oct. 1

BY JERRY NEEDHAM
EXPRESS-NEWS STAFF WRITER

A federal judge ordered restrictions on pumping from the Edwards Aquifer by the city of San Antonio and other defendants Friday, in an endangered species lawsuit filed by the Sierra Club.

Mayor Bill Thornton and City Council members vowed an appeal.

The order by Senior U.S. District Judge Lucius D. Bunton III does not take effect until Oct. 1. Depending on how much rain falls by then, the San Antonio Water System and other large users of aquifer water could be limited to no more than 1.2 times their winter average pumpage.

Joe Aceves, SAWS president, said that to meet that limit, the city probably would have to ban any outdoor water use by residen-

■ See FEDERAL/8A

the WATER CRISIS

The water debate is about a lot more than blind critters.
Carlos Guerra/1B

San Antonio Water System

Previously Planned Projects

City leaders agree it's time to lay Applewhite to rest

Mayor, water system to take action killing reservoir permits

By Ronda Templeton
Express-News Staff Writer

One day after voters turned up their noses at the proposed Applewhite reservoir for a second time, project supporters said the project finally rests in a watery grave.

Mayor Nelson Wolff said he will ask City Council to pass a resolution abandoning Applewhite along with the permit allowing its construction.

"It's time to tell the Texas Natural Resource and Conservation Commission and the Army Corps of Engineers that we no longer want to pursue the permit," Wolff said.

Cliff Morton, an avid Applewhite [illegible] and chairman of the San [illegible] board, said only of the water plan, not an indictment of San Antonio's elected officials and business community.

SAWS chief wants to drop Guadalupe plan

CONTINUED FROM 1A

River Authority (GBRA) and the San Antonio River Authority.

It proposes to bring 30.8 billion gallons of water to the city each year as soon as 2012 to address the city's growing needs and diversify its supply sources.

"It's disappointing," said Bill West, general manager of the GBRA. "Water today has become so complicated that it has to be addressed in a regional, multiparty process.

"We were disappointed that the attitude toward the project has changed from SAWS' perspective. The signs all point toward pure economics for SAWS without consideration to the rest of the region. I'm concerned about the implications there."

West said he's concerned that San Antonio is slipping back into overdependence on the Edwards Aquifer for its water supply, jeopardizing the supply for those on the Guadalupe who depend on springflows.

"One of our major reasons for participating in that project was to protect the springflow (from the Edwards Aquifer) and that appears not to be an objective of SAWS," he said.

The city and region have historically relied on the Edwards for all drinking water. A 1993 state law created the Edwards Aquifer Authority to regulate its use, guaranteeing historic users certain amounts and limiting overall pumping to 450,000 acre-feet a year.

That authority is finishing up its permitting of water rights and the amounts guaranteed to users totaled 570,000 acre-feet. Pending legislation -- Senate Bill 3 -- would raise the pumping cap to match those rights. The Lower Guadalupe Water Supply Project was designed to capture excess flows on the lower Guadalupe, supplement them in dry times with groundwater, and pump them back to San Antonio.

The project, especially the groundwater component, has drawn heated opposition downstream. Some critics in San Antonio have said that the Edwards should be managed better rather than pumping springflows back uphill.

SAWS has spent about $5 million dollars on environmental studies related to the project, which would affect freshwater flows into San Antonio Bay and the food supply for the wintering whooping cranes.

"As stewards of the water supply for the residents of San Antonio, we have to balance the competing objectives of having a completely unlimited water supply and having affordability in rates," Chardavoyne said Tuesday, adding that he and the task force still are analyzing other projects.

The utility is proceeding with a $333 million project that would bring 18 billion gallons of water to the city each year from well fields sunk into the Carrizo Aquifer in western Gonzales County as soon as 2008.

jneedham@express-news.net

LCRA board act sours S.A. water supply deal

SAWS feels partner wrongly pulled plug on Colorado River project.

Just when the atmosphere seems peaceful in the world of water supply projects, another conflict appears.

Recently, the San Antonio Water System board of trustees voted to declare the Lower Colorado River Authority in breach of a contract for a project to bring Colorado River water to San Antonio.

SAWS officials said the [illegible]k action late [illegible]fectively [illegible]" on the [illegible]t was [illegible]2.

[illegible]me assump- [illegible]utside con- [illegible]e not agreed [illegible]arties to de- [illegible] water would [illegible] San Antonio. [illegible]o work out [illegible]ietly, the [illegible]ed to force a [illegible]ss. If the [illegible]ss is unsuc- [illegible]vill have the [illegible]a lawsuit. [illegible]e, the SAWS [illegible]ado River of- [illegible]ng away [illegible]l of 180,000 [illegible]er from the

SAWS originally expected 150,000 acre-feet from the supply project with the LCRA, but that estimate was downsized to 90,000 acre-feet in 2006.

LCRA's decision came after SAWS invested $40 million in studies and environmental work. Under the contract, SAWS has the right to end the project and get half of the funds back.

At this stage, the notion of the two agencies working together on a successful water project seems unlikely.

Additionally, the estimated cost of water from the LCRA project was increasing as the yield dropped.

Still, SAWS officials see value in owning a pipeline that runs almost to the coast because desalinated sea water is likely to be a key source in the future.

SAWS officials say they have hope for reviving the LCRA deal, but the best move for SAWS is to get its half of the $40 million back plus damages for LCRA's breach of contract.

The most promising parts of SAWS' new 50-year water supply plan don't rely on the LCRA deal, and it is time to move forward with projects that have better prospects.

Planned Projects Came Up Dry

Project Name	Year Planned	Planned Yield (AF)	Dollars Expended	Yield
Applewhite Reservoir I	1980s	48,000	$40 M	0
Applewhite Reservoir II	1990s	60,000		0
Simsboro Groundwater	1998	55,000	$4 M	0
Lower Guadalupe Project	2001	94,500	$6 M	0
LCRA – SAWS Water Project	2002	150,000	$42 M	0

Projects Successfully Completed…Sort of…

Project	Year Planned	Year Completed	Planned Yield (AF)	Yield
Regional Carrizo Project	2000	2013	56,000	11,688
Brackish Desalination Project	2004	2017	*29,000	13,000

* 2008 RW Beck projection

Political, Legal and Regulatory

Securing our Water Future Through Open Bid

Shifting Risks to Private Sector

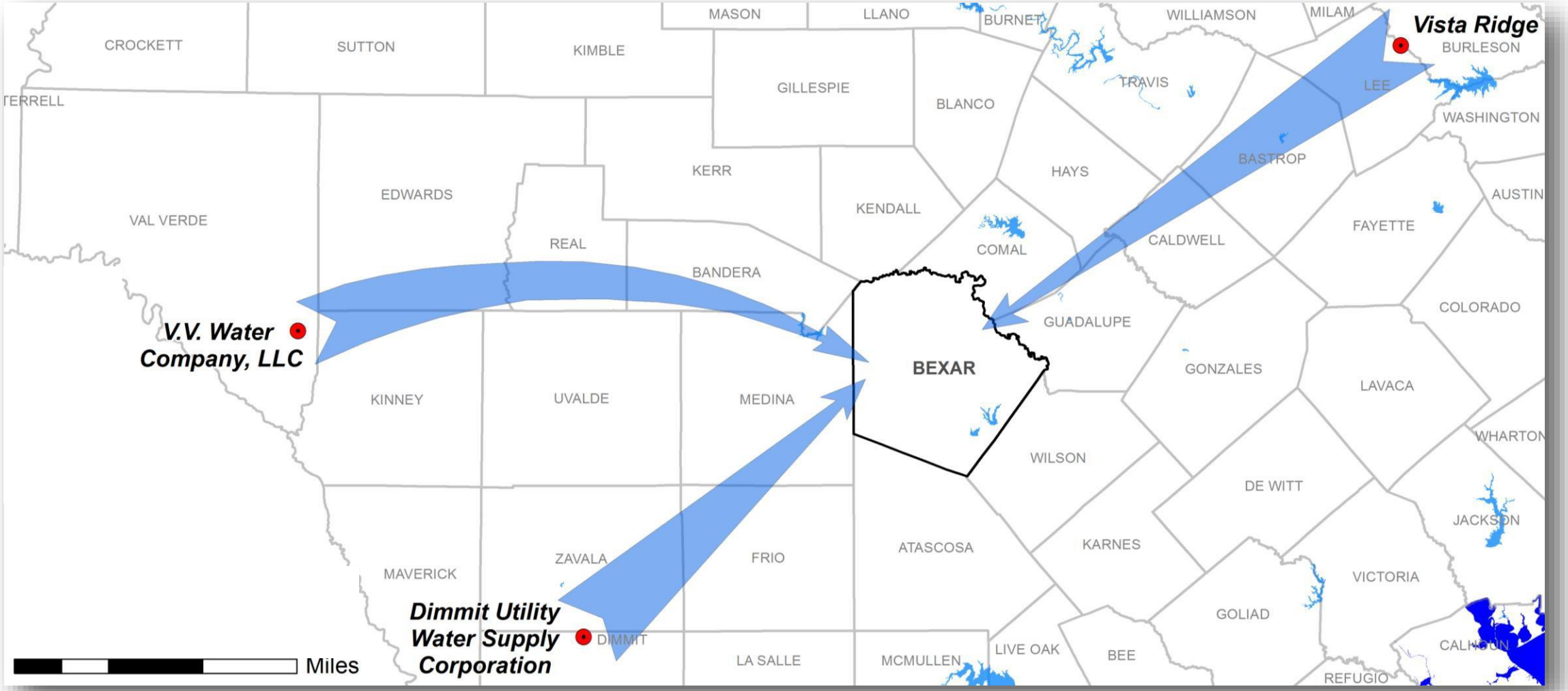
- September 2010 – RFI to determine types of projects available
  - Groundwater
  - Surface Water
  - Desalination
  - Other Sources
  - Location
  - Water Quality

Securing our Water Future Through Open Bid

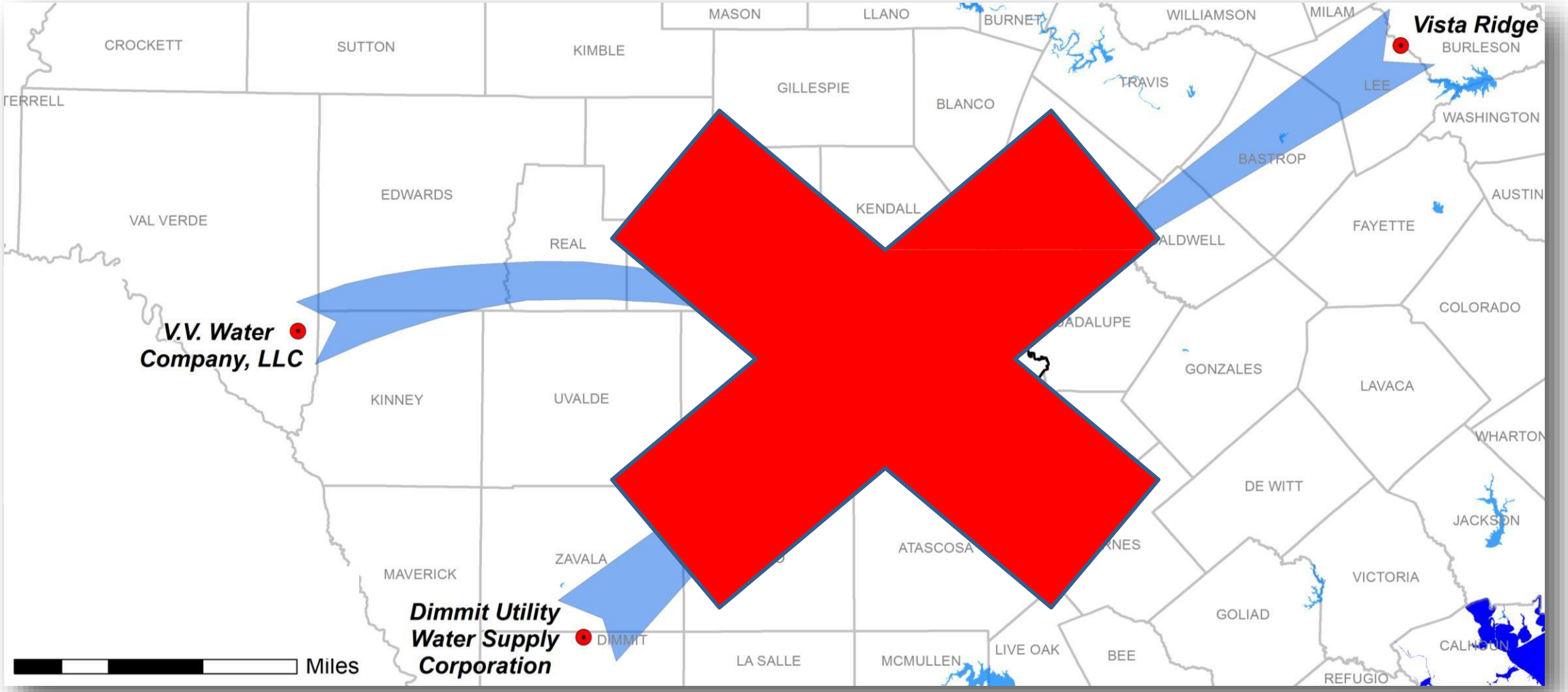
Shifting Risks to Private Sector

- January 2011 – RFCSP solicitation issued for 20K AFY, with ability to gradually increase up to 80,000 AFY
  - Ownership/Control
  - Permit stability
  - Risks
  - Project Approach
  - Water Quality
  - Cost

Shortlisted Candidates



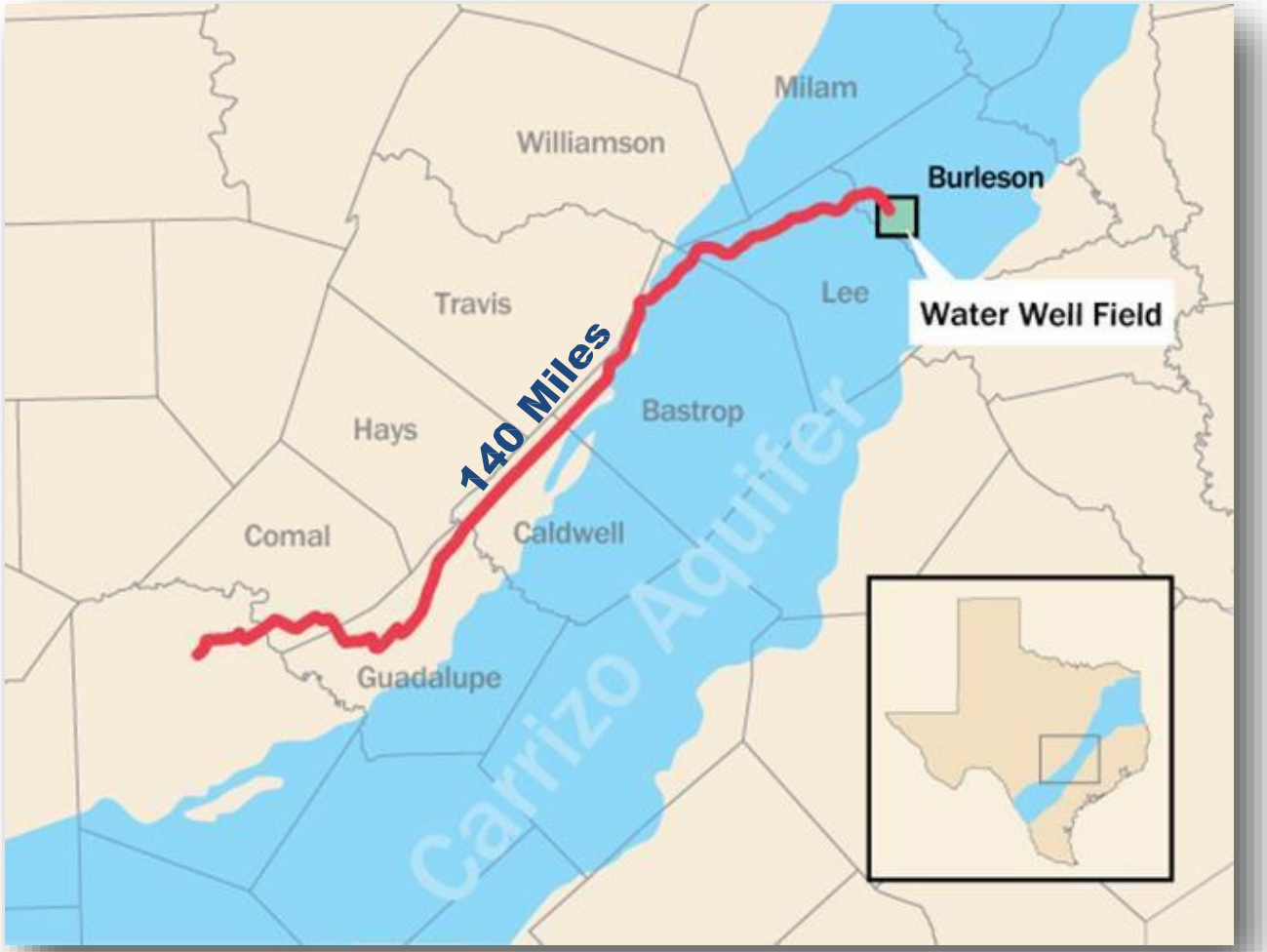
Candidates Not Willing to Accept Supply Risks



Back to the Public Negotiation Table

Vista Ridge Project

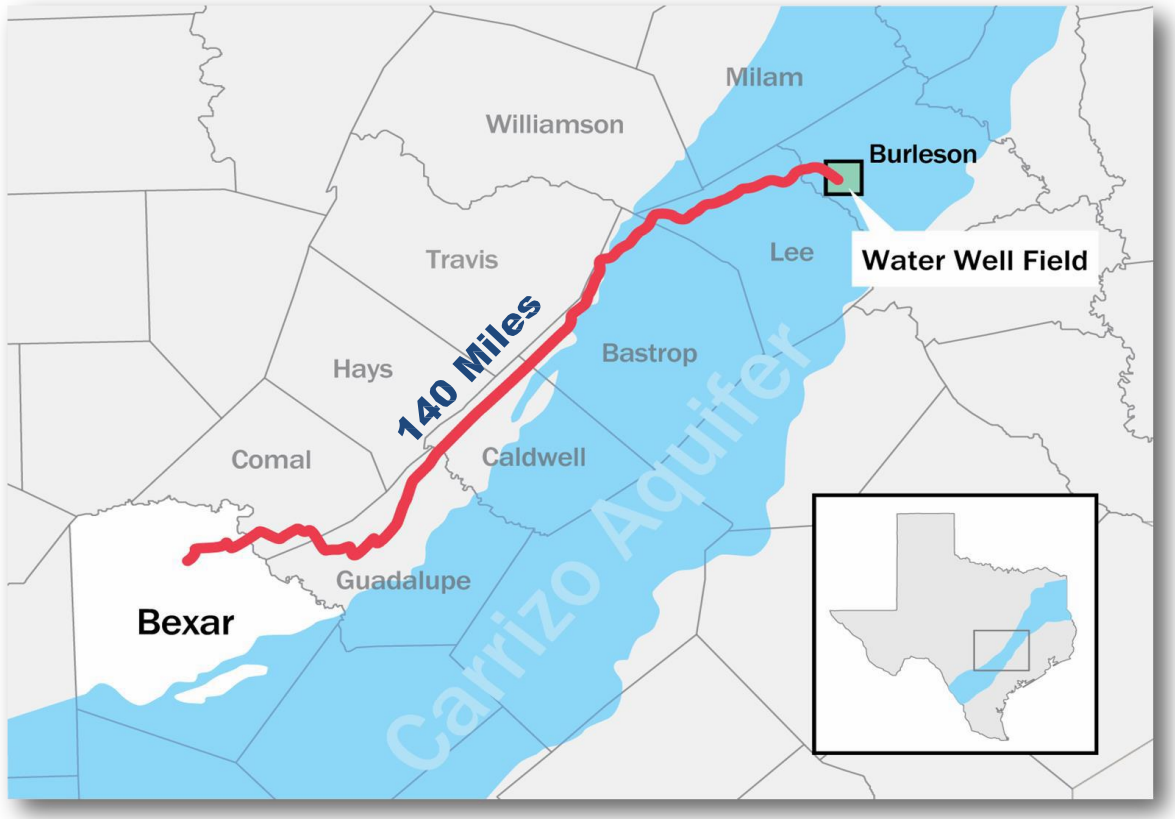
- Further discussions led to acceptance of risk by Vista Ridge
- Publically negotiated Contract through posted Open Meetings
- Significant Public Outreach prior to City Council approval



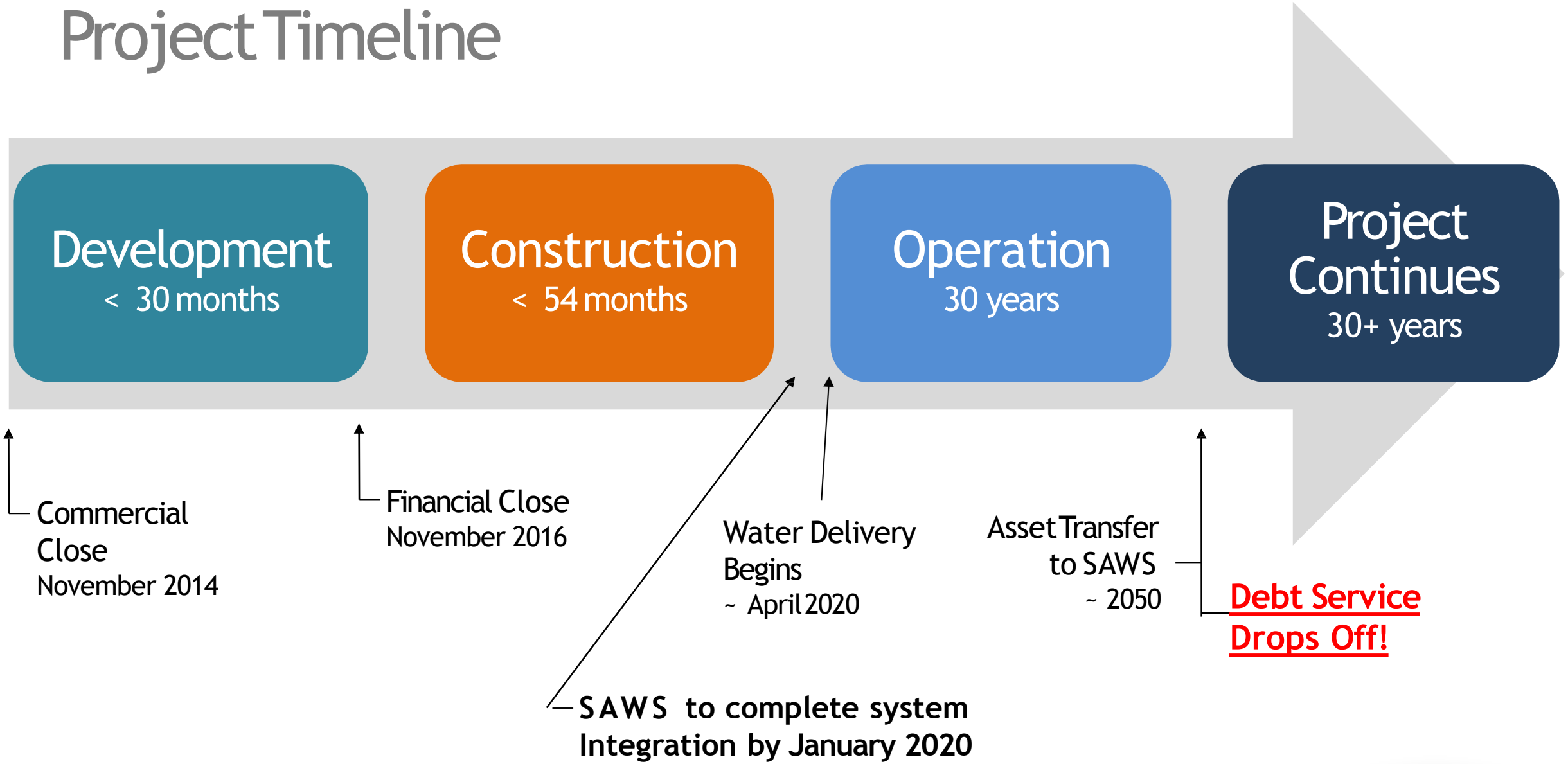
Vista Ridge – Public-Private Partnership

Historic Risk Shifting

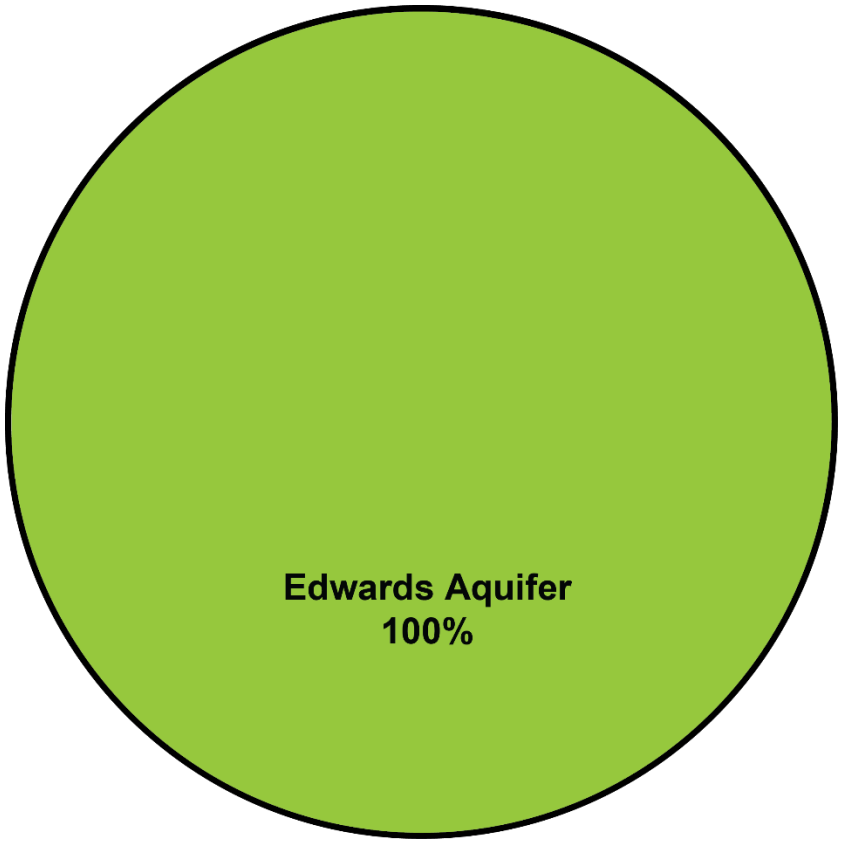
- 50,000 AFY (*45 MGD*); **SAWS only pays for water made available**
- Two 30 year terms
- Assets transfer to SAWS in 2050
- Fixed price for Infrastructure & Water
  (O&M, Electrical are Variable)
  - *~$2,000 per AF for all components*



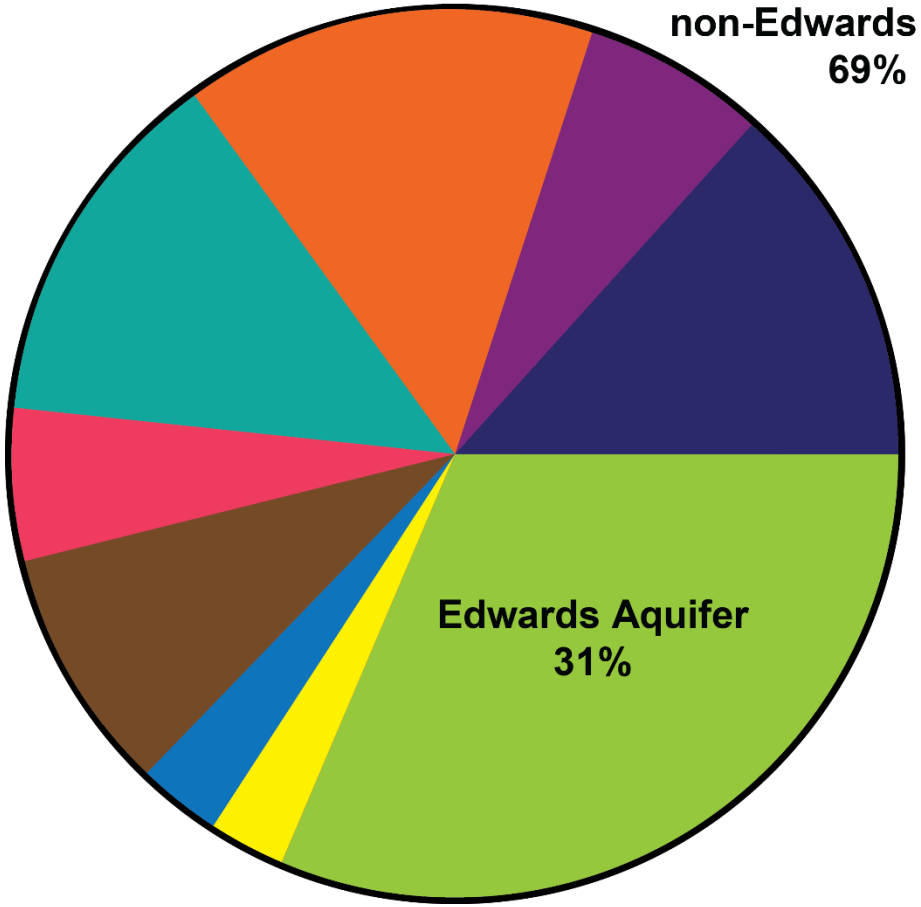
Project Timeline



Supply Portfolio Diversification (drought year)



- Recycled Water (CPSE)
- Recycled Water (Direct)
- ASR Recovery
- Expanded Carrizo
- Vista Ridge
- Brackish Desal
- Regional Carrizo
- Medina System
- Canyon Regional
- Canyon Lake
- Local Carrizo
- Trinity Aquifer
- Edwards Aquifer



1996 → **2070**

Vista Ridge Water Cost Breakdown:

• Water Purchase Price	$460/ac ft
• Infrastructure Debt Service and Finance	**$1,146/ac ft***
• Operation and Maintenance	$196/ac ft
• Electricity	$191/ac ft
Total Cost	$1,993/ac ft
	$6.11/ 1000 gal.

Increases Avg. Water Bill $10.00/month

*Cost eliminated during second 30 year period

Brackish Groundwater Desalination Project

- 12 MGD – 13,440 acre ft/yr – 53,000 Households
- Modular Approach
- Project Cost $210 million
- Production Began November 9, 2016

Aquifer Storage and Recharge

- Purpose is Storage for Future Recovery
- SAWS bought 6,000 acres of farm and ranch land
- Mitigation Program for affected existing wells
- Installed 29 recharge and recovery wells
- Pumping Rate - 64 MGD
- Total Storage Capacity – 233,000 acre feet of water
- Currently stores – 70% of SAWS annual water demand
- $250 million

Lessons Learned:

- Public Outreach is essential
- Planning for future (long term!) is critical
- New sources must be carefully examined and vetted
- Obtaining new water supplies involves risk
- Risk can be shared or shifted
- Shifting risk to the supplier significantly increases cost
- Water will only get more expensive

Recommendations:

- Continue diversification of water supply
- Aggressively plan for future growth
- Pursue Desalination and Groundwater
- Negotiate, obtain and permit both options
- Have both ready to execute at the appropriate time
- Consider Aquifer Storage and Recharge