TEXAS WATER SMART
TEXASWATERSMART.COM
Sponsored by The Texas Water Smart™ Coalition*

Promoting Water Conservation in Texas

April 2014

Water Shortage is a Growing Global Issue

World's population is growing by **80 million** people per year

an increase in water demands of ***16.9 trillion gallons per year.***

In the U.S. water systems alone, we need ***$1 trillion*** in infrastructure improvements by 2035.[1]

Outdoor Use is Targeted as Part of the Cause

Up to **60%** of consumer water consumption is for ***outdoor usage.***[2]

Many local municipalities are responding with outdoor water restrictions

Consumers are Responding by Adapting How they Landscape

49% of consumers in the U.S. either have, or are considering, incorporating **water saving techniques into their landscape**.

The trend is growing, with **60%** having started within the **past 3 years**.[3]

Texas Water Smart is part of the solution

1. UNESCO, World Water Assessment Programme (WWAP)
2. http://www.aquacraft.com/Publications/resident.htm
3. *Source: Xeriscaping Habits & Practices Study, 2013*

Coalition started small in 2012
But quickly expanded

Then: Founding Four

Now: 60 Corporations,
+ 160 Elected Officials

Consumer research was the foundation for the coalition

- High desire to conserve as part of overall water solution…
- Low understanding of how to do it OUTSIDE home – it's not top of mind.
- Simple steps that appeal to Texan pride are most motivating
- Focus on low/no cost things that don't require consumer sacrifice.
  - Rain barrel = NO; Mulch = YES

Our communication objectives are straightforward

- ✓ Educate residents
- ✓ Drive behavior change (10%)
- ✓ ***Simple*** low/no cost steps
- ✓ Complement existing programs

Our efforts have yielded positive results

WHAT WE DID

- Radio, Online, Billboard campaign
- PR/Press Coverage
- TexasWaterSmart.com
- Fundraising

RESULTS

✓ **92%** **of Texans support water conservation messaging**

✓ **80%+** **awareness of conservation campaign**

✓ **81%** **who used less met 10% water reduction goal**

Water conservation is still top of mind for Texas residents

% of Texans who agree with the following:

Water is an important resource we need to protect	85%
I am concerned about drought and water shortages	75%
I want to do my part to help conserve	80%

Our Outreach Continues to Build in 2014

Media

Digital

Member Outreach

PR & Press

IMPORTANT: Green Spaces Are Still Good…

YES

NO

…Because Green Spaces Enhance Lives!

Economic

- Beautification draws customers & reduces shopping stress
- Generates tourism revenue
- Job creation from increased services demanded
- Reduced health care costs
- Increased property values
- Reduced street repairs and maintenance costs

Environmental

- Carbon sequestration
- Improved air quality
- Attracts wildlife and promotes biodiversity
- Reduced heat and cold damage
- Offsets heat islands
- Reduced noise pollution
- Reduced soil erosion
- Reduced storm water runoff
- Improved water quality

Social

- Improved concentration and memory retention
- Plants generate happiness
- Reduced stress and depression
- Health and recreation benefits
- Accelerates healing process
- Improves relationships / compassion
- Improved mental health
- Reduced community crime

Recovering Stranded Assets (Idled Wells) via Groundwater Profiling and Selective Extraction

Presented by:
Debra Cerda
Director of Technical Sales and Licensing

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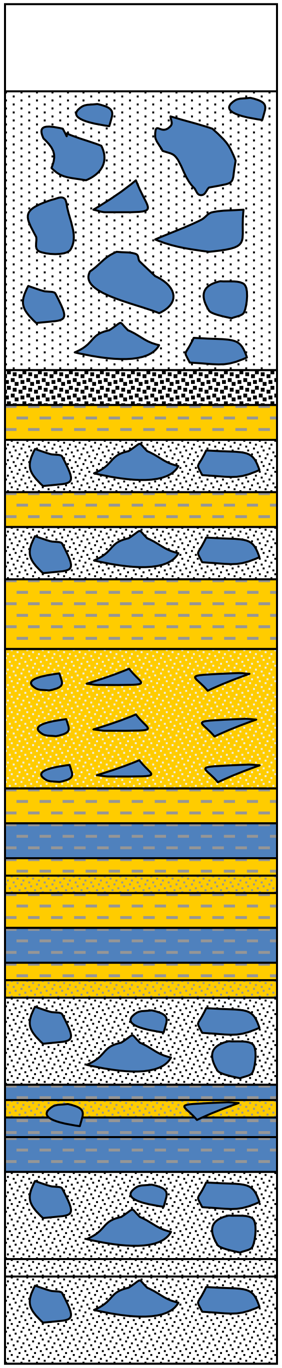
Key Concepts

- Miniaturized Down-hole Diagnostics:
  - Minimally invasive, fast, low-cost
  - Only true method to understand dynamics of operational wells
- Selective Extraction:
  - Produce the good water – leave the bad water behind
  - Reduce or eliminate treatment for contaminants



Questions

- What are we missing in routine groundwater well diagnostics?
  - **Vertical variable flow and quality** across diverse strata within a well
- Versus mixed flow at wellhead

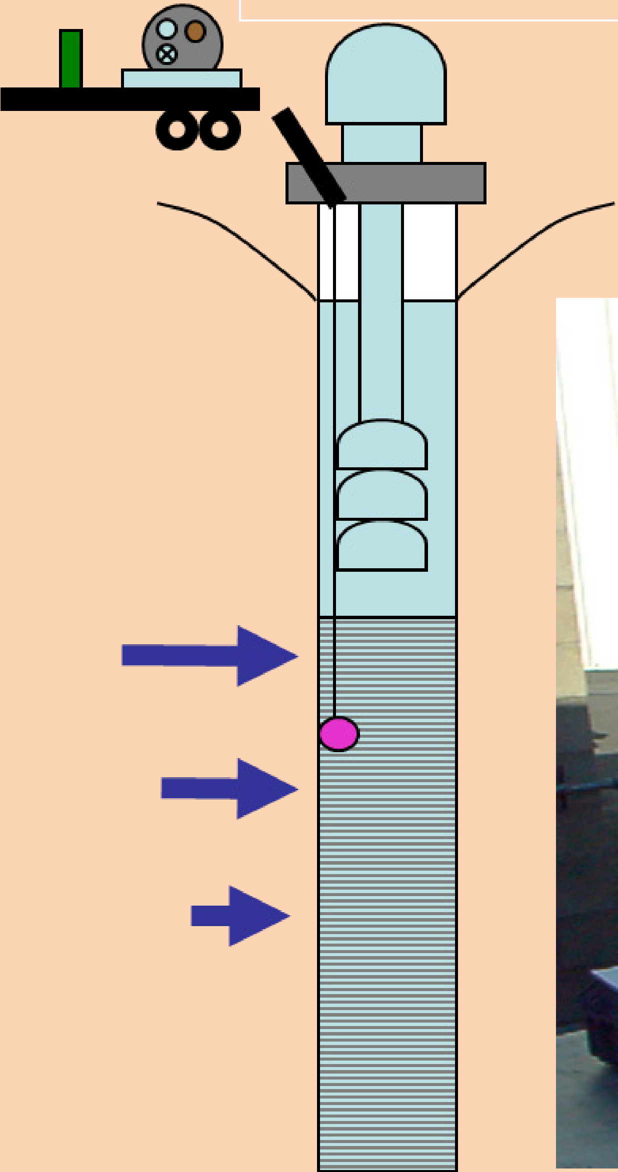
Miniaturized Down-hole Diagnostics

Views normal working conditions:

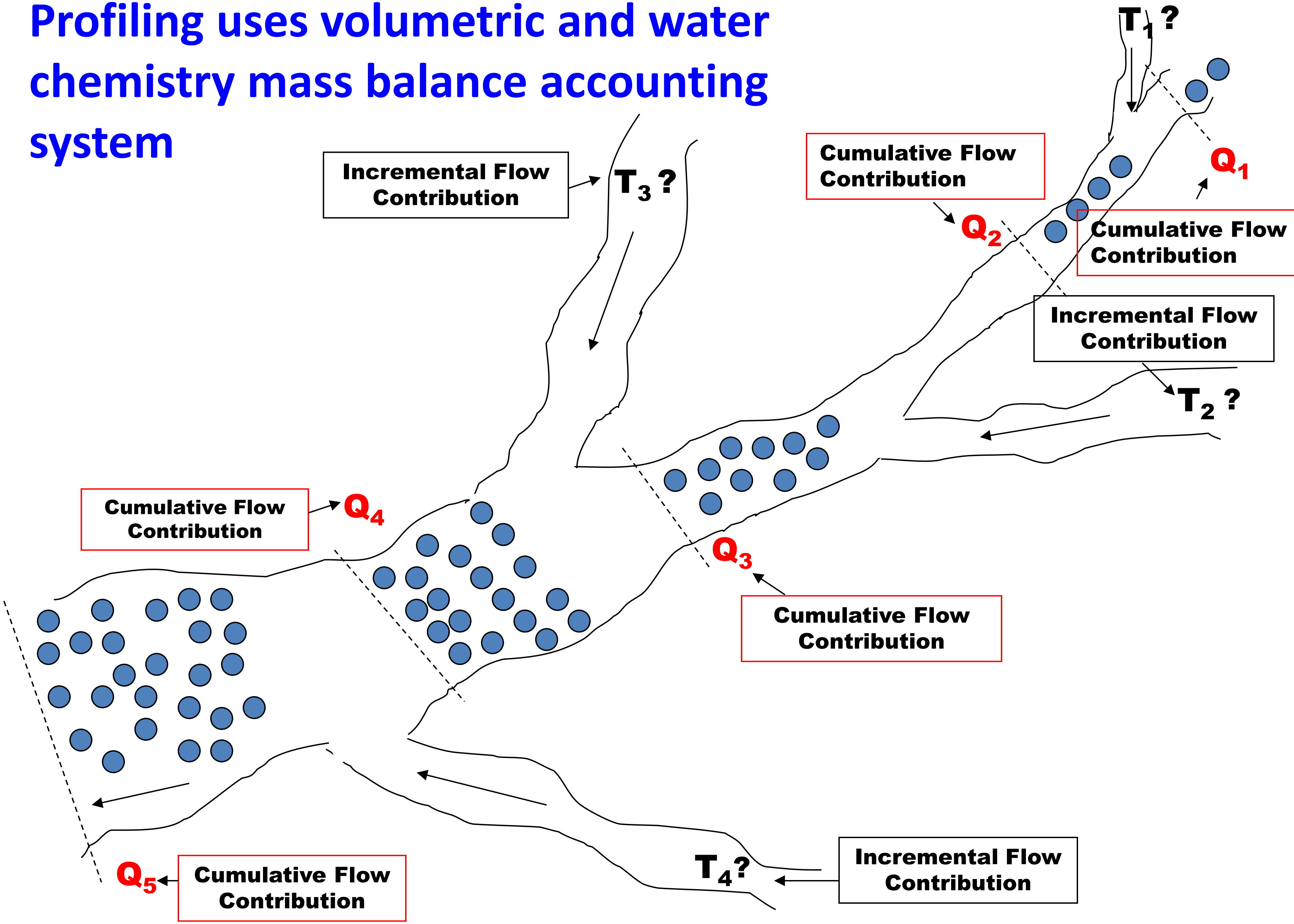
- Depth-dependent quality
- Depth-dependent flow
- Visual 360°

To date, BESST has profiled over 400 groundwater wells, **saving water suppliers ~$300 M**

USGS Patented
Tracer-Pulse Profiling Method



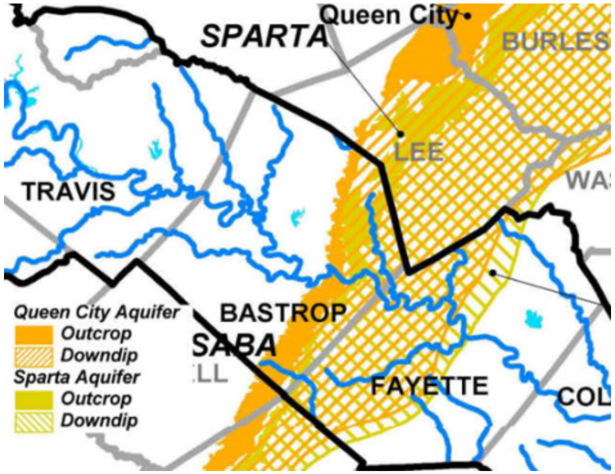
Profiling uses volumetric and water chemistry mass balance accounting system

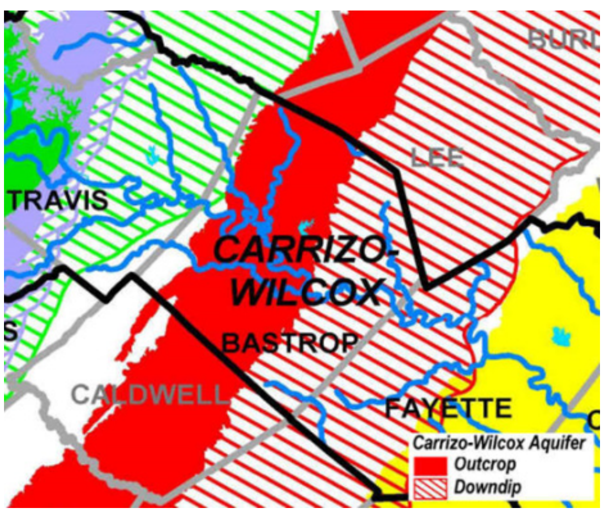


How do we produce the good water and leave the bad behind?

- Change pumping rate
  - Up or down to shift flow contribution
- Change pump intake location and/or diameter
- Install packer, sleeve, or grouting
- Rehabilitate well screen
  - remove mineral or biofilm encrustrations

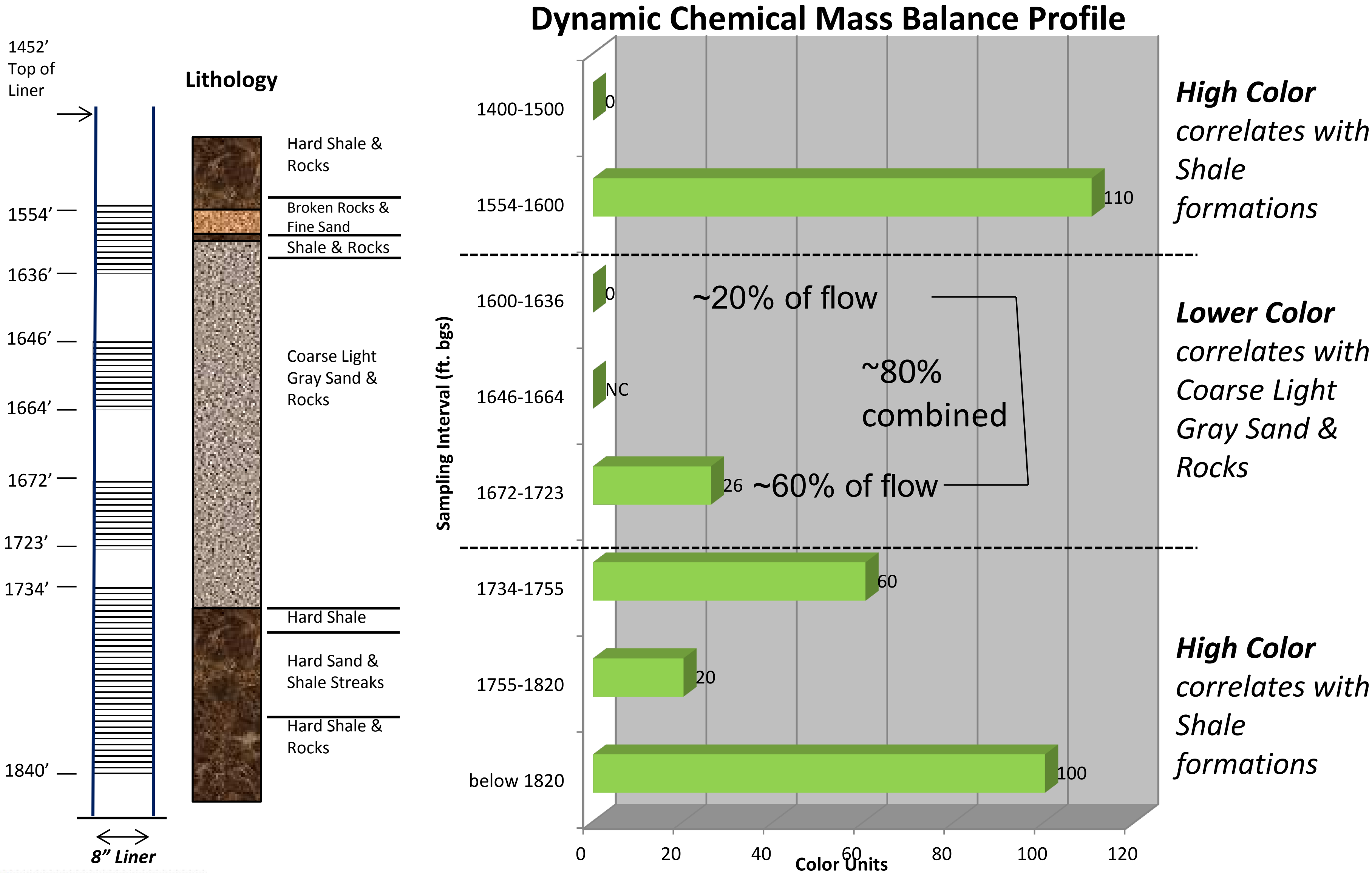
Texas Case Study: Lee County WSC





- LCWSC serves:
  - 3536 connections
- Water quality issues at new well site:
  - $2.9M stranded asset
  - 875 GPM idle
  - **poor quality:** color, turbidity, iron, and more

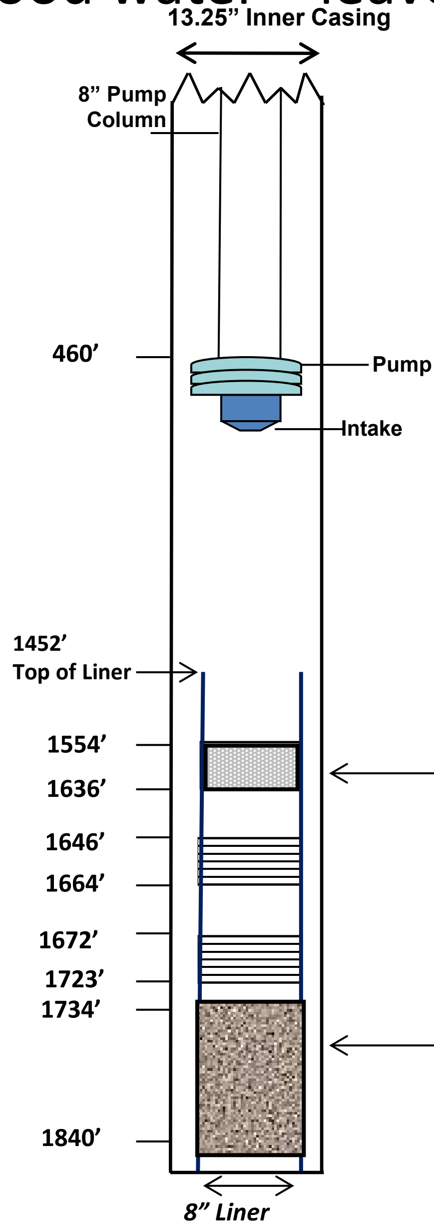
Color



Dynamic Chemical Mass Balance Profile
1452' Top of Liner
Lithology
1554'
1636'
1646'
1664'
1672'
1723'
1734'
1840'
8" Liner
Hard Shale & Rocks
Broken Rocks & Fine Sand
Shale & Rocks
Coarse Light Gray Sand & Rocks
Hard Shale
Hard Sand & Shale Streaks
Hard Shale & Rocks
Sampling Interval (ft. bgs)
1400-1500
1554-1600
1600-1636
1646-1664
1672-1723
1734-1755
1755-1820
below 1820
0
110
0
NC
26
60
20
100
~20% of flow
~80% combined
~60% of flow
0
20
40
60
80
100
120
Color Units
High Color correlates with Shale formations
Lower Color correlates with Coarse Light Gray Sand & Rocks
High Color correlates with Shale formations

Selective Extraction at Work:

Produce the good water – leave the bad behind

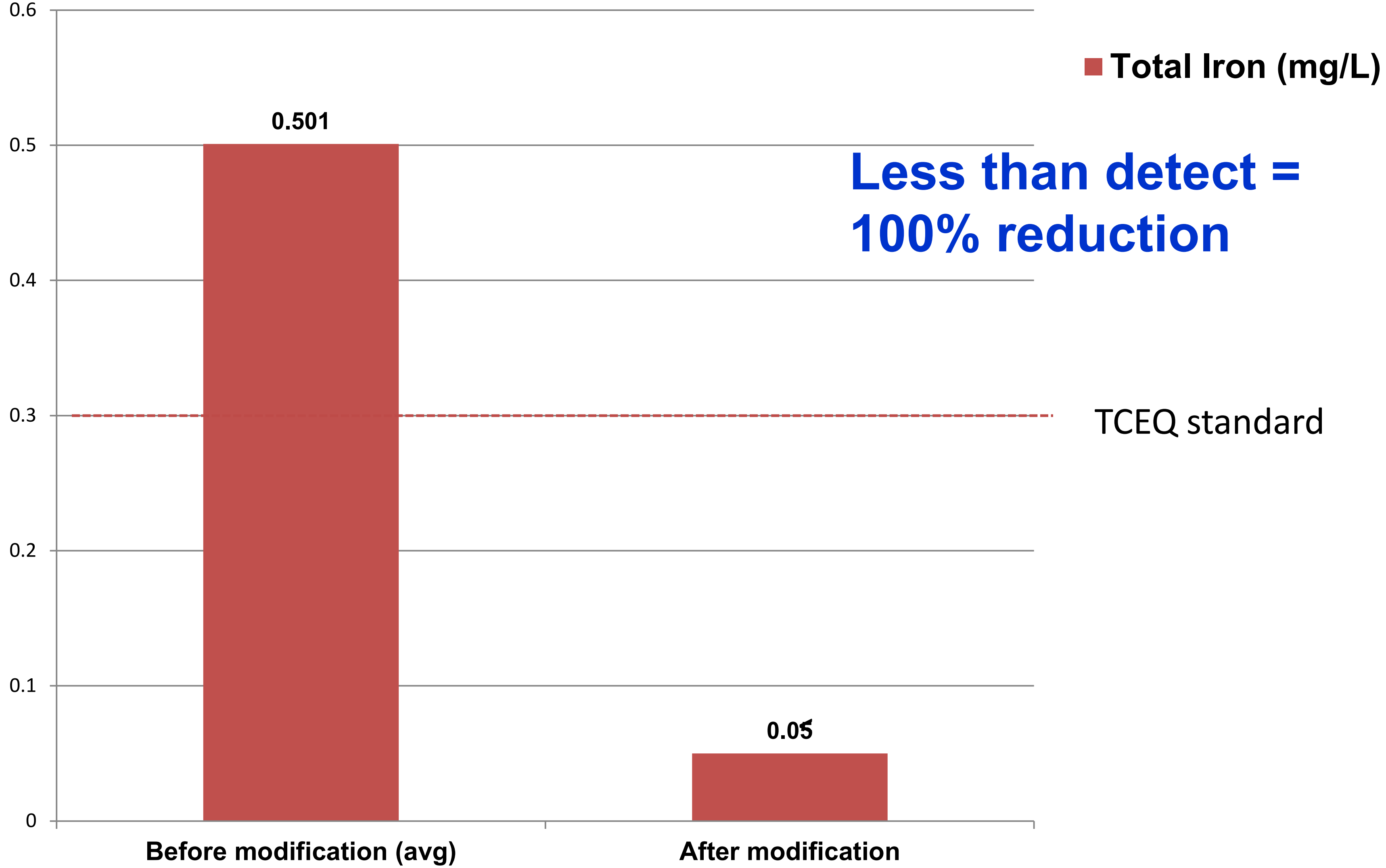


LCWSC Solutions:

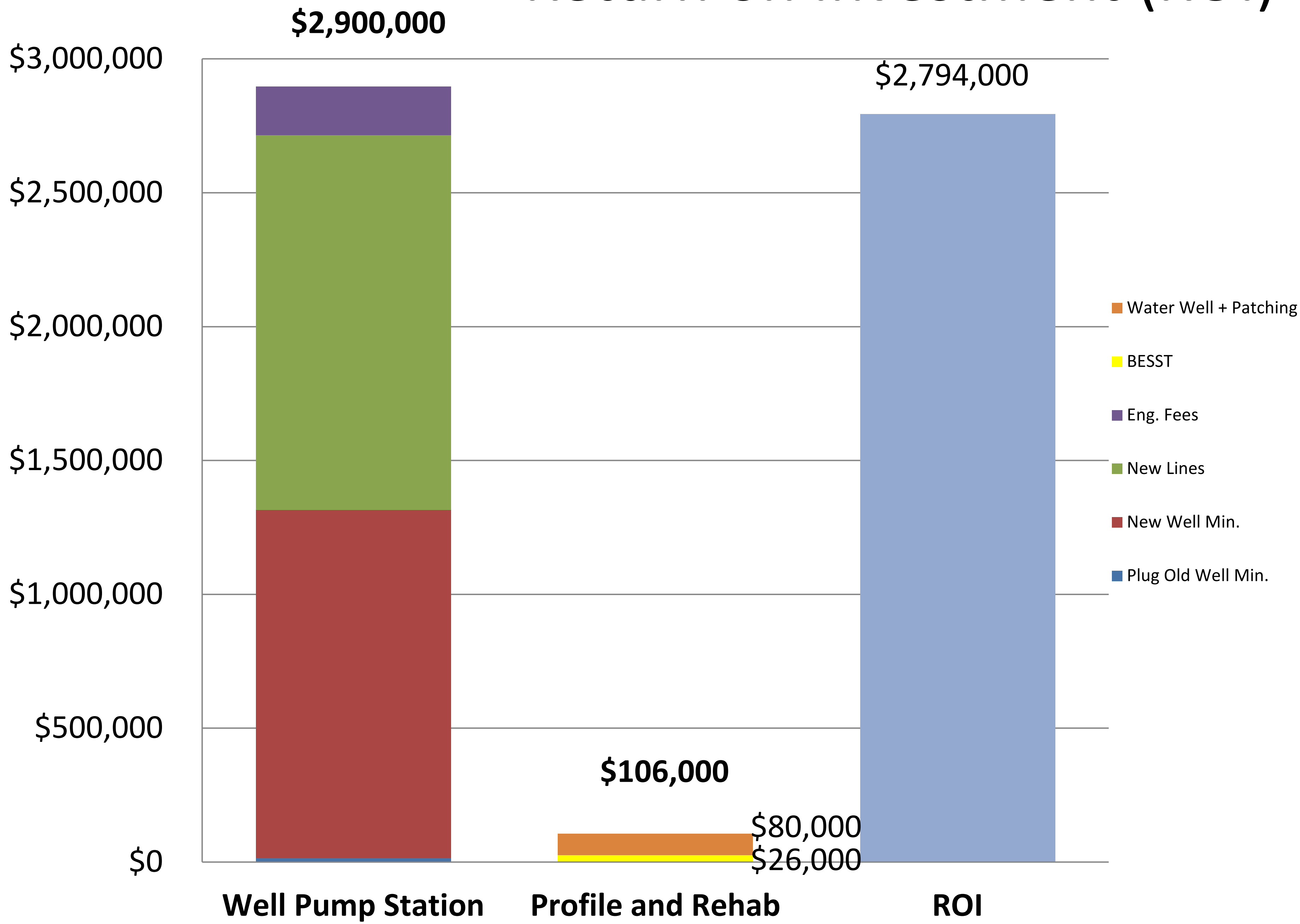
Sleeve off shallow screen

Grout deepest screen

Metrics of Success



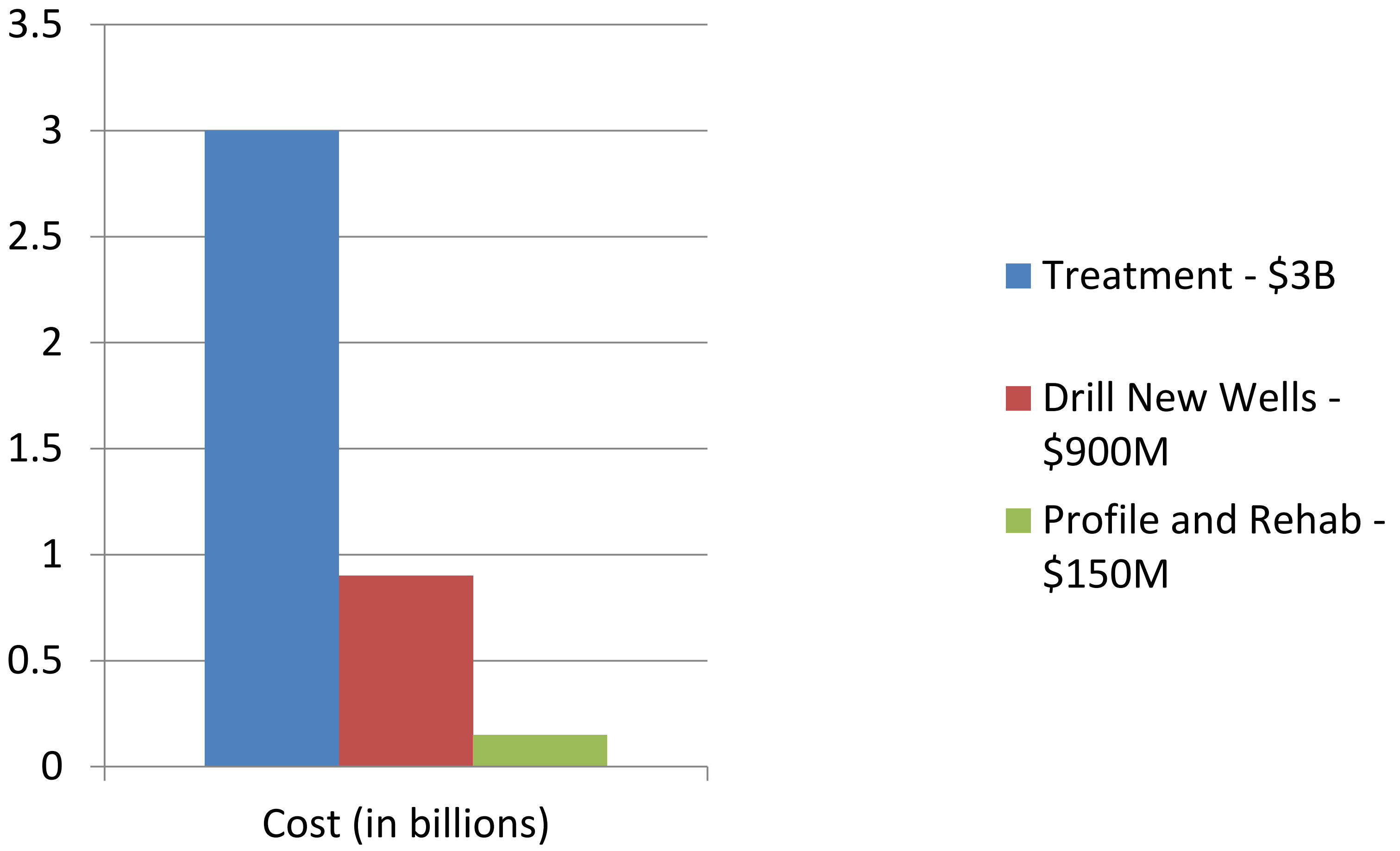
Return on Investment (ROI)



Well Driller's Perspective

New well proposed in close proximity

Addressing Stranded Assets in Texas



Potential in Texas

> 20,000 Public supply wells in Texas (per TCEQ)

•Estimate 15% stranded (unused) assets = 3,000 wells

•3000 wells x $300,000/well installation = $900M

<u>Can profile and rehab idle wells at fraction of cost</u>

Options to Rescue Stranded Assets and Associated Costs

1. **Treatment** of well supply = ~ $1M/well site x 3000 wells = **$3B**
2. **Drill** new wells= ~$300K/well x 3000 wells = **$900M**
3. **Profile and rehab** idle wells at a fraction of alternatives = **$150M**

Profile and Rehab
Cost and Resource Impact Summary

0f 3,000 idle wells, ~ 50% are profile candidates = 1500 wells

- Profile and associated costs per well = ~ $50,000
- 1500 wells x $50,000/well = $75M

Avg. Rehab = ~ $50,000 x 1500 wells = $75M

- **Total of profile and rehab option for 1500 wells = $150 M**

Idle wells equals "Stranded Water"

- 1500 Wells x 200 GPM x 400 Minutes/day = **120 MGD**
- Equal to avg. day production for the City of Austin

Questions?

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Draft-Final Flow Profile and Chemical Mass Balance Analysis: Lee County WSC Country Corners Well

Prepared For:
Lee County Water Supply Corporation
Giddings, TX

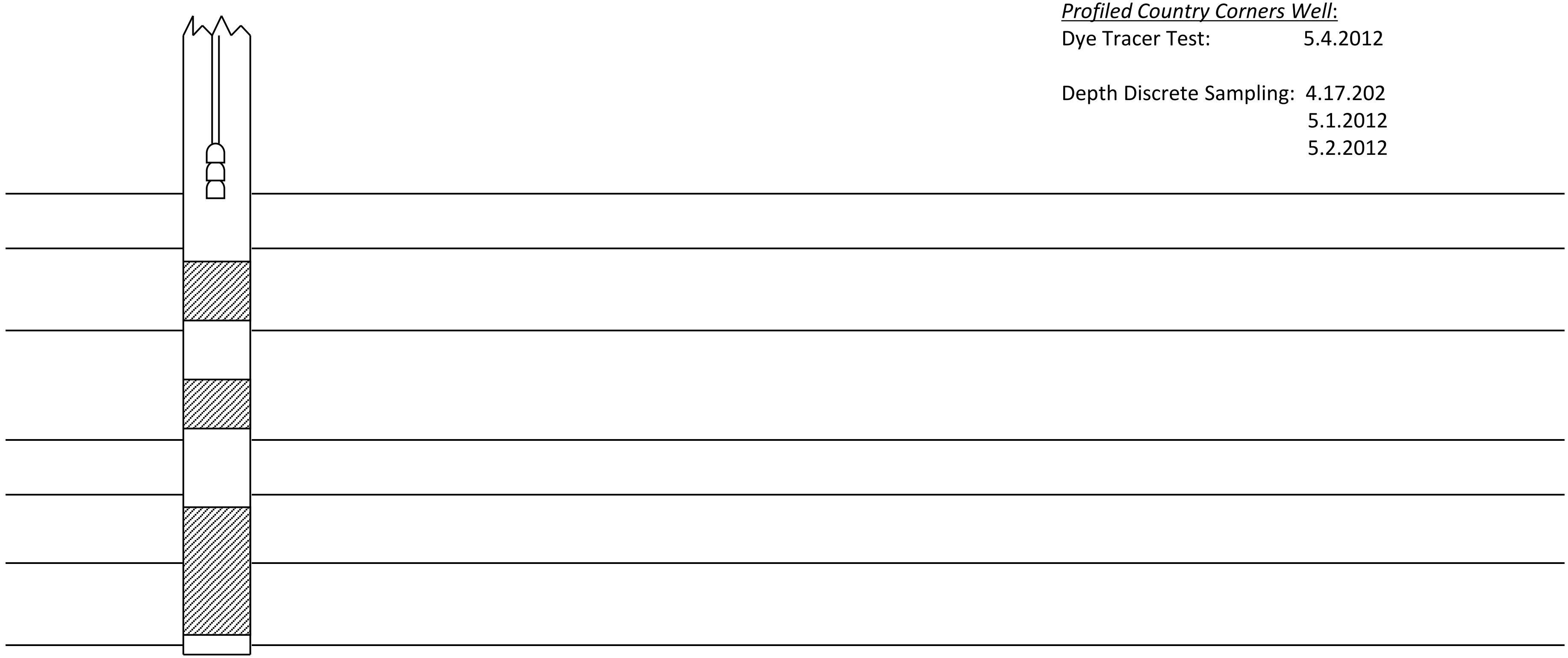
Prepared By:
John Hofer, TX PG 11341
Mehrdad Hajazian

Reviewed By:
Noah Heller, President

Profiled Country Corners Well:

Dye Tracer Test: 5.4.2012

Depth Discrete Sampling: 4.17.202
5.1.2012
5.2.2012



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Dynamic Flow and Water Chemistry Report – Country Corners Well

Introduction:

BESST performed a dynamic flow and water chemistry profile on the Country Corners Well on April 17th and May 1st through 4th, 2012. The dynamic flow profile was performed using the USGS Tracer Pulse Dynamic Flow Profile method to measure flow contribution along four screen sections (figures 1 through 3). Available well information is summarized on Figure 1.

Flow Contribution:

Figures 2 and display the profile of flow contribution in gallons per minute (gpm) and percentage of flow, respectively. The profiles show that more than half of the flow contribution to the well is from the 3rd screen (approximately 59%) with an additional major contributor in the 1,600 – 1,610-ft zone of the top screen. Flow velocities are shown on Figure 4.

Chemistry:

BESST conducted dynamic water quality sampling using the HydroBooster sampling method on April 17th and May 1st and 2nd, 2012, collecting eight (8) water samples. Two samples were collected at the tap taken before and after the depth samples were taken. The samples were analyzed for color, turbidity, TDS, chlorides, odor, and iron. The water chemistry data was mass balanced using the flow contribution data on Figures 5 through 9.

While little flow contribution occurs above 1,600 ft in the top screen or any of the bottom screen interval (Figure 5), these zones contribute most of the color, and other constituents. The 1,554 to 1,600-ft zone is providing the bulk of the color, turbidity, and iron, while the very bottom of the well is producing most of the TDS and almost all of the chloride. Interestingly, most of the odor is coming from 1,600 to 1,636 ft which is the zone immediately below where most of the color, turbidity, and iron.

Discussion:

The well appears to be a good candidate for reconstruction or re-engineering. The bulk of the flow is coming from the third screen interval (1,673 – 1,723 ft) as well as secondary contribution from the bottom of the first screen (1,600 – 1,634 ft). However, most of the color, turbidity, and iron is emanating from the 1,554 to 1,600 ft zone while TDS and chlorides are coming in the bottom of the well.

Figure 11 displays the general lithology of the aquifer material that has been screened across. There are two shale or shaley units, one across the top screen and the second across the bottom screen. In addition, these shale units appear to be of differing composition. The upper shale appears to be somewhat pyrite-rich, and of non-marine (freshwater) origin, while the lower shale has a high chloride content, indicating a marine (seawater) environment. These differences are important in that they explain why there are different issues with the two zones.

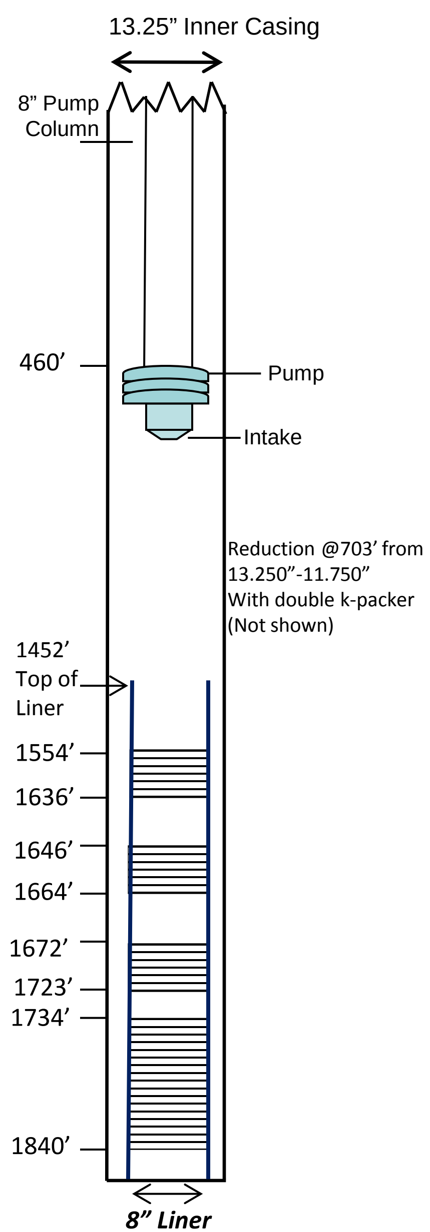
The upper shale appears to have a higher organic content, the leaching (through chemical oxidation) of which gives rise to the high color, iron, and turbidity in the 1,554 – 1,600-ft zone. The odor spike in the zone immediately below the color and iron (1,600 – 1,636 ft) is likely the result of sulfate leaching from pyrite in the upper shale and creating a sulfate front in the sand immediately below the shale that is at partially removed during pump start-up. The high TDS and chlorides coming from the bottom portion of the well is attributable to the saltwater sediments that comprise the shale.

Recommendations:

Figure 12 provides a hypothetical well modification to reduce the color in the discharge water – as well as decrease the concentration of other constituents. This solution should be first proven out by means of a packer-isolation test deployed on the basis of the dynamic survey results. The well modification would include installation of a test packer and engineered suction that would block of the upper and lower screens. This test-modification would theoretically result in a reduction of color from 20 to 15 units. However, there is a reasonable chance that the color could be reduced further as the sulfate front leaching from the upper shale is cleaned out of the sand unit aligned with the isolated, useful section of the well; by continued pumping. If the packer-isolation test proves out through weekly trend sampling from the well discharge line sampling point, then the strategy would be to convert the test packer system into a full modification and apply the rental fees for the test system to the purchase price. During the packer test there might be a need to make small adjustments to the pumping rate for the purpose of fine-tuning the suction force applied to the useful section of the well. Also, very careful consideration should be given to the design of the engineered suction such that the top and lower end of the perforations are not too close to the bottom of the top packer the top of the lower packer. The suction force velocities need to be far enough away from the packers such that there is no, or minimal, short circuiting of undesirable constituents through the gravel pack of the well. We recommend at least 10 feet of clearance or distance at each end of the perforations.

In addition to the reduction in color, the modification would also result in significantly lower iron, odor, turbidity, TDS, and chloride concentrations.

Figure 1: Well Information



This report represents a Dynamic flow and Chemistry profile of Lee County Water Supply Corporation Country Corners Well. Depth dependent samples were collected by BESST Inc. on April 17th and May 1-2, 2012. The Dye tracer test was conducted on May 4, 2012. Mass balance was performed by BESST Inc. using water quality data that was collected in the field and analyzed by a NELAP certified laboratory.

Well Information

- Original Casing Diameter: 15"- Lined to 13.25-inch ID
- New Well casing diameter: 13.25-inch reduced to 11.750 @703' then reduced to 8" liner @ 650
- Well screen diameter: 8-inch liner
- Pump Column Diameter (in): 10
- Cross Sectional Area of well (ft^2): .349
- Reported Well Bottom (ft. bgs): 1860
- Reported Screen Intervals (ft. bgs): 1554'-1636',1646'-1664', 1672'-1723', 1734'-1840'
- Pump Intake Depth: around 470'
- Calculated Flow rate: 704.49 GPM

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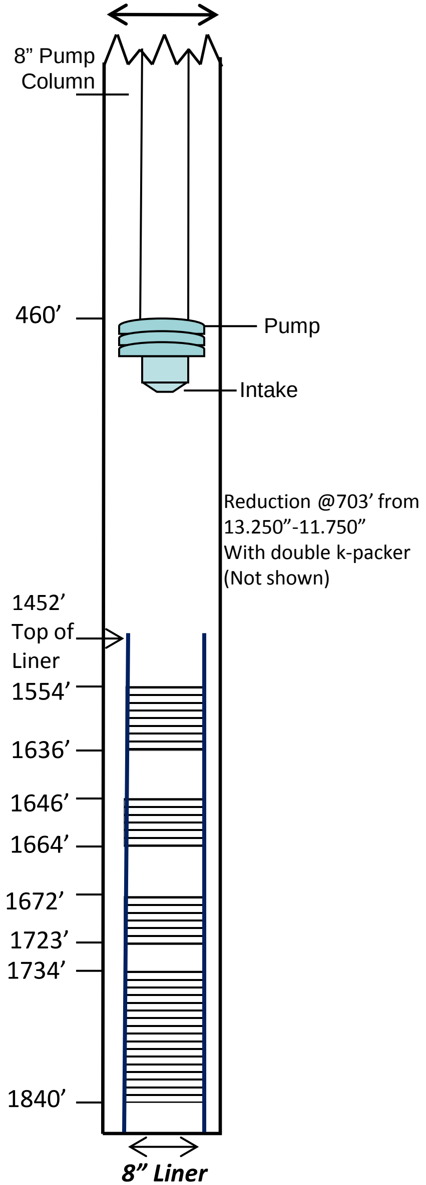
Figure 2: Dynamic Flow Contribution (GPM) By Depth and Screen Intervals



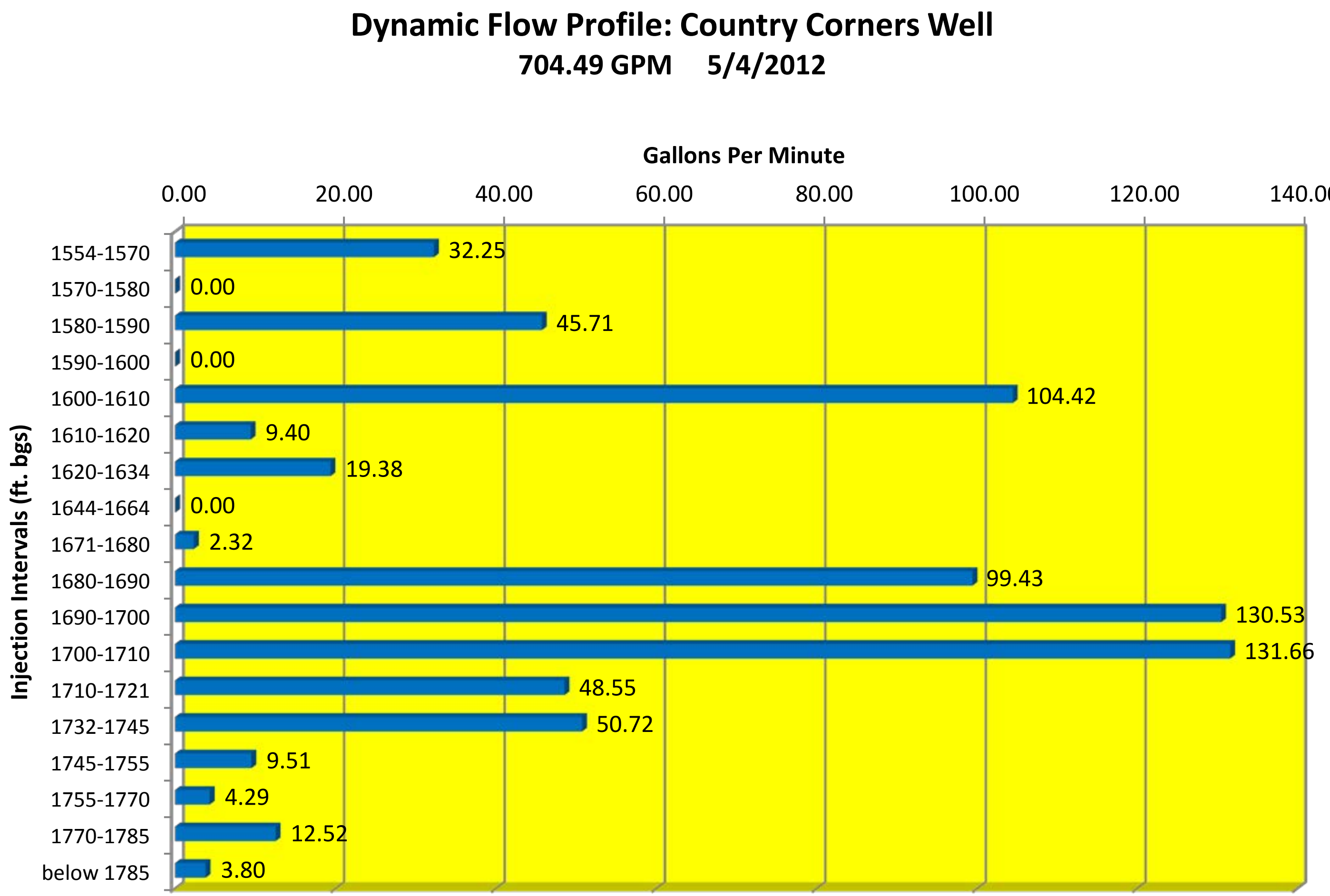


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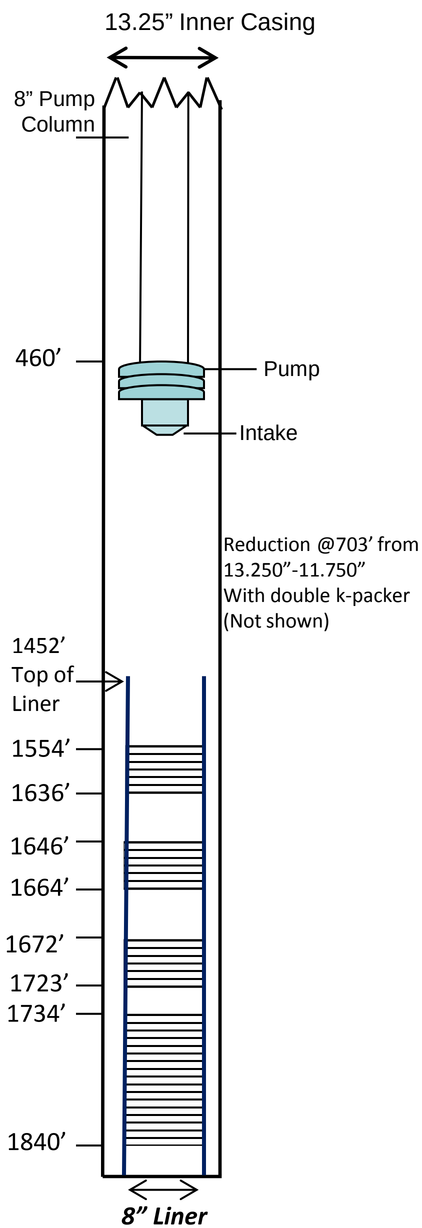
Figure 3: Dynamic Flow Contribution (%) By Depth and Screen Intervals



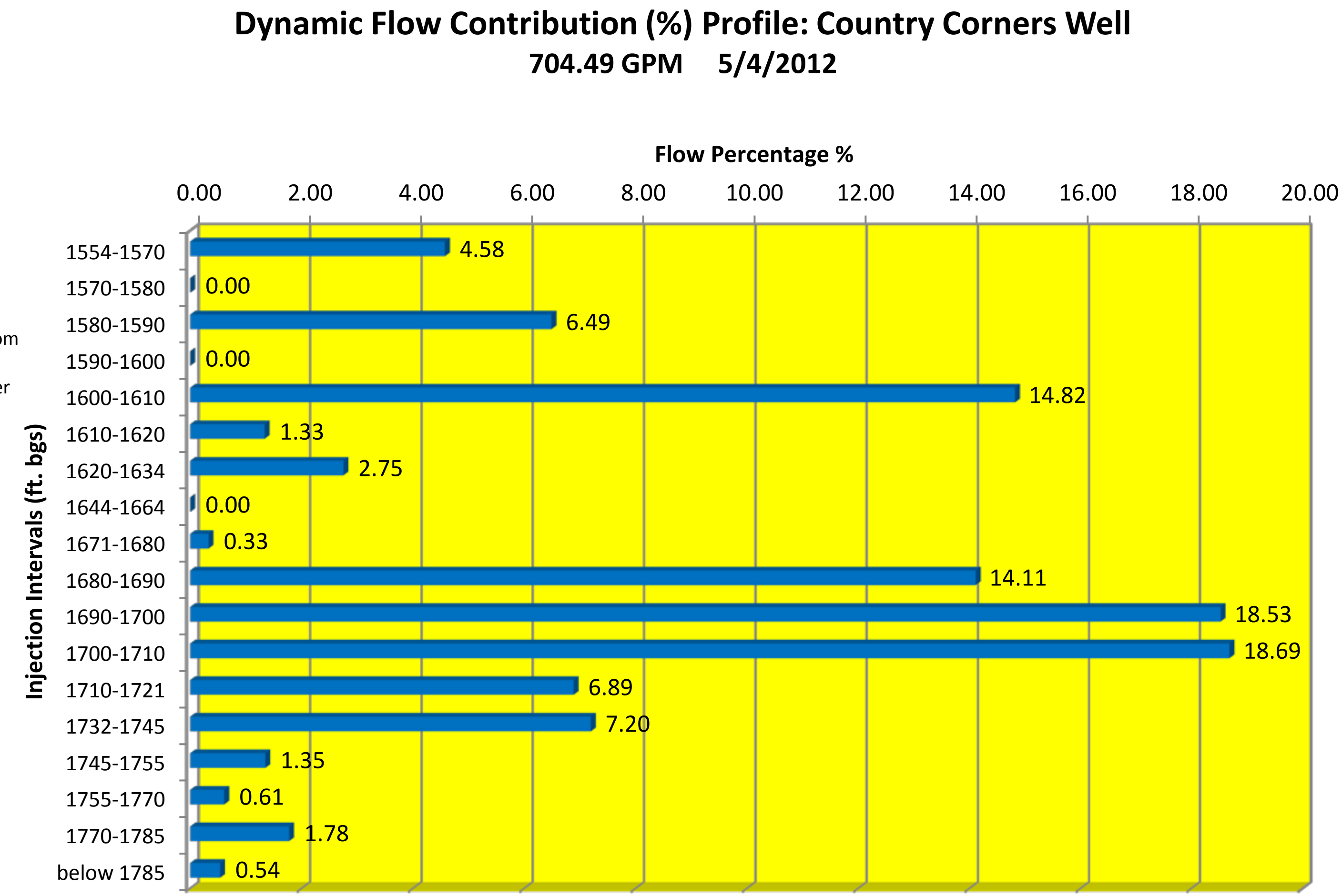


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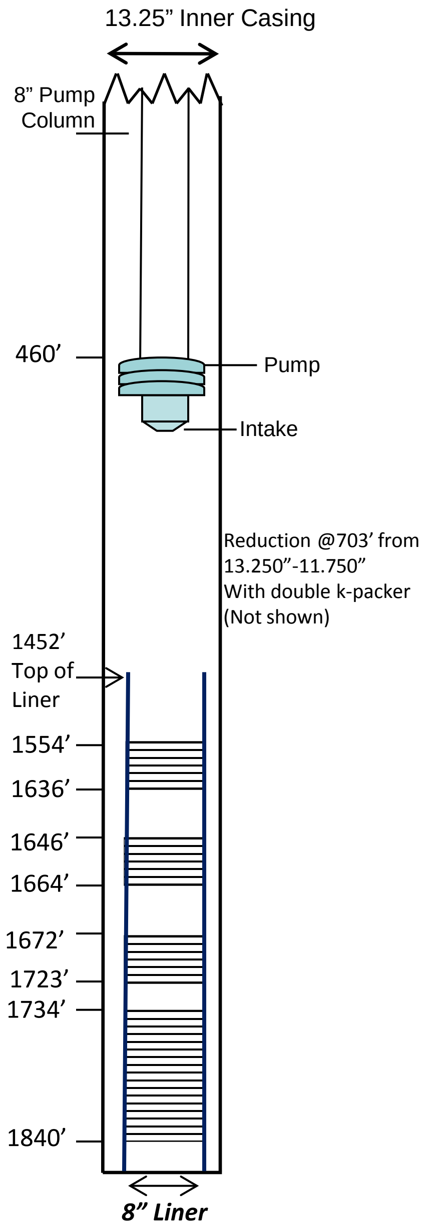
Figure 4: Dynamic Flow Velocity By Depth and Screen Intervals



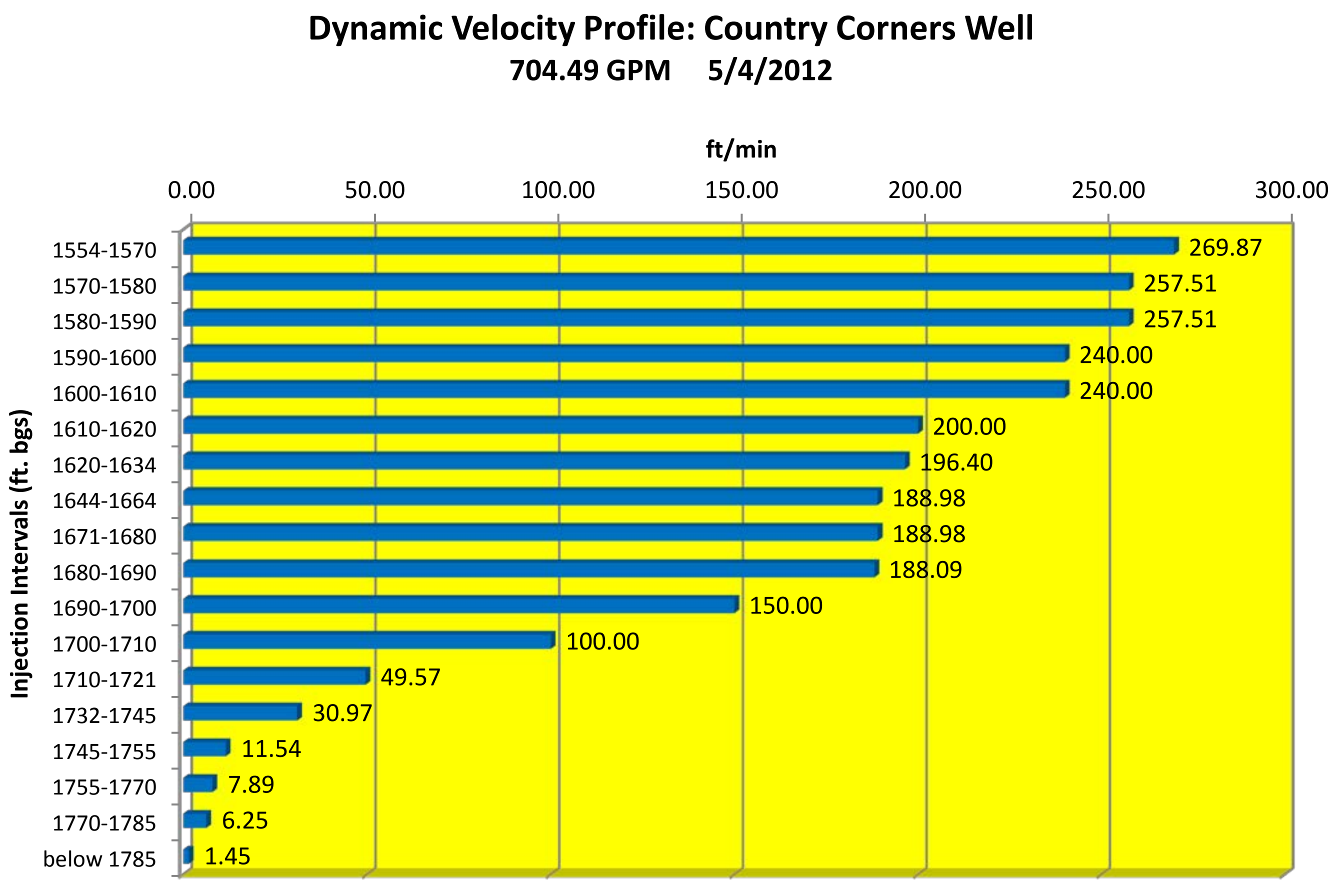


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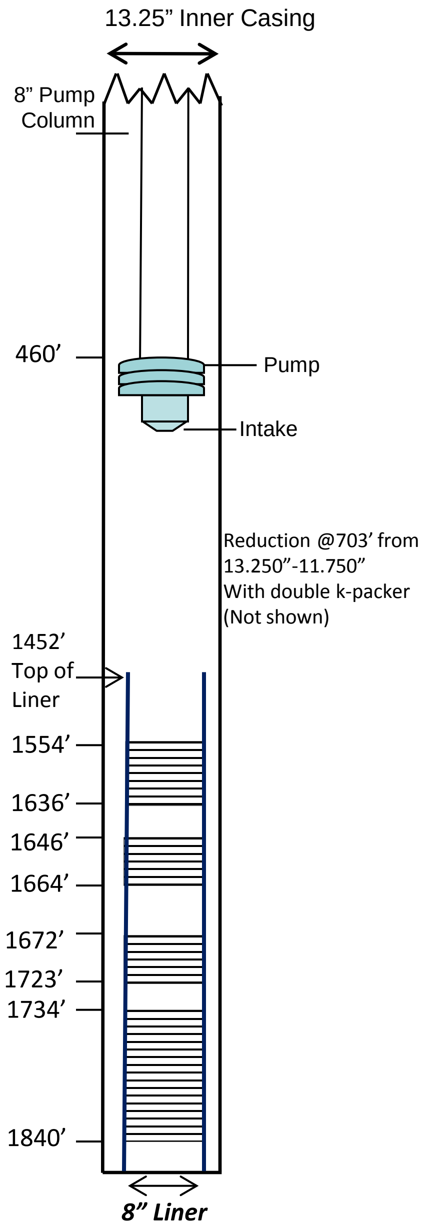
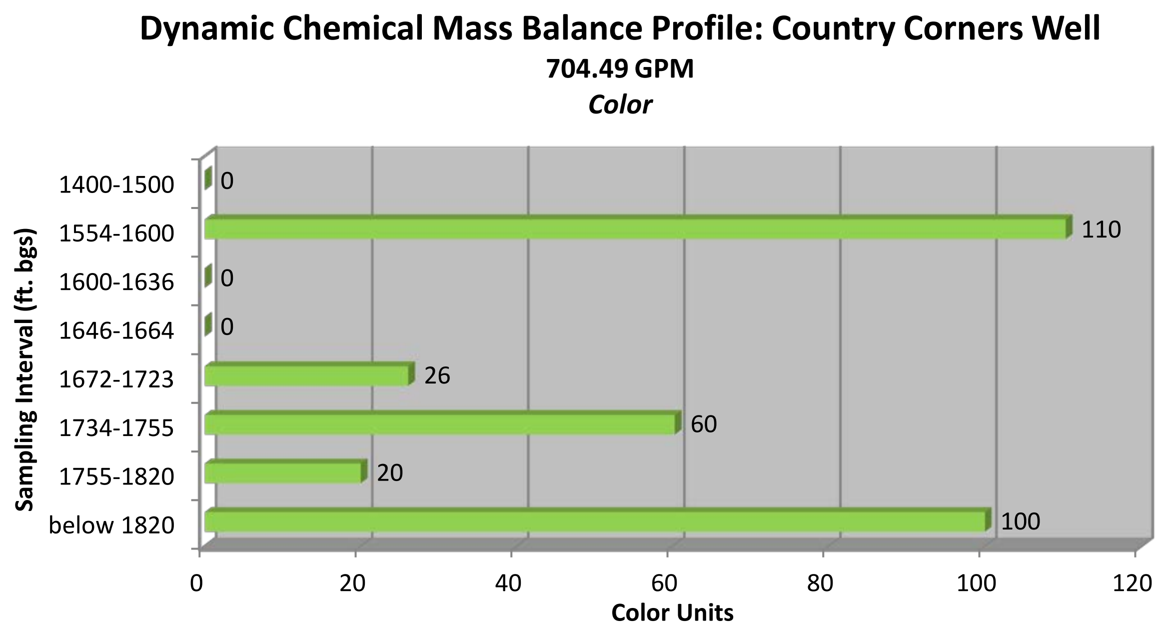
Figure 5: Chemical Mass Balance Analysis: Color (Apparent)



Color (Apparent)	ft. bgs	ft. bgs	GPM	Color Units	GPM	Color Units	
	Depth	Interval	Cumulative Flow	Measured Concentration	Incremental Flow	Incremental Concentration	Mass Balance
	1400	1400-1500	704.49	20	0.00	0	0.0000
	1500	1554-1600	704.49	30	77.96	110	8604.1487
	1600	1600-1636	626.52	20	133.20	(0)	-2269.3024
	1640	1646-1664	493.33	30	0.00	NC	0.0000
	1668	1672-1723	493.33	30	412.48	26	10757.7029
	1729	1734-1755	80.84	50	60.23	60	3629.9081
	1755	1755-1820	20.61	20	20.61	20	412.1874
	1820	below 1820	0.00	100	0.00	100	0.0000
	Wellhead 1	Cumulative	704.49	20			21134.6447
	Wellhead 2	Cumulative	704.49	20			29.9999



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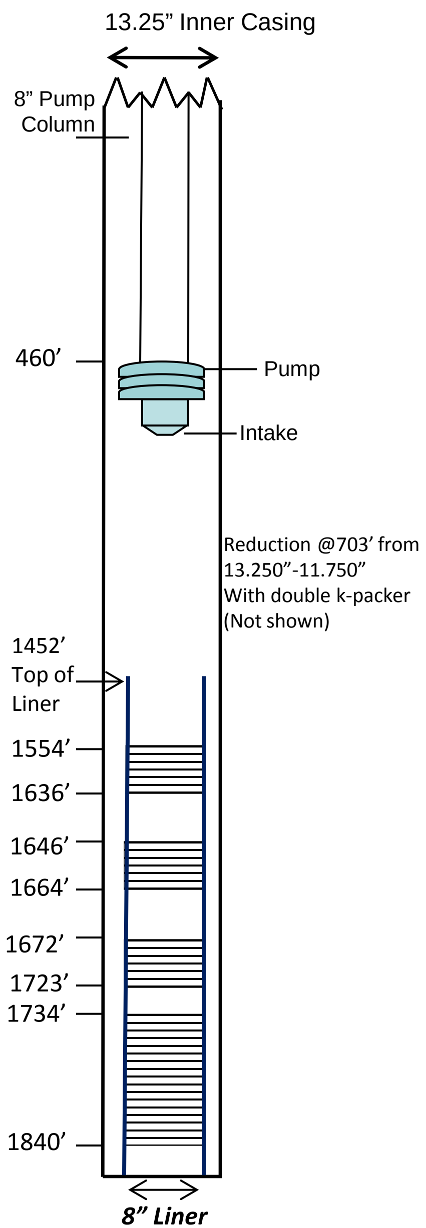

Figure 6: Chemical Mass Balance Analysis: Turbidity

Turbidity	ft. bgs	ft. bgs	GPM	NTU	GPM	NTU	
	Depth	Interval	Cumulative Flow	Measured Concentration	Incremental Flow	Incremental Concentration	Mass Balance
	1400	1400-1500	704.49	0.739	0.00	0.000	0.0000
	1500	1554-1600	704.49	11.200	77.96	55.720	4344.1370
	1600	1600-1636	626.52	5.660	133.20	(0)	-8984.3656
	1640	1646-1664	493.33	25.400	0.00	NC	9210.4079
	1668	1672-1723	493.33	6.730	412.48	4.600	1897.2705
	1729	1734-1755	80.84	17.600	60.23	19.721	1187.8708
	1755	1755-1820	20.61	11.400	20.61	11.400	234.9468
	1820	below 1820	0.00	14.000	0.00	14.000	0.0000
	Wellhead 1	Cumulative	704.49	0.723			7890.2673
	Wellhead 2	Cumulative	704.49	3.720			11.2000

Dynamic Chemical Mass Balance Profile: Country Corners Well

704.49 GPM

Turbidity

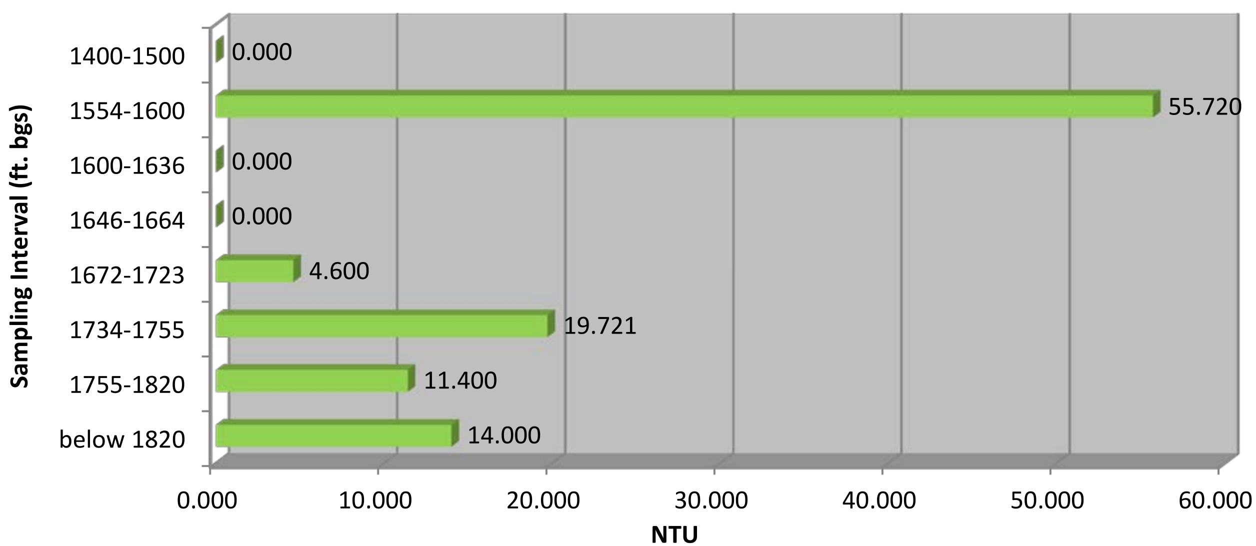

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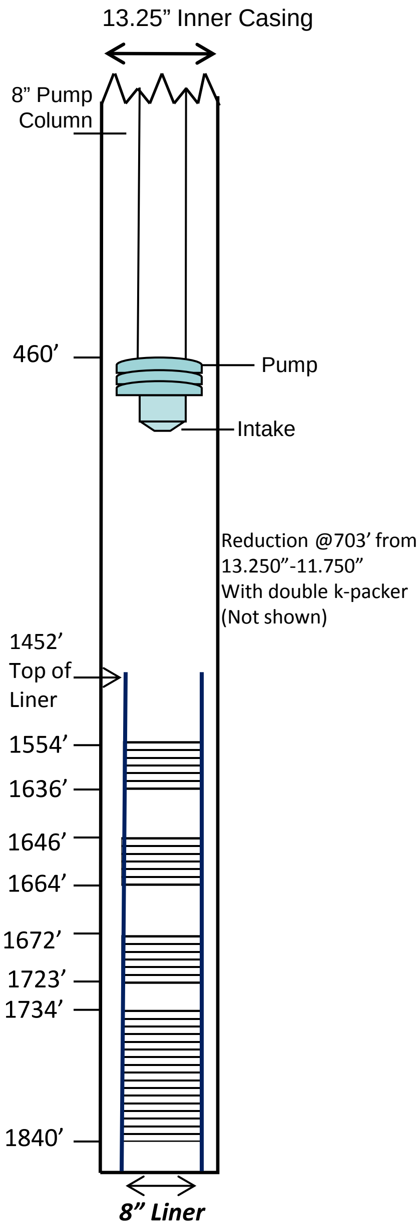
Figure 7: Chemical Mass Balance Analysis: Iron



Iron	ft. bgs	ft. bgs	GPM	mg/L	GPM	mg/L	
	Depth	Interval	Cumulative Flow	Measured Concentration	Incremental Flow	Incremental Concentration	Mass Balance
	1400	1400-1500	704.49	0.000	0.00	0.000	0.0000
	1500	1554-1600	704.49	0.743	77.96	6.241	486.5950
	1600	1600-1636	626.52	0.059	133.20	(0.000)	-110.6650
	1640	1646-1664	493.33	0.299	0.00	NC	-249.1299
	1668	1672-1723	493.33	0.804	412.48	0.884	364.7829
	1729	1734-1755	80.84	0.394	60.23	0.451	27.1734
	1755	1755-1820	20.61	0.227	20.61	0.227	4.6783
	1820	below 1820	0.00	1.110	0.00	1.110	0.0000
	Wellhead 1	Cumulative	704.49	0.000			523.4347
	Wellhead 2	Cumulative	704.49	0.236			0.7430

Dynamic Chemical Mass Balance Profile: Country Corners Well

704.49 GPM

Iron

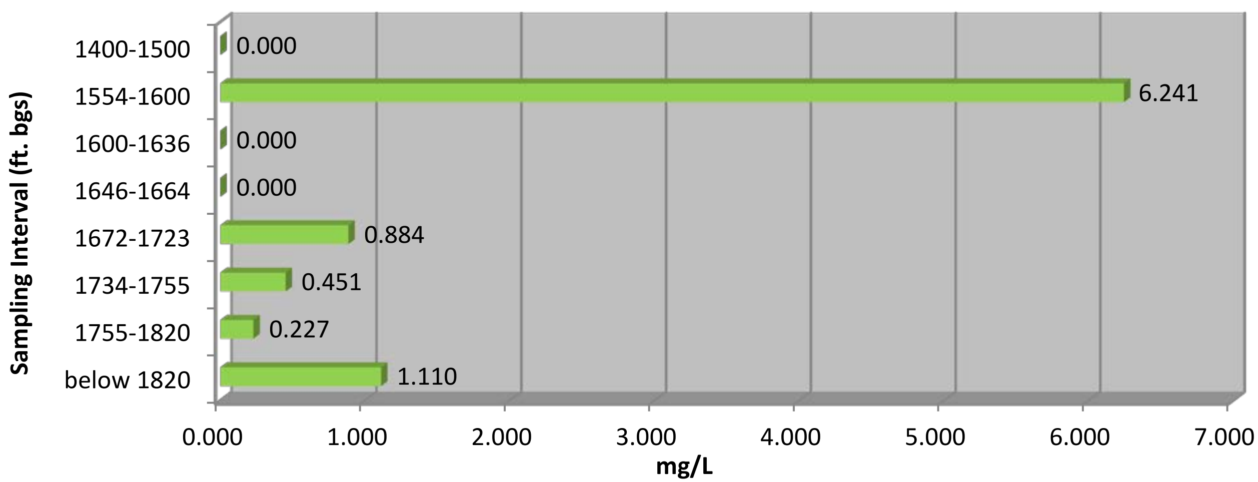


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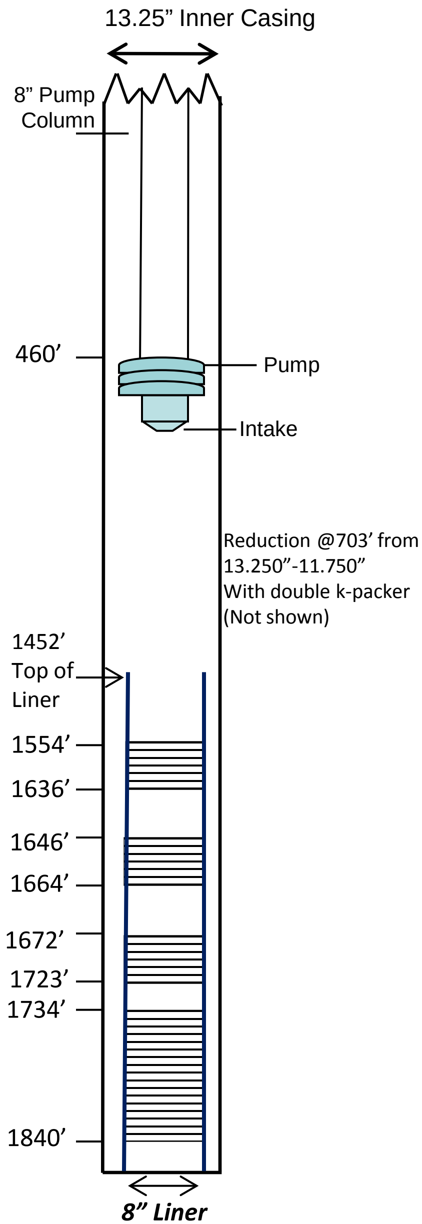
Figure 8: Chemical Mass Balance Analysis: Odor



Odor	ft. bgs	ft. bgs	GPM	TON	GPM	TON	
	Depth	Interval	Cumulative Flow	Measured Concentration	Incremental Flow	Incremental Concentration	Mass Balance
	1400	1400-1500	704.49	3.00	0.00	0	0.0000
	1500	1554-1600	704.49	3.00	77.96	(0)	-6031.3579
	1600	1600-1636	626.52	13.00	133.20	50	6664.8426
	1640	1646-1664	493.33	3.00	0.00	(0)	493.3266
	1668	1672-1723	493.33	2.00	412.48	2	744.1275
	1729	1734-1755	80.84	3.00	60.23	3	201.3070
	1755	1755-1820	20.61	2.00	20.61	2	41.2187
	1820	below 1820	0.00	4.00	0.00	4	0.0000
	Wellhead 1	Cumulative	192.00	2.00			2113.4645
	Wellhead 2	Cumulative	192.00	0.00			3.0000

Dynamic Chemical Mass Balance Profile: Country Corners Well

704.49 GPM

Odor

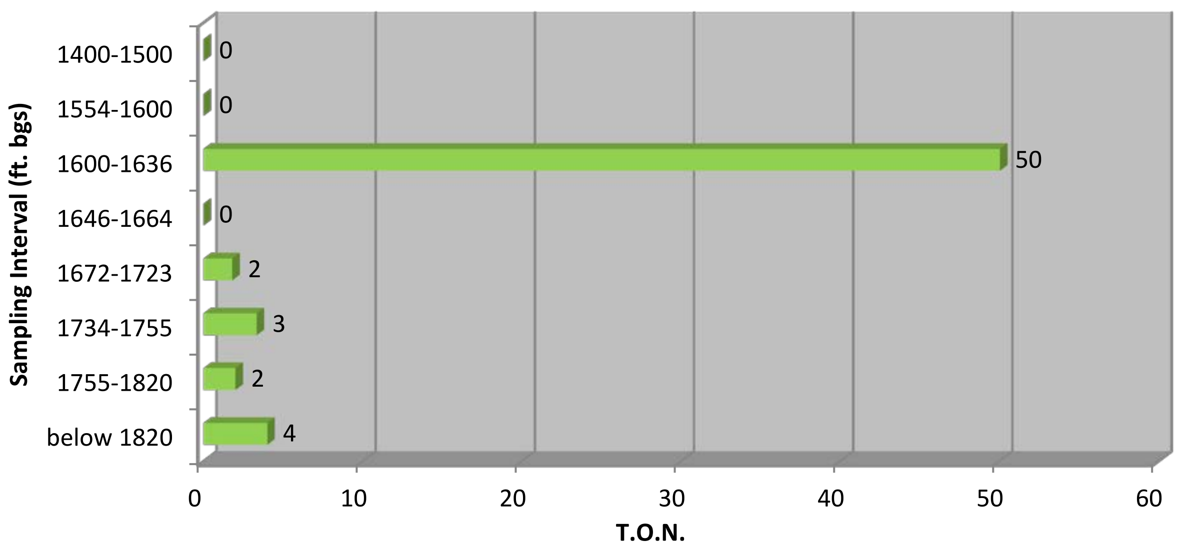


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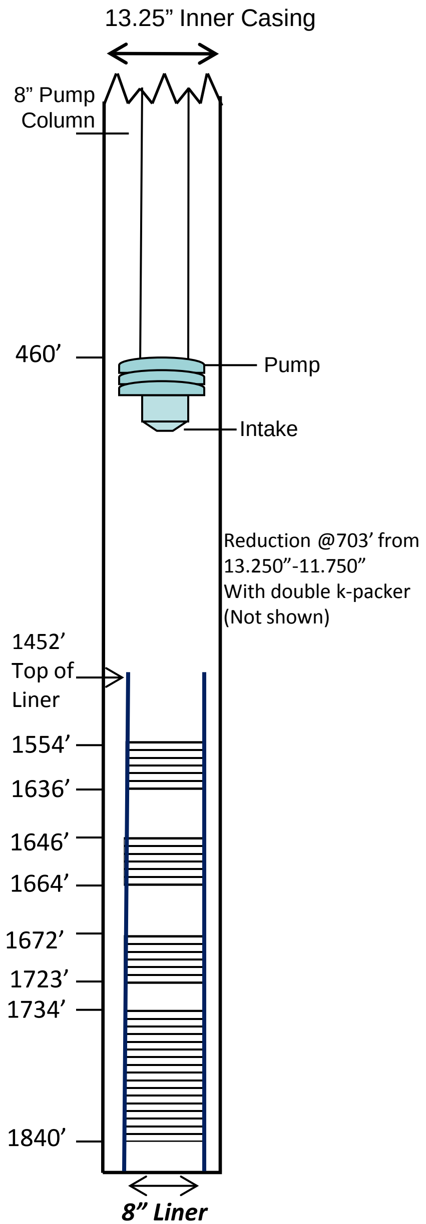
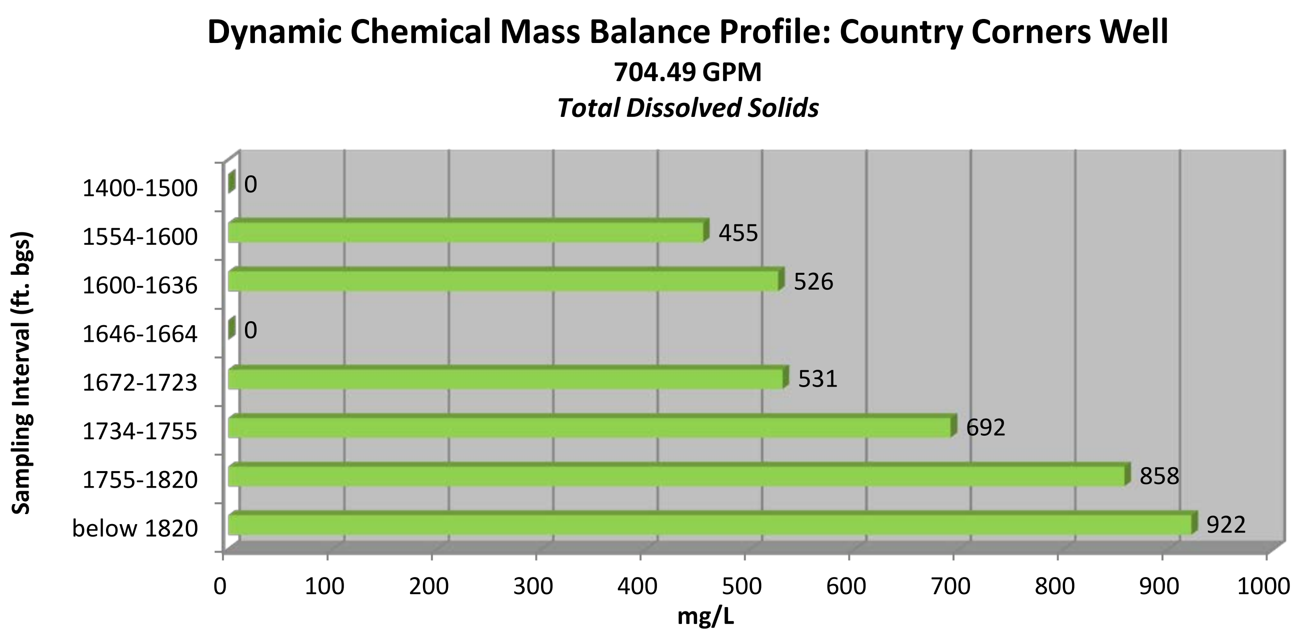
Figure 9: Chemical Mass Balance Analysis: TDS

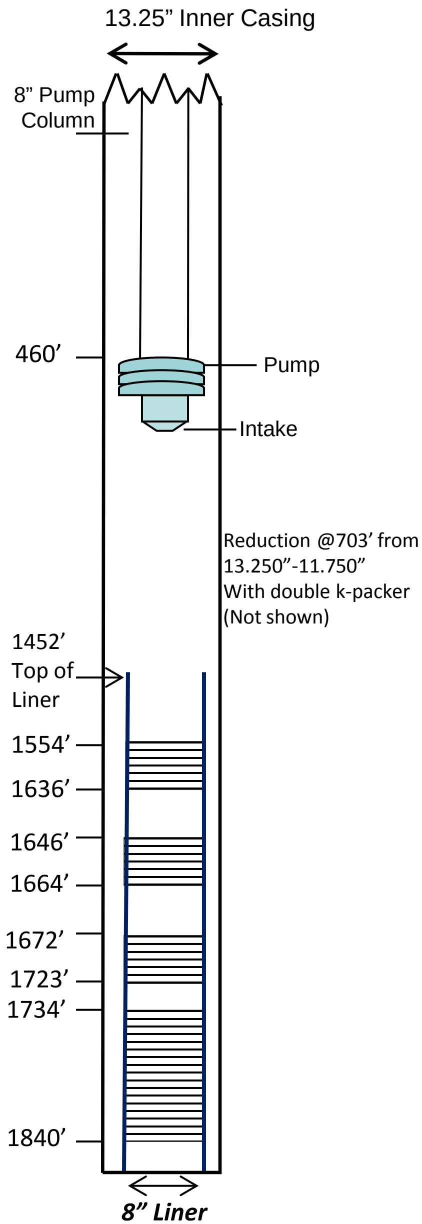


TDS	ft. bgs	ft. bgs	GPM	mg/L	GPM	mg/L	
	Depth	Interval	Cumulative Flow	Measured Concentration	Incremental Flow	Incremental Concentration	Mass Balance
	1400	1400-1500	704.49	529	0.00	0	0.0000
	1500	1554-1600	704.49	535	77.96	455	35445.1474
	1600	1600-1636	626.52	545	133.20	526	70126.3782
	1640	1646-1664	493.33	550	0.00	(0)	-6906.5726
	1668	1672-1723	493.33	564	412.48	531	218898.2487
	1729	1734-1755	80.84	734	60.23	692	41655.1236
	1755	1755-1820	20.61	858	20.61	858	17682.8381
	1820	below 1820	0.00	922	0.00	922	0.0000
	Wellhead 1	Cumulative	704.49	543			376901.1634
	Wellhead 2	Cumulative	704.49	548			534.9986



BESST INC. GLOBAL SUBSURFACE TECHNOLOGIES

Figure 10: Chemical Mass Balance Analysis: Chloride

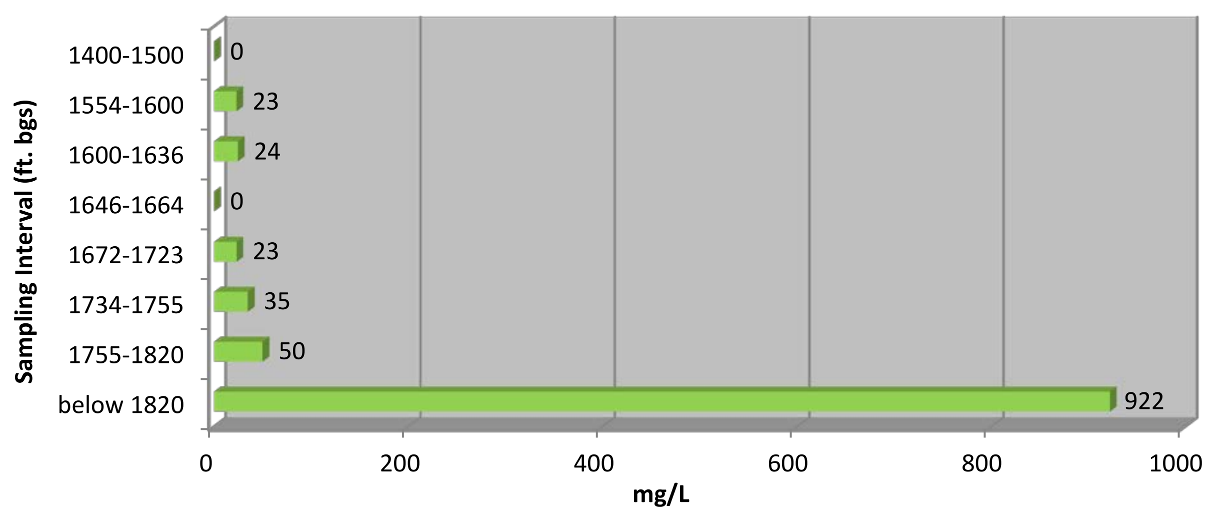


Chloride	ft. bgs	ft. bgs	GPM	mg/L	GPM	mg/L	
	Depth	Interval	Cumulative Flow	Measured Concentration	Incremental Flow	Incremental Concentration	Mass Balance
	1400	1400-1500	704.49	24.50	0.00	0	0.0000
	1500	1554-1600	704.49	24.60	77.96	23	1792.5936
	1600	1600-1636	626.52	24.80	133.20	24	3253.9823
	1640	1646-1664	493.33	24.90	0.00	(0)	-345.3286
	1668	1672-1723	493.33	25.60	412.48	23	9516.7478
	1729	1734-1755	80.84	38.50	60.23	35	2084.0060
	1755	1755-1820	20.61	49.90	20.61	50	1028.4075
	1820	below 1820	0.00	54.50	0.00	922	0.0000
	Wellhead 1	Cumulative	704.49	24.60			17330.4086
	Wellhead 2	Cumulative	704.49	24.40			24.5999

Dynamic Chemical Mass Balance Profile: Country Corners Well

704.49 GPM

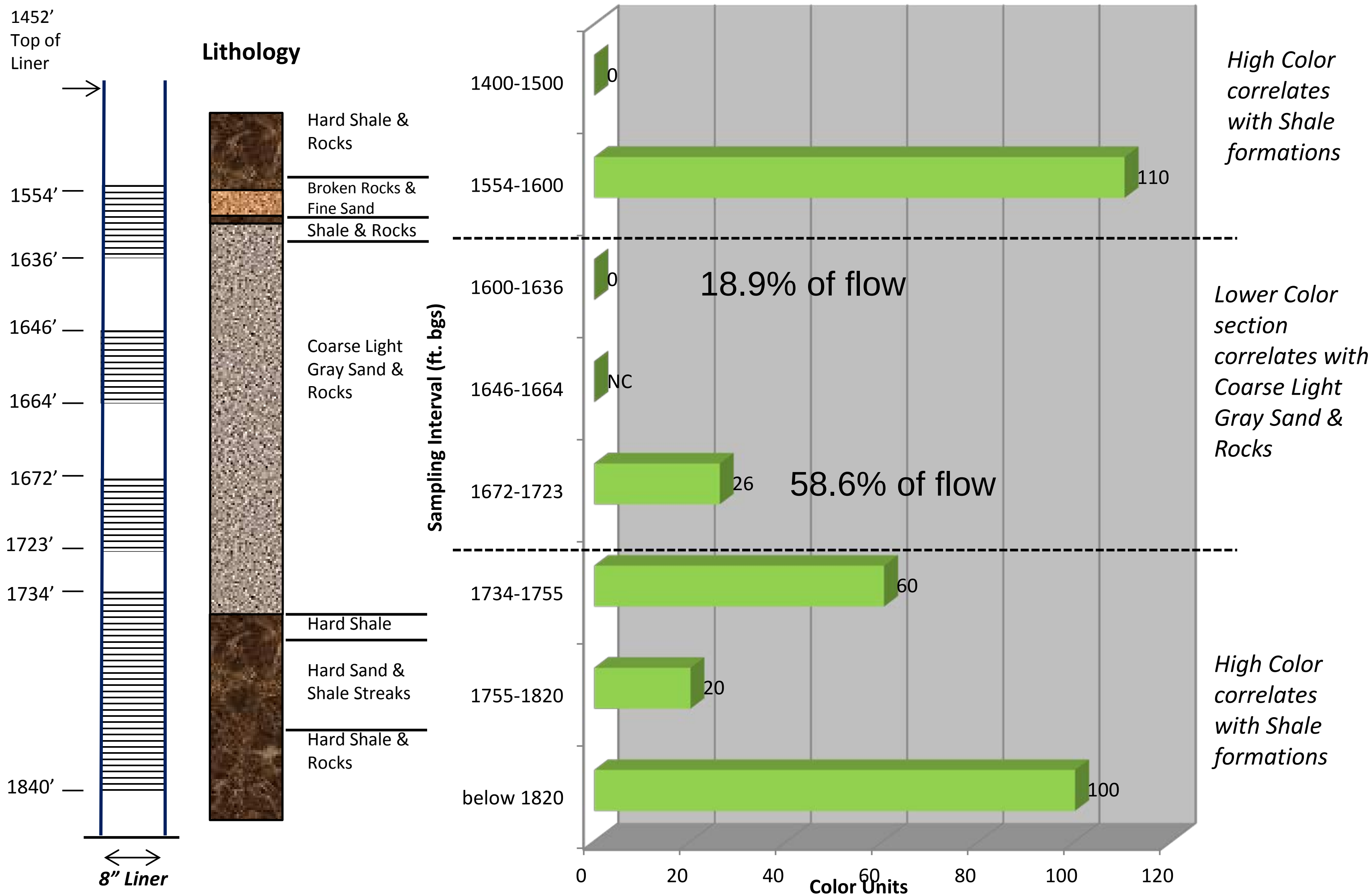
Chloride



BESST INC. GLOBAL SUBSURFACE TECHNOLOGIES

Figure 11: Color Mass Balance: Flow Contribution and Lithology

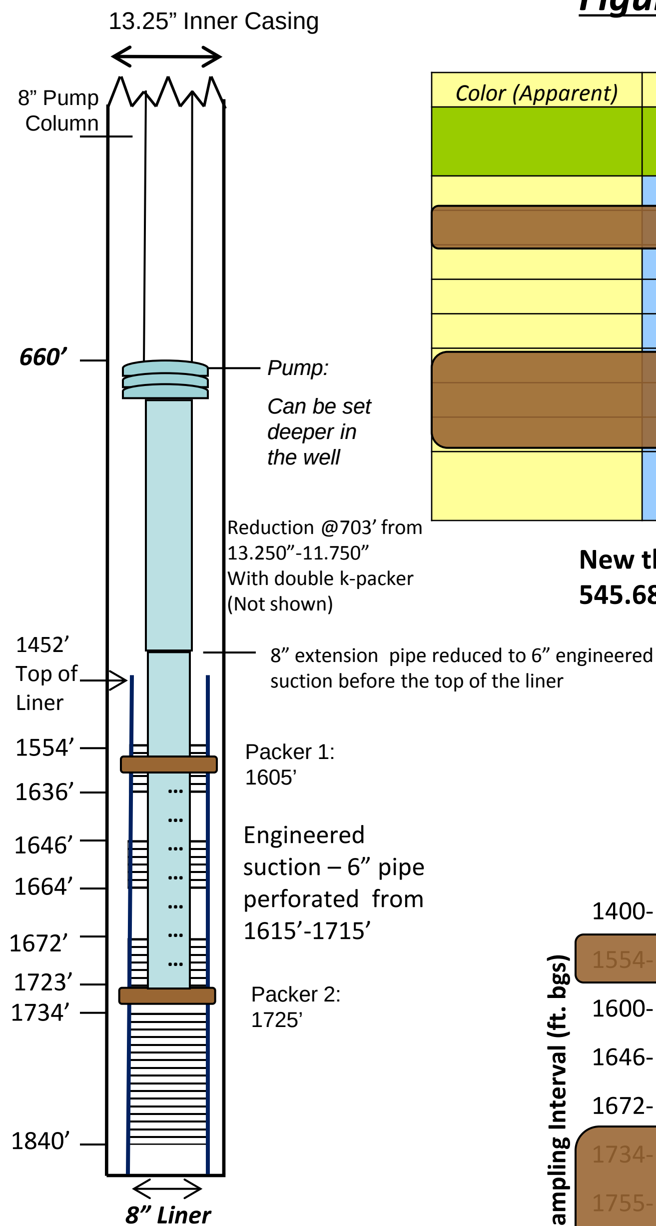
Dynamic Chemical Mass Balance Profile: Country Corners Well



1500	**-**	**1560**	**Hard Shale & Rocks**
1560	**-**	**1595**	**Broken Rocks & Fine Sand**
1595	**-**	**1600**	**Shale & Rocks**
1600	**-**	**1750**	**Coarse Light Gray Sand & Rocks**
1750	**-**	**1760**	**Hard Shale**
1760	**-**	**1810**	**Hard Sand & Shale Streaks**
1810	**-**	**1872**	**Hard Shale & Rocks**

BESST INC. GLOBAL SUBSURFACE TECHNOLOGIES

Figure 12: Hypothetical Well Modification Scenario: Color Reduction

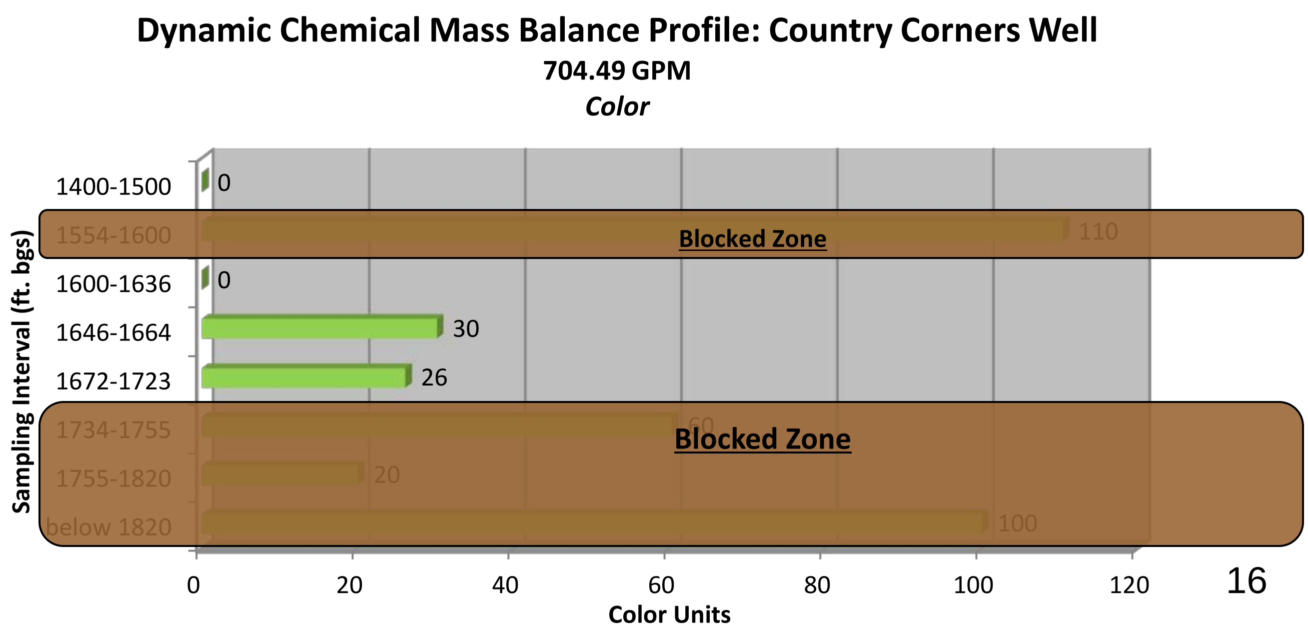


Color (Apparent)	ft. bgs	ft. bgs	GPM	Color Units	GPM	Color Units	
	Depth	Interval	Cumulative Flow	Measured Concentration	Incremental Flow	Incremental Concentration	Mass Balance
	1400	1400-1500	704.49	20	0.00	0	0.0000
Blocked Zone	1500	1554-1600	704.49	20	77.96	110	8604.1487
	1600	1600-1636	626.52	20	133.20	(0)	-2269.3024
	1640	1646-1664	493.33	30	0.00	No Contribution	0.0000
	1668	1672-1723	493.33	30	412.48	26	10757.7029
Blocked Zone	1729	1734-1755	80.84	50	60.23	60	3629.9081
	1755	1755-1820	20.61	20	20.61	20	412.1874
	1820	below 1820	0.00	100	0.00	100	0.0000
	Wellhead 1	Cumulative	704.49	20		Conc * Q	21134.6447
	Wellhead 2	Cumulative	704.49	20		Theoretical Result	29.9999

New theoretical flow rate: 545.68 GPM
545.68/704.49 = 22.5% reduction in flow

Conc * Q	8488.4005
New Theoretical Result	**15.5555**

Compared to Theoretical Wellhead Result: *15.5555/29.9999 = 48.1% reduction in Color*
Compared to True Wellhead Result: *15.5555/20 =22.2% reduction in Color*



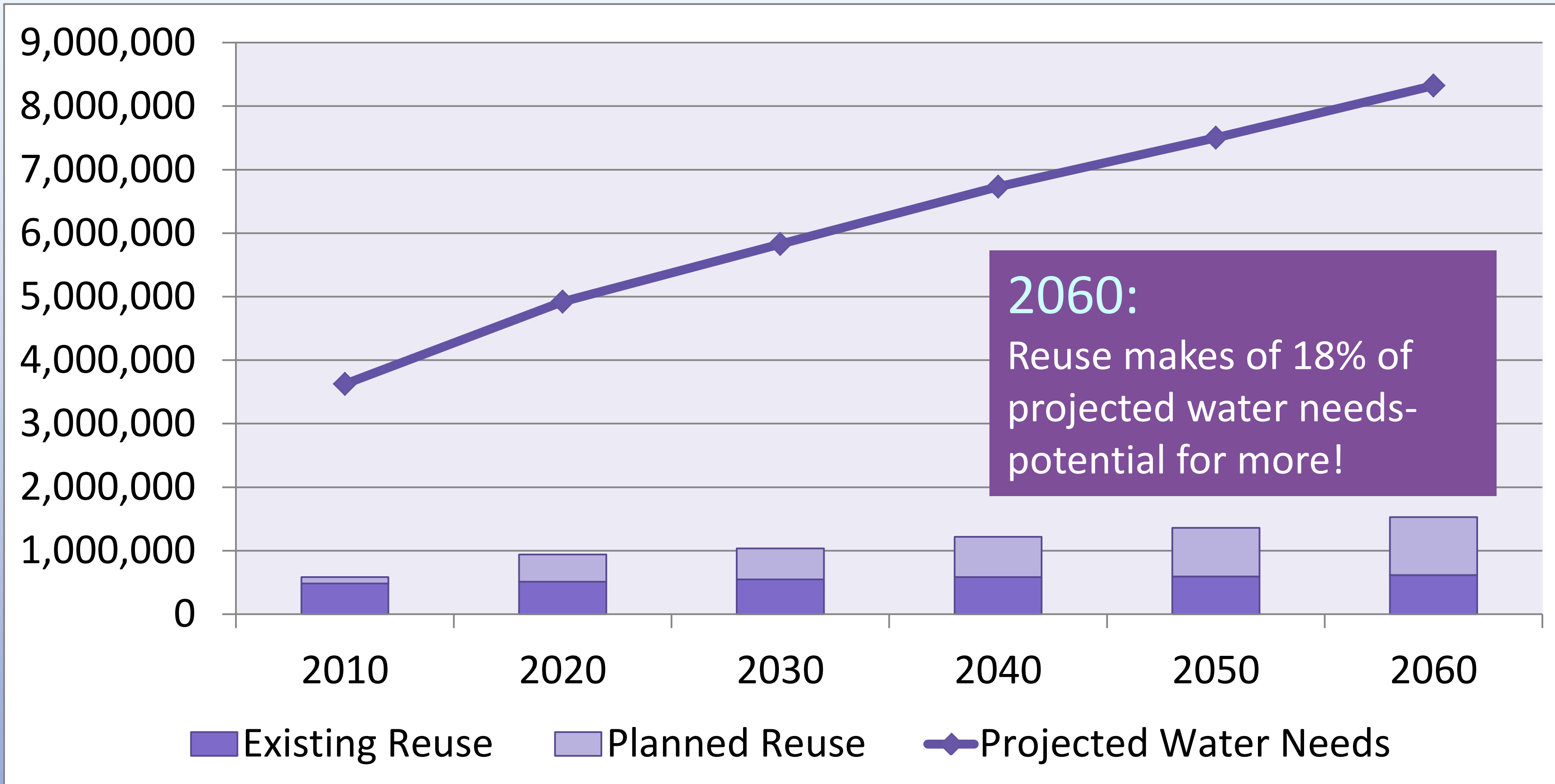
BESST INC. GLOBAL SUBSURFACE TECHNOLOGIES

Water Reuse:
A Major Water Management Strategy

Background and Future Direction

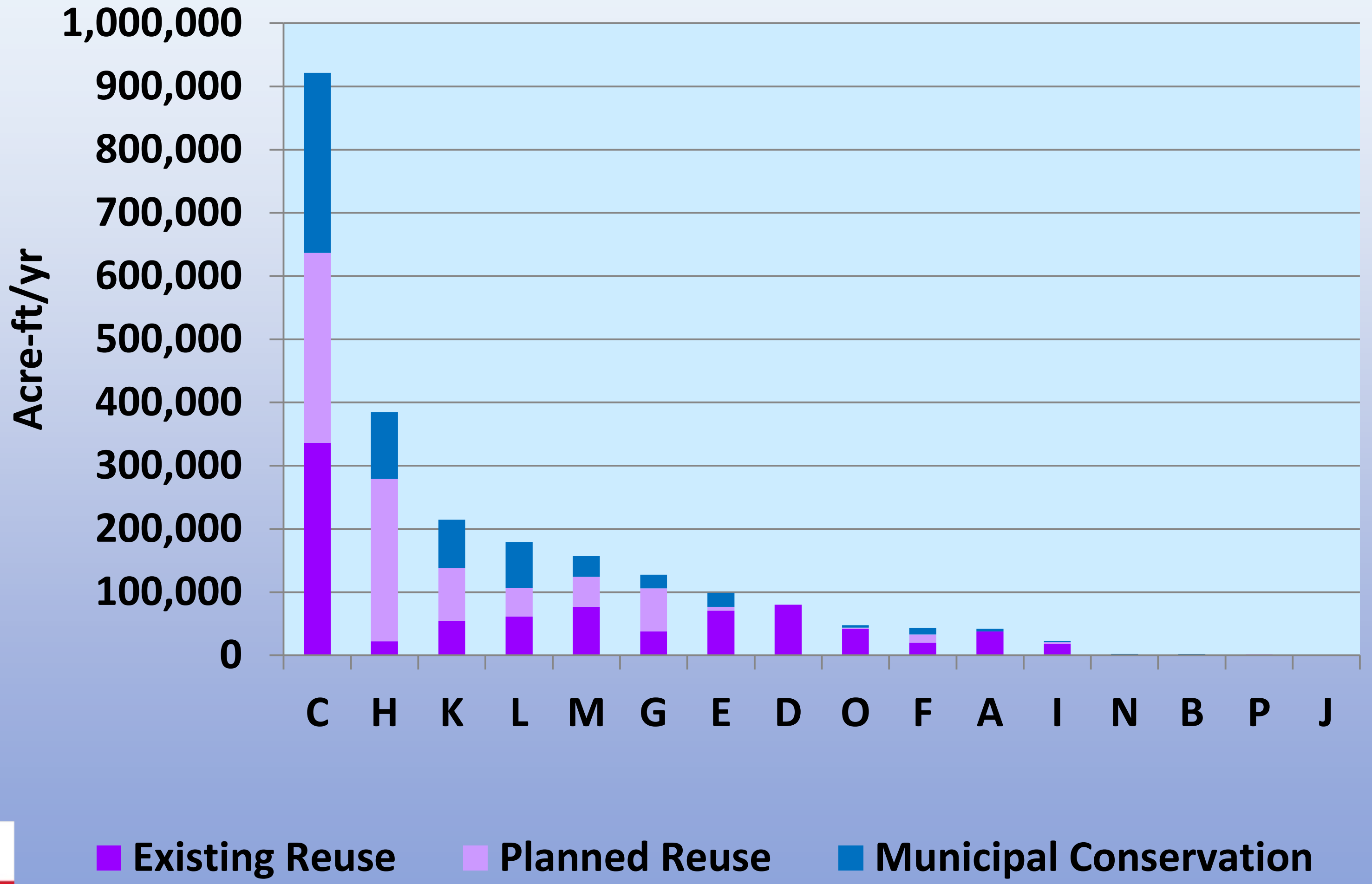
Alan H. Plummer, P.E.
Ellen T. McDonald, Ph.D., P.E.

2012 State Water Plan: Role of Water Reuse (acre-ft/yr)



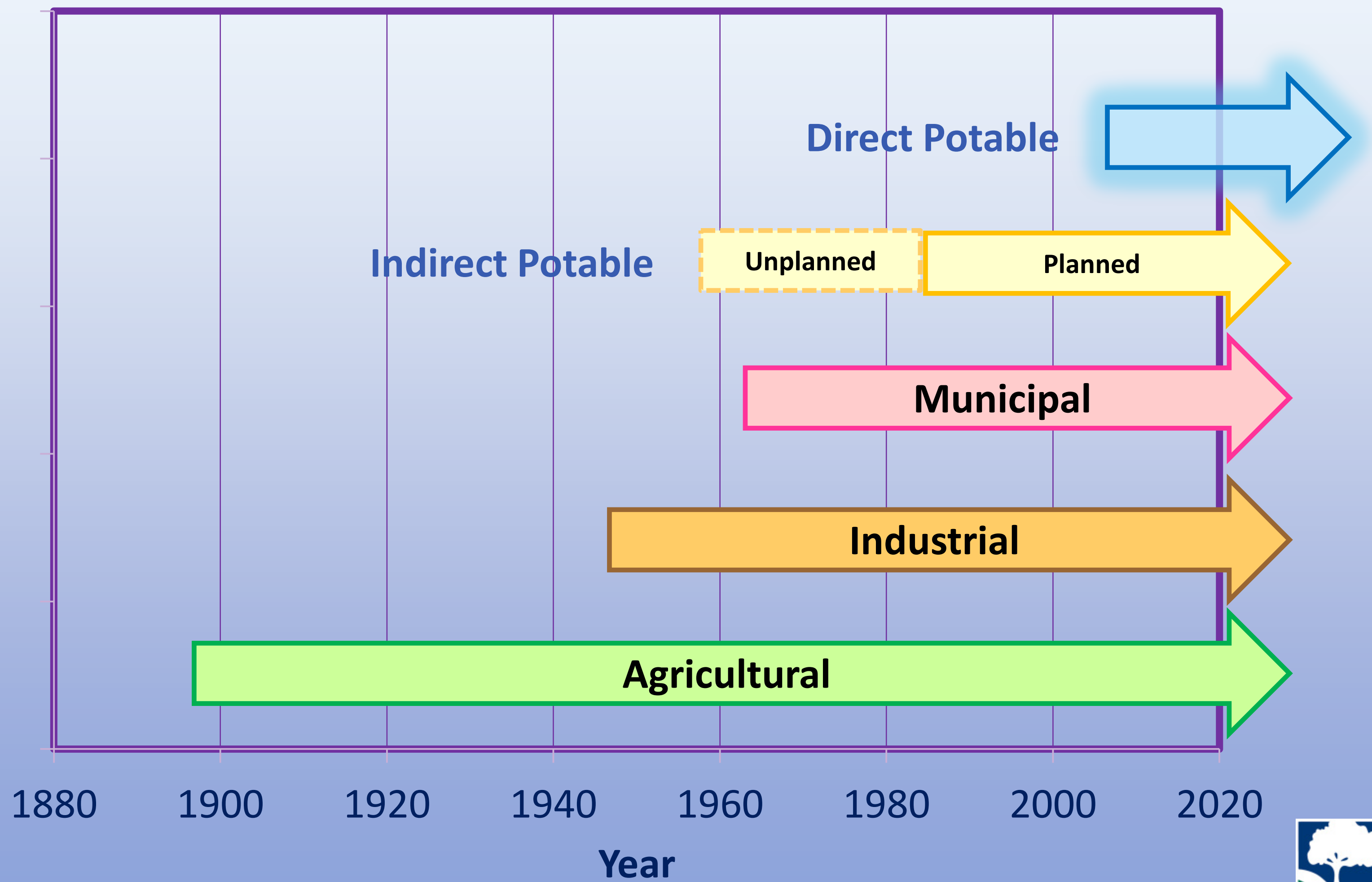
Source: Water for Texas 2012, Texas Water Development Board

Planned 2060 Reuse and Conservation Supplies by Region



Source: 2011 Region C Water Plan

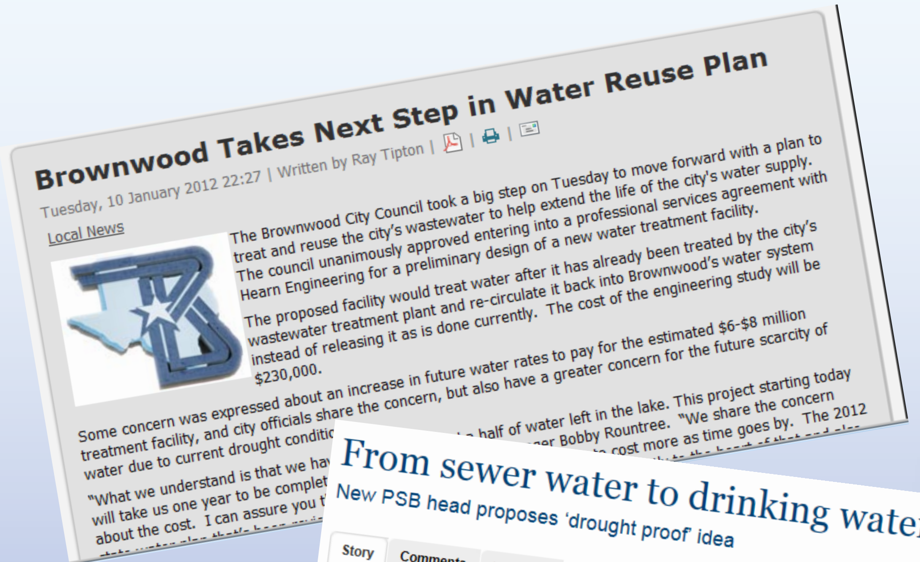
Evolution of Reuse in Texas



Major Texas Potable Reuse Projects

- Trinity River Basin projects
- El Paso
- Colorado River Municipal Water District

DPR Projects In Process


Brownwood Takes Next Step in Water Reuse Plan

Tuesday, 10 January 2012 22:27 | Written by Ray Tipton |

Local News

The Brownwood City Council took a big step on Tuesday to move forward with a plan to treat and reuse the city's wastewater to help extend the life of the city's water supply. The council unanimously approved entering into a professional services agreement with Hearn Engineering for a preliminary design of a new water treatment facility.

The proposed facility would treat water after it has already been treated by the city's wastewater treatment plant and re-circulate it back into Brownwood's water system instead of releasing it as is done currently. The cost of the engineering study will be $230,000.

Some concern was expressed about an increase in future water rates to pay for the estimated $6-$8 million treatment facility, and city officials share the concern, but also have a greater concern for the future scarcity of water due to current drought conditio... half of water left in the lake. This project starting today ...er Bobby Rountree. "We share the concern ... cost more as time goes by. The 2012

"What we understand is that we ha... will take us one year to be complet... about the cost. I can assure you t...


THE TEXAS TRIBUNE

Water-Reuse Ideas Go Forward, Despite 'Toilet to Tap' Concerns

The Cypress Water Treatment Pl...

By AUDREY WHITE

Published: Febru...

Brandon Thibodeaux for The Texas Tribune


From sewer water to drinking water

New PSB head proposes 'drought proof' idea

Story | Comments | Image (3)

Previous | Next

Print | Font Size:

Posted: Sunday, April 28, 2013 6:00 pm | Updated: 10:20 pm, Sun Apr 28, 2013.

By David Crowder El Paso Inc. staff writer |

0 comments

Astronauts in space have been recycling their toilet water for decades – treating toilet water to a standard that makes it perfectly good, purified drinking water.

Now the new head of El Paso Water Utilities wants the city to go where few cities have gone before: cleaning toilet water for what experts call "direct potable water reuse."

This fall, the utility's new president and CEO, John Balliew, plans to ask the Public Service Board to approve the first phase of a water reuse project that would turn 10-million gallons of sewage effluent a day into purified drinking water.

The water could then be put directly back into city water lines.

Photo by Melody Parra

Rio Grande

The nearly dry Rio Grande near Mount Cristo Rey. The historic river drought means the city and local farmers will get barely a...

TWDB Reuse Research Agenda

- Identified priority topics
- Completed Feb. 2011
- Accompanying documents:
  - History of reuse in Texas
  - State of technology

Ongoing TWDB Water Reuse Research Projects

- “Evaluating the Potential for Direct Potable Reuse in Texas”
- “Testing Water Quality in a Municipal Wastewater Effluent Treated to Drinking Water Standards”

Evaluating the Potential for Direct Potable Reuse in Texas

- Project goals
  - Develop a resource document for DPR that can be used by
    - Utilities
    - Agencies
    - Consultants
  - Provide information that is technically sound and promotes safe and practical implementation of DPR in Texas

Project Stakeholders

- City of College Station/ Brazos Valley GCD
- El Paso Water Utilities
- City of Houston
- City of Irving
- City of Lewisville
- City of Lubbock
- San Antonio Water System
- Upper Trinity Water Quality Compact
  - City of Dallas
  - City of Fort Worth
  - North Texas MWD
  - Trinity River Authority
- WateReuse Texas

Challenges to Advancing Reuse in Texas

- Technical issues
- Public acceptance
- Funding
- Balancing human and environmental needs

TWDB Reuse Support Opportunities

- Promote and support research
  - Opportunities to partner with other research entities
- Support public education and awareness efforts
- Allocate funding for reuse projects
- Collaborate with other agencies and organizations

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The power to change life.SM

April, 2014

NRG: Energy and Water

Howard Taylor

SVP, Asset Management & Development

nrg

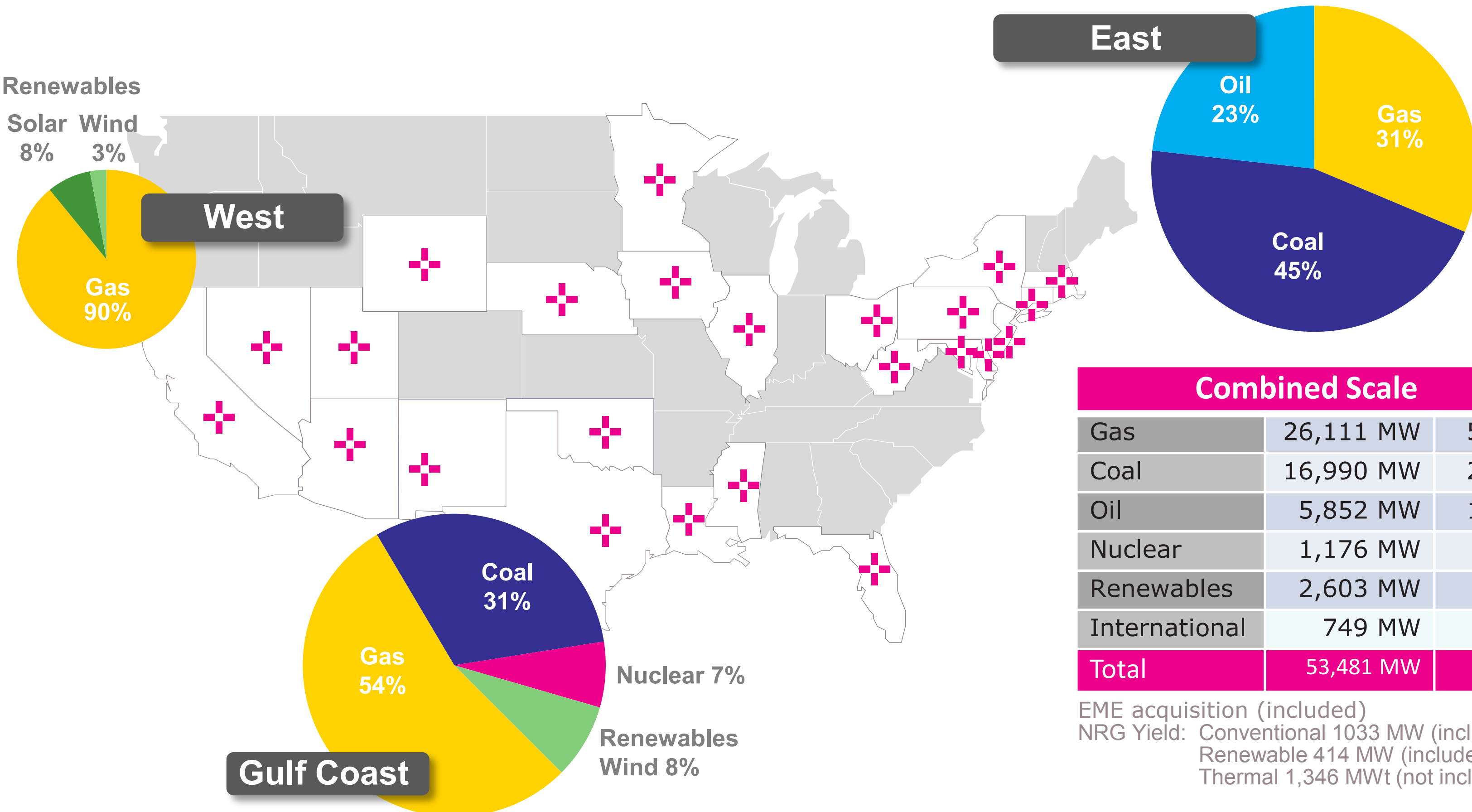
The power to change life.℠

NRG - Our Strength in Numbers

1	Largest competitive electricity company in the U.S.
3M	Serving nearly 3 million customers with NRG retail brands.
53K	Generating approximately 53,000 MW of global, diverse energy.
46M	Providing enough generation capacity to power 46 million homes.
9K	Created or supported almost 9,000 clean economy jobs from 2007 – 2013.
3B	Invested more than $3 billion on environmental improvements since 2000.
500	Fortune 500 and S&P 500 Index company

One of the Nation's Largest and Most Diverse Generation Portfolios

The power to change life.℠



Combined Scale		
Gas	26,111 MW	52%
Coal	16,990 MW	28%
Oil	5,852 MW	12%
Nuclear	1,176 MW	2%
Renewables	2,603 MW	2%
International	749 MW	1%
Total	53,481 MW	

EME acquisition (included)
NRG Yield: Conventional 1033 MW (included)
Renewable 414 MW (included)
Thermal 1,346 MWt (not included)

Diversity of fuel-type, dispatch level, and geographic region help mitigate risk and moderate market demand cycles

The power to change life.℠

Water Supply Concerns

PROBLEM	Communities, states and countries running short of water for drinking, agriculture and industry.
REASON	Persistent U.S. and global drought exacerbated by climate change, combined with growing population and industry.
A SOLUTION	Treatment of underutilized water resources to cost-effectively produce supplies of water to meet the growing demand.

nrg

The power to change life.[SM]

Energy and Water

- Growth - it is becoming increasingly clear that as we plan for the future growth we must consider energy and water together.
  - Texas currently consumes more than 17 million acre-feet/year.
  - 80% growth in Texas population is expected by 2060 – demand for energy and water will increase as well.
  - Traditional approaches to developing new water supplies and energy supplies will be challenged.

- Large amounts of energy / electricity are required to acquire and process water, and water is needed to produce electricity from traditional generation sources.

- As we continue to develop more sustainable energy resources, we also need to consider more sustainable approaches to water production and how we might jointly deploy these efforts.

- Commonalities of water and power project challenges,
  - Identification of options to meet the needs,
  - Long lead time to bring projects to operation - development, engineering, procurement, construction,
  - Ability to source project debt and equity,
  - Commitment to efficient management of operations for a 20 to 30+ year project life.

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Potential Water Solutions

- Reservoirs.
- Water reclamation, re-use and conservation.
- Advanced treatment of water resources – desalination of seawater.
- Advanced treatment of non-traditional water resources – desalination of brackish groundwater.

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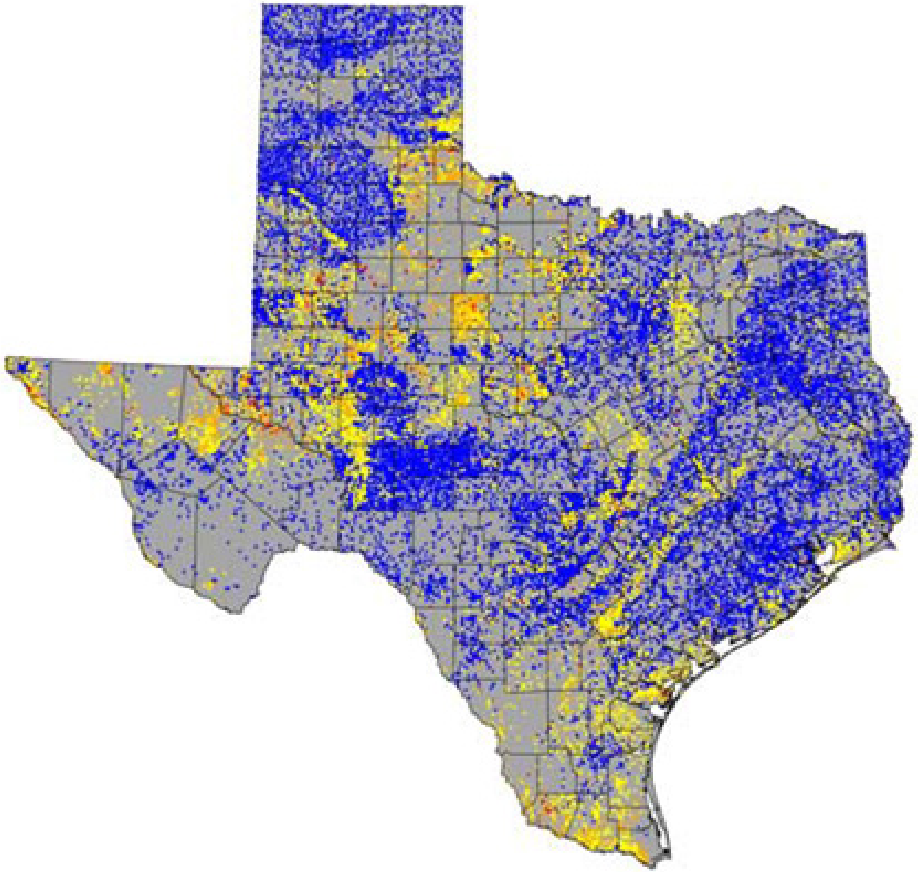
Where to focus? Desalination

- Energy costs represent as much as 50% of the total cost to produce treated water.
- Certain efficiencies can be gained by co-locating a desalination project with a power plant.
    - Thermal energy, operation and maintenance, access to existing infrastructure, and others.
- Operations can be optimized to produce electricity to meet grid demand and water needs.
- Opportunities for both large scale and small projects in the areas where NRG already has operations.

Vast Supply of Brackish Water

- Brackish water supplies.
  - Estimated 2.7 billion acre-feet of saline/brackish groundwater under Texas.
- Significant resources underlying much of the state.
- Technology exists and is being used in selected locations.
- Cost reduction – many companies are pursuing efficiencies now.
- NRG worked closely with legislators / stakeholders during the 2013 session to seek legislation to support brackish desalination projects.



Blue = <999 mg/l TDS (fresh water)
Yellow = 1,000 – 3,000 mg/l TDS
Orange = 3,000 – 9,999 mg/l TDS
Red = >10,000 mg/l TDS

Source : Texas Water Development Board

Conclusion

- The capabilities that make water production viable are the same that are required in the energy space where NRG is very active:
  - Energy management and strategic sourcing of project energy needs.
  - Expertise in engineering, design and construction of capital projects.
  - Ability to secure sources of capital and financing.
  - Commitment to long-term operations and the knowledge to drive out inefficiencies.
  - Finally, the ability to evaluate and introduce advanced technologies that meet the needs of a changing market.

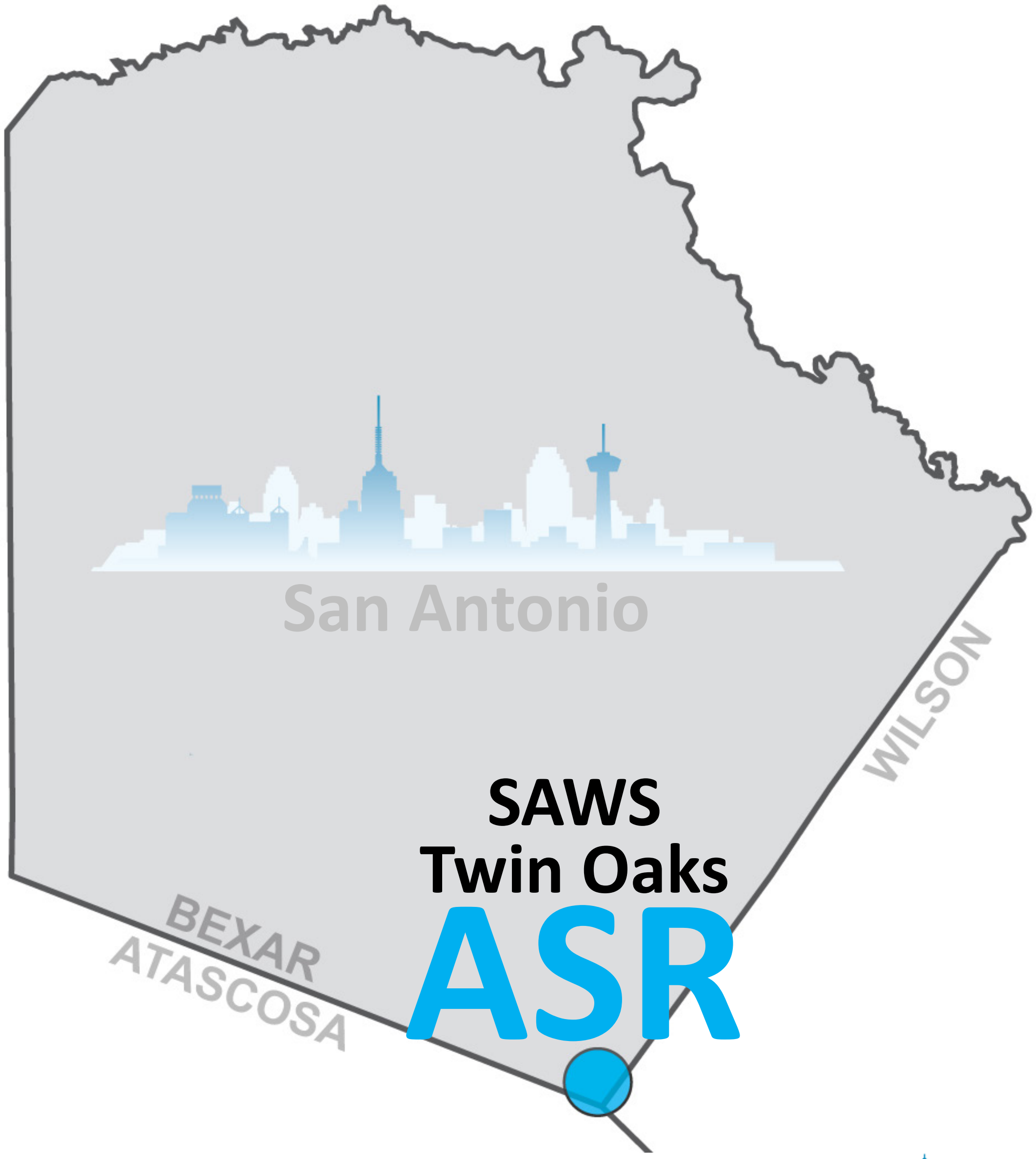
SAWS Twin Oaks ASR Plant

Robert R. Puente
President/Chief Executive Officer

April 17, 2014

TWDB Board Meeting

San Antonio Water System



San Antonio
WILSON
SAWS
Twin Oaks
ASR
BEXAR
ATASCOSA

Project History

- 1998 – TWDB funded Feasibility study for SAWS ASR
- Part of SAWS 1998 50-Year Water Plan
- Land purchased in 2000 and 2001
- Facility online in 2004, additional capacity added by 2009
- Cost of Project - ~ $250 Million

Innovative Supplies

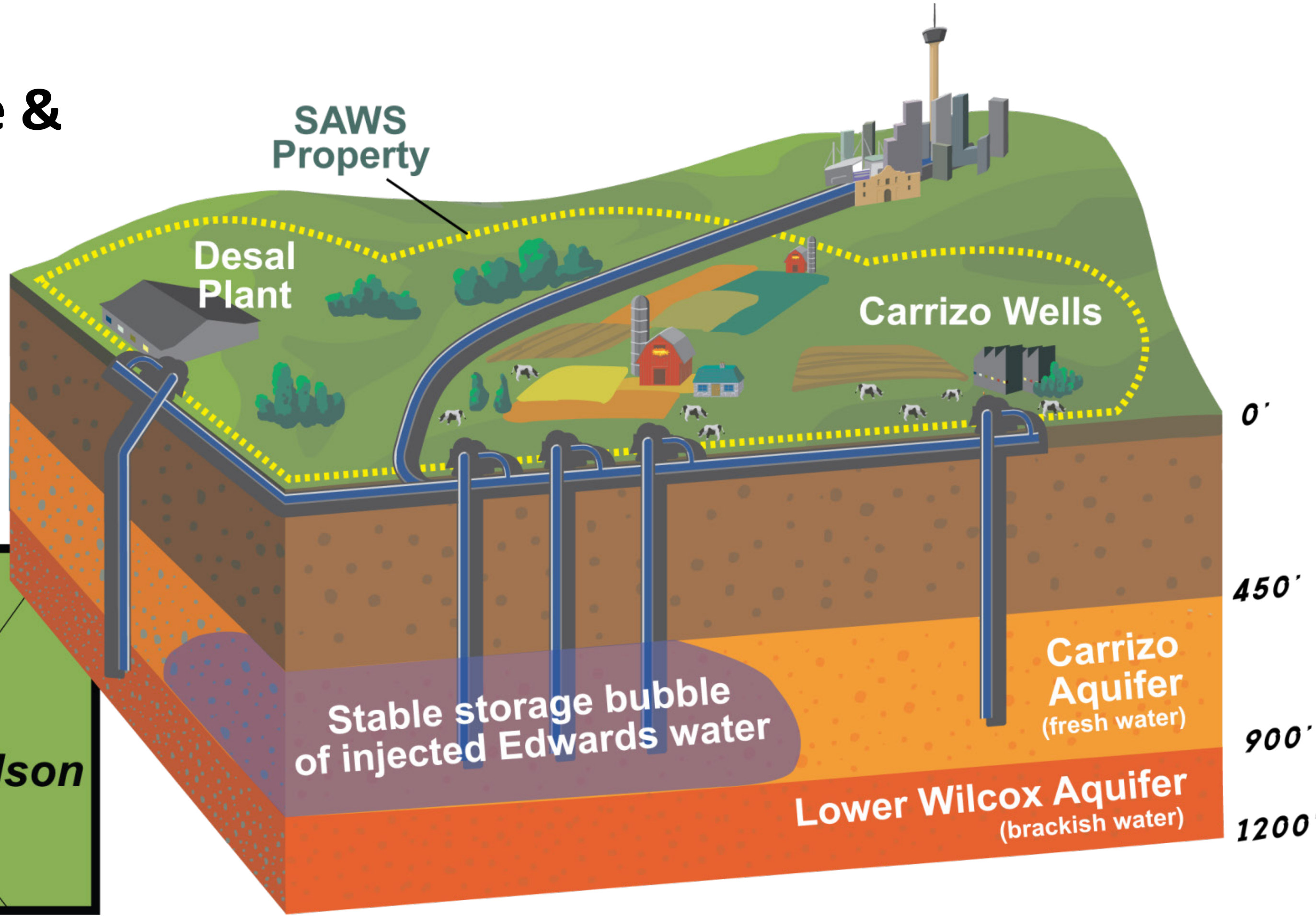
Aquifer Storage & Recovery

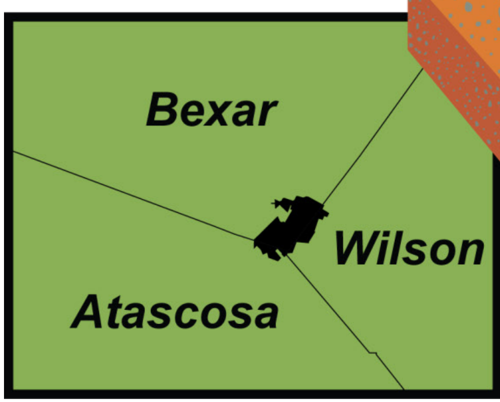
- One of largest ASR facilities in the nation
- 1/3rd of SAWS annual demand stored underground
- 3,200 acres of land
- Property leased back to landowners for ranching

Current Water Supply Projects

Three Projects on One Site

- Aquifer Storage & Recovery (ASR)
- Desalination
- Expanded Local Carrizo





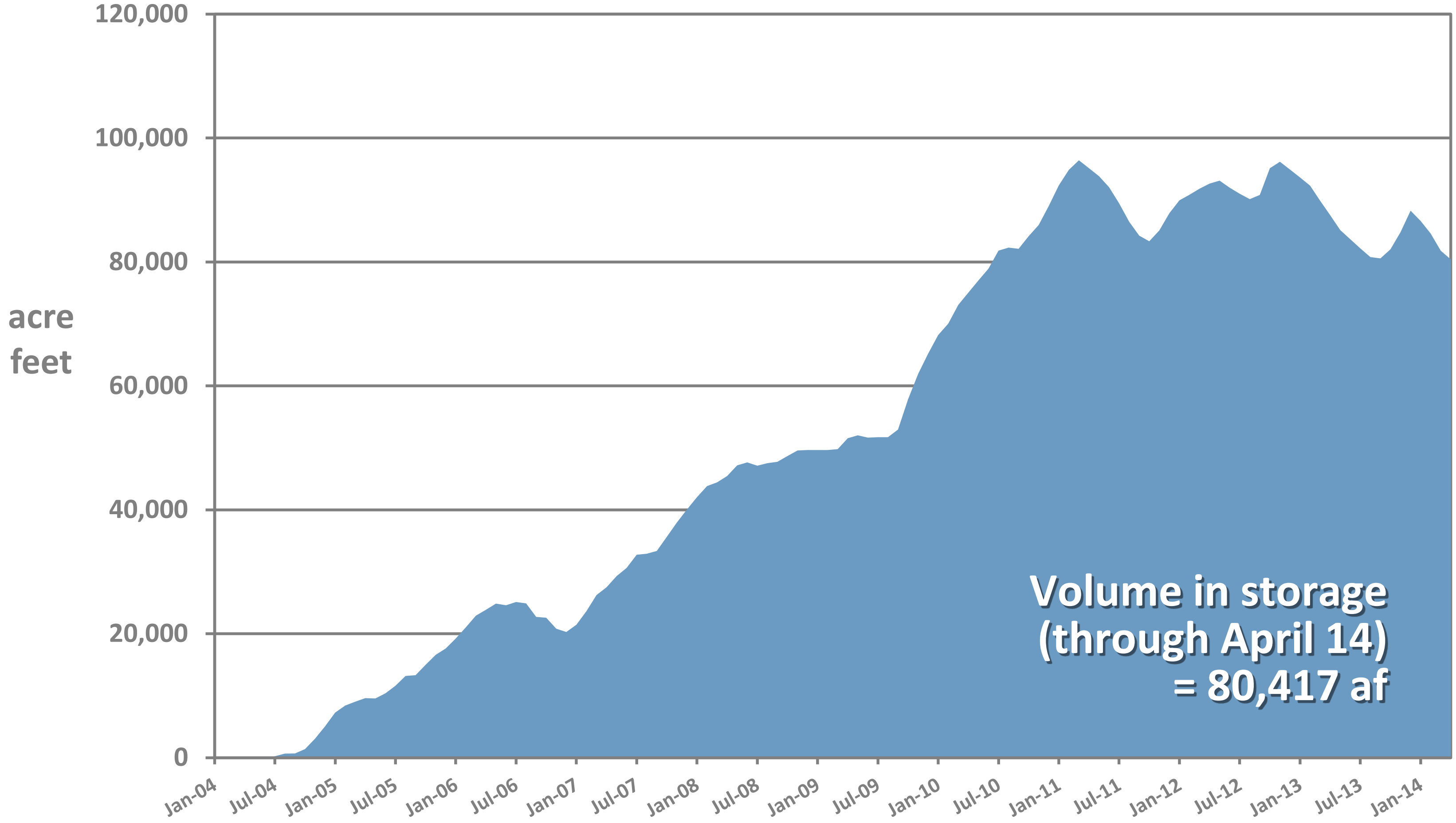
Aquifer Storage & Recovery Operations

Great Geology

- Carrizo Aquifer is well-suited for storage
  - Sand Aquifer allows to remain with little movement
  - Little migration controlled by Carrizo Aquifer wells
- Stored Edwards Aquifer water retains character
- May be able to store other water sources in future
- Further capacity studies ongoing

Aquifer Storage & Recovery (ASR)

Potential capacity over 200K ac-ft



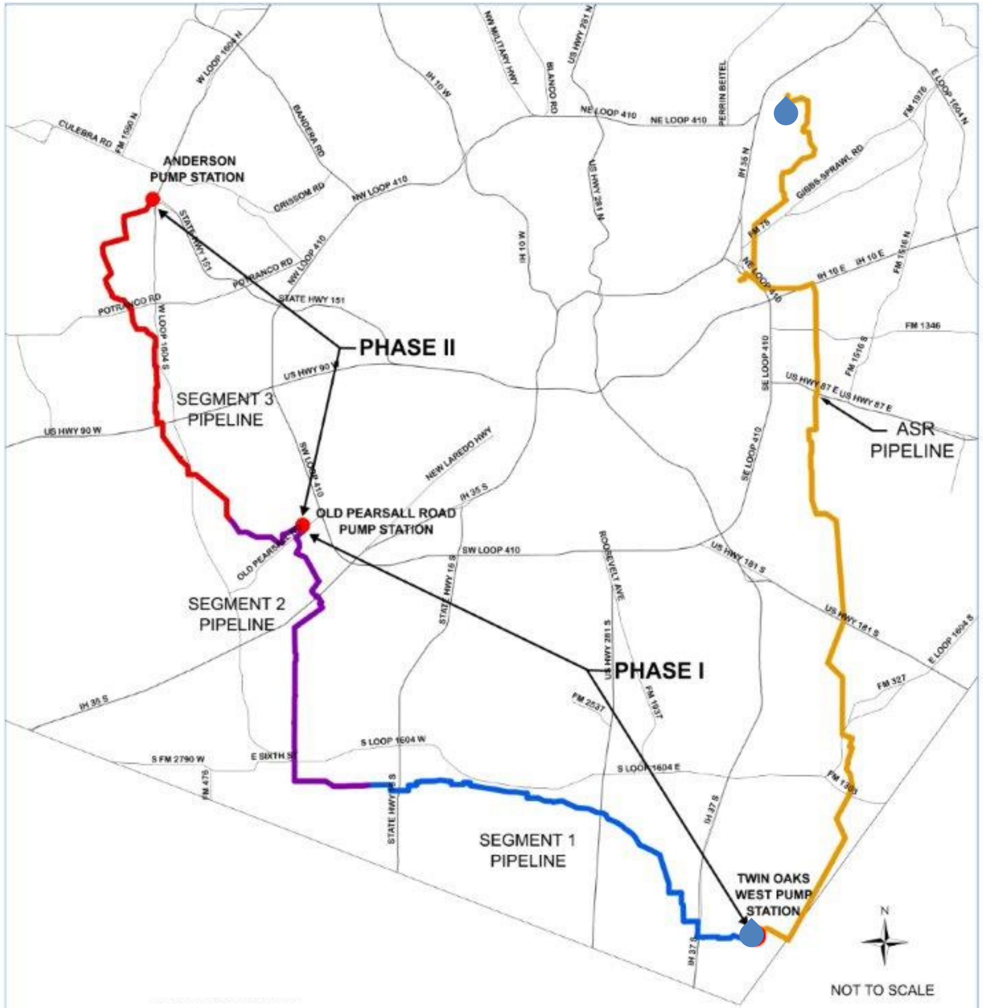
Cornerstone of Edwards Aquifer HCP

Regional Partners

- HCP developed by regional utilities, agriculture users, state entities and environmental groups
  - Resolve decades of in-fighting over Edwards usage
  - Calls for SAWS to use more ASR during times of deep drought to replace aquifer pumping
    - EAA leases Edwards rights to store in SAWS ASR
  - Ensures more springflow for endangered species and rivers
  - Brings more stability to SAWS Edwards Aquifer supplies

Overview

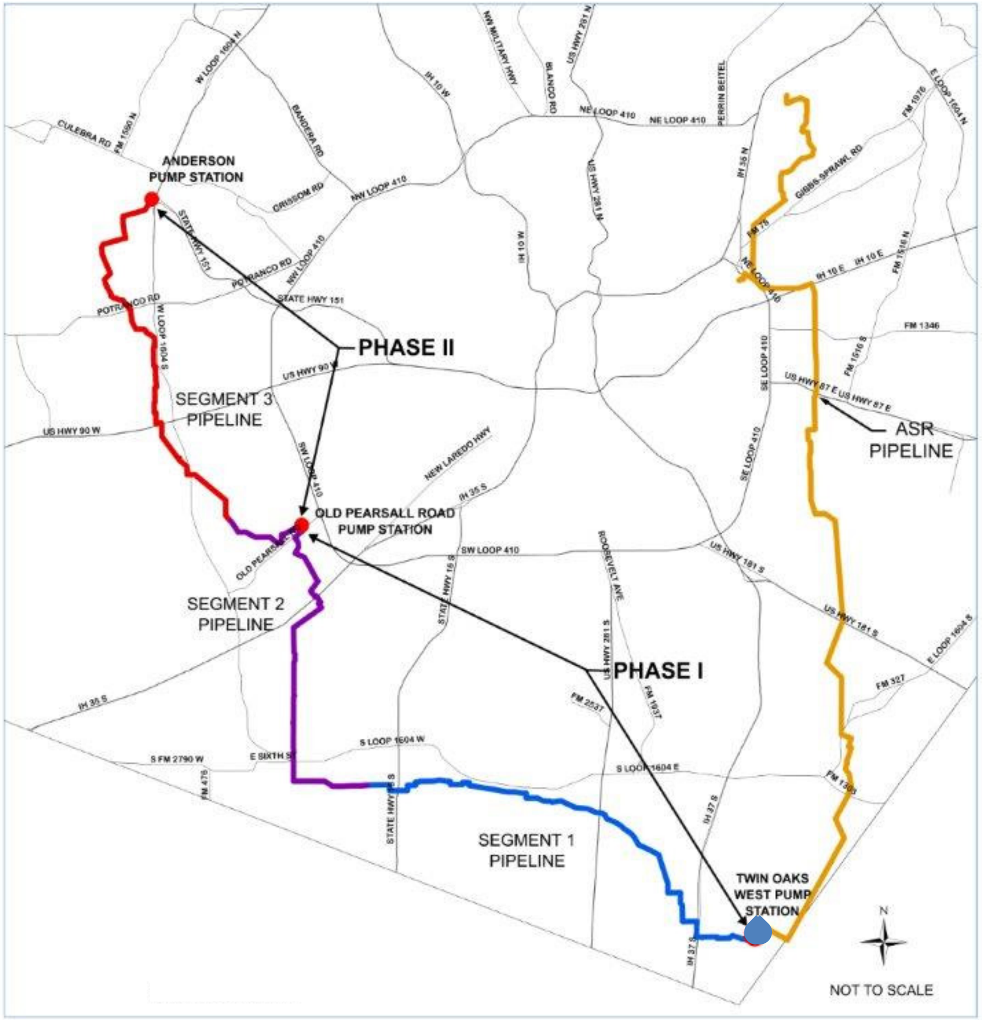
Benefits – Normal Conditions



San Antonio Water System

Overview

Benefits – Drought Conditions



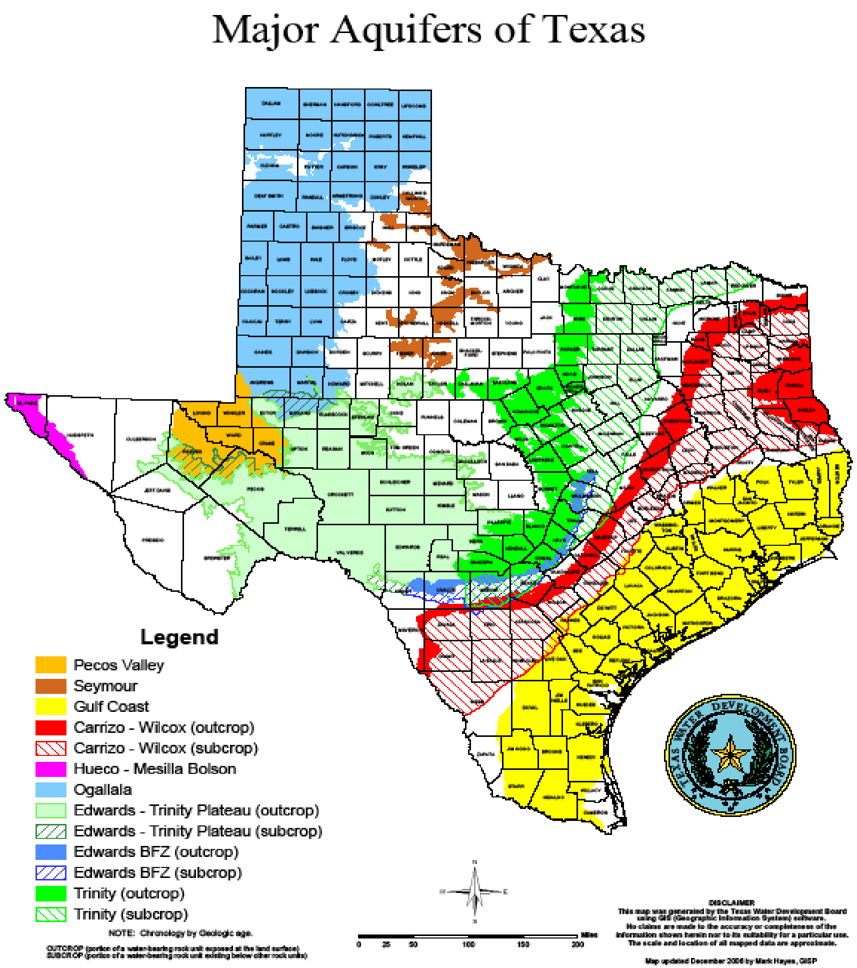
Bech Bruun Tours SAWS ASR

Kathleen Jackson Tours SAWS ASR

Carlos Rubinstein Tours SAWS ASR?

Why Brackish Desalination?

- 2.7 billion ac-ft in Texas
- Un-tapped, abundant, and reduces pressure on freshwater
- The Lower Wilcox Aquifer ***"…one of the best potential sources for brackish water in Texas"*** (TWDB)
- Promotion by State leadership

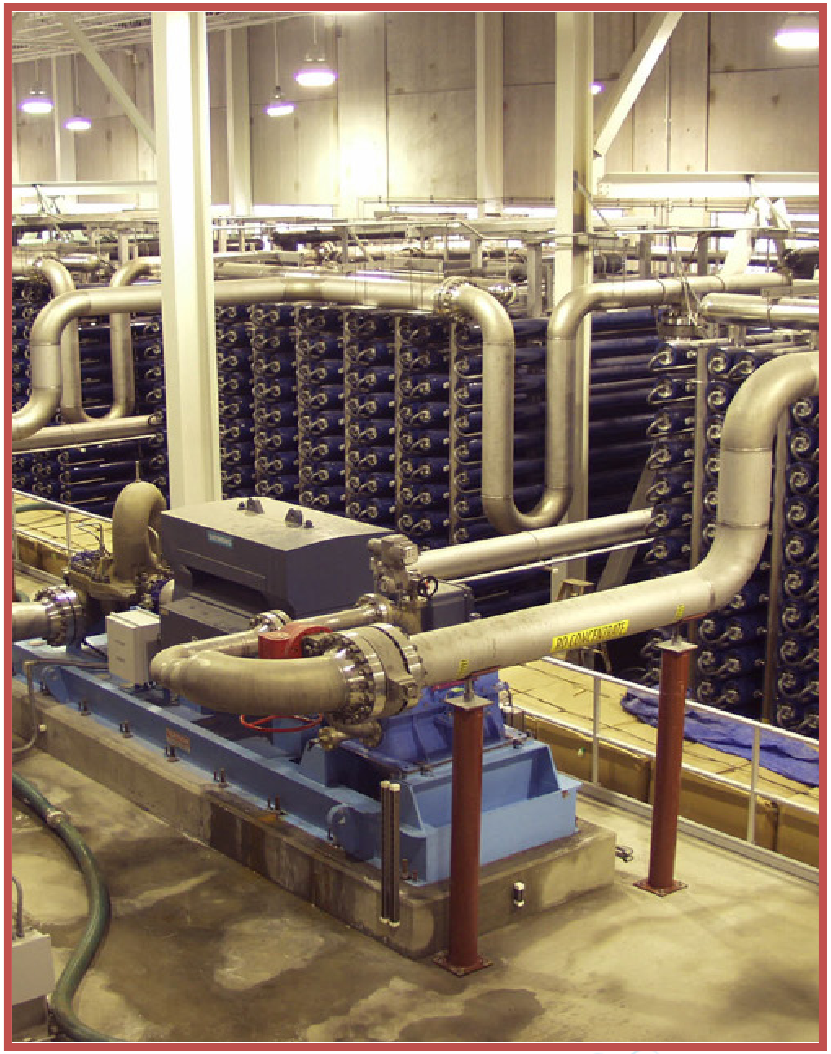


San Antonio Water System

Brackish Groundwater Desalination

Partners with TWDB

- Three-Phase Program
  - First phase on-line in 2016
  - Over 33,000 ac-ft/yr by 2026
    - ~15% of SAWS current water supply
- $411 M total cost for Phase 1
- $109 million loans from TWDB



Expansion of Brackish Desalination Plant

Energy-Water Nexus

- 50,000 ac-ft additional brackish water treatment
- Co-location of CPS Energy gas plant with SAWS desal plant
- Utility synergy and sustainability
- Mid-late 2020’s

SAWS Twin Oaks ASR Plant

Robert R. Puente
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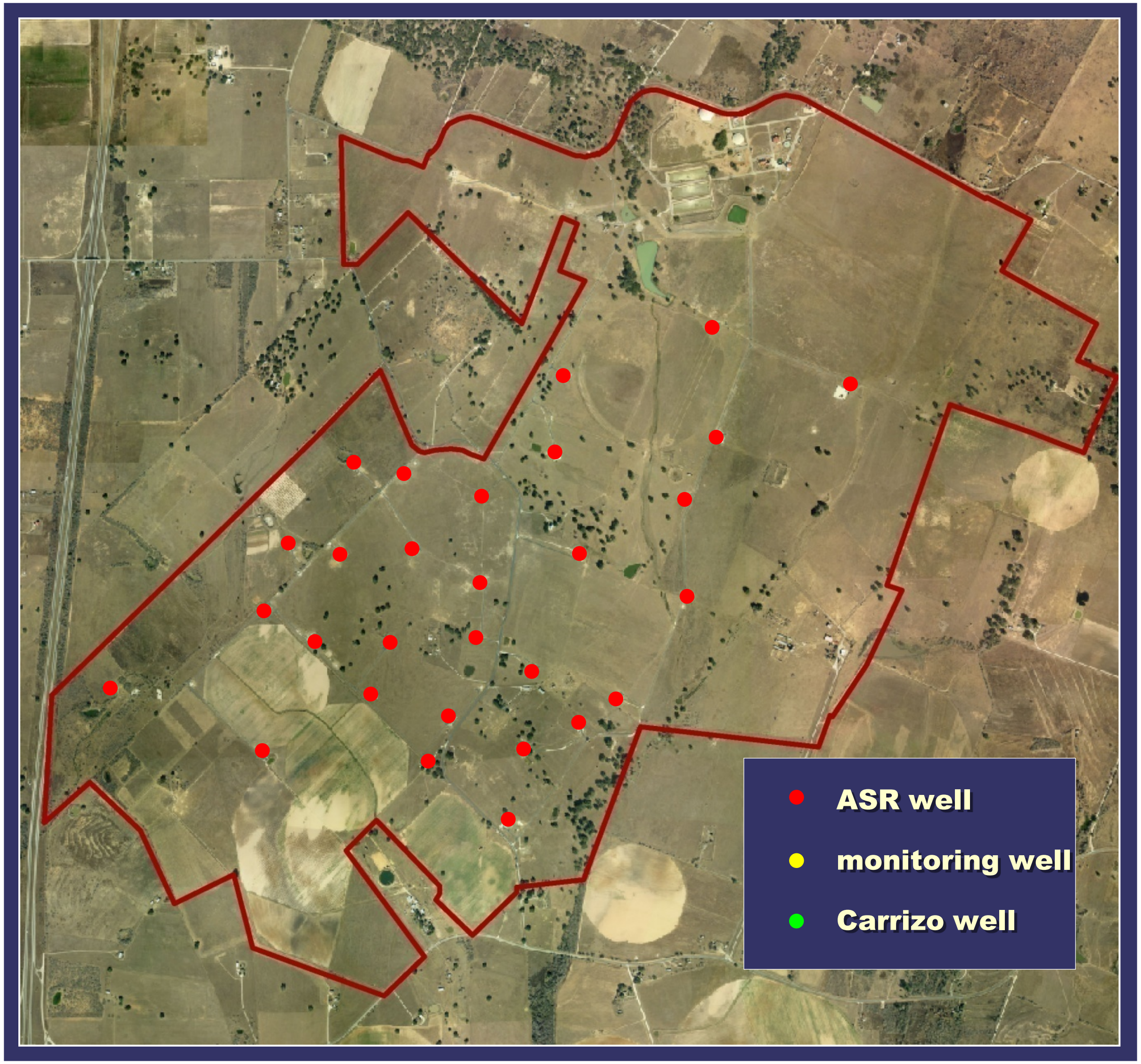
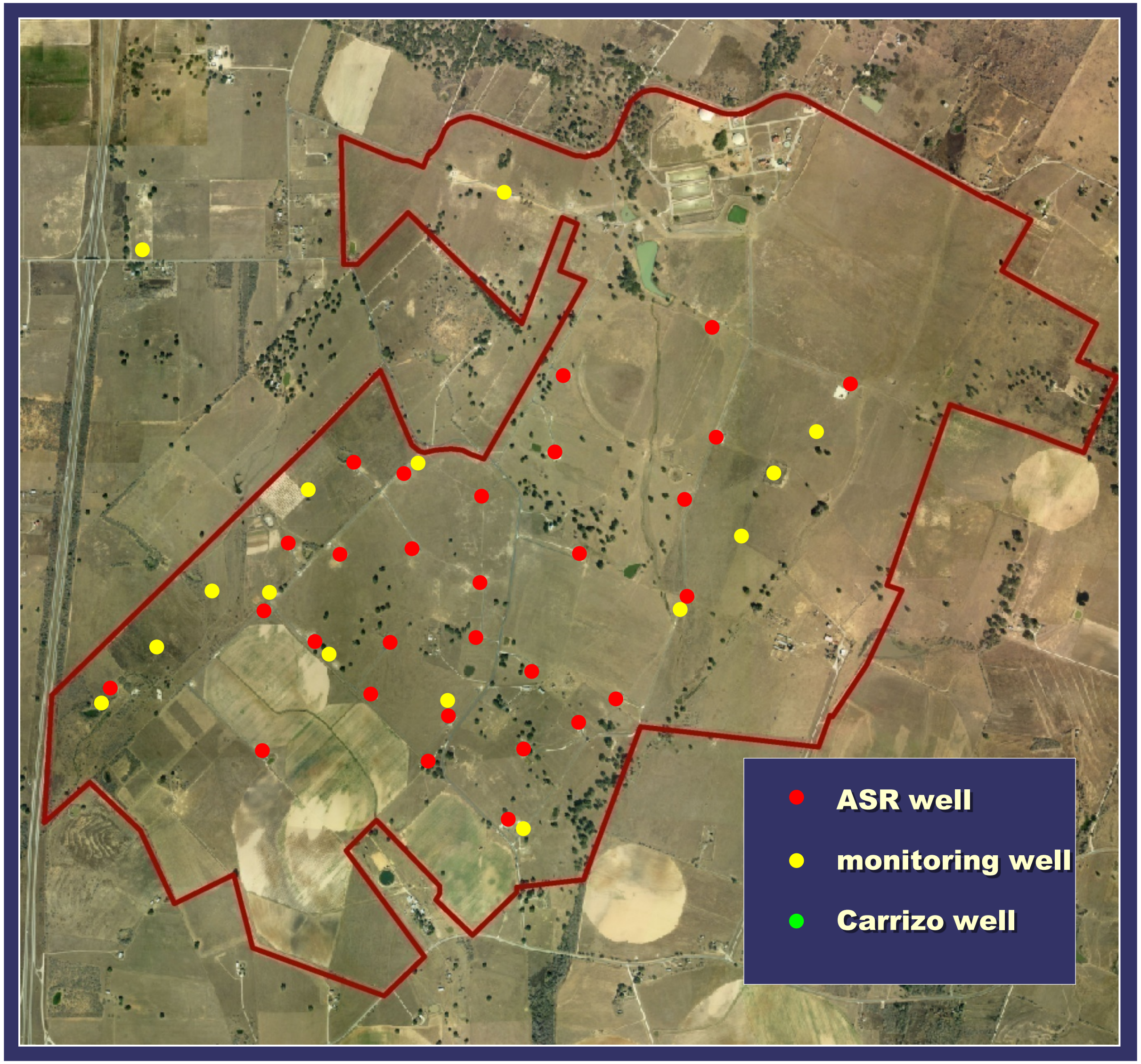
San Antonio Water System

Well Locations

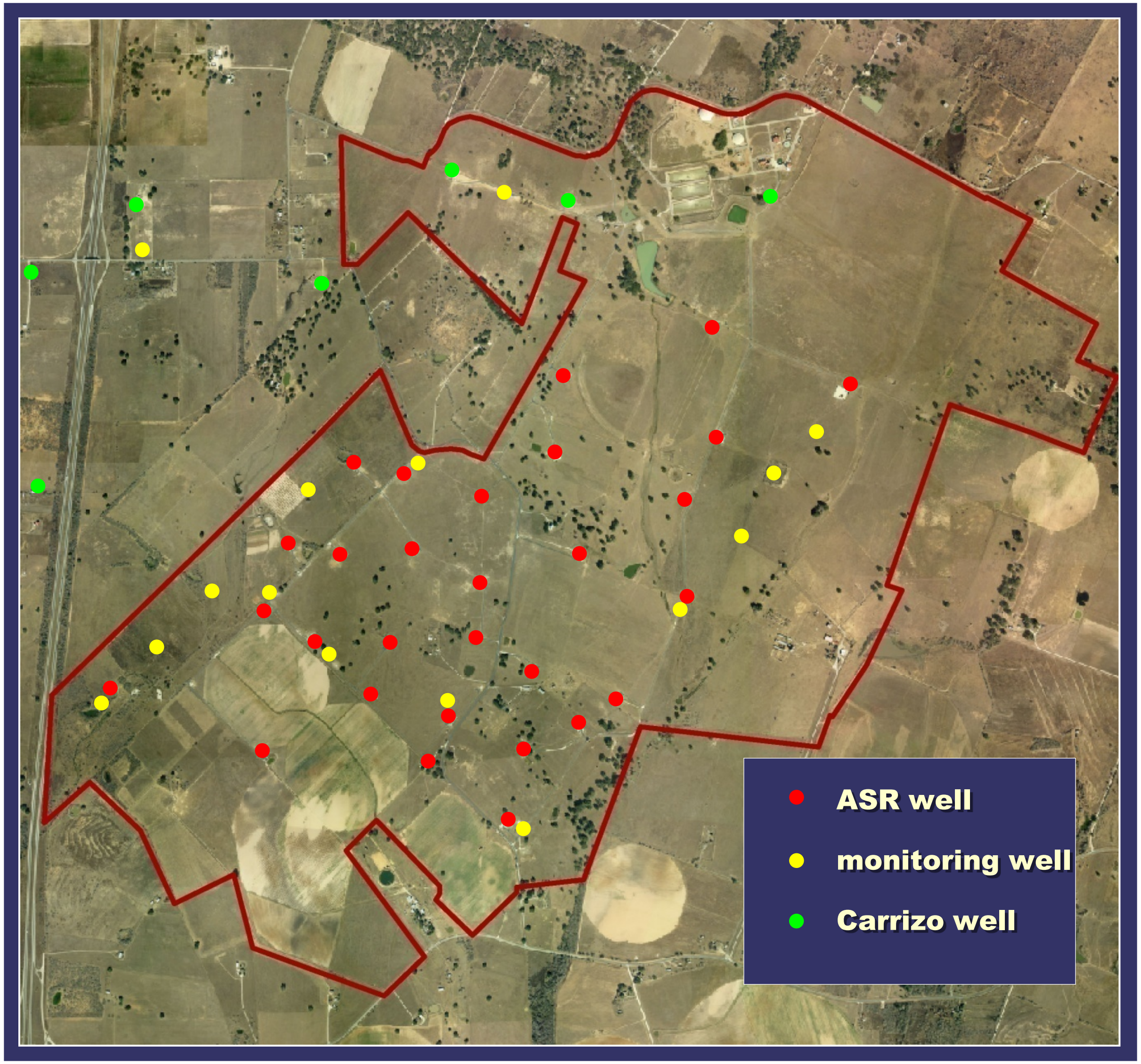


San Antonio Water System

Well Locations



Well Locations



San Antonio Water System

General Water Quality

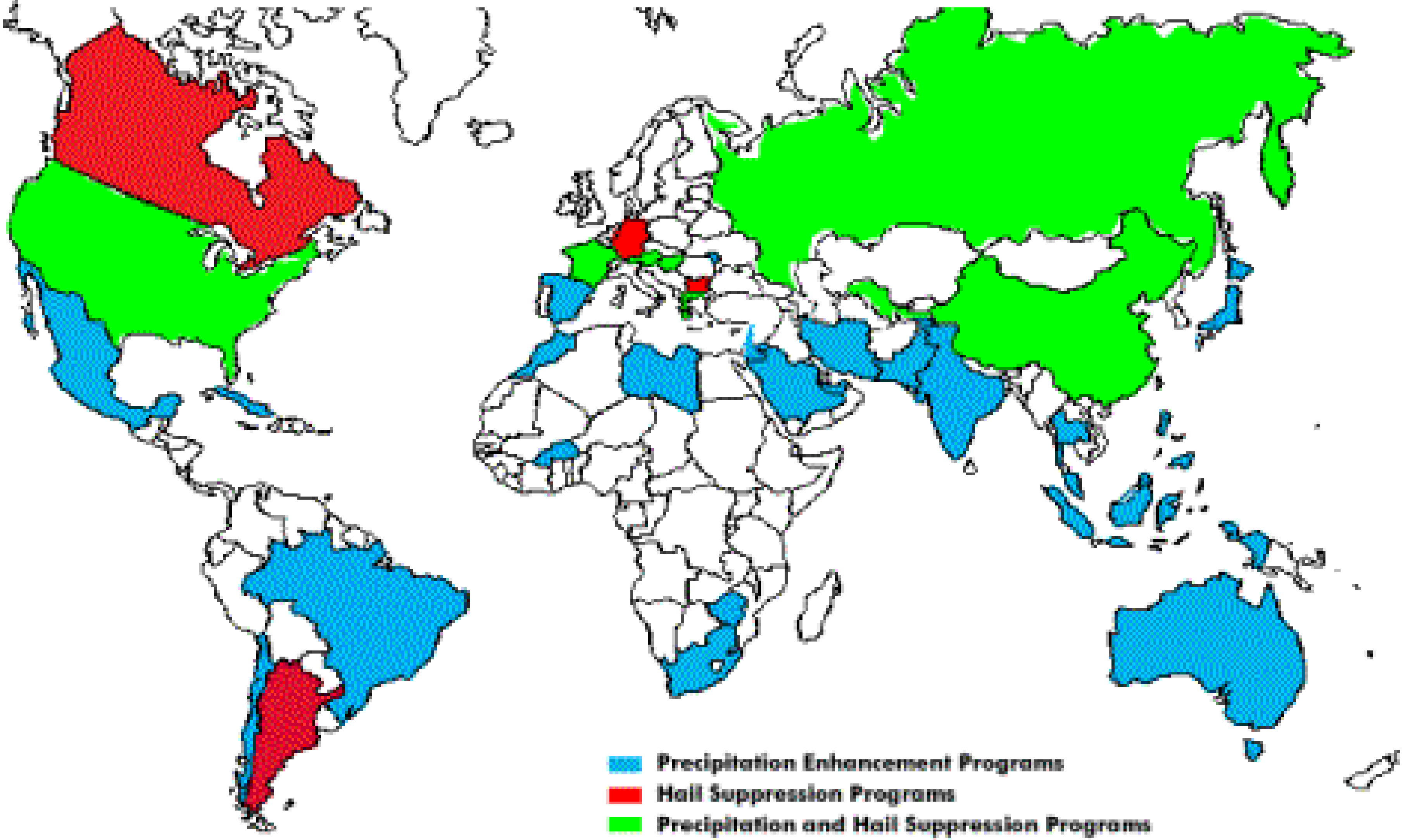
Parameter	Edwards	Carrizo	Units
Plant Flow Rate	Variable	Variable	MGD
TDS	298	296	mg/L
Total Alkalinity	218	30	mg/L as $CaCO_3$
pH	7.7	5.7	--
Calcium (Total)	76.9	11.7	mg/L as Ca^{2+}
Water Temperature	21.5	25.8	°C (temp. at which pH was analyzed)
Field Water Temperature	21.5	25.8	°C (operating temperature at facility)
Cl^-	16	34	mg/L
Mg^{2+}	16.5	5.3	mg/L
SO_4^{2-}	25	18.73	mg/L
Fe^{2+}	0.01	0.56	mg/L
Mn^{2+}	0.0003	0.018	mg/L
Dissolved Oxygen	2	0.5	mg/L
Odor	2	1.5	TON
Color	2	1.375	color units
H_2S	0	2	mg/l

Gary Walker

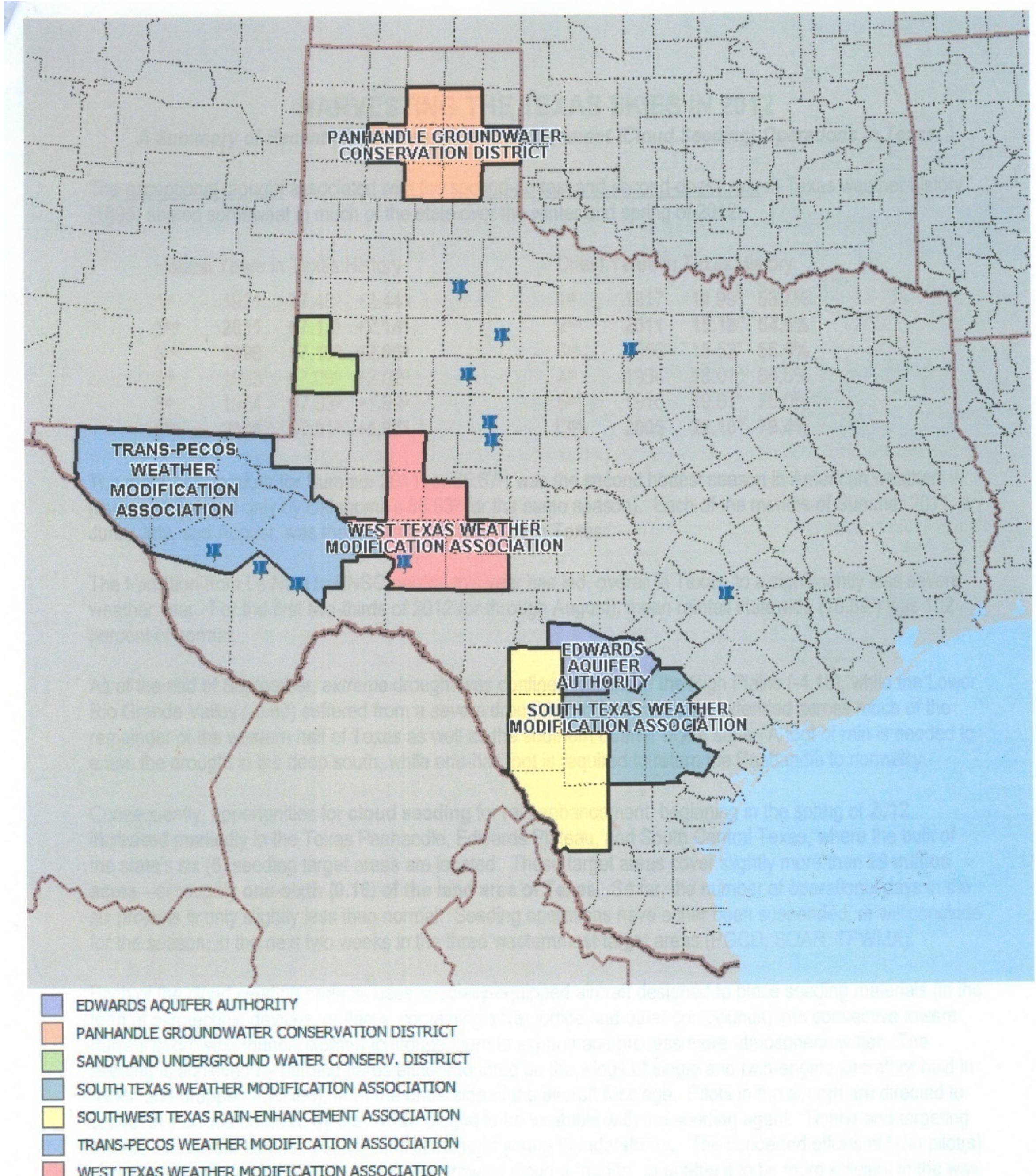
Manager

Sandy Land UWCD

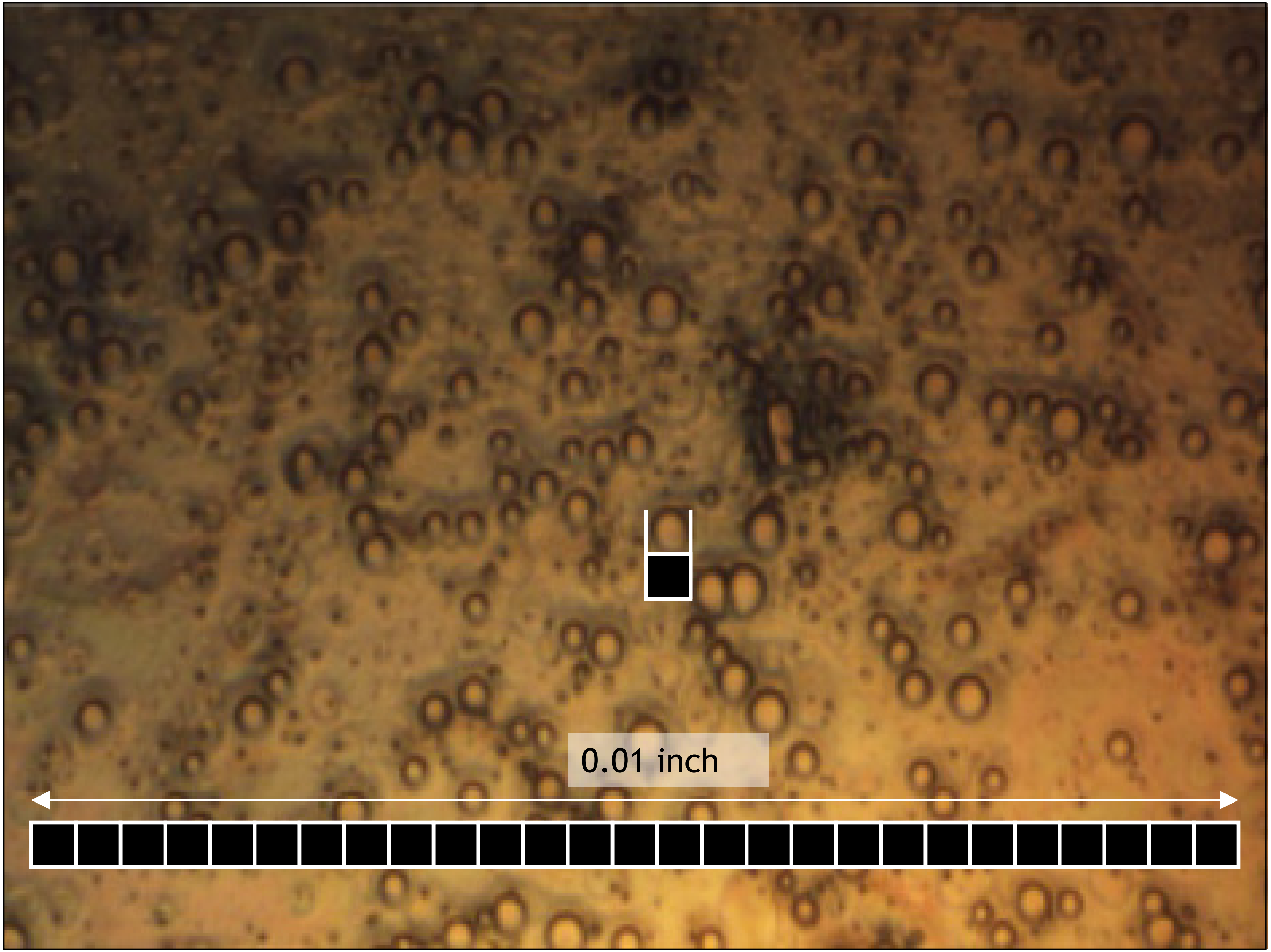
Weather Modification Around the World



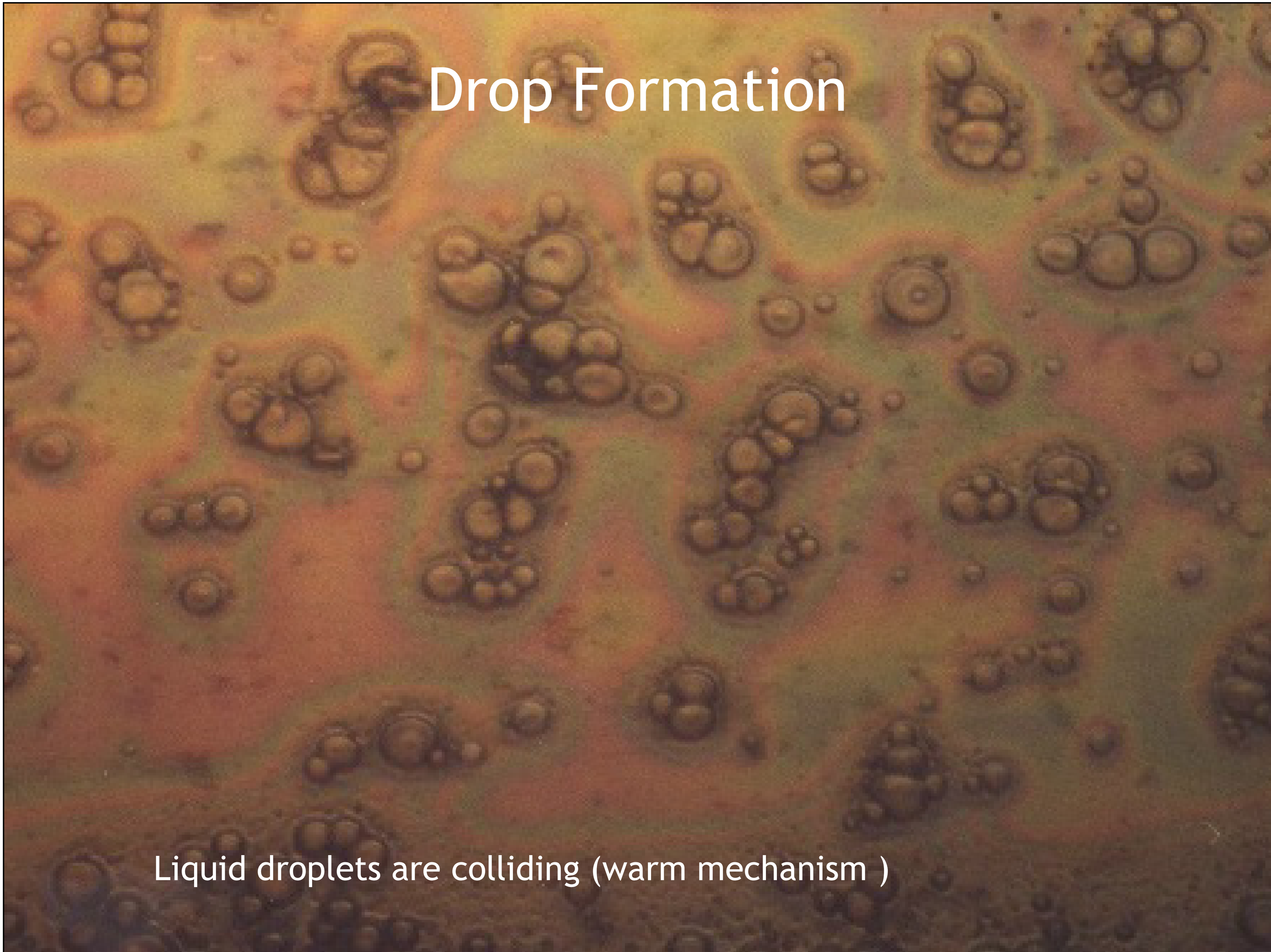
40+ countries; 66 operational programs in the USA



PANHANDLE GROUNDWATER CONSERVATION DISTRICT
TRANS-PECOS WEATHER MODIFICATION ASSOCIATION
WEST TEXAS WEATHER MODIFICATION ASSOCIATION
EDWARDS AQUIFER AUTHORITY
SOUTH TEXAS WEATHER MODIFICATION ASSOCIATION
EDWARDS AQUIFER AUTHORITY
PANHANDLE GROUNDWATER CONSERVATION DISTRICT
SANDYLAND UNDERGROUND WATER CONSERV. DISTRICT
SOUTH TEXAS WEATHER MODIFICATION ASSOCIATION
SOUTHWEST TEXAS RAIN-ENHANCEMENT ASSOCIATION
TRANS-PECOS WEATHER MODIFICATION ASSOCIATION
WEST TEXAS WEATHER MODIFICATION ASSOCIATION


0.01 inch

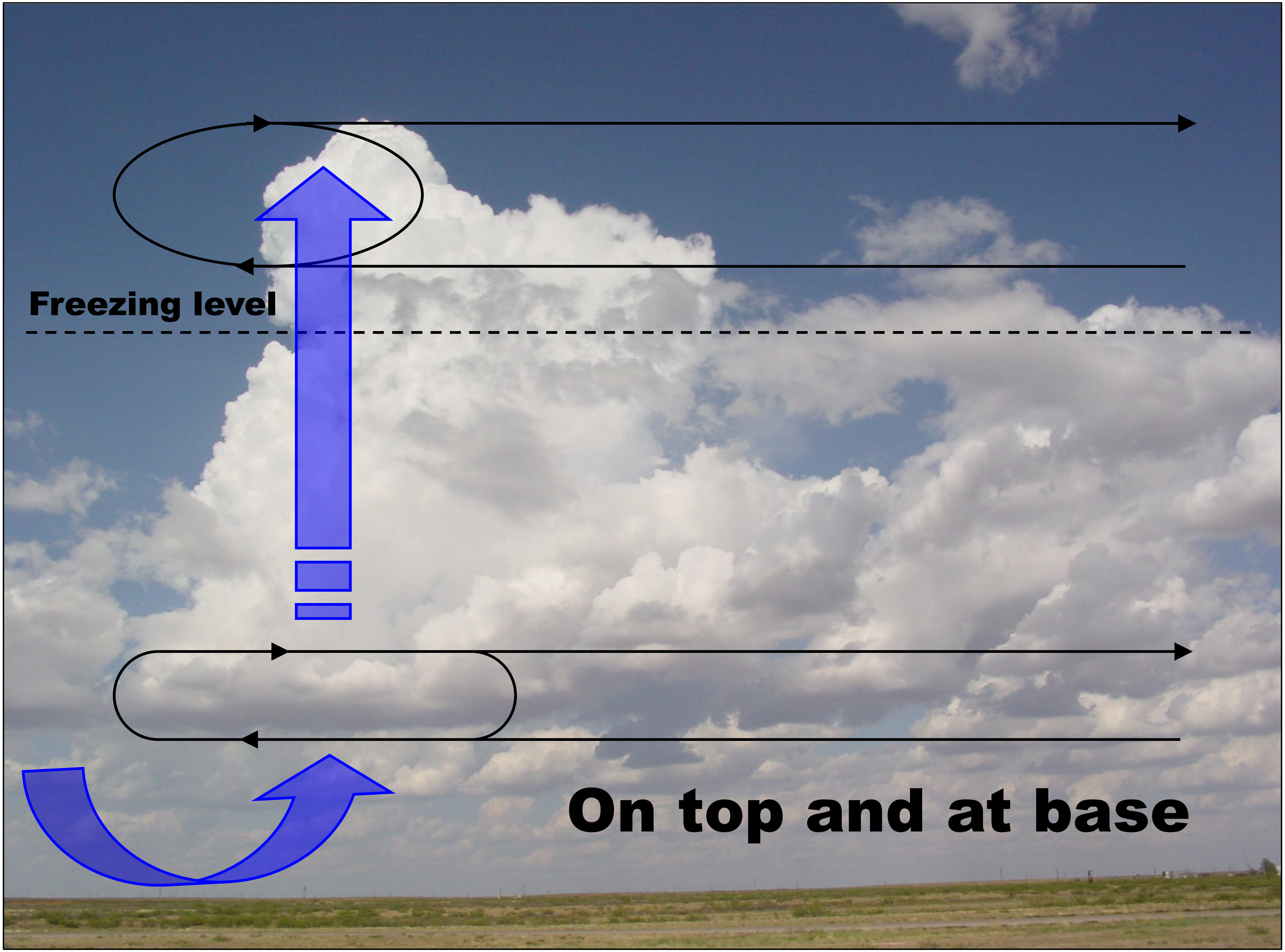
Drop Formation

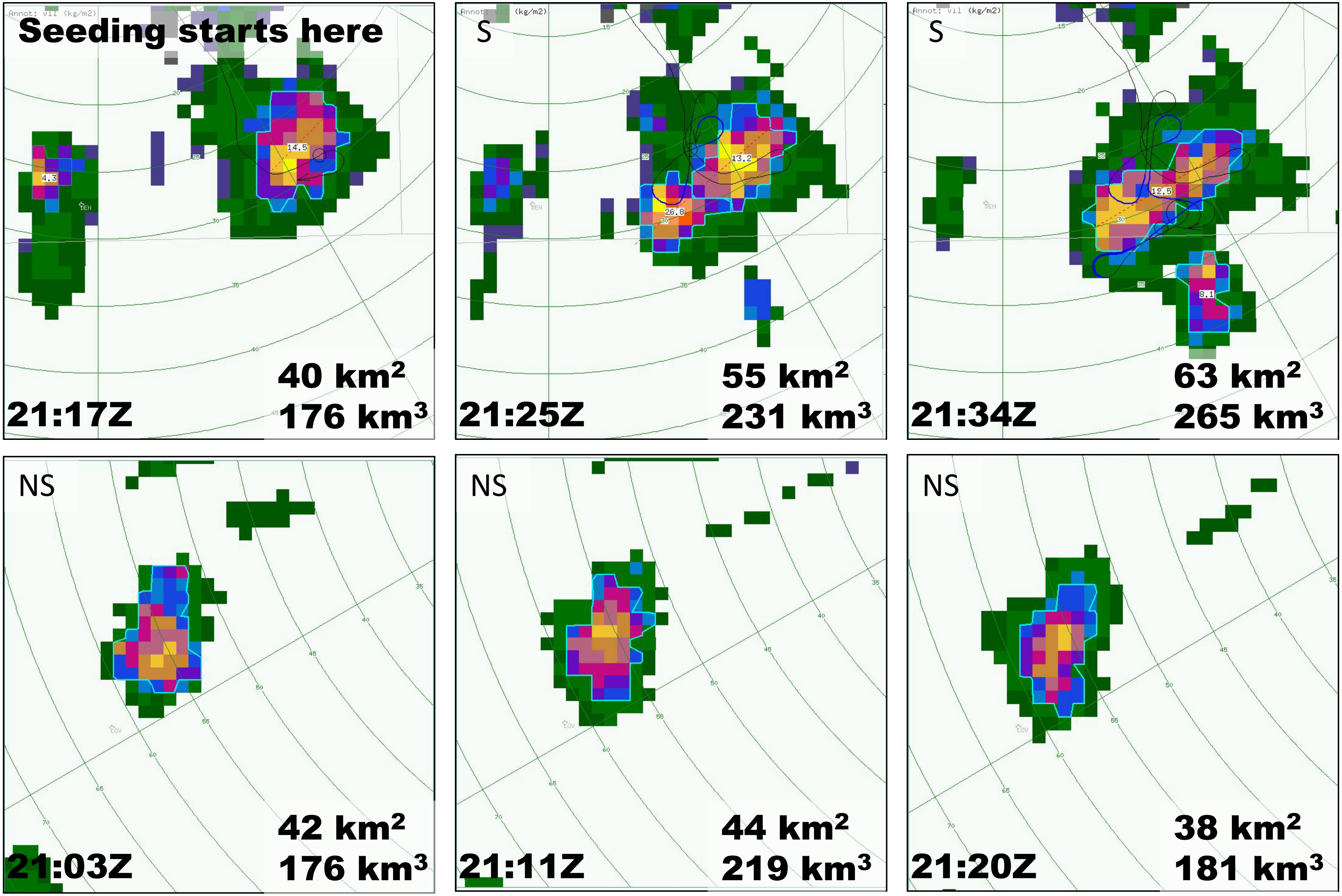


Liquid droplets are colliding (warm mechanism)

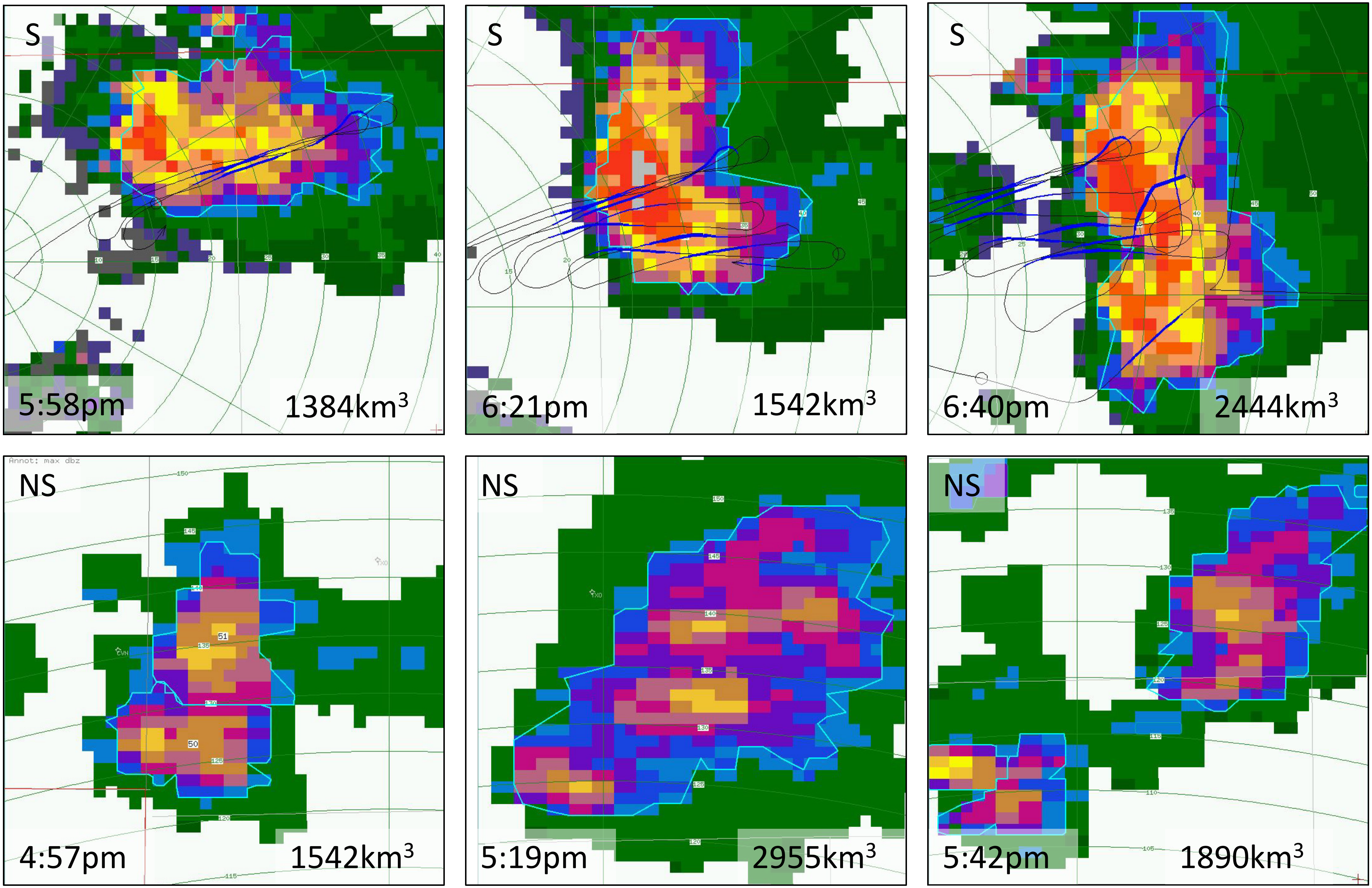
Ice Formation

A T-shape ice aggregate grows at expenses of nearby drops (mixed mechanism)

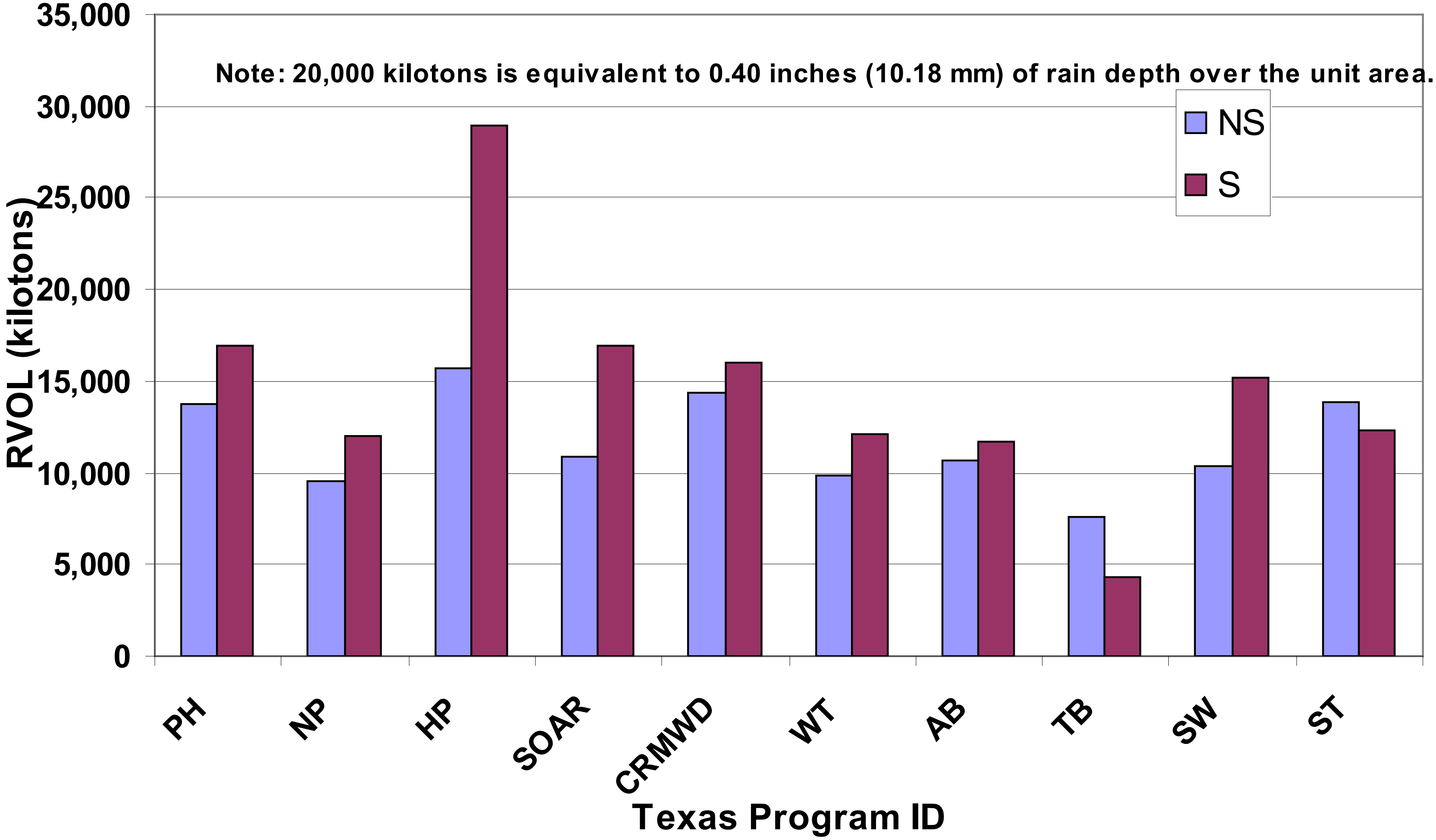

Freezing level
On top and at base


Seeding starts here
40 km²
176 km³
21:17Z
S
55 km²
231 km³
21:25Z
S
63 km²
265 km³
21:34Z
NS
42 km²
176 km³
21:03Z
NS
44 km²
219 km³
21:11Z
NS
38 km²
181 km³
21:20Z

Seeded vs non seeded



Comparison of S and NS Average RVOLS (kilotons) by Program after Correcting for Apparent Biases



Portion of Evaluation Report by Arquímedes Ruiz-Columbié of Active Influence & Scientific Management

*Results from the classic TITAN evaluation for the 14 small seeded clouds which obtained proper control clouds.

*Seeded Sample versus Control Sample (14 couples, averages)

Variable	Seeded Sample	Control Sample	Simple Ratio	Increase (%)
Lifetime	60 min	40 min	1.50	50 (33)
Area	65.5 km^2	40.6 km^2	1.61	61 (48)
Volume	257.8 km^3	164.9 km^3	1.56	56 (44)
Top Height	9.3 km	9.0 km	1.03	3 (1)
Max dBz	48.5	46.2	1.05	5 (4)
Top Height of Max dBz	4.3 km	4.8 km	.89	.11 (1)
Volume Above 6 km	93.1 km^3	84.1 km^3	1.11	11 (25)
Prec. Flux	343.5 m^3/s	176.0 m^3/s	1.95	95 (37)
Prec. Mass	1334.1 kton	478.9 kton	2.79	179 (120)
Cloud Mass	154.0 kton	90.5 kton	1.70	70 (39)
η	8.7	5.3	1.64	64 (58)

Final Comments:

1. Results are evaluated as excellent; three operational days were not evaluated due to loss of data (approximately 4 non-evaluated seeded clouds);
2. The average timing was excellent, about 83%; the average used dosage was about 45 ice-nuclei per liter, whereas the seeding duration was about 30 minutes. These three parameters are real improvements from the corresponding last year values.

QUESTIONS?

Water Conservation Via Evaporation Control

Texas 2014

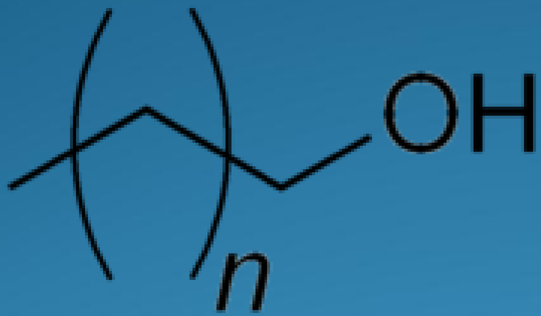
Company Background

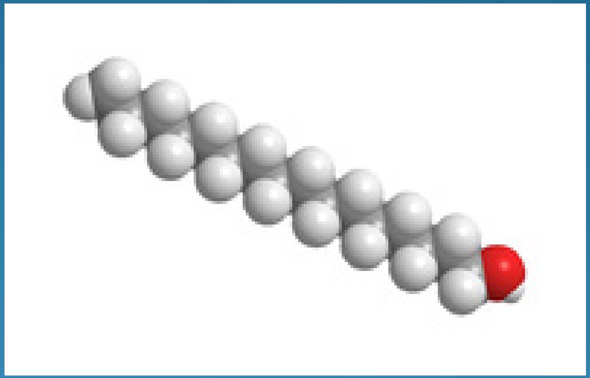
- Flexible Solution International - US Based Company in Bedford Park, Illinois and satellite office in Victoria, Canada
- Established 12 years ago and publicly listed on NYSE for 8 years.
- Three main divisions – Nanochems™, HeatSavr™, WaterSavr™
- Watersavr™ product made in the USA and warehoused in Illinois and Louisiana

What is WaterSavr™ ?

- Developed and Manufactured by Flexible Solutions under U.S. Pat 6,303,133 (global patents filed).
- The only commercially available method proven safe and economically viable for reducing evaporation on large potable reservoirs .
- Formula:
- 10% Cetyl + Steryl Alcohols (Coconut and Palm Oil)
- 90 % Calcium Hydroxide (food grade hydrated lime)
- Automatically reforms after wind, rain, waves or recreational activities.

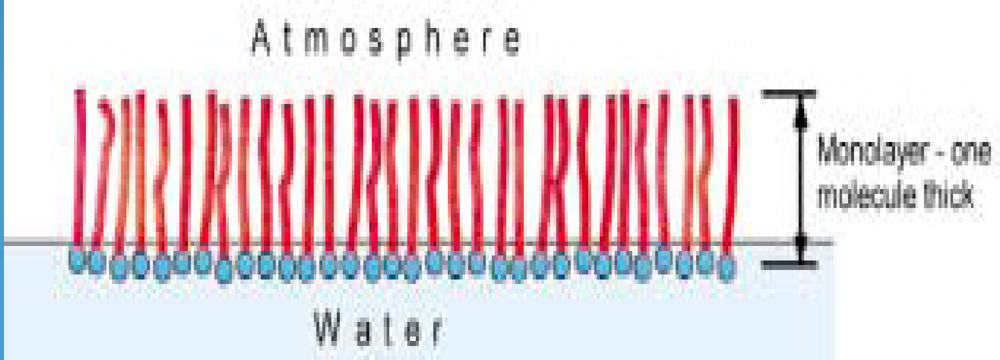
The monolayer





Hexadecanol and Octadecanol $–CH_3(CH_2)_{15(17)}OH$

Insoluble Fatty Alcohols - Natural Coconut / Palm Sources



Is *WaterSavr* Safe?

- **90% of ingredients in formula is lime - always used in Texas Water (ie: liming to balance PH levels)**
- **10% of ingredients in formula is ceryl and steryl alcohol (ie: used in first aid cream, rubbing alcohol to disinfect human wounds, etc..)**
- **WaterSavr™ is NSF ANSI 60 Approved for potable water and drinking filtration systems.**
- **Awarded for the United Nations Environment Program**

  “Environmentally Sustainable Technology” Designation
- **Fully biodegrades in 24-72 hours**
- **EPA Gold Seal registered for application to reservoirs**

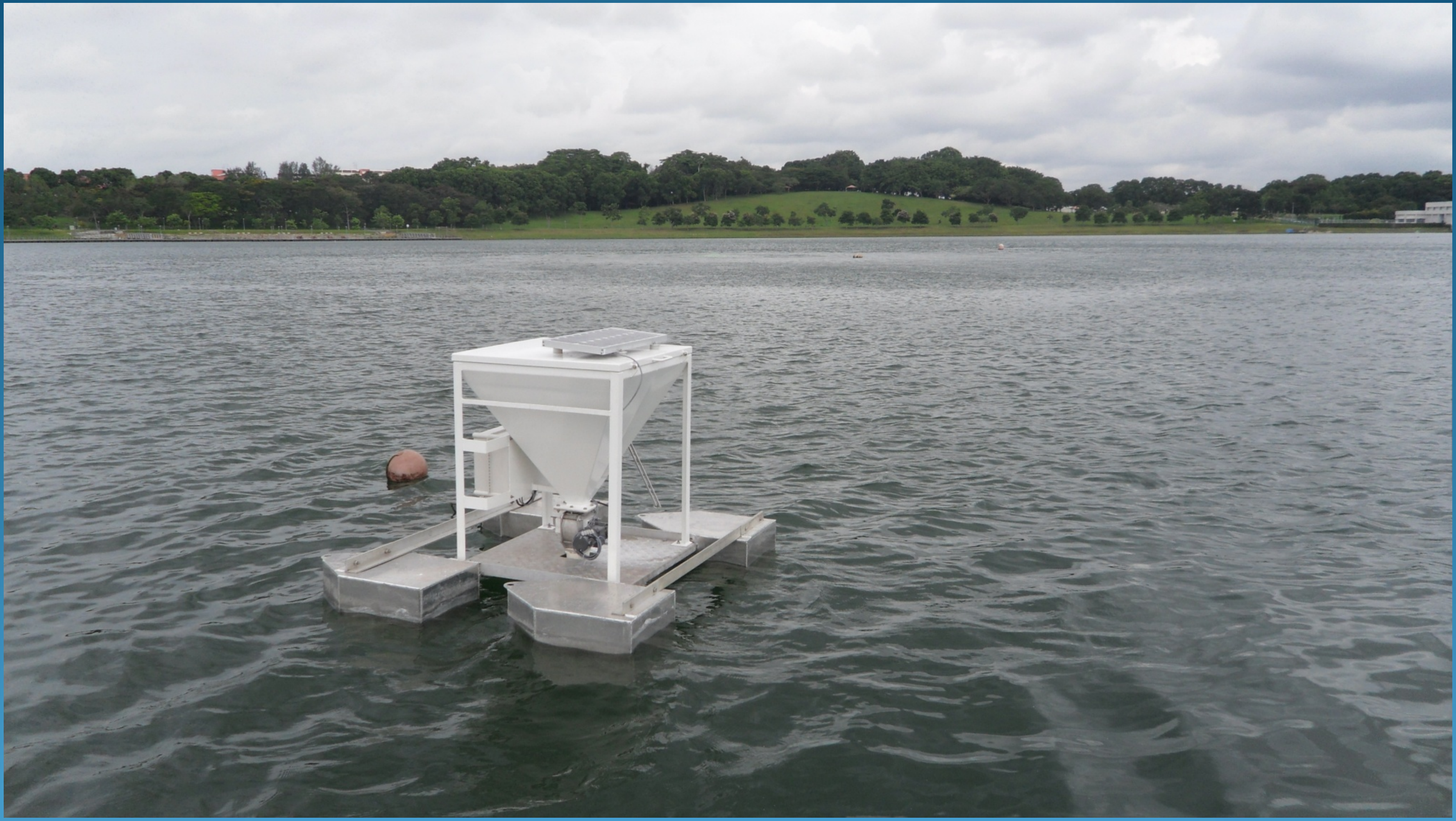
  since 2005

Demonstration of self spreading action - Photos courtesy of Coliban Water Australia

30 seconds later

60 seconds later

How Is WaterSavr™ spread?
Solar Powered anchored spreaders



Existing trials done with WaterSavr™ around the world by various water authorities

- ✓2009 - Australia, Coliban Water (near Melbourne)
- ✓2010 - Singapore, Public Utility Board (rated as one of top water authorities in the world)
- ✓2011 - Turkey DSI (Federal agency for Turkey Water)
- ✓2012 / 13 – USA – South Nevada Water Authority (Las Vegas)
- Note: Data for all trials demonstrate no water quality changes and average savings between 30% to 35%

Results of latest trial by SNWA

- Results published in AWWA Journal March 2014 edition
- Overall conclusion show no changes in water quality
- Average savings of 30% of water evaporation based on trial
- Client paid for the product on live trial and received over 500% return on investment last year (Saved over 5x the money usually spent on its water vs the cost of WaterSavr™ and its spreading cost)

Location of trial – Lake Sahara, Las Vegas

LAKES ASSOCIATION

2800 LAKE EAST DR, 891476723

Trial on Lake Sahara approved by Nevada Fish and Wildlife

- Lake Sahara has a number of ducks and birds species and even contains endangered species of fish in its Lake that protected by the Harbour Protection (ie: Razorback sucker fish)
- Lake has been constantly monitored by various authorities for the last two years while WaterSavr™ was used and spread daily and showed no changes in water quality

Numerous Water Quality parameters were checked.

AN_CAT	ANALYTE	UOM	AN_VALUE
PHOSPHATE-Total_LL	T-Phosphate as P	mg/L	0.017
MINERALS	Calcium	mg/L	90
MINERALS	Magnesium	mg/L	53
MINERALS	Potassium	mg/L	13
MINERALS	Sodium	mg/L	200
NITRATE	Nitrate as N	mg/L	<.02
NITRITE	Nitrite as N	mg/L	<.02
NITROGEN-Total	Total Nitrogen	mg/L	<.5
IRON	Iron	mg/L	<.05
PHOSPHATE-O_SPEC_LL	o-Phosphate as P	mg/L	0.0018
MINERALS	Ca 40	ppb	91090
SATURATION INDEX	Saturation Index		0.864
TDS	TDS	mg/L	1140
TEMPERATURE_CHEM	Temperature	Deg. C	22
NITROGEN-Total	Total Organic Carbon	mg/L	7.3
TURBIDITY_CHEM	Turbidity	NTU	2.24
MINERALS	Ca 42	ppb	596
MINERALS	Ca 44	ppb	1302
PH_CHEM	pH	pH units	8.41
ALGAL TOXINS	ALGAL TOXIN VALUE	ppb	< 0.5
MINERALS	Ca 43	ppb	66
HARDNESS_ICP	Hardness, Total	mg/L as CaCO3	440
MINERALS	Ca Total	ppb	91090
ALKALINITY	Alkalinity, OH	mg/L	0
ALKALINITY	Alkalinity, CO3	mg/L	3.56
ALKALINITY	Alkalinity, HCO3	mg/L	108
ALKALINITY	Alkalinity, Total	mg/L	112
AMMONIA_SPEC	Ammonia as N	mg/L	0.037
BROMIDE	Bromide	mg/L	0.156
DAPHNIA TOXICITY	Toxicity		No
CONDUCTIVITY_CHEM	Conductivity	uS/cm	1700
CS_MPN	Avg TC MPN per 100ml		>2420
CS_MPN	Avg EC MPN per 100ml		1
DAPHNIA TOXICITY	Total Organisms		29
DAPHNIA TOXICITY	# Sample Glowing		29
DAPHNIA TOXICITY	% Fluorescence	%	100
FLUORIDE_ISE	Fluoride	mg/L	1.36
FC MF	Average FC per 100ml	CFU	<100
Chlorophyll Single	Average Chlorophyll	ug/L	5.68

- Over 1,500 water quality tests were donated by SNWA
- No concerns noted from the study team

*Provided by SNWA staff

Feedback from various public stakeholders

- No complaints on aesthetics
- Lake Associations hears comments such as " The Lake is shinier than usual"; The water stays calmer" ; "It is wonderful that we are saving money and water at the same time"
- WS spreading evenly in all areas of Lake within few hours.

Cost Information

- Application rate is one pound per acre every three days
- Cost of the product is $2.50 per pound .
- Cost per acre-ft of water saved is about $100 per acre-ft.

Thank you and Q&A

Flexible Solutions

6502 S. Archer Road
Bedford Park, IL, 60501
USA

1 800 661 3560

Kyle Jensen and Tom Harrison
WaterSavr Division

Project Development, Certification, and Financing

BECC / NADB Experience

Texas Water Development Board

April 17, 2014

Border Environment Cooperation Commission

North American Development Bank

1994-2014

Topics

1. **Agency Overview and Achievements**
2. **Funding Programs and Process**
3. **Project Development Assistance Program (PDAP) and Border Environment Infrastructure Fund (BEIF)**
   - Program Overview and the transition to a Prioritization Process selection scheme
   - Prioritization Methodology – EPA Region 6
   - Prioritization Process - Challenges / Benefits
4. **Innovation and Sustainability**

Cooperation Agreement

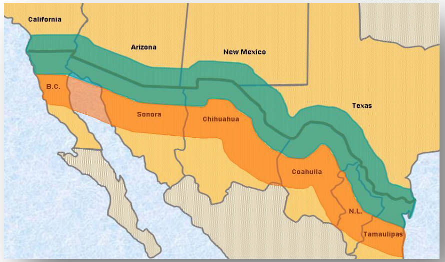
1994-2014

Agreement Signed in October 1993

Side Agreement to NAFTA

Border Environment Cooperation Commission (BECC)

North American Development Bank (NADBank)



“Preserve, protect, and enhance the environment in US-MX border region” identifying, developing, implementing and overseeing **environmental infrastructure projects.”**

A project that will “**prevent, control or reduce** environmental pollutants or contaminants, improve the drinking water supply, or protect flora and fauna so as to improve human health, promote sustainable development, or contribute to a **higher quality of life**.”

“… through a transparent bi-national process, in close coordination with **NADBank, Federal, State and Local governments, the private sector and the civil society**.”

Projects certified by BECC are financed by NADB and/or other institutions

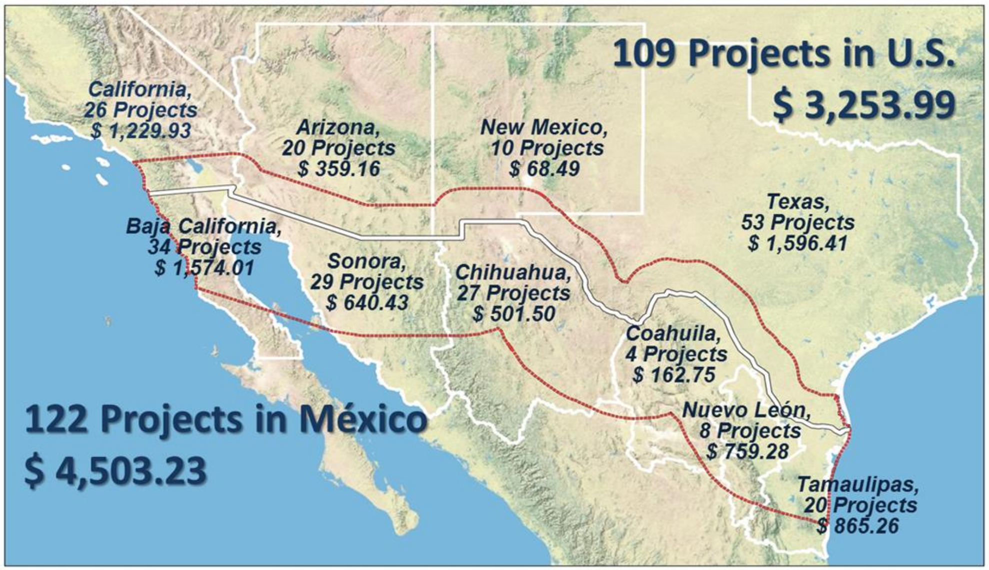
Board of Directors

A unique and innovative structure among bi-national organizations, where the general public is represented on its Board of Directors

Representative of the Border States	**Representative of the Border States**
Public member who is a resident of the border region	**Public member who is a resident of the border region**

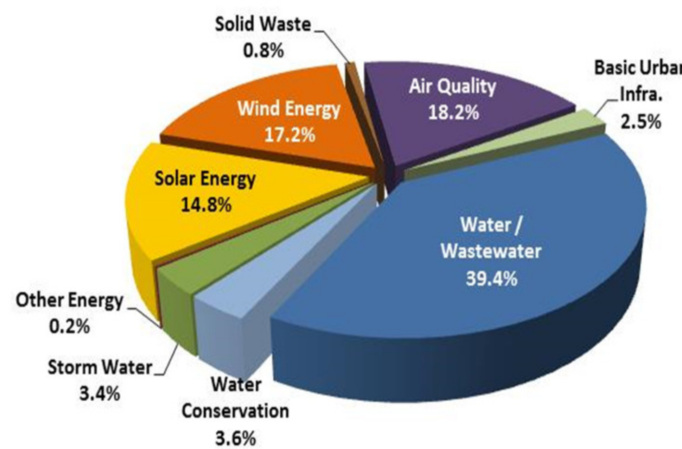
Certified Projects & Technical Assistance

As of February 28, 2014



- Certified Projects **231**
- Total estimated investment **$7.757 billion**
- Benefitted Population **17.5 million**

✓ US$1.53 billion in loans ✓ US$0.69 billion in grants



EPA-PDAP / BECC TA Programs: $44.46 million

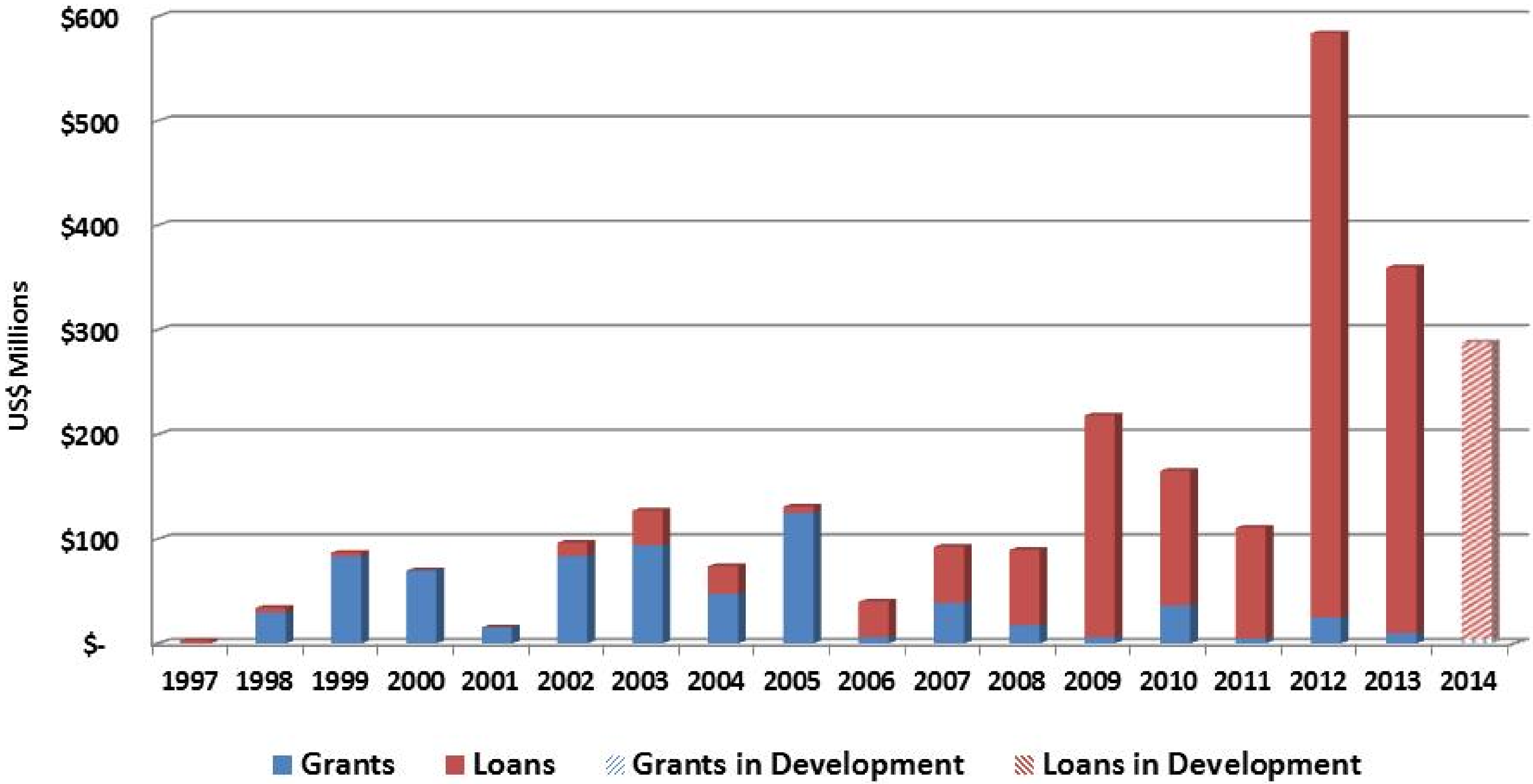
- **Communities:**
  - ✓ 72 in Mexico: $16.18 million
  - ✓ 93 in U.S.: $28.28 million
- **More than $38 million dollars in EPA-PDAP grants for project development in 160 communities.**
- **Approximately 85% of the funds have resulted in implemented projects.**

EPA-Border 2012 Program: $8.942 million

Technical Assistance to date
$53.40 million

Annual Financing Activities

Breakdown of Annual Grant & Loan Activity
As of February 28, 2014



Project Outcomes

As of December 31, 2013

- **Of the 192 certified projects financed by NADB to date:**
  - ✓ **140 – have been fully implemented**
  - ✓ **41 – are in various stages of construction**
  - ✓ **11 – are at the bidding or design stage**
  - ✓ **1 – has been cancelled**
- **These projects include:**
  - ✓ **22 WTP & 39 drinking water distribution systems**
  - ✓ **177,112 households with first-time/improved water services**
  - ✓ **58 WWTP & 94 WW collection systems**
  - ✓ **294,829 sewer connections to treatment systems that will prevent the risk of direct human contact**
  - ✓ **Wastewater treatment capacity to eliminate more than 457 MGD (20 m3/sec) of untreated or inadequately treated discharges into rivers and streams.**
  - ✓ **Wastewater treatment coverage in Mexican border region increased about 27% to over 80%**

Project Outcomes

As of December 31, 2013

- **9.3 million square meters of dirt roads paved and 187 km of roadway improvements, resulting in better traffic circulation and reduced CO_2 emissions**
- **1 port of entry reducing idling times, fuel consumption and exhaust emissions**
- **16 landfills built/expanded & 12 dumpsites closed**
- **759.7 MW of new solar and wind energy capacity installed, which will contribute to the displacement of an estimated 1.5 million metric tons/yr. of CO_2 emissions**




Programs, Sectors and Project Types

1994-2014

BECC / NADB PROGRAMS

Technical Assistance

- Support project development with regards to the closing of financing, project design, related development studies, and project bidding.
- Border 2012 -2020 and Special Grants

Construction Funds

- Loans offering competitive fixed or floating rates
- Focus on financial viability (credit risk analysis, source of repayment, collateral and guarantee structure)
- Community Assistance Program (CAP grant) – Financed with NADB's retained earnings; max grant $500,000 priority for DW, WW, SW, and water conservation
- BEIF grant – Funded by EPA; only available for prioritized projects.

Capacity Building

- BECC and NADB provide training to project sponsors for institutional strengthening through Sector workshops and Utility Management Institute.

Eligible Sectors

Water and Sewage

- Potable water treatment plants
- Wastewater collection & treatment
- Water conservation
- Stormwater management

Waste Management

- Landfills
- Recycling
- Equipment
- Toxic waste disposal

Air Quality

- Street paving
- Pavement rehabilitation
- Mobility

Clean & Efficient Energy

- Renewables: Wind; Solar; Hydroelectric; Geothermal;
- Alternative fuels: Bio-fuels; Methane
- Equipment replacement (i.e. public lighting)

Public Transportation

Ports of Entry

New Sectors

- Production of goods/services to enhance environment

Certification and Financing Process

Project Development Cycle

Planning
- Project Scoping
- Preliminary Engineering
- Technology Selection
- Site/Resource Assessment
- Financial Planning

Acquisition and Design
- Environmental Authorization
- Land and ROW acquisition
- Design

Financing
- Technical/Legal/ Financial Due Diligence
- Formal Credit Proposal
- Credit Committee

Certification
- Criteria Compliance Evaluation
- Results Estimates
- Technical Review Committee
- 30-day comment period
- Board review and decision

Implementation
- Execute Financial Agreements
- Procurement of Construction/ Supervision
- Implementation

Close-out
- Validation of inputs/ outputs
- Evaluation of results achievements
- Reporting
- Feedback Loop

	Week	1	2	3	4	5	6	7	8	9	10	11	12
Project Certification and Financing Approval Process													
1	Application for Certification and Financing	X											
2	Initial review of scope, eligibiilty and applicable regulations												
3	Project Documentation Review												
4	Evaluation of compliance to certification criteria												
5	Quantification of potential environmental benefits												
6	30-Day Public Comment												
7	Board Review												
8	Recommendation to the Board									X			
9	Board Decision												X

Influenced by quality and completeness of information.

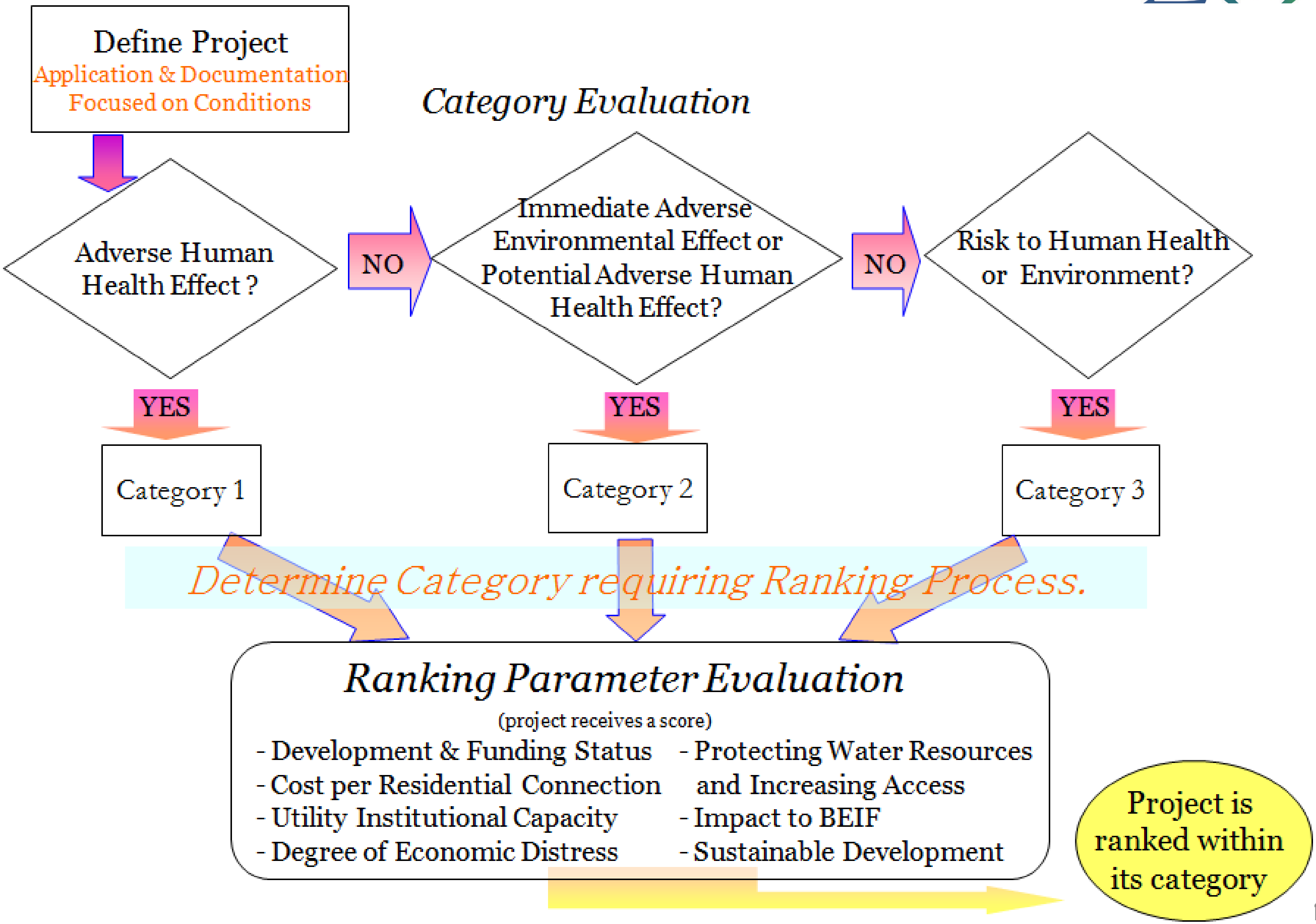
EPA US-Mexico Border Program

EPA OIG Report Trigger: Program's Unliquidated Balance – concerns expressed by EPA OCFO and some members of Congress (FY08 appropriation bill states, "…the Committee is very concerned that EPA's Mexico border program is carrying forward nearly $300,000,000 in Unliquidated or unobligated balances for priority projects.")

Success through Effective Program Management

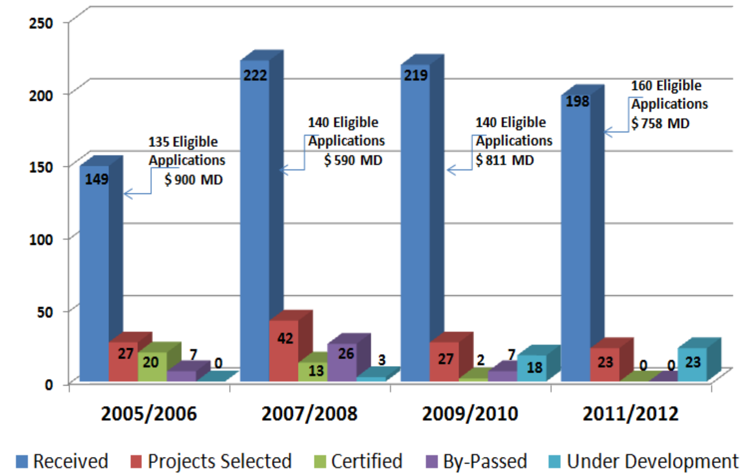
- **Biannual Project Prioritization Process** (Pre-OIG) **–** identifies needs and prioritizes funding to address the most severe environmental and human health conditions; provides a pipeline of needs.
- **By-pass and Schedule Provision** (Pre-OIG) – establishes new management controls including the development of schedules and quarterly review meetings (5 ½ year)
- **Policy for US-Mexico Border Program (OCFO)** (Pre-OIG) **–** aims to optimize project completion times, reduce program balances and clarify management controls.
- **Transition Plan** (Post-OIG) **-** defines an approach to decouple grant awards for project planning/design and construction to develop a portfolio of projects ready for construction investment, as appropriated.

Prioritization Methodology – EPA Region 6



Prioritization Project Selection Process – Challenges experienced with this selection approach

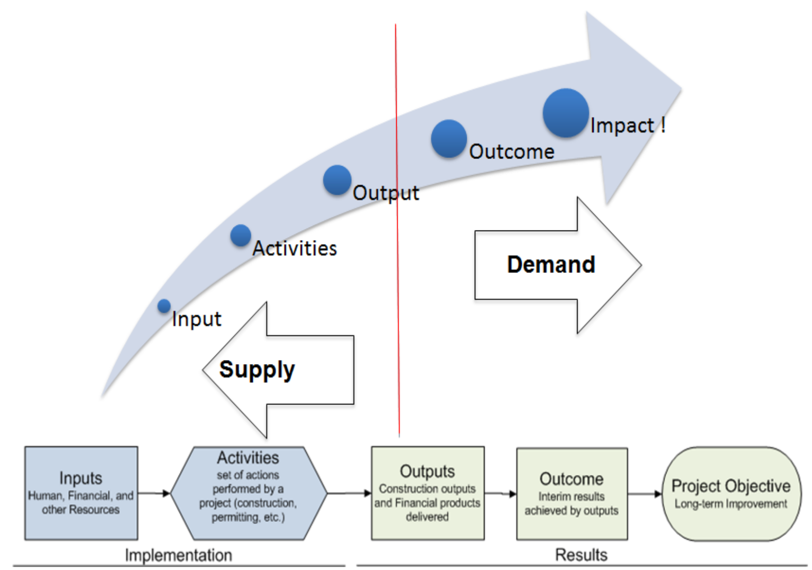
- The process is very resource intensive – 8 to 12 months to complete.
- Conditions are not consistent throughout the region, therefore region-specific approaches are necessary.
- Critical to have funding partner participation; challenge is with unique application document/cycles as well as development periods.
- Unsatisfactory quality and/or availability of documentation (conditions, level of development)
- Fewer than 1/3 of the applications submitted have accessed BEIF, due to insufficient funding availability.
- All projects if not addressed can have serious consequences.



05/06	$ 1030 MD	$ 141 MD	$ 163 MD	0
07/08	673 MD	$ 252 MD	$ 107 MD	$ 8 MD
09/10	$ 1130 MD	$ 249 MD	$ 9 MD	$ 62 MD
11/12	$ 841 MD	$ 193 MD	TBD	$ 193 MD

Prioritization Project Selection Process – Benefits achieved for the Program

- **Fair and competitive selection process.**
- **Documentation of needs, resulting in a demonstrated justification for program funds.**
- **Creates an opportunity to focus resources on a specific sub-set of projects and to develop a pipeline of construction-ready projects.**
- **Supports a strategy of "Managing for Results" - Valuable transition from supply- to demand-based selection.**
- **High Impact Projects - Program investments target most severe environmental and human health conditions.**



EPA US-Mexico Border Program

Border Environment Infrastructure Fund (BEIF)

As of February 28, 2014

- **US$648 million in funds provided by EPA for projects since program inception; 89% has been allocated to date**
- **US$601 million in approved BEIF grants for border water and wastewater projects:**
  - ✓ **99% has been contracted**
  - ✓ **95% has been disbursed**
- **Of the 107 projects with contracted BEIF funds, 84 have been completed and are in operation**
- **Approximately $46 million available for 26 projects are currently under development**

1994-2014

Promoting Sustainable Practices and Investments

- Infrastructure Planning
  - ✓ Green Building Practices

- Demand Reduction
  - ✓ Water and Energy efficiency
  - ✓ Enhanced Re-Use capability
  - ✓ Conservation and Drought management

- Capacity Strengthening
  - ✓ Sustainable rate structures & reserve practices
  - ✓ Energy Audits
  - ✓ Outreach and Education

- Clean and Renewable Energy: Wind, Solar, Biomass



Public-Private Partnerships

Expanding the public sector toolkit

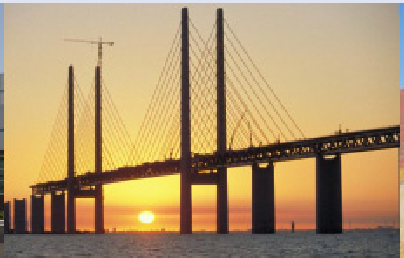
Strategic Partnerships, Inc.
For more information contact us at:
(512) 531-3900
www.spartnerships.com

Where we are in Texas

Stressors:

Population Growth | Oil & Gas Industry | Persistent Drought

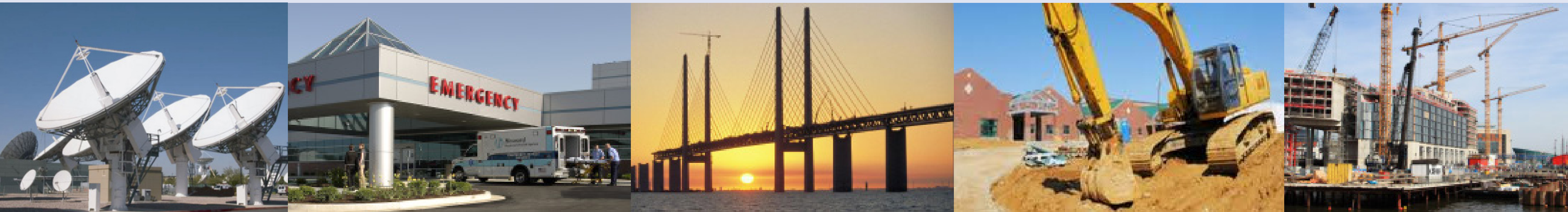
- **$2 Billion in SWIFT funds**
- **Approximately $53 billion in projects listed in 2012 State Water Plan**
- **P3s offer an attractive funding option**

What exactly is a P3?

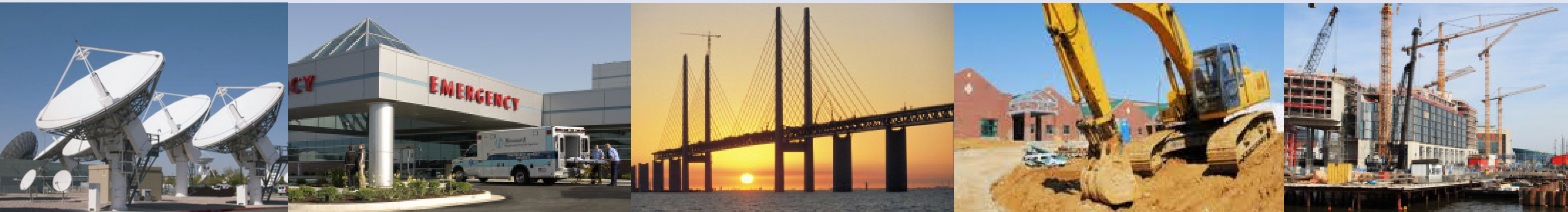
A contractual agreement between a public agency and a private sector entity

- **Many different models of P3s**
- **Skills and assets of partners are shared**
- **Each party shares in the risks and rewards**
- **Private sector partner provides capital and assumes majority of risk**



P3s offer benefits to both partners

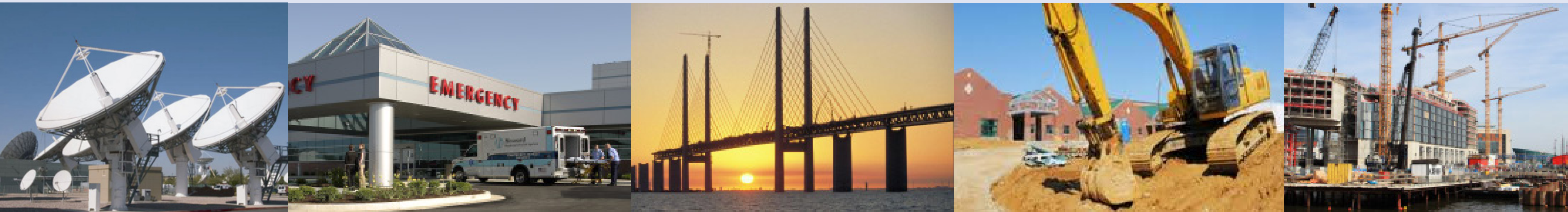
To Public Sector	To Private Sector
Provides needed capital	Long-term ROI with trusted partner
Critical projects can begin sooner	Opportunities often large in size & scope
Monetize non-revenue producing assets	Expertise allows costs to be minimized
Reduce service cost	Contribute to “greater good”
Transfer risk to private partner	



Calculating public project costs

Costs calculated - traditional vs. P3s

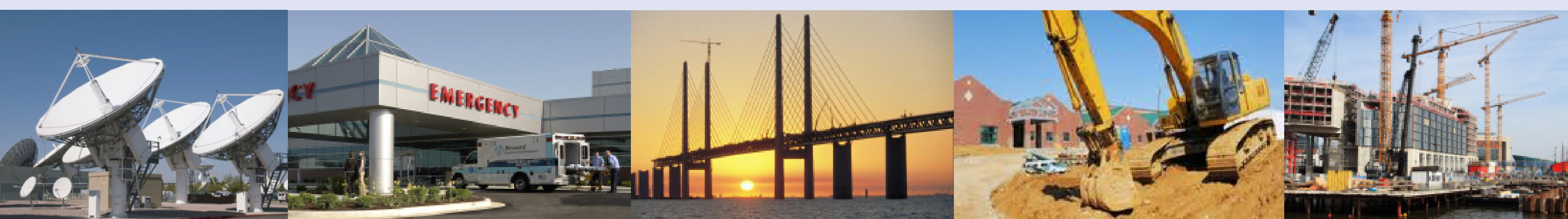
Costs	Traditional	P3
Capital expenditures	✓	✓
Design & construction	✓	✓
Maintenance & operations	Sometimes	✓
Utilities & energy	Sometimes	✓
Lifecycle refurbishment	Sometimes	✓
Risk	Rarely	✓



Common misconceptions

Commonly held misconceptions about P3s create barriers for successful implementation.

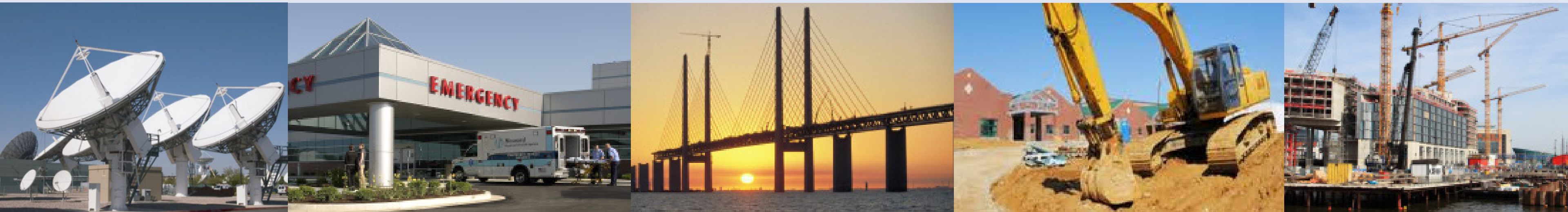
Same as privatization/outsourcing	Results in loss of public sector jobs
Government loses control of services	Only apply to transportation projects
Only for new projects	More expensive than traditional financing



Greatest threats to P3s

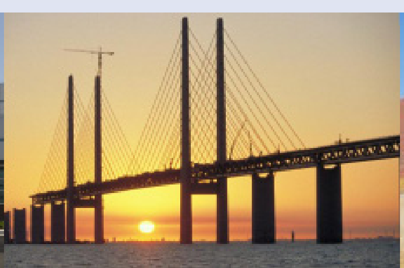
Many obstacles must be overcome in order to create a more receptive environment for P3s.

Reluctance to lead	Fear of risk	Lack of understanding
Complicated models	Cultural differences	Few guidelines
Negative media attention	Political interference	



What public officials & private partners want from each other

Public officials want potential P3 partners to…	Private sector partners want public officials to…
Share expertise during planning	Carefully select & evaluate projects
Understand issues facing public sector	Hire outside P3 expertise
Ask questions until a clear understanding	Commit before engaging potential partners
Accept transparency mandates	Understand private partner requirements
Not ask for/expect unrealistic profit margins	Provide as much information as possible
Compete fairly & ethically	Write financially sound & clear solicitations
	Not change rules once the process starts

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