

Production & Treatment

Twin Oaks Aquifer Storage & Recovery System Overview

Jeff Haby



16 March 2009



Agenda

- Conservation is the foundation
- What is ASR?
- Where is it?
- Benefits of ASR
- Treatment Facility
- South Bexar Carrizo Production
- Mitigation
- Q & A

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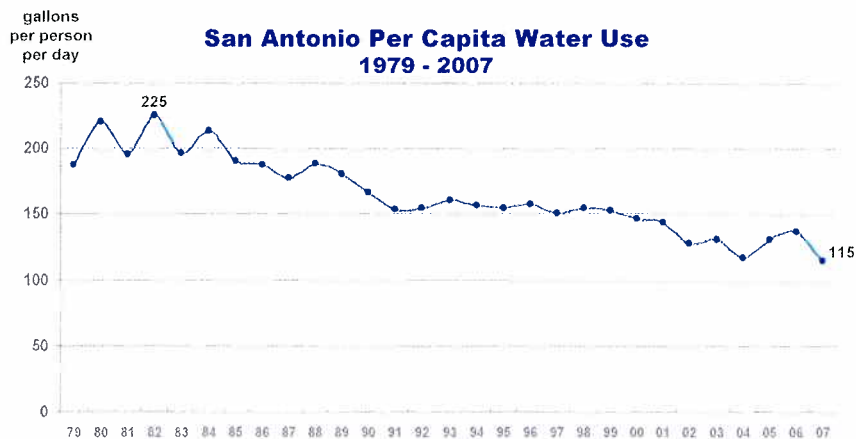


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San Antonio Water System

What is an acre foot of water?

- It is enough water to cover one acre of land with 12 inches of water or,
- One acre foot of water is enough for 2 families of four for a year or,
- An acre foot of water is equivalent to 325,851 gallons of water

It All Starts With Conservation



What is Aquifer Storage and Recovery?

- Environmentally friendly method of storing Edwards Aquifer drinking water in the Carrizo-Wilcox Aquifer.
- Water stored during rainy seasons will be used during dry, hot months.
- Maximizes the pumpage allocations from the Edwards throughout the year

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Why an ASR in San Antonio?

- Allocations from Edwards Aquifer are limited by legislation
- During wet periods there is no method to store allocations that we do not use
- There is no carryover or credit provided from the Edwards Aquifer Authority
 - If we don't use it, we lose it

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Benefits of ASR Project

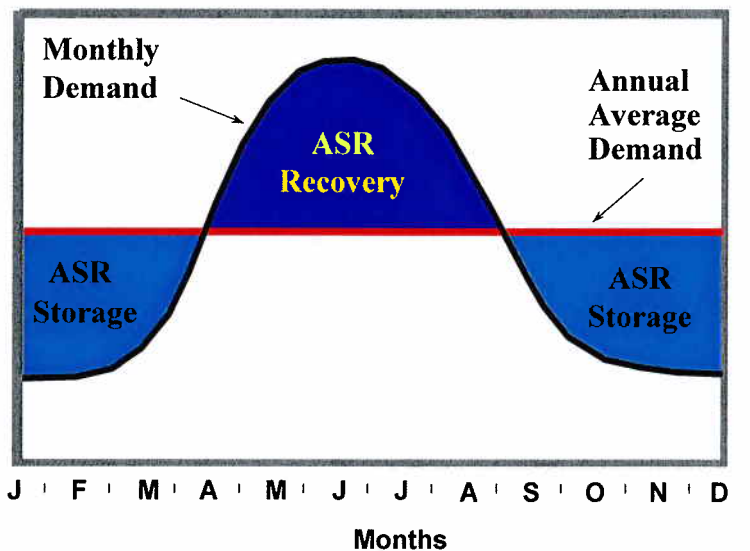
- Storage management tool
 - Allows for flexibility and management of water resources throughout the year
- Less water evaporates when water is stored underground
 - When compared to a surface reservoir
- Is less vulnerable to contamination
- Much of the land directly above the ASR can continue its prior use

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Seasonal Storage



ASR Project Site



Aquifer Storage and Recovery Wellfield



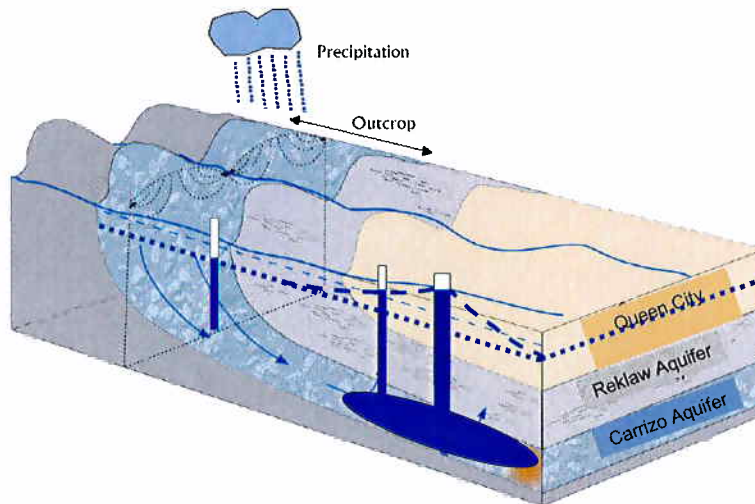
Phase II

- 34 MGD Expansion
- 12, 20" Wells
- Integrated Into Existing WF
- 7.5 MG Tank

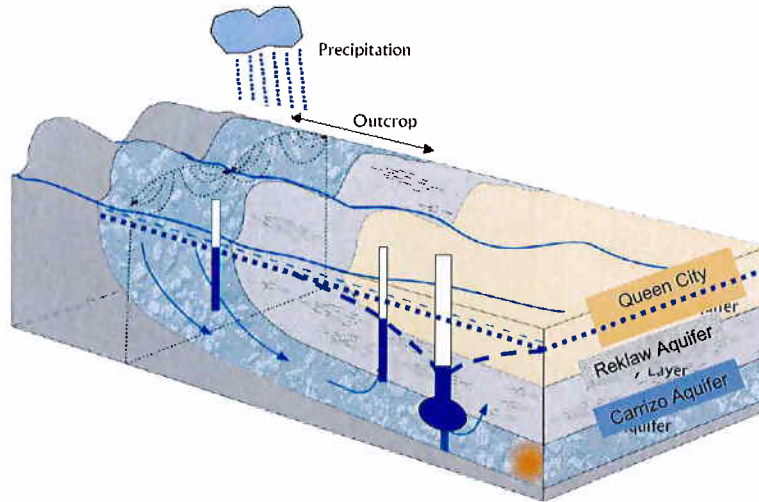
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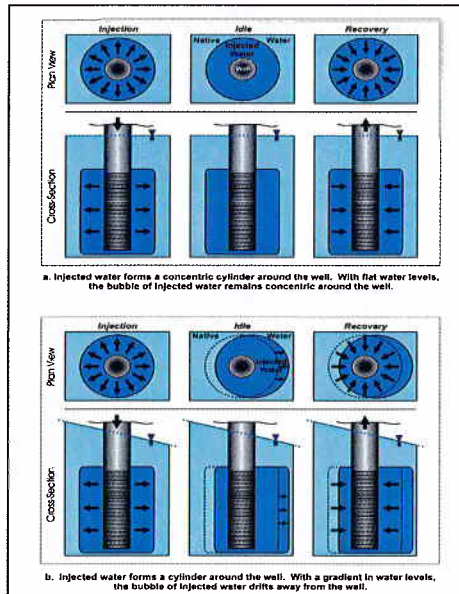
How it Works - Injection Mode



How it Works - Recovery Mode



The "Bubble"



ASR Water Production

- In accordance with an agreement with the Evergreen Underground Water Conservation District two acre-feet of native Carrizo groundwater can be produced for every surface acre owned
 - SAWS owns 3,200 surface acres
 - Able to produce 6,400 acre-feet of water from the Carrizo Aquifer

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Local Carrizo Production Wells

- Three existing wells (submersible pumps)
- Four offsite wells currently being drilled



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Twin Oaks Treatment Facility

- Phase I included a 30 MGD water treatment facility
- Native Carrizo high in iron and manganese
- Lower hardness, alkalinity and pH
- Loop testing determined compatibility of various water supplies – drove the design

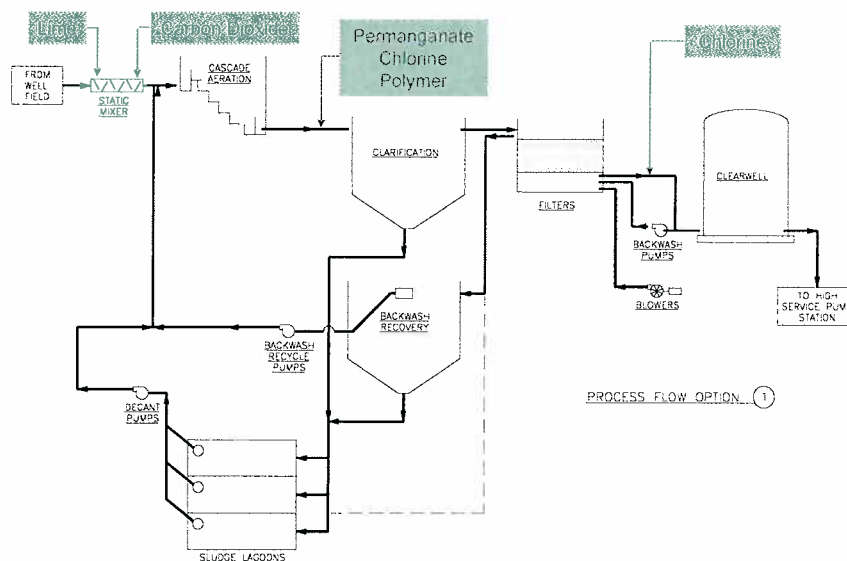
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ASR Treatment Plant Design



Twin Oaks Treatment



- Carbon dioxide and lime added to increase pH, hardness, and alkalinity
- Step feed aeration process oxidizes iron to ferric hydroxide and adds oxygen
- Permanganate & chlorine added before the clarifier/solids contact units to oxidize hydrogen sulfide to sulfate and manganese to manganese dioxide

Twin Oaks Treatment



- Dual media filter (sand & anthracite) removes any remaining solid particles
- A 3 MG clearwell stores the treated water
- 1750 HP pumps move the water to the distribution system

Twin Oaks Treatment Facility

- Phase I included:
 - 30 MGD water treatment facility
 - 17 ASR Wells
 - 30 miles of 42 and 60-inch pipe
 - Cost \$185 million
- Phase II included:
 - 12 additional ASR Wells
 - 7.5 mg clearwell
 - Pipeline connecting Seale Pump Station to Randolph Pump Station (about 12 miles of 42-inch)
 - Cost \$65 million

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Mitigation Program Background

- SAWS Board established mitigation policy in February 2002 (Resolution #02-077).
- Mitigation is not required by State law.
- Inter-local agreement between Evergreen and SAWS to mitigate wells.
- Only Carrizo Aquifer wells are eligible for mitigation.

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Well Mitigation Process

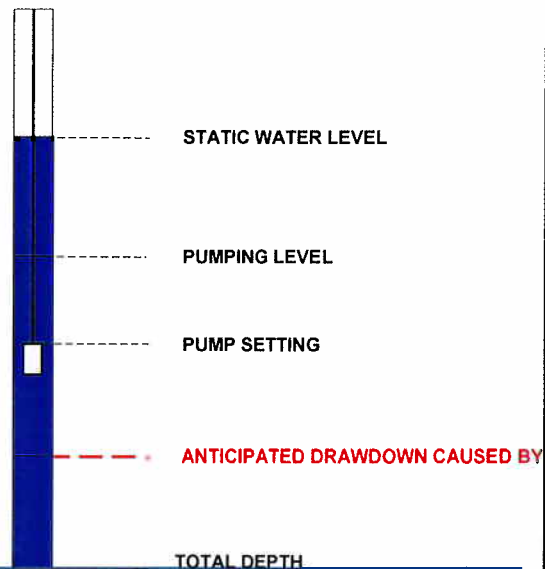
- Initial Investigation
- Water Well Diagnostics
- Diagnostics Evaluation
- Well Mitigation
- Well Owner Complaint Response

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Well Diagnostics



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Program through January 2009

- Carrizo Production = 463 million gallons or 1,422 acre-feet
- Edwards in Storage = 16,642 million gallons or 51,072 acre-feet.
- Edwards Recovery = 3,004 million gallons or 9,220 acre-feet



Questions?



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