

DRAFT

Name of Project: Expanded Carrizo Project

Duration of Project: 50 years. Construction completed by 2026.

Amount of Water Available Annually: 21,000 acre-feet per year (af/yr) upon project completion

Cost per AF Annualized:

Date Benchmarking Commenced: August 2014

Date Benchmarking Completed: March 2015

Managing Staff: Meagan Brown, Project Engineer, Desalination Engineering

SAWS Mission Statement: Sustainable Affordable Water Services

Executive Summary

The Expanded Carrizo Project is a component of San Antonio Water System's (SAWS) long-term water supply plan to diversify the water sources and reduce its dependence on the Edwards Aquifer, while meeting the system's water supply demands. It is noted that SAWS has already successfully completed the Local Carrizo Aquifer groundwater program in south Bexar County that currently delivers 9,900 acre-feet per year (acft/yr) to SAWS customers.

The *2012 Water Management Plan* calls for the Expanded Carrizo Project to be constructed in three phases, with each phase delivering approximately 7,000 acft/yr or 6.2 million gallons per day (MGD). When completed, the Project will provide approximately 21,000 acft/yr or 18.7 MGD. Phase I of the project will begin delivering water in 2016, with subsequent phases planned for completion in 2022 and 2026. Water from the Expanded Carrizo project will be treated at the Aquifer Storage and Recovery (ASR) treatment facilities before distribution.

The CAP notes that this - and all water resource projects - will bring additional costs to current rates, but believes that the additional supply is essential to ensure that SAWS is preparing to meet current and future residential and commercial customer needs.

Project Overview

Phase I of this Project is to be located on SAWS-owned properties near the ASR facility. (Appendix A) Project components include design requirements for Phases I and II and infrastructure construction of four (4) wells and collection piping. When completed, Phase I will produce 7,000 acft/yr (6.2 MGD) of raw untreated groundwater. Phases II and III will follow, leading to total production of 21,000 acft/yr upon completion in 2026. The existing models will

be updated to provide additional detail so that the Expanded Carrizo wells are developed in the most productive and cost effective locations.

It is noted that the Project reflects ongoing cooperative efforts with regional entities that are a part of the Region L water planning efforts led by the Texas Water Development Board (TWDB). Information is regularly shared with local, county, and state agencies having common interests with SAWS in ensuring the region offers a safe and sufficient supply of water. It also is noted that increasing regional requirements for water, stemming from population growth and economic activity, will require continued communication and efforts to meet those requirements in an effective and efficient manner. SAWS is committed to maintaining that dialog.

Environmental impacts, water quality, and cost to SAWS ratepayers are components of the overall project, and the CAP has been briefed and concurs with those findings.

Benchmarking Document

1. How does this project reflect a cooperative relationship with neighboring communities?

The Expanded Carrizo Project is planned to develop 21,000 acre-feet per year of Carrizo Aquifer groundwater on SAWS-owned property in south Bexar County. Water resources in South Bexar County are not governed by a groundwater conservation district as in neighboring counties. SAWS does maintain open dialogue with the Evergreen Underground Water Conservation District in adjacent Atascosa and Wilson Counties. In addition, a small water supply corporation (Nico-Tyme Corporation) with a water supply well in the Carrizo Aquifer supplying 25 connections is located near the SAWS production sites.

SAWS will continue its collaborative efforts with both Evergreen UWCD and will ensure outreach efforts to Nico-Tyme Corporation lead to successful implementation of the Expanded Carrizo Project.

The CAP recognizes that such regional approaches require time and shared information as well as good stewardship of a common resource and encourages SAWS to work towards that goal.

2. What are the water sources related to this project?

SAWS wells will produce groundwater from the Carrizo Aquifer within Bexar County.

3. What volume of water will be available during both average and drought of record conditions?

Based on preliminary modeling results, SAWS will be able to produce at least 21,000 acre-feet per year from the Carrizo Aquifer within Bexar County during both average and drought of record conditions.

4. Is water available for the duration of this project in adequate quantity to justify the project?

Hydraulic modeling of the Carrizo Aquifer conducted by SAWS confirms the availability of 21,000 acft/yr within Bexar County for the next 50 years. This volume maintains the Desired Future Conditions (DFCs).

The Desired Future Conditions (DFCs) set by Groundwater Management Area 13 (GMA 13) on April 9, 2010, is 23 feet average drawdown for the Carrizo-Wilcox aquifer throughout the GMA. The modeling found that the current GMA 13 DFC would not be exceeded by the full development of the Expanded Carrizo Project.

While the 21,000 acre-feet of water is physically available for production, the current Modeled Available Groundwater (MAG) has 5,419 acre-feet available per year. (Appendix B) This is a policy issue not a hydrologic concern. GMA 13 is currently meeting to discuss setting new DFC's and SAWS staff has included the 21,000 acre-feet of Expanded Carrizo production into the updated modeling which may result in a new MAG being issued by the Texas Water Development Board (TWDB) which would fully support SAWS production estimates.

5. Is this project based on reliable scientific data?

Yes. SAWS has performed several hydrologic modeling analyses to determine the availability of water production from the Carrizo Aquifer and is confident that this information is reliable. Additional site specific data will come from new production wells to be drilled in 2015.

Groundwater Management Area 13 (GMA 13), which includes south Bexar County, sets the desired Future Condition for the Carrizo Aquifer. At full production of 21,000 acft/yr, The drawdown established by the current DFCs of 23 feet will not be exceeded. The DFCs are reviewed at least every five years. HB 1282 in the 2013 legislative session extended the deadline to propose the current round of DFC's to May 1, 2016.

6. If groundwater is impacted, what types of mitigation measures are possible, and what will they cost?

During the development of the Aquifer Storage and Recovery and Carrizo Projects, SAWS developed a program in cooperation with neighboring private water well owners to mitigate (or lessen) the impact from increased production from the Carrizo Aquifer. Through this program, the SAWS mitigation team has worked with each well owner to identify and quantify the impact to the owner's well.

Impacts of the Expanded Carrizo Project, at full production, will be continuously reviewed. If mitigation measures are required for existing wells, they will be implemented. The cost of this strategy must be evaluated in light of the water level drawdown in existing private wells impacted by the SAWS production. The SAWS mitigation team will continue to work and share information with the neighboring private well owners as the Expanded Carrizo Project is implemented.

Wells that require mitigation are identified on the basis of their proximity to the project, water level, pump setting, and well depth. The steps in the mitigation process are as follows:

- **Impacted Well Identification** – Private wells impacted by the operation of the water supply project are identified through computer modeling of the ASR plant operation. In addition, a private well owner may submit a complaint that the plant operation is suspected of impacting their well. In either case, these wells are investigated in order to make a determination.
- **Well Investigation** – The well is investigated in order to obtain a water level, any records on the well, and to determine if the problem with the well is likely a water level decline issue or a well maintenance issue.
- **Initial Determination** – Based on the initial review the well is either ruled out for mitigation or determined to be potentially impacted.
- **Well Diagnostics** – If the well is determined to be potentially impacted by the project, the well is set up for a full diagnostics evaluation. This includes:
 - Pump System Evaluation – Determines pump condition, setting, pumping drawdown, and capacity
 - Geophysical Logging – Determines total well depth, screen setting, and geophysical setting
 - Television Survey – Records physical condition of well casing and screens

- **Mitigation Committee Review** – The diagnostics evaluation is reviewed in comparison to the well’s proximity to the water supply project to determine whether the well needs to be mitigated, and if so by what method of mitigation.
- **Well Mitigation** – If it is determined that the well has been impacted, or potentially will be impacted, the well is mitigated by one of the following methods:
 - Pump Lowering – The pump is lowered to a depth that will enable the well to produce water while the supply project is in operation. This may include upgrading pump system components.
 - Drill Replacement Well – If the existing well is not deep enough to handle the supply project’s impact, the existing well is replaced with a deeper well. The existing well is then plugged to limit potential contamination to the aquifer.
 - Water Purveyor Connection – In some cases, it is possible to connect a landowner to a local water purveyor if a water main exists in close proximity to the property. The existing well is then plugged to limit the potential contamination to the aquifer.
- **Mitigation Costs**
 - The average cost for performing diagnostics and mitigation on an existing well are as follows:

Mitigation Action	Average Cost
Perform Well Diagnostics	\$2,700.00
Lower Pump	\$4,000.00
Drill, Outfit, & Connect Replacement Well	\$58,000.00
Water Purveyor Connection	\$5,000.00
Plug Existing Well	\$4,500.00

7. Is there any adverse impact to surface water? If so, what types of mitigation are possible and what will they cost?

The surface water feature closest to the area of the Expanded Carrizo project is the Medina River and its tributaries, which cross the outcrop of the Carrizo aquifer north and east of the project area. The Expanded Carrizo project is in the confined or artesian part of the Carrizo aquifer, but immediately down dip and adjacent to the unconfined or water-table part of the aquifer. To address whether there could be any adverse impact to surface water, CAP needs to know additional information. For example, are the Medina River and its tributaries perennial streams where they cross the outcrop of the Carrizo aquifer? If the answer is no, then it might be that the surface-water flow is mostly runoff from precipitation and has little or no component of groundwater discharge. Even an intermittent stream, however, can receive small and local contributions of groundwater discharge during wet seasons. Also, will the area of drawdown in the potentiometric surface around the Expanded Carrizo project extend to the north and east far enough to include the local watersheds where the Medina River and its tributaries cross the outcrop of the Carrizo aquifer? The area of influence of pumping can extend a considerable distance in the confined aquifer, but once the drawdown reaches the unconfined part of the aquifer, the area of drawdown could grow only slowly. Existing models of the Carrizo aquifer, however, might not have sufficient spatial resolution and detail to accurately predict how far into the outcrop of the Carrizo aquifer the area of drawdown might extend and what effect on any base flow there might be.

8. What are environmental impacts of this project other than those related to groundwater and surface water?

An Environmental Assessment (EA) was completed as part of the Brackish Groundwater Desalination Program. This EA determined the Texas horned lizard, Texas tortoise, and migratory birds may have their habitat affected by the project. These species are listed as threatened by the State of Texas. Because the Expanded Carrizo Project is located on the same properties, the previous EA is applicable. As part of the project, SAWS will provide preservation recommendations of the EA to construction contractors.

9. How does this project ensure quality of the delivered water supply?

The Expanded Carrizo Project water will be delivered to the ASR treatment facility, which currently treats raw water from the Local Carrizo Project. Water produced from the new wells is expected to be similar to the water produced from current Carrizo Aquifer wells. The ASR treatment facility reduces iron levels and adjusts water hardness to levels seen in the Edwards Aquifer water in the distribution system. The final water quality is monitored at the ASR facility and at its entry into the distribution system.

10. Does this project document a long-term hydrologic balance between recharge and discharge of any aquifers involved?

Neither recharge nor discharge has been directly measured in the Carrizo Aquifer in the project area. However, in the past, recharge rates most likely balanced discharge rates in the Carrizo Aquifer. Any sustained significant production of groundwater from an aquifer would be expected to result in some removal of water from storage, some decrease in aquifer discharge, or both. Few, if any, Texas aquifers are managed to maintain a long-term hydrologic balance. Aquifer management, under Texas law, allows regional water planning groups to reach a consensus on what they desire as a future condition for aquifers that are in a GMA. For GMA 13, which includes the Carrizo aquifer for this project, a long-term hydrologic balance has not been specified. Instead, GMA 13 has defined a DFC of an average drawdown of 23 feet. This implies long-term imbalance with discharge exceeding recharge. This project is consistent with that DFC.

11. Is this project in accord with the SAWS Water Management Plan?

Yes. This project is identified in the SAWS *2012 Water Management Plan* (WMP) for implementation in the 2012 to 2020 time frame in order for SAWS to meet demand. This project is also identified in the Semiannual Reports to City Council.

12. Is this project in accord with the Region L Plan?

This project was not included in the 2011 Region L Plan. However, the Expanded Carrizo Project will be identified in the 2016 Region L Plan as a Recommended Water Management Strategy for SAWS to meet future demand.

13. Will this project support economic growth in the SAWS service area?

Yes. Diverse and stable water resources are essential for supporting economic growth in the SAWS service area. Water from this project could be utilized in the high growth areas of northwest and south San Antonio. This project, which provides diversification from the Edwards Aquifer, along with a firm yield during drought which increases sustainability in meeting future demand, will become an important part of any future WMP, which benefits the entire region.

14. Is this project in accord with Texas water law? Are there any unusual risks of litigation?

Yes, this project is in accord with Texas Water Law. The entire project is located within Bexar County, which is not regulated by a groundwater conservation district. There are

no identified unusual litigation risks. However, all water supply projects are controversial and subject to litigation. The CAP acknowledges that public perception of the increasing demands on the Carrizo Aquifer suggests continuing dialogue with users will be beneficial.

15. Is this project suitable for all of the geographic areas served by SAWS?

Yes, this project will produce treated water that can be used throughout the SAWS distribution system. When the Project is completed, the water will be integrated into the distribution system to meet customer demands, assuring an adequate continuing water supply.

16. Has a benefit-cost analysis been done in connection with this project?

No. SAWS reviews the economics of all water projects on an annual basis. Staff determined that for this project a full benefit-cost analysis would not be more useful than the ongoing economic analysis.

17. Has a social and economic impact analysis been done in connection with this project?

No. A specific social and economic impact analysis by a third party has not been done. However, benefits derive to the entire Region L area from SAWS having a diversified water supply. It may reduce instances of critical period management and pumping restrictions. This benefits regional development.

18. What is the cost per AF of water for this project?

The SAWS *2012 Water Management Plan* identifies the cost per acre-foot at \$538. (Appendix C) The cost per acre-foot of the project is currently being updated to reflect current dollars and actual project cost such as the design of Phase I.

Updated costs for the Expanded Carrizo Project are not currently available.

If SAWS conducts a *2015 Water Management Plan*, the Plan will provide a graph of the updated annual cost per acre-foot by project for comparison of projects by cost.

19. What is the effect on the ratepayer?

All of SAWS water diversification strategies have an effect on the ratepayer. The SAWS ratepayer benefits from the Expanded Carrizo project because the Carrizo Aquifer provides a firm supply during drought and is not subject to cutbacks. Unlike Edwards Aquifer critical period reductions, the Carrizo Aquifer water does not need to be replaced with another supply during periods of drought. Thus, this project has a beneficial impact to the ratepayer.

Water costs for this and all water supply projects will be incorporated into SAWS tiered rate structure and distributed among all customers.

20. How do the project costs compare to other SAWS projects?

The Expanded Carrizo project is one of the most cost effective supplies at \$538 per acre-foot per year in SAWS water supply portfolio. (Appendix C)

21. Are there any other issues that need to be addressed?

No other issues have been identified.

Conclusion

The CAP notes that this - and all water resource projects - will bring additional costs to current rates, but believes that the additional supply is essential to ensure that SAWS is preparing to meet current and future residential and commercial customer needs.

Glossary

AF	Acre-Feet (volume) or Acre-Foot (cost)
CAP	Citizens Advisory Panel
CRWA	Canyon Regional Water Authority
DFC	Desired Future Condition
DSP	District Special Project
GBRA	Guadalupe-Blanco River Authority
GCGCD	Guadalupe County Groundwater Conservation District
GCUWCD	Gonzales County Underground Water Conservation District
GMA	Groundwater Management Area
MAG	Modeled Available Groundwater
SCTRWPG	South Central Texas Regional Water Planning Group
TWDB	Texas Water Development Board
WMP	Water Management Plan

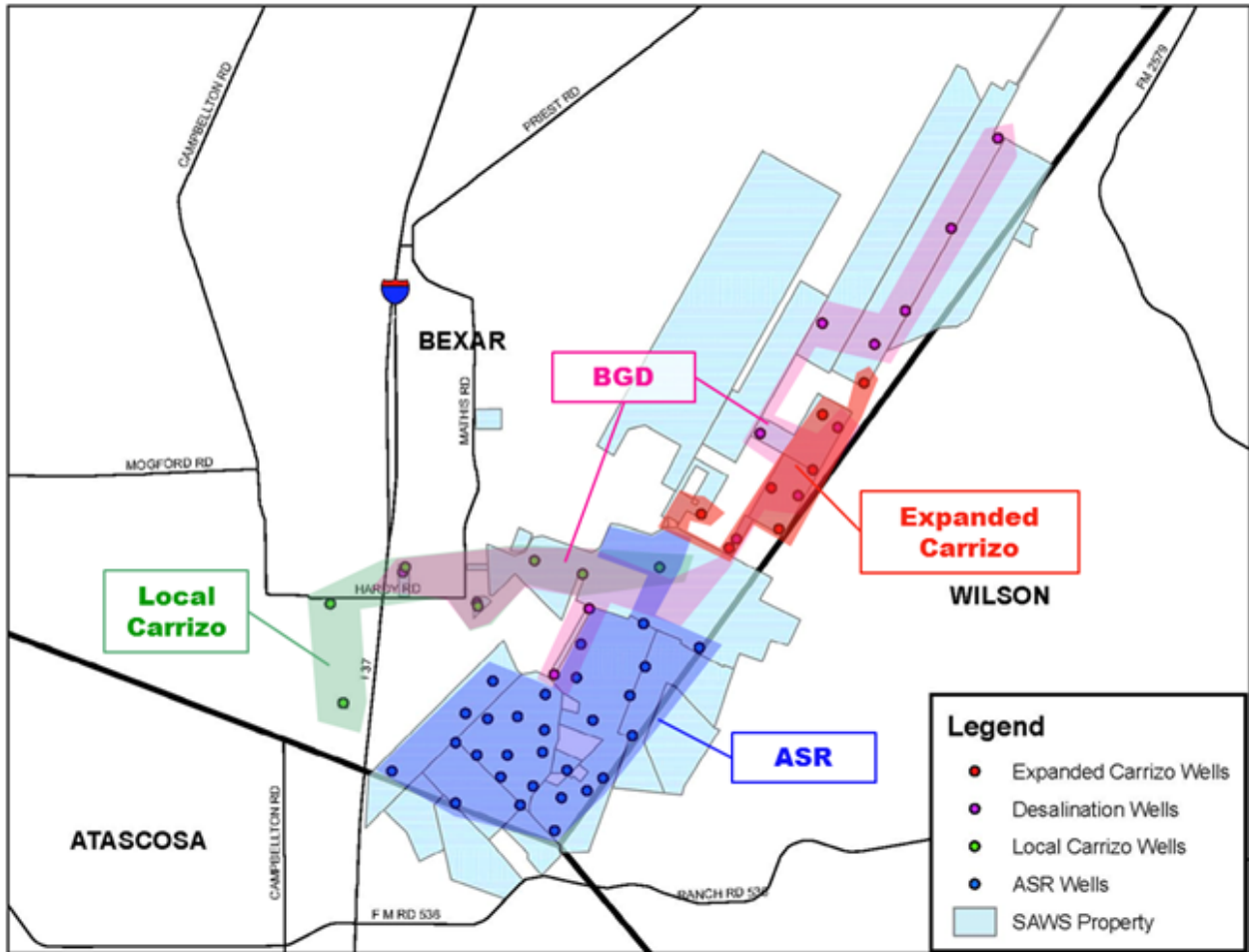
Definitions

Desired Future Condition (DFC) – Defined by Title 31, Part 10, §356.10 (6) of Texas Administrative Code as “the desired, quantified condition of groundwater resources (such as water levels, spring flows, or volumes) within a management area at one time or more specified future times as defined by participating groundwater conservation districts within a groundwater management area as part of the joint planning process.”

Firm Yield – The volume of water which can be produced from a defined source during a repeat of the drought of record under existing regulatory, legal, contractual, hydrological or infrastructure constraints.

Modeled Available Groundwater (MAG) – Defined by TWDB as groundwater availability resulting from the addition of policy (desired future conditions) and science (model or other tool) to result in informed decision making.

Appendix A: Project Area Map

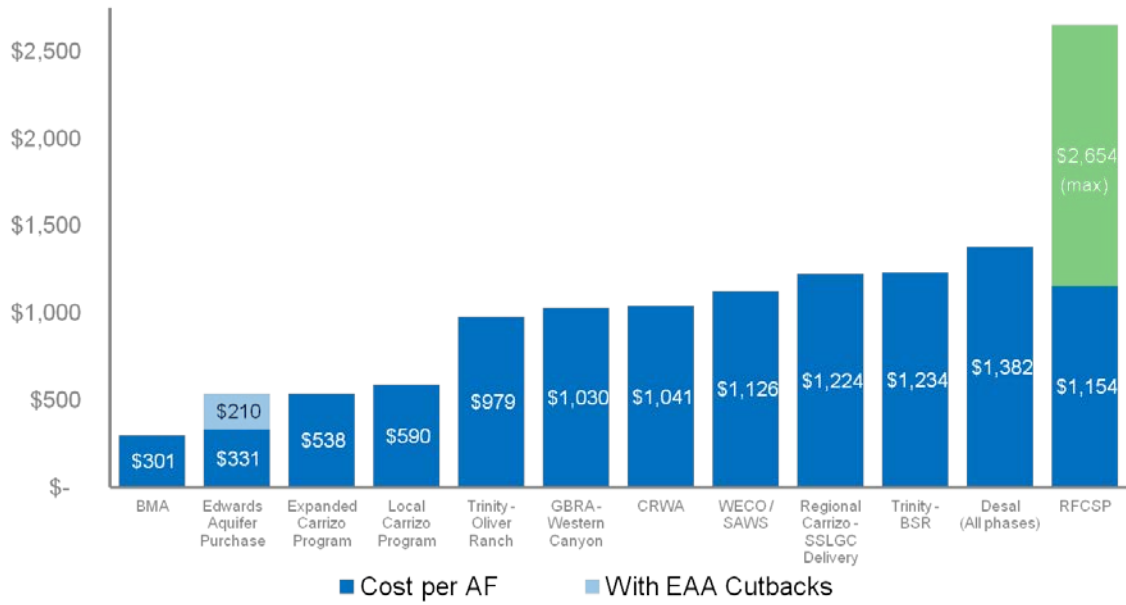


Appendix B:

- **Groundwater Availability:**

- For each aquifer in the region, the GCDs have adopted desired future conditions (DFCs). In some GCDs, full use of all groundwater supplies (permitted, grandfathered and exempt) may result in non-achievement of the DFCs for an aquifer. To ensure consistency with the DFCs, TWDB currently requires that groundwater availability for each aquifer be limited for planning purposes to the modeled available groundwater (MAG) for the aquifer. This has resulted, for planning purposes only, in adjustments to permit amounts, and a lack of firm water available for future permits in this plan for some areas for certain time periods. This should not be construed as recommending or requiring that GCDs make these adjustments, or deny future permit applications. SCTRWPG recognizes and supports the ability of permit holders to exercise their rights to groundwater use in accordance with their permits and it recognizes and supports the GCDs discretion to issue permits and grandfather historical users for amounts in excess of the MAG. SCTRWPG may not modify groundwater permits that GCDs have already issued or limit future permits that GCDs may issue. If the MAG is increased during or after this planning cycle, SCTRWPG may amend this Plan to adjust groundwater supply numbers that are affected by the new MAG amount.

Appendix C: Annual Cost per Acre-Foot by Project



Source: SAWS 2012 Water Management Plan