

Sustainable, Droughtproof Supply

El Paso's Advanced Water Purification Facility will be the first pipe-to-pipe direct potable reuse facility in the United States

Sanaan Villalobos

hile many U.S. communities have unencumbered access to water resources, others are experiencing drought cycles and have been forced to take a closer look at their water portfolios. This is the case in El Paso, a desert community situated in the western tip of Texas that receives just 23 cm

(9 in.) of rainfall each year — significantly less than the national average of 76 cm (30 in.). To meet the challenge of providing a consistent water supply into the future, El Paso Water (EPWater) has partnered with Carollo Engineers (Walnut Creek, California) on a state-of-the-art project that could significantly improve El Paso's water security for years to come.



A Water Innovator

The city of El Paso shares a border and groundwater resources with portions of New Mexico and Juarez, Mexico, a sister city with a population of more than 1.5 million — both of which expect sustained population growth into the future. EPWater serves a population of approximately 865,000 through customer connections and wholesale water. Because of El Paso's continued population growth, Chihuahuan Desert location, and climate conditions affecting water supplies conveyed from other states, the city needs additional water resources to meet future demand.

El Paso is no stranger to water reuse. In the 1960s, EPWater already was supplying reclaimed water for golf course irrigation. In the 1980s, the utility developed the first aquifer recovery facility in Texas, the Fred Hervey Reclamation Plant, which made the utility a leader in indirect potable reuse (IPR). The plant treats wastewater to drinking water standards and uses it to recharge groundwater through percolation ponds. In its

lifetime, the facility has recharged more than 114 million m³ (30 billion gal) of water into the Hueco Bolson aquifer.

Over the years, EPWater has continued to diversify its water supply portfolio while applying a holistic One Water approach, which emphasizes that every drop within a water system should be maximized. This has helped the utility be resilient through various drought cycles.

El Paso is fortunate to have several water sources of water supply.

- Groundwater The Hueco Bolson and Mesilla Bolson aquifers are the primary sources of water in El Paso, supplying approximately 50% of the water used. These resources are shared by two countries and three states.
- Surface water The Rio Grande provides nearly 40% of the water supply for El Paso but is only available seasonally when water is released from the Elephant Butte reservoir. Even though surface water is more costly to produce, EPWater leverages its use during the irrigation season to safeguard groundwater resources.



Once operational, EPWater's new, direct-to-distribution facility is anticipated to provide as much as 38,000-m³/d (10 mgd).

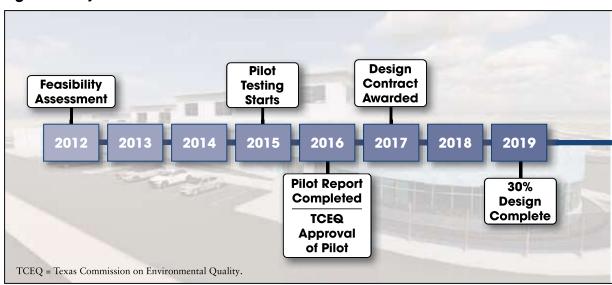
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- Desalination As the region has pumped groundwater, brackish water intrusion has occurred. To meet potable water quality standards, EPWater treats brackish groundwater at the Kay Bailey Hutchison Desalination Plant (KBH), which has been operational since 2007. KBH is the largest inland desalination plant in the world, capable of producing 104,000 m³/d (27.5 mgd). The source wells of KBH are placed to form a barrier to prevent additional brackish water intrusion into fresh water.
- Nonpotable reuse EPWater has implemented nonpotable reuse at all four of its water resource recovery facilities, with purple pipe delivery to power plants, golf courses, and parks to help conserve drinking water.

- IPR EPWater has been an implementer of IPR since 1985. The 45,000-m³/d (12-mgd) Fred Hervey Water Reclamation Plant treats reclaimed water to drinking water standards to recharge the Hueco Bolson aquifer.
- Conservation El Paso has reduced its water consumption by more than 35%, from 776 L/d (205 gal/d) per capita in 1985 to the current rate of 484 L/d (128 gal/d) per capita. The utility has the goal of reaching 473 L/d (125 gal/d) per capita by 2030. Conservation is the foundation of EPWater's efforts to ensure water sustainability.
- Importation To meet future growth projections, the Far West Texas Regional Water Plan anticipates water importation to begin in about 2050, but conservation, water

Figure 1. Project Timeline





The Roberto
R. Bustamente
Wastewater
Treatment Plant
will supply effluent
to the new facility,
where treatment
steps will include
reverse osmosis.

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reuse, and expanded desalination may push that date farther back.

A Groundbreaking Next Step

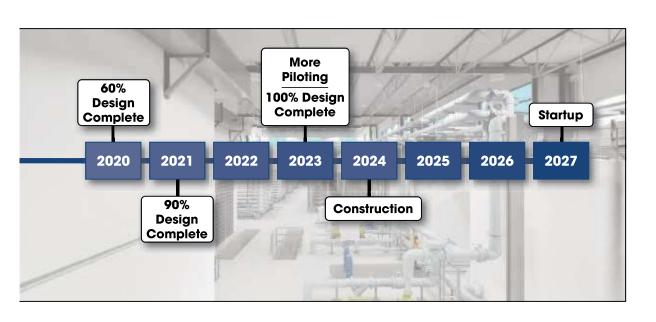
Even with its current water resources, El Paso needs to develop additional supplies to keep pace with population growth. EPWater's planned Advanced Water Purification Facility (AWPF) — anticipated to start up in 2027 — will be the first direct-to-distribution, direct potable reuse (DPR) facility in the United States. The facility will provide up to 38,000-m³/d (10 mgd) of water at buildout, allowing El Paso to meet water demands when surface water is not available, and it will reduce groundwater usage, protecting the long-term viability of the aquifers.

The new facility will be sited between the existing Jonathan Rogers Water Treatment Plant

(JRWTP) — a surface water treatment plant — and the Roberto R. Bustamante Wastewater Treatment Plant, which will supply the effluent to the new facility. This proximity not only will provide AWPF immediate access to feed water, but also will allow the treated water to be distributed using the existing water distribution infrastructure already in place for JRWTP.

Years in the Making

Originally, AWPF was conceived as an IPR project that would convey reuse water to the Rio Bosque wetlands. The reuse water would find its way to groundwater, where it would be pumped and treated to drinking water standards. But for El Paso, IPR generated too many additional costs and high energy consumption.





El Paso's Advanced **Water Purification** Facility is anticipated to start up in 2027.

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Instead, EPWater decided to build a direct-todistribution facility, to maximize drinking water production and reduce the resource and energy consumption that would have been necessary to re-treat the water for IPR. AWPF will send the water where it is needed the most — to the drinking water system. The city also will supply reuse water to the Rio Bosque wetlands to aid in their regeneration.

EPWater has taken a measured approach to its implementation of direct potable reuse, as decades of past planning, preparation, and conservation have afforded the utility a secure water supply not as easily affected by cyclical droughts. Early planning began in 2012, and final facility design will be complete this winter (see Figure 1, p. 38).

The extensive planning process included a holistic review of the utility's existing water system rather than viewing AWPF as just one project. In 2018, EPWater undertook a plant capacity and effluent needs evaluation of its wastewater system. The goal of the project was to take full advantage of existing

wastewater treatment plant infrastructure before designing new expansion facilities and providing increased source water protection for AWPF. Recommendations resulting from the project included

- rehabilitation projects that will extend the useful life and decrease the need for building new facilities; and
- rerouting refinery flows to an underutilized plant, which will provide additional protection

for AWPF source water, reduce the loading rate of the Bustamante facility, and reduce the capacity of a Bustamante facility expansion.

Carollo is responsible for the preliminary design of AWPF, as well as construction and postconstruction services. The project team has completed technical evaluations and preliminary engineering and has secured initial grant funding. The next step is finalizing design documents for the full-scale DPR treatment system.

Safety by Design

Because it will provide direct, pipe-to-pipe delivery, AWPF will use a redundant treatment train with multiple polishing steps (see Figure 2, below). Each stage in this process will provide a specific element of safety and reliability.

■ Microfiltration/ultrafiltration is the primary barrier for particles and microorganisms that can cause illness, such as bacteria, viruses, and protozoa.

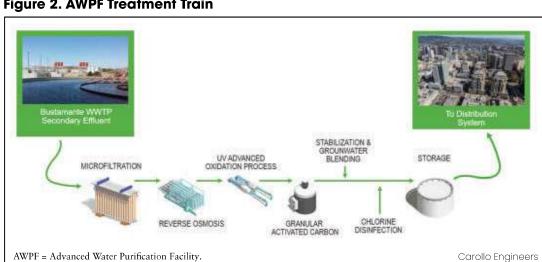


Figure 2. AWPF Treatment Train

- Nanofiltration/ reverse osmosis removes salts and organic chemicals and provides an additional barrier for microorganisms.
- Advanced oxidation with ultraviolet light and hydrogen peroxide provides a third barrier for microorganisms and a way to get rid of any remaining organic chemicals.



The facility will have a redundant treatment train that includes multiple polishing steps, including advanced oxidation and granular activated carbon.

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- **Granular activated carbon** eliminates excess hydrogen peroxide and provides another barrier to trace organic chemicals.
- Chlorine disinfection eliminates microorganisms while the water travels to homes and businesses.

EPWater and the project team have been working closely with the Texas Commission on Environmental Quality (TCEQ). This frequent communication helps avoid any untimely surprises, as ultimately the TCEQ will set the pathogen treatment levels and chemical control points.

We're Drinking What?

Readers may be curious about how El Paso residents feel about DPR and how EPWater is educating their community about the concept. A 2016 survey showed a majority of El Pasoans were supportive of the project. The EPWater staff has been proactive in distributing information about the progress of the project using public outreach tools such as social media, videos, media relations, and their website. They have provided public pilot facility tours as well as media events and classroom instruction to demonstrate to the community that the facility will deliver safe, reliable, and droughtproof water.

Living in the desert, El Pasoans have a great appreciation for the value of water. With this appreciation — and the benefits they've experienced from the many innovative water projects successfully carried out by EPWater over the years — comes an admiration of the One Water principles that will be implemented through the new facility.

A 'Game-Changer'

While the DPR concept is new to El Paso, it is time-tested. The world's first DPR project in Namibia, Africa, has been successfully purifying water for nearly 50 years. And while El Paso's AWPF may not be the first of its kind, when the facility completes construction, it will be one of the largest pipe-to-pipe DPR facilities in the world.

According to Pat Sinicropi, Executive Director of the WateReuse Association, "This facility is the game-changer in the nation's efforts to secure safe and reliable water supply for ratepayers throughout the West and nationwide."

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AWPF treatment steps.Carollo Engineers