



WATERWORKS

WEST HARRIS COUNTY REGIONAL WATER AUTHORITY

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Save Money!



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WHCRWA Celebrates 16th Anniversary



Former Texas Legislators Representative Bill Callegari (left) and Senator Jon Lindsay.

Recently, Sen. Lindsay and Rep. Callegari spent some time talking about their experiences during the 77th Texas Legislature when they worked together on some critical water issues. They recalled that the Harris-Galveston Subsidence District (HGSD) had some real success in arresting subsidence in southeast Harris and Galveston counties and issued a similar Plan for the northwest Harris County area in 1999.

Sen. Lindsay had carried the Senate bill to create the North Harris County Regional Water Authority in the 76th Legislature and subsequently worked with Rep. Callegari to establish a new West authority in the next Legislative session. They each authored and submitted similar versions of the bill at the beginning of the legislative session and agreed that whichever bill passed first would be the one they'd go with. Callegari's House Bill 1842 was the version signed into law, and the WHCRWA was born.

"We learned from the previous experience and made a few changes," Lindsay said. "We were really fortunate to have a broad leadership base of folks within this new entity who understood current and future water issues and who supported our efforts."

"Now, a decade and a half later, while the WHCRWA continues to fulfill its mission, it is still necessary to help educate folks about the massive infrastructure projects underway to secure water for future generations, and all the reasons we should use finite supplies of water more efficiently," Callegari explained. "There is only so much water on this planet and drinking water is going to cost more in the future. It is important that we work together to avoid wasting a single drop of it!" 💧



The 77th Texas Legislature created the West Harris County Regional Water Authority (WHCRWA) in 2001 -- introduced in the House by Rep. Bill Callegari and sponsored in the Senate by Sen. Jon Lindsay. The new Authority became the second such entity in Harris County to be tasked with managing a massive conversion to surface water mandated by the Harris-Galveston Subsidence District (HGSD).

For decades, residents in west Harris County had traditionally relied on groundwater pumped from individual wells by municipal utility districts or other water suppliers for the community's needs. Few people realized that there was a growing problem with land subsidence in their area or that aquifers supplying the region were beginning to decline. Few noticed when, just 50 miles south in the early 1970's, an entire subdivision was overwhelmed by flooding and sank into the marsh.



The **Harris-Galveston Subsidence District** — a special purpose district created by the Texas Legislature in 1975, the first of its kind in the U.S. — was

authorized to “end subsidence” and was armed with the power to restrict groundwater withdrawals. They went right to work. By 1976, the District had begun compiling hydrologic information on the aquifers, studying water usage and water supply in Galveston and Harris Counties. HGSD issued its first groundwater regulatory plan, converting industries on the Houston Ship Channel to surface water supplied from the recently completed Lake Livingston reservoir.

As a result, subsidence in the Baytown-Pasadena area was dramatically improved, and has since been largely halted.

Subsidence was stabilizing in the coastal areas, but groundwater levels in inland areas north and west of Houston were rapidly declining. **In the Evangeline aquifer, measurements recorded a decline of more than 100 feet between 1977 and 1997.** As a result of the increasing threat subsidence posed to these areas, the HGSD adopted a series of regulatory plans that mandated a reduction in groundwater pumpage to only 20% reliance on groundwater by 2030 (1999 Regulatory Plan).

The HGSD's goal was that the same dramatic improvements they had achieved by reducing

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Mandates and Milestones

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groundwater pumpage south and east of Houston would occur in north and west Harris County, as well.

Make Up and Mission

The WHCRWA is made up of approximately 125 municipal utility districts and the City of Katy. The Board – which held its first meeting on June 6, 2001 – includes nine directors who represent Voting Precincts made up of individual utility districts and municipalities, and serve staggered four-year terms.

The primary mission of the Authority is to: acquire and provide surface water and groundwater for residential, commercial, industrial, agricultural, and other uses; reduce groundwater withdrawals; promote the conservation, preservation, protection, recharge, and prevention of waste of groundwater, and of groundwater reservoirs or their subdivisions; and control subsidence caused by withdrawal of water from those groundwater reservoirs or their subdivisions.

The Board adopted a resolution to charge fees for water pumped by the well owners within their boundaries in order to pay Authority costs. Initially, these fees covered operating expenses and the process of negotiating a water supply contract with the City of Houston, but soon included costs related to the development and execution of the Groundwater Reduction Plan (GRP) required by HGSD, engineering to design and construct an entirely new infrastructure to transport and deliver surface water to the region, and the costs associated with purchasing the staggering number of easements necessary to comply with the timeline mandate. ***The phased 30-year effort required in the 1999 Plan called for 30 percent reduction in groundwater usage by 2010, 70 percent by 2020, and 80 percent by 2030.***

The negotiations with the City of Houston for a long term water supply contract were very successful, and locked in both cost-methodology and water reservation for the next 20 years. Initially, the total anticipated water demand for the area within the Authority's boundaries was determined to be 54.5 million gallons a day (mgd), of which 16.3 mgd must be supplied by surface water. The WHCRWA's first Revenue Bond sale took place in July 2003 and generated funding for construction and an initial payment to the City of Houston for surface water.

Bulldozers and Backhoes

With the funding in place, the Authority moved with alacrity to design, advertise for bid, purchase easements and rights of way, and construct new waterlines and support facilities. In the fall of 2005 – just

a little over four years since its creation – the WHCRWA delivered the first surface water ever in northwest Harris County. And they did it consistent with its initial schedule and within budget constraints.

The surface water being supplied significantly ahead of the 2010 timeline was provided by the City of Houston's Jersey Village Pump Station. This delivery was accomplished to assist districts with water quantity or quality issues and to provide the Authority with early conversion credits under its Groundwater Reduction Plan approved by the HGSD. Additionally, as the Board proudly confirmed, the miles of waterline installed for this inaugural water delivery had been constructed with "today's dollars and funded by bond issues with very favorable interest rates." The new infrastructure became the foundation for the initial phase of the overall surface water delivery system.

By December 2006, slightly more than 12,000 homes within WHCRWA boundaries were receiving surface water – about two million gallons a day, in fact. As the aggressive construction projects were designed and completed, the need for funding increased correspondingly.

In 2006, the Authority was able to purchase a 44-mile long dormant pipeline easement from Exxon Mobil Corporation. The location of this easement not only saved a significant amount of time and money, but enabled the Authority to utilize a more direct route for the large transmission lines necessary to bring surface water from the City of Houston's northeast water purification plant all the way across town to within the WHCRWA boundaries. *(In partnership with the North Fort Bend Water Authority, WHCRWA will build a 39-mile-long, eight foot diameter water line from Houston's northeast water plant near Lake Houston crossing Harris County.)*

In 2007, the first of three 5 million gallon storage tanks was erected on the WHCRWA's Pump Station site that also included a disinfection facility; an electrical controls building; standby



power generators (with the capacity to operate the entire facility in an emergency); a storage facility for parts and equipment as well as to house the operator's computerized controls; and a SCADA system to monitor the entire operation.

As the end of 2010 rolled around, the Authority had met the Subsidence District's initial mandate by converting 30 percent of its customers from ground- to surface water – that included having 39 districts and some 49 water plants hooked up to the new system! This involved the construction of 51 miles of new waterlines, completing the \$17 million Pump Station, with two new 5 million gallon tanks under construction.

Drought, Population Growth, and Water Demand Cause Concern

The devastating drought of 2011-12 taught some difficult lessons throughout Harris County. Local lake levels sank to historic lows, millions of trees died in parks and neighborhoods causing a dreaded “crown-burn” fire hazard. At the beginning of September, 2011, more than 95 percent of the state was experiencing critical or exceptional drought conditions, including Harris County. Climatologists called this the worst drought in more than four decades. Devastating wildfires made headlines across the state, while drought conditions hit agriculture and livestock especially hard, with recreation and the environment suffering, too.



Houston had only approximately 1.5 inches of rain between February and April; that's about what the Sahara Desert might receive during the same period. The experience left Texans hoping for a hurricane or tropical storm. It wasn't necessary to remind people to use water carefully; there wasn't enough to waste.

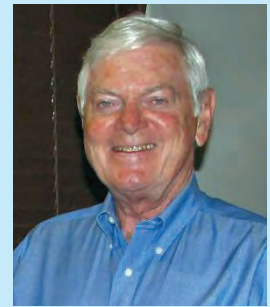
As destructive as this most recent drought was – with its relentless, blistering temperatures, wildfires and the loss of billions of dollars in crops – Texas is no stranger to this climate phenomenon. In fact, paleo-climatologists have found that mega-droughts, at least as bad as the 1950's drought of record, have occurred numerous times over the centuries – some lasting 20 to 40 years.

As planners looked ahead to the next

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WHCRWA's Veteran Board Members

Bruce Parker served on Nottingham Country MUD for 12 years before working with the Advisory Committee to promote the creation of the WHCRWA. “We have accomplished much since our inception, and none of it would have been possible without an outstanding consultant team: legal, project management, financial, bookkeeping, and operations,” he says. “We continue to work diligently to meet the HGSD conversion requirements and to do so cost-effectively. We rely on regular rate analyses to keep fees as low as possible while meeting debt requirements.”



Cam Postle previously served on the Board of HC MUD 257. His expertise as a specialist in the real property/ROW acquisition business made him a strong candidate for the WHCRWA Board of Directors -- an assignment he willingly accepted. Cam remains committed to completing all real property/ROW acquisitions on time to meet WHCRWA facilities construction time frames.

Karla Cannon served as a Director for Clay Road MUD for 8 years before joining the WHCRWA Board in 2001. She says that, in her opinion, finalizing the contract with the City of Houston to purchase a long term supply of surface water was the first of many important accomplishments of the WHCRWA.



Larry Weppner, P.E. served on the board of Mission Bend MUD 2 for 9 years before joining the WHCRWA board in 2001. Larry believes that a secure, sustainable water supply is critical to the growth of the community. He supports the WHCRWA's goal of helping to arrest subsidence in west Harris County... and is committed to do so in the most economical and cost-effective manner possible. The toughest challenge, he believes, is the completion of the Surface Water Supply Project that will move water from one side of Harris County to the other.

THE LUCE BAYOU CONNECTION

A River, A Lake and Pipes Big Enough to Drive a Truck Through

Driving east from Lake Houston, the crowded and congested FM 1960 quiets as it passes through miles of flat, green pastures east of the Atascocita and Huffman lakeside communities. The road comes to a discreet end at State Highway 321 in Dayton, a city of about 7,200 that was once bisected by the Trinity River, with the two halves called West Liberty and Liberty until West Liberty morphed into Day's Town around 1854, and then Dayton 30 years later. Liberty proper still exists across the Trinity River, with a slightly larger population than Dayton as the Liberty County seat. Not unlike a lot of cities and towns nestled in riverbends, the landscape that envelops these Texas towns is lush and green with trees as far as the eye can see.

While many Houstonians have traveled the piney woods northeast of the vast metropolis, they may not be aware of the connection that exists between the Trinity River water that flows through its veins and the city of Houston, which lies miles to the west of the river. They might be surprised to learn that about 10 miles north of Dayton and Liberty on the Trinity River, crews are working steadily on a project that will one day bring up to 500 million gallons of water a day (the equivalent of what it would take to fill up 250 elevated storage tanks) from the Trinity River to homes and businesses in north and west Harris County, north Fort Bend County, and Houston. Why? Because the city and its suburbs need it. In this context, the term “need it,” means, “they won’t be able to survive without it.”



If the water is that important, then how does the City of Houston get it from Point A (Trinity River) to Point B (Lake Houston) so that it can be delivered to current and future water users in unincorporated Harris County, which now has almost as many residents as the city itself? It is a question that Houston’s forefathers pondered long ago...and came up with a clever plan that is being carried out today.

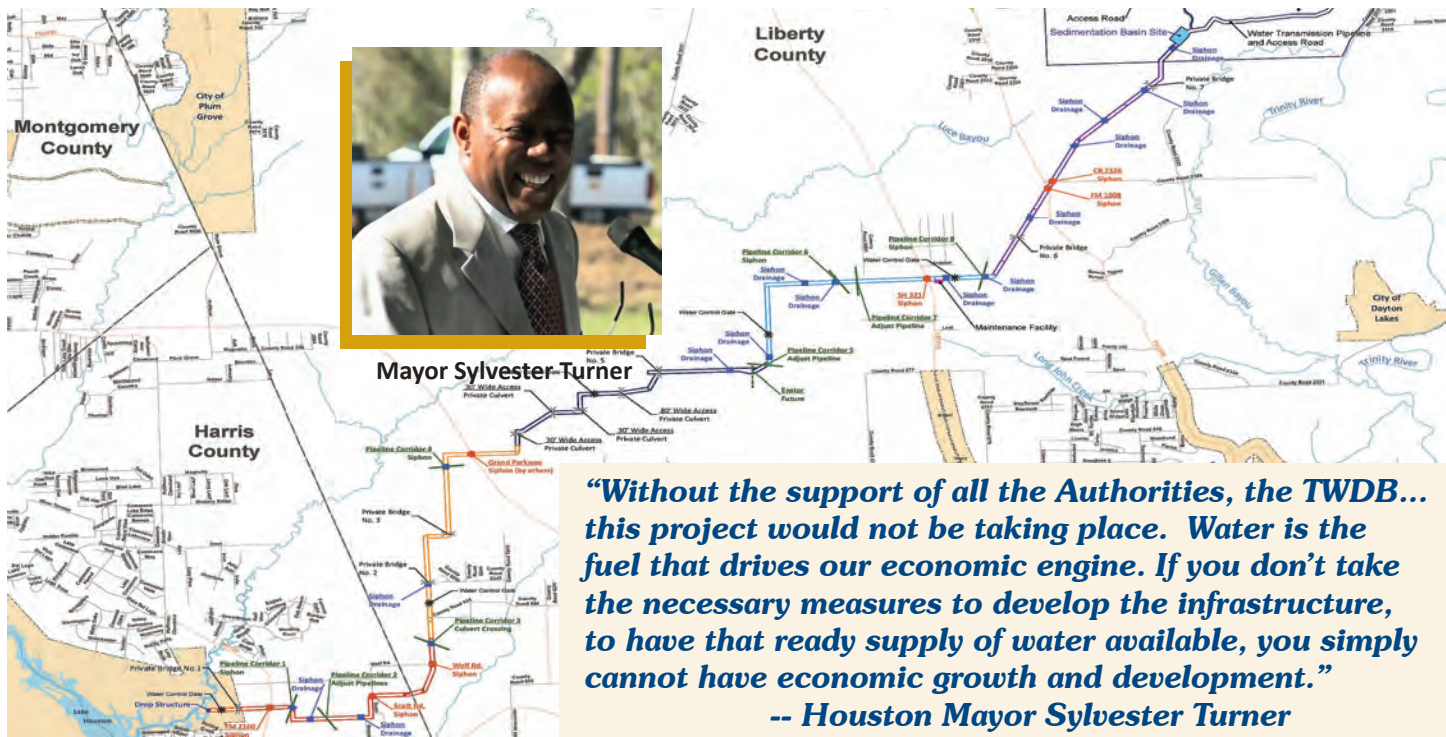


Groundbreaking ceremony

LBITP is Not Something to LOL About

The \$350 million **Luce Bayou Interbasin Transfer Project** – or **LBITP** – is a complex name for a straightforward and well-planned water delivery project that held a Groundbreaking Ceremony in February 2017. The Coastal Water Authority (CWA), a conservation and reclamation district created by the State in 1967, is managing the project in its role as the City of Houston’s surface water provider; i.e., the city owns the water and the CWA builds, operates and maintains the systems, and gets the water where it needs to go. The City of Houston, North Harris County Regional Water Authority, West Harris County Regional Water Authority, Central Harris County Regional Water Authority, and North Fort Bend Water Authority are partners in the LBITP, and are paying their fair share for equipment and pipelines that will treat, transport and deliver the water from Lake Houston to points beyond.

“Water is the fuel that drives the economic engine,” said Houston Mayor Sylvester Turner at the project’s groundbreaking ceremony in February. “Without it, not only will you not grow, but you will be paralyzed where you are.”



Turner said he is grateful that the regional partners are working together, because otherwise it would be difficult to carry out the massive Luce Bayou project.

“If we can dream it we can do it, and we are getting it done,” Turner said.

Crews are currently constructing the 90-acre Capers Ridge Pump Station on the river’s west bank that, when fully functional will be able to divert up to 500 million gallons of water a day from the river and pump it into side-by-side pipelines that could each easily fit a Ford F150 pickup truck with room to spare (8 feet in diameter). The water will flow underground through these dual pipelines for about 3.6 miles to a 20-acre storage and sedimentation basin near the secluded FM 1008, and then into a 100-foot-wide canal that runs 23.5 miles in a slightly southwestern

direction across former rice paddies to the northeastern tip of Lake Houston.

A Project 80 Years In The Making

The Luce Bayou project dates back to the late 1930s, when visionary Houston leaders realized the need to identify water sources for future Houstonians. Like fortune-tellers, they gazed into their crystal ball and saw people flocking to the city by the bay in search of the American dream. They realized that the water they were pumping from underground sources would not satisfy the appetite of future generations, and that waiting 20, 30 or even 50 years to find other water sources could mean real problems for their successors.

They looked north, south, east and west for options. The saltwater to the southeast in Galveston Bay was plentiful, but expensive to convert to drinking water, and there was the issue of pumping it uphill to where it was needed. Nearby rivers flowing from places north had potential. The San Jacinto River and its two “forks” flowed directly through Harris County on their winding pathways to Galveston Bay. The Trinity River to the east had potential also. The planets started to align when former Houston Mayor Richard H. Fonville wrote a personal check to purchase the land that is now Lake Houston during his 1937-38 term in office. Next, the city acquired water rights in both rivers, and by 1973 had created three reservoirs – Lake Conroe on the San Jacinto River’s West Fork in north Montgomery County, Lake Houston on the San Jacinto River’s East Fork in northeast Harris County, and Lake Livingston on the Trinity River near Huntsville.

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LUCE BAYOU

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Wayne Klotz, the Coastal Water Authority's board president, said the Luce Bayou project is the culmination of that 80-year effort to provide water to the Houston region.

Why Water From The Trinity River?

Why is there a need to build this project to get water from the Trinity River when there are two lakes in Houston's backyard (Conroe and Houston), and in Lake Livingston just outside of Huntsville? The answer is somewhat complicated. In Houston's early days, its water supply came from wells that pumped water from underground wells, and that took its toll on the very land that homes and businesses were built on. As the water underneath diminished, the ground above began to compact and sink – or subside – into the empty space where water was once stored naturally. Fast forward through some very rough times in terms of sinking land and even a neighborhood disappearing into the Ship Channel, and city leaders started proactively taking steps to replace groundwater with surface water from lakes and rivers.

In 1975, the Texas Legislature created the Harris Galveston Subsidence District (HGSD) to regulate groundwater usage in Houston and Galveston counties to prevent additional land subsidence. The HGSD set deadlines for Harris County water providers to convert to primarily using surface water by 2035. That meant building a huge network of pipelines and pumping stations, and an enormous water treatment plant on Lake Houston, to get the surface water to hundreds of small municipal utility districts that supplied water to neighborhoods in north, central and west Harris County, and north Fort Bend County.

The water in the three existing reservoirs is sufficient for existing water customers for several decades to come. Beyond that, water supplies in the

three lakes could fall short of what water suppliers need to convert their water users, particularly if the region falls into drought mode. With regional planners predicting that Harris County will add another 2 million residents by 2040, it is necessary to use the untapped capacity the City of Houston owns in the Trinity River to quench that added thirst.

It is important to plan NOW to build the system that will deliver the water THEN.

In 2005, the City of Houston tasked the CWA with planning, building and operating the Luce Bayou project. It was a logical move, as the CWA is already delivering 640 million gallons of water a day from the Trinity River to customers in east and southeast Harris County, and is a regional intermediary that can bring the project pieces and partners together because it does not sell or buy water.

"The CWA is the largest water authority in Texas that doesn't own water," said Klotz.

The Project Won't Touch Luce Bayou

Though Luce Bayou is a key component of the LBTP moniker, it is important to note that the project will not disturb the natural drainage channel that is known as Luce Bayou, which meanders from the Sam Houston National Forest south to the East Fork of the San Jacinto River near upper Lake Houston.

Don Ripley, CWA's Executive Director, said that the in-depth environmental studies carried out long before any dirt was turned on LBTP found that using the bayou as an avenue to carry the water from the Trinity River to Lake Houston could disturb its natural environment. The Coastal Water Authority would be required to make up for – or mitigate – those changes, which would mean the project's cost would skyrocket. The alternative was to dig a new canal to carry water from the pipelines to the lake. The canal would parallel Luce Bayou, with the two approaching each other near FM 2100 where the bayou drains into the East Fork of the San Jacinto River.

Ripley said the CWA conducted a full environmental impact study on the canal option, and purchased a 3,000-acre site on the San Marcos River to mitigate impacts along the canal's path, which primarily runs through old rice fields. The CWA donated the mitigation land to the U.S. Fish and Wildlife Service, which has property across the river.

So if the bayou is no longer part of the project, why is Luce Bayou still part of the project's name? It is a nod to the project's history, which is impressive and extensive. The concept of transporting water from the Trinity River through Luce Bayou was envisioned early in the city's history, and in fact, was mentioned as a future option for water





Pump station materials

management in an article in the Houston Chronicle in 1938. In the 1970s, a population boom spurred by Houston's red-hot oil and gas market prompted Houston city leaders to move the Luce Bayou concept to the project planning stage. The plan that emerged in the early 1980s supported moving water through Luce Bayou because no environmental studies had yet been carried out, and the concept made sense. The vision gained traction after the City of Houston obtained a permit allowing the transfer of up to 940,000 acre-feet of water from the Trinity River Basin to the San Jacinto River Basin each year (one-acre foot equals 326,000 gallons, enough to serve two typical Texas families for one year).

Ripley said the Luce Bayou project plan was shelved in the mid-1980s because of the oil bust that followed the boom.

"There was no demand for the project at that time because the population growth that was once projected was not there anymore," Ripley said. "The plan was put on the shelf for close to 30 years."

Time to Face the Music

The Luce Bayou project was resurrected recently for two reasons: One, of course, was the need to set the wheels in motion to secure more water for future generations; and the other involves the not uncomplicated matter of weaning Harris

County water providers and users off groundwater. Ripley said the LBITP project under construction today mirrors the water demand, which has shifted to north and the west over the years.

After breaking ground on the project in October 2016, construction started immediately on the Capers Ridge Pump Station and the canal's first segment. The entire project – pump station, canal and pipelines – is on schedule to be completed by June 30, 2019, just a blink of the eye in today's fast-paced world.

When the project is done, Klotz said, the CWA will turn on the pumps and let water flow to Lake Houston. The amount that is pumped through the pipelines and canal will be determined by demand at that time.

"This project will take care of Houston for 100 years," Klotz said. "We will have a stable, plentiful supply of water that will affect generations." 💧



Capers Ridge Pump Station site



Existing pipeline relocation

WHAT A TALE EACH DROP COULD TELL

***Billion-Dollar Project Will
Expand Nucleus of Regional
Water Treatment System***

***“We are fortunate
that we have formed
a strong and enduring
partnership with water
authorities in Harris
and Fort Bend counties
that are dedicated
to upholding the
responsibility we all
have as regional water
providers. This joint
project will ensure that
clean water continues to
flow when our existing
and future residents turn
on the tap.”***



***Yvonne Forrest, acting Deputy
Director for the City's Houston
Water Division in the Public Works
and Engineering Department.***

Water is life. Whether used to wash clothes, water lawns, bathe children, quench thirst – it is one of the only things on earth that humans cannot live without. Houston is fortunate that its leaders - past and present - have had the vision to plan for the water needs of future generations.

It seems hard to imagine that the water that runs from faucets today is the same water that a T-Rex drank from an ancient stream or that was one of billions of crystals that formed icebergs during the Ice Age. The fact that there is a finite source of water on earth – that has been coursing through the water cycle for billions of years – can be mind-boggling.

This line of thought highlights the driving need for stringent, reliable and advanced water treatment systems to ensure that earth's water is safe to drink. A clean and abundant water supply should never be taken for granted, but we have become accustomed to it. If the water flows freely when we turn on the faucet, little thought is given to how it gets there.

For decades, the City of Houston has done its part to ensure that an ample, clean supply of water is available to residents in the Houston region. A \$1.3 billion water treatment expansion project for the city's Northeast Water Purification Plant on Lake Houston, planned and funded by five regional water providers, will enable it to treat more water from Lake Houston, as well as a future supply that will be pumped from the Trinity River more than 25 miles away. The water is needed to meet growing demand in north, central and west Harris County, where the population is exploding and municipal utility districts are reducing reliance on well water in a regional effort to arrest subsidence.

HOUSTON'S WATER WORKS

Houston's H₂O history is an intriguing one. When the city was in its infancy, residents got their water from the bayous and creeks that drained water from the swampy city, cisterns that captured rain, and even shallow wells.

In the late 1800s, the private Houston Water Works Company dammed part of Buffalo Bayou and began delivering water through pipes to Houstonians. Loud, angry complaints about tainted bayou water quality caused the company to look for other water sources, and it hit blue gold after tapping into an ample supply of fresh water pumped from an underground reservoir.

Houston Water Works tried to keep up with growing demand for fresh water that grew with Houston's booming population, but big city problems came with that growth. Buffalo Bayou became a dumping ground for a lot more than rainwater, so when the water company started mixing bayou water with well water to meet water demand, residents took notice. As the situation worsened, the City of Houston made the bold decision to purchase the Water Works Company in 1906, and to assume responsibility for providing residents with a safe, clean and plentiful water supply. The new City of Houston Water Department added 66 new wells to the 55 existing wells, installed water meters, and constructed three new pumping plants while enlarging the existing Central Water Plant on Buffalo Bayou.

That forward momentum has not slowed since. City leaders kept pace with growing the system while planning for the needs of future generations. Land was purchased in northeast Harris County for a future reservoir (now Lake Houston), and water rights were acquired in the San Jacinto River and lower Trinity River. Three reservoirs were created by damming portions of those rivers – Lake Houston and Lake Conroe on the San Jacinto River and Lake Livingston on the Trinity River.

As it grew increasingly clear that the Houston-Galveston region needed to reduce its dependence on groundwater, the City of Houston started deactivating its water wells and building water treatment plants that could purify surface water from lakes and rivers. The East Water Purification Plant near the Houston Ship Channel was the first to treat water from Lake Houston in 1954. After Lake Livingston was created in 1969, water flowed to the east plant, and then later to the city's Southeast Water Purification Plant, which was built near Ellington Airport in 1989.



The Northeast Water Purification Plant is the baby of the bunch. It was built on the shore of Lake Houston in 2005, and has been a key player in providing surface water to Houston's thirsty northern and northwestern suburbs in recent years.

Houston's surface water trio has operated intrepidly through the years. They pull in water from sometimes turbid lake water sources and literally wring out sediments, toxins and bacteria to produce safe drinking water for a growing population. The three plants, and some regional water wells, currently produce more than 160 billion gallons of drinking water each year, which is distributed through more than 7,500 miles of pipes.

However, in the grand tradition of planning for future generations, regional water providers realized even that was not enough.



BUILDING TO MEET THE DEMAND

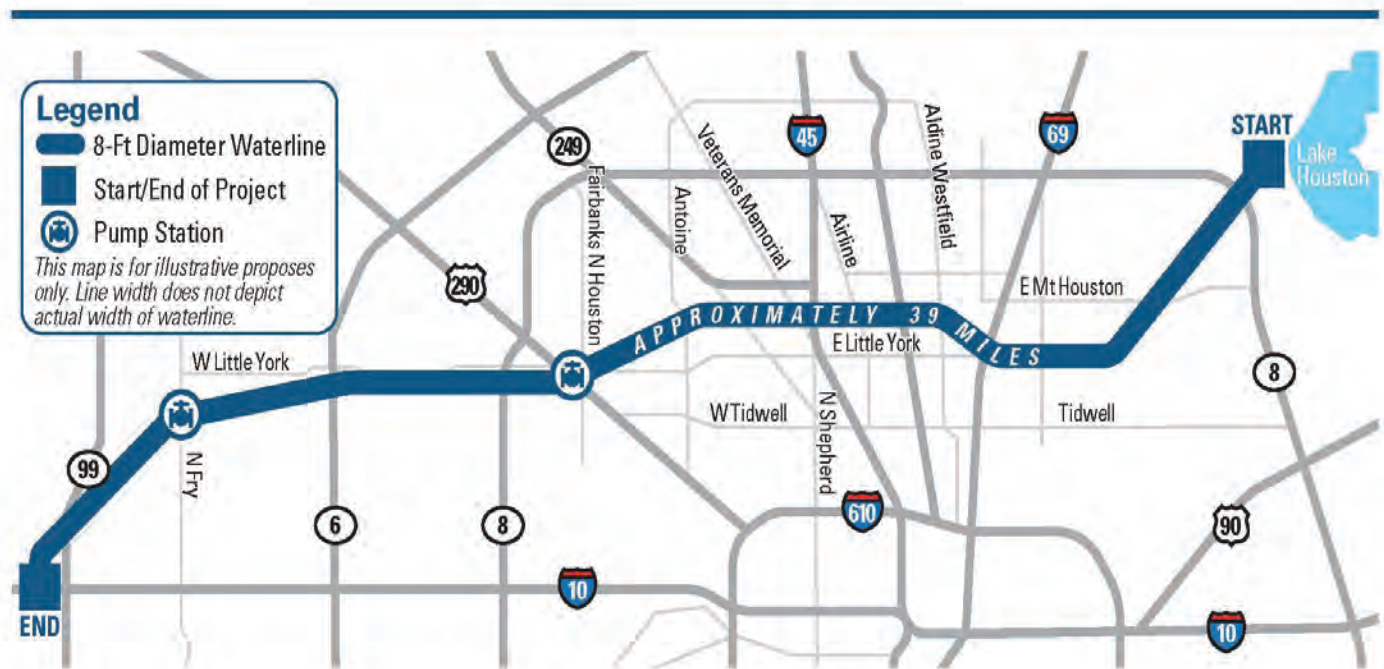
Houston is not falling short on the water supply side of the equation. The City of Houston has over 1.2 billion gallons per day of reliable surface water rights (a 70 percent share of Lake Livingston, a 70 percent share of Lake Conroe, 100 percent ownership of Lake Houston and a 70 percent share of the future Allens Creek Reservoir). That, combined with its groundwater supply, is enough to serve customers in the city and surrounding counties through approximately 2050.

The key to meeting demand is tapping into some of the **unused** water supply on the Trinity River and getting it to where it is needed most – in west, central and north Harris County and north Fort Bend County. That means constructing new pipelines, pump stations and water treatment plant capacity. Houston and the regional water authorities responsible for delivering a safe and plentiful water supply to municipal utility districts in those areas joined forces at the start of the 21st Century and embarked on construction of a multi-faceted system that will get the job done. The nucleus of that system is the city's Northeast Water Purification Plant.

The plant currently purifies about 70 million gallons of water a day. It will need to treat more than 400 million gallons a day to meet the 2040 demand projected by the North Harris County Regional Water Authority, Central Harris County Regional Water Authority, West Harris County Regional Water Authority and North Fort Bend Water Authority.

In 2015, the city and water authorities came together and worked out a mutually-beneficial plan

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HOW THE WEST WILL BE WON

With a Water Supply Project that May Be the First of Its Kind

Houston's history is peppered with examples of men and women who were unafraid to venture into the unknown with a smile on their face and a firm opposition to the phrase, "Can't be done." It almost always can be done in Houston, and if the first time fails, then find another way to do it.

A water pipeline project is probably not the first thing that comes to a Houstonian's mind when thinking of projects that are nearly impossible to do, because folks have been installing pipelines in this region since the late 1800s. But this one is different. It's enormous. It runs for 40 miles, and runs through the busiest part of Houston.

Like our ancestors, the team that is designing and managing this mega-waterline — part of the West Harris County Regional Water Authority's and North Fort Bend Water Authority's **Surface Water Supply Project** — is tackling the unknown. Sure, there have been large pipelines installed for long distances, but none come to mind that were constructed through the heart of a crowded city.

"We are venturing into new territory," said Wayne Ahrens, engineer for the West Harris County Regional Water Authority. "We have done a number of pipeline projects, but nothing of this magnitude." Ahrens said the pipeline is a joint project with the North Fort Bend Water Authority (NFBWA) that will cross U.S. 59, the Hardy Toll Road, Interstate 45, U.S. 290 and Beltway 8 — twice. It also traverses several bayous and creeks, and two fault lines.

Crossing the Urban Frontier

The West Harris County Regional Water Authority (WHCRWA) and the NFBWA are building the mega-waterline for good reason. The WHCRWA was created in 2001 to help more than 100 west Harris County municipal utility districts — and the City of Katy — shift from pumping underground well water to using a surface water supply. Those municipal providers deliver water and sewer services to neighborhoods in west Harris County, outside of the Houston city limits in an area bordered by U.S. 290 on the north, the Harris County line on the west and south, and the City of Houston on the east.

The mega-waterline (large enough to drive a pickup truck through) will carry much-needed treated surface water from Lake Houston across almost 40 miles of Houston/Harris County to water users in the west. Another pipeline will branch off the main line near US 290 and the Sam Houston Tollway and run south across the Katy Freeway to NFBWA where water demand is also on the rise. A second connection to NFBWA will be made in the Katy Freeway/Grand Parkway area.

Melinda Silva, engineer for the WHCRWA, said building a pipeline through an urban area will be challenging, but it is a project borne out of necessity, so the team will get it done in the safest and most economical way possible. In 2006, the WHCRWA bought a dormant pipeline easement from Exxon Mobil Corporation that runs from Oates Road north of Wallisville Road through

the City of Houston into the WHCRWA's boundaries. This old Exxon easement will provide the vast majority of right-of-way needed for the new water pipeline, and additional smaller easements will be acquired where necessary.

A Project With Many Layers

So why take on this massive project? It is a matter of public necessity and demand.

In 1975, the Texas Legislature created the Harris Galveston Subsidence District to regulate groundwater usage in Houston and Galveston counties to prevent additional land subsidence, which is the sinking – or compacting – of land into the empty space where water was once stored naturally. Over-pumping groundwater can lead to subsidence. The alternative was surface water, but getting an abundant supply from the lakes north and east of the city to hundreds of smaller water providers that supplied water to neighborhoods in north, central and west Harris County and Fort Bend County entails building a huge network of pipelines and pumping stations, and an enormous water treatment plant on Lake Houston.



On the west side of town, the WHCRWA started planning the system needed to get the water to the water providers within its boundaries. The first phase of that plan was completed by 2008, and included the construction of a pump station operated by the WHCRWA near FM 529 and U.S. 290 that is connected to the City of Houston's Jersey Village pump station by a 48"-diameter pipe. The city delivers water from its east water treatment plant through transmission lines to the Jersey Village pump station, then some of the water is transferred through the connector pipeline to the WHCRWA's pump station across the road. From there, the WHCRWA built a network of 52 miles of smaller pipelines that deliver surface water to 38 water districts in an area that covers the Copperfield, Horsepen, the Colonies, Bear Creek, Hearthstone, and Deerfield communities.

This aquatic feat was accomplished just over seven years after the WHCRWA was created, and ahead of the Subsidence District's first conversion deadline. The quick action helped bring water to districts that were having water quantity or quality issues with their wells, and gave the WHCRWA early conversion credits under its groundwater reduction plan approved by the Subsidence District. By December 2006, more than 12,000 homes in the west were receiving surface water – about two million gallons a day. The pump station and pipelines became the bedrock of the WHCRWA's surface water delivery system.

How the West Will be One

Looking forward, Ahrens said the next phase of work – the **Surface Water Supply Project** - will be monumental because it will convert another 55-60 municipal water providers to surface water.

If the mega-waterline, which is currently under design, is the backbone of the Surface Water Supply Project, then the other project components are its heart and soul. The team is designing two pump stations at key locations that will take water from the 96-inch pipeline and store it in tanks and then, when needed, transfer it to smaller lines that deliver it to water districts. One pump station will be built at Fry and Clay Roads, which will deliver water to customers in the west. The second pump station is east of U.S. 290 at West Little York Road. A few miles downstream of this pump station is where a portion of water will branch off from the main line and transfer to a "smaller" 84-inch diameter pipeline that will deliver water to NFBWA.

The WHCRWA team is also designing the network of smaller lines - 75 miles in total - that will take water from the Fry Road pump station and deliver it to water districts in the west.

Silva said the pipelines and pump stations are expected to be under construction by 2019. It will be a carefully orchestrated project because everything needs to be up and running by 2021, when the first phase of the City of Houston's northeast water treatment plant's expansion is complete, treating and pumping an additional 320 million gallons of water per day from Lake Houston into two separate megapipelines – one of which is the Surface Water Supply Project's 40-mile pipeline. When the entire system is in place, it will deliver up to 150 million gallons of water a day, which is the equivalent of re-filling 75 elevated storage tanks – the kind you find towering above almost every town in America – every day! It will be a challenge, but like those who blazed new trails when the region was young, it's nothing a team of hardy Houstonians can't accomplish! 💧



What do motor oil, lawn fertilizers, cigarette butts, grass clippings and pet poop all have in common? They all contribute to what the U. S. Environmental Protection Agency (EPA) warns is the number one threat to our drinking water supplies...

Nonpoint Source Pollution.

Today, most oil pollution in North America's coastal waters comes not from leaking oil tankers or oil rigs, but from countless oil leaks from the more than 263 million cars currently on the road in this country. Automobiles make daily oil deposits on roadways, parking lots and driveways and neighborhood streets. When it rains, storm water runoff carries with it globs and sheens of oil from paved surfaces into the storm drains...on to creeks and streams... and ultimately into bays and estuaries...and finally into the Gulf of Mexico, as is the case here in Houston.

Storm drains collect water from outside our homes and commercial establishments and take it -- untreated -- directly to streams, creeks and rivers.

Sewers, on the other hand, collect water from inside homes and businesses and carry it to treatment plants, where it is cleaned before being released back into nature.

Most water pollution does not come from illegal dumping of chemicals and toxic waste, which in fact, accounts for less than ten percent of it. Forty percent of water pollution originates with automotive fluids washing off paved surfaces from normal rainfall and cleaning activities.

Twenty five years ago, most of the "point-source" pollution -- the kind where the source was easily identified -- was eliminated when industries cleaned up their discharge to public waters to comply with the Clean Water Act or face crippling fines. Today, most water pollution comes from far more benign looking causes -- pastures, construction sites, parking lots, housetops, lawns and driveways.

Since the pollution comes from so many diverse sources that may also vary by season, it is often difficult to determine the exact point of origin. And consider who causes this pollution...it's you and me, doing things we do every day...without thinking about a more global impact.

Much has been written about the many causes of nonpoint-source pollution -- lawn fertilizer, silt from construction projects, hazardous household chemicals, and pesticides. There have been major public information campaigns about the impact of 'pet poop' on local streams and waterways. People are getting the message from homeowner associations and parks that if their dog makes a 'deposit' in a public place, the owner has a responsibility to scoop the poop and deposit it in the trash or in receptacles provided. How bad a problem can this be, you ask? In the densely populated Washington, D.C. suburb of Arlington, Virginia, there's a community park (Four Mile Run) where scientists estimate that dogs deposit more than 5,000 pounds of poop each day!



There are two other major sources of nonpoint source pollution, however, that haven't received the same kind of attention: **powerwashers** and **car washing**. Powerwashers are powerful cleaning machines that use water under pressure to make quick work of cleaning commercial parking structures and asphalt surfaces as well as residential driveways, patios and homes. Powerwashers can generate 10,000 to 20,000 gallons of wastewater for every 100,000 to 150,000 square feet of surface being cleaned.

When the weather warms up, on any given weekend you can hear the distinct sound of the gasoline-generated power washers in the neighborhood. Residents wash driveway oils and

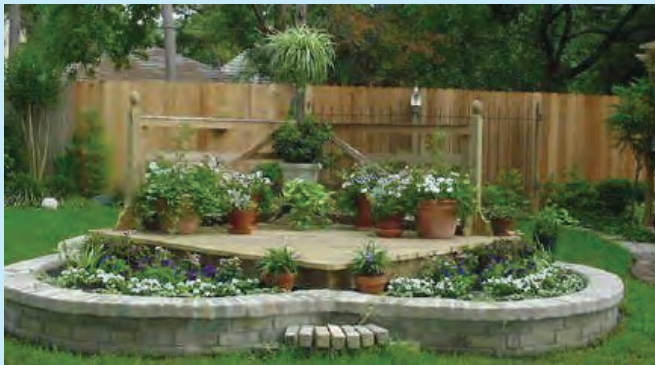
deposits along with molds and other patio stains and discolorations -- a veritable cocktail of toxic deposits -- right down the drain...the storm drain that is. Even simple motor oil contains lead, copper, cadmium and chromium -- all toxic to humans and fish and wildlife.

Then there is the simple matter of washing the family car. Just pull it up in the driveway, get out the hose and a bucket of soapy water and you're ready to begin. Maybe once upon a time, but today we're paying a whole lot more attention to how we impact the environment. It's not just the quantity of water used...now consider the soap. Most soap contains phosphates and other chemicals that may be harmful to fish and marine life. Phosphates cause excess algae to grow that not only looks bad, but smells awful and harms water quality. As algae decays, it uses up oxygen in the water that fish need to survive.

Make a commitment to do everything you can to minimize the risk that your activities will endanger the environment. When washing the car, use soap sparingly, pour the bucket of soapy water into the sink, not the storm drain; and consider washing the car while it is parked on a grassy area, not the driveway. Best of all choices, have your car washed commercially -- at a business that uses state-of-the-art environmentally-friendly equipment and processes... and recycles the water, too. 💧

WHAT YOU CAN DO...

Learn more about nonpoint source pollution. Make a commitment to do everything you can to minimize the risk that your activities will endanger the environment.



Consider constructing a wooden deck or a rock garden to keep the natural ground cover intact and allow rainwater to slowly seep into the ground. This acts as a natural filtering process and reduces harmful water quality impact from rainfall that carries chemicals and pollutants with it into storm sewers and eventually into nearby streams and lakes.

THE RISING COST OF WATER DO THE MATH...

In 2003, a long-term water supply contract with the City of Houston was successfully negotiated and design and construction of the necessary transmission lines and facilities began to deliver surface -- or alternate -- water to neighborhoods within the boundaries of the West Harris County Regional Water Authority (WHCRWA).

In 2010, WHCRWA met and exceeded the first of the Subsidence District's groundwater reduction mandates by converting to more than 30 percent surface (or alternate) water. The next groundwater reduction mandate is to increase surface water usage to 60 percent of total usage by 2025 (HGSD's 2013 Regulatory Plan).

A large sum of money will be needed to pay for the massive projects discussed in this publication to move from the design phase into the construction phase. The WHCRWA has to charge sufficient rates to cover **debt service and operating costs** for the infrastructure we already have in the ground, continue paying for the water we purchase from the City of Houston, funding our Capital Improvement Plan that includes constructing 75 miles of new water distribution lines and converting an additional 52 MUDs to surface water, and paying our fair share of the massive infrastructure projects -- estimated to be at least \$1.1 Billion.

Fortunately, we have access to a great new source of funding thanks to the State's new approach for turning water plans into water supplies. The WHCRWA has submitted several financial assistance applications under the **State Water Implementation Revenue Funding Program (SWIRFT)**. The TWDB approved these multi-year, low interest loan requests in 2015, for a total of \$812,140,000.

The three WHCRWA projects to receive SWIRFT funding include: the WHCRWA's share of the City of Houston's Northeast Water Purification Plant Expansion; the WHCRWA's share of the Surface Water Supply Project (a joint project, 96" transmission line with North Fort Bend Water Authority); and the WHCRWA's Internal Distribution System.

The WHCRWA Board of Directors is committed to keeping the periodic rate increases charged to the municipal utility districts and water providers reasonable and responsible. Increasing the WHCRWA fee steadily and in smaller amounts will help avoid a sharp increase in the fee in the years ahead. 💧

Mandates and Milestones

Continued from page 5

HGSD imposed conversion deadline in 2020, new population and water usage projections for Harris County suggested that attaining that goal may be even more challenging than previously anticipated. Research showed that the desirable West Harris County area would grow at a much faster rate than anticipated over the next decade, which meant that the Authority must speed up conversion from groundwater wells in order to have any hope of achieving the 70 percent of total demand to surface water 2020 milestone.

Previous forecasts had pegged the 2020 population in the West Authority at 455,000. Based on the official 2010 census, the Authority had *already reached that level by 2010!* The new 2020 population projection is 548,000 – an increase of more than 20 percent. Water demand projections estimate total demand in 2020 at 79 mgd, instead of the previously forecast 70 mgd. This jumped the Authority's 2020 (70 percent) conversion goal to 55 mgd from 49 mgd – an increase of about 13 percent.



*Source: Water Research Foundation; Residential End Uses of Water, Version 2: Executive Report; April 2016

Authority officials credit robust conservation education efforts – along with the higher water rates – with keeping a lid on per-capita demand, despite the steeper-than-expected population surge. The impact of the upwardly revised population and demand projections is to convert more districts and deliver more surface water sooner than planned. Interestingly enough, new projections show population and water demand further out – around 2050 – remain roughly the same as previously

forecast. Authority engineers and planners agree that “the finish line is still the same, but we have to do more, build more, spend more – sooner.”

HGSD Eases Mandate

Concern continued to mount about the projections and the ability of the water authorities to meet the HGSD's 2020 mandate. At its January 2013 board meeting, the Subsidence District voted to delay the next conversion date from 2020 to 2025, and to reduce the percentage conversion from 70 percent to 60 percent of total water usage.

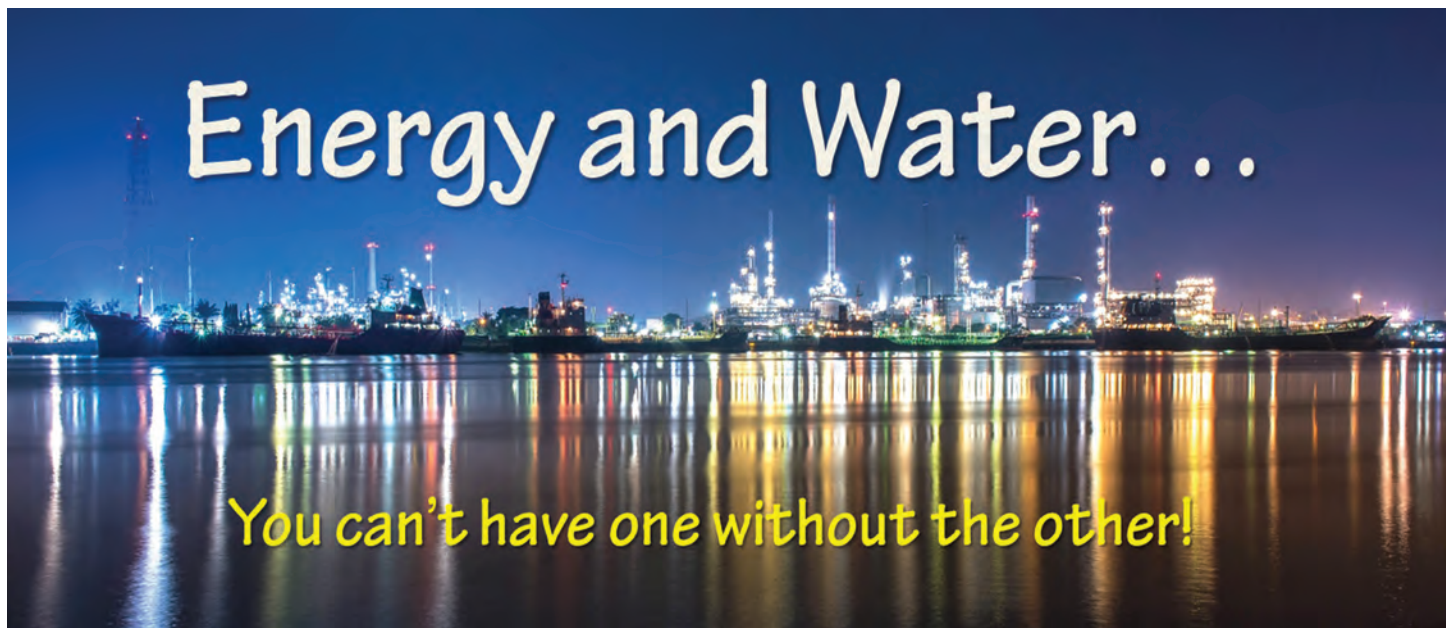
Authority officials and engineering team suggest that the delay will allow a more logical, reasonable approach to the design, bid and construction process.

Summary

The West Harris County Regional Water Authority has met and exceeded regulatory mandates for the conversion to surface water with the goal of reducing reliance on groundwater and eliminating subsidence. As of mid-2017, the WHCRWA has designed, purchased easements for, and constructed over 57 miles of new waterlines, constructed Pump Station #1, and is delivering up to 28.25 million gallons of surface water a day to 53 water plants, with 40 districts converted – that translates to approximately 36 percent of the Authority's districts converted.

And, as it has since its inception in 2001, the Authority continues to aggressively promote water efficiency by residents of all ages, through educational programs and community outreach efforts. In addition to pursuing its Capital Improvement and construction programs, the WHCRWA continues to encourage water conservation by offering incentives to individual water districts that find creative ways to reuse water resources, or find other alternatives to groundwater pumping. *(Read more about these important topics in this publication.)* 💧





For decades, Houston -- known as the *Energy Capital of the World* -- has been at the center of innovation in the oil and natural gas business. The Port of Houston's 25-mile network of public and private docks serves the second largest petrochemical complex in the world, and is the busiest seaport in the country in terms of ship traffic.

Have you ever thought about the **nexus** of water and energy? Probably not. But, in addition to the fact that we take both of these important resources in our lives for granted, it takes water to generate electricity, for example...and it takes electricity to produce our drinking water -- and the cost of both is likely to increase in the future.

There is a growing urgency to "spend" our water and energy supplies more efficiently and to do that, we will have to become better "stewards" of our dwindling resources. The more we understand about how we use water and energy in our homes, the more we realize that very often saving one results in saving the other. Many of the things that use the most water around the house also have a high energy consumption... like water heaters, washing machines and dishwashers. And showers use a huge amount of hot water.

Let's take a look at the basics. In the U.S, electricity is generated using a number of different energy resources; including fossil fuels (coal, oil and natural gas), nuclear, and hydroelectric power. Each of these use a significant amount of water to extract (fossil fuels), create, and produce the different kinds of energy we rely on everyday.

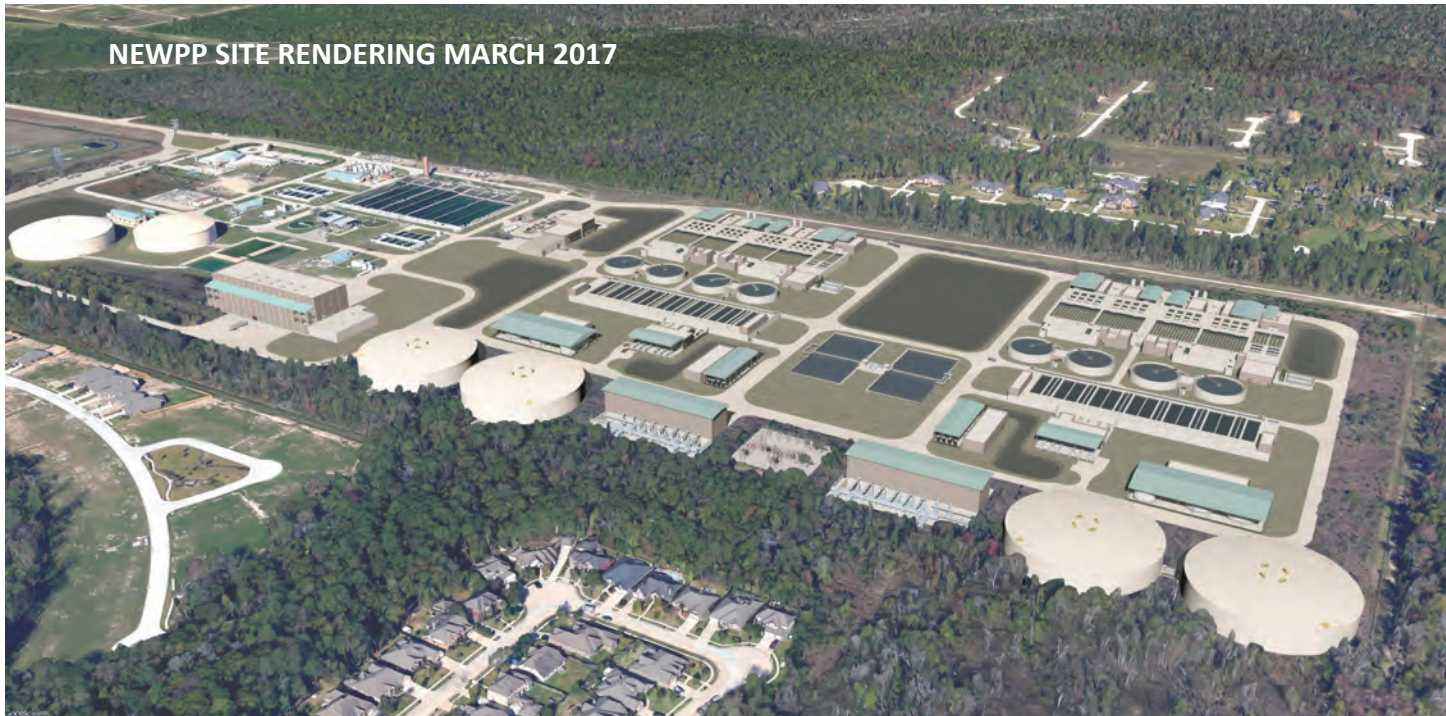
It also takes a significant amount of energy to treat and move water to where it is needed for household use and for irrigating crops and lawns. Electricity is used to collect, treat and dispose of wastewater, and we use energy to cook our food, and to heat the water for washing ourselves and clothing. Energy is also consumed when water is used by households or industries for heating and cooling.

We rely on having an adequate supply of water and energy in our daily lives and -- until an emergency like a hurricane or drought can demonstrate so dramatically -- few of us ever stop to think what life would be like without them. When there are shortages of these vital resources each impacts the other. A shortage of water, for example, can affect the production of energy since power plants in this country use billions and billions of gallons of water every day. A shortage of energy -- such as power outages during storms or periods of extreme demand that can occur during the hot summer months -- can impact operations at water plants.

There are many things each of us can do to help conserve water and energy at home. Focus on the activities that use both. An average household uses 32 percent of its heated water for washing clothes; 20 percent goes down the shower drain; another 20 percent is used for bathing (sink and bath tub use); dishwashing takes another 12 percent; which leaves 5 percent for preparing food and 4 percent for washing hands.

It isn't life-altering to use our finite water and energy resources more efficiently -- it just requires some good, old fashioned common sense and a commitment.

Remember, the water and energy we conserve today can serve us tomorrow! 💧



so that the Northeast Water Purification Plant could be expanded to treat the additional water supply. The five groups forged a partnership – the Northeast Plant Expansion Team – and hammered out a cost-sharing agreement so that each paid its fair share of the two-phase expansion project.

“We take a consensus vote on all major decisions,” said Jun Chang, P.E., D.WRE, the North Harris County Regional Water Authority’s Deputy General Manager and former Deputy Director for the City of Houston’s Public Utilities Division in the Public Works and Engineering Department. “All participants have a voice.”

The Houston Waterworks Team, a joint venture between CH2M and CDMSmith, was hired to design and build the project. Their chosen name was a nod to Houston’s original water provider.

Chang said the project is under design and on schedule to start construction in early 2019. The first phase needs to be finished by the end of 2021 to start delivering water from the Trinity River to north, central and west Harris County. The second phase of the project will allow the plant to treat up to 400 million gallons of water a day by 2024. It is considered the largest design-build project of its kind underway in the U.S.

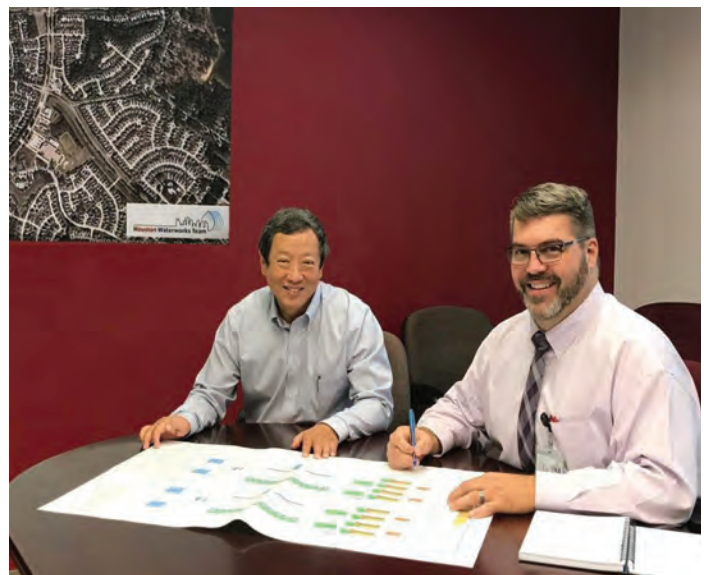
“We continually revise plans as we move forward,” said Chang. “We use the best data that can be gathered and put it together in the best way possible.”

After the first phase is complete, the plant will double its current water treatment capability. The Coastal Water Authority is currently building a pump station

at Capers Ridge near Dayton to be able to feed that additional Trinity River water supply through canals and underground pipelines to north Lake Houston.

After it is treated, water will run through two separate, yet equally massive, transmission pipelines to points north and west. From there, the water authorities will distribute the water through their own pipeline networks to water districts.

“Visionary leaders, past and present, have brought us where we are today, and we are moving forward with our partners to ensure that we do the same for future generations,” said Forrest. “This is a partnership that will stand the test of time.” 💧



Jun Chang, P.E., D.WRE, left, with Jeffrey Benjamin, P.E., Project Director, NEWPP Expansion, Houston Water Division, City of Houston Public Works and Engineering.



As the price of water continues to go up, it is likely that more water-users will embrace cost-effective, alternate water opportunities. The West Harris County Regional Water Authority (WHCRWA), for example -- in its 2016 Water Conservation Plan Annual Report to the Texas Water Development Board (TWDB)-- reported some very impressive results in this area. An estimated 444 million gallons of recycled/reused water were used in 2016 (primarily for irrigation, parks and golf courses) which resulted in a savings equivalent of approximately \$1.2 million dollars.

Here's some background. The primary focus of the WHCRWA has been on meeting the mandatory reductions in groundwater pumpage imposed by the Harris-Galveston Subsidence District (HGSD) with a goal of reducing subsidence. The first milestone -- a 30% reduction in use of groundwater -- was achieved by WHCRWA well before the 2010 deadline.

The HGSD revised their conversion requirements in their 2013 Regulatory Plan, which now calls for 60% conversion by 2025. This should make compliance with the mandate easier to accomplish, but currently there is not enough water in the San Jacinto River system to meet our 2025 need and beyond.

The use of untreated surface water and wastewater treatment plant effluent for non-potable uses can help reduce groundwater withdrawals to stretch available supplies, and the WHCRWA is offering some incentives to encourage these practices*.

The area within the WHCRWA boundaries includes lots of outdoor public spaces, golf courses, hiking/walking trails, family oriented parks, and recreational lakes -- many of which currently rely on "drinking" water to fill and supply ponds and irrigation. There is a very real opportunity to substitute non-potable water resources for these uses with the added bonus of earning valuable conversion credits for treated effluent reuse and rainwater capture.

Why the incentives? WHCRWA is responsible for managing overall conversion requirements against total water use for hundreds of wells within its boundaries. Any alternate water used above and beyond the regulatory requirement is eligible for over-conversion "credits" issued by the HGSD. These credits can be earned, stockpiled and used by WHCRWA in future emergencies such as operational outages, supply interruptions, during droughts, or toward meeting future conversion requirements.

How does it work? First, a participant must have a groundwater well or water plant to qualify. An agreement is made between the WHCRWA and the water owner -- usually a MUD, golf course, or homeowner's association (HOA). Typically, treated effluent reuse is metered directly, and rainwater capture is measured indirectly. For example...a well owner has a recreational lake that is filled by a metered groundwater well. That lake is used for irrigation water supply, which is also metered. If the amount of metered irrigation water is more than the amount of groundwater pumped into the lake, then the difference is assumed to be captured rainwater -- for which credits are awarded.

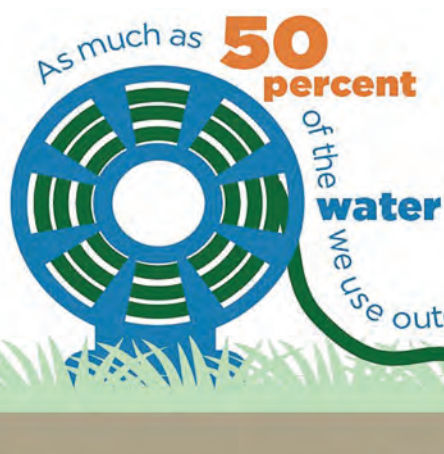
Financial credits are issued for metered alternate water use; no checks are written! The credits can be used against any fees owed to the WHCRWA. Today the Authority has entered into or is working on agreements for 6 effluent reuse projects for irrigating green space or golf courses, 4 rainwater capture projects on amenity lakes, and 2 non-potable surface water projects.

That has all the earmarks of a successful "win/win" effort. 💧

(*The complete Resolution adopting this policy is on the Authority's website: <http://whcrwa.com/wp-content/uploads/2014/03/Resolution-Adopting-untreated-surface-water-use-and-wastewater-treatment-plant-effluent-reuse-policy-September-2011.pdf>.)



West Harris County Regional Water Authority
3200 Southwest Freeway, Suite 2600
Houston, TX 77027
www.WHCRWA.com



Sources: Texas A&M
AgriLife Research
and Extension;
EPA; NASA

inefficient
watering methods and systems.
WATER LESS, SAVE MORE

Some important facts about RESIDENTIAL IRRIGATION

- **85 million U.S. homes have a lawn.** The average size landscape is one-fifth of an acre. All together, that adds up to **30 million acres of grass.**

- 89% of single family households use some kind of irrigation -- 95% of them use spray irrigation. 92% of the 95% do not understand how an irrigation system runs or how a controller works!

- The typical (U.S.) lawn/landscape soaks up more than 10,000 gallons of (primarily drinking) water a year, not including rainwater.

- Do the math -- that's 10,000 x 85 million = 850 billion gallons of water a year just for our lawns!

- The overall efficiency of an irrigation system depends on the design, what kind of equipment it uses, and how well it is maintained:

- ◆ Surface/subsurface drip -- 90% efficient
- ◆ Surface micro-drip -- 85% efficient
- ◆ Large rotors -- 70% efficient
- ◆ Small rotors -- 65% efficient
- ◆ Spray heads -- 50% (= 50% INEFFICIENT)

- During the summer months, it is estimated that 40 to 60 percent of water used by residential customers is applied to the landscape.

- Audit, repair and replace faulty irrigation equipment and adjust the controller to use the "Cycle and Soak" method to allow the water to seep into the ground and avoid runoff. More information at www.SaveWaterTexas.org. ■

IRRIGATION EFFICIENCY is a key component in water management strategies, and focuses on *doing more with less:*

- Irrigate according to your plants' water requirements and routinely adjust system controller seasonally.
- Replace water-thirsty turf with trees and shrubs and install 90% efficient drip irrigation wherever possible.
- Save time by installing low maintenance shrubs and mulch.
- Capture and use rainwater for container plants and other non-potable purposes.
- Choose the right plant for the right place.
- Reduce future water demand and create beautiful, drought-tolerant landscapes.