2016 Water Quality Summary

2016 WATER QUALITY SUMMARY

The purpose of EAA's water quality program is to monitor the quality of water in the aquifer by sampling streams, wells, and springs across the region for a variety of parameters. Stream sample locations, upstream of the recharge zone, monitor the quality of water entering the aquifer. Well samples are located throughout the recharge and artesian zones so that the water quality can be monitored within the aquifer. Spring samples monitor the quality of water flowing out of the aquifer. EAA's sampling program provides a representative "snapshot" of water quality conditions relative to the location, time, and date that the sample was collected. The Edwards Aquifer is a karst groundwater system that was formed by the dissolution of limestone rock by carbonic and sulfuric acid. Dissolution occurs when slightly acidic rainwater dissolves the limestone and creates caves and sinkholes. Sulfuric acid has a deep aquifer source, and dissolution generally occurs along the saline water/freshwater interface. These two processes significantly enhance the permeability of the Edwards Aquifer. The aquifer is characterized by rapid recharge and groundwater velocities in the recharge zone, highly productive wells in the artesian zone, and large springs, e.g., Comal and San Marcos springs.

Sample-Collection Summary, Calendar Year 2016

Parameter Group	Number of Sample Locations	Number of Samples	Detections above MCL
Bacteria Samples	30 Edwards wells	35	3
	4 Trinity wells	4	0
	5 spring groups	54	29
	8 stream sites	16	16
Metal Samples	35 Edwards wells	44	0
	43 Trinity wells	107	24
	5 spring groups	66	1
	12 stream sites	20	2
Nitrate-Nitrite as Nitrogen	35 Edwards wells	44	0
	43 Trinity wells	107	0
	5 spring groups	66	0
	12 stream sites	20	0
Volatile Organic Compounds (VOCs)	30 Edwards wells	39	0
	4 Trinity wells	4	0
	5 spring groups	61	0
	0 stream sites	0	0
Semivolatile Organic Compounds (SVOCs)	30 Edwards wells	38	0
	4 Trinity wells	4	0
	5 spring groups	61	8
	8 stream sites	16	0
Pesticide and/or Herbicide Compounds	30 Edwards wells	39	0
	4 Trinity wells	4	0
	5 spring groups	61	0
	8 stream sites	16	0
Polychlorinated Bi-Phenyls (PCBs)	8 Edwards wells	8	0
	0 Trinity wells	0	0
	5 spring groups	61	0
	8 stream sites	16	0
Pharmaceuticals and Personal Care Products (PPCPs)	2 Edwards wells	2	No MCLs are established for this parameter group
	0 Trinity wells	0	
	5 spring groups	69	
	2 stream sites	2	

MCL= Maximum Contaminant Level. For water quality samples, analytical results are compared with the primary standards on the basis of concentrations published in Title 30 of the Texas Administrative Code, Chapter 290, Subchapter F http://www.sos.state.tx.us/tac/index.shtml. For compounds that do not have an established MCL, the protective concentration level is based on the Texas Risk Reduction Program, Tier 1, residential value, as referenced in Title 30, Texas Administrative Code, Chapter 350 https://www.tceq.texas.gov/remediation/trrp/trrppcls.html.

Water quality composition in the recharge zone can change quickly and vary greatly in time and location because of stream infiltration, rainfall, and rapid groundwater velocities. In contrast, water quality composition in the deep artesian zone is generally more stable because of slower groundwater velocities and larger volumes of water.

In 2016, EAA staff collected water quality samples from 12 streams, 78 wells (35 Edwards wells and 43 Trinity wells; some wells were sampled multiple times), and five spring groups. Samples for PPCPs were collected at three wells, five spring groups, and eight streams. All the water samples were grab samples, which are discrete samples that represent the water composition at that specific time and place. Routine water quality data collected from streams, wells, and springs can be viewed and downloaded from the EAA's Scientific Reports Document Library, which can be found at http://www.edwardsaquifer.org/scientific-research-and-data/scientific-reports-document-library.

The EAA sampled both Edwards and Trinity wells in 2016 to investigate informational flow between the Edwards and Trinity aquifers. The interconnectivity is significant between the aquifers, according to studies related to upland recharge variability, streamflow gain and loss, tracer testing, multi-port monitoring wells, geochemistry, biologic habitat analysis, geophysics, and groundwater modeling. Whereas these studies clearly illustrate connectivity, a wide range of uncertainty remains regarding the amount of water that moves from the Trinity to the Edwards across the region. The EAA has initiated a study to reduce this uncertainty—the Edwards-Trinity Interformational Flow Investigation.

Overall, the Edwards Aquifer produces high quality water suitable for almost any purpose. Although most samples contained no detectable contaminants, concentrations of compounds of concern that were detected were fewer than Texas Commission on Environmental Quality's MCLs.

In Edwards wells, compounds detected most frequently were VOCs, such as tetrachloroethene (PCE) and chloroform. PCE is a common organic solvent used for dry-cleaning and degreasing. Former dry-cleaning sites are known to have PCE contamination in Bexar and Uvalde counties. Chloroform, a common byproduct associated with chlorination of water, probably entered the aquifer from septic tanks or lawn watering. None of the VOC detections exceeded their MCL, and no SVOCs, metals, or pesticide compounds were detected in Edwards wells. However, the herbicide compound 2, 4,-D was detected once in an Edwards well. A common herbicide, 2, 4-D destroys weeds but not lawn turf; this herbicide compound did not exceed its MCL. In Trinity wells, no VOCs, SVOCs, herbicides, or pesticides were detected. However, iron, manganese, and strontium were detected above the MCL in Trinity wells: iron was detected 16 times, manganese once, and strontium seven times. Although these detections were at concentrations above their MCLs, they are naturally occurring.

Stream samples were generally collected within the drainage area and recharge zone of the aquifer at USGS gauging stations located upstream of the recharge zone. These streams contribute significant groundwater recharge to the Edwards Aquifer. No PCBs, SVOCs, or herbicide or pesticide compounds were detected in surface water analyses.

Springs provide water samples that have been composited by the vast underground drainage network that makes up the aquifer. Spring samples analyzed for VOCs detected one compound (chloroform) whose concentration was below its MCL. The SVOC compound di-n-butyl phthalate was detected five times, below its MCL. Bis (2-ethylhexyl) phthalate (DEHP) was detected 10 times; twice below its MCL and eight times above its MCL. DEHP is used as a plasticizer. No PCBs or herbicide or pesticide compounds were detected in spring samples. One metal (iron) was detected above its MCL, but the detection is most likely associated with the natural occurrence of iron in the system.

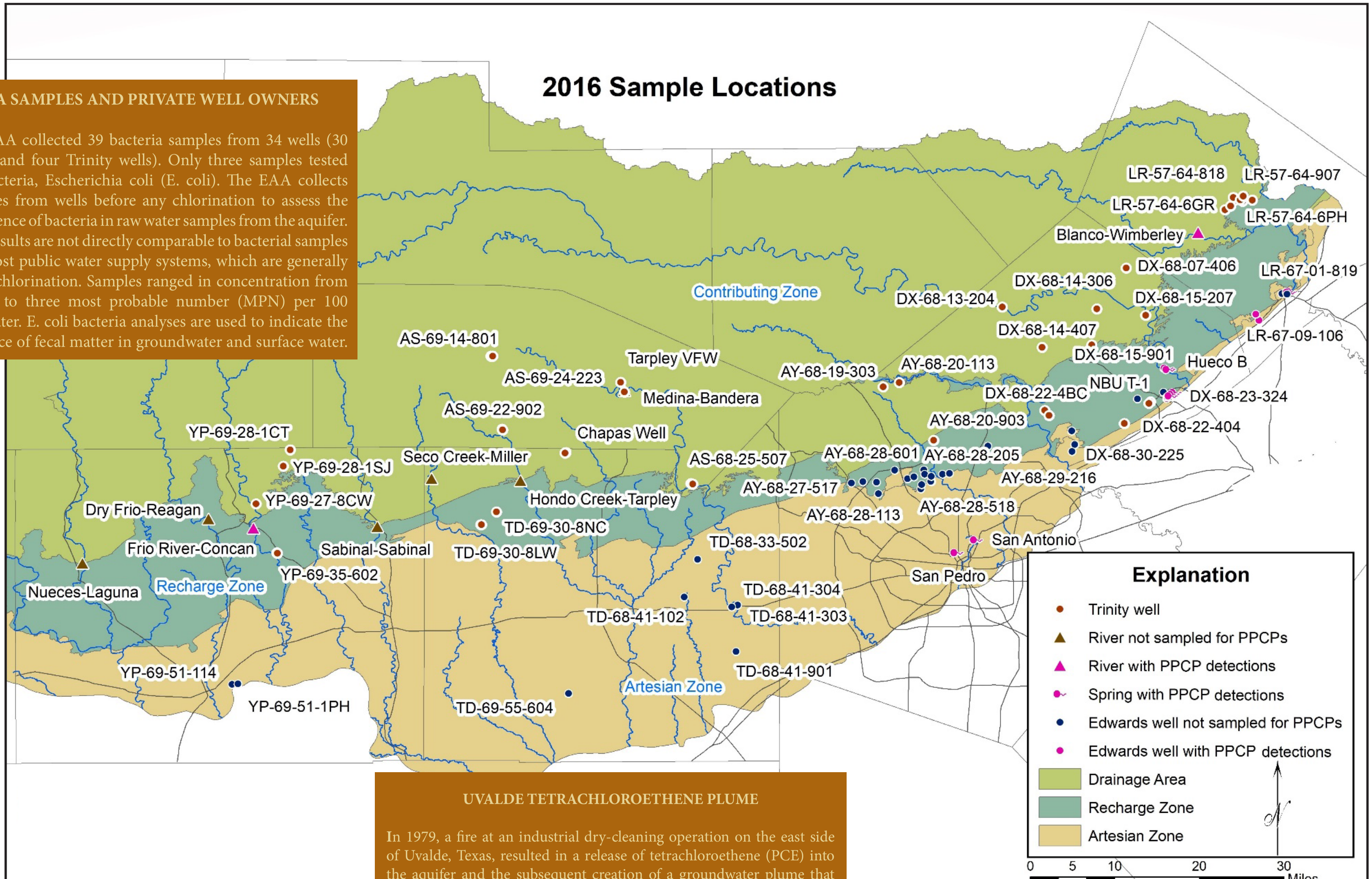
PPCP sampling performed in 2016 provided additional insight into the presence of these compounds in surface water, groundwater, and springwater. At the 13 sample sites tested for PPCPs in 2016, although 21 compounds were detected (see map), all detections were at extremely low levels. The types of compounds detected were generally trace concentrations of antibiotics, estrogen compounds, and other medications.

However, an unprecedented number of PPCP compounds were detected in 2016 because some of the compounds were also detected in laboratory blank samples (i.e., false positives). The laboratory reported them, and the compounds were flagged as blank contaminants. PPCP compounds currently detected in environmental samples do not have a regulatory limit.

Although the Edwards Aquifer produces high quality water for drinking water and agriculture, the potential exists for contaminants to enter the aquifer through the recharge zone, making the aquifer vulnerable. The EAA will continue to manage, enhance, and protect the Edwards Aquifer and its water quality. The map on the right shows locations of water quality samples from 12 streams, 78 wells, and five spring groups that EAA staff collected in 2016. Samples for PPCPs were collected at two Edwards wells, five spring groups, and two streams. Most of the samples were obtained from the Recharge and Artesian Zones of the Edwards Aquifer, and most sample locations had no detection of organic or PPCP compounds. Sample locations with no detection of anthropogenic compounds are indicated by blue, orange, and brown symbols. A few surface water and well locations and all spring sample locations detected PPCP compounds, and they are indicated by pink symbols.

BACTERIA SAMPLES AND PRIVATE WELL OWNERS

In 2016, the EAA collected 39 bacteria samples from 34 wells (30 Edwards wells and four Trinity wells). Only three samples tested positive for bacteria, Escherichia coli (E. coli). The EAA collects bacteria samples from wells before any chlorination to assess the presence or absence of bacteria in raw water samples from the aquifer. These sample results are not directly comparable to bacterial samples collected by most public water supply systems, which are generally collected after chlorination. Samples ranged in concentration from non-detectable to three most probable number (MPN) per 100 milliliters of water. E. coli bacteria analyses are used to indicate the possible presence of fecal matter in groundwater and surface water.



UVALDE TETRACHLOROETHENE PLUME

In 1979, a fire at an industrial dry-cleaning operation on the east side of Uvalde, Texas, resulted in a release of tetrachloroethene (PCE) into the aquifer and the subsequent creation of a groundwater plume that extends approximately two miles down gradient to the east. The PCE was first detected in a City of Uvalde water supply well (Edwards Aquifer well) in 1982, which was removed from service. Groundwater monitoring is continuing in the area, particularly at sample location YP-69-51-114. This location has been sampled quarterly since August 2014 and routinely indicates low level detections of PCE.

EDWARDS AQUIFER AUTHORITY


EDWARDS AQUIFER
AUTHORITY
edwardsaquifer.org