

Our Stolen Future: Austin's Barton Springs contaminated with PAHs and arsenic

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[Toxic chemicals taint Barton waters](#)

Pool, other city creeks may pose health risk; decades-old fuel waste cited as possible source

By Kevin Carmody and Mike Ward

Levels of toxic chemicals in Barton Springs Pool and just upstream on a hillside overlooking the pool have exceeded those found in a dozen of the worst hazardous waste sites in the country, an Austin American-Statesman investigation has found.

At points along three other Austin bodies of water — East Bouldin Creek, Waller Creek and the Central Market ponds at Lamar Boulevard and West 45th Street — levels of chemicals that increase the risk of cancer after prolonged exposure also have exceeded those found at toxic waste sites that federal authorities have declared public health hazards or Superfund sites.

Scientists who reviewed test results documenting the contamination say the data suggest that the pollution found in the pool and along the hillside is from hazardous waste dumped nearby. The most likely culprit, they say, is waste from coal gasification plants that produced fuel for city lighting from the 1870s to 1928.

Two toxicologists said the elevated levels of the neurotoxic metal arsenic and seven benzene-based compounds found in sediments at Barton Springs warrant temporarily closing Austin's environmental treasure, the spring-fed pool whose iconic value has driven more than a decade of anti-development campaigning and reshaped city politics. They recommend closing the pool until questions about public safety are resolved. The pool attracts an average of about 1,000 paid visitors a day.

This figure, adapted from the American-Statesman ([original PDF](#)), compares Barton Springs PAH levels with EPA standards and with contamination levels at other sites. Units are parts per billion benzo(a)pyrene equivalents.

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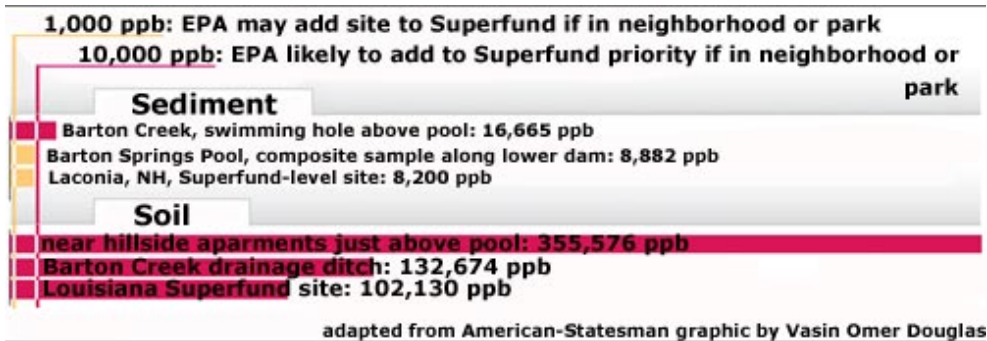
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Scientists also recommend that warning signs be posted to alert swimmers and fishermen to risks and that site assessments be done at the worst areas to document the extent and source of the contamination.

Though the city found the chemicals in the springs area as early as 1994, its focus in its testing program was on the endangered Barton Springs salamander and not on human health, city officials acknowledge.

The newspaper's findings go beyond its report in August, which showed that the presence of one benzene-based chemical, benzo(a)pyrene, sometimes exceeded state safety guidelines at the pool and on the hillside. Atop that hillside sit the Barton Springs Park Place apartments, at 1200 Barton Hills Drive in the Barton Hills neighborhood.

City officials said then that the carcinogen was not detected often enough to close the pool or pose any health concern for people.

The city maintained its position until Jan. 10, when nine city officials and their consultants met with editors and reporters of the American-Statesman. Because of the seriousness of the findings, the newspaper wanted to give the city a briefing and another opportunity for response before publication.

After the Jan. 10 meeting, City Manager Toby Futrell ordered her staff to take samples of sediment in the pool and Barton Creek on Jan. 11.

On Tuesday, the top public health authority in Austin and Travis County said that he and city officials now realize the hillside may pose a risk and needs a full assessment but that they don't have enough information about the level of exposure in the pool to know whether it poses a risk to swimmers.

"I think we all agree that we have a problem on the hillside," Dr. Ed Sherwood said. "I don't think there's any question about that."

City officials said they think seal coat treatments on streets and parking lots are the cause of the hillside contamination.

The newspaper's new findings suggest that swimmers in the pool and Barton Creek have been exposed not just to one contaminant but to a toxic stew of tainted sediment at least periodically for seven years, probably longer. The findings detail problems with arsenic and polycyclic aromatic hydrocarbons, a family of more than 100 chemicals known as PAHs.

Seven of those benzene-based chemicals — one of them benzo(a)pyrene — are the most dangerous of the PAH family, federal health officials say. The newspaper's findings are based on city tests of sediment and soil from 1991 to 2002 and a review of 11,000 pages of city documents obtained under the Texas open records law.

All six experts who provided a detailed assessment of the test results said the extraordinarily high levels and the number of contaminants found upstream in Barton Creek and on the hillside, including neurotoxins such as mercury and the pesticide heptachlor, indicate there may be previously unknown hazardous waste sites nearby.

It is possible, the newspaper's experts said, that the pollution came from coal gasification plants whose wastes might have been dumped on the ground or in an old gravel pit that was filled in before the Barton Hills neighborhood developed.

An e-mail obtained from the city under the Texas open records law shows that the serious nature of the contamination at the pool, creek and hillside had independent confirmation in early 2002 by scientists with the U.S. Geological Survey, the federal government's sciences research arm. A federal scientist reported to city officials that she was shocked by the "astronomical" levels of benzene compounds recorded in USGS tests.

Pete Van Metre, another USGS scientist who advises the city on water quality issues, told the newspaper he cautioned city staff that the levels upstream, particularly on the hillside creek bed, were higher than his agency had ever detected anywhere in the country in routine surveys of waterways. Those levels would be expected "at a contaminated industrial site," Van Metre said he told them in May 2001.

The newspaper also found elevated levels of the benzene compounds. In December, sediment from shallow areas along the northwest side of the pool was collected by two reporters and sent to a state-certified lab in Round Rock, DHL Analytical Inc., for analysis. The tests showed levels of benzene compounds higher than the U.S. Environmental Protection Agency has deemed safe for regular human contact.

Assessing the risks

The hillside contains a tree-lined dry creek bed as deep as 6 feet in some places with its upper portions strewn with rock, concrete

and chunks of asphalt. When rain falls, the water flows to Barton Creek below.

The hillside has repeatedly recorded the seven benzene compounds above the minimum level of 1,000 parts per billion that can make a residential or recreational area eligible for the federal Superfund list of the nation's most dangerous toxic sites needing cleanup. In one test, the compounds were found at 355 times that minimum.

The seven benzene compounds are listed by federal and international health agencies as either probable or possible human carcinogens. Arsenic is considered a known human carcinogen.

The EPA assumes that a safe level of the seven benzene compounds in the soil or sediment is 90 ppb or below. In the pool, the peak levels have been up to nearly 100 times higher, and nearly nine times the minimum that can qualify a site in a recreational or residential setting for a federal Superfund cleanup.

Scientists think the other locations with elevated levels of the benzene compounds — East Bouldin Creek, Waller Creek and the Central Market ponds — could have become contaminated by a variety of sources, including coal gas waste and leaking underground petroleum storage tanks.

In four other areas, along Shoal, Blunn and Harper's Branch creeks and Taylor Slough, the city's tests have recorded contaminant levels that exceed some state or federal safety guidelines. However, according to the EPA, the levels of chemicals and apparently low frequency of human exposure at most of those sites might not be great enough for action under the federal Superfund law.

Around the country, about 600 sites contaminated with the benzene compounds have qualified for Superfund cleanups. Documents and interviews with EPA Superfund staff identified a dozen sites where the benzene compounds were among the primary pollution concerns and were found at levels comparable to or lower than some of the Austin sites.

In New Hampshire, the Agency for Toxic Substances and Disease Registry, a branch of the federal Centers for Disease Control and Prevention, declared a public health hazard and banned swimming in the Winnepesaukee River near the former Messer Street Manufactured Gas Plant. Contamination of shallow sediment in the river in comparable samples had peak levels lower than the peak found in Barton Springs Pool.

In suburban Houston, Patrick Bayou joined the Superfund priority list on Sept. 5. It also had peak readings of the benzene compounds at lower levels than the peak detected in the pool and at about half the level the City of Austin detected in November 2000.

Near Conroe, the United Creosote site made the list with levels of soil contamination significantly lower in comparable samples than what has been recorded on the Barton Creek hillside.

The city knew about the high levels of the benzene compounds in the pool as early as 1995. City officials had mentioned the chemicals in several reports to the City Council and other government agencies. The reports were available but not widely distributed to the public. They typically suggested the chemicals might pose a threat to the endangered salamander but did not address whether they might be harmful to people.

Although the American-Statesman's August article prominently stated that a state toxicologist said there was no immediate health risk at the pool, city officials denounced the article as unnecessarily scary and "inappropriate."

City officials hired toxicologists to assess the health effects information on Jan. 10, and they started working immediately.

At the meeting at the American-Statesman, the city officials were asked how they could have failed to seek a human health assessment between 1995, when the pool recorded its first high measurement of the benzene compounds, and 2002, when salamanders started dying mysteriously.

"We didn't look at it from a human health perspective," said Nancy McClintock, manager of the Environmental Resource Management Division. She said the city tested three months later and could find nothing.

City officials did emphasize they had expanded the waterways testing program in 1997. They began looking upstream for the source of the pool's benzene compounds they thought might be threatening the salamanders.

By early 1998 those tests identified the hillside and another area on the opposite bank as the likely sources. The city put a project designed to stop erosion on the hillside into its capital improvement program in 1999, but design work did not start until after the Statesman's story in August.

In Austin, no official data exist about health problems that might stem from the pollution. It is known that a city biologist and three swimmers have experienced rashes or skin problems after being in the pool or Barton Creek. Last year, city scientists discovered endangered salamanders dying from a mysterious disease that produced blisterlike gas bubbles under their skin.

The benzene compounds can increase one's risk of developing various cancers after long-term exposure. At relatively low exposures, those contaminants and arsenic can cause subtle neurological problems, including memory loss and behavioral

changes if swallowed or absorbed through skin, according to medical literature and the newspaper's toxicologists.

The level of risk is always difficult to assess at contaminated sites, even at Superfund sites extensively investigated, the toxicologists said.

Risk depends on the frequency and level of exposure and a person's unique genetic makeup. Children typically ingest more soil or sediment than adults and may be more sensitive to certain contaminants. They could face a greater risk than adults do — particularly if they play in and along Barton Creek above the pool, the toxicologists said.

Swimmers cautioned

The toxicologists and several other experts urged caution for all swimmers. The crude nature of the city's tests in the pool, combined with the city's four detections of relatively high levels, offer more questions than answers — questions begging for a thorough site assessment, they said.

"When you think there may be harm, even though you are not sure, it's best to use prudent avoidance," said David Palmerton, a certified hazardous materials manager and owner of an Upstate New York-based company that coordinates the cleanup of contaminated sites for Fortune 100 companies.

One expert who advises closing Barton Springs Pool is Marvin Legator, longtime director of an environmental toxicology program at the University of Texas Medical Branch in Galveston and a former chief of genetic toxicology at the U.S. Food and Drug Administration.

"No matter how we look at it, the data really present to us a highly contaminated area," he said, referring to the Barton Springs area and the other three most contaminated sites. "If we confirm the measurements as they are, I would certainly think of just closing it (the pool) down till it's cleaned up. . . . If we have an individual who swims just once a month, I don't think that's really a threatening thing. However, if we have somebody who swims five days out of the week, that would be a real concern."

The pool has daily swimmers year-round.

The concern for swimmers' health was echoed by Patricia Williams, who teaches toxicology at the Louisiana State University School of Medicine in Shreveport and studied the health effects at the Lincoln Creosote Superfund site near Shreveport. She was surprised by the high levels of the benzene compounds in Barton Springs Pool and upstream. "I know of nothing in a natural setting, with this level of human exposure, that has a contamination level like that," she said.

Other than Legator, the other five primary experts said they didn't have the medical expertise to assess the extent of health risks in the pool. But three — Palmerton, Allen Hatheway, a retired University of Missouri professor of geology and past president of the Association of Engineering Geologists, and Michael Stenstrom, associate dean and professor, UCLA School of Engineering and Applied Science — urged caution.

The city should issue advisories or post warning signs at the pool and other sites alerting swimmers and fishermen to the contamination if experienced toxicologists suspected a possible human health threat, they said. Along with Williams and Legator, they said a detailed assessment of the most contaminated sites was warranted.

As for the hillside 80 yards upstream from Barton Springs and on the left for a person walking west: In the opinion of the newspaper's experts and environmental officials, it poses a far more serious problem than the pool.

"Based on the levels I'm hearing, in a residential setting next to apartments, a cleanup is certainly warranted," said John Meyer, an EPA manager for Superfund cleanups in the five-state region that includes Texas and the one who managed the cleanup at the Lincoln Creosote site in Louisiana. "A lot of times that falls under what we call time-critical removal, rather than the normal remediation process that can take many years to complete. Based on the immediacy of the risk, you take immediate action."

Some ground-level concrete patios at the Barton Hills Park Place apartments on top of the hill are as few as 15 feet from the dry creek bed, where levels of benzene compounds in the city's two initial tests were seven and nine times higher than in residential surface soils at the Lincoln Superfund site in Louisiana.

The pollution at Lincoln Creosote has, in a study by LSU Medical School staff, been associated with increased levels of cancer and other diseases. At Lincoln, the benzene compounds migrated into adjoining neighborhoods and drainage ditches where children played.

At the sites around Austin, the levels of the various contaminants vary widely site to site, suggesting there would likely be different levels of risk, the experts said.

Waller Creek, north of 24th Street near the University of Texas campus, recorded the highest level of the benzene compounds of any location in the city. That site has not been retested since the August 2000 result.

The level of toxic lead reported in that 2000 test was nearly three times the level that can prompt a Superfund cleanup when found in soil and nearly 15 times the level in soils that medical

researchers have found to cause reduced brain function in children playing in contaminated yards.

(EPA's soil guidelines can be used to assess contaminated sediments where there is regular human exposure in residential or recreational settings, an EPA Superfund manager and an EPA toxicologist said.)

Earl Janssen, head of the University of Texas environmental safety office, said he was shocked by the high level of lead recorded. His staff will investigate possible sources of the lead and the benzene-based compounds. Drainage from around the engineering school and the university power plant enters Waller Creek near 24th Street, Janssen said.

There is no information available on whether or how often children might play in or near the most contaminated spot. Children do play and fish in Waller Creek in areas several blocks downstream, where contamination appears lower.

Experts who study benzene compounds say it is possible that the source of contamination at Waller Creek is something other than coal gasification, perhaps a leaking petroleum storage tank.

The three Central Market ponds were designed by the city to help capture sediment flowing through a tributary of Shoal Creek. The city officials said they expected these ponds to capture pollutants.

But the levels of the benzene compounds and metals are high enough to pose a health risk for anyone who may wade in the ponds and possibly for those who regularly play at the edge; at the very least, signs should be posted as a warning about potential risks, according to the newspaper's toxicologists.

Coal gasification was a method used during the 1800s and early 1900s to extract gas from coal for use in street and home lighting. The resulting wastes contained high levels of the benzene compounds, mercury, arsenic and ammonia.

Austin had at least three manufactured gas plants downtown after the early 1870s. Two were coal gasification plants. The third used wood products in its gas-making process.

"The gas makers would take to, as they say in Texas, 'getting shut' of the wastes by dumping them in other nearby depressions in the ground," said Hatheway, the retired University of Missouri geology professor who is considered the nation's top expert on coal gasification sites.

Seeking the source

The tainted soils above Barton Springs are near what in the late 1800s was a primary road from Austin to points west, including

Bee Cave. The stone bridge that crossed Barton Creek on that early-day trade road washed out in 1900.

The city also had several ice plants in the mid-1800s — one of which was operating downstream from Barton Springs Pool at a grist mill by about 1875. Ice plants sometimes used small coal gasification units to provide energy and produce ammonia as a refrigerant. It is unknown whether the ice plant at Barton Springs had such a unit.

A successful cleanup of the upstream site could halt the flow of most benzene compounds and metals into the pool and Barton Creek. But it could be costly and difficult, depending on the amount of waste and whether it is below a small or large section of the Barton Hills neighborhood, the experts said.

The limestone aquifer system in Austin makes remediation "very difficult . . . if (contamination) has entered the ground water or is transported as particles through bedrock fractures," said Palmerton, the hazardous materials manager. "Typical gas plant sites . . . can cost tens of millions of dollars to investigate and remediate."

It is unknown whether ground water in or near the Barton Creek sites is contaminated with the benzene compounds.

City officials theorize that the benzene compounds from the hillside enter the pool only when floods spill over the dam at the upstream end of the pool. The levels of the benzene compounds found upstream and in the pool, and recent Geological Survey tests of the suspended sediment entering the pool from the springs, appear to support the city's explanation of how the tainted sediment typically enters the pool.

The city has said there is no human health concern because some floods leave little sediment in the pool and the shallow areas often contain little sediment. That view, however, doesn't hold up to a toxicologist's scrutiny.

"I don't quite see the city's argument on this," said Legator, the University of Texas toxicologist. "If we're getting those measurements . . . and this is where everybody is swimming, they're exposed."

The city also argues that because the tests showed 19 nondetections of contaminants over 11 years, the problem is intermittent and therefore not risky. The experts don't see it that way.

"That's not appropriate," said Paul Templet, former head of Louisiana's environmental agency. "If just one analysis exceeds a standard, you want to look a lot more closely, . . . and somebody ought to take a closer look at this situation."

Until a few weeks ago, city scientists never attempted to test the shallow end of the pool, where hundreds of children frolic in a few inches to a few feet of water on many summer days. After initially rebuffing suggestions to test the shallow end and other shallow areas in which adults might walk and be exposed to tainted sediment, the city tried to collect sediment samples in the shallow end on Nov. 14.

"There wasn't enough to get a valid sample," said Ed Peacock, a member of the city's watershed protection staff.

Within a month, members of the American-Statesman staff, using the city's sample collection protocols, collected a sediment sample from the shallow end that was deemed adequate by a state-certified lab.

Last weekend the city staff tested at sites around Barton Creek and three locations in the pool, including the shallow end. The results showed lower levels of the seven benzene compounds in soil than in previous tests at the hillside. The shallow end of the pool recorded levels of two benzene compounds at 8 ppb in the sediment — significantly lower than the EPA's health-effects threshold of 90 ppb.

However, arsenic levels in the sediment were 3,640 ppb, far above the 400 ppb screening level the EPA has deemed safe in most locations. A sample of sediment in a deeper part of the pool showed a level of 880 ppb of the seven benzene compounds, below the 1,000 ppb that can lead to EPA action under the Superfund program. Arsenic levels were 5,540 ppb.

Arsenic also a mystery

On Thursday, the Texas Commission on Environmental Quality, the Texas equivalent of the EPA, began testing throughout the Barton Springs area.

City literature describes the pool as "one of the crown jewels of Austin." It attracts 350,000 paid visits a year and as many as 500,000 visitors, including free after-hours visits.

It is not unusual for the city to close the pool during and after heavy rains, but not because of benzene compounds. It happens when water testing finds elevated levels of bacteria that can cause gastrointestinal illness.

More problematic than benzene compounds for the pool's future may be the arsenic that federal scientists recently found flowing directly from the spring itself, attached to sediment at levels that Legator and other toxicologists consider too high for regular human exposure.

The source of the arsenic is not known, although some soils have naturally elevated arsenic levels. Tainted runoff into creeks miles

from the pool could be contaminating the aquifer that feeds the springs, city officials said.

The EPA recently reevaluated the risk of arsenic in drinking water, based on new studies showing the metal is more toxic and carcinogenic than previously thought. Despite resistance from the Bush White House, the EPA lowered the acceptable level in drinking water from 50 to 10 parts per billion.

On one occasion, in November 1995, the city detected arsenic in the pool water at 46 parts per billion. The typical readings at the pool are 1 or 2 parts per billion.

The levels of arsenic in suspended sediment entering the pool range from 17,800 to 22,300 parts per billion, according to city records of Geological Survey tests from 1999 to 2002. In the sediment on the bottom of the pool, the levels have been measured as high as 13,600 parts per billion, by the city in May 2001.

"With PAHs together with metals such as arsenic, you'll want to look at whether there is an increase in birth defects," Williams said. "Arsenic is a particularly bad actor, and for exposed individuals, there may be a wide range of cancer and noncancer effects occurring."

Arsenic is a cumulative poison, Williams said, so it will build up in the body a little bit more each time someone is exposed, particularly accumulating in the testes and affecting sperm.

"You have the question of what's going to happen to the next generation," she said.