

SPORTS



Undeclared Nyquist becomes fourth straight favorite to win Kentucky Derby.

ZEST

A mother's story

When Desiré Waller got pregnant, she put her trust in Houston midwife Afua Hassan. "My great-grandmother had her 13 babies under a tree. I trust my body. I know I can do it."



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HOUSTON CHRONICLE

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CHEMICAL BREAKDOWN

Explosions and toxic releases are frequent and frightening. They can strike in any community in the Houston area, ignited in workplaces big and small, and yet the threats are hidden from the public.



Michael Ciaglo photos / Houston Chronicle

Goodyear, which ranked near the top on the A&M list of plants that pose a high potential for harm, sits across from a park in Pasadena.

By Mark Collette and Matt Dempsey

First in a series

Just outside Pearland, theater patrons come and go within 200 feet of a warehouse that stockpiles a pesticide so toxic it seeped into a family's house in Utah and killed two little girls.

A metal forging company about a half-mile from Cy-Fair High School stores 27 chemicals, including titanium, a material that blew up at a golf club manufacturer in Los Angeles and leveled a city block.

And in Crosby, a public sports complex is close to a plant that houses explosive organic peroxides, a class of chemicals used in terror attacks in Paris and Brussels.

All over America and across greater Houston, capital of the nation's petrochemical industry, hundreds of chemicals pose serious threats to public safety at facilities that may be unknown to most neighbors and are largely unpoliced by government at all levels, a yearlong Hous-



Jose Flores drives chemicals through the warehouse at Palmer Logistics, a distribution company.

ton Chronicle investigation reveals.

The Occupational Safety and Health Administration doesn't inspect most facilities; when it does, it's often due to an accident or complaint. The Environmental Protection Agency ignores entire classes of hazardous chemicals when looking at which sites to scrutinize. Texas and other states have made accessing information about chemical stockpiles more difficult. Local emergency planning groups are in

many cases unfunded, and, in the most extreme instances, include people on staff lists who have died.

The danger is real. Since November 2014, when four employees died after a gas leak at a DuPont plant in La Porte, there have been 12 explosions, fires and toxic releases widely reported around greater Houston, including one on Thursday that destroyed a Spring Branch packing facility that handles hazardous materials. That's one every six weeks. Nationally, at least 17 people have died and 573 have been hospitalized in more than 93 incidents involving hazardous chemicals in the last year and a half.

In response to the DuPont accident, the Chronicle obtained the chemical inventories of more than 2,500 businesses in greater Houston. Chemical safety experts at Texas A&M University's Mary Kay O'Connor Process Safety Center then ranked the potential of each facility to kill or injure people and cause property or environmental damage should an incident

Chemical continues on A24

★ » To see an interactive map of facilities, read the complete A&M analysis and watch an accompanying video, go to HoustonChronicle.com/chemicalbreakdown

A sacred space under a rare hill

Cistern's beauty at long last to be open for viewing

By Lisa Gray

In early summer of 2010, nobody thought much about the artificial hill where, every year, the city of Houston launched Fourth of July fireworks. Next to Jamail Skate-

park, the hill lay inside a strip of land that Buffalo Bayou Partnership was preparing to buy and transform into a park. Hills being rare in Houston, the partnership's consultants thought they might be able to put this one to good use — maybe as the site of the park's concert hall, which then would have a stunning, up-close view of down-

town.

And maybe, they thought, the park could find a use for the enormous underground space that they knew must exist beneath the hill. It had been a drinking-water reservoir, built in 1926, a space as large as one and a half football fields. Now the city was taking bids to demolish the leaky old

Cistern continues on A11



Melissa Phillip / Houston Chronicle

The Buffalo Bayou Park Cistern, built in 1926 to hold drinking water, contains hundreds of columns.

Trump upended Cruz's strategy

Mogul usurped Texan's role of political outsider

By Kevin Diaz

WASHINGTON — For Ted Cruz, it all came to a head outside The Mill restaurant in Marion, Ind., site of a final campaign stop on the eve of the Hoosier State primary that would end his bid for the White House.

As the junior senator from Texas headed for a waiting car, he spotted a half-dozen protesters across the street. Some were holding up signs for front-runner Donald Trump.

With news cameras in tow, Cruz, a Harvard-trained lawyer, walked over to talk.

"What do you like about Donald Trump?" he asked. "Everything," said a man in sunglasses.

Further efforts to engage were met with insults and jeers.

"Indiana don't want you," said the man in the

Cruz continues on A9

Longtime Saudi oil minister ousted

Texas producers hopeful change sets new course

By James Osborne

The sudden replacement of Saudi Arabia's oil minister Saturday set off fresh speculation over whether the kingdom might shift tactics amid one of the largest oil busts in history.

Longtime minister Ali Al-Naimi refused to maintain Saudi Arabia's traditional role as a swing producer and lower crude production, even as oil prices have remained at historic lows since late 2014. This position had been widely viewed as an attempt to put shale producers in Texas and other oil rich states out of business.

The new minister, Khaled Al-Falih, the chairman of state-owned Saudi Aramco and a Texas A&M graduate, offered no signs

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CHEMICAL BREAKDOWN



Michael Ciaglo / Houston Chronicle

Patrons and performers at the Pearl Theater near Pearland were surprised to learn that the warehouse across the street stores thousands of pounds of highly toxic aluminum phosphide.

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occur. The analysis was based on the properties and quantities of the chemicals and the size of the surrounding population.

The results — adjusted for OSHA violations and company responses — found 55 facilities with the highest potential for harm to the public. Close to 600 scored in the medium tier, storing chemicals dangerous enough to impose serious harm in an accident. Nearly 80 percent of the facilities in those tiers have 10,000 or more people within a 2-mile radius.

One medium-tier plant: The DuPont facility in La Porte, where the 2014 leak involved methyl mercaptan, a highly flammable chemical that never found a spark. If it had, the explosion could have hurled debris, piercing tanks of hydrogen fluoride. That could kill and injure people up to 25 miles away, encompassing an area with more than 2 million residents, according to information DuPont and its spinoff company, Chemours, disclosed to the EPA. Such an accident nearly happened at an Exxon-Mobil plant in California, where flying debris narrowly missed a hydrogen fluoride tank, the U.S. Chemical Safety Board reported.

Sam Mannan, who heads the O'Connor center and is one of the nation's preeminent experts on chemical safety, watches the same root causes play out again and again in accidents — lack of assessed risks, communities kept in the dark, inattention to zoning. "We are literally running from disaster to disaster without a well-thought-out plan," he said.

It's only a matter of time, Mannan said, before an accident reaches beyond a plant's fence-line to claim lives.

The Texas A&M analysis

Degesch America's pesticide warehouse is surrounded by a chain-link fence north of Pearland. The Pearl Theater is across the street. The only signs of potential danger at Degesch are two diamond placards near the front door, marked with colors and numbers that, to first-responders, offer important warnings: reacts with water, highly flammable, fatal if inhaled.

The aluminum phosphide inside is so toxic it can't legally be used within 100 feet of a building that could be occupied by living creatures.

Degesch ranked second for potential harm in the A&M analysis, partly because of the pesticide's toxicity and also because it can house up to 75,000 pounds. It took less than 2 pounds of aluminum phosphide pellets placed in the ground around a home in Utah to produce enough gas to slowly kill a 4-year-old and her baby sister in 2010.

"There's 1,200 chemical pesticides out there, and I'd put this one at the top of the list of things that scare me," said Dave Stone, an environmental toxicologist and former director of the National Pesticide Information Center at Oregon State University.

The A&M analysis does not measure the risk of an accident happening, where a problem is likely to occur or the safety of the operations at a given facility.

Mannan noted that the properties that make chemicals dangerous also make them inherently useful. He hopes the analysis will inspire industry and government to better manage the risks.

Facilities across the country would likely produce similar results, in terms of the percentages in each tier, if the same methodology was applied, Mannan said.

Federal law requires companies to file inventories that include any of more than 500,000 hazardous products. Based on the data collected from greater Houston companies, A&M evaluated 983 substances. But under the EPA's Risk Management Program, its chief accident prevention strategy, the agency looks at only 148 chemicals, ignoring places like Degesch.

The A&M study does not cover all of greater Houston.

Many facilities that produce or house hazardous chemicals couldn't be identified by the Chronicle because the state allowed local governments to withhold inventories, citing a Texas law that restricts information that might be useful to terrorists. Brazoria and Galveston counties, home to some of the largest concentrations of chemical plants in the world, refused the paper's

"We are literally running from disaster to disaster without a well-thought-out plan."

Sam Mannan, Texas A&M

request. So did Fort Bend and Waller counties.

A federal right-to-know law mandates disclosure, under the theory that the public is better protected by being informed. The law is not enforced.

Degesch rejected interview requests from the Chronicle — two employees hung up on reporters — and an inquiry to the company's German headquarters went unanswered.

Peter van Nifterik, president of the Pearl Theater, knew nothing about the pesticide stored at Degesch. He assumed the facility was as benign as the plumbing place next door.

If an incident happened at Degesch during a show, Van Nifterik said he wouldn't know whether to take shelter or evacuate.

Pearland neighbors

Degesch is in a light industrial park, with warehouses, crane suppliers and machine shops, and is about three quarters of a mile from Shadow Creek Ranch.

The suburban community of up to 12,000 homes with sought-after schools is the kind of place where people live precisely because it's nowhere near the Houston industrial complex.

But other sites of concern are on either side of the industrial park. AkzoNobel Surface Chemistry operates a 45-acre plant southwest of Degesch that, among dozens of other hazardous materials, stores up to 2 million pounds of ethylene oxide, a highly flammable, explosive and toxic gas.

The plant has tanks and a couple of towers, but it doesn't look like its massive counterparts on Houston's east side. People with extensive experience in Pearland real estate — two salesmen for home builders and one agent — said prospective buyers almost never ask about AkzoNobel, yet most of Shadow Creek Ranch is

within 2 miles, the range used in the A&M analysis. Many in the neighborhood took notice of the plant as a suspect after an offensive odor materialized last year. State officials are investigating possible sources, including a nearby landfill.

The company is confident the plant isn't the source of the odor, spokesman George Nolan said, and has invited nearby residents for site visits.

For ethylene oxide and other hazardous materials, AkzoNobel often does more than federal safety and environmental standards require, Nolan said.

East of Degesch, tucked among the trees on Hooper Road, Syntech Chemicals occupies little more than 3 acres, and stores up to 50,000 pounds of formaldehyde solution, considered highly corrosive, toxic and flammable. It also has about a dozen other hazardous chemicals.

In 2002, fire ignited several 10,000-gallon tanks of methyl alcohol. Explosions destroyed most of the plant and sent a plume of black smoke toward the Sam Houston Tollway, snarling rush-hour traffic. Investigators attributed the blaze to an overheated oil reactor. Three months later, one of the tanks caught fire again. OSHA fined the company more than \$100,000 for violating chemical process safety standards.

Three years ago, OSHA inspectors — prompted by a complaint — found hoses attached with hanger wires or patched with duct tape because clamps

were damaged or missing. Employees told investigators that a worker damaged his eyesight after being sprayed with chemicals when he disconnected a hose.

Syntech Vice President James Gordon, in an email, attributed the 2002 fire to a faulty valve. The company rebuilt the plant, upgrading to the most modern equipment and safety features, he said.

Syntech then ran it for 11 years, OSHA found, without properly inspecting certain pressure relief valves, the last line of defense against fires, explosions and toxic releases.

The company reported that it fixed the problems from the 2013 inspections within one year, OSHA data shows. Gordon called the company's compliance record in the last 15 years exemplary.

"We at Syntech do not take safety lightly or as an afterthought," he said.

Syntech, Degesch and AkzoNobel were in place long before Shadow Creek Ranch's developers broke ground in 2001. None of the facilities will be visible above the treeline from the neighborhood's new sports complex, under construction less than a mile from Syntech and a couple thousand feet from the other plants.

Dangers hit home

In Pasadena, east of Houston, residents who live near the Houston Ship Channel know that myriad chemicals could cause the next fire, explosion or

Chemical continues on A25



Michael Ciaglo / Houston Chronicle

A sign for new homes sits across from AkzoNobel Surface Chemistry, one of the businesses in the A&M analysis.

Dangerous and potentially deadly

The Chronicle/A&M analysis considered hundreds of chemicals. Here are four used by facilities on the list of those having high potential for harm.

TRIETHYLALUMINIUM



WHAT IT LOOKS LIKE: Colorless liquid.
WHAT IT'S USED FOR: As a catalyst in the production of polyethylene and as a plating agent. A mixture of triethylaluminum and triethylborane is used as the ignitor for the first stage of the SpaceX Falcon 9 rocket.

WHY IT'S SCARY: Ignites immediately upon exposure to air. Contact with eyes or skin causes severe burns.

HYDRAZINE



WHAT IT LOOKS LIKE: Colorless liquid with an ammonia-like odor.

WHAT IT'S USED FOR: As a rocket propellant and in fuel cells.

WHY IT'S SCARY: Highly flammable. Also highly toxic when inhaled or absorbed by the skin. Can cause seizures or coma and damage to the liver, kidneys and central nervous system. The EPA says it's a carcinogen.

ALUMINUM PHOSPHIDE



WHAT IT LOOKS LIKE: Dark gray or yellow crystals, powder or pellets, with a garlic odor.

WHAT IT'S USED FOR: As a pesticide. Can also be used in devices such as LEDs.

WHY IT'S SCARY: When it comes into contact with atmospheric moisture or the hydrochloric acid commonly found in the stomach, it releases phosphine gas, which is deadly on contact. Especially toxic to aquatic life.

CUMENE HYDROPEROXIDE



WHAT IT LOOKS LIKE: Colorless or pale yellow liquid with a sharp, irritating odor.

WHAT IT'S USED FOR: In the production of polymers and fiberglass products.

WHY IT'S SCARY: A powerful oxidizing agent, it reacts violently with water. Highly flammable. Toxic if swallowed. Inhalation causes headache and burning throat. The liquid form can burn the skin or cause eye damage.

CHEMICAL BREAKDOWN

Chemical from page A24

release. Most are employed at the plants or at related service companies. For them, the pipes mean prosperity.

An October explosion at SunEdison (formerly known as MEMC) near Highway 225 burned four workers, one so severely that he needs long-term care. The blast resulted from a release of silane gas, one of several hazardous substances used to produce silicon wafers for the electronics and solar industries. A Harris County report said it appeared a valve leaked during maintenance.

The company didn't respond to inquiries about the A&M findings, which placed it on the high-potential-harm list for another substance, an aluminum compound that ignites upon exposure to air.

After the fall explosion, spokesman Gordon Handelsman said earlier incidents had triggered enhanced inspection, maintenance and safety programs.

Fifteen workers went to hospitals after a release of corrosive fumes in 2008, and that same year, a loose pipe fitting resulted in a fire shutting down the silane unit for a week.

In 2011, OSHA cited SunEdison for cracked valves in that unit and for failing to provide workers with a way to lock valves, exposing them to hazards.

A Pasadena area plant near the top of the A&M study, LyondellBasell (also known as Houston Refining), had a fire on April 8. No one was hurt, but schools and homes nearby were told to shelter-in-place for an hour. The plant had 11 violations during a 2009 OSHA inspection, many related to the mishandling of hazardous chemicals.

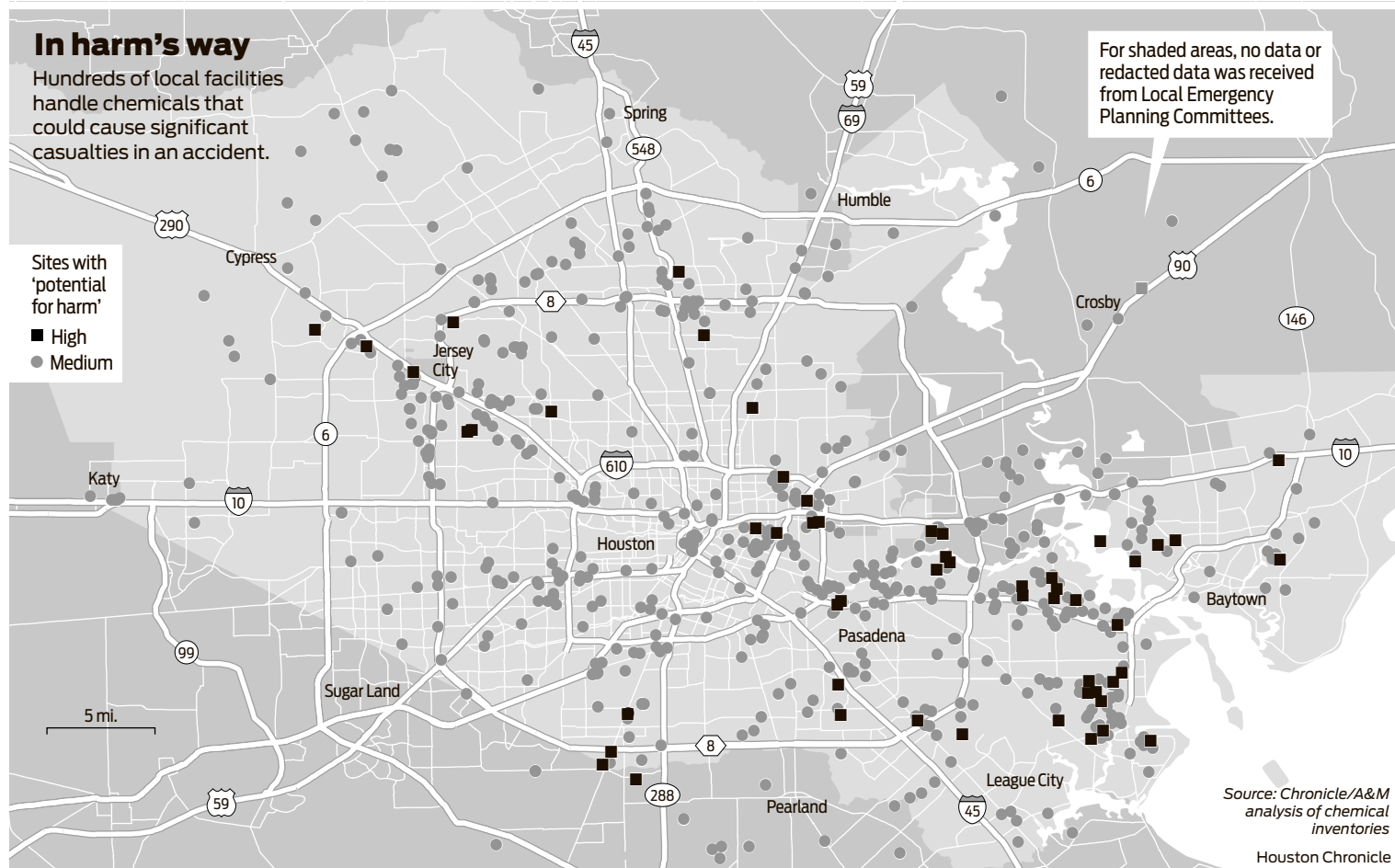
"We take our commitment to safe operations and compliance with federal and state regulations very seriously," Lyondell-Basell spokesman George Smalley said by email. "We regularly meet with our community and local officials and strive to be a good neighbor at all times."

LyondellBasell can house more than 10 million pounds of methyl mercaptan. That's more than 430 times the amount that spewed into an enclosed building at DuPont.

DuPont knew for years that hazards at its pesticide plant were capable of killing not only workers but nearby residents, yet problems with clogged pipes and fire protection weren't fixed, the CSB said last fall over company objections. The plant had not seen an OSHA inspector since 2007.

DuPont is closing the plant and spun off part of it into a new company, Chemours. It has up to 2.1 million pounds of toxic hydrofluoric acid, which tops the list of chemicals that advocates want industries to replace. When released, the acid forms a dense, rolling cloud of gas that hangs close to the ground, potentially sending lethal concentrations for miles. In 2012, a South Korean plant released 8 tons of it, killing five workers and triggering emergency treatment for more than 3,000 people in towns downwind.

Sergio Serrano, 76, and his wife have lived near such dangers for 40 years. They sleep to the ceaseless hum of chemical plants in Pasadena, like giant vacuum cleaners running in their back yard. Booming explosions or wailing sirens indicating chemical releases have pierced some nights - more times than Serrano can recall.



Nearby, there's Goodyear, with sodium sulfide, a dangerous chemical in rubber production.

In 2008, a heat exchanger exploded at the plant, killing one worker with flying debris and spraying six others with toxic ammonia. OSHA fined the tire giant \$43,000. A year earlier, OSHA had cited the plant for violating a rule that requires companies to take action in response to their own hazard analyses, and for having infrequent inspections of processing equipment.

Over the years, chemical giants have bought out Serrano's neighbors and tried to buy his 860-square-foot home. No one has offered more than \$15,000, and that's not enough to afford a move, said Serrano, who is retired after years of washing hospital linens. So here he remains, looking out across weed-covered lots, sleeping to the hum.

'Operating responsibly'

East of downtown, a park, a community center and three schools are within half a mile of Palmer Logistics, a chemical distributor.

The location epitomizes Houston's haphazard zoning.

Palmer has held dangerous chemicals there for more than 30 years but has not had a major release. It stores but does not process chemicals like paraformaldehyde. Nonetheless, chemical disasters have influenced president Brett Mears and his colleagues.

Palmer has decided to move all its hazardous chemicals to a new facility in an industrial area in Baytown, even though the lease is about 50 percent more expensive.

"Maybe the regulations say it's acceptable to put a hazmat facility in a neighborhood," Mears said, "but if you could be 5 miles from the closest houses, wouldn't that be better?"

The Chronicle followed up with all the high-potential-for-harm facilities to learn what they do to prevent releases. Most responded with general comments about safety, maintenance and monitoring programs. Some went deeper. For example, the AkzoNobel facility in La Porte, which ranked highest in the A&M analysis, described precautions for triethylaluminum.

People who handle it are specially trained, wear customized, stringently tested protective suits



Michael Ciaglio / Houston Chronicle

Barrels are marked for transport at Palmer, which is moving chemicals to a new facility in Baytown that will be farther from the public than its location east of downtown.

and work with constant surveillance, site director Allen Tribble said. The company conducted research and safety studies to develop best-handling practices, including eliminating contact with air and moisture, which leads to fires.

The East Harris County Manufacturers Association weighed in on behalf of many facilities.

Craig Beskid, executive director of EHCMA, said its member companies regularly share best practices and assess hazards and risks, and use state-of-the-art technologies.

"We understand that the public wants to have confidence that our industry is operating responsibly, which is why we have multiple layers of safety protection in place," Beskid said. "Assessing the risks without factoring in these safeguards is similar to assessing the risks of driving a car without factoring in speed, seat belts, anti-lock brakes, safety glass and other car safety improvements."

At KMCO in Crosby, northeast of Houston, new owners made changes in recent years to improve safety.

The plant, near the sports complex, a restaurant and a church, stores organic peroxides, which can burn and explode. A similar substance called TATP

is increasingly favored by terrorists because it can be made with household chemicals. Harris County sued the KMCO plant in 2008 for spills and fumes that gave neighbors headaches. The lawsuit ended in 2009, with a permanent injunction requiring KMCO to pay \$100,000 in civil penalties and to give investigators easy access to the facility and prompt notification of releases.

The plant has dozens of OSHA violations since 2010, and an explosion in 2011 sent two workers to a hospital.

Kelly Nidini, the plant's safety manager, said the company has significantly upgraded its facilities since 2013, has won multiple industry awards and will invest millions, primarily for safety and environmental concerns.

"We have no higher priority than ensuring safe and compliant operations," Nidini said.

Hazards near two schools

At a facility in northwest Houston, Wyman-Gordon Forgings makes components for aircraft, missiles, power plants, and the nuclear and petrochemical industries. The company uses titanium, a volatile metal that caused two explosions in Los Angeles in 2010. Those blasts blew out fire engine windows, injured four firefighters and launched molten debris hundreds of feet.

On the other side of U.S. 290 from Wyman-Gordon, more than 5,000 students attend Arnold Middle School and Cy-Fair High School.

Company and school officials said they do not talk to each other about possible dangers from the plant.

In a statement, the school district said each campus has an emergency operation plan.

"We conduct mandatory crisis drills for sheltering in place and evacuations," assistant superintendent Nicole Ray said.

The facility isn't without problems. In 1996, an explosion of a pressurized nitrogen tank killed eight workers, blew a jagged hole in the roof and propelled a piece of equipment that weighs as much as a Honda Civic more than 200 yards and more than 5 feet into the ground. The company agreed to pay \$1.8 million in OSHA fines and promised to improve safety. In 2011, it was cited by OSHA for not recording worker accidents. The company

paid a \$2,000 fine. In 2014, OSHA cited it for exposing a worker to hazardous chemicals. The company paid a \$100 fine.

Wyman-Gordon, like many large plants, has its own safety staff. The company has a full-time safety manager, a 31-member emergency response team, a certified EMT and a "confined space" rescue team.

It also recently started working with the Cy-Fair Volunteer Fire Department to improve the safe storage and use of titanium metal and to prepare for a fire. Company spokesman Jay Khetani described its recent OSHA violations as minor.

"The facility's primary focus is the safety of its employees and ensuring that all members of its team return safely to home each night," Khetani said.

Southeast of Wyman-Gordon on 290, Chem One is housed in a plain, single-story building. The company stores up to half a million pounds of reactive and toxic potassium permanganate.

Many facilities with hazardous chemicals look just as innocuous.

Near Oak Forest: International Paint, which can store an equal amount of flammable copper oxide.

Near Hobby airport: Buffalo Flange, with just as much toxic and flammable iron carbonyl.

Near George Bush Intercontinental Airport: Enduro Composites.

Walter Dunn lives about 2,000 feet from Enduro's plant, which houses up to 5,000 pounds of cumene hydroperoxide - explosive and reactive and a chemical he'd never heard of.

"Small people have no say in where this stuff goes," said Dunn, who was hunched over and working on his car on a warm spring day. His dog, Jack, greeted passersby, and down the street, teenagers played basketball.

If he wanted to move, Dunn said, where would he go? "There's no safe place," he said. "It's all over this town."

Coming soon: An industry left to police itself

Project methodology

Reporters from the Houston Chronicle and researchers from the Mary Kay O'Connor Process Safety Center at Texas A&M created a first-of-its-kind study showing the potential harm to the public posed by hazardous materials at local businesses.

The Chronicle, in 2015, obtained the chemical inventories, called Tier Twos, for about 2,500 businesses. Companies are required by federal law to submit their Tier Twos annually to the state, first-responders and Local Emergency Planning Committees.

A&M researchers started by looking at the materials themselves.

Chemicals can be harmful in three key ways: flammability, reactivity and toxicity.

Flammability represents the harm posed by fires or explosions. The National Fire Protection Association (NFPA) rates a large number

of chemicals based on their flammability. These ratings were used when possible. If an NFPA rating was not available, the flammability rating from the chemical's Material Safety Data Sheet was used instead.

Reactivity represents the instability of a substance in certain conditions. The NFPA also rates chemicals on their reactivity. These ratings were used when possible, and if not, drawn from the chemical's Material Safety Data Sheet.

Toxicity represents the harm posed to human health or the environment. The NFPA rates chemicals on toxicity, but does not distinguish between types of exposure. Since inhalation hazards are the most dominant threat, the NFPA ratings were modified by A&M according to the chemical's lethal Protective Action Criteria number, created by the U.S. Department of Energy. These values are based

on a chemical's maximum airborne concentrations before life-threatening effects occur.

The potential for harm from toxicity, reactivity and flammability were weighted equally.

So a chemical with a score of 4 in any single category was rated more dangerous than a chemical with 3s in each category.

Since each facility can have multiple chemicals, the final rating was based on the chemical with the highest potential for harm.

The amount of chemical stored at a facility also factors into the harm a business could pose to the public. A highly toxic chemical would be potentially less harmful to the public if only small amounts were at the facility.

Researchers created a penalty multiplier based on the quantity

Methodology continues on A27

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