Illegal Air Pollution in Texas 2020

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Air pollution from startups, shutdowns, malfunctions and maintenance at industrial facilities in Texas in 2019

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Table of contents

Executive summary

From the oilfields of West Texas to the industrial facilities of the Gulf Coast, Texas is home to an abundance of oil, gas, and petrochemical operations, which frack and refine natural gas, ship oil across the state, manufacture plastic, and more. Every year, according to documents the companies file with the State of Texas, these facilities release millions of pounds of pollution in violation of their permits through "upsets" or "emissions events." These unauthorized air pollution events emit known toxins such as butadiene, benzene, particulate matter, and hydrogen sulfide, and they often do so in close proximity to residential neighborhoods, schools, and other populated areas, putting Texans at risk of harmful health impacts.

According to our analysis of violations self-reported by companies to the Texas Commission on Environmental Quality, industrial facilities released over 174 million pounds of unauthorized air pollution in 2019, an increase of 155 percent since 2015.

- In 2019, companies reported 4,086 breakdowns, malfunctions, and other unauthorized air pollution events that resulted in the release of over 174 million pounds of illegal air pollution.

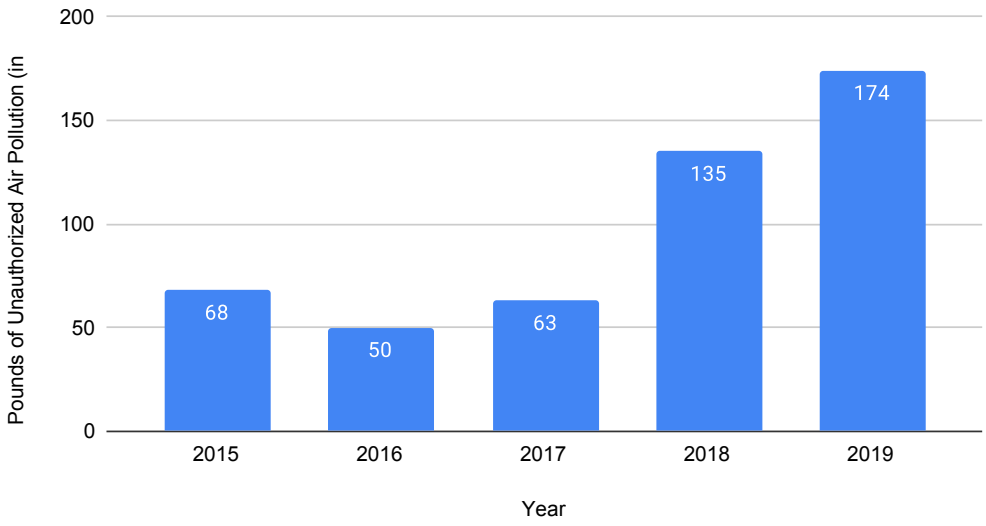

Figure 1. Unauthorized air pollution in Texas is on the rise

- Carbon dioxide emissions composed nearly half of this pollution, or approximately 74 million pounds. A single facility – Beaumont Gas to Gasoline Plant in Jefferson County – was responsible for over 71 million pounds of all unauthorized carbon dioxide emissions statewide.

- Unauthorized carbon dioxide pollution, as discussed in this report, is a relatively new phenomenon as facilities start to get greenhouse gas permits. For example, the Beaumont Gas to Gasoline Plant only opened in 2018[1] and is responsible for the vast majority of total unauthorized carbon dioxide emissions. However, even when Beaumont Gas to Gasoline Plant is excluded, air pollution increased 50% from 2015 and 100% from 2016.[2]

Pollution linked to cancer and other health problems

- Researchers at the Massachusetts Institute of Technology found in a 2013 study that more than 14,000 Texans lose their lives each year due to air pollution, including 3,583 Texans who die prematurely due to particulate matter released by authorized and unauthorized industrial emissions.[3]

- Scientists at Environmental Defense Fund and Harvard University found that in the Greater Houston area, 5,213 Texans died prematurely due to particulate matter exposure in 2015 and that this pollution resulted in over $49 billion in associated economic damages.[4]

- According to the UT School of Public Health, children living within two miles of the heavily industrialized Houston Ship Channel face a 56 percent greater risk of contracting leukemia, which researchers link to oil refineries and chemical plants.[5]

Pollution increases have coincided with weakening of federal air protections

- EPA enforcement is at a record low nationally.[6] And in Texas, EPA levied just 15 clean air enforcement actions each year on average from 2017 to 2019, compared with 24 per year from 2014 to 2016, a drop of 38%.[7]

- Since 2017, the U.S. Environmental Protection Agency (EPA) has repealed or significantly weakened more than a dozen air quality and chemical safeguards for industrial facilities, including weakening air pollution monitoring requirements for refineries and rolling back safety standards adopted after a chemical plant exploded in Texas in 2013.[8]

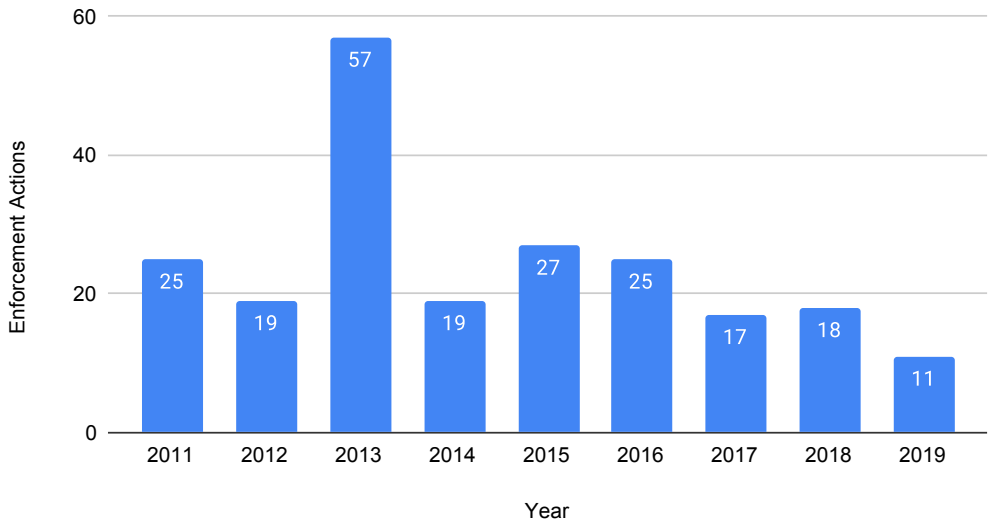

Figure 2. EPA enforcement actions in Texas by Year

- The EPA withdrew its plan to end the "affirmative defense" loophole, which allows polluters to escape financial penalties if they meet certain criteria.[9] In 2019, companies claimed the affirmative defense 97% of the time, according to TCEQ data.[10]

Texas acknowledges enforcement efforts have been lagging

- The EPA shares joint regulatory oversight of Texas industrial facilities with the Texas Commission on Environmental Quality (TCEQ), whose Executive Director admitted last month that enforcement efforts in Texas have "been lagging." He described the rash of high profile chemical disasters in 2019 as "incompatible with TCEQ's mission."[11]
- In contrast to the decline in EPA enforcement, TCEQ enforcement actions doubled from 2017 to 2019. Still, less than 3% of emissions violations drew any penalties from TCEQ or the State of Texas.

Illegal air pollution events happen daily across Texas.

- Every single day in 2019, at least one industrial facility was responsible for an unauthorized air pollution event somewhere in Texas.
- In TCEQ's Midland region, one or more unauthorized air pollution events happened every single day in 2019. TCEQ's Houston and Corpus Christi regions had unauthorized air pollution events on 357 and 351 calendar days out of the year, respectively.

Oil and gas facilities top lists of worst illegal polluters in 2019

The Intercontinental Terminals Deer Park Terminal facility in Harris County released more benzene, particulate matter and volatile organic compounds as a result of a fire at its facility in March of 2019 than the total annual volume of unauthorized emissions of any other facility in the state during 2019. This

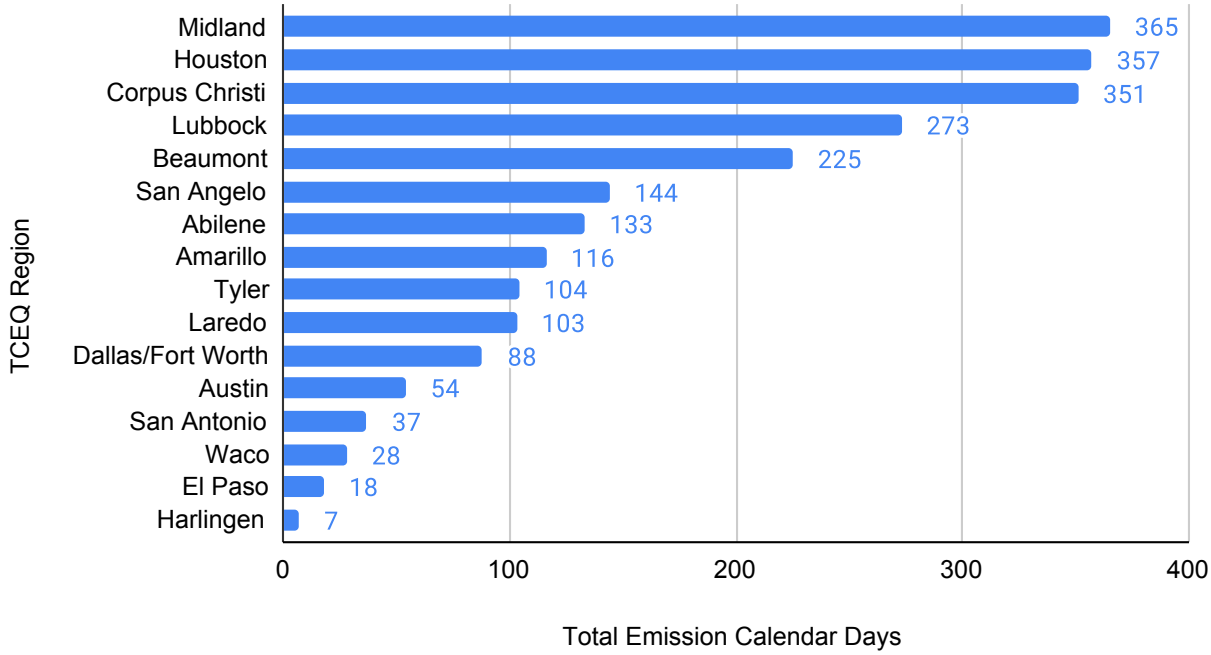

Figure 3. Total unique calendar days with unauthorized air pollution events by TCEQ region

*Table 1. Facilities in TCEQ's Beaumont region[14] released the largest amount of pollution from unauthorized air pollution events in 2018 and 2019**

TCEQ Region	Total Pollution (pounds) in 2018	Total Pollution (pounds) in 2019	Percentage Change (%)
Beaumont	63,940,765	76,842,349	+20
Midland	39,500,243	61,565,460	+56
Houston	7,458,544	23,124,933	+210
Corpus Christi	5,504,278	3,878,271	-30
Lubbock	3,668,930	2,948,250	-20
San Angelo	3,526,737	2,909,923	-17
Laredo	564,283	761,937	+35
Abilene	1,551,044	752,656	-51
Amarillo	681,689	518,780	-24
San Antonio	3,034,059	482,737	-84
Tyler	821,928	337,009	-59
Dallas/Fort Worth	87,023	140,178	+61
Harlingen	14,541	124,930	+759
El Paso	4,892,945	76,287	-98
Austin	2,933	41,025	+1299
Waco	619,484	31,240	-95

*Our methodology changed between years

single event – which lasted from March 17, 2019 to July 1, 2019 – released 15 million pounds of unauthorized air pollution, double the pollution from all unauthorized emissions in the Houston region in 2018.[12]

- The TPC Port Neches facility released 664,184 pounds of pollution when it caught fire and exploded in late 2019. According to the company's report to TCEQ, the emissions event from the TPC explosion lasted from November 27, 2019 to March 30, 2020, and over half of the pollution released was particulate matter, or soot.[13]

In order to reduce illegal air pollution and hold violators accountable, the state and federal governments should:

- Eliminate the "affirmative defense" loophole
- Adopt mandatory minimum penalties for unauthorized air pollution events including from upset events, as well as unscheduled MSS (Maintenance, Startup and Shutdown) activities or planned MSS activities such as equipment maintenance
- Increase inspections and monitoring
- Improve the TCEQ STEERS database reporting system and instructions so that facilities report uniformly, accurately and in a way that enables citizens to easily determine the amount and type of pollution released during unauthorized events
- Require that polluting facilities share information and emergency response plans with neighbors in case of explosions or chemical disasters

Introduction

In 2019, an unauthorized air pollution event happened at an industrial facility in Texas 365 days out of the year. Every single day, somewhere in Texas, a facility violated their permits, exposing nearby residents and workers to hazardous air pollutants. These small, everyday emissions events add up, and, in the Houston area, chemical disasters happen about every six weeks.[15]

In one such event, on November 27, 2019 – the day before Thanksgiving – Port Neches residents awoke to a massive explosion at a nearby chemical plant. The explosion blew out windows, knocked doors off their hinges, and even cracked the foundations of homes. Over five miles away, residents of Port Arthur heard and felt the blast. Looking outside, residents saw a

Photo: REUTERS/Erwin Seba

TPC explosion 2019

fiery sky and pillars of smoke coming from the facility. Within 13 hours of the first explosion, there was a second explosion, prompting a mandatory evacuation and a 10 p.m. curfew for nearby residents.[16] One resident, Fred Vernon, rushing to evacuate, covered his baby daughter in a blanket to protect her from the pollution. The daughter, and her father, were still overcome with the fumes and vomited. Vernon recalled evacuating so fast, "we left all the yams and the turkey [we were cooking], we just abandoned that and left it in the house."[17] Thousands of people were temporarily unhoused right as they were planning to celebrate the Thanksgiving holiday with family and friends.

This fire expelled more than a million pounds of harmful pollutants into the air. According to the company's report to TCEQ, the unauthorized air pollution event from the TPC explosion lasted from November 27, 2019 to March 30, 2020, releasing 664,184 pounds of pollution, over half of which was particulate matter, or soot, pollution.[18] The 218-acre chemical manufacturing plant is situated mere blocks away from schools and libraries.[19]

The facility has a significant history of environmental violations -- ahead of the explosion, the facility had been in violation of the Clean Air Act for 12 quarters.[20]

John Beard, Jr., director of the Port Arthur Community Action Network (PACAN), described how the small incidents lead to the big ones. "These explosions and fires aren't just single, isolated events. They are the result of smaller warning events that were ignored and dismissed. The result is a major catastrophe like TPC or ITC."

The TPC fire is an example of one of thousands of unauthorized air pollution events that occur at industrial facilities each year in Texas. Facilities in Texas regularly violate their permits and release millions of pounds of harmful pollutants into our air each year. The U.S. Environmental Protection Agency (EPA) and the Texas Commission on Environmental Quality (TCEQ) share responsibility for regulating the facilities and holding them accountable for their unauthorized air pollution events. However, according to self-reported company data submitted to the TCEQ in 2019, unauthorized air pollution rose again this year. EPA and TCEQ financially penalized only a fraction of polluters.

To improve air quality and compliance with our clean air laws, the federal and state governments must do much more to hold violators accountable and create an effective deterrent to future violations.

Air pollution in Texas

Despite significant progress, air pollution levels in many parts of Texas still threaten public health.

- Researchers at the Massachusetts Institute of Technology found in a 2013 study that more than 14,000 Texans lose their lives each year due to air pollution, including 3,583 Texans who die prematurely due to particulate matter released by authorized and unauthorized industrial emissions.[21]
- Scientists at Environmental Defense Fund and Harvard University found that in the Greater Houston area, 5,213 Texans died prematurely due

Photo: Heather Carroll Photography

Playground near TPC's Port Neches Plant

to particulate matter exposure in 2015 and resulted in over $49 billion in associated economic damages.[22]

- A 2019 study found that unauthorized pollution from start-ups, shutdowns, and malfunctions results in the premature deaths of at least 42 elderly people and $241 million in health costs in Texas on average per year.[23]
- According to the UT School of Public Health, children living within two miles of the heavily industrialized Houston Ship Channel face a 56 percent greater risk of contracting leukemia, which researchers link to oil refineries and chemical plants.[24]

Soon after the start of the COVID-19 pandemic in early 2020, researchers linked air pollution to increased risk of experiencing severe symptoms of the coronavirus if infected.

- Early research found that exposure to particulate matter resulted in an 8% increase in COVID-19 death in the United States.[25]
- COVID-19 can be made more serious by exposure to hazardous air pollutants, or HAPs, a category of pollutants that include things like benzene, butadiene, and ethylene oxide, which are all known carcinogens.[26]

In March of 2020, the U.S. Environmental Protection Agency announced a new COVID-19 policy, dramatically scaling back enforcement of core environmental protections, like the Clean Air Act and Clean Water Act. The policy, which lasted until August 31, 2020, removed requirements for facilities to report and monitor their pollution. leading to an increase in pollution and a worsening of the coronavirus pandemic.[27]

- One early study found that since the EPA announced its non-enforcement policy, smog and soot pollution increased in counties with higher concentrations of facilities that report emissions to the EPA. And since the policy began, those same counties experienced a 19 percent increase in daily death rates, when compared to counties with fewer industrial facilities.[28]

Top polluters during reported unauthorized air pollution events

Under Texas law, both emission events, which are "upset events or unscheduled MSS (Maintenance, Startup and Shutdown)"[29] events, and planned MSS activities that release unauthorized pollution, constitute air pollution violations which companies must report to the TCEQ.[30] This report analyzes unauthorized emissions from those types of events.[31]

Photo: Heather Carroll Photography

Playground near TPC's Port Neches Plant

According to a study by researchers at Indiana University, air pollution from upset events or unscheduled MSS activities result when "pollution abatement systems — such as scrubbers, baghouses, or flares that curtail emissions before they are released—fail to fully operate as the result of an unexpected malfunction, startup or shutdown,"[32] resulting in the release of illegal air pollution. These events may be a result of equipment breakdowns, process malfunctions or operator error, or may occur during the startup and shutdown of equipment. When chemical facilities shut down, excess gases often cannot be processed, and, as a result, companies will flare, or burn, them off to relieve pressure during a shutdown, causing releases of pollution.[33]

In a 1982 memo, EPA's Assistant Administrator for air wrote that while there are circumstances where start-ups and shutdowns might legitimately result in emissions, "startup and shutdown of process equipment are part of the normal operation of a source and should be accounted for in the design and implementation of the operating procedure for the process and control equipment. Accordingly, it is reasonable to expect that careful planning will eliminate violations of emission limitations during such periods."[34]

Unauthorized air pollution events are largely avoidable. Rather than flaring[35] excess gases at facilities, permittees can capture and recycle most gases with a gas recovery system. If flaring took place only during serious emergencies, there would be a significant reduction in air emissions. Second, companies can increase staffing and preventive maintenance, provide better training to allow for further monitoring of leaks, equipment malfunctions, and other potential sources of emissions, and ensure faster responses when unauthorized events do occur. Finally, companies should improve and expand upon backup systems, including backup power sources, to reduce the impact of events like electrical failures and major weather events that might otherwise require equipment shut-downs and start-ups.

The Texas Commission on Environmental Quality requires companies to publicly disclose upset events and unplanned MSS events that release a "reportable" quantity of pollutants, as well as planned MSS events that release unauthorized levels of pollution and excess opacity events. Companies file these reports via the State of Texas Environmental Electronic Reporting System (STEERS). These reports are available on the TCEQ's Air Emission Event Report database at: http://www2.tceq.texas.gov/oce/eer/.

An initial report must be filed within 24 hours, and a final report within two weeks. Unauthorized air pollution events below the reporting threshold, known as "recordable emission events," are to be recorded and kept in documents held on-site at the facility.[36]

This analysis is drawn only from self-reported violations that were submitted, via STEERS, to the TCEQ.[37] The numbers do not include emissions from the unreported "recordable emissions events" or from excess emissions that occur during normal operation and thus actually under-represent the amount of illegal air pollution released in Texas.

Different air contaminants harm people and the environment in various ways, and so this report presents several snapshots, each one a "top 10" list based on different pollutants of concern. The rankings below show the state's top ten industrial plants responsible for the highest levels of self-reported air pollution from malfunctions and maintenance for pollutants of concern, including benzene, nitrogen oxides, particulate matter, sulfur dioxide, hydrogen sulfide, 1,3-butadiene, carbon dioxide, volatile organic compounds, and inorganic compounds.

We feature certain facilities found to be the top polluters of these contaminants, highlighting who lives near the facility, what's near the facility, what the facility does, and where the facility is. Many of the facilities mentioned in this report are located near population centers and areas of community significance, like schools, senior centers, and community centers, and affect the livelihood of people who live, work, and play near these facilities.

Benzene

Benzene is a highly flammable gas used by many industries that process, store, or produce petroleum products such as fuels, plastics, or pesticides. Exposure to benzene can result in drowsiness, dizziness, headaches, rapid or irregular heartbeat, and irritation to the eyes, skin, or respiratory system. Exposure to high amounts of benzene can cause unconsciousness, vomiting, and even death. In the long term, benzene can cause blood disorders, damage to the immune and reproductive systems, and cancer.[38] A 2010 study by the University of Texas School of Public Health and the Texas Department of State Health Services found that women living in neighborhoods with higher-than-average levels of benzene are more likely to give birth to babies with serious neurological defects.[39] The World Health Organization warns that there is no safe level of benzene exposure.[40]

Three Houston-area facilities — Intercontinental Terminals Deer Park Terminal, Chevron Phillips Chemical Cedar Bayou Plant, and ExxonMobil Chemical Baytown Olefins Plant — took the top three spots statewide for unauthorized releases of benzene during unauthorized air pollution events in 2019.

Facility feature: Intercontinental Terminals Deer Park Terminal

Intercontinental Terminals Deer Park Terminal stores large quantities of chemicals for major Texas oil and gas companies, like Exxon Mobil, Valero Energy, and Phillips 66, to export and trade.[42] In 2019, Intercontinental Terminals Deer Park Terminal emitted over three million pounds of unauthorized air pollution and is listed as the worst polluter for both benzene and volatile organic compounds.

Intercontinental Terminals Deer Park Terminal is among several industrial facilities adjacent to the city of Deer Park. 79 thousand people live within five miles of this facility, 32 percent of whom are living below the poverty line.[43] Within this same radius, there are eight schools, including three elementary schools under two miles away. Deer Park, Texas is home to several community establishments, including Monument Baptist Church, Deer Park Community Center, and The Battleground Golf Course.

Photo: Heather Carroll Photography

Skater at Unidad Park near ExxonMobil's Chemical Baytown Olefins Plant

Table 2. Top 10 Benzene Polluters During Unauthorized Air Pollution Events[41]

Rank	Facility name	Name of owner or operator	County	Total Benzene (pounds)
1	Intercontinental Terminals Deer Park Terminal	Intercontinental Terminals Company LLC	Harris	715,494
2	Chevron Phillips Chemical Cedar Bayou Plant	Chevron Phillips Chemical Company LP	Harris	56,186
3	ExxonMobil Chemical Baytown Olefins Plant	ExxonMobil Oil Corporation	Harris	15,738
4	Equistar Chemicals Channelview Complex	Equistar Chemicals, LP	Harris	6,646
5	Chevron Phillips Chemical Cedar Port Arthur Facility	Chevron Phillips Chemical Company LP	Jefferson	5,095
6	Port Arthur Refinery	Motiva Enterprises LLC	Jefferson	5,051
7	Dow Texas Operations Freeport	The Dow Chemical Company	Brazoria	5,033
8	ExxonMobil Oil Beaumont Chemical Plant	ExxonMobil Oil Corporation	Jefferson	3,221
9	Vopak Terminal Deer Park	Vopak Terminal Deer Park Inc	Harris	2,000
10	Motiva Chemicals	Motiva Chemicals LLC	Jefferson	1,863

Nitrogen Oxides (NOx)

Nitrogen oxides are emitted through the burning of coal, oil, diesel and natural gas. Short term exposure to nitrogen oxides can cause eye and skin irritation, respiratory aggravation and difficulty breathing, abdominal pain, headaches and nausea. Long term exposure can lead to asthma and respiratory infections. Exposure to very high levels of nitrogen oxides can harm developing fetuses, decrease female fertility, and cause genetic mutations.[44]

Nitrogen dioxide is also an ingredient in acid rain and in the formation of smog, or ozone pollution, which can irritate the airways, causing a burning sensation, coughing, wheezing and shortness of breath.[45]

Benedum Gas Plant in Upton County, Martin County Gas Plant in Martin County, and Sale Ranch Gas Plant in Martin County were the top three polluters of nitrogen oxides via unauthorized air pollution events in 2019.

Facility feature: Sale Ranch Gas Plant

Sale Ranch Gas Plant is located in Stanton, Texas, just west of Midland. Gas plants, like this one, are responsible for removing impurities from liquid natural gas and producing dry natural gas that then can be transported through a pipeline to be used in the production of plastics, or in homes, businesses, and utilities. Unauthorized air pollution events often occur at gas processing facilities like these when excess gas or other chemicals are flared off to reduce pressure throughout the facility.[46]

Many of the gas plants mentioned in this report are located in west Texas, where companies process natural gas before it is shipped out of the Permian Basin to be used in homes and businesses, or further refined into raw plastics.

Table 3. Top 10 Nitrogen Oxides Polluters During Unauthorized Air Pollution Events[47]

Rank	Facility name	Name of owner or operator	County	Total No_x (pounds)
1	Benedum Gas Plant	WTG SOUTH PERMIAN MIDSTREAM LLC	Upton	1,407,647
2	Martin County Gas Plant	WTG North Permian Midstream LLC	Martin	1,019,542
3	Sale Ranch Gas Plant	WTG Gas Processing, L.P.	Martin	752,440
4	Driver Gas Plant	Targa Pipeline Mid-Continent WestTex LLC	Midland	312,911
5	Freeport LNG Pretreatment Facility	Freeport LNG Development LP	Brazoria	294,785
6	Corpus Christi Liquefaction	Corpus Christi Liquefaction, LLC	San Patricio	271,200
7	Freeport LNG Liquefaction Plant	Freeport LNG Development LP	Brazoria	237,494
8	Chevron Phillips Chemical Cedar Bayou Plant	Chevron Phillips Chemical Company LP	Harris	212,197
9	Benedum Gas Plant	Targa Pipeline Mid-Continent WestTex LLC	Upton	202,254
10	Midkiff Gas Plant	Targa Pipeline Mid-Continent WestTex LLC	Reagan	166,942

Particulate Matter

Particulate matter (PM), or soot pollution, is composed of many different components, such as metals and soil or dust particles, that are emitted from power plants, industrial facilities, and motor vehicles. Exposure to particulate matter can irritate the eyes, nose, and throat, and exposure to high amounts of particulate matter may cause low birth weight, preterm deliveries, and fetal and infant deaths. Over the long term, exposure to particulate matter can cause reduced lung function, development of chronic bronchitis, and premature death for those with heart or lung disease.[48]

The Intercontinental Terminals Deer Park facility in Harris County had the highest unauthorized emissions of particulate matter via unauthorized air pollution events, followed by Phillips 66's Borger oil refinery in Hutchinson County and Phillip 66's Sweeny Refinery in Brazoria County.

Table 4. Top 10 Particulate Matter Polluters During Unauthorized Air Pollution Events[49]

Rank	Facility name	Name of owner or operator	County	Total PM (pounds)
1	Intercontinental Terminals Deer Park Terminal	Intercontinental Terminals Company LLC	Harris	8,654,720
2	Borger Refinery	Phillips 66 Company	Hutchinson	51,657
3	Sweeny Refinery	Phillips 66 Company	Brazoria	18,950
4	Valero McKee Refinery	Diamond Shamrock Refining Company LP	Moore	9,093
5	McKinney Plant 3	TXI Operations LP	Collin	8,000
5	Fulton Plant	Argos USA LLC	Harris	8,000
7	Freeport LNG Pretreatment Facility	Freeport LNG Development LP	Brazoria	7,345
8	Big Spring Carbon Black Plant	Tokai Carbon CB LTD	Howard	4,770
9	Port Arthur Refinery	Motiva Enterprises LLC	Jefferson	3,262
10	KMCO Crosby Plant	KMCO LLC	Harris	3,197

Facility feature: Borger Refinery
Location: Borger, Texas

Borger Refinery, owned by Phillips 66, is a refinery located in Borger, Texas in Hutchinson County. The facility primarily processes crude oil, turning crude oil into transportation fuels, such as gasoline or diesel, as well as natural gas liquids, petroleum coke, and solvents.[50] In 2019, Borger Refinery emitted over 51 thousand pounds of unauthorized air pollution during and was the second worst polluter for particulate matter.

11 thousand people live within five miles of the facility, 41 percent of whom live below the poverty line.[51] Within the five mile radius, there are several schools, including Buttercup House Day Care Center, Crockett Elementary School, and Gateway Elementary School. Borger, Texas is also home to community establishments, such as Cofield Community Center, Grace Fellowship Church, and Hutchinson County Museum.

Sulfur Dioxide

Sulfur dioxide (SO_2) is a colorless gas with a strong, suffocating odor, and mainly comes from facilities and power plants that burn or process sulfur-rich fuels, like oil for electrical power and other industrial processes. Sulfur dioxide pollution poses serious health problems particularly in large urban areas where there's concentrated use of fossil fuels, as well as poorly controlled combustion events from industrial installations.[52]

Short term exposure to sulfur dioxide can make breathing difficult and harm the respiratory system. Exposure to high amounts of sulfur dioxide can cause burning sensations in the nose and throat, difficulty breathing, and obstruction of the airways. In the long term, sulfur dioxide can impair lung function, inflame airways, cause chronic bronchitis, increase risk of respiratory illness, and decrease fertility.[53]

Sand Hills Gas Plant and JT McElroy 202 TB in Crane County were the top two polluters of sulfur dioxide in 2019. Goldsmith Gas Plant in Ector County was the third worst polluter.

Table 5. Top 10 Sulfur Dioxide Polluters During Unauthorized Air Pollution Events[54]

Rank	Facility name	Name of owner or operator	County	Total SO_2 (pounds)
1	Sand Hills Gas Plant	Targa Midstream Services LLC	Crane	5,001,378
2	JT McElroy 202 TB	Chevron U.S.A. Inc.	Crane	2,725,911
3	Goldsmith Gas Plant	DCP Operating Company LP	Ector	2,560,196
4	Seminole Gas Processing Plant	OXY USA Inc.	Gaines	2,369,997
5	Oahu Gas Plant	Targa Southern Delaware LLC	Pecos	1,944,496
6	McElroy Section 199 Emergency Flare	Chevron U.S.A. Inc.	Crane	1,554,116
7	West Seminole San Andres Unit CO2 Facilities	Occidental Permian Ltd	Gaines	1,179,450
8	South Mojo Booster Station	OXY USA Inc.	Ector	617,424
9	Willard CO2 Separation Plant	OXY USA WTP LP	Yoakum	534,386
10	Waha Gas Plant	ETC Field Services LLC	Pecos	529,703

Hydrogen Sulfide

Hydrogen sulfide (H_2S) is a colorless, flammable gas that emits a "rotten egg" smell. Industrial facilities that often use hydrogen sulfide include petroleum refineries, natural gas plants, and wastewater treatment facilities. Short term exposure to hydrogen sulfide can lead to headaches, nausea, tremors, and skin and eye irritation. Long term exposure to hydrogen sulfide, however, can lead to more severe health impacts, including low blood pressure, loss of appetite and weight loss, fatigue, and eye inflammation. If inhaled at high concentrations, hydrogen sulfide can lead to rapid unconsciousness, inability to breathe and smell, and, potentially, death.[57]

Sand Hills Gas Plant, JT McElroy 202 TB, and Goldsmith Gas Plant were the three worst polluters of hydrogen sulfide in 2019.

Table 6. Top 10 Hydrogen Sulfide Polluters During Unauthorized Air Pollution Events[58]

Rank	Facility name	Name of owner or operator	County	Total H_2S (pounds)
1	Sand Hills Gas Plant	Targa Midstream Services LLC	Crane	59,073
2	JT McElroy 202 TB	Chevron U.S.A. Inc.	Crane	30,624
3	Goldsmith Gas Plant	DCP Operating Company, LP	Ector	27,782
4	Seminole Gas Processing Plant	OXY USA Inc.	Gaines	25,451
5	US National 2 Wellpad	Callon Permian LLC	Ward	20,821
6	McElroy Section 199 Emergency Flare	Chevron U.S.A. Inc.	Crane	17,229
7	N Cowden Unit TS 19	Occidental Permian Ltd	Ector	16,557
8	N Cowden Unit TS 22	Occidental Permian Ltd	Ector	15,808
9	N Cowden Unit TS NO 25	Occidental Permian Ltd	Ector	13,276
10	Red Bluff Gas Processing Plant	ETC Texas Pipeline Ltd	Reeves	13,164

Facility feature: Seminole Gas Processing Plant

Owned by the OXY Occidental company, Seminole Gas Processing Plant is a gas plant located in Seminole, Texas in Gaines County. It is responsible for separating the impurities from liquid natural gas to create dry natural gas, which is then transported through a pipeline to be used in homes, businesses, and utilities.[55] In 2019, Seminole Gas Processing Plant emitted over 2 million pounds of unauthorized air pollution, and was one of the top ten worst polluters of hydrogen sulfide and sulfur dioxide.

Eight thousand people live within five miles of the facility, 42 percent of whom are below the poverty level.[56] The five mile radius also includes a range of community establishments, such as Memorial Health Care Center, M S Doss Youth Center, and Trinity Baptist Church. Furthermore, Seminole Junior High School and Seminole Elementary School are within four miles of this polluting facility.

Butadiene

Butadiene is a colorless, highly flammable gas that has a mildly aromatic gas-like odor. It is commonly produced from petroleum gases and is used to make rubber and plastics.[59] Exposure to low levels of butadiene in the short term can cause irritation to the eyes, nose, throat, and lungs, and exposure to high levels can cause blurred vision, fatigue, headache, nausea, and fainting. Over the long term, exposure can cause cardiovascular diseases and cancer.[60]

In 2019, Chevron Phillips' Chemical Cedar Bayou Plant and ExxonMobil's Chemical Baytown Olefins Plant, both located in Harris County, were the top two polluters of butadiene.

Photo: Heather Carroll Photography

ExxonMobil's Beaumont Facility

Table 7. Top 10 Butadiene Polluters During Unauthorized Air Pollution Events[61]

Rank	Facility name	Name of owner or operator	County	Total 1,3-Butadiene (pounds)
1	Chevron Phillips Chemical Cedar Bayou Plant	Chevron Phillips Chemical LP	Harris	27,757
2	ExxonMobil Chemical Baytown Olefins Plant	Exxon Mobil Corporation	Harris	27,600
3	Chocolate Bayou Plant	INEOS USA LLC	Brazoria	5,903
4	Equistar Chemicals Channelview Complex	Equistar Chemicals LP	Harris	5,638
5	Chevron Phillips Chemical Port Arthur Facility	Chevron Phillips Chemical Company LP	Jefferson	5,578
6	ExxonMobil Oil Beaumont Chemical Plant	ExxonMobil Oil Corporation	Jefferson	5,373
7	Houston Plant	TPC Group LLC	Harris	1,508
8	Motiva Chemicals	Motiva Chemicals LLC	Jefferson	1,399
9	Dow Texas Operations Freeport	The Dow Chemical Company	Brazoria	1,080
10	TPC Group Port Neches Operations	TPC Group LLC	Jefferson	1,005

Carbon Dioxide

Carbon dioxide (CO_2) is a heat-trapping, greenhouse gas that significantly drives climate change. As climate change progresses, it brings warmer temperatures, rising sea levels, increasingly acidic oceans, acid rain, and more frequent and severe weather events like rainstorms, droughts, floods, and fires.[62]

Beaumont Gas to Gasoline Plant in Jefferson County was the worst polluter of carbon dioxide in 2019, releasing over 71 million pounds.[63]

Table 8. Top 10 Carbon Dioxide Polluters During Unauthorized Air Pollution Events[64]

Rank	Facility name	Name of owner or operator	County	Total carbon dioxide (pounds)
1	Beaumont Gas to Gasoline Plant	Natgasoline LLC	Jefferson	71,761,326
2	Citgo Corpus Christi Refinery East Plant	Citgo Refining and Chemicals Company LP	Nueces	12,747
3	Duke Energy Field Services Pipeline Webb County	DCP Operating Company LP	Webb	12,671
4	Duke Energy Field Services Pipeline Wilson County	DCP Operating Company LP	Wilson	12,259
5	Targa Midstream Services Pipeline Ward County	Targa Midstream Services LLC	Ward	10,943
6	Huntsman Port Neches	Indorama Ventures Oxides LLC	Jefferson	9,303
7	Benedum Gas Plant	Targa Pipeline Mid-Continent WestTex LLC	Upton	6,779
8	Ascend Performance Materials Chocolate Bayou Plant	Ascend Performance Materials Texas INC	Brazoria	6,714
9	Duke Energy Field Services Pipeline Nueces County	DCP Operating Company LP	Nueces	6,359
10	KMCO Crosby Plant	KMCO LLC	Harris	6,301

Facility Feature: Beaumont Gas to Gasoline Plant

Beaumont Gas to Gasoline Plant, also known as Natgasoline's Methanol Plant, is on track to become the biggest methanol plant in the US[65] with an annual production capacity of 1.7 million metric tons of methanol.[66] Methanol is used in solvents and chemical production, and can be blended into gasoline to extend gasoline supply.[67]

This facility has a gas-to-gasoline plant (GtG), which converts synthetic gas to methanol, and a methanol to gasoline (MtG) production unit, which converts motor-grade methanol to gasoline.[68] This facility is strategically located on the Texas Gulf Coast, where it is close to existing infrastructure, storage facilities, transportation facilities, and export terminals.[69]

Over 49 thousand people live within five miles of this facility, the majority of whom are Black people or people of color, and nearly 40% of people living within five miles of this facility are living below the poverty level.[70]

Volatile Organic Compounds (VOCs)

Volatile organic compounds (VOCs) are chemical compounds, like benzene, butadiene, formaldehyde, and toluene, that are commonly emitted as vapors or gases. VOCs result from diesel emissions, industrial emissions, and oil and gas extraction and processing.[71] Short term exposure most commonly irritates the eyes and respiratory tract and causes headaches and dizziness. Over the long term, exposure to VOCs can cause health effects, such as nausea, fatigue, loss of coordination, damage to the liver and kidneys, and, in some cases, cancer.[72]

VOCs are also a key ingredient in ozone, or smog pollution. Ground-level smog can irritate the airways, causing a burning sensation, coughing, wheezing and shortness of breath. Scientists have linked smog to several health problems, including premature death, heart failure, increased hospital admissions, increased emergency room visits and possible long-term damage to the lungs.[73]

Intercontinental Terminals Deer Park in Harris County was the worst polluter of VOCs in 2019, releasing over 4 million pounds.

Table 9. Top 10 VOC Polluters During Unauthorized Air Pollution Events[74]

Rank	Facility name	Name of owner or operator	County	Total VOCs (pounds)
1	Intercontinental Terminals Deer Park Terminal	Intercontinental Terminals Company LLC	Harris	4,840,736
2	Corpus Christi Liquefaction	Corpus Christi Liquefaction LLC	San Patricio	1,007,678
3	Wildcat Gas Plant	Targa Delaware LLC	Winkler	761,639
4	E-Line Booster Station	WTG South Permian Midstream LLC	Upton	672,172
5	Chevron Phillips Chemical Cedar Bayou Plant	Chevron Phillips Chemical Company LP	Harris	667,063
6	Benedum Gas Plant	WTG South Permian Midstream LLC	Upton	638,461
7	Hodges 8	Occidental Permian LTD	Sterling	601,984
8	Perkins Treating Facility	WTG Jameson LP	Coke	527,368
9	Harper Devonian Unit	Occidental Permian LTD	Ector	488,021
10	Targa Midstream Services Pipeline Ward County	Targa Midstream Services LLC	Ward	427,708

Inorganic Compounds

Inorganic compounds are a category of substances that do not contain elements, like hydrogen and carbon, that are found in living organisms. Arsenic, mercury, and sulfuric acid are all examples of inorganic compounds. Inorganic compounds released by industrial facilities eventually end up in water, and drinking water contaminated with inorganic compounds can damage the liver, kidney, nervous system, gastrointestinal system, bones, and skin. Some inorganic compounds, like arsenic, are poisonous to humans when ingested.[75] Inorganic compounds are also one of the main causes of chemical pollution in the environment, particularly in bodies of water.[76]

Huntsman's Port Neches facility in Jefferson County and Swift Beef Cactus Plant in Moore County were the top two polluters of inorganic compounds in 2019.

Table 10. Top 10 Inorganic Compound Polluters During Unauthorized Air Pollution Events[77]

Rank	Facility name	Name of owner or operator	County	Total Inorganic Compounds (pounds)
1	Huntsman Port Neches	Indorama Ventures Oxides LLC	Jefferson	100,497
2	Swift Beef Cactus Plant	Swift Beef Company	Moore	12,621
3	Ash Grove Cement	Ash Grove Cement Company	Ellis	9,302
4	Monahans North Compressor Station	Targa Midstream Services LLC	Winkler	5,196
5	Invista Sarl Sabine River Site	Invista SA RL	Orange	3,156
6	Arkema Clear Lake	Arkema INC	Harris	1,939
7	Freeport LNG Pretreatment Facility	Freeport LNG Development LP	Brazoria	1,779
8	HEB Retail Support Center	H-E-B LP	Bexar	1,665
9	Formosa Point Comfort Plant	Formosa Plastics Corporation Texas	Calhoun	1,590
10	Braskem Seadrift Polypropylene Plant	Braskem America INC	Calhoun	1,575

Facility Features: Huntsman Petrochemical Port Neches

Huntsman Petrochemical facility manufactures chemicals used to make plastics, like ethylene, ethylene glycols, ethylene oxide, and propylene.[78] In 2019, this facility emitted over 169 thousand pounds of unauthorized air pollution. It's listed in the top ten worst polluters of inorganic compounds.

This facility is nestled in between Groves and Port Neches, both small cities located in Jefferson County. 65 thousand people live within five miles of the facility, of which 29% are living below the poverty line.[79] Within this same radius, there are several schools, including Groves Middle School and Van Buren Elementary School, both located just a little over a mile away from the facility, as well as senior care facilities, like Oak Grove Nursing Home and Port Neches Senior Center.

One Groves, Texas resident, who lives less than two miles from the Huntsman facility, described their experience living near this facility. Since moving to the area, "my family has had a significant increase in sinus and respiratory issues each year. Many days the sky is hazy and plumes are visible. The smell of the area is very distinct. Many days there is an unpleasant smell in the air."

Photo: Heather Carroll Photography

Groves Middle School zone near Huntsman's Facility

Facility Features: Formosa Plastics Point Comfort Plant

Formosa Plastics' Point Comfort plant is a 2,500 acre petrochemical complex that produces plastic products. The Point Comfort plant produces intermediate chemicals, like ethylene and propylene, in the plastics production process, as well as chemicals used to make plastic and plastic pellets – or nurdles – that then can be melted down, molded, and hardened into solid plastic.[80]

Formosa is one of the world's leading producers of polyvinyl chloride (PVC).[81] PVC is suspected to cause endocrine disruption, which in turn can cause development malformation, increased cancer risk, and harm to the reproductive and immune systems.[82] Formosa's Point Comfort facility, though relatively isolated by land and Lavaca Bay, is located near several places of community significance. The Calhoun County School District, Point Comfort City Park, Waterfront Park, Point Comfort Library, City Hall, and several churches and residential areas are located within two to three miles of the Formosa Plant, and constitute the small town of Point Comfort.

The facility has discharged billions of plastic pellets, also known as nurdles, into Lavaca Bay. Since January of 2016, a local group, the San Antonio Bay Estuarine Waterkeepers, have collected and documented a total of approximately 30 million nurdles through weekly sweeps of nearby waterways.[83]

After the group filed a lawsuit against Formosa, Formosa agreed to pay a record $50 million settlement, clean up any past pollution, and implement increased monitoring systems in 2019. This settlement is the largest amount paid in response to a Clean Water Act suit filed by private individuals.[84]

Formosa is trying to build a new $9.4 billion, 2,300-acre facility in St. James Parish, Louisiana, within Louisiana's "Cancer Alley" and near a predominantly Black and low-wealth community. Formosa faces fierce opposition from citizens, local groups, and environmental advocates, who oppose the project given it's threats to the environment, cultural sites, and human health.[85]

Clean air permitting and enforcement

Few violations result in penalties

In 2019, there were 4,086 reported unauthorized air pollution events across the state of Texas, which resulted in the release of hundreds of millions of pounds of dangerous pollutants. In 2019, TCEQ and the State of Texas financially penalized companies for approximately 119 unauthorized air pollution events. Looking back over the last eight years, the total number of enforcement orders filed by TCEQ is less than 3 percent of the total number of unauthorized air pollution events recorded by the agency in that time.[86]

EPA enforcement is at a record low nationally.[87] In Texas, EPA levied just 15 clean air enforcement actions every year on average from 2017 to 2019, compared with 24 per year from 2014 to 2016, a drop of 38%.[88] The EPA also withdrew its plan to end the "affirmative defense" loophole, which allows polluters to escape financial penalties if they meet certain criteria.[89] In 2019, companies claimed the affirmative defense over 3 thousand times, or 97% of the time, according to TCEQ data.[90]

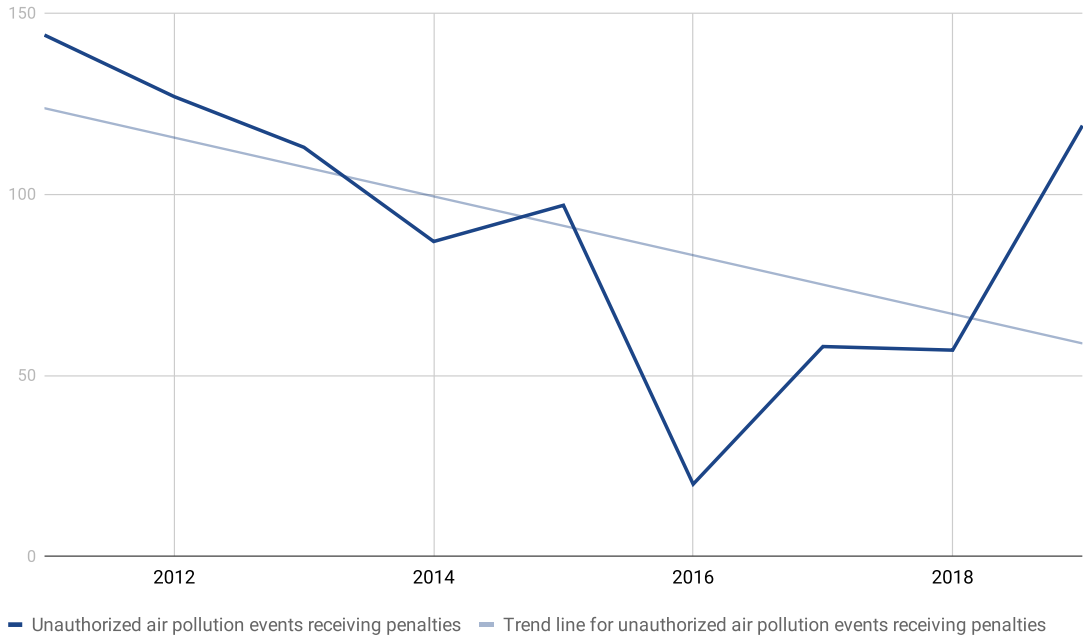

Figure 4. TCEQ and State of Texas Enforcement Actions for Unauthorized Air Pollution Events

Since 2017, the U.S. Environmental Protection Agency (EPA) has repealed or significantly weakened more than a dozen air quality safeguards for industrial facilities, including weakening air pollution monitoring requirements for refineries and rolling back safety standards adopted after a chemical plant exploded in Texas in 2013.[91]

In contrast, TCEQ's enforcement actions increased two-fold from 2017 to 2019, although enforcement actions are levied against a fraction of unauthorized pollution events.[92]

TCEQ has wide discretion in determining the amount of a penalty and rarely assesses the maximum. The agency's penalty policy[93] directs staff to calculate a penalty based on factors including the degree of harm and a facility's past record of compliance. In 2019, a total of approximately $1.8 million was assessed in penalties for these 119 unauthorized air pollution events, amounting to $0.01 per pound of unauthorized emissions in 2019.

Investigation, enforcement, and the affirmative Defense

TCEQ's "Agency Philosophy"[94] states that it will "ensure consistent, just, and timely enforcement when environmental laws are violated," but also that it seeks to "promote and foster voluntary compliance with environmental laws and provide flexibility in achieving environmental goals." The data would suggest TCEQ emphasizes the latter over the former goal.

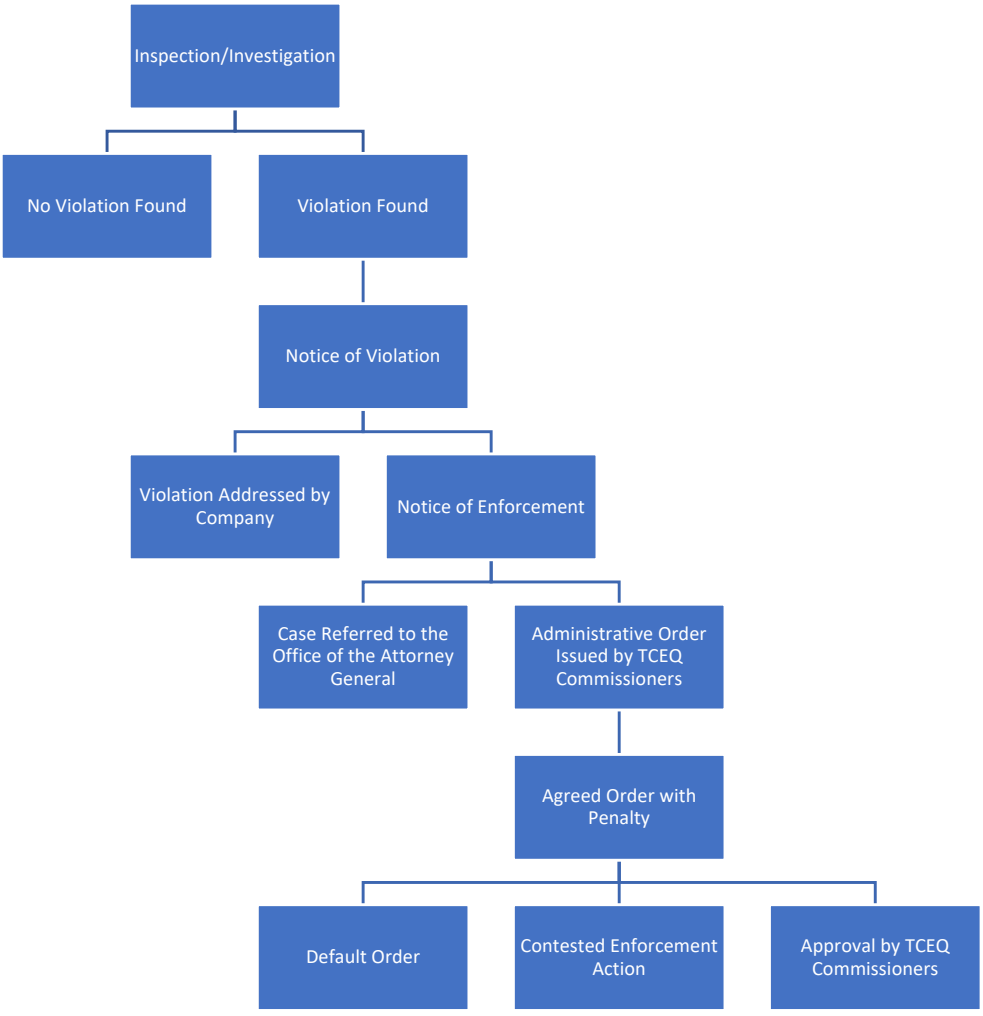

Figure 5. TCEQ Investigation and Enforcement Process

The TCEQ is supposed to investigate each reportable unauthorized air pollution event but, according to the Environmental Integrity Project's Ilan Levin, these "investigations" are almost always paperwork reviews and rarely involve on-site inspections.[95] The number of TCEQ investigations into air reportable incidents[96] in FY19 increased by 13 percent from the previous fiscal year, as the volume of emissions increased more than 29 percent, and the number of reportable incidents increased at least 13 percent.[97]

Following the review of documents filed by a permittee, the TCEQ determines whether it will initiate enforcement. This determination is based, in part, on whether the event is deemed to be "excessive" and whether the permittee has qualified for an "affirmative defense" from penalties. The affirmative defense effectively exempts facilities which exceed permit limits during unauthorized air pollution events from financial penalties, although a facility may still be ordered to take steps to prevent future violations.

According to the Texas Administrative Code, "Upset events that are determined not to be excessive emissions events are subject to an affirmative defense to all claims and enforcement actions brought for these events other than claims for administrative technical orders and actions for injunctive relief."[98] The owner or operator must prove it has met 11 different criteria in order to qualify for the defense — including that the unauthorized emissions could not have been prevented, that all possible steps were taken to minimize the impact of the unauthorized emissions on ambient air quality, and that the emissions did not contribute to a condition of air pollution.

An ExxonMobil manager testified at trial in the Environment Texas v. ExxonMobil case that he checks the "yes" box for every emissions event without fail, despite not actually investigating or confirming whether ExxonMobil has in fact met all 11 affirmative defense criteria.[99]

According to TCEQ data, companies claimed the affirmative defense for emission events 97% of the time in 2019.[100]

When permittees file a report of an emissions event to STEERS, they must select on the reporting form either "yes" or "no" to indicate whether the permittee believes it meets the affirmative defense standard.

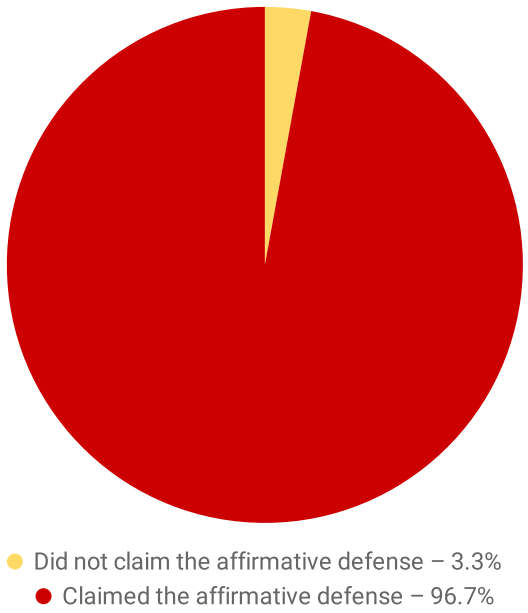

Figure 6. Affirmative Defense Claims for Unauthorized Air Pollution Events, 2019[101]

Due in part to the above outlined difficulties, in previous years, the U.S. Environmental Protection Agency has found that the affirmative defense serves as a barrier to effective oversight of polluting industries. In 2015, the agency directed Texas and 35 other states to eliminate affirmative defense provisions from air quality enforcement plans.[102] TCEQ ignored EPA's directive and retained the affirmative defense criteria.

In January of 2020, EPA Administrator Wheeler signed a final action, allowing Texas to retain its affirmative defense provisions. In response, the Sierra Club, Air Alliance Houston, and seven other groups filed suit against the EPA in April of 2020 in the D.C. Circuit Court, challenging the EPA's plan to allow the affirmative defense loophole in Texas. The State of Texas and industry groups have filed a motion to dismiss the suit and for a venue change to the 5th Circuit Court of Appeals. The suit is ongoing.[103]

During Texas' 2019 legislative session, Representative Blanco moved to eliminate this loophole, sponsoring House Bill 4087, which would remove the affirmative defense criteria from TCEQ's toolbox.[104] The bill stalled in committee, and just months later, the EPA proposed to withdraw their original ruling against affirmative defense, claiming that Texas' current regulatory process adequately complies with the Clean Air Act.[105]

Even if a company claims an affirmative defense, TCEQ can still determine that an unauthorized air pollution event was "excessive," based on a set of standards laid out in the agency's Enforcement Initiation Criteria, including the frequency, cause, quantity, impact, and duration of an event.[106] In that case, TCEQ will not accept an affirmative defense. In FY19, TCEQ determined that just 10 unauthorized air pollution events were excessive, down from 13 in FY18 and 14 in FY17.[107]

If TCEQ determines that if a violation resulted from an unauthorized air pollution event and the affirmative defense criteria was not met, it may (but is not required to) issue a written Notice of Violation (NOV), requiring the permittee to return to compliance.[108] If TCEQ is satisfied that all violations have been corrected within the time period the agency prescribed, no enforcement action is taken.[109]

If violations are not corrected in time, TCEQ may then issue the permittee a Notice of Enforcement (NOE) and an administrative enforcement order (without filing a lawsuit in court), seeking penalties up to the statutory cap of $25,000 per day.[110] However, fines rarely, if ever, are that high.[111] TCEQ may also refer cases to the Office of the State Attorney General, which may elect to pursue civil or criminal action through the courts.

Rethinking our enforcement strategy

Following a permittee's claim to the affirmative defense, EPA and TCEQ may conduct an on-site investigation to determine its validity. Although these site visits can better enable effective regulation of polluters, conducting a thorough review requires investigators to have a high level of industry knowledge and expertise – something many investigators may not possess.

On-site investigators must be able to adequately inspect the industrial equipment in question, and if necessary, challenge a company engineer's explanation of why the equipment malfunction or upset was not foreseeable or part of a recurring pattern. In order to perform these duties, an inspector would need either years of experience dealing with the mechanical operations of oil refineries and petrochemical plants or an extensive work-training program -- both costly staffing investments by EPA and the TCEQ.

In light of these barriers, on-site inspections often remain a secondary tactic for EPA and the TCEQ, leaving the enforcement process largely dependent on permittee accounts and interviews.[112] This makes it difficult for the investigator to then prove that the permittee is not eligible for the affirmative defense.

Due to the barriers associated with case by case assessments, a more standardized process for enforcement could better ensure permit compliance. For instance, EPA and TCEQ could eliminate the affirmative defense and issue escalating fines per pound of pollution, based on the number of emissions violations previously committed by the company in question. First time offenders would receive smaller fines, encouraging them to institute better practices in order to avoid a second, more costly, penalty, and repeat offenders would pay costs which more clearly reflect the overall damage their facilities impart on Texas communities. In addition, mandatory penalties are a proven method for increasing compliance. In New Jersey and California, the introduction of mandatory penalties significantly decreased violations.[113]

Proposed revisions to TCEQ's penalty policy and compliance history

In response to a series of high-profile chemical disasters in 2019 and 2020, TCEQ staff proposed significant revisions to their penalty policy in September of 2020. The revisions include increasing base penalties, counting more violations, and levying a 20% higher penalty for illegal air pollution in counties with populations greater than 85 thousand people.[114]

Staff also proposed expanding the discretion of TCEQ's Executive Director to downgrade or upgrade a facility's compliance history following disasters and explosions, or good faith efforts to come into compliance. These proposed changes are still in review, but are a sign that TCEQ is listening to community concerns and working to improve accountability.

More still needs to be done to put an end to widespread non-compliance. In order to change a reality where polluters often prefer paying minor fines to complying with the law, TCEQ should strengthen their penalty policy by making sure no polluter profits from violating the law by ensuring that penalties always recover the full economic benefit of non-compliance, eliminating the affirmative defense for emissions events, which exempts polluters from all penalties, and issuing mandatory penalties for unauthorized air pollution.

Enforcement under attack

Given the TCEQ's failure to consistently hold polluters accountable, citizen groups and local governments, like Harris County,[115] have stepped up to enforce state and federal clean air laws themselves. The Clean Air Act contains a "citizen suit" provision that allows private citizens affected by violations of the law (or the non-profit groups to which they belong) to bring an enforcement suit in federal court. Since 2008, environmental groups in Texas have successfully sued at least 4 facilities over illegal air pollution resulting from unauthorized air pollution events.[116]
In response, polluters have worked to change the law to shield themselves from these lawsuits.

For example, in 2019, Governor Abbott signed HB 2826 into law, requiring local governments to receive approval from the state Attorney General before suing polluters.[117]

As mentioned previously, in 2015 EPA directed 36 states, including Texas, to remove affirmative defense provisions from their State Implementation Plans (SIPs),[118] which seek to "reduce air pollution in areas that do not meet National Ambient Air Quality Standards."[119] Industry groups sued to block the EPA's action,[120] and in April 2017 the new Trump Administration leadership at the EPA asked the DC Circuit Court of Appeals to delay oral arguments over the SIP call so it could "reconsider all or part" of the rule.[121] In July 2017, EPA officials met to discuss, among other things, "initiating" the rule's withdrawal,[122] and in 2020, the EPA signed a final action, allowing Texas to retain its affirmative defense provisions. In response, nine environmental groups collectively filed suit in April of 2020, challenging the EPA's decision. The State of Texas and industry groups have filed a motion to dismiss the suit. The suit is ongoing.[123]

Harris County and the Texas Attorney General

In the absence of enforcement actions by the TCEQ, local governments are stepping in. For example, Harris County, home to some of the largest polluters in the state, has prosecuted dozens of polluters under the Clean Air Act.[124]

In one such case, Harris County attorneys filed suit against ExxonMobil's Baytown refinery, where, in July of 2019, an explosion and fire ignited, sending thousands of pounds of unauthorized pollution into the air and injuring 37 people.[125]

Since 2013, the county has sued several large companies including ExxonMobil, Intercontinental Terminals Company, and KMCO over pollution violations like these,[126] and thanks to a recent vote by the Harris County Commissioners Court, that number is set to rise in future years.

Following a slew of large industrial fires in 2019, the Harris County Commissioners Court voted to significantly boost funding for pollution control, approving the hire of four new assistant district attorneys to prosecute environmental crimes[127] and investing a total of $7 million in the county's Pollution Control and Public Health departments.[128] According to county staff, these investments will support prosecution efforts against large industrial firms,[129] equipping the county with the staff, monitoring equipment, and resources required to pursue complex legal battles.[130]

As citizen pressure for stronger regulations of pollut-

ing industries has mounted,[131] the State of Texas also announced suits against several polluters. The Texas Attorney General's office announced a total of 5 cases against large polluters in 2019[132] including, Valero,[133] ExxonMobil,[134] and Intercontinental Terminals Company[135] in Harris County -- up from 1 in 2018, and 0 in 2017.[136] If these cases hold up in court, this development could establish more effective, state-based, regulation of polluting industries.

However, even with an increase in court filings by the State of Texas, these cases still only represent a small fraction of the thousands of unauthorized air pollution events which occur each year. For instance, in 2019 judicial actions represented just 0.001% of the total unauthorized events in 2019.[137]

The cases have also sparked controversy about state versus local jurisdiction under the state and federal Clean Air Acts. For example, in May of 2019, Environment Texas, the Sierra Club, and the Port Arthur Community Action Network announced intent to sue the Valero Energy Corporation and Premcor Refining Group, Inc. in federal court for "emission events" which violated the federal Clean Air Act at their Port Arthur, Texas refinery.[138] Later, in July, the Texas Attorney General preempted Environment Texas' suit, announcing a state suit against the company.[139]

In order to ensure that polluters receive the maximum penalty under the law, Harris County has continued to pursue legal action even in cases where the State of Texas has announced suits. For instance, in August of 2019, both Harris county and the State of Texas filed suit against ExxonMobil -- one in Harris County State District Court, and the other in Travis County State District Court, respectively.[140] As long as Attorney General Paxton's case remains in a different jurisdiction, the county's suit will stand independently. Otherwise, authority will transfer to the Attorney General Paxton, superseding the suit filed by Harris County.[141] In reference to a similar case against ITC and KMCO, Harris county's chief environmental prosecutor, Rock Owens, said that if the state attempts to preempt Harris County's lawsuit, the Harris County Attorney's office intends to challenge him.[142]

Conclusions and recommendations

Illegal air pollution continues to rise year after year in Texas. Meanwhile, the Houston area saw at least five major chemical explosions and fires, and 357 unique days with unauthorized air pollution events. And, every single day in Texas a facility had an unauthorized air pollution event, releasing pollutants that can be harmful to human health and the environment. These every-day pollution events add up, leaving Texans to suffer the consequences. Allowing industries to pollute the air with impunity erodes the public's confidence in the agencies charged with protecting our health, while at the same time providing no incentive for polluters to clean up.

State and federal officials have the tools they need to protect our health and our environment from dangerous air pollution. They can do more to hold industrial plants that routinely release excessive air pollution, through preventable malfunctions and maintenance activities, accountable. Enforcing existing laws consistently and fully is a direct and effective way to rein in rogue polluters.

Citizens can also take action to clean up air pollution when the government agencies charged with protecting the air we breathe fail to do their jobs. Until the EPA and TCEQ improves its enforcement, citizen groups should exercise this right and file citizen suits to force polluters and scofflaws to install modern pollution control equipment and pay meaningful penalties for air pollution violations.

Companies should not be allowed to use malfunctions and maintenance as a blanket excuse to spew unlimited amounts of dangerous pollutants into the air we Texans breathe without serious consequences or accountability. Strict and consistent enforcement of permit limits will not only create a financial incentive for industries to better maintain their plants and invest in modern equipment, but also protect public health and the environment.

In order to reduce illegal air pollution and hold violators accountable, the state should:

- Eliminate the "affirmative defense" loophole
- Adopt mandatory minimum penalties for unauthorized air pollution events including from upset events, as well as unscheduled MSS (Maintenance, Startup and Shutdown) activities or planned MSS activities such as equipment maintenance
- Issue escalating fines per pound of pollution, based on the number of emissions violations via unauthorized air pollution events previously committed by the company in question
- Increase TCEQ inspections and monitoring
- Develop a plan to reduce unauthorized air pollution events and increase compliance
- Revoke a facility's permit after repeated violations until the facility implements plans to return to compliance

- Establish additional monitors, including SO_2 monitors in the Permian basin, to accurately measure air quality impacts from unauthorized emissions from industrial sources
- Improve the TCEQ STEERS database reporting system and instructions so that facilities report uniformly, accurately and in a way that enables citizens to easily determine the amount and type of pollution released during unauthorized events
- Require that polluting facilities share information and emergency response plans with neighbors in case of explosions or chemical disasters
- Work with federal and local agencies to implement continuous monitoring requirements for toxic pollutants
- Promptly review STEERS reports for accuracy and update them with the status of TCEQ's review regularly
- Provide emergency alerts to community members that register for notification of releases of toxic chemicals by manufacturing facilities as well as when the chemicals are no longer a threat.

At the national level:

- EPA should maintain, and vigorously defend in court, its previous ruling on affirmative defense, requiring that states strengthen rules dealing with emissions from equipment startups, shutdowns, malfunctions, and maintenance.
- EPA should work with TCEQ and local agencies to implement continuous monitoring requirements for toxic pollutants
- EPA should require that polluting facilities share information and emergency response plans with neighbors in case of explosions or chemical disasters
- Congress should reject efforts to weaken or eliminate the ability of citizen groups to sue to enforce environmental laws when government agencies are not enforcing the law
- Congress should maintain, and increase, funding for enforcement by the EPA

Methodology and data

This report ranks the state's worst air polluters based on companies' self-reports of unauthorized air pollution events in 2019, reported to the State of Texas Electronic Emissions Reporting System (STEERS). This data is publicly accessible (http://www2.tceq.texas.gov/ oce/eer/) and allows members of the public to track unauthorized releases of air pollution by county, or from any facility of interest. This report's analysis includes malfunctions; unplanned maintenance, startups and shutdowns (MSS); and planned MSS events that resulted in unauthorized emissions, and does not include routine emissions or excess opacity events. Opacity is a measure of how much light is blocked by a release of particulate matter.

Environment Texas Research and Policy Center obtained this data from the Texas Commission on Environmental Quality (TCEQ) via a Public Information Act request on April 27, 2020. Environment Texas Research and Policy Center then reviewed the data and removed entries with duplicate incident unique identifiers ("INCID_TRACK_NUM").

For the total emissions portion of the report, we analyzed STEERS data for 2019, the most recent full year for which information is available. We included events that began in 2019 and ended in 2019. The total emissions data do not include any events that began in 2018 and ended in 2019.

Before conducting the analysis, we conducted extensive data-cleaning to remove duplicate events, double-counted pollutants, cancelled and postponed events, incidents that were likely not violations,and to check for large pollution events changed retroactively:

- We checked events that facilities claimed were duplicates and removed them if other information in the database supported that claim.
- We attempted to remove all events that did not occur or that were not violations – facilities sometimes report events that they are anticipating that end up being postponed or cancelled, or that do not end up being violations.
- To avoid double-counting, we excluded aggregate fields of nitrogen monoxide and nitrogen dioxide entries (ex: nitrogen oxides) when the same event and location also had a general nitrogen oxides entry that was the sum of those fields or equal to those fields. For other contaminant groups included in the by-facility analysis (sulfur dioxide, particulate matter, hydrogen sulfide, carbon dioxide, butadiene, volatile organic compounds, inorganic compounds, and benzene), we confirmed that no double counting occurred.
- The STEERS system allows companies two weeks to make any corrections to entries made in their initial reports. In some cases, changes are

made well after the two-week deadline by facilities or STEERS. In late August of 2020, Environment Texas Research and Policy Center spot-checked data regarding especially large emissions events in the spreadsheet from TCEQ against the online STEERS system to capture any late changes.

We also took steps to determine the number of pounds released for events. Facilities report emissions to STEERS in three units – pounds, pounds per hour and opacity. Our dataset only includes pounds data.

After performing data cleaning, data points contained in the above analysis were calculated as follows:

- To calculate the number of facilities that had unauthorized emission events we tallied the unique identifiers for facilities ("RN").
- To calculate the total number of unauthorized emission events we tallied the unique identifiers for events ("INCID_TRACK_NUM").
- To calculate the total unauthorized pollution released in Texas during 2019, we summed the pounds of pollution released during all events. To rank the 16 TCEQ regions, we summed the total pounds of pollution released in each during 2019.
- To determine which facilities in the state released the most NOx, PM, SO_2, H2S, carbon dioxide, inorganic compounds, volatile organic compounds, benzene, and butadiene, we tallied each facility's releases of each of those separate contaminant categories.
- We tallied each facility's total emissions to determine which facilities in each region released the most pollution.
- We found each regulated entity's principal customer by searching TCEQ's STEERS database for the principal customer for a regulated entity's name or number.
- To calculate total emission calendar days, we tallied each day an event occurred. If an event started at 11 pm on one day and ended at 11 pm the next day we'd count that as 2 days.

The emissions data analyzed from the TCEQ has various limitations that may impact the accuracy of our analysis. The details of each of the thousands of self-reported events have not yet been verified by state regulators, and companies' self-reported data can contain reporting errors. For example, some of the initial emissions event links for STEERS that we received from TCEQ in April no longer exist. TCEQ has since added new emissions events to the STEERS database. Previous research has also documented that facilities under-report emissions[143] to the STEERS database, for example of particulate matter, and over-report to the STEERS database[144] (by including routine emissions along with those from unauthorized air pollution events). As described above, we attempted to remove instances of over-reporting and double-counting which were present in the data. Despite our best efforts, our text search may not have found all instances of double-counting, duplicate events, and non-reportable events.

To calculate TCEQ's enforcement rates, we first reviewed the list of STEERS reports for 2019. We submitted an open records request to TCEQ to obtain all the air enforcement orders issues from January through December of 2019. We received this data on April 29, 2020. We submitted additional open records requests for data indicating whether or not companies claimed affirmative defense, which we received on September 22, 2020. We then used docket numbers contained in the annual administrative air enforcement information from TCEQ to download each air enforcement order from the TCEQ's Integrated Database: http://www14.tceq.texas.gov/epic/eCID/.

Next, we tallied the total number of unauthorized air pollution events penalized by each enforcement order in 2019. We searched each individual enforcement order for an incident number connected to a specific

STEERS emissions event or an MSS violation which, according to the enforcement order, "exceeded the permitted emissions rate."[145] These numbers are typically found in either the "Findings of Fact" or "Allegations" sections of the enforcement order. Enforcement orders for emissions events not reported to STEERS (indicated by the phrase "not reported" in the "Findings of Fact" or "Allegations" sections of the enforcement order) were not included in administrative penalty calculations. The State of Texas filed five court orders on behalf of TCEQ that applied to air pollution violations in 2019. All of those, obtained directly from the Office of Attorney General via an open records request, applied to unauthorized air pollution events and are included in our calculations for the total number of enforcement actions taken in 2019.

Using this information, we calculated the percentage of reported unauthorized air pollution events that were subject to enforcement for 2019. We took the total number of unauthorized air pollution events covered by air enforcement and court orders issued in 2019 and compared that to the total number of unauthorized air pollution events reported to STEERS that took place in 2019. Enforcement rates for prior years were calculated in the 2019 report *Illegal Air Pollution in Texas in 2018* by Environment Texas.

Appendix A – Worst polluters by metro area

Table A-1. Top 10 Polluters in Region 1 - Amarillo

Rank	Facility name	Name of owner or operator	County	Total pounds
1	Borger Refinery	Phillips 66 Company	Hutchinson	93,396
2	Borger Carbon Black Plant	Tokai Carbon CB Ltd	Hutchinson	83,360
3	DCP Midstream Ochiltree County Pipeline	DCP Operating Company LP	Ochiltree	69,944
4	Rock Creek Gas Plant	DCP Operating Company, LP	Hutchinson	60,100
5	Sneed Booster Station	DCP Operating Company, LP	Moore	45,189
6	Agrium US Borger Nitrogen Operations	Agrium US INC	Hutchinson	36,216
7	Hansford County Pipeline Segments	Panhandle Eastern Pipeline Company LP	Hansford	33,659
8	Solvay Specialty Polymers USA	Solvay Specialty Polymers USA LLC	Hutchinson	24,125
9	Spearman Compressor Station	DCP Operating Company LP	Ochiltree	22,586
10	Valero McKee Refinery	Diamond Shamrock Refining Company, L.P.	Moore	14,611

Table A-2. Top 10 Polluters in Region 2 - Lubbock

Rank	Facility name	Name of owner or operator	County	Total pounds
1	Wasson CO2 Removal Plant	Occidental Permian Ltd	Yoakum	768,201
2	Willard CO2 Separation Plant	OXY USA WTP LP	Yoakum	578,503
3	Denver Unit CO2 Recovery Plant	Occidental Permian Ltd	Yoakum	338,470
4	Mallet CO2 Recovery Plant	Occidental Permian Ltd	Hockley	323,428
5	Cornell-Mahoney Gas Plant	XTO Energy Inc	Yoakum	158,050
6	Anton CO2 Reinjection Facility	Occidental Permian Ltd	Hale	152,778
7	West RKM Battery 1 & Header 7	Occidental Permian Ltd	Hockley	91,338
8	Campo Viejo Gas Processing Plant	Stakeholder Gas Services, LLC	Yoakum	88,977
9	Slaughter Gasoline Plant	Occidental Permian Ltd	Hockley	86,287
10	Cedar Hill Gas Plant	Cedar Hill Gas Plant LP	Garza	84,948

Table A-3. Top 10 Polluters in Region 3 - Abilene

Rank	Facility name	Name of owner or operator	County	Total pounds
1	Sykes Compressor Station	WTG Jameson LP	Runnels	223,841
2	May Compressor Station	WTG Jameson LP	Brown	94,897
3	Tiger Compressor Station	Targa Midstream Services LLC	Jack	69,998
4	Talpa Compressor Station	WTG Jameson LP	Coleman	69,409
5	Salt Creek Gas Plant	OXY USA WTP LP	Kent	57,553
6	Glen Cove Comp Station	WTG Jameson, LP	Coleman	52,519
7	Parramore Compressor Station	WTG Jameson LP	Runnels	50,743
8	Cogdell Canyon Reef Unit Battery No 3 Temporary Flare	Occidental Permian Ltd	Kent	27,896
9	Westbrook Unit North Lact Battery	Sabinal Energy Operating LLC	Mitchell	23,000
10	Snyder Gas Plant	Kinder Morgan Production Company LLC	Scurry	17,260

Table A-4. Top 10 Polluters in Region 4 - DFW (Dallas/Fort Worth) Metroplex

Rank	Facility name	Name of owner or operator	County	Total pounds
1	Springtown Gas Processing Plant	Colt G & P (North Texas) L.P.	Parker	70,590
2	Chico Gas Plant	Targa Midstream Services LLC	Wise	39,500
3	Ash Grove Cement	Ash Grove Cement Company	Ellis	9,302
4	McKinney Plant 3	TXI Operations LP	Collin	8,000
5	Holcim Texas	Holcim US Inc	Ellis	3,916
6	Bridgeport Gas Plant	EnLink Midstream Services LLC	Wise	2,261
7	James Hardie Building Products	James Hardie Building Products Inc	Johnson	2,172
8	Peterbilt Motors	Paccar Inc	Denton	2,000
9	Qorvo Texas	Qorvo Texas LLC	Collin	1,016
10	Owens Corning Insulating Systems Waxahachie Plant	Owens Corning Insulating Systems LLC	Ellis	898

Table A-5. Top 10 Polluters in Region 5 - Tyler

Rank	Facility name	Name of owner or operator	County	Total pounds
1	Pittsburg Gas Plant	Midcoast G & P (East Texas) L.P.	Camp	152,482
2	Eastman Chemical Texas Operations	Eastman Chemical Company	Harrison	112,395
3	Duke Energy Field Services Pipeline Panola County	DCP Operating Company, LP	Panola	21,366
4	Hawkins Gas Plant	XTO Energy INC	Wood	12,011
5	Westlake Longview	Westlake Longview Corporation	Harrison	11,473
6	Enterprise Products Operating Pipeline Harrison County	Enterprise Products Operating LLC	Harrison	8,837
7	Roberts HV Unit 1H-4H CTB	Rockcliff Energy Operating LLC	Panola	8,542
8	Delek Tyler Refinery	Delek Refining Ltd	Smith	6,078
9	Compressor Station 388 Longview	Natural Gas Pipeline Company of America LLC	Harrison	2,374
10	Enbridge Pipelines NE Texas Pipeline Camp County	Midcoast G & P East Texas LP	Camp	805

Table A-6. Top 10 Polluters in Region 6 - El Paso

Rank	Facility name	Name of owner or operator	County	Total pounds
1	Apollo Compressor Station	Delaware Basin Midstream LLC	Culberson	25,813
2	Delaware Ranch CGF	Delaware Basin Midstream LLC	Culberson	25,813
3	Newman Power Station	El Paso Electric Company	El Paso	18,172
4	Marathon El Paso Refinery	Western Refining Company LP	El Paso	5,480
5	Falcon Gas Plant	Targa Delaware LLC	Culberson	1,001
6	B & M Machinery	Acala, Ricardo	El Paso	7
7	Veolia Borderland Plant	Veolia North America Regeneration Services LLC	El Paso	1

Table A-7. Top 10 Polluters in Region 7 - Midland

Rank	Facility name	Name of owner or operator	County	Total pounds
1	Sand Hills Gas Plant	Targa Midstream Services LLC	Crane	5,431,907
2	Benedum Gas Plant	Targa Pipeline Mid-Continent WestTex LLC	Upton	4,919,128
3	Martin County Gas Plant	WTG North Permian Midstream LLC	Martin	3,179,369
4	Seminole Gas Processing Plant	OXY USA Inc.	Gaines	2,921,814
5	JT McElroy 202 TB	Chevron U.S.A. Inc	Crane	2,826,261
6	Goldsmith Gas Plant	DCP Operating Company, LP	Ector	2,773,773
7	Sale Ranch Gas Plant	WTG Gas Processing, L.P	Martin	2,471,195
8	Oahu Gas Plant	Targa Southern Delaware LLC	Pecos	2,042,459
9	McElroy Section 199 Emergency Flare	Chevron U.S.A. Inc	Crane	1,633,491
10	Driver Gas Plant	Targa Pipeline Mid-Continent WestTex LLC	Midland	1,374,974

Table A-8. Top Polluters in Region 8 - San Angelo

Rank	Facility name	Name of owner or operator	County	Total pounds
1	Midkiff Gas Plant	Targa Pipeline Mid-Continent WestTex LLC	Reagan	910,476
2	Hodges 8	Occidental Permian Ltd	Sterling	601,984
3	Perkins Treating Facility	WTG Jameson LP	Coke	527,462
4	Saxon Booster	WTG South Permian Midstream LLC	Reagan	294,419
5	Stiles Booster Station	WTG South Permian Midstream LLC	Reagan	121,562
6	Cox Compressor Station	Targa Pipeline Mid-Continent WestTex LLC	Reagan	107,286
7	Duke Energy Field Services Pipeline Reagan County	DCP Operating Company, LP	Reagan	70,919
8	Big Lake Treating Facility	Davis Gas Processing Inc	Reagan	60,535
9	WTG Pipeline Segment 4.3 MI S OF BLTF	West Texas Gas Inc	Reagan	58,665
10	Sherrod Tank Battery	XTO Energy Inc	Reagan	54,049

Table A-9. Top Polluters in Region 9 - Waco

Rank	Facility name	Name of owner or operator	County	Total pounds
1	Somerville Booster Station	DCP Operating Company LP	Burleson	11,304
2	Enbridge Pipelines Freestone County	Midcoast Pipelines East Texas LP	Freestone	10,571
3	Aker Plant	Midcoast G & P (East Texas) L.P	Freestone	8,896
4	Space Exploration Technologies Rocket Development Facility	Space Exploration Technologies Corp	McLennan	420
5	Owens Brockway Glass Container	Owens-Brockway Glass Container Inc	McLennan	50

Table A-10. Top 10 Polluters in Region 10 - Beaumont

Rank	Facility name	Name of owner or operator	County	Total pounds
1	Beaumont Gas to Gasoline Plant	NatGasoline LLC	Jefferson	72,693,756
2	ExxonMobil Beaumont Refinery	ExxonMobil Oil Corporation	Jefferson	1,952,749
3	Chevron Phillips Chemical Port Arthur Facility	Chevron Phillips Chemical Company LP	Jefferson	395,036
4	Port Arthur Refinery	Total Petrochemicals & Refining USA Inc	Jefferson	342,596
5	Motiva Chemicals	Motiva Chemicals LLC	Jefferson	283,405
6	Valero Port Arthur Refinery	The Premcor Refining Group Inc	Jefferson	259,168
7	Huntsman Port Neches	Indorama Ventures Oxides LLC	Jefferson	258,390
8	Port Arthur Refinery	Total Petrochemicals & RefiningUSA INC	Jefferson	215,863
9	ExxonMobil Oil Beaumont Chemical Plant	ExxonMobil Oil Corporation	Jefferson	139,981
10	Performance Materials NA	Performance Materials NA Inc	Orange	100,389

Table A-11. Top Polluters in Region 11 - Austin

Rank	Facility name	Name of owner or operator	County	Total pounds
1	Warrenton Booster	DCP Operating Company LP	Fayette	27,190
2	Stranger Compressor Station	DCP Operating Company LP	Lee	6,829
3	Post Oak Booster Station	DCP Operating Company LP	Lee	5,212
4	La Grange Gas Processing Plant	ETC Texas Pipeline Ltd	Fayette	1,567
5	Winchester Power Park	Lower Colorado River Authority	Fayette	227

Table A-12. Top Polluters in Region 12 - Houston

Rank	Facility name	Name of owner or operator	County	Total pounds
1	Intercontinental Terminals Deer Park Terminal	Intercontinental Terminals Company LLC	Harris	15,395,184
2	Freeport LNG Pretreatment Facility	Freeport LNG Development LP	Brazoria	1,606,138
3	Chevron Phillips Chemical Cedar Bayou Plant	Chevron Phillips Chemical Company LP	Harris	1,430,405
4	Freeport LNG Liquefaction Plant	Freeport LNG Development LP	Brazoria	1,150,495
5	ExxonMobil Chemical Baytown Olefins Plant	Exxon Mobil Corporation	Harris	575,533
6	Houston Refining	Houston Refining LP	Harris	446,066
7	Chocolate Bayou Plant	INEOS US LLC	Brazoria	386,386
8	ExxonMobil Baytown Refinery	Exxon Mobil Corporation	Harris	349,865
9	Enterprise Mont Belvieu Complex	Enterprise Products Operating LLC	Chambers	346,127
10	Dow Texas Operations Freeport	The Dow Chemical Company	Brazoria	248,836

Table A-13. Top 10 Polluters in Region 13 - San Antonio

Rank	Facility name	Name of owner or operator	County	Total pounds
1	Lancaster Ranch Compressor Station and Treating Facility	Frio LaSalle Pipeline LP	Frio	230,206
2	San Miguel Electric Plant	San Miguel Electric Cooperative, Inc.	Atascosa	79,453
3	South Karnes Central Facility	Marathon Oil EF LLC	Karnes	57,073
4	Duke Energy Field Services Pipeline Wilson County	DCP Operating Company LP	Wilson	38,488
5	Patton Trust South Production Facility	Ovintiv USA INC	Karnes	38,115
6	Pearsall Compressor Station	Enterprise Products Operating LLC	Frio	17,855
7	Karnes Central Facility 2 with Owens Unit A1	Burlington Resources Oil & Gas Company LP	Karnes	9,475
8	Mixon Production Facility	Ovintiv USA INC	Karnes	4,486
9	Watermelon Production Facility	EOG Resources INC	Atascosa	2,583
10	HEB Retail Support Center	H-E-B LP	Bexar	1,665

Table A-14. Top 10 Polluters in Region 14 - Corpus Christi

Rank	Facility name	Name of owner or operator	County	Total pounds
1	Corpus Christi Liquefaction	Corpus Christi Liquefaction LLC	San Patricio	2,429,485
2	Duke Energy Field Services Pipeline Nueces County	DCP Operating Company LP	Nueces	286,496
3	Javelina Gas Processing Facility	MarkWest Javelina Company LLC	Nueces	277,321
4	Citgo Corpus Christi Refinery West Plant	Citgo Refining and Chemicals Company LP	Nueces	218,095
5	Equistar Chemicals	Equistar Chemicals LP	Nueces	94,095
6	Wombat Compressor Station	American Midstream (Lavaca) LLC	Lavaca	75,410
7	Dewitt Central Delivery Point	Burlington Resources Oil & Gas Company LP	Dewitt	64,211
8	Citgo Corpus Christi Refinery East Plant	Citgo Refining and Chemicals Company LP	Nueces	44,220
9	Valero Corpus Christi Refinery East Plant	Valero Refining-Texas LP	Nueces	42,715
10	Robstown Fractionator	Epic Y-Grade Logistics LP	Nueces	40,072

Table A-15. Top Polluters in Region 15 - Harlingen

Rank	Facility name	Name of owner or operator	County	Total pounds
1	Duke Energy Field Services Pipeline Brooks County	DCP Operating Company, LP	Brooks	116,634
2	Enterprise Products Operating Pipeline Hidalgo County	Enterprise Products Operating LLC	Hidalgo	8,016
3	Silas Ray Power Plant	Public Utilities Board of the City of Brownsville Texas	Cameron	200
4	Southwest Terminal	Transmontaigne Operating Company LP	Cameron	52
5	LIneage Logistics	Lineage Logistics LLC	Hidalgo	29

Table A-16. Top 10 Polluters in Region 16 - Laredo

Rank	Facility name	Name of owner or operator	County	Total pounds
1	Duke Energy Field Services Pipeline Webb County	DCP Operating Company LP	Webb	352,133
2	Martinez South 101H & 102H Production Facility	Trinity Operating USG LLC	Dimmit	54,325
3	Tilden Gas Plant	ETC Field Services LLC	McMullen	51,205
4	Lone Star NGL Pipeline Kinney County	Lone Star NGL Pipeline LP	Kinney	47,519
5	Enterprise Products Operating Pipeline Dimmit County	Enterprise Products Operating LLC	Dimmit	43,259
6	Traylor North No 1 Central Facility	Paradigm Midstream Services - ST, LLC	Zavala	31,428
7	Turman Nos 101H-105H Production Facility	Trinity Operating USG LLC	LaSalle	30,146
8	Enterprise Products Operating Pipeline Duval County	Enterprise Products Operating LLC	Duval	24,102
9	Gates Facility 16	Rosetta Resources Operating LP	Webb	23,140
10	Yarbrough 110H-116H Production Facility	Trinity Operating USG LLC	La Salle	17,935

Appendix B – Largest unauthorized pollution events

Table B-1: Largest Unauthorized Pollution Events

Rank	Facility name	Name of owner or operator	County	Total pounds
1	Beaumont Gas to Gasoline Plant	Natgasoline LLC	Jefferson	20,432,088
2	Intercontinental Terminals Deer Park Terminal	Intercontinental Terminals Company LLC	Harris	15,393,969
3	Beaumont Gas to Gasoline Plant	Natgasoline LLC	Jefferson	9,606,190
4	Beaumont Gas to Gasoline Plant	Natgasoline LLC	Jefferson	8,325,041
5	Beaumont Gas to Gasoline Plant	Natgasoline LLC	Jefferson	7,780,768
6	Beaumont Gas to Gasoline Plant	Natgasoline LLC	Jefferson	7,776,407
7	Beaumont Gas to Gasoline Plant	Natgasoline LLC	Jefferson	5,357,572
8	Beaumont Gas to Gasoline Plant	Natgasoline LLC	Jefferson	3,789,482
9	Beaumont Gas to Gasoline Plant	Natgasoline LLC	Jefferson	3,553,386
10	Beaumont Gas to Gasoline Plant	Natgasoline LLC	Jefferson	3,024,570

Appendix C – Polluters with the highest count of unauthorized pollution events

Table C-1. Highest Count of Unauthorized Pollution Events

Rank	Facility name	Name of owner or operator	County	Total pounds
1	Sand Hills Gas Plant	Targa Midstream Services LLC	Crane	105
2	Goldsmith Gas Plant	DCP Operating Company LP	Ector	72
3	Wildcat Gas Plant	Targa Delaware LLC	Winkler	68
4	Driver Gas Plant	Targa Pipeline Mid-Continent WestTex LLC	Midland	53
5	Campo Viejo Gas Processing Plant	Stakeholder Gas Services LLC	Yoakum	53
5	Seminole Gas Processing Plant	OXY USA INC	Gaines	50
7	Emperor Compressor Station	ETC Texas Pipeline LTD	Winkler	49
8	Mabee Ranch CO2 Plant	Chevron USA Inc	Andrews	47
9	Benedum Gas Plant	WTG South Permian Midstream LLC	Upton	41
10	Welch CO2 Gas Processing Facility	OXY USA WTP LP	Dawson	40

Appendix D – Total emission days by region

Table D-1. Total Number of Unique Calendar Days with Unauthorized Air Pollution Events

TCEQ region	Total Unique Emission Days
Statewide	365
Midland	365
Houston	357
Corpus Christi	351
Lubbock	273
Beaumont	225
San Angelo	144
Abilene	133
Amarillo	116
Tyler	104
Laredo	103
Dallas/Fort Worth	88
Austin	54
San Antonio	37
Waco	28
El Paso	18
Harlingen	7

Notes

1. "Natgasoline." Proman. Accessed 3 September 2020. https://www.proman.org/companies/natgasoline/

2. To find percentage change, we did two separate calculations, subtracting the total unauthorized air pollution from 2015 and 2016 from 2019 (excluding Beaumont Gas to Gasoline Plant's 2019 emissions), and divided by the unauthorized air pollution in 2015 and 2016, respectively.

3. Caiazzo, Fabio, Akshay Ashok, Ian A. Waitz, Steve H.L. Yim, and Steven R.H. Barrett. "Air pollution and early deaths in the United States. Part I: Quantifying the impact of major sectors in 2005." May 31, 2013. Accessed August 25, 2020. https://coolgreenschools.com/wpcontent/uploads/2015/07/US-airpollution-paper.pdf, Table 5.

4. Roy, Ananya, Fullmer, Rachel, Proville, Jeremy, and Grace Tee Lewis. "Texas Clean Air Matters." *Environmental Defense Fund.* 11 May 2020. Accessed 22 June 2020. http://blogs.edf.org/texascleanairmatters/

5. Horswell, Cindy, and Susan Carroll. "Study: Children near Ship Channel Face More Risk." *Houston Chronicle*. July 25, 2011. Accessed August 25, 2020. https://www.chron.com/news/houston-texas/article/Study-Children-near-Ship-Channelface-morerisk-1583566.php.

6. Irfan, Umair. "How Trump's EPA is letting environmental criminals off the hook, in one chart." *Vox.* 27 February 2019. Accessed 30 September 2020. https://www.vox.com/2019/1/16/18183998/epa-andrew-wheeler-environmental-policy-enforcement

7. The U.S. Environmental Protection Agency. "EPA ECHO State Air Dashboard." Accessed 30 September 2020. https://echo.epa.gov/trends/comparative-maps-dashboards/state-air-dashboard

8. Popovich, Nadja, Albeck-Ripka, Livia, and Kendra Pierre-Louis. "The Trump Administration Is Reversing 100 Environmental Rules. Here's the Full List." *The New York Times.* 15 July 2020. Accessed 2 October 2020. https://www.nytimes.com/interactive/2020/climate/trump-environment-rollbacks.html

9. The U.S. Environmental Protection Agency. "Final Action to Withdraw the Finding of Substantial Inadequacy for the Texas State Implementation Plan and to Withdraw the SSM SIP Call for Texas." 7 January 2020. Accessed 5 October 2020. https://www.epa.gov/air-quality-implementation-plans/final-action-withdraw-finding-substantial-inadequacy-texas-state

10. Data obtained via a public information request to TCEQ on September 22, 2020.

11. Taken from comments at TCEQ work session on September 24, 2020. Accessible here: https://www.youtube.com/watch?v=UBb5jYOD49Y, 3 min.

12. See methodology; "Illegal Air Pollution in Texas in 2018." *Environment Texas Research and Policy Center.* December 2019. https://environmenttexas.org/sites/environment/files/reports/TX_Pollution_scrn%20%281%29.pdf

13. Since the TPC emissions event ended in 2020, pollution from the TPC explosion and fire is not included in the 2019 numbers in this report.

14. The Texas Commission on Environmental Quality (TCEQ) divides the state into 16 regions. More information on TCEQ's regions are available here: https://www.tceq.texas.gov/agency/directory/region

15. Collette, Mark and Matt Dempsey. "Chemical Breakdown." 7 May 2016. Accessed 19 September 2020. https://www.houstonchronicle.com/news/investigations/article/Dangerous-chemicals-roadblocks-to-information-7420931.php

16. Toal, Margaret, Bogel-Burroughs, Nicholas, and Manny Fernandez. "Thousands evacuated in Texas after explosion at Port Neches chemical plant." *The New York Times.* 27 November 2019. Accessed 7 October 2020. https://www.nytimes.com/2019/11/27/us/texas-explosion-port-neches-tpc.html

17. Taken from public testimony to TCEQ on December 18, 2019. Accessible here: https://www.youtube.com/watch?v=t4RaiK94HMk, 30 min.

18. Since the emissions event ended in 2020, pollution from the TPC explosion and fire is not included in the 2019 numbers in this report.

19. Hardy, Michael. "TPC Chemical Plant Explosion Dumps Toxics Into Community." *Sierra Club.* 18 December 2019. Accessed 2 July 2020. https://www.sierraclub.org/sierra/tpc-chemical-plant-explosion-dumps-toxics-community

20. Blum, Jordan. "Houston company TPC Group has long history, spotty environmental record." *Houston Chronicle.* 28 November 2019. Accessed 2 July 2020. https://www.chron.com/business/article/Houston-company-TPC-Group-has-long-history-14867950.php

21. Caiazzo, Fabio, Akshay Ashok, Ian A. Waitz, Steve H.L. Yim, and Steven R.H. Barrett. "Air pollution and early deaths in the United States. Part I: Quantifying the impact of major sectors in 2005." May 31, 2013. Accessed August 25, 2020. https://coolgreenschools.com/wpcontent/uploads/2015/07/US-airpollution-paper.pdf, Table 5.

22. Roy, Ananya, Fullmer, Rachel, Proville, Jeremy, and Grace Tee Lewis. "Texas Clean Air Matters." *Environmental Defense Fund.* 11 May 2020. Accessed 22 June 2020. http://blogs.edf.org/texascleanairmatters/

23. Zirogiannis, Nikolaos, Alex J. Hollingsworth, and David M. Konisky. "The health consequences of weak regulation: Evidence from excess emissions in Texas." Pg. 26. May 9, 2019. Accessed August 25, 2020. https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3382541.

24. Horswell, Cindy, and Susan Carroll. "Study: Children near Ship Channel Face More Risk." *Houston Chronicle*. July 25, 2011. Accessed August 25, 2020. https://www.chron.com/news/houston-texas/article/Study-Children-near-Ship-Channelface-morerisk-1583566.php.

25. Wu, Xiao, Nethery, Rachel, Sabbath, M Benjamin, Braun, Danielle, and Francesvca Dominici. "Exposure to air pollution and COVID-19 mortality in the United States: A nationwide cross-sectional study." 24 April 2020. Accessed 11 September 2020. https://projects.iq.harvard.edu/covid-pm

26. Petroni, Michael, Hill, Dustin, Younes, Lylla, Barkman, Liesl, Howard, Sarah, Howell, Brielle, Mirowsky, Jaime, and Mary Collins. "Hazardous air pollutant exposure as a contributing factor to COVID-19 mortality in the United States." *Environmental Research Letters.* 11 September 2020. Accessed 11 September 2020. https://iopscience.iop.org/article/10.1088/1748-9326/abaf86

27. Reilly, Sean. "Study of emissions and virus deaths implicates EPA policy." *E&E News.* 17 July 2020. Accessed 11 September 2020. https://www.eenews.net/greenwire/2020/07/17/stories/1063580943

28. Perscio, Claudia and Kathryn Johnson. "The Effects of Increased Pollution on COVID-19 Cases and Deaths." *American University.* 22 June 2020. Accessed 11 September 2020. https://www.eenews.net/assets/2020/07/17/document_gw_02.pdf

29. "Annual Enforcement Report Fiscal Year 2019." TCEQ Annual Enforcement Reports, November 2019. Accessed 1 September 2020. https://www.tceq.texas.gov/assets/public/compliance/enforcement/enf_reports/AER/FY19/enfrptfy19.pdf, pg. 5-1.

30. "Reportable Event/Activity Notification/Reporting Form." Texas Commission on Environmental Quality. Accessed 1 September 2020. https://www.tceq.texas.gov/assets/public/compliance/field_ops/fod_forms/upset/eefguide.pdf, pg. 2.

31. Air emissions event reports, filed in the STEERS database (https://www2.tceq.texas.gov/oce/eer/), include event reports for five types of events: startup, shutdown, maintenance, emissions events, and opacity. This report analyzes startup, shutdown, maintenance, and emissions events. Our analysis does not include opacity violations.

32. Zirogiannis, Nikolaos, Hollingsworth, Alex, and David Konisky. "Air Pollution From Industrial Shutdowns and Startups a Grave Danger to Public Health." *EcoWatch.* April 26, 2018. Accessed August 25, 2020. https://www.ecowatch.com/airpollution-startupsshutdowns-2534981679.html.

33. Cassiday, Laura. "Lessons learned from Hurricane Harvey." *AOCS.* Accessed 1 September 2020. https://www.aocs.org/stay-informed/inform-magazine/featured-articles/lessons-learned-from-hurricane-harvey-march-2018?SSO=True

34. Bennett, Kathleen M. "Policy on Excess Emissions during Startup, Shutdown, Maintenance, and Malfunctions." Office of Air, Noise, and Radiation, February 15, 1983. February 25, 1998. Accessed 25 August 2020. https://www.epa.gov/sites/production/files/2015-07/documents/ssm.pdf, pg.1.

35. "Section 3: VOC Controls." Environmental Protection Agency, September 2000. September 2000. Accessed August 25, 2020. https://www.epa.gov/sites/production/files/2019-08/documents/flarescostmanualchapter7thedition_august2019vff.pdf, pg. 1-18.

36. TCEQ. "Instructions for Form TCEQ -10360." Pg. 2. February 2014. Accessed August 25, 2020. https://www.tceq.texas.gov/assets/public/compliance/field_ops/fod_forms/upset/eefguide.pdf

37. Further information regarding Texas' reporting and enforcement process for emissions events is available in Environment Texas Research and Policy Center's January 2019 report, "Major Malfunction: Air Pollution from Industrial Malfunctions and Maintenance in Texas in 2017" https://environmenttexas.org/sites/environment/files/reports/TX_MajorMal_scrn.pdf.

38. "Benzene Hazard Summary." *U.S. Environmental Protection Agency.* 2012. Accessed 3 August 2020. https://www.epa.gov/sites/production/files/2016-09/documents/benzene.pdf; "IRIS Assessment: Benzene." *U.S. Environmental Protection Agency.* 2017. Accessed 3 August 2020. https://cfpub.epa.gov/ncea/iris2/chemicalLanding.cfm?&substance_nmbr=276; "Toxic Substances Portal: Benzene." ATSDR. 2011. Accessed 3 August 2020. https://www.atsdr.cdc.gov/substances/toxsubstance.asp?toxid=14; West, Allyn. "What is benzene?" *One Breath Partnership.* 1 November 2019. Accessed 7 October 2020. https://onebreathhou.org/newsroom/2019/11/what-is-benzene/; Centers for Disease Control and Prevention. "Facts About Benzene." 2018. Accessed 7 October 2020. https://emergency.cdc.gov/agent/benzene/basics/facts.asp#:~:text=Benzene%20is%20a%20chemical%20that,float%20on%20top%20of%20water.

39. Tresaugue, Matthew. "Study links benzene exposure in Texas neighborhoods with spina bifida." *The Dallas Morning News.* October 2010. Accessed August 25, 2020. https://www.dallasnews.com/news/texas/2010/10/28/study-links-benzeneexposure-in-texas-neighborhoods-with-spina-bifida/.

40. World Health Organization Public Health and Environment. Exposure to Benzene: A Major Public Health Concern. 2019. Accessed August 25, 2020. https://apps.who.int/iris/bitstream/handle/10665/329481/WHO-CED-PHE-EPE-19.4.2-eng.pdf?ua=1

41. See methodology.

42. Luck, M. "ITC to reopen after plant fire, ending 'logistic nightmare' for chemical industry." *Houston Chronicle.* 3 May 2019. Accessed July 23, 2020. https://www.houstonchronicle.com/business/energy/article/ITC-to-reopen-after-plant-fire-ending-13816778.php

43. The U.S. Environmental Protection Agency. "Detailed Facility Report." Enforcement and Compliance History Online. Accessed 3 September 2020. https://echo.epa.gov/detailed-facility-report?fid=110000504268

44. National Library of Medicine. "Nitrogen Oxides: Your Environment, Your Health." Accessed 1 June 2020. https://toxtown.nlm.nih.gov/chemicals-and-contaminants/nitrogen-oxides

45. "Nitrogen Oxides." Accessed 1 June 2020. https://scied.ucar.edu/nitrogen-oxides; Fraser, Catherine. "What is ozone?" *One Breath Partnership.* 27 May 2020. https://onebreathhou.org/newsroom/2020/05/ozone-pollution-industrial-emissions-houston/

46. Earthworks. "Gas Processing." 13 August 2018. Accessed 23 July 2020. https://earthworks.org/issues/gas_processing/

47. See Methodology

48. "Particle Pollution and Your Health." Environmental Protection Agency. 2003. Accessed 25 August 2020. https://nepis.epa.gov/Exe/ZyPDF.cgi?Dockey=P1001EX6.txt; Tresaugue, Matthew. "What is particulate matter?" *One Breath Partnership.* 27 April 2020. Accessed 25 August 2020. https://onebreathhou.org/newsroom/2020/04/particle-pollution-soot-standards-epa-houston/

49. See methodology.

50. Borger Refinery." Phillips 66. Accessed 7 October 2020. https://www.phillips66.com/refining/borger-refinery#:~:text=The%20refinery%20processes%20primarily%20medium,fractionation%20capacity%20of%2022%2C500%20BPD.&text=Pipelines%20move%20refined%20products%20to,Colorado%20and%20the%20Midcontinent%20region.

51. The U.S. Environmental Protection Agency. "Detailed Facility Report." Accessed 4 September 2020. https://echo.epa.gov/detailed-facility-report?fid=110042005843

52. "Sulfur Dioxide Pollution." Environmental Protection Agency. 2019. Accessed 25 August 2020. https://www.epa.gov/so2-pollution/sulfur-dioxide-basics#what%20is%20so2; "Toxic Substances Portal: Sulfur Dioxide." ATSDR. 2011. Accessed 25 August 2020. https://www.atsdr.cdc.gov/substances/toxsubstance.asp?toxid=46; "Air Quality Guideline: Global Update." World Health Organization. 2005. Accessed 25 August 2020. http://www.euro.who.int/__data/assets/pdf_file/0005/78638/E90038.pdf?ua=1

53. "Sulfur Dioxide Pollution." Environmental Protection Agency. 2019. Accessed 25 August 2020. https://www.epa.gov/so2-pollution/sulfur-dioxide-basics#what%20is%20so2; "Toxic Substances Portal: Sulfur Dioxide." ATSDR. 2011. Accessed 25 August 2020. https://www.atsdr.cdc.gov/substances/toxsubstance.asp?toxid=46; "Air Quality Guideline: Global Update." World Health Organization. 2005. Accessed 25 August 2020. http://www.euro.who.int/__data/assets/pdf_file/0005/78638/E90038.pdf?ua=1

54. See methodology.

55. Earthworks. "Gas Processing." 13 August 2018. Accessed 23 July 2020. https://earthworks.org/issues/gas_processing/

56. The U.S. Environmental Protection Agency. "Detailed Facility Report." Accessed 4 September 2020. https://echo.epa.gov/detailed-facility-report?fid=110033349552

57. Hydrogen Sulfide." ATSDR. 21 October 2014. Accessed 25 August 2020. https://www.atsdr.cdc.gov/mmg/mmg.asp?id=385&tid=67; "Hydrogen Sulfide." OSHA. 2005. Accessed 25 August 2020. https://www.osha.gov/OshDoc/data_Hurricane_Facts/hydrogen_sulfide_fact.pdf

58. See methodology.

59. "1,3 Butadiene." Environmental Protection Agency. March 2009. Accessed 25 August 2020. https://www.epa.gov/sites/production/files/2016-08/documents/13-butadiene.pdf; "Medical Management Guidelines for 1,3-Butadiene." ATSDR. 21 October 2014. Accessed 25 August 2020. https://www.atsdr.cdc.gov/mmg/mmg.asp?id=455&tid=81

60. "1,3-Butadiene." Occupational Safety and Health Administration. Accessed 25 August 2020. https://www.osha.gov/SLTC/butadiene/healtheffects.html

61. See methodology.

62. "Greenhouse Gas Emissions: Overview of Greenhouse Gases." Environmental Protection Agency. 28 May 2020. Accessed 25 August 2020. https://www.epa.gov/ghgemissions/overview-greenhouse-gases; "Why does CO2 get most of the attention when there are so many other heat-trapping gases?" *Union of Concerned Scientists.* 3 August 2017. Accessed 25 August 2020. https://www.ucsusa.org/resources/why-does-co2-get-more-attention-other-gases; EarthSky Voices. "6 things to know about carbon dioxide." EARTH. 2 July 2019. Accessed 25 August 2020. https://earthsky.org/earth/6-things-to-know-carbon-dioxide-co2-greenhouse-gas

63. In 2014, the EPA gave TCEQ authority over the greenhouse gas permitting program, and facilities began reporting carbon dioxide emissions to STEERS under Title V permit requirements. Not all facilities are required to report carbon dioxide emissions, and, as a result, the carbon dioxide pollution reported in this report is only a subset of what is emitted by facilities, both legally and illegally, across Texas. For more information, see https://www.tceq.texas.gov/permitting/air/guidance/newsourcereview/ghg/ghg-permitting.html

64. See methodology.

65. "Natgasoline's Methanol Plant, Beaumont, Texas." *Chemicals Technology.* Accessed 3 September 2020. https://www.chemicals-technology.com/projects/natgasolines-methanol-plant-beaumont-texas/

66. "Natgasoline." Proman. Accessed 3 September 2020. https://www.proman.org/companies/natgasoline/

67. "Methanol Use In Gasoline." Methanol Institute. Accessed 3 September 2020. http://www.methanol.org/wp-content/uploads/2016/06/Blending-Handling-Bulletin-Final.pdf

68. "Natgasoline." Proman. Accessed 3 September 2020. https://www.proman.org/companies/natgasoline/

69. Natgasoline's Methanol Plant, Beaumont, Texas." *Chemicals Technology.* Accessed 3 September 2020. https://www.chemicals-technology.com/projects/natgasolines-methanol-plant-beaumont-texas/

70. The U.S. Environmental Protection Agency. "Detailed Facility Report." Accessed 11 September 2020. https://echo.epa.gov/detailed-facility-report?fid=110064577006

71. American Lung Association. "Volatile Organic Compounds." 12 February 2020. Accessed 23 June 2020. https://www.lung.org/clean-air/at-home/indoor-air-pollutants/volatile-organic-compounds

72. National Library of Medicine. "Volatile Organic Compounds (VOCs): Your Environment, Your Health." National Library of Medicine. 31 May 2017. Accessed 23 June 2020. https://toxtown.nlm.nih.gov/chemicals-and-contaminants/volatile-organic-compounds-vocs

73. Fraser, Catherine. "What is Ozone?" *One Breath Partnership.* 27 May 2020. https://onebreathhou.org/newsroom/2020/05/ozone-pollution-industrial-emissions-houston/

74. See methodology.

75. "Chemical Contaminants." Drinking Water Toolkit. Accessed 8 June 2020. https://www.midrinkingwater.org/chemical_contaminants

76. Environmental Pollution Centers. "What Is Chemical Pollution: Environmental Pollution Centers." 2017. Accessed 8 June 2020. https://www.environmentalpollutioncenters.org/chemical/

77. See methodology.

78. Strong, Kaye. "Huntsman Port Neches, Anderson 'among the industry's best.'" *BIC Magazine.* 1 October 2016. Accessed 3 September 2020. https://www.bicmagazine.com/departments/lift-transport/huntsman-port-neches-anderson-%E2%80%98among-the-industry%E2%80%99s-best%E2%80%99/

79. The U.S. Environmental Protection Agency. "Detailed Facility Report." Accessed 3 September 2020. https://echo.epa.gov/detailed-facility-report?fid=110000599567

80. "Our Operations - Point Comfort, Texas." Formosa Plastics. Accessed 3 September 2020. https://www.fpcusa.com/company/operations/point_comfort_tx.html

81. Allikas, Corey. "Top Suppliers of PVC (Polyvinyl Chloride)." *Thomas.* Accessed 3 September 2020. https://www.thomasnet.com/articles/top-suppliers/pvc-manufacturers-suppliers/

82. National Institutes of Health. "ToxTown: Polyvinyl Chloride (PVC)." Accessed 10 September 2020. https://toxtown.nlm.nih.gov/chemicals-and-contaminants/polyvinyl-chloride-pvc#:~:text=PVC%20contains%20chemicals%20that%20may,suspected%20to%20be%20endocrine%20disruptors.; The U.S. Environmental Protection Agency. "Endocrine Disruption." 22 February 2017. Accessed 10 September 2020. https://www.epa.gov/endocrine-disruption/what-endocrine-disruption

83. Moore-Eissenberg, Lily. "Nurdles All the Way Down." *Texas Monthly.* October 2019. Accessed 4 September 2020. https://www.texasmonthly.com/news/texans-gulf-coast-plastic-pollution/

84. Moore-Eissenberg, Lily. "No More Nurdles? Formosa's agreement to stop pumping plastics into Lavaca Bay is historic." *Texas Monthly.* 16 October 2019. Accessed 8 October 2020. https://www.texasmonthly.com/news/nurdles-formosas-agreement-stop-plastics-lavaca-bay-historic/

85. Mitchell, David. "Formosa won't build St. James plant for up to 7 months, will continue some work that avoids graves." *The Advocate.* 23 July 2020. Accessed 4 September 2020. https://www.theadvocate.com/baton_rouge/news/environment/article_e6c7abb6-cd3a-11ea-8f2e-a377364adab4.html

86. See methodology for the 2019 numbers and the 2018 Environment Texas report Major Malfunction for the 2011-2017 numbers.

87. Irfan, Umair. "How Trump's EPA is letting environmental criminals off the hook, in one chart." *Vox.* 27 February 2019. Accessed 30 September 2020. https://www.vox.com/2019/1/16/18183998/epa-andrew-wheeler-environmental-policy-enforcement

88. U.S. Environmental Protection Agency. "EPA ECHO State Air Dashboard." Accessed 30 September 2020. https://echo.epa.gov/trends/comparative-maps-dashboards/state-air-dashboard

89. Popovich, Nadja, Albeck-Ripka, Livia, and Kendra Pierre-Louis. "The Trump Administration Is Reversing 100 Environmental Rules. Here's the Full List." *The New York Times.* 15 July 2020. Accessed 2 October 2020. https://www.nytimes.com/interactive/2020/climate/trump-environment-rollbacks.html

90. Data obtained via a public information request to TCEQ on September 22, 2020.

91. Popovich, Nadja, Albeck-Ripka, Livia, and Kendra Pierre-Louis. "The Trump Administration Is Reversing 100 Environmental Rules. Here's the Full List." *The New York Times.* 15 July 2020. Accessed 2 October 2020. https://www.nytimes.com/interactive/2020/climate/trump-environment-rollbacks.html

92. ibid.

93. TCEQ. "Penalty Policy." September 1, 2011. Accessed August 25, 2020. https://www.tceq.texas.gov/assets/public/comm_exec/pubs/rg/rg253/penaltypolicy2011.pdf, pg 1.

94. "Mission Statement and Agency Philosophy." TCEQ. Accessed August 25, 2020. https://www.tceq.texas.gov/agency/mission.html.

95. Sadasivam, Naveena. "Report: Lax Enforcement, Loopholes Lead to Few Consequences for Polluters." *Texas Observer.* 27 April 2016. Accessed August 25, 2020. https://www.texasobserver.org/industrial-pollutants-tceq-report-loopholes/.

96. "Reportable incidents" includes scheduled maintenance, scheduled startup, scheduled shutdown, emissions events, and excess opacity violations. This report does not total emissions from excess opacity events, however, these events represent a small subset of reportable incidents. For example, excess opacity events represented just 143 of 4068 reported incidents in 2017, and 145 of 4554 reported incidents in 2018.

97. TCEQ. "Annual Enforcement Report Fiscal Year 2019." Pg. 46, "Figure 5-5: Incident Investigations." Accessed September 1, 2020. https://www.tceq.texas.gov/assets/public/compliance/enforcement/enf_reports/AER/FY19/enfrptfy19.pdf

98. "Environmental Quality." Texas Administrative Code. Accessed August 25, 2020. https://texreg.sos.state.tx.us/public/readtac$ext.TacPage?sl=R&app=9&p_dir=&p_rloc=&p_tloc=&p_ploc=&pg=1&p_tac=&ti=30&pt=1&ch=101&rl=222.

99. From transcript of trial proceedings, Day 8, February 20, 2014, in Environment Texas Citizen Lobby, Inc and Sierra Club v. Exxon Mobil Corporation et al.

100. Data obtained via a public information request to TCEQ on September 22, 2020.

101. See methodology.

102. Environmental Protection Agency, State Plans to Address Emissions During Startup, Shutdown and Malfunction: Final Action on Response to Petition for Rulemaking, Restatement of Policy, Findings of Inadequacy and Call for Revisions, H.R. Doc. (). Accessed December 7, 2018. https://www.epa.gov/sites/production/ files/2016-03/documents/20150522fs.pdf

103. Whitely Coleman, Lisa. "What's going to happen to the affirmative defense within SIPs?" *EHS Daily Advisor.* 17 July 2020. Accessed 13 September 2020. https://ehsdailyadvisor.blr.com/2020/07/whats-going-to-happen-to-the-affirmative-defense-within-sips/

104. HB 4087. Texas Legislature Online. Accessed November 7, 2019. https://capitol.texas.gov/BillLookup/History.aspx?LegSess=86R&Bill=HB4087.

105. Environmental Protection Agency. "Withdrawal of Finding of Substantial Inadequacy of Implementation Plan and of Call for Texas State Implementation Plan RevisionAffirmative Defense Provisions." Federal Register. April 4, 2019. Accessed November 7, 2019. https://www.federalregister.gov/documents/2019/04/29/2019-08480/withdrawal-of-finding-ofsubstantial-inadequacy-of-implementation-plan-and-of-call-for-texas-state.

106. Environmental Protection Agency, Texas Chapter 101 – General Air Quality Rules, H.R. Doc. (Jan. 10, 2011). Accessed December 7, 2018. https://www.epa.gov/sites/production/files/2017-07/documents/ch_101_sect_101.221-101.224.pdf.

107. TCEQ. "Annual Enforcement Report Fiscal Year 2019." Pg. 46, "Figure 5-5: Incident Investigations." Accessed September 1, 2020. https://www.tceq.texas.gov/assets/public/compliance/enforcement/enf_reports/AER/FY19/enfrptfy19.pdf

108. "Enforcement Definitions." Texas Commission on Environmental Quality. June 28, 2018. Accessed December 05, 2018. https://www.tceq.texas.gov/compliance/enforcement/definitions.html#noe.

109. In its FY19 Annual Enforcement Report, TCEQ writes that, "in many cases it (an NOV) is enough to encourage compliance, thereby halting possible damage to the environment." However, the data in this and similar reports over the last several years show that TCEQ's enforcement strategy is not in fact leading to higher rates of compliance. As an example, the second highest category of repeat offenders (at 15%) is petroleum refineries. https://www.tceq.texas.gov/assets/public/compliance/enforcement/enf_reports/AER/FY19/enfrptfy19.pdf

110. Shaw, Bryan W., Ph.D., P.E., Toby Baker, Zak Covar, and Richard A. Hyde, P.E. "Penalty Policy." Penalty Policy, April 1, 2014. April 1, 2014. Accessed December 5, 2018, https://www.tceq.texas.gov/assets/public/comm_exec/pubs/rg/rg253/penaltypolicy2014.pdf. Note that under the federal Clean Air Act, the maximum penalty is $93,750 per day per violation.

111. See methodology.

112. Sadasivam, Naveena. "Report: Lax Enforcement, Loopholes Lead to Few Consequences for Polluters." Texas Observer. April 27, 2016. Accessed November 27, 2019. https://www.texasobserver.org/industrial-pollutants-tceq-reportloopholes/.

113. Texas Public Interest Research Group. "Mandatory Fines Proven Clean Water Enforcement Tool." 10 May 2004. Accessed 13 September 2020. https://environmenttexas.org/news/txe/mandatory-fines-proven-clean-water-enforcement-tool

114. The Texas Commission on Environmental Quality (TCEQ). "Fifth Revision of the Commission's Penalty Policy." 14 September 2020. Accessed 22 September 2020. https://www.tceq.texas.gov/assets/public/comm_exec/agendas/worksess/backup/2020-09-24/PP_CH.pdf

115. Bubenik, Travis. "Harris County Continues To Pressure Industry Polluters." Houston Public Media. June 27, 2019. Accessed November 7, 2019. https://www.houstonpublicmedia.org/articles/news/energy-environment/2019/06/27/337828/harris-countycontinues-to-pressure-polluters/.

116. According to analysis from Environment Texas Research and Policy Center.

117. HB2826. Texas Legislature Online. Accessed November 7, 2019. https://capitol.texas.gov/BillLookup/History.aspx?LegSess=86R&Bill=HB2826.

118. EPA. "State Plans to Address Emissions during Startup, Shutdown and Malfunction: Supplemental Proposal to Address Affirmative Defense Provisions." Accessed November 28, 2019. https://www3.epa.gov/airquality/urbanair/sipstatus/docs/SSM_SIP_SNPR_Fact_Sheet.pdf.

119. "Basic Information about Air Quality SIPs." EPA. Accessed December 5, 2019. https://www.epa.gov/sips/basicinformation-air-quality-sips.

120. Mehta and Samuels. "The receding role of affirmative defense provisions in Clean Air Act regulations." American Bar Association. January 1, 2015. Accessed November 28, 2019. https://www.americanbar.org/groups/environment_energy_resources/publications/trends/2014-2015/january-february-2015/the_receding_role_affirmative_defense_provisions_clean_air_act_regulations/, paragraph 9.

121. UNITED STATES SECURITIES AND EXCHANGE COMMISSION. "FORM 10-Q." Accessed November 28, 2019. https://www.sec.gov/Archives/edgar/data/1013871/000101387117000013/nrg2017033110q.htm, Note 16, Paragraph 3.

122. Reilly, Sean. "EPA Weighed Rollback of Obama Startup-shutdown Rule." *E&E News PM*. September 25, 2018. Accessed December 05, 2018. https://www.irangi.org/fa/post/AIR-POLLUTION-EPA-weighed-rollback-of-Obama-startup-shutdown-rule.

123. Whitely Coleman, Lisa. "What's going to happen to the affirmative defense within SIPs?" *EHS Daily Advisor.* 17 July 2020. Accessed 13 September 2020. https://ehsdailyadvisor.blr.com/2020/07/whats-going-to-happen-to-the-affirmative-defense-within-sips/

124. Bubenik, Travis. "Harris County Continues To Pressure Industry Polluters." *Houston Public Media*. June 27, 2019. Accessed November 7, 2019. https://www.houstonpublicmedia.org/articles/news/energy-environment/2019/06/27/337828/harris-county-continues-to-pressure-polluters/.

125. Smith, Sarah, Blum, Jordan, Dempsey, Matt, and Michelle Iracheta. "Harris County sues Exxon Mobil after fire that injured 37, setting the stage for future crackdowns." *Houston Chronicle.* 1 August 2019. Accessed 18 Septembe r2020. https://www.houstonchronicle.com/news/houston-texas/houston/article/Harris-County-sues-Exxon-Mobil-after-fire-that-14273251.php#:~:text=e%2DEdition-,Harris%20County%20sues%20Exxon%20Mobil%20after%20fire%20that%20injured%2037,the%20stage%20for%20future%20crackdowns&text=The%20suit%20alleges%20that%20the,unauthorized%20emissions%20into%20the%20atmosphere.

126. Trevizo, Perla. "Harris County may turn to federal courts to crack down on Valero's air pollution violations." *Houston Chronicle*. June 24, 2019. Accessed November 28, 2019. https://www.houstonchronicle.com/news/houston-texas/houston/article/Harris-County-may-turn-to-federal-courts-to-crack-14039759.php.

127. Despart, Zach. "Harris County OKs new environmental prosecutors, names Pollution Control leader." *Houston Chronicle*. April 30, 2019. Accessed November 6, 2019. https://www.houstonchronicle.com/news/houston-texas/houston/article/Harris-County-OKs-new-environmental-prosecutors-13808633.php.

128. Despart, Zach. "Harris County boosts pollution efforts, staff in response to spring chemical fires." *Houston Chronicle*. Sep. 10, 2019. Accessed November 6, 2019. https://www.houstonchronicle.com/news/houston-texas/houston/article/Harris-County-to-boost-pollution-efforts-staff-14428247.php.

129. Despart, Zach. "Harris County OKs new environmental prosecutors, names Pollution Control leader." *Houston Chronicle*. April 30, 2019. Accessed November 6, 2019. https://www.houstonchronicle.com/news/houston-texas/houston/article/Harris-County-OKs-new-environmental-prosecutors-13808633.php.

130. Despart, Zach. "Harris County boosts pollution efforts, staff in response to spring chemical fires." *Houston Chronicle*. Sep. 10, 2019. Accessed November 6, 2019. https://www.houstonchronicle.com/news/houston-texas/houston/article/Harris-County-to-boost-pollution-efforts-staff-14428247.php.

131. Editorial Board, *Houston Chronicle*. "Houston shouldn't have so many bad air days [Editorial]", April 29, 2019. Accessed November 21, 2019. https://www.chron.com/opinion/editorials/article/Houston-shouldn-t-have-so-many-bad-air-days-13805092.php.

132. Number of 2019 state suits obtained directly from the State of Texas Attorney General's Office via public information act request.

133. Luck, Marissa. "Texas attorney general sues Valero over Port Arthur refinery pollution." *Houston Chronicle*. July 19, 2019. Accessed November 28, 2019. https://www.houstonchronicle.com/ business/energy/article/Texas-attorney-general-sues-Valero-overPort-14109689.php.

134. KHOU Staff. "Texas AG Paxton files lawsuit against ExxonMobil for violating Texas Clean Air Act." KHOU 11 (Houston, Texas). August 5, 2019. Accessed November 28, 2019. https://www.khou.com/article/news/local/texas/texas-ag-paxton-files-lawsuit-against-exxonmobil-for-violating-texas-clean-air-act/285-fbd7704c-cbae-42cd-9985-ba91ab9e1e0e.

135. Collier, Kiah. "Texas sues company behind Deer Park terminal fire." *Texas Tribune*. March 22, 2019. Accessed November 28, 2019. https://www.texastribune.org/2019/03/22/texas-sues-company-deer-park-terminal-fire/.

136. Number of 2017 and 2018 state suits obtained from previous reports by Environment Texas Research and Policy Center and the Environmental Integrity Project. See Environment Texas' 2018 report "Major Malfunction," and EIP and Environment Texas' 2017 report "Breakdowns in Enforcement."

137. See methodology.

138. Environment Texas. "Valero faces clean air lawsuit for violations at Port Arthur, Texas refinery." May 22, 2019. Accessed November 28, 2019. https://environmenttexas.org/news/txe/valero-faces-clean-air-lawsuit-violations-port-arthur-texas-refinery.

139. Corso, Jessica. "Texas AG files lawsuit against Valero." *San Antonio Business Journal*. July 23, 2019. Accessed November 8, 2019. https://www.bizjournals.com/sanantonio/news/2019/07/22/texas-ag-files-lawsuit-against-valero.html.

140. Trevizo and Luck. "Texas sues Exxon Mobil over environmental violations from Baytown fire." *Houston Chronicle*. August 6, 2019. Accessed November 28, 2019. https://www.houstonchronicle.com/news/houston-texas/houston/article/State-sues-ExxonMobile-over-environmental-14284024.php.

141. ibid.

142. Collier, Kiah. "Why has Texas suddenly decided to immediately sue industrial polluters?" April 5, 2019. *Texas Tribune*. Accessed November 7, 2019. https://www.texastribune.org/2019/04/05/texas-attorney-general-ken-paxton-quickly-sue-industrial-polluters/.

143. Bozlaker, A. et al. "Insights into PM10 sources in Houston, Texas: Role of petroleum refineries in enriching lanhanoid metals during episodic emission events." *Atmospheric Environment*. 2013. https://asu.pure.elsevier.com/en/publications/insights-into-pmsub10sub-sources-in-houston-texas-role-of-petrole

144. McCoy, B. et al.. "How big is big? How often is often? Characterizing Texas petroleum refining upset air emissions." *Atmospheric Environment*. July 2010. https://www.sciencedirect.com/science/article/abs/pii/S1352231010005686

145. "Exceeded the permitted emissions rate" is a specific phrase used in TCEQ enforcement orders to indicate an air emissions violation.