Environmental Justice for Delaware

Mitigating Toxic Pollution in New Castle County Communities

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Environmental Justice Health Alliance
DELAWARE CONCERNED RESIDENTS FOR ENVIRONMENTAL JUSTICE
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coming clean

Toxic Chemical Risks and Environmental Justice

Though there has been a significant improvement in our overall national environmental quality over the past several decades, many communities across the United States have not reaped the benefits. An extensive and expanding body of scientific evidence finds that people of color and those living in poverty are located more often in communities—termed environmental justice communities or overburdened communities—that are exposed to disproportionately higher levels of environmental pollution than Whites or people not living in poverty (Collins, Munoz, and JaJa 2016; Cushing et al. 2015; Bullard, Johnson, and Torres 2011; Mohai, Pellow, and Roberts 2009; Ash et al. 2009; Downey and Hawkins 2008; Hynes and Lopez 2007; Mohai and Saha 2006; Ringquist 2005; Bullard 2000). The Environmental Protection Agency (EPA) defines environmental justice as "the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income, with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies" (EPA n.d.a). People in these communities are exposed on a daily basis to high pollution levels from industrial sources, such as those releasing toxic pollution into air and water or disposing pollution onto the land; pollution from high volumes of cars, trucks, and rail freight; and other pollution sources including toxic waste sites.[1]

> ***People in these communities are exposed on a daily basis to high pollution levels from industrial sources.***

CHRONIC EXPOSURE AND RISK OF DISASTROUS CHEMICAL RELEASES

The high pollution levels that these populations face results in cumulative health impacts that are amplified by other negative socioeconomic and health factors, such as the lack of access to health care, healthy foods, and public transportation; poor housing conditions and infrastructures; and stress from poverty, unemployment, and crime, among other factors (Prochaska et al. 2014; O'Neill et al. 2003). These cumulative stressors underscore the need to address environmental justice for these communities, especially since the compounding factors can make it more challenging to identify adverse health effects from environmental pollution and thus discourage much-needed research on these effects.

In addition to being subject to health risks posed by exposure to toxic pollution day in and day out, people in these environmental justice communities often live near hazardous chemical

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At home, work, school, pray, and play, the health of community members is put at risk by chemicals and pollution released by industrial facilities.

Cover photo: Gretchen Goldman/UCS

facilities vulnerable to unplanned chemical releases. Compared with national averages, a significantly greater percentage of Blacks (African Americans), Latinos (Hispanics), and people living in poverty live near industrial facilities that store, process, or transport large quantities of toxic chemicals that present a risk of chronic exposure to toxic air pollutants and major chemical disasters (CEG 2016; EJHA 2014). Conversely, larger, more chemical-intensive facilities tend to be located in counties with larger Black populations and in counties with high levels of income inequality, and facilities in counties with larger Black populations are at greater risk of chemical accidents and spills (Elliott et al. 2004).

Releases of toxic chemicals from industrial sources into surrounding communities are frequent events. The EPA estimates that approximately 150 catastrophic incidents occur each year in industrial facilities regulated under its Risk Management Program (RMP). These facilities are the nation's most high-risk industrial facilities that produce, use, or store significant quantities of toxic, explosive, and flammable chemicals. Among other requirements, these facilities must prepare plans for responding to a worst-case incident such as a major fire or explosion in which toxic chemical pollution is released in to the surrounding community (EPA 2017a). The EPA notes that these incidents "pose a risk to neighboring communities and workers because they result in fatalities, injuries, significant property damage, evacuations, sheltering in place, or environmental damage" (EPA 2017b). Less severe incidents happen regularly—425 chemical incidents occurred in the little more than two years between an explosion in April 2013 at a West Texas fertilizer facility that killed 15 people and August 2015 (CPCD 2015), and many others likely went unreported. Less severe, "near miss" incidents are often precursors to more catastrophic events (EPA 2017c), and frequent facility malfunctions that result in the release of high levels of toxic chemicals may themselves directly impact the health of people living in nearby communities (EIP 2004). Communities closest to these hazardous facilities also have the least amount of time to escape these dangers (USCSB 2016).

PROTECTING RESIDENTS' HEALTH

Responses such as cleaner industrial production and other means of reducing environmental and health risks are politically challenging to implement, whether voluntarily or through regulation/enforcement and policy change. Alternatively, residents could relocate in the face of these risks. However, given the multiple societal constraints faced by low-income people, especially those who are people of color, relocation from the immediate vicinity of these hazardous industrial sources is often not a realistic option without substantial financial and political assistance. Historical failure to achieve substantial improvements in their situation is due to a host of interrelated factors including poverty, institutionalized racism and discrimination, lack of political power, poor health, hopelessness, fear, and skepticism regarding the potential for change. To effectively address the needs of these communities requires a deeper understanding of, and respect for, the issues facing them—not only regarding the intersection of race, gender, culture, poverty, and disproportionate impacts of pollution, but including a broader look at the societal systems that allowed these situations to develop.

Relocation from the immediate vicinity of these hazardous industrial sources is often not a realistic option without substantial financial and political assistance.

The purpose of this collaborative study between the Union of Concerned Scientists; the Environmental Justice Health Alliance for Chemical Policy Reform; Delaware Concerned Residents for Environmental Justice; Community Housing and Empowerment Connections Inc.; and Coming Clean, Inc. is to provide technical information to several northern New Castle County communities about potential cumulative health risks from residents' proximity to polluting industrial facilities, contaminated sites, and exposure to toxic air pollution. The aim of the study is to assist their advocacy efforts to address the connection between their environmental pollution exposures and public health. Our findings and recommended solutions to these environmental justice issues will also inform policymakers about the scope of disproportionate environmental health risks in these communities and describe a path forward to address them.

The impetus for this study was the many questions and stories of people in Delaware, with families, friends, and communities suffering and dying from brain cancer and other cancers. Many of these communities and families are also grappling with, and have histories of health challenges that are linked to or worsen by, exposure to pollution such as strokes, heart diseases, severe dementia and Alzheimer's disease, sudden infant death syndrome, and chronic childhood illnesses such as asthma, learning disabilities, and neurological diseases.

This report examines the health and safety risks for seven communities with a percentage of people of color and/or poverty levels greater than the Delaware average, located along an industrial corridor in the northern portion of Delaware's New Castle County—an area that is home to major polluting industrial sources as well as facilities that use large quantities of toxic, flammable, or explosive chemicals. It compares these communities to a predominantly White and affluent community located outside the industrial corridor and to Delaware residents overall.

Our analysis looked at potential cumulative impacts from the following health and safety issues for these communities:

- risk of cancer and potential for respiratory illnesses affecting residents in the seven communities that stem from toxic outdoor air pollution;
- proximity to facilities in EPA's Risk Management Program (RMP) that use large quantities of toxic, flammable, or explosive chemicals and pose a high risk of a major chemical release or catastrophic incident;
- proximity to major polluting industrial sources that report their pollution emissions to the EPA Toxics Release Inventory (TRI); and
- proximity to contaminated hazardous waste sites listed in EPA's Brownfield and Superfund Programs.

While we focused specifically on seven environmental justice communities—Belvedere, Cedar Heights, Dunleith, Marshallton, Newport, Oakmont, and Southbridge—other nearby environmentally-impacted communities such as Rosegate, Rose Hill, and Hamilton Park likely face similar risks.

> ***Many homes were built with cheap and substandard building materials, and—with stressors from pollution—declined drastically over time.***

Seven Environmental Justice Communities in Delaware: Past and Present

Numerous communities in Delaware, unseen by many, suffer economic and environmental disparities and lack political representation. In these environmental justice communities—or legacy communities—long-standing social and environmental injustices persist, and old injustices have given way to new ones. Historical injustices inform how residents of these communities understand present-day environmental injustices. The histories of Delaware's legacy/environmental justice communities encompass pre-Civil War struggles of resistance, participation in the historic 1954 Supreme Court case *Brown v. Board of Education*, segregated housing patterns, and months of federal occupation in Black communities after Dr. Martin Luther King Jr.'s assassination. These events and experiences undergird the communities' resilience and profoundly inform their approaches to such entrenched problems.

A HISTORY OF SUBSTANDARD HOUSING

Present-day concerns about legacy communities' proximity to large industrial facilities and their exposure to toxic pollution released on a daily basis or potentially released in acute, unplanned incidents cannot be separated from the communities' history of discrimination and substandard housing.

During the 1940s and early 1950s, Blacks in Wilmington began to be steered toward newly created housing, including the public housing community of Southbridge built just outside the South Wilmington city limits. These buildings, like others in the state, were built on top of a filled marsh in an area where flooding was a perennial issue, now made worse as the sea level rises due to climate change.

Other types of housing created along the Route 9 industrial corridor also targeted Blacks. These homes were also built on top of filled marshes, and none of these homes were built with basements to minimize flooding risks. Moreover, many of the homes were built with cheap and substandard building materials, and—with stressors from pollution—the condition of the homes declined drastically over time. These homes were in communities such as Hamilton Park, Dunleith, Oakmont, Rose Hill, and Rosegate. A thriving Black middle class once lived where the Chemours (formerly DuPont) headquarters is now located, with many of them relocating to the newly created communities of Belvedere and Cedar Heights located near the Town of Newport. The communities along the Route 9 corridor are all within one mile of the Delaware Memorial Bridge, which handles a large volume of truck and car traffic and extends over a DuPont chemical plant, and all are near the now closed nearby Cherry Lane landfill.

COMMUNITIES' EFFORTS TO PROTECT THE ENVIRONMENT AND HUMAN HEALTH

Communities are already taking action to protect the environment from industrial pollution and to address some of their own health problems arising from environmental contamination. A recent challenge prompting community action was an

effort by the newly elected Democratic governor and state legislators to amend the Coastal Zone Act to spur new economic development for Delaware. Delaware's Coastal Zone Act was signed in 1971 by Governor Russell Peterson, a former DuPont research scientist, responding to constituents' calls to block an international oil and gas refinery from locating on Delaware's coast. The governor felt he was protecting wildlife species, and the state regulatory agency considered that the bill protected communities from coastal storms. However, the law grandfathered in 14 existing industries and offered no protection for the health and well-being of those who lived, worked, and recreated along the coast.

Today, the state legislature is threatening to amend the law to allow for heavy industrial operations on the coast in an attempt to re-invigorate Delaware's manufacturing and energy economy. Concerned residents are calling for a facilitated, scientific, fact-based process that includes impacted workers' and community voices, input that is particularly crucial today in light of its absence in 1971.

Communities have also taken steps to counter the recurring argument that their *lifestyles*, rather than broader environmental factors, are responsible for their health problems. Some communities have organized and conducted their own health studies. The outcomes of these studies have resulted in the organization of community-directed cancer clinics, housing relocation, and community organizing to make better connections between (1) exposure to toxic chemicals and pollution, (2) threats of sea level rise and the impacts on flooding in coastal communities, and (3) heavy metals and diesel contamination related to trucks and ships. The Route 9 Industrial Task Force has served as a force along the Route 9 industrial corridor to hold industries and regulatory agencies accountable, especially in those gray areas where jurisdictional lines allow gaps in protection.

Gretchen Goldman/UCS

Kenneth Dryden of the Delaware Concerned Residents for Environmental Justice and a former Southbridge resident leads a tour of toxic facilities to teach scientists and community members about the dangers of local air pollution.

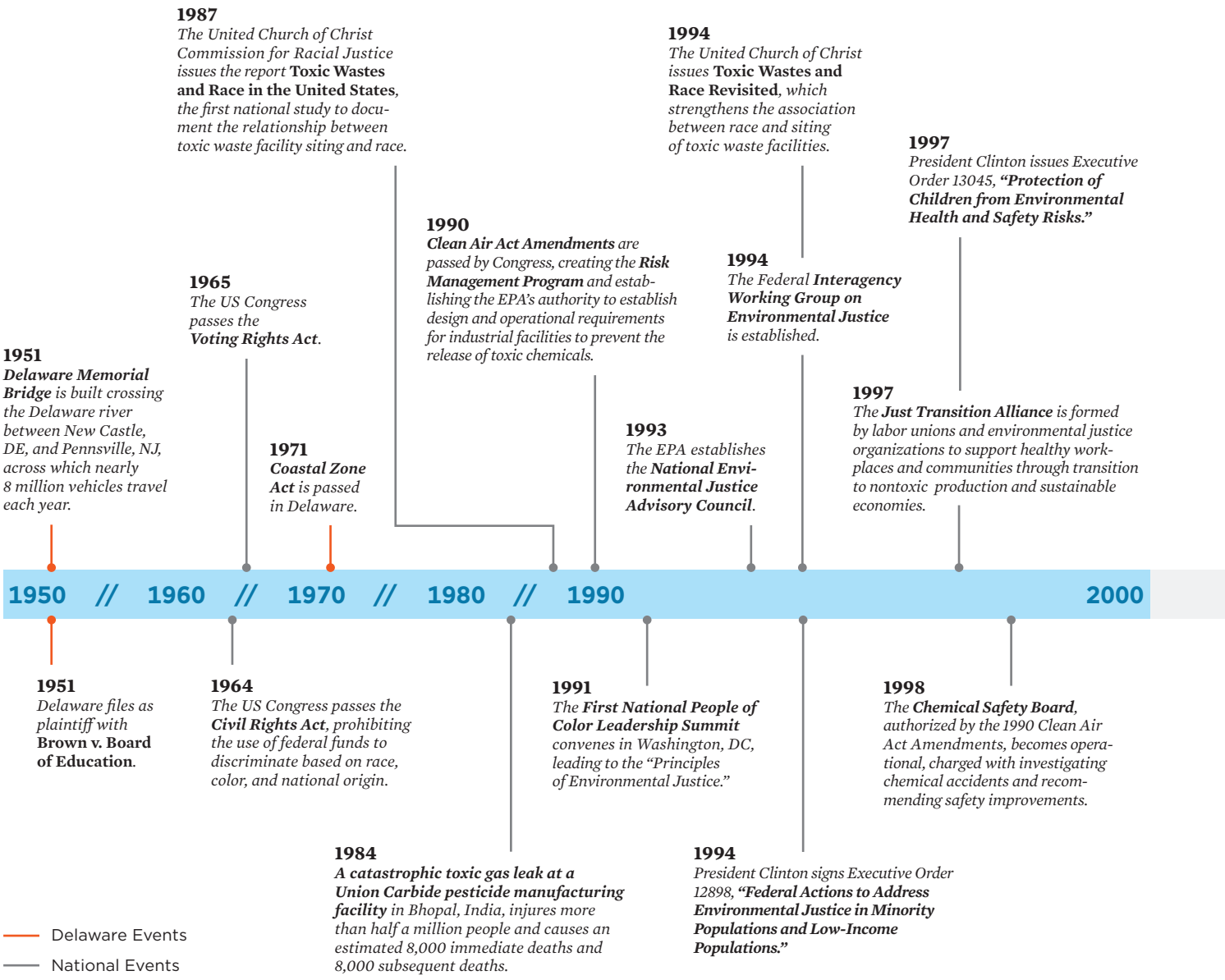
CALLING FOR EDUCATION, INFORMATION, AND EMPOWERMENT

Communities are pressing for more resources with which to take necessary, effective action. Residents want evacuation plans that they can practice. They want urban planners and housing developers to understand the importance of incorporating safe and healthy building materials. They want safe, healthy, and affordable communities and housing structures irrespective of race and income.

Organizations such as the Delaware Concerned Residents for Environmental Justice, Neighbors Rebuilding Our Neighborhoods, Community Housing and Empowerment Connection Inc., Minority Workforce Development Coalition, Delaware Sierra Club, Route 9 Industrial Taskforce, and the Delaware Department of Natural Resources and Environmental Control are providing tools and support to residents, advocates, and elected officials to provide communities the tools needed to help them navigate what environmental justice communities call the journey of "speaking for themselves" and taking their own destinies into their hands. For example, during the 1990s the Delaware Department of Natural Resources and Environmental Control facilitated a statewide community engagement process with community leaders that produced more than 30 recommendations to the state regulatory process for better engaging environmental justice communities throughout the state and better addressing their concerns, including cumulative impacts of health and safety risks.

Today, environmental justice communities in northern New Castle County are calling for a policy approach that addresses exposure to both indoor and outdoor air toxics. They support changes in development and land use policies, including permits and practices that address cumulative environmental and health impacts and the siting of healthcare facilities and schools. Overall, they are calling for proactive plans that will protect them from chronic exposure to toxic air pollution and disastrous chemical releases. In all of these efforts, communities want to be part of the process because they are closest to the problems and potential solutions and are committed to healthy lives along a healthy coast.

Selected Events in the History of Environmental Justice, 1951–2017



Note: This timeline includes selected environmental justice events that are most relevant to the information contained in this report. For a more complete history and timeline of the environmental justice movement, see Bullard et al. 2014 and EJHA 2014.

SOURCES: ADAPTED FROM BULLARD ET AL. 2014 AND EJHA 2014.

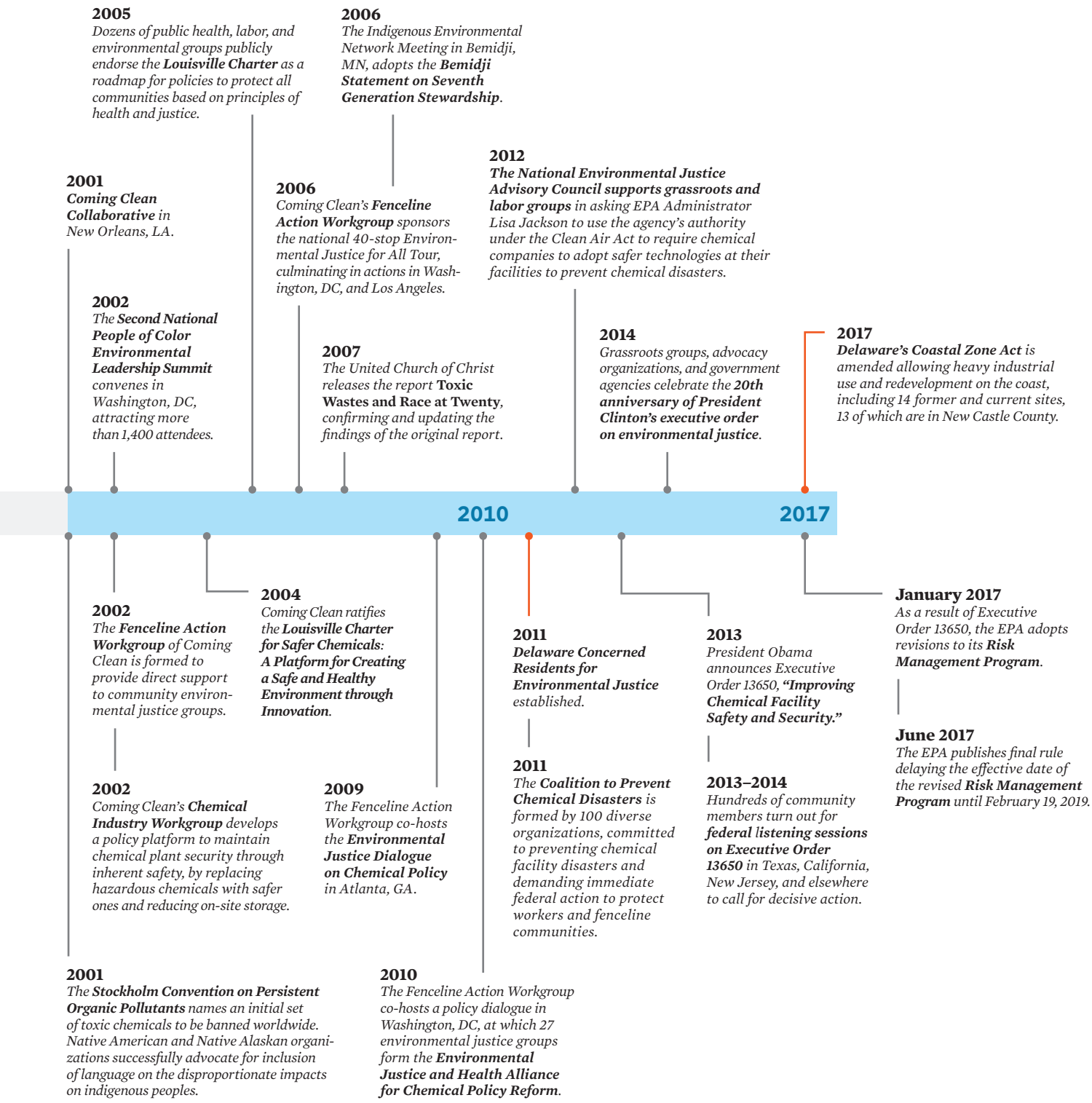
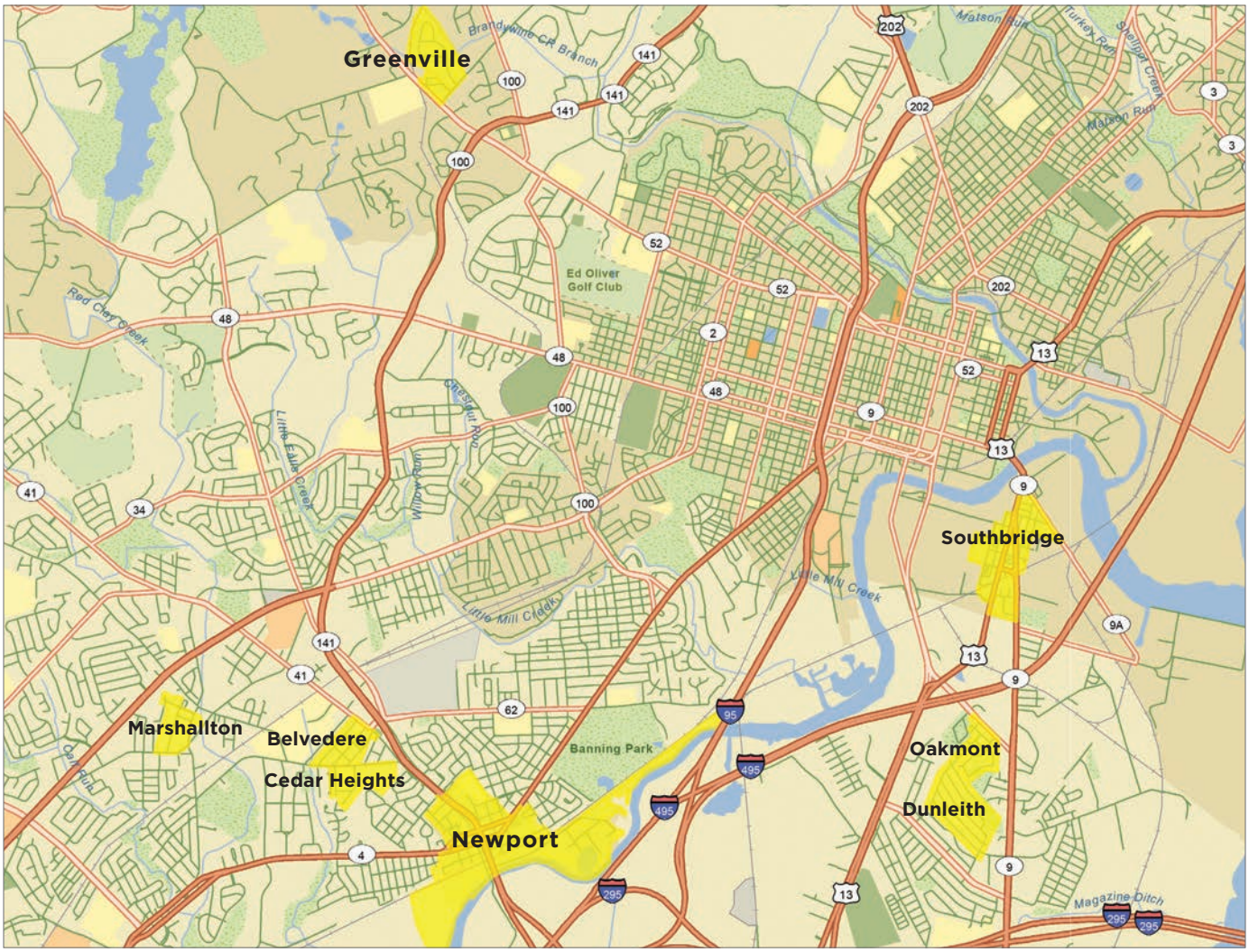

2005
Dozens of public health, labor, and environmental groups publicly endorse the Louisville Charter as a roadmap for policies to protect all communities based on principles of health and justice.
2006
The Indigenous Environmental Network Meeting in Bemidji, MN, adopts the Bemidji Statement on Seventh Generation Stewardship.
2001
Coming Clean Collaborative in New Orleans, LA.
2006
Coming Clean's Fenceline Action Workgroup sponsors the national 40-stop Environmental Justice for All Tour, culminating in actions in Washington, DC, and Los Angeles.
2012
The National Environmental Justice Advisory Council supports grassroots and labor groups in asking EPA Administrator Lisa Jackson to use the agency's authority under the Clean Air Act to require chemical companies to adopt safer technologies at their facilities to prevent chemical disasters.
2002
The Second National People of Color Environmental Leadership Summit convenes in Washington, DC, attracting more than 1,400 attendees.
2007
The United Church of Christ releases the report Toxic Wastes and Race at Twenty, confirming and updating the findings of the original report.
2014
Grassroots groups, advocacy organizations, and government agencies celebrate the 20th anniversary of President Clinton's executive order on environmental justice.
2017
Delaware's Coastal Zone Act is amended allowing heavy industrial use and redevelopment on the coast, including 14 former and current sites, 13 of which are in New Castle County.
2010
2017
2002
The Fenceline Action Workgroup of Coming Clean is formed to provide direct support to community environmental justice groups.
2004
Coming Clean ratifies the Louisville Charter for Safer Chemicals: A Platform for Creating a Safe and Healthy Environment through Innovation.
2011
Delaware Concerned Residents for Environmental Justice established.
2013
President Obama announces Executive Order 13650, "Improving Chemical Facility Safety and Security."
January 2017
As a result of Executive Order 13650, the EPA adopts revisions to its Risk Management Program.
2002
Coming Clean's Chemical Industry Workgroup develops a policy platform to maintain chemical plant security through inherent safety, by replacing hazardous chemicals with safer ones and reducing on-site storage.
2009
The Fenceline Action Workgroup co-hosts the Environmental Justice Dialogue on Chemical Policy in Atlanta, GA.
2011
The Coalition to Prevent Chemical Disasters is formed by 100 diverse organizations, committed to preventing chemical facility disasters and demanding immediate federal action to protect workers and fenceline communities.
2013–2014
Hundreds of community members turn out for federal listening sessions on Executive Order 13650 in Texas, California, New Jersey, and elsewhere to call for decisive action.
June 2017
The EPA publishes final rule delaying the effective date of the revised Risk Management Program until February 19, 2019.
2001
The Stockholm Convention on Persistent Organic Pollutants names an initial set of toxic chemicals to be banned worldwide. Native American and Native Alaskan organizations successfully advocate for inclusion of language on the disproportionate impacts on indigenous peoples.
2010
The Fenceline Action Workgroup co-hosts a policy dialogue in Washington, DC, at which 27 environmental justice groups form the Environmental Justice and Health Alliance for Chemical Policy Reform.

FIGURE 1. Seven Delaware Communities Were Analyzed for Their Proximity to Sources of Toxic Chemical Pollution and Health Risks and Compared with the Wealthier and Predominantly White Community of Greenville and Delaware Overall



DEMOGRAPHICS

Table 1 summarizes demographics for the eight Wilmington-area communities examined. Dunleith and Oakmont are almost entirely populated by people of color (96 percent), and the majority of people in Southbridge and Belvedere are people of color (67 percent and 55 percent, respectively). Whites represent a majority in Marshallton, Cedar Heights, and Newport. Greenville, the community selected for comparison, is almost entirely White (87 percent). Poverty rates in Oakmont, Dunleith, and Southbridge, which were the highest of the seven Wilmington-area communities, are about six times higher than in the predominantly White and wealthier Greenville community, and these three communities had approximately twice the poverty rate of the state of Delaware overall.

Methodology

DEMOGRAPHIC DATA AND LOCATION OF FACILITIES

The boundaries of the communities of Belvedere, Cedar Heights, Dunleith, Greenville, Marshallton, Newport, Oakmont, and Southbridge were determined using the Census Bureau's map layers (Census Bureau 2016) as were the boundaries for the census tracts and block groups. Block group data

were obtained from the US Census Bureau's American Community Survey 2009–2015 demographic data (Census Bureau n.d.a.). The block group that contained the largest portion of the community was used to represent the demographic data for the entire community.

The demographic data were obtained from the US Census Bureau's American Community Survey. The Census Bureau's advanced American FactFinder interface was used to create tables of these data at the level of census tract and block group (Census Bureau n.d.a). The American Community Survey database is updated annually and summarized into one-, three-, and five-year spans. Per the Census Bureau's recommendation regarding data selection, we selected the most recent five-year span, 2011–2015 (Census Bureau n.d.b).

Publicly available data from the EPA's Risk Management Program, as provided by the Right-to-Know Network, were used to determine which RMP facilities were located in Delaware.[2] Facilities were located based on their self-reported latitude and longitude. All other information about the facilities (e.g., number of accidents, number of injuries) was also obtained from the Right-to-Know Network's database and is reported by the facilities.

Toxic Release Inventory facilities, Superfund sites, and Brownfields locations were obtained from the EPA's Federal Reporting System geospatial database (EPA n.d.c). The Delaware facilities were extracted from the database based on the "state" field; the locations as provided by the EPA were used with no modifications.

Three of the environmental justice communities had approximately twice the poverty rate of the state of Delaware overall.

Public and private school data were downloaded from the National Center for Education Statistics, and the most recent dataset was used for each (2014–2015 school year for the public school data (NCES n.d.a) and 2011–2012 school year for the private school data (NCES n.d.b). All schools in the dataset were mapped using their self-reported addresses. Since schools within one mile of the communities in the study are likely to have children from those communities in attendance, we drew a one-mile buffer around the communities and identified all schools within the boundaries of those buffers.

TABLE 1. Demographic Differences Among Environmental Justice Communities Compared with Greenville and Delaware Overall

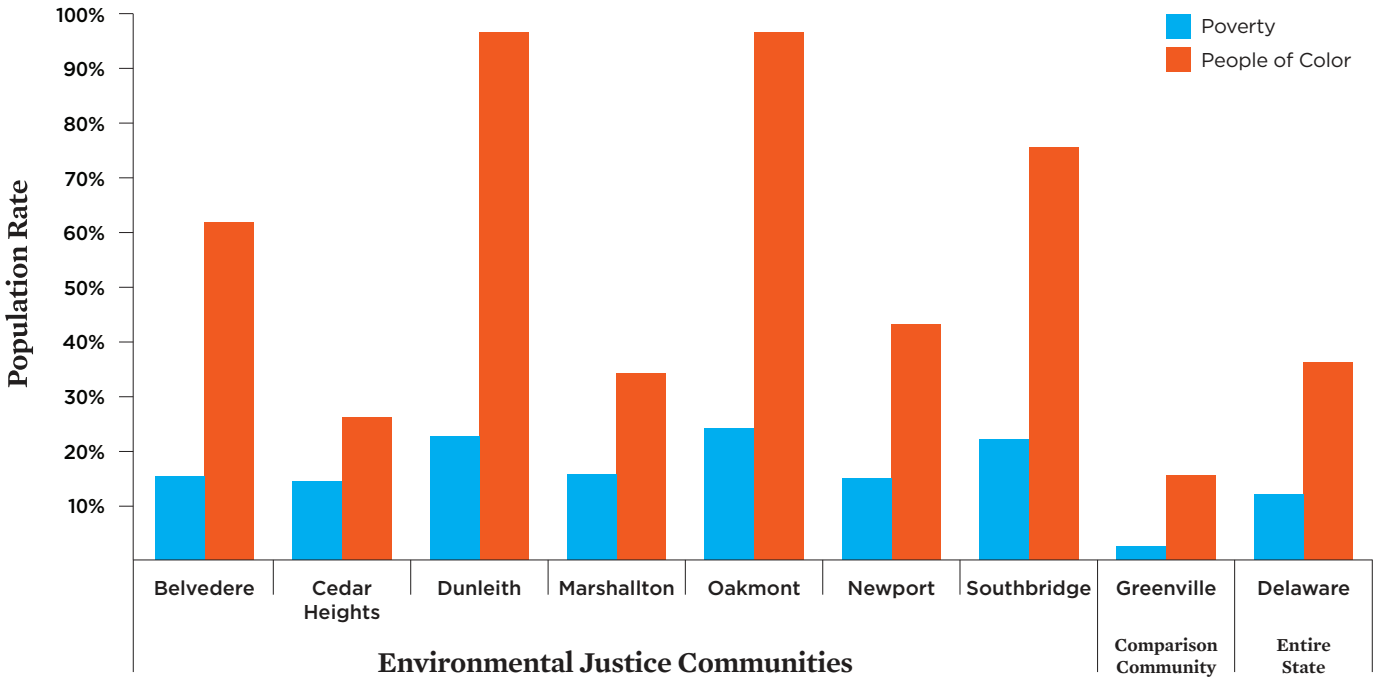
		Total Population*	Black	Hispanic	White	Other	Poverty
Environmental Justice Communities	Belvedere	2,074	22%	33%	38%	7%	15%
	Cedar Heights	1,508	23%	3%	74%	0%	14%
	Dunleith	1,717	81%	15%	3%	<1%	23%
	Marshallton	746	6%	24%	66%	4%	16%
	Newport	1,299	18%	23%	57%	2%	15%
	Oakmont	1,717	81%	15%	3%	<1%	24%
	Southbridge	1,270	65%	2%	21%	12%	22%
Comparison Community	Greenville	1,411	1%	1%	87%	11%	4%
Entire State	Delaware	926,454	21%	9%	64%	6%	12%

Using geographic boundaries and racial and poverty statistics from the Census Bureau, the demographics of the population in each of the eight communities and the state of Delaware were compared with each other.

*Community populations are based on census block group within geographic boundaries.

SOURCE: CENSUS BUREAU N.D.A.

FIGURE 2. Poverty and People of Color in Environmental Justice Communities Compared with Greenville and Delaware Overall



Residents of Dunleith, Oakmont, and Southbridge are predominantly people of color and experience poverty rates substantially higher than Delaware overall. People of color are in the majority in Belvedere, while poverty rates in Cedar Heights, Marshallton, Newport as well as Belvedere are above the overall Delaware rate.

SOURCE: CENSUS BUREAU N.D.A.

DATA ON HEALTH RISKS AND HAZARDS

We obtained cancer risk and respiratory hazard index data as well as data on specific pollutants from the 2015 National Air Toxics Assessment (NATA) using the census tract identification (EPA 2015). The 2015 NATA data are the most recent available. The census tract that contains the largest portion of a given community was used with no further calculations.

The NATA was developed primarily as a tool to inform both national and more localized efforts to collect air toxics information and characterize emissions (e.g., to prioritize pollutants or geographical areas of interest for more-refined data collection such as monitoring). The 2015 NATA dataset is based on 2011 data for 140 toxic air pollutants from a broad spectrum of sources including large industrial facilities such as refineries and power plants, and smaller sources, such as gas stations, oil and gas wells, and chrome-plating operations. Other pollution sources include cars, trucks, and off-road sources such as construction equipment and trains, as well as pollution formed by chemical reactions of these emissions

Other pollution sources include cars, trucks, and off-road sources such as construction equipment and trains.

in the atmosphere. The numbers calculated by the EPA are intended to reflect toxic air pollution–related health hazards that are, in principle, controllable through better management practices by emitters.

WHAT THE NUMBERS MEAN: HOW CANCER RISK AND RESPIRATORY HEALTH HAZARDS WERE CALCULATED

The EPA calculates the amount of toxic air pollution faced by people at the census-tract level and uses health benchmarks to estimate cancer risks and the potential for respiratory

Gretchen Goldman/UCS

Refineries, such as the Delaware City Refinery shown here, can emit toxic chemicals that can increase risks for cancer and respiratory disease.

health hazards from the combined effect of those exposures. Health risks and health hazards are distinct measures (see below), but both reflect the negative impacts on communities of exposure to toxic industrial facilities located near schools and homes.

The EPA generates data on the health risks from toxic air pollution using emission reports from industry and pollution dispersion models combined with data from a limited number of pollution-monitoring stations. **Cancer risks** are expressed as the projected number of air pollution–related cancers per million people based on a 70-year lifetime of exposure. The EPA estimates that the national average risk of cancer from a lifetime of exposure to toxic air pollution at 2011 levels is 40 cancers per million people (EPA n.d.d). For comparison, when the EPA sets national toxic air pollution standards for industrial sources, its cancer risk target for the general population is one in one million (EPA 1999).

A **respiratory hazard index**, in contrast, does not speak to a direct effect on human health but rather is a measure of the amount of the hazardous substance in the environment (which, of course, has important effects human health) compared with a health metric. A respiratory hazard index is the ratio of existing pollutant levels to levels established by the EPA as not likely to cause non-cancer respiratory illnesses based on a lifetime of exposure. If an existing pollutant level is the same as the non-concerning benchmark, the ratio is 1. An index value greater than 1 indicates the potential for adverse respiratory health impacts, with increasing concern as the value increases above 1.

Both health measures are based on a combination of monitored and modeled data and thus are estimates of average risks and hazards affecting a community rather than exact risks or hazards for a particular person. The lower the cancer risk and respiratory hazard index values, the lower the overall cancer risk and potential for respiratory illness. However, many other factors determine any given person's health; therefore, even relatively low values must be considered with caution.

ADDITIONAL RISKS NOT CAPTURED IN THIS ANALYSIS

NATA's estimates include only the chronic cancer risks for those air toxics that the EPA is currently able to identify and quantify. Therefore, these risk estimates represent only a subset of the total potential cancer risk associated with air toxics exposures. Importantly, these risk estimates do not consider additional exposure pathways such as ingestion of toxic chemicals from foods or water or the breathing toxic air pollution from indoor sources, nor do they take into account the potential for combined impacts from exposure to multiple chemicals. In addition, while the NATA health risk data are based on exposure to outdoor air pollution, urban outdoor air pollution can be an important contributor to indoor air quality, especially in highly ventilated homes or in homes near pollution sources (WHO n.d.).

Results: Health Risks of Exposure to Toxic Air Pollution

CANCER AND RESPIRATORY HEALTH RISKS

Residents of the seven northern New Castle County environmental justice communities face substantially higher cancer risks and respiratory hazard indices from toxic air pollution than people in the comparison community of Greenville or the overall Delaware population (Table 2). People in Marshallton, which has a substantial proportion of people of color and poverty rates above the Delaware average, face the highest cancer risk and respiratory health hazard of all the communities studied, with cancer risks and respiratory health hazards that are 33 and 71 percent higher, respectively, than Greenville and 28 and 55 percent higher than for Delaware overall. The communities of Dunleith, Oakmont, and Southbridge, whose residents are predominantly low-income people of color, have cancer risks that are 19 to 23 percent higher than for Greenville and 14 to 18 percent higher than for Delaware overall. Respiratory health hazards in these three communities are 32 to 43 percent higher than for Greenville and 20 to 30 percent higher than for Delaware overall.

> ***Residents of the seven New Castle County communities face substantially higher cancer risks than people in the comparison community.***

Wavebreakmedia/Shutterstock

Air pollution exposure can lead to respiratory disease and cancer. Children are particularly vulnerable.

Cancer risks in Newport, Belvedere, and Cedar Heights, which have a substantial proportion of people of color and poverty rates above the Delaware average, are 21, 15, and 12 percent higher than for Greenville, respectively, and are 16, 10, and 7 percent higher than for Delaware overall. Respiratory health hazards in Newport, Belvedere and Cedar Heights are 44, 30, and 24 percent higher than for Greenville, respectively, and 31, 18, and 13 percent higher than for Delaware overall.

TOXIC AIR POLLUTANTS WITH THE GREATEST POTENTIAL HEALTH IMPACTS

Using NATA data, we selected air pollutants with the largest contribution to health risks in the study communities (Table 3, p. 14). The five chemicals that contributed the most to cancer and respiratory hazard risks were generally consistent across all communities. Formaldehyde was by far the most significant chemical contributing to the cancer risk, accounting for

TABLE 2. Cancer Risks for Environmental Justice Communities Compared with Greenville and Delaware Overall

		Cancer Risk	Comparison to Greenville	Respiratory Hazard Index	Comparison to Greenville
Environmental Justice Communities	Marshallton	46.51	33%	2.39	71%
	Southbridge	42.95	23%	2.00	43%
	Newport	42.19	21%	2.02	44%
	Dunleith	41.45	19%	1.85	32%
	Oakmont	41.45	19%	1.85	32%
	Belvedere	40.08	15%	1.82	30%
	Cedar Heights	39.03	12%	1.74	24%
Comparison Community	Greenville	34.85	—	1.40	—
Entire State	Delaware	36.40	4%	1.54	10%

Note: Cancer risk is expressed as the incidences of cancer per million people. For the respiratory hazard index, an index value of 1 or less indicates a level of studied pollutants equal to a level the EPA has determined not to be a health concern, while a value greater than 1 indicates the potential for adverse respiratory health impacts, with increasing concern as the value increases.

SOURCE: EPA 2015.

approximately one-half of the overall cancer risk in most cases. Outdoor air pollution sources of formaldehyde include gasoline-fueled cars and trucks; industries that produce fertilizer, paper, plywood, and urea-formaldehyde resins; and the breakdown of organic outdoor air pollutants (EPA n.d.e; CDC n.d.). Although formaldehyde contributed the most to cancer risk in Marshallton, the community with the highest cancer risk in this study, cancer risks from benzene, a common ingredient in gasoline and emitted by motor vehicles, by oil refineries, and from burning coal and oil (EPA n.d.f), were also high—about 40 to 70 percent higher than in the other environmental justice communities and more than twice those of Greenville, the comparison community (see Table A-1 in the online appendix).

Acrolein, which is produced from burning gas and oil in cars and trucks, in power plants, and from the breakdown of outdoor air pollutants (EPA n.d.g.), contributed the majority of potential respiratory hazard in all of the study communities and typically accounted for approximately 70 percent or more of the total respiratory hazard. As was the case with the higher cancer risk from benzene in Marshallton, acrolein-related respiratory hazard were about 25 to 50 percent higher in Marshallton than in the other environmental justice communities and about twice those of Greenville, the comparison community (see Table A-1 in the online appendix).

DISTRIBUTION OF CHEMICAL POLLUTION SOURCES

As previously noted, the EPA's Risk Management Program encompasses the nation's most high-risk industrial facilities that produce, use, or store large quantities of toxic and flammable chemicals. People living near these facilities must contend with chronic emission of toxic chemicals, as well as the possibility of acute events that pose immediate threats to their health and safety. Industrial facilities that emit significant quantities of any of the 650 toxic chemicals included in the program must report their emissions to the EPA's Toxics Release Inventory on an annual basis. These are typically larger facilities involved in manufacturing, metal mining, electricity generation, chemical manufacturing, and hazardous waste treatment.

It is important to note that while the cancer and respiratory health risks discussed above are based solely on continuous exposure to toxic air pollution, people in the study communities also live close to other potential sources of toxic pollution, such as contaminated sites included in the EPA Superfund and Brownfields Programs. They are also at risk from acute events and chemical disasters at nearby industrial facilities (Table 5, p. 16). Under the Superfund Program, the EPA is responsible for cleaning up some of the nation's most contaminated sites, while its Brownfields Program provides funds to communities, states, tribes, and others to assess, and clean up properties

TABLE 3. Top Five Cancer-Causing and Respiratory Hazard Chemicals in Environmental Justice Communities and Greenville by Contribution to Total Risk

		Top Five Chemicals Associated with Cancer Risk	Total Cancer Risk	Top Five Chemicals Associated with Respiratory Hazard	Respiratory Hazard
Environmental Justice Communities	**Belvedere**	Formaldehyde	49%	Acrolein	72%
		Benzene	15%	Acetaldehyde	12%
		Acetaldehyde	10%	Formaldehyde	8%
		Carbon Tetrachloride	8%	Diesel Particulate Matter	5%
		1,3-Butadiene	6%	Chlorine	1%
	Cedar Heights	Formaldehyde	50%	Acrolein	71%
		Benzene	14%	Acetaldehyde	12%
		Acetaldehyde	11%	Formaldehyde	9%
		Carbon Tetrachloride	8%	Diesel Particulate Matter	4%
		1,3-Butadiene	6%	Chlorine	1%
	Dunleith	Formaldehyde	47%	Acrolein	69%
		Benzene	13%	Acetaldehyde	11%
		Acetaldehyde	10%	Formaldehyde	8%
		Carbon Tetrachloride	8%	Diesel Particulate Matter	6%
		1,3-Butadiene	5%	Chlorine	3%
	Marshallton	Formaldehyde	43%	Acrolein	77%
		Benzene	20%	Acetaldehyde	9%
		Acetaldehyde	9%	Formaldehyde	7%
		1,3-Butadiene	7%	Diesel Particulate Matter	5%
		Carbon Tetrachloride	7%	Naphthalene	1%
	Newport	Formaldehyde	48%	Acrolein	72%
		Benzene	15%	Acetaldehyde	11%
		Acetaldehyde	10%	Formaldehyde	8%
		Carbon Tetrachloride	8%	Diesel Particulate Matter	6%
		1,3-Butadiene	6%	Chlorine	2%
	Oakmont	Formaldehyde	47%	Acrolein	69%
		Benzene	13%	Acetaldehyde	11%
		Acetaldehyde	10%	Formaldehyde	8%
		Carbon Tetrachloride	8%	Diesel Particulate Matter	6%
		1,3-Butadiene	5%	Chlorine	3%

TABLE 3. Top Five Cancer-Causing and Respiratory Hazard Chemicals in Environmental Justice Communities and Greenville by Contribution to Total Risk (CONTINUED)

		Top Five Chemicals Associated with Cancer Risk	Total Cancer Risk	Top Five Chemicals Associated with Respiratory Hazard	Respiratory Hazard
Environmental Justice Communities	**Southbridge**	Formaldehyde	46%	Acrolein	70%
		Benzene	15%	Acetaldehyde	11%
		Acetaldehyde	10%	Formaldehyde	8%
		Carbon Tetrachloride	8%	Diesel Particulate Matter	6%
		1,3-Butadiene	6%	Chlorine	3%
Comparison Community	**Greenville**	Formaldehyde	52%	Acrolein	67%
		Benzene	13%	Acetaldehyde	14%
		Acetaldehyde	11%	Formaldehyde	10%
		Carbon Tetrachloride	9%	Diesel Particulate Matter	5%
		1,3-Butadiene	4%	Chlorine	1%

SOURCE: EPA 2015.

contaminated by a hazardous substance or pollutant for redevelopment or sustainable reuse. Of the estimated more than 450,000 brownfields in the United States, states and tribes have completed more than 117,000 clean-ups and made more than one million acres available for reuse (EPA 2017d), transforming formerly polluted areas into parks, arts centers, and retail development.

When assessing the health and safety risks to communities, it is important to account for the potential cumulative environmental risks posed across the range of hazardous sources. Dunleith and Oakmont have several brownfield sites and are in close proximity to TRI facilities. The Southbridge community has 48 brownfield sites—more than half of all brownfields in Delaware—within a one mile radius. Also within one mile are two RMP facilities, 13 TRI facilities, and four Superfund sites.

CHILDREN AT RISK

Children are especially vulnerable to the effects of toxic air pollution (CalEPA 2003). In addition to being exposed—on a daily basis—to toxic air pollution, children in these communities could also be exposed to toxic chemicals released from an unplanned incident at the hazardous RMP chemical facilities in or near their communities. For example, the John G. Leach School and Harry O. Eisenberg Elementary School near

TABLE 4. Cancer and Non-Cancer Health Effects of Major Toxic Air Pollutants Impacting Environmental Justice Communities

Air Pollutant	Cancer	Non-cancer
Formaldehyde	✔	Respiratory system, eyes
1,3-Butadiene	✔	Female reproductive system
Benzene	✔	Immune system
Acetaldehyde	✔	Respiratory system, eyes
Carbon Tetrachloride	✔	Liver, kidney
Acrolein		Respiratory system, eyes
Diesel Particulate Matter*	✔	Respiratory system, heart
Chlorine		Respiratory system, eyes

*The EPA does not include cancer risks from diesel particulate matter in the NATA.

SOURCES: CARB 2016; ATSDR 2014; EPA N.D.H.

Dunleith, with a total of 661 students, are located within one mile of an RMP high-risk chemical facility.

Table 6 provides the schools and numbers of school children within one mile of the study communities as well as the cancer risks and respiratory hazards for the children at those schools. Particularly concerning is that seven schools within one mile of Southbridge, with more than 2,200 students, are in locations with substantially higher cancer risks and respiratory hazards than schools in all other communities in this study. The almost 300 elementary-school-aged students in the Kuumba Academy Charter School near Southbridge are exposed to toxic air pollution that result in cancer risks that are almost three times higher, and respiratory hazards that are more than three times higher, than schools in Greenville, the comparison community. Six other schools within one mile of the Southbridge area have toxic air pollution levels that result in cancer risks that are 55 to 74 percent higher, and potential respiratory hazards that are 81 to 125 percent higher, than schools in Greenville.

It is important to note that the cancer risks are calculated based on a lifetime of exposure to outdoor air and the children would only be subject to those conditions for the years they are attending these schools. While students spend the majority of their time in classes indoors, outdoor air is used for ventilation in schools; therefore, students may also be exposed to these pollutants while in classes, although at different (most likely lower) levels. However, these data provide a basis for comparing the cancer risks and respiratory hazards to which these children are exposed while outdoors across the various schools.

Conclusion

People in the seven communities along the industrial corridor in the northern portion of Delaware's New Castle County face a substantial cumulative health risk from exposure to toxic air pollution and their proximity to polluting industrial facilities, hazardous chemical facilities, and contaminated waste sites. These health risks are substantially greater than those experienced by residents of a nearby wealthier and predominantly White community in Delaware and for Delaware as a whole.

Recommendations and Solutions

Significant and expedited improvements in regulatory and public policy are needed at the national, state, and municipal levels to address the health and well-being of at-risk communities in Delaware and elsewhere. In 2017, the EPA adopted revisions to its Risk Management Plan rule for chemical facilities (EPA 2017a) that have the potential to improve the safety of chemical facilities and the ability of communities to prepare for—and respond to—accidents at these dangerous facilities (Kothari 2016). However, implementation of the revised RMP

TABLE 5. Sources of Chemical Hazards and Pollution in Environmental Justice Communities Compared with Greenville and Delaware Overall

		RMP Facilities	TRI Facilities	Brownfield Sites	Superfund Sites
Environmental Justice Communities	Southbridge	2	13	48	4
	Dunleith	2	9	6	1
	Oakmont	2	6	4	1
	Cedar Heights	0	6	0	2
	Belvedere	0	4	0	0
	Marshallton	0	2	0	0
	Newport	0	5	0	2
Comparison Community	Greenville	0	0	0	0
Entire State	Delaware	45	157	83	47

Note: All facilities are located within 1 mile of communities.

SOURCE: EPA N.D.I.

TABLE 6. Respiratory Hazard and Cancer Risks at Schools in Environmental Justice Communities Compared with Greenville

		Schools	Total Number of Students*	Cancer Risk	Respiratory Hazard Index
Environmental Justice Communities	**Belvedere**	Conrad Schools of Science	1153	39.75	1.82
		Richey Elementary School	429	42.19	2.02
		Delcastle Technical High School	1519	40.08	1.82
	Cedar Heights	Conrad Schools of Science	1153	39.75	1.82
		Richey Elementary School	429	42.19	2.02
		Delcastle Technical High School	1519	40.08	1.82
	Dunleith	McCullough Middle School	754	41.86	1.97
		Eisenberg Elementary School Leach School	661	42.56	2.11
	Marshallton	Mote Elementary School	598	47.97	2.60
		St. John the Beloved School	594	42.42	2.06
		Delcastle Technical High School	1519	40.08	1.82
	Newport	Delcastle Technical High School	1519	40.08	1.82
		Delaware Military Academy Richardson Park Learning Center Richardson Park Elementary School Richey Elementary School	1778	42.19	2.02
		Conrad Schools of Science St. Matthew School	1380	39.75	1.82
	Oakmont	McCullough Middle School	754	41.86	1.97
	Southbridge	Elbert-Palmer Elementary School	246	42.95	2.00
		Stubbs (Frederick Douglass) Elementary School Howard High School of Technology	1224	64.06	3.23
		Bancroft Elementary School Elementary Workshop Montessori School St. Michael's School & Nursery	489	58.05	2.89
		Kuumba Academy Charter School	298	105.73	5.58
		Prestige Academy	287	46.45	2.17
		St. Peter Cathedral School	192	65.62	3.60
Comparison Community	**Greenville**	duPont Middle School duPont High School	1596	37.38	1.60

*Some schools are within one mile of more than one community; therefore, the columns from the community numbers cannot be added to get totals.

Notes: Cancer risk is expressed as the incidences of cancer per million people. For the respiratory hazard index, an index value greater than 1 indicates the potential for adverse respiratory health impacts, with increasing concern as the value increases.

SOURCES: NCES N.D.A; NCES N.D.B.; EPA 2015.

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Mobile air monitoring stations like this one from the Delaware Department of Natural Resources and Environmental Control can allow communities to obtain air pollution data from locations without permanent monitoring but where pollutant levels may be high.

rule was placed on hold, and as of June 2017 the Trump administration has proposed delaying the rule's implementation until February 19, 2019 (Rest 2017).

The first four recommendations that follow aim to improve the safety of high-risk industrial facilities, expand communities' access to information about the severe hazards posed by nearby facilities, restrict the siting of schools and other facilities near dangerous facilities, and improve communities' preparedness for responding to a toxic chemical release. These recommendations may have the additional benefit of reducing the daily load of toxic air pollution that affects these communities. The next two recommendations address both the severe risks from chemical facility accidents as well as the risks from daily chronic exposure to toxic air pollution. The last recommendation addresses the need to reduce motor vehicle air pollution in these communities.

1. **Require chemical facilities to use safer chemicals and technologies**. Companies that own chemical facilities should adopt inherently safer chemicals and technologies wherever feasible as the most effective way to prevent deaths and injuries from chemical disasters. The EPA should enforce the Risk Management Program requirement that high-risk chemical facilities assess the use of safer processes and, further, should require that these safer alternatives be adopted wherever feasible.
2. **Ensure that chemical facilities share information and their emergency response plans with nearby communities**. Chemical facilities should provide nearby local communities with essential information on hazards posed by their operations and their planned response in the event of an unplanned release of hazardous chemicals. Local residents, trained health care professionals, emergency responders, and health-care providers need this information to prepare for and effectively respond to a chemical disaster. Communities should be included in emergency response planning and implementation. Emergency response facilities and the measures devised under these plans should be ready for operation should a chemical release occur. The EPA as well as state and local agencies should ensure that communities have access through effective and purposeful outreach to information on hazards and emergency planning under its Risk Management Program and that they have information on facility hazards submitted to states under the Emergency Planning and Community Right-to-Know Act.
3. **Require large chemical facilities to continuously monitor and publicly report their fenceline-area emissions and health hazards**. "Near miss" incidents that result in unplanned releases of toxic chemicals are often precursors to more serious incidents at chemical

facilities and facility malfunctions, serious incidents that could result in the release of high levels of toxic chemicals that may directly impact the health of people living in nearby communities. People living in nearby communities should be able to easily access information (based on validated continuous monitoring) on the toxic emissions coming from industrial facilities, along with information about the chemicals' health hazards. The EPA or state or local pollution control agencies should expand current requirements for oil refineries to monitor benzene at their fence line by adding other toxic air pollutants such as toluene and xylene and requiring fenceline monitoring for other major industrial sources. This information can help communities in several ways: to advocate for vigorous enforcement of regulatory requirements by relevant authorities; push companies to use safer chemicals; alert and educate friends, family members, and community members; and encourage the media to report on polluting facilities in their areas.

People living in fenceline communities should be able to easily access the information on the toxic emissions coming from industrial facilities.

4. **Prevent the construction of new or expanded chemical facilities near homes and schools and, conversely, the siting of new homes and schools near dangerous chemical plants**. When new chemical facilities are sited or existing ones are expanded in close proximity to homes, schools, or playgrounds, this significantly increases the possibility that an incident will result in serious harm to children and adults. Similarly, new homes, schools, and playgrounds should not be sited near dangerous chemical plants. Municipal authorities should adopt and enforce local ordinances that require an assessment of the potential health and safety risks when siting homes, schools, and other public facilities. Requiring a buffer zone between these areas and polluting sources also reduces residents' daily exposure to toxic chemical pollution.
5. **Require that publicly accessible, comprehensive health-impact assessments and mitigation plans be conducted to evaluate the cumulative impact of hazardous chemical exposures on nearby communities**.

A focus on cumulative impacts is a cornerstone of environmental justice. Environmental and public health agencies in Delaware and at the federal level should assess the potential impact of unplanned chemical releases and the cumulative impacts of daily air-pollution exposures on the health of nearby communities and should incorporate such assessments into agency decisionmaking. Agencies and elected officials should provide the affected communities with the tools and resources they need to fully engage in the assessment process, and the EPA should review hazard assessments of these communities. Emissions permits, for example, should be strengthened where necessary to account for the cumulative impact of air-pollution emissions on nearby communities and provide the reductions in air pollution necessary to protect public health—in particular vulnerable populations, such as the elderly, children, and people with existing health conditions.

Delaware's Coastal Zone Act should be amended to include an environmental justice analysis. A science-based stakeholder process should be created before any changes to the legislation can be voted on. The stakeholder process should be a science-based, facilitated dialogue that provides for communities, workers, fisherfolk, and other coastal communities to have input into the entire process. The process should allow stakeholders to determine for themselves the impacts of cumulative risk, provide an environmental justice analysis, and determine a path toward safer processes and a healthier, greener port.

6. **Strengthen the enforcement of existing environmental and workplace health and safety regulations**. Environmental and workplace safety enforcement is historically underfunded and now under threat (CEG 2015). Congress and the administration should preserve the EPA's authority and should increase funding to the EPA and the states for improving the enforcement of environmental and workplace health and safety laws, so that problems in chemical facilities can be identified before they lead to disasters. Better oversight and enforcement will also help agencies and the public hold companies accountable if they fail to address identified hazards and emissions of toxic pollution.

A focus on cumulative impacts is a cornerstone of environmental justice.

Communities that face some of the greatest threats from chemical facility incidents, toxic air pollution, and contaminated sites need strong governmental policies, including strict permitting requirements and reliable inspection and enforcement of these requirements. If state and municipal governments are not providing adequate protection, it is essential that the EPA defend these communities' right to a safe environment. Locally, cities and counties must do a better job of enforcement in areas of "jurisdictional overlap." There must be an accountability mechanism in place for communities to enforce existing ordinances, especially those with a goal of protecting public health.

7. **Adopt and enforce strict motor vehicle emissions standards and limit heavy-duty truck traffic and idling in residential areas**. In 2014 the EPA adopted strict motor vehicle emission limits ("Tier 3" standards) to reduce hazardous air pollution from motor vehicles that phase in over the model year 2017–2025 timeframe (EPA 2014). These emissions standards complement the EPA's 2012 greenhouse gas limits and fuel economy standards (EPA 2012), and together these rules are expected to substantially reduce motor vehicle toxic air and climate pollution over the next decade. It is essential that the EPA effectively enforce these current standards and that future standards be adopted that further reduce this pollution. Further, heavy-duty truck traffic should be limited, and idling should be eliminated in residential areas in order to reduce community exposures to these harmful emissions.

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Regular monitoring of air quality near pollution sources is crucial to understanding community exposure to harmful pollutants.

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ENDNOTES

1 *For the EPA, overburdened communities are "minority, low-income, tribal, or indigenous populations or geographic locations in the United States that potentially experience disproportionate environmental harms and risks. This disproportionality can be as a result of greater vulnerability to environmental hazards, lack of opportunity for public participation, or other factors. Increased vulnerability may be attributable to an accumulation of negative or lack of positive environmental, health, economic, or social conditions within these populations or places. The term describes situations where multiple factors, including both environmental and socio-economic stressors, may act cumulatively to affect health and the environment and contribute to persistent environmental health disparities" (EPA n.d.b).*

2 *For more information, see* www.rtknet.org.

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Environmental Justice for Delaware

Mitigating Toxic Pollution in New Castle County Communities

> ***Environmental justice communities in Delaware face substantial cumulative health risks from exposure to toxic air pollution, much greater than those faced by wealthy White neighborhoods.***

This report studies the health risks for seven communities located along an industrial corridor in the northern portion of Delaware's New Castle County. These communities—Belvedere, Cedar Heights, Dunleith, Marshallton, Newport, Oakmont, and Southbridge—have higher percentages of people of color and/or higher poverty levels than the Delaware average and compared them to Greenville, a predominantly White and affluent community located outside the industrial corridor and to the population of Delaware overall.

We found that people in the seven communities face a substantial cumulative health risk from exposure to toxic air pollution and their proximity to polluting industrial facilities, hazardous chemical facilities, and contaminated waste sites. These health risks are substantially greater than those experienced by residents of a nearby wealthier and predominantly White community in Delaware and for Delaware as a whole.

Significant and expedited improvements in regulatory and public policy are needed at the national, state, and municipal levels to address these issues. Our recommendations aim to improve the safety of high-risk industrial facilities, expand communities' access to information about the severe hazards posed by nearby facilities, restrict the siting of schools and other facilities near dangerous facilities, improve communities' preparedness for responding to a toxic chemical release, and more.

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