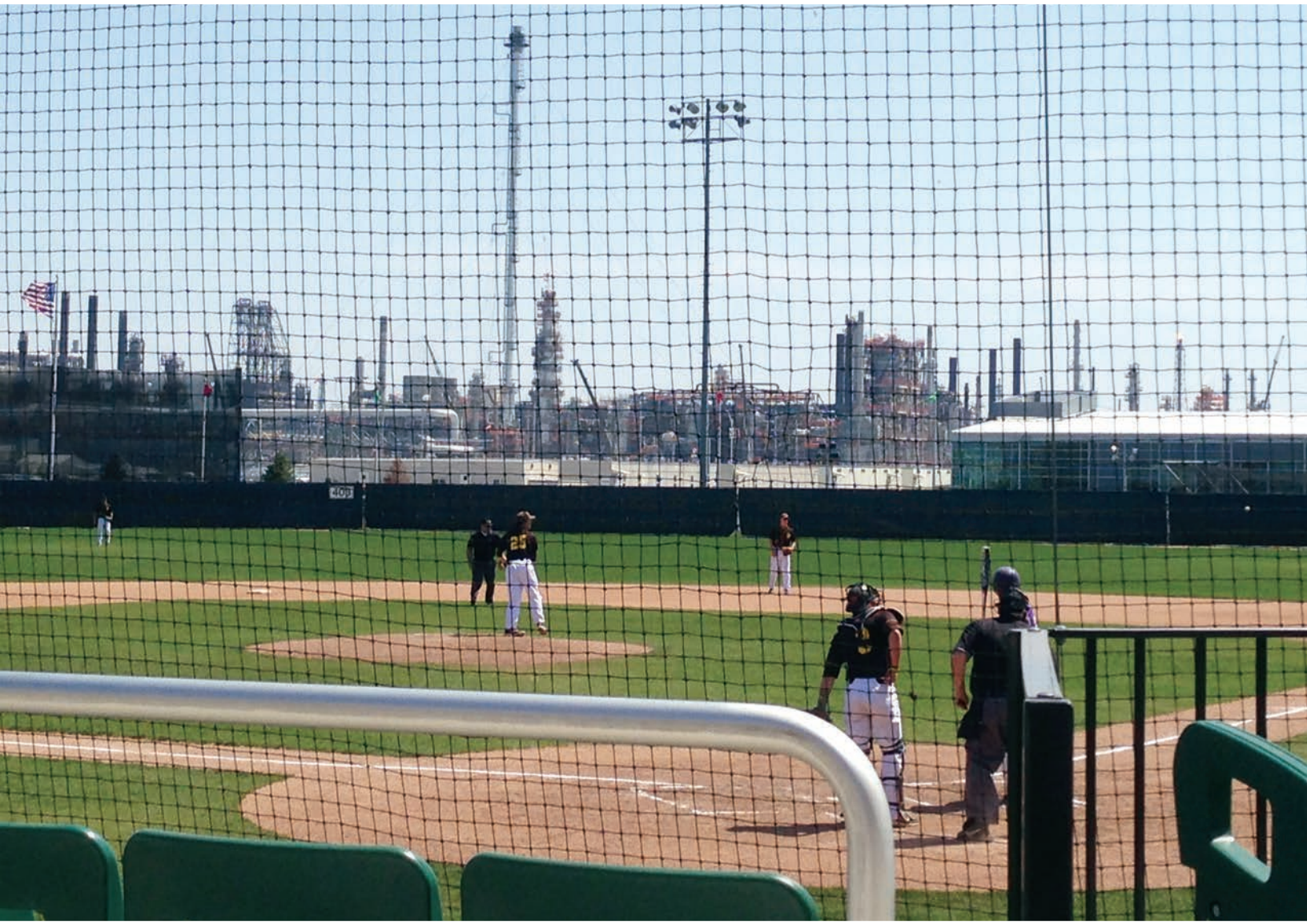
ENVIRONMENTAL JUSTICE AND HEALTH ALLIANCE FOR CHEMICAL POLICY REFORM

WHO'S IN DANGER?

Race, Poverty, and Chemical Disasters



A DEMOGRAPHIC ANALYSIS OF CHEMICAL DISASTER VULNERABILITY ZONES

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May 2014

ENVIRONMENTAL JUSTICE AND HEALTH ALLIANCE
FOR CHEMICAL POLICY REFORM

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The **Environmental Justice and Health Alliance for Chemical Policy Reform** networks grassroots organizations throughout the country to build collective intelligence and advocate for chemical policy reforms that protect environmental justice communities. Visit *www.comingcleaninc.org/programs/environmental-justice.*

Coming Clean unites community organizers, scientists, advocates, business leaders, communications specialists, and diverse issue experts in collaborative work to transform the chemical and fossil fuel industries so they are sources of health, economic sustainability, and justice rather than of pollution, disease, and planetary harm. Visit *www.comingcleaninc.org.*

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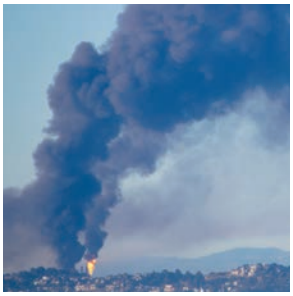

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GLOSSARY OF TERMS AND ABBREVIATIONS

ACC
American Chemistry Council, the largest trade association of basic chemical manufacturers.

FENCELINE ZONE
An area designated as one-tenth the distance of the vulnerability zone, in which those affected are least likely to be able to escape from a toxic or flammable chemical emergency, but not representing the outer bounds of potential harm. For example, if the vulnerability zone is a radius of 10 miles around the facility, then the fenceline zone is a radius of one mile around the facility. See Figure 3 on page 11 for a graphic representation of sample vulnerability zones and fenceline zones.

RMP
Risk Management Plan, a plan prepared under the chemical accident prevention provisions of the Clean Air Act, section 112(r), and submitted to the U.S. Environmental Protection Agency by a facility that produces, handles, processes, distributes, or stores more than a threshold amount of certain extremely hazardous substances (77 toxic or 63 flammable chemicals).

SOCMA
Society of Chemical Manufacturers and Affiliates, a trade association of batch, custom, and specialty chemical manufacturers.

VULNERABILITY ZONE
An estimate made by a facility under EPA's Risk Management Planning program of the maximum possible area where people could be harmed by a worst-case release of certain toxic or flammable chemicals. The vulnerability zone is a radius (or circle) distance around the facility, for example one mile, five miles, or 20 miles in all directions. See Figure 3 on page 11 for a graphic representation of sample vulnerability zones and fenceline zones.

WORST-CASE SCENARIO
An estimate made by a facility under EPA's Risk Management Planning program of the largest potential chemical release from a single vessel or process under conditions that result in the maximum possible affected area.

EXECUTIVE SUMMARY

More than 134 million Americans live in the danger zones around 3,433 facilities in several common industries that store or use highly hazardous chemicals. Millions more people work, play, shop, and worship in these areas. But *who* are the people that live daily with the ever-present danger of a chemical disaster?

This report is the first public accounting of the demographic characteristics of populations within the "vulnerability zones" of entire industry sectors that manufacture chemicals, treat water or wastewater, produce bleach, generate electric power, refine petroleum, produce pulp and paper, or otherwise have large numbers of people living in the path of a potential worst-case chemical release. It also shares the stories of some of these communities.

The new research presented in this report finds that residents of chemical facility vulnerability zones are disproportionately Black (African American) or Latino, have higher rates of poverty than the U.S. as a whole, and have lower housing values, incomes, and education levels than the national average. The disproportionate or unequal danger is sharply magnified in the "fenceline" areas nearest the facilities.

Almost thirty years ago, the Union Carbide chemical spill in Bhopal, India killed thousands of people and drew stark attention to the need for improved chemical facility safety. Unfortunately, no U.S. federal law, regulation, or guidance adopted before or since requires companies to fully assess and substantiate whether the toxic chemicals they use or store are truly necessary—or whether effective and safer alternatives might be used instead. Chemical facilities, many of which endanger thousands of people, continue using highly hazardous chemicals even when safer alternatives are available, effective, and affordable.

These policy failures have led to the needless persistence of catastrophic chemical hazards in communities. The U.S. experiences several serious toxic chemical releases every week, including the August, 2012 explosion at the Chevron refinery in Richmond, CA that sent 15,000 people to hospitals seeking treatment, and the April, 2013 fertilizer storage facility explosion in West, TX that killed 15 people and leveled an entire neighborhood. In a typical year, the U.S. Chemical Safety Board screens more than 250 high consequence chemical incidents involving death, injury, evacuation, or serious environmental or property damage—and these are only the very worst incidents.

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In Louisville, KY, industrial facilities border the Chickasaw Park, an historic gathering place for the local African American community that is also contaminated with dioxin from industry emissions.

KEY FINDINGS

Our analysis produced striking findings about the fenceline zones nearest to the facilities, where residents live closest to hazardous chemicals and with the least time to react in the event of a catastrophic release.

- Residents of the fenceline zones have average home values 33% below the national average.
- Average household incomes in the fenceline zones are 22% below the national average.
- The percentage of Blacks in the fenceline zones is 75% greater than for the U.S. as a whole, while the percentage of Latinos in the fenceline zones is 60% greater than for the U.S. as a whole.
- The percentage of adults in the fenceline zones with less than a high school degree is 46% *greater* than for the U.S. as a whole, and the percentage of adults in the fenceline zones with a college or other post-secondary degree is 27% *lower* than for the U.S. as a whole.
- The poverty rate in the fenceline zones is 50% higher than for the U.S. as a whole.

Separate analysis of different industry sectors generally confirms these findings with some regional and other variations.

Fortunately, many existing options can dramatically reduce these dangers and protect workers and communities. For example, a wastewater plant that switches from chlorine gas to ultraviolet light disinfection removes the danger of a chlorine gas release. A power plant that replaces highly toxic anhydrous ammonia gas with safer aqueous ammonia dramatically reduces the size of its vulnerability zone. But because federal laws and rules don't require companies to research safer alternatives or convert even when it's easily affordable, existing solutions are not in use by thousands of facilities.

Simple changes could protect millions of Americans, reduce costs and liabilities for companies, and modernize chemical facilities and regulations.

TIME FOR ACTION

Action to prevent a major chemical disaster is needed now—workers, communities, businesses, and governments face severe potential costs to life, health, and finances from chemical hazards that are often unnecessary. Federal policies have missed obvious opportunities to improve safety and security by removing avoidable hazards.

This report recommends several policy solutions that can remove millions of Americans from potential harm in and around hazardous chemical facilities. Some solutions can—and should—be implemented immediately. Others may require more time, but should also be started now and aggressively pursued.

1. Make information on chemical hazards and alternatives widely available, and ensure that workers, communities, and government at all levels are fully informed and actively engaged in prevention planning.
2. Require companies that use or store hazardous chemicals to assess and document whether safer chemicals or processes could be used that would remove hazards and prevent disasters.
3. Develop accessible national data on alternatives based on companies' assessments and lessons learned by facilities that have successfully removed chemical hazards.
4. Require companies to convert to safer alternatives when feasible, and justify in detail any decisions not to remove major chemical hazards when alternatives are available, effective, and affordable.
5. End government policies that subsidize danger, and ensure that existing patchwork chemical safety and security requirements are complete, comprehensive, up to date, and mutually reinforcing.

For almost 30 years since the Bhopal disaster, chemical facilities, Congress, and a series of Presidential Administrations have neglected the potential for toxic disaster that millions of Americans—who are disproportionately Black, Latino, and low income—live with every day. While some companies have adopted safer alternatives, thousands of similar facilities have not.

Enough is enough. It's time for the federal government, state and local governments, and the industries themselves to implement the most effective strategies that reduce and eliminate avoidable chemical hazards whenever possible, and adopt a comprehensive set of policies to protect workers and communities.

Waiting for a catastrophe is not acceptable. Communities that already bear the brunt of industrial pollution will also bear the greatest harm from a chemical disaster—making chemical safety and security a central environmental justice issue of our time.

CHAPTER ONE

INTRODUCTION

More than 134 million Americans, and their homes, schools, businesses, parks, and places of worship, live in harm's way of a toxic chemical release from several basic industries, according to this new analysis of 3,433 facilities that use or store extremely hazardous chemicals. Neighbors of facilities in these industries are disproportionately Black (African American) or Latino,[1] have higher rates of poverty than for the U.S. as a whole, and have lower housing values, incomes, and education levels than the national average.

This report is the first to assess the demographic characteristics of populations within the "vulnerability zones" of entire industry sectors that manufacture chemicals, treat water or wastewater, produce bleach, generate electric power, refine petroleum, produce pulp and paper, or otherwise have 100,000 or more people living in the path of a potential worst-case chemical release.[2] These zones—which are delineated and reported by the companies themselves—are the areas around facilities, sometimes extending for many miles, in which people can be seriously

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Background on Environmental Justice and Chemical Safety[a]

People and organizations who live and work in the shadow of chemical and fossil fuels facilities have been concerned about their toxic outputs since long before the term "environmental racism" was coined. But once data began to be collected proving the connection between where these facilities were located and the demographics of the surrounding communities (including the 1987 report *Toxic Wastes and Race in the United States*) groups concerned about these environmental health hazards began creating a more coordinated, grassroots movement to prevent harm to disenfranchised areas. The First National People of Color Leadership Summit, held in 1991, helped advance this process and expand the emerging movement into issues beyond the location of hazardous facilities.

Then in 1994, with little movement in Congress toward reforms that would protect disproportionately impacted communities, President Bill Clinton responded to the outcry for action and issued Executive Order 12898 to address Environmental Justice in Minority and Low-Income Populations. Under this Order, government agencies are required to consider and assess potential disproportionate impacts of activities on low-income and minority communities before the activity takes place. Community environmental justice and advocacy groups were able to use the Executive

a This brief summary 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 EJ movement, we recommend Robert Bullard, Ph.D, et al, *Environmental Justice Milestones and Accomplishments: 1964–2014* (Barbara Jordan-Mickey Leland School of Public Affairs, Texas Southern University, February 2014), available at *http://www.tsu.edu/academics/colleges__schools/publicaffairs/files/pdf/EJMILESTONES2014.pdf.*

hurt or killed by the sudden release of toxic or flammable chemicals.

Our analysis uses data reported to the U.S. Environmental Protection Agency (EPA) in Risk Management Plans (RMPs) by facilities that produce, handle, process, distribute, or store certain extremely hazardous substances. The plans include companies' own assessments of a potential worst-case release of specific toxic gases or flammable chemicals. These RMP assessments identify vulnerability zones that are intended to inform people in nearby homes, schools, and businesses that they are within range of a potentially deadly chemical release and to encourage preventive action by industry. Although each facility uses only one chemical to prepare a worst-case release scenario, many facilities store or use several other hazardous chemicals as well.

The vulnerability zones examined in this report vary widely in scope, ranging from a radius of 0.01 to 25 miles. But their potential magnitude can be understood in view of one of the world's worst industrial disasters—the Union Carbide Company's pesticide factory tragedy in Bhopal, India. Thousands of people died near the Bhopal factory in December 1984 and many thousands more were permanently injured by toxic gases that leaked at night into the surrounding community. Though decades have since passed, comparable hazards remain across America virtually unchecked, as people live and work next to hazardous chemical facilities with minimal government oversight and little community awareness. In many cases, local police, firefighters, and government officials are not aware of the specific chemical hazards in their community and the potential for disaster—or the safer options that can help make communities more secure.

While Bhopal-scale chemical catastrophes are thankfully rare, chemical fires and spills are remarkably common. In a typical year, the U.S. Chemical Safety Board screens more than 250 high consequence chemical incidents involving death, injury, evacuation, or serious environmental or property damage.[3] Chemical incidents in recent years have killed workers, first responders, and nearby residents, and destroyed homes, businesses, and schools. On April 17, 2013, an explosion in West, TX leveled an entire neighborhood. On August 6, 2012, a fire and explosion at the Chevron refinery in Richmond, CA sent 15,000 people to hospitals seeking treatment.[4] Other chemical release incidents in recent years include Big Spring TX; Paulsboro, NJ; Danvers, MA; Rosedale, MD; Delaware City, DE.; Mossville, LA; and Charleston, WV; among others. The United States has fortunately avoided in recent years a chemical disaster of the scale that occurred in Texas City in 1947, when a ship laden with ammonium nitrate exploded killing at least 581 people.

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Flaring oil refineries in Port Arthur, TX are an all-too-common sight for local residents.

Order as a tool to expose the ongoing human rights violations of people of color and low-income people living in environments contaminated with toxic chemicals.

However, because the Executive Order carried no legal mandates and because there has since been no meaningful federal chemical policy reform (and few significant state reforms), the toxic contamination and disproportionate impacts have continued. Community leaders and other environmental health advocates began to conceptualize a more comprehensive reform solution to protect fenceline communities, workers, and people exposed to chemicals from industrial facilities, fossil fuel operations, and products purchased and used each day. In 2004, members of a nationwide collaborative environmental health and justice network, known as Coming Clean, put these concepts to paper in a document called the Louisville Charter for Safer Chemicals. The Charter was named at a meeting held in Louisville, Kentucky, at which the Charter was finalized.

CONTINUED ON NEXT PAGE

CHEMICAL FACILITIES AND ENVIRONMENTAL JUSTICE

In 1987, a landmark national study, *Toxic Wastes and Race in the United States*, helped document a national pattern that many people knew anecdotally from daily life: industrial and environmental hazards are concentrated in poorer areas and areas with more people of color. *Toxic Wastes and Race* helped catalyze a national movement—known as the environmental justice movement—by making visible the adverse environmental and health impacts to workers and vulnerable communities living near the fencelines of chemical facilities. This movement asserts that equal protection and a healthy environment are basic human rights, and promotes precaution and prevention by design as a primary strategy to achieve health and justice for all.

Subsequent research has confirmed the core findings from 1987. Two decades later the report *Toxic Wastes and Race at Twenty 1987–2007* replicated the 1987 study using newer data and analytical methods, and found that people of color and poor people are even more heavily concentrated around hazardous waste facilities than the 1987 and other earlier studies found.[5] In addition, dozens of other quantitative studies have documented inequitable distribution of environmental hazards, such as chemical plants, refineries, incinerators, power plants, waste facilities, and other polluting industries.[6] These studies have consistently found people of color and low-income communities are disproportionately affected; they endure an unfair share of adverse impacts to air and water quality, human health, property values and the local economy.

Now, this report—*Who's in Danger? Race, Poverty and Chemical Disasters*—presents new evidence that the dangers associated with large quantities of toxic and flammable industrial chemicals are unequally distributed. This new research presents troubling findings about housing values, household incomes, race and ethnicity, education levels, and poverty rates of people who live within range of chemical fires and spills from 3,433 industrial facilities, and especially of people who live closest to the facilities. (See Appendix C for a listing of the facilities and their vulnerability zones.)

CURRENT OPPORTUNITIES

Over the years, many initiatives have sought to address the avoidable chemical hazards that exist unchecked in many communities. In 1994, the same year that President Clinton signed his Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations, scores of public interest organizations urged the EPA to make the systematic search for safer solutions part of risk management planning rules. Unfortunately, the agency took public comment but did not act. Every session of Congress since 1999 has considered

The name honors the struggles of the largely African American "Rubbertown" community in West Louisville, where industrial facilities released 11 millions of pounds per year of toxic air emissions and where numerous chemical disasters have taken place. Seventy-four diverse organizations endorsed the Charter as a common platform for chemical safety policies based on health and justice.[b] Hundreds of groups and networks have used the Louisville Charter as a measuring stick against which local, state and federal policies can be compared to the health and safety needs of all communities.

Communities from each of the ten Environmental Protection Agency (EPA) Regions led discussions about the Charter among hundreds of people and dozens of organizations over the next two years, as a way to share and harmonize local and national priorities to lift all communities out of environmental injustice. In 2006, in an effort to raise the profile of the need for comprehensive chemical policy reforms, groups carried out a national event called "EJ For ALL," a three-bus, 40-stop tour of communities disproportionately impacted by toxic pollution and hazards.[c] The Tour placed the environmental exploitation of low-income people and people of color by polluting industries before the public and on the notice of Federal agencies and EPA Regional Offices.

The northeastern and southern legs of the Tour converged in Washington, DC, while the western leg concluded in Los Angeles. While traveling together and visiting each other, far-flung groups shared similar stories of sickness and chronic conditions caused by toxic exposures in their communities. Many who traveled and gathered were stricken with various forms of cancer and heart disease, asthma, learning disabilities, childhood leukemia, and neurological illnesses. They also represented the many others, young

b "Endorsers of the Louisville Charter for Safer Chemicals," accessed April 20, 2014, *http://www.louisvillecharter.org/endorsements.shtml.*

c A record of the Tour, including photos, video, and profiles, can be found at *http://www.ej4all.org.*

chemical safety and security legislation that would give structure and priority to *preventing* chemical incidents. Yet most workers and residents endangered by the most hazardous chemical facilities are still awaiting solutions beyond more security guards and fences.

In 2002, Homeland Security and the EPA prepared policy options that included reducing chemical inventories, substituting materials, or otherwise modifying processes to avoid chemical hazards, but the Bush White House blocked the proposal.[7] Starting in 2006, then-Senator Obama cosponsored legislation and spoke of using safer technology to make communities safer and chemical plants less attractive targets for terrorists.[8] In 2009, with the support of the Obama administration, the House of Representatives passed a comprehensive chemical security bill to make removing unnecessary chemical targets a core tenet of chemical security.[9] Unfortunately, the bill stalled in the Senate. Federal agencies including the Government Accountability Office and Chemical Safety Board have called out opportunities to incorporate prevention through design into federal chemical regulations.[10,11]

In March 2012, the National Environmental Justice Advisory Council (NEJAC) recommended that the EPA use its existing authority under the Clean Air Act to reduce or eliminate catastrophic chemical hazards wherever feasible. On August 1, 2013, in response to the devastating fertilizer plant explosion at West, TX, as well as to years of organizing, President Obama signed Executive Order 13650, Improving Chemical Facility Safety and Security. This Executive Order sets forth a process with deadlines for improving and modernizing chemical safety and security regulations. After months of public input, the federal agencies charged with carrying out the Executive Order are now considering various measures to improve chemical safety and security, including new prevention requirements


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Members of the Environmental Justice and Health Alliance at the February 2014 EPA National Environmental Justice Advisory Council meeting in Denver, CO.

MOMENTUM FOR REFORM

has continued to grow among grassroots community groups and policy advocacy networks all over the U.S., who have spoken out as constituents to their own legislators and collectively to the Administration—the White House, EPA and other agencies—for meaningful action to reduce chemical hazards and exposures.

and old, who had already died from toxic conditions at home and could not join them.

The Tour helped galvanize interest not only in revising federal laws to reduce chemical hazards that could result in a toxic release or explosion, but even more so in reforming the Toxic Substances Control Act (TSCA), a law enacted in 1976 that was supposed to protect people from everyday toxic chemical exposures. However, since 1976 only a handful of chemicals have been fully examined for health and safety impacts under TSCA, and only five have ever been restricted. Federal bills to revise TSCA have variously included elements of meaningful reform and reduction of hazards from toxic chemicals, but also proposals advocated by the chemical industry to weaken TSCA even further.[d]

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d Bills have included the Kid-Safe Chemicals Act (2008), the Safe Chemicals Act (2010–2013), the Chemical Safety Improvement Act (2013), and the Chemicals in Commerce Act (2014).

for safer chemicals and processes that could be implemented using existing authorities.

SCOPE OF ANALYSIS

The Clean Air Act Amendments of 1990 require industrial facilities that make, distribute, or use large amounts of certain extremely hazardous chemicals to prepare Risk Management Plans (RMP) and submit the plans to the U.S. EPA.[12] The plans are intended to save lives, protect property, and prevent pollution. Some 12,600 facilities currently submit RMPs.[13]

The RMPs include companies' own assessments of a worst-case chemical emergency, including the distance from the facility where toxic or flammable chemicals could cause serious harm if released. Areas within these distances —called "vulnerability zones"—extend from 0.01 to 25 miles from the facility depending on the amount and characteristics of the chemical stored or used at the facility that poses the greatest danger to the surrounding community. [14] Company chemical release scenarios are intended to inform people in the circular vulnerability zones around the facilities that they are within range of potential harm and to encourage preventive action by industry.

Figure 1 shows the size distribution of the 3,433 vulnerability zones used this report, by the distance range around the chemical facilities. Of the distance ranges shown, the largest number of facilities (1,172 or 34%) have vulnerability zones that range in distance from 1.01 to 2.50 miles around the chemical facilities, and a large majority of facilities (82% or 2,813) have vulnerability zones within five miles of their respective chemical facilities. Some 18% of facilities, or 620, have vulnerability zones greater than five miles. Only 5% of facilities, or 168, have RMP vulnerability zone distances that are greater than 20 miles in radius.

The RMP vulnerability zone distances provide the basis for the demographic analysis in this report. In order to obtain each facility's vulnerability zone distance, we first had to research RMP information at federal reading rooms. We limited our analysis to a complete review of RMP facilities in several basic industries: water treatment; wastewater treatment; bleach manufacturing; electric power generation; petroleum refining; pulp and paper production; and chemical manufacturing. We added RMP facilities not already included that have 100,000 or more people residing in their self-reported vulnerability zones, in order to include facilities that pose chemical safety risks to the largest populations.

Following an established method, we used Geographic Information Systems (GIS) software and the most recent U.S. Census Bureau population data to estimate residential populations within the vulnerability zone distances. (See Appendix A for a discussion of the methods.)

Momentum for reform has continued to grow among grassroots community groups and policy advocacy networks all over the U.S., who have spoken out as constituents to their own legislators and collectively to the Administration—the White House, EPA and other agencies—for meaningful action to reduce chemical hazards and exposures. These EJ messengers come from groups in more than 12 states—primarily states with weak policies and regulations, where fossil fuel extraction often takes place, or where major oil, gas and chemical facilities are located. Some EJ groups are near military bases and harmed by military toxics. Others are farmworkers, or farmer and rancher networks whose livelihoods are threatened by toxic releases to land and water from chemical facilities or extractive industries. Together, these groups, working together as the Environmental Justice and Health Alliance for Chemical Policy Reform (EJHA), seek to further the work established by the environmental justice movement, the Just Transition Alliance, and groups working locally to strengthen their communities and secure long-lasting reforms and practical solutions.

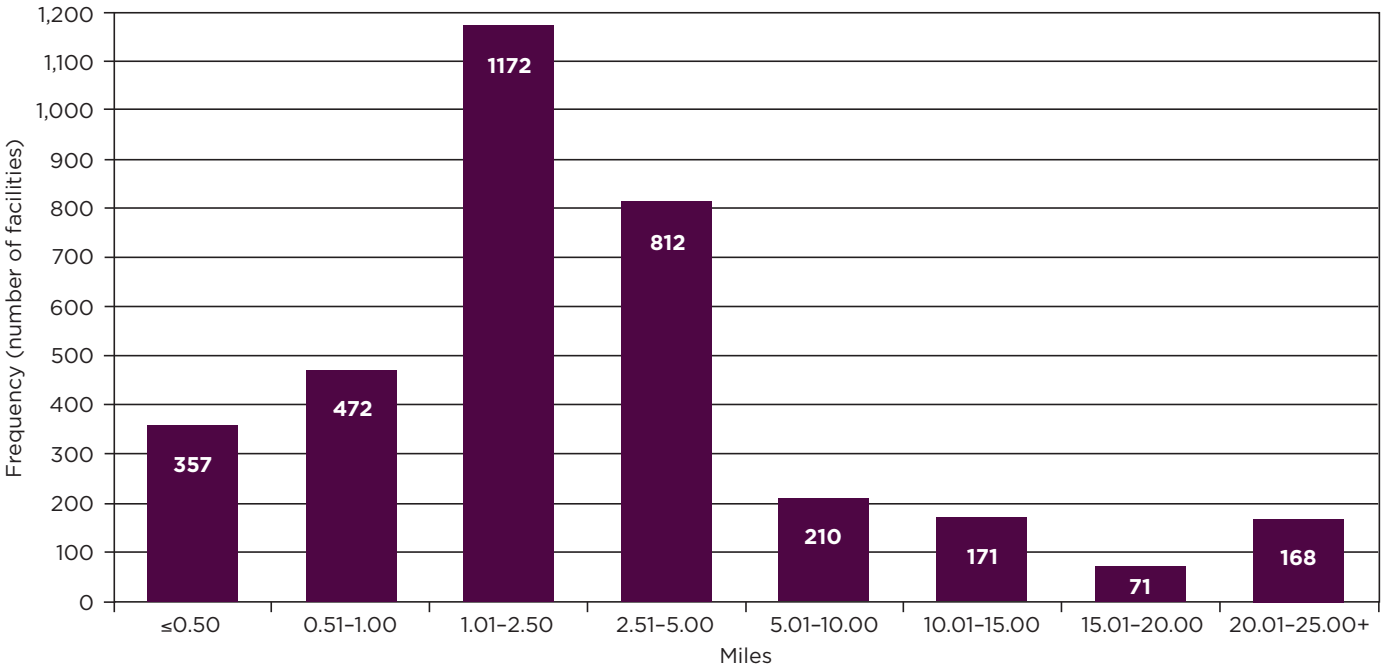
These environmental justice groups advance a vision for change that includes an energy and chemical system that makes proven safe alternatives a priority; a movement for change in the manufacturing, production, and movement of goods in this country; and a movement for local farming that is just and provides all people and the land with the right to health and life. EJHA's work adheres to the Principles of Environmental Justice, the Jemez Principles for Democratic Organizing, and the Louisville Charter for Safer Chemicals as a platform for chemical policy reforms.

These initiatives are challenging all levels of government to be accountable and provide the transparency necessary to address the inter-related issues that keep environmental justice communities exploited.

To that end, the critical issue of chemical safety and security needed to be addressed. Many community organizations had for decades been concerned with acute exposures and deaths as a result of leaks, spills and explosions at chemical facilities. Following the September 11, 2001 attacks in New

FIGURE 1

Distribution of 3,433 Facility Vulnerability Zones by Size (distance ranges around chemical facilities in miles)



Altogether, 134 million U.S. residents live within the vulnerability zones of one or more of the 3,433 facilities studied in this report. Table 1 shows the populations residing in facility vulnerability zones by industry sector and the number of these RMP facilities in each sector. Water treatment, chemical manufacturing, and wastewater treatment sectors have the greatest number of these RMP facilities, 1,284, 778, and 686, respectively. Of the various industry sectors examined, the chemical and bleach manufacturing sectors have the largest

York City, Pennsylvania, and the Pentagon near Washington, DC, chemical security risks from terrorism gained the attention of legislators, but still no policies that focused on prevention of chemical hazards were adopted. EJ, labor, health, environmental, and advocacy organizations that had been working for some time to prevent toxic chemical releases banded together in 2011 to form the Coalition to Prevent Chemical Disasters.

Since then, community members have testified repeatedly in public meetings to the EPA, as well as local and state agencies, to address ongoing legacy contamination issues and for more effective chemical disaster prevention policies based on the use of safer design wherever feasible. EJ groups and allies urged President Obama and the National Environmental Justice Advisory Council (NEJAC) to move the U.S. EPA to use existing authority under the Clean Air Act to require disaster prevention at chemical facilities. In August 2013, President Obama issued an Executive Order on Chemical Facility Safety and Security—a welcome action, but one that community groups know will require ongoing pressure to result in meaningful reform and health protections.

Behind the petitions and beyond the statistics are the stories that news outlets rarely report, including how local agencies are made aware of hazards at nearby industrial operations and yet do not respond until after disasters happen. News accounts often ignore the lies communities are told about how safe facilities are or how many jobs will come to residents when polluting industries move or expand near their homes and schools. We don't often hear about the lack of existing infrastructure (sewer, water, drainage, and fire hydrants) to support safe operations, or the absence of knowledge, protocols and trained staff and community members in the event of a chemical release or explosion. Given how many people in America live daily in the shadow of extremely dangerous chemical facilities—more than 134 million as documented by this report—it is shocking how little we know about these people and their experience. This report sheds light on who lives in these chemical disaster zones and tells some of their stories.

populations living in the vulnerability zones, 79.7 million and 64.0 million, respectively.

Additionally, an estimated 400,000 full time equivalent personnel work at these sites, and uncounted additional people work, travel, shop, study, worship, or recreate in vulnerability zones.[15] The shipment of extremely hazardous chemicals by rail and truck also further distributes the dangers into unsuspecting communities far from the original sources. However, the demographic analysis in this report is limited to the residential populations around the 3,433 facilities studied.

Vulnerability Zones and Fenceline Zones

Communities that cope with constant toxic emissions and hazards from nearby industries are sometimes referred to as "fenceline" communities because homes, schools, businesses, parks, and other places where people live and work are located at or near the boundary—or fenceline—of industrial facilities. But the full vulnerability zones used in this report (see Box 1 and Figure 3) can cover circular areas as large as 25 miles in radius around a facility and can encompass enormous areas—entire cities in some cases, such as Los Angeles, Houston, Memphis, Louisville, and Chicago. Over such large areas, people choose where they live based on many factors such as access to transportation, schools, jobs, and open space. They may not be aware of the dangers of chemical accidents.

For this reason, we examined both the populations that live inside the reported full vulnerability zones and those that live within one-tenth the distance of the full zones, where people live closest to potential harm. We refer to this nearer zone as the "fenceline zone." For example, if the full vulnerability zone distance encompasses a circular area seven miles around the facility, then the fenceline

FIGURE 2
3,433 Chemical Facilities in This Report

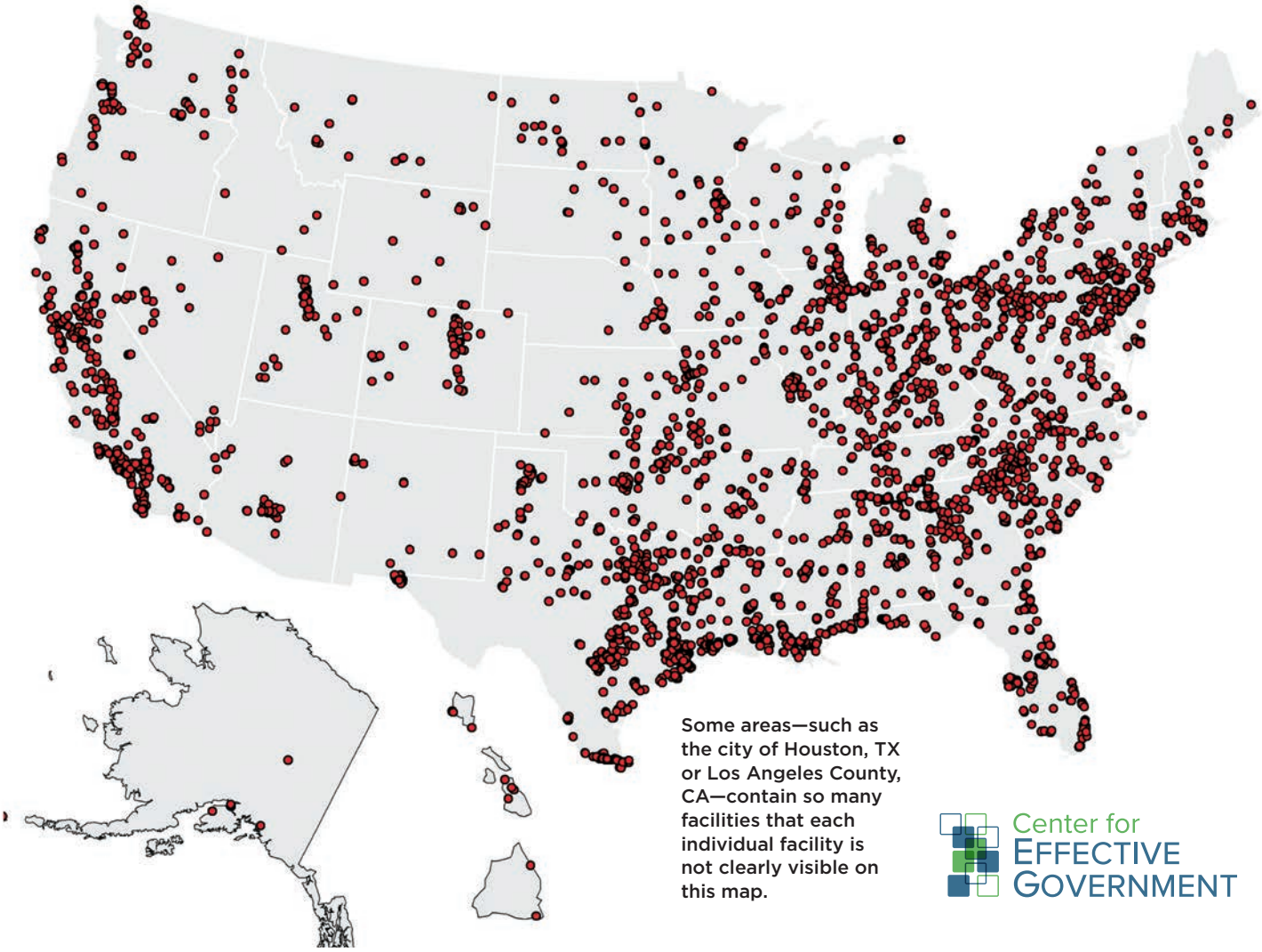


TABLE 1

Number of RMP Facilities and Vulnerability Zone Populations in This Report by Industry Sector

Industry Sector	RMP Facilities*	Vulnerability Zone Population**
Water treatment	1,284	33,692,612
Wastewater treatment	686	21,004,374
Bleach manufacturing	91	63,952,735
Electric power generation	334	4,052,030
Petroleum refining	130	18,484,212
Pulp and paper production	72	5,462,950
Chemical manufacturing***	778	79,726,744
Total for all sectors	**3,433**	**134,932,009**

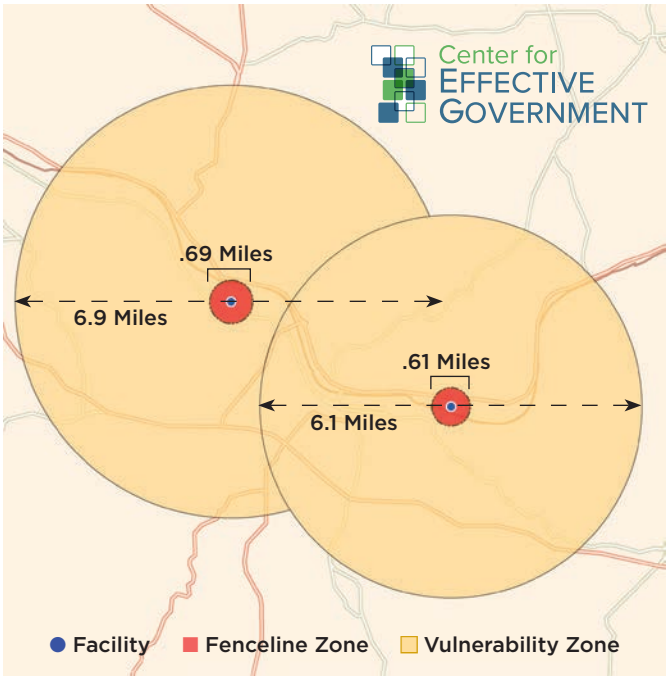
* Facilities may be in more than one industry sector and thus do not equal the total for all sectors.

** Values represent merged overlapping vulnerability zones to eliminate double counting within each industry sector. Because facilities may be in more than one sector, the sum of population values does not equal the population total for all sectors.

*** Defined as member companies of the American Chemistry Council (ACC) and Society of Chemical Manufacturers and Affiliates (SOCMA).

FIGURE 3

Sample Vulnerability Zones and Fenceline Zones



BOX 1

"Vulnerability Zones" in This Report

The chemical disaster vulnerability zone distances described in this report (which represent a radius or circle around the facility) were calculated by the companies themselves as part of worst-case chemical release scenario analysis required under EPA's Risk Management Program. The scenarios are projections that the chemical facilities report to the EPA, and include the maximum area of potential serious harm from a worst-case release of chemicals, a distance around the facility ranging from 0.01 to 25 miles. The area within this distance is known as the vulnerability zone for such a release. The area within one-tenth of the vulnerability zone distance we have called the fenceline zone. The scenarios are not forecasts of potential casualties. People living or working within vulnerability zones are at risk of serious harm, but actual impacts of a release would vary due to weather, wind direction, and distance from the facility.

zone distance is 0.7 miles. (Figure 3 depicts sample vulnerability zones and fenceline zones.) Approximately 3.8 million people live within the fenceline zones closest to potential harm, where, as noted above, they are least likely to be able to evacuate in the event of a serious chemical release.

The communities in these fenceline zones bear a greater risk to their safety and security from the large quantities of extremely hazardous chemicals stored or used in the neighboring facilities. A toxic gas cloud or blast wave could engulf a large area and enter homes, schools, businesses, eldercare facilities, places of worship, sports arenas, hospitals, and automobiles long before people could evacuate or shelter in place. For those who do shelter in place, which means to go inside, close doors, windows, and vents, and wait for toxic fumes to blow away, toxic gases may filter into the building before the company can stop a major chemical release—if it can be stopped. A simple analysis shows that shelter in place cannot possibly protect people in the fenceline zones (see Appendix B). Shelter in place is a desperation strategy, not a plan for public safety or for preventing a chemical disaster, yet shelter in place is the "safety" measure encouraged by many facilities.

Studies and on-the-ground experience show that practical barriers preclude complete evacuation or effective shelter in place. Leaks sometimes go undetected for days even with alarm systems.[16] Companies may not promptly report leaks.[17] Companies may not provide sufficient information, thereby delaying emergency responders.[18] Public notifications take time and are inevitably incomplete.[19] And many residents don't heed warnings to stay indoors.[20]

SELECTED EVENTS IN THE HISTORY OF ENVIRONMENTAL JUSTICE, 1964–2014

1964 — U.S. Congress passes the **Civil Rights Act** of 1964, prohibiting the use of federal funds to discriminate based on race, color, and national origin.

1965 — U.S. Congress passes the **Voting Rights Act** of 1965.

1984 — Catastrophic toxic gas leak at Union Carbide pesticide manufacturing facility in **Bhopal, India**. Government confirms 558,125 injuries and 3,787 deaths. NGOs estimate 8,000 immediate deaths and 8,000 subsequent deaths resulting from effects of gas exposure.

1987 — United Church of Christ (UCC) Commission for Racial Justice issues the famous ***Toxic Wastes and Race in the United States*** report, the first national study to document a relationship between waste facility siting and race.

1990 — **Clean Air Act Amendments** passed by U.S. Congress, establishing the Risk Management Plan (RMP) program, the independent Chemical Safety Board, and U.S. Environmental Protection Agency's (EPA's) authority to establish design and operational requirements to prevent toxic chemical releases.

1991 — **First National People of Color Leadership Summit** convenes in Washington, DC, leading to the Principles of Environmental Justice.

1993 — EPA establishes the **National Environmental Justice Advisory Council** (NEJAC).

1994 — President Clinton signs **Executive Order 12898**: "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations."

1994 — Federal **Interagency Working Group on Environmental Justice** established.

1994 — United Church of Christ issues ***Toxic Wastes and Race Revisited***, which strengthens the association between race and siting of waste facilities.

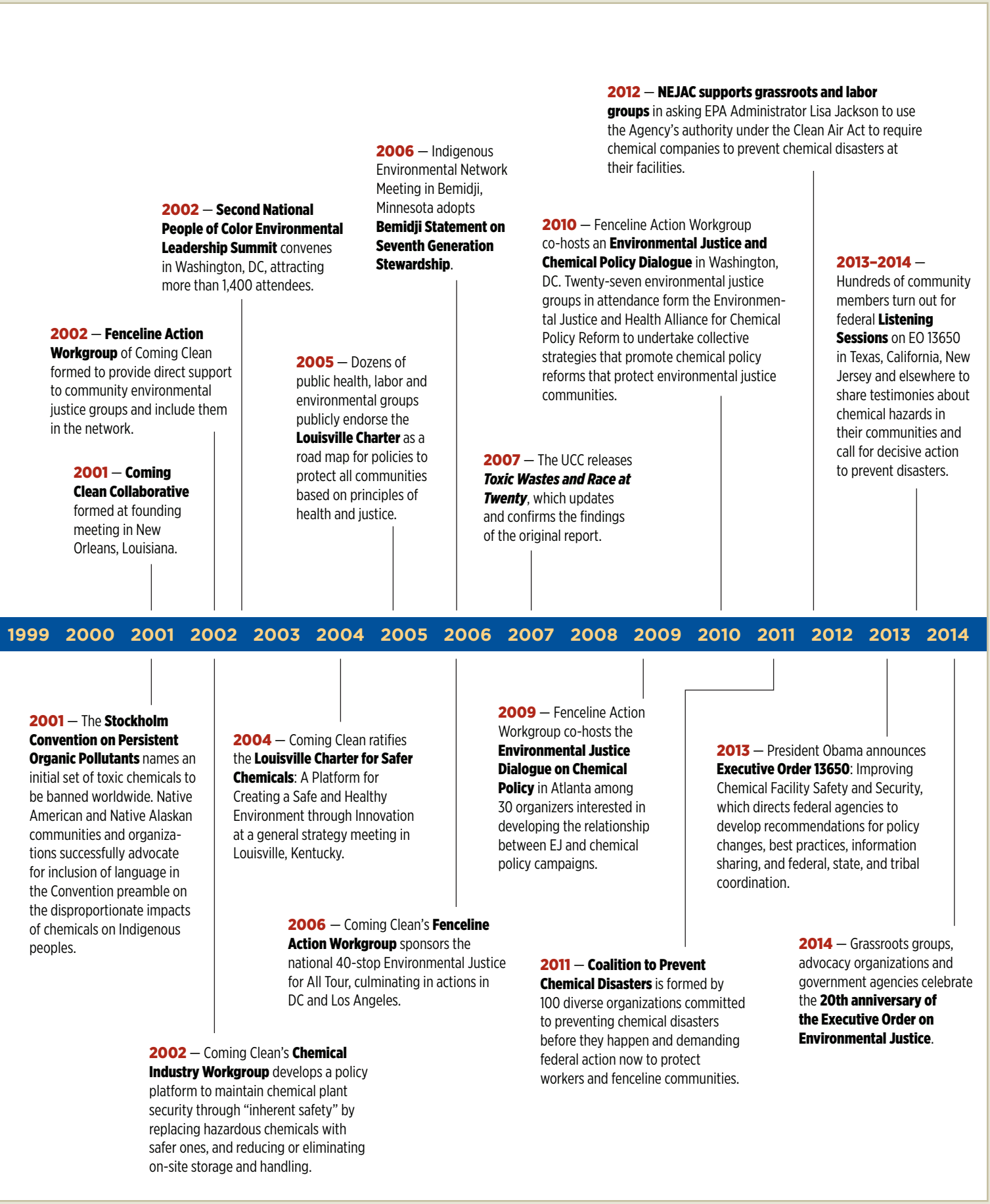
1997 — **Just Transition Alliance** is formed by labor unions and environmental justice organizations to support healthy workplaces and communities through transition to clean production and sustainable economies.

1997 — President Clinton issues **Executive Order 13045**: "Protection of Children from Environmental Health and Safety Risks."

1998 — The **Chemical Safety Board**, authorized by the 1990 Clean Air Act Amendments, becomes operational, charged with investigating chemical "accidents" and recommending safety improvements.

1964 1965 1984 1985 1986 1987 1988 1989 1990 1991 1992 1993 1994 1995 1996 1997 1998

THE PATH TOWARD SAFETY AND JUSTICE is for government and industry to take precautionary steps that include affordable, common sense measures. Precautionary measures would reduce and eliminate unnecessary hazards, improve oversight of the facilities, and produce better engagement of communities living near these facilities and the workers who staff them.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2001 — Coming Clean Collaborative formed at founding meeting in New Orleans, Louisiana.
2002 — Fenceline Action Workgroup of Coming Clean formed to provide direct support to community environmental justice groups and include them in the network.
2002 — Second National People of Color Environmental Leadership Summit convenes in Washington, DC, attracting more than 1,400 attendees.
2005 — Dozens of public health, labor and environmental groups publicly endorse the Louisville Charter as a road map for policies to protect all communities based on principles of health and justice.
2006 — Indigenous Environmental Network Meeting in Bemidji, Minnesota adopts Bemidji Statement on Seventh Generation Stewardship.
2007 — The UCC releases Toxic Wastes and Race at Twenty, which updates and confirms the findings of the original report.
2010 — Fenceline Action Workgroup co-hosts an Environmental Justice and Chemical Policy Dialogue in Washington, DC. Twenty-seven environmental justice groups in attendance form the Environmental Justice and Health Alliance for Chemical Policy Reform to undertake collective strategies that promote chemical policy reforms that protect environmental justice communities.
2012 — NEJAC 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 prevent chemical disasters at their facilities.
2013–2014 — Hundreds of community members turn out for federal Listening Sessions on EO 13650 in Texas, California, New Jersey and elsewhere to share testimonies about chemical hazards in their communities and call for decisive action to prevent disasters.
2001 — The Stockholm Convention on Persistent Organic Pollutants names an initial set of toxic chemicals to be banned worldwide. Native American and Native Alaskan communities and organizations successfully advocate for inclusion of language in the Convention preamble on the disproportionate impacts of chemicals on Indigenous peoples.
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 or eliminating on-site storage and handling.
2004 — Coming Clean ratifies the Louisville Charter for Safer Chemicals: A Platform for Creating a Safe and Healthy Environment through Innovation at a general strategy meeting in Louisville, Kentucky.
2006 — Coming Clean's Fenceline Action Workgroup sponsors the national 40-stop Environmental Justice for All Tour, culminating in actions in DC and Los Angeles.
2009 — Fenceline Action Workgroup co-hosts the Environmental Justice Dialogue on Chemical Policy in Atlanta among 30 organizers interested in developing the relationship between EJ and chemical policy campaigns.
2011 — Coalition to Prevent Chemical Disasters is formed by 100 diverse organizations committed to preventing chemical disasters before they happen and demanding federal action now to protect workers and fenceline communities.
2013 — President Obama announces Executive Order 13650: Improving Chemical Facility Safety and Security, which directs federal agencies to develop recommendations for policy changes, best practices, information sharing, and federal, state, and tribal coordination.
2014 — Grassroots groups, advocacy organizations and government agencies celebrate the 20th anniversary of the Executive Order on Environmental Justice.

THE STRUGGLE FOR A TOXIC-FREE COMMUNITY

Alaska Community Action on Toxics, Savoonga, St. Lawrence Island, Alaska

http://www.akaction.org

Facilities that use and store hazardous chemicals don't only endanger people who live nearby. Chemicals that are released can travel long distances and build up in the environment and food over decades. And facilities often leave toxic chemicals behind when they close, further contaminating people and the environment.

Alaska Native peoples experience fenceline impacts from hundreds of contaminated former military and industrial sites in their own backyards, and are also connected to communities in states in the "lower 48" working for chemical security. On Alaska's small St. Lawrence Island in the northern Bering Sea, Yupik communities are suffering health hazards linked to chemical releases both from contaminated sites on the island and from thousands of miles away.

"Indigenous Arctic peoples are among the most highly exposed people on earth to toxic chemicals, because these chemicals—DDT, PCBs, brominated flame retardants, and perfluorinated compounds, to name a few—are persistent, and drift hundreds and thousands of miles north on wind and ocean currents from more southern latitudes where they are manufactured, stored, and used," stated Vi Waghiyi, a Yupik mother and grandmother, Native Village of Savoonga, St. Lawrence Island, Alaska, and Environmental Health and Justice Program Director, Alaska Community Action on Toxics (ACAT). "These chemicals contaminate our traditional foods and affect our health and the health of our children."

Tiffany Immingan, a 20-year-old Yupik woman from the village of Savoonga, St. Lawrence Island said: "As a result of these daily exposures to toxic chemicals, those of us who live in remote places like Alaska and the Arctic have some of the highest levels of toxic chemicals in our own bodies. These chemicals have been linked to serious diseases such as cancer, diabetes, learning disabilities, birth defects and reproductive harm. Our toxic chemicals laws are badly broken. Communities like mine are working on reform for safer chemical laws that protect our human health. Everyone who truly cares about the health of Alaskans must voice their support for stronger toxic chemicals laws. We want chemical policy reform, but we want to ensure that it is done right."

© Samarys Seguinot-Medina

Tiffany Immingan (right) conducting water testing for chemicals, Snake River, Nome, AK.

> **"OUR TOXIC CHEMICALS LAWS** are badly broken. Chemical companies are not required to show that the chemicals they use to make the products we buy are safe for human health and the environment."
>
> **TIFFANY IMMINGAN**
> 20-year-old Yupik woman from the village of Savoonga, St. Lawrence Island

THE STRUGGLE FOR A TOXIC-FREE COMMUNITY

The Just Transition Alliance

http://www.jtalliance.org

© Ana Mascareñas

Jose Bravo of the Just Transition Alliance explains the need to protect workers and communities from toxic chemicals outside the federal Listening Session on chemical facility security in Los Angeles, CA, January 2014.

What is a Just Transition?

A "Just Transition" is a principle, a process and a practice. The principle of a Just Transition is that a healthy economy for everyone and a clean environment can co-exist. The process for achieving a Just Transition should be a fair one that does not cost workers or community residents their health, environment, jobs, or economic assets. Any losses that occur should be fairly and justly compensated. The practice of a Just Transition means that people and the environment that are affected by pollution and economic restructuring – the frontline workers, the community and the environment – must all be prioritized and that workers along with community residents must lead the crafting of solutions.

"People of color, Indigenous communities and low-income neighborhoods continue to be the canaries in the coal mine, in harm's way from exposure to toxic chemical production, storage, incineration, and use, and from hazardous waste disposal," says Jose T. Bravo, Executive Director of the Just Transition Alliance in San Diego, CA.

> **"WE MUST MOVE TOWARD** engineering the danger out of chemicals and processes that expose workers at the frontline of production, and the communities at the fenceline of exposure."
>
> **JOSE T. BRAVO**
> Executive Director of the Just Transition Alliance in San Diego, CA

"We must move toward engineering the danger out of chemicals and processes that expose workers at the frontline of production, and the communities at the fenceline of exposure. We must also strive to change zoning so that sensitive areas are kept out of harm's way, especially those living with the disproportionate legacy of toxics. A Just Transition to a sustainable future must include: a cradle to cradle approach that protects everyone and everything at all the stages. It's imperative that chemical security reforms include a Just Transition towards a healthier, safer and sustainable future for all."

THE STRUGGLE FOR A TOXIC-FREE COMMUNITY

West County Toxics Coalition, Richmond, CA

http://www.dhventures.com/West_home.htm

Toxic smoke released during the Chevron refinery fire in Richmond, CA, August 2012.

Part of the Chevron refinery in Richmond, CA.

On August 6, 2012, a release of flammable vapor led to a fire at the Chevron Refinery in Richmond, California. The smoke and toxic fallout caused more than 15,000 residents to seek treatment at area hospitals with respiratory problems.[a] Richmond is filled with heavy industry and petrochemical containers, and crisscrossed by train tracks. About 80 percent of people living within a mile of the Chevron refinery are people of color, and a quarter of them live below the poverty line.

Many residents insist that the 2012 release is emblematic of a willful negligence that dates back decades, at the expense of the low-income communities and communities of color who can't afford to leave the area. The refinery was in "high priority violation" of federal rules on toxic air emissions for several years up through 2010.[b] The independent U.S. Chemical Safety Board concluded that Chevron ignored warnings from its employees about the danger posed by corroded pipes.[c] The pipe that failed in August 2012 had lost 90 percent of its original thickness.[d] In December 2013, the U.S. EPA threatened Chevron with daily fines because the company had failed to address 62 violations identified since the fire. EPA also found 13 instances when Chevron failed to report toxic air releases promptly.[e]

"Not only do we have to be exposed to chemical fumes day and night, but we also get contaminated when these explosions happen. They are not 'accidents,' they are preventable, and we demand protection now," said Dr. Henry Clark, director of the West County Toxics Coalition, a multi-racial environmental justice organization that works to empower low and moderate income residents to exercise greater control over environmental problems. "We applaud any sincere efforts by Chevron or anyone else that wants to do the right thing. But that doesn't mean that we give Chevron a blanket approval to continue to increase the pollution."

> **"NOT ONLY DO WE HAVE TO BE** exposed to chemical fumes day and night, but we also get contaminated when these explosions happen. They are not 'accidents,' they are preventable, and we demand protection now."
>
> **DR. HENRY CLARK**
> Director of the West County Toxics Coalition

a *http://www.sfgate.com/bayarea/article/EPA-cites-62-Richmond-violations-by-Chevron-5072914.php*

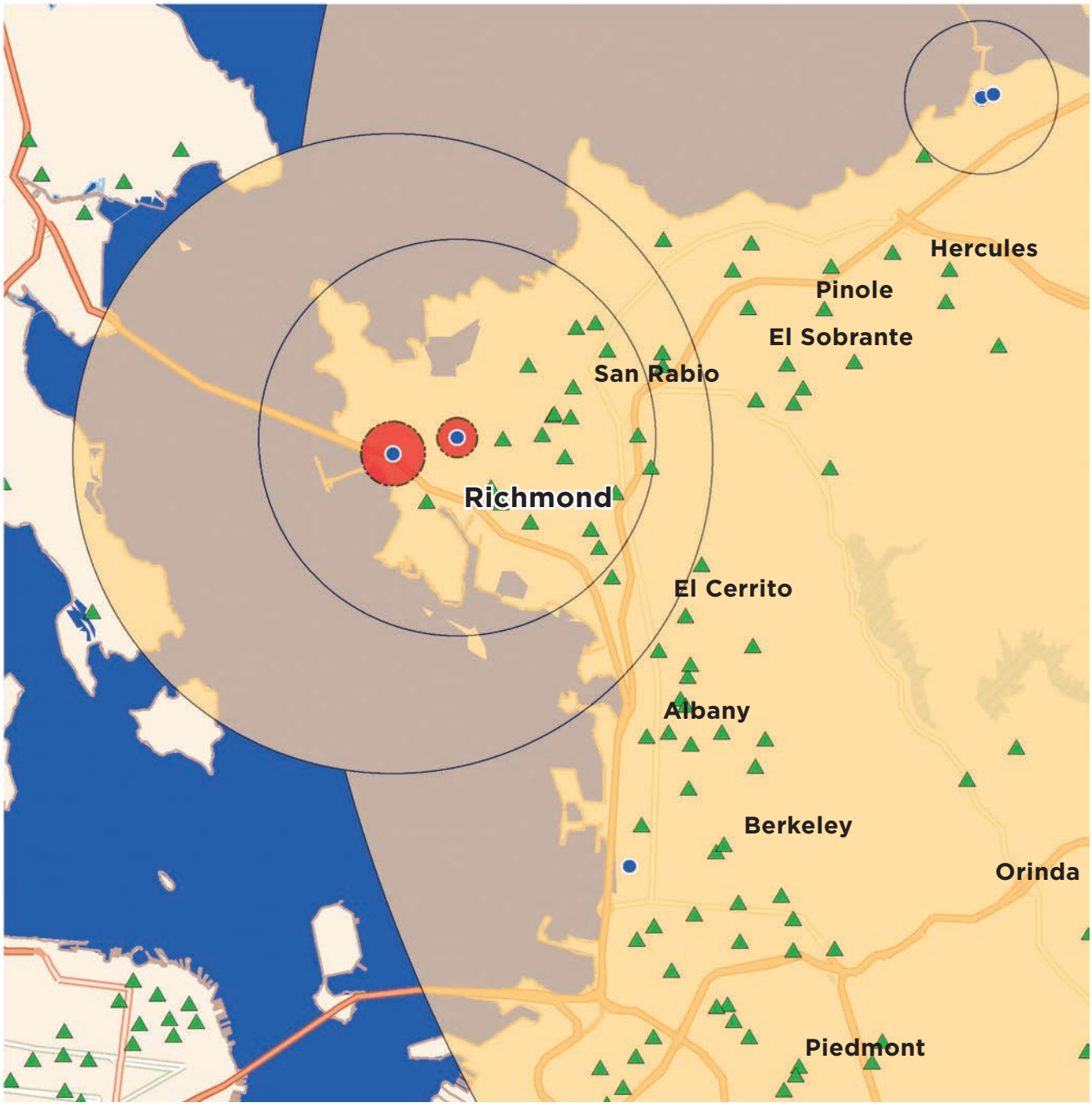
b *http://articles.latimes.com/2012/aug/14/opinion/la-oe-0814-juhasz-chevron-refinery-pollution-20120814*

c *http://www.contracostatimes.com/west-county-times/ci_24734895/federal-report-calls-sweeping-reforms-aftermath-chevron-richmond*

d *http://www.sfgate.com/bayarea/article/EPA-cites-62-Richmond-violations-by-Chevron-5072914.php*

e Ibid.

RICHMOND, CALIFORNIA



● Facility ▲ Schools ■ Fenceline Zone ■ Vulnerability Zone

This map shows vulnerability zones and fenceline zones for facilities included in this report near Richmond, CA, and the approximate location of nearby schools. The fenceline zones for some facilities are too small to appear at this scale.

Center for EFFECTIVE GOVERNMENT

THE STRUGGLE FOR A TOXIC-FREE COMMUNITY

Mossville Environmental Action Now (MEAN), Mossville, Louisiana

http://meannow.wordpress.com

In the historic African American community of Mossville, Louisiana, 14 toxic industrial facilities spew millions of pounds of pollution into the area annually and their operations dissect the 5.5 square mile community throughout with pipelines, railroad tracks and tanker cars. An area that used to boast some of the richest biodiversity in all of Louisiana is now among the state's most toxic and dangerous places.

In December 2013, Mossville resident and grandmother Dorothy Felix heard an explosion at the Axial chemical production facility and saw a huge black cloud hovering near the local school. The school was told to shelter the children in place—but there were no alarms in the community to advise the residents. Meanwhile, the highway was shut down due to the explosion, preventing anxious family members from collecting their children from the school. The incident was responsible for more than a dozen members of the community going to the hospital. Because Mossville residents have been living for decades under these conditions—massive industrial operations, no alarms, shelter in place protocols, undrinkable water, and contaminated fish and farming soil from industrial contaminants—a majority of the population now consists of children and elderly people disproportionately sick and dying.

Mossville Environmental Action Now (MEAN) is one of the grassroots environmental justice groups that are demanding that government and industry be accountable for the destruction caused by the chemical industry in their communities. The EJHA has worked alongside MEAN to advocate for federal standards and regulations of the chemical industry that protect the lives of the people of Mossville. In 2013, Mossville residents and members of MEAN began a residential relocation process with global energy and chemical giant Sasol due to the dangers and chemical hazards of Sasol operations in Mossville. More "relocations" or forced migrations are expected in other communities due to concentrated chemical contamination and chronic illnesses among fenceline residents.

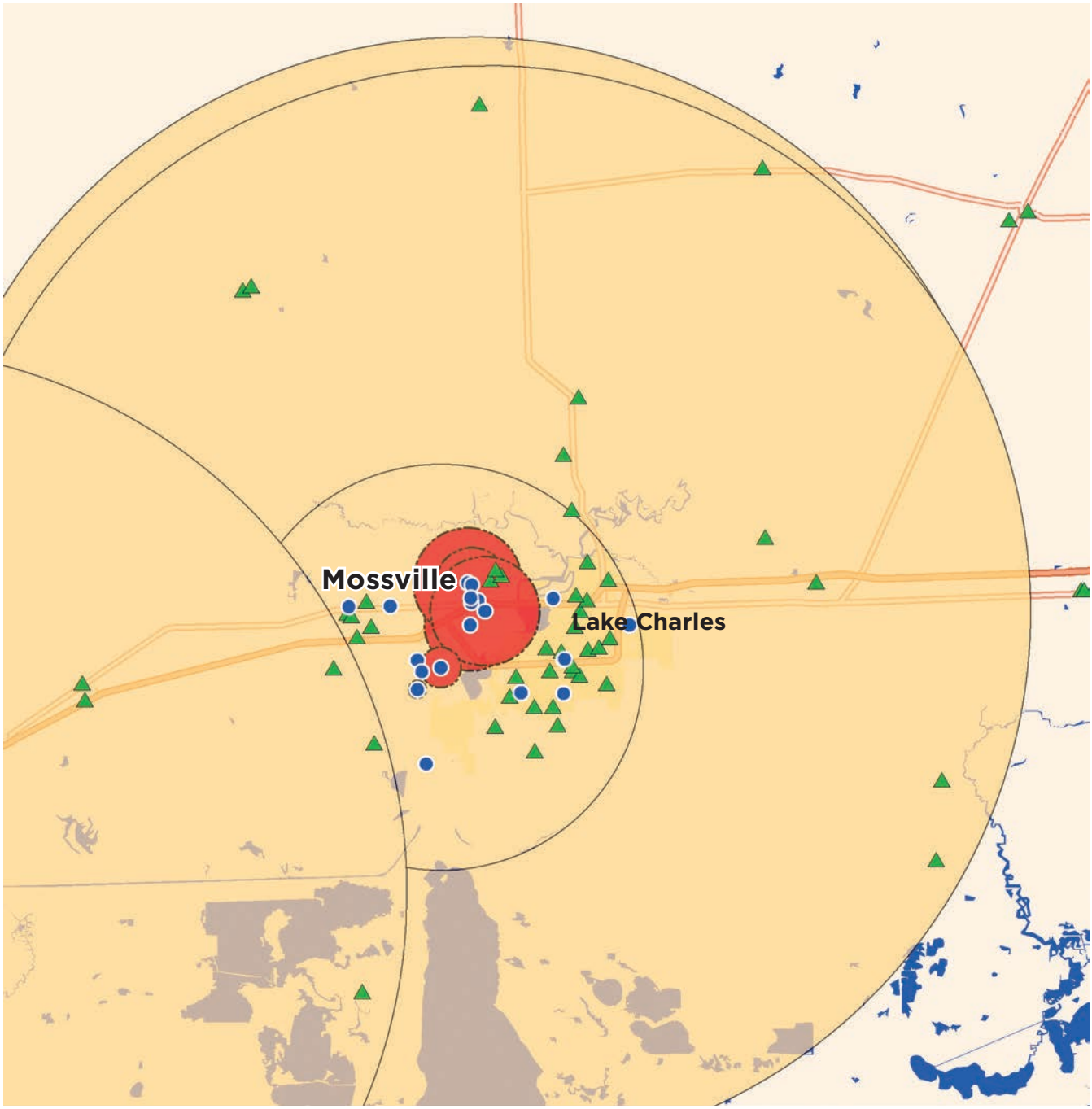
"We were here before these plants came and we were here because this was an Afro-American community and we didn't have anywhere that we could go. We had to go somewhere where we felt safe and away from all the racial problems that were going on. This was the place for us. Now they're forcing us to leave." Dorothy Felix, Mossville Environmental Action Now (MEAN).

Edgar Mouton (right) fought to protect the health and environment of himself and other residents of Mossville, LA, until his death in June 2012.

"THERE IS NO PLACE OR person in Mossville that has not been harmed by the toxic chemicals spewed out by all of the industrial facilities. Instead of our government helping our community to become healthy, we see our government helping the industries to release more and more pollution."

EDGAR MOUTON

MOSSVILLE, LOUISIANA



● Facility ▲ Schools ■ Fenceline Zone ■ Vulnerability Zone

This map shows vulnerability zones and fenceline zones for facilities included in this report near Mossville, LA, and the approximate location of nearby schools. The fenceline zones for some facilities are too small to appear at this scale.

Center for EFFECTIVE GOVERNMENT

THE STRUGGLE FOR A TOXIC-FREE COMMUNITY

Los Jardines Institute (The Gardens Institute), South Valley of Albuquerque, NM

www.facebook.com/los.ji.92

Community organizing to demand safer alternatives has successfully reduced and removed chemical hazards. For years, residents and members of the Southwest Network for Environmental and Economic Justice and Los Jardines Institute (The Gardens Institute) have organized to address the water contamination and toxic smells coming from the Southside Water Reclamation Plant's use of chlorine gas to treat wastewater. "We have known for decades the unidentifiable sicknesses and cancers in our community were the result of the many chemicals we were being exposed to, including exposure to chlorine from the wastewater treatment plant," says Richard Moore, former Director of the Southwest Network for Environmental and Economic Justice, and Coordinator of Los Jardines Institute. Moore goes on to say, "We knocked on the doors of people living in the community to build the community power needed to pressure the government to take action."

The Mountain View community is home to a sewage treatment plant that serves the city of Albuquerque. "Approximately 4,300 Mountain View residents live across 8,400 acres and the homes are mingled with more than 25 junkyards, five gravel and concrete companies, seven petroleum bulk terminals, a brick company, and dozens of other industries, many surrounded by razor wire. Seventy-eight percent of the people in Mountain View are Chicano/Mexicano and more than half speak Spanish as their primary language. Nearly 40 percent of the families with children are so poor that they would have to triple their income to climb above the federal poverty line," says Magdalena Avila, Dr.P.H., resident of the Mountain View community and Associate Professor at the University of New Mexico.

With 160,000 people at risk from the bulk use and storage of chlorine, an accident involving this chemical could potentially impact an area up to 5.40 miles downwind of the plant. Community advocates brought this issue to the attention of the Environmental Protection Agency, which found the wastewater treatment plant in violation of the federal Clean Water Act and issued an order for the plant to fix the problem. "We've eliminated chlorine gas, which is a very hazardous chemical, making the process much safer and more cost-effective," said Albuquerque Bernalillo County Water Utility Authority Compliance Manager Barbara Gastian.[a] The plant has upgraded to safer alternative technology and implemented an ultraviolet disinfection system, reducing the plant's use of chlorine and reducing the toxic burden felt by Mountain View residents.

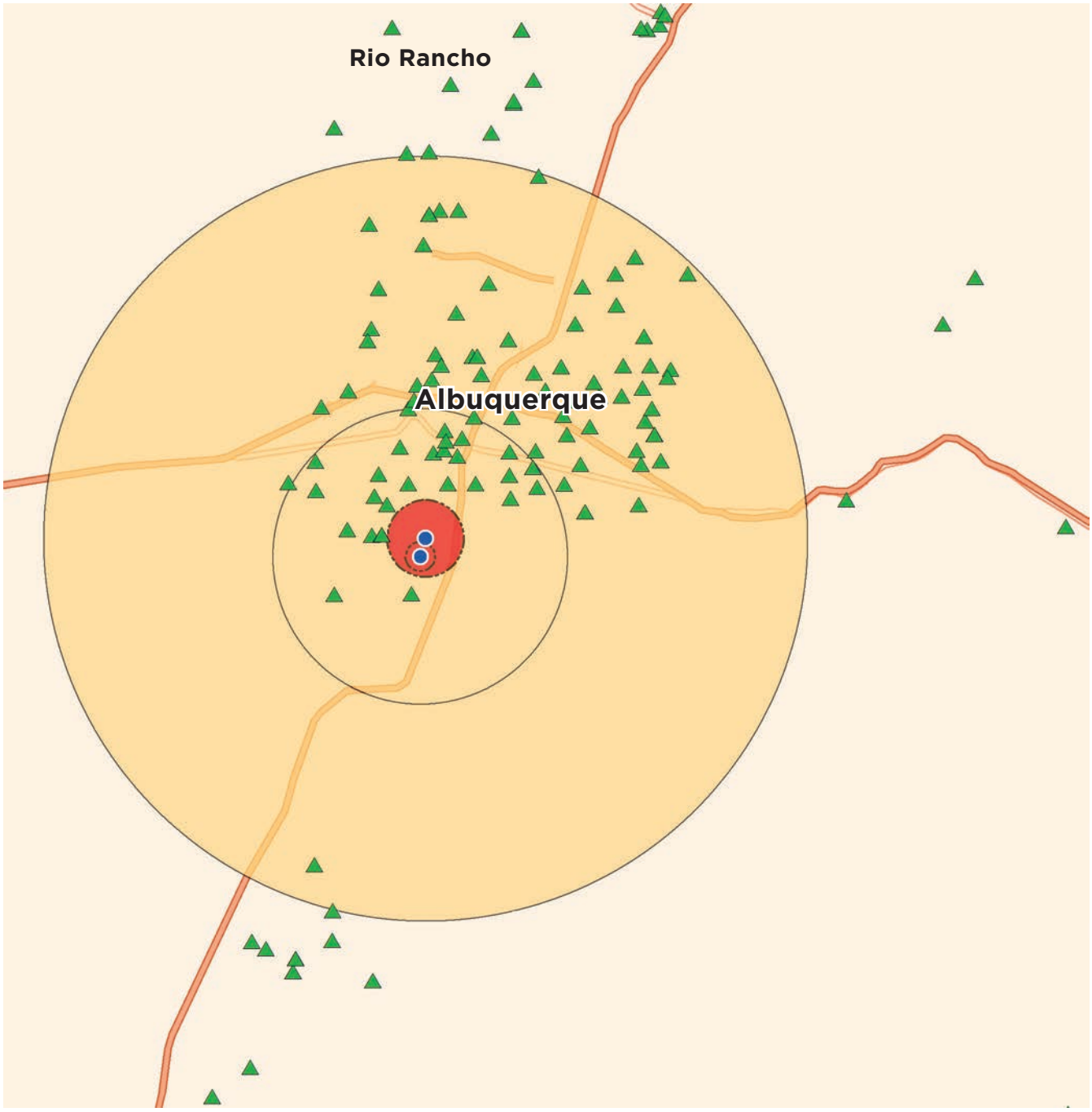
© Lauro Silva

Participants in a Health Impact Assessment Training learn how to conduct community research into health impacts from industrial facilities, Mountain View, NM.

> **"WE HAVE KNOWN FOR** decades the unidentifiable sicknesses and cancers in our community were the result of the many chemicals we were being exposed to, including chlorine from the wastewater treatment plant."
>
> **RICHARD MOORE**
> Coordinator of Los Jardines Institute

a *http://www.bizjournals.com/albuquerque/print-edition/2011/10/07/abcwua-launches-massive-waste-water.html?page=all*

ALBUQUERQUE, NEW MEXICO



● Facility ▲ Schools ■ Fenceline Zone ■ Vulnerability Zone

This map shows vulnerability zones and fenceline zones for facilities included in this report near Albuquerque, NM, and the approximate location of nearby schools. The fenceline zones for some facilities are too small to appear at this scale.

Center for EFFECTIVE GOVERNMENT

THE STRUGGLE FOR A TOXIC-FREE COMMUNITY

Texas Environmental Justice Advocacy Services (t.e.j.a.s.), Houston, Texas

http://www.tejasbarrios.org

© t.e.j.a.s.

Members of t.e.j.a.s. and other organizations demand action to prevent chemical disasters at a federal Listening Session on chemical safety and security in Houston, TX, January 2014.

Due to concentrated chemical industry presence and the lack of zoning laws, the City of Houston has more than 100 facilities that have 10,000 or more people living in their vulnerability zones, making Houston residents unusually vulnerable to chemical hazards from many directions. In the historically Latino community of Manchester, a community that has existed for over 150 years and is now dwarfed by industrial operations, there is a large cluster of childhood leukemia cases and high rates of asthma.

Being located right next to the Ship Channel means Manchester residents and the industrial operations nearby are in the direct line of hurricanes that pound the Gulf Coast annually.

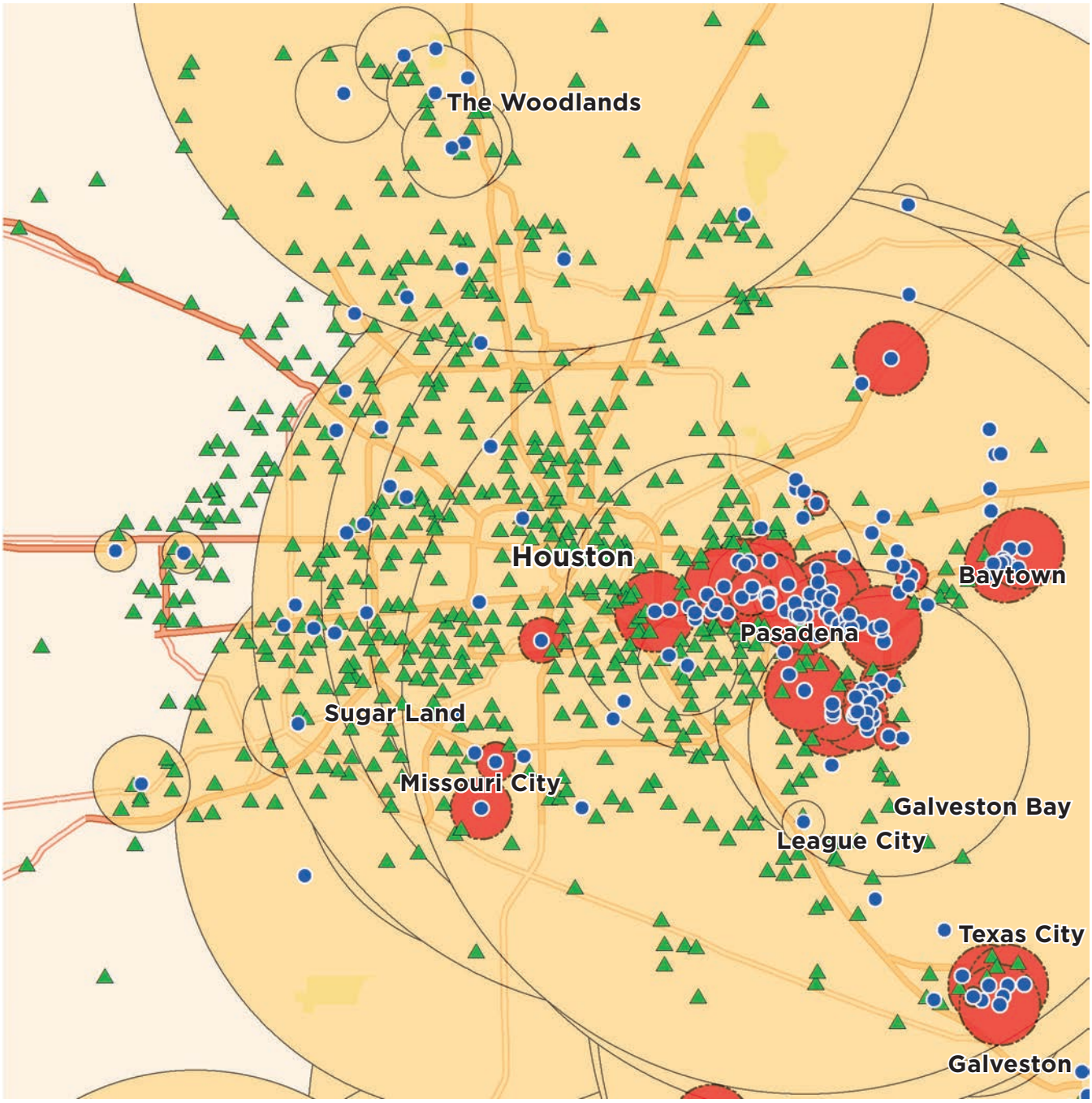
The Channel near Manchester was recently dredged deeper and wider to ship out the refined tar sands oil that is expected to come via the Keystone XL pipeline, if President Obama approves it.

The Texas Environmental Justice Advocacy Services (t.e.j.a.s.) group works with residents of this overburdened community to bring the issues of Manchester's pollution, poverty, vulnerability and illness to the attention of the U.S. EPA, the Department of Homeland Security, and the Department of Labor, as well as other local, state, and federal agencies. Manchester is seeking redress for damages to their health and their homes, and for some in the community this includes seeking relocation from the path of harm before it is too late.

> **"WE CAN CALL THEM** vulnerability zones, or hazard zones, but whatever term we use, the reality is that people are sick and dying from exposure to toxic chemicals. It's time we work together to transform these 'kill zones' into safe places for people to live, work and play."
>
> **YUDITH NIETO**
> Manchester resident and youth environmental justice organizer

"Whether it's Houston, TX; Mossville, TX; West, TX; West Virginia or hundreds of other communities where chemical plants have been allowed to be built—millions of people, disproportionately people of color and low-income communities, are living in harm's way with chemical threats. There is an urgent need to set up strong protections from the toxic and petrochemical industry contamination in our communities, now," says Juan Parras, Executive Director of t.e.j.a.s.

GREATER HOUSTON, TEXAS



● Facility ▲ Schools ■ Fenceline Zone ■ Vulnerability Zone

This map shows vulnerability zones and fenceline zones for facilities included in this report near Houston, TX, and the approximate location of nearby schools. The fenceline zones for some facilities are too small to appear at this scale.

Center for EFFECTIVE GOVERNMENT

THE STRUGGLE FOR A TOXIC-FREE COMMUNITY

People Concerned About Chemical Safety, Charleston, West Virginia

http://peopleconcernedaboutmic.com

On January 9, 2014, a highly toxic chemical, crude 4-methylcyclohexanemethanol (MCHM), was released from a Freedom Industries facility into the Elk River in Charleston, West Virginia, just upstream from the intake for a water treatment plant serving nine counties.

"10,000 gallons of a toxic chemical mix used for coal processing spilled into the river, contaminating the public water source that serves 300,000 residents in nine counties. This chemical disaster was 100% preventable," says Maya Nye, President of People Concerned About Chemical Safety (PCACS) in Kanawha County, West Virginia. Nye is the daughter of employees of the Union Carbide chemical company, and as a teen was exposed to toxic chemicals following an explosion at a neighboring chemical plant.

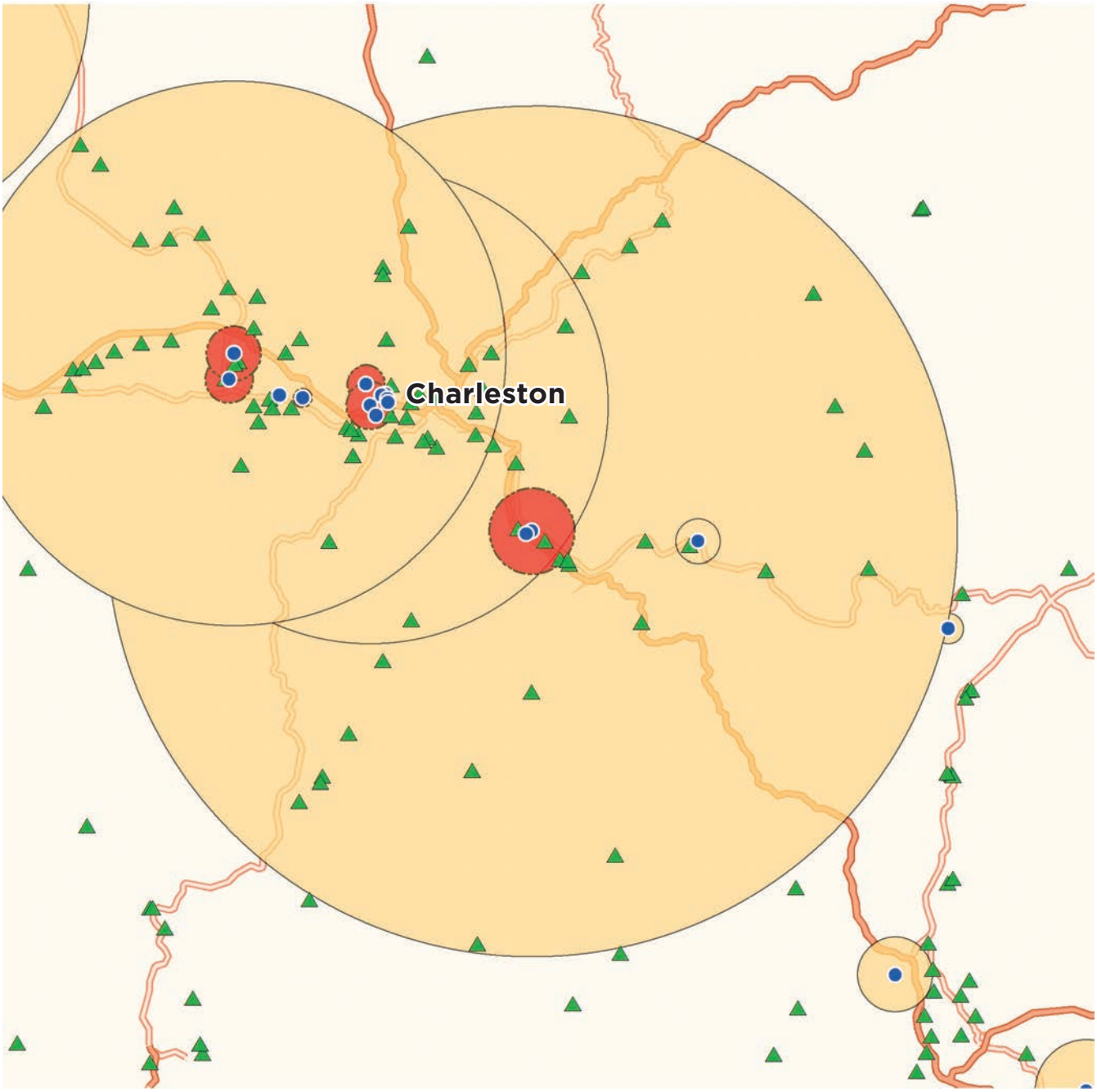
The Freedom Industries spill forced local community organizers to navigate the loss of potable water while bringing these issues forward to the responsible government agencies. "We need the EPA, the Department of Homeland Security, and the Department of Labor to come to Charleston to take responsibility and hold Freedom Industries accountable."

People Concerned About Chemical Safety is dedicated to the protection of health and safety of all who reside, work, and study in the vicinity of local plants producing highly toxic chemicals. PCACS joined the Environmental Justice and Health Alliance (EJHA) to amplify these demands after the Elk River chemical disaster. Organizers from West Virginia joined the EJHA delegation to the National Environmental Justice Advisory Council meeting in February 2014 to ask EPA Administrator Gina McCarthy to prioritize West Virginia and chemical security on the 20th Anniversary of President Clinton's Environmental Justice Executive Order.

Residents demand action from state and federal agencies after a chemical spill contaminated the water for 300,000 people in Charleston, WV, January 2014.

> **"10,000 GALLONS OF A TOXIC** chemical mix used for coal processing spilled into the river, contaminating the public water source that serves 300,000 residents in nine counties. This chemical disaster was 100% preventable."
>
> **MAYA NYE**
> President of People Concerned About Chemical Safety in Kanawha County, WV

CHARLESTON, WEST VIRGINIA



● Facility ▲ Schools ■ Fenceline Zone ■ Vulnerability Zone

This map shows vulnerability zones and fenceline zones for facilities included in this report near Charleston, WV, and the approximate location of nearby schools. The fenceline zones for some facilities are too small to appear at this scale.

Center for EFFECTIVE GOVERNMENT

CHAPTER TWO

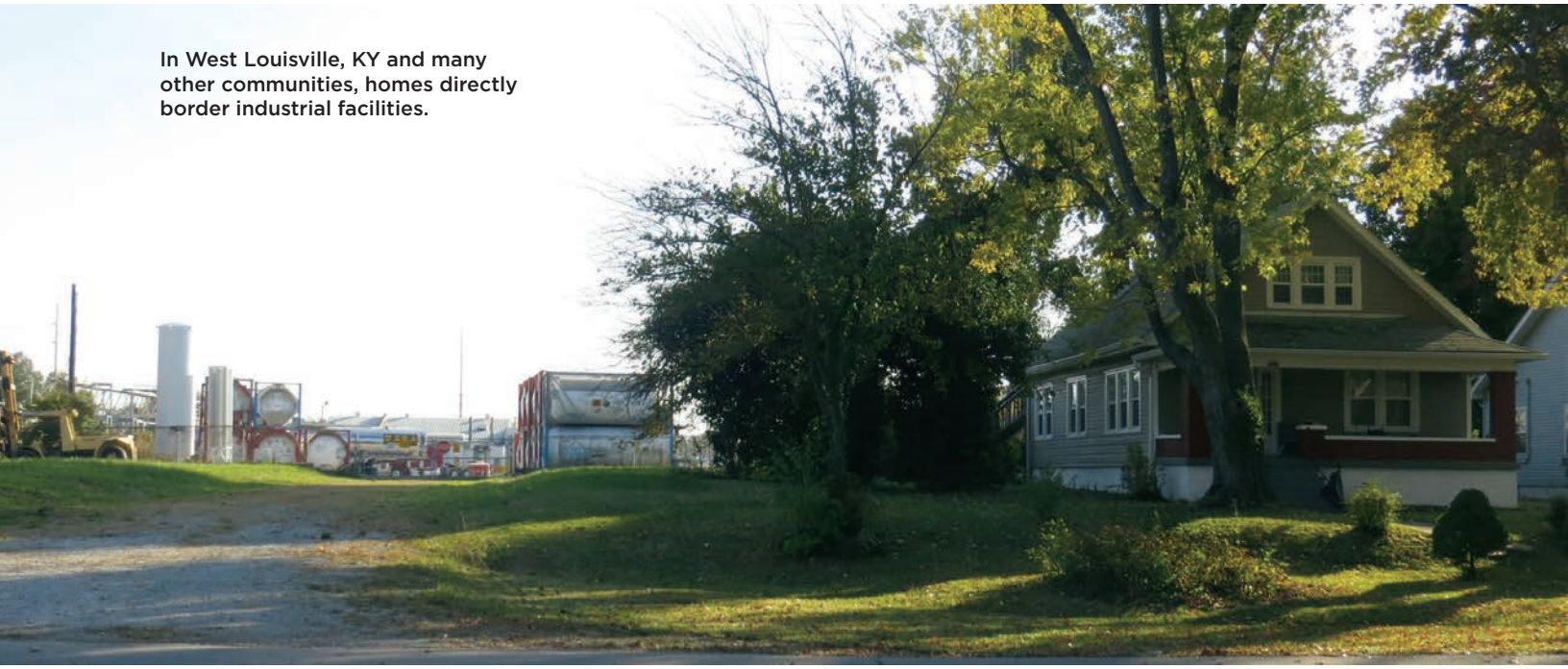
DEMOGRAPHIC ANALYSIS OF CHEMICAL FACILITY VULNERABILITY ZONES

This report examines the chemical disaster vulnerability zones reported to EPA by 3,433 facilities that are required to file Risk Management Plans (RMPs) because they make, distribute, or use certain extremely hazardous substances. These facilities are in seven basic industrial sectors or have more than 100,000 people living in their self-reported vulnerability zones. All told, 134 million people in the United States live within range of a worst-case chemical release from one or more of these facilities, and 3.8 million live within the fenceline zones closest to potential harm and with the least time to react in the event of a catastrophic release.[21]

Demographic analysis of five socio-economic criteria show Black, Latino, and low-income populations disproportionately represented in the vulnerability zones of these high-hazard chemical facilities, and even more greatly represented in the fenceline zones (one-tenth the distance of the full vulnerability zone), compared to the U.S as a whole. The five indicators studied are housing value, household income, race and ethnicity, education level, and poverty. These indicators were chosen to assess hazards and impacts based on race, income, or social status and to conduct an environmental justice analysis of on-the-ground impacts of chemical security policies and practices.

Key findings about the fenceline zones nearest to the facilities are:

- Residents of the fenceline zones have average home values 33% below the national average.
- Residents of the fenceline zones have average household incomes 22% below the national average.
- The percentage of Blacks in the fenceline zones is 75% greater than for the U.S. as a whole, while the percentage of Latinos in the fenceline zones is 60% greater than for the U.S. as a whole.
- The percentage of adults in the fenceline zones with less than a high school degree is 46% *greater* than for the U.S. as a whole, and the percentage of adults in



In West Louisville, KY and many other communities, homes directly border industrial facilities.

the fenceline zones with a college or other post-secondary degree is 27% *lower* than for the U.S. as a whole.
- The poverty rate in the fenceline zones is 50% higher than for the U.S. as a whole.

Detailed findings are presented below.

Who's In Danger? Demographics of Vulnerability Zone Populations

NATIONAL FINDINGS

Housing Value (Table 2)

Average housing value of owner-occupied homes within the vulnerability zones is lower than the national average, and much lower in the fenceline zones (one-tenth the distance of the vulnerability zone). While home values in facility vulnerability zones are only slightly lower compared to the national average, the very large size of some zones may mask the association between lower housing values and these industrial chemical hazards. Average home value in the fenceline zones drops precipitously to only two-thirds (66%) of the national average (from $246,375 to $164,346) (Figure 4). In addition, many families living in fenceline areas may be renters who do not own the home or apartment they live in. These figures suggest that low-income families gravitate to communities surrounding chemical facilities where housing is cheaper.

Household Income (Table 3)

Similar to the finding for home values, average household income in the full vulnerability zones is slightly lower than the national average ($71,333 vs. $73,033), but much lower in the fenceline zones: only $56,814, or 22% less than the national average (Figure 5).[22] The relatively small difference between income in the vulnerability zones and the national average may be due to many zones being found around urban areas that tend to have higher incomes than rural areas, all of which are included in the national average. This finding reinforces the finding of lower home values in fenceline zones, and indicates that these residents who live nearest to hazardous chemical industries tend to have lower income, fewer options for leaving the area, and less influence to ensure that nearby facilities upgrade operations.

Race and Ethnicity (Table 4)

The proportion of the residential population within the vulnerability zones that is Black or Latino is greater than

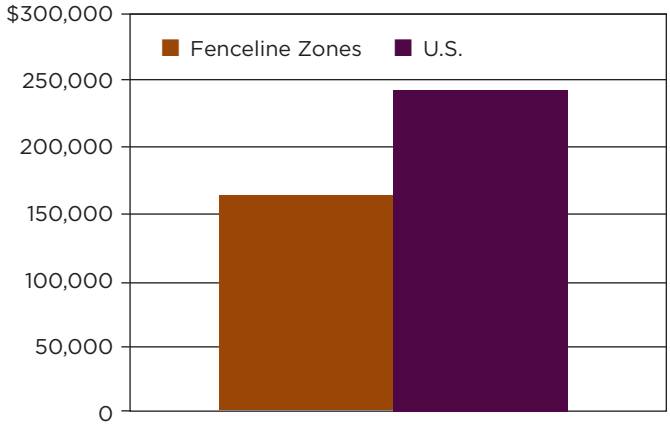
TABLE 2

Housing Value in the Vulnerability Zones

	Fenceline Zones	Vulnerability Zones	U.S.
Average Home Value	$164,346	$238,498	$246,375
Percent of U.S. Average	66.7%	96.8%	100.0%

FIGURE 4

Housing Value in Fenceline Zones



Average home value in the fenceline zones is only two-thirds (66.7%) of the national average.

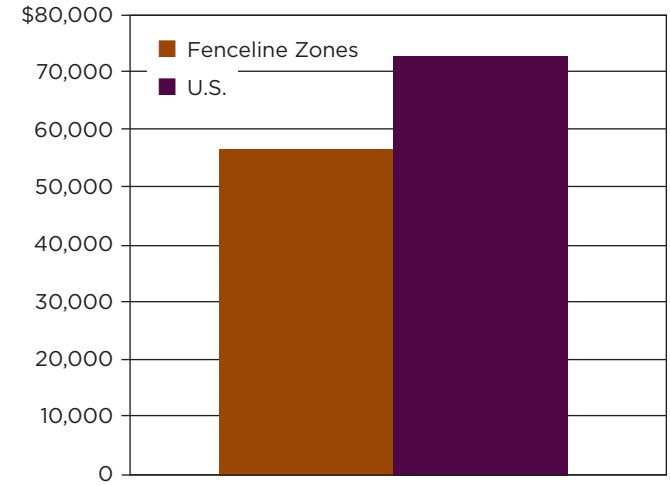
TABLE 3

Household Income in the Vulnerability Zones

	Fenceline Zones	Vulnerability Zones	U.S.
Average Household Income	$56,814	$71,333	$73,033
Percent of U.S. Average	77.8%	97.7%	100.0%

FIGURE 5

Household Income in Fenceline Zones



Average household income in the fenceline zones is 22.2% lower than the national average.

the national average, and greater still in the fenceline zones. Nationally Latinos make up 16% of the population and Blacks make up 12%. However, these percentages increase in the vulnerability zones to 21% for Latinos and 15% for Blacks, and rise still more within the fenceline zones, where Latinos make up more than 25% and Blacks make up 21% of the population (Figure 6). Almost half the people living in the fenceline zones are Black or Latino, compared to less than 30% nationwide. Stated differently, the percentage of Blacks in the fenceline zones is 75% greater than for the U.S. as a whole, and the percentage of Latinos is 60% greater than for the U.S. as a whole.

TABLE 4
Race and Ethnicity in the Vulnerability Zones

Race/Ethnicity	Fenceline Zones Population	Vuln. Zones Population	U.S. Population
White (non-Latino)	1,819,584	75,272,348	196,674,476
Percent Within Area	47.2%	55.8%	64.2%
Latino	991,422	28,332,083	49,214,650
Percent Within Area	25.7%	21.0%	16.1%
Black (non-Latino)	822,531	20,754,953	37,449,500
Percent Within Area	21.3%	15.4%	12.2%
Other (non-Latino)*	220,237	10,572,625	23,207,279
Percent Within Area	5.71%	7.84%	7.57%

* Census category includes Asian, Pacific Islander, Native American, two or more races, and some other race.

THE PERCENTAGE OF ADULTS in the fenceline zones who did not complete high school education is 46% greater than for the U.S. as a whole.

Education (Table 5)
Education levels show an association with vulnerability zones and fenceline zones—but only for those with the least or most formal education (those without a high school degree and those with a post-secondary degree). For those in the middle (such as those with a high school degree or some college), education levels do not seem associated with residence in these zones. The percentage of adults in the fenceline zones who did not complete high school education is 46% greater than for the U.S. as a whole. Conversely, the percentage of adults in the fenceline zones who have completed college or post-college education is 27% lower than for the U.S. as a whole (Figure 7).

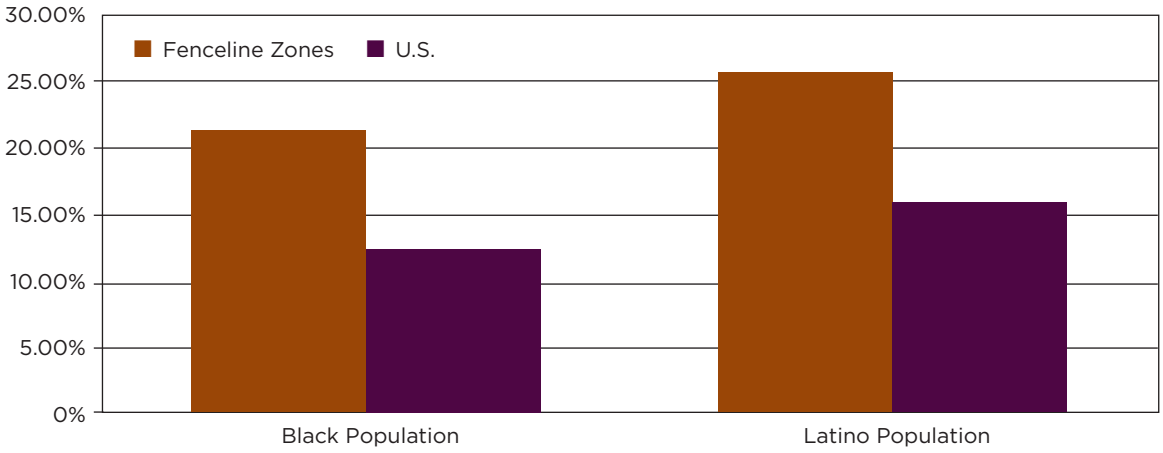
TABLE 5
Education in the Vulnerability Zones*

	Fenceline Zones	Vulnerability Zones	U.S.
Less than High School	20.9%	15.8%	14.3%
High School/ Some College	52.8%	48.7%	49.5%
Post-secondary degree**	26.3%	35.5%	36.2%

* Education figures include people 25 years and older.

** Post-secondary includes a completed Associate's, Bachelor's, Master's, Professional, or Doctorate degree.

FIGURE 6
Black and Latino Populations in Fenceline Zones

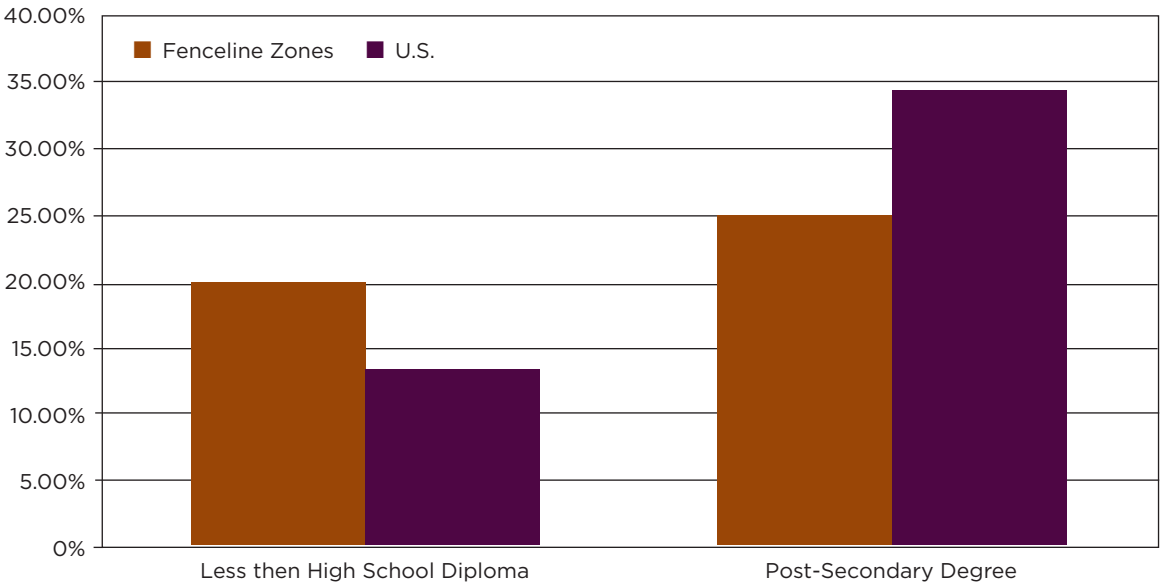


The percentage of Blacks in the fenceline zones is 75% greater than for the U.S. as a whole.

The percentage of Latinos in the fenceline zones is 60% greater than for the U.S. as a whole.

FIGURE 7

Educational Attainment in Fenceline Zones



The percentage of adults in the fenceline zones who did not complete high school is 46% greater than for the whole U.S. The percentage of adults in the fenceline zones who have completed post-secondary education is 27% lower than for the whole U.S.

Poverty (Table 6)

The poverty rate in the fenceline zones is much higher than in the vulnerability zones, and the poverty rate in both zones is higher than the national average. The poverty rate in the fenceline zones is 50% greater than the national average (21% compared to 14%) (Figure 8). Living in poverty is associated with many forms of social disadvantage, including less access to health care, higher disability rates, lower education levels, greater prevalence of substandard housing, exclusion, and greater exposure to environmental health hazards, to which can now be added disproportionate representation in the disaster vulnerability zones of chemical facilities.

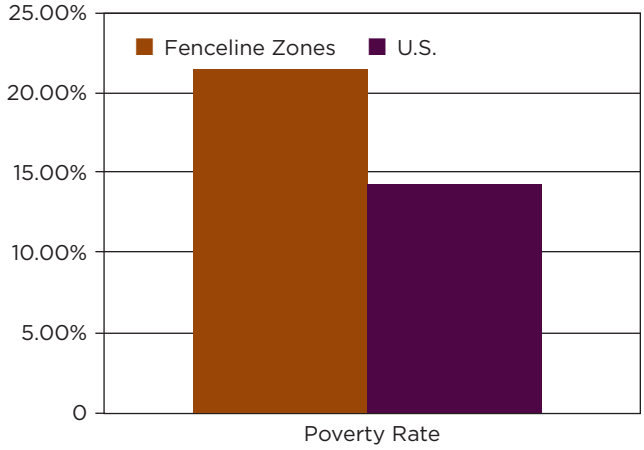
TABLE 6

Poverty Rates in the Vulnerability Zones

	Fenceline Zones	Vulnerability Zones	U.S.
People in Poverty	812,211	21,603,803	42,638,091
Poverty Rate	21.5%	16.2%	14.3%

FIGURE 8

Poverty Rate in Fenceline Zones



The poverty rate in the fenceline zones is 50% greater than the national average.

THE POVERTY RATE IN THE FENCELINE ZONES is 50% greater than the national average. Living in poverty is associated with many forms of social disadvantage, including less access to health care, higher disability rates, lower education levels, greater prevalence of substandard housing, exclusion, and greater exposure to environmental health hazards.

INDUSTRY SECTOR FINDINGS

The industry types included in this report are water treatment, wastewater treatment, bleach manufacturing, electric power generation, petroleum refining, pulp and paper production, and chemical manufacturing. The finding that facility vulnerability zones have lower housing values, lower incomes, greater Black and Latino populations, lower education levels, and higher rates of poverty than national averages is generally found across different types of industries, but does vary somewhat by industry. The tendency of racial, income, and other social status disparities to be more pronounced in the fenceline zones (one-tenth of the vulnerability zone distance) is also generally true across industries.

Certain industry sector findings stand out as showing the greatest disparities or most disproportionate impacts. For example, wastewater facilities, SOCMA member facilities, and pulp and paper mills had the highest percentage of Blacks in their fenceline zones (2.4 times. 2.3 times, and 2.2 times greater than for the U.S. as a whole, respectively). The percentage of Latinos living in the fenceline zones around bleach plants is twice as high as for the U.S. as a whole. When viewing the results in Tables 8 and 9 together, it appears that both Blacks and low-income whites are overrepresented near petroleum refineries and pulp and paper mills.

Discussion of alternatives that can reduce or eliminate vulnerability zone dangers in each industry type is included below in Removing Chemical Hazards: Solutions for Companies and Communities (page 35).

Housing Value by Industry Sector (Table 7)
Average home values are lower in the vulnerability zones than the national average for all but one industry sector examined. The lowest average home values in the full vulnerability zones are found around the pulp and paper industry facilities, 25% lower than the national average. Average home values in the fenceline zones are consistently lower across all sectors, often much lower, than in the full vulnerability zones. The *highest* average home values in the fenceline zones of particular industry sectors are only 77% of the national average. Again, the pulp and paper sector had low average home values in the fenceline zones around its facilities, 59% of the national average. Fenceline zones around SOCMA facilities showed the largest disparity in home values at just 51% of the national average. The bleach manufacturing industry actually showed a higher average home value, 107% of the national average, in the vulnerability zones. This may be the result of a masking effect from exceptionally large reported vulnerability zones around conventional bleach plants, which include more affluent neighborhoods that are often further away. The average home value in the fenceline zones for bleach manufacturing, which dropped to 77% of the national average, would seem to confirm that a masking effect is present.

TABLE 7
Housing Values in the Vulnerability Zones by Industry Sector

Industry Group	Fenceline Zone Average Home Value	Vulnerability Zone Average Home Value	U.S. Average Home Value
Water Treatment	$191,370	$218,375	$246,375
Percent of U.S. Average	77.7%	88.6%	100.0%
Wastewater Treatment	$173,216	$200,471	$246,375
Percent of U.S. Average	70.3%	81.4%	100.0%
Bleach Manufacturing	$190,976	$265,778	$246,375
Percent of U.S. Average	77.5%	107.9%	100.0%
Power Generation	$178,211	$213,186	$246,375
Percent of U.S. Average	72.3%	86.5%	100.0%
Petroleum Refining	$150,455	$230,166	$246,375
Percent of U.S. Average	61.1%	93.4%	100.0%
Pulp and Paper Production	$145,975	$183,757	$246,375
Percent of U.S. Average	59.3%	74.6%	100.0%
ACC Member Companies	$155,124	$244,021	$246,375
Percent of U.S. Average	63.0%	99.0%	100.0%
SOCMA Member Companies	$126,257	$209,013	$246,375
Percent of U.S. Average	51.3%	84.8%	100.0%

Household Income by Industry Sector (Table 8)
For every industry sector examined, household incomes are substantially lower than the national average in the fenceline zones. In some sectors, household incomes in vulnerability zones are close to the national average. This likely demonstrates a masking effect of facilities within these sectors that have very large vulnerability zones (ranging up to 25 miles). The industry sector with highest fenceline zone household incomes is water treatment, at 85% of the national average. The industry sector with the lowest fenceline zone household incomes is pulp and paper production, with incomes only two-thirds (66%) of the national average.

TABLE 8
Household Incomes in the Vulnerability Zones by Industry Sector

Industry Group	Fenceline Zone Income	Vuln. Zone Income	U.S. Average Income
Water Treatment	$62,385	$69,226	$73,033
Percent of U.S. Average	85.4%	94.8%	100.0%
Wastewater Treatment	$57,205	$66,898	$73,033
Percent of U.S. Average	78.3%	91.6%	100.0%
Bleach Production	$56,863	$73,078	$73,033
Percent of U.S. Average	77.9%	100.1%	100.0%
Power Generation	$60,087	$63,337	$73,033
Percent of U.S. Average	82.3%	86.7%	100.0%
Pulp and Paper Production	$48,583	$60,947	$73,033
Percent of U.S. Average	66.5%	83.5%	100.0%
Petroleum Refining	$57,758	$73,133	$73,033
Percent of U.S. Average	79.1%	100.1%	100.0%
ACC Member Facilities	$56,640	$72,592	$73,033
Percent of U.S. Average	77.6%	99.4%	100.0%
SOCMA Member Facilities	$50,976	$71,642	$73,033
Percent of U.S. Average	69.8%	98.1%	100.0%

Race and Ethnicity by Industry Sector (Table 9)
While our research consistently shows Blacks and Latinos more greatly represented in both vulnerability zones and fenceline zones than in the U.S. as a whole, the relationship of race and ethnicity to specific industry sectors is more varied. For example, Latinos are more highly represented near power plants but not pulp and paper mills, while the reverse is true for Black populations. Whites are less represented in the vulnerability zones of all sectors except pulp and paper mills. The percentage of Latinos in the fenceline zones near bleach plants is twice as high (or 100% greater) than for the U.S. as a whole. The percentage of Blacks in the fenceline zones near wastewater facilities, SOCMA member facilities, and pulp and paper mills is also quite high (2.4 times, 2.3 times, and 2.2 times greater than for the U.S. as a whole, respectively).

Regional characteristics may explain some of these variations. Latinos may be highly represented near power plants because of the significant number of these facilities found in California, Texas, Nevada, and other states that also have relatively larger Latino populations. These three states together host 38% of the power plants in this report, but less than 3% of the pulp and paper mills. Blacks may be more represented near pulp and paper mills because more than half of mills reviewed are in Southern states that also have higher Black populations.

Education by Industry Sector (Table 10)
People with the least formal education (less than high school) are overrepresented in the fenceline zones across all industry sectors examined compared to the U.S. as a whole. Conversely, people with the most formal education (a post-secondary degree) are underrepresented in the fenceline zones of all industry sectors examined. But for those in the middle (such as a high school degree or some college) there is less association. For those at either end of the spectrum—with the most or least formal schooling—disparities in education level are magnified in the fenceline zones when compared to the full vulnerability zones. Fenceline zones around SOCMA member facilities showed the largest disparity, with 25% of these residents having less than a high school education (compared to 14% nationally) and only 21% having a post-secondary degree (compared to 36% nationally).

TABLE 9

Race and Ethnicity in the Vulnerability Zones by Industry Sector

Sector	Area	White	Latino	Black	Other*
U.S. Averages	Nation	64.2%	16.1%	12.2%	7.57%
Water Treatment	Vulnerability Zone	49.5%	28.8%	14.9%	6.81%
	Fenceline Zone	46.8%	30.9%	16.1%	6.29%
Wastewater Treatment	Vulnerability Zone	51.8%	22.4%	18.4%	7.40%
	Fenceline Zone	38.2%	24.7%	29.5%	7.71%
Bleach Production	Vulnerability Zone	50.1%	26.0%	14.9%	8.95%
	Fenceline Zone	45.0%	32.6%	14.3%	8.06%
Power Generation	Vulnerability Zone	45.9%	32.4%	11.4%	10.3%
	Fenceline Zone	55.0%	27.4%	10.8%	6.84%
Petroleum Refining	Vulnerability Zone	58.3%	16.6%	18.1%	6.98%
	Fenceline Zone	63.4%	14.6%	17.3%	4.80%
Pulp and Paper Production	Vulnerability Zone	66.1%	5.9%	23.1%	4.84%
	Fenceline Zone	65.4%	4.5%	26.9%	3.31%
ACC Member Facilities	Vulnerability Zone	55.5%	18.3%	17.9%	8.29%
	Fenceline Zone	49.9%	20.4%	24.1%	5.61%
SOCMA Member Facilities	Vulnerability Zone	54.0%	17.0%	22.5%	6.53%
	Fenceline Zone	39.9%	27.2%	28.1%	4.74%

* Census category includes Asian, Pacific Islander, Native American, two or more races, and some other race.

TABLE 10

Education Levels in the Vulnerability Zones by Industry Sector*

Sector	Area	Less Than High School	High School/ Some College	Post-Secondary Degree**
U.S. Averages	Nation	14.3%	49.5%	36.2%
Water Treatment	Vulnerability Zone	17.2%	47.8%	35.0%
	Fenceline Zone	19.3%	48.8%	31.9%
Wastewater Treatment	Vulnerability Zone	17.1%	49.7%	33.2%
	Fenceline Zone	23.2%	47.8%	29.0%
Bleach Manufacturing	Vulnerability Zone	17.1%	46.9%	36.0%
	Fenceline Zone	21.9%	50.8%	27.3%
Power Generation	Vulnerability Zone	22.0%	50.1%	27.9%
	Fenceline Zone	21.7%	52.5%	25.9%
Petroleum Refining	Vulnerability Zone	14.3%	49.5%	36.2%
	Fenceline Zone	15.7%	59.1%	25.2%
Pulp and Paper Production	Vulnerability Zone	14.1%	54.3%	31.6%
	Fenceline Zone	17.7%	57.7%	24.6%
ACC Member Facilities	Vulnerability Zone	15.7%	48.3%	36.0%
	Fenceline Zone	19.9%	55.6%	24.5%
SOCMA Member Facilities	Vulnerability Zone	16.0%	49.2%	34.8%
	Fenceline Zone	25.0%	53.6%	21.4%

* Education figures include people 25 years and older.
** Post-secondary includes a completed Associate's, Bachelor's, Master's, Professional, or Doctorate degree.

Poverty by Industry Sector (Table 11)
For each industry sector examined, the poverty rate is higher in the vulnerability zones than the national average and consistently still higher in the fenceline zones. The highest poverty rates around facilities in this report are found in the fenceline zones of SOCMA chemical manufacturers (25% of residents living in poverty), wastewater plants (25%), and pulp and paper mills (24%), compared to the national poverty rate of 14%.

TABLE 11
Poverty Rates in the Vulnerability Zones by Industry Sector

Industry Group	Fenceline Zone Percent in Poverty	Vulnerability Zone Percent in Poverty	U.S. Percent in Poverty
Water Treatment	19.5%	17.5%	14.3%
Wastewater Treatment	25.5%	18.3%	14.3%
Bleach Manufacturing	21.1%	16.4%	14.3%
Power Generation	19.7%	18.9%	14.3%
Petroleum Refining	18.8%	15.3%	14.3%
Pulp and Paper Production	24.6%	18.0%	14.3%
ACC Member Companies	20.3%	16.3%	14.3%
SOCMA Member Companies	25.6%	16.7%	14.3%

Vulnerability Zone Distances and Affected Populations by Industry Type (Table 12)
Worst-case chemical release scenarios vary by industry. Average vulnerability zone distance ranges from 2.13 miles radius for water treatment facilities to 15.9 miles for bleach manufacturing facilities. Average vulnerability zone population ranges from 13,172 people for electric power production to 929,826 for bleach plants. Of the industry sectors studied in this report, chemical manufacturing and bleach manufacturing endanger by far the most people—almost 80 million for chemical manufacturing and almost 64 million for bleach (calculated separately by industry). On a per-facility average basis, bleach plants endanger the most people, with an average vulnerability zone that includes 929,826 people. As noted below in Chapter 3, safer chemicals and processes could dramatically reduce the size and population of vulnerability zones of these industry sectors.

Vulnerability Zones within Two Industry Sectors (Table 13)
The chemicals and processes used *within* industry sectors can also have a dramatic impact on the size of vulnerability zones. For example, the 202 power plants that use anhydrous ammonia (a toxic gas) have vulnerability zones that average 3.74 miles and 21,188 people, while the 86 power plants that use less hazardous aqueous (liquid) ammonia have vulnerability zones that average just 0.47 miles and 798 people. Similarly, a single highly hazardous process dominates the vulnerability zone profile of the petroleum refining sector. The 50 petroleum refineries that use

TABLE 12
Vulnerability Zone Distances and Affected Populations by Industry Sector*

Industry Sector	RMP Facilities	Vulnerability Zone Population	Vulnerability Zone Average Miles	Vulnerability Zone Average Population
Water treatment	1,284	33,692,612	2.13	34,951
Wastewater treatment	686	21,004,374	2.27	42,250
Bleach manufacturing	91	63,952,735	15.86	929,826
Electric power generation	334	4,052,030	2.51	13,172
Petroleum refining	130	18,484,212	7.49	232,550
Pulp and paper production	72	5,462,950	11.12	77,663
Chemical manufacturing**	778	79,726,744	6.48	208,415
ACC member facilities	715	77,046,976	6.53	213,607
SOCMA member facilities	107	18,459,503	6.33	205,805

* Figures are calculated separately for each industry group using methods that remove any double counting of facilities or persons. Industry sector figures in Table 12 cannot be added together to obtain national totals.

** Forty four RMP facilities in this report are members of both the American Chemistry Council (ACC) and the Society of Chemical Manufacturers and Affiliates (SOCMA).

TABLE 13

Vulnerability Zones within Two Industry Sectors*

Industry Sector	RMP Facilities	Vulnerability Zone Population	Vulnerability Zone Average Miles	Vulnerability Zone Average Population
Electric power generation	334	4,052,030	2.51	13,172
Using anhydrous ammonia	202	3,938,961	3.74	21,188
Using aqueous ammonia (conc. ≥ 20%)	86	64,864	0.47	798
Petroleum refining	130	18,484,212	7.49	232,550
Using hydrofluoric acid	50	17,733,913	16.28	551,558
Not using hydrofluoric acid	80	2,146,709	2.00	33,170

* Figures are calculated separately for each industry group using methods that remove any double counting of facilities or persons. Industry subsector figures in Table 13 cannot be added together to obtain industry totals.

hydrofluoric acid have vulnerability zones that average 16.3 miles and 551,558 people, while the 80 refineries that do not use hydrofluoric acid have much smaller vulnerability average zones of 2.0 miles and 33,170 people.

Overall, at the reviewed facilities chlorine gas was by far the most common chemical in worst-case release scenarios, reported by 2,054 facilities. Anhydrous ammonia gas was second, reported by 347 facilities. Anhydrous sulfur dioxide gas was third, reported by 143 facilities. Of the worst-case scenarios evaluated, 3,175 involve a toxic gas scenario and 258 involve a flammable chemical scenario.[23]

TABLE 14

Top Ten Chemicals in This Report

Chemical	Facilities*
Chlorine	2,054
Ammonia (anhydrous)	347
Sulfur dioxide (anhydrous)	143
Ammonia (conc. ≥ 20%)	109
Flammable mixture	80
Hydrofluoric acid (conc. ≥ 50%)	75
Chlorine dioxide	55
Ethylene oxide	51
Formaldehyde (solution)	50
Vinyl acetate monomer	39

* The number of facilities reporting the chemical as their worst-case scenario chemical.

Just some of the massive oil and chemical facilities in the Manchester, TX community.

CHAPTER THREE

REMOVING CHEMICAL HAZARDS: SOLUTIONS FOR COMPANIES AND COMMUNITIES

Fortunately, there are many ways by which companies can dramatically reduce or remove from workplaces and communities the major chemical hazards that cause tens of millions of people to live in vulnerability zones. A previous survey of high-hazard facilities identified some 20 industries in which safer and more secure alternatives are already in use, including all of the industry sectors studied in this report.[24] These options include a variety of alternate chemicals and processes.

WATER TREATMENT PLANTS

The water treatment plants cited in this report have 33.7 million people living in their merged vulnerability zones. These 1,284 water treatment plants have vulnerability zones that average 2.13 miles and 34,951 people. Water treatment plants commonly eliminate bulk chlorine gas (used to treat water) by using liquid bleach (sodium hypochlorite). Water plants increasingly generate their bleach on-site from salt and electricity. More than 235 water treatment plants had converted from chlorine gas according to just one partial survey of the industry.[25]

WASTEWATER PLANTS

The wastewater plants cited in this report have 21 million people living in their merged vulnerability zones. These 686 wastewater plants have average vulnerability zones of 2.27 miles and 42,250 people. Wastewater plants eliminate bulk chlorine gas (used to treat wastewater) by using liquid bleach, and eliminate sulfur dioxide gas (used to remove chlorine) by using sodium bisulfite, or eliminate both chemicals by using ultraviolet light. More than 300 wastewater plants have made such changes according to just one partial survey of the industry. When combined with the converted water treatment plants above, more than 40 million people no longer live in danger from one or more of these converted facilities.[26]

BLEACH MANUFACTURING PLANTS

The bleach manufacturing plants cited in this report have 63.9 million people living within their merged vulnerability zones. These 91 conventional bleach plants have average vulnerability zones of 15.9 miles and 929,826 people. Many conventional bleach plants receive chlorine gas in railcars, resulting in very large vulnerability zones as well as additional transportation hazards. A growing number of commercial bleach plants produce chlorine bleach as needed from salt and electricity without ever storing or transporting chlorine gas, an effective solution that removes the enormous vulnerabilities of this industry sector.[27]

© Les Stone/Greenpeace

Clara Smith looking out her window at the Shell refinery in Norco, LA.

ELECTRIC POWER PLANTS

The electric power plants cited in this report have four million people living within their merged vulnerability zones. Power plants that generate electricity substantially reduce vulnerability zones by converting from anhydrous ammonia gas (used to control nitrogen oxides, a component of smog) to less hazardous aqueous ammonia or even solid urea. Of the 334 total power plants, 202 use anhydrous ammonia, a toxic gas, and have average vulnerability zones of 3.74 miles and 21,188 people in areas where 3.9 million people live. In contrast, the 86 power plants that use safer aqueous ammonia have much smaller average vulnerability zones of 0.47 miles and 798 people in areas where 64,864 people live. Power plants can also avoid gaseous chlorine in cooling towers and process water by using liquid bleach.[28]

PULP AND PAPER MILLS

The pulp and paper mills cited in this report have 5.5 million people living in their merged vulnerability zones. These 72 pulp and paper mills have average vulnerability zones of 11.1 miles and 77,663 people. Some pulp and paper mills remove chlorine by employing an oxygen-based process with ozone or hydrogen peroxide; others avoid or minimize storage of chlorine dioxide.[29] These mills may also remove anhydrous sulfur dioxide by generating sulfur chemicals on-site.[30]

PETROLEUM REFINERIES

The petroleum refineries listed in this report have 18.5 million people living in their merged vulnerability zones (for 130 facilities). The hazards posed by concentrated hydrofluoric acid, a toxic gas used in refining high octane gasoline, dominate the catastrophic chemical hazards at petroleum refineries. However, many refineries already use sulfuric acid processes that are not covered by the RMP program because of low airborne release hazards. In addition, newer solid acid and liquid ionic catalysts are under development in the industry.[31] The 50 refineries that use concentrated hydrofluoric acid have average vulnerability zones of 16.3 miles and 551,558 people, and a total vulnerability zone population of 17.7 million people. In contrast, the 80 refineries that do not use hydrofluoric acid have average vulnerability zones of only 2.0 miles and 33,170 people, and a total vulnerability zone population of only 2.1 million people (Figure 9). Some refineries have removed chlorine gas from cooling towers by using liquid bleach; others avoid anhydrous ammonia in power cogeneration by using aqueous ammonia.

CHEMICAL MANUFACTURING FACILITIES

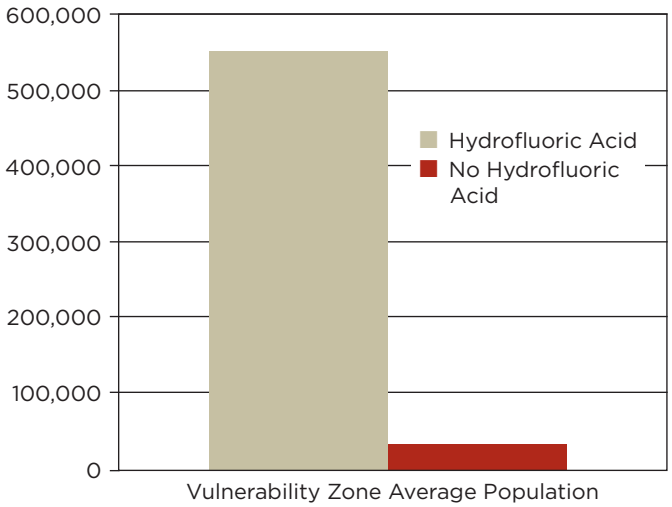
The chemical manufacturing facilities in this report include a combined 778 member company facilities of the American Chemistry Council (ACC) and Society of Chemical Manufacturers and Affiliates (SOCMA). These ACC and SOCMA facilities combined have average vulnerability zones of 6.48 miles and 208,415 people in areas where 79.7 million live. Of this total, 715 are ACC member company facilities with average vulnerability zones of 6.53 miles and 213,607 people in areas where 77 million people live. And 107 are SOCMA member company facilities with averages vulnerability zones of 6.33 miles and 205,805 people in areas where 18.5 million people live. In this report, 44 facilities are members of both ACC and SOCMA. Chemical manufacturers use diverse production processes and therefore varied solutions are applicable. Common hazard reduction strategies include adopting an alternate chemical or process, using a chemical in a less dangerous or less concentrated form, or generating a chemical only as needed without storage. For example, some manufacturers of polyurethane foam use soy-based polyols rather than store and transport bulk amounts of ethylene oxide. Some manufacturers of ferric chloride use hydrochloric acid below 37% concentration rather than store and transport bulk chlorine gas. And some detergent manufacturers have switched to on-site sulfur burning equipment rather than store and transport large amounts of sulfur trioxide.[32]

SAFER ALTERNATIVES CAN PROTECT COMMUNITIES WHILE AVOIDING COSTS AND LIABILITIES

An ounce of prevention is worth a pound of cure. And in the case of chemical disaster vulnerability zones, the prevention turns out to often be easily affordable. In one survey of nearly 200 respondent facilities that had converted to a safer chemical or process, about half spent less than $100,000 to switch and 87% spent less than $1 million.[33] Another survey found that twenty large water and wastewater facilities converted from chlorine gas, which they formerly received in vulnerable railcars, to safer alternatives for no more than $1.50 per person served each year—or the price of a small bag of peanuts—and often for much less.[34]

FIGURE 9

Hydrofluoric Acid and Petroleum Refineries



Petroleum refineries that DO NOT use hydrofluoric acid have average vulnerability zone populations of 33,170 people, compared to 551,558 people for refineries that DO use hydrofluoric acid.

One in ten students in the U.S. attend school within one mile of a high-risk chemical facility. Shown here, Whiting, IN.

© Global Community Monitor

In contrast, not seizing opportunities to switch to safer chemicals and processes can be surprisingly expensive. One insurance industry study projected $7 billion in potential damages from the worst-case release of a railroad tank car of chlorine in an urban area.[35] Damages from the April 2013 explosion of a single fertilizer facility in West, TX reportedly will start at $100 million.

Many facilities that switch to safer alternatives realize savings that offset some or all costs of converting. In a survey of converted facilities, respondents reported many types of *avoided* costs of safety and security measures that were no longer needed, including: safety devices and personal protective equipment; inspections, certifications, permits, and fees; higher risk-group insurance and potential liabilities; specialized emergency response teams, training, and planning; compliance with chemical related fire codes; chemical purchases; chemical thefts; physical security measures; worker and community notification; background checks; and regulatory compliance.[36]

Companies do not routinely analyze and document savings and avoided costs under the major chemical emergency safety and security laws, including EPA Risk Management Planning, OSHA Process Safety Management, and DHS Chemical Facility Anti-Terrorism Standards. Nor do these laws create any duty or obligation for chemical facility owners or operators to demonstrate knowledge of available alternatives, to justify decisions that result in immense but avoidable chemical hazards, or to reduce or remove these hazards. As a result, these laws don't develop cost-effective safer solutions and instead focus outcomes on more costly control and management strategies that inevitably fail some of the time. The costs of those failures are unduly borne by residents, workers, businesses and the local governments where they occur. And, as this report documents, these hazards, costs, and harms are disproportionately borne by low-income, Black, and Latino residents. Requiring hazardous chemical facilities to systematically review, document, and justify alternatives to highly hazardous chemical operations, and convert when appropriate, could modernize chemical safety and security.[37]

CHAPTER FOUR

CONCLUSIONS AND RECOMMENDATIONS

This report finds that more than 134 million Americans live within one or more vulnerability zones of 3,433 chemical facilities that use or store highly hazardous chemicals. Our research demonstrates that the percentages of African Americans and Latinos who live in these vulnerability zones, and especially within the fenceline zones closest to the facilities, are much greater than for the U.S. as a whole. We also document additional disparities: lower average home values, lower average household incomes, lower education levels, and greater rates of poverty in these zones than for the U.S. as a whole. Many people who live in the fenceline zones are aware that they are exposed to toxic chemicals regularly and are at risk of a chemical disaster. Others—especially those who live further from a facility but still within range of a catastrophic release—may be unaware of the dangers. **After years of grassroots organizing and mobilizing, testimony to government agencies, and studies that demonstrate the pattern of environmental racism described in this report, the U.S. government has been notified of the hazards created by chemical facilities and the threats these hazards pose to human life and communities.**

It is time to finally and fully address the inequitable distribution of these dangers, and the need for everyone—regardless of race, income, or education—to be protected by the government from chemical disasters. The time to act was firstly in 1964, when the Civil Rights Act was passed, prohibiting discrimination and disproportionate impacts on the basis of race, color, or national origin. The percentage of African Americans living in the fenceline zones of chemical facilities studied in this report is 75% greater than for the U.S. as a whole, and the percentage of Latinos in the fenceline zones is 60% greater than for the U.S. as a whole. These and other findings in this report document a pattern of disproportionate exposure to chemical hazards created over a long period of time, which should be considered discrimination under Title VI of the Civil Rights Act. The time to address these dangers was also twenty years ago, when President Clinton signed Executive Order 12898 on Environmental Justice.

It is past time for local, county, and state governments, state and federal agencies, Congress, the White House, and the industries themselves to act aggressively to protect the lives of people living near and working in these facilities from chemical disasters.

The question now is: what will it take for government and industry to finally act to prevent disasters, and protect the communities and workers whose safety and security are unfairly and unequally put in jeopardy? The path toward safety and justice is for government and industry to take precautionary steps that include affordable, common sense measures. Precautionary measures would reduce and eliminate unnecessary hazards, improve oversight of the facilities, and produce better engagement of communities living near these facilities and the workers who staff them. Three central approaches could dramatically improve chemical facility safety and security: **requiring safer chemicals and processes when feasible**; **improving laws and regulations**; and **fully engaging workers and communities**. Without taking these approaches, government and industry will continue to deny to the people living and working in the vulnerability zones their right to clean air, water, and land.

SAFER AND MORE SECURE ALTERNATIVES

Many of the dangers cited in this report could be substantially reduced or entirely removed by replacing hazardous chemicals and processes with existing safer alternatives. For example, many wastewater treatment plants have removed highly toxic chlorine gas by switching to ultraviolet light disinfection. Such options remove the potential for a major chemical release that could harm employees and the public, rather than only attempting to control the hazard with fallible controls or security strategies. Those living and working in the vulnerability zones and fenceline zones have the most to gain from this approach. Companies also

benefit when they convert to safer chemicals and processes by avoiding the costs and liabilities of controlling, managing, mitigating, and remediating chemical hazards. In this way, using safer materials or processes can uniquely improve economic performance and reduce potential harm to those working or living nearby—the proverbial win-win solution.

The Pollution Prevention Act of 1990 makes it the national policy of the United States to reduce hazards to public health and the environment through source reduction (such as substituting safer materials for hazardous ones) prior to any add-on pollution management and control.[38] Congress also intended the Clean Air Act Amendments of 1990 to give preference to "**measures which entirely eliminate the presence of potential hazards … as opposed to those which merely provide additional containment….**"[39] Nonetheless, current chemical safety and security policies and practices are oriented toward risk management, rather than finding and using safer and more secure alternatives.

Prevention through design is the only major chemical safety and security approach that is largely undeveloped in current U.S. regulations, which attempt to control and manage chemical hazards much more than prevent and avoid these hazards. That said, the United States must shift immediately from a "risk management" regime to a "prevention-based" regime. Under the current risk management regime, the most complete and effective solutions are left out. Adding management features may reduce the frequency of serious accidents but not the underlying hazard.[40] Under a safety-based or prevention-based regime, strategies include the reduction or removal of potential catastrophic consequences from ongoing operations.

Government agencies at all levels should formally adopt a prevention-focused approach that gives preference to prevention through design before control, management, mitigation, or remediation strategies. Regulated facilities should be required to demonstrate knowledge of their major chemical hazards and options to reduce or remove those hazards, switch to safer alternatives when feasible, and fully justify any decisions not to convert.

Federal agencies should seamlessly incorporate these requirements into existing programs, in particular EPA Risk Management Planning (RMP), OSHA Process Safety Management (PSM), and DHS Chemical Facility Anti-Terrorism Standards (CFATS). These agencies should also collect and disseminate basic information from facilities that are no longer covered by these programs because they have removed their underlying hazards, in order to share lessons learned and best practices. The EPA should use its existing authority under 112(r)(7)(A) of the Clean Air Act to develop standards for the avoidance of catastrophic chemical hazards. EPA should also update guidance under 112(r)(1) of the Clean Air Act to prioritize prevention in enforcement.

Residents of the Manchester community near Houston, TX demand environmental justice.

© Bryan Parras

For example, an EPA Risk Management Plan (RMP) consists of a hazard assessment, a prevention program, and an emergency response program. The RMP prevention program includes 12 general elements, but no explicit analysis of safer options. Similarly, a process hazards analysis conducted under OSHA Process Safety Management (PSM) requires a facility owner or operator to identify hazards and then controls to abate those hazards. There is also no requirement under OSHA PSM to identify and document ways to reduce, remove, or modify the underlying hazard—even when affordable alternatives are readily available. Likewise, vulnerability assessments and site security plans conducted under DHS Chemical Facility Anti-Terrorism Standards (CFATS) are subject to 18 performance standards for conventional security measures such as perimeter security, access controls, and cyber security. But none of the CFATS performance standards address making the facility a less attractive target by avoiding intrinsic hazards.

BOX 2
The Toxic Substances Control Act and Chemical Safety

While this report primarily examines populations that could be exposed to acute airborne chemical releases, other aspects of the federal chemical safety system, such as chronic health hazards, also lack preventive approaches. The Toxic Substances Control Act of 1976, or TSCA, discourages innovation and encourages the ongoing use of hazardous chemicals even when safer alternatives might be available. TSCA largely exempts all chemicals that existed in 1976, encouraging continued use of these older chemicals and limiting both health and safety assessment and investigation into existing or possible safer alternatives. Even for chemicals registered since 1976, a series of barriers make it difficult for EPA to require complete safety assessments and virtually impossible for the agency to restrict even the most dangerous chemicals. Since 1976, only five chemicals have ever been restricted under TSCA, and even asbestos could not be fully removed from commerce under the law. TSCA must be revised to include requirements for full disclosure of toxic substances made and used, safety determinations on all chemicals, prompt phase out of the most toxic chemicals, protection for disproportionately impacted "hot spot" communities and the most vulnerable populations, and innovation incentives for identifying new safer chemicals.

In short, federal programs almost universally fail to require facilities that store or use highly hazardous chemicals and endanger millions of people (who are disproportionately Black, Latino, and poor) to determine whether safer alternatives could be used instead. This failure ensures that cost-effective means to address chemical hazards by avoiding them altogether are routinely ignored in planning and analysis.

Voluntary industry public relations programs, such as the American Chemistry Council's "Responsible Care," also do not document and disclose options and costs of removing catastrophic chemical hazards, nor do they have any measurable goals and timelines to reduce the vulnerability zones of chemical companies. Also, there has been little or no meaningful involvement of workers or fenceline communities as joint decision makers. Voluntary industry programs have simply not produced substantial, documented progress. In nearly 30 years since the chemical gas disaster at Bhopal, India, and 15 years since companies first filed RMP vulnerability zone reports, the industry as a whole has still not even acknowledged the basic expectation of workers and communities that companies should remove catastrophic chemical hazards wherever possible.

MORE EFFECTIVE LAWS AND REGULATIONS

Better and more equitable enforcement of existing laws would help, but can't fix the underlying problem of failed policies. Providing more resources to the federal agencies that oversee chemical safety and security could improve compliance, but would not address underlying limitations that reduce these agencies' effectiveness. The regulatory system overseeing chemical security and safety needs to be overhauled and strengthened. In addition to requiring use of safer alternatives when feasible (addressed above), this effort should harmonize the regulatory programs currently in place, and eliminate loopholes and weaknesses.

Existing patchwork laws and infrequent inspections entirely miss some hazardous operations and conditions. For example, no major law, standard, or code prohibits the conditions that apparently contributed to the blast that destroyed an entire neighborhood around the West, TX fertilizer facility in April 2013 and are found at many similar fertilizer facilities. These conditions include flammable wooden storage bins, lack of fire-suppression sprinkler systems, and use of conventional detonable forms of ammonium nitrate.[41] Federal agencies should immediately and comprehensively review chemical security and safety

Raven Pena (left), Juan Parras, and Yudith Azareth Nieto from Texas Environmental Justice Advocacy Services (t.e.j.a.s.) advocating for safer chemicals in Washington, DC.

© t.e.j.a.s.

requirements to ensure that their coverage is complete and that the programs complement and reinforce each other.

Where regulations are based on lists of hazardous chemicals, agencies should regularly review the lists and add new chemicals as appropriate through a rulemaking process on a short schedule, such as every two years. This would help agencies fill gaps and stay current with the ever-changing landscape of chemicals in commerce. But the better approach is to use chemical hazard characteristics and basic thresholds to trigger requirements, as is the case for hazardous inventory reporting under the Emergency Planning and Community Right-to-Know Act and for Safety Data Sheets under OSHA's Hazard Communication Standard. This approach would help ensure that the broadest number of chemicals of concern, types of hazards, and facilities are promptly covered in a consistent manner. Federal regulations should always include, prioritize, and promote safer alternatives.

Government agencies should immediately require chemical facilities to identify and document hazardous materials and conditions, the potential consequences of major releases, the specific measures that can address these scenarios, and possible further measures to reduce hazards. This is especially important in overburdened communities that lack appropriate land-use zoning laws and where facilities are concentrated. There are forward-thinking chemical management laws in place, among them the State of New Jersey and Contra Costa County in California. The strongest elements of these laws have various requirements related to comprehensive reporting on chemical inventories and processes, as well as documented review of chemicals and processes that can remove hazards. The central elements of these programs go beyond current federal requirements through a critical focus on prevention.

Facilities should be required to replace hazardous chemicals with safer alternatives when feasible, and to justify in detail decisions to not convert when alternatives are available, effective, and affordable. These demonstrations should be verified through frequent engagement from knowledgeable inspectors, preferably funded through industry hazard fees to cover the costs of inspections, auditing, air monitoring, and other oversight.

Government agencies should also identify and eliminate regulatory provisions that weaken public protections and

leave us less safe. Some laws actually contribute to the problem. For example, common carrier railroads are required to carry extremely hazardous cargoes without sharing the costs of enormous potential liabilities with shippers. The result is systematic overuse of vulnerable railcars for shipping and storing extremely hazardous substances and unwanted, potentially ruinous liabilities for the railroads. Hazardous chemical facilities are not required to carry liability insurance commensurate with a worst-case incident, which encourages continued use of the most hazardous chemicals and often results in tax-payer-funded cleanups. It is not common practice for local planners to evaluate vulnerability zones and conduct environmental justice analysis when making decisions to approve new facilities, expand existing sites, or approve housing development, an omission that contributes to the very problems documented in this report.

Local Emergency Planning Committees should be supported and strengthened by ensuring that they have the resources to increase transparency and community engagement, preferably funded through fees paid by the industries creating the hazards.

INFORMED AND ENGAGED WORKERS AND COMMUNITIES

Residents and workers exposed to or endangered by hazardous chemicals have a right to know about both the dangers and alternatives. An informed and engaged workforce and public make facilities and communities safer. Access to information about hazards and solutions can help fix problems before a disaster happens. All levels of government should immediately adopt enforceable requirements for chemical facilities to provide workers, governments, and communities better information about available safer options.

Chemical safety and security programs must disclose basic information about hazardous chemical operations. For instance, disclosing the names and locations of

Extremely hazardous chemicals are often stored for long periods near homes and schools in unsecured rail cars like the ones shown here in Louisville, KY.

© Elizabeth Crowe

regulated facilities, chemical names and quantities, the status of reporting, status of inspections, notices of violations, and other general information would allow the public to better understand which facilities are following safety rules and which are not. Linking this information through a single facility identification number across all governmental programs would also facilitate effective oversight by revealing gaps in regulations and deficiencies in performance. Use of "smart reporting" tools (software that automatically flags incorrect data entry of information, such as a zip code that does not match an address) would improve the accuracy of company-reported data, including the RMP data used in this report.

The Clean Air Act Amendments of 1990 took steps to manage worst-case chemical hazards by requiring companies that use large amounts of certain extremely hazardous substances to prepare Risk Management Plans (RMPs). The plans include chemical facility self-assessments of potential worst-case chemical releases, including off-site consequences—the vulnerability zone scenarios that inform this report.

In 1999, Congress limited public access to these scenarios, but without adopting policies to reduce vulnerability zones or prevent disasters, despite the fact that industrial facilities are generally already widely known, readily observed, or easily discovered. Chemical disasters, such as the fertilizer facility explosion that devastated West, TX, demonstrate that these potential risks should not be hidden. The public, shareholders, and workers have a need and right to be informed about dangers and available means to remove those dangers, to work with experts of their choosing, and to benefit from informed oversight by government agencies. Excessive secrecy makes government ineffective and costs lives in a chemical emergency. Communities and decision-makers at all levels have a right and responsibility to know about hazards and solutions.

THE TIME FOR ACTION IS NOW

The need for action to prevent a catastrophic chemical disaster is urgent—workers, communities, businesses, and governments face severe potential costs to life, health, and finances from chemical hazards that are ultimately preventable. Waiting for a catastrophic release is not acceptable. The United States must shift its framework from a risk management regime to a precautionary, prevention-based regime. If not, communities that already bear the brunt of industrial pollution will also bear the greatest harm from a chemical disaster, making this one of the central environmental justice issues of our time.

We demand that the following recommendations be addressed promptly and with concrete actions by the President, Congress, federal agencies, State and local governments, courts, and the chemical industry:

- Implement national, state, local and industry systems based on prevention and safety (rather than incident management) that require chemical facilities to use safer chemicals and processes whenever feasible, in order to reduce the frequency and severity of chemical facility releases;
- Prioritize the most endangered and vulnerable populations by passing and implementing laws that protect the health and safety of workers, first responders, people of color, low-income communities, women and children, and the communities surrounding these facilities;
- Recognize, implement, and enforce the Civil Rights Act of 1964 to protect communities from the disproportionate impacts of chemical disasters and the lack of appropriate regulations;
- Adopt and strengthen statutes and regulations—including the Secure Chemical Facilities Act and the Toxic Substances Control Act—to promote chemical safety and uphold the recommendations described in this report;
- Fully implement Executive Order 12898: Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations, and Executive Order 13650: Improving Chemical Facility Safety and Security;
- Require full disclosure to workers and communities of the types and amounts of chemicals stored at facilities *and* of alternatives that could reduce or remove hazards.

ENDNOTES

1 This report uses U.S. Census data, in which "Hispanic or Latino" refers to a person of Cuban, Mexican, Puerto Rican, South or Central American, or other Spanish culture or origin regardless of race, and "Black or African American" refers to a person having origins in any of the Black racial groups of Africa, inlcuding people who indicated their race(s) as "Black, African American, or Negro" or reported entries such as African American, Kenyan, Nigerian, or Haitian.

2 For demographic analysis of populations around some two-dozen specific facilities, see also Rick Hind et al, *The Danger in Our Backyards* (Greenpeace, Los Jardines Institute, Environmental Justice and Health Alliance for Chemical Policy Reform, and Advocates for Environmental Human Rights, January 2013).

3 The U.S. Chemical Safety and Hazard Investigation Board (CSB) screened news media reports of 1,275 high consequence incidents over a recent five-year period, 2009–2013. High consequence incidents result in injury, fatality, acute environmental damage, evacuation or shelter-in-place of 500 or more members of the public, onsite property damage greater than $500,000, or offsite property damage. The CSB data do not represent the universe of all chemical incidents.

4 Henry K. Lee, "Richmond sues Chevron over refinery fire," *San Francisco Chronicle*, August 2, 2013, accessed April 20, 2014, *http://www.sfgate.com/bayarea/article/Richmond-sues-Chevron-over-refinery-fire-4703370.php*

5 Robert D. Bullard, Ph.D, et al, *Toxic Wastes and Race at Twenty, 1987–2007* (United Church of Christ Justice and Witness Ministries, March 2007). This study found that over half (56%) of all people living within 3.0 km of a hazardous waste facility in the U.S. are people of color, and where such facilities are clustered people of color make up over two-thirds (69%). Poverty rates are also much higher in the areas within 3.0 km of such facilities than nationally (18% vs. 12%).

6 See reviews by: (1) Lester, J.P., D.W. Allen, and K.M. Hill. 2001. *Environmental Injustice in the United States: Myths and Realities*. Boulder, CO: Westview Press; (2) Mohai, P., and B. Bryant. 1992. "Environmental Racism: Reviewing the Evidence." In B. Bryant and P. Mohai (Eds.), *Race and the Incidence of Environmental Hazards: A Time for Discourse* (163–176). Boulder, CO: Westview Press; (3) Mohai, P., and R. Saha, 2006. "Reassessing Racial and Socioeconomic Disparities in Environmental Justice Research". *Demography* 43(2): 383–399; (4) Ringquist, E. 2005. "Assessing Evidence of Environmental Inequities: A Meta-Analysis." *Journal of Policy Analysis and Management* 24(2): 223–247; (5) Goldman, B.A. 1994. *Not just prosperity: Achieving sustainability with environmental justice.* Washington, DC: National Wildlife Federation.

7 Art Levine, "Dick Cheney's Dangerous Son-in-Law: Philip Perry and the politics of chemical security," *The Washington Monthly,* March 2007.

8 See "Obama and Obama Administration Examples of Support for Chemical Disaster Prevention," accessed April 20, 2014, *www.documentcloud.org/documents/563364-obama-amp-his-administrations-policy-on-chem.html.*

9 House, *Chemical and Water Security Act of 2009,* 111th Congress, 2009–2010, H.R. 2868.

10 See for example, U.S. Government Accountability Office, *Wastewater Facilities: Experts' Views on How Federal Funds Should Be Spent to Improve Security,* GAO-05-165 (Washington, DC: U.S. Government Printing Office, January 2005).

11 See for example, U.S. Chemical Safety and Hazard Investigation Board, *Draft Investigation Report: Catastrophic Rupture of Heat Exchanger (Seven Fatalities), Tesoro Anacortes Refinery, Anacortes, Washington*, Report 2010-08-I-WA (January 2014), which among other recommendations calls for the U.S. EPA to "use inherently safer systems analysis and the hierarchy of controls to the greatest extent feasible in establishing safeguards for identified process hazards."

12 Section 112(r) of the Clean Air Act Amendments of 1990.

13 U.S. Environmental Protection Agency, RMP* National Database (without OCA Data), March 3, 2014.

14 The average vulnerability zone radius for the 3,433 facilities included in this report is 4.11 miles.

15 This report does not analyze demographic characteristics of employees, contractors, or non-residential off-site populations because this information is not included in Risk Management Plans or available Census information.

16 See for example, U.S. Chemical Safety and Hazard Investigation Board, *Investigation Report: E.I. DuPont de Nemours & Co., Belle, West Virginia*, Report 2010-6-I-WV (September 2011).

17 See for example, United States Fire Administration, Technical Report Series, *Massive Leak of Liquefied Chlorine Gas: Henderson, Nevada, USFA-TR-05 (May 6, 1991).*

18 See for example, U.S. Chemical Safety and Hazard Investigation Board, *Final Investigation Report: Pesticide Chemical Runway Reaction Pressure Vessel Explosion (Two Killed, Eight Injured), Bayer CropScience, Institute, West Virginia,* Report 2008-08-I-WV (January 2011).

19 See for example, National Transportation Safety Board, *Cargo Hose Rupture and Release of Anhydrous Ammonia During Offloading of a Werner Transportation Services Cargo Tank Motor Vehicle at the Tanner Industries Plant, Swansea, South Carolina, July 15, 2009,* NTSB/HZM-12/01/SUM (2012). In 2009, a mother died of ammonia poisoning after driving her car into a cloud of anhydrous ammonia leaking from a Tanner Industries facility in Swansea, SC.

20 Only 60% of residents heeded siren, phone, and media warnings to stay indoors after an incident at an Equilon oil refinery; "One-quarter didn't obey Martinez refinery warning," *Contra Costa Times*, November 7, 2001.

21 These totals count only once people who live within the vulnerability zones of more than one facility.

22 Average individual incomes show a similar proportional decline, from $34,960 in the U.S., to $34,043 in the vulnerability zones, and to $27,129 in the fenceline zones.

23 This report lists only the chemical associated with each facility's largest potential vulnerability zone; covered facilities may hold other chemicals that also pose serious hazards.

24 Paul Orum, *Chemical Security 101: What You Don't Have Can't Leak, or Be Blown Up by Terrorists* (Center for American Progress, November 2008).

25 Reece Rushing and Paul Orum, "Leading Water Utilities Secure Their Hazards" (Center for American Progress, March 2010).

26 Rushing and Orum, "Leading Water Utilities Secure Their Hazards."

27 Commercial producers of liquid bleach from salt and electricity without bulk transportation and storage of chlorine gas include Odyssey Manufacturing (Tampa, FL); BleachTech (Seville, OH and Petersburg, VA); Kuehne Chemical (Delaware City, DE); FSTI (Greenville, TX); Buckman's (Pottstown, PA); Allied New Technologies, (Fort Pierce, FL); and KIK (Denver, CO). In addition, K2Pure Solutions (Pittsburg, CA) co-locates with and supplies Dow Chemical eliminating previous deliveries of chlorine by railcar.

28 Previous analysis of vulnerability zones and safer alternatives at power plants can be found in Paul Orum, *Unnecessary Dangers: Emergency Chemical Release Hazards at Power Plants* (Working Group on Community Right-to-Know, July 2004).

29 Alex Fidis, *Pulp Fiction: Chemical Hazard Reduction at Pulp and Paper Mills* (U.S. Public Interest Research Group Education Fund, August 2007).

30 Orum, *Chemical Security 101.*

31 *A Risk Too Great: Hydrofluoric Acid in U.S. Refineries*, United Steelworkers, Tony Mazzocchi Center, New Perspectives Consulting Group, April 2013.

32 Orum, *Chemical Security 101.*

33 Paul Orum and Reece Rushing, *Preventing Toxic Terrorism: How Some Chemical Facilities Are Removing Danger to American Communities* (Center for American Progress, April 2006).

34 Paul Orum, *Toxic Trains and the Terrorist Threat: How Water Utilities Can Get Chlorine Gas Off the Rails and Out of American Communities* (Center for American Progress, April 2007).

35 *Catastrophe, Injury, and Insurance: The Impact of Catastrophes on Workers Compensation, Life, and Health Insurance* (Risk Management Solutions, Inc., 2004).

36 Orum and Rushing, *Preventing Toxic Terrorism.*

37 The Secure Chemical Facilities Act (S.68) would require chemical facilities to document: "the technical feasibility, costs, avoided costs (including liabilities), personnel implications, savings and applicability of implementing each method to reduce the consequences of a terrorist attack." The Secure Water Facilities Act (S.67) proposes parallel language for water and wastewater facilities to review the feasibility and "costs (including capital and operational costs) and avoided costs (including savings and liabilities) associated with applying each method to reduce the consequences of a chemical release...."

38 Pollution Prevention Act of 1990, 42 U.S.C. § 13101.

39 Senate Committee on Environment and Public Works, *Report on the Clean Air Act Amendments of 1990, 106th Congress*, S. Report 101-228, at 209 (2000).

40 "Normal accidents" are considered inevitable, especially in complex environments, since the interaction of multiple small failures foils even the most effective conventional safety arrangements. See Charles Perrow, *Normal Accidents: Living With High Risk Technologies* (Princeton University Press, 1999).

41 The OSHA Explosives and Blasting Agents Standard (1910.109(i)) and National Fire Protection Association codes are among relevant standards that do not prohibit conditions found at West Fertilizer and many similar facilities.

APPENDIX A
METHODOLOGY

This report investigates the demographic composition of populations residing within vulnerability zone distances that are self-reported to the EPA's Risk Management Plan (RMP) program by facilities in several industry groups. This program requires facilities that produce, handle, process, distribute, or store threshold amounts of certain extremely hazardous toxic or flammable chemicals to submit an RMP that includes a vulnerability zone analysis (more generally called an "offsite consequences analysis") for a worst-case release of one of these chemicals.

The vulnerability zone is a circular area with a radius extending between 0.01 and 25 miles from the facility. The size of the zone depends on the quantity and characteristics of the chemical. EPA defines the general methods that facilities subject to RMP requirements (RMP facilities) must use in determining vulnerability zone size or distance (radius), but companies can use any credible modeling method that follows the EPA guidelines.

The most common methods used by RMP facilities to determine vulnerability zone distances include EPA guidance reference tables or equations, dispersion models such as Areal Locations of Hazardous Atmospheres (ALOHA) or Dense Gas Dispersion (DEGADIS), and EPA's RMP*Comp planning program.[a] RMP facilities determine vulnerability zones based on the largest potential chemical release from a single vessel or process under conditions that result in the maximum possible affected area. Worst-case scenarios apply to residential populations only (i.e., they do not include people who visit, work, shop, recreate, or worship in the zones) and are not forecasts of potential casualties. All people living or working within vulnerability zones are at risk of serious harm, but actual impacts of a release would vary due to weather, wind direction, distance from the facility, and activities nearby populations were engaged in at the time.

RISK MANAGEMENT PLAN

(RMP) facilities determine vulnerability zones based on the largest potential chemical release from a single vessel or process under conditions that result in the maximum possible affected area.

We obtained RMP program and facility identification data other than vulnerability zone information in an electronic file through a Freedom of Information Act request to the U.S. EPA. Members of the public can also identify RMP facilities by using RTKNET, a project of the Center for Effective Government, at *www.rtknet.org/db/rmp*. However, off-site consequences analysis portions of the RMPs (including the vulnerability zone distance and the chemical that is the basis of the worst-case release scenario) are only available to the public in a restricted manner through designated federal reading rooms.[b] We gathered this RMP data (presented in Appendix C) in standardized notes made through multiple visits to the federal reading rooms within the last five years.

We used RMP data that companies had submitted to EPA current as of December 27, 2013. Companies submit RMPs on an ongoing basis, at a minimum every five years or when there are significant changes to the chemical hazards that make a facility subject to the RMP program. For this reason, we did not include 66 facilities that had RMP

a RMP dispersion modeling methods are described in United States Environmental Protection Agency, Office of Solid Waste and Emergency Response, *Risk Management Program Guidance for Offsite Consequence Analysis*, EPA 550-B-99-009 (Washington, DC: U.S. Government Printing Office, March 2009).

b For information on accessing RMP data through the federal reading rooms, see *www.epa.gov/oem/content/rmp/readingroom.htm*.

re-submissions overdue by six months or more. We also did not include RMP facilities in Puerto Rico or U.S. Territories.

Our facility selection criteria were:

1. Facilities that belong to the following industry sectors: potable water treatment, wastewater treatment, commercial bleach manufacturing, electric power production, petroleum refining, pulp and paper production, and chemical manufacturing. We included these industry sectors because of their diversity and varied dispersion patterns.

2. Facilities that self-reported in their RMP having 100,000 or more people living within their vulnerability zones, regardless of industry sector. We included these facilities regardless of industry type because they pose dangers to relatively large populations.

We applied our selection criteria using the following procedures:

- We identified facilities in the industry sectors other than chemical manufacturing primarily based on their self-reported North American Industry Classification System (NAICS) codes, and secondarily based on facility name or other descriptive information. In some cases, facilities reported more than one industrial activity, in which case we relied on the facility's primary reported industrial activity.

- We identified facilities belonging to the chemical manufacturing industry based on company facilities' membership in the two primary chemical manufacturing industry trade associations: the American Chemistry Council (ACC) and the Society of Chemical Manufacturers and Affiliates (SOCMA). These trade associations represent companies that produce the bulk of basic and specialty chemicals in the U.S. We identified ACC and SOCMA members by comparing RMP facility names, parent companies, and Dun and Bradstreet numbers to companies listed on the associations' websites through December 28, 2013. In some cases it was difficult to determine whether a particular facility is covered by trade association membership. A weakness of these industry programs is that they identify member companies but not directly member facilities. In addition, companies may have changed name or ownership but failed to update EPA registrations as required. In ambiguous cases, we used our best judgment based on parent company information. Collectively, facilities belonging to those trade associations comprised what this report refers to as the chemical manufacturing sector.

- As noted above, we used information from company RMPs that we gathered from federal reading rooms to identify facilities that reported 100,000 or more people living within their vulnerability zones.

After identifying facilities that met the above selection criteria and gathering RMP data for the facilities, we used facilities' self-reported latitude-longitude data to establish facility locations and mapped them using Geographic Information System (GIS) software (ESRI ArcGIS Desktop Advanced 10.2). We corrected location data only for nine facilities that had obviously inaccurate geographic coordinates that placed the facility in the ocean.[c] We otherwise relied on latitude-longitude location data directly as reported by the facilities in their RMPs.

We used the most recent Census tract-level population data covering the entire country (2008–2012 American Community Survey 5-Year Estimates) to calculate the demographic composition of the populations living within vulnerability zones.[d] To do so we used the same method used in *Toxic Wastes and Race at Twenty,* known as the areal apportionment method. This method involves using GIS to intersect the 2010 Census tract boundaries[e] with the circles that define facility vulnerability zones, and then summing the population living in any tract that lies

c The nine facilities for which we did not rely on plainly erroneous latitude-longitude data and instead used the facility street address were: Tesoro Hawaii Corporation- Refinery (RMP ID 100000034107); Chevron El Segundo Refinery (100000101454); WJCMWD, Water Treatment Plant (100000197761); Total Petrochemicals & Refining U.S.A. Inc. (100000159286); Keegan Bayou Wastewater Treatment Plant (100000053354); D'Iberville Wastewater Treatment Plant (100000053498); Long Beach/Pass Christian Treatment Plant (100000050437); South Gulfport Wastewater Treatment Plant (100000050614); and West Biloxi Wastewater Treatment Plant (100000049814).

d We obtained the Census data tables through Data Ferrett at *http://thedataweb.rm.census.gov/TheDataWeb/launchDFA.html*

e Census tract boundaries used part of the ESRI ArcGIS Desktop Advanced 10.2 software.

entirely within the vulnerability zone with estimates of the population in any tract that lies partially within the zone.[f] For the latter type of tract, the proportion of the tract area within the vulnerability zone is used to estimate the population of the partially intersected tract, whereby the population is estimated by multiplying the proportion of the area of the tract within the vulnerability zone distance times the total population for the tract. For example, if 30% of the area of the tract lies within that distance, then 30% of the population is estimated to live within that distance. Similar apportioning was used to estimate tract subpopulations, for example, the number of people of different races in vulnerability zones. This method estimates the population living in these circular areas that do not directly correspond with the shapes of Census tracts. It assumes that the population is evenly distributed throughout the tract and has been shown to yield reliable and consistent results for distances of about a half mile or more (Mohai and Saha 2007).

For the vulnerability zone population estimates, we used the following tables from the 2008–2012 American Community Survey 5-Year Estimates:

- **Average home value**—Table B25080, Aggregate Value (Dollars) by Units in Structure;
- **Mean household income**—Table B19025, Aggregate Household Income in the Past 12 Months;
- **Race and ethnicity**—Table B03002, Hispanic or Latino Origin by Race;
- **Educational attainment levels—**Table B15003, Educational Attainment for the Population 25 Years and Over;
- **Poverty rates**—Table B17001, Poverty Status in the Past 12 Months by Sex and Age.

Demographic data for individual facility vulnerability zones presented in Appendix C may differ from population data that facilities self-report to EPA in their RMPs, which may have been determined using different methods or earlier Census data sets.

IF THE VULNERABILITY ZONES of different facilities in the same sector overlapped, their boundaries were merged, the merged boundaries were intersected with Census tract boundaries, and the areal apportionment method was applied to the intersected tracts. This procedure prevented any double counting of people living in vulnerability zones of two or more facilities within a sector.

We also used the areal apportionment method to estimate the population characteristics of areas closest to potential harm, i.e., areas within one-tenth of the distance of the full vulnerability zones. We call these high-risk areas the "fenceline zones."

We used the same method to determine the demographic composition of vulnerability zones of facilities belonging to various industry sectors. However, if the vulnerability zones of different facilities in the same sector overlapped, their boundaries were merged, the merged boundaries were intersected with Census tract boundaries, and the areal apportionment method was applied to the intersected tracts (Table 1 and Tables 7–13). This procedure prevented any double counting of people living in vulnerability zones of two or more facilities within a sector. Similar merging of vulnerability zones of all facilities prevented double counting in our national level findings (Tables 2–6).

f An Albers geographic projection was used for digitized Census tracts boundaries and circular buffers of vulnerability zones.

APPENDIX B

"SHELTER IN PLACE" WON'T PROTECT US TIMELINE WORKSHEET

People who live near chemical facilities are often told to "shelter in place" in the event of a hazardous chemical release. That means go indoors, close doors, windows, and vents, and wait for toxic fumes to blow away. But a simple timeline analysis shows that shelter in place can't possibly protect numerous people nearby.

1. How long will it take (in minutes) for:

   - The company to find a chemical leak? _____ (minutes)
   - The company to decide to report the leak? _____ (minutes)
   - The company to notify the fire department? _____ (minutes)
   - The fire chief to arrive at the scene? _____ (minutes)
   - The fire chief to order protective action? _____ (minutes)
   - Emergency responders to fully notify the public? _____ (minutes)
   - Workers and neighbors to shelter or evacuate? _____ (minutes)
   - All of these events added together? _____ (minutes)

2. How long will it take (in minutes) for:

   - A toxic cloud (or blast wave) to reach nearby homes, schools, businesses, eldercare facilities, places of worship, sports arenas, hospitals, or automobiles? _____ (minutes)
   - Toxic gases to filter into places where people shelter in place? _____ (minutes)
   - The company to stop the chemical leak—if it can? _____ (minutes)

3. Given these estimates, how big is the "fenceline zone" where neither sheltering nor evacuation will protect people in a major release? _____ (miles)

   And, if shelter in place won't work, by when and how will the company reduce or eliminate the chemical hazard at the source? _____ (date)

APPENDIX C
VULNERABILITY ZONES OF 3,433 CHEMICAL FACILITIES

This table presents basic information about the Vulnerability Zones of 3,433 facilities that produce, handle, process, distribute, or store more than a threshold amount of certain extremely hazardous substances. Basic facility and vulnerability zone information is self-reported to EPA by the companies in Risk Management Plans. We calculated the population in each Vulnerability Zone based on a standardized method using U.S. Census Bureau data. See "Appendix A: Methodology" for a complete description of the methods used to research the information presented in this table.

Facilities in the table appear in order by State, then County, then City. Most information in the table—including Facility Name, State, County, City, and Facility Type—is self-explanatory.

PARENT COMPANIES
If the facility self-reports that it is owned or controlled by another entity, that "parent company" is listed here. If the parent company is owned or controlled by yet another company or division, this "second parent company" is listed and marked with an asterisk. "Parent Company" is the term used by the U.S. EPA even when the parent is a city, county, or other public entity.

CHEMICAL
The specific chemical that is the basis of the facility's worst-case release scenario, but facilities may store or use other hazardous chemicals as well.

VULNERABILITY ZONE MILES
The range of a potential worst-case chemical release in miles. The distance indicated is a radius (or circle) around the facility. See Box 1 and Figure 3 on page 11 for a more detailed explanation and depiction of Vulnerability Zones.

VULNERABILITY ZONE CENSUS POPULATION
The residential population within the Vulnerability Zone, based on U.S. Census data. These figures are not forecasts of potential casualties.

A sample page of the entire data table appears in this printed version of the report.
The complete 143-page table is available online at *www.EJ4All.org/whos-in-danger-report*.

Facility Name	Parent Companies	State	County	City	Facility Type	Chemical	Vulnerability Zone Miles	Vulnerability Zone Census Population*
ALASKA								
Pyramid Water Treatment Plant	City of Unalaska	AK	Aleutians West Census Area	Unalaska	Water treatment	Chlorine	0.80	<10
International Station Power Plant	Chugach Electric Association, Inc.	AK	Anchorage Municipality	Anchorage	Electric power generation	Ammonia (conc. ≥20%)	0.20	371
John M. Asplund Wastewater Treatment Facility	Anchorage Water and Wastewater Utility Municipality of Anchorage*	AK	Anchorage Municipality	Anchorage	Wastewater treatment	Chlorine	2.20	2,300
Univar Anchorage	Univar USA, Inc.	AK	Anchorage Municipality	Anchorage	Basic chemicals – ACC	Ammonia (conc. ≥20%)	0.80	5,013
Flint Hills Resources Alaska, LLC	Flint Hills Resources, LP	AK	Fairbanks North Star Borough	North Pole	Petroleum refinery	Flammable Mixture	0.40	160
Kenai Refinery	Tesoro Petroleum Corporation Tesoro Alaska Company*	AK	Kenai Peninsula Borough	Kenai	Petroleum refinery	Flammable Mixture	1.20	284
Petro Star Valdez Refinery		AK	Valdez–Cordova Census Area	Valdez	Petroleum refinery	Flammable Mixture	0.07	<10
ALABAMA								
Tenaska Central Alabama Generating Station	Tenaska Alabama II Partners LP	AL	Autauga County	Billingsley	Electric power generation	Ammonia (anhydrous)	5.10	1,814
Tenaska Lindsay Hill Generating Station	Tenaska Alabama Partners, LP	AL	Autauga County	Billingsley	Electric power generation	Ammonia (anhydrous)	5.10	1,833
E.B. Harris Electric Generating Plant	Southern Power Company Southern Company*	AL	Autauga County	Prattville	Electric power generation	Ammonia (anhydrous)	3.30	1,137
Georgia Pacific Consumer Products LP, Naheola Mill	Georgia Pacific LLC	AL	Choctaw County	Pennington	Pulp and paper	Chlorine dioxide	25.00	36,725
Boise White Paper, LLC	Boise, Inc.	AL	Clarke County	Jackson	Pulp and paper	Chlorine dioxide	9.50	8,268
Cherokee Nitrogen Company	ThermoClime, Inc.	AL	Colbert County	Cherokee	Basic chemicals – ACC	Ammonia (anhydrous)	25.00	161,239
Harcros Chemcials Inc. – Muscle Shoals	Harcros Chemicals Inc.	AL	Colbert County	Muscle Shoals	Bleach manufacturing	Chlorine	14.00	117,593
James A. Vann, Jr. Power Plant	PowerSouth Energy Cooperative, Inc.	AL	Covington County	Andalusia	Electric power generation	Ammonia (conc. ≥20%)	0.40	29
Cullman Water Treatment Plant	The Utilities Board of the City of Cullman, Alabama	AL	Cullman County	Cullman	Water treatment	Chlorine	1.30	1,745
Ozark Southside WWTP		AL	Dale County	Ozark	Wastewater treatment	Chlorine	2.20	3,082
International Paper Riverdale Mill	International Paper	AL	Dallas County	Selma	Pulp and paper	Chlorine dioxide	6.80	6,361
Fort Payne Wastewater Treatment Plant	City of Fort Payne, Alabama	AL	DeKalb County	Fort Payne	Wastewater treatment	Chlorine	3.00	3,734
Wilako Wastewater Treatment Plant	Water & Sewer Board of the City of Wetumpka	AL	Elmore County	Wetumpka	Wastewater treatment	Chlorine	3.00	4,379
Five Star Water Supply District		AL	Elmore County	Wetumpka	Water treatment	Chlorine	3.00	5,915
Georgia–Pacific Brewton LLC	Georgia–Pacific LLC	AL	Escambia County	Brewton	Pulp and paper	Chlorine dioxide	12.00	17,461
West River Wastewater Treatment Plant	Gadsden Water Works and Sewer Board	AL	Etowah County	Gadsden	Wastewater treatment	Chlorine	1.86	7,880
East River Wastewater Treatment Plant	Gadsden Water Works and Sewer Board	AL	Etowah County	Gadsden	Wastewater treatment	Chlorine	2.05	8,644

* Residential population within the facility's Vulnerability Zone. These figures are not forecasts of potential casualties.

WHO'S IN DANGER?

Race, Poverty, and Chemical Disasters

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A DEMOGRAPHIC ANALYSIS OF CHEMICAL DISASTER VULNERABILITY ZONES

More than 134 million Americans live in the danger zones around 3,433 facilities in several common industries that store or use highly hazardous chemicals. But who are the people that live daily with the ever-present danger of a chemical disaster?

This report presents new research showing that residents of chemical facility "vulnerability zones" are disproportionately Black (African American) or Latino, have higher rates of poverty than the U.S. as a whole, and have lower housing values, incomes, and education levels than the national average. The disproportionate or unequal danger is sharply magnified in the "fenceline" areas nearest the facilities.

Action to prevent chemical disasters is needed now—workers, communities, businesses, and governments face severe potential costs to life, health, and finances from chemical hazards that are often unnecessary. Despite the fact that the U.S. experiences several serious toxic chemical releases every week, federal policies do not require companies to fully assess whether the chemicals they use or store could be replaced with safer alternatives. This report recommends policy solutions that can remove millions of Americans from potential harm in and around hazardous chemical facilities.

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