Murky Waters:

An Analysis of Hurricane Ida Pollution Reports

By Naomi Yoder and Sheehan Moore
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This report is dedicated to the well-being of all of the people who have lost loved ones, livelihoods, and resources due to hurricanes and disasters, and who suffer from pollution exposure year after year, generation after generation. You are not a sacrifice.

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Thank you to the community of people in southeast Louisiana and across the world who helped people evacuating, who gave money and time and services, who responded to the crisis and helped us rescue, rebuild, and recover after Hurricane Ida.

Supplemental Information: Data utilized in this analysis is available at the following links, and upon request to naomi@healthygulf.org .

Data and tables for this analysis:
https://docs.google.com/spreadsheets/d/1umw_iWYuDHSYDRp8iG5RGN7uzFUKcz6SgadcKiYQxAE/edit#gid=1706056801

LOSCO EPA ASPECT Report:
https://drive.google.com/file/d/1pAcYmgXhhXo23WNqEG0lcZ-Zh4xSXMAi/view?usp=sharing

BSEE Data:
https://docs.google.com/spreadsheets/d/1nBbtnaZvKAA_QOW2g9FToySEDvn1QW7Q/edit?usp=sharing&ouid=114448779791697796889&rtpof=true&sd=true

I. Executive Summary

In the months following the August 29, 2021 landfall of Hurricane Ida, reports of pollutant releases due to the storm were examined by aggregating and analyzing otherwise unorganized data from several reporting agencies. In total, the assessment of Hurricane Ida-related release data shows that there were 2,230 pollution events that occurred directly or indirectly because of the hurricane (Fig. 1). Among those were 171 oil spills involving at least 5,436 barrels (229,633 gallons) cumulatively. There were 257 reports of oil spills or sheens, and 22 of these oil spills and sheens added up to an area that equaled over 65 million square meters (approximately 25 square miles). There were 48 instances of air pollution reported, with 1,614,076 pounds of pollutants emitted (approximately 730 tons). Despite the alarmingly high numbers, these totals are almost guaranteed to be an undercount of what was actually released due to severely lacking data protocols by the response agencies involved. There was also an unreasonable level of difficulty in obtaining this (public) data, and what was obtained was highly variable in quality and depth of information. The vast amount of pollution incident records obtained were simply a data point indicating a simple occurrence, without specification of type of pollution or amount, but that were flagged to be investigated further.

Of the 2,230 reported releases, only 150 reports included specific spill or pollution amounts. The majority of identifiable types of pollution events consisted of spills, emissions or debris from the fossil fuel industry (oil, gas and petrochemical). The recklessness of the fossil fuel industry, and the lack of meaningful regulation of that industry, is evident since there are myriad pollution incidents that occur with every massive hurricane. The increasing frequency and intensity of tropical cyclones are a result of climate change resulting from the burning of fossil fuels. Since fossil fuels are the basis of the majority of polluting facilities, there is a clear case for moving away from fossil fuels, and doing so under a justice-driven lens.

Gulf Coast communities and ecosystems can't afford to continue the old ways of using and processing fossil fuels. The fossil fuel industry has an imperative to commit to this transition process, and also must focus on prevention of future spills and toxic disasters. Fossil fuel facilities should conduct every prevention measure available, until a "Just Transition" to renewable energy has successfully occurred. Fossil fuel facilities must also shoulder the cost burden of implementing prevention measures, as well as disposing safely of waste and decommissioning facilities properly. Regulators and disaster environmental response agencies can create a system of accountability that protects people and is focused on clean air and water, prioritizing the most vulnerable populations. These agencies must live up to their mission statements, by employing vastly improved transparency and accessibility of pollution data. A data standard across agencies and a centralized, easily accessible and publicly communicated database, should be amongst the highest priorities.

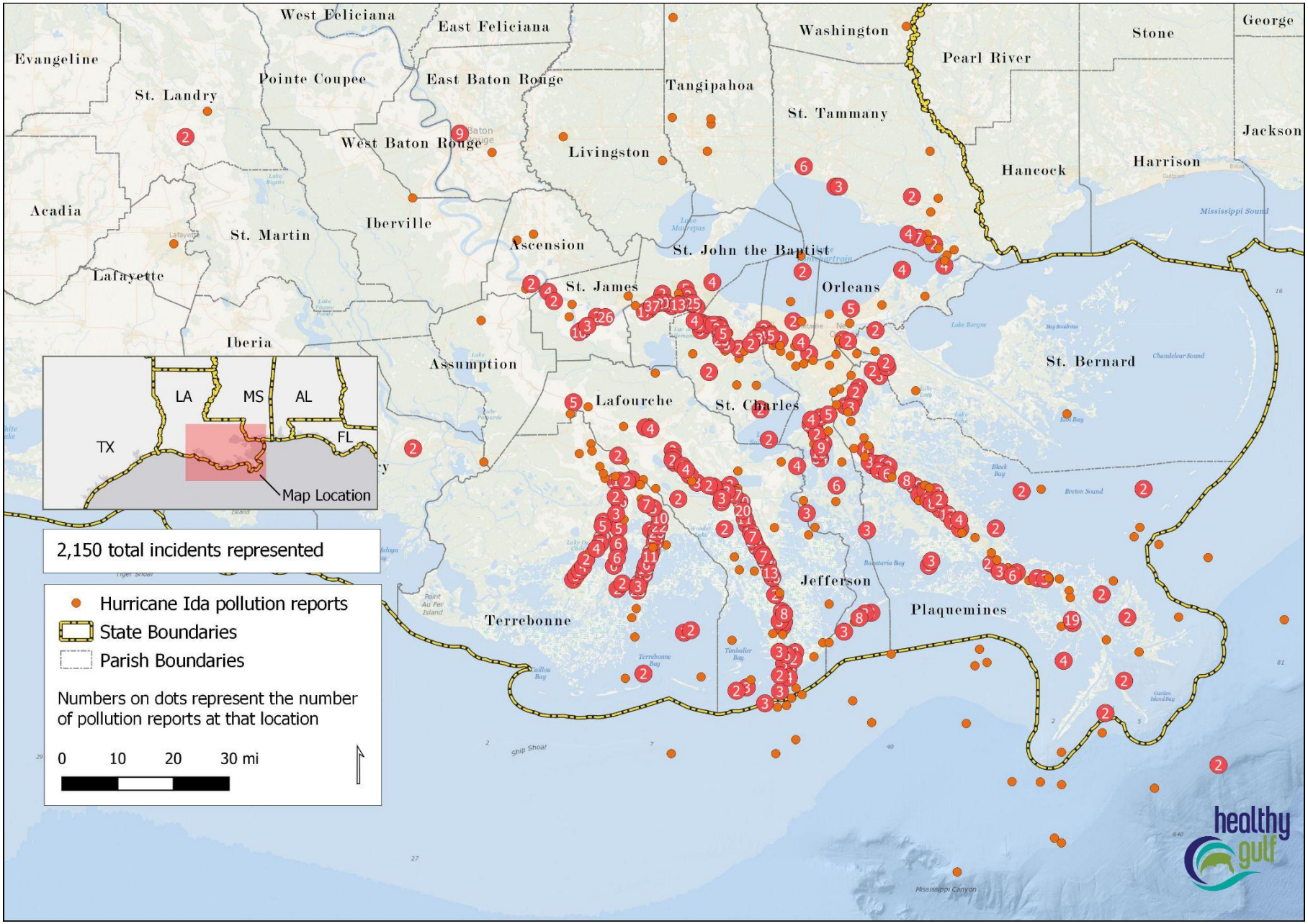

Figure 1. Of the full 2,230 pollution incidents in this report, 2,150 occurrences of pollution specified geographic locations. The full dataset consists of 2,230 pollution incidents. Data: Healthy Gulf, LOSCO, LDEQ, EPA, US Census, ESRI.

II. Introduction

Hurricane Ida ("the storm", "Ida") made landfall in the northern Gulf of Mexico at Port Fourchon, Louisiana as a Category 4 storm at 11:55am on Sunday, August 29, 2021. As it tracked northeast across the contiguous United States, Ida caused massive amounts of damage and at least 91 deaths.[1] At least twenty additional fatalities occurred in Venezuela before the storm moved across the Gulf of Mexico.[2] An estimated $76.5 billion of damage has been accrued so far in the United States as a result of Hurricane Ida.[3]

The questions behind this analysis were seemingly simple questions that arose in the weeks and months after the storm. What was spilled or released into the environment as pollution, as a result of the storm? How much of each of those pollutants had been released? In practice, answering those questions became close to impossible due to poor recordkeeping and lack of data stewardship by corporations and environmental response agencies. Clearly, lessons have not been learned from the rigorous previous analyses of pollution following Gulf Coast storms. Instead, history is repeating itself, and some impacts are getting worse.

The storm's impact on the region was exacerbated by the intensity and extent of fossil fuel industrial development in coastal Louisiana and offshore. Hurricane Ida forced the shut-down and reduction of activities for at least nine refineries, while also shutting in 96% of crude oil and 94% of natural gas production in federal waters in the Gulf of Mexico.[4] The long legacy of oil and gas wells, pipelines, and canals excavated and maintained in southern Louisiana has resulted in the region experiencing higher rates of subsidence than other areas of the world.[5] Subsidence, paired with sea level rise spurred by climate change, results in significant, extensive land loss in the region.[6] Land loss then leaves the area even more susceptible to hurricane impacts, due to lack of vegetation to slow both winds and storm surge, and lack of wetlands to soak up water.

The coastal region hit by Hurricane Ida is home to over 380 oil refineries, petrochemical complexes, fertilizer manufacturers, gas plants, plastics manufacturers and facilities with toxic chemicals ("point source polluters").[7] Southeast Louisiana is also home to over half of American grain exports to the world, and grain exports were severely curtailed for weeks as a result of closures and damage following the storm.[8] Offshore, there were 3,839 oil and gas rigs and wells

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[1] Hanchey A, Schnall A, Bayleyegn T, et al. *Notes from the Field:* Deaths Related to Hurricane Ida Reported by Media — Nine States, August 29–September 9, 2021. MMWR Morb Mortal Wkly Rep 2021;70:1385–1386. DOI: http://dx.doi.org/10.15585/mmwr.mm7039a3.

[2] https://www.reuters.com/world/americas/death-toll-rises-16-western-venezuela-floods-2021-08-25/

[3] NOAA. "Costliest U.S. Tropical Cyclones." https://www.ncei.noaa.gov/access/billions/dcmi.pdf

[4] U.S. Energy Information Administration, 2021. "Hurricane Ida disrupted crude oil production and refining activity." September 16. https://www.eia.gov/todayinenergy/detail.php?id=49576

[5] Kolker et al., 2011, An evaluation of subsidence rates and sea-level variability in the northern Gulf of Mexico, Geophysical Research Letters, VOL. 38, L21404,doi:10.1029/2011GL049458, 2011

[6] Törnqvist et al., 2020, Tipping points of Mississippi Delta marshes due to accelerated sea-level rise, Sci. Adv. 2020; 6

[7] Baurick and Adelson, 28 August 2021. More than 20% of local industrial sites are still down two weeks after Hurricane Ida | Business | theadvocate.com The article reports that 590 toxic sites were in the possible path of the hurricane. Louisiana has 17 oil refineries (all on the coast), constituting about 1/5th of the country's refining capacity.

[8] Masters and Henson, 28 August 2021. Intensifying Hurricane Ida a significant threat to key infrastructure. Yale Climate Connections.

in the wind swath of Hurricane Ida (Appendix A). There are so many thousands of pipelines that are operational and abandoned in the northern Gulf of Mexico that the true number is not clearly known. All of these facilities pose pollution threats following storms.

A. We Couldn't Have Known?

Even before the storm made landfall, scientists and economists predicted that the impact would be deep and deeply felt across the United States economy. Some journalists and meteorologists warned of pollution risks[9], but overall, there was scant information for local residents about the chemical or toxin-related risks from Hurricane Ida. One of the reasons for that is disclosure. Industrial, point source pollution facilities are only required to disclose general information on their operations, chemicals on site, and risks associated with the facility in a Risk Management Plan (RMP) document. Some, such as liquefied fossil gas (LNG) facilities, are not even required to have that. RMPs are essentially a "worst case scenario" assessment of what could happen and how the company plans to respond in a catastrophic disaster. RMPs are publicly accessible, but they are prohibitively difficult to obtain, housed in federal reading rooms with restrictive hours and conditions.[10] Thus even though they are publicly accessible, RMPs are not readily accessible. A safety document like an RMP also doesn't let local residents know what danger might be lurking in their midst in normal times, much less in the aftermath of a storm. This lack of information contradicts what so many of the industrial companies, facilities, and regulatory agencies purport as their commitment to safety and public health.

Both the Louisiana Department of Environmental Quality (LDEQ) and the Environmental Protection Agency (EPA) claim protection of the environment and public health as central to their missions. LDEQ regulates air and water pollution in Louisiana.

> "*The mission of the Department of Environmental Quality is to provide service to the people of Louisiana through comprehensive environmental protection in order to promote and protect health, safety and welfare while considering sound policies that are consistent with statutory mandates.*"[11]

The mission of the EPA, which regulates air and water pollution at the federal level, is even more succinct. It states,

> "*The mission of EPA is to protect human health and the environment.*"[12]

Despite the robust appearance of these missions that would seem to be enough to ensure public and ecological health, in practice many inconsistencies and shortcomings remain.

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[9] For example, see Baurick and Adelson, 28 Aug 2021, Almost 600 Louisiana sites with toxic chemicals lie in Hurricane Ida's path | Environment | nola.com

[10] Sneath, 07 Dec 2020. 'Ticking Time Bombs': Residents Kept In The Dark About Risks To La.'s Chemical Plants During Storms | WWNO

[11] https://www.deq.louisiana.gov/

[12] https://www.epa.gov/aboutepa/our-mission-and-what-we-do

One of the obstacles to effective regulation of pollutants is that in many cases, the very limits of pollution stipulated in air and water permits issued by LDEQ and EPA, are suspended in an emergency declaration. State regulators in Louisiana consider a storm that disrupts power and raw materials supply to be out of the control of each facility. While this may be true insofar as humans do not control the weather, impacts of storms should be planned for using every reasonable means necessary, and prevention measures can also be put in place. Yet the state does not require such action to prevent spills and releases caused by a disaster. Industrial facilities could be, and are not currently, required to retrofit their terminals and equipment to prevent catastrophic failure or pollution as a result of a storm.[13,14] Multiple experts, including engineers from Rice University and Louisiana State University, have been raising the alarm for decades about the risks of pollution from industrial and fossil fuel sources in a storm.

The Environmental Protection Agency's (EPA's) Office of the Inspector General (OIG) completed an audit of the combined response of the EPA and the State of Texas to Hurricane Harvey in 2017. The OIG analyzed how those agencies monitored Harvey-related air pollution, as well as reported and communicated the results.[15] The auditors found that none of the agencies monitored air pollution resulting from the storm adequately. The OIG also found that the inadequacies were in large part due to the lack of guidance for agencies, and lack of response plans in place. The auditors ultimately recommend creating rigorous guidelines. Other authors produced an extensive report following Hurricane Isaac in 2012, documenting pollution following that storm.[16] The researchers with the Gulf Monitoring Consortium stated the primary lesson from the analysis in the report's title: "Gulf Coast Coal and Petrochemical Facilities Still Not Storm Ready" [for hurricanes].

Unfortunately, neither report saw their recommendations enacted into practice. No such guidelines were in place at the EPA in 2020 when Hurricanes Laura and Delta struck, nor in 2021 for Hurricane Ida. As of this writing, no such guideline is in place as the 2022 hurricane season begins. Instead, the EPA's Hurricane page is filled with tips for individuals to prepare for a storm.[17] There is a section on that page for "Chemical or Fertilizer Storage", where one of the links redirects to the "Agriculture" site of the EPA, and the other to a short discussion of proper procedures for shutting down ahead of a storm.[18]

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[13] Pardue, J, 10 Sept 2020, A burning chemical plant may be just the tip of Laura's damage in this area of oil fields and industry. Louisiana Weekly.

[14] Baurick, 09 Dec 2021, Gathering storm: The industrial infrastructure catastrophe looming over America's Gulf coast - Bulletin of the Atomic Scientists.

[15] EPA Office of the Inspector General. 2019. Report: EPA Needs to Improve Its Emergency Planning to Better Address Air Quality Concerns During Future Disasters

[16] Gulf Monitoring Consortium, 2013, Hurricane Isaac Pollution Report: Lessons from Hurricane Isaac: Gulf Coast Coal and Petrochemical Facilities Still Not Storm Ready

[17] https://www.epa.gov/natural-disasters/hurricanes

[18] https://www.epa.gov/natural-disasters/hazardous-weather-release-prevention-and-reporting; This EPA document spells out clearly the responsibilities of point source polluters to report chemical releases and spills (above the "reportable quantity") to the National Response Center (NRC). This would seem to make the NRC database a definitive source of pollution data following a storm, but unfortunately that's not the case. The NRC database, discussed in more detail below, is unwieldy and cumbersome to use, intimidating even for the seasoned data analyst, much less a layperson trying to identify spills in their community.

Some facilities have settled lawsuits for pollution violations in the past in the form of a consent decree, and those settlements can include an obligation to declare a *force majeure* in the event of a storm. Force majeure is a legal term that allows a company to fail to "perform" or deliver the goods and services under a contract. For example, an oil refinery that fails to supply jet fuel to an airport due to a shutdown from a hurricane, will not be held to the terms of the contract with the airport if there was a force majeure clause in the contract. The suspension of violation of a contract by force majeure lasts for the duration of the emergency declaration. Similarly, an EPA or Department of Justice settlement with a point source polluter is like a contract agreement, and the same principles apply in the event that such a company will not be able to meet the obligations detailed in the terms of the settlement. Thus, some facilities that have been found guilty of significant violation of environmental laws declare force majeure after a hurricane and are thereby allowed to emit more than is stipulated in the terms of their settlement.

In short, there is absolutely no justification for the claim that point source polluters have no way of predicting what will happen as a result of a storm. The details of each type of damage in every situation might not be clear, but there is an abundance of information about the risks for each facility based on many years of evidence and analysis. The real unpredictability is whether or not the companies behind the facilities will take actions to minimize and eliminate the impacts of those risks.

B. Agencies and Entities Involved in Pollution Monitoring

Spills and other pollution incidents are reported to several different state and federal agencies in a disaster in Louisiana. The primary agencies involved are the LDEQ, the Louisiana Oil Spill Coordinator's Office (LOSCO), the US Coast Guard (USCG), the EPA and the EPA/USCG National Response Center (NRC). Each agency collects data and releases reports with varying levels of detail and follow-up, and with different systems organizing and sharing the information. The various databases suffer confusingly from both double-counting and under-reporting, and there are vague or incomplete data around substances, quantities, and locations of releases. There is no single source of comprehensive data that is accessible to the public or journalists for pollution incidents following a hurricane. Various datasets are available for download (NRC, LDEQ, EPA), but each of these have different parameters, publication frequency, and breadth of coverage. In addition the user must know where to look, what criteria to select, and how to interpret the result.

The NRC operates 24 hours a day, 365 days a year. Yet the data are released only once a week, and incidents from the entire calendar year must be downloaded and waded through every time a user wants to access those data (Fig. 2). By Sept 29th, 2021, there were 18,609 records in the NRC database for 2021. Furthermore, the NRC data tables themselves are unwieldy Microsoft Excel files, essentially comprising a database in spreadsheet format. These tables take significant expertise to navigate smoothly. The NRC data are also wildly variable and inconsistent, with no standardized list of "materials" released and no standardization of facility

names where there is one (such as using the name of the facility in EPA Toxics Release Inventory database, for example).

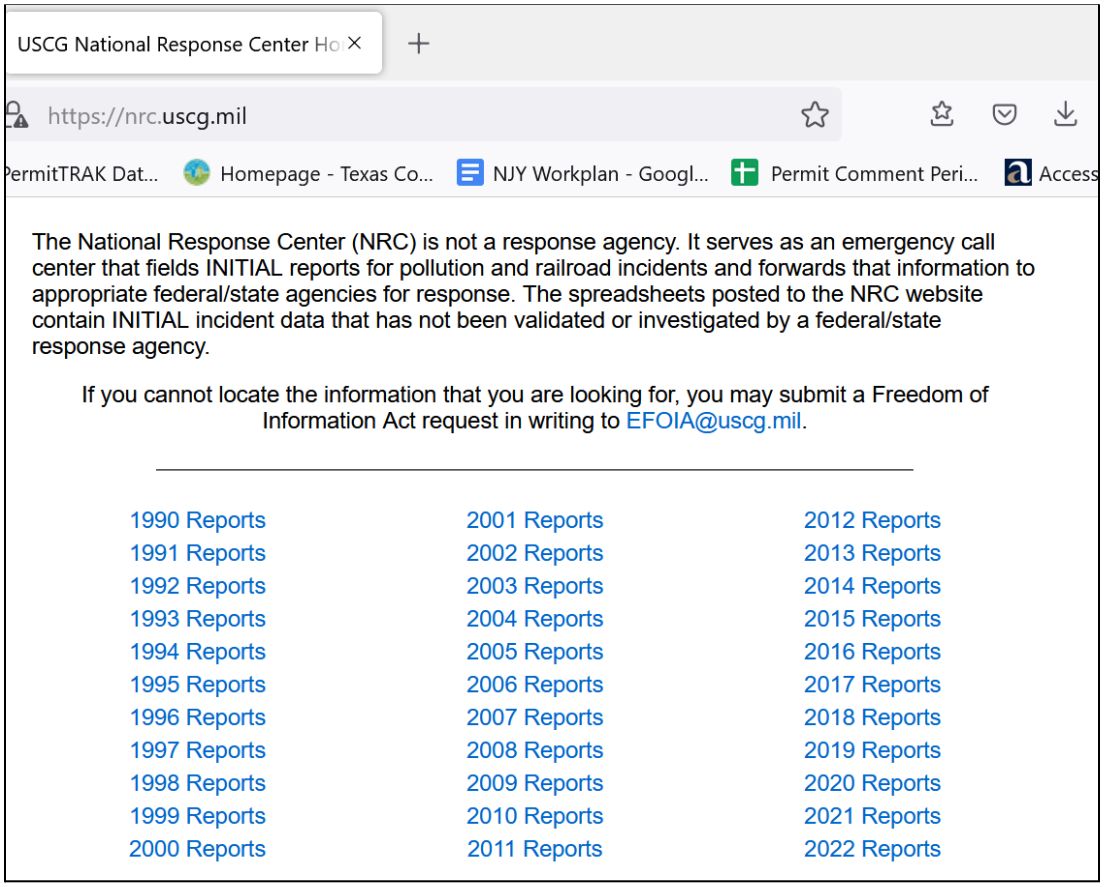

Figure 2. NRC data download page. Data are released by the week, with no availability to select a date range or other criteria for downloading. Just below this download table is a statement that government agency users (only) may apply for incident notification.

One non-profit organization, SkyTruth, has addressed some of these shortcomings through SkyTruth Alerts.[19] SkyTruth Alerts is a website that takes in each new weekly batch of incident data, and for all of those incidents that have geographic coordinates assigned, places each point on a map with basic identifying information (*e.g.*, NRC report number, location, responsible party/suspected, amount).[20] Users can browse by map, or select results from criteria such as date or location. Some details of the NRC database are omitted from SkyTruth Alerts, such as details of the substance spilled. However, SkyTruth does add an infinitely useful category: estimate of minimum gallons spilled. This is an estimate calculated from reports of oil sheens, combined with SkyTruth methodology that predicts thickness of oil slick using satellite image analysis to produce volume estimates. SkyTruth understandably does not attempt to standardize the messy NRC dataset issues, so the poor data management standards practiced at

[19] https://alerts.skytruth.org/

[20] SkyTruth estimated that about 10 - 15% of NRC incidents have no geographic coordinates and therefore are omitted from the mapped SkyTruth Alerts dataset (D. Cogswell, *pers. comm.*).

the NRC are carried over into the SkyTruth data. SkyTruth Alerts data are significantly easier to use than the NRC database, but some missing details remain. Thus, as close as NRC is to a centralized database of pollution reports, the database and its iterations each fall short in their own ways.

Other agencies are also involved in responding to pollution after a storm in other capacities, such as reconnaissance flights and data hosting. These agencies include National Oceanic and Atmospheric Association (NOAA), Louisiana Department of Natural Resources (LDNR) and the Louisiana Department of Wildlife and Fisheries (LDWF). For Hurricane Ida, the Civilian Air Patrol[21] was contracted by USCG's parent, the Department of Homeland Security, to fly missions taking aerial photographs that could then be classified into pollution incidents.

C. Data Accessibility

Both EPA and LDEQ created Ida-specific websites or resources following the storm.[22] In LDEQ's case, the agency created a storm-specific activity interest (AI) number for their online records database.

Three datasets were utilized for this analysis (described in detail in the Methods section below). All three datasets were bewilderingly difficult to come by. Freedom of Information Act (FOIA) requests were submitted to EPA, NOAA and USCG, and a public records request (PRR) was submitted to LOSCO. Response was received for incidents from LOSCO, EPA and NOAA, although the specifically requested usable data was from LOSCO.[23] EPA responded to the FOIA with *.pdf files, which are not accessible for data mining.[24] LDEQ was difficult because the agency does not promote the information of a specific AI for the storm, but also because all of the data is in the format of scanned images of *.pdf's, which means that the contents of each incident report are not searchable or transferable without significant data entry.

Each dataset from each agency and source has benefits and drawbacks. It's remarkable that, even after decades of destructive storms, along with increasing awareness of the pervasiveness of extensive pollution as a result of each storm, there is still no centralized or standardized method of providing clear, accessible information to the public. Even upon request, these data are often unavailable. Attempting to find the seemingly simple information about how many spills, and of what, there are, proved impossible without extensive analysis. According to the US Coast Guard's documentation,

> "*The mission of the United States Coast Guard is to ensure our Nation's maritime safety, security and stewardship. We will serve our Nation through the selfless performance of our missions. We will honor our duty to protect those we serve and those who serve with us.*"[25]

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[21] https://www.gocivilairpatrol.com/
[22] https://response.epa.gov/site/site_profile.aspx?site_id=15323
[23] LOSCO_PRR Google Drive folder
[24] EPA
[25] https://www.history.uscg.mil/Home/Missions/

The USCG has 11 mission components, including "Maritime Environmental Protection", "Search and Rescue" and "Marine Safety". This being the case, why isn't the USCG more transparent with threats and risks to the maritime environment? Furthermore, if the USCG is responsible primarily for safety of the ocean and waterways, which agency is responsible for air and land pollution? Discussions with Joe Smith of USCG's Gulf Strike Team after Hurricane Ida revealed some of the information. Despite the Gulf Strike Team being unavailable most of the time, even weeks after the storm (phone messages left for them were not returned, and phone lines would ring with no response on the other end)[26], a discussion with Mr. Smith revealed that USCG serves as something of a "central clearinghouse" for pollution response and reports. Mr. Smith stated that the agency collects incident report data from at least four sources, including other agencies (EPA, NOAA, Customs and Border Patrol, state agencies), satellite imagery, USCG overflights and NRC reports. After an incident has been identified, USCG then attempts to assess each incident by sending pilots or personnel to the scene. Once an assessment has been made, USCG attempts to hand off the clean-up and monitoring to the appropriate responsible entity, often the owner of the facility. If there is no identifiable responsible party, USCG hires contractors to perform any cleanup and containment actions. USCG will then purportedly check up on each incident to make sure proper action has been taken and that cleanup is satisfactory. USCG stated that in general, they handle waterborne pollution, while EPA handles land-based pollution (once the initial assessment has been made). Regardless of the process of responding to incidents, neither agency was willing to share their pollution monitoring databases, or even provide a snapshot of the data they collect.

Each incident the USCG receives, whether or not assessed, is input into a database housed at NOAA's Environmental Response Management Application (ERMA). ERMA data are typically publicly viewable, and sometimes even downloadable. However, the USCG incidents data are not even viewable. The database is restricted, according to the Gulf Strike Team. A FOIA request to NOAA (Appendix B) revealed the already publicly accessible National Environmental Satellite, Data, and Information Service (NESDIS) remote sensing data only; not the USCG "restricted" dataset as clearly requested. A FOIA request to the USCG was not answered.

An independent research group, Cartoscope, utilized NOAA National Geodetic Survey (NGS) high-resolution aerial photography data[27] to search for pollution events. NOAA NGC captures images of hurricane-affected areas, as soon as possible after a storm occurs. This imagery is one of the most consistent, user-friendly, publicly accessible datasets available for evaluating the situation on the ground. The only limitations are occasional obscured visibility due to light conditions, and the overall coverage of the imagery. Coverage is limited mostly to land-based areas, and the imagery doesn't always extend to an area of interest. For example, NOAA NGS flew the entire Mississippi River corridor from Venice to Belle Chase, but then none of the rest of the river was photographed except a slice at the Waterford Nuclear Power

[26] The authors spoke with the USCG twice over a three month period, even with dozen or more attempts.
[27] https://storms.ngs.noaa.gov/storms/ida/index.html#9/29.2029/-90.1932

Station. The Cartoscope group crowdsourced image analysis of the NGS data, and categorized 102 oil spills, with a high level of confidence.[28] While the coverage was limited, there is still the potential for NOAA, or other researchers, to use the NOAA NGS storm response data similarly to quickly categorize open water spills in the future.

D. Environmental Justice, Climate Justice

Exposure of fossil fuel facilities to intensifying storms like Hurricane Ida increases the risk of pollution in the already vulnerable communities surrounding them. In southeast Louisiana, many such vulnerable communities are historically Black towns, where free formerly enslaved people gathered to live, often in close proximity to or sometimes on the very same plantation land that had enslaved them.

Other vulnerable communities include indigenous bands, tribes and towns. Many indigenous groups visited coastal areas of Louisiana pre-colonization, often to trade, hunt and fish. However, fewer groups lived in coastal Louisiana year-round. The indigenous groups living on the coast now are often descended from people that were forced off of their lands, and either were forcibly removed or fled to the coast in southeast Louisiana as a survival mechanism. Thus many of the indigenous people living in areas of Lafourche and Terrebonne Parishes (also referred to as the "Bayou Parishes") are descendants of pre-colonial people. Other groups such as Creoles, Vietnamese Americans and Hispanic people also reside in significant numbers in the areas that were impacted by Hurricane Ida.

Communities and areas with higher numbers of minorities than average, and/or areas with more low-income occupants than average, and where there is an outsized pollution burden, are "environmental justice" communities. Similarly, where the effects and impacts of climate change are outsized on low-income communities and communities of color, the term "climate justice" applies. In coastal Louisiana, every environmental justice community is also a climate justice community, because of the impacts from hurricanes, sea level rise, and climate change that pervade the region. Strained fisheries and land loss, for example, pervade the region. Climate injustice and environmental injustice collide and compound for Hurricane Ida, similar to Hurricanes Delta, Laura, Rita and Katrina. The aftermath of these hurricanes all saw spillages of massive amounts of pollution in the air, soil and water. Pollution is already a significant concern for human and ecological health, on its own, but combined with injustice, the situation starts to suggest intentional "sacrifice zones" where people (and the ecosystems we depend on) are discarded or regarded as lesser than others. Human rights and rights of nature are non-negotiable. No person or ecosystem deserves to be treated as a sacrifice zone, much less people that have been marginalized and oppressed for centuries.

Southern Louisianans are keenly aware of the impacts of storms to their lives. For years, affected Louisianans have been militating for better protections from storm damage to refineries and related facilities, which pollute the air and water even on sunny days. But these protections

[28] Results and data are available here: https://cartosco.pe/kioskProject.html#/results/Ou9nXNDyuLPm

in large part have not come, and then on top of it all the public faces outsized obstacles to obtaining data on the pollution, ecosystem health and public health impacts of storms.

Healthy Gulf has helped with monitoring and reports documenting pollution from Hurricanes Isaac, Laura and Delta, among others. The current project is based on methodology developed in 2020 after Hurricanes Laura and Delta, which devastated southwest Louisiana. This process included collating, organizing, and analyzing data on storm-related releases. The primary aim of this reporting was to create a resource for residents to better assess the impact of present and future storms, and the real risks from facilities causing pollution in their communities. With such information, people will be more well-equipped to act effectively. A secondary intent of this project was to create a method that could be replicated in the future, and which would provide the most accurate data possible about spills and other releases after a storm. A final intention was to call attention to the difficulties involved in obtaining these data from the public agencies that respond to disasters. The hope is that agencies will respond accordingly, enacting justice by creating systems that easily inform the public of pollution.

Information on pollution from major events like hurricanes, which can cause thousands of unplanned releases, should be made clearly and widely available to the public. For instance, the Louisiana Department of Environmental Quality (LDEQ) has, since 2005, created distinct Agency Interest (AI) numbers when a storm is large enough in impact. There have been such AI numbers for twelve named storms over that time. However, Hurricane Ida's AI number—which links almost all storm-related incidents and allows public access by a single search—is not advertised on the LDEQ database, or on the LDEQ homepage, or on any other agency's Hurricane Ida resource page. The primary response agency, US Coast Guard, declined to make their pollution assessments public (even when requested under the Freedom of Information Act). Thank goodness the United States of America has so many response agencies and entities evaluating pollution and taking reports of pollution. How is it then, though, that no one single agency provides this information back to the public? How is it that the facilities that spill repeatedly after storms face very few, if any, consequences and are not required to change operations or shore up their equipment to protect from such a future occurrence? After so many audits and discussions of the need for such measures, it is outrageous that these actions have not been taken, and communities continue to be poisoned and sickened, year after year.

III. Methods

Three sources of data were utilized for this analysis. These three datasets were chosen because they were the highest quality, and each contained some level of reliability for pollution reporting. While USCG and NOAA declined to share their master database of incidents and responses, a snapshot of the same information was provided by LOSCO. One of the datasets LOSCO provided was a map shapefile of incident response points, and therein terminology was used that matched exactly the USCG categories of incident response. USCG refers to incidents reported as "targets", and there is a classification system of targets that was found in the LOSCO data that matches exactly the phrases that the USCG reported using. LOSCO confirmed that one

of their sources of data was the USCG, and it was assumed that the LOSCO map dataset was a piece of the USCG response database.

The LOSCO datapoints all contained geographic coordinates already assigned. For the other agencies, geographic coordinates were variously entered by hand or by address matching. Some "incident addresses" for LDEQ reports are actually the corporation's address so there could be errors in exact locations for some incidents. Where LDEQ incidents did not specify latitude longitude coordinate, and where the "incident address" was outside of the area of affected Parishes, no location was recorded for that incident. It was determined that the NRC database would not be utilized, since LOSCO data presumably captured the same information.

LDEQ

For incident reports from the Louisiana Department of Environmental Quality, in the agency's Electronic Document Management System (EDMS) database was queried and data from those records were tabulated. The initial data retrieved for this report was for incidents ranging from August 23, 2021, when Ida's tropical wave first formed, to September 23, 2021, one month later. The query was limited to a function of "Incidents - Emergency" and "Incidents - Non-Emergency"; and to the media of Air, Ground Water, Hazardous Waste, Inactive & Abandoned Sites, Radiation, Solid Waste, Surface Water, and Underground Storage Tanks. The document type was set to "Reports". This dataset was combined with a second query of EDMS, performed in January 2022 (five months after landfall) for all LDEQ assigned "Hurricane Ida" Agency Interest (AI) number 225873.[29] The datasets were checked for relevance to Hurricane Ida, and any incident without reference to the storm in the description or notes, or otherwise unrelated to Hurricane Ida, was removed. All incidents related to "debris site checks" were also removed out of abundance of caution. Data were restricted to incidents that occurred in one of the 25 parishes affected by the Governor's emergency decree (see Appendix C). In addition, another area was added for "Offshore" incidents. Incidents were attributed with latitude and longitude data wherever possible from the incident reports or occasionally from a facility's known location.

LOSCO

A public records request was submitted to LOSCO on September 14th, 2021. LOSCO responded with approximately 60 GB of data, ranging from spreadsheets to shapefiles. Within the LOSCO public records request fulfillment were several incident GIS map files that formed the bulk of the data utilized for this project. The LOSCO data files were compiled from several different agencies' datasets that all responded to the hurricane disaster. These agencies include the USCG, the EPA, LDEQ and NOAA.[30] The USCG classifies targets according to the status of response. USCG uses seven categories of target, ranked below according roughly to the level of "completeness" of response from the Coast Guard. The original number (before sorting and eliminating duplicates) of incidents for each category is also listed in parentheses:

[29] This was the AI that was created expressly for Hurricane Ida incidents.
[30] *Pers. comm.*, LOSCO Oct. 8th, 2021

Not Assessed (1,465)
Assessed Threat Monitor (344)
Assessed Threat USCG Ops (79)
Target Not Found (23)
No Action - LIP (58)
USCG Action Complete LIP (24)
Target Removal Complete (3)

There were 1,996 total incidents in the LOSCO dataset. All incidents with status "Target Not Found" were eliminated from the data used for this analysis, since that status indicates that the target was searched for and not found by the USCG responders. USCG data are compiled from several sources, including reports called in to the NRC, overflights by USCG and the Civilian Air Patrol and any other contractors and agencies, reports called in to LDEQ, and oil spills identified as anomalies in National Oceanic and Atmospheric Agency (NOAA) satellite data (at NESDIS), plus NOAA aerial photography (at NGS). NRC reports posed a special concern for duplication, since an NRC report is dispatched by the USCG to the various responsible agencies, and thus there was a suspected level of overlap between LDEQ incidents and LOSCO data points. These records were checked as closely as possible to avoid duplication.

EPA

Despite the lack of usable data supplied from the EPA FOIA request, EPA Region 6 had sent out weekly briefings for the first few weeks following the storm (now accessible on the Hurricane Ida website).[31] The EPA requested self-reported emissions from 10 large facilities, and eight facilities responded. These responses were shared with the same email list as the email briefings, and thus the data points were tabulated and incorporated herein.

Standardization

Each of the records (incidents) was given a unique id ("Record ID") using the source agency's acronym, plus the document or record ID assigned in the source dataset, plus an incident record number (this was the AI, for LDEQ). Placeholder numbers were appended where needed. Data from each agency was combined into a master data list. Incident records were then compared for duplication by sorting for facility name, date, location (latitude and longitude), and substance spilled. Lists of facility names were compiled from each dataset, and cross referenced to eliminate duplicates. Several generic facility names were created: Business, Debris, Marina, Need to Investigate, Residence, Unassignable and Vessel. Two LDEQ reports (LDEQ_2638_13051889; LDEQ_85594_12993671) and one LOSCO report (LOSCO_330910_C02) described the release of multiple pollutants. These were split into distinct incidents to fully account for each pollutant.

[31] EPA's Response to Hurricane Ida

IV. Results

After data sorting and sifting for duplicates was completed, there were 20 records utilized from the EPA (all air pollution), 254 records from LDEQ, and 1,956 from LOSCO (Table 1). This resulted in a grand total of 2,230 suspected or confirmed pollution occurrences as a result of Hurricane Ida. The 2,230 incidents include onshore and offshore documentation of spills and emissions, as well as solid waste like asbestos, capsized or beached vessels, and other hazardous or polluting debris. Narrowing these data points down to only those with geographic coordinates leaves 2,150 incidents of pollution (Fig. 1, Table 1).

Table 1. Environmental Protection Agency, Louisiana Department of Environmental Quality, and the Louisiana Oil Spill Coordinator's Office agency data points utilized under this study, after eliminating duplicates. Incidents of suspected pollution were assumed to be pollution for this analysis. The majority of the LOSCO records contained no identifying information except geographic coordinates.

Agency	*Incidents of pollution*	*Incidents with known geography*
EPA Total	20	20
LDEQ Total	254	182
LOSCO Total	1,956	1,948
Grand Total	**2,230**	**2,150**

The vast majority of incidents reported no known substance. Only 440 specified a substance (Table 2; also see Appendix D). Of those that specified a substance, 150 incidents were reported with a known amount, and the remainder were tallied simply as one occurrence per incident record. There were 374 incidents of spills of concern, consisting of oil, gasses, chemicals, contaminated water or sewage spills. Several incidents indicated a "large spill" (oil) or ongoing spill (sewage) over a period of weeks. The duration of each spill is not captured in this report as very few incidents contained specific duration.

The majority of pollution incidents with known substances were from fossil fuels ("Oil by volume" or "Sheen"; see Table 2 and Fig. 3). It is likely that the majority of substances categorized as "sheen" are fossil fuel-based. The total volume spilled was 233,543 gallons (5,560 barrels) of liquids. While that liquids total included sewage and contaminated water, 98% of the volume was fossil fuels liquids, including 228,332 gallons or 5,436 barrels of oil (Tables 2, 3).

Table 2. Total incidents tally according to which substance was spilled and whether or not an amount was known. These substances have been collapsed into broad categories; a more detailed list can be found in Appendix D. Those spills where the substance is listed as "Unspecified" denote an incident where pollution was reported, but no substance was indicated. For example, a capsized vessel might leak fluids, or might be considered solid waste, but it is impossible to discern which types of pollution were present.

Total Incidents by Substance	Occurrences (Unknown Amount)	Occurrences (Known Amount)	**Total Occurrences**	Known Amount	Known Amount Units
Acid	1		**1**		
Ammonia	1		**1**	10	gallons
Asbestos	2		**2**		
Chlorine	1		**1**		
Coal	1		**1**		
Gas, Ammonia	2	7	**9**	46,922	pounds
Gas, Compressed Liquefied	1	4	**5**	908,356.34	pounds
Gas, GHG	11	8	**19**	138,354.95	pounds
Gas, H2S		2	**2**	4,479	pounds
Gas, NOx		2	**2**	14,650	pounds
Gas, SOx	1	2	**3**	499,190	pounds
Gas, Various Other	3	3	**6**	2,124	pounds
Gasoline	19	10	**29**	611	gallons
Methanol	1		**1**		
Molasses	1		**1**		
Oil, by volume	75	86	**161**	228,332.43	gallons
Oil, by area		10	**10**	8,915,543.65	m2
Particulate Matter	1		**1**		
Sewage	32	1	**33**	500	gallons
Sheen	74	12	**86**	56,165,800.37	m2
Sludge	1		**1**		
Solid Waste	3		**3**		
Unspecified	54		**54**		
Water, Contaminated	6	2	**8**	210	gallons
Totals	**291**	**149**	**440**		

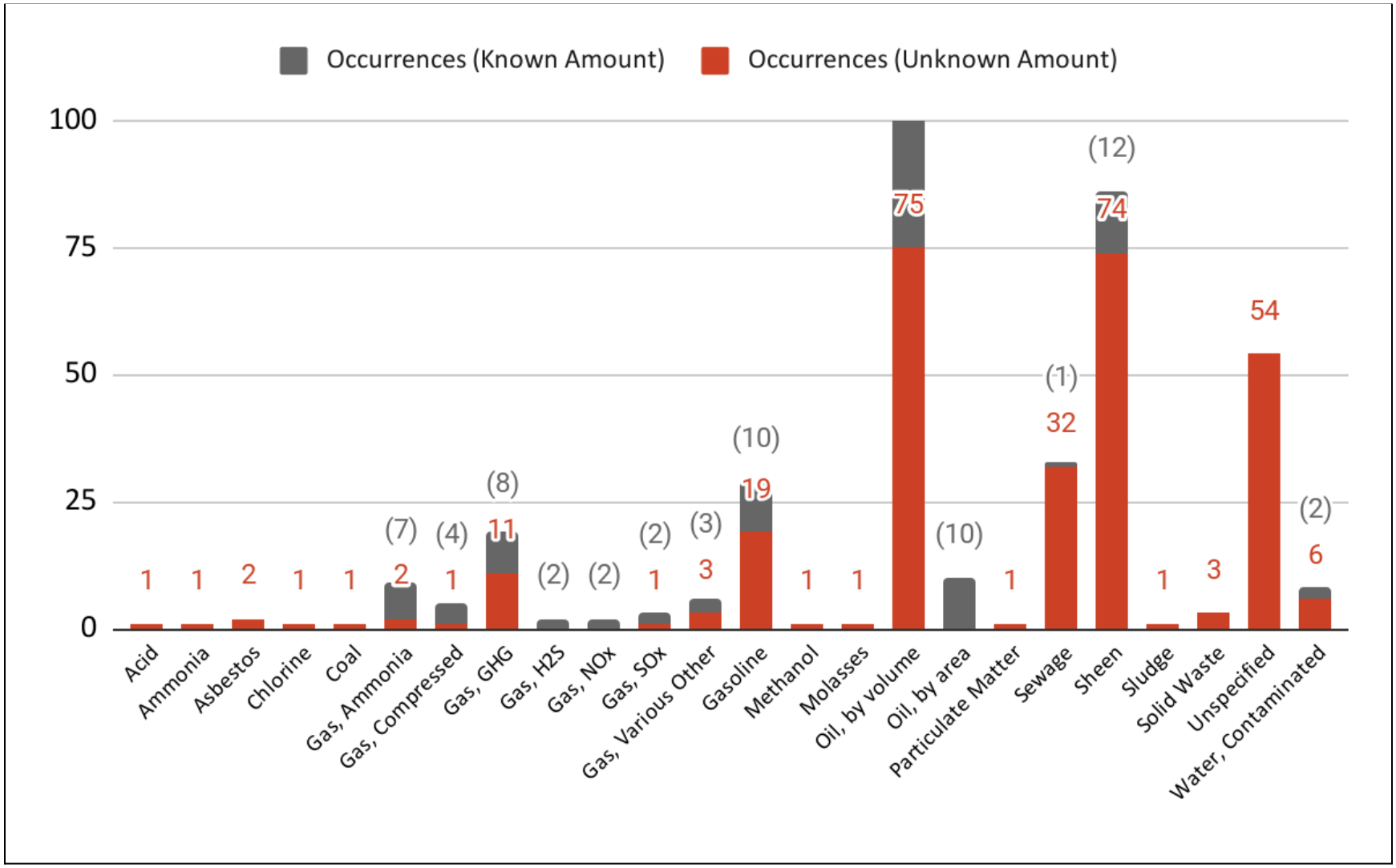

Figure 3. Occurrences of confirmed pollution following Hurricane Ida, with unknown amounts (red) and known amounts (gray). For "Oil, by volume" the axis is truncated and there are 86 occurrences with known amounts.

Table 3. Final volumes and areas for incidents with known amounts. Gasses equate to roughly 730 tons of material emitted. 229,663 gallons equates to approximately 5,468 barrels. Area of sheens and oil is equal to approximately 25 square miles.

	Amount	Amount Unit	Incidents with Amount	Incidents Total by Category
Total gasses:	1,614,076	pounds	28	46
Total liquids:	229,663	gallons	99	232
Total area (sheens, oil):	65,081,344	m2	22	96

Total reported gasses emitted as a result of the storm was 1,614,076 pounds, or about 730 tons. The two largest reported single emissions events were for Compressed Liquid gasses consisting of propylene and isobutane. These two events occurred at the same time at separate concurrent Phillips 66 pipelines near Paradis. Another large category of air emissions was sulfur dioxides (SOx), and the approximately 499,000 pounds reported are almost certainly an underestimate given that one single event reported 498,000 pounds of SOx from the Exxon Mobil Refinery and Chemical plant in Baton Rouge. Multiple other refineries and chemical companies were also burning flares that formed large sooty black and orange flames, visible from many miles away. The sulfurous stench of rotten eggs pervaded for weeks after the storm (Figs. 4, 5).

Figure 4. Phillips 66 Alliance Oil Refinery, 04 Sept 2021. The refinery is flooded and burns flares that smell of rotten eggs and are visible for many miles. Oil and chemicals pervade the flood waters - note the sheen in the upper left corner and the absorbent booms in the center pond. Photo: Healthy Gulf, % SouthWings.

Figure 5. Norco Shell Oil Refinery, 04 Sept. 2021, burning at least four flares that smell of rotten eggs and send billowing black smoke into the air. Visibility is low due to the billowing smoke. Flares from this and other shuttered refineries and petrochemical plants were burning for weeks on end after the storm. Photo: Healthy Gulf, % SouthWings.

Sheens were reported, often by area estimates as seen from the air. A total estimate of 65,081,344 square meters of sheens and chemical spills were present in the water (Table 3). This equates to 16,082 acres, or about 25 square miles. For reference, this area is equal to about the size of the New Orleans suburb of Metairie (Fig. 6). Again, this value doesn't reflect any volume, and volume is impossible to be determined from these sheens without more identifying information. The area value itself, as with the other numbers, is most certainly an underestimate.

Oil spills and sheens accounted for the largest number of incidents in any category (Fig. 3). Together, there were 257 oil spills and sheen incidents documented in this analysis. Some of these incidents were satellite-derived suspected spills, or suspected spills identified by a pilot. This number is assumed to also be a minimum and probably a vast underestimate for the storm, since many of the unknown substances could have been oil or chemical spills. There were 1,790 pollution incident reports that still needed to be investigated after September 15th 2021. There are likely other spills spurred from the hurricane that were never identified.

All of these spill numbers should be regarded as a minimum starting point for thinking about pollution following Hurricane Ida.

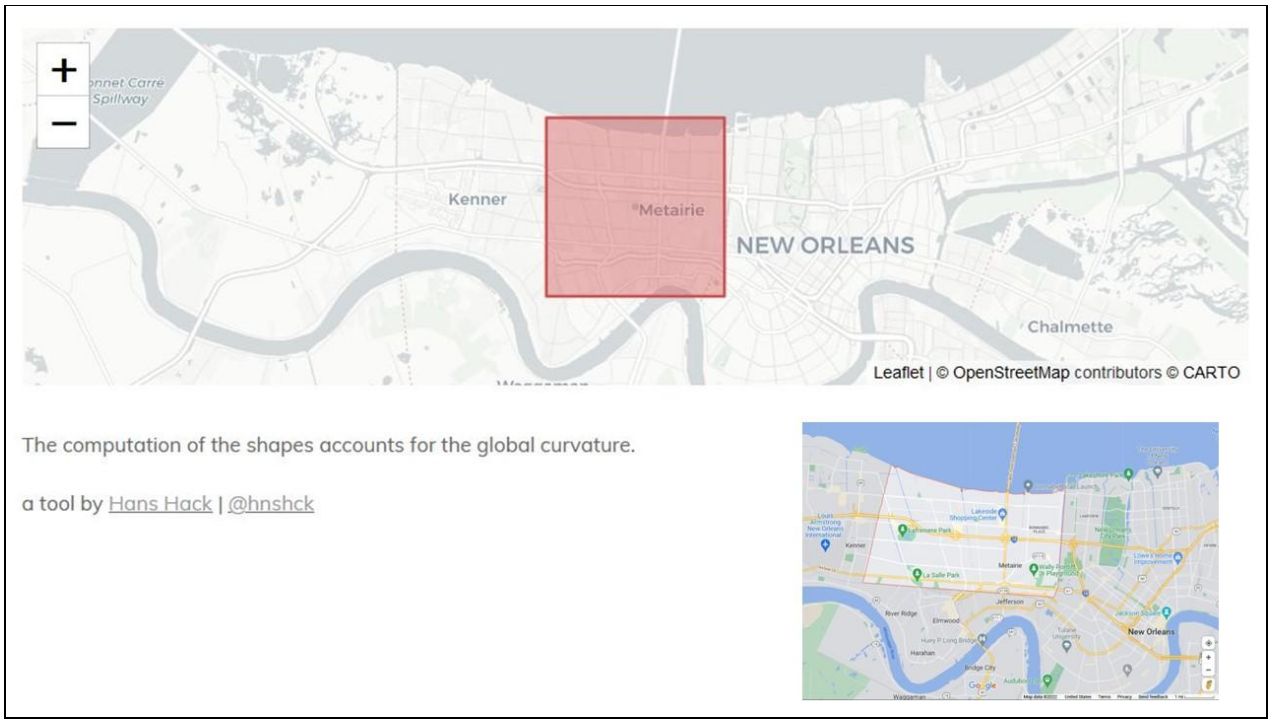

Figure 6. The area of sheens spotted after Hurricane Ida equals the size of the city of Metairie, a suburb of New Orleans. Top: orange square equal to 25 square miles. Bottom: the city of Metairie. Maps: Hans Hack, Google Maps

Transformer oil is a group of oils used as lubricant, heat distributor and insulator for an electric transformer. Most often the type of oil used is mineral oil but there can be other types, so the term "transformer oil" applies to any oil that is used in electrical transformers. This analysis found 55 instances of transformer oil spills; 48 of those were mineral oil spills (see Table 4 and Appendix D). Problems with down and leaking transformers was one of the most common reported pollution events at LDEQ. Several smaller leaks and spills seem probably innocuous, but these spills add up quickly, and can easily pollute surface water or even seep into groundwater. Furthermore, there were many areas of power substations or transformer stations that were flooded or sitting in standing water after the storm (see Fig. 7).

Table 4. Transformer oil spills documented with this dataset. Many transformer spills were under 200 gallons each, but the 49 transformer oil spills with known volume spilled combined reached 6,377 gallons.

	Number of Spills	Known Gallons
Transformer or Mineral Oil	55	6,377

Figure 7. Electrical transfer stations in Plaquemines Parish flooded after Hurricane Ida (04 Sept 2021). Photos: Healthy Gulf % SouthWings.

V. Discussion

One of the most troubling findings of this study is lack of reliability and accountability in the data and agency reporting. There is no reliable way of knowing where there were omissions, errors, underreporting or duplicates in the final dataset. Thus there is no way of verifying how accurate this dataset is. Despite the large numbers of volume, area and air emissions tonnage, identifying data is only available for a fraction of the incidents that are recorded. Other pollution events may not have ever been detected or recorded, especially in the more remote regions of the coast or offshore. In the case of offshore, many leaks from abandoned pipelines and wells, or other "slower" leaks, may not be detected from the air, due to current and wave action.[32] Given the number of incidents lacking substance and volume data, it is almost certain that this dataset and these results herein this report represent an undercount of the actual pollution released as a result of the storm. The problem is compounded with air pollution, as there are relatively few reports of air pollution, and even fewer that contain amounts emitted.

A. Oil Spills and Sheens

There is very little information about the relative proportions of each oil and chemical spill, with respect to amount spilled, duration or intensity. A few large, visible spills were somewhat decently documented, such as the pipeline spill southwest of Port Fourchon (see Fig. 8).[33] The largest recorded single oil spill (inland) in volume was 113,400 gallons of oil, or 2,700 barrels, from Phillips 66 Pipeline at a location in St. Charles Parish.[34] This may even be a low

[32] Offshore Oil and Gas: Updated Regulations Needed to Improve Pipeline Oversight and Decommissioning | US GAO

[33] Tabuchi and Migliozzi, 04 Sept 2021, Satellite Images Find 'Substantial' Oil Spill in Gulf After Ida - The New York Times; Carlowicz, 03 Sept 2021, Hurricane Ida Leaves a Trail of Oil, Earth Observatory; Baurick, T., 08 Sept 2021, Reports of Hurricane Ida oil, chemical spills escalate in Louisiana waters | Environment | nola.com

[34] Note: this incident was referenced by several NRC reports, and the exact location is unclear. One of the incident reports cited Phillips 66 Pipeline as the source.

estimate, as at least one news source covered this oil spill and reported 3,433 barrels (from two pipelines) in the same region.[35]

Figure 8. Oil trails visible as blueish lines in this image, as captured from the LANDSAT-8 - OLI satellite and sensor. Photo: NASA Earth Observatory, 03 Sept 2021.
https://earthobservatory.nasa.gov/images/148820/hurricane-ida-leaves-a-trail-of-oil

The Shell Pipeline at Fourchon Booster Station was another spill of concern, since it was a sizable oil spill somewhat inland, with a total of 3,780 gallons (90 barrels) reported spilled. Closer inspection of the NOAA's National Geodetic Survey (NGS) hurricane response imagery shows a sheen in standing water around part of the facility (Fig. 9).

Another noteworthy example of the shortcomings of the agencies and corporations to report to the public is the Marathon tank farm spill of crude oil in St. James Parish. The spill was reported to the NRC on 31 Aug 2021,[36] by Miss Sharon LaVigne (*pers. comm.*). On 02 Sept 2021, an entry into the USCG database was made for this NRC report and the spill (Fig. 10 shows the SkyTruth entry). The LOSCO/USCG record lists the incident as "Assessed Threat Monitor", and describes the spill: "Discharge is secured in secondary dike containment." An update from a few days later in the LOSCO entry states "Update 05SEP21: RP [responsible

[35] Schlefstien and Baurick, 13 Sept 2021, Hurricane Ida oil spills 'mind-boggling,' but likely not as bad as Katrina, Rita, Times-Picayune New Orleans Advocate; Chase, 01 Sept 2021, Phillips 66 product pipeline damaged by Ida | Argus Media
[36] NRC Report Number 1315352

party] has cleanup contractors on site." Yet Ms. LaVigne states that Marathon's oil was not cleaned up by this time.[37] Neither Marathon nor the USCG is on record attempting to contact Ms. LaVigne or any of her neighbors to say that there had been a pollution event, or that there was a cleanup underway. Even if there was a cleanup underway, photographic evidence shows oil streaked all around the tank, and some had likely seeped into surface waters. The roof had blown off of the storage tank.

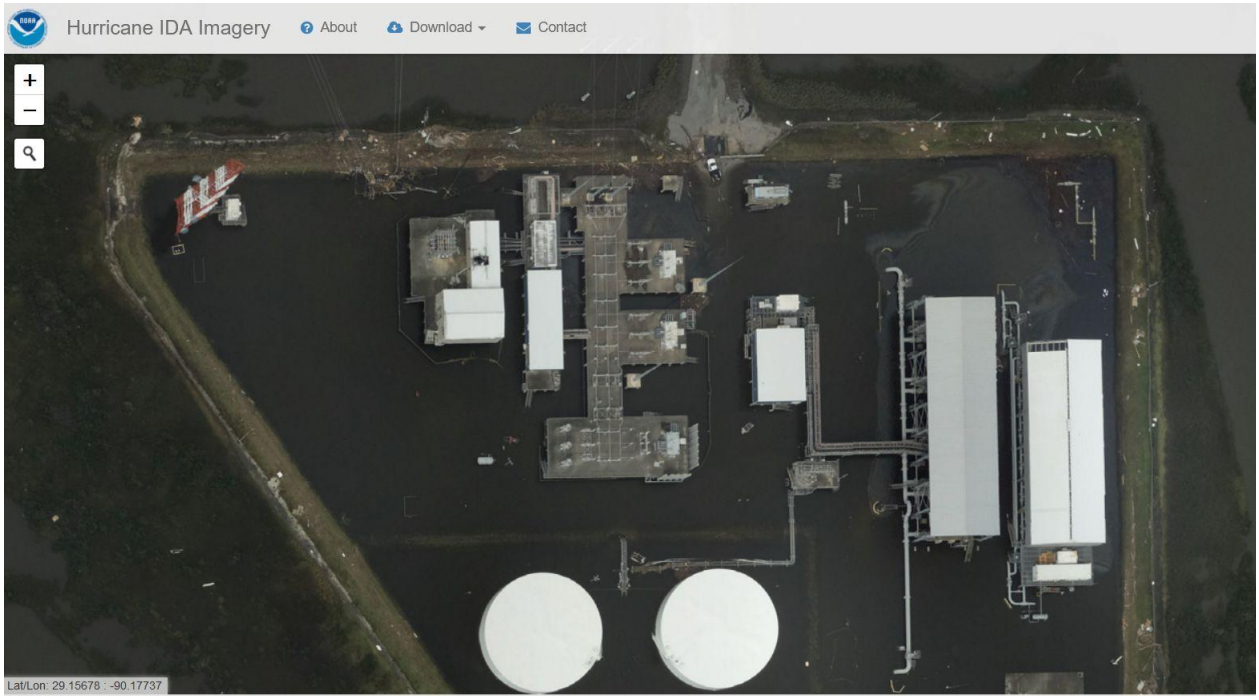

Figure 9. Hurricane Ida NOAA NGS Imagery of Shell Pipeline, Fourchon Booster Station, 31 August 2021. Oil sheen visible in the upper right corner of the enclosed facility in the image.
https://storms.ngs.noaa.gov/storms/ida/index.html#19/29.15662/-90.17502

[37] Juhasz, 07 Sept 21, Hurricane Ida Pounded Louisiana's 'Cancer Alley.' Residents Need Help - Rolling Stone.

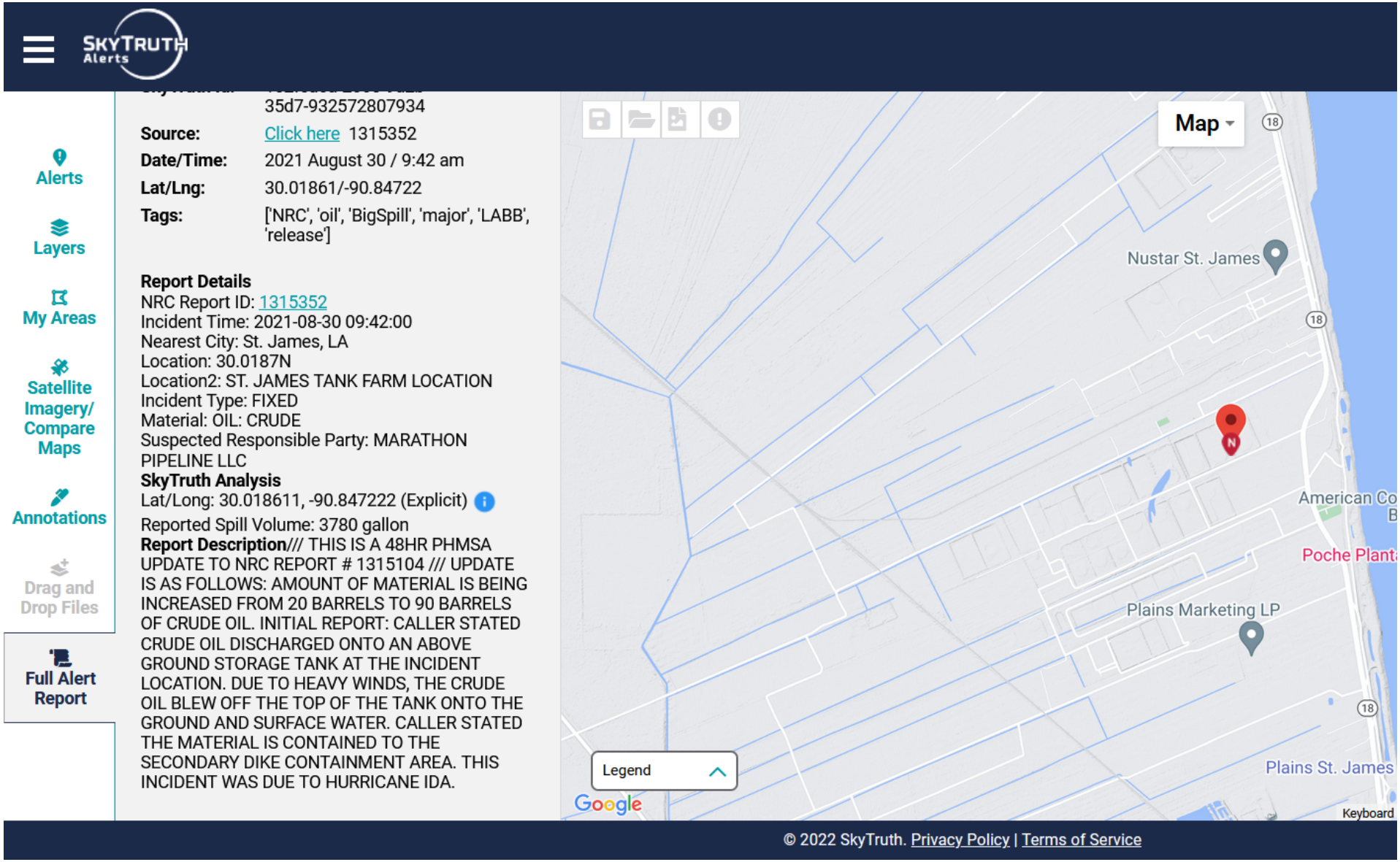

Figure 10. SkyTruth Alerts display of NRC report 131532, which indicated a large spill of oil from storage tanks at a tank farm owned by Marathon, on the west bank in St. James Parish.

Two problems emerge from this incident: the response actions were not communicated to the nearby residents, or even to the person who reported the incident. Then there is the question of "what is adequate response and containment?", which seems to be answered based on the subjective opinion rather than evidence-based, clearly documented procedure. In non-emergency times, facility employees testify that they feel, more often than not, pressured to portray a spill or accident as minimal. Employees might be afraid that if they report the actual spills and leaks, they could be fired or otherwise penalized financially or socially. Furthermore, there may not be enough people to attend to all the problems since many facilities operate on an emergency-only crew in the case of a hurricane. Employees may also be understandably consumed with a personal situation such as needing to tend to their home and their family's safety.

In addition to the question of adequate containment and reporting, there remain pressing questions of how much pollution occurred and the resulting effects on public health. Recent studies have shown that even short term increases in fine particulate matter ($PM_{2.5}$) pollution amounts can contribute to mortality and disease.[38] The air pollution permitted to any given facility does not take this into account; a facility has to violate the permitted amount of pollutant for a timespan of 24 hours, as opposed to a spike or shorter term large release. Most facility managers are aware of these limits, and limit their emissions at certain times of day, so as not to exceed the 24-hour limit. However, after a disaster, in an emergency declaration, even these restrictions of the 24-hour limits are suspended. With a few exceptions, the only incentive a facility has to report and limit emissions after a storm, is to be a good neighbor. Needless to say, air pollution from an industrial facility is often weakly characterized, at best following a storm.

The largest sheen in this dataset was 17 by ½ nautical miles, or approximately 29,150,000 m2, found near offshore Cox Oil facilities. This area alone equates to over 7,200 acres, or over 11 square miles. It is unclear exactly how much oil had spilled, or how long the spill was active, before the corporation quelled it. It is also impossible to assign responsibility to any one drilling rig, well or pipeline without close investigation, since Cox Oil Offshore operates over 500 rigs in the Gulf of Mexico.[39] In this case, Cox Oil employees reported spills and sheens coming from their facilities, so the origin of these spills is presumably known with some confidence. However, there were many other sheens and open water spills reported that were unattributed to a responsible party. This is partly due to the vast number of abandoned and operational wells and pipelines in the northern Gulf of Mexico (Appendix A),[40] making it exceedingly difficult to discover, track and clean each spill.

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[38] Nance, E. Monitoring Air Pollution Variability during Disasters. Atmosphere 2021, 12, 420. https://doi.org/10.3390/atmos12040420

[39] https://coxoperating.com/oil-field-operations/

[40] Tabuchi and Migliozzi, 06 Sept 2021, Oil Spill in the Gulf of Mexico: What We Know - The New York Times; see also Eustis, 2021, Oil and Gas Pipeline Integrity in Texas and Louisiana 2010 - 2020 available here:https://healthygulf.org/wp-content/uploads/2022/01/Oil-and-Gas-Pipeline-Integrity-in-Texas-and-Louisiana-2010-2020-1.pdf

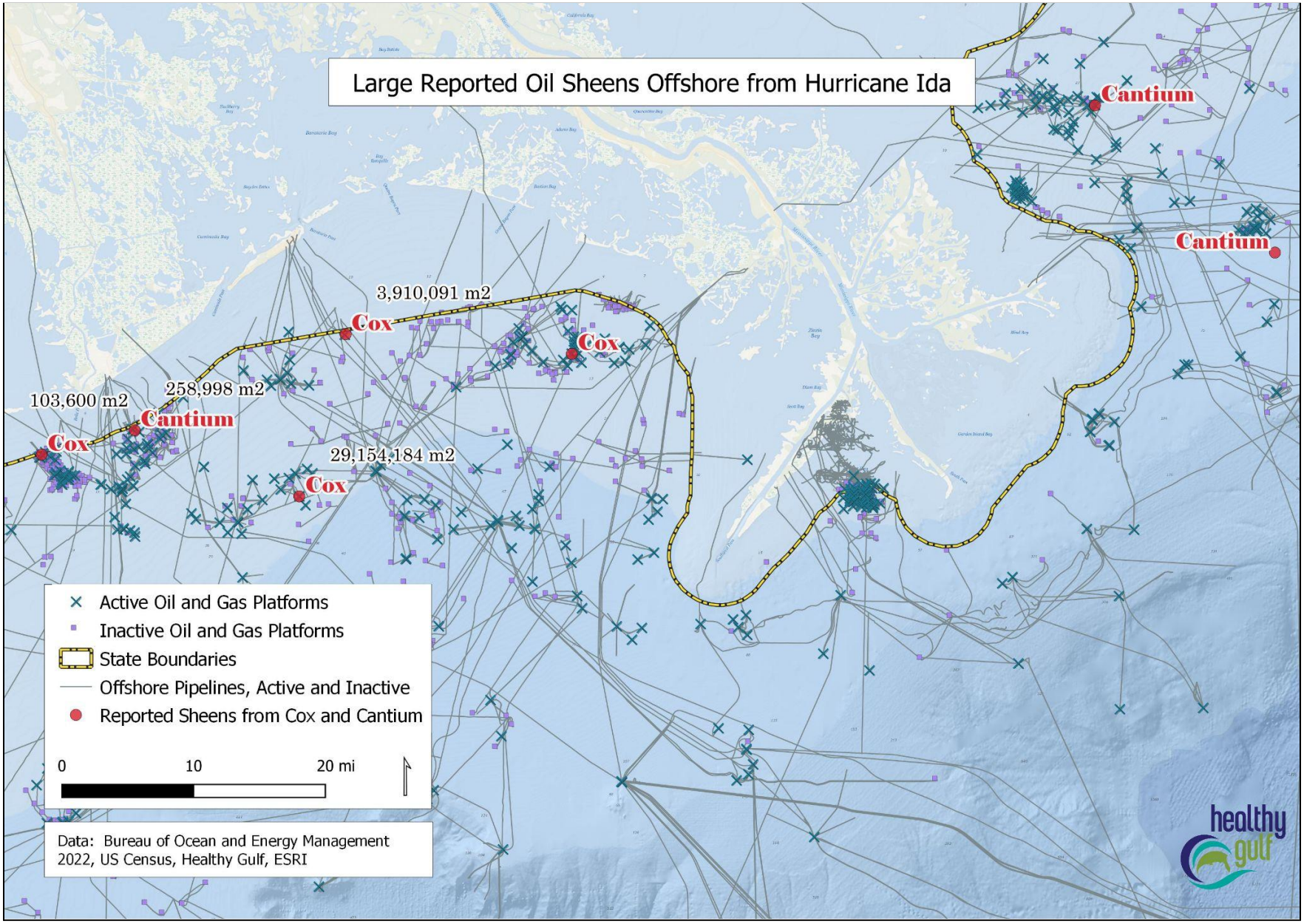


Figure 11. Cox Oil Offshore and Cantium reported spills from Hurricane Ida amounting to millions of square meters, or thousands of acres of sheens detected.

Cox Oil Offshore and Cantium together accounted for at least seven offshore spills, three of which had no known volume or area (Fig. 11). Cox and Cantium sheens accounted for 33,426,873 m2 of sheens, more than half of the total area of sheens recorded. Thus, these four sites account for an outsized portion of the 22 total sheens (where area was specified). However, neither Cox Oil Offshore nor Cantium have received penalties, violation fines, or operating suspensions as a result of these spills. Neither of these companies were required to change their practices, despite both having a history of environmental non-compliance and emergency "incidents".

According to the Bureau of Safety and Environmental Enforcement (BSEE), in 2020 there were 689 incidents of record in federal waters; a whopping 649 of these were in the Gulf of Mexico.[41] An "incident" according to BSEE can be anything from pollution to accidents to safety, injury, or collisions, so not all of these incidents included pollution. Regardless, in 2020, BSEE reported Cantium with 10 incidents and Cox Offshore Oil (including Energy XXI GOM, a subsidiary) with 35 incidents. Of the top 10 largest sheens, Cox and Cantium are the primary responsible parties. Chevron and Hilcorp also rank on this "top 10" list. Hilcorp is identified in 11 pollution reports for this study. Five of the Hilcorp records are for spills of one barrel or less, but three of the records are thousands of meters squared sheen areas. Hilcorp has also been a repeat offender in the past in terms of environmental violations. Hilcorp doesn't show up on BSEE's incident list from 2020, but according to the Corporate Research Project of Good Jobs First, Hilcorp has been fined a cumulative total of $2,106,622 since 2001 for environmental violations.[42]

Given that many of the companies that had pollution events as a result of Hurricane Ida already had poor records of environmental compliance and stewardship, one question arises. Where is the reassurance that any of these companies are actually making changes to prevent spills in a future storm? It's one thing to hold facilities and corporations accountable for their compliance by levying fines and penalties. It's another for the companies to actually change practices or to "hurricane-proof" their facility.

One of the more important examples of this lack of accountability in terms of corporate change is the Phillips 66 Alliance Refinery (also referred to herein as "Alliance"). This facility has been plagued with problems, even since Hurricane Katrina. Parent company Phillips 66 is a notorious offender, with almost $700 million in environmental penalties fined since 2000.[43] In 2014, Phillips 66 was found guilty of failing to comply with air pollution monitoring, record keeping, reporting, sampling and testing requirements at several facilities including Alliance.[44] The refinery was shut down and flooded in at least three previous hurricanes (Katrina, Isaac, Harvey). Alliance struggled with maintaining compliance for decades, and then after Hurricane Ida, Alliance reported the site flooded but contained within earthen berms (Fig. 12). It is unclear

[41] See Supplemental Information, BSEE Data. Source data available at: https://www.bsee.gov/stats-facts/offshore-incident-statistics
[42] https://violationtracker.goodjobsfirst.org/prog.php?parent=hilcorp-energy
[43] https://violationtracker.goodjobsfirst.org/prog.php?parent=phillips-66
[44] Schlefstien, 24 Mar 2014, Phillips 66 to pay $500,000 fine, cancel sulfur credits for pollution violations at Alliance, other refineries | Environment | nola.com

how accurate that statement is. Nearby flyovers show the back-levee breached and fields flooded for miles, with rainbow sheens streaking across (Fig. 13). Alliance, after having been closed, flooded and spewing pollution for months, decided to close operations and turn the refinery into an oil export terminal.[45]

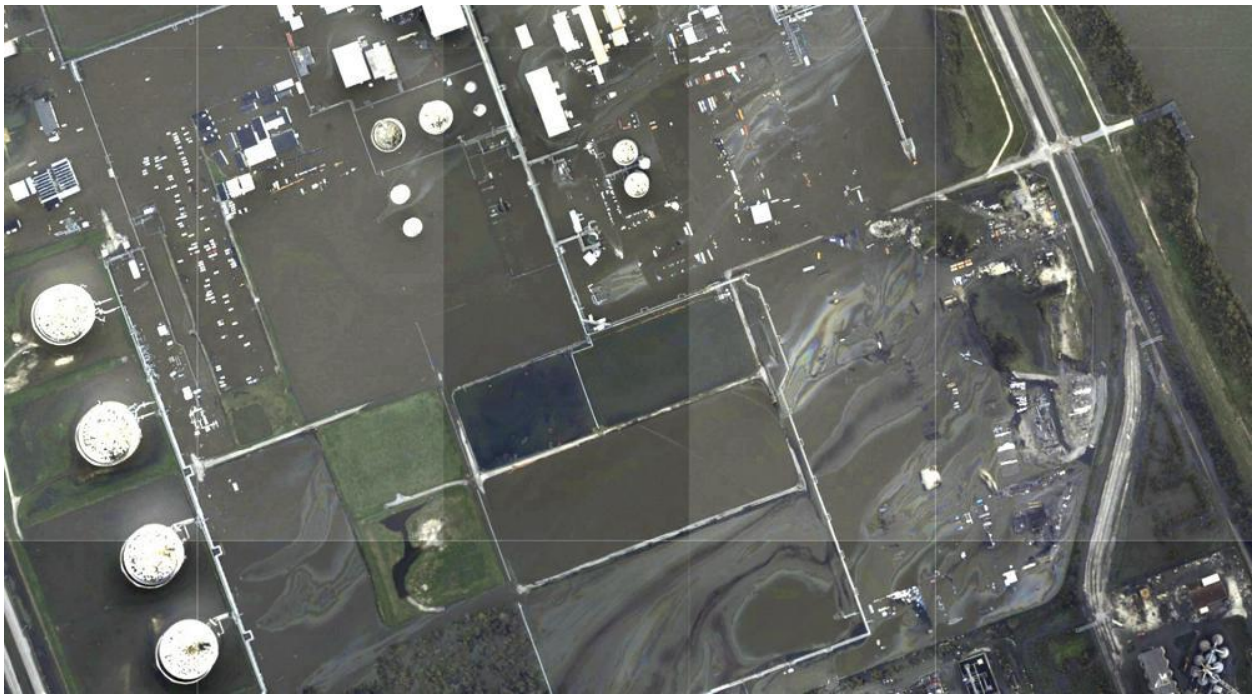


Figure 12. Phillips 66 Alliance Refinery 31 Aug 2021, flooded with oil streaks across the refinery site. Photo: NOAA NGS.

B. Air Pollution

Again, these oil and industrial spills are very likely undercounts of what was actually spilled. If there is uncertainty around liquid spills, there is even more uncertainty around air pollution or emissions. All of the EPA data records used in this analysis were for air pollution, as these were self-reported numbers by the companies, supplied to the EPA. For LDEQ and LOSCO, less than 10% of the pollution records were of air pollution (Table 5).

Table 5. Air pollution records as a percentage of the total number of records from each agency. Note: any records labeled "Unspecified" in the substance field were removed from the count of "Total with Substance".

	EPA	LDEQ	LOSCO
Total with Substance	20	244	122
Percent of Total Air Pollution	100%	6.97%	8.20%

The State of Louisiana (LDEQ and others) called on the EPA to perform air pollution sampling following the storm, which was a welcome change of events from past hurricanes. However, several problems arose in terms of accessibility and pollutant detectability with this sampling.

[45]09 Feb 2022, Layoffs begin at shuttered Phillips 66 Alliance Louisiana refinery -sources | Reuters

Figure 13. Fields between Ironton and Myrtle Grove Marina flooded with rainbow sheen streaks across the field. Highway 23 is underwater until just upstream of Ironton. The Phillips 66 Alliance Refinery is upstream, in the upper middle of the image. 04 Sept 2021, Photo: Healthy Gulf % SouthWings.

First, the EPA-collected data (called "ASPECT", collected by airplane) was not made available in any clear way on the EPA's website, or upon repeated request. Even after a FOIA was made and fulfilled, EPA did not disclose the results of the ASPECT flights.[46] Instead, data from the ASPECT flights was included with the LOSCO public records request fulfillment.

Second, upon examination of one ASPECT flight report from a mission flown September 5th, 2021,[47] the EPA personnel and sensors found that "ASPECT did not detect any programmed compounds", despite having flown over several "plumes of black smoke". Upon closer inspection, the detection limits for the ASPECT sensors were too coarse to return usable results for some pollutants anyway. For example, the detection limit for sulfur dioxide is anything above 15 parts per million (ppm) (Appendix E). However, the National Ambient Air Quality Standard (NAAQS) primary standard for sulfur dioxide is .075 ppm, or 75 parts per billion.[48] Thus the sensor itself wouldn't have detected, to within two magnitudes of order, whether or not

[46] EPA answered the FOIA request for data (spatial and tabular) of pollution incidents with 203 PDF format documents. There was valuable NRC data, for example, that was tabulated, but into tables in a PDF which are utterly unusable for analysis purposes. Nothing about the process of obtaining data from the EPA was simple or straightforward, despite repeated attempts asking for those data.

[47] See Supplemental Information

[48] https://www.epa.gov/criteria-air-pollutants/naaqs-table

the NAAQS had been exceeded during the course of one of the flight missions (much less for weeks on end). Furthermore, sulfur dioxide is the only "criteria pollutant"[49] detectable from ASPECT's sensors. Some Volatile Organic Compounds (VOCs) that are of concern are detectable, but EPA does not have specific NAAQS standards for those. Some VOCs contribute to ozone (is a criteria pollutant), but none of that is specified in the report or the monitoring summary.

Sulfur dioxide is notoriously difficult to sample for and detect, so even if the EPA is given the benefit of the doubt and the results from the ASPECT flights findings are acceptable, the data access and transparency is still entirely unacceptable. Neither the public nor journalists were given sampling data. When queried, EPA officials repeatedly referred questioners to data that were supposedly posted on the Hurricane Ida response website, but that were impossible to find.[50] Follow-up conversations with the same EPA officials proved unfrutiful.

There is a chronic deficit of air pollution data reported to the agencies after every hurricane, including Hurricane Ida. What's worse, this deficit has been known for decades, and it seems as if the agencies and the polluting companies either don't want to make the changes needed to remedy the situation, or they're using the same tactics and expecting a different outcome every time there is a new storm. Either way, the situation is unacceptable and entirely inadequate for protecting public and environmental health.

C. Cumulative Impact

There wasn't much coverage of the smaller spills and leaks (and even of some of the larger ones). However, even small spills can persist for days and even weeks. Small amounts of oil or chemicals can adversely affect and impair wildlife and people that come into contact with them. There was no discussion or recognition from the USCG of the cumulative impact of many small spills. For an offshore oil spill, the clean-up effort is focused on both stopping the leak, and also preventing oil from reaching the shore and the marsh. While oil in the open ocean can be extremely problematic for the organisms and water quality there, oil onshore poses unique threats. When oil reaches the shore, there is a catastrophic cascade of effects on the vegetation, fish, wildlife and people that interact with the coast.

Regardless of the location, each oil and chemical spill contributes to a "cumulative impact" of environmental and human exposure to pollutants. As more pollutants are added to this exposure accounting, or "pollution burden", the cumulative impact can become staggering. Furthermore, adding in a component of time (if a community has been exposed to a certain pollutant for many years on end, say) adds another dimension of impact. If there is no way to account for each pollutant in the first place, no way to assess even a ballpark figure for pollutants present and the amount, there is no way of accounting for a cumulative pollution burden.

People deserve to know what is in the air and water around them. The people most disadvantaged after a hurricane are people with low-incomes, and people of color. Thus our climate justice and environmental justice communities are most severely affected. This analysis

[49] https://www.epa.gov/criteria-air-pollutants
[50] https://response.epa.gov/site/site_profile.aspx?site_id=15323

has demonstrated the difficulty of finding usable data regarding pollution following Hurricane Ida. It is a truly sorry state of affairs when Hurricane Ida actually had more pollution information availability than in previous hurricanes in Louisiana, and there was still a complete block to informing the community of the pollution burden. The EPA held weekly briefings, the Civilian Air Patrol was called in to fly reconnaissance photographic missions, and the Louisiana Department of Environmental Quality requested air sampling from EPA. The lack of communication, on top of the inadequate sampling, monitoring, and accessibility of pollution data amounts to climate racism, environmental racism, and severe injustice. The "burden of proof" of bringing to light pollution occurrences should be on the agencies whose very mission is to document and hold accountable environmental violators. It is also entirely unjust to place the burden of proof and documentation of pollution and remediation on residents, or on volunteers and non-profit organizations.

The industries that pollute must bear the cost and responsibility of this burden. The agencies must ensure that the polluters are held accountable, that independent monitoring is performed regularly at stacks, flares, outfalls, wellheads and drill rigs, in disaster and non-disaster times. The agencies must also enforce remediation and retrofitting to change the cause of pollution at any polluting site. Finally, it is patently absurd to allow new polluter facilities to build and expand, when these systems are not in place, and when the facilities are not scrutinized for weakness to storm conditions. Everyone on the Gulf Coast knows it's not a matter of if but when the next storm strikes and leaves human and chemical disaster in its wake.

VI. Conclusion, Further Questions

There is something broken in our system, when a lawsuit that holds a corporation accountable for massive pollution and environmental violations does not actually stop the things from happening that caused the pollution. Wouldn't a more adequate accountability for a point source polluter corporation be that, in addition to a fine, the facility would be shuttered, until a full investigation has been completed and the problems have been completely remediated? (Note: workers should not be punished for this either; a shutdown due to environmental violations should also include full pay for all site employees for the duration.)

Similarly, when pollution is found in water after a storm, the USCG informs the responsible party and asks the company to take on the cleanup. USCG stated that agency personnel check up on the site, if possible, to make sure cleanup is progressing. However, that's a best case scenario, and when any one of those pieces breaks down, there is no backup or safety net. For example, when a company cleans up after themselves, what reason does the public have to trust the clean up is adequate? What happens when the USCG receives too many calls and can't investigate each one, or can't check up on the ones that have been handed off to a "responsible party" for clean up? There must be a better way.

Regulatory agencies should require independent, regular monitoring at every pollution emissions site at a plant and the data from those sensors should be collected and held at the agency, accessible to both the public and the company to see. As it is, the companies are

responsible for collecting pollution data for the most part, and the public has no choice but to trust those numbers and reports. Again, it seems absurd to entrust the companies, who have every incentive to "not" have spilled anything, to report pollution accurately.

The avenues of data mining that produced the most benefit in this analysis were from LDEQ (especially utilizing their storm-specific AI records) and LOSCO. It is recommended in the future to utilize more of the (raw) NRC data, and since those data are not tied to a storm event, to choose a reasonable time span instead as a selector.

Polluters and the regulators must step up to take the responsibility for monitoring, clearly and simple communications, and supervision of adequate cleanup of pollution after a storm. Large scale recommendations are for agencies to coordinate more intentionally and clearly. Best practice would be to utilize a centralized database that all agencies (and the public) can at least see, if not contribute to. Those tools need to be planned out ahead of time, instead of created on the fly, every time there is a new disaster. Data collection, management and communication protocol needs to be put in place, so agencies, companies, journalists and the public alike can all refer to the process when there's a question.

At a smaller scale, communications with affected residents needs to be carefully and deliberately planned ahead of time, taking power outages into account. A tiered approach to communications could work, where the agencies and the media are publishing pollution information at least daily online, and those outside the affected area can relay messages to those that are in the disaster zone. Radio and television stations could be informed ahead of time that they will be expected to communicate the pollution information, for those that can access those modes of communication. Finally, texting in the form of "reverse 911" alerts could be employed, and also reliable "communication locations" could be prearranged where residents could physically go to talk to someone and receive information. Representatives from the agencies plus emergency responders, for example, could be empowered to relay messages to the National Guard, the cities, the Parishes and mutual aid organizations, so that people on the ground are able to find out about pollution that would affect them.

Issues of inadequate pollution reporting and communications are pervasive through industries and agencies in Louisiana, disaster or not. Everything is exacerbated after a storm, and the pollution and the lack of assessment compounds with the lack of informing the public. Agencies need to provide better options to people for exposure to acute toxins, rather than simply issuing "shelter in place" orders. Many people in a hurricane affected area won't even receive shelter in place orders when the power is out. If they do receive shelter in place orders, this means people sitting inside a house with no windows open and no air conditioning running, even if they have a generator, in the summer heat. A situation like that can lead to dangerous conditions from heat stroke, and some people will not be able to locate a "sealed" structure due to damage from the hurricane.

The best remedy for this situation is prevention. Point source polluter facilities need to have a much more rigorous method of analyzing structural and material safety for all facilities,

chemicals and debris on site. Then those facilities need to be required to clean up, shape up, and shore up.

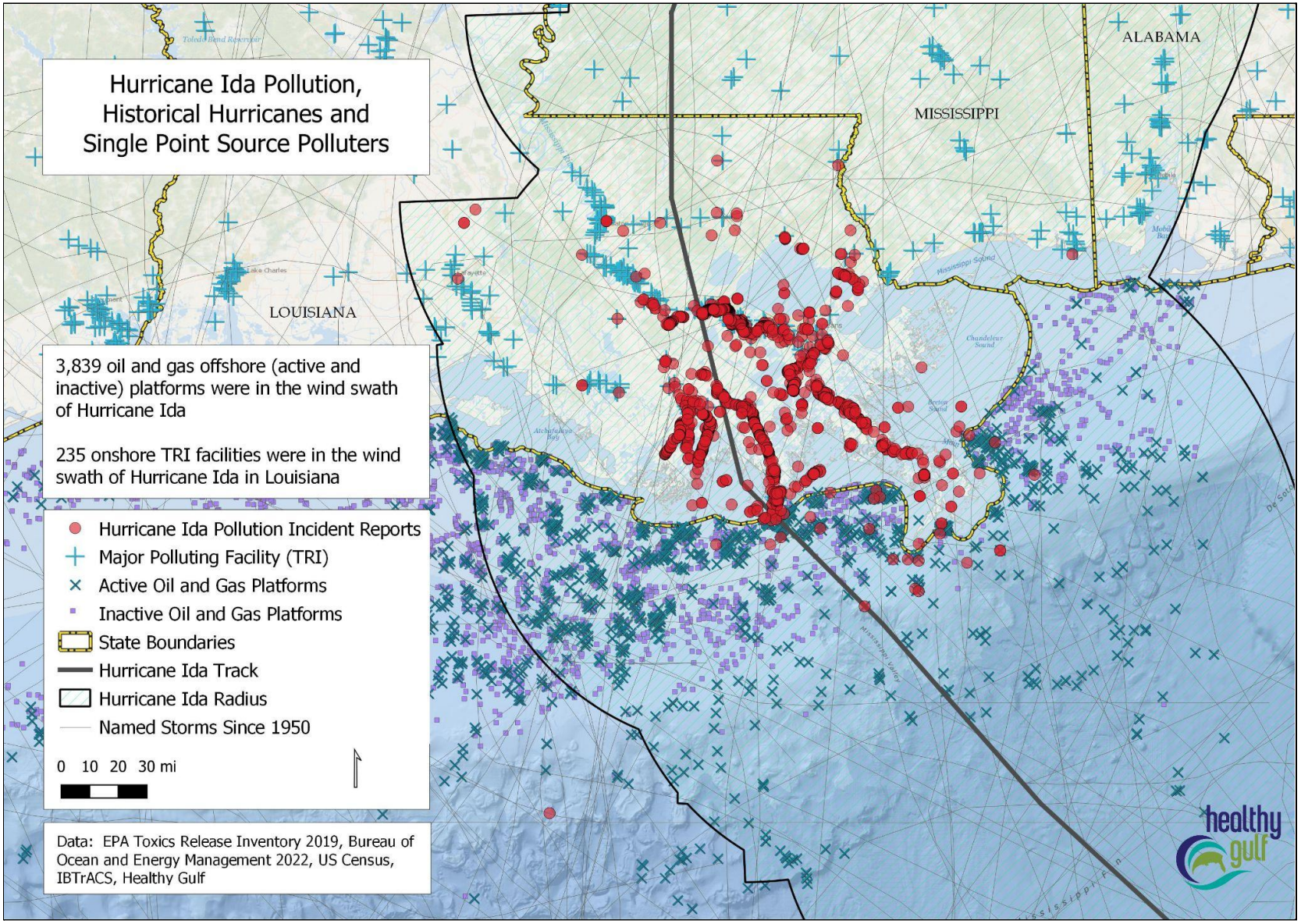
One way to incentivize prevention would be to require companies to comply with the terms of their environmental permits, even during and after a storm. Instead of companies declaring that they've experienced an "Act of God" and there is nothing to be done, ask companies to take responsibility for their facilities, for when there is a catastrophic disaster. If a company violates the terms of its permits, or is found in violation of any laws, then it could be imposed that no agency will issue new permits, permit renewals, extensions of time or any other authorization allowing the facility to expand operations until the situation is fully remedied and independent inspectors agree.

Individuals and households are asked to take responsibility for their well being during and after a storm. The public is asked to assemble hurricane preparedness kits, and spend extensively on food, water, battery packs, flashlights or other non-electrical lamps. Some take on even greater expense in preparations by purchasing a generator (and fuel for the generator) or large battery operated appliances. The public is also largely responsible for self-financing evacuation (transportation, lodging, food, etc) in the case of a non-mandatory evacuation. These are not minor expenses, yet households receive no monetary compensation for any preparations made. How is it then, that corporations with large budgets and profits are not expected to "prepare", are not expected to make any and every necessary change to prevent pollution, and to shoulder the costs? Polluting companies have "operating expenses" in the form of a fund to cover environmental violations fines. Shouldn't this be reversed, where companies have, as part of the cost of doing a polluting business, large funds dedicated to prevention of environmental catastrophe in the face of a disaster?

Clean air and clean water are human rights. How can anyone know if those rights are being violated in the wake of a disaster, if the information is not being collected, and/or if the data are not being readily shared in plain-language? People that live in environmental justice and climate justice communities also have outsized pollution burdens and storm-impact burdens, often that persist for decades. At this point in time, there are only proxies, at best, for evaluating cumulative impacts of pollution, much less cumulative impacts of pollution from storms. When our health and livelihood are on the line, the need to have dependable storm pollution data is difficult to overstate.

Appendix A

Map of Point Source Polluters, Hurricane Ida Incident Reports and historical Hurricanes



Hurricane Ida pollution reports with "Toxic Release Inventory" (TRI) facilities from the EPA. Offshore oil and gas platforms, active and inactive, according to BOEM are also shown, along with Hurricane Ida's track and wind swath, and named tropical cyclone systems from previous years that made landfall on the Gulf Coast.

Appendix B
FOIA Request Response from NOAA

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL ENVIRONMENTAL SATELLITE, DATA, AND INFORMATION SERVICE

October 27, 2021

Ms. Pam Spees
Center for Constitutional Rights
666 Broadway 7th Floor
New York, NY 10012

Re: FOIA Request DOC-NOAA-[2021-002229]

Dear Ms. Spees,

This letter is in response to your Freedom of Information Act (FOIA) request entered into FOIAonline, our request tracking database, on September 28, 2021 in which you requested:

"the database and GIS data of all "targets," or pollution incidents received or responded to by NOAA, and all incidents and targets received and responded to by the U.S. Coast Guard leading up to and following Hurricane IDA, from August 23, 2021 through the date of this letter (September 28, 2021).

This request specifically includes, but is not limited to, any and all descriptive attributes, including responsible party and material(s) spilled, plus geographic coordinates, date and time, and scope or extent of the target."

Please see below for the requested data:

All GIS data of possible oil pollution is publicly available in the Archive section at:

https://www.ospo.noaa.gov/Products/ocean/marinepollution/

The data can be freely downloaded and distributed without restriction.

You have the right to file an administrative appeal if you are not satisfied with our response to your FOIA request. All appeals should include a statement of the reasons why you believe the FOIA response was not satisfactory. An appeal based on documents in this release must be received within 90 calendar days of the date of this response letter at the following address:

Assistant General Counsel for Employment, Litigation, and Information
U.S. Department of Commerce Room 5896
1401 Constitution Ave. NW
Washington, DC 20230

An appeal may also be sent by email to FOIAAppeals@doc.gov or by FOIAonline at https://foiaonline.gov.

For your appeal to be complete, it must include the following items:

- a copy of the original request,
- our response to your request,
- a statement explaining why the determination was in error; and
- "Freedom of Information Act Appeal" must appear on your appeal letter. It should also be written on your envelope, email subject line, or your fax cover sheet.

Appendix B
FOIA Request Response from NOAA

FOIA appeals posted to the email box, FOIAonline, or Office after normal business hours will be deemed received on the next business day. If the 90th calendar day for submitting an appeal falls on a Saturday, Sunday or legal public holiday, an appeal received by 5:00 p.m., Eastern Time, the next business day will be deemed timely.

FOIA grants requesters the right to challenge an agency's final action in federal court. Before doing so, an adjudication of an administrative appeal is ordinarily required.

The Office of Government Information Services (OGIS), an office created within the National Archives and Records Administration, offers free mediation services to FOIA requesters. They may be contacted in any of the following ways:

Office of Government Information Services
National Archives and Records Administration
Room 2510
8601 Adelphi Road
College Park, MD 20740-6001

Email: ogis@nara.gov

Phone: 301-837-1996
Fax: 301-837-0348
Toll-free: 1-877-684-6448

If you have questions regarding this correspondence please contact Maria Burke at maria.burke@noaa.gov or by phone at (202) 308-4959, or the NOAA FOIA Public Liaison Tony LaVoi at tony.lavoi@noaa.gov or by phone at (843) 740-1274. Please refer to your FOIA request tracking number DOC-NOAA-2021-002229 when contacting us.

Sincerely,

BURKE.MARIA.STELLA.1042493429
Digitally signed by BURKE.MARIA.STELLA.1042493429
Date: 2021.10.27 13:38:54 -04'00'

Maria S. Burke
FOIA Liaison
NOAA Satellite and Information Service

Appendix C
List of Parishes Within the Governor's Emergency Decree for Hurricane Ida

1. Ascension Parish
2. Assumption Parish
3. East Baton Rouge Parish
4. East Feliciana Parish
5. Iberia Parish
6. Iberville Parish
7. Jefferson Parish
8. Lafourche Parish
9. Livingston Parish
10. Orleans Parish
11. Plaquemines Parish
12. Pointe Coupee Parish
13. St Bernard Parish
14. St Charles Parish
15. St Helena Parish
16. St James Parish
17. St John the Baptist Parish
18. St Martin Parish
19. St Mary Parish
20. St Tammany Parish
21. Tangipahoa Parish
22. Terrebonne Parish
23. Washington Parish
24. West Baton Rouge Parish
25. West Feliciana Parish

Appendix D
Detailed List of Spills by Substance and Amount

Detailed Incidents by Substance	Occurrences (Unknown Amount)	Occurrences (Known Amount)	**Total Occurrences**	Known Amount	Known Amount Units
Ammonia		1	**1**	10.000	gallons
Asbestos	2		**2**		
C4	1		**1**		
Chlorine	1		**1**		
Coal	1		**1**		
Gas, Ammonia	2	7	**9**	46,922.000	pounds
Gas, Butadiene	1	1	**2**	6.000	pounds
Gas, Carbon disulfide		1	**1**	1,980.000	pounds
Gas, Carbon monoxide		1	**1**	16.000	pounds
Gas, CO2		2	**2**	105,002.000	pounds
Gas, Ethylene	1	1	**2**	138.000	pounds
Gas, H2S		2	**2**	4,479.000	pounds
Gas, Isobutane		1	**1**	521,449.200	pounds
Gas, Methane	11	5	**16**	33,336.950	pounds
Gas, NOx		2	**2**	14,650.000	pounds
Gas, Propane		1	**1**	2,057.140	pounds
Gas, Propylene	1	2	**3**	384,850.000	pounds
Gasoline	6	3	**9**	82.000	gallons
Gasoline, Diesel	12	7	**19**	529.000	gallons
Gasoline, Pyrolysis	1		**1**		
High pH water	2		**2**		
Hydrochloric Acid	1		**1**		
Methanol	1		**1**		
Molasses	1		**1**		
Oil, by area (misc + crude)		4	**4**	1,664,438.354	m2
Oil, by volume (misc)	29	10	**39**	122,355.000	gallons
Oil, Crude	26	21	**47**	99,172.440	gallons
Oil, Diesel Fuel	1		**1**		
Oil, Fuel	3	1	**4**	50.000	gallons
Oil, Hydraulic	1	2	**3**	14.200	gallons
Oil, Mineral	1	47	**48**	6,312.000	gallons
Oil, Motor	1	2	**3**	308.000	gallons
Oil, Quench		1	**1**	55.790	gallons
Oil, Sheen	8	6	**14**	7,251,105.300	m2
Oil, Transformer	5	2	**7**	65.000	gallons
Particulate Matter	1		**1**		

Appendix D
Detailed List of Spills by Substance and Amount

Detailed Incidents by Substance	Occurrences (Unknown Amount)	Occurrences (Known Amount)	**Total Occurrences**	Known Amount	Known Amount Units
Produced Water		2	**2**	210.000	gallons
Saltwater	1		**1**		
Sewage	32	1	**33**	500.000	gallons
Sheen, Unspecified	74	12	**86**	56,165,800.370	m2
Sludge	1		**1**		
Solid Waste, Biohazard	1		**1**		
Solid Waste, Insulation	1		**1**		
Solid Waste, Plastic Pellets	1		**1**		
SOx	1	2	**3**	499,190.000	pounds
Unspecified	54		**54**		
Wastewater	1		**1**		
Water	2		**2**		
Totals	**290**	**150**	**440**		

Appendix E
Table of Detectable Compounds and their Detection Limits for the EPA's ASPECT Air Pollution Monitoring Flights

Table 1. ASPECT Automated Compounds

This table contains ASPECT's library of automated compounds.
Detection limits are for each chemical is found in parenthesis in units of parts per million (ppm)

Acetic Acid (2.0)	Cumene (23.1)	Isoprene (6.5)	Phosphine (8.3)
Acetone (5.6)	Diborane (5.0)	Isopropanol (8.5)	Phosphorus Oxychloride (2.0)
Acrolein (8.8)	1,1-Dichloroethene (3.7)	Isopropyl Acetate (0.7)	Propyl Acetate (0.7)
Acrylonitrile (12.5)	Dichloromethane (6.0)	MAPP (3.7)	Propylene (3.7)
Acrylic Acid (3.3)	Dichlorodifluoromethane (0.7)	Methyl Acetate (1.0)	Propylene Oxide (6.8)
Allyl Alcohol (5.3)	1,1-Difluoroethane (0.8)	Methyl Acrylate (1.0)	Silicon Tetrafluoride (0.2)
Ammonia (2.0)	Difluoromethane (0.8)	Methyl Ethyl Ketone (7.5)	Sulfur Dioxide (15)
Arsine (18.7)	Ethanol (6.3)	Methanol (5.4)	Sulfur Hexafluoride (0.07)
Bis-Chloroethyl Ether (1.7)	Ethyl Acetate (0.8)	Methylbromide (60)	Sulfur Mustard (6.0)
Boron Tribromide (0.2)	Ethyl Acrylate (0.8)	Methylene Chloride (1.1)	Sulfuryl Fluoride (1.5)
Boron Triflouride (5.6)	Ethyl Formate (1.0)	Methyl Methacrylate (3.0)	Tetrachloroethylene (10)
1,3-Butadiene (5.0)	Ethylene (5.0)	MTEB (3.8)	1,1,1-Trichloroethane (1.9)
1-Butene (12.0)	Formic Acid (5.0)	Naphthalene (3.8)	Trichloroethylene (2.7)
2-Butene (18.8)	Freon 134a (0.8)	n-Butyl Acetate (3.8)	Trichloromethane (0.7)
Carbon Tetrachloride (0.2)	GA (Tabun) (0.7)	n-Butyl Alcohol (7.9)	Triethylamine (6.2)
Carbonyl Fluoride (0.8)	GB (Sarin) (0.5)	Nitric Acid (5.0)	Triethylphosphate (0.3)
Carbon Tetraflouride (0.1)	Germane (1.5)	Nitrogen Mustard (2.5)	Trimethylamine (9.3)
Chlorodifluoromethane (0.6)	Hexafluoroacetone (0.4)	Nitrogen Trifluoride (0.7)	Trimethyl Phosphite (0.4)
Chloromethane (12)	Isobutylene (15)	Phosgene (0.5)	Vinyl Acetate (0.6)