



**LESSONS FROM HURRICANE ISAAC:
GULF COAST COAL AND PETROCHEMICAL
FACILITIES STILL NOT STORM READY**
A GULF MONITORING CONSORTIUM REPORT





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About Gulf Monitoring Consortium:

Founded in April 2011 by SkyTruth, SouthWings, and the Waterkeeper Alliance, GMC recently welcomed the Gulf Restoration Network and Louisiana Bucket Brigade as the newest partners in a collaborative effort to detect and report petrochemical and fossil fuel pollution in the Gulf of Mexico and the Gulf Coast Region. GMC is a fact-based data sharing organization, providing a platform for collecting, sharing, and publishing information. GMC uses the tools and expertise of each member organization to investigate and publicize new and chronic pollution using information acquired from space, from the air, and from the surface. Our members engage in systematic monitoring of pollution in the Gulf of Mexico using satellite images and mapping, aerial reconnaissance and photography, combined with on-the-ground and on-the-water observation and sampling. The Consortium's long-term goal is to reduce pollution by ensuring that industry and government pollution reports are accurate, credible and understandable, so that the true state of pollution related to energy development is widely acknowledged and incorporated into public debate, policy and decision-making.



Cover Photos (clockwise from top):

[GRN] Offset chemical tank and upset railcars at Stolthaven Chemical near Braithwaite, La.;

[NOAA] Satellite image of Hurricane Isaac making landfall on Aug. 28;

[GRN] Sheen from offshore oil and gas infrastructure in Barataria Bay;

[GRN] Flooded Kinder Morgan Coal Terminal

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[GRN] Wide-angle of derailed rail cars and flood-shifted tanks at Stolthaven Chemical on Sept. 10.

A note about pollution estimates and self-reporting by “responsible parties”:

Only 20% of all NRC reports received for pollution caused, or suspected to be caused, by Hurricane Isaac attempted to estimate how much pollutant was spilled. The volume estimates we cite in this report are based on reports submitted to the NRC and Louisiana Department of Environmental Quality, and these agencies in turn primarily rely on self-reporting by the “responsible party” to estimate how much they spilled. However, it should be noted that GMC member SkyTruth and academics at Florida State University (FSU) found for offshore drilling in the Gulf that these reports consistently under-report the amount of pollution where they could be compared to independent observation on satellite imagery.

During overflights, boat trips, and on-the-ground monitoring trips in the field, Consortium members submitted 27 separate reports to the NRC due to Hurricane Isaac. However, GMC members only reported evidence of oil sheens, contaminated runoff from coal terminals, or other visible indicators of pollution, and no GMC-generated reports to the NRC included volume estimates.

LESSONS FROM HURRICANE ISAAC: Gulf Coast Coal and Petrochemical Facilities Still Not Storm Ready

A Gulf Monitoring Consortium Report



Introduction: On August 28, 2012, Hurricane Isaac made landfall in the United States as a Category 1 hurricane at the mouth of the Mississippi River. In the wake of the storm, oil, coal, gas, and petrochemical facilities/infrastructure released at least the following pollution into the surrounding land, waters and air of the Gulf region:

- 341,044 gallons of oil, chemicals, and untreated waste-water**
- 192.3 tons of gases and other materials (354,819 pounds)**
- 12.6 million gallons of untreated “process area water” from one overwhelmed facility**

During the storm and in the days immediately afterward, the U.S. Coast Guard’s National Response Center (NRC) received 221 reports of fossil fuel and petrochemical pollution: 130 reports specifically identified the Hurricane as the cause of the spill or release; and Gulf Monitoring Consortium (GMC) member Louisiana Bucket Brigade (LABB) determined an additional 91 events were likely due to the storm, based on date and incident type. Of the 221 reported incidents, GMC members monitoring the Gulf Region by air, land, and water submitted 27 individual reports in the aftermath of the storm.

KEY FINDINGS:

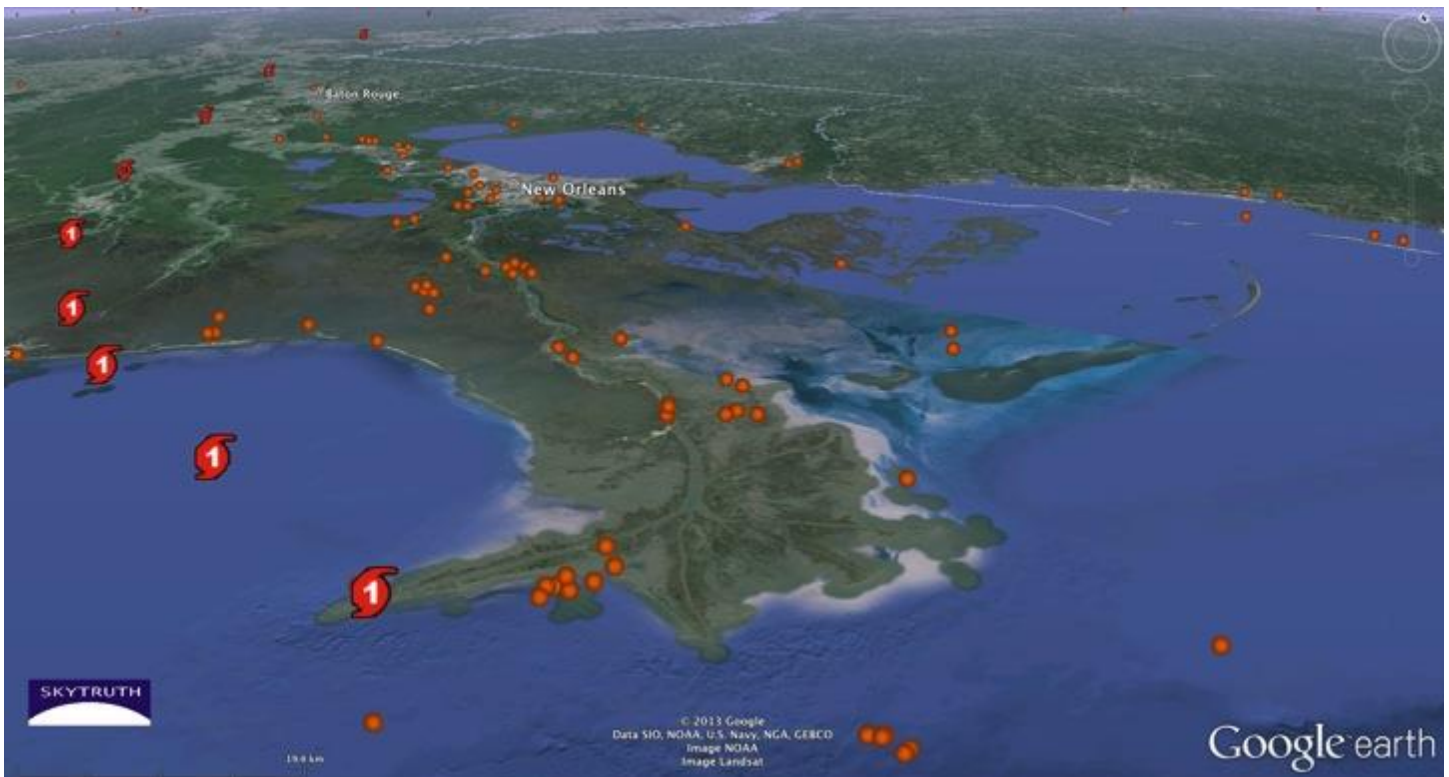
- 1) *Substantial amounts of pollution were released into the environment due to damage from the only hurricane to make landfall on the Gulf Coast in 2012.***
- 2) *Harmful chemicals, including recognized neurotoxins and carcinogens, were released due to damage from the storm.***
- 3) *Despite advance warning of the storm path and intensity, operators used the weather as an excuse for polluting.***
- 4) *Fossil fuel infrastructure in the Gulf Region is vulnerable to predictable tropical weather events.***
- 5) *Oil from the BP / Deepwater Horizon disaster continues to wash ashore.***

In preparation for the 2013 hurricane season, GMC members assembled official reports submitted to government regulatory and emergency response agencies and compiled our findings from independent monitoring in the aftermath of this relatively weak hurricane. This report is a case study of pollution from fossil fuel and petrochemical infrastructure, resulting from the vulnerability of these facilities to the severe tropical weather that repeatedly—and predictably—assails the Gulf Region.

Key Findings

Finding #1: Substantial amounts of pollution were released into the environment due to damage from the only hurricane to make landfall on the Gulf Coast in 2012

During and following Hurricane Isaac, from August 28 to September 18, 2012, a total of 130 accidents were reported to the NRC as a direct result of the storm; 69 additional reports to the NRC may be related to the storm given the report date and incident type, but these reports did not specifically mention Hurricane Isaac. Of the 130 accidents attributed to the hurricane, 108 reports identified specific pollutants released or suspected to have been released. There were an additional 32 reports not associated with specific pollutants released (e.g., reports of unmarked 55-gallon drums found in storm debris). Of the 108 NRC and LDEQ reports of pollution due to Hurricane Isaac, 45 provided estimates of the amount of specific pollutants released, totaling **at least 12,941,044 gallons of pollutants and contaminated water, and over 192 tons of gases** released into the environment of the Gulf Coast Region.



In red, the path of Hurricane Isaac, and in orange, pollution reports received by the NRC between August 28 and September 11, 2012, the dates of the storm and the initial cleanup.

Finding #2: Harmful chemicals, including recognized neurotoxins and carcinogens, were released due to damage from the storm

Besides the aforementioned reports with pollution estimates, two-thirds of the incidents reported to the NRC due to Hurricane Isaac did not give any estimate of the amount of materials released. While the actual releases were probably significantly greater than the amounts given below and groups like LABB are still finding incident reports from operators, we at least have documentation from the NRC of the following releases resulting from Hurricane Isaac:

Significant NRC Reports of Fossil Fuel and Petrochemical Spills and Releases from Hurricane Isaac †			
NFPA 704 "Fire Diamond"‡	Material	# of NRC Reports	Minimum Volume (Amount Reported to NRC)
	Crude Oil	29	20,727 gallons (gal.)
N/A	Misc. Oil/Oily Water	25	129,215 gal.
	Natural Gas Condensate/ Natural Gas	7	Condensate -1,179 gal./ Nat. Gas - No Volume Reported to NRC
	Anhydrous Ammonia	2	No Volume Reported to NRC or LDEQ
N/A	Coal/Petroleum Coke	2	No Volume Reported to NRC or LDEQ
	Propane	2	No Volume Reported to NRC/2.5 tons reported to LDEQ from 1 facility
	Sulfur Dioxide	2	No Volume Reported to NRC/ Over 76 tons reported to LDEQ from 3 facilities
	Benzene	1	No Volume Reported to NRC/107 lbs. reported to LDEQ from 2 facilities
	Chlorine	1	No Volume Reported to NRC or LDEQ
	Hydrogen Sulfide	1	No Volume Reported to NRC/ 258 pounds reported to LDEQ from 1 facility
†Does not include initial report from Stolthaven Chemical due to vastly divergent initial and final reports (see detail at right).			
‡Standard guide for determining the hazard severity of materials in four categories (Blue = Health, Red = Flammability, Yellow = Explosion Risk, White = Special Hazard) on a scale of 0-4 (0 = minimal, 4 = severe)			

In addition to the releases reported to the NRC noted here, Stolthaven New Orleans LLC initially reported to the NRC a potential release of as much as 191,331 gallons of chemicals, including a wide range of carcinogens and toxicants. Later, between September 1 and September 19, Stolthaven verbally reported spill estimates to LDEQ, indicating a potential release of much as 227,608 gallons. On October 4, 37 days after the storm, Stolthaven submitted its final report to LDEQ,¹ reporting a **total spill of 169,810 gallons of oil and petrochemicals**, including:

Octene—80,467 gallons (gal.)

Diethanolamine—76,998 gal.

Ultra S-4 (lubricant)—6,168 gal.

Vivatac—2,906 gal.

Soybean Soapstocks—2,051 gal.

Alcohols, C10-16—1,220 gal. [Safol 23, Lauryl Myristyl Alcohol]

Finding #3: Despite advance warning of the storm path and intensity, operators used the weather as an excuse for pollution

Weather is frequently cited by fossil fuel and petrochemical facilities as a cause of accidents and chemical releases, but hurricanes and tropical storms are generally predictable and are an annual occurrence in the Gulf Region. Citing storms and hurricanes as the cause of pollution suggests poor planning and/or inadequate protections.

For example, Motiva Norco Refinery in St. Charles Parish blamed the weather for its pollution, while the Valero refinery next door shut down in advance of the hurricane and reported no incident. The Motiva refinery encountered major problems and had to send workers out in the middle of the storm to tie down equipment².

Instead of acknowledging this failure in its report to LDEQ, the refinery said pollution was “from the unexpected shutdown and restart of the site before and during inclement weather due to landfall of Hurricane Isaac³.” However, Hurricane Isaac was not an unexpected event, and continuing to operate into the storm resulted in the release of chemicals and gases. Between trying to keep the flares lit in the high wind and continuing to run the flares for days after the hurricane (for as-yet undisclosed reasons), Motiva’s Norco Refinery released 135 tons of pollution including 27 tons of volatile organic compounds (VOCs), 16.5 tons of sulfur dioxide, and nearly a ton of benzene, a known carcinogen.

Other examples from Hurricane Isaac include ExxonMobil’s Chalmette Refining LLC (CRLLC) who wrote to LDEQ on August 31, “*CRLLC asks LDEQ and EPA to exercise enforcement discretion and not seek penalties for the activities undertaken to respond to and recover from the Hurricane Isaac,*” and, “*due to higher than normal rain and wind volumes, flare pilots experienced temporary outages*⁴.”

Hurricanes typically bring “higher than normal” rain and winds. What’s more, weather forecasts predict more intense conditions days in advance, so refineries should not be surprised when such conditions arise. In many of these cases the weather was described as an uncontrollable anomaly, not a predictable event that can be accommodated. Proper preparation and/or better management may have prevented or mitigated these and other pollution incidents.

Finding #4: Fossil fuel infrastructure in the Gulf Region is vulnerable to predictable tropical weather events

Hurricane Isaac made landfall on August 28, 2012 as a Category 1 storm, the weakest classification for a hurricane. By wind speed, it was among the weakest of the 28 hurricanes that have made landfall in Louisiana since 1956. Isaac’s rainfall totals and storm surge height, although significant, were by no means unprecedented—multiple storms in Louisiana and elsewhere have exceeded Isaac⁵. Ultimately, Hurricane Isaac was a predictable event.

Despite the relatively unremarkable nature of the storm, GMC documented numerous examples of pollution from infrastructure failures at fossil fuel transport, storage, and refining facilities during and after the storm. These failures included inadequate levees which allowed contaminated water to spill into surrounding wetlands, waterways, and communities; insufficient storage capacity to handle stormwater and/or wastewater during predictable high-rain events; tanks and railroad tanker cars shifted or upset by the storm and floodwaters, and other weaknesses.

Chemical processing and storage facilities:

- On September 11, fourteen days after the storm, Stolthaven New Orleans LLC’s petroleum and chemical storage and transfer terminal in Braithwaite, LA reported a worst-case scenario potential release of 191,337 gallons of oil and petrochemicals⁶. Thirty-seven days later on October 4, they submitted their “final estimated quantities released” to LDEQ⁷—169,810 gallons, or 88% of their maximum estimate.



Flooded Stolthaven chemical facility observed on August 31 by a NOAA aerial survey of the storm damage. The facility reported releasing 169,810 gallons of oil and petrochemicals in the flood. Image: NOAA/National Geodetic Survey

It took Stolthaven 37 days to report their best estimate to the state, which differed dramatically from the inventory of chemicals they initially reported might have been released, which were based on a pre-storm inventory. While bulk quantities of benzene and toluene were not actually released as initially reported, no early reports even suggested a release of Octene, Ultra S-4 lubricating oil, or Vivatec, substances which were in fact released in quantities of 80,467 gallons, 6,168 gallons, and 2,906 gallons respectively. The discrepancy means that emergency responders, residents returning to their homes, and possibly even workers were not accurately informed of potential health and environmental risks of these and other chemicals contaminating the floodwaters. The total volume of oil and chemicals spilled here almost equals all of the other 45 Hurricane Isaac-related incidents that provided an estimated spill volume.

- The ExxonMobil Chemical Plant in Baton Rouge reported numerous problems from the wind, including the hatches of tanks that simply blew away. According to reports, “Several floating roof tank socks were discovered missing or torn as a result of high winds. Multiple tank hatches discovered missing or open as a result of high winds⁸.”

Oil refineries:

- The Marathon Refinery in Garyville dumped 12.6 million gallons of untreated stormwater runoff from their process areas into Lake Maurepas after the storm, stating in their report to LDEQ that they “had reached the on-site storage capacity⁹.”

- Interviews with workers at the Motiva refinery in Norco revealed dangerous conditions inside the plant during landfall. All of the compressors malfunctioned because they were flooded and workers had to go out in the hurricane to tie machinery down while units were malfunctioning. As a result, according to refinery reports, the refinery released many chemicals and gases during the storm, including benzene and carbon dioxide¹⁰.

- At the Phillips 66 Alliance Refinery in Belle Chasse, storm surge overtopped their western levee, flooding the facility. The operators reported that oily wastewater overflowed the collection system and that oil had “come out of their sewers and into the floodwater¹¹.” Phillips 66 only reported that the amount of oil exceeded 1 barrel; and claimed a sheen was only observed on the Mississippi River on August 30, but not on the following day. Aerial survey imagery from NOAA on August 31 and GMC monitoring flights on September 2 and 10 documented oily sheens on floodwaters inside the facility and lingering on fields around the refinery, but the source is indeterminate.



Oily sheen on water at the flooded Phillips 66 Alliance refinery in Belle Chasse observed by a GMC overflight on September 2.

Photo Credit: Jonathan Henderson, GRN

- In Chalmette, the Valero Refinery spilled 47 gallons of slop oil including 7.8 pounds of benzene. Valero reported “the root cause of this spill to be inadequate containment for the heavy rains and high winds experienced during hurricane Isaac¹².” The pollution during Hurricane Isaac went into the 20 Arpent Canal, where children play.
- Exxon’s Chalmette Refinery shut down in advance of the storm, but had significant issues with pollution controls during shut-down resulting in a 58 ton release of sulfur dioxide. Furthermore, even though the Chalmette Refinery made additional preparation for the storm, they still had to discharge an undefined amount of untreated stormwater runoff from the facility due to insufficient storage capacity¹³. Even when facilities are not operating, they sometimes report inability to retain all potentially polluted water until it can be treated.



Left: Sept. 2—Flooded Kinder Morgan International Marine Terminals at Myrtle Grove, LA where floodwaters saturate dirty fossil fuels such as coal and petroleum.

Right: Sept. 10— Same facility with floodwaters being pumped out into surrounding waterways.

Photo Credits: Left—Jonathan Henderson, GRN; Right—Jeffrey Dubinsky for LMRK

Coal Terminals:

- Kinder Morgan’s International Marine Terminals (IMT) facility, on the Mississippi River in Plaquemines Parish, flooded during Hurricane Isaac. As a result of the flooding, when barriers built around the facility failed, the runoff inundated surrounding waters, wetlands, and farmland with stormwater contaminated by contact with stockpiles of coal, petcoke, or other similar materials. GRN documented the pre-storm condition of the site during a SouthWings flyover on August 25. Following the storm, GRN conducted aerial surveys of storm impacts with Southern Seaplanes on September 2 and with SouthWings on September 10, in addition to on-the-ground investigation on September 6. GRN documented International Marine Terminal actively pumping contaminated floodwaters out of their facility grounds into the surrounding wetlands, river, and environment. Aerial photos documented a dark coating of sediments spreading for miles away from the facility, which GRN concluded was coal or petcoke from the facility threatening the nearby community of Ironton. GRN also documented cattle wading through contaminated floodwaters and drinking from the runoff being pumped from the facility, and birds searching for food in dirty drainage ditches near the terminal.
- GRN documented conditions at another coal terminal on the Mississippi River in Plaquemines Parish, United Bulk Terminal LLC. Flooding at this terminal also resulted in contamination of surrounding fields and waterways.

In addition to these cases of confirmed infrastructure damage, GMC members observed oiling in several marsh or offshore locations that appeared to be associated with damaged infrastructure. In several of these instances we submitted reports to the NRC, alerting government agencies to the suspected pollution incidents documented by GMC members.

- As the clouds cleared after the storm, GMC member SkyTruth began monitoring satellite images collected by NASA's Moderate Resolution Imaging Spectroradiometer (MODIS) and detected a small offshore slick at an improperly shut in Chevron well¹⁴.

Right: Detail of an image from NASA's Aqua satellite, consistent with an NRC report received from High Island Block 563.



- On a SouthWings flyover on September 10, Lower Mississippi Riverkeeper, LABB, and GRN observed and documented multiple problems, including (1) suspected oiling of marshes in Bay Jimmy, near a leaking oil production and storage tank facility in northern Barataria Bay; (2) an apparently leaking oil production facility in the Pass a l'Outre Wildlife Management Area; (3) oily sheen at offshore sites and in the vicinity of a production/storage facility in southern Plaquemines parish; and (4) an oil leak in northern Barataria Bay that appeared to be emanating from either a pipeline below the surface or a nearby facility.

Finding #5: Oil from the BP / Deepwater Horizon disaster continues to wash ashore

Twelve miles of beach were closed after Hurricane Isaac between Grand Isle and Port Fourchon because of the large amounts of oil present. Furthermore, tarballs were found washed ashore as far east as Alabama. Auburn University reported that 37,000 pounds of tar balls, tar mat fragments, and other oil-tainted material were removed from Alabama beaches in the wake of Hurricane Isaac¹⁵.

On September 2, Lower Mississippi Riverkeeper took samples of suspected BP oil washed up on Fourchon Beach just before it was closed. On September 4, in partnership with Greenpeace, GRN conducted ground surveys of East Ship and West Ship islands, part of the Gulf Islands National Seashore, and Greenpeace sent samples of tar balls suspected to be from the BP oil spill for laboratory analysis. On September 6 Consortium member GRN and their colleagues at Greenpeace surveyed storm damage by boat and documented fresh oil coating the marsh in Bay Batiste in northern Barataria Bay.



At Elmer's Island, La., one of countless tarballs still washing ashore from the BP/ Deepwater Horizon Oil Disaster in 2010.

Photo Credit: Jonathan Henderson, GRN



GRN's Jonathan Henderson collecting oil samples from a marsh at Bay Batiste after Hurricane Isaac. Photo Credit: GRN

Oil samples from the marsh in Bay Batiste were sent to Dr. Ed Overton at Louisiana State University for analysis. Dr. Overton found that the fingerprint of oil samples taken in Bay Batiste matched that of oil from BP's failed Macondo well, suggesting that oil from the BP / *Deepwater Horizon* disaster continues to resurface on the Louisiana coast during storm events. In addition, nearly a month after Hurricane Isaac, GRN conducted a ground investigation and documented more oil, also confirmed by Dr. Overton¹⁶ to be from the BP/Gulf Oil Disaster, still polluting marshes and shorelines on Elmer's Island and Grand Isle.

Summary:

The abundance of pollution caused by a relatively routine and predictable storm indicates deficiencies in the condition, maintenance, and/or operations of fossil fuel and petrochemical facilities in the Gulf Region. The vulnerability of facilities that contain and process oil, coal, petroleum coke, natural gas, and a wide range of hazardous chemicals and gases could lead to catastrophic effects in more severe storms. A preponderance of evidence shows that extensive pollution caused by storm damage is not isolated to Hurricane Isaac:

- In 2004, Hurricane Ivan, a Category 3 storm, created a sub-sea landslide that wiped out Taylor Energy Platform #23051 off the Louisiana coast. Nearly nine years later crude oil continues to ooze into the waters of the Gulf, as detailed in GMC's 2011 report¹⁷.
- In 2005, Hurricanes Katrina and Rita devastated the Gulf Coast¹⁸. According to a report to Congress from the U.S. Coast Guard¹⁹, the NRC logged over 5,000 minor spill incidents from the storms. Over nine million gallons of oil were released from coastal and offshore facilities, including six major and five medium spills. Furthermore, the U.S. Minerals Management Service²⁰ reported that the two storms totally destroyed 113 offshore oil and gas platforms and damaged 457 pipelines, including 101 large pipelines (>10" in diameter).
- In 2008, the Associated Press (AP) reported²¹ that Hurricane Ike, a Category 2 storm, caused "at least 448 releases of oil, gasoline and dozens of other substances into the air and water and onto the ground in Louisiana and Texas." Aerial photos showed extensive sheen and oil slicks on floodwaters near Galveston, around High and Goat Islands in Texas, and on flooded lands in Southern Louisiana²².

Gulf industrial facilities continue to show disturbing susceptibility to damage from the annual barrage of strong, yet predictable, summer storms, with Gulf Coast residents and the environment repeatedly paying the price. As the public and our elected officials consider expanded drilling in the Gulf of Mexico, on the Eastern Seaboard, and in the Arctic Ocean, coupled with the increased export of domestically produced fossil fuels to foreign markets, it is imperative that this vulnerability be recognized and addressed by natural resource development plans and regulations that safeguard our Nation's waters and coastal residents.

GMC Response to Hurricane Isaac:

In August 2012, anticipating the arrival of Hurricane Isaac, GMC members made the following preparations to identify areas at risk from the storm, document weatherproofing efforts being made at industrial facilities, and inform residents of potential environmental and public health impacts that could arise from the storm.

- LABB created a map showing the oil and gas infrastructure in the projected path of Isaac and publicized the iWitness Pollution Map to facilitate reporting about industrial accidents.
- SkyTruth published seven reports identifying areas likely to be hardest hit and tracked the arrival of the storm on weather and earth-observation satellites.
- SouthWings flew with Gulf Restoration Network (GRN) to document the pre-storm status of refineries and coal terminals in Southern Louisiana.
- GRN, Lower Mississippi Riverkeeper, and SkyTruth warned the public about the possibility of the storm stirring up residual oil from the BP / *Deepwater Horizon* disaster and promoted reporting of spills, tar balls/mats, and other incidents to the National Response Center (NRC) and the LABB's iWitness Pollution Map.



Kinder Morgan IMT on August 25, three days before Hurricane Isaac made landfall.

After Isaac's landfall, GMC members worked together to collect data documenting the resulting pollution:

Photo Credit: Jonathan Henderson, GRN

- SkyTruth tracked the aftermath of the storm on earth-observation satellites and using aerial survey imagery flown after the storm by NOAA's National Geodetic Survey.
- LABB compiled and publicized the initial NRC reports to convey the significant pollution during the storm. The iWitness Pollution Map, deployed in partnership with SkyTruth and others, allowed the public to report how fossil fuel and petrochemical spills resulting from the storm affected their communities. For more detailed information, see the refinery report prepared by LABB from official reports submitted to the NRC and LDEQ.
- GRN conducted eight aerial, ground, and on-the-water surveys of coastal Louisiana and Mississippi (see section—GMC in the Field), documenting and reporting²³ pollution including residual oil from the BP / *Deepwater Horizon* disaster that washed up in Bay Batiste and on Elmer's Island, and multiple releases from fossil fuel and petrochemical facilities such as coal terminals, chemical



Sept. 2—Floodwaters on and around Kinder Morgan's IMT where containment levees failed, allowing contaminated runoff to escape into the surrounding environment. Photo Credit: Jonathan Henderson, GRN

plants, and oil refineries. GRN also documented the state of coastal and marshland restoration projects, checking the status of wetland and barrier island restoration projects—valuable defenses against storm surge.

- Lower Mississippi Riverkeeper conducted on-the-ground assessments of environmental damage in storm-impacted communities across southern Louisiana, including documenting hazardous waste containers from the Stolthaven refining and storage facility that were washed away by floodwaters and deposited downstream in the batture* of the Mississippi River.
- SouthWings conducted a post-storm flight with Lower Mississippi Riverkeeper, GRN, and LABB to collect aerial observations of suspected pollution from fossil fuel and petrochemical sites impacted by the storm. SkyTruth provided satellite image analysis and mapped NRC report data to support flight planning; and LABB filed 10 reports²⁴ with the NRC documenting pollution observed during the flight.

GMC in the Field
By Gulf Restoration Network

GRN, one of the newest GMC members, is a group committed to uniting and empowering people to protect and restore the natural resources of the Gulf Region. Working to coordinate responses to a variety of pollution events caused by Hurricane Isaac, GRN coordinated with numerous Gulf region partners to document pre-Isaac conditions and the aftermath on the ground, out on the water, and in the air. GRN and their partners found the following impacts:

- 17 NRC reports filed for oil, chemical, and coal pollution
- Coal and chemical storage facilities with insufficient levees resulting in flooding and pollution
- Oil from the BP/Deepwater Horizon Disaster is still washing up on shore
- Dead wildlife found on the beaches and domestic livestock seen drinking from contaminated water near coal terminals

On **August 25**, just days before Hurricane Isaac arrived on the Louisiana coast, GRN conducted a flyover with SouthWings and captured aerial images of industrial facilities along the Mississippi river in Plaquemines and St. Bernard parishes. GRN was concerned that the impending storm defense systems at facilities like the Kinder Morgan IMT and the Phillips 66 Alliance Refinery would not be adequate to withstand hurricane force winds and storm surge.

On **September 2**, in the immediate aftermath of Hurricane Isaac, GRN took a monitoring flyover to some of the same facilities from the prior week and documented visual evidence that the internal levees at numerous facilities failed to withstand the pressure from Isaac's wind, rain and surge. Having taken the August 25 flight, GRN could now provide before and after geotagged images for those locations. From the air, GRN was able to discover, document and file NRC reports with the Coast Guard. A total of 6 NRC reports were filed for this particular monitoring trip and included incident report numbers: 1023144, 1023150, 1023151, 1023153, 1023147, and 1023154. Our flight took us over the following (but not limited to) heavily impacted communities, industrial facilities, oil and gas infrastructure, barrier islands, and other locations: the communities of Braithwaite, Ironton, Delacroix, Lafitte, Myrtle Grove, and Grand Bayou; the Phillips 66 Alliance Refinery, United Bulk coal terminal, and Kinder Morgan IMT; Breton Island and the Chandeleur Islands.

* The batture is the land area between a levee and the edge of a river, a term commonly used along the Lower Mississippi River.



Photo Credit: Jonathan Henderson—GRN

On **September 4**, GRN boarded a boat in Biloxi, Mississippi, to survey the damage to the barrier islands and look for any recurrence of BP oil on East and West Ship Islands, part of the Gulf Islands National Seashore. Right away, we found impacts on both islands. On East Ship Island, the impacts were mostly in the form of tar balls. We also found tar balls on West Ship, as well as rainbow sheen in several locations. All indications were that residual BP / *Deepwater Horizon* oil was seeping up from the beach sand on the Gulf side of the island. GRN filed three NRC reports from this trip.

Additionally, as the photos show, we found a stunning number of dead pelicans, over 100 at least, in our incomplete survey of the islands.

On **September 5**, GRN took a convoy by car into Plaquemines Parish and captured ground-level shots of coal pollution from Kinder Morgan IMT and impacts to the neighboring town of Ironton. GRN had planned to board a boat and travel into Barataria Bay to look for signs of re-oiling of marsh from lingering BP / *Deepwater Horizon* oil. However, poor weather conditions thwarted the boat portion of that day's monitoring trip.

On **September 6**, GRN and two Greenpeace staffers took the convoy into Plaquemines parish and captured more ground-level images of coal pollution from Kinder Morgan IMT. More favorable weather conditions made it possible for boating this day. Weathered oil was found in the marsh at Bay Jimmy while seemingly fresh, liquid oil was found in Bay Batiste. See NRC Report # 1023684 for Bay Batiste.

On **September 7**, GRN flew with Southern Seaplanes over current, ongoing restoration projects, in an educational flight sponsored by National Wildlife Federation. There were considerable impacts from Isaac, especially to upper Breton Sound, the "ground zero" of the storm-surge wave. Upper Breton intermediate wetlands were also very brown from the saltwater pulse. Further down the river, the wetlands of the Bohemia spillway were still green. We photographed Bohemia, the barrier islands, the Bayou Dupont restoration, and the new wetlands at Big Mar.

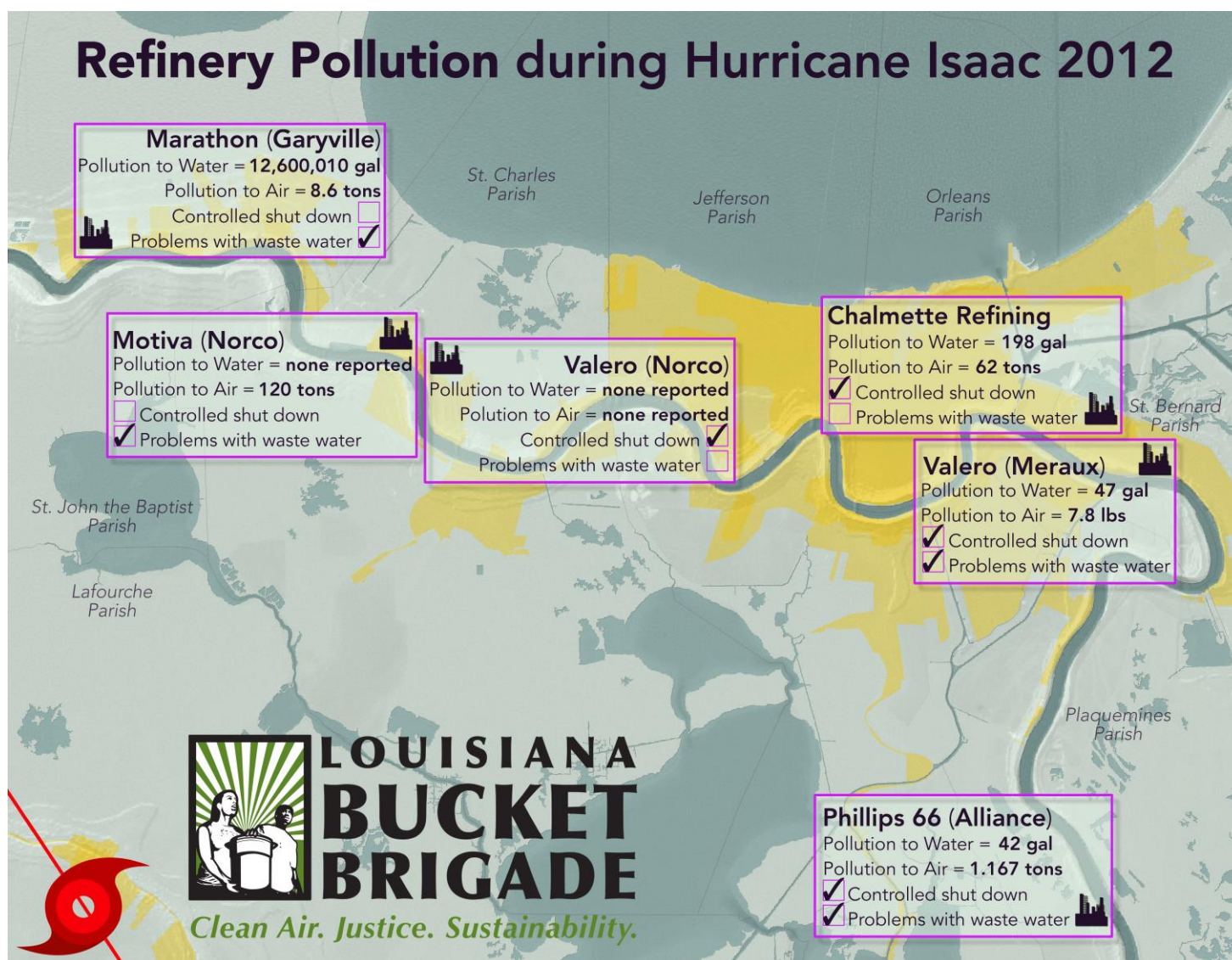
On **September 10**, GRN and GMC partners LABB and LMRK and SouthWings conducted another Post-Isaac flyover to continue assessing environmental impacts. In addition to flying over the damaged industrial facilities at Stolthaven, GRN filed 7 NRC reports as a result of this trip: # 1023986, 1023994, 1024002, 1024005, 1024007, 1024010, 1024011.

On **September 26**, GRN made a post-Isaac monitoring trip to Elmer's Island Wildlife Refuge. Owned and maintained by the state of Louisiana, Elmer's Island is a 230-acre tract of barrier beachfront located on the southwestern tip of Jefferson Parish. The state closed the Island to the public in May 2010 due to heavy oiling from the BP / *Deepwater Horizon* drilling disaster. This on-the-ground trip revealed that parts of the island were awash in BP oil, as confirmed by samples analyzed by Dr. Ed Overton at LSU²⁵.

On **September 28**, GRN visited Horn Island, a long, thin barrier island off the Gulf Coast of Mississippi, south of Ocean Springs. It is part of the Gulf Islands National Seashore and was also heavily impacted by BP oil in 2010. While signs of Hurricane Isaac were visible such as dead wildlife and beach erosion, no obvious signs of pollution could be seen and no NRC reports were filed.

Summary of Pollution from Refinery Facilities
By Louisiana Bucket Brigade

In the wake of Hurricane Isaac, refineries and chemical storage facilities leaked oil and petrochemicals into the waters of the Gulf Coast region and vented gases into the atmosphere. These pollution impacts are less visible, but equally important and no less detrimental to the health of the Gulf than oiled marshes and flooded coal export terminals. GMC partner LABB is an environmental health and justice organization that works with communities neighboring the state's oil refineries and chemical plants to empower residents to document the pollution they experience. Since Hurricane Isaac passed through the Gulf in Summer 2012, LABB has been meticulously reviewing NRC reports and reports that are still trickling in to LDEQ documenting releases that occurred during the storm.



Coastal refineries and petrochemical facilities are an integral part of the offshore oil drilling pollution issues that motivated GMC's formation. Like offshore platforms and facilities, these coastal facilities are also vulnerable to severe weather events, but the weather is still used as an excuse for pollution events that are often the result of a failure to prepare. Hurricanes and their path are predicted days before landfall and operators should have sufficient time to safely shut-in their facilities, as is usually the case with offshore facilities.

Refinery by Refinery Assessment:

Phillips 66 Alliance Refinery—Belle Chasse

Did refinery shut down? Yes, on August 27. The refinery flare burned for 14 hours. The shutdown began in enough time to minimize pollution.

Air pollution total, cause of pollution: Over 2,300 pounds of sulfur dioxide—a respiratory and lung irritant—released because of the shut down and start up processes²⁶.

Water pollution total, cause of pollution: More than 42 gallons of oil were dumped into the Mississippi River and the nearby swamp. The cause of the water pollution was a lack of capacity, as noted in the report:

“The water flow inundated the oily wastewater collection system, and many of the roadways in the refinery. This caused a backup of oily water present in the collection system to come out and flow to ground. A thin layer of oil was deposited on vegetation and soil in the areas where the wastewater collection system overflowed”²⁷.

ExxonMobil’s Chalmette Refining

Did refinery shut down? Yes, on August 27. The refinery flared for 21 hours. The problem with the shutdown is that the flare gas recovery system was not working. The flare gas recovery system never seems to be working. This is important not only because it leads to massive amounts of pollution, but also because the flare gas recovery system is a requirement of a federal consent decree.

Air pollution total, cause of pollution: The cause of the air pollution was the start up and shut down process. The emissions were so bad because there was no flare gas recovery system and because the refinery began its shut down too late. The process was taking place during the beginning of the storm, as noted in the report. *“During the shutdown due to higher than normal rain and wind volumes, flare pilots experienced temporary outages”²⁸.*

This poor performance stands in contrast to Phillips 66 Alliance Refinery in Belle Chasse which reported an orderly, unhurried shut down. In total Exxon Chalmette reported:

- Sulfur dioxide—58.6 tons
- Hydrogen sulfide—258 pounds
- Nitrogen oxide—693 pounds
- Carbon Monoxide—1.8 tons
- VOCs—1,938 pounds
- Benzene—Less than 100 pounds
- Particulate matter (PM 10)—232 pounds

ExxonMobil–Chalmette (cont.): Water pollution total, cause of pollution: The refinery’s good management of its process water stands out. Every other refinery dumped their process water but Chalmette Refining did not. Chalmette stored their process water in tanks until it could be treated before dumping it into local waterways.

There were reports of “*isolated pockets of stormwater in the refinery which contained some sheen material and potential hydrocarbon*²⁹” but there are no amounts given. Chalmette Refining reported wastewater discharge that was essentially storm water, but samples taken on August 29th, 2012 indicated they had exceeded permit limits for Total Suspended Solids. There was also a release of 198.2 gallons of crude oil. This release was deemed preventable because ExxonMobil’s inspection data was inadequate. According to its own reports, the refinery should have known that it had a problem with its pipes³⁰.

ExxonMobil Chemical Plant and Refinery—Baton Rouge

Hurricane Isaac did not seriously impact Baton Rouge, yet the complex’s storm preparation does raise questions.

LDEQ issues variances before storms. These variances are just that—changes from ordinary operations in order to facilitate response to the storm. ExxonMobil requested and was granted permission to dump an additional 30 tons of sulfur dioxide³¹. However, citizens and public officials should be concerned with the reasons petrochemical companies submit variance requests, and what criteria LDEQ uses to review and approve them. Limits on pollution are intended to protect public health and the environment, and as these systems are even more vulnerable during a state of emergency, not less, it is critical that variances only be used as a last resort.

ExxonMobil Chemical—Baton Rouge

The chemical plant reported numerous problems from the wind, including the hatches of tanks that simply blew away.

Did chemical plant shut down? No. Hurricane Isaac did not seriously impact Baton Rouge. According to reports³², “Several floating roof tank socks were discovered missing or torn as a result of high winds. Multiple tank hatches discovered missing or open as a result of high winds.”

Air pollution total, cause of pollution: 160 pounds of Hexane, 49 pounds of flammable vapor, and over 400 pounds of VOCs.

ExxonMobil did report a valve vent leak but has never reported total emissions from the leak (the emissions listed above were single day estimates taken a week before the valve vent leak was fixed).

Water pollution total, cause of pollution: There were approximately 11 gallons of process water leaked from a wastewater holding tank.

ExxonMobil Refinery—Baton Rouge

ExxonMobil filed no reports of any kind for Hurricane Isaac. This is curious given the reports from ExxonMobil Chemical. High winds affected the chemical plant and seem likely to have affected the refinery, also.

Did refinery shut down? No

Marathon—Garyville

One of the unanswered questions regarding Marathon is the variance that the refinery received for storing sulfur. LDEQ gave Marathon a variance to move 3,750 long tons of sulfur to a concrete pad. There is no further information in follow up reports provided about this sulfur. Did it get washed away or was it safely returned to the refinery processes? Marathon was also granted a variance for an additional 13.30 tons of sulfur dioxide, 7 tons of carbon monoxide, and 8.5 tons of VOCs.

Did refinery shut down? No

Air pollution total, cause of pollution: The refinery did flare, including propane flaring and a problem with a compressor. They did not report total quantities released, but rather listed quantities released over permitted levels. Over a dozen different chemicals were reported as released, including:

Nitrogen Oxide—530 pounds

Carbon Monoxide—1.5 tons

VOCs—3 tons

Propane—2.5 tons

A problem with their power supply was a cause of the pollution.

Water pollution total, cause of pollution: Twelve million gallons of untreated process water were dumped into Lake Maurepas after the storm. Ten gallons of gasoline were also spilled³³.

Motiva—Norco

Though the refinery did not shut down before the storm, the strength of Hurricane Isaac forced sudden shutdowns during the storm. According to refinery reports, the refinery dumped many chemicals during the storm, including benzene and carbon dioxide. Interviews with workers revealed a terrifying situation inside the plant during landfall. All of the compressors malfunctioned because they were flooded. Workers had to go out in the hurricane to tie machinery down while units were malfunctioning.

Did refinery shut down? No

Motiva–Norco (cont.): Air pollution total, cause of pollution: The Motiva Refinery flares burned for many days following Hurricane Isaac. They released a total of 135 tons of pollution including:

- VOCs—27 tons
- Sulfur Dioxide—16.5 tons
- Carbon Monoxide—59.5 tons
- Particulate Matter—2 tons
- Benzene (known carcinogen)—Nearly 1 ton

Water pollution total, cause of pollution: No numbers given, though the report acknowledges pollution. “*Stormwater Treatment Facility was impacted and bypassed during flooding*³⁴.”

Valero—Norco (New Sarpy)

Did refinery shut down? Yes

Air pollution total, cause of pollution: All emissions were reported as within permit limits³⁵.

Water pollution total, cause of pollution: None reported

Valero—Meraux

This refinery has long had a problem with water pollution during rain, leading residents to say “cloudy with a chance of oil.” The pollution during Hurricane Isaac went into the 20 Arpent Canal, where children play. Valero reported that the grass along this canal was stained with oil.

Did refinery shut down? Yes

Air pollution total, cause of pollution: None reported

Water pollution total, cause of pollution: 47 gallons of slop oil including 7.8 pounds of benzene. Valero reports “the root cause of this spill to be inadequate containment for the heavy rains and high winds experienced during hurricane Isaac³⁶.”

What to Watch For In 2013

Refinery	Questions for Storm Season 2013
Chalmette Refining (ExxonMobil)— Chalmette	Will the flare gas recovery system finally work? Will the refinery management make earlier decisions to shut down so that the process can be done more safely? And will good management of its wastewater continue?
Phillips 66 Alliance Refinery— Belle Chasse	Has the refinery done anything to expand its ability to manage its water?
ExxonMobil Refinery and Chemical —Baton Rouge	Will the refinery shut down when a hurricane approaches?
Marathon—Garyville	Will Marathon improve its back up power systems and stormwater capacity?
Motiva—Norco	Will the refinery shut down in advance of a storm and avoid repeating the problems during Hurricane Isaac?
Valero—New Sarpy / Norco	Will the refinery repeat its prudent approach and shut down when a storm is coming?
Valero—Meraux	The refinery said it would conduct an engineering study to improve its ability to contain water. Has that study been conducted, and has the refinery improved in this regard?

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