935 Gravier St, STE 700
New Orleans, LA 70112

Oil and Gas Pipeline Integrity in Texas and Louisiana, 2010-2020

Scott Eustis

2021

Healthy Gulf

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Executive Summary

Maps showing the high geographic densities of pipeline incidents in Texas and Louisiana do not simply reflect the large amount of pipelines in Texas and Louisiana. Instead, they are an indicator of the general integrity failure foreseeable from locating large scale oil and gas infrastructure in saltwater areas prone to hurricane damages.

When we examine the lower end of a range for calculated incidents per mile of pipeline, there are substantial increases in incident rate in Texas, Louisiana, as well as Offshore Gulf waters. Each jurisdiction shows some attention to certain pipelines, but the overall rate changes show an increasing lack of integrity as proximity to the ocean increases.

Texas has a per-mile incident or "leak" rate 2.57 times the rate for the entire nation.

Coastal Texas has a per-mile incident or "leak" rate 16.08 times the rate for the nation. This is driven by incidents from oil pipelines as well as gas pipelines. Coastal Texas had high rates of Hazardous Liquid releases, 5x the national rate for Hazardous Liquids, but also similar rates for Gas Transmission and Gathering pipelines, 4.17 times the national rate.

Louisiana has a per-mile incident or "leak" rate 2.22 times the rate for the entire nation.

Coastal Louisiana has a per-mile incident or "leak" rate 5.92 times the rate for the nation. This is largely driven by Gas Transmission and Gathering incidents, which happen 6.58 times the national rate.

Louisiana and Texas combined
Since many existing and proposed pipelines and pipeline networks will move oil and gas wastes from Houston into Louisiana, **we calculated a "Texas_Louisiana" per-mile rate of 2.49 times the national rate.**

Offshore Gulf per-mile incident rate is 10.28 times the national rate, which is consistent for infrastructure subject to ocean forces. However, the Hazardous Liquids rate is less than the national rate. The overall rate is driven largely by the Gas Transmission and Gathering rate, which is very large—**The Offshore Gulf Gas Transmission and Gathering rate is 13.91 times the national rate**.

We conclude, then, that, over the project life of any new proposed pipeline or infrastructure, these rates will increase with the rising sea.

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Oil and Gas Pipeline Integrity in Texas and Louisiana, 2010-2020.

Previously, maps of pipeline incident data after 2010, published by PHMSA Office of Pipeline Safety by pipeline commodity type, show Texas and Louisiana to be states with high incident, or "leak" densities[1][2]. According to NOAA, Texas, Louisiana, and Florida have each received double the economic damages of rich, populous, and yet disaster-prone states like New York and California[3].

EPA SITE modules for measuring state-based climate emissions demand a "per mile" evaluation of pipeline emissions, so we compared pipeline incidents by state, and by coastal parishes and counties in those states, to pipeline mileage, and by commodity type. We chose the latest data series (2010 - present) for ease of replication, although important years, like 2005 and 2008 are elided.

Despite its legacy of environmental racism, and increasing flood damages from the sky and sea, the USA seems set on locating the vast majority of its petrochemical manufacturing infrastructure on the Gulf Coast. This includes hundreds of acres of wetland damage, annually, for new oil and gas pipelines, as well as products and waste pipelines for LNG, CO_2, CCUS, Produced Saltwater, Methanol, Hydrogen, and Plastics. This continues to be unwise.

We sought to create *minimum* multipliers for the emission factors in the SITE module using emission incidents records from PHMSA and pipeline mileages from PHMSA, based on geographic observations of the relative magnitude of incidents in Texas and Louisiana, and particularly on the Gulf Coast, than in other US states and regions. We sought to draw "per-mile" multipliers out of these data to illustrate the failing integrity "per-mile" of the national strategy of abusing the nation's wetland coast to create a trading floor for the oil and gas casino. These rates should be understood to be the lowest end of a range.

Here, we provide links to data downloaded, so that interested parties can reproduce our numbers. Previously, we analyzed data that included incidents from 1970 onward, and included the damages from Hurricanes Rita, Katrina, Ike, and Gustav, among others, but these data are solely from the modern era, after 2010. We are drawing from a history of data compilation begun by Center for Biological Diversity, and Dr. Richard Stover, but seek to highlight the Gulf Coast as a place worthy of particular attention for more analysis of pipeline and infrastructure failure rates.

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[1] Hazardous Liquid Pipeline Accident Heat Map 2010 - Present July 2020. Office of Pipeline Safety
[2] Gas Transmission Pipeline Incident Heat Map 2010 - Present July 2020. Office of Pipeline Safety
[3] https://www.ncdc.noaa.gov/billions/summary-stats/LA/1980-2021

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Methods

How to find and use US Office of Pipeline Safety pipeline incidents data:

How to find pipeline incidents data:

1. Go to https://www.phmsa.dot.gov
2. Resources
3. PHMSA Data and Statistics
4. Data and Statistics Overview
5. Distribution, Transmission & Gathering, LNG, and Liquid Accident and Incident Data

https://www.phmsa.dot.gov/data-and-statistics/pipeline/distribution-transmission-gathering-lng-and-liquid-accident-and-incident-data

Find a summary of Dr. Richard Stover's pipeline research, along with links to a video at:
http://www.icogitate.com/~oildrop/

Certain fields of the pipeline incidents data is currently being compiled into two separate worksheets, one for Hazardous Liquids, one for Gas Transmission and Gathering, and one for Gas Distribution in this shared folder. The "related fields" tab for each sheet shows which fields have been compiled. Mileage information and rates are summarized in this worksheet, also within the shared folder.

Geographical notes. The data generally has county or parish information all the way back, although there are omissions, even after 2010. From 2004 on, there is an Offshore field—although the definition of "Offshore" seems to have been left to the reporter. If there is no "county" or "parish" in data earlier than 2004 earlier, it's either Offshore (Outer Continental Shelf, federal waters), in PHMSA's "state waters," or in a county or parish that has water within it—there is a reporter bias, reporters are less likely to report a county or parish if they are in water, or "off the shore." Some remote West Texas oilfield reports also lack a county.

According to its public viewer, PHMSA has a separate designation for water areas of, say Terrebonne Parish—these are called Louisiana "State Waters." So these areas may also lack a geographical description, and may not be designated as "Louisiana" although they are within state and parish boundaries. This is troubling, as these areas, in Louisiana, are often sacred to various state and federal Native American tribes, and heavily used for food and fiber for local fishers, Native American or not.

Gaps in county and parish data after 2010 were filled using the latitude and longitude reported and parish and county boundaries as found in the US Census (American Community Survey 2016).

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Mileage

PHMSA portal: Mileage by pipeline type, state and year (2020) are served by the "portal" server, an update to the "hip" server from 2017. Queries can be executed from this page, and results are here. A login is required. Texas Gas Transmission queries are not available. PHMSA portal query results are available in the online folder.

PHMSA public viewer: To create the "coastal" mileage, "active" pipeline mileage statistics were downloaded in July 2021 by county or parish (20 parishes and LA state waters, 18 counties and TX state waters). Each county or parish with any part in the coastal zone shall be included as a whole. PHMSA's pipeline viewer does not consider state waters to be within state counties, but these arbitrary geographies cohere when "state waters" are included as a "coastal" state.

Public Viewer pipeline mileage data does not distinguish between Gas Transmission/Gathering and Gas Distribution, but only list the commodity "Natural Gas." Perhaps the subsystem units can be distinguished as such using the "**OPID**" and "**SubSysNM**", but this typology is not recorded as a field. So, "Coastal" mileage analysis must examine a general "Gas" pipeline incident rate per mile, rather than one by type of gas pipeline.

https://portal.phmsa.dot.gov/analytics/
https://pvnpms.phmsa.dot.gov/PublicViewer/

US Coastal Zone Management Act and "Coastal" Parishes and Counties in this analysis

Texas removed itself from the federal coastal program in 1981, and the General Land Office has a much smaller coastal zone boundary from its original 41 counties, which touches 18 counties. Incidents in those original 41 outside of the 18 were noted. Louisiana has a less political coastal zone boundary; but nearly the entire state lies within the coastal plain or an alluvial plain of the Red and Mississippi Rivers. So, the designated coastal zone is much smaller than the actual coastal plain, and it touches 20 parishes.

The coastal zones of both states are not the entire boundaries of the parishes and counties listed here, but because the regulated coastal zones for both states are extremely conservative, and do not include all tidal areas, we feel using a multi-county and multi-parish boundary to facilitate a "per mile" analysis under SITE is still parsimonious.

TX Coastal Zone Counties Mileage. | LA Coastal Zone Parishes Mileage.
OCS Gulf Mileage

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Mileage by state and commodity was also compiled by NSCL for 2011.
Those data are published online and documented here[4]
NationalStatistics PHMSA DOT 2021 for LACITF SITE module
Texas Gas Transmission data for 2020 were not available on the PHMSA portal, so NSCL data point was used for the Texas statewide Gas Transmission mileage. The 2011 mileage number is very likely a smaller denominator than the 2020 number. Leak rates for Texas Gas Transmission and gathering were still low compared to national rates.

2021
For our 2021 analysis, we limit the analysis to jan 2010 - dec 2020, due to the haphazard data collection for years previous, as well as changes in industry practices in years previous to 2010, and changes in data collection in jan 2021.

At a later date, we will seek to include the data since 2004, due to the significance of the 2005 releases. The EPA SITE Module uses data back to 1990. PHMSA incident data has two other sets per each commodity (six datasets) that could be included to get rates since 1990. Mileage data via the PHMSA portal are generally limited to years after 2009.

We could have also analyzed NRC data; that analysis involves much more information.

There are three incident data files to download

- Gas Distribution Incident Data - January 2010 to present (ZIP)
- Hazardous Liquid Accident Data - January 2010 to present (ZIP)
- Gas Transmission & Gathering Incident Data - January 2010 to present (ZIP)

These files contain a much larger amount of information than has been reported before 2010. Incidents after Dec 31, 2021 were elided for repeatability. Many of the hundreds of fields have been abridged to conduct this location-based analysis, which only relies on some of the incident location fields that have been consistent since 1980.

The incidents from 2010-2020 are located here:
2021 GasDist_CompiledData
2021 HazLiq_CompiledData
2021 GasTransGath_CompiledData
And here: allcommodities_jan2010tojan2021_abridged

[4] National Conference of State Legislatures,Jacquelyn Pless, Kristy Hartman, March 2011 https://www.ncsl.org/research/energy/state-gas-pipelines.aspx

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Results

Table 1. Overall Incident Rate by Region, State, and Dual State

Incidents	Years	Offshore Gulf	CoastalLA	CoastalTX	LA	TX	TX_LA		USA
Incidents/Mile of Pipeline:		.0251	.0144	.0392	.0054	.0063	.0061		.0024
1 Incident every ___ Miles:		39.88	69.25	25.50	184.52	159.81	164.40		410.08
Rate XUSA, all		10.28	5.92	16.08	2.22	2.57	2.49		1
	1 PHMSA pipeline incident data								
	2 PHMSA Portal Server								
	3 Texas Gas Transmission Mileage unavailable via the PHMSA portal, and this number is from 2011, National Conference of State Legislatures, Jacquelyn Pless, Kristy Hartman, March 2011								
	4 Coastal Mileage is for active pipelines, downloaded from the PHMSA Viewer.								

The final calculations are presented here, with color-coding for different mileage data sources. NationalStatistics PHMSA DOT 2021 for LACITF SITE module

Texas

Overall, since 2010, **Texas has a per-mile incident or "leak" rate 2.57 times the rate for the entire nation** (including Texas and Offshore). Texas had lower than national rates of incidents for Gas Transmission and Gathering incidents, and it's likely that, were the rates calculated with 2020 mileage data, rather than 2011 mileage data, the rates would be lower.

Coastal Texas has a per-mile incident or "leak" rate 16.08 times the rate for the nation. This is driven by incidents from oil pipelines as well as gas pipelines. Coastal Texas had high rates of Hazardous Liquid releases, 5x the incident USA incident rate for Hazardous Liquids, but also similar rates for Gas Transmission and Gathering pipelines, 4.17 times the national rate.

Louisiana

Overall, since 2010, **Louisiana has a per-mile incident or "leak" rate 2.22 times the rate for the entire nation** (all data including Louisiana and Offshore).

Coastal Louisiana has a per-mile incident or "leak" rate 5.92 times the rate for the nation. This is largely driven by Gas Transmission and Gathering incidents, which happen 6.58 times the national rate.

Louisiana has lower than USA rates per mile, for incidents for Gas Distribution pipelines.

Louisiana and Texas combined

Since many proposed pipelines and pipeline networks will move oil and gas wastes from Houston into Louisiana, **we calculated a "Texas_Louisiana" per-mile rate of 2.49 times the national.** This would likely be higher if we excluded Gas Distribution, since many utilities in Texas are independent and intrastate.

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Offshore Gulf

The Offshore Gulf per-mile incident rate is 10.28 times the national rate, which is consistent for infrastructure subject to ocean forces. However, the Hazardous Liquids rate is less than the national rate, and the general rate is driven largely by the Gas Transmission and Gathering rates, which are very large—**The Offshore Gulf Gas Transmission and Gathering rate is 13.91 times the national rate**.

We refer only to the federal waters on the Outer Continental Shelf as "offshore."

Offshore Incidents were derived from a subset of the incidents labeled "Offshore" fields—if PHMSA labeled an incident "Offshore", but if the incident was within a state boundary (including state waters), we added a county or parish to the incidents data, then excluded it from our offshore number. These changes included less than 30 records, and are documented on our incident data worksheets.

Mileage data were available from the PHMSA Public Viewer as "OCS -Gulf." The boundaries for "OCS-Gulf" and the US Census and American Community Survey are the same.

Discussion

As mentioned above, these rates are meant to be a lower end of a bound. Mileage statistics from 2020 were used for simplicity, but also so that coastal rates and statewide rates would be comparable, although we used two different PHMSA sources. Federal and state agencies should have all the data available to them, and won't be as limited as we were, to the public information.

Average mileages from 2010-2020 were available for statewide and OCS areas, and are available in our reference worksheets in the shared folder. Generally, the 2020 mileage data are greater than the average data, so our rates are lower than if we used average mileages. This is consistent with seeking a lower end of a range.

For some reason, Texas Gas Transmission mileages were not available to the public via the PHMSA portal, but could be available to the federal and state agencies. Here, we were forced to use a mileage denominator lower than our expected number, but because that number did not result in a particularly high rate number, we remain unconcerned about how this deviation affects our general statewide result for Texas.

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As a reminder, there are many definitions of "offshore", and incidents data often rely on the reporter's definition, even when the incidents are within state boundaries and miles from federal waters. We wanted to ensure that the offshore category wasn't "packed" with incidents, in order to get a lower end of a range for our rate.

Labelling incidents in state waters or parishes or counties as "offshore" is also a subtle exclusion of native ideas about the nation's wetland coast, as these areas of ambiguity for PHMSA are sacred lands and waters on the Gulf Coast, and essential to food and fiber production.

Relying on a reporter's definition is also an irresponsible practice from a regulatory standpoint, as the vulnerability of pipelines and other infrastructure in these areas is likely to be rapidly increasing. These areas should receive more attention, not less, from the agencies.

We include any incident inside of a census boundary as within the parish or county delineated by the census, because of the critical economic and social importance of these lands and waters. Thus, we include these incidents as within the states.

PHMSA pipeline incidents are not the only federal data for leaks and emissions. The National Response Center[5] data contain many more incidents that could be analysed with the same "per-mile" denominators to produce a second kind of result concerning oil and gas infrastructure integrity.

These analyses should be repeated for data back to 2004, in order to include incidents from Rita, Katrina, Ike, and Gustav. These analyses could be repeated for Oklahoma, California, and New Jersey to get a larger appreciation of state-to-state regulatory differences.

Conclusion

Maps showing the high geographic densities of pipeline incidents in Texas and Louisiana do not simply reflect the large amount of pipelines in Texas and Louisiana.

When we examine incidents per mile of pipeline, there are substantial increases in incident rate in Texas, Louisiana, as well as Offshore Gulf waters. Each jurisdiction shows some attention to certain pipelines, but the overall rate changes show an increasing lack of integrity as proximity to the ocean increases. We conclude, then, that, over the project life of any new proposed pipeline or infrastructure, these rates will increase with the rising sea.

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[5] https://nrc.uscg.mil/

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Miles								
Total Haz Liquid (2,4)	**2020**	**4585.72**	**6873.59**	**7296.1**	**13623.9**	**75598.1**	**89222.0**	**228532.45**
Total Gas Distribution (2)	**2020**	na	na	na	**43305.0**	**162289.0**	**205594.0**	**2283911.583**
Total Gas Transmission and Gathering (2,3,4)	**2020, 2011**	**2633.46**	na	na	**25000.1**	**72944.3**	**97944.4**	**301922.429**
Total Gas (2,3,4)	**2020, 2011**	see above	**10784.69**	**12157.9**	**68305.1**	**235233.3**	**303538.4**	**2585834.0**
TOTAL (2,3,4)	**2020, 2011**	**7219.18**	**17658.28**	**19454.0**	**81929.0**	**310831.4**	**392760.4**	**2814366.462**
Incidents	Years	Offshore Gulf	CoastalLA	CoastalTX	LA	TX	TX_LA	USA
Hazardous Liquid								
	2010-2020	.0037	.0255	.0943	.0197	.0220	.0216	.0189
		0.20	1.35	5.00	1.05	1.16	1.15	
Gas Distribution								
	2010-2020	na	na	na	.0003	.0006	.0005	.0005
					0.57	1.17	1.05	
Gas Transmission and Gathering								
	2010-2020	.0623	na	na	.0065	.0025	.0035	.0045
		13.91			1.45	0.56	0.79	
Gas								
	2010-2020	see above	.0065	.0041	.0026	.0012	.0015	.0010
		see above	6.58	4.17	2.60	1.22	1.53	
TOTAL								
Incidents/Mile of Pipeline:		.0251	.0144	.0392	.0054	.0063	.0061	.0024
1 Incident every ___ Miles:		39.88	69.25	25.50	184.52	159.81	164.40	410.08
Rate XUSA, all		10.28	5.92	16.08	2.22	2.57	2.49	1

1 PHMSA pipeline incident data
2 PHMSA Portal Server
3 Texas Gas Transmission Mileage unavailable via the PHMSA portal, and this number is from 2011, National Conference of State Legislatures, Jacquelyn Pless, Kristy Hartman, March 2011
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Incidents per Mile of Pipeline

Incidents	over 11 years Years	July 2021 Offshore Gulf	CoastalLA	CoastalTX	LA	TX	TX_LA		USA
Rate XUSA, all		10.28	5.92	16.08	2.22	2.57	2.49		1
Hazardous Liquid (1)									
	2010-2020	17	175	688	269	1661	1930		4313
Gas Distribution (1)									
	2010-2020	na	10	25	13	100	113		1198
Gas Transmission (and Gathering) (1)									
	2010-2020	164	70	50	162	184	346		1352
TOTAL(1)		**181**	**255**	**763**	**444**	**1945**	**2389**		**6863**
Miles									
Total Haz Liquid (2,4)	**2020**	**4585.72**	**6873.59**	**7296.1**	**13623.9**	**75598.1**	**89222.0**		**228532.45**
Total Gas Distribution (2)	**2020**	na	na	na	**43305.0**	**162289.0**	**205594.0**		**2283911.583**
Total Gas Transmission and Gathering (2,3,4)	**2020, 2011**	**2633.46**	na	na	**25000.1**	**72944.3**	**97944.4**		**301922.429**
Total Gas (2,3,4)	**2020, 2011**	see above	**10784.69**	**12157.9**	**68305.1**	**235233.3**	**303538.4**		**2585834.0**
TOTAL (2,3,4)	**2020, 2011**	**7219.18**	**17658.28**	**19454.0**	**81929.0**	**310831.4**	**392760.4**		**2814366.462**