U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
National Ocean Service
Office of Response and Restoration
1305 East West Highway
Silver Spring, MD 20910

MPOG11015 incident (previously identified as Third Coast Midstream Pipeline Spill): Main Pass, LA

Oil Fate Analysis

Produced By:
NOAA Office of Response and Restoration
20 November 2023

Executive Summary:

This analysis is based on observations and data that have been reported to NOAA as of 20 November. If any of this information is incorrect, or if new information comes to light that is different from what has been reported thus far, that would affect our analysis. Additionally, there are important gaps in our knowledge that we may never be able to fill, and which could also affect this analysis.

Release conditions:

This analysis is based on the following assumptions:

A leak occurred from an 18-inch offshore pipeline operated by Main Pass Oil Gathering Company. The release is thought to have started at around 2100 local time on 15 November 2023. The pipeline is carrying a mixture of crudes from the Louisiana Gulf oil and gas platforms. The affected segment of pipeline was shut in around 0600 on 16 November, and a maximum estimated 27,700 bbl of crude oil was reportedly released from the pipeline during the nine-hour period between the beginning of the rupture to when the pipeline was shut in.

The release location is thought to be located about 19 miles NE of the mouth of the North Pass of the Mississippi River in about 250 feet (ft) of water depth. The exact location of the rupture is still unknown. Winds at the time were averaging around 25 knots, gusting to 27 knots. Seas were rough, at around 12 ft.

Oil transport summary

Based on observations of oil on water and modeling analyses, upon reaching the ocean surface, the released oil began moving southwest towards the Mississippi River Delta. Strong currents associated with the freshwater front around the Delta moved oil rapidly around the Delta with the leading edge reaching the vicinity of Southwest pass (remaining ~10 miles offshore) by the afternoon of 16 November. Offshore winds combined with the buoyancy front associated with the freshwater outflow combined to reduce the threat of shoreline impacts during this time. Over the following days the remaining observed floating sheens and tarballs spread west and south. No shoreline impacts were observed.

Oil fate analysis

On 17 November, LSU performed a chemical analysis (gas chromatography/mass spectrometry and density) of the source oil sample collected from the pipeline by the responsible party on 17 November at 1200. This analysis indicates that the oil is very similar to other light sweet Louisiana crude oils, which can be used as a proxy for this oil for forecasting. See Oil Properties section for more details.

At the time of the reported discharge on 15 November at 2100, the winds were above 20 knots, causing a high sea state (~12 foot waves). Based on the chemical analysis, modeling, and previous experience with spills of this oil type, we expect that under these conditions a large fraction of the oil will have evaporated and dispersed in the first few days after the release. After that, the winds and seas were calmer, and the remaining oil likely spread into sheens with possible patches of emulsified oil, and formed tarballs and patties. These tarballs and patties may not sheen, and would therefore be hard to observe from the air. The sheens and tarballs are likely to be spread over a large area. Some of the oil likely mixed with and was scavenged from the water column by suspended sediment and could eventually be deposited on the seafloor over a very large area.

Detailed timeline of release:

Weather conditions:

Figure 1. Wind speed from NDBC Buoy 42040 from 15 November to 20 November.

Winds near the release site from NDBC Buoy 42040. Note the very strong winds in the hours immediately after the release. As of 17 November, winds have mostly been moderate, around 10-15 knots, though expected to increase in the next few days.

15 November 2023

At 2100 CST, an 18-inch offshore pipeline operated by Main Pass Oil Gathering Company reportedly ruptured and began to release crude oil. This is a transfer pipeline carrying a mixture of crudes from the Louisiana Gulf oil and gas platforms.

The ruptured pipeline was located several miles to the east of the Main Pass of the Mississippi River in about 250 feet of water depth. The exact location of the rupture is still unknown.

Winds at the time were averaging around 25 knots, gusting to 27 knots. Seas were rough, around 12 ft.

16 November 2023

At 0600 CST MPOG Segment 11015, a 65-mile section of the pipeline surrounding the break, was shut in. Pressure readings in this segment of the pipeline went down to zero. Calculations based on the volume and pressure of the pipeline indicate that up to 27,700 bbl of crude oil was released from the time of the rupture to when this section of pipeline was shut in. It is possible that small amounts of crude will continue to escape the line until repairs can be made.

Winds started off around 23 knots and then gradually decreased over the course of the day to around 15 kts. Seas were around 5 ft.

Initially, the released oil formed black oil patches and stringers and areas of extensive sheen (Figure 2).

Figure 2. A Main Pass Oil Gathering Company, LLC helicopter aircrew spotted crude oil during an overflight near Main Pass, Louisiana, 16 November 2023.
https://gcaptain.com/crude-oil-release-in-the-gulf-of-mexico-prompts-unified-command-response

17 November 2023

The morning overflight (Figure 3) showed the oil extending from South Pass to about 60 miles to the south-southwest and a maximum width of about 9.5 miles. The mapped extent near the Mississippi River Birds Foot Delta was similar to NESDIS analysis of satellite imagery for the morning of 17 November, but the imagery coverage did not extend to the western section of the overflight observations. There were extensive areas of sheen and smaller areas of black oil (Figure 4), often at convergence zones with the Mississippi River plume.

The NOAA research vessel *Oregon II* on a NOAA Fall Groundfish Project transited near Southwest Pass on 11/17 and traveled across a visual oil slick at 0800-0900. They reported

strong hydrocarbon odors and <10% floating oil as silver sheen, with patties up to 2 inches in diameter. They also reported seeing dolphins (28º49.144'N–089º29.134'W) that appeared normal.

Multiple brown pelicans were in the area and waterfowl floating in and around the sheen, in contact with the surface sheen. No wildlife affected by oil or coming in contact with oil were reported.

Winds were at 5-8 kts and seas were around 3-5 ft.

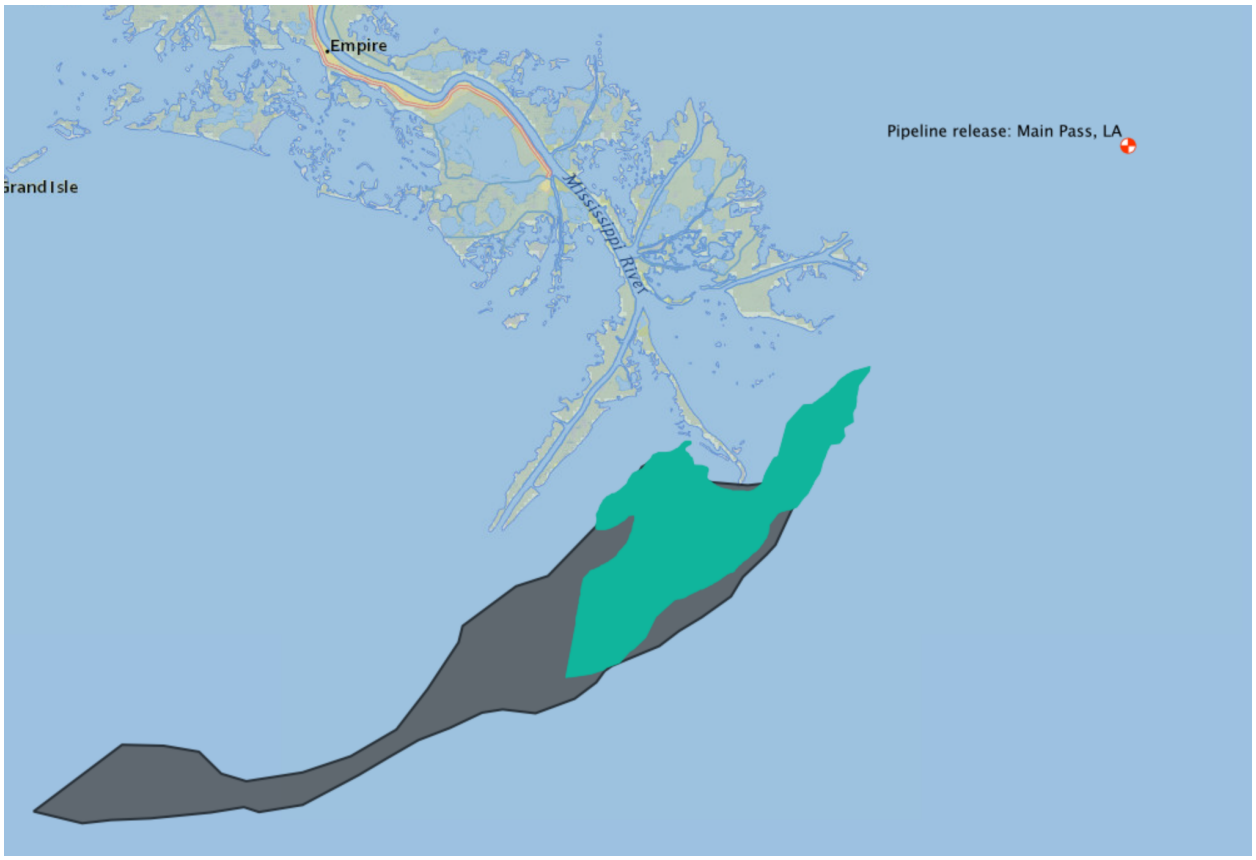

Figure 3. Forefront overflight observations of surface oil footprint on the morning of 17 November (gray polygon), with the NESDIS imagery analysis plotted on top (green polygon). The assumed location of the pipeline release site is shown. The satellite imagery did not cover the area to the west (note the sharp line along the western edge of the imagery, indicating the western extent of the imagery). Oil coverage and thickness was not homogeneous in these polygons but varied from light sheens to areas containing darker oil and tar balls/patties.

Figure 4. Photograph by Forefront on the morning of 17 November off South Pass, showing black oil patches, often associated with the convergence of the Mississippi River sediment plume.

18 November 2023

The morning overflight showed extensive areas of light sheens throughout the mapped area of oil (Figure 5) and darker sheen in the leading, western edge of the oil (Figure 6). No satellite imagery was available on this date.

Winds were somewhat higher, at 10-15 knots and seas around 5 ft.

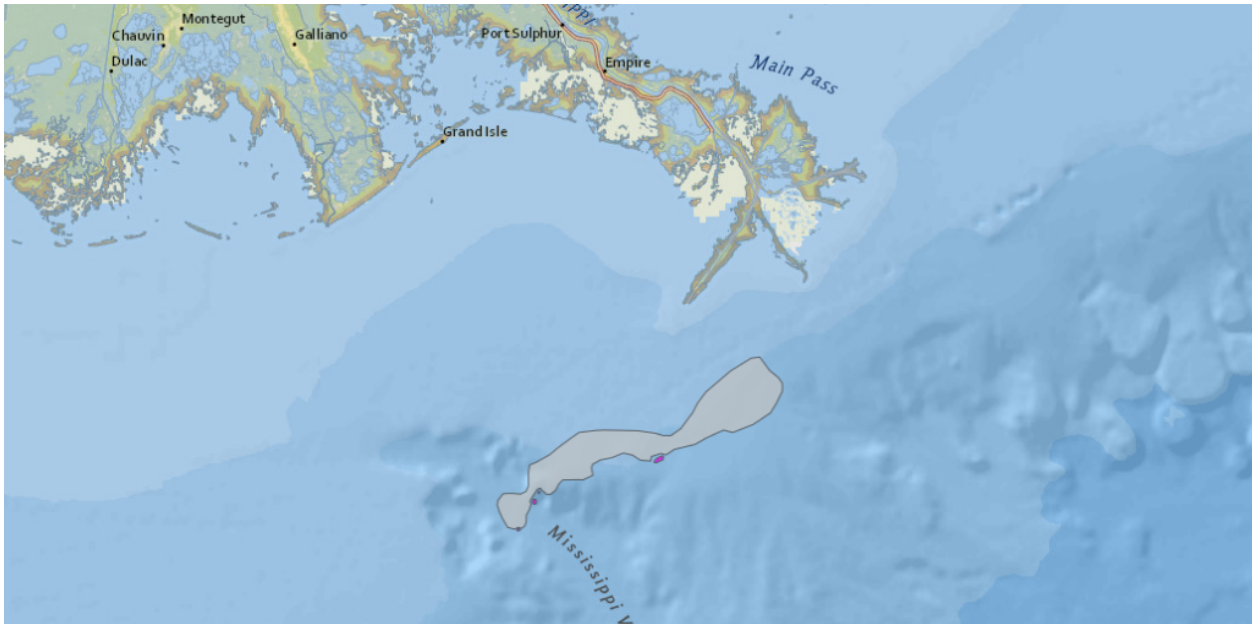

Figure 5. Forefront overflight observations of oil distribution on the morning of 18 November. The bulk of the oil represents barely visible/silver sheen, 30-50% coverage within the polygon. The four purple polygons represent metallic/rainbow sheen.

Figure 6. Dark sheen in the western, leading edge of the oil on the morning of 18 November.

19 November 2023

As of 19 November, mostly extensive sheens were observed during the overflight (Figure 7). There were heavier sheens reported at the leading edge of the oil (Figure 8).

Response vessels observed tarballs the size of golf balls and shen about 30 miles south of South Pass.

Winds were moderate, at 5-10 knots and seas of 1-2 ft

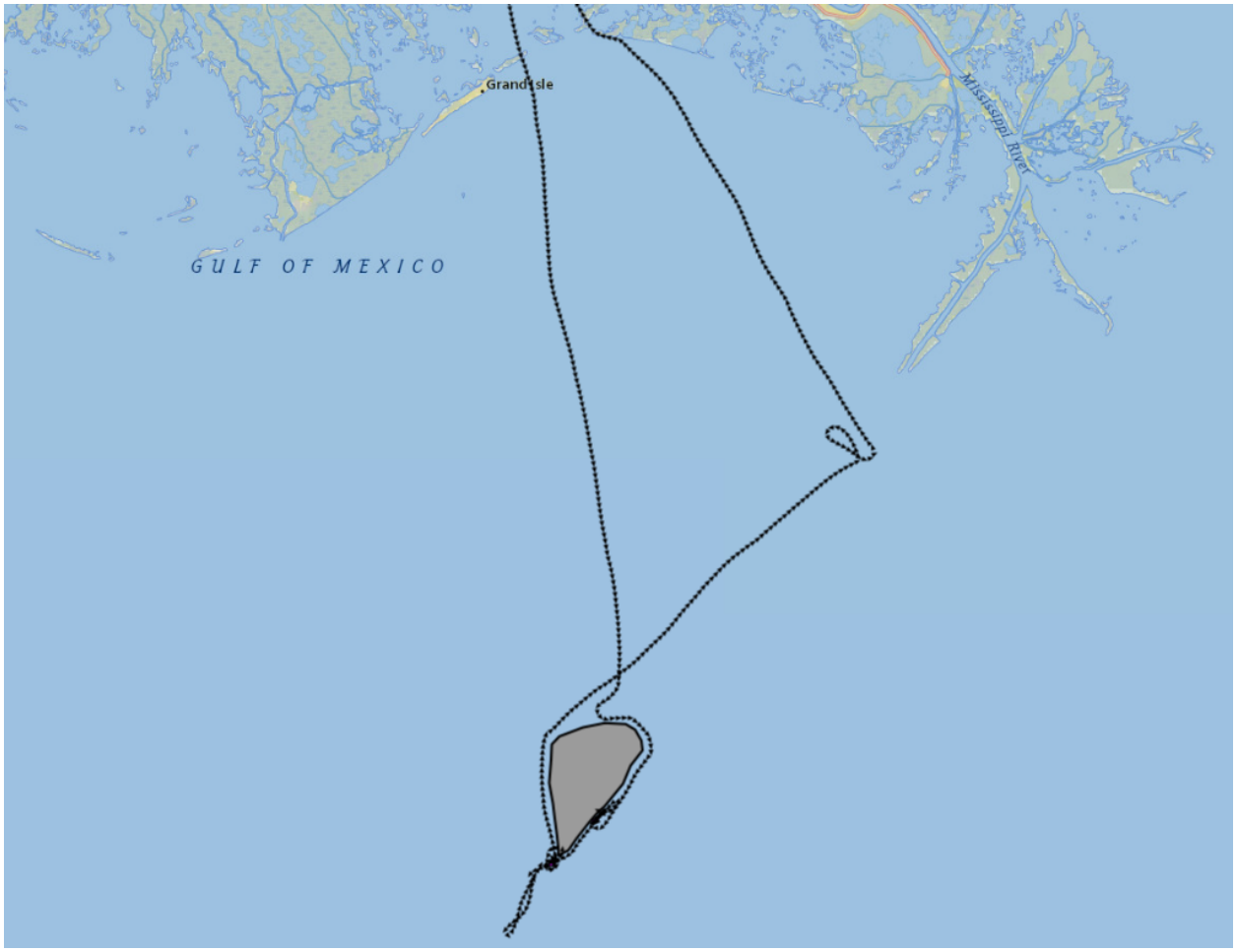

Figure 7. Forefront overflight track line and oil extent on 19 November.

Figure 8. Photograph of the heavier sheens near the leading edge of the oil on 19 November.

20 November 2023

On 20 November, NOAA overflights observed only a band of silver sheen about 50 miles southwest of Southwest Pass. Satellite imagery (synthetic aperture radar) from about noon CST on this date reportedly showed no detectable oil.

Winds were around 15 knots with gusts up to 20 knots.

Oil Properties:

The density and the chemical composition of the MPOG Segment 11015 pipeline crude oil appears to be typical of South Louisiana crude oils. LSU performed some analyses of the source oil from the pipeline and compared it to MC252 oil, which is commonly used as a standard for South Louisiana crude oils.

Density:
LSU measured the density of the MPOG Segment 11015 pipeline source oil as 0.83 g/mL at 68°F (API of 38.47). The RP reported the API as 36.2 (observed) at 78°F and 34.8 (base density). The MC252 crude oil had a density of 0.839 g/mL at 60°F (API of 36.65).

Chemical Composition:
Based on gas chromatography/mass spectrometry (GC/MS) analysis, the crude oil released from the MPOG Segment 11015 pipeline is similar in composition to MC252 oil. Figures 9 and 10 show the total ion chromatogram (TIC) from these two oils.

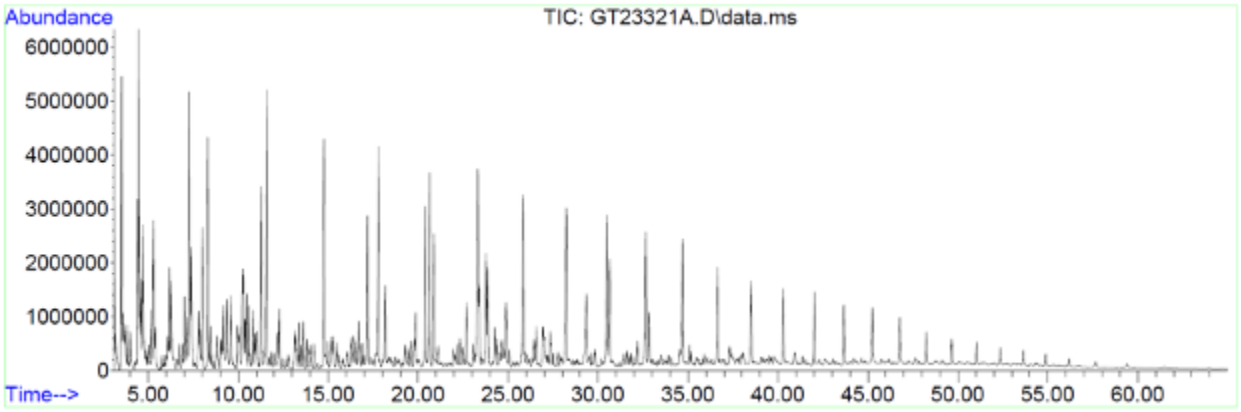

Figure 9. TIC for MPOG Segment 11015 pipeline crude oil.

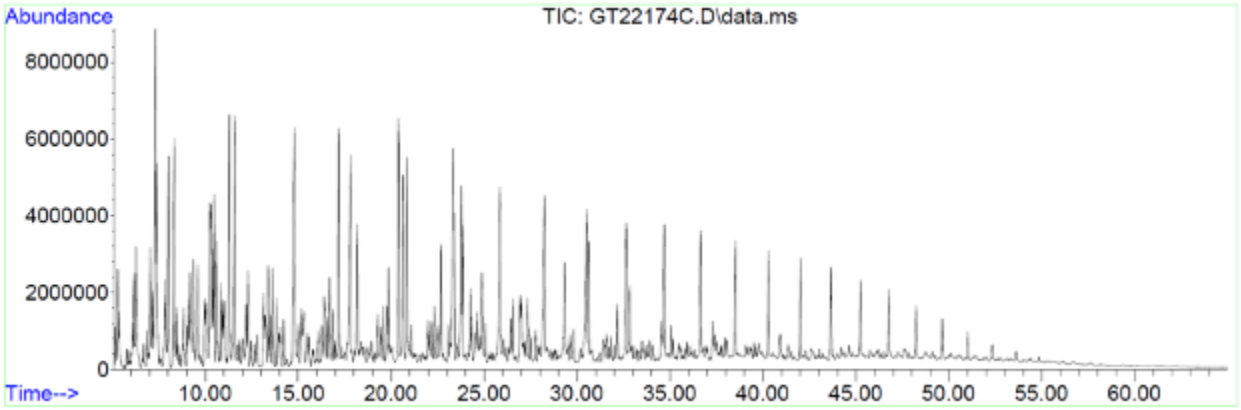

Figure 10. TIC for the MC252 crude oil, used as a reference standard for Louisiana crude oils.

Oil weathering study:
A benchtop oil weathering study was also conducted at LSU by adding some of the source oil to artificial sea water (ASW) at different salinity levels. When Erlenmeyer flasks were used, a small fraction of the oil sank to the bottom and did not return to the surface layer. However, when wide mouth beakers were used, no oil was observed sinking in the flask (Figure 11).

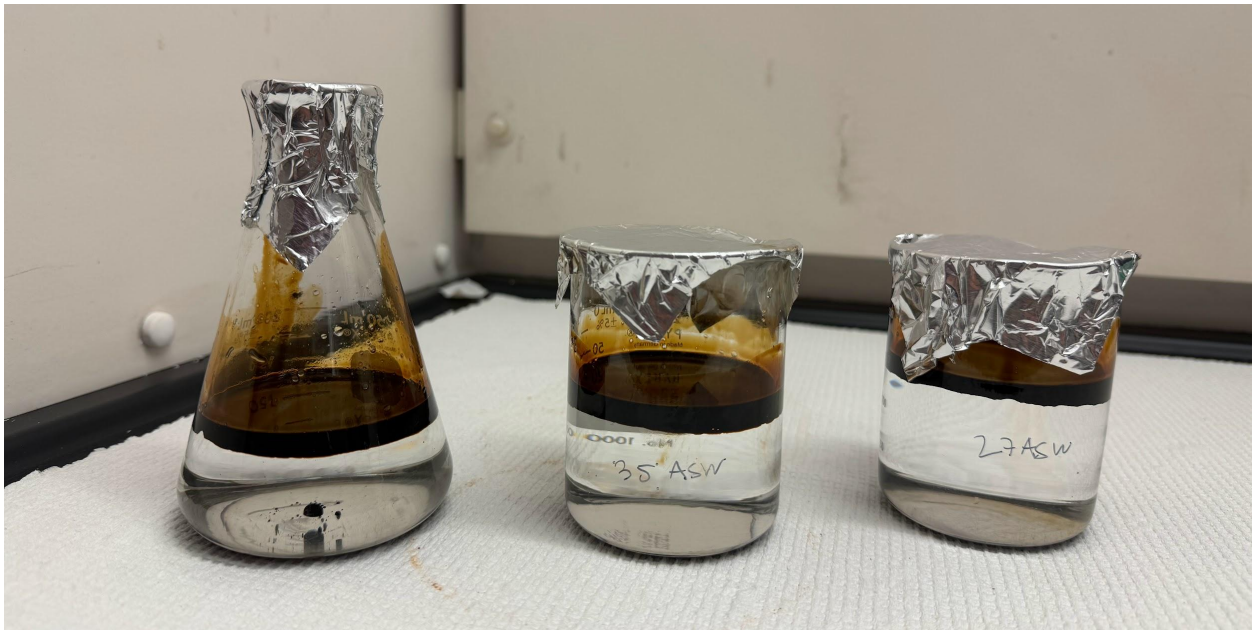

Figure 11. Laboratory tests with the source oil and different salinities and flask types (Erlenmeyer flask on the left, wide-mouth beakers in center and right).

Modeling Analysis:

Using “South Louisiana” Crude oil: (https://adios.orr.noaa.gov/oils/EC00696), Table 1 shows the fate of the oil predicted using the GNOME oil weathering model. Wind speed values were those measured by the NDBC Buoy 42040. South Louisiana Crude oils contain a significant fraction of volatile compounds that will evaporate when exposed to the environment. Laboratory results indicate that fresh oil will not emulsify, but the oil might form an unstable emulsion after substantial weathering. For this model run, onset of emulsification was set to 12 hrs after the initial release. Once an oil emulsifies, it is less likely to be dispersed into the water column.

Model Settings	
Oil Name: South Louisiana	**Water Temp:** 76 °F
API: 33.7	**Total Amount of Oil Released:** 27000 bbl
Wind Speed: Variable Speed	**Spill Rate:** 3000.00 bbl/hour
Pour Point: -41 °C	**Spill Duration:** 9 hours
Wave Height: Computed from wind	

Time (hours)	Amount released (bbl)	Evaporated (%)	Natural dispersion (%)	Sedimentation (%)	Beached (%)	Off map (%)	Floating (%)
1	2970	6.3	0.4	0.1	0	0	93.3
2	5940	13	1.5	0.4	0	0	85.2
3	8910	16.2	2.7	0.7	0	0	80.4
4	11880	17.9	4.1	1.1	0	0	76.9
5	14850	19.1	6	1.9	0	0	73.1
6	17820	19.8	8	2.6	0	0	69.6
9	27000	21.1	12.6	4	0	0	62.3
12	27000	24.5	21.7	6.4	0	0	47.4
15	27000	25.8	30.5	8.5	0	0	35.2
18	27000	26.8	36	9.8	0	0	27.5
21	27000	27.3	38.3	10.4	0	0	24
24	27000	27.6	38.7	10.5	0	0	23.2
30	27000	27.8	38.8	10.5	0	0	22.8
36	27000	28	38.8	10.5	0	0	22.7
42	27000	28.1	38.8	10.5	0	0	22.5
48	27000	28.2	38.8	10.5	0	0	22.4
60	27000	28.5	38.8	10.5	0	0	22.1
72	27000	28.7	38.8	10.5	0	0	21.9
84	27000	28.9	38.8	10.5	0	0	21.7
96	27000	29	38.8	10.5	0	0	21.6

Table 1. ADIOS model output for four days after a release of 27,700 bbl of South Louisiana crude oil.

At the end of a few days, various model runs indicate almost 25-30% will have evaporated, 40-50% will have dispersed, ~10% been scavenged by sedimentation, leaving 10-20% floating on the water surface. The high winds / seas resulted in a large amount of dispersion and sedimentation. There is a high level of uncertainty in the model results, but the observed amount of floating oil is consistent with these modeling results. Tarballs likely constitute a large volume of oil compared to sheens, but they are difficult to observe and are spread over very large areas. It is likely that there will be strandings of widely scattered tarballs along the coastline of the western Gulf of Mexico over the next few weeks.