Bakken Crude Oil Spill
Barge E2MS 303
Lower Mississippi River
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Details of the Spill

- Boat-barge collision on the Mississippi River at River Mile Marker 154, on February 22, 2014
- Collision resulted in a gash in one of the barge tanks at the waterline and 750 – 800 barrels of Bakken Crude was released
- First known instance of large-scale release of Bakken Crude in navigable waterway

Initial Release

Photo Credit: Coast Guard

Barge pulled near bank, initial oil released was dark, but quickly transitioned to yellowish emulsion and silvery sheen

Photo Credit: Coast Guard

On initial overflight, all that was visible downstream of spill site was “light, milky, silvery sheen”

Map of Affected Area

Extent of Spill in River Miles
Barge Fleet Area
Shoreline Sheen Observations

Day 2: Weathered In

Heavy fog on the river prevented overflights, and kept recovery crews off the river

Some potentially recoverable product noted, sheen appearance still “light, milky, silvery”

Photo Credit: Coast Guard

River Mile Marker 127

Photo Credit: Coast Guard

River Mile Marker 113

Some pockets of recoverable oil trapped in barge fleet extending from River Mile Marker 153 to 151 (256 barges)

Day 3: Little Recoverable Product

Photo Credit: Coast Guard

Product at initial spill site cleaned up, required only high volume, low-pressure flushing

Continued sheening from barge fleet, prior to decontamination

Photo Credit: Coast Guard

Day 6: Sheen Near Barge Fleet at River Mile Marker 151

Photo Credit: NOAA

Rainbow sheen and slight yellowish emulsion visible following decontamination operations at barge fleet

Coloration of sheen and emulsion fairly consistent with that observed immediately post spill

Photo Credit: NOAA

Final Report

- Unified Command stand down on Day 8
- Total oil recovered: 95 gallons (2.3 barrels)
- No reports of oiled wildlife or fish kills
- No shoreline clean up measures required other than in immediate vicinity of spill
- Reports of high concentrations of benzene vapors during lightering operations
- 65 mile closure of the Lower Mississippi River for 2 days

Characteristics of Bakken Crude

- From the MSDS provided by RP
  - Specific Gravity 0.7 – 0.8
  - Vapor Pressure 280-360 mm Hg @20º C
  - Percent Volatiles 15 – 30 (estimated)
  - Coefficient of Water/Oil Distribution <0.1
- Average API of 44 (LSU Final Report)
- Significant chemical variability depending on time and location of crude production

Appearance of Bakken Crude Oil Spilled in this Incident

Photo Credit: NOAA

"Looks like two-stroke oil mixed with gasoline"

Low viscosity, flows much more like a diesel or gasoline than a crude oil

Photo Credit: NOAA

Fate Estimate from ADIOS

- Bakken crude was not in ADIOS library at time of spill, modeling performed based on approximate API of 42
- ADIOS evaporation estimates were:
  - 40% after 8 hours (320 barrels)
  - 43% after 24 hours (344 barrels)
  - 46% after 48 hours (368 barrels)
- Dispersion caused by river turbulence and flow not accounted for, model estimates based on primarily on wind

Conclusions from Laboratory Analysis of E2MS 303 Bakken

- Oil has a low viscosity, and will quickly spread and evaporate
- Oil will quickly adhere to suspended solids in the water column, forming unstable emulsions
- Oil contains a high level of alkanes in the nC-10 to nC-18 range (which volatilize), and high levels of PAHs in napthalene to phenanthrene range (which can dissolve in the water column)

Response Considerations for Bakken Crude Spill

- Product will spread and evaporate quickly
  - Recoverable product may persist for only 4-8 hours, depending on size of spill
  - High evaporation rate and low LEL pose hazard for source control responders and public near spill location
  - Air monitoring and ignition source control critical
- Low molecular weight PAH may dissolve in water column, causing toxic effects
- Absence of shoreline impact in this spill related to river flow, effects more likely in calm waters