

## Environmental Studies Program: Studies Development Plan | FY 2022–2023

Title	Impact of Abandoned Oil and Gas Wells on Air and Water Quality in the Gulf of Mexico (GOM) (GM-22-01)
Administered by	Gulf of Mexico Regional Office
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Procurement Type(s)	Contract, Inter-agency Agreement, Cooperative Agreement
Conducting Organization(s)	TBD
Total BOEM Cost	TBD
Performance Period	FY 2022–2024
Final Report Due	TBD
Date Revised	March 30, 2021
PICOC Summary	
<i><u>Problem</u></i>	Abandoned oil and gas wells are not typically inspected. If there are abandoned wells that leak, little is known about the environmental impact on the air and water quality.
<i><u>Intervention</u></i>	Identify leaks from abandoned wells and measure to determine if the leaks are significant enough to emit air pollution at the sea surface, affect water quality, or have potential to impact coastal areas.
<i><u>Comparison</u></i>	Comparison between the air and water quality impacts of leaking and non-leaking abandoned wells.
<i><u>Outcome</u></i>	Assessment of the environmental risks from abandoned oil and gas wells.
<i><u>Context</u></i>	Central GOM and Western GOM

**BOEM Information Need(s):** BOEM needs to determine whether there are abandoned oil and gas wells leaking in the GOM. Oil and gas activities are authorized under the Outer Continental Shelf Lands Act (OCSLA) and leakage could have long-term impacts to the human and marine environment. According to OCSLA (42 U.S.C. § 1346) BOEM must conduct assessments of environmental impacts related to oil and gas development. The data collected from this study would be used in environmental analyses, prepared pursuant to the National Environmental Policy Act, because potential leaks would be identified and measured to examine the environmental risks to the water and air quality. Furthermore, this information would support BOEM’s emission inventories and Tribal Consultation responsibilities. Native American Tribes have voiced concerns about the potential for oil leaks from abandoned wells to contaminate coastal areas, including archaeological sites and other resources. Finally, BOEM also needs to be aware of other federal agencies initiatives such as geological sequestration activities in the GOM. Information gained from this study may help inform future offshore geological sequestration activities by understanding the vulnerability of the wells to leakage.

**Background:** It has been shown that leaking abandoned oil and gas wells onshore in the United States emit methane (Townsend-Small et al., 2016a). In the State of Louisiana “orphan wells” are known with some located in state waters of the GOM (DNR, 2020). Orphan wells are unrestored abandoned oil and

gas wells. In the federal waters of the GOM, it is not well understood if abandoned wells are leaking and if this could cause long-term impacts to the air and water quality. The GOM has thousands of abandoned oil and gas wells with some dating back to the 1960s. Due to the large number of wells, few inspections are conducted. Evaluating the environmental risks will support BOEM's future decommissioning environmental impact statement for the GOM.

A study funded by BOEM (formerly Minerals Management Service) conducted an operational risk assessment on temporarily abandoned or shut-in wells. Their work identified possible leak paths from permanently abandoned wells. They also found wells with sour fluids—those containing significant amounts of hydrogen sulfide—have a significantly higher probability of premature component failure because of higher corrosion rates (Nichol et al., 2000). Often abandoned wells are injected with waste fluids in accordance with the National Pollutant Discharge Elimination System (NPDES) general permit (USEPA, 2017). The risks associated with downhole waste are unknown.

In the future, abandoned wells could be injected with carbon dioxide (CO<sub>2</sub>) for permanent geologic storage. A primary concern for the security of CO<sub>2</sub> storage is the potential for leakage through pre-existing wellbores (Nogues et al., 2012). The Department of Energy (DOE) has been conducting research projects on assessing offshore storage potential in the GOM (DOE, 2020) and the Internal Revenue Service (IRS) recently published a news release on carbon capture credits (IRS, 2020).

#### **Objectives:**

- Determine whether abandoned oil and gas wells are leaking
- Measure leak characteristics to determine if a leak is significant enough to emit air pollution at the sea surface, affect water quality within the water column or have the potential to impact coastal areas

**Methods:** This project would identify leaks from 30–50 randomly selected abandoned wells by using subsurface cameras, water column measurements (temperature, dissolved oxygen, dissolved methane, etc.), and surface measurements. This would include collecting water samples from leaking and non-leaking wells to extract volatile air pollutants (methane and volatile organic compounds) using headspace extraction methods (Townsend-Small et al., 2016b). Wells selected for this study may include areas for potential CO<sub>2</sub> geological storage (DOE, 2020). Contoured magnetometer surveys would be conducted to confirm the location of the abandoned wells. Video footage would be collected using a remotely operated vehicle (ROV). Water samples and water column measurements would be collected using a water sampler device and Sonde, respectively. Water column profiles would be generated. Satellite imaging may be used to identify the extent of leaks. For oil, slicks have been observable by the synthetic aperture radar (MacDonald et al., 2015). The National Aeronautics and Space Administration (NASA) plans to launch NASA-ISRO Synthetic Aperture Radar (NISAR) in 2022 (NASA).

#### **Specific Research Question(s):**

1. Are there abandoned oil and gas wells leaking in the GOM?
2. Is there a correlation between the age of well and potential for leakage? Are there other correlations?
3. Are the leaks enough to emit air pollution at the sea surface?
4. If the leaks are enough to emit air pollution at the sea surface, what are the emission rates?

5. Are the leaks enough to affect water quality in the vicinity of the well?
6. Do the leaks have the potential to reach coastal areas?
7. What biodiversity was observed in the abandoned oil and gas well area?

**Current Status:** N/A

**Publications Completed:** N/A

**Affiliated WWW Sites:** N/A

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