

Project Lochridge (DE-FE0032270)

Ben Wernette, PhD
Southern States Energy Board
wernette@sseb.org

On Behalf of the Lochridge Team

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Project Motivation

- Local industrial activity and associated emissions (90 MMT/yr)
- Motivated commercial partners NRW and Repsol with assets and offshore expertise
- Goal: Establish the basis for a commercial CO₂ storage hub in the federal waters of the US Gulf of Mexico
 - Saline Reservoirs
- Serve as an opportunity for knowledge sharing with other project developers – collaborate with DOI
- Community and stakeholder engagement

Carbon-Zero and Repsol Sign Agreement to Evaluate Opportunities for Innovative Carbon Sequestration on US Gulf Coast

Carbon Capture and Sequestration projects on the U.S. Gulf Coast

GlobeNewsWire press release announcing the partnership between Carbon-Zero and Repsol.



Awarded: October 1, 2024

Awarded Period of Performance: September 1, 2023 – August 31, 2025

NCTE: + 8 months, through April 30, 2026

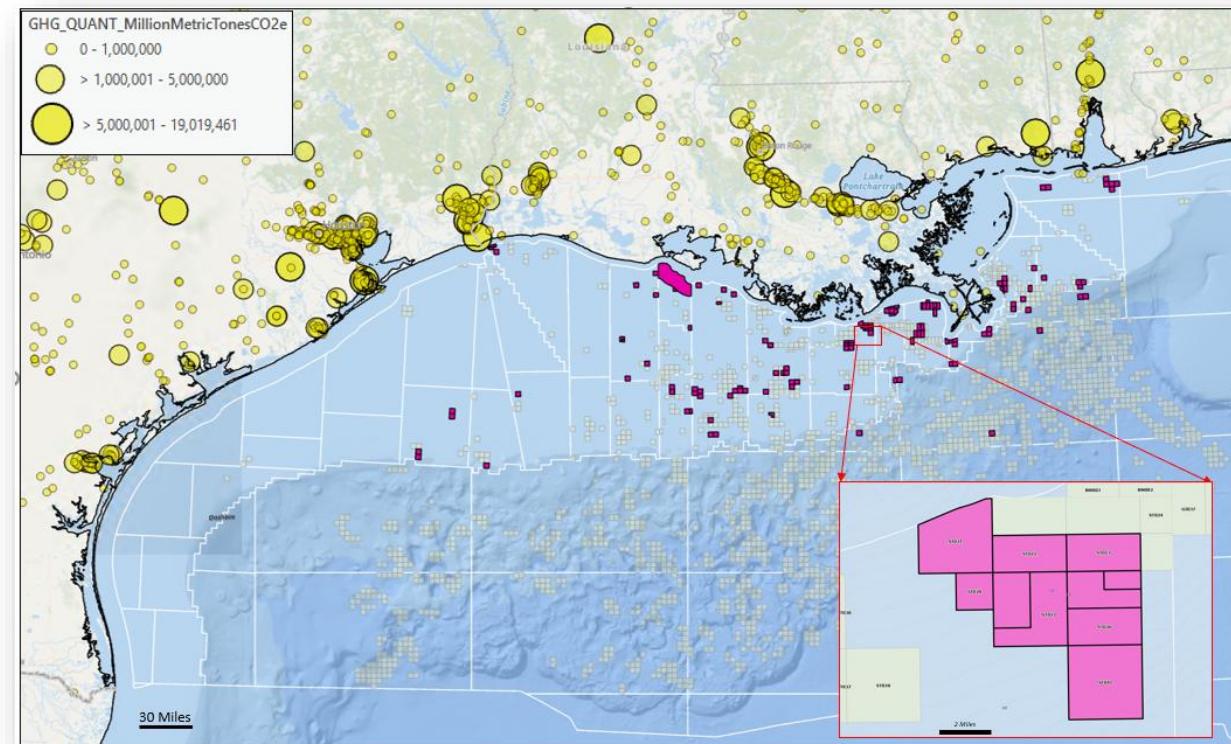
Budget: \$10,575,268 (\$2,133,353 cost-share)



Transcending Boundaries

Location

- Initial screening was conducted to identify areas prospective for further investigation
- Criteria included:
 - Lease control
 - Close proximity to the coast and regional emitters
 - Large volumes of geological, geophysical, and drilling information available
 - Ideally, limited number of legacy well penetrations
 - Limited proximal resource development
- South Timbalier lease blocks

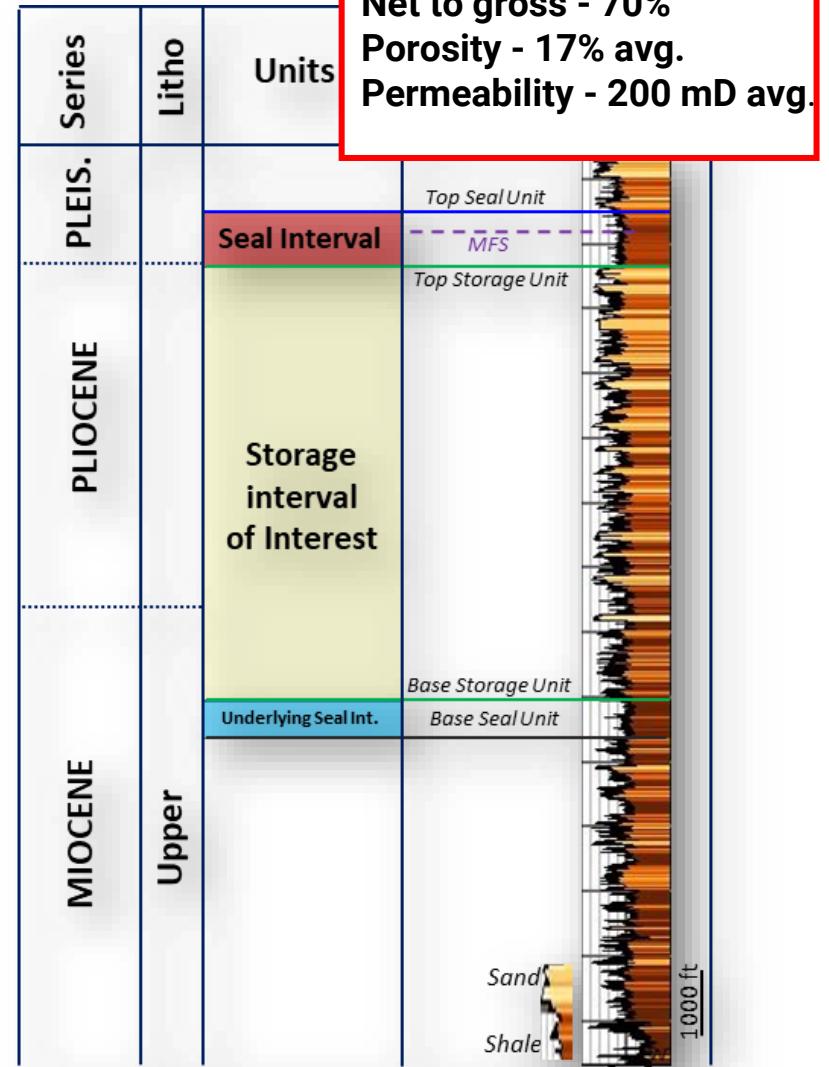


Map illustrating the location of the South Timbalier lease blocks and regional emitters from the EPA Greenhouse Gas Reporting Database.



Geology

- Storage window depth was used to ascertain approximate depth
 - Storage window is the interval wherein CO₂ is stored a supercritical conditions, but the reservoir is not at risk for over pressure
 - Burke et al. (2012) was utilized to constrain pore pressure
 - 3,000 to 10,000 feet below seabed
- Type logs used to identify thick, sandy intervals in the Upper Miocene/Pliocene



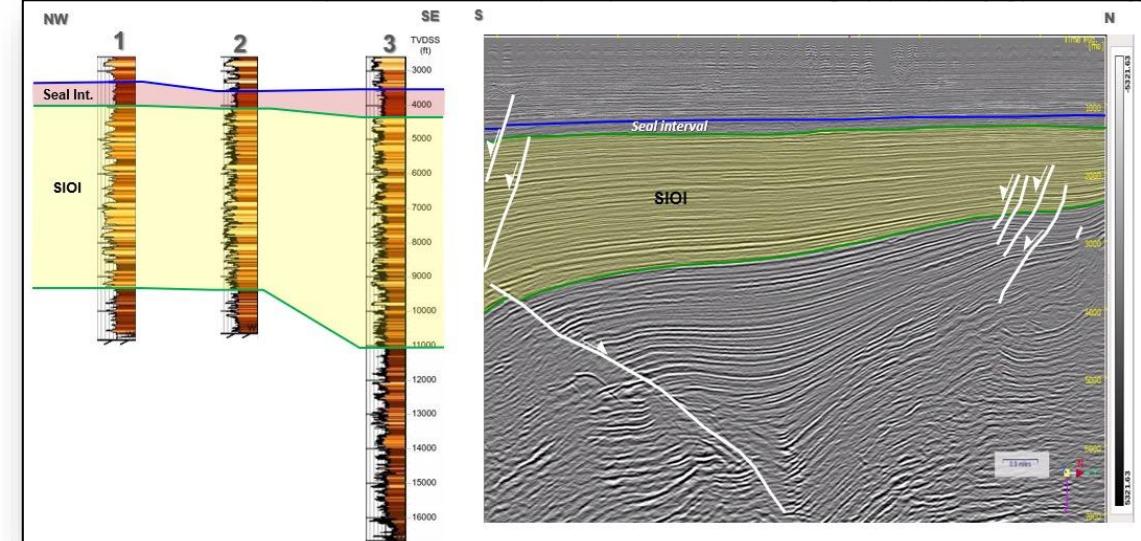
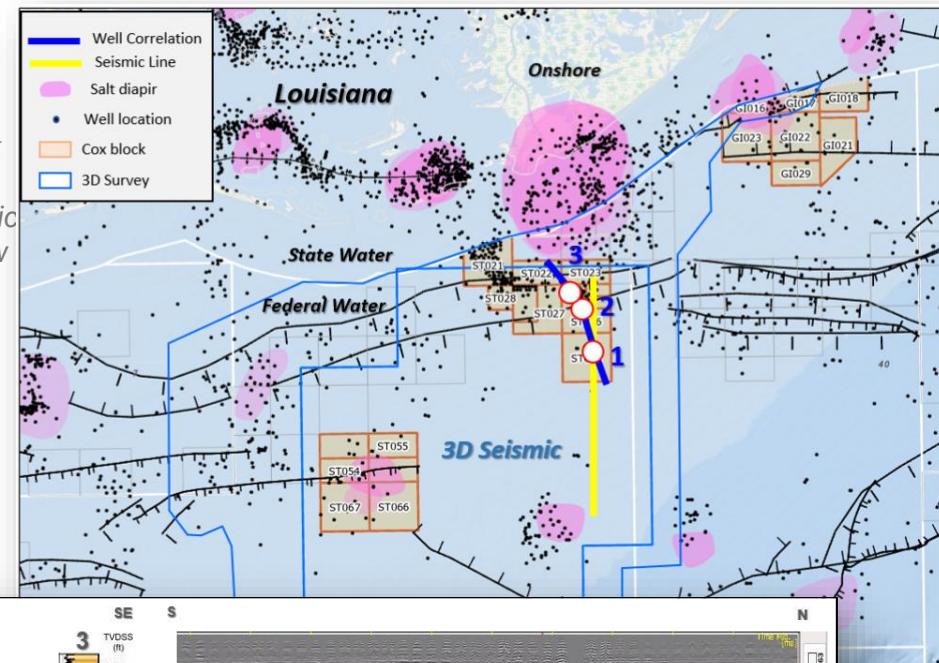
Stratigraphic column and type log for the ST lease blocks.



Geology

- Initial seismic interpretations confirm the storage interval of interest and confining interval are laterally continuous
- Well correlation confirm observations and show numerous shale baffles that act as composite confining system for individual sand units
- Structural considerations include large extensional faults to the north and salt diapirs to the north and south

Map of the South Timbalier lease area. Also shown are regional faults (black lines), wells (black dots), existing seismic lines (blue and yellow lines), and publicly available 3D seismic data (blue polygons).



Cross section of three wells from the South Timbalier area (left). North-south seismic section that transects the project site location.

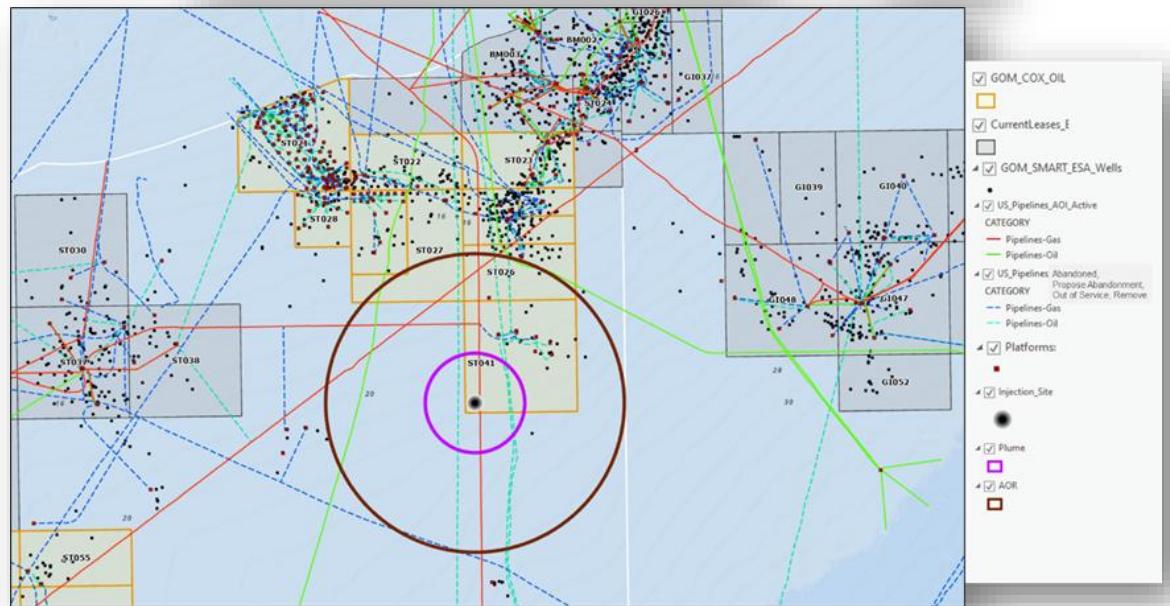


Geology

- Capacity estimates calculated using efficiency factors from the NETL CO₂ Screen Tool
- In all instances, capacity exceeds 50 MMT over a 30-year period
- Likely much greater capacity as these calculation were conducted for only a portion of the storage interval of interest
- P50 area of review transects few existing wells

Calculated static storage capacity estimates for a single interval of the SIOI

Parameters	P10	P50	P90
Area (sq. km)	5	20	35
Gross Thickness (m)	550	650	750
Effective Porosity (%)	20	24	28
Pressure (MPa)	30	35	40
Temperature (degC)	65	75	85
Efficiency Factors (COBRA 2022)			
Injection Duration (years)	30	30	30
Net-to-Toal Area	1	1	1
Net-to-Gross Thickness	0.4	0.45	0.5
Effective-to-Total Porosity	1	1	1
Volumetric Displacement	0.38		0.58
Microscopic Displacement	0.31		0.39
Output			
Saline Efficiency Factor	5.59	7.48	9.64
CO ₂ Storage Capacity (Mt)	56	145	368

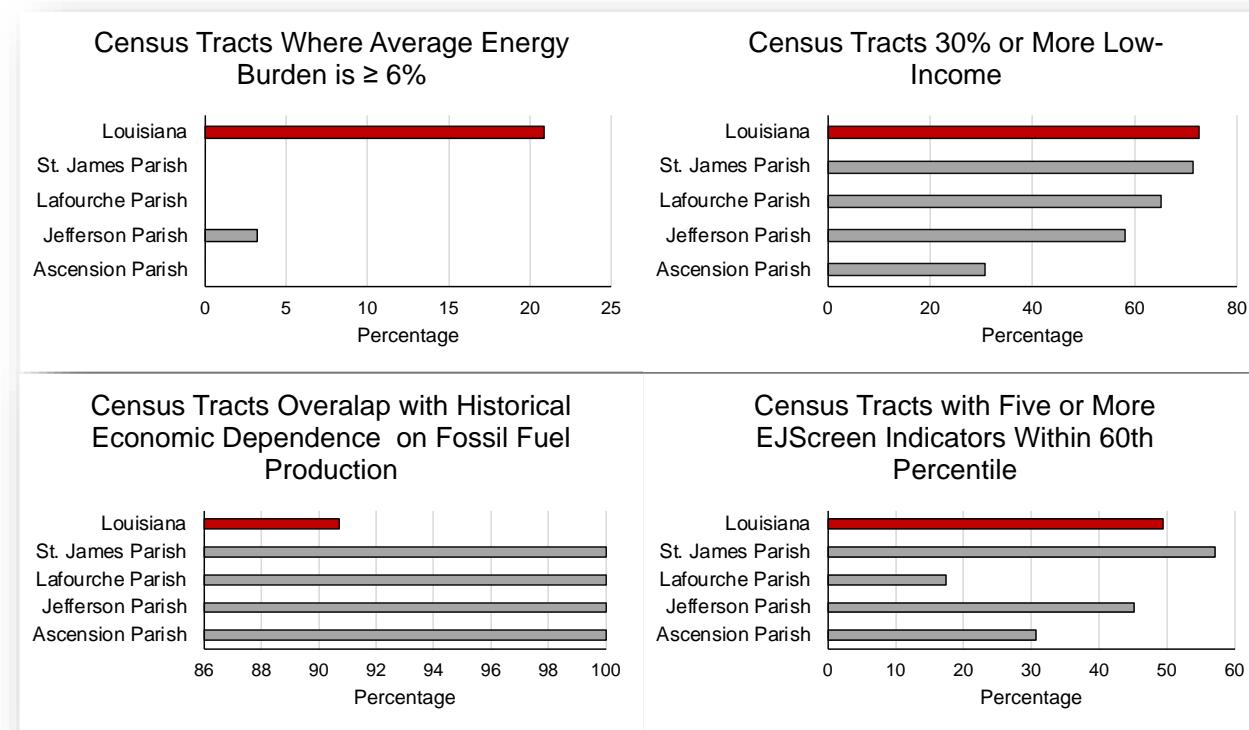


Calculated CO₂ and pressure plume at the proposed site location (ST041 lease block).



Evaluating Community Dynamics

- No direct impacts as part of this phase of the project
- Assumed an integrated project transporting CO₂ onshore to the offshore environment – 4 parishes transected
- Different legacy burdens will certainly point to different concerns between parishes
- More attention needed moving forward
- **Working through LSU and SUSLA as local hubs**



Overview of EJScreen data for the four administrative areas that may be impacted by an integrated project in the future. Data are compared to Louisiana.. Note that EJScreen Indicators include percentage of pre-1960 housing (lead paint indicator), diesel particulate matter, air toxics cancer risk, air toxics respiratory hazards, traffic proximity and volume, major direct discharges of water, proximity to national priorities list sites, proximity to risk management plan facilities, proximity to treatment storage and disposal facilities, index for ozone in the air, and index for PM2.5 in the air. The aggregate metric (i.e., five or more EJ indicators in the 60th percentile) is adopted from the U.S. DOE Communities LEAP eligibility criteria



Organization Chart

U.S. Department of Energy (DOE)
National Energy Technology Laboratory (NETL)

Southern States Energy Board (SSEB)

Lead PI: Kenneth Nemeth

Co-PI/Project Coordinator: Kimberly Sams-Gray, Ben Wernette, PhD

Key Team Members: Patricia Berry, Nicholas Kaylor, PhD

Tasks: 1, 2, 4, 5, 6

Industry Stakeholder
Carbon Zero

Crescent Resource Innovation (CRI)

Lead PI: Brian Hill
Tasks: 1, 3, 4, 5, 6

Louisiana State University (LSU)

Lead PI: Brian Snyder, Ph.D.
Co-PIs:
Richard Hughes, Ph.D.
Margaret Reams, Ph.D.
Tasks: 2, 6

Natural Resources Worldwide (NRWW)

Lead PI: Ken Jackson
Tasks: 2, 4, 5, 6

Repsol

Lead PI: Laszlo Benkovics, Ph.D.
Tasks: 2, 3, 4, 5, 6

Southern University Shreveport (SUSLA)

Lead PI: Scott Guitreau
Task: 4

Task 6 Vendor Arrangements
SSEB → UT-BEG, ARI
NRWW → Array, Context Labs, KBR



Transcending Boundaries

Project Objectives

Demonstrate that the subsurface saline formations at the Storage Complex can store at least 50 million metric tons of captured CO₂ safely and permanently over a 30-year period

Conduct meaningful engagement and two-way communications with communities and stakeholders

Identify commercial project risks and develop a comprehensive mitigation strategy

Complete a technical and economic feasibility assessment

Develop a plan for subsequent detailed site characterization to support the U.S. Department of Interior's Bureau of Safety and Environmental Enforcement (BSEE) Outer Continental Shelf (OCS) permit readiness



Transcending Boundaries

Tasks

Task 1 – Project Management and Planning

Task 2 – Community Benefits Plan

Task 3 – Site Specific Characterization and Assessment of the CO₂ Storage Complex

Task 4 – Preliminary Project Risk Assessment with Mitigation and Management Plans

Task 5 – Plan for Subsequent Detailed Site Characterization and BSEE OCS Permitting

Task 6 – Project Technical and Economic Feasibility Assessment, including Conceptual-Level Design Study for CO₂ Transport



Transcending Boundaries

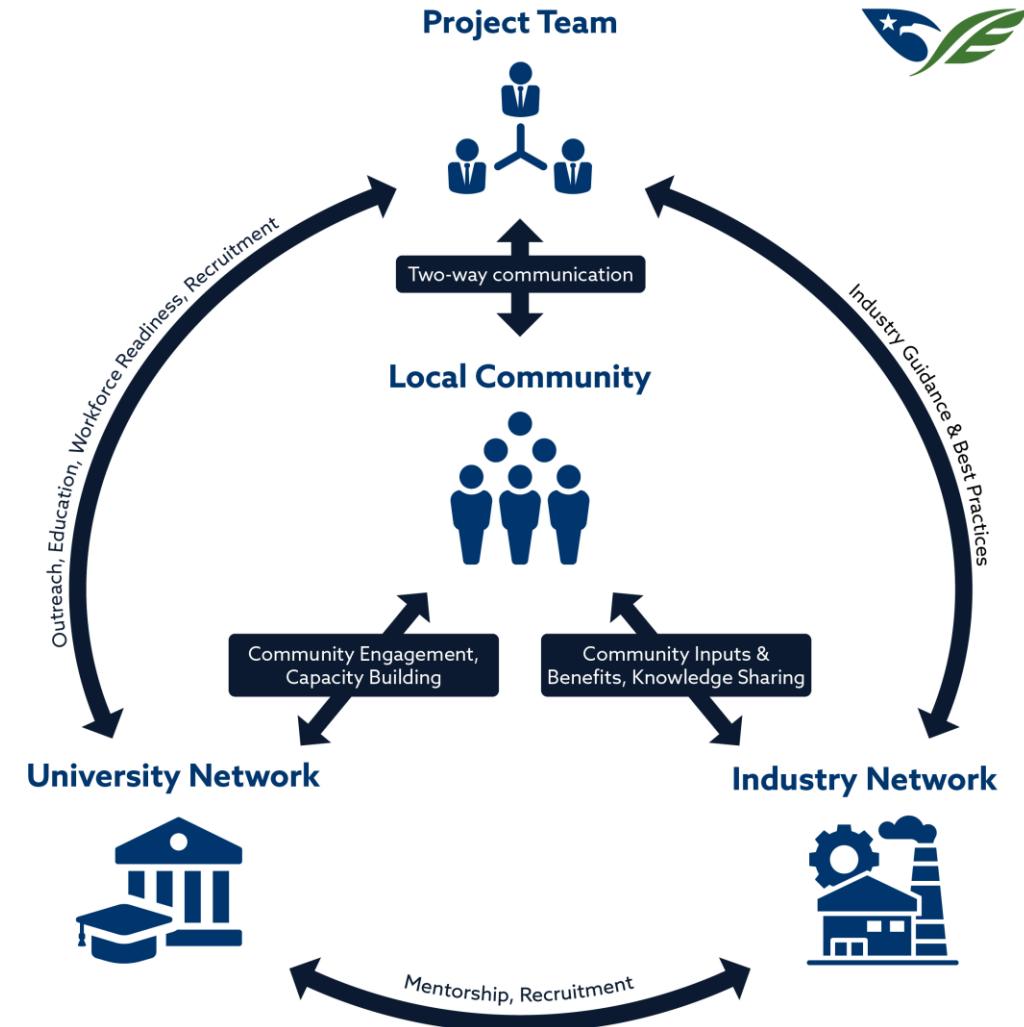
Task 1 – Project Management

- Notified that ST041 ownership was in doubt on October 11, 2023
- SSEB issued a stop work order to ensure opportunities to retain the lease and preserve the long-term viability of the project could be explored
 - In total, 8-month process
- Updated the PMP, applied for and received NCTE
- Lifted stop work order on May 22, 2024



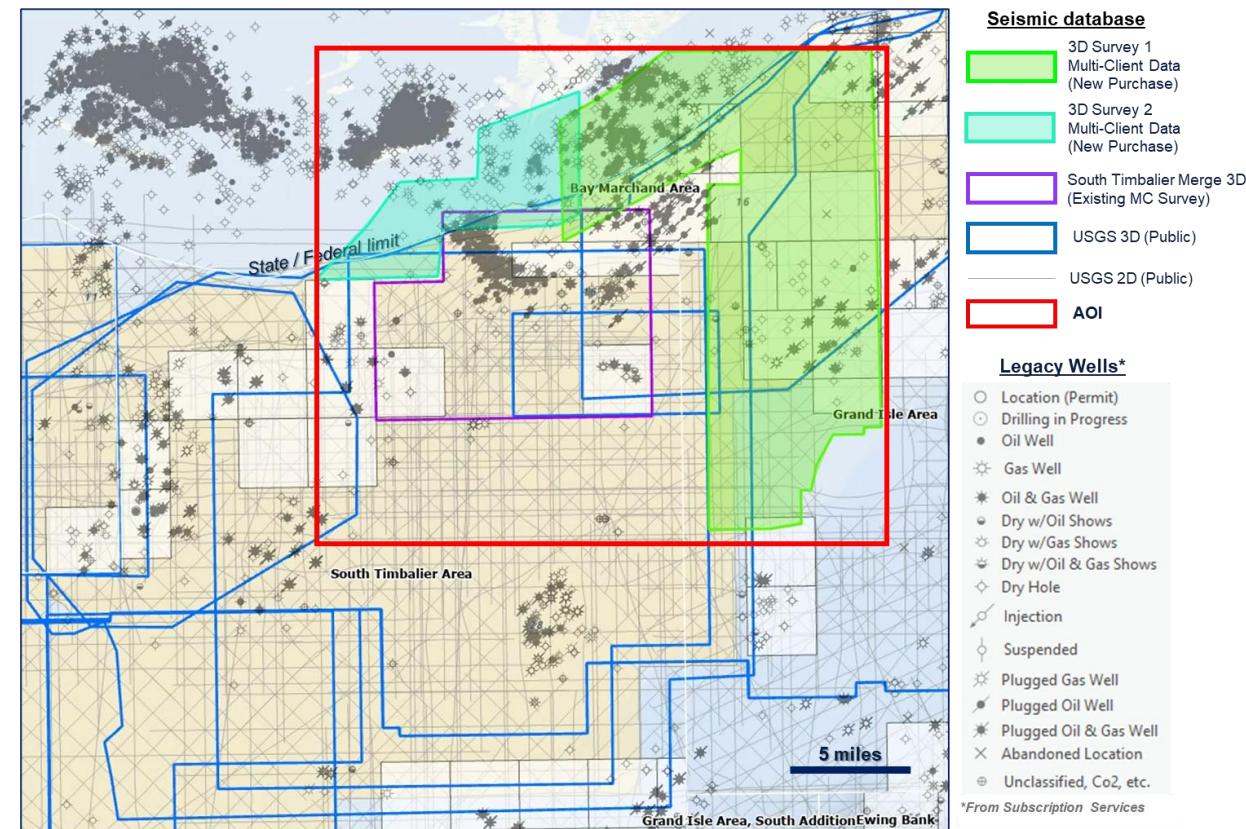
Task 2 – Community Benefits Plan

- Develop a diverse and comprehensive list of stakeholders
- Host at least one community and stakeholder engagement event
- Partner LSU to develop economic impact assessment
- Host engagement events to communicate CCUS job opportunities
- Actively engaged with state and federal regulators



Task 3 - Site Specific Characterization and Assessment of the CO₂ Storage Complex

Subtask	Goal
Data collection through open sources & subscription services	<i>Build a comprehensive geologic database for completing subsequent tasks</i>
Review existing well and well data & purchase new data	<i>Fill in data gaps where applicable. Purchase multi-client 3D surveys and well data within AOI</i>
Seismic Reprocessing	<i>Post-Stack re-processing to enhance features and combine all available surveys (Public and proprietary) to create one merge in AOI</i>
Geologic & Geophysical Analysis	<i>Detailed seismic and well interpretation for storage reservoir, sealing intervals, and main structural features</i>
Subsurface Model	<i>Build static model in the AOI integrating all data and interpretations</i>
Dynamic Model	<i>Run scenarios for updated CO₂ and pressure plumes</i>



Public data, subscription data, and multi-client data within the Area of Interest that will be serve as the foundation of the geologic database.



Transcending Boundaries

Deliverables

Task/Subtask	Deliverable Title	Due Date
1.0	Project Management Plan	Update due 30 days after award. Revisions to the PMP shall be submitted as requested by the NETL Project Manager.
3.0	Storage Complex Characterization and Assessment Report	30 Days Prior to End of Performance Period
4.2	Risk Assessment with Mitigation and Management Plans for an Offshore Storage Project	30 Days Prior to End of Performance Period
5.0	Detailed Plan for Subsequent Site Characterization and BSEE OCS Permitting	30 Days Prior to End of Performance Period
6.0	Technical and Economic Feasibility Assessment, Including Conceptual-Level Design Study for CO ₂ Transport, and Stakeholder Evaluation	30 Days Prior to End of Performance Period



Thanks!

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