2023Annual Gulf Coast Ecosystem Restoration Council Report

Texas RESTORE Centers of Excellence

(October 01, 2022 - September 30, 2023)

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I. Executive Summary

As the Texas Governor's appointee to the RESTORE Council, Toby Baker, Deputy Chief of Staff for the Office of the Governor (OGG) has established two Centers of Excellence in Texas in accordance with the requirements set forth in the RESTORE Act and U.S. Treasury regulations.

Texas OneGulf

The mission of the Texas OneGulf (OG) Center of Excellence is to gather and improve knowledge about the Gulf of Mexico to inform decision-making around the challenges to environmental and economic sustainability of the Gulf of Mexico and its impact on the health and well-being of Texans and the nation. Texas OneGulf is designed with the capacity and flexibility to address all five disciplines denoted in Section 1605 of RESTORE. For this reporting period, OG has begun activities for three projects. One project has recently been completed and two are on-going. OG currently has three additional research projects pending final approval by TCEQ. Those projects are expected to begin in January 2024.

Subsea Systems Institute

The Subsea Systems Institute (SSI) is a Center of Excellence formed under the Restore Act and represents a collaboration between the University of Houston, Rice University and NASA/Johnson Space Center. The mission of SSI is to improve the safety and efficiency of offshore energy development by conducting translational engineering and technology development for offshore energy production. The key outcomes from the work of the SSI are:

- Unbiased third-party validation to build public trust in the safety and operation of offshore energy production;
- Deployment of advantaged safest technologies for offshore energy development to ensure safety and operational excellence in offshore applications;
- The attraction of talent for jobs and investment in the local, state, and national economy reinforce Houston and the state of Texas's reputation as the Energy Capital of the World.

For this reporting period, SSI is working on four projects.

II. Programmatic Elements

A. Award Recipient

In July 2020 TCEQ, on behalf of Baker and the Governor, received the Grant II award from Treasury with an end date of August 31, 2024. That award addresses all five disciplines denoted in Section 1605 of RESTORE (1605). An amendment to this award was issued in April 2022, adding $6,460,267 to the grant for a Grant II total of $9,965,167. At this time, TCEQ is working with the two Centers to submit a monetary amendment to Treasury for additional funds to TCEQ to support on-going oversight activities, as well as new funds to each of the Centers for additional research projects.

Annual TCEQ accomplishments include:

- Oversaw the operations of both Texas OneGulf (OG) and the Subsea Systems Institute (SSI), which included the review and acceptance of deliverables, invoices, and travel requests;
- monitored activities associated with all active projects and the two operational GADs (Grant Activity Description);
- reviewed and accepted close out reports on six SSI projects (GADs 2 thru 7);
- reviewed OG's final report for one of its projects (GAD 2);
- approved four new SSI projects (GADs 8 thru 11);
- approved two new OG projects (GADs 3 and 4);
- performed a final review of three new OG projects (GADs 5 thru 7);
- worked with both Centers in developing presentations for Treasury's webinar on Bkt 5/Centers of Excellence activities;
- executed amendment to both Centers' GAD 1 (operational) to expand the use of funds to include sponsorship of the Gulf of Mexico Conference (GOMCON) scheduled for early 2024;
- responded to inquiries from Centers;
- generated and submitted required federal reporting to Treasury; and
- held meetings with each of the two Centers to discuss detailed reviews of the progress for each of the active projects and to discuss upcoming and longer-term activities and goals, including submission of a monetary amendment for additional funds and to extend the grant end date.

B. Award Subrecipient(s)

Texas OneGulf Consortium

The nine participants in the Texas OneGulf Consortium include:

- Texas A&M University Corpus Christi, Harte Research Institute for Gulf of Mexico Studies;
- Texas A&M University at Galveston, Marine Biology, Science and Engineering Departments;
- University of Houston Law Center, Center for U.S. and Mexican Law;
- Texas A&M University, Center for Translational Environmental Health Research (CTEHR);
- Gulf of Mexico Coastal Ocean Observing System-Regional Association (GCOOS);
- University of Texas Medical Branch at Galveston, Sealy Center for Environmental Health and Medicine (UTMB);
- Texas A&M University, Geochemical and Environmental Research Group (GERG);
- University of Texas Rio Grande Valley, Biological and Environmental Sciences; and
- Texas State University, The Meadows Center for Water and the Environment.

The five participants in the Texas OneGulf Agency Council include:

- Texas Commission on Environmental Quality (TCEQ)
- Texas Division on Emergency Management
- Texas General Land Office
- Texas Parks and Wildlife Department
- Texas Water Development Board

PROJECTS

TCEQ monitored activities associated with the operational Grant Activity Description (GAD) and the three projects active during this period, GADs 2 thru 4. The agency expects to approve three additional projects by January 2023, GADs 5 thru 7.

GAD 1 General Operations of Center of Excellence project, project, principals Dr. Kateryna Wowk Porter (Harte). The project Scope of Work is to operate the CoE and perform research on the Gulf Coast Region as defined in 31 CFR 34.2. OneGulf performs research across all five of the CoE disciplines and will use the information to help state and local officials make decisions that will benefit Texas. Status of performance and annual accomplishments include:

- met the reporting requirements, continued to oversee the day-to-day operations, and administration of the Center;
- accepted Notice of Funding Availability (NOFA) letters of intent and reviewed the information with the Texas OneGulf Agency Council (TOAC);
- held the Texas OneGulf Knowledge Co-Production meeting on potential projects and reviewed proposals;
- selected three projects to award from NoFA;
- drafted GADs 5-7 for submission to TCEQ upon receival of PGAs;
- planned Texas OneGulf in-person meeting with Texas OneGulf Agency Council and Texas OneGulf Consortium Leadership that will be held in spring 2024;
- conducted one-on-one interviews with each TOAC and TOCL member in preparation for meeting and analysis to establish funding priorities for next NoFA;
- prepped for Texas OneGulf Director (Wowk)'s departure from the Center of Excellence as of 9/29/2023, with Dr. Greg Stunz stepping in as Interim Director; and
- Completing monetary amendments documents for submission.

GAD 2, Geospatial Framework and Analysis for Coastal Resilience, South Texas Coastal Bend project. The project Scope of Work was to improve the science and practice of resilience through completing a quantitative and qualitative resilience assessment template for civic infrastructure, facilities, natural assets and disaster risk factors for three Coastal Bend counties (Nueces, Kleberg and Kenedy). These counties lack capacity to conduct this work. The purpose of the project is to develop data and assessment for a web-based, user-friendly, and visually compelling tool that is extensible and scalable to a wide range of communities.

This tool can integrate with existing and future climatological, oceanographic and meteorological models to assess flood, inundation and sea-level rise, and can form the basis for a standard approach to risk assessment and mitigation for communities and their co-located assets. Project was completed, and deliverables were submitted, reviewed, and accepted.

GAD 3 Evaluating the Fiscal and Social Implications of Property Buyouts in Flood-prone Communities. The team held meeting with Harris County Flood Control District (property acquisition department), Harris County Property Appraisal, the office of (Harris) County Engineer (relocation manager, Real Property Division) and successfully secured additional data on property buyouts. In addition, the team has successfully connected with two communities, El Lago and Pasadena, suggested by the Houston Galveston Area Council to partner with on co-production of a GIS support tool related to property buyouts. Made progress with fiscal data (e.g., categories of revenues and expenditure) at the municipality and school district levels and merged them with spatial data at the same scale. The team has estimated a hedonic property model to understand the effect of buyouts on property sales prices in Harris county. The team has made a progress towards hotspot analyses of property buyouts at their original and relocation tracts, employing social vulnerability indices and flood depth (assembled and developed during past reporting cycles).

GAD 4 An Observational Study of Ship Channel and Shallow Bay Interactions and their Influence on Sediment Transport, Mixing, and Water Quality in Corpus Christi Bay. Held meetings with co-PIs at TAMU College Station and University of Houston to discuss project timeline and critical initial steps. These included identifying QAPP documentation needs, subaward establishment, reviewed need for extension to adjust project timeline, and initiating instrumentation component review and analysis to proceed with procurement. Held follow up discussions with OG to plan for stakeholder engagement.

Subsea Systems Institute

The six participants in the SSI Consortium include:

- University of Houston
- Rice University
- National Aeronautics and Space Administration (NASA) Johnson Space Center (JSC)
- Texas Southern University
- Lone Star College System
- Houston Community College

PROJECTS

TCEQ monitored activities associated with the operational GAD, the completion of six project GADs and the initiation of four additional project GADs.

GAD 1 Subsea Systems Institute General Operations and Administration of the Center of Excellence, principal Ramanan Krishnamoorti. The project Scope of work is to oversee the Subsea Systems Institute's activities associated with the project activity for its GADs. Activities included:

- met the reporting requirements of the COE;
- oversaw the day-to-day operations and administration of the COE, including all project GADs; and
- completed monetary amendments documents for submission.

GAD 2 Multi-port Energy Router Using Intelligent Transformers (MERIT) to Interconnect Renewable Resources and Subsea Oil and Gas Factories via HVDC Link. The Scope of work was to facilitate the co-location of renewable resources (wind, wave, floating solar, etc.), energy storage (batteries), and subsea processing systems regardless of distance from shore or depth of installation. The project also explores the control strategy of the MERIT system to reduce the intermittent renewable energy sources, to ensure the safety and stability of the grid interconnection. Project was completed during this reporting period.

GAD 3 Asset Integrity of Valves and Bolted Connections. The Scope of Work was to develop robotics that will enable valve inspection and operation for offshore oil platforms. To develop tapping-listening approaches to detecting the looseness of the flange. Timely unmanned inspection and operation of valves is the key to extending the lifetime of offshore assets and ensuring safety if assets are considered for repurposing for renewable energy development and reefing. Project was completed during this reporting period.

GAD 4 High Accuracy Localization and Underwater Communication. The Scope of Work was twofold, 1) develop methods to perform short distance, high accuracy localization underwater using MI (Magnetic Induction), and 2) use triaxial coil antennas mounted on autonomous underwater agents to transmit and receive signals conveying information and determine the position and orientation.
Current underwater localization methods, such as acoustics and optics, have multi-path fading and line-of-sight requirements constraints. Even though the MI approach cannot propagate far, it is less susceptible to environmental parameters. This project aims to fill the gap for high accuracy localization and robust communication needs at short distances (less than ten meters). However, better hardware implementation and calibration are needed to improve the accuracy of the results. Project was completed during this reporting period.

GAD 5 Developing Bio-Inspired Buoyancy Control for Subsea Service AUVs. The Scope of Work was to develop bio-inspired buoyancy control for an underwater service robot that can adapt its volume to achieve neural buoyancy state and change its orientation. The research focuses on the problem of fine buoyancy control by exploring new enabling ideas from soft robotics. Service robot with efficient buoyancy control will save energy for AUVs when they deliver and replace tools to subsea infrastructures, which will extend the lifetime of subsea

infrastructures and ensure safety if assets are considered for repurposing for renewable energy development and reefing. Project was completed during this reporting period.

GAD 6 Sensors Based on Organic Electrochemical Transistors (OECTs) for Deep Sea Leakage and Chemical Detection. The Scope of Work was to design, fabricate, and model compact, low cost and autonomous chemical sensors for early detection of leakages and spills in subsea applications.
Pipeline networks are the most efficient method to transport oil, gas, and other liquids but leaks are common and oftentimes go undetected. A better leak detection method will improve the safety and efficiency of offshore oil and gas production and could be used in the future to monitor for leaks when carbon or hydrogen is stored offshore. Project was completed during this reporting period.

GAD 7 High-Energy and High-Power Quasi-Solid-State Lithium Batteries for Subsea Applications. The Scope of Work was to fabricate quasi-solid-state lithium battery by balancing power and energy to be operable at wide temperature range and high pressure. Will provide safe and reliable power supply for charging underwater unmanned vehicles, well monitoring, decommissioning applications to extend operation of offshore infrastructure including repurposing for renewable energy development and reefing. Project was completed during this reporting period.

GAD 8 Offshore Asset Integrity Monitoring: Environmental Monitoring. Work began during this reporting period. Scope of Work includes:

- Development of Self-Powered Distributed Sensors/Reporters for Integrated Offshore Asset and Local Environment Monitoring
- Practical Implementation of Organic Electrochemical Transistors (OECTs) for Subsea Detection

GAD 9 Design and Development of Offshore Power Systems. Work began during this reporting period. Scope of Work includes:

- Multi-port Energy Router using Intelligent Transformers (MERIT): Energy
- Optimal Sizing of Onsite Generation Resources for Self-Sustainable Offshore Loads

GAD 10 Offshore Robotics and Automation for Safer Offshore Energy Systems Work began during this reporting period. Scope of Work includes:

- Robotic Fish Enabled Pipeline
- Autonomous Underwater Vehicle Navigation through Steel Scaffolding
- Monitoring Subsea Connections using Percussion and Machine

GAD 11 Offshore Energy Transition: Repurposing Gulf of Mexico Assets. Work began during this reporting period. Scope of Work includes:

- Characterization of Deep-water GOM (Gulf of Mexico) Salt Domes and Proximal Sediments for Storage of Hydrogen and Sequestration of CO_2

- Developing Methods of Producing and Processing Marine Algae to Biocrude
- Extending the Life of Offshore Oil and Gas Infrastructure in the Gulf of Mexico for Profitable New uses in Power and Hydrogen Generation in Preparation for the Energy Transition

III. Financial Elements

A. Award Recipient

The following has been expended from the **$9,965,167 Grant II total award, as amended**:

TCEQ

- TCEQ's total budget is **$392,291**. From January 2021 through August 31, 2023, $129,868.84 has been expended on salaries and fringe and from January 2021 through September 30, 2023, $12,688.99 has been expended on items such as travel, other, etc…

OneGulf

- RESTORE Center of Excellence (OneGulf) contract was executed November 16, 2020. Amendment 1 was executed August 3, 2022, increasing the total from $1,612,450 to **$4,882,412**. From January 2021 through September 2023, $944,778.42 has been expended.

Subsea Systems Institute

- RESTORE Center of Excellence (Subsea Systems Institute) contract was executed October 5, 2020. Amendment 2 was executed August 3, 2022, increasing total from $1,612,450 to **$4,690,464**. From January 2021 through September 2023, $1,643,479.03 has been expended.

B. Award Subrecipient(s)

Center	Project	Awarded	Expended	Lower Tier Subawardee	Amount
Subsea Systems Institute	GAD 8	$60,000	$0	Rice University	$60,000
Subsea Systems Institute	GAD 8	$22,180	$0	American Bureau of Shipping	$22,180

IV. Gulf Coast Ecosystem Restoration Council Element

A. Leveraging Multipliers

Coordination between RESTORE Centers of Excellence

Texas **OneGulf** has played a leading role in establishing coordination between both designated and presumptive COE's from all five Gulf states. There is a monthly call between the Centers, where the focus has been on joint research activities.

The Gulf Restoration Science Programs Ad Hoc Coordination Forum, hosted by the NOAA RESTORE Science Program, provides a venue for all Gulf science programs to come together to develop common data management, share funding opportunities and look for synergies and activities that can be shared. The Texas OneGulf Executive Director and Coordinator participates in the monthly call and attends events like Gulf of Mexico Conference. These face to face meetings serve to enhance coordination and joint actions, reduce duplication and afford opportunities to leverage individual actions.

The Texas OneGulf Director also leads a working group under the Coordination Forum on understanding the impact of science.

SSI
An Advisory Board has been established to guide and support the strategic planning and technical direction of SSI. Membership is on a volunteer basis drawn primarily from industry. This committee supports the strategic planning for SSI.

SSI participates in the Gulf Restoration Science Program Ad Hoc Coordination Forum hosted by NOAA RESTORE Science Program. A bi-monthly meeting for synthesis, integration, and working with other regional research programs to share and integrate scientific findings.

SSI participates in the monthly RESTORE Act Centers of Excellence (COE) meeting. Five states (AL, FL, MS, LA, and TX) form the six Centers of Excellence. These centers collaborate to discuss and address priority research questions for the Gulf. COEs are intricately tied with their respective state agencies, allowing for genuine knowledge co-production that benefits each state locally and, more broadly, Gulf-wide.

Both Centers, OneGulf and SSI participate in the Gulf of Mexico Conference (GoMCon). GoMCon emphasizes the intersection of scientific research and the management of human and natural systems of the Gulf of Mexico. A great

resource for researchers, resource managers, and stakeholders to collaborate on the natural resources of the Gulf of Mexico.