RESTORE ACT CENTER OF EXCELLENCE FOR LOUISIANA FINAL TECHNICAL REPORT

Due within 30 days of the close of the award

Project Title: Subsurface Controls on Subsidence and Carbon Sequestration in Mississippi Delta Diversion Receiving Basins

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Co-Principal Investigator Institution:	**Louisiana State University**
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A. TECHNICAL ACTIVITIES

1. **Research Summary**: Please include methods, main findings and conclusions, significance of the research, and any representative tables or figures. Approximately 5 pages**.**

The record of landscape change captured in a delta's deposited sediments holds the key to unlocking the dynamics of processes that govern the balance of land gain and loss as well as carbon sequestration. The aim of this 2-year project was to build understanding of the heterogeneous geological framework of deltaic basins as it relates to subsidence and carbon sequestration, particularly in and near the Mid-Barataria Bay Diversion receiving basin. By using a combination of instrumental (e.g., geophysical surveys), historical (e.g., maps), and geochronologic (e.g., radiometric dating) tools, we made strides toward quantifying differential vertical accretion and subsidence within three depositional environments common in the Mississippi Delta: marsh, local waterbody (bay, lake), and (paleo)channel/distributary. We also progressed toward assessing the benefit diversions offer to global climate through carbon sequestration. This work augments previous work performed in the receiving basin, specifically by (1) establishing detailed underlying litho-and chrono-stratigraphy of the receiving basin, expanding the deltaic environments to include (paleo)channels, marshes, and local waterbodies; and (2) quantifying differential vertical accretion and preliminary subsidence rates within each deltaic subenvironment. Major findings over the 2-year project are as follows:

1) Historical Analyses

Through both online and in-person research to find and acquire the best historical maps available for the Mid-Barataria study area, we downloaded (or scanned), georeferenced, and uploaded relevant maps for the region into an ArcGIS environment for geospatial analysis and map production. Maps included large-scale (1:20,000) NOAA T-Sheets from 1877-78; small-scale (1:400,000) NOAA General Chart of the Coast No. 19, Gulf Coast Approaches to the Mississippi River, Mobile Bay to Atchafalaya 1900; USGS 1:62,500 scale quadrangles from 1891-93; large-scale (1:20,000) NOAA T-Sheets from the 1930s (incomplete coverage); USGS 1:62,500 scale quadrangles from 1939-41; USGS 1:24,000 scale quadrangles from 1973; and modern USGS 2020 LANDSAT satellite imagery (Fig. 1, and Supplemental Fig. S1-S3). By comparing the earliest maps (1877-78 NOAA T-Sheets) with modern 2020 LANDSAT satellite imagery, we observed: *i*) paleochannels Bayou Dupont and Bayou Barataria dissect and create the western margin for the Mid-Barataria Diversion receiving basin, respectively (Fig. 1); *ii*) the predominate changes in waterways and waterbodies appears to be due to subsidence between 1956 and 1973 and subsequent erosion, and the construction of canals (*sensu* Couvillion et al., 2017; Fig. S1-S3); and *iii*) the marshes proximal to the Bayou Barataria paleochannel appear more robust over time compared to those surrounding Bayou Dupont, however that location has much fewer oil and gas canals (Fig. S1-S3).

Project core locations were chosen by comparing all of these maps and geophysical survey data (see next section), and targeting modern marsh environments, modern bay environments, and marsh environments that are proximal to or overlying the Bayou Dupont and Bayou Barataria paleochannel locations (Fig. 1, Fig. S1-S3, Table S1).

2) Geophysical Analyses

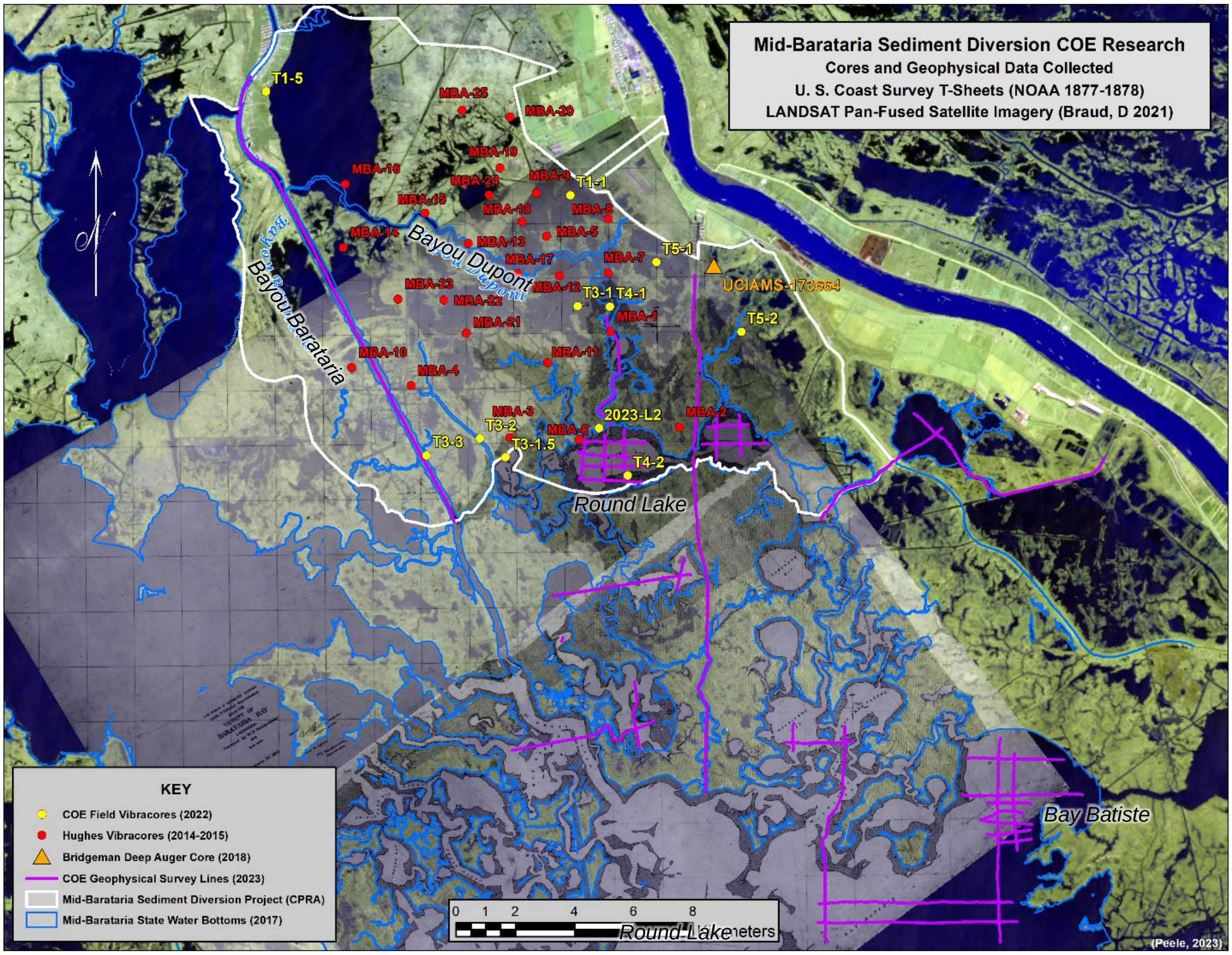


Figure 1 – Summary of field data collected and reanalyzed in this COE project. The NOAA US Coast Survey T-sheets from 1877-1878 show the historical locations of Bayou Dupont and Bayou Barataria that dissect and form the western margin for the Mid-Barataria Sediment Diversion receiving basin, respectively. Approximately 170 km of geophysical lines were undertaken across the receiving basin, as well as to the south and southeast. Eleven new auger cores coupled with vibracore samples were collected within the receiving basin in the following environments (marsh, bay, paleochannel) to achieve accurate lithology and chronology of deltaic deposits using isotopes ^{210}Pb and ^{137}Cs, ^{14}C, and Optically Stimulated Luminescence (OSL) over short to longer timescales (10^1-10^3 yr). This information was compiled with previous cores collected in the basin by Hughes (2016) and Bridgeman (2018).

Geophysical surveys were performed on two separate trips in May 2022 and March 2023, covering approximately 170 kilometers within the Mid-Barataria Diversion receiving basin and to the south and southeast (Fig. 1). This is probably the largest super shallow-water CHIRP dataset ever collected in and near Mid-Barataria Diversion receiving basin. The two biggest challenges in our geophysical survey were shallow water and biogenic gas. Due to the shallow water environment of the study area (≤ 1.5 m), a new pontoon system, developed and maintained by the Coastal Studies Institute of LSU, was utilized for our surveys. While the study area is regularly influenced by tidal changes, wind speed and direction often have a greater influence than tides. An EdgeTech 2000 (ET-2000) was utilized for this study and was attached to the pontoon system for the survey. ET-2000 is equipped with swept frequency CHIRP sonar and combination side-scan sonar. For this study, the CHIRP was set to a frequency of 2 – 8 kHz and 20 ms as this allowed for best penetration through the substrate. Multiple days of efforts were made to try to access the middle area of Mid-Barataria Diversion receiving basin. Unfortunately, much of the middle area was too narrow and shallow to navigate.

Following historical analyses of potential paleochannel locations, the collection of CHIRP geophysical data confirmed paleochannel locations in multiple locations (Figure 2). Paleochannel in Round Lake moves in a southwest direction from the current Bayou Dupont in the northern area of Round Lake through the western exterior of Round Lake, extending at least 1.3 Km. Survey line in the northwest corner of Round Lake (Figure 3, line 1-1') showed channel crossings at approximately 1.5 m depth below the lake floor. Extensive gas was also noted with the eastern side in the surveys, and this can be either attributed to organic matter degradation or marsh deposition in the recent past.

Multiple survey lines in Bay Batiste, northeast region of Barataria Bay, showed paleochannel crossings between 5 and 10 m below the seafloor (Figure 4, lines 2-2' and 3-3'). The channel moves in a north to south direction and is at least 5 km in length. Less outgassing noted in these survey lines and the paleochannel is more visible in the post-processed profiles (Figure 4). These data show that there are at least two prominent layers in the study area, upper flat muddy layer and lower irregular channel deposit.

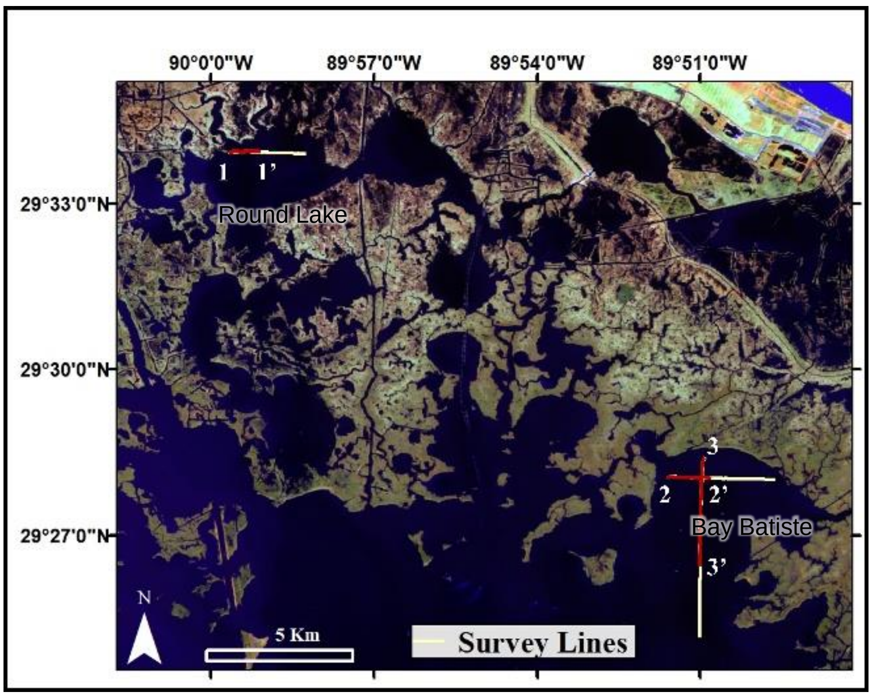


Figure 2. Selected geophysical seismic lines where paleochannels are located and shown in Figures 3 and 4 (see Figure 1 for all lines collected). Red sections of lines relate to the corresponding survey profiles below.

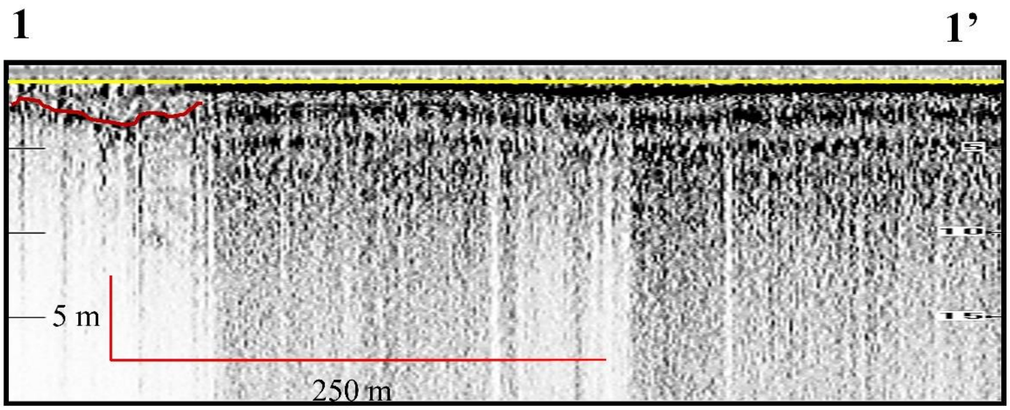
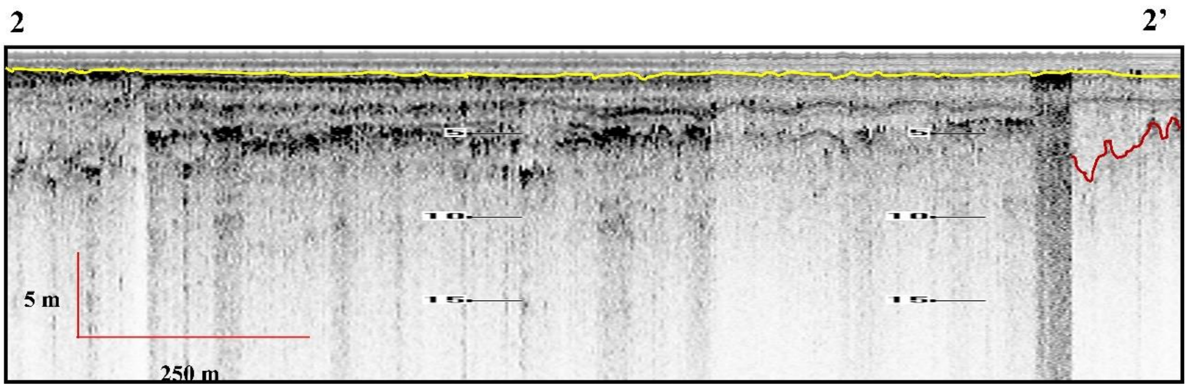


Figure 3. Processed subbottom seismic profile 1-1’ showing the paleochannel outlined in red. See Figure 2 for geophysical profile location.



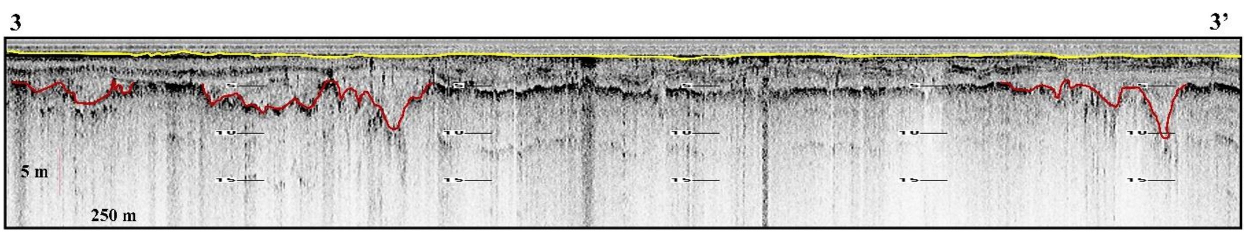


Figure 4 – (Top) Processed subbottom seismic profile of east-west oriented line 2-2’ in Bay Batiste showing the paleochannel outlined in red at the eastern extent of the survey data. The orientation of the channel shows that survey line crosses the channel. (Bottom) Processed subbottom seismic profile of north-south oriented line 3-3’ in Bay Batiste with the paleochannel highlighted in red. The orientation of the channel shows that the survey line was running with and parallel to the channel at different points. See Figure 2 for geophysical profile locations.

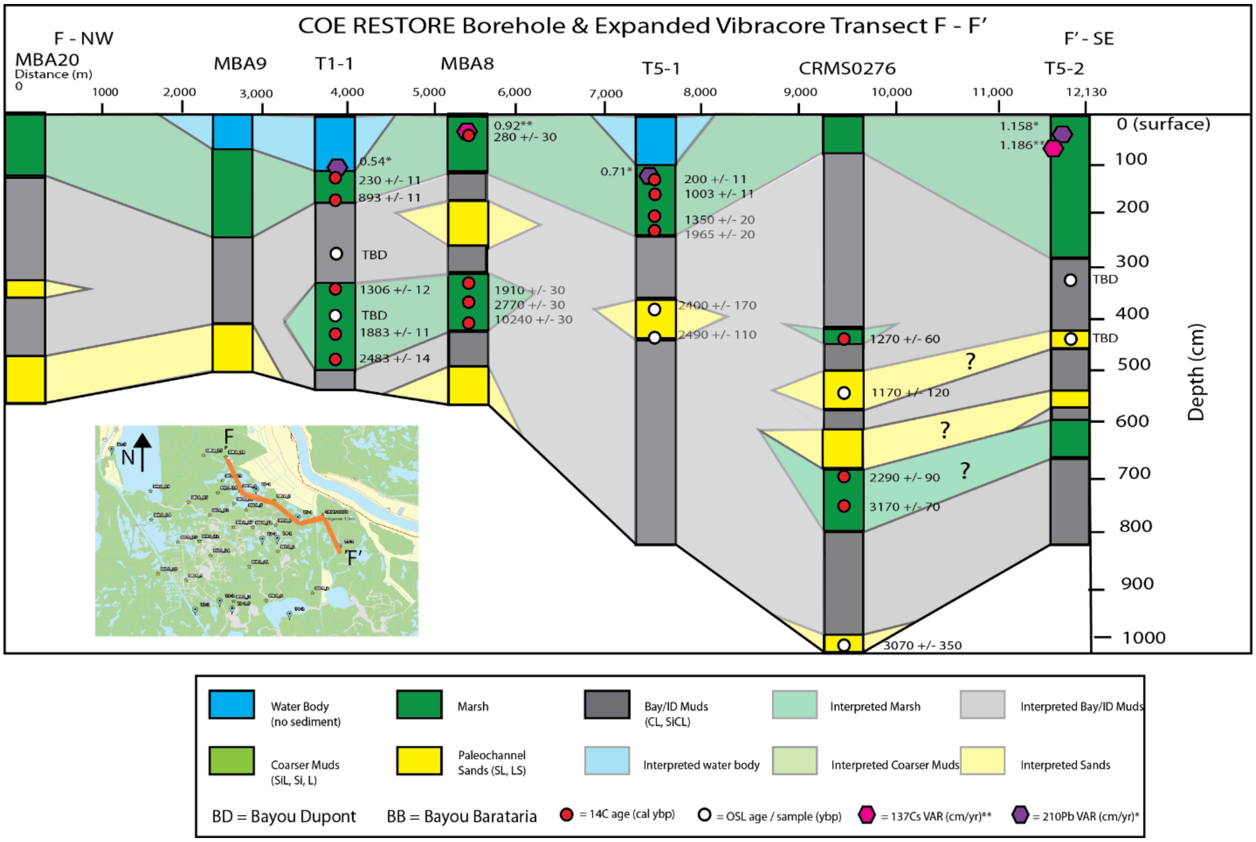


Figure 5 – Representative ithologic fence diagram running NW – SE across the Mid-Barataria Diversion receiving basin. Deltaic lithology is shown, as well as chronology results to date from this project using radioisotopes ^{210}Pb, ^{137}Cs, ^{14}C, and OSL. MBA cores from Hughes (2016), and CRMS0276 from Bridgeman (2018). See also Figures S4-S5.

3) Core lithostratigraphy

This study builds upon 26 shallow vibracores and push cores collected by Hughes (2016) and Bridgeman (2018). A total of 11 new shallow vibracores coupled with deeper auger cores were collected in the basin to obtain better chronology of buried wetland deposits, fluvial-deltaic deposits, and paleochannels (Fig. 1; Table S1). Lithology at depth can be viewed with new cross-sectional fence diagrams oriented parallel and perpendicular to the Mid-Barataria Diversion outlet (Fig. 5, also Figs S4-S5*)*. Representative core geotechnical data for the upper 2 m is shown in Figs S6-S8. Marsh lithology consists of low-density (<0.1 g/cm3), high-water content (~80%), moderate organic content (20-40%), and fine-grained (clayey silt, ~7 phi) sediment that extends downcore for 1-4 m. Marsh lithologies found deeper in cores were designated as peat due to slightly lower water content (~70%), more consolidated sediment (>0.2 g/cm3), and higher organic content (60-80%). Bay muds were classified based upon their gray-light gray clayey-silt grain size (5-7 phi), consistent low organic content (5-20%), lower water content (50%), and higher density (0.2-1.5 g/cm3). At each bay site, a very thin veneer of mud (5-10 cm) overlies the top of each core (classified as bay bottom muds), and these typically overlay marsh lithologies that extend at depth (see Figures S4-S8). At depth, bay cores often contained thin (<5cm) siderite ($FeCO_3$) lenses and 10-20 cm thick shell hash at depth. Paleochannel, mouth bar, or crevasse splay sands were classified upon their light-gray color, coarser granulometry (<3.9 phi) including very fine sand, greater density (0.2-1 g/cm3),

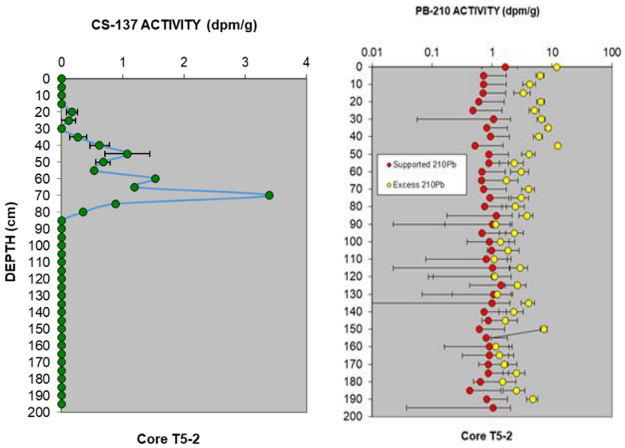


Figure 6 – Representative ^{137}Cs and ^{210}Pb core profiles for marsh core, T5-2, located within the receiving basin. See Figure 1 for core location, and Figs S9-11 for all core data.

and low organic content (<20%). Coarser muds typically overlie these sands, sharing similar physical properties to bay muds, although the grain size is predominantly medium to fine silt (6-7 phi).

Modern (10^1-10^2 yr) vertical accretion rates (VAR) were determined using radioisotopes ^{210}Pb and ^{137}Cs following methods from Corbett and Walsh (2015). Cesium-137 is a product of nuclear bomb testing, and ^{210}Pb is a naturally occurring isotope from the decay of uranium in sediment. The ^{137}Cs activity results show peaks of activity at depths as shallow as 45 cm, and as deep as 90 cm (see Fig 6, S9). For marsh environments, the average VAR was found to be 0.92 +/- 0.26 cm/yr, while the average VAR for paleochannel environments was found to be 1.25 +/- 0.28 cm/yr (Table S2). Bay cores did not contain any ^{137}Cs as many of these areas were marsh prior to 1956, and became inundated and converted to bays by 1973 (see Figs. S2-S3; Couvillion et al., 2017). Vertical accretion rates in these locations could be determined using ^{210}Pb, however: they averaged 0.61 +/- 0.25 cm/yr (Fig. S10, Table S2). Vertical accretion rates from ^{210}Pb in marsh and paleochannel environments corroborated Cs results at 0.82+/- 0.36 cm/yr, and 1.36+/- 0.19 cm/yr, respectively (Fig. S11, Table S2).

4) Organic carbon and radiocarbon analyses

We carried out organic carbon (OC) measurements and radiocarbon (^{14}C) dating on seven new sediment cores obtained from vibracores extracted within the receiving basin. Ages from radiocarbon results ranged between 200 to 2655 years BP (before 1950), representing modern marsh wetland and past peat (wetland) environments associated with the Plaquemines-Modern and St. Bernard delta complexes of the Mississippi River. Results are presented in Table S3, also within the cross-sectional fence diagrams shown in Fig. 5, S4-S5. In addition, we collected two hand cores in the upper Bayou Lafourche area that were sampled for OC measurements only (these cores have previously been dated by OSL). In total, we measured OC content with an elemental analyzer on 339 samples. We used 49 ^{14}C measurements, in most cases from duplicate subsamples for 27 dated stratigraphic levels. Results from individual samples are presented in Table S2 and the cross-sectional fence diagrams Fig. 5 and S4-S5. Combined with OSL ages (see next section), we have obtained geochronology that enables an age-depth model to be established for several cores, encompassing modern environments characterized by marsh, bay, and paleochannels (see Fig. 7 for preliminary results from ^{14}C).

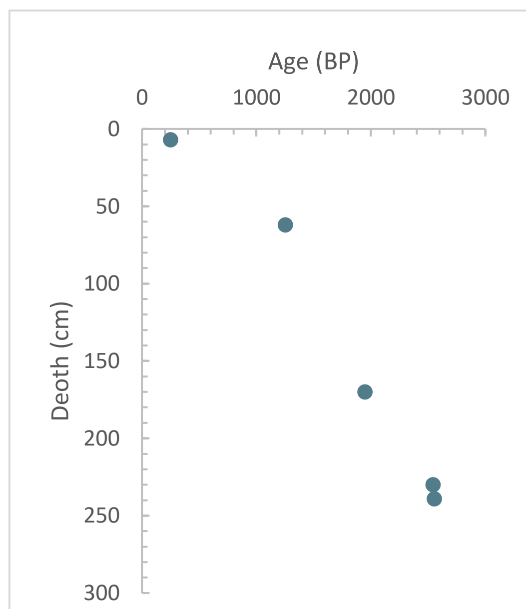


Figure 7 - Plot of ^{14}C age vs. depth for core 602292003 (T3-1), a bay core. Age is in years BP (before 1950). See Figure 1 for core location.

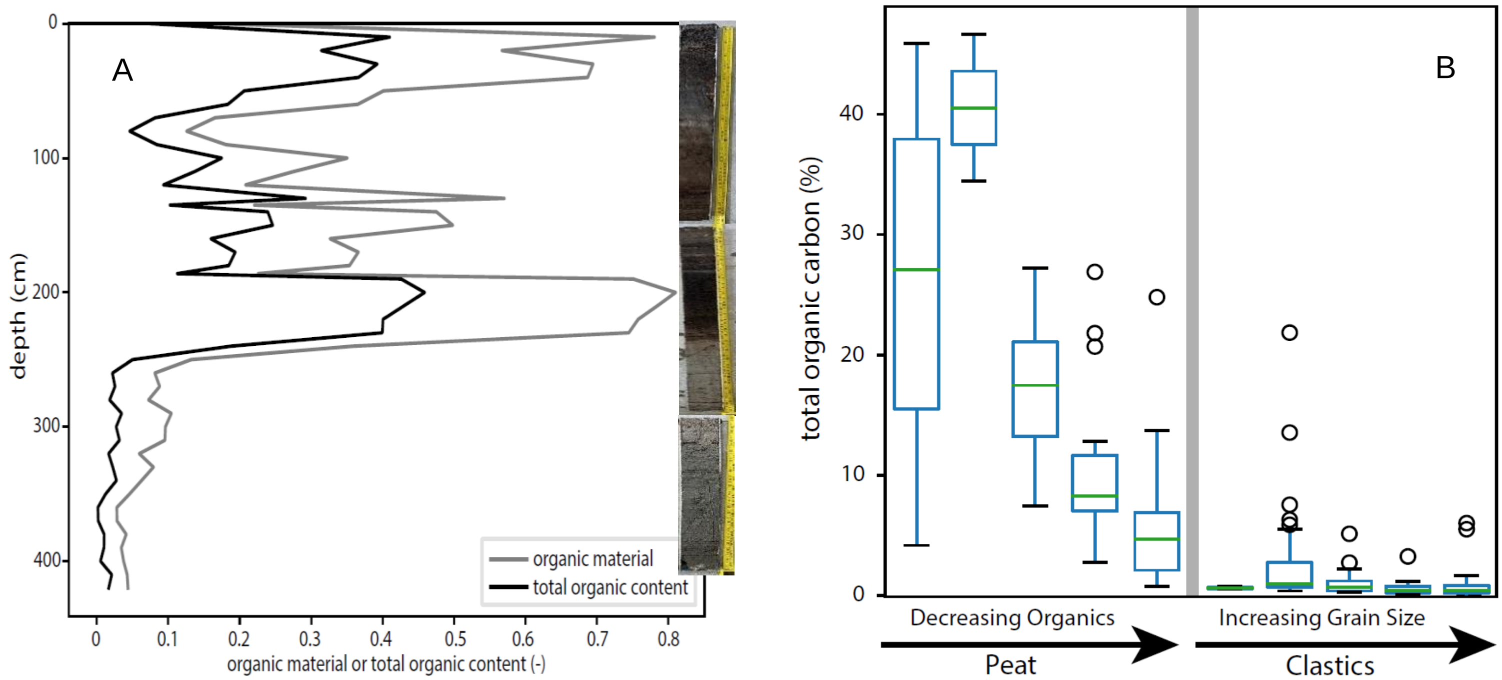


Figure 8 – A) Fraction organic material (grey) and organic carbon (black) vs. depth for the water/bay core 602292003 (T3-1). B) Total organic carbon (%) for peat vs. clastic sediments in Barataria Bay.

As mentioned in the section above, cores from Barataria Basin generally include a surficial peat bed up to a few meters in thickness, underlain by clastic deposits associated primarily with the St. Bernard lobe and to a much lesser extent with the Modern (Plaquemines-Balize) lobe of the Mississippi River. We find this succession both in cores taken in marshes and in adjacent shallow bays. A characteristic example is provided in Fig. 8A. Even though OC values are much higher in the peats (~30%) compared to the clastics (~1-3%; Fig. 6B), the large difference in accretion rates (order mm/yr for peat versus cm/yr for clastics) shows that OC burial rates between these two facies and associated depositional environments is not that different, with typical values of 300 gC/m^2/yr. This observation is intuitive with the chronology, which indicates that the majority of land construction in this area (through natural delta growth processes) occurred ~2-3 ka during the activity of the St. Bernard lobe. The modern landscape therefore may have little relation to the accretion and sequestration processes that preceded it, and the Modern lobe has been largely non-constructive in the region we studied.

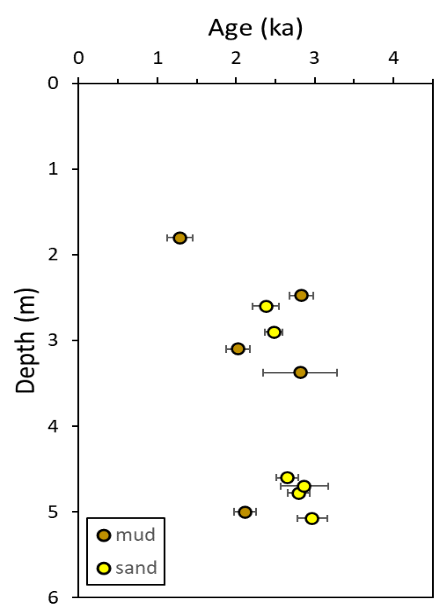


Figure 9 - OSL ages of sandy and muddy deposits at different depths. Age is in ka (thousands of years ago). See Table S4 for all results to date.

5) OSL dating

Twenty-five samples were obtained for optically stimulated luminescence (OSL) dating. OSL allows for estimating the timing of sediment deposition based on a light-sensitive signal that accumulates in quartz and feldspar mineral grains following their burial and sequestration in the stratigraphic record. This is useful for paleoenvironmental reconstruction and specifically understanding the time when different parts of the delta formed and how it has since evolved, e.g., through subsidence. The samples were obtained by cutting sections from the unsplit vibracores and by coring and extraction with a lined stainless-steel sediment sampler. The OSL samples were processed at the Netherlands Centre for Luminescence dating (NCL) of Wageningen University. Luminescence measurements of purified quartz were conducted using automated Risoe TL/OSL readers, following standard measurement protocols, and radioactivity of the surrounding sediment matrix determined using a gamma spectrometer.

Dating has been completed for eleven samples and selection/processing is underway for the remaining samples. Preliminary results are presented in Fig 9 and Table S4, and within the cross-sectional fence diagrams shown in Fig. 5 and S4-S5. These results yield ages in the range from ~ 3.0 – 1.3 ka (thousands of years before 2023), with the majority dating to ~ 2.8 ka (Fig. 5, 9, S4-S5). These preliminary data suggest that much of the clastic land underlying the Mid-Barataria Diversion receiving basin is part of the St. Bernard subdelta of the Mississippi River and the Modern (Plaquemines-Balize) subdelta has had only minor input, likely through localized crevasse splay activity (Fig. 5). While analyses remain underway, once fully compiled these chronologic data will be of critical value for quantifying differential subsidence and carbon sequestration at the various environments of this study (marsh, bay, marsh that overlie paleochannels and crevasse splays).

Major Conclusions and Significance (how relates to Master Plan objectives)

Preliminary analyses show that Bayou Barataria and Bayou Dupont are relatively old deltaic features within the Mid-Barataria Diversion receiving basin (with Bayou Barataria sands dating to ~2.8 ka, and Bayou Dupont at least ~2.5 ka; Figs. 5, S4-S5). These old paleochannels have since transgressed due to subsidence and are overlain by younger clastic and wetland marsh deposits. The thickness of the marsh deposits ranges from 0.3 to 4.6 m (averaging ~1.5 m), and they are dated as modern within the upper ~1 m (^{210}Pb and ^{137}Cs for age dating), and can be 200 to 1000 years old between 1-3 m depth (Fig. 3, S4-S5), with continuous peat dated to ~2.5 ka at its base (i.e. immediately above the clastic-organic transition) in some cases. Figure 10 shows an updated isopach map of the thickness of these wetland deposits combining our results with previous core data collected from Hughes (2016) and Bridgeman (2018). Marsh thickness was determined by re-expanding compacted vibracore samples from Hughes (2016), and adding our and Bridgeman (2018) uncompacted auger core data. A raster marsh thickness isopach was calculated from these COE core marsh thickness measurements within an ArcGIS Desktop Spatial Analyst environment using the Natural Neighbor Interpolation function in ArcToolbox. This interpolation technique preserves the point values for each core location, interpolation between adjacent core locations, and does not interpolate beyond the extent of the outer bounding cores. The resulting raster isopach was then rendered by classifying the histogram into 14 Natural Breaks (Jenks) classes and choosing an intuitive colormap to apply to the classes for cartographic presentation (Fig. 10).

Prior work has emphasized the vulnerability to compaction of peat (Tornqvist et al., 2008), especially when unconsolidated. Furthermore, a previous study by Bomer et al. (2019) found that

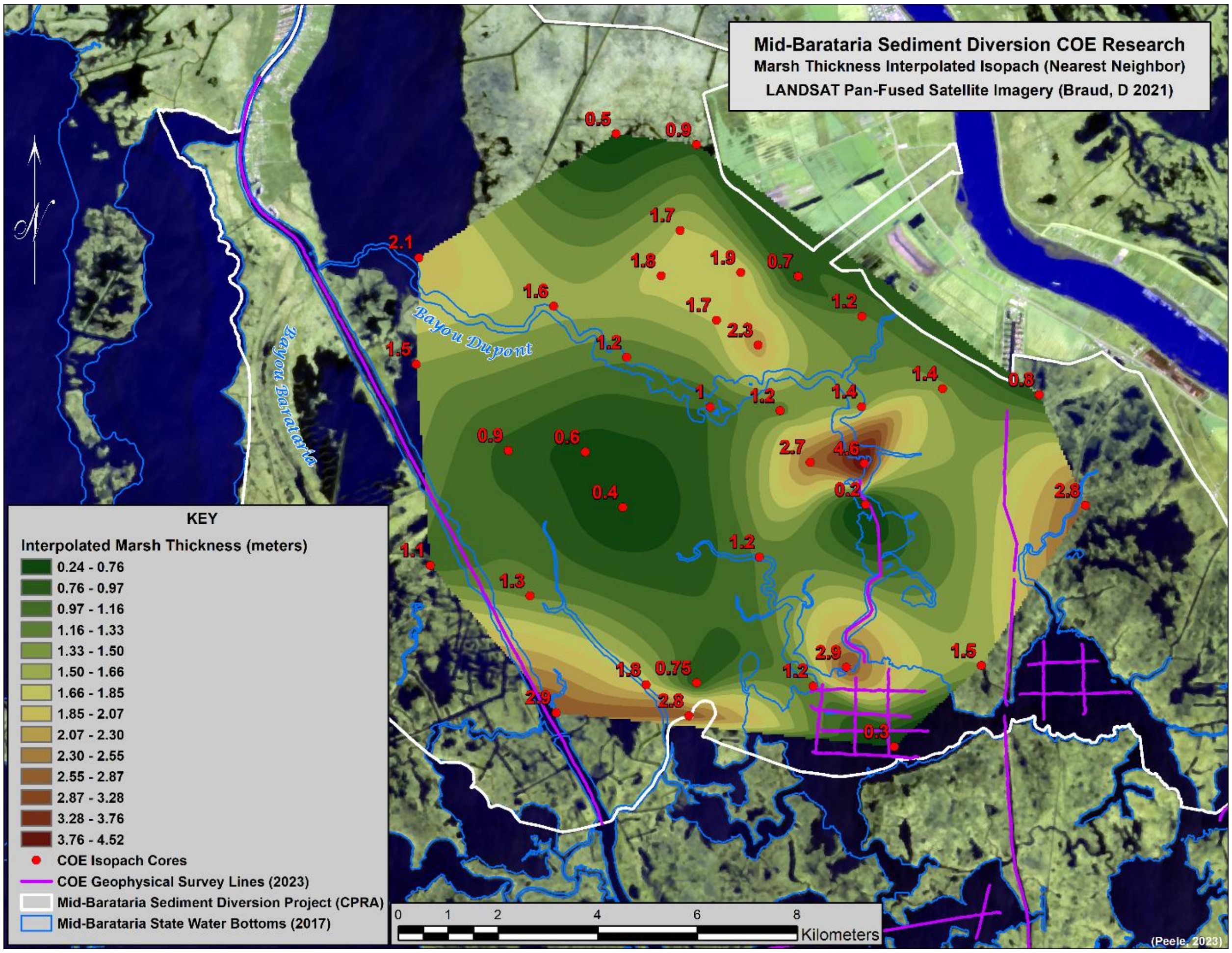


Figure 10 – Isopach map of wetland surface within the Mid-Barataria Diversion receiving basin. This is updated from Hughes (2016), as we re-expanded their vibracore data to calculate thickness of wetland soil prior to compaction (from the vibracoring practice), and included our new core locations as well as Bridgeman (2018) uncompacted core data. Red numbers indicate marsh thickness at each core location in meters. Note there are some "hotspots" of thicker organic-rich deposits located near and just north of Bayou Dupont. The layers are thinner near the modern Mississippi River and in the center of the basin. Hughes (2016) found crevasse splay deposits at depth, and we confirm his observations, with better chronology of St. Bernard vs Plaquemines activity.

wetland soils within the Mid-Barataria Diversion receiving basin were much weaker than underlying clastic deltaic sediments, and are expected to undergo erosion and/or extensive consolidation with operation of the diversion. The peat we identified in this study (Fig. 5, 10, S4-S5) has in most places not been consolidated by loading with clastic deposits. This, combined with its thickness and soil weakness, poses a major likelihood for compaction and erosion of peat in the receiving basin when the Myrtle Grove diversion is activated.

We hypothesized that marshes overlying paleochannels would display the least subsidence, and bay environments the greatest. However, the chronostratigraphic data show that almost all regions are characterized by thick (~1-3 m) continuous and erosion-/compaction-prone wetland soil/peat, and that the Modern river has accomplished little construction in this area—the youngest crevasse splay dated here was 1.1 ka (though dating is still in progress)—allowing the post-St. Bernard wetland to persist for millennia in Barataria Bay. This indicates that all modern environments found in this basin (channel, marsh, bay) are similarly prone to significant elevation loss by erosion or compaction due to their fine-grained nature. However, data analyses and work is still in process regarding differential vertical accretion rates and subsidence within the paleoenvironments investigated here (marsh, bay, paleochannel). Over the coming months as new chronologies are obtained, we aspire to deliver more age-depth relationships within the Mid-Barataria Bay Diversion receiving basin, which will help with the creation of a revised subsidence map and relating subsidence rates to underlying lithologies in and near the basin.

Preliminary analyses of carbon sequestration indicate that growing deltas accomplish the greatest sequestration rates (higher than e.g., marine mud deposition), and this is a hopeful finding in regard to diversions which will simulate delta growth processes. In other words, we expect the Myrtle Grove diversion to support delta growth conditions which are among those most optimal for carbon sequestration.

References

Bridgeman, J. (2018). Understanding Mississippi Delta subsidence through stratigraphic and geotechnical analysis of a continuous Holocene core at a subsidence Superstation. Tulane University, M.S. Thesis, 86 p.

Bomer, E.J., Bentley, S.J., Crawford, F., Hughes, J.E.T., Wilson, C.A., and Xu, K. (2019). Deltaic Morphodynamics and Stratigraphic Evolution of Middle Barataria Bay and Middle Breton Sound Regions, Louisiana, USA: Implications for River-Sediment Diversions. *Estuarine, Coastal and Shelf Science.* 224: 20-33

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2. **Application of research to implementation of Coastal Master Plan**: Bulleted list of suggested applications

- Our core data show the highly heterogenous nature of sediment deposit and stratigraphy in the study area. Organic rich mud/peat layer thickness can vary from about only 1 m in some cores to >4 m in others. This surficial layer is likely highly erodible and can be removed near the diversion channel. This process should be taken into consideration in numerical modeling, i.e., incorporated into future model/forecasts aimed at informing the land-building capacity and evolution of the Myrtle Grove diversion.
- This organic rich mud/peat layer--as well as bay bottom mud--is also prone to new and future subsidence. When new land is built in future decades, new sediment loading on top of soft mud-rich layers can lead to additional compaction/consolidation (leading to subsidence) which should be considered in modeling.
- Based on new seismic data, deeper paleo channel sediment tends to be more reflective than flat lying shallow sediment. Thus, buried channel sand is likely to be coarser than bay mud deposit. These channels can either be used as foundation to build new land for marsh creation project, or potentially re-used for diverting water and sediment in the study area.
- This study shows that while the peats and muds in the basin are highly prone to consolidation, the longevity of the wetlands (thousands of years) and long-term accretion of organic-rich muds suggests suspended muds delivered from the diversion will be highly beneficial to maintain the intertidal vegetated landscape away from the major depocenter of coarser sediments.

B. DELIVERABLES

*Note – please submit all PDFs of reports, papers, and presentations with the final report **in the portal** (LA-COE Apply). Thank you!*

1. **Deliverables on proposed goals and objectives.** If a goal or activity is not completed, please describe in the "comments" why actual output / deliverable deviated from the proposed.

#	Proposed goal / objective / activity	Target output / deliverable	Completed (Y/N)	Comments	Topical area (s) and research need(s) addressed (as described in the proposal)
1	Determine the location and age of paleo-channels and crevasses within the Mid-Barataria Bay Diversion receiving basin	Historical maps of receiving basin; chronology within fence diagrams across basin	Y		Topic Area 4: Deltaic Geology, Geomorphology, Subsidence, and Sediment Dynamics
2	Quantify differential vertical accretion rates within three depositional environments common in the Mississippi Delta: marsh, bay, and (paleo)channel	Vertical accretion rates	Y		Topic Area 4: Deltaic Geology, Geomorphology, Subsidence, and Sediment Dynamics
3	New estimates of carbon sequestration by deltaic depositional environments.	Carbon sequestration rates	Y	As more chronologic age control is obtained (ongoing analyses), age:depth models will be refined and completed	Topic Area 2: Estuarine and Coastal Ecology (estimate response of belowground biomass and soil organic matter accumulation in wetlands)
4	Develop a revised isopach map of wetland soils in the substrate of the diversion receiving basin	Isopach map created in GIS framework	Y		Topic Area 4: Deltaic Geology, Geomorphology, Subsidence, and Sediment Dynamics

5	A novel subsidence map relating subsidence rates to underlying lithologies in the Mid-Barataria-Bay Diversion receiving basin.	Subsidence map with lithology	N	Remains in progress - As more chronologic age control is obtained (ongoing analyses), age:depth models will be refined and completed, which will generate more substantive subsidence rates	Topic Area 4: Deltaic Geology, Geomorphology, Subsidence, and Sediment Dynamics
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2. **Peer-reviewed publications.** Please provide .pdf copies of all publications.

Authors	List author names of graduate students/postdocs	Title	Journal	DOI (or other identifier)	Published; submitted; in prep; planned?	Date
A. Gartelman, K. Xu, C. Wilson, T. Tornqvist, and E. Chamberlain	A. Gartelman	Shallow stratigraphy and paleo distributaries in Mid-Barataria Diversion receiving basin	Estuarine Coastal and Shelf Science		In prep	
M. Piorkowski, C. Wilson, K. Sanks, E.. Chamberlain, T. Tornqvist, and K. Xu	M. Piokowski, K. Sanks	Long-term vertical accretion and subsidence rates within paleo-environments of the Mid-Barataria Diversion Receiving Basin, Louisiana, USA.	Estuarine Coastal and Shelf Science or Geomorphology		In prep	
K. Sanks, E. Chamberlain, T. Tornqvist	K. Sanks	Organic carbon sequestration rates in clastic versus organic strata of the Mississippi Delta	Earth Surface Processes and Landforms		In prep	

3. **Oral presentations and posters.** Please provide .pdf copies.

Presenter	Co-authors	List author names of graduate students/Postdocs	Title	Oral or poster?	Conference or meeting name	Date	Proceedings published? (Y/N)
E.L. Chamberlain			Tools for interrogating deltas	Oral plenary, invited	Ocean Carbon and Biogeochemistry (OCB)	June 14, 2023	N
M. Piorkowski	C.A. Wilson, K.M. Sanks, T. Tornqvist, H. Peele, and E.L. Chamberlain	M. Piorkowski, K.M. Sanks	Long-term vertical accretion and subsidence rates within paleo-environments of the Mid-Barataria Diversion Receiving Basin, Louisiana, USA.	Poster	American Geophysical Union (AGU) Annual meeting	December 12, 2022	N
K.M. Sanks	T. Tornqvist, E.L. Chamberlain, M. Piorkowski, and C.A. Wilson	K.M. Sanks, M. Piorkowski	The potential of the planned Mid-Barataria Sediment Diversion (Mississippi Delta) as a blue carbon sink	Oral	American Geophysical Union (AGU) Annual meeting	December 12, 2022	N

4. **List other products or deliverables**. These can include white papers, patent applications, workshops, outreach activities/products. Describe and provide .pdf copies, as applicable.

5. **Data.** Making data publicly accessible in a timely manner is a key goal of the data management policy of RESTORE Act Center of Excellence. All projects must ensure that data and ISO metadata are collected, archived, digitized, and made available using methods that allow current and future investigators to address new questions as they arise. Per the U.S. Department of the Treasury's Office of Gulf Coast Restoration Data Accessibility and Management Best Practices[1] *"Data are generally expected to be made publicly available at the time of publication of a peer- reviewed article relying on the data or two years after the data are collected."* All information products resulting from funded projects must be associated with detailed, machine-readable metadata (ISO format) and shared in a regional or national digital repository or data center (e.g., National Centers for Environmental Information, Gulf of Mexico Research Initiative Information & Data Cooperative, Inter-university Consortium for Political and Social Research, DataOne Dash) for discovery and long-term preservation. Metadata, a brief description of the data, and location of the data (e.g., repository, DOI) must be provided to the LA-COE to enable tracking of all data and information products.

#	Data Title	Data Description	Repository or Data Center	Date by when it will be publicly available (1 year after final report)	DOI link (if already available)
1	OSL chronology	25 OSL ages for clastic sediment deposition	Netherlands Centre for Luminescence dating LumiD database	1 year after completion of project	www.lumid.nl
2	Radiochemistry and geotechnical properties	Short core (top 2m) vertical accretion and geotechnical parameters (bulk density, organic content, grain size)	NCEI, USGS or equivalent data server	1 year after completion of project	Not available yet
3	CHIRP seismic data	CHIRP subbottom seismic data collected using EdgeTech 2000	NCEI, USGS or equivalent data server	1 year after completion of project	Not available yet
4	Radiocarbon chronology	27 Radiocarbon ages for organic matter deposition	Open Access Journal article	1 year after completion of project	Not available yet
5					
6					

[1] https://www.fio.usf.edu/documents/flracep/program-documents/Treasury%20RESTORE%20COE%20data%20management%20best%20practices%20Jan%202018.pdf

7					
8					

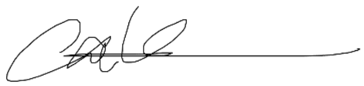
6. **Mentoring and Training.** Please list post-doctoral and graduate and undergraduate student participants (provide .pdf copies of thesis/dissertation).

First Name	Last Name	BS/MS/PhD/Postdoc	# Years involved	Institution	Thesis/Dissertation Title/Research Topic or Tasks	Did the student graduate? (Y/N)	If they graduated, current position/location?
Michael	Piorkowski	MS	2	Louisiana State University	Long-term vertical accretion rates within paleo-environments of the Mid-Barataria Diversion receiving basin	N	N/A
Adam	Gartelman	PhD	2	Louisiana State University	Shallow stratigraphy and paleo distributaries in Mid-Barataria Diversion receiving basin	N	N/A
Kelly	Sanks	Post-doc	2	Tulane University	Radiocarbon dating and organic carbon sequestration	N/A	N/A
Lieke	van der Lee	MS	1 (2023-2024)	Wageningen University	Linking past river lobe activity to modern sediment diversions in the Mississippi Delta	N	N/A

C. CERTIFICATION

Certification: I certify to the best of my knowledge and belief that this report is correct and complete for performance of activities for the purposes set forth in the award documents.

Principal Investigator:

Signature: 

Name: Carol Wilson

Date Signed: November 30, 2023

Approval: I have evaluated the final report and associated invoice and confirm that the project is finished.

LA-COE Technical Point of Contact:

Signature: Francesca Messina

Name: Francesca Messina

Date Signed: 12/13/2023

Approval: I have reviewed the final report and approve for payment.

LA-COE Director:

Signature: Jessica R. Henkel

Name: Jessica R. Henkel

Date Signed: 12/20/2023