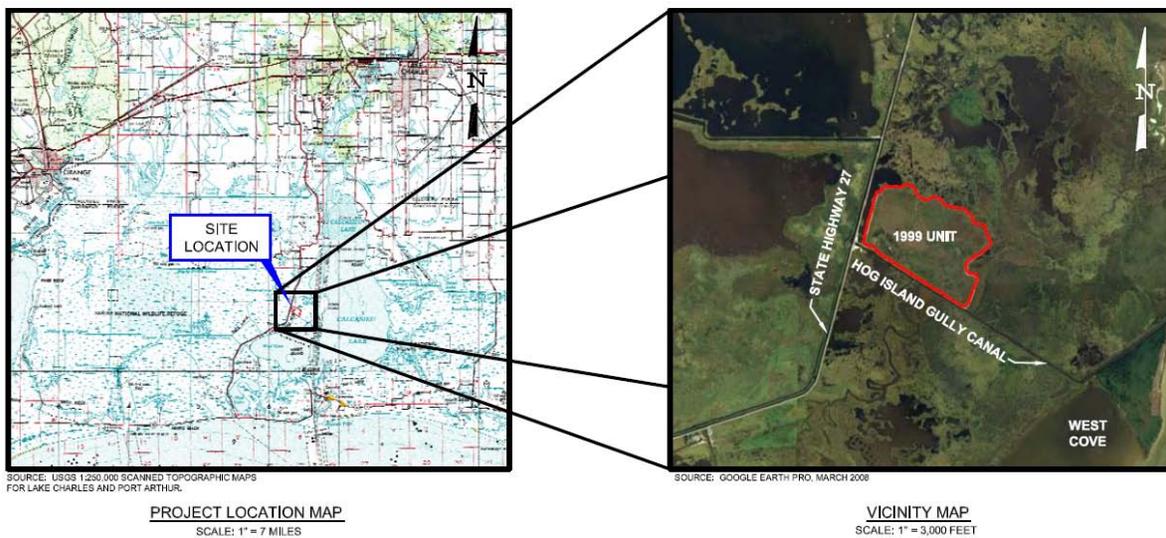


**SCOPE OF WORK
RESTORATION MONITORING
BAYOU VERDINE, MARSH RESTORATION PROJECT
NOVEMBER 2011**

The Bayou Verdine (BV) Marsh Restoration Project site is located in the Calcasieu Estuary, in Southwestern Louisiana. The restoration site, known as the “Sabine 1999 Unit”, is a former dredge disposal site near West Cove Canal, located within the Sabine National Wildlife Refuge (Sabine NWR) and is publicly owned and managed by the United States Fish and Wildlife Service (USFWS). The site is bordered to the east by Calcasieu Lake, to the west by LA Highway 27, is approximately 8 km south of the town of Hackberry, and is approximately 16 km north of the Gulf of Mexico, as seen in the figures below.



The estuary and its associated tributaries (including Bayou Verdine) comprise a large, tidally influenced wetland system approximately 40 miles in length, extending north from the Gulf of Mexico to the saltwater barrier upstream of Lake Charles. The area is located within the 100-year and 500-year flood plains of the Calcasieu River basin, and the elevation gradients are small. Relief in the area of the bayou ranges from 1 to 5 meters above mean sea level (MSL). This project will serve as compensation for Natural Resource Damages at a hazardous waste site along Bayou Verdine and Coon Island Loop, in the upper part of the estuary. For more information on the damage assessment, see the [Final Damage Assessment and Restoration Plan and Environmental Assessment for Bayou Verdine, Calcasieu Parish, Louisiana](#) (http://www.darrp.noaa.gov/southeast/bayou_verdine/index.html).

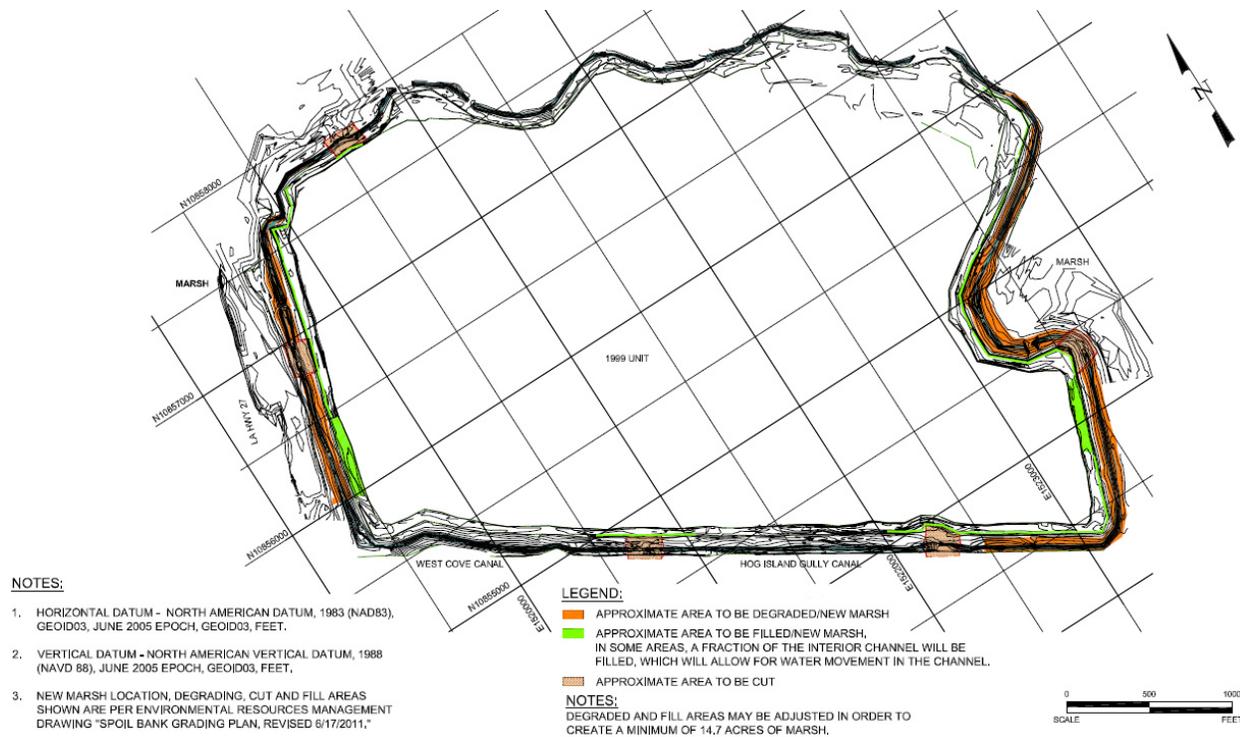
Project Objectives

The objectives of the restoration project are to:

- 1) Extend the longevity and enhance the ecological services of the 247 acres of existing marsh at the Site through increased tidal exchange that will
 - (i) Increase the rate of accretion,
 - (ii) Decrease the rate of elevation change across the Site, and
 - (iii) Improve the functional quality of the habitat; and
- 2) Create an additional 14.7 acres of sustainable, functionally equivalent brackish marsh.

The purpose of this Scope of Work (SOW) is to establish monitoring plan requirements for completion of post-restoration construction. Post-construction performance monitoring is necessary to verify that the restoration project will meet its identified restoration objectives, or whether corrective action(s) are necessary to achieve, facilitate or eliminate obstacles to restoration success. Performance criteria represent short-term milestones that, if met, provide reasonable assurance the project will be successful in meeting its restoration objectives in the long term.

ConocoPhillips, the Potentially Responsible Party (PRP), will have overseen construction of 14.7 acres of marsh from the degradation of levees and filling of interior channels in the Sabine 1999 Unit area. ConocoPhillips contracted URS to perform engineering and serve as the contractor for the marsh creation project. Approximately 6,000 linear feet of existing levees/berm were degraded to obtain material for the creation of 14.7 acres of marsh between elevations of +0.85 and +1.75 feet, NAVD 88. Deeper cuts (with an average depth of 0.53 feet, NAVD 88 elevation) were included at five locations in the levee to promote hydrologic exchange within the 1999 Unit. The following figure provides a layout of the marsh creation area and cuts. Field designed 'trenasses' (ditches) were also created to further facilitate hydrologic connectivity within the marsh unit.



Objective 1: Hydrologic Restoration

The project's hydrologic restoration actions are intended to increase hydrologic exchange and increase sediment deposition on the marsh surface across the project site.

Performance Criterion #1a: The hydrologic regime will result in the inundation/wetting of the marsh surface (at and below +1.5 feet, NAVD 88 in elevation) during normal high tidal events. Tidal data from the USGS tide gauge station 08017095 (North Calcasieu Lake near Hackberry, LA) will be incorporated for understanding of tidal events.

Performance Criterion #1b: An average marsh accretion (combination of mineral and organic sediments) rate of at least 0.50 cm/yr will be achieved through year 4 (December 2016).

Objective 2: Marsh Creation

The Project includes actions to create 14.7 acres of sustainable, ecologically functional brackish marsh that follow the criteria set forth by the trustees.

Performance Criterion #2a: Spatial extent of marsh creation area (i.e., combined areas of marsh platform created in old flotation canals using fill material from the spoil banks) at year 4 is at least equal to 14.7 acres.

Performance Criterion #2b: Elevations within marsh creation area at year 4 are within minimum and maximum elevations of +0.85 and +1.75 feet, NAVD 88, respectively.

Performance Criterion #2c: Average annual vegetative cover is at least 80% within the marsh creation area.

Performance Criterion #2d: The vegetation communities that colonize the marsh creation area shall not contain the following: Chinese tallow (*Triadica sebifera*), salt cedar (*Tamarix ramosissima*), Jesuit's bark (*Iva frutescens*), or eastern baccharis (*Baccharis halimifolia*).

Project Management Team

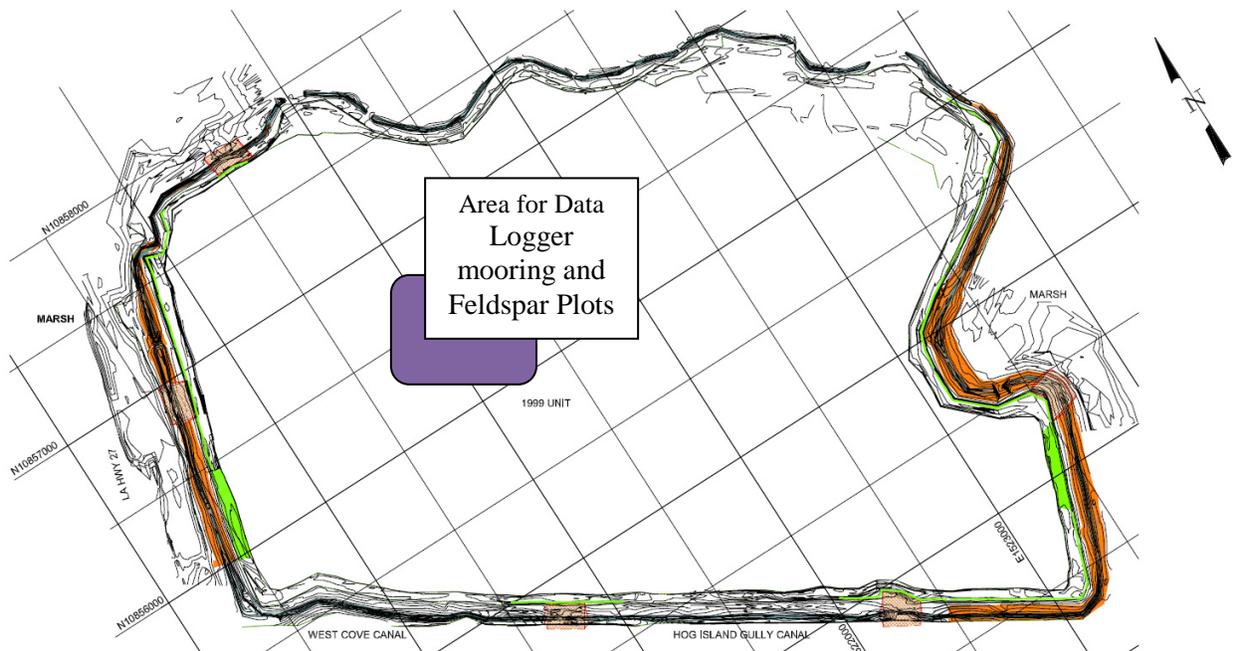
On behalf of the Natural Resource Trustee Council (Department of Environmental Quality, Louisiana Department of Wildlife and Fisheries, US Fish and Wildlife Service, and the National Oceanographic and Atmospheric Administration (NOAA)), known as the "Trustees", NOAA, the lead administrative trustee, will be responsible for hiring contractors to conduct all monitoring components specified in this document. Questions regarding the technical and scheduling aspects of this SOW will be directed to Mairi.Miller@noaa.gov (225-578-4303). General contract issues will be directed to Cecelia.Linder@noaa.gov (301-427-8675), the NOAA Contracting Officer Technical Representative (COTR).

Scope of Work

The following SOW is provided as an outline. Tasks are to be conducted through an integrated approach and are not necessarily listed in chronological order. The contractor should provide a detailed description of all tasks performed in their full proposal. Submitted proposals may vary from the following scope with a stated reason for the variation. Proposals for this contract will be evaluated based on knowledge of the intended tasks, qualification of staff assigned to the project and location of the technical field teams.

Task 1 Development of a Project Work Plan

The contractor shall develop a Draft Project Work Plan based on a site visit conducted by the contractor prior to the kickoff meeting aimed at understanding the project area. This Draft Plan will provide the Trustees with information on equipment to be used by the contractor, installation methodology, data management, monitoring report format, data logger and feldspar plot locations. Procedures for coordinating site visits are discussed in Task 5. The location of the data logger and feldspar plots shall be within the area identified on the map below. The project work plan shall include the proposed locations as recommended by the contractor; these locations will be discussed and accepted by the trustees during the kickoff meeting. The Project Work Plan shall also include an anticipated schedule for the project and proposed report outline.



Task 2 Attend monitoring project kickoff meeting

The contractor has organized and documented a meeting with the trustees to discuss project tasks, timelines, and deliverables. The Trustees reviewed or made the contractor aware of existing data, reports, studies, survey efforts, and all pertinent information related to the design work. The following resources are provided for information:

- Attachment 1 – 2011 Construction Drawings
- CRMS Reference - (www.lacoast.gov/reports/project/CRMS-Wetlands_SOP_2008.pdf)

Task 3 Monitoring

The following criteria, parameters for measurement, methods and timing will be used to monitor the success of the Restoration Project against the above identified performance criteria.

Subtask 3.1 Baseline Establishment/Site Setup

Following the project kickoff meeting, the contractor shall perform a site visit with up to two trustee personnel to establish the following:

- Hydrologic data-logger and staff gauge location and
- Feldspar horizon plot at one location;
- Vegetation transects;
- Documentation of current percent cover of the native vegetation community through the Braun-Blanquet Cover Abundance Scale and
- Presence/absence of invasive species and woody shrubs in the marsh creation areas.

Data logger, feldspar plot locations and vegetation transects will be approved by the trustees following the initial site visit. The contractor shall install the hydrologic data-logger in accordance with the continuous data collection system design established in Section 3 of “A

Standard Operating Procedures Manual for the Coast-Wide Reference Monitoring System-Wetlands: Methods for Site Establishment, Data Collection, and Quality Assurance/Quality Control” (SOP Manual for CRMS) September 18, 2008 by the Louisiana Coastal Protection and Restoration Authority Office of Coastal Protection and Restoration. The marsh installation methodology outlined in the SOP Manual will be followed depending upon the exact location of the data-logger. The hydrologic data-logger shall be surveyed and correlated to NAVD88 elevations.

A staff gauge shall be installed in close proximity to the continuous hydrologic data-logger for verification purposes. The staff gauge shall be marked with 0.1-foot increments and correlated to NAVD88 elevations.

The contractor shall be responsible for constructing and maintaining any necessary boardwalks associated with the establishment and monitoring of the feldspar horizons. Procedures for the establishment and data collection of vertical accretion from feldspar horizons are discussed in the SOP Manual for CRMS.

The contractor will be required to submit a baseline monitoring report documenting these activities with the data collected from baseline establishment.

Subtask 3.2 Hydrologic Restoration

The project’s hydrologic restoration actions are intended to increase hydrologic exchange and increase sediment deposition on the marsh surface across the project site. A hydrologic data logger shall be securely positioned relative to marsh elevation to determine the frequency and duration of tidal inundation over the marsh area. The data logger shall sample hourly for the duration of the study (four years). The contractor will perform nine servicing events per year, and use his discretion on timing of the service events to address instrument fouling during summer months. Data will be downloaded, and the logger calibrated and maintained following service events.

Average marsh accretion will be assessed annually using feldspar horizons to monitor mineral and organic deposition and will be included in the annual report each year for four years.

Subtask 3.3 Marsh Creation

To ensure establishment of the 14.7 acres of created brackish marsh by the completion of project life, a topographic survey will be conducted immediately post-construction and again at Year 4. The topographic survey immediately following construction completion will be performed as part of the construction contract and is not part of this scope of work.

This scope of work includes a topographic survey that shall be conducted and certified by a Louisiana registered professional land surveyor (PLS) or professional engineer (PE) by the end of Year 4 (2016) to evaluate the created marsh elevations. The contractor shall provide a PLS or PE stamped drawing showing the contours of the topographic survey along with identification of any areas that fall outside the required elevations.

Percent cover of the native vegetation community will be assessed annually for 4 years on the 14.7 acres of marsh creation platform, during the growing season, using the Braun-Blanquet Cover Abundance Scale method. Monitoring plots should be placed so that they can provide an accurate assessment of the success of the overall site. The vegetation community in the 14.7 acres will be assessed in two general sections, one in the southeastern portion of the site and the second in the western portion of the site. A CRMS reference site is located near this area and will be used by the trustees as a comparison for the restoration sites.

Plant communities within restored areas will be inspected annually for the invasive species Chinese tallow (*Triadica sebifera*), and salt cedar (*Tamarix ramosissima*). The woody shrubs Jesuit's bark (*Iva frutescens*), and eastern baccharis (*Baccharis halimifolia*) shall also be noted. Evidence of these woody shrubs indicate that the elevation of this area is greater than desired. Evidence and location of invasive species and woody shrubs shall be clearly documented in the annual report.

Task 4 Reporting

Reporting Requirements - The Contractor will be required to submit an electronic data report "data dump" to the Lead Administrative Trustee (NOAA) within 15 calendar days following the each monitoring event. This report should incorporate raw and corrected data (according to data logger calibration) for provided observations in Microsoft format. Interim reports are intended to inform the trustees of data collection and oversight. There shall not be discussion or lengthy prose in interim reports unless there were issues or problems during the interim period that needs to be recorded for trustee knowledge. Short discussion shall be reserved for annual reports.

Annual reports and the final report shall be submitted electronically to the technical coordinator for the Trustees (Mairi Miller); the technical coordinator will distribute these deliverables to each Trustee. Each monitoring report will describe the monitoring event (including the data collection method(s) performed during that event) and include all data collected. These annual reports should include raw and corrected data (according to data logger calibration) for hourly, daily (average, maximum, and minimum), and weekly (average, maximum, and minimum) observations, simple summary statistics and graphical displays in Microsoft format as well as monthly hydrologic averages, feldspar horizon measures, vegetative cover and invasive species / woody shrub documentation.

The final report should include a complete summary of findings for the four-year study period, with the year 4 report incorporated into the final report. The report shall include all relevant data (such as plant community composition, percent cover, accretion, tidal inundation) as well as figures of the initial and final surveys performed after construction and monitoring [NOAA will provide contractor with electronic copy of post construction survey data), simple statistical analyses (ANOVA, t-test, etc.), associated graphics, and photographic documentation (sample plots and feldspar horizons)]. The Trustee Council will review the report within 15 calendar days following its receipt.

The Trustee Council may disapprove or reject reports that are deficient in content, in whole or in part, with the basis set forth in writing to the Contractor. Within 15 calendar days of receipt of a disapproval/rejection of a report from the Trustee Council, the Contractor will submit a revised report that addresses the identified content deficiencies.

Task 5 Site visits

Procedures for Site Visits – The Contractor will notify the NOAA, as Lead Administrative Trustee, at least 21 calendar days in advance of the date of any planned post-construction site-visit, including for the purpose of conducting monitoring. At least seven (7) days before such date, NOAA shall confirm and advise the Contractor whether any Trustee representative(s) will attend and, if so, the number of representatives who will attend that visit. The Contractor will provide transportation at the Project Site as needed to allow the participating Trustee representatives to accompany the Contractor on the site visit (if necessary one vehicle may be used with multiple trips). The date of the site visit may be changed by agreement of Contractor and NOAA if weather conditions, or other circumstances justify rescheduling

Task 6 Deliverables

1. Project Work Plan
2. Detailed meeting notes
3. Monitoring reports (Interim and Annual)

Year	Report	Specific Information
0	Baseline report (project work plan)	Data logger location Feldspar location(s) Vegetative monitoring plot locations Vegetative reference plot locations Additional information regarding logistics (e.g. need for airboat)
1– 4	interim hydrologic data	9/ year depending on summertime fouling of data sonde Electronic file Tidal gauge data Raw and corrected data
1– 3	Annual report Hydrologic summary report Accretion / Deposition Vegetation Percent cover Invasive species	Total of 4 (year 4 report can be incorporated into final report) Electronic report Averaged weekly and monthly data Maximum weekly and monthly data Minimum weekly and monthly data (raw and corrected data) Feldspar horizons (with photos) Braun-Blanquet method (with

		representative photos)
4	Final report	Complete summary of findings Averaged yearly data Topographic survey* Acreage Elevation

* Topographic survey will be conducted and certified by a Louisiana registered professional land surveyor (PLS) as stated above.

Contacts

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Period of Performance

The Period of Performance for this scope of work is 4 years (January 2012 to December 2016). This period includes time for completion of reports after the conclusion of the fieldwork.

Security Requirements

The C&A requirements of clause CAR 1352.239-73 Security Requirements for Information Technology Resources (October 2006) does not apply, and a Security Accreditation Package is not required.