NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

Third Interim, Partial Claim for Assessment and Restoration Planning Costs

20 April 2010 Deepwater Horizon (MC252) Incident

Time Period: January-December 2014

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Acronym	Definition
ADCP	Acoustic Doppler Current Profilers
AR	Administrative Record
AVIRIS	Airborne Visible/Infrared Imaging Spectrometer
BFT	Atlantic bluefin tuna
BIA	Bureau of Indian Affairs
BLM	Bureau of Land Management
BP	British Exploration and Production, Inc.
BSE	Bays, sounds, and estuaries
BTEX	Benzene, toluene, ethylbenzene, and xylenes
CPUE	Catch per unit effort
CTD	Conductivity/temperature/depth
CY	Calendar year
DAVPR	Digital-automatic Video Plankton Recorder
DISL	Dauphin Island Sea Lab
DOD	U.S. Department of Defense
DOI	U.S. Department of the Interior
DOSS	Dioctyl sodium sulfosuccinate
DWH	Deepwater Horizon
DWHOS	Deepwater Horizon oil spill
ECM	Electronic Content Management
ECMS	Electronic Content Management System
EDDs	Electronic data deliverables
EEZ	Exclusive economic zone

Acronym	Definition
EFH	Essential Fish Habitat
EIS	Environmental Impact Statement
EPA	Environmental Protection Agency
ESA	Endangered Species Act
FAU	Florida Atlantic University
FISMA	Federal Information Security Management Act
FTE	Full time equivalent
FY	Fiscal year
GCRL	Gulf Coast Research Laboratory
GOM	Gulf of Mexico
HSMRT	High Speed Midwater Rope Trawl
IEc	Industrial Economics, Incorporated
ISIIS	In Situ Ichthyoplankton Imaging System
KSA	Knox Storage Archive
LDWF	Louisiana Department of Wildlife and Fisheries
LIDAR	Light Detection and Ranging
MARU	Marine Autonomous Recording Units
MC	Mississippi Canyon
MC252	Deepwater Horizon/Mississippi Canyon 252
MMPA	Marine Mammal Protection Act
MMSN	Marine Mammal Stranding Network
MOCNESS	Multiple Opening/Closing Net and Environmental Sensing System
MODIS	Moderate Resolution Imaging Spectrometer
MSA	*Magnuson-Stevens* Fishery Conservation and Management Act
NCCOS	National Centers for Coastal Ocean Science

Acronym	Definition
NEPA	National Environmental Policy Act
NFWF	National Fish and Wildlife Foundation
NHPA	National Historic Preservation Act of 1966
NMFS	National Marine Fisheries Service
NMSA	National Marine Sanctuaries Act
NOAA	National Oceanic and Atmospheric Administration
Notice	Notice of Intent to Conduct Restoration Planning
NPFC	National Pollution Funds Center
NPS	National Park Service
NRDA	Natural Resource Damage Assessment
NSU	Nova Southeastern University
NWFSC	Northwest Fisheries Science Center
OLE	Office of Law Enforcement
OPA	Oil Pollution Act
OPR	Office of Protected Resources
PAH	Polycyclic aromatic hydrocarbon
PAWNNS	Plan for Adaptive Water Column NOAA-NRDA Sampling
PEIS	Programmatic Environmental Impact Statement
PI	Principal investigator
POPs	Persistent organochlorine pollutants
PRP	Programmatic Restoration Plan
QA/QC	Quality Assurance/Quality Control
QC	Quality Control
RBC	Red blood cell
ROV	Remotely operated vehicle

Acronym	Definition
RPs	Responsible Parties
RTK	Real time kinematic
RV	Research vessel
SAR	Synthetic Aperture Radar
SAV	Submerged aquatic vegetation
SCAT	Shoreline Cleanup Assessment Technique
SDI	Swartz's Dominance Index
SEAMAP	Southeast Area Monitoring and Assessment Program
SEFSC	Southeast Fisheries Science Center
SIMAP	Spill Impact Model Application Package
SIPPER	Shadowed Image Particle Profiling Image Evaluation Recorder
SOPs	Standard operating procedures
SPMD	Semipermeable Membrane Device
STSSN	Sea Turtle Stranding and Salvage Network
SWAN	Simulating WAves Nearshore
TEH	Total extractable hydrocarbons
TWG	Technical Working Group
UF	University of Florida
UME	Unusual mortality event
USDA	U.S. Department of Agriculture
USFWS	United States Fish and Wildlife Service
USM	University of Southern Mississippi
VIMS	Virginia Institute of Marine Science
VPRII	Video Plankton Recorder II
WAFs	Water accommodated fractions

Acronym	Definition
WBC	White blood cell

EXECUTIVE SUMMARY

On April 20, 2010, an explosion and fire on the Deepwater Horizon mobile offshore drilling unit resulted in 11 worker fatalities and discharges of oil and other substances from the rig and seabed wellhead into the Gulf of Mexico. Pursuant to section 1006 of the Oil Pollution Act ("OPA"), 33 U.S.C. §§ 2701, et seq., federal, state, and federally recognized tribes are Trustees for natural resources and are authorized to act on behalf of the public to: (1) assess natural resource injuries resulting from a discharge of oil or the substantial threat of a discharge and response activities and; (2) develop and implement a plan for restoration of such injured resources.

Immediately following the Deepwater Horizon/Mississippi Canyon 252 ("MC252") Oil Spill, the affected Trustees initiated joint efforts to begin the collection and analysis of: (1) data reasonably expected to be necessary to make a determination of jurisdiction or a determination to conduct restoration planning; (2) ephemeral data; and (3) information needed to design or implement anticipated emergency restoration and assessment activities as part of the Restoration Planning Phase. In addition, pursuant to Natural Resource Damage Assessment (NRDA) regulations (15 CFR § 990.14), one of the identified Responsible Parties, BP Exploration and Production, Inc. "BP", informed the Trustees of its intent to participate in the NRDA. As a result, the Trustees provided opportunities for BP to comment on Trustee-developed assessment plans and to participate in field work when the Trustees and BP reached a mutual agreement. As a condition of participation, BP is required to fund the joint plans. In this Claim, the *Deepwater Horizon*/MC252 Oil Spill is referred to as "Oil Spill" or "Incident" which may include, as applicable, all Incident(s) related to the events of the explosion, fire and subsequent discharges of oil and other substances from the rig and wellhead on the seabed into the Gulf of Mexico.

Pursuant to the NRDA regulations applicable to OPA, 15 C.F.R. Part 990 ("NRDA regulations"), the Trustees issued a Notice of Intent to Conduct Restoration Planning ("Notice"). That Notice confirmed the Trustees were ready to proceed with restoration planning to fully evaluate, assess, and quantify and develop plans for restoring, replacing or acquiring the equivalent of natural resources and their services injured by and losses resulting from the Incident. The restoration planning process will include collection of information that the Trustees determine is appropriate for identifying and quantifying natural resource injuries and associated losses of resources and their services, and determination of the need for, and type and scale of restoration actions.

This Claim document identifies assessment and restoration planning activities, including studies, that the U.S. Department of Commerce, National Oceanic and Atmospheric Administration (NOAA) plans to implement in 2014 to inform injury determination, injury quantification, and restoration selection activities associated with the Incident. The collection of activities identified in this Claim reflect consideration of the factors identified in 15 C.F.R. §990.27 (use of assessment procedures), §990.51 (injury determination) and §990.52 (injury quantification). The assessment activities also reflect consideration of data and analyses conducted during the pre-assessment phase of the NRDA. Restoration planning activities identified reflect consideration of the factors identified in 15 C.F.R. §990.53 (developing restoration alternatives), §990.54 (evaluation of alternatives), and §990.55 (developing restoration plans). NOAA also will be evaluating injury assessment and restoration planning and

implementation records for inclusion into Administrative Record(s) (§990.61). Scientific information to support injury determination and quantification, although incomplete, is sufficient for the Trustees to proceed with restoration planning. NOAA assessment and restoration planning activities in this Claim are a subset of the NRDA activities conducted by all Trustees. NOAA activities in this Claim focus on affected natural resources that NOAA directly manages – including coastal habitats, fisheries, marine mammals and sea turtles, endangered and threatened marine species, and resources associated with National Estuarine Research Reserves and National Marine Sanctuaries. NOAA reserves its ability to supplement the assessment and restoration planning procedures identified herein.

This Claim covers NOAA's assessment and restoration planning activities and estimated costs for 2014 that are unique from activities already paid for by BP or the U.S. Coast Guard. The document is organized to provide a description of NOAA's proposed activities and associated expenditures by resource category or major topic area. NOAA combined labor costs of all scientists and attorneys required to prepare a comprehensive injury assessment and continue region-wide restoration planning. NOAA requests a total of $147,902,421 to complete NRDA activities during the budgeted period. Although different labor rates and total hours were estimated for a variety of NOAA personnel, the total cost is used to cover expenses for more than 100 administrative support specialists, scientists, restoration specialists, attorneys, and program managers working on the NRDA. A contract and agency sub-total is provided in each section of the Claim to clearly indicate the amount money needed for a particular study or activity. In total, NOAA requests $23,412,129 for agency support and $124,490,292 for contract support to complete NRDA procedures outlined in this Claim (Tables 1 and 2). NOAA is not requesting contingency funding for any of the activities.

NOAA and co-Trustees also are examining human use patterns in the region affected by the Incident, and how the oil is affecting recreational activities or use of the Gulf of Mexico. The Trustees are surveying for potential direct, lost human-uses related to this oil spill, including effects to outdoor recreation. NOAA submitted separate claims for assessment costs on November 9, 2011, May 4, 2012, and July 27, 2012 to the RPs to address these activities. The requested funds for procedures in this Claim are additional to monies provided by the NPFC in summer 2012 for Claim #N10036-OC08. On July 5, 2012, The NPFC provided $19.4M in a partial adjudication of NOAA's Interim Claim submitted on March 23, 2012. About three weeks later on July 27, 2012, the NPFC adjudicated the remaining portion of NOAA's first Interim Claim for assessment and restoration planning. The NPFC provided $103.1M to NOAA in 2012 for all procedures that were originally scheduled for April-December 2012.

In total, NOAA requests a sum certain of $147,902,421 for injury assessment and restoration planning activities specified in this third Interim Claim for Assessment and Restoration Planning.

Table 1. Summary of contract costs and labor effort by injury and restoration procedure.

Activity/Procedure	Total Contract Costs	Contract Equivalents
Soft Bottom Sediment	$6,950,836	22.2
Hard Ground Corals	$595,013	1.6
Mesophotic Reefs	$5,884,710	6.8
Benthic Megafauna	$1,134,409	3.6
Bluefin Tuna Spawning Habitat Analyses	$692,085	2.6
Oil Fate Modeling and Comparisons with Observational Data	$2,975,364	7.0
Hydrodynamic Modeling	$1,414,703	3.4
Exposure and Injury Modeling and Data Inputs	$1,653,583	3.9
Evaluation of Historical Biological Data and Analysis of Field Data from 2010-2011	$2,655,454	9.7
Documentation of Oil Pathway, Water Column Organisms Exposed and Injured	$1,458,851	3.5
Sargassum Communities, Mapping and Injury Assessment	$991,010	3.4
Sea Turtle Exposure and Injury Assessment Report	$1,096,604	2.8
Strandings: Necropsies, and Management, Transport and Storage of Sea Turtles and Marine Mammals	$2,722,782	5.6
Estuarine Dolphins	$4,954,949	17.4
Coastal/Shelf Dolphins	$254,002	0.7
Coastal and Estuarine Cetacean Strandings	$5,444,345	7.3
Oceanic Marine Mammals	$363,579	0.9
Inhalation	$439,267	1.1
Assessing Recovery of Coastal Wetlands	$2,156,617	6.3
Completing Analysis of Coastal Wetland Injury	$152,601	0.4
Completing Analysis of Coastal Wetland Erosion	$902,850	4.2
Characterizing Nearshore Sediment Contamination	$726,916	2.9
Characterizing Nearshore Biota Contamination	$323,565	1.3
Completing Analysis of Nearshore Benthic Injury	$330,969	0.9
Supplemental Collection and Analysis of Nearshore Sediment Data	$5,031,357	15.5
Integrate and Interpret Findings Regarding Nearshore Exposure and Injury and Prepare Reports	$2,361,607	6.5
Continued Monitoring of Subtidal Oyster Injury (Abundance and Biomass)	$3,514,114	9.7
Continued Monitoring of Subtidal Oyster Injury (Recruitment)	$7,493,605	23.6
Continued Monitoring and Analysis of Nearshore Oyster Injury	$5,551,672	18.2
Comprehensive Integration of Oyster Injury Assessment Elements	$5,098,406	14.3
Restoration Planning Activities	$12,157,836	23.0
Toxicity to Aquatic Organisms	$8,196,986	27.9

Activity/Procedure	Total Contract Costs	Contract Equivalents
Contaminant Analytical Chemistry	$14,069,500	16.6
Storage and Long Term Archive of Samples	$3,668,409	1.9
Data Management: Infrastructure	$2,811,524	9.6
Data Management: Documentation	$977,948	3.8
Injury Assessment and Legal Case Management	$4,381,584	17.8
Deepwater Horizon (DWH) Electronic Content Management (ECM) and Oil Pollution Act (OPA) Administrative Record (AR) Management System	$2,900,680	9.5
Grand Total	$124,490,292	317.3

Table 2. Summary of agency labor effort by injury and restoration procedure

Activity/Procedure	Agency Labor Equivalents
Soft Bottom Sediment	1.1
Hard Ground Corals	0.4
Mesophotic Reefs	5.4
Benthic Megafauna	1.0
Bluefin Tuna Spawning Habitat Analyses	1.3
Oil Fate Modeling and Comparisons with Observational Data	1.8
Hydrodynamic Modeling	1.2
Exposure and Injury Modeling and Data Inputs	1.5
Evaluation of Historical Biological Data and Analysis of Field Data from 2010-2011	1.2
Documentation of Oil Pathway, Water Column Organisms Exposed and Injured	1.7
Sargassum Communities, Mapping and Injury Assessment	0.5
Sea Turtle Exposure and Injury Assessment Report	1.4
Strandings: Necropsies, and Management, Transport and Storage of Sea Turtles and Marine Mammals	0.4
Estuarine Dolphins	4.9
Coastal/Shelf Dolphins	0.4
Coastal and Estuarine Cetacean Strandings	2.0
Oceanic Marine Mammals	0.5
Inhalation	0.5
Assessing Recovery of Coastal Wetlands	1.1
Completing Analysis of Coastal Wetland Injury	0.0
Completing Analysis of Coastal Wetland Erosion	0.2
Characterizing Nearshore Sediment Contamination	0.1
Characterizing Nearshore Biota Contamination	0.0
Completing Analysis of Nearshore Benthic injury	0.1
Supplemental Collection and Analysis of Nearshore Sediment Data	0.3
Integrate and Interpret Findings Regarding Nearshore Exposure and Injury and Prepare Reports	1.5
Continued Monitoring of Subtidal Oyster Injury (Abundance and Biomass)	0.2
Continued Monitoring of Subtidal Oyster Injury (Recruitment)	0.5
Continued Monitoring and Analysis of Nearshore Oyster Injury	0.3
Comprehensive Integration of Oyster Injury Assessment Elements	1.1
Restoration Planning Activities	20.1
Toxicity to Aquatic Organisms	2.8
Contaminant Analytical Chemistry	0.5

Activity/Procedure	Agency Labor Equivalents
Storage and Long Term Archive of Samples	0.0
Data Management: Infrastructure	1.6
Data Management: Documentation	0.5
Injury Assessment and Legal Case Management	10.2
Deepwater Horizon (DWH) Electronic Content Management (ECM) and Oil Pollution Act (OPA) Administrative Record (AR) Management System	3.0
Grand Total	71.4

Claimant eligibility and coordination with co-Trustees

The following entities are designated natural resource Trustees under OPA and are acting as Trustees for this Incident:

- the National Oceanic and Atmospheric Administration ("NOAA"), on behalf of the U.S. Department of Commerce;
- the U.S. DOI, as represented by the National Park Service ("NPS"), United States Fish and Wildlife Service ("USFWS"), Bureau of Indian Affairs ("BIA"), and Bureau of Land Management ("BLM");
- the Environmental Protection Agency (EPA);
- the U.S. Department of Agriculture (USDA);
- the U.S. Department of Defense ("DOD");
- the State of Louisiana's Coastal Protection and Restoration Authority, Oil Spill Coordinator's Office, Department of Environmental Quality, Department of Wildlife and Fisheries and Department of Natural Resources;
- the State of Mississippi's Department of Environmental Quality;
- the State of Alabama's Department of Conservation and Natural Resources and Geological Survey of Alabama;
- the State of Florida's Department of Environmental Protection; and Florida Fish and Wildlife Conservation Commission; and
- the State of Texas' Parks and Wildlife Department, General Land Office, and Commission on Environmental Quality.

In addition to acting as Trustees for this Incident under OPA, the States of Louisiana, Mississippi, Alabama, Florida and Texas are also acting pursuant to their applicable state laws and authorities, including the Louisiana Oil Spill Prevention and Response Act of 1991, La. R.S. 30:2451 et seq., and accompanying regulations, La. Admin. Code 43: 10 1 et seq.; the Texas Oil Spill Prevention and Response Act, Tex. Nat. Res. Code, Chapter 40, Section 376.011 et seq., Fla. Statutes, and Section 403.161, Fla. Statutes; the Mississippi Air and Water Pollution Control Law, Miss. Code Ann. § § 49-17-1 through 49-17-43; and Alabama Code § § 9-2-1 et seq. and 9-4-1 et seq.

Several technical working groups (TWGs) are led by the Trustees to guide and coordinate data collection and analysis for the NRDA. As appropriate, these TWGs coordinate with and consider input from BP on joint plans. All of the procedures identified in this document are planned to be implemented by NOAA personnel, and were developed in coordination with co-Trustees, including extensive review in the

appropriate TWGs. Proposed assessment work in deepwater communities are planned to be implemented by NOAA and DOI scientists. Expenses incurred in the following Claim categories may occur from NOAA or DOI personnel:

- Deep sea soft bottom sediments
- Deep sea hard ground corals
- Mesophotic reefs
- Benthic megafauna

Funds received by NOAA previously from BP have not been applied to any of the proposed activities in this Claim.

Responsible Party information

The Responsible Parties ("RPs") identified for this Incident thus far are BP Exploration and Production, Inc. ("BP"); Transocean Holdings Inc. ("Transocean"); Triton Asset Leasing GmbH ("Triton"); Transocean Offshore Deepwater Drilling Inc. ("Transocean Offshore"); Transocean Deepwater Inc. ("Transocean Deepwater"); Anadarko Petroleum ("Anadarko"); Anadarko E&P Company LP ("Anadarko E&P"); and MOEX Offshore 2007 LLC ("MOEX"). Pursuant to 15 CFR § 990.14(c), concurrent with the publication of the Notice to Conduct Restoration Planning, the Trustees invited the RPs identified above to participate in an NRDA. The Trustees have coordinated with BP, the only RP who accepted this invitation to actively participate in the NRDA process. When the term "Responsible Party" or "RP" (in the singular form) is used in the remainder of this document, it refers to BP.

Determination of jurisdiction

For reasons identified in the Notice of Intent to Conduct Restoration Planning for this Incident, the Trustees determined they have jurisdiction to pursue restoration under OPA. 75 Fed. Reg. 60800 (Oct. 1, 2010).

Time limitations on claims

This Claim for funding of reasonably necessary assessment and restoration planning procedures to inform Incident- specific injury determination and quantification analyses is presented in writing to the Director, National Pollution Funds Center (NPFC) within time limits specified in 33 C.F.R. §136. 101. The NRDA for this Incident is not complete.

Legal action

On December 15, 2010, the United States filed its complaint against the RPs in the Eastern District of Louisiana (Civil Case no.2:10-cv-04536). At this time, the trial schedule does not include natural resource damages quantification in the first two phases of litigation.

Claim presentation

This Interim, Partial Claim for Assessment and Restoration Planning Costs has been presented for a sum certain, in accordance with OPA to all of the identified RPs by letters dated July 11, 2013.

ASSESSMENT: OVERVIEW OF APPROACH

OPA regulations provide that NRDA procedures be tailored to the circumstances of the Incident and the information needed to determine appropriate restoration. With respect to standards for assessment procedures, the regulations provide that (15 CFR § 990.27(a)):

> (1) The procedure(s) must be capable of providing assessment information of use in determining the type and scale of restoration appropriate for a particular injury;
>
> (2) The additional cost of a more complex procedure must be reasonably related to the expected increase in the quantity and/or quality of relevant information provided by the more complex procedure; and
>
> (3) The procedure must be reliable and valid for the particular Incident.

OPA regulations identify several categories of assessment procedures available to Trustees, including but not limited to: procedures conducted in the field or laboratory; model-based procedures; and/or literature-based procedures (15 CFR § 990.27(b)). If a range of assessment procedures providing the same type and quality of information is available, the most cost- effective procedure must be used (15 CFR § 990.27(c)). Finally, assessment procedures must contribute to injury determination (i.e., by establishing the spatial and temporal magnitude of exposure to oil, the pathway(s) of exposure, and/or the presence of injury, as described in 15 CFR § 990.51) and/or injury quantification (i.e., quantifying the degree, spatial and temporal extent of injury to natural resources and the associated reduction in services caused by the injury, as described in 15 CFR § 990.52).

The goal of NOAA's assessment is to create a holistic view of the effects to the Gulf of Mexico ecosystem from the discharged oil. Immediately following the Incident, NOAA evaluated the resources at risk in the affected area and developed injury assessment hypotheses and conceptual models to guide field investigations. NOAA then developed work plans to document the pathway and exposure of discharged oil to resources and services that may have been affected by the Incident. Finally, NOAA and co-Trustees designed and implemented studies to evaluate the severity and extent of injuries to resources and services from discharged oil and to evaluate alternative hypotheses for potential injuries. As of July 11, 2013, NOAA completed or is participating in more than 125 NRDA investigations in all resource categories except birds and terrestrial mammals.

Many ongoing and proposed activities in 2014 involve the collection and analysis of field data needed to inform estimates of the magnitude of injury and associated reductions in services. Models and literature-based methods also are used in selected investigations. The scale and cost of each proposed activity was carefully considered with co-Trustees, and represents a balance between the need for cost-effective assessment efforts and the unprecedented geographic scale and complexity of this oil spill. Table 3 outlines planned laboratory analyses for 2014.

NOAA determined that the assessment procedures identified in this document meet the requirements set forth in the OPA regulations, and are integrated with and not duplicative of co-Trustee NRDA data collection and analysis activities. Modifications to the identified assessment procedures may be made

because of the participation of BP in the NRDA pursuant to 15 CFR § 990.14. A description of each assessment activity's purpose and related implementation information is provided in subsequent sections of this document, and in some cases, in the related work plans. Additional budget detail or information about the proposed activities can be provided upon request.

NOAA regularly posts final NRDA work plans and study-related data on the Internet. For the official record of Trustee NRDA investigations, visit the Deepwater Horizon Oil Spill NRDA Administrative Record. As of July 11, 2013, the site contains links to more than 125 NRDA work plans. Many of these work plans provide detailed technical methods and implementation information, and are incorporated by reference into this Claim.

NRDA work plans and study-related data
http://www.gulfspillrestoration.noaa.gov/oil-spill/gulf-spill-data/

NRDA Administrative Record
http://www.doi.gov/deepwaterhorizon/adminrecord/index.cfm

A list of all signed work plans related to this claim is presented in Table A-1, which lists the title and date each work plan was signed, as well as the general objectives of the plans. Almost all of these assessment work plans were focused intentionally on the data collection phase after the Incident. Therefore, the assessment plans do not address Trustee activities focused on data compilation, synthesis, analysis, interpretation, reporting, and restoration planning. Many of our activities in this Claim are focused on the analysis and interpretation of scientific data necessary to quantify injuries from the Incident, complete NRDA analyses, and plan for restoration.

Overview of How NOAA Estimated Assessment Costs for Each Activity

NOAA is planning to complete many NRDA assessment analyses by the end of 2014 (including injury quantification and draft technical and interpretive reporting). Therefore, our Claim is largely based on the amount of technical effort required to develop our interpretation of injuries to natural resources and services from the Incident and conduct region-wide restoration planning with the co-Trustees. For each activity, we first estimated the number of agency staff and contractor labor hours and any direct contract or agency costs that were necessary to complete all appropriate NRDA tasks. Data management, scientific documentation, and legal review of analyses and technical deliverables are included as part of each activity's cost. We used agency and contract equivalents to simply portray the extent of our labor effort in each category.

We then compared each activity's projected level of effort and cost against the expected amount of co-Trustee and RP coordination, laboratory and other data analysis schedules, and the number of anticipated deliverables, including finalization of large environmental and chemical datasets. The types of deliverables and laboratory/sample analyses are described in more detail below. Our internal analysis of cost projections was extensive and involved agency technical experts and managers in each resource area.

Where appropriate in this Claim, we noted that some of the assessment subtasks, injury quantification activities, and Trustee review of data and interpretive reports may extend into 2015.

The types of deliverables described in this Claim are diverse:

- Datasets/databases – Datasets/databases include laboratory-based chemistry analyses, other biological laboratory analyses, field observation and measurement data, models and model outputs, and maps of observations in two and three dimensions. They include electronic data deliverables (EDDs) from laboratories, third-party validated or TWG-validated data, and final spatial data layers housed on Trustee data management systems.

- Work plans – Work plans have been developed for each major sampling effort. Final, signed work plans are redacted as appropriate and posted to NOAA's Gulf Spill Restoration web site (http://www.gulfspillrestoration.noaa.gov/) and other relevant locations.

- Data reports – Data reports and data summaries present relevant data and sometimes include descriptive statistics, basic analyses, or study methods. They typically present data in tabular format and may also include figures and maps.

- Interpretive reports – Interpretive reports are authored by senior technical experts and provide extensive interpretation of study results across studies and even across Technical Working Groups (TWGs). Quantification of injured resources and services is included and the technical basis for our interpretation is described using all relevant data about the release scenario, pathway of oil, exposure of resources to oil, and measureable injuries documented from discharged oil.

The third and final step in our process involved checking to make sure that 2014 costs were not duplicative of previous funding received in 2011 and 2013 from BP and 2012 by the NPFC. All of NOAA's costs in this Claim are for assessment analyses, restoration planning, and interpretive activities that are not accounted for in previous funding requests to BP and the NPFC.

We structured this Claim to present to the National Pollution Funds Center after 90 days if the Responsible Party(s) declines to pay NOAA's assessment and restoration planning costs. The repetitive style of the document helps ensure that critical information for each activity is considered.

Table 3. 2014 costs in labor[1] and/or dollars for analytical and non-analytical samples or analyses

2014 Claim Activity	2014 Sample or Analysis Type	2014 Number of Samples or Amount of Analysis	2014 Principal Investigators and Laboratories	Portion of 2014 Total Activity Cost Related to Sample Analyses	Number of Samples or Analyses Estimated Completed with 2013 Funds by December 31, 2013
Activity A: Soft Bottom Sediment	Macrofauna Meiofauna	240 (total)	TAMU/Montagna UNR/Baguley	10 Contract Equiv. ($1.6M) 5.3 Contract Equiv. ($1.4M) (Contaminant chemistry costs included below under Activity N)	65 cores collected as part of the response 870 cores collected during the NRDA cruises conducted on the Sarah Bordelon and Holiday Chouest
Activity A: Mesophotic Reefs	Analysis of video transects and photos	Analysis of photos and video from 2014 cruise for fish abundance and coral health, as well as continued analysis of baseline photos and video for comparisons	Sulak (USGS) / Etnoyer (NOAA) / MacDonald (FSU)	NOAA, Other Agency Labs 3.7 FTE[2] ($959K) Contract Labs 1.2 Contract Equiv. ($335K)	Evaluation of coral health and enumeration of fish from videos taken post-spill, and to some extent prior to the spill, will be completed by the end of 2013.

[1] Personnel equivalents are based on the assumption of 2080 hours per year and are only specified to provide an understanding of the magnitude of labor associated with the total costs.

[2] FTE = Full Time Equivalent

2014 Claim Activity	2014 Sample or Analysis Type	2014 Number of Samples or Amount of Analysis	2014 Principal Investigators and Laboratories	Portion of 2014 Total Activity Cost Related to Sample Analyses	Number of Samples or Analyses Estimated Completed with 2013 Funds by December 31, 2013
Activity A: Benthic Megafauna (Red Crab)	Assessment of egg health and tissue hydrocarbon analysis	Red crab tissue samples; red crab egg samples; number of samples is expected to be equivalent to the number of samples collected during the 2011 cruise	Foy (NOAA)	0.3 Contract Equiv. ($75K) (Contaminant chemistry costs included below under Activity N)	All evaluations of exposure to oil, reproductive health, and histological condition of red crabs collected in 2011 have been completed.
Activity D: Evaluation of Historical Biological Data and Analysis of Field Data from 2010 and 2011	Nekton processing and interpretation	~828 samples	Nova/Sutton	7.1 Contract Equiv. ($1.7M)	~828 samples (approximately half of the total collected)
Activity E: Sargassum Communities	Sargassum mapping using satellite images	Remote sensing data 2000-2011 (excluding 2010)	USF/Hu, Feng	1.0 Contract Equiv. ($162K)	Mapping of Sargassum in 2010 to be completed by December 2013. The 2014 activities will focus on mapping Sargassum in 2000-2009 and in 2011.
Activity E: Sargassum Communities	Neuston and bongo net sample analysis (from 2011 cruise)	160 samples [some portion of these have already been analyzed]	GCRL/Hernandez, Franks	0.5 Contract Equiv. ($121K)	Approximately 110 samples expected to be analyzed in 2013. Remaining samples are to be completed in 2014.

2014 Claim Activity	2014 Sample or Analysis Type	2014 Number of Samples or Amount of Analysis	2014 Principal Investigators and Laboratories	Portion of 2014 Total Activity Cost Related to Sample Analyses	Number of Samples or Analyses Estimated Completed with 2013 Funds by December 31, 2013
Activity F: Sea Turtle and Marine Mammal Strandings	Samples from dead, live captured, stranded turtles	Estimate approximately 400 animals stranded in 2014.	U. Florida/Stacy, TBD	NOAA, Other Agency Labs 1.1 FTE ($132K) Contract ($446K) (includes freezer storage and grant for veterinarian)	0 (funding in 2013 was only requested for transport and storage)
Activity G: Estuarine dolphins	Health assessments-Standard diagnostics, functional immunology, contaminant analysis, serology, toxicogenomics, stable isotopes, blubber hormone analysis, dental assessment, photo analysis, ultrasound	500 samples	SWFSC/Schwacke, Rowles	NOAA Labs 0.3 FTE Blubber hormone analysis ($10K), contaminant analysis ($90K), toxicogenomics ($69K) Contract Labs 3.0 Contract Equiv. Standard diagnostics ($63K), serology ($3K), toxicogenomics ($112K), blubber hormone analysis ($64K), functional immunology ($120K), stable isotopes ($31K); dental assessment ($46K), photo analysis ($180K), toxicogenomics ($112K), ultrasound ($213K)	2013 health assessments are currently underway; field work will be completed in August 2013. Samples from Sarasota capture are currently being analyzed. These are subsequent assessments following the results of 2011 assessments. 2013 health assessments will include both "known" animals from 2011 as well as new animals from Barataria and Mississippi Sound. Data from 2011 health assessment (including lab samples) are all complete, except for blubber chemistry (now awaiting Query Manager entry). 2014 health assessments are proposed, but exact locations not determined, as they will depend on 2013 findings are. No remote biopsies (i.e., no additional blubber samples) are proposed for 2014.

2014 Claim Activity	2014 Sample or Analysis Type	2014 Number of Samples or Amount of Analysis	2014 Principal Investigators and Laboratories	Portion of 2014 Total Activity Cost Related to Sample Analyses	Number of Samples or Analyses Estimated Completed with 2013 Funds by December 31, 2013
Activity G: Estuarine Dolphins	Genetic analyses – DNA extraction, sequencing and genotyping	60 tissue samples plus 450 strandings samples	Wilcox, Hutchison, Rosel	NOAA, Other Agency Labs 0.5 FTE ($149K) Contract Labs 0.9 FTE ($96K)	This activity continues to determine species and population relatedness from strandings and new health assessment animals in 2013 (analysis underway). All previous NRDA samples (remote biopsy and health assessments through 2011) are complete.
Activity G: Coastal and Estuarine Cetacean Strandings	Stranding samples from the northern Gulf	Variable	NWFSC, OPR, NIST, NOS Biotoxins Lab and Life History Lab / Rowles, Fourgeres, Litz, and Garrison	NOAA Labs Direct costs only - Brucella serology ($3K), biotoxin analyses and teeth analyses ($50K), freezer ($20K), supplies ($15K), sample archival ($198K) Contract and non-NOAA Agency Labs Direct costs only - PAH and POP analyses ($153K), microbiological cultures ($8K), biotoxin analyses and teeth analyses ($152K), morbillivirius PCR ($24K), histo tissue ($22K), sample archival ($18K), histo and diagnostics ($157K)	Histopath: Slides: 510 slides Brucella PCR: 460 tissue samples Brucella sequencing: 70 tissue samples There are a total of 200 animals being evaluated for histopathology (whole case). Stable Isotope: 600 samples (initially envisioned as samples from marine mammals – biopsies and strandings tissue – but some may end up being fish). Samples continue to be collected from stranded samples as they come in, so exact numbers are difficult to predict. PAHs are not routinely measured, but any animal with suspected oiling is sampled for fingerprinting. Sampling and analysis needs to follow the investigation as more is learned; it is possible that additional analyses will be needed.

2014 Claim Activity	2014 Sample or Analysis Type	2014 Number of Samples or Amount of Analysis	2014 Principal Investigators and Laboratories	Portion of 2014 Total Activity Cost Related to Sample Analyses	Number of Samples or Analyses Estimated Completed with 2013 Funds by December 31, 2013
Activity G: Coastal and Estuarine Cetacean Strandings	Stranding samples from West Florida and Texas	Variable; equivalent to number of strandings from previous years	SEFSC / Rowles, Fourgeres, Litz, and Garrison	NOAA Labs Direct costs only - Brucella serology ($6K), sample archiving ($85K) Contract Labs 2.0 Contract Equiv. Epidemiological analyses ($26K), morbillivirus PCR ($15K), histo tissue ($14K), microbiological cultures ($7K), PAH and POP chemical analyses ($90K), biotoxin analyses ($112K), labor ($179K), histo and diagnostics ($86K), sample archiving ($6K)	N/A; This activity is based on number of strandings from previous years.
Activity H: Assessing recovery of coastal wetlands	Belowground biomass cores and aboveground vegetative clips from 2013 collection in Mississippi	~57 cores ~57 clips	WAR/Hester and Willis	0.5 Contract Equiv. ($101K)	Processing of the CWV 2013 Louisiana samples will have begun on all 240 cores and 183 clips by the end of 2013. Processing can require several months and is expected to be ~75% complete by the end of 2013. Processing of the Louisiana samples will be completed using 2013 funds.

2014 Claim Activity	2014 Sample or Analysis Type	2014 Number of Samples or Amount of Analysis	2014 Principal Investigators and Laboratories	Portion of 2014 Total Activity Cost Related to Sample Analyses	Number of Samples or Analyses Estimated Completed with 2013 Funds by December 31, 2013
Activity H: Assessing recovery of coastal wetlands	Nutrient and physical analysis cores from 2013 collection in Mississippi	~114 nutrient cores ~114 physical cores	AEL/Hester and Willis	0.6 Contract Equiv. ($114K)	Processing of the CWV 2013 Louisiana samples will have begun on all 446 nutrient cores and 446 physical cores by the end of 2013. Processing can require several months and is expected to be ~75% complete by the end of 2013. Processing of the Louisiana samples will be completed using 2013 funds.
Activity K: Completing analysis of subtidal oyster injury [abundance & biomass]	Oyster abundance/biomass metrics	600 oyster quadrats	DISL/Powers	0.4 Contract Equiv. ($37K)	600 quadrats collected in 2013
Activity K: Completing analysis of subtidal oyster injury [recruitment]	Settlement plates (live/dead spat)	1,064 sets of plates (532 in Spring, 532 in Fall)	DISL/Powers	1.0 Contract Equiv. ($172K) (including freezer storage)	532 sets of settlement plates collected in 2013
Activity K: Completing analysis of subtidal oyster injury [recruitment]	Gonadal index	730 samples (365 in Spring, 365 in Fall)	DISL/Powers	1.1 Contract Equiv. ($101K)	365 gonadal index samples collected in 2013

2014 Claim Activity	2014 Sample or Analysis Type	2014 Number of Samples or Amount of Analysis	2014 Principal Investigators and Laboratories	Portion of 2014 Total Activity Cost Related to Sample Analyses	Number of Samples or Analyses Estimated Completed with 2013 Funds by December 31, 2013
Activity K: Continued monitoring and analysis of nearshore oyster injury	Oyster abundance/biomass metrics	266 stations / 1,596 oyster quadrats	DISL/Powers	2.2 Contract Equiv. ($256K) (including freezer storage)	1,596 quadrats collected in 2013
Activity N: Contaminant Chemistry	Nearshore sampling (BP currently drafting a work plan, field collections likely late 2013)	1,600 sediment samples	Ian Zelo; Alpha Analytical Laboratory	Direct costs only PAHs and associated analyses ($1.8M)	N/A
Activity N: Contaminant Chemistry	Deep Benthic 2014 collections	2,000 sediment and tissue samples (1,700 red crab cruise; 250 soft bottom cruise; 50 mesophotic cruise)	Topher Lewis; Alpha Analytical Laboratory	Direct costs only PAHs and associated analyses ($2.2M)	N/A
Activity N: Contaminant Chemistry	Stranded oil and other matrices needing analysis after storms, etc.	Variable; estimating 700 samples	Greg Baker; Alpha Analytical Laboratory	Direct costs only PAHs and associated analyses ($800K)	N/A
Activity N: Contaminant Chemistry	Sediment cores collected by David Hollander	500 sediment samples	David Hollander; Alpha Analytical Laboratory	Direct costs only PAHs and associated analyses ($600K)	

2014 Claim Activity	2014 Sample or Analysis Type	2014 Number of Samples or Amount of Analysis	2014 Principal Investigators and Laboratories	Portion of 2014 Total Activity Cost Related to Sample Analyses	Number of Samples or Analyses Estimated Completed with 2013 Funds by December 31, 2013
Activity N: Contaminant Chemistry	Additional analyses of existing samples at chemistry labs	Variable; estimating 3,000	Several TWGs; Alpha Analytical Laboratory, ALS-Kelso, TDI-Brooks	Direct costs only DOSS, PAHs, Biomarkers, and associated analyses ($3.2M)	None. This assumes that as assessment data compilation and processing proceeds TWGs will identify needs for supplemental contaminant analyses, e.g. TPH screened samples originally thought to not need further analysis now needing PAHs and biomarkers. Or: comparisons of BP analyzed and NOAA analyzed sample splits lead to request to reanalyzed each other's extracts.
Activity N: Contaminant Chemistry	Additional analyses of existing samples at chemistry labs	Variable; estimating 500	Several TWGs; Alpha Analytical Laboratory, ALS-Kelso, TDI-Brooks	Direct costs only PAH and associated analyses ($600K)	None. This assumes that there will be need for reanalysis of samples or extracts to address or investigate potential inter-laboratory variability across multiple laboratories including labs contracted by NOAA and BP.

Offshore Aquatic Habitat and Resource Investigations

A. Offshore Benthic Habitat and Communities

NOAA is assessing injuries to soft bottom sediments, hard ground corals, mesophotic reefs, and benthic megafauna injured by discharged oil. After the spill, oil was transported through the water column, exposing resources along the sea floor, and then settled out onto the benthic environment. Soft bottom sediments, and the infauna and epifauna (including benthic megafauna, such as red crabs) that inhabit these sediments, as well as hard ground corals were injured as a result. In addition, the surface oil slick resulting from the oil spill, and associated airborne dispersant applications, extended over areas along the continental shelf edge, where mesophotic reef habitats were injured.

Soft bottom sediments and the biota that inhabit them, including the infauna as well as benthic megafauna, play an important role in the turnover and cycling of nutrients in the deep sea, as well as provide a ready prey source to higher trophic level organisms that feed in the deep ocean. Mesophotic reefs and the deeper hard ground coral habitats support unique and long-lived coral assemblages and provide protective structure for a variety of resident and migrating water column and benthic species.

During 2014, a series of cruises to revisit and evaluate the potential for ongoing injury, or additional delayed onset injury, to be occurring in each of four deepwater resource groups will be the thrust of planned assessment activities. For each of these four resource groups, below we provide (1) background information about the projects and work expected to be completed by the end of 2013; (2) details about specific activities for which we are seeking funding in 2014; (3) names of individuals likely to be responsible for conducting the particular activities; and (4) budgets for completing the outlined work.

Soft Bottom Sediment

Soft bottom sediment assessment activities to date have been focused on the identification, enumeration, and analysis of sediment infauna collected as part of Response and NRDA sample collection efforts. Data collected are being used to assess the geographic extent and magnitude of changes in infauna community health. Infauna are identified to the lowest practical taxonomic level, and biological response variables being evaluated include numbers of taxa, diversity, total density, species abundances, community structure, Swartz's Dominance Index (SDI), and percentages of sensitive vs. tolerant species. Data are being evaluated in the context of known responses that have been shown in previous studies to serve as sensitive indicators of pollution-induced disturbances. For example, bioindicators of contaminant exposure previously used around platforms in the Gulf of Mexico include the relative percentages of sensitive species such as echinoderms and crustaceans (especially amphipods and harpacticoids) versus other more tolerant species such as polychaetes, oligochaetes, and nematodes (especially non-selective deposit feeders) that are often enhanced by the presence of contaminants. In addition, the biota are being examined for evidence of visible abnormalities, such as oil-coated appendages, empty shells or other animal parts, lesions, parasites, and any other abnormal appearances that may be apparent. Analysis of samples currently in hand is anticipated to be complete by the end of 2013. Specifically, it is anticipated that all 65 cores collected as part of the Response, and all 870 cores collected during the NRDA cruises

conducted on the Sarah Bordelon and Holiday Chouest will have been analyzed. Further, hydrocarbon analysis will have been completed for all samples in hand.

For 2014, funds being requested are primarily for completion of QA/QC and reporting activities associated with infauna analysis, coordination of activities and findings with the co-Trustees and BP, planning and conduct of a follow-up sample collection cruise, and analysis of collected sediment cores in a manner consistent with previous analytical approaches used to date. Specifically, anticipated activities include the following:

- QA/QC and reporting of results in data reports, as well as in Trustee-internal interpretive reports.
- Participation of technical contractors in ongoing technical consultations with BP. Soft bottom sediment infauna analysis to date has been conducted under a cooperative work plan with BP. As such, continued interaction with BP and its consultants, including the provision of interim results and verbal updates, as well as participation in cruise planning efforts will be likely.
- Planning and conducting a cruise to collect sediment cores for analysis of infauna, hydrocarbon content, and other sediment parameters.
- Infauna analysis (identification and enumeration) at the Texas A&M and University of Nevada-Reno laboratories. It is anticipated that approximately 240 samples for macrofauna and meiofauna analysis will be collected as part of the 2014 cruise effort. Sample analysis will allow for an understanding of the temporal change in infauna community health from 2011 to 2014 and will provide for better spatial resolution of infauna injuries.
- A subgroup of technical experts will be called upon to inform the Trustees on issues related to pathway and the transport of oil via mechanisms related to marine snow.
- Analysis of sediment samples taken by academics outside the NRDA process to assess the spatial extent of sediment oiling (costs for hydrocarbon analysis are included in the contaminant analytical chemistry activity.
- Oversight and consulting support provided by the contract TWG lead, and legal and technical support provided by NOAA technical experts. Data management support related to soft bottom sediment investigation will include support systems for housing resultant data and sharing those data with other Trustees and BP and its contractors (i.e., through NOAANRDA.org), as well as mapping support.

The activity also includes compilation of documentation and records related to the activity.

Connection to NRDA Process

Reductions in infauna community health (particularly, reductions in the density of animals) is being evaluated in the context of sediment concentrations of contaminants including the toxic components of petroleum hydrocarbons (e.g., PAHs). Injury is being quantified in terms of the magnitude of reduction of infauna community health and the spatial and temporal extent of reduction. Planned cruise and analysis activities for 2014 will provide for an understanding of the temporal progression of injury.

Sample/Data Handling

No soft bottom sediment field samples have been collected since May of 2011. Planned assessment activities include the collection of additional deep sea soft bottom sediment samples. Infauna enumeration and identification and results analysis will be conducted at Texas A&M University (under the direction of Dr. Paul Montagna) and the University of Nevada, Reno (under the direction of Dr. Jeff Baguley). Hydrocarbon analysis and other sediment parameter analyses will be conducted at Alpha Analytical and NewFields or at Texas A&M University. Data and metadata for sample analysis will be managed at these locations and by Industrial Economics, Inc. (IEc) in Cambridge, MA.

Data management activities are required to manage, statistically analyze, and map these data. Samples and associated data acquired through cooperative work plans will be collected through methods defined in joint signed protocols. These samples will be analyzed and the data will be tracked, organized, and QA/QC'd by NOAA. These data, along with associated documentation such as validation reports, are maintained by NOAA's data management team and will be distributed to Trustee representatives through NRDA and cooperative databases.

Data/Deliverables Produced

A final QA/QCed database will be produced for data collected on the 2011 Sarah Bordelon cruise that will contain infauna data (both macro- and meiofauna) counts by taxon by sampling station; including all relevant metadata and paired sediment parameter data (e.g., sediment grain size, sediment contaminant concentrations, etc.). Further, two reports are anticipated to be produced as a result of this effort: one data report and one interpretive Trustee-internal report that addresses the extent and magnitude of injury to the sediment infauna community resulting from the oil spill, based on data from samples collected in 2010 and 2011. Finally, assuming completion of follow-up cruise activities in the second quarter of 2014, it is anticipated that a draft dataset of similar scope as detailed above will be created to house results of the 2014 sampling effort.

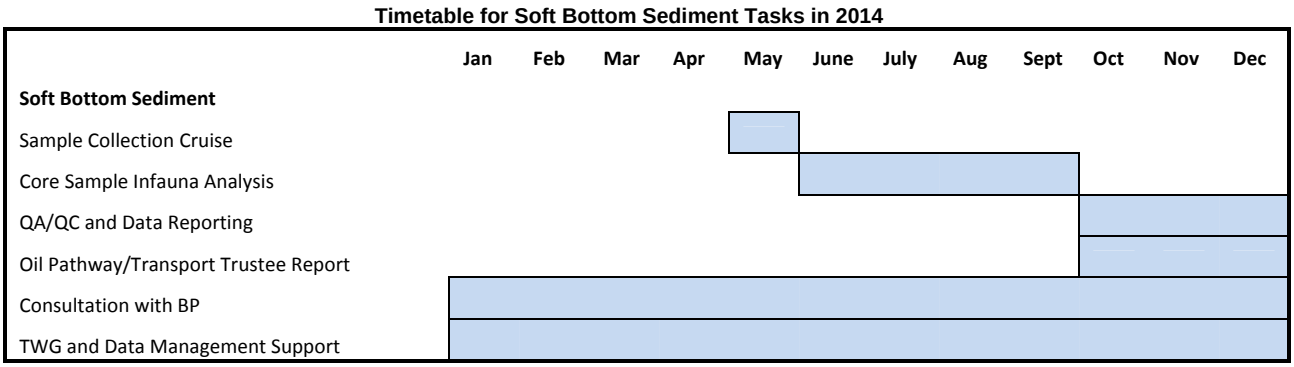
Level of Effort

Our request for the soft bottom sediment activity is $6,950,836 in contract funds. The request includes 1.1 agency FTEs and 22.2 contract equivalents. Key personnel include the PIs and their staff, agency scientists, and agency and IEc data management teams.

PIs (NOAA and other)

Macrofauna are being evaluated by Dr. Paul Montagna and his team at Texas A&M University, and meiofauna are being evaluated by Dr. Jeff Baguley and his team at the University of Nevada, Reno. Drs. Jeff Hyland and Cynthia Cooksey of NOAA are providing technical support.

Timetable



RP Involvement

The Deepwater Benthic Communities TWG Trustees and their representatives have worked cooperatively with BP throughout the exposure and injury assessment phases to date. Trustees and BP have periodic coordination conference calls. We currently anticipate that additional activities planned for 2014 will also be cooperative.

Hard Ground Corals

Hard substrate is uncommon relative to soft substrate in the northern Gulf of Mexico, but can have distinct associated communities. Megafaunal communities associated with hard-bottom include chemosynthetic seep communities (including foundation species such as tube worms with life spans that can exceed 250 years and deepwater mussels), as well as deep-sea coral communities (e.g., framework-forming scleractinian coral species such as *Lophelia pertusa* or *Madrepora oculata*, and/or antipatharian and gorgonian corals, sponges, and other associated taxa). These habitats are diverse in and of themselves, but also provide structure and protection to a host of other transient species.

Hard ground coral assessment activities to date have focused on identifying hard ground coral sites within the vicinity of the wellhead or the likely path of water column oil movement, close-up evaluation of the health of the corals at these sites, and quantitative evaluation of coral health. To date two hard ground coral sites have been confirmed to have been injured. Although the last NRDA cruise to investigate potential impacts to hard ground coral habitats finished in late 2011, some non-NRDA follow-up at these sites, as well as quantitative and statistical analysis of data on additional sites where injury may have occurred is ongoing throughout 2013; this work is anticipated to conclude by the end of 2013 and will use previous funding sources. Under the current claim, funds are requested for the following assessment activities extending into the 2014 calendar:

- Participation of laboratory leaders in ongoing technical consultations with BP, including participation in regularly scheduled TWG calls; and technical consultations with NOAA representatives.
- A synthesis of information related to baseline hard ground coral habitat abundance.

- Oversight and consulting support provided by the contract TWG lead, and legal and technical support provided by NOAA. The TWG lead and subcontractors, as well as legal staff from NOAA's General Counsel will provide scientists involved with the hard ground coral assessment the technical and legal support specific to conducting NRDA.

- Data management support related to hard ground coral investigation will include support systems for ultimately housing resultant data and sharing those data with other Trustees and/or BP and its contractors (i.e., through NOAANRDA.org). In addition, data management costs cover mapping and data coordination efforts.

The activity also includes compilation of documentation and records related to the activity.

Connection of Activities to NRDA Process

This activity will build on previous hard ground coral assessment activities to evaluate injury to this habitat type.

Sample/Data Handling

Data management activities are required to manage, statistically analyze, and map these data. Samples and associated data acquired through cooperative work plans were collected through methods defined in joint signed protocols. These samples have been analyzed and the data are being tracked, organized, and QA/QC'd by NOAA. These data, along with associated documentation such as validation reports, are maintained by NOAA's data management team and will be distributed to Trustee representatives through NRDA and cooperative databases.

Data/Deliverables Produced

A memorandum describing the abundance of hard ground coral habitats under baseline in the Northern Gulf of Mexico will be produced, which will be used to support injury determination efforts. In addition, PIs will continue to conduct QA/QC efforts, efforts to support generation of the Administrative Record, and provide ongoing technical consultation with NOAA; including relay of information about hard ground habitat resource health obtained through non-NRDA activities (i.e., planned or potential cruises conducted outside of the NRDA process).

Level of Effort

Our request for the hard ground corals activity is $595,013 in contract funds. These costs include 0.4 agency FTEs and 1.6 contract equivalents. Key personnel include the PIs and their staff, agency scientists, and agency and IEc data management teams.

PIs (NOAA and other)

Hard ground coral assessment activities have primarily been undertaken by Drs. Chuck Fisher (Pennsylvania State University) and Erik Cordes (Temple University) and their academic teams. Additional investigators have included, for example, Esther Peters (George Mason University) and Tim

Shank (Woods Hole Oceanographic Institute). At this time it is anticipated that these same investigators will be the PIs for assessment activities outlined for 2014.

Timetable

Timetable for Hard Ground Corals Tasks in 2014

	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Hard Ground Corals												
Consultation with BP												
TWG and Data Management Support												
Provide legal and technical support to NRDA researchers												

RP Involvement

The Deepwater Benthic Communities TWG Trustees and their representatives to date have worked cooperatively with BP throughout the exposure and injury assessment phases. Trustees and BP have regularly scheduled coordination conference calls and additional calls, as necessary. It is anticipated that efforts outlined for 2014 will also be cooperative with BP.

Mesophotic Reefs

The Deepwater Benthic Community TWG is evaluating injuries to mesophotic reefs, which reside along the length of the continental shelf at depths ranging from 60 to 90 m. Two well-studied mesophotic reefs, in particular, referred to as Alabama Alps and Roughtongue Reef, were overlain by the surface oil slick (and associated areal dispersant applications) for a period of months during 2010. Mesophotic reef assessment activities to date have focused on photographic and video documentation of reef health, and enumeration of resident planktivorous fish abundance. Analysis of video collected at the mesophotic reefs during 2010 and 2011 indicates persistently low abundances of resident planktivorous fish. It is anticipated that evaluation of coral health and enumeration of fish from videos taken post-spill, and to some extent prior to the spill, will have been analyzed by the end of 2013.

For 2014, we are requesting funds to continue to enumerate fish in baseline imagery collected prior to the oil spill, plan for and implement a follow-up cruise to evaluate the temporal progression of injury to mesophotic reefs and flesh out the spatial extent of impacts, collect sediment samples at locations proximate to the mesophotic reefs to assess reef exposure, and analyze and report on resultant data from the follow-up cruise. In particular, analysis of baseline video during 2013 has focused on USGS videos from the period from 1997 to 2003. This 2014 funding request covers evaluation of baseline video from other sources.

Methods used to enumerate plantivorous fish and assess reef coral health in additional baseline videos as well as new video to be collected in 2014 will be consistent with methods used previously in the NRDA. Nominal transect times from historical ROV videos vary depending on the objectives of the cruises. Thus, transects will be vetted for comparability (i.e., in terms of length of time of transect) to NRDA data obtained in 2010, 2011, and 2014. Video imagery during these historical USGS ROV cruises was obtained with earlier generations of underwater video cameras, underwater lighting, and video media

(VHS, S-VHS, High-8, and mini-DV tapes). Thus, image quality for historical missions is lower than for the HDTV video imagery obtained in 2010 and 2011, and anticipated to be obtained in 2014.

There are several anticipated activities associated with mesophotic reef assessment in 2014:

- Review of baseline fish and coral conditions from additional pre-spill videos. Quantification of fish abundance and diversity, as well as assessment of coral health in historical, pre-release video will allow for documentation of baseline conditions at reefs targeted for assessment. A complete understanding of baseline will allow for the accurate quantification of injury to these reefs.
- Follow-up cruise planning and implementation.
- Analysis of data generated on the 2014 follow-up cruise and reporting of those data.
- Participation of Drs. Sulak and Etnoyer in ongoing technical consultations with BP. Mesophotic reef data collection efforts to date have been conducted cooperatively with BP; and we anticipate that efforts in 2014 will also be cooperative. As such, we anticipate that ongoing interaction with BP and its consultants, including the planning and implementation of the follow-up cruise and provision of interim results and verbal updates, will be required.
- Oversight and consulting support provided by the TWG lead, and legal and technical support provided by NOAA. The TWG lead, as well as legal staff from NOAA's General Council, will provide the PIs involved with the mesophotic reef assessment the technical and legal support specific to conducting NRDA. In addition, these individuals will assist in cruise planning, work plan development, and supporting PIs in ongoing interactions with BP and its contractors.
- Data management. Data management support related to mesophotic reef investigation will include support systems for ultimately housing resultant data and sharing those data with other Trustees and/or BP and its contractors (i.e., through NOAANRDA.org).

The activity also includes compilation of documentation and records related to the activity.

Connection to NRDA Process

Quantification of fish abundance and diversity, as well as assessment of coral health in historical, pre-release video will allow for documentation of baseline conditions at reefs targeted for assessment, and therefore aid in the accurate quantification of injury to these reefs. Planning and implementation of a cruise to collect new video data of the mesophotic reefs will allow for analysis of current conditions at the mesophotic reefs and evaluation of the potential time progression of injury.

Sample/Data Handling

One, approximately four week cruise to collect video imagery at mesophtic reef sites is planned for 2014. Resultant video as well as additional baseline videos compiled in 2013 will be analyzed at either USGS Gainesville, NOAA National Centers for Coastal Ocean Science (NCCOS) in South Carolina, or Florida State University. It is anticipated that a limited number of sediment and tissue samples may be taken for

hydrocarbon analysis, which will be conducted at Alpha Analytical. We expect these efforts to be conducted cooperatively with BP.

Data management activities are required to manage, statistically analyze, and map these data. Samples and associated data acquired through cooperative work plans will be collected through methods defined in joint signed protocols. These samples will be analyzed and the data will be tracked, organized, and QA/QC'd by NOAA. These data, along with associated documentation such as validation reports, are maintained by NOAA's data management team and will be distributed to Trustee representatives through NRDA and cooperative databases.

Data/Deliverables Produced

Deliverables anticipated in 2014 include: a follow-up cruise to collect additional data at mesophotic reef sites, data results (from the analysis of both baseline and 2014 video) in the form of fish counts and summaries of coral health, and a report presenting the results of the cruise effort.

Level of Effort

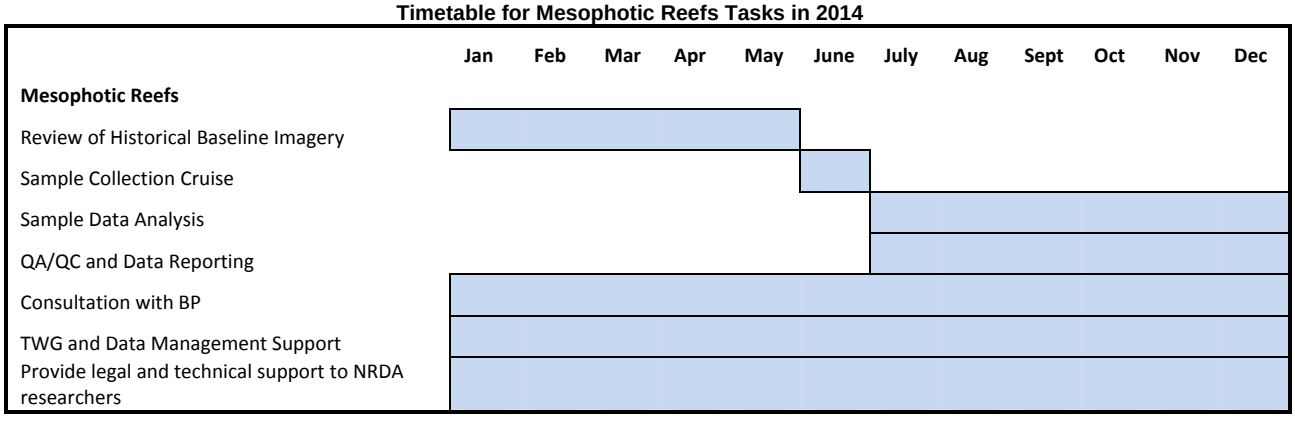
Our request for the mesophotic reef activity is $5,884,710 in contract funds. These costs include 5.4 agency FTEs and 6.8 contract equivalents. Key personnel include the PIs and their staff, agency scientists, and agency and IEc data management teams.

PIs (NOAA and other)

Dr. Ken Sulak and his team at USGS have been responsible for fish assessment to date, and will be responsible for assessing this historical imagery for identification and enumeration of resident planktivorous fish. Similarly, Dr. Peter Etnoyer and his team at NOAA will be responsible for assessing coral health in these historical images. We anticipate that both Drs. Sulak and Etnoyer, in addition to Dr. Ian MacDonald of Florida State University will share leadership roles in planning and implementing the 2014 follow-up cruise; and each will play a role in data analysis.

Timetable

Timetable for Mesophotic Reefs Tasks in 2014



RP Involvement

To date, the Deepwater Benthic Communities TWG Trustees and their representatives have worked cooperatively with BP throughout the exposure and injury assessment phases. Trustees and BP have regularly scheduled coordination conference calls. Going forward, we anticipate additional efforts in 2014 to also be cooperative with BP.

Benthic Megafauna

The term "benthic megafauna" refers to those larger biological organisms that reside on the ocean floor, which may be stationary or mobile. In order to assess potential injuries to benthic megafauna, the assessment has focused on red crabs as a susceptible representative organism. More specifically, assessment activities have focused on evaluating red crab health. After the oil spill, researchers studying red crabs reported decreased catches and apparently unhealthy crabs. NRDA activities to date have included the collection of red crabs at various locations throughout the Gulf of Mexico in 2011, and the subsequent evaluation of their potential exposure to oil, reproductive health, and histological condition. In 2014, a follow-up cruise is planned to determine if red crabs are still being exposed to spill-related contaminants and to track the temporal progression of injury since 2011. Budgeted activities include:

- Planning and implementation of a follow-up cruise to collect red crabs, and assess red crab health.
- Evaluation of data generated as part of the 2014 follow-up cruise and reporting of results.
- Oversight and consulting support provided by the contract TWG lead, and legal and technical support provided by NOAA. The TWG lead, as well as legal staff from NOAA's General Counsel office will provide the IEc staff involved with the red crab assessment the technical and legal support specific to conducting NRDA.
- Data management. Data management support related to red crab assessment will include support systems for ultimately housing resultant data and sharing those data with other Trustees and/or BP and its contractors (i.e., through NOAANRDA.org); as well as mapping and sample coordination support.

The activity also includes compilation of documentation and records related to the activity.

Connection to NRDA Process

Planned cruise and data analysis activities will generate data to evaluate the potential for persistent exposure of red crabs to spill-related contaminants to be occurring, as well as allow for development of an understanding of the temporal progression of injury since 2011.

Sample/Data Handling

As part of the planned 2014 cruise effort, we anticipate collecting a similar number of samples as were collected on the 2011 cruise to assess red crab health. These samples will be red crab tissue samples taken

for purposes of hydrocarbon analysis, to be conducted at Alpha Analytical. In addition, red crab egg samples will again be taken in 2014 from any ovigerous crabs to evaluate red crab reproductive health.

Data management activities are required to manage, statistically analyze, and map these data. Samples and associated data acquired through cooperative work plans will be collected through methods defined in joint signed protocols. These samples will be analyzed and the data will be tracked, organized, and QA/QC'd by NOAA. These data, along with associated documentation such as validation reports, are maintained by NOAA's data management team and will be distributed to Trustee representatives through NRDA and cooperative databases.

Data/Deliverables Produced

Deliverables in 2014 include: a follow-up cruise to collect red crabs, data generated as a result of the 2014 follow-up cruise effort, and a report presenting the results of the cruise effort.

Level of Effort

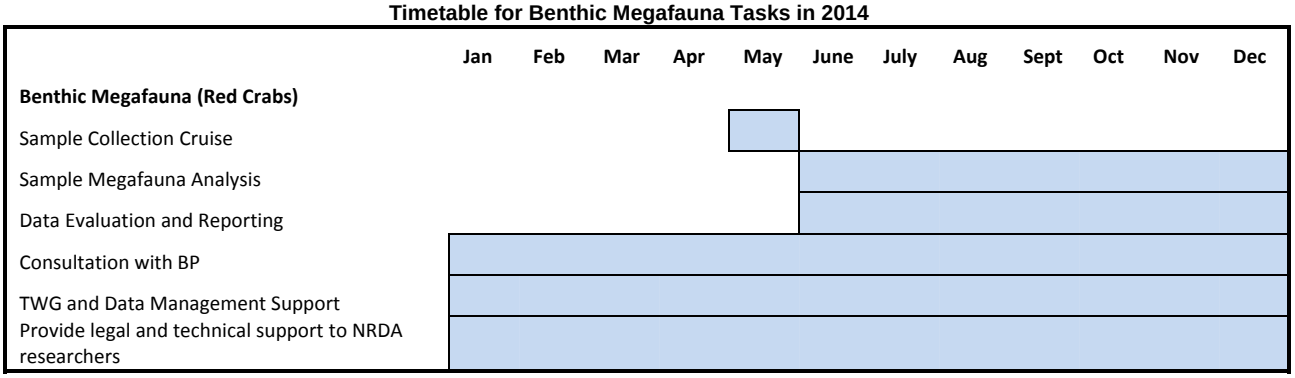
Our request for the benthic megafauna activity is $1,134,409 in contract funds. These costs include 1.0 agency FTEs and 3.6 contract equivalents. Key personnel include IEc scientists and data management team, as well as academic and NOAA PIs.

PIs (NOAA and other)

PIs will likely include Harriet Perry and Darcie Graham, investigators responsible for red crab activities performed in 2011; as well as personnel from NOAA's Alaska Fisheries Science Center.

Timetable

Timetable for Benthic Megafauna Tasks in 2014



RP Involvement

Red crab data collection efforts in 2011 were performed cooperatively, and it is anticipated that planned 2014 activities will also be performed cooperatively with BP.

B. Bluefin Tuna

Bluefin Tuna Spawning Habitat Analyses

NRDA field investigations with Atlantic bluefin tuna (BFT) (*Thunnus thynnus)* started in 2010 and continued through 2012. As part of each year's study, BFT were tagged with satellite transmitters, and data were transmitted or retrieved from tags. In 2013, a total of 27 new animal tracks for the Gulf of Mexico (GOM) were visualized and distributed as part of the multi-year study. Also in 2013, preliminary maps displaying zones of actual and predicted tuna spawning site selection were generated. Tuna spawning site selection analyses are based on known ocean conditions and peer-reviewed modeling techniques that mathematically determine the likelihood of presence/absence and behavior of adult spawners using telemetry results and other sources of ocean and biological information. Commercial tuna catch information and field surveys for larval fish abundance also inform the tuna injury quantification.

Funds are requested in 2014 to pair the preliminary spawning habitat maps with updated, model-generated outputs of injury to early life stages of tuna. This procedure also involves reviewing the latest tuna catch data and larval survey datasets from the National Marine Fisheries Service (NMFS). Model-derived injury outputs for tuna are not expected to occur until at least mid-2014, but episodic analysis costs for the BFT procedure will extend throughout the period of the 2014 claim as post-Incident data are reviewed and factored into the injury assessment.

Atlantic bluefin tuna are a large, long-lived, highly migratory tuna. The shelf waters of the GOM are the known North American spawning ground for a portion of the western Atlantic stock. This region was designated a Habitat Area of Particular Concern by NOAA in 2009. The Deepwater Horizon Oil Spill occurred during the peak of the known spawning time, thereby exposing fish at all life stages from egg to adult. Atlantic bluefin tuna move from spring spawning grounds (April to June) to northern foraging grounds off of the northeast U.S. and Canadian coastlines where intensive commercial fisheries exist.

As stated in NOAA's first interim, partial Claim, the Trustees have evidence from Stanford University telemetry records in 2010 that at least one Atlantic bluefin tuna spawned in oiled waters of the Gulf of Mexico. A second tagged Atlantic bluefin tuna was in the oiled area and exhibited directed movements away from the oiled region to spawn nearby off Tampa, Florida. The Trustees also have preliminary oil fate and transport model runs that show surface and sub-surface oil in previously-observed Atlantic bluefin tuna spawning locations determined from catch and telemetry datasets. Models, in concert with toxicity tests on bluefin tuna, indicate that bluefin tuna eggs and larvae were killed based on oil dose calculations in ppb-hours. The Trustees also have evidence from ichthyoplankton collections that tuna eggs and larvae are found in waters that were oiled in 2010 during the spill.

Additional telemetry visualization work in 2013 confirmed that several tagged adult tuna in 2011 and 2012 used zones of the GOM oiled during the Incident for spawning or other parts of their life cycle. Preliminary mathematical analyses of ocean data, behavior patterns, and telemetry tracks also indicate certain zones of the GOM have ocean conditions year-to-year that meet BFT spawning needs. In summary, based on analyses funded in 2013, the Trustees have evidence from animal tracks before, during, and after the spill that BFT use the vicinity of the GOM affected by the Incident. Monies for 2014

will be used to fine-tune injury quantification models and spawning habitat analyses using the latest catch and larval data from NMFS.

The activity also includes compilation of documentation and records related to the activity.

Connection to NRDA Process

Recent outcomes from our NRDA analyses, combined with the concerns about the potential long-term spill effects to this imperiled species, provide the rationale for why NOAA is undertaking additional work to finalize our injury quantification. In general, we will be using the tagging data and models to document contaminant pathway and exposure, and to help assess injury. The injury will be determined by modeling direct loss and production foregone based on literature-based toxicity thresholds and Incident-specific data. Evaluations of spawning or ranging areas (i.e., movement corridors) that were oiled will be considered habitat injury, and dose-response relationships from tuna toxicity testing will be used to inform final model-based calculations of resource injuries.

Sample/Data Handling

Telemetry data are available in GulfTOPP and other NRDA data management systems, and the raw data can be accessed by the RP and Trustees. Other interpretive analysis products have not been shared with the RP.

Data management activities are required to manage, statistically analyze, and map these data. Samples and associated data acquired through cooperative work plans were collected through methods defined in joint signed protocols. These samples have been analyzed and the data are being tracked, organized, and QA/QC'd by NOAA. These data, along with associated documentation such as validation reports, are maintained by NOAA's data management team and will be distributed to Trustee representatives through NRDA and cooperative databases.

Data/Deliverables Produced

Deliverables in 2014 include fined-tune injury quantification models and spawning habitat analyses using the latest catch and larval data from NMFS.

Level of Effort

Our request for the bluefin tuna telemetry studies is $692,085 in contract funds. These costs include 1.3 agency FTEs and 2.6 contract equivalents. Key personnel include PIs and their staff, and agency scientists.

PIs (NOAA and other)

The PI for this study is Dr. Barbara Block of Stanford University. Other investigators include Dr. Steven J. Bograd of the NOAA Southwest Fisheries Center, Dr. Randy Kochevar of Stanford University, and Dr. Wilson of Stanford University.

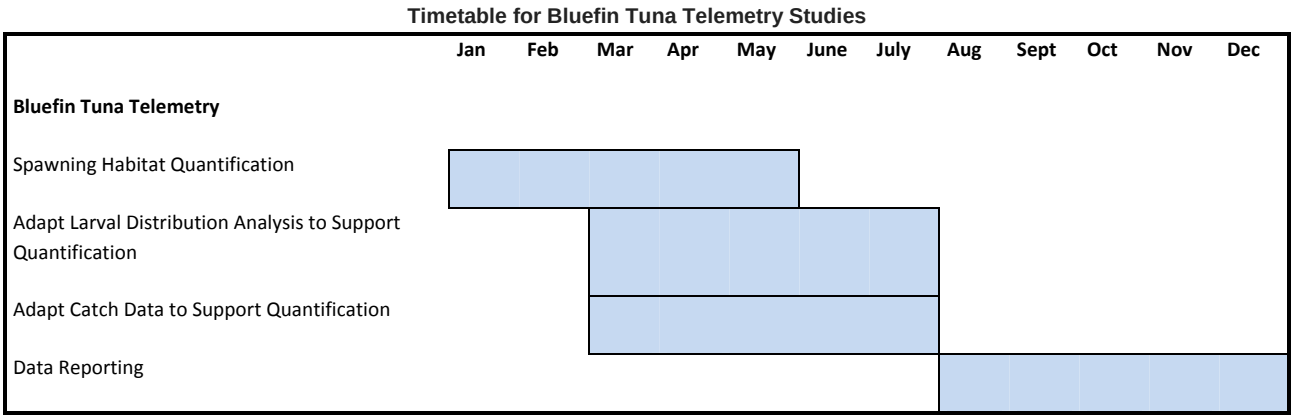
Team locations:

Tuna Research and Conservation Center at Hopkins Marine Center, Stanford University

NOAA scientists in Pacific Grove, CA

NOAA Southeast Fisheries Science Center, Highly Migratory Branch

Timetable



RP Involvement

In 2013, NOAA had phone calls with RP representatives as telemetry data were distributed, but analysis and interpretation of the data has not been cooperative with the RP.

C. Transport, Fate, and Effects Modeling

Introduction and Background

The massive release of MC252 oil and application of chemicals during the Response had a high probability of causing substantial harm to life throughout the Gulf. Under emergency conditions, the Water Column TWG undertook a large, sustained, and multifaceted oceanographic field program involving 42 cooperative work plans with BP that required multiple oceanographic research vessels, remotely operated underwater vehicles, aircraft, satellite resources, and much specialized equipment. The study area was enormous and diverse, covering the full range of environments from 1,500 meters below the ocean surface to the shoreline and across nearly 700 kilometers of the northern Gulf of Mexico. Technical considerations ranged broadly from survey design to oceanography, engineering, image processing, database design, and computer science. This effort produced a large inventory of biological and chemical samples and voluminous electronic data, all of which requires extensive processing.

Oil released from the broken wellhead both dispersed at depth and rose through nearly a mile of water column. The composition of the released gas-liquid mixture changed over time and space as the result of dilution, changes in pressure, dissolution, and addition of other constituents such as dispersants, methanol, and anti-foaming additives. Of the oil that made it to the water surface, some volatilized in the

air, entrained water forming mousse, was dispersed into the water column naturally and by application of dispersants, and was removed mechanically or by in situ burning. Floating oil, oil droplets, and dissolved components were transported large distances at various levels of the water column. Oil also picked up sediments and other particulate material, some of which became neutrally or negative buoyant, sinking to various depths. The oil dispersed at the wellhead (both via turbulence and by injection of dispersants) and was transported by currents that varied in time and space, yielding a complex pathway of surface and subsurface oil contamination that affected abyssal, bathypelagic, meso-pelagic, and epi-pelagic waters of the Gulf of Mexico.

Fish and invertebrates throughout the water column, from ocean depths to surface, are exposed to both dissolved and droplet forms of contaminants by swimming through the water column, passing water over respiratory structures, and ingesting water and particulates contaminated with oil as part of feeding. Sensitive life stages of pelagic fish and invertebrates come in direct contact with floating oil that covered and mixed into the neuston layer where embryos and larvae develop. Developing embryos, when exposed to oil, are shown to have genetic, physiological, metabolic, and developmental problems that lead to reduced fitness and higher mortality. Cardiac edema, reduced heart rate and blood flow, and spinal deformations are likely effects, contributing to an overall increase in mortality. Effects to the eggs, developing embryos, juveniles, and adults are a function of both physical fouling with oil and the toxicity of oil constituents. Dispersants and other chemicals introduced into the water column during the Incident Response may have increased toxicity of or vulnerability to oil hydrocarbon effects. Other neustonic organisms exposed to surface oil include many small invertebrates, important components of the food web. Offshore water column organisms also were exposed to dissolved and water-borne chemical additives such as methanol and anti-foaming agents in addition to dispersants.

Because of the magnitude of the spill, the extensive area of the Northeastern Gulf of Mexico potentially affected, and the logistical constraints of obtaining sufficient field sample data to completely characterize the contamination in space and time over and after the 84 days of oil and gas release, the Trustees are engaging in a modeling analysis of the transport, fate and effects of the spill. Figure C-1 is a flow diagram of the modeling approach, and models and input datasets being developed, for quantification of the injuries to water column biota caused by the spill. The modeling will also provide datasets and products for other TWGs for their analyses of injuries.

The modeling approach encompasses several separate model codes and analyses, each providing information that is input to the next model in the chain. The core model is based on Spill Impact Model Application Package (SIMAP, French McCay, 2004), with other models providing needed inputs to the SIMAP calculations.

The blowout model evaluates the oil-gas release near to the wellhead and broken riser. This model follows the movements of the oil and gas as it comes out of the pipe holes. The blowout model outputs the locations, volumes, and droplet sizes of the released oil droplets, which then becomes input to the oil fate modeling.

The oil fate model used by NOAA and co-Trustees estimates the distribution and mass of oil in the water column, on the water surface, on shorelines, and in the sediments through time. Processes simulated in the physical fates model include oil droplet and surface oil transport and dispersion, oil surfacing, surface oil

spreading, evaporation of volatiles from surface oil to the atmosphere, stranding of oil on shorelines, emulsification of oil, entrainment of oil as droplets into the water column, re-surfacing of oil, dissolution of soluble components into the water column, volatilization from the water column to the atmosphere, partitioning of oil between water and sediment, sedimentation of oil droplets, and degradation. The model results provide estimates of water volumes and their associated chemical concentrations. The output of the fate model includes the location and dimensions of floating oil, concentrations of hydrocarbon constituents in water, and fluxes of hydrocarbons to air and sediment over time. Concentrations of particulate (oil droplet) and dissolved aromatic concentrations are used by the exposure, toxicity, and biological effects models.

In addition to the initial conditions provided by the blowout model, the oil fate model requires winds, waves and currents as inputs. NOAA and BP have cooperatively agreed to use the Ocean Weather wind and wave models, and BP has provided a licensed copy of the Ocean Weather wind and wave model output for the Gulf of Mexico in 2010 to the Trustees for their use in the DWH modeling analysis. In addition, NOAA is evaluating other wind products and measurement data.

Current data are available for the offshore continental slope area of the northern Gulf of Mexico from Acoustic Doppler Current Profilers (ADCPs) that are moored or attached to offshore platforms and are included in NOAA's online datasets. Other field data designed to measure currents are also available for 2010. Existing and tested hydrodynamic models have been developed through 2012 and 2013, and will continue to be evaluated by the Trustees to develop appropriate datasets for the modeling of transport, i.e., for modeling oil trajectory, fate, and effects.

The Trustees will use the exposure model in SIMAP to evaluate the time history of oil component concentrations experienced by various types of water column biota, representing biota with Lagrangian Elements to track their movements in the environment. Biota may be simulated as stationary, planktonic, or swimming under their volition with a variety of behavior patterns and habitats used. By combining model estimates of water volumes exposed above various thresholds indicating injury (based on the Lagrangian Elements' time histories and the volume sampled by each Lagrangian Element) with spatially- and time-varying density estimates for water column biota, direct exposure to biota can be estimated. Toxicity modeling is being used to evaluate the effects of these exposures to dissolved and whole oil constituents. The SIMAP toxicity model described in French McCay (2002) provides a basis for the acute toxicity modeling being employed. The toxicity model is being updated with information being developed by the Trustees.

Activities related to Transport, Fate, and Effects Modeling are directly related to the Fish and Plankton activities described in this claim. In general, the modeling activities will use the data produced from Fish and Plankton activities as inputs or for calibration of the model and are not duplicative of any effort detailed in that portion of the claim. Modeling activities include incorporation of data from plankton samples, net tows, trawls, and related information from the Fish and Plankton Activity to develop baseline density estimates for assessing injuries. A variety of statistical techniques are being examined to develop densities for model input. The Trustees are also reviewing and including information gleaned from stock assessments by the NMFS. In addition, the injury analyses include consideration of the growth and (natural plus fishing) mortality the affected organisms would have undergone if there had not been a spill in projecting future losses.

The effort under these modeling activities will support analyses by other TWGs. For instance, water column biota are the prey base for marine mammals, sea turtles and birds, and so the activities outlined here and described below support the assessment of injuries via the prey base for these high trophic-level vertebrates. Modeling will provide quantification of exposures to floating oil and subsurface hydrocarbons for fish, invertebrates, aquatic plants (including sargassum communities) and higher trophic level vertebrates. Injury quantification of fish, invertebrates, and aquatic plants exposed may be used by other TWGs in their evaluations of injuries via the food web or other ecosystem-level effects. The modeling will also provide estimates of hydrocarbon fluxes to the atmosphere at the sea surface and to the sediments. Other TWGs, such as those concerned with marine mammals, sea turtles, birds and benthos, may use this information as input to their analyses.

NOAA performed many assessment tasks in 2012 and 2013 related to oil transport, fate, and effects modeling; several of these activities will continue into 2014. By the end of 2013, initial draft model simulations of the spilled oil fate and resulting concentrations will be completed, but input and verification data are still being developed and will be incorporated into refined fate and transport models in 2014. For example, hydrodynamics modeling is being evaluated and refined after some contracting delays; digital sensor and particulate imaging information processing will be complete by the end of 2013, however analysis and interpretation continues following extensive protocol development and negotiations with BP; and many needed biological samples remain to be worked up and quantified. Biological effects modeling will be performed in late 2013 with available data inputs and refined in 2014 as more information becomes available. The budget developed for 2013 assumed a level of effort required to complete the activities included in the Transport, Fate, and Effects Modeling, and the in the Fish and Plankton procedures. NOAA was not able to acquire the resources needed to meet that level of effort, therefore a portion of the work proposed for 2013 remains to be completed in 2014. The need for additional funds above those requested for 2013, versus the need for continued support within the 2013 budget scope, is described in detail within the individual sub-task's level of effort below.

Oil Fate Modeling and Comparisons with Observational Data

The NRDA oil transport and fate modeling framework employs demonstrable laws of physics and chemistry to calculate the time-dependent distribution of oil and surfactants in the study area. The water column, ocean surface, and sediments are all explicitly considered. This framework addresses such processes as the release specifications, rising, dispersion, surfacing, and advection of subsurface oil, the spreading, entrainment, emulsification and evaporation of surface oil, the effects of dispersants, the dissolution of soluble components, the partitioning onto suspended particulate matter, sedimentation to the sea floor, impingement on the shoreline, stranding on shoreline, and weathering and degradation.

NOAA undertook a number of studies and data compilation activities to define the release and provide inputs for the oil transport and fate modeling, including: winds and waves at the water surface and over time; currents in 3-dimensional space and over time; oil characterization and amount released in space and time; spatially- and time-varying environmental conditions (e.g., temperature, salinity, suspended particulates); bathymetry and habitat mapping; Response activities; and oil and component hydrocarbon properties. Twelve work plans were developed cooperatively for the collection of physical and chemical data from the water column which are being used for modeling the discharge, transport, and fate of oil from the wellhead.

It is important to evaluate the oil and gas release conditions in order to initialize the oil fate modeling with appropriate distributions of oil volume in space (horizontally and vertically) and over time. NOAA has been examining the ROV videos that recorded events at the oil and gas release points to evaluate the specific conditions determining release rates and droplet sizes. More than 10 terabytes of data, and an estimated 20,160 hours of underwater video recorded by BP contractors has been evaluated. This work is complete, and no additional support is requested. The product of this analysis will be used in the blowout model, described below.

As may be seen in hundreds of CTD/fluorometers/dissolved oxygen profiles taken by vertical casts and transects, hydrocarbons from the spill were trapped and transported several hundred kilometers in deep waters between approximately 1000 and 1300m (~3300-4300 feet) below the sea surface. Using blowout modeling, NOAA and the Trustees will develop outputs of locations, volumes, and droplet sizes of the released oil droplets, which then become input to the oil fate modeling.

In addition to the initial conditions provided by the blowout model, the oil fate model requires winds, waves and currents as inputs. NOAA has evaluated various wind products and measurement data for model inputs including a licensed copy of the Ocean Weather wind and wave model output for the Gulf of Mexico in 2010 provided by BP to the Trustees for their use in the DWH modeling analysis. The Ocean Weather wind and waves models utilize measured winds to hindcast the 2010 time period of interest. This approach interpolates available measurement data, accounting for fetch to land and land effects on the winds. The wave model used is a government accepted "community" model named Simulating WAves Nearshore (SWAN) that was developed by Delft University of Technology. SWAN is supported by Office of Naval Research (USA) and Rijkswaterstaat (as part of the Ministry of Transport, Public Works and Water Management, The Netherlands). NOAA continues to evaluate the performance of the Ocean Weather winds and waves, larger domain wind and wave fields, as well as NOAA products and measurement data.

Hydrodynamics modeling is being used to develop current datasets for input to the oil transport and fate modeling. Activities related to hydrodynamics modeling are described in the next task.

Physical measurements and samples were collected cooperatively during and after the oil spill (in 2010 and 2011) to document oil pathway and calibrate/verify the oil transport and fate modeling. These datasets include conductivity/temperature/depth (CTD) data; fluorometry results that indicate oil and organic material presence; dissolved oxygen measurements indicating microbial degradation of oil; transmissometers that sense particulates in the water; acoustics that reflect from oil, gas, and particulates; video and photography; water chemistry measurements of hydrocarbons, dispersants, and isotopes; chlorophyll measurements of plant life; and plant/microbial nutrient analyses. Thousands of water chemistry samples were analyzed under the management of the Chemistry TWG, and the resulting data are continuing to be validated. Other physical chemical data have been analyzed according to carefully and cooperatively developed protocols and QA/QC procedures. Analyses of these datasets are described in a later task.

Additionally, as part of this activity, the development of remote sensing products supporting modeling will build on remote sensing activities from 2012 and 2013. These tasks include the compilation, evaluation, and interpretation of remote sensing data from NOAA, NASA, and other government sources

to provide a time series of the distribution and thickness of surface oil in the Gulf of Mexico between April and August of 2010. These data will be used as input into hydrodynamic modeling, and for use in the analysis of Plankton and Fish sample data. Additional remote sensing products being evaluated include sea surface temperature, sea surface height, ocean color, and surface reflectance. The estimates of both the thickness and volume of surface oil will enhance quantification of the pathway and exposure to ocean and shoreline habitats. Resulting oiling maps will also provide input and calibration opportunities for the modeling efforts described elsewhere in this document. Completion of the remote sensing product development is extremely high priority as it will be a fundamental component in several TWGs' assessment activities

In 2012 and 2013, NOAA performed several assessment tasks related to oil transport and fate modeling, and these activities will continue into 2014. Draft model simulations of the spilled oil fate and resulting concentrations will be largely completed by December 2013, but refinements utilizing input and verification data (such as those described above and under the hydrodynamics task) are expected to be completed in 2014. Tasks performed in 2012 and 2013 included:

- Use information from the Response phase and ROV video to characterize oil discharge scenarios for blowout modeling;
- Review and update of SIMAP oil fate model codes;
- Update oil transport and fate modeling with relevant ocean data, including calibration of model output to appropriate field observations of oiling, such as floating oil and shoreline oiling distributions;
- Model refinements incorporating new information and data (e.g., CTD and sensor measurements, hydrodynamics results, analyses of floating oil distributions);
- Imagery acquisition, processing, and analysis of Moderate Resolution Imaging Spectrometer (MODIS), MODIS Thermal, Synthetic Aperture Radar (SAR) data;
- Acquisition and processing of Airborne Visible/Infrared Imaging Spectrometer (AVIRIS) imagery is not included in this effort (DOI-lead), though the AVIRIS data will eventually be incorporated into the analysis with other imagery;
- Coordination of scientists with imagery expertise, data, and analysis from multiple remote sensing platforms;
- Coordination of federal Trustee agencies and technical experts;
- Requesting access to data from the RP;
- Coordinated postings of data for TWG use;
- Development of interim interpretive products based on analysis;
- Final imagery based thickness and volume estimates for available image days;

- Report preparation; and
- Document development and publication.

In 2014, tasks under this activity will continue work on-going in 2013 and will focus on model application and integration, reporting, and technical review.

The activity also includes compilation of documentation and records related to the activity.

Connection to NRDA Process

The oil transport and fate modeling quantifies pathway and exposure concentrations for water column biota. Physical and chemical data evaluations are being compared to model results to document the pathway and exposures, and verify the transport and fate modeling.

The effort under these modeling activities will support analyses by other TWGs such as the areas exposed to floating oil, timing of shoreline oiling and the overlap between tagged animals and oil. Oil transport and fates modeling will provide quantification of exposures for fish, invertebrates (water column and benthos exposed to water concentrations), aquatic plants (phytoplankton and sargassum) and higher trophic level vertebrates (marine mammals, sea turtles and birds).

The specific remote sensing products described above are for the environmental data used to support the modeling work in this activity. The development of these products is not duplicative of the other remote sensing activities included in this claim (i.e., shoreline mapping, sargassum mapping) or in the DOI claim. Though several of the datasets used are similar, the specific images processed for each activity are different, and when select imagery may be used in more than one analysis, those costs are only included in one portion of the claim. The surface oil analysis integrates pathway and exposure information across open water, nearshore, and shoreline resources and habitats. This information will be used to quantify snapshots of observed floating oil and can be compared to model-based fate and transport. And because these products cover both the offshore and nearshore environment, they will provide important data for use in several other TWGs' assessment activities.

Sample/Data Handling

Sample analysis is expected to be complete by the end of 2013; however some continued support is required in 2014 in order to maintain, update, and manage the large volume of data, and to develop outputs from the various modeling activities.

Data management activities are required to manage, statistically analyze, and map these data. Samples and associated data acquired through cooperative work plans were collected through methods defined in joint signed protocols. These samples have been analyzed and the data are being tracked, organized, and QA/QC'd by NOAA. These data, along with associated documentation such as validation reports, are maintained by NOAA's data management team and will be distributed to Trustee representatives through NRDA and cooperative databases.

Remote sensing products for environmental data are downloaded and documented with the data source and other metadata. QA/QC protocols used in developing the remote sensing products will be fully documented.

The effort related to the oil on water analysis will rely exclusively on data collected from a variety of remote sensing platforms engaged in the Deepwater Horizon Response and NRDA activities. These data will be re-processed and re-analyzed to support pathway and exposure assessment.

Data and information retrieved from published literature are recorded in a database which undergoes NOAA QA/QC protocols.

Data/Deliverables Produced

Output of transport and fate modeling includes estimates of the water volume and surface water contaminated and the degree of contamination. These results will be in geographic information system format, as well as tabular summaries. Information on the degree of contamination is then related back to established thresholds for assessing injury, such as water quality criteria and other standards.

A technical data report will be generated from the oil and chemical transport and fate modeling, and the report will contain graphics and summaries of mass distribution and concentrations of oil components floating and in the water column in space and time; mass loading to sediments and shorelines over time; and mass loss to degradation and volatilization. Additional products include videos that track transport and fate through time so that mass distributions can more easily be visualized.

The environmental data products for the surface oil analysis will be those downloaded from government servers and compiled for easy access and use within noaanrda.org/ERMA.

The surface oil related products include:

- Re-processed and re-analyzed SAR data for 82 image days,
- Thickness and volume estimates for approximately 45 image days,
- Cumulative oiling extent from all SAR data footprints (maximum, total coverage area),
- Cumulative oiling index

In addition, a technical data report will be developed that summarizes the results of the remote sensing analyses.

Level of Effort

Our request for the oil fate modeling and comparisons with observational data activity is $2,975,364 in contract fund including the remote sensing products supporting modeling task. These costs include 1.8 agency FTEs and 7.0 contract equivalents.

One agency scientist will oversee all of the contractors working on the various aspects of the modeling. Since NOAA is leading the offshore portion of the assessment, additional agency scientists will continue

to focus on co-Trustee coordination in 2014, and develop and review the deliverables described above. The contractors assisting NOAA are all experienced with NRDA and are senior engineers, modelers, remote sensing scientists, and physical oceanographers.

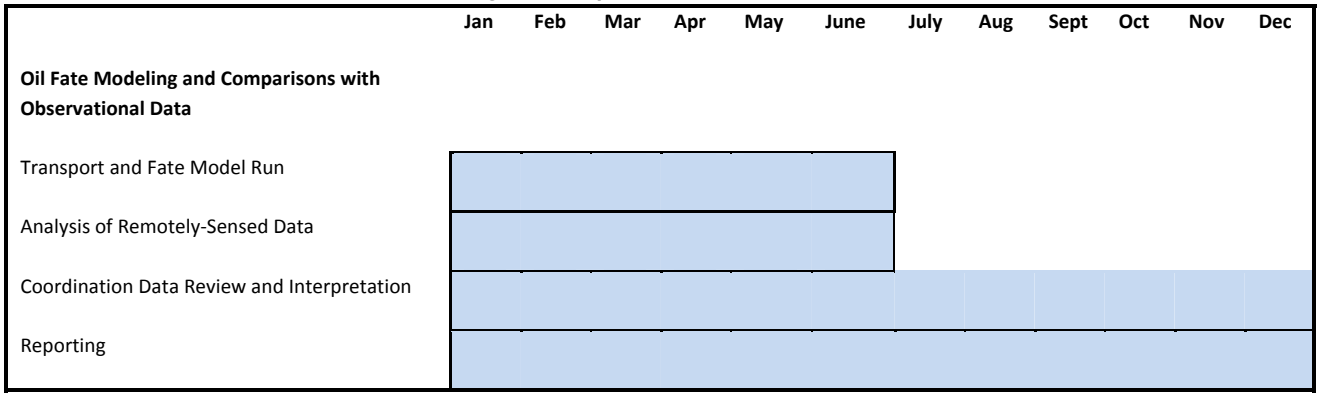
The activity in 2014 will continue and follow-up on work ongoing in 2013. The budget for this activity includes managing input datasets, modeling of oil transport and fate, review of model output, and integration with other components of the assessment. Multiple model runs will be conducted for sensitivity analysis and calibration to observational data and to refine the modeling to best characterize the transport and oil fate. This activity will require considerable effort for documentation of model inputs and algorithms, evaluation and comparison to extensive observational datasets and sample results, description of the outputs, and dissemination of results to other TWGs.

PIs (NOAA and other)

The PI for this activity is Deborah French McCay (RPS-ASA). Other investigators include Malcolm Spaulding (ASA), Yong Kim (ASA), Matthew Horn (ASA), Jamie Holmes (Stratus), George Graettinger (NOAA), Dr. Oscar Garcia-Pineda and Dr. Ian MacDonald, (FSU), Dr. Frank Muller-Karger and Dr. Chuanmin Hu (USF), and Jan Svejkovsky (OI).

Timetable

Timetable for Oil Fate Modeling and Comparisons with Observational Data Tasks in 2014



Some of the modeling efforts that were projected to be completed in 2013 will be performed in 2014 owing to longer-than-expected time required to negotiate protocols (for example, for the CTD data processing) and develop necessary input datasets for oil transport and fates modeling (such as the hydrodynamics modeling needed). Thus the timelines provided for 2013 have been updated here, and projected through 2014. Due to the complex nature of ongoing cooperative assessment activities, formal and informal reporting will occur throughout 2014.

Task	Approximate Percentage of Total Contract Cost	% Complete (start of Claim period)	% Complete (end of Claim period)	Approximate Timing of Task (2014)
Run model for transport and fate quantification	25	80	100	Jan-Aug
Analyses of remotely-sensed data	40	50	95	Jan - Jun
Coordination co-Trustee data review and interpretation	50	10	100	Jan – Dec
Reporting	25	80	100	Jan – Dec

For the remote sensing task, the work in 2014 will continue and follow-up on work begun in 2011 and underway in 2012 and 2013. Most of the effort is expected to be completed by the end of 2013, but reviews and updates may continue after December of 2013. Due to the complex nature of ongoing cooperative assessment activities, potential for settlement, and need to prepare for litigation, formal and informal reporting will occur throughout 2013.

Task	Approximate Percentage of Total Contract Cost	% Complete (start of Claim period)	% Complete (end of Claim period)	Approximate Timing of Task (2013)
Analyses of remotely-sensed data	40	50	95	Jan - Jun
Coordination co-Trustee data review and interpretation	10	10	90	Jan – Dec
Reporting	50	10	95	Jan – Dec

RP Involvement

This is not a cooperative study with BP.

Hydrodynamic Modeling

NOAA is using hydrodynamic modeling to evaluate currents in three-dimensional space and over time. Hydrodynamic models use winds and other environmental data as inputs, and established methods and equations based on physical laws to compute the currents and related information. Specifically, the model inputs include: wind stress and direction at water surface and over time; radiation (heat); river inflows over time; model boundary conditions such as tides; calibration data, such as Acoustic Doppler Current Profilers (ADCPs), sea surface height, and sea surface temperature; and verification data such as additional ADCPs, drifters, and documentation of transport of materials.

NOAA has employed the ROMS models SABGOM and IASROMS to provide hindcasts of the currents in the Gulf of Mexico in 2010. These models are well-established and supported by both government agencies and industry for application to the Gulf of Mexico. In Phase 1 of the hydrodynamic modeling

effort in 2011, the SABGOM hindcast was run without adding calibration to ADCP measurement data of currents and other so-called assimilated data. In Phase 2, performed in 2012, the expanded ROMS grid of IASROMS was used to hindcast 2010 and include data assimilation (i.e., calibration) to ADCPs, temperature and salinity datasets, and estimates of sea surface height based on satellite imagery that is supplied by an international consortium of governments (i.e., the 1/4 degree global product produced by AVISO (http://www.aviso.oceanobs.com/en/data/products/sea-surface-height-products/global/index.html), a public source). Also in 2012, NOAA NOS prepared and provided an updated hindcast for 2010 using its NGOM and NGOFS models, which assimilate temperature and salinity datasets, and estimates of sea surface height in order to calibrate the model results. NOAA continued to evaluate the results of these hindcasts against measurement data in 2013.

In addition, NOAA is evaluating the ADCIRC model that has been successfully applied to the Gulf of Mexico previously to evaluate the currents and storm surges related to Hurricanes Katrina and Rita. The ADCIRC grid and model inputs were updated in 2010 under National Science Foundation funding for application to the Deepwater Horizon spill.

In 2012 and 2013 NOAA performed several assessment tasks related to hydrodynamic modeling. Draft hydrodynamic model simulations will be largely completed by December 2013. Evaluation and refinement of hydrodynamic models will be completed in 2013, along with documentation of the work. Additionally, work will continue on integration of offshore and shelf hydrodynamics. Tasks completed in 2012 and 2013 include:

- Compiling and interpreting in-situ and remotely sensed oceanographic data; and
- Developing hydrodynamic models including model comparisons with in-situ data.

Task to be completed in 2014 include review of the different hydrodynamic models, and integration with other components of the assessment.

The activity also includes compilation of documentation and records related to the activity.

Connection to NRDA Process

Hindcasting of the circulation patterns present in the northern Gulf of Mexico throughout the study period will enhance NOAA's ability to establish, document, quantify, understand, and communicate the pathway for contaminants and the resulting exposure to natural resources in the region. These hydrodynamic results will provide insights into the physical state of the environment during the study period and the major processes involved in contaminant transport and fate, as well as for interpreting the results of field operations. These results will also have direct linkages to other Technical Working Groups such as Marine Mammals, Turtles, Shoreline, and Deepwater Communities.

Sample/Data Handling

Environmental and current data originally maintained and distributed by NOAA and data retrieved from published literature and ongoing federally-funded studies are being maintained under strict QA/QC

management plans. Outside sources of data have been used with author's permission. All original data have been pre-processed and QC administered by NOAA in coordination with the originating entity.

Data management activities are required to manage, statistically analyze, and map these data. Samples and associated data acquired through cooperative work plans were collected through methods defined in joint signed protocols. These samples have been analyzed and the data are being tracked, organized, and QA/QC'd by NOAA. These data, along with associated documentation such as validation reports, are maintained by NOAA's data management team and will be distributed to Trustee representatives through NRDA and cooperative databases.

Data/Deliverables Produced

The hydrodynamic modeling efforts produce current data (u,v,w components of current vectors), spatially- and time- varying for entire oil model domain and from April to September of 2010 (or potentially longer and into 2011). Data will be provided as a circulation model hindcast in NetCDF (Network Common Data Form). Technical data reports documenting methodology and hydrodynamic model comparisons with in-situ data will be finalized in 2014 when a final hydrodynamic model, or suite of models, is complete.

Level of Effort

Our request for the hydrodynamic modeling activity is $1,414,703 in contract funds. These costs include 1.2 agency FTEs and 3.4 contract equivalents. Key personnel include the PIs and their staff.

One agency scientist will oversee all of the contractors working on the various aspects of the hydrodynamic modeling. Since NOAA is leading the offshore portion of the assessment, additional agency scientists will be focusing on co-Trustee coordination throughout 2014 and creating and reviewing the deliverables described above, which will be generated by the end of 2013, reviewed and finalized in 2014.

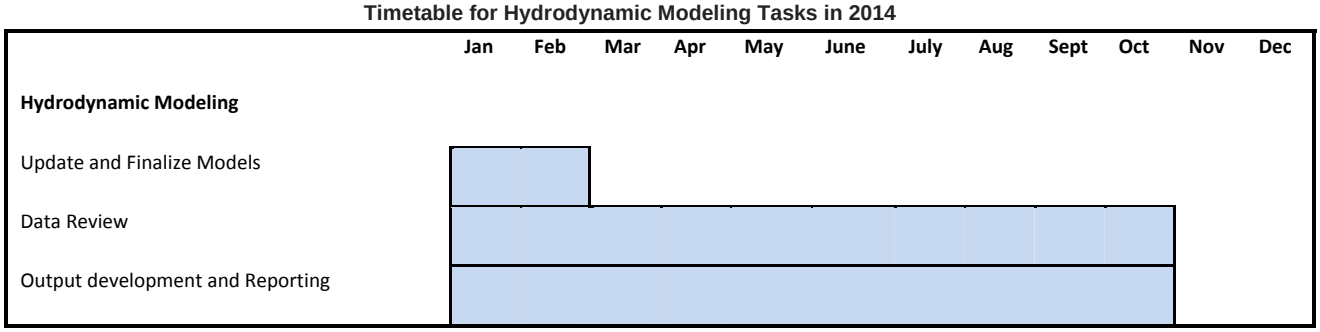
The types of contractors assisting NOAA are all experienced with NRDA and are senior engineers, modelers, and physical oceanographers.

This activity includes refinement of hydrodynamic modeling of currents, model updates, review, model output development, and reporting.

PIs (NOAA and other)

The PIs for this activity include John Quinlan (NOAA), as well as Deborah French McCay, Malcolm Spaulding, and Yong Kim, all of RPS-ASA, who are coordinating with hydrodynamic modelers and evaluating the results as compared with observational datasets.

Timetable



The hydrodynamic modeling work in 2014 will continue and follow-up on work underway in 2013. Due to the complex nature of ongoing cooperative assessment activities, formal and informal reporting will occur throughout 2013.

Task	Approximate Percentage of Total Contract Cost	% Complete (start of Claim period)	% Complete (end of Claim period)	Approximate Timing of Task (2014)
Update and finalize hydrodynamic models with all relevant ocean data, including calibration of model to field observations.	10	90	100	Jan - Feb
Review	40	50	100	Jan – Oct
Reporting	50	50	100	Jan – Oct

RP Involvement

NOAA has met with the RP several times to discuss hydrodynamic modeling. However, different timeframes for delivery of hydrodynamic models have led to less interaction with the RP on hydrodynamics than previously anticipated, and the overall effort has not been pursued cooperatively. In 2013, the Trustees and the RP are planning to continue holding meetings and discussions on data inputs to modeling components.

Exposure and Injury Modeling and Data Inputs

NOAA will use oil exposure and biological effects modeling (an updated set of models based on SIMAP, described in French McCay, 2002, 2009) to evaluate and quantify water column injuries resulting from oil hydrocarbons and chemicals introduced into the water column during the Deepwater Horizon Oil Spill. Modeling includes several components related to water column biota. First, the oil distributions, degree of weathering, and concentrations produced by the oil fate modeling described above is evaluated to determine the exposure history of various types of water column biota. This involves consideration of the distributions and behavior of the organisms. In the exposure model, Lagrangian Elements are used to

track the movements and exposure history (time history of oil component concentrations experienced) of each organism behavior type defined in the inputs to the model. Biota are simulated as stationary, planktonic, or swimming under their volition with a variety of behavior patterns and habitats used. The results are summarized as water volumes exposed to varying degrees to each of the hydrocarbon components by each of the behavior categories.

Toxicity modeling is being used to evaluate the effects of these exposures to dissolved and whole oil constituents. The SIMAP toxicity model described in French McCay (2002) provides a basis for the acute toxicity modeling being employed. The toxicity model is being updated with information being developed by the Trustees.

To support these models, NOAA and the Trustees have performed extensive literature and data reviews involving evaluation of horizontal and vertical distributions, behavior and movements, densities, life histories, growth rates and natural and fishing mortalities. The organisms considered include plankton, early life history stages (eggs and larvae) of fish and invertebrates (e.g., decapods), and juvenile and adult fish and invertebrates in deep offshore, surface offshore, and continental shelf waters. As the life stages and size classes of fish and invertebrates within a species occupy different habitats and parts of the water column as well as show various behavior patterns, there are numerous species to be considered, and the literature and available databases are diverse and disparate in approaches and analyses; compiling, quantifying and formatting these datasets for use in the modeling was an extremely resource intensive task. A variety of statistical techniques were examined to develop densities for model input. The Trustees also reviewed information from NMFS stock assessments, and data from field studies. NOAA undertook a number of studies and data compilation activities to define an extensive set of the organisms present to the biological abundances in the affected region. Numerous updates to existing biological databases were necessary and included the assimilation of biological information collected on cruises. The sample processing effort for this activity is included in the Fish and Plankton activity and those data products will be incorporated into the modeling activities described here.

Approximately thirty cooperative work plans were primarily designed to collect biological abundance and distribution data for plankton and/or small pelagic fish and invertebrates. These samples require sorting and identification, and a network of labs are currently working up the samples. Data is being compiled, evaluated for QA/QC, statistically analyzed, and integrated into the biological distribution and abundance maps for use in injury modeling and direct comparison with historical datasets. The sample processing effort for this activity is included in the Fish and Plankton activity, and those data products will be incorporated into the modeling activities described here.

In 2012 and 2013, NOAA addressed several major injury assessment tasks related to offshore fish and water column biota, including:

- Completion of literature reviews and analysis of historically-collected data;
- Updated biological databases with evidence that will be processed in labs through fall 2012;
- Defined the spatial and temporal trends in distribution and abundance of biological resources in deep water and surface waters; and

- Updated exposure algorithms, effects thresholds, and toxicity models in the biological effects model in SIMAP.

In 2014, NOAA will continue work on the following tasks related to exposure and injury modeling:

- Integrating NRDA toxicity studies as they become available throughout 2013 and into 2014; and
- Refining exposure and injury modeling using the most complete physical, chemical, biological and toxicological information available.

Biological databases from the Southeast Area Monitoring and Assessment Program (SEAMAP; a state/federal/university program for collection, management and dissemination of fishery-independent data and information in the southeastern United States) and published literature were reviewed and extensively analyzed to develop inputs for the biological effects modeling. As described in the Fish and Plankton activity, the SEAMAP datasets include bongo (0-200m) and neuston (surface ~0.5meter) samples of ichthyoplankton and other plankton, fish trawls, and longline catch statistics, as well as associated size and weight information and analyses in published reports. The stock assessments for fisheries and other species contain considerable information, but involve complex quantitative analyses, modeling, and interpretations that required Trustee review. The effort to analyze and utilize this information was completed in 2013.These analyses are being used to develop baseline densities of fish (adult, juvenile, and ichthyoplankton), invertebrates, and other to be spatiotemporally resolved resulting in baseline density maps used to inform injury modeling. Additional analysis of SEAMAP databases, published literature, and data from cooperative studies allow integration of horizontal and vertical distributions of water column biota into the injury modeling effort.

Published literature documentation, results of towed image analysis systems that are used to identify and count plankton, analyses of biota filmed in video taken on ROVs deployed deep in offshore waters, data from multiple opening and closing net samples that sample individual depth strata, counts and identifications of fish and invertebrates taken in mid-water trawls, analysis of acoustics identifying aggregations of fish and invertebrates at specific depths, and technical expertise are being used to determine depth distributions, behavior, and movements of water column biota. The datasets and associated analyses are described in the Fish and Plankton activity. These collected data, as well as biota density models and general biological information regarding water column biota, are being incorporated into various components of the injury modeling effort to quantify exposure of biota to floating and water column oil and hydrocarbons, which will allow for injury quantification modeling and estimation of direct losses from hydrocarbon exposures.

To more accurately quantify injury to water column biota, oil toxicity modeling will continue to be refined in 2014 as more data become available. The Trustees are performing extensive toxicity testing under a separate activity, and results are still being developed. The toxicity model has been updated in 2012 and 2013 with previously-available information, and revised in 2014 to reflect the findings of the toxicity testing.

The potential phototoxic effects of exposure to UV light following aromatics exposure is also being considered in the modeling effort. Specifically, suspended particle and UV light exposure data will be

mapped and analyzed. These analyses will be incorporated into the model in order to more accurately describe injury.

Life histories, growth rates, and mortality rates of water column biota are being developed from published literature, stock assessment analyses, technical reports, and newly-collected NRDA datasets for model input. These model inputs are important for analyzing how long the biota directly injured would have otherwise lived, and what production (growth) they would have undergone, had there not been a spill.

The activity also includes compilation of documentation and records related to the activity.

Connection to NRDA Process

The objective of this activity is to quantify injuries to water column biota resulting from the Incident. NOAA has developed baseline density estimates both to evaluate organisms exposed and as inputs to the modeling used for quantification of injuries from direct exposures. The injury modeling utilizes information developed from toxicity studies, both as part of the NRDA, and also from the literature.

The effort under these modeling activities will support analyses by other TWGs. Water column biota are the prey base for marine mammals, sea turtles, and birds, and so the activities described support the assessment of injuries via the prey base for high trophic-level vertebrates. Modeling will provide quantification of exposures for fish, invertebrates, aquatic plants, and higher trophic level vertebrates. Injury quantification of fish, invertebrates, and aquatic plants exposed may be used by other TWGs in their evaluations of injuries via the food web or other ecosystem-level effects.

Sample/Data Handling

Biological data include information on species location and catch numbers from various gear type collections. These data are originally maintained and distributed by NOAA, the Gulf States Marine Fisheries Commission, state agencies, and academic institutions. Data have also been retrieved from published literature to inform biota densities and have been used with author's permission. All original data have been pre-processed and QC administered by NOAA in coordination with the originating entity.

Data management activities are required to manage, statistically analyze, and map these data. Samples and associated data acquired through cooperative work plans were collected through methods defined in joint signed protocols. These samples have been analyzed and the data are being tracked, organized, and QA/QC'd by NOAA. These data, along with associated documentation such as validation reports, are maintained by NOAA's data management team and will be distributed to Trustee representatives through NRDA and cooperative databases.

Biological information regarding behavior and movements and life history of water column biota were retrieved from published literature and recorded in a database which undergoes NOAA QA/QC protocols.

Data/Deliverables Produced

The biological exposure and effects modeling will estimate for water column biota:

- Exposures (e.g., concentrations experienced over time) to dissolved and whole-oil hydrocarbons for each behavior group modeled (e.g., deepwater mesopelagic, pelagic, demersal, and planktonic);
- Exposures for each of the species/life stage groups modeled (e.g., the various species and life stages considered are assigned a behavior to evaluate their exposure);
- Toxic effects in exposed water volumes for each species/life stage group modeled;
- Numbers and biomass of organisms directly injured (by species and life stage); and
- Future lost production.

A technical data report summarizing injury modeling results will also be produced.

Level of Effort

Our request for the exposure and injury modeling and data inputs activity is $1,653,583 in contract funds. The request includes 1.5 agency FTEs and 3.9 contract equivalents. Key personnel include statisticians and ASA staff.

One agency scientist will continue to oversee all of the contractors working on the various aspects of the modeling, including quantifying injuries using information from the toxicity investigations. Another scientist is focused on the statistical analysis of biological information obtained from all of the offshore sampling cruises conducted in 2010 and 2011, and in particular the trends of field-collected information compared to baseline. Since NOAA is leading the offshore portion of the assessment, additional agency scientists will be focusing on co-Trustee coordination throughout 2013 and creating and reviewing relevant deliverables.

By the end of 2012, a draft report summarizing injury modeling results, using the best available inputs at the time, was generated. These results and the draft technical data report were updated in 2013 as additional data become available.

The following efforts in this activity were completed in 2013:

- Updated biological datasets (ichthyoplankton, other plankton, and mesopelagic, deepwater demersal, offshore pelagic, shelf and shelf demersal fish and invertebrates) for model inputs with results from samples that were being processed in labs through 2013; and
- Defining the spatial and temporal trends in distribution and abundance of biological resources with statistical and other approaches.

The following efforts are expected to continue into 2014:

- Continued integration of biological data as remaining samples are processed in labs into 2014 (see Fish and Plankton below);
- Integrating NRDA toxicity studies as they become available in 2014;

- Refining injury model runs using the most complete physical, chemical, biological, and toxicological information available;
- Technical reviews and refinements of the input data and modeling; and
- Documentation and reporting.

The contractors assisting NOAA are all experienced with NRDA and are senior engineers, ecological modelers, statisticians, oceanographers, biologists, fisheries scientists, and toxicologists.

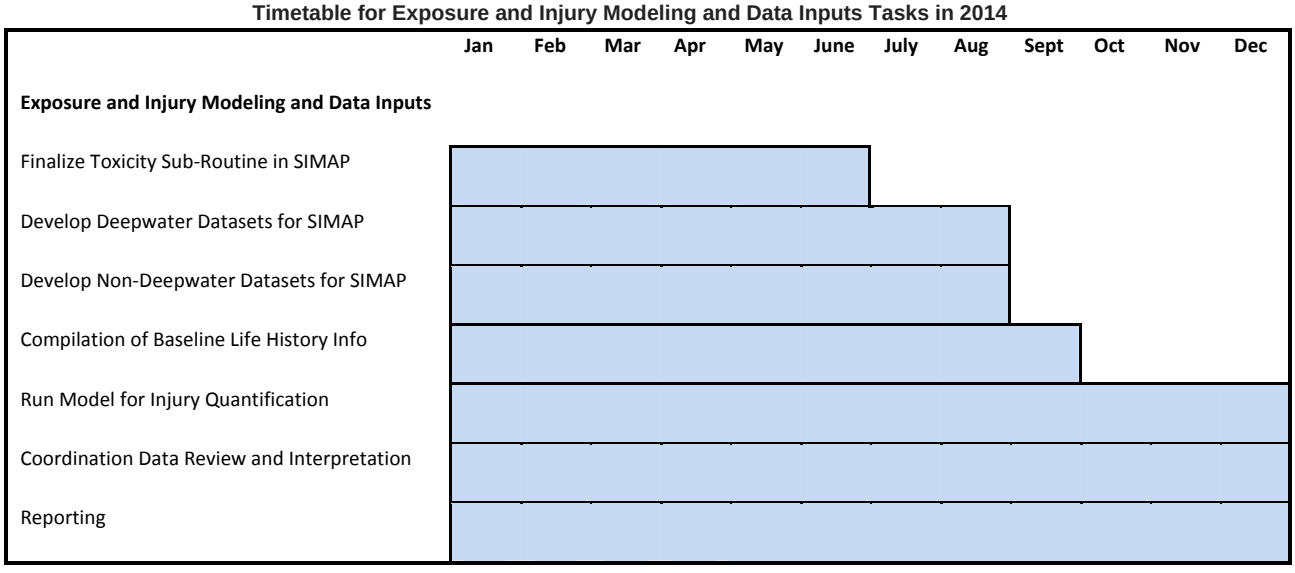
The budget for this activity includes ongoing support to manage and update biological datasets for plankton, fish, and invertebrates offshore (deep and surface waters), on the shelf and nearshore, as well as modeling of exposure, toxicity, and injuries. The work in 2014 will continue and follow-up on work underway in 2013. Biological and toxicological data continue to be developed and will become available late in 2013 and throughout 2014. The activity will involve analysis of the data to prepare needed model inputs, model updates as these data are analyzed, evaluation of the results, comparison to observations and evidence of injuries, and technical reviews, as well as documentation, reporting, and coordination with other Trustees. The proposed budget includes support for detailed technical reviews, updates of these analyses, and finalizing reports.

PIs (NOAA and other)

The PI for this activity is Deborah French McCay of RPS-ASA. Marine biologists at RPS-ASA who are leading tasks for this effort are Jill Rowe, Melanie Schroeder, and Eileen Graham.

Timetable

Timetable for Exposure and Injury Modeling and Data Inputs Tasks in 2014



Some of the modeling efforts that were projected to be completed in 2013 will continue into 2014 owing to longer-than-expected time required to develop necessary input datasets for biological effects modeling

(such as biological density data from samples, trawls and image-processing) and the oil fate modeling (such as the hydrodynamics modeling) that is used for the biological effects calculations. Some datasets will not be ready until late 2013, and additional sample processing data will continue to become available in 2014 (see Fish and Plankton below). Toxicity studies are expected to continue through 2013 and 2014, and results will be incorporated into the modeling as these become available. Thus the timelines previously provided have been updated here, and projected through 2014. Due to the complex nature of ongoing cooperative assessment activities, formal and informal reporting will occur throughout 2014. This effort is expected to be completed by the end of 2014.

Task	Approximate Percentage of Total 2013 Contract Cost	% Complete (start of Claim period)	% Complete (end of Claim period)	Approximate Timing of Task (2014)
Finalize compilation, statistical evaluation, and integration of biological datasets for input to SIMAP	10	80	100	Jan - Sept
Run model for injury quantification	25	70	100	Jan - Oct
Coordination co-Trustee data review and interpretation	40	40	100	Jan – Nov
Reporting	25	70	95	Jan – Dec

RP Involvement

The RP has been involved in the development of numerous work plans including biological sampling cruises and work-up of samples. The RP had representatives in the field for most data collection efforts, and the RP's representatives participate in several of the biological processing plans by either providing scientists for identification of animals or by providing input on QA/QC among NOAA contracted labs. NOAA holds regular calls with the RP to discuss water column work plans.

Analysis and interpretation of the data, as well as biological effects modeling, have not been conducted cooperatively with the RP.

D. Fish and Plankton

Introduction and Background

The 2010 Deepwater Horizon Incident resulted in an unprecedented release of contaminants into U.S. waters with respect to both duration and spatial scope. The NRDA has been investigating the full range of environments from 1,500 meters below the ocean surface to the shoreline and across nearly 700 kilometers of the northern Gulf of Mexico. Direct mortality has been observed across a number of trophic levels, and shifts in ecological community structure and function have occurred. It is clear that the

Deepwater Horizon Incident resulted in substantial impacts, and the NRDA continues to evaluate the extent and severity of this injury.

The NRDA Water Column TWG has been focused on assessing injury associated with the Deepwater Horizon Incident to the natural resources present in the water column. The approach taken by the Water Column TWG was to examine potential injury across a number of trophic levels ranging from primary producers to top-level predators. Based on the expected sensitivity of the early life stages of fishes and invertebrates to hydrocarbons, significant effort was placed on collecting data regarding the distribution and abundance of these life stages. Additionally, extant sampling programs (SEAMAP) largely fielded in support of fisheries management, were reviewed and found to be useful, however needing augmentation to supply adequate information for assessing injury to mesopelagic and epipelagic organisms. The extensive field program developed by the TWG collected ephemeral data for a significant component of the northern Gulf of Mexico ecosystem, helping to address gaps in available data and provide high-resolution information across seasons. In combination with the historical datasets, this information was collected in order to meet a set of specific objectives as described below.

An extensive compilation of pre-spill 'historical' data characterizing the physics, chemistry, biota, and ecology of the northern Gulf of Mexico was developed by the TWG. These data drew from a variety of information sources including previous Minerals Management Service field programs, NMFS living marine resource surveys, laboratory studies, stock assessments, data collections by state agencies and academics, NOAA/NASA remote sensing, and the scientific literature. Some of these data collections extend back several decades. These data are used to characterize baseline conditions, systematic changes, and the magnitude of variability of biological, physical, and chemical conditions in the northern Gulf of Mexico.

The 2010 – 2011 water column biological field program was comprised of over 42 oceanographic cruises and supported by an array of scientific expertise (biology, ecology, toxicology, physics, engineering, computer science, remote sensing, oceanography, numerical modeling, etc.) using a variety of sampling platforms (ships, towed instruments packages, profiling instruments, remotely operated underwater vehicles (ROVs), aircraft, and satellites). This field program specifically targeted the collection of phytoplankton, microzooplankton, zooplankton, ichthyoplankton, juvenile fishes and invertebrates, adult fishes and invertebrates, mesopelagic organisms, and epipelagic organisms (i.e., collections across multiple trophic levels and biomes). In addition to net-based biological samples, the field program collected an enormous amount of electronic data using holographic cameras, video cameras, line scan cameras, LIDAR, and acoustic-based sensors. The sheer size of the electronic data collection program is exemplified by the fact that collections for one of the line scan cameras produced about 80 terabytes of raw data during three fourteen day cruises. Analysis of that data was completed in 2013, yielding a library of 35 million classified images of plankton and other particles observed in the water column near the wellhead during, and immediate following the spill.

The TWG's physical/chemical oceanographic program (described in detail in the Transport, Fate and Effects section of the claim) was largely conducted concurrently with the biological program and collected physical and chemical information such as temperature, salinity, fluorescence, dissolved oxygen, methane concentration, PAH concentration, etc. This program also deployed ROVs and ADCPs as well as drifters or drogues to provide additional information on oceanographic circulation patterns in

the study area. These data are critical for defining the physical and environmental conditions present in the northern Gulf during and subsequent to the Incident and for analyzing the spatial and temporal distribution of the associated biological community.

The information sources described above were collected and compiled to support four fundamental objectives for the NRDA:

- First, historical data are being used to characterize the baseline conditions and variability of the ecosystem of the northern Gulf of Mexico. This objective will help the TWG gauge whether or not 2010 and 2011 were anomalous given observations from previous years. It will also help the TWG to better understand the distribution, dynamics and properties of water masses, river discharge, species-habitat associations, and ecological community structure.

- Second, these data provide valuable evidence on the pathway of DWH contaminants from release to injury. This will provide empirical evidence in support of the NRDA. Field observations collected during and after the Incident will be used to provide a description of the temporal and spatial dynamics of discharged oil as the event unfolded.

- Third, these data sources will allow the NRDA to assess the impact of the spill on the biota and chemistry of the northern Gulf of Mexico. DWH event-related data will be directly contrasted with data collected from other periods of time to provide a statistically rigorous evaluation of the DWH Incident's impacts on the ecosystem and its natural resources.

- Fourth, all of this information is being used to support numerical modeling studies which will aid the description of the magnitude of the injury resulting from the DWH Incident. These modeling studies, described previously, help synthesize, or pull together, this vast collection of data and will allow scientists, the legal teams, and the general public to better understand and gauge the damage caused by the release of discharged oil into the Gulf of Mexico in 2010.

The work associated with collecting, processing and analyzing the data necessary to evaluate the scope and scale of injury to natural resources in the water column has consumed the scientific capacity of the region with regard to skilled personnel and laboratory facilities. For instance, processing biological samples (more than 7000 individual plankton samples were collected) involve approximately ten different sorting and identification laboratories and approximately 70 agency and contract staff. Two additional labs were added in 2013 to help expand sample sorting capacity. More additional capacity is required to speed completion of the sorting and identification of all samples.

Evaluation of Historical Biological Data and Analysis of Field Data from 2010-2011

Historical Biological Data – During the past 30 years, NMFS and state partners working in the northern Gulf of Mexico have developed a variety of specialized, multispecies, fishery-independent living marine resource surveys using either a stratified random or fixed grid systematic survey designs. Sampling gear employed (ranging from bongo nets to longlines) depends on the target species and the habitat expected. Additionally, because each survey was initiated at a different time and is conducted at fixed times of the year, the spatial and temporal coverage is survey-specific. These surveys are now organized under the Southeast Area Monitoring and Assessment Program (SEAMAP) and are conducted to supply data to support fisheries stock assessments; however, SEAMAP is also a primary source of baseline information for the NRDA investigation.

Data collected under the auspices of SEAMAP include information from extensive plankton, shrimp/groundfish, mesopelagic (high opening bottom trawl), and longline surveys. These surveys also collect information on environmental parameters such as temperature and salinity. Because this information was collected for supporting fisheries stock assessments, it was generally not prepared in a manner intended to address NRDA needs. The NRDA evaluates injuries to all components of the ecosystem which includes organisms that were collected by SEAMAP but not evaluated in detail (for example, the plankton database alone consisted of several gigabytes of data on hundreds of different taxa collected from thousands of individual samples, over the course of eleven years). NOAA has made significant progress examining the SEAMAP plankton data in 2013. No additional work is required in 2014 beyond the ongoing data analysis, review, and coordination associated with the Model activities.

Analyses of these data fall into the general framework of statistical analyses/modeling, and the applications fall into direct assessment of injury and oil transport and fate modeling. To determine the magnitude of injury requires detailed information on the spatial and temporal abundance of organisms in the impacted area. These supporting data will be largely derived from SEAMAP data with augmentation from Incident-related data. Direct evaluation of the injury will be derived from both the historical data described here and from the Incident-related data to be described below. Both of these applications will rest on sophisticated and rigorously reviewed statistical modeling currently under development by the Trustees. This work will be described in the Analysis section below.

Overview of data availability for various 'ecosystem components from historical standard sampling (SEAMAP) and sampling conducted as part of the NRDA investigation into the Deepwater Horizon Incident.

Ecosystem Component	***SEAMAP***	***Incident-Related***
Biovolume	X	X
Phytoplankton		X
Microzooplankton		X
Zooplankton		X
Ichthyoplankton	X	X
Juvenile Fishes and Invertebrates	X	X
Adult Fishes and Invertebrates	X	X
Epipelagic Community		X
Mesopelagic Community		X

Overview of SEAMAP historical sampling programs for the northern Gulf of Mexico and their approximate years of operation.

Survey Program	***Years of Operation***
Plankton Sampling	1977-present
Shrimp/Juvenile Groundfish	1982-present
Reef Fish	1996-present
Bottom Longline	1995-present
Shark Longline	1995-present
Small Pelagics Deepwater	2002-present

Analysis of Field Data from 2010-2011 - This activity encompasses the completion of the processing of field data collected during the 2010-2011 field programs. Significant progress on sample processing has been made in 2013. Details of the number of samples processed, and number of samples remaining are detailed below to highlight the need for ongoing support. Completion of the sample processing described in the section below is important for the assessment of exposure and injury of the water column biota as a result of the spill. The data produced will be compared with historical information described above, analyzed spatially and temporally, and used as input for the Transport, Fate, and Effects Modeling activity.

Plankton Sample Processing

The purpose of the plankton sample processing plan is to establish a protocol for the analysis of plankton samples collected during the Deepwater Horizon NRDA. Over 7000 plankton samples were collected during the 2010-2011 field activities. Data products from sample processing include taxonomic identifications, biomass measurements, counts, and length/width measurements of each component of the plankton samples. The purpose of the first two amendments to the plankton sample processing plan was to bring on additional laboratory capacity compared to that outlined in the original plan. Based on current laboratory capacity and rates of sample completion, approximately half of the total number of samples collected will be complete by the end of 2013. If current sample processing capacity is maintained, processing could be complete by the beginning of 2015, if not by the end of 2014.

Fish and Invertebrate Trawl and Net Sample Processing

This activity encompasses the continuation of the processing of fish and nekton samples collected during the 2010-2011 field programs. This is a continuation of a processing plan that was signed by BP, the nekton sample processing plan, and its amendment which increased the sample processing capacity by adding an additional laboratory. Based on current laboratory capacity and rates of sample completion, approximately half of the total number of samples collected will be complete by the end of 2013. If current sample processing capacity is maintained, processing could be complete by the beginning of 2015, if not by the end of 2014.

Image Analysis Processing

This activity encompasses the effort to analyze the imaging data collected in situ on a series of cruises during 2010-2011. Each of the PIs will have completed the data processing, documentation, and technical data reports by the end of 2013. No additional support is requested for 2014.

Production and Energy Flow Analyses

During a number of cruises (e.g., *American Diver* 1 and 3, *Walton Smith* 1, 3, 4 and *Nick Skansi* 8) conducted to investigate the biological communities of the Gulf of Mexico, chlorophyll and phytoplankton/microzooplankton samples were collected alongside other plankton samples. Sample processing work plans have not been developed, and therefore this work has not yet been pursued. Funds were requested for this work in 2013. No additional support in 2014 is requested.

Mesopelagic Megafauna Sample Processing

The Mesopelagic Megafauna plan is a BP-led plan for analysis of video and still image data collected during two cooperative cruises for data that could be used to estimate the abundances of: (1) macroplanktonic, megaplanktonic, and micronektonic organisms in the water column between 150 m and

the seafloor; and (2) benthic/demersal megafauna at the sea floor. NOAA will provide the expertise of four PIs to provide review and quality assurance of the data produced from this work. Funds were requested for this work in 2013. No additional support in 2014 is requested.

The activity also includes compilation of documentation and records related to the activity.

Connection to NRDA Process

The plankton and the fish and invertebrate sample processing activities cover the continued processing of samples and data collected under cooperative field programs. Due to the volume of samples and data collected during 2010-2011, not everything has been processed. As such, this activity accounts for the samples and data that will not have been processed by the end of 2013. The data produced from this activity will expand the NRDA-collected dataset and allow for further injury quantification-related analyses as discussed in the Transport, Fate, and Effects Modeling activity above.

The complete processing of field data collected 2010-2011 will support analyses in progress by the Water Column TWG and several other TWGs. Water column biota are the prey base for marine mammals, sea turtles, and birds, and so these analyses support the assessment of injuries via the prey base for high trophic-level vertebrates.

Sample/Data Handling

Sample and data handling for the plankton and the fish and invertebrate sample processing activity will continue to utilize the existing protocols currently in place. The plankton and nekton plans will require continued logistical support as samples are processed in labs around the country. Upon completion of tasks listed in the work plans, the PIs pass on the processed datasets to NOAA.

Data management activities are required to manage, statistically analyze, and map these data. Samples and associated data acquired through cooperative work plans will be collected through methods defined in joint signed protocols. These samples will be analyzed and the data will be tracked, organized, and QA/QC'd by NOAA. These data, along with associated documentation such as validation reports, are maintained by NOAA's data management team and will be distributed to Trustee representatives through NRDA and cooperative databases.

All samples will be handled according to standard NRDA procedures and protocol, including strict adherence to chain of custody. Data handling will also require the previously developed NRDA systems. It is not envisioned that additional protocols will need to be developed for these activities. All data handling systems developed in 2010-2011 should be able to incorporate this additional information.

Data/Deliverables Produced

Data produced by the plankton processing activity include taxonomic identifications, biomass measurements, counts, and length/width measurements of each component of the samples. Data produced from the fish and invertebrate sample processing activity include specimens identified to family- and species-level. For both the plankton and the fish and invertebrate sample processing the following data reports will be provided: (i) quarterly progress reports, (ii) electronic data reports (prepared upon

completion of family-level identification for all samples from a cruise and upon completion of full taxonomic identifications for all samples from a cruise), and (iii) a final, comprehensive data report with summaries of data generated as part of this plan. At the species level, data products include taxonomic identifications, biomass measurements, counts, and length/width measurements of the nekton samples. At the family level, data products include taxonomic identifications and counts of the nekton samples. The purpose of the first amendment to the nekton sample processing plan is to bring on additional laboratory capacity compared to that outlined in the original plan. This information is delivered to all parties with the field sample information (see descriptions above and the full work plans for further detail on the data that will be produced).

Level of Effort

Our request for the evaluation of historical biological data and analysis of field data from 2010-2011 activity is $2,655,454 in contract funds, which will primarily fund the completion of the nekton sample processing. Some additional support is requested for the other ongoing sample processing programs described above. The request includes 1.2 agency FTEs and 9.7 contract equivalents. The budget requested in 2013 for the plankton processing program was expected to fund the complete processing of all samples remaining as of January 1, 2013. While the plankton processing effort will continue into 2014, no additional funds are requested in 2014 above the original request in 2013. For the nekton program, the budget requested in 2014 is in addition to budget requested in 2013.

For the plankton processing activity, there are over 7,000 samples that are slated for processing under the plankton processing plan. By the end of 2013, roughly 4,300 samples will have been processed leaving approximately 3,500 samples to be processed in 2014. Each sample requires analysis at three taxonomic levels before it is completed processed; the taxonomic analysis for each sample is completed for zooplankton, ichthyoplankton, and decapods. To ensure quality across all participants, five percent of samples are completely reprocessed and resulting information compared. It is estimated that at current laboratory capacity, the remaining 3,500 samples will be processed by the beginning of 2015, if not by the end of 2014. The budget requested in 2013 was for completion of all plankton samples remaining, and assumed an increased capacity to achieve completion in 2013. Though two labs have been added in 2013, this increased capacity was not sufficient to complete sample processing in 2013. As detailed above, no additional funds are requested to continue the plankton processing in 2014, however, as the processing is expected to continue through 2014, support for plankton processing should continue with funds requested in the 2013 budget. Given that the per sample processing cost has not changed, an increase in support is not anticipated above the original budget request to complete sample processing in the 2013 claim.

The samples under the nekton processing plan were collected on eight cruises: four cruises for deepwater fish and nekton (average number of samples: 64), three cruises for micronekton throughout the water column (average number of sample (450), and one cruise for small pelagic species at the surface (sample estimate: 50). It takes roughly four months for the lab to process all the samples from one of the micronekton cruises, and one of the three was completed in 2012. The other two micronekton cruises, and more refined taxonomic identifications for the deepwater fish and nekton was completed in 2013 by the same lab. An additional lab was brought on to process the small pelagic samples, beginning in 2012 and continuing through 2013. At the end of 2013 approximately half of the samples will be processed. Based

on current lab capacity, and sample sorting rates, nekton sample processing should be complete by the end of 2014.

For the analysis of field data from 2010-2011 activity, three agency scientists will oversee all of the contractors working on the various aspects of this activity. Another scientist is focused on the statistical analysis of biological information obtained from all of the offshore sampling cruises conducted in 2010 and 2011, and in particular the trends of field-collected information compared to baseline. Since NOAA is leading the offshore portion of the assessment, additional agency scientists will be focusing on co-Trustee coordination throughout 2014 and creating and reviewing relevant deliverables. The types of contractors assisting NOAA are all experienced with NRDA and are ecological modelers, statisticians, oceanographers, biologists, and toxicologists.

A budget of $300,000 is included in the total budget for completing the processing of samples collected 2010-2011 for shipment of samples between labs during the 2014 claim period. Certain samples undergo different stages of processing at multiple labs requiring that an individual sample be shipped multiple times. Due to the number of samples collected and remaining to be analyzed, the shipping costs are large.

PIs (NOAA and other)

The PIs for the plankton processing plan include Malinda Sutor (LSU), Joanne Lyczkowski-Shultz (NOAA), Trika Girard (NOAA), James Ditty (NOAA), Richard Heard (University of Southern Mississippi, USM), Sara LaCroy (USM), Robert Cowen (University of Miami), Maria Criales (University of Miami), and Carly Knight (NOAA). The PIs for the nekton processing plan include Tracey Sutton (Virginia Institute of Marine Science, VIMS), Jon Moore (Florida Atlantic University, FAU), Tamara Frank (Nova Southeastern University, NSU), Martha Nizinski (NOAA), Michael Vecchione (NOAA), Heather Judkins (USF), Bruce Collette (NOAA), David Wells (TAMU), and Marsh Youngbluth (HBOI).The PIs for the fish and invertebrate sample processing activity are Tracey Sutton (VIMS), Tamara Frank (NSU), and David Wells (TAMU).

Timetable

Timetable for Analysis of Samples Collected 2010-11 Subtasks in 2014

	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Analysis of Field Data from 2010-11												
Sample Processing												
Coordination Data Review and Interpretation												
Reporting												

The work in 2014 will continue and follow-up on work underway in 2013.

Task	Approximate Percentage of Total Contract Cost	% Complete (start of Claim period)	% Complete (end of Claim period)	Approximate Timing of Task (2013)
Sample processing of 2010-2011 field data	80	50	95	Jan-Dec
Coordination co-Trustee data review and interpretation	10	20	90	Jan – Dec
Reporting	10	20	95	Jan – Dec

Due to the complex nature of ongoing cooperative assessment activities, potential for settlement, and need to prepare for litigation, formal and informal reporting will occur throughout 2013 and 2014.

RP Involvement

The plankton processing plan and the nekton processing plan are cooperative work plans with the RP.

The field data collections and the processing of the samples and data are cooperative studies with BP. BP signed all the cruise plans involved. BP has also signed the nekton sample processing plan. The addendum to the nekton plan has been developed but is currently in Trustee review before being submitted to BP.

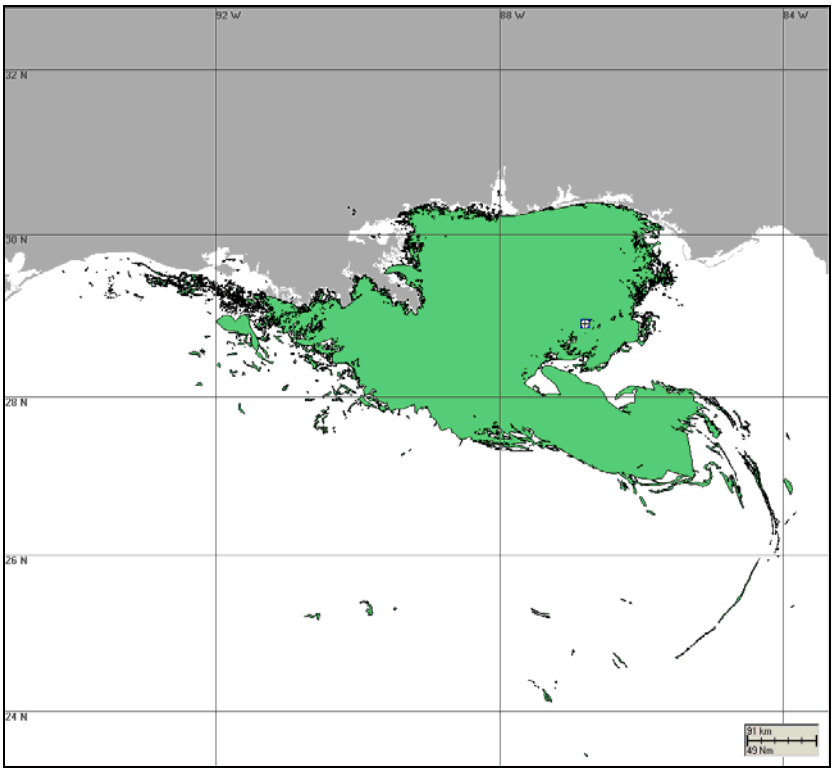
Documentation of Oil Pathway, Water Column Organisms Exposed and Injured

Oil pathway and water column organisms exposed and injured will be documented using empirical observations, spatio-temporal distributions, abundances, trends, and any changes in the living marine resources of the water column. Pathway and exposure will be assessed by evaluating water chemistry observations, instrument records (e.g., fluorometry, dissolved oxygen, transmissometer, and acoustics), and imaging data (e.g., from SIPPER, Holocam, and video data analysis). Pathway and exposure will also be assessed based on the observations of oil at the surface, which include visual observations from overflights and related documentation, observations from photography (as documented in ERMA from Response activities and monitoring) and remote sensing observations. Additional sources of information for this evaluation arise in observations of oil at the shoreline analyzed by the Shoreline TWG, and sediment samples and chemistry taken during the spill analyzed by the Deepwater Communities and Chemistry TWGs.

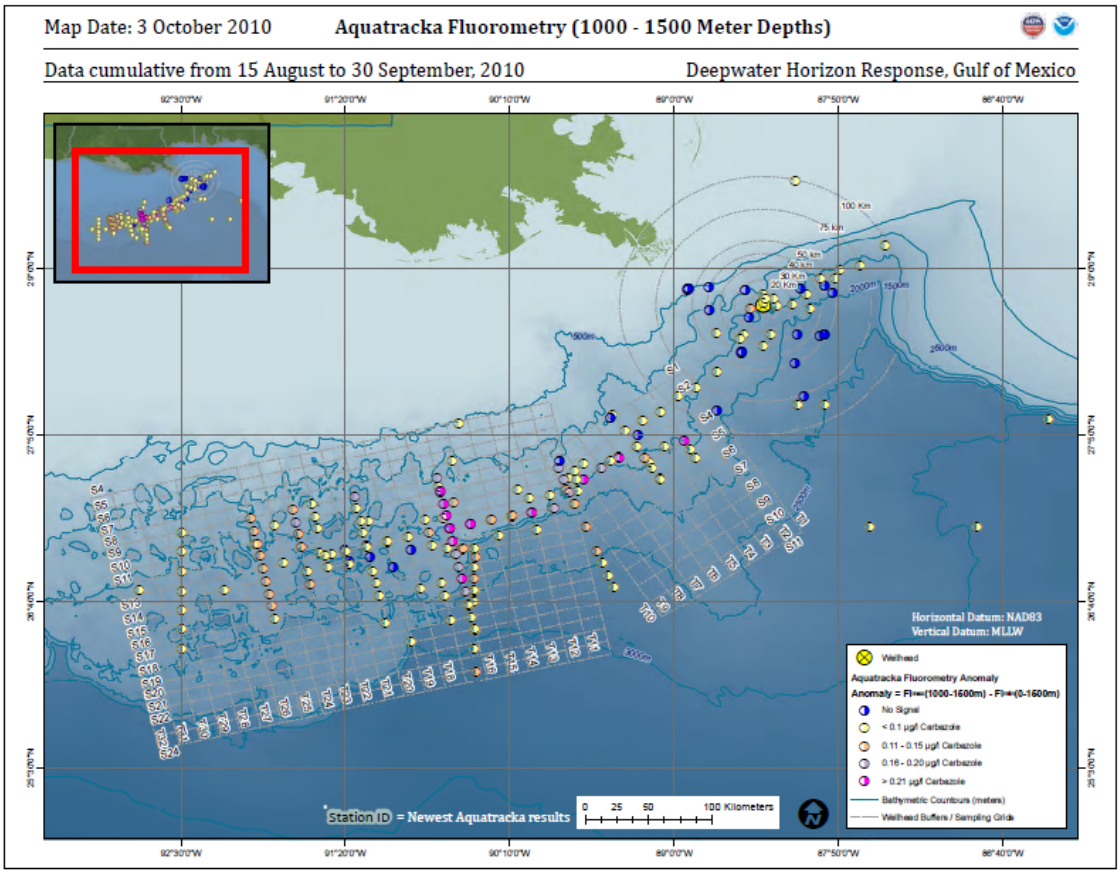
Fish and invertebrates in the water column are exposed to contaminants by swimming through contaminated water, spending time on/in contaminated sediments, taking up contaminants through body surfaces, passing contaminated water over respiratory structures, and ingesting water, oil droplets, contaminated biota, and particulates contaminated with oil as part of feeding. Additionally, sensitive life stages of pelagic fish and invertebrates come in direct contact with floating oil that covers and is mixed into the neuston layer where many embryos and larvae develop. Other neustonic organisms exposed to surface oil include many small invertebrates important to the food web. In the water column, organisms

are also exposed to suspended oil droplets, which can foul appendages or other body surfaces. Water column organisms have also been exposed to dispersants dissolved in water, on oil droplets and adsorbed to suspended particulate matter. Water column organisms were also exposed to dissolved and water-borne chemical additives, such as methanol and anti-foaming agents.

Invertebrates and fish in the north-eastern Gulf of Mexico, which include early life history stages of fish and invertebrates, as well as smaller invertebrate holoplankton, gelatinous zooplankton and fish of various size classes, are among those biota exposed to the released oil and spill-related chemicals. Organisms throughout the water column of deep offshore slope areas were potentially exposed, including the deeper depth strata where sub-surface oil has been observed (i.e., 1000-1300 m). The figure below shows the approximate extent of oil observed on the water surface, which indicates areas of surface waters potentially affected. A second figure shows a cumulative summary of fluorescence measurements between 1000 and 1500 m, indicating a possible southwestward transport of the oil and some locations where plankton may have been exposed in deepwater (laboratory analyses to establish whether or not these measurements are linked to MC252 oil have not yet been analyzed).



Cumulative potential surface floating oil extent of the Deepwater Horizon oil spill. (Figure derived from compositing April, May, June, and July 2010 radar shape files available on the NOAA ERMA website. Note that radar images with noted anomalies were not included in composite.)



Cumulative summary of Aquatracka fluorescence measurements between 1000 and 1500 m, 15 August to 30 September 2010.

Exposure to oil is being evaluated using plankton data, image processing data, and fish and invertebrate sample data in coordination with the physical and chemical data collected. These data will be described with appropriate statistical and mathematical techniques to establish exposure.

Active acoustics were deployed on many cruises during both Response and NRDA activities. These data contain valuable insight into the distribution, abundance, and size distribution of marine organisms that can backscatter sound. These data have been used to evaluate the vertical distribution of backscatters (organisms), and how their distributions change in time and space. A portion of the acoustic data was collected concomitantly with net samples and/or aerial observations in an effort to identify the organisms contributing to the backscatter. These data have been processed using standard hydroacoustic techniques (i.e., Echoview and MATLAB software). The effort to integrate and interpret the distribution of biomass in the northern Gulf of Mexico region is projected to continue into 2014. Comparisons between historical, Incident, and post-spill conditions will also be made.

The activity also includes compilation of documentation and records related to the activity.

Connection to NRDA Process

The objective of this activity is to synthesize and thoroughly evaluate empirical evidence to establish the pathway, exposure, and injury resulting from the Deepwater Horizon Incident, as well as to support and validate the oil transport, fate, and effects modeling results. This work will have linkages to other activities including those focused on marine mammals, turtles, and fish.

Sample/Data Handling

Various data sources are being analyzed for this activity, including direct observations, field measurements, and remotely sensed data. Some of these data, specifically the remotely sensed data, are originally maintained and distributed by NOAA. All original data have been pre-processed and QC administered by NOAA in coordination with the originating entity. Data and information retrieved from published literature are recorded in a database which undergoes NOAA QA/QC protocols.

Data management activities are required to manage, statistically analyze, and map these data. Samples and associated data acquired through cooperative work plans were collected through methods defined in joint signed protocols. These samples have been analyzed and the data are being tracked, organized, and QA/QC'd by NOAA. These data, along with associated documentation such as validation reports, are maintained by NOAA's data management team and will be distributed to Trustee representatives through NRDA and cooperative databases.

Data/Deliverables Produced

This activity will produce an interpretive report documenting and synthesizing empirical evidence to establish the pathway, exposure, and injury resulting from the Incident for resources under the Water Column TWG area of responsibility.

Level of Effort

Our request for the documentation of oil pathway, water column organisms exposed and injured activity is $1,458,851in contract funds. The request includes 1.7 agency FTEs and 3.5 contract equivalents. Key personnel include the PIs and their staff.

One agency scientist will oversee all of the contractors working on the various aspects of this activity. Another scientist is focused on the statistical analysis of biological information obtained from all of the offshore sampling cruises conducted in 2010 and 2011, and in particular the trends of field-collected information compared to baseline. Since NOAA is leading the offshore portion of the assessment, additional agency scientists will be focusing on co-Trustee coordination throughout 2014 and creating and reviewing draft and final data and interpretive reports. The types of contractors assisting NOAA are all experienced with NRDA and are ecological modelers, statisticians, oceanographers, biologists, and toxicologists.

Evaluation of acoustics data collected in 2010 and 2011 is expected to continue into 2014; however, no additional funds are requested. The remaining budget is for statistical analysis, synthesis, and

interpretation of pre-spill and post-spill data. This effort will likely require coordination between investigators, reviewers, and occasional meetings of small working groups.

PIs (NOAA and other)

The PIs for this activity are Kevin Boswell (Florida International University) and John Quinlan (NOAA). Additional key personnel include Daniel Hahn (NOAA), Jennifer Kunzelman (NOAA), Deborah French McCay (RPS-ASA), Yong Kim (RPS-ASA), and lead PI's from other activities.

Timetable

Timetable for Documentation of Oil Pathway, Water Column Organisms Exposed and Injured Tasks in 2014

	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Documentation of Oil Pathway, Water Column Organisms Exposed and Injured												
Analysis of Oil Pathway, Water Column Organisms												
Coordination Data Review and Interpretation												
Reporting												

The 2014 work will continue and follow-up on work ongoing in 2013. The majority of this effort was completed in 2013; however, some work will continue into 2014. Due to the complex nature of ongoing cooperative assessment activities, formal and informal reporting will occur throughout 2014.

Task	Approximate Percentage of Total Contract Cost	% Complete (start of Claim period)	% Complete (end of Claim period)	Approximate Timing of Task (2014)
Analysis of oil pathway, water column organisms exposed and injury	40	20	95	Jan-Dec
Coordination co-Trustee Data review and interpretation	10	20	90	Jan – Dec
Reporting	50	20	95	Jan – Dec

RP Involvement

BP was engaged in the collection of acoustic data in cooperatively signed work plans. NOAA contractors will take the lead on processing the data, and BP may be involved. Other components of this activity are not cooperative.

E. Sargassum

Sargassum Communities, Mapping and Injury Assessment

Sargassum is a key oceanic habitat that has been impacted by the MC252 oil spill. Floating sargassum patches in the Gulf of Mexico are formed by the convergence and aggregation of two species of brown algae: *Sargassum natans* and/or *fluitans.* Sargassum patches (which may be mats, clumps or convergence lines) are an important habitat for a variety of invertebrate and vertebrate species, including large and diverse assemblages of marine fish in early life history stages. Sargassum serves as pelagic "nursery habitats" for many fishery species, including common dolphinfish, trigegerfishes, tripletail, billfishes, tunas, amberjacks, as well as forage fish species, such as butterfishes and flyingfishes. It is also important feeding habitat for predators. For these reasons, sargassum has been designated an Essential Fish Habitat by both the South Atlantic and Gulf of Mexico Fishery Management Councils and by NMFS.

Sea turtles use sargassum mats as nurseries where hatchlings have food and shelter. In particular, sargassum patches are a key nursery habitat for four of the species of sea turtles that inhabit the Gulf of Mexico: loggerhead (*Caretta caretta*), green (*Chelonia inydas*), Kemp's ridley (*Lepidocheiys kempii*), and hawksbill (*Eretmochelys imbricata*). As sargassum clumps and mats are concentrated in the Northern GOM, these neustonic habitats and associated fauna may have been exposed to surface oil, sheens, chemical dispersants, burns and other response activities introduced as a result of the MC252 discharge.

Estimates of the extent of oiled *Sargassum* are still being refined. For 2014, NOAA is requesting funding for the following activities: completion of sargassum community biota counts; completion of sargassum mapping; combining sargassum mapping and biota counts with updated surface oiling maps, PAH water column concentrations, and toxicity data; continued data validation, synthesis, and interpretation; peer and statistical review; TWG coordination; and data management. Combining sargassum and biota counts with PAH water column concentrations will involve coordination with the Water Column TWG's work on modeling PAH concentrations using SIMAP.

Sargassum Biota Community Assessment: The sargassum community assessment investigation is focused on the scientific process of mapping sargassum communities and characterizing the organisms associated with sargassum in order to quantify injuries to this resource. Trustees will analyze field data collected in 2011 and remote sensing data from 2000-2011 to characterize sargassum communities, determine the spatial and temporal extent of sargassum, and quantify injury from exposure to MC252 oil.

The Trustees collected about 140 samples of fish, postlarval/juvenile decapods, ichthyoplankton, and encrusting communities from seven sargassum cruises in 2011. Twenty-five locations were sampled with neuston and bongo nets. Analysis of these samples is ongoing in 2013. Neuston net samples are being analyzed for type, abundance, and size frequency of fishes and postlarval/juvenile decapods. Bongo net samples are being analyzed for type, abundance, and size frequency of ichthyoplankton. In addition, sargassum collected in neuston nets is being analyzed for encrusting invertebrates (e.g., hydroids, bryozoans, tunicates). Finally, ROV video surveys from the cruises are being analyzed to characterize fish communities, including species composition, abundance, and length frequency of fish associated with sargassum.

Sargassum Mapping: Ongoing efforts in 2013 involve using field observations from 15 total flights in 2011 to create more accurate maps of sargassum distribution in the Gulf of Mexico. Nine were conducted solely for mapping with academic contractors, and six were associated with oceanic sea turtle investigations (field costs for the 15 flights are not included in this claim). In addition, remote sensing data from 2010 (from Landsat and Aviris) are being analyzed to help characterize the extent of sargassum present in the Gulf of Mexico during the period when oil from the Deepwater Horizon Spill was present on the surface. Trustees will evaluate the MC252 surface oil slick with respect to sargassum, generating an exposure and injury zone for this important open ocean habitat.

Several tasks described in NOAA's 2013 funding request will continue into 2014. This primarily includes lab analyses for bongo and neuston samples and mapping activities using remote sensing data from additional years to establish trends in the amount and location of sargassum throughout the Gulf of Mexico.

For 2014, NOAA is requesting funding for the following activities: continued data validation, synthesis, and interpretation; combining sargassum mapping and biota counts with updated surface oiling maps, PAH water column concentrations, and toxicity data; peer and statistical review; TWG coordination; and data management. Combining sargassum and biota counts with PAH water column concentrations will involve coordination with the Water Column TWG's work on modeling PAH concentrations using SIMAP. If necessary, NOAA also may investigate additional modeling approaches.

Specific tasks under this activity include:

- Completion of 2011 cruise samples analysis (bongo and neuston net samples) (no new funds are being requested; instead, funds approved for 2013 will be used).
- Final summarization of lab results (no new funds are being requested, instead, funds approved for 2013 will be used.
- Completion of mapping of sargassum distribution for years other than 2010 (no new funds are being requested, instead, funds approved for 2013 will be used.
- Validation of data
- Refinement and completion of injury assessment based on integration of sargassum mapping and biota counts with updated surface oiling maps, PAH water column concentrations, and toxicity data.
- Peer and statistical review of injury assessment
- Data management
- TWG coordination

The activity also includes compilation of documentation and records related to the activity.

Connection to NRDA Process

This activity is an injury quantification task and integrates information on pathway, exposure, and effects across nearshore and shoreline resources.

Sample/Data Handling

This effort integrates chemistry data, lab sample data, and field data collected by prior NRDA activities.

Data management activities are required to manage, statistically analyze, and map these data. Samples and associated data acquired through cooperative work plans were collected through methods defined in joint signed protocols. These samples have been analyzed and the data are being tracked, organized, and QA/QC'd by NOAA. These data, along with associated documentation such as validation reports, are maintained by NOAA's data management team and will be distributed to Trustee representatives through NRDA and cooperative databases.

Data/Deliverables Produced

Sargassum Community Data:

- Draft data report summarizing ROV video, bongo net, and neuston net data from some of the 2011 sargassum cruises will be completed in 2013. The draft report will be updated in 2014 to reflect analysis of additional bongo and neuston net samples from additional cruises, with a final data report for all cruises available by July 2014.
- Data report summarizing overflight data associated with the 2011 sargassum cruises will be completed in 2013.

Sargassum Mapping:

- Sargassum maps in the areas affected by the spill for 2010 will be completed in 2013. This work will be expanded to other years for trend analysis throughout 2014. Maps will be made available throughout 2014 as they are developed. A final report will be available by November 2014.

Interpretation and Synthesis into an Injury Assessment Report:

- A preliminary draft sargassum injury assessment incorporating data from sargassum studies and published literature will be completed in 2013. This assessment will be updated in 2014 based on updated surface oil mapping, modeled PAH concentrations, toxicity studies, and additional sargassum community data and sargassum mapping that become available in 2014, as well as peer review and statistical review. A final integrated injury report will be available by December 2014.

Level of Effort

Our request for the sargassum communities' activity is $991,010 in contract funds. These costs include 0.5 agency FTEs and 3.4 contract equivalents. Key personnel include PIs and their staff, agency scientists, and IEc data management team.

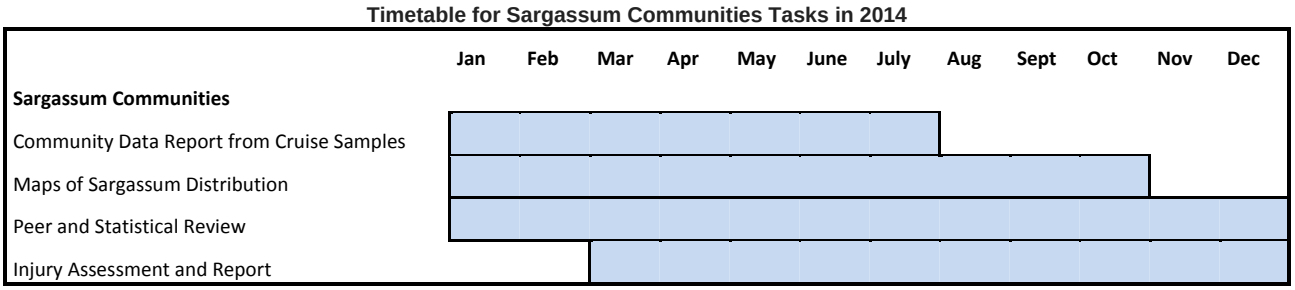
PIs (NOAA and other)

Sean Powers, DISL

Frank Hernandez, Gulf Coast Research Laboratory (GCRL)

Chuanmin Hu, USF

Timetable



A primary focus under this activity during the first half of 2014 will be the ongoing effort to finalize cruise sample analysis and validation and to complete a report on these data. This task is expected to be finished by July 2014. Analysis of remote sensing data for the purpose of exploring trends in sargassum amounts and locations in the Gulf of Mexico will also be conducted starting in early 2014 and will be completed by October. Finally, building on the preliminary interpretation and injury quantification completed at the end of 2013, a revised assessment will be completed in 2014 that reflects updated information on surface oil mapping, PAH concentrations, toxic effects of oil exposure, and sargassum communities, as well as the results of peer review and statistical review.

RP Involvement

The RP was involved in the sargassum field efforts and collection of most of the underlying data. The Trustees continue to engage the RP as analyses are completed and the data are validated. Data interpretation will be conducted independent of BP.

F. Sea Turtles

Sea Turtle Exposure and Injury Assessment Report

Under this activity, NOAA will continue to integrate and summarize data and findings from ongoing efforts to document exposure and injury to oceanic, neritic, and nesting sea turtles from the Deepwater Horizon Oil Spill. Funding was previously requested from NOAA in 2013 for the following sea turtle related activities: (1) Sea Turtle Exposure and Injury Assessment, (2) Transport and Storage of Stranded Sea Turtles and Marine Mammals, and (3) Sea Turtle Surrogate Study. Data and analyses generated as part of these efforts, as well as other ongoing activities to document exposure and injury to oceanic,

neritic, and nesting sea turtles, including DOI's efforts on nesting sea turtles and hatchlings, will need to be synthesized into an overall sea turtle exposure and injury assessment report. This interpretive report will represent the culmination of the injury determination and will discuss exposure and subsequent quantification of injuries to sea turtles resulting from the Deepwater Horizon Oil Spill. This activity will include involvement of sea turtle scientists and statistical and peer review to help interpret findings and develop conclusions. The tasks included under this activity, including the development of an overall injury assessment report, are described below:

Oceanic and Neritic Sea Turtle Exposure and Injury Assessment

Ongoing efforts in 2013 to document exposure and injury to oceanic and neritic sea turtles are focused on the following activities: estimates of oceanic turtle abundance and mortality and estimates of neritic turtle abundance and mortality. Information from these activities, as well as necropsy findings, exposure via oil ingestion, estimates of biological impacts for oceanic sea turtles from veterinary and toxicological scientists, results from the sea turtle surrogate study, postmortem sea turtle sample analysis, inhalation exposure analysis, estimates of pelagic sea turtle habitat (sargassum), sea turtle tag dive analysis, surface oil mapping products, and mapping products characterizing impacts from on-water response actions, will also be incorporated into this effort.

For 2014, NOAA requests funds to update and integrate data and analyses generated by the activities completed in 2013 and to continue to develop an interpretive report describing exposure and injury to oceanic and neritic sea turtles. Activities to be completed include review of available literature on oceanic and neritic sea turtle exposure and injury, as well as preparation of an interpretative report based on information available in the literature and data collected as part of the efforts noted, including estimates of sea turtle abundance and habitat oiled, oil ingestion, dietary information, biological impacts and postmortem sea turtle sample analyses combined with conclusions from necropsies. Turtle exposure and injury will also be assessed on a species by species basis, integrating exposure and injury information across their life stages. Existing estimates will then be integrated and updated with the latest information on surface oiling products, sargassum mapping, surrogate study toxicity results, and strandings.

For oceanic sea turtles, exposure assessment efforts to date have included estimates of abundance based on directed capture data. Estimates of oceanic sea turtle habitat (sargassum) may be used in conjunction with the estimates of oceanic sea turtle abundance as part of the process of determining the number of oceanic sea turtles that were exposed to oil. Estimates of oil ingestion exposure may be combined with an estimate of inhalation exposure. Necropsy findings will include summaries of the extent of both external and internal oiling (where applicable). Surface oil and response activity maps will display where the surface oil was and where response activities took place.

Injury assessment efforts will summarize work completed by veterinary and toxicology scientists to estimate biological impact by degree of oiling. Postmortem sea turtle tissue analysis data, including PAH and DOSS concentrations detected in samples of various tissues (liver, enteric contents, bile, esophageal and muscle) will be incorporated, as well as an assessment of impacts potentially resulting from response actions on water. In addition to the results of the proposed sea turtle surrogate study, injury assessment efforts will also consider data generated on oceanic sea turtles recovered through the sea turtle stranding and salvage network (STSSN) response activities and findings from necropsies completed or that may be

completed in 2014 as part of the activity Strandings: Necropsies, and Management, Transport and Storage of Sea Turtles and Marine Mammals.

For neritic turtles, exposure assessment efforts to date have included estimates of abundance for neritic turtles gathered during synoptic aerial surveys and adjustment of the abundance estimates using dive data from sea turtles fitted with satellite tags to account for sea turtles that may have been diving when observations were made. Data on PAH levels in common sea turtle prey items collected in 2010, 2011, and 2012 are being evaluated, and updated surface oil maps will be incorporated. Necropsy findings will include summaries of the extent of both external and internal oiling, where applicable.

Injury assessment efforts will also consider data generated on neritic sea turtles recovered through the sea turtle stranding and salvage network (STSSN) response activities and findings from necropsies completed or that may be completed in 2014 as part of the activity Strandings: Necropsies, and Management, Transport and Storage of Sea Turtles and Marine Mammals.

Northern Gulf of Mexico Sea Turtle Mortality Working Group

Strandings of large numbers of Kemp's ridley sea turtles have continued to occur in the northern Gulf of Mexico as annual seasonal events since 2010. There is significant concern over these deaths by the public, Trustee agencies, and environmental groups. These strandings are within the same area as a declared marine mammal unusual mortality event (UME) as specified by the Marine Mammal Protection Act (MMPA) (NOAA, 2012a). There is therefore a concern that long-term impacts to the health and viability of sea turtles may be occurring and needs to be assessed. For 2014, NOAA will convene technical meetings to consider sea turtle stranding data, necropsy findings, anthropogenic threat data, and all other pertinent information given concerns over long-term impacts of the Deepwater Horizon Oil Spill on sea turtle populations as a part of the Gulf ecosystem and the concurrence between dolphin deaths and the Deepwater Horizon Oil Spill within the same area. Attendees will consist of invited federal and non-federal participants and discuss regional sea turtle mortality, including possible causes of death, and data gaps.

Life History Tables Working Group

Efforts are ongoing under NRDA to characterize and fully understand the magnitude of the injury to both sea turtle species and life stages. Early restoration efforts are also underway and will use information generated by the NRDA to ensure proper compensation for the injury to sea turtles. Life history tables consisting of various population parameters have been developed based on existing literature and other sources of information. However, a robust review of these parameters to ensure their appropriateness for use in translating injury across life stages is needed. The application of sea turtle life history information is critical to understanding and interpreting the short and long-term effects of the injury that occurred at various life stages. For 2014, NOAA requests funds to convene a working group of internal and external scientists to review and provide input on the existing sea turtle life history tables.

Integration of Oceanic and Neritic Sea Turtle Exposure and Injury Assessment with Nesting Sea Turtle Exposure and Injury Assessment

For 2014, NOAA requests funds to integrate findings of the oceanic and neritic sea turtle exposure and injury assessment reports activity with the ongoing efforts by DOI to document exposure and injury to nesting sea turtles (being conducted by the USFWS). The end product of this effort will be the production of a Trustee sea turtle interpretive report which will summarize data and findings for all life stages of sea turtles impacted by the Deepwater Horizon Oil Spill.

The activity also includes compilation of documentation and records related to the activity.

Connection to NRDA Process

This task documents and describes exposures and quantifies injuries to oceanic, neritic and nesting sea turtles. Determining the spatial extent of exposure and injury will enable the determination of appropriate restoration projects to compensate for injury.

Sample/Data Handling

This effort integrates a variety of oil and tissue chemistry and other lab sample data collected by prior response, NRDA and other activities. In addition, visual observation and photographs were collected to further support the assessment.

Data management activities are required to manage, statistically analyze, and map these data. Samples and associated data acquired through cooperative work plans were collected through methods defined in joint signed protocols. These samples have been analyzed and the data are being tracked, organized, and QA/QC'd by NOAA. These data, along with associated documentation such as validation reports, are maintained by NOAA's data management team and will be distributed to Trustee representatives through NRDA and cooperative databases.

Data/Deliverables Produced

Deliverables for this activity will include draft and final interpretive reports summarizing exposure and injury to sea turtles. The reports will include documentation of purpose and methods, as well as data tables, maps, and figures illustrating and summarizing results, conclusions, and interpretations.

Level of Effort

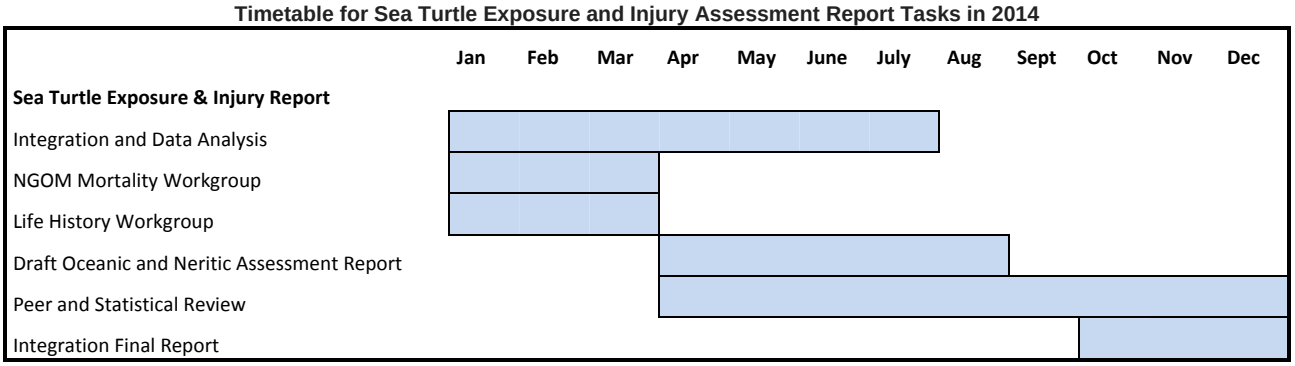
Our request for the sea turtle exposure and injury assessment report activity is $1,096,604 in contract funds. These costs include 1.4 agency FTEs and 2.8 contract equivalents. Key personnel include study PIs and agency scientists.

Funding is requested to support the PIs in data analysis, interpretation, synthesis, and report writing. Other costs include NOAA staff and contract support to assist in the completion of the oceanic and neritic exposure and injury assessment reports, as well as synthesis with nesting turtle reports being generated by DOI into an overall sea turtle injury and assessment report.

PIs (NOAA and other)

The lead PIs for this activity are Barbara Schroeder and Lance Garrison of NOAA NMFS, turtle scientists, and peer reviewers (individuals to be determined).

Timetable



The overall timetable for this activity is from January to December 2014. During the first quarter of 2014, the focus of efforts will be the integration of data and analyses, a task scheduled to be completed by the end of July. In addition, the NGOM Mortality and Life History Workgroups will convene and produce input for the injury assessment during the first quarter. The effort to quantify injury will be conducted from March through August. This effort will result in the production of an interpretive report that describes exposure and injury to oceanic and neritic sea turtles. The draft Trustee exposure and injury report will be developed from April through the end of August 2014. Peer and statistical review of integration, quantification of injury, and the exposure and injury report will occur from April through December 2014. The final draft exposure and injury report will be drafted during the fourth quarter of 2014 and completed before the end of the year.

RP Involvement

No direct involvement of the RP is envisioned for this activity. Only two of the studies being relied on for developing the sea turtle exposure and injury assessment report are being conducted cooperatively with the RP – the aerial surveys to quantify neritic sea turtles and the collection and analysis of sea turtle prey items for oil contamination.

Strandings: Necropsies, and Management, Transport and Storage of Sea Turtles and Marine Mammals

This activity will allow for the collection, transport, necropsy, and storage of dead, stranded sea turtles collected to date through 2014. This work will further NOAA's effort to continue to investigate the nature and extent of sea turtles that wash ashore or "strand" on shorelines of the northern Gulf of Mexico. Approximately 2,700 sea turtle carcasses are currently in storage at NRDA supported facilities at present. It is estimated that approximately 700-800 additional sea turtle carcasses will be collected in each of 2013

and 2014 in the northern GOM. This request also includes resources for collection and storage of marine mammal carcasses, which is described more fully under the marine mammal activities.

Marine mammal and sea turtle strandings continue to occur. It is of critical importance for NOAA to have the capability to continue to quickly respond to stranded animals, conduct field necropsies using enhanced protocols and NRDA chain of custody procedures, transport carcasses to laboratory necropsy facilities and storage, properly preserve samples and carcasses for additional examination, and provide data/evidence handling and support. These data will be used to assess the need for further assessment of potential injuries to marine mammals and sea turtles resulting from the Deepwater Horizon Oil Spill. Funds to support the existing marine mammal networks are being requested under the marine mammal activities. Under this activity, funds are being requested to support the Sea Turtle Stranding Networks and for the transport and storage of marine mammal and sea turtle carcasses once they have been collected by the stranding networks. This activity also involves conducting necropsies on the collected sea turtle carcasses obtained during and after the oil spill.

Supplies for Necropsies of Sea Turtles from the Northern Gulf of Mexico

For 2014, NOAA requests basic equipment and disposables that are required for continued postmortem examination of sea turtles recovered from the northern Gulf of Mexico and preservation of carcasses and samples in accordance with NRDA guidelines. These activities are essential for investigation of sea turtle mortality in the years following the spill. Included are materials necessary for processing approximately 400 sea turtles including necropsy, sample collection and storage, sanitation and personal protection, and record keeping.

Sea Turtle Stranding and Salvage Network Support

Each of the Gulf states have active Sea Turtle Stranding and Salvage Network (STSSN) programs. Maintaining an active stranding network has been identified in each of the sea turtle recovery plans, developed jointly by the Fish and Wildlife Service and NMFS, as a task necessary for the conservation and recovery of listed sea turtles. The STSSN was formally established by NMFS in the southeastern U.S. and Gulf of Mexico in 1980. The STSSN has since spread to encompass the entire east and gulf coasts of the U.S. The STSSN was established in response to the need to better understand the threats sea turtles face in the marine environment, to provide aid to stranded sea turtles, and to salvage dead sea turtles that may be useful for scientific and educational purposes. Actions taken by stranding networks improve the survivability of sick, injured, and entangled turtles; while also helping scientists and managers to expand their knowledge about diseases and other threats that affect sea turtles in the marine environment and on land. An active network of organizations participate in the STSSN, and while NMFS coordinates the network, it is participating organizations that respond to stranded turtles, rehabilitate sick and injured turtles, and help educate the public, for the overall goal of sea turtle conservation.

STSSN responders have been working with NOAA to respond to, salvage where appropriate, and collect data from stranded sea turtles in the Gulf of Mexico to monitor trends in strandings, unusual stranding events, and potential mortality factors that may be linked to DWH. Strandings are also handled in a manner that ensures compliance with the litigation hold procedures.

For 2014, NOAA requests additional resources for the organizations that participate in the STSSN in order to maintain the increased level of effort necessary to provide adequate coverage of the areas affected by the Deepwater Horizon Oil Spill. The funds requested will be used for additional staff (mainly seasonal/part-time), vehicles, supplies, equipment, and training.

Field Walk-in Freezers

The marine mammal and sea turtle stranding networks (MMHSRP and STSSN) are currently using six 8x20' walk-in freezers. Locations of freezers include: Padre Island National Seashore (Corpus Christi, TX); Louisiana Department of Wildlife and Fisheries (LDWF) Grand Isle Lab (Grand Isle, LA); Audubon Aquarium (New Orleans, LA); NMFS Pascagoula Lab (Pascagoula, MS); and the University of Florida (Gainesville, FL). For 2014, NOAA request funds for six freezers to hold carcasses until they can be necropsied and transferred to long-term storage.

Sample Storage, -80 Freezer Space

For 2014, NOAA requests funds for additional ultra-cold freezer space to maintain tissue samples in accordance with NRDA guidelines. Locations of the freezers are still to be identified.

Long-term Storage Warehouse

The current long-term storage facility (currently directly funded by BP) is the Marques Food Distributor Warehouse in Harvey, LA. This freezer is expected to reach capacity at some point in 2014. It is currently being reorganized to free up additional space using stackable bins for dolphin carcasses. For 2014 NOAA requests funds for when Marques reaches capacity and we will need an alternative facility for long-term carcass storage. This will be covered under the Chemistry TWG budget.

Transport by Dade Moeller, Inc.

For 2014, NOAA requests funds to allow transports of sea turtle and marine mammal carcasses from field responder locations to long-term storage to comply with NRDA guidelines. Additional storage crates and/or bins for stacking turtle and marine mammal carcasses are also needed.

Logistics Contractor for Marine Mammals and Sea Turtle Carcass Management

For 2014, NOAA request funds for an outside contractor to provide the full scope of coordination efforts for carcass inventory, collection, storage, transport, and chain of custody that NMFS Office of Protected Resources (OPR) staff can no longer manage while continuing to meet other priorities including NRDA and restoration obligations. Duties would include maintaining contact with sea turtle and marine mammal stranding personnel to monitor freezer space and anticipate and plan transports as needed. Additional responsibilities include working with BP and NOAA Office of Law Enforcement (OLE) on the transfer of carcasses to long-term storage and tracking transport and freezer costs.

University of Florida Research Assistant/Veterinary Technician

For 2014, NOAA requests funds for a research assistant to continue to assist Dr. Stacy in meeting all NRDA obligations. The veterinary technician will assist with various duties related to NRDA including

evidence handling, maintenance of the evidentiary electronic database, preparation and collation of necropsy reports and evidence records, compilation and collation of medical records and analytical results, and other field, lab, and office related tasks associated with DWH.

GOM Strandings Coordinator– For 2014, NOAA requests funds for a GOM Strandings Coordinator to coordinate and support local networks in Louisiana, Mississippi, and Alabama (also Florida and Texas, as needed), collect samples, respond to carcasses, etc. This person would be likely based out of the NMFS Pascagoula Lab, contracted through the National Fish and Wildlife Foundation (NFWF) or other contracting organization. This person would work with the state coordinators and NMFS staff to investigate mortality causes in the Northern Gulf, and other needs of the STSSN.

The activity also includes compilation of documentation and records related to the activity.

Connection to NRDA Process

This task documents and describes exposure of stranded marine mammals and sea turtles to MC252 oil.

Sample/Data Handling

The specific sample and data handling activities include transport of sea turtle carcasses from stranding network facilities to the University of Florida (UF) where necropsies will be performed and carcasses will be retained. Marine mammal carcasses will be stored in field freezers located in several locations in the Northern Gulf during the stranding season. After they are necropsied by stranding personnel, the carcasses will be transported to the long-term storage facility located in Louisiana.

Data management activities are required to manage, statistically analyze, and map these data. Samples and associated data acquired through cooperative work plans will be collected through methods defined in joint signed protocols. These samples will be analyzed and the data will be tracked, organized, and QA/QC'd by NOAA. These data, along with associated documentation such as validation reports, are maintained by NOAA's data management team and will be distributed to Trustee representatives through NRDA and cooperative databases.

Data/Deliverables Produced

Deliverables for this effort include data summaries on numbers and location of stranded marine mammals and sea turtles, description of condition, and results of sea turtle necropsies.

Level of Effort

Our request for the transport and storage of stranded sea turtles and marine mammals activity is $2,722,782 in contract funds. These costs include agency 0.4 FTEs and 5.6 contract equivalents. The study also requires in direct costs associated with transport and storage.

Funding is requested here for Brian Stacy (NOAA veterinarian), an additional veterinarian for necropsy work, a research assistant/laboratory technician, and a carcass logistics coordinator to assist with transport, a northern GOM strandings coordinator, handling and storage of carcasses from sea turtle and

marine mammal strandings, subsequent necropsy work at UF, transport for long-term storage and support for the STSSN's. Other costs include NOAA staff and contract support to assist and coordinate these activities.

PIs (NOAA and other)

Brian Stacy, a veterinarian at UF, is the PI for this activity. Sara McNulty is the freezer/transport coordinator.

Timetable

Timetable for Strandings: Necropsies, and Management, Transport and Storage of Sea Turtles Tasks in 2014

Transport & Storage of Stranded Turtles and Marine Mammals	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Carcass Transport and Records Intake												
Necropsies (Turtles Only)												
Carcass Storage												

All tasks described under this activity may occur throughout the entire year: January to December 2014.

RP Involvement

No direct involvement of the RP is envisioned for this task. However, the RP provides direct payment for the long-term holding of marine mammal and sea turtle carcasses at the facility in Louisiana, which currently holds all marine mammals and sea turtle carcasses collected in 2010 and 2011 and the majority of carcasses collected in 2012. This task involves periodically transporting 2013 and 2014 stranded carcasses to the Louisiana facility for long-term storage when the field freezers meet their capacity.

G. Marine Mammals

The Marine Mammal Technical Work Group (TWG) is assessing injury from the Deepwater Horizon Oil Spill to Gulf of Mexico marine mammals by habitat and stock as follows:

Habitat	**Stock**
Bays, sounds, and estuaries (BSE) of the northern Gulf of Mexico	Multiple bottlenose dolphin stocks
Coastal areas outside the bays, sounds and estuaries to the 200 m isobath	Delphinids with a focus on coastal and shelf stocks of bottlenose dolphin
Oceanic areas from 200 m depth to the	Approximately 20 species of delphinids, Brydes whale and the

US EEZ endangered sperm whale

This request is organized by resource category as follows:

Estuarine dolphins (BSE stocks)—NRDA studies and overall injury assessment for estuarine dolphins

Coastal/shelf dolphins—NRDA studies and overall injury assessment for coastal/shelf dolphins

Coastal and estuarine cetacean strandings—relevant data and samples from strandings will be used to support injury assessment for estuarine and coastal/shelf dolphins.

Oceanic marine mammals—NRDA studies and overall injury assessment for oceanic marine mammals

Inhalation—a separate assessment that may be used to support injury based on exposure through inhalation for estuarine, coastal/shelf and oceanic marine mammals

Estuarine Dolphins

Assessment of mortality, illness, and reproductive outcome for dolphins, or cetaceans is difficult. While recovery of stranded animals including carcasses and investigation of cause-of-death or illness is essential, mortality or illness cannot be solely determined by direct observation because only a very small fraction of carcasses or strandings are ever reported or recovered. In addition, ethical and legal issues preclude experimental toxicity studies for these protected species. These limitations prompt the need for additional observational studies such as longitudinal photographic surveys to document and follow individuals over time and capture-release health assessments. The longitudinal studies allow for the estimation of population losses (presumed mortality), documentation of reproductive outcomes, and detection of declines in overall abundance over time. Capture-release health assessments allow for the evaluation of overall health and diagnoses of disease conditions potentially indicative of oil-related toxic effects. The combined information from stranding response, photographic monitoring surveys and health evaluations provides an integrated picture of the health of estuarine dolphin populations, allowing for assessment of impacts from the DWH oil spill and covers the full spectrum of health to death conditions. As with other investigations of the impacts of a stressor on mammals in which direct toxicity studies are not possible (such as the harmful effects of tobacco on people), broad integrated studies evaluating health metrics in living animals, studies of the dead or dying, and targeted surrogate studies or literature evidence are important to determining the acute and long-term impacts of chemicals on any animal or population.

For many species, such as estuarine bottlenose dolphin populations and humans, such studies must be carried out over multiple years. Cetaceans represent an extreme for k-selected species, having life spans of 50+ years, gestation periods generally of at least one year, and calving intervals of 3-5 years. Therefore, for dolphins and cetaceans in general, impacts on survival and/or reproduction cannot be immediately quantified but must be evaluated over a longer period of time. As an example, direct mortality of killer whales following the Exxon Valdez oil spill could not be documented, but through photographic monitoring it was concluded that one resident pod and one transient pod had suffered losses

of 33% and 41%, respectively, in the year following the Exxon Valdez spill. Continued population assessments a decade after the spill have suggested that the loss of members, which included reproductive females, has hindered the pods' recovery and that one of the pods continues to decline towards extinction. In addition, studies in mink have shown first and second generation reproductive effects which would indicate additional need for longer term reproductive studies.

Multiple stocks of bottlenose dolphins (*Tusiops truncatus*) in bays, sounds, and estuaries were likely exposed to oil and response activities from the DWH Oil Spill. The NRDA initiated a combination of cooperative preassessment and assessment field work beginning in the summer of 2010, with the last of the current cooperative field work ending in summer 2013. In addition, 2010 was the first of several years of unusually high marine mammal strandings in the northern Gulf of Mexico, precipitating the declaration of a UME under the Marine Mammal Protection Act (NOAA, 2012a). Data and analyses from marine mammal strandings are being incorporated into the injury assessment for estuarine dolphins and for coastal/shelf dolphins (see "Coastal and Estuarine Cetacean Strandings").

Information from NRDA studies and stranding response for the Gulf of Mexico dolphin UME have documented heightened mortality, a high incidence of reproductive failure, and a number of health issues. Therefore, the Trustees are proposing additional analysis and review of findings, laboratory analyses, stranding response support, and additional fieldwork in 2014 to continue to document population effects and to examine potential recovery.

Specific endpoints of interest for the NRDA are: 1) sublethal effects, 2) mortality, and 3) reproductive failure. Sublethal effects will be addressed with additional capture-release health assessments and laboratory analyses of samples. Mortality (direct observation and indirect assessment of population losses) will be addressed using information from longitudinal photographic surveys, genetic analyses, and continued stranding response and analysis of tissues. Reproductive failure will be assessed with direct observations of live or dead fetuses in ultrasound examinations in capture-release studies, direct observations of fetal, perinatal and calf mortalities through photo-identification and strandings, and longitudinal follow-up of individual dolphins to assess success/failure of documented pregnancies. Activities included in this funding request for estuarine dolphins build on data collected by NRDA cooperative plans as well as efforts and analyses performed independently by the Trustees.

In 2011, bottlenose dolphin (*Tursiops truncatus*) capture-release health assessments were conducted in Barataria Bay, LA, and in Sarasota Bay, FL, to address potential sublethal and/or chronic health impacts of the DWH Oil Spill. Currently (summer 2013), the Trustees are conducting additional health assessments in the same two sites (Barataria Bay and Sarasota Bay), as well as in one additional site (Mississippi Sound). Barataria Bay and Mississippi Sound were selected as assessment sites due to oiling that occurred within these areas following the DWH Oil Spill. Sarasota Bay was selected as a comparison site because it did not receive significant DWH oil.

To date, the dolphin health assessment studies have found endocrine, respiratory, and hepatic disease in Barataria Bay dolphins consistent with adverse health effects reported from experimental oil exposure studies. Specifically, severe lung damage, evidence of poor adrenal stress response, and abnormal liver enzymes were observed. These health conditions were not observed in dolphins from Sarasota Bay. The dolphin health assessments indicate that bottlenose dolphins in Barataria Bay showed signs of severe ill

health, with 44% of dolphins sampled in Barataria Bay given a "guarded", "poor" or "grave" prognosis. Symptoms included low body weight, anemia, low blood sugar, and/or symptoms of liver and lung disease. Nearly half of the 32 dolphins examined also had abnormally low levels of the hormones that help with stress response, metabolism, and immune functions. The assessment of these dolphins (along with other dolphins in other bays along the Gulf Coast) is ongoing. Results from the Mississippi Sound dolphin health assessments will not be available until fall 2013. The health assessments/sample collection and a subset of sample analyses were conducted cooperatively with the RP under the work plan *Assessing Potential Sublethal and Chronic Health Impacts from the Mississippi Canyon 252 Oil Spill on Coastal and Estuarine Bottlenose Dolphins, April 2011* with follow up for tag assessment and to document outcome of pregnancies in summer of 2012 under the work plan *Assessing Potential Sublethal and Chronic Health Impacts from the Mississippi Canyon 252 Oil Spill on Coastal and Estuarine Bottlenose Dolphins: Addendum, February 2012*. Health assessments in 2013 are also being conducted under a cooperative plan.

Under this current proposal, the Trustees will conduct photographic surveys in Barataria Bay and Mississippi Sound as follow-up to the health assessments conducted in 2013. The photographic studies will be conducted in spring and summer 2014 with the primary purpose being to document reproductive outcomes of the dolphins determined to be pregnant when assessed in summer 2013. A full mark-recapture photo-identification survey will also be conducted in spring 2014 that will be combined with previous photo-identification survey data to provide information on survival rates of dolphins in two areas which received DWH oil (Barataria Bay and Mississippi Sound).

Dolphin health assessments will also be conducted in 2014 in two additional northern Gulf of Mexico sites. Specific sites will be selected pending results from 2013 health assessments, but will likely include one site along the Louisiana coast (e.g., Chandeleur Sound or Terrebone Bay), as well as a more easterly site (e.g., Perdido Bay). Similar to the previous dolphin health assessments, a team of veterinarians, biologists, toxicologists, and epidemiologists will conduct comprehensive health evaluations including a physical examination, diagnostic ultrasound, and blood and tissue sampling for a suite of diagnostic assessments. Dolphins will be captured using established methods and temporarily (usually < 1 hour) restrained for the examination and tissue sampling. Satellite-linked tags will be attached to the dorsal fin of dolphins to obtain location information for up to 6 months to help elucidate movements of dolphins.

The objective of the follow-up health assessment is to determine if health conditions previously documented in dolphins from the heavily oiled Barataria Bay are detectable in dolphins from other oiled sites.

Laboratory analyses, data analysis, and initial injury quantification are expected to be completed by the end of 2014. Another level of interpretive review will be conducted in late 2014 once all data from other TWGs have been received and interpreted by the investigative team.

For dolphins observed remotely, species verification and stock genetics must be conducted through analysis of skin collected from remote dart biopsies using genetic sexing techniques. Genetic analysis of NRDA-collected marine mammal samples was completed for samples collected from 2010 to August 2012. These analyses include sex determination, species/ecotype identification, and/or mtDNA and microsatellite analysis for stock structure. Most of the genetics was completed under a cooperative

assessment plan *Genetic Analysis of Stock Structure, Species Identification, and Sex Determination for Marine Mammal Biopsies and Strandings*. Analysis of the samples from the 2013 health assessment will be completed by the end of 2013.

Additional work will analyze up to 500 skin/blubber samples both from the 2014 health assessment and any relevant stranding samples received through September 30, 2014. Animals will be assessed for sex determination and species/ecotype definition through genetic analysis and/or stock structure through mtDNA analysis and microsatellite analysis. These latter techniques determine the degree of genetic exchange between animals from different geographic areas. This information will help identify genetic isolation amongst estuarine stocks and between Barataria Bay and the adjacent coastal waters.

In summary, field and laboratory data collection work proposed for 2014 under the estuarine dolphin category include: (1) follow-up surveys to document reproductive outcomes from the 2013 health assessments (Mississippi Sound and Barataria Bay); (2) health assessments in two additional areas of the northern Gulf of Mexico, with the associated lab and field measurements as described in the text; (3) a full photo-ID session in both Mississippi Sound and Barataria Bay to contribute to abundance and survivorship estimates, and (4) genetics analysis of samples collected as part of the health assessments, as well as from stranded cetaceans.

The injury to estuarine dolphins will need to take into account multiple lines of evidence from multiple studies, using data from live capture, aerial and boat surveys, and analysis of stranded animal samples from 2010-2013. This would include working with the UME to incorporate any information regarding cause of death for stranded dead animals. This effort is directed at planning and implementing an integrated assessment that includes data and conclusions relevant to the impacts of MC252 oil on BSE dolphins. It will be necessary to collaborate across all studies and incorporate peer review of findings to bring the different studies together.

The Trustees anticipate producing an interpretive analysis that summarizes multiple lines of evidence gathered through the BSE dolphin assessment. The summary will be developed throughout 2014 as assessment activities are completed and data are available and analyzed. This activity includes all the necessary coordination, planning, and reviews of the overall estuarine dolphin assessment with legal staff, with co-Trustees, and with the RP.

The activity also includes compilation of documentation and records related to the activity.

Connection to NRDA Process

The proposed health assessment and associated analyses in 2014 are important for NOAA to fully quantify the extent of marine mammal injuries resulting from the DWH Oil Spill and the timing and duration of any recovery.

The photo-identification studies are important to fully quantify injuries related to reproductive failure and to estimate survival rates for the 2013-2014 period.

Sample/Data Handling

This effort involves sample and observation data that will be collected to support the assessment. Data management activities are required to manage, statistically analyze, and map these data. Samples and associated data acquired through cooperative work plans will be collected through methods defined in joint signed protocols. These samples will be analyzed and the data will be tracked, organized, and QA/QC'd by NOAA. These data, along with associated documentation such as validation reports, are maintained by NOAA's data management team and will be distributed to Trustee representatives through NRDA and cooperative databases.

Data/Deliverables Produced

The routine dolphin health examinations will provide data on morphometric measurements, sampling of blood, urine, feces, blowhole, and blubber as well as a tooth extraction to determine age. Diagnostic ultrasound will also be conducted. Specific routine health parameters to be measured are provided in the table below. In addition, genomic analysis will be conducted using mRNA extracted from skin and blood. Persistent organochlorine pollutants (POPs) will be measured in blubber or blood as they can be considered a potential confounding factor for genomic measures. Health data for individual dolphins will be synthesized, and the prevalence of specific disease categories will be determined for each study site.

Health parameters to be measured from dolphin blood & urine samples

Hematology (Cornell)	Electrophoresis (Cornell)	Serum chemistry (Cornell)	Endocrinology (Blood –Cornell; Blubber - NOAA)	Functional Immunology (UConn)	Urinalysis (on vessel)
Hematocrit	total protein	electrolytes: sodium, potassium, chloride	total thyroxine	T-lymphocyte proliferation	Color
packed cell volume	Albumin	bicarbonate	free thyroxine	B-lymphocyte proliferation	Turbidity
Hemoglobin	alpha 1, alpha 2 & total alpha globulin	anion gap	total triidothyronine	neutrophil phagocytosis	pH
red blood cell count	beta 1, beta 2 & total beta globulin	urea nitrogen	progesterone (blood & blubber)	monocyte phagocytosis	specific gravity
MCV, MCH, MCHC	gamma globulin	Creatinine	estradiol	cytokines	Glucose
red cell distribution width		uric acid	aldosterone	respiratory burst	Bilirubin
reticulocyte count		calcium, phosphate, magnesium	testosterone (blood & blubber)		Ketone

Hematology (Cornell)	Electrophoresis (Cornell)	Serum chemistry (Cornell)	Endocrinology (Blood –Cornell; Blubber - NOAA)	Functional Immunology (UConn)	Urinalysis (on vessel)
white blood cell (WBC) count & differential: segmented neutrophils, band neutrophils, lymphocytes, monocytes, eosinophils		total protein, albumin, globulin	cortisol (blood & blubber)		Blood
platelet count		Glucose			Protein
plasma appearance		enzymes: ALT, AST, SDH, LDH, AP, GGT			urobilinogen
RBC morphology, WBC exam, parasites		total, direct, & indirect bilirubin			nitrite
		Amylase			leukocytes
		cholesterol, triglycerides			
		creatine kinase			
		iron, total iron binding capacity, saturation			
		lipemia, hemolysis, icterus			

The health assessment studies will be conducted over a two-week period in summer 2014 in two locations of the northern Gulf to be determined after completion of field work in 2013. Dolphins will be captured using established methods, estimating 30 dolphins apiece for the two target sites. The capture fleet will consist of six to seven boats: a net boat, up to five chase boats, and a veterinary processing boat. The field team will consist of approximately 50 experienced personnel including at least three experienced veterinarians, and all field work will be done under a MMPA research permit and Animal Care and Use Committee review issued to Dr. Teri Rowles. Permit reports will be provided as needed to fulfill permit requirements.

Analysis of photos from the photo-ID surveys (photo analysis) will be performed using the Finbase database, and photos will be incorporated into the Finbase catalog and will be completed by the end of 2014.

For the genetics analysis, laboratory analysis will begin in January 2014 as samples are received. Analyses will be complete by the end of 2014 and associated data delivered to the data warehouse. The

number of samples is an estimate, since the actual number of captured animals, remote biopsies, and strandings is unknown.

Level of Effort

Our request for the estuarine dolphins activity is $4,954,949 in contract funds. These costs include agency 4.9 FTEs and 17.4 contract equivalents. Key personnel include study PIs and agency scientists.

PIs (NOAA and other)

Dr. Lori Schwacke, NOAA NCCOS (Health Assessment and Photo-ID)

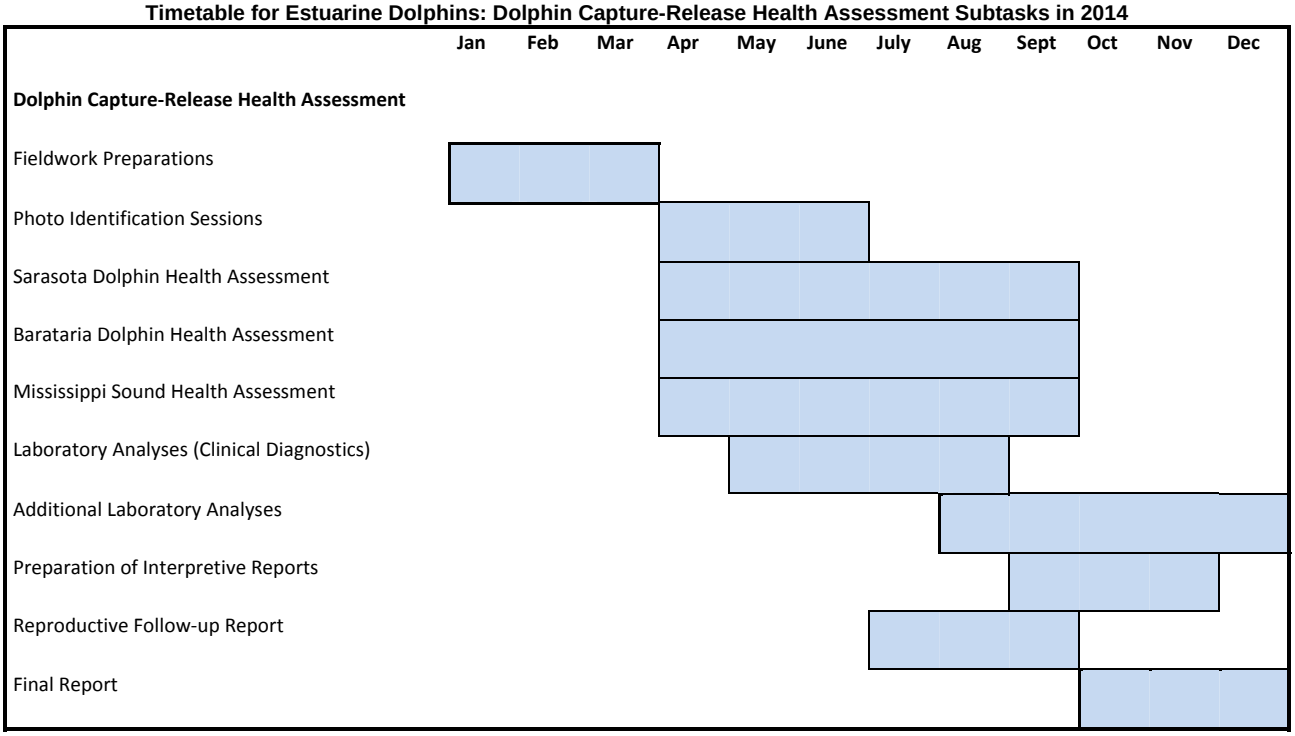
Dr. Teri Rowles, NOAA OPR (Health Assessment)

Dr. Keith Mullin, NOAA, SEFSC (Photo-ID)

Dr. Patricia Rosel (Genetics)

Timetable

Timetable for Estuarine Dolphins: Dolphin Capture-Release Health Assessment Subtasks in 2014



The primary focus of the first quarter of calendar year (CY) 2014 will be preparations for fieldwork. The photo ID sessions will take place in the second quarter of 2014. The dolphin health assessments will take place in the second and third quarters of the calendar year. Some clinical diagnostics are ephemeral and will be done as the samples are collected and shipped to diagnostic laboratories. The rest of the clinical

diagnostics will be submitted for laboratory analyses in batches after the completion of the health assessments and therefore will likely begin in the third quarter. Completion of this subtask is expected by the end of August 2014, with additional laboratory analyses lasting through December 2014. Work on the interpretive reports will begin in September 2014. Development of the final report will commence in the fourth quarter of 2014.

It is expected that the reproductive follow-up work from the 2013 health assessments will take place in Quarter 3 of 2014, depending on the due dates of any pregnant dolphins assessed.

RP Involvement

The Responsible Party participated in field work for both the 2011 and 2013 health assessments, as well as in all photo ID sessions. Genetics and other laboratory data were shared as soon as data were validated.

Coastal/Shelf Dolphins

There are four stocks of bottlenose dolphins (*Tursiops truncatus*) occupying the coastal and continental shelf waters of the northern Gulf of Mexico. These include the Eastern, Northern, and Western Coastal stocks that occupy waters from the shoreline to the 20 m isobath, and the Continental Shelf stock, which occupies waters from the 20 m isobath to the continental shelf break at the 200 m isobath. The Northern Coastal, Western Coastal, and Continental Shelf stocks occur within the primary area of the northern Gulf of Mexico impacted by DWH oil. At this point in time, coastal/shelf bottlenose dolphins cannot be genetically distinguished from estuarine stocks.

In addition to bottlenose dolphins, Atlantic spotted dolphins (*Stenella frontalis*) and rough-toothed dolphins (*Steno bredanensis*) are known to occur in continental shelf waters. This assessment relies on information from health assessment studies for estuarine dolphins, survival rates from photo ID studies from estuarine dolphins, inhalation risk evaluations, and abundance estimates from aerial surveys done in 2010-2012. These evaluations are based on the behavioral characteristics, study methods, and potential exposure scenarios specifically related to coastal and continental shelf stocks.

The Trustees are using marine mammal aerial survey data in combination with surface oil maps developed in other parts of the case to document oil exposure to coastal and shelf marine mammals. The determination of exposure metrics is an ongoing process that is expected to occur into 2014, dependent partially on products from other parts of the NRDA. Aerial surveys conducted during the spill and through 2012 will document abundance and number of animals exposed.

The injury to coastal and shelf dolphins will build on information developed for BSE dolphins and other information. However, the different species, habitats and exposure regimes for coastal/shelf stocks need to be taken into account for developing an integrated injury assessment. The Trustees will use multiple lines of evidence from multiple studies, using data from live captures for estuarine animals (2011, 2013 and 2014) aerial surveys (2010-2012), and analysis of stranded animal samples from 2010-present. This would include working with scientists investigating the UME to incorporate any information regarding cause of death for stranded dead animals. This effort is directed at planning and implementing an integrated assessment that includes data and conclusions relevant to the impacts of MC252 oil on

coastal/shelf dolphins. It will be necessary to collaborate across all studies and incorporate peer review of findings to bring the different studies together.

The Trustees anticipate producing an interpretive analysis that summarizes multiple lines of evidence. The summary will be developed throughout 2014 as assessment activities are completed and data are available and analyzed. The Trustees will utilize peer review to assess the interim summary.

This activity includes all the necessary coordination, planning, and reviews of the overall coastal/shelf dolphin assessment with legal staff, with co-Trustees, and with the Responsible Party.

The activity also includes compilation of documentation and records related to the activity.

Connection to NRDA Process

This effort integrates data and findings on coastal and shelf dolphins into an injury assessment.

Sample/Data Handling

This effort relies on existing data and information. Data management activities are required to manage, statistically analyze, and map these data. Samples and associated data acquired through cooperative work plans were collected through methods defined in joint signed protocols. These samples have been analyzed and the data are being tracked, organized, and QA/QC'd by NOAA. These data, along with associated documentation such as validation reports, are maintained by NOAA's data management team and will be distributed to Trustee representatives through NRDA and cooperative databases.

Data/Deliverables Produced

This activity will culminate with an injury assessment.

Level of Effort

Our request for the coastal/shelf dophins activity is $254,002 in contract funds. These costs include 0.4 agency FTEs and 0.7 contract equivalents. Key personnel include study PIs and agency scientists.

PIs (NOAA and other)

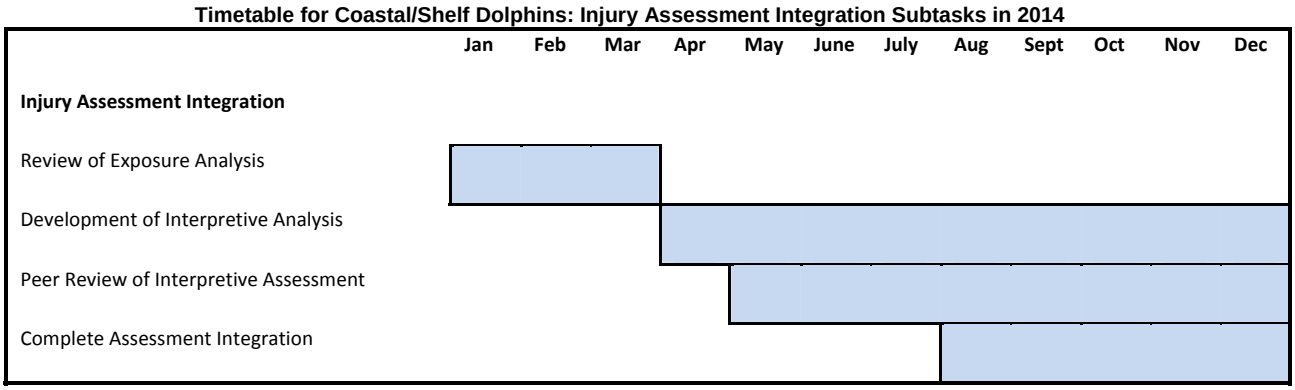
Dr. Lance Garrison, NOAA SEFSC

Dr. Keith Mullin, NOAA SEFSC

Dr. Patricia Rosel, NOAA SEFSC

Dr. Trent MacDonald, West, Inc.

Timetable



An interim exposure evaluation was funded as part of NOAA's 2012 request and, in part, the 2013 funding request. The initial analysis of aerial survey information is largely complete. We are requesting funds to complete the exposure evaluation using additional information and data reviewed within the TWG in 2013-2014.

Work on the integration of assessment will continue in early 2014 and continue throughout 2014. The primary focus in the first quarter of the year will be a comprehensive review of the data. Development of the interpretive analysis that summarizes multiple lines of evidence gathered through the coastal and shelf dolphin assessment will begin in the second quarter. Soon after, peer review of this assessment will take place. Both activities will continue through the end of the year; complete integration of all information cannot begin until field work is complete in August 2014 and initial data analyses are complete.

RP Involvement

The RP has not participated in planning work proposed for 2014.

Coastal and Estuarine Cetacean Strandings

The Marine Mammal Stranding Network (MMSN) was formalized as part of the Marine Mammal Health and Stranding Response Act in the 1992 amendments to the Marine Mammal Protection Act (MMPA), and NOAA NMFS was designated as the lead agency to establish the program and coordinate responses in US waters for all cetaceans and pinnipeds (except walrus). Volunteer participants in the National Marine Mammal Stranding Program exist in all coastal states and territories to respond to marine mammal strandings and are authorized under Section 112c Stranding Agreements from one of the six NOAA NMFS regional offices or under Section 109h (for federal, state, or local government officials who are operating in their official duties) of the MMPA. These MMSN organizations/participants receive no consistent financial support from the federal government for their activities, thus the ability of the MMSN to respond to and investigate strandings can vary by organization, by level of training, by level of other funding, and by year. Participants in the MMSN may apply for Prescott grants (NOAA, 2012b) in annual competitions or through emergency funds, which do provide limited support for stranding response activities to some MMSN organizations. Due to cuts to the Prescott progam's funding in the

fiscal year (FY) 2013 budget, it is expected that no organizations in the northern Gulf will have Prescott funding to conduct stranding response activities during CY 2014.

In accordance with the Marine Mammal Health and Stranding Response Act, an UME has been declared for cetaceans in the northern Gulf of Mexico from February 2010 through the present (NOAA, 2012a). In addition, a separate UME was declared in Texas from November 2011 – March 2012. As per the requirements under the National Contingency Plan, independent investigations of causes of strandings/deaths are underway using samples from cetaceans which stranded in each of these UME areas/time frames.

Preliminary analysis suggests that oil cannot be ruled out as a causal effect in cetacean mortalities that have occurred since the DWH spill, particularly for the northern Gulf. As described in the approach above in the section on estuarine dolphin injuries, as shown in previous studies on oil impacts from spills, and from laboratory investigations, the impacts of oil exposure can have profound changes in reproduction, health, and mortality. Using a robust system of evaluation utilizing both live (from health assessments, live strandings, remote sensing) and dead animals allows us to evaluate the continuum from exposure to poor health (disease) to reproductive failure or death and to identify the processes by which those occur over time. As a result of this integrated approach to evaluating the impacts of oil exposure and response activities, the NRDA is evaluating results from the UME investigations related to mortality and oil-related connections to these mortalities.

As explained above, NOAA NMFS is designated as the lead agency to coordinate MMSNs in the United States for cetaceans and pinnipeds (except walrus). In the Gulf of Mexico, the NMFS Southeast Region staff coordinate cetacean stranding response. As a result of the NRDA for the DWH Oil Spill, the MMSNs in the northern Gulf of Mexico have been directed by NOAA to follow strict sampling, necropsy, handling, and documentation protocols for all stranded marine mammals. These protocols require the network to collect and handle carcasses and samples differently than their normal operating procedures. These requirements result in additional NRDA-specific costs.

Funding for 2014 includes support for stranding networks to collect samples to be used in the NRDA and to perform the NRDA-required sample handling and retention, for database management, for completing pathologies that may be consistent with oil exposure, spatial/temporal and historical trends in strandings, and for evaluating and interpreting data. This activity also includes the evaluation of multipliers. Freezer and transport costs for carcasses are shared with other assessment activities and are included in the turtle request.

These data include information that is necessary to determine cause of death, types of lesions or diseases, and assess potential impacts of the DWH Oil Spill on coastal/estuarine bottlenose dolphins. In addition, providing rapid response and investigations of neonatal, calf, or pregnant female morbidity and mortality, especially during the peak stranding season from January through April, is critical to ongoing monitoring and assessment of this population for reproductive impacts, and the effects on this population from the DWH Oil Spill.

Samples and data from strandings in the northern Gulf are of interest to the NRDA and require additional sample collection and/or analysis beyond what is needed for the stranding program or UMEs. Within this activity are included some additional analyses of strandings data or samples from strandings (i.e.,

histopathology) to assist in the assessment, including evaluating potential stressors such as disease or other environmental stressors. This request includes the analysis of remaining samples that were not covered for the 2013 BP request including newly collected samples from recent strandings.

Additionally, this request includes stranding database management and sample handling for strandings. Basic information regarding strandings (location, date, time) is collected by the stranding network on national forms completed by the individual stranding agencies (Level A data). These data are entered into a national database (MMHSRP database) and only include the basic stranding information. Given the large temporal and spatial scale of this event, there continues to be a need to add additional fields not typically collected (degree of visible oiling, etc.) and combine these stranding data with tissue tracking and chain of custody information in a single database that was developed over the last year. The needs in 2014 are to continue data entry, data validation, and sample tracking, and to integrate these data with the UME analytical results data for easier searching and access for injury assessment efforts. In addition, for the interpretation portion, there continues to be a need to update historic records and query them as additional questions or needs are raised from the NRDA assessment team. Over 22,000 samples have been entered into the sample tracking database to date. The data entries for tracking these samples are ongoing, and samples are still being collected and shipped for analyses. This activity requires funding in 2014 to continue data entry, data validation, data integration, data and sample tracking, and data assessment and comparisons to historic data.

This activity funds agency employees and contractors to manage the data and samples from stranded animals including data entry, QA/QC, database management, and data integration. Funding also covers sample tracking, documentation, and shipping.

Marine mammal carcasses recovered from beaches (i.e., strandings) provide a minimum count of the mortalities that have occurred within bottlenose dolphin stocks occupying a region and time period. Spatial and temporal patterns in the recovery of stranded carcasses reflect variability in both the rate of mortalities and the probability that animals dying in nearshore coastal waters will be transported to beaches where they can be recovered by responders. Wind or currents may transport carcasses away from the initial location of the mortality and affect the likelihood that carcasses will reach the beach.

Between April 2010 and May 2013 (as of the writing of this document), the number of observed marine mammal carcasses on the Gulf beaches was significantly higher than historical numbers. The underlying cause of this elevated number of strandings is currently under investigation to determine if it is related to the DWH Oil Spill. To determine the actual number of mortalities, it is necessary to estimate the probability that a given marine mammal carcass will be transported to the beach. Further, it is necessary to understand the underlying variability in that probability given possible changes in weather and current patterns. In addition, the probability a carcass washing ashore would then be observed and recovered also needs to be estimated. Developing these probabilities will result in a multiplier that expands the number of observed stranded carcasses to the predicted mortality for affected marine mammal stocks.

The Marine Mammal TWG will work with modelers to conduct a study of particle drift to simulate the movements of marine mammal carcasses and estimate both the likely sources of carcasses and the probability that a floating carcass would be transported to the shoreline at different places and times within the period of the DWH Oil Spill and the northern Gulf UME.

Funds for the Marine Mammal TWG will support staff time to define the model runs for dolphin carcass tracking and evaluation of results. After developing appropriate multipliers from modeling runs, the Marine Mammal TWG will work with scientists skilled in developing multipliers for marine mammal strandings to use these data to develop estimates of the total mortality of marine mammals within coastal and estuarine waters of the northern Gulf of Mexico during the period from April 2010 to May 2013.

The activity also includes compilation of documentation and records related to the activity.

Connection to NRDA Process

Presently, exposure to MC252 oil cannot be ruled out as a contributor to mortality under the UME. As noted previously and as funded in previous years, actual mortality data is a critical component in understanding the continuum from oil exposure through various disease processes, as outlined above in estuarine dolphins, to death. Stranding data continue to be one of the critical lines of evidence that may be used to develop the injury assessment for coastal and estuarine dolphins as the longer term consequences of oil exposure are recognized. The development of multipliers will improve the estimate of the number of cetaceans that died post oil spill.

Sample/Data Handling

Samples will continue to be collected from stranded animals and managed under chain of custody and coordinated by the data management team as outlined above. Field sample data sheets will be maintained by the NOAA NMFS SEFSC under chain of custody and entered into the stranding database. Data management activities are required to manage, statistically analyze, and map the data collected under this activity. Samples and associated data acquired through cooperative work plans will be collected through methods defined in joint signed protocols. These samples will be analyzed and the data will be tracked, organized, and QA/QC'd by NOAA. These data, along with associated documentation such as validation reports, are maintained by NOAA's data management team and will be distributed to Trustee representatives through NRDA and cooperative databases.

Data/Deliverables Produced

This activity will provide a database that contains stranding-related data.

Level of Effort

Our request for the coastal and estuarine cetacean strandings activity is $ $5,444,345 in contract funds. These costs include 2.0 agency FTEs and 7.3 contract equivalents. Key personnel include study PIs and agency scientists.

PIs (NOAA and other)

Dr. Teri Rowles, NOAA OPR

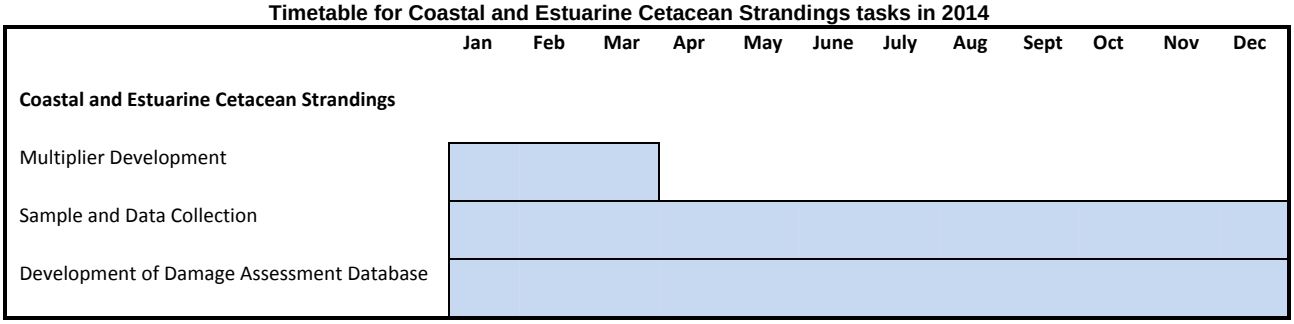
Dr. Erin Fourgeres, NOAA SE OPR

Dr. Jenny Litz, NOAA SEFSC

Dr. Lance Garrison, NOAA SEFSC

Timetable

Timetable for Coastal and Estuarine Cetacean Strandings tasks in 2014



NRDA samples from strandings will continue to be collected in the northern Gulf throughout 2014. The development of a database containing data to be used for the damage assessment will continue throughout 2014. The development of a multiplier is expected to begin in Quarter 1 of 2014 and continue for the remainder of the year.

RP Involvement

The RP has not participated in planning work proposed for 2014.

Oceanic Marine Mammals

A diverse community of tropical and sub-tropical cetaceans occupies the waters of the north-central Gulf of Mexico. Twenty defined stocks of marine mammals in the oceanic waters of the northern Gulf of Mexico include the endangered sperm whale (*Physeter macrocephalus*), a small resident population of Bryde's whales (*Balenoptera edeni*), and a suite of medium and small-bodied delphinids and small whales. The region affected by the DWH Oil Spill includes a high diversity and abundance of many of these species, particularly in the area along the shelf-break between Mississippi Canyon and DeSoto Canyon.

Visual observations for marine mammals were made near the DWH site by helicopter from 28 April through 31 July 2010. Observations included characterization of oil within the area and photo-documentation of marine mammals. In addition, skin biopsies for CYP1A induction were collected in a limited number of sperm whales in 2010 to assess exposure. Additional measures of exposure are being developed in other work groups and include the development of surface and subsurface oiling products and water contamination observations and modeling.

Several cooperative studies were undertaken to better understand the abundance of sperm whales and other marine mammals in the Gulf of Mexico through passive acoustic arrays and shipboard surveys. Sperm whales were satellite tagged in 2010, 2011, and 2012 to assess behavioral changes and home range

patterns. Interim and final reports for these studies are expected at the end of 2013 to assist in 2014 assessment activities.

The injury assessment will integrate information on surface oil, inhalation risk, effects to prey, shipboard surveys, passive acoustics, and telemetry. The report will be developed throughout 2014 as assessment activities are completed and data analyses become available. Because of the complexity of the data and analyses for this activity and the involvement of multiple species and multiple studies, we will incorporate peer review as part of the review process.

This activity includes all the necessary coordination, planning, and reviews of the overall oceanic marine mammal assessment with legal staff, with co-Trustees, and with the Responsible Party.

The activity also includes compilation of documentation and records related to the activity.

Connection to NRDA Process

This effort integrates data and findings into an injury assessment.

Sample/Data Handling

This effort integrates tissue and other lab sample data collected by prior NRDA activities. There are no new data collection efforts in this activity for 2014. Data management activities are required to manage, statistically analyze, and map these data. Samples and associated data acquired through cooperative work plans were collected through methods defined in joint signed protocols. These samples have been analyzed and the data are being tracked, organized, and QA/QC'd by NOAA. These data, along with associated documentation such as validation reports, are maintained by NOAA's data management team and will be distributed to Trustee representatives through NRDA and cooperative databases.

Data/Deliverables Produced

This activity will culminate with an injury assessment.

Level of Effort

Our request for the oceanic marine mammals activity is $363,579 in contract funds. These costs include 0.5 agency FTEs and 0.9 contract equivalents. Key personnel include agency and contract staff.

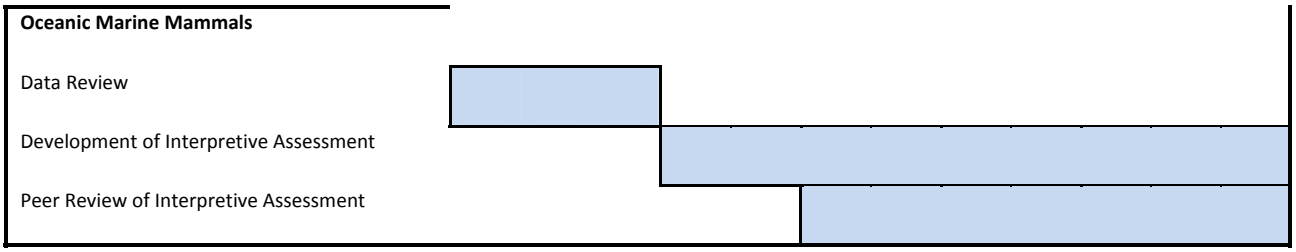
PIs (NOAA and other)

Agency and contract staff

Timetable

Timetable for Oceanic Marine Mammals Tasks in 2014

	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec



The primary focus of this effort during the first quarter of 2014 will be data review to investigate the process of summarizing multiple lines of evidence gathered through the assessment of oceanic marine mammals. The development of the interpretive assessment will begin in the second quarter and will continue through the end of the year as assessment activities are completed and data become available. Concurrent to the development of the assessment will be the peer review of this assessment, a task anticipated to begin in June 2014 and continue to the end of the year. The draft injury assessment will be available by the end of 2014.

RP Involvement

The RP has been very active in the data collection for this part of the case. The reports produced for passive acoustics and satellite tagging are submitted jointly to the RP and the Trustees. The interpretive injury assessment and quantification will be prepared by the Trustees.

Inhalation

The Trustees hypothesize that marine mammals may have been exposed to MC252 oil through inhalation. Airborne contaminants from discharged oil result from both volatilization of oil and entrainment of droplets from the ocean surface, as well as the generation of particulate matter and products of incomplete combustion during controlled burns conducted during the response effort. The Trustees have identified multiple marine mammal species that may have been exposed during the oil spill via inhalation, based on known populations in the Gulf and on sightings during the spill, for an assessment to marine mammals from inhalation exposure.

To support this risk assessment, estimated contaminant exposure levels have been compiled from measured and modeled air concentrations (both oceanic and nearshore). In addition, a comprehensive toxicology literature review, encompassing both marine mammals and laboratory mammals, has been conducted to evaluate the inhalation toxicity of oil and its individual constituents. For approximately 15 individual compounds, and potentially mixtures, exposure concentrations and toxicity assessments will be combined to predict the potential for short-term (acute) and long-term (chronic) marine mammal health effects due to inhalation exposures during and following the Deepwater Horizon oil spill. The unique physiology and behaviors of the marine mammals will be quantitatively taken into account when estimating potential health risks for these animals. Finally, the predicted health impacts will be correlated with observations of marine mammal health from the dolphin capture-release health assessments conducted over the past two years in the Gulf, as well as results from the ongoing investigation of the UME in the Gulf.

NOAA's first, interim partial claim for 2012 contained funding to perform a literature review and to collect air monitoring data. Based on preliminary review of the information, and particularly the modeled magnitude of harmful oil compounds near the ocean surface for multiple months after the spill, injuries to marine mammals from inhalation of oil compounds were more likely than not. NOAA's Phase 2 claim for 2013 contained funding to complete an inhalation risk assessment based on model results and peer-reviewed, mammalian injury thresholds for inhalation of oil compounds. The initial results of this risk assessment show that multiple health impacts are likely from the inhalation exposures during the DWH spill. We are requesting funds to complete an injury assessment for estuarine, coastal/shelf and oceanic marine mammals described in previous sections.

This activity includes all the necessary coordination, planning, and reviews of the overall assessment of inhalation-related injuries with legal staff, with co-Trustees, and with the Responsible Party.

The activity also includes compilation of documentation and records related to the activity.

Connection to NRDA Process

Inhalation of contaminants is a potential exposure pathway for marine mammals that may result in potential health impacts. This activity will evaluate exposure and potential toxicity to marine mammals.

Sample/Data Handling

This activity does not involve additional data collection. Data management activities are required to manage, statistically analyze, and map these data. Samples and associated data acquired through cooperative work plans were collected through methods defined in joint signed protocols. These samples have been analyzed and the data are being tracked, organized, and QA/QC'd by NOAA. These data, along with associated documentation such as validation reports, are maintained by NOAA's data management team and will be distributed to Trustee representatives through NRDA and cooperative databases.

Data/Deliverables Produced

This activity will provide a draft injury assessment, following a peer review.

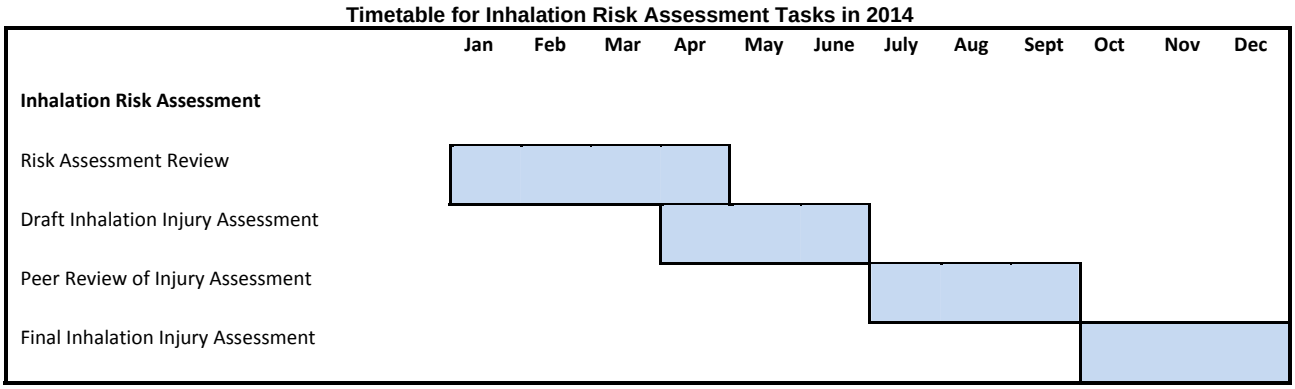
Level of Effort

Our request for the inhalation risk assessment activity is $439,267 in contract funds. These costs include 0.5 agency FTEs and 1.1 contract equivalents. Key personnel include agency and contract staff.

PIs (NOAA and other)

Amy Rosenstein, MPH, IEc

Timetable



The primary focus during the first quarter of 2014 for this activity will be on incorporating the risk assessment results into the injury assessment for marine mammals. In the second quarter of the year, the preparation of the draft inhalation injury assessment will begin. This draft is anticipated to be complete by the end of June 2014, at which point it will be available for peer review. A revised injury assessment will be prepared subject to the results of the peer review. This revised assessment is scheduled to be complete by the end of 2014.

RP Involvement

The RP has not participated in planning work proposed for 2014.

NEARSHORE HABITAT AND RESOURCE INVESTIGATIONS

H. Shoreline

Assessing Recovery of Coastal Wetlands

This activity includes several tasks related to the evaluation of injury and recovery of coastal wetlands. Specifically, the activity includes completion of laboratory analyses of 2013 coastal wetland vegetation samples; integration of 2013 coastal wetland vegetation data (field observation and measurement data and laboratory data) into the existing interpretive report; an evaluation of recovery of coastal wetland vegetation; an evaluation of recovery of the coastal wetland faunal community; and an evaluation of data collected under BP's non-cooperative soil and staking studies. These tasks are described in more detail below.

The Trustees are using the coastal wetland vegetation study to assess injury to coastal marshes and mangroves resulting from exposure to MC252 oil. The work plan for this effort, *Sampling and Monitoring Plan for the Assessment of MC252 Oil Impacts to Coastal Wetland Vegetation in the Gulf of Mexico* (coastal wetland vegetation plan), describes the study methodology in detail. The coastal wetland investigations are designed to detect changes in primary production, reproduction, and soil function. Data have been collected across four sampling seasons (fall 2010, spring 2011, fall 2011, and fall 2012) in

Louisiana and across three sampling seasons (spring 2011, fall 2011, and fall 2012) in Mississippi and Alabama. Sampling sites represent a spectrum of oiling conditions (including sites where no oil was observed) and a variety of coastal wetland vegetation habitat types (including mainland herbaceous salt marsh, back barrier herbaceous salt marsh, coastal mangroves, and Phragmites). A total of 200 sites have been sampled. At many of these sites, multiple "zones" have been sampled at various distances from the marsh edge (e.g., edge, middle, and furthest inland, with the furthest inland zone located at the inland boundary of observed oiling), resulting in the study of more than 500 zones. At each zone, field observation and measurement data have been collected. Key metrics include: visual measures of oiling, vegetative condition (based on degree of chlorosis), percent live and dead vegetative cover, canopy height, chlorophyll content, light adapted fluorescence, and elevation, among others. Soil and vegetative biomass samples have also been collected from each zone for a variety of metrics, including PAHs and chemical fingerprinting, sediment grain size, soil bulk density, soil organic matter, nutrients, and extractable elements. Field collection methods are based on standard methods published in peer-reviewed journals and standard NRDA methods. Laboratory methods are standard methods used by academic or commercial laboratories. These field and lab measurements allow for an evaluation of a range of ecological services, including primary production, provision of marsh habitat, marsh sustainability (i.e., resilience to land loss), and soil function.

Initial data analyses have indicated adverse impacts (for metrics such as vegetative health, biomass, and percent vegetative cover) to coastal wetland vegetation in oiled areas compared to unoiled areas, particularly in heavily oiled areas and when the oiling was persistent in nature. Greater adverse impacts to the vegetation have also been observed along the marsh edge, compared to the marsh interior.

Under separate funding, a subset of the coastal wetland vegetation sites will be sampled in fall 2013. Specifically, mainland herbaceous and mangrove sites in Louisiana (113 sites total) will be sampled for all metrics sampled in fall 2012. Expected samples to be collected in 2013 include approximately 240 belowground biomass cores, 183 aboveground vegetative clips (for biomass, stem density, and other measurements), 446 soil cores for nutrient analyses, 446 soil cores for physical analysis, and 223 surface soil samples for PAH analysis. These samples will be analyzed using 2013 funds.

The current funding request includes costs for data processing and statistical analyses of 2013 data and integration of these data and analyses with the previous seasons' data and analyses. The fall 2013 field effort will generate field observation and measurement data collected at 113 locations, which will result in an anticipated 72,000 or more individual data elements, in addition to the lab results data.

In addition to the sampling in Louisiana described above, we will also sample all 22 sites in Mississippi and all 16 sites in Alabama in 2013. Sampling and laboratory analysis costs for these sites were not included in the 2013 claim. Therefore, we are including these costs in the 2014 claim. Costs include $9,720 for equipment and vessels. (The states plan to use their own vessels for most of the work, so NOAA vessel costs are minimal.) No additional funds are requested for PAH analysis of the Mississippi and Alabama samples. Other costs associated with the Mississippi and Alabama sampling include non-PAH lab analysis costs, which we estimate to be $215,200 for analysis of approximately 87 belowground biomass cores, 88 aboveground vegetative clips, 176 soil cores for nutrient analyses, and 176 soil cores for physical analysis. (Expected number of samples is based on the number of samples collected in 2012.)

We will use the 2013 data analyses to update the interpretive report that was developed in 2013 and that summarizes objectives and methods, presents results of data analyses, and interprets results in the context of injury to vegetation. The interpretive report synthesizes statistical analyses of the coastal wetland vegetation data. Examples of specific types of statistical analyses are summarized in the "Connection to NRDA Process" section below. The interpretive report also describes the findings of our study in the context of other relevant studies, including literature from other spills.

In addition to updating the interpretive report with 2013 data, this activity also includes an analysis of recovery of the coastal wetland vegetation communities studied. This task will entail an examination of the five seasons of data collected to date (including the 2013 data) to determine whether recovery to baseline conditions has occurred, and if not, when full recovery is projected to be achieved, if ever. Literature on the recovery of these communities following non-Deepwater Horizon oil spills will also be considered, particularly if full recovery has not been observed under the coastal wetland vegetation study. If full recovery is not expected based on the coastal wetland vegetation study data and based on recovery at other spill sites of similar characteristics, we will estimate the expected maximum level of recovery. We will develop a report that includes the results of our time-series analyses, a summary of any non-Deepwater Horizon information used, and based on these sources, predictions about the duration and magnitude of recovery. The recovery analysis may include construction of a trajectory and may be developed separately for each habitat type, geographic location, key vegetative health metrics, and/or ecological services.

In addition to assessing recovery to coastal wetland vegetation, this activity includes an evaluation of recovery to coastal wetland fauna. The results of the coastal wetland faunal study (conducted under the *Work Plan for MC252 Oil Impacts to Fiddler Crabs and Periwinkles along the Gulf of Mexico)* were summarized in a coastal wetland faunal technical report developed in 2012 and 2013. Under the current activity, these results will be evaluated in the context of results from other studies of the Incident (including non-NRDA studies), as well as relevant non-Deepwater Horizon studies. The end product will be an estimated recovery trajectory and/or an estimate of the maximum level of recovery and the time to maximum recovery.

This activity also includes examination of data from two coastal wetland studies conducted non-cooperatively by BP. These studies are the *Coastal Vegetated Habitats Soil Study* ("BP soil study") and the *Sampling and Monitoring Plan for the Assessment of Marsh Loss Due to Impacts from MC252 Oil in the Gulf of Mexico* ("BP staking study"). The objectives of the BP soil study were to (1) determine concentrations of total extractable hydrocarbons (TEH) in marsh soils at locations previously sampled under the coastal wetland vegetation study; (2) determine extent of chemical weathering of oil and rates of oil biodegradation in impacted areas; (3) determine potential benthic community changes due to the presence of MC252 oil; and (4) assess the potential toxicity of MC252 contamination to benthic species by using standardized sediment bioassay tests. In the BP staking study, stakes were placed along shoreline segments representing different SCAT oiling categories in Barataria Bay, the Mississippi River Delta, and the barrier islands. Stakes were then surveyed using real time kinematic (RTK) or similar technology. BP's study objectives were to: (1) measure the loss of coastal wetland vegetation at unoiled sites; (2) measure the loss of coastal wetland vegetation at sites exposed to various levels of MC252 oiling; and (3) ground-truth shoreline recession measured from aerial photographs or LiDAR (Light Detection and Ranging) data. BP plans to share data from these two studies with the Trustees. Under this activity, we

will explore the data and potentially perform statistical analyses. We do not at this time plan to incorporate the data into the coastal wetland vegetation interpretive report.

The activity also includes compilation of documentation and records related to the activity.

Connection to NRDA Process

Under this activity, we will continue to document and describe injury to coastal wetland vegetation habitats using data collected in 2013. Injuries will be assessed through comparison of key metrics between oiled and unoiled sites in fall 2013. Statistical analyses will be grouped by habitat type, as well as by marsh zone (edge, middle, furthest inland). The recovery analysis will provide an understanding of the pattern of injury and/or recovery over time and will provide an estimate of when, if ever, full recovery may occur. The degree and spatial extent of habitat injuries over time will be used to inform the extent of restoration needed to compensate for injuries.

Sample/Data Handling

Data management activities are required to manage, statistically analyze, and map the coastal wetland vegetation data. Previous samples and associated data acquired through cooperative work plans were collected through methods defined in joint signed protocols. These samples are being analyzed and data are being tracked, organized, and QA/QC'd by NOAA. These data, along with associated documentation such as validation reports, are maintained by NOAA's data management team and will be distributed to Trustee representatives through NRDA and cooperative databases.

NOAA's shoreline statistical team, comprised primarily of NewFields staff, has taken the lead on all data processing and statistical analyses to date and will continue to do so under this activity. Their analyses are directed by the study's PIs and are regularly shared with Trustees. Funding is requested for this work under the current activity.

The efforts of the project's Data Management Team (comprised of NOAA and IEc/subcontractors) to manage the coastal wetland data are included under a separate data management activity.

Data/Deliverables Produced

Deliverables for this effort include a revised interpretive report summarizing injury to shoreline habitats. The report will include documentation of purpose and methods, as well as data tables, maps, and figures illustrating and summarizing results, conclusions, and interpretations. The report will also include, by reference, the final validated coastal wetland vegetation dataset. The final dataset will also likely be posted on public websites. In addition, a report will be developed presenting an analysis of coastal wetland vegetation injury over time, which may include recovery. This report will present methods used in the analysis, non-Deepwater Horizon studies relied upon, if any, and the results of the analysis. This activity does not include development of a coastal wetland faunal recovery report.

Level of Effort

Our request for the coastal wetland recovery activity is $2,156,617 in contract funds. These costs include 1.1 agency FTEs and 6.3 contract equivalents. Key personnel include the study PIs, statisticians and data analysts, and IEc and agency data management teams.

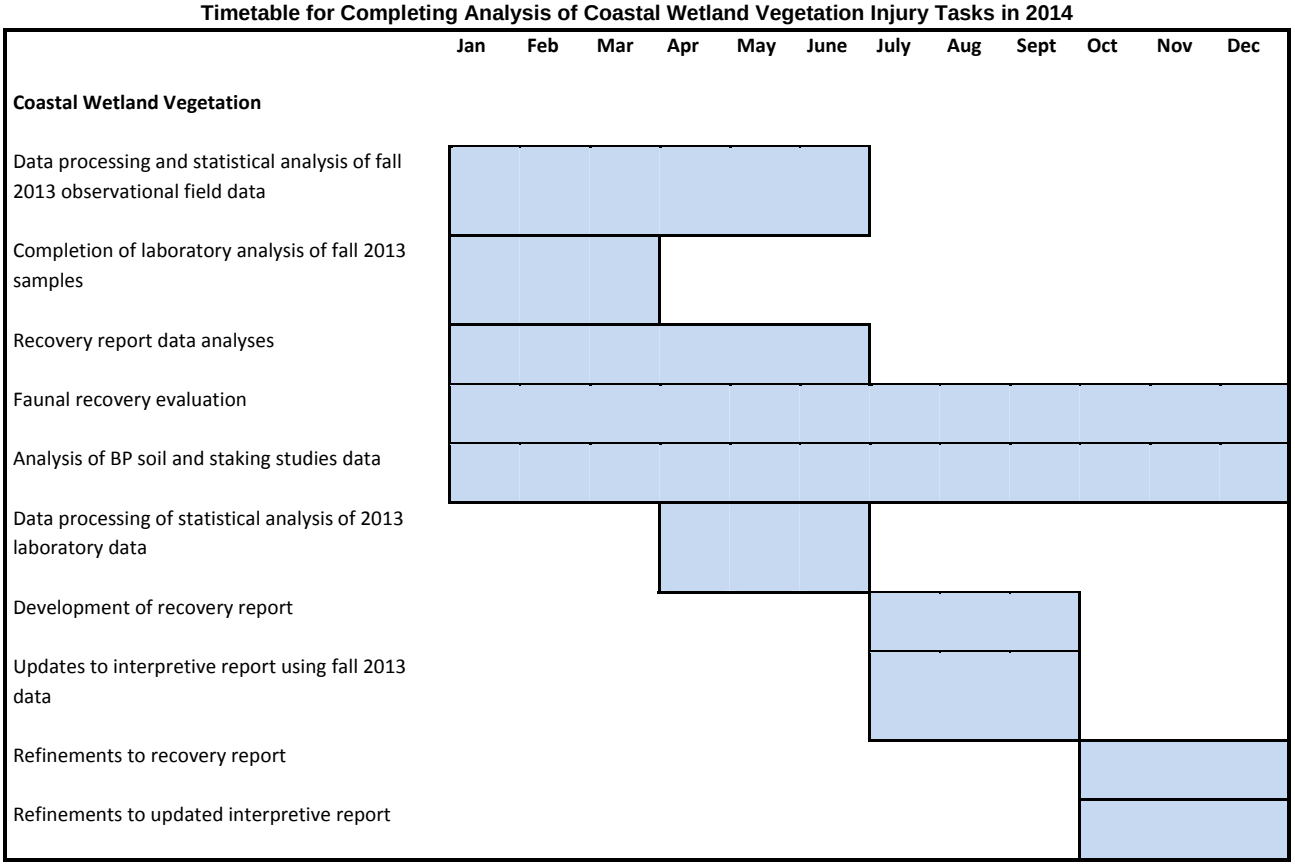
The majority of the coastal wetland vegetation data manipulation and statistical analysis will be conducted by high-level statisticians and data analysts at NewFields, with agency scientists providing guidance and oversight and managing communication with Trustees and the RP. Dr. Shahrokh Rouhani of NewFields is providing statistical support. Marla Steinhoff of NOAA is overseeing the effort. Contractors, including academic research biologists (PIs), statisticians, and data analysts, will collaborate on statistical analyses, interpreting the results of coastal wetland vegetation studies, and production of the interpretive report. The interpretive report and recovery report will largely be written by Drs. Mark Hester and Jonathan Willis, both of the University of Louisiana at Lafayette. IEc will assist in report development. The statisticians and PIs will regularly communicate with the Trustees and will attend and present at analysis-focused meetings.

PIs (NOAA and other)

The PIs for the coastal wetland vegetation study are Drs. Mark Hester and Jonathan Willis, both of the University of Louisiana at Lafayette.

Timetable

Timetable for Completing Analysis of Coastal Wetland Vegetation Injury Tasks in 2014



RP Involvement

The RP participated in the development of and is a signatory to the coastal wetland vegetation plan and its associated addenda (for Mississippi/Alabama and response cleanup site sampling), as well as the coastal wetland fauna plan. They also provided field staff for these sampling efforts. The addendum for the fall 2013 field effort has not yet been signed by the RP, but it is expected to be a cooperative effort. The RP actively participates in the monthly Shoreline TWG RP-Trustee calls to discuss the status of data collection and laboratory analysis activities, as well as future assessment activities.

The Shoreline TWG has shared data generated from the coastal wetland vegetation study and coastal wetland faunal study with the RP. Observational data have been entered in a shared web-based database within weeks of data collection. (RP field representatives have access to copies of the completed datasheets on the day of data collection.) NOAA expects to work cooperatively with the RP on the process to validate observational data. Laboratory data are shared upon receipt following third-party data validation.

The RP has not been involved in data analysis/interpretation or report development, and we do not envision their involvement in these efforts in the future.

Completing Analysis of Coastal Wetland Injury

This activity documents and evaluates injury from PAHs attributable to the Deepwater Horizon Incident.

The main focus of this task in future months is to generate estimates of loss for coastal wetland and wetland biota of ecological importance. This task involves reliance on field and/or laboratory-based MC252-specific toxicity results that illustrate effect of oil exposure on relevant endpoints. This information will be combined with information on exposure of these organisms to MC252-related oil, as well as other information from the literature.

This approach will be taken for other nearshore species such as penaeid shrimp and other species, including *Fundulus grandis*. Applying this approach to coastal species will allow for consistency across nearshore habitats and for leveraging costs. These modeling efforts will simply be a matter of assembling available coastal wetland data and accessing toxicity test results.

Overall, the proposed work is a new task under the shoreline TWG that will build on work conducted by other nearshore efforts under the Phase 1 and 2 requests.

Additional 2014 tasks for this activity include continuing to coordinate across technical working groups and integrating exposure and injury information across resource categories for the nearshore zone.

The activity also includes compilation of documentation and records related to the activity.

Connection to NRDA Process

This activity documents and connects exposure, pathway, and injury to key coastal wetland biota and plant species. Information developed under this activity will be used to integrate injury across coastal wetlands and link with the approach for nearshore species. Information from the modeling will build off existing exposure and injury studies conducted in the coastal wetlands. Injury determination and quantification are critical steps in the NRDA process. Determining the extent of injury will facilitate the determination of appropriate restoration projects to compensate for lost services.

Sample/Data Handling

This activity will not result in the collection of additional data. Rather, this effort integrates soil chemistry data and laboratory toxicity data collected by prior NRDA and other activities. It will use field-collected soil data, literature-based information on species density, and Incident-specific toxicity information to quantify injury to selected coastal wetland organisms and vegetation. Sample and data handling costs for information used in these analyses are not included in this task as they are already included elsewhere.

Data/Deliverables Produced

Deliverables for this effort include draft and final interpretive reports. New data will not be collected; instead, existing datasets will be analyzed and integrated. The report will include documentation of purpose and methods, as well as data tables, maps, and figures illustrating and summarizing results, conclusions, and interpretations.

Level of Effort

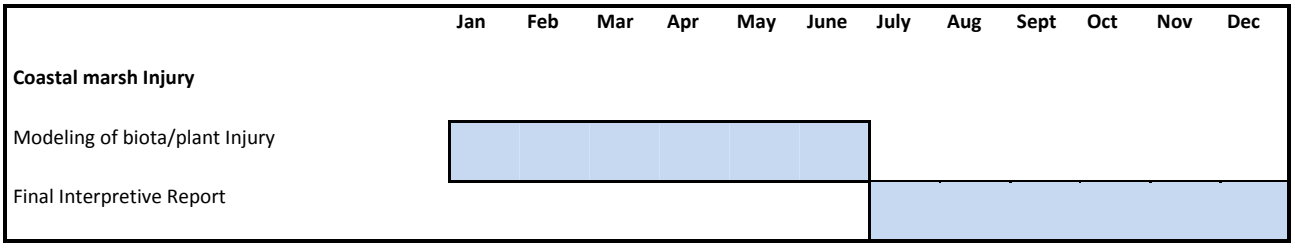
Our request for the activity to complete analysis of coastal wetlands injury is $152,601 in contract funds. These costs include 0.4 contract equivalents. Key personnel include the study PI and his staff, agency and contractor scientists, and IEc and agency data management teams. The majority of funds is for interpretive technical analyses, a task that will be completed by DISL. Additional funds are for overseeing and coordinating the activity and analyses, coordination, and statistical exploration and analysis (to be completed by NewFields).

PIs (NOAA and other)

Sean Powers of DISL will complete technical analyses as well as draft and final reports. Marla Steinhoff of NOAA, supported by IEc, will provide oversight of the activity and coordination with other NRDA entities who will supply data and analyses in support of the evaluation. Shahrokh Rouhani of NewFields will conduct spatial and statistical analyses and contribute technical findings (data tables, maps, figures) and interpretations to the interpretive reports.

Timetable

Timetable for Completing Analysis of Coastal Wetland Injury Tasks in 2014



The primary focus of the first two quarters of 2014 will be on modeling vegetation/biota injury. This task is expected to reach completion by the end of the first quarter, although the exact timing depends on the timing of availability of inputs needed for these calculations. The development of the final interpretive report will take place during the third and fourth quarters of the year.

RP Involvement

The RP participated in the collection of underlying data (for example, coastal wetland vegetation studies 2010 – 2013, shoreline preassessment and rapid assessment exposure studies in 2010, and the fiddler crab/periwinkle snail study 2011). We expect to continue to collaborate with RP representatives in the determination of final datasets to consider and apply as part of this activity.

Completing Analysis of Coastal Wetland Erosion

Loss of substrate and structure of wetland habitat is an important component of the injury assessment for coastal wetlands. Vegetation stabilizes soil and helps minimize loss due to waves and wind. Loss of vegetation along the marsh edge due to oiling may render areas vulnerable to erosion. Accelerated erosion due to oiling is of significant concern in light of current loss of wetlands in Louisiana. The Shoreline TWG

has coastal wetland vegetation sites across Louisiana, Mississippi, and Alabama. In Louisiana, sites were established in fall 2010. In subsequent resampling in 2011, site erosion was documented. Therefore, Trustees are interested in determining erosion as another component of shoreline injury.

Various datasets have been collected to evaluate potential erosion. These datasets provide complementary information that could be used to determine whether coastal wetlands are experiencing land loss due to oiling. A conceptual model will be developed to explain shoreline change rates. This activity will culminate in a data assessment and analysis product detailing findings.

In 2014 we will build upon work completed in 2013. A pilot study was conducted to process aerial imagery and develop a methodology to evaluate shoreline change. By the end of 2013, this methodology will have been applied to coastal wetland vegetation sites in Barataria Bay. In 2014, the scope will expand beyond Barataria Bay to other coastal wetland vegetation sites in Louisiana. Any datasets made available in 2014 (described in Sample/Data Handling) will be processed and incorporated into the analysis as appropriate. Prior scientific studies and data from NRDA and non-NRDA studies, such as the Shoreline TWG's coastal wetland vegetation study, may be used to help explain the pattern of shoreline change. A data assessment and analysis product will be developed that outlines the approach, data utilized, and conclusions.

A large portion of the data compilation and analysis will be conducted by contract staff, with input from Trustees. NOAA and contract scientists in coastal geology, coastal wetland systems, and NRDA will participate in the marsh erosion investigation. The contract technical lead will regularly communicate with the Trustees and lead shoreline change assessment calls and in-person meetings. The funding will support the contract technical lead and his technical staff for the analysis. Funding will support the contract technical lead for travel to participate in technical meetings. It will also fund contract statistical support from NewFields.

The activity also includes compilation of documentation and records related to the activity.

Connection of Activities to NRDA Process

This assessment is a component of the injury assessment for coastal wetland vegetation and associated fauna. The degree and spatial extent of coastal erosion over time that is attributable to oiling will be used to inform the extent of restoration needed to compensate for injuries.

Sample/Data Handling

This effort integrates several key datasets previously collected by NRDA activities. No new data will be collected under this activity. The following describes several key datasets previously collected under the NRDA and funded by the RP to evaluate potential erosion due to oiling. Real Time Kinematic (RTK) elevation surveys were conducted in association with 150 Louisiana coastal wetland vegetation sites. The RTK surveys provide horizontal and vertical coordinate data along a specified transect. These data characterize geomorphology and the elevation of substrate and coastal wetland vegetation at specific sites. Repeated surveys provide data on topographic changes at the coastal wetland vegetation edge. The first survey was conducted November 2010 through June 2011. These sites were resurveyed in 2012 (April – May) and 2013 (March – May). LiDAR data were acquired in spring of 2011 in oiled and reference areas in Louisiana. The LiDAR data allow for the mapping of elevation and shoreline position continuously

along impacted and reference shorelines. In addition, the RP funded acquisition of aerial imagery, which is suitable for shoreline mapping and change analysis, during the fall of 2010, the spring/fall of 2011, spring of 2012, and pre/post Isaac in the fall of 2012. This imagery is available via the Aerial Imagery TWG. BP independently collected shoreline staking data at the Louisiana coastal wetland vegetation sites in the fall of 2011, spring of 2012, and the fall of 2012. These datasets and others will be considered in the analysis.

Data management activities are required to manage, statistically analyze, and map these data. Samples and associated data acquired through cooperative work plans were collected through methods defined in joint signed protocols. These samples have been analyzed and the data are being tracked, organized, and QA/QC'd by NOAA. These data, along with associated documentation such as validation reports, are maintained by NOAA's data management team and will be distributed to Trustee representatives through NRDA and cooperative databases.

Data/Deliverables Produced

Deliverables for this effort include an interpretative report characterizing shoreline change in selected areas in Louisiana. The report will include documentation of purpose and methods, as well as data tables, maps, and figures illustrating and summarizing results, conclusions, and interpretations. The report will also include shoreline positions as a derived product from existing datasets.

Level of Effort

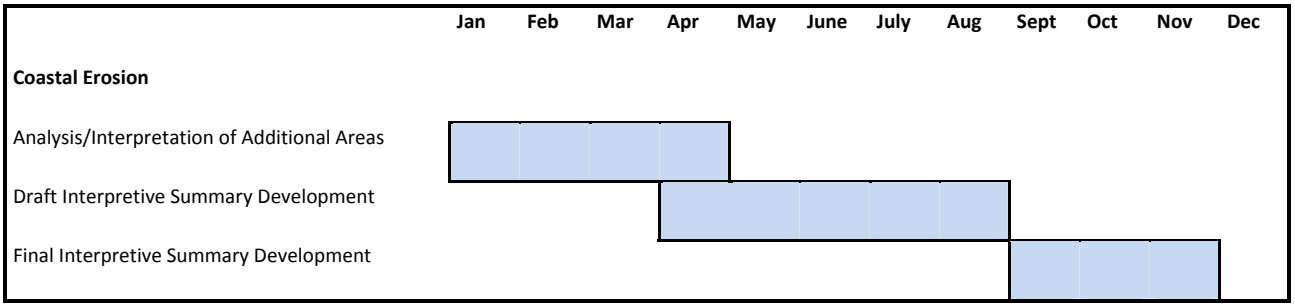
Our request for the coastal wetland erosion activity is $902,850 in contract funds. These costs include 0.2 agency FTEs and 4.2 contract equivalents. Key personnel include the study PI and his staff, agency scientists, and IEc and agency data management teams.

PIs (NOAA and others)

Dr. James Gibeaut, a coastal geologist and shoreline change scientists from Texas A&M University - Corpus Christi, is the PI for this activity.

Timetable

Timetable for Completing Analysis of Coastal Wetland Erosion Tasks in 2014



The primary focus of the first quarter of 2014 will be expanding the analysis beyond Barataria Bay. Aerial imagery datasets will be processed and analyzed using the methodology developed by the contract technical lead. In addition, the analysis at the site level will be expanded across the Louisiana coastline as applicable. These activities are predicted to end in the first and second quarters, respectively. The development of a draft interpretive report will commence in the second quarter of 2013 with the final interpretive summary beginning in the third quarter and reaching completion in the fourth quarter of the year.

RP Involvement

The RP participated in the development of the LiDAR acquisition plan and the three RTK acquisitions. The first RTK survey (fall 2010 – spring 2011) was a component of the coastal wetland vegetation study. The second and third RTK surveys in 2012 and 2013 were addenda to the coastal wetland vegetation study.

The RP participated in the development of the aerial imagery work plan and has participated in the development and is a signatory to the *Technical Specifications and Scope of Work for Aerial Imagery Acquisition, and the Low Altitude Aerial Photography of the Seagrass Beds of Southeastern Louisiana and Coastal Mississippi* (undertaken as part of the Mississippi Canyon 252 Incident Submerged Aquatic Vegetation Tier 2 Pre-Assessment). The Aerial Imagery TWG has shared data generated from the aerial imagery flights, the Quick Look for 2010, and the low altitude flights oblique imagery with the RP in a timely manner. The RP has not been involved in shoreline change data analysis/interpretation or report development, and we do not envision their involvement in these efforts in the future.

I. Nearshore Sediment and Biota

Characterizing Nearshore Sediment Contamination

To determine the potential for injury to organisms in the nearshore zone, nearshore sediment contamination will continue to be evaluated. This activity documents and evaluates exposure and pathways for PAHs attributable to the Incident and will be used as input for Activity I: Completing Analysis of Nearshore Benthic Injury and Activity J: Integration of Nearshore Exposure and Injury.

Activities between April and December 2012 (funded under the NPFC Phase 1 claim) included developing initial maps of PAH concentrations in sediment across the entire affected area for 2010 and 2011. Maps for 2010 incorporate the analytical results of geographically relevant NRDA and Response sample collections. Maps for 2011 use data collected specifically for determining nearshore sediment concentrations based on geomorphological/observed oiling strata (see work plans for more details on strata). The maps and related analyses are also incorporating the shoreline oiling database and maps that are currently under development as well as forensic chemistry analyses.

Past and planned activities between January and December 2013 (funded under NOAA's second interim, partial Claim) include developing initial analyses of sediment PAH concentrations, assessment of datasets collected by non-NRDA studies for potential inclusion in analyses, preliminary exploration of baseline, and incorporation of forensic analyses of nearshore results as they have become available. Additional

effort is required beyond that described in our 2013 request. The process we are using to generate the sediment contamination products is iterative. At the end of 2013, activities proposed in the second interim, partial Claim are projected to be approximately 75% complete due to delays in chemical analysis and data validation.

Additional funds are required for 2014 to continue these tasks and to pursue additional sediment sampling. In particular, the RP has proposed supplemental nearshore sediment sampling and contaminant analysis. The Trustees agree that additional contaminant sampling, even three years after the release, if designed properly, could be useful in assessing potential MC252 exposure, especially given the reports of oil observations at some of the nearshore sites. The Trustees' objectives for such a plan would include further delineating these areas of oiling and identifying other areas where oil could potentially accumulate and persist over time. Of note, the RP's proposed plan has yet to be shared with the Trustees, and we expect that the details of this plan will evolve over the course of several Trustee-RP discussions at the technical level. Therefore, at the present time, we are providing a placeholder estimate of costs for this activity based on a level of effort commensurate with past nearshore sampling efforts.

Throughout the remainder of 2013, we will continue to work with the RP to design and implement this additional nearshore sediment sampling effort. In addition, we will continue to refine our integration products and plan to finalize them in 2014 (noting that achieving this goal will depend in part on the timetable for the additional sediment sampling, which is not yet known). The final products will rely on finalized input from the shoreline oiling database and forensics efforts. Additionally, the final analysis will also require fully validated datasets. Validation, posting, and analysis of data from previously-collected samples are ongoing and will continue into 2014.

Specific activities include:

- Working cooperatively with the RP to design and implement the additional nearshore sediment sampling effort;
- Coordinating across technical personnel to gather relevant data;
- Validating data;
- Coordinating data reporting and posting;
- Integrating exposure information across resource categories for the nearshore zone;
- Summarizing interpretive results, including synthesis of statistical and geospatial analyses;
- Producing maps and tables describing nearshore sediment contamination concentrations in 2010, 2011, and in 2013/2014 sampling (the exact timing of which is yet to be determined);
- Documenting specific methods and results in a technical report;
- Conducting peer review on approaches for characterizing and describing exposure; and
- Compiling documentation and records related to the activity.

Connection to NRDA Process

This activity documents and describes pathways and exposure to nearshore habitats and biota by characterizing the nature and extent of sediment contamination. The additional sediment sampling may help Trustees assess whether potential injury to biota in nearshore areas is ongoing due to continued exposure to MC252 oil. If designed properly, results from this additional sampling could also inform estimates of the likelihood of false negative results at oiled sites from past sediment sampling efforts.

Overall, the nearshore sediment contaminant characterization is a critical component of the nearshore exposure assessment. The results of this effort include data products used to estimate the foregone production of nearshore species (e.g. brown and white shrimp) being conducted under Activity I: Completing Analysis of Nearshore Benthic Injury. In addition, determining the spatial extent of exposure and injury will inform the selection of appropriate restoration projects to compensate for injury.

Sample/Data Handling

The field work component of this activity will produce new data on sediment contaminant chemistry in nearshore areas. In addition, this task includes data verification/validation, data integration, and data management activities.

Data management activities are required to manage, statistically analyze, and map these new data. Samples and associated data acquired through cooperative work plans will be collected through methods defined in joint signed protocols. These samples will be analyzed and the data will be tracked, organized, and QA/QC'd by NOAA. These data, along with associated documentation such as validation reports, are maintained by NOAA's data management team and will be distributed to Trustee representatives through NRDA and cooperative databases.

Data verification and validation are important tasks to ensure the quality of data. Data verification is a process intended to ensure that the data stored in NOAA data repositories are an accurate representation of the values on datasheets; data verification also helps ensure that data entry rules have been followed. Data validation involves conducting reviews to ensure that original datasheets contain correct/appropriate data. Data validation allows for the completion of missing data fields and correction of clearly erroneous entries. Data verification and validation of critical fields, followed by the incorporation of changes into NOAA data repositories, promote Trustee-wide analyses of a consistent data product. Validation of critical fields for the 2011 submerged oil characterization plan is complete, but validation of critical fields for the 2010 results is ongoing and is expected to continue in 2014. WEST has been and will continue to provide validation and QA/QC evaluations of these data.

Data/Deliverables Produced

Deliverables for this effort include:

- Verified datasets of sediment contaminant chemistry from nearshore areas;
- Briefing materials and presentations documenting the preliminary results of the 2014 sampling efforts and their implications for the injury assessment and assessment of potential recovery;

- Integrated data summaries and syntheses, including relevant maps, tables, and figures; and
- Draft and final reports summarizing the results of statistical and geospatial analyses of nearshore sediment contamination data.

Level of Effort

Our request for the nearshore sediment additional data collection sub-activity is $726,916 in contract funds. These costs include 0.1 agency FTEs and 2.9 contract equivalents, excluding IEc and agency data management activities, which are tabulated separately. Key personnel include the study PI, agency and IEc scientists, WEST statisticians, and field and lab staff.

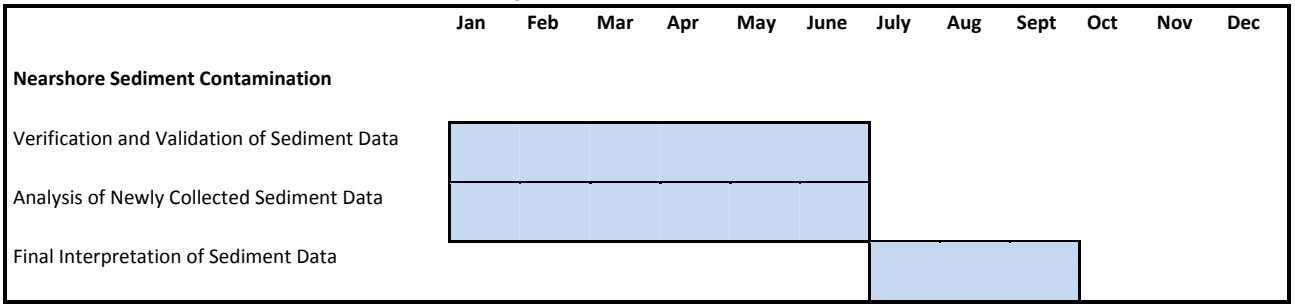
In addition, this request includes funding for the ongoing activities related to nearshore sediment contamination characterization described above.

PIs (NOAA and other)

Ian Zelo of NOAA, supported by Henry Roman and Alexandra van Geel of IEc, will provide oversight of the activity and coordination with other NRDA entities who will supply data and analyses in support of the evaluation. Key personnel expected to be involved with the data collection work include WEST, Inc., and Sean Powers of Dauphin Island Sea Lab of the University of South Alabama. NewFields will serve as the lead party responsible for conducting spatial and statistical analyses and contributing technical findings (data tables, maps, figures) and interpretations to the technical report.

Timetable

Timetable for Characterizing Nearshore Sediment Contamination Tasks in 2014



The first two quarters of 2013 will focus on the remaining verification and validation processes for available sediment data. In addition, analysis, verification and validation of newly collected sediment data is expected to occur in approximately this timeframe, but is subject to uncertainty. The final interpretation of the sediment data is scheduled to commence and be completed within the third quarter of the year. All activities are anticipated to be finalized by the fourth quarter of 2013.

RP Involvement

We anticipate the RP and Trustees will implement this plan cooperatively, although final decisions regarding implementation will ultimately be decided following review of the RP's proposed plan. The

division of labor among the RP and Trustees has yet to be determined. The RP funded previous work plans and has access to the associated data. The RP has participated in technical work group calls periodically to discuss the status of data collection and laboratory analysis activities on cooperative plans.

Most of the currently available sediment data to be used for this activity was collected cooperatively with the RP (as part of the 2010 and 2011 Submerged Oil Characterization Plans). The cooperative review and approval of changes to critical fields from Submerged Oil 2011 effort are complete (although work with the data management team to implement the changes and make them available for download is ongoing). We continue to engage the RP routinely as we complete analyses and work through the data validation process. We are actively engaged in jointly validating our sediment data from 2010.

Characterizing Nearshore Biota Contamination

The activity includes summarizing concentrations of contaminants in nearshore biota (e.g., oyster tissues, marine mammal and turtle prey, and marsh edge sandy shore samples). Results will be used across multiple TWG's to document the potential pathway from nearshore sediments to nearshore organisms, some of which serve as prey for (and thus, represent a potential pathway of exposure to) upper trophic level biota. The results of this activity will also be considered within the context of Activity J: Integration of Nearshore Exposure and Injury. This is a continuation of a 2013 activity that will continue into 2014.

Past and planned activities between January and December 2013 (funded under NOAA's second interim, partial Claim) include refining/adding to existing compilations and analyses of nearshore tissue PAH concentration data. Additional effort is required beyond that described in our 2013 request. The process we are using to generate the tissue contamination products is iterative. At the end of 2013, activities proposed in the second interim, partial Claim are projected to be approximately 75% complete due to delays in chemical analysis, including the availability of forensics result, and data validation.

Additional funds are required for 2014 to continue these tasks. Throughout the remainder of 2013, we will continue to refine our products and will finalize them in 2014. The final products are integrative and will rely on finalized input from the forensics efforts. Additionally, the final analysis will also require fully validated datasets. Validation, posting, and analysis of these additional datasets are ongoing and will continue into 2014.

Specific activities include:

- Continuing to gathering and collate relevant tissue and sediment concentration data from other NRDA efforts to the extent that additional data are generated;
- Incorporating the results of forensics analyses;
- Summarizing results in tables and graphical formats as appropriate;
- Documenting specific methods and results in a technical report; and
- Compiling documentation and records related to the activity.

Connection to NRDA Process

This activity documents and describes exposure to nearshore biota. The data and analyses will inform the benthic injury assessment and will contribute to pathway determination for higher trophic level organisms such as turtles and marine mammals. Determining the spatial extent of exposure and injury will inform the selection of appropriate restoration projects to compensate for injury.

Sample/Data Handling

This effort integrates tissue chemistry data collected by prior response, NRDA, and other activities, particularly those collected as part of the marsh edge sandy shore sampling plan, submerged aquatic vegetation oil exposure plan, marine mammal and turtle prey plan, the 2012 oyster intertidal plan, the oyster sampling plan, the oyster transition plan, the spring 2011 oyster recruitment plan, and the 2012 oyster recruitment monitoring plan. Results from several hundred samples are or will be available for this analysis.

Data management activities are required to manage, statistically analyze, and map these data. Samples and associated data acquired through cooperative work plans were collected through methods defined in joint signed protocols. These samples have been analyzed and the data are being tracked, organized, and QA/QC'd by NOAA. These data, along with associated documentation such as validation reports, are maintained by NOAA's data management team and will be distributed to Trustee representatives through NRDA and cooperative databases.

Data/Deliverables Produced

Deliverables for this effort include validated datasets and a draft and final report summarizing exposure to nearshore and shoreline biotic resources. New data will not be collected; instead, existing datasets will be analyzed and integrated. The report will include documentation of purpose and methods, as well as data tables, maps, and figures illustrating and summarizing results and conclusions. Additional deliverables include final tables of validated data posted on public websites.

Level of Effort

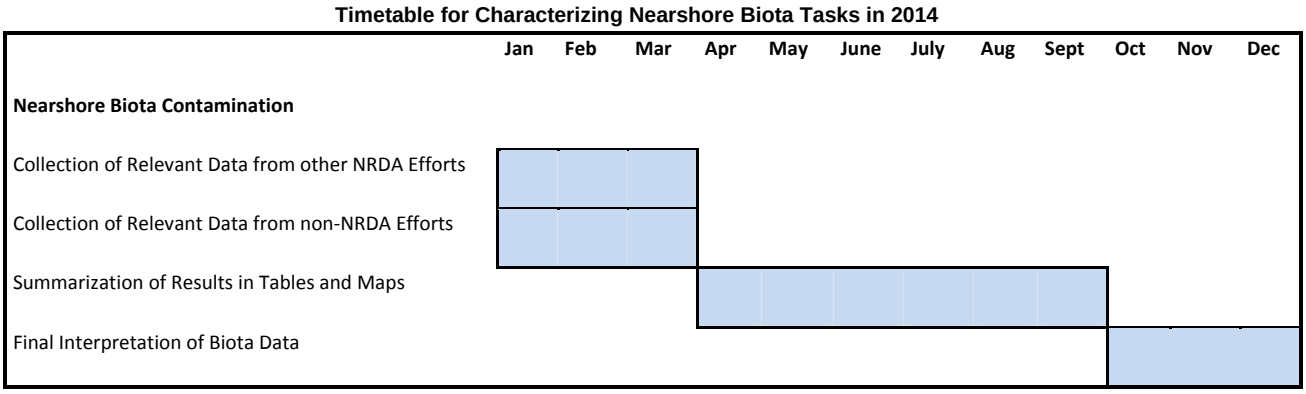
Our request for the activity to characterize nearshore biota contamination is $323,565 in contract funds. These costs include 1.3 contract equivalents. Key personnel include IEc scientists and NewFields statisticians and data analysts, who will complete statistical analyses and produce interpretive reports.

PIs (NOAA and other)

Ian Zelo of NOAA will provide oversight of the activity and coordination with other NRDA entities who will supply data and analyses in support of the evaluation.

NewFields will conduct spatial and statistical analyses and contribute technical findings (data tables, maps, figures) and interpretations to the reports. IEc will assemble data, conduct general analyses, and draft report text.

Timetable



Much of the available data on tissues has been identified, but some new data are in the process of being generated. In addition, forensic results for tissues are not yet available. The greatest level of effort during the first quarter of 2013 will be focused on updating the data collection to reflect this new information. The continuation of these tasks in 2014 follows their commencement in late 2012 (not shown on the timetable above). This data collection is expected to be complete by the beginning of the second quarter. The second and third quarters of 2014 will see a shift to focusing revising draft summaries of results and producing relevant tables and maps. Final interpretation of the biota data will take place in the fourth quarter of the year.

RP Involvement

The RP was deeply involved in the collection of most of the underlying data, including the marsh edge sandy shore sampling plan, submerged aquatic vegetation oil exposure plan, the oyster sampling plan, and the oyster transition plan. We continue to engage the RP routinely as we complete analyses and work through the data validation process.

Completing Analysis of Nearshore Benthic Injury

This activity documents and evaluates injury from PAHs attributable to the Deepwater Horizon Incident. It relies on outputs coming from Activity I: Characterizing Nearshore Sediment Contamination, and its results will be used as input for Activity J: Integration of Nearshore Exposure and Injury.

A main focus of this task in future months is to generate estimates of loss for a number of nearshore species of ecological and/or human use importance. This task involves reliance on field and/or laboratory-based MC252-specific toxicity results that illustrate effect of oil exposure on relevant endpoints. This information will be combined information on exposure of these organisms to MC252-related oil, as well as other information from the literature.

Overall, the proposed work will expand and extend work conducted to date under NOAA's first and second partial, interim assessment and restoration Claims. Activities proposed in NOAA's second interim, partial Claim for 2013 will be approximately 30-50% complete by December due to delays in

toxicity testing and data validation and delivery. A new task for 2014 will be to conduct a peer review of the approaches and methods used to evaluate injury to nearshore benthic organisms.

Additional 2014 tasks for this activity include continuing to coordinate across technical working groups and integrating exposure and injury information across resource categories for the nearshore zone.

This activity also includes compilation of documentation and records related to the activity.

Connection to NRDA Process

This activity documents and connects exposure, pathway and injury to key nearshore benthic species. The injury evaluation will apply the exposure documentation from Activity I: Characterizing Nearshore Sediment Contamination to relate injury to benthic fauna to oiled areas in the Gulf. The data and analyses from Activity I: Characterizing Nearshore Biota Contamination may be used as part of the benthic injury assessment to evaluate whether there are indications of biological uptake in addition to effects from sediment exposures. Information developed under this activity will be used as input for Activity J: Integration of Nearshore Exposure and Injury, which will integrate nearshore benthic injury with other nearshore injury categories. Injury determination and quantification are critical steps in the NRDA process. Determining the extent of injury will facilitate the determination of appropriate restoration projects to compensate for lost services.

Sample/Data Handling

This activity will not result in the collection of additional data. Rather, this effort integrates sediment chemistry data and laboratory toxicity data collected by prior Response, NRDA, and other activities. It will use field-collected sediment data, literature-based information on species density, and Incident-specific toxicity information to quantify injury to selected nearshore organisms. Data management activities are required to manage, statistically analyze, and map these data. Samples and associated data acquired through cooperative work plans were collected through methods defined in joint signed protocols. These samples have been analyzed and the data are being tracked, organized, and QA/QC'd by NOAA. These data, along with associated documentation such as validation reports, are maintained by NOAA's data management team and will be distributed to Trustee representatives through NRDA and cooperative databases. Sample and data handling costs for information used in these analyses are not included in this task as they are already included elsewhere.

Data/Deliverables Produced

Deliverables for this effort include draft and final interpretive reports. New data will not be collected; instead, existing datasets will be analyzed and integrated. The report will include documentation of purpose and methods, as well as data tables, maps, and figures illustrating and summarizing results, conclusions, and interpretations.

Level of Effort

Our request for the activity to complete analysis of nearshore benthic injury is $330,969 in contract funds. These costs include 0.1 agency FTEs and 0.9 contract equivalents. Key personnel include the study PI and

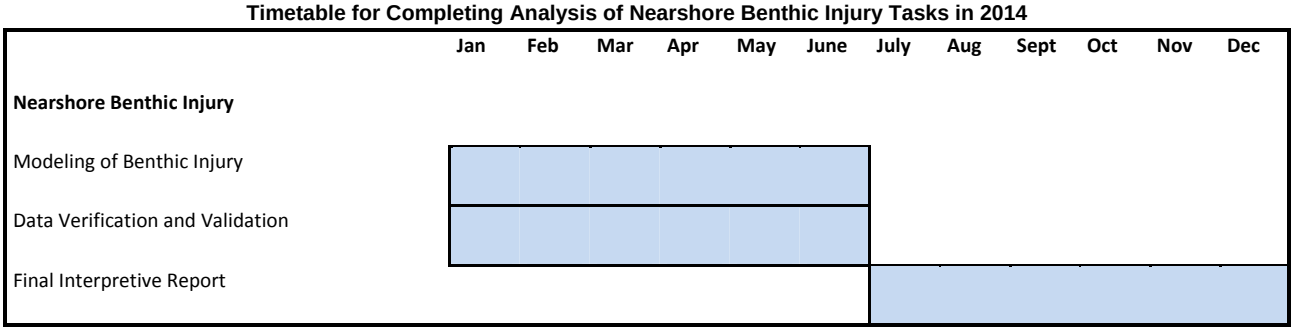
his staff, agency and contractor scientists, and IEc and agency data management teams. The majority of funds are for interpretive technical analyses, a task that will be completed by DISL. Additional funds are for overseeing and coordinating the activity and analyses, coordination, and statistical exploration and analysis (to be completed by NewFields).

PIs (NOAA and other)

Sean Powers of DISL will complete technical analyses and complete draft and final reports. Ian Zelo of NOAA, supported by IEc, will provide oversight of the activity and coordination with other NRDA entities who will supply data and analyses in support of the evaluation. NewFields will conduct spatial and statistical analyses and contribute technical findings (data tables, maps, figures) and interpretations to the interpretive reports.

Timetable

Timetable for Completing Analysis of Nearshore Benthic Injury Tasks in 2014



Following the completion of chemical analysis of marsh edge sandy shore biota samples in 2012 (funded under the NPFC Phase 1 request and not shown in timetable above), the primary focus of the first two quarters of 2014 will be on modeling benthic injury. This task is expected to reach completion by the end of the first quarter, although the exact timing depends on the availability of inputs needed for these calculations. Also commencing in the first quarter of 2014 will be the verification and validation processes of marsh edge sandy shore biota data, a task that is estimated to be complete by the end of the second quarter. The development of the final interpretive report will take place during the third and fourth quarters of the year.

RP Involvement

The RP participated in the collection of underlying data (for example, the 2010 and 2011 submerged oil characterization plans, marsh edge sandy shore sampling plan, submerged aquatic vegetation oil exposure plan, oyster sampling plan, and the oyster transition plan). We expect to continue to collaborate with RP representatives in the determination of final datasets to consider and apply as part of this activity.

Supplemental Collection and Analysis of Nearshore Sediment Data

The 2013 and 2014 nearshore oyster sampling plans are designed to relate data on oyster abundance in the nearshore to shoreline oiling category classifications as an indicator of exposure. In order to provide additional information related to ongoing exposure for oysters, he RP has proposed supplemental sampling in the nearshore environment for sediment and tissue contaminant samples. [The details of this plan are currently being developed by the RP and have yet to be shared with the oyster Trustees.] The trustees are interested in identifying areas of continuing oil exposure to all nearshore biota, not just oysters, and ongoing conversations to refine goals, approaches, and methods will occur over the next few months.

[Details of this plan are currently being developed. As a placeholder, we assume a level of activity similar to that employed in the 2014 Nearshore Oyster sampling plan. Criteria to select areas for sampling could include observations of oil during prior sampling events, ongoing cleanup activities, predictions of oil fate based on hydrologic and geomorphic factors, and presence of sensitive habitats and species.]

This activity will include compilation of documentation and records related to the activity.

Connection to NRDA Process

This activity samples sediment and tarmats in nearshore areas. Previous oyster work plans sampled sediments across subtidal oyster habitat, but did not sample sediments close to shore. Contaminant chemistry data in nearshore areas may help Trustees assess whether potential injury in nearshore areas is ongoing due to continued exposure to MC252 oil. Results may inform determination of restoration needed to compensate for injury.

Sample/Data Handling

The field work aspect of this activity will produce new data on sediment contaminant chemistry in nearshore areas. Data management activities are required to manage, statistically analyze, and map these data. Samples and associated data acquired through cooperative work plans will be collected through methods defined in joint signed protocols. These samples will be analyzed and the data will be tracked, organized, and QA/QC'd by NOAA. These data, along with associated documentation such as validation reports, are maintained by NOAA's data management team and will be distributed to Trustee representatives through NRDA and cooperative databases.

Data/Deliverables Produced

This activity will result in verified datasets of sediment contaminant chemistry from nearshore areas. In addition, under this activity, briefing materials and presentations documenting the preliminary results of the 2014 sampling efforts and their implications for the injury assessment will be produced.

Level of Effort

Our request for the nearshore sediment activity is $5,031,357 in contract funds. These costs include 0.3 agency FTEs and 15.5 contract equivalents, excluding IEc and agency data management activities, which are tabulated separately. Key personnel include the study PI, agency and IEc scientists, WEST statisticians, and field and lab staff.

PIs (NOAA and other)

TBD.

Other key personnel include:

- Sean Powers, Dauphin Island Sea Lab and University of South Alabama
- Ian Zelo, NOAA
- Henry Roman, IEc
- Michelle Bourassa Stahl

Timetable

TBD

RP Involvement

We anticipate RP and Trustees will implement this plan cooperatively, though final decisions regarding implementation will ultimately be decided following review of the RP's proposed sediment collection plan. The division of labor among the RP and Trustees has yet to be determined. For planning purposes, we assume similar Trustee levels of effort to those in the 2014 nearshore oyster plan. Data collection and laboratory analysis pursuant to cooperative plans would be discussed with the RP. Data would be shared as it is validated.

J. Integration of Nearshore Exposure and Injury

Integrate and Interpret Findings Regarding Nearshore Exposure and Injury and Prepare Reports

The shoreline and nearshore environment is a complex ecosystem that processes and transfers nutrients, productivity, and energy to other zones of the Gulf of Mexico. Oiling of vegetated and beach shorelines creates a pathway for exposure and injury to nearshore biota. The importance of marsh edge as nursery habitat for fish species is of particular interest. This task will integrate analysis of final data and describe pathways, exposures and injuries to nearshore and shoreline habitats and biota, including coastal wetland vegetation and fauna, beaches, nearshore fish and benthos, oysters, gulf sturgeon, nesting turtles, and submerged aquatic vegetation (SAV). It will integrate and summarize data and findings from other activities and is necessary to describe and quantify injury and its implications. This task includes two face-to-face meetings to review and interpret results and preparation of an interpretive report required to support presentation of the Trustees' claim for damages/compensatory restoration for injury to shoreline and nearshore ecological resources. Delays in the completion of preceding work resulted in little progress on this task in 2013; it is currently expected to commence later in 2013 and continue through 2014. Funds are requested for the 2014 work.

Specific activities include:

- Coordinating within and across technical working groups;
- Compiling and analyzing exposure data;
- Compiling and analyzing injury findings;
- Analyzing and interpreting baseline conditions;
- Synthesizing statistical and geospatial analyses;

- Preparing reports; and
- Completing a peer review.

Additionally, high-altitude, high-resolution aerial images are available for SAV areas potentially affected by the Incident. Imagery data collected during four aerial missions will be analyzed by NOAA using object-based habitat classification techniques in spatial software. The analysis will allow the Trustees to quantify the extent of structural and functional injuries in the Chandeleur Islands, Petit Bois Island, and Horn Island SAV from oil exposure and from propeller and boom scars attributable to response activities. In addition, impacts from the creation of a five mile sand berm at the north end of the Chandeleur Island chain will be analyzed. Funds are requested to complete the analysis of aerial imagery of only the Chandeleur Islands and the five priority locations in the central and southern portions of the chain where oiling has been confirmed. The interpretation of the imagery uses the object-based habitat classification technique. Various datasets will be compared and degree of injury (as determined by change in cover) will be determined.

This activity also includes the compilation of documentation and records related to the activity.

Connection to NRDA Process

This activity is an injury quantification task and integrates pathway, exposure, and injury information across nearshore and shoreline resources and habitats. Determining the degree and spatial extent of injury will enable the determination of appropriate types and scales of restoration projects needed to compensate the public for injuries to natural resources.

Sample/Data Handling

This effort will summarize and integrate data collected in specific exposure and injury assessment tasks. Data management activities are required to manage, statistically analyze, and map these data. Samples and associated data acquired through cooperative work plans were collected through methods defined in joint signed protocols. These samples have been analyzed and the data are being tracked, organized, and QA/QC'd by NOAA. These data, along with associated documentation such as validation reports, are maintained by NOAA's data management team and will be distributed to Trustee representatives through NRDA and cooperative databases.

NewFields data analysts will compile final, validated databases for each of the studies of interest into a relational database or databases and will perform any manipulations necessary to facilitate the necessary statistics. GIS software will also be used. NewFields will direct these efforts, including activities required to integrate, summarize, and statistically analyze the data.

Data/Deliverables Produced

Deliverables for this effort include a draft and final interpretive report summarizing pathway, exposure, and injury to nearshore and shoreline resources and habitats. The report will include documentation of purpose and methods, as well as data tables, maps, and figures illustrating and summarizing results, conclusions, and interpretations.

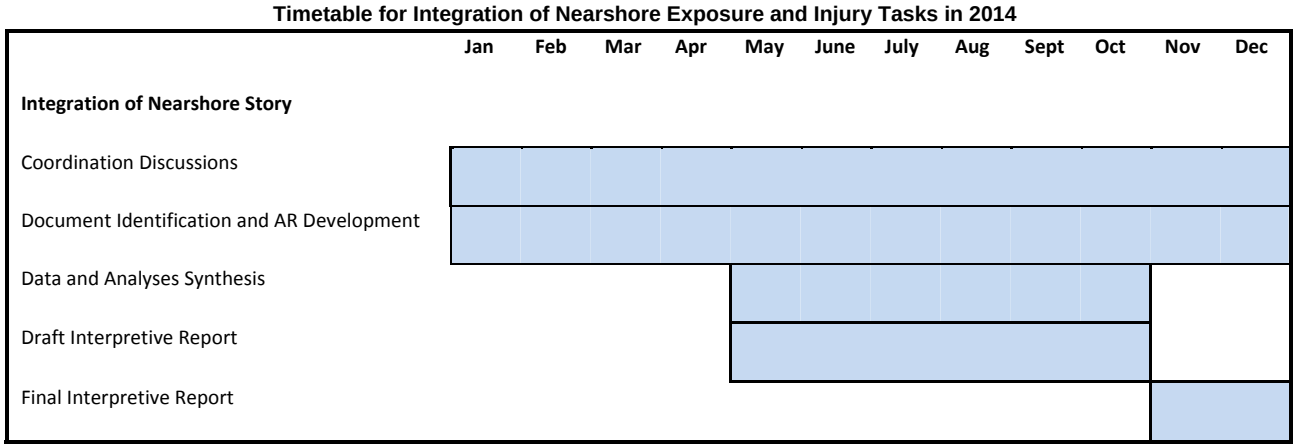
Level of Effort

Our request for the activity to integrate nearshore exposure and injury is $2,361,607 in contract funds. These costs include 1.5 agency FTEs and 6.5 contract equivalents. Key personnel include agency scientists, statisticians and data analysts from NewFields, scientists responsible for designing and managing the field data collection efforts the results of which will be included in this report, independent scientists to provide guidance and/or peer review services, as well as support staff from IEc. Tasks include but are not necessarily limited to: coordination support from the PIs, data analysis support from NewFields, input from PIs of key studies of nearshore and shoreline habitats and biota, peer review, and document and coordination support from IEc.

PIs (NOAA and other)

Mary Baker of NOAA will lead this activity. The activity will be a collaborative effort of the NOAA TWG leads for each of the relevant habitats and biota. These TWG leads include Marla Steinhoff, Ian Zelo, Natalie Cosentino-Manning, Laurie Sullivan, and Diane Wehner. Representatives from DOI will also collaborate on nesting sea turtles. NewFields will provide statistical support, and scientists responsible for designing and managing the field data collection efforts will also contribute on topics specific to their areas of expertise.

Timetable



Coordination discussions between the nearshore TWGs will commence in January 2014 and will continue regularly throughout the year. Beginning in May 2014, data and analyses from each of the relevant studies will be synthesized. A draft interpretive report will be developed by the end of October 2014 and will be finalized by the end of 2014.

The AR will be developed on an ongoing basis as the case progresses; document identification and associated AR development work is expected to continue throughout 2014.

RP Involvement

The RP has been involved in designing and implementing data collection activities to support these tasks. Additional time for collaborating and coordinating with the RP regarding designing future studies and processing and sharing data has been included in the level of effort estimates. Data interpretation and analysis is envisioned as an independent task for Trustees without RP involvement.

K. Oysters

Continued Monitoring of Subtidal Oyster Injury (Abundance and Biomass)

At field sites across the Gulf Coast, NOAA is participating in injury assessment activities centered on measuring oyster abundance and biomass, assessing the reproductive condition of oysters, and estimating the recruitment of oyster larvae to oyster reefs throughout the portion of the coast affected by oil from the Deepwater Horizon Incident and in unoiled areas to determine reference conditions. Oyster sampling occurs in areas with varying levels of oiling, including areas that were also affected by low salinities because of the openings of the freshwater diversion structures in 2010 and the Bonnet Carré and Morganza spillways in 2011. Sampling conducted by NOAA and its contractors throughout 2011 and fall 2012 illustrated that both spat settlement and abundance of live seed and market oysters in subtidal oyster reefs remain low in areas throughout much of the Gulf for more than two years following the Incident.

NOAA, its co-Trustees, and the RP are currently engaged in cooperative monitoring of oyster abundance in the subtidal zone in 2013 using settlement plates in spring 2013 and quadrat sampling in late summer 2013. Understanding the recovery trajectory of an injured resource is critical to the Trustees' injury quantification efforts, because it allows us to understand the temporal scope of the injury to that resource. Preliminary data observed to date suggests an extended injury period with little evidence of recovery in the oyster population. As a result, further monitoring of subtidal oysters in 2014 is necessary to allow Trustees to continue to quantify the temporal and spatial extent of diminished oyster resources, and to further document the recovery trajectory for these resources in the Gulf. The tasks that will be undertaken to complete the field work and analysis of subtidal oyster abundance and biomass are described in this section. Descriptions of subtidal oyster recruitment assessment work, nearshore oyster assessment work, and work necessary to integrate the results of the separate oyster assessment studies into a conceptual model that can be used to quantify the overall injury to oyster resources and the loss of ecological services that resulted from that injury, are discussed in Activity K: Continued Monitoring of Subtidal Oyster Injury - Recruitment, Activity K: Continued Monitoring of Nearshore Oyster Injury, and Activity K: Comprehensive Integration of Oyster Injury Assessment Elements.

Under this activity, we will continue to monitor abundance, biomass, and oyster mortality levels in 2014 for spat, seed, and market-sized oysters in sub-tidal nearshore habitats in Louisiana, Mississippi, Alabama, and Florida. Monitoring results from 2014 will be analyzed and added into models of exposure and injury to subtidal oyster resources.

In 2010, a large number of stations (roughly half) indicated low to very low abundance of market-size, spat-size, and seed-size oysters, particularly at the stations in upper Barataria Bay, Breton Sound, Mississippi Sound, and Mobile Bay. These areas had recently dead oysters present. In both 2011 and 2012, a greater number of stations indicated low to very low abundance in Louisiana, Mississippi, and Alabama, and recently dead oysters were only observed in a limited number of stations. Initial analysis of larval settlement patterns (see Activity K: Continued Monitoring of Subtidal Oyster Injury - Recruitment) shows widespread recruitment failure in 2010, 2011, and 2012, suggesting ongoing reproductive difficulties.

Recent analysis of preliminary quadrat-based abundance results from 2010 through 2012 shows a decrease in oyster abundances between late summer/early fall 2010 and fall 2011 and continued low abundance through 2012. Decreased preliminary dredge abundances from spring 2011 also appear to support a decline from low 2010 levels. Continued monitoring of oyster abundance and biomass provides critical information on whether oyster populations are facing longer term injury and a potential failure to fully recover to baseline levels.

Thus, although we have yet to collect the abundance monitoring samples for 2013, continued monitoring of abundance and biomass is also warranted in 2014. Continued monitoring of adult, spat, and seed oysters will bolster the Trustees' ability to assess and understand the temporal extent of injury and the recovery trajectory of the adult and juvenile oyster resources injured by the Incident. This understanding is a critical component in the quantification of the oyster injury and is absolutely necessary to inform a determination of restoration needed to compensate for injuries.

We are proposing to sample all subtidal sites which were sampled in 2011 and 2012 for abundance and biomass. These same sites will be sampled in 2013. Due to the low abundance counts found to date, monitoring at the full suite of sites allows for sufficient statistical power to detect statistically significant differences in abundance and biomass.

In 2013, the NOAA oyster team has been conducting extensive analyses of these datasets, but the scope of the data required to generate predictive models of all these areas and the complexity of NOAA's planned refinements to the modeling require that work on these models continues into 2014.

Specific activities include:

- Sampling oyster abundance and biomass, by size class, using quadrats at all 149 previously sampled sites and enumerating samples at a contract lab (Dauphin Island Sea Lab) using the same protocols as previous oyster abundance and biomass sampling efforts; and

- Analyzing abundance and biomass, including both absolute changes and changes in the relative abundance in different size classes, to understanding the extent of injuries and the trajectory of recovery for adult and juvenile oysters.

Sampling will begin with a two-day in-person training for field samplers covering monitoring plan standard operating practices and NRDA sample collection guidelines. This task also requires funds for field sampling support, technical support from Dauphin Island Sea Lab, contractor-provided project management support, oyster specialists, statisticians, data management support, sample preparations and shipping support, and vessels.

The activity also includes compilation of documentation and records related to the activity.

Connection to NRDA Process

This activity will enable the Trustees to quantify injury and integrate exposure, pathway, and injury information for subtidal oysters by producing estimates of changes in abundance and biomass following the Incident and the extent of time the injury persists. The monitoring component continues the work of previous NRDA oyster abundance and biomass sampling plans and is critical to assessing the injury and recovery trajectory of oyster resources following the Incident. Collection of these data is critical to maintaining our continuous record of subtidal oyster abundance data since the Incident.

Sample/Data Handling

This effort integrates and analyzes data collected under both previous and proposed new oyster work plans. Data management activities are required to manage, statistically analyze, and map these data. Samples and associated data acquired through cooperative work plans will be collected through methods defined in joint signed protocols. Samples and associated data already acquired were similarly collected through methods defined in joint signed protocols. These samples will be analyzed and the data will be tracked, organized, and QA/QC'd by NOAA. These data, along with associated documentation such as validation reports, are maintained by NOAA's data management team and will be distributed to Trustee

representatives through NRDA and cooperative databases. This effort will collect and analyze abundance and biomass of subtidal oysters in previously sampled locations.

Data/Deliverables Produced

This activity will result in the development of a work plan documenting sampling approach and standard operating procedures (SOPs). Produced under this activity will be a preliminary dataset of abundance and biomass measurements for 2014 subtidal sites (at the Dauphin Island Sea Lab). Additionally, preliminary statistical and geographic analysis of abundance and biomass from 2014 as compared to previous years (2010, 2011, 2012 and 2013) for sites with quadrat samples in all years will be completed. Analysis of data collected by the states at historically sampled sites and comparisons of these data with the NRDA collected data will be undertaken, and briefing materials and presentations documenting the preliminary results of the 2014 sampling efforts and their implications for the injury assessment and assessment of potential recovery will be produced.

Level of Effort

Our request for the subtidal oyster injury (abundance and biomass) activity is $3,514,114 in contract funds, excluding IEc and agency data management activities, which are tabulated separately. These costs include 0.2 agency FTEs and 9.7 contract equivalents. Key personnel include the study PI, agency and IEc scientists, WEST statisticians, and field and lab staff. Costs are primarily driven by the field work effort.

PIs (NOAA and other)

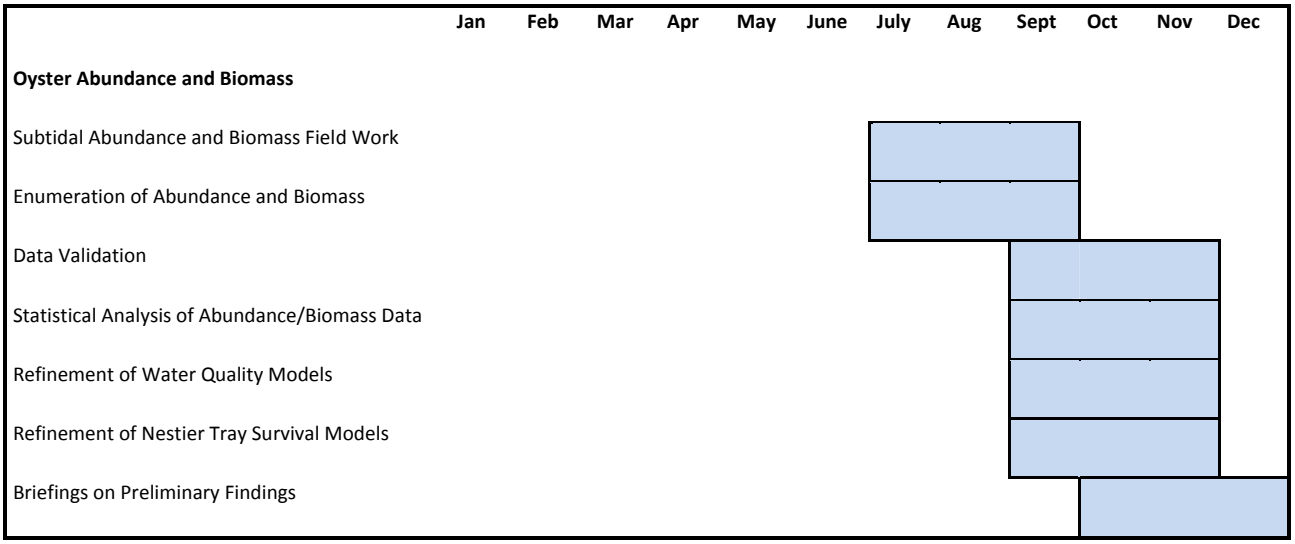
Dr. Sean Powers is Professor and Chair of the Department of Marine Sciences at the University of South Alabama, and is a Senior Marine Scientist at the Center for Ecosystem Based Fisheries Management at the Dauphin Island Sea Lab (DISL). He has been the lead oyster biologist advising and overseeing the Oyster TWG sampling activities since the start of the NRDA injury assessment. He directs the fisheries ecology lab at DISL, which is responsible for analyzing oyster quadrats for abundance and biomass of oysters and related fauna and performing gonadal and condition index analyses on oysters. In addition, Dr. Powers will play a key role in advising the design of sampling activities as well as in writing and editing the interpretive report of exposure and injury.

Other key personnel include:

- Ian Zelo, NOAA
- Henry Roman, IEc
- Lyman McDonald, WEST, Inc.

Timetable

Timetable for Continued Monitoring of Subtidal Oyster Injury – Abundance and Biomass Tasks in 2014



During the third quarter of 2014, the field work for subtidal abundance and biomass work will be completed. Also during this quarter, the enumeration of abundance and biomass data will occur such that preliminary results will be finished within several days of the completion of field activities. Toward the end of the third quarter, statistical analysis of abundance and biomass data is expected to begin. These three tasks are expected to be complete before the end of the fourth quarter. Completion of the interpretive report of exposure and injury to subtidal oysters will take place by the end of 2014.

RP Involvement

RP involvement in this activity is undetermined at this time. The RP funded previous oyster work plans and has access to the data, with the exception of the 2012 abundance monitoring. The RP participates on Oyster TWG calls periodically to discuss the status of data collection and laboratory analysis activities on cooperative plans, and the potential scope and design of new plans. Plans for 2014 abundance monitoring have yet to be shared with the RP.

Continued Monitoring of Subtidal Oyster Injury (Recruitment)

As mentioned above, understanding the recovery trajectory of an injured resource is critical to the Trustees' injury quantification efforts, because it allows us to understand the temporal scope of the injury to that resource. Preliminary data observed to date suggests an extended injury period with little evidence of recovery in the oyster population. Lack of observed recovery in subtidal oyster populations is consistent with Trustees' observations of rates of recruitment of oyster larvae to reefs since 2010, which have continued to be suppressed through the fall of 2012. Continued monitoring in both spring and fall 2014 will allow Trustees to further track these reproductive difficulties and more fully assess subtidal oyster recruitment injury and potential recovery over time. Under this activity, we will continue to monitor oyster larval recruitment rates (spat settlement) and adult oyster reproductive condition in

subtidal nearshore habitats in Louisiana, Mississippi, Alabama, and Florida, and integrate the 2014 monitoring results into models of injury to subtidal oyster resources.

Recruitment (the successful attachment of live oyster larvae to hard substrate) is a key event in the oyster life cycle. The Trustees collected recruitment and reproductive data in the late summer through fall of 2010, through most of 2011, and fall of 2012; recruitment data for spring 2013 is currently being collected. Preliminary analysis of recruitment data through 2012 shows widespread recruitment failure in areas affected by the Incident and a continued lack of recovery in 2012. Reproductive condition data also suggests impaired reproduction in many locations, including the possibility that many subtidal oysters may not have spawned in 2011. NOAA is thus proposing continued monitoring of recruitment and reproductive health during the spring 2014 and fall 2014 spawning seasons to assess whether recovery or continued injury is occurring. Assessing both the spring and fall spawning will allow NOAA to better assess continued injury to oyster reproduction, by providing additional data points for a time series of reproductive data for both of these important spawning periods. This study will provide information about the trajectory of oyster recruitment recovery and/or continued injury. After sampling is complete, NOAA and co-Trustees will synthesize and interpret all the results of the analyses and develop interpretive reports.

Specific activities include recruitment monitoring and preliminary statistical analysis as described below:

- Recruitment monitoring will include collection of settlement plates deployed for three-week intervals and collection of adult oysters for gonadal index measurement via dredges. In the spring and fall of 2014, field teams will deploy settlement plates at all sampling stations of the 2011 spring recruitment sampling. During the spring season, up to four rounds of recruitment sampling will be performed at three-week intervals. The fall effort will involve three rounds of recruitment sampling. Two sets of three settlement plates will be deployed at each station during each round (about 930 plates total), with one set serving as a duplicate in case of settlement plate loss. Trustees will analyze one of these sets of plates at each station following retrieval to enumerate live and dead spat that settle at these stations during the deployment period. Planning for up to four rounds of sampling in the spring will help ensure that the spring peak settlement will be captured. Due to unusually cool weather conditions in the spring of 2013, the Oyster TWG extended recruitment sampling from three to four rounds in order to increase the likelihood of capturing the peak settlement period of spring oyster recruitment. Gonadal index will be measured from up to 365 samples of adult oysters in the spring and up to 300 in the fall season to help understand the reproductive status of oysters and to identify when spawning is approaching, when it has occurred, or if it does not appear to occur within the sampling period. The project PI, Dr. Sean Powers (from the University of South Alabama and the Dauphin Island Sea Lab) will oversee the measurement of recruitment rates using the settlement plate samples. Settled live and dead oyster larvae (spat) will be enumerated for the three plates in each sample. Data will be converted into a measure of settlement per meter squared per day, using the enumeration data and the length of deployment. He also will oversee the evaluation of the reproductive condition of the adult oysters collected using the gonadal index measurement. The gonadal index is measured as the width of the gonad divided by adductor muscle length. A condition index can also be measured for each oyster and is calculated as the weight of the oyster meat divided by shell weight. The field work will be preceded by a two-day in-person training for field samplers

detailing monitoring plan standard operating procedures and NRDA sample collection guidelines. This task requires funds for field sampling support, technical support from Dauphin Island Sea Lab, contractor-provided project management support, oyster specialists, statisticians, data management support, sample preparations and shipping support, and vessels.

- Preliminary statistical analysis of all recruitment metrics collected under the 2014 recruitment monitoring will be performed, as will comparison to recruitment results from the oyster sampling plan, the oyster transition plan, the spring 2011 recruitment plan, the 2012 recruitment monitoring plan, and the 2013 recruitment monitoring plan. The data collected in 2014 under the NRDA will also be compared to historical data to quantify the temporal and geographic extent of injury and determine changes in recruitment patterns. This task requires funds for contractor-provided project management, analysis, and drafting support for briefings, and support from oyster specialists and statisticians.

The activity also includes compilation of documentation and records related to the activity.

Connection to NRDA Process

This activity will quantify injury and integrate exposure pathway and injury information for subtidal oysters to produce estimates of changes in recruitment following the Deepwater Horizon spill. The monitoring component continues the work of previous NRDA oyster recruitment and reproductive condition sampling efforts and will improve the Trustees' ability to understand and characterize the temporal extent of injury and the recovery trajectory expected for oyster reproductive injury. The degree and spatial extent of diminished oyster larvae settlement over time, including recovery trajectories, has implications for recovery of spat, seed, and adult oyster populations and may be used in combination with data from other oyster NRDA studies to inform a determination of restoration needed to compensate for injuries.

Sample/Data Handling

This effort will collect and analyze larval recruitment and reproductive condition in previously sampled locations. Data generated from this plan will be combined with data from previous work plans as well as historical data to characterize potential temporal and geographical components of injury.

This effort integrates tissue samples analyzed for oyster larval recruitment, gonadal index, and condition index metrics collected by prior response, NRDA, and other activities. In addition, visual observation, instrumentation, and photographs were collected to further support the assessment. Approximately 5,600 oyster settlement plates will be collected (2,800 of which will be analyzed) under the 2014 oyster recruitment work to ascertain larval recruitment rates in addition to settlement plates and gonad and condition samples collected under previous plans. Data management activities are required to manage, statistically analyze, and map these data. Samples and associated data acquired through cooperative work plans will be collected (or were collected) through methods defined in joint signed protocols. These samples were and will be analyzed and the data will be tracked, organized, and QA/QC'd by NOAA. These data, along with associated documentation such as validation reports, are maintained by NOAA's

data management team and will be distributed to Trustee representatives through NRDA and cooperative databases.

Data/Deliverables Produced

- Work plan documenting sampling approach and SOPs.
- Preliminary dataset of recruitment and gonadal index metrics for 2014. (Lab enumeration and measurement of field collected samples will be completed at the Dauphin Island Sea Lab).
- Preliminary statistical and geographic analysis of collected data in 2014, including comparisons to previously collected data and assessment of recovery or lingering sub-lethal injury.
- Briefing materials and presentations documenting the preliminary results of the 2014 sampling efforts and their implications for the injury assessment and assessment of potential recovery.

Level of Effort

Our request for the subtidal oyster injury (recruitment) activity is $7,493,605 in contract funds. These costs include 0.5 agency FTEs and 23.6 contract equivalents, excluding IEc and agency data management activities, which are tabulated separately. Key personnel include the study PI, agency and IEc scientists, WEST statisticians, and field and lab staff.

PIs (NOAA and other)

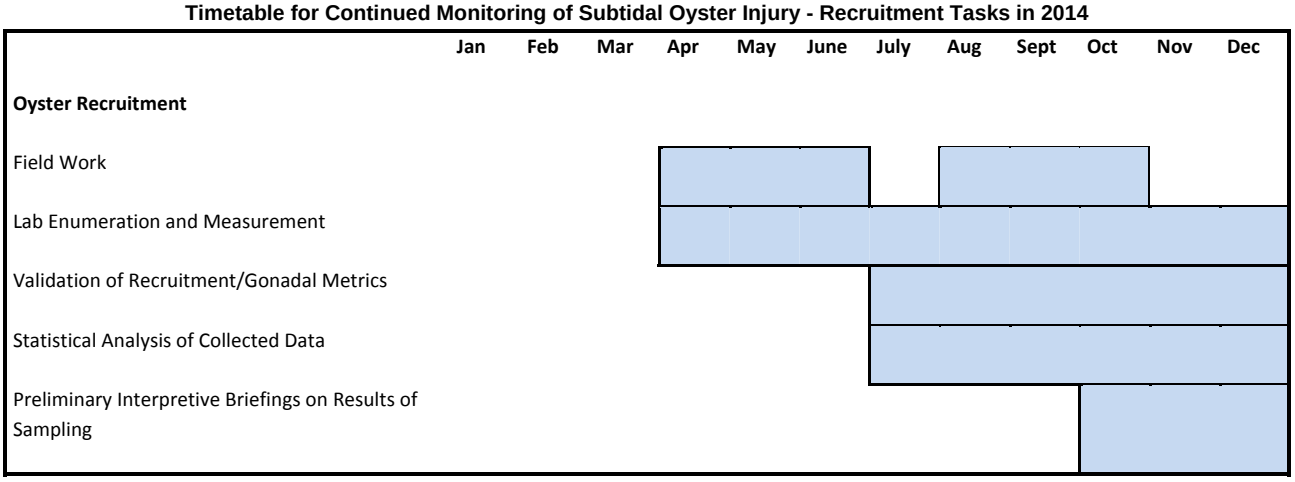
Dr. Sean Powers is Professor and Chair of the Department of Marine Sciences at the University of South Alabama, and a Senior Marine Scientist at the Center for Ecosystem Based Fisheries Management at the Dauphin Island Sea Lab (DISL). He has been the lead oyster biologist advising and overseeing the Oyster TWG sampling activities since the start of the DWH NRDA injury assessment. He directs the fisheries ecology lab at DISL, which is responsible for analyzing oyster settlement plates to measure recruitment of oysters and related fauna. In addition, Dr. Powers will play a key role in advising the design of sampling activities as well as writing and editing the draft and final interpretive reports. Furthermore, his lab will analyze adult oysters for gonadal index measurements.

Other key personnel for this effort include:

- Ian Zelo, NOAA
- Henry Roman, IEc
- Lyman McDonald, WEST, Inc.

Timetable

Timetable for Continued Monitoring of Subtidal Oyster Injury - Recruitment Tasks in 2014



The primary focus of the second quarter of 2014 will be the field collection of all samples. Also during this time, lab enumeration and measurement of field collected samples will commence at the Dauphin Island Sea Lab. This task will continue through the end of the year. The third quarter of 2014 will mark the start of the fall recruitment fieldwork and the beginning of the validation of recruitment and gonadal index metrics collected during the spring of 2014 as well as the start of the statistical and geographic analyses of collected data. This latter task includes comparisons to previously collected data and the assessment of recovery or lingering effect and is estimated to be complete in the fourth quarter. Finally, the completion of an interpretive report related to the extent of injury to larval oysters and oyster reproduction will be drafted in the fourth quarter of 2014 and completed by the end of the year.

RP Involvement

RP involvement in this activity is undetermined at this time. The RP funded previous oyster work plans and has access to the data. The RP participates on Oyster TWG calls periodically to discuss the status of data collection and laboratory analysis activities on cooperative plans. Plans for 2014 recruitment monitoring have yet to be discussed with the RP.

Continued Monitoring and Analysis of Nearshore Oyster Injury

NOAA is concerned about potential injury to oyster resources in nearshore area within approximately 20 meters of shoreline, based on results from a BP-funded NOAA study of exposure and abundance of oysters at marsh and beach sites along the Gulf of Mexico coastline in early 2012. Initial results from this limited study at over 50 sites with a varying range of oiling in sediments found that oyster habitat was present at more sites than previously anticipated based on observations of NOAA teams conducting submerged oil investigations. It also found evidence of petroleum in sediments and tissues in some locations as well as low oyster abundances in locations with petroleum. The Oyster TWG expanded the scope of nearshore oyster assessment in 2013 and recently completed fieldwork in nearshore areas across 266 sites in Louisiana, Mississippi, Alabama, and Florida. Field teams continued to find evidence of current or former oyster resource at a significant portion of these sites. In addition, teams observed

weathered oil at several of these sites, and samples of the oil from these locations are currently being fingerprinted to assess whether they match the MC252 oil signature. These preliminary findings of potential continued exposure of oysters to MC252-related contaminants, low abundance in areas with submerged oil, and the greater than expected extent of potential oyster habitat, coupled with the substantial extent of potentially affected shoreline, indicates the need for NOAA to continue its investigations of oyster injury in the nearshore zone in 2014. Additionally, nearshore oysters have been suggested to be a very important source of larvae that recruit to subtidal reefs (Dr. Earl Melancon, pers. comm. to Dr. Sean Powers). Our preliminary findings of potential injury to nearshore oysters, together with the dramatic, widespread, and persistent recruitment failure observed in the subtidal reefs further offshore, underline the importance of additional nearshore oyster injury assessment study. A better understanding of the degree and extent of the nearshore oyster injury may therefore be critical in understanding when oyster recruitment may return to pre-Incident levels in subtidal oyster reefs and thus may be used to quantify injury to subtidal oyster resources, as well to nearshore oyster resources themselves. Given that nearshore sampling did not begin until 2012, an additional year of sampling data is critical to understanding any extended injuries to oysters in the nearshore and how they may relate to injury observed in subtidal oyster resources in the Gulf of Mexico since the Incident.

Under this activity NOAA will assess, evaluate, and quantitatively characterize Incident-related exposure and injuries to oysters in the nearshore zone along the shoreline of the Gulf. NOAA first studied these oysters in early 2012, following receipt of information from the marsh edge sandy shore submerged oil sampling teams that oysters were present at more than thirty of their sites. NOAA expanded nearshore oyster sampling in 2013 and sampled at 266 sites across the Gulf, including sites previously sampled by the Oyster TWG in 2012, an expanded random sample of sites from previous DWH NRDA shoreline plans, and randomly selected shoreline segments in areas less intensively sampled in previous plans. The sample frames were designed to select sampling locations across a range of expected shoreline oiling conditions based on data collected following the Incident. The presence of oysters in shallow water in areas affected by wave tidal action, combined with the presence of submerged oil, could create the potential for continued exposure and injury. Furthermore, as noted above, nearshore oysters are thought to contribute substantially to the overall larval pool of oysters in the Gulf, and thus injury to these resources may have ripple effects on the rest of the oyster population. Preliminary data from NOAA's 2012 oyster intertidal plan and 2013 nearshore plan support the conceptual injury model above. In order to further monitor the abundance of nearshore oyster populations, we propose to repeat the 2013 nearshore plan in 2014. Continuing sampling will provide a statistically robust dataset across multiple years which will help inform assessments of nearshore oyster injury and potential recovery. Under this activity, the preliminary 2014 nearshore study results will be documented in interpretive briefing materials discussing potential exposure and injury in the nearshore and will be compared with results from the 2012 and 2013 studies.

Field work for this activity includes reconnaissance activities to locate and estimate percent cover of resource at each site, assessment of oyster abundance and biomass, and characterization of contaminant levels in oyster tissues in nearshore areas. In 2012 the NOAA team developed a new transect-based reconnaissance method for finding nearshore oyster reefs that can be conducted from the shoreline. This method is efficient in finding potential oyster resource, is cost-effective, and allows the team to map percent cover and identify quadrat sampling locations all within the same site visit, minimizing the need for multiple trips and for additional labor to pre-identify sample sites. The resulting detailed data on the

percent cover of oyster resources in nearshore habitats are critical for the Trustees to estimate more broadly the percent cover of oyster resources in areas with suitable environmental conditions, information which we need to conduct injury quantification and restoration planning. Mapping is typically not conducted in this zone, and NOAA's team has not been able to identify any pre-existing nearshore oyster habitat maps or estimates of nearshore oyster densities on relevant geographical scales. 2014 mapping will use transects offset from those mapped in previous nearshore oyster plans to avoid overlap with quadrat sample locations from those plans.

Specific activities include the 2014 nearshore field effort and preliminary statistical analysis as described below:

- The 2014 nearshore field effort will consist of sampling the same sites sampled under the 2013 nearshore plan, with replacement sites assigned for any 2013 sites that were inaccessible. Sites were chosen from sites for which exposure has been characterized either through previous sediment sampling or via shoreline oiling characterizations conducted by other TWGs. As noted above, the plan will involve transect mapping of oyster resources at each site coupled with sampling of oysters. As in the 2012 and 2013 studies, abundance and biomass by size class will be assessed using quadrat samples. A representative subsample of oysters from each quadrat will also be examined for shell height and condition index. The field component of nearshore oyster work is expected to begin in February 2014 and be finished by early April 2014. The result of this investigation will be detailed data on percent cover of oyster habitat, abundance estimates that can be compared across site exposure characteristics, and data on distribution of shell height and condition index by sample site. Field work will begin with a two day in-person training for field samplers detailing monitoring plan standard operating procedures and NRDA sample collection guidelines, as well as safety procedures.

- Preliminary statistical analysis of the data from the 2014 nearshore plan will be performed, including generating percent cover estimates from nearshore field efforts, as well as analyzing the abundance and biomass data collected under this plan and comparing preliminary 2014 results to data from the 2012 and 2013 plans. Additional exposure metrics, including water and sediment data from other NRDA TWG sampling efforts will be added into this analysis as needed to better characterize injury to nearshore oysters. The analysis and briefing development work will begin in the second quarter of 2014, continuing through the end of 2014.

The activity also includes compilation of documentation and records related to the activity.

Connection to NRDA Process

This activity continues work performed under the 2012 oyster intertidal plan and the 2013 oyster nearshore plan and provides additional data on oyster habitat and abundance in nearshore areas. This activity will enable NOAA to quantify injury and integrate exposure pathway and injury information for nearshore oysters and will also enable NOAA to estimate a percent cover estimate for nearshore oysters critical to the final injury assessment and quantification of the nearshore area impacted as a result of the Incident. The results of the nearshore effort will help inform injury assessment in the subtidal zone related to the suspected link to the diminished larval supply in the Gulf, under the activity of developing the

integrated oyster injury quantification discussed below (Comprehensive Integration of Oyster Injury Assessment Elements). Results will inform determination of restoration needed to compensate for injury.

Sample/Data Handling

The field work aspect of this activity will produce new data on percent cover of oysters in nearshore areas as well as abundance and biomass counts of nearshore oysters. This effort integrates abundance and biomass of oyster tissue samples collected by the 2012, 2013 and 2014 oyster nearshore sampling activities. In addition, visual observation, instrumentation, and photographs will be collected to further support the assessment. Up to 1,600 oyster quadrats will be collected under the 2014 oyster nearshore work to ascertain abundance and biomass metrics in addition to approximately 1,074 quadrats collected under the previous oyster nearshore plans.

Data management activities are required to manage, statistically analyze, and map these data. Samples and associated data acquired through cooperative work plans will be collected through methods defined in joint signed protocols. These samples will be analyzed and the data will be tracked, organized, and QA/QC'd by NOAA. These data, along with associated documentation such as validation reports, are maintained by NOAA's data management team and will be distributed to Trustee representatives through NRDA and cooperative databases.

Data/Deliverables Produced

- Work plan documenting sampling approach and SOPs;
- Preliminary dataset of percent cover estimates of nearshore oyster habitat;
- Preliminary 2014 datasets of abundance and biomass measurements (at Dauphin Island Sea Lab);
- Preliminary 2014 datasets of shell height and condition index measurements (at Dauphin Island Sea Lab);
- Preliminary maps, charts, and graphs of unverified 2014 data on abundance, biomass, shell height, and condition index; and
- Briefing materials and presentations documenting the preliminary results of the 2014 sampling efforts, initial comparisons to past plans, and implications for the injury assessment and assessment of potential recovery.

Level of Effort

Our request for the nearshore oyster injury activity is $5,551,672 in contract funds. These costs include 0.3 agency FTEs and 18.2 contract equivalents, excluding IEc and agency data management activities, which are tabulated separately. Key personnel include the study PI, agency and IEc scientists, WEST statisticians, and field and lab staff.

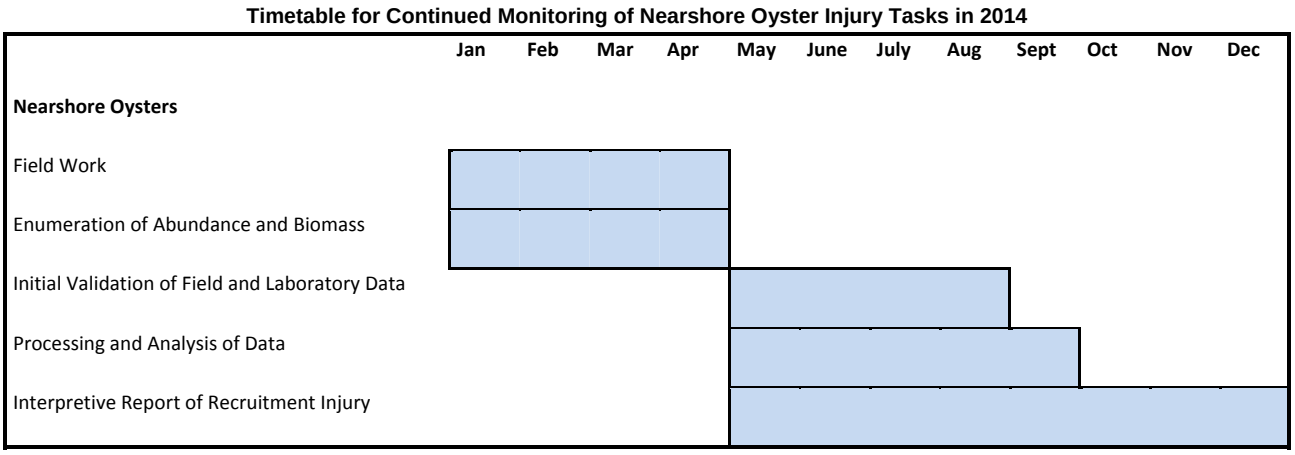
PIs (NOAA and other)

Dr. Sean Powers is Professor and Chair of the Department of Marine Sciences at the University of South Alabama, and a Senior Marine Scientist at the Center for Ecosystem Based Fisheries Management at the Dauphin Island Sea Lab (DISL). He has been the lead oyster biologist advising and overseeing the Oyster TWG sampling activities since the start of the Deepwater Horizon NRDA injury assessment. He directs the fisheries ecology lab at DISL, which is responsible for analyzing oyster quadrats for abundance and biomass of oysters and related fauna. In addition, Dr. Powers will play a key role in advising nearshore study design and statistical analysis as well as writing and editing the draft and final interpretive reports.

Other key personnel include:

- Ian Zelo, NOAA
- Henry Roman, IEc.
- Lyman McDonald, WEST, Inc.

Timetable



The primary focus during the first quarter of 2014 will be the field component of the nearshore oyster work which is expected to finish by late spring 2014. The enumeration of abundance and biomass will occur concurrently with fieldwork and preliminary results will be finished within several days of the completion of field activities. Initial review and validation of field and laboratory data will begin in the second quarter and is expected to be complete by the end of summer 2014. Also beginning in the second quarter is the processing and analysis of field collected data, which is estimated to be complete by the end of the third quarter of 2014. Briefing materials on the injury assessment of nearshore oysters is estimated to be complete by the end of 2014.

RP Involvement

RP involvement in this activity is undetermined at this time. The RP funded previous oyster work plans and has access to the data. The RP participates on Oyster TWG calls periodically to discuss the status of data collection and laboratory analysis activities on cooperative plans. Plans for 2014 nearshore work have yet to be discussed with the RP.

Comprehensive Integration of Oyster Injury Assessment Elements

After the work described in Continued Monitoring of Subtidal Oyster Injury – Abundance and Biomass, Continued Monitoring of Subtidal Oyster Injury – Recruitment, and Continued Monitoring of Nearshore Oyster Injury above is completed, NOAA and co-Trustees will synthesize and interpret results of the analyses and develop injury quantification reports. Completion of this activity will involve piecing together the separate lines of evidence for oyster injury from the different metrics measured in the various oyster DWH NRDA studies that have been conducted to develop an overall quantification of injury to oysters resulting from the Incident. For example, the reduction in larval supply from both subtidal and nearshore oysters has resulted in oyster production foregone, as well as a reduction in the amount of ecological services that would have been provided by these "missing" oysters. The injury quantification reports will use relevant scientific literature and reports (both DWH and non-DWH related) to support our conclusions. Therefore, even prior to the completion of the 2014 work related to analysis of all the oyster

DWH NRDA studies, NOAA personnel and contractors will be continuing their efforts reviewing literature and other data reports, conducting analysis and modeling relevant to the conceptual model of exposure and injury, performing data verification on datasets from previous plans, and integrating data from oyster studies from 2010 through 2013.

Under this task, the NOAA team will conduct additional analyses and will coordinate with other Trustees to review injury assessment results for the oysters by zone (subtidal and nearshore) and metric (abundance and reproduction) to develop a unified summary report of the impacts of the Incident on oysters in the Gulf. Work undertaken by the Trustees on this task in 2013 is expected to continue through 2014, as we continue to verify field and lab data from past years and process data from 2013 and 2014. We expect to have completed approximately 60 percent of the data verification activities on previously collected data by the end of 2013; progress was slower than expected in 2013 because of the demands of ongoing data collection on data verification staff. Completion of this task will involve both in-person meetings as well as continued validation and analysis of data from past plans to ensure consistency across datasets and to address the remaining data validation needs related to the substantial volume of data generated during past oyster plans. Additionally, the integration task for 2014 includes the following modeling tasks:

- Hydrodynamic modeling and modeling of particles in the nearshore environment where oyster nearshore and subtidal samples have been collected under previous plans. This modeling will focus on estimating larval flow patterns and distances, understanding the transport of surface oil in this environment, refining estimates of areas impacted by freshwater diversions in Louisiana in 2010 and by the Bonnet Carre and Morganza spillway openings in 2011, and enhancing our understanding of potential spatial correlations across sampling areas. Larval modeling will help inform the Oyster TWG's understanding of the distance larvae travel between basins within the Gulf and will complement assessment of recruitment sampling data. Surface oil modeling would potentially focus on estimating water concentrations of PAHs based on oil thickness as well as estimates of exposure of larval, juvenile, and adult oysters to oil in the nearshore and subtidal zones. Three-dimensional water quality modeling would inform assessment of exposure to lower salinities due to response actions undertaken by the state of Louisiana in response to the DWH spill.

- Developing methods to refine oil exposure estimates for oysters in the nearshore and, to some extent, subtidal regions that relate data collected on nearshore and subtidal region oil contamination (e.g., oiled shoreline categories and surface oil observations, including Shoreline Cleanup Assessment Technique (SCAT) sites and surface oil slick aerial photographs, respectively) to quantifiable impacts on the oyster population. This will involve producing estimates of sediment and water column oil concentrations in areas of oyster sampling.

In the nearshore environment, estimation approaches for oil concentration and oyster exposure to oil must consider the behavior of oil in the physical and chemical characteristics specific to this environment. For example, oil deposition in sediments and oyster exposure to deposited oil are impacted by tidal and wave action, wind, water temperature, and flow dynamics near freshwater spillways and diversions, among other factors. Estimation approaches based solely on spatial proximity of SCAT sites to areas of oyster sampling are therefore inadequate as they only represent one dimension of a multi-faceted exposure

process. Thus, it is important to develop more complex estimation methods that integrate rather than ignore these other relevant factors. In subtidal oyster habitat and potential habitat, current estimations of oil contamination of oysters are sometimes based on SCAT sites (when in close proximity) and oil slick aerial photographs. The physical and chemical characteristics of the subtidal environment, such as current and tidal flow, wave action, and temperature, influence the concentrations of oil oysters are exposed to at each stage of their life cycle. For example, surface oil slicks more seriously impact oysters in the larval stage, and suspended and settled oil have greater impacts on oysters attached to substrate. Work on this task began in 2013, but limited progress is expected by the end of 2013 due to delays in obtaining modeling data in nearshore environments in close proximity to oyster sampling.

Combining oyster larval counts and other oyster enumeration data with PAH water column concentrations will involve coordination with the Water Column TWG's work on modeling PAH concentrations using SIMAP. If necessary, NOAA also may investigate additional sampling and modeling approaches. Specific activities include:

- Continued refinement of preliminary models for the prediction of water quality parameters in areas critical to the injury claim; specifically, the areas of influence of the Davis Pond and Caenarvon freshwater diversion areas in Louisiana (which were fully opened as a response action to the Incident in 2010) where lowered salinities could increase the susceptibility of oysters to other stressors, such as MC252 oil, as well as in the estimated areas of influence of the Morganza and Bonnet Carre spillways, which were opened to relieve high Mississippi River water levels in spring 2011. The latter are important to address any subsequent oyster mortality or sub-lethal impacts that may have occurred in areas impacted by the Incident in 2011, which could limit the temporal extent of injury in those zones due to the Incident. Refinement to the models includes adjustment of the preliminary models to better account for land influences, influences of continuous data monitoring versus monthly monitoring at some locations, influences of wind, water depth, and fetch, smaller diversions or freshwater seeps, and incorporation of variables for precipitation, water temperature, and other relevant factors. These refinements will be followed by additional statistical model testing of refined products and development of draft and final interpretive reports. Work on this task began in 2013, and we estimate that it will be approximately 50 percent complete by the end of 2013, due to delays in obtaining relevant data from states and other sources for modeling spillway impacts in 2011. This task requires funds for contractor-provided project management, analysis, and documentation drafting support, and support from oyster specialists and statisticians.

- Continued refinement of survival models based on Louisiana historical Nestier tray data in the Davis Pond and Caernarvon areas of influence. Refinements are expected to include incorporation of additional years of Nestier tray data, development of relevant data on key covariates such as hurricane activity, river discharge, lagged temperature, and data on rapid temperature and/or salinity changes. These refinements will be followed by additional statistical model testing of refined products and development of draft and final interpretive reports. This task requires funds for contractor-provided project management, analysis, and documentation drafting support, and support from oyster specialists and statisticians. Work on this task began in 2013, and we expect modeling to be approximately 75 percent complete by the end of 2013.

Obtaining the data to refine these models has taken longer than expected, which will delay completion of the modeling to 2014.

- Integration of data across plans, including integration of larval data from 2010 and 2011 plans with data from recruitment and gonadal index sampling conducted from 2010 through 2014.

- Continuation of efforts to develop refined percent cover estimates from subtidal oyster reconnaissance efforts conducted in 2013 and used to synoptically extend the injury assessment to other affected areas of subtidal oyster habitat. The data collected will be compared to historical data to quantify the temporal and geographic extent of injury and determine changes in abundance and biomass. This task requires funds for contractor-provided project management, analysis, and documentation drafting support, and support from oyster specialists and statisticians. This task was originally proposed in 2013, but will likely be in the early stages at the end of 2013, because the mapping field work planned for 2013 will likely not be completed until mid-to-late 2013.

This effort will develop a comprehensive interpretive report on oyster injury assessment, explaining the conceptual model for the impacts of the Incident on oyster resources in the Gulf and linking the results of individual injury assessments according to that model. This task will first involve completion of data verification for all plans – a task that requires greater effort than originally anticipated, due to the large volume of data involved, the need to effectively link and harmonize data across multiple plans, and the need to coordinate with the RP to agree on changes leading to the ultimate development of a consensus dataset with which both sides can conduct analyses. Completion of this verification is a critical step in moving from preliminary analytical results to final results. We fully expect data verification to continue through the end of 2014, as we correct data and update preliminary analyses of oyster metrics to address data changes.

Additionally, this task involves coordinating several in-person meetings. One meeting will bring the Trustees on the Oyster TWG together to discuss the results of sampling and data analysis tasks and to discuss the development of a cohesive model of injury across multiple oyster life-stages. This meeting will likely take place in New Orleans, LA in the second quarter of 2014. Additionally, three smaller meetings with NOAA personnel and contractors will focus on determining the most appropriate analytical approaches and discussing the refinement of the comprehensive interpretive report. These meetings are expected to take place in Cambridge, MA; Laramie, WY; and Seattle WA.

This activity also includes compilation of documentation and records related to the activity.

Connection to NRDA Process

This work will use data collected under previous NRDA oyster sampling plans and refine preliminary analyses on oyster recruitment, adult and juvenile abundance and biomass, and oyster resource percent cover estimation efforts. The product will be the TWG's final injury determination of injury to oysters due to the Incident.

Sample/Data Handling

This effort integrates and analyzes data collected under previous NRDA oyster work plans, response, other NRDA TWGs, and other activities. Data management activities are required to manage, statistically analyze, and map these data. Samples and associated data acquired through cooperative work plans were collected through methods defined in joint signed protocols. These samples have been analyzed and the data are being tracked, organized, and QA/QC'd by NOAA. These data, along with associated documentation such as validation reports, are maintained by NOAA's data management team and will be distributed to Trustee representatives through NRDA and cooperative databases. No new samples will be taken under this activity.

Level of Effort

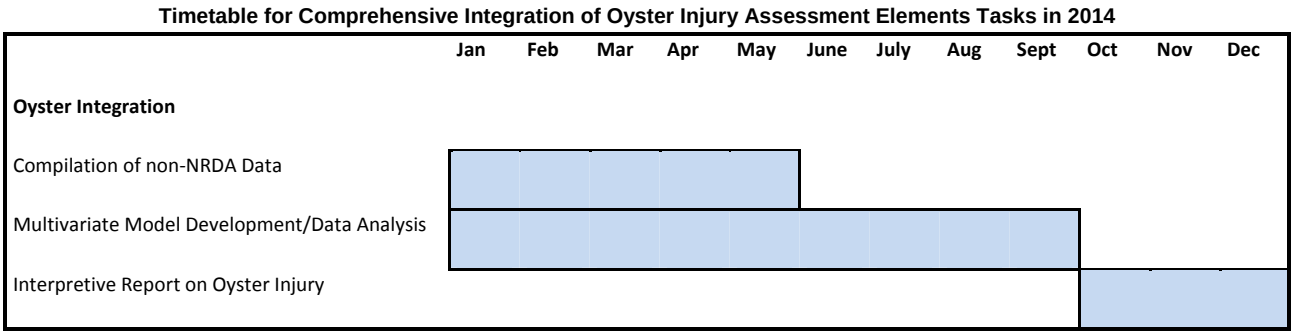
Our request for the comprehensive oyster integration activity is $ $5,098,406 in contract funds. These costs include 1.1 agency FTEs and 14.3 contract equivalents. Key personnel include the study PI, agency and IEc scientists, and WEST statisticians.

Personnel

Dr. Sean Powers, Professor and Chair of the Department of Marine Sciences at the University of South Alabama, and a Senior Marine Scientist at the Center for Ecosystem Based Fisheries Management at the Dauphin Island Sea Lab (DISL). Other key personnel include:

- Ian Zelo, NOAA
- Henry Roman, IEc
- Lyman McDonald, WEST, Inc.
- Joannes Westerlink, Notre Dame University

Timetable



The primary focus in the first quarter of 2014 will be development of multivariate models based on the results of pre-2014 plans, as well as nearshore circulation modeling. This component of the activity will start concurrent with the compilation of the data but will continue through the end of the third quarter of 2014. The interpretive report on extent of injury to both nearshore and subtidal oysters across multiple life-stages will begin in the third quarter of 2014 and will be complete by the end of the year.

RP Involvement

No RP involvement is expected for this activity. This activity will synthesize and interpret oyster data, some of which were collected under cooperative studies.

OTHER

L. Restoration Planning Activities

Restoration planning activities are presented in nine categories.

Third Assessment Claim Restoration Planning Categories
Leadership, Management and Oversight
Finance
Emergency Restoration
Early Restoration Planning and Offset Development
Early Restoration Regulatory and Environmental Compliance
Early Restoration Project Management
Programmatic Environmental Impact Statement and Programmatic Restoration Plan
Data Management
Communications

Leadership, Management and Oversight

Every facet of restoration planning and implementation under OPA, from Early Restoration to concept development to post implementation data management, is underway for this case. Managers, supervisors and senior staff, including attorneys with NOAA General Counsel for Natural Resources, are both actively engaging with and prioritizing and coordinating the day to day work of teams made up of both FTE and contract personnel. Coordinating and communicating relevant information on the progress and status of ongoing efforts with the Department of Commerce, other line offices within NOAA, DOI and other federal agencies (including the Council on Environmental Quality, Army Corps of Engineers, Forest Service and Environmental Protection Agency), state co-trustees, the Trustee Council and Executive Council, members of Congress and a variety of interested NGOs, local governments, and members of the public also falls upon senior managers, supervisors and senior staff. Senior managers are responsible for the broad financial oversight and fiscal management of restoration planning and implementation funds.

NOAA staff are participating in developing the overall Trustee Council support structure and governance requirements for both Early and long term restoration implementation. Like the Exxon Valdez Trustee Council, procedures, protocols, common terms of reference, internal controls and periodic audits will be necessary to govern what may be decades worth of restoration implementation. Because there is no precedent for multi-state and federal trustee governance agreements, crafting procedures agreeable to all parties will take time and a sustained effort.

For the purposes of this claim presentment, labor for managers, supervisors, and certain senior staff is being budgeted under the single category of Leadership, Management and Oversight despite their active participation in multiple categories.

The activity also includes compilation of documentation and records related to the activity.

Level of effort: A total of $2.567M is projected for this requirement, which includes 12 agency FTEs and contractor equivalents[3] and associated travel.[4]

Other requirements for this effort: There are no contract or other support requirements under Leadership, Management and Oversight.

Total required for Leadership, Management and Oversight: $2.567M

Finance

[3] Because NOAA staff are working across this and other restoration planning categories, the number of staff working under any one category is dynamic and depends upon agreement of Early Restoration projects between BP and the co-trustees. Consequently, actual labor effort within any category may shift considerably from projections.

[4] Travel is incorporated for all restoration planning categories as cost/unit/employee but can be separated if required.

Finance team activities include budget planning, tracking and execution as well as documenting expenditures for cost recovery. The finance team supports major restoration planning expenditures requiring contracts or other procurement vehicles. Finance staff apply knowledge of both agency policies and Federal Acquisition Regulations in order to execute day to day budget execution requirements. Additionally, cost recovery teams compile documentation for all NMFS program offices, as well as non-NMFS program offices, engaged in NRDA restoration planning. Contract and FTE personnel track, review and compile all supporting cost documentation needed to satisfy all requirements.

Level of effort: A total of $1.069M is projected for this requirement, which includes 5 agency FTEs and contractor equivalents and associated travel.

Other requirements for this effort: Financial oversight of restoration funds, whether Early or post-resolution funds, is of paramount importance. Never before have multiple states and federal trustees been accountable for the financial oversight of such considerable restoration funds. Accordingly, it is important to ensure that proper internal controls, independent validation of costs, and transparency of expenditure reporting is put into place early to ensure the proper use and administration of restoration funds for the public. To this end, NOAA will execute a contract for an accounting firm to provide NOAA independent reviews of cost documentation and other audit services as a specific part of this request. This contract was requested in NOAA's last claim but cannot be started in CY 2013 so the request is carried over from 2013. Specifically, the contractor will be an independent third party accounting firm that will perform the following activities at NOAA's request, 1) compile and summarize the certified cost packages of co-trustees' projects, 2) validate that those certified packages are accurate, complete, and have appropriate supporting documentation, 3) provide NOAA the option to perform audits, at the request of any Trustee, for projects undertaken by contractors or third parties other than co-trustees, or the co-trustee agencies involved in the expenditure of restoration funds and 4) provide summary level (i.e., clearinghouse) accounting services to the Trustee Council. NOAA sees this contract as a necessary element of its fiduciary responsibility and to enhance transparency of their restoration expenditures to the public. At the time of this request, the co-trustees are evaluating whether they also desire these services. Accordingly, NOAA's estimate of this contract is based on the assumption that the contract will be made available for and will serve all co-trustees. Funds are requested to cover the first 24 months of this contract (CY 2014 Q1, $1M).

Total required for Finance: $2.069M

Emergency Restoration

In 2013, NOAA finished the implementation of a Submerged Aquatic Vegetation Emergency Restoration Plan project. In CY 2014 NOAA will address outstanding project monitoring and closeout costs. Close out costs include labor and travel for year 2 monitoring and estimated costs for OPA-required project reporting.

As agreed to between BP and NOAA, NOAA is paying for contract costs with its own funds to complete the negotiated Mississippi Canyon 252/Deepwater Horizon Scope of Work for Emergency Restoration Plan For Response Impacts to Seagrasses in Northern Gulf of Mexico, dated Nov, 21, 2011, and NOAA

will invoice BP at a later date for this work. Accordingly, this section only includes NOAA labor and travel costs necessary for NOAA's oversight, monitoring and close-out activities.

Level of effort: A total of 1 agency FTE and contractor equivalent and $0.214M are projected for this requirement, which includes labor and associated travel.

Other requirements for this effort: There is no contract requirement under Emergency Restoration. As agreed to between NOAA and BP, NOAA will invoice BP for project-specific costs in arrears, and BP will reimburse NOAA.

Total required for Finance: $0.214M

Early Restoration Planning and Offsets Development

Activities under this category relate to Early Restoration project development for both non-NOAA led and NOAA led projects and activities supporting OPA activities for developing restoration scaling and injury offsets. This budget anticipates project-specific labor costs necessary to bring projects up to both OPA and NEPA readiness through the signing of project-specific stipulations. Some projects may require extensive planning, including design and engineering, in order to adequately evaluate environmental consequences and apply OPA project selection criteria.

OPA requires that restoration projects be scaled to natural resource injuries and lost resource services. Similarly, the Early Restoration Framework Agreement also specifies that offsets, i.e., restoration credits, be negotiated for every Early Restoration Project proposed by the Trustees and agreed to by BP. Further, the injury offsets must be incorporated into a draft restoration plan available for public review before both BP and the Trustees can stipulate to the offsets and proceed with project implementation. Therefore, restoration project scaling, alternatives analysis, and offset development are a time intensive effort.

In CY 2014, Phase III projects will undergo public review, and will be finalized in an Early Restoration Plan / Final Programmatic Environmental Impact Statement (PEIS). For Phase III projects, the Trustees will also be completing environmental and regulatory compliance. A fourth phase of early restoration will likely be under development in CY 2014 as well. Phase IV projects are expected to require the same extensive level of planning, evaluation preparation, environmental compliance analysis, and public review as Phase III.

Level of effort: A total of $0.642M is projected for this requirement, which includes 3 agency FTEs and contractor equivalents and associated travel.

Other requirements for this effort: There are no contract or other support requirements under Early Restoration and Offsets Development.

Total required for Early Restoration Planning and Offsets Development: $0.642M

Early Restoration Project Regulatory and Environmental Compliance

This section covers activities to comply with multiple statutes for Early Restoration projects. NOAA must meet numerous environmental compliance responsibilities for project-specific Early Restoration actions.

The broadest environmental compliance statute is the National Environmental Policy Act (NEPA) which, simply put, requires federal agencies to evaluate and document the environmental effects of proposed federal actions.

Like the *Deepwater Horizon* Oil Spill Final Phase I Early Restoration Plan/Environmental Assessment and Phase II Early Restoration Plan/Environmental Review, additional NEPA analysis will continue to be prepared for subsequent rounds of Early Restoration projects. NOAA staff will participate in the development, drafting, review, and public engagement of these future NEPA documents. Specifically, public review and finalization of the Phase III Early Restoration Plan/Programmatic EIS will be conducted in CY 2014. Additional NEPA analyses may be conducted as the need arises (i.e., following agreement between the Trustees and BP on Early Restoration projects).

As a lead federal action agency, NOAA is required to assess and document project effects and apply for necessary consultations/permitting. Among the many statutes that NOAA is responsible for consulting and obtaining authorization are:

- Section 7 consultations under the Endangered Species Act (ESA) for species and critical habitats under USFWS and NMFS jurisdiction;
- Essential Fish Habitat (EFH) consultations under the *Magnuson-Stevens* Fishery Conservation and Management Act (MSA);
- Incidental take authorization under the Marine Mammal Protection Act (MMPA) for species under NMFS jurisdiction;
- Scientific research and enhancement permitting under the ESA (10(a)(1)(A)) and MMPA (104).
- 304(d) consultations under the National Marine Sanctuaries Act (NMSA)
- Section 404 of the Clean Water Act (e.g., dredge and fill permits);
- Federal coastal consistency determinations under the Coastal Zone Management Act;
- Section 106 of the National Historic Preservation Act of 1966 (NHPA); and
- Other state and local permits where applicable.

Level of effort: A total of $1.711M is projected for Regulatory and Environmental Compliance, which includes 8 agency FTEs and contractor equivalents and associated travel.

Other requirements for this effort: There are no contract or other support requirements under Regulatory and Environmental Compliance.

Total required for Early Restoration Regulatory and Environmental Compliance: $1.711M.

Post-Stipulation Early Restoration Project Management and Implementation

This category includes funding for NOAA's management and implementation roles for projects when NOAA is not the lead implementation trustee. NOAA anticipates being involved with our co-trustees after negotiations with BP and stipulations are signed with activities such as Statement of Work development, project and financial management oversight, project monitoring and evaluation, and incorporating project data into a DWH project database.

NOAA's labor costs associated with Phases I, II, III non-NOAA project implementation are addressed in this section. Eight early restoration projects were negotiated under the early restoration framework agreement in Phase I of Early Restoration, an additional two covering three states were negotiated in Phase II. Both the Phase I and Phase II projects have also been finalized in Final Early Restoration Plans and their associated NEPA. In CY 2014 NOAA anticipates that all Phase I early restoration projects will be in the process of implementation or already implemented, and that Phase II projects will be in the process of implementation. In Phase III an additional 28 projects have been negotiated and are being prepared for public review. NOAA anticipates that in CY 2014 BP and the Trustees will have completed public review of a restoration plan and stipulations will be signed, triggering NOAA's management and implementation roles for projects not led by NOAA.

NOAA staff and contractors will also be developing adaptive management concepts, processes, and structure for the evaluation of restoration projects. While much is known about restoration projects, there is still incomplete knowledge about the efficacy of all restoration projects and the synergistic effects of multiple restoration projects. Therefore, restoration science and project evaluation is needed to adapt, and alter projects or programs. Such science-based checks and balances ensure desirable restoration outcomes and wise use of restoration funds.

Level of effort: A total of $2.356M is projected for Project Management which includes 11 agency FTEs and contractor equivalents and associated travel.

Other requirements for this effort: There is no contract or other support requirements under Early Restoration and Offsets Development.

Total Required for Early Restoration Project Management: $2.356M

Programmatic Restoration Plan and Programmatic Environmental Impact Statement

NOAA is leading the development of the DWH Programmatic Restoration Plan (PRP) and PEIS. A draft PRP, the foundation of an OPA restoration-based claim to compensate the public for injured resources and lost services, is underway and will continue until the draft plan is ready for public review and input. Consistent with OPA regulations, restoration planning will be integrated with NEPA, the Council on Environmental Quality regulations, and NEPA regulations promulgated by federal trustee agency(ies) through the development of a PEIS. The scope of the restoration planning and, thus these documents, is comprehensive and requires a massive effort that cannot be assumed by the responsible party nor delegated to the state co-trustees.

As required by the OPA regulations, trustees must consider a reasonable range of restoration alternatives before selecting their preferred alternative(s). Each restoration alternative is comprised of restoration components that address one or more specific injury(ies) associated with the Incident. Each alternative

must be designed so that, as a package of one or more actions, the alternative would make the environment and public whole. After trustees have identified the types of restoration actions that will be considered, they must determine the scale of those actions that will make the environment and public whole. The PRP will contain the package of restoration actions, described in the PEIS, deemed necessary to restore and compensate for resource injuries and lost services. Development of the restoration plan will require NOAA FTE and contract staff, working in consultation with external restoration scientists, and will include a thorough analysis of the reasonable range of alternatives and identification of the proposed action(s) that best meets the trustees' goals. Work will include development of scaling approaches, and application of those approaches to develop the claim. Drafting this document will be the primary responsibility of NOAA, with FTE and contract staff. However, coordination of trustee comments and revisions, copy-editing, formatting, printing, and distribution will be conducted through contract.

Work continues on the associated, companion draft PEIS for comprehensive restoration planning for the oil spill. The PEIS must evaluate the reasonable range of alternatives that meet the purpose and need for restoration planning (discussed above), and provide the basis for a meaningful comparison of alternatives with respect to their environmental consequences. The PEIS considers the direct, indirect and cumulative impacts of the preferred restoration action and alternatives, and explores options for mitigating adverse effects associated with restoration actions. A programmatic EIS of this size and scope must provide a thorough, broad analysis with sufficient detail to explore environmental consequences and serve as a solid foundation for tiering NEPA analysis for future, more specific restoration plans.

Drafting and finalization of the PEIS will continue to be a combination of contract supported efforts and internal FTE and contractor staff, cooperating agencies, and co-trustees. NOAA is coordinating the efforts of cooperating agencies, which include the state and federal co-trustees and additional non-trustee federal agencies. Likewise the public (including BP) also has a role during the next phase which will be reviewing and commenting upon the public draft documents. Thus, the effort to comply with just NEPA is considerable. This endeavor will require, as it already has, considerable FTE labor, contract labor, and contract-based effort (see discussion below).

These companion documents (draft PRP and draft PEIS) will undergo internal NOAA, Trustee and Cooperating Agency review and subsequent adjudication of Trustee and agency comment in preparation for public review of the documents. Considerable effort from other NOAA line offices, including FTE and contract labor, is being utilized for development, review, and revision of the documents to ensure they are technically sufficient and accurately capture the impacts of potential future restoration efforts. In addition, this PRP must comply with multiple environmental statutes including but not limited to Section 7 of the Endangered Species Act and the Essential Fish Habitat provisions of the Magnuson-Stevens Act. Integration of regulatory and environmental compliance and coordination efforts will be critical to developing the draft PEIS.

Public review of the draft PRP and PEIS will consist of meetings, distribution of the draft documents to repositories and identified members of the public and availability on a NOAA website. Resulting public review comments will be captured and synthesized. A Comment Response document will be prepared and all input considered and responded to, as appropriate, will be integrated into the development of the final documents. Finalization of the PRP and PEIS will require incorporation of public comment and response to comments, and subsequent Trustee, Cooperating Agency and internal review and approval, including

incorporation of programmatic regulatory efforts described in the above section. The work of conducting public review and finalizing the documents subsequent to public review will be accomplished through NOAA FTE and contract labor, with the support of contract.

Level of effort: A total of $1.711M is projected for the Programmatic Restoration Plan, which includes 8 agency FTEs and contractor equivalents and associated travel.

Other requirements for this effort: Contracted elements of completion of both documents include: meetings, calls and project management; consultation on restoration options and scaling approaches; support for application of scaling approaches to develop claim; documents copy editing, formatting, printing and distribution; conducting public meetings; providing analysis and consolidation of public comments; preparation of public comment reports; incorporation of comments and continuing effort to develop final documents, graphics support for PRP and PEIS public meeting materials, and support for coordination of trustees to develop final documents. Regulatory consultation requirements, described in the task above, are an integral component of completing the restoration plan, but are not included in these cost estimates. Scientific consultation in CY 2014 requires $1.848M. Contract for the Draft and Final PEIS in CY 2014 requires $1.8 M. Contract for the Draft and Final PRP in CY 2014 requires $410K.

Additional contract support in the amount of $150K is required for programmatic consultations under ESA and MSA. Those costs will support the development of a Biological Assessment and EFH Assessment documents for programmatic consultations under those acts.

Total required for Programmatic Restoration Plan and Programmatic Environmental Impact Statement: $5.919M.

Data Management

The Data Management Team supports the document management and information needs of the DWH Restoration Planning case teams. The team coordinates discovery requests, provides guidance on records management, and ensures appropriate documentation is included in the Administrative Record per NOAA's responsibilities. The team continues to manage a DWH SharePoint site and provides guidance, technical expertise, and problem solving skills to all case team members (federal and state). The team also provides technical support to the public to assist with submitting project ideas through the online database or with viewing the information on the website. The Data Management Team continues to maintain and manage a database to collect and analyze restoration project suggestions. The team coordinates with other federal and state trustees to provide periodic data exports of all suggested projects as well as a web-based interactive project atlas that allows for viewing the project information.

The Data Management team is also developing and maintaining solutions for managing and tracking Early Restoration projects through project planning, implementation, and long-term monitoring. The team is coordinating with other federal and state trustees to determine tracking and reporting needs for Early Restoration as well as future projects. This effort requires dedicated time to coordinate with a number of trustees as well as IT staff to fully scope the requirements and manage the development of the project tracking system. Finally, the Data Management team supports the spatial analysis and mapping needs of the case team and is actively working to integrate restoration project information into existing mapping tools.

Level of effort: A total of $0.642M is required for this requirement, which includes 3 agency FTEs and contractor equivalents and associated travel.

Other requirements for this effort: Document management and information needs of the DWH Restoration Planning case teams are supported through the use of a MS SharePoint site. Contracted services are needed to provide enhancements and maintenance as well as cover software license cost (CY 2014 Q1 $50K).

Development and hosting costs for the Socrata software and services used for the collection and management of public comments is required (CY 2014 Q2, $5K).

The Trustees' use of the Socrata software application can be found at the following URL:

http://www.gulfspillrestoration.noaa.gov/restoration/give-us-your-ideas/see-what-others-are-saying/

A database and web-based solution for managing, tracking, and reporting Early Restoration projects through project planning, implementation, and long-term monitoring is required. The initial version of the database is nearing completion (July 2013) and includes the base requirements to track projects and create the mandatory quarterly progress reports on Early Restoration projects. Additional database development work is needed to refine financial tracking according to standard operating principles being developed by the Program Implementation Group. Further development is also needed to incorporate modules such as performance metrics, monitoring, environmental compliance, spatial data integration, and reporting features.

A database and web-based solution for collecting, storing, and interpreting baseline and monitoring data is needed to track restoration progress and regulatory compliance and facilitate associated reporting. Contracted services are needed to fully scope the requirements and design, implement, and maintain the data system (CY 2014 Q1, $1.400M).

Total requirement for Data Management: $2.097M

Communications

The NOAA communications team will provide support integral to the overall damage assessment and restoration planning effort. Working to ensure that the American public is well-informed about and fully engaged in the NRDA process will continue to be central to its responsibilities. The NOAA Gulf Spill Restoration website (www.gulfspillrestoration.noaa.gov), social media channels and list-serves the communications team manages are critical to this effort. The website is the centerpiece of this effort, as it provides the avenues for the public to submit restoration project ideas; view/map all projects submitted for consideration; review and comment on the restoration planning documents; and explore the natural resource injuries that drive restoration planning decisions. This platform has been embraced by the trustees as the central repository for materials, an invaluable function, and houses a restoration project tracking database critical to providing public transparency during project implementation.

Communications staff will aid the planning, promotion and execution of numerous public meetings throughout the Gulf Coast and in Washington, DC that afford the trustees an opportunity to educate the public and gather input on proposed restoration approaches. It is anticipated that the trustees will hold up

to 12 public meetings in Q1 2014 to solicit comment of the Draft Early Restoration Programmatic Environmental Impact Statement/Phase III Early Restoration Plan. It also is anticipated that the trustees will hold up to another 12 public meetings in Q3-4 2014 to solicit comment on the Phase IV Draft Early Restoration Plan. The Department of the Interior will serve as the lead in planning and executing these meetings; NOAA will provide close support, devoting staff to on-site media relations and providing in-person expertise on a range of issues of interest to the public. NOAA subject matter experts on damage assessment operations, restoration planning and marine mammals have added significant value for members of the public at previous meetings and will continue to do so in the future.

Level of effort: A total of $0.428M is required for this requirement, which includes 2 agency FTEs and contractor equivalents and associated travel.

Other requirements for this effort:

Throughout the NRDA process, NOAA has used any array of fact sheets and other graphic-driven materials produced under contract as a key part of our public education and outreach efforts. These include a suite of a half-dozen fact sheets jointly created by the trustees (commonly referred to as the "Trustee Toolkit") that provide a basic introduction to NRDA and the various parts of the process. Updated quarterly, these sheets are vital to our outreach effort and are relied upon at each of our public meetings; this proposal includes funding for quarterly printing of one thousand copies for each of the six sheets ($10K in CY 2014 Q1).

Recognizing the public's interest in tracking the progress of NRDA restoration projects, the trustees have created an online restoration planning database (outlined in previous section) designed to provide quarterly updates on the progress of project implementation. NOAA proposes to turn the quarterly online project updates into hard copy fact sheets, and has included the layout and design expenses for this task in a contract that also provides for illustrations and document design and layout support in the drafting of future restoration plans. As the number of approved projects grows, the costs associated with this task will increase commensurately ($20K in CY 2014 Q1).

Total requirement for Communications: $0.458M

Level of Effort for the Restoration Activity

Our request for the restoration planning activity is $12,157,836 in contract funds. The request includes 20.1 agency FTEs and 23.0 contract equivalents. Key personnel include study PIs and agency scientists.

M. Toxicity to Aquatic Organisms

Comparison of CY 2013 and 2014 Requests

The FY 2014 toxicity funding request is roughly $8 million in contract funds. We projected the FY 2014 costs with the understanding that there will be a similar amount of testing as occurring during FY 2013, a similar or greater frequency of meetings with BP, and additional time needed by the Trustees to distill and summarize test findings. Although we have undertaken many tests already, some have required repetition,

some need to be replaced with other test species, and some new types of tests are needed in CY 2014 to help interpret field data obtained for specific groups of animals not included in the initial rounds of toxicity testing. We have also identified potential additional species to test based on their ecological importance in specific habitat types affected by the spill.

In summary, the toxicity work is a central and critical piece of the DWH damage assessment and will be used by all TWGs to aid interpretation of their data and frame documented or modeled exposure concentrations in terms of likely resulting injuries. The following text provides detail on the toxicity work for the case and specific funding needs.

Toxicity to aquatic organisms

The primary goal of the toxicity investigations is to evaluate toxicological responses of representative Gulf of Mexico aquatic organisms, or appropriate surrogate species, to petroleum constituents and dispersants comparable to what was discharged by the Deepwater Horizon oil spill. The laboratory toxicity data, as represented through dose responses, will be used to help interpret empirical and modeled data representing field conditions, observations, and samples. As such, the toxicity studies serve a broad role in the overall case to explain or predict levels of injury to natural resources associated with a range of exposure conditions.

Assessment activities in the toxicity group are focused on understanding the exposure, pathway, and effects of oil and dispersant from the Incident on a variety of test animals. NOAA requests funds to continue toxicity tests as part of a program that was started in 2010 and is ongoing. The additional work that we propose for 2014 will complement existing studies and strengthen our current toxicity testing plan.

The toxicity budget for 2014 is based on maintaining a comparable level of effort to that of activities in 2013. We will continue additional phases of toxicity tests that are currently underway as well as design and implement new toxicity tests for selected species. We will also continue analytical chemistry testing of oil and dispersant formulations. We identified some additional data gaps within our nearshore and offshore species for addressing potential spill impacts to specific communities. Additionally, through the course of testing some species that are prevalent in the Gulf but are not standardized test species (e.g., pelagic fish species), we identified better methods to handle and test organisms that improved survivorship in controls and yielded more robust data. Consequently, we plan to repeat some tests with the new methods. We also plan to include some new species in our toxicity tests.

Contract expenditures are included to cover all laboratory-based toxicity testing, sample analysis, and work by PIs and their teams to oversee the assessment studies. The Trustees, through NOAA, are working with roughly nine PIs and implementing tests in more than ten research laboratories to complete toxicity investigations for the NRDA. Toxicity testing investigations are not collaborative with the Responsible Party; thus, signed study plans are not available.

To assess the effects of oil discharged by the Incident, a variety of tests are conducted using representative Gulf of Mexico fish and invertebrate species. The lethal and sub-lethal toxicity of field-collected MC252 oil, artificially weathered MC252 oil, COREXIT 9500, and oiled sediments is evaluated using several exposure pathways and endpoints. Pathways investigated include water accommodated

fractions (WAFs) of oil, exposure to oil droplets, exposure to oil slicks, exposure to oiled sediment, and ingestion of contaminated prey. The type(s) of oil used for test exposures depend on what oil(s) species were likely exposed to over the duration of the oil spill. Endpoints evaluated during these tests include survival, growth, reproductive metrics, development, tissue damage (histology), gene expression, immunological effects, other physiological injuries, and behavior. The majority of tests are focused on the effects to early life stages (e.g., embryo and larvae) or on adults during their reproductive cycles. The Trustee schedule of toxicity testing coincides with the reproductive season(s) for each test species when appropriate.

Institutions under contract to NOAA for conducting laboratory-based toxicity work:

- Auburn University
- Florida Gulf Coast University
- Miami University of Ohio
- Stanford University
- University of Maryland
- University of Miami, Rosenstiel School of Marine and Atmospheric Science
- University of North Texas
- University of Southern Mississippi, Gulf Coast Research Laboratory
- Pacific EcoRisk

Species used or proposed for use in toxicity tests:

- Amberjack (*Seriola lalandi lalandi*)
- Amphipod (*Ampelisca abdita*)
- Amphipod (*Leptocheirus plumulosus*)
- Blackfin Tuna (*Thunnus atlanticus*)
- Blue crab (*Callinectes sapidus*)
- Bluefin tuna (*Thunnus thynnus* and *T. maccoyii*)
- Cobia (*Rachycentron canadum*)
- Comb jelly (*Mnemiopsis leidyi,* a.k.a. *sea walnut*)
- Eastern oyster (*Crassostrea virginica*)
- Fiddler crab (*Uca spp.*)
- Goggle eye (*Selar crumenophthalmus*)
- Grass shrimp (*Palaemonetes pugio*)
- Inland silverside (*Menidia beryllina*)
- Killifish (*Fundulus grandis*)
- Mahi-mahi (*Coryphaena hippurus*)
- Moon jelly (*Aurelia aurita*)
- Pacific mackerel (*Scomber japonicus*)
- Polychaete worm (*Neanthes arenacoedentata*)
- Red drum (*Scianenops ocellatus*)
- Red-eared slider (Trachemys scripta elegans*)*
- Sea urchin (*Strongylocentrotus purpuratus*) or Sand dollar (*Dendraster excentricus*)
- Sheepshead minnow (*Cyprinodon variegates*)
- Southern flounder (*Paralichthys lethostigmata*)
- Snapping turtle (*Chelydra serpentina*)
- Speckled sea trout (*Cynoscion nebulosus*)
- Yellowfin tuna (*Thunnus albacares*)

Toxicity investigations scheduled between January and December 2014 will use animals from a variety of ecological habitats that are addressed in our injury assessment. Further testing will be conducted on pelagic fish (e.g., tuna, goggle eye, cobia, and mahi-mahi), invertebrates (e.g., shrimp), predatory fish (e.g., red drum), and prey fish (e.g., inland silverside and sheepshead minnow). To address potential injuries in benthic habitats, testing is planned for invertebrates (e. g., amphipods, blue crab, flounder, gulf killifish). NOAA is completing tests, with all appropriate oil and dispersant formulations, on the organisms and life stages that were started in 2012 and 2013. In 2014, tests will be conducted on appropriate life stages that were not started in 2012 and 2013. Results from 2011, 2012, and 2013 testing will be used to inform future testing. The results produced to date will continue to undergo rigorous statistical evaluation.

NOAA's estimated costs for 2014 include funds to support planned toxicity testing using various life stages, endpoints, exposure scenarios and test species. NOAA requests funds for laboratory analysis of samples collected during the tests. Water and sediment samples are analyzed during the course of each toxicity test to characterize the actual exposure conditions and consequently the dose. Also included in the budget are funds for analysis and interpretation of the resulting data. Water samples analyzed for PAHs and dispersant markers cost approximately $400 per sample. The unit cost for analysis of sediments is higher. Each test that Trustees conduct results in a minimum of 5-15 water samples sent to the lab, and depending on the testing scenario, there may be both sediment and water samples for analysis.

The activity also includes compilation of documentation and records related to the activity.

Connection to NRDA Process

The toxicity testing results will be used to produce dose - response curves and determine the water and sediment concentrations that are toxic to organisms. The Trustees' toxicity testing program considers field evidence of oil impacts to resources observed in large areas of the Gulf of Mexico and at different trophic levels and utilizes the laboratory results and dose - response curves to put the field observations in a toxicological perspective. The selection of species in the Trustees' testing regime is representative of many ecological niches or guilds that were affected by MC252 oil (using models or direct observations from field sampling). Incident-specific toxicity data is important because existing literature cannot address toxicity of the sweet crude oil spilled as altered by the unique scenario of deep sea release, associated biological and physical weathering, and mixing with a large volume of applied dispersants. Literature values do not exist for many of the representative Gulf of Mexico species that NOAA is and will be testing. The DWH oils that NOAA is utilizing for toxicity tests represent a variety of weathering states and a unique combination of oil constituents. For Gulf of Mexico species that have literature values for a similar type of sweet crude oil, the testing was typically done using unweathered oil, which is not representative of many exposure conditions during the DWH oil spill. Additionally, the toxicity testing that NOAA will conduct is using current scientific testing and analytical methods with sensitive endpoints such as early life stage development, cardiac function, immune function, and gene alterations – a combination that represents a more comprehensive and improved approach than found in most previously published studies.

Water and sediment concentrations that are toxic to the aquatic organism may be paired with laboratory results of field-collected environmental samples that have been displayed on maps. Exactly how the

information is used will depend on the animal's spatial distribution in the Gulf habitats and related exposure characterization. For example, aquatic toxicity information for pelagic species will be utilized in the SIMAP modeling efforts to predict toxicity and losses in many blue water habitats affected by the Incident. MC252-specific LC50 values for species will be incorporated in the SIMAP model and used to quantify lost biomass and production forgone.

Results from the toxicity tests may be used to calculate direct loss of animals in areas affected by oil or contribute to service loss estimates in various habitats. Restoration specialists will consider the spatial scale and magnitude of resource or habitat injuries supported by the toxicity test results and target restoration projects or types that have a close geographic or resource nexus to the injuries.

Sample/Data Handling

Data management activities are required to manage, statistically analyze, and map these data. Samples and associated data acquired through cooperative work plans will be collected through methods defined in joint signed protocols. These samples will be analyzed and the data will be tracked, organized, and QA/QC'd by NOAA. These data, along with associated documentation such as validation reports, are maintained by NOAA's data management team and will be distributed to Trustee representatives through NRDA and cooperative databases.

Data/Deliverables Produced

The sum total of the individual toxicity tests that NOAA expects to conduct will be around 400. The actual number of data points produced depends on the type of test. However, the endpoints evaluated during these tests include survival, growth, reproductive metrics, development, tissue damage (histology), gene expression, immunological effects, and behavior. An individual test can produce hundreds to thousands of individual data points, and certain tests monitoring behavioral changes utilize video documentation that has not yet been quantified in terms of individual data points. The data from all of these 400 tests will require robust statistical analysis and interpretation. NOAA has selected a team of statisticians for this purpose. Based on recommendations of the statisticians, data will be analyzed and reported through summaries to account for statistical power and appropriate presentation of the results. Data will be examined to look for trends within a species, among species, and within ecozones (nearshore, offshore, deep water). The anticipated deliverables will be data summary reports and internal reports including data interpretation. Individual TWGs will also be using the toxicity data in their assessments, models, and data interpretations. The proposed budget accounts for a limited amount of vetting drafts and revisions through multiple steps of review by the case teams.

Level of Effort

Our request for the toxicity to aquatic organisms activity is $8,196,986 in contract funds. The request includes 2.8 agency FTEs and 27.9 contract equivalents. Key personnel include study PIs and agency scientists.

All of the testing will be led by PIs from laboratories specified in the Claim. For the period of January – December 2014, NOAA requested funds for the PIs and their lab staff to work nearly full-time for the duration of their portion of the testing. About two FTE personnel will handle all technical, legal, and

coordination tasks related to this large testing program. NOAA is using two contract equivalents at the Office Support, Contract Support, Support Associate, Research Associate, Associate, Senior Associate, Manger, and Officer levels to help oversee the subcontracts with the individual laboratories, assist coordinating with the Trustees and RP, and assist with inter-lab coordination and data sharing.

Timetable

NOAA plans to conduct additional tests from January to December 2014. Data from individual tests will be compiled and undergo QA/QC as the results become available. Data from individual tests will continually be statistically analyzed. Data from individual tests will be integrated with previously conducted tests.

RP Involvement

NOAA has had discussions with BP and their contractors regarding the general scope of the toxicity testing program. NOAA had a meeting the end of 2012 (December 13, 2012), is currently planning a meeting for the summer of 2013, and had numerous phone conferences. NOAA has coordinated with BP but jointly agreed to conduct tests separately and share data when tests are fully completed and data have undergone full QA/QC. This constitutes the basic level of our cooperative arrangement between the Trustees and BP on the toxicity portion of the assessment. The expressed intent of both sides is to share toxicity data at a future date comes with the understanding that BP will reimburse the Trustees for all relevant and associated costs deemed reasonable and appropriate under the law.

NOAA does not jointly sign toxicity work plans with BP. Beyond the in-person meeting, NOAA provides a calendar every month to BP that includes the tests completed to date and the tests that NOAA expects to conduct in the upcoming month. The schedule conveys the following information about the tests: date, laboratory, test substance, test substance mixing method, species, life stage, endpoints, and test duration.

In summary, the full complement of toxicity tests on a cross-section of species and life stages, as they are designed, are necessary for Trustees to complete their injury assessment. The unique release and response scenario associated with the Incident and paucity of toxicity testing literature on Gulf of Mexico species influence the complex toxicity testing design. Further, toxicity testing is a proven, reasonable, and cost-effective assessment method to address potential injuries to a wide variety of resources and habitats potentially exposed in a large marine ecosystem. The Trustees will use the toxicity results to aid interpretation of field exposures and support injury quantification activities.

N. Chemistry

Contaminant Analytical Chemistry

Since 2010 tens of thousands of samples of wide ranging types have been collected for chemical analysis for the presence and concentration of contaminants associated with the Deepwater Horizon oil spill, such as PAHs, VOCs, metals, and DOSS. Many of these samples have also required specialized analytical testing to support forensic interpretation. The principal NRDA laboratories conducting the oil-related and dispersant-related contaminant analysis (and associated testing such as grain size, TOC, and lipids) are Alpha Analytical, TDI-Brooks, ALS, and NOAA Northwest Fisheries Science Center (NWFSC). Analytical chemistry performed at NWFSC is described and budgeted separately under the Sea Turtles and Marine Mammals sections. All other such analyses conducted at the three contracted chemistry laboratories are described and budgeted here.

During 2014 it is anticipated that there will be approximately 9,200 samples analyzed for PAHs, petroleum biomarkers, DOSS, and related tests at Alpha, TDI-Brooks, and ALS. TWGs anticipate collecting approximately 1,600 sediment samples as part of the oyster injury assessment, 2,000 deep sea sediment and biota samples as part of the deep benthic injury assessment, and about 500 soil samples as part of the coastal wetland vegetation sample time series. We also anticipate continued collection and analysis of an estimated 700 stranded oils, oily sheens, and other surface oil samples either re-deposited onshore after storms or otherwise obtained as opportunities arise, or collected by BP or other investigators and requiring analysis by NOAA's contracted NRDA laboratories. Additional analysis of already analyzed samples is anticipated as TWGs interpret findings and request further analysis of samples (e.g. samples requiring forensic interpretation necessitating additional analysis). We anticipate approximately 3,000 such additional analyses of previously collected and stored samples, including analysis of source oil and weathered oils managed at TDI-Brooks and periodically mixed and bottled for distribution to toxicity laboratories. It is further anticipated that as many as 500 samples will be shipped from one laboratory to another for re-analysis to address potential inter-laboratory variance that can affect statistical analysis across limited datasets. Finally, there are approximately 850 unanticipated additional sample analyses that BP has requested for SAV, sargassum, and other studies, and for which samples were collected during 2010 - 2012, for which NOAA doesn't have sufficient funding to analyze in 2013.

The activity also includes compilation of documentation and records related to the activity.

Connection to NRDA Process

These contaminant analyses, which are associated with several specific assessment activities outlined above, are better managed and coordinated as a group with the laboratories conducting the analyses.

Sample/Data Handling

Data management activities are required to manage, statistically analyze, and map these data. Samples and associated data acquired through cooperative work plans will be collected through methods defined in joint signed protocols. These samples will be analyzed and the data will be tracked, organized, and QA/QC'd by NOAA. These data, along with associated documentation such as validation reports, are maintained by NOAA's data management team and will be distributed to Trustee representatives through NRDA and cooperative databases.

Data/Deliverables Produced

The laboratories produce electronic data deliverables (EDDs) and complete data packages which are routed for third party data validation and ultimately entered into the case-wide contaminant chemistry data base.

Level of Effort

Our request for the contaminant analytical chemistry activity is $14,069,500 in contract funds. The request includes 0.5 agency FTEs and 16.6 contract equivalents. Key personnel include study PIs and agency scientists.

Greg Baker, Nancy Rothman (NEH), Bill Driskell (PECI)

Timetable

Ongoing throughout the year as samples are collected and shipped to the laboratories, or as analyses are requested by specific activity leads.

RP Involvement

With rare exceptions, all of these analyses are cooperative and are shared with the RP.

Storage and Long Term Archive of Samples

NOAA requests funds to store chemistry and oil samples at analytical laboratories and consolidate samples to a reduced number of facilities in 2014. Storage and transport costs and leasing of freezers and refrigerators at several sites are separately itemized within the budgets of turtle and oyster work groups. In addition to these, there are overarching costs for the storage of chemistry samples and large quantities of oil and dispersant products at analytical laboratories. In addition, during 2014 it is anticipated that archived samples will be consolidated at a reduced number of facilities including the Knox Storage Archive (KSA) in Fort Collins, Colorado. Large carcasses may also need to be transported to the KSA should the Marques warehouse reach capacity.

The activity also includes compilation of documentation and records related to the activity.

Connection to NRDA Process

These overarching sample preservation activities, while not specific to a particular task or TWG, are necessary to comprehensively maintain and ensure proper sample preservation in accordance with legal orders.

Sample/Data Handling

Samples will be handled as described in the activity summary above.

Data/Deliverables Produced

Deliverables include inventories of samples across the many activities of the case.

Level of Effort

Our request for the storage and long term archive of samples activity is $3,668,409 in contract funds. The request includes 1.9 contract equivalents. Key personnel include the study PIs and agency professionals.

PIs (NOAA and other)

Greg Baker, Kevin Kirsch; Mark Curry (IEc)

Timetable

Anticipated development of facilities at the KSA and initiation of custodial subcontract: Q1 2014

RP Involvement

The RP has direct involvement with this activity.

O. Data Management and Visualization

Data Management Infrastructure

An unprecedented quantity of samples, instrument files, photographs, video recordings, and visual observations were acquired to assess the impact of the MC252 oil spill. The Data Management TWG has and continues to lead the effort to ensure the preservation of all such files and data. This effort has entailed tracking, storage, maintenance, and sharing of these data with the NOAA TWG PIs and support staff as well as the wider Trustee and RP community. For example, data from over 20,000 field event collections, comprising over 1 million individual field data forms and associated files, have been generated and uploaded to the file collection repository. Similarly, 7 million contaminant chemistry sample analytical result records have already been generated and maintained in the database repositories, including NOAA NRDA, response, and historic data. An additional half million records provide tracking of the instrument data, photographs, telemetry data, and observation data.

NOAA directs the architecture, development, management, and oversight of the data repositories used in the assessment process. These repositories include ERMA; noaanrda.org; Data Integration, Visualization, Exploration, and Reporting (data warehouse); Photologger; and Query Manager. Activities associated with this infrastructure include:

- Maintenance of the information management servers, including server patching and rebooting of separate production, testing, and development environments
- System backups
- Infrastructure monitoring, such as data drive space, memory allocation, and server error logs
- Address server connection and user administration issues

- Oversight and implementation of functionality to ensure control of files and development of comprehensive metadata
- Design, development, and maintenance of overarching data retrieval and information sharing tools
- Configuration and maintenance of online collaboration tools
- Configuration of new data storage arrays and databases
- Forensically sound transfer of data, as required

Connection to NRDA Process

These overarching activities, while not specific to a particular task or TWG, are necessary to comprehensively maintain and ensure proper document and data preservation. Furthermore, system development and maintenance is necessary to continue fostering access to assessment files and data.

Data/Deliverables Produced

The information management systems are actively managed on a daily basis to ensure continued access to NRDA and related data by the Trustees. System functionality changes are released on a periodic basis, as necessary.

Level of Effort

Our request for the data management - infrastructure activity is $2,811,524 in contract funds. The request includes 1.6 agency FTEs and 9.6 contract equivalents. Key personnel include the study PIs and agency professionals.

PIs (NOAA and other)

Amy Merten, Kevin Kirsch, Michele Jacobi, Ben Shorr, George Graettinger (NOAA), Daniel Hudgens (IEc), Neal Etre (IEc), and Jim Anderton (Solea)

Timetable

Ongoing infrastructure management will occur in concert with timing of other Phase 3 tasks.

RP Involvement

The RP does not have direct involvement in these infrastructure activities with the exception of the TWG-specific tasks under which the RP is provided access to the corresponding file and data records.

Data and System Documentation

As part of the assessment process and due to the expansive volume of data collected, comprehensive documentation is necessary to fully record the processes applied and updates made to the data. Under this

activity, the data management team will develop comprehensive documentation of all aspects of the data management process, including data intake, tracking, integration into source systems, and publishing via end user data systems. In addition to this overarching documentation, the data management team works to acquire and share important metadata regarding each source system and, where applicable, datasets. This information is then integrated into the metadata records required for sharing spatial data.

In response to government requirements for data systems, the data management team will also conduct a detailed review of the security layers associated with the data repositories. Through the review, the team will create the comprehensive documentation required for ongoing maintenance and hosting.

Connection to NRDA Process

These overarching activities, while not specific to a particular task or TWG, are necessary to properly record the standard methods applied in the data management process and to track and report information on these methods and caveats to end users.

Data/Deliverables Produced

The dataset-based documentation will be developed on an ongoing basis to ensure continued access to NRDA and related data by the Trustees. In addition, documentation of the system infrastructure, processes, and security methods will be drafted, reviewed, and finalized prior to the end of the calendar year.

Level of Effort

Our request for the data management - documentation activity is $977,948 in contract funds. The request includes 0.5 agency FTEs and 3.8 contract equivalents. Key personnel include the study PIs and agency professionals.

PIs (NOAA and other)

Ben Shorr (NOAA), Ann Jones (IEc), Daniel Hudgens (IEc), Tyler Vick (MFA), and Jim Anderton (Solea)

Timetable

Development of the overarching documentation as well as dataset metadata will occur in concert with timing of other Phase 3 tasks.

RP Involvement

The RP does not have direct involvement in these activities with the exception of receipt of the TWG-specific data under which the RP is provided access.

P. Injury Assessment Management and Administration

Injury Assessment and Legal Case Management

This activity includes Incident-wide case management and administration costs for NOAA. The NOAA FTEs are program or regional managers that are dedicated for a significant period of time on the Oil Spill, or are staff assigned full-time to lead large areas of NOAA's assessment activities at the technical level. Attorneys that are supporting assessment activities full-time and whose duties are cross-TWG, rather than TWG-specific, also are included in the estimate.

This activity also includes contracts management and accounting support from IEc to oversee numerous subcontracts. Case-wide field operations support, including five staff and a New Orleans field command post office space, as well as a safety officer, is also included.

The activity also includes compilation of documentation and records related to the activity.

Sample/Data Handling

The NRDA activities related to this procedure are management- and administration-oriented, and thus no samples or data will be collected.

Data/Deliverables Produced

The NRDA activities related to this procedure are management- and administration-oriented, and thus technical deliverables will not be produced.

Level of Effort

Our request for the injury assessment and legal case management activity is $4,381,584 in contract funds, which includes 10.2 agency FTEs and 17.8 contract equivalents. Key personnel include ARD program managers and regional managers, agency attorneys, and IEc program managers, contracts and accounting staff, and field operations staff.

PIs (NOAA and other)

NOAA management will lead this activity.

Timetable

The NRDA activities will occur continuously during the period of the Claim.

RP Involvement

The Responsible Party has worked with all of the agency management staff on activities identified in this section of the Claim since the Oil Spill, and worked with the Trustees to optimize the activities of the New Orleans field command post.

Deepwater Horizon Electronic Content Management and Oil Pollution Act Administrative Record Management System

Activity and System Description

This activity supports the continued operation, management, improvement, and use of the Deepwater Horizon (DWH) Electronic Content Management System (ECMS) and the complex workflow supporting NOAA DWH OPA Administrative Record (AR) development. The ECMS, developed and implemented during FY 2013, improves NOAA staff efficiency and productivity by opening access to DWH-related content, while protecting the integrity and availability of mission critical information.[5] During FY 2013, the DWH ECMS activity has established a pragmatic and defensible architecture to support a user-friendly, centralized, Federal Information Security Management Act (FISMA) compliant, Federal Records Act (FRA) compliant, web-accessible archive. The ECMS is a repository from which authorized NOAA users efficiently retrieve and use content that is preserved and maintained in an unaltered form.

System Content Description

Valuable content related to NOAA's ongoing study of the DWH oil spill's effects on natural resources, including habitats and species in and using the Gulf of Mexico, has been collected in the ECMS and continues to be created and stored in locations across NOAA line and staff offices and behind multiple fire walls; that is, in individual email accounts, local area network shares, and on the hard drives of devices. This content has critical operational, regulatory compliance, and strategic value. Collection of these materials is ongoing.

System Processes Description

The continuing NOAA DWH OPA AR development process is a critical OPA compliance activity[6] that is supported and enabled within the ECMS. The NOAA DWH OPA AR is a complex system workflow within the ECMS that automates and supports the major components of NOAA DWH AR development to

[5] This system is physically separate and technically distinct from the Data Management System that NOAA is using for DWH assessment samples, analytical databases and results.

[6] The Trustees announced the establishment and opening of the Administrative Record for this NRDA (AR) on October 1, 2010, with DOI having lead for the AR. (See Notice of Intent to Proceed with Restoration Planning, 75 Fed. Reg. 60800, at 60802). The establishment of the AR is in accordance with 15 CFR 990.44 and .45.

make the most effective use of staff resources. The DWH OPA AR[7] is, in its final form, a publicly accessible collection that is intended to include documents considered by the Trustees during the pre-assessment, assessment, and restoration planning phases of the NRDA performed in connection with the DWH Incident.

The requirement under Federal regulations that agencies manage electronic records in a legally compliant manner is met by the current software application and records management support assigned to the system.

By the end of FY 2013, the DWH ECMS will hold 10 terabytes of content in support of NOAA's NRDA efforts that will be accessible by 25 NOAA staff. Continued operation, management, and access to the DWH ECMS is essential to enable NOAA to utilize existing research and studies collected and produced by researchers and scientists for decision making related to the natural resource damage assessment and restoration planning and implementation. NOAA employees require access to DWH-related information in a system where it is organized and can be located, searched, retrieved, and read.

The DWH ECMS allows NOAA staff and contractors to capture, categorize, associate, retain, manage, search, review, mark, tag, share, and export the content using an internal-facing, permission-based web link. The ECMS system includes a rights management module which allows an administrator to give access to documents, based on type, to appropriate people or groups of people within NOAA.

System Costs Descriptions

Continuing operational, record review, and other associated NOAA costs for the Electronic Content Management System and Administrative Record workflow activities are encompassed in four major component areas of effort that are at times interrelated at other times distinct and separate. For instance, a system administrator will work on activities that touch on all four areas below; a reviewer in restoration planning content may only work in one area.

1) Assessment Content, from NOAA-led TWGs and NRDA operational support groups, and any NOAA content considered candidate for inclusion in the AR. Examples of the process activities for contracted and NOAA staff included in these costs are: oversight, direction, guidance, regulatory compliance, process design, processes integration, content identification, capture, categorization, selection, web-accessibility, records management, search, review, tagging, and export.

2) Restoration Planning Process Content, from NOAA-led (e.g., PEIS and related restoration plans) or NOAA participation (e.g., Early Restoration plans) considered candidate for inclusion in the AR. Examples of the process activities for NOAA and contracted staff included in these costs are: oversight, direction, guidance, regulatory compliance, process design, processes integration, content identification,

[7] Although DOI has lead responsibility for the AR, the underlying effort to identify, collect, organize, review and approve materials for inclusion in the AR necessarily involves all Trustees. The costs to provide for and maintain a sufficient AR have been increasing as attention in the AR effort turned to fully addressing both TWG and Trustee Council level records.

capture, categorization, selection, web-accessibility, records management, search, review, tagging, and export.

3) Integrative Co-Trustee Content Management Processes from all co-Trustee collaboration points of operation. Includes NOAA and contracted staff helping DOI provide legal guidance for AR record searches, to define protocols and platforms for joint legal reviews, and to participate in and provide services appropriate to support AR decision-making processes at the Trustee Council level, including records management, joint legal reviews, redaction reviews for NOAA records, and public accessibility.

4) Technical Support and Equipment such as hardware, software, system management, platform support, platform web-accessibility, system administration, operations, maintenance, required upgrades, out year licensing of existing software, and advanced analytic software.

NOAA will continue to coordinate with TWGs, chemistry and toxicity groups, NMFS scientists at Centers and Labs, the NMFS Habitat and Restoration Division, the NMFS Protected Resources Section, the National Ocean Service Office of Response and Restoration, the NOAA Office of the Chief Information Officer, line and staff office information technology personnel and others in the NOAA science community to populate this repository.

NOAA will methodically update the repository by identifying, preserving, collecting, capturing and indexing pertinent information, including email, documents, images, and information in other formats, from a wide range of NOAA employees and contractors in relevant line and staff offices.

Level of Effort

Our request for the Deepwater Horizon Electronic Content Management and Oil Pollution Act Administrative Record Management System activity is $2,900,680. A total of 9.5 contract equivalents are required for this activity in, in addition to 3.0 agency FTEs.

These estimates were based on the ongoing potential scope of this effort (and costs) across all of NOAA's NRDA activities, and the volumes of candidate records that may require review. The contractors undertaking this task will be in communication with hundreds of Trustees or Trustee representatives across the region on a weekly and monthly basis. We expect our AR workflows and review needs for this Incident to be unique because of the volume of records and national scope of the effort. Off-the-shelf file sharing and document review systems cannot be used for this activity without extensive modification to the software or data management architecture.

Timetable

The NRDA-related AR activities will occur continuously during the period of the Claim.

RP Involvement

NOAA is not planning to coordinate with the RP on this activity.

REFERENCES

French McCay, D.P., 2002. Development and Application of an Oil Toxicity and Exposure Model, OilToxEx. Environmental Toxicology and Chemistry 21(10): 2080-2094.

French McCay, D.P., 2004. Oil spill impact modeling: development and validation. Environmental Toxicology and Chemistry 23(10): 2441-2456.

French-McCay, D.P, 2009. State-of-the-Art and Research Needs for Oil Spill Impact Assessment Modeling. In Proceedings of the 32nd AMOP Technical Seminar on Environmental Contamination and Response, Emergencies Science Division, Environment Canada, Ottawa, ON, Canada, pp. 601-653.

NOAA. 2012a. 2010-2012 Cetacean Unusual Mortality Event in Northern Gulf of Mexico. Office of Protected Resources. www.nmfs.gov/pr/health/mmume/cetacean_gulfofmexico2010.htm.

NOAA. 2012b. John H. Prescott Marine Mammal Rescue Assistance Grant Program. Office of Protected Resources. www.nmfs.noaa.gov/pr/health/prescott.

NOAA. 2013. Gulf Spill Restoration. Damage Assessment, Remediation, and Restoration Program. http://www.gulfspillrestoration.noaa.gov/oil-spill/gulf-spill-data/.

Table A-1. List of final, signed work plans posted on NOAA's Gulf Spill Restoration website as of June 28, 2013 (NOAA, 2013)

Claim Category	Habitat / Resource / Claim Activity	Work Plan #	Name of Work Plan	Date Signed	Objective
Shoreline	Shoreline	1	Deepwater Horizon/MC252/BP Shoreline/Vegetation NRDA Pre-assessment Data Collection Plan	7/30/2010	To determine the shoreline areas that were exposed to potentially harmful levels of oil and to characterize the habitat, vegetation, and fauna on those shoreline resources that were exposed to DWH oil. The purpose of this pre-assessment study is to collect the information necessary to map the extent of shoreline exposure to oil and select locations so that further potential injury assessment studies can be identified
Shoreline	Shoreline	2	Shoreline/Vegetation Rapid Shoreline Oiling Survey NRDA Pre-Assessment Data Collection Plan	3/3/2011	To provide additional information to be used in conjunction with information obtained in the Tier 2 data collection efforts under the Deepwater Horizon/MC252/BP Shoreline/Vegetation NRDA Pre-Assessment Data Collection Plan to determine the spatial extent and degree of oiling on intertidal shoreline resources.
Shoreline	Shoreline	3	Sampling and Monitoring Plan for the Assessment of MC252 Oil Impacts to Coastal Wetland Vegetation in the Gulf of Mexico	8/23/2011	Objectives: (1) to collect and evaluate ephemeral and other data that will assist in the evaluation and assessment of the potential effects of MC 252 oil on herbaceous coastal wetland vegetation health and in design implementation of additional assessment activities appropriate to the purpose; (2) to collect and evaluate ephemeral and other data that will assist in the design and implementation of other assessment activities related to Louisiana black mangrove health; and (3) to provide data that will assist in the design and implementation of other activities as may be needed.
Shoreline	Shoreline	4	Light Detection and Ranging (LIDAR) Data Acquisition	11/3/2011	The purpose of this plan is to acquire Light Detection and Ranging (LIDAR) data along the affected and unaffected areas of the Louisiana coast. This data will provide information for deriving and mapping elevation and shoreline position along the shorelines.
Shoreline	Shoreline	6	Work Plans for MC252 Oil Impacts to Fiddler Crabs and Periwinkle along the Gulf of Mexico	3/28/2012	Objectives: (1) collect and evaluate data for the assessment of the potential effects of MC252 oil on coastal fiddler crabs and periwinkles; and (2) collect and evaluate data to assist in the design and implementation of additional assessment activities appropriate to the purposes of the plan.
Shoreline	Shoreline	7	Addendum to the Sampling and Monitoring Plan for the Assessment of MC252 Oil Impacts to Coastal Wetland Vegetation in the Gulf of Mexico - 2012 Data Collection - Coastal Wetland Vegetation Elevation Survey	4/10/2012	This addendum will allow the 2012 surveys (Sampling and Monitoring Plan for the Assessment of MC252 Oil Impacts to Coastal Wetland Vegetation in the Gulf of Mexico 2012 Data Collection – Coastal wetland vegetation elevation survey
Data Management and Visualization	Aerial Imagery	8	Technical Specification and Scope of Work/Services for Aerial Image Acquisition and Image Processing in Support of the MC252 NRDA Process	10/11/2010	This document is a scope of work that has been developed to support the needs of the submerged aquatic vegetation (SAV) and shoreline technical working groups. Aerial imagery will be acquired in predefined priority areas on a six-month basis.

Claim Category	Habitat / Resource / Claim Activity	Work Plan #	Name of Work Plan	Date Signed	Objective
Nearshore	Oysters	9	Mississippi Canyon 252 Spill Oyster Sampling Plan Phase 1 - High Priority Sites	2/22/2011	This plan provides for the collection of ephemeral data on the condition of oysters in the Gulf of Mexico - both baseline (pre-oiling) and post-oiling. These data will be collected for use in evaluating whether oysters may be or are being injured by oil or response actions associated with the Deepwater Horizon/Mississippi Canyon 252 Incident (MC 252 Spill) and to assist in implementing future procedures that may be chosen to assess any such injuries to oysters, as appropriate.
Nearshore	Oysters	10	Mississippi Canyon 252 Spill Oyster Sampling Plan Phase 1 - High Priority Sites - Amendment 1	2/22/2011	This first amendment makes modifications to the previous Oyster Sampling Plan Phase I, adding 18 additional alternative sampling locations for the heavily oiled sites.
Nearshore	Oysters	11	Mississippi Canyon 252 Spill Oyster Sampling Plan Phase 1 - High Priority Sites - Amendment 2	2/22/2011	This second amendment makes modifications to the previous Oyster Sampling Plan Phase I.
Nearshore	Oysters	12	Mississippi Canyon 252 Spill Oyster Sampling Transition Plan Summary October 2010 - April 2011	2/22/2011	To collect further data to document the potential exposure of oysters to oil and dispersants released into the environment as a result of the Deepwater Horizon Oil Spill, as well as documenting potential injury to oyster resources as a result of such exposure. Specifically, this transition plan will allow for continued progress on identifying future sample locations within the area of known oyster habitat, including both mapped oyster reef and unmapped areas. Quantitative contaminant samples of oysters and sediments, larval densities, and recruitment of spat as well as qualitative abundance estimates of adult oysters (catch per unit effort (CPUE) data from oyster dredges).
Nearshore	Oysters	13	Mississippi Canyon 252 Spill Oyster Sampling Transition Plan - Amendment 1	7/29/2011	This document amends the initial Oyster Sampling Transition Plan covering sampling efforts from October 2010 to April 2011. It updates three sections of the Transition Plan including the Estimated Samples from This Activity section, the Site Selection section, and the Cost Estimate section. These are updated to reflect the addition of 20 supplemental sites based on a review of available exposure data.
Nearshore	Oysters	14	Mississippi Canyon 252 Spill Spring 2011 Oyster Recruitment Sampling Plan	7/29/2011	This plan is intended to resample sites from both Phase I Pre-assessment work plan and its amendments and the Oyster Sampling Transition Plan, during the spring oyster reproductive season to further characterize the temporal and geographic extent of any potential injury.
Nearshore	Oysters	15	Mississippi Canyon 252 Spill Spring 2011 Oyster Recruitment Sampling Plan - Amendment 1	9/6/2011	This plan amends the initial Spring 2011 Oyster Recruitment Sampling Plan (Spring Plan). The original Spring Plan included three rounds of recruitment sampling starting in April 2011. This amendment updates the plan to include additional rounds of recruitment sampling across all sites to gather additional data through the summer months.
Nearshore	Oysters	16	Mississippi Canyon 252 Spill Spring 2011 Oyster Recruitment Sampling Plan - Amendment 2	9/23/2011	This plan further amends the Spring 2011 Oyster Recruitment Sampling Plan (Spring Plan). This plan expands the Spring Plan to include continued recruitment sampling into the fall of 2011.

Claim Category	Habitat / Resource / Claim Activity	Work Plan #	Name of Work Plan	Date Signed	Objective
Nearshore	Oysters	17	2011 Oyster Quadrat and Sediment Sampling Plan	10/6/2011	This plan involves resampling of the Phase I sites (from summer 2010) for oysters by quadrat and expands the sampling plan to collect quadrat samples from the Transition Plan sites in Louisiana and Mississippi as well. The plan also includes collecting sediment samples for contaminant analysis at all sites. Quadrat sampling at the Transition Plan sites would provide abundance and biomass per square meter values for these locations. This additional sampling will contribute to understanding of the geographical and temporal extent of injuries to the adult and juvenile oyster populations, and counts of spat-sized oysters from the quadrat samples will complement data on oyster settlement monitoring that the oyster working group has been collecting under the Phase I, Transition, and Spring 2011 plans.
Offshore	Telemetry	18	Satellite Tracking of Sperm Whales in the Gulf of Mexico in 2011, a Follow-up to the Deepwater Horizon Oil Spill	10/6/2011	Objectives: (1) obtain a better understanding of 2011 sperm whale movements, including home range, core areas, and habitat utilization; diurnal behavior, and foraging behavior, and abundance and distribution, through collection of satellite tag and dive tag data; (2) determine any differences between such movements in comparison with previous datasets; (3) if practicable, obtain a better understanding of the movement of Brydes whales, by tagging up to 5 of them opportunistically; (4) collect echosounder data using the Simrad EK60 to assess biomass in an effort to understand squid abundance and distribution, and obtain a better understanding of squid species in the vicinity of sperm whales through opportunistic sampling; (5) obtain visual information on the health condition of tagged whales; and (6) determine sex and genetics of biopsied, tagged sperm whales.
Offshore	Telemetry	19	Addendum to the Satellite Tracking of Sperm Whales in the Gulf of Mexico in 2011, a Follow-up to the Deepwater Horizon Oil Spill: Analysis Plan for Years 2010/2011	3/29/2012	The addendum plan provides the planned analyses for the field investigations of the potential impacts of the Deepwater Horizon/Mississippi Canyon 252 Oil Spill and subsequent response efforts (the “MC252 Oil Spill”) on endangered sperm whales that were performed in 2010 and 2011, in order to quantify potential injury for the purposes of a Natural Resource Damage Assessment.
Nearshore	Injury Quantification to Organisms from Contaminated Sediments	20	Submerged Oil Reconnaissance Plan	6/6/2010	To conduct an initial reconnaissance of very shallow (<3m) subtidal habitats in the very nearshore water column (within 100m from the shoreline). The sampling would target areas where submerged oil is observed or is expected to be found based on shoreline assessment observations, to characterize the extent of oiling and document exposure of the water column and benthos to hydrocarbons. The method used to detect the submerged oil is through the use of chain-weighted snare drags using devices know as V-SORS along designated transects identified from Incident response or NRDA shoreline assessment observations. Additionally, as able, survey teams will conduct opportunistic biological sampling using small seine or trawl nets, and/or ponar grab samples to characterize the biological communities at the snare deployments.
Nearshore	Injury Quantification to Organisms from Contaminated Sediments	21	Submerged Oil Characterization Plan 2010	8/4/2010	The purpose of the plan is to direct the collection of samples of weathered, submerged oil from the nearshore environment (from the shoreline to the 20m isobath). The sampling locations are to be determined in the field, and the total volume to be collected is approximately 250gallons. The samples will be collected using trawl nets towed by typical shrimp trawlers or other appropriate vessels. To the extent possible, the samples of submerged oil will be collected from discrete geographic areas over a limited period of time (any single sample will be collected during a period of no more than one day).

Claim Category	Habitat / Resource / Claim Activity	Work Plan #	Name of Work Plan	Date Signed	Objective
Nearshore	Injury Quantification to Organisms from Contaminated Sediments	22	Submerged Oil Characterization Plan 2011	6/7/2011	To document and quantify MC 252-related hydrocarbon and other contaminant levels in benthic sediments of shallow subtidal nearshore environments known or suspected to have been impacted by the MC 252 oil spill.
Nearshore	Injury Quantification to Organisms from Contaminated Sediments	23	Marsh Edge and Sandy Shoreline Biota Sampling Plan	8/17/2011	Determine contaminant levels in benthic infauna and small, epibenthic crustaceans along a continuum of exposure levels to MC252 oil
Offshore	Sargassum / Sea Turtles	24	Assessment Plan for Juvenile Sea Turtles in Sargassum Communities Potentially Exposed to MC252 Discharge	1/5/2011	Objectives:(1) Determine the areal extent and distribution of Sargassum in the north-central and eastern Gulf of Mexico, and its spatial relationship to previously observed surface oil and dispersants associated with the MC 252 discharge via aerial surveys; and(2) Document the density, condition, diet, and potential MC 252 oil exposure of pelagic neonate sea turtles associated with floating Sargassum in the north-central and eastern Gulf of Mexico, and along the southeast coast of Florida.
Offshore	Sargassum	25	Sargassum Communities and Associated Fauna	5/8/2011	Objectives: (1) Determine the 2011 areal extent and distribution of Sargassum in the north-central Gulf of Mexico via aerial surveys, and its spatial relationship to previously observed surface oil and dispersants in 2010 associated with the MC 252 discharge; and (2) Document the density, abundance and diversity of invertebrate and fishes associated with pelagic Sargassum, including assessment of any remaining degrees of MC252 oil
Offshore	Sargassum / Sea Turtles	26	2011 Addendum to the Assessment Plan for Juvenile Sea Turtles in Sargassum Communities	5/13/2011	The main objectives of this addendum are to: (1) Determine the 2011 areal extent and distribution of Sargassum the north-central and eastern Gulf of Mexico; and (2) document the density, condition diet, and MC252 oil exposure of pelagic neonate sea turtles associated with floating Sargassum in the north-central and eastern Gulf of Mexico
Offshore	Sargassum	27	Addendum to Assessment Plan for Sargassum Communities and Associated Fauna in the Northern Gulf to Support Sargassum Mapping	11/3/2011	Objective: the determination of 2011 areal extent and distribution of Sargassum in the north-central Gulf of Mexico via aerial surveys, and its spatial relationship to previously observed surface oil and dispersants in 2010 associated with the MC 252 discharge. The purpose of this addendum is to obtain field data to facilitate the interpretation of satellite imagery of Sargassum before and during the MC 252 oil spill, and since the plume has dissipated.
Offshore	Sargassum	28	Sargassum Injury Assessment Plan: Mapping Using Remote Sensing	2/28/2012	Objectives: (1) using existing remote sensing datasets, develop a validated method that can differentiate among oil, oiled Sargassum, and un-oiled Sargassum; (2) map Sargassum abundance and distribution in 2010; (3) depending on results of Phases 1 -3, map Sargassum abundance and distribution from 2000-2009 and 2011; and (4) depending on method development, attempt to determine what percent of Sargassum was contaminated by oil during the spill.

Claim Category	Habitat / Resource / Claim Activity	Work Plan #	Name of Work Plan	Date Signed	Objective
Nearshore	SAV	29	Submerged Aquatic Vegetation Tier 1 Pre-Assessment Plan Pre-Impact Baseline Characterization	10/27/2010	Objectives: (1) to document and compile relevant data from existing Submerged Aquatic Vegetation (SAV) mapping and monitoring programs; (2) to review existing information and identify spatial, temporal and/or attribute data gaps relative to the suite of SAV metrics identified; (3) to conduct targeted sampling for baseline data to fill identified data gaps; and (4) to acquire and/or develop aerial imagery in support of mapping the baseline areal extent of SAV resources at risk in the northern Gulf of Mexico. To achieve these objectives, the following tasks will be conducted: compile SAV areal coverage; compile SAV biological characteristics, including SAV coverage, density, biomass and species composition; and compile chemistry data, including available chemical data for sediments, water, SAV, and invertebrates, in the areas; obtain invertebrate densities and species composition; and obtain SAV associated fauna data. The geographic scope of this work plan includes the nearshore and estuarine environments containing SAV habitats along the northern Gulf of Mexico from eastern Louisiana to the Florida Panhandle to the southeastern tip of Florida, including the Florida Keys.
Nearshore	SAV	30	Workplan for Assessing Potential Impacts of Fresh and Brackish Water Submerged Aquatic Vegetation Communities	2/11/2011	Objective: To determine if fresh and brackish water SAV and associated faunal communities that are likely to support wintering waterfowl and fisheries have been exposed to MC252 related products and or agents by identifying whether PAH residues and PAH sources, or dispersants and other agents, related to the MC252 release are present in sediment, plant, detrital material, and invertebrate tissues collected from oiled and unoiled areas.
Nearshore	SAV	31	Sampling and Analysis Plan for the Jean Lafitte National Historic Park and Preserve Submerged Aquatic Vegetation	9/5/2011	The purpose of the study is to assess the potential impacts of the increased freshwater inputs into JELA due to the diversion of Mississippi River freshwater into JELA following the MC 252 Oil Spill.
Nearshore	SAV	32	Submerged Aquatic Vegetation Tier 2 Pre-Assessment Post-Spill Exposure Characterization Plan	11/8/2011	This document presents a plan to collect data concerning the post-spill condition of Submerged Aquatic Vegetation (SAV) resources in the north-central Gulf of Mexico, extending from the coastal areas and islands of Louisiana, Mississippi, and Alabama, through the panhandle of Florida to evaluate whether SAV habitats and communities were exposed to MC252 oil or related products. This plan builds on the ―Mississippi Canyon 252 Oil Spill Submerged Aquatic Vegetation Tier 1 Pre-Assessment Plan Pre-Impact Baseline Characterization with some additional parameters added to evaluate potential exposure.
Offshore	Deepwater communities	33	NRDA Tier 1 for Deepwater Communities	7/2/2010	Objectives: Systematic photosurvey of previously surveyed mesophotic reef, deep water corals, and chemosyntheic community sites to a) increase baseline, b) document ephemeral data for initial injury; increase pre-exposure baseline data; obtain tissue samples; document and measure other initial injuries to deep water biota potentially caused by the MC252; deploy sediment trap moorings; retrieve passive oil samplers (SPMDs)
Offshore	Deepwater communities	34	NRDA Tier 1 for Deepwater Communities - Addendum	7/2/2010	Modifications to Tier 1 plan due to weather impacts on cruise progress

Claim Category	Habitat / Resource / Claim Activity	Work Plan #	Name of Work Plan	Date Signed	Objective
Offshore	Deepwater communities	35	NRDA Tier 1 Proposal: SPMD Detection of DWHOS Hydrocarbons in the Water Column Immediately Over the NEGOM Shelf-Edge Pinnacle Reefs	7/9/2010	To deploy 2 moored arrays of 4 SPMD canisters immediately above the reef top of Alabama Alps reef to document the presence of oil (PAHs) if any in the near bottom habitat of the deep reef community during the early potential impacts stage of the DWH oil spill event
Offshore	Deepwater communities	36	NRDA Tier 1 Sampling Plan - Reconnaissance Survey of Hard Ground Megafauna Communities in the Vicinity of the Deepwater Horizon Spill Site	10/19/2010	Utilizing a drift camera to survey predicted hard-ground areas and obtain visual determination of the presence of megafauna communities; Identify these areas in relation to potential exposure to oil, dispersants, or other chemicals associated with the Deepwater Horizon Incident
Offshore	Deepwater communities	37	NRDA Sampling Plan: Time Lapse Camera and Sediment Trap Retrieval and Redeployment Plan	3/8/2011	Collection of time-lapse camera used to collect imagery from MC338 site of deep water coral community covered with flocculent-like material; retrieve sediment traps from site VK826 in order to examine the chemical composition and temporal delivery of particulate matter, and the identification of larval composition (e.g., larvae of coral, tube worms, crustaceans, etc.) and flux; visit site MC118 to collect high resolution imagery and examine corals in this area for visual signs of impact, collect a limited number of soft sediment cores and faunal samples for analysis for the presence of hydrocarbons from the MC252 Incident and the assessment of macro- and meiofauna, including identification to the lowest possible taxonomic level and enumeration
Offshore	Deepwater communities	38	NRDA Sampling Plan: Offshore and Deepwater Softbottom Sediment and Benthic Community Structure Survey	4/20/2011	This SPI survey will complement the proposed Deepwater Sediment Sampling Study and any other planned benthic studies by: (1) obtaining much greater sample density than is feasible with sediment coring techniques; (2) providing additional information on bottom habitat conditions that may aid in the interpretation of benthic data collected during sediment coring efforts; and (3) helping to inform future sediment sampling designs by identifying areas or strata that show potential impact. Water sampling objectives: (1) to provide measurements of the general water column structure at the time of the SPI survey, and 2) if features suggestive of the presence of hydrocarbons in the water column are detected, then to characterize water chemistry near those features and the sediment bed.

Claim Category	Habitat / Resource / Claim Activity	Work Plan #	Name of Work Plan	Date Signed	Objective
Offshore	Deepwater communities	39	NRDA Tier 1 Sampling Plan - AUV Reconnaissance Survey II of Potential Hard-Ground Megafaunal Communities in the Vicinity of the Deepwater Horizon Spill Site	4/26/2011	The overall objectives of this cruise are to identify biological communities associated with hard ground in the deep waters of the Gulf of Mexico that may have been adversely affected by the release of oil, dispersants, and/or other adverse secondary effects associated with the oil spill. Because the extent of such communities is not fully understood, and due to the difficulty of conducting natural resource damage assessment activities in the deep ocean, this plan proposes a targeted assessment of potential sites within the study area (described below). The work to be executed under this plan represents preliminary potential exposure assessment. Exposure and injury assessment of any biological communities discovered through the course of execution ofthis plan may be pursued in subsequent cooperative work plans.This plan describes the use of two underwater reconnaissance systems that will be used in parallel. The primary objective for the cruise will be the use of the Sentry AUV at prioritized sites to confirm the presence of hard ground and associated biological communities. The use of the TowCam is an additional tool to be used in a complementary manner to the AUV to meet and support this objective. Using these two systems together will allow for more efficient identification of potential hard ground biological communities. For example, the use of the TowCam will allow the survey team to preview some larger sites before deciding where to deploy the Sentry over larger features. Similarly, while the Sentry is in the water, the TowCam may also be used to examine close-by features that may be near to the prioritized sites. Finally, if longer, linear features are found, use of TowCam may be warranted for a rapid assessment so that the Sentry can focus on the areas more appropriate for survey by AUV. Below, we describe the objectives for the work proposed in this plan. The Methodologies section below describes in greater detail the use of the proposed survey systems.
Offshore	Deepwater communities	40	Deepwater Sediment Sampling to Assess Post-Spill Benthic Impacts from the Deepwater Horizon Oil Spill	6/06/2011	The overall goal of this study is to help identify any potential impacts of the DWH oil spill on deep water sediments and resident benthic fauna in support of the NRDA injury-assessment process. There are two fundamental questions to be answered in addressing this goal. First, are sediments in areas with a greater likelihood of exposure, such as near the well-head, under the former surface sea slick, or under the dispersed sub-surface hydrocarbons, impacted by hydrocarbons traceable to the oil spill? If the answer is yes, the second question is, do living benthic resources show evidence of a difference in community indices or other injuries that can be related to exposure to the hydrocarbons?
Offshore	Deepwater communities	41	NRDA Tier 1 for Deepwater Communities - Addendum Plan for Coral Aging	4/13/2012	This work plan outlines the ageing of corals collected as part of these NRDA efforts.

Claim Category	Habitat / Resource / Claim Activity	Work Plan #	Name of Work Plan	Date Signed	Objective
Offshore	Deepwater communities	42	Distribution, Abundance, and Biodiversity of Benthic Megafauna and Mesopelagic Bathypelagic Megaplankton	6/8/2011	This document describes a plan to conduct surveys of megafauna that include revisits to sites sampled in August 2010, which may help quantify how the biological conditions (in terms of megafauna) have changed around the spill site following capping of the well. This program will provide data with the potential to quantify the biodiversity, distribution, and abundance of benthic and demersal megafauna that are observable and identifiable from video and still photography on the seafloor at selected locations around MC252. In this plan it is understood that estimates of biodiversity, distribution, and abundance are all restricted to organisms that are observable with the cameras. As a secondary objective, the data necessary to estimate biodiversity and relative abundance of megaplanktonic organisms larger than 2.5 centimeters in diameter will also be collected. This program will conduct a single examination of selected sites in close proximity to, and further away from the Macondo BOP.
Offshore	Deepwater communities	43	Distribution, Abundance, and Biodiversity of Benthic Megafauna and Mesopelagic Bathypelagic Megaplankton - Addendum	8/15/2011	Perform water column and seafloor and surveys in selected locations both near and distant from the Macondo Blowout Preventer. Sites are primarily those not visited in the first phase of the plan.
Offshore	Deepwater communities / Transport, Fate and Effects Modeling	44	Offshore and Deepwater Softbottom Sediment and Benthic Community Structure Survey	4/6/2011	Sediment Profiling Objectives: to complement the proposed Deepwater Sediment Sampling Study and any other planned benthic studies by: 1) obtaining much greater sample density than is feasible with sediment coring techniques; 2) providing additional information on bottom habitat conditions that may aid in the interpretation of benthic data collected during sediment coring efforts; and 3) helping to inform future sediment sampling designs by identifying areas or strata that show potential impact. B. Water Sampling Objectives: 1) to provide measurements of the general water column structure at the time of SPI survey, and 2) if features suggestive of the presence of hydrocarbons in the water column are detected, then to characterize water chemistry near those features and the sediment bed.
Offshore	Transport, Fate and Effects Modeling	45	Field Plan for Cooperative Research Cruise (RV Weatherbird II)	5/4/2010	Objectives: establish pre-impact baseline for organism abundance in Gulf of Mexico continental shelf waters near spill; characterize zooplankton distribution, abundance, and species composition at a minimum of 6 stations in the area to the southeast of the oil plume, and use SIPPER (Shadowed Image Particle Profiling Image Evaluation Recorder) technology to detect and document mortality of zooplankton and fish larvae in spill area; and characterize the distribution of crude oil droplets (number and size) in the vicinity of the oil plume, to 300 m depths. Sample collection includes invertebrate zooplankton, fish eggs, fish larvae and postlarval, shrimp and groundfish, benthic (bottom-dwelling) invertebrates, tissue samples for toxicology and stable-isotope analysis, water and sediment samples.

Claim Category	Habitat / Resource / Claim Activity	Work Plan #	Name of Work Plan	Date Signed	Objective
Offshore	Transport, Fate and Effects Modeling	46	Field Plan for Water Column Profiling Measurements (M/V Jack Fitz)	5/8/2010	Objectives: a. measure discrete, free-oil droplet concentrations at multiple depths and b. measure dissolved phase (BTEX (benzene, toluene, ethylbenzene, and xylenes) and water-soluble lower-molecular-weight PAH (naphthalenes and phenanthrenes/anthracenes) at the same stations. Data to be used to calibrate 3-dimensional modeling of subsurface oil plume structure, fate (dissolution behavior), and transport.
Offshore	Transport, Fate and Effects Modeling	47	Proposal to Extend Water Column Profiling Cruise (M/V Jack Fitz)	5/11/2010	An extension of the original cruise of May 9-10 to include May 10-15. The extension was needed to maximize the sampling window referenced in the original cruise plan, for the purpose of collecting samples at additional locations.
Offshore	Transport, Fate and Effects Modeling	48	Sampling Plan for R/V TDI Brooks McCall Cruise	5/13/2012	Objective: to obtain splits of whole water samples for NRDA from a response cruise on the RV TDI Brooks McCall. Samples will be analyzed for Trustee list of PAHs and VOAs.
Offshore	Transport, Fate and Effects Modeling	49	Water Column Injury Ephemeral Data Collection: ADCP Monitoring Plan (M/V Bunny Bordelon)	5/21/2010	Objective: to monitor currents throughout the water column in the vicinity of the Wellhead via ADCP (Acoustic Doppler Current Profiler) to improve NRDA water sampling location selections and refine data inputs into models.
Offshore	Transport, Fate and Effects Modeling	50	Water Column Injury Ephemeral Data Collections, Cruise 2: Surface Water Sampling Plan (M/V Jack Fitz)	5/31/2010	A cruise originally planned for May 21 - 28, aboard the Jack Fitz, was extended to June 1 due to a vessel mechanical problem.
Offshore	Transport, Fate and Effects Modeling	51	Data Collection Plan for Gordon Gunter Cruise	6/5/2010	Objective: to collect data and analytical samples to better quantify and model the distribution and weathering of oil (including dispersed and burned oil) released from the Deepwater Horizon platform. Water samples in the surface mixed layer will be collected to test for the presence of dispersed oil and droplet size. Sample locations are in areas of where oil dispersant was applied or suspected, and the area of a controlled burn. SIPPER (Shadowed Image Particle Profiling and Evaluation Recorder) will be used to measure plankton presence and distribution.
Offshore	Transport, Fate and Effects Modeling	52	NRDA Plans for Samples of Opportunity in Support of a Water Column Baseline	6/5/2010	Objective: to obtain samples of whole water from the Coral Reef Monitoring Project in the Florida Keys. Chemical analysis of whole water, sub-surface discrete samples will augment or complement other baseline samples collected under other work plans.
Offshore	Transport, Fate and Effects Modeling	53	Water Column Injury Ephemeral Data Collections, Cruise 3: Surface Water Sampling Plan for Dispersant Treated Oil (M/V) Bunny Bordelon)	6/5/2010	Objective: to obtain surface and sub-surface samples of water impacted by oil. Water samples were collected for an analysis of physical and chemical conditions of surface waters. Conductivity, Temperature and Depth (CTD) was utilized for characterizing the surface mixed layer and pycnoclines; CDOM fluorescence for indicating the vertical distribution of hydrocarbons; whole water samples for measurement of PAH, BTEX, TPH, dispersant concentrations, and oil droplet size and distribution using FLOWCAM. Surface oil photography and samplings of water for oil weathering analysis were also collected. FLOWCAM and ZOOSCAN were used for plankton analysis, identification and density counts.

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Offshore	Transport, Fate and Effects Modeling	54	Water Column Injury Ephemeral Data Collections, Cruise 4 Jack Fitz 3 Water Sampling Plan	6/11/2010	Objective: to document physical and chemical conditions of deep waters and to characterize the deep water oil plumes. In addition, to sample conditions in surface waters near the spill source.
Offshore	Transport, Fate and Effects Modeling	55	DWHOS Plan for Adaptive Water Column NOAA-NRDA Sampling Cruise Plan - American Diver 1 and Ocean Veritas 9	7/29/2010	Two cruises in July were proposed to conduct an adaptive focused sampling strategy that was to target portions of the water column and areas where oil was detected within 20 km of the wellhead. Many categories of data were collected, including, but not limited to: salinity, temperature, dissolved oxygen, along with concentrations of hydrocarbon, suspended sediments, plankton, and pyrosomes. Analysis of data during and between cruise deployments will aid in determining the need for additional sampling efforts or any modifications for additional sampling efforts.
Offshore	Transport, Fate and Effects Modeling	56	Amendment to DWHOS Plan for Adaptive Water Column NOAA-NRDA Sampling Cruise Plan - American Diver 1 and Ocean Veritas 9	7/31/2010	The cruises in July were delayed due to logistics, storms, and staff scheduling and rescheduled from July to late July-early August.
Offshore	Transport, Fate and Effects Modeling	57	Plan for Adaptive Water Column NOAA-NRDA Sampling Cruise Plan - HOS1	8/25/2010	This plan is another in a series of cruises conducted with adaptive sampling strategy. The objective is to apply in-situ methods to characterize subsurface oil at and beyond the area of the MC252 wellhead. The goals of this cruise include the following: (1) develop and employ sampling protocols for various continuous sampling instruments in characterizing and measuring oil droplet sizes and numerical densities of particulates; (2) characterize signals identified by acoustics and fluorescence measurements; and (3) obtain data on oil droplet size, water chemistry, and other particulate densities.
Offshore	Transport, Fate and Effects Modeling	58	Plan for Adaptive Water Column NOAA-NRDA Sampling Cruise Plan - HOS Davis 2	9/7/2010	This plan is another in a series of cruises conducted with an adaptive sampling strategy. It is a continuation of the HOS Davis 1 plan with the same goals.
Offshore	Transport, Fate and Effects Modeling	59	Plan for Adaptive Water Column NOAA-NRDA Sampling Cruise Plan - American Diver2	9/22/2010	Objective: to determine the plankton distributions and community composition in the upper water column in a region to the southwest of the wellhead where oil exposure may have occurred. The plan will utilize acoustic, bio-optics, and direct collection methods to assess the horizontal and vertical distribution patterns, along with the abundance and community composition of the plankton. The data collected for this plan can be compared with concurrent sampling on the HOS Davis 2 in the deeper water.
Offshore	Transport, Fate and Effects Modeling	60	Plan for Adaptive Water Column NOAA-NRDA Sampling (PAWNNS) Cruise Plan for HOS Davis 3 (September 8 to September 20)	11/15/2010	This plan is another in a series of cruises conducted with adaptive sampling strategy. It is a continuation of the HOS Davis 1 and 2 plan (excluding attachments 7 and 8 from HOS Davis 1) with the same goals.

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Offshore	Transport, Fate and Effects Modeling	61	NRDA Plankton Sampling Plan & Fall 2010 Cruise Plan (Specialty Diver 1), September 2010 SIPPER Cruise	11/15/2010	This plan is part of a series of cruises to be conducted to evaluate the distribution and densities of ichthyoplankton and other zooplankton in Gulf of Mexico waters potentially affected by the Deepwater Horizon Oil Spill and in surrounding areas. Herein, the fall 2010 Specialty Diver 1 upper-water column (200m) plankton sampling plan is described. Sampling and analysis protocols have been developed for offshore stations for the upper 200m of the water column. The primary objective of the cruise is to collect plankton image data using the Shadowed Image Particle Profiling and Evaluation Recorder (SIPPER). The occurrence, abundance, biomass, vertical distribution, and daily vertical migration of zooplankton species of the Gulf of Mexico will be assessed.
Offshore	Transport, Fate and Effects Modeling	62	NRDA Plankton Sampling Plan & Fall 2010 Cruise Plan: Walton Smith 1	11/15/2010	This plan is part of a series of cruises to be conducted to evaluate the distribution and densities of ichthyoplankton and other zooplankton in Gulf of Mexico waters potentially affected by the Deepwater Horizon Oil Spill and in surrounding areas. The primary objective is to collect depth discrete plankton samples at various intervals throughout the entire water column using a Multiple Opening/Closing Net and Environmental Sensing System (MOCNESS). Stations correspond to locations sampled during the 2010 SEAMAP Fall Plankton survey cruise on the R/V Gordon Gunter. The occurrence, abundance, biomass, vertical distribution, and daily vertical migration of the early life stages of fall spawning and deep water ichthyo- and zooplankton species of the Gulf of Mexico will be assessed.
Offshore	Transport, Fate and Effects Modeling	63	NRDA Plankton Sampling Plan & Fall 2010 Cruise Plan: Walton Smith 2	11/15/2010	This plan is part of a series of cruises to be conducted to evaluate the distribution and densities of ichthyoplankton and other zooplankton in Gulf of Mexico waters potentially affected by the Deepwater Horizon Oil Spill and in surrounding areas. Herein, the fall 2010 Walton Smith 2 deep water plankton sampling plan is described. Sampling and analysis protocols have been developed for offshore stations for the entire water column. The primary objective of the cruise is to collect plankton image data using the digital-automatic Video Plankton Recorder (DAVPR) and the Holocam. The occurrence, abundance, biomass, vertical distribution, of plankton and marine snow in the Gulf of Mexico will be assessed. In addition, high resolution imagery of the seabed will be collected using the Woods Hole Seasled.
Offshore	Transport, Fate and Effects Modeling	64	NRDA Plankton Sampling Plan & Fall 2010 Cruise Plan: Walton Smith 3	11/15/2010	This plan is part of a series of cruises to be conducted to evaluate the distribution and densities of ichthyoplankton and other zooplankton in Gulf of Mexico waters potentially affected by the Deepwater Horizon Oil Spill and in surrounding areas. Herein, the fall 2010 Walton Smith3 deep water plankton sampling plan is described. The same overall sampling approach will be followed in subsequent seasons. Sampling and analysis protocols have been developed for offshore stations for the entire water column. The primary objective is to collect depth discrete plankton samples at various intervals throughout the entire water column using a Multiple Opening/Closing Net and Environmental Sensing System (MOCNESS). Stations correspond to locations sampled during the 2010 SEAMAP Fall Plankton survey cruise on the R/V Gordon Gunter. The occurrence, abundance, biomass, vertical distribution, and daily vertical migration of the early life stages of fall spawning and deep water ichthyo- and zooplankton species of the Gulf of Mexico will be assessed.

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Offshore	Transport, Fate and Effects Modeling	65	NRDA SEAMAP Plankton Sampling Plan and Fall Cruise Plan (Gordon Gunter: 8/24-9/30)	11/15/2010	This plan is the first of a series of cruises to be conducted to evaluate the distribution and densities of ichthyoplankton and other zooplankton in Gulf of Mexico waters potentially affected by the Deepwater Horizon oil spill and in surrounding areas. This plan describes a program of expanded fall SEAMAP plankton sampling to be conducted in August and September, 2010. The same sampling design will be followed in subsequent seasons as needed to capture data relevant to the injury assessment. The sampling and analysis protocols in the upper 200m of the water column are those used in the SEAMAP program. lchthyo- and zooplankton will be sampled using paired bongo nets and at the water surface with a neuston net. Depth-discrete plankton samples taken at various intervals will be carried out using a Multiple Opening/Closing Net and Environmental Sensing System (MOCNESS).
Offshore	Transport, Fate and Effects Modeling	66	Deepwater Horizon Oil Spill (DWHOS) NRDA Offshore Deep Meso- and Bathypealic Fish Sampling Plan	11/30/2010	Objective: to collect fish and invertebrate samples using a High Speed Midwater Rope Trawl (HSMRT). In addition to trawling, the shipboard acoustics system will be running and collecting water column data for the entire cruise track. In this way, the occurrence, abundance biomass and daily vertical migration of juvenile and adult deep water meso and bathypelagic species within the study area can be assessed.
Offshore	Transport, Fate and Effects Modeling	67	NRDA Winter 2011 Plankton Imaging Sampling Cruise Plan (Arctic)	1/12/2011	This plan is part of a series of cruises scheduled for the winter of 2011 intended to evaluate the distribution and densities of ichthyoplankton, other zooplankton, and some phytoplankton in Gulf of Mexico waters potentially affected by the Deepwater Horizon Oil Spill and in surrounding areas. This plan describes the sampling effort for winter 2011. The primary objective of the cruise is to collect plankton image data using the digital autonomous Video Plankton Recorder (DAVPR) and the Holocaum. The occurrence, abundance, biomass, and vertical distribution, of plankton and marine snow in the Gulf of Mexico will be assessed.
Offshore	Transport, Fate and Effects Modeling	68	NRDA 10-meter MOCNESS Winter 2011 Plankton Sampling Cruise Plan: Meg Skansi	1/24/2011	This plan is a series of cruises scheduled for the winter of 2011 to evaluate the distribution and densities of invertebrates (i.e., larger plankton and small nekton) and small fish (also considered small nekton) in Gulf of Mexico waters potentially affected by the Deepwater Horizon Oil Spill and in surrounding areas.
Offshore	Transport, Fate and Effects Modeling	69	ADCP-Measured Currents Monitoring Plan: February 2011 ADCP Maintenance Mission HARP Recovery and Maintenance Plan - Amended	2/26/2011	The initial ADCP single mooring study plan was approved and implemented in June 2010. Following the initial array installation, two amended work plans were developed and approved authorizing the installation of the real-time buoy and the conduction of quarterly maintenance missions. These amended tasks were successfully conducted in September and December of 2010. The following mission is required to repair components of the array and conduct regularly scheduled maintenance and extend data collection and management for the period of March 2011 through June 2011.
Offshore	Transport, Fate and Effects Modeling	70	Spring 2011 Plankton Imaging Sampling Cruise Plan (RV Oceanus)	3/8/2011	This plan describes the sampling effort for March 8-April 9, 2011. The cruise plan covers March 1-April 18, 2011 to account for the eight day transit to/from the Woods Hole Oceanographic Institute, Massachusetts. The primary objective of the proposed Spring 2011 R/V Oceanus plankton imaging sampling cruise is to collect high-resolution data on plankton and marine snow together with environmental variables using the VPRII.

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Offshore	Transport, Fate and Effects Modeling	71	Deepwater Horizon Oil Spill (DWHOS) NRDA Offshore Deep Meso- and Bathypealic Fish Sampling Plan - RV Pisces, Spring 2011	3/19/2011	This plan is being conducted along with other surveys to evaluate the composition, distribution, and densities of juvenile and adult fish and larger invertebrates in the offshore Gulf of Mexico waters potentially affected by the Deepwater Horizon Oil Spill (DWHOS) and in surrounding areas. The primary objective is to collect fish and invertebrate samples using a midwater trawl net.
Offshore	Transport, Fate and Effects Modeling	72	Plankton Sampling Plan & Winter 2011 Cruise Plan (Oregon II)	3/29/2011	This plan is part of a series of cruises intended to evaluate the distribution and densities of ichthyoplankton, other zooplankton and phytoplankton in Gulf of Mexico waters potentially affected by the Deepwater Horizon Oil Spill (DWHOS) and in surrounding areas. This plan describes a NRDA survey for winter 2011 plankton sampling where a subset of the standard SEAMAP stations have been selected for sampling, as well as additional offshore stations.
Offshore	Transport, Fate and Effects Modeling	73	Addendum - Plankton Imaging Sampling	4/7/2011	The NRDA Spring 2011 Plankton Imaging Sampling Cruise Plan, utilizing the R/V Oceanus, is as a signed cooperative cruise (date of the signed plan: 2011 March 8, signed March 9). This addendum documents the use of an instrument package being utilized on the cruise, which was inadvertently left out of the cruise plan.
Offshore	Transport, Fate and Effects Modeling	74	Addendum to Offshore Deep Meso- and Bathypelagic Fish Sampling Plan, Spring 2011 - R/V Pisces	4/16/2011	The NRDA Spring 2011 Offshore Deep Meso- and Bathypelagic Fish Sampling Plan, utilizing the R/V Pisces, is a signed cooperative cruise (date of the signed plan: March 19, 2011). The plan is being conducted along with other surveys to evaluate the composition, distribution, and densities of juvenile and adult fish and larger invertebrates in the offshore Gulf of Mexico waters potentially affected by the Deepwater Horizon Oil Spill (DWHOS) and in surrounding areas. This addendum documents a change in the cruise plan necessitated by the failure of the portside trawl block on the Pisces, which is jammed irreparably. With the jammed block, conducting deep trawls is no longer an option, even with a back-up net. Thus, expanding the acoustic and DIDSON work already being conducted as part of the approved plan is a viable way to acquire information on vertical distributions of biota in the Deep Scattering Layer and at other depths.
Offshore	Transport, Fate and Effects Modeling	75	NRDA 1-meter MOCNESS Spring 2011 Sampling Cruise Plan (M/V Nick Skansi)	4/16/2011	This plan is a series of cruises scheduled for the spring of 2011 to evaluate the distribution and densities of ichthyoplankton and other zooplankton in Gulf of Mexico waters potentially affected by the Deepwater Horizon Oil Spill (DWHOS) and in surrounding areas. Plankton in the upper 200 m of the water column of the Gulf of Mexico off of Texas to Florida have been sampled by the NMFS/NOAA SEAMAP program over the past ~25 years (attachment 9). The overall NRDA plankton sampling plan takes advantage of this historical data set and plans for continuation and extension of the NMFS Southeast Fisheries Science Center (SEFSC) SEAMAP program into deep water areas where the spill took place
Offshore	Transport, Fate and Effects Modeling	76	NRDA 10-meter MOCNESS Spring 2011 Plankton Sampling Cruise Plan: Meg Skansi	4/16/2011	This plan is a series of cruises scheduled for the spring of 2011 to evaluate the distribution and densities of invertebrates (i.e., larger plankton and small nekton) and small fish (also considered small nekton) in Gulf of Mexico waters potentially affected by the Deepwater Horizon Oil Spill (DWHOS) and in surrounding areas. The primary objective is to collect depth discrete samples at various intervals throughout the entire water column using a 10-m2 MOCNESS. The occurrence, abundance, biomass, vertical distribution, and daily vertical migration of large plankton and small nekton of both surface and deep water species/life stages of the Gulf of Mexico will be assessed.

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Offshore	Transport, Fate and Effects Modeling	77	Addendum - Epipelagic Plankton Bongo & Neuston Sampling	5/23/2011	Assess the occurrence, abundance, and distribution of the early life stages of fishes in the north central Gulf of Mexico, commercially important invertebrates (lobsters, decapods) and other zooplankton potentially affected by the DWH Oil Spill.
Offshore	Transport, Fate and Effects Modeling	78	Addendum to 10-meter MOCNESS Spring 2011 Plankton Sampling Cruise Plan (Meg Skanski)	6/16/2011	This addendum incorporates into the plan the archiving of tissue samples at the discretion of the Chief Scientist.
Offshore	Transport, Fate and Effects Modeling	79	Addendum to the 1-meter MOCNESS Spring 2011 Plankton Sampling Cruise Plan (Nick Skanski)	6/16/2011	This work plan is an addendum to NRDA Summer 2011 Plankton Imaging Sampling Cruise Plan Sampling Vessel: R/V McArthur II and incorporates additional sampling effort and vessel coordination.
Offshore	Transport, Fate and Effects Modeling	80	NRDA Summer 2011 Plankton Imaging Sampling Cruise Plan (R/V McArthur JJ)	6/16/2011	This plan is part of a series of cruises scheduled for the summer of 2011 intended to evaluate the distribution and densities of ichthyoplankton, other zooplankton, and some phytoplankton in Gulf of Mexico waters potentially affected by the Deepwater Horizon Oil Spill and in surrounding areas. This plan describes the sampling effort for summer 2011. The primary activity of these cruises is to collect plankton image data using the In Situ Ichthyoplankton Imaging System (ISIIS). The objective of these ISIIS surveys is to assess the degree of patchiness are scales not resolved by sampling on the 30 nautical mile SEAMAP grid. The occurrence, abundance, biomass, and vertical distribution of plankton and marine snow in the GOM will be assessed.
Offshore	Transport, Fate and Effects Modeling	81	Offshore Deep Meso- and Bathypelagic Fish Sampling Plan, Summer 2011 (R/V Pisces)	6/21/2011	This plan is being conducted along with other surveys to evaluate the composition, distribution, and densities of juvenile and adult fish and larger invertebrates in the offshore Gulf of Mexico wasters potentially affected by the DWHOS. In this plan, deep water communities (deep mesopelagic and bathypelagic) are targeted. This plan is not intended to investigate deep water benthic communities.
Offshore	Transport, Fate and Effects Modeling	82	Epipelagic Plankton Bongo & Neuston Sampling Cruise Plan - McArthur II	7/1/2011	Evaluate the distribution and densities of ichthyoplankton and other zooplankton in the Gulf of Mexico waters potentially affected by the DWH Oil Spill.
Offshore	Transport, Fate and Effects Modeling	83	Deepwater Benthic Communities and Water Column Data Collection/ Sediment and Bottom-Water Sampling Cruise Plan, July - September 2011 (HOS Sweetwater ROV)	7/15/2011	Objectives: (1) Examine potential locations where hydrocarbons and dispersants related to the MC252 oil spill and particulate matter may have settled on the sea floor by sampling surface sediments and flocculent material; (2) evaluate potential concentrations of MC252-related hydrocarbons and dispersants in bottom waters that may be related to any sediment contamination by sampling water overlying locations of sediment samples; (3) opportunistically collect red crabs and other megafauna found along transects for exposure assessment; and (4) document occurrence and location of hardgrounds and/or sessile megafauna potentially exposed.

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Offshore	Transport, Fate and Effects Modeling	84	NRDA 1-meter MOCNESS Summer 2011 Plankton Sampling Cruise Plan (M/V Nick Skanski)	7/15/2011	This plan is part of a series of cruises scheduled for the summer of 2011 intended to evaluate the distribution and densities of ichthyoplankton and other zooplankton in Gulf of Mexico waters potentially affected by the Deepwater Horizon Oil Spill and in surrounding areas. This plan describes the sampling effort for summer 2011. The primary objective is to collect depth discrete samples at various intervals to a maximum depth of 1500 meters. The occurrence, abundance, biomass, vertical distribution and daily vertical migration of mero- and holoplankton of both surface and deepwater species/life stages of the GOM will be assessed.
Offshore	Transport, Fate and Effects Modeling	85	NRDA Summer 2011 Epipelagic Plankton Bongo & Neuston Sampling Cruise Plan (M/V Bunny Bordelon)	7/19/2011	This plan is part of a series of cruises scheduled for the summer of 2011 intended to evaluate the distribution and densities of ichthyoplankton and other zooplankton in Gulf of Mexico waters potentially affected by the Deepwater Horizon Oil Spill and in surrounding areas. This plan describes the NRDA survey for summer 2011 where a subset of the SEAMAP stations have been selected for sampling ichthyo-and other plankton in the upper water column. The primary objective is to assess the occurrence, abundance, and distribution of the early life stages of fishes in the northern GOM, commercially important invertebrates (lobsters, decapods), and other zooplankton found in the surface waters less than 200 meters.
Offshore	Transport, Fate and Effects Modeling	86	Plankton Sampling Cruise, August 11	8/8/2011	This plan is a series of cruises scheduled for the summer of 2011 to evaluate the distribution and densities of invertebrates (i.e., larger plankton and small nekton) and small fish (also considered small nekton) in Gulf of Mexico waters potentially affected by the Deepwater Horizon Oil Spill (DWHOS) and in surrounding areas. This plan describes the sampling effort for summer 2011.
Offshore	Transport, Fate and Effects Modeling	87	NRDA Offshore Deep Meso- and Bathypelagic Fish Sampling Plan, September 2011 (NOAA Ship Pisces)	9/2/2011	Objective: to collect fish and invertebrate samples using a midwater trawl net. The primary intended use of the resulting data is to fill existing data gaps on community characteristics to better inform biological inputs to models and other potential injury assessments.
Offshore	Transport, Fate and Effects Modeling	88	Addendum - Epipelagic Plankton Bongo & Neuston Sampling	9/6/2011	Assess the occurrence, abundance, and distribution of the early life stages of fishes in the north central Gulf of Mexico, commercially important invertebrates (lobsters, decapods) and other zooplankton found in surface waters less than 200 meters that have potentially been affected by the DWH Oil Spill.
Offshore	Transport, Fate and Effects Modeling	89	ADCP-Measured Currents Monitoring Plan: September 2011 ADCP Maintenance Plan	9/9/2011	The initial ADCP single mooring study plan was approved and implemented in June 2010. This plan is required to conduct regularly scheduled maintenance (scheduled for September 2011) and extend data collection and management for the period of September 2011 thru December 2011.
Offshore	Transport, Fate and Effects Modeling	90	Plankton Processing Plan	6/7/2012	This plan describes processing of imaging data collected as part of the NRDA cooperative sampling efforts in 2010-2011. Imaging and particle size data were collected by a variety of instruments on various cruises. This plan covers the data collected by Holographic Camera, Digital Autonomous Video Planton Recorder (DAVPR) and Video Plankton Recorder II (VPRII).

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Offshore	Transport, Fate and Effects Modeling	91	NRDA Offshore Fish and Nekton Sample Processing Plan	6/1/2012	The purpose is to establish a protocol for the analysis of fish and large invertebrate samples collected during the NRDA associated with the DWH Oil Spill. The samples to be analyzed under this plan include the following cruises: Pisces Summer 2011, Meg Skansi Spring 2011, McArthur II Fall 2011, Pisces Spring 2011, Meg Skansi Summer 2011, Meg Skansi Summer 2011, Pisces Fall 2011, Pisces Winter 2010, and Meg Skansi Winter 2011. The first sample processing priority will be completion of family-level identification and associated counts followed by full taxonomic identification.
Nearshore	Transport, Fate and Effects Modeling	92	NRDA Late Summer 2011 Small Pelagics Sampling Plan: NOAA Ship McArthur II	10/8/2011	Objectives: (1) Document the large scale distribution of epipelagic fish and plankton in the study area; (2) document day/night differences in the distribution of fish and plankton; (3) investigate spatial scales not available to the ship survey; (4) use aerial imagery/Light Detection And Ranging (LIDAR) to direct ship sampling to regions of high biological concentrations; and (5) collect biological, physical, and acoustic data to help support and interpret the LIDAR observations.
Nearshore	Marine Mammals	93	Assess Injury to MS & LA Estuarine Dolphin Stock - 3rd Addendum	8/1/2011	Assess potential changes in seasonal abundance, to estimate dolphin survival rates, to increase sample sizes for genetic stock assessment, and to collect longitudinal tissue samples for two years post spill.
Nearshore	Marine Mammals	94	Northern Gulf of Mexico MARU Recovery Mission Plan	11/3/2011	Objective: to recover the Marine Autonomous Recording Units (MARU), retrieve the data, and redeploy the instrument in a new location for the passive acoustic monitoring of marine mammals in the Northern Gulf. The specific scope of this plan covers the recovery, servicing (data download and sensor refurbishment), and redeployment of the 18 northern Gulf of Mexico MARU units, and the final recovery of the four MARU units located in the vicinity of the Dry Tortugas.
Nearshore	Marine Mammals	95	Proposed Data Collection Plan for LA and MS Estuarine Dolphin Stocks (including Addendum	6/9/2010	Objective: to assess polycyclic aromatic hydrocarbon (PAH) and other contaminant exposure to dolphins associated with the DWH Incident and to determine potential effects on fecundity and survival and document changes in abundance. This plan identifies the required sampling of dolphin tissues to assess contaminant exposure and hormone levels, and photo-identification mark-recapture surveys to establish baseline abundance, prevalence of calves and to identify individual animals to support longitudinal study for survival analysis. An addendum also states that biopsy samples will be analyzed for sex and stock identification. For this plan, there are 4 areas that are targeted for sampling and include: Chandeleur Sound, LA; Mississippi Sound, MS; Barataria Bay, LA; and St. Joseph Bay, FL. Sampling was planned to begin in May and continue through December.
Nearshore	Marine Mammals	96	Workplan for the Collection of Data to Determine Impacts on Endangered and Protected Marine Mammals in the Northern Gulf	6/14/2010	This plan proposes a study of sperm whales and other protected marine mammals in four areas of the deep-water habitats of the north-central Gulf of Mexico impacted by the oil spill. The study will provide information on the acute effects of the spill, monitor spatial distribution in the near-term, and develop information with which to evaluate longer-term chronic effects. Specifically, the objectives of the study include the collection of data to (1) identify the incidence of exposure to oil through photo documentation, visual and passive acoustic monitoring, and satellite tags; (2) cetacean distribution related to oil exposure or other factors through passive acoustic, satellite tags, and visual and passive acoustic monitoring; (3) information on population demographics of Sperm and Brydes whales through tissue biopsy; (4) habitat information to characterize water column productivity and prey resources; and (5) necropsy analysis and/or sampling of discovered carcasses.

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Nearshore	Marine Mammals	97	Post-release monitoring/ tracking of injured, stranded, or entrapped and released cetaceans in the oil spill impact area	9/10/2010	Objective: to tag, track, and monitor rehabilitated and released cetaceans. Post-release monitoring could provide information on ranging patterns for these animals, potential exposure of these populations to MC252 oil and dispersants, and effectiveness of rehabilitation (received as part of the spill response). This proposal provides the capability to track and monitor up to eight cetaceans that become stranded in the area likely impacted by MC252 oil after rehabilitated and released
Nearshore	Marine Mammals	98	Second Addendum to Data Collection Plan to Assess Injury to Estuarine Dolphin Stocks	11/1/2010	The original dolphin assessment plan proposed to conduct three sessions of biopsy sampling and photo-identification (photo-id) session surveys in Barataria Bay, Chandeleur Sound, and Mississippi Sound. However, logistical and safety concerns have prevented crews from completing photo-id surveys within Chandeleur Sound and therefore this addendum addresses survey plan revision. The revision includes omitting photo-identification surveys in Chandeleur Sound and extending photo-identification in Baratara Bay and Mississippi Sound to include a Spring 2011 session.
Nearshore	Marine Mammals	99	Addendum to Collection of Data to Determine the Impacts on Endangered and Protected Marine Mammals in the Northern Gulf	1/4/2011	Objectives: (1) collect field data on the abundance, spatial distribution and habitat of Bryde's whales in the northeastern Gulf; (2) obtain samples from Bryde's whales for future analysis to be conducted under a separate Plan; and (3) evaluate potential impacts of the MC252 events on the prey of sperm whales and other oceanic marine mammals.
Nearshore	Marine Mammals	100	Assessing Potential Sublethal and Chronic Health Impacts on Coastal and Estuarine Bottlenose Dolphins	4/1/2011	Objectives: 1) to provide information on potential health impacts of DWH oil and dispersants in bottlenose dolphins; and 2) gain a better understanding of movements and ranges of dolphins in Barataria Bay, an area which has been impacted by the oil from MC 252 oil spill
Nearshore	Marine Mammals	101	Northern Gulf of Mexico HARP Servicing Cruise, September and December 2011 Mission Plan	8/25/2011	This plan describes the proposed field operations to support a bioacoustics monitoring program. The purpose of the September effort will be the recovery, refurbishment and redeployment of a recording package used for passive acoustic monitoring of marine mammals at the site north of the Dry Tortugas.
Nearshore	Marine Mammals	102	Assessing Potential Sublethal and Chronic Health Impacts from the Mississippi Canyon 252 Oil Spill on Coastal and Estuarine Bottlenose Dolphins	3/21/2012	Objectives: 1) to continue tracking satellite-linked tags and photographic monitoring of Barataria Bay Dolphins; and 2) Conduct focused boat-based surveys to monitor reproductive outcomes of pregnant dolphins identified during the August 2011 capture and release in Bartaria Bay as well as dolphins that have been sampled via remote biopsy in Barataria Bay and Mississippi Sound during 2011.
Nearshore	Marine Mammals and Sea Turtles	104	Aerial Surveys for Marine Mammals and Turtles	5/5/2010	Objective: to conduct aerial surveys using helicopters and Twin Otter aircraft to document the exposure of the diverse marine mammal community of the Mississippi canyon area to impacts from the oil spill. In addition, the flights will allow documentation of acute adverse effects, if any, through behavioral changes or distribution shifts. Data collected from the Twin Otter flights will allow quantitative estimation of the abundance and spatial distribution of marine mammals and sea turtles within the surveyed area.
Nearshore	Marine Mammals and Sea Turtles	105	Addendum-Aerial Surveys for Marine Mammals and Sea Turtles	8/27/2010	This addendum serves to continue survey efforts to monitor marine mammal and sea turtle exposure to oil and dispersants and their spatial distribution and abundance.

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Nearshore	Marine Mammals and Sea Turtles	106	Assessing Population Size and Spatial Distribution of Marine Mammals and Sea Turtles in the Northern Gulf of Mexico	1/23/2012	The objective of this study is to collect data that will help assess potential injury from MC 252 oil on continental shelf and inner continental slope populations of marine mammals and sea turtles in the northern Gulf of Mexico. Specific objectives to be accomplished by conducting aerial visual line-transect surveys include: (1) collect data on the seasonal abundance and spatial distribution of marine mammals and turtles over the continental shelf in the Northern Gulf of Mexico; and (2) collect data on the seasonal abundance and spatial distribution of marine mammals near the shelf-break in the north-central Gulf of Mexico.
Nearshore	Marine Mammals and Sea Turtles	107	Assessing Population Size and Spatial Distribution of Marine Mammals and Sea Turtles in the Northern Gulf of Mexico - Addendum	8/16/2011	This addendum reflects budget changes to the original plan due to flight schedule changes
Nearshore	Sea Turtles	108	Pre-assessment Plan to Determine Potential Exposure and Injuries of Nesting and Hatchling Loggerhead Sea Turtles	8/2/2010	The purpose of this Plan is to determine potential exposure to DWH oil and dispersants and associated injuries of the nesting adult loggerhead turtles that reside in and nest along the U.S. shores of the Gulf of Mexico as a result of the DWH spill. Objectives: 1. assessing nesting female physical condition, inter-nesting movements and blood chemistry, egg and hatchling toxicity; and hatching and emergence success as a function of concentrations of DWH oil; and 2. measuring chemical, toxicological and physiological levels for DWH oil and constituents in sand samples, nesting females, eggs and hatchlings along beaches in the Gulf of Mexico to evaluate potential exposure to oil and determine if there is a concentration gradient of oil across the study area.
Nearshore	Sea Turtles	109	Preassessment Plan to Determine Potential Exposure and Injuries of Nesting and Hatchling Kemp's Ridley Turtles	9/7/2010	The purpose of this Plan is to determine potential exposure to DWH and dispersants and associated injuries of the nesting adult Kemp's Ridley sea turtles that reside in the Gulf of Mexico and nest along the Texas shoreline. The objectives include: 1. Assessing nesting female physical condition, inter-nesting movements, and blood chemistry as part of the normal annual assessment. In addition, the Plan calls for assessment of potential egg and hatchling toxicity impacts and hatching and emergence success to determine the potential relationship between MC252 oil exposure and injury; and 2. assessing possible toxicological and physiological effects and impairments in nesting females, eggs, and hatchlings along beaches in the Gulf of Mexico within Texas.
Nearshore	Sea Turtles	110	Plan to Determine Potential Exposure and Injury of Sea Turtles West of the Mississippi Delta Utilizing Entanglement Netting Surveys	10/26/2010	Objectives: (1) to characterize sea turtle species composition spatial distribution, catch-per-unit effort, size/age structure, site fidelity and habitat preferences at beachfront and estuarine nearshore habitats at selected oiled and non-oiled areas along Louisiana coast; (2) to use satellite telemetry to assess post –capture/release movements and habitat use patterns; (3) to assess potential exposure of sea turtles to MC 252 oil and possibility of associated injury; and (4) to provide blood and other tissue samples for chemical, toxicological and sex ratio analyses. To collect these data, large mesh entanglement nets will be set in MC252 oil impacted areas, along with areas of the Louisiana, and possibly the Texas coast.
Nearshore	Marine Mammals	111	Unscheduled HARP Recovery February Mission Plan	2/14/2011	This document describes the recovery, refurbishment, and re-deployment of the HARP unit which was deployed for passive acoustic monitoring of marine mammals but was prematurely released on 6 February 2011.

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Nearshore	Marine Mammals	112	MC252 Deepwater Horizon Oil Spill Dry Tortugas MARU and HARP Recovery February Mission Plan	2/24/2011	The following describes the proposed field operations to support two bioacoustics monitoring programs. These programs are being conducted by the Whale Acoustics Laboratory, Scripps Institution of Oceanography and the Cornell Bioacoustics research program, Cornell University.
Nearshore	Sea Turtles	113	Nearshore Cetacean & Sea Turtle Prey Item Sampling Plan	7/6/2011	Collect samples of prey species potentially consumed by nearshore cetaceans and sea turtles that are known to inhabit the geographic area of the Deep Water Horizon Gulf of Mexico oil spill
Nearshore	Sea Turtles	114	Addendum to Plan to Determine Potential Exposure and Injury of Sea Turtles West of the Mississippi Delta Utilizing Entanglement Netting Surveys	8/1/2011	Objectives: (1) to characterize sea turtle species composition, spatial distribution, catch-per-unit effort, size/age structure, site fidelity and habitat preferences at high energy and low energy nearshore habitats, as well as in selected oiled and lesser or non-oiled areas along the Louisiana coast, and west of the Mississippi River Delta; (2) to utilize satellite telemetry to assess post-capture/release movements and habitat use patterns; (3) to assess potential exposure of sea turtles to MC252 oil and the possibility of associated injury via visual inspection of captured turtles for external evidence of MC 252 oil as well as the observation of potential oil-related adverse effects on their overall external body condition and behavior at study areas along the Louisiana coast; and (4) to provide blood and other tissue samples for chemical, toxicological, and sex ratio analyses which may provide evidence related to the potential exposure of nearshore sea turtle populations along the Louisiana coast, and west of the Mississippi River Delta to MC 252 oil.
Nearshore	Sea Turtles	115	Addendum to Preassessment Plan to Determine Potential Exposure and Injuries of Nesting and Hatchling Loggerhead Sea Turtles Nests	9/7/2011	Objectives: (1) assess nesting female physical condition, inter-nesting and post-nesting movements, and blood chemistry; (2) collect samples to assess possible toxicological and physiological effects and impairments in nesting females, eggs, and hatchlings along the Florida and Alabama beaches in the Gulf of Mexico.
Nearshore	Sea Turtles	116	Addendum to Preassessment Plan to Determine Potential Exposure and Injuries of Nesting and Hatchling Kemp's Ridley Turtles and their Nests	10/12/2011	Objectives: (1) Assess nesting female physical condition, conduct satellite tracking inter-nesting and post-nesting movement, and collect blood samples as part of the annual Kemp's ridley management program; and (2) collect samples to assess possible toxicological and physiology effects and impairments in nesting females, eggs, and hatchlings at Padre Island National Seashore and Upper Texas coastal beaches in the GOM.
Offshore	Telemetry	117	Investigative Plan to Monitor and Assess Potential Impacts of the Deepwater Horizon on Whale Sharks in the Northern Gulf of Mexico	8/14/2010	Objectives: (1) to document movements of whale sharks in the northern Gulf of Mexico including the time of occurrence in the spill area to evaluate the potential for exposure to oil or dispersants; and (2) to document the disappearance or continued presence of whale sharks. The plan is to deploy 60 satellite tags to whale sharks as a reliable method to assess the behavioral aspects within an area of the Gulf of Mexico that is identified as essential feeding habitat.
Offshore	Telemetry	118	Whale Shark Tagging Plan Addendum	9/24/2010	This Plan is an addendum to the Whale Shark Tagging Plan. In this addendum, the plan is to include a second spotter aircraft in the field work plan in order to cover more area and increase the chances of finding and successfully tagging whale sharks.

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Offshore	Telemetry	119	Preassessment Plan for the Collection of Data to Determine Potential Exposure and Injuries of Threatened Gulf Sturgeon	9/7/2010	Objective: to collect information that will facilitate the evaluation of potential injury of the Deepwater Horizon oil spill to adult sturgeon. The specific objectives of this plan are to document the condition of Gulf sturgeon during fall and spring migrations, collect blood samples from up to 180 adult Gulf sturgeon from nine major river systems, and document offshore movement and habitat use of up to 180 adult Gulf sturgeon during the overwintering period.
Nearshore	Injury Quantification to Organisms from Contaminated Sediments	120	Investigative Plan for Fish and Invertebrate Kills in the Northern Gulf of Mexico	12/14/2010	Objectives: (1) to gather information on location and causes (if known) and counts by species of fish kills in the last ten years to help establish a baseline for variability of fish kills between years; and (2) documentation and investigation of reported fish kills from April 20, 2010 until the presence of MC 252 oil is no longer detected in concentration that could likely cause fish kills.
Chemistry	Chemistry	121	Procedure for Obtaining Source Oil Samples from Drillship	8/16/2010	Objective: to initiate the protocols and sampling sites that would be used for the collection of baseline water and sediment samples to represent conditions prior to any oil from the Deepwater Horizon spill affecting the Keys.
Chemistry	Chemistry	122	Work Plan for Obtaining Nearshore Spatial Extent of On-Water Samples	8/16/2010	Objective: to obtain initial samples of on-water oil believed to be from the MC 252 event for polycyclic aromatic hydrocarbons characterization and fingerprinting. Samples will be collected opportunistically from areas where teams or other information sources have identified where oil accumulations are on water in near shore areas (less than half a mile from shore). Samples will also be collected from locations where sensitive resources or shorelines exist and appreciable quantities of oil pose a significant threat to natural resources and services.
Chemistry	Chemistry	123	Work Plan for Obtaining Nearshore Spatial Extent of On-Water Samples - Addendum 1	8/16/2010	Addendum 1 - Work Plan for Obtaining Near Shore Spatial Extent of On-Water Samples, August 16, 2010: The plan is being expanded to include collection of stranded oil and oil in vegetation or on other environmental media for the purpose of documenting the presence and current condition of oil believed to be from the MS Canyon 252 event on shorelines in different habitats in Mississippi River delta region.
Chemistry	Chemistry	124	NRDA UV Radiation Sampling Plan - October 2010 Cruise Plan (CSA-P1_25 ft Parker)	10/23/2010	This plan is designed to collect scoping data aimed at evaluating the potential magnitudes of UV light extinction coefficients in nearshore waters. Data collected will help elucidate the amount of data collection needed in the future to quantify extinction coefficients of radiation as a function of sun angle, wavelength and organic and inorganic content in the water.
Chemistry	Chemistry	125	Holding Time Study for Environmental Samples in Frozen Archives: Laboratory Analysis Plan	8/18/2011	Objectives: (1) prioritize and analyze four replicates of the 11 oyster samples listed in Table 1 from the NOAA Status and Trends Mussel Watch Program; (2) conduct all analyses as close to the original testing protocols as possible in order to minimize variability solely due to changes in methodology; (3) conduct analyses of quality control sample per the Mussel Watch protocol; (4) acquire quantitative results from PAH compounds identified for the Mussel Watch program in Table 2 plus percent lipids and percent moisture for each replicate analysis; and (5) generate comparable data to the original Mussel Watch data.
Nearshore	Marine Mammals	126	MARU & HARPS Recovery February 20 – March 9 Mission Plan	4/19/2012	Recover 18 previously deployed MARUs and the 4 HARPS in the northern Gulf of Mexico.

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Nearshore	Marine Mammals and Sea Turtles	127	Nearshore Cetacean and Sea Turtle Prey Item Sampling Plan: Addendum to Update Target Species List	3/30/2012	This addendum supplements the list of prey species targetd for collection pursuant to the Nearshore Cetacean and Seat Turtle Prey Item Sampling Plan. This Addendum expands the original target list in order to increase and diversity the pool of prey samples available for collection.
Offshore	Sargassum	128	Second Addendum: Assessment Plan for Sargassum Communities and Associated Fauna in the Northern Gulf of Mexico: Sargassum Sample Processing Plan for Remotely Operated Underwater Vehicle (ROV) data, Bongo Net Samples and Neuston Net Samples	6/02/2012	Objectives: process neuston net samples for type, abundance and size frequency of fishes and postlarval/juvenile decapods, and bongo net samples for type, abundance and size frequency of ichthyoplankton; (2) create larval/juvenile fish and postlarval/juvenile decapod reference collections based on neuston and bongo net samples; (3) identify encrusting invertebrates (e.g., hydroids, bryozoans, tunicates) on sargassum blades, stems, and vesicles collected via neuston nets; and (4) determine species composition, abundance and length frequency of fish observed during ROV video surveys of Sargassum patches.
Offshore	Telemetry	129	Tagging of Atlantic Bluefin Tuna for Evaluation of Habitat Utilization of Gulf of Mexico Spawning Grounds Using Telemetry Data	6/05/2012	Objective: Deploy electronic tags on Atlantic Bluefin tuna in the GSL foraging ground and collect telemetry data that will improve the understanding of Atlantic Bluefin tuna habitat utilization in the GOM, thereby facilitating assessment of potential injury to Atlantic Bluefin tuna as a result of the MC 252 oil spill.
Offshore	Transport, Fate and Effects Modeling	130	Deepwater Horizon Oil Spill (DWHOS) Water Column Technical Working Group NRDA CTD Processing Plan	6/19/12	The work plan describes the processing and validation of conductivity, temperature, and depth (CTD) data and associated sensor data, collected as part of the DWH NRDA and other deepwater sampling efforts in 2010-2011.

[1] There is no work plan number 5 (Addendum to the Sampling and Monitoring Plan for the Assessment of MC252 Oil Impacts to Coastal Wetland Vegetation in the Gulf of Mexico - Addendum to the states of Mississippi and Alabama) or 103 (Genetic analysis of stock structure, species identification, and sex determination for marine mammal biopsies and strandings) in this list. **Both of these plans are signed by all parties but are undergoing the process for public posting to NOAA's Gulf Spill Restoration website.**