Deepwater Horizon

Open Ocean Trustee Implementation Group

MONITORING AND ADAPTIVE MANAGEMENT ACTIVITY IMPLEMENTATION PLAN:

DEEP-SEA BENEFITS – OUTCOMES OF MESOPHOTIC AND DEEP BENTHIC COMMUNITY RESTORATION

October 2023

Deep-Sea Benefits - Outcomes of Mesophotic and Deep Benthic Community Restoration

1.0 Introduction and Purpose

The Deepwater Horizon (DWH) oil spill settlement in 2016 provides the Natural Resource Damage Assessment (NRDA) Trustees (Trustees) up to $8.8 billion, distributed over 15 years, to restore natural resources and services injured by the spill. As described in the DWH oil spill Final Programmatic Damage Assessment and Restoration Plan and Final Programmatic Environmental Impact Statement (PDARP/PEIS; DWH NRDA Trustees. 2016a), the Trustees selected a comprehensive, integrated ecosystem approach to restoration. The Final PDARP/PEIS considers programmatic alternatives, composed of Restoration Types, to restore natural resources, ecological services, and recreational use services injured or lost as a result of the DWH oil spill incident. As shown in the PDARP/PEIS, the injuries caused by the DWH oil spill affected such a wide array of linked resources over such an enormous area that the effects must be described as constituting an ecosystem-level injury. The PDARP/PEIS and information on the settlement with BP Exploration and Production Inc. (called the Consent Decree) are available at the Gulf Spill Restoration website.

Given the unprecedented temporal, spatial, and funding scales associated with the DWH oil spill restoration effort, the Trustees recognized the need for robust Monitoring and Adaptive Management (MAM) to support restoration planning and implementation. As such, one of the programmatic goals established in the PDARP/PEIS is to "Provide for Monitoring, Adaptive Management, and Administrative Oversight to Support Restoration Implementation" to ensure that the portfolio of restoration projects provides long-term benefits to natural resources and services injured by the spill (see Monitoring and Adaptive Management Framework, Appendix 5.E of the PDARP/PEIS). This framework allows the Trustees to evaluate restoration effectiveness, address potential uncertainties related to restoration planning and implementation, and provide feedback to inform future restoration decisions.

The Trustees also established a governance structure that assigned a Trustee Implementation Group (TIG) to each of the eight designated Restoration Areas, including the Open Ocean (OO) Restoration Area. Each TIG makes restoration decisions for the funding allocated to its Restoration Area and is also responsible for identifying MAM priorities for its respective TIG. The OO TIG includes the four federal Trustee agencies: U.S. Department of Commerce, represented by the National Oceanic and Atmospheric Administration (NOAA); U.S. Department of the Interior (DOI); U.S. Department of Agriculture (USDA); and U.S. Environmental Protection Agency (EPA). The Open Ocean TIG is responsible for restoring the natural resources and services within the Open Ocean Restoration Area that were injured by the DWH oil spill and associated spill response efforts.

The DWH Trustees opened a publicly available Administrative Record for the NRDA of the DWH oil spill, including restoration planning activities, concurrently with publication of the 2010 Notice of Intent (pursuant to 15 CFR § 990.45). DOI is the lead federal Trustee for maintaining the Administrative Record, which can be found at http://www.doi.gov/deepwaterhorizon/adminrecord. This administrative record is used by the OO TIG to provide the public with information about DWH restoration planning, including MAM Activities. Additional information is also provided at http://www.gulfspillrestoration.noaa.gov. Information about restoration projects and MAM Activities, including any data and/or analyses produced and annual reports, are made publicly available via the Data Integration Visualization

Exploration and Reporting portal (DIVER), available at https://www.diver.orr.noaa.gov/web/guest/home.

To articulate its approach to MAM, the OO TIG released its MAM strategy in April 2019 and updated it in June 2020. The strategy describes the TIG's responsibilities, goals, and priorities for the use of the OO Restoration Area MAM allocation. Three goals were identified for the use of OO MAM funds: (1) the evaluation of outcomes of the OO restoration effort across the portfolio of OO projects; (2) the identification and filling of data gaps that affect the OO TIG's ability to meet and/or evaluate progress toward restoration goals for OO resources; (3) and the identification of benefits and outcomes from OO restoration activities to resource, cross-resource, and ecosystem restoration across the northern Gulf of Mexico. The strategy also identifies three priorities for OO MAM: evaluation of restoration progress, identification of stressors, and assessment of focal species and important habitats. In addition to MAM goals and priorities, the strategy also describes the TIG's process to develop and release MAM Activities. MAM Activities are projects or other MAM efforts (e.g., monitoring, modeling, data collection, studies) developed to address identified MAM priorities.

This MAM Activity Implementation Plan (MAIP) describes the MAM Activity, "Deep-Sea Benefits - Outcomes of Mesophotic and Deep Benthic Community Restoration" that will use monitoring/new data collection to begin to address MAM priorities preliminarily identified by the OO TIG for fish & water column invertebrates (FWCI), marine mammals (MM), sea turtles (ST), and mesophotic & deep benthic communities (MDBC) Restoration Types. The purpose of this MAM Activity is to quantify MM, ST, and FWCI distribution, abundance, habitat use, community composition, and/or trophic dynamics with respect to bentho-pelagic coupling, or vertical connectivity, to MDBC and water column habitats impacted by the *Deepwater Horizon* oil spill and those that were not. The objectives of this MAM Activity are to synthesize existing information and collect new data to better characterize FWCI, ST, and MM interactions with MDBC habitats to assess MDBC (i.e., Active Management and Protection [AMP] project) reference conditions and help quantify ecosystem level benefits associated with MDBC restoration. Benefits will be assessed by measuring FWCI, ST, and MM association with MDBC habitats (e.g., identifying biological hotspots) and quantifying trophic connectivity (e.g., identifying prey fields and productivity pathways) among MM, ST, FWCI, and MDBC. This MAM Activity will be informed by the OO Conceptual Model to Inform Open Ocean Ecosystem Indicators MAM Activity https://www.gulfspillrestoration.noaa.gov/project?id=335and will support evaluation of benefits and restoration outcomes within the OO Restoration Area across resources and at an ecosystem level by filling data gaps while also taking note of other gaps or informational needs that may be identified during completion of the Activity.
This document provides details about the activities to be implemented and how it addresses current data gaps and uncertainties. It also describes the consistency of this MAM Activity with the programmatic alternative selected by the Trustees in the PDARP/PEIS.

2.0 MAM Activity Description

2.1 Background

Benthic habitats exist not as separate, disconnected habitats but interact with overlying pelagic habitats due to, among other mechanisms, vertical productivity transfer associated with movements of forage species and the predators that consume them (Figure 1). Benthic habitats support sessile and demersally oriented mobile faunal communities that directly associate and interact with them and also indirectly benefit pelagic communities via trophic connectivity (Weaver et al. 2002). Mesopelagic vertical migrators include mid-trophic level species that feed in the epipelagic zone at night as well as mesopelagic predators that similarly migrate to feed on mid-trophic level species (Sutton and Hopkins 1996, Drazen and Sutton 2017). These species serve as prey for predators such as toothed whales (Urmy and Benoit-Bird 2021) and yellowfin tuna (Olson et al. 2014) while in the epipelagic zone at night. Other higher trophic level predators, such as Atlantic bluefin tuna (Olafsdottir et al. 2016), the threatened oceanic whitetip shark (Howey et al. 2016), and endangered Rice's whale (Soldevilla et al. 2017) consume mesopelagic fishes during diurnal foraging dives. These predator-prey interactions result in both upward and downward vertical transfers of energy that contribute to productivity in both pelagic and benthic habitats. This bentho-pelagic coupling bypasses detrital flux as a primary source of production for deeper oceanic habitats (Drazen and Sutton 2017).

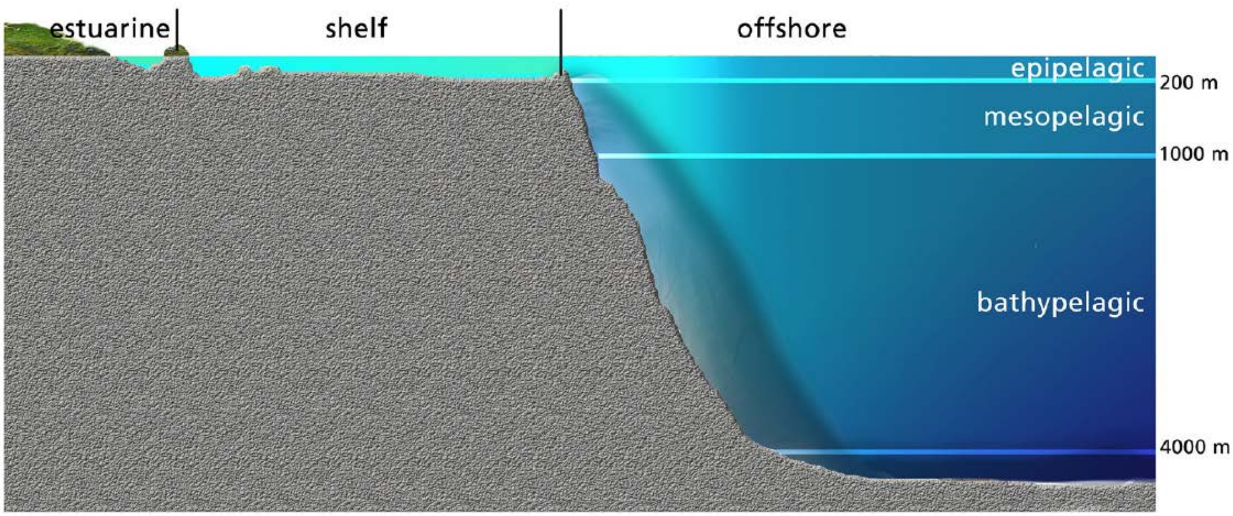

Figure 1: Diagram depicting the pelagic zonation, and the depth ranges associated with them, and their interface with the benthos. Reproduced from the PDARP/PEIS (DWH NRDA Trustees. 2016a).

Globally, biomass of meso- and bathypelagic fishes increase near large topographic structures such as shelf breaks, continental slopes, seamounts, mid-ocean ridges, and/or volcanic islands. These 'mesopelagic-boundary communities' can be assemblages distinct from oceanic mesopelagic communities found further offshore. Further, horizontal mesopelagic-boundary community migrations up onto topographical features that occur along with diel vertical migrations may facilitate retention of these communities on topographic features. These behaviors can lead to 'trapping' of mesopelagic communities against the benthos leading to their concentration and increased availability of predictable prey distributions for higher trophic levels. This phenomenon has been observed in the Gulf of Mexico, although its extent and effects on open ocean productivity are less well known. For example, northern Gulf of Mexico euphausiid and shrimp abundance and biomass has been reported as higher on the continental slope relative to locations further offshore (Frank et al. 2020). Similarly, the northern Gulf of Mexico shelf break appears to be a primary habitat for the endangered Rice's whale; it is suspected this species capitalizes on the heightened shelf break productivity as they forage near the benthos to consume small pelagic fishes 'trapped' near the ocean bottom (Soldevilla et al. 2017). The continental slope and shelf break also appear to be important foraging habitats for leatherback sea turtles (Valverde and Holzwart 2017). Recent calls have been made for deeper understanding of these vertical trophic connections to address major data gaps affecting the stewardship of apex predatory fishes, cetaceans, and seabirds (Sutton et al. 2021, Bassett et al. 2022).

Describing vertical behavioral, trophic, and productivity connectivity are important to developing a more complete understanding to improve assessment of the restoration benefits across resource types and at the ecosystem level. Indeed, these sorts of knowledge gaps were identified during in MDBC Habitat Assessment and Evaluation (HAE) project planning workshops conducted in the fall of 2021 (Bassett et al. 2022). Furthermore, improved characterization of the unique, diverse, productive and/or otherwise nationally significant biological communities associated with these topographical features would directly support the MDBC AMP project by providing knowledge needed to support science-based approaches to identifying and selecting locations to focus additional resource management. Indeed, data insufficiency played a critical role in eliminating from further consideration the inclusion of certain topographical features during the recent Flower Garden Banks National Marine Sanctuary (FGBNMS) expansion (ONMS 2020). Presently, gaps exist in monitoring and understanding the continental slope region's role, with respect to both its interspersed topographical features and the overlying water column, in supporting and maintaining Gulf of Mexico ecosystem level productivity. In the northern Gulf of Mexico, existing monitoring and other research efforts benthic habitats and their associated species (here, approximately 50 to 200 m deep) or mesopelagic environments further offshore that may not interact with the benthos due to water depths (>1,000m: Figure 1). These existing efforts expose a gap in monitoring and understanding of pelagic communities' associations and interactions with benthic habitats within continental slope and shelf break regions (~200 to 1000m; Figure 1).

The goal of this MAM Activity is to improve assessment of broader, ecosystem benefits to other Restoration Types that can be attributable to MDBC restoration portfolio implementation. To achieve this, this MAM Activity will quantify MM, ST, and FWCI vertical connectivity to MDBC habitats with respect to their distribution, abundance, habitat use, community composition, and/or trophic dynamics. A better understanding of FWCI distribution would also benefit other Restoration Types, such as MM, ST, and higher trophic level FWCI that prey upon them, by providing spatiotemporal knowledge of prey fields that influence predator behavior and distribution. Through careful site selection, the present monitoring activities will take place at both 'reference' and 'managed' locations located in the eastern and western Gulf of Mexico as well as at one location impacted by the *Deepwater Horizon* oil spill. The intent of monitoring 'impacted' area is not to continue assessment of *Deepwater Horizon* oil spill associated injuries but to quantify the benefits accrued from habitat management. A deeper understanding of vertical connectivity between water column and benthic communities will be achieved by employing a multidisciplinary approach (e.g., Milligan et al. 2018) to monitoring of MM, ST, FWCI, and MDBC communities that includes passive acoustic monitoring (PAM), passive/active acoustic tracking (PAAT), mid-water Multiple Opening and Closing Nets with Environmental Sampling System (MOCNESS) trawls, active acoustics, eDNA, stable isotopes and gut contents, and detrital flux sampling. This monitoring will inform project planning and assessment of benefits derived for multiple resources from restoration activities, including but not limited to MDBC (i.e., AMP) project activities, by providing reference conditions. This MAM Activity will also contribute to quantifying cross-resource and ecosystem level habitat service flow benefits associated with MDBC restoration (e.g., inform ecosystem modeling). These observations would aid in identifying biological hotspots associated with MDBC topographical features and/or quantifying productivity and trophic connectivity (e.g., identifying prey fields and productivity pathways) among MM, ST, FWCI, and MDBC. Additional benefits of this MAM Activity would include cross-comparison of multiple monitoring approaches with the potential to identify future monitoring efficiencies as well as collection of information that could help inform other OO TIG activities, such as the identification and mapping of threats and stressors. This MAM Activity will address four primary questions:

> 1) How and when are MM, ST, and FWCI (including prey for MM, ST, and higher trophic level FWCI) directly utilizing or otherwise associated with MDBC locations, and thus, how would restoration of these locations facilitate maintenance of maximal productivity?
> 2) What, if any, differences are there in how MM, ST, and FWCI utilize 'managed' and 'unmanaged' MDBC habitats in the eastern and western Gulf of Mexico? How would these differences influence distribution of restoration activities across the Gulf of Mexico?
> 3) What, if any, differences are there in how FWCI utilize structured vs. unstructured MDBC benthic habitat locations?
> 4) What behavioral and/or trophic linkages are there between MDBC and the overlying water column? How do these linkages contribute to ecosystem-level productivity?

Addressing these questions will lead to an improved ecosystem level understanding of vertical connectivity between MDBC organisms and their habitats with organisms utilizing overlying pelagic ecosystems. Furthermore, this MAM Activity will lead to a clearer understanding of how 'managing' biological productivity hotspots leads to maintaining their high productivity. The results will be reported to the OO TIG and the public during annual and final project reporting as well as directly to the broader management and scientific communities by peer-reviewed publication of the MAM Activity findings. This information will be made directly available by the AMP project to resource managers to further inform their understanding of the ecosystem-level productivity linkages associated with the areas they manage. This MAM Activity will also inform future planning efforts associated with the MDBC Restoration Type, as new knowledge gaps may be realized and thus inform future project foci or activities.

2.2 Tasks Description

Task 1: Implementation Planning and MDBC Coordination (1 year)
This MAM Activity will be initiated with approximately one year of project implementation planning. This planning step will be crucial to coordinate future MAM Activity field work with work underway and/or planned by the existing MBDC restoration projects to leverage existing resources (e.g., ship mobilization, field equipment such as benthic landers or CTD instruments) and technical expertise. Indeed, high level planning discussions had already been initiated to establish the feasibility of this MAM Activity early during its conceptualization. Implementation planning is anticipated to include developing collaborations with existing field, laboratory, analytical, and other technical expertise, in order to leverage and build off existing similar efforts ongoing in the Gulf of Mexico region.

Once the project working team is assembled, implementation planning will focus on refining the field monitoring design including the selection of specific sampling locations as well as the approach(es) to analyze the data with respect to the identified locations. Location selection will build off previous and existing efforts, such as consideration of locations previously identified in the *Open Ocean Trustee Implementation Group Final Restoration Plan 2/Environmental Assessment: Fish, Sea Turtles, Marine Mammals, and Mesophotic and Deep Benthic Communitie*s (OO TIG RP2/EA) as potential MDBC target areas (Figure 2) and alignment with more recent understanding as developed by MDBC project teams.

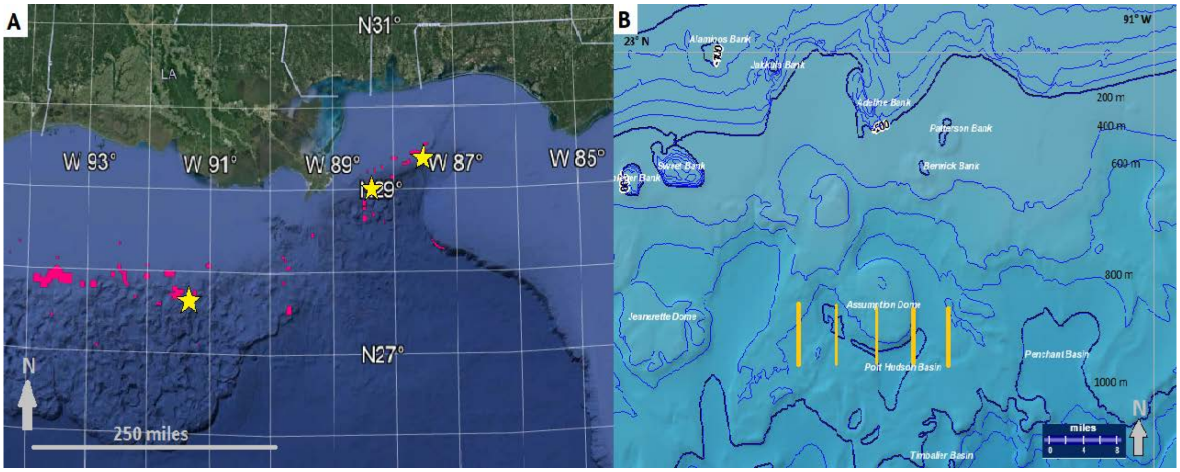

Figure 2: For illustrative purposes, the locations of A) transect locations (yellow stars) and MDBC potential target areas (magenta polygons) previously identified in OO TIG RP2/EA and B) an example of five station MOCNESS tracks (light orange lines) at Assumption Dome (western yellow star of panel A).

While subject to further refinement during project implementation planning, the monitoring design will include three (3) transect locations with five (5) transect stations (MOCNESS tracks) in each transect location (Figure 2a). Within each transect location, the five (5) transect stations will be oriented parallel to continental slope isobaths while the MOCNESS tracks themselves will be oriented perpendicular to the isobaths (Figure 2b). This arrangement will allow for investigation of structured (i.e., 'on-feature') and adjacent unstructured (i.e., 'off-feature') differences in FWCI communities while controlling for potential broader spatial differences across the continental slope. Location selection will also consider means to maximize MM encounters with deployed PAM/PAAT equipment that also complements and, to the extent practical, leverages existing, similar existing monitoring efforts. The three transect locations would be arranged to target eastern and western Gulf of Mexico as two 'reference' areas as well as one transect location situated near the *Deepwater Horizon* impact zone (Figure 2). These transects, and stations within them, will also include consideration of areas currently under some form of management to compare against areas that are not managed. In order to assess management benefits, transect stations within a location would require 'pairing' between managed and unmanaged conditions to address differences between them. While specific locations will be identified during Task 1, example locations include Viosca Knolls East (impacted), DeSoto Canyon slope (eastern Gulf of Mexico reference), and the northwest banks region east/southeast of FGBNMS (western Gulf of Mexico reference, possibly including Jeanerette Dome and/or Assumption Dome: Figure 2b). These types of locations were previously identified during MDBC workshop planning activities as areas of interest (Bassett et al. 2022). The field activities would be timed to focus on peak summer-time biological productivity. To the extent practical, the timing of sampling events will consider dynamic processes, such as changes in oceanographic processes and water mass movements, which may drive interannual differences in habitat conditions. This stage of planning will also identify target, or focal, species; this stage would align with existing OO TIG MAM Strategy, OO TIG Fish and Water Column Invertebrate Strategic Plan, and previous MDBC planning activities (Bassett et al. 2022). A number of likely species or groups have already been identified:

MM: vocal whales and dolphins of the GOM, but with specific emphasis on Rice's whale (Soldevilla et al. 2017, 2021, 2022), sperm whale (Jochens et al. 2008), and oceanic dolphins;

FWCI: daily vertical migrators (e.g., myctophid and stomiid fishes [Woodstock et al. 2022] and invertebrates such as euphausiids and shrimps [Frank et al. 2020]);

ST: leatherback sea turtle (Valverde and Holzwart 2017).

Target species will be selected by assessing which species will likely be encountered, with consideration of life stages; are of strong interest to this MAM Activity (e.g., are known prey for higher trophic organisms); align with the DWH injury assessment and existing OO MM and FWCI Plans; and are readily available in species genetic barcode libraries (e.g., Barcode of Life Data systems). Consideration of potential intersections of potential prey with other living marine resources (e.g., ST, MM, and higher trophic level FWCI) could also warrant consideration of target species within specific monitoring approaches (e.g., eDNA monitoring of jellyfish as ST prey). Target species selection will also consider the feasibility of including ST species (e.g., leatherback sea turtles) in order to build further understanding of their distribution and interactions with MDBC and FWCI communities. Careful development of the monitoring design is crucial to ensure future field activities are not only feasible but will also yield data appropriate to address the primary questions guiding this MAM Activity. Anticipated analytical approaches will also be identified, though this framework may need to be flexible to allow the data itself to dictate analyses and incorporate potential unforeseen uncertainties encountered during monitoring. Development of a data management plan will also be completed during Task 1.

A literature review will be led by external collaborators and guided by other technical experts involved in the project. The review would facilitate selection of target species and refinement of the monitoring plan to ensure adequacy of the planned data collections to improve and/or develop ecosystem assessment approaches (e.g., ecosystem modeling). The review would also further highlight gaps in understanding to ensure this MAM Activity is positioned to address those gaps. The literature review would be formalized as a peer-reviewed publication.

This implementation planning period would also involve careful and coordinated refinement of field logistics to execute the new data collection activities. This would include, but not be limited to, identifying specific ship platforms and equipment to be used, and completing subcontracts needed to secure equipment. Logistical planning will build upon existing planning conducted by MDBC project teams to leverage ship time, equipment, or other needs as they are identified. Emphasis would be placed on balancing the needs crucial to the success of this MAM Activity and gaining efficiencies by leveraging MDBC or other activities related to this MAM Activity's efforts (e.g., existing RESTORE science projects). For example, while more complicated field efforts described in this MAM Activity (i.e., MOCNESS sampling) would require dedicated ship time to execute, the specific ship platform and the timing of their execution could leverage existing MDBC cruises to gain efficiencies in ship mobilization costs. Other efficiencies could include leveraging of existing MDBC equipment (e.g., benthic lander equipment to collect detrital flux data). Other field activities of the MAM Activity (i.e., deployment of PAM receivers) would require a lower degree of ship dedication or time to execute; thus, implementing these activities could integrate with existing MDBC cruises and thus not require dedicated ship time.

Product: Task 1 will culminate with a complete monitoring, analytical, and data management plan that details the execution of Tasks 2 and 3, including sampling protocols, of this MAM Activity. A draft manuscript to be submitted for peer-reviewed publication will also be completed. This manuscript will summarize our current understanding and identify knowledge gaps pertaining to the vertical connectivity between MDBC communities and MM, ST and FWCI communities, how target species can be used to address the four primary questions driving this MAM Activity, and other details affecting the vertical connectivity between MDBC communities and MM, ST, and FWCI communities.

Task 2: Implement field activities as designed during Task 1 (3 years).
Task 2 will implement the refined monitoring plan as detailed in Task 1. Broadly, this will include a suite of new data collection to characterize:

- Vertical connectivity of FWCI and MDBC communities: water column fish and invertebrate communities to be assessed by paired monitoring approaches as described below.
- Marine mammal distribution/occurrence and feeding behavior at select project locations
- Sea turtle distribution/occurrence

Further detail of these activities is provided in the 'Methods' section below. While field activities will occur over three consecutive years, it is acknowledged that laboratory processing of field collected samples may continue into the 4th project year.

Product: Three years of data collection and resulting datasets, with associated metadata, that characterize vertical connectivity among MDBC, FWCI, ST and MM communities.

Task 3: Analyze and synthesize new data collections and conduct project reporting (1 year).
Task 3 will analyze and synthesize the data collected during Task 2. This work will describe vertical connectivity among MM, FWCI, ST, and MDBC communities. Final project reporting of these findings will identify cross-resource and ecosystem level benefits of specific restoration actions, chiefly the additional benefits to FWCI, ST, and MM from potential future MDBC AMP project activities, allowing for a more complete assessment of outcomes across the restoration portfolio. Final reporting will also include recommendations for future MDBC project implementation and assessment, including any monitoring and/or implementation efficiencies identified during project implementation, and make recommendations for future monitoring based on the project's multidisciplinary monitoring approach. This task will develop draft manuscripts to be submitted for peer-reviewed publication that describe these findings, bolster their merit, and make them available to the broader management and scientific community.

Product: An improved understanding and description of vertical connectivity among MM, FWCI, ST, and MDBC, formalized in a final project report, that identifies and improves assessment of cross-resource and ecosystem level benefits of MDBC and related restoration activities. This understanding will be achieved by analysis of data collected by this MAM Activity, along with data leveraged from ongoing MDBC or other projects, that can inform future ecosystem modeling efforts to quantify ecosystem-level productivity. Draft manuscripts to be submitted for peer-review publication are expected to highlight this vertical connectivity with respect to the different Restoration Types.

2.3 Methods

Task 1: Implementation Planning and MDBC Coordination
Project implementation planning to conduct this MAM Activity will require extensive collaboration between existing efforts. As discussed above, this planning will also incorporate a targeted literature review to inform the planning process. Implementation planning will include a series of meetings among

the project technical advisors to develop the monitoring plan to be executed in Task 2. To the extent practicable, these planning meetings will use existing meetings for efficiency. This task is data-based only and does not involve field-based activities.

Task 2: Implement field activities as designed during Task 1
This MAM Activity will utilize a multidisciplinary monitoring approach that couples prior approaches (Cook et al. 2020, DEEPEND|RESTORE Science Program project) with approaches currently employed by the MDBC HAE project and other existing research programs. Multiple monitoring approaches will be used to characterize the distribution, abundance, and biomass/standing stock of FWCI species relative to continental slope and MDBC habitats. Prior to each sampling event, pre-cruise planning will be initiated to incorporate lessons learned from prior events, coordinate with existing MDBC activities, and consider minor updates to sampling design (e.g., timing of the cruises) to incorporate dynamic processes that may alter habitat conditions from year to year (e.g., changes in Gulf of Mexico water masses).

A combination of MOCNESS, active acoustics, and eDNA (water) sampling will be employed to characterize and quantify FWCI distribution, abundance, species composition, size distributions, and biomass/standing stock. If deemed feasible during Task 1 target species selection, the distribution/occurrence of ST (e.g., leatherback sea turtles) will also be investigated using eDNA monitoring. Utilizing multiple, simultaneous monitoring approaches (i.e., active acoustics and eDNA) will corroborate fish and invertebrate vertical distribution, abundance, community composition, and biomass/standing stock measured at broader spatial scales with those derived from finer-scale MOCNESS sampling. This approach could lead to future efficiencies in monitoring by refining less costly and intensive monitoring. For target species, biological samples collected from the MOCNESS trawls will be analyzed for gut contents and tissue stable isotopes to assess food web connectivity. As described above, this monitoring will be conducted as three (3) horizontal transects, each comprised of five (5) stations, that each span the width of the Gulf of Mexico continental shelf. These three (3) transects would target one 'reference' location in the eastern Gulf of Mexico, one 'impacted' location that transverses the *Deepwater Horizon* wellhead, and one 'reference' location in the western Gulf of Mexico. These transects will encompass an offshore-onshore depth gradient (approximately 1000m to 200m bottom depth, respectively), thus targeting an already identified 'gap' in present monitoring activities that target either farther inshore mesophotic/continental shelf communities or farther offshore pelagic communities. As described above in Task 1 Description Specific stations within each transect will be selected to target MDBC structured habitat/topographical features. Station selection will also consider, to the extent practical, the influence of predominate GOM current flows and water masses, both of which may influence observed biological communities.

Prior to MOCNESS sampling, active acoustics will be employed across each horizontal transect to provide data on FWCI distribution, depth, relative biomass, and broad information regarding community composition (Figure 3). Active acoustic sensing employs an echosounder system (e.g., Simrad EK60/Simrad EK80) that uses multiple transducer frequencies (e.g., 18, 38, 70, and 120 kHz) to detect the size, number, and depth of objects (i.e., fish and invertebrates) in the water column. Given the limitations in using this pole-mounted system onboard a non-dedicated vessel, the acoustic transects are typically conducted at a vessel speed of about 2 knots. Measurements of acoustic backscatter may only utilize one of the return frequencies in order to maximize detection of target organisms. Backscatter data are interpreted with respect to sound speed profiles and absorption coefficients computed from Conductivity Temperature Depth (CTD) instrument data. The acoustic data can be analyzed from depths of ~15 m (to exclude shallower data to account for sound beam formation and to eliminate surface-vessel associated interference) to ~1,000 m (due to range dependent losses in attenuation and signal strength). These data will be collected across diurnal and nocturnal time periods as separate, continuous surveys (~8 hr in duration for each diel period) to serve as a comparative dataset with subsequent MOCNESS and eDNA sampling. This information is preliminarily interpreted onboard to identify peaks of biological activity in order to inform MOCNESS sampling and collection of discrete water samples for eDNA (both described below).

A MOCNESS system is used to collect midwater column fishes and invertebrates at discrete depth intervals by actively sequencing the opening and closing of nets at user-selected depths. MOCNESS sampling does not contact the bottom. The ‘MOC10’ unit that will be used has a mouth area of 10.05 m^2 (3.17 m wide X 3.17 m tall). The unit consists of a rigid, aluminum I-beam frame, six nets (3-mm mesh) attached to sliding net bars, and a controller unit that releases nets on command via on-deck actuation through a 0.68” diameter conducting tow cable. Nets on the unit are rigged such that when a net bar is released, it closes the lower net while opening the next consecutive net. Attached to the MOC10 net frame are environmental sampling instruments (e.g., temperature, depth, and salinity/conductivity) that passively read water quality conditions throughout the duration of the MOCNESS deployment. Also attached is a flowmeter that records distance through water of each net individually. In water, the unit is towed at a 45° angle relative to horizontal. The tow angle and distance through water metrics are used to quantify effort (i.e., volume filtered) for each net so that raw catch counts can be standardized by volume filtered prior to analysis. The MOC10 can be deployed and used from surface waters (0 m) down to depths of ~1,500m (Figure 3). The MOC10 is generally towed at a speed of 1.5 kts or less (slower if the vessel is capable) while ship’s speed and winch speed are continuously adjusted during deployment and retrieval to maintain a constant mouth angle. Winch speed during deployment is generally 30 m wire out min^{-1} while retrieval is ~ 10 m wire in min^{-1}. Net speed over ground, strong currents notwithstanding, is approximately equal during deployment and retrieval (~1.5 kts). For each deployment, the MOC10 takes about 1.5 hours to get to the deepest sampling interval (assuming 1,500 m) during which the first net is open. Upon reaching the max depth, the first net is closed as the second net is opened and towed for approximately 40-50 min while sampling the targeted depth interval, after which the net is closed and the next consecutive net is opened to sample its respective, consecutive depth interval. This process is repeated until all nets have sampled their respective depth intervals up to the water surface and the MOC10 unit is then retrieved into the boat. This process leads to a total deployment duration of ~6 hours or less over a maximum transect length of approximately 6 nautical miles. Deployment time is less when bottom depth is less. MOCNESS sampling will be conducted during daytime (i.e., diurnal) and nighttime (i.e., nocturnal) hours at each station to capture diel differences in vertical distribution (i.e., diel vertical migration) of the targeted fishes and water column invertebrates. The MAM Activity description anticipates 3 years of sampling at 3 locations (one sampling event annually at each location), each with 5 stations with 10 trawl tracks (5 day, 5 night) per station, for a total of up to 30 trawls annually from 2024-2026, and a total of up to 90 trawls over the course of the MAM Activity.

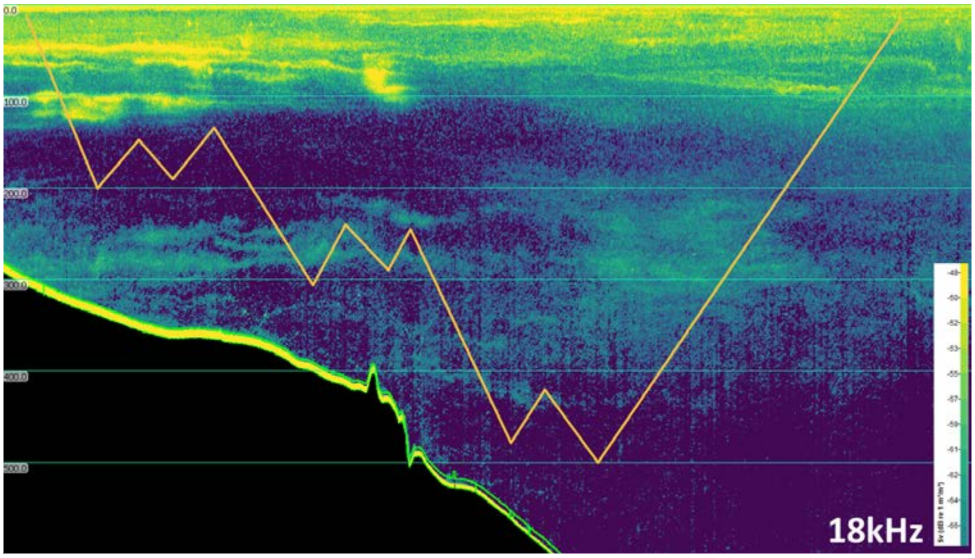

Figure 3: Depiction of MOCNESS trawl track (orange line) superimposed above 18 kHz acoustic data depicting biological backscatter where brighter green and yellow colors represent higher backscatter levels, and thus concentration of biological activity. (Photo Credit DEEPEND Consortium).

In conjunction with MOCNESS deployments, a CTD instrument will be lowered through the water column to collect vertical profiles of water quality parameters and collect water samples, via 12 L Niskin bottles affixed to CTD instrument, at discrete depths of interest (i.e., peaks of biological activity as identified by active acoustics). From these water samples, sub-samples will be taken for further analysis of detrital flux (i.e., Particulate Organic Matter [POM]), primary production (e.g., chlorophyll concentration), dissolved inorganic nutrients, and eDNA of target species (e.g., FWCI and ST). Immediately upon retrieval of the CTD instrument, replicate 5 L water samples would be taken from each Niskin bottle and filtered through sterile 0.45 µm filter membranes to remove all cells and other 'larger' detrital matter. The filter membranes would then be frozen until later land-based laboratory analysis is conducted to extract and amplify target DNA material. eDNA sample laboratory processing will follow established protocols (e.g., Easson et al. 2020 and/or methods currently being used by MDBC project team members on a related RESTORE Science Gulf Fishery Independent Survey of Habitat and Ecosystem Resources project). To complement eDNA work, tissue collected from voucher specimens collected by MOCNESS will also likely need to be retained during cruises in order to further develop species barcode libraries. However, target species selection completed during Task 1 will have identified which species would be amenable to eDNA processing. Given the relatively low current state of development for eDNA monitoring approaches, this work will be conducted to build capacity towards future efficiencies that can be achieved via eDNA monitoring approaches rather than as a more immediate end product within this MAM Activity. Additional 4 to 6 L of water samples collected from Niskin bottles will be required for various POM, nutrient, and primary production analyses. Coordination of site selection would carefully consider alignment with MDBC activities to leverage data from ALBEX (Autonomous Lander for Biological Experiments) system benthic landers currently being used by MDBC project teams. Each lander is ~2 m in height and capable of up to 1 year deployment periods. These landers can be affixed with sediment traps and other instrumentation to record water quality and collect detrital flux (i.e., POM) data near the benthos; these landers may also be fitted with instrumentation for eDNA sample collection. However, the use and deployment of this equipment for this MAM Activity would require coordination of data collection and sampling station design with existing MDBC project locations should this approach be incorporated within this MAM Activity. Ideally, this equipment would also be employed by this MAM Activity to develop a more holistic view of vertical trophic connectivity at select monitoring locations. Water column and benthos POM samples will be further analyzed for stable isotope signatures to gain information regarding this component of the vertically connected food web. Sediment trap data will be processed using existing procedures (Hanz et al. 2021, Mienis et al. 2012) to extract parameters of interest.

With the exception of benthic landers, which are deployed for up to one (1) year in duration and collect samples at predetermined intervals, these activities will be limited to the duration of the cruise monitoring period itself, which would include appropriately six (6) days of field work for each transect location. This project will include three (3) cruises (or, could be legs of cruises for efficiency and as deemed possible during project planning), one (1) for each monitoring location, across the three (3) years of field activities, resulting in nine (9) cruises (or legs) for the entire MAM Activity. While subject to further refinement and alignment with planned MDBC activities, these cruises will require approximately eighteen (18) sampling days per year for a total of fifty-four (54) sampling days over the course of the MAM Activity. When considering transit times, up to twenty-four (24) field days per year, or seventy-two (72) field days over the entire project, could be required to complete the proposed activities. These estimates could also be subject to change due to circumstances, such as weather, that could affect ship sampling and transit activities. These field activities will be timed to coincide with peak summer-time biological activity.

To quantify MM habitat associations at select monitoring locations, high-frequency acoustic recording package (HARP) PAMs will be deployed (in conjunction with existing cruises) for approximately six (6) months to one (1) year intervals to autonomously record MM vocalizations at the monitoring locations (Soldevilla et al. 2021, 2022). Similarly, Passive/Active acoustic tracking (PAAT) systems coupled with active acoustics similar to that used during previously described MOCNESS work will be deployed to monitor odontocete whale behavior and FWCI distributions on a continuous basis. Briefly, PAM equipment is moored to the seafloor and consists of a packaged data logger that records data from a calibrated hydrophone(s) tethered ~ 15 m above the instrument, batteries, flotation, acoustic release, and ballast weights. PAAT equipment is similar, but includes placement of paired hydrophone arrays in close proximity at multiple locations with the upper most set being higher in the water column (~300 m) in order to triangulate/track MM vocalization locations within the water column. These instruments would be configured with different sample rates and number of hydrophones to maximize detections of a variety of MM species. While details would be defined during Task 1 planning work, these instruments can be affixed to the benthos via moorings or can be deployed as separate seafloor packages. This work would leverage equipment and technical expertise associated with the ongoing NOAA RESTORE Science *Assessing Long-term Trends and Processes Driving Variability in Cetacean Density throughout the Gulf of Mexico using Passive Acoustic Monitoring and Habitat Modeling* project. These longer-term deployments are necessary to detect and quantify MM interactions with MDBC habitats because those interactions are anticipated to be less frequent and more ephemeral in nature. This passive acoustic monitoring would also provide information on soundscapes, which would complement and be useful to other ongoing OO TIG activities (Reduce Impacts of Anthropogenic Noise on Cetaceans project; Analysis of Open Ocean Habitat Use, Threats, and Animal Movements MAIP). The near-continuous, consecutive deployments of PAMs will be able to record MM activity throughout each of the three field monitoring years.

Task 3: Analyze and synthesize new data collections and conduct project reporting
Analysis and synthesis of the data collected in Task 2 will build upon prior analyses of similar datasets: FWCI assemblages (e.g., Frank et al. 2020), active acoustics (Boswell et al. 2020, Easson et al. 2020),

HARP recordings (Soldevilla et al. 2022), and FWCI and ST eDNA (Easson et al. 2020). These analyses and syntheses will be the basis of the final MAM Activity report as well as be the basis for up to five (5) peer-reviewed publications that detail this work. These publications would likely focus on the following topics: 1) FWCI spatiotemporal trends and assemblages, 2) active acoustics spatiotemporal trends, 3) eDNA spatiotemporal trends, 4) monitoring approach comparison (MOCNEES, active acoustics, eDNA), and 5) MM habitat utilization. However, the specific content and details of these publications will be further planned during Task 1 and Task 2. This task is data-based only and does not involve field-based activities.

2.4 Objectives of Tasks

The objectives of the three tasks as outlined above are:

- Task 1: Develop a complete monitoring, analytical, and data management plan that details the execution of Tasks 2 and 3 of this MAM Activity and balances the needs crucial to the success of this MAM Activity while identifying and capitalizing on efficiencies by leveraging other MDBC or related activities. Identify data that can be leveraged from existing projects and how it influences project planning (e.g., monitoring location selection) or future analyses within this project (e.g., data leveraged to complement this MAM Activity).
- Task 2: Implement three years of data collection.
- Task 3: Analyze and synthesize data collected by the MAM Activity as well as data leveraged from existing projects to describe vertical connectivity among MM, ST, FWCI, and MDBC communities. Complete all reporting, data management, and other activities as needed for project closeout. Draft manuscripts to be submitted for up to five (5) peer-reviewed publications.

2.5 Outputs and Their Use

Outputs:

- Final MAM Activity report that details the monitoring activities and outcomes including observed vertical connectivity among MM, FWCI, ST and MDBC resources and recommendations for future MDBC project implementation and assessment. The analyses associated with project outcomes will be developed in a manner that facilitates their use to assess benefits of MDBC restoration activities and ecosystem-level assessment (e.g., ecosystem modeling).
- Peer-reviewed publications.
- Annual progress reports, including progress on deliverables within each fiscal year.

Use of These Outputs:
This MAM Activity will result in new data collection. This data, and their associated analyses, will be used to further inform restoration planning as well as the assessment of benefits derived from future restoration activities, such as informing the planning and implementation of the MDBC AMP project. This information will describe vertical connectivity between pelagic resources (i.e., MM, ST, and FWCI) and MDBC communities. Deliberate transfer of this information to the AMP project will support its ‘Science to Management’ working group, ensuring they maintain current knowledge of broader benefits associated with MDBC restoration at priority locations. The ‘Science to Management’ group is comprised of representatives from agencies (e.g., FGBNMS Sanctuary Advisory Council, Gulf of Mexico Fisheries

Management Council, and Bureau of Ocean Energy Management) responsible for managing MDBC habitats and their overlying water column. The information will also be developed into peer-reviewed publications, to advance the science of these topics by making these findings available to the broader management and scientific community. These technical publications will be deliberately transferred to the AMP Science to Management working group for their consideration and/or use during management of habitat resources. Outputs from this MAM Activity will also be used to inform future restoration planning under the MDBC Restoration Type. Data collected by this MAM Activity will ultimately support the assessment (e.g., future ecosystem modeling) and reporting (e.g., programmatic reports) of outcomes to broader Restoration Types resulting from MDBC restoration activities.

2.6 Timeline

This MAM Activity will occur over a period of five years. The project will be initiated during Fiscal Year 2024 (FY24) with planning activities of approximately one year in duration as described in Task 1 above. Field activities would commence at the end of FY24 (summer of 2024) and continue annually for a total of three years as described in Task 2 above. The last year of data collection (considering both field efforts and post-field laboratory sample processing) are anticipated to carry over into FY27 in order to complete post-field laboratory processing of samples collected during the third year (FY26) sampling effort. These Task 1 and Task 2 activities will be executed with forward thinking towards analysis and outcomes derived from the new data collection (e.g., Task 1 final location and station selection leading to a framework for later analyses). However, this MAM Activity will finalize analyses of the newly collected data and conduct final report writing, including drafting of peer-reviewed publications, during FY28.

	FY24	FY25	FY26	FY27	FY28
Task 1: Project Implementation Planning/MDBC Coordination	■				
Task 2: Implement Data Collection	■	■	■	■	
Task 3: Analysis and Synthesize Data, Final Products				■	■

2.7 Budget

The total budget requested for this MAM Activity is $7,650,000. This includes anticipated costs for technical input and coordination with ongoing MDBC projects and related activities, contracting of external collaborators and associated contracting costs, publication of six (6) peer-reviewed publications, oversight and administrative costs, and a 20% MAM Activity contingency.

Cost Category	Cost Estimate
Task 1: Implementation Planning and MDBC Coordination	$200,800
Task 2 + 3: Implement field activities, Analyze and synthesize new data collections and conduct project reporting	$5,412,600
Admin and Oversight	$761,300

Sub-total	$6,374,700
Contingency (20%)	$1,275,000
TOTAL ESTIMATED COST	**$7,650,000**

3.0 Roles and Responsibilities

NOAA will be the Implementing Trustee responsible for implementing this MAM Activity and will serve as both technical and administrative lead. NOAA will be responsible for coordinating with the OO TIG and providing overall direction and oversight for this MAM Activity, including administration of any contracts or cooperative agreements, completing compliance requirements, financial tracking, annual reporting, and DIVER data management. Project implementation will require the coordination of various internal and external partners by NOAA. Coordination of field activities with existing MDBC project teams' activities will require their collaboration and review of field operation plans. This would also include considerable coordination with the MDBC HAE project to align sampling methodologies as well as identify opportunities to leverage efforts, including but not limited to data and understanding, operational logistics, site selection, and equipment. Substantial field, laboratory, analytical, and other technical expertise already exists to carry out the activities described above. NOAA will coordinate external partners, including all associated contracting requirements, to leverage this existing expertise and ensure contracts provide deliverables that address the objectives of this MAM Activity.

4.0 Data Management and Reporting

The DWH Trustees, as stewards of public resources under the Oil Pollution Act (OPA), will inform the public on the MAM Activity's progress and performance. Therefore, NOAA will report the status of the proposed MAM Activity via the Data Integration, Visualization, Exploration, and Reporting (DIVER) Restoration Portal annually, as outlined in Chapter 7 of the PDARP/PEIS (DWH NRDA Trustees 2016). All reports and their associated analyses and datasets and other documentation created or compiled as part of this MAM Activity, including peer-reviewed publications, will also be stored on the DIVER Restoration Portal.

Data storage and accessibility will be consistent with the guidelines in Section 3.1.3 of the MAM Manual (DWH NRDA Trustees 2021). In the event of a public records request related to data and information that are not already publicly available, the Trustee to whom the request is addressed would provide notice to the other OO TIG members prior to releasing any data that are the subject of the request. Some of the data collected may be protected from public disclosure under federal and state law (e.g., personally identifiable information under the Privacy Act) and therefore would not be publicly distributed.

5.0 Consistency with the DWH Programmatic Restoration Plan

This MAM Activity is consistent, as well as aligned with the comprehensive, integrated ecosystem restoration portfolio approach taken in the PDARP/PEIS (section 5.5). This MAM Activity will specifically support OO TIG Restoration Types and associated goals described in the PDARP/PEIS, including *Fish and*

Water Column Invertebrates, (section 5.5.6; e.g., offshore habitat restoration implemented under MBDC Restoration Type), *Marine Mammals* (section 5.5.11; e.g., identify and implement actions that support the ecological needs of the stocks), and *Mesophotic and Deep Benthic Communities* (section 5.5.13; e.g., improve understanding of MDBC communities to inform better management and ensure resiliency). The PDARP/PEIS recognized that no absolute biological or physical line separates individual habitats, which exist not as distinct habitats but as transitional or gradients that occur along a continuum from inshore coastal areas to the deepest oceanic regions. These habitats support faunal communities that directly utilize them as well as communities they indirectly support via trophic connectivity. Furthermore, many species move among habitats and/or thrive on the edges of habitat types and in doing so facilitate transfer of productivity among these habitats. Information obtained from this MAM Activity will directly benefit understanding of vertical trophic and productivity flows between Gulf of Mexico MDBC and water column habitats and their associated food webs that support multiple living resources (e.g., FWCI, ST, and MM). This MAM Activity also has direct linkages to the PDARP/PEIS, *Monitoring and Adaptive Management Framework* (section 5.E). The framework calls for Trustees to synthesize monitoring information and restoration outcomes across multiple injured resources and to support restoration evaluation and inform adaptive management at regional scales. This MAM Activity will improve the OO TIG's ability to quantify and evaluate how MDBC habitat restoration activities restore not only the mesophotic and deep benthic invertebrates and fishes that directly rely on them, but also lead to direct and indirect trophic transfer between these resources, water column fishes and invertebrates, and marine mammals, thus leading to cross-resource and ecosystem level benefits.

6.0 Compliance Considerations

6.1 NEPA Review and Conclusion

The Trustees' approach to compliance with NEPA summarized in this section is consistent with, and tiers where applicable from the PDARP/PEIS Section 6.4.11 (Restoration Type: Mesophotic and Deep Benthic Communities) and Section 6.4.14 (Preliminary Phases of Restoration Planning). Resources considered and impact definitions (minor, moderate, major) align with the PDARP/PEIS. Relevant analyses from the PDARP/PEIS are incorporated by reference. Such incorporation by reference of information from existing plans, studies or other material is used in this analysis to streamline the NEPA process and to present a concise document that briefly provides sufficient evidence and analysis to address the OO TIG's compliance with NEPA (40 CFR 1506.3, 40 CFR § 1508.9). All source documents relied upon are available to the public and links are provided in the discussion where applicable. The methods described above are consistent with previous work evaluated in the Open Ocean Restoration Plan 2/Environmental Assessment and in the NOAA RESTORE Science *Assessing Long-term Trends and Processes Driving Variability in Cetacean Density throughout the Gulf of Mexico using Passive Acoustic Monitoring and Habitat Modeling* project and are incorporated here by reference.

As discussed in Chapter 6 of the PDARP/PEIS, a TIG may propose and engage in activities intended to lead to restoration of mesophotic and deep benthic coral communities. Similarly, a TIG may fund a planning phase (e.g., initial engineering, design, and compliance) in one plan for a conceptual project, or for studies needed to maximize restoration planning efforts. These activities can include a mixture of data collection, modeling of ecological response to projects, conducting surveys, and creating maps and scale drawings of potential project sites. These activities may also include minimally intrusive field activities. This would allow the TIG to develop information needed leading to sufficient project information to develop a more detailed analysis in a subsequent restoration plan, or for use in the restoration planning process. Where these conditions apply and activities are consistent with those described in the PDARP/PEIS, NEPA evaluation is complete and no additional evaluation of individual activities is necessary at this time. The activities described in this MAIP fall within the scope described in the PDARP/PEIS.

The present MAM Activity includes restoration planning activities such as characterizing the environment and comparing results and conditions with and without a project. Specifically, this MAM Activity will lead to an increased understanding of how restoration and management activities carried out under the MDBC Restoration Type can result in long-term benefits not only for mesophotic and deep-water communities, but also other resources found in the area. Other restoration and management benefits could include informing habitat management actions that could lead to reduction of resource extraction impacts that otherwise alter predator-prey relationships, disturb bottom habitats, and increase loss of fish biomass. This MAM Activity will collect new information needed to develop more detailed analyses to assess outcomes of ongoing and planned restoration activities, subsequent restoration plan(s), or for use in the restoration planning process. The following description summarizes previous evaluations of these activities as they are described in the Open Ocean Restoration Plan 2/Environmental Assessment and the NOAA RESTORE Science *Assessing Long-term Trends and Processes Driving Variability in Cetacean Density throughout the Gulf of Mexico using Passive Acoustic Monitoring and Habitat Modeling* project. The new data collection would cause short term, localized, and minor adverse impacts to biological resources, specifically water column communities collected by MOCNESS. Short term, local, and minor adverse impacts are also anticipated to physical resources, specifically impacts to geology, substrates, and noise via disturbance of benthic habitats by the placement of benthic lander and/or PAM/PAAT equipment and the use of active acoustics to characterize water column fish and invertebrate communities. However, the long-term benefits, applied at a broad regional scale (i.e., across the restoration area) would outweigh short-term, localized, and minor adverse effects of implementing this MAM Activity. For similar NOAA actions involving sonar and ROVs, this is consistent with previous evaluations (NOAA 2013, 2016; OOTIG 2019). This MAM Activity will improve characterization of linkages between MDBC communities and overlying water column communities and other resources in the area to inform restoration efforts including the use of protective measures and management to reduce threats to them. This information would ultimately improve management and restoration of these resources, leading to long-term benefits.

It is unlikely that this MAM Activity would impact marine management, tourism and recreation or fisheries. Short term, localized, and minor impacts may be realized as shipboard operations conducted under this MAM Activity would coordinate with other vessel traffic within the area of operations. While disturbance to seafloor cultural resources (e.g., shipwrecks) could occur during offshore activities utilizing underwater equipment (e.g., deployment of benthic landers and/or PAM/PAAT equipment), caution and use of industry best practices during subsea operations make impacts unlikely. In addition, existing mapping of cultural resources would be utilized as part of the planning for field operations and associated gear deployments where there is a potential for disturbance. This MAM Activity would likely lead to improved populations of marine organisms and subsequently increased recreational enjoyment of those resources which may result in long-term benefits by improving opportunities for tourism and recreation in these areas.

Upon review, the federal trustees of the OO TIG find the environmental conditions and NEPA analysis in the PDARP/PEIS current and valid. Therefore, this review relies on the analysis in Section 6.4.11 and 6.4.14 of the PDARP/PEIS, which is incorporated herein by reference and summarized below.

NEPA Review of MAM Activity

The activities and tasks described here consist of desktop planning for field work (including engagement with subject matter experts anticipated to contribute to field work implementation), implementation of planned field work, and analysis of new information acquired during field work implementation. The new data collection could cause short term, localized, and minor adverse impacts to physical resources, biological resources, and socioeconomic resources. The information gathered from this MAM Activity would contribute to restoration that would have long-term benefits to biological resources, specifically MDBC communities and other pelagic communities that interact with them, at a regional scale (i.e., across the restoration area).

NEPA Conclusion

After review of the proposed activities against those actions previously evaluated in the PDARP/PEIS, the OO TIG determined that the environmental consequences resulting from this MAM Activity fall within the range of impacts described in Section 6.4.11 and 6.4.14 of the PDARP/PEIS and those described in Open Ocean Restoration Plan 2/Environmental Assessment and the NOAA RESTORE Science *Assessing Long-term Trends and Processes Driving Variability in Cetacean Density throughout the Gulf of Mexico using Passive Acoustic Monitoring and Habitat Modeling* project; thus, no additional NEPA evaluation is necessary at this time.

6.2 Compliance with Other Environmental Laws and Regulations

This MAM Activity will include the collection of new data. Compliance for the field activities associated with this MAM Activity have been incorporated into the compliance approval process associated with the portfolio of MDBC project activities and is currently under review, including all necessary consultations, permits, authorizations, determinations of effects to species or habitats, and other associated compliance determinations. If any project activities fall outside of previously completed compliance, the activities will be reviewed and compliance will be initiated and completed prior to field work commencing.

Federal environmental compliance responsibilities and procedures follow the Trustee Council Standard Operating Procedures (SOP), which are laid out in Section 9.4.6 of that document. Following the SOP, the Implementing Trustees for each activity will ensure that the status of environmental compliance (e.g., completed vs. in progress) is tracked through the Restoration Portal.

Documentation of regulatory compliance will be available in the Administrative Record that can be found at the DOI's Online Administrative Record repository for the DWH NRDA (https://www.doi.gov/deepwaterhorizon/adminrecord). The current status of environmental compliance can be viewed at any time on the Trustee Council's website: http://www.gulfspillrestoration.noaa.gov/environmental-compliance/.

Status of federal regulatory compliance reviews and approvals for the proposed project.

Federal Statute	Compliance Status
Bald and Golden Eagle Protection Act (USFWS)	N/A
Coastal Barrier Resources Act (USFWS)	N/A
Coastal Zone Management Act	In Progress
Endangered Species Act (NMFS)	In Progress
Endangered Species Act (USFWS)	Complete, existing compliance
Essential Fish Habitat (NMFS)	In Progress
Marine Mammal Protection Act (NMFS)	In Progress
Marine Mammal Protection Act (USFWS)	Complete, existing compliance
Migratory Bird Treaty Act (USFWS)	In Progress
National Historic Preservation Act	In Progress
Rivers and Harbors Act/Clean Water Act	N/A
National Environmental Policy Act	Complete, see analysis above.

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