Florida Trustee Implementation Group Monitoring and Adaptive Management Implementation Plan

Title: Coastal Environmental Sensitivity Index Mapping of Florida Gulf Coast

Need: Environmental Sensitivity Index datasets and maps (ESIs) are a valuable resource to inform restoration planning, implementation, monitoring, and overall coastal resiliency that need to be updated every 5 to 10 years due to natural and anthropogenic factors such as sea level rise, storms, and coastal development that change the coastal landscape over time. This project will update the ESIs for the Florida Gulf of Mexico regions (Panhandle, Northwest [NW] Peninsular, Southwest [SW] Peninsular, and South Florida) to more adequately inform oil spill response planning, implementation, damage assessment, and restoration. These updated ESIs will be more reliable, relevant, and comparable, as well as more readily available for restoration managers, including the Florida Trustee Implementation Group, to utilize in their decision-making process when proposing and selecting restoration projects.

Summary: The *Deepwater Horizon* Programmatic Damage Assessment and Restoration Plan and Programmatic Environmental Impact Statement (PDARP/PEIS; DWH NRDA Trustees 2016) calls for monitoring to inform restoration decisions and to better understand the progress and benefits of restoration actions. Furthermore, the Monitoring and Adaptive Management Procedures and Guidelines Manual (DWH NRDA Trustees 2021) consistently recommends the acquisition of baseline data for project monitoring. ESIs, which are a detailed and comprehensive clearinghouse showing shoreline types, habitats, fish and wildlife (including detailed temporal and life history information), and socio-economic interests for all of Florida's coastal areas, will help provide this baseline and monitoring data that can be utilized in the selection of coastal restoration projects. This project will update the ESIs for the four regions along Florida's Gulf Coast over 5 years and will involve 1) updating the regional ESIs, 2) producing cartographic products, and 3) developing a publicly accessible ESI website. The activities described in this Monitoring and Adaptive Management Implementation Plan (MAIP) is a tabletop exercise only that has no field work associated with it.

Implementing Trustee: Florida Fish and Wildlife Conservation Commission (FWC)

Period of Performance: 5 years

Cost: $1,473,993
- NRDA: $1,473,993
- FWC: $999,594
- Total project cost: $2,473,587

Description of Work:

Task 1: Update regional ESIs including shoreline classification, biology, and socio-economic resources

Description: The sequential update of the four regions will include a detailed reclassification of the current shoreline types (including storm inundation data layers), mapping of coastal and

benthic habitats, literature reviews, and interviews with wildlife biologists and resource managers to present a comprehensive, localized picture of coastal wildlife (including concentrations, seasonality, life stages, etc.), and a new representation of current socio-economic land uses. Mapped data will follow the National Oceanic and Atmospheric Administration (NOAA) ESI data schema (NOAA ESI Guidelines Version 4 [Petersen et al. 2019]; hereafter Guidelines) to include agreed upon data efficiencies and improvements resulting from the NOAA ESI workshops held in the fall of 2020. Additionally, the area of interest for the updated Florida ESIs will be based on the previously published ESI atlas regions from roughly 5 miles inland to approximately the 100-meter bathymetric contour offshore in the Gulf of Mexico. Sensitive areas/features that may extend further offshore than the 100-meter contour, such as Pully Ridge, will be included in the updated ESIs.

Shoreline Classification: ESI Base Map Layers (ESI Line, ESI Polygon, Hydro Line, Hydro Polygon)

One of the most important decisions at the onset of an ESI project is the selection and/or creation of a digital shoreline dataset used as the baseline for creating the ESI Line, ESI Polygon, Hydro Line, and Hydro Poly layers. The shoreline data will be developed using available data from the U.S. Federal Mapping Coordination site, the NOAA Continually Updated Shoreline Product (CUSP), and the FWC 1:12K shoreline dataset. The goal is to utilize the most recent high-resolution shoreline data available. Other shoreline datasets may include the U.S. Geological Survey high-resolution National Hydrography Dataset or manual digitization of shoreline at a scale of 1:4,000 from the latest FWC aerial imagery, Microsoft BING Bird's Eye and Aerial imagery, Environmental Systems Research Institute, Inc. (ESRI) Basemap World Imagery, Google Earth aerial imagery, and other sources. The most recent and accurate shoreline will be used for developing the vector line for the base map layers.

ESI Line Layer

The compiled shoreline data will be reviewed to check for continuous shoreline (no gaps) and ensure all features being mapped meet or exceed the minimum mapping unit (MMU) established for the ESIs. Based on previous mapping experience in Florida, it is likely the CUSP data will be the main shoreline source supplemented with the FWC 1:12K shoreline dataset for the ESI Line layer. CUSP contains attributes that can be converted to specific ESI classifications within the standardized ESI data schema. A developed crosswalk between the CUSP attributes and ESI classifications will be used for all ESIs ensuring data consistency. This crosswalk is used to pre-classify the ESI Line layer. Once the layer is created, the inland extent of the project area of interest (AOI) is created. The inland extent is based on, at minimum, a 10-mile buffer of the compiled ESI Line layer. The resulting buffer may be extended further inland if sensitive habitats are identified beyond the 10-mile buffer. The resulting AOI will be closely reviewed to ensure boundaries for tributaries and sensitive habitats are adequately captured within the project AOI.

ESI Polygon Layer

In addition to acquiring and pre-classifying digital/vector shoreline data, polygonal wetland data from the U.S. Fish and Wildlife Service National Wetlands Inventory (NWI) will be collected and evaluated for inclusion. All or portions of the NWI data may be replaced with state

developed wetlands and/or Land-Use/Land-Cover data if more current and accurate than the NWI. A standard NWI-to-ESI classification crosswalk has been developed and will be used to pre-classify the ESI Polygon layer. Utilizing this crosswalk will ensure consistency across the ESIs.

Once the compiled ESI Line (shoreline) and ESI Polygon (wetlands and flats) layers are pre-classified, the wetlands data are clipped by the shoreline to eliminate wetlands that would extend beyond the land/water interface into water. Cost-savings improvements resulting from the NOAA ESI workshop will be implemented, such as decoupling the shoreline and wetland layers. Decoupling the wetlands from the shoreline eliminates the need to correct small unclassified land polygons that previously existed between these layers, requiring a significant number of labor hours to mitigate. Additionally, decoupling these layers eliminates the creation of unnecessary new shoreline segments that previously complicated the classification process.

A geologist/GIS analyst will segment and classify the shoreline habitats using the standard NOAA ESI shoreline ranking system. The decoupled wetlands layer will be used as a reference layer when classifying shoreline habitats. The shoreline may be classified using low-altitude oblique and nadir aerial imagery from the following sources: FWC, National Geodetic Survey, BING Bird's Eye, BING Aerial, ESRI Basemap, Google Earth, and other available sources. ESI shoreline classification is performed by photointerpretation of available aerial imagery sources, and the attributes are transferred to the segmented shoreline using heads-up digitization. The previous ESI data will also be used as a reference layer during the classification process. In addition to segmenting and classifying the shoreline data, significant sheltered and exposed flats may be delineated, and the wetlands data for accuracy and update as necessary. Once the shoreline and wetland classifications are completed and a final review is conducted by the project geologist/GIS analyst, shoreline descriptions of each mapped ESI habitat are written, and representative photographs are provided for inclusion in the Introductory pages for the atlas. The final ESI Line and ESI Polygon feature classes are stored in the ESI feature dataset as specified in the NOAA ESI data schema.

Hydro Line Layer

The Hydro Line layer is an unsegmented vector line extracted from the ESI Line layer representing all of the shoreline, including islands, rivers, and streams that meet or exceed the MMU for the features being mapped. Line segments in this layer will be coincident with the vector line in the ESI Line and Hydro Polygon layers, and topological rules have been established to ensure this is the case. The shoreline datasets used for the ESI Line layer are used to create the Hydro Line layer. The final Hydro Line feature class is stored in the ESI feature dataset as specified in the NOAA ESI data schema.

Hydro Polygon Layer

The Hydro Polygon layer is created after the shoreline and wetlands layers are completed. This layer is generated by dissolving the shoreline and wetlands, keeping only the land and water value of each polygon. The final Hydro Polygon feature class is stored in the ESI feature dataset as specified in the NOAA ESI data schema.

The base map layers described above are very important datasets because the biology and human-use data are built using these layers. Features from these layers will be used to develop topological rulesets upon which other datasets rely.

Biological Resources: ESI Biology Layers

Working with the FWC/Fish and Wildlife Research Institute (FWRI), resource experts from NOAA and other federal agencies, and the appropriate Florida state agencies, the project biologist will identify resource managers and experts who can provide knowledge and/or relevant source materials for mapping biological resources and sensitive habitats that could potentially be at risk from spills, response activities, and other hazards/natural disasters. The focus will be on state and federally threatened and/or endangered (T/E) species as well as those species that are most vulnerable to spills, response activities, and disasters. The mapped elements per the Guidelines and the map legend for the previous ESI products will include at least the following major categories:

- Sensitive Biological Resources: spatial extent, concentrations, life stages/activities, and protection status for:
    - Fish
    - Birds
    - Terrestrial Mammals
    - Marine Mammals
    - Invertebrates
    - Herpetofauna
    - Benthic – includes submerged aquatic vegetation, coral reef, and hardbottom habitats
    - Habitat
- Within the above biological resources, content will focus on:
    - T/E and rare plant and animal species
    - Concentration areas, such as areas where significant percentages of populations are likely to be exposed to spills or natural disasters
    - Areas where species concentrate during significant life stages or activities—such as nesting, rearing, foraging, spawning, pupping, molting, wintering, or migrating
    - Habitats suitable for specific life stages or along critical migratory routes
    - Species/habitats that may be impacted by cleanup activities, treatment of spills, or other response activities
    - Species of commercial, recreational, and/or ecological importance

<u>Collection and Compilation</u>

Although biological resource data will be collected from readily available datasets, these data will not be utilized as-is without review or integration with other sources. Resource experts are heavily relied upon since they typically hold the most current data. In many cases, these data are not published or otherwise available until compiled with other data sources and included in the ESI dataset. The data providers and resource experts are engaged from the start of data collection to the final review of the compiled geodatabases. All biological data collected and compiled for the ESI are well vetted and peer reviewed prior to publishing the final NOAA formatted geodatabase and maps. A detailed list of experts that includes federal and state natural resource

agency biologists, academic experts, and non-governmental organizations will be created during the data collection and review process. The list of experts will be included in the sources table of the ESI dataset and also listed in the introductory pages of the ESI atlas.

Digitization

Prior to digitizing and merging the compiled data sources by resource as required in the Guidelines, the project team will meet to discuss issues specific to the source data layers, such as data sharing and/or non-disclosure agreements and information provided by resource experts. Detailed documentation is recorded for all unique circumstances for an atlas, and the agreements are maintained for reference by the project team. Biology data are digitized using heads-up digitization techniques into a GIS if the data are provided in hardcopy format. Digital data acquired during and after data collection meetings are integrated and reformatted to follow the Guidelines. The biology layers are built upon and/or clipped to the ESI/HYDRO shoreline data. The processed biology data will be edge-matched to the adjacent ESI dataset. Additional tabular data are entered into the database, and all data are checked for accuracy. Review data are created and checked by the biologist. At this time, a digital ESI draft review project, or upon request, a set of in-house review maps, is generated.

Customized GIS tools have been developed for use with ESI data. These tools allow for displaying and reviewing the spatial data and allows for QA/QC of the associated tabular data for both the biological and human-use data. These data will be reviewed for omissions, commissions, and logical consistency errors. Spatial and tabular errors identified during the QA/QC process will be corrected prior to conducting review meetings with resource experts and data providers.

Peer-review Meetings

A second set of workshops with experts and data providers will be organized to ensure that the source data are processed and compiled as agreed upon during data collection meetings and/or specified in data-sharing agreements. At this time, all review edits and comments are compiled, reviewed by the project biologist, and discussed with the project team before edits are made. An ESI Viewer is developed that facilitates the review process, whether it is in person or conducted virtually. The review process is essential to producing the highest quality datasets. All spatial and tabular edits are processed, and the revised biology data layers are QA/QC'd (similar procedures are used for the human-use data as well).

Socio-economic Resources: ESI Human-use Resource Layers

Mapping socio-economic (human-use) resources for the ESIs will follow a similar process as that for the biological resources. The team will work closely with the FWC/FWRI, resource experts from NOAA and appropriate federal and state agencies to identify human-use resources that are most likely to be affected in the event of a spill or natural disaster, as well as those resources that support response activities. Human-use resources to be mapped per the Guidelines may include, but are not limited to, the following:

- High-use shoreline access and recreational use areas, such as boat ramps, marinas, recreational beaches, and sport-fishing and diving areas.

- Officially designated natural resource management or protected areas, such as national parks, marine sanctuaries, national wildlife refuges, preserves, and reserves.
- Resource extraction sites, such as aquaculture sites, locations of subsistence and commercial fisheries, log storage sites, mining leases, and surface water intakes.
- Water-associated archaeological, historical, and cultural sites, including lands managed by Native Americans. Cultural sites located in the intertidal zone or close to the shoreline where they could be damaged by cleanup crews are at particular risk.

Working with FWC/FWRI, the appropriate resources to be mapped for the ESIs will identified and collected.

Collection and Compilation

GIS specialists will initially identify and collect human-use datasets from state and federal GIS clearinghouses. Simply relying on these online sources poses some data quality issues including: 1) sources may lack proper metadata; 2) attributes such as feature names and contacts are excluded; 3) sources are not current or it is difficult to verify the date; 4) it is difficult to determine if source data are the "official" dataset; and 5) the level of QA/QC is unknown. Therefore, the team will attempt to identify and contact the source agency and data providers to ensure the human-use data used are as accurate as possible.

The geospatial data collected (points, lines, and polygons) will be merged in the appropriate feature classes and stored in the SOCECON feature dataset as outlined in the Guidelines. Human-use features will be clipped by the ESI/HYDRO, if appropriate, based on the feature type. Point data within the same feature layer, e.g., boat ramps, will be reviewed for duplicate points. Topological rules and data evaluation scripts will be used to ensure coincident arcs and remove duplicate points as necessary. Where applicable, these data will be edge-matched to the adjacent ESI.

Peer-review Meetings

The collected and compiled human-use data will be included in the ESI Viewer in the NOAA ESI data schema along with the biological resources for review by resource experts. For example, wildlife refuge boundaries included in the dataset will be reviewed by refuge managers, along with the biological resources in the refuge. Edits will be made by the GIS analyst after all the review edits are compiled. A final ESI Viewer will be created and reviewed by the team to confirm review edits are made as suggested by the resource experts.

Data Deliverables and Metadata

Once the BIOLOGY, SOCECON, and ESI feature datasets are completed, these data are organized into the appropriate atlas geodatabase following NOAA ESI Data Schema (see Figure 1). Appendix B of the Guidelines provides detailed mapping guidance for the ESI feature datasets and the atlas geodatabase. The final geodatabase will follow the NOAA ESI Data Schema but must include accepted changes and functional improvements to the schema accepted by NOAA as a result of the 2020 NOAA ESI Workshop. The deliverable will include IOS compliant metadata which will be entered into NOAA's InPort metadata catalog in coordination

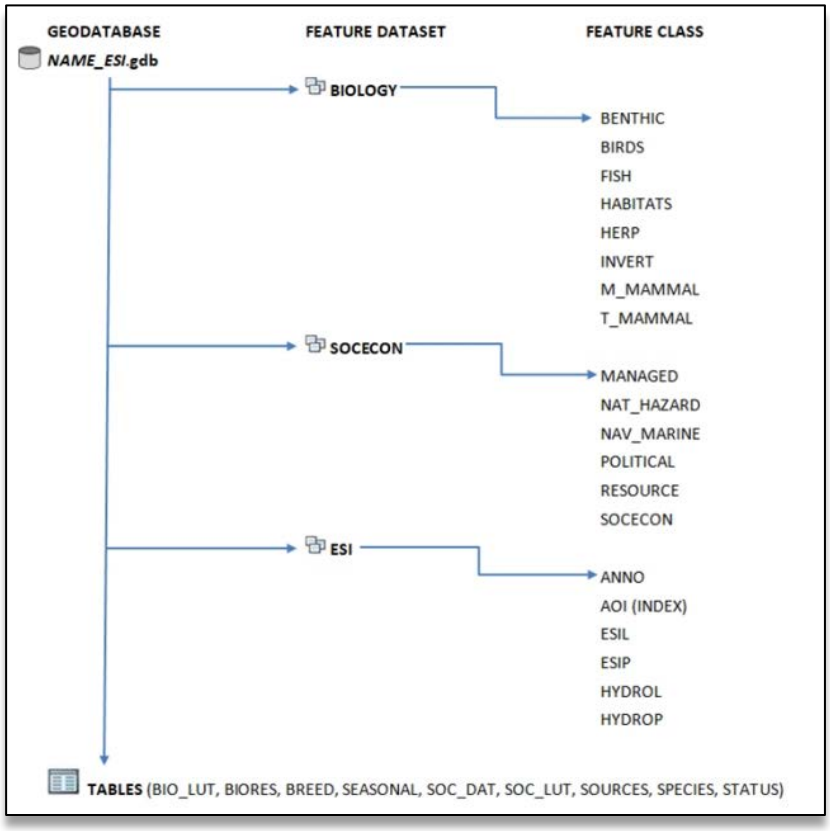

Figure 1. Geodatabase delivery format outlined in Appendix B of the 2019 NOAA ESI Guidelines. As of Fall 2020, the BIOCOMB Table is an acceptable deliverable and replaces many of the tables listed.

with the NOAA metadata lead. The final ESIs (geodatabases and cartographic products) will be available for visualization in NOAA's Environmental Response Management Application (ERMA), which provides access to ESI data nationwide in a consistent format.

Atlas Production and Introductory Pages

Introductory pages will be created using the recently delivered introductory pages for East Florida as a template. They will include detailed information for the data layers mapped in the ESI: shoreline, biological resources, and socio-economic resources. They will include shoreline descriptions with representative photos; response considerations for each shoreline type; tables for name, agency, contact information, and expertise for resource experts and data providers; and a bibliography of all sources cited. The bibliography will include all seasonality references as the seasonality source (S_SOURCE) information is no longer required to be stored in the SOURCES table for the ESI product.

- **Equipment/materials needed:** Primarily contract services with management oversight and data contributions from FWC/FWRI scientists. FWC will require use of computers, network resources, ESRI ArcMap/ArcPro, and office supplies.
- **Deliverable:** File geodatabase for each updated ESI with introductory pages, legend, and metadata.
- **Schedule:**
  - Panhandle – July 2022 to June 2023
  - South Florida – July 2023 to June 2024
  - SW Peninsular – July 2024 to June 2025
  - NW Peninsular– July 2025 to June 2026

Task 2: Produce cartographic products

Description: FWC/FWRI staff will use ESRI ArcMap (or ArcPro) software with Research Planning Inc.'s (RPI) ESI toolbar add-in to produce layer-enabled georeferenced digital PDF ESI maps from the newly updated regional geodatabases (Locke et al. 2020). The layered PDF maps will be suitable for visualization in ERMA. The map layout and structure will be consistent with the Guidelines and the latest accepted improvements. The appropriate NOAA symbology will be used for the map information, spatial and tabular information, and the legend. An FWC/FWRI template will be used for the border information and page layout. The existing USGS index (7.5-minute quadrangles) will be used for the updated regions. The final layout for the entire product (Introductory Pages, Legends, Indexes, Maps, and Data Tables) will be in an 11x17-inch printable format. Biological and socio-economic data will be represented on separate maps in order to make the maps more readable. 'Present Throughout' boxes will have a geographic reference and will be assigned using cartographic discretion to make the maps more readable and reduce clutter. Icon placement will follow NOAA standards with cartographic discretion to highlight threatened or endangered species in key areas.

- **Equipment/materials needed:** ESRI ArcMap (or ArcPro) software with RPI's ESI toolbar add-in for editing and symbolizing ESI data; network resources, office supplies, printing and binding services for atlas production
- **Deliverable:** Layer-enabled digital PDF maps for each region; 10 sets each region of printed and bound ESI atlases for delivery to response and restoration partner agencies; hyperlinked PDF atlas files suitable for printing and for website access
- **Schedule:**
  - Panhandle – within 6 months of updated geodatabase delivery (by 2023)
  - South Florida – within 6 months of updated geodatabase delivery (by 2024)
  - SW Peninsular – within 6 months of updated geodatabase delivery (by 2025)
  - NW Peninsular – within 6 months of updated geodatabase delivery (by 2026)

Task 3: Develop an ESI website to make data and maps more available and accessible

Description: FWC/FWRI staff will create a centralized, enhanced, and focused ESI website to make data and maps more available to the public, planners, responders, damage assessors, restoration managers, and other users. The website will have a user-friendly interface that can be easily updated as new data become available. Users will be able to view/download individual maps, regional map atlases, and regional geodatabases for use with other GIS applications. The website will feature educational and outreach materials related to ESI data/maps as well as links to partner agencies' ESI products. The website will include analytics metrics (number of visitors, page views, downloads, duration, etc.) for progress reporting and improvements.

- **Equipment/materials needed:** Network resources, computers, office supplies, and information technology expertise
- **Deliverable:** A FWC/FWRI-hosted ESI website featuring viewable/downloadable maps, atlases, and geodatabases; educational and outreach materials; and targeted links.
- **Schedule:** Website planning and design will begin immediately. The redesigned ESI website will be available to the public at the end of the first funded state fiscal year (June 2023). Availability of updated geodatabases and maps will be concurrent with those deliverables (see Task 1 and Task 2).

Summary of Tasks, Deliverables, and Schedule

Task	Deliverables	Schedule
Task 1 – Update regional ESIs including shoreline classification, biology, and socio-economic resources	File geodatabase for each updated ESI with introductory pages, legend, and metadata.	Panhandle: mid-2023
		South Florida: mid-2024
		SW Peninsular: mid-2025
		NW Peninsular: mid-2026
Task 2 – Produce cartographic products	Layer-enabled digital PDF maps for each region; 10 sets each region of printed and bound ESI atlases for delivery to response and restoration partner agencies; hyperlinked PDF atlas files suitable for printing and for website access	Panhandle: 2023
		South Florida: 2024
		SW Peninsula: 2025
		NW Peninsular: 2026
Task 3 – Develop an ESI website to make data and maps more available and accessible	Redesign a FWC/FWRI-hosted ESI website	Mid-2023
	Post accessible ESI geodatabases	See schedule for Task 1
	Post accessible ESI cartographic products	See schedule for Task 2

Data Management and Reporting

FWC staff will compile appropriate data throughout the calendar year, synthesize the results, and send the data and a draft annual progress report to FWC DWH staff within two months of the calendar year ending. FWC DWH staff will perform quality assurance and quality control (QA/QC) procedures on the materials and coordinate with project staff should any changes be necessary. FWC will give the other FL TIG members time to review the materials before making such information publicly available. Implementing Trustee and/or project managers will present to the TIG the results of each task once that task has been completed.

The QA/QC'ed data and reports will be stored in the DIVER Restoration Portal. FWC will submit annual reports to the publicly available DWH DIVER Portal. FWC will prepare a final summary report synthesizing the findings of this monitoring and adaptive management (MAM) activity. The FL TIG will develop performance metrics as this MAM activity progresses.

Consistency with the PDARP/PEIS

Section 5.5.15.2 of the PDARP/PEIS (DWH NRDA Trustees 2016) states that for MAM of restoration types that "monitoring, modeling, analysis, engagement of internal and external scientific experts and other scientific support may be conducted to inform restoration planning, implementation, and evaluation at multiple scales" (Lyons et al. 2008; Roni 2005; Thayer et al. 2003; Thom 2000). This MAM activity is intended to facilitate future restoration planning and implementation activities for various restoration types in Florida. Information gained from this MAM activity will directly benefit the Trustees' ability to effectively restore for various restoration types, such as nearshore, coastal, and wetland habitats and living coastal and marine

resources, within the context of future DWH restoration projects. Therefore, this MAM activity is consistent with the PDARP/PEIS, including the MAM framework, as described in Section 5.5.15.2.

National Environmental Policy Act (NEPA) Review

The Trustees' approach to compliance with NEPA summarized in this section is consistent with and follows where applicable from the PDARP/PEIS, Section 6.4.14. Resources considered and impacts 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 Florida 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.

As discussed in Chapter 6 of the PDARP/PEIS, a TIG may propose funding 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. 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.

Section 6.4.14 of the PDARP/PEIS considers the environmental consequences associated with activities including, but not limited to planning, feasibility studies, design, engineering, and permitting of conceptual projects. These activities can include a mixture of research into historical conditions, computer-based modeling, conducting surveys, and creating maps and scale drawings. The activities described in this MAIP include collation of historical data and expert opinions, computer-based modeling, and creation of maps, all of which fall within the scope described in the PDARP/PEIS. For purposes of this NEPA review, activities to be conducted are categorized as "tabletop" work, and as such, the affected environment does not include any resources that could be measurably affected. In this review, data management and reporting activities such as data compilation, data synthesis, and similar activities would not cause adverse impacts to any resource area.

NEPA Conclusion

Based on review of the proposed activities against those actions previously evaluated in the PDARP/PEIS, no further NEPA analysis for these activities is required.

Compliance with Other Environmental Laws and Regulations

The FL TIG has completed compliance with all applicable local, state, and federal laws and regulations relevant to this MAM activity, as described below. See Table 1 below for the status of compliance by statute, at the time of this MAIP.

The FL TIG Trustees agree that all applicable consultations and regulatory compliance activities must be completed and appropriately documented prior to utilizing FL TIG funds to undertake these activities and that the terms and conditions of all federal and state permits must be complied with in the course of implementing these activities. 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.

Table 1. Status of federal regulatory compliance reviews and approvals for this FL TIG MAM 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	N/A
Endangered Species Act (NMFS)	N/A
Endangered Species Act (USFWS)	N/A
Essential Fish Habitat (NMFS)	N/A
Marine Mammal Protection Act (NMFS)	N/A
Marine Mammal Protection Act (USFWS)	N/A
Migratory Bird Treaty Act (USFWS)	N/A
National Historic Preservation Act	N/A
Rivers and Harbors Act/Clean Water Act	N/A
National Environmental Policy Act	Complete, in NEPA analysis section above

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 (www.doi.gov/deepwaterhorizon/adminrecord). The current status of environmental compliance can be viewed at any time on the Trustee Council's website: www.gulfspillrestoration.noaa.gov/environmental-compliance/.

References

DWH NRDA Trustees. 2016. *Deepwater Horizon* Oil Spill: Final Programmatic Damage Assessment and Restoration Plan (PDARP) and Final Programmatic Environmental Impact Statement (PEIS).

DWH NRDA Trustees. 2021. Monitoring and Adaptive Management Procedures and Guidelines Manual Version 2.0. Appendix to the Trustee Council Standard Operating Procedures for Implementation of the Natural Resource Restoration for the DWH Oil Spill. Available: www.gulfspillrestoration.noaa.gov/

Lyons, J.E., Runge, M.C., Laskowski, H.P., & Kendall, W.L. (2008). Monitoring in the context of structured decision-making and adaptive management. *Journal of Wildlife Management, 72*(8), 1683-1692. doi:10.2193/2008-141

Locke, C., M. White, and J. Horsman. 2020. A GIS Add-in for Creating Sensitivity Atlases Using NOAA Environmental Sensitivity Index (ESI) Data. Proceedings of the 2020 International Oil Spill Conference

Petersen, J., D. Nelson, T. Marcella, J. Michel, M. Atkinson, M. White, C. Boring, L. Szathmary, and J. Weaver. 2019. Environmental Sensitivity Index Guidelines, Version 4.0. NOAA Technical Memorandum NOS OR&R 52.

Roni, P., ed. (2005). *Monitoring stream and watershed restoration.* Bethesda, MD: American Fisheries Society.

Thayer, G.W., McTigue, T.A., Bellmer, R.J., Burrows, F.M., Merkey, D.H., Nickens, A.D., Lozano, S.J., Gayaldo, P.F., Polmateer, P.J., & Pinit, P.T. (2003). *Science-based restoration monitoring of coastal habitats, volume one: A framework for monitoring plans under the Estuaries and Clean Waters Act of 2000 (Public Law 160-457).* Silver Spring, MD: National Oceanic and Atmospheric Administration.

Thom, R.M. (2000). Adaptive management of coastal ecosystem restoration projects. *Ecological Engineering, 15*, 365-372.