RESTORE Council Proposal Document

General Information

Proposal Sponsor: Texas Commission on Environmental Quality (TCEQ)

Title:
Texas Coastal Water Quality Program

Project Abstract:
Texas, through the Texas Commission on Environmental Quality (TCEQ), is requesting $25.86M in Council-Selected Restoration Component funding for the proposed Texas Coastal Water Quality Program. This would include $3,749,700 in planning and project management funds as FPL Category 1, as well as a separate $22,110,300 implementation component as an FPL Category 2 priority for potential funding. The program will support the primary RESTORE Comprehensive Plan goal to restore water quality and quantity through activities that aim to restore water quality and freshwater inflows on the Texas coast using a variety of proven methods. Methods include the implementation of best management practices in Texas coastal watersheds to reduce nonpoint source pollution, the repair and enhancement of drainage channels and outfalls to improve stormwater flow and increase freshwater inflow to adjacent marshes, and the construction of living shoreline features to reduce erosion and improve water quality. The program will utilize specified criteria for selecting projects that were identified earlier through public meetings and as part of a stakeholder process.

Water quality on the Texas Coast is adversely impacted by diverted freshwater inflows and increased nutrient input from agriculture. This program will address environmental issues focused on stormwater runoff, freshwater inflows, floodplain management, sediment control and water quality for activities related to coastal communities, wetlands, and agriculture. Program duration is 4 years.

FPL Category: Cat1: Planning/ Cat2: Implementation

Activity Type: Program

Program: Texas Coastal Water Quality Program

Co-sponsoring Agency(ies): N/A

Is this a construction project?:
Yes

RESTORE Act Priority Criteria:
(I) Projects that are projected to make the greatest contribution to restoring and protecting the natural resources, ecosystems, fisheries, marine and wildlife habitats, beaches, and coastal wetlands of the Gulf Coast region, without regard to geographic location within the Gulf Coast region.
(II) Large-scale projects and programs that are projected to substantially contribute to restoring and protecting the natural resources, ecosystems, fisheries, marine and wildlife habitats, beaches, and coastal wetlands of the Gulf Coast ecosystem.
(III) Projects contained in existing Gulf Coast State comprehensive plans for the restoration and protection of natural resources, ecosystems, fisheries, marine and wildlife habitats, beaches, and coastal wetlands of the Gulf Coast region.

Priority Criteria Justification:
This program will meet three of the RESTORE Act Priority Criteria:

1. Projected to make the greatest contribution to restoring and protecting natural resources. Non-point source pollution and decreased freshwater inflows negatively impact water quality and quantity in bays and estuaries. Runoff carrying nutrient pollution into estuaries can degrade water quality and the health of seagrass beds, wetlands and other coastal habitats and the species they support. Adequate inflows are essential to maintain salinity levels and water quality in estuaries to support healthy coastal habitats. This program aims to enhance and restore water quality to protect Texas coastal habitats by maintaining or restoring freshwater inflows, creating and protecting habitats, and reducing non-point source pollutions through the use of BMPs.

2. Large-scale projects and programs. This program will protect and restore water quality coastwide throughout Texas through a variety of methods tailored to the unique coastal environments and water quality needs of each region. Each individual initiative within the program is large-scale in its scope and potential positive impacts to water quality and the habitats that are at risk.

3. Contained in existing Gulf Coast State Comprehensive Plans. Water quality monitoring and management and marsh restoration projects are included in the TCRMP (TGLO, 2019).

Project Duration (in years): 4

Goals

Primary Comprehensive Plan Goal:
Restore Water Quality and Quantity

Primary Comprehensive Plan Objective:
Restore, Improve, and Protect Water Resources

Secondary Comprehensive Plan Objectives:
Restore , Enhance, and Protect Habitats

Secondary Comprehensive Plan Goals:
Restore and Conserve Habitat

PF Restoration Technique(s):
Reduce excess nutrients and other pollutants to watersheds: Agriculture and forest management
Reduce excess nutrients and other pollutants to watersheds: Erosion and sediment control
Reduce excess nutrients and other pollutants to watersheds: Stormwater management
Restore hydrology and natural processes: Restore hydrologic connectivity
Restore hydrology and natural processes: Restore natural salinity regimes

Location

Location:
Texas Coastwide

HUC8 Watershed(s):
Texas-Gulf Region(Neches) - Neches(Lower Neches)
Texas-Gulf Region(Central Texas Coastal) - Guadalupe(Lower Guadalupe)
Texas-Gulf Region(Central Texas Coastal) - Central Texas Coastal(West San Antonio Bay)
Texas-Gulf Region(Nueces-Southwestern Texas Coastal) - Southwestern Texas Coastal(San Fernando)
Texas-Gulf Region(Nueces-Southwestern Texas Coastal) - Southwestern Texas Coastal(Baffin Bay)

State(s):
Texas

County/Parish(es):
TX - Calhoun
TX - Kleberg
TX - Nueces
TX - Orange
TX - Refugio
TX - Victoria

Congressional District(s):
TX - 27
TX - 36
TX - 34

Narratives

Introduction and Overview:

The degradation of water quality on the Texas coast has put the environmental health of coastal ecosystems at risk. Water quality in Texas is adversely impacted by diverted freshwater inflows and an increase in nutrient input from agriculture (Brickier et al., 2007; Wetz et al., 2016; TCEQ, 2019). Water quality and the estuarine environments of coastlines are intrinsically linked. Healthy habitats associated with estuaries can act as filters, helping to remove sediments and pollutants to improve water quality. But when water quality is depleted due to increased nutrient loading, sensitive habitats become vulnerable to instances of eutrophication, hypoxia, and harmful algal blooms (Brickier et al., 2007; Wetz et al., 2017). Urban and agricultural land uses have been found to contribute significant amount of nutrients to nearby watersheds, leading to water quality degradation (Hopkinson and Vallino, 1995, Handler et al., 2006). The lack of freshwater inflow additionally puts marshes at risk, particularly freshwater marshes, which are vulnerable to changes in salinity. Extended periods of reduced inflows lead to increased salinity and nutrient reductions in bay waters, altering the composition and distribution of plant and animal populations (Elexander and Dunton, 2002). This program aims to restore water quality and freshwater inflows on the Texas coast using a variety of methods that will enhance the natural environment.

Coastwide, the implementation of best management practices (BMPs) to reduce non-point source pollution will improve the water quality of Texas bay systems. The goal of this program is to reduce nutrient loading into Texas bays, thereby reducing the instances of eutrophication, hypoxia or harmful algae blooms that impact economically valuable fisheries and sensitive habitat that occur within the bay systems (Park et al., 1994). This project would build on existing watershed studies and initiatives being undertaken by several water quality workgroups, including the DWH NRDA trustees. This program would incentivize farmers to utilize cropland management strategies and BMPs to reduce nutrient loading into waterways and ditches that drain into watersheds. These methods could include but are not limited to: conservation, constructed wetlands, cover crops, reduced till, nutrient management, filter strips, and vegetated/grassed waterways. Additionally, planning efforts, including engineering & design, will be used to identify and assess water quality activities that will provide restoration of hydrology and natural process to reduce excess nutrients.

This program will consider improving freshwater inflows by improving sections of existing drainage channels and tributaries and extending outfalls into nearby fresh or estuarine marshes. This will result in the introduction of more sediment and freshwater, which will help restore marshes suffering from the effects of saltwater intrusion and inundation and improve overall water quality. Multiple recent events, including Hurricane Ike (2008) and Hurricane Harvey (2017), have caused damage to drainage outfalls on the Texas coast, resulting in increased flooding in nearby communities and degraded water quality flowing into the bays. These natural disasters, along with land surface subsidence, and increasing residential development along important drainages have contributed to impairment.

This program will also consider improving water quality through the implementation of projects that utilize living shorelines, which consist of marsh plantings and, in higher energy environments, the construction of breakwaters to reduce erosion issues. This approach will also create new and protect existing critical environments that improve water quality and allow natural re-habitation by a variety of aquatic organisms.

This program will develop a process for selecting locations for water quality enhancements that build on Texas' stakeholder-driven process for developing the RESTORE Planning Framework and for selecting preliminary projects for FPL3 consideration. During this earlier work, county governments, NGOs, and a workgroup made up of Texas NFWF/NRDA and Texas Coastal Resiliency Master Plan

(TCRMP) (TGLO, 2019a) representatives submitted 38 projects for FPL3 consideration. Coastal experts, HRI staff, and TCEQ staff reviewed the projects and selected 23 for public comment. Among these 23 projects, several projects included water quality enhancements that this program will consider for implementation, but additional projects that are part of the TCRMP will also be considered.

Texas has a history of success in implementing BMPs. The Texas Water Development Board (TWBD) and TCEQ work closely with stakeholders to implement and maintain resources for agriculture, industrial, and municipal BMPS (TWBD, 2013). Local NGOs, like the Coastal Bend Bays and Estuaries Program, have also developed large stakeholder groups and funded studies that will help further enhance the efficacy of BMPs in critical watersheds (CBBEP, 2020).

Drainage improvement projects in coastal Texas have proven to be critical and are especially a priority for communities after Hurricane Harvey made landfall in 2017 (TGLO, 2019b). Houston was greatly impacted post-Harvey due to the failure of the bayous and reservoirs to drain the extreme amount of precipitation dumped by the storm (Zhang et al., 2018). Expanding development and climate change likely increasing the frequency and intensity of storms will only further compound this problem (Toffol and Rauch, 2009). Studies have shown that suitably large scale and holistically considered infrastructure improvements that consider the system as a whole are better at draining large areas than traditional methods, like curb-and-gutter and underground piping (Brabec, 2009; Dietz and Clausen, 2008; Ellis and Marsalek, 1996; Yang and Li, 2013). Improving local infrastructure and drainage will be critical to protecting both the natural environment and local communities.

Past successful living shoreline projects implemented in Texas projects include Clear Lake Forest Park on Galveston Bay and the Shipe Woods living shoreline on Trinity Bay. Both living shorelines were constructed with funding from NOAA and the Galveston Bay Foundation. The two projects are on higher energy, eroding shorelines and include breakwater elements combined with marsh plantings. Living shorelines have a long history of being successful alternatives to traditional shoreline armoring methods (Hardaway et al., 2010).

Texas is requesting $25,860,000 for the implementation of this program with an estimated program duration of 4 years. The overall program includes activities that may be scaled or phased, if necessary. Several independent project sites will be identified with distinct line item budgets for each component. Some projects can be phased by selecting individual methods for each distinct location contingent on the allocated funding available.

This program addresses the 2016 update to the Comprehensive Plan by using the best available science for restoring water quality and quantity, developing a monitoring and data management framework, and defining metrics of success of the various program components. Additionally, this program conforms to the RESTORE Planning Framework by adhering to the priority to restore, improve, and protect water resources.

Proposed Methods :

Voluntary BMPs are used to reduce nutrient loads from cropland, pastureland, privately held off-field areas and road rights- of-way (TCEQ, 2019). Targeted methods are tailored to the dry-land agricultural practices and livestock pastureland employed along watersheds where excess nutrient loads are a stressor to the system. Some recommended strategies include but are not limited to conservation, constructed wetlands, cover crops, reduced till, nutrient management, filter strips, and vegetated/grassed waterways.

Steps to effectively implement BMPs include:

1. Identify target watersheds where BMPs would be effective at improving water quality
2. Conduct outreach to local stakeholders and potential project partners
3. Implement BMPs or conservation strategies identified in various scientific literature and reports, including the Texas Coastal Waters: Nutrient Reduction Strategies Report (TCEQ, 2019)
4. Conduct monitoring and adaptive management

The implementation of BMPs should be evaluated on a case-by-case basis depending on landowner willingness, soil type, topography, crop type, agribusiness market conditions, planting and harvesting methods, livestock type, size of operation, annual precipitation, and other field specific factors (TCEQ, 2019). Cost-effectiveness of strategies should also be considered. Engagement of stakeholders and landowners to develop individual projects that employ effective and feasible strategies will be necessary to determine what will eventually be the overall approach to nutrient reduction in each watershed (TCEQ, 2019).

For drainage outfall repairs and other drainage mitigation activities of the program, enhancements will consist of improved channels and extension of outfalls into areas where water quality may improve before moving through the estuary and where the flow will enhance the outfall area, such as an adjacent marsh. The first phase of implementation after determining project locations will be full and complete hydraulic and hydrologic ("H&H") assessments of the drainage outfalls, along with environmental impact assessments. Based on these assessments, the projects will be designed to improve water quality runoff entering estuaries and to enhance and restore adjacent marsh complexes by increasing freshwater inflow into the system. The projects within the program will be designed in such a manner that the outfalls are maintainable on a short and long-term basis. Alternatively, following a complete environmental assessment, the program may include the incorporation of pumps and pump basins, which will lessen the length of any channel extension.

This program also aims to construct small scale (500-1000ft) living shorelines consisting of a breakwater or groin with marsh plantings on bay shorelines to improve water quality. In general, the living shoreline design and implementation process will follow these steps:

1. Identify priority areas and analyze site-specific information
2. Engineering and design
3. USACE Permitting
4. Oversee bidding and contractor selection
5. Construction
6. Monitoring and adaptive management.

The type of living shoreline must be location specific. Living shorelines are not a one size fits all mechanism - they are versatile and can be designed and tailored to fit the specific conditions at that site (Morris et al., 2018). Site conditions that will affect living shoreline design include water depth, wave energy and the current rate of erosion.

Environmental Benefits:

This program seeks to improve the quality of water flowing across our coastal watersheds and through our estuaries. Water quality (and quantity) is not only fundamental to the ecosystem, but it is impacted by many activities occurring in the coastal zone including agriculture, navigation, recreation, and development. This program will use proven techniques to improve estuarine water quality thus improving ecosystem health.

Implementing BMPs will protect and restore water quality within identified impaired Texas watersheds and their headwater tributaries, which will enhance ecosystem services and improve the overall productivity of the systems. Water quality is a major determinant of the health of estuaries

(Whitfield and Elliott, 2002, Eby et al., 2005). There is a growing urban footprint on coastal land use coverage, and agriculture remains a significant land use in many Texas watersheds (NOAA Coastal Change Analysis Program). Highly urbanized and agricultural watersheds tend to have high inorganic nutrient, dissolved organic matter and chlorophyll concentrations where the system has excessive wastewater effluent, leading to water quality degradation through pollutant inputs (Hopkinson and Vallino, 1995; Handler et al., 2006; Wetz et al., 2016). Reduction of excessive nutrient loading into Texas coastal waters will help maintain stable food webs, healthy and diverse seagrass and wetland plant communities, and increase populations of recreationally and commercially important fish and macroinvertebrate species (Wetz et al., 2016). Additionally, BMPs will aid in reducing the instances of eutrophication, hypoxia or harmful algae blooms (Wetz et al., 2017).

Improving drainage channels and outfalls will result in the increase of freshwater inflows to the estuarine system, restoring natural salinity gradients (Palmer et al., 2002). Coastal marshes in Texas depend upon periodic freshwater inundation to support current community structure and promote further establishment and expansion of emergent vegetation, but decades of watershed modifications have dramatically decreased freshwater discharge into Texas estuaries (Elexander and Dunton, 2002). The introduction and restoration of more freshwater into estuarine marshes will enhance and help restore estuarine marsh from adverse effects caused by the lack of inflows and/or the inundation of saltwater into these important ecosystems. More inflow will also bring sediments to marshes increasing vertical accretion rates and partially countering inundation by rising sea level (White et al., 2002). Additionally, improved drainage will enhance community resilience by reducing the risk of flooding and property damage.

Implementation of a living shoreline has the potential to improve water quality by reducing erosion and creating environments that filter pollutants. Living shorelines also increase coastal resiliency by buffering storm surges (Arkema et al., 2013; Barbier et al., 2013; Manis et al., 2015). Oyster reefs and breakwater structures can become valuable substrate for marine organisms, as well as provide shelter and habitat for many fish, crab, oysters and other mobile species (Davis et al., 2006; Scyphers, et al., 2011). Reefs and offshore structures also dampen wave energies and increase sediment retention. Because shellfish are filter feeders, oyster reefs can improve water quality (Scyphers, et al., 2011). Living shorelines also contribute to healthy habitat for juvenile fish, which can improve recreational and commercial fisheries in the area, thus protecting important natural resources that support actives which are critically important to the region's economy such as fishing, hunting, and nature-based tourism (Sutton-Grier, et al., 2015).

Metrics:

Metric Title: HM001 : Nutrient reduction - Lbs. N avoided or removed
Target: TBD
Narrative: After project selection and design is complete, a quantitative target of nitrogen reduction will be set. The nitrogen target for each watershed implementing a BMP plan will be different but guided by recommendations from the EPA (EPA, 2017).

Metric Title: HM003 : Nutrient reduction - Lbs. P avoided or removed
Target: TBD
Narrative: After project selection and design is complete, a quantitative target of phosphorus reduction will be set. The phosphorus target for each watershed implementing a BMP plan will be different but guided by recommendations from the EPA (EPA, 2017).

Metric Title: HM005 : Agricultural BMPs - acres under contracts/agreements
Target: TBD

Narrative: A key component of this program will be implementing BMP agreements with land owners at a scale large enough to impact the nutrient loads in targeted watersheds. After project selection and design is complete, a quantitative target of acres under BMP agreements will be set so that the intended goals are met.

Metric Title: HR013 : Wetland restoration - Acres restored
Target: TBD
Narrative: Freshwater wetlands will be targeted for restoration through the increase of freshwater inflows via improved drainage. After project selection and design is complete, a quantitative target of wetland acres restored will be set.

Metric Title: RES002 : Watershed management - # upgrades to stormwater and/or wastewater systems
Target: TBD
Narrative: A key to the success of the program is to upgrade stormwater drainage systems at a scale large enough to have an impact on wetlands and communities. After project selection and design is complete, a quantitative target of upgrades will be set.

Metric Title: HR003 : Stream restoration - Miles of stream channel protection installed
Target: TBD
Narrative: A key to the success of the program is to upgrade stream channels at a scale large enough to have an impact on wetlands. After project selection and design is complete, a quantitative target of the length of protected channels will be set.

Metric Title: HR009 : Restoring hydrology - Acres with restored hydrology
Target: TBD
Narrative: Restoring hydrology is a key outcome in this program to positively impact wetlands that have been affected by altered hydrology. After project selection and design is complete, a quantitative target of the acres of restored hydrology will be set.

Risk and Uncertainties:

The major uncertainty in implementing BMPs is the willingness of agriculture producers and land managers to participate in a BMP program. Stakeholders may need to be incentivized to participate in the program. Education levels, capital, income, farm size, access to information, positive environmental attitudes, environmental awareness, and utilization of social networks are variables that are positively associated with adoption rates (Feather and Amacher, 1994; Prokopy et al., 2008). Understanding the stakeholder's perspective and working with them will be key to the program's success. Compared to regulation or financial incentives, raising producer information levels may be a more cost-effective method of increasing adoption, and so an information/outreach program may be part of BMP implementation (Feather and Amacher, 1994).

Risks and uncertainties surrounding construction activities involve the long-term sustainability of the enhancements and repairs, weather events, relative sea level rise, the degree of drainage improvement, and the response of degraded habitats to the increase in freshwater input (Winter et al., 1998; NAS, 2017). Monitoring and adaptative management can decrease these risks.

Additional uncertainties include the potential impacts from changes in human activity and land use that may result from improvements in drainage and inland flows. Increasing population trends in coastal areas will impact drainage capacity through the increase in impermeable surfaces and may cause increases in point source pollution from storm drains, industrial facilities, and sewage treatment plants (Arnold and Gibbons, 1996; Winter et al., 1998). Additionally, the reduction in flood risk may encourage even further expansion of development and impermeable surfaces in the area,

which will put more pressure on the drainage capacity. Improvements to existing drainage systems and enhancement of wetlands with these population increase pressures in mind will be critical to the success of the program.

The effects of climate change pose additional uncertainties. Climate change is likely to directly impact precipitation patterns and urban drainage (Arnbjerg-Nielsen et al., 2013). Extreme rainfall events will likely become more frequent in the future, impacting urban drainage systems and potentially overwhelming their capacity (Toffol and Rauch, 2009). If wetlands, especially those that are impounded, are flooded when urban infrastructure fails, those wetlands can become permanently flooded and convert to open water (Day et al., 1990). Although the magnitude of these changes is still uncertain, designing drainage improvements considering climate change impacts will be important to the long-term success of these projects (Grum et al., 2006).

The predominant risk to living shorelines is relative sea level rise and compaction of soils which lowers breakwater elevation, reducing their effectiveness. and potentially drowning intertidal marsh plantings (Hardaway et al., 2010). In order to alleviate this risk, relative sea level rise will be incorporated into the design to ensure that elevations remain sufficient to protect the shorelines from erosive forces and promote sediment trapping to decrease water depths to levels that support marsh vegetation. Additionally, incomplete geotechnical information regarding substrate stability and data on wave and tidal energy, sea level changes, water quality, and sediment supply can cause a project to be risky (GBF, 2014; Hardaway et al., 2010). This program will assess each project site for data gaps and for suitability for using a living shoreline technique.

Monitoring and Adaptive Management:

Project monitoring for this program will involve observations for ensuring (1) proper construction, (2) performance, and (3) to support adaptive management (NAS, 2017). Type of monitoring data will include biophysical observations (vegetation, hydrologic, nutrient load, salinity) of the project and of adjacent areas to serve as reference sites and to detect off site impacts (DWH-NRDA, 2017). Monitoring will occur on semiannual or annual bases for a minimum of two years following project completion.

Watersheds implementing BMPs will be monitored for changes in nutrient load via water samples taken regularly. Since the primary goal of the program is to reduce non-point source pollution from agriculture, the primary metric of success will be measuring the amount of nitrogen and phosphorous removed or avoided in each system. Other water quality parameters can be assessed while the samples are collected, such as water temperature, dissolved oxygen, and salinity, that are also important indicators of the functioning of the watershed (EPA, 2017).

Construction activities to improve drainage will be monitored for the effectiveness of the repairs/enhancements. Primary indicators of success will be the number of enhancements made, the health of adjacent marsh complexes, and the total acres of restored hydrology. Methods of monitoring may include regular vegetation sampling, salinity sampling, measuring flow characteristics, and land cover surveys (NAS, 2017).

A successful living shoreline requires maintenance and monitoring (NAS, 2017; Thayer et al., 2005; TGLO, 2020). Monitoring the area over time will help determine how well the living shoreline is performing and if it is providing the expected benefits. Semiannual or annual project monitoring will enable effective adaptive management actions such as additional vegetation plantings, removal of debris at the project site, and repositioning of structural components (Kreeger and Moody, 2014; TGLO, 2020).

Data Management:
Data management for this program will make data publicly available thereby enhancing outcomes and future restoration efforts.

Planning data: During program planning, a variety of existing data and newly acquired data will be gathered. Data in this category includes mostly existing geospatial data on land cover, land use, water quality, elevation, and ecological data describing past and current environmental conditions. Geotechnical and engineering data with construction specifications are also included.

Project implementation data: these data are needed for determining as-built conditions. Detailed engineering survey data and photography are included.

Post-project implementation data: these data are needed for monitoring performance, informing adaptive management actions, and for improving future projects. They include time series of biophysical and engineering data plus hydrological and water quality data for understanding trends.

Program activities will identify data used. TCEQ and GRIIDC (Gibeaut, 2016) will work with data users to ensure data are shared when key activities end. GRIIDC is a well-known data repository designed to receive data from a variety of sources and from various scientific and engineering disciplines. GRIIDC will track, curate, and archive data in the GRIIDC repository and make it publicly discoverable and available. Metadata will follow the ISO 19115-2 standard and datasets will be reviewed for completeness and organization to enable reuse.

Collaboration:
Two Texas workgroups were established to provide input on coastal priorities: State & Federal Representatives and Non-Governmental Organizations. On-line and in-person meetings were held to discuss plans to develop Texas coastal priorities and to ensure the public's involvement. A survey was developed that asked for individual's coastal priorities. These surveys were available to the public and were also completed by members of the two work groups. Public meetings were conducted in three coastal cities for the public to present their issues and concerns. Information received from workgroup meetings, discussions with elected officials, public meetings and the surveys was used to develop a list of priorities to be included in the RESTORE Council's Planning Framework document. These efforts of collaboration will continue throughout the process to develop programs and projects. Work will continue with Texas representatives for NRDA/NFWF to consider leveraging opportunities.

Public Engagement, Outreach, and Education:
The decision to submit this program was based on many months of discussions with work groups and participation by the public. It began with discussions with the Texas representatives for NRDA & NFWF to identify programs/projects for FPL 3b. This identified list was shared with the two workgroups (State & Federal and NGOs) established for Bucket 2 planning purposes, for their review and comment. County judges in the coastal area also were given the opportunity to identify potential programs/projects for their areas. Using the information compiled as part of this process, a list of 23 projects were posted for public comment on the Texas RESTORE website. In addition, two public hearings were held in coastal cities. In reviewing the comments received, the timing to move forward with proposals, and in discussions with the Texas Governor's staff, it was determined that program rather than project specific proposals would be submitted. The development of the program proposals was done to ensure that projects posted for public comment could be considered in at least one of the program submissions. Much of the work has already been done to identify projects that could be funded within this program submission. The process to select FPL 3b grant recipients will include the requirement that projects will have to already been vetted by this process or through other public processes such as the TGLO's Coastal Resiliency Master Plan, or NRDA &

NFWF related activities. The criteria to select the specific projects would include, but not limited to, the following: addresses issues presented in the program proposal; amounts of funds available for the program; readiness; leveraging opportunities; scalability; risk/benefit ratio; and distribution of funds across the Texas coastline. Notification of the projects selected to receive grant funds will be posted on the Texas RESTORE website. This overall process, parts already completed and others to be completed after the program has been approved for FPL 3b funds, will ensure that the ultimate selection of projects for this program are not only consistent with the RESTORE Planning Framework document, but also reflect the ideas that were discussed by the work groups, the elected officials, the public and the Office of the Governor.

Leveraging:

Funds: TBD
Type:
Status:
Source Type:
Description: As part of the process to initially identify programs for FPL 3b, Texas held discussions with county judges, NGOs, NRDA and NFWF. Projects that are selected for funding in Texas could likely include partnerships leveraging various funds, including RESTORE, NRDA and NFWF monies. All parties have emphasized the need to leverage DWH Oil spill associated funds, as well as other funds, and it is Texas' intent to consider leveraging as a criteria in selecting projects, including the recognition of previous projects and the potential for a new project to add to the cumulative impact to the area. This selection process would be similar to the decision-making associated with the proposed programmatic areas included in the Texas pre-proposals.

Environmental Compliance:

Drainage channel and outfall enhancements and repairs will be presented to the United States Army Corps of Engineers for approval and permitting purposes. Project permitting may also be required from the Texas Historical Commission, U.S. Fish & Wildlife Services, and Texas Commission on Environmental Quality.

Living shorelines implementation will require Section 10 and 404 permits from the Corps and a submerged lands lease from the Texas General Land Office. The Corps permit process ensures compliance with all applicable federal laws, primarily environmental laws such as the Clean Water Act. Coordination is planned with the USACE and reviewing agencies such as Texas General Land Office, United States Fish and Wildlife Services, Texas Commission on Environmental Quality will be necessary to address regulation compliance with the Coastal Zone Management Act, Endangered Species Act, Clean Water Act, Coastal Barrier Resource Act, and the Rivers and Harbors Act, and other as applicable.

The FPL Category 1 portion of this program involves only planning actions that are covered by the Restore Council's NEPA Categorical Exclusion for planning, research, or design activities (Section 4(d)(3) of the Council's NEPA Procedures). The implementation component is currently proposed for Category 2. Texas intends to work with other members of the Council to move some or all of the implementation component to Category 1 prior to a Council vote on the final FPL.

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Budget

Project Budget Narrative:
The total requested for this program is $25.86 million. Of that amount, approximately $24.5 million will be provided to sub-recipients to implement projects selected for this program. TCEQ estimates that it will require approximately $1.36 million to support the following: administrative expenses (salary, indirect, travel, fringe, supplies, etc.); hosting & maintenance costs for the Texas RESTORE web site; and for a contract to provide technical assistance to TCEQ staff.

Category 1: $3,749,700
Planning (9%) = $2,327,400
Project Management (5.5%) = $1,422,300

Category 2: $22,110,300
Implementation (84.5%) = $21,851,700
Contingency (1%) = 258,600

Data management and monitoring & adaptive management costs are included in the implementation costs.

Since some costs are uncertain depending on the type of individual project ultimately selected, contingency costs are included at this point and could be considered in a project specific budget as appropriate.

Total FPL 3 Project/Program Budget Request:
$ 25,860,000.00

Estimated Percent Monitoring and Adaptive Management: 0 %
Estimated Percent Planning: 9 %
Estimated Percent Implementation: 84.5 %
Estimated Percent Project Management: 5.5 %
Estimated Percent Data Management: 0 %
Estimated Percent Contingency: 1 %

Is the Project Scalable?:
Yes

If yes, provide a short description regarding scalability.:
The overall program includes activities that may be selected from, enhanced or phased, if necessary. Several independent project sites will be identified with distinct line item budgets for each component. The project can be phased by selecting individual methods for each distinct parcel contingent on the allocated funding available.

Environmental Compliance[1]

Environmental Requirement	Has the Requirement Been Addressed?	Compliance Notes (e.g.,title and date of document, permit number, weblink etc.)
National Environmental Policy Act	Yes	The FPL Category 1 portion of this program involves only planning actions that are covered by the Restore Council's NEPA Categorical Exclusion for planning, research, or design activities (Section 4(d)(3) of the Council's NEPA Procedures). The implementation component is currently proposed for Category 2. If applicable, these requirements will be addressed and documentation will be supplied prior to a Council vote on the final FPL.
Endangered Species Act	No	The FPL Category 1 portion of this program involves only planning actions that are covered by the Restore Council's NEPA Categorical Exclusion for planning, research, or design activities (Section 4(d)(3) of the Council's NEPA Procedures). The implementation component is currently proposed for Category 2. If applicable, these requirements will be addressed and documentation will be supplied prior to a Council vote on the final FPL.
National Historic Preservation Act	No	The FPL Category 1 portion of this program involves only planning actions that are covered by the Restore Council's NEPA Categorical

[1] Environmental Compliance documents available by request (restorecouncil@restorethegulf.gov).

		Exclusion for planning, research, or design activities (Section 4(d)(3) of the Council's NEPA Procedures). The implementation component is currently proposed for Category 2. If applicable, these requirements will be addressed and documentation will be supplied prior to a Council vote on the final FPL.
Magnuson-Stevens Act	No	The FPL Category 1 portion of this program involves only planning actions that are covered by the Restore Council's NEPA Categorical Exclusion for planning, research, or design activities (Section 4(d)(3) of the Council's NEPA Procedures). The implementation component is currently proposed for Category 2. If applicable, these requirements will be addressed and documentation will be supplied prior to a Council vote on the final FPL.
Fish and Wildlife Conservation Act	No	The FPL Category 1 portion of this program involves only planning actions that are covered by the Restore Council's NEPA Categorical Exclusion for planning, research, or design activities (Section 4(d)(3) of the Council's NEPA Procedures). The implementation component is currently proposed for Category 2. If applicable, these requirements will be addressed and documentation will be supplied prior to a Council

		vote on the final FPL.
Coastal Zone Management Act	No	The FPL Category 1 portion of this program involves only planning actions that are covered by the Restore Council's NEPA Categorical Exclusion for planning, research, or design activities (Section 4(d)(3) of the Council's NEPA Procedures). The implementation component is currently proposed for Category 2. If applicable, these requirements will be addressed and documentation will be supplied prior to a Council vote on the final FPL.
Coastal Barrier Resources Act	No	The FPL Category 1 portion of this program involves only planning actions that are covered by the Restore Council's NEPA Categorical Exclusion for planning, research, or design activities (Section 4(d)(3) of the Council's NEPA Procedures). The implementation component is currently proposed for Category 2. If applicable, these requirements will be addressed and documentation will be supplied prior to a Council vote on the final FPL.
Farmland Protection Policy Act	No	The FPL Category 1 portion of this program involves only planning actions that are covered by the Restore Council's NEPA Categorical Exclusion for planning, research, or design activities (Section 4(d)(3) of the Council's NEPA Procedures). The implementation component is currently

		proposed for Category 2. If applicable, these requirements will be addressed and documentation will be supplied prior to a Council vote on the final FPL.
Clean Water Act (Section 404)	No	The FPL Category 1 portion of this program involves only planning actions that are covered by the Restore Council's NEPA Categorical Exclusion for planning, research, or design activities (Section 4(d)(3) of the Council's NEPA Procedures). The implementation component is currently proposed for Category 2. If applicable, these requirements will be addressed and documentation will be supplied prior to a Council vote on the final FPL.
River and Harbors Act (Section 10)	No	The FPL Category 1 portion of this program involves only planning actions that are covered by the Restore Council's NEPA Categorical Exclusion for planning, research, or design activities (Section 4(d)(3) of the Council's NEPA Procedures). The implementation component is currently proposed for Category 2. If applicable, these requirements will be addressed and documentation will be supplied prior to a Council vote on the final FPL.
Marine Protection, Research and Sanctuaries Act	No	The FPL Category 1 portion of this program involves only planning actions that are covered by the Restore Council's NEPA Categorical Exclusion for planning,

		research, or design activities (Section 4(d)(3) of the Council's NEPA Procedures). The implementation component is currently proposed for Category 2. If applicable, these requirements will be addressed and documentation will be supplied prior to a Council vote on the final FPL.
Marine Mammal Protection Act	No	The FPL Category 1 portion of this program involves only planning actions that are covered by the Restore Council's NEPA Categorical Exclusion for planning, research, or design activities (Section 4(d)(3) of the Council's NEPA Procedures). The implementation component is currently proposed for Category 2. If applicable, these requirements will be addressed and documentation will be supplied prior to a Council vote on the final FPL.
National Marine Sanctuaries Act	No	The FPL Category 1 portion of this program involves only planning actions that are covered by the Restore Council's NEPA Categorical Exclusion for planning, research, or design activities (Section 4(d)(3) of the Council's NEPA Procedures). The implementation component is currently proposed for Category 2. If applicable, these requirements will be addressed and documentation will be supplied prior to a Council vote on the final FPL.

Migratory Bird Treaty Act	No	The FPL Category 1 portion of this program involves only planning actions that are covered by the Restore Council's NEPA Categorical Exclusion for planning, research, or design activities (Section 4(d)(3) of the Council's NEPA Procedures). The implementation component is currently proposed for Category 2. If applicable, these requirements will be addressed and documentation will be supplied prior to a Council vote on the final FPL.
Bald and Golden Eagle Protection Act	No	The FPL Category 1 portion of this program involves only planning actions that are covered by the Restore Council's NEPA Categorical Exclusion for planning, research, or design activities (Section 4(d)(3) of the Council's NEPA Procedures). The implementation component is currently proposed for Category 2. If applicable, these requirements will be addressed and documentation will be supplied prior to a Council vote on the final FPL.
Clean Air Act	No	The FPL Category 1 portion of this program involves only planning actions that are covered by the Restore Council's NEPA Categorical Exclusion for planning, research, or design activities (Section 4(d)(3) of the Council's NEPA Procedures). The implementation component is currently proposed for Category 2. If

		applicable, these requirements will be addressed and documentation will be supplied prior to a Council vote on the final FPL.
Other Applicable Environmental Compliance Laws or Regulations	No	The FPL Category 1 portion of this program involves only planning actions that are covered by the Restore Council's NEPA Categorical Exclusion for planning, research, or design activities (Section 4(d)(3) of the Council's NEPA Procedures). The implementation component is currently proposed for Category 2. If any other environmental compliance laws of regulations are applicable, those requirements will be addressed and documentation will be supplied prior to a Council vote on the final FPL.

Maps, Charts, Figures

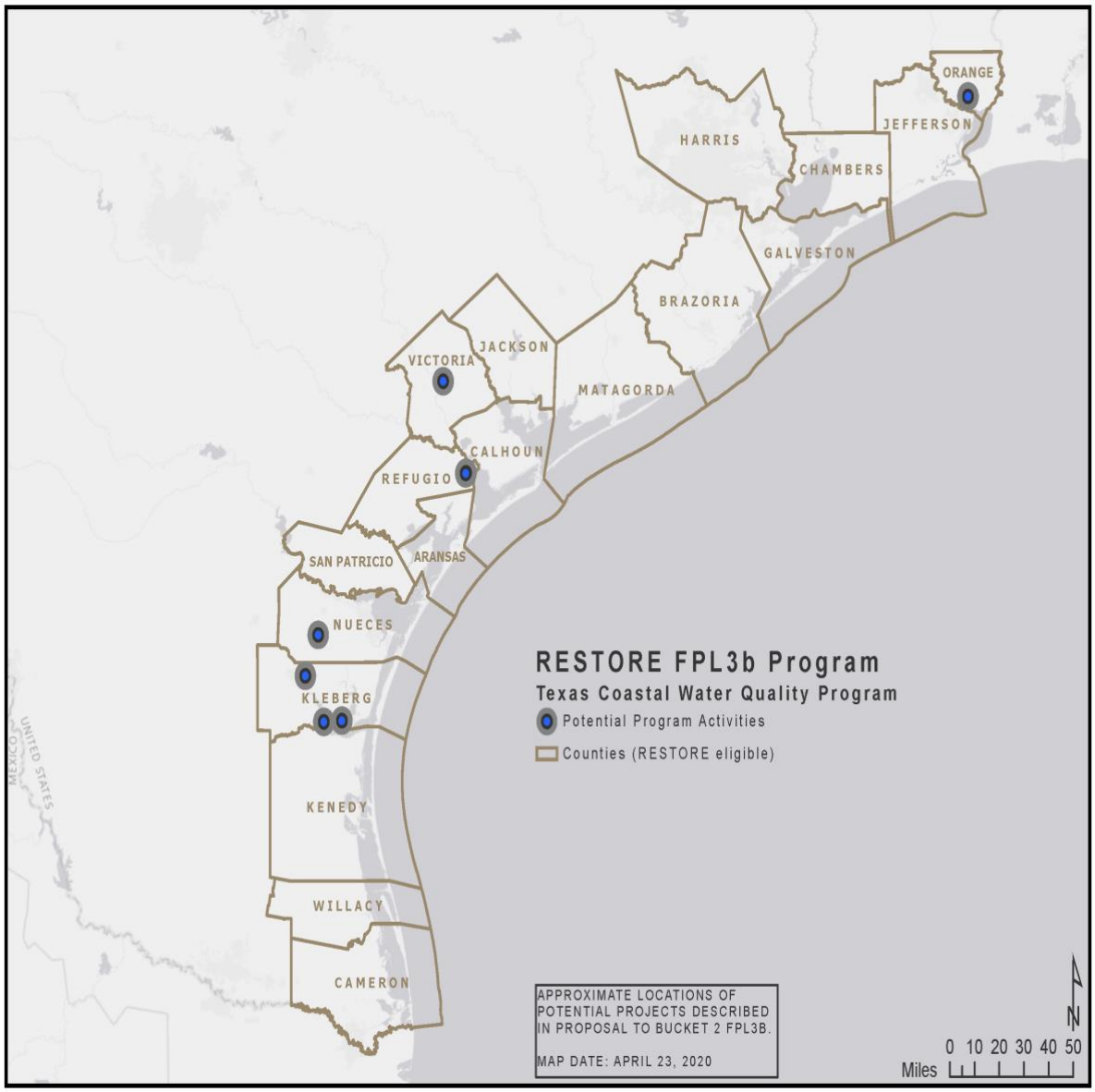

Figure 1 : Approximate locations of Texas Coastal Water Quality program activities.

RESTORE Council FPL 3 Proposal Document

General Information

Proposal Sponsor:
Texas Commission on Environmental Quality

Title:
Texas Coastal Water Quality Program

Project Abstract:
The degradation of water quality on the Texas coast has put the environmental health of coastal ecosystems at risk. Water quality in Texas is adversely impacted by diverted freshwater inflows and increased nutrient input from agriculture. This program aims to restore water quality and freshwater inflows on the Texas coast using a variety of proven methods that will enhance the natural environment including: the implementation of best management practices (BMPs) in Texas coastal watersheds to reduce non-point source pollution, the repair and enhancement of drainage channels and outfalls to improve stormwater flow and increase freshwater inflow to adjacent marshes, and the construction of living shoreline features to reduce erosion and improve water quality. This program will address environmental issues focused on stormwater runoff, freshwater inflows, floodplain management, sediment control and water quality for activities related to coastal communities, wetlands, and agriculture. The program will develop a process for selecting locations for water quality enhancements that builds on Texas' stakeholder-driven process for developing the Planning Framework and for selecting preliminary projects for FPL3 consideration. Texas is requesting $25,860,000 for the implementation of this program with an estimated program duration of 4 years.

FPL Category: Cat 1: Planning, Implementation/Cat2: Planning, Implementation

Activity Type: Program

Program: Texas Coastal Water Quality Program

Co-sponsoring Agency(ies): N/A

Is this a construction project?
Yes

RESTORE Act Priority Criteria:
(I) Projects that are projected to make the greatest contribution to restoring and protecting the natural resources, ecosystems, fisheries, marine and wildlife habitats, beaches, and coastal wetlands of the Gulf Coast region, without regard to geographic location within the Gulf Coast region.
(II) Large-scale projects and programs that are projected to substantially contribute to restoring and protecting the natural resources, ecosystems, fisheries, marine and wildlife habitats, beaches, and coastal wetlands of the Gulf Coast ecosystem.
(III) Projects contained in existing Gulf Coast State comprehensive plans for the restoration and protection of natural resources, ecosystems, fisheries, marine and wildlife habitats, beaches, and coastal wetlands of the Gulf Coast region.

Priority Criteria Justification:
This program will meet three of the RESTORE Act Priority Criteria:

1. Projected to make the greatest contribution to restoring and protecting natural resources. Non-point source pollution and decreased freshwater inflows negatively impact water quality and quantity in bays and estuaries. Runoff carrying nutrient pollution into estuaries can degrade water quality and the health of seagrass beds, wetlands and other coastal habitats and the species they support. Adequate inflows are essential to maintain salinity levels and water quality in estuaries to support healthy coastal habitats. This program aims to enhance and restore water quality to protect Texas coastal habitats by maintaining or restoring freshwater inflows, creating and protecting habitats, and reducing non-point source pollutions through the use of BMPs.

2. Large-scale projects and programsThis program will protect and restore water quality coastwide throughout Texas through a variety of methods tailored to the unique coastal environments and water quality needs of each region. Each individual initiative within the program is large-scale in its scope and potential positive impacts to water quality and the habitats that are at risk.

3. Contained in existing Gulf Coast State Comprehensive PlansWater quality monitoring and management and marsh restoration projects are included in the TCRMP (Texas General Land Office, 2019).

Project Duration (in years): 4

Goals

Primary Comprehensive Plan Goal:
Restore Water Quality and Quantity

Primary Comprehensive Plan Objective:
Restore, Improve, and Protect Water Resources

Secondary Comprehensive Plan Objectives:
Restore , Enhance, and Protect Habitats

Secondary Comprehensive Plan Goals:
Restore and Conserve Habitat

PF Restoration Technique(s):
Reduce excess nutrients and other pollutants to watersheds: Agriculture and forest management
Reduce excess nutrients and other pollutants to watersheds: Erosion and sediment control
Reduce excess nutrients and other pollutants to watersheds: Stormwater management
Restore hydrology and natural processes: Restore hydrologic connectivity
Restore hydrology and natural processes: Restore natural salinity regimes

Location

Location:
Texas Coastwide

HUC8 Watershed(s):
Texas-Gulf Region(Neches) - Neches(Lower Neches)
Texas-Gulf Region(Central Texas Coastal) - Guadalupe(Lower Guadalupe)
Texas-Gulf Region(Central Texas Coastal) - San Antonio(Lower San Antonio)
Texas-Gulf Region(Nueces-Southwestern Texas Coastal) - Southwestern Texas Coastal(San Fernando)
Texas-Gulf Region(Nueces-Southwestern Texas Coastal) - Southwestern Texas Coastal(Baffin Bay)

State(s):
Texas

County/Parish(es):
TX - Calhoun
TX - Kleberg
TX - Nueces
TX - Orange
TX - Refugio
TX - Victoria

Congressional District(s):
TX - 27
TX - 36
TX - 34

Narratives

Introduction and Overview:

The degradation of water quality on the Texas coast has put the environmental health of coastal ecosystems at risk. Water quality in Texas is adversely impacted by diverted freshwater inflows and an increase in nutrient input from agriculture (Brickier et al., 2007; Wetz et al., 2016; TCEQ, 2019). Water quality and the estuarine environments of coastlines are intrinsically linked. Healthy habitats associated with estuaries can act as filters, helping to remove sediments and pollutants to improve water quality. But when water quality is depleted due to increased nutrient loading, sensitive habitats become vulnerable to instances of eutrophication, hypoxia, and harmful algal blooms (Brickier et al., 2007; Wetz et al., 2017). Urban and agricultural land uses have been found to contribute significant amount of nutrients to nearby watersheds, leading to water quality degradation (Hopkinson and Vallino, 1995, Handler et al., 2006). The lack of freshwater inflow additionally puts marshes at risk, particularly freshwater marshes, which are vulnerable to changes in salinity. Extended periods of reduced inflows lead to increased salinity and nutrient reductions in bay waters, altering the composition and distribution of plant and animal populations (Elexander and Dunton, 2002). This program aims to restore water quality and freshwater inflows on the Texas coast using a variety of methods that will enhance the natural environment.

Coastwide, the implementation of best management practices (BMPs) to reduce non-point source pollution will improve the water quality of Texas bay systems. The goal of this program is to reduce nutrient loading into Texas bays, thereby reducing the instances of eutrophication, hypoxia or harmful algae blooms that impact economically valuable fisheries and sensitive habitat that occur within the bay systems (Park et al., 1994). This project would build on existing watershed studies and initiatives being undertaken by several water quality workgroups, including the DWH NRDA trustees. This program would incentivize farmers to utilize cropland management strategies and BMPs to reduce nutrient loading into waterways and ditches that drain into watersheds. These methods could include but are not limited to: conservation, constructed wetlands, cover crops, reduced till, nutrient management, filter strips, and vegetated/grassed waterways. Additionally, planning efforts, including engineering & design, will be used to identify and assess water quality activities that will provide restoration of hydrology and natural process to reduce excess nutrients.

This program will consider improving freshwater inflows by improving sections of existing drainage channels and tributaries and extending outfalls into nearby fresh or estuarine marshes. This will result in the introduction of more sediment and freshwater, which will help restore marshes suffering from the effects of saltwater intrusion and inundation and improve overall water quality. Multiple recent events, including Hurricane Ike (2008) and Hurricane Harvey (2017), have caused damage to drainage outfalls on the Texas coast, resulting in increased flooding in nearby communities and degraded water quality flowing into the bays. These natural disasters, along with land surface subsidence, and increasing residential development along important drainages have contributed to impairment.

This program will also consider improving water quality through the implementation of projects that utilize living shorelines, which consist of marsh plantings and, in higher energy environments, the construction of breakwaters to reduce erosion issues. This approach will also create new and protect existing critical environments that improve water quality and allow natural re-habitation by a variety of aquatic organisms.

This program will develop a process for selecting locations for water quality enhancements that build on Texas' stakeholder-driven process for developing the RESTORE Planning Framework and for selecting preliminary projects for FPL3 consideration. During this earlier work, county governments, NGOs, and a workgroup made up of Texas NFWF/NRDA and Texas Coastal Resiliency Master Plan

(TCRMP) (Texas General Land Office, 2019) representatives submitted 38 projects for FPL3 consideration. Coastal experts, HRI staff, and TCEQ staff reviewed the projects and selected 23 for public comment. Among these 23 projects, several projects included water quality enhancements that this program will consider for implementation, but additional projects that are part of the TCRMP will also be considered.

Texas is requesting $25,860,000 for the implementation of this program with an estimated program duration of 4 years. The overall program includes activities that may be scaled or phased, if necessary. Several independent project sites will be identified with distinct line item budgets for each component. Some projects can be phased by selecting individual methods for each distinct location contingent on the allocated funding available.

This program addresses the 2016 update to the Comprehensive Plan by using the best available science for restoring water quality and quantity, developing a monitoring and data management framework, and defining metrics of success of the various program components. Additionally, this program conforms to the RESTORE Planning Framework by adhering to the priority to restore, improve, and protect water resources.

Proposed Methods:

Voluntary BMPs are used to reduce nutrient loads from cropland, pastureland, privately held off-field areas and road rights- of-way (TCEQ, 2019). Targeted methods are tailored to the dry-land agricultural practices and livestock pastureland employed along watersheds where excess nutrient loads are a stressor to the system. Some recommended strategies include but are not limited to conservation, constructed wetlands, cover crops, reduced till, nutrient management, filter strips, and vegetated/grassed waterways.

Steps to effectively implement BMPs include:

1. Identify target watersheds where BMPs would be effective at improving water quality

2. Conduct outreach to local stakeholders and potential project partners

3. Implement BMPs or conservation strategies identified in various scientific literature and reports, including the Texas Coastal Waters: Nutrient Reduction Strategies Report (TCEQ, 2019)

4. Conduct monitoring and adaptive management

The implementation of BMPs should be evaluated on a case-by-case basis depending on landowner willingness, soil type, topography, crop type, agribusiness market conditions, planting and harvesting methods, livestock type, size of operation, annual precipitation, and other field specific factors (TCEQ, 2019). Cost-effectiveness of strategies should also be considered. Engagement of stakeholders and landowners to develop individual projects that employ effective and feasible strategies will be necessary to determine what will eventually be the overall approach to nutrient reduction in each watershed (TCEQ, 2019).

For drainage outfall repairs and other drainage mitigation activities of the program, enhancements will consist of improved channels and extension of outfalls into areas where water quality may improve before moving through the estuary and where the flow will enhance the outfall area, such as an adjacent marsh. The first phase of implementation after determining project locations will be full and complete hydraulic and hydrologic (“H&H”) assessments of the drainage outfalls, along with environmental impact assessments. Based on these assessments, the projects will be designed to improve water quality runoff entering estuaries and to enhance and restore adjacent marsh

complexes by increasing freshwater inflow into the system. The projects within the program will be designed in such a manner that the outfalls are maintainable on a short and long-term basis. Alternatively, following a complete environmental assessment, the program may include the incorporation of pumps and pump basins, which will lessen the length of any channel extension.

This program also aims to construct small scale (500-1000ft) living shorelines consisting of a breakwater or groin with marsh plantings on bay shorelines to improve water quality. In general, the living shoreline design and implementation process will follow these steps:

1. Identify priority areas and analyze site-specific information
2. Engineering and design
3. USACE Permitting
4. Oversee bidding and contractor selection
5. Construction
6. Monitoring and adaptive management.

The type of living shoreline must be location specific. Living shorelines are not a one size fits all mechanism - they are versatile and can be designed and tailored to fit the specific conditions at that site (Morris et al., 2018). Site conditions that will affect living shoreline design include water depth, wave energy and the current rate of erosion.

Environmental Benefits:

This program seeks to improve the quality of water flowing across our coastal watersheds and through our estuaries. Water quality (and quantity) is not only fundamental to the ecosystem, but it is impacted by many activities occurring in the coastal zone including agriculture, navigation, recreation, and development. This program will use proven techniques to improve estuarine water quality thus improving ecosystem health.

Implementing BMPs will protect and restore water quality within identified impaired Texas watersheds and their headwater tributaries, which will enhance ecosystem services and improve the overall productivity of the systems. Water quality is a major determinant of the health of estuaries (Whitfield and Elliott, 2002, Eby et al., 2005). There is a growing urban footprint on coastal land use coverage, and agriculture remains a significant land use in many Texas watersheds (NOAA Coastal Change Analysis Program). Highly urbanized and agricultural watersheds tend to have high inorganic nutrient, dissolved organic matter and chlorophyll concentrations where the system has excessive wastewater effluent, leading to water quality degradation through pollutant inputs (Hopkinson and Vallino,1995; Handler et al., 2006; Wetz et al., 2016). Reduction of excessive nutrient loading into Texas coastal waters will help maintain stable food webs, healthy and diverse seagrass and wetland plant communities, and increase populations of recreationally and commercially important fish and macroinvertebrate species (Wetz et al., 2016). Additionally, BMPs will aid in reducing the instances of eutrophication, hypoxia or harmful algae blooms (Wetz et al., 2017).

Improving drainage channels and outfalls will result in the increase of freshwater inflows to the estuarine system, restoring natural salinity gradients (Palmer et al., 2002). Coastal marshes in Texas depend upon periodic freshwater inundation to support current community structure and promote further establishment and expansion of emergent vegetation, but decades of watershed modifications have dramatically decreased freshwater discharge into Texas estuaries (Elexander and Dunton, 2002). The introduction and restoration of more freshwater into estuarine marshes will enhance and help restore estuarine marsh from adverse effects caused by the lack of inflows and/or the inundation of saltwater into these important ecosystems. More inflow will also bring sediments to marshes increasing vertical accretion rates and partially countering inundation by rising sea level

(White et al., 2002). Additionally, improved drainage will enhance community resilience by reducing the risk of flooding and property damage.

Implementation of a living shoreline has the potential to improve water quality by reducing erosion and creating environments that filter pollutants. Living shorelines also increase coastal resiliency by buffering storm surges (Arkema et al., 2013; Barbier et al., 2013; Manis et al., 2015). Oyster reefs and breakwater structures can become valuable substrate for marine organisms, as well as provide shelter and habitat for many fish, crab, oysters and other mobile species (Davis et al., 2006; Scyphers, et al., 2011). Reefs and offshore structures also dampen wave energies and increase sediment retention. Because shellfish are filter feeders, oyster reefs can improve water quality (Scyphers, et al., 2011). Living shorelines also contribute to healthy habitat for juvenile fish, which can improve recreational and commercial fisheries in the area, thus protecting important natural resources that support actives which are critically important to the region's economy such as fishing, hunting, and nature-based tourism (Sutton-Grier, et al., 2015).

Metrics:

Metric Title: HM001: Nutrient reduction - Lbs. N avoided or removed: Habitat Management
Target: TBD
Narrative: After project selection and design is complete, a quantitative target of nitrogen reduction will be set. The nitrogen target for each watershed implementing a BMP plan will be different but guided by recommendations from the EPA (EPA, 2017).

Metric Title: HM003: Nutrient reduction - Lbs. P avoided or removed: Habitat Management
Target: TBD
Narrative: After project selection and design is complete, a quantitative target of phosphorus reduction will be set. The phosphorus target for each watershed implementing a BMP plan will be different but guided by recommendations from the EPA (EPA, 2017).

Metric Title: HM005: Agricultural BMPs - acres under contracts/agreements: Habitat Management
Target: TBD
Narrative: A key component of this program will be implementing BMP agreements with land owners at a scale large enough to impact the nutrient loads in targeted watersheds. After project selection and design is complete, a quantitative target of acres under BMP agreements will be set so that the intended goals are met.

Metric Title: HR013: Wetland restoration - Acres restored: Habitat Restoration
Target: TBD
Narrative: Freshwater wetlands will be targeted for restoration through the increase of freshwater inflows via improved drainage. After project selection and design is complete, a quantitative target of wetland acres restored will be set.

Metric Title: RES002: Watershed management - # upgrades to stormwater and/or wastewater systems: Watershed Management
Target: TBD
Narrative: A key to the success of the program is to upgrade stormwater drainage systems at a scale large enough to have an impact on wetlands and communities. After project selection and design is complete, a quantitative target of upgrades will be set.

Metric Title: HR003: Stream restoration - Miles of stream channel protection installed: Habitat Restoration
Target: TBD
Narrative: A key to the success of the program is to upgrade stream channels at a scale large enough to have an impact on wetlands. After project selection and design is complete, a quantitative target of the length of protected channels will be set.

Metric Title: HR009: Restoring hydrology - Acres with restored hydrology: Habitat Restoration
Target: TBD
Narrative: Restoring hydrology is a key outcome in this program to positively impact wetlands that have been affected by altered hydrology. After project selection and design is complete, a quantitative target of the acres of restored hydrology will be set.

Risk and Uncertainties:

The major uncertainty in implementing BMPs is the willingness of agriculture producers and land managers to participate in a BMP program. Stakeholders may need to be incentivized to participate in the program. Education levels, capital, income, farm size, access to information, positive environmental attitudes, environmental awareness, and utilization of social networks are variables that are positively associated with adoption rates (Prokopy et al., 2008). Understanding the stakeholder's perspective and working with them will be key to the program's success.

Risks and uncertainties surrounding construction activities involve the long-term sustainability of the enhancements and repairs, weather events, relative sea level rise, the degree of drainage improvement, and the response of degraded habitats to the increase in freshwater input. Monitoring and adaptative management will decrease these risks.

The predominant risk to living shorelines is relative sea level rise and compaction of soils which lowers breakwater elevation, reducing their effectiveness. and potentially drowning intertidal marsh plantings. In order to alleviate this risk, relative sea level rise will be incorporated into the design to ensure that elevations remain sufficient to protect the shorelines from erosive forces and promote sediment trapping to decrease water depths to levels that support marsh vegetation. Additionally, incomplete geotechnical information regarding substrate stability and data on wave and tidal energy, sea level changes, water quality, and sediment supply can cause a project to be risky. This program will assess each project site for data gaps and for suitability for using a living shoreline technique.

Monitoring and Adaptive Management:

Project monitoring for this program will involve observations for ensuring (1) proper construction, (2) performance, and (3) to support adaptive management (NAS, 2017). Type of monitoring data will include biophysical observations (vegetation, hydrologic, nutrient load, salinity) of the project and of adjacent areas to serve as reference sites and to detect off site impacts (DWH-NRDA, 2017). Monitoring will occur on semiannual or annual bases for a minimum of two years following project completion.

Watersheds implementing BMPs will be monitored for changes in nutrient load via water samples taken regularly. Since the primary goal of the program is to reduce non-point source pollution from agriculture, the primary metric of success will be measuring the amount of nitrogen and phosphorous removed or avoided in each system. Other water quality parameters can be assessed while the samples are collected, such as water temperature, dissolved oxygen, and salinity, that are also important indicators of the functioning of the watershed (EPA, 2017).

Construction activities to improve drainage will be monitored for the effectiveness of the repairs/enhancements. Primary indicators of success will be the number of enhancements made, the health of adjacent marsh complexes, and the total acres of restored hydrology. Methods of monitoring may include regular vegetation sampling, salinity sampling, measuring flow characteristics, and land cover surveys (NAS, 2017).

A successful living shoreline requires maintenance and monitoring (NAS, 2017; Thayer et al., 2005; TGLO, 2020). Monitoring the area over time will help determine how well the living shoreline is performing and if it is providing the expected benefits. Semiannual or annual project monitoring will enable effective adaptive management actions such as additional vegetation plantings, removal of debris at the project site, and repositioning of structural components (Kreeger and Moody, 2014; TGLO, 2020).

Data Management:

Data management for this program will make data publicly available thereby enhancing outcomes and future restoration efforts.

Planning data: During program planning, a variety of existing data and newly acquired data will be gathered. Data in this category includes mostly existing geospatial data on land cover, land use, water quality, elevation, and ecological data describing past and current environmental conditions. Geotechnical and engineering data with construction specifications are also included.

Project implementation data: these data are needed for determining as-built conditions. Detailed engineering survey data and photography are included.

Post-project implementation data: these data are needed for monitoring performance, informing adaptive management actions, and for improving future projects. They include time series of biophysical and engineering data plus hydrological and water quality data for understanding trends.

Program activities will identify data used. TCEQ and GRIIDC (Gibeaut, 2016) will work with data users to ensure data are shared when key activities end. GRIIDC is a well-known data repository designed to receive data from a variety of sources and from various scientific and engineering disciplines. GRIIDC will track, curate, and archive data in the GRIIDC repository and make it publicly discoverable and available. Metadata will follow the ISO 19115-2 standard and datasets will be reviewed for completeness and organization to enable reuse.

Collaboration:

Two Texas workgroups were established to provide input on coastal priorities: State & Federal Representatives and Non-Governmental Organizations. On-line and in-person meetings were held to discuss plans to develop Texas coastal priorities and to ensure the public's involvement. A survey was developed that asked for individual's coastal priorities. These surveys were available to the public and were also completed by members of the two work groups. Public meetings were conducted in three coastal cities for the public to present their issues and concerns. Information received from workgroup meetings, discussions with elected officials, public meetings and the surveys was used to develop a list of priorities to be included in the RESTORE Council's Planning Framework document. These efforts of collaboration will continue throughout the process to develop programs and projects. Work will continue with Texas representatives for NRDA/NFWF to consider leveraging opportunities.

Public Engagement, Outreach, and Education:

The decision to submit this program was based on many months of discussions with work groups and participation by the public. It began with discussions with the Texas representatives for NRDA & NFWF to identify programs/projects for FPL 3b. This identified list was shared with the two workgroups (State & Federal and NGOs) established for Bucket 2 planning purposes, for their review and comment. County judges in the coastal area also were given the opportunity to identify potential programs/projects for their areas. Using the information compiled as part of this process, a list of 23 projects were posted for public comment on the Texas RESTORE website. In addition, two public hearings were held in coastal cities. In reviewing the comments received, the timing to move forward with proposals, and in discussions with the Texas Governor's staff, it was determined that program rather than project specific proposals would be submitted. The development of the program proposals was done to ensure that projects posted for public comment could be considered in at least one of the program submissions. Much of the work has already been done to identify projects that could be funded within this program submission. The process to select FPL 3b grant recipients will include the requirement that projects will have to already been vetted by this process or through other public processes such as the GLO's Coastal Resiliency Master Plan, or NRDA & NFWF related activities. The criteria to select the specific projects would include, but not limited to, the following: addresses issues presented in the program proposal; amounts of funds available for the program; readiness; leveraging opportunities; scalability; risk/benefit ratio; and distribution of funds across the Texas coastline. Notification of the projects selected to receive grant funds will be posted on the Texas RESTORE website. This overall process, parts already completed and others to be completed after the program has been approved for FPL 3b funds, will ensure that the ultimate selection of projects for this program are not only consistent with the RESTORE Planning Framework document, but also reflect the ideas that were discussed by the work groups, the elected officials, the public and the Office of the Governor.

Leveraging:

Funds:TBD
Type: TBD
Status: TBD
Source Type: TBD
Description: The expectation is that programs that are ultimately selected for funding in Texas could likely include partnerships leveraging various funds, including RESTORE, NRDA and NFWF monies. In continuing discussions with NRDA, NFWF, county judges and NGOs, all parties have emphasized the need to leverage DWH Oil spill associated funds, as well as other funds, and it is Texas' intent to consider leveraging as a criteria in selecting projects. This selection process would be similar to the decision-making associated with the Texas pre-proposals. Addressing water quality/quantity challenges has been a focus of RESTORE, NRDA & NFWF and we intend to leverage FPL 3b funds to expand those efforts in on-going relationships.

Environmental Compliance:

Drainage channel and outfall enhancements and repairs will be presented to the United States Army Corps of Engineers for approval and permitting purposes. Project permitting may also be required from the Texas Historical Commission, U.S. Fish & Wildlife Services, and Texas Commission on Environmental Quality.

Living shorelines implementation will require Section 10 and 404 permits from the Corps and a submerged lands lease from the Texas General Land Office. The Corps permit process ensures compliance with all applicable federal laws, primarily environmental laws such as the Clean Water

Act. Coordination is planned with the USACE and reviewing agencies such as Texas General Land Office, United States Fish and Wildlife Services, Texas Commission on Environmental Quality will be necessary to address regulation compliance with the Coastal Zone Management Act, Endangered Species Act, Clean Water Act, Coastal Barrier Resource Act, and the Rivers and Harbors Act, and other as applicable.

The FPL Category 1 portion of this program involves only planning actions that are covered by the Restore Council's NEPA Categorical Exclusion for planning, research, or design activities (Section 4(d)(3) of the Council's NEPA Procedures). The implementation component is currently proposed for Category 2. Texas intends to work with other members of the Council to move some or all of the implementation component to Category 1 prior to a Council vote on the final FPL.

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Budget

Project Budget Narrative:
The total requested for this program is $25.86 million. Of that amount, approximately $24.5 million will be provided to sub-recipients to implement projects selected for this program. TCEQ estimates that it will require approximately $1.36 million to support the following: administrative expenses (salary, indirect, travel, fringe, supplies, etc…); hosting & maintenance costs for the Texas RESTORE web site; and for a contract to provide technical assistance to TCEQ staff.

Total FPL 3 Project/Program Budget Request:
$ 25,860,000.00

Estimated Percent Monitoring and Adaptive Management: 0 %
Estimated Percent Planning: 6 %
Estimated Percent Implementation: 87.5 %
Estimated Percent Project Management: 5.5 %
Estimated Percent Data Management: 0 %
Estimated Percent Contingency: 1 %

Is the Project Scalable?
Yes

If yes, provide a short description regarding scalability.:
The overall program includes activities that may be selected from, enhanced or phased, if necessary. Several independent project sites will be identified with distinct line item budgets for each component. The project can be phased by selecting individual methods for each distinct parcel contingent on the allocated funding available.

Environmental Compliance[1]

Environmental Requirement	Has the Requirement Been Addressed?	Compliance Notes (e.g.,title and date of document, permit number, weblink etc.)
National Environmental Policy Act	No	The FPL Category 1 portion of this program involves only planning actions that are covered by the Restore Council's NEPA Categorical Exclusion for planning, research, or design activities (Section 4(d)(3) of the Council's NEPA Procedures). The implementation component is currently proposed for Category 2. If applicable, these requirements will be addressed and documentation will be supplied prior to a Council vote on the final FPL.
Endangered Species Act	No	The FPL Category 1 portion of this program involves only planning actions that are covered by the Restore Council's NEPA Categorical Exclusion for planning, research, or design activities (Section 4(d)(3) of the Council's NEPA Procedures). The implementation component is currently proposed for Category 2. If applicable, these requirements will be addressed and documentation will be supplied prior to a Council vote on the final FPL.
National Historic Preservation Act	No	The FPL Category 1 portion of this program involves only planning actions that are covered by the Restore Council's NEPA Categorical Exclusion for planning, research, or design activities (Section 4(d)(3) of the Council's NEPA Procedures). The implementation component is currently proposed for Category 2. If applicable, these requirements will be addressed and documentation will be supplied prior to a Council vote on the final FPL.
Magnuson-Stevens Act	No	The FPL Category 1 portion of this program involves only planning actions that are covered by the Restore Council's NEPA Categorical Exclusion for planning, research, or design activities (Section 4(d)(3) of the Council's NEPA Procedures). The implementation component is currently proposed for Category 2. If applicable, these requirements will be addressed and documentation will be supplied prior to a Council vote on the final FPL.
Fish and Wildlife Conservation Act	No	The FPL Category 1 portion of this program involves only planning actions that are covered by the Restore Council's NEPA Categorical Exclusion

[1] Environmental Compliance document uploads available by request (restorecouncil@restorethegulf.gov).

		for planning, research, or design activities (Section 4(d)(3) of the Council's NEPA Procedures). The implementation component is currently proposed for Category 2. If applicable, these requirements will be addressed and documentation will be supplied prior to a Council vote on the final FPL.
Coastal Zone Management Act	No	The FPL Category 1 portion of this program involves only planning actions that are covered by the Restore Council's NEPA Categorical Exclusion for planning, research, or design activities (Section 4(d)(3) of the Council's NEPA Procedures). The implementation component is currently proposed for Category 2. If applicable, these requirements will be addressed and documentation will be supplied prior to a Council vote on the final FPL.
Coastal Barrier Resources Act	No	The FPL Category 1 portion of this program involves only planning actions that are covered by the Restore Council's NEPA Categorical Exclusion for planning, research, or design activities (Section 4(d)(3) of the Council's NEPA Procedures). The implementation component is currently proposed for Category 2. If applicable, these requirements will be addressed and documentation will be supplied prior to a Council vote on the final FPL.
Farmland Protection Policy Act	No	The FPL Category 1 portion of this program involves only planning actions that are covered by the Restore Council's NEPA Categorical Exclusion for planning, research, or design activities (Section 4(d)(3) of the Council's NEPA Procedures). The implementation component is currently proposed for Category 2. If applicable, these requirements will be addressed and documentation will be supplied prior to a Council vote on the final FPL.
Clean Water Act (Section 404)	No	The FPL Category 1 portion of this program involves only planning actions that are covered by the Restore Council's NEPA Categorical Exclusion for planning, research, or design activities (Section 4(d)(3) of the Council's NEPA Procedures). The implementation component is currently proposed for Category 2. If applicable, these requirements will be addressed and documentation will be supplied prior to a Council vote on the final FPL.
River and Harbors Act (Section 10)	No	The FPL Category 1 portion of this program involves only planning actions that are covered by the Restore Council's NEPA Categorical Exclusion for planning, research, or design activities

		(Section 4(d)(3) of the Council's NEPA Procedures). The implementation component is currently proposed for Category 2. If applicable, these requirements will be addressed and documentation will be supplied prior to a Council vote on the final FPL.
Marine Protection, Research and Sanctuaries Act	No	The FPL Category 1 portion of this program involves only planning actions that are covered by the Restore Council's NEPA Categorical Exclusion for planning, research, or design activities (Section 4(d)(3) of the Council's NEPA Procedures). The implementation component is currently proposed for Category 2. If applicable, these requirements will be addressed and documentation will be supplied prior to a Council vote on the final FPL.
Marine Mammal Protection Act	No	The FPL Category 1 portion of this program involves only planning actions that are covered by the Restore Council's NEPA Categorical Exclusion for planning, research, or design activities (Section 4(d)(3) of the Council's NEPA Procedures). The implementation component is currently proposed for Category 2. If applicable, these requirements will be addressed and documentation will be supplied prior to a Council vote on the final FPL.
National Marine Sanctuaries Act	No	The FPL Category 1 portion of this program involves only planning actions that are covered by the Restore Council's NEPA Categorical Exclusion for planning, research, or design activities (Section 4(d)(3) of the Council's NEPA Procedures). The implementation component is currently proposed for Category 2. If applicable, these requirements will be addressed and documentation will be supplied prior to a Council vote on the final FPL.
Migratory Bird Treaty Act	No	The FPL Category 1 portion of this program involves only planning actions that are covered by the Restore Council's NEPA Categorical Exclusion for planning, research, or design activities (Section 4(d)(3) of the Council's NEPA Procedures). The implementation component is currently proposed for Category 2. If applicable, these requirements will be addressed and documentation will be supplied prior to a Council vote on the final FPL.
Bald and Golden Eagle Protection Act	No	The FPL Category 1 portion of this program involves only planning actions that are covered by the Restore Council's NEPA Categorical Exclusion for planning, research, or design activities (Section 4(d)(3) of the Council's NEPA

		Procedures). The implementation component is currently proposed for Category 2. If applicable, these requirements will be addressed and documentation will be supplied prior to a Council vote on the final FPL.
Clean Air Act	No	The FPL Category 1 portion of this program involves only planning actions that are covered by the Restore Council's NEPA Categorical Exclusion for planning, research, or design activities (Section 4(d)(3) of the Council's NEPA Procedures). The implementation component is currently proposed for Category 2. If applicable, these requirements will be addressed and documentation will be supplied prior to a Council vote on the final FPL.
Other Applicable Environmental Compliance Laws or Regulations	No	The FPL Category 1 portion of this program involves only planning actions that are covered by the Restore Council's NEPA Categorical Exclusion for planning, research, or design activities (Section 4(d)(3) of the Council's NEPA Procedures). The implementation component is currently proposed for Category 2. If any other environmental compliance laws of regulations are applicable, those requirements will be addressed and documentation will be supplied prior to a Council vote on the final FPL.

Maps, Charts, Figures

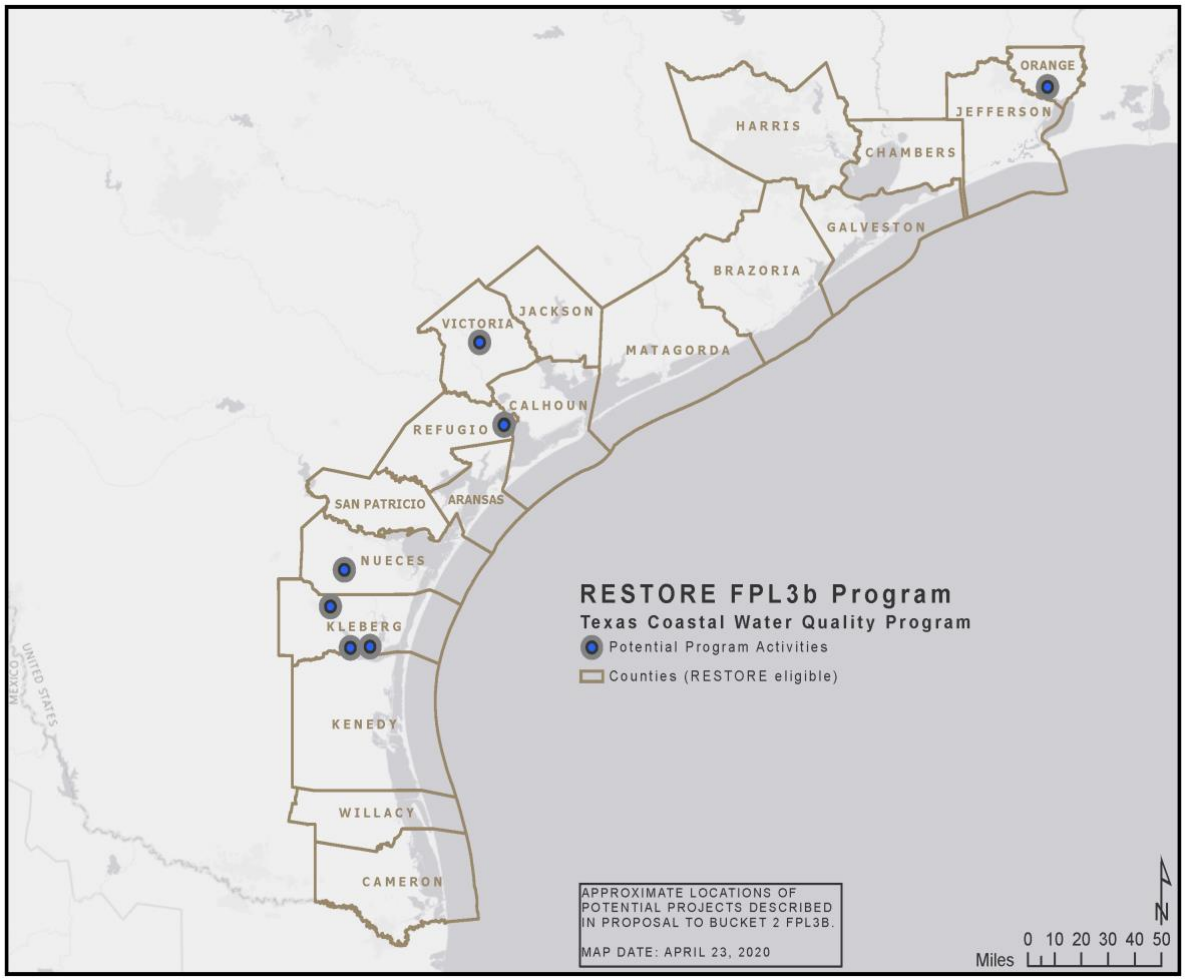

Figure 1: Approximate locations of Texas Coastal Water Quality program activities.

FPL 3b Internal Staff Review of Proposal Submitted 4/24/2020

Project/Program	Texas Coastal Water Quality Program		
Primary Reviewer	Heather Young	Sponsor	Texas
EC Reviewer	Heather Young	Co-Sponsor	
1. Is/Are the selected Priority Criteria supported by information in the proposal?			
Notes			
2. Does the proposal meet the RESTORE Act geographic eligibility requirement?			Yes
Notes			
3. Are the Comprehensive Plan primary goal and primary objective supported by information in the proposal?			Yes
Notes			
4. Planning Framework: If the proposal is designed to align with the Planning Framework, does the proposal support the selected priority approaches, priority techniques, and/or geographic area?			Yes
Notes			
5. Does the proposal align with the applicable RESTORE Council definition of project or program?			
Notes			
6. Does the budget narrative adequately describe the costs associated with the proposed activity?			No
Notes	Any changes resulting from movement of activities proposed for Category 2 to Category 1 as described in the Environmental Compliance comments below would also require changes in the budget narrative. Council staff recommend that the sponsor edit the budget narrative to specifically identify the amount of funding being requested in FPL Category 1 and FPL Category 2. If both planning and implementation are requested under either or both Categories, please identify the amount of funding requested for each activity type under Cat1 and Cat2. The proposed budget indicates that 6% of the overall program cost will be dedicated to Planning, and an additional 5.5% ($1.36 million) for Program Management. Program		

	Management activities described in the narrative can be grouped with Planning under Cat 1. A small amount of funding is budgeted for contingency; however there is no discussion of the need for contingency funding. Council staff recommend including a statement in the budget narrative that the need for contingency costs will be considered as appropriate when developing individual project-specific budgets for construction projects.

7. Are there any recommended revisions to the selected leveraged funding categories?			No
Notes			

8. Have three external BAS reviews been completed?	More information needed
Notes	Please see the external BAS review comments, and external reviews summary attached with these review comments.

9. Have appropriate metrics been proposed to support all primary and secondary goals?	Yes
Notes	

10. Environmental compliance: If FPL Category 1 has been selected for the implementation component of the project or program, does the proposal include environmental compliance documentation that fully supports the selection of Category 1?	No
Notes	The sponsor indicates Texas is seeking funding approval (FPL Category 1) for planning and implementation and is also proposing both planning and implementation as Category 2. However, both the environmental compliance section and checklist state only planning activities covered by the Council's NEPA Planning CE are proposed as Category 1, and that the implementation component is currently proposed for Category 2. This appears to be a discrepancy or a typo in the proposal. No environmental compliance documentation has been provided to Council staff to suggest that any implementation activities are ready for Category 1 consideration at this time. Therefore, Council staff recommends Texas propose all planning as Category 1 and implementation as Category 2 for now. Council staff also recommends revising the environmental compliance checklist to indicate "Yes" for NEPA and "N/A" for all other environmental requirements.The additional compliance notes provided are appreciated and can be left as is.

11. Geospatial Compliance: Have the appropriate geospatial files and associated metadata been submitted along with a map of the proposed project/program area?	More information needed

Notes	The submitted GIS project boundary includes the West San Antonio Bay watershed but does not intersect the Lower San Antonio watershed. Council staff recommends the sponsor add West San Antonio Bay watershed and remove Lower San Antonio watershed. The GIS project boundary does not intersect Calhoun County. Was this selection made because the Austwell Water Quality & Erosion Mitigation - Component IV project location will impact that county as well as Refugio? If yes, no action is recommended on County selection. If no, council staff also recommends Calhoun be removed from county list.

FPL 3b BAS Review Summary – Texas Coastal Water Quality Program

May 2020

Overall, the external Best Available Science reviews for the *Texas Coastal Water Quality Program* proposal are positive. All reviewers agree that the proposal is based on science that uses peer-reviewed data that directly pertains to the Gulf Coast region. In addition to pertinent peer-reviewed literature, the TCEQ (2019) report cited provides further background justification (Reviewer 2). All reviewers feel that the scientific basis of this project is justified using science that maximizes the quality, objectivity, and integrity of information, and that literature sources used to support the proposal are accurately and completely cited.

The program has clearly defined goals and objectives (all reviewers), with a focused strategy (Reviewer 2). The proposal provides a clear description of the methods proposed (all reviewers), and the numerous citations indicate an understanding of the systems being proposed (Reviewer 3). Reviewers note that while clear metrics for the interventions chosen through specific targets have yet to be determined in the planning stage (Reviewers 1 and 2), the development of overarching and nonbinding targets for the program as a whole could help in selecting projects to include in the program (Reviewer 1).

All reviewers agree the proposal "provides a thorough and well-researched outline of the likely environmental benefits of the proposed interventions" (Reviewer 1), including discussion of the benefits of implementing water quality BMPS, improving draining channels and outfalls, as well as creating living shorelines (Reviewer 2)." Reviewer 3 does recommend addressing the environmental cost-benefits of potential increases in human activities that may result from the improved drainages and inland flows. Reviewers note that while monitoring is only briefly discussed (Reviewers 2 and 3), the proposal clearly describes the different types of data that will need to be collected (Reviewer 1) as well as a good data management plan (Reviewer 3).

All reviewers agree that the proposal effectively evaluates uncertainties and risks in achieving its objectives over time. The proposal shows a clear understanding of risk, using effective sources to discuss approaches to mitigate those risks (Reviewers 1 and 2). Reviewer 1 calls attention to the proposal's willingness to participate in uncertainty in outlining research around correlations between demographic characteristics and participation in BMP programs. Risks and uncertainties are discussed along with monitoring and adaptive management to describe problem mitigation and evaluate progress (Reviewer 2). Reviewer 3 notes that while the proposal relies on strong adaptive management to minimize the potential for risks to adversely influence program outcomes, there is only one reference in the discussion of risk.

With regard to long-term environmental risks, reviewers agree while the proposal does a good job of identifying risks such as sea level rise (all reviewers), however more information should be provided to address risks related to climate change (Reviewers 1 and 2), changing land use (Reviewer 2), and stakeholder participation (Reviewer 3). Reviewers note that more information is needed to address implementation risks and uncertainties which may represent short or long term risks-- such as stakeholder participation (Reviewers 2 and 3), and possible changing land use (Reviewer 3).

While the justification of methods and discussion of risks implies an understanding of the risk that will require use of best management practices and adaptive management strategies (Reviewer 3), reviewers generally agreed that more information is needed to fully evaluate the past successes and failures of similar efforts (Reviewers 2 and 3). Reviewers highlight that Texas has demonstrated significant expertise in managing coastal zone restoration and partnering with the public (Reviewer 3), and the program seems to fit into an ongoing process in Texas (Reviewer 2).

In final comments, Reviewer 3 notes that this proposal seems to be on the correct track, suggesting that a stronger approach for land preservation perhaps though land trusts could be useful. Reviewer 2 highlights that the proposal is focused on several key issues, with a clear sub-project selection process.

Texas Coastal Water Quality Program

RESTORE Act Bucket 2 FPL3b Proposal

Response to Best Available Science External Review

15 June 2020

From summary of BAS reviews provided by RESTORE Council Staff:

"Overall, the external Best Available Science reviews for the Texas Coastal Water Quality Program proposal are positive. All reviewers agree that the proposal is based on science that uses peer-reviewed data that directly pertains to the Gulf Coast region. In addition to pertinent peer-reviewed literature, the TCEQ (2019) report cited provides further background justification (Reviewer 2). All reviewers feel that the scientific basis of this project is justified using science that maximizes the quality, objectivity, and integrity of information, and that literature sources used to support the proposal are accurately and completely cited."

Following are replies to specific comments.

> (1) Reviewers 1 and 2: Note that clear metrics for the interventions chosen through specific targets have yet to be determined in the planning stage.

Reply: Metrics were determined with the help of Restore council staff to address a broad range of proposed actions that program aims to implement. Once program and project selection has occurred, more specific metric targets will be developed but it is not currently required at the FPL proposal stage.

> (2) Reviewer 1: The development of overarching and nonbinding targets for the program as a whole could help in selecting projects to include in the program.

Reply: Overarching targets for the projects are reflected in the metrics chosen to evaluate the success of the program (reduction in nutrients, acres of wetlands restored, acres of land under BMP agreements, number of upgrades to stormwater and wastewater systems). Projects chosen from implementation will be guided by and align with these metrics.

> (3) Reviewer 3: Recommends addressing the environmental cost-benefits of potential increases in human activities that may result from the improved drainages and inland flows.

Reply: Important concern here. Text to be added to the uncertainty and risk section is below. (See also reply to comment 6)

Text: "Additional uncertainties include the potential impacts from changes in human activity and land use that may result from improvements in drainage and inland flows. Increasing population trends in coastal areas will impact drainage capacity through the increase in impermeable surfaces and may cause increases in point source pollution from storm drains, industrial facilities, and sewage treatment plants (Arnolda and Gibbons, 1996; Winter et al., 1998). Additionally, the reduction in flood risk may encourage even further expansion of development and impermeable surfaces in the area, which will put more pressure on the drainage capacity. Improvements to existing drainage systems and enhancement and protection of wetlands with these population increase pressures in mind will be critical to the success of the program."

References:

Arnold CL Jr. and Gibbons CJ. 1996. Impervious Surface Coverage: The Emergence of a Key Environmental Indicator, Journal of the American Planning Association, 62:2, 243-258, DOI: 10.1080/01944369608975688

Winter, TC, Harvey JW, Franke OL, and Alley WM. 1998. U.S. Geological Survey Circular 1139. Denver, Colorado. Link.

> (4) Reviewers 2 and 3: Monitoring is only briefly discussed. (Reviewer 1 does note that the proposal clearly describes the different types of data that will need to be collected, and Reviewer 3 notes that a good data management plan has been described).

Reply: Project monitoring is imprecise at this point in the program since project selection still needs to take place. A detailed monitoring plan that would describe the parameters needed to demonstrate program success is not required at the FPL proposal stage but will be developed fully for all projects implemented from this program. A data collection program will be key to the success of this program.

> (5) Reviewer 3: Notes that while the proposal relies on strong adaptive management to minimize the potential for risks to adversely influence program outcomes, there is only one reference in the discussion of risk.

Reply: We will include additional references. See highlighted additions below:

> The major uncertainty in implementing BMPs is the willingness of agriculture producers and land managers to participate in a BMP program. Stakeholders may need to be incentivized to participate in the program. Education levels, capital, income, farm size, access to information, positive environmental attitudes, environmental awareness, and utilization of social networks are variables that are positively associated with adoption rates (Feather and Amacher, 1994; Prokopy et al., 2008). Understanding the stakeholder's perspective and working with them will be key to the program's success. Compared to regulation or financial incentives, raising producer information levels may be a more cost-effective method of increasing adoption, and so an information program may be part of BMP implementation. (Feather and Amacher, 1994) .
>
> Risks and uncertainties surrounding construction activities involve the long-term sustainability of the enhancements and repairs, weather events, relative sea level rise, the degree of drainage improvement, and the response of degraded habitats to the increase in freshwater input (Winter et al., 1998; NAS, 2017). Monitoring and adaptative management will decrease these risks.
>
> The predominant risk to living shorelines is relative sea level rise and compaction of soils which lowers breakwater elevation, reducing their effectiveness, and potentially drowning intertidal marsh plantings (Hardaway et al., 2010). In order to alleviate this risk, relative sea level rise will be incorporated into the design to ensure that elevations remain sufficient to protect the shorelines from erosive forces and promote sediment trapping to decrease water depths to levels that support marsh vegetation . Additionally, incomplete geotechnical information regarding substrate stability and data on wave and tidal energy, sea level changes, water quality,

and sediment supply can cause a project to be risky (Hardaway et al., 2010; Galveston Bay Foundation, 2014). This program will assess each project site for data gaps and for suitability for using a living shoreline technique.

References:

Feather PM and Amacher GS. 1994. Role of information in the adoption of best management practices for water quality improvement. Agricultural Economics, Volume 11, Issues 2–3, Pages 159-170, https://doi.org/10.1016/0169-5150(94)00013-1.

Winter, TC, Harvey JW, Franke OL, and Alley WM. U.S. Geological Survey Circular 1139. Denver, Colorado, 1998. Link.

Hardaway, SC, Milligan DA, and Duhring, K. "Living Shoreline Design Guidelines for Shore Protection in Virginia's Estuarine Environments." Special Report in Applied Marine Science and Ocean Engineering No. 421, Virginia Institute of Marine Science, September 2010.

Galveston Bay Foundation (GBF). Living Shorelines: A Natural Response to Erosion Control. Houston, Texas. 2014. Link.

(6) Reviewers 1, 2, and 3: Suggest more information should be provided to address risks related to climate change, changing land use, and stakeholder participation. Reviewers 1, 2, and 3: Suggest more information is needed to address implementation risks and uncertainties which may represent short or long term risks-- such as stakeholder participation and possible changing land use.

Reply: Will add risks and uncertainties relating to climate change, LULC change, and stakeholder participation. See text additions below. (Paragraph 2 also addressed in comment 3)

Text: "Understanding the stakeholder's perspective and working with them will be key to the program's success. Compared to regulation or financial incentives, raising producer information levels may be a more cost-effective method of increasing adoption, and so an information program may be a key component of BMP implementation (Feather and Amacher, 1994).

Additional uncertainties include the potential impacts from changes in human activity and land use that may result from improvements in drainage and inland flows. Increasing population trends in coastal areas will impact drainage capacity through the increase in impermeable surfaces and may cause increases in point source pollution from storm drains, industrial facilities, and sewage treatment plants (Winter et al., 1998). Additionally, the reduction in flood risk may encourage even further expansion of development and impermeable surfaces in the area, which will put more pressure on the drainage capacity. Improvements to existing drainage systems and enhancement and protection of wetlands with these population increase pressures in mind will be critical to the success of the program.

The effects of climate change pose additional uncertainties. Climate changes are likely to directly impact precipitation patterns and urban drainage (Arnbjerg-Nielsen et al., 2013). Extreme rainfall events will likely become more frequent in the future, impacting urban drainage systems and potentially overwhelming their capacity (Toffol and Rauch, 2009). If wetlands, especially those that are impounded, are flooded when urban infrastructure fails, those wetlands can become permanently flooded and revert to open water (Day et al., 1990). Although the magnitude of these changes is still uncertain,

designing drainage improvements considering climate change impacts will be important to the long-term success of these projects (Grum et al., 2006)."

References:

Arnbjerg-Nielsen K, Willems P, Olsson J, et al. 2013. Impacts of climate change on rainfall extremes and urban drainage systems: a review. Water Sci Technology, 68(1):16-28. doi:10.2166/wst.2013.251

Day, RH, Holz, RK, and Day JW. 1990. An inventory of wetland impoundments in the coastal zone of Louisiana, USA: Historical trends. Environmental Management 14, 229–240. https://doi.org/10.1007/BF02394040

De Toffol S, Laghari AN, Rauch W. 2009. Are extreme rainfall intensities more frequent? Analysis of trends in rainfall patterns relevant to urban drainage systems. Water Sci Technology, 59(9), 1769-1776. doi:10.2166/wst.2009.182

Grum M, Jørgensen AT, Johansen RM, and Linde JJ. 2006. The effect of climate change on urban drainage: an evaluation based on regional climate model simulations. Water Sci Technology, 54 (6-7): 9–15. doi: https://doi.org/10.2166/wst.2006.592

(8) Reviewers 2 and 3: Suggest more information is needed to fully evaluate the past successes and failures of similar efforts.

Reply: We will add incorporate text addressing this in the Introduction section of the narrative as follows:

Text: "Texas has a history of success in implementing BMPs. The Texas Water Development Board (TWBD) and TCEQ work closely with stakeholders to implement and maintain resources for agriculture, industrial, and municipal BMPS (TWBD, 2013). Local NGOs, like the Coastal Bend Bays and Estuaries Program, have also developed large stakeholder groups and funded studies that will help further enhance the efficacy of BMPs in critical watersheds (CBBEP, 2020).

Drainage improvement projects in coastal Texas have proven to be critical and are especially a priority for communities after Hurricane Harvey made landfall in 2017 (GLO, 2019). Houston was greatly impacted post-Harvey due to the failure of the bayous and reservoirs to drain the extreme amount of precipitation dumped by the storm (Zhang et al., 2018). Increasing development and climate change likely increasing the frequency and intensity of storms will only further compound this problem, especially along the relatively wetter upper Texas coast (Toffol and Rauch, 2009). Studies have shown that suitably large scale and holistically considered infrastructure improvements that consider the system as a whole are better at draining large areas than traditional methods, like curb-and-gutter and underground piping (Brabec, 2009; Dietz and Clausen, 2008; Ellis and Marsalek, 1996; Yang and Li, 2013). Improving local infrastructure and drainage will be critical to protecting both the natural environment and local communities.

Past successful living shoreline projects implemented in Texas projects include Clear Lake Forest Park on Galveston Bay and the Shipe Woods living shoreline on Trinity Bay. Both living shorelines were constructed with funding from NOAA and the Galveston Bay Foundation. The two projects are on higher energy, eroding shorelines and include breakwater elements combined with marsh plantings. Living

shorelines have a long history of being successful alternatives to traditional shoreline armoring methods (Hardaway et al., 2010)."

References:

"Baffin Bay Stakeholder Group – Coastal Bend Bays & Estuaries Program." Coastal Bend Bays Estuaries Program, 2020, www.cbbep.org/baffin-bay/.

Brabec E. 2009. Imperviousness and land use policy: Toward an effective approach to watershed planning. J. Hydrol. Eng., 14, 425–433

Dietz ME and Clausen C. 2008. Stormwater runoff and export changes with development in a traditional and low impact subdivision, Journal of Environmental Management, 87:4, 560-566, https://doi.org/10.1016/j.jenvman.2007.03.026.

Ellis JB and Marsalek J. 1996. Overview of urban drainage: environmental impacts and concerns, means of mitigation and implementation policies, Journal of Hydraulic Research, 34:6, 723-732, DOI: 10.1080/00221689609498446

Galveston Bay Foundation (GBF). Living Shorelines: A Natural Response to Erosion Control. Houston, Texas. 2014. Link.

Texas General Land Office (TGLO). Summary of Hurricane Harvey State Action Plan. Austin, Texas. 2019. Link.

Texas Water Development Board (TWDB). Water Conservation Best Management Practices: Best Management Practices for Agricultural Water Users. Austin, Texas. September 2013. Link.

Zhang W, Villarini G, Vecchi GA, et al. 2018. Urbanization exacerbated the rainfall and flooding caused by hurricane Harvey in Houston. Nature 563, 384–388. https://doi.org/10.1038/s41586-018-0676-z

(9) Reviewer 3: Suggests that a stronger approach for land preservation perhaps though land trusts could be useful.

Reply: Although that is a proven and optimal solution, land preservation is outside the scope of this program. Another Texas FPL3 program is addressing land acquisition and those projects will have positive impacts on drainage and water quality enhancements.

Gulf Coast Ecosystem Restoration Council

FPL 3b Internal Best Available Science Review Panel Summary

July 2020

Introduction

On Tuesday, June 30, and Wednesday July 1, 2020 the RESTORE Council convened the Funded Priorities List (FPL) 3b Internal Best Available Science (BAS) Review Panel. The purpose of this internal panel was to use Council member-agency expertise to address external BAS review comments provided for FPL 3b submitted project/program proposals, and potentially identify project/program synergies not identified prior to proposal submission. The ultimate goal of the panel was to provide Council members with substantive best available science content to inform their decision-making.

The internal panel was convened via webinar with representatives from each of the Council's eleven member agencies present. Each BAS Panel member was provided the following:

1) Full FPL 3b proposals
2) 3 external BAS reviews for each proposal
3) Summary of external BAS reviews for each proposal
4) Proposal Sponsor's response to the BAS reviews summary
5) Any proposed revisions to the proposal

Proposal sponsors provided a brief synopsis of their proposal to the panel, a summary of comments made in external reviews, and discussed their proposed response to the external reviews. Council staff then solicited feedback from the panel on the proposal sponsor's presentation of comments and responses to those comments, and any additional BAS concerns. Council staff also solicited feedback on any existing or future synergies with other Gulf restoration activities. The proceedings of the meeting for this proposal are summarized below.

Texas

Texas Coastal Water Quality Program

Feedback from the panel on the proposal sponsor's presentation of comments and responses to those comments, and any additional BAS concerns:

Metrics: Clear metrics have yet to be determined and the development of overarching and nonbinding targets for the program could help in selecting projects.

- The BAS panel agrees that Texas has appropriately addressed this comment.

Monitoring: Monitoring is only briefly discussed.

- The BAS panel agrees that Texas has appropriately addressed this comment.

Risks: It is suggested that more information be provided to address risks related to climate change, changing land use, and stakeholder participation and should address the environmental cost-benefits of potential increases in human activities

- The BAS panel agrees that the response Texas has indicated will appropriately address this comment.

Lessons learned: It is suggested that more information is needed to fully evaluate the past successes and failures of similar efforts

- The BAS panel agrees that the response Texas has indicated will appropriately address this comment.

Techniques: A stronger approach for land preservation perhaps though land trusts could be useful.

- The BAS panel agrees that Texas has appropriately addressed this comment.

Panel comments on existing or future synergies with proposed activity:
Mississippi, Florida, Alabama, and Texas agree that synergies can be fostered between the proposed water quality improvement programs across these states, such as by adopting shared metrics, measures, and monitoring methodologies.

SCIENCE EVALUATION

Bucket 2: Comprehensive Plan Component

Proposal Title: Texas Coastal Water Quality Program
Location (If Applicable): Texas
Council Member Bureau or Agency: Texas Commission on Environmental Quality
Type of Funding Requested: Planning / Implementation

Reviewed by: Reviewer 1
Date of Review: 5/10/2020

Best Available Science:

These 4 factors/elements help frame the reviewer's answers to A, B and C found in next section:

Question 1.	
Have the proposal objectives, including proposed methods, been justified using peer reviewed and/or publicly available information?	Yes
Comments:	
The proposal's objectives and proposed methods are clearly justified using either peer reviewed and/or publicly available data.	

Question 2.	
If information supporting the proposal does not directly pertain to the Gulf Coast region, are the proposal's methods reasonably supported and adaptable to that geographic area?	Yes
Comments:	
The proposal directly pertains to the Gulf Coast region.	

Question 3.	
Are the literature sources used to support the proposal accurately and completely cited? Are the literature sources represented in a fair and unbiased manner?	Yes
Comments:	
The sources cited are represented fairly and accurately cited.	

Question 4.	
Does the proposal evaluate uncertainties and risks in achieving its objectives over time? (e.g., is there an uncertainty or risk in the near- and/or long-term that the project/program will be obsolete or not function as planned?)	Yes
Comments:	
The proposal identifies a number of major uncertainties and risks associated with implementing BMPs including the willingness of participants. Other major uncertainties and risks from construction to weather and climate related events are also outlined.	

Based on the answers to the previous 4 questions, and *giving deference to the sponsor to provide within reason the use of best available science,* the following three questions can be answered:

Question A	
Has the applicant provided reasonable justification that the proposal is based on science that uses peer- reviewed and publicly available data?	Yes
Comments:	
The proposal is based in best-available and well-researched science. It uses soures from both peer-reviewed and publicly available data.	

Question B	
Has the applicant provided reasonable justification that the proposal is based on science that maximizes the quality, objectivity, and integrity of information (including, as applicable, statistical information)?	Yes
Comments:	
The proposal shows a clear understanding of the types of data and evaluations needed to evaluate the program in a objective and accurate manner.	

Question C	
Has the applicant provided reasonable justification that the proposal is based on science that clearly documents and communicates risks and uncertainties in the scientific basis for such projects/programs?	Yes
Comments:	
The proposal shows a clear understanding of the risks the proposed program faces and uses effective sources to discuss approaches to mitigate those risks. With the willingness to participate uncertainty, the proposal outlines the research around correlations between demographic characteristics and willingness to participate in BMP programs.	

Science Context Evaluation:

Question A	
Has the project/program sponsor or project partners demonstrated experience in implementing a project/program similar to the one being proposed?	Yes
Comments:	
Click here to enter text.	

Question B	
Does the project/program have clearly defined goals objectives?	Yes
Comments:	
The proposal outlines clearly defined goals and metrics with which to measure them.	

Question C	
Has the proposal provided a clear description of the methods proposed, and appropriate justification for why the method is being selected (e.g., scientifically sound; cost-effectiveness)?	Yes
Comments:	
The proposal has included citations for the methods they will be using. These methods are well-researched and already implemented throughout the country.	

Question D	
Does the project/program identify the likely environmental benefits of the proposed activity? Where applicable, does the application discuss those benefits in reference to one or more underlying environmental stressors identified by best available science and/or regional plans?	Yes
Comments:	
The proposal provides a thorough and well-researched outline of the environmental benefits of the proposed interventions. The proposal describes these benefits in light of the stressors that the coast of Texas is facing.	

Question E	
Does the project/program have measures of success (i.e., metrics) that align with the primary Comprehensive Plan goal(s)/objectives? (Captures the statistical information requirement as defined by RESTORE Act)	Need more information
Comments:	
The proposal has identified clear metrics for the interventions chosen though the specific targets have yet to be determined. Developing overarching and nonbinding targets for the program as a whole could help in selecting projects to include in the program.	

Question F	
Does the proposal discuss the project/program's vulnerability to potential long-term environmental risks (i.e., climate, pollution, changing land use)? (Captures risk measures as defined under best available science by the RESTORE Act)	Need more information
Comments:	
The proposal does a good job of identifying environmental risks such as sea level rise and the compaction of soil. However one major risk that is not discussed is climate change. As the global temperature rises, precipitation rates throughout the country are expected to shift. This in turn will most likely increase sediment and nutrient loading in the nation’s rivers and wetlands. This could have a direct impact on the level of success of these projects and as such should be considered.	

Question G	
Does the project/program consider other applicable short-term implementation risks and scientific uncertainties? Such risks may include the potential for unanticipated adverse environmental and/or socio-economic impacts from project implementation. Is there a mitigation plan in place to address these risks? Any relevant scientific uncertainties and/or data gaps should also be discussed. (Captures risk measures as defined under best available science by the RESTORE Act)	Yes
Comments:	
The proposal does a good job of outlining short-term risks and uncertainties both in terms of project effectiveness and environmental risks.	

Question H	
Does the project/program consider recent and/or relevant information in discussing the elements above?	Yes
Comments:	
Click here to enter text.	

Question I	
Has the project/program evaluated past successes and failures of similar efforts? (Captures the communication of risks and uncertainties in the scientific basis for such projects as defined by the RESTORE Act)	Choose an item.
Comments:	
Click here to enter text.	

Question J	
Has the project/program identified a monitoring and data management strategy that will support project measures of success (i.e., metrics). If so, is appropriate best available science justification provided? If applicable, how is adaptive management informed by the performance criteria? (Captures statistical information requirement a defined by the RESTORE Act)	Yes
Comments:	
The proposal shows a clear understanding of the different sets of data that will need to be collected as well as methods of curating and archiving the data.	

Please summarize any additional information needed below:
Click here to enter text.

SCIENCE EVALUATION

Bucket 2: Comprehensive Plan Component

Proposal Title: Texas Coastal Water Quality Program
Location (If Applicable): Texas
Council Member Bureau or Agency: Texas Commission on Environmental Quality
Type of Funding Requested: Planning / Implementation

Reviewed by: Reviewer 2
Date of Review: 5/10/2020

Best Available Science:

These 4 factors/elements help frame the reviewer's answers to A, B and C found in next section:

Question 1.	
Have the proposal objectives, including proposed methods, been justified using peer reviewed and/or publicly available information?	Yes
Comments:	
There is good reference to the literature, both peer-reviewed articles as well as prior agency reports.	

Question 2.	
If information supporting the proposal does not directly pertain to the Gulf Coast region, are the proposal's methods reasonably supported and adaptable to that geographic area?	Yes
Comments:	
In general, where citations refer to studies outside the Gulf/Texas coastal region, they are nonetheless broadly applicable.	

Question 3.	
Are the literature sources used to support the proposal accurately and completely cited? Are the literature sources represented in a fair and unbiased manner?	Yes
Comments:	
While I certainly couldn't check everything, in general I would say that the referencing is fair and unbiased.	

Question 4.	
Does the proposal evaluate uncertainties and risks in achieving its objectives over time? (e.g., is there an uncertainty or risk in the near- and/or long-term that the project/program will be obsolete or not function as planned?)	Yes
Comments:	
Yes, the proposal discusses risks/uncertainties along with monitoring and adaptive management to help mitigate problems and evaluate progress.	

Based on the answers to the previous 4 questions, and *giving deference to the sponsor to provide within reason the use of best available science,* the following three questions can be answered:

Question A	
Has the applicant provided reasonable justification that the proposal is based on science that uses peer- reviewed and publicly available data?	Yes
Comments:	
Applicant cites pertinent literature as well as TCEQ (2019) report that provides further backround justification. This is achievable because the proposed program is reasonably well-focused (diverted freshwater inflows and increased nutrient input from agriculture plus living shorelines).	

Question B	
Has the applicant provided reasonable justification that the proposal is based on science that maximizes the quality, objectivity, and integrity of information (including, as applicable, statistical information)?	Yes
Comments:	
In general, yes, there is reasonable justification mainly through prior state planning. I was confused by the statement on p. 5 ('This program addresses the 2016 update to the Comprehensive Plan'….I'm guessing the Restore Council's 2016 update) where no such plan was listed. Nonetheless, there seems to be a reasonable, justified, and sound process behind the proposal.	

Question C	
Has the applicant provided reasonable justification that the proposal is based on science that clearly documents and communicates risks and uncertainties in the scientific basis for such projects/programs?	Yes
Comments:	
Yes, risks and uncertainties are discussed along with strategies for ameliorating this including monitoring and adaptive management.	

Science Context Evaluation:

Question A	
Has the project/program sponsor or project partners demonstrated experience in implementing a project/program similar to the one being proposed?	Yes
Comments:	
The project seems to fit into an ongoing process in Texas.	

Question B	
Does the project/program have clearly defined goals objectives?	Yes
Comments:	
I liked the fact that their strategy is fairly focused (i.e., on diverted freshwater inflows and increased nutrient input from agriculture plus living shorelines). However, many of the target metrics for success seem to be 'TBD'.	

Question C	
Has the proposal provided a clear description of the methods proposed, and appropriate justification for why the method is being selected (e.g., scientifically sound; cost-effectiveness)?	Yes
Comments:	
Within the proposal text itself, this is outlined with details left to a state report (TCEQ, 2019).	

Question D	
Does the project/program identify the likely environmental benefits of the proposed activity? Where applicable, does the application discuss those benefits in reference to one or more underlying environmental stressors identified by best available science and/or regional plans?	Yes
Comments:	
Proposers discuss benefits of implementing water quality BMPs, improving drainage channels and outfalls, as well as creating living shorelines.	

Question E	
Does the project/program have measures of success (i.e., metrics) that align with the primary Comprehensive Plan goal(s)/objectives? (Captures the statistical information requirement as defined by RESTORE Act)	Need more information
Comments:	
Metric for success are identified but targets are 'TBD'.	

Question F	
Does the proposal discuss the project/program's vulnerability to potential long-term environmental risks (i.e., climate, pollution, changing land use)? (Captures risk measures as defined under best available science by the RESTORE Act)	Need more information
Comments:	
There is brief discussion of relative sea level rise, but overall climate change and changing land use are not really addressed.	

Question G	
Does the project/program consider other applicable short-term implementation risks and scientific uncertainties? Such risks may include the potential for unanticipated adverse environmental and/or socio-economic impacts from project implementation. Is there a mitigation plan in place to address these risks? Any relevant scientific uncertainties and/or data gaps should also be discussed. (Captures risk measures as defined under best available science by the RESTORE Act)	Need more information
Comments:	
They do accept monitoring and adaptive management and also talk about possible need to incentivize stakeholders. But certainly there is little detail given addressing the issues raised in this question.	

Question H	
Does the project/program consider recent and/or relevant information in discussing the elements above?	Yes
Comments:	
TCEQ (2019) seems to bring in recent information.	

Question I	
Has the project/program evaluated past successes and failures of similar efforts? (Captures the communication of risks and uncertainties in the scientific basis for such projects as defined by the RESTORE Act)	Need more information
Comments:	
A discussion of what has or has not worked in the past was lacking.	

Question J	
Has the project/program identified a monitoring and data management strategy that will support project measures of success (i.e., metrics). If so, is appropriate best available science justification provided? If applicable, how is adaptive management informed by the performance criteria? (Captures statistical information requirement a defined by the RESTORE Act)	Need more information
Comments:	
Monitoring is only briefly mentioned. While there is a data management section, it is light on detail.	

Please summarize any additional information needed below:
Overall, I liked the fact that this proposal was fairly well-focussed on several key issues. Additionally, they seem to have a decent sub-project selection process well underway. But, there were several areas where the proposers could have been clearer on the details. Monitoring, data management, and metrics for success were all dealt with fairly briefly. Likewise, more information is needed on project vulnerabilities and risks. Information on past successes and failures (and ameliorization thereof) of the approaches would be helpful. I note, however, that the prescribed proposal format does limit the amount of information that can be contained in the proposal and thus makes is challenging to thoroughly address all elements.

SCIENCE EVALUATION

Bucket 2: Comprehensive Plan Component

Proposal Title: Texas Coastal Water Quality Program
Location (If Applicable): Texas
Council Member Bureau or Agency: Texas Commission on Environmental Quality
Type of Funding Requested: Planning / Implementation

Reviewed by: Reviewer 3
Date of Review: 5-7 May 2020

Best Available Science:

These 4 factors/elements help frame the reviewer's answers to A, B and C found in next section:

Question 1.	
Have the proposal objectives, including proposed methods, been justified using peer reviewed and/or publicly available information?	Yes
Comments:	
There is good justification of the proposed approaches and goals.	

Question 2.	
If information supporting the proposal does not directly pertain to the Gulf Coast region, are the proposal's methods reasonably supported and adaptable to that geographic area?	Yes
Comments:	
This question is not applicable to the proposal. The areas involved are in Gulf Coastal regions.	

Question 3.	
Are the literature sources used to support the proposal accurately and completely cited? Are the literature sources represented in a fair and unbiased manner?	Choose an item.
Comments:	
Yes, there are numerous literature sources.	

Question 4.	
Does the proposal evaluate uncertainties and risks in achieving its objectives over time? (e.g., is there an uncertainty or risk in the near- and/or long-term that the project/program will be obsolete or not function as planned?)	Yes
Comments:	
Uncertainties and risks related to landowner participation, sustainability of improved drainage systems and sea level rise are all addressed.	

Based on the answers to the previous 4 questions, and *giving deference to the sponsor to provide within reason the use of best available science,* the following three questions can be answered:

Question A	
Has the applicant provided reasonable justification that the proposal is based on science that uses peer- reviewed and publicly available data?	Yes
Comments:	
There are many peer reviewed and government reports supporting this proposal.	

Question B	
Has the applicant provided reasonable justification that the proposal is based on science that maximizes the quality, objectivity, and integrity of information (including, as applicable, statistical information)?	Yes
Comments:	
The literature cited justifies the proposed direction of the requested funding. It should be mentioned that this is a difficult question to answer for this type of overarching proposal to distribute funds for individual projects. Those projects are most likely to be the ones to justify their approaches with the type of literature requested here.	

Question C	
Has the applicant provided reasonable justification that the proposal is based on science that clearly documents and communicates risks and uncertainties in the scientific basis for such projects/programs?	Yes
Comments:	
There are several referenecs for adaptive management, but only one for actual risks. The yes is based on the reliance on strong adaptive management to minimize the potential for risks to adversely influence program outcomes.	

Science Context Evaluation:

Question A	
Has the project/program sponsor or project partners demonstrated experience in implementing a project/program similar to the one being proposed?	Yes
Comments:	
The State has demonstrated significant expertise in managing coastal zone restoration and partrering with the public.	

Question B	
Does the project/program have clearly defined goals objectives?	Yes
Comments:	
Coastal zones will be improved through management of non-point source influx, improvement of freshwater inflows, and nurturing of living shorelines.	

Question C	
Has the proposal provided a clear description of the methods proposed, and appropriate justification for why the method is being selected (e.g., scientifically sound; cost-effectiveness)?	Yes
Comments:	
There are numerous citations that incicate an understanding of the systems being proposed. The approaches to land and “stream” flow management is good. Attention to the environmental cost-benefits of potential increases in human activities that may result from the improved drainages and inland flows should be addressed. For example, if the water management makes land more accessible or more attractive for development or higher intensity agriculture, will this increase nutrient releases to sensitive coatal ecosystems?	

Question D	
Does the project/program identify the likely environmental benefits of the proposed activity? Where applicable, does the application discuss those benefits in reference to one or more underlying environmental stressors identified by best available science and/or regional plans?	Yes
Comments:	
Restoring freshwater inflows and expanding living shorelines will balance salt and fresh water inputs into estuaries thereby providing essential habitats for important species and protecting coastal recreational and private interests in coastal regions.	

Question E	
Does the project/program have measures of success (i.e., metrics) that align with the primary Comprehensive Plan goal(s)/objectives? (Captures the statistical information requirement as defined by RESTORE Act)	Yes
Comments:	
These are well described. It should be noted that some of the metrics may stongly covary. This may introduce bias into the selection or evaluation process. It is also possible that these metrics are appropriately selected to target well designed and comprehensive programs.	

Question F	
Does the proposal discuss the project/program's vulnerability to potential long-term environmental risks (i.e., climate, pollution, changing land use)? (Captures risk measures as defined under best available science by the RESTORE Act)	Need more information
Comments:	
Rising sea level and construction on properties adjacent to restoration activies are the only long term risks noted. Some general risks are likely to be long term, even if not explicitly listed as such. For example stakeholder participation could be short or long term.	

Question G	
Does the project/program consider other applicable short-term implementation risks and scientific uncertainties? Such risks may include the potential for unanticipated adverse environmental and/or socio-economic impacts from project implementation. Is there a mitigation plan in place to address these risks? Any relevant scientific uncertainties and/or data gaps should also be discussed. (Captures risk measures as defined under best available science by the RESTORE Act)	Need more information
Comments:	
Short term risks are not explicitly denoted. However, stakeholder participation and changing land useages could pose short or long term risks.	

Question H	
Does the project/program consider recent and/or relevant information in discussing the elements above?	Yes
Comments:	
Integration of current knowledge is well done.	

Question I	
Has the project/program evaluated past successes and failures of similar efforts? (Captures the communication of risks and uncertainties in the scientific basis for such projects as defined by the RESTORE Act)	Need more information
Comments:	
This is not explicitly addressed in the proposal, although the justification of methods and discussion of risks implies an understanding of the risk that require use ofbest management practices and adavtive management strategies.	

Question J	
Has the project/program identified a monitoring and data management strategy that will support project measures of success (i.e., metrics). If so, is appropriate best available science justification provided? If applicable, how is adaptive management informed by the performance criteria? (Captures statistical information requirement a defined by the RESTORE Act)	Yes
Comments:	
Although this section is brief, it does succinctly describe a very good data management system.	

Please summarize any additional information needed below:
This proposal seems to be on the correct track. A stronger approach for land preservation perhaps though land trusts could be useful. It is understood that such approaches are difficult and take significant trust between conservation and land owner groups. As part of this grant, Texas should be encouraged to accept land donations into their parks system for proper management, a practice the State has been largely unwilling to employ.