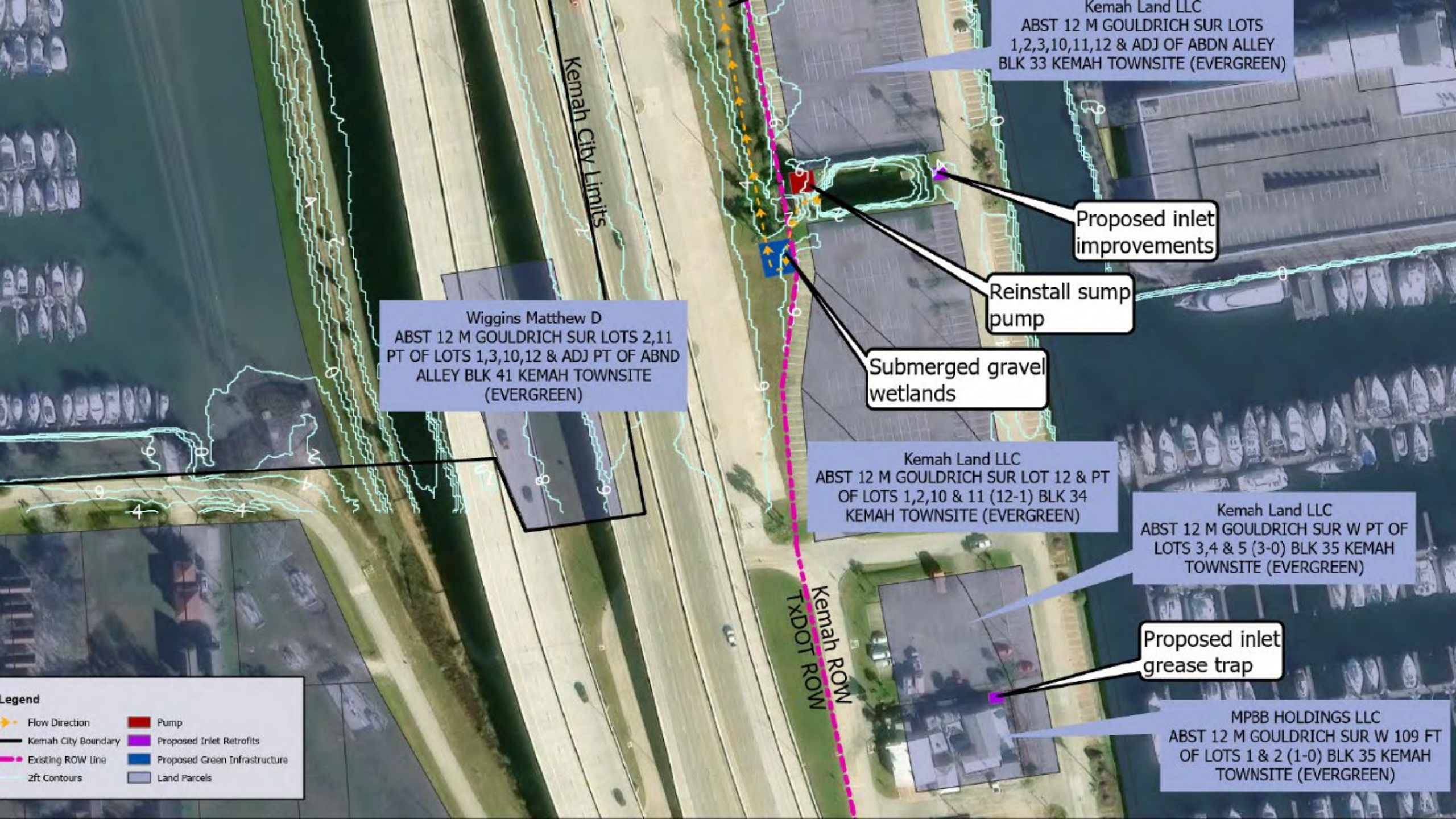


# Kemah Stormwater Pump Station Nature-Based Stormwater Infrastructure and Water Quality Improvements



Cesar Garcia  
City of Kemah, City Administrator  
409-941-9651  
[cgarcia@kemahtx.gov](mailto:cgarcia@kemahtx.gov)





**Photo 11.** Pump station discharge area and receiving channel immediately downstream of the pump station.



**Photo 27.** Receiving-water context beneath SH 146 near the downstream end of the project area and Clear Creek.



**Photo 8.** Existing forebay/inlet area with ponded water and visible sediment accumulation upstream of the pump station.



**Photo 25.** Receiving channel near the downstream end with emergent vegetation and accumulated sediment.



**Photo 12.** Receiving channel downstream of the pump station adjacent to the elevated SH 146 corridor.

| Kemah Pump Station                                                                                                                                                   |     |                      |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|----------------------|
| Cost Verification Controls must be in place to assure that construction costs are reasonable and consistent with market costs at the time and place of construction. |     |                      |
| <b>Applicant/Subrecipient:</b> City of Kemah, Texas                                                                                                                  |     |                      |
| Upgrades to the Kemah Pump Station to                                                                                                                                |     |                      |
| <b>Site/Activity Title:</b> Incorporate Green Infrastructure                                                                                                         |     |                      |
| <b>Eligible Activity:</b> Submerged Gravel Wetland                                                                                                                   |     |                      |
| Project Element                                                                                                                                                      |     | Construction Cost    |
| Proposed Inlet Area Improvements                                                                                                                                     |     | \$24,000.00          |
| Sump Pump Re-Installation                                                                                                                                            |     | \$50,000.00          |
| Submerged Gravel Wetland                                                                                                                                             |     | \$76,000.00          |
| Wetland Outlet Control Device                                                                                                                                        |     | \$12,000.00          |
| <b>Total Material Cost</b>                                                                                                                                           |     | <b>\$162,000.00</b>  |
| Mobilization                                                                                                                                                         | 10% | \$ 16,200.00         |
| Barricades                                                                                                                                                           | 3%  | \$ 4,860.00          |
| Prep Right-of-Way                                                                                                                                                    | 4%  | \$ 6,480.00          |
| Material Testing                                                                                                                                                     | 1%  | \$ 1,620.00          |
| Engineering                                                                                                                                                          | 15% | \$ 24,300.00         |
| Administration                                                                                                                                                       | 3%  | \$ 4,860.00          |
| Environmental (Permitting and SW3P)                                                                                                                                  | 6%  | \$ 9,720.00          |
| <b>Project Cost</b>                                                                                                                                                  |     | <b>\$ 230,040.00</b> |
| Contingency                                                                                                                                                          | 30% | \$ 69,012.00         |
| <b>Total Cost</b>                                                                                                                                                    |     | <b>\$ 299,052.00</b> |
| <b>Rounded Cost</b>                                                                                                                                                  |     | <b>\$ 300,000.00</b> |

# Kemah Stormwater Pump Station Nature-Based Stormwater Infrastructure and Water Quality Improvements



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# Design and Performance Metrics Decision Support for Green Infrastructure and Living Shorelines for Coastal Resilience



Hanadi S. Rifai and Abigail L. Beck  
University of Houston

*Partner: Galveston Bay Foundation*



***Best  
Management  
Practices***



***Living Shorelines  
&  
Nature Based  
Solutions***

# What is the project about?

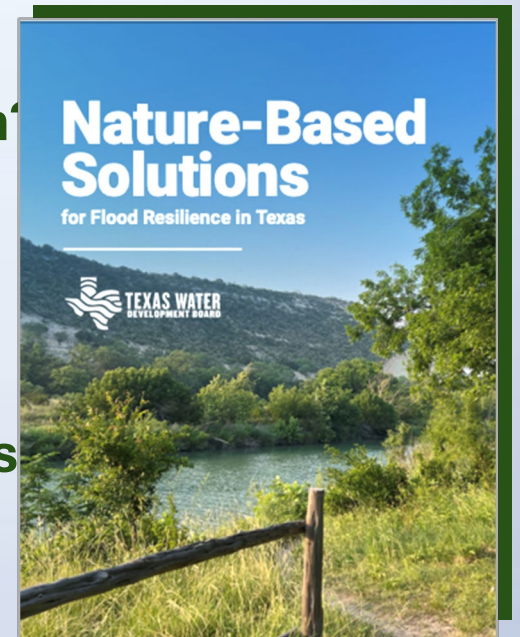
## The Need

A comprehensive framework to identify, classify, and rank potential GI implementations to reduce risks and increase resilience to **multiple stressors (flooding, extreme heat, drought, and environmental quality)**

## Closing the Gap: Project Goal

A risk-based decision support framework for GI with design and performance metrics

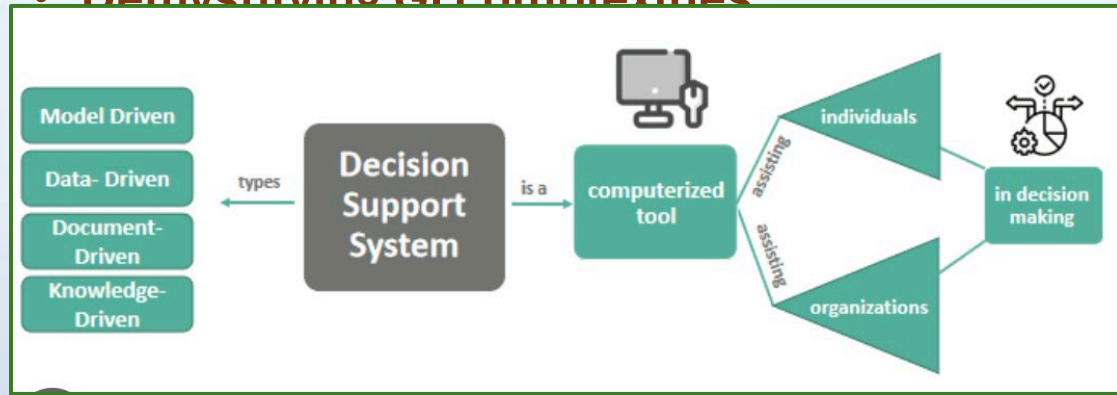
- Green Infrastructure (GI) of interest for mitigation and adaptation, exemplified by:
  - Implementations Under Way
  - Guidance Manuals
  - Training Programs
  - Advocacy Efforts
- Community Perception
- Always considered?
- Hard infrastructure long timelines
- At scale considerations
- O&M challenges



# Project Scope and Novelty: *urban, rural, coastal, at scale*

## Prioritization and ranking Decision-Support System

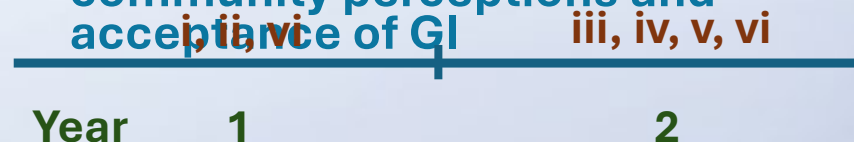
- Identifying the most beneficial Green Infrastructure for the lower Galveston Bay Watershed
- Deploying systems-based approach for multiple GI types
- Contextualizing mitigation of multiple stressors
- Leveraging GI expertise and community engagement from GBF
- Demystifying GI complexities



## Tasks

Direct Cost \$181,081

- Develop a GIS-based mapped database of current and potential locations for GI
- Develop a knowledge base of the various types of GI and the criteria for their selection
- Develop a risk-based ranking decision support tool for exploring implementation of various GI and their associated benefits
- Illustrate with demonstration case studies for three pilot watersheds: coastal, rural and urban
- Design overarching decision support risk-based management framework
- Elucidate understanding of community perceptions and acceptance of GI



# Outputs and Outcomes

## Outputs:

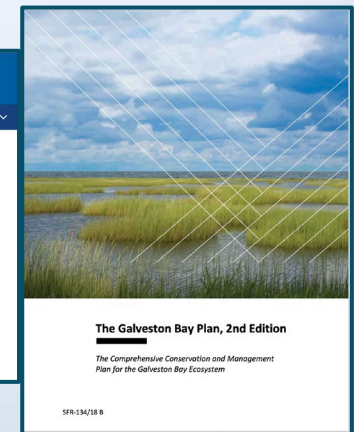
- Guidance for communities
- Case study demonstrations
- mapped database of current and potential GI within Galveston Bay
- system-level risk-based decision support tool
- Time, Cost, and Scale-level Supporting Information

## Outcomes:

- *Re-shaping the conversation about GI from individual projects to an integrated distributed, interconnected network of natural and engineered systems that reduces multiple risks simultaneously while considering community and stakeholder perceptions and acceptance*
- *Informing watershed action plans*

## Alignments: (WSQ and M&R)

- Implements several actions:
  - Evaluating best management practices (RES-6)
  - Evaluating ecosystem services and economic valuation (RES-7)
  - Completing coastal resiliency and acclimation studies (RES-8).
- Increases access to Galveston Bay ecosystem information (ACS 1, 2 & 3)
- Engages communities (PEA 1 & 2)
- Contributes to ensuring safe human and aquatic life use (NPS 1 & 3)
- Protects and sustains living resources (HC 3)



Directly aligned with EPA interests and direct focus on GI for improving water quality

# Expanded Evaluation of Micro- and Nanoplastic Pollution through Emerging Methods

Lead-PI: Mandi Gordon; [gordon@uhcl.edu](mailto:gordon@uhcl.edu)

Co-PI: Dr. Ruaa Al-Mezrakchi; [almezrakchi@uhcl.edu](mailto:almezrakchi@uhcl.edu)

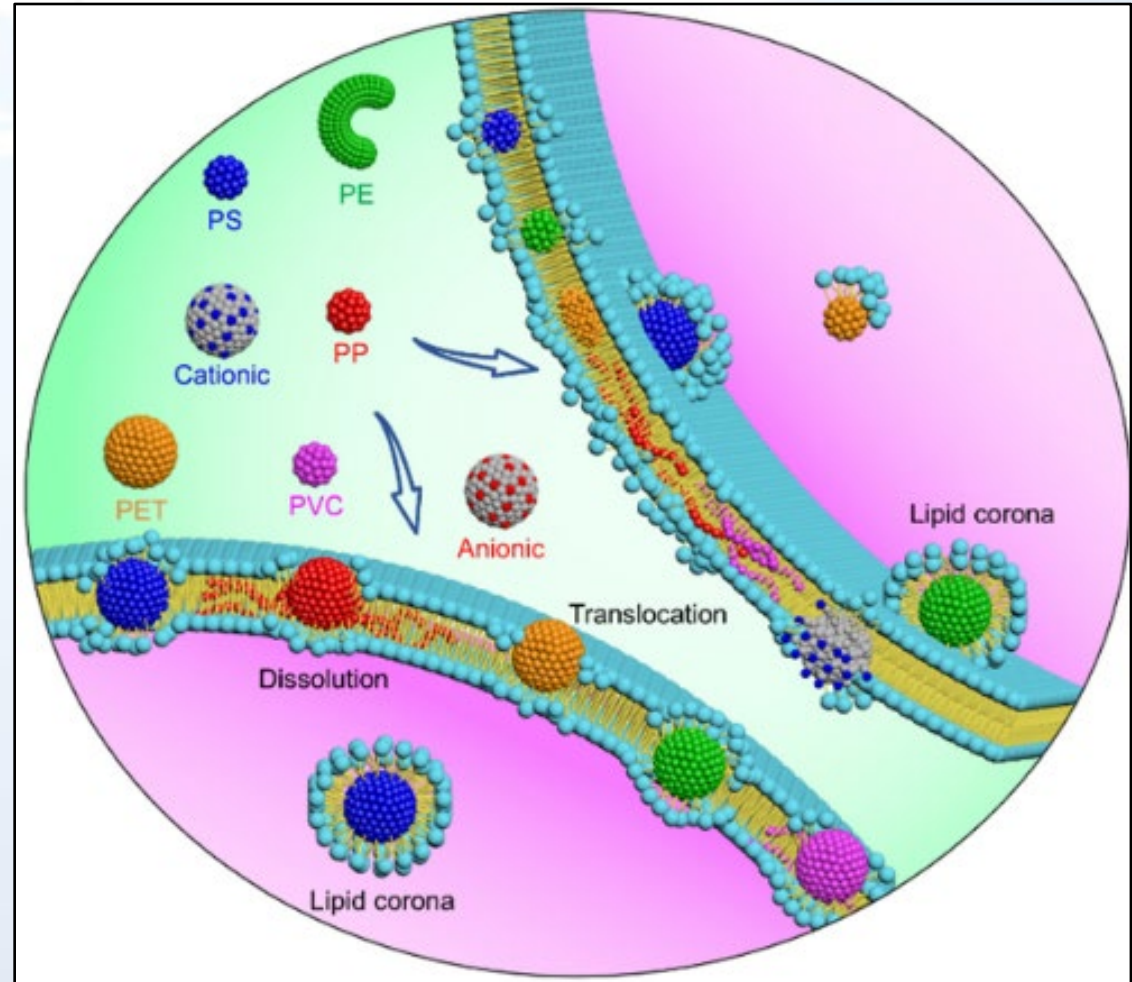
Co-PI: Dr. Asif Mortuza; [mortuza@uhcl.edu](mailto:mortuza@uhcl.edu)

Co-PI: Dr. Jenny Oakley; [jenny.oakley@h-gac.com](mailto:jenny.oakley@h-gac.com)



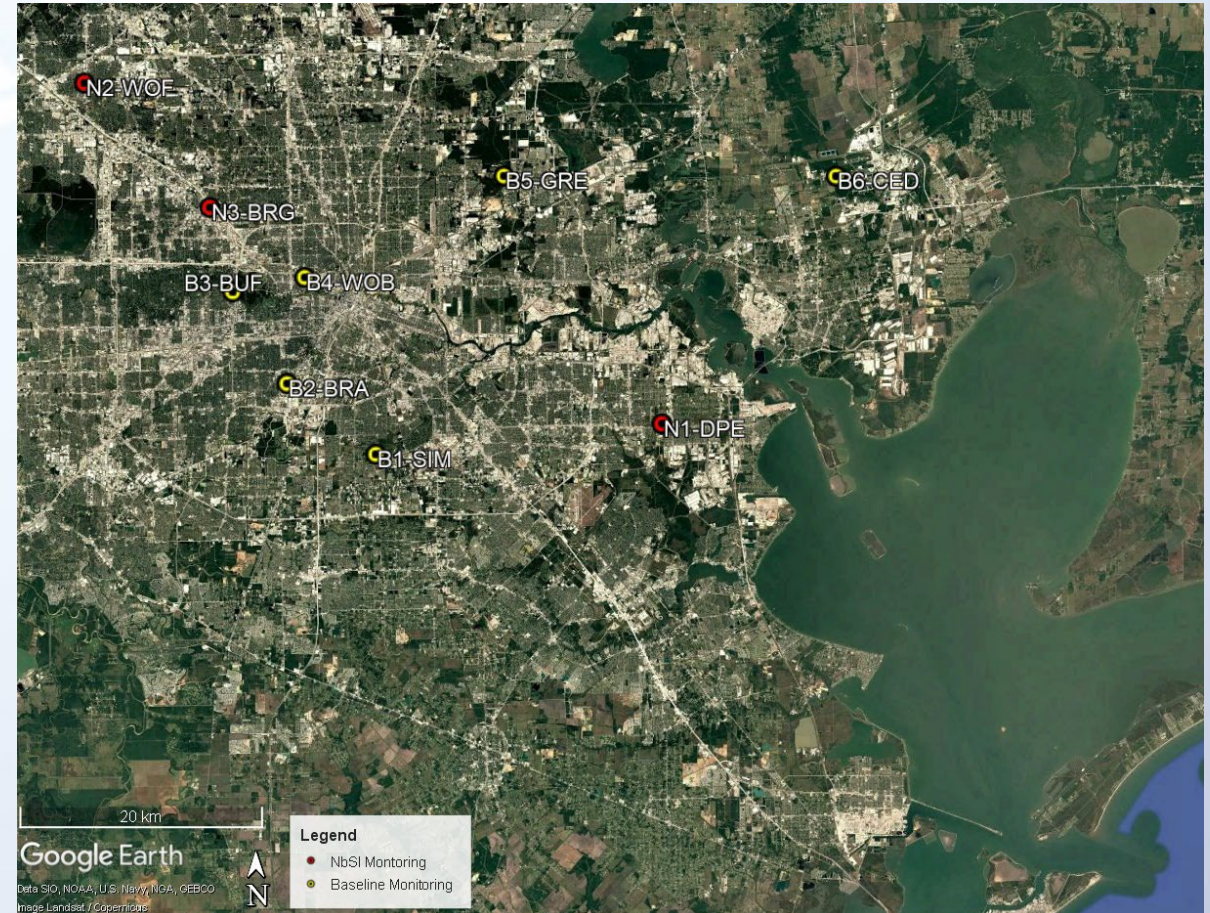
# Risks of Nanoplastics

- Size definitions:
  - Microplastics (MP) < 5mm
  - Nanoplastics (NP) < 1  $\mu\text{m}$
- Embedded and digested
- Membrane-crossing
  - Negative surface charge
  - Nano-diameters and fiber shapes
- Inflammation and oxidative stress
- May extend to carcinogenicity or teratogenicity



# Project Expansion Details

- Current GBEP-funded study scope:
  - Quarterly sampling in 6 watersheds
  - Treatment efficiency of 3 NbSI sites for reduction/removal of MP
  - **MP range: 100 $\mu$ m-5mm**
- Proposed expansion scope:
  - Concurrent samples
  - **Increases MP range to < 100 $\mu$ m)**
  - Emerging technologies:
    - Differential Scanning Calorimetry (DSC)
    - Pyrolysis-Gas Chromatography-Mass Spectrometry (Py-GC-MS)



# Project Urgency and Timeline

- QAPP for NbSI study still in review by TCEQ
- Field sample collection intended to start in FY27 Q1
- Samples for study expansion can be collected and stored until FY28
- Last opportunity for NbSI study to be expanded in it's current timeline

| Month/Year                     | Project Activity                                         |
|--------------------------------|----------------------------------------------------------|
| December 2025 – June 2026      | NbSI QAPP Development                                    |
| June 2026 – August 2026        | NbSI QAPP Review and Finalization                        |
| June 2026 – August 2026        | NbSI Study Method Testing                                |
| September 2026 – August 2027   | NbSI Field Data Collection                               |
| September 2026 – August 2027   | Concurrent Expansion Field Sample Collection and Storage |
| September 2026 – October 2027  | NbSI Laboratory Analyses                                 |
| September 2027 – February 2028 | Study Expansion QAPP Development                         |
| October 2027 – March 2028      | NbSI Data Analysis and Reporting                         |
| March 2028 – May 2028          | NbSI Final Report Revision(s)                            |
| March 2028 – February 2029     | Study Expansion Sample Analyses                          |
| March 2029 – May 2029          | Study Expansion Data Analysis and Reporting              |
| June 2029 – August 2029        | Study Expansion Final Report Revision(s)                 |

# Project Budget and Priorities Met

- Leverage:
  - FY26-28 NbSI Study: \$221,928
- Total Project Costs: \$390,900 (43% requested)
- Galveston Bay Plan Priorities:
  - **NPS-1, NPS-3**
  - **PHA-4, PHA-5**
  - **RES-1, RES-5, RES-6**
  - **ACS-2, ACS-3**
- WSQ and M&R FY28 Priorities

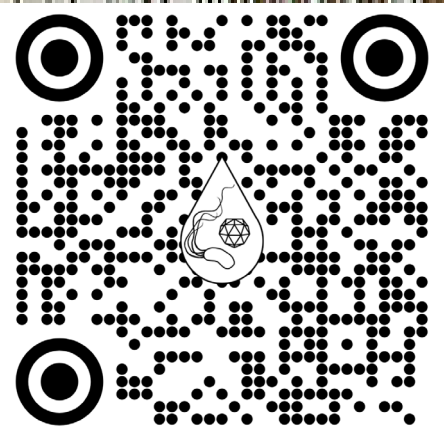
| Cost Category  | FY28 Total | FY29 Total | Project Total |
|----------------|------------|------------|---------------|
| Salary         | \$ 53,021  | \$ 53,828  | \$ 106,849    |
| Fringe         | \$ 11,743  | \$ 11,977  | \$ 23,720     |
| Equipment      | \$ -       | \$ -       | \$ -          |
| Travel         | \$ -       | \$ 2,600   | \$ 2,600      |
| Supplies (M&O) | \$ 2,500   | \$ 2,500   | \$ 5,000      |
| Contractual    | \$ -       | \$ -       | \$ -          |
| Other          | \$ 4,000   | \$ 4,600   | \$ 8,600      |
| Sub-total      | \$ 71,263  | \$ 75,506  | \$ 146,769    |
| IDC (16%)      | \$ 10,762  | \$ 11,441  | \$ 22,203     |
| Total          | \$ 82,026  | \$ 86,947  | \$ 168,972    |

# Informing contact recreation safety: linking salinity and temperature to fecal indicator organism, enteric virus, and *Vibrio vulnificus* occurrence in Galveston Bay

Lauren C. Kennedy

[lkennedy@utep.edu](mailto:lkennedy@utep.edu)

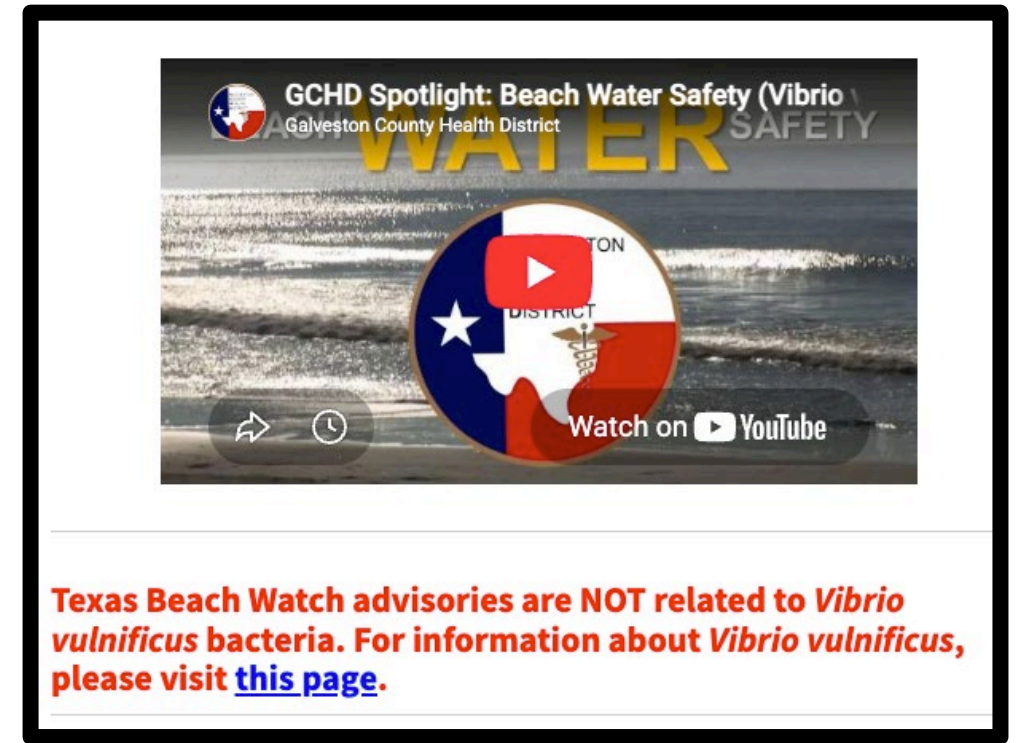
WSQ Subcommittee meeting



WATER LABS

# Despite low case numbers, Galveston Bay's brackish waters<sup>1</sup> support *Vibrio vulnificus*,<sup>2</sup> contributing to public concern.<sup>3</sup>

- Recreational water quality monitoring in Texas relies on fecal indicator bacteria, such as *Enterococcus*
- We have observed that enteric viruses differ in persistence from fecal indicator organisms.<sup>4</sup>
- Naturally occurring pathogens, such as *Vibrio vulnificus*, are not captured by fecal indicator monitoring<sup>5</sup> and can cause severe and life-threatening infections.<sup>6</sup>



1. NGOFS2 – Galveston Bay Salinity Forecast Guidance. Tides and Currents. NOAA.
2. Kelly, MT. Effect of temperature and salinity on *Vibrio (Beneckea) vulnificus* occurrence in a Gulf Coast environment. *Applied and Environmental Microbiology*. 1982.
3. KPRC 2 Houston. Flesh-eating bacteria warning — should Galveston beachgoers be concerned? August 12, 2026
4. Kennedy, LC et al. Temperature and particles interact to affect human norovirus and MS2 persistence in surface water. *Environmental Science: Processes & Impacts*. 2023.
5. Galveston County Health District. *Vibrio vulnificus* bacteria.
6. Centers for Disease Control and Prevention. About *Vibrio* infection. May 14, 2024.

# What if readily available salinity and temperature data could help identify contact recreation risks missed by current monitoring?

**Objective i:** Determine whether temperature and salinity help explain differences between fecal indicator bacteria, enteric viruses, and *Vibrio vulnificus* across the Galveston Bay watershed.

**Objective ii:** Quantify the effects of salinity and temperature on the persistence of *Enterococcus faecalis* and *Vibrio vulnificus* under controlled conditions.

**Objective iii:** Translate findings into a decision support tool and white paper for watershed managers as well as peer reviewed publications to help the academic community build on the findings.

**We request \$199,433 to complete the proposed research, which would support future watershed planning and contact recreation management.**

| Budget Category          | Requested amount |
|--------------------------|------------------|
| Salary / Wages           | \$69,590         |
| Fringe Benefits          | \$11,341         |
| Travel                   | \$10,000         |
| Supplies                 | \$30,000         |
| Graduate student tuition | \$13,804         |
| Indirect costs           | \$64,698         |
| Total                    | \$199,433        |

**Timeline: 9/2027 – 5/2030**



**PHA-3:** The project will support watershed planning by identifying when salinity and temperature conditions may indicate a need for additional pathogen monitoring, interpretation, or public communication.



**RES-4, ACS-2, and M&R priority 3** are also addressed.

An aerial photograph of a bayou system in Houston, Texas. A winding waterway flows through a lush green landscape, bordered by dense trees and residential neighborhoods. A small bridge crosses the bayou in the lower right. In the far background, the Houston skyline is visible under a hazy sky.

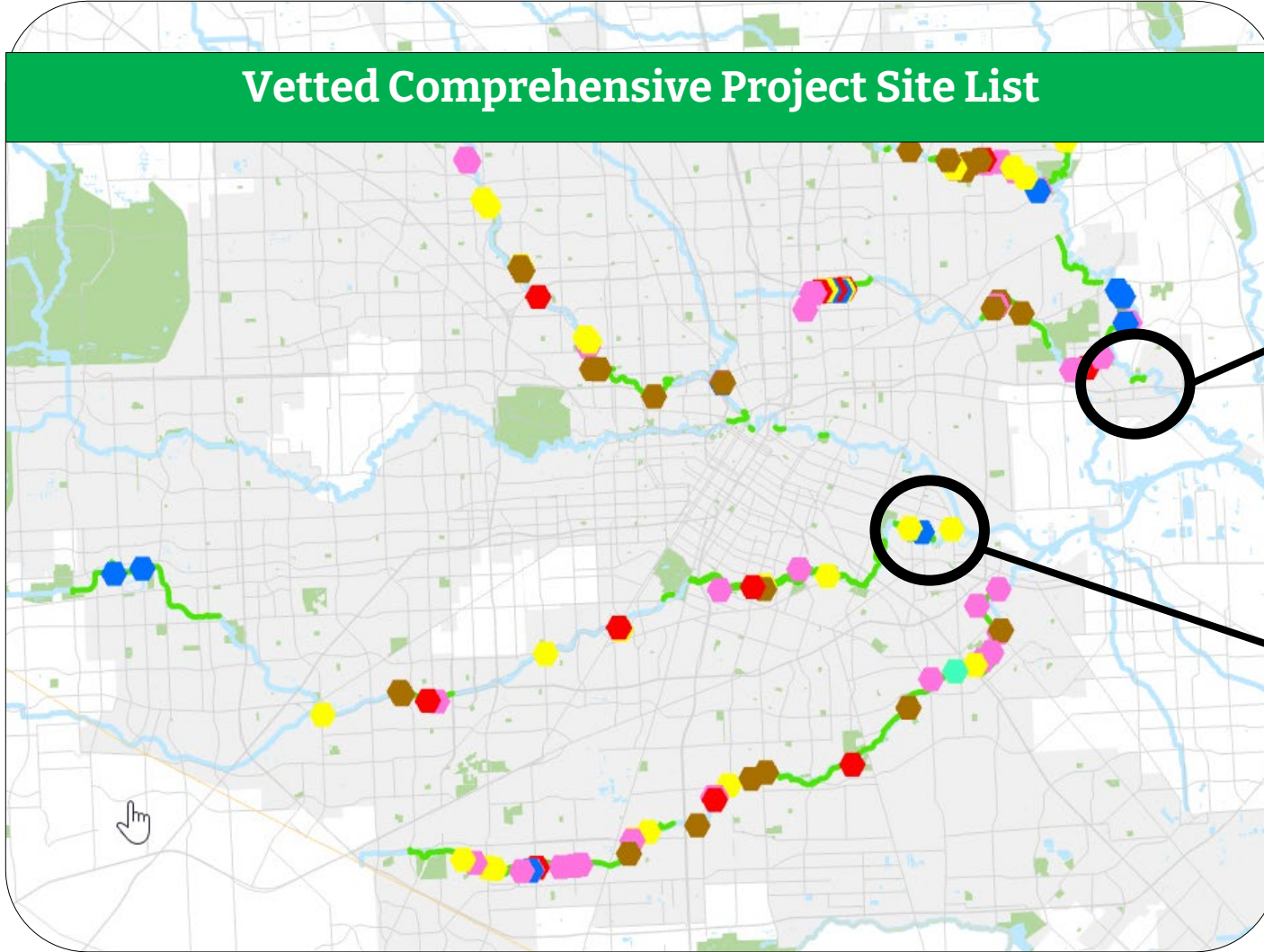
# BAYOU GREENWAYS CONSERVATION PLAN - WETLANDS

HOUSTON PARKS BOARD  
Marissa Llosa, Conservation Manager

SEPTEMBER 2026

# BAYOU GREENWAYS | CONSERVATION PLAN

## Vetted Comprehensive Project Site List



Thomas Bell Foster Tidal Wetland



Mason Park Stormwater Wetland

# BAYOU GREENWAYS | PROPOSED PROJECT SITE CONDITIONS

Mason Park



Thomas Bell Foster Park



# BAYOU GREENWAYS | PLAN OF ACTION

## Pond Surfaces

Chemical Treatment for Algae

Mechanical removal of noxious species

## Marsh Edges

Removal of wood encroachment

Herbicide treatment of cattails

Mechanical removal of noxious species

Supplemental planting

## Surrounding Grassland Buffer

Herbicide treatment of noxious species

Reseeding area with HCFCD seed stock

