

# Monitoring Water Quality Around Key West: Q1 Progress Report

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THE  
COLLEGE  
OF THE  
FLORIDA KEYS

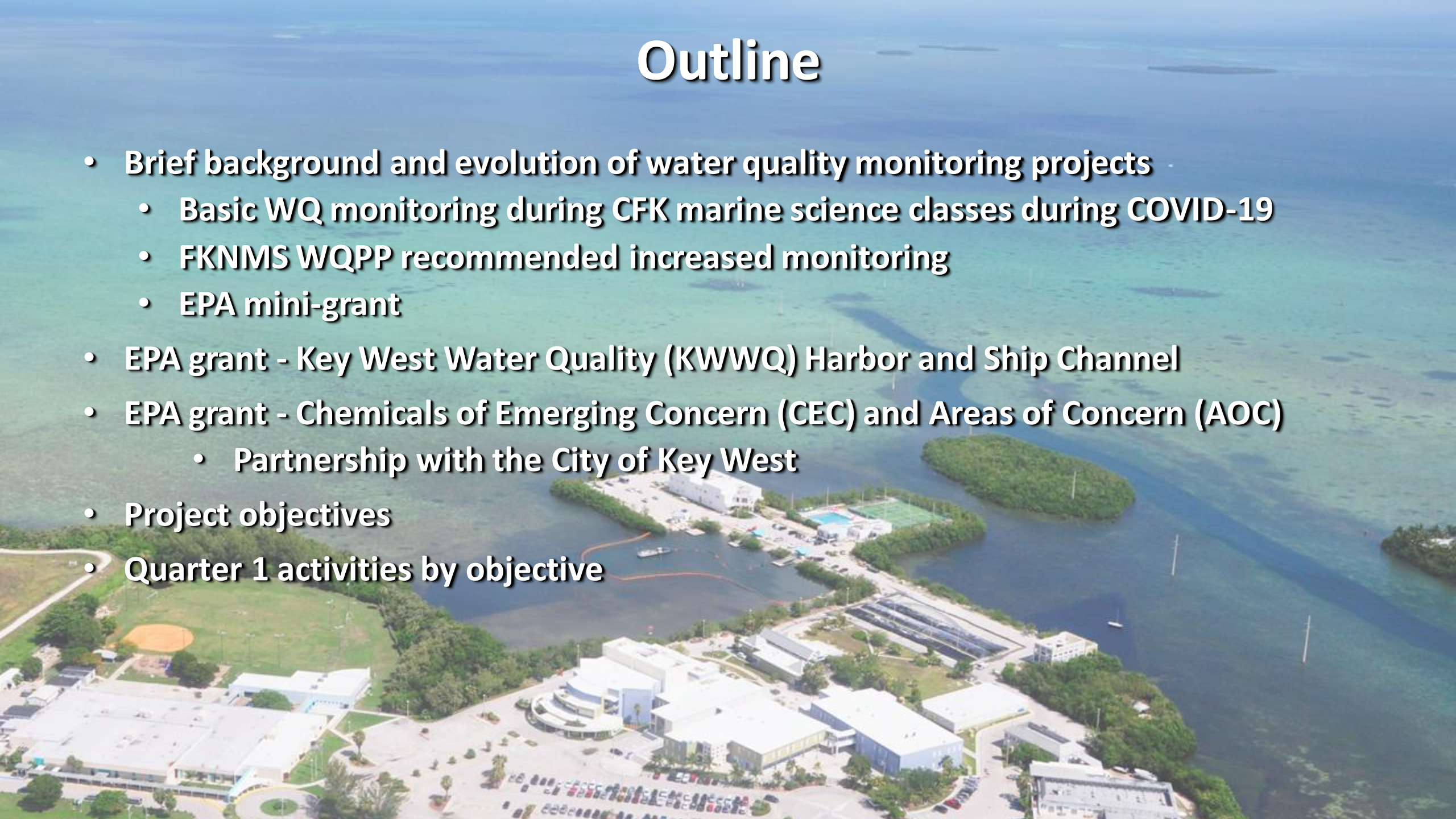


**FIU**  
FLORIDA  
INTERNATIONAL  
UNIVERSITY



# Outline

- **Brief background and evolution of water quality monitoring projects**
  - **Basic WQ monitoring during CFK marine science classes during COVID-19**
  - **FKNMS WQPP recommended increased monitoring**
  - **EPA mini-grant**
- **EPA grant - Key West Water Quality (KWWQ) Harbor and Ship Channel**
- **EPA grant - Chemicals of Emerging Concern (CEC) and Areas of Concern (AOC)**
  - **Partnership with the City of Key West**
- **Project objectives**
- **Quarter 1 activities by objective**



# Background

- **Fall 2020**
  - **Basic water quality testing in KW Harbor and ship channel due to COVID-19 anthropause (i.e. lack of human activity)**
    - Temperature
    - Salinity
    - Dissolved oxygen (DO)
    - Turbidity
    - Ammonia
    - pH
    - Hydrogen sulfide
- **Summer 2021**
  - CFK awarded an EPA mini-grant to support the 2020 efforts
- **Spring 2022**
  - CFK awarded the EPA KWWQ - Harbor and Ship Channel
- **Summer 2022**
  - CFK partners with City of Key West on a 3<sup>rd</sup> EPA grant
- **Spring 2023**
  - CFK and City awarded EPA grant for CEC in AOC around KW
  - April 18, 2023, the City Commission approved an interlocal agreement (ILA) with CFK



# KWWQ Objectives

**Objective 1.** Deploy WQ monitoring equipment to study connectivity between Key West Harbor and the Key West ship channel to Eastern Dry Rocks Sanctuary Preservation Area (EDR-SPA).

## Problems:

- 10% inflation
- Supply chain delays
- Weather related issue
- Equipment failures

## Successes:

- QAPP approved by the EPA
- Samples collected and analyzed by FIU CACHÉ
- WQ sondes delivered and deployed
- TK equipment repaired and deployed
- Partnership with the City of Key West and others



# Progress

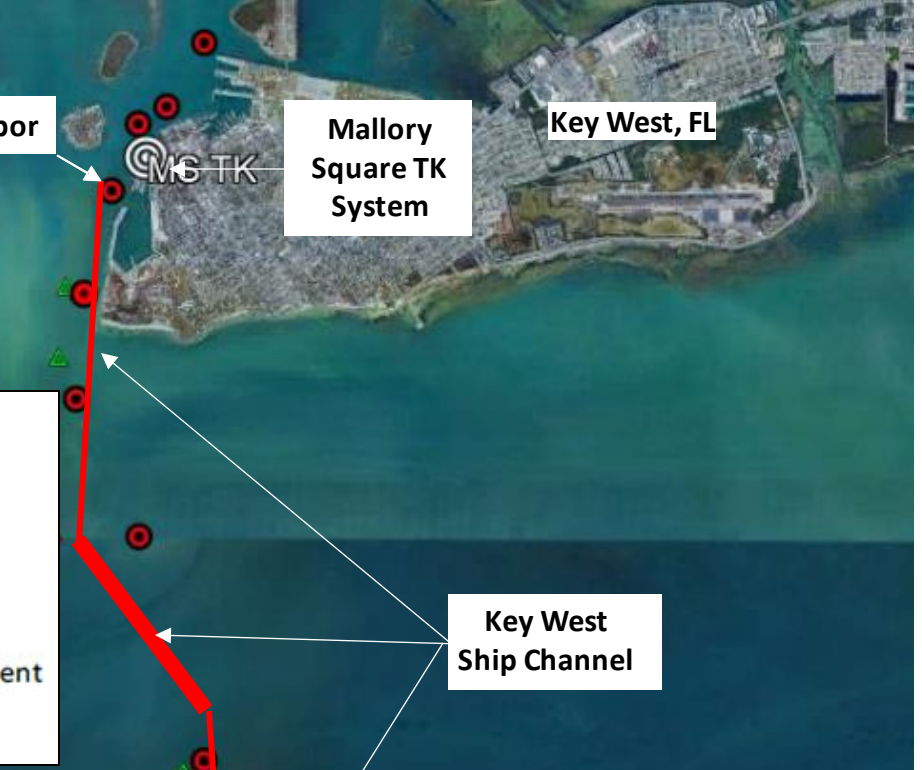
Latitude  
59" W



Introducing Eureka's Unique  
**Manta F35  
Anti-Fouling  
Multiprobe**

Eureka has fitted its highly successful Manta+35 Water-Quality Multiprobe with a copper-filled, silicone "nose cone" that covers all of the exposed sensors except the critical measurement surfaces. A central wiper keeps those measurement surfaces clean, meaning that you get unaffected data with minimal clean-up.

**eureka**  
water probes



**Table 2. FIU Water Sample Lab Analysis**

- Dissolved Inorganic Nutrients (NO<sub>2</sub><sup>-</sup>, NO<sub>3</sub><sup>-</sup>, NH<sub>4</sub><sup>+</sup>, PO<sub>4</sub><sup>-3</sup>)
- Total Phosphorus (TP)
- Total Nitrogen - ANTEK (TN)
- Total Organic Carbon (TOC) and Dissolved Organic Carbon (DOC)
- Dissolved Silicate (SI)
- Chlorophyll a (GF/F filtered, spectrofluorometric)

**Channel Bend Sonde (Monitor 3)**

CBS sonde

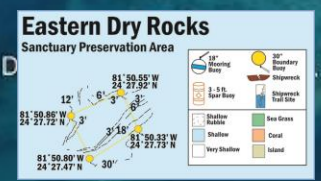
**Eastern Dry Rocks Reef (Monitor 4)**

EDR Sonde

**Western Dry Rocks Reef (Control)**

WDR Sonde

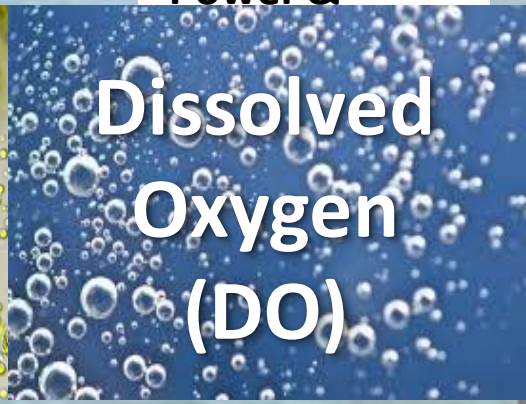
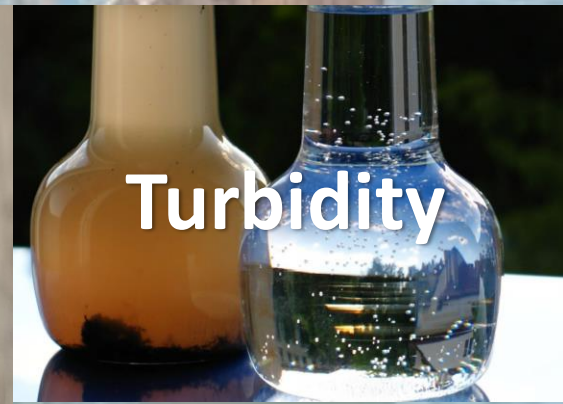
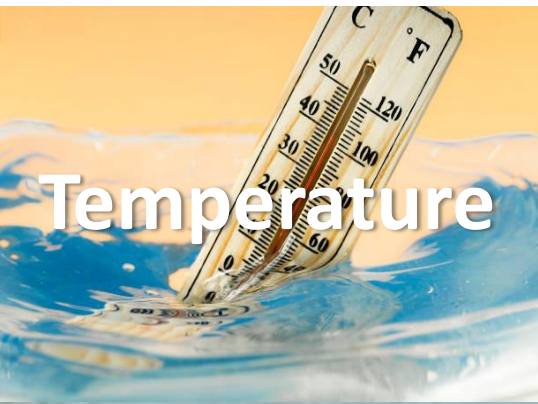
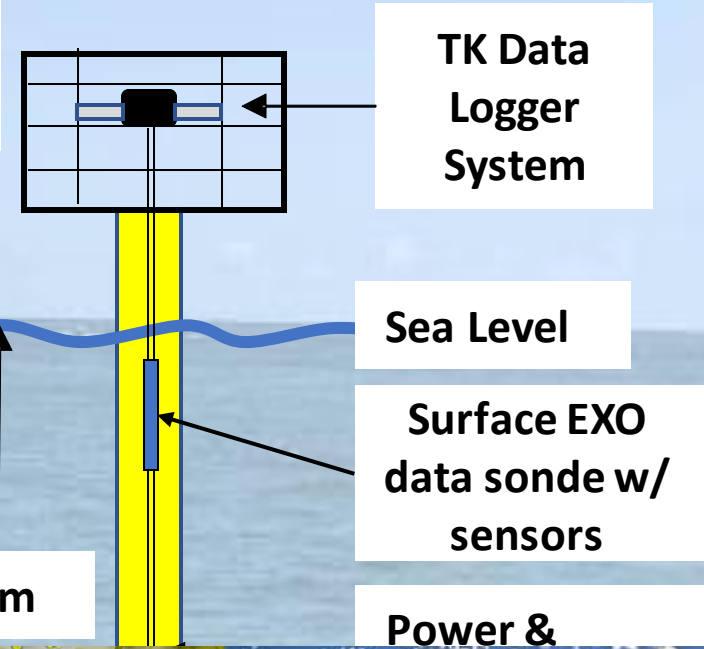
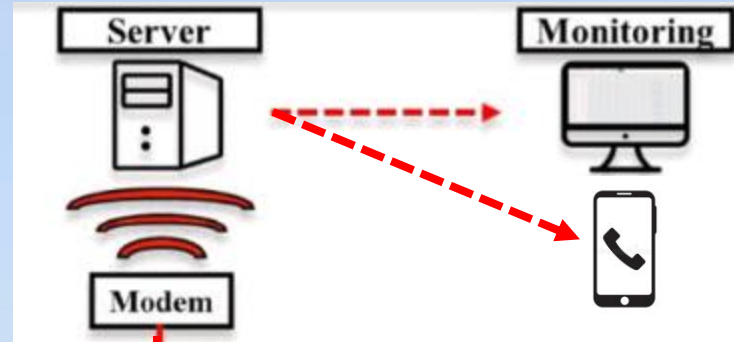
**Ship Channel Entrance**



NGA, GEBCO

# Mallory Square TK System

YSI EXO Water  
Quality Data Sonde



# KWWQ Objectives (cont.)

***Objective 2.*** Conduct field measurements and collect monthly water samples for NELAC certified lab analysis from the waters of the Key West Harbor and along the Key West ship channel.

***Objective 3.*** Conduct field measurements and collect monthly water samples for NELAC certified lab analysis from the waters at EDR and WDR for field and lab analysis to compare to Key West Harbor and Key West ship channel water samples.

- **Sending samples to the FIU Institute of Environment - CAChE Nutrient Analysis Core Facility**
  - **National Environmental Laboratory Accreditation Program (NELAC) -accredited nutrient analysis laboratory to directly support research**

# KWWQ Objectives

**Objective 4.** Periodically measure water quality immediately before and after large industrial ships enter and exit the Key West Harbor.

## Progress:

- Started partnership w/ City of Key West
- Down payment in Nov. 2022
- ILA approved in April 2023
- Final purchase order in May 2023
- Est. 30 weeks for delivery
- Expected delivery date in Dec. 2023
- CFK will host a training event (TBD)
  - College Marine Science **staff** employees
  - Monroe County Sheriff's Office Search and Rescue
  - City of Key West staff





# **3<sup>rd</sup> EPA Grant: Chemicals of Emerging Concern (CECs) in Areas of Concern (AOC)**

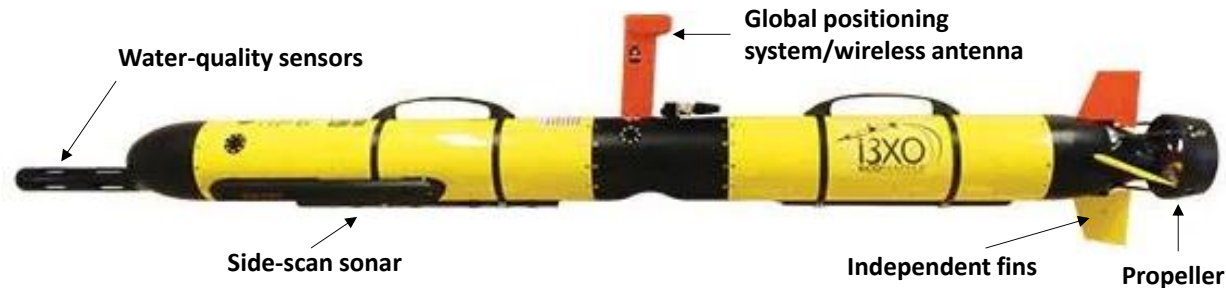
## ***Objectives***

- 1. Continue water quality monitoring in the Key West harbor and ship channel using existing technology and infrastructure.**
- 2. Expand water quality monitoring to seven AOC around the islands of Key West using an Autonomous Underwater Vehicle equipped with sensors for dissolved oxygen, temperature, salinity, turbidity, and total algae.**
- 3. Expand water quality monitoring to beach AOC around the southern section of Key West for oxybenzone in the marine food chain.**
- 4. Expand water quality monitoring to seven AOC around the islands of Key West for sewage discharge indicators (i.e. ammonia and sucralose).**
- 5. Expand water quality monitoring to marine environment near Stock Island Landfill for toxic pollutants (i.e. hydrogen sulfide).**
- 6. Provide data and input for the City of Key West's Water Quality Improvement Plan.**

# EPA Grant for Chemicals of Emerging Concern (CECs) Areas of Concern (AOC)

## Objective 2.

Expand water quality monitoring to seven AOC around the islands of Key West using an Autonomous Underwater Vehicle equipped with sensors for dissolved oxygen, temperature, salinity, turbidity, and total algae.



An image of the YSI EcoMapper Autonomous Underwater Vehicle (AUV) (Photo courtesy of YSI).

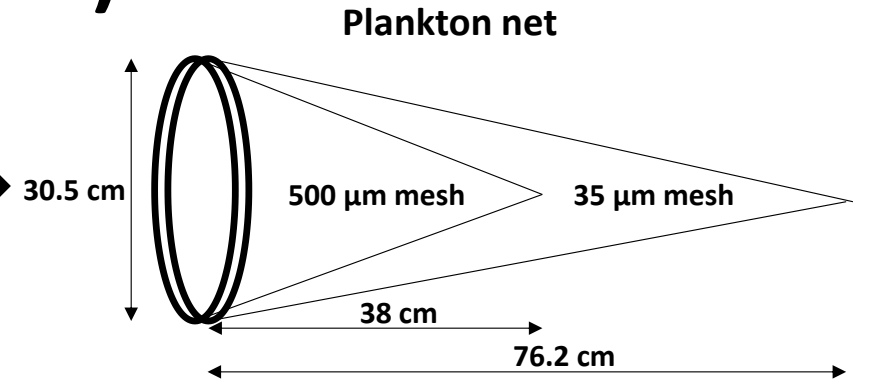
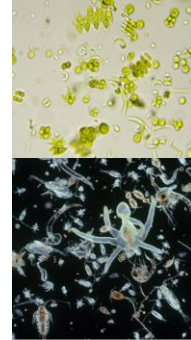
# EPA Grant for Chemicals of Emerging Concern (CECs) Areas of Concern (AOC)



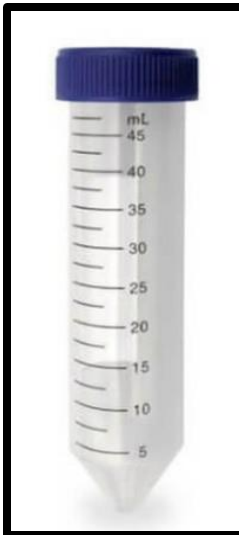
# EPA Grant for Chemicals of Emerging Concern (CECs) Areas of Concern (AOC)

## Objective 3.

Expand water quality monitoring to beach AOC around the southern section of Key West for oxybenzone in the marine food chain.



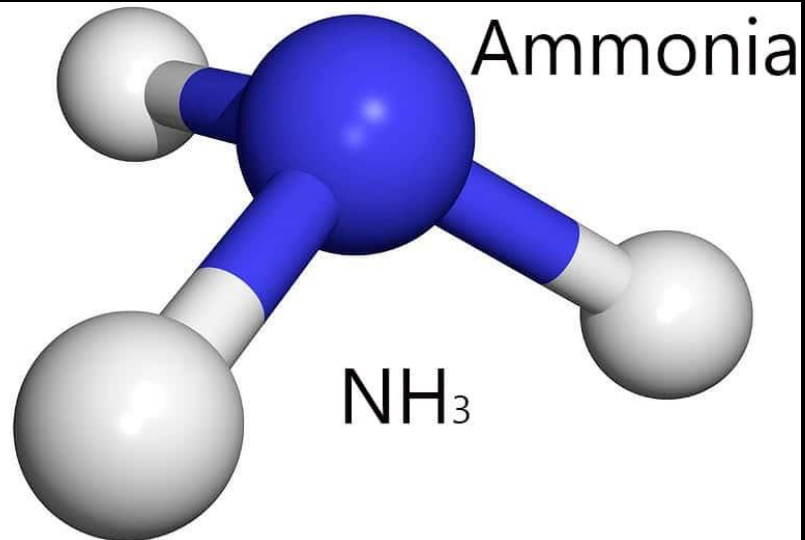
Plankton net design with a 500 µm mesh net embedded in a longer 35 µm mesh net.



# EPA Grant for Chemicals of Emerging Concern (CECs) Areas of Concern (AOC)

## Objective 4.

Expand water quality monitoring to seven AOC around the islands of Key West for sewage discharge indicators (i.e. ammonia and sucralose).



SUCRALOSE  
+ Maltodextrin

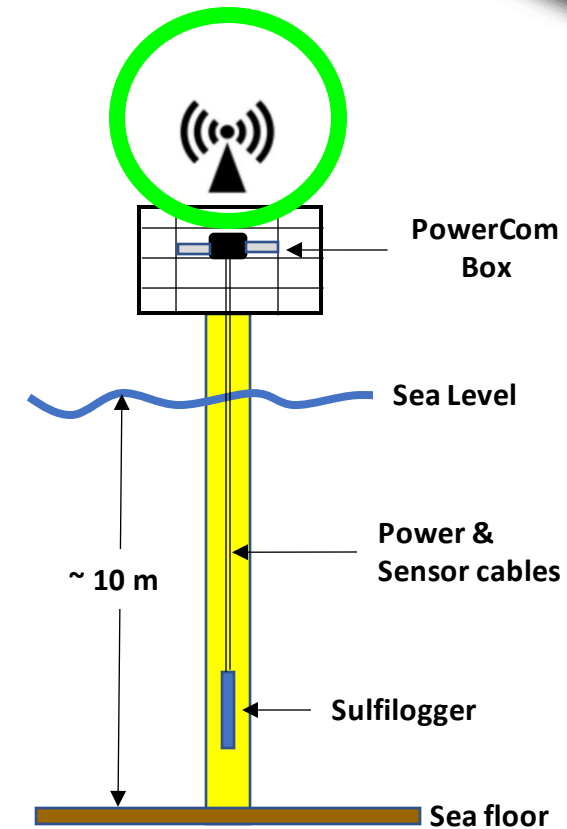
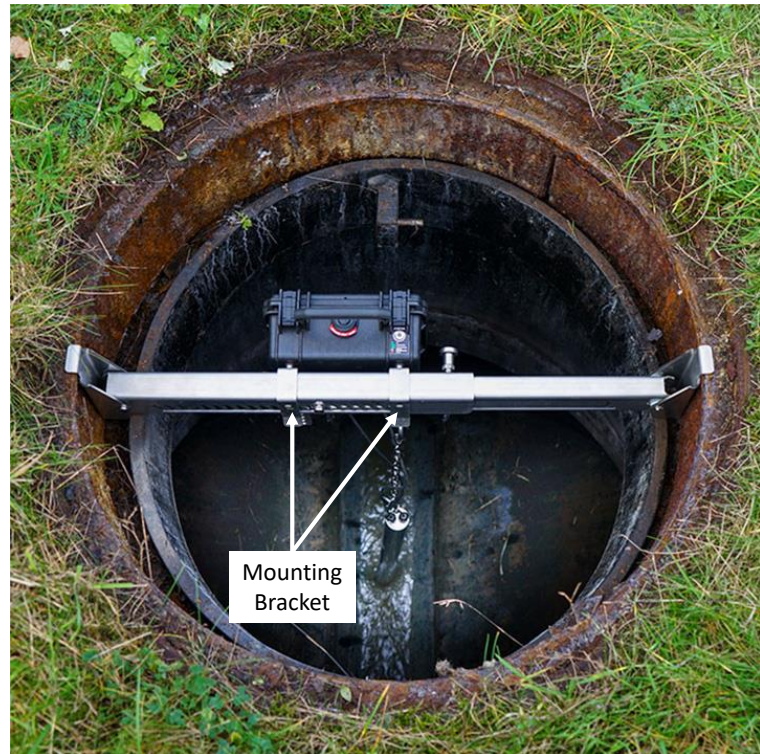


SUCRALOSE  
+ Erythritol

# EPA Grant for Chemicals of Emerging Concern (CECs) Areas of Concern (AOC)

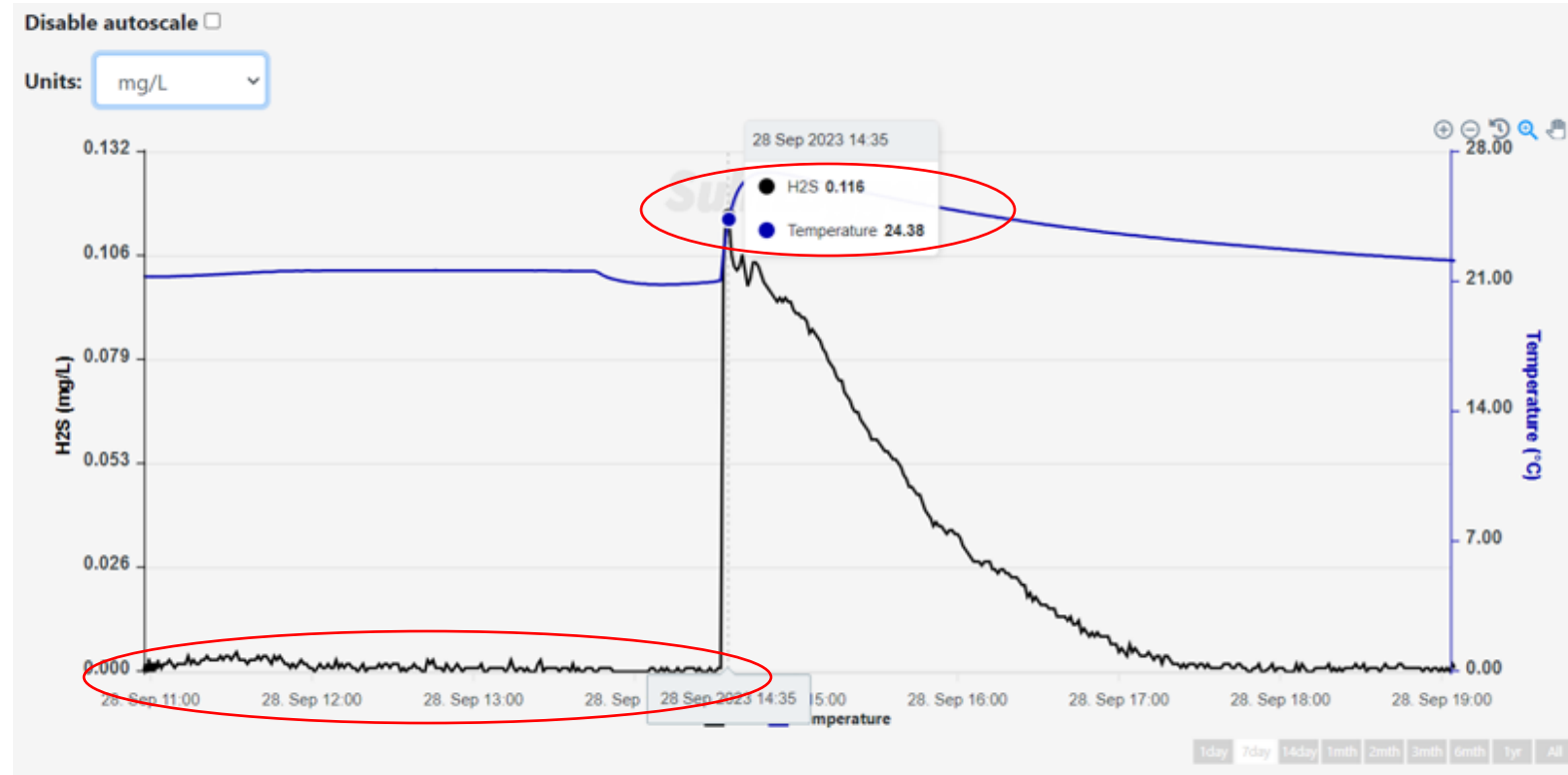
## Objective 5.

Expand water quality monitoring to marine environment near  
Stock Island Landfill for toxic pollutants (i.e. hydrogen sulfide).



# EPA Grant for Chemicals of Emerging Concern (CECs) Areas of Concern (AOC)

- Appears to provide excellent data
- Sensitive at appropriate levels
  - Normal background levels are approx. 0.001 mg/L (1  $\mu\text{g/L}$ )
- 5  $\mu\text{g/L}$  H<sub>2</sub>S causes stress in SW fish
- 25  $\mu\text{g/L}$  H<sub>2</sub>S lethal to SW fish



# EPA Grant for Chemicals of Emerging Concern (CECs) Areas of Concern (AOC)

## Objective 6.

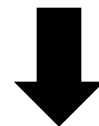
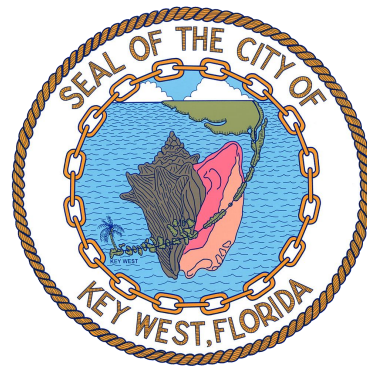
Provide data and input for the City of Key West's Water Quality Improvement Plan.

- This process is just beginning

### Key Outcome

- Development of a Key West water quality monitoring consortium
- Development of a GIS based water quality monitoring website

## Water Quality Monitoring Consortium



**Key West Water Quality Improvement Plan**



# Questions?

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