



# **Draft Plan of Study for Marathon Nearshore Monitoring**

**FDEP Division of Environmental Assessment and  
Restoration**

**Water Quality Protection Program Technical Advisory  
Committee Meeting  
June 26, 2020**



# Background

- FOLKs (and other stakeholders) sent letter to DEP and the WQPP expressing concerns about water quality in the “Halo Zone” around Marathon, contending injected wastewater from shallow injection wells (SIW) is migrating through karst conduits to surface waters in concentrations sufficient to cause degradation to nearshore waters
  - Letter provided photographs of turbid water taken June 2019, results of sucralose samples collected July 2019 in a cove 400 meters N of the Area 4 WWTP SIW, and noted that EPA strategic targets are not being met in halo zone
    - Based on data from 2011-17, DIN met in 22% of samples and TP met in 58% of samples, and there is a general declining trend in meeting targets



# Scope of Study

## *Purpose*

- Conduct WQ monitoring in nearshore marine waters adjacent to City of Marathon and Key Colony Beach SIWs, to determine if there is evidence of treated wastewater migrating to nearshore in concentrations indicating degradation of nearshore water quality
- Conduct WQ monitoring at “control” sites (targeted > 1,000 m away from SIWs, but within the 500 m “Halo Zone”) to characterize background conditions in middle Keys nearshore waters
- Conduct WQ monitoring of effluent at all WWTPs with SIWs, for chemical tracers only (other analytes already collected)



# Scope of Study

## *Stations and Frequency*

- Three sampling stations near each of the six injection wells (18) plus control stations (12) for a total of 30 stations
- Quarterly sampling one year (120 total sample suites plus 5% blanks and duplicates)
- Quarterly sampling frequency will allow for capture of potential seasonal differences in WQ due to seasonal differences in wastewater treatment demand
- Effluent at the six facilities will be sampled quarterly for one year for chemical tracers only (24 sample suites)



# Scope of Study

## *Analytes*

### Nutrients

Total Kjeldahl Nitrogen (TKN)

Nitrate+Nitrite (NO<sub>2</sub>+NO<sub>3</sub>)

Ammonia (NH<sub>4</sub>)

Total Nitrogen (TN)

Total Phosphorus (TP)

### Other

Turbidity

Total Suspended Solids (TSS)

### Chemical Markers of Wastewater

Sucralose

Acetaminophen

Ibuprofen

Naproxen

Carbamazepine

Sulfamethoxazole

### Field Testing measurements

pH

Temperature

Dissolved

Oxygen

Salinity

- Field sampling and laboratory analyses responsibilities TBD



# Scope of Study

## *Notes on Chemical Tracers*

- Tracers differ in how they respond to wastewater treatment and how they persist in the environment, allowing for characterization of anthropogenic pollutants and determination of sources (treated vs. raw or poorly treated wastewater)

### Low removal efficiency by typical WWTP processes

Sucralose (artificial sweetener)

Carbamazapine (anti-seizure drug)

Sulfamethoxazole (antibiotic)

### High removal efficiency by typical WWTP processes

Acetaminophen (pain reliever)

Ibuprofen (pain reliever)

Naproxen (pain reliever)



# Scope of Study

## *Data Management and Analysis*

- All WQ data will be uploaded to Florida's Watershed Information Network (WIN)
- Chemical tracer results will be compared among the effluent, test, and control sites; all sites will be compared with concentrations that have been found in other studies of wastewater sources and ambient waters
- Nutrient results will be compared to targets summarized in the Florida Keys Reasonable Assurance Plan (RAP) Document, with the understanding that the targets apply at 500 m and beyond, and that statistical comparisons between the test and control sites, or comparisons to other studies, may be more applicable



**Figure 1.** City of Marathon Area 3 Wastewater Treatment Facility and Water Quality Monitoring Stations (facility and test sites in yellow, control sites in blue)



**Figure 2.** City of Marathon Areas 4 and 5 Wastewater Treatment Facilities and Water Quality Monitoring Stations (facilities and test sites in yellow, control sites in blue)



**Figure 3.** Key Colony Beach and City of Marathon Area 6 Wastewater Treatment Facilities and Water Quality Monitoring Stations (facilities and test sites in yellow, control sites in blue)



**Figure 4.** City of Marathon Area 7 Wastewater Treatment Facility and Water Quality Monitoring Stations (facilities and test sites in yellow, control sites in blue)



# Questions for TAC members

1. Is it a correct assumption that nearshore areas with exposed hard bottom are more porous than areas with a marl cover, and may have more potential for migration of the injected wastewater via karst conduits?
2. If the answer to #1 is yes, is there a practical way to target these areas for sampling? Such as existing LIDAR maps or other tools that might help identify fine-scale bottom substrate types?
3. If maps aren't a suitable option, could targeting the areas more likely to have the connections be done reliably with field observations by samplers?



# Questions for TAC members

(continued)

4. Are the spatial and temporal extent and the distribution of sampling stations sufficient to address the question we are trying to answer?
5. Are there other factors that should be considered when siting specific sampling locations?
6. Should dye tracers be included in the study, understanding that this would change the scope and require additional expertise and sampling entities?
7. Is groundwater sampling needed for the study, and if so, what should be done? (again, understanding that this expands the scope and requires additional expertise)



**Julie Espy**

**[Julie.Espy@FloridaDEP.gov](mailto:Julie.Espy@FloridaDEP.gov)**

**Ashley O'Neal**

**[Ashley.Oneal@FloridaDEP.gov](mailto:Ashley.Oneal@FloridaDEP.gov)**

**Nia Wellendorf**

**[Nijole.Wellendorf@FloridaDEP.gov](mailto:Nijole.Wellendorf@FloridaDEP.gov)**