

**FLORIDA KEYS NATIONAL MARINE SANCTUARY**  
**Water Quality Protection Program**  
**Technical Advisory Committee Meeting**

**April 15, 2021**

**DRAFT NOTES**

**Technical Advisory Committee Members Present:**

Michael Boehmler - Monroe County Mosquito Control  
Christopher Kavanagh - National Park Service, Everglades and Dry Tortugas  
Nick Parr - Florida Department of Environmental Protection  
George Garrett -City of Marathon  
Henry Briceño -Florida International University  
Julie Espy - Florida Department of Environmental Protection  
Lee Kump - Penn State University  
Mark Chiappone - Miami-Dade College  
Peter Frezza - The Village of Islamorada  
Rene Price - Florida International University  
Sandy Walters - Sandy Waters Consultants, Inc.  
Shelly Krueger - University of Florida  
Steven Blackburn - U. S. Environmental Protection Agency

---

**I. Review Agenda and Technology Orientation**

Nicholas Parr (DEP) welcomed everyone to the WQPP TAC meeting.

Karen Bohnsack (FKNMS) provided an introduction to the virtual meeting format and instructions for attendee participation.

**II. Update on the Water Quality Data Compilation Project**

Luke McEachron (FWC) provided information and requested feedback on a project funded by DEP to compile water quality data across south Florida.

This is a collaborative project between AOML, FKNMS, FWC and USF. As background, FWC was previously involved in a project to investigate the extent of Endocrine Disrupting Compound (EDC) sampling in south Florida. They found that EDC sampling was variable in space and time, and not consistently defined. Such variability is a regular occurrence across all water quality sampling in south Florida, and includes different detection limits, sampling intervals, etc. which makes it difficult to determine trends across the region. Thus, the goal of this project is to leverage existing sampling and satellite imagery to achieve 4 objectives:

- 1) Aggregate, crosswalk and map WQ data

- 2) Determine how we can compare quantities between programs
- 3) ID spatial and temporal hotspots and changing patterns from aggregate data
- 4) Integrate remote sensing data to validate data and ID additional hotspots.

This analysis is primarily focused on data from established programs, with 5-10 years of sampling from Martin to Monroe counties. Additionally, the project is primarily concerned with 9 parameters: Chlorophyll a, temperature, salinity, Nitrate and nitrite (NO<sub>x</sub>), soluble reactive phosphorus (PO<sub>4</sub>), silica, turbidity, total nitrogen, and total phosphorus. The process for identifying data was largely reliant on existing professional connections. The team looked at previous work and reached out to known partners. Many of these programs are already in a DEP data compilation project called SEACAR, others are in WIN as required for regulatory purposes. This process resulted in 80 programs, which was narrowed down to 19 to meet criteria for length of time, geography, and parameters. MOST data sources included were in WIN or SEACAR.

Luke requested feedback from the TAC on additional data sources that may have been missed by the process, as well as any feedback on how a unified map of south Florida WQ data could be housed in the future (the end goal of this effort is a product similar to the Unified Florida Reef Map).

#### Discussion

Are there any established WQ monitoring programs that we could have missed?

- Rene Price: Do data sets need to have all parameters listed on the slide?
  - No. The team understands that not all water quality monitoring programs collect all of these parameters. They do want good representation across all 9 parameters.
- A suggestion was made to look at the Florida Coastal Everglades LTER data set?
  - This was likely included, but Luke will confirm. If any government entity is involved, we've likely captured that data already.
- Julie Espy: Have you checked WaterCat? It's intended to be a catalog of monitoring programs throughout the State, in addition to those that may submit data to WIN.
  - No. Will add it to the list.
- Shelley Krueger: Was data from Florida Keys WaterWatch considered?
  - Yes, this was included.
- Patrick Rice: College of the Florida Keys has data from marine science data collection classes. This needs to be formatted, etc. but it could be another source. This is sporadic data collection
- Christopher Kavanagh: the park collects a lot of data on these parameters. These are kept in a database and could be shared. Will follow-up.

Is there a community preference for a long-term database solution?

- No input was provided on this question.

### **III. Update on EPA-Funded Shallow Injection Well Study**

Dr. Miquela Ingalls (PSU) provided an update on the FY20 EPA-funded project to investigate shallow injection wells in the Florida Keys.

The purpose of this project is to quantify the impact of shallow injection wells on groundwater nutrient fluxes to surface waters in FKNMS. The team is still in the project planning phase, but they expect to receive funding soon and start implementation. Miquela noted that new guidance recently became available from EPA regarding the Supreme Court's ruling relevant to the Clean Water Act/ National Pollutant Discharge Elimination System and whether pollutants from a point source that travel through groundwater are the "functional equivalent" of a direct discharge. This study should shed light on these considerations in the Keys.

The basis for this project is that, despite stricter regulations on wastewater management in the Keys, the surface waters of FKNMS still reflect elevated nutrient levels and 23 specific Water Body Identification Units have been identified as impaired for nutrients. This study area will specifically focus on Marathon's Area 3 wastewater treatment facility, and will include lessons learned from a previous shallow injection well study in Key Colony Beach. The study will investigate the fate of water after it is injected and inform wastewater practices to reduce surface water contamination in the Keys.

From previous studies, we know that wastewater effluent plumes are less dense/more buoyant than saline groundwater. Because of this density contrast, it is likely to return to a surface at some point. The Keys are composed of porous Key Largo limestone, which has 45% porosity or higher, so injected wastewater is destined to have rapid groundwater migration and reemergence. The project hypothesis is that short residence times of shallow wastewater effluent injections in the aquifer will reduce the efficiency and permanence of nutrient removal. From previous studies, we know that nitrogen and phosphorus are effectively removed from the slower velocity flow path margins by microbial nitrogen cycling and phosphate adsorption into Key Largo limestone karst. The question remains whether these are effective and permanent sinks for these nutrients. EPA wastewater nutrient effluent standards are 3ppm (NO<sub>3</sub>) and 1ppm (PO<sub>4</sub>).

Specific objectives of the project include:

1. Characterize wastewater plume geometry, composition and migration at a single facility in the Keys.
2. Quantify the impact of shallow well effluent injections on nitrogen and phosphorus contents of groundwater in the halo zone
3. Evaluate generalizability of findings to sites with different geology, effluent chemistry and volume, and plume migration, with the goal of informing DEP regulatory decisions in the Keys.

To meet these objectives, the project team will characterize the plume's nutrient loads and travel time to the surface, report on the nutrient contents of both the groundwater and nearshore surface waters, calculate the stability of dissolved phases as an assessment of water quality, mineral reactivity, and nutrient removal efficiency, assimilate all of this geochemical data into SEAWAT (USGS reactive transport model) to evaluate the transferability of knowledge to other sites in the Keys, and to assess the causative relationship between shallow injection practices and high nutrient loads in surface waters.

Marathon's Area 3 facility is permitted for 500 million gpd of wastewater injection. Five groundwater monitoring wells will be drilled within 1000' of the wastewater facility. These wells are designed according to EPA specifications and drilled to 60' with sampling at 10' and 50'. Study site: Marathon Area 3 WWT facility. An additional 5 wells will be added following some modeling outputs. Six sampling events will occur over two years and will measure total nitrogen, phosphate and ammonium within the main flow path and slower velocity plume margins. NELAC certified labs will be used for analysis. Additional tracer studies will be used to track where and how quickly wastewater nutrients emerge in the halo zone. A final component of this study will be an experiment to inject mixed seawater and effluent to reduce density contrast between the plume and surrounding saline groundwater. The predicted outcome of this experiment is that increased residence time in subsurface karst will increase denitrification efficiency and phosphate adsorption onto KLL.

Miquela reviewed the timeline for fieldwork (beginning June 2021), analysis and modeling, and final data synthesis and report writing over the next few years. Key stakeholders (FOLKS) will participate as citizen scientists in the field work.

#### Discussion

- Patrick Rice noted the increase in denitrification as wastewater moves away from the injection site, and inquired if any part of the study will investigate the effects of that (this process creates H<sub>2</sub>S).
  - Lee Kump noted that this was included in the Key Colony Beach Study. A signature of denitrification is an accumulation of N<sub>2</sub>, and they also saw accumulation of ammonium. Groundwater is already H<sub>2</sub>S rich, but they did see some accumulation of that too.
- What is the saturation rate of phosphorus? At some point there is no more surface area for adsorption?
  - This is a question they're interested in. Based on previous studies, P was effectively removed very quickly. But there is finite space for this to occur, and there is the possibility of desorption when not injecting high-P waters.
  - Lee: One of his students looked at longer term removal options. With slow precipitation there is the potential for permanent removal.
- Henry Briceño referenced other injection experiments done in the past (by Gene Shinn and USGS), as well as the recent fluorescence study in Cudjoe Key.
  - This work was done in collaboration with Lee Kump in their previous work. Lee noted that Cudjoe has a lower permeability Oolite cap, so it may be higher permeability in Marathon.
- The presentation and papers referenced will be distributed to the TAC after the meeting.

#### **IV. (10:15 AM) Public Comment**

No public comments.

## V. Break

### VI. Priority Topic Recommendations for FY21 EPA funding Opportunity

Steve Blackburn (EPA) provided an introductory overview to the priority topics reviewed and approved by the WQPP Steering Committee for inclusion in the FY21 EPA funding opportunity. The Steering Committee asked the TAC to review these special studies topics, as has been done in the past.

EPA's South Florida Geographic Initiative (SFGI) area includes the Keys, Biscayne Bay, Florida Bay, the Caloosahatchee and Indian River Lagoon. As the geographic area increased, so has funding.

Steve reviewed the type of projects funded over the past 5 years. Primarily, there has been a large focus on canal work with many projects funded for Monroe County. This was not identified as a 2021 priority, which doesn't mean these projects aren't eligible for funding, although being a priority the likelihood of selection. Some other projects have been put forth in the past with no applicants, including non-municipal wastewater and stormwater pollution reduction. Public Education & Outreach has also been a priority topic, and two projects have been awarded in the past 5 years (including Florida Keys WaterWatch). Projects have also been funded for sponge/habitat restoration in Florida Bay. Research on endocrine disruptors has and continues to be a priority. Corals and HABs have also been defined by Congress as priorities in this geographic area.

Steve provided an overview of the six currently proposed priorities for FY 21, and reminded TAC members that the content in the Request for Applicants (RFA) needs to be written as a broad concept versus a very narrow project description.

- Stormwater Pollutant Investigation
- Large Vessel Impacts on Water Quality in Key West Harbor and the Adjacent Marine Ecosystem
- Water Quality Connectivity from Southern Florida to the Keys
- Inputs of Contaminants of Emerging Concern on Aquatic Ecosystems in the Florida Keys
- Non-Municipal Wastewater Sources
- Public Education and Outreach

### Discussion

The following discussion occurred relevant to the topic of Large Vessel Impacts on Water Quality in Key West Harbor and the Adjacent Marine Ecosystem:

- Shelly Krueger: The description mentions evaluation of existing data vs. including an option for more research? Should this be expanded to include additional data gathering?
- Nick Parr provided comments sent ahead by Chris Bergh, who recommended looking at archived remote sensing and other data from before and during the shipless period. Those same parameters should be re-evaluated after ships return. More in-situ monitoring may take too much time to gain a baseline.

- Steve Blackburn noted that funding for these projects would not be received until the fall, so ship traffic may resume before any additional in-situ monitoring could be included.
- Henry Briceño took an initial look at water quality in Key West Harbor during the Anthropause compared to previously collected data from the FKNMS water quality monitoring program.
  - He also noted that as written, this topic seems constrained to existing data vs. additional measurements and monitoring for turbidity and Kd. That language in the RFA should include the ability to conduct additional research, since data is limited in this area. Data needs to be designed to answer this specific question. Other, existing monitoring data was not designed to answer this question, although they can provide some information.
- Christopher Kavanagh: Determining impacts from ships requires high frequency data collection. This would ideally include continuous monitoring and have added components to exclude factors such as weather and currents. It will take time to establish such high frequency monitoring. The Anthropause may be over before this could get up and running, so it may not be able to collect baseline data, but could still provide impact data if you have reference points away from the shipping areas. Christopher indicated support for Chris Bergh's suggestion to look more closely at existing data, and mine that to see what it can say. Also determine if additional, more focused continuous monitoring focused on the shipping channel is worthwhile.
- Henry Briceño emphasized that his report was just to look if 2020 data was different from before. He did not address specifically the issue of cruise ships, which requires more data from before, during and after the cruise ship pause, including from the navigation channel. The problem with remote sensing is that the study area close to land and shallow, and much of that satellite data is lower resolution. A more robust analysis with more remote sensing data could be incorporated (he only looked at 2019 remote sensing data). USF does wonderful work with satellite data and could provide time series remote sensing data from this area. We also need some in-situ data. Recommend requesting SFWMD to run an instrument in that area before the cruise ships return. This instrument can be on a boat and operated up to 20 knots in a transect pattern to measure surface water turbidity, etc. Chris Madden of SFWMD has this equipment and may be able to deploy this instrument/do a series of surveys in this area before ships come back to port.
- Lee Kump: Agrees now is the opportunity if emergency funding can be made available to do this survey during the pause in cruise ships.
- Question from the Public: Does anyone know whether PAR light attenuation data have been/is being collected in the Key West Harbor area - or anywhere in the Keys for that matter.
  - Henry Briceño has read that some measurements have been done in the past while the channel was being dug (during the construction). Would need to go back to check on the source of that information.
  - There was extensive monitoring during the Navy maintenance dredging project and that should all be available through DEP as the permitting entity.
- Initial analysis of the cruise ship track only used data from one satellite sensor (MODIS/Aqua). Other satellite sensors may provide a better look (especially higher spatial resolution). Perhaps

the limitations that Henry listed (benthic contamination, shore adjacency, longer time series) should be enumerated within the topic?

- Henry Briceño: There are buoys in the area and we can generate some time series satellite data. It would be better to have a longer time series. There are other sensors but most if not all will have the same challenge with shallow water creating a bottom signal. Henry is working with people to try and unravel this problem to take into account the bottom (need to differentiate between water column and bottom signal). This is ongoing research.
- What are depth limits in terms of satellite data?
  - Henry Briceño: It's a combination of depth and clarity. If the water is too clear, it looks at the bottom. If water is cloudy, the satellite can pick up the water signal.
  - Brian Barnes (USF): This is correct. The bottom composition also matters. Sandy bottom is bright and that makes it harder to differentiate the signal. It may be good to enumerate these limitations in the RFA - we're looking for specific investigations from experts who understand satellite data.
  - Shelly Krueger: Keep RFA broad, but these types of qualifications should be considered when reviewing projects.

The following discussion occurred relevant to the topic of Inputs of Contaminants of Emerging Concern on Aquatic Ecosystems in the Florida Keys:

- Shelly Krueger: Evaluation of existing data vs. including an option for more research? Does CEC include microplastics?
  - Steve Blackburn: Yes, research can be included in this RFA topic; CECs do include microplastics.
- Christopher Kavanagh asked for clarification on the definition of CECs, and whether that only includes nominal chemicals or also older contaminants that are becoming present again in quantities that are concerning.
  - Steve Blackburn: Yes, CECs can include old contaminants too.
- Henry Briceño: CECs are unregulated. So if old chemicals that we know are pollutants are NOT regulated they are also part of the "emerging pollutants" category.

The following discussion occurred relevant to the topic of Water Quality Connectivity from Southern Florida to the Keys:

- Henry Briceño if new models could be considered as part of this topic. What are currently accepted models? There are some models, but they are limited in this area and may not fulfill the needs. The RFA should include the option to develop new models to investigate connectivity.
  - Steve Blackburn noted we can add language to develop new models, if the TAC thinks that is important.
  - Luke McEachron provided information on the DEP SLIM model. They are looking at disease dispersant, but you can use their simulations to look at other connectivity. This

is 100m resolution at the reef scale: [http://maps.elie.ucl.ac.be/coral-disease/presentations/iMarCo\\_2019/imarco\\_2019.html#/](http://maps.elie.ucl.ac.be/coral-disease/presentations/iMarCo_2019/imarco_2019.html#/)

- Lee Kump: In the context of connectivity and external inputs to FKNMS waters, he wonders about airborne inputs. Has this been of interest or funded in the past? Consider dust and other airborne mechanisms for pathogen transport.

The following discussion occurred relevant to the topic on Stormwater Pollutant Investigation:

- Sandy Walters: Stormwater pollution reduction may get more attention this year with the reevaluation of TMDLs, hopefully this will stay on the list.
- Lee Kump: Why wasn't this successful in generating project proposals in the past? Is there a strategy for improving success/generating focus on this among people who can do the work?
  - Steve Blackburn noted that we may be able to offer more funding for this type of investigation in the future, which may help.
  - Karen Bohnsack added that the suggested language for the RFA has also been updated, which may help, and asked the TAC to help raise awareness of these funding opportunities among their colleagues to help generate strong proposals that will fill these needs identified by the WQPP.

Other general comments:

- Shelly Krueger: Would like to add habitat restoration as a priority (this seems important considering coral disease, etc.)
  - Steve Blackburn confirmed that will be a topic for all of south Florida. This may not include coral restoration b/c there is other funding going to that.
- Nick Parr also reiterated that these are FKNMS special studies - so things like canal and coral restoration may not be as applicable as it relates to higher-cost implementation.
- Steve Blackburn noted they are currently in the process of drafting the RFA. The topics need to be kept relatively broad, but he will try to incorporate the suggestions within those limitations.
- Gus Rios noted that there is still an interest among the WQPP in reinvigorating the TAC, and thanked the participants at this meeting for helping with that effort. To ensure updated TAC membership, Gus will send the membership list out and ask each TAC member to confirm that they are still willing and able to serve.

## **VII. Public Comment**

No public comments.

## **Meeting Adjourn**