

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

**March 7, 2024**

**DRAFT MINUTES**

**Steering Committee Members Present**

Wade Lehmann, US Environmental Protection Agency (EPA), Region 4 (Chair)  
Kim Shugar, Florida Department of Environmental Protection (DEP) (Co-Chair)  
Sarah Fangman, Florida Keys National Marine Sanctuary (FKNMS)  
Greg Boling, Florida Keys National Wildlife Refuges Complex  
Gil McRae, Florida Fish and Wildlife Conservation Commission  
Pete Frezza, Village of Islamorada  
Sue Heim, Key Largo Wastewater Treatment District  
Alison Higgins, City of Key West  
George Garrett, City of Marathon  
Kelly Cox, FKNMS Sanctuary Advisory Council  
Chris Bergh, Florida Keys Program, The Nature Conservancy  
Jennifer Savaro, Resource Environmental Solutions  
Shelly Krueger, Florida Sea Grant/IFAS Extension Monroe County  
Patience Cohn, Marine Industries Association of South Florida

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**Summary of Resolutions**

- Motion 1 (passed): Mr. Lehmann reviewed the agenda and minutes and requested edits or a vote to approve from the Steering Committee. Sue Heim made the motion to approve; George Garrett seconded. The agenda and minutes were approved with no changes.

**Other Action Items**

- Review the draft WQPP Report to Congress and share any additional input as soon as possible. Establish a timeline to stay on target for having a draft for agency reviews by the summer.
- Share the names of individuals who may be willing to participate in a WQPP Communications Subcommittee, which will be scoped over the coming months.
- Consider including a resolution on the next WQPP meeting agenda related to the Florida Keys Water Quality Improvement Program. The Steering Committee could be provided an opportunity to review a resolution and provide input, with a draft distributed prior to the meeting.
- Update recommended topics for FY24 EPA funding based on Steering Committee discussion.

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**I. Welcome and Opening Remarks**

Wade Lehmann, Ocean and Estuarine Section Chief, EPA Region 4, called the meeting to order at 9:15 am and welcomed everyone. Kim Shugar, Division of Ecosystem Assessment and Restoration (DEAR) Director, FDEP, and Mr. Lehmann are the meeting co-chairs.

Members of the WQPP Steering Committee, Management Committee and Technical Advisory Committee in attendance were introduced and recognized.

Ms. Shugar gave the opening remarks on behalf of FDEP. Thanks to all for joining today's meeting.

Mr. Lehmann introduced Division Director Katie Butler who gave opening remarks on behalf of EPA. Thank you to the city of Marathon for hosting this meeting. EPA remains a willing and enthusiastic partner in protecting water quality in the Keys. These partnerships have been essential to success achieved to date and will continue to be key for success in the future; EPA remains committed to maintaining these relationships. During their visit to the Keys this week, EPA was able to see a number of different projects at work, including coral restoration, resilience efforts, canal restoration, marina pollution reduction, and a wastewater treatment plant. They also were able to get on the boat yesterday to learn about tidal restoration in the state park. EPA is committed to integrating environmental justice into all their work, including the Water Quality Protection Program. The FY24 Request for Applications (RFA) will be released in a few months; this will drive approximately \$8M in funding, including BIL funding, to special areas including the Florida Keys' aquatic ecosystems.

Karen Bohnsack, FKNMS, reviewed housekeeping information, including the hybrid meeting format and instructions for attendee participation and public comment. The presentations and materials associated with the meeting will be available at the Steering Committee page on the Water Quality Protection Program website [http://ocean.floridamarine.org/FKNMS\\_WQPP/](http://ocean.floridamarine.org/FKNMS_WQPP/).

#### *Agenda and Minutes*

Mr. Lehmann reviewed the agenda and minutes and requested edits or a vote to approve from the Steering Committee. Sue Heim made the motion to approve; George Garrett seconded. The agenda and minutes were approved with no changes.

## **II. Congressional Report Update**

Mr. Lehmann introduced a brief update on the WQPP congressional report and invited input from the Steering Committee. We've been trying to complete this report for a few years. Getting this done is key to maintaining funding; we need to tell Congress what we are doing with the money that has been allocated to this program. This has been a challenge but we are working hard to get it done. The latest draft was shared via email yesterday.

#### *Questions & Answers/Comments/Discussion:*

- Gil McRae inquired about the timeline to get the report done, and for what specifically, FWC may need to contribute but has not yet.
  - Karen Bohnsack noted that FWC has been responsive to requests. What has been circulated is Part 1 of the report, which is immediately responsive to the direction provided in the legislation that created the WQPP, including updates on program implementation, any modifications to the program, and future needs and priorities. We also have a Part 2 to the report which provides more in depth information from the long term monitoring programs, including the Coral Reef Evaluation and Monitoring Program (CREMP) that FWC leads. That information has been provided already.
  - Wade Lehmann added that the goal is to get the draft to the point where the agencies can begin their review this calendar year - specifically this summer. We will still need to work on a process for review. As a reminder, we are supposed to complete this report every two years.

- Sue Heim: Do we still want to include where we've been and why it's important, or is that piece being diminished in the latest draft?
  - Kim Shugar responded that we want to keep some of the 'where we've been' information, but summarize it via tables in the back. We don't want the report to be so long that we lose people's attention. We don't want to lose the history, but the primary focus needs to be on accomplishments since the last report was completed. Her efforts to clean this up have reduced the report length by 6 pages; some of this was redundant information. Please flag if anything important that has been moved to the back should be maintained up front.
  - Sue Heim agreed that the focus should be on progress since the last report. We have come a long way from where we were.
  - We can have a short paragraph to summarize where we were, but the report should highlight where we've been and then discuss where we intend to go in the future.
- Wade Lehmann added that congressional reports need to be concise with strong points delivered up front. Additional detail will be accessible in the back. Steering Committee members are encouraged to send updates in response to this draft; please try to do so without delay. DEP has been working with a tech writer to try and streamline this content. Does anyone else have access to someone to help with this? The government has a mandate to provide information so that it is accessible to a middle school reading level. Please let us know if you have technical help available to support this report.
- Sarah Fangman: Is there a source of funds to bring additional technical support in?
  - Wade noted that there may be, however they need to look for capacity internally and use that first; there may be existing contracts in the agency. DEP has a similar situation; they can probably do most of this within their group.
  - Sarah Fangman noted her support to bringing in this assistance if money is available. Such assistance now could set up a template so that reporting is more streamlined in the future. FKNMS does not have any technical writing capacity to offer, but this is a good idea.
- Wade added that to date, the Management Committee has largely been responsible for pulling this content together; that is why it is so technical. If the Steering Committee has input on the process for seeking final review from this group, please let us know. We expect we'll need several agencies to complete reviews, but perhaps some representatives could rely on the reviews being conducted by the others.
- Regarding report distribution, Wade noted that EPA is working on a website that will be published in a few months. The report could go here; it could also be hosted on other sites and shared through social media. What other avenues should we consider for distributing the final report to the public and elected officials?
  - Sarah Fangman offered that FKNMS will support distribution via their various channels, including the sanctuary's website and social media. NOAA branding and/or co-authorship will require NOAA review, but then we can do more in terms of sharing it. Sarah noted she would be proud to carry this and support its distribution to elected officials. Overall, she is not supportive of printed distribution.
  - Kelly Cox flagged that in Congress there are caucuses. The Everglades Caucus consists of representatives who are in the south Florida area. The WQPP should consider organizing a staff-level briefing for caucus members for their awareness; she would be happy to help with this.
  - Shelly Krueger added that the South Florida Ecosystem Restoration Task Force (SFERTF) should also be a point of distribution.
  - Becky Allenbach, EPA, agreed. The SFERTF is a well-oiled machine. They produce Reports to Congress every 2 years; let's reach out to them on the process for getting the word out and follow their distribution system.

- Peter Rosasco, KLWTD, added that while he was in Tallahassee this year state level folks were asking about what data we have on improvements resulting from all the efforts undertaken to improve water quality. He encourages communicating the data as much as possible. We've invested all this money; we need to highlight the results we have seen from that.
- Chris Bergh: It might be particularly effective to have Keys' county and municipal governments coordinate efforts to share with state and federal elected officials.
- George Garrett: It is relatively easy to get to councils, county commissions, rotary clubs, chambers, etc.
- Wade Lehmann flagged that there is no budget for printing these days. That's not to say we shouldn't format the report for printing, but it is unlikely that will be how we distribute it.

### III. WQPP Communications

The WQPP Steering Committee discussed opportunities to potentially improve external communications about the WQPP and water quality issues, efforts, successes and milestones in the Florida Keys. Wade Lehmann introduced this topic, noting the importance of communicating about the WQPP and water quality related issues and efforts. This topic has come up intermittently over the past couple of years, and more specifically during the last couple of meetings. Public education and outreach is also a foundational aspect of the WQPP overall. The Steering Committee was asked to provide input on how we better message the work of this group and improve overall water quality communication.

#### *Questions & Answers/Comments/Discussion:*

- Wade Lehmann initiated discussion, noting that it would be nice to develop a communications plan.
- Sue Heim: There is a network of Public Information Officers (PIOs) from groups across south Florida. Engaging with this PIO network would provide access to a large audience.
- Shelly Krueger: In the past there was a symposium to highlight research for public audiences.
- Wade Lehmann: EPA Region 4 covers eight states so very specific regional communications are challenging, but not impossible. Could we consider hosting a symposium in conjunction with a WQPP meeting?
- George Garrett: In the past, technical experts doing current research were brought in for that symposium. The purpose of that effort was to develop a white paper and other documents. This purpose continues today. Originally, we needed to document and prove there was a problem, and proving the problem required funding for various projects. The purpose these days would be to remind the community about where we've been and to show all we've accomplished. This is a big sanctuary, and we've done a lot of work. Other areas also influence what happens here; we need to push that message more.
  - Wade Lehmann reminded attendees about the Florida Keys and South Florida Ecosystem Connectivity Team, which the WQPP supported standing up. The Connectivity Team could help highlight the outside influences during such a meeting.
- Alison Higgins flagged that the City of Key West is currently developing a city-specific Water Quality Improvement Plan (WQIP). They looked at the larger WQPP priorities and action items to hone in on those that a city can specifically support. Education and outreach is an important piece of this; local cities put out a lot of local press releases. Alison recalled sitting down with a subteam in the past to come up with a few key messages that all partners could share. That effort resulted in a PSA that still plays today. The City of Key West would be interested in convening such a group again. Alison also noted that hosting a symposium every 5 years is part of the City of Key West's WQIP. The symposium could rotate through different districts - e.g., move from Key West to the Middle Keys to the Lower Keys, etc. - to allow a focus on more local issues.
- Wade Lehmann: Sound bites and short videos are good at grabbing attention; this is a great idea. He noted his support for standing up a subcommittee to help coordinate educational messaging,

but expressed the importance of getting the congressional report done first. In the interim, we could consider who would be involved in such a group and reach out to see if people are willing to join.

- Sue Heim: With the election coming up this year, do we think the report will come out before that?
  - Wade Lehmann: We would love to get done before, but agency review timelines are hard to predict. The goal is to have a draft report by summer.
  - Sue Heim requested a working schedule be established and distributed to the Steering Committee to make this happen.
- Sarah Fangman agreed that completing the congressional report is priority #1. However, a communications group may also help with planning and launching that document. Consider a soft launch to such a group by identifying and starting to convene professionals to participate in it. Their first job could be to help get the congressional report finished, polished and broadcast. That way, once it is done, we will be ready to share that report with the world. In other words, we could stand up such a group sooner than later, but they would not be tasked with focusing on any new products until the congressional report is complete.
- Kim Shugar: Communications plans require an understanding of what each organization is already doing and what they can do. Everyone has different audiences and abilities to get information out; this is a key part of developing plans.
- Steve Blackburn added that in the past the WQPP had strong relationships with the local press. Can we do press releases - either individually or as a whole? Each year this group also provides input on priority topics; communications and outreach could also be included as a priority topic for funding. The WQPP also used to have the Waterways video program.
- Chris Bergh: Florida's Coral Reef Resilience Program has a Communications Committee with most of the agencies and some other players represented. That could be a vehicle to support WQPP efforts.
- Sarah Fangman: Should we move forward with this concept, FKNMS has capacity to support it. Our team has experience developing interpretation and education and outreach plans. We'd be happy to facilitate this process and host a workshop to create a roadmap for WQPP outreach efforts.
- Wade: If anyone has specific individuals willing to participate in a sub-team to more formally coordinate on water quality communication efforts, please share their names.

#### **IV. Use of Shallow Injection Wells for Wastewater Disposal.**

##### ***City of Marathon Wastewater Update***

George Garrett, City of Marathon, discussed the City of Marathon's wastewater infrastructure, including plans to update that system in the coming years. The City of Marathon has 5 wastewater treatment plants and a total of 12 wastewater shallow injection wells. These plants are distributed across the city over an area of roughly 10 miles. The typical capacity/effluent export from those plants is about 900k gallons per day in total.

The City of Marathon recently was part of a federal lawsuit with the Friends of the Lower Keys (FOLKs), who had a similar lawsuit against the Cudjoe Regional Plant, which also had a shallow well and operates at close to one million gallons per day in that single plant. These shallow wells were originally permitted and funded under state law, however a lawsuit in Maui a few years ago changed the perspective on this issue. There were some differences between the Maui lawsuit and the Keys, including different geologies, but there were also similarities in that both locations involved shallow injection wells. Mr. Garrett also noted his understanding that Maui's effluent did not undergo Advanced Wastewater Treatment (AWT) but only secondary treatment. Ultimately, after two years of effort with the federal lawsuit, there were

enough similarities with the Maui case that the City of Marathon decided to settle the lawsuit. Mr. Garrett noted his continued belief that the impacts from the City of Marathon's current system is minimal, and reiterated the input from Dr. Lee Kump during the last WQPP meeting, in which he shared that there are impacts from the shallow wells, but that those could not be considered a functional equivalent.

As part of the settlement, the City of Marathon agreed to move all effluent across the existing 12 shallow wells and 5 plants to one location and put it down a deep injection well. While one can debate how much AWT nutrients reach the nearshore waters, there is no question that the impacts associated with a deep injection well are less than those associated with a shallow well. Moving to a deep well is a good decision, although it is expensive. Mr. Garrett reminded the committee that prior to the Keys-wide upgrade to central sewer, the Keys had had package plants, and secondarily treated wastewater going down shallow wells, there were easily 10,000 - 12,000 septic tanks in Marathon alone, along with several thousand cesspools leaching into the ground. We have come a long way from where we were before. Even package plants that had plumbed sewage treatment systems were very leaky.

Mr. Garrett provided additional information that when the City of Marathon decided to settle the lawsuit, they hired a firm to begin looking at the feasibility and cost associated with effluent disposal down a deep well. He displayed an image of the location of the existing wastewater treatment plants in Marathon. Originally the City was going to have seven in total, but that was reduced to five when the plants envisioned at Boot Key and Knights Key were removed from the plan. Boot Key did not have sufficient space or people, Knights Key was consolidated into the Area 3 plant. The Area 3 plant was being expanded when the lawsuit started; that proposed expansion became the basis for the lawsuit as it required updated permits from DEP and documentation showing that this would not be impactful. This would not have been an issue without the Maui case, as the plant was originally established according to the law.

The city spent two years on modeling studies to show minimal impacts. When DEP was notified about sucralose impacts, they suggested additional monitoring. The WQPP Technical Advisory Committee (TAC) noted that such monitoring would only tell us what is there, but not the source. They suggested the importance of monitoring where you have wells, and to look at sources and directions. Thus, there were a series of monitoring wells drilled around the Area 3 plant to determine impacts. The city supported this study and allowed it to happen. EPA funded it. This was a great process and resulted in similar results as those found from the City of Marathon's modeling efforts. Mr. Garrett again reiterated that Dr. Kump did identify an impact, but that it is not the functional equivalent of a direct discharge. Mr. Garrett reviewed the average flow and permitted capacity of the City of Marathon's plants, noting that this is a vacuum system. He also showed an image that depicts the difference in drilled depth between a shallow and deep injection well. The deep well injects beyond the boulder zone which is understood to be a complete refining layer. The deep well the city will install will be drilled to a depth of 3,500 feet.

In addition to a deep injection well, the city looked at other options for upgrading their wastewater system. In total, 12 options were reviewed including a single deep well, five separate deep wells to replace the existing shallow wells at all plants, indirect and direct reuse, and indirect and direct potable reuse. Similar to aquifer storage and recovery (ASR), indirect potable reuse entails taking effluent from plants and injecting to a place where it would sit before being pumped back out and processed for potable use. The other option is to run that effluent directly through a reverse osmosis (RO) plant. Even with the deep well, Mr. Garrett noted his support for potable water reuse. In assessing these 12 options, a number of criteria were established ranging from cost to acceptance issues. These were evaluated over a period of 30 years, including the 30-year lifecycle costs. Across the options, the cost ranged from \$56M and \$247M. The single deep well was the cheapest option, and came out as the winning solution across the criteria. The location for the single deep well is still being determined; it may be located at the existing Area 6 plant (Coco Plum) or located at a new site that would be created on Crawl Key. When the

Wastewater Master Plan was being developed, they carved out a piece of property on Crawl Key. That property was ceded to FKAA who is proposing to establish a desalination plant there. It is possible that the deep injection well could be co-located with the desalination plant at Crawl Key. This would allow for dual systems; FKAA would do RO on salt water while the City of Marathon would be doing RO on the effluent

The City of Marathon agreed to a consent order that has been filed and approved. They are required to complete installation of the deep injection well by December 2028 (5 years), despite plans showing it may take closer to 7 years to complete. There is also an issue associated with where the deep well will ultimately be located, as there is a sentiment of “not in my backyard” although the area required for the well system is not large, and the system does not have a smell associated with it. Where the deep well will be established remains to be determined.

### ***Outstanding Research Questions and Suggested Next Steps***

In a pre-recorded presentation. Dr. Miquela Ingalls and Dr. Lee Kump, Pennsylvania State University, provided a short summary of additional research questions related to shallow injection wells in the Keys. These questions were first presented during the last WQPP Steering Committee in November 2023, and were reiterated and elaborated on here.

First, Dr. Ingalls reminded attendees that the premise of their study is that wastewater derived phosphorus is removed from the shallow subsurface waters by chemical reactions. That wastewater interacts with the carbonate Key Largo limestone that makes up the bedrock in the Florida Keys, and adsorbs onto the carbonate lattice site. The hope is that on longer time scales phosphate will mineralize to form appetite group minerals to more permanently remove the phosphorus from the water. A remaining question from this study is whether this adsorption and mineralization process is both an efficient and permanent solution to wastewater derived phosphate from shallow injection in the Florida Keys.

Dr. Ingalls reminded attendees of some of the findings presented to the WQPP in November. A dye tracer experiment was conducted, in which fluorescent dye was injected at the Area 3 Wastewater Treatment Facility shallow injection well. Over the following year and a half, they analyzed the fluorescence of well waters at depths of 3m, 6m, 15m and 27 meters in an array of well clusters radiating away from the injection well. These analyses detected the arrival of the fluorescent effluent plume at the different depths and well clusters and from this, it was determined that the dominant flow path and the fastest flow path is to the northeast.

This study provided information about the duration of effluent migration (days), but also the distances of migration. Overall, the study found that most wastewater derived phosphorus is removed from the subsurface. A graph was presented where the X axis denotes the “days to peak arrival” going from zero days (at the most proximal wells where the plume arrives in the days following the injection) to in excess of 300 days at the more distal wells. The Y axis provides the percent of soluble reactive phosphorus removed compared to what was predicted from the mixing of the fraction of wastewater, saline groundwater, and rainwater for each of the well sites and samples. This shows that less soluble reactive phosphorus is removed at our more proximal wells, as you might expect. But as the residence time in the subsurface increases towards 300 days, a higher percentage of the soluble reactive phosphorus is removed from the subsurface waters.

However, note that all of the values fall below 100%, which shows that the soluble reactive phosphorus is not 100% removed from any of the well sites. And as time proceeds, there is a suggestion in the small amount of data that we may be seeing desorption of phosphorus from the carbonate bedrock.

A hypothesis is that if we could increase the residence time of the effluent plume in the subsurface, we could potentially increase the efficiency of this phosphorus removal. Some open questions that still exist are: (a) whether the Key Largo limestone bedrock has a capacity or a limit that would be reached if these open lattice sites become saturated with phosphate; and (b) whether the effects of competing ions in the saline groundwater, which serve as kinetic inhibitors to these adsorption and mineralization reactions, may cause desorption in the subsurface.

Dr. Kump reminded listeners that the transport of the plume is driven by the density contrast between the low salinity wastewater plume and the natural high salinity saline groundwater system that exists throughout the Florida Keys. Wastewater injected at depth thus rises buoyantly very close to the point of injection toward the surface and then spreads out laterally. They've found that the whole transport system is driven by the wastewater plume itself; that has totally modified the groundwater flow close to the Area 3 injection plant. The idea is to think about ways that we could modify that transport and reduce the buoyancy of the wastewater plume (e.g., reduce the buoyancy contrast) so that there'd be a longer residence time within the subsurface. This would allow us to modify the salinity distribution of the subsurface, and theoretically the phosphate distribution as well. Once again cross sections were presented, showing the highest concentrations of phosphate are close to the point of injection near the surface and then decreasing concentrations as that plume moves out laterally, primarily to the north and the east.

One experiment that could be performed would be to increase the density of the wastewater plume, thus increasing its residence time in the subsurface while also increasing the phosphate removal that would be associated with that plume and therefore promoting mineralization. This would require a blending experiment where saltwater would be blended with the wastewater plume to increase its density. In contrast to the current situation with wastewater injection at depth is a buoyant material rising to the surface and moving out laterally, blending saltwater with that wastewater plume could reduce that contrast and therefore increase the amount of time that the wastewater plume spends in the subsurface promoting phosphate removal.

This experiment could be done fairly straightforwardly, although there are issues about where the salt water would be derived. Particularly, there are good reasons not to try to derive that salt water very locally from the point of injection to drive convection within the system. Instead, one would probably want to bring in salt water from either Boot Key Harbor or Florida Bay, which presents some challenges here. There are other things that might surprise us with such an experiment. As Michaela pointed out, the adsorption process is most efficient under low salinity conditions. Thus, by increasing the salinity of the wastewater plume, we are actually decreasing that efficiency toward absorption. It's possible that by increasing the salinity of the wastewater plume that we might actually desorb some pre-existing phosphate from the subsurface.

If performing this experiment, we'd recommend that it be of limited duration and include monitoring of conditions close to the site of injection. We have a sense now from the tracer study that we wouldn't want to do this for hundreds of days where we're impacting the plume far from the point of injection. Thus, this would be a short-term study to determine whether or not this increase in the wastewater plume salinity and residence time in the groundwater tends to favor phosphate removal and perhaps nitrate removal from the wastewater plume as well.

In addition to this study of wastewater derived phosphate, Drs. Ingalls and Kump have conducted a parallel study looking at the fate of wastewater nitrogen. This study is nearing completion. The general findings are similar in that time is a really important factor in the subsurface where, in this case, the removal process for nitrate is biological (denitrification) rather than a chemical process. Drs. Ingalls and Kump also noted that they have been making progress on hydrological modeling efforts to generalize these findings to other sites in the Florida Keys that are still performing shallow injection. Finally, Dr.



Ingalls suggested that it would be beneficial to assess other wastewater derived contaminants that were not assessed in this study, such as broader collection of pharmaceuticals, pesticides, sunscreens and other anthropogenic contaminants. These could be sampled and analyzed using the wells that we drilled for this study. Dr. Ingalls noted their regret for not being present in person for the meeting today, but offered their contact information for any questions: [ingalls@psu.edu](mailto:ingalls@psu.edu) and [lkump@psu.edu](mailto:lkump@psu.edu).

*Questions & Answers/Comments/Discussion:*

- George Garrett: Marathon has begun shifting Florida Keys Water Quality Improvement Program (FKWQIP) money to support the deep injection well. Considering that there has been a lawsuit, he expressed concern that there are eight additional shallow wells still out there that may also be subject to lawsuits. One is at Baypoint, which could be connected to the Cudjoe Regional Plant, but others are very low volume. For example, the Layton plant serves Duck Key and Conch Key. He suggested that the state go back and look at the law. If effluent is below 1 million gallons per day, the law says that a shallow well with AWT is okay.
  - In response to a question, George clarified that USACE did say that the FKWQIP money could be used to establish the deep injection well.
- Alison Higgins asked Marathon whether they are still considering potable reuse.
  - George Garrett noted that they would like to implement potable reuse if they can convince FCAA to establish a system at Crawl Key. It still wouldn't be immediate, but long term if the deep well is co-located with FCAA they could have dual reuse facilities at that location and share costs to dump down the same well. This would provide potable water that would go to FCAA and could be blended with the salt water RO.
  - Peter Rosasco added that the KLWTD is also looking into potable reuse. There is a law to have potable reuse in place by 2032. That is an impossible timeline, but a lot of folks are working on it. Other areas in the state are spending a lot of money trying to approach this topic and determine how to do it. This is something we need to do. The Florida Keys was a test case with AWT and now we need to continue to make improvements to lessen our impact. This is all connected to the Florida aquifer system; we will run out of water if we don't do better. This is a big issue and it will take a lot of work and cooperation. FKWQIP and state funds should support this.
- Alison Higgins made the following comment for Dr.'s Kump and Ingalls: In thinking about the application of these findings to other shallow injection wells, I would be interested in looking at the shallow well on Stock Island. This is part of the Key West Resort Utilities.
- George Garrett made the following comment for Dr.'s Kump and Ingalls: The blending study is worth looking at. One may ask why since the City of Marathon is already moving to a deep injection well, but that information has a purpose for areas like Layton where flow is small enough and/or it is too expensive to connect to a deep well. At \$10 - 12M to put a deep injection well in, that may be too pricey and not worth the effort for the amount of effluent generated. If adding salt water helps improve the performance of a shallow well, that may be the better and cheaper option.

**Break**

**V. Direct Potable Wastewater Reuse: Innovative Treatment and Feasibility Studies**

Lynn Spivey, Director of Utilities, Plant City, Florida provided an overview of the One Water framework for potable reuse in Florida, and lessons learned from ongoing potable reuse projects around the state.

Integrated Water Resource Management, also known as One Water, is an approach to managing water that looks holistically at the planning and management of water supply, wastewater, and stormwater systems. One Water is a transformative way of viewing, valuing, and managing water. The One Water

approach manages all water—whether from the tap, a stream, a storm, an aquifer, or a sewer—in a collaborative, integrated, inclusive, and holistic manner across the water cycle. This is a collaborative and integrated approach. Hallmarks of a One Water approach include valuing water at every stage and in every form; focus on achieving multiple benefits; a systems mindset; watershed-scale thinking and action; intervening with right-size solutions; relying on partnerships and inclusion; and accounting for climate action urgency and opportunities. The Water Environment Federation discusses a circular water economy which has triple bottom line benefits for people, nature and businesses.

Florida’s Campaign for Potable Reuse and One Water started well before 2018 with beneficial use, but the past 5 years were especially big for water. In 2018 the Florida Potable Reuse Commission was established. This 11-member consensus group includes 6 utilities and representatives from big water users in Florida, including agriculture, public health, environment and industry. The Water Management District and DEP were ex-officio members of the Commission. This was a big effort that entailed monthly face to face meetings over a period of 18 months. During these meetings, the group discussed challenges and came up with consensus solutions representative of all users. The Water Research Federation moderated the meetings and developed a framework document that was the final product of the Commission.

In 2019, Executive Order 19-12 was signed by Governor DeSantis. This awarded funding through DEP to create a public education campaign to implement potable reuse. This funding was used to develop surveys to understand what people felt about reclaimed water and potable reuse, and to develop the One Water campaign and logo. In 2020, following the 18-month effort by the Potable Reuse Commission, the Framework for the Implementation of Potable Reuse in Florida was published by the Water Research Federation. This was also a big year for water law as Senate Bill 712, the Clean Water Act, required DEP to initiate rulemaking based on the Potable Reuse Commission’s framework. This also added potable reuse as a source water in Florida, which was a major step in recognizing that resource. In 2021, Senate Bill 64 further encouraged potable use by eliminating non-beneficial surface water discharge. This also required municipalities with surface water discharge to submit a plan by November 2021 to eliminate such discharges by 2032; those plans are updated every year.

There are a number of drivers for integrated water management /potable reuse. Notably, over 65% of the SWFWMD and all of the SFWMD are within a Water Resource Caution Area (WRCA). This includes the Florida Keys. WRCA is a geographic area identified as having existing water resource problems, or where water resource problems are projected to develop in the next twenty years. These areas require a water supply plan. Although water is plentiful in Florida, so are the challenges, including saltwater intrusion, overpumping leading to declining groundwater levels, red tide, blue-green algae blooms, etc.

Trends in reuse with the SWFWMD and across the state include: a decline in agricultural industries (with those being replaced by high density development projects); a flatline of golf course development; a shift away from reliance on public access distribution (purple pipe was a great idea, but for various reasons it’s inefficient and we’re trying to move from this solution); a shift away from coal power plant reuse; increased interest in economics of reuse and rates (the purple pipe venture has poor return on investment); increased interest in natural systems, wetlands and minimum flow levels; and an overall increased interest in potable reuse (as surface water discharge from wastewater treatment plants must be eliminated by 2032).

A number of potable water reuse pilot projects have taken place in Florida. These include both direct and indirect potable reuse. A few examples of these projects include:

- JEA; Water Purification Treatment Evaluation and Pilot Testing. This is a demonstration facility that will be large in scale; this is one to pay attention to.
- City of Daytona Beach. This was one of the first systems put into place and is a great system.

- City of Altamonte Springs. This was another project on the forefront and includes a science center built around the facility.
- City of Clearwater had one of the first systems designed with groundwater replenishment.
- The City of Tampa has struggled in their venture but are continuing to work at it.
- Hillsborough County's project is in its second phase, which includes injecting reclaimed water into the aquifer to reduce saltwater intrusion. This is working well.

All of these examples are to say that potable reuse is not new. There are a lot of places that have implemented pilot projects, and a lot of lessons have been learned as a result.

In Polk County, the NW Direct Potable Reuse (DPR) feasibility study and pilot project is currently underway. This includes a full source water characterization, treatment technology investigation, a large-scale 14,400 gpd DPR pilot facility; and cost estimates for full-scale implementation. This also includes a full educational program. This is a \$2.6M project that is co-funded by the SWFWMD. The treatment process flow is a non-membrane train. The process flow is as follows: Reclaimed water from the Northwest Regional Wastewater Treatment Facility has an option of enhanced coagulation for sedimentation, or that can be bypassed to the main treatment of ozone and biofiltration. From there, ultrafiltration is an option when needed, or could be bypassed to the activated carbon adsorption, UV disinfection and the final chlorination stage. This plant is currently up and running and offers tours of the facility. Polk County is part of the One Water Movement; this facility is co-located with the Cherry Hill wastewater treatment plant, such that the AWT potable reuse and conventional plant are side by side. The available reuse balances the potable water deficit.

Another example project is the North Port Feasibility Study. This project is a direct potable reuse feasibility study that includes source water characterization, investigating treatment technology specific to a coastal DPR system, and preliminary costing. The project is the first step in the development of a potential future full scale DPR project which is necessary to determine what is possible by 2032.

Next a case study of Plant City was presented; this demonstrates how integrated water resource management, potable reuse and environmental projects can come together. Plant City is located between Tampa and Orlando on the I4 corridor, and is independent from regional water supply authorities. Plant City has one 10MGD AWT water reclamation facility, and soon to be 5 wastewater treatment plants. DPR is needed in this area as the population is exploding, water demand is projected to surpass the permitted supply (already happened), they are in a Water Use Caution Area (they are now recovered but may revert back due to over pumping), and Senate Bill 64 calls for the elimination of non beneficial surface water discharge by 2032 (Plant City has a surface water discharge permit for 6 MGD). Overall, they both need more water and something to do with the existing reclaimed/highly treated water.

The McIntosh Preserve Integrated Water Management Plan includes wetlands hydration and potable use. This will apply highly treated water for wetland expansion (going into construction now) and keep that wetland hydrated with reclaimed water year round. Meanwhile, the wetland will promote flood mitigation and stormwater treatment. The other portion of this water will be used for source water for potable reuse.

The goals and objectives of this pilot project include: meeting regulatory requirements, establishing design and operating criteria for a full scale process, developing a robust public engagement program, and providing operator training for operation and maintenance. This is an expensive project and was not easy to sell to the County Commission, but they were able to do it. Both non-reverse osmosis and RO-based potable reuse treatment were considered for a variety of factors, including treatment efficacy, regulatory unknowns (CECs), waste stream disposal, operations and maintenance needs, and long term costs. Plant city has a lot of industrial contribution and were skeptical about the non-membrane train, but they looked at all the technologies available. Selection of an RO-based treatment (full advanced treatment with

membranes) was ultimately driven by the Florida total dissolved solids (TDS) removal requirement, industrial discharges, and draft potable reuse regulations in Florida.

Overall, the Plant City water cycle shows everything being done with highly treated water, from wetlands, landscape irrigation, and conveyance to the Water Purification Facility (AWT facility) where it goes through various processes to create safe drinking water that is available to augment the existing potable water supply.

This project serves as a One Water demonstration facility, and a variety of materials were developed to explain what the treatment entails. Public engagement started at the top: city leadership were involved in reviewing and revising the information that was being developed to ensure that the information was communicated well to general audiences. Graphics accompany the text to explain processes and complement tours of the demonstration facility. The systems include monitoring requirements, a dashboard, and transparent and inclusive public engagement. All of the Plant City Commission was at the ribbon cutting for the facility, along with the SWFWMD Executive Director, state representatives, etc.. This transparency and inclusivity were key to building trust. A number of graphics and information were displayed throughout the facility. Over 300 people came through and were able to interact with the facility through a variety of surveys, QR codes, take away materials, etc. Another good outreach opportunity was when a local farm to table/winery owner who was interested in water purification brewed beer using 500 gallons of the potable reuse water. This was served at an industry event supported by the city and provided a good way for the public to interact with and enjoy this product.

#### *Questions & Answers/Comments/Discussion:*

- Alison Higgins: Tell us more about your experience with “ick factor;” how did you overcome that?
  - Ultimately, they learned a lot from looking at what went wrong in Tampa (despite having a good project), and trying to avoid those same pitfalls. A lot of information from the City of Tampa was distributed to Plant City leadership, and they supported a strong public education campaign from the beginning.
  - The City Manager was averse to this at first and thought this was a plot to get him to drink toilet water. They spent time talking about the treatment system, how it’s proven, and how it’s done elsewhere and that allowed people to become more comfortable. Source water characterization, treatment system, messaging and graphics were all discussed at BOCC meetings.
  - SWFWMD conducted a survey in Central Florida that showed that a lot of people felt safer with this water than indirect potable reuse. They understood it could be made into a safe product. They were also more comfortable drinking this water than the alternative of putting it into the environment where they were experiencing a lot of challenges.
  - Overall, the city saw this as proactive, progressive, and important for independence and resilience.
- Alison: What did Tampa do wrong?
  - There was a complicated mix of factors. This was a different and more difficult situation because they are a municipality within a regional supply authority. Thus, they didn’t have to be transparent just within their utility, but with all member governments in the Tampa Bay Water Authority. There is more talk of water wars in this area because there are so many people who live there (the water authority includes Tampa, St. Petersburg, etc.). They had greater challenges and less transparency from the beginning. Once things went south, it was hard to right the ship and correct those issues. Interestingly, the challenges were never about the treatment technology.
- Ms. Spivey recommended a book called *Purify* by Peter Annin. This book discusses struggles in both California and Florida with potable reuse ventures, including a focus on the “ick factor.”

## Lunch Break

### VI. Water Quality Improvement Program.

Manny Vianzon, USACE, provided an update on the status of the Florida Keys Water Quality Improvement Program (FKWQIP) funding, as well as ongoing planning and implementation efforts. This program was originally implemented in the late 1990s/early 2000s with a \$100M federal authorization by public law 106-554. This authorized USACE to provide technical and financial assistance to carry out projects for the planning, design and construction of stormwater and wastewater treatment in the Florida Keys. This includes a cost share with the municipalities (65% federal; 35% municipalities), so the total program cost is \$153M. The goal of this program was to improve water quality in FKNMS by implementing projects within the wastewater and stormwater master plans prepared for Monroe County and the municipalities. The federal government reimburses the municipalities for their efforts.

The original \$100M was allocated to 6 municipalities: Key Colony Beach, Key West, Layton, Key Largo, Islamorada and Marathon. An Intergovernmental Task Force (IGTF) determined the municipalities to be reimbursed and the amount each was to receive. Once established, Project Partnership Agreements (PPAs) were developed for each municipality, which outline the scope of the projects that are eligible for reimbursement. Work within the FKWQIP is ongoing, with amendments to the PPAs currently underway for the three eligible municipalities who still have money available from the original allocation.

To date, \$80M of the \$100M has been reimbursed. Key Colony Beach, Key West, and Layton have completed their reimbursements. Key Largo, Islamorada and Marathon are still fulfilling those reimbursements. In the next few years, Key Largo and Marathon are expected to meet their total allocations; Islamorada has more money remaining. The PPA amendments in progress right now will provide an additional scope of work for this remaining funding.

Through WRDA 2022, Congress authorized an additional \$100M to the FKWQIP. The allocation of these funds will go through the same process that occurred when the program started in the early 2000s whereby the IGTF will provide direction on the allocation amounts for each municipality with USACE support. The SFWMD is a key member of this process too. Actual funding comes from Congressional Ad and Workplan funding. Over the past 5-6 years, USACE has expressed capabilities between \$6M - \$10M. Reimbursements in FY24 will depend on Workplan funding.

#### *Questions & Answers/Comments/Discussion:*

- George Garrett flagged that Key Largo is identified in the list of 6 municipalities that would be funded, but Key Largo is not a city/municipality. There were interesting politics occurring at the time this program was set up, which excluded the rest of Monroe County from the program. As we begin to look at the new \$100M, we would like a new MOU to include the county and Key Largo, including possibly the KLWTD.
  - Yes, USACE is aware of this. Those decisions were made early on in the program and we understand that circumstances have changed. The Steering Committee will be involved in establishing recommended allocations in this next round.
- George Garrett provided additional context about the process for this program. Between Key Largo, Marathon, and Islamorada, we have lobbyists who speak to the congressional delegation and seek funding under FKWQIP every year. The original MOU was drafted a while ago and there's a question about whether USACE was party to that MOU. I don't think they were, but they operate under that MOU. The local governments figure out how they want to divide the allocated money. This WQPP Steering Committee may have a part to play in a new MOU for the new

money that was not included in the first MOU. The WQPP Steering Committee was part of decision making early on.

- Manny Vianson: Correct.
- Pete Frezza requested an update on where USACE stands on the current PPA amendments. These would include canal restoration and stormwater management projects within the scope of the main agreements.
  - Islamorada: The PPA with stormwater and canal restoration work has been submitted to the Division and is currently under review. We are hopeful for a positive outcome. That PPA has also been sent to Islamorada in pre-draft form.
  - Marathon is currently working on a new scope of work (SOW); this is still early in the process and will take additional time once the new SOW is in place.
  - Key Largo: Hopeful this will be ready to submit before too long.
  - Overall, these PPA amendments are needed to increment out the remaining work. These PPAs will hopefully be final for spending the remaining funding from the original allocation.
  - An all new set of PPAs will be required for the municipalities with the new funding allocation. There is a distribution formula and that may take some time, but USACE looks forward to seeing the great projects that will happen with this money.
- Sue Heim requested clarification about the funding that is still available for KLWTD, and when that is coming through.
  - Key Largo has \$3.8M remaining; there are projects proposed in the PPA for that amount.
  - The PPA is in draft form right now and USACE will propose edits and process them soon, with an expectation that this will be submitted in the next few months. USACE has new requirements for this type of PPA amendment/reimbursable so they need to provide more documentation and reporting to move these forward. The municipalities will see the same amendment language, but internally USACE requires a lot more information to be added for the review. This is moving forward. The remaining reimbursements should be on the PPAs that are being reviewed and executed now.
- Pete Rosasco expressed his appreciation for this work. I understand that WRDA has \$6M for FKWQIP right now. For the new \$100M authorization we will have to get local stakeholders together and work on a new agreement to operate under moving forward.
- Shelly Krueger proposed a resolution from the WQPP to support efforts related to the FKWQIP, including gratitude for the additional \$100M authorization, and urging the completion of the PPA amendments.
  - Wade Lehmann acknowledged this. Such a resolution would not be able to be passed today, but it could be proposed and voted on during a future meeting once members have a chance to review it. Federal members cannot vote on an action directed at a federal agency, so some members will likely need to abstain.
  - Peter Rosasco agreed that the KLWTD would want time to read and consider a resolution before it was put to a vote.
- George Garrett reiterated the history behind inclusion of Key Largo as a “city” within the Keys. That was a political issue. At this point, we would like to include the full county in this allocation. That is reflected in the proposed resolution.
- Wade Lehmann added that even without a vote today, this conversation will be part of the meeting record that Monroe County was not included in the allocation, but that this group supports that for the purposes of improving water quality across the entirety of the Florida Keys.
- George Garrett: Completing the PPAs is critical. The City of Marathon has been trying to get the PPA done, but they are behind Islamorada by 2 years. This has to get done. Including Monroe County is a no brainer. For the next step, we cannot access the new \$100M authorization until a new MOU is done, but that has nothing to do with the current PPA amendments. Looking ahead to the next set of allocations, the City of Marathon would plan to use theirs to help fund their

wastewater system upgrade to deep injection well, although they support the inclusion of canal work elsewhere. Regardless of how the money is allocated and for what purpose, we need agreements with the local governments to use that money, then USACE can act on it.

- Sue Heim noted that Monroe County has an active interest in canal restoration because their wastewater work is mostly done. Which need is greater?
- Peter Rosasco added that this money has been well spent, we deploy projects on time and on budget. Now we have another \$100M to support additional projects. I am also in favor of including the county, but we need to keep track of issues beyond canal restoration. The billion dollar sewer project is mostly complete, but there are other issues including sea level rise. The issues associated with sea level rise and the response to that will dwarf wastewater. Monroe County has a plan for stormwater management and wastewater assets will have to be adjusted so they will continue to function. The cost estimate will be \$20-25M just for Key Largo. Including the full suite of projects and working collectively to set goals for moving forward is key.
- George Garrett: However, each entity uses money is up to them. The money is authorized; then it becomes a matter of what is in the PPA. Marathon will do a PPA that talks about deep wells, the county will probably talk about canals, etc. Each local government will develop these plans with USACE.

Wade Lehmann wrapped up this discussion with a recommendation that Steering Committee members can continue to communicate about this. The WQPP can provide water quality information and support this effort from a technical perspective; all are encouraged to reach out to the WQPP for this support.

Shelly Krueger reiterated a request to consider formally including a resolution on the next WQPP meeting agenda for discussion and a potential vote. The Steering Committee could be provided an opportunity to review a resolution and provide input/content edits beforehand.

## **VII. EPA South Florida Geographic Initiative Funding and Priority Topics**

### ***FY23 Projects***

Steve Blackburn, EPA, updated the Steering Committee on the special study topics that received EPA South Florida Geographic Initiative funds over the past several years, including the new projects funded in FY2023. Between FY2019 and FY2022, a total of 23 projects and \$7M in funding was allocated within FKNMS. A lot of those projects were driven by recommendations from the WQPP. The suite of projects includes continuation of the long term water quality, coral and seagrass monitoring projects, emerging contaminants, upstream connections, coral health, injection wells, etc. Mr. Blackburn walked attendees through the list of these funded projects, which included the project title, applicant, funding amount and the priority area.

In response to the FY2023 request for applicants (RFA), EPA received 56 proposals requesting \$25M. Approximately \$9M was available, and 20 projects were selected, not including long term monitoring programs. The average award was \$465k. Funding available in FY24 is still to be determined, but there is a hope for an additional \$8-9M between the SFGI and BIL funds. The projects funded this year were spread across south Florida, with approximately 20% of the funding awarded in the Florida Keys. A project was also funded in Florida Bay, and others along Florida's Coral Reef which has been included in the congressional language. The project located in Immokalee is with the Florida Department of Agriculture and is an Environmental Justice project.

Mr. Blackburn reviewed the projects that were funded in the Florida Keys in FY2023. These include: environmental education, sponge restoration, roseate spoonbill and mangrove wetland monitoring in Florida Bay, canal restoration monitoring and outreach, halo zone monitoring, and two projects to support coral reef monitoring and restoration.

### ***FY24 Priority Topics for Consideration***

Karen Bohnsack, FKNMS, reviewed the draft priority topics recommended by the Management Committee for FY2024 funding. The list of topics was circulated prior to the meeting for review. The first 4 topics on the list are repeat topics from the FY23 recommendation. These are included on the list again because no proposals were received and/or funded in FY23, or because there is a continuing need for additional funding on those topics. These repeat topics include: Coastal Resiliency and Stormwater Mitigation (this topic combines climate change resilience and stormwater priorities and is intended to assess the efficacy of stormwater treatment systems associated with upcoming large-scale infrastructure); Canal Water Quality Improvements (this continues to be a major focus of county and municipal partners and requires additional funding for planning, monitoring innovative technologies, etc.); Water Reuse (investigate opportunities for additional treatment and potable reuse of wastewater); and Nutrient Loading Budget (improve understanding of the relative contribution of various sources of nutrients to nearshore waters in the Florida Keys now that extensive wastewater upgrades are largely complete).

The recommendation also includes a series of new topics for consideration, including: Legacy Nutrients from Septic Systems (investigate whether drain fields associated with previously decommissioned septic systems may continue to leach into nearshore waters); Continuous Water Quality Monitoring Network (support maintenance, expansion, and coordination within a network of continuous water quality monitoring stations); Shallow Injection Well Investigation (support additional research needs as identified during the current project); and Light Attenuation as a Stressor (look at the relationship between turbidity and light attenuation to inform efforts to understand the levels of turbidity that are detrimental to coral health).

Ms. Bohnsack also noted that the Management Committee highlighted an internal recommendation to improve upon the existing WQPP website for better communication about water quality issues and progress. Furthermore, she flagged a question for WQPP input about whether an additional topic should be added related to the unusual fish behavior, fish kills and sawfish mortality event currently happening in the lower Keys. The EPA RFA is not set up for emergency response, which this event requires, so it may not be appropriate. However, it may be applicable if a longer-term investigation is required.

### ***Questions & Answers/Comments/Discussion:***

- Gil McRae noted his appreciation for acknowledgement of the ongoing whirling fish/sawfish issue. This is not appropriate to include as a topic for this source of funding, although that is not meant to discount the importance of what's going on currently. At this point, we don't know if these are connected, so we are treating the whirling fish and the sawfish mortality as two separate lines of inquiry. Thus far, nothing points to a pathogen. This sawfish mortality is concerning. We have counted approximately 20 deaths this year, which is 4-5x higher than the average. The fish behavior is also concerning, but is likely not a long term resource issue.
- In response to a question, Karen Bohnsack clarified that the list of topics presented by the Management Committee is not ranked according to priority. Steve Blackburn further clarified that the EPA RFA does not prioritize the topics either. A committee is assembled to rank and determine funding decisions. The funding allows for demonstration projects, development of best management practices, research studies, etc., but not restoration itself, so the work that can be done is limited in scale.
- Gil McRae expressed his support for the continuous water quality monitoring topic. Is this type of potentially long term-monitoring obligation appropriate for this funding?
  - Wade Lehmann: It depends on how the project is set up, and what it specifically entails. Notably EPA does fund the ongoing FKNMS monitoring network in this 'special projects' category.



- Steve Blackburn: Long term monitoring is also specifically mentioned in the Florida Keys National Marine Sanctuary and Protection Act, which created the WQPP.
- In light of these responses, Gil reiterated his support for the continuous water quality monitoring topic.
- Alison Higgins: Are contaminants of emerging concern (CECs) included anywhere in these topics?
  - Karen Bohnsack noted that while CECs are not specifically called out in this current recommendation from the Management Committee, they are not excluded (so they could be incorporated into any project proposal). The WQPP previously recommended a priority topic related specifically to CECs, which was ultimately included in the EPA RFA. Quite often previous topics also carry over into future years.
- Kelly Cox requested language be included in the RFA that would allow for opportunistic response to emerging research needs/emergency situations. Although not quite sure how to define that here, a lot of researchers were constrained in their response to the marine heat wave by funding limitations. To the extent that some flexibility could be built into this funding, that could help address any number of emerging issues like sawfish mortality, algae blooms, etc.
  - Karen Bohnsack indicated that she would follow-up after this meeting with a suggestion for how this topic could be incorporated into the WQPP recommendation.

Wade Lehman shared the prototype for a new EPA website. This includes a story map with projects that have been funded within the South Florida Program boundary (which is the same as the SFWMD boundary). This website also provides additional detail about the South Florida program including its origins, regulatory basis, and importance considering the population and economy, geography, and unique ecological landscape of south Florida. Within the map, a new tool is being developed in which funded projects are categorized and color coded according to the type of project, and the map shows where projects are located. Example project types include canals, corals, sponge restoration, and equity and inclusion projects. Each project can be selected for more information about what the project is, who the principal investigator is, how much was funded, publications generated, and a few other pieces of information. This tool will help with WQPP discussions and help the community to better see where EPA has been contributing to water quality and ecosystem restoration efforts in south Florida.

As a next step, EPA could possibly consider using this website as a repository for WQPP information that the EPA will maintain. There are currently two WQPP websites that are out of date. A WQPP website update should be included as part of a future communications strategy. The website is a primary tool to put up documents and share other information relevant to the program. The new EPA website is still in draft form, but they hope to have a final product in a few months.

The two WQPP websites referenced include:

- NOAA FKNMS website: <https://floridakeys.noaa.gov/wqpp/>
  - This includes summary information about the WQPP; links refer to the external WQPP website.
- External FKNMS WQPP website: [https://ocean.floridamarine.org/FKNMS\\_WQPP/](https://ocean.floridamarine.org/FKNMS_WQPP/)
  - This website has more comprehensive information about the WQPP, and is where meeting notices and agendas are currently posted.

### **VIII. Florida Keys Water Watch Sponge Restoration Aquaculture**

Shelly Krueger, Florida Sea Grant Extension Agent, UF/IFAS Monroe County Extension summarized preliminary results of sponge propagule reproduction following aquaculture propagation. Ms. Krueger began by acknowledging the funding source and project team for their support. The objectives of this project include: document spawning seasons in loggerhead and sheepswool sponges using histology and

light microscopy (Year 1); investigate propagule reproduction following nursery propagation for 6 sponge species (Year 2); and create the first Florida Keys nearshore sponge identification field guide for 31 species.

Sponge restoration involves generating fist-sized sponge cuttings (propagules), attaching them via zip ties to a brick or other medium, and placing them in a nursery to heal. Once healed, sponges may be retained in the nursery or outplanted to a restoration site. Ms. Krueger showed images of flat vase sponge propagules in the nursery and again after 2 years of growth, where the sponge has grown upward and resembles typical vase sponge morphology. After 4 years the propagules have grown completely over the brick and new sponges have recruited on the base.

Objective 1: Spawning seasonality of adult donor sponges. This project documented when sheepswool and loggerhead sponges were reproducing over a year time frame (May 2022 - April 2023). Sheepswool sponges are male or female, and Ms. Krueger showed images of sheepswool eggs and fertilized ciliated pre-larva (female sponge); and a male sponge with spermatozoa. The eggs and pre-larva are relatively large compared to the spermatozoa. A total of 20 sponges were sampled monthly between May 2022 and April 2023, which revealed that sheepswool sponges are most reproductive in April and May, as documented by the percent of individuals in gametogenesis.

For loggerhead sponges, over 200 individuals were sampled, but only one contained eggs. These eggs are very small compared to sheepswool eggs. The spermatid cysts are much smaller, which may explain why no males were observed. It is possible that this species may reproduce synchronously and rarely; similar to corals, they are large and long-lived.

Objective 2: Determine if sponge propagules are reproducing. In the second year of this project, further examination of the propagules revealed that propagules are reproducing. This is important from a resource management perspective as the goal with aquaculture is to result in a self-sustaining, reproductive community. The propagules studied were found to be self-sustaining and off the charts in terms of fecundity. Of the 28 sponge propagules collected from 4 species, almost 100% were in active gametogenesis. While this was a small sample size, they will increase the number of individuals and the number of species investigated.

Objective 3: Florida Keys nearshore sponge ID guide. This portion of the project has started; the project team has collected photos and is working on the publication.

Ms. Krueger ended her presentation noting that the 2023 marine heat wave resulted in a major sponge die-off in the Lower Keys between, at a minimum, Summerland Key and Boca Grande. This shows how important it is that the sponge propagules are reproductively viable and can contribute to sponge recruitment.

*Questions & Answers/Comments/Discussion:*

- None.

## **IX. FWC Sponge Restoration Project Update**

Bill Sharp, FWC, provided an update on current sponge outplanting efforts and an overview of future research objectives. FWC last presented to the WQPP about sponge restoration efforts in 2017 and a lot has transpired since then.

In 2017, FWC was working on a project to scale up sponge community restoration in south Florida. The key objectives of that project were to: a) test if you can scale up sponge nurseries to be an efficient

method for large scale restoration in Florida Bay; and b) determine if it's possible to produce enough biomass to undertake a large scale sponge restoration effort.

Widespread sponge mortality in FL bay began in 1991 when cyanobacteria blooms killed loggerhead sponges and other species in a matter of 4 days. Since then, there have been periodic cyanobacterial blooms and large scale die offs. By the end of the 1990s, a large area in central Florida Bay, ~500km<sup>2</sup>, had been affected by blooms. Mr. Sharp showed images of a reasonably healthy sponge community vs. the areas of the bay affected by blooms that lacked structural complexity as a result. Sponges are very ecologically important. They have associations with microorganisms, are important for water column chemistry, and are a habitat for many animals. The association of snapping shrimp and sponges is especially ecologically important.

FWC tested in situ sponge nurseries beginning in 2016. Through this study, they set up 4 nurseries between Long Key and just south of the 7 Mile Bridge (Sand Fly Key). The goal of this effort was to produce 15k sponges over the course of a 3 year project. This was already a daunting endeavor when first started, and unfortunately Hurricane Irma and a number of other perturbations delayed the work and required the team to spend months gathering displaced nursery material and returning it. In addition to nursery sponges, Hurricane Irma affected natural sponge communities, including those at Burnt Point in Marathon. This once had a nice sponge community; surveys at this location occurred as recently as 2014 so there was quantitative data about what was there prior to the hurricane. Upon revisiting this site in 2018, it was stunning how different it was. Across 6 conspicuous sponge species (sheepswool, vase, brown, branching, glove, yellow and loggerhead), they documented a dramatic decrease with a loss of 95% of the sponge biomass.

Despite these setbacks, FWC continued with this work and by early 2020 the Sandfly Key and other sponge nurseries had approached the goal of 15k sponges. Thus, FWC began to initiate the task of outplanting these. Because they knew what was originally at Burnt Point before that site was decimated by Hurricane Irma, they targeted that as a restoration site with a goal of reproducing the natural community. Surprisingly, 15k sponges doesn't go that far, but they were still able to set up four 0.25 hectare plots. Three separate control sites were identified too. A monitoring plan was developed to include annual surveys to document the change in the community over time, including sponge community composition, sponge biomass, benthic invertebrates, and finfishes. Two sites were successfully outplanted in early 2020 before COVID hit and shut down operations for a year. The remaining two sites were outplanted in 2021.

Data from this effort show that sponge restoration increased sponge biomass, with annual increases in the biomass of all species. Mr. Sharp presented a graph showing the increases in biomass across all 6 species. Vase and brown branching sponges are fast growers, while sheepswool and loggerhead are slower growing but still show a progressive increase. The same patterns were observed at the sites outplanted in 2020 and 2021.

Unlike other areas, Burnt Point had never been affected by the semi-regular cyanobacterial blooms - until October 2022. Again, during this event loggerhead sponges were affected. Mr. Sharp presented a slide showing remote sensing of cyanobacteria in Florida Bay and that these blooms are becoming more common through time. At the easternmost site, the data show that the fast growing sponges were knocked back quite a bit, although there were still survivors. This bloom did not locally extirpate any species. In April 2023, healthy sponges were documented at this site. Unfortunately, the 2023 marine heatwave followed, in which datasondes recorded temperatures of 90-95F. Once again, sponges were affected with die offs/mortality associated with this event. By October 2023, temperatures had moderated and the sites looked different. Some sponges were still reasonably healthy, but data show that the fast growers were

almost, if not entirely, extirpated. Others, including loggerhead sponges, persevered through the event. FWC will re-survey these sites in the next month or so.

Finally, Mr. Sharp gave a preview of a new EPA-funded project to further refine sponge nursery design and optimize the effectiveness of sponge filtration on water quality for sponge community restoration in the Florida Keys. This will be conducted at FWC's two nurseries off of Marathon. The project objectives are as follows:

Objective 1: Test different configurations of in situ sponge nursery designs to optimize sponge growth rates in support of large-scale restoration efforts. With the early project, FWC found that sponges grew slowly, so now they want to investigate if there is a way to make this more efficient. Those early nurseries were high density with several species lumped together. In this new project, they will configure experimental plots to test monoplots vs. mixed plots and density dependence (with low and high density nurseries).

Objective 2: Test species-specific filtration effects on planktonic communities by nursery propagated sponges transplanted into nearshore habitats. For this objective, FWC will outplant sponges, take water samples over a year, and analyze what goes in and out using flow cytometry and DNA analysis conducted by FWC's Harmful Algal Bloom (HAB) lab in St. Petersburg, FL.

Objective 3: Test whether sponge nurseries will act as local spawning hubs by improving local sponge recruitment and adding habitat for fish and invertebrate species. This objective will be tested through extensive surveys.

Objective 4: Using controlled ex-situ assays, test the relative tolerance of two species of nursery propagated sponges to cyanobacteria cells cultured from previous blooms in Florida Bay. This will be a lab-based experiment to determine if sponge species have different tolerance to *Synechococcus* blooms. These blooms will not go away, but the hope is to gain insight into which species are hardier than others, in order to inform future restoration efforts.

#### *Questions & Answers/Comments/Discussion:*

- Peter Rosasco inquired whether FWC is stress hardening sponges like Mote Marine Lab does with corals.
  - Not quite. While genetics for some sponge species have been worked on, we don't have that information for most. We are not yet looking at the genetic basis of resilience; sponge restoration is 15 years behind the coral world.
- Wade Lehmann acknowledged that this work is important; these ecosystems are all interconnected.
- Gil McRae reiterated Dr. Sharp's comment about how slowly these sponges are growing. Recognizing that restoration is part of the future and that sponges are an organism we can propagate and outplant to achieve full ecosystem services capacity, sponges still seem to have advantages compared to seagrass/coral. Can you elaborate on that?
  - The advantage of sponges is that they are simple animals. They have higher survival rates after propagation. They grow slowly, but once we have adequate biomass in the nurseries, and once you release them from competition and move them to a restoration site, they take off. The hope is that will happen here; if we can get enough biomass to outplant to the restoration sites will see much faster growth.
- Wade Lehmann invited a question from the audience: You mentioned some species are slow growing and long lived. How do you know? Is there anything in the literature before the 1991 die offs?

- Yes, there is information from the early 20th century, including a paper from 1910. The species FWC works with include both faster growing/short lived and slower growing/long lived species. This is similar to pine trees vs. oaks. Sponges are filter feeders, so when they are jammed together they have a lot of competition to pull food from the water column. Growth rates increase once they are given more space.

## **Break**

## **X. Florida Keys Tidal Connection Project**

Dr. Nicholas Parr, DEP, was unable to present during this meeting. This presentation on the Florida Keys Tidal Connection Project was deferred to a future WQPP meeting.

## **XI. Injection Wells and Canal Restoration – Preliminary Monitoring Results**

Stephen Hanks, Senior Engineer, WSP Environmental Services discussed performance results and preliminary water quality data from the restoration of Canal 114 in the Village of Islamorada. This was the first canal restoration project to utilize injection well technology.

In 2014, the canal demonstration program set out to evaluate the effectiveness of a variety of canal restoration technologies. The selected technologies addressed excessive depth (backfilling), length and stagnation (culverts), and organic accumulation (capping, dredging, and air curtains). There were plans to look at circulation pumping, but it was expensive and not feasible. The situation was that not all stagnant canals have a connection where a culvert could be installed to increase circulation. Because there are a lot of canals that need improved circulation, but other options were not feasible, there was a need to identify an alternative to increase canal circulation.

In 2017, Canal 278 on Big Pine Key was evaluated and an infiltration well was identified as the recommended technology. A pilot gravity infiltration well project was designed for Canal 114 in Islamorada to see if it would work there. The design was the first step, and included an evaluation of surrounding wells, formation capacity, and the geologic profile. This was submitted as a Underground Injection Control permit to DEP. Due to a lack of reliable data, parameters indicated that the well could infiltrate a range between 0.4 and 4.1 MGD.

The infiltration well design includes an intake with a weir structure. They wanted to avoid floating debris, fish, etc. getting into the pipe, so the weir is a steel shroud/box that goes around the intake pipe so it is blocked. Water underflows through the intake before it goes into the vault. They didn't want to have a push-pull effect with the well, so the design is such that the water cannot bleed back into the canal at low tide (otherwise, water would move back and forth with the tide and have no net canal benefit). Thus, during high tide water will go into the well and to the subsurface, during low tide the canal will flush out. This would give 2 inflow cycles per day based on tidal cycles. A flow measurement device was installed to measure infiltration of the well; head determines flow rate. The structure also has a control gate that allows the well to be turned off for maintenance. The well is chambered and a steel grate under the well protects against anything getting in. The well is cased to 60 feet, then has a 2' diameter borehole to 120 feet. This requires minimal maintenance. Mr. Hanks showed pictures of the well during installation, including excavation, drilling the well, and the vault set on the well. From the intake to the pipe to the well there is no chance for leakage - it is one continuous unit.

Mr. Hanks reviewed the performance of the injection well. A line graph shows the water surface elevation of the canal water vs. groundwater. At the peak, the groundwater is 0.6' below the canal. This is what drives the well. The gravity of the canal/higher water surface pushes water into the well. Performance was

measured at 4000 GPM with 0.6 feet of head. That amounts to a cumulative flow of 1.1 MGD, and with 2 tidal cycles per day the amount of flow is doubled. As a reminder, the average daily flow was bracketed between at 0.4 to 4.1 MGD. Performance in this canal was right in the middle, at 2.2 MGD. We didn't have as much of a vertical gradient as we hoped for; it was an order of magnitude less than what was in the literature. If groundwater is lower that will result in more inflow. Transmissivity/flow capacity was double what was expected at 2 million ft<sup>2</sup>/day; this is high compared to the average. Turnover rate was a point of concern. They hoped for a 40% turnover rate but what was observed was closer to 20% daily waterbody turnover. Thus, in 5 days, the water in this canal would be turned over completely by the infiltration well. Aside from the volume of water there is a hydrodynamic effect. Long canals only have mixing with nearshore water in the first 500 ft of the canal. The rest of the water doesn't mix but just goes up and down with tides. With this device, when the water goes up it creates circulation and mixing so that even though the volume isn't as huge as with a culvert, it is still enough that water is mixing further in the canal.

A year of monitoring was conducted to establish the effect of this well. Mr. Hanks presented an aerial image of the canal; the installation is represented by a green circle, and monitoring sites (yellow triangles) were established close to the installation point, midway down the canal, and at the mouth of the canal. Monitoring sites were also established in a control canal, Canal 113.

A series of graphs were presented showing pre and post construction monitoring data. Pre-construction, the pink line represents the average and the other lines show data from the various monitoring stations down the canal. A lot of oscillation is observed in the water quality (dissolved oxygen, DO) data between March 2022 and March 2023. State standard for DO is 42%, so there was a lot of time when we weren't meeting the state standard; there is also a large range between monitoring point D (mouth of canal) and A (back of the canal nearest the injection well). There is a disparity in the back of the canal; represented by the blue line (monitoring point A), DO at the back of the canal was always lagging.

The well opened in May 2023. After the well opened for operation, we see that DO at point A was still lagging and the range was still high between the monitoring sites, but over time everything coalesces to where the data at each location is similar. Cooler temperatures in the winter months help with DO too.

To compare water quality profiles, they took the average of points A and B and points C and D; then A and B were subtracted from C and D to determine the average DO at the front (opening) of the canal minus the back of the canal. With this analysis, we see that DO at the back of the canal is steadily 20% higher than before the well. The well increases circulation and allows nearshore waters to mix and move further into the canal.

Mr. Hanks also showed graphs comparing the control, Canal 113, with Canal 114 pre and post-construction. Pre construction, we see that points A and B are relatively comparable for 113 vs. 114. Canal 114 had more drastic peaks and valleys (this data is averaging a wider area of water, which increases the variability compared to A and B in canal 113, which are closer together). Still, Canal 113 is a good reflection of 114 and thus a good point of reference to determine whether there is a beneficial effect from well.

After the well opened, we see that Canal 113 had better DO until November; in January there was a large offset and DO in Canal 114 was better. Overall, we see a net benefit of this well relative to the control canal with increasing DO and circulation in canal 114. Mr. Hanks presented the comparison between Canal 113 and 114 through time in a tabular format. In the first sampling collections after the well opened we see a delta of approximately 15%; in the last few samples, we see that 114 is exhibiting on average 10% better DO than 113. Canal 114 has increased DO 25% relative to the control after 8 months; this is a good number. This is a passive system similar to culverts (which are faster), but this is minimal

maintenance that entails brushing off debris that accumulates on the grate. This information provides evidence that there is a benefit to this technology and it could be considered for other projects in the canal restoration. The main hindrance is the logistics of installation, which requires access for large equipment.

*Questions & Answers/Comments/Discussion:*

- Wade Lehmann acknowledged this effort towards canal restoration.

## **XII. Public Comment**

No public comments were received during the meeting.

Additional public comments on topics discussed during this meeting were circulated in writing directly to the Steering Committee by Caron Balkany, Counsel for Friends of the Lower Keys (FOLKs) on June 5, 2024.

## **XIII. Steering Committee Member Updates**

*Alison Higgins, City of Key West*

The City of Key West continues to work on their Water Quality Improvement Plan. Groups of experts have been convened to assist in operationalizing this plan, with two goals each being worked on each month. The intent of this effort is to provide greater detail about what the city can accomplish relative to each goal in the plan. There are 4 goals left to operationalize; this effort will be complete by April when budgets are due. They hope to contract some support to help achieve those goals since bandwidth is limited. This effort continues to be supported by the City Commission.

*Kim Shugar, DEP*

DEP has a new staff member who will be supporting the WQPP. Genevieve Shave was present at the meeting and introduced. She will be working at the DEP office in Marathon.

*Sarah Fangman, FKNMS*

In light of the temperature event this past summer, we are keeping an eye on what may be in store for summer 2024. Sea surface temperatures in the North Atlantic are higher than average right now, although there are regional differences. Currently temperatures are lower than average in the Florida Keys, so that's good. However, in looking at the satellite data it is swinging back to normal. FKNMS is keeping an eye on this and are working with colleagues from the National Weather Service and Coral Reef Watch to get regular updates about what is coming so we can be ready for another potential temperature event this summer. An unusual set of circumstances set up the conditions last summer, and we hope those won't occur again. Still, we may have temperature stress. Response efforts, such as installing deep water nurseries and moving coral tree structures, is a lot of work. Some of these actions also have a shelf life and you don't want to start too soon. We need to find the sweet spot for triggering actions to help corals when we can. FKNMS and partners also continue to explore other interventions that could be valuable. For example, shading is being explored as a pilot project, which could be useful on a small scale such as in nursery settings and on reefs with vulnerable and reproductive corals. We won't know how to do it if we don't start, so we're working on this.

*Gil McRae, FWC*

Thanks for continuing to support CREMP and DRM monitoring efforts. That 25-year time series is invaluable as we move further into large scale coral restoration. The Florida Coral Reef Coordination Team has been fully stood up under the umbrella of the South Florida Ecosystem Restoration Task Force and is starting to set priorities. This group is a parallel between Everglades restoration and restoration

efforts down here; it's all part of one big ecosystem. Gil McRae sits on a number of these groups and will act as a liaison between these efforts.

**Meeting Wrap-Up and Adjourn**

Wade Lehman thanked everyone for participating in the meeting and reviewed accomplishments and next steps. The meeting was adjourned at 3:50 pm.

DRAFT