Agenda Report

2725 Judge Fran Jamieson Way
Viera, FL 32940

New Business - Development and Environmental Services Group

J.1. 2/22/2022

Subject:

Adoption of the Save Our Indian River Lagoon Project Plan 2022 Update as recommended by the Save Our Indian River Lagoon Citizens Oversight Committee

Fiscal Impact:

The recommended plan update recognizes a $53 million increase in total revenues to be generated by the Save Our Indian River Lagoon Surtax over its 10-year life (increased from $489 million to $542 million) and a net increase of $6 million allocated to projects. The net changes in allocation, broken down by project type, are as follows:

- $4.2 million more for wastewater - septic to sewer and wastewater plant upgrades;
- $1.0 million more for public education and outreach (including 5 years of oyster gardening);
- $0.3 million more for stormwater treatments;
- $0.3 million more for vegetation harvesting;
- $0.3 million more for environmental dredging of muck;
- $47 million more for contingency, based on an inflation factor of 2.5% for Plan Years 0-3, 6.8% for Year 4, and 5.9% for years 5-10.

Dept/Office:

Natural Resources Management

Requested Action:

1) Adopt the Save Our Indian River Lagoon Project Plan 2022 Update, as recommended by the Save Our Indian River Lagoon Citizen Oversight Committee (Committee) on January 21, 2022;
2) authorize associated budget change requests;
3) approve continued signature authority to the Chair (or authorized representative, in accordance with the threshold limits provided for in Brevard County policies and administrative orders) to execute agreements, task orders, change orders, contract renewals, amendments, and other contract-related documents, subject to review and approval by the County Attorney, Risk Management and Purchasing, as appropriate, to provide cost share from the Save Our Indian River Lagoon Trust Fund for projects and programs approved in the Save Our Indian River Lagoon Project Plan;
4) approve continued authority for the Director of Natural Resources Management to execute up to two no-cost time extensions up to six months each;
5) grant permission to advertise formal solicitation of bids and proposals, and to award to the qualified bidder having the lowest, responsible and best response for tangible items, capital improvement projects, and/or equipment, when required and subject to available funding; and
6) authorize the County Manager, or designee, to submit grant applications for leveraging cost share for projects and programs approved in the Save Our Indian River Lagoon Project Plan.

Summary Explanation and Background:

Each year, in order to account for new information and opportunities, the Save Our Indian River Lagoon Citizen Oversight Committee is tasked with recommending an Update to the Save Our Indian River Lagoon Project Plan (S.O.I.R.L.P.P.). The Committee has held monthly public meetings throughout the year to keep informed, gather ideas from the community, review potential changes, and recommend an annual plan update to the County Commission. The Committee's annually recommended S.O.I.R.L.P.P. Updates are posted on the Committee's webpage for public access at least 15 days prior to being brought to the County Commission for consideration. The County Commission may adopt or modify the Committee's recommended Plan Update.

An intergovernmental coordination meeting was held on July 27th, 2021 to review the process for submitting project requests to be considered for addition in the 2022 annual update. Project requests were due October 4th. Project submissions listed in the summary table (attached) were reviewed by the Committee during a November 19th public meeting. New projects that were recommended in November, as well as other changes based on new information gathered and analyzed throughout the year, were incorporated into the attached Draft Save Our Indian River Lagoon Project Plan 2022 Update, as recommended by the Committee on January 21st.

The draft 2022 Update (attached) includes 30 new projects, bringing the total number of funded projects during the 10-year plan to 337, plus 876 individual quick connections to sewer, 1625 septic upgrades and 20 miles of filter feeding living shorelines. The plan also includes performance updates and refinements on a number of project types. To help readers find all areas of the SOIRLPP that contain proposed updates or modifications, the attached Draft 2022 Update uses yellow highlighted text, table and figure captions to indicate additions and revisions.

Significant updates in the draft 2022 Update in addition to 30 new projects include:

- Broadening the existing oyster gardening program to a community collaborative supporting volunteers gardening oysters, clams, planting shorelines or restoring seagrasses;
- Increasing the cost share provided to individual homeowners connecting to sewer or upgrading their septic from $700 to $1200 per pound of nitrogen pollution prevented;
- Updating information on an independent analysis of ocean inflow and pilot study being conducted by Florida Institute of Technology under direct contract with the State of Florida;
- Updating the current status of seagrass losses and seagrass restoration efforts, including a Resilient Florida grant secured by the County to plant 1.5 acres of seagrass to test different planting methods and planting densities to find the most economical and effective approach for large-scale restoration in the Indian River Lagoon, and developing a seagrass restoration toolkit for all agencies and stakeholders to use, that will include map layers and a decision tree for selecting the most promising sites for planting, selecting the best design for those sites, and identifying performance measures that will improve knowledge of the abiotic factors and threshold limits for seagrass establishment and survival in the lagoon;
- Adding information on a 2022 effort to use remote sensing to rapidly identify and map the location, migration, duration, and dissipation of harmful algal blooms to identify critical pollution areas and inform prioritization of future pollution reduction efforts;
- Reporting on the costs, benefits, successes and lessons learned from completed projects and resulting, data-driven plan modifications; and

- Revising the revenue projection and construction inflation contingencies in response to economic fluctuations.

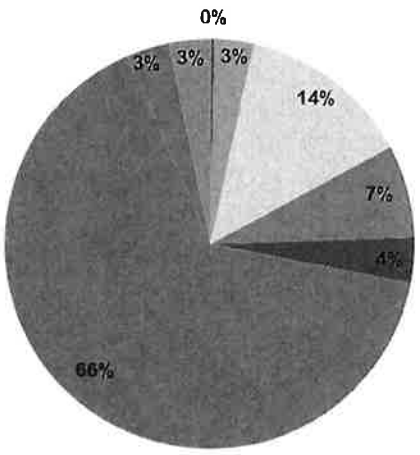
During fiscal year 20/21, tax collections were $53.8 million instead of the budgeted estimate of $47.8 million. This $6 million in unanticipated revenue was used to fund $6 million of new projects. Revenue growth and construction inflation during the fiscal year called for adjusting estimates of future revenues and construction price index assumptions. Using actual revenues collected in 2016 through September 2021, inflation of 4.0% for 2022 and 3% for revenue growth in 2023 through 2026, the estimate of 10-year collections was increased from $489 million to $542 million. This increase in revenue was allocated to the contingency fund to offset ongoing and construction inflation estimated as 2.5% for Plan Years 0-3, 6.8% for Year 4, and 5.9% for years 5-10. Revenue forecasting and construction inflation adjustments will continue to be considered as part of the annual Plan Update process.

Available funding is divided between projects that **reduce** the incoming load of new pollution, **remove** accumulations of old pollution, **restore** natural stabilization and filtration systems, or facilitate processes to **respond** to new information. The original distribution of funds between project types was guided by best available data in 2016 regarding major contributing sources of pollution to the Indian River Lagoon.

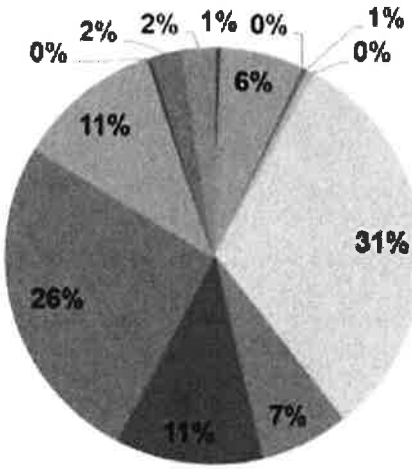
In the 2022 Update, $191 million (46%, up from 24% in the original plan) is directed to projects that improve the treatment of human waste through upgraded treatment of reclaimed water, connection of package treatment plants to central sewer, nutrient removal from treatment plant spray-fields and rapid infiltration basins, smoke testing to identify leaky sewer infrastructure coupled with funding to incentivize repairs, conversion of septic neighborhoods to sewer service, connection of septic homes to adjacent sewer lines, and upgrade of high-risk conventional septic to advanced septic systems. The 2022 Update allocates 26% for muck removal (down from 66% in the original plan) plus 11% for stripping nutrients from the dredge outflow water.

The recommended changes in the 2022 update are consistent with the prior year shifts in emphasis that reduced muck dredging and increased human wastewater related projects and stormwater treatment, as illustrated in the cost allocation pie charts (below).

Original Plan



2022 Plan Update Total Cost



- Public Education
- Rapid Infiltration Basin/Sprayfield Upgrades
- Sewer Laterals
- Septic System Upgrades
- Muck Removal
- Vegetation Harvesting
- Project Monitoring
- WWTF Upgrades for Reclaimed Water
- Package Plant Connection
- Septic System Removal
- Stormwater Projects
- Treatment of Interstitial Water
- Oyster Reef Living Shorelines

Clerk to the Board Instructions:

N/A

BREVARD County
BOARD OF COUNTY COMMISSIONERS

FLORIDA'S SPACE COAST

Kimberly Powell, Clerk to the Board, 400 South Street • P.O. Box 999, Titusville, Florida 32781-0999

Telephone: (321) 637-2001
Fax: (321) 264-6972
Kimberly.Powell@brevardclerk.us

February 23, 2022

M E M O R A N D U M

TO: Virginia Barker, Natural Resources Management Director

RE: Item J.1., Adoption of the Save Our Indian River Lagoon Project Plan 2022 Update as Recommended by the Save Our Indian River Lagoon (SOIRL) Citizens Oversight Committee (COC)

The Board of County Commissioners, in regular session on February 22, 2022, adopted the SOIRL Project Plan 2022 Update, as recommended by the SOIRL COC on January 21, 2022; authorized staff to apply the increased cost share from $700 per pound to $1,200 per pound, to the three early adopters of the advanced septic systems, for a total cost of $17,305.00; authorized associated Budget Change Requests; approved continued signature authority to the Chair, or authorized representative, in accordance with the threshold limits provided for in Brevard County policies and administrative orders, to execute agreements, task orders, change orders, contract renewals, amendments, and other contract-related documents, subject to review and approval by Risk Management, County Attorney, and Purchasing Services, as appropriate, to provide cost share from the SOIRL Trust Fund for projects and programs approved in the Project Plan; approved continued authority for you to execute up to two no-cost time extensions up to six months each; granted permission to advertise formal solicitation of bids and proposals, and to award to the qualified bidder having the lowest, responsible, and best response for tangible items, capital improvement projects, and/or equipment, when required and subject to available funding; and authorized the County Manager, or his designee, to submit grant applications for leveraging cost share for projects and programs approved in the SOIRL Project Plan.

Your continued cooperation is always appreciated.

Sincerely,

BOARD OF COUNTY COMMISSIONERS
RACHEL M. SADOFF, CLERK

Kimberly Powell

Kimberly Powell, Clerk to the Board

cc: County Attorney
Risk Management
County Manager
Finance
Budget

VERBATIM OF ITEM J.1. – SAVE OUR INDIAN RIVER LAGOON PROJECT PLAN 2022 UPDATE – FEBRUARY 22, 2022

Zonka - We'll move on to Item 1, or J.1., and I have a bunch of cards so we're going to kind of introduce the Item, and if the Commission is agreeable, we'll listen to the public comment cards first and then we'll bring it back to the Board. Ms. Barker.

Barker – Thank you. This is adoption of the Annual Update of the Save Our Indian River Lagoon Project Plan as recommended by six out of seven of the voting members on the Save Our Indian River Lagoon Citizen Oversight Committee. In terms of fiscal impact with what is going on with our economy, we re-projected the 10-year revenues for the half cent sales tax, and increased the fiscal impact by $53 million. $6 million of that is dollars that were already collected in 2021 above and beyond what was previously projected. The remaining $47 million is projections for the future. And so what the Committee recommended that's in your packet was to take that $6 million that is already collected and allocate that to new projects. So, approximately $4.2 million of that six is going to more wastewater projects, either septic to sewer or wastewater treatment plant upgrades. $1 million is going to public engagement and outreach. This is a variation on the previous contract for oyster gardening that the Board, two years ago, had asked the Committee to consider incorporating into Lagoon Plan. It was previously paid for out of the stormwater fees, and so this would take that program and extend it out for the five-year remaining life of the half-cent sales tax. It would also expand that program from not just oysters but also whatever restoration projects that are going on in the Lagoon that volunteers could be engaged in, whether that be clams or living shorelines or seagrass, mangroves, any of those restoration-type projects. There's another $300,000 going towards stormwater treatments, approximately $300,000 going towards vegetation harvesting, $300,000 going for environmental dredging of muck, and the remaining, that $47 million, that's based on future inflation, is all put into contingency, because we know that as materials cost more we collect more, construction costs will also go up, and so that idea is to have those reserves ready to be able to deliver the projects that are in the Plan. The requested action includes adoption of the Plan if that's the will of the Board; associated Budget Change Requests; continued signature authority for the Chair or authorized representative to enter contracts, to implement those projects; continued authority for me as the Director to execute up to two no-cost time extensions up to six months each, as previously authorized by the Board; permission to advertise formal solicitation of bids and proposals to get these projects implemented; and authorization to submit grant applications to leverage the half-cent sales tax dollars with whatever grant opportunities are out there for these sorts of projects. I would just like to highlight one other thing from the Agenda Summary, which is there were a lot of updates in this 2022 Plan, and we updated the current status of seagrass losses and seagrass restoration efforts in the Lagoon, including a Resilient Florida grant, which has been secured by the County which will allow us to plant one and a half acres of seagrass to test different planting methods and planting densities to find the most economical and effective approach for large scale restoration in the Lagoon, and development of the seagrass restoration toolkit for all of the agencies, stakeholders, non-profit groups that are out there looking to plant seagrass in the Lagoon to help start that restoration process. That restoration is limited by where in the Lagoon the water quality is sufficient to be able to actually support seagrasses. So, with that, I just want to quickly jump to slides. So we have completed 56 projects. The stars on the map show you the location of those projects distributed from Mims to Micco, mainland, at beaches, Merritt Island in the Indian River and the Banana River Lagoon. There are also 63 individual septic lateral repairs that have been funded to private homeowners, 34 septic to sewer connections for people that live nearby, sewer

lines that didn't have to wait for a sewer extension project, and 53 septic upgrades for people to replace their old conventional septic with a new, advanced septic system. Additionally, there are 24 more projects that are contracted for construction, with construction underway, and 39 more projects that are constru . . . contracted and in design, and there are 15 more projects that the contracts are in development right now. So, in terms of progress, we have reduced the annual loading of nitrogen to the Lagoon by nearly a hundred thousand pounds per year. This graph is, was provided by St. John's River Water Management District. Each of the pies is for a different segment of the Lagoon. From left to right, the Mosquito Lagoon, the Banana River Lagoon, the Northern Indian River Lagoon, which is from the northern limits of the Indian River down to the 192 Causeway in Melbourne, and then the Central Indian River Lagoon is from the 192 Causeway, south through Indian River County. And so, this, the scale on these pie charts is how much do we need to reduce, the top row is nitrogen, the bottom row is phosphorous, how much do we need to reduce each of those nutrients to hit the load reduction targets for seagrass to recover. And so, the green portion of those pie charts shows you how much of that load reduction we have achieved so far. So, we are making progress, but obviously we still have a long way to go. We are halfway through this half-cent sales tax and we still need years to implement the projects and programs that are proposed in the Plan. And so, what this means for seagrass is that we don't have the water quality that these standards are, have predicted we will need for seagrass to be able to recover and survive. These standards were development by the Water Management District, they were reviewed and adopted by the Florida Department of Environmental Protection, and then reviewed and approved by the U.S. Environmental Protection Agency. And so, we are, we are on our way, but to work on seagrass restoration, we have to look for specific areas of the Lagoon, which are cleaner than others where we have clearer water that lasts longer, long enough for seagrass to see sunlight and grow long enough to store enough energy in the rhizomes that it can suffer through the bloom season, and then bounce back the following year. And so, we are going through an effort currently to identify what areas of the Lagoon are cleanest and shallowest, and most likely to be able to support seagrass the soonest; and those are the areas that we would work to, where we would attempt our pilot project and point other people to those areas as well for their restoration work. In this 2022 proposed plan, there are 31 project additions. I talked about the bottom of the list, the Oyster Gardening Program, which is revamped to include whatever sort of public participation and restoration might be going on at the time over the next five years, but there's also 13 septic to sewer conversion projects, eight stormwater projects, four vegetation harvesting projects, couple of oyster bars, one wastewater treatment plan upgrade, one small environmental dredging project in Melbourne, and one planted shoreline project. That brings the total of all projects in the Plan to 337. And these pie charts are part of your Board packet. They show what the distribution of funding was by project type in the original 2016 Plan versus what it is in this proposed 2022 plan. And so, you see on the left hand pie chart, the large gray area that was 66 percent going towards muck removal addressing the legacy load in the Lagoon, and several years back the Board asked the Committee to consider reducing the amount of funding spent on that to put more into addressing the sources of pollution, especially human sewage. And so, all of those yellow and orange wedges of the pie on the right hand side, those are all different types of wastewater-related projects, with the largest piece, the yellow, being septic to sewer conversions. So, that's my part of the presentation. I also have the consultant, Tetra Tech, here who developed the original Plan and has been working with collecting their recommendations, the Committee, throughout the years and then implementing that into the recommended plan updates. Marcie Frick is a Senior Water Resources Engineer in Tetra Tech's Water Resources Group. She has 19 years of experience. She spent most of her

career working on restoration plans throughout the State of Florida, including implementation of the Comprehensive Everglades Restoration Plan. She also, as a contractor for the State of Florida, developed their Basin Management Action Plans for many locations around the State of Florida, including the Basin Management Action Plans for the North Indian River Lagoon, the Central Indian River Lagoon, and the Banana River Lagoon; and so, she was very familiar with our issues, with our water quality challenges, the types of projects that were feasible here, what sort of credit the agencies would be willing to grant us for these sorts of projects, and all of the stakeholders who had been working with the State developing those Basin Management Plans was familiar with her and her work, which made development of that initial Plan in 2016 when we had six weeks to produce a plan, it made it possible for that to happen, and in the timeframe that we had. She's also worked on the Indian River Lagoon National Estuary Program, the latest rendition of the Comprehensive Conservation and Management Plan. She's developed Martin County's Water Quality Needs Assessment, St. Lucie County's Water Quality Assessment, and Indian River County's Lagoon Management Plan. And so, you have her slideshow in your packet. It goes through all of the changes in the 2022 plan update. She's available to either go through that slideshow or answer any questions that you might have.

Zonka – What's the Board's desire? Do you have any questions?

Lober – Comment after when it's available.

Zonka – Okay. All right. So, we'll move on to our comment cards for now. I'm sure we may have questions later. Mr. John Windsor, and after John, it'll be Rick Heffelfinger. I should say Dr. Windsor.

Windsor – Good morning. John Windsor, Melbourne, Florida. Good morning, Commissioners. Thank you for allowing me to speak and thank you for your ongoing commitment to Indian River Lagoon restoration. I'm sticking to my script today. Forty years ago I started studying Indian River Lagoon issues. I recommend the adoption of the 2022 SOIRL project plan update. I'm one of 14 SOIRL COC members whose expertise includes science, finance, tourism, education, real estate, technology, and Lagoon advocacy. Over the last year the COC has continued to meet nearly monthly. Most COC members continue to be present at all meetings. We heard progress reports and results from funded projects. Natural Resources Management staff arranged presentations from technical experts on many topics important to COC members and the public. During the last year, some of the topics addressed include low impact development, septic upgrades, mechanical harvesting of aquatic vegetation, resiliency opportunities, human fish health investigations, climate-ready estuaries, drift macro algae in the Lagoon, floating wetlands for stormwater treatment, our annual audit report, wastewater treatment asset management, package plant to sewer conversions, shovel ready seagrass restoration, Manatee habitat enhancement, aeration of canals along the Lagoon, sand capping of muck deposits, and improving circulation in the Indian River Lagoon. At each meeting comment was solicited for any project planned changes that COC voted on; and an open public comment period was near the end of each meeting. Some comments were outside the scope of the COC, and I think you guys are familiar with that kind of thing. On more than one occasion, individual COC members reached out to assist the citizen after the meeting. Our meetings have been well-organized and productive, primarily due to the Natural Resources Management staff. Staff has always been available to answer my questions or provide me data in a very timely manner. I want to thank them publicly for their outstanding work. After considering new projects this year, the plan before you has been carefully reviewed and

recommended by the SOIRL COC. I sort, I support the adoption of the SOIRL project plan. Thank you once again for your continued support of Indian River Lagoon restoration.

Zonka – Thank you. Rick. And after Rick, Vinnie Tartanto.

Heffelfinger – Rick Heffelfinger, 2000 Juniper Drive, Cocoa, Florida 32926. I'm here to talk about this item, not because I know anything about the Indian River Lagoon Restoration Program. I assume you guys are all doing a wonderful job. Based on the previous comments, I'd say you're looking at a lot of different stuff, a lot of projects. My concern is, the issue, I don't know if you read the paper, but there's been some opinion pieces that there's some issues about people raising questions and getting shut down, and then when they try to find information through public records requests, they come up with a huge bill for hours to get information that sounds . . . I don't have all of the specifics, but I've experienced the same thing. I've made public records requests, and I have been told the documents that were passed to you guys during meetings didn't exist. Didn't get copies, refunded some of my money. So, I don't know how you do public records, I thought it all went through the Attorney, but there's something wrong because it's so hard to get information. And to have somebody tell you that hey, your questions are not valid or you, you don't get that information, that sounds wrong. I don't what, you know, what it sounds like it was seagrass and we talked a lot about . . . by the way, is that, is that up on the public record thing, under the Item, that presentation? Does it, does it get linked to the, what do they call it, the . . .

Barker – It's a part of the video. That particular pie chart is in the Agenda Summary, but the other slides were not in the Agenda . . . well, one of them was, two of them are, were not part of the Agenda Package.

Heffelfinger – Telstar, whatever, and I didn't see that PowerPoint linked. Is that something you usually do or don't do?

Barker – This was information that, that came up and seemed timely after I submitted the Agenda Packet two weeks, but I, I'm happy to provide that information to you.

Heffelfinger – Well, that again, that's, I guess that goes toward a little bit of transparency too. I mean, if you don't attend all these meetings and watch all the videos, and then you do have questions and somebody shuts you down, I don't know what you do. You have to do a public records request, and I've had trouble with them too. So, I think you guys need to . . . a thousand dollars for 12 hours quote I think I heard this lady, she wrote her opinion part. You're quoting her at rates for a director's salary. How hard is it to pull email? You go into your email and you say search for seagrass and you dump it out. May I, Maybe I misunderstood. Maybe it was more than an email request, but that seems insane. That looks like you're throwing a financial block at somebody getting information, and if she couldn't get the information the other way, she had no choice but to do that. And then you're going to vote on it tonight, right? She didn't get her information. She wasn't able to make a case, I guess that she thinks there's something dealing with the seagrass that's, that's not right. So, you're going to vote, you're going to approve it, and then try to change it later. You're shutting her down, and I think that's, that's something you guys need to look at, what that process is, how much money does it really cost. You know, its staff, but do you need a supervisor to pull records? That seems insane. Thank you.

Zonka – Commissioner Pritchett.

them in email, we just, we just send them out. So, that would be something that we probably should consider and look at. Thank you, sir, for bringing that up. Another thing that a lot of times, what we read isn't always all the things going and, and so, you know, we almost have to show up sometimes to get all this information so you can make good decisions. That's the goal of this Board is get all the information we can so we are having good decisions moving forward. So, I just wanted to mention that. I wouldn't mind re-looking at public records costs. County Manager, if it's something that we can do as far as making the process simpler. It is the goal to get information out to the community, and we don't want to stop that.

Zonka – Ms. Barker, would you mind addressing, you know, there was an accusation made in an opinion piece, would you mind addressing where that thousand dollar cost came from?

Barker – That particular request was for every email from me that contained the word, or to or from me that contained the word seagrass, and the County Attorney did pull those records. There were 7,022 pages, and per the County's Policy on public records requests, it says all emails shall be reviewed by the records custodian and the appropriate County staff member to ensure no exempt and/or confidential information is contained therein; and so, the time that was quoted was the time for me to review the 7,022 pages to ensure that no exempt or confidential information was contained therein.

Zonka – And the reason why you had to review them because, because you were either part of the email or you were the originator?

Barker – It was, they were my emails.

Zonka – It wasn't your choice, correct?

Barker – Correct.

Zonka – And it was per Policy?

Barker – Correct.

Zonka – Because I asked the same question. Obviously when someone makes such an outlandish accusation, I definitely want, I want those questions answered. Commissioner Lober.

Lober – A couple of thoughts. Is that on? Yeah, a couple of thoughts with respect to this. I don't know that there's a very diplomatic way to phrase this, so I'm just going to say it. From my impression there is a concern that I have. I would not have been concerned were the only item that was brought to my attention, solely the invoice for the public records, but it was what preceded that, that caused me to consider that there may be more of an issue going on there than might otherwise be the case; and what I'm referring to in particular is one of the folks that requested the records from Natural Resources at first was told that the records either were or may have been covered by Sunshine Law, and Sunshine Law precluded the release to those individuals who serve on the Citizens Oversight Committee. I'm not the County Attorney but I know enough when it comes to public record law to know that's absolute nonsense. I had the person reach out to me to see if I would intercede on their behalf to avoid them having to sue the County in order to get the records. I sent Abby an email at that point in time, and said, Abby I don't know, I'm paraphrasing here, I don't know why she was told this but I don't believe that's the case at all. I think she's entitled to the records. There's no basis in Sunshine to deny her the records. I hope you agree, and I copied the individual who reached out to me on that. Abby thankfully shared the

the records. I sent Abby an email at that point in time, and said, Abby I don't know, I'm paraphrasing here, I don't know why she was told this but I don't believe that's the case at all. I think she's entitled to the records. There's no basis in Sunshine to deny her the records. I hope you agree, and I copied the individual who reached out to me on that. Abby thankfully shared the same opinion that I had that she was entitled to the records and Sunshine was essentially, and I'm paraphrasing this part here, I'm saying Sunshine was essentially red herring there. That in and of itself means one of two things, either there's a, a lack of knowledge when it comes to what Sunshine Law precludes on the part of at least one department director, or alternatively, which is worse, information is intentionally being kept from being disseminated to folks who are entitled to it. I can't make a judgment call objectively on that. I have my subjective opinion and it is what it is. What I'll tell you is to have that where information is essentially held at the gates is an objective statement unreasonably or unlawfully to then have a thousand dollar quote generated. It causes me concern, and Virginia just mentioned, and I'm going to look at the wording because I was jotting it down as she was speaking, out of the Policy to have the appropriate County staff member ensure there's no exempt or confidential information contained therein. If she doesn't understand that Sunshine's a non-issue, there's already in my mind a lack of foundation to say that she's the appropriate person to determine whether or not that information is confidential or exempt because she clearly has had issues with respect to understanding what needs to be kept versus what needs to be produced. I can tell you, I've gotten a slew of public records requests in my office. Some of them Kika handles, some of them I handle, it depends, but my general policy, it's not a general policy, my policy period is the lowest, compensated employee who's capable of filling the public records request is the one that handles it. If it is something where there is a basis to believe there's confidential or exempt information, I had things that have requested communication with law enforcement officers, and I can tell you that some of the information contained therein is absolutely exempt from disclosure. It's not that I don't want to produce it, I'm legally prohibited from producing it, and Kika, I love her, she's been in my office for three years, she's great, I hope she doesn't go anywhere, but I don't know that she knows the exemptions as well as I do, and I don't know that she knows the content as well as I do, to be able to go through without spending an inordinate amount of time to determine what should or shouldn't be produced. And, I'm not a conspiracy theorist. It may very well be that there's some reasons that I'm not aware of why Virginia is the only County employee in that department who's able to fulfill the request, but I don't know what that would, why that would be the case. I don't know why there isn't someone who's paid $15 bucks an hour, $20 bucks and hour, who couldn't go through the same information. If there's a reason to think that every single one of those emails contained exempt, or a number of them contained exempt and confidential information, okay, I mean that may be a legitimate thing but I've just not seen it, and I think it smacks when you consider the Sunshine refusal at first. It smacks of there being at least an argument to be made that it looks bad, and that it looks like it's trying to be kept. I'm not saying that's the case, but I'm saying the image and the way that it appears doesn't look good.

Pritchett – I just want to make a couple of notes on that. Just, in the beginning, Commissioner Lober, when we first got on here, something happened and all of your personal information got out, and so, I think at that time we started making some adjustments to make sure everything got redacted that would harm anybody else and we wouldn't have any unforeseen consequences. And then, I, whenever I get public records requests, I typically get it from the Clerk's Office or a member of County, and if I get any, I usually send it to them, just let them handle it, they have access to everything I have, all my computers, everything. So, everything's easily to be obtained.

So, really the appropriate thing if someone wants this maybe to get a hold of the Clerk or somebody or get sent to that department so the correct department can do it, because I know we all get a little bit busy on trying to accomplish things, but some of these things are actually asking for almost a report, which takes some time to compile. So, I like Commissioner Zonka's, the last one, you know, for us to get some information for them, but then we have the responsibility of making sure that things are redacted, because then we're liable if we hand out things and we haven't done the appropriate measures. So, it's really almost always safer to send it through County, those, through departments that have the ability to do that and the responsibility and making sure nobody gets harmed with it again. I've sat with us long enough and with the staff, and none of us have tried to withhold information from the community. It's what we're about is communication. So, I, I understand some people are frustrated but I, I think they're frustrated because typically communication has been very poor in a lot of areas, and I don't necessarily think its staff, I just think everybody's trying to work a project, and that's, that's part of the issue. So, I just wanted to mention that, sir. I am, I don't believe for a minute Ms. Virginia doesn't get information out in a timely manner. She has so much to, to manage. She has got one of the very, very high dollar responsibilities in our County as far as Lagoon, its high dollar. And so, this, the COC board and everybody that comes together to make recommendations, and I watch the board meetings, I have no life. But, they're, they're interesting hear all of the minds that come together and all of the personalities, and the way they work together. So, I know this is a hot topic. I know people don't agree upon the outcome, and that's where the problem comes in, because when you don't get what you want done . . . I, I think a way to kind of to take everybody down a rabbit trail so that you get off focus of what we're trying to accomplish is what happens many times. It's human nature. So, again, I just want to mention this because I, I don't know if it'll come up again, but at our meeting we had for budget, I thought it was very important that all of us had that information, because four of us were not privy to information requests and things going around. Was it wrong? Not necessarily, but I think to make good decisions up here . . . we vote on this, we have to have as much data stuck in our heads as we can get and go after as much information as we can. And so, it's just some, and if I realize we're not getting information, we have to have it. It's very important to have it. And I watched the COC meeting, and Miss Laura Lee thank you for bringing up our project we're getting ready to up there to help with the seagrass, but I didn't hear any of the COC board actually having a whole lot of conflict with, with the, what was being presented, and I listened for it. I wanted to go back and listen for . . . I read Miss Hamberlin's newspaper article, so I wanted to see what, what the conflict was because I, I didn't hear that before I went back, and I just didn't hear it; and ma'am you can come up later maybe there's a different time that you mentioned that. I didn't hear it. But from all the data I have been given so far, and everything I've been going after, I haven't heard anything in conflict to what we're bringing, and this Board will have a conversation here in a minute and we'll see what's coming up. We're under Sunshine, we can't communicate, so I don't know what's in their heads right now. So, at public meetings we have to talk about these things so that we know what's going on, so, that's why we bring up things out there that we're trying to figure out and, and work through. But Miss Barker, your, your integrity is not in question with me. The things you do are not in question. I am amazed at what you get done. I actually went through one of these emails somebody asked you about, and with your indulgence, I want to give you guys, these, these, these time periods. She was given a question by constituent at 9:32 in the morning. She gave an answer at 12:28. She had another one coming in at 1:41. She gave another answer at 2:51, and then she followed up again that same night at 6:43 in the evening. And then the next email then question that came in wasn't till February 8th. I, I haven't seen her trying to block information on these, and I went through

the emails and I just tried to research it and find out what's going on. I don't like moving off emotions or everybody's opinions, I try to gather as much information as I can. So, ma'am, everything I found I, I haven't seen that, that happening, and I'm just telling you that Commissioner Lober. I put a little extra work into the spreadsheets. But, I, I just want to state that because that's come up, and I, I just want to, for the record, with, with all that's in my heart with what I'm trying to find, I have, I haven't found anything unappropriate as far as trying to withhold information for constituents. Some of them might take more, longer to get together, but I recommend we send it to the County departments to handle these and let them get the information out as quickly as possible.

Zonka – I didn't, I try not to interrupt public comments with a lot of these comments, but, but Commissioner Lober, you were the one that increased those public, public records rates because you were getting just inundated. Remember, back when you brought it to the board and you, you . . .

Lober – (unclear) unilaterally.

Zonka – What I'm saying is you brought that to the Board to talk about, you know, because you were getting public record abuse at that point, I mean with the amount of requests. So, I mean, I know, some of your public records costs have been kind of high as well. I'm not questioning as far as, you know, who has higher, but I believe if, if I have 12,000 emails to go through, not only am I going to want to make sure that whoever's requesting it gets the correct information, I'm going to want to make sure there is nothing private that, that just inadvertently gets mentioned, because of that release we had in the beginning, that issue we had with IT in the beginning. So, I mean, again for me I want to see what's going out. Half the time we don't even know when public records requests are being made till after the fact, but because of that release of, I mean it was like a FAFSA banking information personal computer stuff. There was an issue, a big issue for all of us, even some of our staff. So, I, I know I would want to see something to that magnitude, and, and obviously for good reason, because things get completely blown out of proportion. People take opportunities and they make accusations, and, and it makes for good print but it's not the whole truth, and, and barely part of the truth, and that's what I take issue with. So, we'll address it later I'm sure but . . .

Lober – I really would like to respond to that a little bit. So, as far as the business with the public records requests in my office, the bottom line is the request that released exempt, statutorily exempted information pertaining to me. It, we never had the opportunity to have anyone in my office review it. It was sent without us even knowing the request had come in. Had I had Kika or Rocket who, who have hourly wages that are far less than mine have the ability to review it, that would have been fine. They could have reviewed it, but what we're talking about here is that not only did the part, the department have the opportunity to review it, it went to the highest paid staff member in the department. So, it's totally not an apples to apples to say that the reason that led to the change in the public records structure here is somehow analogous to this.

Zonka – What I'm saying is the request was of her records though. I mean, so I mean she understandably would get that request, and I know I've seen some of your public records requests costs before and they were directly related to what your wage was. So, I mean I'm just saying I would be careful of, of not, of holding everyone to the same standard that, that you apply because I don't think you let your staff go through your stuff without charging your rates.

Lober – I absolutely do.

Zonka – Maybe now, but that's not how it was.

Lober – I have. If you can find one instance in which you have an issue, bring it up and set an Agenda Item, and we'll go over it.

Zonka – Okay.

Lober – Please, because I, I think that's absolutely fallacious.

Zonka – Oh, well, we'll have them pull it, we'll have Nadia pull those calls.

Lober – That's fine. It's great to make an accusation with no specifics so that there is nothing to rebut, but that's nonsense.

Zonka – All right, we'll bring it to the next meeting.

Lober – Okay.

Zonka – Vinnie Taranto, and after Vinnie, Sandra Sullivan. Hi.

Taranto – (unclear) Commissioners. Vinnie Taranto, 313 10th Terrace, Indialantic, Florida. And Commissioner Tobia, I use Map Quest, too, so, that makes two of us. First of all, as chairman, one of my tasks to assist the oversight committee is to present the plan to you all for your consideration, and so we've done that. I wanted to make myself available for any questions; but, due to the previous comment, I just have to say that they're unequivocally, there is nobody shut down at the last meeting; and I would request everybody take a look at it if they think somebody was shut down. As chairman my task is to make sure that we have an orderly meeting, and I take it personal to make sure that everybody on that committee feels that they've been heard; and so, please look back at the meeting, look it's online. Unequivocally nobody was shut down. So, thank you very much and if you have any questions, I'll make myself available. Thank you.

Zonka – Thank you. Sandra Sullivan, and after Sandra Sullivan, Stel Bailey.

Sullivan – Good morning. Sandra Sullivan. So I just want to say that I have records which are not fulfilled on this issue. As it still stands right now, I reviewed the video from the Budget meeting during the break and did confirm that following D-1's comments, the contents of the action items, which I never used in my emails was referred as records requests, and a conversation ensued. So, I would still like that to be looked at. Pertaining to the last oversight meeting, there were three committee members who brought concerns that the purpose of that Citizen Oversight Committee is to advise the County and to provide oversight, and so three issues were brought up. One brought up pesticides that got redirected by Tetra Tech and by the director. The second comment was brought up about the pesticides in the impoundment area, which is on the plan, and that then went on to another comment about biocides, copper being a biocide. Of that, at no time did the director say to the concerns brought up by the COC, do you want to see a change in plan? There's a process to modifying these. So, I just want to say, the issue I have with the plan, and why I'm asking you not to approve it today FDEP knew, as of 2011, that more than nutrients loading was causing the seagrass to die off. Last year Marine Resource Council data sent to you found that even in areas of good nutrient levels, the seagrass was still dying suggesting another factor. The plan has not been adjusted beyond nutrient loading in Section 3. This here is the number of, 177 dead Manatees as of 11 February 22. Seventy percent of those Manatees are here in Brevard County. When you see massive die-off of species in the Lagoon that rely on seagrass, it's telling you other species as well in the Lagoon are dying, this is more species in this Lagoon than any

80 percent of the seagrass in the Lagoon. The Lagoon Plan is not working, that is evident right now. So, we need to re-assess what could be causing and look at the scientific literature. This issue is not limited to Brevard, it is across the world in fact, and there is a lot of research in other areas as copper is mixed with herbicides and there's a lot of runoff of copper to the Lagoon, as well as other contaminants that can cause the decline of seagrass. Thank you.

Zonka – Stel Bailey, and after Stel, Lew Kontnik.

Bailey – Good morning, Stel Bailey with Fight for Zero. I'm the Executive Director, I'm also the National PFAS Contamination Coalition Leader. I'm also a community liaison for Academy of Sciences. I wanted to come up here and talk about this plan, because Fight for Zero has been doing testing across the County on PFAS. We just had our University of Florida presentation last week, and a lot of people have been readily available to answer our questions on this plan. I am probably one of the half cent tax biggest critics, but at the same time I have been boots on the ground and I have been seeing the manatees, I have been seeing the water quality decline. I know that we need this money. I know that we need this project implemented, and we need to continue going down this scientific-proven path of this plan. And so, you have amazing organizations like ORCA that are doing the studies. Our group, doing the studies. We do not need to waste taxpayer's money redoing something that organizations are already doing that are funded outside the taxpayer's money. I am, like I said boots on the ground. People, the biggest failure I think that I see in this plan is the education aspect of it. People are getting so much misinformation, they're not educated, and there's so many creative ways that we can execute that on a County level. I was able to help with a 500 dollar million cleanup with the 2022 NDAA, 168 million prior to that, $10 billion towards the infrastructure, 29 more PFAS on the UCMR5, and I was able to go to the table with the EPA, DOD, ATSDR, and COC on these issues. It's being cleaned up. There is money going towards it. We do not need to waste any more money. The taxpayer's want you to fix it, they want us to do the studies, and to get the answers and the data to you guys. Thank you.

Zonka – Lew, and after Lew, Courtney Barker.

Kontnik – Hi, thank you very much. Lew Kontnik, 3208 Bird Song Court in Melbourne. I represent the Brevard Indian River Lagoon Coalition, and the recently formed Indian River, the Indian River Lagoon Roundtable. I followed the SOIRL plan, the COC, and the Commission's actions closely over the past several years. I believe that we all understand that the Lagoon is in trouble, and that we all want to see it brought back. I also believe that the Lagoon's problems are complex, and through science that we continue to learn more about them and the best solutions that we have going forward. That's why I thank Brevard voters who approved the SOIRL program, you the Commissioners that support it, the community for its ongoing comments into the SOIRL program, and the SOIRL staff and COC who have worked tirelessly to organize and operate the plan, and to look deeply into the information to make adjustment to incorporate our new understandings. Best of all, from my point of view, the SOIRL program is working. Currently there are 80 projects that have been completed or are under construction. That's great. Another 115 are contracted and/or in design. The plan has reduced total nitrogen into the Lagoon by some 100,000 pounds per year, and the 22, 2022 plan adds 18 new projects, requests, bringing the total to 337 restoring projects. All of the efforts, as complex as the SOIRL plan, face issues and questions. That's just life. The staff and the COC have proven that they can honestly and publicly dig into these questions. So let's let the legitimate issues be examined by our existing process. Let's approve the plan. Let's help the Lagoon. Let's move forward. Thank you.

questions. So let's let the legitimate issues be examined by our existing process. Let's approve the plan. Let's help the Lagoon. Let's move forward. Thank you.

Zonka – Courtney, and after Courtney, Philip Harris.

Barker – Good morning. Courtney Barker, on the COC and I've been a part of the COC since the beginning of the plan, so I'm one of the founding members of the COC. I'm here today to ask for your support for the plan. We did keep the list of projects this year, very similar to the direction that you gave us previously about shifting to, you know, the wastewater treatment and the septic to sewer projects, so I think that's clearly represented in the plan. I just wanted to, before I stopped talking, I wanted to give a lot of kudos to the Natural Resources department staff and Virginia Barker for all of their work. They are an amazing staff, and they work very hard. In addition to having to fill all these public records requests and answering all these questions, they're managing hundreds of projects, and that includes bids, contracts, you know, visiting sites, site inspections, it's a lot of work, all those contractors. So, they do this all day long in addition to having to answer the questions from the public and all of the public records requests. So, if it takes time, it takes time for them to fill those. I also wanted to comment about the meeting. A lot of times, unfortunately, some people perceive if other people don't agree with them that we're not listening, and that's not the case. The, the committee gives all of the committee members a chance to speak, ask their ques, you know, ask their questions, get all the answers at the meeting, and that's clearly what happened at the meeting; and I think if you guys go back and watch that, you'll see that. So, and it, you know, to sum up what we really hope for your support, and thank you for all the support you've given the Lagoon in the past. Appreciate it. Thank you.

Zonka – Thank you. Commissioner Lober, is this an old light?

Lober – It's for after public comment.

Zonka – Oh, okay. Philip and after Philip Harris, Craig. Craig Wallace.

Harris – It's like being on the Price is Right. Hey, pick me. Okay. Um. My name is Philip Harris. I live at 4088 Trovita Circle in Melbourne, and I'm a transplant of course, from Pennsylvania, and I moved down here about seven years ago, shortly like the next year that the half-cent sales tax was passed in Brevard to help the Save Our Indian River Lagoon Project, and I was like thrilled. I couldn't believe it. I thought that was really wonderful and it's been wonderful to see multiple groups, private and public, government and grassroots, working together with vision and financing that will benefit the lives of future generations of species that live in, or live near, the Indian River Lagoon. I hope that SOIRL will continue in its present form and that we will not lose sight of the objective of the Project, nor the general goodwill that is generated from Brevard County, and all of Florida. Um. Thank you very much.

Zonka – Thank you. Okay. Laurilee or after Craig. Craig Wallace first. I'm sorry. I just like watching you guys dance. After Craig, Laurilee, and then after Laurilee, Susan Hodgers.

Wallace – Good morning. Uh, Craig Wallace, Satellite Beach. Uh, I'm also here, uh, representing the Brevard Indian River Lagoon Coalition. Just to give you a little bit of background, I know, you guys know basically who we are, but one of our goals is to make sure that we get as much information from the, the staff and from the Citizens Oversight Committee regarding this plan, and communicate that out to the public so they get as best picture that that we can, because they, they're not going to sit in every, every, uh, COC meeting. One of the issues that I see and I've

brought up from the beginning is that if you look at the, the expenditures here, and you look at public education, it's not even visible on there. So, that's one of the things that we're trying to do as a coalition, is to try to provide a little bit more, uh, translation of what's going on from not the technical, not the technical talk but the general, the impact, the things that are important to improving the Lagoon. So, we spend a lot of time, we talk to just about everybody, you know, we don't have a lot of scientists in our coalition, but we do reach out to the scientists in the community and we try to get as much information. So, we do believe in a science-backed plan and what we have seen from the beginning of this plan and we said in every COC meeting, what we've seen from the beginning is that everything they do is based on science, and that's what we're looking for and, you know, it the, the plan has changed over the years and we think it's because of the science that the things that have been brought to the attention of, of the COC, of the, uh, Natural Resources Department. And, you know, because of those things we're able to now, you know, continue to shift the plan, and so, we feel that our assessment anyway is that the plan, uh, is a good one, and we definitely support it. So, thank you.

Zonka – Thank you. Laurilee, and after Laurilee Susan Hodgers.

Thompson – Morning, Laurilee Thompson, 3550 Irwin Avenue, Mims. Um, I represent tourism on the COC, but I also represent the commercial industry, commercial fishing industry, and those are probably the two biggest industries that have been impacted by the death of the Lagoon. Um, my family, four generation of us, had made a living off the Lagoon's waters. We can't do that anymore. We can't serve Indian River Lagoon seafood in my restaurant. So, it really hurts me and it really, it's breaking my heart to see the dead manatees, but we can't waste time. So, you have a really good group of people on the COC. They spend a lot of time vetting, um, the new money and how to spend it., and where to, where to place it, and every day that we, that we delay moving forward, it puts us backwards in the Lagoon. Um, things will cost more in the future. So, we really need... I hope that you guys will approve what's in front of you today and then if you want to make some changes, you know, give us some direction on the Committee, and we'll be glad to consider it. We'll be glad. I mean you look at the chart, you can see how, how it's been rearranged. We had a lot of money for muck dredging. I still believe that muck dredging is critically important, but we're, we're flexible. We'll move stuff around. If, we'll do whatever you guys want to do, but if you, if you delay the Project today and then you send it back to the Committee, then you slow us down and, and you stall the process and we don't want to do that. We want to keep moving forward, so tell us what you want us to do, but, please consider, um, passing what's in front of you today and giving us guidance on what you would like to see us do in the future. Thank you.

Zonka – Thank you. Susan.

Hodgers – Good morning. I just wanted to clarify, first, um, I am on the COC as a real estate member and at the Budget Review Commission meeting last week a few of the Commissioners had recommended that the appointee go back to their Commissioner, but I was voted by all five of the Commissioners and rated by all five; but there was three people that applied, so, I'm not any persons appointee, number one. Part of the Citizen Oversight Committee, as an appointee is to task, my task, is for oversight, accountability, transparency, and some of the questions that I discovered when I was blocked by the public records for the seagrass., and I was told it was Sunshine, I couldn't have it, I started doing more public records requests. Um, I asked Miss Barker for a spreadsheet of the Projects with the contractors, and she's like I've never had to do that before. I can send an email to all of you with her email that was forward to me. Second, I

got an email from Ms. Barker at 8:41 p.m. last night from a public record request that I did nine days ago. So, that's, as Ms. Commissioner Pritchett said outside the terms of her parameters. So, why did she send me an email last night with information, not charging me right, at literally the eleventh hour? So, a lot of these things...when I asked for just seagrass and pesticides, I wasn't asking about transferring seagrass. So, if you guys go back and watch the last meeting, that's what it was. If I hadn't been obstructed by that, by saying the Sunshine rule, then going back to the County Attorney. County Attorney Abby said that's correct, it's not Sunshine. Then I get an invoice of an outlandish rate, so to me it's concerning that there are some people that are possibly covering up and hiding something. So, why the Citizen Oversight Committee if I'm bringing up information and people are saying that we have a definite agenda, or, um, outlandish accusations? In Brevard County, it's not, we've had misuse of funds by government officials. So, to turn around and call people crazy or conspiracy theorists, when you can't tell me that you ... I think Joy sent me an email that there was no audit done in 2020. So, you told the taxpayers that we would have an annual audit. So, as elected officials, you're elected to serve the people, you're not above the people. Thank you.

Zonka – Uh, we have questions, Susan, you got a sec?

Pritchett – Hi, Ms. Susan. Um, I understand you're frustrated and I'm sure a lot of this had to do with frustration. Um, let me, um, ask you a question though. We'll get back to that maybe in a little bit. But.

Zonka – Oh.

Pritchett – Opps.

Zonka – Sorry.

Pritchett – So, I'm, I'm guessing that with, with this, because I tried to read through this and figure them out. Again, you, you said there was an agenda, there probably was because you're trying to get things figured out and get your information out, and you, you would want all of us to have that information, and we didn't have it before. So, I wanted all the Commissioners to get those emails, whether it's good or bad it didn't matter to me, I just want information out. I wasn't accusing you of anything evil, and a matter of fact, I didn't even say your name, I just wanted us to have information. But, my question on this is, is, is from going back and watching the SOIRL plan, I'm guessing that you wanted a different outcome, as far as seagrass?

Hodgers – (Unclear) Um, can I answer?

Pritchett – Yeah.

Hodgers – Okay.

Pritchett – I'm asking a quick question.

Hodgers – Okay.

Pritchett – Yeah, you can answer all together.

Hodgers – My specific, um, Representative Fine, had wrote an, um, op-ed on seagrass.

Pritchett – Okay.

Hodgers – And then Tom Weinberg's wife had written one, so I had mentioned about seagrass and the effects of pesticide, and the question was redirected by Marcy of Tetra Tech to talk about planting seagrass, which I did not say. If you go back and watch the January . . .

Pritchett – I, I.

Hodgers – . . . COC meeting.

Pritchett – I was watching the one where y'all voted, but my question is right now.

Hodgers – It was the same meeting.

Pritchett – Because we have to make a vote on this and I really want to make a good decision here. From what we are doing right now, in your opinion, what would you request that was done different, and what science are you basing that on? This is just for us to have information right now so we're making a good decision today. So.

Hodgers – Well, right now my decision is not to approve it because I'm concerned that I couldn't even get a spreadsheet information until last night at 8:41 p.m. that they couldn't tell me the specific projects and vendors of the projects. Like, if I said in District 1, what projects are in District 1, what are the projects, what are the, um, vendors? One of the elected officials took me out on a boat on Sunday and was showing me some of the dredging that was being done in Cocoa Beach, which was impressive, and the water clarity. So, there is being, there's good being done, but.

Pritchett – Can you tell me what it is though, in the plan that you would want to see different right now?

Hodgers – Well, transparency and accountability of . . .

Pritchett – Well, that's.

Hodgers – . . . not being able to.

Pritchett – I got.

Hodgers – For me.

Pritchett – I, I understand what you're saying and I understand your frustration.

Hodgers – Can I even finish what I'm saying? If I went over to the Clerk of Court, I sent a thing in for Tetra Tech and closed waters, they were able to whip out something from I.T., and send me the information within a few days. I sent this in to Ms. Barker nine days ago and I sent in to the County Attorney's Office, and Ms. Barker responded to me saying I couldn't have it due to Sunshine. So, the answer...

Pritchett – Well, I'm going to let them respond in a minutes. I, I don't want to do the, the public records request right now.

Hodgers - I'm just asking that . . .

Pritchett – I'm not a firm believer.

Hodgers – . . . not approve the plan.

Pritchett – In public records. We're probably going to go through all that in a little bit, but my question is, right now in this plan, if you're Queen for a Day what is it that you want to tweak and make different for this Board to approve? What specifically is it that you're in disagreement with right now?

Hodgers – To go back and look at all the Projects and be able to talk about the spending and the contractors which…

Pritchett – You've been on the board. I, I just, I, we're going to make a vote here and I really want your input right now.

Hodgers – I'm asking you not to approve the plan. Thank you.

Pritchett – Well, that's not helping me. Hold on just a second. Okay. I'm not going to get answers, ma'am.

Zonka – Did she not want to answer any more questions?

Hodgers – Inaudible.

Pritchett – It wasn't, I was just asking you. That was appropriate, right?

Lober – Commissioner Pritchett, I think maybe, I'm paraphrasing here perhaps or assuming something, but perhaps she doesn't necessarily have an answer to that because the information wasn't made available to her until less than 12 hours ago.

Pritchett – I.

Lober – I don't know that I would have one either.

Pritchett – Commissioner Lober, if you watched it she, she didn't want to pass it because of seagrass, but I wanted her to explain that to us right how. She's on the board, they've got that information from the presentations. I don't want to miss anything here today. If she put out a newspaper article, and I, and I have problems with a lot of the things put in here and it's, it's okay, everybody's allowed to say stuff, but if, if I'm trying to get real information right now, this is the time to give it to us. So, that's, that's my request right now, but it's, its, its fine.

Zonka – All right. Commissioner Lober.

Lober – Thank you. It's still for after, after public comment. Are we done with it, or?

Zonka – We're done with public comment.

Lober – Okay. I've. I've got some things that I want to get across here, and bear with me, because I was just jotting this down as we were going through. Virginia, and I believe it was Lew Kontnik, as well had mentioned that we're removing about 100,000 pounds a year in the form of organics, as a result of the SOIRL Project. Is that right? I see Virginia nodding and I see Lew nodding. So, I'm going to stick with that metric. Uh, I want to talk about one sewage spill, one. At the end of 2020 moving into the beginning of 2021 Titusville, and I don't mean to pick on D1, they had a utility leak that put out 7.2 million gallons of raw sewage. Guess where that ended up? You got it. Pure, freshwater and I know this, because I've had fish tanks for almost as long as I've been alive, weighs 8.4 pounds. Saltwater is heavier, brackish water is heavier than freshwater as well. Uh, if you have anything that is in the water, it increases the weight. So, when, when I'm talking

about a 7.2 million gallon affluent leak, we're talking raw sewage, so it is certainly more than 8.4 pounds per gallon because freshwater with nothing in it is 8.4. Recognizing that there's no way that raw sewage weighs less than pure water, if we stick with eight, let's just say eight and a half pounds per gallon, which is an overly conservative number in reality it's going to be heavier. Let's say raw sewage weighs eight and a half pounds a gallon. You take 7.2 million gallons and if the little calculator app on here is right, you multiply that by eight and a half pounds per gallon. You're talking 59 and a half million pounds or raw sewage. Again, guess where that went? Fifty-nine and a half million pounds of literally crap and other stuff. I'm sure there were pharmaceuticals and you probably, probably had bacteria, viruses, because, again, this is untreated, this is what goes down the toilet and down your drain. So, it's whatever's down there. And, again, we're focusing just on the organics here because that's, that's the metric that, that was discussed. If we assume that less than two percent, one and three-quarter percent, and why, because it's a low number and I'm confident it's lower than what the real number is. Let's say one and three-quarter percent of that raw sewage is organic, that's over a million pounds of organics at one and three-quarter percent of the overall being organics, and it may be 10 times that but I'm being very conservative here, both in the weight and in the percentage of organics. As Virginia mentioned and as Lew mentioned, the pounds, the plan is removing 100,000 pounds of organics per year. If that's representative of other years prior and future, that million pounds of organics over the 10-year lifespan of the SOIRL tax and the roughly half billion dollars, if we could have prevented the one spill, it would have been worth more than the 80 Projects, I think Lew said were completed or under construction with another 115 upcoming, it would have worth more than all of those because we would have gotten the goal of removing organics to that degree, or a greater degree in fact, if we could have prevented that one spill. So, everyone's spinning their wheels. We have a COC. We have the County Commission dealing with it. We have experts coming from everywhere. If we could have prevented that one thing it would have been more valuable than all this nonsense put together. I just want people to put this in perspective. Wisely, in my opinion, three years ago the Commission, at least a majority of the Commission, directed the COC to cut the crap, forgive the pun, and to address more as far as the sources of pollution are concerned. Thank God, that was a step in the right direction. However, since that time, we've not really made any meaningful additional steps in that direction. I voted for it not because I thought three years ago it was wonderful, but because I thought there was a good faith effort on the other part, on the other side of things, to work with us. Okay, I could work with that, but that essentially is stagnated. My opinion as to why, and I'm speculating here, I admit that, but from what I've seen and from what I'm looking at in the direction I'm looking today, there are certain individuals that the COC has kowtowed to, who to their credit have figured out how to lobby very effectively, to have their particular grant recipient of choice, which may be someone they work for, get a disproportionate share of the grant funding. We have some of these same individuals who try to argue, that, well the utilities should be paid for by the folks that are on utilities. I'm looking and I honest to God, did not know that Ms. Sullivan was going to hand this out today, the ballot language that the voters voted on to approve back in, in 16. It doesn't talk about giving municipalities their wedge of the pie, or their share of the pie. It talks about resolving the problem. It doesn't say anything about making sure that Satellite Beach or any other city gets a particular share, talks about resolving the problem; and I'll tell you, my District is confined to the Central part of the County. If none of the money went to my District because it's from a Return on Investment (ROI) standpoint, preventing a 7.2 million gallon leak in Titusville, spend it all there, don't give anything to my folks, that's fine because that's what the voters voted to do. Not to give any particular little municipality that happens to be excellent in lobbying and kudos to particular municipalities, one in particular

who seems to involve itself in everything from redistricting, to SOIRL, to whatever, whatever you have, that's not what the voters wanted. If you look at the language here, I mean, unless you're just closing your eyes to it, there's nothing that talks about that, they want the problem resolved; and what we need to do is to knock this crap off once and for all and do it purely based on ROI. I appreciate that they've ranked things based on that, as far as the Projects are concerned. But, why are we doing anything that's not ROI based? Why don't we put in the utility issues where we have…my building is from 1963, that my office is in, it's got asbestos in the walls. I'm not moaning about it, but I'm pointing out we've got infrastructure that's as old as that under the ground. This stuff is supposed to a quarter-century. Guess what? That's come and gone. The stuff is older than I am, by far a lot of it. It's got a 25, 30-year life expectancy. What do you think happens after 30 years, or 35 years, or 40 years? Doesn't last indefinitely. There's a reason it's a life expectancy. You may get a person that lives to be 100 years old, but that ain't common. So, I'm not going to vote for it today. I, I think, even if I were okay with last year's plan and I wasn't, for the same reason I just mentioned, my real concern, over and above what I've just mentioned is we've been getting costs back whether it's Utilities, whether it's Natural Resources, whether it's Public Works including Road and Bridges that have been double digit percent higher than what we've anticipated. This is not me, talk to any of the staff members, and talk to any of the Directors for those Departments. All of these things are coming back substantially higher than we banked on. I'm not going to go throw Biden under the bus, as much as I might want to, to say its inflation or Biden inflation. Okay, I kind of did in a little bit of a back ended way. I'm sorry. I couldn't help myself there, but the point is these things are getting more and more expensive and I don't know why we're adding 18 projects when we really don't know what the true cost of the existing approved projects will be. Frankly, any additional money that we're able to bring in over what we anticipated, I think needs to be put in Reserves, even if you discount everything that I've just said, as far as why we shouldn't be doing things the way we are because I don't know that we're going to have the funding to pay for all of it. So, I, I'm not voting for this, this. We were going the right way before, we're not at this point. I respect other folk's votes, but this is not the way forward.

Zonka – Commissioner Tobia.

Tobia – Thank you, Madam Chair, and, um, to put this in perspective, it appears as Russia just invaded the Ukraine

Zonka – Oh, I hate to hear that.

Tobia – Um, so, there are bigger issues out there, um, and this one is, is pretty minor.

Pritchett – What?

Zonka – Russia just invaded Ukraine.

Tobia – Yeah. Uh, so I'd like to amend, uh, the, uh upcoming motion, and this one shouldn't be too controversial, but to authorize staff to apply the increased cost share formula for the 2022 plan to early adopters of advanced septic system. Uh, there were some folks that went ahead and did this. And when I say some folks, I mean three. Uh, at the 700 pound… Uh, $700 per pound. We recently updated it to $1,200. Three people got caught, uh, as, uh, at the 700 as opposed to had they waited and got the full $1,200, the difference for those three people, and the impact on the plan would be $17,305. I've run this by Ms. Barker, as well as a couple members on the, uh, COC, and, uh, did not hear, uh, any pushback. So, um, just wanted to give folks the heads-up on, um, that.

Zonka – Commissioner Pritchett.

Pritchett – Thank you, ma'am. I, um, Commissioner Lober, thanks for bringing up Titusville by the way.

Lober – Sorry.

Pritchett – It's all right. You know, um, part of the problem... I remember when I first got into office, I wanted to talk to Ms. Barker...is some areas of our County are really, really old, and I moved over here when I was little, and that's how old they are and some of these old pipes. We're having problems with them, and it's, it's going to take a long time, a lot of money to get underground and fix a lot of these things. And we've got to work, um, expediently as we can towards it. But it's, this is not a quick process. Um, Commissioner Tobia, um, I... It sounds like a good idea and I looked over there and, I guess, you've ran it by them and they're pretty comfortable with it, too. So, it probably sounds like it's something I'm going to support. The, the thing with all this is, it's so important that the Commissioners get information. We vote this and so, when there is any kind of lack of information the five of us don't get, we can't bring forth good, um, votes moving forward, and that's, that's what we're about, is getting information and moving forward, and if, if, if that gets hung up there's, there's a, there's a pretty big problem, as well. I do want to state one thing. Commissioner Tobia, I can give you this if you want to actually transcribe it, you're the only one that wasn't at the meeting but the rest us of were, and we know, but, I, I want to state this very clearly and I hope the newspaper will print this. There was not one mention of trying to hold up public records requests. Not one. The request was that Miss Virginia would focus on this meeting today, which was two days after that meeting to make sure we got enough information to make good decisions. As far as all the personal attacks on her, you know, send in things, and she'll send you out stuff, I, I'm pretty confident that's going to end up ended in a good place anyways. But, I've learned long enough that when you don't agree with somebody, all of a sudden you end up with rabbit trails, and you can go down all kinds of tracks and you don't end up where you need to be to make good decisions; and, I will never apologize for guarding that, of making sure we have good information to make good decisions moving forward. I'm also a little concerned that we're accused of rubberstamping things. I mean, I don't know how many times we frustrate the fire out of staff by sending stuff back. Commissioner Lober, you're really guilty of this. Last time you sent it back and we changed the whole plan. So, it's just the farthest thing from the truth and accusations go out, and it's so easy just to say stuff. And, I think, people think, if they say it four times and write it once it becomes the truth. It's just not true. You can put five little facts together and you don't paint the truth. The goal is to be finding truth and to seek truth, and I really have a lot of problem with some of the things going around, and I'm not going to backup from it because it is good for this community to always have the best representation they, making good decisions. It's not always perfect, but I don't, I don't apologize for that, and if you got issue with that print the paper away. I don't care, but eventually, the truth will come out, and people will know the truth and I just wanted to say all that, because I'm really concerned about that. And, so, I'm going to throw out a recommendation, if you ever have trouble with these things, get a hold of your Commissioner, all five Commissioners, and give them information. That is the best way of making sure that the best public process happens at the end of the day. Thank you.

Zonka – Thank you. Commissioner Lober.

Lober – I, I'm going to pass at this point.

Zonka – Yeah, and I would just say the same thing. If, if Ms. Hodgers or anybody else wasn't getting information, rather than reaching out to only one Commissioner, several emails back and forth with just District 2 Office, we can't even address the problem, should there be a problem that exists. So, again, deciding, you know, a couple of weeks before the plan comes to the Board, when you've been sitting on the board for an entire year, that information could have been asked for; and you asked to create a spreadsheet. I mean every project, I'm assuming Ms. Barker comes before that board. Every, every vendor is known. It's all full, just fully disclosed correct?

Barker – All the projects come before the board. The vendor contracts go through the procurement Policy, you know, whether that is an open bid for lowest price, or whether that is an RFQ for the most qualified firm. So, just to clarify the, the records, the County has two different databases. There's one database where all the expenses, all the budget, and the expenses happen, and then there's a completely separate database that is the contracts management system where all of the contracts and the vendor information exists.

Zonka – Because you were asked to create a spreadsheet, correct?

Barker – I was asked to create a spreadsheet that would have required pulling information from two…

Zonka – And that wasn't a direct.

Barker – Different databases.

Zonka – And that wasn't a direction from your board, it was a direction from one board member, correct?

Barker – Correct.

Zonka – Okay, and nine days on public records. Is that acceptable, Abby?

Jorandby – There. There is no mandatory deadline for records. We do as reasonable.

Zonka – It has to be reasonable.

Jorandby – Reasonable, yes.

Zonka – Because, I think, a lot of these issue could have been addressed, and perhaps even this, that op-ed that again, told partial truths and, and, probably blew up a lot worse than it needed to be. Just let us know if you feel like you're being obstructed or you're not getting the information your best bet is to come to the Commission, or email Commissioners, because we're your best advocates. I mean, we've . . . and to say that that rubberstamping thing kind-of irked me a little bit, too, because we've, we've did, we've refused the plan. We've sent it back to the board, much to their board's frustration, as a majority the board wasn't happy, but that's the reason why the plan has been modified so much. But we've kicked, we've rejected the plan plenty of times when we haven't agreed with it. So, again, it makes for good print, but it's not always the truth. So, I don't . . .

Smith – Madam Chair.

Zonka – . . . I don't want to keep dancing around. I don't want to, yeah, I don't . . . we're kind of getting off of.

Pritchett – Commissioner Smith.

Tobia – Commissioner Smith.

Zonka – Of what we're doing here, but, so, I'll just let it go. But, Commissioner Smith.

Smith – Thank you, Madam Chair. I just specifically (inaudible) like so many... Indian River Lagoon rest full out with emotion. I live in, on, and play on and in the Indian River Lagoon... (Inaudible) full out with emotion. I live on and play on and in the Indian River Lagoon.

Zonka – Can you understand him?

Smith – In fact, Duane De Freese (inaudible) doesn't know many people see or have more (inaudible) Indian River Lagoon restoration. I am emotion invested like I think everybody is, but I am in a position as one of your fellow Commissioners where I must look at all of the aspects and see that they're addressed back (inaudible). I do support them. Jim Barfield, Virginia Barker, and myself spent many, many hours traveling down County back in 2016 I guess it was speaking to groups on pros and cons of the Indian River Lagoon tax, and primarily we were told what the facts were, leaving it up to them. We weren't pushing the plan as much as were just trying to get them the facts. I realized early on that emotion was very high for most folks on their list of reasons to support or not support. I don't think that's changed, but we have COC making suggestions, offering solutions, and there solutions and suggestions passed on to Frank (inaudible) the way pros and cons, and then he gets the voter for information, and then that's forwarded on to us for (inaudible) several of you all, we dissect this stuff, and if we're not happy with it (inaudible), so there's an awful lot of oversight, not just from the Oversight Committee but the scientists themselves, the Commissioners, Commissioners themselves. So I want to end my comments at that point. I said everything else that could be done, but I am very, very proud of where we've gotten to from 2016, collecting a lot of money that supports the program. (Inaudible) a lot of progress. And is it perfect? Probably not, but I think we have an awful lot to be proud of.

Zonka – I think I got enough of that, a little choppy, but. Commissioner Lober.

Lober – A couple of thoughts. First as to what Mister, excuse me, Commissioner Tobia had mentioned, I don't know that it's necessarily as innocuous as you may have read it, and I say that because . . . I'll give you a quick analogy. So when I, when I first got on the Board there were some concerns on one of the CRA's spending and I agreed with those concerns. I sat in the meeting where they literally asked a beautification grant recipient as they were walking out of the door after the discussion was over, oh, hey, did you put an ADA accessible entryway here? Oh, yeah, I did. Well, you just need to fill out an eight and a half by 11 sheet of paper and you get an extra thousand dollars. So, there's no ROI for that. I understand it might be the right thing to do in the sense of having these people put on equal footing and not wanting to penalize them for jumping into it a little bit earlier than others, but the concern that I have is the ROI, because it's already done. It's not that we're going to get more folks on advanced septic because we essentially make these folks whole even if that may otherwise be the right thing to do. I just think that we have a greater obligation to chipping away more, so, at the problem than to making people happy. Aside from that, a couple other thoughts as to what's been going around, not to belabor it too much. I don't know what it would have accomplished had Ms. Hodgers emailed everyone else, although certainly she's welcome to do that . . . other than, I guess, the one downside is potentially might run into a Sunshine issue as interesting as that may be given the, the history of this particular item; but when she emailed me, it's not that while the other Commissioners didn't have

a chance to fix it, it got fixed almost immediately. I wrote back to her, I sent Abby an email, and it was done within 12 hours maybe, a day at most. So it wasn't something that I wasn't able to resolve, and if she wanted . . . I mean if you guys want to get copies of everything I get, it doesn't matter to me, but in this case, it would not have accomplished anything. And I think it's, it's great to talk about certain aspects of Ms. Hodgers requests that may have required either extraordinary work or spending time regenerating a record where a record doesn't exist, that's well and good, but we're kind of glossing over the most important part, at least in my opinion, as to, to the whole crux of her argument. We put someone on the COC to advise us, and then we had a department director who, God bless her, graduated from Duke, not an idiot, far from an idiot, wrongly tell our COC appointee that Sunshine Law either did or may preclude production of the requested records. I'm not going to say she did it maliciously or intentionally, it doesn't matter what I think, but that wasn't correct. And I can tell you, my intention to get involved was to avoid the County being sued because we told her something we weren't lawfully entitled to tell her. When I say we, I don't mean any of us sitting here, I mean, our Duke graduate department director who's been here long enough that frankly she should know better. So, as far as anyone with a comparable, and I was just looking through some PRR records that I had, I know that anyone has ever been told in response to a public records request, other than Miss Hodgers, that Sunshine may preclude the production. I don't have any record that it's ever happened before. Maybe it has, but I've not been able to find one looking up here. So, I, I agree with you and that there may be have been aspects of her request where a nine-day turnaround is totally reasonable, but that's where I'm at.

Zonka – Miss Joranby.

Joranby - Yes, if I could just clarify. So, how my office got involved, there was a records request to Miss Barker. She had a question about Sunshine, and there was some confusion there, and I got pulled in when there was that question whether those emails that were requested by Miss Hodgers could actually be turned over to Miss Hodgers due to Sunshine. I did clarify that, but there was really, really no attempt, I, I it was just some confusion and I did clear that up with Miss Barker. I don't think there was any attempt to block those records going out, it's just once I got involved and that question could be cleared up, then we worked on that public records request, which did actually request a lot of records, so that's where my office also helps departments generate that bill; and that bill would be my, and that bill goes to a cost.

Zonka – And that would be my second question. When, and technically if you create a new spreadsheet, you're creating the public record, correct?

Joranby – That is correct. So, we do instruct the departments. We are not to create new records, we only provide records that we have. If for some reason we don't have the record, then the response is there is no request, no records responsive to that request.

Zonka – Commissioner Pritchett.

Pritchett – Yeah, just real quickly a follow-up on that. Commissioner Lober, I don't mind if people send you emails or ask you questions. My point was that it might have been a little bit more expedient for us to get some of those as well, because until I brought up the information that we get this and read through some of these concerns, because there was an agenda. The agenda was the seagrass, and we, we didn't have, we didn't have the concerns. There's no way for us to know. So we've only got one Commissioner knowing, but gotta have three to vote this through. So, that was my point. I think is moving forward we have a communication issue, and if people that have concerns, if they would reach out and at least let us know.

Lober – That's fair.

Pritchett – And then it doesn't seem like there's a conspiracy thing going on. I never use those terms on purpose because I just realized we didn't have information, and we had to have that information. Because in all fairness, other people had it except the people that had to vote on it, and that's not, that's not, that's not a very good thing to do. It's hard to work through some of this. I don't know how much Ms. Hodgers was able to watch the meeting again, or if she heard second hand with stuff, because that's what I'm thinking, it's a frustrated article she wrote. It's probably comments to a lot of her frustration. And so, when I'm working through this I try not to get a lot of emotional things in it. I'm trying to pull out information. So, it was a little difficult today, and I understand she's still frustrated, but I was sincerely trying to find out if there was some reason we needed to put a halt on this today. So, as, as far as the public records, we got to work through this and figure this out. I think there's just, just too much this happened, this happened, I think this happened. We really need to find out what we need to do moving forward, and get the best path we can to get information to people. I mean, I totally get it, but I, I, I think we're getting a little sidetracked. I, I understand but we've had a lot of sidetracking going on, Madam Chair, so I don't think it was necessarily . . . if you wouldn't mind me expanding on some of those things, because I, I get very concerned . . . you know, you can lie about me to other people, but it's really hard to lie about me to me because I'm always there. So, I really need to get that straightened out because I'm always trying to get truth. I just want to get truth and seek after trust and move forward; and hopefully I come off as a grown up by the time we're done, and I'm done ma'am. Thank you.

Smith – Madam Chair, can I make a motion to approve J.1.?

Zonka – Okay, do you want to make the motion with Commissioner Tobia's changes?

Smith – Yes, ma'am.

Zonka – Okay, I, I don't think when you're hitting your button it always goes through. I think you really have to hit it. Did you hit it?

Lober – I was just hitting the microphone . . .

Zonka – Oh, okay.

Lober - . . . for the vote.

Zonka – I have a motion by Commissioner Smith, second by Commissioner Tobia. All those in favor say Aye.

Pritchett, Zonka, Smith, Tobia – Aye.

Zonka – Any opposed?

Lober – Nay.

Zonka – Motion passes 4:1.

Zonka – Yes, Commissioner Tobia.

Tobia – Thank you, Madam Chair. Ordinance 2016-15, Section 17, Paragraph B, reads, "Appointees must have a field of expertise." We have an appointee who has an inactive license. Inactive is not working or inactive according to DBPR on 02-21-22, as of yesterday. Section 2213 addresses the removal and that is done by a simple majority. So I have a motion on, I'd like to make a motion to remove and appointee and immediately advertise for a replacement due to an inactive license as of yesterday, Madam Chair.

Zonka – Commissioner Lober.

Lober – Can we get just a little more info, because I don't have . . . I'm looking at the Agenda, I get it's still early in the week yet, but either the order has changed or there's something I'm not seeing here. Could someone help me out a little bit on this one? I'm looking after J.1., the next one I saw was the Federal Legislative Lobbying services on the Agenda.

Tobia - Madam Chair.

Zonka – Yes, go ahead.

Tobia – And I can address the meeting that this was brought up at, no motions were in the meeting, but that one failed. I think I've tried it twice. So, this is a motion that . . . this just came to my attention again, the DBPR search was on 02-21. If there's new information so be it, but . . .

Lober – Is this with SOIRL or . . .

Tobia – That is correct. Again, I delineated Ordinance 2016-15.

Zonka – Can you tell us where to find that?

Tobia – I mean, I have a copy of it, Ordinance 2016-15.

Zonka – No, I mean we're looking up a . . .

Tobia – Sorry, Section 17, Paragraph B, details the appointment process.

Lober – I'm just looking up the DBPR page now. Do we have a name or . . .

Tobia – Oh, I'm sorry, you're looking for the licensing information.

Lober – Yes, sir.

Tobia – You can pull that up on licensing details, and you can search . . . I mean, you want a license number? It's SL3217990.

Lober – 3217990?

Tobia – Yes, and I only have one copy but you're welcome to look at it and make copies of it.

Lober – Thank you.

Pritchett – Commissioner Tobia, are you saying someone is on a board that doesn't qualify to be on the board.

Tobia – No, not necessarily. I just think that there may be individuals better represent that as they have active licenses according to . . . since that Ordinance doesn't specifically deal with the

removal, consulting the County Attorney's Office, she mentioned that removal would best be handled in Section 2213. It is done through a simple majority so there would need, according to the County Attorney, three votes to remove someone. And that is in the motion to remove and advertise for a replacement for someone that could better represent that field of expertise.

Zonka – Okay, Commissioner Lober.

Lober – I'm just looking at this based on that sales licensing number that was provided, and I do see, and I do see there's a status and an expiration. The status says current and, and the expiration says inactive, but it shows 09-30-22 as the expiration. So, it doesn't look like it's expired. It does look like its current. I'm not sure what inactive means, and I'm happy to consider this, I just, I'd like to do a little more recon on my end before voting to pull someone off an advisory board. So, if you, if you're amenable to adding this to the eighth as, as with the other items, if you're okay with it, I don' mind it necessarily even being on consent. If there's not an issue I won't pull it.

Pritchett – (Inaudible)

Tobia – Madam, Madam Chair.

Zonka – Yes.

Tobia – According to terms and status used by the Division of Real Estate, revised 07/07/2021, defines current/inactive quote "This means a license has met all renewal requirements but is not actively participating in real estate services." I also have a copy of that should you want that, and I'd be more than willing to . . .

Lober – I appreciate that. This is one of those things where you know, I know we've talked about, in the past as you've mentioned, avoided having motions on things that aren't on the Agenda. I, are we having a meeting for this group between now and when we come back on the eighth? If we're not, I don't know why we've got to just basically shotgun it through right now. I may support it on the eighth. I'd just like to have more than glancing at a folder over eight and a half by 11 sheet in the middle of a meeting to figure out whether I'm going to remove someone. That's my concern.

Zonka – Commissioner Pritchett.

Pritchett – Yeah, might get, I'm guessing through this with the conversation, because I'm looking right here in the article, its Susan Hammerling-Hodgers, is that what we're talking about?

Tobia – I, I was trying to refrain from using names Madam Chair, but that . . .

Pritchett – Okay, I'm sorry. I, I get it.

Tobia - . . . that is correct.

Pritchett – I see where she is the real estate appointee in her article. So, and I do know she works as a physician assistant, and they, I'm not going to say where, but they have a good, good business. So, my question is that when we appointed this person she was working real estate?

Zonka – I don't think she's ever worked real estate but I couldn't say for sure.

Pritchett – We did it as a Board.

Zonka – That's why I didn't support the appointment myself. So . . .

Pritchett – Okay, okay, so now I'm, you know, I, okay. I need to figure this out with you, because that's definitely a place that we had open for a real estate appointee, right?

Tobia – Madam Chair.

Zonka – Yes.

Tobia – Yes, however, again, and I'd be more, and I should have made copies of this. I apologize, and I will pass them out but DBPR as of yesterday at 3:13 p.m. lists the status as current, inactive according to myfloridalicense.com produced by the State. This means a licensee has met renewal requirements but is not actively participating in real estate services. So, again, I'm not dealing with the content, I think that's been mentioned. Whether you agree or disagree with what was said, whether you agree or disagree with disparaging hard-working staff members. I'm, I'm not arguing that. I do take some offense though on, on, on disparaging Duke. That's a fine university. Richard Nixon graduated law school there. But, I, I, for the reasons stated in the motion stands to, I don't know if there'll be a second, but I think I've provided, and I'll provide copies of the information I have here, to remove the real estate appointee and advertise for a replacement, hopefully someone that has an active license and is engaged in real estate services.

Smith – Madam Chair.

Zonka – Commissioner Smith.

Smith – Thank you. I'm in agreement with Lober on this. I would really like to look into this a little bit more (inaudible) brought up at the next meeting (inaudible) spring it on us at the last minute, doesn't give us really (inaudible).

Zonka – I can hardly hear him. I think, I think I got some . . .

Pritchett – He said he wanted to wait with Commissioner Lober.

Lober – Sounds like he agreed with me.

Tobia – Yeah, it was.

Zonka – Yeah. Ms. Abby, if, if someone, I mean in your legal opinion, if someone doesn't have an active, or doesn't have an active, or isn't actively working as a, in the real estate field, would they qualify for that slot?

Jorandby – And I would have to actually speak with staff as to how they evaluate those applications as far as whether you have to have an active real estate license or not. I, I would not that under Chapter 2, the Commissioner has the wherewithal to remove with or without cause an individual from an advisory board. So, I can answer that question but as far as what they're looking for as a real estate agent or, or whether it's a broker or they have to have an active license, I would have to look into that.

Zonka – Probably the intent of it is they have to be in the real estate.

Jorandby – I would imagine that's what they're looking when they, they receive the applications but I have not been involved in that process.

Barker – I don't have the enabling Ordinance in front of me but I believe it was, you know, real estate expertise. I don't recall it specifying an active license, but the idea was that the different categories of people would be actively engaged with whatever that expertise was so that they would be conveying information and ideas, you know, back and forth between that community of concern and the oversight committee.

Zonka – Again, for me it's an easy one because I didn't, because I supported the . . . I think we had two applications at that time for that position. I believe so.

Barker – I believe she just said she was one of three but I, I haven't looked that up recently.

Zonka – Well, there was a really qualified candidate. I think his name was Ron Becker. Does that sound familiar?

Barker – Yes, and there was also the, the person who was in the non-voting alternate seat at that time, Dennis Basile, who has been a leader, a leader in various realtor organizations, but he has since resigned, that's why there is the vacancy that was Item F.1. on today's Agenda. So, we do have five other current applicants from that search that, you know, the applicants that were just sent to the League of Cities.

Zonka – Okay. Commissioner Pritchett.

Pritchett – I just heard crickets out there. So funny at that moment. Okay, Commissioner Tobia, I want to vote and support this today, but on the risk of it looking like that we're having a knee-jerk reaction to someone questioning us on public records, if you wouldn't mind bring it back in March so we, we can, we can discuss that; but if we have somebody that's supposed to fulfill a certain position on a board, that's, that's a problem and we probably need to get that information, look at it. But I, if you b ring it back next week and we don't have any changes, any more information I'm going to vote with you to do it, just so we can have all those right people on this board, because it's such an important oversight board, and nothing to do with personalities or opinions. Everybody's allowed to say and do what they want. I will fight for your right to have it, but sir, you have my attention on this, and so I'm going to request that with Commissioner Smith and Commissioner Lober that you bring it back the very first meeting and we vote on this at that meeting.

Zonka – Commissioner Tobia.

Tobia – Madam Chair, clearly this Board is not there. There needs to be a majority in order to do that, so I don't want to put you in a tough position. So, I will . . .

Zonka – No, I think, I think the majority is not there even if I agree with you.

Tobia – Oh, oh to be very clear, yes you, I don't want to put you in the tough position to be a second and then go down 2:3 on that one.

Pritchett – Table it to next meeting, sir.

Zonka – But again for me, I didn't support that appointment to begin with because I knew she didn't work in real estate.

Tobia – You rub it in, yeah I, I think . . .

Zonka – So I told you.

Tobia – . . . that individual was number one on my, on my, on my selection on, on, on that. So, you are correct and I am incorrect.

Pritchett – So, you bring it back in March sir?

Zonka – Okay.

Pritchett – If you don't I'm tempted to vote on it now just because of the predicament we're in, but if you could do that it . . .

Tobia – Madam Chair.

Zonka – Yes.

Tobia – I, I mean, I'm, I'm looking at, I'm looking at my Agenda here for the next time. I've got changes to towing. I've got changes to parks. I've got changes to Library. I've got a staff member out there, Gabe, who is just sweating, right, now as far as what's going to happen in the next, you know, two weeks, and he ma6y run to the top floor. So, you know, I would rather us take action and, instead of let this, let this fester again. This has nothing to do with an op-ed. I didn't even discuss it. I'm just concerned with information that again I pulled yesterday at 3:13. It was cited in the newspaper and I looked it up, and this is the information I found again. So I'd prefer a vote right, I'd prefer a vote right now. Will I bring it up again? You know, honestly I, I, I have these other three things that are pretty heavy, and I don't want to burden, I don't want to burden Gabe over there with that. So I'd prefer an affirmative.

Lober – This is really directed mostly to Commissioner Pritchett. I just want to highlight, I think that you, you hit the nail right on the head as far as the optics are concerned, this is going to look retaliatory if we do it today. Whether or not it takes place in the future, it's a different matter potentially. You know that *Florida TODAY* or at least I imagine that you know that *Florida TODAY*, for a variety of reasons, has proven that they're not trustworthy. If we had Sheriff Ivey investigate a robbery the headline would read 'Sheriff Ivey Involved in Robbery' to just mislead the heck out of people. I, I agree that we can't count on them to cover things fairly. Given the history, given what we've heard as far as, and let's go ahead and phrase it as a mistake, given that there was mistaken information provided to Ms. Hodgers, it tends to lend credibility to folks who are going to say that this is retaliatory, and I, I don't like it. I just think that's a bad way to go about it.

Pritchett – I, may I? I don't want to do anything to hurt public trust. Commissioner Tobia, are you okay if I bring this next meeting then?

Tobia – Madam Chair.

Zonka – Yes.

Tobia – I, you, you will have my support should I bring it next . . .

Pritchett: I think I'll bring it.

Tobia - . . . meeting. I greatly, appre, I greatly appreciate it.

Pritchett – Okay because that way if we have somebody on the board that, that's not appropriate then we can, we can talk about it at that meeting. We all have time to gather data. That way it's not retaliatory, it's not that word, but it's, it's, I'm just trying to do the best for the community. So,

nothing on the person or anything with it but when these things come to our attention, it's something we should do.

Tobia – So again Madam Chair . . .

Pritchett – I'll bring it to the next meeting.

Tobia - . . . I'll pull, pull my motion.

Zonka – Commissioner Lober.

Lober – Madam Chair, I was just going to say just, and I'm thinking as Commissioner Tobia just mentioned, he's got a whole slew basically a Commissioner Tobia day coming on the 8th. Maybe we, we put this on the zoning meeting on the 3rd instead. If you are all okay with that, I don't' have any problem with it. Is that all right?

Pritchett – How about . . . is it going to be hard for us just to gather data? So, basically us just having a discussion whether it's, it's allowed to be on the board or not, right?

Lober – It's up to you. I mean, if you guys are good having it on the 8th, that's fine. I just think it's a lot.

Pritchett – So, public, public . . .

Lober – If you want the 3rd, that's fine.

Pritchett - . . . can always get comment, but we're actually just trying to determine if she's even allowed to be on the board at this point, and that's just something we would do. It's just administrative, right?

Lober – In my opinion.

Pritchett – Okay, so it should be pretty quick. So if, it's fine we're fine, and if not we'll just make changes.

Lober – So, are you all okay with it going on the zoning meeting then on the 3rd?

Zonka – Whatever Commissioner Pritchett . . .

Pritchett – I don't, I don't . . . it doesn't matter to be. I don't think it's going to be tough. Do we have any meetings before then that's going to cause any harm?

Barker – No, the next meeting of the Oversight Committee is the third Friday in March.

Pritchett – I'm fine with that.

Lober – Sounds good.

Pritchett – I'll bring it back on the zoning meeting, Ms. Carol, if you'll write that down and we'll get it ready.

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2022 Save Our Indian River Lagoon Project Plan Update Summary

February 22, 2022

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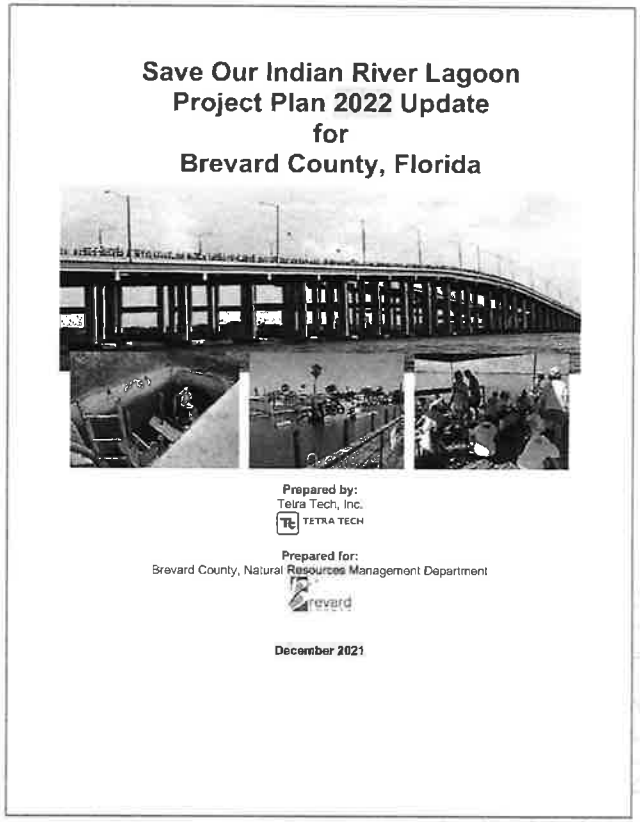
Table of Contents


Save Our Indian River Lagoon
Project Plan 2022 Update
for
Brevard County, Florida

Prepared by:
Tetra Tech, Inc.
TETRA TECH

Prepared for:
Brevard County, Natural Resources Management Department

December 2021

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Sections 1 – 3 Summary of Changes

- **Section 1. Background**
  - No major changes
- **Section 2. Approach, Outputs, and Outcomes**
  - Added vision and mission statements in text box in Section 2.2
- **Section 3. Pollutant Sources in the IRL Watershed**
  - No changes

Vision Statement: *An Indian River Lagoon teeming with fish, birds, and wildlife that provides recreation, economic vitality, and pride in our community.*

Mission Statement: *Restoring the Indian River Lagoon through collaborative, science-based projects which Reduce and Remove pollution to benefit our community, economy, and natural resources.*

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Section 4.1 Projects to Reduce Pollutants Changes

- **4.1.1 Public Education and Outreach**
  - Updated information on the Lagoon Loyal Program
  - Updated information on the Oyster Gardening Program and added new project for $1 million ($200,000/year for 5 years of the Restore Our Shores: Community Collaborative)
- **4.1.2 WWTF Upgrades**
  - Added new project recommended during last meeting
- **4.1.3 Sprayfield and Rapid Infiltration Basin Upgrades**
  - Revised the recommended project for upgrade – selected most cost-effective facility that is not likely to become eligible to connect to sewer
- **4.1.4 Package Plant Connections**
  - Revised estimates of load reductions and costs using latest data
  - Revised list of recommended projects to reflect most cost-effective
- **4.1.5 Sewer Laterals Rehabilitation**
  - No changes

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Section 4.1 Reduce Project Changes

- **4.1.6 Septic System Removal and Upgrades**
  - Updated the estimate to connect the septic systems to sewer using costs from completed projects and refined distance categories (Tables 4-16 through 4-18)
  - Updated septic system connection maps to add new projects
  - Updated text and cost-share (from $700 to $1,200/pound) for quick connects and upgrades
  - Added new projects recommended during last meeting
- **4.1.7 Stormwater Treatment**
  - Revised costs and nutrient reductions for original basin projects to exclude portions that were funded as separate projects
  - Added new projects recommended during last meeting
- **4.1.8 Vegetation Harvesting**
  - Moved to Reduce category from Remove
  - Added new projects recommended during last meeting

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Section 4.2 Projects to Remove Pollutant Changes

- **4.2.1 Muck Removal**
  - Added Berkley Canal to Grand Canal project using contingency funding, as approved in March 2021
  - Added new project recommended during last meeting
  - Updated figures to include new projects
- **4.2.2 Treatment of Muck Interstitial Water**
  - Added Berkeley Canal to Grand Canal project using contingency funding, as approved in March 2021
- **4.2.3 Spoil Management Areas**
  - No changes
- **4.2.4 Surface Water Remediation System**
  - No changes
- **4.2.5 Enhanced Circulation**
  - Added latest information about the Florida Institute of Technology inflow study

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Section 4.3 Projects to Restore the Lagoon Changes

- **4.3.1 Oyster Restoration**
  - Added information about the County Oyster Habitat Suitability and Rehabilitation Success Plan
  - Added new projects recommended during last meeting
- **4.3.2 Planted Shorelines**
  - Added information about the minimum size of mangroves used in planted shorelines
  - Added new project recommended during last meeting
- **4.3.3 Clam Restoration and Aquaculture**
  - No changes
- **4.3.4 Seagrass Planting**
  - Updated information on seagrass losses using latest data
  - Added details about grant proposal submitted to the state to test seagrass planting

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Section 4.4 Projects to Respond to New Information Changes

- **Section 4.4.1 Adaptive Management to Report, Reassess, and Respond**
  - No changes
- **Section 4.4.2 Cost-share for Substitute Projects**
  - Reflected latest cost-share information
- **Section 4.4.3 Additional Project Benefits**
  - No changes

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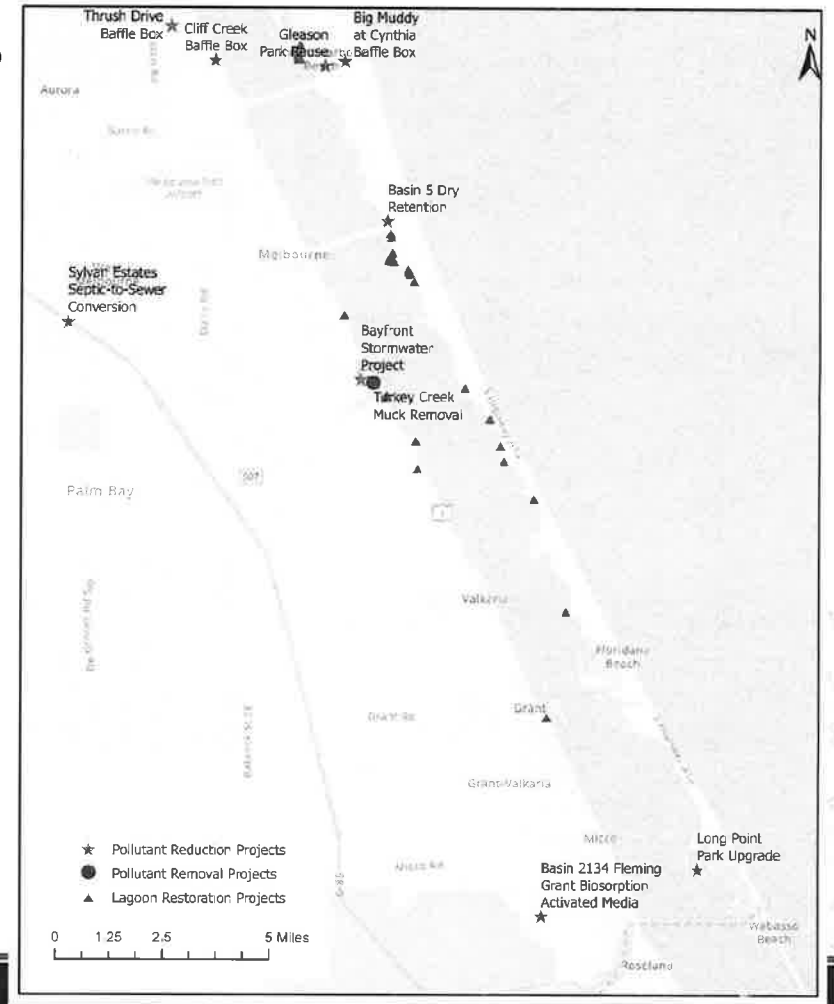
Section 4.4 Respond Project Changes

- **Section 4.4.4 Responding to Implemented Projects**
  - Updated table of tax funds expended on completed and underway construction projects
  - Updated maps of completed projects



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Section 4.4 Respond Project Changes, continued

- **Section 4.4.4 Responding to Implemented Projects (continued)**
  - Updated information on the Lagoon Loyal Program
  - Updated information and figure in Measuring Performance
  - Added new information on the smoke testing in Sewer Lateral Rehabilitation
  - Updated costs in Septic System Removal
  - Updated costs in Septic System Upgrades
  - Updated study results for Muck Removal
  - Updated information for the In-lagoon Aeration Study
  - Updated study findings for Oyster Restoration and Planted Shorelines
  - Added new section on Remote Sensing of Harmful Algal Blooms in IRL and Connected Waterways in Brevard County

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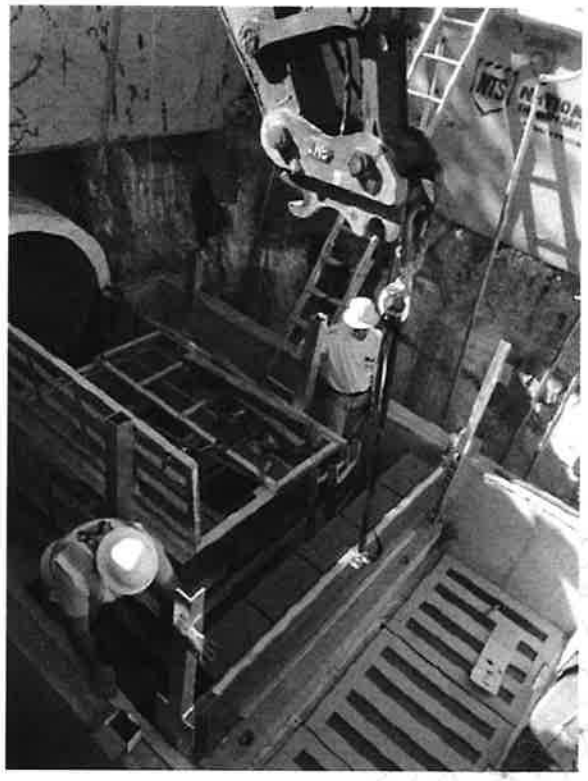
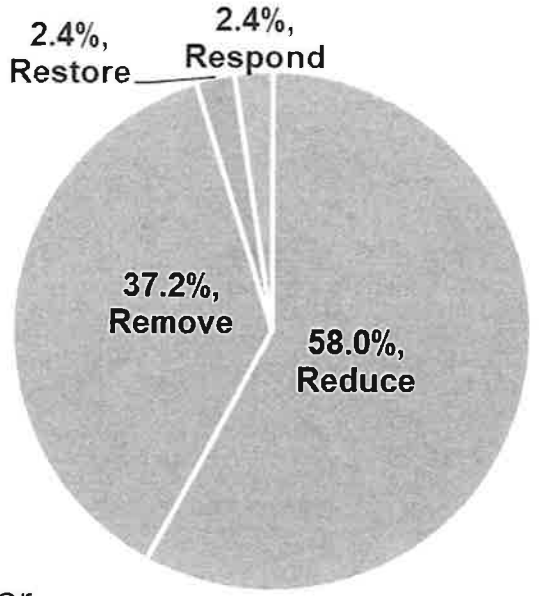
Section 4.4 Respond Projects, continued

- **Section 4.4.5 Research Needs**
  - Updated research items to reflect the updated basin management action plans
- **Section 4.5 Unfunded Projects**
  - Updated the list of unfunded package plant connections and rapid infiltration basin/sprayfield upgrade tables based on latest data



Sections 5. Project Funding

- **Section 5.1 Project Funding, Schedule, and Scope Adjustments**
  - Added new header title and sub-headers to delineate information
  - Section 5.1.1 Contingency Fund Reserve – refined details, updated inflation rates
  - Section 5.1.2 Schedule Acceleration – refined details
  - Section 5.1.3 Scope Reduction – refined details
- **Section 5.2 Revenue Projection Update**
  - Updated with current revenue projection
- **Section 5.3 Project Funding Allocation**
  - Updated pie chart for split between Reduce, Remove, Restore, and Respond projects
  - Added 2022 Update pie chart for comparing funding allocations by year



Comparison of Plan Costs

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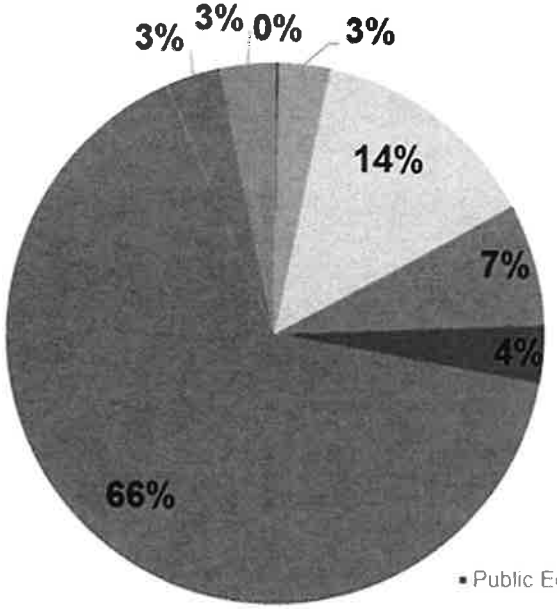
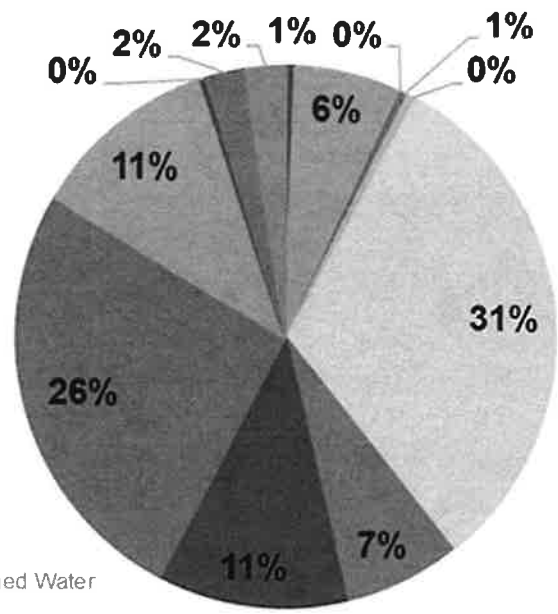
Original Plan



2022 Plan Update Total Cost



- Public Education
- Rapid Infiltration Basin/Sprayfield Upgrades
- Sewer Laterals
- Septic System Upgrades
- Muck Removal
- Vegetation Harvesting
- Project Monitoring
- WWTF Upgrades for Reclaimed Water
- Package Plant Connection
- Septic System Removal
- Stormwater Projects
- Treatment of Interstitial Water
- Oyster Reef Living Shorelines

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Change in Costs from 2021 to 2022 Update

Project Type	2021 Estimated Cost	2022 Estimated Cost	Change in Cost
Public Education and Outreach	$1,425,000	$2,425,000	$1,000,000
Wastewater	$186,661,038	$190,822,052	$4,161,014
Stormwater	$47,261,101	$47,515,821	$254,720
Vegetation Harvesting	$1,086,096	$1,410,709	$324,613
Muck and Interstitial	$155,097,881	$155,395,014	$297,133
Restoration	$10,000,105	$10,000,105	$0
Monitoring	$10,000,000	$10,000,000	$0
Contingency and Inflation	$77,323,952	$124,654,881	$47,330,929
Total	***$488,855,173***	***$542,223,582***	***$53,368,409***

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Section 6. Summary of the Plan through the 2022 Update

- Updated all tables comparing project reductions to locally proposed total maximum daily loads
- Updated table with reductions from Remove and Restore projects
- Updated table with project summary, estimated TN and TP reductions, and costs
- Updated rainbow table

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Proposed 2022 Plan Additions

13 Septic-to-Sewer Conversion Projects

8 Stormwater Projects

4 Vegetation Harvesting Projects

2 Oyster Bars

1 Wastewater Treatment Plant Upgrade Project

1 Environmental Dredging Project

1 Planted Shoreline Project

1 Oyster Gardening Program

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31 New Projects ⟹ 337 New Total

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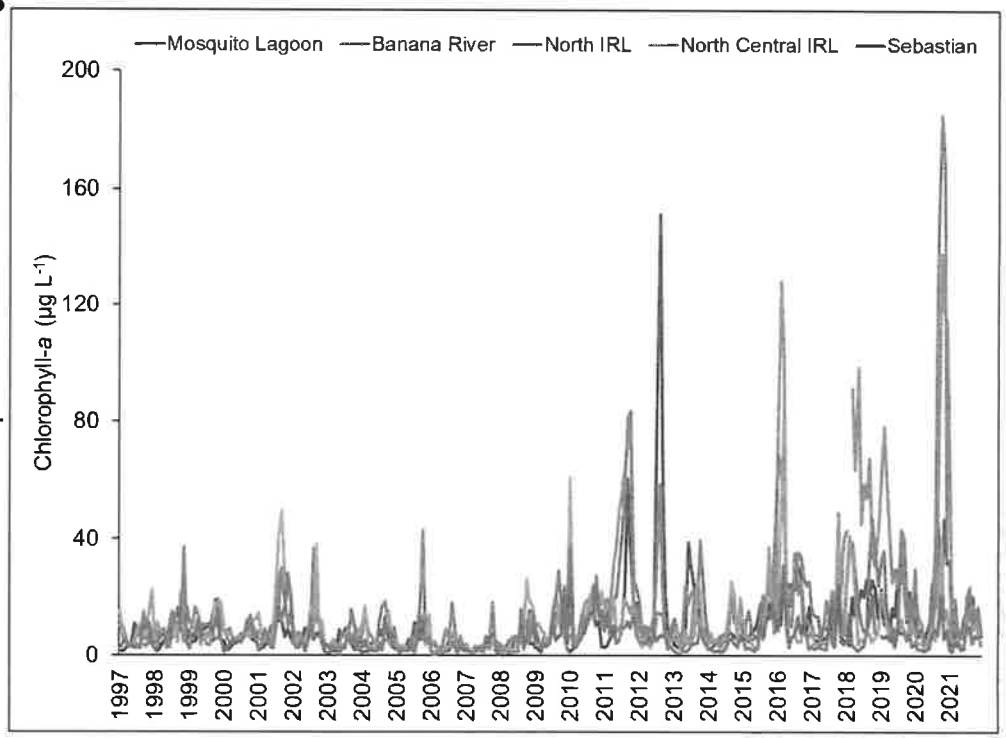
Appendices

- **Appendix A: Funding Needs and Leveraging Opportunities**
  - Updated sales tax projection
- **Appendix B: References**
  - New references are highlighted
- **Appendix C: Seagrasses**
  - Updated information based on new data
  - Updated figure to add data through 2021
- **Appendix D: Withdrawn Projects**
  - Added projects withdrawn as part of this 2022 Plan Update
- **Appendix E: Long Descriptions of Figures**
  - Updated descriptions for new/revised figures



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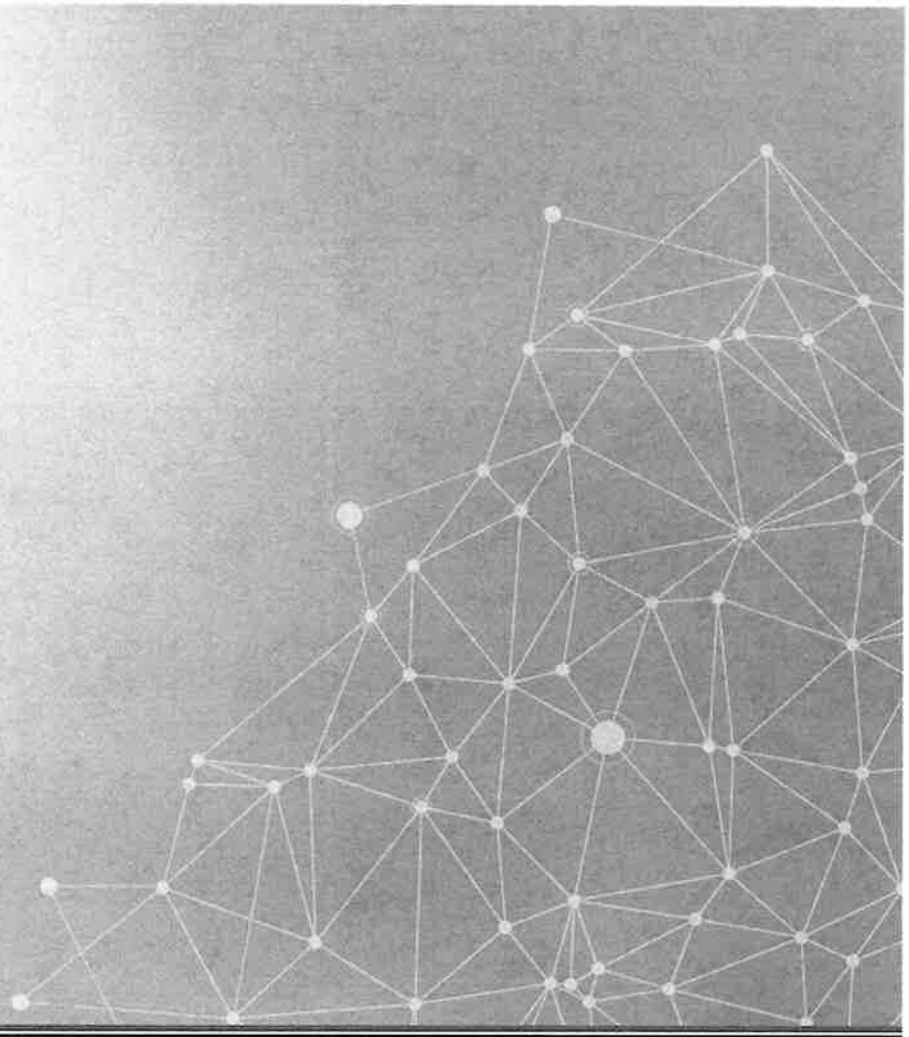
Questions and Comments



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Project Number	Project Name	Entity	Project Type	TN Reduction (pounds/year)
208	Maritime Hammock Preserve Stormwater Pond Aquatic Vegetation Harvesting	City of Cocoa Beach	Vegetation Harvesting	14
209	Basin 1398 Sand Dollar Canal Harvesting	Brevard County Natural Resources	Vegetation Harvesting	222
210	Basin 958 Pioneer Road Vegetation Harvesting	Brevard County Natural Resources	Vegetation Harvesting	363
211	Cocoa Beach Golf Course Stormwater Ponds Aquatic Vegetation Harvesting	City of Cocoa Beach	Vegetation Harvesting	393
212	Titusville Causeway Multi-Trophic Restoration and Living Shoreline Resiliency Action Project	Brevard County Natural Resources	Living Shorelines	131
213	Johnson Jr High Organic Nitrogen Denitrification Media Chamber Modification	Brevard County Natural Resources	Stormwater Projects	206
95	Cherry Street Baffle Box	City of Melbourne	Stormwater Projects	980
96	Spring Creek Baffle Box	City of Melbourne	Stormwater Projects	1057
214	Sand Point Park Baffle Box	City of Titusville	Stormwater Projects	438
215	Basin 960 Pioneer Road Denitrification	Brevard County Natural Resources	Stormwater Projects	105
216	City of Rockledge Flow Equalization Basin Project	City of Rockledge	WWTF Upgrades for Reclaimed Water	5365
217	Central IRL Oyster Project 4	Brevard Zoo	Oyster Reef	348
218	Central Oyster Project Offshore Reefs	Brevard Zoo	Oyster Reef	900
219	McNabb Outfall Bioretentions	City of Cocoa Beach	Stormwater Projects	44
220	Basin 1398 Sand Dollar Canal Bioreactor	Brevard County Natural Resources	Stormwater Projects	444
221	Burris Way Alley West Stormwater Low Impact Development Improvement	City of Cocoa Beach	Stormwater Projects	3
222	Hedgecock/Grabowsky and Desoto Fields	City of Satellite Beach	Septic System Removal-Connect	81
223	Spring Creek Dredging	City of Melbourne	Muck Removal	154
2016-35	South Beaches A	Brevard County Utility Services	Septic System Removal-Extend	1306

224	Lake Ashley Circle	City of West Melbourne	Septic System Removal-Extend	1136
2016-29	South Banana B	Brevard County Utility Services	Septic System Removal-Extend	915
225	Dundee Circle and Manor Place	City of West Melbourne	Septic System Removal-Extend	1499
148	North Merritt Island E	Brevard County Utility Services	Septic System Removal-Extend	2541
48	Sykes Creek M	Brevard County Utility Services	Septic System Removal-Extend	1798
47	Sykes Creek N	Brevard County Utility Services	Septic System Removal-Extend	2784
147	Sykes Creek R	Brevard County Utility Services	Septic System Removal Extend	2925
49	Sykes Creek T	Brevard County Utility Services	Septic System Removal-Extend	3360
2016-31/32	N. Indian River Dr. Sewer Improvements - Areas J and K	City of Cocoa	Septic System Removal-Extend	3748
203	South Central A	Brevard County Utility Services	Septic System Removal-Extend	3655
2016-27	Sharpes A	Brevard County Utility Services	Septic System Removal-Extend	5248

Total Cost	Total Cost ($/pound TN)	Eligible Tax Funding ($/pound TN)	Eligible Tax Funding Cost Share	Cumulative Eligible Tax Funding Increase	Dollar Amount Secured Grants
$8,484	121	110	$7,700	$7,700	
$54,000	243	110	$24,420	$32,120	
$186,000	512	110	$39,930	$72,050	
$238,158	121	110	$216,150	$288,200	
$163,930	1251	240	$31,440	$288,200	
$140,000	680	313	$64,478	$352,678	
$626,250	639	313	$306,740	$567,298	
$725,000	686	313	$330,841	$798,781	
$423,000	965	313	$137,135	$935,916	
$312,672	2978	370	$38,850	$974,766	
$8,369,000	1560	383	$2,054,795	$3,029,561	
$138,156	397	397	$138,156	$3,029,561	
$357,300	397	397	$357,300	$3,029,561	
$186,512	4283	446	$19,423	$3,048,984	$124,768
$370,000	833	446	$198,024	$3,247,008	
$186,512	66611	446	$1,249	$3,248,257	$123,000
$183,874	2357	487	$39,447	$3,287,704	$183,874
$1,400,000	9091	520	$80,080	$3,367,784	
$2,546,581	1950	1500	$1,959,000	$4,092,020	$1,165,236

$3,160,000	2782	1500	$1,704,000	$5,796,020	
$3,644,729	3983	1500	$1,372,500	$5,800,268	
$3,720,000	2482	1500	$2,248,500	$8,048,768	
$4,413,899	1737	1500	$3,811,500	$8,225,268	
$4,800,000	2670	1500	$2,697,000	$9,053,436	$423,936
$4,991,758	1793	1500	$4,176,000	$10,626,420	
$6,645,983	2272	1500	$4,387,500	$11,513,920	$1,500,000
$9,900,000	2946	1500	$5,040,000	$11,614,864	$1,071,936
$10,401,520	2775	1500	$5,622,000	$12,898,504	
$13,051,279	3571	1500	$5,482,500	$15,010,432	$3,370,572
$21,634,596	4122	1500	$7,872,000	$16,675,240	

Notes

6,010 pounds of wet weight plant material removed from 1-acre stormwater pond over 5 years
13,500 pounds of wet weight plant material removed from 2.75 acre canal

30,132 pounds of wet weight plant material removed
168,268 pounds of wet weight plant material removed from 19 ponds totaling 28 acres over 5 years

1,950 feet of living shoreline planted; funding allocated throughliving shoreline projects

Previously approved for $92,120; requesting additional $214,620
Previously approved for $99,358; requesting additional $231,483

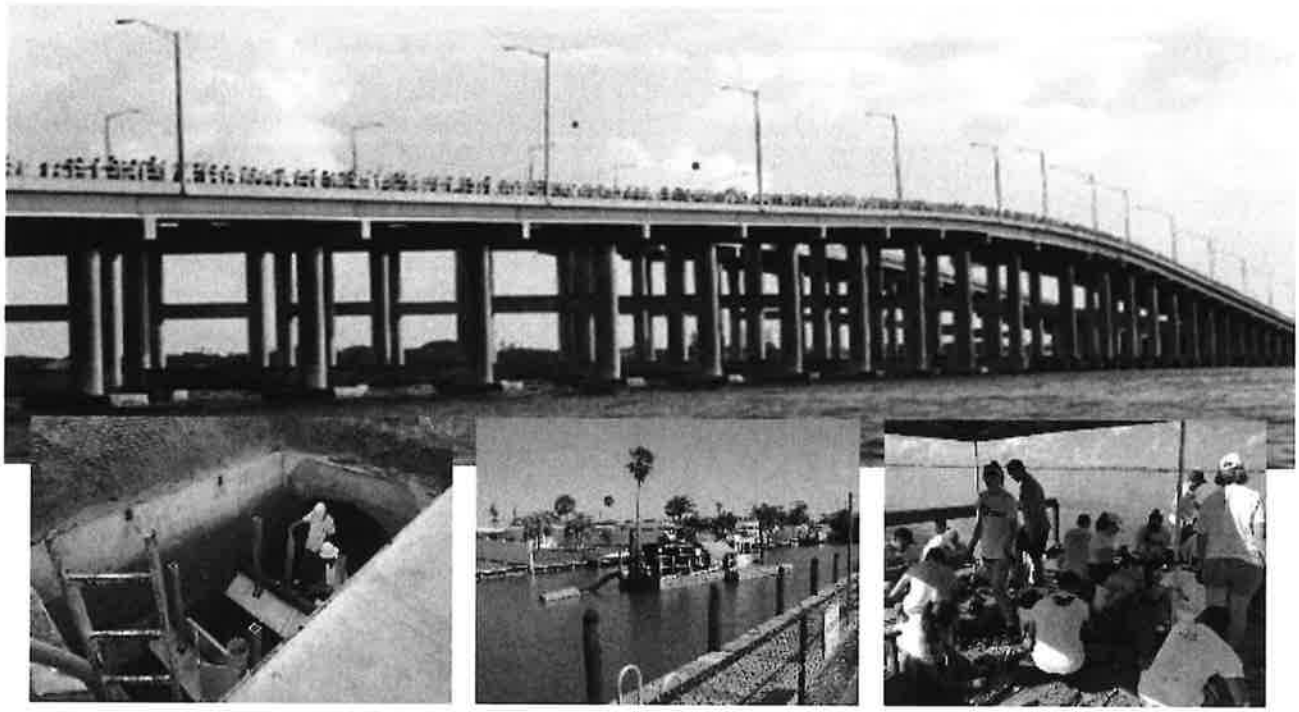
Reducing reclaimed water concentration from 7.94 to 3.23 mg/l
Construct 8,700 square feet of oyster bars; funding allocated through living shoreline
Construct 22,500 square feet of oyster bars; funding allocated through living shoreline

Remove 1.47 acres of muck
Previously approved for $1,234,764; requesting additional $724,236

Connect 46 homes
Previously approved for $1,368,252; requesting additional $4,248

Connect 60 homes
Previously approved for $3,635,000; requesting additional $176,500
Previously approved for $1,868,832; requesting additional $828,168
Previously approved for $2,603,016; requesting additional $1,572,984
Previously approved for $3,500,000; requesting additional $887,500
Previously approved for $4,939,056; requesting additional $100,944
Previously approved for $4,338,360; requesting additional $1,283,640
Previously approved for $3,370,572; requesting additional $2,111,928
Previously approved for $6,207,192; requesting additional $1,664,808

Save Our Indian River Lagoon Project Plan 2022 Update for Brevard County, Florida



Prepared by:
Tetra Tech, Inc.

Prepared for:
Brevard County, Natural Resources Management Department

February 2022

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Bottom middle from the muck dredging project in the City of Cocoa Beach
Bottom right from the Bomalaski oyster bar project in Merritt Island

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2021 Citizen Oversight Committee:

- Vinnie Taranto (2021 Chair), Technology Member
- David Sherrer, Technology Alternate
- Stephany Eley (2018 Chair, 2021 Vice Chair), Education/Outreach Member
- Kimberly Newton, Education/Outreach Alternate
- John Windsor (2019 Vice Chair, 2020 Chair), Lagoon Advocacy Member
- Terry Casto, Lagoon Advocacy Alternate
- Courtney Barker (2020 Vice Chair), Finance Member
- Todd Swingle, Finance Alternate
- David Lane (2018 Vice Chair, 2019 Chair), Tourism Member
- Laurilee Thompson, Tourism Alternate
- Lorraine Koss (2017 Chair), Science Member
- Charles Venuto, Science Alternate
- Susan Hodgers, Real Estate Member
- Dennis Basile, Real Estate Alternate

Citizen Oversight Committee Past Members:

- Gene Artusa, Real Estate Member, First Term
- Danielle Bowden, Real Estate Member, First Term, Partial Second Term
- John Byron (2017 Vice Chair), Technology Member, First Term
- John Durkee, Education/Outreach Alternate, First Term
- John Luznar, Technology Member, Second Term
- Melissa Martin, Education/Outreach Alternate, Partial Second Term
- Karen McLaughlin, Tourism Alternate, First Term
- Jay Moynahan, Real Estate Member, Second Term

Guest Speakers at Citizen Oversight Committee Meetings:

- Holly Abeels, Florida Sea Grant
- Hannah Atsma, Ocean Research Conservation Association
- Scott Barber, City of Cocoa Beach
- Drew Bartlett, Florida Department of Environmental Protection
- Jeff Beal, Florida Fish and Wildlife Conservation Commission
- Alix Bernard, City of Rockledge
- Stephen Berry, Jones Edmunds & Associates
- Robert Bolton, City of Vero Beach
- Bill Buckman, ASAP Septic
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- Stacy Delano, Tourist Development Council

- Dr. Melina Donnelly, University of Central Florida
- Rich Dunkel, Irrigreen
- Dr. Jeff Eble, Florida Institute of Technology
- Joe Faella, Brevard County Mosquito Control
- Dr. Beth Falls, Ocean Research Conservation Association
- Dr. Mark S. Fonseca, CSA Ocean Sciences Inc.
- Edward Fontanin, Brevard County Utility Services
- Dr. Austin Fox, Florida Institute of Technology
- Dr. Xueqing Gao, Florida Department of Health
- Lisa Good, Blue Life
- Roxanne Groover, Florida Onsite Wastewater Association
- Lauren Hall, St. Johns River Water Management District
- Dr. Dennis Hanisak, Florida Atlantic University Harbor Branch Oceanographic Institute
- Carter Henne, Sea & Shoreline
- Andrea Hill, Brevard Zoo
- Dr. Chuck Jacoby, St. Johns River Water Management District
- Steve Krzyston, Rockledge Gardens
- Jim Langenbach, P.E., B.C.E.E., Geosyntec Consultants
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- Laura Manlove, RSM US LPP
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- Tara McCue, East Coast Regional Planning Council
- Benjamin Melnick, Florida Department of Environmental Protection
- Dr. Jennifer Mitchell, St. Johns River Water Management District
- Julie Mitchell, Florida Fish & Wildlife Conservation Commission
- Dr. Martha Monroe, University of Florida
- Lori Morris, St. Johns River Water Management District
- Robert Musser, Canaveral Port Authority
- Dr. Todd Osborne, University of Florida
- Dr. Drew Palmer, Florida Institute of Technology
- Dr. Randall W. Parkinson, RW Parkinson Consulting, Inc.
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- Dr. Leesa Souto, Marine Resources Council
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- Cynthia Thurman, Brevard County
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- Dr. John Trefry, Florida Institute of Technology
- Al Vazquez, CloseWaters LLC
- Dr. Tom Waite, Florida Institute of Technology
- Dr. Linda Walters, University of Central Florida
- Dr. Marty Wanielista, University of Central Florida
- Aaron Watkins, Florida Department of Environmental Protection Central District
- Dr. Robert Weaver, Florida Institute of Technology
- Missy Weiss, S.E.A. a Difference Environmental Services
- Dr. John Windsor, Florida Institute of Technology
- Keith Winsten, Brevard Zoo
- Walter C. Wood, Marketing Talent Network Advertising
- Chris Zambito, Atkins North America, Inc.
- Dr. Gary Zarillo, Florida Institute of Technology
- Jake Zehnder, Brevard Zoo

Scientist Subject Matter Experts Consulted during Original Plan Development:

- Dr. Duane De Freese, Indian River Lagoon National Estuary Program and Indian River Lagoon Council Executive Director
- Dr. Richard (Grant) Gilmore, expert in Indian River Lagoon fisheries and ecology
- Dr. Charles Jacoby, St. Johns River Water Management District Supervising Environmental Scientist
- Dr. Kevin Johnson, Florida Institute of Technology Associate Professor, Marine and Environmental Systems
- Dr. Mitchell A Roffer, Florida Institute of Technology Adjunct Professor, President Roffer's Ocean Fishing Forecasting Service, Inc.
- Dr. Jonathan Shenker, Florida Institute of Technology Associate Professor of Marine Biology
- Dr. John Trefry, Florida Institute of Technology Professor of Marine and Environmental Systems
- Martin S. Smithson, Sebastian Inlet District Administrator
- Joel Steward, St. Johns River Water Management District Supervising Environmental Scientist (Retired)
- Dr. John Windsor, Florida Institute of Technology Oceanography and Environmental Science Professor Emeritus and Program Chair

Economic Impacts Subject Matter Experts Consulted during Original Plan Development:

- Jim Brandenburg, Brevard County Property Appraiser Information Technology
- Eric Garvey, Brevard County Tourism Development Council Executive Director

- Herb Hiller, Brevard County Tourism Development Council Consultant on Ecotourism
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- Dr. Alexander Vamosi, Florida Institute of Technology Associate Professor, Nathan M. Bisk School of Business

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- Space Coast Tourism Development Council
- St. Johns River Water Management District
- Brevard County Budget Office
- Brevard County Natural Resources Management Department
- Brevard County Property Appraiser Information Technology
- Brevard County Utility Services Department
- City of Melbourne
- City of Palm Bay
- City of Titusville
- City of West Melbourne

Executive Summary

The Indian River Lagoon (IRL) system includes Mosquito Lagoon, Banana River Lagoon, and Indian River. This is a unique and diverse system that connects Volusia, Brevard, Indian River, St. Lucie, Martin, and Palm Beach counties. The IRL is part of the National Estuary Program, one of 28 estuaries of National Significance, and has one of the greatest diversity of plants and animals in the nation. A large portion of the IRL system, 71% of its area and nearly half its length, is within Brevard County (County) and provides County residents and visitors many opportunities and economic benefits.

However, the balance of this delicate ecosystem has been disturbed as development in the area has led to harmful impacts. Stormwater runoff from urban and agricultural areas, wastewater treatment facility discharges, septic systems, and excess fertilizer applications have led to harmful levels of nutrients and sediments entering the lagoon. These pollutants create cloudy conditions in the lagoon and feed algal blooms, both of which negatively affect the seagrass community that provides habitat for much of the lagoon's marine life. In addition, these pollutants lead to muck accumulation, which releases (fluxes) nutrients and hydrogen sulfide, depletes oxygen, and creates a lagoon bottom that is not hospitable to seagrass, shellfish, or other marine life.

Efforts have been ongoing for decades to address these sources of pollution. Despite significant load reductions, in the last five years, signs of human impact to the IRL system have been magnified. In 2011, the "superbloom" occurred, an intense algal bloom in the Mosquito Lagoon, Banana River Lagoon, and North IRL, as well as a secondary, less intense bloom in the Central IRL. There have also been recurring brown tides; unusual mortalities of dolphins, manatees, and shorebirds; and large fish kills due to low dissolved oxygen from decomposing algae.

Local governments and the St. Johns River Water Management District have been proactive in implementing projects over the last several decades. However, to restore the lagoon to health and prosperity, additional funds were needed to eliminate current excess loading and remove the legacy of previous excess loading. Therefore, the County placed a Save Our Indian River Lagoon 0.5 cent sales tax referendum on the ballot in November 2016, which passed and is providing a funding stream for the types of projects listed in this plan for Brevard County and its municipalities.

The Save Our Indian River Lagoon Project Plan outlines local projects planned to meet water quality targets and improve the health, productivity, aesthetic appeal, and economic value of the lagoon. Implementation of these projects is contingent upon funding raised through the 0.5 cent sales tax. This sales tax funding also allows the County to leverage additional dollars in match funding from state and federal grant programs because the IRL ecosystem is valued not only in Florida but also nationally. Funding implementation of this plan would help to restore this national treasure. Lagoon ecosystem response may lag several years behind completion of nutrient reductions; however, major steps must begin now to advance progress on the long road to recovery.

In the development of this plan, Subject Matter Experts were consulted to provide feedback on the plan elements. The experts all agreed that there is a "critical mass" of nutrient reductions that must be achieved to see a beneficial result in the IRL. This critical level of nutrient reduction will be achieved through the implementation of the projects in this plan. During plan development, it was estimated that the benefit of restoring the lagoon has a present value of $6 billion and a cost of $300 million. Therefore, implementing this plan to restore the IRL is an

excellent investment in the future of Brevard County's community and economy with a benefit to cost ratio of 20:1.

To restore the lagoon's balance, Brevard County seeks to accelerate implementation of a multi-pronged approach to **Reduce** pollutant and nutrient inputs to the lagoon from fertilizer, reclaimed water from wastewater treatment facilitates, sprayfields and rapid infiltration basins, package plants, sewer laterals, septic systems, and stormwater; **Remove** the accumulation of muck from the lagoon bottom; **Restore** water-filtering oysters and clams and related lagoon ecosystem services; and monitor progress to **Respond** to changing conditions, technologies, and new information by amending the plan to include actions that will be most successful and cost-effective for significantly improving the health, productivity, and natural resilience of the IRL.

The portfolio of projects in this plan were selected as the most cost-effective suite of options to achieve water quality and biological targets for the lagoon system. Investment has been distributed among a set of project types with complimentary benefits to reduce future risk of failure. Approximately 58% (originally one-third) of the effort and expense is split among multiple projects to reduce incoming load to healthy levels. Approximately 37% (originally two-thirds) of the effort and expense is directed toward muck removal to address decades of past excess nutrient loading. Nitrogen and phosphorus released each year as muck decays are now larger than any current source of nutrient pollution to lagoon waters. Less than 5% of tax revenues go towards restoring natural filtration systems; measuring the success of different project types; and responding to new information, technologies, and opportunities with annual plan updates.

The plan projects have been prioritized and ordered to deliver improvements to the lagoon in the most beneficial spatial and temporal sequence so that the implementation of this plan is expected to result in a healthy IRL system. If a future project is ready to move forward earlier than scheduled in the plan, if such advancement is consistent with temporal sequencing goals in the plan and is recommended by the Citizen Oversight Committee, and if there are sufficient Trust Fund dollars available, the County Manager (for budget changes less than $100,000) or Brevard County Commission have the authority to adjust the project schedule at any time to ensure that approved projects funded in the plan move forward as soon as feasible.

This 2022 Update to the Save Our Indian River Lagoon Project Plan contains the sixth set of project updates, new approved projects, and schedule modifications to the plan. Local stakeholders submitted projects annually to Brevard County for inclusion in the plan. The appointed Citizen Oversight Committee reviewed the submitted projects and made a recommendation to the Board of County Commissioners on which projects should be added to the Save Our Indian River Lagoon Project Plan. This update includes those projects that were reviewed by the Citizen Oversight Committee and approved for inclusion by the Board of County Commissioners.

The timing of the projects is shown in **Figure ES-1**. A summary of the types of projects included in the plan, as well as the associated costs and total nitrogen (TN) and total phosphorus (TP) reductions in pounds per year are shown in **Table ES-1**. Despite the considerable cost of restoration, analysis demonstrates that the economic cost of inaction is double the cost of action. Furthermore, although there are many tangible and intangible benefits for saving the lagoon, the readily estimated return on investment for three benefits – tourism, waterfront property values, and commercial fisheries – is approximately 10% to 26%.

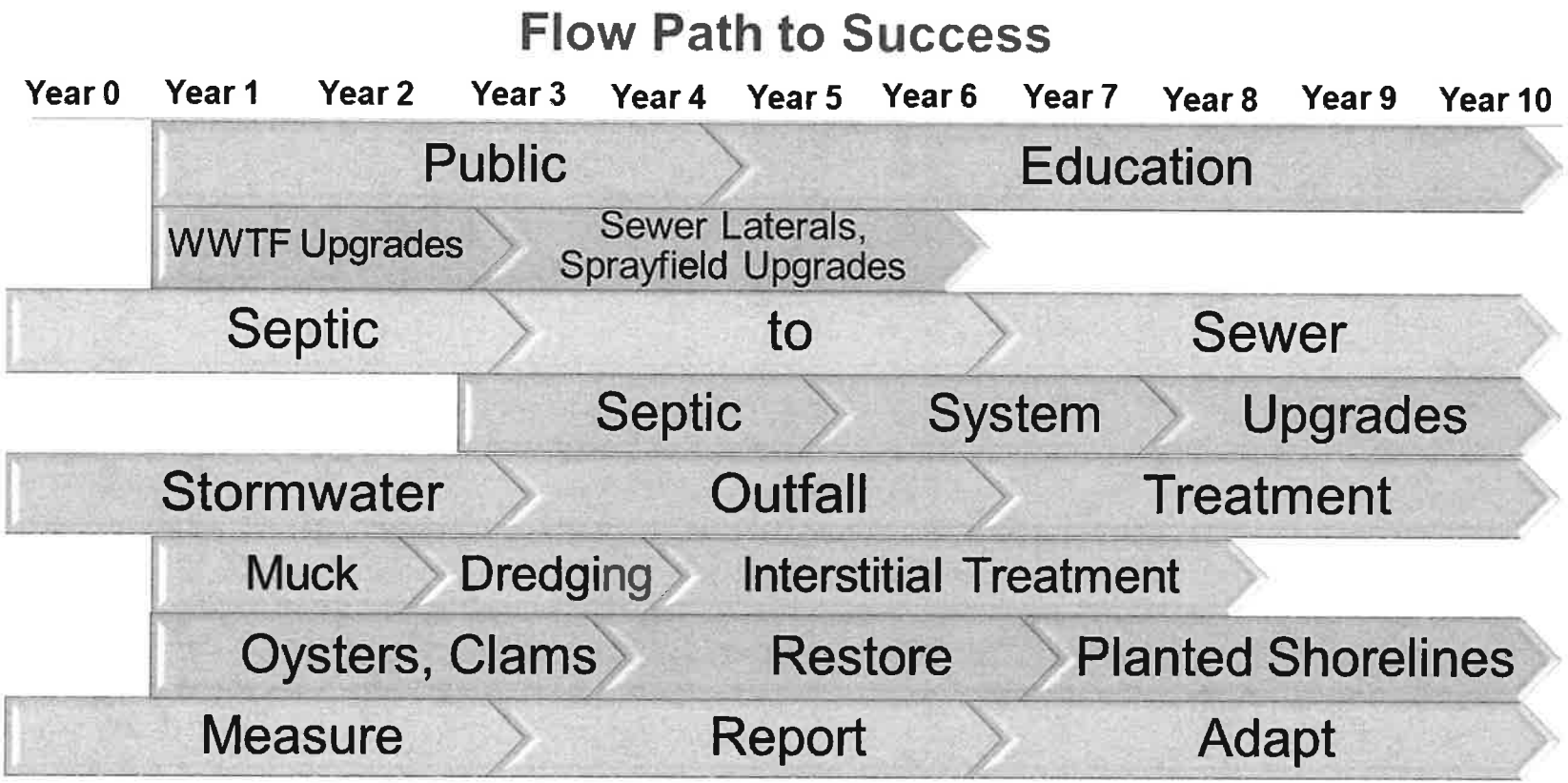


Figure ES-1: Save Our Indian River Lagoon Project Implementation Schedule

Table ES-1: Summary of Project Types, Costs, and Nutrient Reductions in the 2022 Update of the Save Our Indian River Lagoon Project Plan

Project Category	Project Type	Estimated Total Project Cost	Nitrogen Reductions (pounds per year)	Average Cost per Pound per Year of Total Nitrogen	Phosphorus Reductions (pounds per year)	Average Cost per Pound per Year of Total Phosphorus
Reduce	Public Education	$2,425,000	28,879	$84	2,013	$1,205
Reduce	Wastewater Treatment Facility Upgrades for Reclaimed Water	$26,766,195	69,823	$383	13,760	$1,945
Reduce	Rapid Infiltration Basin/Sprayfield Upgrades	$82,207	317	$259	To be determined	To be determined
Reduce	Package Plant Connection	$2,157,072	2,003	$1,077	To be determined	To be determined
Reduce	Sewer Lateral Rehabilitation	$1,580,000	6,196	$255	188	$8,404
Reduce	Septic System Removal by Sewer Extension	$119,686,296	95,816	$1,249	To be determined	To be determined
Reduce	Septic System Removal by Sewer Connection	$11,317,176	21,527	$526	To be determined	To be determined
Reduce	Septic System Upgrades	$29,233,106	37,981	$770	To be determined	To be determined
Reduce	Stormwater Projects	$47,515,821	271,170	$175	37,450	$1,269
Reduce	Vegetation Harvesting	$1,410,709	20,274	$70	2,010	$702
Remove	Muck Removal	$108,417,949	208,428	$520	17,874	$6,066
Remove	Treatment of Muck Interstitial Water	$46,977,065	484,332	$97	28,605	$1,642
Restore	Oyster Bars	$9,809,545	24,699	$397	780	$12,576
Restore	Planted Shorelines	$130,560	544	$240	186	$702
Restore	Clam Restoration	$60,000	1,000	$60	To be determined	To be determined
Respond	Projects Monitoring	$10,000,000	-	-	-	-
Respond	Contingency	$19,814,425	-	-	-	-
Respond	Inflation	$104,840,456	-	-	-	-
Total	***Total***	***$542,223,582***	***1,272,989***	***$426 (average)***	***102,866***	***$5,271 (average)***

Section 1. Background

The Indian River Lagoon (IRL) system includes Mosquito Lagoon, Banana River Lagoon, and Indian River. A large portion of the IRL system, 71% of its area and nearly half its length, is within Brevard County (County) and provides County residents and visitors many opportunities.

However, the balance of this delicate ecosystem has been disturbed as development in the area has led to harmful impacts. Stormwater runoff from urban and agricultural areas, wastewater treatment facility discharges, septic systems, and excess fertilizer applications have led to harmful levels of nutrients and sediments entering the lagoon. In addition, these pollutants lead to muck accumulation on the lagoon bottom, which fluxes nutrients and creates a lagoon bottom that is not conducive to seagrass, shellfish, or benthic invertebrate growth.

Efforts have been ongoing to address these sources of pollution. The Indian River Lagoon System and Basin Act of 1990 (Chapter 90-262, Laws of Florida) was enacted to protect the IRL system from wastewater treatment facility discharges and the improper use of septic tanks. The act includes three objectives: elimination of surface water discharges, investigation of feasibility of reuse, and centralization of wastewater collection and treatment facilities (Florida Department of Environmental Protection, 2016). This act led to the removal of effluent discharges to the lagoon from more than 40 wastewater treatment facilities (St. Johns River Water Management District, 2016a).

Stormwater regulations were adopted in unincorporated Brevard County in 1978 and adopted statewide in 1989. Due to stormwater regulations, stormwater treatment systems were constructed along with all new development exceeding size thresholds. Privately owned and operated stormwater treatment systems have prevented more than a million pounds of sediments from entering the lagoon since 1989 (St. Johns River Water Management District, 2016a). Stormwater treatment projects also reduce nutrient inputs to the lagoon. In addition, dredging projects have been ongoing since 1998 to remove muck from the lagoon and major tributaries, including Crane Creek, Turkey Creek, and St. Sebastian River (St. Johns River Water Management District, 2016a). These stormwater treatment and muck removal projects contributed to significant improvements in water quality and water clarity in the lagoon, which allowed for a great expansion of seagrass from 2000–2010.

However, recently, human impacts on the IRL system have been magnified. In 2011, the "superbloom" occurred, an intense algal bloom in the Mosquito Lagoon, Banana River Lagoon, and North IRL, as well as a secondary, less intense bloom in Central IRL. The extent and longevity of the bloom had a detrimental impact on seagrass. There have also been recurring brown tides; unusual mortalities of dolphins, manatees, and shorebirds; and large fish kills due to low dissolved oxygen from decomposing algae.

In 2009, to improve lagoon water quality and restore seagrass, the Florida Department of Environmental Protection adopted total maximum daily loads for total nitrogen (TN) and total phosphorus (TP) allowed to discharge to the Banana River Lagoon, North IRL, and Central IRL. The purpose of these total maximum daily loads is to reduce nutrients that lead to algae growth, which block sunlight from seagrass and create low dissolved oxygen conditions that affect fish in the lagoon. To implement these total maximum daily loads, the Florida Department of Environmental Protection adopted three basin management action plans that outline responsibilities for reductions by the local stakeholders, list projects, and stipulate a timeline for implementation. The intent of the nutrient reductions is to provide water quality conditions that

should result in seagrass growth in the lagoon at historical levels. Brevard County has a major responsibility in all three basin management action plans along with its 16 municipalities, Florida Department of Transportation District 5, Patrick Space Force Base, National Aeronautics and Space Administration – Kennedy Space Center, and agriculture. The Florida Department of Environmental Protection updated all three basin management action plans in 2020.

From 2012 to 2015, Brevard County led an effort with its municipalities, Florida Department of Transportation District 5, and Patrick Space Force Base to update the estimates of nutrient loadings to the lagoon. The County and its partners teamed with several consultants to develop the Spatial Watershed Iterative Loading model that revised the estimates of loading by source to the lagoon (refer to **Section 2** for more details). The revised loading estimates were compared to seagrass area to recommend refinement of state and federal approved total maximum daily loads. The loading estimates and total maximum daily load targets referenced in this plan are from these local efforts, as they are based on the most up-to-date data and analyses even though the state and federal total maximum daily loads have not been officially updated.

Damage to the lagoon has been occurring for decades and will require time and money to reverse. An important example is the accumulation of muck on the bottom of 10% of the IRL. This muck kills marine life and releases stored pollutants into the IRL. To address the damage to the IRL system, in 1990, Brevard County implemented a stormwater utility assessment, which established an annual assessment rate of $36 per year per equivalent residential unit that stayed at this level until 2014. The rate increased to $52 per equivalent residential unit for 2014 and 2015 and increased to $64 per equivalent residential unit in 2016. This raised collections from $3.4 million (in 2014) to $6.0 million (in 2016). Of the funding raised, a portion is available for capital improvement programs or other stormwater best management practices and is split between water quality improvement programs and flood control and mitigation programs. In addition, funding is spent on annual program operating expenses. Operation and maintenance includes National Pollutant Discharge Elimination System permit compliance activities (street sweeping, trap and box cleaning, and aquatic weed harvesting), outfall/ditch treatments, small scale oyster restoration, as well as harvesting and replanting of floating vegetative islands.

While revenues from this stormwater assessment have funded many projects, a significant portion of projects have been partially funded by grants. When applicable, federal water quality grants provide up to 60% matching funds, state total maximum daily load grants provide up to 50% match, and St. Johns River Water Management District cost-share grants fund up to 33% of construction. All these grant programs are highly competitive and subject to variable state and federal appropriations, as well as changing priorities.

Due to funding limitations and the continuing degradation of key indicators of health in the IRL, such as seagrass and fish, Brevard County identified a need for additional funding to implement projects identified as critical to lagoon restoration. Therefore, the County placed a Save Our Indian River Lagoon 0.5 cent sales tax referendum on the ballot in November 2016. This referendum passed by more than 60% of the votes and provides a funding mechanism for the projects listed in this plan and annual updates for the County and its municipalities. Revenue collection from the sales tax began in January 2017.

This Save Our Indian River Lagoon Project Plan outlines projects planned to meet updated total maximum daily load targets and improve the health, productivity, aesthetic appeal, and economic value of the lagoon. Almost all these projects require sales tax funding to be implemented. Furthermore, the local sales tax funding is being used to leverage more in match funding from state and federal grant programs. The IRL ecosystem is an asset valued not only

in Florida but also nationally; therefore, implementation of this plan would help to restore this national treasure. If additional funding is provided through matching funds from other sources, additional projects may be implemented, which would increase the overall plan cost, and/or project timelines may be moved up to allow the benefits of those projects to occur earlier than planned. Response of the lagoon ecosystem may lag for several years behind completion of nutrient reduction implementation; however, action must be accelerated now to ensure restoration succeeds over time.

1.1. Return on Investment and Economic Value

The economic value of the lagoon system was evaluated during development of this plan. It was estimated that at least a total present value of $6 billion is tied to restoration of the Indian River Lagoon (IRL). There is approximately $2 billion in benefits from restoration and an estimated $4 billion in damages if the IRL is not brought back to health during the next decade. If viewing this project plan purely as a financial investment that pays the $2 billion in benefits alone (i.e. not counting the avoidance of the $4 billion loss), the projected pretax internal rate of return is 10%, if the plan takes 10 years to implement.

Table 1-1 documents projections of three economic engines likely to have significant economic impacts on Brevard County residents with positive impacts if the IRL is restored versus negative impacts if the IRL is not restored. Additional detail on each of these impacts is provided in **Section 1.1.1**. The upper part of the table lists the economic benefits for restoring a healthy IRL while the lower part of the table lists the economic costs of declining IRL health in the absence of restoration through plan implementation.

Economic impacts in the table are expressed both as annual cash flows and as the discounted expected present value of those cash flows over a 30-year financial plan period. Expected present value is an economic indicator used in business to express the present monetary value of a future stream of cash flows. This expected monetary value discounts the future stream by an interest rate and discounts it further by a probability factor to account for the uncertainty of future events. Therefore, the expected present value of IRL economic benefits shown in **Table 1-1** is much less than the sum of those future cash flows.

Table 1-1: Economic Impact Scenarios Based Upon the Condition of the IRL

Economic Benefits for Restoring a Healthy IRL and Costs of Declining IRL Health	Annual Cash Flow	Expected Present Value
Tourism and Recreation Growth Benefits	$95 million	$997 million
Property Value Growth Benefits	$81 million	$852 million
Rebirth of Commercial Fishing Benefits (excludes indirect benefits)	$15 million	$159 million
Healthy Residents and Tourists Benefits	Not quantified	Not quantified
Total Benefits	***$191 million***	***$2.01 billion***
Tourism and Recreation at Risk Damages	-$237 million	-$3 billion
Property Value at Risk Damages	-$92 million	-$1.2 billion
Decline of Commercial Fishing (excludes indirect impacts)	-$6 million	-$87 million
Potential Pathogen Impacts to Residents and Tourists	Not quantified	Not quantified
Total Damages	***-$335***	***-$4.29 billion***

Note: Developed by CloseWaters LLC for the original Save Our Indian River Lagoon Project Plan.

Today there is a $6 billion decision point for the IRL. Despite unprecedented algae blooms and fish kills, conditions could become worse. If large-scale fish kills continue with increasing frequency, algae blooms continue or become toxic, or there is a pathogen outbreak, then real

estate, tourism, and the quality of life and health for Brevard County residents would likely suffer.

1.1.1 Areas of Economic Value at Risk

Tourism and Recreation

Today's tourism revenue in Brevard County (County) comes primarily from the beaches. To diversify the tourism base and increase revenue, Brevard County has developed a plan to increase ecotourism, a globally growing and high value sector of tourism that depends on restoration and maintenance of a healthy Indian River Lagoon (IRL). High value ecotourism relies on exceptional natural experiences including fishing, bird watching, kayaking, paddle boarding, camping, hiking, and nature tours. In the short-term, there are opportunities for tourists to participate in restoration experiences, such as collecting mangrove seeds by kayak or canoe, planting mangrove seedlings, or establishing colonies of clams, oysters, or mussels. A successful example of Brevard County ecotourism is the world famous annual Space Coast Birding and Wildlife Festival that brings $1.2 million annually to the County and attracts approximately 5,000 visitors.

Property Value

While the economic benefits of IRL restoration are likely to increase property value throughout the County, to be conservative this plan assessed the exposure only to properties with frontage on Mosquito Lagoon, IRL, Banana River Lagoon, Sykes Creek, and connected waterways. Approximately 11.2% of the County's $27 billion in taxable property value is directly on the IRL. Therefore, more than $3 billion in taxable property value is directly at risk with ongoing IRL issues, such as algal blooms and fish kills. Furthermore, a weighted-average millage rate of 18.58 results in an estimated annual tax revenue of $56 million that is also at risk in the absence of IRL restoration. The $852 million of incremental expected present value assumes a 20% improvement in IRL frontage property value, which would be 90% likely after 10 years with the IRL restored.

Consultants for the County surveyed the Space Coast Association of REALTORS® to assess the likely impacts of IRL health on the waterfront property value. Approximately 170 REALTORS® most familiar with the waterfront market replied to the survey. These professionals assessed that waterfront IRL property values would increase 22% on average over five years if the IRL were healthy and would decrease by 25% over five years if the lagoon were not restored.

Commercial Fishing

IRL restoration is critical to the recovery of a once thriving, valuable, and world-class fishery, both commercial and recreational. In 1995, the commercial fish harvest in Brevard County was $22 million annually. While a 1995 ban on commercial net fishing marked economic decline, the degradation of the lagoon system contributed considerably to a severe reduction in value of only $6.7 million annually in 2015, based on Florida Fish and Wildlife Conservation Commission data (see **Figure 1-1**). These numbers do not include the many indirect benefits of a robust commercial fishing industry including fresh local fish for restaurants, employment, commerce of supplies and services for the industry, and benefits of local fresh fish for residents and visitors.

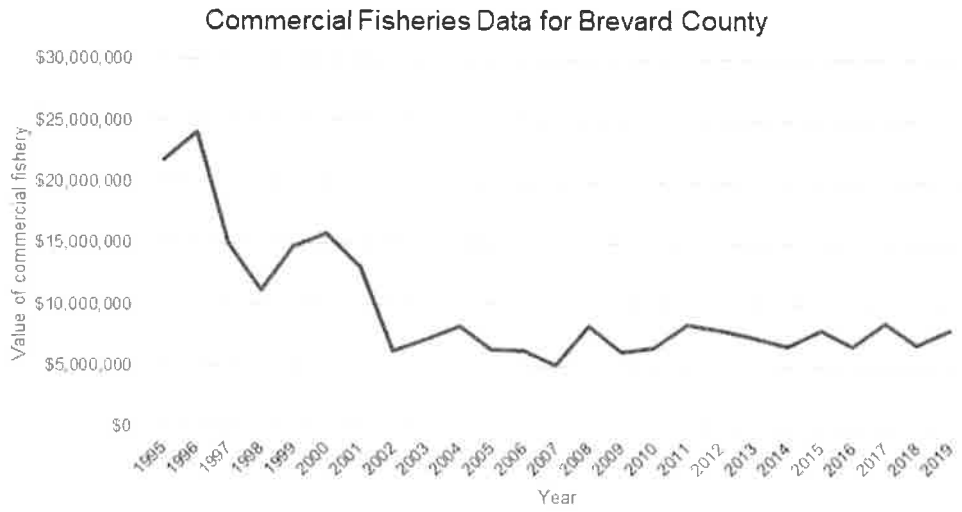


Figure 1-1: Decline of Commercial Fishing in Brevard County

Figure 1-1 Long Description

In addition, a healthy fish population is critical to the brand of any coastal community. Historically Brevard County was once home to a world-class abundance and diversity of rare and widespread species of fish, crabs, shrimp, and clams that made the IRL a global brand. That brand can be restored along with the fish and shellfish of the IRL.

Healthy Residents and Tourists
Septic systems within Brevard County can pollute groundwater that migrates to the lagoon. This groundwater moves slowly toward the lagoon through soils that attenuate some but not all these pollutants. It would cost at least $1.19 billion to convert all 59,500 septic tanks to central sewage treatment. While total conversion is cost prohibitive, this plan targets the septic systems with the highest potential impacts to the lagoon. Targeted action includes connection to the central sewer system or upgrade to advanced treatment systems that remove significantly more nutrients and pathogens than traditional septic systems.

Although there are studies that have identified pathogens migrating from septic systems into waterways, it is not possible to estimate the economic impact of potential disease from these waterborne pathogens. The conversion of septic systems is expensive relative to other types of nutrient reduction projects; however, the additional health benefits associated with septic system upgrades make this option a priority beyond only the abatement of nutrients.

1.2. Maximizing Benefits and Managing Risk

There is much at stake with regard to both economic outcomes and the incremental funding critical to restoration; therefore, Brevard County (County) chose to address the unavoidable risks inherent in a multi-year, large-scale restoration plan in a transparent and objective manner. To help ensure objectivity, the County retained outside consultants to assess risk and to estimate potential positive or negative outcomes.

The approach for this plan to evaluate the different project options included using expected monetary value models; a decision science tool used in business to improve decision-making and planning in a context of unavoidable uncertainty. Expected monetary value is a financial model of probability-weighted outcomes expressed in quantified financial terms that are comparable across multi-year planning periods. To compare outcomes, expected present value was used as a key metric. Expected present value has the benefit of valuing future financial costs and benefits in common present day terms to take into account the value of time and to facilitate comparisons of initiatives spanning long periods of time.

As part of this methodology, consultants engaged Subject Matter Experts to assess the uncertainties of project scenarios. Subject Matter Experts include scientists, property value experts, tourism experts, lagoon advocates, and agency staff. Subject Matter Experts brought expertise in Indian River Lagoon (IRL) science, nutrient reduction technologies, waterborne pathogens, and relevant law or county financial and accounting parameters needed for the expected monetary value models. Information gathered during these assessments was used to document the key interdependence of initiatives, minimize risk, and maximize the likely return on investment.

1.2.1 Project Selection to Maximize Return on Investment

Assessment of risk by Subject Matter Experts determined that the amount and speed of nutrient reductions are the two most critical factors affecting the success of restoring Indian River Lagoon (IRL) health. Therefore, those projects with the greatest nutrient reduction benefit for the least cost are recommended for funding and, of those, the projects with the greatest benefits are planned for implementation first. Three other key criteria drove this plan:

1. Achieving sufficient nutrient abatement through a blend of options was a key success factor for restoration.
2. No one type of project alone could achieve an adequate nutrient abatement.
3. The target for nutrient reduction must be sufficient to minimize the need for recurring expensive muck removal, which is important for future cost avoidance.

The plan sequences a diversity of project types, implementing the highest nutrient reduction impact early and implementing other projects concurrently to achieve a multi-pronged blend of total nutrient abatement as quickly as possible with minimal risk. Another important consideration for project sequencing was how quickly projects could produce significant nutrient pollution reduction. For decades, man-made nutrient pollution from fertilizers, septic systems, and stormwater runoff have been introduced at varying distances from the IRL. The soils are still saturated with those nutrients. Therefore, if all sources of nutrient pollution ended today, groundwater would continue to transport nutrients accumulated in the soil into the IRL with every rain event for decades in the future. However, soils next to the IRL will purge themselves quickly, in days or weeks. Septic system conversions near the lagoon or near drainage conduits into the lagoon are likely to produce water quality and reduced pathogen benefits in the lagoon in weeks or months whereas septic conversions more distant from waterways are not anticipated to generate lagoon benefits for several decades. Therefore, whenever possible, project selection and sequencing scheduled nutrient abatements closest to the IRL first.

Undoing the damage to a unique and complex biological system as large as the IRL carries inherent risk. The County made the decision to be open and transparent about that risk. Assessing that risk diligently has allowed the County to mitigate and manage risk proactively in the development of this plan.

Two subjective risk assessments were conducted by an independent consultant working with top science Subject Matter Experts most knowledgeable about the IRL. The first assessment was conducted with individual Subject Matter Experts and occurred before plan projects were defined. These experts assessed that the likelihood of a healthy fish population in the IRL would begin to rise faster after reaching a critical point of nutrient reduction. Therefore, there is a "critical mass" of nutrient reduction needed to achieve significant and sustainable IRL health benefits. The Subject Matter Experts also assessed that the likelihood of recovery would continue to improve as more nutrients are removed from the IRL and then begin to decline if too many nutrients were removed. The result of that first risk assessment reinforced the objective of reducing nutrients in the IRL as quickly as possible through the definition and sequencing of the projects in this plan.

A second uncertainty assessment was conducted in a meeting at the Florida Institute of Technology with a group of water quality, toxicity, muck, fish, algae, invertebrates, and seagrass Subject Matter Experts. First, the experts were briefed about the projects proposed in this plan. The experts were then asked their subjective assessment of the likelihood of a healthy lagoon after this plan was implemented in each sub-lagoon. Sub-lagoons were assessed because the experts had commented previously that each sub-lagoon functioned differently. This group assessment indicated higher likelihoods of success than the first assessment. However, the scientists continued to voice concern about the restoration of the IRL in the absence of regulatory reform needed to prevent new development from adding more septic system and stormwater pollution to the lagoon. Therefore, updated regulations are needed as a complement to this plan to ensure timely and sustained success in restoring health to the IRL.

Figure 1-2 represents the input from the Subject Matter Experts.

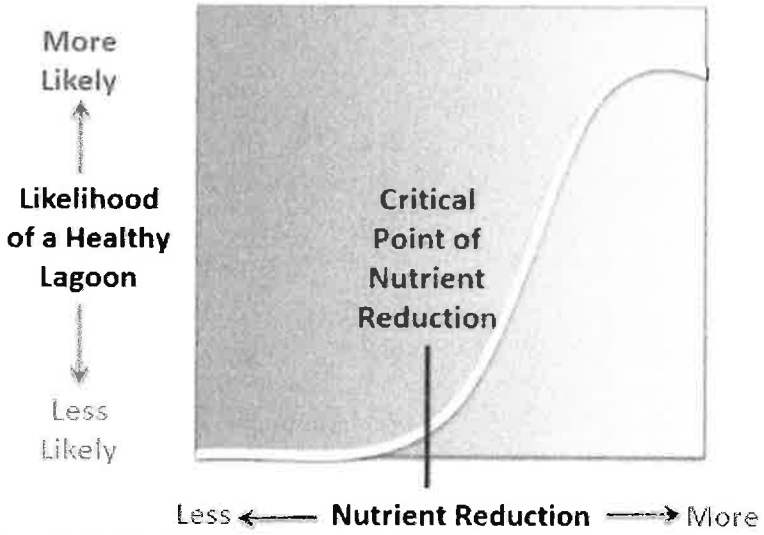


Figure 1-2: Likelihood of a Healthy IRL as Nutrients are Removed

There are other large-scale aquatic system restoration efforts that have been successful in achieving restoration. Some of these systems were damaged even more so than the IRL, but they have recovered through the implementation of extensive, multi-year, and multi-pronged restoration plans. These include the Chesapeake Bay, Cuyahoga River, Lake Erie, and Tampa Bay. These areas have reaped enormous economic and quality of life benefits as a result of dedicated investments in their restoration.

Section 2. Approach, Outputs, and Outcomes

The amount and distribution of nutrient loading from the sources described in **Section 3** were examined to determine the key locations where nutrient reduction projects are needed and the extent of reductions required from each source to achieve Brevard County's proposed total maximum daily loads for each sub-lagoon. For each source, a reduction goal is set and projects are proposed to meet the goal. The estimated cost for each project is also included. Information on expected project efficiencies and project costs were gathered from data collected by Brevard County in implementation of similar projects, as well as literature results from studies in Florida, where available, and across the country. The most cost-effective projects are selected and prioritized to maximize the nutrient reductions that can be achieved.

2.1. Plan Focus Area

This plan focuses on projects implemented in three sub-lagoons in the Indian River Lagoon (IRL) system: Banana River Lagoon, North IRL, and Central IRL. **Figure 2-1** shows the locations of these sub-lagoons. All the Banana River Lagoon watershed and the majority of the North IRL watershed are located within Brevard County (County). However, only a portion of the Central IRL watershed is located within the County. As shown in **Figure 2-1**, Central IRL Zone A is located entirely in Brevard County, whereas Zone SEB straddles Brevard and Indian River counties. For Zone SEB, the County has completed several projects in this area and the St. Johns River Water Management District is completing projects along the C-54 Canal and on the Wheeler property to treat the Sottile Canal. The reductions from these projects for total nitrogen [TN] and total phosphorus [TP]) should be sufficient to meet the estimated need for reductions in the Brevard County portion of Zone SEB, as shown in **Table 2-1**. This plan includes some additional beneficial projects located in Zone SEB to help ensure that the necessary reductions are achieved throughout Brevard County; however, most of the projects proposed in this plan for the Central IRL fall within Central IRL Zone A.

Table 2-1: Summary of Load Reductions and Projects in Central IRL Zone SEB

Category	Annual Total Nitrogen Load (pounds per year)	Five-Month Total Nitrogen Load (pounds per year)	Annual Total Phosphorus Load (pounds per year)	Five-Month Total Phosphorus Load (pound per year)
Stormwater and Baseflow Loading	248,233	79,956	34,901	11,242
Atmospheric Deposition Loading	22,371	7,206	404	130
Point Sources Loading	0	0	0	0
Total Loading	270,604	87,162	35,305	11,372
Target Percent Reductions	18.0%	38.0%	16.0%	35.0%
Targeted Reductions	***48,709***	***33,121***	***5,649***	***3,980***
Completed County Projects (2010-February 2016)	29,890	12,454	9,643	4,018
C-54 Project	65,974	27,489	10,558	4,399
Wheeler Property Project	36,582	15,243	21,784	9,077
Total Project Reductions	***132,446***	***55,186***	***41,985***	***17,494***
% of Targeted Reductions Achieved	***271.9%***	***166.6%***	***743.2%***	***439.5%***

In addition, a small portion of the County is located within the Mosquito Lagoon. Brevard County does not have stormwater outfalls, septic systems, or point sources in this sub-lagoon.

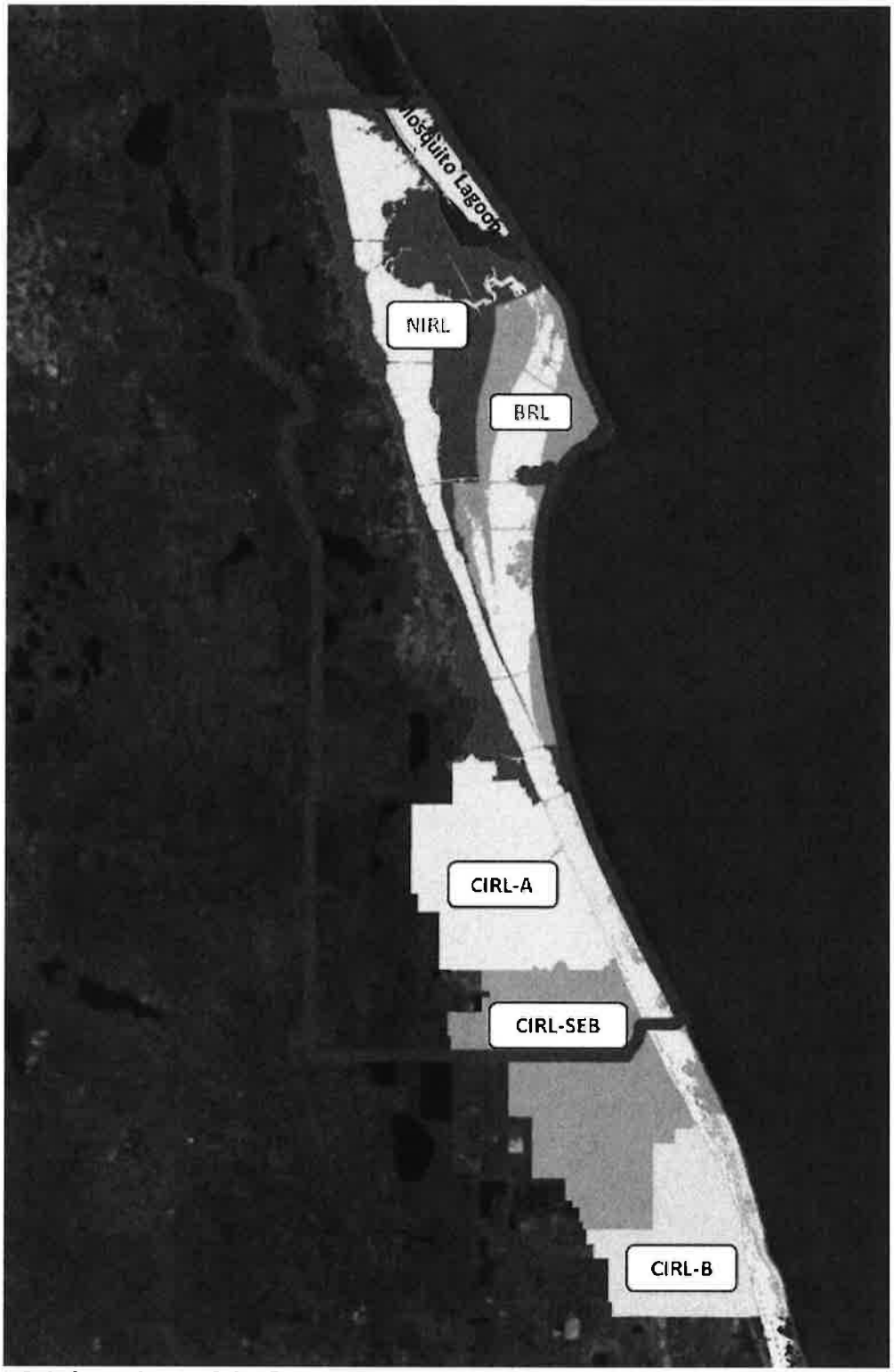


Figure 2-1: Locations of the Banana River Lagoon (BRL), North IRL (NIRL), and Central IRL (CIRL) Sub-lagoons

2.2. Plan Outputs and Outcomes

Vision Statement: *An Indian River Lagoon teeming with fish, birds, and wildlife that provides recreation, economic vitality, and pride in our community.*

Mission Statement: *Restoring the Indian River Lagoon through collaborative, science-based projects which Reduce and Remove pollution to benefit our community, economy, and natural resources.*

There are several outcomes expected from implementation of the plan. The plan outputs represent the project types included to **Reduce** external loads to the lagoon, **Remove** internal sources from the lagoon, **Restore** the natural filtration systems, and **Respond** to the changing conditions and opportunities. The outcomes from these outputs are the results, impacts, and accomplishments that will occur due to plan implementation (**Figure 2-2**). The timeframes for reaching various outcomes may be impacted by many factors outside Brevard County control, including federal and state legislation and weather; however, division of outcomes into short-term, mid-term, and long-term categories is meant to illustrate the sequence and approximate schedule of anticipated natural recovery.

Figure 2-2. Summary of the Save Our Indian River Lagoon Outputs and Outcomes

Figure 2-2 Long Description

Section 3. Pollutant Sources in the IRL Watershed

Pollutant loads in the Indian River Lagoon (IRL) watershed are generated from multiple external sources that discharge to the lagoon. Excess loads also accumulate in nutrient sinks within the lagoon, which release nutrients to the water column during certain conditions.

External sources fall into the following major categories:

- Stormwater runoff that occurs when rainfall hits the land and cannot soak into the ground:
  - Urban stormwater runoff is generated by rainfall and excess irrigation on impervious areas associated with urban development. Urban runoff picks up and transports nutrient loading from fertilizers, grass clippings, and pet waste, as well as other pollutants including sediments, pesticides, oil, and grease. Stormwater ponds and baffle boxes reduce the nutrient loading in stormwater; however, proper maintenance of these systems is necessary to maintain their performance.
  - Agricultural stormwater runoff occurs on agricultural land and this runoff also carries nutrients from fertilizers, as well as livestock waste, pesticides, and herbicides. This source of stormwater runoff is not addressed in this plan as the County does not have jurisdiction over agricultural use. The Florida Department of Agriculture and Consumer Services has an agricultural best management practice program, and they work with agricultural producers to control the loading from this source.
  - Natural stormwater runoff comes from the natural lands in the basin. This source is not addressed by this plan as natural loading does not need be controlled.
- Baseflow is the groundwater flow that contributes loading to the IRL. Due to the sandy soils in the basin and excess irrigation, nutrients can soak quickly into the groundwater with little removal. This groundwater can recharge surface water in ditches, canals, tributaries, or the IRL.
  - Excess fertilizer that soaks into the ground past the root zones.
  - Septic systems, both functioning and failing, contribute nutrient loading to the groundwater.
  - Leaking sewer pipes located above the water table can contribute nutrient loading to the groundwater.
- Atmospheric deposition that falls on both the land and the lagoon itself:
  - Nutrients in the atmosphere fall into the basin largely during rainfall events. The sources of these nutrients are from power plants, cars, and other sources that burn fossil fuels. However, because of atmospheric conditions and weather patterns, not all the nutrients from atmospheric deposition are generated within the watershed. Atmospheric loading is not directly addressed by this plan as air quality and air emission standards are regulated by the federal Clean Air Act and are not within the County's control. However, the stormwater projects and in-lagoon projects will treat some of the nutrient loading from atmospheric deposition that falls on the land and lagoon surface.
- Point sources that treat collected sewage and discharge treated effluent:
  - The direct wastewater treatment facility discharges to the lagoon have been largely removed, and most of the facilities in the basin use the treated effluent for reclaimed water irrigation. However, depending on the level of treatment at the wastewater treatment facility, the reclaimed water can have an excessive concentration of nutrients that may contribute loading to the baseflow.

- There have been issues with inflow and infiltration into the sanitary sewer collection system. Large rain events can result in large amounts of water entering the sewer collection system, and this additional water can cause sewer overflows that contribute nutrients and bacteria to local waterbodies.

In addition to these external sources of loading to the lagoon, nutrients from muck (muck flux) is an internal source of loading within the lagoon itself. Muck is made up of organic materials from soil erosion on the land and from decay of organic matter (leaves, grass clippings, algae, and aquatic vegetation) in the lagoon. As these organic materials decay, they constantly flux nutrients into the water column above, where they add to the surplus of nutrients coming from external sources.

Table 3-1 summarizes the estimated total nitrogen (TN) and total phosphorus (TP) loading from these sources in the Banana River Lagoon (including canals), North IRL, and Zone A of the Central IRL. The stormwater runoff and baseflow/septic systems loading estimates are from the Spatial Watershed Iterative Loading model, the point source loading estimates were based on the facility monthly operating reports and discharge monitoring reports, and the atmospheric deposition loads are from measured data at nearby stations. The muck flux load estimates are calculated based on the muck area in each portion of the lagoon and flux estimates from studies in the lagoon (refer to **Section 4.2.1** for more details). The loading from these sources is also shown graphically in **Figure 3-1, Figure 3-2**, and **Figure 3-3**.

Table 3-1: Loading from Different Sources in Each Sub-lagoon

Source	Banana River Lagoon Total Nitrogen (pounds per year)	Banana River Lagoon Total Phosphorus (pounds per year)	North IRL Total Nitrogen (pounds per year)	North IRL Total Phosphorus (pounds per year)	Central IRL Zone A Total Nitrogen (pounds per year)	Central IRL Zone A Total Phosphorus (pounds per year)
Stormwater Runoff	119,923	15,064	328,047	45,423	279,351	43,193
Baseflow/Septic, Leaking Sewer, Reclaimed Water	164,225	22,613	344,111	47,383	370,129	50,966
Atmospheric Deposition	175,388	3,222	301,977	5,505	49,456	892
Point Sources	17,484	3,370	14,711	1,029	0	0
Muck Flux	393,948	43,216	247,078	17,583	16,927	2,277

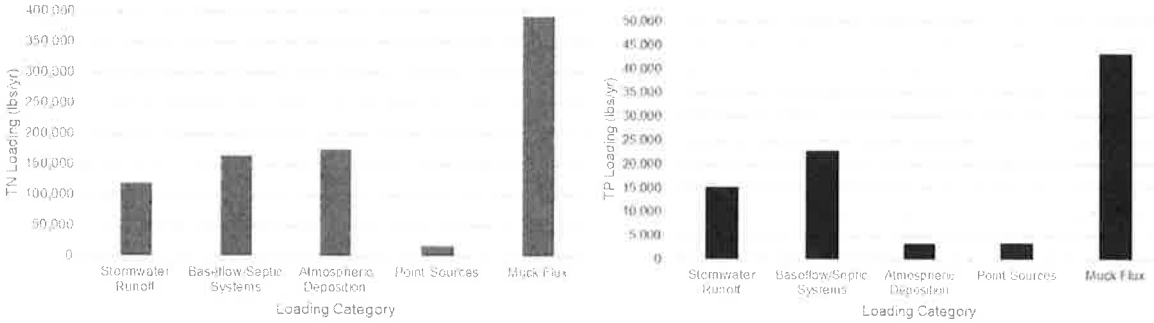


Figure 3-1: Banana River Lagoon TN (left) and TP (right) Annual Average Loads by Source

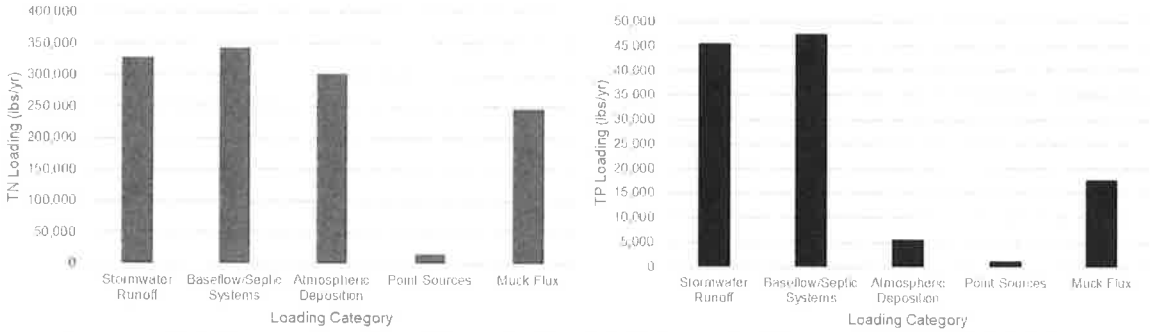


Figure 3-2: North IRL TN (left) and TP (right) Annual Average Loads by Source

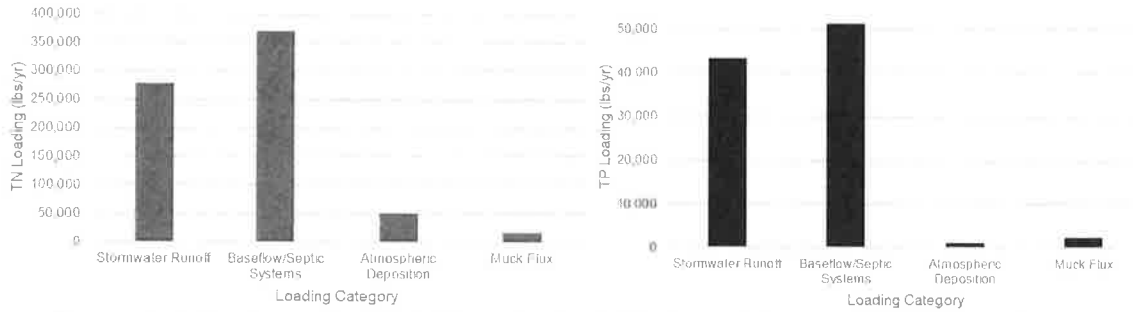


Figure 3-3: Central IRL TN (left) and TP (right) Annual Average Loads by Source

Section 4. Project Options

To restore the lagoon's balance, Brevard County has been implementing a multi-pronged approach to **Reduce** pollutant and nutrient inputs to the lagoon, **Remove** the accumulation of muck from the lagoon bottom, and **Restore** water-filtering oysters and related lagoon ecosystem services. This plan also recommends funding for project monitoring, needed for accountability and to **Respond** to changing conditions and opportunities. Respond funds will be used to track progress, measure cost effectiveness, and report on performance. Each year, the Citizen Oversight Committee (additional details are included in **Section 4.4.1**) will review monitoring reports and make recommendations to the Brevard County Board of County Commissioners to redirect remaining plan funds to those efforts that will be most successful and cost-effective. Although research is important to better understand factors that significantly impact the health, productivity, and natural resilience of the Indian River Lagoon (IRL), funding for research is not included in this project plan.

Several goals were set to help select the projects for this plan. The goal for the **Reduce** projects is to achieve the proposed total maximum daily load for each sub-lagoon (refer to **Section 6** for additional details on the total maximum daily loads). The goal for the **Remove** projects is to achieve about a 25% reduction in estimated recycling of internal loads. The goals for the **Restore** projects are to filter the entire volume of the lagoon annually and to reduce shoreline erosion. The most cost-effective projects in each category were selected to maximize nutrient reductions, minimize lag time in lagoon response, reduce risk, and optimize the return on investment.

Section 4.1 through **Section 4.5** provide information on the proposed projects, estimated nutrient reduction benefits, and costs, as well as the ongoing studies needed to measure and assess the project efficiencies and benefits to the lagoon system.

4.1. Projects to Reduce Pollutants

An important step in restoring the lagoon system is reducing the amount of pollutants that enter the Indian River Lagoon (IRL) through stormwater runoff and groundwater. Reduction efforts include source control (such as fertilizer reductions) to reduce the amount of pollutants generated, as well as treatment to reduce pollutants that have already been discharged before they are washed off in stormwater runoff or enter the groundwater system and ultimately discharge to the IRL. Monitoring of these projects will be performed to verify the estimated effectiveness of each project type implemented (refer to **Section 4.4**).

The benefits from fertilizer management and public education, wastewater treatment facility upgrades for reclaimed water, and stormwater treatment are seen fairly quickly in the lagoon system. Public education about fertilizer and other sources of pollution addresses nutrients at their source and prevents these nutrients from entering the system. Wastewater treatment facility upgrades result in reduced nutrients in the treated effluent, which is then used throughout the basin for reclaimed water irrigation. The stormwater projects will capture and treat runoff, which is currently untreated or inadequately treated, before it reaches the lagoon.

While greatly beneficial, septic system removal or upgrade projects may take longer to result in a nutrient reduction to the lagoon. The septic systems in key areas must be removed or upgraded to see the full benefits. In addition, septic systems contribute nutrient loading to the lagoon through groundwater, and the travel time of the nutrient plumes through the groundwater to a waterbody vary throughout the basin depending on watershed conditions.

The following subsections summarize (1) public education and outreach efforts; (2) infrastructure improvements for wastewater treatment facilities; (3) sprayfield and rapid infiltration basin upgrades; (4) package plant connections; (5) sewer laterals rehabilitation; (6) septic system removal and upgrades; and (7) stormwater treatment projects.

4.1.1 Public Outreach and Education

The education and outreach campaigns are summarized in the sections below.

> *Approximately 81,700 pounds per year of TN and 4,200 pounds per year of TP enter the lagoon watershed from excess fertilizer application.*

Fertilizer Management

It is a common practice to apply fertilizer on urban and agricultural land uses. However, excessive and inappropriately applied fertilizer pollutes surrounding waters and stormwater. To help address fertilizer as a source of nutrient loading, local governments located within the watershed of a waterbody or water segment that is listed as impaired by nutrients are required to adopt, at a minimum, the Florida Department of Environmental Protection's Model Ordinance for Florida-Friendly Fertilizer Use on Urban Landscapes (Section 403.067, Florida Statutes). Brevard County and its municipalities adopted fertilizer ordinances that included the required items from the Model Ordinance in December 2012, as well as additional provisions in 2013 and 2014. Local fertilizer ordinances are posted online at the Brevard County Extension website. These ordinances require zero phosphorus year-round, nitrogen to be at least 50% slow release, no nitrogen use during the rainy season, and variable surface water protection buffers.

Florida Department of Agriculture and Consumer Services compiled information on the fertilizer sales by county, as well as the estimated nutrients from those fertilizers. It is important to note that all fertilizer sold in a county may not be applied within that county because a portion of that fertilizer may be transported to another county. However, details on the amount of fertilizer transported between counties is not tracked. Therefore, the information in the Florida Department of Agriculture and Consumer Services reports is simply the best estimate of the amount of fertilizer used, and the associated nutrient content, in a county.

Based on the Florida Department of Agriculture and Consumer Services information, the lawn fertilizer sold in Brevard County in fiscal year 2014–2015 contained 408,220 pounds of nitrogen and 32,520 pounds of phosphorus. The fertilizer applied is attenuated through several naturally occurring physical, chemical, and biological processes including uptake by grass. The environmental attenuation/uptake for urban fertilizer is 80% for nitrogen (Florida Department of Environmental Protection, 2017) and 90% for phosphorus. The estimated total nitrogen (TN) and total phosphorus (TP) that is applied but is not naturally attenuated is shown in **Table 4-1**. It is important to note that not all the un-attenuated nutrients will migrate to the lagoon, either through runoff or baseflow (groundwater that enters ditches, canals, and tributaries), but these numbers provide an idea of the excess nutrients that could be reduced as a result of public education and changes in fertilizer use.

Table 4-1: Estimated TN and TP Not Attenuated in Fiscal Year 2014–2015

Parameter	Pounds Sold Fiscal Year 2014-15 (Lawn Only)	Environmental Attenuation (%)	Fiscal Year 2014-15 Pounds (Lawn Only) after Attenuation
Total Nitrogen	408,220	80%	81,644
Total Phosphorus	32,520	90%	3,252

When recent sales data are compared to the fertilizer sold in fiscal year 2013–2014, which is before adoption of the more protective amendments to the ordinance, significant reductions are observed. These reductions from the implementation of the ordinance are shown in **Table 4-2**.

Table 4-2: Reductions from Fertilizer Ordinance Compliance as of Fiscal Year 2014–2015

Parameter	Fiscal Year 2013-14 Pounds (Lawn Only) after Attenuation: Pre-Ordinance (pounds per year)	Fiscal Year 2014-15 Pounds (Lawn Only) after Attenuation: Post-Ordinance (pounds per year)	Reductions from Ordinance to Date (pounds per year)
Total Nitrogen	127,540	81,644	45,896
Total Phosphorus	12,640	3,252	9,388

Based on studies by the University of Florida, approximately 0.03% of applied nitrogen ends up in runoff during establishment of sodded Bermudagrass on a 10% slope. Nitrogen leaching ranged from 8% to 12% of the amount applied (Trenholm and Sartain, 2010). Therefore, nitrogen leaching from fertilizer into the groundwater is 300 to 400 times as much as the nitrogen running off in stormwater. To help address the leaching issue, the Brevard County fertilizer ordinance encourages the use of slow release nitrogen fertilizer. Slow release fertilizer decreases nitrogen leaching by about 30% (University of Florida-Institute of Food and Agricultural Sciences, 2012). In addition, the ordinance requires that fertilizer with zero phosphorus is used.

The public education and outreach campaign will be expanded to include focus on slow release and zero phosphorus fertilizers. An important component of this will be to reach out to stores within Brevard County to ensure they are making slow release and zero phosphorus fertilizers more visible and to add signage to let buyers know which fertilizers are compliant with all local ordinances. This would cost approximately $125,000 per year for a period of five years. If an additional 25% of fertilizer users switch to 50% slow release nitrogen and zero phosphorus formulations, compliant with the ordinance, this would result in a reduction of 6,123 pounds per year of TN and 813 pounds per year of TP.

In 2019, the University of Florida Institute of Food and Agricultural Sciences and MTN Marketing conducted a survey that was concentrated on fertilizer awareness questions. The results from the 2019 survey were compared to similar questions from the 2015 Blue Life survey to evaluate changes in fertilizer use. Based on the survey results, 33.33% of respondents in 2019 stated that they use slow release nitrogen fertilizer compared to only 6.30% in 2015, which is a 27% increase in the usage of slow release fertilizer. Therefore, as part of the 2021 Update, the estimated nitrogen reductions from the expanded fertilizer education was updated to 27%, which results in an estimated reduction of 6,613 pounds per year of TN. The TP reductions were kept at 25% compliance because, the way the survey was setup, participants were only able to select one option for the type of fertilizer used. Therefore, an update on the use of zero phosphorus formulas could not be obtained. The estimated reductions are shown in **Table 4-3**.

Table 4-3: Project for Additional Fertilizer Ordinance Compliance

Year Added	Project Number	Project Name	Responsible Entity	Sub-lagoon	Total Nitrogen Reduction (pounds per year)	Total Nitrogen Cost per Pound per Year	Total Phosphorus Reduction (pounds per year)	Total Phosphorus Cost per Pound per Year	Plan Funding
Original	58a	Expanded Fertilizer Education*	Brevard County	All	6,613	$95	813	$769	$625,000

Note: The projects highlighted in green and marked with an asterisk were identified in the original plan.

In 2018, the Citizen Oversight Committee recommended extending the fertilizer education and outreach beyond the original plan recommendation of five years to all ten years of the plan. The $625,000 for this project will be redistributed as follows: (1) $125,000 in Year 1 to create the education campaign and begin implementation, (2) $50,000 per year to continue implementation in Years 2–10, and (3) an additional $50,000 in Year 6 (for a total of $100,000 in this year) to evaluate program success and update the outreach materials, as needed.

Grass Clippings

Grass clippings contain nutrients and those nutrients are released in stormwater or the lagoon as they decompose (Brevard County Natural Resources Management Department, 2017). St. Augustine grass contains 2.5% nitrogen and 0.2–0.5% (average of 0.5%) phosphorus and Bahia grass contains 2% nitrogen (University of Florida-Institute of Food and Agricultural Sciences, 2015). According to Okaloosa County Extension (2017), a 7,500-square foot lawn produces about 3,000 pounds of clippings per year. Unfortunately, the percentage of those total clippings that end up in stormwater is not known.

To estimate the potential nutrient reduction impact of a grass clippings campaign, it was assumed that the average home lot size is 10,000 square feet with a 100-foot by 100-foot boundary, with 2,500 square feet of built space and 7,500 square feet of lawn (**Figure 4-1**). The University of Florida-Institute of Food and Agricultural Sciences estimated that 3,000 pounds of grass clippings are produced annually from a healthy lawn of this size. It was assumed that most of the grass clippings in Brevard County are from St. Augustine grass, which means that 3,000 pounds of clippings contains approximately 75 pounds of TN and 10.5 pounds of TP.

It was also assumed that the standard mower size is two feet wide. From one roadside pass along 100 feet of the average lawn with a two-foot wide mower, 200 square feet or 2.6% of the total lawn clippings could be cast into the road. This equals 0.02 pounds of TN and 0.0027 pounds of TP per foot per year left in the road. With about 3,800 miles of roads in the Indian River Lagoon (IRL) Basin within Brevard County, of which approximately 1,250 miles are paved with curb and gutter and are most likely to allow the ready transport of grass clippings to the lagoon in stormwater, the potential nutrient release from those grass clippings could be up to 260,000 pounds per year of TN and 35,640 pounds per year of TP from mowing along both sides of the road.

If Brevard County expects a similar rate of awareness of 24% as Alachua County (2012), then a potential 200,000 pounds per year of TN and 27,000 pounds per year of TP may be entering the stormwater. If a successful grass clippings campaign in Brevard County can capture an increase of awareness similar to Alachua County (from 24% to 69%), then there is a potential reduction of 88,920 pounds per year of TN and 12,189 pounds per year of TP. In addition, assuming the environmental attenuation/uptake for grass clippings is similar to the urban fertilizer uptake of 80% for nitrogen and 90% for phosphorus, the estimated reductions would be 17,800 pounds per year of TN and 1,200 pounds per year of TP.

This estimate assumes a simplified worst-case scenario in which everyone leaves a portion of their clippings in the road; however, it does not take into account the number of driveways, sidewalks, medians, and other impervious surfaces that grass clippings could be falling or the grass clippings being directly cast into the IRL, canals, and other waterways. Using the available information, this provides an order of magnitude estimate of the potential benefits of a grass clippings campaign for the IRL.

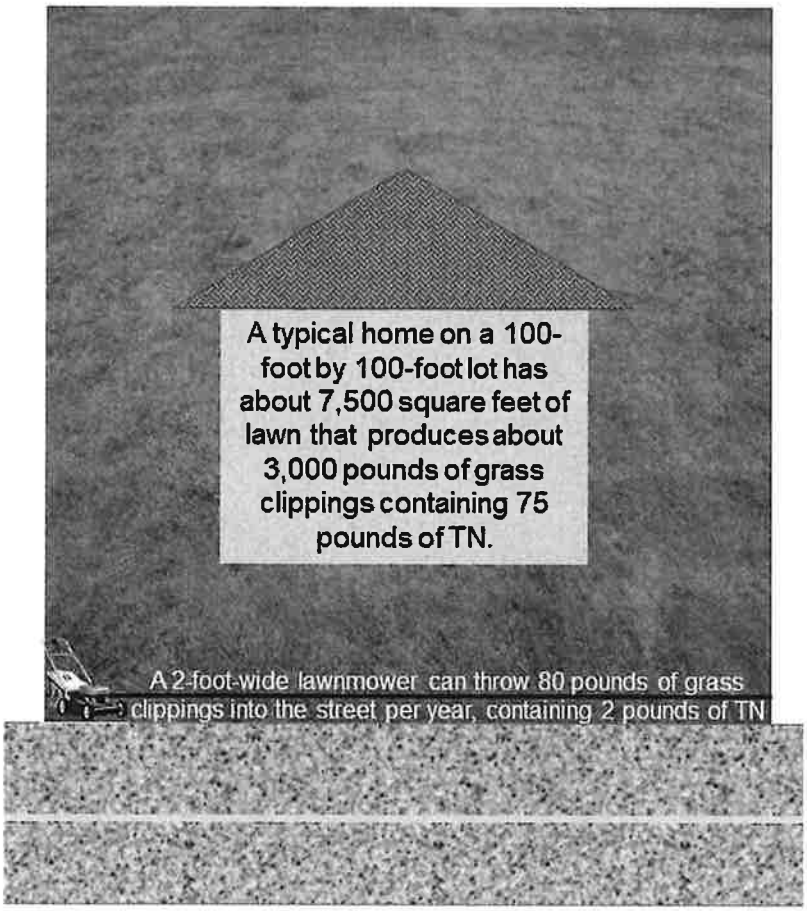


Figure 4-1: Grass Clippings Example for a Typical Lot

Figure 4-1 Long Description

The Marine Resources Council proposed a partnership between the IRL Basin counties to pursue a grass clippings campaign similar to the Alachua County campaign. The Citizen Oversight Committee recommended contributing $20,000 in Year 1 of the plan towards the research and marketing to develop the campaign. This was followed by an annual investment of $20,000 per year for Years 2 through 10 for media and promotional materials targeting Brevard County. Therefore, the total project cost is $200,000. **Table 4-4** summarizes the costs and benefits of implementing the grass clippings campaign.

Table 4-4: Project for Grass Clippings Campaign

Year Added	Project Number	Project Name	Responsible Entity	Sub-lagoon	Total Nitrogen Reduction (pounds per year)	Total Nitrogen Cost per Pound per Year	Total Phosphorus Reduction (pounds per year)	Total Phosphorus Cost per Pound per Year	Plan Funding
2018	58b	Grass Clippings Campaign+	Brevard County	All	17,800	$11	1,200	$167	$200,000

Note: The projects highlighted in tan and marked with a plus sign were added to the plan as part of an annual update.

Market research needed to guide development of a grass clipping campaign was contracted through the Marine Resources Council to a community-based social marketing firm, Uppercase Inc. Survey results from 2018 are reported in **Section 4.4.3**.

Excess Irrigation
Fertilizer nutrients are more susceptible to leaching if turfgrass is overwatered, carrying nutrients beyond the reach of the turf roots. During excess watering, soluble nutrients, such as highly mobile nitrate, wash through the soil from the root zone too quickly. Excess irrigation is easy to accomplish in Florida's sandy soils as these soils typically hold no more than 0.75 inches of water per foot of soil depth (Hochmuth et al., 2016). This excess irrigation is part of the baseflow contributing nutrient loading to the IRL.

From June 2015 to May 2016, 470,737 pounds of TN in fertilizer were sold within Brevard County. Florida Department of Agriculture and Consumer Services Urban Turf Fertilizer Rule (RE-1.003[2], Florida Administrative Code) does not specify a percentage of slow-released nitrogen in fertilizer or separately track slow-release nitrogen from all nitrogen sources. However, if it is assumed that 50% of fertilizer was soluble nitrogen (compliant with local fertilizer ordinances), then the total soluble nitrogen sold in Brevard County could be as high as 235,368 pounds per year. If 13% of soluble nitrogen were leached, up to 30,597 pounds per year of TN could potentially enter the groundwater. If, like South Florida survey respondents, 50% of irrigation users in Brevard County are not over-irrigating and if an outreach campaign can impact half of those who do over-irrigate, fertilizer leaching could be reduced by 7,649 pounds per year of TN. As noted above, the environmental attenuation/uptake for urban fertilizer is 80% for nitrogen (Florida Department of Environmental Protection, 2017). Therefore, the total amount of TN that could be reduced by reducing excess irrigation is 1,530 pounds per year.

Conducting an outreach campaign with an initial $50,000 social marketing research and development investment and $25,000 in annual implementation, the total 10-year budget would be $300,000. This results in an average of $196 per pound of TN reduced per year (see **Table 4-5**). Funding for this education campaign is not recommended at this time.

Table 4-5: Estimated TN Reductions and Costs from Reducing Excess Irrigation

Project	Cost	Estimated Total Nitrogen Reductions (pounds per year)	Cost per Pound per Year of Total Nitrogen Removed
Irrigation Education	$300,000	1,530	$196

Stormwater Pond Maintenance
Wet detention ponds, also known as stormwater ponds, are one method used to remove nutrients from stormwater as mandated by Florida Statutes 403.0891. Retention/detention time of water in the pond accommodates the removal of accumulated nutrients by allowing material to settle and be absorbed. By itself, an optimally sized and properly maintained stormwater pond typically provides a 35–40% removal of nitrogen and 65% removal of phosphorus through settling (Florida Department of Environmental Protection and Water Management Districts, 2010). Additional behaviors and technologies can be combined with ponds to increase removal rates. On the other hand, poor pond maintenance practices can decrease nutrient removal rates or worse yet, release nutrients to downstream waterbodies.

A stormwater pond maintenance program would initially focus on vegetative buffers and their appropriate maintenance to reduce stormwater pollution. Brevard County contains 4,175 stormwater ponds covering 13,276 acres with 6,976,338 linear feet of shoreline. The average size of a pond is 3.2 acres with 1,671 linear feet of shoreline. These numbers include ponds

affiliated with both residential and commercial areas. The average load to stormwater ponds is 11.4 pounds of TN per acre of land surrounding the pond annually according to the Florida Department of Environmental Protection's Spreadsheet Tool for Estimating Pollutant Loads. Assuming that a 50-foot perimeter directly impacts the pond, there are 8,008 acres contributing 91,288 pounds of TN annually to the ponds. Of this, up to 40% of the TN is removed through retention in the pond leaving a potential 54,773 pounds per year of TN to enter the lagoon. For TP, approximately 18,836 pounds per year is entering the stormwater pond. Of this, up to 65% of the TP is removed through retention in the pond leaving a potential of 6,593 pounds per year TP to enter the lagoon.

Creating a 10-foot-wide low-maintenance buffer zone of un-mowed ornamental grasses has the potential to remove about 25% of the TN and TP entering the pond (United States Environmental Protection Agency, 2005). This amount increases with the width of the buffer and the addition of woody vegetation. For the plan calculations, the assumption was made that convincing homeowners to not mow a 10-foot buffer is the easiest practice to achieve. The pond will remove up to 40% of the remaining TN. Assuming that the education campaign can reach at least half of the 48% of people unaware of what stormwater is, the reduction could be 3,286 pounds per year of TN and 396 pounds per year of TP.

Conducting an outreach campaign with an initial $50,000 social marketing research and development investment plus $25,000 in annual implementation, would require a 10-year total budget of $300,000. This would result in reductions at $91 per pound of TN and $750 per pound of TP (see **Table 4-6**). Additionally, during focus group research in the first year, it may be possible to identify other best management practices that homeowners' associations are willing to adopt that would further improve the performance of their stormwater pond. This would improve the cost effectiveness of this campaign. Funding for this education campaign is not recommended at this time.

Table 4-6: Estimated TN and TP Reductions and Costs from Stormwater Best Management Practice Maintenance

Project	Cost	Estimated Total Nitrogen Reductions (pounds per year)	Cost per Pound Per Year of Total Nitrogen Removed	Estimated Total Phosphorus Reductions (pounds per year)	Cost per Pound per Year of Total Phosphorus Removed
Stormwater Best Management Practice Maintenance Education	$300,000	3,300	$91	400	$750

Septic Systems and Sewer Laterals Maintenance

Nationwide, 10–20% of septic systems are failing from overuse, improper maintenance, unsuitable drainfield conditions, and high-water tables. When septic systems are older and failing or are installed over poor soils close to the groundwater table or open water, they can be a major contributor of nutrients and bacterial and viral pathogens to the system (De and Toor, 2017; United States Environmental Protection Agency, 2002).

A properly functioning septic tank and drainfield system reduces TN by 30–40%. However, the reduction has been measured at 0–20% in adverse conditions. The best available studies estimate a 10% reduction in nitrogen within a properly maintained tank versus an improperly maintained tank. The remaining 20–30% of nitrogen removal occurs in a properly functioning drainfield (Anderson 2006). If 15% of systems are failing and failing systems attenuate 30% less of the nitrogen load, these systems may pose far greater impacts to the groundwater, tributaries, and lagoon than the average impact reported for properly functioning systems.

Without the 30% reduction, the potential load to the IRL and its tributaries is estimated to be 27.2 pounds per year of TN for properties within 55 yards (instead of 19 pounds per year of TN for functioning systems), 5.2 pounds per year of TN for properties between 55 and 219 yards away (instead of 3.6 pounds per year of TN for functioning systems), and 1.1 pounds per year of TN for properties more than 219 yards away (instead of 0.8 pounds per year of TN for functioning systems).

There are an estimated 53,204 septic systems in Brevard County within the IRL Basin. As noted in **Section 4.1.6**, the total loading of septic systems within 55 yards of the IRL and its tributaries is calculated at 299,590 pounds per year of TN, the total loading of systems between 55 and 219 yards is 86,575 pounds per year of TN, and the total loading of septic systems further than 219 yards is 10,805 pounds per year of TN. If the failure rate in Brevard County is about 15%, and if failing systems receive 30% less attenuation, then failing systems within 55 yards of open water are contributing 13,481 pounds per year of TN, failing systems between 55 and 219 yards of open water are contributing 3,896 pounds per year of TN, and failing tanks further than 219 yards are contributing 486 pounds per year of TN. By factoring in this failure rate, the total additional loading to the IRL from failing septic systems is approximately 17,863 pounds per year of TN.

A 10-year outreach campaign budget of $300,000, which includes $50,000 for research and campaign development and $25,000 per year for implementation to improve septic system maintenance, reduce excess use, and prevent harmful additives, would strive to reduce the number of failing systems countywide by 25%, thereby reducing the excess loading from failing systems by 4,466 pounds per year of TN. This would result in average cost of $67 per pound of TN (see **Table 4-7**).

Table 4-7: Project for Septic System Maintenance Program

Year Added	Project Number	Project Name	Responsible Entity	Sub-lagoon	Total Nitrogen Reduction (pounds per year)	Total Nitrogen Cost per Pound per Year	Total Phosphorus Reduction (pounds per year)	Total Phosphorus Cost per Pound per Year	Plan Funding
2018	58c	Septic System Maintenance Education+	Brevard County	All	4,466	$67	Not applicable	Not applicable	$300,000

Note: The projects highlighted in tan and marked with a plus sign were added to the plan as part of an annual update.

Market research needed to guide development of a septic maintenance campaign was contracted with state grant funding through the Marine Resources Council to the University of Central Florida. Survey results from 2018 are reported in **Section 4.4.3**. In reaching out to citizens to participate in the survey, it was found that many people are unsure of whether they are on central sewer or a septic system. When developing the septic system maintenance education program, Brevard County will identify opportunities to educate people who are on central sewer about proper maintenance of their sewer laterals. Adding this education component to the septic system maintenance education campaign is not anticipated to require additional funding.

Lagoon Loyal Program

Using funding from the fertilizer education and septic system maintenance education programs, the marketing company MTN Advertising was contracted to create an outreach campaign to engage Brevard citizens in IRL restoration efforts. The Lagoon Loyal campaign uses an incentive program to motivate positive actions that benefit the IRL (website). Citizens can create

an online Lagoon Loyal profile that keeps track of participation in suggested activities that benefit the lagoon and then provides rewards. Completing each activity earns points, which can accumulate and be redeemed for discounts to local area businesses.

Lagoon Loyal businesses providing discounts are given display materials that indicate their support for the lagoon and their participation in the program. These display materials also advertise the program to their customers. Citizens who complete Lagoon Loyal actions receive coupons that encourage them to patronize Lagoon Loyal businesses, providing a positive feedback loop for local citizens and businesses. Combined with social media marketing and traditional media advertising, the program uses the slogan "Let's Be Clear…" to share easy actions that citizens can take to reduce their contribution to lagoon pollution. Message selection is guided by focus groups and survey responses from citizens who either care for a yard or maintain a septic system.

The Lagoon Loyal program has also developed and distributed outreach materials targeted for greatest impact with the public. Fertilizer ordinance signs, educating the public on proper use of fertilizer, were distributed to all fertilizer retail locations in Brevard County. These signs must remain posted anywhere fertilizer is sold. A pilot program is underway with stickers marking ordinance compliant fertilizer bags to help direct the public in making the right choice when purchasing fertilizer.

For the septic system outreach program, a best management practices magnet was created and provided to septic contractors to distribute to clients when making service calls. An educational flyer on septic system best management practices, which also encourages septic system inspections during home purchases, was created to be distributed by realtors and title agencies to buyers of homes with septic systems. The Lagoon Loyal Program website also maintains landing pages to help interested homeowners find links to the applications for septic system upgrade and removal grants available to eligible locations.

Oyster Gardening Program

Much of the IRL system in Brevard County no longer has a sufficient oyster population to allow for natural recruitment of oysters to suitable substrate (Futch, 1967). Therefore, to create the oyster bars, the oysters must be grown and then carefully placed on appropriate substrate in the selected locations. To help grow the oyster population, in fiscal year 2013–2014, the Board of County Commissioners approved $150,000 to launch the Oyster Gardening Program. This program is a citizen-based oyster propagation program where juvenile oysters are raised under lagoon-front homeowners' docks for about six months before being used to populate constructed oyster bar sites. Oyster Gardening participants receive spat-on-shell oysters plus all supplies needed to care for their oysters. The Oyster Gardening Program is executed in partnership with the Brevard Zoo. The project continued during fiscal year 2014–2015 with funding from the state and has continued since with annual County funding.

In 2020, the Citizen Oversight Committee approved $300,000 from the Save Our Indian River Lagoon Tax to fund two years of the Oyster Gardening Program through September 2021 (**Table 4-8**).

Table 4-8: Project for Oyster Gardening Program

Year Added	Project Number	Project Name	Responsible Entity	Sub-lagoon	Total Nitrogen Reduction (pounds per year)	Total Nitrogen Cost per Pound per Year	Total Phosphorus Reduction (pounds per year)	Total Phosphorus Cost per Pound per Year	Plan Funding
2020	193	Oyster Gardening Program+	Brevard County	All	Not applicable	Not applicable	Not applicable	Not applicable	$300,000
2022	227	Restore Our Shores: Community Collaborative+	Brevard County and Brevard Zoo	All	Not applicable	Not applicable	Not applicable	Not applicable	$1,000,000

Note: The projects highlighted in tan and marked with a plus sign were added to the plan as part of an annual update.

As the IRL restoration needs continue to grow, the Oyster Gardening Program is poised to help meet the need for additional resources. Through independent grants, Brevard Zoo Restore Our Shores has begun participating in seagrass and clam restoration efforts. The Oyster Gardening Program has diversified to connect waterfront homeowners with other community members to tend oyster habitats and grow *Mercenaria mercenaria* clams to repopulate the lagoon. Clams are important filter feeders that can live within seagrass meadows directly benefiting the habitat through local water quality improvements (Wall et al., 2008). Brevard Zoo also plans to pilot "community gardens" where residents can participate in restoration activities on public property, such as tending clam cover nets during the first year of growth.

There has been increasing need for seagrass restoration and, as water quality conditions in the lagoon become suitable, it will be necessary to raise seagrass to plant in the lagoon. The establishment of seagrass nurseries can provide opportunities for the public to engage in seagrass grow-out. The existing network of community participants in the Oyster Gardening Program will be invaluable to support these additional restoration efforts.

4.1.2 Wastewater Treatment Facility Upgrades

> *88% of reclaimed water in the County is used in public access areas and for landscape irrigation.*

The direct wastewater treatment facility discharges to the Indian River Lagoon (IRL) have been largely removed, and the majority of facilities in the basin use the treated effluent for reclaimed water irrigation. While the use of reclaimed water for irrigation is an excellent approach to conserving potable water, if the reclaimed water is high in nutrient concentrations, the application of the reclaimed water for irrigation can result in nutrients leaching into the groundwater. It is important to note that there are no regulations on the concentration of nutrients in reclaimed water that is used for irrigation. However, University of Florida-Institute of Food and Agricultural Sciences studies indicate that a nitrogen concentration of 5 to 9 milligrams per liter is optimal for turfgrass growth, and each year a maximum amount of 1 pound of nitrogen can be applied per 1,000 square feet of turf (University of Florida-Institute of Food and Agricultural Sciences, 2013a and 2013b). Nitrogen leaching increases significantly when irrigation is greater than 2 centimeters per week (0.75 inches per week), even if the nitrogen concentrations are half of the maximum Institute of Food and Agricultural Sciences recommendation of 9 milligrams per liter.

In Brevard County (County), 88% of the reclaimed water is used in public access areas and for landscape irrigation. The total reclaimed water used countywide is approximately 18.5 million

gallons per day, which is applied over 7,340 acres. The unincorporated County and city wastewater treatment facilities with the reclaimed water flows, total nitrogen (TN) concentrations based on permit data and loads in pounds per year are shown in **Table 4-9**. This table also summarizes the excess TN in the reclaimed water after environmental attenuation/uptake (75% for TN [Florida Department of Environmental Protection, 2017]), for both the current TN effluent concentration and if the facility were upgraded to achieve a TN effluent concentration of 6 milligrams per liter (the City of Palm Bay Water Reclamation Facility update will achieve a TN effluent concentration of 7.5 milligrams per liter and the City of Melbourne Grant Street Wastewater Treatment Facility will achieve a TN effluent concentration of 5 milligrams per liter).

Table 4-9: TN Concentrations in Wastewater Treatment Facility Reclaimed Water

Facility	Permitted Capacity (million gallons per day)	Reclaimed Water Flow (million gallons per day)	Total Nitrogen Concentration (milligrams per liter)	Total Nitrogen After Attenuation (pounds per year)	Total Nitrogen After Attenuation and Upgrade (pounds per year)
City of Palm Bay Water Reclamation Facility	4.0	1.20	29.4	27,305	6,966
City of Melbourne Grant Street	5.5	2.08	21.0	33,806	8,049
City of Titusville Osprey	2.75	1.67	12.7	16,415	7,755
Brevard County Port St. John	0.5	0.35	12.6	3,413	1,625
Cape Canaveral Air Force Station	0.8	0.80	11.9	7,368	3,714
City of West Melbourne Ray Bullard Water Reclamation Facility	2.5	0.85	11.1	7,302	3,947
Brevard County Barefoot Bay Water Reclamation Facility	0.9	0.48	10.3	3,826	2,229
Brevard County South Beaches	8.0	1.12	9.3	8,061	5,201
Brevard County North Regional	0.9	0.26	8.9	1,791	1,207
Rockledge Wastewater Treatment Facility	4.5	1.40	7.0	7,584	6,501
Brevard County South Central Regional	5.5	3.79	6.7	19,653	17,600
City of Titusville Blue Heron	4.0	0.84	4.8	4,993	Not applicable
City of Cape Canaveral Water Reclamation Facility	1.8	0.88	3.8	4,141	Not applicable
City of Cocoa Jerry Sellers Water Reclamation Facility	4.5	1.44	3.5	6,241	Not applicable
Brevard County Sykes Creek	6.0	1.48	3.4	3,895	Not applicable
City of Cocoa Beach Water Reclamation Facility	6.0	3.66	2.5	11,331	Not applicable

Based on a 2007 study by United States Environmental Protection Agency, the cost to upgrade wastewater treatment facilities to meet advanced wastewater treatment standards is approximately $4,200,000 per plant. This cost is in 2006 dollars, which, when inflated to 2016 dollars and costs are included for design and permitting, is approximately $6,000,000 per facility. Where cost estimates were available for facility upgrades, these costs were used instead of the inflated estimated costs. Due to the high cost per pound of TN and total phosphorus (TP) removed to upgrade some of these facilities compared to other projects in this plan, only those facilities in **Table 4-10** are recommended for upgrades as part of this plan. This table also includes the wastewater treatment facility upgrade projects submitted as part of an annual update to the plan. As part of the public education and outreach efforts, customers who use reclaimed water for irrigation should be informed of the nutrient content in the reuse water because they can and should eliminate or reduce the amount of fertilizer added to their lawn and landscaping. This information can be provided to the customers through their utility bill.

Table 4-10: Projects for Wastewater Treatment Facility Upgrades to Improve Reclaimed Water

Year Added	Project Number	Project Name	Responsible Entity	Sub-lagoon	Total Nitrogen Reduction (pounds per year)	Cost per Pound per Year of Total Nitrogen Removed	Total Phosphorus Reduction (pounds per year)	Cost per Pound per Year of Total Phosphorus Removed	Plan Funding
Original	2016-17	City of Palm Bay Water Reclamation Facility*	City of Palm Bay	Central IRL	20,240	$180	102	$35,656	$3,636,900
Original	2016-02a	City of Titusville Osprey Wastewater Treatment Facility*	City of Titusville	North IRL	8,660	$1,016	Not applicable	Not applicable	$8,800,000
2018	59	Grant Street Water Reclamation Facility Nutrient Removal Improvements+	City of Melbourne	Central IRL	18,052	$375	9,671	$700	$6,769,500
2019	99	Cocoa Beach Water Reclamation Facility Upgrade+	City of Cocoa Beach	Banana	2,520	$375	685	$1,380	$945,000
2020	2016-2b	City of Titusville Osprey Nutrient Removal Upgrade Phase 2+	City of Titusville	North IRL	3,626	$83	Not applicable	Not applicable	$300,000
2020	138	Ray Bullard Water Reclamation Facility Biological Nutrient Removal Upgrade+	City of West Melbourne	Central IRL	11,360	$375	3,302	$1,290	$4,260,000
2022	216	City of Rockledge Flow Equalization Basin Project+	City of Rockledge	North IRL	5,365	$383	Not applicable	Not applicable	$2,054,795
-	-	***Total***	-	-	***69,823***	***$383 (average)***	***13,760***	***$1,945 (average)***	***$26,766,195***

Note: The projects highlighted in green and marked with an asterisk were identified in the original plan. The projects highlighted in tan and marked with a plus sign were added to the plan as part of an annual update.

4.1.3 Sprayfield and Rapid Infiltration Basin Upgrades

Another opportunity to reduce the nutrient loading from the wastewater treatment facilities is to upgrade the disposal locations, either sprayfields or rapid infiltration basins, for the treated effluent. The sprayfields and rapid infiltration basins could be modified to include biosorption activated media to provide additional nutrient removal. Examples of biosorption activated media include mixes of soil, sawdust, zeolites, tire crumb, vegetation, sulfur, and spodosols (Wanielista et al., 2011). Based on a pilot project in the City of DeLand, the potential removal of adding biosorption activated media to a sprayfield or rapid infiltration basin is 83% for total nitrogen (TN) and 66% for total phosphorus (TP) (City of DeLand and University of Central Florida, 2018). The loads for the facilities in Brevard County that dispose of reclaimed water to a sprayfield or rapid infiltration basin were estimated based on permit and discharge monitoring report information (where available). Attenuation rates used were based on Florida Department of Environmental Protection (2017) estimates of 60% for sprayfields and 25% for rapid infiltration basins. Then the biosorption activated media efficiency rate was applied to determine the TN that could be removed. Costs were estimated for each upgrade and the upgrades that could be made for the least cost per pound of TN are recommended for pilot project funding as part of this plan (see **Table 4-11** and **Table 4-12**). Information on nutrient concentrations or the size of the sprayfield/rapid infiltration basin were missing from several facilities. As this information is gathered, additional upgrades may be found to be cost-effective.

Table 4-11: Projects for Sprayfield or Rapid Infiltration Basin Upgrades for Public Facilities

Year Added	Project Number	Project Name	Responsible Entity	Sub-lagoon	Total Nitrogen Reduction (pounds per year)	Total Nitrogen Cost per Pound per Year	Total Phosphorus Reduction (pounds per year)	Total Phosphorus Cost per Pound per Year	Plan Funding
2017	6	Long Point Park Upgrade+	Brevard County Parks Department	Central IRL	163	$625	Not applicable	Not applicable	$101,854
-	-	***Total***	-	-	***163***	***$625***	***Not applicable***	***Not applicable***	***$101,854***

Note: The projects highlighted in tan and marked with a plus sign were added to the plan as part of an annual update.

Table 4-12: Projects for Sprayfield or Rapid Infiltration Basin Upgrades for Private Facilities

Year Added	Project Number	Project Name	Responsible Entity	Sub-lagoon	Total Nitrogen Reduction (pounds per year)	Total Nitrogen Cost per Pound per Year	Total Phosphorus Reduction (pounds per year)	Total Phosphorus Cost per Pound per Year	Plan Funding
2022	196	Sterling House Condominium Sprayfield+^	Brevard County	Central IRL	154	$390	To be determined	To be determined	$60,000
-	-	***Total***	-	-	***154***	***$390***	***To be determined***	***To be determined***	***$60,000***

Note: The projects highlighted in tan and marked with a plus sign were added to the plan as part of an annual update.
^ This is the most cost-effective location that is not likely to become eligible to connect to sewer in the near future.

4.1.4 Package Plant Connections

Package plants are miniature wastewater treatment facilities that serve small communities producing more than 2,000 gallons of effluent per day. The most common package plant treatment methods are extended aeration, sequencing batch reactors, and oxidation ditches; the

same biological treatment methods used in larger wastewater treatment plants. The smallest package plants often use the same technology as advanced septic systems. Following this treatment, the effluent is disposed of in rapid infiltration basins (ponds), sprayfields, or drainfields (United States Environmental Protection Agency, 2000).

Most package plants were removed in the 1990s following the Indian River Lagoon System and Basin Act of 1990. However, opportunities still exist to address some of the worst remaining package plants by upgrading the existing plant, adding nutrient scrubbing technology, or preferably connecting them to central sewer where the wastewater will receive further treatment and disposal far from the lagoon. A few of these package plants are located along the Indian River Lagoon (IRL) and, therefore, pose a substantial nutrient risk due to their effluent concentration and disposal methods. **Table 4-13** lists the estimated total nitrogen (TN) reductions and costs to connect the package plants to the sewer system. The estimated TN load from each package plant accounts for attenuation rates that were based on Florida Department of Environmental Protection (2017) estimates of 60% for sprayfields and 25% for rapid infiltration basins.

Table 4-13: Projects for Package Plant Connection

Year Added	Project Number	Project Name	Responsible Entity	Sub-lagoon	Total Nitrogen Reduction (pounds per year)	Total Nitrogen Cost per Pound per Year	Total Phosphorus Reduction (pounds per year)	Total Phosphorus Cost per Pound per Year	Plan Funding
2022	202	Merritt Island Utility Company+	Brevard County	North IRL	1,367	$987	To be determined	To be determined	$1,349,445
2022	228	Indian River Shores Trailer Park+	Brevard County	Central IRL	450	$1,175	To be determined	To be determined	$528,627
2021	192	Oak Point Wastewater Treatment Facility Improvements+	Oak Point Mobile Home Park	North IRL	186	$1,500	0	Not applicable	$279,000
-	-	***Total***	-	-	***2,003***	***$1,077 (average)***	***To be determined***	***To be determined***	***$2,157,072***

Note: The projects highlighted in tan and marked with a plus sign were added to the plan as part of an annual update.

4.1.5 Sewer Laterals Rehabilitation

Sewage overflows following heavy rainfall events are an indicator of illegal connections or inadequate sewer asset conditions. There are three major components of wastewater flow in a sanitary sewer system: (1) base sanitary (or wastewater) flow, (2) groundwater infiltration, and (3) rainfall inflow. Virtually every sewer system has some infiltration and/or inflow. Historically, small amounts of infiltration and/or inflow are expected and tolerated. However, infiltration and/or inflow becomes excessive when it causes overflows, health, and/or environmental risks. There have been recurring overflows from the South Beaches Wastewater Treatment Facility sewer system, including significant overflows following Hurricane Matthew in 2016 and Hurricane Irma in 2017. Less frequent overflows and line breaks have occurred in other sewer service areas.

In 2012, in recognition of aging infrastructure and increasingly frequent issues, the Brevard County (County) Utility Services Department engaged seven professional engineering firms to perform independent field evaluations of the condition of the sewage infrastructure assets located in each of the County's seven independent sewer service areas. The output of this

investigation was identification of $134 million in specific capital improvement needs required over a ten-year period to bring County-owned sewer system assets up to a fully-functional, reliable, affordable, efficient, and maintainable condition (Brevard County Utility Services, 2013). The field evaluation results and corresponding 10-year Capital Improvement Program Plan were presented to the Brevard County Commission in 2013. In response, the Commission approved financing the entire Capital Improvement Program Plan and increased the County's sewer service rates to repay the debt. Plan implementation began in 2014 and projects are progressing quickly.

Because there was already a capital improvement plan and funding mechanism for updating the County's aging sewer system infrastructure, the original Save Our Indian River Lagoon Project Plan did not include analysis or funding for sewer system repairs. Unfortunately, even in areas where capital improvements have been made, infiltration and/or inflow continues to be a problem that contributes to overflows that discharge untreated wastewater into the Indian River Lagoon (IRL). This indicates the probability of problems outside the County-owned assets and could include illegal connections and/or leaks in the privately owned lateral connections of homes and businesses to the County sewer system.

Identifying problems on the customer side of the connection required smoke testing each building or private residence to determine if leaks or illegal connections are present. The extent of infiltration and/or inflow on the customer side of the connections is unknown and, therefore, the nutrient loading associated with these issues are also unknown. As a first step to determine the extent of infiltration and/or inflow problems with the sewer laterals, the County partnered with the City of Satellite Beach on a pilot project to perform smoke testing of more than 12,000 buildings and residences within the area of concern in March through July of 2018. Smoke testing results are included in **Section 4.4.3**.

Repair of privately-owned portions of the sewer system is not funded in the County's adopted Capital Improvement Program Plan for the Wastewater Utility; therefore, consideration has been given to the use of the Save Our Indian River Lagoon Tax funding. The Brevard County Utility Services Department estimates that infiltration and/or inflow due to rainfall and flooding associated with Hurricane Irma, caused 1,835 pounds per year of total nitrogen (TN) and 350 pounds per year of total phosphorus (TP) to enter the lagoon from sewer overflowing from the South Beaches Regional Wastewater Treatment Facility sewer system. Staff reviewed 13 years of storm-related release data (2004–2017) to estimate the average annual nutrient load to the lagoon from emergency sewage overflows. If repairing private connections could prevent similar overflows in the future, then the average annual nitrogen reduction benefit of such repairs would be approximately 988 pounds per year of TN. The average cost effectiveness of sewer expansion projects funded in the 2017 Plan Supplement was $852 per pound of nitrogen removed, thus the cost to reduce 988 pounds per year of TN loading by implementing septic-to-sewer projects would be $841,842. Therefore, the 2018 Update allocated $840,000 to assist property owners with the cost to repair leaky sewer connections expected to be found through smoke testing.

After smoke testing was complete, based on the leaks identified, the cost to make the repairs in the pilot area was estimated at $646,200. A second pilot area for smoke testing was added in 2019 and three more areas were added in 2020; however, funds were not added to assist owners with making repairs in these areas. Instead, the Citizen Oversight Committee and Brevard County Board of County Commissioners decided in 2020 to make the $840,000 of funding available to offer grants county-wide for the repair of leaky laterals within the watershed of the IRL. **Table 4-14** summarizes the sewer laterals rehabilitation projects. It should be noted

that smoke testing alone does not result in nutrient load reductions; identified issues must be repaired to achieve a nutrient load reduction benefit. Therefore, the funding for this type of project is focused on repairs to achieve reductions.

The Save Our Indian River Lagoon Trust Fund will also be used to conduct performance monitoring to measure the nutrient reduction benefits of repairing privately-owned leaky lateral connections. In addition to documenting less groundwater leaking into pipes and overwhelming the sewer infrastructure, monitoring will also seek to document improvement in groundwater quality that may occur when the leaks are repaired. The results of performance monitoring will be used to consider expansion of this program from the Satellite Beach pilot areas to other city and county sewer service areas. The lessons learned from this pilot study and a pilot study in Titusville (added in the 2019 Update) will be applied to future sewer lateral evaluation and repair projects.

Table 4-14: Projects for Sewer Laterals Rehabilitation

Year Added	Project Number	Project Name	Responsible Entity	Sub-lagoon	Total Nitrogen Reduction (pounds per year)	Cost per Pound per year of Total Nitrogen Removed	Total Phosphorus Reduction (pounds per year)	Cost per Pound per Year of Total Phosphorus Removed	Plan Funding
2018, 2021	63ab	Satellite Beach Lateral Smoke Testing and Countywide Repair/Replacement+	Brevard County	Banana	988	$850	188	$4,468	$840,000
2019	100	Osprey Basin Lateral Smoke Testing+	City of Titusville	North IRL	640	Not applicable	Not applicable	Not applicable	$200,000
2020	114	Barefoot Bay Lateral Smoke Testing+	Brevard County Utility Services Department	Central IRL	864	Not applicable	Not applicable	Not applicable	$90,000
2020	115	South Beaches Lateral Smoke Testing+	Brevard County Utility Services Department	Central IRL	1,662	Not applicable	Not applicable	Not applicable	$200,000
2020	116	Merritt Island Lateral Smoke Testing+	Brevard County Utility Services Department	North IRL	2,042	Not applicable	Not applicable	Not applicable	$250,000
-	-	***Total***	-	-	***6,196***	***$1,230 (average)***	***188***	***$8,404 (average)***	***$1,580,000***

Note: The projects highlighted in tan and marked with a plus sign were added to the plan as part of an annual update.

4.1.6 Septic System Removal and Upgrades

Septic systems are commonly used where central sewer does not exist. When properly sited, designed, constructed, maintained, and operated, septic systems are often a safe means of disposing of domestic waste but still add nutrients to the system. However, when septic systems are older and failing or are installed over poor soils close to the groundwater table or open water, they can be a major contributor of nutrients and bacterial and viral pathogens to the Indian River Lagoon (IRL) system. To address this source, options for both septic system removal and septic system upgrades were evaluated. It is important to note that although Brevard County (County) is taking the lead on these projects, the Florida Department of Health is responsible for the regulation and permitting of septic systems. The County will coordinate with Florida Department of Health on the septic system projects recommended in this plan.

Septic System Removal by Sewer Extension

In 2018, Brevard County conducted a more detailed evaluation of septic system impacts to surface waters through both groundwater monitoring and modeling using the Florida Department of Environmental Protection-approved ArcGIS-Based Nitrate Load Estimation Toolkit (Rios et al., 2013). This evaluation found that groundwater conductance and soil types were more important for nitrogen transport from septic systems than was previously accounted for in the approach used for ranking in the original Save Our Indian River Lagoon Plan. Therefore, for the 2019 Update, the approach to prioritize areas for septic system connection to the sewer system was modified. The updated approach and recommended projects are summarized below.

The updated approach to rank areas for septic system impacts used information on the potential nutrient contribution from the ArcGIS-Based Nitrate Load Estimation Toolkit (Rios et al., 2013). Potential nutrient contributions were determined based on numerous factors, but after testing model sensitivity to these factors, a simplified approach was developed for Brevard County that was based primarily on the spatial location of the septic system (i.e. Barrier Island, Merritt Island, Mainland, or Melbourne Tillman Water Control District), soil type (soil hydraulic conductance), and the minimum distance to waterbodies (Applied Ecology, 2018).

A direct comparison between the previous model that adapted studies from Martin and St. Lucie counties (**Table 4-15**) and the new model tailored to Brevard County's soil and water (**Table 4-16**) is difficult. For loading in pounds per year, the previous study estimated total nitrogen (TN), which is the sum of nitrate, nitrite, ammonia, and organic nitrogen, whereas the new approach using the ArcGIS-Based Nitrate Load Estimation Toolkit estimated only nitrate and ammonia. Through the detailed ArcGIS-Based Nitrate Load Estimation Toolkit analysis it was also determined that there are 6,260 fewer septic systems in the IRL Basin than estimated in the original plan.

Table 4-15: Original Estimate of TN Loading and Cost to Connect for Septic Systems

Septic System Distance from Surface Water (yards)	Number of Septic Systems	Total Nitrogen Load Per System (pounds per year)	Total Nitrogen Load (pounds per year)	Cost per System to Connect	Total Cost	Cost per Pound per Year of Total Nitrogen
0–55	15,090	27.095	408,863	$20,000	$301,800,000	$738
55–219	25,987	6.865	178,395	$20,000	$519,740,000	$2,913
Greater than 219	18,361	0.001	10	$20,000	$367,220,000	$37,624,010
Total	***59,438***	***9.880 (average)***	***587,268***	***$20,000***	***$1,188,760,000***	***$2,024 (average)***

Table 4-16: Updated Estimate of TN Loading based on ArcGIS-Based Nitrate Load Estimation Toolkit and Updated Cost to Connect for Septic Systems

Septic System Distance from IRL (yards)	Number of Septic Systems	Total Nitrogen Load per System (pounds per year)	Total Nitrogen Load (pounds per year)	2022 Cost per System to Connect	Total Cost	Cost per Pound per Year of Total Nitrogen
0–55	2,632	31.574	83,103	$48,277	$127,065,064	$1,529
55–219	2,531	13.529	34,244	$48,277	$122,189,087	$3,568
Greater than 219	48,015	5.823	279,624	$48,277	$2,318,020,155	$8,291
Total	***53,178***	***Not applicable***	***396,971***	***$48,277***	***$2,567,274,306***	***$6,467 (average)***

Those septic systems within 55 yards of surface waters were further analyzed by soil hydraulic conductivity since it was found to be a highly influential variable in nutrient loading from septic systems. Hydraulic conductance is the ability of water to move through pore space in the soil with sandy soils having a higher conductance compared to loamy and clay soils. As shown in **Table 4-17**, nitrogen loading is much higher in the very high and high conductivity soils compared to the average for all soils within 55 yards. Although only half of the septic systems are in very high and high conductance soils, these account for 76% of the nitrogen loading.

Table 4-17: Septic Systems by Soil Hydraulic Conductance Class within 55 Yards of IRL

Hydraulic Conductivity of Septic Systems Within 55 Yards of IRL	Number of Septic Systems	Total Nitrogen Load per System (pounds per year)	Total Nitrogen Load (pounds per year)	Cost per System to Connect	Total Cost	Cost per Pound per Year of Total Nitrogen
Very High	705	40.333	28,435	$48,277	$34,035,285	$1,197
High	1,243	35.647	44,309	$48,277	$60,008,311	$1,354
Medium	669	15.292	10,230	$48,277	$32,297,313	$3,157
Low	14	7.975	111	$48,277	$675,878	$6,054
Very Low	1	10.664	9,683	$48,277	$48,277	$4,527
Total	***2,632***	***Not applicable***	***92,768***	***$48,277***	***$127,016,787***	***$1,369 (average)***

Table 4-18 shows those properties with septic systems in very high and high hydraulic conductance soils distributed by distance to surface waterbodies. Waterfront properties served by septic systems, including those properties adjacent to the lagoon, tributary rivers and creeks, or on canals or drainage ditches that discharge to the lagoon contribute 48% of all septic system loading in the IRL watershed in Brevard County. Changes in the 2019 Update shifted septic-to-sewer and septic upgrade projects as much as feasible to areas of high conductivity soils located adjacent to waterways that contribute the greatest loading to the IRL.

Table 4-18: Septic Systems in Very High and High Hydraulic Conductance Soils Distributed by Distance to Surface Waters

Septic System Distance from Surface Water (yards)	Number of Septic Systems	Total Nitrogen Load per System (pounds per year)	Total Nitrogen Load (pounds per year)	Cost per System to Connect	Total Cost	Cost per Pound per Year of Total Nitrogen
0–11	5,584	33.838	188,956	$48,277	$269,578,768	$1,427
11–22	1,207	16.404	19,799	$48,277	$58,270,339	$2,943
22–33	465	17.466	8,121	$48,277	$22,448,805	$2,764
33–44	384	12.458	4,784	$48,277	$18,538,368	$3,875
44–55	563	15.456	8,702	$48,277	$27,179,951	$3,124
Total	***8,203***	***28.083***	***230,362***	***$48,277***	***$396,016,231***	***$1,719 (average)***

For the funded opportunities that were identified using the new ranking method, the number of lots that could be connected, associated cost of the connection, and estimated TN reductions are shown in **Table 4-19**. **Figure 4-10** through **Figure 4-14** show the location of each of these areas. These funded opportunities, including the quick connection projects described below, represent the connection of approximately 4% of the septic systems in Brevard County within the IRL Basin but reduce over 17% of the nutrient load contribution attributed to existing septic systems in Brevard.

Another opportunity for removing septic systems is to use a hybrid septic tank effluent pumping system. In this system, effluent from the septic tank is connected to sewer pressure lines. Small-diameter pipes, which can be installed relatively quickly, are used instead of the gravity sewer system. A high pressure ½ horse power pump (115 volt) pumps the effluent from the septic system to a force main or gravity sewer system. The City of Vero Beach is installing these systems and they are leaving the drainfields in place, which saves money and allows for a backup in the event that a power outage affects the septic tank effluent pumping system. If the drainfield is not left in place, a 500-gallon pump chamber is installed to allow enough reserve capacity to address power outages. Each septic tank effluent pumping system also has an emergency generator receptacle to address long-term power outages associated with hurricanes. The estimated cost per connection is $6,000 to $10,000, which includes the cost of the pipes. The City of Vero Beach maintains the septic tank effluent pumping system and pumps out the septic tank when needed. The customer pays the electrical costs to operate the pump for this system.

For highly ranked properties located within the vicinity of a pressure line or gravity sewer system, the septic tank effluent pumping system may be a good option instead of the septic system upgrades described below. If septic tank effluent pumping systems are selected as a preferred option anywhere in Brevard County, specific locations for septic tank effluent pumping system installation can be submitted for funding consideration through the annual project funding request and plan update process.

Table 4-19: Projects for Septic System Removal

Year Added	Project Number	Project Name	Responsible Entity	Sub-lagoon	Total Nitrogen Reduction (pounds per year)	Total Nitrogen Cost per Pound per Year	Total Phosphorus Reduction (pounds per year)	Total Phosphorus Cost per Pound per Year	Plan Funding
Original	2016-47	Sykes Creek - Zone N*	Brevard County	Banana	2,784	$1,500	Not applicable	Not applicable	$4,176,000
Original	2016-48	Sykes Creek - Zone M*	Brevard County	Banana	1,798	$1,500	Not applicable	Not applicable	$2,697,000
Original	2016-49	Sykes Creek - Zone T*	Brevard County	Banana	3,360	$1,500	Not applicable	Not applicable	$5,040,000
Original	2016-30	City of Rockledge*	City of Rockledge	North IRL	712	$703	Not applicable	Not applicable	$500,580
Original	2016-31/32	City of Cocoa – Zones J and K*	City of Cocoa	North IRL	3,748	$1,500	Not applicable	Not applicable	$5,622,000
Original	2016-33	City of Melbourne*	City of Melbourne	North IRL	878	$988	Not applicable	Not applicable	$867,672
Original	2016-35	South Beaches - Zone A*	Brevard County	North IRL	1,306	$1,500	Not applicable	Not applicable	$1,959,000
Original	2016-39	City of Palm Bay – Zone A*	City of Palm Bay	Central IRL	2,136	$1,203	Not applicable	Not applicable	$2,569,644
Original	2016-46	City of Palm Bay – Zone B*	City of Palm Bay	Central IRL	6,809	$1,220	Not applicable	Not applicable	$8,309,628
Original	109	City of Titusville - Zones A-G*	City of Titusville	North IRL	1,563	$769	Not applicable	Not applicable	$1,201,392
Original	203	South Central - Zone A*	Brevard County	North IRL	3,655	$1,500	Not applicable	Not applicable	$5,482,500
2017	1	Breeze Swept Septic-to-Sewer Connection+	City of Rockledge	North IRL	2,002	$440	Not applicable	Not applicable	$880,530
2017	2a	Merritt Island Septic Phase Out Project+	Merritt Island Redevelopment Agency	North IRL	2,501	$128	Not applicable	Not applicable	$320,268
2017	4	Hoag Sewer Conversion+	City of Melbourne	Central IRL	101	$852	Not applicable	Not applicable	$86,031
2017	5	Pennwood Sewer Conversion	City of Melbourne	Central IRL	103	$786	Not applicable	Not applicable	$81,000
2018	60	Sylvan Estates Septic-to-Sewer Conversion+	City of West Melbourne	Central IRL	1,073	$1,455	Not applicable	Not applicable	$1,561,215
2018	61	Riverside Drive Septic-to-Sewer Conversion+	City of Melbourne	North IRL	305	$872	Not applicable	Not applicable	$265,960

Year Added	Project Number	Project Name	Responsible Entity	Sub-lagoon	Total Nitrogen Reduction (pounds per year)	Total Nitrogen Cost per Pound per Year	Total Phosphorus Reduction (pounds per year)	Total Phosphorus Cost per Pound per Year	Plan Funding
2018	62	Roxy Avenue Septic-to-Sewer Conversion+	City of Melbourne	North IRL	102	$872	Not applicable	Not applicable	$88,944
2019	2016-27	Sharpes - Zone A+	Brevard County	North IRL	5,248	$1,500	Not applicable	Not applicable	$7,872,000
2019	2016-29	South Banana - Zone B+	Brevard County	Banana	915	$1,500	Not applicable	Not applicable	$1,372,500
2019	2020-34	South Central - Zone F+	City of Melbourne	North IRL	1,688	$1,008	Not applicable	Not applicable	$1,701,972
2019	2016-36	South Beaches - Zone O+	Brevard County	North IRL	136	$979	Not applicable	Not applicable	$133,488
2019	2016-37	South Beaches - Zone P+	Brevard County	North IRL	242	$1,241	Not applicable	Not applicable	$300,348
2019	2016-38	City of Titusville - Zone H+	City of Titusville	North IRL	910	$1,284	Not applicable	Not applicable	$1,168,020
2019	2016-40	Rockledge - Zone B+	City of Rockledge	North IRL	4,037	$1,323	Not applicable	Not applicable	$5,339,520
2020	2016-28	South Central – Zone D (Melbourne)+	City of Melbourne	North IRL	177	$1,500	Not applicable	Not applicable	$265,500
2020	145	Merritt Island - Zone F+	Brevard County Utility Services Department	Banana	1,292	$851	Not applicable	Not applicable	$1,100,000
2020	50b	South Central - Zone C+	Brevard County Utility Services Department	North IRL	5,146	$1,283	Not applicable	Not applicable	$6,600,000
2020	136	Micco - Zone B+	Brevard County Utility Services Department	Central IRL	8,687	$1,036	Not applicable	Not applicable	$9,000,000
2020	146	Merritt Island - Zone C+	Brevard County Utility Services Department	Banana	1,419	$1,113	Not applicable	Not applicable	$1,580,000
2020	147	Sykes Creek - Zone R+	Brevard County Utility Services Department	Banana	2,925	$1,500	Not applicable	Not applicable	$4,387,500
2020	150	South Central - Zone D+	Brevard County Utility Services Department	North IRL	3,387	$1,410	Not applicable	Not applicable	$4,774,500

Year Added	Project Number	Project Name	Responsible Entity	Sub-lagoon	Total Nitrogen Reduction (pounds per year)	Total Nitrogen Cost per Pound per Year	Total Phosphorus Reduction (pounds per year)	Total Phosphorus Cost per Pound per Year	Plan Funding
2020	148	North Merritt Island - Zone E+	Brevard County Utility Services Department	Banana	2,541	$1,500	Not applicable	Not applicable	$3,811,500
2020	151	Merritt Island - Zone G+	Brevard County Utility Services Department	Banana	11,078	$1,500	Not applicable	Not applicable	$16,617,000
2020	152	Sharpes - Zone B+	Brevard County Utility Services Department	North IRL	2,692	$1,500	Not applicable	Not applicable	$4,038,000
2020	153	Cocoa - Zone C+^	Brevard County Utility Services Department	North IRL	3,499	$1,500	Not applicable	Not applicable	$800,000
2021	3	Micco Sewer Line Extension (Phase I and II)+	Brevard County	Central IRL	1,493	$1,500	Not applicable	Not applicable	$2,239,500
2021	189	Avendia del Rio Septic-to-Sewer+	City of Melbourne	Central IRL	71	$986	Not applicable	Not applicable	$70,000
2021	190	Bowers Septic-to-Sewer+	City of Melbourne	North IRL	120	$1,225	Not applicable	Not applicable	$147,000
2021	191	Kent and Villa Espana Septic-to-Sewer Conversion+	City of Melbourne	North IRL	542	$1,310	Not applicable	Not applicable	$710,000
2022	224	Lake Ashley Circle+	City of West Melbourne	Central IRL	1,136	$1,500	Not applicable	Not applicable	$1,704,000
2022	225	Dundee Circle and Manor Place+	City of West Melbourne	Central IRL	1,499	$1,500	Not applicable	Not applicable	$2,248,500
-	-	***Total***	-	-	***95,816***	***$1,249 (average)***	***Not applicable***	***Not applicable***	***$119,690,212***

Note: The projects highlighted in green and marked with an asterisk were identified in the original plan. The projects highlighted in tan and marked with a plus sign were added to the plan as part of an annual update.

^ The Cocoa – Zone C project is not fully funded at this time. The $800,000 allocated to this project is for design and permitting to prepare the project for construction and make it more competitive for grant funding.

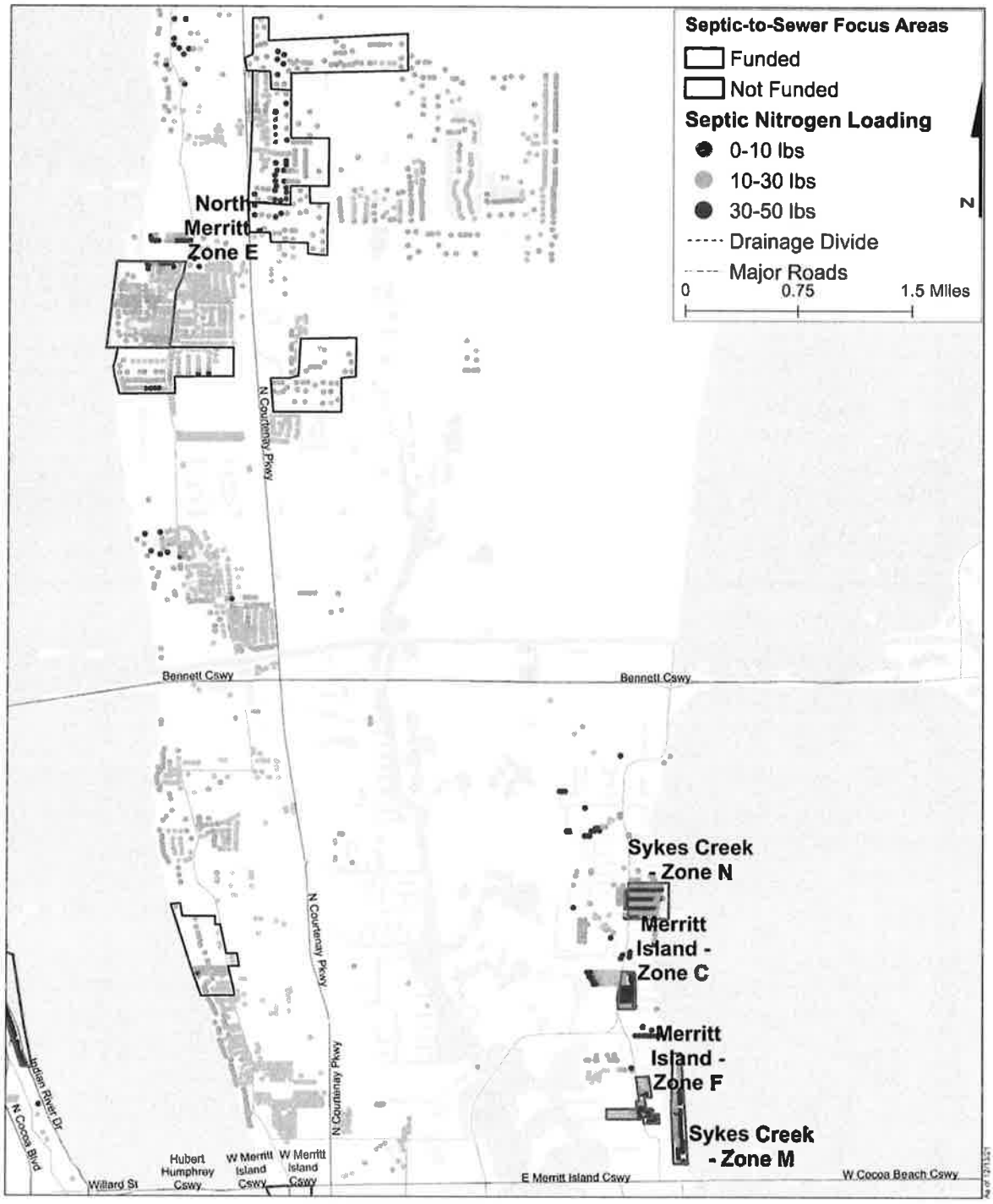


Figure 4-2: Septic System Removal Projects in Banana River Lagoon

Figure 4-2 Long Description

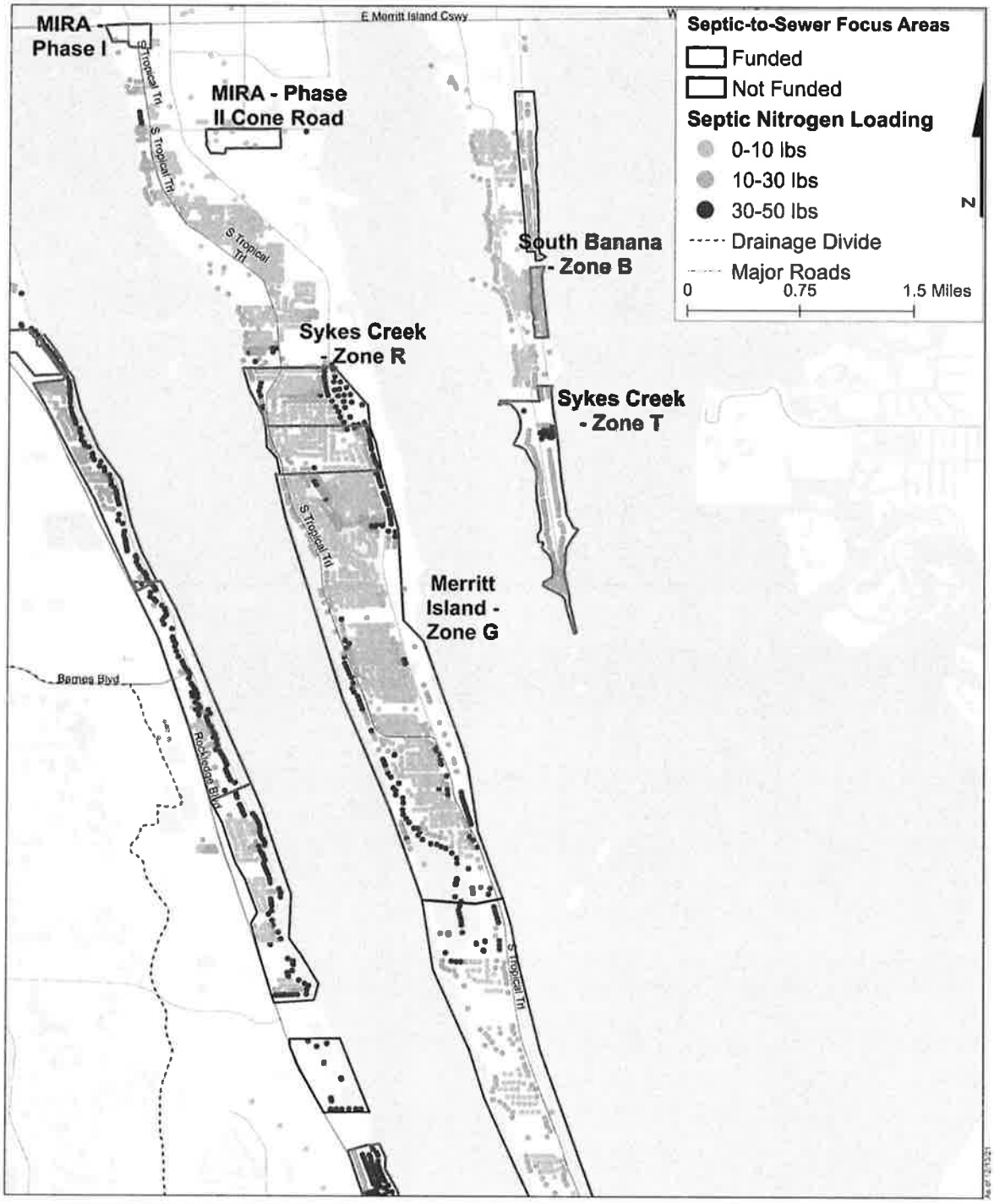


Figure 4-3: Septic System Removal Projects in Banana River Lagoon, continued

Figure 4-3 Long Description

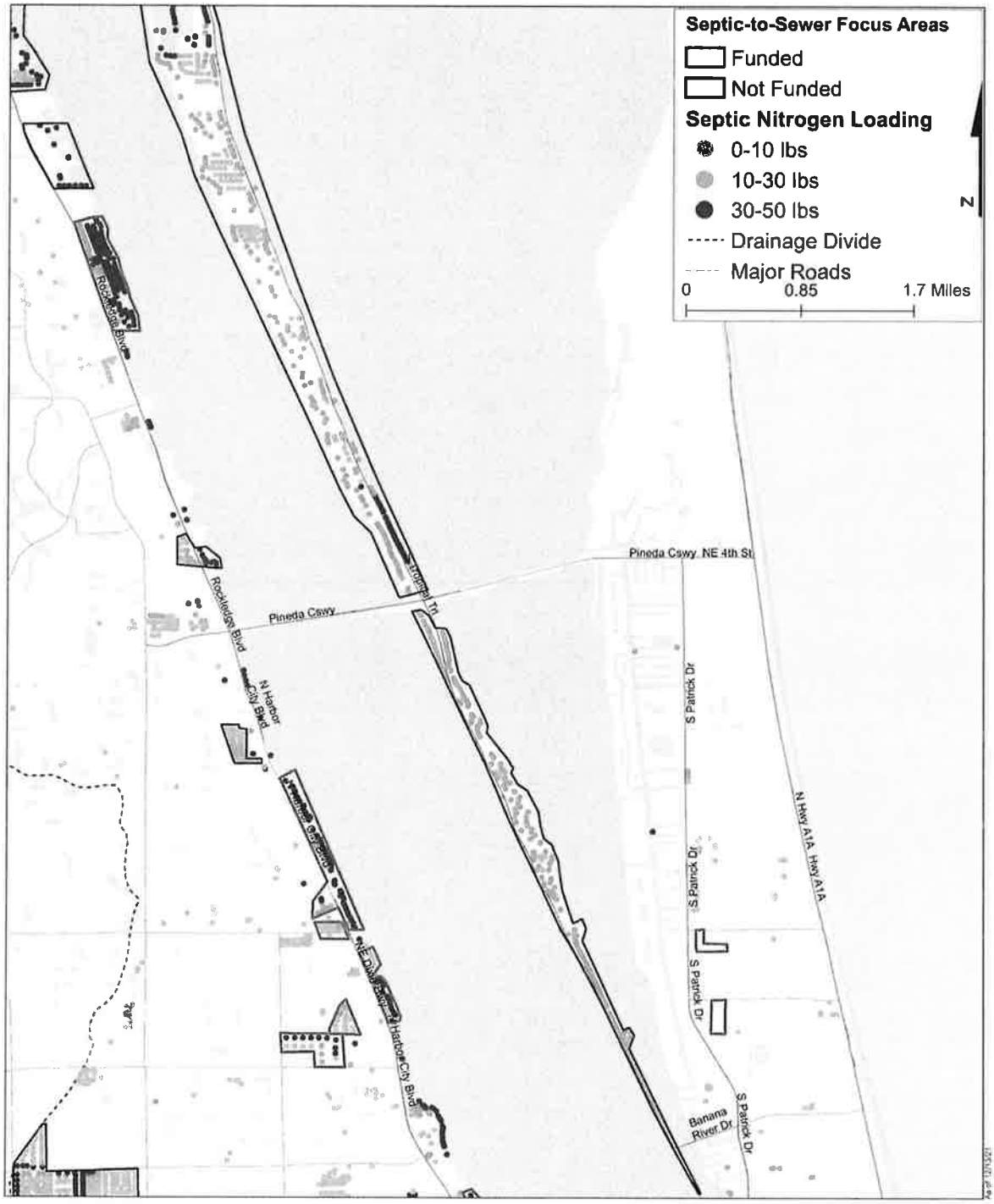


Figure 4-4: Septic System Removal Projects in Banana River Lagoon, continued

Figure 4-4 Long Description

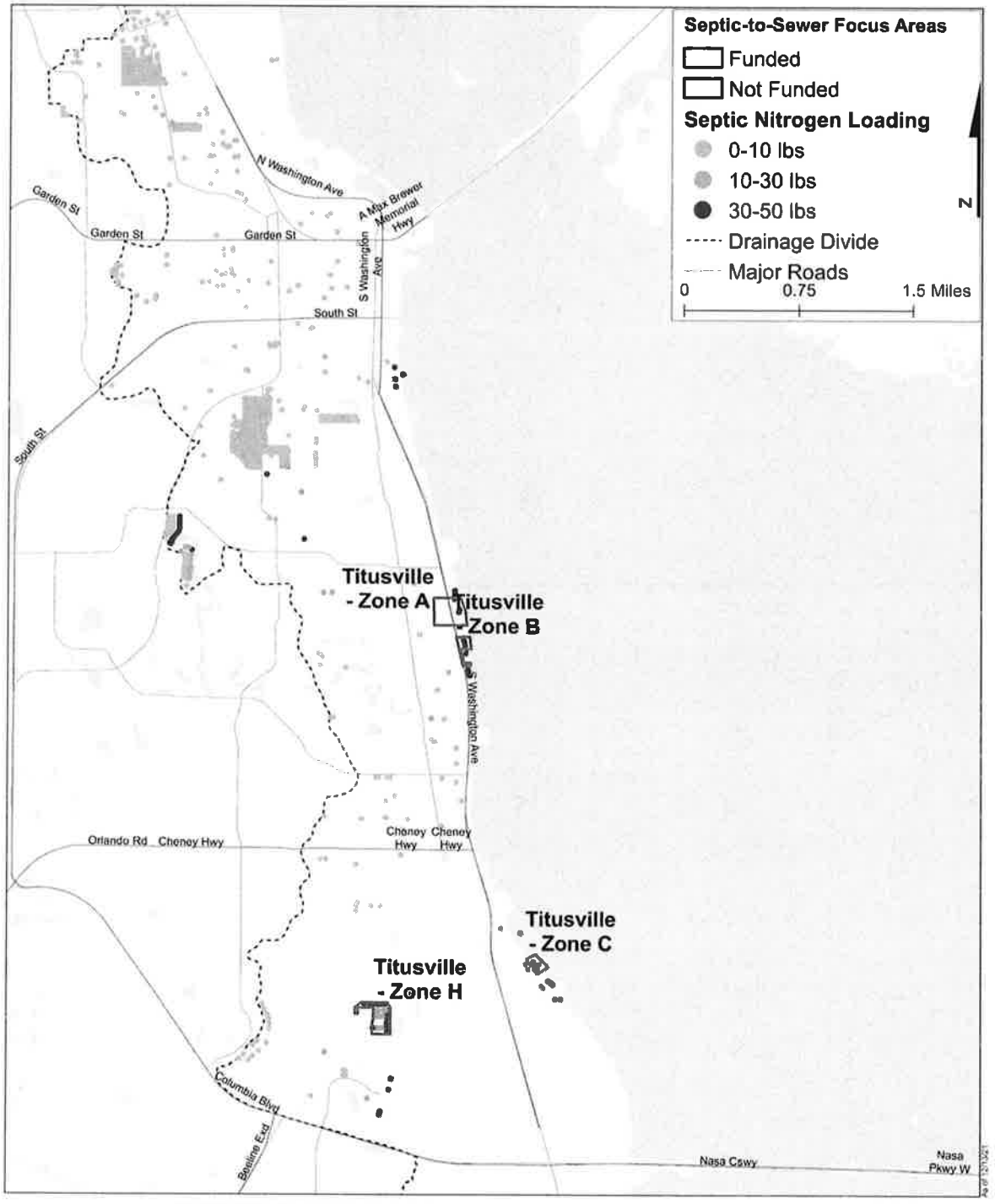


Figure 4-5: Septic System Removal Projects in North IRL

Figure 4-5 Long Description

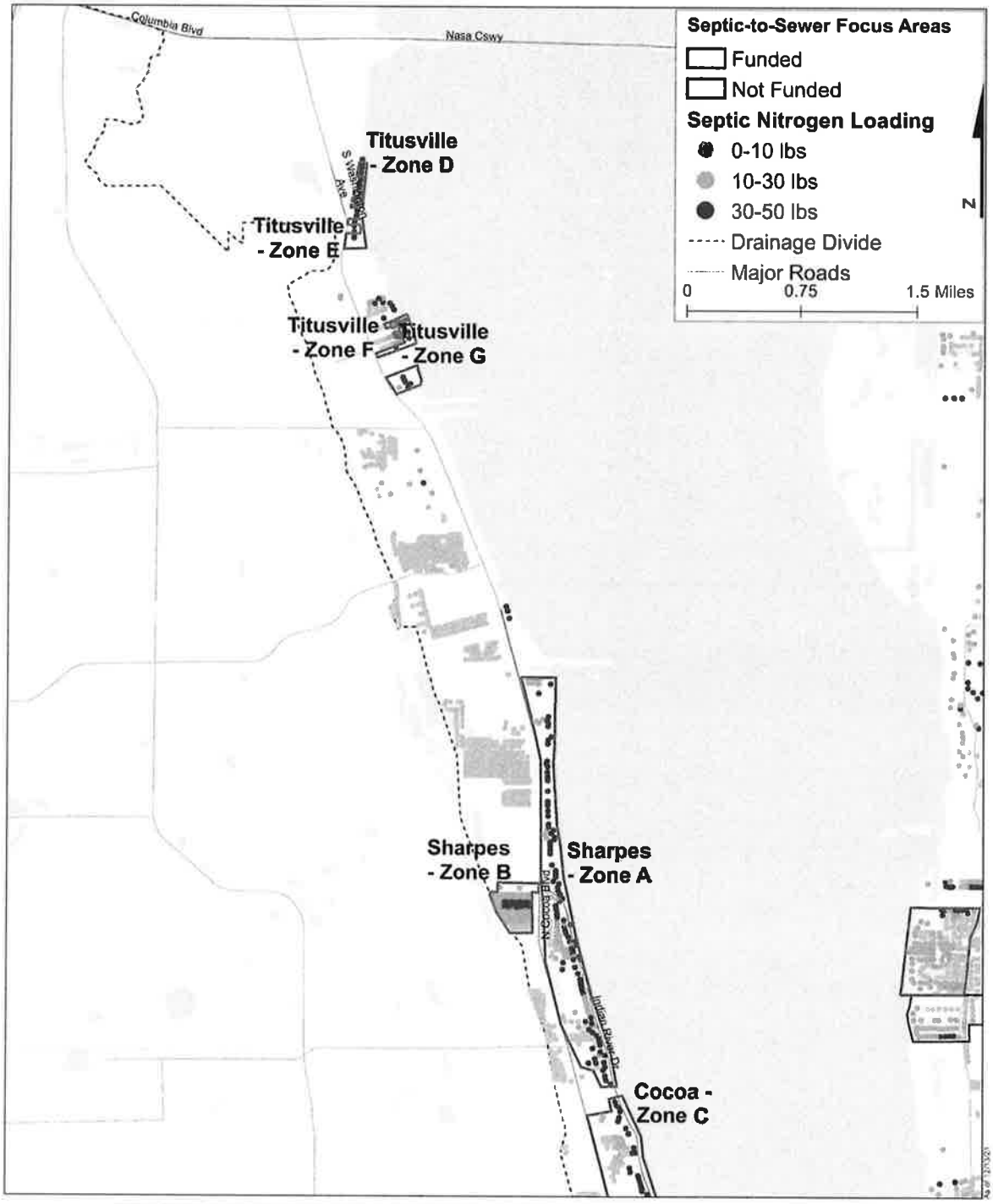


Figure 4-6: Septic System Removal Projects in North IRL, continued

Figure 4-6 Long Description

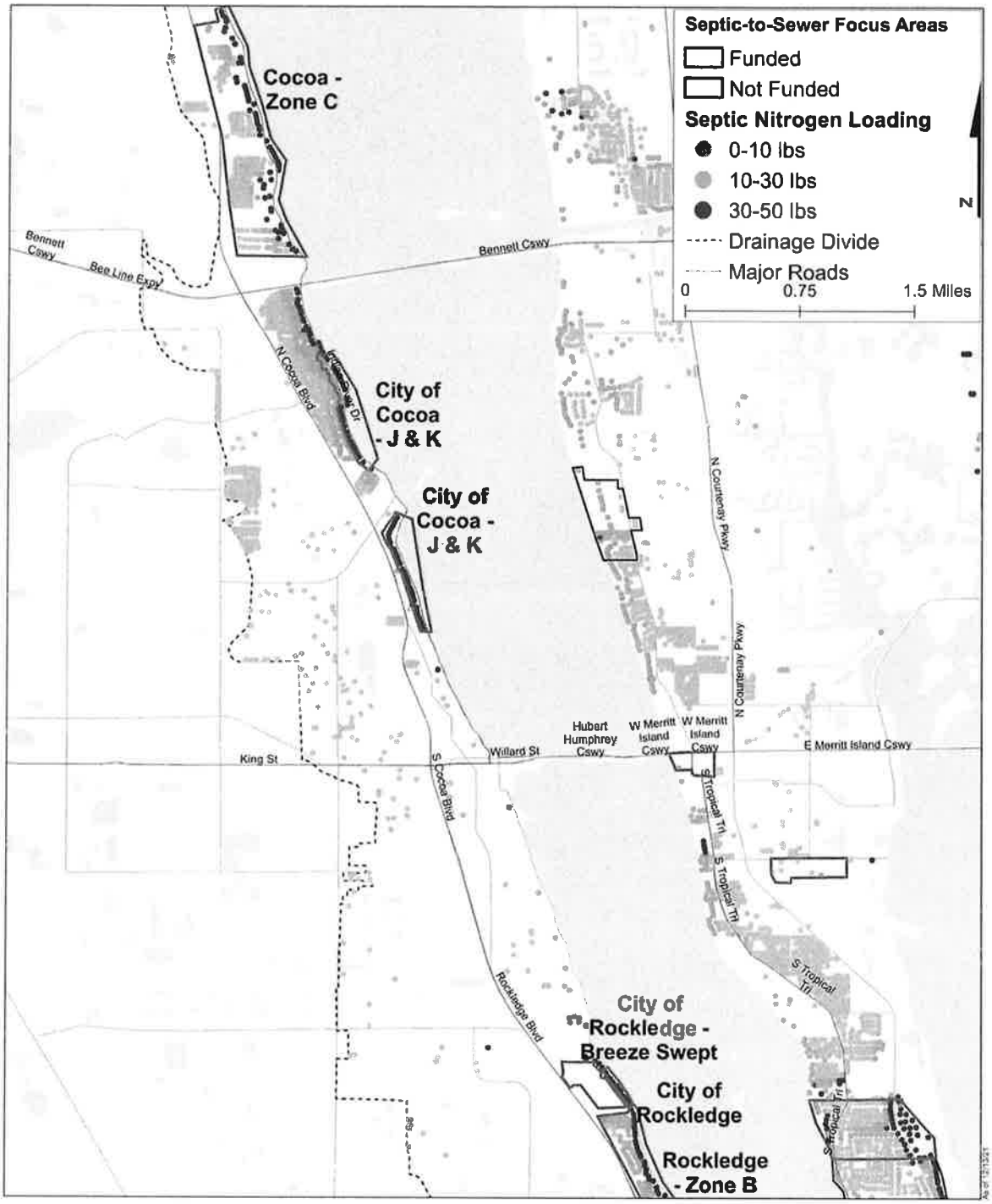


Figure 4-7: Septic System Removal Projects in North IRL, continued

Figure 4-7 Long Description

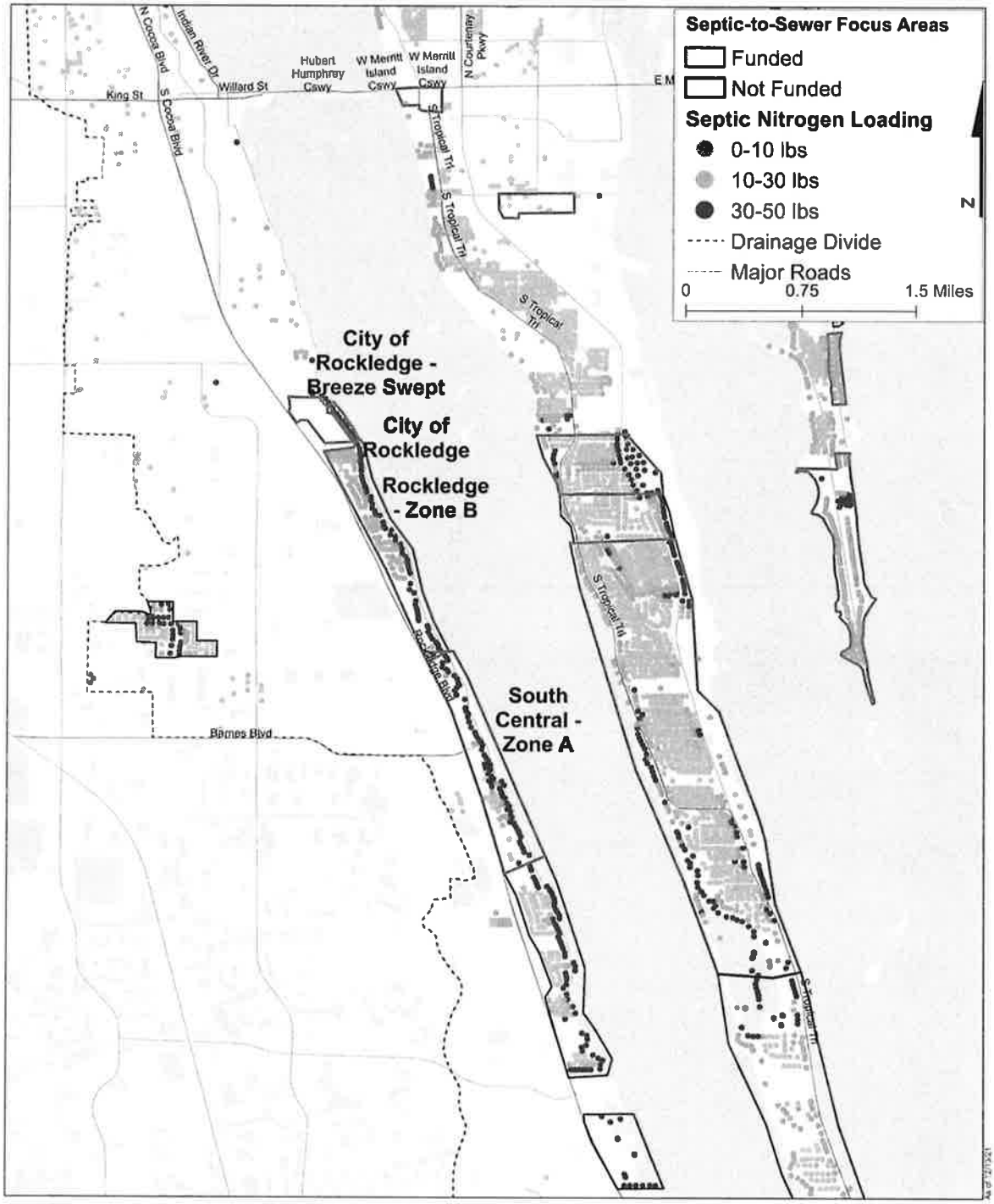


Figure 4-8: Septic System Removal Projects in North IRL, continued

Figure 4-8 Long Description

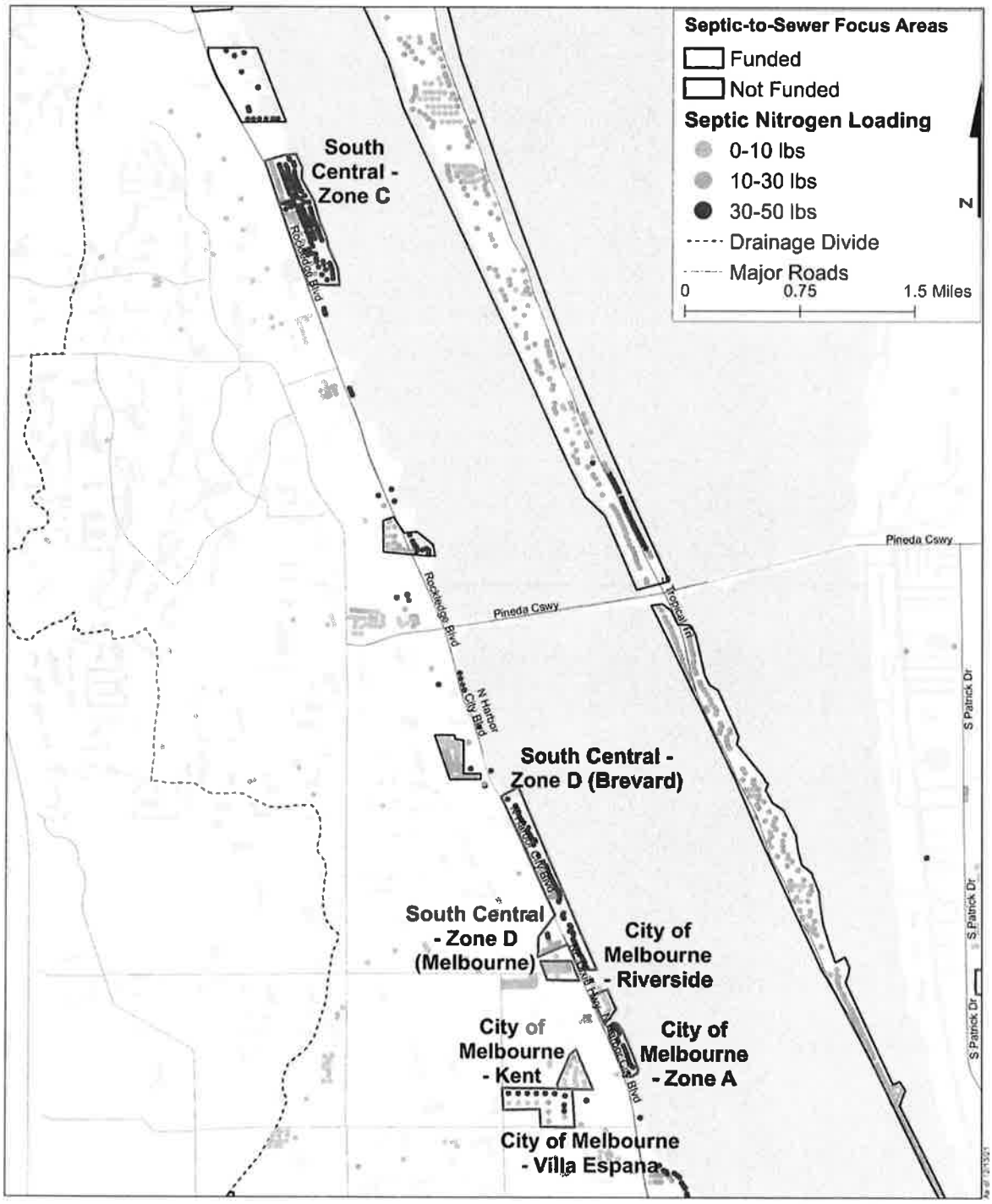


Figure 4-9: Septic System Removal Projects in North IRL, continued

Figure 4-9 Long Description

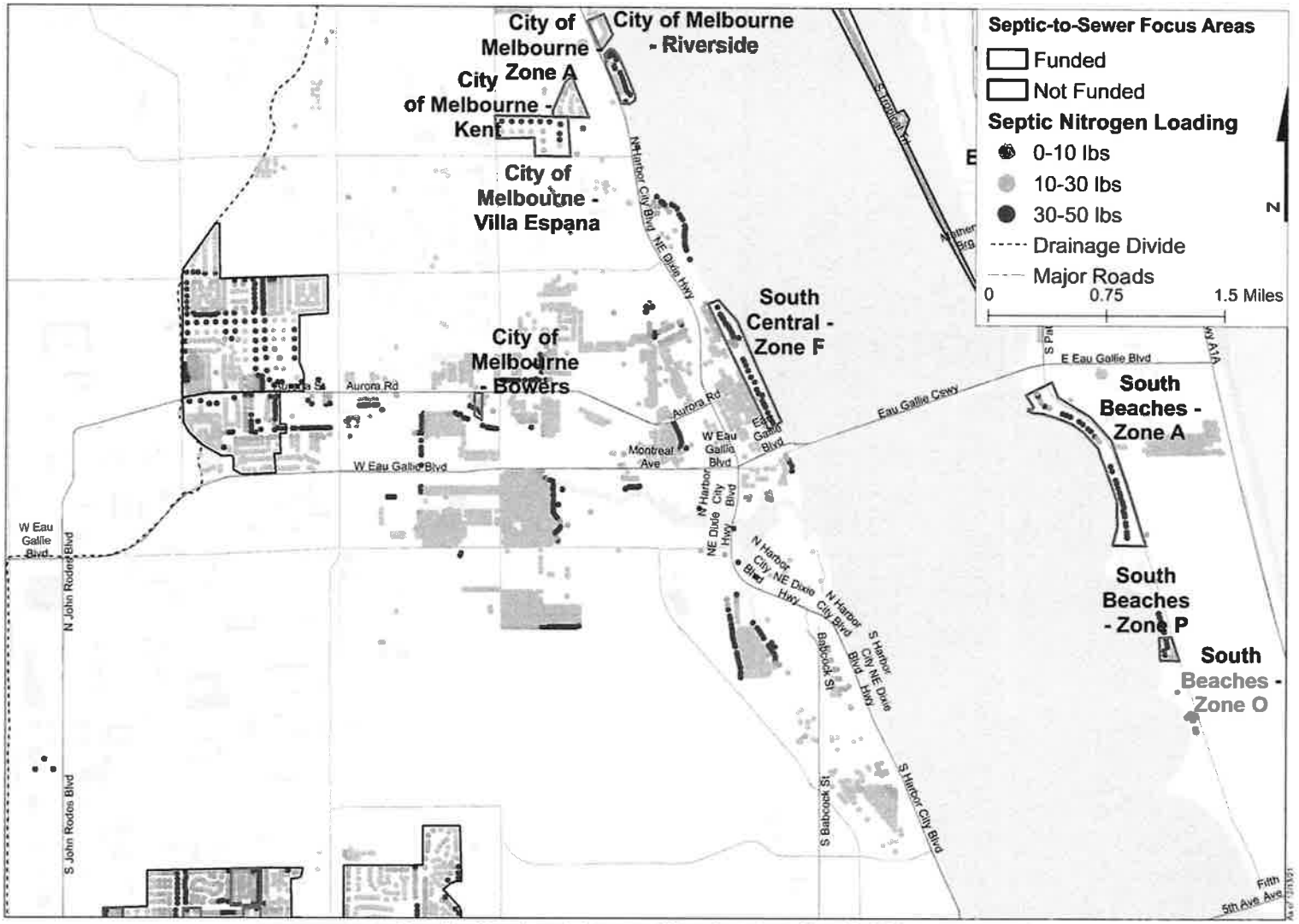


Figure 4-10: Septic System Removal Projects in North IRL, continued

Figure 4-10 Long Description

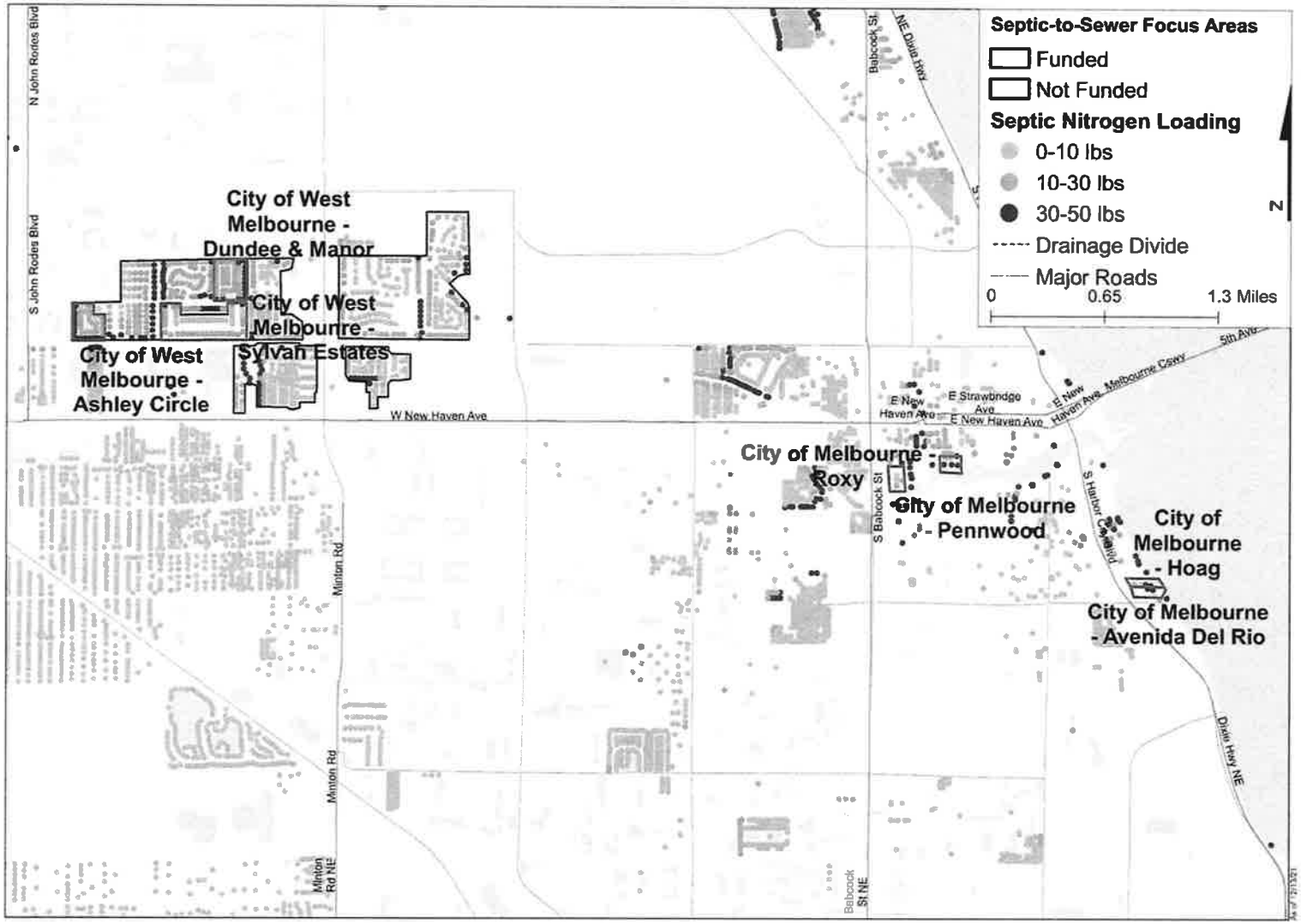


Figure 4-11: Septic System Removal Projects in Central IRL

Figure 4-11 Long Description

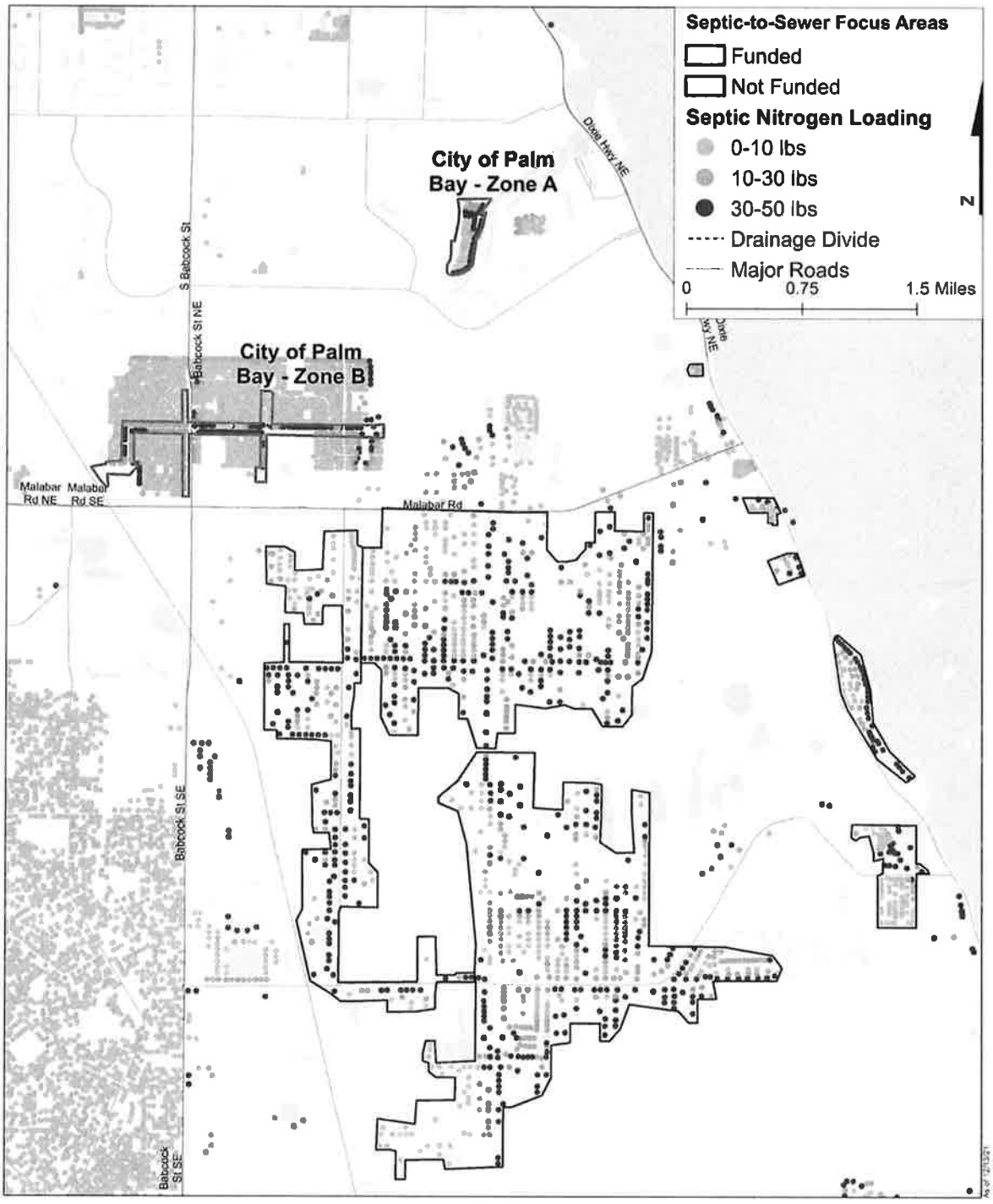


Figure 4-12: Septic System Removal Projects in Central IRL, continued

Figure 4-12 Long Description

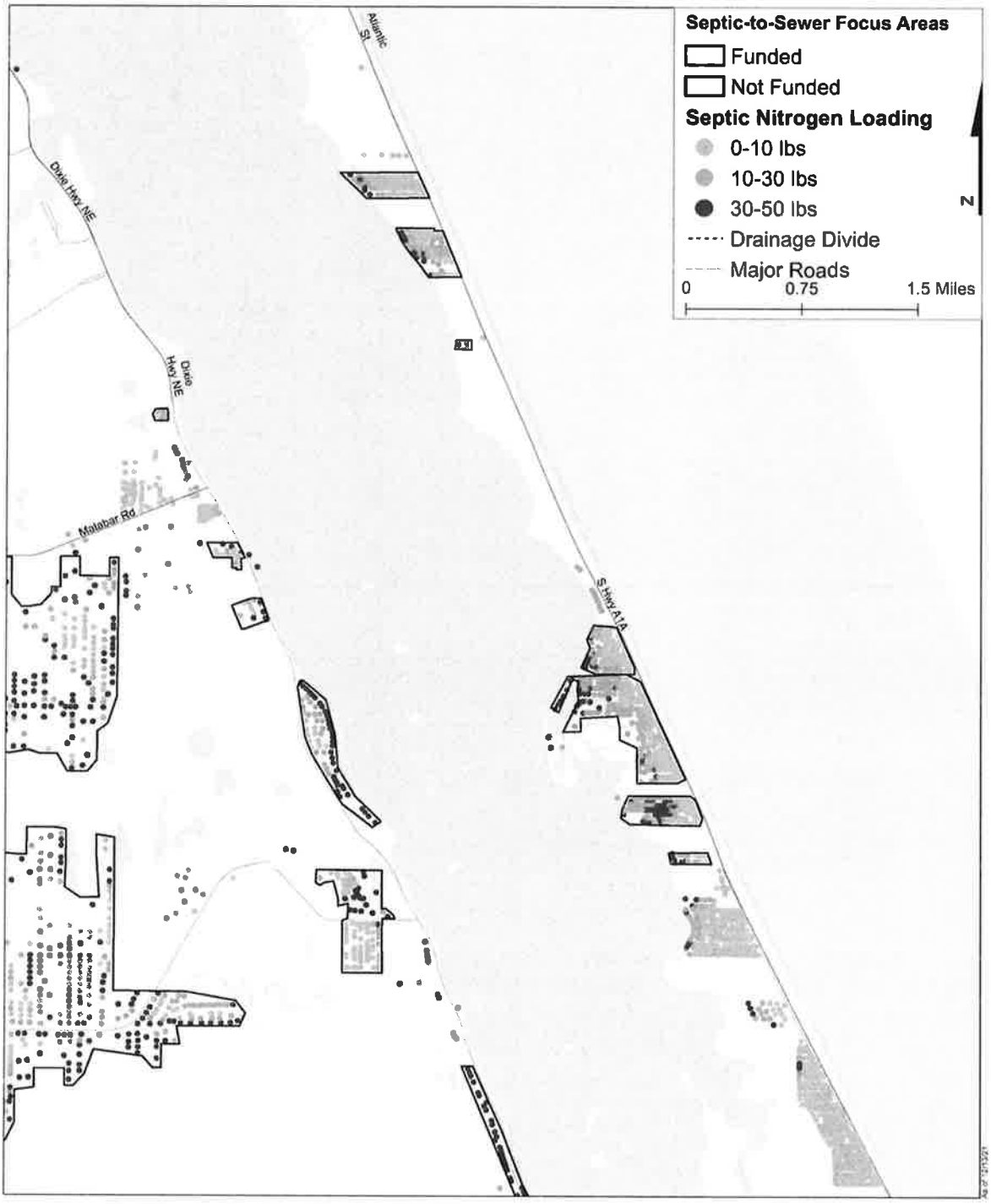


Figure 4-13: Septic System Removal Projects in Central IRL, continued

Figure 4-13 Long Description

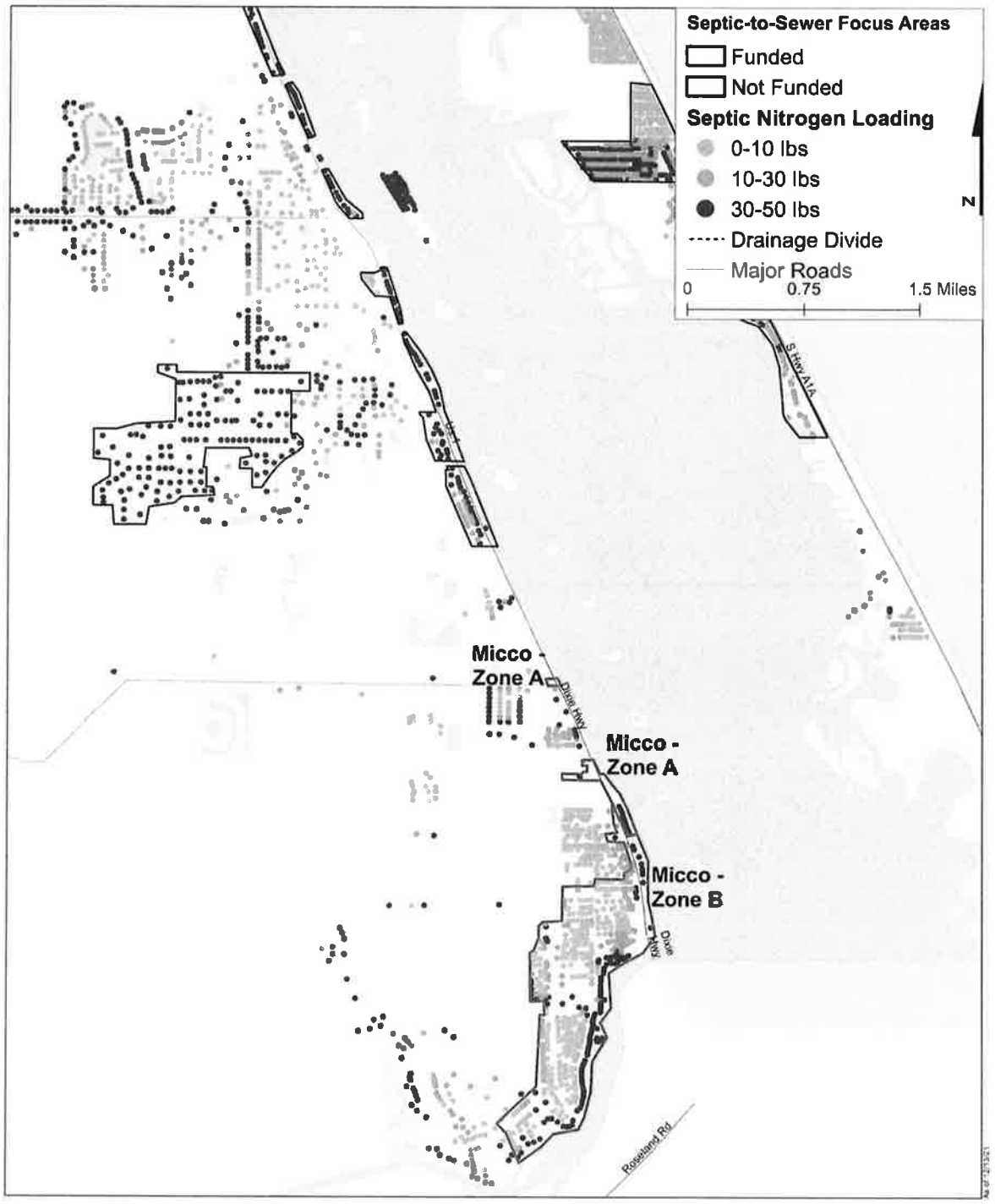


Figure 4-14: Septic System Removal Projects in Central IRL, continued

Figure 4-14 Long Description

Septic System Removal by Sewer Connection

The detailed septic analysis also identified 4,496 properties located within 30 feet of existing sewer infrastructure. The highest loading "Quick Connect" opportunities are included in **Table 4-20** based on their ability to connect to gravity or force main sewer and are shown in **Figure 4-15** through **Figure 4-17**.

Quick Connects to sewer will be funded on a prorated basis of $1,200 per pound of nitrogen loading to the lagoon reduced, up to a maximum of $18,000 for connection to force main sewer and a maximum of $12,000 for connection to gravity sewer. Funding allocation for this grant program is based on the number of highest priority connection opportunities within each sub-lagoon as reported in **Table 4-20**. However, recently secured funding from state cost-share grants will allow the County to offer these grants to more locations than the priority lots identified for Save Our Indian River Lagoon Trust funding listed in **Table 4-20**. Combined state and local funding is currently offered to all property owners within the IRL watershed on a first-come, first-served basis, prorated based on a property's estimated nitrogen loading.

Table 4-20: Projects for Septic System Removal by Sewer Connection

Year Added	Project Number	Project Name	Responsible Entity	Sub-lagoon	Total Nitrogen Reduction (pounds per year)	Total Nitrogen Cost per Pound per Year	Total Phosphorus Reduction (pounds per year)	Total Phosphorus Cost per Pound per Year	Plan Funding
2019	2016-16	Banana Quick Connects – 144 lots+	Brevard County	Banana	3,224	Average of $592 Maximum of $1,200	Not applicable	Not applicable	$1,908,000
2019	2016-18	North IRL Quick Connects – 463 lots+	Brevard County	North IRL	11,339	Average of $531 Maximum of $1,200	Not applicable	Not applicable	$6,018,000
2019	2016-19	Central IRL Quick Connects – 269 lots+	Brevard County	Central IRL	6,883	Average of $487 Maximum of $1,200	Not applicable	Not applicable	$3,354,000
2022	222	Hedgecock/ Grabowsky and Desoto Fields+	City of Satellite Beach	Banana	81	$487	Not applicable	Not applicable	$39,447
-	-	***Total***	-	-	***21,527***	***$526 (average)***	***Not applicable***	***Not applicable***	***$11,319,447***

Note: The projects highlighted in tan and marked with a plus sign were added to the plan as part of an annual update.

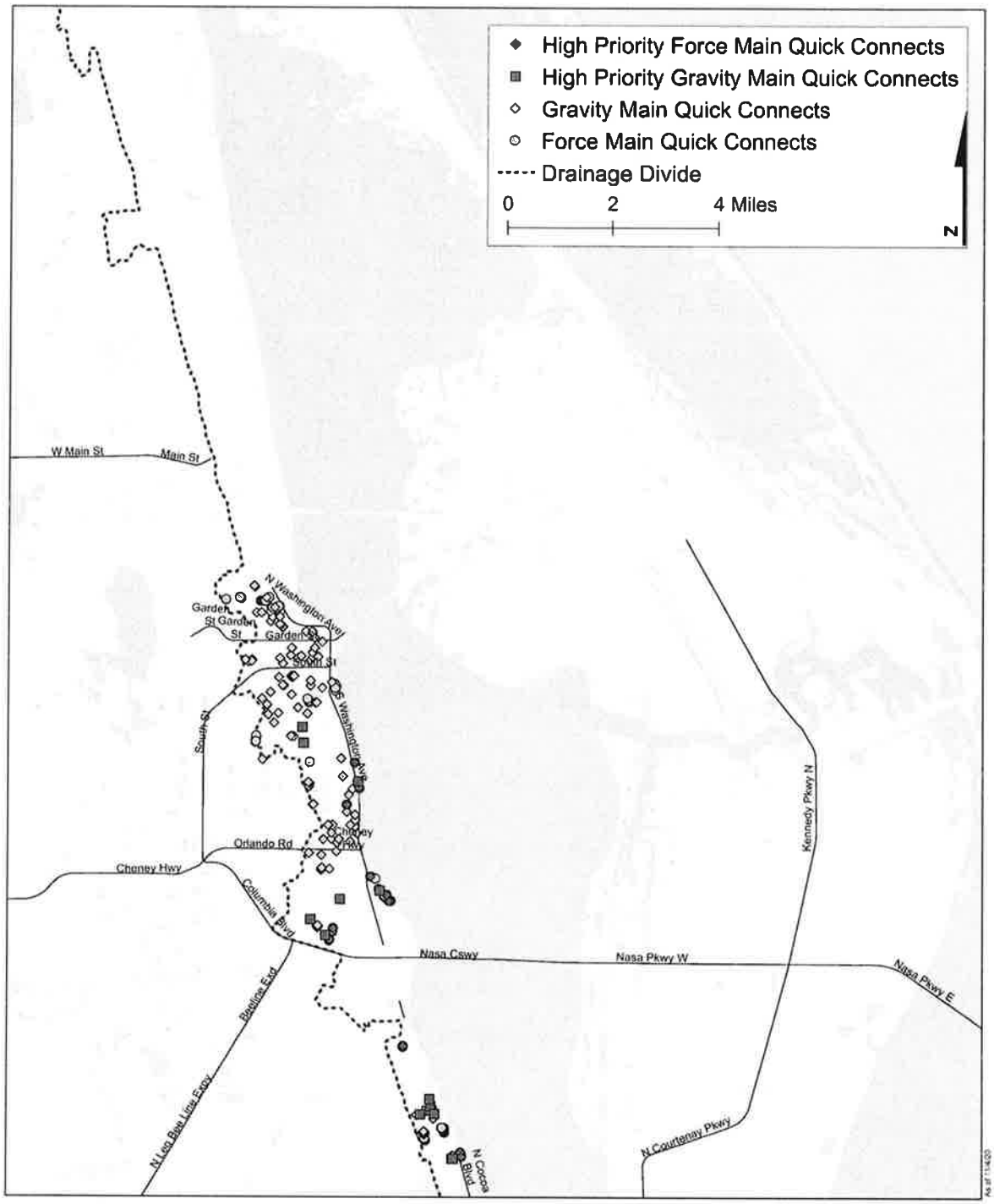


Figure 4-15: Quick Connection Septic System Removal Locations in North Brevard County

Figure 4-15 Long Description

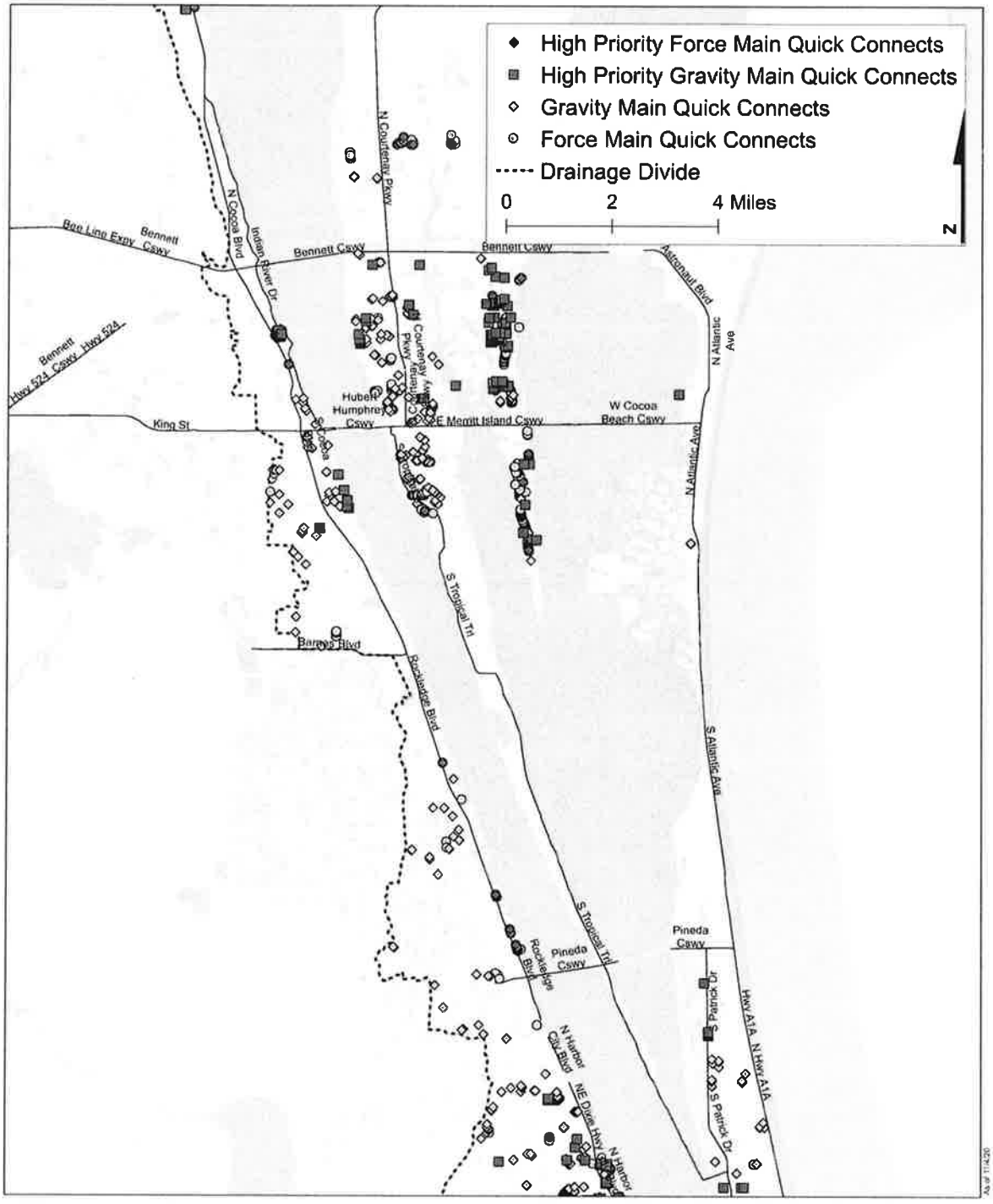


Figure 4-16: Quick Connection Septic System Removal Locations in Central Brevard County

Figure 4-16 Long Description

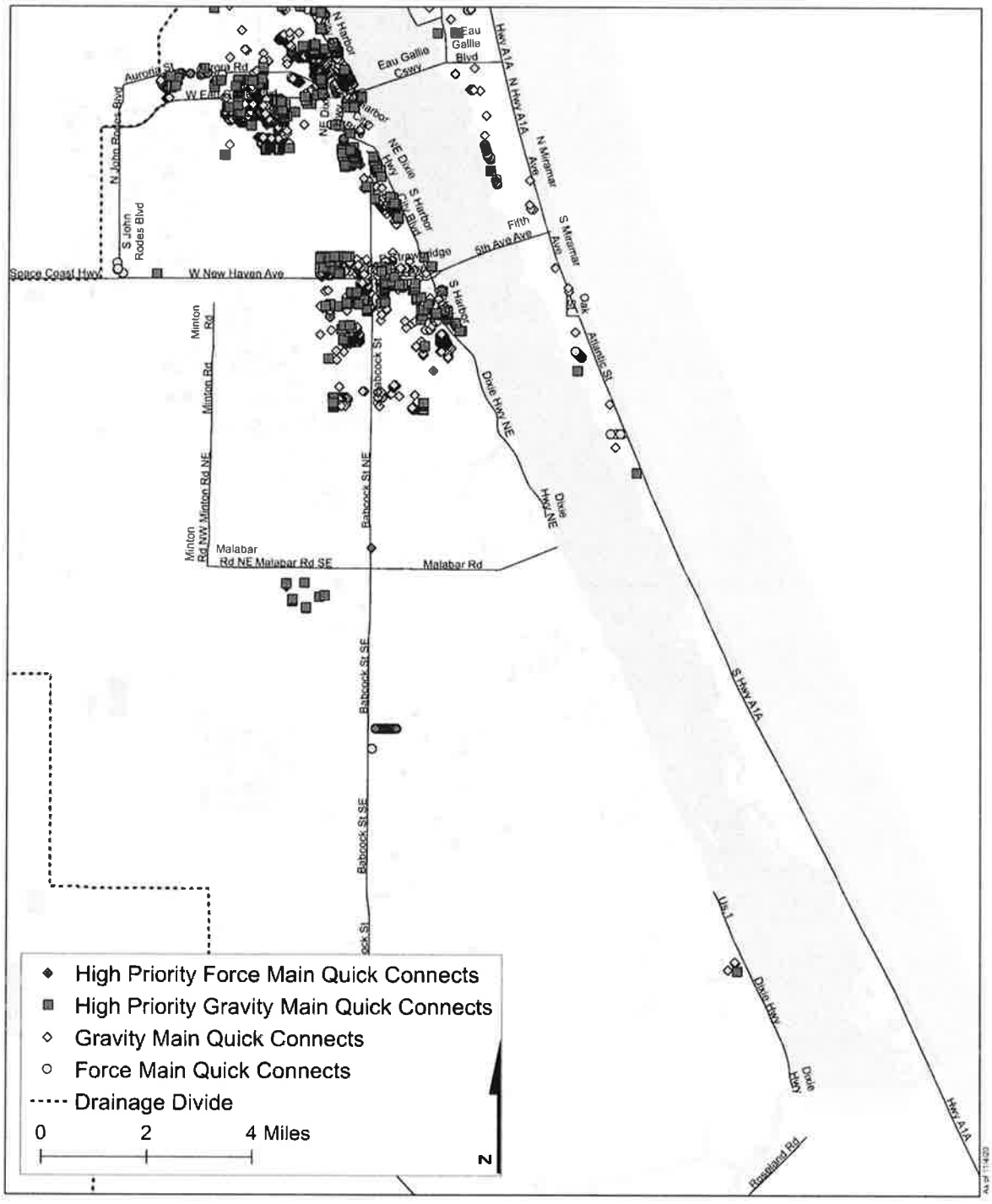


Figure 4-17: Quick Connection Septic System Removal Locations in South Brevard County

Figure 4-17 Long Description

Septic System Upgrades

In locations where providing sewer service is not feasible due to distance from sewer infrastructure, facility capacity, or insufficient density of high-risk systems, there are options to upgrade the highest risk septic systems to increase the nutrient and pathogen removal efficiency. In recent years, research has been conducted on passive treatment systems, which provide significant treatment efficiencies without monthly sewer fees or highly complex maintenance needs for mechanical features.

In July 2018, the Florida Department of Health adopted new rules that allow for In-Ground Nitrogen-Reducing Biofilters under the drainfield of septic systems (**Figure 4-18**). This passive nitrogen-reducing technology is a result of the Florida Onsite Sewage Nitrogen Reduction Strategies project and the Springs and Aquifer Protection Act. Pilot projects to install this new system are currently in progress throughout the state and Brevard County is a participating partner in these initial installations. This passive In-Ground Nitrogen-Reducing Biofilter system is expected to remove 65% of nitrogen from the effluent and cost an extra $4,000 above the typical costs of a conventional septic system. This system requires 51" of soil above the groundwater and, therefore, may not be appropriate in areas with shallow groundwater.

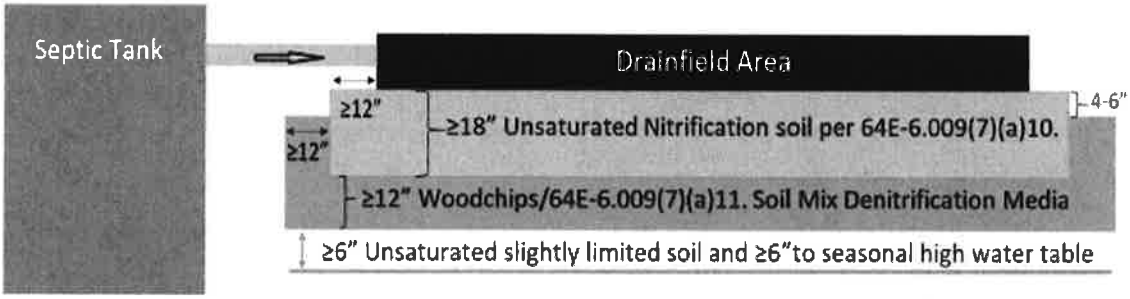


Figure 4-18: Example In-Ground Nitrogen-Reducing Biofilter Septic System

Figure 4-18 Long Description

The current ruling by Florida Department of Health only allows woodchips within the denitrification layer of this system; however, other biosorption activated media can also enhance nutrient and bacterial removal before the effluent reaches the drainfield or groundwater, potentially removing more than 65% of nitrogen from effluent, and lasting longer than woodchips. A test of the biosorption activated media removal capacity was conducted at Florida's Showcase Green Envirohome in Indialantic, Florida. This test location is a residential site built with stormwater, graywater, and wastewater treatment in a compact footprint onsite (Wanielista et al., 2011). The media used in this study was Bold & Gold®, which is a patented blend of mineral materials, sand, and clay. In this study, the effluent from the septic tank was evenly divided between an innovative biosorption filter media bed and a conventional drainfield. The study found that the TN and TP removal efficiencies were 76.9% and 73.6%, respectively, for the Bold & Gold® media drainfield system, which was significantly higher than the 45.5% TN removal and 32.1% TP removal from the conventional drainfield.

In 2019, Brevard County entered into agreement with the Florida Department of Health to test In-Ground Nitrogen Reducing Biofilter septic systems with known nitrogen-reducing media. The first six septic systems under this agreement were installed in summer of 2020 using Bold & Gold® wastewater filtration media. To measure effectiveness of the alternative media, nutrient concentration of septic tank effluent is being measured before and after passage through a layer of filtration media. The study sites will be monitored quarterly for one year and a final report will

be completed in 2022. The agreement allows for testing of other nitrogen-reducing media as they become available.

In areas where septic systems are in close proximity to a surface waterbody but are not in a location where connection to the sewer system is feasible, adding biosorption activated media to the drainfield or upgrading to the passive nitrogen removing systems could be used to retrofit the existing septic systems. The estimated cost for these retrofits was increased from $16,000 per septic system in the original plan to $18,000 each in the 2019 Update. Any operations and maintenance costs associated with these upgrades, once installed, will be the responsibility of the owner. To be conservative and to match the Florida Department of Health rule, the estimates of the TN reductions that could be achieved are based on an efficiency of 65% removal, which is the average efficiency from the two state studies described above that tested biosorption activated media in the drainfield.

In areas where the In-Ground Nitrogen-Reducing Biofilters system or biosorption activated media retrofits are not appropriate, National Sanitation Foundation 245 certified aerobic treatment units are another alternative. National Sanitation Foundation 245 certification verifies that these advanced septic systems remove at least 50% of nitrogen within the septic tank, although some systems have been shown to remove up to 80% of nitrogen. The drainfield is credited with removing another 15% of nitrogen, which brings the total nitrogen removed by the advanced septic system to 65%. Due to the electrical plumbing requirements of aerobic treatment units, the owner is required to have a maintenance agreement with a septic company and an operating permit from the Florida Department of Health. Individually engineered performance-based septic systems, some of which use the septic system effluent for drip irrigation, provide another septic system option for meeting 65% nitrogen load reduction onsite.

There are also options for distributed onsite sewage treatment systems that are approved by the Florida Department of Environmental Protection as miniature sewage treatment plants sized for residential and commercial use. These systems provide additional opportunities to improve nutrient removal from sites where connection to central sewer is not feasible and are eligible options for septic system upgrades as part of this plan. Both the Save Our Indian River Lagoon Project Plan and Springs and Aquifer Protection Act have highlighted the need for other wastewater options that have less impact on surface water and groundwater. Brevard County will continue to vet these options as they become available in Florida.

To prioritize the septic systems for upgrade, the scoring matrix used in the original Save Our Indian River Lagoon Project Plan was replaced in the 2019 Update using ArcGIS-Based Nitrate Load Estimation Toolkit modeling performed during determination of the Nitrogen Reduction Overlay area adopted in the Countywide Septic Ordinance, as noted above.

The septic systems with the highest loading in each sub-lagoon are recommended for retrofit upgrades to reduce the impacts of these septic systems on the waterbodies. The costs and nutrient reductions by sub-lagoon are shown in **Table 4-21**. The locations of the highest priority sites for septic system upgrades are shown in **Figure 4-19**, **Figure 4-20**, and **Figure 4-21**. This upgrade opportunity addresses at least 2% of the septic systems in the IRL drainage basin.

Septic retrofit upgrades will be funded on a prorated basis of $1,200 per pound of reduced nitrogen loading to the lagoon, up to a maximum of $18,000 per septic parcel. Funding allocation for this grant program is based on the number of highest priority upgrade opportunities within each sub-lagoon as reported in **Table 4-21**. However, recently secured funding from state cost-share grants allows the County to offer these grants to more locations

than the priority lots identified for Save Our Indian River Lagoon Trust funds listed in **Table 4-21**. Combined state and local funding is currently offered to all property owners within the IRL watershed (excluding those within a funded septic-to-sewer project area) on a first-come, first-served basis, prorated based on a property's estimated nitrogen loading.

In some circumstances, properties qualified for septic system upgrade funding may be near a sewer line. These septic upgrade funds can be used to connect the qualified property to sewer as this option results in a greater reduction in nitrogen loading to the lagoon.

Table 4-21: Projects for Septic System Upgrades

Year Added	Project Number	Project Name	Responsible Entity	Sub-lagoon	Total Nitrogen Reduction (pounds per year)	Cost per Pound per Year of Total Nitrogen	Total Phosphorus Reduction (pounds per year)	Cost per Pound per Year of Total Phosphorus	Plan Funding
Original	51	Banana River Lagoon – at least 100 lots*	Brevard County	Banana	1,934	Average of $931 Maximum of $1,200	Not applicable	Not applicable	$1,800,000
Original	52	North IRL – 586 lots*	Brevard County	North IRL	13,857	Average of $761 Maximum of $1,200	Not applicable	Not applicable	$10,548,000
Original	53	Central IRL – 939 lots*	Brevard County	Central IRL	22,190	Average of $762 Maximum of $1,200	Not applicable	Not applicable	$16,902,000
-	-	***Total***	-	-	***37,981***	***$770 (average)***	***Not applicable***	***Not applicable***	***$29,250,000***

Note: The projects highlighted in green and marked with an asterisk were identified in the original plan. The projects highlighted in tan and marked with a plus sign were added to the plan as part of an annual update.

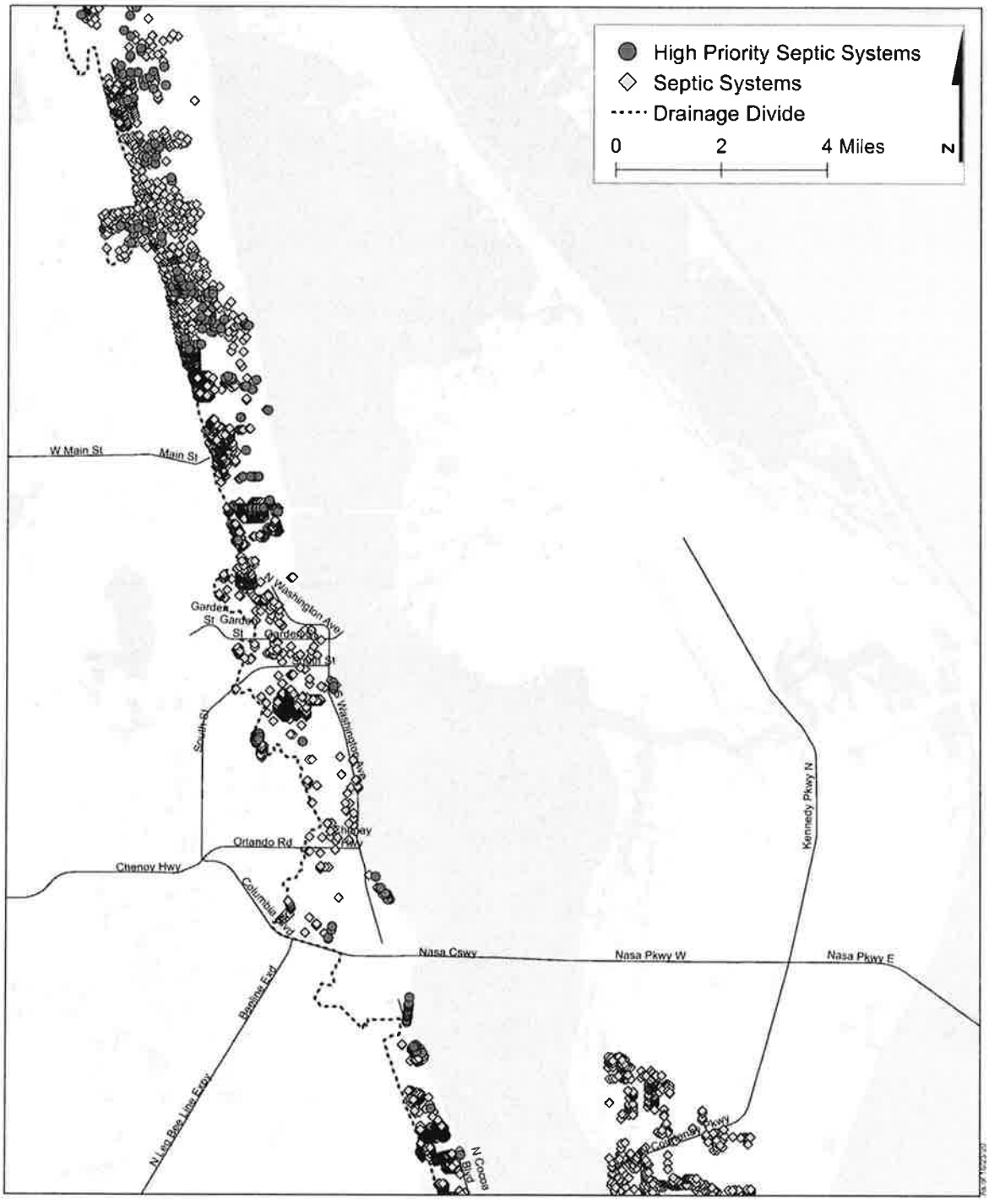


Figure 4-19: Septic System Upgrades in North Brevard County

Figure 4-19 Long Description

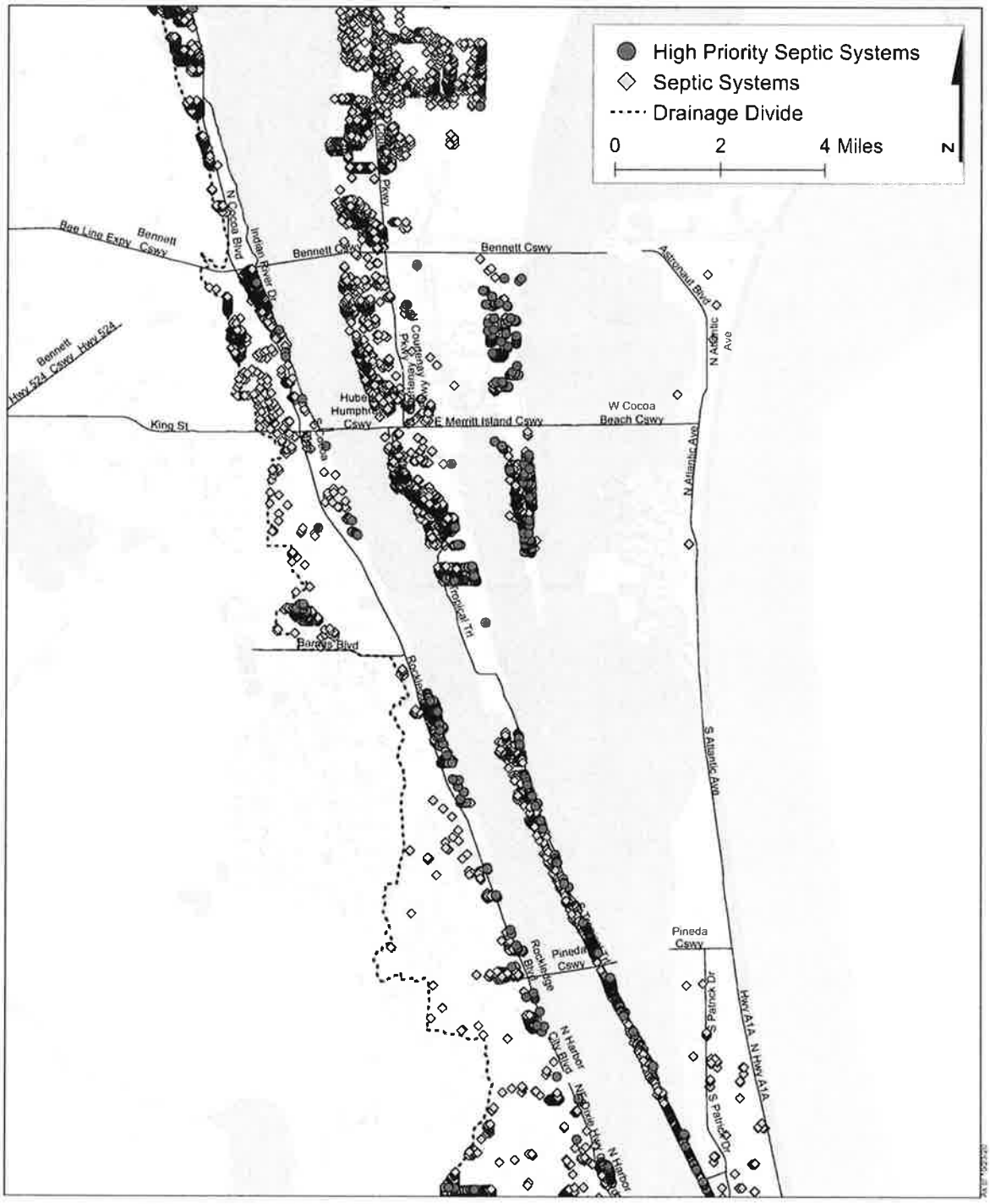


Figure 4-20: Septic System Upgrades in Central Brevard County

Figure 4-20 Long Description

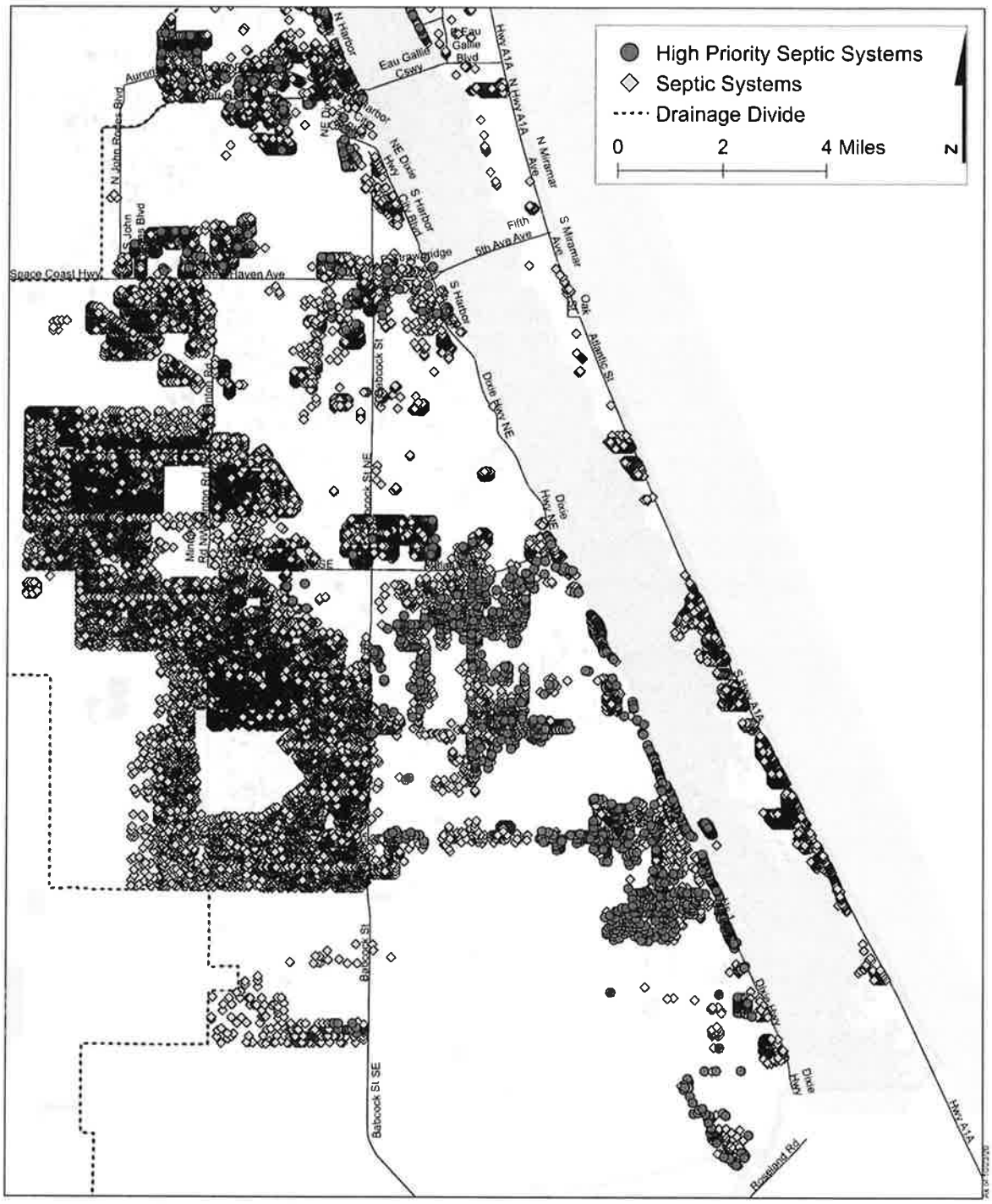


Figure 4-21: Septic System Upgrades in South Brevard County

Figure 4-21 Long Description

4.1.7 Stormwater Treatment

Stormwater runoff contributes 33.6% of the external TN loading and 43.4% of the external TP loading to the lagoon annually.

Stormwater runoff from urban areas carries pollutants that affect surface waters and groundwater. These pollutants include nutrients, pesticides, oil and grease, debris and litter, and sediments. In Brevard County, there are more than 1,500 stormwater outfalls to the Indian River Lagoon (IRL).

There are a variety of best management practices that can be used to capture and treat stormwater to remove or reduce these pollutants before the stormwater runoff reaches a waterbody or infiltrates to the groundwater. Potential stormwater best management practices that could help restore the IRL system include:

- Traditional best management practices – These are the typical practices used to treat stormwater runoff and include wet detention ponds, retention, swales, dry detention, baffle boxes, stormwater reuse, alum injection, street sweeping, catch basin inserts/inlet filters, floating islands/managed aquatic plant systems. Descriptions of these traditional best management practices and expected total nitrogen (TN) and total phosphorus (TP) efficiencies are shown in **Table 4-22**.
- Low impact development/green infrastructure – These practices use natural stormwater management techniques to minimize runoff and help prevent pollutants from getting into stormwater runoff. These best management practices address the pollutants at the source so implementing them can help decrease the size of traditional retention and detention basins and can be less costly than traditional best management practices (University of Florida Institute of Food and Agricultural Sciences, 2016). Descriptions of low impact development and green infrastructure best management practices and estimated efficiencies are shown in **Table 4-23**.
- Denitrification best management practices – These practices use a soil media, known as biosorption activated media to increase the amount of denitrification that occurs, which increases the amount of TN and TP removed. Biosorption activated media includes mixes of soil, sawdust, zeolites, tire crumb, vegetation, sulfur, and spodosols. Additional details about denitrification best management practices are included below.
- Best management practices to reduce baseflow intrusion – These practices are modifications to existing best management practices help reduce intrusion of captured groundwater baseflow into stormwater drainage systems. These best management practices include backfilling canals so that they do not cut through the baseflow, modifying canal cross-sections to maintain the same storage capacity while limiting the depth, installing weirs to control the water levels in the best management practice, or adding a cutoff wall to prevent movement into the baseflow.
- Re-diversion to the St. Johns River – There are portions of the current IRL Basin that historically flowed towards the St. Johns River. By re-diverting these flows back to the St. Johns River, the excess stormwater runoff, as well as the additional freshwater inputs, to the IRL would be removed. The re-diversion projects would include a treatment component so that the runoff is treated before being discharged to the St. Johns River. The St. Johns River Water Management District has taken the lead on large-scale projects while the County has re-diverted more than 400 acres in the Crane Creek basin and partnered with the St. Johns River Water Management District to increase re-diversion from the Melbourne-Tillman Water Control District canal system.

Table 4-22: Traditional Stormwater Best Management Practices with TN and TP Removal Efficiencies

Best Management Practice	Definition	Total Nitrogen Removal Efficiency	Total Phosphorus Removal Efficiency	Source
Wet detention ponds	Permanently wet ponds that are designed to slowly release a portion of the collected stormwater runoff through an outlet structure. Recommended for sites with moderate to high water table conditions. Provide removal of both dissolved and suspended pollutants through physical, chemical, and biological processes.	8%-44%	45%-75%	Florida Department of Environmental Protection et al., 2010
Off-line retention	Recessed area that is designed to store and retain a defined quantity of runoff, allowing it to percolate through permeable soils into the groundwater aquifer. Runoff in excess of the specified volume of stormwater does not flow into the retention system storing the initial volume of stormwater.	40%-84%	40%-84%	Harper et al., 2007
On-line retention and swales	Recessed area that is designed to store and retain a defined quantity of runoff, allowing it to percolate through permeable soils into the groundwater aquifer. Runoff in excess of the specified volume of stormwater does flow through the retention system that stores the initial volume of stormwater.	30%-74%	30%-74%	Harper et al., 2007
Dry detention	Designed to store a defined quantity of runoff and slowly release it through an outlet structure to adjacent surface waters. After drawdown of the stored runoff is completed, the storage basin does not hold any water. Used in areas where the soil infiltration properties or seasonal high-water table elevation will not allow the use of a retention basin.	10%	10%	Harper et al., 2007
2nd generation baffle box	Box chambers with partitions connected to a storm drain. Water flows into the first section of the box where most pollutants settle out. Overflows into the next section to allow further settling. Water ultimately overflows to the stormwater pipe. Floating trays capture leaves, grass clippings, and litter to prevent them from dissolving in the stormwater.	19.05%	15.5%	GPI, 2010
Stormwater reuse	Reuse of stormwater from wet ponds for irrigation. Compare volume going to reuse to total volume of annual runoff to pond.	Amount of water not discharged annually	Amount of water not discharged annually	Not applicable
Alum injection	Chemical treatment systems that inject aluminum sulfate into stormwater systems to cause coagulation of pollutants.	50%	90%	Harper et al., 2007
Street sweeping	Cleaning of pavement surfaces to remove sediments, debris, and trash deposited by vehicle traffic. Prevents these materials from being introduced into the stormwater system.	Total nitrogen content in dry weight of material collected annually	Total phosphorus content in dry weight of material collected annually	University of Florida, 2011
Catch basin inserts/inlet filters	Devices installed in storm drain inlets to provide water quality treatment through filtration of organic debris and litter, settling of sediment, and adsorption of hydrocarbon by replaceable filters.	Total nitrogen content in dry weight of material collected annually	Total phosphorus content in dry weight of material collected annually	University of Florida, 2011

Best Management Practice	Definition	Total Nitrogen Removal Efficiency	Total Phosphorus Removal Efficiency	Source
Managed Aquatic Plant System	Aquatic plant-based best management practices that remove nutrients through a variety of processes related to nutrient uptake, transformation, and microbial activities.	10% with 5% pond coverage	10% with 5% pond coverage	Florida Department of Environmental Protection, 2018

Table 4-23: Low Impact Development and Green Infrastructure Best Management Practices and TN and TP Removal Efficiencies

Best Management Practice	Definition	Total Nitrogen Removal Efficiency	Total Phosphorus Removal Efficiency	Source
Permeable pavement	Hard, yet penetrable, surfaces reduce runoff by allowing water to move through them into groundwater below (University of Florida Institute of Food and Agricultural Sciences, 2016).	30%-74%	30%-74%	Harper et al., 2007
Bioswales	An alternative to curb and gutter systems, bioswales convey water, slow runoff, and promote infiltration. Swales may be installed along residential streets, highways, or parking lot medians (University of Florida Institute of Food and Agricultural Sciences, 2016). Must be designed for conveyance, greater in length than width, have shallow slopes, and include proper landscaping.	38%-89%	9%-80%	Florida Department of Environmental Protection, 2014
Green roofs	These systems can significantly reduce the rate and quantity of runoff from a roof and provide buildings with thermal insulation and improved aesthetics (University of Florida Institute of Food and Agricultural Sciences, 2016). Retention best management practice covered with growing media and vegetation that enables rainfall infiltration and evapotranspiration of stored water. Including a cistern capture, retain, and reuse water adds to effectiveness.	45% (without cistern) 60%-85% (with cistern)	Not applicable	Florida Department of Environmental Protection, 2014
Bioretention basins/rain gardens	Small, vegetated depressions in the landscape collect and filter stormwater into the soil (University of Florida Institute of Food and Agricultural Sciences, 2016). Constructed adjacent to roof runoff and impervious areas.	30%-50%	30%-90%	Florida Department of Environmental Protection, 2014
Tree boxes	Bioretention systems with vertical concrete walls designed to collect/retain specified volume of stormwater runoff from sidewalks, parking lots and/or streets. Consists of a container filled with a soil mixture, a mulch layer, under-drain system, and shrub or tree (Florida Department of Environmental Protection, 2014).	38%-65%	50%-80%	Florida Department of Environmental Protection, 2014

Due to the importance of treating dry season baseflow to the lagoon, Brevard County has found that ditch denitrification is the most cost-effective best management practice. Biosorption activated media can be added in existing best management practices or to new best management practices to improve the nutrient removal efficiency. The removal efficiencies of using biosorption activated media in various stormwater treatment projects (Wanielista, 2015) are summarized in **Table 4-24**. While the efficiencies in **Table 4-24** are only for Bold & Gold®, other types of biosorption activated media may be used in a project, if there is Florida-specific information available on the removal efficiencies for that media.

Table 4-24: TN and TP Removal Efficiencies for Biosorption Activated Media

Location in Best Management Practice Treatment Train	Material	Total Nitrogen Removal Efficiency	Total Phosphorus Removal Efficiency
Bold & Gold® as a first practice, example up-flow filter in baffle box and a constructed wetland	Expanded clay, tire chips	55%	65%
Bold & Gold® in up-flow filter at wet pond and dry basin outflow	Organics, tire chips, expanded clay	45%	45%
Bold & Gold® in inter-event flow using up-flow filter at wet pond and down-flow filter at dry basin	expanded clay, tire chips	25%	25%
Bold & Gold® down-flow filters 12-inch depth at wet pond or dry basin pervious pavement, tree well, rain garden, swale, and strips	Clay, tire crumb, sand and topsoil	60%	90%

Note: From Wanielista, 2015

The County's proposed total maximum daily loads include two components: (1) a total maximum daily load for the five-month period (January–May) that is critical for seagrass growth, and (2) a total maximum daily load for the remaining seven months of the year to avoid algal blooms and protect healthy dissolved oxygen levels. In 2019, Brevard County updated the estimates for nutrient loading entering the lagoon through each stormwater ditch and outfall. The update incorporated more recent land use data, more recent rainfall and evapotranspiration data, and improved stormwater infrastructure mapping and topography. There are more than 2,000 hydrologically distinct catchment basin areas within the lagoon watershed countywide. These connect to the lagoon through more than 1,500 stormwater ditches and outfall structures. For the purpose of maximizing seagrass response to stormwater treatment, these new loading estimates for catchment basins were prioritized based on the amount of nutrients migrating into the stormwater system as groundwater baseflow during a five-month season found to be most critical to annual seagrass expansion or loss.

The stormwater project benefits were estimated, as follows, to ensure both components of the total maximum daily load are adequately addressed. The five-month total maximum daily load covers the dry season in this area when there is minimal rainfall and stormwater runoff; therefore, the benefits of stormwater biosorption activated media projects during this period were based only on January–May baseflow loading estimates from the Spatial Watershed Iterative Loading model. The estimated project treatment efficiencies used for January to May baseflow only are 55% for TN and 65% for TP. To estimate annual load reduction benefits, the annual baseflow and stormwater loading estimates from the Spatial Watershed Iterative Loading model were used with a project efficiency of 45% for TN and 45% for TP. The estimated TN and TP reductions in pounds per year accomplished by using biosorption activated media upstream of these priority outfalls are summarized in **Table 4-22**. The locations of the basins to be treated are shown in **Figure 4-22**, **Figure 4-23**, and **Figure 4-24**. Projects approved as part of an annual update to the plan are also included in **Table 4-25**.

Table 4-25: Projects for Stormwater Treatment

Year Added	Project Number	Project Name	Responsible Entity	Sub-Lagoon	Total Nitrogen Reduction (pounds per year)	Cost per Pound of Total Nitrogen Removed	Total Phosphorus Reduction (pounds per year)	Cost per Pound of Total Phosphorus Removed	Plan Funding
Original	-	Basin 1329*	Brevard County	Banana	51	$76	8	$483	$3,864
Original	-	Basin 611*	Brevard County	Banana	1,354	$130	115	$873	$176,300
Original	-	Basin 828*	Brevard County	Banana	1,397	$155	127	$785	$215,900
Original	-	Basin 951*	Brevard County	Banana	1,562	$166	154	$812	$258,900
Original	-	Basin 691*	Brevard County	Banana	1,749	$172	183	$682	$300,600
Original	-	Basin 984*	Brevard County	Banana	1,412	$178	143	$873	$251,100
Original	-	Basin CCB-E*	Brevard County	Banana	1,335	$182	210	$596	$243,400
Original	-	Basin 873*	Brevard County	Banana	775	$182	69	$1,439	$141,500
Original	-	Basin CCB-F*	Brevard County	Banana	1,043	$195	158	$632	$203,100
Original	-	Basin 497*	Brevard County	Banana	952	$196	95	$1,051	$186,700
Original	-	Basin 925*	Brevard County	Banana	895	$197	90	$1,115	$176,000
Original	-	Basin 1066*	Brevard County	Banana	1,150	$202	173	$579	$232,200
Original	-	Basin 602*	Brevard County	Banana	1,135	$203	122	$817	$230,000
Original	-	Basin 998*	Brevard County	Banana	953	$204	144	$696	$194,400
Original	-	Basin 1002*	Brevard County	Banana	903	$205	126	$792	$185,300
Original	-	Basin CCAFS-4A*	Brevard County	Banana	2,091	$208	296	$675	$435,000
Original	-	Basin 979A*	Brevard County	Banana	1,162	$209	173	$721	$242,300
Original	-	Basin 781*	Brevard County	Banana	817	$209	82	$1,224	$170,900
Original	-	Basin CCB-G*	Brevard County	Banana	956	$211	147	$680	$201,300
Original	-	Basin 539*	Brevard County	Banana	935	$212	98	$1,023	$198,200
Original	-	Basin CCAFS-6B*	Brevard County	Banana	3,907	$212	545	$505	$829,500
Original	-	Basin 1037*	Brevard County	Banana	708	$212	97	$1,029	$150,400
Original	-	Basin CCAFS-3A*	Brevard County	Banana	2,896	$221	450	$611	$640,700
Original	-	Basin CCAFS-5A*	Brevard County	Banana	1,967	$225	281	$713	$442,300
Original	-	Basin CCB-B*	Brevard County	Banana	760	$226	110	$905	$172,100
Original	-	Basin CC-B2A*	Brevard County	Banana	774	$228	125	$803	$176,700
Original	-	Basin CCAFS-1A*	Brevard County	Banana	2,531	$229	390	$705	$580,100
Original	-	Basin 674*	Brevard County	Banana	1,206	$230	145	$859	$277,900
Original	-	Basin 650*	Brevard County	Banana	1,251	$232	160	$937	$289,900
Original	-	Basin 1222*	Brevard County	Banana	931	$235	135	$739	$218,800
Original	-	Basin CCAFS-6D*	Brevard County	Banana	905	$236	107	$931	$213,200
Original	-	Basin 1024*	Brevard County	Banana	668	$237	104	$960	$158,700
Original	-	Basin CCAFS-6A*	Brevard County	Banana	734	$243	81	$1,231	$178,300
Original	-	Basin CCAFS-2A*	Brevard County	Banana	1,778	$244	309	$648	$434,200
Original	-	Basin 1304*^	Brevard County	Banana	397	$245	To be determined	To be determined	$97,171
Original	-	Basin CCB-C*	Brevard County	Banana	525	$249	83	$1,209	$130,700

Year Added	Project Number	Project Name	Responsible Entity	Sub-Lagoon	Total Nitrogen Reduction (pounds per year)	Cost per Pound of Total Nitrogen Removed	Total Phosphorus Reduction (pounds per year)	Cost per Pound of Total Phosphorus Removed	Plan Funding
Original	-	Basin 1172*	Brevard County	Banana	919	$249	133	$754	$228,800
Original	-	Basin CCB-D*	Brevard County	Banana	628	$250	103	$972	$156,700
Original	-	Basin 1067*	Brevard County	Banana	811	$250	114	$876	$202,600
Original	-	Basin 484*	Brevard County	Banana	445	$251	40	$2,495	$111,800
Original	-	Basin CCB-I*	Brevard County	Banana	1,337	$253	187	$934	$338,000
Original	-	Basin 730*	Brevard County	Banana	576	$255	61	$1,628	$146,900
Original	-	Basin 483*	Brevard County	Banana	708	$261	84	$1,189	$184,400
Original	-	Basin CCB-H*	Brevard County	Banana	629	$261	102	$977	$163,900
Original	-	Basin 601*	Brevard County	Banana	506	$261	52	$1,912	$132,100
Original	-	Basin 1309*	Brevard County	Banana	593	$262	89	$1,118	$155,500
Original	-	Basin 1280B*	Brevard County	Banana	551	$263	81	$1,228	$145,100
Original	-	Basin 350*	Brevard County	Banana	695	$266	85	$1,174	$184,500
Original	-	Basin 997*	Brevard County	Banana	545	$266	83	$1,206	$144,900
Original	-	Basin 476*	Brevard County	Banana	680	$266	78	$1,274	$181,100
Original	-	Basin 479*	Brevard County	Banana	445	$268	42	$2,379	$119,300
Original	-	Basin 520*	Brevard County	Banana	400	$269	35	$2,843	$107,600
Original	-	Basin 1037A*	Brevard County	Banana	540	$270	79	$1,258	$145,700
Original	-	Basin 537*	Brevard County	Banana	591	$272	68	$1,464	$161,100
Original	-	Basin 543*	Brevard County	Banana	511	$272	54	$1,853	$139,300
Original	-	Basin 1187*	Brevard County	Banana	645	$275	85	$1,182	$177,400
Original	-	Basin CCAFS-9A*	Brevard County	Banana	614	$277	129	$774	$170,100
Original	-	Basin 1124*	Brevard County	Banana	533	$278	78	$1,287	$148,100
Original	-	Basin 585*	Brevard County	Banana	474	$279	48	$2,083	$132,000
Original	-	Basin 591*	Brevard County	Banana	399	$279	37	$2,698	$111,200
Original	-	Basin 508*	Brevard County	Banana	546	$281	59	$1,683	$153,600
Original	-	Basin 673*	Brevard County	Banana	595	$282	70	$1,421	$167,900
Original	-	Basin CCAFS-4C*	Brevard County	Banana	801	$288	115	$1,085	$230,900
Original	-	Basin 638*	Brevard County	Banana	445	$292	47	$2,112	$130,200
Original	-	Basin 940B*	Brevard County	Banana	523	$293	75	$1,329	$153,200
Original	-	Basin CC-B2C*	Brevard County	Banana	430	$298	63	$1,579	$128,000
Original	-	Basin CC-B4B*	Brevard County	Banana	411	$304	66	$1,506	$125,100
Original	-	Basin 592*	Brevard County	Banana	359	$305	34	$2,903	$109,500
Original	-	Basin 716*	Brevard County	North IRL	1,157	$108	84	$1,188	$124,800
Original	-	Basin 622*	Brevard County	North IRL	1,172	$130	86	$1,162	$152,100
Original	-	Basin 608*	Brevard County	North IRL	744	$138	69	$1,455	$102,800
Original	-	Basin 286*	Brevard County	North IRL	839	$154	63	$1,578	$129,500
Original	-	Basin 668*	Brevard County	North IRL	1,508	$156	139	$720	$235,400
Original	-	Basin 659*	Brevard County	North IRL	784	$157	56	$1,797	$122,700

Year Added	Project Number	Project Name	Responsible Entity	Sub-Lagoon	Total Nitrogen Reduction (pounds per year)	Cost per Pound of Total Nitrogen Removed	Total Phosphorus Reduction (pounds per year)	Cost per Pound of Total Phosphorus Removed	Plan Funding
Original	-	Basin 384*	Brevard County	North IRL	986	$161	84	$1,193	$158,700
Original	-	TV-St. Johns Basin*	Brevard County	North IRL	2,588	$162	351	$569	$419,300
Original	-	Basin 253*	Brevard County	North IRL	1,242	$167	132	$760	$207,100
Original	-	Basin 911*	Brevard County	North IRL	1,004	$168	90	$1,108	$168,500
Original	-	Basin 560*	Brevard County	North IRL	572	$169	41	$2,447	$96,800
Original	-	TV-ST Teresa Basin*	Brevard County	North IRL	2,872	$171	426	$528	$492,400
Original	-	Basin 16*	Brevard County	North IRL	1,095	$172	176	$567	$188,800
Original	-	Basin 338*	Brevard County	North IRL	1,938	$176	210	$713	$340,900
Original	-	Basin 1419*	Brevard County	North IRL	1,735	$181	249	$603	$313,800
Original	-	TV-Addison Canal Basin*	Brevard County	North IRL	7,070	$181	914	$301	$1,280,300
Original	-	Basin 199*	Brevard County	North IRL	1,125	$181	108	$929	$204,100
Original	-	Basin 973*	Brevard County	North IRL	2,134	$182	307	$570	$387,600
Original	-	TV-Chain of Lakes Basin*	Brevard County	North IRL	4,707	$182	683	$403	$857,100
Original	-	Basin 498*	Brevard County	North IRL	1,243	$183	118	$847	$227,900
Original	-	Basin 662*	Brevard County	North IRL	977	$184	101	$995	$180,000
Original	-	Basin 1399*	Brevard County	North IRL	1,498	$185	232	$539	$276,500
Original	-	Basin CO-2K*	Brevard County	North IRL	1,448	$186	204	$612	$269,500
Original	-	Basin 1430*	Brevard County	North IRL	2,361	$186	347	$576	$439,700
Original	-	TV-La Paloma Basin*	Brevard County	North IRL	2,146	$186	314	$557	$399,600
Original	-	Basin CO-2QA*	Brevard County	North IRL	1,354	$187	199	$627	$253,200
Original	-	Basin 895*	Brevard County	North IRL	1,130	$189	135	$740	$213,100
Original	-	TV-South Marine Basin*	Brevard County	North IRL	1,252	$189	176	$567	$237,200
Original	-	Basin 176*	Brevard County	North IRL	797	$191	74	$1,357	$152,400
Original	-	Basin 1396*	Brevard County	North IRL	1,011	$192	147	$680	$193,900
Original	-	Basin RL-2A*	Brevard County	North IRL	1,715	$192	246	$610	$329,500
Original	-	Basin 62*	Brevard County	North IRL	721	$192	118	$847	$138,500
Original	-	Basin 141*^	Brevard County	North IRL	482	$276	77	$1,726	$132,926
Original	-	Basin 19*	Brevard County	North IRL	818	$193	128	$779	$157,600
Original	-	TV-Main Street Basin*	Brevard County	North IRL	1,298	$193	189	$662	$250,200
Original	-	Basin 94*	Brevard County	North IRL	1,141	$194	178	$562	$221,500
Original	-	Basin 115*^	Brevard County	North IRL	707	$289	98	$2,086	$204,390
Original	-	Basin 478*	Brevard County	North IRL	896	$195	80	$1,254	$174,400
Original	-	Basin RL-3B*	Brevard County	North IRL	2,158	$196	307	$652	$422,400
Original	-	Basin 992*	Brevard County	North IRL	1,241	$197	186	$671	$244,000
Original	-	Basin 865*	Brevard County	North IRL	879	$198	109	$918	$174,300

Year Added	Project Number	Project Name	Responsible Entity	Sub-Lagoon	Total Nitrogen Reduction (pounds per year)	Cost per Pound of Total Nitrogen Removed	Total Phosphorus Reduction (pounds per year)	Cost per Pound of Total Phosphorus Removed	Plan Funding
Original	-	Basin 388*	Brevard County	North IRL	1,203	$198	130	$768	$238,700
Original	-	Basin 116*	Brevard County	North IRL	936	$199	142	$703	$185,700
Original	-	Basin 193*^	Brevard County	North IRL	343	$510	49	$3,571	$174,965
Original	-	Basin 1377*	Brevard County	North IRL	1,324	$199	200	$625	$263,400
Original	-	TV-Parrish Basin*	Brevard County	North IRL	1,070	$199	163	$612	$213,200
Original	-	Basin 26*^	Brevard County	North IRL	295	$358	46	$2,298	$105,690
Original	-	Basin RL-3*I	Brevard County	North IRL	3,009	$200	423	$650	$600,700
Original	-	Basin 1392*	Brevard County	North IRL	1,050	$200	159	$629	$210,600
Original	-	Basin 204*	Brevard County	North IRL	622	$201	55	$1,810	$125,000
Original	-	Basin 451*	Brevard County	North IRL	1,075	$201	123	$811	$216,100
Original	-	Basin 1335 (Sherwood Park)*	Brevard County	North IRL	1,452	$201	209	$598	$292,400
Original	-	Basin 72*	Brevard County	North IRL	1,038	$202	150	$668	$209,300
Original	-	TV-Sycamore Basin*	Brevard County	North IRL	1,246	$202	184	$680	$251,900
Original	-	Basin 1387*	Brevard County	North IRL	890	$203	125	$799	$180,400
Original	-	Basin 474*	Brevard County	North IRL	801	$204	76	$1,309	$163,100
Original	-	Basin 157*	Brevard County	North IRL	898	$204	90	$1,110	$183,500
Original	-	Basin 816*	Brevard County	North IRL	678	$205	130	$770	$138,800
Original	-	TV-Marina Basin*	Brevard County	North IRL	1,169	$205	170	$587	$239,500
Original	-	Basin 410*	Brevard County	North IRL	1,322	$205	158	$791	$271,300
Original	-	Basin 1456*	Brevard County	North IRL	952	$205	138	$727	$195,400
Original	-	Basin 824*	Brevard County	North IRL	721	$206	103	$967	$148,500
Original	-	Basin 833*	Brevard County	North IRL	1,083	$207	183	$545	$224,300
Original	-	Basin 254*	Brevard County	North IRL	581	$207	45	$2,229	$120,200
Original	-	Basin 575*	Brevard County	North IRL	662	$208	54	$1,859	$137,600
Original	-	Basin 218*	Brevard County	North IRL	491	$208	39	$2,562	$102,100
Original	-	Basin CO-2I*	Brevard County	North IRL	979	$209	146	$687	$204,500
Original	-	Basin 155*	Brevard County	North IRL	913	$209	94	$1,068	$191,100
Original	-	Basin 1464*	Brevard County	North IRL	968	$210	134	$746	$202,800
Original	-	Basin 1368*	Brevard County	North IRL	1,125	$211	162	$616	$237,200
Original	-	Basin 738*	Brevard County	North IRL	497	$211	51	$1,980	$104,900
Original	-	Basin 832*^	Brevard County	North IRL	506	$317	90	$1,784	$160,536
Original	-	Basin 314*	Brevard County	North IRL	827	$212	86	$1,166	$175,100
Original	-	Basin 1458*	Brevard County	North IRL	947	$212	128	$780	$200,500
Original	-	Basin 901*	Brevard County	North IRL	1,895	$212	232	$860	$401,100
Original	-	Basin 1256*	Brevard County	North IRL	1,580	$213	236	$635	$337,000
Original	-	TV-South Street Basin*	Brevard County	North IRL	900	$215	131	$762	$193,300

Year Added	Project Number	Project Name	Responsible Entity	Sub-Lagoon	Total Nitrogen Reduction (pounds per year)	Cost per Pound of Total Nitrogen Removed	Total Phosphorus Reduction (pounds per year)	Cost per Pound of Total Phosphorus Removed	Plan Funding
Original	-	Basin 829*	Brevard County	North IRL	812	$216	161	$621	$175,200
Original	-	Basin 6*	Brevard County	North IRL	716	$216	84	$1,191	$154,900
Original	-	Basin 22*^	Brevard County	North IRL	293	$323	19	$4,985	$94,723
Original	-	Basin 439*	Brevard County	North IRL	585	$217	53	$1,898	$127,100
Original	-	Basin 10*^	Brevard County	North IRL	356	$378	To be determined	To be determined	$134,627
Original	-	Basin 413*	Brevard County	North IRL	915	$218	103	$975	$199,200
Original	-	Basin 1263*	Brevard County	North IRL	914	$218	132	$759	$199,500
Original	-	Basin 758*	Brevard County	North IRL	533	$219	49	$2,023	$116,900
Original	-	Basin 835*	Brevard County	North IRL	1,134	$220	159	$785	$249,000
Original	-	Basin 1078*	Brevard County	North IRL	1,017	$221	150	$666	$224,800
Original	-	Basin 831*	Brevard County	North IRL	733	$221	105	$950	$162,200
Original	-	TV-Royal Palm Basin*	Brevard County	North IRL	878	$223	127	$786	$195,500
Original	-	Basin 499*	Brevard County	North IRL	761	$223	78	$1,289	$169,800
Original	-	Basin 1381*	Brevard County	North IRL	968	$224	146	$686	$216,500
Original	-	Basin 1342*	Brevard County	North IRL	1,034	$224	157	$637	$231,700
Original	-	Basin 1298*^	Brevard County	North IRL	750	$384	113	$2,552	$288,371
Original	-	Basin 112*	Brevard County	North IRL	734	$226	107	$931	$165,700
Original	-	Basin RL-3A*	Brevard County	North IRL	796	$226	113	$881	$179,800
Original	-	Basin 89*	Brevard County	North IRL	1,084	$226	150	$835	$245,100
Original	-	Basin 2159*	Brevard County	Central IRL	2,754	$148	350	$500	$407,500
Original	-	Basin 2185*	Brevard County	Central IRL	1,208	$162	94	$1,064	$196,200
Original	-	Basin 2163*	Brevard County	Central IRL	1,264	$163	89	$1,118	$205,500
Original	-	Basin 1736*	Brevard County	Central IRL	4,263	$167	551	$499	$710,600
Original	-	Basin 1604*	Brevard County	Central IRL	2,916	$167	425	$529	$486,400
Original	-	Basin 2239*	Brevard County	Central IRL	1,643	$169	261	$479	$276,900
Original	-	Basin 1762*	Brevard County	Central IRL	4,250	$169	621	$443	$716,700
Original	-	Basin 2222*	Brevard County	Central IRL	1,534	$169	226	$552	$258,700
2017	13	Central Boulevard Baffle Box+	City of Cape Canaveral	Banana	481	$72	14	$2,479	$34,700
2017	14	Church Street Type II Baffle Box+	City of Cocoa	North IRL	937	$94	135	$652	$88,045
2017	15	Bayfront Stormwater Project+	City of Palm Bay	Central IRL	348	$88	83	$369	$30,624
2017	16	Gleason Park Reuse+	City of Indian Harbour Beach	Banana	48	$88	9	$469	$4,224
2017	18	Denitrification Retrofit of Johns Road Pond+	Brevard County	North IRL	1,199	$88	Not applicable	Not applicable	$105,512

Year Added	Project Number	Project Name	Responsible Entity	Sub-Lagoon	Total Nitrogen Reduction (pounds per year)	Cost per Pound of Total Nitrogen Removed	Total Phosphorus Reduction (pounds per year)	Cost per Pound of Total Phosphorus Removed	Plan Funding
2017	19	St. Teresa Basin Treatment+	City of Titusville	North IRL	3,100	$88	459	$594	$272,800
2017	20	South Street Basin Treatment+	City of Titusville	North IRL	987	$88	156	$557	$86,856
2017	21	La Paloma Basin Treatment+	City of Titusville	North IRL	2,367	$88	346	$602	$208,296
2017	22	Kingsmill-Aurora Phase Two+	Brevard County	North IRL	4,176	$88	814	$451	$367,488
2017	23	Denitrification Retrofit of Huntington Pond+	Brevard County	North IRL	1,190	$88	Not applicable	Not applicable	$104,720
2017	24	Denitrification Retrofit of Flounder Creek Pond+	Brevard County	North IRL	856	$88	Not applicable	Not applicable	$75,328
2017	34	Cliff Creek Baffle Box+	City of Melbourne	North IRL	3,952	$88	797	$436	$347,781
2017	35	Thrush Drive Baffle Box+	City of Melbourne	North IRL	3,661	$88	773	$417	$322,200
2018	64	Stormwater Low Impact Development Convair Cove 1 – Blakey Boulevard+	City of Cocoa Beach	Banana	30	$155	3	$1,550	$4,650
2018	65	Stormwater Low Impact Development Convair Cove 2 – Dempsey Drive+	City of Cocoa Beach	Banana	29	$155	3	$1,498	$4,495
2018	66	Big Muddy at Cynthia Baffle Box+	City of Indian Harbour Beach	Banana	269	$155	48	$869	$41,695
2018	67	Grant Place Baffle Box+	City of Melbourne	Central IRL	937	$88	193	$427	$82,481
2018	68	Crane Creek/M-1 Canal Flow Restoration+	St. Johns River Water Management District	Central IRL	23,113	$88	2,719	$748	$2,033,944
2018	69	Apollo/GA Baffle Box+	City of Melbourne	North IRL	3,381	$88	479	$621	$297,522
2019	66b	Big Muddy at Cynthia Baffle Box Expansion+	City of Indian Harbour Beach	Banana	167	$155	10	$2,584	$25,837
2019	85	Basin 1304 Bioreactor+	Brevard County	Banana	958	$94	127	$709	$90,000

Year Added	Project Number	Project Name	Responsible Entity	Sub-Lagoon	Total Nitrogen Reduction (pounds per year)	Cost per Pound of Total Nitrogen Removed	Total Phosphorus Reduction (pounds per year)	Cost per Pound of Total Phosphorus Removed	Plan Funding
2019	87	Fleming Grant Biosorption Activated Media+	Brevard County	Central IRL	602	$94	91	$622	$56,588
2019	88	Espanola Baffle Box+	City of Melbourne	Central IRL	1,119	$94	148	$711	$105,186
2019	89	Basin 1298 Bioreactor+	Brevard County	North IRL	917	$94	116	$743	$86,198
2019	90	Johns Road Pond Biosorption Activated Media+	Brevard County	North IRL	245	$94	37	$622	$23,030
2019	91	Burkholm Road Biosorption Activated Media+	Brevard County	North IRL	685	$94	104	$619	$64,390
2019	92	Basin 115 Carter Road Biosorption Activated Media+	Brevard County	North IRL	665	$94	101	$619	$62,510
2019	93	Basin 193 Wiley Avenue Biosorption Activated Media+	Brevard County	North IRL	954	$87	144	$575	$82,735
2019	94	Basin 832 Broadway Pond Biosorption Activated Media+	Brevard County	North IRL	456	$94	69	$621	$42,864
2019	95	Cherry Street Baffle Box+	City of Melbourne	North IRL	980	$313	174	$1,763	$306,740
2019	96	Spring Creek Baffle Box+	City of Melbourne	North IRL	1,057	$313	232	$1,426	$330,841
2019	97	Titusville High School Baffle Box+	City of Titusville	North IRL	1,190	$94	166	$674	$111,813
2019	98	Coleman Pond Managed Aquatic Plant System+	City of Titusville	North IRL	1,240	$28	198	$177	$35,000
2020	110	Osprey Plant Pond Managed Aquatic Plant Systems+	City of Titusville	North IRL	606	$99	88	$682	$60,000
2020	117	Basin 10 County Line Road Woodchip Bioreactor+	Brevard County Stormwater	North IRL	597	$122	90	$809	$72,773
2020	118	Basin 26 Sunset Road Serenity Park Woodchip Bioreactor+	Brevard County Stormwater	North IRL	605	$122	92	$802	$73,810

Year Added	Project Number	Project Name	Responsible Entity	Sub-Lagoon	Total Nitrogen Reduction (pounds per year)	Cost per Pound of Total Nitrogen Removed	Total Phosphorus Reduction (pounds per year)	Cost per Pound of Total Phosphorus Removed	Plan Funding
2020	119	Basin 141 Irwin Avenue Woodchip Bioreactor+	Brevard County Stormwater	North IRL	567	$122	86	$804	$69,174
2020	120	Draa Field Pond Managed Aquatic Plant Systems+	City of Titusville	North IRL	256	$122	38	$823	$31,281
2020	121	Basin 2258 Babcock Road Woodchip Bioreactor+	Brevard County Stormwater	Central IRL	412	$122	62	$810	$50,203
2020	122	Basin 22 Hunting Road Serenity Park Woodchip Bioreactor+	Brevard County Stormwater	North IRL	329	$122	50	$802	$40,077
2020	124	Floating Wetlands to Existing Stormwater Ponds+	City of Cocoa	North IRL	12	$125	3	$499	$1,497
2020	125	Diamond Square Stormwater Pond+	City of Cocoa	North IRL	85	$122	23	$451	$10,383
2020	127	Basin 5 Dry Retention+	Town of Indialantic	North IRL	113	$148	18	$927	$16,680
2020	128	Jackson Court Stormwater Treatment Facility+	City of Satellite Beach	Banana	56	$148	8	$1,033	$8,266
2020	129	Forrest Avenue 72-inch Outfall Baseflow Capture/Treatment+	City of Cocoa	North IRL	94	$148	12	$1,163	$13,956
2021	169	Sherwood Park Enhancement+	City of Melbourne	North IRL	1,762	$57	670	$149	$99,708
2021	174	St. Johns 2 Baffle Box+	City of Titusville	North IRL	1,992	$122	611	$398	$243,070
2021	123	Ray Bullard Water Reclamation Facility Stormwater Management Area+	City of West Melbourne	Central IRL	1,317	$122	400	$402	$160,674
2021	175	High School Baffle Box+	City of Melbourne	North IRL	1,183	$122	319	$452	$144,326
2021	176	Funeral Home Baffle Box+	City of Melbourne	North IRL	481	$122	129	$455	$58,682

Year Added	Project Number	Project Name	Responsible Entity	Sub-Lagoon	Total Nitrogen Reduction (pounds per year)	Cost per Pound of Total Nitrogen Removed	Total Phosphorus Reduction (pounds per year)	Cost per Pound of Total Phosphorus Removed	Plan Funding
2021	177	North and South Lakemont Ponds Floating Wetlands+	City of Cocoa	North IRL	107	$122	25	$522	$13,054
2021	178	Marina B Managed Aquatic Plant Systems+	City of Titusville	North IRL	55	$122	7	$953	$6,670
2021	179	Lori Laine Basin Pipe Improvement Project+	City of Satellite Beach	Banana	117	$150	21	$835	$17,525
2022	213	Johnson Junior High Denitrification Media Chamber Modification+	Brevard County Natural Resources	Central IRL	206	$313	Not applicable	Not applicable	$64,478
2022	214	Sand Point Park Baffle Box+	City of Titusville	North IRL	438	$313	71	$1,931	$137,135
2022	215	Basin 960 Pioneer Road Denitrification+	Brevard County Natural Resources	Banana	105	$370	3	$12,950	$38,850
2022	219	McNabb Outfall Bioretention+	City of Cocoa Beach	Banana	44	$441	7	$2,775	$19,423
2022	220	Basin 1398 Sand Dollar Canal Bioreactor+	Brevard County Natural Resources	North IRL	444	$446	70	$2,829	$198,024
2022	221	Burris Way Alley West Stormwater Low Impact Development Improvement+	City of Cocoa Beach	Banana	3	$416	0	Not applicable	$1,249
-	-	***Total***	-	-	***271,170***	***$175 (average)***	***37,450***	***$1,270 (average)***	***$47,577,124***

Note: The projects highlighted in green and marked with an asterisk were identified in the original plan. The projects highlighted in tan and marked with a plus sign were added to the plan as part of an annual update.

^ The costs and nutrient reductions for these original projects were modified to exclude portions of these priority basins that were funded as separate projects.

Figure 4-22: Stormwater Projects in North Brevard County

Figure 4-22 Long Description

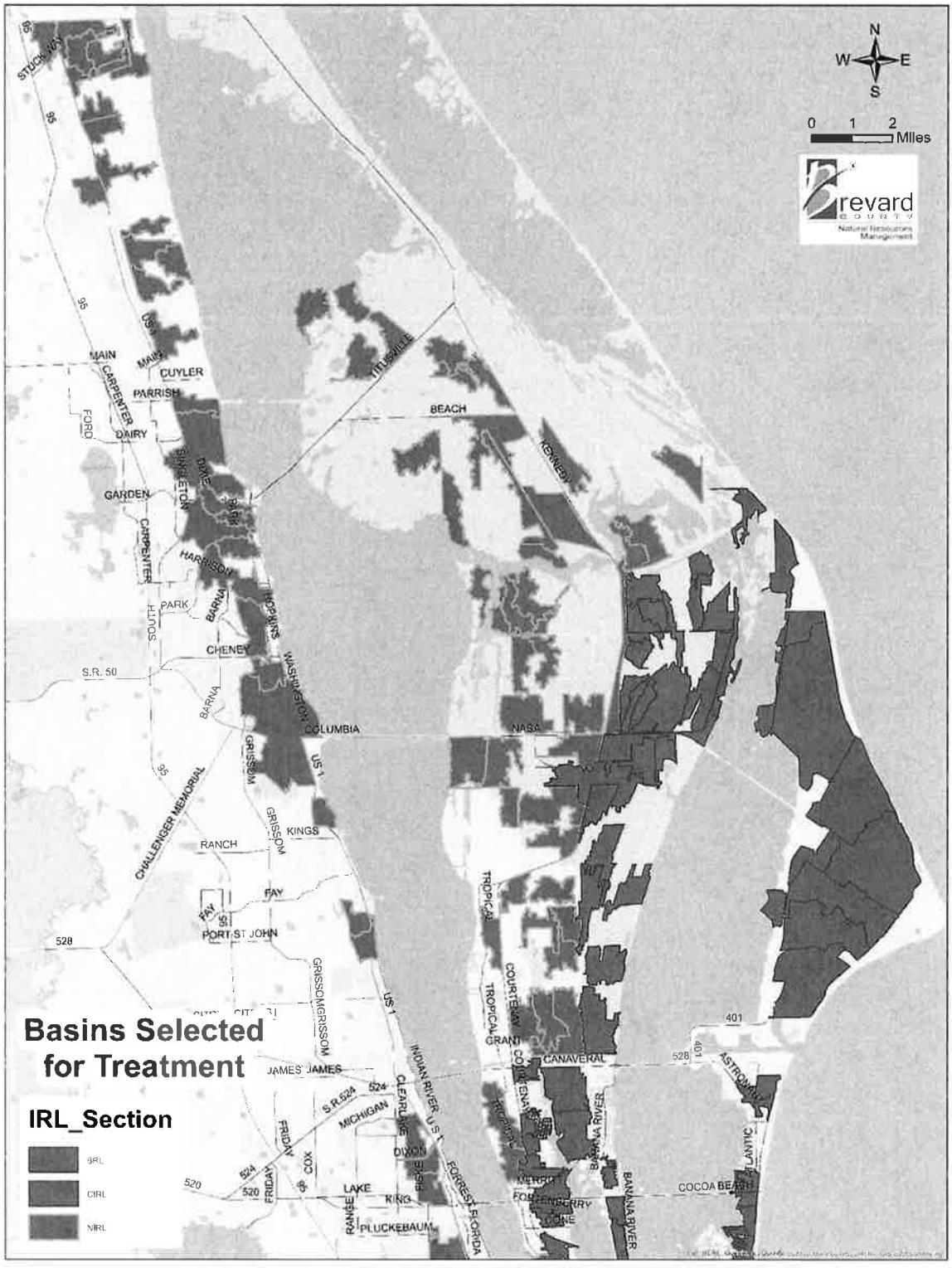


Figure 4-23: Stormwater Projects in Central Brevard County

Figure 4-23 Long Description

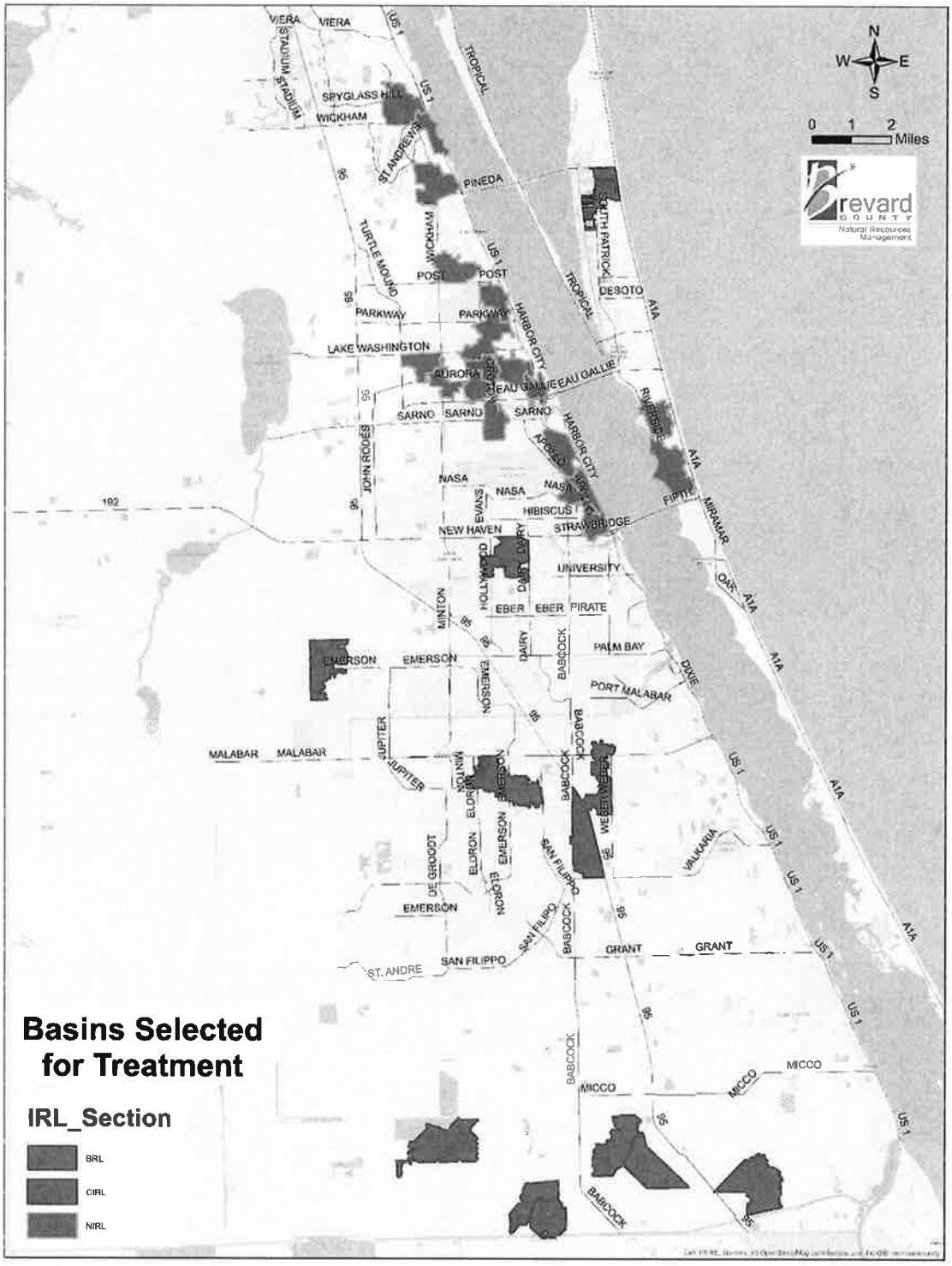


Figure 4-24: Stormwater Projects in South Brevard County

Figure 4-24 Long Description

4.1.8 Vegetation Harvesting

Mechanical removal or harvest of aquatic vegetation rather than treatment with herbicides or other control mechanisms may be one method of reducing nutrient loads to the Indian River Lagoon (IRL) and its tributaries. The use of aquatic plants for nutrient management has been considered since at least the 1960s (Boyd, 1969). The harvest of aquatic vegetation removes nutrients from the waterbody rather than recycling them through decomposition and settlement of the plant material into the sediment. Most freshwater plants do not tolerate the salinity of the IRL and, upon release (such as floating plants washed out of canals) to the lagoon, will die and decompose adding a nutrient load directly to the IRL.

Aquatic vegetation can occur either in mixed stands or as large monocultures. It is not uncommon for invasive plants to form largely monotypic stands. The plant material can form dense floating mats that prevent light diffusion into the water column, thus shading the bottom and limiting benthic habitat. The dense layer of vegetation also limits exchange of gases across the water surface and can cause depletion of dissolved oxygen under the mat. At greater densities, vegetation may also form floating islands or tussocks and incorporate woody plants.

Common invasive plants present in waterways that connect to the IRL are hydrilla, water lettuce, duck weed, and water hyacinth, and these plants present the greatest opportunity for harvest and removal of nutrients through plant biomass. However, native vegetation can be intermixed with exotics. Examples of common native aquatic vegetation that may also be removed includes cattails, fanwort, coontail, bladderwort, and water lilies.

The removal of aquatic vegetation may be accomplished in several ways. For canals or waterbodies with small surface area, booms laid across the water surface can divert flow to screening and sorting facilities for removal of floating vegetation. Also, in canals, drag lines or back hoes can be used for removal of submerged vegetation or modified front end loaders with baskets can collect floating plant material. There are also specifically designed harvesters and shredders that move through the water and cut and remove vegetation (Florida Department of Environmental Protection, 2012).

The cost-share for vegetation harvesting was based on actual annualized costs and laboratory analyses of the total nitrogen (TN) and total phosphorus (TP) content of plant material removed from floating vegetative islands in eight Brevard County stormwater ponds (see **Table 4-26**). Cost-share reimbursement of approved projects will be based on laboratory analysis of plant material to determine true nutrient removal. Eligible cost-share will be adjusted as additional cost and nutrient removal benefit data are collected.

Table 4-26: Estimated Costs and Nutrient Reductions for Vegetation Harvesting

Project	Annualized Cost	Annualized Total Nitrogen Reductions (pounds per year)	Cost per Pound per Year of Total Nitrogen Reduction	Annualized Total Phosphorus Reductions (pounds per year)	Cost per Pound per Year of Total Phosphorus Reduction
Vegetation Harvesting	$198,868	1,812	$110	191	$1,041

Table 4-27 summarizes the approved projects for vegetation harvesting.

Table 4-27: Projects for Vegetation Harvesting

Year Added	Project Number	Project Name	Responsible Entity	Sub-lagoon	Total Nitrogen Reduction (pounds per year)	Cost per Pound per Year of Total Nitrogen Reduction	Total Phosphorus Reduction (pounds per year)	Cost per Pound per Year of Total Nitrogen Reduction	Plan Funding
2020	111	Draa Field Vegetation Harvesting+	City of Titusville	North IRL	786	$110	99	$873	$86,413
2020	112	County Wide Stormwater Pond Harvesting+	Brevard County Stormwater	North IRL	140	$100	28	$500	$14,000
2021	171	Mechanical Aquatic Vegetation Harvesting+	Melbourne-Tillman Water Control District	Central IRL	16,636	$61	1,664	$608	$1,011,976
2021	172	Horseshoe Pond Vegetative Harvesting+	Brevard County Stormwater	North IRL	74	$110	7	$1,163	$8,140
2021	173	North and South Lakemont Ponds Vegetation Harvesting+	City of Cocoa	North IRL	18	$110	4	$495	$1,980
2022	208	Maritime Hammock Preserve Stormwater Pond Aquatic Vegetation Harvesting+	City of Cocoa Beach	Banana	70	$110	5	$1,540	$7,700
2022	209	Basin 1398 Sand Dollar Canal Harvesting+	Brevard County Natural Resources	North IRL	222	$110	21	$1,163	$24,420
2022	210	Basin 958 Pioneer Road Vegetation Harvesting+	Brevard County Natural Resources	Banana	363	$110	47	$850	$39,930
2022	211	Cocoa Beach Golf Course Stormwater Ponds Aquatic Vegetation Harvesting+	City of Cocoa Beach	Banana	1,965	$110	135	$1,601	$216,150
-	-	***Total***	-	-	***20,274***	***$70 (average)***	***2,010***	***$702 (average)***	***$1,410,709***

Note: The projects highlighted in tan and marked with a plus sign were added to the plan as part of an annual update.

4.2. Projects to Remove Pollutants

The purpose of the projects in this section is to remove pollutants that have accumulated in the lagoon. Brevard County (County) has already begun to remove deep accumulations of muck from the lagoon bottom. Dredging to remove muck in other locations of the lagoon will continue, as well as treatment of the interstitial water when feasible. These muck removal projects have more immediate benefits on the lagoon water quality than external reduction projects because the nutrient flux is reduced as soon as muck is dredged from the system whereas it takes time for the external load reduction benefits to reach the lagoon. The County is also evaluating opportunities to use new treatment technologies to provide surface water remediation. In addition, the St. Johns River Water Management District, Indian River Lagoon National Estuary Program, and Florida Institute of Technology are evaluating opportunities for enhanced circulation projects, which will allow additional water to flow into the lagoon system to help remove the built-up sediments and muck. The following sections describe the County's proposed muck removal projects, scrubbing of muck interstitial water, as well as potential surface water remediation and potential circulation enhancement projects.

4.2.1 Muck Removal

Muck flux contributes 45% of the TN and 49% of TP load to the Banana River Lagoon each year.

The muck in the Indian River Lagoon (IRL) increases turbidity, inhibits seagrass growth, promotes oxygen depletion in sediments and the water above, stores and releases nutrients, covers the natural bottom, and destroys healthy communities of benthic organisms (Trefry, 2013). When muck is suspended within the water column due to wind or human activities such as boating, these suspended solids limit light availability and suppress seagrass growth. Even for deeper water areas without seagrass growth, muck remains a nutrient source that potentially affects a broader area of the lagoon through nutrient flux and resuspension of fine sediments and their subsequent transport. As shown in **Table 3-1,** the annual release of nutrients from decaying muck is almost as much as the annual external loading delivered by stormwater and groundwater baseflow combined. The muck deposits cover an estimated 6,700 acres of the lagoon system bottom in Brevard County (Trefry, 2018).

The muck deposits in the lagoon flux nutrients that enter the water column and contribute to algal blooms and growth of macroalgae. Muck flux rates for nitrogen and phosphorus have been estimated through studies in the IRL system. For this plan, the average flux rates used are 150 pounds of total nitrogen (TN) per acre per year and 20 pounds of total phosphorus (TP) per acre per year (Trefry, 2018) except where specific measurements indicate otherwise.

The focus of the muck removal projects for this plan is on large deposits of muck in big, open water sites within the lagoon itself. Several of the canal systems that directly connect to the lagoon are also included for muck removal. The goal of the muck removal is to reduce TN and TP muck flux loads by 25%, which should result in a significant improvement in water quality and seagrass extent, as well as a reduced risk of massive algal blooms and fish kills. A 70% efficiency for muck removal projects was applied. This efficiency accounts for two factors: (1) each target dredge area has less than 100% muck cover, and (2) some pockets of muck within dredged areas will inevitably be left behind regardless of the dredge technology used. In 2018 and 2019, the Florida Institute of Technology conducted evaluations of the muck deposits throughout the lagoon system for Brevard County (Fox and Trefry, 2018; Fox and Trefry, 2019; Shenker, 2018; Souto, 2018; Trefry et al., 2019a and 2019b; Zarillo and Listopad, 2019). The updated muck acreage estimates are shown in **Table 4-28**.

Table 4-28: Muck Acreages in the IRL System

Muck Reduction Targets	Open Banana	Banana Canals	North IRL	North IRL Canals	Central IRL	Central IRL Canals	Mosquito Lagoon
Muck area (acres)	1,276	752	3,035	51	59	37	398
Muck flux (pounds of total nitrogen per year)	281,148	112,800	233,992	7,650	40,226	5,550	7,164
Funded dredging sites (acres)	223	0	251	0	0	0	0
Flux from funded dredging sites (pounds of total nitrogen per year)	123,723	0	85,325	0	0	0	0
Flux reduction from funded sites (pounds of total nitrogen per year)	86,606	0	59,728	0	0	0	0
Percent of total flux reduced by dredging the funded sites	31%	0%	26%	0%	0%	0%	0%

Using the information from the Florida Institute of Technology, Brevard County reevaluated the priority muck locations for dredging. The estimated area and nutrient flux using average flux rates for Brevard County or site-specific data collected by the Florida Institute of Technology are shown in **Table 4-29** for the recommended projects. **Table 4-30** provides a summary of the recommended projects and the projects submitted as part of an annual plan. The locations of these projects are shown in **Figure 4-25** through **Figure 4-28**.

As dredging proceeds, upland input of muck components must be reduced to prevent new muck accumulation. Therefore, land-based source control measures for nutrients, organic waste, and erosion are needed. Without source controls, muck removal will need to be frequently repeated, which is neither cost-effective nor beneficial to the lagoon's health. Public awareness and commitment are needed to control future muck accumulation. Activities that contribute organic debris and sediment to stormwater and open water must be curtailed. Additional scientific assessment should be carried out to evaluate and optimize the dredging process.

Table 4-29: Estimated Costs and Nutrient Reductions for Muck Removal Project Areas

Location	Sub-Lagoon	Cubic Yards	Acres	Total Nitrogen Flux (pounds per acre per year)	Total Phosphorus Flux (pounds per acre per year)
Canaveral South	Banana	420,000	55	919	50
Pineda Banana River Lagoon	Banana	195,000	28	767	35
Patrick Space Force Base	Banana	205,000	26	357	21
Cocoa Beach Golf	Banana	975,000	140	303	21
Titusville Railroad West	North IRL	90,000	70	294	12
National Aeronautics and Space Administration Causeway East	North IRL	285,000	34	919	44
Rockledge A	North IRL	125,000	38	285	31
Titusville Railroad East	North IRL	115,000	36	214	9
Eau Gallie Northeast	North IRL	250,000	73	205	29

Table 4-30: Projects for Muck Removal

Year Added	Project Number	Project Name	Responsible Entity	Sub-Lagoon	Total Nitrogen Reduction (pounds per year)	Cost per Pound per Year of Total Nitrogen Removed	Total Phosphorus Reduction (pounds per year)	Cost per Pound per Year of Total Phosphorus Removed	Plan Funding
Original	2016-10a	Canaveral South*	Brevard County	Banana	35,382	$415	1,925	$7,636	$14,700,000
Original	2016-5a	Pineda Banana River Lagoon*	Brevard County	Banana	15,033	$454	686	$9,949	$6,825,000
Original	2016-11a	Patrick Space Force Base*	Brevard County	Banana	6,497	$1,104	382	$18,783	$7,175,000
Original	168a	Cocoa Beach Golf*^	Brevard County	Banana	29,694	$719	2,058	$10,374	$21,350,000
Original	2016-06a	Titusville Railroad West*	Brevard County	North IRL	14,406	$219	588	$5,357	$3,150,000
Original	2016-07a	National Aeronautics and Space Administration Causeway East*	Brevard County	North IRL	21,872	$456	1,047	$9,527	$9,975,000
Original	2016-04a	Rockledge A*	Brevard County	North IRL	7,581	$577	825	$5,303	$4,375,000
Original	2016-08a	Titusville Railroad East*	Brevard County	North IRL	5,393	$746	227	$17,731	$4,025,000
Original	54a	Eau Gallie Northeast*	Brevard County	North IRL	10,476	$835	1,482	$5,904	$8,750,000
2017	41a	Grand Canal Muck Dredging+#	Brevard County	Banana	10,469	$251	1,396	$1,882	$2,626,600
2017	42a	Sykes Creek Muck Dredging+	Brevard County	Banana	19,635	$240	2,618	$1,797	$4,705,428
2018	70a	Cocoa Beach Muck Dredging – Phase III+	City of Cocoa Beach	Banana	4,095	$336	780	$1,764	$1,376,305
2018	71	Merritt Island Muck Removal – Phase 1+	Brevard County	Banana	8,085	$957	1,540	$5,022	$7,733,517
2018	72a	Muck Removal of Indian Harbour Beach Canals+	City of Indian Harbour Beach	Banana	3,780	$961	720	$5,044	$3,631,815
2018	2016-3a	Muck Re-dredging in Turkey Creek+	Brevard County	Central IRL	5,691	$38	221	$973	$215,000
2019	101	Cocoa Beach Muck Dredging Phase II-B+	City of Cocoa Beach	Banana	6,300	$939	840	$7,045	$5,917,650
2020	144	Satellite Beach Muck Dredging+	City of Satellite Beach	Banana	3,885	$485	518	$3,638	$1,884,225
2022	223	Spring Creek Dredging+	City of Melbourne	North IRL	154	$520	21	$3,813	$80,080
-	-	***Total***	-	-	***208,428***	***$521 (average)***	***17,874***	***$6,070 (average)***	***$108,495,620***

Note: The projects highlighted in green and marked with an asterisk were identified in the original plan. The projects highlighted in tan and marked with a plus sign were added to the plan as part of an annual update.

^ The Cocoa Beach Golf project is not fully funded at this time. A total of $21,350,000 is available and Brevard County is looking for options to fund the remaining $12,775,000 for dredging plus associated interstitial water treatment.

In 2021, contingency funding was approved to add Berkeley Canal to the Grand Canal project.

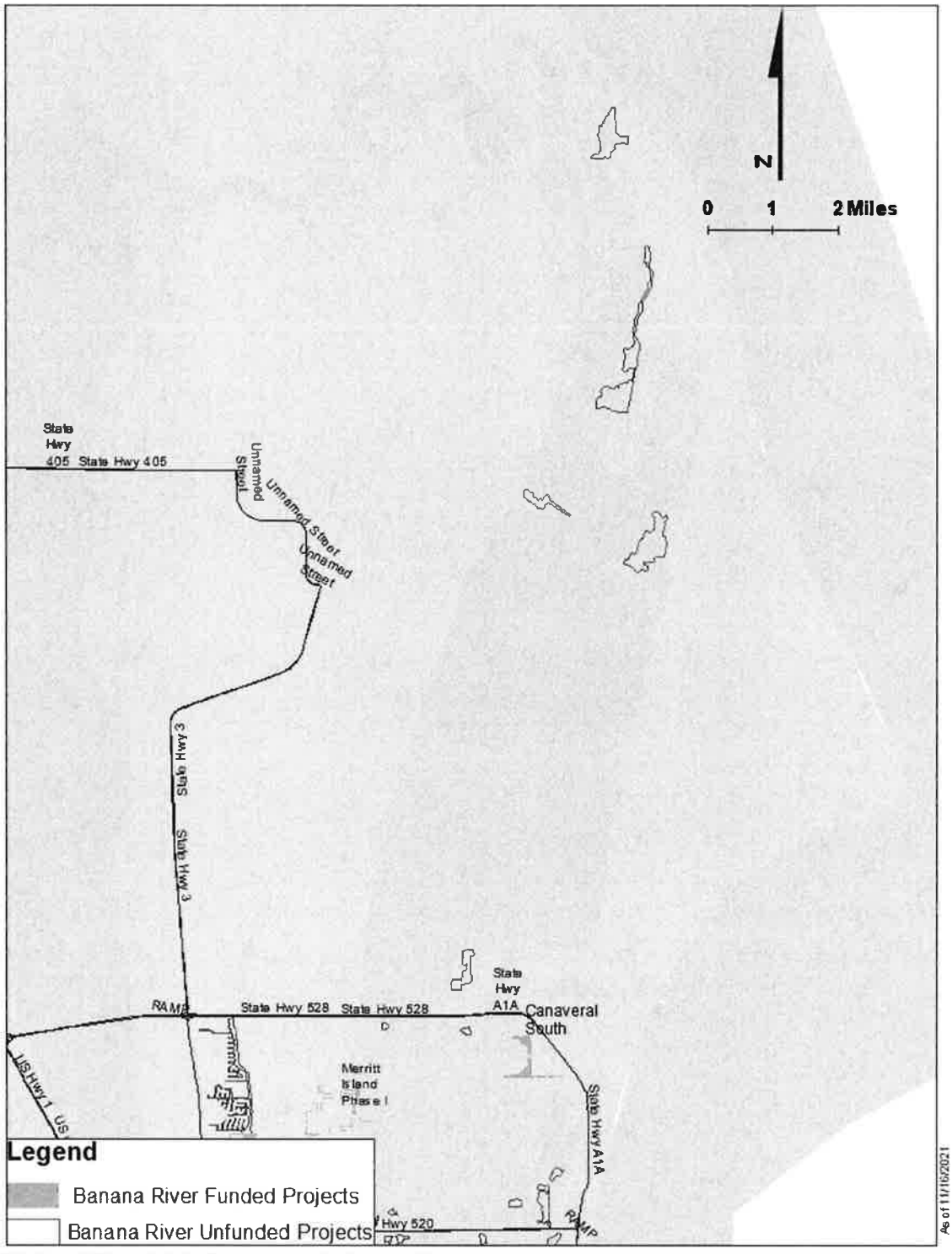


Figure 4-25: Location of Muck Removal Projects in the Northern Banana River Lagoon

Figure 4-25 Long Description

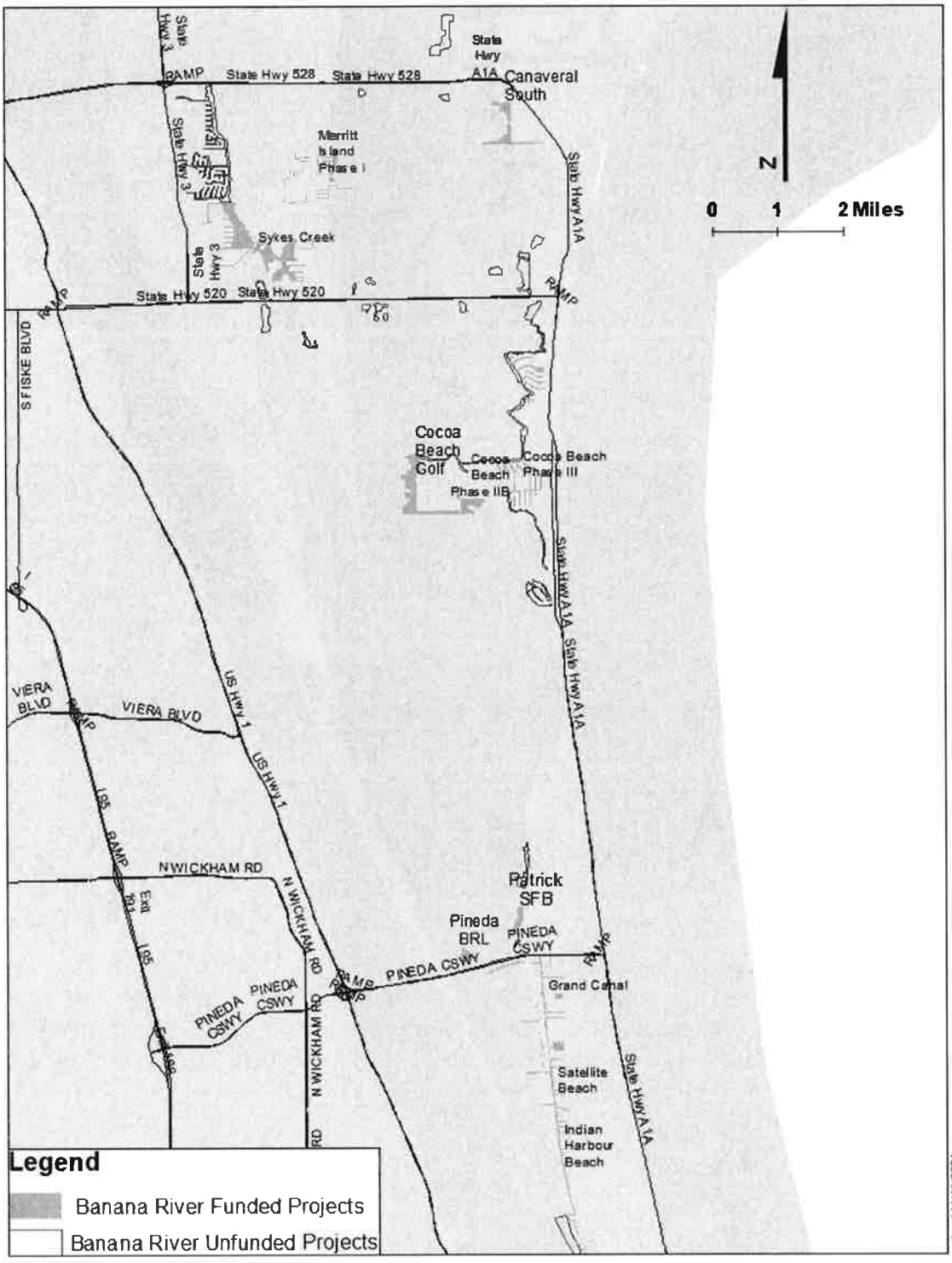


Figure 4-26: Location of Muck Removal Projects in the Southern Banana River Lagoon

Figure 4-26 Long Description

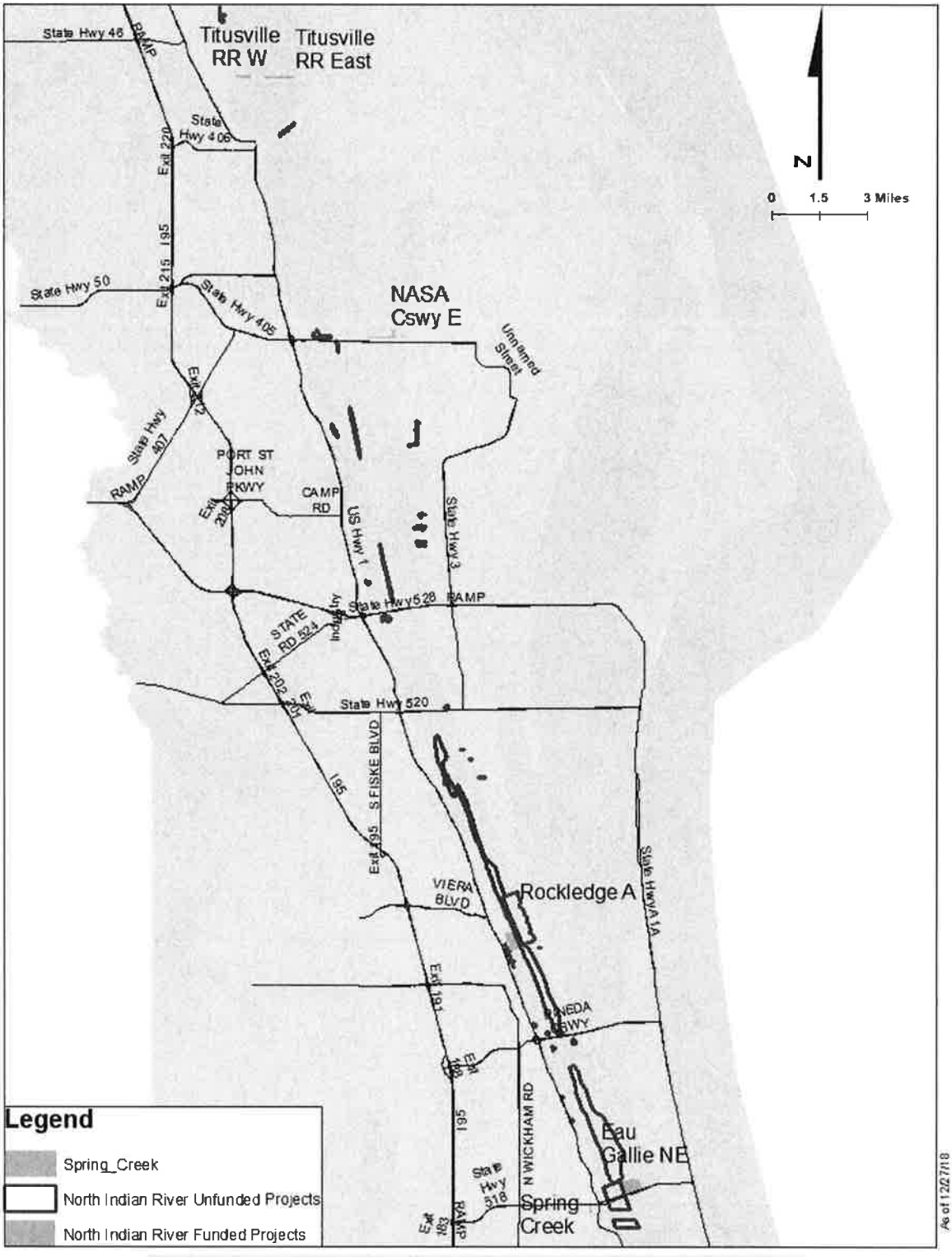


Figure 4-27: Location of Muck Removal Projects in North IRL

Figure 4-27 Long Description

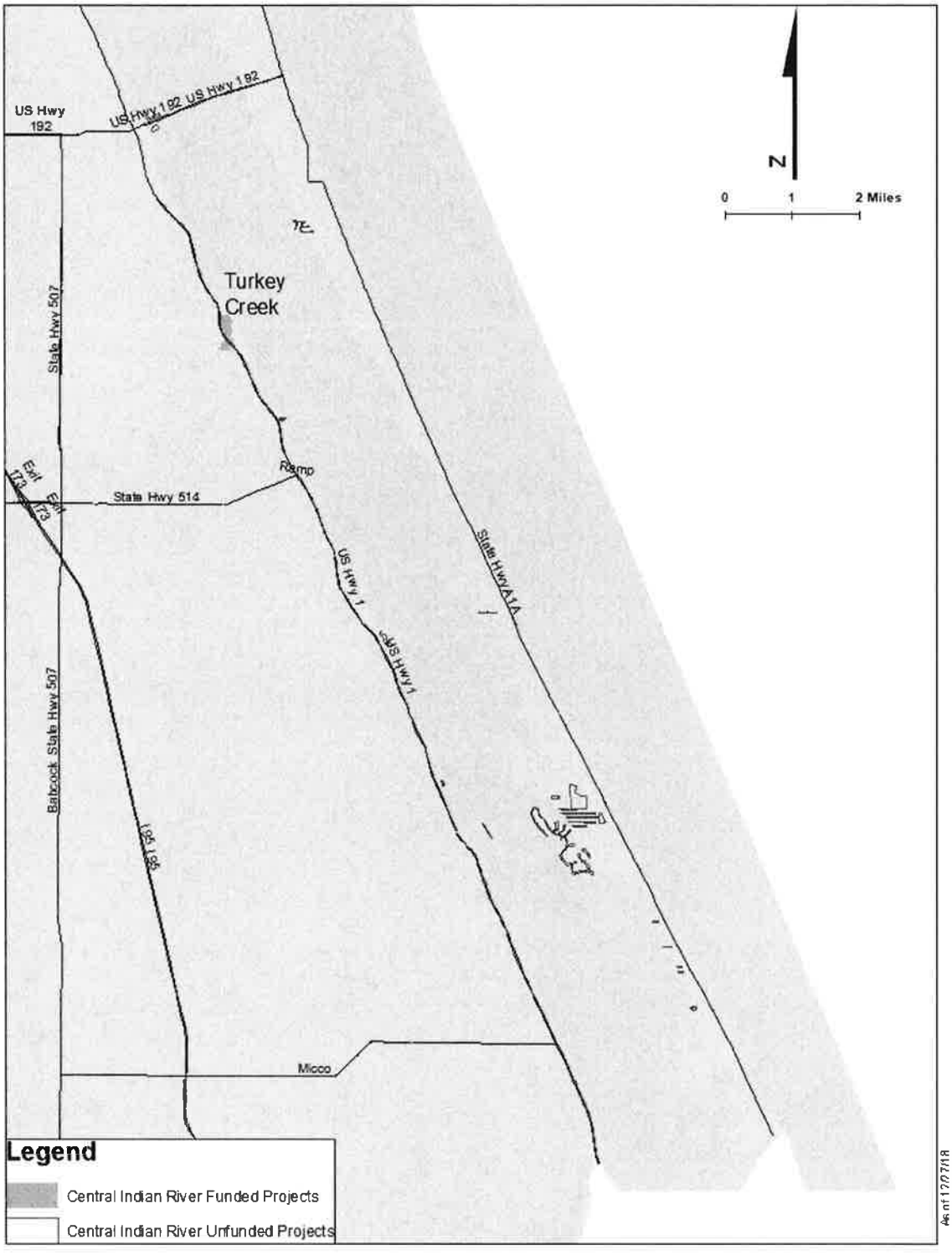


Figure 4-28: Location of Muck Removal Projects in Central IRL

Figure 4-28 Long Description

4.2.2 Treatment of Muck Interstitial Water

Interstitial water refers to the water content that is present within the muck material. Sampling and testing conducted by Florida Institute of Technology researchers has shown that the majority of nutrients are bound to solid particles in the muck; however, the interstitial water also contains a significant amount of dissolved nutrients. When the muck material is dredged, interstitial water nutrients are pumped with the muck and lagoon water in a slurry to the dredged material management area. At the dredged material management area, the muck slurry is processed in a settling pond where sediments settle out and overflow water is returned to the Indian River Lagoon (IRL). Treatment of this overflow water represents a significant opportunity to prevent return of these nutrients to the IRL.

Working with the dredging industry, sewage treatment industry, stormwater treatment entrepreneurs and industrial waste treatment engineers, feasible and reasonably cost-effective concentration targets for return water to the IRL were initially identified as 2,000–3,000 parts per billion for total nitrogen (TN) and 75–100 parts per billion for total phosphorus (TP). Treatment options for TP were demonstrated during the state-funded initial dredging of Turkey Creek, with Florida Institute of Technology researchers providing independent third-party verification of performance levels. These targets can be achieved through a variety of technologies including, but not limited to, coagulants, polymers, biosorption activated media, or a combination of these technologies. Costs associated with these technologies vary by technology, target nutrient reduction levels, and interstitial nutrient concentrations. Open market costs were initially collected through three bid solicitations: (1) Mims Boat Ramp muck removal project, (2) Sykes Creek muck removal project, and (3) Grand Canal muck removal project. More recent dredging experience indicates that concentration targets for TN may need to be adjustable and procured as bid options or alternates to allow market conditions to identify what targets are most cost-effective.

To encourage partnering entities and applicants for Save Our Indian River Lagoon Trust Fund dollars to take advantage of this opportunity to enhance the performance of muck removal projects by removing interstitial water nutrients from the dredge slurry during muck dredging operations whenever project configuration allows, a separate cost-share was developed to account for this added cost and associated nutrient reduction benefit. Using available cost information from Turkey Creek, Mims, and Sykes Creek, County staff considered how to incentivize the addition of this processing step as soon as possible into permitted muck removal projects, as well as future projects. When the substitute project request form was distributed to the public in 2018, staff estimated that a cost-share of $200 per pound of TN removed would be sufficient to entice most partners to agree to stipulate a specific condition in their bids and dredging contracts that return water not exceed 3,000 parts per billion of TN nor 100 parts per billion of TP. However, based on recent bids for nutrient mitigation alternatives for sediment dewatering for Sykes Creek (Tetra Tech, 2015), Grand Canal, and Mims, the cost-share used for Brevard County projects in the 2019 Update was reduced to $50 per pound of TN removed. This cost will remain volatile until a contractor meets the concentration targets long enough to determine cost more accurately.

The recommended locations for interstitial water treatment and load reductions are shown in **Table 4-31**.

Table 4-31: Projects for Treatment of Interstitial Water

Year Added	Project Number	Project Name	Responsible Entity	Sub-lagoon	Total Nitrogen Reduction (pounds per year)	Cost per Pound per Year of Total Nitrogen Removed	Total Phosphorus Reduced (pounds per year)	Cost per Pound per Year of Total Phosphorus Removed	Plan Funding
2017	40	Mims Muck Removal: Outflow Water Nutrient Removal+*	Brevard County	North IRL	2,803	$143	244	$1,639	$400,000
2018	2016-10b	Canaveral South+	Brevard County	Banana	42,688	$50	3,887	$549	$2,134,419
2018	2016-5b	Pineda Banana River Lagoon+	Brevard County	Banana	19,820	$50	1,804	$549	$990,980
2018	2016-11b	Patrick Space Force Base+	Brevard County	Banana	20,836	$50	1,897	$549	$1,041,800
2018	168b	Cocoa Beach Golf+^	Brevard County	Banana	99,098	$30	9,022	$334	$3,013,100
2018	41b	Grand Canal+#	Brevard County	Banana	89,495	$174	To be determined	To be determined	$15,610,821
2018	42b	Sykes Creek+	Brevard County	Banana	64,278	$175	To be determined	To be determined	$11,248,704
2018	2016-06b	Titusville Railroad West+	Brevard County	North IRL	9,148	$50	833	$549	$457,375
2018	2016-07b	National Aeronautics and Space Administration Causeway East+	Brevard County	North IRL	28,967	$50	2,637	$549	$1,448,355
2018	2016-04b	Rockledge A+	Brevard County	North IRL	12,705	$50	1,157	$549	$635,244
2018	2016-08b	Titusville Railroad East+	Brevard County	North IRL	11,688	$50	1,064	$549	$584,424
2018	54b	Eau Gallie Northeast+	Brevard County	North IRL	25,410	$50	2,313	$549	$1,270,487
2018	2016-3b	Muck Interstitial Water Treatment for Turkey Creek+	Brevard County	Central IRL	Not applicable	Not applicable	688	Not applicable	Part of dredging cost
2018	72b	Muck Interstitial Water Treatment for Indian Harbour Beach Canals+	City of Indian Harbour Beach	Banana	27,418	$200	To be determined	To be determined	$5,483,600
2020	113	Satellite Beach Interstitial Water Treatment+	City of Satellite Beach	Banana	29,978	$102	3,059	$1,000	$3,057,756
-	-	***Total***	-	-	***484,332***	***$98 (average)***	***28,605***	***$1,656 (average)***	***$47,377,065***

Note: The projects highlighted in tan and marked with a plus sign were added to the plan as part of an annual update.

* Outflow Water Nutrient Removal for the Mims Muck Removal project was funded, bid, and awarded to the lowest successful bidder; however, the contractor was unsuccessful at reducing outflow water nutrient concentrations as much as required by the contract. Therefore, only partial reductions were achieved and the Save Our Indian River Lagoon 0.5 cent sales tax funding was not used.

^ The Cocoa Beach Golf project is not fully funded at this time. A total of $3,013,100 is available and Brevard County is looking for options to fund the remaining $1,941,800.

In 2021, contingency funding was approved to add Berkeley Canal to the Grand Canal project.

4.2.3 Spoil Management Areas

As Brevard County (County) seeks to execute muck dredging projects, the availability of upland processing areas for the treatment of dredge spoils has become a growing concern. These working sites, referred to as temporary spoil management areas or in the industry as dredged material management areas, are upland parcels of land that can be used as needed for the temporary processing of dredge spoils until such time as the materials can be moved offsite to a permanent beneficial use or disposal location.

To move muck dredging projects forward in a timely manner, initial project locations were selected to make use of existing dredged material management areas through the County's long-standing partnership with the Florida Inland Navigation District. The Florida Inland Navigation District manages Florida's Intracoastal Waterway for which it has acquired eight dredged material management area sites distributed from north to south along the 72 miles of the Indian River Lagoon (IRL), not the Banana River, in Brevard County. Only three of these Florida Inland Navigation District dredged material management areas are presently developed; however, the County is working on partnership agreements with the Florida Inland Navigation District to construct dredged material management area facilities at their remaining sites.

The eight Florida Inland Navigation District sites are insufficient to meet the volume and timing of muck dredging projects included in this plan. As the distance between dredging sites and dredged material management areas increase, more booster pumps are required. Booster pumps can complicate project operations and increase cost, particularly as multiple boosters become necessary. Booster pumps are required as project pump distances approach one-mile and are required at one-mile intervals thereafter. Each booster pump adds approximately $1 per cubic yard of material dredged. Pump distances for the Eau Gallie and Sykes Creek projects have five- to seven-mile pump distances to the Florida Inland Navigation District sites and project amounts in excess of 400,000 cubic yards each.

As a supplement to the Florida Inland Navigation District sites, Brevard County staff investigated lease and purchase options for the development of additional multi-use spoil management areas. Lease options for parcels of interest resulted in unfavorable cost-benefit ratios on these short-term investments due to the up-front costs of site development including design, permitting, mitigation, and construction. Similar cost effectiveness issues arise from depending on private sector contractors to provide a temporary dredged material management area as part of construction costs. The contractor passes along most or all the costs of providing a dredged material management area, but the County does not have the benefit of using the site multiple times over the 10-year timespan of this plan or thereafter.

Fee simple purchase and development of spoil management areas, designed with multi-use options for the implementation of regional surface water or stormwater treatment projects, emerges as the most cost-effective long-term option. Through fee simple site acquisition and a prescribed site use and management plan, investments in acquisition and development costs, including required mitigation, can be recovered. For example, the acquisition of a spoil management site four miles closer than the nearest Florida Inland Navigation District site could reduce booster pump costs by $1.6 million on a single 400,000 cubic yard muck removal project. This savings can offset site acquisition and development costs associated with the parcel.

Publicly owned dredged material management area sites could be used for stormwater or surface water treatment, when not being used for dredging. These additional uses can be

factored into site selection and design to provide supplementary lagoon benefits. Therefore, land acquisition shall be considered an eligible muck management project cost, particularly when the site can be designed to provide multi-use regional surface water or stormwater treatment alongside or intermittently between usages for muck management. A preliminary project design and construction layout with cost evaluation (comparison to an existing, more distant dredged material management area) shall be part of the site selection and land acquisition decision process.

Another factor to consider when evaluating long-term operations and the feasibility of muck dredging projects is the strategy for final disposal and the development of permanent beneficial use or disposal locations. Often left to the contractor as part of their construction and implementation plan, a final disposition strategy is in many cases not part of the dredging project plan. The dependency on private sector contractors to provide a final disposition strategy and permanent material disposal site can have consequences that a managed permanent disposal site can avoid. These consequences can increase the contractor's risk and drive up project costs.

A managed disposal site would consider the fiscal, environmental, and social implications of the site. A final disposition strategy evaluates the appropriateness of the disposal site in terms of the local community and future development, the environmental proximity to surface waters and runoff potential, groundwater protection, hauling costs, and minimizing risk by providing a defined disposal site. A defined material disposal site, laid-out in the project design, provides a level of security at the time of project bidding that reduces risk to the contractor and potentially lowers the project cost. Staff investigation into the purchase, use and reclamation of existing borrow pits are an example of final disposal areas that are being considered. Similar to what is seen with the development of temporary spoil management areas, the most cost-effective long-term option for the disposal of muck material should include the evaluation of fee simple purchase options and the development of spoil disposal areas.

4.2.4 Surface Water Remediation System

In 2016, AquaFiber Technologies Corporation had a technology that could treat up to 25 cubic feet per second (16 million gallons per day) of water from Turkey Creek, which is a major tributary to the Central Indian River Lagoon (IRL). This project would reduce total suspended solids by more than 90%, remove algal blooms and cyanobacteria to improve the lagoon's color and clarity, improve the dissolved oxygen concentration by returning water with near 100% oxygen saturation, and produce a biomass that can be processed into fertilizer pellets or used as a feedstock for waste-to-energy utilities to produce electricity.

This project would remove an estimated 35,633 pounds per year of total nitrogen (TN) and 2,132 pounds per year of total phosphorus (TP) from the watershed. The facility would cost $19,720,760 for design, permitting, construction, and use of a technology to destroy the biomass onsite. The cost to operate and maintain the remediation facility is estimated to be $6,271,200 per year. **Table 4-32** summarizes the benefits and costs of nutrient removal for this project for a 10-year period. On an annual basis, the yearly costs would be $8,243,276, which would result in an annual cost per pound per year of TN removed of $231 and cost per pound per year of TP removed of $3,867.

Brevard County also received information from Phosphorus Free Water Solutions, which has a pay for performance treatment technology to reduce phosphorus, nitrogen, color, and turbidity in surface waters. Phosphorus Free evaluated a project to treat 50 cubic feet per second of water

from Turkey Creek. Based on the measured concentrations in Turkey Creek, Phosphorus Free Water Solutions provided two options for treating nitrogen. The measured phosphorus concentration in Turkey Creek is very low and it would not be cost-effective to remove additional phosphorus from the system through this technology. The first option would use the basic nitrogen removal process, which would remove a portion of the dissolved organic nitrogen. This option would reduce TN by 53% or 50,353 pounds per year at a cost of $6,797,000 or $135 per pound of TN removed. The second option would include an additional treatment step to increase the removal of dissolved organic nitrogen. This option would reduce TN by 86% or 81,469 pounds per year at a cost of $13,035,000 or $160 per pound of TN removed (**Table 4-32**). The costs for each scenario do not include the capital costs to construct the treatment facility, only the annual pay for performance cost estimates for a ten-year contract for treatment.

Table 4-32: Summary of Annual Benefits and Ten-Year Costs of a Surface Water Remediation System

Project	Ten-Year Project Cost	Total Nitrogen Reduction (pounds per year)	Cost per pound per Year of Total Nitrogen Removed	Total Phosphorus Reduction (pounds per year)	Cost per Pound per Year of Total Phosphorus Removed
AquaFiber	$82,432,760	35,633	$2,313	2,132	$38,665
Phosphorus Free Option 1	$67,970,000	50,353	$1,350	To be determined	To be determined
Phosphorus Free Option 2	$130,350,000	81,469	$1,600	To be determined	To be determined

These technologies have not yet been tested in estuarine systems; therefore, these remediation systems are not recommended at this time. However, these types of treatment technologies offer additional benefits that should be more thoroughly explored to better assess the total value to restoring and maintaining lagoon health. In 2020, Brevard County received a grant to collaborate with AquaFiber Technologies Corporation to pilot test their surface water remediation technologies. Unfortunately, AquaFiber had to cancel the project due to COVID-19 related economic hardships. Brevard County continues to investigate potential surface water remediation technologies and a portion of the Respond funding may be used to incentivize pilot testing. As feasible technologies are proven, projects may be added to future plan updates.

4.2.5 Enhanced Circulation

The 2011 superbloom occurred in the Banana River Lagoon, North Indian River Lagoon (IRL), and southern Mosquito Lagoon. These areas have long residence times, which means that water in these areas stagnates and nutrients can build up leading to additional algal blooms. Options to address this condition are to increase circulation by replacing causeways with bridges, installing culverts under causeways, or increasing ocean exchange by adding culverts, pump stations, or inlets to provide new connections to the ocean. Addressing manmade causeways that interfere with natural circulation should be beneficial without unintended consequences and modeling can help prioritize actions, but implementation is costly and requires participation by the Florida Department of Transportation.

New artificial ocean exchange projects introduce a lot of unknowns. While the residence time of water in the IRL system would decrease, the input ocean water with its complement of marine life has the potential to alter the lagoon ecosystem. Whether the amount of ocean exchange needed to have a beneficial impact on the system can be achieved without causing unintended harm to the lagoon is unknown. Artificial ocean exchange projects are costly with significant

social implications and permitting hurdles to overcome. For these reasons, causeway replacements are encouraged while ocean exchange projects are not a recommended component of this plan. Other entities are taking the lead on evaluating options. The results of evaluations by the St. Johns River Water Management District and the IRL National Estuary Program are summarized below.

The St. Johns River Water Management District contracted with CDM Smith and Taylor Engineering to identify potential locations where enhanced circulation projects would be beneficial. The first phase of the project (CDM Smith et al., 2014) involved a literature review and geographic information system desktop analysis. All the locations considered in Phase I, including the top ranked locations, are shown in **Figure 4-29**. From this first phase, ten locations were identified for future evaluation as shown in **Table 4-33**. The external projects are those that could potentially connect the IRL system with the Atlantic Ocean whereas internal projects are connections within the IRL (CDM Smith et al., 2015).

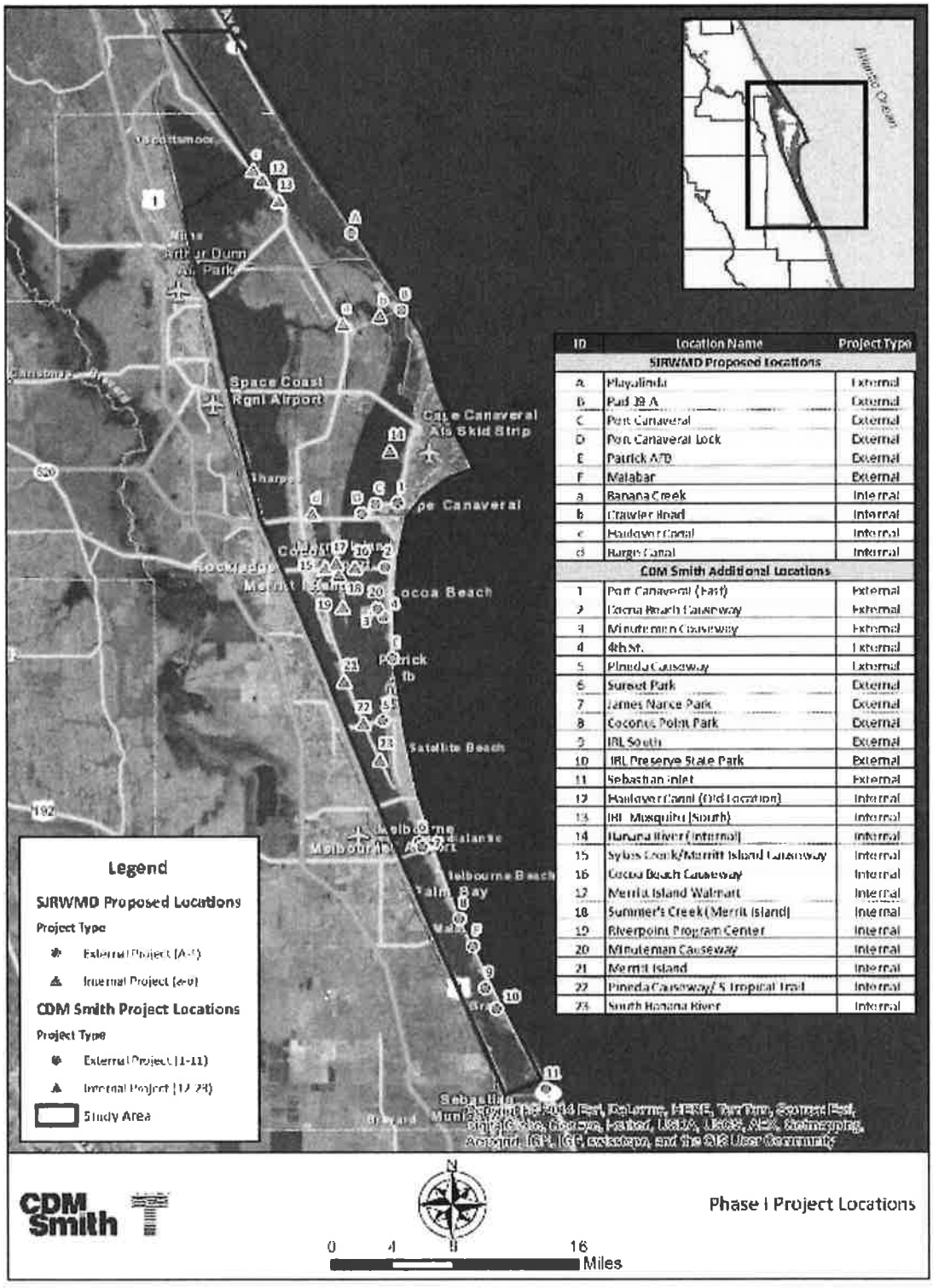
Table 4-33: Phase I Top Ranked Potential Enhanced Circulation Project Locations

Project Site	Project Description	Zone	Project Type	Rank
D	Canaveral Lock*	Banana River Lagoon	External	1
C	Port Canaveral*	Banana River Lagoon	External	2
15	Sykes Creek/Merritt Island Causeway*	Banana River Lagoon	Internal	3
B	Pad 39-A*	Banana River Lagoon	External	4
16	Cocoa Beach Causeway	Banana River Lagoon	Internal	5
23	South Banana River	Banana River Lagoon	Internal	6
E	Patrick Air (Space) Force Base *	Banana River Lagoon	External	7
20	Minuteman Causeway	Banana River Lagoon	Internal	8
1	Port Canaveral (East)	Banana River Lagoon	External	9
8	Coconut Point Park*	Central and Southern Portion of IRL Study Area	External	10

Source: CDM Smith et al., 2015.
* Sites evaluated in Phase 2 of the CDM Smith and Taylor Engineering project for the St. Johns River Water Management District.

As part of the second phase of the project, six of the top ranked sites were further evaluated to assess the water volumes. These sites are noted in **Table 4-33**. Based on the initial evaluation of the sites, CDM Smith and Taylor Engineering determined that a project at the Sykes Creek/Merritt Island Causeway was not feasible. This location had a relatively new bridge crossing with built-up abutment protection that precludes construction of culverts and the increase of bridge openings. In addition, this connection would only provide an internal connection in the IRL and would not increase the tidal exchange. The five remaining sites were evaluated for the following types of connections (additional information in **Table 4-34**):

- Port Canaveral (Project Site C) – Culvert connection
- Pad 39-A (Project Site B) – Culvert connection
- Patrick Air (Space) Force Base (Project Site E) – Culvert connection
- Canaveral Lock (Project Site D) – Open channel flow by keeping the Canaveral Lock open over extended periods. Additional maintenance dredging may be needed to remove sediment deposition near the gates.
- Coconut Point Park (Project Site 8) – Culvert connection
- Coconut Point Park (Project Site 8) – Inlet connection with an inlet that is at least 1,350-feet long, with an average depth of about 25 feet below mean sea level.



Source: CDM Smith et al., 2015.

Figure 4-29: Phase I Potential Enhanced Circulation Project Locations

Figure 4-29 Long Description

Table 4-34: Computed Hydraulics for Connections at Select Locations

Site/Potential Project	Flood Prism (million cubic feet)	Ebb Prism (million cubic feet)	Maximum Flow (cubic feet per second)	Estimated Impacted Area for 0.27 Foot Tide Range (acres)
Port Canaveral Culvert (Project Site C)	1.51	-1.08	89	92 to 128
Pad 39-A Culvert (Project Site B) (estimated)	1.38 to 1.51	-1.08 to -1.59	Not applicable	92 to 135
Patrick Air (Space) Force Base Culvert (Project Site E) (estimated)	1.38 to 1.51	-1.08 to -1.59	Not applicable	92 to 135
Canaveral Lock Open Channel Flow (Project Site D)	68.67	-83.03	-4,670	5,839 to 7,060
Coconut Point Park Culvert (Project Site 8)	1.38	-1.59	-94	117 to 135
Coconut Point Park Inlet (Project Site 8)	1,890	Not applicable	111,000	160,698

Source: CDM Smith et al., 2015.
Note: Positive flow is towards the IRL.

A screening matrix was used to evaluate the costs and benefits of the project based on the criteria for the tidal prism, area affected, land acquisition, relative costs, ease of construction, seagrass loss, and benefit to cost ratio. The top ranked project from this evaluation is the Port Canaveral culvert (CDM et al., 2015). It is important to note that a culvert will likely not provide the amount of exchange needed to provide a significant benefit to the lagoon. The size of the lagoon in Brevard County is more than 150,000 acres. The second ranked project is the Canaveral Lock open channel. This option may have challenges moving forward based on past experience with sediment blocking submarines from using the port after the lock was held open for an extended period of time. In addition, there are limited data for estimating the water quality benefits and unintended ecological consequences that could result from keeping the lock open.

In 2019, the Florida Institute of Technology received $800,000 in funding from the Florida Legislature, which is administered by the Florida Department of Education, to plan and perform studies at sites within the lagoon and along the coast to restore lagoon inflow. The first phase of the study gathered baseline data and performed modeling on existing water quality, biological parameters, and hydrologic conditions at potential locations for future temporary permitted inflow test structures. The Phase 1 modeling and engineering project research was conducted in parallel with the biological and water quality monitoring to gather data for an enhanced circulation pilot project. The first phase of the project was completed in September 2020. Phase 1 provided baseline biological and geochemical data near the three proposed inflow locations: Port Canaveral and south Cocoa Beach in Brevard County and Bethel Creek in Indian River County. Modeling results were provided for different flow rates in each location based on preliminary engineering concepts for three structure options: pipe with no pump, pump and pipe, and weir (Florida Institute of Technology, 2020).

In 2020, the Florida Institute of Technology received another $752,000 in funding from the Florida Legislature, which was also administered by the Florida Department of Education, for Phase 2 of the study. Phase 2 identified the most feasible and cost-effective location for a temporary inflow pilot system in the Banana River Lagoon within a cove that would receive inflow from the ocean side of the Port Canaveral lock system. Engineering design for a 0.5 cubic meter per second pumping system was completed, and pre-application meetings were held with the permitting agencies. This phase also included additional water quality, geochemical, and biological monitoring to build a baseline conditions database, and updated models to predict changes due to the pilot inflow. Phase 2 was completed in September 2021. Future proposed project phases include permitting and constructing the pilot inflow system, which would be operated for a one-year period to gather data to help determine the feasibility of a permanent inflow project (Florida Institute of Technology, 2021).

Temporary Inlet: Another potential option for ocean exchange is when a large storm creates an opening. Instead of immediately filling in the new opening, an evaluation should be completed using available models to determine the potential benefits of temporarily stabilizing the opening long enough to provide significant ocean exchange for short-term water quality benefits, but not long enough to excessively alter beach erosion and sand transport into the lagoon.

Causeway Modification: In 2018, the IRL National Estuary Program, in partnership with the Canaveral Port Authority, worked with the Florida Institute of Technology to assess the potential for modifications of the State Road 528 and State Road 520 causeways and bridge structures to enhance circulation in the northern portion of the Banana River Lagoon and adjacent North IRL. The Florida Institute of Technology used the United States Army Corps of Engineers Coastal Modeling System for this evaluation (Zarillo, 2018).

The model was set up to reproduce the physical conditions of 2015 to ensure the model was well calibrated. Measured data, including water levels, freshwater inflows, wind velocity, and topography, were used to drive the model. Nine model tests were performed to represent current conditions and scenarios with hypothetical bridge spans over the Banana River Lagoon and North IRL. Three of the model tests included flow relief structures embedded in the State Road 528 and State Road 520 causeways. The tests were run using numerical tracer dye concentration throughout the model domain to track the dye concentration reduction throughout the model simulation. Circulation in the model occurred through ocean exchanges though the Sebastian Inlet, freshwater inflows, and wind (Zarillo, 2018).

The model results indicated that modifying the bridge and causeway structures would have a detectible influence on exchange rates within the Banana River Lagoon and North IRL. Longer bridge spans over the Banana River Lagoon along State Road 528 combined with longer bridge spans over State Road 520 resulted in a 10% net reduction in the dye concentration in the Banana River Lagoon between State Road 528 and State Road 520 at the end of the 340-day model run. The net improvement in exchange in the Banana River Lagoon immediately to the north of State Road 528 was predicted to be 5% if bridge spans are present on both state roads. The study concluded that a significant improvement in exchange in the Banana River Lagoon study area and adjacent North IRL would require bridge spans on both State Road 520 and State Road 528 (Zarillo, 2018).

In 2019, Dr. Zarillo expanded his circulation model to include Mosquito Lagoon and the ocean inlet at New Smyrna instead of a closed boundary at Haulover Canal. This expanded model was run again to estimate the impact of causeways on residence time in various compartments of the IRL. In this study, longer bridge spans over the Banana River Lagoon along State Road 528 and State Road 520 resulted in a 17% net reduction in the dye concentration in the Banana River Lagoon between State Road 528 and State Road 520 at the end of the 340-day model run. The net improvement in exchange in the Banana River Lagoon immediately to the north of State Road 528 was predicted to be 8% and exchange within Sykes Creek improved by 20% (Zarillo, 2019).

In response to the 2019 model results, the St. Johns River Water Management District offered to use their state-of-the-art ecological modeling tools to quantify water quality improvements and algal bloom reductions anticipated from the proposed causeway modifications. At the request of Brevard County, Port Canaveral, and IRL National Estuary Program, the Florida Department of Transportation agreed to pause their causeway widening project for six months until the ecological impacts could be estimated and evaluated. The modeling results confirmed the

improvement in residence time identified in Dr. Zarillo's modeling but found little corresponding change in chlorophyll *a* concentrations (St. Johns River Water Management District, 2020).

4.3. Projects to Restore the Lagoon

Another component of this plan is to implement projects that will restore important, filtering ecosystem services within and adjacent to the lagoon to improve water quality and resilience. Oyster reefs provide ecosystem services including improved water quality, shoreline stabilization, carbon burial, and habitat (Grabowski et al., 2012). Creating oyster bars and planting shorelines with natural vegetation will help to filter excess nutrients and suspended solids from the lagoon (Grizzle et al., 2008; Reidenbach et al., 2013), which will improve water quality, allowing for seagrass growth (Newell and Koch, 2004) and may reduce the number and severity of algal blooms in the lagoon system. Oyster bars and planted shorelines also create habitat for more than 300 different lagoon species. These types of projects take years before the full benefits are seen in the lagoon as it takes some time for the oysters and vegetation to grow and become established.

The sections below summarize the oyster restoration and planted shoreline projects that are proposed, as well as considerations for seagrass planting.

4.3.1 Oyster Restoration

> *The primary mechanism by which oyster bars remove nitrogen is by increasing local denitrification rates.*

In addition to the fisheries value of oysters, they provide a variety of nonmarket ecosystem services, with a combined estimated economic value between $5,500 and $99,000 per hectare per year (Grabowski et al., 2012). Restored oyster bars have been shown to result in a positive net effect on the removal and sequestration of nitrogen compared to unrestored sites. As nitrogen is a major contributor to algal blooms and resulting increased turbidity, removal of nitrogen from the system often yields water quality benefits. The nitrogen is removed through three pathways: (1) assimilation of the nitrogen in the shell and tissues of the oysters, (2) enhanced burial of nitrogen into the sediments surrounding oyster bars, and (3) conversion to gaseous form with return to the atmosphere through microbe-related denitrification (zu Ermgassen, 2016).

The primary mechanism by which oysters remove nitrogen from the system is by increasing local denitrification rates (Grabowski et al., 2012). While the impacts of oyster bars may be localized, they also influence the larger ecosystem. For example, a study by Sharma et al. (2016) found that even with limited bio-filtration and nonsignificant reef effects on water velocity, there was a "shadow" effect on seagrass beds between the reef and shoreline, which resulted in higher localized seagrass area five years after deployment relative to other nearby areas. Further, in a study by Kroeger (2012), it was noted that the eastern section of Mobile Bay had experienced harmful algal blooms that caused fish kills. These conditions occur in the summer months when denitrification by restored oysters would be highest. Therefore, the nitrogen removal associated with the oyster bar project in the bay may make a noticeable contribution to the local water quality by avoiding peak nitrogen concentrations that may trigger algal blooms. In a study by Kellogg et al. (2013), the denitrification rates associated with oyster bars from various studies were documented. Based on these studies, the average denitrification rate is 159.3 pounds of total nitrogen (TN) per acre per year (291 micromoles of TN per square meter

per hour, which equates to 0.04 pounds of TN per square meter per year). A 2017 study was also conducted in the Mosquito Lagoon to determine the local benefits from oyster bed restoration. This study found that the average denitrification rate is 401.5 pounds of TN per acre per year (450 kilograms of TN per hectare per year) and measured nitrogen sequestration in oyster tissues and shells is 0.04 pounds of TN per square foot, which equates to 4,741.1 pounds of TN per acre per year (Schmidt and Gallagher, 2017).

The focus for oyster restoration in the Indian River Lagoon (IRL) system is to provide filtration, sequestration, denitrification, and scour protection along the shoreline (see **Section 4.3.2** for details on scour protection). The goal is not to restore historical oysters in the system because limited information is available on where oysters were historically located. In addition, seagrasses are a more critical component of the system, so restoration efforts aim to use the beneficial aspects of oysters in protecting seagrass from waves and increasing light availability (Newell and Koch, 2004) while minimizing the competition for space. Therefore, sites are evaluated for relative seagrass and oyster habitat requirements such as salinity, depth, and bottom type. In October 2021, Brevard County adopted an Oyster Habitat Suitability and Rehabilitation Success Plan, which details environmental and biological targets to guide site selection for oyster bar projects, outlines adaptive management strategies, and defines related success criteria. Oyster bars may be constructed in submerged areas deeper than seagrass, in areas without an historic persistence of seagrass presence, or as narrow bars along the shoreline to act as a living wave break to reduce erosion.

The oysters from the Oyster Gardening Program have been used to develop several pilot bars and demonstration sites in the IRL. In fiscal year 2014–2015, Brevard County received a $410,000 appropriation from the Florida Legislature for the Indian River Lagoon Oyster Restoration Project. This pilot study was completed in fall 2016. The design of oyster wave breaks funded by the Save Our Indian River Lagoon tax is based on monitoring results from the pilot bars and wave tank studies at Florida Institute of Technology that tested the oyster bar stability and wave attenuation of different designs. From these studies the importance of reef location and seasonal water depth (Anderson, 2016) as well as the ability of the reef to act as a wave break (Weaver et al., 2017) were highlighted.

To create enough oyster bar area to filter the volume of lagoon water annually, approximately 20 miles (105,600 feet) of oyster bars is needed at a width of six feet. These bars will be placed throughout the IRL system, at sites that meet Habitat Suitability selection criteria, along mosquito impoundments, parks, and private properties where owners want to participate. Based on the pilot project costs and knowing that larger bars will be constructed more efficiently (using information from the pilot projects), it was estimated that the 20 miles of oyster bars could be constructed at a cost of $10 million.

With the recent study on oyster bars in the IRL system (Schmidt and Gallagher, 2017), the benefits associated with oyster bars versus planted shorelines could be delineated. For the proposed oyster bar along 20 miles (105,600 feet) of shoreline with a width of six feet (total of 633,600 square feet), the estimated reductions are 25,344 pounds per year of TN and 906 pounds per year of total phosphorus (TP). These estimates are based on the estimated TN reduction rate of 0.04 pounds of TN per square foot of oyster bar from Schmidt and Gallagher 2017 and the estimated TP reduction rate of 0.001 pounds of TP per square foot of oyster bar from Kellogg et al. (2013). The projects for oyster bar restoration are summarized in **Table 4-35**.

Table 4-35: Projects for Oyster Restoration

Year Added	Project Number	Project Name	Responsible Entity	Sub-lagoon	Total Nitrogen Reduction (pounds per year)	Cost per Pound per Year of Total Nitrogen Reduction	Total Phosphorus Reduction (pounds per year)	Cost per Pound per Year of Total Phosphorus Reduction	Plan Funding
Original	2016-55	Banana River Lagoon Oyster Bars*	Brevard County	Banana	7,864	$395	197	$15,750	$3,102,755
Original	2016-56	North IRL Oyster Bars*	Brevard County	North IRL	7,314	$395	183	$15,770	$2,885,834
2018	75	Marina Isles Oyster Bar+	Brevard Zoo	Banana	60	$445	20	$1,335	$26,700
2018	76	Bettinger Oyster Bar+	Brevard Zoo	Banana	24	$445	8	$1,335	$10,680
2018	78a	McNabb Park Oyster Bar+	City of Cocoa Beach	Banana	72	$473	24	$1,419	$34,056
2018	79	Gitlin Oyster Bar+	Brevard Zoo	Banana	36	$445	12	$1,335	$16,020
2018	80	Coconut Point/Environmentally Endangered Lands Oyster Bar+	Brevard Zoo	Central IRL	96	$470	2	$22,560	$45,120
2018	81	Wexford Oyster Bar+	Brevard Zoo	Central IRL	70	$445	24	$1,298	$31,150
2018	82a	Riverview Park Oyster Bar+	City of Melbourne	Central IRL	230	$473	78	$1,395	$108,790
2018	83	Bomalaski Oyster Bar+	Brevard Zoo	North IRL	20	$445	7	$1,271	$8,900
2018	73	Riverview Senior Resort Oyster Bar+	Brevard County	Central IRL	77	$394	2	$15,152	$30,304
2019	104	Brevard Zoo Banana River Oyster Project+	Brevard Zoo	Banana	1,476	$395	37	$15,757	$583,020
2019	105	Brevard Zoo Central IRL Oyster Project+	Brevard Zoo	Central IRL	408	$395	10	$16,116	$161,160
2019	106	Brevard Zoo North IRL Oyster Project+	Brevard Zoo	North IRL	864	$395	22	$15,513	$341,280
2020	139	Brevard Zoo North IRL Oyster Project 2+	Brevard Zoo	North IRL	841	$400	21	$16,019	$336,400
2020	140	Brevard Zoo Central IRL Oyster Project 2+	Brevard Zoo	Central IRL	677	$400	17	$15,929	$270,800
2020	141	Brevard Zoo Banana River Oyster Project 2+	Brevard Zoo	Banana	662	$400	17	$15,576	$264,800
2020	142	Brevard Zoo Oyster Reef Adjustments North IRL+	Brevard Zoo	North IRL	68	$400	2	$13,600	$27,200
2020	143	Brevard Zoo Oyster Reef Adjustments Banana River+	Brevard Zoo	Banana	32	$400	1	$12,800	$12,800

Year Added	Project Number	Project Name	Responsible Entity	Sub-lagoon	Total Nitrogen Reduction (pounds per year)	Cost per Pound per Year of Total Nitrogen Reduction	Total Phosphorus Reduction (pounds per year)	Cost per Pound per Year of Total Phosphorus Reduction	Plan Funding
2021	184	Brevard Zoo North Indian River Lagoon Oyster Project 3+	Brevard Zoo	North IRL	1,056	$397	26	$16,124	$419,232
2021	185	Brevard Zoo Central Indian River Lagoon Tributary Pilot Oyster Project+	Brevard Zoo	Central IRL	581	$397	15	$15,377	$230,657
2021	186	Brevard Zoo North Indian River Lagoon Individual Oyster Project+	Brevard Zoo	North IRL	436	$397	11	$15,736	$173,092
2021	187	Brevard Zoo Central Indian River Lagoon Oyster Project 3+	Brevard Zoo	Central IRL	218	$397	5	$17,309	$86,546
2021	188	Brevard Zoo Banana River Oyster Project 3+	Brevard Zoo	Banana	143	$397	4	$14,193	$56,771
2022	217	Central IRL Oyster Project 4+	Brevard Zoo	Central IRL	348	$397	9	$15,351	$138,156
2022	218	Central Oyster Project Offshore Reefs+	Brevard Zoo	Central IRL	900	$397	23	$15,535	$357,300
2022	226	Hog Point Offshore Oyster Bar+	Brevard County	Central IRL	126	$397	3	$16,674	$50,022
-	-	***Total***	-	-	***24,699***	***$397 (average)***	***780***	***$12,576 (average)***	***$9,809,545***

Note: The projects highlighted in green and marked with an asterisk were identified in the original plan. The projects highlighted in tan and marked with a plus sign were added to the plan as part of an annual update. As specific project locations are added each year, the amount of funding for the original projects is reduced accordingly to keep the total funding allocation constant for projects that restore natural filtration processes (including oyster, clam, and planted shoreline projects).

4.3.2 Planted Shorelines

Typically, efforts to protect shorelines have involved hardened structures, such as seawalls, rock revetments, or bulkheads, to dampen or reflect wave energy. Although these types of structures may mitigate shoreline retreat, they accelerate scour and the ecological damages that result can be great (Scyphers et al., 2011). The planted shoreline approach incorporates natural habitats into a shoreline stabilization design; maintains the connectivity between aquatic, intertidal, and terrestrial habitats; and minimizes the adverse impacts of shoreline stabilization on the estuarine system. These efforts range from maintaining or transplanting natural shoreline vegetation without additional structural components to incorporating shoreline vegetation with hardened features, such as rock sills or oyster bars, in settings with higher wave energy (Currin et al., 2010). Selection of the most appropriate management system begins with a site analysis to evaluate the type of shoreline, amount of energy that a shoreline experiences, sediment transport forces, type and location of ecological resources, and adjacent land uses (Restore America's Estuaries, 2015).

Oyster bars can function as natural breakwaters, in addition to providing nutrient removal benefits through denitrification, as noted in **Section 4.3.1**. The rate of vertical oyster bar growth on unharvested bars (2–6.7 centimeters per year) is greater than predicted sea-level rise rate (2–6 millimeters per year); therefore, bars could serve as natural protection against shoreline erosion, shoreline habitat loss, and property damage and loss along many estuarine shorelines (Ridge et al., 2017). Oyster bars reduce erosion of other estuarine habitats such as salt marshes and submerged aquatic vegetation by serving as a living breakwater that attenuates wave energy and stabilizes sediments (Grabowski et al., 2012).

As part of a study for the Chesapeake Bay, Forand et al. (2014) evaluated the pollutant load reductions from planted shoreline projects in the area. The results of this evaluation are shown in **Table 4-36**, and were used to update the United States Environmental Protection Agency Chesapeake Bay Program Office estimate of the total nitrogen (TN) and total phosphorus (TP) reductions per foot of planted shoreline. The estimated nutrient reductions from planted shorelines can be calculated using Chesapeake Bay Program Office recommended rates of 0.2 pounds of TN per linear foot and 0.068 pounds of TP per linear foot (Forand et al., 2014.), which is for an average planting width of 24 feet. These values were adjusted for the proposed average planting width of eight feet, which results in a reduction of 0.067 pounds of TN per linear foot and 0.023 pounds of TP per linear foot.

Table 4-36: Pollutant Load Reductions for Shoreline Management Practices

Source	Total Nitrogen (pounds per foot per year)	Total Phosphorus (pounds per foot per year)	Study Location
Ibison, 1990	1.65	1.27	Virginia
Ibison, 1992	0.81	0.66	Virginia
Proctor, 2012	Not applicable	0.38 or 0.29	Virginia
Maryland Department of the Environment, 2011	0.16	0.11	Maryland
Baltimore County mean (Forand, 2013)	0.27	0.18	Maryland
Chesapeake Bay Program Office Scenario Builder, 2012	0.02	0.0025	Chesapeake Bay Program policy threshold from one restoration site
New Interim Chesapeake Bay Program Office Rate (Expert Panel, 2013)	***0.20***	***0.068***	***Chesapeake Bay Program Office policy thresholds that comes from six stream restoration sites***

Note: Table is from Forand et al., 2014.

To promote success, mangroves incorporated into planted shorelines will be at least three years old with fully woody trunks, which have been found to increase successful establishment by 1,087% compared to seedlings based on studies conducted in Mosquito Lagoon (Fillya, 2021). A capstone project with students at the United States Naval Academy is currently underway to further investigate methods to increase the successful establishment of planted shorelines. Methods will be developed and tested in a wave tank by students and faculty.

At this time, the plan does not recommend a total length of planted shoreline. Planted shoreline projects will be considered for funding annually as partners submit projects for the plan. A cost-share of $16 per linear foot of shoreline, planted in eight-foot wide swaths, was established by using typical nursery installation costs and standard canopy dimensions for native shoreline species found in Brevard County. This equates to $240 per pound of nitrogen reduced by shoreline plantings.

Brevard County conducted a survey of the shorelines, in conjunction with the University of Central Florida, to determine if the shoreline included a bulkhead/seawall, hardened slope/riprap, or no structure to help identify potential locations for future oyster bars and planted shorelines (Donnelly et al., 2018) (**Figure 4-30**).

Table 4-37 summarizes the approved projects for planted shorelines and the estimated load reductions.

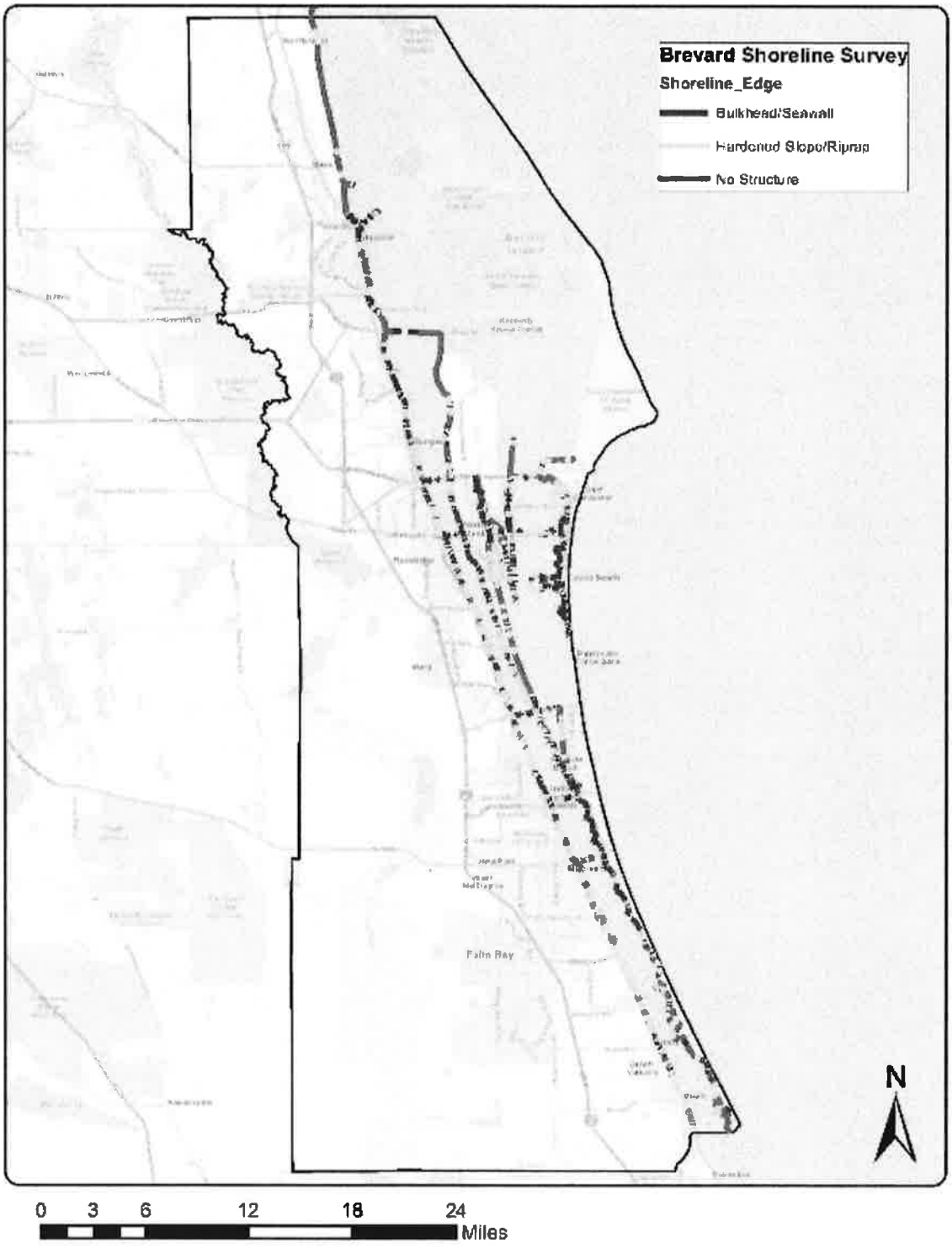


Figure 4-30: Shoreline Survey to Identify Locations Appropriate for Oyster Bars and Planted Shorelines

Figure 4-30 Long Description

Table 4-37: Projects for Planted Shorelines

Year Added	Project Number	Project Name	Responsible Entity	Sub-lagoon	Total Nitrogen Reduction (pounds per year)	Cost per Pound per Year of Total Nitrogen Reduction	Total Phosphorus Reduction (pounds per year)	Cost per Pound per Year of Total Phosphorus Reduction	Plan Funding
2018	77a	Cocoa Beach Country Club Planted Shoreline+	Marine Resources Council	Banana	67	$240	23	$699	$16,080
2018	77b	Lagoon House Shoreline Restoration Planting+	Marine Resources Council	Central IRL	100	$240	34	$706	$24,000
2018	78b	McNabb Park Planted Shoreline+	City of Cocoa Beach	Banana	24	$240	8	$720	$5,760
2018	82b	Riverview Park Planted Shoreline+	City of Melbourne	Central IRL	77	$240	26	$711	$18,480
2019	103	Brevard Zoo North IRL Plant Project+	Brevard Zoo	North IRL	3	$240	1	$720	$720
2020	130	Brevard Zoo North IRL Plant Project 2+	Brevard Zoo	North IRL	41	$240	14	$703	$9,840
2020	133	Fisherman's Landing+	Marine Resources Council	Central IRL	20	$240	7	$686	$4,800
2020	135	Rotary Park+	Marine Resources Council	Central IRL	20	$240	7	$686	$4,800
2021	180	Scottsmoor Impoundment+	Marine Resources Council	North IRL	44	$240	15	$704	$10,560
2021	181	Riveredge+	Marine Resources Council	North IRL	17	$240	6	$680	$4,080
2022	212	Titusville Causeway Multi-Trophic Restoration and Living Shoreline Resiliency Action Project+	Brevard County Natural Resources	North IRL	131	$240	45	$699	$31,440
-	-	***Total***	-	-	***544***	***$240 (average)***	***186***	***$702 (average)***	***$130,560***

Note: The projects highlighted in tan and marked with a plus sign were added to the plan as part of an annual update.

4.3.3 Clam Restoration and Aquaculture

Another potential tool for nutrient extraction, scour prevention, and water filtration in the Indian River Lagoon (IRL) is through clam aquaculture and restoration. Like oysters, clams can remove nitrogen from a system by burying it in sediments and enhancing the denitrification process through increased microbial activity in biodeposits (Clements and Comeau, 2019). The harvesting of clam shells and tissues can also extract nitrogen, as bivalves directly incorporate nitrogen (i.e., from consumption of phytoplankton and detritus; not dissolved nitrogen in the water) into their tissues and shells (Clements and Comeau, 2019).

Studies suggest that bivalve aquaculture has the potential to stimulate rates of denitrification equal to that of wild oyster beds and that the impacts of biodeposition from aquaculture are minimal (Clements and Comeau, 2019). The culture gear (bags, cover netting) used by growers creates a favorable environment for a myriad of plants and animals, such as juvenile fish and crabs, by providing habitat, substrate, and protection. This is especially significant since shellfish aquaculture leases can only be located in areas of the lagoon that undergo a resource survey to ensure the site is devoid of seagrasses and other marine life.

The exploration of clam aquaculture in Brevard County as a mitigation tool to extract excess nutrients from the IRL is warranted. According to the University of Florida Clam Farm Benefits Calculator, a single littleneck clam can filter 4.5 gallons of seawater per day and remove 0.09 grams of nitrogen when harvested. Therefore, in 2020, the Citizen Oversight Committee approved allocating $60,000 in funds to stimulate bivalve aquaculture in Brevard County. This funding would be used to sponsor 10 farms with up to $6,000 per farmer to plant up to 500,000 clams each. The funding would help to offset licensure, lease, and/or material costs. It is estimated that the clams from this stimulus project would remove 1,000 pounds per year of total nitrogen (TN) at a cost of $60 per pound of TN (**Table 4-38**). This program will also help promote education directed toward awareness of local aquaculture industries and their dependence on water quality to create mindfulness of the effects of eutrophication in a visceral, practical way. IRL clam restoration may lead to opportunities for successful partnerships with local clam farmers. Public sentiment toward clam restoration has been positive and the nutrient-removal aspects of shellfish aquaculture align with the Plan's goals.

In addition, a statewide partnership aims to restore clams in the IRL using genetic stock able to withstand the unfavorable condition of an algae bloom-ridden lagoon. The IRL Clam Restoration project is a cooperative venture between the Coastal Conservation Association, Florida Fish and Wildlife Conservation Commission, University of Florida Whitney Lab, Brevard Zoo, and Florida Oceanographic Society. They collected brood stock living in the IRL, spawned them, and have begun outplanting these "super clams" in bags or under cover netting to strategic locations in the IRL (based upon historical sites and current water quality trends) including existing partner habitat restoration and commercial lease areas. Next steps include tracking survivorship and growth. One final goal is to establish brood stock that will serve as the optimized variety (phenotype) lines for further stock enhancement.

In 2020, grant funding was requested (but has not yet been secured) to outplant super clam progeny at 100 sites throughout the lagoon. The sites would be a combination of private properties and public locations so that volunteers can assist with restoration. This project would help to obtain information on survival rates in different locations to improve restoration efforts.

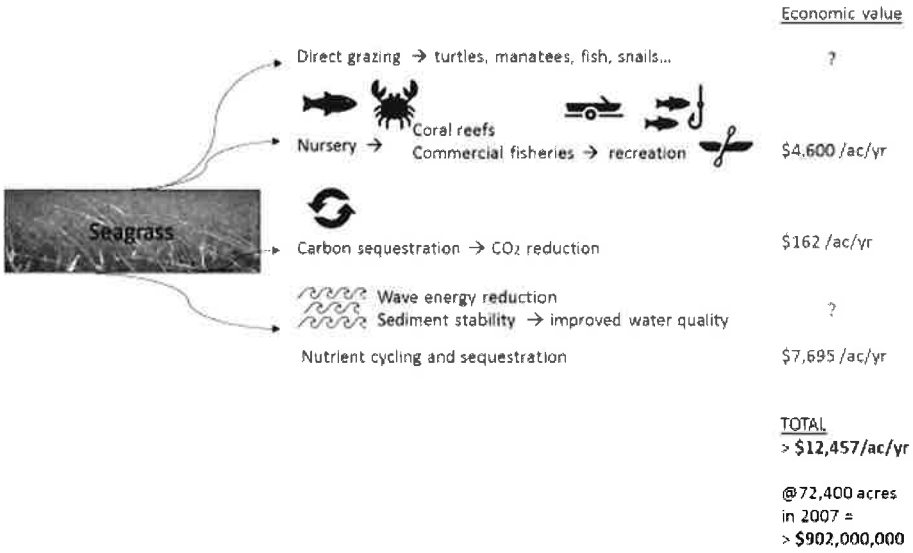
Table 4-38: Projects for Clam Restoration

Year Added	Project Number	Project Name	Responsible Entity	Sub-lagoon	Total Nitrogen Reduction (pounds per year)	Cost per Pound per Year of Total Nitrogen Reduction	Total Phosphorus Reduction (pounds per year)	Cost per Pound per Year of Total Phosphorus Reduction	Plan Funding
2021	194	Aquaculture Stimulus Project+	Brevard County	All	1,000	$60	Not applicable	Not applicable	$60,000
-	-	***Total***	-	-	***1,000***	***$60***	***Not applicable***	***Not applicable***	***$60,000***

Note: The projects highlighted in tan and marked with a plus sign were added to the plan as part of an annual update.

4.3.4 Seagrass Planting

The original Indian River Lagoon (IRL) Surface Water Improvement and Management Plan of 1989, as well as subsequent management plans up to and including the current basin management action plans, target a healthy, estuarine ecosystem populated by seagrasses. Seagrasses provide crucial benefits to Florida's estuaries by providing food and shelter to a variety of animals, improving water quality, and preventing erosion of sediment (Orth et al., 2006). In total, the lagoon's 72,000 acres of seagrass could provide an economic benefit of more than $900 million per year (**Figure 4-31**; Dewsbury et al., 2016).



Note: Adapted from Dewsbury et al., 2016

Figure 4-31: Estimated Economic Value of Some Seagrass Services

Figure 4-31 Long Description

One key ecological role for seagrasses is to absorb and cycle nitrogen and phosphorus (Romero et al., 2006). Seagrasses do not remove these nutrients permanently, but they compete for them against phytoplankton and macroalgae and hold them longer (Banta et al., 2004). By stabilizing the cycling of nutrients, seagrasses can increase a system's ability to absorb nutrient loads without the initiation of detrimental blooms of phytoplankton or macroalgae (Schmidt et al., 2012). Seagrasses can filter nitrogen inputs via photosynthesis and nutrient

according to project design and site-specific conditions but often include significant reduction of pathogenic bacteria, viruses, human and animal wastes, chemicals, metals, plastics, and sediments (see **Table 4-42**).

Table 4-42: Pollutants Removed by Different Project Types

Stormwater	Septic System Removal	Septic System Upgrade	Muck Removal
Nitrogen	Nitrogen	Nitrogen	Nitrogen
Phosphorus	Phosphorus	Phosphorus	Phosphorus
Sediments	Escherichia coli	Escherichia coli	Clay sediments
Escherichia coli	Viruses	Viruses	Hydrogen sulfide
Viruses	Fecal coliform	Fecal coliform	Biochemical oxygen
Fecal coliform	Pharmaceuticals	Biochemical oxygen demand	demand
Pesticides	Biochemical oxygen demand		
Metals			
Oil			
Litter			

This Save Our Indian River Lagoon Project Plan is an adaptable document informed by science and under supervision of the community. As monitoring updates our understanding of Indian River Lagoon pollutants, the plan projects will target funds to the most successful and cost-effective projects.

4.4.4 Responding to Implemented Projects

During the first years of plan implementation, dozens of projects have been completed throughout the Indian River Lagoon (IRL) system as shown in **Figure 4-32** through **Figure 4-34**. The implementation of these projects provided new cost information and actual pollution reduction measurements used to update the project cost-effectiveness for the 2022 Update. The project costs and Save Our Indian River Lagoon Tax Fund money expended on completed projects are shown in **Table 4-43**. **Table 4-44** summarizes the Save Our Indian River Lagoon Tax Fund money that has been contracted and/or expended on projects that are currently underway.

Table 4-43: Save Our Indian River Lagoon Tax Funds Expended on Completed Construction Projects (as of October 31, 2021)

Project Number	Project	Project Type	Estimated Total Cost	Final Total Cost	Change in Total Cost	Eligible Save Our Indian River Lagoon Cost	Final Save Our Indian River Lagoon Cost	Change in Save Our Indian River Lagoon Cost
193	Oyster Gardening	Public Education	$300,000	$300,000	$0	$300,000	$300,000	$0
99	Cocoa Beach Water Reclamation Facility Upgrades	Wastewater Treatment Facility Upgrades	$5,920,320	$6,554,233	$633,913	$945,000	$945,000	$0
6	Long Point Park Denitrification	Package Plant Rapid Infiltration Basin Upgrade	$101,854	$22,207	-$79,647	$101,854	$22,207	-$79,647
1	Breeze Swept Septic-to-Sewer	Septic-to-Sewer	$3,400,000	$3,400,000	$0	$880,530	$880,530	$0
2	Merritt Island Redevelopment Agency Phase 1 and 2 Septic-to-Sewer	Septic-to-Sewer	$3,138,098	To be determined	To be determined	$320,000 (plus $268 of contingency)	$320,268	$268
60	Sylvan Estates Septic-to-Sewer	Septic-to-Sewer	$1,720,430	$2,431,490	$711,060	$1,561,215	$1,561,215	$0
52	North IRL 15 of 586 Septic System Upgrades	Septic System Upgrades	$270,000	$275,998	$5,998	$270,000	$270,000	$0
53	Central IRL 28 of 939 Septic System Upgrades	Septic System Upgrades	$504,000	$506,642	$2,642	$504,000	$487,106	-$16,894
2016-16	Banana Septic System 2 of 144 Quick Connections	Quick Connections	$24,000	$21,789	-$2,211	$24,000	$21,729	-$2,271
2016-18	North IRL Septic System 32 of 463 Quick Connections	Quick Connections	$869,428	$908,516	$39,088	$570,000	$570,000	$0
13	Central Boulevard Baffle Box	Stormwater	$41,700	$43,700	$2,000	$34,700	$34,700	$0

uptake, acting as a sink seasonally (McGlathery, 2008). However, when systems become eutrophic, this function can be lost (McGlathery, 2008). The contribution of seagrasses can be evaluated by examining the quantity of nutrients bound in its aboveground and belowground structures (its mass of biological material or biomass), with this approach treating uptake and release of nutrients as offsetting components of the nutrient cycle (**Table 4-39**).

Table 4-39: Average Nutrients in Seagrass from 1996–2009

Sub-lagoon	Acres	Seagrass (pounds per 100 acres)	Nitrogen (pounds per 100 acres)	Phosphorus (pounds per 100 acres)
Southern Mosquito Lagoon	14,000	45,000	1,000	100
Banana River Lagoon	21,000	45,000	1,000	100
North IRL	19,000	37,000	900	90
Central IRL	7,000	36,000	900	90

Seagrass restoration may be necessary because more than 30,000 acres of seagrasses were lost due to shading during the superbloom in 2011, recovery has been limited, and the brown tide in 2016 exacerbated the situation. In fact, the Banana River Lagoon in Brevard County experienced the largest initial losses of seagrass (**Appendix C**). Throughout the northern lagoon, decreases in the extent and cover of seagrass between 2009 and 2019 meant that approximately 216,053 pounds (98 metric tons) of nitrogen and 22,046 pounds (10 metric tons) of phosphorus were no longer stored in seagrass. These quantities represent 11% and 40% of the mean concentrations of dissolved nitrogen and phosphorus in the northern lagoon, respectively (Morris et al., In Review). After the loss of seagrass, nitrogen and phosphorus became available to phytoplankton, drift algae, and other primary producers (**Table 4-40**). Furthermore, the absence of seagrasses has made the sediments less stable, which will hamper future colonization and spread of new seagrass.

Overall, seagrasses may need some help to recover in the short-term, with more rapid recovery helping to sequester nutrients and reduce the amounts available to phytoplankton. Measures that could help seagrasses recover include protecting existing seagrass to promote expansion or protecting areas from waves to reduce the movement of sediment and allow seagrasses to colonize. Planting has also been discussed, and *Halodule wrightii* would be the initial focus because it has been the most widespread species in the lagoon (Dawes et al., 1995; Morris et al., 2021), and this species can act as a pioneer due to its rapid growth and wide tolerance thresholds.

Table 4-40: Average Seagrass Lost and Nutrients Made Available to Other Primary Producers in 2015

Sub-lagoon	Reduction in Acres	Seagrass Reduction* (pounds per 100 acres)	Nitrogen Reduction (pounds per 100 acres)	Phosphorus Reduction (pounds per 100 acres)
Southern Mosquito Lagoon	0	15,000	300	30
Banana River Lagoon	12,000	37,000	900	90
North IRL	1,000	8,000	200	20
Central IRL	4,000	20,000	500	50

* Changes in seagrass cover yield changes in biomass of seagrass within the same number of acres.

Planting seagrass is not a trivial undertaking; it requires considerable planning, resources, and time. For example, having suitable conditions is critical as shown in Tampa Bay where stakeholders invested more than $500 million in projects to reduce nutrient pollution before they saw any return from planting seagrass (Lewis et al., 1999). Costs documented during a

workshop on seagrass restoration started at $1.4 million per acre for larger scale projects (Treat and Lewis, 2006). Seagrass meadows influence nutrient dynamics through storage, cycling, and promoting denitrification. Scaled nitrogen storage and removal rates vary from 6 to 78 pounds per acre per year based on studies of various seagrass species conducted in Australia, Virginia, North Carolina, and IRL (Russel and Greening, 2015; Smyth et al., 2015; Aoki et al., 2019; Morris et al., In Review). With project costs ranging from approximately $2 to $7 per pound of seagrass, this equates to $1,085 to $48,306 per pound of nitrogen sequestration. Some of the lessons learned from past projects include selecting sites that will support seagrass growth, employing optimal methods for planting (e.g., type of planting units, use of chemicals to enhance growth, and density of initial planting), and protecting newly planted seagrass from disturbance (e.g., grazing, waves, exposure, and low salinity) until it is established. It may be best to tailor approaches to a specific location; therefore, one or more pilot studies prior to attempting full-scale restoration should prove valuable.

The Brevard County Natural Resources Management Department has submitted a grant for state resiliency funds to support a pilot project at a location in the Central IRL. If funded, Brevard County will partner with private and non-profit entities to plant 1.5 acres of seagrass and build an adjacent oyster bar to aid in dampening wave energy and stabilizing sediments. The project would be designed to test different planting methods (e.g., type of unit to be planted and density of units) to better understand how to approach, most effectively and economically, future, larger-scale restoration. The area would be monitored for two years post-restoration to document growth and survival, with potential measures being density, percent cover, and canopy height, as well as water depth, dissolved oxygen concentration, light availability, and other environmental conditions.

Similar or more complex pilot studies could be designed to investigate other key components of restoration. Overall, successfully incorporating planting into restoration of tens of thousands of acres of seagrass will benefit from strategic investment in optimizing techniques. For example, site selection and project scale may be critical to surviving chronic natural disturbance and increasing the potential for natural recolonization (Fonseca presentation to the Citizen's Oversight Committee on August 20, 2021). Brevard County is investing in a decision tree that will help all interested groups with these issues. The decision tree will be based on decades of research by St. Johns River Water Management District regarding abiotic factors and thresholds found to limit seagrasses in the IRL. **Appendix C** includes additional details about seagrass.

4.4. Projects to Respond to New Information

The funding raised from the Save Our Indian River Lagoon sales tax will go towards the projects listed in the sections above that will reduce or remove pollutants and restore the lagoon. In addition, $10 million of the funding, over a period of 10 years, will go towards monitoring efforts to measure the success, nutrient removal efficiency, and cost effectiveness of projects included in this plan and in future updates of this plan. Measuring effectiveness is important for reporting progress toward total load reduction targets and for refining project designs to be more effective with each iteration. The monitoring data will be used to determine which projects are providing the most benefit in the most cost-effective manner so that the plan can be updated, as needed. The data will also be used to ensure the lagoon is responding as anticipated to the reductions made so that changes to the plan can be implemented if the lagoon is not responding as expected.

4.4.1 Adaptive Management to Report, Reassess, and Respond

The Indian River Lagoon (IRL) is located along the Space Coast, which is also known as a global center for exploration, innovation, and development of cutting edge technology. With a dedicated funding source and a brilliant community dedicated to meeting the challenges of today and tomorrow, it is wise to have a process that allows this plan to be updated and revised as new opportunities and better solutions are developed. The intent of the proposed adaptive management strategy is to provide a process that not only allows but also fosters the development and implementation of better tools and techniques and allows the tax rate to be reduced accordingly or retired ahead of schedule.

Although this plan was developed with the best information available in 2016, identifying the sources of water quality pollution and pairing those problems with the most timely and cost-effective solutions is a rapidly changing field of knowledge. To respond to change and take advantage of future opportunities, monitoring is necessary. Even without change in the industry, monitoring will provide data to support and refine the application of existing technology. An adaptive management approach is used to provide a mechanism to make adjustments to the plan based on new information. As projects from this plan are implemented, the actual costs and nutrient reduction benefits will be tracked, and the plan will be modified, as needed, as project performance in the lagoon basin is better understood.

This plan will be updated approximately annually with information from implemented projects and adjustments to the remaining projects. A volunteer committee of diversely skilled citizens has been assembled to assist Brevard County with the annual plan updates. The Citizen Oversight Committee consists of seven representatives and seven alternates that represent the following fields of expertise: science, technology, economics/finance, real estate, education/outreach, tourism, and lagoon advocacy. The League of Cities nominated representatives for three fields of expertise and nominated alternates for the remaining four fields of expertise. The Brevard County Board of County Commissioners nominated representatives for the other four fields of expertise and alternates for the remaining three fields of expertise. All Citizen Oversight Committee representatives and alternates were appointed by the Brevard County Board of County Commissioners. Appointees serve for two-year terms, after which time they may be considered for reappointment or replacement. The first term ended in February 2019 and the second term ended in February 2021. The Committee's recommendations for plan updates will be presented at least annually to the Board of County Commissioners, and changes to the plan will be approved by the Board of County Commissioners.

Brevard County staff provides project monitoring reports to the Citizen Oversight Committee and works with them to recommend adjusting the planned projects, as needed. The adaptive management process allows for alternative projects to be submitted by the county, municipalities, and other community partners to be reviewed by the Citizen Oversight Committee for inclusion in the next annual update to this plan. Projects that deliver comparable nutrient removal benefits may be approved for inclusion in the plan. If a new approved project costs more than the average cost per pound of total nitrogen for that project type listed in this plan at the time of project submittal, the requesting partner must provide the balance of the costs. The requesting partner will be allowed reasonable overhead cost to manage the project from design and permitting through construction completion.

As projects are implemented, progress toward meeting the County's proposed revisions to the total maximum daily loads are being tracked. Adjustments to the types and locations of projects

implemented will be made to ensure that total maximum daily loads can be achieved in all Brevard County portions of the lagoon.

4.4.2 Cost-share for Substitute Projects

For the 2022 Update, local municipalities and partners were once again invited to submit new projects for inclusion in the Save Our Indian River Lagoon Project Plan. The projects submitted were required to deliver comparable nutrient removal benefits as those projects listed in the original plan and plan updates for each sub-lagoon.

The requesting partners each submitted a "Save Our Indian River Lagoon Project Plan Project Submittal Request" to Brevard County for review of the proposed projects. The project requests were provided to the Citizen Oversight Committee to evaluate the potential for inclusion in the plan. The projects recommended by the Citizen Oversight Committee were included in the draft plan update presented to the Brevard County Board of County Commissioners for approval.

To determine the amount of funding that a project would be eligible to receive from the Save Our Indian River Lagoon Trust Fund, the estimated total nitrogen (TN) reductions from the project were multiplied by the allowable cost per pound per year of TN shown below in **Table 4-41** for that project type. The costs shown in **Table 4-41** were included in the application instructions provided to the partners in July 2021 and were an average of the actual or engineer's estimate of cost per pound of TN removed from the projects previously listed in the Save Our Indian River Lagoon Project Plan, as amended, or comparable projects recently planned or completed elsewhere in the Indian River Lagoon (IRL) watershed.

Table 4-41: Cost-share Offered for Project Requests Submitted for the 2022 Update

Project Type	Average Cost per Pound per Year of Total Nitrogen
Wastewater Treatment Facility Upgrades for Reclaimed Water	$383
Rapid Infiltration Basin/Sprayfield Upgrades	$136
Package Plant Connections	$1,500
Sewer Lateral Rehabilitation	$255
Septic System Removal by Sewer Extension	$1,500
Septic System Removal by Sewer Connection	$487
Septic System Upgrades	$1,200
Stormwater Projects	-
Mainland	$313
Merritt Island	$370
Beaches	$446
Muck Removal	$520
Treatment of Muck Interstitial Water	$98
Vegetation Harvesting	$110
Oyster Bar	$397
Planted Shorelines	$240

4.4.3 Additional Project Benefits

Although the eligible Save Our Indian River Lagoon Trust Fund contribution to new projects is determined based on the amount of total nitrogen removed, the benefits of implementing these projects include reductions in other pollutant sources, as well. These projects will reduce a multitude of different contaminates to meet water quality targets and improve the health, productivity, aesthetic appeal, and economic value of the lagoon. These additional benefits vary

Project Number	Project	Project Type	Estimated Total Cost	Final Total Cost	Change in Total Cost	Eligible Save Our Indian River Lagoon Cost	Final Save Our Indian River Lagoon Cost	Change in Save Our Indian River Lagoon Cost
14	Church Street Baffle Box	Stormwater	$233,455	$233,455	$0	$88,045	$88,045	$0
15	Bayfront Stormwater Ponds	Stormwater	$630,956	$635,702	$4,746	$30,624	$30,624	$0
16	Gleason Park Reuse Expansion	Stormwater	$11,000	$7,193	-$3,807	$4,224	$4,224	$0
19	St. Teresa Basin Treatment	Stormwater	$375,250	$474,292	$99,042	$272,800	$272,800	$0
20	South Street Basin Treatment	Stormwater	$475,125	$683,969	$208,844	$86,856	$86,856	$0
21	La Paloma Basin Treatment	Stormwater	$375,250	$462,347	$87,097	$208,296	$208,296	$0
34	Cliff Creek Baffle Box	Stormwater	$350,000	$737,612	$387,612	$347,781	$347,781	$0
35	Thrush Drive Baffle Box	Stormwater	$350,000	$609,394	$259,394	$322,200	$322,200	$0
66	Big Muddy at Cynthia Baffle Box	Stormwater	$288,640	$288,640	$0	$67,532	$59,631	-$7,901
85	Basin 1304 Bioreactor	Stormwater	$125,000	$141,988	$16,988	$90,000	$83,029	-$6,971
87	Basin 2134 Fleming Grant Biosorption Activated Media	Stormwater	$172,300	$169,300	-$3,000	$56,588	$56,588	$0
89	Basin 1298 Bioreactor	Stormwater	$125,000	$136,100	$11,100	$86,198	$85,829	-$369
90	Basin 51 Johns Road Biosorption Activated Media	Stormwater	$116,905	$154,000	$37,095	$23,030	$23,030	$0
91	Basin 100 Burkholm Road Biosorption Activated Media	Stormwater	$117,735	$141,457	$23,722	$64,390	$64,390	$0
92	Basin 115 Carter Road Biosorption Activated Media	Stormwater	$156,079	$146,950	-$9,129	$62,510	$62,510	$0
93	Basin 193 Wiley Ave Biosorption Activated Media	Stormwater	$117,735	$162,216	$44,481	$82,735	$82,735	$0

Project Number	Project	Project Type	Estimated Total Cost	Final Total Cost	Change in Total Cost	Eligible Save Our Indian River Lagoon Cost	Final Save Our Indian River Lagoon Cost	Change in Save Our Indian River Lagoon Cost
94	Basin 832 Broadway Pond Biosorption Activated Media	Stormwater	$269,751	$269,750	-$1	$42,864	$42,864	$0
98	Coleman Pond Managed Aquatic Plant System	Stormwater	$35,000	$11,438	-$23,563	$35,000	$11,438	-$23,563
110	Osprey Pond Managed Aquatic Plant System	Stormwater	$60,000	$37,500	-$22,500	$60,000	$37,500	-$22,500
117	Basin 10 County Line Road Woodchip Bioreactor	Stormwater	$180,116	$166,174	-$13,942	$72,773	$72,773	$0
119	Basin 141 Irwin Avenue Woodchip Bioreactor*	Stormwater	$124,626	$146,926	$22,300	$69,174	$69,174	$0
120	Draa Field Pond Managed Aquatic Plant Systems	Stormwater	$60,000	$48,750	-$11,250	$31,281	$31,281	$0
122	Basin 22 Huntington Road Serenity Park Woodchip Bioreactor*	Stormwater	$103,852	$99,334	-$4,518	$40,077	$40,077	$0
124	Floating Wetlands to Existing Stormwater Ponds	Stormwater	$50,000	$14,336	-$35,664	$1,497	$1,497	$0
127	Indialantic Basin 5 Dry Retention Pond	Stormwater	$74,700	$62,718	-$11,982	$16,680	$16,680	$0
169	Sherwood Park Stormwater Quality Project	Stormwater	$1,696,489	$1,696,489	$0	$292,400 (plus $99,708 of contingency)	$392,108	$0
178	Marina B Managed Aquatic Plant System	Stormwater	$14,531	$17,424	$2,893	$6,670	$6,670	$0
111	Draa Field Vegetation Harvesting	Vegetation Harvesting	$60,000	$115,261	$55,261	$57,360 (plus $29,053 of contingency)	$86,413	$0
112	County Stormwater Pond Harvesting	Vegetation Harvesting	$14,000	$14,777	$777	$14,000	$14,000	$0

Project Number	Project	Project Type	Estimated Total Cost	Final Total Cost	Change in Total Cost	Eligible Save Our Indian River Lagoon Cost	Final Save Our Indian River Lagoon Cost	Change in Save Our Indian River Lagoon Cost
2016-03	Turkey Creek Hurricane Dredge and Interstitial Treatment	Muck Removal & Interstitial Treatment	$1,545,522	$1,098,631	-$446,891	$215,000	$137,329	-$77,671
40	Mims Muck Dredging Interstitial Treatment*	Interstitial Treatment	$2,162,286	$1,546,187	-$616,099	$400,000	$0	-$400,000
70	Cocoa Beach Muck Dredging Phase III	Muck Removal	$3,109,818	$2,903,356	-$206,462	$1,376,305	$1,376,305	$0
73	Riverview Senior Oyster Bar	Oyster	$30,304	$30,304	$0	$30,304	$30,304	$0
75	Marina Isles Oyster Restoration	Oyster	$26,700	$26,700	$0	$26,700	$26,700	$0
76	Bettinger Oyster Bar	Oyster	$10,680	$10,680	$0	$10,680	$10,680	$0
79	Gitlin Oyster Bar	Oyster	$16,020	$16,020	$0	$16,020	$16,020	$0
80	Brevard Zoo Coconut Point/Environmentally Endangered Lands Oyster Restoration	Oyster	$45,120	$45,120	$0	$45,120	$45,120	$0
81	Wexford Oyster Bar	Oyster	$31,150	$31,150	$0	$31,150	$31,150	$0
83	Bomalaksi Oyster Bar	Oyster	$8,900	$8,900	$0	$8,900	$8,900	$0
77a	Cocoa Beach Country Club Living Shoreline	Living Shoreline	$16,080	$16,080	$0	$16,080	$16,080	$0
77b	Lagoon House Living Shoreline	Living Shoreline	$24,000	$24,000	$0	$24,000	$24,000	$0
103	Brevard Zoo North Plant Project	Living Shoreline	$720	$720	$0	$720	$720	$0
130	Brevard Zoo Plant Project 2	Living Shoreline	$9,840	$9,840	$0	$9,840	$9,840	$0
133	Fisherman's Landing Living Shoreline	Living Shoreline	$4,800	$4,800	$0	$4,800	$4,800	$0
135	Rotary Park Living Shoreline	Living Shoreline	$4,800	$4,800	$0	$4,800	$4,800	$0
-	***Total***	-	***$30,100,065***	***$28,127,356***	***$1,165,398***	***$10,365,303***	***$9,856,544***	***-$637,520***

* Not paid due to the contractor not meeting nutrient scrubbing contract requirements.

Table 4-44: Save Our Indian River Lagoon Tax Funds Contracted or Expended on Projects Underway (as of October 31, 2021)

Project Number	Project	Project Type	Save Our Indian River Lagoon Plan Funding	Save Our Indian River Lagoon Funds Contracted	Save Our Indian River Lagoon Expenditures for Projects Underway
58	Expanded Fertilizer Education	Public Education	$625,000	$312,500	$216,999
58	Grass Clippings Campaign	Public Education	$200,000	$100,000	$26,638
58	Septic System Maintenance Education	Public Education	$300,000	$150,000	$120,334
2016-02	City of Titusville Osprey Wastewater Treatment Facility	Wastewater Treatment Facility Upgrade	$8,300,000	$8,300,000 (plus $800,000 of contingency)	$3,242,18
2016-17	City of Palm Bay Water Reclamation Facility	Wastewater Treatment Facility Upgrade	$3,636,900	$3,636,900	$3,100,699
59	City of Melbourne Grant Street Water Reclamation Facility	Wastewater Treatment Facility Upgrade	$6,769,500	$6,769,500	$0
138	Ray Bullard Water Reclamation Facility	Wastewater Treatment Facility Upgrade	$4,260,000	$4,260,000	$123,592
63ab	Satellite Beach Pilot & County-wide Repair/Replacement	Sewer Laterals	$840,000	$840,000	$10,432
114	Barefoot Bay Lateral Smoke Testing	Sewer Laterals	$90,000	$90,000	$0
115	South Beaches Lateral Smoke Testing	Sewer Laterals	$200,000	$200,000	$0
116	Merritt Island Lateral Smoke Testing	Sewer Laterals	$250,000	$250,000	$0
192	Oak Point Wastewater Treatment Facility Improvements	Package Plant Connection	$279,000	$279,000	$11,403
27	Sharpes – Zone A	Septic System Removal	$6,207,192	$562,031	$0
29	South Banana - Zone B	Septic System Removal	$1,368,252	$735,750	$0
2020-34	South Central - Zone F	Septic System Removal	$1,701,972	$1,701,972	$0
2016-35	South Beaches - Zone A	Septic System Removal	$1,234,764	$18,000	$18,000
2016-36	South Beaches - Zone O	Septic System Removal	$133,488	$133,488	$16,855
2016-37	South Beaches - Zone P	Septic System Removal	$500,580	$500,580	$65,931

Project Number	Project	Project Type	Save Our Indian River Lagoon Plan Funding	Save Our Indian River Lagoon Funds Contracted	Save Our Indian River Lagoon Expenditures for Projects Underway
2016-47	Sykes Creek - Zone N	Septic System Removal	$2,603,016	$2,603,016	$202,702
2016-48	Sykes Creek - Zone M	Septic System Removal	$1,868,832	$1,868,832	$96,786
2016-49	Sykes Creek - Zone T	Septic System Removal	$4,939,056	$4,939,056	$144,764
2016-50	South Central - Zone C	Septic System Removal	$6,600,000	$6,600,000	$312,932
3	Micco Sewer Line Extension	Septic System Removal	$2,038,500	$2,038,500	$240,971
4	Hoag Sewer Conversion	Septic System Removal	$86,031	$86,031	$26,095
5	Pennwood Sewer Conversion	Septic System Removal	$40,632	$40,632 (plus $40,368 of contingency)	$17,074
61	Riverside Drive Septic-to-Sewer Conversion	Septic System Removal	$265,960	$262,044	$0
62	Roxy Avenue Septic-to-Sewer Conversion	Septic System Removal	$88,944	$88,944	$39,495
109	City of Titusville - Zones A-G	Septic System Removal	$1,201,392	$943,110	$86,860
136	Micco - Zone B	Septic System Removal	$9,000,000	$2,248,125	$0
145	Merritt Island - Zone F	Septic System Removal	$1,100,000	$735,750	$0
146	Merritt Island - Zone C	Septic System Removal	$1,580,000	$735,750	$0
147	Sykes Creek - Zone R	Septic System Removal	$3,500,000	$735,750	$0
148	North Merritt Island - Zone E	Septic System Removal	$3,635,000	$562,031	$0
151	Merritt Island - Zone G	Septic System Removal	$16,617,000	$735,750	$0
152	Sharpes - Zone B	Septic System Removal	$4,038,000	$562,031	$0

Project Number	Project	Project Type	Save Our Indian River Lagoon Plan Funding	Save Our Indian River Lagoon Funds Contracted	Save Our Indian River Lagoon Expenditures for Projects Underway
153	Cocoa - Zone C	Septic System Removal	$5,248,500	$562,031	$0
18	Basin 62 Denitrification Retrofit of Johns Road Pond	Stormwater	$105,512	$105,512	$27,230
22	Basin 1387 Kingsmill-Aurora Phase Two	Stormwater	$367,488	$367,488	$0
23	Basin 41 Denitrification Retrofit of Huntington Pond	Stormwater	$104,720	$104,720	$9,074
24	Basin 71 Denitrification Retrofit of Flounder Creek Pond	Stormwater	$75,328	$75,328	$19,923
64/65	Convair Cove	Stormwater	$9,145	$9,145	$0
68	Crane Creek/M-1 Canal Flow Restoration	Stormwater	$2,033,944	$2,033,944	$100,000
97	Titusville High School Baffle Box	Stormwater	$111,813	$111,813	$0
118	Basin 26 Sunset Road Serenity Park Woodchip Bioreactor	Stormwater	$73,810	$73,810	$0
121	Basin 2258 Babcock Street Woodchip Bioreactor	Stormwater	$50,203	$50,203	$0
123	Ray Bullard Water Reclamation Facility Stormwater Management Area	Stormwater	$160,674	$160,674	$52,368
128	Jackson Court Stormwater Treatment Facility	Stormwater	$8,266	$8,266	$0
174	St. Johns 2 Baffle Box	Stormwater	$243,070	$243,070	$0
205	Basin 998 Hampton Homes	Stormwater	$194,400	$63,618	$0
206	Basin 1066 Angel Ave	Stormwater	$232,200	$29,487	$0
207	Basin 1124	Stormwater	$148,100	To be determined	$0
171	Mechanical Aquatic Vegetation Harvesting	Vegetation Harvesting	$1,011,976	$1,011,976	$0
172	Horseshoe Pond Vegetation Harvesting	Vegetation Harvesting	$8,140	$8,140	$0
2016-04	Rockledge A Muck & Interstitial Treatment	Muck and Interstitial	$5,010,244	$175,340	$143,331
2016-05	Pineda Banana River Lagoon & Interstitial Treatment	Muck and Interstitial	$7,815,980	$0	$0
2016-06	Titusville Railroad West & Interstitial Treatment	Muck and Interstitial	$3,607,375	$146,361	$143,107
2016-07	National Aeronautics and Space Administration Causeway East & Interstitial Treatment	Muck and Interstitial	$11,423,355	$209,255	$182,059

Project Number	Project	Project Type	Save Our Indian River Lagoon Plan Funding	Save Our Indian River Lagoon Funds Contracted	Save Our Indian River Lagoon Expenditures for Projects Underway
2016-08	Titusville Railroad East & Interstitial Treatment	Muck and Interstitial	$4,609,424	$204,017	$268,499
2016-10	Canaveral South & Interstitial Treatment	Muck and Interstitial	$16,834,419	To be determined	$0
2016-11	Patrick Space Force Base & Interstitial Treatment	Muck and Interstitial	$8,216,800	To be determined	$0
41	Grand Canal Muck & Interstitial Treatment	Muck and Interstitial	$18,020,368	$18,020,368	$3,550,830
42	Sykes Creek Muck & Interstitial Treatment	Muck and Interstitial	$15,954,132	$1,078,266	$852,108
54	Eau Gallie Northeast Muck & Interstitial Treatment	Muck and Interstitial	$10,020,487	$98,323	$117,094
71	Merritt Island Muck Removal – Phase 1	Muck and Interstitial	$7,733,517	To be determined	$0
72	Muck Removal of Indian Harbour Beach Canals & Interstitial Treatment	Muck and Interstitial	$9,115,415	$9,115,415	$0
101	Cocoa Beach Muck Dredging Phase II-B	Muck and Interstitial	$5,917,650	$5,917,650	$4,294,790
168	Cocoa Beach Golf Muck & Interstitial Treatment	Muck and Interstitial	$24,363,100	$24,363,100	$402,766
78a	McNabb Park Oyster Project	Oyster Bars	$34,056	$34,056	$0
104	Brevard Zoo Banana River Oyster Project	Oyster Bars	$583,020	$583,020	$19,424
105	Brevard Zoo Central IRL Oyster Project	Oyster Bars	$161,160	$161,160	$20,459
106	Brevard Zoo North IRL Oyster Project	Oyster Bars	$341,280	$341,280	$169,188
139	Brevard Zoo North IRL Oyster Project 2	Oyster Bars	$336,400	$336,400	$45,913
140	Brevard Zoo Central IRL Oyster Project 2	Oyster Bars	$270,800	$270,800	$50,622
184	Brevard Zoo North Indian River Lagoon Oyster Project 3	Oyster Bars	$419,232	$419,232	$38,943
78b	McNabb Park Planted Shoreline	Planted Shoreline	$5,670	$5,670	$0
181	Riveredge	Planted Shoreline	$4,080	$4,080	$0
182	Newfound Harbor Drive	Planted Shoreline	$1,680	$1,680	$0
-	Respond and Monitoring	Respond	$10,000,000	-	$1,897,314
-	***Total***	-	***$267,085,944***	***$121,129,771***	***$20,525,792***

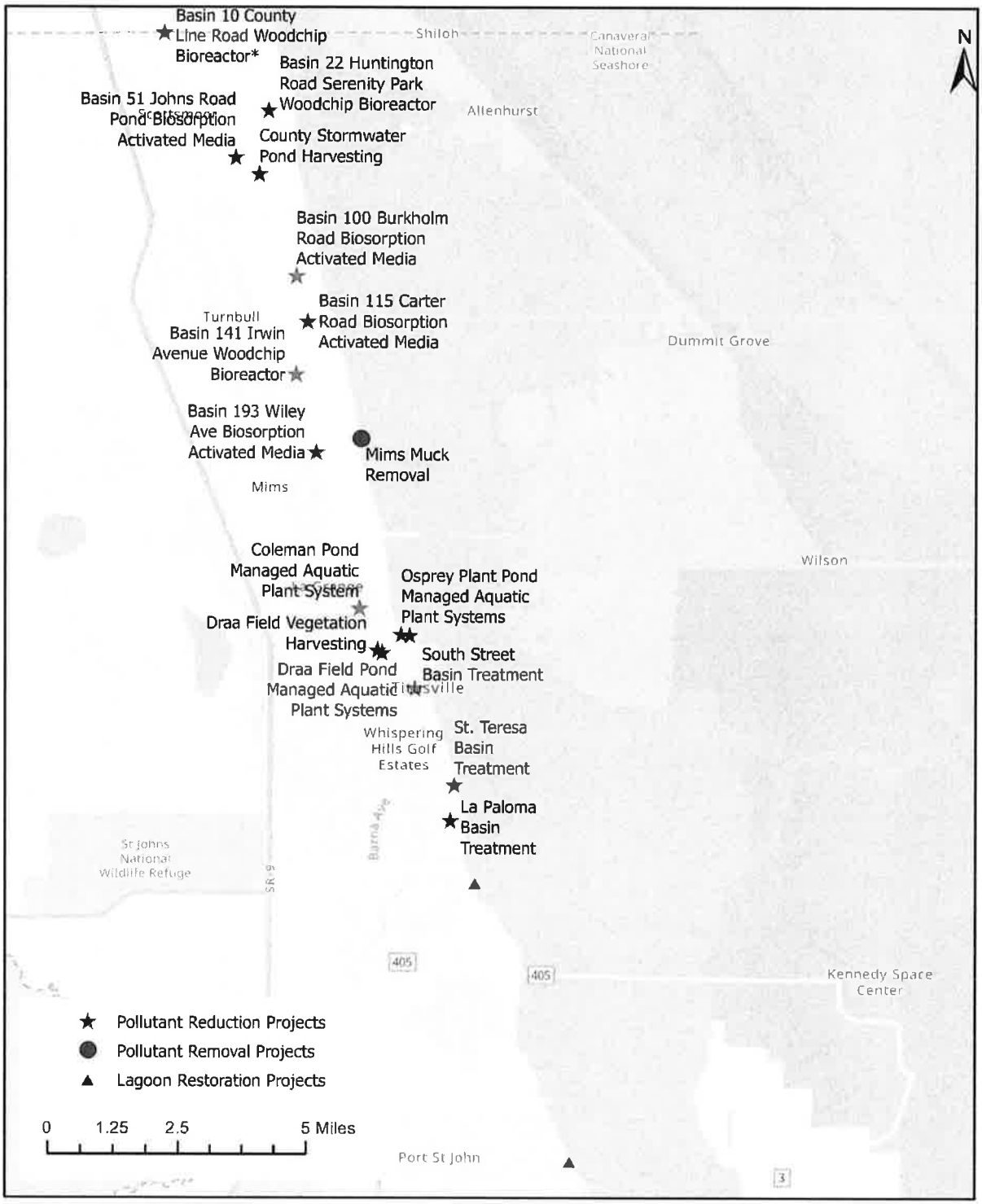


Figure 4-32: Completed Projects in North Brevard County

Figure 4-32 Long Description

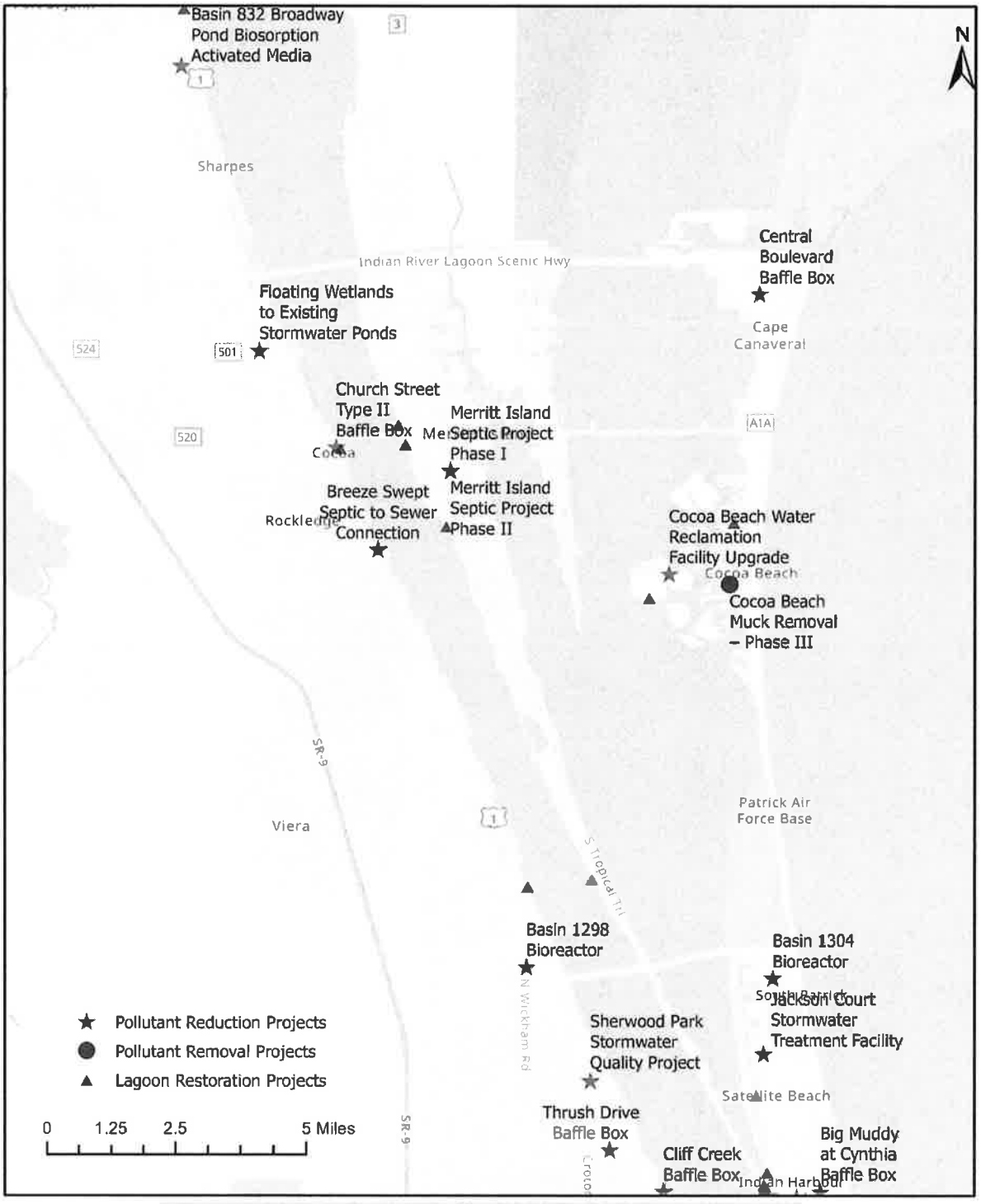


Figure 4-33: Completed Projects in Central Brevard County

Figure 4-33 Long Description

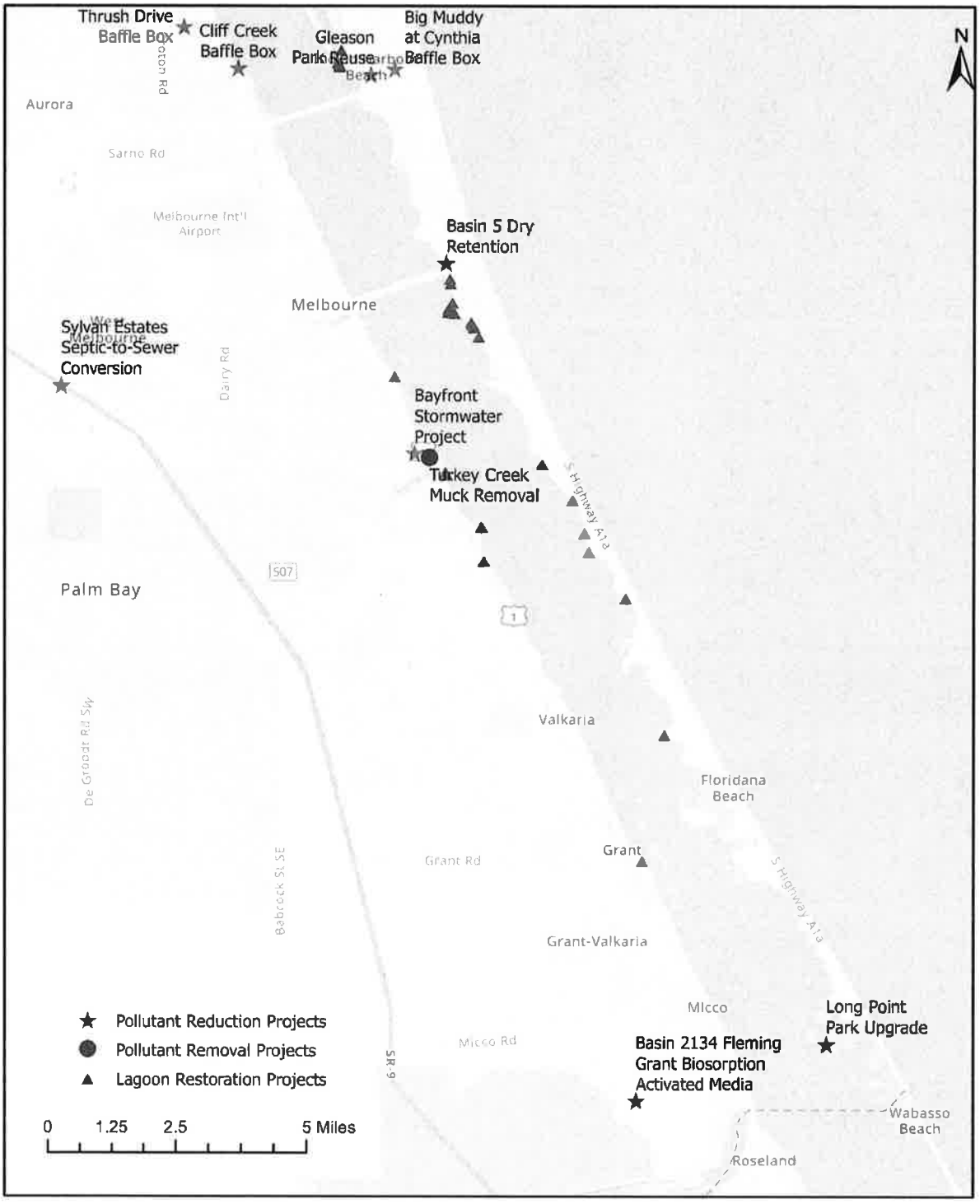


Figure 4-34: Completed Projects in South Brevard County

Figure 4-34 Long Description

Fertilizer Management Outreach
As noted in Section 4.1.1, in 2019, the University of Florida Institute of Food and Agricultural Sciences and MTN Marketing conducted a survey that was concentrated on fertilizer awareness questions. The results from the 2019 survey were compared to similar questions from the 2015 Blue Life survey to evaluate changes in fertilizer use. Based on the survey results, 33.33% of respondents in 2019 stated that they use slow release nitrogen fertilizer compared to only 6.30% in 2015, which is a 27% increase in the usage of slow release fertilizer. This resulted in better than anticipated cost effectiveness. The cost per pound of total nitrogen (TN) removed improved from an initial estimate of $102 to a revised estimate of $95. The total phosphorus (TP) reductions were kept at the original plan estimate of an additional 25% compliance because, the way the survey was setup, participants were only able to select one option for the type of fertilizer used. Therefore, an update on the use of zero phosphorus formulas could not be obtained.

Also in 2019, Brevard County amended the fertilizer ordinance to require all fertilizer retail stores to display signage at the point of sale informing the public on the ordinance and best practices for fertilizer management. Focus groups were conducted to enhance the design of the sign. A total of 132 signs were distributed to 53 retails stores across Brevard County. In summer 2020, the stores were surveyed for compliance with the ordinance. Only eight stores were out of compliance with no signage posted. Request for compliance letters were issued to the eight stores and additional signs were delivered to stores that could not locate the original signs. The stores were receptive of the letters and willing to come into compliance.

Grass Clipping Outreach
Uppercase, Inc. conducted a survey between September 9, 2018 and November 11, 2018 reaching out to citizens of Brevard, Martin, and Volusia counties through advertisements on social media sites, in popular mobile apps, on Google advertisements, in instant messenger, and other online and app platforms, as well as on the counties' social media pages. The survey received 733 responses from the three counties. When asked which items in the list provided are pollutants, 61% of respondents said grass clippings were a pollutant and 50% said leaves were a pollutant. Landscape professionals were more likely to say grass clippings were a pollutant (65%). About 48% of respondents maintained their own yards and 36% used a lawn care company. When asking those respondents who maintain their own yards what they do with grass clippings, 68% say they "seldom" or "never" leave the clippings where they land. 70% of respondents say they "always" or "usually" blow clippings back into their yard, 94% said they "never" or "seldom" blow clippings into the middle of the road, 97% said they "seldom" or "never" blow clippings toward a storm drain, and 97% say they "never" or "seldom" blow grass clippings toward a waterbody. The survey also tested taglines and images to encourage keeping grass clippings out of the street and waterbodies, and the best communication channels to provide this information (Uppercase, 2018). The results from this survey will be used to guide the grass clipping campaign.

Septic System and Sewer Lateral Maintenance Outreach
The University of Central Florida conducted a survey of Brevard County residents to gather information on septic system-related topics. The survey was conducted between May 2018 and September 2018 through phone calls and door-to-door visits, resulting in a total of 404 completed surveys. Most respondents (70%) said that they have had their septic system pumped out, of which most (39.1%) had their system pumped out in the last 2–4 years or within the last 12 months (38%). Most respondents (51%) answered that they have had their current septic system inspected although many (42%) answered that they have not had their septic system inspected. Of those who responded that their septic systems had been inspected, most

were inspected within the past 12 months (41.8%) followed by within the past 2–4 years (37.2%). Most residents (53%) did not receive any information regarding the home's septic system when they moved into the home. Of the total respondents, 55.8% strongly agreed with the statement "I restrict what I flush in toilets to prevent damage." The participants strongly agree (44.8%) and agree (42.8%) with the statement "I avoid pouring chemicals and solvents down the sink" (Olive et al., 2018). The results from this survey will be used to help guide implementation of the septic system maintenance education program.

Lagoon Loyal Program

The full launch of the Lagoon Loyal website and incentive program was on July 1, 2020. To date, there are 1,245 citizens and 90 businesses participating in the Lagoon Loyal Program. They have reported a total of 2,612 actions taken to help the lagoon. There have also been 46,815 educational sessions on the Lagoon Loyal websites.

Measuring Performance

Groundwater monitoring wells have been installed to measure the pre-project pollution levels in multiple project areas. This includes areas where upgrades are underway for the reduction of nutrients in the reclaimed water supplied by two wastewater treatment plants, in several septic areas where permitting is underway to provide sewer service, in sewer areas to estimate pollution from leaky infrastructure, and at six septic upgrade pilot projects.

This countywide groundwater monitoring effort has been ongoing for more than three years. It demonstrates that septic systems and reclaimed water communities have significantly higher TN concentrations in comparison to sewer service areas and natural areas across all regions of the county. Communities on septic systems had significantly higher TP concentrations compared to the other communities across all regions of the county (**Figure 4-35**) (Applied Ecology and Marine Resources Council, 2021).

Package Plant Rapid Infiltration Basin Upgrade

A denitrification wall was built surrounding a rapid infiltration basin approximately 120 feet from the IRL at Long Point Park in Melbourne Beach. Six monthly measurements of nitrogen and phosphorus from within the rapid infiltration basin were compared to nutrient measurements in the IRL versus in the groundwater at three locations between the basin and the lagoon. Average percent removals have been high when comparing concentrations in the rapid infiltration basin to the groundwater location closest to the lagoon. Ammonia decreased by 62%, nitrite by 99%, nitrate by 82%, TN by 60%, total Kjeldahl nitrogen by 59%, orthophosphate by 72%, and TP by 66%. When comparing the basin concentrations to the groundwater inside the denitrification wall, the ammonia was reduced by 59%, nitrite by 98%, TN by 53%, total Kjeldahl nitrogen by 57%, orthophosphate by 78%, and TP by 61%; however, nitrate increased by 834%. Once the water passes through the denitrification wall, nitrate levels drop substantially (97% immediately). Overall, this project has been successful and no further monitoring is planned. Based on actual costs and current data on nitrogen removal, the cost effectiveness is $136 instead of $802 per pound of TN reduced.

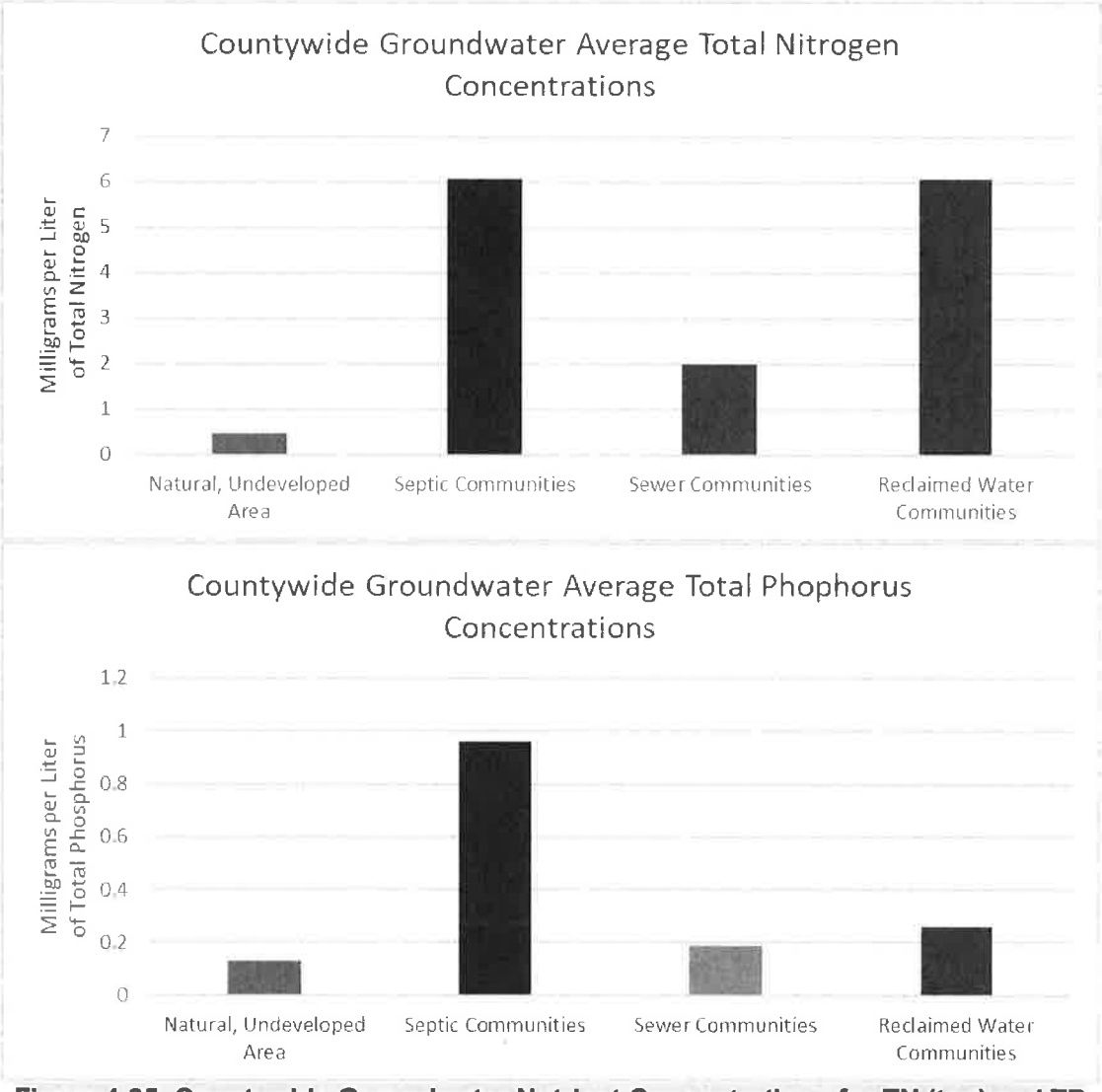


Figure 4-35. Countywide Groundwater Nutrient Concentrations for TN (top) and TP (bottom)

Figure 4-35 Long Description

Sewer Lateral Rehabilitation

Brevard County Utilities hired Kimley-Horn to conduct a sanitary sewer system smoke testing pilot study within the South Beaches service area in the City of Satellite Beach. The intent of the study was to use smoke testing to identify major contributors of stormwater into the sanitary sewer system and identify the necessary repairs. A smoke blowing machine that produces a non-toxic artificial "smoke" is used to pump smoke into the sewer system through an open manhole. As the smoke travels through the sanitary sewer system, it rises to the surface through any deficiencies in the lateral lines, such as cracks, leaks, and breaks. The South Beaches service area was selected because it had been experiencing elevated sanitary flow rates during storm events due to stormwater flow into the sanitary sewer through broken or missing infrastructure. Smoke testing was performed for the Phase 1 area in April and May 2018 for 5,165 properties. The testing identified 99 deficiencies of which there were 87

broken/missing cleanout caps, 9 broken lateral pipes, 2 damaged gravity sewer pipes, and 1 damaged manhole. Smoke testing was performed for the Phase 2 area in May and July 2018 for 7,592 properties. The testing identified 190 deficiencies of which there were 163 broken or missing cleanout caps, 21 broken lateral pipes, 1 storm connection, and 5 damaged manholes/gravity mains. The County purchased cleanout caps and replaced the damaged or missing caps that were identified, accessible, and had no damage to the cleanout port (Kimley Horn, 2018a and 2018b).

Based on the data collected during the pilot study, the Save Our Indian River Lagoon Trust Fund will cover the costs to repair up to 250 broken cleanout ports or missing caps and 30 broken private lateral lines. The estimated cost for these repairs is $646,200, which is well below the $840,000 budgeted for this project. The lessons learned from this pilot study will be applied to future sewer lateral evaluation and repair projects. Because the broken sewer pipes are buried, the potential repair costs are unknown. This unknown cost has dis-incentivized cash-limited homeowners from starting repairs in a timely manner. In response, Brevard County now has qualified plumbers that can be paid directly by the county to fix these repairs.

The preliminary results from performance data for this area noted that the groundwater sampled at seven of the eight lateral sites had evidence of sewage leaking out of the lateral when the groundwater table was low. Multiple sites had high nitrogen concentration values at or near the break locations, likely directly caused by a sewer leak. Most of the elevated phosphorus was in the readily bioavailable form of ortho-phosphorus (Applied Ecology, 2019). Additional sampling will be conducted after repairs are complete to verify improvements.

Additional smoke testing will take place in Titusville, Merritt Island, Barefoot Bay, and the South Beaches during 2022. The results from these efforts will add to these existing data to provide a more accurate average deficiency rate for private sewer laterals in Brevard County.

Septic System Removal

The Breeze Swept septic-to-sewer project in the City of Rockledge removed 143 septic systems installed between 1958 and 1967. This was the first septic-to-sewer conversion project to be undertaken as a strategic measure to reduce the nutrient loading to the IRL. During construction, the contractor noticed that many septic systems were already failing, which posed an increased health and environmental risk. The City of Rockledge authorized Applied Ecology to install five shallow groundwater monitoring wells in June 2017, three within the Breeze Swept community and two additional reference (i.e., control) wells in an adjacent septic community. Post-construction monitoring continued through summer 2019. There were 18 sampling events with a total of 90 samples collected. All samples were sent to a certified lab and analyzed for ammonia, nitrate-nitrite, total Kjeldahl nitrogen, and fecal coliform. The median ammonia, nitrate-nitrite, total Kjeldahl nitrogen, and mean TN concentrations from the post-construction samples taken from wells within the Breeze Swept community decreased with a statistically significant difference while the control wells showed no significant differences in median concentrations of nitrate-nitrite, total Kjeldahl nitrogen, and TN concentrations during the sampling period. These data provide a better understanding of the impact of septic systems on local water quality and help inform future septic-to-sewer conversion projects.

Construction costs for septic-to-sewer projects increased significantly since the original plan was developed in 2016. At that time, the estimated cost per lot for connection to gravity sewer was $20,000. This estimate included construction of the public and private side of the sewer, abandonment of the septic tank, connection fee, and restoration of the site. Based on 2018 actual and budgeted costs from within Brevard County and surrounding counties, the estimated

cost per lot was previously increased to $33,372. Cost estimates have continued to increase due to construction inflation and supply-chain issues. Challenges associated with constructing sewer within old, narrow rights-of-way filled with existing utilities also drive up costs.

The project in the Breeze Swept community in the City of Rockledge, completed in 2017, cost $23,800 per lot. The West Melbourne Sylvan Estates project increased from an engineer's estimate of $28,800 to an actual project cost of $41,212 per lot. Indian River County experienced a similar increase in costs for a sewer project in West Wabasso. Phase 1 of West Wabasso was approved in 2011 with an estimated cost of $20,348 per lot. Actual costs for construction in 2014 were $22,942 per lot. Cost estimates for phase 2 of West Wabasso are $46,269 per lot. The South Central C sewer project was recently contracted at $73,748 per lot.

There are many opportunities to remove septic systems in areas with existing sewer lines. The plan currently allocates $12,000 to these connection opportunities. Costs to connect to gravity lines were found to be consistent with this estimate; however, costs to connect to force main lines were more. In the 2019 Update, connection costs to force main sewer were increased to $18,000 to cover the cost of a grinder pump, the pump's electrical connection, directional drilling of the lateral line, abandonment of the septic tank, connection fee, and restoration of the site.

Septic System Upgrades
The average cost of an upgraded septic system was increased from $16,000 to $18,000 in the 2019 Plan Update to reflect the more accurate cost to safely decommission the old tank and install the new tank and drainfield, electrical costs, and restoration of the site. Many of the oldest septic systems that are contributing the most loading to the lagoon do not comply with modern setbacks established by the Florida Department of Health. Bringing these septic systems to current standards in small lots is contributing to the higher average upgrade costs. The estimate of $16,000 is more accurate for new construction. For the 49 upgrades completed so far, the average cost was $18,353 (previously noted as $17,811 for the first eight completed upgrades).

Stormwater Treatment
Brevard County was awarded a grant to help upgrade multiple baffle boxes to second generation technology. Eight baffle boxes in Cocoa, Cape Canaveral, Melbourne, and Titusville were retrofitted with screens to collect larger items such as litter, leaves, and twigs from the stormwater entering the baffle box. Three of the baffle box projects were sampled twice each to estimate the pollutant removal effectiveness of the added screens. The baffle box projects chosen for sampling were Central Boulevard (City of Cape Canaveral), Church Street (City of Cocoa), and South Street (City of Titusville). By applying state-approved dry bulk density ratios to the volumes of material captured in the screens, nutrient removal was estimated to be 7.12 pounds of TN per year and 0.57 pounds of TP per year.

Muck Removal
Pre-project muck flux data have been collected by researchers at Florida Institute of Technology for more than 20 potential muck dredging sites. These data were considered with other available data to reprioritize muck dredging areas in the 2019 Update.

The goal of the muck removal program is to improve water quality and ecosystem health within the IRL. Muck removal benefits include reducing nitrogen, phosphorus, hydrogen sulfide, turbidity, pathogens, and contaminants; improving dissolved oxygen and pH; as well as uncovering clean, sandy sediments for recolonization by seagrass, shellfish, and a diversity of benthic marine life to support an abundant and productive food web. The St. Johns River Water Management District maintains several long-term water quality monitoring stations in the IRL,

including one northeast of Brevard County's Turkey Creek muck removal project and one east of the St. Johns River Water Management District's Eau Gallie River and Elbow Creek restoration dredging project. Median turbidity values, measured monthly for 17.5 years at the St. Johns River Water Management District monitoring station near Turkey Creek, were 2.79 nephelometric turbidity units before dredging, 1.71 nephelometric turbidity units during dredging, and 2.26 nephelometric turbidity units for the three years of monthly data available after dredging. Median turbidity values, measured monthly for 25 years at the St. Johns River Water Management District monitoring station near Eau Gallie River and Elbow Creek, were 3.07 nephelometric turbidity units before dredging, 2.83 nephelometric turbidity units during dredging, and 1.61 nephelometric turbidity units for the two years of monthly data available after dredging. Although the median turbidity values are lower after dredging compared with before dredging, there is too much monthly variability in the data to determine if the water quality improvements are statistically significant. However, the data indicate no significant increase in turbidity during dredging.

In 2020, Tetra Tech prepared a document with lessons learned for the muck dredging projects implemented between 2014 and 2019. One lesson learned is that the thickness and extent of muck deposits is generally difficult to determine. Therefore, a combination of sediment probes to plan an optimum density and pattern of sediment cores can improve the accuracy of muck sediment isopach mapping. Another lesson learned was related to the use of polymers and flocculants. The contractor methods used at the Mims Boat Ramp did not work for performance-based specifications for nutrient removal. For future projects, more than just bench testing of the chemicals is needed and enhanced contract standards, developed by Brevard County, should be included in future project specifications. Muck sediments with high clay contents can be difficult to dewater. Design efforts should include bench testing of polymer additives to improve flocculation of the suspended sediments and the geotechnical testing of the dredged material slurry to help optimize the dewatering of the dredged material. Significant benefits to TP removal can be realized through the appropriate use of polymers (Tetra Tech, 2020).

In-lagoon Aeration Study

Dr. Austin Fox and Dr. John Trefry from the Florida Institute of Technology conducted two separate aeration studies in the northern IRL. The first studied microbubble aeration in two canals that were similar in bottom type and hydrology before aeration: (1) Anderson Canal (south of Anderson Court, Satellite Beach, Florida) was used as the control canal, and (2) Redwood Canal (south of Redwood Court, Satellite Beach, Florida) was used as the aeration canal. In the first study, from July 2017 to July 2018, microporous diffusers were installed at 50-meter intervals along the bottom of the aerated canal. An additional three diffusers were placed at the mouth the aerated canal, forming a bubble curtain to prevent any suspended material from being blown out of the canal. Water quality sampling was collected monthly for one year at the aeration and control sites. Microbubble aeration creates overturning vertical circulation of the water column, facilitating gas exchange at the water's surface and from the bubbles themselves. In a separate second study using a similar experiment setup, aeration using nanobubbles (highly-concentrated dissolved oxygen) was studied from February 2019 to March 2020 in the canal off Turkey Creek along the Florida Institute of Technology Rivers Edge property. During the second study, highly-concentrated dissolved oxygen was injected directly into bottom water using six injection nozzles located at the bottom of the Rivers Edge Canal, with a control area adjacent to the aerated canal.

Results from the first study showed that aeration using microporous diffusers created a uniform concentration of dissolved oxygen vertically throughout the water column, whereas sites in the control (non-aerated) canal had high dissolved oxygen saturation at the surface and low to no

dissolved oxygen saturation near the bottom. Nanobubble aeration used in the second study resulted in oversaturation of oxygen in bottom water without causing vertical mixing. Benthic fluxes of nitrogen and phosphorous showed similar seasonal variations between the aerated and control canals, except when the average nitrogen flux between February to April 2018 was 35% lower in the microbubble-aerated canal than in its control. It was also noted that the microbubble-aerated canal experienced recruitment of benthic infauna during winter months when oxygen was able to enter the sediment, but in the summer months when bacterial metabolism and oxygen demand was high, mortality of the recruits occurred. Muck thickness, volume, and dissolved nutrients did not significantly decrease and water clarity did not significantly improve using either the microbubble or nanobubble aeration techniques. Despite this, these two studies illustrated how aeration using microporous diffusers or highly concentrated dissolved oxygen can decrease benthic fluxes during cool months and how both types of aeration can increase bottom water dissolved oxygen in localized areas surrounding the aerators.

Brevard County conducted a separate aeration experiment in Sykes Creek (2576 Sykes Creek Drive, Merritt Island, Florida) from December 4–7, 2018. A commercial, floating, surface-pond aerator with no fountain was deployed in a fixed location. Dissolved oxygen levels were measured in 10-foot increments at a depth of two feet extending out from the aerator in both a northeast and southeast direction for 200 feet, before the aerator was turned on and after it was run continuously for three days (but before it was turned off and removed). The results showed dissolved oxygen concentrations near 100% saturation at 7.9–9.0 milligrams per liter before aeration began, and significantly higher ($p<0.001$), above 100% saturation, at 10.3–11.1 milligrams per liter at the end of the three-day experiment. Aeration using atmospheric air is only capable of bringing dissolved oxygen to 100% saturation. Therefore, although dissolved oxygen increased during aeration, the rise above 100% dissolved oxygen saturation suggests that aeration was not directly responsible for the significant increase in dissolved oxygen — it was likely due to increased photosynthetic activity in the area on the sunny December 7, relative to the overcast December 4. Wind direction in the area from December 4–7 (Time and Date, 2021) was consistently from the north, north-northwest, or northwest with similar low speeds (about 10 miles per hour), indicating similar physical parameters across the study days and that differences in weather conditions were mainly influenced by cloud cover before and during aeration.

Thus, both the Florida Institute of Technology studies and Brevard County experiment illustrated how aeration — whether from microbubbles, nanobubbles, or surface aeration — can help create small areas of refugia for benthic organisms against hypoxic events, although benefits are limited to localized areas surrounding the aerators.

Oyster Restoration and Planted Shorelines

Brevard County oyster bars are predominately built using mesh bags filled with oyster shell, known as cultch. They are typically two layers tall and, in some areas, are seeded with approximately 100 young adult oysters per square yard of the top layer. A University of Central Florida research team conducts independent monitoring of oyster bar projects, visually inspecting for oysters growing through the bags and cementing or "bridging" of adjacent oysters, and documenting the presence of predators, algal cover, and sedimentation. Additionally, a subsample of building units is emptied to quantify oyster survival, growth, recruitment, and the abundance as well as the diversity of fish and invertebrates living within the modules.

Monitoring results inform future decisions about oyster bar site selection, design, material type, and the need for seeding. Recruitment is necessary for oyster bars to sustain themselves

without additional seeding. Significant recruitment of new oysters has been observed at nine of the 11 sites graphed in **Figure 4-36** (University of Central Florida, 2020b). Ten of the 11 sites are reported in the University of Central Florida monitoring reports. Riverview Senior Center was funded with grants and is monitored by Brevard Zoo.

The formation of bridges between bags has been noted at Bomalaski and Marina Isles, two of the oldest sites. Comparison of data from multiple sites indicates that oyster bars located in narrow canals are exposed to more variable salinities and less recruitment and, although surviving oysters do grow, the numbers of live oysters declines over time (University of Central Florida, 2020a). In contrast, bars constructed in open waters of the lagoon have up to nine times as many oysters as initially seeded. Finally, two projects located within 500 feet of one another are being compared to determine the influence of initial seeding in the Central IRL (Ahmed/Niland and MacNeill/Pitner locations in **Figure 4-36**). At one year of age, recruitment and oyster density were similar at both sites, 10 and 12 settlers and 28 and 26 oysters per bag at the two sites, respectively.

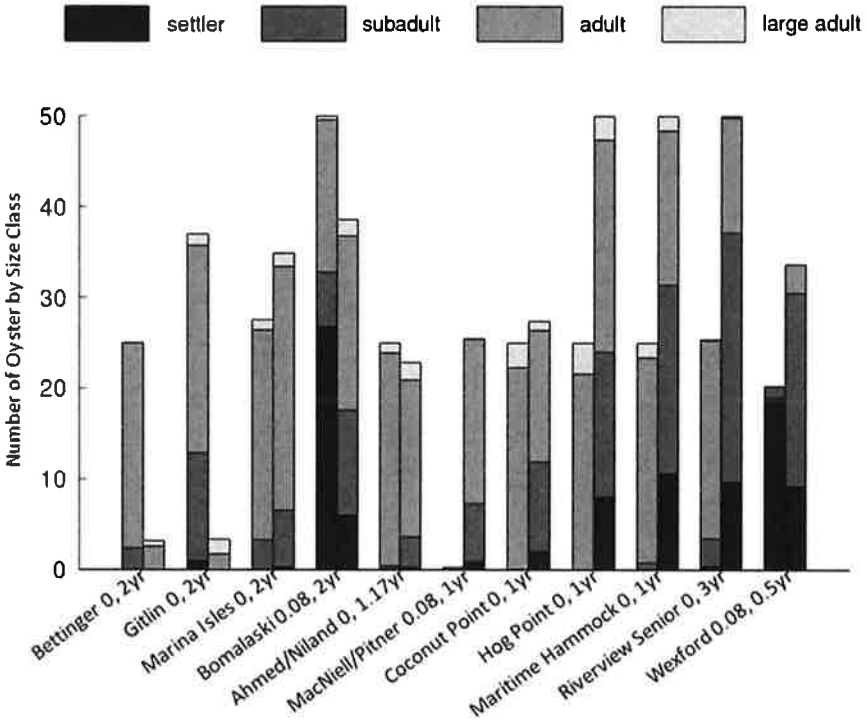


Figure 4-36. Distribution of Oyster Sizes, Age, and Average Number of Measured Oysters Per Unit

Figure 4-36 Long Description

The University of Central Florida has also monitored planted shorelines projects. Earlier projects (2018–2019) had higher success rates; 46–64% for red mangroves and 36–38% for sand cordgrass. In more recent projects, survival was initially similar to previous projects at equivalent ages. However, significant erosion was noted at two locations after fall 2020. Competition with terrestrial vegetation and erosion via waves and boat wakes are common causes of loss.

In response to concerns related to the breakdown of plastics in the environment, alternative oyster restoration materials are being examined. Six alternatives to using ultraviolet stabilized plastic mesh bags for securing loose oyster shell, are being tested at three locations in the IRL. With funding from the IRL National Estuary Program and collaborators from the University of Florida, Brevard County and Brevard Zoo Restore Our Shores team built test structures that will be monitored throughout an 18-month study. Modules were hung from docks and consist of controls (Naltex™ bags); two gauges of galvanized steel gabions; and multiple configurations of cement, oyster shell, and several natural materials including Community Oyster Reef Enhancement modules, jute-reinforced calcium sulfoaluminate Plastic-free Restoration of Oyster Shorelines units, and oyster balls. Monitoring of degradation, fouling, and oyster recruitment and growth occurs quarterly. Data collected will build on material testing results from other studies, while ensuring they will meet site-specific constraints of the IRL in Brevard County. In the first six months, the Naltex™ bags, Community Oyster Reef Enhancement modules, Plastic-free Restoration of Oyster Shorelines units, and gabions have had successful recruitment and growth of oysters, with gabions generally supporting the greatest number of oysters.

Data on oyster reef denitrification rates are very limited in Florida; therefore, a scientist with the University of Florida's Institute of Food and Agricultural Sciences will sample sediment from three oyster bar projects, one each from the North IRL, Central IRL, and Banana River Lagoon. This work will build on a previous study conducted for Brevard County on intertidal oyster reefs of different ages within the Mosquito Lagoon (Schmidt and Gallagher, 2017). Improved analysis techniques will be employed on the subtidal oyster bars present in Brevard County to obtain sediment denitrification, percent organic matter, oxygen demand, and nitrate, ammonium, and phosphate flux rates across the sediment-water interface. The field component of this study has been completed and final results are expected by spring 2022.

Remote Sensing of Harmful Algal Blooms in IRL and Connected Waterways in Brevard County
The identification of algae bloom triggers and behaviors is vital to local efforts to manage the watershed. In 2021, Brevard County was awarded $290,972 from a Florida Department of Environmental Protection Water Protection Grant for development of innovative technologies to address harmful algal blooms. Brevard County will use remote sensing technologies as a cost-effective and encompassing approach to provide rapid identification of harmful algal bloom formation, determine the harmful algal bloom lifecycle, and identify hotspots of harmful algal bloom occurrences.

The scope of work includes the development, implementation, and analysis of satellite and unmanned aerial vehicle remote sensing of harmful algal blooms in the lagoon. The European Space Agency Sentinel-2 and Sentinel-3 satellites will be the primary sources of remote sensing data to provide Brevard County with weekly harmful algal bloom updates. Applied Ecology, Inc. will perform spatiotemporal statistical analysis of these harmful algal blooms and corresponding water quality parameters. Applied Ecology, Inc. will also fly an unmanned aerial vehicle equipped with a hyperspectral camera, which will provide high resolution imagery of the lagoon tributaries and canals as well as on-the-ground data to improve the analysis of the satellite imagery. The year of weekly mapping and data that will be collected and analyzed for this project will be made available to interested agencies and researchers through an ArcGIS Online webapp.

4.4.5 Research Needs

Although this project plan does not fund research, it should be recognized that many important research questions need attention. Universities, state agencies, and non-profit organizations are currently leading lagoon research efforts. This plan acknowledges the research needs identified in the Florida Department of Environmental Protection basin management action plans, St. Johns River Water Management District 2011 Superbloom Report, and Indian River Lagoon (IRL) National Estuary Program Comprehensive Conservation and Management Plan, which are summarized below.

- Research needs identified in the basin management action plans (Florida Department of Environmental Protection 2021a, 2021b, and 2021c):
  - Collect data to update the bathymetry for the IRL Basin, which would be used in evaluations of seagrass depth limits.
  - Continue coordinated monitoring of phytoplankton, periphyton, drift algae, and macroalgae in the basin to gain insights into the cycling of nutrients as well as toxin production and release.
  - Analyze storm event monitoring data at the major outfalls.
  - Refine load estimates delivered by baseflows and modeling the contributions of baseflows.
  - Synthesize data on nutrient flux/internal recycling of legacy nutrient loads held within IRL sediments and exchanged with the water column.
  - Complete the development, calibration, and validation of a water quality model that can be used to design, site, and prioritize projects that reduce nutrient loads (e.g., Hydrologic Simulation Program FORTRAN or Spatial Watershed Iterative Loading model coupled with the Environmental Fluid Dynamics Code model, or another model that generates predictions of conditions that may be favorable for seagrass growth).

- Research needs identified in the Comprehensive Conservation and Management Plan revision (IRL National Estuary Program 2019):
  - Undertake further studies to quantify the impacts of septic systems on the IRL with a focus on identifying high priority "problem" and "potential problem" areas.
  - Develop, improve, and implement best management practices and education programs for stormwater management and freshwater discharges.
  - Determine the impacts of atmospheric deposition of nutrients and other pollutants on the nutrient budget, water quality, and resources of the IRL.
  - Support implementation, review, and update of IRL total maximum daily loads as needed and as best available science evolves.
  - Work to continue, expand, update, and improve the IRL species inventory.
  - Research and develop new and improved wetland best management practices with a focus on understanding wetland responses to sea level rise and climate change.
  - Continue to support and expand research initiatives and coordinated finfish and shellfish management strategies specific to the IRL.
  - Prepare a Risk-Based Vulnerability Assessment and Adaptation Plan for the IRL.
  - Develop a comprehensive IRL monitoring plan.
  - Advance the ten research priorities in the 2018 Looking Ahead – Science 2030 Report.
  - Update the IRL economic analysis produced by the Treasure Coast and East Central Florida Regional Planning Councils every five years.

- Support advancements in hydrological model development, verification, and application.
- Continue evaluation of options to enhance water flow through engineering solutions that have well defined water quality and ecological outcomes.
- Complete muck mapping of the entire IRL, prioritize muck dredging projects and site selection for seagrass and filter feeder restoration projects, and reduce source contributions of sediment and biomass that result in muck formation.
- Track emerging technologies, innovative approaches or alternatives to dredging, muck capping, upstream controls of muck transport, more efficient approaches to dewatering, enhanced pollutant removal in post-dredge water, and enhanced muck management to improve process efficiency and identify beneficial uses of muck.
- Monitor and research to better understand contaminants of emerging concern within the IRL system.
- Research spatially explicit data on the extent and condition of existing filter feeder habitat.
- Research and report on science-based siting, planning, design, and construction criteria for living shorelines.
- Support research and assessment to identify and map suitable habitats and spawning habitats for forage fishes and track population size and health.

- Research needs identified in 2011 Superbloom Report (St. Johns River Water Management District 2016b):
  - Garner an improved understanding of the ideal biological and physiological conditions and tolerances of picocyanobacteria (small cyanobacteria) and Pedinophyceae (green microflagellate), including their ability to use organic forms of nutrients, their ability to fix nitrogen, their nutrient uptake rates, their reproductive rates, and their defenses against grazers.
  - Maintain or expand water quality sampling to ensure spatiotemporal variations are captured adequately, which could include continuous monitoring of various parameters to fill gaps between monthly samples.
  - Develop an improved understanding of the physiological tolerances of drift algae and seagrasses, especially manmade conditions that could be mitigated to improve health or natural resilience.
  - Maintain or expand surveys of drift algae and seagrasses to improve the capacity to evaluate their role in nutrient cycles.
  - Improve the ability to model bottom-up influences from external and internal nutrient loads, including atmospheric deposition, surface water runoff, groundwater inputs, diffusive flux from muck, decomposition of drift algae, and cycling and transformation of nitrogen and phosphorus.
  - Enhance surveys of bacterioplankton to improve the understanding of nutrient cycling.
  - Improve surveys of potential zooplanktonic, infaunal, epifaunal, and fish grazers to enhance the understanding of spatiotemporal variation in top-down control of phytoplankton blooms.
  - Evaluate grazing pressure exerted by common species to enhance the understanding of top-down control of phytoplankton blooms.

4.5. Unfunded Projects

Throughout initial development and annual updates of this plan, there have been projects considered that are not funded due to being less cost-effective than similar projects that were

selected for funding. If some of the recommended projects in the plan receive funding from outside sources, such as grants or legislative appropriations, additional projects could be implemented using the Save Our Lagoon Trust Fund. If funding becomes available, the projects listed in **Table 4-45** through **Table 4-50** include numerous unfunded opportunities sorted by the next most cost-effective projects (based on total nitrogen [TN] and total phosphorus [TP] load reductions in pounds per year available for each major type of pollution reduction strategy.

Table 4-45: Unfunded Public Outreach and Education Projects

Project	Cost	Total Nitrogen Reductions (pounds per year)	Cost per Pound per year of Total Nitrogen Removed	Total Phosphorus Reductions (pounds per year)	Cost per Pound per Year of Total Phosphorus Removed
Irrigation Education	$300,000	1,530	$196	Not applicable	Not applicable
Stormwater Pond Best Management Practice Maintenance Education	$300,000	3,300	$91	400	$750
Total	***$600,000***	***4,830***	***$124 (average)***	***400***	***$1,500 (average)***

Table 4-46: Unfunded Wastewater Treatment Facility Reclaimed Water Upgrade Projects

Facility	Cost to Upgrade	Total Nitrogen Removed after Attenuation (pounds per year)	Cost per Pound per Year of Total Nitrogen Removed	Total Phosphorus Removed after Attenuation (pounds per year)	Cost per Pound per Year of Total Phosphorus Removed
Cape Canaveral Air Force Station	$6,000,000	3,653	$1,642	To be determined	To be determined
Brevard County South Beaches	$6,000,000	2,860	$2,098	To be determined	To be determined
Brevard County South Central Regional	$6,000,000	2,053	$2,923	To be determined	To be determined
Brevard County Port St. John	$6,000,000	1,788	$3,356	To be determined	To be determined
Rockledge Wastewater Treatment Facility	$6,000,000	1,084	$3,460	To be determined	To be determined
Brevard Count Barefoot Bay Water Reclamation Facility	$6,000,000	1,597	$5,535	To be determined	To be determined
Total	***$36,000,000***	***13,035***	***$2,762 (average)***	***To be determined***	***To be determined***

Table 4-47: Unfunded Package Plant Connection Projects

Facility Name	Number of Units	Cost to Connect to Sewer	Total Nitrogen Load Reduction (pounds per year)	Cost per Pound Per Year of Total Nitrogen Removed
Pelican Bay Mobile Home (also known as Riverview)	200	$1,028,802	537	$1,916
Housing Authority of Brevard County	26	$451,375	230	$1,963
Willow Lakes Recreational Vehicle Park	280	$1,822,750	680	$2,681
River Grove I & II Mobile Home Park	200	$1,761,167	594	$2,965
Sterling House Condominium	45	$660,445	203	$3,253
Tropical Trail Village	74	$648,025	155	$4,181
Lighthouse Cove	80	$1,182,706	216	$5,463
River Forest Mobile Home Park	130	$725,029	131	$5,520
Riverview Mobile Home and Recreational Vehicle Park	110	$763,933	130	$5,876

Facility Name	Number of Units	Cost to Connect to Sewer	Total Nitrogen Load Reduction (pounds per year)	Cost per Pound Per Year of Total Nitrogen Removed
South Shores Utility	134	$1,301,154	208	$6,256
Palm Harbor Mobile Home Park	130	$728,858	94	$7,754
Cove At South Beaches Condominium Association	80	$751,007	71	$10,578
Treetop Villas	28	$1,157,797	48	$24,121
Canebreaker Condo	24	To be determined	No data	To be determined
Enchanted Lakes Estates	190	To be determined	No data	To be determined
Camelot Recreational Vehicle Park Inc.	178	To be determined	No data	To be determined
Southern Comfort Mobile Home Park	40	To be determined	No data	To be determined
Summit Cove Condominium	84	To be determined	No data	To be determined
Total	***2,285***	***$14,861,120***	***5,114***	***$2,906 (average)***

Table 4-48: Unfunded Sprayfield or Rapid Infiltration Basin Upgrade Projects

Facility	Type	Estimated Cost to Upgrade	Total Nitrogen Removed from Upgrade (pounds per year)	Cost per Pound per Year of Total Nitrogen Removed
Indian River Shores Trailer Park	Rapid Infiltration Basin	$38,145	193	$198
Housing Authority of Brevard County	Rapid Infiltration Basin	$52,272	180	$290
River Grove Mobile Home Village	Rapid Infiltration Basin	$182,299	493	$370
South Shores Utility	Sprayfield	$300,564	771	$390
Merritt Island Utility Company	Rapid Infiltration Basin	$495,277	1,135	$436
Pelican Bay Mobile Home	Rapid Infiltration Basin	$222,156	446	$498
Lighthouse Cove	Sprayfield	$120,000	180	$667
River Forest Mobile Home Park	Sprayfield	$78,405	109	$719
Cove At South Beaches Condominium Association	Sprayfield	$51,480	59	$873
Tropical Trail Village	Rapid Infiltration Basin	$90,169	54	$1,670
Treetop Villas	Sprayfield	$105,000	58	$1,810
Riverview Mobile Home and Recreational Vehicle Park	Sprayfield	$333,234	108	$3,086
Palm Harbor Mobile Home Park	Sprayfield	$300,564	78	$3,853
Harris Malabar Facility	Rapid Infiltration Basin	$2,085,000	495	$4,212
Enchanted Lakes Estates	Sprayfield	$36,000	To be determined	To be determined
Camelot Recreational Vehicle Park Inc	Sprayfield	Unknown size	To be determined	To be determined
Southern Comfort Mobile Home Park	Rapid Infiltration Basin	To be determined	To be determined	To be determined
Space X Launch Complex 39A	Sprayfield	To be determined	To be determined	To be determined
Total	-	***$4,550,565***	***4,513***	***$1,008 (average)***

Table 4-49: Unfunded Septic-to Sewer-Projects

Service Area	Number of Lots	Cost	Total Nitrogen Reduction (pounds per year)	Total Nitrogen Cost per Pound Per Year
Grant-Valkaria – Zone G	30	$1,001,160	1,418	$706
Grant-Valkaria – Zone E	128	$4,271,616	5,862	$729
Grant-Valkaria – Zone B	34	$1,134,648	1,501	$756
Grant-Valkaria – Zone F	17	$567,324	688	$824
Grant-Valkaria – Zone D	18	$600,696	690	$871

Service Area	Number of Lots	Cost	Total Nitrogen Reduction (pounds per year)	Total Nitrogen Cost per Pound Per Year
Grant-Valkaria – Zone A	42	$1,401,624	1,296	$1,082
Malabar – Zone B	64	$2,135,808	1,929	$1,107
Grant-Valkaria – Zone C	30	$1,001,160	853	$1,173
Malabar – Zone A	430	$14,349,960	11,456	$1,253
Valkaria – Zone I	223	$7,441,956	5,380	$1,383
South Beaches – Zone F	3	$100,116	70	$1,435
Valkaria – Zone J	503	$16,786,116	11,507	$1,459
Malabar – Zone C	14	$467,208	289	$1,617
South Central – Zone B	180	$6,006,960	3,700	$1,623
Sharpes – Zone B	136	$4,538,592	2,692	$1,686
South Beaches – Zone E	387	$12,914,964	7,491	$1,724
Rockledge – Zone C	91	$3,036,852	1,736	$1,749
South Beaches – Zone K	21	$700,812	397	$1,765
North Merritt Island – Zone F	34	$1,550,000	830	$1,867
North Merritt Island – Zone D	29	$1,293,000	685	$1,888
City of West Melbourne	60	$2,002,320	1,041	$1,923
Pineda	27	$1,257,000	644	$1,952
Sykes Creek – Zone IJ	77	$1,900,000	62	$1,974
South Beaches – Zone L	178	$5,940,216	2,973	$1,998
Sykes Creek – Zone J	63	$2,102,436	1,028	$2,045
South Banana – Zone A	88	$3,025,000	1,444	$2,095
South Central – Zone BC	13	$1,222,000	582	$2,100
South Beaches – Zone G	112	$3,737,664	1,764	$2,119
City of West Melbourne – Zone B	60	$2,002,320	894	$2,240
Malabar – Zone D	24	$800,928	352	$2,278
North Merritt Island – Zone A	107	$4,245,000	1,821	$2,331
South Beaches – Zone D	89	$2,970,108	1,273	$2,333
South Central – Zone E	411	$13,715,892	5,761	$2,381
South Beaches – Zone M	334	$11,146,248	4,293	$2,596
Grant-Valkaria – Zone H	100	$3,337,200	1,272	$2,624
Malabar – Zone F	14	$467,208	174	$2,683
Melbourne Village – Zone B	224	$7,475,328	2,705	$2,763
Sykes Creek – Zone H	74	$2,469,528	887	$2,783
South Central – Zone I	72	$2,170,000	772	$2,811
Sykes Creek – Zone G	52	$1,735,344	602	$2,881
South Beaches – Zone N	103	$3,437,316	1,193	$2,882
Sykes Creek – Zone C	81	$2,703,132	929	$2,909
Melbourne Village – Zone A	85	$2,836,620	918	$3,091
South Central – Zone H	165	$5,506,380	1,779	$3,096
South Central – Zone G	196	$6,540,912	2,090	$3,129
North Merritt Island – Zone C	71	$2,369,412	737	$3,217
Merritt Island – Zone H	285	$22,500,000	5,464	$4,118
Sykes Creek – Zone S	164	$6,600,000	1,584	$4,167
North Merritt Island – Zone B	56	$4,690,000	1,066	$4,399
Merritt Island – Zone A	249	$16,700,000	3,440	$4,855
South Beaches – Zone C	118	$3,937,896	683	$5,763
Total	***6,166***	***$232,843,980***	***111,598***	***$2,086 (average)***

Table 4-50: Unfunded Muck Dredging and Interstitial Treatment Projects

Sub-Lagoon	Indian River Lagoon Muck Sites	Dredging Cost Estimate	Interstitial Water Treatment Cost	Total Cost	Total Nitrogen Reduction (pounds per year)	Cost per Pound of Total Nitrogen Removed	Total Phosphorus Reduction (pounds per year)	Cost per Pound of Total Phosphorus Removed
Banana	Cocoa Beach Golf (unfunded portion)*	$12,775,000	$1,941,800	$14,716,800	Not applicable	Not applicable	Not applicable	Not applicable
Central IRL	Goat Creek	$350,000	$50,819	$400,819	735	$545	98	$4,090
North IRL	Pineda to Eau Gallie	$30,625,000	$4,446,705	$35,071,705	34,965	$1,003	1,554	$22,569
North IRL	520 to Pineda	$31,500,000	$4,573,754	$36,073,754	35,280	$1,022	1,568	$23,006
Central IRL	Mullet Creek Islands Area	$4,550,000	$660,653	$5,210,653	4,305	$1,210	574	$9,078
North IRL	National Aeronautics and Space Administration Causeway West	$4,375,000	$635,244	$5,010,244	3,903	$1,284	193	$25,960
North IRL	Pineda	$5,250,000	$762,292	$6,012,292	4,610	$1,304	492	$12,220
Banana	Kent Drive	$1,750,000	$254,097	$2,004,097	1,365	$1,468	182	$11,012
Banana	National Aeronautics and Space Administration Area	$98,000,000	$14,229,457	$112,229,457	68,985	$1,627	9,198	$12,202
Banana	528 East	$1,225,000	$177,868	$1,402,868	840	$1,670	112	$12,526
North IRL	North IRL Venetian Canals/Channels	$13,475,000	$1,956,551	$15,431,551	9,160	$1,685	1,243	$12,415
Banana	Newfound Harbor East	$1,575,000	$228,688	$1,803,688	1,050	$1,718	140	$12,883
Banana	Banana Venetian Collector Canals/Channels	$119,000,000	$17,278,627	$136,278,627	78,960	$1,726	10,927	$12,472
Banana	Patrick Space Force Base Borrow Pit-2	$4,725,000	$686,063	$5,411,063	3,045	$1,777	406	$13,328
Banana	Newfound Harbor South	$4,725,000	$686,063	$5,411,063	3,045	$1,777	406	$13,328
Banana	Mathers Bridge Area	$12,250,000	$1,778,682	$14,028,682	7,875	$1,781	1,050	$13,361
North IRL	Max Brewer Causeway	$2,800,000	$406,556	$3,206,556	1,785	$1,796	238	$13,473
Banana	Newfound Harbor North	$3,150,000	$457,375	$3,607,375	1,995	$1,808	266	$13,562
Banana	Cocoa Beach High School	$6,825,000	$990,980	$7,815,980	4,305	$1,816	574	$13,617
Central IRL	Central IRL Venetian Collector Canals/Channels	$6,300,000	$914,750	$7,214,750	3,904	$1,848	537	$13,435
Banana	Brightwaters	$8,225,000	$1,194,258	$9,419,258	5,040	$1,869	672	$14,017
Banana	Patrick Space Force Base Borrow Pit-4	$525,000	$76,229	$601,229	315	$1,909	42	$14,315
Banana	Sunset Café	$3,850,000	$559,014	$4,409,014	2,310	$1,909	308	$14,315
Banana	520 Borrow Pit-1	$1,400,000	$203,278	$1,603,278	840	$1,909	112	$14,315
Banana	Cape Canaveral Hospital	$2,100,000	$304,917	$2,404,917	1,260	$1,909	168	$14,315
Banana	520 Borrow Pit-2	$700,000	$101,639	$801,639	420	$1,909	56	$14,315
Banana	520 Borrow Pit-3	$525,000	$76,229	$601,229	315	$1,909	42	$14,315
Banana	520 Borrow Pit-4	$1,400,000	$203,278	$1,603,278	840	$1,909	112	$14,315

Sub-Lagoon	Indian River Lagoon Muck Sites	Dredging Cost Estimate	Interstitial Water Treatment Cost	Total Cost	Total Nitrogen Reduction (pounds per year)	Cost per Pound of Total Nitrogen Removed	Total Phosphorus Reduction (pounds per year)	Cost per Pound of Total Phosphorus Removed
Banana	520 Borrow Pit-5	$1,050,000	$152,458	$1,202,458	630	$1,909	84	$14,315
Banana	520 Borrow Pit-6	$525,000	$76,229	$601,229	315	$1,909	42	$14,315
Banana	520 Borrow Pit-7	$700,000	$101,639	$801,639	420	$1,909	56	$14,315
Central IRL	Trout Creek	$175,000	$25,410	$200,410	105	$1,909	14	$14,315
Central IRL	Melbourne Causeway North	$875,000	$127,049	$1,002,049	525	$1,909	70	$14,315
Central IRL	Front St Park	$875,000	$127,049	$1,002,049	525	$1,909	70	$14,315
North IRL	Warwick Dr	$700,000	$101,639	$801,639	420	$1,909	56	$14,315
North IRL	Crab Shack	$700,000	$101,639	$801,639	420	$1,909	56	$14,315
Banana	Port Canaveral	$9,275,000	$1,346,716	$10,621,716	4,988	$2,129	245	$43,354
North IRL	Cocoa South	$5,250,000	$762,292	$6,012,292	1,947	$3,088	182	$33,035
Central IRL	Turkey Creek	$4,900,000	$711,473	$5,611,473	1,750	$3,207	231	$24,292
North IRL	National Aeronautics and Space Administration Causeway to 528	$16,625,000	$2,413,926	$19,038,926	4,694	$4,056	313	$60,827
North IRL	Rockledge A	$29,575,000	$4,294,247	$33,869,247	8,093	$4,185	1,184	$28,606
North IRL	Eau Gallie Northwest	$19,145,000	$2,779,826	$21,924,826	3,207	$6,837	244	$89,856
North IRL	Cocoa 520-528	$3,850,000	$559,014	$4,409,014	599	$7,361	40	$110,225
North IRL	Eau Gallie South	$40,250,000	$5,844,241	$46,094,241	4,144	$11,123	777	$59,323
-	***Total***	***$518,420,000***	***$75,360,713***	***$593,780,713***	***314,234***	***$1,890 (average)***	***35,032***	***$16,961 (average)***

*Note: The funding for the Cocoa Beach Golf project is the balance of funding needed to fully implement this project. Brevard County is looking for sources of funding for this balance.

Section 5. Project Funding

5.1. Project Funding, Schedule, and Scope Adjustments

5.1.1 Contingency Fund Reserve

The 2018 Update established a Contingency Fund Reserve (Reserve) that will be included with the development and adoption of the County's budget each fiscal year. The Reserve will amount to inflation plus 5% of the total Trust Fund dollars that are budgeted for all approved projects scheduled to occur or move ahead in that fiscal year. This includes projects in the Save Our Indian River Lagoon Project Plan (Plan), including additions captured in annual updates or supplements. The purpose of the Reserve is to fund emergency response to harmful algal blooms and major fish kills; cover reasonable funding shortfalls that may occur during project implementation and would delay implementation or completion of that project unless a ready source of funds is on hand; provide funding for projects (whether during the term of the project or upon project completion) that remove additional nutrients beyond the amount originally planned or anticipated in the project cost-share agreement; or move projects forward ahead of schedule if ready to proceed.

The Reserve includes an additional amount of funding to account for the impact of inflation on project delivery costs. Inflation is estimated by applying the Consumer Price Index to project costs, compounded for the number of years between the year the project cost was estimated and the year that the project is expected to be constructed. Since 2016, the Consumer Price Index has varied between 1.3% and 3.25%, with a high of 6.8% in 2021. For the 2022 Plan Update, inflation is applied and compounded annually for the years between when a project was added to the plan and when its construction is now anticipated. For projects that are not yet completed, an inflation factor of 2.5% is applied for Years 0–3, 6.8% for Year 4, and 5.9% for Years 5–10.

If a cost increase for an individual project is less than 10% of the amount identified in the project's cost-share agreement or the estimated cost or eligible amount of Trust Fund cost-share stated in the Save Our Indian River Lagoon Project Plan, as updated, then additional funding from the Reserve may be allocated to the project, as needed, in accordance with Brevard County approvals, policies, and administrative orders. For projects that are contracted with government entities and other partners that encounter cost overruns, the cost-share agreement may be increased up to 10% over the eligible cost-share amount stated in Attachment E of the respective cost-share agreement. Such an amendment will be executed by the authorized County representative and the appropriate representative or authorized agent of the government entity or partnering organization.

For project cost increases that are more than 10% above the amount identified in the project's cost-share agreement or the estimated cost or eligible amount of Trust Fund cost-share stated in the Save Our Indian River Lagoon Project Plan, as updated, County staff will evaluate the project circumstances and present findings to the Citizen Oversight Committee for review. The Committee will recommend rejection, modification, or approval of the funding request and provide such recommendation to the County representative authorized to sign the amendment. Staff will provide the Committee's recommendation to the County representative authorized to sign the request based on the authority granted by the County Commission.

The Reserve may also be used to increase funding for approved projects (whether during the term of the project or upon project completion) that provide greater nutrient reduction benefits than planned or anticipated if funding could be made available before the next Plan update. If a

project can be or was expanded or altered to provide greater nutrient reduction benefits than planned, contingency funds can be allocated at the rate for that project type established in the most recently adopted Plan update in the table titled "Cost-share Offered for Project Requests Submitted for the 2022 Update" (**Table 4-41**). In no case shall the governmental entity or partnering organization request Reserve funds that result in the total cost-share award exceeding the actual project costs incurred by the recipient, minus other grants or donations for that project.

Amendments to the project cost-share agreements shall follow one of the two approval processes identified below:

1. If a cost increase for an individual project is less than 10% of the cost identified in the project's cost-share agreement, then the authorized County representative is eligible to review and, if acceptable, approve an amendment to the project cost-share agreement.
2. If a cost increase for an individual project is more than 10% of the cost identified in the project's cost-share agreement, then County staff will bring the item before the Citizen Oversight Committee for a recommendation to reject, modify, or approve the funding request. This recommendation will then be brought to the authorized County representative for review and, if acceptable, approval of an amendment to the project cost-share agreement.

5.1.2 Schedule Acceleration

If a project has already been approved by the County Commission and is: (1) ready to move forward earlier than scheduled in the Plan; (2) consistent with temporal sequencing goals in the Plan; and (3) recommended by the Citizen Oversight Committee, and if there are sufficient Trust Fund dollars available for the project, then the County Manager (for budget changes less than $100,000) or County Commission (in any circumstance) are authorized to adjust the project schedule to ensure that approved projects funded in the Plan move forward as soon as feasible. This authority allows projects to move forward as soon as they are ready and funding is available.

5.1.3 Scope Reduction

If a project is not able to be fully completed as initially approved in the Plan due to extenuating circumstances including, but not limited to, permitting restrictions, loss of additional funding, or other situations beyond the entity's control, then the project may be downsized, within the framework of the already-approved project, and upon recommendation by the Citizen Oversight Committee. This recommendation will then be brought to the authorized County representative for review and, if acceptable, approval of an amendment to the costs and scope of the project's cost-share agreement. The revised funding amount will be based on the pounds of nitrogen removal estimated for the reduced project multiplied by the eligible cost-share per pound of total nitrogen removed that is adopted for that project type in the most recent Save Our Indian River Lagoon Project Plan. If a project is downsized between Plan updates, the revised Plan costs and nutrient load reductions will be reflected in the next annual Plan update.

5.2. Revenue Projection Update

Brevard County calculated a new estimate for Save Our Indian River Lagoon Sales Tax revenues. This estimate is based on the actual revenues for 2017, 2018, 2019, 2020, and the first nine months of 2021. The October, November, and December 2020 revenues were used to estimate the revenue for the remaining three months of 2021 by using a rate of growth of 6.8%.

The estimate then uses a rate of growth of 4.0% for 2022 and 3.0% for future years compounded over the remaining life of the tax. The new estimate for the total tax revenue is $542,223,794, or an average of $54.2 million per year. This current estimate is $20.2 million per year more than the $34 million per year estimate in the original Save Our Indian River Lagoon Plan, which was based on 2016 dollars, and $5.3 million per year more than the projection in the 2021 Plan Update.

5.3. Project Funding Allocations

Figure 5-1 summarizes the funding allocated by category (Reduce, Remove, Restore, and Respond) in this 2022 Plan Update. **Figure 5-1** shows the funding allocations by project type from the original plan through the 2022 Plan Update.

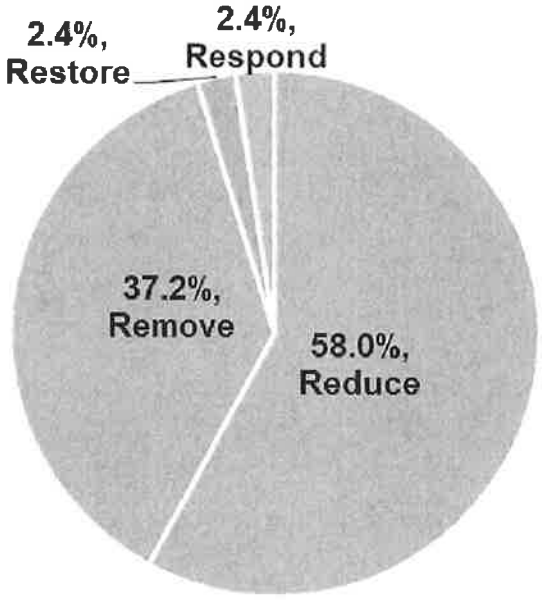


Figure 5-1: Funding for Reduce, Remove, Restore, and Respond Projects

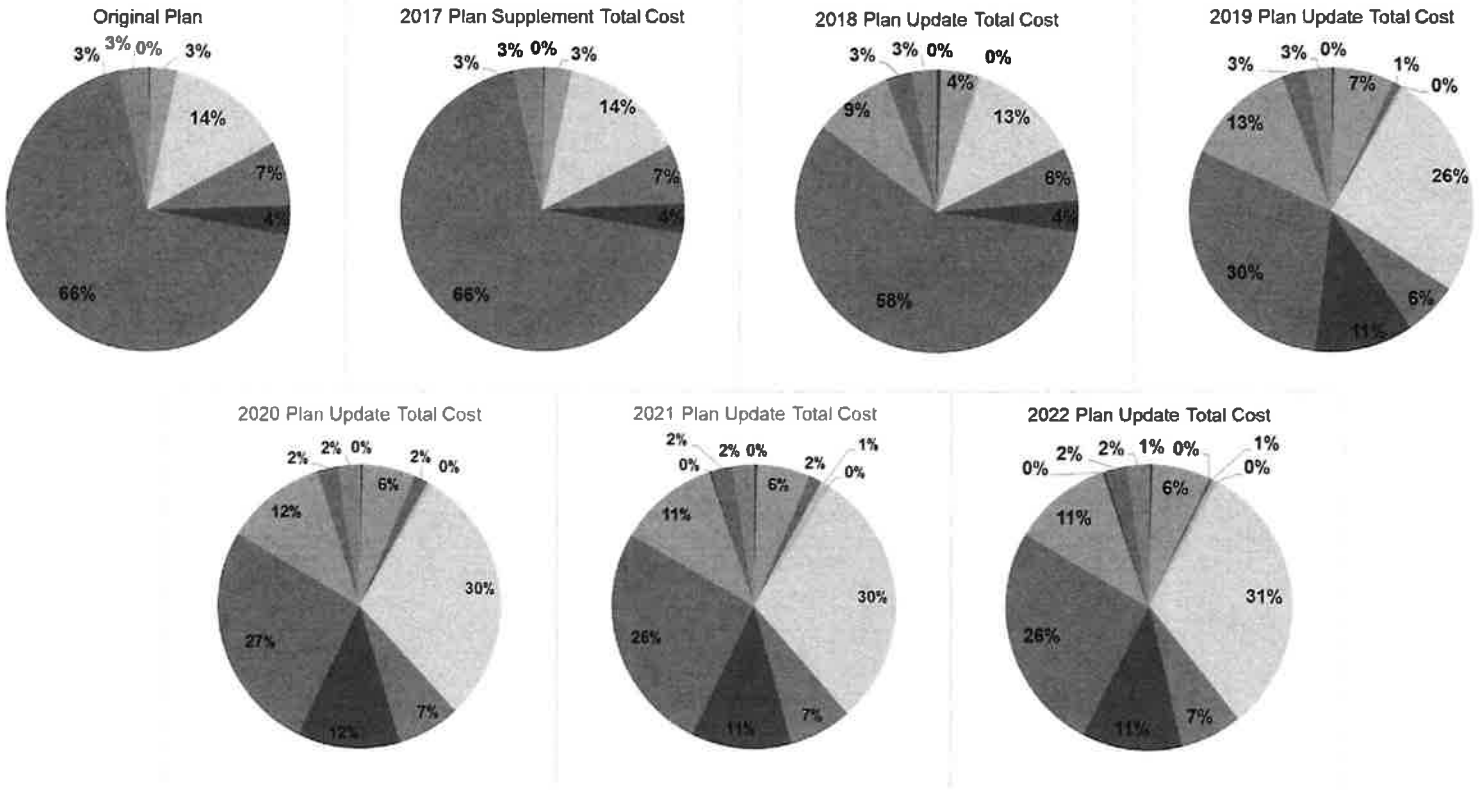


Figure 5-2: Evolution of Project Funding Allocations

Figure 5-2 Long Description

Section 6. Summary of the Plan through the 2022 Update

6.1. Progress Toward the Local Targets for Maximum Total Loads

The County has been working with its municipalities, Florida Department of Transportation District 5, and Patrick Space Force Base to update total loading estimates to the lagoon and revise the total maximum daily loads for nitrogen and phosphorus using the best available data and more detailed modeling than previously available. Based on this process, five-month total maximum daily loads, which target the load reductions needed during the seagrass growing period (January – May), were proposed in addition to annual total maximum daily loads that protect water quality year-round. These load reductions specifically target water quality conditions needed for restoring lagoon seagrass beds to provide crucial habitat for fish and other marine life. Therefore, as this Save Our Indian River Lagoon Project Plan was developed, the total nitrogen (TN) and total phosphorus (TP) reductions from the project types that **Reduce** incoming load were compared to the proposed five-month total maximum daily loads for each sub-lagoon. After satisfying the five-month total maximum daily loads, annual load reductions for each project were compared to the 12-month total maximum daily loads. In all cases, the projects identified to meet the five-month total maximum daily loads were sufficient to meet the proposed 12-month total maximum daily loads. As projects are implemented, progress toward meeting the five-month and full-year total maximum daily loads are being tracked.

Only the projects that reduce external loading to the lagoon, not muck removal or living shorelines, were used to meet the total maximum daily loads. Even though decades of treatment projects to reduce nutrient loads have been completed to date, only the reductions associated with basin management action plan projects that were completed between January 1, 2010 (the last year of the Spatial Watershed Iterative Loading model period) and February 29, 2016 (the end of the last basin management action plan reporting period when the Save Our Indian River Lagoon Project Plan was developed) were included in the load reduction calculations as these projects also provide nutrient load reductions that have occurred after the period of record used to develop the proposed total maximum daily load updates. In Zone A of the Central Indian River Lagoon (IRL), the reductions from the St. Johns River Water Management District's C-1 re-diversion project, which was implemented with cost-share funding from the Florida Department of Environmental Protection and Brevard County, were also included as this project results in significant load reductions that were not included in the February 29, 2016 basin management action plan annual progress report. As shown in **Table 6-1**, **Table 6-3**, and **Table 6-5**, the projects proposed in this plan plus the recently completed basin management action plan projects and C-1 re-diversion project exceed the five-month reductions called for by the proposed total maximum daily load updates.

The total project reductions were also compared to the full year estimated loading to the lagoon from the Spatial Watershed Iterative Loading model. As shown in **Table 6-2**, **Table 6-4**, and **Table 6-6**, the proposed projects in this plan, as well as the recently completed basin management action plan projects and C-1 re-diversion project, achieve significant reductions of the overall loading to the lagoon and exceed the full year reductions called for by the proposed local total maximum daily loads).

Table 6-1: Banana River Lagoon Project Reductions to Meet Five-Month Total Maximum Daily Load

Project	Total Nitrogen Reductions (pounds per year)	Total Phosphorus Reductions (pounds per year)
Fertilizer Ordinance Implementation	2,945	603
Future Education	1,853	129
Wastewater Treatment Facility Upgrade for Reclaimed Water	1,050	285
Sewer Laterals	412	78
Septic System Removal	13,090	0
Septic System Upgrade	806	0
Stormwater Projects	14,106	2,238
Vegetation Harvesting	999	78
Basin Management Action Plan Projects (2010-February 2016)	5,303	1,440
Total	***40,564***	***4,851***
Proposed Total Maximum Daily Load Reductions (five-month)	***30,337***	***2,737***
Percent of Proposed Total Maximum Daily Load Reductions Achieved	***133.7%***	***177.2%***

Table 6-2: Banana River Lagoon Project Reductions Compared to Full Year Loading

Project	Total Nitrogen Reductions (pounds per year)	Total Phosphorus Reductions (pounds per year)
Fertilizer Ordinance Implementation	7,068	1,446
Future Education	4,447	310
Wastewater Treatment Facility Upgrade for Reclaimed Water	2,520	685
Sewer Laterals	988	188
Septic System Removal	31,417	0
Septic System Upgrade	1,934	0
Stormwater Projects	65,757	8,564
Vegetation Harvesting	2,398	187
Basin Management Action Plan Projects (2010-February 2016)	12,726	3,456
Total	***129,255***	***14,836***
Starting Load (full year)	***477,020***	***44,269***
Percent of Starting Load Reduced	***27.1%***	***33.5%***
Proposed Full-Year Total Maximum Daily Load Percent Reductions	***9.0%***	***9.6%***

Table 6-3: North IRL Project Reductions to Meet Five-Month Total Maximum Daily Load

Project	Total Nitrogen Reductions (pounds per year)	Total Phosphorus Reductions (pounds per year)
Fertilizer Ordinance Implementation	8,070	1,651
Future Education	5,078	354
Wastewater Treatment Facility Upgrade for Reclaimed Water	7,355	To be determined
Sewer Laterals	1,118	To be determined
Package Plant Connection	647	To be determined
Septic System Removal	23,306	0
Septic System Upgrade	5,774	0
Stormwater Projects	38,810	6,525
Vegetation Harvesting	517	66
Basin Management Action Plan Projects (2010-February 2016)	16,983	3,180
Total	***107,658***	***11,776***
Proposed Total Maximum Daily Load Reductions (five-month)	***61,447***	***7,410***
Percent of Proposed Total Maximum Daily Load Reductions Achieved	***175.2%***	***158.9%***

Table 6-4: North IRL Project Reductions Compared to Full Year Loading

Project	Total Nitrogen Reductions (pounds per year)	Total Phosphorus Reductions (pounds per year)
Fertilizer Ordinance Implementation	19,368	3,962
Future Education	12,187	849
Wastewater Treatment Facility Upgrade for Reclaimed Water	17,651	To be determined
Sewer Laterals	2,682	To be determined
Package Plant Connection	1,553	To be determined
Septic System Removal	55,935	0
Septic System Upgrade	13,857	0
Stormwater Projects	157,527	22,573
Vegetation Harvesting	1,240	159
Basin Management Action Plan Projects (2010-February 2016)	40,758	7,632
Total	***322,758***	***35,175***
Starting Load (full year)	***988,847***	***99,340***
Percent of Starting Load Reduced	***32.6%***	***35.4%***
Proposed Full-Year Total Maximum Daily Load Percent Reductions	***11.4%***	***11.4%***

Table 6-5: Central IRL Project Reductions to Meet Five-Month Total Maximum Daily Load

Project	Total Nitrogen Reductions (pounds per year)	Total Phosphorus Reductions (pounds per year)
Fertilizer Ordinance Implementation	8,108	1,659
Future Education	5,102	356
Wastewater Treatment Facility Upgrade for Reclaimed Water	20,688	5,448
Sewer Laterals	1,053	To be determined
Rapid Infiltration Basin/Sprayfield	132	To be determined
Package Plant Connection	188	To be determined
Septic System Removal	12,496	0
Septic System Upgrade	9,246	0
Stormwater Projects	15,158	2,104
Vegetation Harvesting	6,932	693
C-1 Re-Diversion	53,892	6,295
Basin Management Action Plan Projects (2010-February 2016)	378	243
Total	***133,373***	***16,798***
Proposed Total Maximum Daily Load Reductions (five-month) *	***67,547***	***8,151***
Percent of Proposed Total Maximum Daily Load Reductions Achieved	***197.5%***	***206.1%***

* The total maximum daily load reductions are for Zone A only; however, some of the septic system projects are in Zone SEB. There are sufficient projects to achieve the Zone A reductions without the Zone SEB projects (refer to **Section 2.1**).

Table 6-6: Central IRL Project Reductions Compared to Full Year Loading

Project	Total Nitrogen Reductions (pounds per year)	Total Phosphorus Reductions (pounds per year)
Fertilizer Ordinance Implementation	19,460	3,981
Future Education	12,245	854
Wastewater Treatment Facility Upgrade for Reclaimed Water	49,652	13,075
Sewer Laterals	2,526	To be determined
Rapid Infiltration Basin/Sprayfield	317	To be determined
Package Plant Connection	450	To be determined
Septic System Removal	29,991	0
Septic System Upgrade	22,190	0
Stormwater Projects	47,886	6,313
Vegetation Harvesting	16,636	1,664
C-1 Re-Diversion	129,341	15,108
Basin Management Action Plan Projects (2010-February 2016)	908	582
Total	***331,602***	***41,577***
Starting Load (full year) *	***698,937***	***95,051***
Percent of Starting Load Reduced	***47.4%***	***43.7%***
Proposed Full-Year Total Maximum Daily Load Percent Reductions	***17.8%***	***16.3%***

* The total maximum daily load reductions are for Zone A only; however, some of the septic system are in Zone SEB. There are sufficient projects to achieve the Zone A reductions without the Zone SEB projects (refer to **Section 2.1**).

In addition to the projects that address the external nutrient loading summarized above, the plan includes muck flux, interstitial water treatment, oyster bars, and planted shoreline projects that will significantly reduce internal nutrient loading within the lagoon itself. The annual reductions from these projects are summarized in **Table 6-7**, along with the percentage of nutrients from 2018 estimates of muck flux that would be reduced by these projects.

Table 6-7: Annual Muck Flux, Muck Interstitial Water, Oyster Bar, and Planted Shoreline Project Benefits Compared to Annual Nutrient Loadings from Muck Flux

Project Type	Banana River Lagoon Total Nitrogen (pounds per year)	Banana River Lagoon Total Phosphorus (pounds per year)	North IRL Total Nitrogen (pounds per year)	North IRL Total Phosphorus (pounds per year)	Central A Total Nitrogen (pounds per year)	Central A Total Phosphorus (pounds per year)
Muck Flux Reduction	142,855	13,463	59,882	4,190	5,691	221
Average Annual Removal of Nutrients from Interstitial Water	39,361	1,967	9,072	825	69	0
Oyster Bars	10,369	320	10,599	272	3,731	188
Clams	423	0	432	0	145	0
Planted Shorelines	91	31	236	81	217	74
Total Project Reductions	***193,099***	***15,781***	***80,221***	***5,368***	***9,853***	***483***
Estimated Muck Flux Loading	***393,948***	***43,216***	***247,078***	***17,583***	***16,927***	***2,277***
Percent of Muck Flux Reduced	***49.0%***	***36.5%***	***32.5%***	***30.5%***	***58.2%***	***21.2%***

6.2. Plan Summary

Table 6-8 summarizes all the project types, as well as their estimated costs, total nitrogen (TN) and total phosphorus (TP) reductions, and costs per pound of TN and TP removed. The information from this table on the project reductions and cost effectiveness was used to determine the schedule for implementing the projects (see **Table 6-9**). Projects that could achieve large reductions quickly, such as fertilizer reductions and wastewater treatment facility upgrades, as well as the most cost-effective septic-to-sewer, and stormwater projects were prioritized for earliest implementation. This prioritization allows for the reductions to occur as quickly as possible while best using available funding sources. Project scheduling also considered the timing of upstream reductions with downstream removals, where feasible.

The timeline in **Table 6-9** is shown in years after funding from the Save Our Indian River Lagoon sales tax became available. Each year corresponds to the County's fiscal year, which is October 1st through September 30th. Year 1 started on October 1, 2017, which was just before revenues would have begun to accrue if the funding source had been a property tax, as initially considered. When the referendum approved by the voters was a sales tax, collections began in January 2017 and the first revenue check was received by the County in March 2017. Therefore, a plan update was adopted in March 2017 to begin plan implementation in Year 0. **Table 6-9** includes the cost estimates developed as part of the original plan or provided in the year new or substitute projects were added to the plan.

As noted in **Section 4.4.1**, an adaptive management approach is being used in the implementation of this plan. As projects are completed and information on the actual construction costs, timeline, and reductions are obtained, the plan will continue to be adjusted, as needed, to ensure that the most cost-effective projects are being used to meet the Indian River Lagoon (IRL) restoration goals.

Table 6-8: Summary of Projects, Estimated TN and TP Reductions, and Costs

Project Number	Project	Save Our Lagoon Project Cost	Total Nitrogen Reductions (pounds per year)	Cost per Pound per Year of Total Nitrogen	Total Phosphorus Reductions (pounds per year)	Cost per Pound per Year of Total Phosphorus
-	**Public Education**	-	-	-	-	-
58a	Expanded Fertilizer Education	$625,000	6,613	$95	813	$769
58b	Grass Clippings Campaign	$200,000	17,800	$11	1,200	$167
58c	Septic System Maintenance Education	$300,000	4,466	$67	To be determined	To be determined
193	Oyster Gardening Program	$300,000	Not applicable	Not applicable	Not applicable	Not applicable
227	Restore Our Shores: Community Collaborative	$1,000,000	Not applicable	Not applicable	Not applicable	Not applicable
-	**Wastewater Treatment Facility Upgrades for Reclaimed Water**	-	-	-	-	-
99	Cocoa Beach Water Reclamation Facility Upgrade	$945,000	2,520	$375	685	$1,380
2016-02a	City of Titusville Osprey Wastewater Treatment Facility	$8,800,000	8,660	$1,016	Not applicable	Not applicable
2016-17	City of Palm Bay Water Reclamation Facility	$3,636,900	20,240	$180	102	$35,656
59	City of Melbourne Grant Street Water Reclamation Facility	$6,769,500	18,052	$375	9,671	$700
2016-2b	City of Titusville Osprey Nutrient Removal Upgrade Phase 2	$300,000	3,626	$83	Not applicable	Not applicable
138	Ray Bullard Water Reclamation Facility Biological Nutrient Removal Upgrades	$4,260,000	11,360	$375	3,302	$1,290
216	City of Rockledge Flow Equalization Basin Project	$2,054,795	5,365	$383	Not applicable	Not applicable
-	**Rapid Infiltration Basin/Sprayfield Upgrades**	-	-	-	-	-
6	Long Point Park Upgrade	$22,207	163	$136	To be determined	To be determined
196	Sterling House Condominium Sprayfield	$60,000	154	$390	To be determined	To be determined
-	**Package Plant Connection**	-	-	-	-	-
202	Merritt Island Utility Company	$1,349,445	1,367	$987	To be determined	To be determined
192	Oak Point Wastewater Treatment Facility Improvements	$279,000	186	$1,500	0	Not applicable
228	Indian River Shores Trailer Park Wastewater Treatment Facility	$528,627	450	$1,175	To be determined	To be determined
-	**Sewer Laterals**	-	-	-	-	-
63ab	Satellite Beach Lateral Smoke Testing and Countywide Repair/Replacement	$840,000	988	$850	188	$4,468
100	Osprey Basin Lateral Smoke Testing	$200,000	640	Not applicable	Not applicable	Not applicable
114	Barefoot Bay Lateral Smoke Testing	$90,000	864	Not applicable	Not applicable	Not applicable
115	South Beaches Lateral Smoke Testing	$200,000	1,662	Not applicable	Not applicable	Not applicable
116	Merritt Island Lateral Smoke Testing	$250,000	2,042	Not applicable	Not applicable	Not applicable
-	**Septic System Removal by Sewer Extension**	-	-	-	-	-
47	Sykes Creek - Zone N	$4,176,000	2,784	$1,500	To be determined	To be determined

Project Number	Project	Save Our Lagoon Project Cost	Total Nitrogen Reductions (pounds per year)	Cost per Pound per Year of Total Nitrogen	Total Phosphorus Reductions (pounds per year)	Cost per Pound per Year of Total Phosphorus
48	Sykes Creek - Zone M	$2,697,000	1,798	$1,500	To be determined	To be determined
146	Merritt Island - Zone C	$1,580,000	1,419	$1,113	To be determined	To be determined
49	Sykes Creek - Zone T	$5,040,000	3,360	$1,500	To be determined	To be determined
2016-29	South Banana - Zone B	$1,372,500	915	$1,500	To be determined	To be determined
145	Merritt Island - Zone F	$1,100,000	1,292	$851	To be determined	To be determined
147	Sykes Creek - Zone R	$4,387,500	2,925	$1,500	To be determined	To be determined
148	North Merritt Island - Zone E	$3,811,500	2,541	$1,500	To be determined	To be determined
151	Merritt Island - Zone G	$16,617,000	11,078	$1,500	To be determined	To be determined
2016-30	City of Rockledge	$500,580	712	$703	To be determined	To be determined
2016-31/32	City of Cocoa - Zones and J K	$5,622,000	3,748	$1,500	To be determined	To be determined
109	City of Titusville - Zones A-G	$1,201,392	1,563	$769	To be determined	To be determined
150	South Central - Zone D (Brevard County)	$4,774,500	3,387	$1,410	To be determined	To be determined
2016-28	South Central - Zone D (Melbourne)	$265,500	177	$1,500	To be determined	To be determined
50b	South Central - Zone C	$6,600,000	5,146	$1,283	To be determined	To be determined
203	South Central - Zone A	$5,482,500	3,655	$1,500	To be determined	To be determined
2016-33	City of Melbourne	$867,672	878	$988	To be determined	To be determined
2020-34	South Central - Zone F	$1,701,972	1,688	$1,008	To be determined	To be determined
2016-27	Sharpes - Zone A	$7,872,000	5,248	$1,500	To be determined	To be determined
2016-35	South Beaches - Zone A	$1,959,000	1,306	$1,500	To be determined	To be determined
2016-36	South Beaches - Zone O	$133,488	136	$982	To be determined	To be determined
2016-37	South Beaches - Zone P	$300,348	242	$1,241	To be determined	To be determined
2016-38	City of Titusville - Zone H	$1,168,020	910	$1,284	To be determined	To be determined
2016-40	Rockledge - Zone B	$5,339,520	4,037	$1,323	To be determined	To be determined
1	Breeze Swept Septic-to-Sewer Connection	$880,530	2,002	$440	To be determined	To be determined
2	Merritt Island Septic Phase Out Project	$320,268	2,501	$128	To be determined	To be determined
61	Riverside Drive Septic-to-Sewer Conversion	$262,044	305	$859	To be determined	To be determined
62	Roxy Avenue Septic-to-Sewer Conversion	$88,944	102	$872	To be determined	To be determined
152	Sharpes - Zone B	$4,038,000	2,692	$1,500	To be determined	To be determined
153	Cocoa - Zone C	$800,000	3,499	$1,500	To be determined	To be determined
190	Bowers Septic-to-Sewer	$147,000	120	$1,225	To be determined	To be determined
191	Kent and Villa Espana Septic-to-Sewer Conversion	$710,000	542	$1,310	To be determined	To be determined
2016-39	City of Palm Bay – Zone A	$2,569,644	2,136	$1,203	To be determined	To be determined

Project Number	Project	Save Our Lagoon Project Cost	Total Nitrogen Reductions (pounds per year)	Cost per Pound per Year of Total Nitrogen	Total Phosphorus Reductions (pounds per year)	Cost per Pound per Year of Total Phosphorus
2016-46	City of Palm Bay – Zone B	$8,309,628	6,809	$1,220	To be determined	To be determined
4	Hoag Sewer Conversion	$86,031	101	$852	To be determined	To be determined
5	Pennwood Sewer Conversion	$81,000	103	$786	To be determined	To be determined
60	Sylvan Estates Septic-to-Sewer Conversion	$1,561,215	1,073	$1,455	To be determined	To be determined
136	Micco - Zone B	$9,000,000	8,687	$1,036	To be determined	To be determined
3	Micco Sewer Line Extension (Phase I and II)	$2,239,500	1,493	$1,500	To be determined	To be determined
189	Avendia del Rio Septic-to-Sewer	$70,000	71	$986	To be determined	To be determined
224	Lake Ashley Circle	$1,704,000	1,136	$1,500	To be determined	To be determined
225	Dundee Circle and Manor Place	$2,248,500	1,499	$1,500	To be determined	To be determined
-	**Septic System Removal by Sewer Connection**	-	-	-	-	-
2016-16	Banana Septic System 144 Quick Connections	$1,905,729	3,224	$591	To be determined	To be determined
2016-18	North IRL Septic System 463 Quick Connections	$6,018,000	11,339	$531	To be determined	To be determined
2016-19	Central IRL Septic System 269 Quick Connections	$3,354,000	6,883	$487	To be determined	To be determined
222	Hedgecock/Grabowsky and Desoto Fields	$39,447	81	$487	To be determined	To be determined
-	**Septic System Upgrades**	-	-	-	-	-
51	Banana River Lagoon 100 Septic System Upgrades	$1,800,000	1,934	$931	To be determined	To be determined
52	North IRL 586 Septic System Upgrades	$10,548,000	13,857	$761	To be determined	To be determined
53	Central IRL 939 Septic System Upgrades	$16,885,106	22,190	$761	To be determined	To be determined
-	**Stormwater Projects**	-	-	-	-	-
-	Banana River Lagoon 68 Basin Projects	$14,324,135	63,450	$226	8,311	$1,724
13	Central Boulevard Baffle Box	$34,700	481	$72	14	$2,479
16	Gleason Park Reuse	$4,224	48	$88	9	$469
64	Stormwater Low Impact Development Convair Cove 1 – Blakey Boulevard	$4,650	30	$155	3	$1,550
65	Stormwater Low Impact Development Convair Cove 2- Dempsey Drive	$4,495	29	$155	3	$1,498
66	Big Muddy at Cynthia Baffle Box	$41,695	269	$155	48	$869
66b	Big Muddy at Cynthia Baffle Box Expansion	$17,936	167	$107	10	$1,794
85	Basin 1304 Bioreactor	$83,029	958	$87	127	$654
128	Jackson Court Stormwater Treatment Facility	$8,266	56	$148	8	$1,033
179	Lori Laine Basin Pipe Improvement Project	$17,525	117	$150	21	$835
215	Basin 960 Pioneer Road Denitrification	$38,850	105	$370	3	$12,950
219	McNabb Outfall Bioretention	$19,423	44	$441	7	$2,775
221	Burris Way Alley West Stormwater Low Impact Development	$1,249	3	$416	0	Not applicable

Project Number	Project	Save Our Lagoon Project Cost	Total Nitrogen Reductions (pounds per year)	Cost per Pound per Year of Total Nitrogen	Total Phosphorus Reductions (pounds per year)	Cost per Pound per Year of Total Phosphorus
-	North IRL 95 Basin Projects	$22,114,028	112,154	$197	14,662	$1,508
14	Church Street Type II Baffle Box	$88,045	937	$94	135	$652
18	Denitrification Retrofit of Johns Road Pond	$105,512	1,199	$88	To be determined	To be determined
19	St. Teresa Basin Treatment	$272,800	3,100	$88	459	$594
20	South Street Basin Treatment	$86,856	987	$88	156	$557
21	La Paloma Basin Treatment	$208,296	2,367	$88	346	$602
22	Kingsmill-Aurora Phase Two	$367,488	4,176	$88	814	$451
23	Denitrification Retrofit of Huntington Pond	$104,720	1,190	$88	To be determined	To be determined
24	Denitrification Retrofit of Flounder Creek Pond	$75,328	856	$88	To be determined	To be determined
34	Cliff Creek Baffle Box	$347,781	3,952	$88	797	$436
35	Thrush Drive Baffle Box	$322,200	3,661	$88	773	$417
69	Apollo/GA Baffle Box	$297,522	3,381	$88	479	$621
89	Basin 1298 Bioreactor	$85,829	917	$94	116	$740
90	Johns Road Pond Biosorption Activated Media	$23,030	245	$94	37	$622
91	Burkholm Road Biosorption Activated Media	$64,390	685	$94	104	$619
92	Carter Road Biosorption Activated Media	$62,510	665	$94	101	$619
93	Wiley Avenue Biosorption Activated Media	$82,735	954	$87	144	$575
94	Broadway Pond Biosorption Activated Media	$42,864	456	$94	69	$621
95	Cherry Street Baffle Box	$306,740	980	$313	174	$1,763
96	Spring Creek Baffle Box	$330,841	1,057	$313	232	$1,426
97	Titusville High School Baffle Box	$111,813	1,190	$94	166	$674
98	Coleman Pond Managed Aquatic Plant System	$11,438	1,240	$9	198	$58
110	Osprey Plant Pond Managed Aquatic Plant Systems	$37,500	606	$62	88	$426
117	Basin 10 County Line Road Woodchip Bioreactor	$72,773	597	$122	90	$809
118	Basin 26 Sunset Road Serenity Park Woodchip Bioreactor	$73,810	605	$122	92	$802
119	Basin 141 Irwin Avenue Woodchip Bioreactor	$69,174	567	$122	86	$804
120	Draa Field Pond Managed Aquatic Plant Systems	$31,281	256	$122	38	$823
122	Basin 22 Hunting Road Serenity Park Woodchip Bioreactor	$40,077	329	$122	50	$802
124	Floating Wetlands to Existing Stormwater Ponds	$1,497	12	$125	3	$499
125	Diamond Square Stormwater Pond	$10,383	85	$122	23	$451
127	Basin 5 Dry Retention	$16,680	113	$148	18	$927
129	Forrest Avenue 72-inch Outfall Baseflow Capture/Treatment	$13,956	94	$148	12	$1,163
169	Basin 1335 (Sherwood Park) Stormwater Quality Project	$392,108	3,214	$122	879	$446

Project Number	Project	Save Our Lagoon Project Cost	Total Nitrogen Reductions (pounds per year)	Cost per Pound per Year of Total Nitrogen	Total Phosphorus Reductions (pounds per year)	Cost per Pound per Year of Total Phosphorus
174	St. Johns 2 Baffle Box	$243,070	1,992	$122	611	$398
175	High School Baffle Box	$144,326	1,183	$122	319	$452
176	Funeral Home Baffle Box	$58,682	481	$122	129	$455
177	North and South Lakemont Ponds Floating Wetlands	$13,054	107	$122	25	$522
178	Marina B Managed Aquatic Plant Systems	$6,670	55	$121	7	$953
-	Central IRL 8 Basin Projects	$3,258,500	19,832	$164	2,617	$1,245
15	Bayfront Stormwater Project	$30,624	348	$88	83	$369
67	Grant Place Baffle Box	$82,481	937	$88	193	$427
68	Crane Creek/M-1 Canal Flow Restoration	$2,033,944	23,113	$88	2,719	$748
87	Fleming Grant Biosorption Activated Media	$56,588	602	$94	91	$622
88	Espanola Baffle Box	$105,186	1,119	$94	148	$711
121	Basin 2258 Babcock Road Woodchip Bioreactor	$50,203	412	$122	62	$810
123	Ray Bullard Water Reclamation Facility Stormwater Management Area	$160,674	1,317	$122	400	$402
213	Johnson Junior High Denitrification Media Chamber Modification	$64,478	206	$313	Not applicable	Not applicable
214	Sand Point Park Baffle Box	$137,135	438	$313	71	$1,931
220	Basin 1398 Sand Dollar Canal Bioreactor	$198,024	444	$446	70	$2,829
-	**Vegetation Harvesting**	-	-	-	-	-
111	Draa Field Vegetation Harvesting	$86,413	786	$110	99	$872.86
112	County Wide Stormwater Pond Harvesting	$14,000	140	$100	28	$500
171	Mechanical Aquatic Vegetation Harvesting	$1,011,976	16,636	$61	1,664	$608
172	Horseshoe Pond Vegetative Harvesting	$8,140	74	$110	7	$1,163
173	North and South Lakemont Ponds Vegetation Harvesting	$1,980	18	$110	4	$495
208	Maritime Hammock Preserve Stormwater Pond Harvesting	$7,700	70	$110	5	$1,540
209	Basin 1398 Sand Dollar Canal Harvesting	$24,420	222	$110	21	$1,163
210	Basin 958 Pioneer Road Vegetation Harvesting	$39,930	363	$110	47	$850
211	Cocoa Beach Golf Course Stormwater Ponds Harvesting	$216,150	1965	$110	135	$1,601
-	**Muck Removal**	-	-	-	-	-
2016-10a	Canaveral South	$14,700,000	35,382	$415	1,925	$7,636
2016-5a	Pineda Banana River Lagoon	$6,825,000	15,033	$454	686	$9,949
2016-11a	Patrick Space Force Base	$7,175,000	6,497	$1,104	382	$18,783
168a	Cocoa Beach Golf	$21,350,000	29,694	$719	2,058	$10,374
41a	Grand Canal Muck	$2,626,600	10,469	$251	1,396	$1,882

Project Number	Project	Save Our Lagoon Project Cost	Total Nitrogen Reductions (pounds per year)	Cost per Pound per Year of Total Nitrogen	Total Phosphorus Reductions (pounds per year)	Cost per Pound per Year of Total Phosphorus
42a	Sykes Creek Muck	$4,705,428	19,635	$240	2,618	$1,797
70a	Cocoa Beach Muck Dredging – Phase III	$1,376,305	4,095	$336	780	$1,764
71	Merritt Island Muck Removal – Phase 1	$7,733,517	8,085	$957	1,540	$5,022
72a	Muck Removal of Indian Harbour Beach Canals	$3,631,815	3,780	$961	720	$5,044
101	Cocoa Beach Muck Dredging Phase II-B	$5,917,650	6,300	$939	840	$7,045
144	Satellite Beach Muck Dredging	$1,884,225	3,885	$485	518	$3,638
2016-06a	Titusville Railroad West	$3,150,000	14,406	$219	588	$5,357
2016-07a	National Aeronautics and Space Administration Causeway East	$9,975,000	21,872	$456	1,047	$9,527
2016-04a	Rockledge A	$4,375,000	7,581	$577	825	$5,303
2016-08a	Titusville Railroad East	$4,025,000	5,393	$746	227	$17,731
54a	Eau Gallie Northeast	$8,750,000	10,476	$835	1,482	$5,904
2016-3a	Muck Re-dredging in Turkey Creek	$137,329	5,691	$24	221	$621
223	Spring Creek Dredging	$80,080	154	$520	21	$3,813
-	**Treatment of Interstitial Water**	-	-	-	-	-
40	Mims Muck Removal: Outflow Water Nutrient Removal	$0	2,803	Not applicable	244	Not applicable
2016-10b	Canaveral South	$2,134,419	42,688	$50	3,887	$549
2016-5b	Pineda Banana River Lagoon	$990,980	19,820	$50	1,804	$549
2016-11b	Patrick Space Force Base	$1,041,800	20,836	$50	1,897	$549
168b	Cocoa Beach Golf	$3,013,100	99,098	$30	9,022	$334
41b	Grand Canal Interstitial	$15,610,821	89,495	$174	To be determined	To be determined
42b	Sykes Creek Interstitial	$11,248,704	64,278	$175	To be determined	To be determined
72b	Muck Interstitial Water Treatment for Indian Harbour Beach Canals	$5,483,600	27,418	$200	To be determined	To be determined
113	Satellite Beach Interstitial Water Treatment	$3,057,756	29,978	$102	3,059	$1,000
2016-06b	Titusville Railroad West	$457,375	9,148	$50	833	$549
2016-07c	National Aeronautics and Space Administration Causeway East	$1,448,355	28,967	$50	2,637	$549
2016-04b	Rockledge A	$635,244	12,705	$50	1,157	$549
2016-08b	Titusville Railroad East	$584,424	11,688	$50	1,064	$549
54b	Eau Gallie Northeast	$1,270,487	25,410	$50	2,313	$549
2016-3b	Muck Interstitial Water Treatment for Turkey Creek	Included in muck project	Not applicable	Not applicable	688	Not applicable

Project Number	Project	Save Our Lagoon Project Cost	Total Nitrogen Reductions (pounds per year)	Cost per Pound per Year of Total Nitrogen	Total Phosphorus Reductions (pounds per year)	Cost per Pound per Year of Total Phosphorus
-	**Oyster Bars**	-	-	-	-	-
2016-55	Banana River Lagoon County Oyster Bars	$3,102,755	7,864	$395	197	$15,750
75	Marina Isles Oyster Bar	$26,700	60	$445	20	$1,335
76	Bettinger Oyster Bar	$10,680	24	$445	8	$1,335
78a	McNabb Park Oyster Bar	$34,056	72	$473	24	$1,419
79	Gitlin Oyster Bar	$16,020	36	$445	12	$1,335
104	Brevard Zoo Banana River Oyster Project	$583,020	1,476	$395	37	$15,757
141	Brevard Zoo Banana River Oyster Project 2	$264,800	662	$400	17	$15,576
143	Brevard Zoo Oyster Reef Adjustments Banana River	$12,800	32	$400	1	$12,800
188	Brevard Zoo Banana River Oyster Project 3	$56,771	143	$397	4	$14,193
2016-56	North IRL County Oyster Bars	$2,885,834	7,314	$395	183	$15,770
83	Bomalaski Oyster Bar	$8,900	20	$445	7	$1,271
106	Brevard Zoo North IRL Oyster Project	$341,280	864	$395	22	$15,513
139	Brevard Zoo North IRL Oyster Project 2	$336,400	841	$400	21	$16,019
142	Brevard Zoo Oyster Reef Adjustments North IRL	$27,200	68	$400	2	$13,600
184	Brevard Zoo North Indian River Lagoon Oyster Project 3	$419,232	1,056	$397	26	$16,124
186	Brevard Zoo North Indian River Lagoon Individual Oyster Project	$173,092	436	$397	11	$15,736
80	Coconut Point/Environmentally Endangered Lands Oyster Bar	$45,120	96	$470	2	$22,560
81	Wexford Oyster Bar	$31,150	70	$445	24	$1,298
82a	Riverview Park Oyster Bar	$108,790	230	$473	78	$1,395
73	Riverview Senior Resort Oyster Bar	$30,304	77	$394	2	$15,152
105	Brevard Zoo Central IRL Oyster Project	$161,160	408	$395	10	$16,116
140	Brevard Zoo Central IRL Oyster Project 2	$270,800	677	$400	17	$15,929
185	Brevard Zoo Central Indian River Lagoon Tributary Pilot Oyster Project	$230,657	581	$397	15	$15,377
187	Brevard Zoo Central Indian River Lagoon Oyster Project 3	$86,546	218	$397	5	$17,309
217	Central IRL Oyster Project 4	$138,156	348	$397	9	$15,351
218	Central Oyster Project Offshore Reefs	$357,300	900	$397	23	$15,535
226	Hog Point Offshore Oyster Bar	$50,022	126	$397	3	$16,674
-	**Planted Shorelines**	-	-	-	-	-
77a	Cocoa Beach Country Club Planted Shoreline	$16,080	67	$240	23	$699
78b	McNabb Park Planted Shoreline	$5,760	24	$240	8	$720
103	Brevard Zoo North IRL Plant Project	$720	3	$240	1	$720

Project Number	Project	Save Our Lagoon Project Cost	Total Nitrogen Reductions (pounds per year)	Cost per Pound per Year of Total Nitrogen	Total Phosphorus Reductions (pounds per year)	Cost per Pound per Year of Total Phosphorus
130	Brevard Zoo North IRL Plant Project 2	$9,840	41	$240	14	$703
180	Scottsmoor Impoundment	$10,560	44	$240	15	$704
181	Riveredge	$4,080	17	$240	6	$680
212	Titusville Causeway Multi-Trophic Restoration and Living Shoreline	$31,440	131	$240	45	$699
77b	Lagoon House Shoreline Restoration Planting	$24,000	100	$240	34	$706
82b	Riverview Park Planted Shoreline	$18,480	77	$240	26	$711
133	Fisherman's Landing	$4,800	20	$240	7	$686
135	Rotary Park	$4,800	20	$240	7	$686
-	**Clam Restoration**	-	-	-	-	-
194	Aquaculture Stimulus Program	$60,000	1,000	$60	To be determined	To be determined
-	**Projects Monitoring**	**$10,000,000**	-	-	-	-
-	**Contingency**	**$19,814,425**	-	-	-	-
-	**Inflation**	**$104,840,456**	-	-	-	-
	Total	***$542,223,582***	***1,272,989***	***$426 (average)***	***102,866***	***$5,271 (average)***

Table 6-9: Timeline for Funding Needs (Table 46 in the Original Save Our Indian River Lagoon Project Plan)

Project Name/Total Project Cost	Year 0 (Fiscal Year 2016-2017)	Year 1 (Fiscal Year 2017-2018)	Year 2 (Fiscal Year 2018-2019)	Year 3 (Fiscal Year 2019-2020)	Year 4 (Fiscal Year 2020-2021)	Year 5 (Fiscal Year 2021-2022)	Year 6 (Fiscal Year 2022-2023)	Year 7 (Fiscal Year 2023-2024)	Year 8 (Fiscal Year 2024-2025)	Year 9 (Fiscal Year 2025-2026)	Year 10 (Fiscal Year 2026-2027)
Public Education	-	-	-	-	-	-	-	-	-	-	-
Fertilizer Management	-	Year 1 of Program*	Year 2 of Program*	Year 3 of Program*	Year 4 of Program*	Year 5 of Program	Year 6 of Program	Year 7 of Program	Year 8 of Program	Year 9 of Program	Year 10 of Program
$625,000	-	$0	$120,951	$49,477	$46,571	$61,601	$100,000	$61,600	$61,600	$61,600	$61,600
Grass Clippings	-	Year 1 of Program*	Year 2 of Program*	Year 3 of Program*	Year 4 of Program*	Year 5 of Program	Year 6 of Program	Year 7 of Program	Year 8 of Program	Year 9 of Program	Year 10 of Program
$200,000	-	$0	$20,000	$0	$6,638	$31,561	$31,561	$31,560	$31,560	$23,560	$23,560
Septic System Maintenance	-	Year 1 of Program*	Year 2 of Program*	Year 3 of Program*	Year 4 of Program*	Year 5 of Program	Year 6 of Program	Year 7 of Program	Year 8 of Program	Year 9 of Program	Year 10 of Program
$300,000	-	$0	$48,380	$49,245	$22,709	$29,945	$29,945	$29,945	$29,945	$29,943	$29,943
Oyster Gardening	-	-	-	Year 1 of Program*	Year 2 of Program*	-	-	-	-	-	-
$300,000	-	-	-	$150,000	$150,000	-	-	-	-	-	-
Restore Our Shores	-	-	-	-	-	Year 1 of Program	Year 2 of Program	Year 3 of Program	Year 4 of Program	Year 5 of Program	Year 6 of Program
$1,000,000	-	-	-	-	-	$100,000	$200,000	$200,000	$200,000	$200,000	$100,000
Wastewater Treatment Facility Upgrades	-	-	-	-	-	-	-	-	-	-	-
Banana River Lagoon	-	-	Cocoa Beach*	-	-	-	-	-	-	-	-
$945,000	-	-	$945,000	-	-	-	-	-	-	-	-
North IRL	-	-	-	Titusville Osprey Design and Permitting	Titusville Osprey Design and Start Construction	Titusville Osprey Construction	-	-	-	-	-
$8,000,000	-	-	-	$1,000,000	$3,000,000	$4,000,000	-	-	-	-	-
North IRL	-	-	-	-	Osprey Nutrient Upgrade Phase 2	Rockledge Flow Equalization Basin	-	-	-	-	-
$2,354,795	-	-	-	-	$300,000	$2,054,795	-	-	-	-	-
Central IRL	-	Palm Bay Permit and Engineering	Palm Bay Construction	Palm Bay Construction	-	-	-	-	-	-	-
$3,636,900	-	$200,000	$1,200,000	$2,236,900	-	-	-	-	-	-	-
Central IRL	-	-	-	Melbourne Grant Street	-	-	-	-	-	-	-
$6,769,500	-	-	-	$6,769,500	-	-	-	-	-	-	-
Central IRL	-	-	-	Ray Bullard Biological Nutrient Removal	-	-	-	-	-	-	-
$4,260,000	-	-	-	$4,260,000	-	-	-	-	-	-	-
Rapid Infiltration Basin/ Sprayfield Upgrades	-	-	-	-	-	-	-	-	-	-	-
North IRL	-	-	-	-	-	Sterling House Condominium	-	-	-	-	-
$60,000	-	-	-	-	-	$60,000	-	-	-	-	-
Central IRL	Long Point*	-	-	-	-	-	-	-	-	-	-
$22,207	$22,207	-	-	-	-	-	-	-	-	-	-
Package Plant Connections	-	-	-	-	-	-	-	-	-	-	-
North IRL	-	-	-	-	Oak Point	-	-	-	-	-	-
$279,000	-	-	-	-	$279,000	-	-	-	-	-	-
Central IRL	-	-	-	-	-	-	Merritt Island Utility	-	-	-	-
$1,349,445	-	-	-	-	-	-	$1,349,445	-	-	-	-
Central IRL	-	-	-	-	-	Indian River Shores Trailer Park	-	-	-	-	-
$528,627	-	-	-	-	-	$528,627	-	-	-	-	-
Sewer Laterals	-	-	-	-	-	-	-	-	-	-	-
Banana River Lagoon	-	-	-	-	Satellite Beach Smoke Testing and Countywide Repairs	-	-	-	-	-	-
$840,000	-	-	-	-	$840,000	-	-	-	-	-	-
North IRL	-	-	Titusville Osprey Basin	-	-	-	-	-	-	-	-
$200,000	-	-	$200,000	-	-	-	-	-	-	-	-
North IRL	-	-	-	Merritt Island Lateral Smoke Testing	-	-	-	-	-	-	-
$250,000	-	-	-	$250,000	-	-	-	-	-	-	-
Central IRL	-	-	-	Barefoot Bay Lateral Smoke Testing	-	-	-	-	-	-	-

Project Name/Total Project Cost	Year 0 (Fiscal Year 2016-2017)	Year 1 (Fiscal Year 2017-2018)	Year 2 (Fiscal Year 2018-2019)	Year 3 (Fiscal Year 2019-2020)	Year 4 (Fiscal Year 2020-2021)	Year 5 (Fiscal Year 2021-2022)	Year 6 (Fiscal Year 2022-2023)	Year 7 (Fiscal Year 2023-2024)	Year 8 (Fiscal Year 2024-2025)	Year 9 (Fiscal Year 2025-2026)	Year 10 (Fiscal Year 2026-2027)
$90,000	-	-	-	$90,000	-	-	-	-	-	-	-
Central IRL	-	-	-	South Beaches Lateral Smoke Testing	-	-	-	-	-	-	-
$200,000	-	-	-	$200,000	-	-	-	-	-	-	-
Septic Removal	-	-	-	-	-	-	-	-	-	-	-
Banana River Lagoon	Sykes M Engineering	-	Sykes Creek M	-	-	-	-	-	-	-	-
$2,697,000	$250,000	-	$2,447,000	-	-	-	-	-	-	-	-
Banana River Lagoon	-	Sykes Creek N	-	-	-	-	-	-	-	-	-
$4,176,000	-	$4,176,000	-	-	-	-	-	-	-	-	-
Banana River Lagoon	Sykes T Engineering	-	-	Sykes Creek T	-	-	-	-	-	-	-
$5,040,000	$250,000	-	-	$4,790,000	-	-	-	-	-	-	-
Banana River Lagoon	-	-	-	-	South Banana B Engineering	South Banana B	-	-	-	-	-
$1,372,500	-	-	-	-	$275,000	$1,097,500	-	-	-	-	-
Banana River Lagoon	-	-	-	-	Quick Connects*	Quick Connects	Quick Connects	Quick Connects	-	-	-
$1,905,729	-	-	-	-	$24,000	$700,000	$700,000	$481,729	-	-	-
Banana River Lagoon	-	-	-	-	Merritt Island C Engineering	Merritt Island C	Merritt Island C	-	-	-	-
$1,580,000	-	-	-	-	$145,000	$717,500	$717,500	-	-	-	-
Banana River Lagoon	-	-	-	-	Merritt Island F Engineering	-	Merritt Island F	-	-	-	-
$1,100,000	-	-	-	-	$100,000	-	$1,000,000	-	-	-	-
Banana River Lagoon	-	-	-	-	Sykes Creek R Engineering	-	-	Sykes Creek R	-	-	-
$4,387,500	-	-	-	-	$320,000	-	-	$4,067,500	-	-	-
Banana River Lagoon	-	-	-	-	Merritt Island G Engineering	-	-	-	Merritt Island G	-	-
$16,617,000	-	-	-	-	$1,650,000	-	-	-	$14,967,000	-	-
Banana River Lagoon	-	-	-	-	North Merritt Island E Engineering	-	North Merritt Island E	-	-	-	-
$3,811,500	-	-	-	-	$727,000	-	$3,084,500	-	-	-	-
Banana - Satellite Beach	-	-	-	-	-	Hedgecock/Grabowsky and Desoto Fields	-	-	-	-	-
$39,447	-	-	-	-	-	$39,447	-	-	-	-	-
North IRL	South Central C Engineering	South Central C	-	-	South Central C	-	-	-	-	-	-
$6,600,000	$450,000	$4,222,080	-	-	$1,927,920	-	-	-	-	-	-
North IRL	Breeze Swept*	-	-	-	-	-	-	-	-	-	-
$880,530	$880,530	-	-	-	-	-	-	-	-	-	-
North IRL	Merritt Island Redevelopment Agency*	-	-	-	-	-	-	-	-	-	-
$320,000	$320,000	-	-	-	-	-	-	-	-	-	-
North IRL	-	-	Riverside Drive	-	-	-	-	-	-	-	-
$262,044	-	-	$262,044	-	-	-	-	-	-	-	-
North IRL	-	-	Roxy Avenue	-	-	-	-	-	-	-	-
$88,944	-	-	$88,944	-	-	-	-	-	-	-	-
North IRL	-	-	-	Cocoa J and K	-	-	-	-	-	-	-
$5,622,000	-	-	-	$5,622,000	-	-	-	-	-	-	-
North IRL	-	-	-	-	-	-	-	-	Rockledge	-	-
$500,580	-	-	-	-	-	-	-	-	$500,580	-	-
North IRL	-	-	-	Titusville A-G	-	-	-	-	-	-	-
$1,201,392	-	-	-	$1,201,392	-	-	-	-	-	-	-
North IRL	-	-	-	-	-	-	-	Titusville H	-	-	-
$1,168,020	-	-	-	-	-	-	-	$1,168,020	-	-	-
North IRL	-	-	-	-	Quick Connects*	Quick Connects	Quick Connects	Quick Connects	Quick Connects	Quick Connects	-
$6,018,000	-	-	-	-	$570,000	$1,200,000	$1,200,000	$1,200,000	$1,200,000	$648,000	-
North IRL	-	-	-	-	South Central D (Brevard) Engineering	South Central D (Brevard)	-	-	-	-	-
$4,774,500	-	-	-	-	$955,000	$3,819,500	-	-	-	-	-

Project Name/Total Project Cost	Year 0 (Fiscal Year 2016-2017)	Year 1 (Fiscal Year 2017-2018)	Year 2 (Fiscal Year 2018-2019)	Year 3 (Fiscal Year 2019-2020)	Year 4 (Fiscal Year 2020-2021)	Year 5 (Fiscal Year 2021-2022)	Year 6 (Fiscal Year 2022-2023)	Year 7 (Fiscal Year 2023-2024)	Year 8 (Fiscal Year 2024-2025)	Year 9 (Fiscal Year 2025-2026)	Year 10 (Fiscal Year 2026-2027)
North IRL	-	-	-	-	-	-	South Central D (Melbourne)	-	-	-	-
$265,500	-	-	-	-	-	-	$265,500	-	-	-	-
North IRL	-	-	-	-	South Central A Engineering	South Central A	-	-	-	-	-
$5,482,500	-	-	-	-	$675,000	$4,807,500	-	-	-	-	-
North IRL	-	-	-	-	-	South Beaches A	South Beaches A	-	-	-	-
$1,959,000	-	-	-	-	-	$400,000	$1,559,000	-	-	-	-
North IRL	-	-	-	-	-	-	South Central F	-	-	-	-
$1,701,972	-	-	-	-	-	-	$1,701,972	-	-	-	-
North IRL	-	-	-	South Beaches O	-	-	-	-	-	-	-
$133,488	-	-	-	$133,488	-	-	-	-	-	-	-
North IRL	-	-	-	South Beaches P	-	-	-	-	-	-	-
$300,348	-	-	-	$300,348	-	-	-	-	-	-	-
North IRL	-	-	-	-	-	-	-	Melbourne	-	-	-
$867,672	-	-	-	-	-	-	-	$867,672	-	-	-
North IRL	-	-	-	-	Sharpes A Engineering	-	-	-	Sharpes A	-	-
$7,872,000	-	-	-	-	$1,245,000	-	-	-	$6,627,000	-	-
North IRL	-	-	-	-	-	-	-	-	-	Rockledge Zone B	-
$5,339,520	-	-	-	-	-	-	-	-	-	$5,339,520	-
North IRL	-	-	-	-	Sharpes B Engineering	-	-	-	Sharpes B	-	-
$4,038,000	-	-	-	-	$810,000	-	-	-	$3,228,000	-	-
North IRL	-	-	-	-	Cocoa C Engineering	-	-	-	-	-	-
$800,000	-	-	-	-	$800,000	-	-	-	-	-	-
North IRL	-	-	-	-	Bowers	-	-	-	-	-	-
$147,000	-	-	-	-	$147,000	-	-	-	-	-	-
North IRL	-	-	-	-	Kent and Villa Espana	-	-	-	-	-	-
$710,000	-	-	-	-	$710,000	-	-	-	-	-	-
Central IRL	-	-	-	-	Micco Phases I & II	-	-	-	-	-	-
$2,239,500	-	-	-	-	$2,239,500	-	-	-	-	-	-
Central IRL	Hoag	-	-	-	-	-	-	-	-	-	-
$86,031	$86,031	-	-	-	-	-	-	-	-	-	-
Central IRL	Pennwood	-	-	-	-	-	-	-	-	-	-
$40,632	$40,632	-	-	-	-	-	-	-	-	-	-
Central IRL	-	-	-	-	Palm Bay B	-	-	-	-	-	-
$8,309,628	-	-	-	-	$8,309,628	-	-	-	-	-	-
Central IRL	-	-	-	-	-	Quick Connects	Quick Connects	Quick Connects	Quick Connects	Quick Connects	-
$3,354,000	-	-	-	-	-	$697,500	$697,500	$697,500	$697,500	$564,000	-
Central IRL	-	Sylvan Estates*	-	-	-	-	-	-	-	-	-
$1,561,215	-	$1,561,215	-	-	-	-	-	-	-	-	-
Central IRL	-	-	-	-	Palm Bay A	-	-	-	-	-	-
$2,569,644	-	-	-	-	$2,569,644	-	-	-	-	-	-
Central IRL	-	-	-	-	Micco B Engineering	-	Micco B	Micco B	-	-	-
$9,000,000	-	-	-	-	$2,248,125	-	$5,000,000	$1,751,875	-	-	-
Central IRL	-	-	-	-	Avendia del Rio	-	-	-	-	-	-
$70,000	-	-	-	-	$70,000	-	-	-	-	-	-
Central - West Melbourne	-	-	-	-	-	Lake Ashley Circle	-	-	-	-	-
$1,704,000	-	-	-	-	-	$1,704,000	-	-	-	-	-
Central - West Melbourne	-	-	-	-	-	Dundee Circle and Manor Place	-	-	-	-	-
$2,248,500	-	-	-	-	-	$2,248,500	-	-	-	-	-
Septic Upgrades	-	-	-	-	-	-	-	-	-	-	-
Banana River Lagoon	-	-	-	-	-	20 Upgrades	20 Upgrades	20 Upgrades	20 Upgrades	20 Upgrades	-
$1,800,000	-	-	-	-	-	$360,000	$360,000	$360,000	$360,000	$360,000	-
North IRL	-	-	-	-	15 Upgrades*	100 Upgrades	100 Upgrades	100 Upgrades	100 Upgrades	86 Upgrades	85 Upgrades
$10,548,000	-	-	-	-	$270,000	$1,800,000	$1,800,000	$1,800,000	$1,800,000	$1,548,000	$1,530,000
Central IRL	-	-	-	2 Upgrades*	26 Upgrades*	155 Upgrades	155 Upgrades	155 Upgrades	155 Upgrades	155 Upgrades	136 Upgrades
$16,885,106	-	-	-	$34,485	$452,621	$2,790,000	$2,790,000	$2,790,000	$2,790,000	$2,790,000	$2,448,000

Project Name/Total Project Cost	Year 0 (Fiscal Year 2016-2017)	Year 1 (Fiscal Year 2017-2018)	Year 2 (Fiscal Year 2018-2019)	Year 3 (Fiscal Year 2019-2020)	Year 4 (Fiscal Year 2020-2021)	Year 5 (Fiscal Year 2021-2022)	Year 6 (Fiscal Year 2022-2023)	Year 7 (Fiscal Year 2023-2024)	Year 8 (Fiscal Year 2024-2025)	Year 9 (Fiscal Year 2025-2026)	Year 10 (Fiscal Year 2026-2027)
Stormwater Projects	-	-	-	-	-	-	-	-	-	-	-
Banana - Cape Canaveral	Central Boulevard Baffle Box*	-	-	-	-	-	-	-	-	-	-
$34,700	$34,700	-	-	-	-	-	-	-	-	-	-
Banana - Indian Harbour Beach	Gleason Park Reuse*	Big Muddy at Cynthia Baffle Box*	Big Muddy Expansion*	-	-	-	-	-	-	-	-
$63,855	$4,224	$41,695	$17,936	-	-	-	-	-	-	-	-
Banana - Cocoa Beach	-	-	-	-	Convair Cove 1 – Blakey Blvd	McNabb Outfall Bioretention	-	-	-	-	-
$24,073	-	-	-	-	$4,650	$19,423	-	-	-	-	-
Banana - Cocoa Beach	-	-	-	-	Convair Cove 2-Dempsey Drive	Burris Way Alley West	-	-	-	-	-
$5,744	-	-	-	-	$4,495	$1,249	-	-	-	-	-
Banana - Satellite Beach	-	-	-	Jackson Court	Lori Laine	-	-	-	-	-	-
$25,791	-	-	-	$8,266	$17,525	-	-	-	-	-	-
Banana - Brevard	-	-	Basin 1304 Bioreactor*	-	-	Basin 960 Pioneer Road	-	-	-	-	-
$121,879	-	-	$83,029	-	-	$38,850	-	-	-	-	-
Banana - Brevard	-	-	-	5 Projects	9 Projects	9 Projects	9 Projects	9 Projects	9 Projects	9 Projects	9 Projects
$14,324,135	-	-	-	$955,564	$1,858,400	$3,053,600	$2,529,700	$1,878,271	$1,438,400	$1,300,600	$1,309,600
North IRL - Cocoa	Church Street Type II Baffle Box*	-	-	Floating Wetlands*	North and South Lakemont	-	-	-	-	-	-
$102,596	$88,045	-	-	$1,497	$13,054	-	-	-	-	-	-
North IRL - Cocoa	-	-	-	Diamond Square Pond	-	-	-	-	-	-	-
$10,383	-	-	-	$10,383	-	-	-	-	-	-	-
North IRL - Cocoa	-	-	-	Forrest Avenue Outfall	-	-	-	-	-	-	-
$13,956	-	-	-	$13,956	-	-	-	-	-	-	-
North IRL - Titusville	-	St. Teresa Basin Treatment*	Titusville High School Baffle Box	-	St. Johns 2 Baffle Box	Sand Point Park Baffle Box	-	-	-	-	-
$764,818	-	$272,800	$111,813	-	$243,070	$137,135	-	-	-	-	-
North IRL - Titusville	-	South Street Basin Treatment*	Coleman Pond Managed Aquatic Plant System*	Osprey Plant Managed Aquatic Plant Systems*	Marina B Managed Aquatic Plants*	-	-	-	-	-	-
$142,464	-	$86,856	$11,438	$37,500	$6,670	-	-	-	-	-	-
North IRL - Titusville	-	La Paloma Basin Treatment*	-	Draa Pond Managed Aquatic Plant Systems*	-	-	-	-	-	-	-
$239,577	-	$208,296	-	$31,281	-	-	-	-	-	-	-
North IRL - Melbourne	-	Cliff Creek Baffle Box*	Apollo/GA Baffle Box	-	High School Baffle Box	-	-	-	-	-	-
$789,629	-	$347,781	$297,522	-	$144,326	-	-	-	-	-	-
North IRL - Melbourne	-	Thrush Drive Baffle Box*	Cherry Street Baffle Box	-	Funeral Home Baffle Box	-	-	-	-	-	-
$687,622	-	$322,200	$306,740	-	$58,682	-	-	-	-	-	-
North IRL - Melbourne	-	-	Spring Creek Baffle Box	-	-	-	-	-	-	-	-
$330,841	-	-	$330,841	-	-	-	-	-	-	-	-
North IRL - Indialantic	-	-	-	Basin 5 Dry Retention*	-	-	-	-	-	-	-
$16,680	-	-	-	$16,680	-	-	-	-	-	-	-
North IRL - Brevard	-	Kingsmill-Aurora Phase Two	Basin 1298 Bioreactor*	-	-	Basin 1398 Sand Dollar Canal Bioreactor	-	-	-	-	-
$651,341	-	$367,488	$85,829	-	-	$198,024	-	-	-	-	-
North IRL - Brevard	-	Denitrification Retrofit of Huntington Pond	Johns Road Pond*	Basin 10 County Line Road Bioreactor*	-	-	-	-	-	-	-
$200,523	-	$104,720	$23,030	$72,773	-	-	-	-	-	-	-
North IRL - Brevard	-	Denitrification Retrofit of Flounder Creek Pond	Burkholm Road*	Basin 26 Sunset Road Serenity Park Bioreactor	-	-	-	-	-	-	-
$213,528	-	$75,328	$64,390	$73,810	-	-	-	-	-	-	-

Project Name/Total Project Cost	Year 0 (Fiscal Year 2016-2017)	Year 1 (Fiscal Year 2017-2018)	Year 2 (Fiscal Year 2018-2019)	Year 3 (Fiscal Year 2019-2020)	Year 4 (Fiscal Year 2020-2021)	Year 5 (Fiscal Year 2021-2022)	Year 6 (Fiscal Year 2022-2023)	Year 7 (Fiscal Year 2023-2024)	Year 8 (Fiscal Year 2024-2025)	Year 9 (Fiscal Year 2025-2026)	Year 10 (Fiscal Year 2026-2027)
North IRL - Brevard	-	Denitrification Retrofit of Johns Road Pond	Carter Road*	Basin 141 Irwin Avenue Woodchip Bioreactor*	-	-	-	-	-	-	-
$237,196	-	$105,512	$62,510	$69,174	-	-	-	-	-	-	-
North IRL - Brevard	-	-	Wiley Avenue*	Basin 22 Hunting Road Serenity Park Bioreactor*	-	-	-	-	-	-	-
$122,812	-	-	$82,735	$40,077	-	-	-	-	-	-	-
North IRL - Brevard	-	-	Broadway Pond*	-	-	-	-	-	-	-	-
$42,864	-	-	$42,864	-	-	-	-	-	-	-	-
North IRL - Brevard	-	-	-	-	Basin 1335 (Sherwood Park)*	-	-	-	-	-	-
$292,400	-	-	-	-	$292,400	-	-	-	-	-	-
North IRL - Brevard	-	-	-	7 Projects	13 Projects	13 Projects	13 Projects	12 Projects	13 Projects	12 Projects	12 Projects
$22,114,028	-	-	-	$1,026,000	$5,184,600	$3,216,026	$2,924,755	$2,624,590	$2,300,436	$2,392,250	$2,445,371
Central IRL - Palm Bay	Bayfront Stormwater Project*	-	-	-	-	-	-	-	-	-	-
$30,624	$30,624	-	-	-	-	-	-	-	-	-	-
Central IRL - Melbourne	-	-	Grant Place Baffle Box	-	Ray Bullard Stormwater Management Area	-	-	-	-	-	-
$243,155	-	-	$82,481	-	$160,674	-	-	-	-	-	-
Central IRL - Melbourne	-	-	Espanola Baffle Box	-	-	-	-	-	-	-	-
$105,186	-	-	$105,186	-	-	-	-	-	-	-	-
Central - St. Johns River Water Management District	-	-	Crane Creek/M-1 Canal Flow Restoration	-	-	-	-	-	-	-	-
$2,033,944	-	-	$2,033,944	-	-	-	-	-	-	-	-
Central IRL - Brevard	-	-	Fleming Grant*	Basin 2258 Babcock Road Bioreactor	-	Johnson Junior High Denitrification	-	-	-	-	-
$171,269	-	-	$56,588	$50,203	-	$64,478	-	-	-	-	-
Central IRL - Brevard	-	-	-	-	-	2 Projects	2 Projects	2 Projects	2 Projects	-	-
$3,258,500	-	-	-	-	-	$603,700	$916,100	$763,300	$975,400	-	-
Vegetation Harvesting	-	-	-	-	-	-	-	-	-	-	-
Banana - Brevard	-	-	-	-	-	Basin 958 Pioneer Road	-	-	-	-	-
$39,930	-	-	-	-	-	$39,930	-	-	-	-	-
Banana - Cocoa Beach	-	-	-	-	-	Maritime Hammock	-	-	-	-	-
$7,700	-	-	-	-	-	$7,700	-	-	-	-	-
Banana - Cocoa Beach	-	-	-	-	-	Cocoa Beach Golf Course	-	-	-	-	-
$216,150	-	-	-	-	-	$216,150	-	-	-	-	-
North IRL - Brevard	-	-	-	County Wide Pond Harvesting*	Horseshoe Pond	Basin 1398 Sand Dollar	-	-	-	-	-
$46,560	-	-	-	$14,000	$8,140	$24,420	-	-	-	-	-
North IRL - Titusville	-	-	-	Draa Field Vegetation Harvesting*	-	-	-	-	-	-	-
$57,360	-	-	-	$57,360	-	-	-	-	-	-	-
North IRL - Cocoa	-	-	-	-	North and South Lakemont Harvesting	-	-	-	-	-	-
$1,980	-	-	-	-	$1,980	-	-	-	-	-	-
Central IRL - Melbourne-Tillman	-	-	-	-	Mechanical Harvesting	-	-	-	-	-	-
$1,011,976	-	-	-	-	$1,011,976	-	-	-	-	-	-
Muck Removal & Interstitial Treatment	-	-	-	-	-	-	-	-	-	-	-
Banana River Lagoon	-	-	Cocoa Beach Phase III*	Cocoa Beach Ph II-B	-	-	-	-	-	-	-
$7,293,955	-	-	$1,376,305	$5,917,650	-	-	-	-	-	-	-
Banana River Lagoon	-	-	Merritt Island	-	-	-	-	-	-	-	-
$7,733,517	-	-	$7,733,517	-	-	-	-	-	-	-	-

Project Name/Total Project Cost	Year 0 (Fiscal Year 2016-2017)	Year 1 (Fiscal Year 2017-2018)	Year 2 (Fiscal Year 2018-2019)	Year 3 (Fiscal Year 2019-2020)	Year 4 (Fiscal Year 2020-2021)	Year 5 (Fiscal Year 2021-2022)	Year 6 (Fiscal Year 2022-2023)	Year 7 (Fiscal Year 2023-2024)	Year 8 (Fiscal Year 2024-2025)	Year 9 (Fiscal Year 2025-2026)	Year 10 (Fiscal Year 2026-2027)
Banana River Lagoon	-	-	-	Indian Harbour Beach	Indian Harbour Beach	-	-	-	-	-	-
$9,115,415	-	-	-	$500,000	$8,615,415	-	-	-	-	-	-
Banana River Lagoon	-	-	29% Sykes Creek	-	71% Sykes Creek	-	-	-	-	-	-
$15,954,132	-	-	$5,954,132	-	$10,000,000	-	-	-	-	-	-
Banana River Lagoon	-	-	20% Grand Canal	25% Grand Canal	55% Grand Canal	-	-	-	-	-	-
$18,020,368	-	-	$3,020,368	$5,000,000	$10,000,000	-	-	-	-	-	-
Banana River Lagoon	-	-	-	1% Cocoa Beach Golf	1% Cocoa Beach Golf	8% Cocoa Beach Golf	16% Cocoa Beach Golf	30% Cocoa Beach Golf	-	-	-
$24,363,100	-	-	-	$500,000	$500,000	$3,500,000	$6,863,100	$13,000,000	-	-	-
Banana River Lagoon	-	-	-	-	-	2% Canaveral South	25% Canaveral South	48% Canaveral South	25% Canaveral South	-	-
$16,834,419	-	-	-	-	-	$400,000	$4,208,605	$8,017,209	$4,208,605	-	-
Banana River Lagoon	-	-	-	-	-	3% Pineda	47% Pineda	50% Pineda	-	-	-
$7,815,980	-	-	-	-	-	$200,000	$3,707,990	$3,907,990	-	-	-
Banana River Lagoon	-	-	-	-	-	Patrick Space Force Base	-	-	-	-	-
$8,216,800	-	-	-	-	-	$8,216,800	-	-	-	-	-
Banana River Lagoon	-	-	-	Satellite Beach	Satellite Beach	-	-	-	-	-	-
$4,941,981	-	-	-	$500,000	$4,441,981	-	-	-	-	-	-
North IRL	-	-	2% Eau Gallie Northeast	49% Eau Gallie Northeast	49% Eau Gallie Northeast	-	-	-	-	-	-
$10,020,487	-	-	$200,409	$4,910,039	$4,910,039	-	-	-	-	-	-
North IRL	-	1% Titusville East	4% Titusville East	4% Titusville East	21% Titusville East	30% Titusville East	40% Titusville East	-	-	-	-
$4,609,424	-	$46,094	$184,377	$184,377	$967,979	$1,382,827	$1,843,770	-	-	-	-
North IRL	-	1% Titusville West	4% Titusville West	4% Titusville West	21% Titusville West	30% Titusville West	40% Titusville West	-	-	-	-
$3,607,375	-	$36,074	$144,295	$144,295	$757,549	$1,082,212	$1,442,950	-	-	-	-
North IRL	-	1% National Aeronautics and Space Administration East	4% National Aeronautics and Space Administration East	-	25% National Aeronautics and Space Administration East	30% National Aeronautics and Space Administration East	40% National Aeronautics and Space Administration East	-	-	-	-
$11,423,355	-	$114,234	$456,934	-	$2,855,839	$3,427,006	$4,569,342	-	-	-	-
North IRL	-	-	-	4% Rockledge A	48% Rockledge A	48% Rockledge A	-	-	-	-	-
$5,010,244	-	-	-	$200,000	$2,405,122	$2,405,122	-	-	-	-	-
North IRL - Melbourne	-	-	-	-	-	Spring Creek	-	-	-	-	-
$80,080	-	-	-	-	-	$80,080	-	-	-	-	-
Central IRL	-	Turkey Creek*	-	-	-	-	-	-	-	-	-
$137,329	-	$137,329	-	-	-	-	-	-	-	-	-
Oyster Bars	-	-	-	-	-	-	-	-	-	-	-
Banana - Brevard Zoo	-	Marina Isles*	Brevard Zoo Banana River	Brevard Zoo Banana River Oyster Project 2	Brevard Zoo Banana River Oyster Project 3	-	-	-	-	-	-
$931,291	-	$26,700	$583,020	$264,800	$56,771	-	-	-	-	-	-
Banana - Brevard Zoo	-	Bettinger*	-	Brevard Zoo Oyster Reef Adjustments	-	-	-	-	-	-	-
$23,480	-	$10,680	-	$12,800	-	-	-	-	-	-	-
Banana - Cocoa Beach	-	-	-	-	McNabb	-	-	-	-	-	-
$34,056	-	-	-	-	$34,056	-	-	-	-	-	-
Banana - Brevard Zoo	-	Gitlin*	-	-	-	-	-	-	-	-	-
$16,020	-	$16,020	-	-	-	-	-	-	-	-	-
Banana - Brevard	-	-	-	-	-	32,765.1 square feet Oysters	32,765.1 square feet Oysters	32,765.1 square feet Oysters	32,765.1 square feet Oysters	32,765.1 square feet Oysters	32,765.1 square feet Oysters
$3,102,755	-	-	-	-	-	$517,126	$517,126	$517,126	$517,126	$517,126	$517,125
North IRL - Brevard Zoo	-	Bomalaski*	Brevard Zoo North IRL	Brevard Zoo North IRL Oyster Project 2	Brevard Zoo North Indian River Lagoon Oyster Project 3	-	-	-	-	-	-
$1,105,812	-	$8,900	$341,280	$336,400	$419,232	-	-	-	-	-	-
North IRL - Brevard	-	-	-	-	-	30,474.4 square feet Oysters	30,474.4 square feet Oysters	30,474.4 square feet Oysters	30,474.4 square feet Oysters	30,474.4 square feet Oysters	30,474.4 square feet Oysters
$2,885,834	-	-	-	-	-	$480,973	$480,973	$480,972	$480,972	$480,972	$480,972

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North IRL - Brevard Zoo	-	-	-	Brevard Zoo Oyster Reef Adjustments	Brevard Zoo North Indian River Lagoon Individual Oyster Project	-	-	-	-	-	-
$200,292	-	-	-	$27,200	$173,092	-	-	-	-	-	-
Central IRL - Brevard Zoo	-	Coconut Point*	Brevard Zoo Central IRL	Brevard Zoo Central IRL Oyster Project 2	Brevard Zoo Central Indian River Lagoon Oyster Project 3	-	-	-	-	-	-
$563,626	-	$45,120	$161,160	$270,800	$86,546	-	-	-	-	-	-
Central IRL - Melbourne	-	Riverview Park	-	-	-	-	-	-	-	-	-
$108,790	-	$108,790	-	-	-	-	-	-	-	-	-
Central IRL - Brevard Zoo	-	Wexford*	-	-	Brevard Zoo Central Indian River Lagoon Tributary Pilot Oyster Project	Central IRL Oyster Project 4	-	-	-	-	-
$399,963	-	$31,150	-	-	$230,657	$138,156	-	-	-	-	-
Central IRL - Brevard Zoo	-	-	-	-	-	Central Oyster Project Offshore Reefs	-	-	-	-	-
$357,300	-	-	-	-	-	$357,300	-	-	-	-	-
Central IRL - Brevard	-	-	-	-	-	Hog Point	-	-	-	-	-
$50,022	-	-	-	-	-	$50,022	-	-	-	-	-
Central IRL - Brevard	-	Riverview Senior Resort*	-	-	-	-	-	-	-	-	-
$30,304	-	$30,304	-	-	-	-	-	-	-	-	-
Planted Shorelines	-	-	-	-	-	-	-	-	-	-	-
Banana - Marine Resources Council	-	Cocoa Beach*	-	-	-	-	-	-	-	-	-
$16,014	-	$16,014	-	-	-	-	-	-	-	-	-
Banana - Cocoa Beach	-	-	-	-	McNabb	-	-	-	-	-	-
$5,760	-	-	-	-	$5,760	-	-	-	-	-	-
North IRL - Brevard Zoo	-	-	Brevard Zoo North IRL*	Brevard Zoo North IRL Plant Project 2*	-	-	-	-	-	-	-
$10,560	-	-	$720	$9,840	-	-	-	-	-	-	-
North IRL - Marine Resources Council	-	-	-	-	Scottsmoor	-	-	-	-	-	-
$10,560	-	-	-	-	$10,560	-	-	-	-	-	-
North IRL - Marine Resources Council	-	-	-	-	Riveredge	-	-	-	-	-	-
$4,080	-	-	-	-	$4,080	-	-	-	-	-	-
North IRL - Brevard	-	-	-	-	-	Titusville Causeway	-	-	-	-	-
$31,440	-	-	-	-	-	$31,440	-	-	-	-	-
Central IRL - Marine Resources Council	-	Lagoon House*	-	Fisherman's Landing*	-	-	-	-	-	-	-
$28,761	-	$23,961	-	$4,800	-	-	-	-	-	-	-
Central IRL - Melbourne	-	Riverview Park	-	-	-	-	-	-	-	-	-
$18,480	-	$18,480	-	-	-	-	-	-	-	-	-
Central IRL - Marine Resources Council	-	-	-	Rotary Park*	-	-	-	-	-	-	-
$4,800	-	-	-	$4,800	-	-	-	-	-	-	-
Clam Restoration	-	-	-	-	-	-	-	-	-	-	-
All	-	-	-	-	Aquaculture Stimulus	-	-	-	-	-	-
$60,000	-	-	-	-	$60,000	-	-	-	-	-	-
Project Monitoring	Year 0 Monitoring*	Year 1 Monitoring*	Year 2 Monitoring*	Year 3 Monitoring*	Year 4 Monitoring*	Year 5 Monitoring	Year 6 Monitoring	Year 7 Monitoring	Year 8 Monitoring	Year 9 Monitoring	Year 10 Monitoring
$10,000,000	$17,105	$165,036	$363,802	$734,338	$617,033	$1,350,448	$1,350,448	$1,350,448	$1,350,448	$1,350,447	$1,350,447
Contingency	-	-	-	-	-	-	-	-	-	-	-
North IRL	Merritt Island Redevelopment Agency*	-	-	-	-	-	-	-	-	-	-
$268	$268	-	-	-	-	-	-	-	-	-	-

Project Name/Total Project Cost	Year 0 (Fiscal Year 2016-2017)	Year 1 (Fiscal Year 2017-2018)	Year 2 (Fiscal Year 2018-2019)	Year 3 (Fiscal Year 2019-2020)	Year 4 (Fiscal Year 2020-2021)	Year 5 (Fiscal Year 2021-2022)	Year 6 (Fiscal Year 2022-2023)	Year 7 (Fiscal Year 2023-2024)	Year 8 (Fiscal Year 2024-2025)	Year 9 (Fiscal Year 2025-2026)	Year 10 (Fiscal Year 2026-2027)
Banana River Lagoon	-	Cocoa Beach Planted*	-	-	-	-	-	-	-	-	-
$66	-	$66	-	-	-	-	-	-	-	-	-
Central IRL	-	Lagoon House Planted*	-	-	-	-	-	-	-	-	-
$39	-	$39	-	-	-	-	-	-	-	-	-
North IRL - Titusville	-	-	-	-	Draa Field Vegetation Harvesting*	-	-	-	-	-	-
$29,053	-	-	-	-	$29,053	-	-	-	-	-	-
North IRL	-	-	-	Titusville Osprey	-	-	-	-	-	-	-
$800,000	-	-	-	$800,000	-	-	-	-	-	-	-
Banana - Brevard	-	-	-	-	Grand Canal (Berkeley)	-	-	-	-	-	-
$217,053	-	-	-	-	$217,053	-	-	-	-	-	-
North IRL - Melbourne	-	-	-	-	Basin 1335 (Sherwood Park)*	-	-	-	-	-	-
$99,708	-	-	-	-	$99,708	-	-	-	-	-	-
Central IRL - Melbourne	-	-	-	-	Pennwood	-	-	-	-	-	-
$40,368	-	-	-	-	$40,368	-	-	-	-	-	-
All	Year 0 Contingency	Year 1 Contingency	Year 2 Contingency	Year 3 Contingency	Year 4 Contingency	Year 5 Contingency	Year 6 Contingency	Year 7 Contingency	Year 8 Contingency	Year 9 Contingency	Year 10 Contingency
$19,814,425	$53,833	$478,740	$1,312,300	$2,388,009	$4,279,453	$2,956,886	$2,629,567	$2,334,843	$2,120,706	$812,779	$447,309
Inflation	-	Year 1 Inflation	Year 2 Inflation	Year 3 Inflation	Year 4 Inflation	Year 5 Inflation	Year 6 Inflation	Year 7 Inflation	Year 8 Inflation	Year 9 Inflation	Year 10 Inflation
$104,840,456	$139,051	$1,218,547	$3,660,144	$6,745,539	$17,092,502	$12,283,682	$14,869,548	$17,501,986	$16,969,833	$8,467,394	$5,892,231
$542,223,582	***$2,667,250***	***$14,624,249***	***$34,623,958***	***$59,071,046***	***$109,805,846***	***$75,728,741***	***$71,440,897***	***$67,884,136***	***$62,855,111***	***$26,886,191***	***$16,636,158***

* Completed project with actual Save Our Indian River Lagoon Tax Fund cost.

Appendix A: Funding Needs and Leveraging Opportunities

Brevard County explored a variety of possible mechanisms to fund the Indian River Lagoon (IRL) projects in this plan, including:

- Special Taxing District approved by referendum to allow an ad valorem tax levy and bonds
- Special Act by the legislature allowing ad valorem tax levy by referendum to issue bonds
- Local government surtax (0.5 cent sales tax)
- Altering legislation to allow for Tourist Development Council funding to be used for lagoon restoration
- Municipal Service Taxing Unit/Special District
- Increased stormwater utility assessment

The County placed a referendum on the November 8, 2016 ballot for the 0.5 cent sales tax, and this referendum passed by more than 60% of the vote. The Save Our Indian River Lagoon 0.5 cent sales tax will generate approximately $54.2 million per year. The proposed 1 mill increase would have generated approximately $32 million per year, whereas the proposed increase of 0.5 mill would have only generated $16 million per year. To implement the projects in a timely manner according to the schedule in **Table 6-9**, and to accelerate the projects where possible, the County will seek to use funds generated from the sales tax to leverage matching funding from grants and appropriations and/or pay debt service on bonds. If additional funding is provided through matching funds from other sources, additional projects may be implemented, which would increase the overall plan cost, and/or project timelines may be moved up to allow the benefits of those projects to occur earlier than planned.

Examples of other funding programs (many from Florida Department of Environmental Protection, 2019) are:

- Section 319 grant program – The Florida Department of Environmental Protection administers funds received from United States Environmental Protection Agency to implement projects or programs that reduce nonpoint sources of pollution. Projects or programs must benefit Florida's impaired waters, and local sponsors must provide at least a 40% match or in-kind contribution. Eligible activities include demonstration and evaluation of urban and agricultural stormwater best management practices, stormwater retrofits, and public education.
- State water quality assistance grants – Funding may be available through periodic legislative appropriations to the Florida Department of Environmental Protection. When funds are available, the program prioritizes stormwater construction projects to benefit impaired waters, similar to the Section 319 grant program.
- Water management district funding – Florida's five regional water management districts offer financial assistance for a variety of water-related projects, for water supply development, water resource development, and surface water restoration. Assistance may be provided from ad valorem tax revenues or from periodic legislative appropriations for alternative water supply development, springs restoration, and Surface Water Improvement and Management projects. The amount of funding available, matching requirements, and types of assistance may vary from year to year.
- IRL National Estuary Program – The IRL Council funds projects each year through their work plan process.

- Tourism + Lagoon Grant Program – The Brevard County Tourism Development Council has approved funding for the development of projects that demonstrate a benefit to the health of the IRL and a positive impact to Brevard County for litter control along shorelines and causeways/entryways, restoration and protection of living shorelines, habitat restoration to support fish and wildlife viewing, and waterway destinations and access for improved and sustainable recreational waterway access. Due to revenue shortfalls in 2020, this program has been placed on an indefinite hold.
- Budget Appropriation – The Florida Legislature may solicit applications directly for projects, including water projects, in anticipation of upcoming legislative sessions. This process is an opportunity to secure legislative sponsorship of project funding through the state budget.
- Clean Water State Revolving Fund loan program – This program provides low-interest loans to local governments to plan, design, and build or upgrade wastewater, stormwater, and nonpoint source pollution prevention projects. Discounted assistance for small communities is available. Interest rates on loans are below market rates and vary based on the economic wherewithal of the community. The Clean Water State Revolving Fund is Florida's largest financial assistance program for water infrastructure.
- Florida Resilient Coastlines Program – The Florida Department of Environmental Protection offers technical assistance and funding to coastal communities dealing with increasingly complex flooding, erosion, and habitat shifts.
- Florida Rural Water Association Loan Program – This program provides low-interest bond or bank financing for community utility projects in coordination with the Florida Department of Environmental Protection's State Revolving Fund program. Other financial assistance may also be available.
- Rural Development Rural Utilities Service Guaranteed and Direct Loans and Grants – The United States Department of Agriculture's program provides a combination of loans and grants for water, wastewater, and solid waste projects to rural communities and small incorporated municipalities.
- Small Cities Community Development Block Grant Program – The Florida Department of Economic Opportunity makes funds available annually for water and sewer projects that benefit low- and moderate-income persons.
- State Housing Initiatives Partnership Program – Florida Housing administers the program, which provides funds to local governments as an incentive to create partnerships that produce and preserve affordable homeownership and multifamily housing. The program is designed to provide very low, low, and moderate income families with assistance. Funding may be used for emergency repairs, new construction, rehabilitation, down payment and closing cost assistance, impact fees, construction and gap financing, mortgage buy-downs, acquisition of property for affordable housing, matching dollars for federal housing grants and programs, and homeownership counseling.
- Rural Development Funding – The United States Department of Agriculture provides funds that will cover the repair and maintenance of private septic systems. The amount of funds available, as well as the specific purposes for which grants are intended, changes from year to year.

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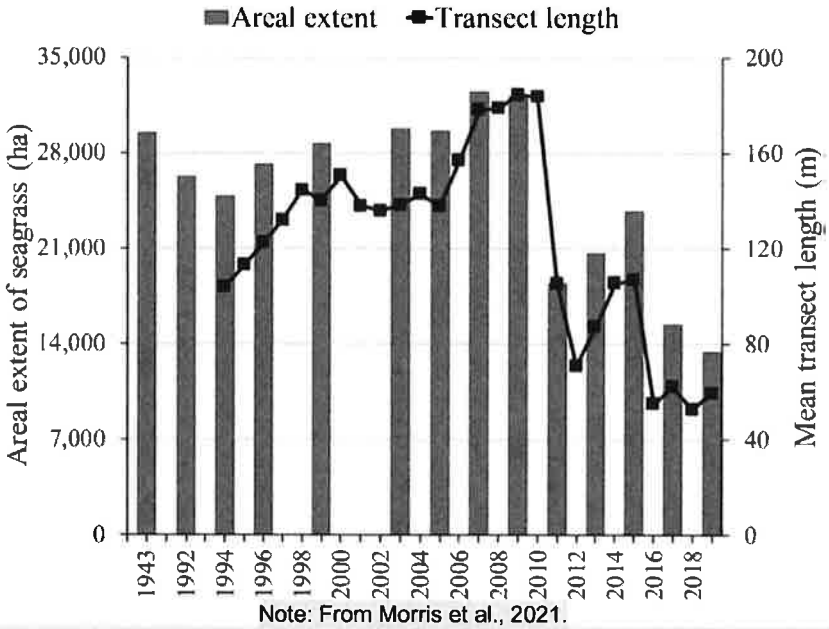
Appendix C: Seagrasses

Loss of Seagrass

In partnership, the St. Johns River Water Management District, South Florida Water Management District, and Florida Department of Environmental Protection mapped seagrass from aerial imagery taken in 1943 and every two to three years since 1986 (**Figure C-1**). Through 2009, the areal footprint of seagrass generally expanded, with some areas nearing their targets, which are benchmarks to evaluate the success of reducing nutrient loads to the Indian River Lagoon (IRL) system. Unfortunately, the areal extent of seagrass in the IRL began to decline in 2011 when mapping documented a loss of almost 43% of the acreage present in 2009. Most of this loss occurred in the reaches adjacent to Brevard County, with extensive losses in Banana River Lagoon (an 88% reduction from 24,000 to 3,000 acres) and in the IRL north of Sebastian Inlet (a 60% reduction from 50,000 to 20,000 acres). The losses resulted from several intense phytoplankton blooms (primarily single-celled algae) that reached unprecedented concentrations for a record duration as indicated by concentrations of chlorophyll-*a* (**Figure C-2**). Beyond the shallowest water, the bloom effectively reduced the amount of light reaching seagrasses below what they required for survival. As a result, the remaining canopies moved shoreward and to shallower depths, with decreased cover, and a disruption to the species distribution (Morris et al., 2021).

After the 2011 losses, the meadows showed some recovery in 2013 and 2015. However, a brown tide (*Aureoumbra lagunensis*) bloom in 2016 reversed recovery such that, in 2019, the areal extent of seagrasses decreased further to only 58% of that present in 2009. The prognosis is not good because, even where seagrass survives, the cover of seagrass is often less than 5%, which is a record drop from the prior 30–50% (Morris et al., 2021).



Note: From Morris et al., 2021.

Figure C-1: Mean Areal Extent of Seagrass and Mean Length of Transects

Figure C-1 Long Description

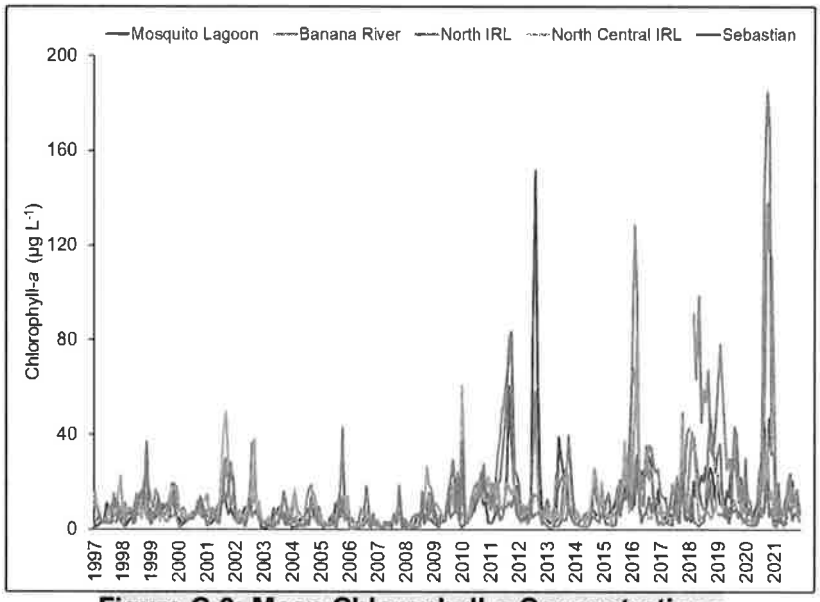
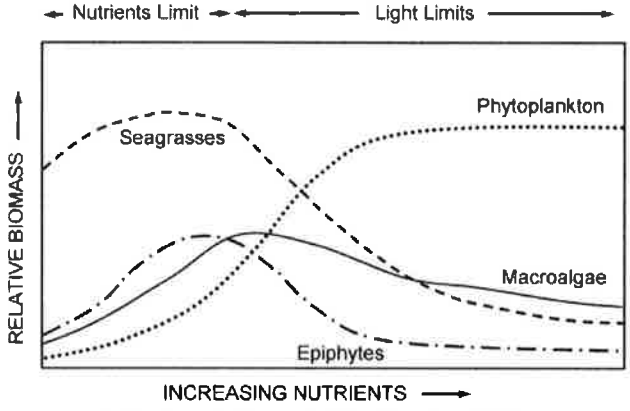


Figure C-2: Mean Chlorophyll-*a* Concentrations

Figure C-2 Long Description

Unfortunately, the IRL appears to be following a pattern described for systems that receive increased loads of nutrients (Duarte, 1995; Burkholder et al., 2007). The pattern involves a shift in the composition of the primary producer assemblage, with higher nutrient loads differentially promoting faster growing macroalgae and ultimately phytoplankton (**Figure C-3**). The macroalgae and phytoplankton can exacerbate loss of seagrasses, primarily through shading. Loss of seagrass and macroalgae makes more nutrients available to phytoplankton through decreased competition (Schmidt et al. 2012), and loss of seagrass means that the sediments may be more prone to resuspension, which also reduces light penetration. Overall, the change in the system becomes self-perpetuating. Reducing nutrient loads represents a critical first step in efforts to reverse the shift in primary producers. However, a return to the previous areal coverage of seagrass may take some time, especially if too few recruits are available and sediments are too destabilized for colonization.



Note: Adapted from Burkholder et al. 2007

Figure C-3: Conceptual Model Illustrating a Shift in Biomass Among Major Primary Producers with Increasing Nutrient Enrichment

Nutrient Content of Seagrass

Halodule wrightii stores nutrients in its aboveground and belowground biological material, or biomass. The biomass of this and other seagrasses changes seasonally, with peak growth of aboveground shoots occurring in April and May and the greatest aboveground biomass recorded during summer. These seasonal changes introduce uncertainty into estimates of nutrient storage, but mean values will suffice for estimating return on investment in the long-term (**Table C-1**). For example, a single shoot of *Halodule wrightii* may contain up to five or more leaves in the summer, whereas in the winter this same shoot may contain only one leaf (Dunton 1996). For this estimate of nutrient content, we will assume that spring-summer growth and fall-winter senescence are equal. Thus, we will focus on our recent estimates of an average amount of aboveground and belowground biomass or standing stock of *Halodule wrightii* (**Table C-1** and **Table C-2**).

Table C-1: Estimates of Biomass for *Halodule* Species

Location	Total Biomass (grams dry weight per square meter)	Reference
Texas (Laguna Madre)	10–400	Zieman and Zieman, 1989
North Carolina (multiple locations)	22–208	Zieman and Zieman, 1989
South Florida and Tampa Bay	10–300	Zieman and Zieman, 1989
IRL (Fort Pierce Inlet)	124–198	Hefferman and Gibson, 1983
IRL (Grand Harbor/Vero)	45	Hefferman and Gibson, 1983
IRL (Link Port)	20–140	Virnstein unpublished
IRL (Brevard County)	53*	Morris, Chamberlain, and Jacoby unpublished
Texas (Laguna Madre)	10–400	Zieman and Zieman, 1989

* Mean aboveground biomass = 23 grams dry weight meters^{-2} = [(mean percent cover × 30.533) × 0.019]; mean belowground biomass = 30 grams dry weight meters^{-2} = 1.3 × aboveground biomass

Table C-2: Total Biomass in Seagrasses Along Brevard County

Sub-lagoon	Description	Total Biomass (grams dry weight per square meter)
Mosquito Lagoon	Brevard County line to southern end of sub-lagoon	74
Banana River Lagoon	National Aeronautics and Space Administration restricted area	64
Banana River Lagoon	Remainder of Banana River Lagoon	44
IRL	North of State Road 405	51
IRL	State Road 405 to Pineda Causeway	35
IRL	Pineda Causeway to Hog Point	28
IRL	Hog Point to Brevard County line	51
Mean	***Not applicable***	***50***

Duarte (1990) compared nutrient contents of 27 species of seagrass, including *Halodule wrightii*. He determined that nitrogen and phosphorus represent about 2.2% and 0.2% of the dry weight of aboveground and belowground tissue of *Halodule wrightii*, respectively. These values are similar to those calculated during a recent study in the IRL (**Table C-3**). The values can be combined with estimates of biomass to calculate how much nitrogen and phosphorus are sequestered by 100 acres of *Halodule wrightii* on average (**Table C-4**).

Table C-3: Estimates of Nutrient Content for *Halodule wrightii* (percentage of dry weight)

Location	Carbon Above Ground	Nitrogen Above Ground	Phosphorus Above Ground	Carbon Below Ground	Nitrogen Below Ground	Phosphorus Below Ground
BRL-1	29.60	2.02	0.17	30.60	1.24	0.14
BRL-2	30.60	2.36	0.24	29.08	1.47	0.27
BRL-3	29.60	2.66	0.26	28.09	1.48	0.25
IRL-1	31.74	2.39	0.18	31.69	1.42	0.15
IRL-2	30.08	2.56	0.26	30.48	1.74	0.27
IRL-3	28.26	2.08	0.25	23.86	1.36	0.20
Mean	***29.98***	***2.35***	***0.23***	***28.97***	***1.45***	***0.21***

BRL = Banana River Lagoon, IRL = Indian River Lagoon

Table C-4: Average Amount of Nutrients Contained in Seagrass from 1996–2009

Sub-lagoon	Acres	Seagrass (pounds per 100 acres)	Nitrogen (pounds per 100 acres)	Phosphorus (pounds per 100 acres)
Southern Mosquito Lagoon	14,000	45,000	1,000	100
Banana River Lagoon	21,000	45,000	1,000	100
North IRL	19,000	37,000	900	90
Central IRL	7,000	36,000	900	90

Draft Evaluation Criteria for Planting Seagrass

Part of the wisdom accumulated from past seagrass restoration projects is the importance of selecting sites that will support seagrass growth. Key information has been synthesized into an initial guide, with higher scores and more certainty indicating better sites for planting seagrass (**Table C-5**). Please note that the presence of seagrass leads to a lower score based on the premise that natural recruitment represents the most cost-effective option for restoring seagrass. In addition, a high level of uncertainty can suggest targets for further study. This guide can be refined following pilot studies to determine optimal methods for planting seagrass (e.g., type of planting units, use of chemicals to enhance growth, and density of initial planting) and protecting it from disturbance (e.g., grazing, waves, exposure, and low salinity) until it is established.

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Table C-5: Guide for Ranking Potential Seagrass Restoration Sites

Category	Metric	Timeframe	Attributes for Score = 0	Attributes for Score = 2	Attributes for Score = 4	Attributes for Score = 6	Score	Uncertainty (1 = low, 3 = high)
Critical Depth Zone 0.5-0.8 meters below mean sea level	**Width of Critical Depth Zone** (distance perpendicular to shore)	**Recent**	**Very narrow:** < 25 meters wide (< 82 feet)	**Narrow:** 25-50 meters (82-164 feet)	**Moderately wide:** 50-100 meters (164-328 feet)	**Broad:** > 100 meters (> 328 feet)		
Critical Depth Zone 0.5-0.8 meters below mean sea level	**Distance to seagrass** (identified via the most recent map or targeted reconnaissance)	**Recent**	**Continuous seagrass at site and within 1 kilometer (land use code = 9116):** seagrass is a dominant feature (restoration not needed)	**Isolated:** no seagrass within 1 kilometers (0.6 miles) so conditions may be unfavorable	**Discontinuous seagrass at site and within 1 kilometers (land use code = 9113):** seagrass is patchy, so restoration may connect patches	**Seagrass nearby:** seagrass within 0.5-1.0 kilometers (0.3-0.6 miles)		
Critical Depth Zone 0.5-0.8 meters below mean sea level	**Percent cover in Critical Depth Zone** (derived from the closest transect, paired considerations)	**Past** (2000-2009)	**High:** > 30%	**Low:** 10-20%	**Moderate:** 20-30%	**High:** > 30%		
Critical Depth Zone 0.5-0.8 meters below mean sea level	**Percent cover in Critical Depth Zone** (derived from the closest transect, paired considerations)	**Last 3 Years**	**High:** > 10% (restoration not needed)	**Low:** < 10% (restoration may not help)	**Low:** < 10% (restoration may help but ultimate gain is likely limited)	**Low:** < 10% (potentially optimum site for restoration)		
Potential stressors	**Water quality** (salinity and light availability derived from the closest station)	**Last 3 Years**	**Bad:** salinity < 10 ppt anytime and < 18 ppt for > 3 consecutive months, or annual mean salinity -1 standard deviation < 17 ppt. Secchi depth < 0.5 m (1.6ft) anytime and < 0.65 m (2.1ft) for > 3 consecutive months, or annual mean Secchi depth -1 standard deviation < 0.65 m.	**Poor:** salinity < 18 ppt for 3 consecutive months but never < 12 ppt, or annual mean salinity -1 standard deviation < 17 ppt. Secchi depth < 0.65 m for < 3 consecutive months but never < 0.5 m, or annual mean Secchi depth -1 standard deviation < 0.65 m.	**Supportive:** salinity always > 18 Secchi depth always > 0.65 meters and may be 0.65-1.0 meters (2.1-3.3 feet) for 3 consecutive months	**Good:** salinity consistently > 23 Secchi depth consistently > 1.0 meters		
Potential stressors	**Sediment** (assessed via visits to the site or other current information)	**Present**	**Not supportive:** anoxic and sulfidic near the surface or easily resuspended or moved	**Minimally supportive:** hard bottom (e.g., compact sand or shells), not conducive for growth of rhizomes and roots, porewater may lack nutrients	**Generally supportive:** unconsolidated sediment that holds plants with relatively little resuspension and movement observed, porewater nutrients not limiting	**Fully supportive:** loosely consolidated sediment with firmly anchored plants if present, anoxic and sulfidic layers located below the zone occupied by roots and rhizomes, porewater rich in nutrients		
Potential stressors	**Water movement** (assessed via visits to the site or other current information)	**Present**	**High currents - possible scouring:** frequent and strong currents or waves that may cause ripples in the sediment and uproot new plants	**Moderate to high currents:** currents and waves bend plants, sweep fragments of seagrass away before they can gain a foothold, and cause some resuspension of sediment	**Moderate currents:** plants often stand upright, fragments of seagrass may be trapped, sediment typically not resuspended	**Low currents:** mild currents or waves, sediment not disturbed, no apparent negative effects on any seagrass that is present		
Potential stressors	**Shoreline characteristics** (assessed via visits the site or other current information)	**Present**	**Unnatural shoreline:** Critical Depth Zone in close proximity to urban development, including canals, and a hardened shoreline (e.g., riprap or bulkhead)	**Semi-natural shoreline:** Critical Depth Zone near moderate development and some shoreline is vegetated	**Mostly natural shoreline:** Critical Depth Zone near low to moderate development, most of the shoreline is vegetated shoreline or the site is associated with living shoreline project	**All natural shoreline:** vegetated shoreline with very limited development		
Potential stressors	**Public use** (assessed via visits to the site visits or other current information, including recent aerial photographs)	**Present**	**High use:** Critical Depth Zone adjacent to or within an area with frequent boating, swimming or fishing (e.g., aerial photographs show prop scars)	**Near high use:** Critical Depth Zone within 0.5 kilometers (0.3 miles) of a highly used area	**Not near high use:** Critical Depth Zone more than 0.5 kilometers from a highly used area	**Low use:** no public facilities nearby and limited signs of use		
Potential stressors	**Biota** (assessed via visits to the site or other current information on grazing or physical disturbance)	**Present**	**Heavy use:** site adjacent to deep water or manatee zone, power plant within 10 kilometers (6.2 miles), freshwater nearby, manatees and rays observed frequently, disturbance or grazing evident in > 50% of the area on a weekly-monthly basis	**Moderate use:** power plant > 10 kilometers away, deep water and manatee zones > 0.5 kilometers away, no freshwater nearby, disturbance or grazing evident in < 50% of the area on a monthly basis	**Intermittent use:** disturbance or grazing evident in < 25% of the area on a quarterly basis	**Rare use:** disturbance or grazing hardly evident		
Logistics	**Enhancement or protection** (assessed via visits to the site)	**Present**	**Extensive need:** dense planting required due to absence of seagrass, fencing or caging required due to grazing, other enhancement or protection required, including living shorelines, sediment barriers, wave baffles	**Substantial need:** moderately dense planting required because only 1-2% cover present, fencing or caging required, few additional enhancements or protections required	**Moderate need:** low density planting sufficient because at least 2% cover present, fencing or caging required for a limited time, other enhancements or protections beneficial but not critical	**Limited need:** minimal density planting or no planting required because > 2% cover present and protection from grazing may result in spread of seagrass, no other enhancements or protections required		
Logistics	**Maintenance** (assessed via visits to the site)	**Anticipated**	**High maintenance:** weekly cleaning	**Moderate maintenance:** monthly cleaning	**Low maintenance:** quarterly cleaning	**Minimum maintenance:** maintain as needed		
Logistics	**Staging and accessibility** (assessed via visits to the site)	**Present**	**Very difficult:** substantial impediments that may include boat ramps > 10 kilometer away, soft sediment that is easily disturbed, permitting and access issues	**Moderately difficult:** boat ramp within 10 kilometers, somewhat firm sediment, tractable permitting and access issues	**Relatively simple:** boat ramp nearby and few other issues	**No issues**		
Logistics	**Monitoring** (relevant past, current and future information on water quality and seagrasses available)	**Present**	**No external support:** no sampling of seagrass within 5 kilometers (3.1 miles), nearest water quality station not representative of conditions at the site	**Minimal external support:** seagrass surveyed within 3-5 kilometers (1.9-3.1 miles); water quality station is representative of conditions at the site	**Moderate external support:** seagrass and water quality sampled within 3 kilometers, so both are representative of conditions at the site	**Considerable external support:** seagrasses and water quality sampled at or adjacent to the site		
Total								

Notes:
Optimize potential for success by planting: a) within the Critical Depth Zone (e.g., at 0.6-0.8 meters below mean sea level) with due recognition of tides and annual changes in water levels; or b) during the spring (e.g., late March to May) when water clarity is best, water temperatures are warming, and grazing by fish is relatively low
Scoring: if conditions do not match the attributes provided, then assign a score between the two that are most applicable

Appendix D: Withdrawn Projects

Some of the projects submitted and approved as part of a plan update were determined to be less cost-effective and/or infeasible to implement after further investigation. Stormwater basin delineations were updated in 2019 with some basins merged or renamed in the 2020 Plan Update. Therefore, these projects were removed from the Save Our Indian River Lagoon Project Plan so that the funding could be used for other projects. **Table D-1** lists the projects that have been removed from the plan at the request of the responsible entity.

Table D-1: Summary of Project Withdrawals from the Plan

Year Removed	Project Name	Responsible Entity	Sub-Lagoon	Total Nitrogen Reduction (pounds per year)	Total Phosphorus Reduction (pounds per year)	Plan Funding
2018	Holman Road Baffle Box	City of Cape Canaveral	Banana	71	2	$6,248
2018	Center Street Baffle Box	City of Cape Canaveral	Banana	297	9	$26,136
2018	International Drive Baffle Box	City of Cape Canaveral	Banana	443	4	$34,700
2018	Angel Isles Baffle Box	City of Cape Canaveral	Banana	131	3	$11,528
2018	Cherie Down Park Swale	City of Cape Canaveral	Banana	27	9	$2,376
2018	Norwood Baffle Box Retrofit	City of Palm Bay	Central IRL	1,631	254	$143,528
2018	Victoria Pond	City of Palm Bay	Central IRL	267	42	$23,486
2018	Goode Park	City of Palm Bay	Central IRL	794	121	$69,872
2018	Florin Pond	City of Palm Bay	Central IRL	75	11	$6,600
2018	Airport Boulevard Dry Retrofit	City of Melbourne	North IRL	99	23	$8,718
2018	National Aeronautics and Space Administration Boulevard Pond Retrofit	City of Melbourne	Central IRL	1,097	157	$96,532
2018	General Aviation Drive Retrofit	City of Melbourne	Central IRL	158	10	$13,937
2018	L-1 Canal Bank Stabilization	Brevard County	North IRL	995	383	$87,560
2018	Stormwater project in Basin 979	Brevard County	Banana	3,275	448	$225,000
2018	Stormwater project in Basin 1280	Brevard County	Banana	1,735	236	$175,000
2018	Stormwater project in Basin 1063	Brevard County	Banana	1,235	192	$100,000
2018	Stormwater project in Basin 970	Brevard County	Banana	1,092	185	$100,000
2018	Stormwater project in Basin 995	Brevard County	Banana	1,048	169	$100,000
2018	Stormwater project in Basin 754	Brevard County	Banana	734	95	$100,000
2018	Stormwater project in Basin 327	Brevard County	North IRL	1,999	283	$125,000
2018	Stormwater project in Basin 1582	Brevard County	Central IRL	2,402	443	$200,000

Year Removed	Project Name	Responsible Entity	Sub-Lagoon	Total Nitrogen Reduction (pounds per year)	Total Phosphorus Reduction (pounds per year)	Plan Funding
2019	Cocoa Beach Muck Dredging – Phase III Interstitial	City of Cocoa Beach	Banana	2,942	To be determined	$514,809
2019	Indian River Drive Oyster Bar (reduction from 1,900 to 140 feet)	Brevard County	North IRL	422	10	$166,672
2019	Indian River Drive Planted Shoreline (reduction from 1,900 to 140 feet)	Brevard County	North IRL	118	41	$20,620
2019	Stormwater project in Basin 905	Brevard County	Banana	1,143	178	$150,000
2019	Stormwater project in Basin 492	Brevard County	Banana	1,020	117	$100,000
2019	Stormwater project in Basin 522	Brevard County	Banana	795	110	$125,000
2019	Stormwater project in Basin 705	Brevard County	Banana	650	95	$100,000
2019	Stormwater project in Basin 821	Brevard County	Banana	627	123	$100,000
2019	Stormwater project in Basin 820	Brevard County	Banana	597	112	$100,000
2019	Stormwater project in Basin 47	Brevard County	North IRL	1,348	139	$125,000
2019	Stormwater project in Basin 219	Brevard County	North IRL	956	113	$125,000
2020	Cape Canaveral Air Force Station Upgrade	Cape Canaveral Air Force Station	Banana	25,627	To be determined	$6,000,000
2020	Malabar - Zone B	Brevard County	Central IRL	1,929	Not applicable	$2,135,808
2020	Malabar - Zone A	Brevard County	Central IRL	11,456	Not applicable	$14,349,960
2020	South Beaches - Zone F	Brevard County	Central IRL	70	Not applicable	$100,116
2020	Carver Cove Swale	City of Cape Canaveral	Banana	32	9	$2,816
2020	Cocoa Palms Low Impact Development	City of Cape Canaveral	Banana	13	10	$1,144
2020	M1 Canal Biosorption Activated Media	Brevard County	Central IRL	1,433	191	$66,300
2020	Oliver Oyster Bar	Brevard Zoo	North IRL	116	39	$51,620
2020	Coconut Point/Environmentally Endangered Lands Oyster Bar (reduction from 27,125 square feet to 2,400 square feet)	Brevard Zoo	Central IRL	989	367	$464,830
2020	Turkey Creek Shoreline Restoration – Oysters	City of Palm Bay	Central IRL	309	8	$122,055
2020	Eden Isles Lane Oyster Bar	Brevard Zoo	Banana	49	17	$21,805
2020	Turkey Creek Shoreline Restoration – Planted	City of Palm Bay	Central IRL	104	36	$24,960
2020	Stormwater project in Basin 388	Brevard County	Banana	1,390	138	$100,000
2020	Stormwater project in Basin 451	Brevard County	Banana	1,168	121	$100,000
2020	Stormwater project in Basin 815	Brevard County	Banana	698	113	$100,000

Year Removed	Project Name	Responsible Entity	Sub-Lagoon	Total Nitrogen Reduction (pounds per year)	Total Phosphorus Reduction (pounds per year)	Plan Funding
2020	Stormwater project in Basin 829	Brevard County	Banana	630	145	$100,000
2020	Stormwater project in Basin 865	Brevard County	Banana	454	151	$100,000
2020	Stormwater project in Basin 889	Brevard County	Banana	539	85	$100,000
2020	Stormwater project in Basin 901	Brevard County	Banana	1,658	196	$150,000
2020	Stormwater project in Basin 912	Brevard County	Banana	1,025	34	$100,000
2020	Stormwater project in Basin 929	Brevard County	Banana	304	41	$100,000
2020	Stormwater project in Basin 933	Brevard County	Banana	302	38	$100,000
2020	Stormwater project in Basin 934	Brevard County	Banana	365	42	$100,000
2020	Stormwater project in Basin 938	Brevard County	Banana	424	160	$100,000
2020	Stormwater project in Basin 940	Brevard County	Banana	816	106	$100,000
2020	Stormwater project in Basin 943	Brevard County	Banana	708	90	$100,000
2020	Stormwater project in Basin 944	Brevard County	Banana	614	83	$100,000
2020	Stormwater project in Basin 955	Brevard County	Banana	522	60	$100,000
2020	Stormwater project in Basin 957	Brevard County	Banana	586	53	$100,000
2020	Stormwater project in Basin 958	Brevard County	Banana	164	26	$100,000
2020	Stormwater project in Basin 960	Brevard County	Banana	537	80	$100,000
2020	Stormwater project in Basin 961	Brevard County	Banana	431	57	$100,000
2020	Stormwater project in Basin 963	Brevard County	Banana	2,092	396	$150,000
2020	Stormwater project in Basin 969	Brevard County	Banana	528	78	$100,000
2020	Stormwater project in Basin 973	Brevard County	Banana	2,048	311	$175,000
2020	Stormwater project in Basin 975	Brevard County	Banana	521	75	$100,000
2020	Stormwater project in Basin 977	Brevard County	Banana	558	59	$100,000
2020	Stormwater project in Basin 980	Brevard County	Banana	836	127	$100,000
2020	Stormwater project in Basin 981	Brevard County	Banana	993	179	$100,000
2020	Stormwater project in Basin 982	Brevard County	Banana	642	68	$100,000
2020	Stormwater project in Basin 988	Brevard County	Banana	621	108	$100,000
2020	Stormwater project in Basin 989	Brevard County	Banana	1,030	110	$100,000
2020	Stormwater project in Basin 990	Brevard County	Banana	634	102	$100,000
2020	Stormwater project in Basin 992	Brevard County	Banana	1,244	195	$100,000

Year Removed	Project Name	Responsible Entity	Sub-Lagoon	Total Nitrogen Reduction (pounds per year)	Total Phosphorus Reduction (pounds per year)	Plan Funding
2020	Stormwater project in Basin 1000	Brevard County	Banana	277	40	$100,000
2020	Stormwater project in Basin 1001	Brevard County	Banana	401	54	$100,000
2020	Stormwater project in Basin 1010	Brevard County	Banana	374	55	$100,000
2020	Stormwater project in Basin 1014	Brevard County	Banana	333	50	$100,000
2020	Stormwater project in Basin 1016	Brevard County	Banana	920	136	$100,000
2020	Stormwater project in Basin 1018	Brevard County	Banana	389	54	$100,000
2020	Stormwater project in Basin 1026	Brevard County	Banana	1,073	180	$100,000
2020	Stormwater project in Basin 1033	Brevard County	Banana	1,113	152	$100,000
2020	Stormwater project in Basin 1038	Brevard County	Banana	157	25	$100,000
2020	Stormwater project in Basin 1039	Brevard County	Banana	708	104	$100,000
2020	Stormwater project in Basin 1041	Brevard County	Banana	273	47	$100,000
2020	Stormwater project in Basin 1048	Brevard County	Banana	107	20	$100,000
2020	Stormwater project in Basin 1070	Brevard County	Banana	113	12	$100,000
2020	Stormwater project in Basin 1071	Brevard County	Banana	1,082	144	$100,000
2020	Stormwater project in Basin 1082	Brevard County	Banana	264	39	$100,000
2020	Stormwater project in Basin 1098	Brevard County	Banana	341	53	$100,000
2020	Stormwater project in Basin 1104	Brevard County	Banana	701	106	$100,000
2020	Stormwater project in Basin 1117	Brevard County	Banana	282	43	$100,000
2020	Stormwater project in Basin 1120	Brevard County	Banana	313	50	$100,000
2020	Stormwater project in Basin 1121	Brevard County	Banana	186	27	$100,000
2020	Stormwater project in Basin 1125	Brevard County	Banana	307	51	$100,000
2020	Stormwater project in Basin 1133	Brevard County	Banana	562	90	$100,000
2020	Stormwater project in Basin 1142	Brevard County	Banana	534	73	$100,000
2020	Stormwater project in Basin 1152	Brevard County	Banana	245	30	$100,000
2020	Stormwater project in Basin 1159	Brevard County	Banana	134	20	$100,000
2020	Stormwater project in Basin 1167	Brevard County	Banana	180	28	$100,000
2020	Stormwater project in Basin 1175	Brevard County	Banana	394	42	$100,000
2020	Stormwater project in Basin 1183	Brevard County	Banana	272	39	$100,000
2020	Stormwater project in Basin 1188	Brevard County	Banana	166	29	$100,000

Year Removed	Project Name	Responsible Entity	Sub-Lagoon	Total Nitrogen Reduction (pounds per year)	Total Phosphorus Reduction (pounds per year)	Plan Funding
2020	Stormwater project in Basin 1198	Brevard County	Banana	365	62	$100,000
2020	Stormwater project in Basin 1220	Brevard County	Banana	396	61	$100,000
2020	Stormwater project in Basin 1223	Brevard County	Banana	561	86	$100,000
2020	Stormwater project in Basin 1225	Brevard County	Banana	122	19	$100,000
2020	Stormwater project in Basin 1231	Brevard County	Banana	300	58	$100,000
2020	Stormwater project in Basin 1248	Brevard County	Banana	306	46	$100,000
2020	Stormwater project in Basin 1250	Brevard County	Banana	188	26	$100,000
2020	Stormwater project in Basin 1251	Brevard County	Banana	448	66	$100,000
2020	Stormwater project in Basin 1262	Brevard County	Banana	443	80	$100,000
2020	Stormwater project in Basin 1265	Brevard County	Banana	743	98	$100,000
2020	Stormwater project in Basin 1270	Brevard County	Banana	187	28	$100,000
2020	Stormwater project in Basin 1296	Brevard County	Banana	241	48	$100,000
2020	Stormwater project in Basin 1302	Brevard County	Banana	172	25	$100,000
2020	Stormwater project in Basin 1303	Brevard County	Banana	166	24	$100,000
2020	Stormwater project in Basin 1305	Brevard County	Banana	119	25	$100,000
2020	Stormwater project in Basin 1310	Brevard County	Banana	583	106	$100,000
2020	Stormwater project in Basin 1311	Brevard County	Banana	104	15	$100,000
2020	Stormwater project in Basin 1314	Brevard County	Banana	170	26	$100,000
2020	Stormwater project in Basin 1317	Brevard County	Banana	1,679	143	$125,000
2020	Stormwater project in Basin 1319	Brevard County	Banana	117	16	$100,000
2020	Stormwater project in Basin 1327	Brevard County	Banana	352	52	$100,000
2020	Stormwater project in Basin 1328	Brevard County	Banana	617	89	$100,000
2020	Stormwater project in Basin 1332	Brevard County	Banana	303	47	$100,000
2020	Stormwater project in Basin 1334	Brevard County	Banana	795	130	$100,000
2020	Stormwater project in Basin 1336	Brevard County	Banana	470	68	$100,000
2020	Stormwater project in Basin 1337	Brevard County	Banana	1,121	186	$100,000
2020	Stormwater project in Basin 1338	Brevard County	Banana	256	37	$100,000
2020	Stormwater project in Basin 1343	Brevard County	Banana	1,388	142	$100,000
2020	Stormwater project in Basin 1346	Brevard County	Banana	189	28	$100,000

Year Removed	Project Name	Responsible Entity	Sub-Lagoon	Total Nitrogen Reduction (pounds per year)	Total Phosphorus Reduction (pounds per year)	Plan Funding
2020	Stormwater project in Basin 1350	Brevard County	Banana	1,049	165	$100,000
2020	Stormwater project in Basin 1351	Brevard County	Banana	129	19	$100,000
2020	Stormwater project in Basin 1357	Brevard County	Banana	338	56	$100,000
2020	Stormwater project in Basin 1362	Brevard County	Banana	476	71	$100,000
2020	Stormwater project in Basin 1366	Brevard County	Banana	1,483	242	$100,000
2020	Stormwater project in Basin 1371	Brevard County	Banana	273	39	$100,000
2020	Stormwater project in Basin 1372	Brevard County	Banana	720	113	$100,000
2020	Stormwater project in Basin 1378	Brevard County	Banana	744	104	$100,000
2020	Stormwater project in Basin 2421	Brevard County	Banana	343	49	$100,000
2020	Stormwater project in Basin 83	Brevard County	North IRL	452	61	$100,000
2020	Stormwater project in Basin 100	Brevard County	North IRL	888	115	$100,000
2020	Stormwater project in Basin 105	Brevard County	North IRL	549	72	$100,000
2020	Stormwater project in Basin 212	Brevard County	North IRL	693	89	$100,000
2020	Stormwater project in Basin 228	Brevard County	North IRL	684	131	$100,000
2020	Stormwater project in Basin 262	Brevard County	North IRL	794	126	$100,000
2020	Stormwater project in Basin 263	Brevard County	North IRL	469	65	$100,000
2020	Stormwater project in Basin 288	Brevard County	North IRL	732	78	$100,000
2020	Stormwater project in Basin 289	Brevard County	North IRL	1,112	223	$100,000
2020	Stormwater project in Basin 290	Brevard County	North IRL	1,116	193	$100,000
2020	Stormwater project in Basin 291	Brevard County	North IRL	485	82	$100,000
2020	Stormwater project in Basin 294	Brevard County	North IRL	551	84	$100,000
2020	Stormwater project in Basin 335	Brevard County	North IRL	1,187	206	$100,000
2020	Stormwater project in Basin 353	Brevard County	North IRL	497	86	$100,000
2020	Stormwater project in Basin 354	Brevard County	North IRL	555	115	$100,000
2020	Stormwater project in Basin 392	Brevard County	North IRL	840	155	$100,000
2020	Stormwater project in Basin 408	Brevard County	North IRL	1,179	170	$125,000
2020	Stormwater project in Basin 454	Brevard County	North IRL	1,996	302	$150,000
2020	Stormwater project in Basin 510	Brevard County	North IRL	586	92	$100,000
2020	Stormwater project in Basin 512	Brevard County	North IRL	364	53	$100,000

Year Removed	Project Name	Responsible Entity	Sub-Lagoon	Total Nitrogen Reduction (pounds per year)	Total Phosphorus Reduction (pounds per year)	Plan Funding
2020	Stormwater project in Basin 513	Brevard County	North IRL	1,137	183	$100,000
2020	Stormwater project in Basin 544	Brevard County	North IRL	624	98	$100,000
2020	Stormwater project in Basin 568	Brevard County	North IRL	534	85	$100,000
2020	Stormwater project in Basin 578	Brevard County	North IRL	430	68	$100,000
2020	Stormwater project in Basin 594	Brevard County	North IRL	833	135	$100,000
2020	Stormwater project in Basin 597	Brevard County	North IRL	800	142	$100,000
2020	Stormwater project in Basin 624	Brevard County	North IRL	860	134	$100,000
2020	Stormwater project in Basin 626	Brevard County	North IRL	1,602	193	$150,000
2020	Stormwater project in Basin 644	Brevard County	North IRL	686	94	$100,000
2020	Stormwater project in Basin 660	Brevard County	North IRL	844	212	$100,000
2020	Stormwater project in Basin 677	Brevard County	North IRL	709	136	$100,000
2020	Stormwater project in Basin 751	Brevard County	North IRL	532	121	$100,000
2020	Stormwater project in Basin 759	Brevard County	North IRL	614	98	$100,000
2020	Stormwater project in Basin 796	Brevard County	North IRL	639	98	$100,000
2020	Stormwater project in Basin 805	Brevard County	North IRL	645	94	$100,000
2020	Stormwater project in Basin 806	Brevard County	North IRL	622	100	$100,000
2020	Stormwater project in Basin 827	Brevard County	North IRL	639	96	$100,000
2020	Stormwater project in Basin 838	Brevard County	North IRL	658	135	$100,000
2020	Stormwater project in Basin 840	Brevard County	North IRL	619	84	$100,000
2020	Stormwater project in Basin 862	Brevard County	North IRL	416	72	$100,000
2020	Stormwater project in Basin 871	Brevard County	North IRL	366	53	$100,000
2020	Stormwater project in Basin 884	Brevard County	North IRL	437	68	$100,000
2020	Stormwater project in Basin 889	Brevard County	North IRL	539	85	$100,000
2020	Stormwater project in Basin 890	Brevard County	North IRL	533	110	$100,000
2020	Stormwater project in Basin 894	Brevard County	North IRL	794	116	$100,000
2020	Stormwater project in Basin 896	Brevard County	North IRL	581	123	$100,000
2020	Stormwater project in Basin 902	Brevard County	North IRL	276	35	$100,000
2020	Stormwater project in Basin 903	Brevard County	North IRL	631	88	$100,000
2020	Stormwater project in Basin 920	Brevard County	North IRL	511	87	$100,000

Year Removed	Project Name	Responsible Entity	Sub-Lagoon	Total Nitrogen Reduction (pounds per year)	Total Phosphorus Reduction (pounds per year)	Plan Funding
2020	Stormwater project in Basin 921	Brevard County	North IRL	743	96	$100,000
2020	Stormwater project in Basin 922	Brevard County	North IRL	601	107	$100,000
2020	Stormwater project in Basin 938	Brevard County	North IRL	424	160	$100,000
2020	Stormwater project in Basin 939	Brevard County	North IRL	502	71	$100,000
2020	Stormwater project in Basin 940	Brevard County	North IRL	816	106	$100,000
2020	Stormwater project in Basin 952	Brevard County	North IRL	1,251	212	$100,000
2020	Stormwater project in Basin 960	Brevard County	North IRL	537	80	$100,000
2020	Stormwater project in Basin 962	Brevard County	North IRL	527	75	$100,000
2020	Stormwater project in Basin 980	Brevard County	North IRL	836	127	$100,000
2020	Stormwater project in Basin 985	Brevard County	North IRL	687	99	$100,000
2020	Stormwater project in Basin 987	Brevard County	North IRL	1,099	172	$100,000
2020	Stormwater project in Basin 993	Brevard County	North IRL	611	93	$100,000
2020	Stormwater project in Basin 1002	Brevard County	North IRL	1,181	159	$100,000
2020	Stormwater project in Basin 1016	Brevard County	North IRL	920	136	$100,000
2020	Stormwater project in Basin 1027	Brevard County	North IRL	560	84	$100,000
2020	Stormwater project in Basin 1029	Brevard County	North IRL	685	93	$100,000
2020	Stormwater project in Basin 1032	Brevard County	North IRL	719	115	$100,000
2020	Stormwater project in Basin 1033	Brevard County	North IRL	1,113	152	$100,000
2020	Stormwater project in Basin 1034	Brevard County	North IRL	902	132	$100,000
2020	Stormwater project in Basin 1037	Brevard County	North IRL	533	105	$100,000
2020	Stormwater project in Basin 1039	Brevard County	North IRL	708	104	$100,000
2020	Stormwater project in Basin 1067	Brevard County	North IRL	463	67	$100,000
2020	Stormwater project in Basin 1071	Brevard County	North IRL	1,082	144	$100,000
2020	Stormwater project in Basin 1073	Brevard County	North IRL	428	61	$100,000
2020	Stormwater project in Basin 1076	Brevard County	North IRL	595	91	$100,000
2020	Stormwater project in Basin 1077	Brevard County	North IRL	1,687	289	$150,000
2020	Stormwater project in Basin 1080	Brevard County	North IRL	861	134	$100,000
2020	Stormwater project in Basin 1081	Brevard County	North IRL	1,281	210	$100,000
2020	Stormwater project in Basin 1112	Brevard County	North IRL	1,032	166	$100,000

Year Removed	Project Name	Responsible Entity	Sub-Lagoon	Total Nitrogen Reduction (pounds per year)	Total Phosphorus Reduction (pounds per year)	Plan Funding
2020	Stormwater project in Basin 1113	Brevard County	North IRL	416	93	$100,000
2020	Stormwater project in Basin 1124	Brevard County	North IRL	681	99	$100,000
2020	Stormwater project in Basin 1128	Brevard County	North IRL	279	77	$100,000
2020	Stormwater project in Basin 1150	Brevard County	North IRL	476	57	$100,000
2020	Stormwater project in Basin 1151	Brevard County	North IRL	1,057	141	$125,000
2020	Stormwater project in Basin 1172	Brevard County	North IRL	852	123	$100,000
2020	Stormwater project in Basin 1197	Brevard County	North IRL	609	82	$100,000
2020	Stormwater project in Basin 1213	Brevard County	North IRL	904	131	$100,000
2020	Stormwater project in Basin 1214	Brevard County	North IRL	727	84	$100,000
2020	Stormwater project in Basin 1215	Brevard County	North IRL	382	52	$100,000
2020	Stormwater project in Basin 1219	Brevard County	North IRL	512	60	$100,000
2020	Stormwater project in Basin 1220	Brevard County	North IRL	396	61	$100,000
2020	Stormwater project in Basin 1221	Brevard County	North IRL	545	85	$100,000
2020	Stormwater project in Basin 1222	Brevard County	North IRL	888	171	$100,000
2020	Stormwater project in Basin 1224	Brevard County	North IRL	401	111	$100,000
2020	Stormwater project in Basin 1228	Brevard County	North IRL	501	83	$100,000
2020	Stormwater project in Basin 1231	Brevard County	North IRL	300	58	$100,000
2020	Stormwater project in Basin 1233	Brevard County	North IRL	605	101	$100,000
2020	Stormwater project in Basin 1240	Brevard County	North IRL	638	100	$100,000
2020	Stormwater project in Basin 1241	Brevard County	North IRL	584	83	$100,000
2020	Stormwater project in Basin 1244	Brevard County	North IRL	576	78	$100,000
2020	Stormwater project in Basin 1245	Brevard County	North IRL	356	49	$100,000
2020	Stormwater project in Basin 1251	Brevard County	North IRL	448	66	$100,000
2020	Stormwater project in Basin 1253	Brevard County	North IRL	379	54	$100,000
2020	Stormwater project in Basin 1259	Brevard County	North IRL	450	106	$100,000
2020	Stormwater project in Basin 1262	Brevard County	North IRL	443	80	$100,000
2020	Stormwater project in Basin 1273	Brevard County	North IRL	1,964	288	$175,000
2020	Stormwater project in Basin 1291	Brevard County	North IRL	518	79	$100,000
2020	Stormwater project in Basin 1292	Brevard County	North IRL	386	60	$100,000

Year Removed	Project Name	Responsible Entity	Sub-Lagoon	Total Nitrogen Reduction (pounds per year)	Total Phosphorus Reduction (pounds per year)	Plan Funding
2020	Stormwater project in Basin 1293	Brevard County	North IRL	461	67	$100,000
2020	Stormwater project in Basin 1294	Brevard County	North IRL	628	94	$100,000
2020	Stormwater project in Basin 1295	Brevard County	North IRL	800	121	$100,000
2020	Stormwater project in Basin 1301	Brevard County	North IRL	1,025	154	$125,000
2020	Stormwater project in Basin 1307	Brevard County	North IRL	431	47	$100,000
2020	Stormwater project in Basin 1312	Brevard County	North IRL	549	120	$100,000
2020	Stormwater project in Basin 1313	Brevard County	North IRL	619	92	$100,000
2020	Stormwater project in Basin 1316	Brevard County	North IRL	557	68	$100,000
2020	Stormwater project in Basin 1318	Brevard County	North IRL	1,124	148	$100,000
2020	Stormwater project in Basin 1324	Brevard County	North IRL	1,422	176	$150,000
2020	Stormwater project in Basin 1330	Brevard County	North IRL	639	89	$100,000
2020	Stormwater project in Basin 1331	Brevard County	North IRL	1,000	159	$100,000
2020	Stormwater project in Basin 1339	Brevard County	North IRL	857	103	$100,000
2020	Stormwater project in Basin 1344	Brevard County	North IRL	459	61	$100,000
2020	Stormwater project in Basin 1348	Brevard County	North IRL	723	102	$100,000
2020	Stormwater project in Basin 1354	Brevard County	North IRL	597	86	$100,000
2020	Stormwater project in Basin 1359	Brevard County	North IRL	887	142	$100,000
2020	Stormwater project in Basin 1361	Brevard County	North IRL	524	79	$100,000
2020	Stormwater project in Basin 1363	Brevard County	North IRL	715	123	$100,000
2020	Stormwater project in Basin 1367	Brevard County	North IRL	1,042	146	$100,000
2020	Stormwater project in Basin 1372	Brevard County	North IRL	720	113	$100,000
2020	Stormwater project in Basin 1378	Brevard County	North IRL	744	104	$100,000
2020	Stormwater project in Basin 1380	Brevard County	North IRL	929	134	$100,000
2020	Stormwater project in Basin 1382	Brevard County	North IRL	622	88	$100,000
2020	Stormwater project in Basin 1384	Brevard County	North IRL	923	142	$100,000
2020	Stormwater project in Basin 1389	Brevard County	North IRL	822	134	$100,000
2020	Stormwater project in Basin 1390	Brevard County	North IRL	612	92	$100,000
2020	Stormwater project in Basin 1391	Brevard County	North IRL	887	142	$100,000
2020	Stormwater project in Basin 1395	Brevard County	North IRL	768	114	$100,000

Year Removed	Project Name	Responsible Entity	Sub-Lagoon	Total Nitrogen Reduction (pounds per year)	Total Phosphorus Reduction (pounds per year)	Plan Funding
2020	Stormwater project in Basin 1398	Brevard County	North IRL	449	74	$100,000
2020	Stormwater project in Basin 1401	Brevard County	North IRL	953	147	$100,000
2020	Stormwater project in Basin 1403	Brevard County	North IRL	558	88	$100,000
2020	Stormwater project in Basin 1413	Brevard County	North IRL	528	78	$100,000
2020	Stormwater project in Basin 1416	Brevard County	North IRL	1,799	229	$150,000
2020	Stormwater project in Basin 1417	Brevard County	North IRL	771	117	$100,000
2020	Stormwater project in Basin 1418	Brevard County	North IRL	832	111	$100,000
2020	Stormwater project in Basin 1423	Brevard County	North IRL	487	73	$100,000
2020	Stormwater project in Basin 1425	Brevard County	North IRL	690	113	$100,000
2020	Stormwater project in Basin 1426	Brevard County	North IRL	720	116	$100,000
2020	Stormwater project in Basin 1428	Brevard County	North IRL	440	65	$100,000
2020	Stormwater project in Basin 1429	Brevard County	North IRL	477	55	$100,000
2020	Stormwater project in Basin 1434	Brevard County	North IRL	932	112	$125,000
2020	Stormwater project in Basin 1435	Brevard County	North IRL	328	43	$100,000
2020	Stormwater project in Basin 1441	Brevard County	North IRL	1,034	149	$100,000
2020	Stormwater project in Basin 1459	Brevard County	North IRL	895	132	$100,000
2020	Stormwater project in Basin 1463	Brevard County	North IRL	1,321	195	$100,000
2020	Stormwater project in Basin 1491	Brevard County	North IRL	641	93	$100,000
2020	Stormwater project in Basin 1498	Brevard County	North IRL	483	74	$100,000
2020	Stormwater project in Basin 2419	Brevard County	North IRL	381	43	$100,000
2020	Stormwater project in Basin 2420	Brevard County	North IRL	450	121	$100,000
2020	Stormwater project in Basin 2421	Brevard County	North IRL	343	49	$100,000
2020	Stormwater project in Basin 1439	Brevard County	Central IRL	1,413	183	$200,000
2020	Stormwater project in Basin 1445	Brevard County	Central IRL	1,493	198	$200,000
2020	Stormwater project in Basin 1470	Brevard County	Central IRL	2,813	452	$200,000
2020	Stormwater project in Basin 1508	Brevard County	Central IRL	2,459	356	$200,000
2020	Stormwater project in Basin 1562	Brevard County	Central IRL	3,314	449	$275,000
2020	Stormwater project in Basin 1615	Brevard County	Central IRL	2,815	390	$200,000
2020	Stormwater project in Basin 1803	Brevard County	Central IRL	2,227	318	$200,000

Year Removed	Project Name	Responsible Entity	Sub-Lagoon	Total Nitrogen Reduction (pounds per year)	Total Phosphorus Reduction (pounds per year)	Plan Funding
2020	Stormwater project in Basin 1825	Brevard County	Central IRL	1,896	394	$200,000
2021	Cape Shores Swales	City of Cape Canaveral	Banana	31	15	$2,746
2021	Justamere Road Swale	City of Cape Canaveral	Banana	6	3	$528
2021	Hitching Post Berms	City of Cape Canaveral	Banana	29	22	$2,552
2021	Oyster Bar	Brevard County	Banana	120	3	$47,350
2021	Stewart Road Dry Retrofit	City of Melbourne	North IRL	208	47	$18,344
2021	Stormwater project in Basin 1349	Brevard County	North IRL	1,747	268	$354,400
2021	Stormwater project in Basin 1409	Brevard County	North IRL	1,375	209	$293,800
2021	Indian River Drive Oyster Bar	Brevard County	North IRL	34	1	$13,258
2021	Indian River Drive Planted Shoreline	Brevard County	North IRL	9	3	$2,240
2021	Stormwater project in Basin 2191	Brevard County	Central IRL	1,925	185	$326,500
2021	Stormwater project in Basin 1511	Brevard County	Central IRL	2,409	378	$410,300
2022	Cape Canaveral Air Force Station Regional – Rapid Infiltration Basin	Brevard County	Banana	4,625	1,226	$5,227,200
2022	Brevard Zoo Banana River Plant Project	Brevard Zoo	Banana	13	4	$3,120
2022	Brevard Zoo Banana River Plant Project 2	Brevard Zoo	Banana	2	1	$480
2022	Newfound Harbor Drive	Marine Resources Council	Banana	7	2	$1,680
2022	Port St. John Wastewater Treatment Plant – Rapid Infiltration Basin	Brevard County	North IRL	4,116	915	$980,100
2022	Brevard Zoo North Indian River Lagoon Plant Project 3	Brevard Zoo	North IRL	4	1	$960
2022	Brevard Zoo Central IRL Plant Project	Brevard Zoo	Central IRL	8	3	$1,920
2022	Canebreaker Condo – Sprayfield	Brevard County	North IRL	61	To be determined	$36,000

Appendix E: Long Descriptions of Figures

Figure 1-1: Decline of Commercial Fishing in Brevard County

The graph shows the declining value of the commercial fishery in Brevard County using Florida Fish and Wildlife Conservation Commission data from 1995 through 2019. The commercial fishery values drop over time while fish kill counts increase with the largest peaks in 2007 and 2016. The following table is an estimate of the values represented in the graph and are not the exact values.

Reporting Year	Value of Commercial Fishery
1995	$21,808,095
1996	$24,052,219
1997	$15,027,821
1998	$11,264,215
1999	$14,765,165
2000	$15,879,487
2001	$13,096,088
2002	$6,253,406
2003	$7,155,669
2004	$8,219,153
2005	$6,314,361
2006	$6,216,198
2007	$5,127,527
2008	$8,207,268
2009	$6,166,197
2010	$6,499,390
2011	$8,354,718
2012	$7,932,126
2013	$7,278,107
2014	$6,588,523
2015	$7,960,368
2016	$6,647,791
2017	$8,444,720
2018	$6,747,679
2019	$7,925,947

Return to **Figure 1-1**.

Figure 2-2. Summary of the Save Our Indian River Lagoon Outputs and Outcomes

Graphic showing output of Public Education will result in years 0–5 early adopters lead, years 6–10 supporters join, and years 10+ lagoon friendly lifestyles are normal. Output of Reclaimed Water Upgrades, Sewer Later Rehabilitation, Septic System Removal and Upgrades, and Stormwater Treatment will result in years 0–5 cleaner ground and surface water, years 6–10 cleaner lagoon water, and years 10+ lush seagrass beds. Outputs of Muck Removal and Treatment of Muck Interstitial Water will result in years 0–5 exposed sandy sediments and tons of pollution removed, years 5–10 plentiful bottom dwelling marine life, and years 10+ abundant fishes. Output of Oyster Reefs and Living Shorelines will result in years 0–5 increased filtration, years 5–10 faster storm recovery, and years 10+ healthy stability. Outputs of Project Performance Monitoring and Plan Updates will result in years 0–5 increased efficiency and cost

effectiveness, years 5–10 lagoon report card shows improvement, and years 10+ the Indian River Lagoon economy grows.

Return to **Figure 2-2**.

Figure 4-1: Grass Clippings Example for a Typical Lot

Example graphic showing the potential for grass clippings to get onto and be left on a road. For a 100 foot by 100 foot lot with a 2,500 square foot home and driveway, it will produce an estimated 3,000 pounds of grass clippings per year containing 75 pounds of total nitrogen and 10.4 pounds of total phosphorus. Grass clippings can be blown into the road from an approximately 2-foot-wide strip of lawn.

Return to **Figure 4-1**.

Figure 4-2: Septic System Removal Projects in Banana River Lagoon

Map showing the locations of the highest priority and high priority sewer locations within the northern portion of the Banana River Lagoon. The five areas with the highest loading, which include North Merritt Island Zone E, Sykes Creek Zone N, Merritt Island Zone C, Merritt Island Zone F, and Sykes Creek Zone M, are funded for septic removal. The map also shows the locations of all individual septic systems with loading estimates of 0–10 pounds, 10–30 pounds, and 30–50 pounds. Most are concentrated along the water in the west and southeast portions of Merritt Island with the areas closest to water being either 10–30 pounds or 30–50 pounds. The areas further from the water are 0–10 pounds. There are areas scattered across the north-central portion of Merritt Island. There is a line running north to south in the west that shows the drainage divide. The Bennett Causeway runs east to west through the middle of the map and North Courtenay Parkway runs north to south.

Return to **Figure 4-2**.

Figure 4-3: Septic System Removal Projects in Banana River Lagoon, continued

Map showing the locations of the highest priority and high priority sewer locations within the southern portion of the Banana River Lagoon. The six areas with the highest loading, which include Merritt Island Redevelopment Agency Phase 1, Merritt Island Redevelopment Agency Phase 2 Cone Road, Sykes Creek Zone R, Sykes Creek Zone G, South Banana Zone B, and Sykes Creek Zone T, are funded. The map also shows the locations of all septic systems with loading estimates of 0–10 pounds, 10–30 pounds, and 30–50 pounds. These cover most of the areas near the water with the areas closest to the water being either 10–30 pounds or 30–50 pounds. The areas further from the water, including the center of Merritt Island, are 0–10 pounds. There is a line running north to south in the west that shows the drainage divide. South Tropical Trail runs north to south through most of the septic areas on this map.

Return to **Figure 4-3**.

Figure 4-4: Septic System Removal Projects in Banana River Lagoon, continued

Map showing the locations of the highest priority and high priority sewer locations within the central portion of the Banana River Lagoon. None of the areas on the map are funded. The map

also shows the locations of all septic systems with loading estimates of 0–10 pounds, 10–30 pounds, and 30–50 pounds. Most of Merritt Island is 10–30 pounds with a scattering of 30–50 pounds in the north portion. There are also a few areas of 0–10 pounds in the center north part of the island. There is a line running north to south in the west that shows the drainage divide. Pineda Causeway runs east to west and Rockledge Boulevard runs north to south in this area.

Return to **Figure 4-4**.

Figure 4-5: Septic System Removal Projects in North IRL

Map showing the locations of the highest priority and high priority sewer locations within the northern portion of the North Indian River Lagoon. The four areas with the highest loading, which include Titusville Zone A, Titusville Zone B, Titusville Zone C, and Titusville Zone H, are funded. The map also shows the locations of all septic systems with loading estimates of 0–10 pounds, 10–30 pounds, and 30–50 pounds. The zones previously mentioned have loading in the 10–30 pounds and 30–50 pounds range. There is a sparse scatter of 0–10 pound zones over the rest of the map with two dense concentrations in the northern half of the map. There is a line running north to south in the west that shows the drainage divide. Garden Street runs east to west in the northern portion of the map and Cheney Highway/Orlando Road runs east to west in the southern part of the map. South Street loops through the map area.

Return to **Figure 4-5**.

Figure 4-6: Septic System Removal Projects in North IRL, continued

Map showing the locations of the highest priority and high priority sewer locations within the north-central portion of the North Indian River Lagoon. The seven areas with the highest loading, which include Titusville Zone D, Titusville Zone E, Titusville Zone F, Titusville Zone G, Sharpes Zone A, Sharpes Zone B, and Cocoa Zone C, are funded. The map also shows the locations of all septic systems with loading estimates of 0–10 pounds, 10–30 pounds, and 30–50 pounds. These cover most of the areas near the water with the areas closest to the water being either 10–30 pounds or 30–50 pounds. The areas further from the water are 0–10 pounds. There is a line running north to south in the west that shows the drainage divide. National Aeronautics and Space Administration Causeway is at the top of the map and Indian River Drive/North Cocoa Boulevard runs north to south.

Return to **Figure 4-6**.

Figure 4-7: Septic System Removal Projects in North IRL, continued

Map showing the locations of the highest priority and high priority sewer locations within the central portion of the central North Indian River Lagoon. The five areas with the highest loading, which include Cocoa Zone C, Cocoa Zones J and K, City of Rockledge Breeze Swept, City of Rockledge, and Rockledge Zone B. All are funded. The map also shows the locations of all septic systems with loading estimates of 0–10 pounds, 10–30 pounds, and 30–50 pounds. These cover most of the areas near the water with the areas closest to the water being either 10–30 pounds or 30–50 pounds. The areas further from the water are 0–10 pounds. There is a line running north to south in the west that shows the drainage divide. Bennett Causeway runs east to west in the northern portion of the map and King Street/Hubert Humphrey Causeway/Merritt Island Causeway runs east to west in the southern portion of the map. Cocoa Boulevard runs north to south in the western portion of the map and North Courtenay Parkway runs north to south in the eastern portion of the map.

Return to **Figure 4-7**.

Figure 4-8: Septic System Removal Projects in North IRL, continued

Map showing the locations of the highest priority and high priority sewer locations within the south-central portion of the North Indian River Lagoon. The areas of City of Rockledge Breeze Swept, City of Rockledge, Rockledge Zone B, and South Central Zone A are funded. The map also shows the locations of all septic systems with loading estimates of 0-10 pounds, 10–30 pounds, and 30–50 pounds. These cover most of the areas near the water with the areas closest to the water being either 10–30 pounds or 30–50 pounds. The areas further from the water are 0–10 pounds. Rockledge Zone C is not along the water and has areas near the center that are 10–30 pounds or 30–50 pounds and the areas near the east and west sides are 0–10 pounds. There is a line running north to south in the west that shows the drainage divide. The Merritt Island Causeway runs east to west at the top of the map. Cocoa Boulevard/Rockledge Boulevard runs north to south in the western portion of the map and South Tropical Trail runs north to south in the eastern portion of the map.

Return to **Figure 4-8**.

Figure 4-9: Septic System Removal Projects in North IRL, continued

Map showing the locations of the highest priority and high priority sewer locations within the southern portion of the North Indian River Lagoon. The areas of South Central Zone C, South Central Zone D (Brevard), South Central Zone D (Melbourne), City of Melbourne Riverside, City of Melbourne Zone A, City of Melbourne Kent, and City of Melbourne Villa Espana are funded. The map also shows the locations of all septic systems with loading estimates of 0–10 pounds, 10–30 pounds, and 30–50 pounds. These cover most of the areas near the water with the areas closest to the water being either 10–30 pounds or 30–50 pounds. The areas further from the water are 0–10 pounds. There is a line running north to south in the west that shows the drainage divide. Pineda Causeway runs east to west in the middle of the map. Rockledge Drive runs north to south in the western portion of the map and South Tropical Trail runs north to south in the eastern portion.

Return to **Figure 4-9**.

Figure 4-10: Septic System Removal Projects in North IRL, continued

Map showing the locations of the highest priority and high priority sewer locations within the southern portion of the North Indian River Lagoon. The areas of City of Melbourne Riverside, City of Melbourne Zone A, City of Melbourne Kent, City of Melbourne Villa Espana, City of Melbourne Bowers, South Central Zone F, South Beaches Zone A, South Beaches Zone P, and South Beaches Zone O are funded. The map also shows the locations of all septic systems with loading estimates of 0–10 pounds, 10–30 pounds, and 30–50 pounds. These cover most of the areas near the water with the areas closest to the water being either 10–30 pounds or 30–50 pounds. The areas further from the water are 0–10 pounds. There are clusters of all three types of loading in the west-central and southwest part of the map. There is a line running north to south in the west that shows the drainage divide. Eau Gallie Boulevard runs east to west in the middle of the map. Dixie Highway runs north to south in the western portion of the map and Patrick Drive runs north to south in the eastern portion.

Return to **Figure 4-10**.

Figure 4-11: Septic System Removal Projects in Central IRL

Map showing the locations of the highest priority and high priority sewer locations within the northern portion of the Central Indian River Lagoon. The funded areas include City of West Melbourne Dundee Place and Manor Place, City of West Melbourne Lake Ashley Circle, City of West Melbourne Sylvan Estates, City of Melbourne Roxy, City of Melbourne Pennwood, City of Melbourne Hoag, and City of Melbourne Avenida del Rio are funded. The map also shows the locations of all septic systems with loading estimates of 0–10 pounds, 10–30 pounds, and 30–50 pounds. These cover some of the areas near the water with the areas closest to the water being 30–50 pounds. The areas further from the water are 0–10 pounds and 10–30 pounds mostly clustered in the center of the map just west of the Melbourne Causeway along U.S. 192 and approximately 4 miles west of U.S. 192 in West Melbourne. New Haven Avenue/Melbourne Causeway runs east to west through the middle of the map. Babcock Street runs north to south in the middle of the map and Dixie Highway runs north to south closer to the eastern portion of the map.

Return to **Figure 4-11**.

Figure 4-12: Septic System Removal Projects in Central IRL, continued

Map showing the locations of the highest priority and high priority sewer locations within the southern portion of the Central Indian River Lagoon. The funded areas include City of Palm Bay Zones A and B. The map also shows the locations of all septic systems with loading estimates of 0–10 pounds, 10–30 pounds, and 30–50 pounds. These cover about 30% of the map with a few areas closest to the water being either 10–30 pounds or 30–50 pounds. The areas further from the water are 0–10 pounds and tightly clustered in the western part of the map west of Babcock Street in the Malabar area. There are clusters of all three types of loading away from the water in the central and south central part of the map. Babcock Street runs north to south in the western portion of the map and Dixie Highway runs north to south in the western portion.

Return to **Figure 4-12**.

Figure 4-13: Septic System Removal Projects in Central IRL, continued

Map showing the locations of the highest priority and high priority sewer locations within the south central portion of the Central Indian River Lagoon. None of the areas on this map are funded. The map also shows the locations of all septic systems with loading estimates of 0–10 pounds, 10–30 pounds, and 30–50 pounds. These cover half of the areas near the water on the Barrier Island on the eastern portion of the map. There are isolated clusters of high loading areas along the waterfront on the mainland or western side of the map. There are clusters of all three types of loading away from the water in the west-central and south west part of the map. Highway A1A runs north to south in the middle of the map.

Return to **Figure 4-13**.

Figure 4-14: Septic System Removal Projects in Central IRL, continued

Map showing the locations of the highest priority and high priority sewer locations within the southern portion of the Central Indian River Lagoon. The funded areas include Micco Zones A and B. The map also shows the locations of all septic systems with loading estimates of 0–10 pounds, 10–30 pounds, and 30–50 pounds. These cover most of the areas near the water and along the Saint Sebastian River with the areas closest to the water being either 10–30 pounds or 30–50 pounds. The areas further from the water in the northwestern portion of the map are 30–50 pounds. There are clusters of all three types of loading in the northwestern and southern part of the map. Dixie Highway runs north to south in the middle of the map and Highway A1A runs north to south in the western portion of the map.

Return to **Figure 4-14**.

Figure 4-15: Quick Connection Septic System Removal Locations in North Brevard County

Map showing the locations of properties eligible to receive reimbursement to connect to a sewer system in the northern portion of the north Indian River Lagoon. Dots scattered along the map indicate whether the owner can connect to a force main or gravity type sewer and whether the parcel is a high priority. On this map the, dots are mostly near the water. Approximately half are for force main connections and half are for gravity sewer connections. There is a line running north to south in the west that shows the drainage divide. These sites are located north and south of the National Aeronautics and Space Administration Causeway on the western side of the lagoon.

Return to **Figure 4-15**.

Figure 4-16: Quick Connection Septic System Removal Locations in Central Brevard County

Map showing the locations of properties eligible to receive reimbursement to connect to a sewer system in the central Indian River Lagoon. Dots scattered along the map indicate whether the owner can connect to a force main or gravity type sewer and whether the parcel is a high priority. On this map the, dots are mostly near the water and tightly clustered in the northern portion of the map on Merritt Island. There are a few scattered near the water in the southern portion of the map south of the Pineda Causeway. Approximately half are for force main connections and half are for gravity sewer connections. There is a line running north to south in the west that shows the drainage divide. The sites are located near the Merritt Island Causeway to the northern portion of the map and Pineda Causeway to the southern portion of the map.

Return to **Figure 4-16**.

Figure 4-17: Quick Connection Septic System Removal Locations in South Brevard County

Map showing the locations of properties eligible to receive reimbursement to connect to a sewer system in the southern portion of the Indian River Lagoon in Brevard County. Dots scattered along the map indicate whether the owner can connect to a force main or gravity type sewer and whether the parcel is a high priority. On this map, the dots are mostly near the water and

tightly clustered in the northern portion of the map near Melbourne and Eau Gallie. There are a few scattered near the water in the central portion of the map near Malabar. Approximately 20% are for force main connections and approximately 80% are for gravity sewer connections. There is a line running north to south in the west that shows the drainage divide.

Return to **Figure 4-17**.

Figure 4-18: Example In-Ground Nitrogen-Reducing Biofilter Septic System

This a diagram showing how an in-ground nitrogen reducing biofilter is constructed. It shows a septic tank to the left with a pipe leading out of it with an arrow showing the direction of water flow to the drainfield. The drainfield area is depicted as an 18-inch layer of soil above a 12-inch layer of woodchips or other denitrification media. There is a layer below these that shows an empty space which indicates native soil that should be at least six inches above the seasonal high water table.

Return to **Figure 4-18**.

Figure 4-19: Septic System Upgrades in North Brevard County

Map showing the locations of properties eligible to receive reimbursement to install an upgraded septic system in the northern portion of Brevard County along the Indian River Lagoon. Dots scattered along the map indicate whether the owner is eligible to receive reimbursement. On this map, the dots are mostly near the water and scattered from north to south. There is a line running north to south in the west that shows the drainage divide. The National Aeronautics and Space Administration Causeway runs east to west near the southern part of the map.

Return to **Figure 4-19**.

Figure 4-20: Septic System Upgrades in Central Brevard County

Map showing the locations of properties eligible to receive reimbursement to install an upgraded septic system in the central portion of Brevard County along the Indian River Lagoon. Dots scattered along the map indicate whether the owner is eligible to receive reimbursement. On this map, the dots are mostly near the water and scattered from north to south on Merritt Island. There is a line running north to south in the west that shows the drainage divide. The Bennett Causeway and Merritt Island Causeway run east to west in the northern portion of the map. Rockledge Parkway runs north to south on the western side and Courtenay Parkway runs north to south on the eastern side of the lagoon.

Return to **Figure 4-20**.

Figure 4-21: Septic System Upgrades in South Brevard County

Map showing the locations of properties eligible to receive reimbursement to install an upgraded septic system in the southern portion of Brevard County along the Indian River Lagoon. Dots scattered along the map indicate whether the owner is eligible to receive reimbursement. On this map, the dots are mostly near the water and scattered from north to south on along U.S. 1 and about one to three miles inland. There is a line running north to south in the west that shows the drainage divide. The Eau Gallie Causeway and 5th Avenue run east to west near the top of the map Babcock Street runs north to south in the middle of the map.

Return to **Figure 4-21**.

Figure 4-22: Stormwater Projects in North Brevard County

Map showing the selected basins for stormwater treatment in the northern portion of the Banana River Lagoon and North Indian River Lagoon in Brevard County. Project areas cover roughly 60% of the shoreline on the mainland and are all part of the North Indian River Lagoon. Project areas cover roughly 75% of North Merritt Island and half are part of the North Indian River Lagoon while the other half are part of the Banana River Lagoon. Project areas cover roughly 85% of the Barrier Island and all are part of the Banana River Lagoon.

Return to **Figure 4-22**.

Figure 4-23: Stormwater Projects in Central Brevard County

Map showing the selected basins for stormwater treatment in the southern portion of the Banana River Lagoon and North Indian River Lagoon in Brevard County. Project areas cover roughly 50% of the shoreline on the mainland and are all part of the North Indian River Lagoon. Project areas cover roughly 70% of South Merritt Island and half are part of the North Indian River Lagoon while the other half are part of the Banana River Lagoon. Project areas cover roughly 80% of the Barrier Island and all are part of the Banana River Lagoon.

Return to **Figure 4-23**.

Figure 4-24: Stormwater Projects in South Brevard County

Map showing the selected basins for stormwater treatment in the Central Indian River Lagoon for Brevard County. There is one project area on the Barrier Island on the north end of the map that is part of the Banana River Lagoon. Project areas for the Central Indian River Lagoon cover roughly 30% of the shoreline and are concentrated in the north half of the mainland with two sections also on the Barrier Island. Ten project areas are scattered inland from the shoreline in the southern half of the map.

Return to **Figure 4-24**.

Figure 4-25: Location of Muck Removal Projects in the Northern Banana River Lagoon

Map of the northern Banana River Lagoon in Brevard County showing the locations of the funded and unfunded muck removal projects. There are four unfunded projects in the very northern part of the Banana River Lagoon near the top of the map. Towards the bottom of the map, just south of State Highway 528, there are two funded projects: Canaveral South is along the Barrier Island shoreline and Merritt Island Phase I is along the Merritt Island shoreline. Additional unfunded projects are located at the bottom of the map, as well as the canals on Merritt Island.

Return to **Figure 4-25**.

Figure 4-26: Location of Muck Removal Projects in the Southern Banana River Lagoon

Map of the southern Banana River Lagoon in Brevard County showing the locations of the funded and unfunded muck removal projects. Towards the top of the map, just south of State Highway 528, are three funded projects. Canaveral South is along the Barrier Island shoreline. Merritt Island Phase I is just to the south and west along the Merritt Island shoreline. The Sykes Creek project is a little further south and west from that project. Further south, below State Highway 520, is the Cocoa Beach IIB project along the Barrier Island shoreline. South of that is the Cocoa Beach Phase III project. To the west of that is the Cocoa Beach Golf project. About six miles south along the Barrier Island is the Patrick Space Force Base project. To the west of that is the Pineda Banana River Lagoon project near the Merritt Island shoreline. South of that project, and south of State Highway 404 is the Grand Canal project on the Barrier Island. South of that project is the Satellite Beach project followed by the Indian Harbour Beach project.

Return of **Figure 4-26**.

Figure 4-27: Location of Muck Removal Projects in North IRL

Map of the North Indian River Lagoon in Brevard County showing the locations of the funded and unfunded muck removal projects. There are six funded projects. Titusville Railroad West is at the top of the map along the mainland shoreline. Just east of that on the Merritt Island shoreline is the Titusville Railroad East project. The National Aeronautics and Space Administration Causeway East project is about 10 miles south along the Merritt Island shoreline and just north of State Highway 405. The Rockledge A project is about 15 miles south along the Merritt Island shoreline. The Eau Gallie Northeast project is about 9 miles south near the Merritt Island shoreline. The Spring Creek project is located about two miles south and near the bottom of the map on the mainland.

Return to **Figure 4-27**.

Figure 4-28: Location of Muck Removal Projects in Central IRL

Map of the Central Indian River Lagoon in Brevard County showing the locations of the funded and unfunded muck removal projects. The only funded project is the Turkey Creek project, which is about three miles south of U.S. Highway 192 along the mainland shoreline.

Return to **Figure 4-28**.

Figure 4-29: Phase I Potential Enhanced Circulation Project Locations

Map of Brevard County showing a 40 square mile area where potential enhanced circulation projects could be located. The St. Johns River Water Management District identified potential projects the following areas: one in the southern part of the Mosquito Lagoon, one in the northern part of the Banana River Lagoon, two in Cape Canaveral, one at Patrick Air (Space) Force Base, and one at Malabar. They identified four internal projects with one at the north end of Merritt Island, two around Haulover Canal, and one in central Merritt Island. CDM Smith identified 23 additional potential project locations both internal and external spread throughout Brevard County with a heavy concentration around central Merritt Island.

Return to **Figure 4-29**.

Figure 4-30: Shoreline Survey to Identify Locations Appropriate for Oyster Bars and Planted Shorelines

Map of Brevard County showing the shoreline survey edge types including bulkhead and seawall, hardened slope and riprap, and no structures. No structures were found mainly in the northern portion of the county on the mainland and also around the central part of Merritt Island near Kennedy Space Center. There were also small concentrations on the southern part of Merritt Island in the Banana River Lagoon and on the southern portion of the Barrier Island. The rest of the shoreline was interspersed with both bulkhead and seawall types and hardened slope and riprap types. A large concentration of bulkhead and seawall was found on the western shore of Merritt Island, along Sykes Creek, in Cocoa Beach, and much of the west coast of the central Barrier Island.

Return to **Figure 4-30**.

Figure 4-31: Estimated Economic Value of Some Seagrass Services

Graphic showing the economic value provided by seagrass adapted from Dewsbury et. al. (2016). Seagrass provide direct grazing by turtles, manatees, fish, and snails, which has an unknown economic value. It is also nursery grounds for fish and crabs and benefit coral reefs, commercial fisheries, and recreation for a $4,600 per acre per year economic value. Additionally, it sequesters carbon, which reduces carbon dioxide for a $162 per acre per year economic value. It also reduces wave energy, which leads to sediment stability and improved water quality for an unknown economic benefit. Finally, it cycles and sequesters nutrients for an economic value of $7,695 per acre per year. Seagrasses provide a total economic benefit of $12,457 per acre per year. In 2007, there were 72,400 acres providing a total benefit of more than $902,000,000.

Return to **Figure 4-31**.

Figure 4-32: Completed Projects in North Brevard County

Map of North Brevard County showing locations of 16 completed projects. Near the top of the map, the Basin 10 County Line Road woodchip bioreactor is located at the north end on the west shore of the Indian River Lagoon. About two and a half miles southeast of that is the Basin 22 Huntington Road Serenity Park woodchip bioreactor. One mile southwest of that is the Basin 51 Johns Road pond biosorption activated media. About a half mile southeast of that is the County stormwater pond harvesting. Two miles south is Basin 100 Burkholm Road biosorption activated media. A half mile south of that is Basin 115 Carter Road biosorption activated media. One mile south of that is the Basin 141 Irwin Avenue woodchip bioreactor. One mile south of that is the Basin 193 Wiley Avenue biosorption activated media. A half mile south of that is Mims muck removal. About three miles south is Coleman Pond managed aquatic plant system. About a mile southeast is the Osprey Plant pond managed aquatic plant system. About a half mile southwest is the Draa Field vegetation harvesting and Draa Field pond managed aquatic plant systems. One mile southeast is the South Street baffle box. Two miles south of that is St. Theresa baffle box. A half mile south of that is the La Paloma baffle box.

Return to **Figure 4-32**.

Figure 4-33: Completed Projects in Central Brevard County

Map of Central Brevard County showing locations of 16 completed projects. Near the top of the map is the Basin 832 Broadway Pond biosorption activated media. Six miles south of that is the floating wetlands to existing stormwater ponds. Two miles south of that is the Church Street baffle box. Two miles south of that is the Breeze Swept septic removal. Eight miles south of that is the Basin 1298 bioreactor. Two miles south of that is the Sherwood Park stormwater quality project. One mile south of that is the Thrush Drive baffle box. One mile southeast of that is the Cliff Creek baffle box. In the southern part of Merritt Island is the Merritt Island Redevelopment Agency Septic Removal Phase 1 and Phase 2 septic removal projects. In the southern part of the Barrier Island is the Central Boulevard baffle box. About five miles south of that is the Cocoa Beach Water Reclamation Facility upgrade and Cocoa Beach muck dredging Phase III. Seven miles south of that is the Basin 1304 bioreactor. Two miles south of that is the Jackson Court stormwater treatment facility. Three miles south of that is the Big Muddy at Cynthia baffle box.

Return to **Figure 4-33**.

Figure 4-34: Completed Projects in South Brevard County

Map of south Brevard County showing locations of 10 completed projects. Near the top of the map is the Thrush Drive baffle box on the western shore of the lagoon. One mile southeast is the Cliff Creek baffle box. Six miles south of that is the Bayfront stormwater project and Turkey Creek muck removal. About six miles to the southwest is the Sylvan Estates septic-to-sewer conversion. About six miles southeast of that is the Basin 2134 Fleming Grant biosorption activated media. Near the top of the map on the Barrier Island is the Gleason Park reuse upgrade and the Big Muddy Cynthia baffle box. About three miles south of that is the Basin 5 dry retention. Twelve miles south of that is the Long Point package plant upgrade.

Return to **Figure 4-34**.

Figure 4-36. Distribution of Oyster Sizes, Age, and Average Number of Measured Oysters Per Unit

A bar chart showing the distribution of oyster sizes, as of most recent monitoring, for oyster sites located within the Banana River Lagoon, North Indian River Lagoon, and Central Indian River Lagoon. At each site, there are two bars for the number of oysters at the start of the bar creation and the number at the time of sampling. The number of settlers, subadults, adults, and large adults are shown. The following table summarizes the values shown in the bar graph.

Location	Oyster Age (Years)	Settler	Subadult	Adult	Large Adult
Bettinger	0.00	0.00	2.40	22.60	0.00
Bettinger	1.50	0.00	0.00	11.20	4.40
Gitlin	0.00	1.00	11.88	22.88	1.25
Gitlin	1.50	0.00	0.00	5.38	1.38
Marina Isles	0.00	0.00	3.33	23.11	1.11
Marina Isles	0.75	2.78	17.78	23.67	1.78
Bomalaski	0.08	26.80	6.00	16.80	0.40
Bomalaski	2.00	6.00	11.60	19.20	1.80
Ahmed/Niland	0.00	0.00	0.43	23.50	1.07
Ahmed/Niland	0.25	5.07	5.57	20.14	1.57
MacNiell/Pitner	0.00	0.00	0.00	0.00	0.00
MacNiell/Pitner	0.25	7.62	6.77	0.31	0.00

Location	Oyster Age (Years)	Settler	Subadult	Adult	Large Adult
Coconut Point	0.00	0.00	0.10	22.20	2.70
Coconut Point	0.50	22.00	15.70	4.10	0.40
Hog Point	0.00	0.00	0.00	21.60	3.40
Hog Point	0.50	19.40	23.20	6.80	0.60
Maritime Hammock	0.00	0.00	0.80	22.60	1.60
Maritime Hammock	0.50	26.00	15.60	7.60	0.80
Riverview Senior	0.00	0.40	3.07	21.80	0.13
Riverview Senior	2.00	36.50	6.67	5.75	0.17

Return to **Figure 4-36**.

Figure 4-35. Countywide Groundwater Nutrient Concentrations for TN (top) and TP (bottom)

Bar graphs showing the total nitrogen (TN) and total phosphorus (TP) concentrations in groundwater for four areas: natural or undeveloped, septic system communities, sewer communities, and reclaimed water communities. The following table summarizes the values shown in the bar graphs.

Area	Total Nitrogen Concentration (milligrams per liter)	Total Phosphorus Concentration (milligrams per liter)
Natural, Undeveloped Area	0.46	0.13
Septic Communities	6.07	0.96
Sewer Communities	1.99	0.19
Reclaimed Water Communities	6.07	0.26

Return to **Figure 4-35**.

Figure 5-2: Evolution of Project Funding Allocations

Series of pie charts showing the percent distribution of funding from the original plan to each of the plan updates in 2017, 2018, 2019, 2020, 2021, and 2022. Public education makes up about 0% of the total funding in all years except 2022 when it is about 1%. Wastewater facility upgrades for reclaimed water were 3% of the costs in the original plan and 2017 Supplement, 4% in the 2018 Update, 7% in the 2019 Update, and 6% in the 2020, 2021, and 2022 Updates. Rapid infiltration basins/sprayfield upgrades were added in the 2019 Update as 1% of the cost, 2% in the 2020 and 2021 Updates, and 0% in the 2022 Update. Package plant connections were added in the 2021 Update and represent 1% of the costs, also in the 2022 Update. Sewer laterals were added in the 2019 Update and represent about 0% of the cost in all years. Septic system removal was 14% of the cost in the original plan and 2017 Supplement, 13% in the 2018 Update, 26% in the 2019 Update, 30% in the 2020 and 2021 Updates, and 31% in the 2022 Update. Septic system upgrades were 7% of the cost in the original plan and 2017 Supplement, 6% in the 2018 and 2019 Updates, and 7% in the 2020, 2021, and 2022 Updates. Stormwater projects were 4% of the costs in the original plan and 2017 and 2018 Updates, 11% in the 2019 Update, 12% in the 2020 Update, and 11% in the 2021 and 2022 Updates. Muck removal was 66% of the cost in the original plan and 2017 Supplement, 58% in the 2018 Update, 30% in the 2019 Update, 27% in the 2020 Update, and 26% in the 2021 and 2022 Updates. Treatment of interstitial water was added in the 2019 Update at 13% of the costs, 12% in the 2020 Update, and 11% in the 2021 and 2022 Updates. Oyster bars and living shorelines were 3% of the costs in the original plan through the 2019 Update, and 2% in the 2020, 2021, and 2022 Updates.

Project monitoring was 3% of the costs in the original plan through the 2019 Update, and 2% in the 2020, 2021, and 2022 Updates.

Return to **Figure 5-2**.

Figure C-1: Mean Areal Extent of Seagrass and Mean Length of Transects

A line and bar graph comparing seagrass extent in hectares versus the mean transect length in meters. The date range is 1943 and then every other year from 1992 to 2019. In 1942, the seagrass extent was about 29,000 hectares. In 1992 the extent was about 26,000 hectares. The extent gradually climbed to a peak of around 32,000 hectares in 2008 and 2010, respectively. The extent then drastically dropped in 2012 to about 17,000 hectares. It slowly increased to about 23,000 hectares in 2016 and then dropped to about 13,500 hectares in 2019. The mean transect length followed a similar trend in years starting at about 100 meters in 1994 with a peak around 180 meters in 2016 and 2018. It dropped to around 70 meters in 2012 and increased to 100 in 2015. It then dropped to about 65 in 2019. The following table is an estimate of the numbers shown in the graph and does not represent the actual data.

Year	Seagrass extent (hectares)	Mean transect length (meters)
1943	29,537	No data
1992	26,334	No data
1994	24,893	104
1996	27,229	122
1999	28,699	140
2003	29,798	138
2005	29,798	138
2007	32,551	178
2009	32,209	184
2011	18,506	105
2013	20,702	87
2015	23,797	107
2017	15,463	62
2019	13,437	59

Return to **Figure C-1**.

Figure C-2: Mean Chlorophyll-a Concentrations

Line graph of mean chlorophyll *a* in micrograms per liter showing lines for the Mosquito Lagoon (ML), Banana River Lagoon (BRL), North Indian River Lagoon (NIRL), North Central Indian River Lagoon (NCIRL), and Sebastian (Seb). The time span is yearly from 1997 to 2021. 1997 had values ranging from 1.14 to 22.74 with the highest in NCIRL. 1998 ranged from 1.25 to 37.14 with the highest in Seb. 1999 ranged from 2.24 to 19.34 with the highest in NIRL. 2000 ranged from 1.06 to 14.00 with the highest in BRL. 2001 ranged from 1.68 to 49.70 with the highest in NCIRL. 2002 ranged from 0.98 to 38.2 with the highest in NCIRL. 2003 ranged from 0.30 to 15.97 with the highest in North IRL. 2004 ranged from 0.80 to 18.72 with the highest in NIRL. 2005 ranged from 0.45 to 42.98 with the highest in NIRL. 2006 ranged from 0.00 to 18.51 with the highest in NIRL. 2007 ranged from 0.34 to 18.55 with the highest in Seb. 2008 ranged from 0.57 to 26.68 with the highest in NCIRL. 2009 ranged from 1.02 to 29.40 with the highest in NIRL. 2010 ranged from 1.08 to 60.70 with the highest in NCIRL. 2011 ranged from 2.63 to 83.73 with the highest in NIRL. 2012 ranged from 2.22 to 151.58 with the highest in ML. 2013

ranged from 0.79 to 39.68 with the highest in NIRL. 2014 ranged from 0.89 to 25.97 with the highest in NIRL. 2015 ranged from 1.49 to 38.20 with the highest in NIRL. 2016 ranged from 2.21 to 128.36 with the highest in BRL. 2017 ranged from 1.86 to 49.28 with the highest in NIRL. 2018 ranged from 1.43 to 98.49 with the highest in BRL. 2019 ranged from 2.95 to 78.16 with the highest in BRL. 2020 ranged from 1.63 to 184.99 with the highest in NIRL. 2021 ranged from 1.32 to 60.36 with the highest in BRL.

Return to **Figure C-2**.

J.1.

SECTION 7. OFFICIAL BALLOT. Ballots to be used in the referendum shall contain a statement of the description of the proposed issue on economic development ad valorem tax exemptions and shall be in substantially the following form:

BALLOT
Brevard County, Florida

Caption: Save Our Indian River Lagoon ½ Cent Sales Tax Referendum

To restore the Indian River Lagoon through financing, planning, constructing, maintaining, and operating capital improvements and capital maintenance projects and programs designed to improve water quality, fish, wildlife and marine habitat, remove muck and reduce pollution, shall an ordinance be approved levying a ½ cent sales tax for ten years and requiring deposit of all revenue to a Save Our Lagoon Trust Fund solely for such projects, with citizen committee oversight and annual independent audits?

___ YES For the ½ cent sales tax

___ NO Against the ½ cent sales tax

SECTION 8. ABSENTEE VOTING. The form of ballots to be used in such referendum for absentee voters shall be the same as used at the polling places for said referendum or such other form as may be prescribed by law.

FWC reported 177 dead manatees in Brevard as of 11 Feb 2022; 70% of dead manatees in Florida

Vince Lamb is with **Kimberly Meehan Agee** and **Dixie Sansom.**
Sep 9, 2016 ·

I was invited to join the two Barker ladies, Virginia Barker and Courtney Harris Barker. to speak at the Government Affairs Committee of the Cocoa Beach Chamber of Commerce this morning. We had lots of good questions about the Project Plan and the Referendum.
... See More

Clark Giangarra and 27 others 1 Share

Like Comment Share

Vince Lamb
Aug 9, 2016 ·

Brevard Country Commission voted unanimously to accept the Lagoon Restoration Plan and to approve a referendum for a half-cent sales to fund the restoration. Now the voters will decide in the November election.

2/22/2022

Natural Resources Management Department
2725 Judge Fran Jamieson Way
Building A, Room 219
Viera, Florida 32940

BOARD OF COUNTY COMMISSIONERS

Inter-Office Memo

TO: The Honorable Kristine Zonka, Chair
Board of County Commissioners

J.1.

THROUGH: Frank Abbate, County Manager
John Denninghoff, Assistant County Manager John Denninghoff (Jun 13, 2022 11:19 EDT)
Virginia Barker, Director, Natural Resources Management (NRM) Barker, Virginia
Tom Belflower, Support Services Manager, NRM Belflower, Tom Digitally signed by Belflower, Tom Date: 2022.06.06 13:16:00 -04'00'
Terri Breeden, Environmental Section Supervisor, NRM Breeden, Terri Digitally signed by Breeden, Terri Date: 2022.06.06 12:10:56 -04'00'

FROM: Jenny Hansen, Associate Environmental Specialist, NRM Hansen, Jenny Digitally signed by Hansen, Jenny Date: 2022.06.06 11:45:32 -04'00'

DATE: June 6, 2022

SUBJECT: Save Our Indian River Lagoon Project Cost-Share Funding Contract Between Brevard County, Florida and The East Coast Zoological Society of Florida, Inc.

We respectfully request your signature on the attached Save Our Indian River Lagoon Cost-Share Funding Contract: S.O.I.R.L. 22-227 between Brevard County and the East Coast Zoological Society of Florida, Inc. (Brevard Zoo) for the Restore Our Shores: Community Collaborative. This project was included in the 2022 Update to the Save Our Indian River Lagoon (S.O.I.R.L.) Project Plan approved by the County Commission on February 22, 2022.

The Brevard County Oyster Gardening Program has been engaging the community and support oyster population rehabilitation in the Indian River Lagoon (I.R.L.) since 2013. As the I.R.L. restoration needs continue to grow, this program is expanding to include the propagation of other natural resources such as clams and seagrasses. Through the Restore Our Shores: Community Collaborative, the Brevard Zoo will maintain contact with approximately 1600 community members and conduct workshops to educate and train volunteers in resource propagation and care, living shorelines, and issues facing the lagoon. The 2022 Update to the S.O.I.R.L. Project Plan approved five years of funding at $200,000/yr for a contract total of $1,000,000.

Please contact Jenny Hansen at jenny.hansen@brevardfl.gov or 321-350-8414 with questions or to arrange for pick-up.

Thank you.

Enclosures:

1. AO-29 Contract Review and Approval Form – Natural Resources Management Department, County Attorney's Office, and Risk Management
2. Ao-29 Contract Review and Approval Form - Purchasing
3. Associated Clerk's Memo for 2022 S.O.I.R.L. Project Plan
4. Save Our Indian River Lagoon Project Cost-Share Funding Contract Between Brevard County, Florida and The East Coast Zoological Society of Florida, Inc. S.O.I.R.L. 22-227.

BREVARD COUNTY
BOARD OF COUNTY COMMISSIONERS

INITIAL CONTRACT REVIEW AND APPROVAL FORM

SECTION I - GENERAL INFORMATION

1. Contractor: East Coast Zoological Society, Inc. d/b/a Brevard Zoo	
2. Fund/Account #: 1260	**3. Department Name:** Natural Resources Management
4. Contract Description: Restore Our Shores: Community Collaborative	
5. Contract Monitor: Jenny Hansen	**7. Contract Type:** SERVICES
6. Dept/Office Director: Virginia Barker	

SECTION II – REVIEW AND APPROVAL TO ADVERTISE

COUNTY OFFICE	APPROVAL YES	APPROVAL NO	SIGNATURE	DATE
User Agency	☐	☐		
Risk Management	☐	☐		
County Attorney	☐	☐		

SECTION III – REVIEW AND APPROVAL TO EXECUTE

COUNTY OFFICE	APPROVAL YES	APPROVAL NO	SIGNATURE	DATE
User Agency	☑	☐	Hansen, Jenny Digitally signed by Hansen, Jenny Date: 2023.03.23 09:16:57 -04'00'	
Risk Management	☑	☐	Julie Jones Digitally signed by Julie Jones Date: 2023.03.24 14:35:56 -04'00'	
County Attorney	☑	☐	Balser, Heather Digitally signed by Balser, Heather Date: 2023.03.24 10:32:15 -04'00'	

SECTION IV - CONTRACTS MANAGEMENT DATABASE CHECKLIST

CM DATABASE REQUIRED FIELDS	Complete ✓
Department Information	☐
Department	☐
Program	☐
Contact Name	☐
Cost Center, Fund, and G/L Account	☐
Vendor Information (SAP Vendor #)	☐
Contract Status	☐
Contract Title	☐
Contract Type	☐
Contract Amount	☐
Storage Location (SAP)	☐
Contract Approval Date	☐
Contract Effective Date	☐
Contract Expiration Date	☐
Contract Absolute End Data (No Additional Renewals/Extensions)	☐
Material Group	☐
Contract Documents Uploaded in CM database (Initial Contract Form with County Attorney/ Risk Management Approval; Signed/Executed Contract)	☐
"Right To Audit" Clause Included in Contract	☐
Monitored items: Uploaded to database (Insurance, Bonds, etc.)	☐

BREVARD COUNTY
BOARD OF COUNTY COMMISSIONERS

CONTRACT REVIEW AND APPROVAL FORM

SECTION I - GENERAL INFORMATION

1. Contractor: East Coast Zoological Society, Inc. d/b/a Brevard Zoo **2. Amount:**	
3. Fund/Account #: 1260	**4. Department Name:** Natural Resources Management
5. Contract Description: Restore Our Shores: Community Collaborative	
6. Contract Monitor: Jenny Hansen	**8. Contract Type:** SERVICES
7. Dept/Office Director: Virginia Barker	
9. Type of Procurement: Other	

SECTION II - REVIEW AND APPROVAL TO ADVERTISE

COUNTY OFFICE	APPROVAL YES	APPROVAL NO	SIGNATURE
User Agency	☑	☐	
Purchasing	☐	☐	
Risk Management	☐	☐	
County Attorney	☐	☐	

SECTION III - CONTRACTS MANAGEMENT DATABASE CHECKLIST

COUNTY OFFICE	APPROVAL YES	APPROVAL NO	SIGNATURE
User Agency	☐	☐	Hansen, Jenny Digitally signed by Hansen, Jenny Date: 2022.03.25 14:00:21 -04'00'
Purchasing	☑	☐	Wall, Katherine Digitally signed by Wall, Katherine Date: 2022.03.26 08:53:38 -04'00'
Risk Management	☐	☐	
County Attorney	☐	☐	

SECTION IV - CONTRACTS MANAGEMENT DATABASE CHECKLIST

CM DATABASE REQUIRED FIELDS	Complete ✓
Department Information	☐
Department	☐
Program	☐
Contact Name	☐
Cost Center, Fund, and G/L Account	☐
Vendor Information (SAP Vendor #)	☐
Contract Status, Title, Type, and Amount	☐
Storage Location (SAP)	☐
Contract Approval Date, Effective Date, and Expiration Date	☐
Contract Absolute End Date (No Additional Renewals/Extensions)	☐
Material Group	☐
Contract Documents Uploaded in CM database (Contract Form with County Attorney/ Risk Management/ Purchasing Approval; Signed/Executed Contract)	☐
"Right To Audit" Clause Included in Contract	☐
Monitored items: Uploaded to database (Insurance, Bonds, etc.)	☐

BREVARD County
BOARD OF COUNTY COMMISSIONERS

FLORIDA'S SPACE COAST

Kimberly Powell, Clerk to the Board, 400 South Street • P.O. Box 999, Titusville, Florida 32781-0999

Telephone: (321) 637-2001
Fax: (321) 264-6972
Kimberly.Powell@brevardclerk.us

February 23, 2022

MEMORANDUM

TO: Virginia Barker, Natural Resources Management Director

RE: Item J.1., Adoption of the Save Our Indian River Lagoon Project Plan 2022 Update as Recommended by the Save Our Indian River Lagoon (SOIRL) Citizens Oversight Committee (COC)

The Board of County Commissioners, in regular session on February 22, 2022, adopted the SOIRL Project Plan 2022 Update, as recommended by the SOIRL COC on January 21, 2022; authorized staff to apply the increased cost share from $700 per pound to $1,200 per pound, to the three early adopters of the advanced septic systems, for a total cost of $17,305.00; authorized associated Budget Change Requests; approved continued signature authority to the Chair, or authorized representative, in accordance with the threshold limits provided for in Brevard County policies and administrative orders, to execute agreements, task orders, change orders, contract renewals, amendments, and other contract-related documents, subject to review and approval by Risk Management, County Attorney, and Purchasing Services, as appropriate, to provide cost share from the SOIRL Trust Fund for projects and programs approved in the Project Plan; approved continued authority for you to execute up to two no-cost time extensions up to six months each; granted permission to advertise formal solicitation of bids and proposals, and to award to the qualified bidder having the lowest, responsible, and best response for tangible items, capital improvement projects, and/or equipment, when required and subject to available funding; and authorized the County Manager, or his designee, to submit grant applications for leveraging cost share for projects and programs approved in the SOIRL Project Plan.

Your continued cooperation is always appreciated.

Sincerely,

BOARD OF COUNTY COMMISSIONERS
RACHEL M. SADOFF, CLERK

Kimberly Powell, Clerk to the Board

cc: County Attorney
Risk Management
County Manager
Finance
Budget

SAVE OUR INDIAN RIVER LAGOON PROJECT COST-SHARE FUNDING CONTRACT BETWEEN BREVARD COUNTY, FLORIDA AND THE EAST COAST ZOOLOGICAL SOCIETY, INC.

CONTRACT NUMBER: SOIRL 22-227

THIS CONTRACT ("Contract") is made and entered into the date of last signature below by and between Brevard County, Florida, a political subdivision of the State of Florida (hereinafter the "COUNTY"), and the East Coast Zoological Society, Inc., a Florida non-profit agency organized and existing under the laws of the State of Florida (hereinafter the "NON-GOVERNMENTAL ORGANIZATION").

RECITALS

WHEREAS, the COUNTY saw the urgent need to implement the "Save Our Indian River Lagoon Project Plan," with the aim to restore the Indian River Lagoon through financing, planning, constructing, maintaining, and operating capital improvements and capital maintenance projects and programs designed to improve water quality, fish, wildlife and marine habitat, remove muck and reduce pollution, as permitted under Section 212.055(2)(d)1., Florida Statutes; and

WHEREAS, pursuant to Section 212.055, Florida Statutes, the COUNTY is authorized to levy a discretionary infrastructure sales tax of one-half cent by ordinance enacted by a majority of the members of the Board of County Commissioners and approved by a majority of the electors of Brevard County voting in a referendum on the surtax; and

WHEREAS, the COUNTY promulgated and passed Brevard County Ordinance No. 2016-15, ("the Ordinance") imposing a one-half cent discretionary infrastructure sales tax for a period of ten (10) years from the date of levy, for the purposes expressed above, subject to approval of said surtax by a majority vote of those qualified electors of Brevard County voting in a referendum that was held on November 8, 2016; and

WHEREAS, it was contemplated that, if approved, said one-half cent discretionary infrastructure sales tax shall be imposed and collected County-wide, commencing on January 1, 2017, and continuing thereafter for a period of ten (10) years until December 31, 2027; and

WHEREAS, on November 8, 2016, a majority of those qualified electors of Brevard County voted in favor of the referendum, thereby authorizing the levy of the one-half cent surtax; and

WHEREAS, the COUNTY deems it in the best interest of all of the citizens and residents of Brevard County, Florida, that the proceeds of the one-half cent discretionary infrastructure sales tax be used to fund projects and programs designed to restore the Indian River Lagoon in the manner set forth in the Ordinance and its incorporated Save Our Indian River Lagoon Project Plan, including operations, maintenance and reasonable administrative costs of those projects and programs; and

WHEREAS, the project identified in the Statement of Work ("the Project") has been included and approved by the Board of County Commissioners as part of the Save Our Indian River Lagoon Project Plan; and

WHEREAS, the COUNTY has determined that providing cost-share funding to the NON-GOVERNMENTAL ORGANIZATION for the purposes provided for herein will assist the COUNTY in effectively and efficiently implementing the Ordinance and its incorporated Save Our Indian River Lagoon Project Plan, as amended from time to time, and would be a proper expenditure of the monies reserved in the Save Our Indian River Lagoon Trust Fund.

NOW, THEREFORE, for value received, and in consideration of the following covenants, promises and provisions, the Parties agree as follows:

Section 1. Documents.
This Contract incorporates all of the following:

a. The Recitals set forth above;
b. The terms of the Contract set forth herein;
c. Attachment A – Statement of Work;
d. Attachment B – Project Progress Report Form;
e. Attachment C – Reimbursement/Invoice Form;
f. Attachment D – Recipient's Certification of Payment Form;
g. Attachment E – Eligible Tax Funding Cost Share Form; and
h. Attachment F – Foreign Disclosure Form (for projects over $100,000).

Section 2. Statement of Work.
In consideration of the above recitals, and the funding assistance described below, the NON-GOVERNMENTAL ORGANIZATION agrees to perform and complete the activities provided for in the **Statement of Work, Attachment A**. NON-GOVERNMENTAL ORGANIZATION shall complete the Project in conformity with the contract documents and all attachments and other items incorporated by reference herein.

Section 3. Term and Extensions.
a. The term of this Contract is from the date upon which the last party has dated and executed the same ("Effective Date") until September 30, 2027 ("Completion Date"). NON-GOVERNMENTAL ORGANIZATION shall not commence the Project until any required submittals are received and approved. Time is of the essence for every aspect of this Contract, including any time extensions.

b. Any request for an extension of time beyond the Completion Date must be made in writing no less than forty-five (45) days prior to the contracted Completion Date. Timely requests to extend for up to one (1) year may be approved by the County Manager or designee. Up to two (2) requests to extend for six (6) months each may be approved by the Natural Resources Management Department Director, or his/her designee. Timely requests to extend for longer than the County Manager's authorization to approve, may only be approved by the Board of County Commissioners.

c. Notwithstanding specific mention that certain provisions survive termination or expiration of this Contract, all provisions of this Contract that by their nature extend beyond the Completion Date, including by way of example without limitation, delivery of a final progress report, will remain in full force and effect after the Completion Date as necessary to affect performance.

Section 4. Offer Limitations.

a. This Contract constitutes an offer until authorized, signed and returned to the COUNTY by the NON-GOVERNMENTAL ORGANIZATION. This offer terminates sixty (60) days after receipt by the NON-GOVERNMENTAL ORGANIZATION; provided, however, that the NON-GOVERNMENTAL ORGANIZATION may submit a written request for extension of this time limit which may be approved by the County Manager or his/her designee.

b. If the Project, which is eligible for reimbursement under this Contract, does not begin within one hundred eighty (180) days of the Effective Date, or if the invoice for non-construction projects is not submitted within two hundred seventy (270) days of the Effective Date, this Contract will be subject to termination and the funds subject to reallocation.

Section 5. Project Management.

The Project Managers listed below shall be responsible for overall coordination and management of the Project. Either party may change its Project Manager upon three (3) business days' prior written notice to the other party. Written notice of change of address shall be provided within five (5) business days. All notices shall be in writing to the Project Managers at the addresses below and shall be sent by one of the following methods: (1) hand delivery; (2) U.S. certified mail; (3) national overnight courier; or (4) e-mail. Notices via certified mail are deemed delivered upon receipt. Notices via overnight courier are deemed delivered one (1) business day after having been deposited with the courier. Notices via e-mail are deemed delivered on the date received.

COUNTY
Jenny Hansen
Associate Environmental Specialist
Department of Natural Resources
2725 Judge Fran Jamieson Way, Building A
Viera, Florida 32940
321-633-2016
Email: jenny.hansen@brevardfl.gov

NON-GOVERNMENTAL ORGANIZATION
Ashley Rearden
Conservation Curator
Brevard Zoo
8225 N. Wickham Road
Melbourne, FL 32940
321-254-9453, ext. 284
E-mail: arearden@brevardzoo.org

a. The COUNTY'S Project Manager shall have sole responsibility for transmitting instructions, receiving information, and communicating the COUNTY'S policies and decisions regarding all matters pertinent to performance of the Project. The COUNTY'S Project Manager may authorize minor changes in the Project that the parties agree are not inconsistent with the purpose of the Project, and do not affect the COUNTY'S cost-share funding amount, the Project's nutrient reduction benefits, Completion Date, or otherwise significantly modify the terms of the Contract.

b. Should additional funding be acquired from sources other than the Indian River Lagoon one-half cent surtax, the County Manager and the authorized NON-GOVERNMENTAL ORGANIZATION representative are authorized to sign amendments to this Contract only if such additional funding: (1) reduces the Indian River Lagoon tax funding amount; and/or (2) reduces the NON-GOVERNMENTAL ORGANIZATION'S cost-share amount.

Section 6. Deliverables.

a. The NON-GOVERNMENTAL ORGANIZATION shall fully implement the Project, as described in the **Statement of Work, Attachment A**. The NON-GOVERNMENTAL ORGANIZATION is responsible for the professional quality, technical accuracy, and timely completion of the Project. Both workmanship and materials shall be of good quality. Unless otherwise specifically provided for herein, the NON-GOVERNMENTAL ORGANIZATION shall provide and pay for all materials, labor, and other facilities and equipment necessary to complete the Project.

b. The COUNTY'S Project Manager shall make a final acceptance inspection of the Project when completed and finished in all respects. Upon satisfactory completion of the Project, the NON-GOVERNMENTAL ORGANIZATION will provide the COUNTY a written statement indicating that the Project has been completed in accordance with this Contract. Acceptance of the final payment by the NON-GOVERNMENTAL ORGANIZATION shall constitute a release in full of all claims against the COUNTY arising from or by reason of this Contract.

c. Unless otherwise provided herein, the COUNTY does not assert an ownership interest in any of the deliverables under this Contract.

Section 7. Progress Reports and Performance Monitoring

a. The NON-GOVERNMENTAL ORGANIZATION shall provide to the COUNTY Project update/status reports as provided in the **Statement of Work, Attachment A**. Reports will provide details on the progress of the Project and outline any potential issues affecting completion or the overall schedule.

b. The NON-GOVERNMENTAL ORGANIZATION shall use the COUNTY'S **Project Progress Report Form, Attachment B**. NON-GOVERNMENTAL ORGANIZATION shall submit the Project Progress Reports to the COUNTY'S Project Manager within twenty (20) days after the closing date of each calendar quarter (March 20, June 20, September 20 and December 20).

c. Commencement of Construction. The NON-GOVERNMENTAL ORGANIZATION shall notify the COUNTY once construction has started at the site.

d. For as long as the Project is operational, the COUNTY shall have the right to inspect the operation of the Project during normal business hours upon reasonable prior notice. The NON-GOVERNMENTAL ORGANIZATION shall make available to the COUNTY any available data that is requested pertaining to the performance of the Project.

Section 8. Written Authorization

The NON-GOVERNMENTAL ORGANIZATION shall obtain written authorization from the property owner(s) where the site is to be constructed that authorizes and secures permission

for the NON-GOVERNMENTAL ORGANIZATION and the COUNTY to enter the subject property/properties to conduct periodic inspections and/or maintenance of the site(s) with reasonable advanced prior notice. This authorization must be obtained prior to beginning work and must contain an indemnification clause that extends to the COUNTY the ability to access the property and/or site where the Project will be constructed. As part of the authorization agreement, the NON-GOVERNMENTAL ORGANIZATION shall include the following language:

> The [property owner] hereby authorizes and permits Brevard County, Florida, its agents, employees, officers, directors, and those under its direction or agency, (the "COUNTY") to access the [property/site] to conduct periodic inspections of and/or maintenance for the [Project located on the property/site]. The COUNTY shall provide reasonable advanced notice to [the property owner] prior to any inspection or maintenance. As part of this authorization and permission to access the [property/site], [the property owner] shall fully indemnify, defend, and hold the COUNTY harmless from and against any and all claims, suits, actions, damages, and costs of every name and description, including attorneys' fees, arising from or relating to bodily injury, sickness, disease, death personal injury, damage to property or loss of use of any property or assets, resulting from or arising out of the performance of the services or products for which the COUNTY and/or the NON-GOVERNMENTAL ORGANIZATION is providing to [the property owner].

Section 9. Notifications.

a. *Commencement of Construction*. The NON-GOVERNMENTAL ORGANIZATION shall notify the COUNTY'S Project Manager once construction has started at the site.

b. *Completion of Construction*. The NON-GOVERNMENTAL ORGANIZATION shall notify the COUNTY'S Project Manager once construction has been completed in order for surveyors to complete their survey and analyze the site.

Section 10. Amount of Funding.

a. For satisfactory completion of the Project, the COUNTY shall pay the NON-GOVERNMENTAL ORGANIZATION its "Eligible Tax Funding Cost Share" as stated in **Eligible Tax Funding Cost Share Form, Attachment E.** This amount shall be reduced correspondingly if additional matching funds for the Project are secured by the NON-GOVERNMENTAL ORGANIZATION. The contract amount may be increased by the appropriate grant amount if the COUNTY is able to secure funds from external revenue sources that are approved for allocation to this Project by the Board of County Commissioners, or its duly authorized representative.

b. The NON-GOVERNMENTAL ORGANIZATION shall be responsible for payment of all additional costs beyond the cost-share amount necessary to ensure completion of the Project.

c. During contract negotiations, the NON-GOVERNMENTAL ORGANIZATION must submit the adopted budget for the Project, the amount of all secured grants for the Project, and an estimate of Project costs as defined in Section 10.e. The Eligible Tax Funding Cost Share shall be reduced as necessary to not exceed the balance of Project costs minus external matching

funds for the Project.

d. The NON-GOVERNMENTAL ORGANIZATION shall notify the COUNTY'S Project Manager in writing upon receipt of any additional external funding for the Project not disclosed prior to execution of this Contract. The Eligible Tax Funding Cost Share shall be reduced as necessary so as not to exceed the balance of Project Costs minus external matching funds for the Project.

e. "Project cost" is defined to include actual costs of constructing project facilities, including construction, construction management, construction QA/QC testing, land acquisition, engineering, design, permitting, permit fees, impact fees, and any other Project-specific costs authorized under the **Statement of Work, Attachment A**. Project cost does not include any costs incurred prior to the Effective Date, unless expressly authorized by the Statement of Work, nor any costs not included in the contracted Statement of Work.

f. The NON-GOVERNMENTAL ORGANIZATION is responsible for owning, operating and maintaining the Project for the typical operating life of the Project.

Section 11. Payment of Invoices.

a. The NON-GOVERNMENTAL ORGANIZATION shall submit itemized invoices as per the **Statement of Work, Attachment A** on a quarterly basis for reimbursable expenses by one of the following four methods by: (1) mail; (2) hand delivery; or (3) national overnight courier to the Brevard County Natural Resources Management Department, Jenny Hansen, Project Manager, 2725 Judge Fran Jamieson Way, Building A, Viera, Florida 32940; or (4) e-mail to jenny.hansen@brevardfl.gov. If a delivery method is not selected in this paragraph, the default invoicing basis will be quarterly increments and sent by mail to the Project Manager.

b. All invoices shall be submitted using **Reimbursement/Invoice Form, Attachment C**, and include the following information: (1) the COUNTY'S contract number; (2) the NON-GOVERNMENTAL ORGANIZATION's name, address, and authorization to directly deposit payment into the NON-GOVERNMENTAL ORGANIZATION's account; (3) the NON-GOVERNMENTAL ORGANIZATION's invoice number and date of invoice; (4) the COUNTY'S Project Manager; (5) the NON-GOVERNMENTAL ORGANIZATION's Project Manager; (6) supporting documentation as to cost and/or Project completion (as per the cost schedule and other requirements of the **Statement of Work, Attachment A**); and (7) **Project Progress Report Form, Attachment B**. Invoices that do not include the above-listed information shall be returned without action within ten (10) business days of receipt, stating the basis for rejection.

Reimbursement Address
East Coast Zoological Society of Florida, Inc.
8225 N. Wickham Road
Melbourne, FL 32940

c. Incremental payments shall be calculated as the fraction of Eligible Tax Funding Cost Share listed in the **Eligible Tax Funding Cost Share Form, Attachment E** (after adjustments per Sections 10.c. and/or d.) divided by Project cost multiplied by the amount of the NON-

GOVERNMENTAL ORGANIZATION's Project Cost incurred during the respective incremental billing period. This percentage may be adjusted as needed if the project is partially funded through other grant funding sources. Payments shall be made within forty-five (45) days of receipt of an approved invoice.

d. The invoices shall be submitted in detail sufficient for proper pre-audit and post-audit review. Invoices shall include a copy of contractor and supplier invoices to the NON-GOVERNMENTAL ORGANIZATION and proof of payment. If necessary for audit purposes, the NON-GOVERNMENTAL ORGANIZATION shall provide additional supporting information as required to document invoices.

e. NON-GOVERNMENTAL ORGANIZATION shall be reimbursed for the actual cost of the Project, or the contracted amount, whichever is less. The COUNTY shall not withhold any retainage from this reimbursement. COUNTY reimbursement is subject to annual budgetary limitations and allocations, if applicable.

f. The COUNTY'S fiscal year ends on September 30th. The COUNTY is required to account for all encumbered funds at that time. Submittal of an invoice as of September 30th satisfies this requirement. Regardless of whether the NON-GOVERNMENTAL ORGANIZATION chooses monthly, quarterly, or annual invoices, if any expenses occur between a previous invoice and September 30th, the NON-GOVERNMENTAL ORGANIZATION shall submit a description of the work completed on the Project through September 30th and a corresponding invoice for that cost-share eligible amount achieved during that time interval.

Section 12. Final Invoice.

a. The final invoice must be submitted no later than forty-five (45) days after the NON-GOVERNMENTAL ORGANIZATION's final payment to its vendors for the Project or October 30th if the NON-GOVERNMENTAL ORGANIZATION's final payment is made between September 15th and September 30th.

b. Final Invoices that are submitted after the requisite date shall be subject to a penalty of ten percent (10%) of the invoice. This penalty may be waived by the COUNTY, in its sole judgment and discretion, upon a showing of special circumstances that prevent the timely submittal of the final invoice. The NON-GOVERNMENTAL ORGANIZATION must request approval for delayed submittal of the final invoice not later than ten (10) days prior to the due date and state the basis for the delay.

Section 13. Travel Expenses.

If the cost schedule for this Contract includes a line item for travel expenses, travel expenses shall be drawn from the Project budget. Travel expenses are otherwise not compensable. If travel expenses are not included in the cost schedule, they are a cost of providing the service that is borne by the NON-GOVERNMENTAL ORGANIZATION.

Section 14. Payments Withheld.

The COUNTY may withhold or, on account of subsequently discovered evidence, nullify, in

whole or in part, any payment to such an extent as may be necessary to protect the COUNTY from loss as a result of: (1) defective work not remedied; (2) failure to maintain adequate progress in the Project; or (3) any other material breach of this Contract. Amounts withheld shall not be considered due and shall not be paid until the ground(s) for withholding payment have been remedied.

Section 15. Multi-Year Contracts.

a. For multi-fiscal year contracts, the COUNTY must budget the amount of funds that will be expended during each fiscal year as accurately as possible. Funds contracted for reimbursement beyond the COUNTY'S current fiscal year will be budgeted in subsequent fiscal years per the schedule specified in the Project Contract, as amended. The **Statement of Work, Attachment A**, includes the parties' current schedule for completion of the work and projection of expenditures on a fiscal year basis (October 1 – September 30) ("Estimated Reimbursement Schedule").

b. If the NON-GOVERNMENTAL ORGANIZATION anticipates that expenditures will exceed the budgeted amount during any fiscal year, the NON-GOVERNMENTAL ORGANIZATION shall promptly notify the COUNTY'S Project Manager and provide a proposed revised work schedule and Annual Spending Plan that provides for completion of the work without increasing the Total Compensation. The last date for the COUNTY to receive this request is August 1 of the then-current fiscal year. Funds allocated in the current fiscal year that are not reimbursed in the current fiscal year due to slippage in the Project delivery schedule will be requested by COUNTY staff to roll forward to the next fiscal year as a Budget Amendment – (Regular), per BCC-21.

c. The COUNTY may in its sole discretion prepare a Budget Change Request incorporating the revised work schedule and Estimated Reimbursement Schedule as appropriate for changes in the Project schedule.

Section 16. Liability and Insurance.

Each party is responsible for all personal injury and property damage attributable to the negligent acts or omissions of that respective party, its officers, employees and agents. The NON-GOVERNMENTAL ORGANIZATION accepts all risks arising from construction or operation of the Project. Nothing contained herein shall be construed or interpreted as denying to any party any remedy or defense available under the laws of the State of Florida, nor as a waiver of sovereign immunity of the COUNTY or NON-GOVERNMENTAL ORGANIZATION beyond the waiver provided for in Section 768.28, Florida Statutes, as may be amended. Nothing in this Agreement is intended to inure to the benefit of any third party for the purpose of allowing any claim which would otherwise be barred under the doctrine of sovereign immunity or by operation of law. Nothing herein shall constitute a waiver of the COUNTY'S sovereign immunity protections. The COUNTY'S liability obligations hereunder shall be subject to the protections of and limitations on damages set forth in Section 768.28, Florida Statutes.

Each party shall acquire and maintain throughout the term of this Agreement such liability, workers' compensation, and automobile insurance as required by their current rules and regulations.

At its own expense, the NON-GOVERNMENTAL ORGANIZATION shall keep in force and at all times maintain during the term of this Contract the following minimum levels of insurance including, but not limited to:

(a) General Liability Insurance: General Liability Insurance issued by responsible insurance companies as outlined in subsection (c) below, with combined single limits of not less than one million dollars ($1,000,000.00) per occurrence for bodily injury and property damage.

(b) Workers' Compensation Coverage: Full and complete Workers' Compensation Coverage, as required by State of Florida law, shall be provided.

(c) Insurance Certificates: the NON-GOVERNMENTAL ORGANIZATION shall provide the County with Certificate(s) of Insurance on all policies of insurance and renewals thereof in an industry standard Acord form. Said General Liability Policy shall provide that the COUNTY be included as an additional insured. The COUNTY shall be notified in writing of any reduction, cancellation or substantial change of policy or policies at least thirty (30) days prior to the effective date of said action if replacement insurance meeting the requirements and specifications therein cannot be obtained. All insurance policies shall be issued by responsible companies who are licensed and authorized under the laws of the State of Florida.

Section 17. Funding Availability.

a. This Contract is at all times contingent upon funding availability, which may include a single source or multiple sources, including, but not limited to: (1) the Save Our Indian River Lagoon one-half cent surtax; (2) annual appropriations by the Florida Legislature; or (3) appropriations from other agencies or funding sources. Contracts that extend for a period of more than one Fiscal Year are subject to annual appropriation of funds in the sole discretion and judgment of the COUNTY for each succeeding Fiscal Year. Should the Project not be funded, in whole or in part, in the current Fiscal Year or succeeding Fiscal Years, the COUNTY shall so notify the NON-GOVERNMENTAL ORGANIZATION and this Contract shall be deemed terminated for convenience five (5) days after receipt of such notice, or within such additional time as the COUNTY may allow. For the purpose of this Contract, "Fiscal Year" is defined as the period beginning on October 1 and ending on September 30.

b. The NON-GOVERNMENTAL ORGANIZATION agrees that any and all NON-GOVERNMENTAL ORGANIZATION funds budgeted (in the adopted or amended budget) for this Project that are saved by the NON-GOVERNMENTAL ORGANIZATION by virtue of reimbursement or allocation received pursuant to this cost-share Contract, shall be reallocated and expended by the NON-GOVERNMENTAL ORGANIZATION solely to other NON-GOVERNMENTAL ORGANIZATION, COUNTY or third-party project(s) benefiting the restoration of the Indian River Lagoon within five (5) years of the Effective Date of this Contract. Should the NON-GOVERNMENTAL ORGANIZATION choose to not expend such funds in the manner described above, the NON-GOVERNMENTAL ORGANIZATION shall transfer those funds to the COUNTY for deposit to the Save Our Indian River Lagoon Trust Fund. The NON-GOVERNMENTAL ORGANIZATION's obligation under this paragraph shall survive the termination of this Contract.

Section 18. Failure to Complete Project.

a. Should the NON-GOVERNMENTAL ORGANIZATION fail to complete the Project, the NON-GOVERNMENTAL ORGANIZATION shall refund to the COUNTY all of the funds provided to the NON-GOVERNMENTAL ORGANIZATION pursuant to this Contract.

b. With a recommendation from its Citizen Oversight Committee, the COUNTY, in its sole judgment and discretion, may determine that the NON-GOVERNMENTAL ORGANIZATION has failed to complete the Project due to circumstances that are beyond the NON-GOVERNMENTAL ORGANIZATION's control, due to termination of this Contract for reasons of funding availability, or due to a good faith determination that the Project is no longer environmentally or economically feasible. In such event, the COUNTY may excuse the NON-GOVERNMENTAL ORGANIZATION from the obligation to return funds provided hereunder.

c. If the Project has not been completed within thirty (30) days after the Completion Date, the NON-GOVERNMENTAL ORGANIZATION shall provide the COUNTY with notice regarding its intention as to completion of the Project. The parties shall discuss the status of the Project and may mutually agree to revise the time for Project completion or the scope of the Project. Failure to complete the Project within ninety (90) days after the Completion Date shall be deemed to constitute failure to complete the Project for the purposes of this provision.

d. In the event the Project constitutes a portion of the total functional project, this paragraph shall apply in the event the total functional project is not completed. In such event, the 90-day timeframe provided herein shall commence upon the date scheduled for completion of the total functional project at the time of execution of this Contract, unless extended by mutual agreement of the parties. Sections 18.a. and b. shall survive the termination or expiration of this Contract.

e. Force Majeure. NON-GOVERNMENTAL ORGANIZATION will not be responsible for failure to carry out any terms of this Contract due to any one of the following circumstances beyond the control of the NON-GOVERNMENTAL ORGANIZATION: (a) the operation and effect of rules, regulations, or orders promulgated by any commission, county, or governmental agency of the state of Florida or the United States; (b) a restraining order, injunction, or similar decree of any court of competent jurisdiction; (c) war; (d) flood; (e) earthquake; (f) fire; (g) severe wind storm or hurricane; (h) acts of public disturbance; (i) quarantine restrictions; (j) epidemic; (k) strikes; or (l) sabotage. The NON-GOVERNMENTAL ORGANIZATION shall not be subject to any liability for failure to carry out any of the terms of this Contract to the extent that such failure shall be due to a Force Majeure event as defined herein. In such event, the NON-GOVERNMENTAL ORGANIZATION shall be excused from the obligation to return funds provided herein if the parties can agree, in writing, to a revised completion date for the Project based on the circumstances.

Section 19. Termination.

a. If the NON-GOVERNMENTAL ORGANIZATION materially fails to fulfill its obligations under this Contract, including any specific milestones established herein, the COUNTY may provide the NON-GOVERNMENTAL ORGANIZATION written notice of the deficiency by forwarding a

"Notice to Cure," citing the specific nature of the breach. The NON-GOVERNMENTAL ORGANIZATION shall have thirty (30) days following receipt of the notice to cure the breach. If the NON-GOVERNMENTAL ORGANIZATION fails to cure the breach within the thirty (30) day period, the COUNTY may issue a "Termination for Default Notice" terminating this Contract without further notice. In such event, the NON-GOVERNMENTAL ORGANIZATION shall refund to the COUNTY all funds provided to the NON-GOVERNMENTAL ORGANIZATION pursuant to this Contract within thirty (30) days of such termination. The COUNTY may also terminate this Contract upon ten (10) days written notice in the event of any material misrepresentations in the Project Proposal.

b. Delay or failure by the COUNTY to enforce any right, remedy or deadline hereunder shall not impair, or be deemed a waiver of, any such right, remedy or deadline, or impair the COUNTY'S rights or remedies for any subsequent breach or continued breach of this Contract.

c. This Contract may be terminated by either party for convenience upon ninety (90) days prior written notice to the other party. In the event the COUNTY terminates for convenience, NON-GOVERNMENTAL ORGANIZATION shall be paid for work completed and costs incurred in good faith through the date of termination. In the event the NON-GOVERNMENTAL ORGANIZATION terminates for convenience, COUNTY shall receive a full refund of the funds provided herein within thirty (30) days of the date of termination.

ADDITIONAL PROVISIONS

Section 20. Assignment.
The NON-GOVERNMENTAL ORGANIZATION shall not assign this Contract, or any monies due hereunder, without the COUNTY'S prior written consent. The NON-GOVERNMENTAL ORGANIZATION is solely responsible for fulfilling all work elements in any contracts awarded by the NON-GOVERNMENTAL ORGANIZATION and payment of all monies due. No provision of this Contract shall create a contractual relationship between the COUNTY and any of the NON-GOVERNMENTAL ORGANIZATION's contractors or subcontractors.

Section 21. Audit; Access to Records; Repayment of Funds.
a. Maintenance of Records. The NON-GOVERNMENTAL ORGANIZATION shall maintain its books and records such that receipt and expenditure of the funds provided hereunder are shown separately from other expenditures in a format that can be easily reviewed. The NON-GOVERNMENTAL ORGANIZATION shall keep the records of receipts and expenditures, copies of all reports submitted to the COUNTY, and copies of all invoices and supporting documentation for at least five (5) years after expiration of this Contract. In addition, the NON-GOVERNMENTAL ORGANIZATION shall maintain records to demonstrate satisfaction of its obligation under subparagraph 17b. above.

b. Review and Auditing. In accordance with generally accepted governmental auditing standards, the COUNTY shall have access to and the right to examine any directly pertinent books and other records involving transactions related to this Contract. In the event of an audit, the NON-GOVERNMENTAL ORGANIZATION shall maintain all required records until the audit is

completed and all questions are resolved. The NON-GOVERNMENTAL ORGANIZATION will provide proper facilities for access to and inspection of all required records.

c. Repayment of Funds. COUNTY funding shall be subject to repayment after expiration of this Contract if, upon audit examination, the COUNTY finds any of the following: (1) the NON-GOVERNMENTAL ORGANIZATION has spent funds for purposes other than as provided for herein; (2) the NON-GOVERNMENTAL ORGANIZATION has failed to perform a continuing obligation of this Contract; (3) the NON-GOVERNMENTAL ORGANIZATION has received duplicate funds from the COUNTY or other external funding entity for the same purpose; (4) the NON-GOVERNMENTAL ORGANIZATION has been advanced or paid unobligated funds; (5) the NON-GOVERNMENTAL ORGANIZATION has been paid funds in excess of the amount the NON-GOVERNMENTAL ORGANIZATION is entitled to receive under the Contract; and/or (6) the NON-GOVERNMENTAL ORGANIZATION has received contributions amounting to more than one hundred percent (100%) of the Project cost through cumulative public agency cost-share funding.

Section 22. Dispute Resolution.
The NON-GOVERNMENTAL ORGANIZATION is under a duty to seek clarification and resolution of any issue, discrepancy, or dispute involving performance of this Contract by submitting a written statement to the COUNTY'S Project Manager no later than ten (10) business days after the precipitating event. If not resolved by the COUNTY Project Manager within ten (10) business days, the COUNTY Project Manager shall forward the request to the County Manager's Office, which shall issue a written decision within ten (10) business days of receipt. This determination shall constitute final action of the COUNTY and may be subject to judicial review upon completion of the Project.

Section 23. Governing Law, Venue, Attorney's Fees, Waiver of Right to Jury Trial.
This Contract shall be construed according to the laws of Florida and shall not be construed more strictly against one party than against the other because it may have been drafted by one of the parties. As used herein, "shall" is always mandatory. In the event of any legal proceedings arising from or related to this Contract: (1) Venue for any state or federal legal proceedings shall be in a court of competent jurisdiction in and for Brevard County; (2) Each party shall bear its own attorney's fees, including appeals; (3) For civil proceedings, the parties hereby consent to trial by the court and **WAIVE THE RIGHT TO JURY TRIAL**.

Section 24. Permits.
The NON-GOVERNMENTAL ORGANIZATION shall comply with all applicable federal, state, and local laws and regulations in implementing the Project and shall include this requirement in all subcontracts pertaining to the Project. The NON-GOVERNMENTAL ORGANIZATION shall obtain any and all governmental permits necessary to implement the Project. Any activity not properly permitted prior to implementation or completed without proper permits does not comply with this Contract and shall not be approved for cost-share funding.

Section 25. Independent Contractors.
The parties to this Contract, their employees and agents, are independent contractors and not

employees or agents of each other. Nothing in this Contract shall be interpreted to establish any relationship other than that of independent contractors during and after the term of this Contract. The NON-GOVERNMENTAL ORGANIZATION is not a contractor of the COUNTY. The COUNTY is providing cost-share funding as a cooperating governmental entity to assist the NON-GOVERNMENTAL ORGANIZATION in accomplishing the Project. The NON-GOVERNMENTAL ORGANIZATION is solely responsible for accomplishing the Project and directing the means and methods by which the Project is accomplished. The NON-GOVERNMENTAL ORGANIZATION is solely responsible for compliance with all labor, health care, and tax laws pertaining to the NON-GOVERNMENTAL ORGANIZATION, its officers, agents, and employees.

Section 26. Scrutinized Companies.

a. The NON-GOVERNMENTAL ORGANIZATION certifies that it and its subcontractors are not on the Scrutinized Companies that Boycott Israel List. Pursuant to Section 287.135, Florida Statutes, the COUNTY may immediately terminate this Contract at its sole option if the NON-GOVERNMENTAL ORGANIZATION or its subcontractors are found to have submitted a false certification; or if the NON-GOVERNMENTAL ORGANIZATION or its subcontractors are placed on the Scrutinized Companies that Boycott Israel List or is engaged in the boycott of Israel during the term of the Contract.

b. If this Agreement is for more than one million dollars, the NON-GOVERNMENTAL ORGANIZATION certifies that it and its subcontractors are also not on the Scrutinized Companies with Activities in Sudan, Scrutinized Companies with Activities in the Iran Petroleum Energy Sector List, or engaged with business operations in Cuba or Syria as identified in Section 287.135, Florida Statutes. Pursuant to Section 287.135, Florida Statutes, the COUNTY may immediately terminate this Agreement at its sole option if the NON-GOVERNMENTAL ORGANIZATION, its affiliates, or its subcontractors are found to have submitted a false certification; or if the NON-GOVERNMENTAL ORGANIZATION, its affiliates, or its subcontractors are placed on the Scrutinized Companies that Boycott the Scrutinized Companies with Activities in Sudan List, or Scrutinized Companies with Activities in the Iran Petroleum Energy Sector List, or engaged with business operations in Cuba or Syria during the term of the Contract.

c. The NON-GOVERNMENTAL ORGANIZATION agrees to observe the above requirements for applicable subcontracts entered into for the performance of work under this Agreement.

d. As provided in Section 287.135(8), Florida Statutes, if federal law ceases to authorize these contracting prohibitions then they shall become inoperative.

Section 27. Public Entity Crime.

A person or affiliate who has been placed on the convicted vendor list following a conviction for a public entity crime may not submit a bid, proposal, or reply on a contract to provide any goods or services to a public entity; may not submit a bid, proposal, or reply on a contract with a public entity for the construction or repair of a public building or public work; may not submit bids, proposals, or replies on leases of real property to a public entity; may not be awarded or perform work as a contractor, supplier, subcontractor, or consultant under a contract with any

public entity; and may not transact business with any public entity in excess of the threshold amount provided in Section 287.017, Florida Statutes, for CATEGORY TWO ($35,000) for a period of 36 months following the date of being placed on the convicted vendor list.

Section 28. Public Records.
Records of the NON-GOVERNMENTAL ORGANIZATION that are made or received in the course of performance of the Project may be public records that are subject to the requirements of Chapter 119, Florida Statutes. If the NON-GOVERNMENTAL ORGANIZATION receives a public records request, the NON-GOVERNMENTAL ORGANIZATION shall promptly notify the COUNTY'S Project Manager. Each party reserves the right to cancel this Contract for refusal by the other party to allow public access to all documents, papers, letters, or other materials related hereto and subject to the provisions of Chapter 119, Florida Statutes, as amended.

Section 29. Royalties and Patents.
The NON-GOVERNMENTAL ORGANIZATION certifies that the Project does not, to the best of its information and belief, infringe on any patent rights. The NON-GOVERNMENTAL ORGANIZATION shall pay all royalties and patent and license fees necessary for performance of the Project and shall defend all suits or claims for infringement of any patent rights and save and hold the COUNTY harmless from loss to the extent allowed by Florida law.

Section 30. Employment Eligibility Verification (E-Verify).
The NON-GOVERNMENTAL ORGANIZATION:
a. shall utilize the U.S. Department of Homeland Security's E-Verify system to verify the employment eligibility of all new employees hired by the NON-GOVERNMENTAL ORGANIZATION during the term of the Contract; and

b. shall expressly require any subcontractors performing work or providing services pursuant to this contract to likewise utilize the U.S. Department of Homeland Security's E-Verify system to verify the employment eligibility of all new employees hired by the subcontractor during the Contract term; and

c. agrees to maintain records of its participation and compliance with the provisions of the E-Verify program, including participation by its subcontractors as provided above, and to make such records available to the COUNTY consistent with the terms of the NON-GOVERNMENTAL ORGANIZATION's enrollment in the program. This includes maintaining a copy of proof of the NON-GOVERNMENTAL ORGANIZATION's and subcontractors' enrollment in the E-Verify Program; and

d. shall require any contractor to provide the NON-GOVERNMENTAL ORGANIZATION with an affidavit stating that it does not employ, contract with, or subcontract with any unauthorized aliens, and

e. nothing in this Section may be construed to allow intentional discrimination of any class protected by law.

f. Compliance with the terms of this section is made an express condition of this Contract and the COUNTY may treat a failure to comply as a material breach.

Section 31. Severability.

If any portion of this Contract is found to be invalid or unenforceable or if applicable law mandates a different interpretation or result, the remaining provisions will remain in effect and the parties will negotiate in good faith to substitute for such invalid, illegal, or unenforceable provision a mutually acceptable provision consistent with the original intention of the parties.

Section 32. Sovereign Immunity and Liability

The COUNTY'S indemnity and liability obligations under this Contract shall be limited to the extent of the protections of and limitations on damages as set forth in Section 768.28, Florida Statutes. Nothing in this Contract is intended to inure to the benefit of any third party for the purpose of allowing any claim which would otherwise be barred under the doctrine of sovereign immunity or by operation of law. Nothing herein shall constitute a waiver of the COUNTY'S sovereign immunity. The NON-GOVERNMENTAL ORGANIZATION shall indemnify and hold harmless the COUNTY, and its officers and employees, from liabilities, damages, losses, and costs, including, but not limited to, reasonable attorney's fees, to the extent caused by the negligence, recklessness, or intentional wrongful acts or omissions of the NON-GOVERNMENTAL ORGANIZATION and persons employed or utilized in the performance of this Contract. In any and all claims against the COUNTY, and its officers and employees, the indemnification obligation under this paragraph shall not be limited in any way by a limitation on the amount or type of damages, compensation or benefits payable by or for the NON-GOVERNMENTAL ORGANIZATION, under workers' compensation acts, or other related policies or insurance. The parties acknowledge specific consideration has been exchanged for this indemnification provision. This indemnification shall survive the termination of this Contract.

[REMAINDER OF PAGE INTENTIONALLY LEFT BLANK. SIGNATURES TO FOLLOW.]

IN WITNESS WHEREOF, the COUNTY has caused this Contract to be executed on the day and year written below in its name by its duly authorized representative, and NON-GOVERNMENTAL ORGANIZATION has caused this Contract to be executed on the day and year written below in its name by its duly authorized representatives. This Contract may be executed in separate counterparts, which shall not affect its validity. Upon execution, this Contract constitutes the entire Contract of the parties and supersedes all other stipulations, proposals, representations, statements, or understandings, whether written or oral, regarding this subject matter. This Contract cannot be changed by any means other than written amendments referencing this Contract and signed by all parties.

Brevard County, Florida

By: _____

Kristine Zonka, Chair

Brevard County Board of County Commissioners

As Approved by the Board on February 22, 2022

Attest

By: _____

Rachel Sadoff, Clerk

Reviewed for legal form and content for Brevard County

3-24-2022

Heather A. Balser, Assistant County Attorney

East Coast Zoological Society of Florida, Inc.

By: _____

Name: Keith Winsten

Title: Executive Director

Date: 4-12-22

EXHIBIT A
Statement of Work

Project: Restore Our Shores: Community Collaborative Year 1

Background: The new Restore Our Shores: Community Collaborative will encompass the previous Oyster Gardening Program and expand to support restoration activities in the Indian River Lagoon, particularly pertaining to oysters, living shorelines, clams, and seagrasses. The gardening programs will aim to propagate organisms vital to the ecosystems of the Indian River Lagoon.

Oyster Gardening is a citizen-based oyster propagation program where juvenile oysters are raised under lagoon-front homeowner's docks and eventually used to populate constructed oyster reef sites in Brevard County. Oyster Gardening participants receive spat-on-shell oysters plus all supplies needed to care for their oysters until they are returned six (6) to nine (9) months later and placed at new reef sites in the Indian River Lagoon.

Clam gardeners will receive juvenile *Mercenaria spp.* clams and all supplies necessary for raising clams adjacent to their property on the lagoon floor. Once clams have grown to the appropriate size, they will be released into the sediment or transported to designated restoration sites.

The zoo plans to establish a nursery for the propagation of seagrasses to provide stock for restoration in the Indian River Lagoon. Maintaining the nursery will be critical to its success and requires daily care. Environmental and biological data collection in this setting can help inform best practices for the culture of these seagrasses, and may contribute to an understanding of stresses present in the lagoon.

Workshops are held throughout the county to increase and accommodate public interest, and to provide training and education about resource propagation and care, living shorelines, and issues facing the lagoon. These workshops will expand from oyster gardening to encompass community engagement in clam and seagrass restoration. Further, through the establishment of a seagrass nursery, community gardens for clams, and expansion of the restoration buddies program for oysters and clams, residents can participate in restoration activities on public and/or private property. The zoo will train citizen volunteers on data collection techniques and maintenance related to these projects using quality assurance and control protocols for these data.

Scope:

Live Bivalve Propagation:

- Brevard Zoo will secure any required permits for oyster and/or clam gardening (i.e., FWC-Special Activity License) and submit associated required reporting directly to FWC.
- Brevard Zoo will conduct sufficient gardening workshops to accommodate public interest and provide all gardening materials/supplies for gardeners and buddies.

- Brevard Zoo will coordinate gardener engagement in the care and propagation of oysters and/or clams during the timeframe of this agreement.
    - Oysters: Brevard Zoo will purchase and distribute about 1-million spat on shell to trained oyster gardeners during the fall of each year. Care will include about six (6) months of oyster propagation and habitat maintenance per spat distribution to produce oysters grown to approximately 1" or larger oysters. In the event of delays in spat productions by the hatchery, this schedule can be modified with written approval from the County staff.
    - Clams: Brevard Zoo will purchase and distribute clams to gardeners with all necessary supplies in the winter of each year. Care will include weekly maintenance by gardeners until clams reach appropriate size for permanent planting.
- Brevard Zoo will maintain contact with approximately 1600 gardeners engaged to date and provide regular communication through e-newsletters and social media.

Seagrass:

- Nursery maintenance will be conducted daily by community volunteers. This will include cleaning of aquaria, ensuring appropriate water flows and light levels, and data collection.

Monitoring:

- Oyster Gardens: Brevard Zoo will conduct site visits one (1) day per week during gardening season at oyster garden locations where site access is allowed, such that each is visited at least once per season.
- Clam Gardens: Gardeners will visit clam gardens one day per week during the gardening season to maintain clam bags and collect environmental and density metrics. Brevard zoo staff will visit each garden at least once per season where access is allowed.
- Seagrass: Environmental and biological data will be collected daily at the seagrass nursery by community volunteers.
- Quality assurance and control protocols will be defined and agreed upon by Brevard Zoo and County staff. Updates will occur as appropriate with approval by both parties.

Collection and Deployment:

- Brevard Zoo will coordinate and manage collection of gardened oysters at the conclusion of the gardening season.
- Brevard Zoo will deploy gardened oysters at permitted reef locations mutually agreed upon in advance by Brevard County and Brevard Zoo.
- Brevard Zoo will deploy gardened clams at permitted locations mutually agreed upon in advance by Brevard County and Brevard Zoo.
- Brevard Zoo will coordinate and manage removal of cover netting, habitats, bags, etc. and markers as required by permit regulations.

Reporting:

- Brevard Zoo will provide quarterly draft and final reports to Brevard County summarizing propagation and program success and milestones.

- Brevard Zoo will provide copies of FWC permits, required reports to FWC, site visit data, seagrass nursery data, workshop registrations and sign-in sheets, presentations, and handouts upon request by Brevard County.

Invoicing:

- Brevard Zoo will submit quarterly invoices for a lump sum reimbursement for costs associated with the tasks of this project for periods ending quarterly on, 6/30, 9/30, 12/31, and 3/31. Payment for such work shall be made after the invoices have been reviewed by County staff.

Timeline for completion: Upon Contract Execution – March 31, 2027

Contractual: $1,000,000.00

Attachment B

Save Our Indian River Lagoon Project Progress Report Form

Date: _____ Report Number: _____

Project Information

Project Name:			
Recipient:		Recipient's Project Manager:	
SOIRL Contract Number:		SOIRL Contract Amount:	
Nitrogen Reduction Benefit:		SOIRL Contract Expiration:	
Phosphorus Reduction Benefit:		County Project Manager:	

Construction Schedule

Start Date (mm/dd/yy):	
Completion (mm/dd/yy):	

Reporting Period

Beginning Date (mm/dd/yy):	
Ending Date (mm/dd/yy):	

Project Financial Information

Total Project Budget:		Total SOIRL Budget Expended:	
Total Expended to Date:		SOIRL Budget Expended This Period:	

Estimated Reimbursement Schedule

Fiscal Year 1

Reimbursement #	Anticipated Amount	Anticipated Date
1		
2		
3		
4		

Fiscal Year 2

Reimbursement #	Anticipated Amount	Anticipated Date
1		
2		
3		
4		

Project Status (include problems, issues, solutions, anticipated plans/deviations from schedule)

Tasks/Milestones/Deliverables Scheduled

Task Number	Tasks/Milestones/ Deliverables	Start Date	Finish Date	Percent Complete (%)
1				
2				
3				
4				
5				

Attach an additional page of notes and photos if needed.

Attachment C – Detail Sheet

Save Our Indian River Lagoon Cost Share Program – Invoice for Reimbursement

RECIPIENT'S NAME:	
PROJECT NAME:	
COUNTY'S PROJECT MANAGER:	
AGREEMENT NO.:	
PERFORMANCE PERIOD FROM:	
PERFORMANCE PERIOD TO:	
PAYMENT REQUEST NO.:	
DATE OF REQUEST:	
TOTAL PROJECT COST:	
COST-SHARE PERCENTAGE:	
COST-SHARE AMOUNT:	
TOTAL COST-SHARE PREVIOUSLY REIMBURSED:	
CURRENT REIMBURSEMENT AMOUNT REQUESTED:	
NOTES:	

ITEM NO.	VENDOR	DESCRIPTION OF SERVICES	CHECK DATE	CHECK NUMBER	INVOICE NUMBER	INVOICE AMOUNT	CURRENT REIMBURSEMENT AMOUNT REQUESTED
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							
					TOTALS:	$ -	$ -

Attachment D

Recipient's Certification of Payment Request

I, _____, on behalf of _____, do hereby certify for SOIRL Agreement No. _____ and Payment Request No. _____ that:

☐The disbursement amount requested is for allowable costs for the project described in Attachment A of the Agreement.

☐All costs included in the amount requested have been satisfactorily purchased, performed, received, and applied toward completing the project; such costs are documented by invoices or other appropriate documentation as required in the Agreement.

☐All procurement for the amount requested was completed in a manner consistent with applicable law and contract requirements.

☐If notified by the County of any restrictions on the use of local preference for this Agreement, the Recipient confirms that no local preference was used.

☐The Recipient has paid such costs under the terms and provisions of contracts relating directly to the project; and the Recipient is not in default of any terms or provisions of the contracts.

Check all that apply:

☐All permits and approvals required for the construction, which is underway, have been obtained.

☐Construction up to the point of this disbursement is in compliance with the construction plans and permits.

☐The Recipient's Grant Manager relied on certifications from the following professionals that provided services for this project during the time period covered by this Certification of Payment Request, and such certifications are included:

Professional Service Provider (Name / License No.)	Period of Service (mm/dd/yy – mm/dd/yy)

_____	_____
Recipient's Grant Manager's Signature	Recipient's Fiscal Agent
_____	_____
Print Name	Print Name
_____	_____
Telephone Number	Telephone Number

ATTACHMENT E

Recipient Name:	Brevard Zoo
Project Name:	Restore Our Shores: Community Collaborative
Agreement Number:	227

Estimated Project Cost-Share Table							
Year	Task Description	Task Cost	Grant 1 (____)	Grant 2 (____)	Grant 3 (____)	Eligible Lagoon Tax Cost Share, Adjusted	Local Match
1	Outreach/Resource Propegation	$200,000				$200,000	$ -
2		$200,000				$200,000	$ -
3		$200,000				$200,000	$ -
4		$200,000				$200,000	$ -
5		$200,000				$200,000	$ -
	Total	$1,000,000	$ -	$ -	$ -	$1,000,000	$ -

Save Our Indian River Lagoon Funding Eligibility Calculation	
Project Type	Outreach/Education
Pounds of Nitrogen Reduction	N/A
Eligible Cost Share per Pound	N/A
Eligible Tax Funding Cost Share	$1,000,000
Reduction so Sum of Grants does not exceed Project Cost	$0
Eligible Cost Share, Adjusted	$ 1,000,000.00
Cost Share Percentage	100%

Attachment F

DISCLOSURE FORM

FOREIGN INFLUENCE ON CONTRACTS OR GRANTS HAVING A VALUE OF $100,000 OR MORE

Summary of Form: In order for the County to comply with section 286.101, Florida Statutes, all prospective contractors and grant recipients seeking to contract with the County, or receive a grant from the County, where said contract or grant has a value of $100,000 or more must disclose to the County (1) any current or prior interest of, (2) any contract with, or (3) any grant or gift received from a foreign country of concern (defined as the People's Republic of China, the Russian Federation, the Islamic Republic of Iran, the Democratic People's Republic of Korea, the Republic of Cuba, the Venezuelan regime of Nicolas Maduro, and the Syrian Arab Republic, or an agency or other entity under the significant control of such foreign country of concern) if such interest, contract, or grant or gift has a value of $50,000 or more and such interest existed at any time or such contract or grant or gift was received or in force at any time during the previous five years. The disclosure is specified below. Within one year before applying for any grant or proposing any Contract, such entity must provide a copy of such disclosure to the Department of Financial Services. Disclosure is not required in certain circumstances, outlined below. A Contract is any agreement for the direct benefit or use of any party to such agreement, including an agreement for the sale of commodities or services. A Gift is any transfer of money or property from one entity to another without compensation. A Grant is a transfer of money for a specified purpose, including a conditional gift. An interest in an entity means any direct or indirect investment in or loan to the entity valued at 5 percent or more of the entity's net worth or any form of direct or indirect control exerting similar or greater influence on the governance of the entity.

I. SECTION I. Please answer yes or no to each statement below:

YES / NO I AM BIDDING ON A CONTRACT/APPLYING FOR A GRANT WITH A POTENTIAL VALUE UNDER $100,000. If yes, this disclosure form has been completed. Please sign and date at the bottom.

YES / NO I AM BIDDING ON A CONTRACT/APPLYING FOR A GRANT WITH A POTENTIAL VALUE OF OVER $100,000. If yes, proceed to the next question.

YES / NO I HAVE MADE A FOREIGN INFLUENCE DISCLOSURE ONLINE WITH THE DEPARTMENT OF FINANCIAL SERVICES. If yes, please proceed to SECTION IV and provide the date of the disclosure, your name and address. Then sign and date at the bottom.

II. SECTION II. Please answer yes or no to the statement below:

YES / NO Bidder/Grantee has (1) a current or prior interest of, any contract with, or any grant or gift received from a foreign country of concern (defined as the People's Republic of China, the Russian Federation, the Islamic Republic of Iran, the Democratic People's Republic of Korea, the Republic of Cuba, the Venezuelan Regime of Nicolas Maduro, and the Syrian Arab Republic, or an agency or other entity under the significant control of such foreign country of concern); and (2)

Attachment F

such interest, contract, or grant or gift has a value of $50,000 or more; and (3) such interest existed, or such contract or grant or gift was received or in force at any time during the previous five years.

III. SECTION III. If you answered NO to SECTION II, you have completed this form. Please sign/date at the bottom. If you answered YES to SECTION II, then answer YES or NO to the following:

YES / NO This is a proposal to sell commodities through an online procurement programs established pursuant to section 287.057(22), Florida Statutes.

YES / NO This is a proposal from an entity that discloses foreign gifts or grants under section 1010.25 or section 286.101(2), Florida Statutes.

YES / NO This is a proposal from a foreign source that, if granted or accepted, would be disclosed under section 286.101(2) or section 1010.25, Florida Statutes.

YES / NO This is a proposal from a public or not-for-profit research institution with respect to research funded by any federal Agency.

IV. SECTION IV. If you answered YES to any question in SECTION III, you have completed this form. Please sign/date at the bottom. If you answered NO to all of the questions in SECTION III, then you must make the following disclosures online to the State of Florida Department of Financial Services before the County may contract with you or award you said grant. Please disclose the following:

Date Disclosure of the information below was made by Bidder/Grantee to the State of Florida Department of Financial Services online:_____

Name of Bidder/Grantee:_____

Mailing Address of Bidder/Grantee: _____

Value of the Contract/Grant or Gift: _____

Foreign Country of Concern or the Agency or other entity under the significant

Control of such Foreign country of Concern: _____

Date of Termination of the contract or interest with the Foreign Country of Concern:

_____

Date of Receipt of the Contract/Grant or Gift:_____

Name of the agent or controlled entity that is the source or interest holder:

_____

Attachment F

I verify that the information provided on this form is true and correct, and that I am duly authorized to make said binding disclosures on behalf of myself or my Company, as applicable.

Signature: _____ Date:_____

Title: _____

STATE OF FLORIDA

COUNTY OF _____

Sworn to and subscribed before me by means of ☐ physical presence or ☐ online notarization, this _____ day of_____, _____, by (name of person making statement).

[Notary Seal]

_____
Notary Public

_____
Name typed, printed or stamped

My Commission Expires: _____

_____ Personally Known OR _____ Produced Identification

Type of Identification Produced _____

2/22/2022

Natural Resources Management Department
2725 Judge Fran Jamieson Way
Building A, Room 219
Viera, Florida 32940

BOARD OF COUNTY COMMISSIONERS

Inter-Office Memo

TO: The Honorable Kristine Zonka, Chair
Board of County Commissioners

THROUGH: Frank Abbate, County Manager
John Denninghoff, Assistant County Manager
Virginia Barker, Director, Natural Resources Management Department (NRM)
Tom Belflower, Support Services Manager, NRM

Barker, Virginia — Digitally signed by Barker, Virginia Date: 2022.05.12 17:32:27 -04'00'

Belflower, Tom — Digitally signed by Belflower, Tom Date: 2022.05.12 14:29:12 -04'00'

Gubler, Anthony — Digitally signed by Gubler, Anthony Date: 2022.05.12 13:42:08 -04'00'

FROM: Anthony Gubler, Environmental Specialist, NRM

DATE: May 12, 2022

SUBJECT: Continuation of Save Our Indian River Lagoon Countywide Groundwater Well Monitoring (Task Order No. 19-4477-014-EC SOIRL), Applied Ecology, Inc.

We respectfully request your signature on the attached Task Order No 19-4477-014-EC SOIRL with Applied Ecology, Inc (AEI), in the amount of $240,415.78, for continuation of the groundwater monitoring, well maintenance, and homeowner surveys per the continuing services agreement (CM 4477).

On February 22, 2022, the Board of County Commissioners delegated signature authority to the Chair for executing Save Our Indian River Lagoon task orders as part of the adoption of the 2022 Plan update.

This Task Order will continue the monthly groundwater well monitoring for one year in 13 distinct communities and three natural areas throughout the county. The project will measure the performance of projects directed at reducing nutrient pollution in groundwater in an effort to quantify the cost-effectiveness of various project types. This information will be used to consider or revise the Save Our Indian River Lagoon Project Plan to improve the efficiency and effectiveness of Lagoon Trust Fund investments.

This Task Order includes minor maintenance of wells, the abandonment of one well, and a one-time homeowner survey to collect data on activities that may affect groundwater nutrient concentrations.

The task order will be funded from the Save Our Indian River Lagoon monitoring budget.

Field is work is scheduled for Monday, May 16. Therefore execution of this package is urgent. It was delayed through AO-29 process.

Please contact Anthony Gubler at Anthony.Gubler@brevardfl.gov or 321-205-7712 with questions or to arrange for pick-up.

Thank you.

Attachment A – AO-29

Attachment B – Clerk's Memo

Attachment C – Task Order

Cc: Terri Breeden, Section Supervisor, NRM

Attachment A

BREVARD COUNTY
BOARD OF COUNTY COMMISSIONERS

CONTRACT REVIEW AND APPROVAL FORM

SECTION I - GENERAL INFORMATION

1. Contractor: Applied Ecology, Inc.	**2. Amount:** 240,415.78
3. Fund/Account #: 1260/271210	**4. Department Name:** Natural Resources
5. Contract Description: Groundwater Well Monitoring	
6. Contract Monitor: Anthony Gubler	**8. Contract Type:**
7. Dept/Office Director: Virginia Barker	CONSULTANT
9. Type of Procurement: Other	

SECTION II - REVIEW AND APPROVAL TO ADVERTISE

COUNTY OFFICE	APPROVAL YES	APPROVAL NO	SIGNATURE
User Agency	☑	☐	
Purchasing	☐	☐	
Risk Management	☐	☐	
County Attorney	☐	☐	

SECTION III - CONTRACTS MANAGEMENT DATABASE CHECKLIST

COUNTY OFFICE	APPROVAL YES	APPROVAL NO	SIGNATURE
User Agency	☑	☐	Gubler, Anthony Digitally signed by Gubler, Anthony Date: 2022.04.22 11:11:06 -04'00'
Purchasing	☐	☐	Wall, Katherine Digitally signed by Wall, Katherine Date: 2022.05.03 13:05:05 -04'00'
Risk Management	☑	☐	Wilson, Shannon Digitally signed by Wilson, Shannon Date: 2022.05.12 09:52:47 -04'00'
County Attorney	☑	☐	Balser, Heather Digitally signed by Balser, Heather Date: 2022.05.10 10:50:53 -04'00'

SECTION IV - CONTRACTS MANAGEMENT DATABASE CHECKLIST

CM DATABASE REQUIRED FIELDS	Complete ✓
Department Information	☐
Department	☐
Program	☐
Contact Name	☐
Cost Center, Fund, and G/L Account	☐
Vendor Information (SAP Vendor #)	☐
Contract Status, Title, Type, and Amount	☐
Storage Location (SAP)	☐
Contract Approval Date, Effective Date, and Expiration Date	☐
Contract Absolute End Date (No Additional Renewals/Extensions)	☐
Material Group	☐
Contract Documents Uploaded in CM database (Contract Form with County Attorney/ Risk Management/ Purchasing Approval; Signed/Executed Contract)	☐
"Right To Audit" Clause Included in Contract	☐
Monitored items: Uploaded to database (Insurance, Bonds, etc.)	☐

Attachment B

BREVARD County
BOARD OF COUNTY COMMISSIONERS

FLORIDA'S SPACE COAST

Kimberly Powell, Clerk to the Board, 400 South Street • P.O. Box 999, Titusville, Florida 32781-0999

Telephone: (321) 637-2001
Fax: (321) 264-6972
Kimberly.Powell@brevardclerk.us

February 23, 2022

MEMORANDUM

TO: Virginia Barker, Natural Resources Management Director

RE: Item J.1., Adoption of the Save Our Indian River Lagoon Project Plan 2022 Update as Recommended by the Save Our Indian River Lagoon (SOIRL) Citizens Oversight Committee (COC)

The Board of County Commissioners, in regular session on February 22, 2022, adopted the SOIRL Project Plan 2022 Update, as recommended by the SOIRL COC on January 21, 2022; authorized staff to apply the increased cost share from $700 per pound to $1,200 per pound, to the three early adopters of the advanced septic systems, for a total cost of $17,305.00; authorized associated Budget Change Requests; approved continued signature authority to the Chair, or authorized representative, in accordance with the threshold limits provided for in Brevard County policies and administrative orders, to execute agreements, task orders, change orders, contract renewals, amendments, and other contract-related documents, subject to review and approval by Risk Management, County Attorney, and Purchasing Services, as appropriate, to provide cost share from the SOIRL Trust Fund for projects and programs approved in the Project Plan; approved continued authority for you to execute up to two no-cost time extensions up to six months each; granted permission to advertise formal solicitation of bids and proposals, and to award to the qualified bidder having the lowest, responsible, and best response for tangible items, capital improvement projects, and/or equipment, when required and subject to available funding; and authorized the County Manager, or his designee, to submit grant applications for leveraging cost share for projects and programs approved in the SOIRL Project Plan.

Your continued cooperation is always appreciated.

Sincerely,

BOARD OF COUNTY COMMISSIONERS
RACHEL M. SADOFF, CLERK

Kimberly Powell, Clerk to the Board

cc: County Attorney
Risk Management
County Manager
Finance
Budget

Attachment C

CONTINUING PROFESSIONAL SERVICES AGREEMENT FOR:

Monitoring Groundwater Quality in 13 Communities to Measure the Performance of Multiple Projects Included in the Save Our Indian River Lagoon Project Plan

TASK ORDER NO. 19-4477-014-EC SOIRL

THIS TASK ORDER is made this _____ day of _____, 2022, by and between Applied Ecology, Inc., hereinafter referred as the ENGINEER, and Brevard County, Florida, a political subdivision of the State of Florida, hereinafter referred to as the COUNTY.

WHEREAS, on October 1, 2019, the ENGINEER and the COUNTY entered into a continuing professional services agreement for Ecological Consulting Services, hereinafter referred to as the AGREEMENT, which is incorporated herein by this reference; and

WHEREAS, under SECTION I of the AGREEMENT, the ENGINEER agrees to provide certain professional services which shall be implemented by task orders; and

WHEREAS, the ENGINEER agrees to provide certain ecological and environmental services which shall be implemented in accordance with this Task Order.

NOW, THEREFORE, the parties do mutually agree as follows:

Summary

The purpose of the task order is to provide environmental services to the Brevard County Natural Resources Management Department (County) to provide Performance Measurement and Monitoring Services called for in the Respond component (Section 4.4) of the Save Our Indian River Lagoon (SOIRL) Project Plan. This task provides for one year of monthly groundwater monitoring at 43 wells located in thirteen communities for the purpose of measuring the performance of multiple septic to sewer conversion projects and reclaimed water treatment upgrade projects funded by the SOIRL Trust Fund. Also included in this task order are well condition assessments and minor maintenance, proper abandonment of a 44th well, and homeowner interviews to identify potential activities that may be affecting nutrient concentration results from the wells.

Section I, Scope of the Work

See Exhibit A – Applied Ecology, Inc. proposal

Section II, Contract Schedule

See Exhibit A – Applied Ecology, Inc. proposal

Section III, Deliverables

See Exhibit A – Applied Ecology, Inc. proposal

Section IV, Basis of Compensation

For the Scope of Work described in Section I of this Task Order, compensation from the COUNTY to the ENGINEER shall be on an hourly basis as indicated in the attached Exhibit A (actual expenses by category and tasks may vary from those indicated during the course of work), not to exceed **$240,415.78** unless authorized by a written Change Order executed by the COUNTY. Upon submittal of deliverables as described in Section III of this Task Order, the COUNTY will be invoiced only for actual work performed. The COUNTY shall pay such invoices in accordance with Florida's Prompt Payment Act. The COUNTY reserves the right to refuse payment for or deduct from any invoice, fees for incomplete or defective work. The following is a summary of the fee breakdown:

A. ECOLOGICAL CONSULTING SERVICES

1. Groundwater Data Collection	$100,006.00
and Task 1 Subcontractor/Laboratory Analysis	$40,052.78
and Task 1 Field Equipment, Supplies, Other	$33,522.00
2. Data Analysis and Reporting	$38,099.00
3. Well Abandonment and Maintenance	$8,214.00
and Task 3 Subcontractor Expenses	$1,575.00
and Task 3 Field Supplies	$1,000.00
4. Homeowner Interviews	$17,947.00
Total Project Cost	**$240,415.78**

Section V, Other Terms and Conditions

All of the terms and conditions of the AGREEMENT, and any amendments thereto, shall apply to this Task Order as fully set out herein. In the case of a conflict between the terms of this Task Order and the AGREEMENT, the latter shall control. It is hereby acknowledged that this Task Order is prepared based upon the Master Agreement executed on October 1, 2019 for Ecological Consulting Services between the ENGINEER and the COUNTY. As such, this Task Order is subject to all conditions and stipulations contained in said AGREEMENT, as may be amended.

PURSUANT TO FLORIDA STATUTE SECTION 558.0035, AN INDIVIDUAL EMPLOYEE OR AGENT OF THE ENGINEER MAY NOT BE HELD INDIVIDUALLY LIABLE FOR NEGLIGENCE.

Section VI, Effective Date and Authorized to Proceed

This Task Order shall be effective on the date specified in the Notice to Proceed from the COUNTY'S designated representative. This Task Order will expire one (1) year from the date of issuance of the Notice to Proceed, unless otherwise extended through a subsequent change order.

Section VII. Authority

The Parties warrant that the person signing this Task Order has all the requisite authority necessary to bind the Party it represents.

IN WITNESS WHEREOF, the parties hereto set their hands and seals effective on the date of the last signature below.

BREVARD COUNTY, FLORIDA

By: _____

Print: Kristine Zonka

Title: Chair

Date: 5/20/22

As approved by the Board on February 22, 2022

Applied Ecology, Inc

By: _____

Print: Claudia M. Listopad, Ph.D., GISP

Title: Principal Scientist

Date: 5/12/2002

Attest

_____

Rachel Sadoff, Clerk

Date: May 26, 2022

EXHIBIT A

SCOPE OF WORK

Monitoring of the Groundwater Quality of 13 Communities under the Save Our Indian River Lagoon Project Plan.

See attached scope of work for breakdown of tasks, rates, and manhour estimates.

April 8, 2022

Virginia Barker
Director
Brevard County Natural Resources Management Office
2725 Judge Fran Jamieson Way, Bldg. A
Viera, Florida 32940

Subject: **Scope of Work and Fees for the Monitoring of the Groundwater Quality of 13 Communities under the Save OurIndian River Lagoon Project Plan (SOIRLPP)**

Dear Ms. Barker,

Applied Ecology, Inc. (AEI) is pleased to submit this scope of work to Brevard County on the above-referenced services. Included, and incorporated as part of this scope, is an outline of the project information provided to us, the proposed scope of services, our fee, and the proposed schedule.

Introduction

This scope of work includes groundwater monitoring well maintenance activities, as well as groundwater monitoring, data analysis, and reporting for 13 distinct communities and three controls (natural areas) within Brevard County (43 total wells). The specific communities were selected in a previous study funded by the State Legislature and based on areas with high potential for retrofit under the SOIRLPP. The following study areas, which were augmented to measure the benefits of retrofit projects included in the SOIRLPP, are included in this groundwater monitoring effort: Merritt Island (septic and sewer communities), Melbourne Beach/Satellite Beach (septic, reclaimed, and sewer communities), Turkey Creek (septic, reclaimed, and sewer communities), Suntree (septic, sewer, and reclaimed), and Titusville (sewer and reclaimed). In addition, three natural areas located in close proximity to various selected communities are included and will be used as controls: Coconut Point (Melbourne Beach), Turkey Creek Sanctuary (Turkey Creek), and Enchanted Forest (Titusville). The costs for well maintenance, groundwater monitoring, and reporting are provided in separate tasks. Please refer to Attachment A for a detailed description of the level of effort and costs by subtask.

Proposed Scope of Work

Task 1- Data Collection and Laboratory Analysis

This task includes groundwater and reclaimed water sampling and analysis, homeowner access agreements, and a homeowner survey. The sampling is expected to occur monthly for 12 months, from May 2022 through April 2023. Groundwater samples will be collected once per month at 43 of the 44 previously installed groundwater monitoring wells. One well in the Merritt Island sewer community will have to be abandoned (included in Task 3). Reclaimed water samples will be collected from the Turkey Creek neighborhood at an estimated rate of two samples per month. Groundwater and reclaimed water sampling will be performed in general compliance with FDEP groundwater and general sampling protocols. Samples will be delivered within hold times to a certified National Environmental Laboratory Accreditation Conference (NELAC) laboratory. Orthophosphate has a short hold time of 48 hours. In order to meet the short hold times, it may be necessary for Applied Ecology to drive the samples to the laboratory. It is anticipated that duplicate teams may be deployed to collect samples in the vicinity, reducing travel time and the number of rush delivery trips to the laboratory.

AEI evaluated the use of various laboratories for the upcoming scope, including an evaluation of prices, reporting limits, and capability to pick up the samples. Based on our evaluation, the best option seems to be to utilize Pace Environmental Laboratories, due to the lower analytical costs and lower reporting limits.

Field parameters (pH, temperature, conductivity, and turbidity) will be collected during sampling. The following laboratory parameters will be analyzed by a NELAC certified lab: ammonia (NH-3-N), nitrate-nitrite (NOX-N), total Kjeldahl nitrogen (TKN), and calculated total nitrogen (TN), orthophosphate as P (OrthoP, or PO43-), and total phosphorus (TP). A total of 594 samples [516 groundwater samples, 24 reclaimed water samples, and 54 blank/duplicates (approximately 10% of the collected samples)] will be collected and analyzed for the nutrients listed above. It is assumed that 10% of the samples will need to be filtered to meet the low turbidity requirements for the orthophosphate analysis. A total of 135 samples (129 groundwater samples and 6 reclaimed water samples; approximately 25% of the collected samples) will be collected for isotopic analysis. A total of 145 samples (10 existing septic tank samples and 135 groundwater and reclaimed water samples) will be shipped to University of California (UC) Davis Laboratory for isotopic analysis. Due to the high cost of shipping, including using dry ice to keep the sample frozen, it is assumed that the samples can be sent in two shipments.

Field and laboratory data will be entered and quality assured monthly. Summary data tables will be updated monthly for quality control. This task also includes coordination time with homeowners to obtain homeowner agreements and schedule monthly efforts, as well as coordination with the local NELAC certified laboratory.

Expenses associated with Task 1 include laboratory analysis of nutrients, isotopic analysis, field supplies and equipment rental, and express laboratory delivery.

Task 2: Data Analysis and Reporting

Data will be analyzed for trends over time for each of the parameters. Changes to the project area (e.g., potential connection to central sewer for the septic sites, upgrades to WWTP for the reclaimed water) will be considered in the evaluation. Summary statistics and seasonality will also be examined for the nitrogen and phosphorus species. Reporting under this task includes quarterly summary reporting of monitoring activities (3 quarters), such as dates of sample collection, laboratory reports, and sampling logs with purge and field data recorded, as well as summary data tables and charts. The quarterly reports will also include documentation of known changes to the project area, including the dates at which the changes occurred. It is expected that within the next year, some properties in Suntree will be connected to the central sewer and at least one of the WWTPs will be upgraded. If appropriate, the changes may be indicated on graphs of data over time and/or on maps of properties. Since only a limited amount of data is expected to be collected after the changes, a comparison of concentrations before and after the changes will not be performed. A brief executive summary highlighting major findings will be included in each quarterly report, but no statistical analyses will be included.

The data from the fourth quarter of sampling will be presented in the annual report. The annual report will include laboratory and field data, summary data, graphical representations of trends, and relevant statistical analysis. This task also includes time for coordination, up to one formal presentation (if requested), and two meetings to discuss the monitoring results, as well as time to incorporate one set of comments in the final annual report. Peer review of the data and analytical interpretation will also be conducted.

Task 2 Deliverables:

- Quarterly summary data reports (3) of monitoring activities that include dates sampling was conducted, laboratory reports, sampling logs with purge and field data recorded, as well assummary data tables.

- Power Point or PDF version of the presentation, if requested.
- Draft Annual Report that summarizes the field and lab data, statistical analysis results, and data interpretation.
- Final Annual Report, which incorporates one set of comments received from County staff.
- Peer review of the findings.

Task 3: Well Abandonment and Maintenance

Well abandonment and maintenance activities will be performed under this task. AEI will subcontract a licensed driller to properly abandon well MW SE 1750 that is located in the Merritt Island neighborhood. Upon abandonment, the driller will remove the well pad and well vault and will restore the land surface to conditions similar to the immediately surrounding area. AEI will prepare a well abandonment report with documentation that the well was properly abandoned. In addition, the well pad at well MW SP 6155 in Suntree is damaged, which could result in a trip hazard and/or damage to the well casing. If desired, AEI will include in the driller's scope to replace the concrete pad at this well.

Budget has been included in this task for well maintenance to be performed on an as needed basis. Maintenance may include, but is not limited to:

1. Minor replacement or repairs, such as for well plugs, bolts, or well pad
2. Well condition assessment with borescope and/or well rehabilitation, potentially due to an increase in iron bacteria growth or manganese oxide depositions
3. Removal of tree roots at MW SE 841

AEI will independently implement minor maintenance and repairs as it is needed. AEI will obtain approval from Brevard County prior to more extensive efforts, such as well rehabilitation or well abandonment. It is anticipated that minor repairs will be documented in quarterly or annual reports. If more extensive maintenance is performed, a Well Maintenance Report may be warranted.

AEI does not propose collecting a comprehensive round of total depth measurements during the upcoming year. AEI does not propose a formal well condition assessment. Our field personnel will monitor the condition of wells during sampling, and will note if maintenance needs to be performed.

The proposed effort in this task includes homeowner notifications, homeowner coordination, subcontractor management, and project management. If budget is needed beyond that scoped,

AEI will notify Brevard County.

Expenses associated with Task 3 include miscellaneous replacement parts for wells, borescope, and/or rehabilitation supplies.

Task 3 Deliverables:

- Well Abandonment Report, documenting that MW SE 1750 was properly abandoned.

Task 4: Homeowner Interviews

A one-time survey of the 43 homeowners will be performed to collect data on activities at the home that may affect nutrient concentrations. The survey is expected to include questions related to topics such as number of people living in the house throughout the year, fertilizer usage (type, frequency, applicator), septic tank maintenance, and other management practices that may affect groundwater nutrients. AEI anticipates the survey being a combination of multiple-choice questions, so the data can be summarized across households, and open ended questions, to obtain information on specific situations that may affect the data. The survey will be individualized to support understanding of localized water quality trends.

The surveys may be completed in person, via telephone, and/or in writing. It is assumed that no more than 10 meetings will occur in person. Up to three attempts will be made to contact each homeowner to perform or schedule the interview. The attempts may be in person, via telephone, and/or in writing. AEI will prepare a draft survey for review by Brevard County and potentially the University of Florida's Institute of Food and Agricultural Sciences (IFAS). If needed, AEI will also attend a one-hour virtual meeting with Brevard and/or IFAS to discuss the survey. AEI will incorporate Brevard County's and/or IFAS's comments in the final survey.

AEI will prepare a report summarizing the homeowner responses. It is anticipated that responses to multiple choice questions will be tabulated and compared across treatment types, if applicable. A blank survey form will be included as an attachment to the report. Individual responses will not be shared in the report. AEI expects to include the Homeowner Interview Summary Report as an appendix to the groundwater sampling Annual Report. AEI may utilize the collected data when comparing nutrient concentrations, if appropriate, though anonymity of responses will be maintained.

Task 4 Deliverables:

- Draft and Final Homeowner Survey
- Homeowner Interview Summary Report

Fee and Method of Compensation

We propose performing the above scope of services for a time and materials not to exceed fee of **$240,415.78** as follows:

Task 1 Labor - Data Collection	$100,006.00
Task 2 Labor - Data Analysis and Reporting	$38,099.00
Task 3 Labor –Well Abandonment and Maintenance	$8,214.00
Task 4 Labor – Homeowner Interviews	$17,947.00
Subcontractor Expenses – Task 1	$40,052.78
Field Equipment, Supplies and Other Expenses – Task 1	$33,522.00
Subcontractor Expenses – Task 3	$1,575.00
Field Equipment, Supplies and Other Expenses – Task 3	$1,000.00
Total Project Cost	**$240,415.78**

Monthly invoices will be billed based on the hourly effort performed and expenses during each calendar month. Details on the level of effort and associated cost by task are provided in Attachment A.

If unforeseen conditions should require services beyond the scope of services described herein, Applied Ecology will notify you immediately of additional costs necessary to complete the project prior to proceeding. Services beyond those described herein would be invoiced in accordance with our standard schedule of fees at the applicable rates.

Schedule

We anticipate initiating the project immediately after notice to proceed (NTP). The first monthly groundwater monitoring event in Task 1 (Data Collection) is scheduled for May 2022, and the final monthly event is scheduled for April 2023. Task 2 (Data Analysis and Reporting) is expected to be completed within three (3) months after the last sampling event, i.e. July 2023, assuming the isotopic analytical results are received by June 2023. The well abandonment in Task 3 is anticipated to occur within 3 months of NTP. Other maintenance activities in Task 3 will be ongoing, as needed. A draft of the homeowner survey in Task 4 is expected to be submitted to Brevard County in July 2022, with interviews commencing once the survey is approved.

Authorization

Please provide written authorization to proceed consistent with the terms and conditions of the Ecological Consulting Contract between Brevard County and Applied Ecology dated 09/12/2019.

We appreciate the opportunity to offer our professional services on this project. If you have any questions concerning this proposal, please contact us at 321-499-3336.

Sincerely,

Catherine A. Soistman, P.E. (FL, CA)
Principal Engineer

Claudia Listopad, Ph.D., GISP
President, Principal Scientist

Attachments:

Attachment A - Detailed level of effort and associated cost by subtask for Monitoring of the Groundwater Quality of 13 communities under the Save Our Indian River Lagoon Project Plan (SOIRLPP)

Attachment A
Detailed Level of Effort and Cost Summary

Task 1: Data Collection

Subtask	Description	Principal ($152)	Senior Scientist ($110)	Staff Scientist ($85)	Assoc Staff Scientist ($66)	Field Technician ($59.5)	Clerical ($40.5)	Total Hrs	Total Cost
1	Homeowner Notifications and Sampling Preparation	0	6	0	114	0	0	120	$8,184.00
2	Sampling effort for 12 monthly events for 43 wells	8	16	0	876	240	0	1140	$75,072.00
3	Compilation and Reporting of Lab Results and Field Parameters, QA	6	24	0	96	0	0	126	$9,888.00
4	Project management (coordination with laboratory, homeowners, client)	24	0	0	8	0	12	44	$4,662.00
5	Contact Homeowners to Obtain Renewals/Abandon Wells	0	8	0	20	0	0	28	$2,200.00
Subs	Laboratory								$40,052.78
Expenses	Laboratory, Supplies, Equipment Rental Expenses for GW Sampling								$33,522.00
	TASK 1 TOTAL:	***38***	***54***	***0***	***1114***	***240***	***12***	***1458***	***$173,580.78***

Task 2: Data Analysis and Reporting

Subtask	Description	Principal ($152)	Senior Scientist ($110)	Staff Scientist ($85)	Assoc Staff Scientist ($66)	Field Technician ($59.5)	Clerical ($40.5)	Total Hrs	Total Cost
1	Quarterly Reporting of Lab Results and Field Parameters (3 quarters)	6	18	0	36	0	12	72	$5,754.00
2	Data Analysis	16	0	24	24	0	0	64	$6,056.00
3	Draft and Final Annual Report	12	16	40	12	0	12	92	$8,262.00
4	Meetings, Presentations & PM (two meetings)	20	0	16	0	0	4	40	$4,562.00
5	Peer review of Findings	32	28	64	0	0	2	126	$13,465.00
	TASK 2 TOTAL:	***86***	***62***	***144***	***72***	***0***	***30***	***394***	***$38,099.00***

Task 3: Well Abandonment and Maintenance

Subtask	Description	Principal ($152)	Senior Scientist ($110)	Staff Scientist ($85)	Assoc Staff Scientist ($66)	Field Technician ($59.5)	Clerical ($40.5)	Total Hrs	Total Cost
1	Well Abandonment and Well Pad Repair	2	0	0	10	0	0	12	$964.00
2	Well Abandonment Report	1	0	0	6	0	2	9	$629.00
3	Well Maintenance, as needed	10	0	0	40	40	2	92	$6,621.00
Subs	Driller								$1,575.00
Expenses	Field Supplies								$1,000.00
	TASK 3 TOTAL:	***13***	***0***	***0***	***56***	***40***	***4***	***113***	***$10,789.00***

Attachment A
Detailed Level of Effort and Cost Summary

Task 4: Homeowner Interviews

Subtask	Description	Principal ($152)	Senior Scientist ($110)	Staff Scientist ($85)	Assoc Staff Scientist ($66)	Field Technician ($59.5)	Clerical ($40.5)	Total Hrs	Total Cost
1	Prepare Homeowner Survey	8	0	0	16	0	4	28	$2,434.00
2	Homeowner Interviews	24	0	0	106	0	0	130	$10,644.00
3	Homeowner Interview Summary Report	8	0	32	8	0	10	58	$4,869.00
	TASK 4 TOTAL:	***40***	***0***	***32***	***130***	***0***	***14***	***216***	***$17,947.00***

Major Task Summary

Task	Description	Principal ($152)	Senior Scientist ($110)	Staff Scientist ($85)	Assoc Staff Scientist ($66)	Field Technician ($59.5)	Clerical ($40.5)	Total Hrs	Total Cost
1	Data Collection	38	54	0	1114	240	12	1458	$173,580.78
2	Data Analysis and Reporting	86	62	144	72	0	30	394	$38,099.00
3	Well Abandonment and Maintenance	13	0	0	56	40	4	113	$10,789.00
4	Homeowner Interviews	40	0	32	130	0	14	216	$17,947.00
ALL	***PROJECT TOTAL***	***177***	***116***	***176***	***1372***	***280***	***60***	***2181***	***$240,415.78***

Description	Total Cost
Project Subtotal (Labor Only)	**$164,266.00**
Subcontractors and Expenses	***$76,149.78***
Project Total (with Expenses)	**$240,415.78**

J.1
2/22/22

SAVE OUR INDIAN RIVER LAGOON PROJECT COST-SHARE FUNDING INTERLOCAL AGREEMENT BETWEEN BREVARD COUNTY, FLORIDA AND THE CITY OF TITUSVILLE, FLORIDA.

AGREEMENT NUMBER: SOIRL 22-214

THIS AGREEMENT ("Agreement") is made and entered into the date of last signature below by and between Brevard County, Florida, a political subdivision of the State of Florida (hereinafter "COUNTY"), and the City of Titusville, Florida, a Florida municipal corporation organized and existing under the laws of the State of Florida (hereinafter "CITY").

RECITALS

WHEREAS, the COUNTY saw the urgent need to implement the "Save Our Indian River Lagoon Project Plan," with the aim to restore the Indian River Lagoon through financing, planning, constructing, maintaining, and operating capital improvements and capital maintenance projects and programs designed to improve water quality, fish, wildlife and marine habitat, remove muck and reduce pollution, as permitted under Section 212.055(2)(d)1., Florida Statutes; and

WHEREAS, pursuant to Section 212.055, Florida Statutes, the COUNTY is authorized to levy a discretionary infrastructure sales tax of one-half cent by ordinance enacted by a majority of the members of the Board of County Commissioners and approved by a majority of the electors of Brevard County voting in a referendum on the surtax; and

WHEREAS, the COUNTY promulgated and passed Brevard County Ordinance No. 2016-15, ("the Ordinance") imposing a one-half cent discretionary infrastructure sales tax for a period of ten (10) years from the date of levy, for the purposes expressed above, subject to approval of said surtax by a majority vote of those qualified electors of Brevard County voting in a referendum that was held on November 8, 2016; and

WHEREAS, it was contemplated that, if approved, said one-half cent discretionary infrastructure sales tax shall be imposed and collected County-wide, commencing on January 1, 2017, and continuing thereafter for a period of ten (10) years until December 31, 2027; and

WHEREAS, on November 8, 2016, a majority of those qualified electors of Brevard County voted in favor of the referendum, thereby authorizing the levy of the one-half cent surtax; and

WHEREAS, the COUNTY deems it in the best interest of all of the citizens and residents of Brevard County, Florida, that the proceeds of the one-half cent discretionary infrastructure sales tax be used to fund projects and programs designed to restore the Indian River Lagoon in the manner set forth in the Ordinance and its incorporated Save Our Indian River Lagoon Project Plan, including operations, maintenance and reasonable administrative costs of those projects and programs; and

WHEREAS, the project identified in the Statement of Work ("the Project") has been

included and approved by the Board of County Commissioners as part of the Save Our Indian River Lagoon Project Plan; and

WHEREAS, the COUNTY has determined that providing cost-share funding to the CITY for the purposes provided for herein will assist the COUNTY in effectively and efficiently implementing the Ordinance and its incorporated Save Our Indian River Lagoon Project Plan, as amended from time to time, and would be a proper expenditure of the monies reserved in the Save Our Indian River Lagoon Trust Fund;

NOW, THEREFORE, for value received, and in consideration of the following covenants, promises and provisions; the Parties agree as follows:

Section 1. Documents.
This Agreement incorporates all of the following:
a. The Recitals set forth above;
b. The terms of the Agreement set forth herein;
c. Attachment A – Statement of Work;
d. Attachment B – Project Progress Report Form;
e. Attachment C – Reimbursement/Invoice Form;
f. Attachment D – Recipient's Certification of Payment Form;
g. Attachment E – Eligible Tax Funding Cost Share Form; and
h. Attachment F – Foreign Disclosure Form (for projects over $100,000).

Section 2. Statement of Work.
In consideration of the above recitals, and the funding assistance described below, the CITY agrees to perform and complete the activities provided for in the **Statement of Work, Attachment A**. CITY shall complete the Project in conformity with the contract documents and all attachments and other items incorporated by reference herein.

Section 3. Term and Extensions.
a. The term of this Agreement is from the date upon which the last party has dated and executed the same ("Effective Date") until May 30, 2024 ("Completion Date"). CITY shall not commence the Project until any required submittals are received and approved. Time is of the essence for every aspect of this Agreement, including any time extensions.

b. Any request for an extension of time beyond the Completion Date must be made in writing no less than forty-five (45) days prior to the contracted Completion Date. Timely requests to extend for up to one (1) year may be approved by the County Manager, or designee. Up to two (2) requests to extend for six (6) months each may be approved by the Natural Resources Management Department Director, or his/her designee. Timely requests to extend for longer than the County Manager's authorization to approve, may only be approved by the Board of County Commissioners.

c. Notwithstanding specific mention that certain provisions survive termination or expiration of this Agreement, all provisions of this Agreement that by their nature extend beyond the

Completion Date, including by way of example without limitation, delivery of a final progress report, will remain in full force and effect after the Completion Date as necessary to affect performance.

Section 4. Offer Limitations.

a. This Agreement constitutes an offer until authorized, signed and returned to the COUNTY by the CITY. This offer terminates sixty (60) days after receipt by the CITY; provided, however, that the CITY may submit a written request for extension of this time limit which may be approved by the County Manager or his/her designee.

b. If the Project, which is eligible for reimbursement under this Agreement, does not begin within one hundred eighty (180) days of the Effective Date, or if the-invoice for non-construction projects is not submitted within two hundred seventy (270) days of the Effective Date, this Agreement will be subject to termination and the funds subject to reallocation.

Section 5. Project Management.

The Project Managers listed below shall be responsible for overall coordination and management of the Project. Either party may change its Project Manager upon three (3) business days' prior written notice to the other party. Written notice of change of address shall be provided within five (5) business days. All notices shall be in writing to the Project Managers at the addresses below and shall be sent by one of the following methods: (1) hand delivery; (2) U.S. certified mail; (3) national overnight courier; or (4) e-mail. Notices via certified mail are deemed delivered upon receipt. Notices via overnight courier are deemed delivered one (1) business day after having been deposited with the courier. Notices via e-mail are deemed delivered on the date received.

COUNTY
Terri Breeden
Project Manager
Department of Natural Resource Management
2725 Judge Fran Jamieson Way, Building A
Viera, Florida 32940
321-633-2016
Email: Terri.Breeden@brevardfl.gov

CITY
Sandra Reller
Public Works Deputy Director
City of Titusville
555 S Washington Ave
Titusville, FL 32796
321-567-3846
E-mail: Sandra.Reller@Titusville.com

a. The COUNTY'S Project Manager shall have sole responsibility for transmitting instructions, receiving information, and communicating the COUNTY'S policies and decisions regarding all matters pertinent to performance of the Project. The COUNTY'S Project Manager may authorize minor changes in the Project that the parties agree are not inconsistent with the purpose of the Project, and do not affect the COUNTY'S cost-share funding amount, the Project's nutrient reduction benefits, Completion Date, or otherwise significantly modify the terms of the Agreement.

b. Should additional funding be acquired from sources other than the Indian River Lagoon one-half cent surtax, the County Manager and City Manager are authorized to sign amendments to

this Agreement only if such additional funding: (1) reduces the Indian River Lagoon tax funding amount; and/or (2) reduces the CITY's cost-share amount.

Section 6. Deliverables.

a. The CITY shall fully implement the Project, as described in the **Statement of Work, Attachment A**. The CITY is responsible for the professional quality, technical accuracy, and timely completion of the Project. Both workmanship and materials shall be of good quality. Unless otherwise specifically provided for herein, the CITY shall provide and pay for all materials, labor, and other facilities and equipment necessary to complete the Project.

b. The COUNTY'S Project Manager shall make a final acceptance inspection of the project when completed and finished in all respects. Upon satisfactory completion of the Project, the CITY will provide the COUNTY a written statement indicating that the Project has been completed in accordance with this Agreement. Acceptance of the final payment by the CITY shall constitute a release in full of all claims against the COUNTY arising from or by reason of this Agreement.

c. Unless otherwise provided herein, the COUNTY does not assert an ownership interest in any of the deliverables under this Agreement.

Section 7. Progress Reports and Performance Monitoring

a. The CITY shall provide to the COUNTY Project update/status reports as provided in the **Statement of Work, Attachment A**. Reports will provide detail on progress of the Project and outline any potential issues affecting completion or the overall schedule.

b. The CITY shall use the COUNTY'S **Project Progress Report Form, Attachment B.** CITY shall submit the Project Progress Reports to the COUNTY'S Project Manager within twenty (20) days after the closing date of each calendar quarter (March 31, June 30, September 30 and December 31).

c. Commencement of Construction. The CITY shall notify the COUNTY once construction has started at the site.

d. For as long as the Project is operational, the COUNTY shall have the right to inspect the operation of the Project during normal business hours upon reasonable prior notice. The CITY shall make available to the COUNTY any available data that is requested pertaining to the performance of the Project.

Section 8. Amount of Funding.

a. For satisfactory completion of the Project, the COUNTY shall pay the CITY its "Eligible Tax Funding Cost Share" as stated in **Eligible Tax Funding Cost Share Form, Attachment E.** This amount shall be reduced correspondingly if additional matching funds for the Project are secured by the CITY. The contract amount may be increased by the appropriate grant amount if the COUNTY is able to secure funds from external revenue sources that are approved for allocation to this Project by the Board of County Commissioners, or its duly authorized

representative.

b. The CITY shall be responsible for payment of all additional costs beyond the cost-share amount necessary to ensure completion of the Project.

c. During contract negotiations, the CITY must submit the adopted budget for the project, the amount of all secured grants for the Project, and an estimate of Project costs as defined below in Section 8.e. The Eligible Tax Funding Cost Share shall be reduced as necessary to not exceed the balance of Project costs minus external matching funds for the Project.

d. The CITY shall notify the COUNTY'S Project Manager in writing upon receipt of any additional external funding for the Project not disclosed prior to execution of this Agreement. The Eligible Tax Funding Cost Share shall be reduced as necessary so as not to exceed the balance of Project Costs minus external matching funds for the Project.

e. "Project cost" is defined to include actual costs of constructing project facilities, including construction, construction management, construction QA/QC testing, land acquisition, engineering, design, permitting, permit fees, impact fees, and any other Project-specific costs authorized under the **Statement of Work, Attachment A**. Project cost does not include any costs incurred prior to the Effective Date, unless expressly authorized by the Statement of Work, nor any costs not included in the contracted Statement of Work.

f. The CITY is responsible for owning, operating and maintaining the Project for the typical operating life of the Project.

Section 9. Payment of Invoices.

a. The CITY shall submit itemized invoices as per the **Statement of Work, Attachment A** on an end of Project basis for reimbursable expenses by one of the following four methods by: (1) mail; (2) hand delivery; or (3) national overnight courier to the Brevard County Natural Resources Management Department, Terri Breeden, Project Manager, 2725 Judge Fran Jamieson Way, Building A, Viera, Florida 32940; or (4) e-mail to Terri.Breeden@brevardfl.gov. If a delivery method is not selected in this paragraph, the default invoicing basis will be quarterly increments and sent by mail to the Project Manager.

b. All invoices shall be submitted using **Reimbursement/Invoice Form, Attachment C**, and include the following information: (1) the COUNTY'S contract number; (2) the CITY'S name, address, and authorization to directly deposit payment into the CITY'S account; (3) the CITY'S invoice number and date of invoice; (4) the COUNTY'S Project Manager; (5) the CITY'S Project Manager; (6) supporting documentation as to cost and/or Project completion (as per the cost schedule and other requirements of the **Statement of Work, Attachment A**); and (7) **Project Progress Report Form, Attachment B**. Invoices that do not include the above-listed information shall be returned without action within ten (10) business days of receipt, stating the basis for rejection.

c. Incremental payments shall be calculated as the fraction of Eligible Tax Funding Cost Share

listed in the **Eligible Tax Funding Cost Share Form, Attachment E** (after adjustments per Section 8c. and/or d.) divided by Project Cost multiplied by the amount of the City's Project Cost incurred during the respective incremental billing period. This percentage may be adjusted as needed if the project is partially funded through other grant funding sources. Payments shall be made within forty-five (45) days of receipt of an approved invoice.

d. The invoices shall be submitted in detail sufficient for proper pre-audit and post-audit review. Invoices shall include a copy of contractor and supplier invoices to the CITY and proof of payment. If necessary for audit purposes, the CITY shall provide additional supporting information as required to document invoices.

e. CITY shall be reimbursed for the actual cost of the Project, or the contracted amount, whichever is less. The COUNTY shall not withhold any retainage from this reimbursement. COUNTY reimbursement is subject to annual budgetary limitations and allocations, if applicable.

f. The COUNTY'S fiscal year ends on September 30th. The COUNTY is required to account for all encumbered funds at that time. Submittal of an invoice as of September 30th satisfies this requirement. Regardless of whether the CITY chooses monthly, quarterly, or annual invoices, if any expenses occur between a previous invoice and September 30th, the CITY shall submit a description of the work completed on the Project through September 30th and a corresponding invoice for that cost-share eligible amount achieved during that time interval.

Section 10. Final Invoice.

a. The final invoice must be submitted no later than forty-five (45) days after the City's final payment to its vendors for the Project or October 30th if the City's final payment is made between September 15th and September 30th.

b. Final Invoices that are submitted after the requisite date shall be subject to a penalty of ten percent (10%) of the invoice. This penalty may be waived by the COUNTY, in its sole judgment and discretion, upon a showing of special circumstances that prevent the timely submittal of the final invoice. The CITY must request approval for delayed submittal of the final invoice not later than ten (10) days prior to the due date and state the basis for the delay.

Section 11. Travel Expenses.

If the cost schedule for this Agreement includes a line item for travel expenses, travel expenses shall be drawn from the Project budget. Travel expenses are otherwise not compensable. If travel expenses are not included in the cost schedule, they are a cost of providing the service that is borne by the CITY.

Section 12. Payments Withheld.

The COUNTY may withhold or, on account of subsequently discovered evidence, nullify, in whole or in part, any payment to such an extent as may be necessary to protect the COUNTY from loss as a result of: (1) defective work not remedied; (2) failure to maintain adequate progress in the Project; or (3) any other material breach of this Agreement. Amounts withheld

shall not be considered due and shall not be paid until the ground(s) for withholding payment have been remedied.

Section 13. Multi-Year Agreements.

a. For multi-fiscal year agreements, the COUNTY must budget the amount of funds that will be expended during each fiscal year as accurately as possible. Funds contracted for reimbursement beyond the COUNTY'S current fiscal year will be budgeted in subsequent fiscal years per the schedule specified in the Project Agreement, as amended. The **Statement of Work, Attachment A**, includes the parties' current schedule for completion of the work and projection of expenditures on a fiscal year basis (October 1 – September 30) ("Estimated Reimbursement Schedule").

b. If the CITY anticipates that expenditures will exceed the budgeted amount during any fiscal year, the CITY shall promptly notify the COUNTY'S Project Manager and provide a proposed revised work schedule and Annual Spending Plan that provides for completion of the work without increasing the Total Compensation. The last date for the COUNTY to receive this request is August 1 of the then-current fiscal year. Funds allocated in the current fiscal year that are not reimbursed in the current fiscal year due to slippage in the Project delivery schedule will be requested by COUNTY staff to roll forward to the next fiscal year as a Budget Amendment – (Regular), per BCC-21.

c. The COUNTY may in its sole discretion prepare a Budget Change Request incorporating the revised work schedule and Estimated Reimbursement Schedule as appropriate for changes in the Project schedule.

Section 14. Sovereign immunity, Liability, and Insurance.

To the extent provided by law, the CITY shall indemnify, defend, and hold harmless the COUNTY against any actions, claims, or damages arising out of, relating to, or resulting from negligent or wrongful act(s) of the CITY, or any of its officers, agents, or employees, acting within the scope of their office or employment, in connection with this Contract, to the extent and within the limitations of Section 768.28, Florida Statutes. The CITY accepts all risks arising from construction or operation of the Project. Nothing contained herein shall be construed or interpreted as denying to any party any remedy or defense available under the laws of the State of Florida, nor as a waiver of sovereign immunity of the COUNTY or CITY beyond the waiver provided for in Section 768.28, Florida Statutes, as may be amended. Nothing contained herein shall constitute agreement by the CITY to indemnify the COUNTY for the negligent acts or omissions of the COUNTY, its officers or employees. Nothing in this Contract is intended to inure to the benefit of any third party for the purpose of allowing any claim which would otherwise be barred under the doctrine of sovereign immunity or by operation of law. Each party shall acquire and maintain throughout the term of this Agreement such liability, workers' compensation, and automobile insurance as required by their current rules and regulations.

The parties acknowledge that specific consideration has been exchanged for this indemnification provision. This indemnification shall survive the termination of this Contract.

Section 15. Funding Availability.

a. This Agreement is at all times contingent upon funding availability, which may include a single source or multiple sources, including, but not limited to: (1) the Save Our Indian River Lagoon one-half cent surtax; (2) annual appropriations by the Florida Legislature; or (3) appropriations from other agencies or funding sources. Agreements that extend for a period of more than one Fiscal Year are subject to annual appropriation of funds in the sole discretion and judgment of the COUNTY for each succeeding Fiscal Year. Should the Project not be funded, in whole or in part, in the current Fiscal Year or succeeding Fiscal Years, the COUNTY shall so notify the CITY and this Agreement shall be deemed terminated for convenience five (5) days after receipt of such notice, or within such additional time as the COUNTY may allow. For the purpose of this Agreement, "Fiscal Year" is defined as the period beginning on October 1 and ending on September 30.

b. The CITY agrees that any and all City funds budgeted (in the adopted or amended budget) for this Project that are saved by the CITY by virtue of reimbursement or allocation received pursuant to this cost-share agreement, shall be reallocated and expended by the CITY solely to other City, County or third party project(s) benefiting the restoration of the Indian River Lagoon within five (5) years of the Effective Date of this Agreement. Should the CITY choose to not expend such funds in the manner described above, the CITY shall transfer those funds to the COUNTY for deposit to the Save Our Indian River Lagoon Trust Fund. The CITY'S obligation under this paragraph shall survive the termination of this agreement.

Section 16. Failure to Complete Project.

a. Should the CITY fail to complete the Project, the CITY shall refund to the COUNTY all of the funds provided to the CITY pursuant to this Agreement.

b. With a recommendation from its Citizen Oversight Committee, the COUNTY, in its sole judgment and discretion, may determine that the CITY has failed to complete the Project due to circumstances that are beyond the CITY'S control, due to termination of this agreement for reasons of funding availability, or due to a good faith determination that the Project is no longer environmentally or economically feasible. In such event, the COUNTY may excuse the CITY from the obligation to return funds provided hereunder.

c. If the Project has not been completed within thirty (30) days after the Completion Date, the CITY shall provide the COUNTY with notice regarding its intention as to completion of the Project. The parties shall discuss the status of the Project and may mutually agree to revise the time for Project completion or the scope of the Project. Failure to complete the Project within ninety (90) days after the Completion Date shall be deemed to constitute failure to complete the Project for the purposes of this provision.

d. In the event the Project constitutes a portion of the total functional Project, this paragraph shall apply in the event the total functional Project is not completed. In such event, the 90-day timeframe provided herein shall commence upon the date scheduled for completion of the total functional Project at the time of execution of this Agreement, unless extended by mutual agreement of the parties. Paragraphs 17(a) and 17(b) shall survive the termination or expiration

of this Agreement.

e. Force Majeure. The failure to carry out any terms of this Agreement due to any one of the following circumstances beyond the control of the CITY: (a) the operation and effect of rules, regulations, or orders promulgated by any commission, county, or governmental agency of the state of Florida or the United States; (b) a restraining order, injunction, or similar decree of any court of competent jurisdiction; (c) war; (d) flood; (e) earthquake; (f) fire; (g) severe wind storm or hurricane; (h) acts of public disturbance; (i) quarantine restrictions; (j) epidemic; (k) strikes; or (l) sabotage. The CITY shall not be subject to any liability for failure to carry out any of the terms of this Agreement to the extent that such failure shall be due to a Force Majeure event as defined herein. In such event, the CITY shall be excused from the obligation to return funds provided herein if the parties can agree, in writing, to a revised completion date for the Project based on the circumstances.

Section 17. Termination.

a. If the CITY materially fails to fulfill its obligations under this Agreement, including any specific milestones established herein, the COUNTY may provide the CITY written notice of the deficiency by forwarding a "Notice to Cure," citing the specific nature of the breach. The CITY shall have thirty (30) days following receipt of the notice to cure the breach. If the CITY fails to cure the breach within the thirty (30) day period, the COUNTY may issue a "Termination for Default Notice" terminating this Agreement without further notice. In such event, the CITY shall refund to the COUNTY all funds provided to the CITY pursuant to this Agreement within thirty (30) days of such termination. The COUNTY may also terminate this Agreement upon ten (10) days written notice in the event of any material misrepresentations in the Project Proposal.

b. Delay or failure by the COUNTY to enforce any right, remedy or deadline hereunder shall not impair, or be deemed a waiver of, any such right, remedy or deadline, or impair the COUNTY'S rights or remedies for any subsequent breach or continued breach of this Agreement.

c. This Agreement may be terminated by either party for convenience upon ninety (90) days prior written notice to the other party. In the event the COUNTY terminates for convenience, the CITY shall be paid for work completed and costs incurred in good faith through the date of termination. In the event the CITY terminates for convenience, COUNTY shall receive a full refund of the funds provided herein within thirty (30) days of the date of termination.

ADDITIONAL PROVISIONS

Section 18. Assignment.

The CITY shall not assign this Agreement, or any monies due hereunder, without the COUNTY'S prior written consent. The CITY is solely responsible for fulfilling all work elements in any contracts awarded by the CITY and payment of all monies due. No provision of this Agreement shall create a contractual relationship between the COUNTY and any of the CITY'S contractors or subcontractors.

Section 19. Audit; Access to Records; Repayment of Funds.

a. Maintenance of Records. The CITY shall maintain its books and records such that receipt and expenditure of the funds provided hereunder are shown separately from other expenditures in a format that can be easily reviewed. The CITY shall keep the records of receipts and expenditures, copies of all reports submitted to the COUNTY, and copies of all invoices and supporting documentation for at least five (5) years after expiration of this Agreement. In addition, the CITY shall maintain records to demonstrate satisfaction of its obligation under subparagraph 15b. above.

b. Review and Auditing. In accordance with generally accepted governmental auditing standards, the COUNTY shall have access to and the right to examine any directly pertinent books and other records involving transactions related to this Agreement. In the event of an audit, the CITY shall maintain all required records until the audit is completed and all questions are resolved. The CITY will provide proper facilities for access to and inspection of all required records.

c. Repayment of Funds. COUNTY funding shall be subject to repayment after expiration of this Agreement if, upon audit examination, the COUNTY finds any of the following: (1) the CITY has spent funds for purposes other than as provided for herein; (2) the CITY has failed to perform a continuing obligation of this Agreement; (3) the CITY has received duplicate funds from the COUNTY or other external funding entity for the same purpose; (4) the CITY has been advanced or paid unobligated funds; (5) the CITY has been paid funds in excess of the amount the CITY is entitled to receive under the Agreement; and/or (6) the CITY has received contributions amounting to more than one hundred percent (100%) of the Project cost through cumulative public agency cost-share funding.

Section 20. Dispute Resolution.

The CITY is under a duty to seek clarification and resolution of any issue, discrepancy, or dispute involving performance of this Agreement by submitting a written statement to the COUNTY's Project Manager no later than ten (10) business days after the precipitating event. If not resolved by the COUNTY Project Manager within ten (10) business days, the COUNTY Project Manager shall forward the request to the County Manager's Office, which shall issue a written decision within ten (10) business days of receipt. This determination shall constitute final action of the COUNTY and may then be subject to judicial review upon completion of the Project.

Section 21. Governing Law, Venue, Attorney's Fees, Waiver of Right to Jury Trial.

This Agreement shall be construed according to the laws of Florida and shall not be construed more strictly against one party than against the other because it may have been drafted by one of the parties. As used herein, "shall" is always mandatory. In the event of any legal proceedings arising from or related to this Agreement: (1) Venue for any state or federal legal proceedings shall be in a court of competent jurisdiction in and for Brevard County; (2) Each party shall bear its own attorney's fees, including appeals; (3) For civil proceedings, the parties hereby consent to trial by the court and **WAIVE THE RIGHT TO JURY TRIAL**.

Section 22. Permits.

The CITY shall comply with all applicable federal, state, and local laws and regulations in implementing the Project and shall include this requirement in all subcontracts pertaining to the Project. The CITY shall obtain any and all governmental permits necessary to implement the Project. Any activity not properly permitted prior to implementation or completed without proper permits does not comply with this Agreement and shall not be approved for cost-share funding.

Section 23. Independent Contractors.
The parties to this Agreement, their employees and agents, are independent contractors and not employees or agents of each other. Nothing in this Agreement shall be interpreted to establish any relationship other than that of independent contractors during and after the term of this Agreement. The CITY is not a contractor of the COUNTY. The COUNTY is providing cost-share funding as a cooperating governmental entity to assist the CITY in accomplishing the Project. The CITY is solely responsible for accomplishing the Project and directing the means and methods by which the Project is accomplished. The CITY is solely responsible for compliance with all labor, health care, and tax laws pertaining to the CITY, its officers, agents, and employees.

Section 24. Scrutinized Companies.
a. The CITY certifies that it and its subcontractors are not on the Scrutinized Companies that Boycott Israel List. Pursuant to Section 287.135, Florida Statutes, the COUNTY may immediately terminate this Agreement at its sole option if the CITY or its subcontractors are found to have submitted a false certification; or if the CITY or its subcontractors are placed on the Scrutinized Companies that Boycott Israel List or is engaged in the boycott of Israel during the term of the Agreement.

b. If this Agreement is for more than one million dollars, the CITY certifies that it and its subcontractors are also not on the Scrutinized Companies with Activities in Sudan, Scrutinized Companies with Activities in the Iran Petroleum Energy Sector List, or engaged with business operations in Cuba or Syria as identified in Section 287.135, Florida Statutes. Pursuant to Section 287.135, Florida Statutes, the COUNTY may immediately terminate this Agreement at its sole option if the CITY, its affiliates, or its subcontractors are found to have submitted a false certification; or if the CITY, its affiliates, or its subcontractors are placed on the Scrutinized Companies that Boycott the Scrutinized Companies with Activities in Sudan List, or Scrutinized Companies with Activities in the Iran Petroleum Energy Sector List, or engaged with business operations in Cuba or Syria during the term of the Agreement.

c. The CITY agrees to observe the above requirements for applicable subcontracts entered into for the performance of work under this Agreement.

d. As provided in Section 287.135(8), Florida Statutes, if federal law ceases to authorize these contracting prohibitions then they shall become inoperative.

Section 25. Public Entity Crime.
A person or affiliate who has been placed on the convicted vendor list following a conviction for

a public entity crime may not submit a bid, proposal, or reply on a contract to provide any goods or services to a public entity; may not submit a bid, proposal, or reply on a contract with a public entity for the construction or repair of a public building or public work; may not submit bids, proposals, or replies on leases of real property to a public entity; may not be awarded or perform work as a contractor, supplier, subcontractor, or consultant under a contract with any public entity; and may not transact business with any public entity in excess of the threshold amount provided in Section 287.017, Florida Statutes, for CATEGORY TWO ($35,000) for a period of 36 months following the date of being placed on the convicted vendor list.

Section 26. Public Records.
Records of the CITY that are made or received in the course of performance of the Project may be public records that are subject to the requirements of Chapter 119, Florida Statutes. If the CITY receives a public records request, the CITY shall promptly notify the COUNTY'S Project Manager. Each party reserves the right to cancel this Agreement for refusal by the other party to allow public access to all documents, papers, letters, or other materials related hereto and subject to the provisions of Chapter 119, Florida Statutes, as amended.

Section 27. Royalties and Patents.
The CITY certifies that the Project does not, to the best of its information and belief, infringe on any patent rights. The CITY shall pay all royalties and patent and license fees necessary for performance of the Project and shall defend all suits or claims for infringement of any patent rights and save and hold the COUNTY harmless from loss to the extent allowed by Florida law.

Section 28. Employment Eligibility Verification (E-Verify):
The CITY:

a. shall utilize the U.S. Department of Homeland Security's E-Verify system to verify the employment eligibility of all new employees hired by the CITY during the term of the contract; and

b. shall expressly require any subcontractors performing work or providing services pursuant to this contract to likewise utilize the U.S. Department of Homeland Security's E-Verify system to verify the employment eligibility of all new employees hired by the subcontractor during the contract term; and

c. agrees to maintain records of its participation and compliance with the provisions of the E-Verify program, including participation by its subcontractors as provided above, and to make such records available to the County consistent with the terms of the CITY'S enrollment in the program. This includes maintaining a copy of proof of the CITY'S and subcontractors' enrollment in the E-Verify Program; and

d. compliance with the terms of this section is made an express condition of this Contract and the COUNTY may treat a failure to comply as a material breach; and

e. shall require any contractor to provide the City with an affidavit stating that it does not

employ, contract with, or subcontract with any unauthorized aliens; and

f. nothing in this Section may be construed to allow intentional discrimination of any class protected by law.

Section 29. Severability.
If any portion of this Contract is found to be invalid or unenforceable or if applicable law mandates a different interpretation or result, the remaining provisions will remain in effect and the parties will negotiate in good faith to substitute for such invalid, illegal, or unenforceable provision a mutually acceptable provision consistent with the original intention of the parties.

[REMAINDER OF PAGE INTENTIONALLY LEFT BLANK. SIGNATURES TO FOLLOW.]

IN WITNESS WHEREOF, the COUNTY has caused this Agreement to be executed on the day and year written below in its name by its duly authorized representative, and CITY has caused this Agreement to be executed on the day and year written below in its name by its duly authorized representatives. This Agreement may be executed in separate counterparts, which shall not affect its validity. Upon execution, this Agreement constitutes the entire agreement of the parties, notwithstanding any stipulations, representations, agreements, or promises, oral or otherwise, not printed or inserted herein. This Agreement cannot be changed by any means other than written amendments referencing this Agreement and signed by all parties.

Brevard County, Florida

By: _____

Date: May 26, 2022

Kristine Zonka, Chair

As Approved by the Board on February 22, 2022

Attest

_____
Rachel Sadoff, Clerk

Date: May 26, 2022

Titusville, Florida

By: _____

Name: Daniel E. Diesel

Title: Mayor

Date: 2-14-22

Reviewed for legal form and content for Brevard County

_____
Heather A. Balser, Assistant County Attorney

ATTACHMENT A
STATEMENT OF WORK

PROJECT TITLE: Sand Point Park Baffle Box

PROJECT LOCATION: 28°37'02.59" N; 80°48'14.47" W - 101 N. Washington Ave, Titusville, FL 32796

PROJECT BACKGROUND: In February 2013, the Florida Department of Environmental Protection adopted a Basin Management Action Plan (BMAP) for implementation of the Total Maximum Daily Loads (TMDLs) for the North Indian River Lagoon (IRL) requiring nutrient load reductions of nitrogen and phosphorus. This planned water quality project will assist the City in striving to meet the pollutant removal allocation required by the BMAP. This project is designed to provide removal efficiencies that help meet TMDL requirements for the IRL and will provide a net water quality benefit to the IRL.

PROJECT DESCRIPTION: The City of Titusville will complete the design of the second-generation baffle box fitted with nutrient-reducing filtration media and obtain all necessary permits for the completion of the project. The City will subcontract the construction with a qualified and licensed contractor, selected through the City's competitive bid process. The City shall prepare and solicit bids utilizing a bid package in accordance with state and federal laws and this Agreement. The selected subcontractor will install the second-generation baffle box fitted with nutrient-reducing filtration media at the location listed according to the design and specifications in the bid package.

INSURANCE AND INDEMNIFICATION: The selected contractor shall purchase and maintain general liability insurance in the amount of $1,000,000/$2,000,000 and auto liability insurance in the amount of $500,000/$1,000,000, and Workers' Compensation to the State of Florida's limits. This insurance shall be placed with an AM Best or Fitch A rated or better (or the equivalent with Mood's or S&P) insurance carrier and this insurance shall remain in force through the entire length of the project. The selected contractor shall list the City of Titusville (CITY) and the Brevard County Board of County Commissioners (BOCC) as an additional insured to the General Liability policy. The selected contractor shall submit a certificate of insurance that meets these requirements to both the CITY and the BOCC before the commencement of the project. Where the City is indemnified under any agreement awarded to the selected subcontractor, the County shall also likewise be so indemnified by the subcontractor and the City shall provide written proof of such indemnification.

TASKS and DELIVERABLES:

Task #1: Design and Permitting

Task Description: The City will complete the design of the second-generation baffle box fitted with nutrient-reducing filtration media and obtain all necessary permits for the completion of the project.

Task Deliverable: Copies of construction plans and permits.

Task #2 Construction of Project

Task Description: The City will construct and install the second-generation baffle box fitted with nutrient-reducing filtration media and any other incidental work necessary to complete the project in accordance with the final design and required permits.

Task Deliverable: Dated photographs of the completed project and signed acceptance of the completed work by the Grantee.

Task	Task Title	Task Start Date	Task End Date
1	Design & Permitting	5/1/2022	2/1/2023
2	Construction of Project	3/1/2023	3/1/2024

Estimated Reimbursement Schedule:
Project reimbursements will be requested after project completion.

Task #	Quarter #2 / Year FY24	Quarter #/Year	Quarter #/Year	Quarter #/Year	Quarter #/Year	Quarter #/Year	Quarter #/Year	Quarter #/Year
1								
2	$137,135							

Deliverables:
Quarterly and final reports including pictures of the progress made, or plans if pictures are not yet available.

Project's Status without Trust Funds (Adjust the highlighted section and delete the other options that do not apply):
This project is not included in the City's FY 2021-2022 budget, therefore without the Save Our Indian River Lagoon Funding the project would not have been executed in the near future.

Attachment B

Save Our Indian River Lagoon Project Progress Report Form

Date: _____ Report Number: _____

Project Information

Project Name:			
Recipient:		Recipient's Project Manager:	
SOIRL Contract Number:		SOIRL Contract Amount:	
Nitrogen Reduction Benefit:		SOIRL Contract Expiration:	
Phosphorus Reduction Benefit:		County Project Manager:	

Construction Schedule

Start Date (mm/dd/yy):	
Completion (mm/dd/yy):	

Reporting Period

Beginning Date (mm/dd/yy):	
Ending Date (mm/dd/yy):	

Project Financial Information

Total Project Budget:		Total SOIRL Budget Expended:	
Total Expended to Date:		SOIRL Budget Expended This Period:	

Estimated Reimbursement Schedule

Fiscal Year 1

Reimbursement #	Anticipated Amount	Anticipated Date
1		
2		
3		
4		

Fiscal Year 2

Reimbursement #	Anticipated Amount	Anticipated Date
1		
2		
3		
4		

Project Status (include problems, issues, solutions, anticipated plans/deviations from schedule)

Tasks/Milestones/Deliverables Scheduled

Task Number	Tasks/Milestones/ Deliverables	Start Date	Finish Date	Percent Complete (%)
1				
2				
3				
4				
5				

Attach an additional page of notes and photos if needed.

Attachment C – Detail Sheet

Save Our Indian River Lagoon Cost Share Program – Invoice for Reimbursement

RECIPIENT'S NAME:	
PROJECT NAME:	
COUNTY'S PROJECT MANAGER:	
AGREEMENT NO.:	
PERFORMANCE PERIOD FROM:	
PERFORMANCE PERIOD TO:	
PAYMENT REQUEST NO.:	
DATE OF REQUEST:	
TOTAL PROJECT COST:	
COST-SHARE PERCENTAGE:	
COST-SHARE AMOUNT:	
TOTAL COST-SHARE PREVIOUSLY REIMBURSED:	
CURRENT REIMBURSEMENT AMOUNT REQUESTED:	
NOTES:	

ITEM NO.	VENDOR	DESCRIPTION OF SERVICES	CHECK DATE	CHECK NUMBER	INVOICE NUMBER	INVOICE AMOUNT	CURRENT REIMBURSEMENT AMOUNT REQUESTED
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							
					TOTALS:	$ -	$ -

Attachment D

Recipient's Certification of Payment Request

I, _____, on behalf of _____, do hereby certify for SOIRL Agreement No. _____ and Payment Request No. _____ that:

☒ The disbursement amount requested is for allowable costs for the project described in Attachment A of the Agreement.

☒ All costs included in the amount requested have been satisfactorily purchased, performed, received, and applied toward completing the project; such costs are documented by invoices or other appropriate documentation as required in the Agreement.

☒ All procurement for the amount requested was completed in a manner consistent with applicable law and contract requirements.

☒ If notified by the County of any restrictions on the use of local preference for this Agreement, the Recipient confirms that no local preference was used.

☒ The Recipient has paid such costs under the terms and provisions of contracts relating directly to the project; and the Recipient is not in default of any terms or provisions of the contracts.

Check all that apply:

☒ All permits and approvals required for the construction, which is underway, have been obtained.

☒ Construction up to the point of this disbursement is in compliance with the construction plans and permits.

☒ The Recipient's Grant Manager relied on certifications from the following professionals that provided services for this project during the time period covered by this Certification of Payment Request, and such certifications are included:

Professional Service Provider (Name / License No.)	Period of Service (mm/dd/yy – mm/dd/yy)

_____ Recipient's Grant Manager's Signature

_____ Print Name

_____ Telephone Number

_____ Recipient's Fiscal Agent

_____ Print Name

_____ Telephone Number

ATTACHMENT E

Recipient Name:	City of Titusville
Project Name:	Sand Point Park Baffle Box
Agreement Number:	22-214

Estimated Project Cost-Share Table							
Task Number	Task Description	Task Cost	Grant 1 (_____)	Grant 2 (_____)	Grant 3 (_____)	Eligible Lagoon Tax Cost Share, Adjusted	Local Match
1	Permitting						$ -
2	Engineering	$ 20,000					$ 20,000
3	Construction	$ 400,000				$ 137,135	$ 262,865
4	Monitoring						$ -
	Total	$ 420,000	$ -	$ -	$ -	$ 137,135	$ 282,865

Save Our Indian River Lagoon Funding Eligibility Calculation	
Project Type	SW Trad BMP
Pounds of Nitrogen Reduction	438.131
Eligible Cost Share per Pound	$ 313
Eligible Tax Funding Cost Share	$ 137,135
Reduction so Sum of Grants does not exceed Project Cost	$ 0
Eligible Cost Share, Adjusted	$ 137,135
Cost Share Percentage	33%

DISCLOSURE FORM

FOREIGN INFLUENCE ON CONTRACTS OR GRANTS HAVING A VALUE OF $100,000 OR MORE

Summary of Form: In order for the County to comply with section 286.101, Florida Statutes, all prospective contractors and grant recipients seeking to contract with the County, or receive a grant from the County, where said contract or grant has a value of $100,000 or more must disclose to the County (1) any current or prior interest of, (2) any contract with, or (3) any grant or gift received from a foreign country of concern (defined as the People's Republic of China, the Russian Federation, the Islamic Republic of Iran, the Democratic People's Republic of Korea, the Republic of Cuba, the Venezuelan regime of Nicolas Maduro, and the Syrian Arab Republic, or an agency or other entity under the significant control of such foreign country of concern) if such interest, contract, or grant or gift has a value of $50,000 or more and such interest existed at any time or such contract or grant or gift was received or in force at any time during the previous five years. The disclosure is specified below. Within one year before applying for any grant or proposing any Contract, such entity must provide a copy of such disclosure to the Department of Financial Services. Disclosure is not required in certain circumstances, outlined below. A Contract is any agreement for the direct benefit or use of any party to such agreement, including an agreement for the sale of commodities or services. A Gift is any transfer of money or property from one entity to another without compensation. A Grant is a transfer of money for a specified purpose, including a conditional gift. An interest in an entity means any direct or indirect investment in or loan to the entity valued at 5 percent or more of the entity's net worth or any form of direct or indirect control exerting similar or greater influence on the governance of the entity.

I. SECTION I. Please answer yes or no to each statement below:

YES / (NO) I AM BIDDING ON A CONTRACT/APPLYING FOR A GRANT WITH A POTENTIAL VALUE UNDER $100,000. If no, this disclosure form as been completed. Please sign and date at the bottom.

(YES) / NO I AM BIDDING ON A CONTRACT/APPLYING FOR A GRANT WITH A POTENTIAL VALUE OF OVER $100,000. If yes, proceed to the next question.

YES / (NO) I HAVE MADE A FOREIGN INFLUENCE DISCLOSURE ONLINE WITH THE DEPARTMENT OF FINANCIAL SERVICES. If yes, please proceed to SECTION IV and provide the date of the disclosure, your name and address. Then sign and date at the bottom.

II. SECTION II. Please answer yes or no to the statement below:

YES / (NO) Bidder/Grantee has (1) a current or prior interest of, any contract with, or any grant or gift received from a foreign country of concern (defined as the People's Republic of China, the Russian Federation, the Islamic Republic of Iran, the Democratic People's Republic of Korea, the Republic of Cuba, the Venezuelan Regime of Nicolas Maduro, and the Syrian Arab Republic, or an agency or other entity under the significant control of such foreign country of concern); and (2)

such interest, contract, or grant or gift has a value of $50,000 or more; and (3) such interest existed, or such contract or grant or gift was received or in force at any time during the previous five years.

III. SECTION III. If you answered NO to SECTION II, you have completed this form. Please sign/date at the bottom. If you answered YES to SECTION II, then answer YES or NO to the following:

YES / NO This is a proposal to sell commodities through an online procurement programs established pursuant to section 287.057(22), Florida Statutes.

YES / NO This is a proposal from an entity that discloses foreign gifts or grants under section 1010.25 or section 286.101(2), Florida Statutes.

YES / NO This is a proposal from a foreign source that, if granted or accepted, would be disclosed under section 286.101(2) or section 1010.25, Florida Statutes.

YES / NO This is a proposal from a public or not-for-profit research institution with respect to research funded by any federal Agency.

IV. SECTION IV. If you answered YES to any question in SECTION III, you have completed this form. Please sign/date at the bottom. If you answered NO to all of the questions in SECTION III, then you must make the following disclosures online to the State of Florida Department of Financial Services before the County may contract with you or award you said grant. Please disclose the following:

Date Disclosure of the information below was made by Bidder/Grantee to the State of Florida Department of Financial Services online:_____

Name of Bidder/Grantee:_____

Mailing Address of Bidder/Grantee: _____

Value of the Contract/Grant or Gift: _____

Foreign Country of Concern or the Agency or other entity under the significant

Control of such Foreign country of Concern:

Date of Termination of the contract or interest with the Foreign Country of Concern:

_____

Date of Receipt of the Contract/Grant or Gift:_____

Name of the agent or controlled entity that is the source or interest holder:

_____

I verify that the information provided on this form is true and correct, and that I am duly authorized to make said binding disclosures on behalf of myself or my Company, as applicable.

Signature: _____ Date: 2-10-22

Title: Mayor

STATE OF FLORIDA

COUNTY OF Brevard

Sworn to and subscribed before me by means of ☒ physical presence or ☐ online notarization, this 10th day of February, 2022, by (name of person making statement).

E. Campbell
Notary Public

[Notary Seal]

EMILY I CAMPBELL
Notary Public-State of Florida
Commission # HH 139587
My Commission Expires
June 08, 2025

Emily Campbell
Name typed, printed or stamped

My Commission Expires: 6/8/25

X Personally Known OR _____ Produced Identification

Type of Identification Produced _____