

Appendix B: Technical Memorandums

Contents

Water Quality Monitoring Program Review and Recommendations.....	2
Pollutant Loading Model Framework.....	16
Programmatic Recommendations.....	23
Reasonable Assurance Plan Development Guidance.....	31



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memorandum

date May 28, 2025
to Brandon Moody, Charlotte County
cc Brett Cunningham, Jones Edmunds
from Jon Perry, ESA
subject Task 2: Water Quality Monitoring Program Review and Recommendations

OBJECTIVE

Based on our knowledge of current County monitoring, the County's goals for monitoring, the *Charlotte County Project Plan for Ambient Surface Water Monitoring Program*, and the information gathered in Task 1, the Jones Edmunds team will evaluate the existing and proposed water-quality monitoring in the County and provide recommendations to support the County's goals.

INTRODUCTION

Water quality monitoring of waterbodies associated with Charlotte County is handled by a number of agencies. The County monitors the watershed areas through its ambient surface water monitoring program it began in 2022. The Coastal and Heartland National Estuary Partnership (CHNEP) is responsible for monitoring the estuarine regions including Charlotte Harbor and Lemon Bay. The Peace River Manasota Regional Water Supply Authority monitors the lower Peace River. All of these programs provide a monthly snapshot of the ambient water quality not only in the receiving waters but also the contributing watershed covering general water quality characteristics, nutrients, fecal indicator bacteria and in some cases metals.

Samples from all three programs are analyzed by Department of Environmental Protection (DEP) certified laboratories and undergo quality assurance checks before being uploaded to the DEP's Watershed Information Network, the state's primary repository for water quality. The DEP use these data, combined with any and all additional data as part of their Biennial Assessment of waters to determine if waters are fail to meet their designated uses. Data may also be accessed through Charlotte County's water quality dashboard. Data from the CHNEP is available through the CHNEP Water Atlas. Links to all of the repositories are available below (Table 1).

TABLE 1. LINKS TO ONLINE DATA REPOSITORIES OF CHARLOTTE COUNTY AMBIENT WATER QUALITY DATA.	
Monitoring Program	Website
Charlotte County Ambient Surface Water Monitoring	https://www.charlottecountyfl.gov/one-charlotte-one-water/
CHNEP Water Atlas	https://chnep.wateratlas.usf.edu/
DEP Watershed Information Network	https://prodenv.dep.state.fl.us/DearWin/public/welcomeGeneralPublic?calledBy=GENERALPUBLIC

REVIEW AND RECOMMENDATIONS

Water Quality

After a long hiatus, Charlotte County resumed monitoring their watersheds in June 2022. Their stated objectives are to:

- Identify of long-term trends and ambient water quality conditions within:
 - waters discharging to Charlotte Harbor, Lemon Bay, and the Caloosahatchee River,
 - waters within WBIDs located in Charlotte County’s boundaries, and
 - waters entering Charlotte County (where warranted/possible);
- Inform potential needs for source tracking and opportunities for water quality improvement;
- Conduct investigatory work as warranted in order to identify or clarify the origin and/or impact of in-stream conditions identified through the ambient monitoring activities of this project;
- Submission of data to FDEP WIN for the purpose of assessing Charlotte County WBIDs per 62-302, 62-303, and 62-304, F.A.C;
- Development of models that will allow for the identification and prediction of loading characteristics and trends and in Charlotte County;
- Presentation of sample results to the public in a manner that clearly describes water quality trends in relation to applicable water quality criteria.

The Charlotte County ambient surface water monitoring program, though early on, has already led to informed decisions. Using the data collected to date, the County has been able to work with DEP to ensure the proper waterbody classifications are being used to assess the county’s waters (Appendix A). This is important as different criteria are used to assess different waterbody types. These changes will be instituted as part of the DEP biennial assessment.

DEP will also begin using the data gathered by the County with its next Biennial Assessment which will assess ambient surface water quality data through July 2024. Unfortunately, it takes three years to assess a waterbody to determine if it is impaired for nutrients, a primary parameter of concern for most waterbodies. It takes a minimum of 5 years of monthly data to determine statistically significant trends in water quality. Long-term trends provide an indication that a waterbody is degrading or improving. As such, it is recommended that the County continue its current monitoring effort for the time being to get the most out of its investment.

Other recommendations regarding water quality monitoring include:

- Developing a consistent QA/QC program across all sampling programs to ensure a timely accurate assessment of the data collected.
- Continue to participate in the Southwest Florida Regional Ambient Monitoring Program (RAMP) working group. The group strives to assist member organizations to achieve quality water quality data consistently along the southwest Florida coast. The County should encourage other organizations collecting data within its waters to participate in RAMP.
- Conduct pre-/post-monitoring of water quality best management capital improvement projects to ensure accurate credit for these improvements. This is important not only for stormwater projects but utility projects as well.

- The DEP verified impairment list and the County's data indicate areas where fecal indicator bacteria exceed the appropriate criteria. The County should look towards utilizing the DEP's Fecal Indicator Bacteria Toolkit to track down the source of excessive bacteria or determine if it is naturally occurring.
- The County should collect the correct fecal indicator bacteria parameter for the waterbody Class rather than based on the conductivity at the time of collection as that is how DEP will assess the data.
- Maintaining the current water quality monitor will be necessary to assess changes due to watershed management actions and increases in development.
- A consistent long-term dataset, consistent with the current program, coupled with discharge flow data will be critical in validating any future development of a future loading model.

Water Quantity

Many of the Counties receiving waters have been deemed impaired for nutrients (Table2). Charlotte Harbor, Lemon Bay and the two rivers are examples of these impaired receiving waters. These impairments usually are the result of pollutant loading from within the watershed contributing runoff to the impaired waterbody. In order to target areas contributing pollutant loads for installation of stormwater improvement, it is also important to understand the quantity of the water running off as it is the quality of the water. To do so requires the use of models or flow monitoring equipment.

Table 2. Charlotte County waterbodies deemed impaired for nutrients.				
Water Segment Name	WBID	Waterbody Type	Waterbody Class	Parameters Assessed Using the Impaired Waters Rule (IWR)
Charlotte Harbor (Middle Segment1)	2065B	Estuary	2	Nutrients (Chlorophyll-a)
Charlotte Harbor (Middle Segment1)	2065B	Estuary	2	Nutrients (Total Nitrogen)
Charlotte Harbor (Middle Segment2)	2065C	Estuary	2	Nutrients (Total Nitrogen)
Charlotte Harbor (Upper Segment)	2065A	Estuary	2	Nutrients (Chlorophyll-a)
Charlotte Harbor (Upper Segment)	2065A	Estuary	2	Nutrients (Total Nitrogen)
Charlotte Harbor (Upper Segment)	2065A	Estuary	2	Nutrients (Total Phosphorus)
Whidden Creek	2079	Estuary	2	Nutrients (Chlorophyll-a)
Whidden Creek	2079	Estuary	2	Nutrients (Total Nitrogen)
Coral Creek (West Branch)	2078A	Estuary	2	Nutrients (Chlorophyll-a)
Coral Creek (West Branch)	2078A	Estuary	2	Dissolved Oxygen (Percent Saturation)
Upper Lemon Bay	1983A	Estuary	2	Nutrients (Chlorophyll-a)
Upper Lemon Bay	1983A	Estuary	2	Nutrients (Total Nitrogen)
Myakka River	1991A	Estuary	2	Nutrients (Total Nitrogen)
Myakka River	1991B	Estuary	2	Nutrients (Total Nitrogen)
Myakka River	1991B	Estuary	2	Nutrients (Total Phosphorus)
Tippecanoe Bay	2055	Estuary	3M	Nutrients (Chlorophyll-a)
Direct Runoff to Stream	2061	Estuary	3M	Nutrients (Chlorophyll-a)
Flopuck Creek	2048C	Estuary	3M	Nutrients (Chlorophyll-a)
Huckaby Creek	2048B	Estuary	3M	Nutrients (Chlorophyll-a)
Manchester Way	2047	Estuary	3M	Nutrients (Chlorophyll-a)

Table 2. Charlotte County waterbodies deemed impaired for nutrients.				
Water Segment Name	WBID	Waterbody Type	Waterbody Class	Parameters Assessed Using the Impaired Waters Rule (IWR)
Shell Creek below Hendrickson Dam	2041A	Estuary	3M	Nutrients (Total Nitrogen)
Shell Creek below Hendrickson Dam	2041A	Estuary	3M	Nutrients (Total Phosphorus)
Middle Peace River Estuary (Middle Segment)	2056B	Estuary	3M	Nutrients (Chlorophyll-a)
Middle Peace River Estuary (Middle Segment)	2056B	Estuary	3M	Nutrients (Total Nitrogen)
Middle Peace River Estuary (Middle Segment)	2056B	Estuary	3M	Nutrients (Total Phosphorus)
Peace River Estuary(Upper Segment South)	2056C2	Estuary	3M	Nutrients (Total Nitrogen)
Gator Slough Canal	2082C	Stream	3F	Nutrients (Macrophytes)
Cow Slough	1964	Stream	1	Nutrients (Macrophytes)
Myrtle Slough	2040	Stream	1	Nutrients (Macrophytes)

Therefore, it is recommended that the County begin a water quantity monitoring program. The installation of flow meters at key locations where water quality is collected will assist in targeting areas with high loading rates for possible BMP implementation. This will also be important for calibrating/verifying any pollutant loading model the County may be considering deploying.

CONCLUSION

The current effort of the County to understand its waterbodies is comparable to similar areas and will provide a good baseline for future evaluation. Utilizing the data for assessment and trends analysis will assist in developing management actions to offset their contribution to downstream impairments, especially when coupled with flow monitoring.

Appendix A

Memorandum: Recommended Revisions to Charlotte County WBIDs



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Technical Memorandum

date June 19, 2024
to Brandon Moody, Charlotte County
cc Brett Cunningham, Jones Edmunds
from Jon Perry, Tony Janicki, ESA
subject Recommended Revisions to Charlotte County WBIDs

Introduction

ESA, as a subcontractor to Jones Edmunds, is assisting Charlotte County in developing the County's One Charlotte/ One Water Plan. This technical memorandum related to Task 2 – Monitoring Plan Recommendations.

Objective

During the review of the available data, it became clear that some of the waterbody classifications attributed by the Florida Department of Environmental Protection (FDEP) to waters in Charlotte County may be incorrect. As part of Task 2 – Monitoring Plan Recommendations, we reviewed the boundaries and classifications of WBIDs in Charlotte County. WBIDs are spatial units FDEP uses to assess waterbodies for impairments and determine Total Maximum Daily Loads. Having the proper waterbody classification ensures the proper criteria are used to assess the waters. The following describes our recommended changes that resulted from the review.

WBID Review

Myakka River (WBID 1991A)

The Myakka River WBID (1991A) is a Class 2 estuarine waterbody and part of the Estuarine Nutrient Region (ENR) designated ENRD7. The Class 2 designation denotes the waterbody is designated for commercial shellfish harvesting if the proper conditions are met. The current boundary extends outside ENR boundary, upstream into the watershed to the west as it extends all the way to Winchester Blvd. We recommend limiting the boundary of the original WBID to the ENR boundary (Figure 1). On the west bank, two (2) WBIDs will be created, one designated Class 3F and the other Class 3M, separated by control structure at Jennings Blvd. A single WBID would be created on the east bank of the Myakka and include Vizcaya Lakes.

Coco Plum Waterway (WBIDs 2010A & 2010B)

We recommend shifting the southern boundary of the South Cocoplum Waterway (2010A) and East Cocoplum Waterway (2010B) north to align with the County boundary and Hillsborough Blvd. (Figure 2). There are drainage structures controlling the discharge from the Cocoplum all along Hillsborough Blvd, which acts as a boundary. The City has established water quality sampling sites both upstream and downstream of these structures to denote the difference in water quality in the Cocoplum Waterway and their various canals. As the

boundary is currently drawn, the stations downstream of the structure would be lumped in with those collected upstream of the structure.

Little Alligator Creek (WBID 2046)

The Little Alligator Creek consists of a system of canals that discharges to the Peace River and is classified as a Class 3 estuarine creek. There are a series of structures along Toledo Blade Blvd. that act as salinity barriers, separating freshwater from marine waters. We recommend splitting WBID 2046 along Toledo Blade Blvd and classifying the waters upstream of Toledo Blade as a Class 3 Freshwater WBID (Figure 3).

Sunrise Waterways (WBID 2056E)

The Sunrise Waterways WBID comprises a number of canals discharging to various locations along the western bank of the Peace River. The various canals all have unique characteristics with land uses representing different eras of development. We recommend breaking this WBID into five distinct areas (Figure 4). The first WBID will include the tidal areas west of US 41 and extend up to the Cocoplum Waterway (Labeled 1, Figure 4). The second WBID will include the freshwaters upstream of the structures along US41 and adjacent to the Port Charlotte Canal System (WBID 2056EA) (Labeled 2, Figure 4). The third WBID created would be east of US 41 and west of Interstate 75 adjacent to WBID 2056EA on the west (Labeled 3, Figure 4). The fourth would be bounded by Interstate 75 on the west, WBID 2056C2 on the east, Sandhill Blvd on the north, and Harborview Rd on the south (Labeled 4, Figure 4). This WBID would be classified as Class 3 freshwater. The final WBID would be the remaining northeast corner of the original WBID boundary (Labeled 5, Figure 4) with some editing of the Bobcat Creek WBID6 in Desoto County (Labeled 6, Figure 4).

We also recommend extending the boundary of the Port Charlotte Canal System north Veterans boulevard, including the Price End and Blueleaf neighborhoods (Labeled 7, Figure 4). This WBID is currently classified as a Class 1 waterbody designated for potable water use. The County is considering changing this designation to Class 3 freshwater as there is no plans to use it as a potable water source.

Buck Creek (WBID 2068)

Buck Creek is currently classified as a Class 3 marine waterbody. The canal features within the Rotunda neighborhood are separated from the rest Buck Creek by structures on the east and west sides of Rotunda and based on data from the County's monitoring program. These waters are consistently well below the 4850 $\mu\text{S}/\text{cm}$ definition for marine waters found in 62-302 F.A.C. We recommend separating the Rotunda Canals and classifying them as Class 3 freshwater (Figure 5). We also recommend extending the Coral Creek (West Branch) north into the SSW quadrant of Rotunda as a hydrologic connection has been restored as part of the Coreal Creek Restoration project. That WBID would remain Class 3 marine.

Cleveland Cemetery Ditch (WBID 2059)

This WBID is classified as Class 3 marine. All of the samples collected by Charlotte County at Belmont Rd have been freshwater samples with specific conductivities < 700 $\mu\text{S}/\text{cm}$ (Figure 6). We recommend that this WBID be reclassified as Class 3 freshwater.

Bear Branch (WBID 2094)

Bear Branch is currently classified as Class 3 freshwater stream. More than half the samples collected by Charlotte County exceed the 4850 $\mu\text{S}/\text{cm}$ definition for marine waters found in 62-302 F.A.C. No data were

identified associated with this WBID during a review of IWR Run 65. We suggest reclassifying this WBID as Class 3 marine.

Conclusion

The revisions described above are being offered for consideration to ensure that the proper water quality criteria are used to assess waterbodies for compliance. It is important that management decisions are made to correct the proper impairments as many of the engineering fixes are expensive to implement.

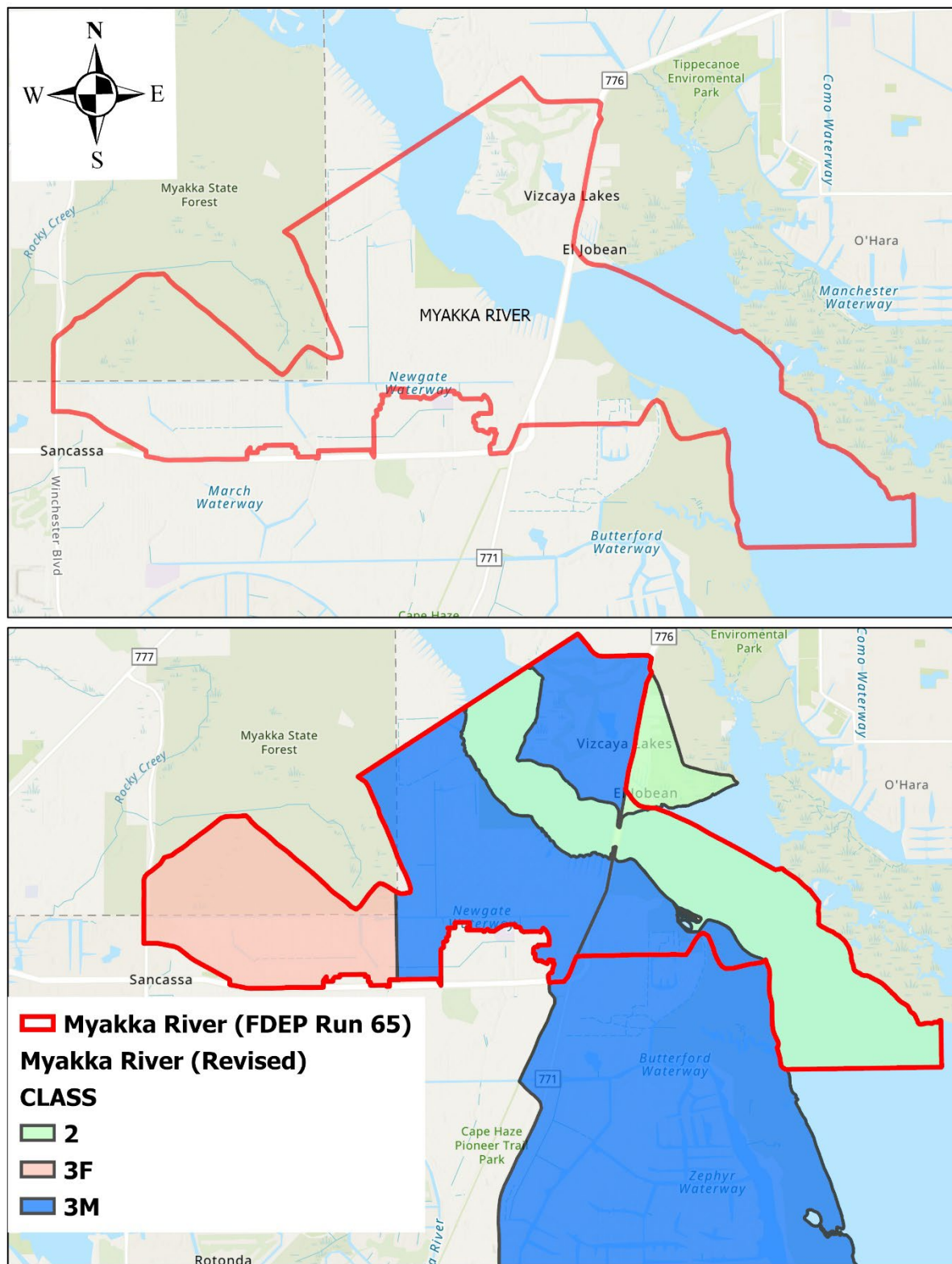


Figure 1 Recommended revisions to the Myakka River (WBID 1991A).

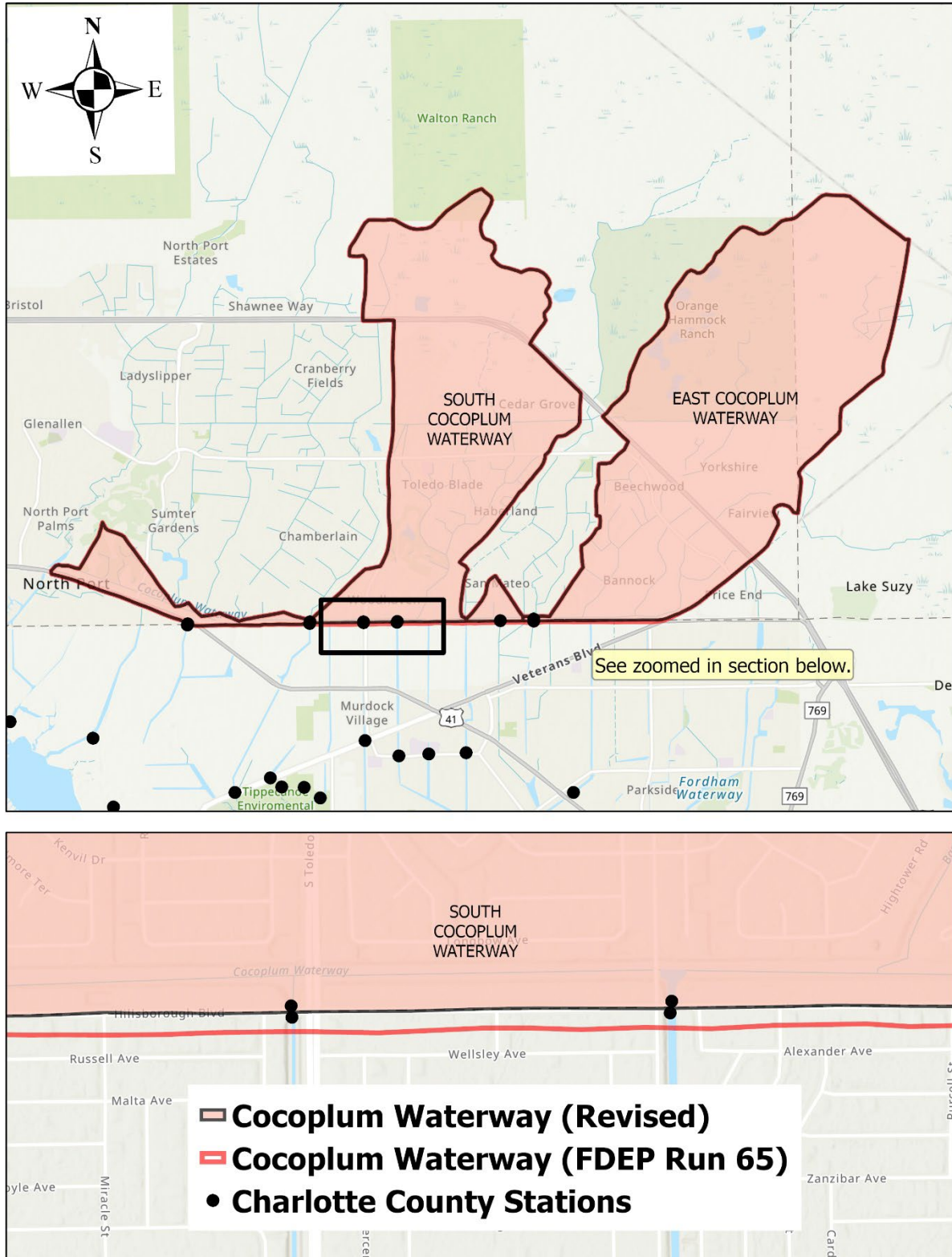


Figure 2 Recommended revisions to the Cocoplum Waterway (WBIDs 2010A & 2010B).

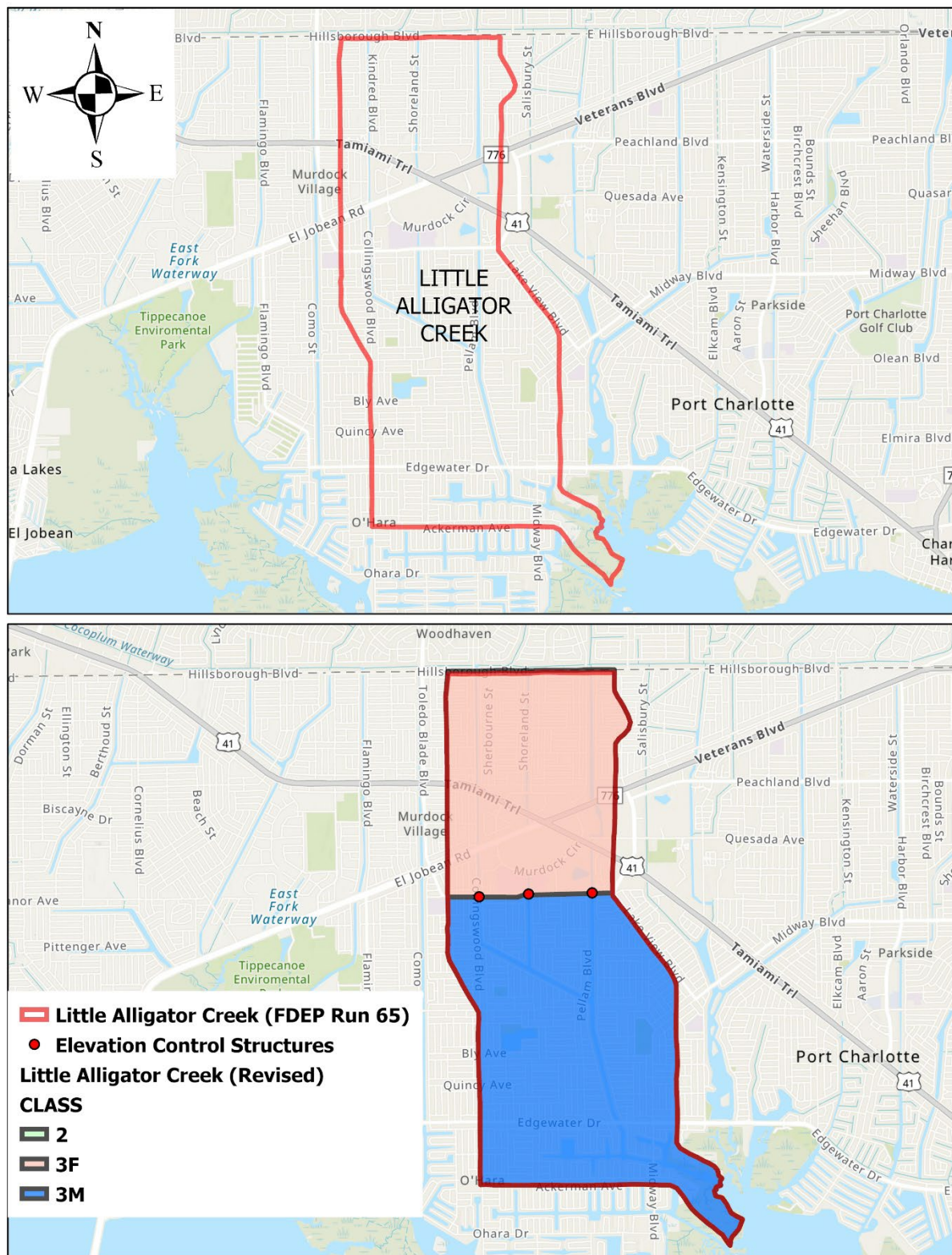


Figure 3 Recommended revisions to the Little Alligator Creek (WBID 2046).

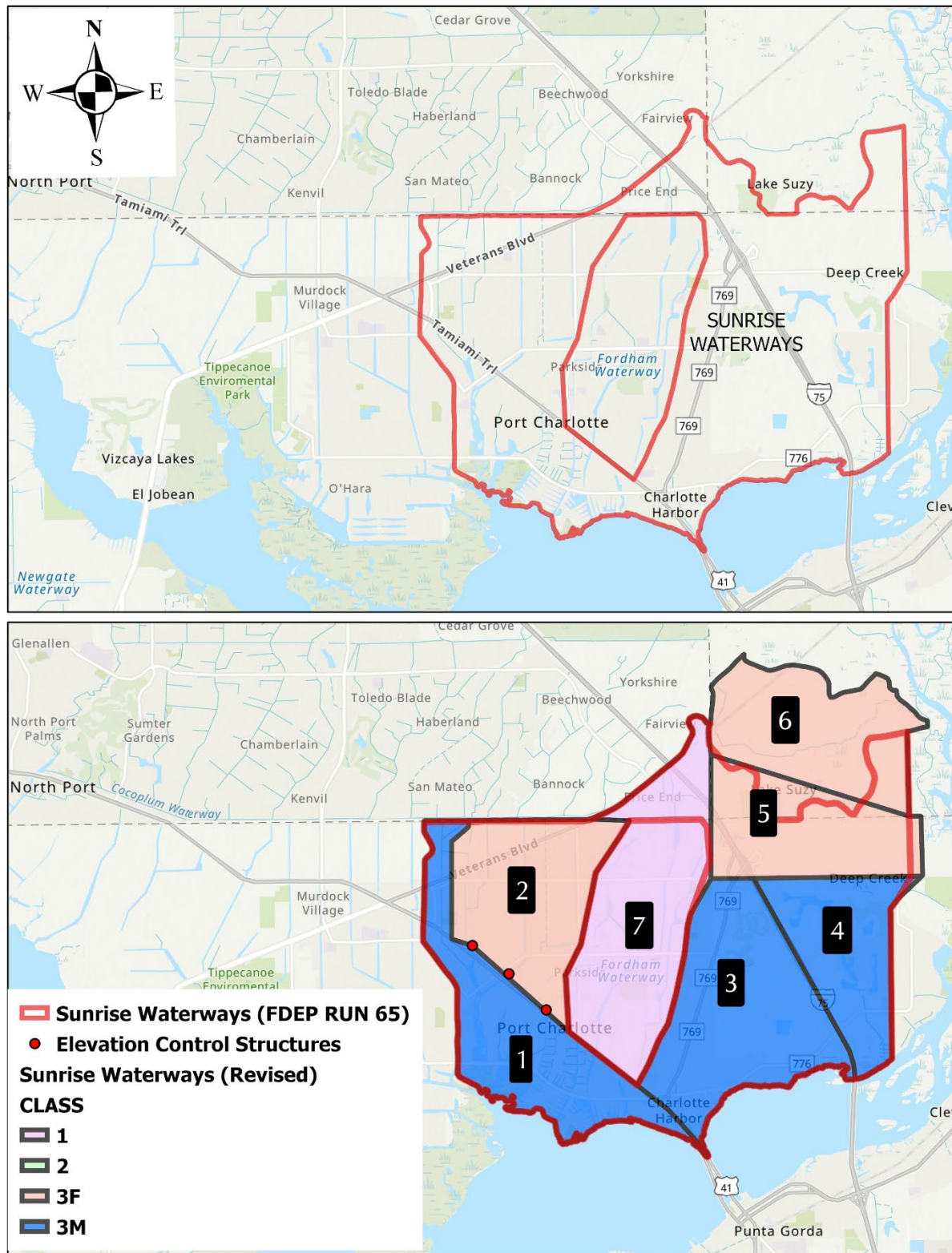


Figure 4 Recommended revisions to the Sunrise Waterway (WBIDs 2056E).

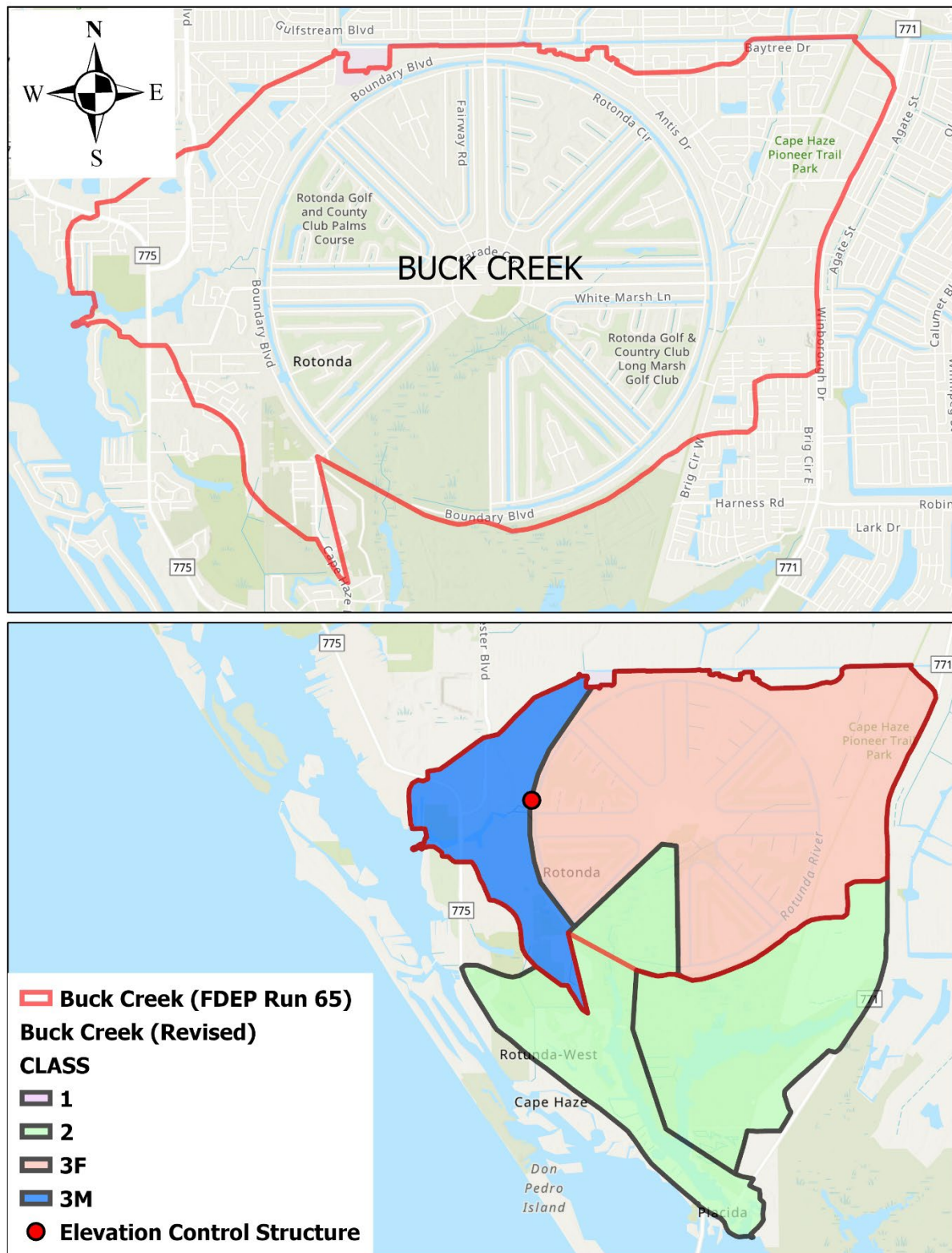


Figure 5 Recommended revisions to Buck Creek (WBID 2068).

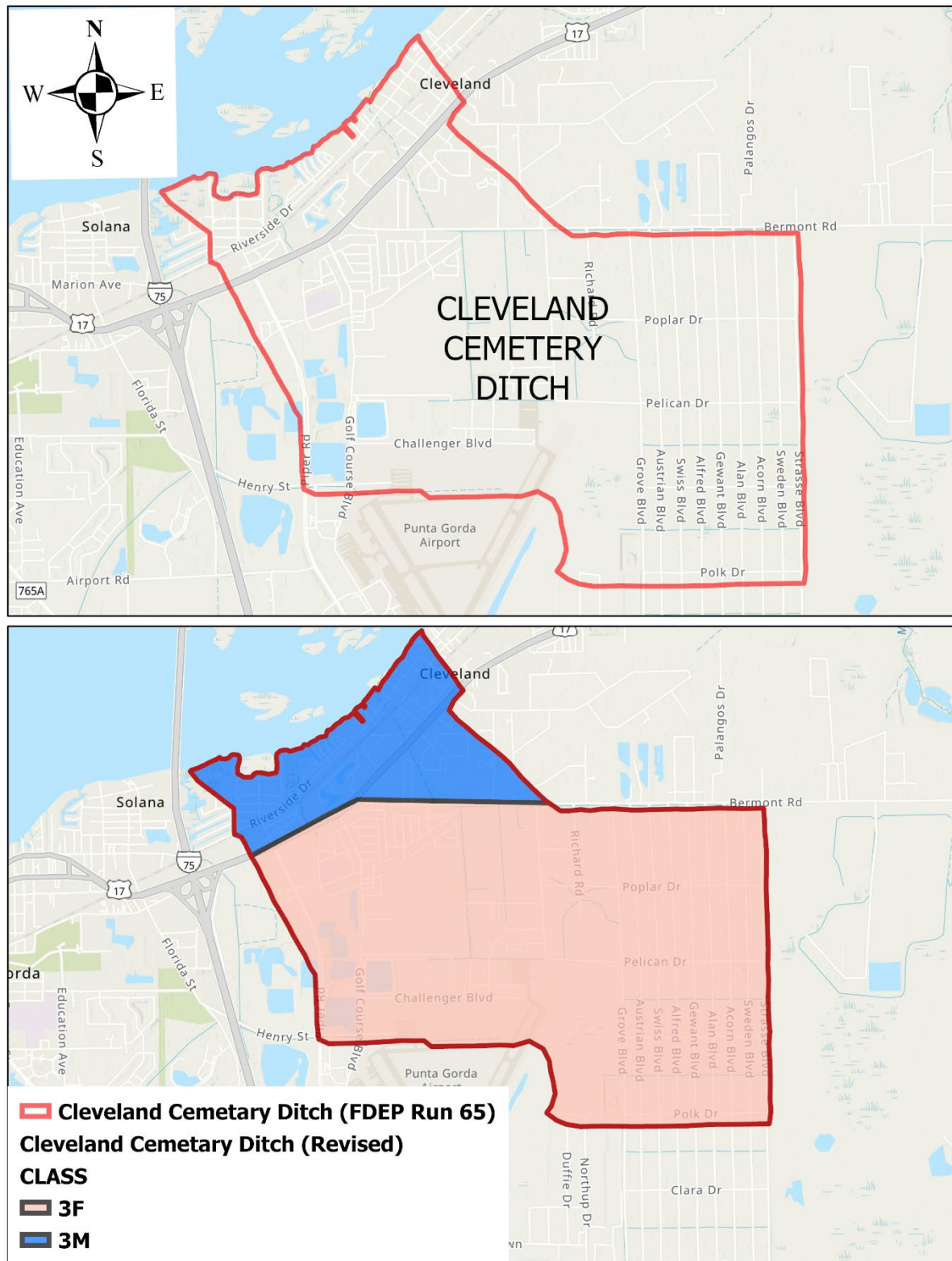


Figure 6 Recommended revisions to Cleveland Cemetery Ditch (WBID 2059).

One Charlotte One Water Plan

TO: Brandon Moody

FROM: Brett Cunningham, PE, ENV SP; Suzanne Kaufman, PE;
Tony Janicki, PhD; and Jon Perry, GISP

DATE: March 21, 2025

SUBJECT: Pollutant-Loading Model Framework
Jones Edmunds Project No. 03405-052-01

1 INTRODUCTION

To support the many goals under the One Charlotte One Water Plan, a pollutant loading model must be developed to project and track pollutant loads across the County. For mainly the same needs that Charlotte County currently has, Sarasota County (together with the Southwest Florida Water Management District [SWFWMD]) requested that Jones Edmunds develop the *Spatially Integrated Model for Pollutant Loading Estimates* (SIMPLE). The model was originally formulated as a seasonal/annual loading model (SIMPLE-Seasonal) and later expanded to a monthly loading model (SIMPLE-Monthly). This pollutant-loading model, which has been accepted by the Florida Department of Environmental Protection (FDEP) on previous alternative restoration plans, is the clear choice to serve the County's needs and support water-quality planning. The following are important needs that are well-supported by the SIMPLE-Monthly model:

- Accounting of a large magnitude of pollutant sources – Virtually every parcel in the County generates direct runoff and base flow pollutant loads, and each one is unique. Other sources of pollutants such as on-site sewage treatment and disposal systems (OSTDSs), point sources, and direct atmospheric deposition are numerous and dispersed throughout the County. Each of these sources must be accounted for to accurately estimate pollutant loads.
- Location of pollutant sources – The location of each source is also important because it allows the results to be visualized to determine sources of higher loading and to integrate results at a receiving waterbody level.
- Planning for load reductions – Understanding the location, source, and current treatment (or lack thereof) of all pollutant loads is the foundation for reducing the most loads for the least cost (i.e., the pollutant load reduction planning process).
- Means of tracking changes and progress – Restoration and preservation of the County's waterbodies will be a lengthy process. It will also very likely require adaptive management as the restoration process occurs. SIMPLE-Monthly provides

the means to track changes in pollutant loads and progress towards restoration while also providing other functionality.

Charlotte County does not currently have a tool to support these needs.

Sarasota County's use of SIMPLE-Monthly is an excellent example of how it can be applied to One Charlotte, One Water:

- Its original application was to develop annual loads for the County's MS4 permit in a way that could be readily verified and updated in a consistent manner from year to year. Sarasota County continues to use it for that purpose.
- Sarasota County has applied it to each of its Watershed/Water Quality Management Plans to understand sources and magnitudes of pollutant loads and plan for their reductions.
- Sarasota County and Sarasota Bay Estuary Program recently applied SIMPLE-Monthly to develop a Reasonable Assurance Plan.

This Technical Memorandum focuses on identifying what data are available for the SIMPLE-Monthly model development, determining what data gaps exist, and developing a summary and cost estimate for future model development.

2 POLLUTANT LOADING AND HYDROLOGIC DATA

This Section discusses the availability of hydrologic data for computing direct runoff and baseflow loads, as well as other pollutant-loading data sources. Previous applications of the model have not made pollutant-loading calculations before the mid-1990s since that is when Next Generation Weather Radar (NEXRAD)-derived rainfall (i.e., rainfall that is based on NEXRAD returns and calibrated to available local rain gauge data) is considered to have become reasonably reliable at a scale of 2 kilometers (km) by 2 km or smaller. Other needed datasets often do not reliably go back before that point. The start date may end up being later than the mid-1990s, but we used that as a cutoff for assessing available data.

2.1 RAINFALL DATA

Rainfall is the primary driver of pollutant loads from direct runoff and is highly variable temporally and spatially. Because of its superior spatial coverage to gauge data, NEXRAD-derived rainfall data will be used to generate direct runoff and baseflow via a hydrologic engine. NEXRAD-derived rainfall is readily available at a relatively nominal cost. Processing the data into the needed model format is a straightforward task, with checking for missing data and gap-filling being most of the effort. We estimate this effort to be approximately \$5,000.

2.2 EVAPOTRANSPIRATION DATA

Although less important than rainfall, evapotranspiration affects the amount of annual direct runoff and base flow. Daily evapotranspiration (ET) data calculated using the Priestly-Taylor method on a 2-km by 2-km pixel grid are available from the US Geological Survey (USGS) Integrated Science Center. Although this dataset represents an improvement of readily

available ET data for large areas, the spatial accuracy from pixel to pixel has not been validated. As such, we will calculate an average of ET for the pixels covering Charlotte County for the available period of record. For nearby counties, sensitivity runs using the pixel-based daily ET and the daily-average ET showed no significant difference for monthly runoff and base flow volumes, validating the use of the daily-averaged ET data. We estimate this effort to be approximately \$5,000.

2.3 SOILS DATA

Soils data are also important in the calculation of direct runoff and base flow. The US Department of Agriculture Natural Resources Conservation Service Soil Survey Geographic Database (SSURGO) is the most widely used and comprehensive geographic information system (GIS) layer of soils data and will be used for this project. The latest version for the County can be easily downloaded. Soils files will be used to parameterize the primary groundwater and vadose zone (infiltration) parameters. Minor processing is needed to condition its use for application in SIMPLE-Monthly. We estimate this effort to be approximately \$2,500.

2.4 LAND USE DATA

Land use affects direct runoff and base flow quantities and concentrations. SIMPLE-Monthly uses time-aware land use data so that a single land use dataset can be modeled over a long period (e.g., decades) without user intervention. Each polygon can have multiple land use attributes and corresponding start dates for when that polygon was converted to that land use. To create the time-aware land use layer, two land use layers are initially used – one from the beginning of the simulation period and one from the end. When these two layers are merged, a significant amount of cleanup is required due to inconsistencies in the layers and the number of slivers created. The raw data are readily available for download.

The final step to set up this layer is to determine when each polygon changed land use conditions. This process is best done using the best management practices (BMP) layer, which is described in the next section. We estimate this effort to create the land use layer to be approximately \$25,000.

2.5 DIRECT RUNOFF AND BASEFLOW TIME SERIES

We are assuming that current hydrologic methods of creating time series of flow for direct runoff and baseflow will be used for the County's SIMPLE-Monthly model. An alternative approach would be to build and use ICPR4 models with the groundwater component exercised. This alternative is not part of our cost estimate. Exercising the model's current method to generate the time series is estimated to be approximately \$10,000.

2.6 BMP LAYER DATA

BMPs reduce direct runoff pollutant loads and sometimes base flow pollutant loads. This layer is one of the most time-intensive to build. The starting point is Environmental Resource Permitting files from SWFWMD, the South Florida Water Management District (SWFWMD), and FDEP. Each BMP needs to have a polygon created showing the area it serves, the BMP type, its removal efficiencies, and the year built. Following that process, aerial

photographs need to be reviewed to determine whether any significant BMPs were not captured in the initial process. Date-built data need to be estimated from available historical aerial photographs, and BMP types need to be estimated from available imagery.

One issue we will need to resolve is consideration of pollutant attenuation in the canals. The County has a record of where County-maintained control structures are located, so we recommend using different removal efficiencies for those with control structures versus those without since the presence of control structures increases residence time and removal efficiencies. The location of non-County-maintained control structures will need to be identified by review of high-resolution aerial photography. We will also need to consider canals that are part of Waters of the State/Waters of the US since we would not recommend accounting for removal in Waters of the State as it is not allowed and would likely not be accepted by FDEP. The County's current data on canals is generally sufficient for us to make that determination. The distinction between private canals and canals in the County's MS4 is less important for creating this layer.

We generally recommend a cutoff size for BMP capture since very small BMPs do not significantly influence pollutant loads at a watershed scale. Assuming a cutoff size for areas served of approximately 2 acres, we estimate the effort to develop the time-aware BMP layer to be approximately \$50,000.

2.7 EVENT-MEAN AND BASEFLOW CONCENTRATION DATA

Event-mean concentrations (EMCs) are correlated with land use and multiplied by direct runoff volumes to predict direct runoff pollutant loads. Unless a sufficiently large dataset of locally sampled flow-weighted EMC data are available, we propose to use the latest EMC data from the recently approved but unratified *Stormwater Rule*. We also propose to use local data for the baseflow concentrations. The baseflow concentrations will be spatially varied to the extent that the data will support them. The effort will depend on the amount of spatial variability supported by the data, but we estimate this effort to be approximately \$2,500.

2.8 POINT SOURCE DATA

Point source loads are ones that typically discharge to a single (point) location, although there are instances such as reclaimed wastewater for irrigation where the 'point' source is spatially distributed. The model requires point source data for pollutants that are ultimately discharged to a surface water body in the County. These are typically water reclamation facilities. These data are available through the monthly National Pollutant Discharge Elimination System (NPDES) Discharge Monitoring Reports (DMRs). The monthly data are applied daily since finer-scale data are rarely available.

There are 27 facilities in Charlotte County with an NPDES wastewater discharge permit that have a potential to discharge directly or indirectly to surface water bodies. However, only 10 of them have a permitted capacity of 0.1 MGD or greater. In discussions with the County, we recommended that a simplified approach be used for facilities with a permitted discharge of 0.1 MGD, which is also consistent with the approach taken in an ongoing alternative restoration plan. For those, we will assume a constant flow rate and concentration based on the average data we calculate from their DMRs. DEP has provided us electronic copies of

the 10 facilities with a permitted of 0.1 MGD or greater. With the exception of one facility, the data goes back to the beginning of 2003. The one exception is FLA665495, which only received its permit in 2017 – the year through which we were provided the DMR data.

We have spotted-checked the DEP-provided data for accuracy and found it to match the individual DMRs we used for spot-checking. There is a relatively small amount of missing data and a few points that may be outliers. These issues are straightforward to address.

The other consideration is if the disposal method is not directly to a surface water body (e.g., reuse or sprayfields). For those instances, the flows and pollutant loads need to be reduced outside the model as a pre-processing step. We estimate the effort to create the point source data layer to be approximately \$10,000.

Non-recurring point source data (e.g., spills) can also be included in this category. Analyses in other similar studies showed that spills were generally not significant enough to consider. We are assuming that will be the case in Charlotte County as well, so we are not currently including a cost estimate for them.

2.9 IRRIGATION DATA

Irrigation is sometimes added to the model. Except for reuse, past modeling efforts have shown irrigation to be a relatively small contributor. The County will need to determine whether including non-reuse irrigation is worth the expenditure. For reuse data, this overlaps with point source data. Reuse polygons need to be created for where reuse is applied, and reuse data (flows and concentrations) from the DMRs have to be distributed to the polygons as time series. We estimate the effort to create the reuse layer to be \$15,000.

2.10 OSTDS DATA

OSTDSs contribute pollutant loads primarily through discharge to shallow groundwater tables that flow horizontally to a surface waterbody. We have the best available OSTDS dataset from the Charlotte County Sewer Master Plan. These data should be adequate for developing the septic load. The current septic module in SIMPLE-Monthly was developed well before the current methods that FDEP uses for basin management action plans (BMAPs) and total maximum daily loads (TMDLs). FDEP's current standard guidance is that the ArcNLET model would need to be used to estimate these loads due to the large number of OSTDSs in the County. However, FDEP may support the use of one of the simpler methods (TMDL Method or SJRWMD-DEP-Modified). The current SIMPLE-Monthly method for septic systems is being used for the alternative restoration plan being developed for the Sarasota Bay Estuary Program. We recommend a discussion with FDEP on this issue before finalizing since it will have a significant impact on the required budget. Assuming that one of the simpler methods can be used, we estimate the effort for this element to be \$10,000. The effort using ArcNLET is estimated to be \$40,000.

2.11 ATMOSPHERIC DEPOSITION DATA

For watersheds with large water bodies (e.g., Charlotte Harbor), the loading from atmospheric deposition can be significant and is important to account for. The data are generally readily available for this element, and some preprocessing is involved to pair that data with the rainfall data. We estimate the effort to be \$10,000.

2.12 OUT-OF-COUNTY LOADING DATA

Myakka River, Peace River, and Shell Creek have watersheds that extend well beyond the County border. If those water bodies or Charlotte Harbor are part of future evaluations, it will be necessary to account for those loads (presumably) outside of the SIMPLE-Monthly model. That type of accounting is usually done using measure flow and concentration data.

There are other smaller watersheds (WBIDs) that extend a relatively small amount out of the County. The ones that extend into Sarasota County are covered already by Sarasota County's SIMPLE-Monthly model. We propose extending Charlotte County's SIMPLE-Monthly model extents to capture the remainder of the small watersheds since the increased effort is minimal and it will be convenient to have complete results. We estimate the effort to be \$15,000, which does not include monitoring.

There are 16 connections from the Cocoplum into Port Charlotte and multiple weirs at different design elevations along the Cocoplum itself. If a finer resolution of this flow split is required, we could modify North Port's existing ICPR4 model for use in continuous simulation, which would include exercising the groundwater component. We do not currently have a copy of that model, but we estimate that this effort would be approximately \$70,000.

2.13 MODEL CALIBRATION

We recommend performing model calibration at two locations where the watershed area is mostly urbanized and two where the watershed is mostly unurbanized. To properly calibrate the model, we need at least a year of flow data to complement the current water quality sampling. We recommend avoiding selecting locations where model calibration is complicated by hydraulic interconnections. The Task 2 Technical Memorandum will cover the recommended locations. We estimate the effort to be \$20,000.

2.14 DOCUMENTATION

Adequate documentation will need to be created for the efforts discussed above. We estimate the effort to be \$15,000.

2.15 TRAINING

Although this element may be considered optional, the County may want to include training of select County staff on use of the model. We estimate the effort to be \$10,000.

2.16 TOTAL

Table 1 shows the total estimated effort in 2023 dollars to set up and calibrate the SIMPLE-Monthly model for Charlotte County.

Table 1 Total Estimated Effort for SIMPLE-Monthly Development

Data/Task	Estimated Effort
Rainfall Data	\$5,000
Evapotranspiration Data	\$5,000
Soils Data	\$2,500

Data/Task	Estimated Effort
Land Use Data	\$25,000
Direct Runoff and Baseflow Time Series	\$10,000
BMP Layer Data	\$55,000
Event-Mean and Baseflow Concentration Data	\$2,500
Point Source Data	\$10,000
Irrigation Data	\$15,000
OSTDS Data	\$40,000 ¹
Atmospheric Deposition Data	\$10,000
Out-of-County Loading Data	\$15,000 ^{2,3}
Model Calibration	\$20,000 ²
Documentation	\$15,000
Training	\$10,000 ⁴
Total	\$240,000

¹ A less-costly effort may be an option.

² Does not include monitoring costs.

³ Does not include ICPR4 continuous simulation.

⁴ This may be considered an optional task.

One Charlotte One Water Plan

TO: Brandon Moody

FROM: Brett Cunningham, PE, ENV SP; Justin Gregory, PE

DATE: October 16, 2025

SUBJECT: Programmatic Recommendations
Jones Edmunds Project No. 03405-052-01

1 INTRODUCTION

The *One Charlotte One Water Plan* has identified several aspirational elements of the *Charlotte County Comprehensive Plan* that would be helpful to further implement. This Technical Memorandum provides examples of how other Florida communities have addressed these elements.

2 INCENTIVIZING CONSERVATION CORRIDORS

There are several good examples where conservation corridors are incentivized. Hernando County's Comprehensive Plan and Land Development Code use density incentives and easement to encourage conservation corridors. The "Rural Cluster Overlay" option allows a landowner to build at higher density than normally allowed if at least 50 percent of the development is set aside as permanent open space connecting to public conservation lands. The permanent open space must be configured as a contiguous wildlife corridor that links existing public preserves or other planned conservation areas on adjacent lands and is protected in perpetuity by a conservation easement held by the county or a conservation agency.

Collier County's Rural Lands Stewardship Area is an overlay planning program established in the early 2000s that directs growth away from ecologically important areas and secures private land as permanent conservation to form broad habitat corridors. It uses a credit system to incentivize landowners to designate Stewardship Sending Areas for conservation via easements or deed restrictions in exchange for the right to build more intensely in designated Receiving Areas. The program has a credit system that favors lands that contribute to large connected ecosystems.

Alachua County's Comprehensive Plan Conservation requires that new developments provide open-space linkages to adjacent habitat corridors or greenways. Alachua County has also identified a network of Critical Ecological Corridors and protects them through multiple tools. The Comprehensive Plan calls for establishing habitat corridors throughout the county and developing economic incentives for private property owners to voluntarily

participate in corridor preservation. The County runs the Alachua County Forever land acquisition program (voter-approved) and a Transfer of Development Rights (TDR) system to purchase or conserve lands in these corridors.

Osceola County has a focus on conservation corridor connectivity in its land acquisition programs and planning policies. The County's Environmental Lands Conservation Program (named SAVE – "Save And Value Environment") uses a voter-approved property tax millage to acquire or place conservation easements on ecologically important private lands. A specific goal of this program is to target lands that serve as links between existing public conservation areas.

Volusia County has collaborated with state and regional partners to establish conservation corridors. Through its Volusia Forever program (a voter-funded conservation land acquisition initiative) and coordination with Florida Forever (state funding), the county has been assembling the Volusia Conservation Corridor – a continuous band of preserved lands running from Tiger Bay State Forest in the west, through central Volusia's wetlands, to the marshes of the St. Johns River in the east. The County's Comprehensive Plan and ECHO recreation grant program also support developing trailheads and multi-use trails on these lands, which increases connectivity.

In 2023 Seminole County approved the Seminole Forever program (modeled after Volusia's) to fund acquisitions that will link pieces of the Florida Wildlife Corridor within the County. Seminole's Comprehensive Plan recognizes the need to connect the Wekiva Basin park lands to the Econlockhatchee River conservation areas, ensuring wildlife can travel between public lands.

3 INCENTIVIZING GREEN DESIGN AT THE SITE PLANNING SCALE

Fee reductions and expedited permitting are the two most common ways that green design is incentivized. The City of Sebastian offers non-residential property owners up to a 50 percent reduction in their stormwater utility fee if they install and maintain approved green design practices on site. Orlando, Tampa, and Gainesville also provide stormwater fee discounts for green design practices.

Other cities provide incentives for green design retrofits. For example, the City of Dunedin has its Resiliency and Sustainability Rebate Program rebates building permit fees (up to \$2,500) for property owners who implement approved resiliency improvements, which can include green site design to better manage stormwater. Similarly, the City of Tallahassee has its Think About Personal Pollution (TAPP) Program which provides education for local-scale water quality improvements and has a grant application process to assist with them.

4 FUNDING VOLUNTARY RETREAT FROM FLOODING

In 2017 Monroe County established a Voluntary Home Buyout Program with \$15 million of disaster recovery funds after Hurricane Irma. Under this program, the County buys private homes that were repetitively damaged, demolishes the structures, and guarantees the land will remain open space or used for flood mitigation in perpetuity. The Monroe County

program prioritized low-income households and high-vulnerability areas, framing it as a step toward managed retreat for a stronger community.

The City of Marathon in the Keys implemented a CDBG-DR funded buyout initiative: the city purchases Irma-damaged homes at post-storm market value and clears the lots to become either small green parks or stormwater retention areas.

Bay County used the Rebuild Florida Voluntary Home Buyout grant program to acquire clusters of flood-prone homes and remove them from development. The City of Jacksonville has been investing local and FEMA funds to buy out homes in chronically flooded neighborhoods even absent a disaster. The land will be turned into green space as a permanent flood buffer, with the goal of helping residents move to higher ground. The program is strictly voluntary.

Sarasota County has implemented the Resilient SRQ Voluntary Buyout Program to acquire properties impacted by Hurricane Ian (2022) and in flood-prone areas. It prioritizes low-to moderate-income homeowners in repetitive loss areas who have limited recovery resources.

5 FLORIDA FRIENDLY LANDSCAPE REQUIREMENTS AS BUFFERS ALONG SHORELINES AND PONDS AND FOR NEW CONSTRUCTION

5.1 LOCAL ORDINANCES REQUIRING FLORIDA-FRIENDLY BUFFERS AND PRACTICES

In 2022 the City of Fort Walton Beach updated its Land Development Code to further protect water bodies. Any new development abutting a waterway is required to retain the natural shoreline vegetation or plant a vegetated buffer if one does not exist. The ordinance also incorporates Florida-Friendly Landscaping (FFL) principles by requiring landscape plants be selected from Florida-Friendly plant lists for North Florida. This requirement promotes drought-tolerant, native or Florida-friendly species are used in buffer areas and throughout the landscape.

Orange County's code encourages FFL principles in site landscaping. Developers may follow an FFL landscape plan in lieu of conventional planting, with limits on turf area (no more than 60 percent turf). For stormwater ponds, the County requires continuous drought-tolerant planting along the pond shore in the form of a row of low-maintenance shrubs and understory trees that must line the top of bank around ponds. The code also explicitly prevents HOAs or rules from prohibiting FFL on private property.

St. Johns County's Land Development Code requires that all new development projects follow FFL principles. At least 50% of installed plant species must be native, and at least half of the landscaped area's irrigation must use low-volume systems. This requirement applies to commercial projects and new residential subdivisions (common areas).

Panama City's landscaping ordinance adopted FFL best practices in 2018. It states that all landscape plans for new development will be evaluated on Florida-Friendly design principles.

The code describes the nine FFL principles and requires designers to incorporate those practices.

Many other Florida jurisdictions have similar provisions. The City of Milton references the Florida-Friendly Landscaping Guide to Plant Selection and Design in its landscape code and prefers native/FFL plants for required buffers and open spaces. The City of Coral Springs and Town of Davie have ordinances stating that all new or redeveloped landscapes must adhere to Florida-Friendly principles. Hernando County's fertilizer ordinance defines a 10-foot "low-maintenance zone" along waterbodies that is planted "preferably with native or Florida-Friendly Landscaping" and requires no mowing or fertilizer in that strip. Many county fertilizer ordinances throughout Florida include a similar fertilizer-free buffer (typically 10 feet) and recommend planting a 6–10 feet Florida-friendly vegetative buffer at the water's edge.

5.2 INCENTIVE PROGRAMS FOR FLORIDA-FRIENDLY SHORELINE BUFFERS

Pinellas County's Florida-Friendly Landscaping Incentive Program (FLIP) was a multi-year pilot rebate program to encourage water-conserving landscapes. Homeowners in target watersheds could receive a 50 percent cost rebate (up to \$2,000) for replacing irrigated turf with Florida-Friendly plants and micro-irrigation. The program's goal was to reduce fertilizer and water use to protect local water bodies. By funding Florida-friendly retrofits – including transitioning lakefront yards to planted buffer zones – the County provided a direct incentive for residents to create FFL-compliant shore buffers.

The City of Dunedin's Resiliency & Sustainability Rebate offers rebates (i.e., grants) for projects that improve environmental resiliency on private property. This includes up to \$2,500 rebates for landscaping projects that use native Florida-Friendly plants or that create "living shorelines" along waterfront yards. For example, a homeowner who converts a mowed lakeshore into a Florida-Friendly planted buffer or installs a mangrove/oyster living shoreline can qualify. The City lists "landscaping for resiliency with native Florida plants and Florida-Friendly practices" and "living shoreline enhancement" as eligible activities.

Haines City's Florida-Friendly Landscape Rebate partners with its utility to incentivize retrofitting landscapes to FFL standards. The program will reimburse up to \$3,000 (covering 75 percent of costs) for converting at least 250 square feet of high-irrigation turf into a Florida-Friendly landscape with low-volume or no irrigation.

Brevard County's Lagoon Loyal Program initiative uses an incentive approach to encourage behaviors that protect water quality. Waterfront residents can earn points (redeemable for local business discounts) for actions like establishing a "lagoon-friendly" vegetative buffer at the water's edge. The program emphasizes planting native Florida-Friendly plants and shrubs along canals or lagoon-front yards in place of lawn. By uploading photos of their shoreline buffer, participants earn points and recognition. This incentive program, funded by the Save Our Indian River Lagoon sales tax, specifically targets private yards along waterways.

6 COUNTY-SUBSIDIZED/SUPPORTED REPLACEMENT OF NON-NATIVES NEAR SENSITIVE HABITATS LIKE AQUATIC PRESERVES

Broward County's NatureScape Broward targets urban and suburban landscapes connecting to sensitive ecosystems (from Everglades "sawgrass" wetlands to coastal seagrass habitats). It is County-funded, and participation is voluntary. Participants are encouraged to create Florida-Friendly landscapes. It emphasizes replacing non-native/invasive ornamentals with native species. The program provides education, landscaping workshops, and free consultations to promote native planting and invasive removal. It partners with the National Wildlife Federation to certify wildlife-friendly yards.

Palm Beach County's Invasive Vegetation Removal & Cost-Share Program targets County natural areas (preserves of wetlands, scrub, mangroves, etc.) and a 500-foot buffer zone around these conservation lands. It is County-funded, and code enforcement ensures long-term compliance. Within 500 feet of county natural preserves, private landowners were offered incentives to voluntarily remove invasive plants. After designated deadlines, removal became mandatory by ordinance. Palm Beach County offered to pay 100% for removal of Australian pine and melaleuca and provided a cost-share for removing the other seven species within the buffer.

Keep Brevard Beautiful (KBB), a non-profit, in partnership with Brevard County and the Indian River Lagoon National Estuary Program created Lagoon Friendly Lawns. It has support from local municipalities, UF/IFAS Extension, Marine Resources Council, and others. It focuses on residential lawns and community greenspaces near the Indian River Lagoon and waterfront properties for "living shoreline" native plantings. The voluntary program provides guidelines and recognizes participants who follow Lagoon-friendly practices. Participants earn certification signs and sometimes rebates or prizes via related initiatives. It emphasizes reducing turf and fertilizer use, removing invasive exotics, and planting native vegetation. Yards are rated (Member, Silver, Gold) based on practices that curb nutrient pollution and enhance native habitat.

7 CITIZEN SCIENCE INITIATIVES MANAGED BY COUNTY/LOCAL GOVERNMENTS

The Sarasota Bay Estuary Program has a citizen science program that enlists citizen scientists to monitor wildlife, water quality, and plant health. It has multiple funding sources.

Florida LAKEWATCH is statewide example that has been in existence since 1986. It is "a citizen volunteer lake monitoring program that facilitates "hands-on" citizen participation in the management of Florida lakes, estuaries, rivers and springs through monthly monitoring activities." It is credited as being one of the largest programs of its kind in the country. Monroe County has Florida Keys Water Watch, which works in partnership with Florida LAKEWATCH. Orange County has a similar partnership for their program.

Hillsborough County has the Adopt-A-Pond Program, which is a citizen stewardship and monitoring program in Hillsborough County focused on neighborhood stormwater ponds. Established in the early 1990s, its purpose is to engage residents in restoring and monitoring their local ponds to improve water quality and aquatic habitat. Residents adopt a stormwater pond and receive guidance, training, and resources from the County to help clean debris, plant native vegetation, and monitor the pond's condition. It is partly funded through the County's stormwater utility fund.

The LagoonWatch Program for the Indian River Lagoon is a multi-county program where volunteers collect water samples in the Indian River Lagoon. It is coordinated by the Marine Resources Council. For over 30 years, LagoonWatch has trained and equipped volunteers to perform weekly water sampling at sites throughout the 156-mile lagoon.

8 ORDINANCES LIMITING CONTAMINANT SOURCES THAT MAY DEGRADE WATER SUPPLY WELLS

Wakulla County has an ordinance that requires advanced nitrogen-removing septic systems in vulnerable areas, caps residential septic tank density, mandates connection to central sewer for new developments in sensitive zones, enforces 100–300 ft setbacks of septic systems from karst features (springs, sinkholes), regulates hazardous material storage near public wellheads, has local fertilizer-use restrictions, and bans fracking and unapproved large water withdrawal.

Miami-Dade County's Northwest Wellfield Protection Ordinance limits residential development on septic tanks to 1 dwelling per 5 acres in the wellfield protection area, prohibits industrial facilities that generate hazardous or non-domestic wastewater from using septic systems, requires a minimum 100 ft well-to-septic setback, and delineates multiple protection zones with stricter controls on land use and chemical storage closer to the wells.

Broward County's Wellfield Protection Ordinance defines wellfield protection zones and prohibits high-risk activities in close zones. It also requires facility handling regulated substances in certain zones to obtain a County license and spill-prevention plan. All potential contaminant sources – including septic tanks – within these zones are inventoried and monitored to prevent groundwater pollution.

Pinellas County Wellhead Protection Ordinance defines four wellhead protection zones around public supply wells and regulates storage or use of hazardous substances in those zones. New high-risk land uses are limited to prevent groundwater contamination. Their Fertilizer Ordinance prohibits the sale or use of lawn fertilizers containing N or P during the summer rainy season (June 1 – Sept 30) and requires best management practices (like slow-release formulations and buffer distances) similar to other counties.

9 LOCAL GOVERNMENTS DEVELOPING AND IMPLEMENTING A LOW-IMPACT DEVELOPMENT MANUALS

Table 1 identifies local governments in Florida that have adopted a low-impact development (LID)/green stormwater infrastructure (GSI) manual.

Table 1 Local Governments in Florida with LDI/GIS Manuals

Local Government	Manual Title	Date
Alachua County	Stormwater Treatment Manual	2018
Brevard County	Low Impact Development Retrofit Guide	2020
Duval County (Jacksonville)	Low-Impact Development Design Manual	2013
Escambia County	Low Impact Design Best Management Practices Manual	2016
Orange County	Stormwater Low Impact Development Manual	2024
City of Ormond Beach	Low Impact Development Design Manual	2013
Sarasota County	Low Impact Development Guidance Document	2014
Hillsborough County	Green Infrastructure Manual	2023

10 FUNDING SUMMARY AND RECOMMENDATIONS

We evaluated the aspirational elements of the items above in terms of noticeable benefits in water quality improvements and citizen literacy/awareness. Based on that evaluation, we recommend prioritizing the following highest ranked issues in the order shown below:

1. Incentivizing Green Design at the Site Planning Scale – This item provides both types of benefits. Retrofit water quality treatment is challenging in many parts of the County due to the nature of the development. Being able to reduce loads one lot at a time while increasing citizen literacy/awareness with the homeowner and likely with the surrounding homeowner at a relatively modest investment for the County is very positive. An added benefit in terms of cost is that the County is not taking on the maintenance of the retrofit water quality treatment.

2. Local Governments Developing and Implementing a Low-Impact Development Manual – This item can go hand-in-hand with the issue above. Low-Impact Development or Green Stormwater Infrastructure manuals can be aimed at a design professional audience, a lay audience, or both. If you develop a Manual for a lay audience, it would supplement the item above.
3. Citizen Science Initiatives Managed by County/Local Governments – This item is very useful for citizen literacy/awareness. It can also add value to County programs with a modest investment from the County.
4. Funding Voluntary Retreat from Flooding – The biggest impact from this item is flood protection. However, vacated properties are often in lower-lying areas, which often make them favorable locations for water quality retrofits.

As discussed in the sections above and in the draft of the *One Charlotte One Water Plan*, there are multiple ways in which local governments in Florida have incentivized some of the aspirational elements of the *Charlotte County Comprehensive Plan*. Fee reductions and other incentives (e.g., increased densities as a tradeoff for important conservation land) are a viable option for many of the aspirational elements. However, they are not universally applicable (e.g., they don't apply to voluntary retreat from flooding), and any reduction in fees may have to be made up elsewhere in the budget. Our recommendation is to incentivize the elements where incentivization is applicable. Those elements should then be tracked for a period of time (e.g., 2 years) to test the effectiveness of incentives. The County should be prepared to remove the incentives if they are not adequately effective.

A Special Purpose Local Option Sales Tax (SPLOST) could be used in conjunction with the incentives as a way to fund them. A significant advantage of a SPLOST is that it could be used to fund much more of the *One Charlotte One Water Plan*. Although funding referendums are typically difficult to pass, ones related to water quality have usually been well received. If the County intends to more broadly implement the *One Charlotte One Water Plan*, we recommend pursuing a SPLOST.

One Charlotte One Water Plan

TO: Brandon Moody

FROM: Brett Cunningham, PE, ENV SP; Tony Janicki, PhD; and
Jon Perry, GISP

DATE: March 21, 2025

SUBJECT: Charlotte County Early-Out Project Identification
Detailed Task Description for a Lemon Bay Reasonable Assurance Plan
Jones Edmunds Project No. 03405-052-01

1 INTRODUCTION

When the *One Charlotte One Water Plan* was originally scoped, Task 6 was envisioned as an effort that would identify an early-out project for grant funding. Several projects were evaluated to fulfill that goal, but no suitable projects were identified during the last grant window. As a substitute for one of the early-out projects, the County and Jones Edmunds agreed to the Jones Edmunds Team providing a detailed description of the steps required to develop an alternative restoration plan – in this case, a Reasonable Assurance Plan (RAP) – for Lemon Bay. This Technical Memorandum (TM) describes those steps, which are as follows:

1. Build consensus among elected officials, management, and technical staff on the need for a RAP for Lemon Bay.
2. Develop a Joint Project Agreement (JPA) or similar mechanism for advertising and managing the RAP.
3. Establish a project budget for each stakeholder entity.
4. Select a consultant.
5. Determine the pollutants of concern.
6. Establish/confirm the water quality targets.
7. Select and develop a pollutant-loading model.
8. Determine the flows and loads.
9. Determine the load-response relationship.
10. Determine the load reductions needed.
11. Develop the load-reduction projects.
12. Develop the draft RAP.
13. Confirm stakeholder commitments.
14. Respond to comments and finalize the RAP.
15. Provide stakeholder involvement.

2 BUILD CONSENSUS

A critical first step in developing a RAP is building consensus among the elected officials of stakeholders who will have a financial stake in the RAP (i.e., those with jurisdiction in the watershed). In the case of Lemon Bay, the largest stakeholders are Charlotte and Sarasota Counties. The Cities of Venice and North Port also have small footprints in the watershed and would need to be included or could possibly be considered de minimis. Discussions during recent Charlotte and Sarasota County Commission meetings indicate a favorable stance on a project like the Lemon Bay RAP, but it will be important to get confirmation from the Commissions that are current at the time the decision to move forward is made since it is a multi-year financial commitment.

Likewise, support for the RAP among management and technical staff is important. Although they take directions from the Commission, it is still helpful for the process if they are supportive of the idea. Management or technical staff not being fully supportive of the idea is typically a result of not having a full understanding of the advantages and disadvantages of a RAP versus the Total Maximum Daily Load (TMDL)/Basin Management Action Plan (BMAP). This gap in understanding can be resolved with a short workshop discussing the different approaches.

During the consensus-building process, identifying the “champions” for the process is also important. Ideally, one of the champions would be at the technical staff level from one of the stakeholders and will serve as the project manager for the stakeholders. RAPs require many meetings and decisions. Keeping the group engaged and seeing the process to a timely conclusion is well-served by someone who has a passion for the subject matter. Having champions among management and elected officials is also highly desirable.

3 DEVELOP A JPA OR SIMILAR MECHANISM

From a practical standpoint, one of the stakeholder entities must be the lead for matters such as procurement and cost-sharing. This process is normally facilitated with a JPA or similar mechanism. The JPA covers items such as legal authority, scope of work, governance and management, funding, responsibilities of parties, terms, liability, and insurance, among other topics. The simplest way to split the funding is based on the percentage of the watershed area that each entity encompasses. A more complex method is to base it on the percentage of pollutant loading; however, that may not be practical if an existing estimation of the pollutant loads that covers the full watershed area and is reasonable to all parties does not exist.

4 ESTABLISH A PROJECT BUDGET FOR EACH STAKEHOLDER ENTITY

This step may be completed in conjunction with the JPA so that each entity understands their financial obligation before finalizing the JPA. Regardless of order, some entities may require a line item in their budget to fund the project. Therefore, this effort should occur early in the process since budgets are typically approved annually.

5 SELECT A CONSULTANT

This step could be optional if adequate expertise and availability exists among the staff of the stakeholders. However, it is usually difficult for both conditions to hold true, and a consultant is generally considered a third party that is impartial in the process. Given that the consultant selection is done under a JPA, a longer than normal selection process may be necessary.

6 DETERMINE THE POLLUTANTS OF CONCERN

In most estuaries in Florida, total nitrogen is the primary nutrient of concern. However, the Florida Department of Environmental Protection (FDEP) may also require that total phosphorus is considered in the RAP. With the work already done on Lemon Bay through the Coastal & Heartland National Estuary Partnership (CHNEP) and FDEP, this step may possibly be skipped. However, the findings used for skipping this step (i.e., agreeing to the already completed science) must be acknowledged and documented.

7 ESTABLISH/CONFIRM THE WATER QUALITY TARGETS

As with the previous step, CHNEP and FDEP previously established the water quality targets for Lemon Bay. Using those well-vetted targets would reduce the effort and timeline for establishing the RAP. However, if the stakeholders have concerns about the existing targets, this could be a worthwhile exercise. Changing targets could trigger other regulatory requirements that would add more time and cost to the process.

8 SELECT AND DEVELOP A POLLUTANT-LOADING MODEL

For the portion of the Lemon Bay watershed in Sarasota County, a pollutant-loading model (the Spatially Integrated Model for Pollutant Loading Estimates [SIMPLE]) currently exists that has been in use since the early 2000s. As part of the *One Charlotte One Water Plan* project, we have already provided a budget estimate for developing a SIMPLE model for Charlotte County. Although other approaches could be used, using SIMPLE is likely the logical choice for performing this part of the RAP. Developing the SIMPLE model for Charlotte County while the steps above are being implemented – or at least the Lemon Bay portion – will expedite development of the RAP and should be considered for the sake of the overall schedule. FDEP accepted the SIMPLE model for use on the Mosquito Lagoon RAP.

9 DETERMINE THE FLOWS AND LOADS

Because of the variability and complexity involved, estuarine water quality criteria are normally based on multi-year annual geometric means. The Lemon Bay water quality criteria are an exception in that they were developed using arithmetic means. A time series of flows and loads that is long enough to support a multi-year analysis for Lemon Bay must be developed. Typically, 10 years is the minimum-desired duration for the time series.

10 DETERMINE THE LOAD-RESPONSE RELATIONSHIP

Before determining the load reductions required to restore Lemon Bay, a connection between nutrient loading and estuarine response will need to be determined using one of three approaches:

- An empirical stressor response approach
- Mechanistic modeling
- A reference condition approach

Each approach should be considered and the most scientifically defensible approach brought forward. An empirical stressor response approach is predicated on having an adequately long dataset to perform the analysis and finding statistically significant signals in the data to support the approach. This approach begins with development of a logical model – one that can be borrowed from other estuaries as a starting point – followed by a statistical analysis to support (or reject) the logical model. Because of the confounding factors that often exist in an ecosystem as complex as an estuary, it is not always possible to use an empirical stressor response approach. However, it should be considered since it is one of the two most cost-effective approaches, along with the reference condition approach.

Mechanistic modeling would be the most expensive and time-consuming of the three approaches. The most efficient approach would likely be to add a water quality component to the existing Environmental Fluid Dynamics Code (EFDC) model that exists for Lemon Bay. That portion of the model would need to be calibrated and verified in order to use for this application, which would require an adequate amount of water quality data to exist for those purposes. One advantage of a mechanistic model is that it is more open to “what if” analyses.

A reference period approach is the most common of the three approaches and is predicated on several requirements – one of which is having a period in the observed data when resources and measurable metrics were being met or at least close to being met (i.e., the reference period). In addition to being straightforward to apply, an advantage to this approach is that it is the most easily understood by a wide range of stakeholders.

Regardless of the approach used, loading targets will need to be identified as protective of estuarine health, and there is sufficient long-term data for Lemon Bay to support the selected approach

11 DETERMINE THE LOAD REDUCTIONS NEEDED

Given the recommended nutrient loading targets, the next step is to identify a defensible baseline for which the calculation of load reductions will be based. The baseline loads can consist of a single year or as a composite (mean or median) that accounts for temporal variability of hydrologic conditions. A consensus from the stakeholders will be sought regarding the appropriate baseline. The load reductions may then be allocated among the stakeholders to account for the spatial distribution of loadings to Lemon Bay.

12 DEVELOP THE LOAD-REDUCTION PROJECTS

Load-reduction projects for the RAP do not need to be designed and permitted – they can simply be conceptual-level projects. The projects can be from existing concepts or ones that are developed during the RAP. Typically, they are more of the former than the latter. Load-reduction goals in RAPs are usually significant, so the focus of the project types needs to be on larger projects.

Cost opinions need to be developed for the capital portions of the project in part to support grant applications. Since the resulting best management practices (BMPs) usually require operation and maintenance, life-cycle cost opinions also need to be developed for the RAP. The consultant will develop the cost opinions. Each project must also have an owner or owners since a responsible implementing stakeholder is required for each one.

Predicted load reductions need to be in line with what FDEP will accept. We recommend using the draft guidelines developed by FDEP (Statewide Best Management Practice (BMP) Efficiencies for Crediting Projects in Basin Management Action Plans (BMAPs) and Alternative Restoration Plans, Draft – September 2021) as a starting point. There may be instances when deviated from those draft guidelines is warranted, and those discussions should occur as part of the normal project communications with FDEP. The consultant will need to estimate load reductions using the best available data for projects using technologies that are not well tested. These projects will likely also have post-construction monitoring requirements. Consideration should also be given to projects that are especially grant-fundable for inclusion in the RAP.

13 DEVELOP THE DRAFT RAP

Developing the draft RAP is generally straightforward since it is mostly a compilation of the work done up to this point in the project. Typical report sections include the following:

- Background
- Description of the Watershed
- Description of the Water Quality Goals
- Description of Proposed Management Actions
- Description of Procedures for Monitoring, Compliance, Assessment, and Reporting
- Commitment to Corrective Actions
- References

In the RAP, the projects developed in Step 12 will need to be prioritized into a schedule with 5-year increments. The RAP will also include annual reporting and 5-year update requirements.

14 CONFIRM STAKEHOLDER COMMITMENTS

With a 15-year schedule, implementation of projects will cover a period that likely exceeds the terms of the elected officials approving the expenditures. To that end, bringing the draft RAP – and particularly the projects that are the responsibility of a given stakeholder – back to the elected officials for buy-in is an important step in the process.

15 RESPOND TO COMMENTS AND FINALIZE THE RAP

Since FDEP is heavily involved in developing the draft RAP, comments on the draft are generally minor and easy to address. However, it is another step in the process and overall schedule that needs to be accounted for.

16 PROVIDE STAKEHOLDER INVOLVEMENT

The importance of stakeholder involvement in developing a RAP cannot be overemphasized. Although it is the final step in this TM, it occurs throughout the entirety of the project. From the JPA on, stakeholders must fully understand and work collaboratively to build consensus on important decisions. Frequent regular meetings should be scheduled throughout the process. As an example, over 20 stakeholder meetings were held while developing the Mosquito Lagoon RAP.

A well-run stakeholder process should include vetting methods and approaches before their application. No surprises regarding how results were developed should arise when they are presented to the stakeholder group. Information sharing and documentation are also important. A repository for technical data and meeting agendas, presentations, and minutes should be readily available for all stakeholders, including a venue for written stakeholder comments.

To distinguish between stakeholders that will have a financial commitment associated with the RAP versus ones that are interested parties, the former group is sometimes called key stakeholders. Selection/solicitation of (non-key) stakeholders is critical. Unintentionally missing a stakeholder that may be vocal against the RAP because they were not made aware of the details of its development could cause needless delay, rework, and frustration among the stakeholder group. Including any group that would have an interest in how the RAP is developed and implemented is important. Although this will likely result in a large number of stakeholders, the result will be a RAP that is well-supported by the community.