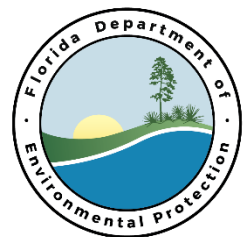


***Final***  
***2017 Progress Report***  
***for the North Indian River Lagoon***  
***Basin Management Action Plan***

**Division of Environmental Assessment and Restoration  
Florida Department of Environmental Protection**

**August 2017**

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## Acknowledgments

This 2017 Progress Report for the North Indian River Lagoon (IRL) Basin Management Action Plan (BMAP) was prepared as part of a statewide watershed management approach to restore and protect Florida's water quality. It was prepared by the Florida Department of Environmental Protection (DEP) with participation from the North IRL stakeholders.

**Table 1. List of North IRL BMAP participants**

| Type of Governmental or Private Entity | Participant                                                                                                                                                                                                                       |
|----------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Counties</b>                        | Brevard County<br>Volusia County                                                                                                                                                                                                  |
| <b>Municipalities</b>                  | City of Cocoa<br>City of Edgewater<br>City of Indian Harbour Beach<br>City of Oak Hill<br>City of Rockledge<br>City of Titusville<br>Town of Indialantic<br>Town of Palm Shores<br>Town of Melbourne Village<br>City of Melbourne |
| <b>Agencies</b>                        | Florida Department of Agriculture and Consumer Services<br>Florida Department of Environmental Protection<br>Florida Department of Transportation District 5<br>Kennedy Space Center<br>St. Johns River Water Management District |
| <b>Other Interested Parties</b>        | Agriculture                                                                                                                                                                                                                       |

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## Table of Contents

|                                                                               |           |
|-------------------------------------------------------------------------------|-----------|
| <b>Acknowledgments .....</b>                                                  | <b>2</b>  |
| <b>List of Acronyms and Abbreviations .....</b>                               | <b>6</b>  |
| <b>Section 1: Introduction .....</b>                                          | <b>7</b>  |
| <b>1.1 Purpose of the Report.....</b>                                         | <b>7</b>  |
| <b>1.2 Total Maximum Daily Loads (TMDLs) for the North IRL Subbasin .....</b> | <b>7</b>  |
| <b>1.3 North IRL Subbasin .....</b>                                           | <b>8</b>  |
| <b>Section 2: Activities During the Reporting Period.....</b>                 | <b>11</b> |
| <b>2.1 Activities by Entity.....</b>                                          | <b>11</b> |
| 2.1.1 Brevard County.....                                                     | 11        |
| 2.1.2 City of Cocoa .....                                                     | 12        |
| 2.1.3 City of Rockledge .....                                                 | 12        |
| 2.1.4 City of Titusville .....                                                | 12        |
| 2.1.5 Agriculture .....                                                       | 12        |
| <b>2.2 Summary of Accomplishments .....</b>                                   | <b>18</b> |
| <b>Section 3: Compliance .....</b>                                            | <b>21</b> |
| <b>Section 4: Water Quality .....</b>                                         | <b>23</b> |
| <b>4.1 Water Quality Monitoring .....</b>                                     | <b>23</b> |
| <b>4.2 SJRWMD Water Quality Analysis .....</b>                                | <b>23</b> |
| 4.2.1 Water Quality Trend Analysis .....                                      | 27        |
| <b>Appendices.....</b>                                                        | <b>29</b> |
| <b>Appendix A. BMAP Projects.....</b>                                         | <b>29</b> |
| <b>Appendix B. Water Quality Trend Analysis Methodology and Results.....</b>  | <b>48</b> |

## List of Figures

|                                                                                                                                                                                                                                              |    |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|
| Figure 1. North IRL Project Zone A stakeholders .....                                                                                                                                                                                        | 9  |
| Figure 2. North IRL Project Zone B stakeholders .....                                                                                                                                                                                        | 10 |
| Figure 3. FDACS BMP Program enrollment progress in North IRL Project Zone A as of<br>December 31, 2016 .....                                                                                                                                 | 15 |
| Figure 4. FDACS BMP Program enrollment progress in North IRL Project Zone B as of<br>December 31, 2016 .....                                                                                                                                 | 17 |
| Figure 5. Progress towards the North IRL TN TMDL for Project Zone A through<br>February 28, 2017 .....                                                                                                                                       | 19 |
| Figure 6. Progress towards the North IRL TP TMDL for Project Zone A through<br>February 28, 2017 .....                                                                                                                                       | 19 |
| Figure 7. Progress towards the North IRL TN TMDL for Project Zone B through<br>February 28, 2017 .....                                                                                                                                       | 20 |
| Figure 8. Progress towards the North IRL TP TMDL for Project Zone B through<br>February 28, 2017 .....                                                                                                                                       | 20 |
| Figure 9. Water quality sampling stations with highlighted representative stations .....                                                                                                                                                     | 24 |
| Figure 10. Concentrations of various forms of nitrogen. TN calculated = Total nitrogen<br>calculated from other forms, TKN-D = Total dissolved Kjeldahl nitrogen,<br>NOx-D = Dissolved nitrate and nitrite, NH4-D = Dissolved ammonium ..... | 25 |
| Figure 11. Concentrations of various forms of phosphorus. TP-T = Total phosphorus,<br>TP-D = Total dissolved phosphorus, PO4-D = Dissolved orthophosphate .....                                                                              | 26 |
| Figure 12. Chlorophyll concentrations. Chl-a = chlorophyll a .....                                                                                                                                                                           | 27 |
| Figure B-1. Station IRLTBC TN trend analysis results.....                                                                                                                                                                                    | 50 |
| Figure B-2. Station IRLTBC TP trend analysis results .....                                                                                                                                                                                   | 50 |

## List of Tables

|                                                                                                        |    |
|--------------------------------------------------------------------------------------------------------|----|
| Table 1. List of North IRL BMAP participants .....                                                     | 2  |
| Table 2. TN TMDLs in the North IRL Subbasin.....                                                       | 7  |
| Table 3. TP TMDLs in the North IRL Subbasin .....                                                      | 8  |
| Table 4. Agricultural acreage in North IRL Project Zone A as of December 31, 2016 .....                | 14 |
| Table 5. BMP enrollment for North IRL Project Zone A as of December 31, 2016.....                      | 14 |
| Table 6. BMP enrollment summary for North IRL Project Zone A .....                                     | 14 |
| Table 7. Agricultural acreage in North IRL Project Zone B as of December 31, 2016 .....                | 16 |
| Table 8. BMP enrollment for North IRL Project Zone B as of December 31, 2016.....                      | 16 |
| Table 9. BMP enrollment summary for North IRL Project Zone B .....                                     | 16 |
| Table 10. Summary of projects completed during the reporting period in the North<br>IRL Subbasin ..... | 18 |
| Table 11. Projects to achieve the TMDL .....                                                           | 21 |
| Table 12. Summary of reductions by entity.....                                                         | 22 |
| Table A-1. Brevard County projects in the North IRL .....                                              | 30 |
| Table A-2. City of Cocoa projects in the North IRL .....                                               | 34 |
| Table A-3. City of Edgewater projects in the North IRL .....                                           | 35 |
| Table A-4. City of Melbourne projects in the North IRL .....                                           | 36 |
| Table A-5. City of Rockledge projects in the North IRL .....                                           | 38 |
| Table A-6. City of Titusville projects in the North IRL .....                                          | 40 |
| Table A-7. FDOT District 5 projects in the North IRL .....                                             | 43 |
| Table A-8. KSC projects in the North IRL .....                                                         | 44 |
| Table A-9. Town of Indian River projects in the North IRL .....                                        | 46 |
| Table A-10. Town of Palm Shores projects in the North IRL .....                                        | 47 |
| Table A-11. Volusia County projects in the North IRL.....                                              | 47 |

## **List of Acronyms and Abbreviations**

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|        |                                                         |
|--------|---------------------------------------------------------|
| µg/L   | Micrograms Per Liter                                    |
| BAM    | Biosorption Activated Media                             |
| BMAP   | Basin Management Action Plan                            |
| BMP    | Best Management Practice                                |
| BRL    | Banana River Lagoon                                     |
| CDS    | Continuous Deflective Separation                        |
| DEP    | Florida Department of Environmental Protection          |
| F.A.C. | Florida Administrative Code                             |
| FDACS  | Florida Department of Agriculture and Consumer Services |
| FDOT   | Florida Department of Transportation                    |
| FYN    | Florida Yards and Neighborhood (Program)                |
| GIS    | Geographic Information System                           |
| IA     | Implementation Assurance                                |
| IDDE   | Illicit Discharge Detection and Elimination (Program)   |
| IRL    | Indian River Lagoon                                     |
| KSC    | Kennedy Space Center                                    |
| lbs/yr | Pounds Per Year                                         |
| m      | Meter                                                   |
| MAPS   | Managed Aquatic Plant System                            |
| MDL    | Minimum Detection Level                                 |
| mg/L   | Milligrams Per Liter                                    |
| N/A    | Not Applicable                                          |
| NASA   | National Aeronautics and Space Administration           |
| NOI    | Notice of Intent                                        |
| NPDES  | National Pollution Discharge Elimination System         |
| OAWP   | Office of Agricultural Water Policy                     |
| O&M    | Operations and Maintenance                              |
| PLSM   | Pollutant Load Screening Model                          |
| POR    | Period of Record                                        |
| PSA    | Public Service Announcement                             |
| SJRWMD | St. Johns River Water Management District               |
| SR     | State Road                                              |
| STORET | STorage and RETrieval (Database)                        |
| TBD    | To Be Determined                                        |
| TKN    | Total Kjeldahl Nitrogen                                 |
| TMDL   | Total Maximum Daily Load                                |
| TN     | Total Nitrogen                                          |
| TP     | Total Phosphorus                                        |
| U.S.   | United States                                           |
| WBID   | Waterbody Identification                                |

## Section 1: Introduction

### 1.1 Purpose of the Report

This is the fourth annual Progress Report for the North Indian River Lagoon (IRL) Basin Management Action Plan (BMAP). **Section 2** describes the activities and projects implemented by stakeholders during the reporting period (March 1, 2016, through February 28, 2017). **Section 3** summarizes stakeholder compliance with the BMAP. **Section 4** summarizes the water quality monitoring, and includes the results of a water quality evaluation conducted in the North IRL. The appendices provide supporting materials. **Appendix A** contains a comprehensive list of stakeholder projects and activities that are planned, completed, underway, or cancelled. **Appendix B** discusses the results of the water quality trend analysis performed on data from select tributary monitoring stations.

### 1.2 Total Maximum Daily Loads (TMDLs) for the North IRL Subbasin

The Florida Department of Environmental Protection (DEP) verified the IRL Basin as impaired because of excessive amounts of total nitrogen (TN) and total phosphorus (TP), as evidenced by a decrease in seagrass distribution and by low dissolved oxygen (DO). In March 2009, DEP adopted the IRL Basin TMDLs with a focus on the water quality conditions necessary for seagrass regrowth at the depth limits where seagrass historically grew in the basin, based on a multiyear composite of seagrass coverage. The median depth limits of seagrass coverage in the IRL Basin have decreased over the years because of changes in water quality resulting from anthropogenic (human) influences. **Table 2** and **Table 3** list the TN and TP TMDLs and pollutant load allocations, respectively, adopted by rule for the segments with waterbody identification (WBID) numbers in the North IRL Subbasin.

**Table 2. TN TMDLs in the North IRL Subbasin**

lbs/yr = Pounds per year; NASA= National Aeronautics and Space Administration; N/A = Not applicable

| WBID Number     | WBID Name                             | Project Zone | Parameter | TMDL (lbs/yr)  | Wastewater Facilities Allocation (lbs/yr) | Stormwater Allocation (lbs/yr) | Atmospheric Deposition Allocation (lbs/yr) |
|-----------------|---------------------------------------|--------------|-----------|----------------|-------------------------------------------|--------------------------------|--------------------------------------------|
| 2963F           | Indian River above Max Brewer         | North A      | TN        | 177,220        | N/A                                       | 88,322                         | 88,898                                     |
| 2963E           | Indian River above NASA Causeway      | North A      | TN        | 173,232        | N/A                                       | 95,932                         | 77,300                                     |
| 2963D           | Indian River above 520 Causeway       | North B      | TN        | 147,524        | 8,111                                     | 73,882                         | 65,531                                     |
| 2963B and 2963C | Indian River above Melbourne Causeway | North B      | TN        | 189,068        | 9,200                                     | 114,458                        | 65,410                                     |
| <b>Total</b>    |                                       |              | <b>TN</b> | <b>687,044</b> | <b>17,311</b>                             | <b>372,594</b>                 | <b>297,139</b>                             |

**Table 3. TP TMDLs in the North IRL Subbasin**

lbs/yr = Pounds per year; NASA= National Aeronautics and Space Administration; N/A = Not applicable

| <b>WBID Number</b>     | <b>WBID Name</b>                      | <b>Project Zone</b> | <b>Parameter</b> | <b>TMDL (lbs/yr)</b> | <b>Wastewater Facilities Allocation (lbs/yr)</b> | <b>Stormwater Allocation (lbs/yr)</b> | <b>Atmospheric Deposition Allocation (lbs/yr)</b> |
|------------------------|---------------------------------------|---------------------|------------------|----------------------|--------------------------------------------------|---------------------------------------|---------------------------------------------------|
| <b>2963F</b>           | Indian River above Max Brewer         | North A             | TP               | 9,320                | N/A                                              | 7,307                                 | 2,013                                             |
| <b>2963E</b>           | Indian River above NASA Causeway      | North A             | TP               | 14,793               | N/A                                              | 13,042                                | 1,751                                             |
| <b>2963D</b>           | Indian River above 520 Causeway       | North B             | TP               | 11,845               | 1,609                                            | 8,752                                 | 1,484                                             |
| <b>2963B and 2963C</b> | Indian River above Melbourne Causeway | North B             | TP               | 20,592               | 225                                              | 18,886                                | 1,481                                             |
| <b>Total</b>           |                                       |                     | <b>TP</b>        | <b>56,550</b>        | <b>1,834</b>                                     | <b>47,987</b>                         | <b>6,729</b>                                      |

### 1.3 North IRL Subbasin

Because of the large size and hydrologic diversity of the IRL Basin, DEP divided the watershed into three subbasins: (1) North IRL, (2) Central IRL, and (3) Banana River Lagoon (BRL). Separate BMAPs were developed for each subbasin; this report focuses solely on the North IRL subbasin.

In addition to dividing the overall IRL Basin into subbasins, the North IRL was further divided into project zones with boundaries based on the distinct hydrology in different areas of the basin and their corresponding annual residence times. These zones are important because flushing times vary greatly among locations and consequently affect how nutrient reductions will impact these distinct areas of the basin. The project zones identify large areas where projects should be implemented to ensure that load reductions achieve the desired response for each subbasin. The North IRL subbasin was split into two project zones, as follows:

- **North A** – Turnbull Creek to NASA Causeway (State Road [SR] 405).
- **North B** – NASA Causeway to Melbourne Causeway (U.S. Highway 192).

**Figure 1** and **Figure 2** show the locations of these project zones and the associated stakeholders.



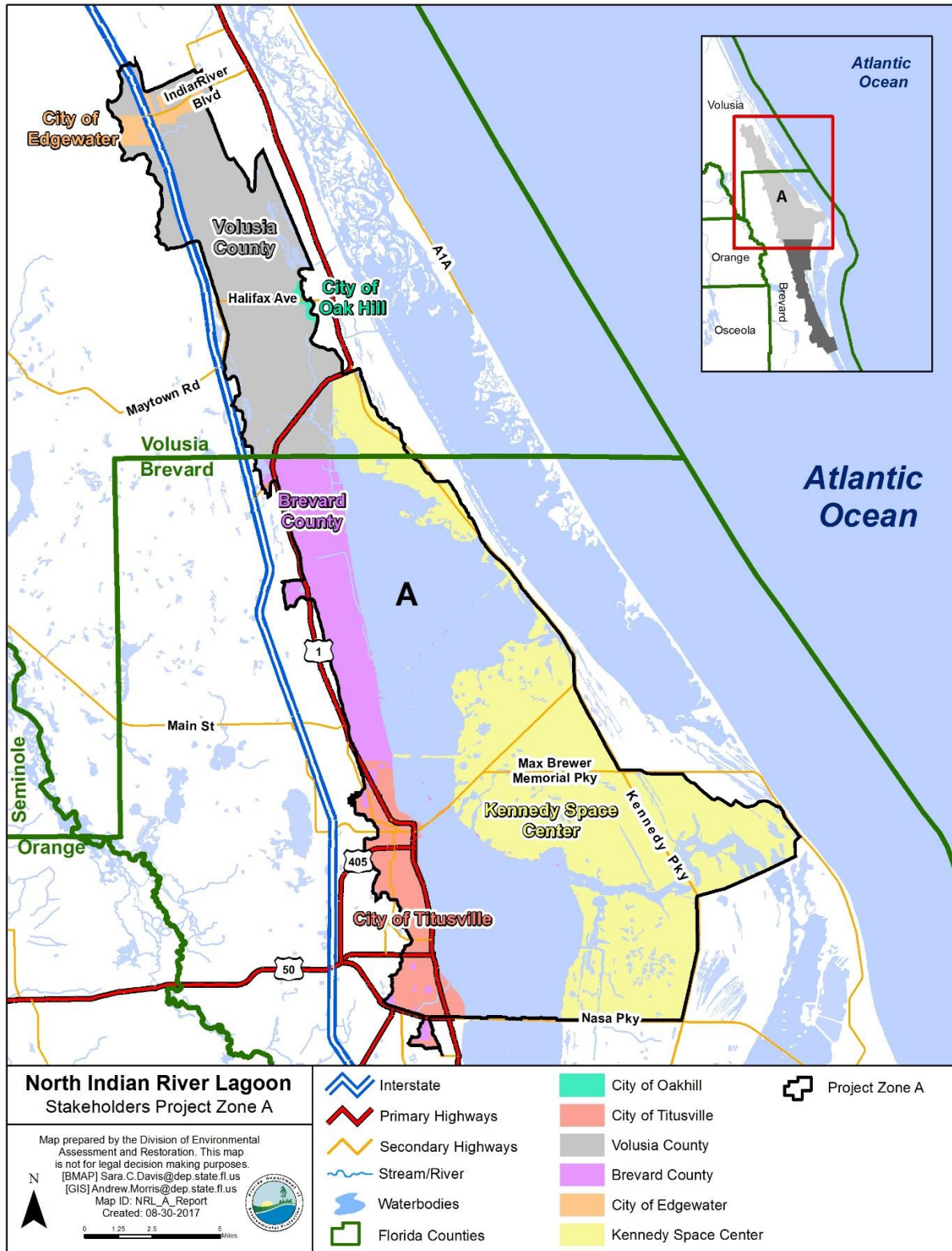


Figure 1. North IRL Project Zone A stakeholders

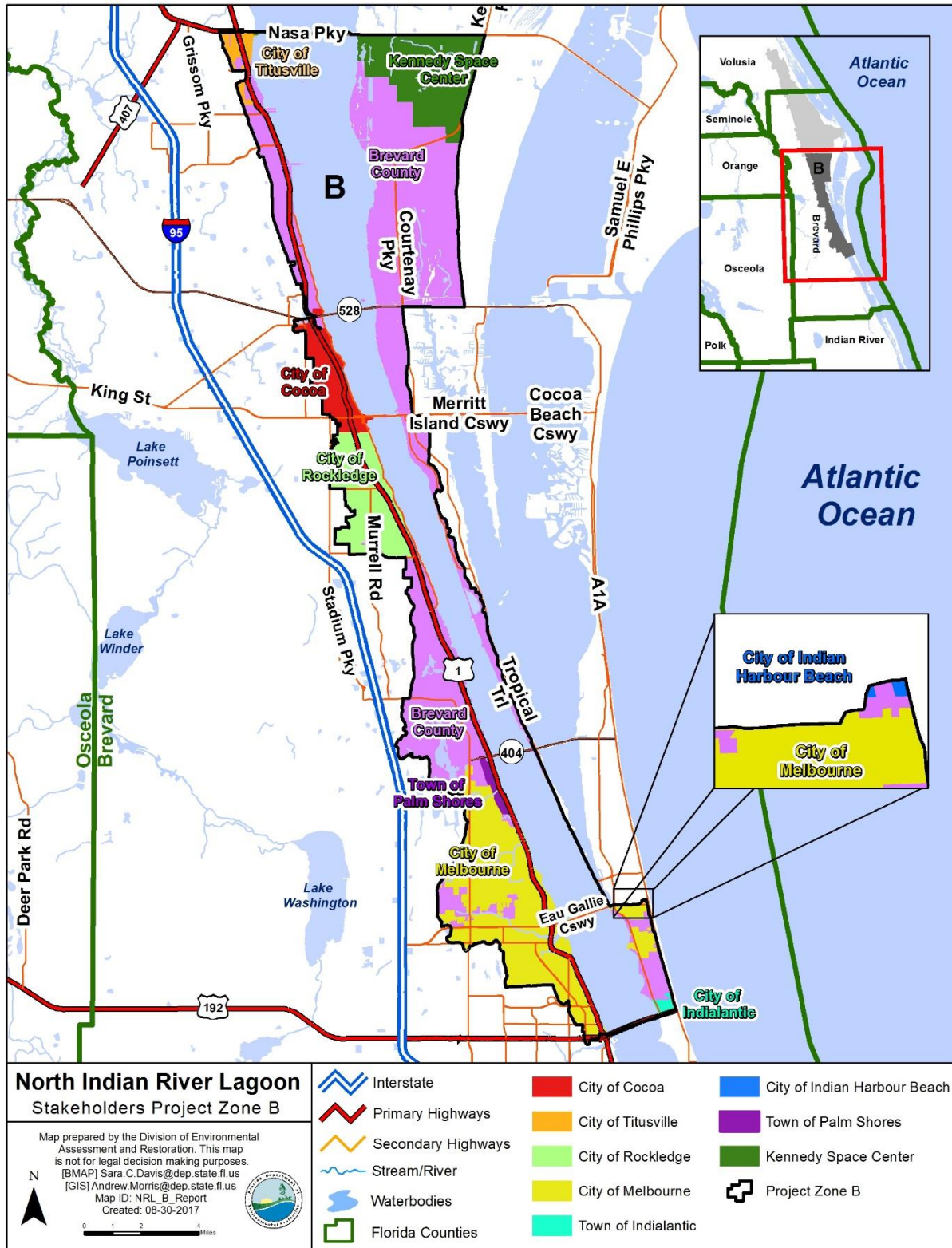


Figure 2. North IRL Project Zone B stakeholders

## **Section 2: Activities During the Reporting Period**

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**Section 2.1** and **Section 2.2** describe the accomplishments in the North IRL during the reporting period (March 1, 2016, through February 28, 2017). New projects added to the individual project tables are described below, as are individual projects completed during the reporting period. Ongoing efforts such as street sweeping, ordinances, and public education efforts are not specifically described below but must continue each year for the project credit to remain effective. **Appendix A** contains the individual project tables.

### **2.1 Activities by Entity**

#### **2.1.1 Brevard County**

In 2016, Brevard County passed a half-cent sales tax to support IRL restoration efforts and implement projects to reduce nutrient loading from stormwater runoff and groundwater discharges to the IRL. The county secured legislative appropriation funding to increase muck dredging projects in five priority areas: Mims boat ramp on Jones Road, Sykes Creek, Cocoa Beach, Grand Canal, and Turkey Creek.

The county completed the Port St. John C (BC-61) and Huntington Road (BC-60) managed aquatic plant system (MAPS) projects during the reporting period. These were partially funded by a DEP grant (G0430). BC-61 is credited with reductions of 62 lbs/yr of TN and 11 lbs/yr of TP. BC-60 is credited with reductions of 520 lbs/yr of TN and 47 lbs/yr of TP.

Brevard County also initiated the development of a Shoreline Management Plan, which will be used to identify opportunities and implement environmental enhancement and erosion protection along the IRL shoreline in Brevard County. The goals of the plan are as follows:

- Stabilize shorelines.
- Prevent erosion.
- Maintain, enhance and restore estuary habitat along the IRL shoreline.
- Protect water quality.

Brevard County, in partnership with the University of Central Florida, began conducting surveys of the IRL shoreline in Brevard County to create geographic information system (GIS) data layers that spatially represent shoreline conditions and features. Grant funding from the Florida Coastal Management Program Coastal Partnership Initiative was used to complete the process.

### **2.1.2 City of Cocoa**

The city completed the Peachtree Street Reconstruction Project (CC-12), Cocoa Riverfront Park Project (CC-13), and Bracco Pond Outfall Control Structure Project (CC-14) during the reporting period. It also added a new dry retention stormwater facility project (CC-20) at Forrest Avenue. Reductions for these projects are still being verified, and will be included in future reports.

### **2.1.3 City of Rockledge**

The city completed the Huntington Lakes II (ROCK-24) retention facility and monitoring. Reductions for this project are still being determined. The city also linked the stormwater video public service announcement (PSA) "Knowing Your Waterways" to the city's webpage and Facebook page.

### **2.1.4 City of Titusville**

The city completed the Draa Field Stormwater Park (TV-03) in December 2016. The treatment system consists of a 4-acre enhanced wet detention pond with littoral plantings, a permeable reactive barrier made of limerock, and a constructed wetland underdrain system. The project will reduce TN by 771 lbs/yr and TP by 312 lbs/yr. Water quality monitoring is ongoing and will be used to verify and update the reductions if necessary.

The city installed MAPS in the senior center wet detention pond (TV-11) in December 2015. Plants were harvested in May and October 2016. Biomass sampling analyses were conducted and reductions are being verified.

Titusville also planted littoral zone vegetation around three existing wet detention ponds (TV-12 and TV-13). Plants are currently being monitored for growth and survival. The results of biomass sampling analyses will be used to verify reduction credits.

### **2.1.5 Agriculture**

In 2015, the Florida Department of Agricultural and Consumer Services (FDACS) Office of Agricultural Water Policy (OAWP) adopted a revised vegetable and agronomic crop manual that includes specific nutrient and irrigation management best management practices (BMPs) for plastic mulch, bare ground, sugar cane, hay/silage, and greenhouse production systems. In early 2016, FDACS adopted a dairy manual targeting dairies that do not have DEP-issued National Pollutant Discharge Elimination System (NPDES) permits. In June 2016, a poultry manual was also adopted. To date, FDACS has developed BMP manuals for cow/calf, citrus, vegetable and agronomic crops, nurseries, equine, sod, dairy, poultry, and specialty fruit and nut operations. Currently, the OAWP is working on a small farms manual as well as revisions to the sod and cow/calf manuals.

As of December 31, 2016, there were 18 agricultural BMP notices of intent (NOIs) issued by FDACS OAWP covering 608 acres in the North IRL (**Figure 3** and **Figure 4**). Agricultural BMPs may or may not be implemented on all these acres because NOIs may include nonproduction acres, such as buildings, parking lots, and fallow acres. Furthermore, this

enrollment acreage includes NOIs on lands not classified as agriculture in the BMAP. However, land use in the BMAP area (St. Johns River Water Management District [SJRWMD] 2000) may not accurately reflect agricultural land uses in the basin today. To calculate the actual agricultural acreage in the North IRL covered by the FDACS BMPs, FDACS used the Pollutant Load Screening Model (PLSM). Per this land use, 447 agricultural acres of the North IRL are enrolled in the FDACS BMP Program. **Table 5** and **Table 8** list the BMPs and the acreage covered by NOIs.

During the reporting period, staff enrolled a total of 16.55 acres in the North IRL area. In Project Zone A, 14.55 acres were enrolled in the Citrus BMP Manual, and in Project Zone B, 2 acres were enrolled.

### **FDACS OAWP Implementation Assurance (IA) Program**

The OAWP formally established its IA Program in 2005 in the Suwannee River Basin as part of the multi-agency/local stakeholder Suwannee River Partnership. In 2007, the OAWP initiated the IA Program in the Lake Okeechobee Watershed and launched a standardized follow-up program for the remaining areas of the state in 2013, beginning with the Ridge Citrus and Indian River Citrus BMPs. In early 2014, the OAWP began to streamline the IA Program to ensure consistency statewide and across commodities and BMP manuals. This effort resulted in a single IA site-visit form, which is currently used by OAWP staff.

The IA Program is based on interactions with producers during site visits, which are conducted by OAWP field staff and technicians as workload allows. For the visits, field staff and technicians use a standard form (not BMP specific) developed in 2014. This form focuses on nutrient management, irrigation management, and water resource protection BMPs common to all of the BMPs that have been adopted by rule. The paper forms are submitted to OAWP staff and compiled into a spreadsheet, and the data are reported annually. From 2007 to 2015, the OAWP conducted 1,936 site visits. However, it is difficult to compare data collected prior to the implementation of the single IA site-visit form developed in 2014 because of regional differences (e.g., different forms and information asked) in administering the IA Program.

Additional emphasis was given to verifying the implementation of BMPs by enrolled producers with the enactment of Chapter 2016-1, Laws of Florida, which directed the OAWP to formalize the Implementation Verification Program into rules. In December 2016, the OAWP published a notice of rule development. As of February 2017, draft rule language has been distributed and presented at a public workshop. This language provides the structure for a statewide uniform implementation verification system, including assessments of the status of implementation, compliance assistance to aid producers in achieving full implementation, and referral of producers who are not implementing BMPs to DEP.



**Table 4. Agricultural acreage in North IRL Project Zone A as of December 31, 2016**

<sup>1</sup> FDACS staff-adjusted acreage for the purposes of enrollment is based on a review of more recent aerial imagery in the basin and local staff observations.

SJRWMD = St. Johns River Water Management District

N/A = Not applicable

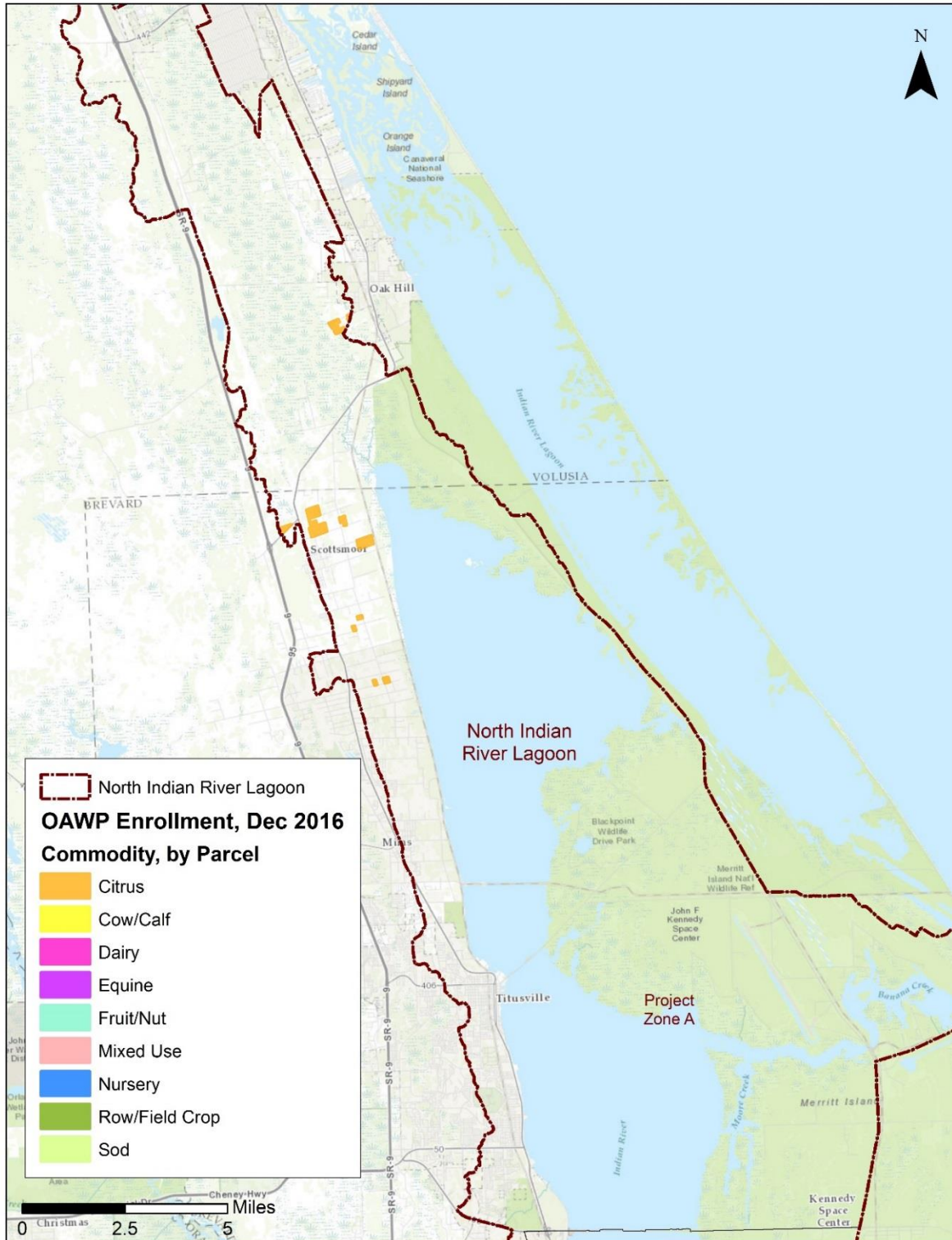
| 2000 SJRWMD Land Use       | 2000 Acres   | FDACS-Adjusted Acres <sup>1</sup> |
|----------------------------|--------------|-----------------------------------|
| Pasture                    | 1,190.5      | 1,164.5                           |
| Row/Field/Mixed Crops      | 618.1        | 574.2                             |
| Fallow Cropland            | 40.7         | 40.7                              |
| Horse Farm                 | 119.7        | 111.0                             |
| Citrus                     | 5,115.2      | 3,515.4                           |
| Abandoned Citrus           | 936.7        | N/A                               |
| Tree Crops                 | 1.7          | 1.7                               |
| Tree Nurseries             | 26.5         | 26.5                              |
| Ornamentals                | 12.1         | 12.1                              |
| Poultry Feeding Operations | 8.0          | 8.0                               |
| <b>Total</b>               | <b>8,069</b> | <b>5,454</b>                      |

**Table 5. BMP enrollment for North IRL Project Zone A as of December 31, 2016**

| Related FDACS BMP Programs | Acreage Enrolled | Related NOIs | PLSM Agricultural Land Use Acres with NOIs |
|----------------------------|------------------|--------------|--------------------------------------------|
| Citrus                     | 266              | 9            | 236                                        |
| <b>Total</b>               | <b>266</b>       | <b>9</b>     | <b>236</b>                                 |

**Table 6. BMP enrollment summary for North IRL Project Zone A**

| Category                                        | Acres        |
|-------------------------------------------------|--------------|
| Total Acreage Remaining in Basin for Enrollment | 5,188        |
| Five-Year Enrollment Goal (50 %)                | 2,727        |
| Acreage Enrolled as of December 31, 2016        | 266          |
| <b>Remaining Acres To Enroll in Phase I</b>     | <b>2,461</b> |



**Figure 3. FDACS BMP Program enrollment progress in North IRL Project Zone A as of December 31, 2016**

**Table 7. Agricultural acreage in North IRL Project Zone B as of December 31, 2016**

<sup>1</sup> FDACS staff-adjusted acreage for purposes of enrollment is based on a review of more recent aerial imagery in the basin and local staff observations.

N/A = Not applicable

| 2000 SJRWMD Land Use  | 2000 Acres   | FDACS-Adjusted Acres <sup>1</sup> |
|-----------------------|--------------|-----------------------------------|
| Pasture               | 164.2        | 84.8                              |
| Row/Field/Mixed Crops | 42.9         | 35.3                              |
| Tree Crops            | 2.8          | 2.8                               |
| Citrus                | 3,364.5      | 2,339.2                           |
| Abandoned Citrus      | 65.7         | N/A                               |
| Ornamentals           | 43.9         | 43.9                              |
| Specialty Farms       | 8.0          | 8.0                               |
| <b>Total</b>          | <b>3,692</b> | <b>2,514</b>                      |

**Table 8. BMP enrollment for North IRL Project Zone B as of December 31, 2016**

| Related FDACS BMP Programs | Acreage Enrolled | Related NOIs | PLSM Agricultural Land Use Acres with NOIs |
|----------------------------|------------------|--------------|--------------------------------------------|
| Citrus                     | 304.36           | 4            | 205.27                                     |
| Cow/Calf Operations        | 8.97             | 1            | 5.71                                       |
| Nurseries                  | 28.39            | 4            | .36                                        |
| <b>Total</b>               | <b>342</b>       | <b>9</b>     | <b>211</b>                                 |

**Table 9. BMP enrollment summary for North IRL Project Zone B**

| Category                                        | Acres      |
|-------------------------------------------------|------------|
| Total Acreage Remaining in Basin for Enrollment | 2,172      |
| Five-Year Enrollment Goal (50%)                 | 1,257      |
| Acreage Enrolled as of December 31, 2016        | 342        |
| <b>Remaining Acres To Enroll in Phase I</b>     | <b>915</b> |





**Figure 4. FDACS BMP Program enrollment progress in North IRL Project Zone B as of December 31, 2016**

## 2.2 Summary of Accomplishments

**Table 10** lists the projects completed during the reporting period in the North IRL. In the North IRL Project Zone A, these projects resulted in a reduction of 1,291 lbs/yr of TN and 359 lbs/yr of TP. These reductions are in addition to those projects given credit at BMAP adoption and in previous annual reports. Therefore, the total reductions to date are 30,647 lbs/yr of TN and 10,370 lbs/yr of TP, or 30 % of the TN and 53 % of the TP reductions needed to meet the TMDLs allocated to the North A project zone.

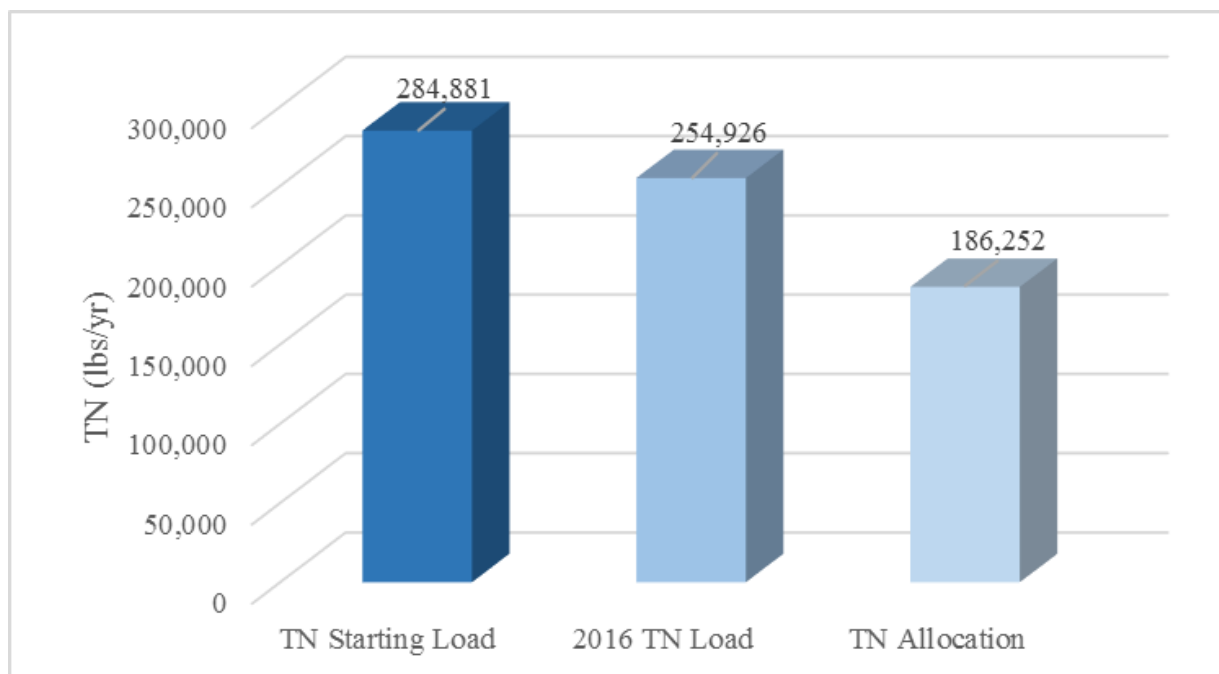
**Table 10** also lists the reductions for projects completed during the reporting period in the North IRL Project Zone B. These projects resulted in a reduction of 509 lbs/yr of TN and 99 lbs/yr of TP. The total reductions to date are 70,809 lbs/yr of TN and 22,403 lbs/yr of TP, or 57 % of the TN and 68 % of the TP reductions needed to meet the TMDLs allocated to the North B project zone.

**Figure 5, Figure 6, Figure 7, and Figure 8** list the load reductions for TN and TP, respectively, compared with the starting load and allocations for North IRL Project Zones A and B.

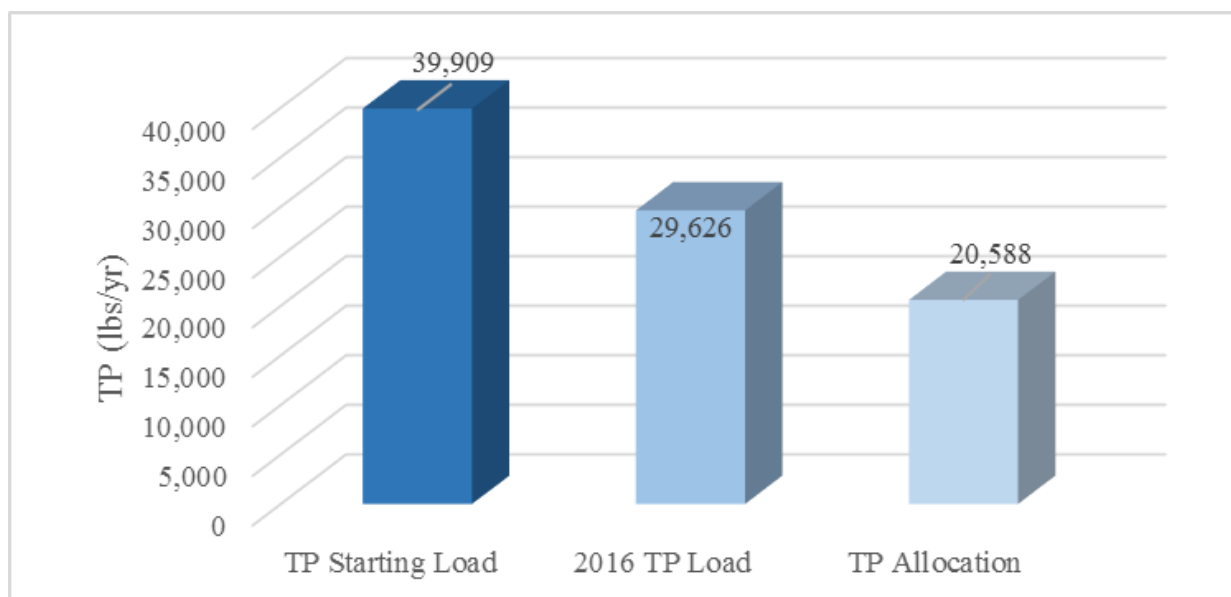
**Table 10. Summary of projects completed during the reporting period in the North IRL Subbasin**

TBD = To be determined; N/A = Not applicable; lbs/yr = Pounds per year

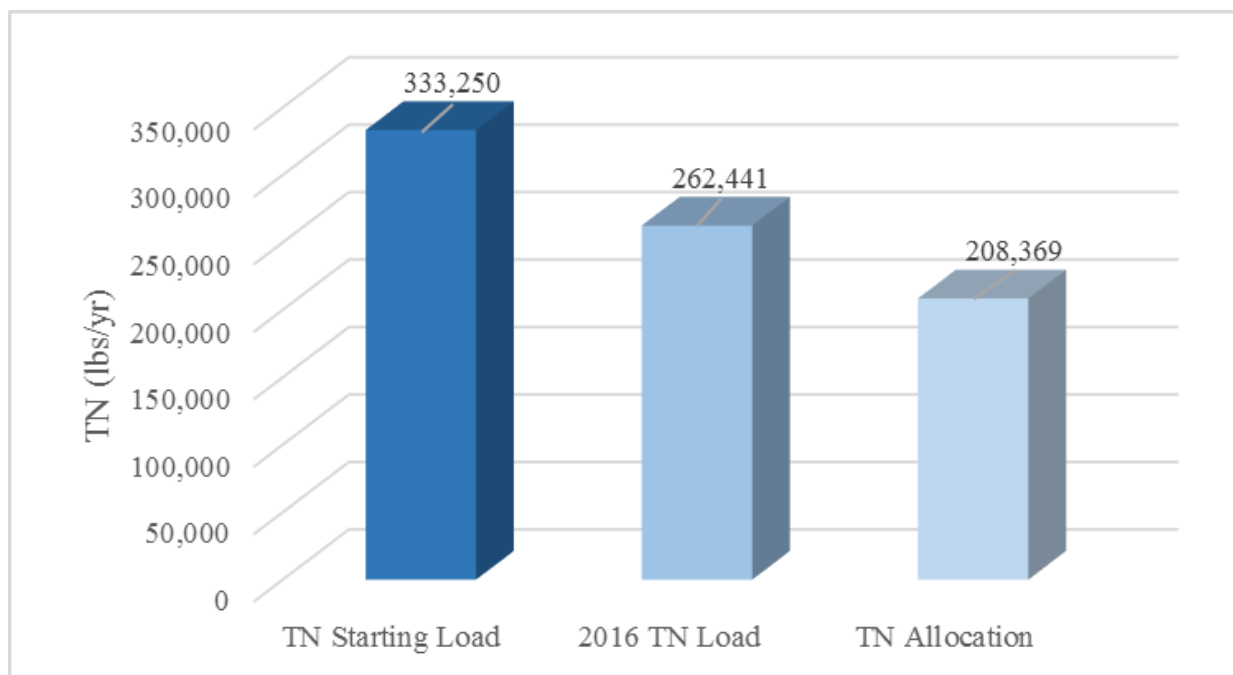
| Entity                  | Project Zone | Project Number | Project Name                                | TN Reduction (lbs/yr) | TP Reduction (lbs/yr) |
|-------------------------|--------------|----------------|---------------------------------------------|-----------------------|-----------------------|
| City of Titusville      | A            | TV-03          | Draa Field Stormwater Park                  | 771                   | 312                   |
| City of Titusville      | A            | TV-12          | Senior Center Ponds Littoral Zone Plantings | TBD                   | TBD                   |
| City of Titusville      | A            | TV-13          | Royal Oak Littoral Zone Plantings           | TBD                   | TBD                   |
| Brevard County          | A            | BC-60          | Huntington Road                             | 520                   | 47                    |
| City of Cocoa           | B            | CC-12          | Peachtree Street Reconstruction             | TBD                   | TBD                   |
| City of Cocoa           | B            | CC-13          | Cocoa Riverfront Park                       | TBD                   | TBD                   |
| City of Cocoa           | B            | CC-14          | Control Gate                                | TBD                   | TBD                   |
| City of Melbourne       | B            | MEL-12         | South Croton Baffle Box                     | 133                   | 32                    |
| City of Melbourne       | B            | MEL-14         | Paradise Baffle Box                         | 125.57                | 17.09                 |
| City of Melbourne       | B            | MEL-18         | Croton Road (Lime) Baffle Box               | 149                   | 35                    |
| City of Melbourne       | B            | MEL-19         | Young Street Existing Baffle Box Upgrade    | 39.3                  | 4.65                  |
| City of Rockledge       | B            | ROCK-24        | Huntington Lakes II                         | TBD                   | TBD                   |
| Brevard County          | B            | BC-61          | Port St. John C                             | 62                    | 10.5                  |
| <b>Total Reductions</b> |              |                |                                             | <b>1,780</b>          | <b>458</b>            |



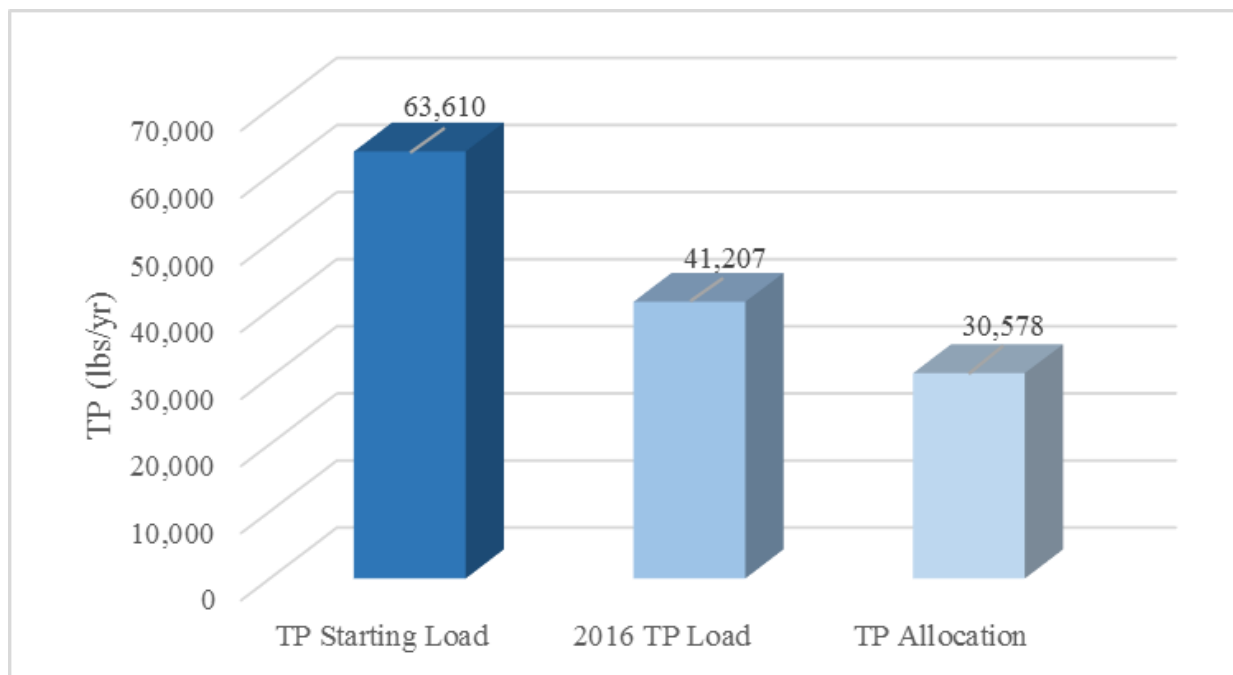
**Figure 5. Progress towards the North IRL TN TMDL for Project Zone A through February 28, 2017**



**Figure 6. Progress towards the North IRL TP TMDL for Project Zone A through February 28, 2017**



**Figure 7. Progress towards the North IRL TN TMDL for Project Zone B through February 28, 2017**



**Figure 8. Progress towards the North IRL TP TMDL for Project Zone B through February 28, 2017**

### Section 3: Compliance

DEP annually reviews each entity's progress towards completing projects in the BMAP and achieving the assigned allocations. **Table 11** lists the number of projects that each entity has committed to in the BMAP and annual reports, along with the status of those projects. **Table 12** summarizes the reductions achieved and required reductions for each entity in the BMAP.

**Table 11. Projects to achieve the TMDL**

| Entity                                                 | Projects   | Completed  | Underway  | Cancelled |
|--------------------------------------------------------|------------|------------|-----------|-----------|
| Agriculture                                            | 2          | 2          | 0         | 0         |
| Brevard County                                         | 78         | 50         | 27        | 1         |
| City of Cocoa                                          | 20         | 14         | 6         | 0         |
| City of Edgewater                                      | 1          | 1          | 0         | 0         |
| City of Melbourne                                      | 23         | 12         | 9         | 2         |
| City of Rockledge                                      | 34         | 28         | 6         | 0         |
| City of Titusville                                     | 32         | 13         | 19        | 0         |
| Florida Department of Transportation (FDOT) District 5 | 22         | 22         | 0         | 0         |
| Kennedy Space Center (KSC)                             | 19         | 19         | 0         | 0         |
| Town of Indialantic                                    | 3          | 3          | 0         | 0         |
| Town of Palm Shores                                    | 1          | 1          | 0         | 0         |
| Volusia County                                         | 3          | 3          | 0         | 0         |
| <b>Total</b>                                           | <b>238</b> | <b>168</b> | <b>67</b> | <b>3</b>  |

**Table 12. Summary of reductions by entity**

N/A = Not applicable; no reductions required.

| <b>Project Zone</b> | <b>Entity</b>       | <b>Total TN Required Reduction (lbs/yr)</b> | <b>Total TP Required Reduction (lbs/yr)</b> | <b>Current TN Reduction (lbs/yr)</b> | <b>Current TP Reduction (lbs/yr)</b> | <b>% of Required TN Reductions Achieved</b> | <b>% of Required TP Reductions Achieved</b> |
|---------------------|---------------------|---------------------------------------------|---------------------------------------------|--------------------------------------|--------------------------------------|---------------------------------------------|---------------------------------------------|
| <b>A</b>            | Agriculture         | 37,313                                      | 6,860                                       | 5,047                                | 1,420                                | 14                                          | 21                                          |
| <b>A</b>            | Brevard County      | 14,533                                      | 1,880                                       | 6,812                                | 1,945                                | 47                                          | 103                                         |
| <b>A</b>            | City of Edgewater   | 160                                         | No required reductions                      | 84                                   | 11                                   | 53                                          | N/A                                         |
| <b>A</b>            | City of Titusville  | 44,033                                      | 9,653                                       | 8,383                                | 3,661                                | 19                                          | 37                                          |
| <b>A</b>            | FDOT District 5     | 2647                                        | 947                                         | 819                                  | 130                                  | 31                                          | 14                                          |
| <b>A</b>            | KSC                 | No required reduction                       | No required reduction                       | 8,941                                | 3,135                                | N/A                                         | N/A                                         |
| <b>A</b>            | Volusia County      | No required reductions                      | No required reductions                      | 588                                  | 67                                   | N/A                                         | N/A                                         |
| <b>B</b>            | Agriculture         | 7,313                                       | 2,967                                       | 4,739                                | 1,029                                | 65                                          | 35                                          |
| <b>B</b>            | Brevard County      | 35,327                                      | 6,633                                       | 27,598                               | 7,518                                | 78                                          | 113                                         |
| <b>B</b>            | City of Cocoa       | 16,067                                      | 3,713                                       | 8,063                                | 3,868                                | 50                                          | 104                                         |
| <b>B</b>            | City of Melbourne   | 44,920                                      | 13,120                                      | 7,476                                | 2,333                                | 16                                          | 17                                          |
| <b>B</b>            | City of Rockledge   | 13,967                                      | 3,960                                       | 6,818                                | 2,548                                | 49                                          | 64                                          |
| <b>B</b>            | City of Titusville  | 313                                         | No required reductions                      | 160                                  | 73                                   | 51                                          | N/A                                         |
| <b>B</b>            | FDOT District 5     | 4,327                                       | 2,127                                       | 2,647                                | 633                                  | 61                                          | 30                                          |
| <b>B</b>            | KSC                 | No required reductions                      | No required reductions                      | 1,273                                | 1,185                                | N/A                                         | N/A                                         |
| <b>B</b>            | Town of Indialantic | 947                                         | 200                                         | 350                                  | 61                                   | 37                                          | 31                                          |
| <b>B</b>            | Town of Palm Shores | No required reductions                      | No required reductions                      | 21                                   | 4                                    | N/A                                         | N/A                                         |

## Section 4: Water Quality

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### 4.1 Water Quality Monitoring

The North IRL BMAP monitoring plan was designed to enhance the understanding of basin loads, identify areas with high nutrient concentrations, and track water quality trends. The information gathered through the monitoring plan will measure progress toward achieving the TMDL and provide a better understanding of watershed loading. The BMAP monitoring plan consists of ambient water quality sampling and biological monitoring.

### 4.2 SJRWMD Water Quality Analysis

Data from 6 stations were used to assess water quality between January 2016 and April 2017 (**Figure 5**). These stations provide information on conditions in the BRL (IRLB04), North IRL Project Zone A (IRLI06), North IRL Project Zone B (IRLI13), and Central IRL Project Zone A (IRLI23). Concentrations of 4 forms of nitrogen, 3 forms of phosphorus, and chlorophyll *a* varied in space and through time (**Figure 6**, **Figure 7**, and **Figure 8**). Concentrations of chlorophyll *a* were high at all stations from IRLI23 north in early 2016, with particularly elevated concentrations evident in the BRL (IRLB04; 126 micrograms per liter [ $\mu\text{g/L}$ ]). *Aureoumbra lagunensis*, or brown tide, was dominant in many of these samples, and the "crash" of the bloom in March 2016 led to a massive fish kill in the BRL. Other peaks in chlorophyll *a* tended to follow or coincide with increases in nitrogen or phosphorus. In early 2017, chlorophyll *a* concentrations fell below 10  $\mu\text{g/L}$  at all stations except IRLI06 and IRLI23, where concentrations fell between 10 and 15  $\mu\text{g/L}$ .



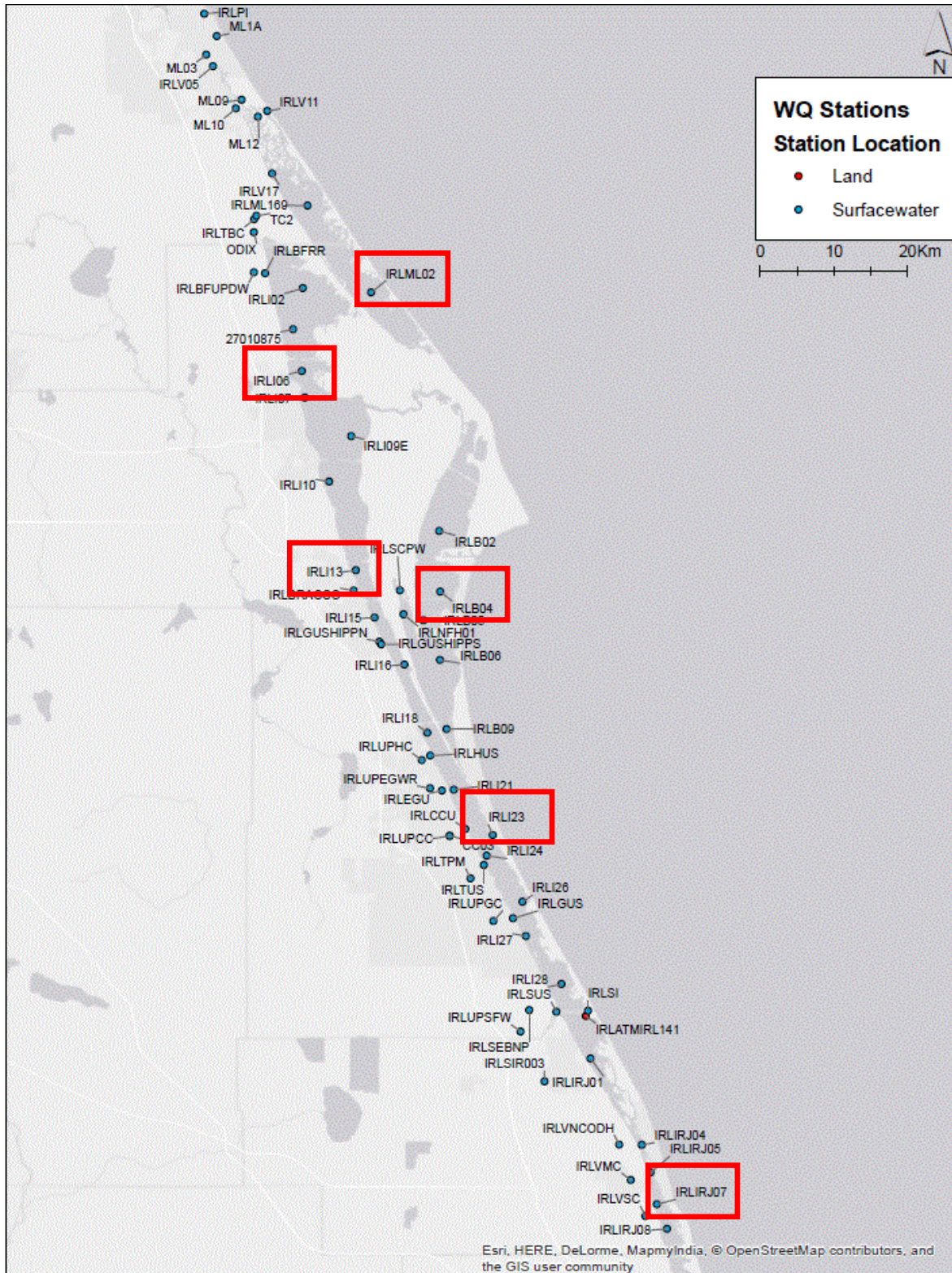
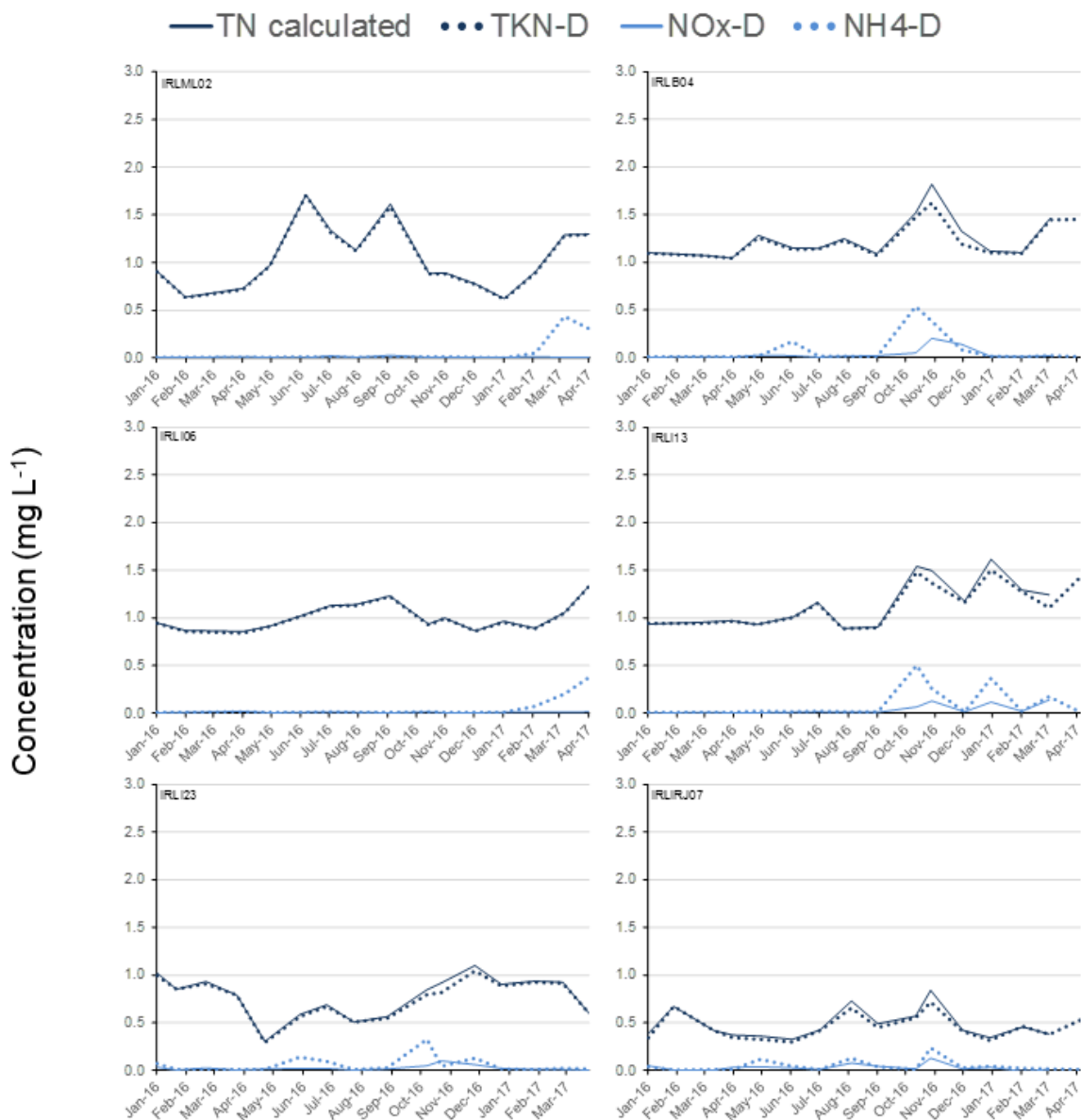


Figure 9. Water quality sampling stations with highlighted representative stations

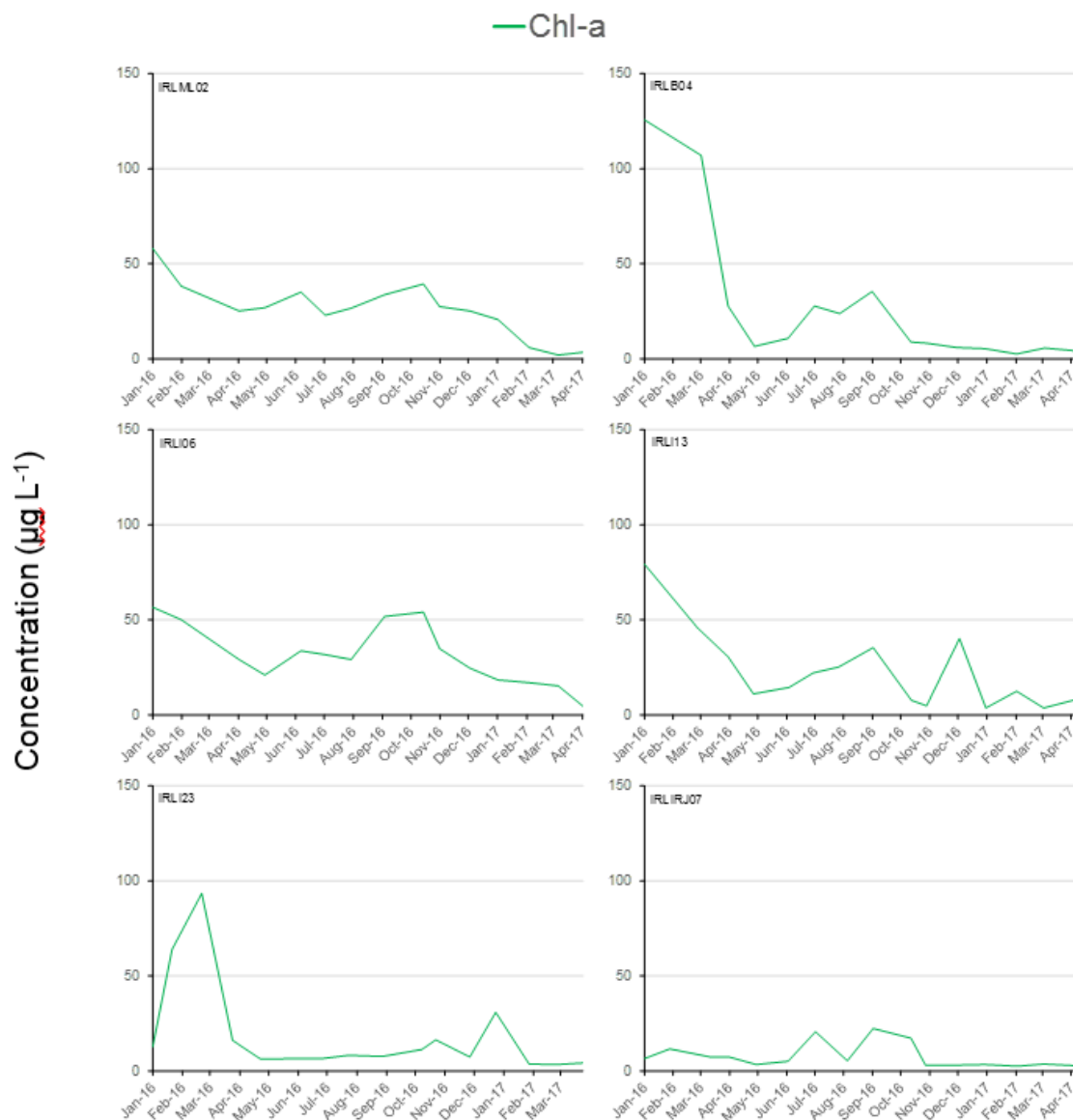




**Figure 10. Concentrations of various forms of nitrogen. TN calculated = Total nitrogen calculated from other forms, TKN-D = Total dissolved Kjeldahl nitrogen, NOx-D = Dissolved nitrate and nitrite, NH4-D = Dissolved ammonium**



**Figure 11. Concentrations of various forms of phosphorus. TP-T = Total phosphorus, TP-D = Total dissolved phosphorus, PO4-D = Dissolved orthophosphate**



**Figure 12. Chlorophyll concentrations. Chl-a = chlorophyll *a***

#### 4.2.1 Water Quality Trend Analysis

The most current STORage and RETrieval (STORET) data for Stations IRLTBC, TC2, and ODIK were processed using the methods described in **Appendix B**. Only data that met quality control objectives were used in the analysis. Nonparametric statistical techniques were used to identify monotonic trend analyses in a statistically rigorous way with the Seasonal Mann-Kendall trend test. Nonparametric tests such as the Mann-Kendall are robust against outliers and large data gaps, and data are not required to conform to a particular distribution for nonparametric analyses.

**Table 13** summarizes the results from the Seasonal Mann-Kendall trend tests, and **Appendix B** provides additional details and graphs.

**Table 13. Summary of results for water quality analyses**

POR = Period of record; N/A = Not applicable.

| WBID  | Station | Zone   | Parameter | POR Start | POR End | N (# of Samples) | Tau   | P-Value | Slope   | Trend Test Interpretation            |
|-------|---------|--------|-----------|-----------|---------|------------------|-------|---------|---------|--------------------------------------|
| 2942B | IRLTBC  | NIRL-A | TN        | 2000      | 2016    | 123              | 0.223 | 0.002   | <0.0001 | Significant increasing trend         |
| 2942B | IRLTBC  | NIRL-A | TP        | 2000      | 2016    | 164              | 0.308 | <0.001  | <0.0002 | Significant increasing trend         |
| 2942A | VC-ODIX | NIRL-A | TN        | 2000      | 2016    | 23               | N/A   | N/A     | N/A     | Insufficient data for trend analysis |
| 2942B | VC-TC2  | NIRL-A | TN        | 2000      | 2016    | 11               | N/A   | N/A     | N/A     | Insufficient data for trend analysis |

## **Appendices**

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### **Appendix A. BMAP Projects**

The BMAP project tables below show the implementation status of the BMAP projects as of February 28, 2017. The tables list (in lbs/yr) the nutrient reduction attributable to each individual project. These projects were submitted to provide reasonable assurance to DEP that each entity has a plan on how to meet its allocation. However, the list of projects is meant to be flexible enough to allow for changes that may occur over time, provided that the reduction is still met within the specified period.

**Table A-1. Brevard County projects in the North IRL**

N/A = Not applicable; O&M = Operations and maintenance; TBD = To be determined

| <b>Year<br/>Project<br/>Added</b> | <b>Project<br/>Number</b> | <b>Project Name</b>                          | <b>Project Type</b>            | <b>Project<br/>Status</b> | <b>Acres<br/>Treated</b> | <b>TN<br/>Reduction<br/>(lbs/yr)</b> | <b>TP<br/>Reduction<br/>(lbs/yr)</b> | <b>Cost</b> | <b>Cost<br/>Annual<br/>O&amp;M</b> | <b>Project Zone</b> |
|-----------------------------------|---------------------------|----------------------------------------------|--------------------------------|---------------------------|--------------------------|--------------------------------------|--------------------------------------|-------------|------------------------------------|---------------------|
| 2013                              | BC-01                     | Old Dixie Highway 601                        | BMP Cleanout                   | Completed                 |                          | TBD                                  | TBD                                  | \$1,000     |                                    | A                   |
| 2013                              | BC-02                     | Chain of Lakes Pond                          | Wet Detention Pond             | Completed                 | 1,072.5                  | 2,699                                | 1,109                                | \$2,051,405 |                                    | A                   |
| 2013                              | BC-03                     | Education Efforts                            | Education Efforts              | Completed                 | N/A                      | 1,660                                | 214                                  |             |                                    | A                   |
| 2013                              | BC-04                     | Scottsmeer I                                 | BMP Treatment Train            | Planned                   | 530.9                    | TBD                                  | TBD                                  | \$601,664   | \$1,000                            | A                   |
| 2013                              | BC-05                     | Chain of Lakes Southern<br>Expansion Phase 1 | Wet Detention Pond             | Completed                 | 575.2                    | 1,325                                | 441                                  | \$3,200,000 | \$1,000                            | A                   |
| 2013                              | BC-06                     | Chain of Lakes Reuse                         | Stormwater Reuse               | Completed                 |                          | 498                                  | 63                                   |             |                                    | A                   |
| 2015                              | BC-07                     | Scottsmeer C                                 | BMP Treatment Train            | Planned                   | 463                      | TBD                                  | TBD                                  |             |                                    | A                   |
| 2013                              | BC-08                     | Twin Lakes North                             | Baffle Box –<br>1st generation | Completed                 | 7.7                      | 10                                   | 1                                    |             |                                    | B                   |
| 2013                              | BC-09                     | Twin Lakes South                             | Baffle Box –<br>1st generation | Completed                 | 8.5                      | 10                                   | 1                                    | \$20,082    |                                    | B                   |
| 2013                              | BC-10                     | Lucas Place 640<br>Baffle Box                | Baffle Box –<br>1st generation | Completed                 | 5.2                      | 8                                    | 1                                    | \$36,835    | \$1,000                            | B                   |
| 2013                              | BC-11                     | Rockledge Drive 2055                         | Baffle Box –<br>1st generation | Completed                 | 2.4                      | 2                                    | 0                                    | \$61,094    | \$1,000                            | B                   |
| 2013                              | BC-12                     | Rockledge and<br>Riverwoods Baffle Box       | Baffle Box –<br>1st generation | Completed                 | 3.8                      | 3                                    | 0                                    | \$47,686    | \$1,000                            | B                   |
| 2013                              | BC-13                     | Anchor Lane                                  | Baffle Box –<br>1st generation | Completed                 | 29.4                     | 47                                   | 5                                    | \$49,560    | \$1,000                            | B                   |
| 2013                              | BC-14                     | Kelmore Baffle Box                           | Baffle Box –<br>1st generation | Completed                 | 9.7                      | 10                                   | 2                                    | \$21,817    | \$1,000                            | B                   |
| 2013                              | BC-15                     | Puesta Del Sol 735<br>Baffle Box             | Baffle Box –<br>1st generation | Completed                 | 2.2                      | 2                                    | 0                                    | \$24,953    | \$1,000                            | B                   |
| 2013                              | BC-16                     | Tequesta Harbor<br>Baffle Box                | Baffle Box –<br>1st generation | Completed                 | 13.1                     | 21                                   | 2                                    | \$27,582    | \$1,000                            | B                   |
| 2013                              | BC-17                     | Broadway Boulevard<br>Pond                   | Wet Detention Pond             | Completed                 | 85.7                     | 272                                  | 56                                   | \$553,169   |                                    | B                   |
| 2013                              | BC-18                     | Fairglen Elementary<br>School Pond           | Wet Detention Pond             | Completed                 | 80.2                     | 350                                  | 111                                  | \$730,869   |                                    | B                   |
| 2013                              | BC-19                     | Lake George                                  | Wet Detention Pond             | Completed                 | 719                      | 1,261                                | 415                                  | \$347,255   | \$1,000                            | B                   |



| Year<br>Project<br>Added | Project<br>Number | Project Name                                 | Project Type                 | Project<br>Status | Acres<br>Treated | TN<br>Reduction<br>(lbs/yr) | TP<br>Reduction<br>(lbs/yr) | Cost        | Cost<br>Annual<br>O&M | Project Zone |
|--------------------------|-------------------|----------------------------------------------|------------------------------|-------------------|------------------|-----------------------------|-----------------------------|-------------|-----------------------|--------------|
| 2013                     | BC-20             | Merritt Island Courthouse Pond               | Wet Detention Pond           | Completed         | 7                | 8                           | 3                           | \$95,584    |                       | B            |
| 2013                     | BC-21             | Parkway Drive Phase 2 Pond                   | Wet Detention Pond           | Completed         | 1,796.9          | 4,041                       | 1,599                       | \$1,817,720 |                       | B            |
| 2013                     | BC-22             | Street Sweeping                              | Street Sweeping              | Completed         | N/A              | 636                         | 408                         |             |                       | B            |
| 2013                     | BC-23             | Education Efforts                            | Education Efforts            | Completed         | N/A              | 6,339                       | 1,035                       |             |                       | B            |
| 2013                     | BC-24             | Pine Island Phase I and II                   | Wet Detention Pond           | Completed         | 6,232.9          | 10,948                      | 3,218                       | \$4,131,255 | \$34,705              | B            |
| 0                        | BC-25             | Merritt Island Airport                       | Wet Detention Pond           | Cancelled         | 0                | 0                           | 0                           | \$0         |                       | B            |
| 2013                     | BC-26             | Pines Industrial                             | Wet Detention Pond           | Planned           | 71               | 802                         | 101                         | \$822,000   |                       | B            |
| 2013                     | BC-27             | Johnson Junior High                          | MAPS                         | Planned           | 133.4            | 187                         | 27                          | \$484,200   |                       | B            |
| 2013                     | BC-28             | Florida Boulevard                            | MAPS                         | Completed         | 88.4             | 197                         | 21                          | \$40,772    | \$18,295              | B            |
| 2013                     | BC-29             | Fairglen Elementary                          | MAPS                         | Planned           | 80.2             | 123                         | 12                          | \$34,996    | \$15,703              | B            |
| 2013                     | BC-30             | Port St. John B                              | MAPS                         | Completed         | 57.9             | 237                         | 42                          | \$16,308    | \$7,315               | B            |
| 2013                     | BC-31             | Wickham Park North                           | MAPS                         | Underway          | 1,796.9          | 2,804                       | 598                         | \$75,428    | \$33,846              | B            |
| 2013                     | BC-32             | West Avenue 6600                             | Baffle Box – Type 1 retrofit | Underway          | 50.7             | 120                         | 12                          | \$15,000    |                       | B            |
| 2013                     | BC-33             | Lucas Place                                  | Baffle Box – Type 1 retrofit | Completed         | 2.7              | 8                           | 1                           | \$12,507    |                       | B            |
| 2013                     | BC-34             | Indian River Isles                           | Baffle Box – Type 1 retrofit | Completed         | 7.3              | 63                          | 8                           | \$30,844    |                       | B            |
| 2013                     | BC-35             | Granada Street 1030 East                     | Baffle Box – Type 1          | Completed         | 38.6             | 99                          | 16                          | \$15,000    |                       | B            |
| 2013                     | BC-36             | Haverhill Avenue                             | Baffle Box – Type 1 retrofit | Completed         | 47.5             | 80                          | 8                           | \$35,857    |                       | B            |
| 2013                     | BC-37             | Manth Avenue                                 | Baffle Box – Type 1 retrofit | Completed         | 69.1             | 226                         | 29                          | \$12,507    |                       | B            |
| 2013                     | BC-38             | Rockledge and Riverwoods Boulevard Rockledge | Baffle Box – Type 1 retrofit | Completed         | 3.8              | 3                           | 0                           | \$15,000    |                       | B            |
| 2013                     | BC-39             | Alamanda Indian Harbour Beach                | Baffle Box – Type 1 retrofit | Completed         | 2.8              | 3                           | 0                           | \$12,507    |                       | B            |
| 2013                     | BC-40             | River Shore 1848 Indialantic                 | Baffle Box – Type 1 retrofit | Completed         | 2.7              | 3                           | 0                           | \$31,751    |                       | B            |

| Year<br>Project<br>Added | Project<br>Number | Project Name                                                  | Project Type                     | Project<br>Status | Acres<br>Treated | TN<br>Reduction<br>(lbs/yr) | TP<br>Reduction<br>(lbs/yr) | Cost        | Cost<br>Annual<br>O&M | Project Zone |
|--------------------------|-------------------|---------------------------------------------------------------|----------------------------------|-------------------|------------------|-----------------------------|-----------------------------|-------------|-----------------------|--------------|
| 2013                     | BC-41             | River Shore 1925<br>Indialantic                               | Baffle Box –<br>Type 1 retrofit  | Completed         | 7.4              | 7                           | 1                           | \$12,507    |                       | B            |
| 2013                     | BC-42             | Cedar Lane Indialantic                                        | Baffle Box –<br>Type 1 retrofit  | Completed         | 3.8              | 6                           | 1                           | \$12,507    |                       | B            |
| 2013                     | BC-43             | Riverview 9856<br>Indialantic                                 | Baffle Box –<br>Type 1 retrofit  | Completed         | 5.7              | 9                           | 1                           | \$15,000    |                       | B            |
| 2013                     | BC-44             | Riverview 9864<br>Indialantic                                 | Baffle Box –<br>Type 1 retrofit  | Completed         | 98.5             | 202                         | 33                          | \$15,000    |                       | B            |
| 2013                     | BC-45             | Oak Ridge Indialantic                                         | Baffle Box –<br>Type 1 retrofit  | Completed         | 126.5            | 257                         | 39                          | \$15,000    |                       | B            |
| 2013                     | BC-46             | Kingsmill-Aurora<br>Phase 2                                   | Wet Detention Pond               | Planned           | 1,220.4          | 4,059                       | 1,590                       | \$1,600,000 | \$1,000               | B            |
| 2013                     | BC-47             | Sediment Trap,<br>Grated Inlet Basket,<br>Inlet Weir Cleaning | BMP Cleanout                     | Completed         |                  | TBD                         | TBD                         | \$392,105   |                       | B            |
| 2013                     | BC-48             | Merritt Ridge 3A                                              | MAPS                             | Completed         | 32.1             | 138                         | 27                          | \$100,362   |                       | B            |
| 2013                     | BC-49             | Lake George                                                   | MAPS                             | Underway          | 719              | 505                         | 51                          | \$51,200    |                       | B            |
| 2013                     | BC-50             | Wickham Park                                                  | Stormwater Reuse                 | Completed         |                  | 75                          | 5                           |             |                       | B            |
| 2013                     | BC-51             | Ellington Park                                                | Stormwater Reuse                 | Completed         |                  | 409                         | 87                          |             |                       | B            |
| 2013                     | BC-52             | Rockledge Barton Park<br>Reuse                                | Stormwater Reuse                 | Completed         |                  | 262                         | 24                          |             |                       | B            |
| 2013                     | BC-53             | Florida Boulevard Pond                                        | Wet Detention Pond               | Completed         | 88.4             | 545                         | 185                         | \$350,384   |                       | B            |
| 2014                     | BC-54             | McGiver South                                                 | Baffle Box –<br>Type 1 retrofit  | Completed         | 2.8              | 6                           | 1                           | \$12,507    |                       | B            |
| 2014                     | BC-55             | 651 Franklyn                                                  | Baffle Box –<br>Type 1 retrofit  | Completed         | 13.7             | 15                          | 2                           | \$12,507    |                       | B            |
| 2014                     | BC-56             | Fountainhead                                                  | Aquatic Vegetation<br>Harvesting | Completed         | 125.5            | 401                         | 65                          | \$39,274    |                       | B            |
| 2015                     | BC-57             | Fiske                                                         | Baffle Box –<br>Type 1 retrofit  | Completed         | 126.2            | 317                         | 56                          | \$12,507    |                       | B            |
| 2015                     | BC-58             | Street Sweeping                                               | Street Sweeping                  | Completed         | N/A              | 110                         | 71                          |             |                       | A            |
| 2015                     | BC-59             | Baffle Box/Sediment<br>Trap Cleaning                          | BMP Cleanout                     | Underway          |                  | TBD                         | TBD                         | \$20,082    |                       | A            |
| 2016                     | BC-60             | Huntington Road                                               | MAPS                             | Completed         | 354.6            | 520                         | 47                          | \$45,788    | \$9,998               | A            |

| Year Project Added | Project Number | Project Name                                   | Project Type                       | Project Status | Acres Treated | TN Reduction (lbs/yr) | TP Reduction (lbs/yr) | Cost         | Cost Annual O&M | Project Zone |
|--------------------|----------------|------------------------------------------------|------------------------------------|----------------|---------------|-----------------------|-----------------------|--------------|-----------------|--------------|
| 2016               | BC-61          | Port St. John C                                | MAPS                               | Completed      | 20            | 62                    | 11                    | \$14,062     | \$3,071         | B            |
| 2016               | BC-62          | Shoreview Circle                               | Baffle Box – Type 1 retrofit       | Underway       | TBD           | TBD                   | TBD                   |              |                 | B            |
| 2016               | BC-63          | Granada West                                   | Baffle Box – Type 1 retrofit       | Underway       | TBD           | TBD                   | TBD                   |              |                 | B            |
| 2016               | BC-64          | Shoreview Lane                                 | Baffle Box – Type 1 retrofit       | Underway       | TBD           | TBD                   | TBD                   |              |                 | B            |
| 2016               | BC-65          | Sunset Park North                              | Baffle Box – Type 1 retrofit       | Underway       | TBD           | TBD                   | TBD                   |              |                 | B            |
| 2016               | BC-66          | Oak Street                                     | Baffle Box – Type 1 retrofit       | Underway       | TBD           | TBD                   | TBD                   |              |                 | B            |
| 2017               | BC-67          | Fountainhead Advanced Denitrification          |                                    | Planned        | 234.7         | TBD                   | TBD                   | \$284,320    |                 | B            |
| 2017               | BC-68          | Multiple Ditch Outfall Denitrification D1      |                                    | Planned        |               | TBD                   | TBD                   | \$3,496,838  |                 | A & B        |
| 2017               | BC-69          | Multiple Ditch Outfall Denitrification D4      |                                    | Planned        |               | TBD                   | TBD                   | \$2,140,000  |                 | B            |
| 2017               | BC-70          | Otter Creek Basin D4                           |                                    | Planned        |               | TBD                   | TBD                   | \$130,000    |                 | B            |
| 2017               | BC-71          | Suntree In-Channel Denitrification D4          |                                    | Planned        |               | TBD                   | TBD                   | \$71,000     |                 | B            |
| 2017               | BC-72          | Multiple Ditch Outfall Denitrification D5      |                                    | Planned        |               | TBD                   | TBD                   | \$927,858    |                 | Unknown      |
| 2017               | BC-73          | Eau Gallie Area Muck Dredging                  | Muck Removal/ Restoration Dredging | Planned        |               | TBD                   | TBD                   | \$26,250,000 |                 | B            |
| 2017               | BC-74          | Flounder Creek Pond Denitrification Retrofit   |                                    | Planned        | 320           | TBD                   | TBD                   | \$180,000    |                 | A            |
| 2017               | BC-75          | Huntington Creek Pond Denitrification Retrofit |                                    | Planned        | 355           | TBD                   | TBD                   | \$180,000    |                 | A            |
| 2017               | BC-76          | Kingsmill Aurora Phase II                      | Pond                               | Planned        | 1,213         | TBD                   | TBD                   | \$990,000    |                 | B            |
| 2017               | BC-77          | Merritt Ridge 2B D2                            | Swale                              | Planned        | 2             | TBD                   | TBD                   | \$45,000     |                 | B            |
| 2017               | BC-78          | Merritt Ridge 2E D2                            | Pond                               | Planned        |               | TBD                   | TBD                   | \$720,000    |                 | B            |

**Total TN Project Reduction = 34,410 lbs/yr    Total TP Project Reduction = 9463 lbs/yr**

**Total TN Reduction Required = 49,890 lbs/yr Total TP Reduction Required = 8, 513 lbs/yr**

**Table A-2. City of Cocoa projects in the North IRL**

N/A = Not applicable; O&M = Operations and maintenance; TBD = To be determined

| Year Project Added | Project Number | Project Name                                       | Project Type                                | Project Status | Acres Treated | TN Reduction (lbs/yr) | TP Reduction (lbs/yr) | Cost        | Cost Annual O&M | Project Zone |
|--------------------|----------------|----------------------------------------------------|---------------------------------------------|----------------|---------------|-----------------------|-----------------------|-------------|-----------------|--------------|
| 2013               | CC-01          | Bracco Pond B                                      | Wet Detention Pond                          | Completed      | 591.8         | 2,328                 | 1,050                 | \$250,000   |                 | B            |
| 2013               | CC-02          | Bracco Expansion Area                              | Wet Detention Pond                          | Completed      | 775.2         | 156                   | 42                    | \$570,762   |                 | B            |
| 2013               | CC-03          | Cocoa Village Park                                 | Dry Detention Pond                          | Completed      | 13.5          | 37                    | 7                     | \$330,000   |                 | B            |
| 2013               | CC-04          | Morris Pond                                        | Wet Detention Pond                          | Completed      | 16.2          | 128                   | 47                    | \$247,480   |                 | B            |
| 2013               | CC-05          | North Brevard Avenue Stormwater Treatment Facility | Continuous Deflective Separation (CDS) Unit | Completed      | 11.3          | 0                     | 5                     |             |                 | B            |
| 2013               | CC-06          | North Fiske Stormwater Retention Facility          | 100 % Onsite Retention                      | Completed      | 33.9          | 42                    | 2                     | \$330,000   |                 | B            |
| 2013               | CC-07          | Suntree Baffle Box #1                              | Baffle Box – 2nd generation                 | Completed      | 5.9           | 7                     | 1                     | \$80,000    |                 | B            |
| 2013               | CC-08          | Street Sweeping                                    | Street Sweeping                             | Completed      | N/A           | 4,027                 | 2,582                 | \$80,000    |                 | B            |
| 2013               | CC-09          | Bracco Supplemental Water Supply                   | Reclaimed Water                             | Completed      |               | 1,102                 | 108                   | 1,200,000   |                 | B            |
| 2013               | CC-10          | Diamond Square Stormwater Improvements             | Wet Detention Pond                          | Completed      | 95.4          | 108                   | 0                     | \$210,000   |                 | B            |
| 2014               | CC-11          | Education Efforts                                  | Education Efforts                           | Completed      | N/A           | 128                   | 26                    |             |                 | B            |
| 2016               | CC-12          | Peachtree Street Reconstruction                    | Other Structural BMP                        | Completed      |               | TBD                   | TBD                   | \$1,700,000 |                 | B            |
| 2016               | CC-13          | Cocoa Riverfront Park                              | Other Structural BMP                        | Completed      |               | TBD                   | TBD                   | \$162,000   |                 | B            |
| 2016               | CC-14          | Control Gate                                       | Control Structure                           | Completed      | TBD           | TBD                   | TBD                   |             |                 | B            |
| 2016               | CC-15          | Florida Avenue Improvements                        | BMP Treatment Train                         | Underway       | 6.9           | TBD                   | TBD                   | \$2,400,000 |                 | B            |
| 2016               | CC-16          | AT&T Detention Pond Retrofit                       | BMP Treatment Train                         | Underway       | 12.3          | TBD                   | TBD                   | \$207,641   |                 | B            |
| 2016               | CC-17          | Church Street Baffle Box                           | Baffle Box                                  | Planned        |               | TBD                   | TBD                   | \$173,620   | \$3,000         | B            |

| Year Project Added | Project Number | Project Name                                                  | Project Type        | Project Status | Acres Treated | TN Reduction (lbs/yr) | TP Reduction (lbs/yr) | Cost      | Cost Annual O&M | Project Zone |
|--------------------|----------------|---------------------------------------------------------------|---------------------|----------------|---------------|-----------------------|-----------------------|-----------|-----------------|--------------|
| 2016               | CC-18          | John Garren Street Realignment and Parking                    | BMP Treatment Train | Planned        |               | TBD                   | TBD                   | \$500,000 | \$2,000         | B            |
| 2016               | CC-19          | Brevard Ave. Bioretention and Tree Preservation               | BMP Treatment Train | Planned        |               | TBD                   | TBD                   | \$500,000 | \$2,000         | B            |
| 2017               | CC-20          | U.S. Highway 1 and Forrest Ave. Stormwater Treatment Facility | Dry Detention Pond  | Planned        | 10            | TBD                   | TBD                   |           |                 | A            |

**Total TN Project Reduction = 8,063 lbs/yr Total TP Project Reduction = 3,868 lbs/yr**

**Total TN Reduction Required =16,067 lbs/yr Total TP Reduction Required = 3,713 lbs/yr**

**Table A-3. City of Edgewater projects in the North IRL**

N/A = Not applicable

| Year Project Added | Project Number | Project Name      | Project Type      | Project Status | Acres Treated | TN Reduction (lbs/yr) | TP Reduction (lbs/yr) | Cost | Cost Annual O&M | Project Zone |
|--------------------|----------------|-------------------|-------------------|----------------|---------------|-----------------------|-----------------------|------|-----------------|--------------|
| 2013               | EW-1           | Education Efforts | Education Efforts | Completed      | N/A           | 84                    | 11                    |      | \$15,000        | A            |

**Total TN Project Reduction = 84 lbs/yr Total TP Project Reduction = 11 lbs/yr**

**Total TN Reduction Required = 160 lbs/yr Total TP Reduction Required = N/A**

**Table A-4. City of Melbourne projects in the North IRL**

N/A = Not applicable; O&M = Operations and maintenance; TBD = To be determined

| Year<br>Project<br>Added | Project<br>Number | Project Name                                                            | Project Type                                        | Project Status | Acres<br>Treated | TN<br>Reduction<br>(lbs/yr) | TP<br>Reduction<br>(lbs/yr) | Cost        | Cost<br>Annual<br>O&M | Project<br>Zone |
|--------------------------|-------------------|-------------------------------------------------------------------------|-----------------------------------------------------|----------------|------------------|-----------------------------|-----------------------------|-------------|-----------------------|-----------------|
| 2013                     | MEL-01            | Fee and Apollo<br>Drainage<br>Improvements                              | Wet Detention Pond                                  | Completed      | 43.6             | 28                          | 79                          | \$525,161   |                       | B               |
| 2013                     | MEL-02            | Dove Street Pond                                                        | Wet Detention Pond                                  | Completed      | 14.9             | 69                          | 31                          | \$156,164   |                       | B               |
| 2013                     | MEL-03            | Charles Drive Pipe<br>Replacement                                       | Wet Detention Pond                                  | Completed      | 143.3            | 183                         | 162                         | \$462,644   |                       | B               |
| 2013                     | MEL-04            | Wickham Park Pond                                                       | Wet Detention Pond                                  | Completed      | 1,796.9          | 627                         | 248                         | \$250,000   |                       | B               |
| 2013                     | MEL-05            | Babcock Street<br>Realignment                                           | Retention BMP                                       | Completed      | 42.3             | 163                         | 42                          | \$1,757,186 |                       | B               |
| 2013                     | MEL-06            | Garfield Street Ponds<br>– Lot 12 (North)                               | Dry Detention Pond                                  | Cancelled      | 0                | 0                           | 0                           |             |                       | B               |
| 2013                     | MEL-07            | Garfield Street Ponds<br>– Lot 24 (South)                               | Dry Detention Pond                                  | Cancelled      | 0                | 0                           | 0                           |             |                       | B               |
| 2013                     | MEL-08            | Education Efforts                                                       | Education Efforts                                   | Completed      | N/A              | 2,583                       | 587                         |             |                       | B               |
| 2013                     | MEL-09            | Street Sweeping                                                         | Street Sweeping                                     | Completed      | N/A              | 793                         | 508                         |             |                       | B               |
| 2013                     | MEL-10            | Autumn Woods                                                            | Wet Detention Pond                                  | Underway       | 56.9             | TBD                         | TBD                         | \$879,220   |                       | B               |
| 2013                     | MEL-11            | Participation in<br>Florida Yards and<br>Neighborhoods<br>(FYN) Program | Education Efforts                                   | Completed      | N/A              | 2,583                       | 587                         |             |                       | B               |
| 2015                     | MEL-12            | South Croton Baffle<br>Box                                              | BMP Treatment<br>Train                              | Completed      | 14.8             | 133                         | 32                          | \$487,296   |                       | B               |
| 2015                     | MEL-13            | Bell Street Baffle Box                                                  | Baffle Box –<br>2nd generation with<br>media filter | Underway       | 127.2            | 1,877                       | 467                         | \$300,000   |                       | B               |
| 2015                     | MEL-14            | Paradise Baffle Box                                                     | Baffle Box –<br>2nd generation with<br>media filter | Completed      | 125.6            | 126                         | 17                          | \$19,000    |                       | B               |
| 2015                     | MEL-15            | Garfield North<br>Baffle Box                                            | Baffle Box –<br>2nd generation with<br>media filter | Underway       | 67               | 993                         | 244                         | \$350,000   |                       | B               |
| 2015                     | MEL-16            | Garfield South<br>Baffle Box                                            | Baffle Box –                                        | Underway       | 11.8             | 176                         | 43                          | \$150,000   |                       | B               |

| Year Project Added | Project Number | Project Name                               | Project Type                                  | Project Status | Acres Treated | TN Reduction (lbs/yr) | TP Reduction (lbs/yr) | Cost        | Cost Annual O&M | Project Zone |
|--------------------|----------------|--------------------------------------------|-----------------------------------------------|----------------|---------------|-----------------------|-----------------------|-------------|-----------------|--------------|
|                    |                |                                            | 2nd generation with media filter              |                |               |                       |                       |             |                 |              |
| 2016               | MEL-17         | Sherwood Stormwater Quality Project        | Wet Detention Pond                            | Planned        | 246.2         | TBD                   | TBD                   | \$2,168,800 |                 | B            |
| 2016               | MEL-18         | Croton Road (Lime) Baffle Box              | Baffle Box – 2nd generation with media filter | Completed      | 13.4          | 149                   | 35                    |             |                 | B            |
| 2016               | MEL-19         | Young Street Existing Baffle Box Upgrade   | Baffle Box – 2nd generation with media filter | Completed      | 7             | 39                    | 5                     | \$20,000    |                 | B            |
| 2017               | MEL-20         | Thrush Drive Baffle Box                    | Baffle Box – 2nd generation with media filter | Planned        |               | TBD                   | TBD                   | \$450,000   |                 | B            |
| 2017               | MEL-21         | Cliff Creek Box                            | Baffle Box – 2nd generation with media filter | Planned        |               | TBD                   | TBD                   | \$450,000   |                 | B            |
| 2017               | MEL-22         | Riverside Drive Septic to Sewer Conversion | Wastewater Service Area Expansion             | Planned        |               | TBD                   | TBD                   | \$215,000   |                 | B            |
| 2017               | MEL-23         | Leewood Forest Wetland and Baffle Box      | Wetland Treatment                             | Planned        |               | TBD                   | TBD                   | \$2,590,000 |                 | B            |

**Total TN Project Reduction = 7,476 lbs/yr    Total TP Project Reduction = 2,333 lbs/yr**

**Total TN Reduction Required = 44,920 lbs/yr    Total TP Reduction Required = 13,120 lbs/yr**



**Table A-5. City of Rockledge projects in the North IRL**

O&M = Operations and maintenance; TBD = To be determined

| Year<br>Project<br>Added | Project<br>Number | Project Name                                                | Project Type                   | Project Status | Acres<br>Treated | TN<br>Reduction<br>(lbs/yr) | TP<br>Reduction<br>(lbs/yr) | Cost        | Cost<br>Annual<br>O&M | Project<br>Zone |
|--------------------------|-------------------|-------------------------------------------------------------|--------------------------------|----------------|------------------|-----------------------------|-----------------------------|-------------|-----------------------|-----------------|
| 2013                     | ROCK-01           | Orange Avenue<br>Baffle Box                                 | Baffle Box –<br>2nd generation | Completed      | 10.4             | 16                          | 2                           | \$8,600     | \$2,555               | B               |
| 2013                     | ROCK-02           | Barton Avenue<br>Baffle Box                                 | Baffle Box –<br>2nd generation | Completed      | 27.1             | 35                          | 5                           | \$9,350     | \$2,555               | B               |
| 2013                     | ROCK-03           | Hardee Circle<br>Baffle Box                                 | Baffle Box –<br>2nd generation | Completed      | 14.6             | 16                          | 2                           | \$43,420    | \$2,555               | B               |
| 2013                     | ROCK-04           | Rockledge Avenue<br>Baffle Box                              | Baffle Box –<br>2nd generation | Completed      | 41               | 73                          | 14                          |             | \$3,682               | B               |
| 2013                     | ROCK-05           | Bougainvillea Drive<br>Baffle Box                           | Baffle Box –<br>2nd generation | Completed      | 35.7             | 104                         | 18                          | \$29,495    | \$2,566               | B               |
| 2013                     | ROCK-06           | Park Avenue<br>Baffle Box                                   | Baffle Box –<br>2nd generation | Completed      | 13.2             | 9                           | 1                           | \$52,529    | \$2,555               | B               |
| 2013                     | ROCK-07           | Little John Lane<br>Baffle Box                              | Baffle Box –<br>2nd generation | Completed      | 11.9             | 16                          | 2                           | \$60,000    | \$2,555               | B               |
| 2013                     | ROCK-08           | Fernwood Drive<br>Baffle Box                                | Baffle Box –<br>2nd generation | Completed      | 12.9             | 14                          | 2                           | \$55,750    |                       | B               |
| 2013                     | ROCK-09           | Valencia Drive<br>Baffle Box                                | Baffle Box –<br>2nd generation | Completed      | 22.9             | 38                          | 6                           | \$58,960    | \$2,555               | B               |
| 2013                     | ROCK-10           | Knollwood<br>Baffle Box                                     | Baffle Box –<br>2nd generation | Completed      | 24.3             | 26                          | 3                           | \$68,248    | \$3,682               | B               |
| 2013                     | ROCK-11           | Sutton Street<br>Baffle Box                                 | Baffle Box –<br>2nd generation | Completed      | 8                | 9                           | 1                           |             |                       | B               |
| 2013                     | ROCK-12           | River Groves<br>Baffle Box                                  | Baffle Box –<br>2nd generation | Completed      | 7.4              | 5                           | 0                           |             |                       | B               |
| 2013                     | ROCK-13           | Summer Place<br>Baffle Box                                  | Baffle Box –<br>2nd generation | Completed      | 9.8              | 7                           | 1                           |             |                       | B               |
| 2013                     | ROCK-14           | Sweet Street Swale                                          | Swales                         | Completed      | 8                | 38                          | 5                           |             |                       | B               |
| 2013                     | ROCK-15           | Community Park of<br>Rockledge Regional<br>Facility Phase 1 | Wet Detention<br>Pond          | Completed      | 25.6             | 5                           | 1                           | \$50,000    | \$23,974              | B               |
| 2013                     | ROCK-16           | Pineland Park<br>Unit Three                                 | Wet Detention<br>Pond          | Completed      | 54.3             | 1                           | 0                           | \$100,000   | \$6,234               | B               |
| 2013                     | ROCK-17           | Barton Park Regional<br>Detention System                    | Wet Detention<br>Pond          | Completed      | 757              | 2,823                       | 1,249                       | \$2,600,000 | \$40,000              | B               |

| Year Project Added | Project Number | Project Name                       | Project Type                      | Project Status | Acres Treated | TN Reduction (lbs/yr) | TP Reduction (lbs/yr) | Cost        | Cost Annual O&M | Project Zone |
|--------------------|----------------|------------------------------------|-----------------------------------|----------------|---------------|-----------------------|-----------------------|-------------|-----------------|--------------|
| 2013               | ROCK-18        | Florida Avenue Stormwater Facility | Wet Detention Pond                | Completed      | 25.2          | 76                    | 50                    | \$435,000   | \$40,950        | B            |
| 2013               | ROCK-19        | Police Department Pond             | Wet Detention Pond                | Completed      | 39.1          | 16                    | 5                     | \$350,000   | \$7,035         | B            |
| 2013               | ROCK-20        | Huntington Lakes I                 | Wet Detention Pond                | Completed      | 36.9          | 1                     | 0                     | \$950,000   |                 | B            |
| 2013               | ROCK-21        | Street Sweeping                    | Street Sweeping                   | Completed      |               | 498                   | 319                   |             | \$54,000        | B            |
| 2013               | ROCK-22        | Treatment Missing from Model       | Monitoring/ Data Collection       | Completed      | 383.2         | 1,248                 | 477                   |             |                 | B            |
| 2013               | ROCK-23        | Education Efforts                  | Education Efforts                 | Completed      |               | 1,541                 | 347                   | \$2,385     | \$0             | B            |
| 2015               | ROCK-24        | Huntington Lakes II                | Wet Detention Pond                | Completed      | 133.5         | TBD                   | TBD                   | \$900,000   | \$15,000        | B            |
| 2016               | ROCK-25        | Aquatic Harvesting                 | Aquatic Vegetation Harvesting     | Completed      |               | TBD                   | TBD                   |             |                 | B            |
| 2016               | ROCK-26        | Breeze Swept Septic Phase-out      | Wastewater Service Area Expansion | Underway       |               | TBD                   | TBD                   | \$3,700,000 | \$20,000        | B            |
| 2016               | ROCK-27        | River Ridge Nondischarge           | 100 % Onsite Retention            | Completed      | 35.3          | 190                   | 39                    |             |                 | B            |
| 2016               | ROCK-28        | Southwest Gus Hipp Conveyance      | BMP Treatment Train               | Completed      |               | TBD                   | TBD                   | \$17,000    |                 | B            |
| 2016               | ROCK-29        | Gus Hipp Pond                      | Wet Detention Pond                | Planned        |               | TBD                   | TBD                   | \$335,000   |                 | B            |
| 2016               | ROCK-30        | Public Works Pond 1                | Dry Detention Pond                | Planned        | 5.7           | 4                     | 1                     | \$5,000     |                 | B            |
| 2016               | ROCK-31        | Public Works Pond 2                | Dry Detention Pond                | Planned        | 7             | 13                    | 3                     | \$10,000    |                 | B            |
| 2016               | ROCK-32        | School Triangle Pond               | Dry Detention Pond                | Planned        | 1.2           | 2                     | 0                     | \$20,300    |                 | B            |
| 2016               | ROCK-33        | Barton Park Irrigation             | Stormwater Reuse                  | Planned        |               | TBD                   | TBD                   |             |                 | B            |
| 2016               | ROCK-34        | Winchester Cove Nondischarge       | 100 % Onsite Retention            | Completed      | 1.9           | 13                    | 2                     |             |                 | B            |

**Total TN Project Reduction = 6,818 lbs/yr    Total TP Project Reduction = 2,548 lbs/yr**

**Total TN Reduction Required = 13,967 lbs/yr    Total TP Reduction Required = 3,960 lbs/yr**

**Table A-6. City of Titusville projects in the North IRL**

N/A = Not applicable; O&M = Operations and maintenance; TBD = To be determined

| Year Project Added | Project Number | Project Name                                                  | Project Type                                  | Project Status | Acres Treated | TN Reduction (lbs/yr) | TP Reduction (lbs/yr) | Cost        | Cost Annual O&M | Project Zone |
|--------------------|----------------|---------------------------------------------------------------|-----------------------------------------------|----------------|---------------|-----------------------|-----------------------|-------------|-----------------|--------------|
| 2013               | TV-01          | Area 1 Stormwater Improvements                                | Wet Detention Pond                            | Completed      | 432.2         | 1,019                 | 412                   | \$2,151,510 | \$4,797         | A            |
| 2013               | TV-02          | Chain of Lakes Regional Stormwater Pond                       | Regional Stormwater Treatment                 | Completed      | 339.8         | 360                   | 160                   |             | \$15,620        | A            |
| 2013               | TV-03          | Draa Field Stormwater Park                                    | Wet Detention Pond                            | Completed      | 105.1         | 771                   | 312                   | \$1,661,443 | \$15,000        | A            |
| 2013               | TV-04          | St. Johns Basin Stormwater Improvements                       | Wet Detention Pond                            | Completed      | 882.1         | 317                   | 1,156                 | \$1,854,254 | \$8,000         | A            |
| 2013               | TV-05          | St. Johns Basin Stormwater Improvements                       | Baffle Box – 2nd generation                   | Completed      | 882.1         | 1,510                 | 216                   | \$167,343   |                 | A            |
| 2013               | TV-06          | Spaceview Park                                                | Alum Treatment                                | Completed      | 110.6         | 1,153                 | 378                   | \$2,300,000 | \$15,000        | A            |
| 2013               | TV-07          | Education Efforts                                             | Education Efforts                             | Completed      | N/A           | 1,522                 | 292                   | \$2,500     | \$5,000         | A            |
| 2013               | TV-08          | Street Sweeping                                               | Street Sweeping                               | Completed      | N/A           | 1,012                 | 649                   | \$188,120   | \$63,106        | A            |
| 2013               | TV-09          | Education Efforts                                             | Education Efforts                             | Completed      | N/A           | 56                    | 6                     | \$2,500     | \$5,000         | B            |
| 2013               | TV-10          | Street Sweeping                                               | Street Sweeping                               | Completed      | N/A           | 104                   | 67                    | \$188,120   | \$63,106        | B            |
| 2016               | TV-11          | Senior Center Pond Floating Islands                           | Floating Islands/ MAPS                        | Completed      | 624           | 719                   | 87                    | \$52,536    | \$43,720        | A            |
| 2016               | TV-12          | Senior Center Ponds Littoral Zone Plantings                   | BMP Treatment Train                           | Completed      | 413.6         | 189                   | 90                    | \$50,000    |                 | A            |
| 2016               | TV-13          | Royal Oak Littoral Zone Plantings                             | BMP Treatment Train                           | Completed      | 123.1         | 79                    | 19                    | \$50,000    |                 | A            |
| 2016               | TV-14          | Main Street Baffle Box with Biosorption Activated Media (BAM) | Baffle Box – 2nd generation with media filter | Planned        | 296           | TBD                   | TBD                   | \$300,000   | \$4,000         | A            |
| 2016               | TV-15          | Sycamore Street Baffle Box with BAM                           | Baffle Box – 2nd generation                   | Planned        | 300.1         | TBD                   | TBD                   | \$300,000   | \$4,000         | A            |

| Year Project Added | Project Number | Project Name                               | Project Type                                  | Project Status | Acres Treated | TN Reduction (lbs/yr) | TP Reduction (lbs/yr) | Cost      | Cost Annual O&M | Project Zone |
|--------------------|----------------|--------------------------------------------|-----------------------------------------------|----------------|---------------|-----------------------|-----------------------|-----------|-----------------|--------------|
|                    |                |                                            | with media filter                             |                |               |                       |                       |           |                 |              |
| 2016               | TV-16          | Knox Mc Rae Baffle Box                     | Baffle Box – 2nd generation with media filter | Planned        | 37.9          | TBD                   | TBD                   | \$250,000 | \$4,000         | A            |
| 2016               | TV-17          | Coleman Basin TMDL Improvements            | BMP Treatment Train                           | Planned        | 107           | TBD                   | TBD                   |           |                 | A            |
| 2016               | TV-18          | South Street Basin TMDL Improvements       | BMP Treatment Train                           | Planned        | 235           | TBD                   | TBD                   | \$380,000 |                 | A            |
| 2016               | TV-19          | St. Theresa Basin TMDL Improvements        | BMP Treatment Train                           | Planned        | 314           | TBD                   | TBD                   | \$250,000 |                 | A            |
| 2016               | TV-20          | La Paloma Basin TMDL Improvements          | BMP Treatment Train                           | Planned        | 488           | TBD                   | TBD                   | \$250,000 |                 | A            |
| 2016               | TV-21          | THS Basin TMDL Improvements                | BMP Treatment Train                           | Planned        | 239.7         | TBD                   | TBD                   |           |                 | A            |
| 2016               | TV-22          | Brevard Street Basin TMDL Improvements     | BMP Treatment Train                           | Planned        | 17.7          | TBD                   | TBD                   |           |                 | A            |
| 2016               | TV-23          | St. Johns 2nd Baffle Box TMDL Improvements | BMP Treatment Train                           | Planned        | 882.1         | TBD                   | TBD                   |           |                 | A            |
| 2016               | TV-24          | Marina Basin TMDL Improvements             | BMP Treatment Train                           | Planned        | 271.2         | TBD                   | TBD                   |           |                 | A            |
| 2016               | TV-25          | Grace Basin TMDL Improvements              | BMP Treatment Train                           | Planned        | 17.7          | TBD                   | TBD                   |           |                 | A            |
| 2016               | TV-26          | Miracle City Basin TMDL Improvements       | BMP Treatment Train                           | Underway       | 2.5           | TBD                   | TBD                   |           | \$500           | A            |
| 2016               | TV-27          | South Marina Basin TMDL Improvements       | BMP Treatment Train                           | Planned        | 322.9         | TBD                   | TBD                   |           |                 | A            |
| 2016               | TV-28          | SR 50 Basin TMDL Improvements              | BMP Treatment Train                           | Planned        | 131.1         | TBD                   | TBD                   |           |                 | A            |
| 2016               | TV-29          | Commons Basin TMDL Improvements            | BMP Treatment Train                           | Planned        | 4.4           | TBD                   | TBD                   |           |                 | A            |
| 2016               | TV-30          | Broad Street Basin TMDL Improvements       | BMP Treatment Train                           | Planned        | 13.4          | TBD                   | TBD                   |           |                 | A            |

| Year Project Added | Project Number | Project Name                             | Project Type        | Project Status | Acres Treated | TN Reduction (lbs/yr) | TP Reduction (lbs/yr) | Cost | Cost Annual O&M | Project Zone |
|--------------------|----------------|------------------------------------------|---------------------|----------------|---------------|-----------------------|-----------------------|------|-----------------|--------------|
| 2016               | TV-31          | Riverview Street Basin TMDL Improvements | BMP Treatment Train | Planned        | 7.3           | TBD                   | TBD                   |      |                 | A            |
| 2016               | TV-32          | THS 2 Basin TMDL Improvements            | BMP Treatment Train | Planned        | 26.5          | TBD                   | TBD                   |      |                 | A            |

**Total TN Project Reduction = 8,543 lbs/yr    Total TP Project Reduction = 3,734 lbs/yr**

**Total TN Reduction Required = 44,346 lbs/yr    Total TP Reduction Required = 9,653 lbs/yr**

**Table A-7. FDOT District 5 projects in the North IRL**

N/A = Not Applicable; O&M = Operations and maintenance

| Year<br>Project<br>Added | Project<br>Number | Project Name                   | Project Type              | Project<br>Status | Acres<br>Treated | TN<br>Reduction<br>(lbs/yr) | TP<br>Reduction<br>(lbs/yr) | Cost | Cost<br>Annual<br>O&M | Project<br>Zone |
|--------------------------|-------------------|--------------------------------|---------------------------|-------------------|------------------|-----------------------------|-----------------------------|------|-----------------------|-----------------|
| 2013                     | FDOT-01           | Education Efforts              | Education Efforts         | Completed         | N/A              | 39                          | 11                          |      |                       | A               |
| 2013                     | FDOT-02           | Street Sweeping                | Street Sweeping           | Completed         | N/A              | 185                         | 119                         |      |                       | A               |
| 2013                     | FDOT-03           | Fertilizer Cessation           | Fertilizer Cessation      | Completed         |                  | 595                         | 0                           |      |                       | A               |
| 2013                     | FDOT-04           | 70100-3517-01<br>French Drains | 100 % Onsite<br>Retention | Completed         | 21.3             | 57                          | 34                          |      |                       | B               |
| 2013                     | FDOT-05           | 70100-3544-01<br>French Drains | 100 % Onsite<br>Retention | Completed         | 7                | 26                          | 14                          |      |                       | B               |
| 2013                     | FDOT-06           | 70020-3501-01<br>Pond 1        | Wet Detention Pond        | Completed         | 17.1             | 38                          | 22                          |      |                       | B               |
| 2013                     | FDOT-07           | 70020-3501-02A<br>Pond 2A      | Wet Detention Pond        | Completed         | 12.6             | 35                          | 19                          |      |                       | B               |
| 2013                     | FDOT-08           | 70020-3501-02B<br>Pond 2B      | Wet Detention Pond        | Completed         | 4.8              | 10                          | 5                           |      |                       | B               |
| 2013                     | FDOT-09           | 70020-3501-03<br>Pond 3        | Wet Detention Pond        | Completed         | 8.4              | 18                          | 10                          |      |                       | B               |
| 2013                     | FDOT-10           | 70020-3501-04<br>Pond 4        | Dry Detention Pond        | Completed         | 7.9              | 17                          | 9                           |      |                       | B               |
| 2013                     | FDOT-11           | 70020-3549-01<br>Pond 1        | Wet Detention Pond        | Completed         | 9.9              | 28                          | 14                          |      |                       | B               |
| 2013                     | FDOT-12           | 70020-3549-02<br>Pond 2        | Wet Detention Pond        | Completed         | 18.9             | 34                          | 18                          |      |                       | B               |
| 2013                     | FDOT-13           | 70020-3549-03<br>Pond 3        | Wet Detention Pond        | Completed         | 11.2             | 32                          | 17                          |      |                       | B               |
| 2013                     | FDOT-14           | 70020-3549-04<br>Pond 4        | Wet Detention Pond        | Completed         | 3.4              | 14                          | 7                           |      |                       | B               |
| 2013                     | FDOT-15           | 70020-3549-05<br>Pond 5        | Wet Detention Pond        | Completed         | 3.4              | 11                          | 6                           |      |                       | B               |
| 2013                     | FDOT-16           | 70140-3514-01<br>Pond A        | Dry Detention Pond        | Completed         | 1.5              | 4                           | 2                           |      |                       | B               |
| 2013                     | FDOT-17           | 70140-3514-02<br>Pond B        | Wet Detention Pond        | Completed         | 5.9              | 18                          | 8                           |      |                       | B               |
| 2013                     | FDOT-18           | 70120-3518-01<br>Pond 7        | Wet Detention Pond        | Completed         | 9.9              | 45                          | 21                          |      |                       | B               |

| Year Project Added | Project Number | Project Name         | Project Type         | Project Status | Acres Treated | TN Reduction (lbs/yr) | TP Reduction (lbs/yr) | Cost | Cost Annual O&M | Project Zone |
|--------------------|----------------|----------------------|----------------------|----------------|---------------|-----------------------|-----------------------|------|-----------------|--------------|
| 2013               | FDOT-19        | 70008-3505-01 Pond 1 | Wet Detention Pond   | Completed      | 2.3           | 6                     | 3                     |      |                 | B            |
| 2013               | FDOT-20        | Education Efforts    | Education Efforts    | Completed      | N/A           | 86                    | 28                    |      |                 | B            |
| 2013               | FDOT-21        | Street Sweeping      | Street Sweeping      | Completed      | N/A           | 616                   | 395                   |      |                 | B            |
| 2013               | FDOT-22        | Fertilizer Cessation | Fertilizer Cessation | Completed      |               | 1,552                 | 0                     |      |                 | B            |

**Total TN Project Reduction = 3,466 lbs/yr Total TP Project Reduction = 762 lbs/yr**

**Total TN Reduction Required = 6974 lbs/yr Total TP Reduction Required = 3,074s/yr**

**Table A-8. KSC projects in the North IRL**

O&M = Operations and maintenance

| Year Project Added | Project Number | Project Name                                  | Project Type            | Project Status | Acres Treated | TN Reduction (lbs/yr) | TP Reduction (lbs/yr) | Cost | Cost Annual O&M | Project Zone |
|--------------------|----------------|-----------------------------------------------|-------------------------|----------------|---------------|-----------------------|-----------------------|------|-----------------|--------------|
| 2013               | KSC-01         | Landscape Fertilizer Reduction                | Fertilizer Reduction    | Completed      |               | 312                   | 44                    |      |                 | A            |
| 2013               | KSC-02         | Citrus Grove Termination Roberts Road         | Fertilizer Reduction    | Completed      |               | 140                   | 557                   |      |                 | A            |
| 2013               | KSC-03         | Citrus Grove Termination Schwartz Road        | Fertilizer Reduction    | Completed      |               | 256                   | 308                   |      |                 | A            |
| 2013               | KSC-04         | Storage Building L5-0734                      | Land Use Change         | Completed      | 0.02          | 0                     | 0                     |      |                 | A            |
| 2013               | KSC-05         | Support Building L5-0683                      | Land Use Change         | Completed      | 0.2           | 3                     | 1                     |      |                 | A            |
| 2013               | KSC-06         | Shuttle Landing Facility – missing from model | Wet Detention Pond      | Completed      | 617.8         | 2,566                 | 1,005                 |      |                 | A            |
| 2013               | KSC-07         | Launch Pad 39A                                | Other Nonstructural BMP | Completed      | 456.5         | 1,255                 | 326                   |      |                 | A            |
| 2013               | KSC-08         | Launch Pad 39B                                | Other Nonstructural BMP | Completed      | 549           | 3,043                 | 589                   |      |                 | A            |



| Year Project Added | Project Number | Project Name                                       | Project Type         | Project Status | Acres Treated | TN Reduction (lbs/yr) | TP Reduction (lbs/yr) | Cost | Cost Annual O&M | Project Zone |
|--------------------|----------------|----------------------------------------------------|----------------------|----------------|---------------|-----------------------|-----------------------|------|-----------------|--------------|
| 2013               | KSC-09         | Schwartz Road Drainage System - missing from model | Impoundment          | Completed      | 1,614.1       | 1,290                 | 271                   |      |                 | A            |
| 2013               | KSC-10         | Warehouse/Processing Area – missing from model     | Wet Detention Pond   | Completed      | 15.2          | 75                    | 33                    |      |                 | A            |
| 2013               | KSC-11         | Landscape Fertilizer Reduction                     | Fertilizer Reduction | Completed      |               | 312                   | 44                    |      |                 | B            |
| 2013               | KSC-12         | Citrus Grove Termination Jerome Road West          | Fertilizer Reduction | Completed      |               | 184                   | 851                   |      |                 | B            |
| 2013               | KSC-13         | KARS II Racquetball Court M6-0328A                 | Land Use Change      | Completed      | 0.1           | 1                     | 0                     |      |                 | B            |
| 2013               | KSC-14         | Visitor Center Storage Building M6-0503            | Land Use Change      | Completed      | 0.1           | 1                     | 0                     |      |                 | B            |
| 2013               | KSC-15         | Causeway Wetland Mitigation                        | Wet Detention Pond   | Completed      | 12.6          | 8                     | 4                     |      |                 | B            |
| 2013               | KSC-16         | Visitors Complex/ NASA Badging Center              | Wet Detention Pond   | Completed      | 131.7         | 452                   | 169                   |      |                 | B            |
| 2013               | KSC-17         | NASA Parkway West                                  | Swales               | Completed      | 135.8         | 239                   | 101                   |      |                 | B            |
| 2014               | KSC-18         | Demolition of Facility J6-2377                     | Land Use Change      | Completed      | 0.1           | 1                     | 0                     |      |                 | A            |
| 2015               | KSC-19         | Demolition of Facility M5-1546                     | Land Use Change      | Completed      | 5.00          | 76                    | 16                    |      |                 | B            |

**Total TN Project Reduction = 10,214 lbs/yr    Total TP Project Reduction = 4,319 lbs/yr**

**Table A-9. Town of Indialantic projects in the North IRL**

N/A = Not Applicable; O&M = Operations and maintenance

| Year<br>Project<br>Added | Project<br>Number | Project Name                                    | Project Type      | Project<br>Status | Acres<br>Treated | TN<br>Reduction<br>(lbs/yr) | TP<br>Reduction<br>(lbs/yr) | Cost | Cost<br>Annual<br>O&M | Project<br>Zone |
|--------------------------|-------------------|-------------------------------------------------|-------------------|-------------------|------------------|-----------------------------|-----------------------------|------|-----------------------|-----------------|
| 2013                     | TI-01             | Swales North of<br>U.S. Highway 192<br>Causeway | Swales            | Completed         | 29.2             | 297                         | 52                          |      |                       | B               |
| 2013                     | TI-02             | 100 % Onsite<br>Retention                       | Retention BMP     | Completed         | 3.5              | 35                          | 6                           |      |                       | B               |
| 2013                     | TI-03             | Education Efforts                               | Education Efforts | Completed         | N/A              | 18                          | 3                           |      |                       | B               |

**Total TN Project Reduction = 350 lbs/yr    Total TP Project Reduction = 61 lbs/yr**

**Total TN Reduction Required = 947 lbs/yr    Total TP Reduction Required = 200 lbs/yr**

**Table A-10. Town of Palm Shores projects in the North IRL**

N/A = Not Applicable; O&M = Operations and maintenance

| Year<br>Project<br>Added | Project<br>Number | Project Name      | Project Type      | Project<br>Status | Acres<br>Treated | TN<br>Reduction<br>(lbs/yr) | TP<br>Reduction<br>(lbs/yr) | Cost | Cost<br>Annual<br>O&M | Project<br>Zone |
|--------------------------|-------------------|-------------------|-------------------|-------------------|------------------|-----------------------------|-----------------------------|------|-----------------------|-----------------|
| 2013                     | PS-01             | Education Efforts | Education Efforts | Completed         | N/A              | 21                          | 4                           |      |                       | B               |

**Total TN Project Reduction = 21 lbs/yr    Total TP Project Reduction = 4 lbs/yr**

**Table A-11. Volusia County projects in the North IRL**

N/A = Not Applicable; O&M = Operations and maintenance; TBD = To be determined

| N/A = Not<br>applicableYear<br>Project Added | Project<br>Number | Project Name               | Project Type      | Project<br>Status | Acres<br>Treated | TN<br>Reduction<br>(lbs/yr) | TP<br>Reduction<br>(lbs/yr) | Cost | Cost<br>Annual<br>O&M | Project<br>Zone |
|----------------------------------------------|-------------------|----------------------------|-------------------|-------------------|------------------|-----------------------------|-----------------------------|------|-----------------------|-----------------|
| 2013                                         | VC-01             | Education Efforts          | Education Efforts | Completed         | N/A              | 588                         | 67                          |      |                       | A               |
| 2017                                         | VC-02             | Roadside Ditch<br>Cleaning | BMP Cleanout      | Completed         |                  | TBD                         | TBD                         |      |                       | A               |
| 2017                                         | VC-03             | Open Channel<br>Cleaning   | BMP Cleanout      | Completed         |                  | TBD                         | TBD                         |      |                       | A               |

**Total TN Project Reduction = 588 lbs/yr    Total TP Project Reduction = 67 lbs/yr**

## **Appendix B. Water Quality Trend Analysis Methodology and Results**

Water quality trend analyses were performed on data from select tributary stations in the North IRL Basin. The most current data for Stations IRLTBC, ODIIX, and TC2 were obtained from STORET. STORET data were processed using the methods described below, and only data that met quality control objectives were used in the analysis.

Nonparametric statistical techniques were used to identify monotonic trend analyses in a statistically rigorous way with the Seasonal Mann-Kendall trend test. Data are not required to conform to a particular distribution for nonparametric analyses. Nonparametric tests are also robust against outliers and large data gaps.

### **Methods**

STORET data were processed according to the following methods (in order of operation):

#### ***Total Nitrogen (TN) Calculation***

"Total Nitrogen" data was calculated for dates where both "Nitrite + Nitrate" and "Total Kjeldahl Nitrogen" data existed, but "Total Nitrogen" data did not. "Total Nitrogen" was calculated as the summation of "Total Kjeldahl Nitrogen" and "Nitrite + Nitrate."

#### ***Sample Depth***

If "surface water," "midwater," and "bottom" samples were collected at a station for the same parameter on the same day, then only the "surface water" sample was retained for analysis.

Only surface samples, which included samples collected at depths less than 1 meter (m), were used in the analyses.

#### ***Data Qualifiers***

Data with result qualifiers of "A," "F," "G," "H," "J," "K," "L," "N," "O," "T," "V," "Y," or "?" were not used in the analysis, per Table 1, Data Qualifier Codes, in Rule 62-160.700, Florida Administrative Code (F.A.C.), Quality Assurance, and per guidance from Kevin O'Donnell in the DEP Water Assessment Standards Program.

Data with a result qualifier of "I" were only used if a corresponding minimum detection level (MDL) was listed.

Data with a result qualifier of "U" were reviewed as follows:

- If not already present, a result qualifier of "U" was assigned to any data with a result value of "\*Non-Detect."
- Data with a result value of "\*Not Reported" were deleted unless they also had a value qualifier of "U."

- Data with a result qualifier of "U" were processed in accordance with Rule 62-303.320 (12), F.A.C., Aquatic Life-Based Water Quality Criteria Assessment. Results reported by a laboratory with the "U" data qualifier code were assessed as half the reported result or half the criterion (whichever was lower).

### ***Sample Frequency***

Samples collected on the same day at the same site were averaged by station.

To be treated as temporally independent, samples must be collected at least four days apart.

A median value was calculated for samples collected within a four-day period at the same station.

Field replicate and field blank samples were not used in the analysis.

## **Results**

### ***IRLTBC Station***

Data for the IRL Turnbull Creek (IRLTBC) station were processed for the period from 2000 to 2016. Sufficient data were available for monthly distribution using the Seasonal Mann-Kendall regression analysis. TP concentration exhibited a significant increasing trend between 2000 and 2016 ( $p < 0.05$ ). The median TP concentration for this period was 0.146 milligrams per liter (mg/L).

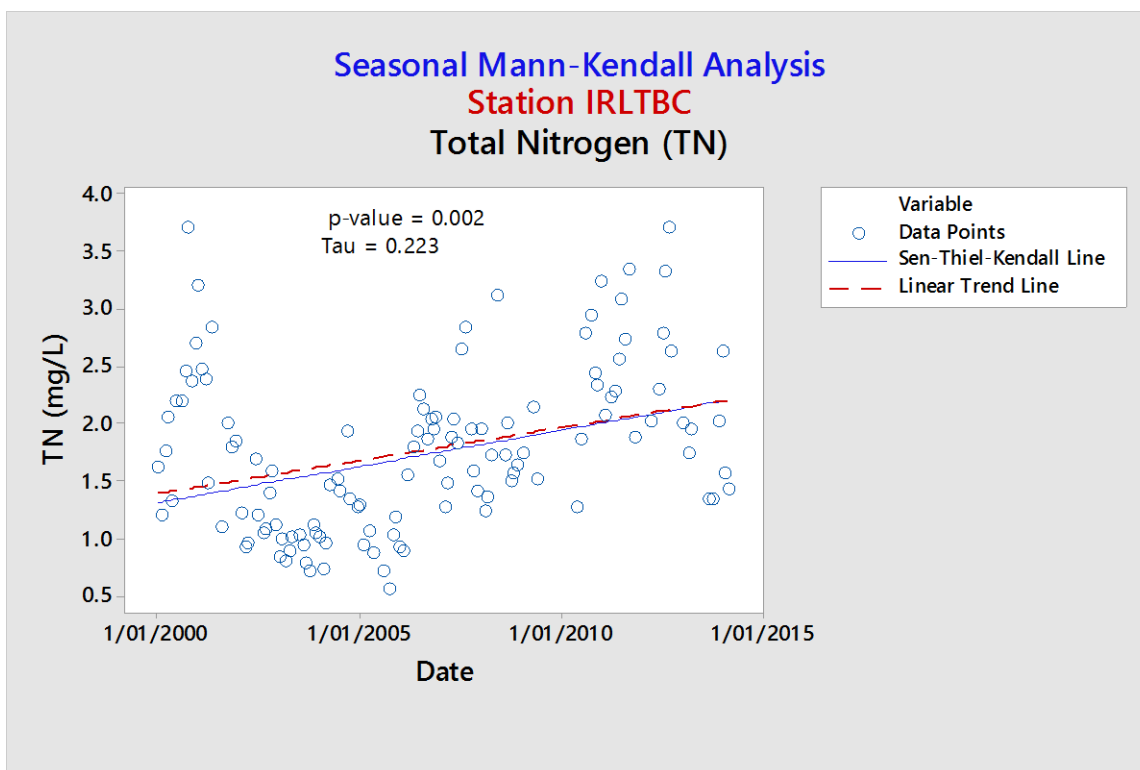
The TN concentration was calculated as the sum of total Kjeldahl nitrogen (TKN) concentration and nitrate/nitrite concentration. The TN concentration trend for IRLTBC increased significantly ( $p < 0.05$ ) from 2000 to 2016. The median TN concentration for this period was 1.709 mg/L. Numerous data were not included in the statistical analyses because the detection limit was not provided for nitrite/nitrate.

### ***ODIX Station***

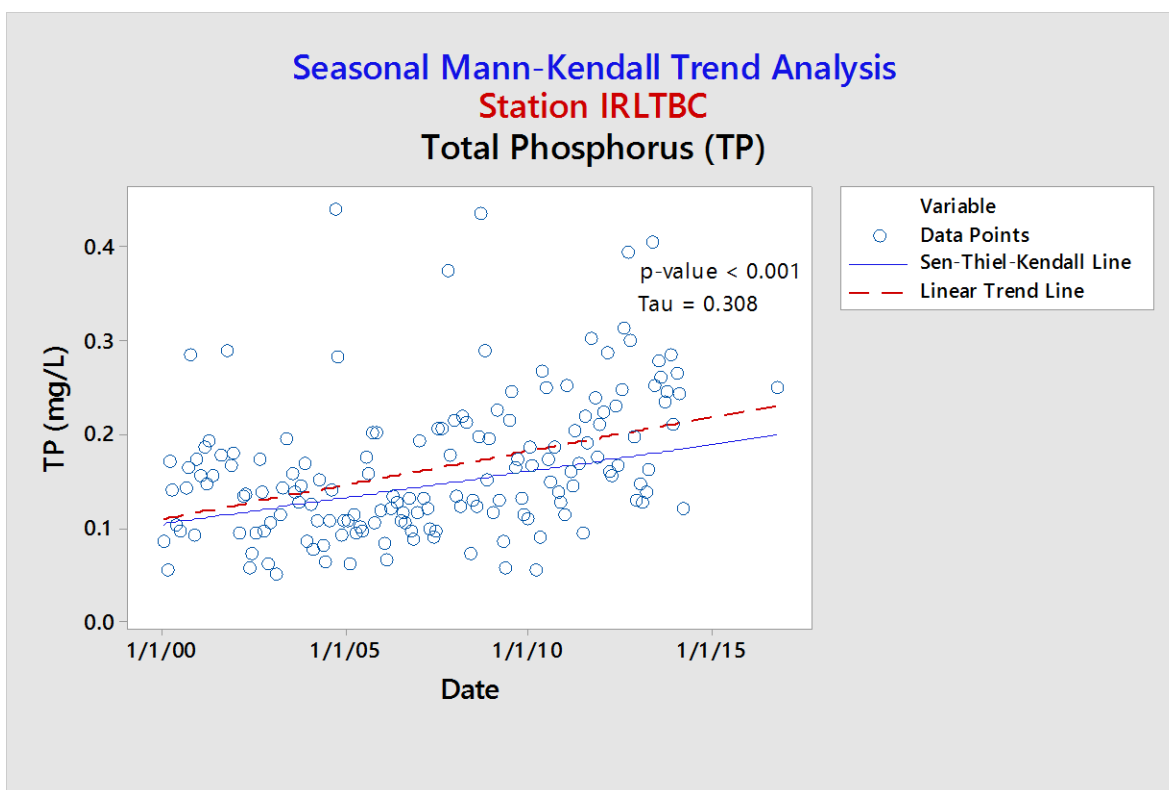
No additional data have been uploaded to STORET for this station since 2016. Although data have been collected periodically since 2011, Seasonal Mann-Kendall analysis is not possible because only 2 data points are available for the fourth quarter between 2011 and 2016. Median TN and TP concentrations were 2.04 and 0.17 mg/L, respectively.

### ***TC2 Station***

No additional data have been uploaded to STORET for this station since 2016. Data provided by Volusia County for the TC2 station (Canal at Watson Stanley Road) covered a period of less than 2 years (May 2014–January 2016) and are insufficient for the Seasonal Mann-Kendall analysis. The median TP concentration was 0.23 mg/L, and the median TN concentration was 1.50 mg/L.



**Figure B-1. Station IRLTBC TN trend analysis results**



**Figure B-2. Station IRLTBC TP trend analysis results**