ORLANDO EASTERLY WETLANDS

ANNUAL REPORT 2022

COMPLIANCE AND PERFORMANCE REVIEW

CITY OF ORLANDO
WATER RECLAMATION

MESSAGE FROM THE MAYOR

As a municipal government, the City of Orlando is committed to providing residents with first-class services and amenities and the Orlando Easterly Wetlands help us provide both at the same time.

One of the world's first large-scale, manmade wetlands designed for the advanced treatment of reclaimed water, the Orlando Easterly Wetlands also are a home for countless wildlife species and a location for recreation activities for residents. The facility is 1,650 acres in size and visitors can participate in hiking, wildlife viewing, biking, horseback riding and guided tours. More than 50,000 people visit the wetlands annually.

I am proud that the Orlando Easterly Wetlands has won numerous environmental and engineering awards over the years. As a city, we are also proud that the wetlands represent a cost-effective and sustainable solution for wastewater treatment.

I hope you find this annual water quality report informative.

Sincerely,

Buddy Dyer
Mayor

Orlando Easterly Wetlands Compliance and Performance Review for City of Orlando Easterly Wetlands Treatment System

2022 Annual Report

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Cover Photo by Tim Hart, Friends of the Orlando Wetlands

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Introduction

Purpose

The Orlando Easterly Wetlands System is considered to be a restricted public access reuse system and is designated as R001 in the Florida Department of Environmental Protection (FDEP) facility permit (No. FLA 037966). The purpose of the Orlando Easterly Wetlands is to further reduce, or polish, nitrogen and phosphorus concentrations in the reclaimed water to meet background concentrations in nearby natural marshes.

Nutrients are removed and reduced as the reclaimed water passes through the wetland system by biological and chemical processes, including plant uptake, assimilation into the plant matter and roots, adsorption into the soil, and nitrification/ denitrification. Careful operation and regulation of flows, water levels, and hydrological cycle are essential to avoid the potential release of sequestered nutrients within plant matter and soils back into the water column and flow stream.

An operating protocol was approved by FDEP and implemented for the wetland treatment system, including both outfalls (D002 and D003). The purpose of the operating protocol is to provide a basis for monitoring the discharges from the wetland treatment system and operation of the facility, including corrective, maintenance, or improvement measures for specific situations. Maintenance and improvements are made on a continual basis.

The purposes of the City of Orlando Easterly Wetlands (OEW) Annual Report include:

- Summarize the operational and monitoring data for Calendar Year 2022.
- Comply with the requirements set forth in Chapter 62-611.700(1), F.A.C. and (FDEP) Domestic Wastewater Facility Permit (No. FL 0037966) for the Iron Bridge Regional Water Reclamation Facility (WRF).
- Review historical data and performance trends related to the operation and maintenance of the OEW during Calendar Year 2022.
- Provide a compliance and performance review of the operations of the Orlando Easterly Wetlands treatment system.

Discharge Requirements

The FDEP facility permit specifies limitations on the discharges to the Little Econlockhatchee River, Orlando Easterly Wetlands, and un-named ditch flowing into the St. Johns River. A waste load allocation was performed by the U.S. Environmental Protection Agency (USEPA) for the Little Econlockhatchee River and the St. Johns River during the late 1970s as part of the 201 Facility Study to determine the nutrient loadings from the Iron Bridge Regional WRF into the Lake Harney basin. The facility permit for the Iron Bridge Regional WRF contains both influent and effluent standards for the wetland treatment system, including limitations on nutrient loadings discharged to the surface waters.

Monitoring locations were defined in the facility permit to determine the nutrient loadings that were discharged to Class III predominantly fresh surface waters through Outfall D001 into the Little Econlockhatchee River and Outfall D002 and Outfall D003 into the St. Johns River. Both effluent flows and constituent concentrations are measured at these discharge points. Compliance monitoring is conducted at these discharge points, including both Outfall D002 and Outfall D003, if that facility is in service.

Other monitoring stations were established throughout the wetland treatment system for assessing the water quality status, nutrient uptake rates, and performance of the individual cells. The monitoring information is used for the operation of the wetland treatment system, troubleshooting problems, research studies and modeling, and demonstrating the efficacy of the facility. Parameters of interest include traditional water quality indicators, such as chlorophyll a, alkalinity, total organic carbon, CBOD, and TSS, plus the various forms of total nitrogen and total phosphorus.

The annual average concentrations of total phosphorus (TP) and total nitrogen (TN) limits are based upon the requirements that were established originally on December 24, 1985, and shall not exceed 0.20 mg/l and 2.31 mg/1, respectively.

The waste load allocation was determined for the nutrient contributions (loadings) from the Iron Bridge Regional facility through all three permitted discharge points (D001, D002, and D003) into the Lake Harney basin within the St. Johns River watershed. A portion of the overall waste load allocation was designated for the wetland treatment system. Total nitrogen loadings to the un-named ditch are restricted to 385 lbs/day, and 33 lbs/day for total phosphorus.

The total mass loadings of total nitrogen and total phosphorus from the various discharge points; that is, to the Little Econlockhatchee River (D001) and wetland treatment system (D002 and D003), cannot exceed a combined loading of 780 lbs/day and 220 lbs/day, respectively, without exceeding the limitations set forth in the waste load allocation for the Iron Bridge Regional facility.

A separate limitation was delineated for the discharge from Outfall D001 to the Little Econlockhatchee River. The maximum total nitrogen mass loading Outfall D001 is limited to 720 lbs/day of total nitrogen (TN) and 220 lbs/day for total phosphorus (TP). For the

wetland treatment system (OEW), an additional 60 lbs/day is allocated only for total nitrogen (TN).

Separate nutrient loadings were defined for the wetland treatment system. These limitations include 385 lbs/day for total nitrogen and 33 lbs/day for total phosphorus for discharges from Outfall D002 and Outfall D003.

The applicable site-specific alternative criterion for dissolved oxygen (DO) concentrations in the discharge from the wetland is based upon the natural background conditions and shall be a minimum of 5.0 mg/1 for the Iron Bridge outfall (D001) and 3.8 mg/l for the OEW (D002 and D003). The criterion is 1.5 mg/l during the rainy season.

The annual average concentration is a rolling average equal to the arithmetic mean of samples collected during consecutive reporting periods over one year or 12 months. For parameters that are measured at least once per month, the annual average shall be computed at the end of each month and is equal to the arithmetic mean of the monthly average of the month being reported and the monthly average of each of the previous eleven months. This annual average shall be reported on the discharge monitoring report for each month.

The annual average concentration limit(s) shall be multiplied by 1.25 to obtain the applicable monthly average concentration limit(s) and shall be multiplied by 1.5 to obtain the applicable weekly average concentration limit(s).

The permit requirements and effluent limitations are summarized in the table on the following page.

Discharge Requirements

Parameter	Permit Effluent Concentrations					Units	Basis	Percent Removal
	D001	***R001***	***R002***	***D002***	***D003***			
pH	6.0 – 8.5							
$CBOD_5$	4.28	10	-	10	10	mg/L	Monthly Average	90
TSS	17.2	15	5	15	15	mg/L	Monthly Average	90
TKN	2.14	-	-	-	-	mg/L	Monthly Average	90
TN (1, 2)	3.08	6.0	-	2.31 (3)	2.31 (3)	mg/L	Monthly Average	90
TP (4, 5)	0.94	0.75	-	0.20 (6)	0.20 (6)	mg/L	Monthly Average	90
UOD	3,718 (7)	-	-	-	-	lbs/day	Monthly Average	90
DO	6.1-7.0 (8)	-	-	-	-	mg/l	Daily Average	N/A
DO	-	-	-	3.8 (9)	3.8 (9)	mg/l	Annual Average	N/A
DO	-	-	-	1.5 (9)	1.5 (9)	mg/l	Rainy Season	N/A
Turbidity	-	2	2	-	-	NTU	Instantly	N/A

NOTES:

(1) TN (D001) ≤720 lb/day

(2) TN (D001, D002 & D003) ≤780 lb/day

(3) TN (D002 & D003 combined) ≤ 385 lb/day

(4) TP (D001) ≤220 lb/day

(5) TP (D001, D002 & D003 combined) ≤ 220 lb/day

(6) TP (D002 & D003 combined) ≤ 33 lb/day

(7) UOD (Ultimate Oxygen Demand) is determined by 8.34 x Flow x (1.43 x CBOD + 4.57 x TKN)

(8) For discharge to the Little Econlockhatchee River, the D.O. limit is temperature dependent; that is, 6.1 mg/L @ 30° C to 7.0 mg/L @ 22° C.

(9) DO is an annual average. A level of 1.5 mg/l is allowed as a monthly average during the rainy season.

Chapter 1
Background

1.1 Iron Bridge Regional Water Reclamation Facility (WRF)

The Iron Bridge Regional WRF (Iron Bridge) was constructed in 1982 in response to an U.S.E.P.A. 201 Study. More than 16 wastewater treatment facilities in east Orange County discharged primary or secondary effluent into the Little Econlockhatchee River by 1980. The result was frequent algae blooms in Lake Harney, which is located about one mile downstream of the confluence of the Econlockhatchee River with the St. Johns River.

Construction of Phase 1 of the Iron Bridge Regional Water Pollution Control Facility (WPCF) began in 1980 with an initial permitted capacity of 24 MGD. The treatment plant is owned and operated by the City of Orlando and provides service to approximately 400,000 residents within the Cities of Orlando, Winter Park, Maitland, and Casselberry as well as parts of unincorporated Orange and Seminole Counties, including the University of Central Florida and sections of the City of Oviedo.

Iron Bridge has a permitted capacity of 40 million gallons per day (MGD) of domestic wastewater. Advanced secondary treatment is provided using the 5-stage modified Bardenpho® Process with nutrient removal, secondary clarification, deep bed filtration, and chlorination. The effluent is dechlorinated and aerated to raise the dissolved oxygen (DO) levels prior to discharge into the Little Econlockhatchee River (D001) using a 72” wide, 670’ long concrete flume.

The 5-stage modified Bardenpho® process was designed with an alternating sequence of aerobic and anoxic processes that stresses and induces the organisms in the mixed liquor to preferentially store phosphorus in the cell mass. Phosphorus removal is achieved by “luxury uptake”. Alum addition may be required at times to remove residual amounts of soluble phosphorus in the flow stream.

Iron Bridge has several permitted effluent disposal and beneficial reuse options. Effluent can be discharged to fresh surface waters through three outfalls, which include the Little Econlockhatchee River (D001) and wetlands treatment system (D002 and D003). These discharges are governed by the conditions and effluent limitations set forth in the FDEP domestic wastewater facility permit.

Effluent flows up to 28 MGD can be discharged to the Little Econlockhatchee River, and up to 35 MGD from the artificial wetland treatment system to the unnamed ditch leading to the St. Johns River. These combined discharges are subject to a waste load allocation for these Class III predominantly freshwater rivers and the Lake Harney basin.

Reclaimed water can be distributed to two destinations, either the man-made Orlando Easterly Wetlands (R001) or public access reuse distribution system (R002), which is part of the Eastern Regional Reclaimed Water Distribution System (ERRWDS). The wetlands treatment system is considered to be a beneficial restricted public access reuse system with a current permitted capacity of 35 MGD.

The regional public access reuse distribution system has a current permitted capacity of 20.3 MGD. The system was placed into service in Fall 2008. Several users, including the University of Central Florida and adjacent corporate parks and residential neighborhoods, receive reclaimed water from the system.

The discharge points are outlined in the table below.

Table 1-1 Permitted Discharge Points

Outfall Designation	Discharge Point	Description
D001	Little Econlockhatchee River	Class III predominantly fresh surface water with a waste load allocation.
D002 *	Unnamed Ditch to St. Johns River	Nutrient concentrations and mass loading limitations apply.
D003 *	Unnamed Ditch to St. Johns River	Nutrient concentrations and mass loading limitations apply (currently not in service).
R001	Orlando Easterly Wetland Treatment System	Artificial wetlands for indirect reuse with restricted public access.
R002	Public Access Reuse Distribution System	Public access reuse distribution system with land application. Placed into service in June 2008.

***** Discharge points for the Orlando Easterly Wetlands Treatment System.

Outfall D003 was placed into service in September 2001 as a major modification to the facility permit.

1.2 Orlando Easterly Wetlands (OEW)

The Orlando Easterly Wetland Treatment System was developed by the City of Orlando during the mid-1980s for the treatment and indirect reuse of reclaimed water by providing habitat for wildlife in east Orange County. The wetland treatment system has operated continuously since 1987 and is located about 20 miles east of Orlando. The wetland treatment system has three parallel flow paths that operate semi-independently.

The purpose of the wetland treatment system is to further reduce nitrogen and phosphorus concentrations in the wastewater to meet background concentrations in nearby natural marshes. The wetlands treatment system is required to comply with both specific influent loadings and discharge limitations. The wetland treatment system is considered beneficial reuse by FDEP due to the recreation of varied wildlife habitats and environmental enhancement.

The wetland treatment system was constructed on 1,220 acres of former cattle pasture in Sections 14, 15, and 22 of Township 22S, Range 36E in east Orange County about two miles west of the St. Johns River. Surveys from the 1850s indicate that the area was previously part of the wetland system adjacent to the St. Johns River. The historical land use of the area was agriculture, primarily ranching and raising livestock, since an elaborate series of ditches were used to drain the wetlands during the 1940s. The Orlando Easterly Wetlands currently encompasses 1,810 acres and abuts the Seminole Ranch Conservation Area along the St. Johns River.

More than 18 miles of earthen berms with access roadways were erected initially to form the 17 treatment cells to facilitate the regulated equal distribution of incoming flows and simulate the hydroperiod of natural wetlands. An additional berm was constructed in early 2003, which partitioned a section from Cell 16A to form Cell 18 for routing the wetland flows through a second outfall, D003. The berms have about three feet of freeboard to accommodate wet weather events. Weir control boards on the upstream end of the connector pipes through the berms control the flows and water depths in each cell.

The wetland treatment system as currently configured has 18 cells, each about three feet deep, 67 control structures, and three flow pathways: north, central, and south. Construction began in early 1986 with start-up of the wetland treatment system in September 1987.

The wetland treatment system was planted originally with three distinct vegetative communities. These included:

- Wet Prairie or Deep Marsh:

  Approximately 420 acres, about 35% of the total area, encompass the first 12 cells. Areas were planted with cattail and different types of bulrush. Water depths range from 0 to 3 feet.

- Mixed Marsh:

  Approximately 380 acres, about 32% of the total area, cover three cells. Areas were planted with 60 different submerged and emergent herbaceous aquatic species. Water depths range from 0 to 2.5 feet.

- Hardwood Swamp:

  Approximately 400 acres, about 33% of the total area, incorporate the remaining two cells. The area was planted with cypress, pop ash, water tupelo, bay, and other species of wetland or aquatic trees. This area was converted later to a mixed marsh with interspersed hydric hardwoods and herbaceous understory. Water depths range from 0 to 1 foot.

The trees within the hardwood swamp did not establish a viable canopy. Currently, this area is now managed as a mixed marsh habitat. An approximately 100-acre lake, known as Lake Searcy, is found within the final two treatment areas, Cell 16 and Cell 17. The lake has depths up to 14 feet and overflows through Outfall D002. Overflows from Cell 13 discharge through Outfall D003. Both outfalls can discharge simultaneously to the un-named ditch, which is a tributary of the St. Johns River.

The lake was created by the excavation of a borrow pit to provide fill material for the construction of more than 18 miles of earthen levees and berms for the individual treatment cells to enhance the hydrology, operation, and wildlife habitat within the man-made treatment system. The OEW is considered a beneficial reuse system, pursuant to FDEP rules, due to the environmental enhancement that is provided by the varied and recreated wetland and wildlife habitats.

The wetland treatment system was designed with an initial capacity of 20 MGD and was permitted with one discharge point, Outfall D002. Flows were limited to 8 MGD for start-up in 1987-88 by FDEP until the efficacy of the wetland treatment system had been demonstrated by the facility. Flows were increased to 13 MGD in August 1988 as the system was phased into service with implementation of new innovative technology for nutrient removal through vegetative and soil assimilation. Flows were gradually increased to the initial permitted capacity of 20 MGD.

After ten years of successful operation and demonstrating compliance with the discharge limitations, stress testing began in 1997-1998 to simulate higher flows through the pathways within the OEW system. An evaluation was performed through one-third of the wetlands system with flows of approximately 10 MGD, 14 MGD, and 15 MGD to simulate higher flows of 30 MGD, 40 MGD, and 45 MGD. The flows were routed through specified pathways within the wetland treatment system.

The data from the simulations was included in the 1997 Annual OEW Performance Report and used as documentation for the FDEP facility permit modification that was approved on September 4, 2001, to increase the hydraulic capacity from 20 MGD to 35 MGD for the wetland treatment system and construction of a second outfall, D003, and Cell 18. Outfall D003 was placed into service in March 2004. Currently, this outfall is not in service and

typically is used during high water events and demucking or other wetland renovation projects to reduce or eliminate discharges from Outfall D002.

A second discharge point was sought by the City for two reasons. First, the additional discharge point would provide flexibility in facility operations and the various available flow routes. Second, maintenance could be performed in the final treatment cell without cessation of discharges or reducing the capacity of the wetland treatment system. Several cells near Outfall D002 and the south flow train were demucked and renovated since construction of the second outfall (D003).

An additional berm between Lake Searcy and Cell 17 was constructed in 2007. Two control structures (WLLS1 and WLLS2) were installed along the new berm for greater hydraulic control of the system. Several small shallow berms were constructed in 2009 within Cell 1, Cell 11, and Cell 12 to promote sheet flow in these areas and increase water levels upstream in these vegetative communities. The water now flows through small openings in these shallow berms.

Hydraulic modeling of the wetland treatment system was completed in January 2013 to determine the overall capacity of the wetland treatment system. The hydraulic analysis demonstrated the response of the wetland treatment system to a 25-year, 24-hour (8.6 inches of rainfall) and a 100-year, 24-hour (10.6 inches of rainfall) storm event with an influent peak flow of 50 MGD, which is equivalent to a proposed flow capacity of 40 MGD with a peaking factor of 1.25.

Results of the hydraulic modeling demonstrated the ability of the wetland treatment system to accommodate flow capacities up to 40 MGD and peak flows up to 57 MGD, which is equivalent to base flow of 45.6 MGD and a peaking factor of 1.25 with a minimum of one foot freeboard and no improvements necessary to the physical features of the system. The maximum peak flow was limited by the available freeboard for Cell #18.

Second, the wetland treatment system has sufficient capacity to handle peak influent flows up to 57 MGD with no additional flows from storm events and with one flow pathway offline without making any improvements and retention of one foot of freeboard for the cells. New mechanical gates for the weirs were installed during 2011 for each flow train. Capacity of the influent structure is 57 MGD with one mechanical gate closed. Modifications to the weir box for the influent flow and distribution structure would be necessary to handle flows greater than 57 MGD.

The study showed that Outfall D002 could handle peak flows in excess of 40.5 MGD; and Outfall D003 could accommodate peak flows in excess of 66 MGD, which is greater than the peak flow from a 100-year, 24-hour storm event.

Another study focused on the response of the wetland treatment system to annual average daily flows of 40 MGD with a peak flow of 50 MGD and significantly higher phosphorus loadings. Removal and retention of total phosphorus is considered to be the limiting operating factor.

A steady-state model, which accounts for hydraulic efficiency and dispersion on phosphorus removal, used to evaluate the responses of the wetland treatment system to an

inflow total phosphorus concentration of 0.25 mg/l was inputted into the model, which is more than 65% higher than the average influent levels.

The study found that the projected post rejuvenation residence time distributions (RTDs) were almost 50% higher at 15 MGD for the northern and central treatment trains than reported in an earlier study. The RTDs are significantly impacted by sedimentation, which reduces the effective overall operating water depths. Demucking rejuvenated the cell and restored the effective water depth and RTDs.

The response of the wetland treatment system to pulse total phosphorus loadings, which were up to 207% of the long-term average, was similar to the removal performance experienced during long term operations (67% versus 70%). Effluent total phosphorus levels remained in the range of 0.05 mg/l to 0.07 mg/l. This indicated that the wetland system can effectively treat abnormally high flow rates and assimilate elevated total phosphorus loadings for different interval pulse events.

Discharge concentrations of total phosphorus were predicted to increase with higher loadings and flow rates. For a 40 MGD flow rate with an influent total phosphorus level of 0.15 mg/l, the resultant effluent concentration is predicted to be 0.066 mg/l. At a higher influent level of 0.25 mg/l, the effluent concentration is forecast to be 0.101 mg/l, which still complies with the discharge limitations and waste load allocation. An increase of 164% in the flow rate (40 MGD versus 15.1 MGD) and 65% higher influent total phosphorus level yielded only a 36% increase in the observed average discharge concentration of 0.065 mg/l.

The effluent pipe for Outfall D002 began leaking in 2017 and caused erosion beneath the recently installed articulating concrete block channel. The effluent channel was lined in May 2018 to prevent further leaking and erosion.

The Wetlands Pump Station at Iron Bridge was upgraded to better supply influent flows to the OEW through a 48 inch diameter concrete pressure pipe transmission force main. New pumps, electrical gear, and instrumentation were installed in the Wetlands Pump Station along with limited modifications to the piping and wet well. As part of these upgrades, a series of 31 air release valves (ARVs) were replaced along the 16 miles of the transmission pipeline to the OEW. The upgraded Wetlands Pump Station went into service in 2017.

The capacity of the Wetlands Pump Station ranges from 1 MGD to 57 MGD with a peaking factor of 1.25. However, the flow rate to the OEW is limited to 37 MGD by the current concrete pressure pipe transmission force main. The lower range of flows to the wetland treatment system is provided by either a single 600 HP pump or a combination of 60 HP pumps. The higher range of flows is conveyed with two 600 HP pumps. A single 600 HP pump can deliver up to 13,100 gpm. A single 60 HP pump can convey up to 4,000 gpm. The variable frequency drives allow the flow rates to be adjusted either from 1 MGD to 14.5 MGD with the 60 HP pumps or 7 MGD to 37 MGD with the 600 HP pumps.

The influent flows to the wetland treatment system are estimated using a flow calculation algorithm, which automatically calculates the discharge flows to the Little Econlockhatchee River (D001), wetland treatment system (R001), and reuse distribution system (R002). The wetland treatment system typically receives the balance of the

reclaimed water flows. A defined flow level can be manually set for each of the three discharge destinations.

The influent distribution structure is located just north of Wheeler Road near the western perimeter of the wetland treatment system. The influent bubbles up through three 32 inch diameter pipes within designated wetland cells. The control structures direct the flows in a general northeasterly direction across the wetland treatment system towards either Outfall D002 or Outfall D003.

The influent distribution structure splits the incoming flows into three different pathways: northern, central, and southern. The northern flow pathway consists of Cells 1, 3, 4, 7, 8, 13, and 17. The influent flow spills from Cell 1 into Cells 3 and 4 before being routed onto Cells 7 and 8. The flow converges into Cell 13 before being routed to a designated outfall.

The central flow pathway includes Cells 2, 5, 6, 9, 10, 14 and 16B, a freshwater lake and Cell 17. Similar to the northern pathway, the influent flows are distributed from Cell 2 into Cells 5 and 6, which discharge into Cells 9 and 10. The flows converge into Cell 14 before being routed through Cell 16B, the 90 acre freshwater lake, and into Cell 17.

The southern flow pathway incorporates Cells 11, 12, 15, 18, and 16A, a freshwater lake and Cell 17. Flows are routed southward from the influent distribution structure through a concrete box culvert under Wheeler Road and into Cells 11 and 12, which discharge into Cell 15. The water from Cell 15 flows northward through a concrete box culvert under Wheeler Road and into Cell 16A. Flows from both the central and southern pathways comingle in the freshwater lake before meandering into Cell 17. Currently, the flows from the three pathways converge into the mixed marsh of Cell 17 before exiting through the effluent discharge structure at Outfall D002.

The water depths, hydroperiod, and flows for each cell are regulated using a system of 67 interconnecting control structures with adjustable wooden weir controls. The control structures were designed initially for one-way flows. Bi-directional control structures were installed in early 2003 for many cells as part of the construction for Outfall D003. The bi-directional control structures provide better regulation and distribution of flows throughout the wetland treatment system. Flows will comingle and pass through a hardwood swamp in Cell 13 before reaching the effluent discharge structure for Outfall D003.

Outfall D002 consists of an aluminum weir gate for flow control, 48 inch diameter reinforced concrete pipe, flow measurement, and a monitoring station. The outfall culvert is about 118 feet long and discharges approximately 2.5 feet below the water surface. The outfall pipe for Outfall D002 was lined in 2018 to prevent erosion and leaking. The outfall channel was renovated and armored with articulating concrete block to prevent erosion.
The discharges are continuously measured with an ultrasonic open channel meter and documented with a circular chart recorder. The monitoring station consists of two automatic composite samplers. One unit collects samples on a flow proportional basis. The other unit operates on a timed interval in the event that the flow signal is lost and prevents the retrieval of flow proportional aliquots. Outfall D003 is almost identical in construction as Outfall D002. Currently, Outfall D003 is not in service, but remains

available for use. Outfall D003 operated during and following Hurricane Ian, from September 30th thru October 4th of 2022.

Both outfalls convey the effluent discharges to an unnamed ditch, which flows through the Seminole Ranch and into the backwater areas for the St. Johns River. The City of Orlando could divert the flows from the wetland treatment system through 640 acres of natural wetlands surrounding the unnamed ditch before entering the St. Johns River.

Flows to the wetland treatment system are anticipated to be highly variable. Higher peak flows and extended periods of low flows may be realized in the future with ongoing climate change. Inflows may vary seasonally from a low of 2 MGD to a peak of 30 or 35 MGD in comparison to the current relatively consistent flow regime of 14 - 15 MGD. Past studies demonstrated that nutrient levels increase dramatically in the water column during stagnant or low flow profiles of 2 MGD to 4 MGD.

A minimum flow of 10 MGD was recommended to keep the treatment cells fully hydrated and functional while operating at peak efficiency for nutrient removal and sequestration. The removal and sequestration of total phosphorus is considered to be the limiting factor for the wetland treatment system and is subject to a variety of factors, including influent flows, flow regime through the wetlands, water levels, dry or stagnant periods, maintenance intervals, and phosphorus loadings.

Removal mechanisms include assimilation into plant tissues during growth phases, adsorption into the soil matrix, and the process of nitrification and denitrification. The wetland treatment system is operated to minimize potential re-release of nutrients from plant debris and soils into the water column.

Since 1993, the average monthly daily inflows to the wetland treatment system have fluctuated around a median value of 15 MGD. The average monthly daily flows ranged between 8 MGD to 20.3 MGD with a median value of 14 MGD during 2008 thru 2013, and between 6.5 MGD to 30.4 MGD during 2017 thru 2022. The highest average monthly daily flows occurred during months with hurricanes while the lowest flows typically happen in the dry season when there are higher demands for reclaimed water.

The retention (travel) time through the system ranges from about 21 days during the dry season to approximately 65 days during the wet season.

The effluent nutrient levels witnessed at the outfalls generally mirrored the concentration trends for the influent. The monthly average nutrient levels were higher during 1999 – 2008 and resulted in higher phosphorus in the discharges. De-mucking and prescribed burns of treatment cells restored the nutrient assimilation capacity of the wetland treatment system.

The locations of Iron Bridge and OEW are shown in Figure 1-1. A recent aerial of the OEW is found in Figure 1-2. A site map of the wetland system and treatment cells within the facility is presented in Figure 1-3.

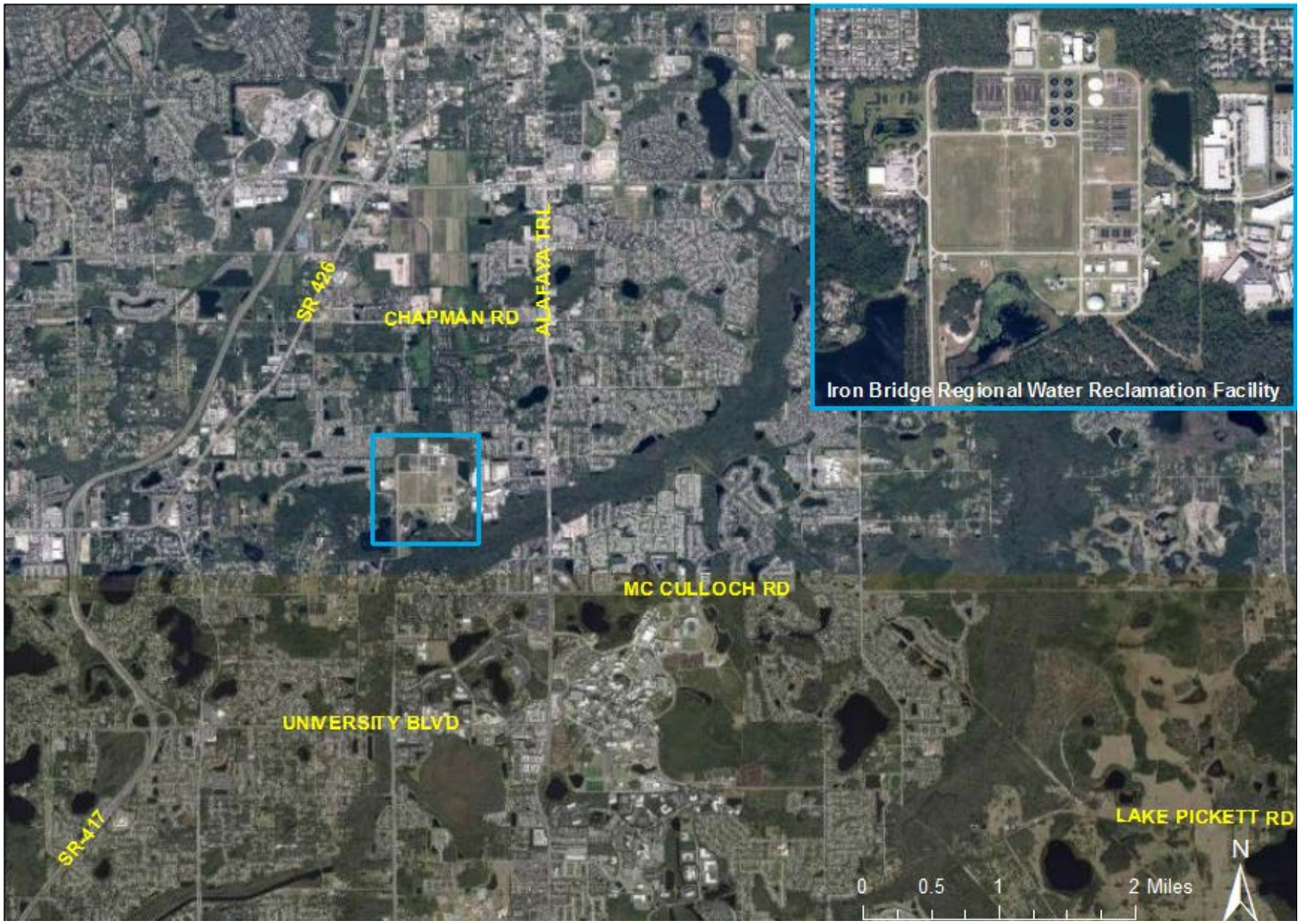
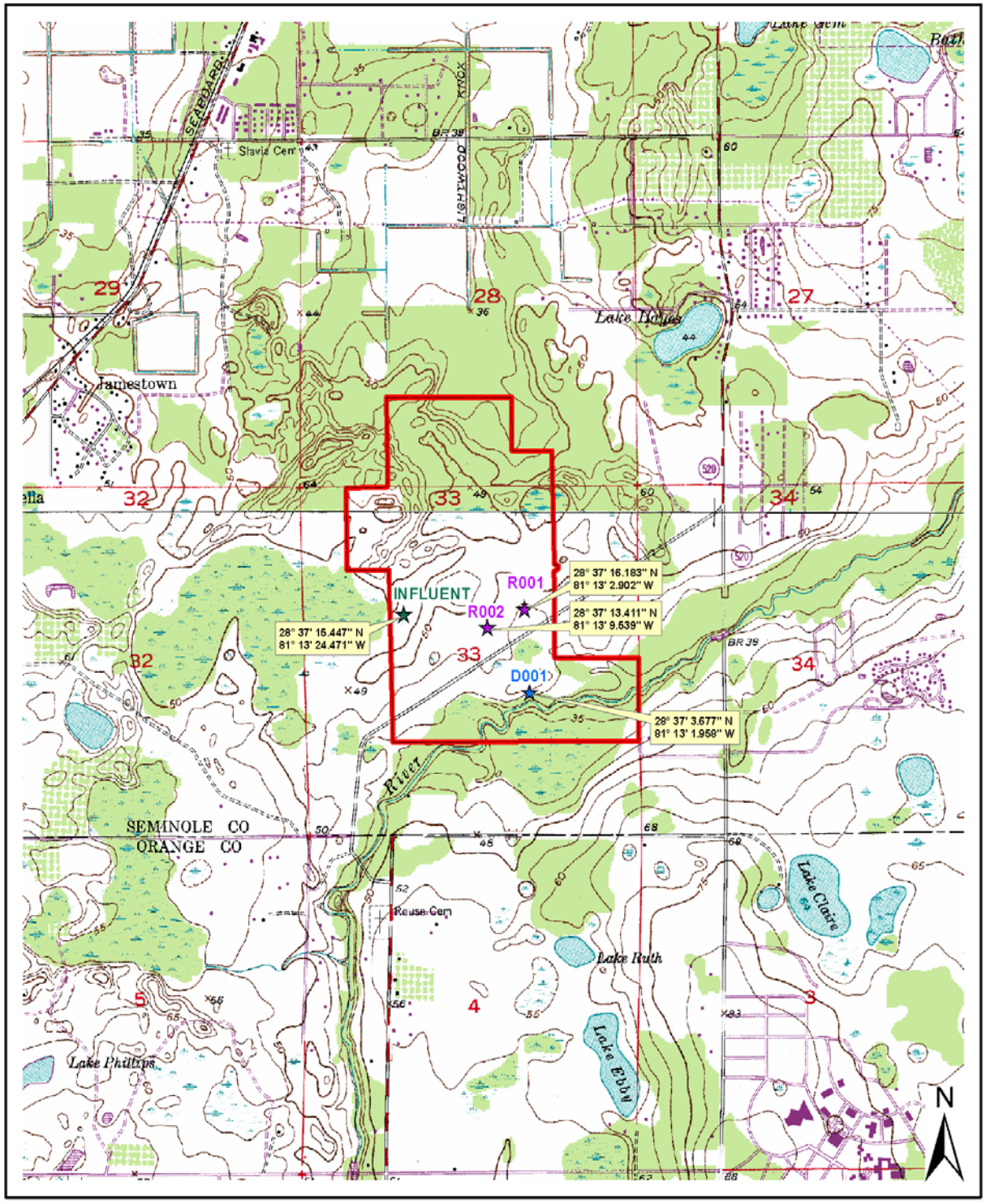
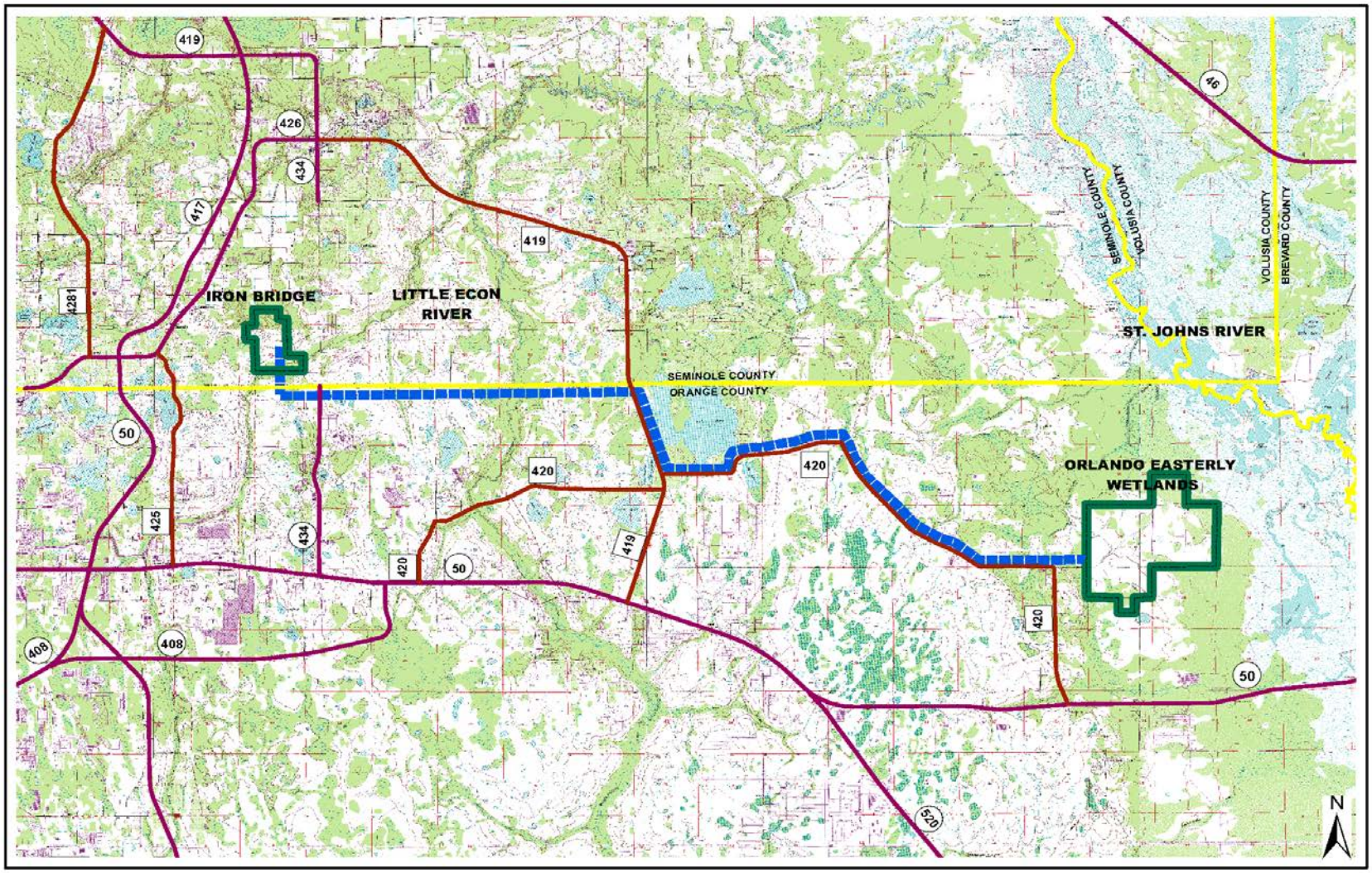


Figure 1-1 Location Map for Iron Bridge Regional Water Reclamation Facility



IRON BRIDGE REGIONAL WRF



ORLANDO EASTERLY WETLANDS TREATMENT SYSTEM
TRANSMISSION PIPELINE

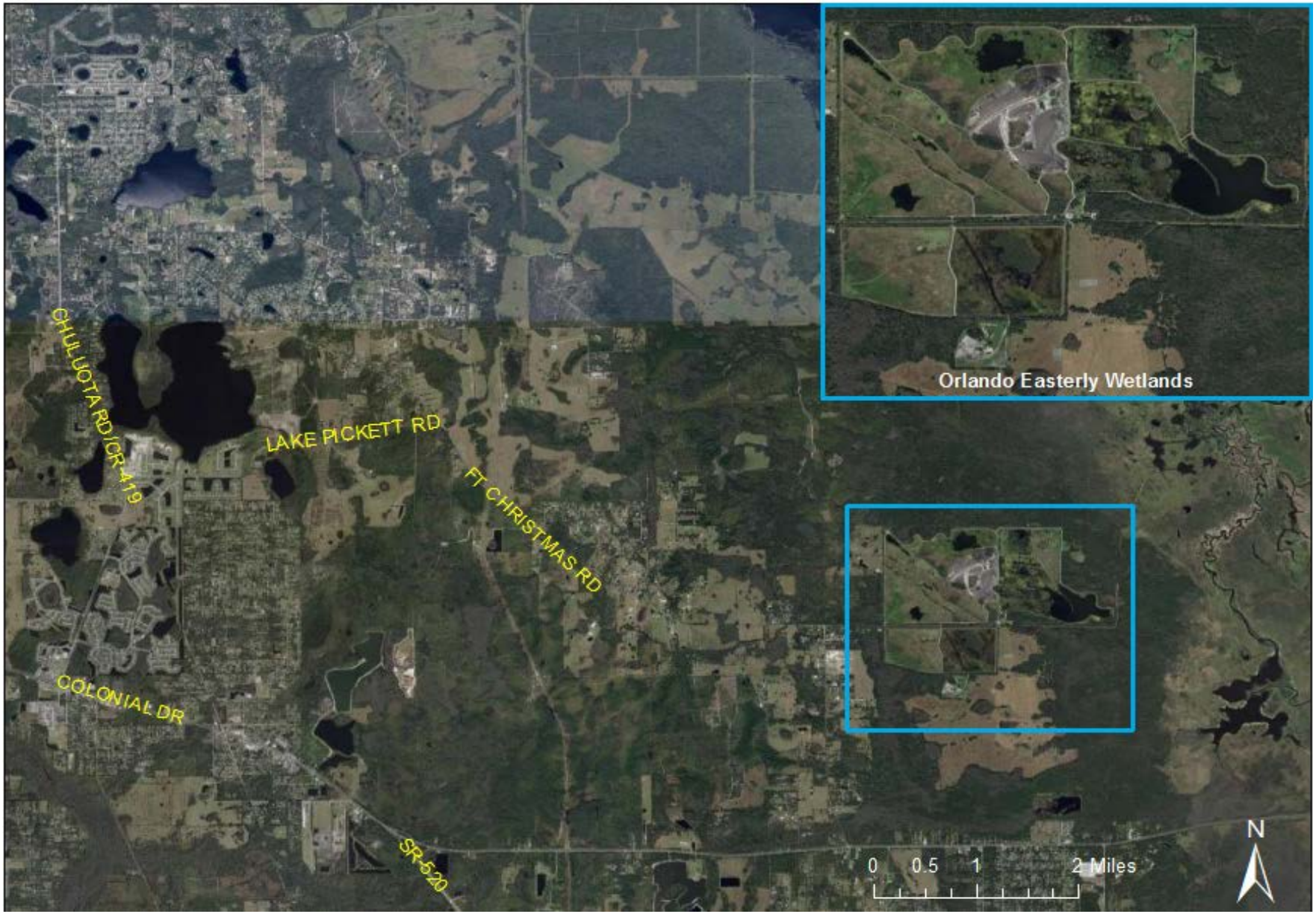
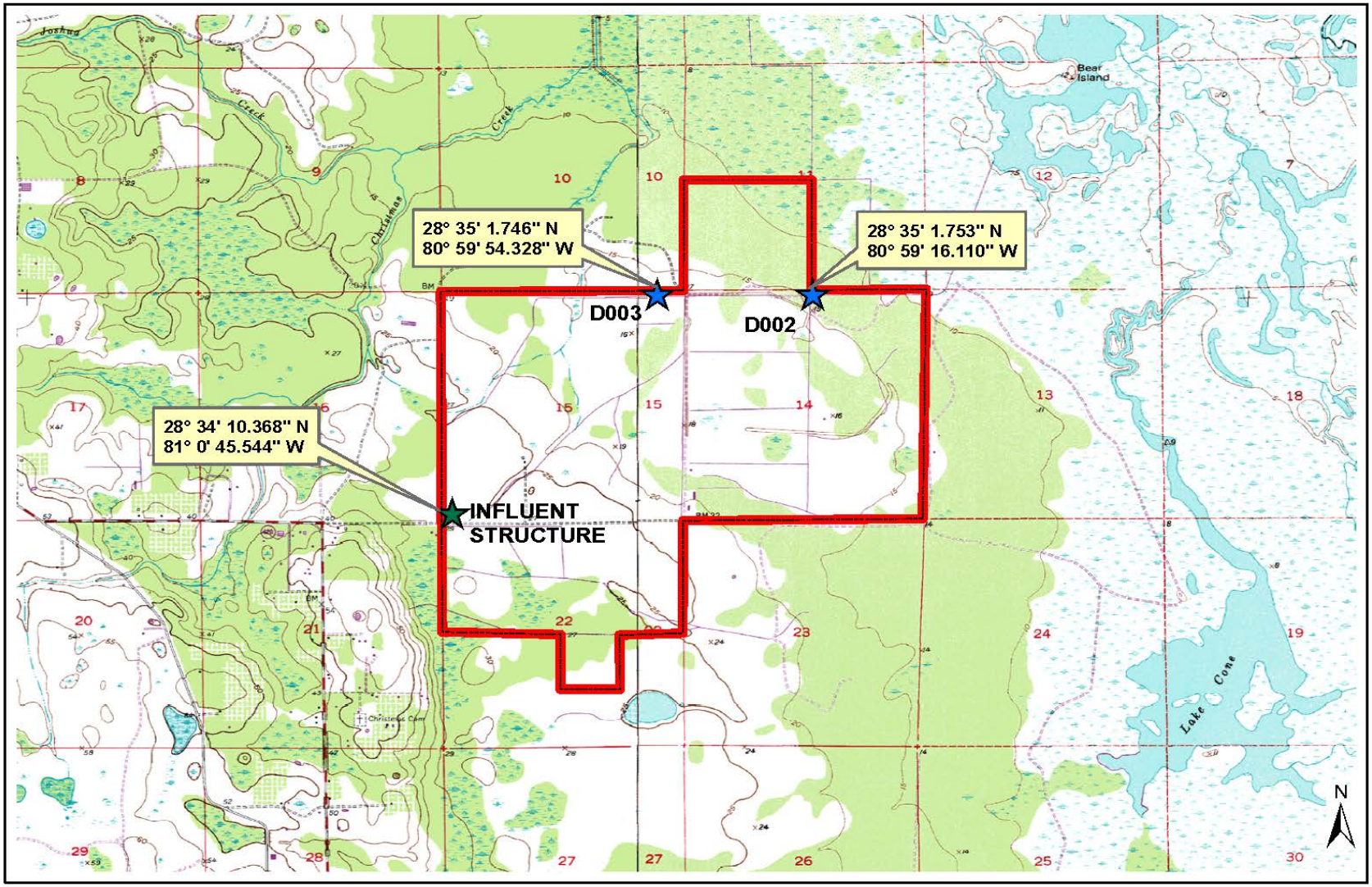


Figure 1-4 Location Map for Orlando Easterly Wetlands



ORLANDO EASTERLY WETLANDS TREATMENT SYSTEM

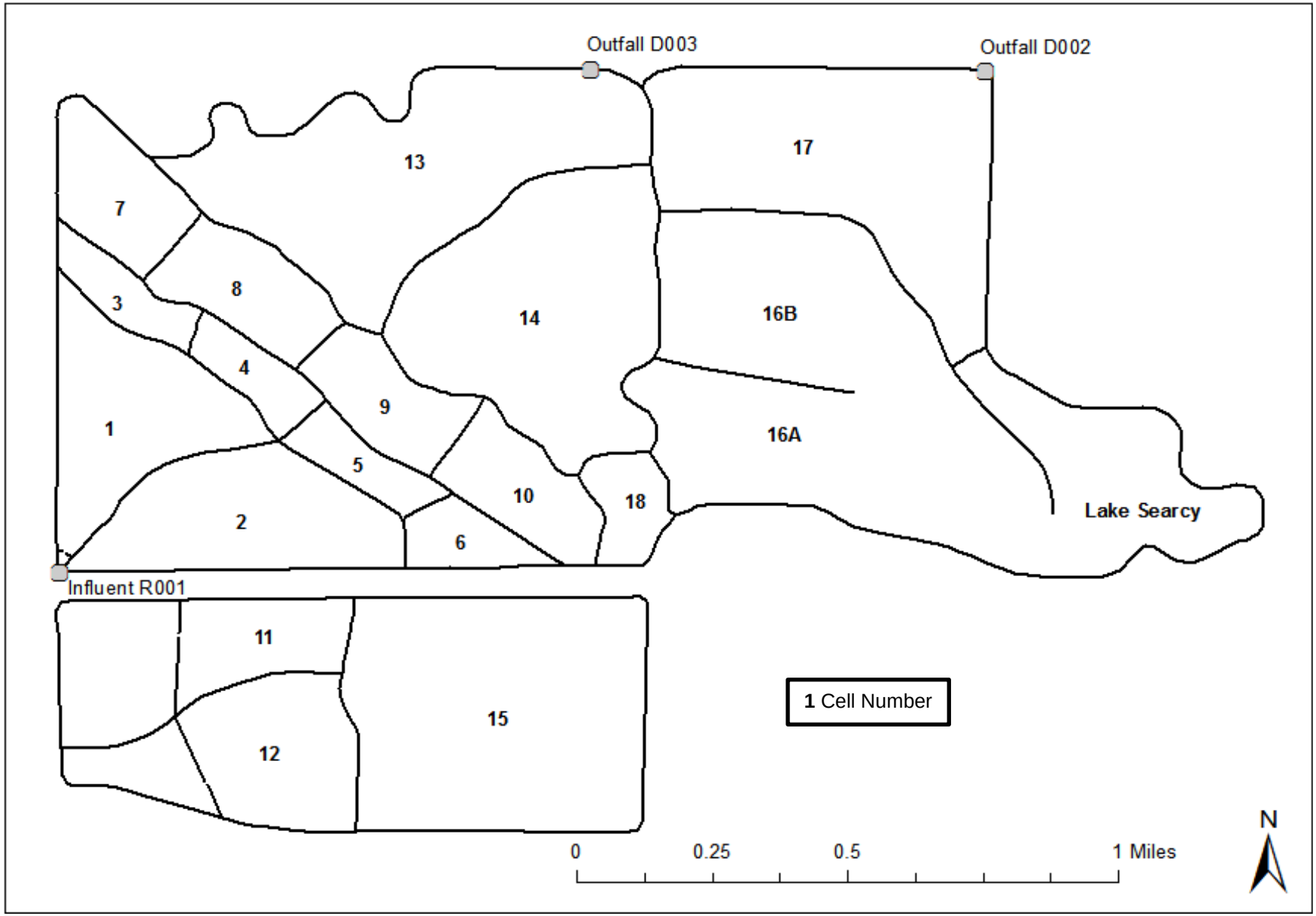


Figure 1-6 Schematic of Orlando Easterly Wetlands Treatment Cells

Chapter 2
Iron Bridge Regional WRF and Little Econlockhatchee River

2.1 Iron Bridge Regional WRF Overview

The Iron Bridge Regional WRF (Iron Bridge) discharges to the Little Econlockhatchee River using a long spillway, permitted as Outfall D001. The discharge is monitored on a daily basis by the City of Orlando. The annual average daily flow during 2022 was 2.348 MGD compared to 2.340 MGD during 2021. Flows in 2022 ranged from 0.28 MGD to 18.71 MGD, which occurred during Hurricane Ian, versus the range of 0.0 MGD to 7.77 MGD during 2021. Flows from Iron Bridge remained relatively consistent since 2017.

Hurricane Ian occurred on September 28-29th and Hurricane Nicole on November 10-11th. The discharge flows from Iron Bridge ranged from 12.89 MGD to 18.71 MGD for Hurricane Ian and from 7.20 MGD to 9.25 MGD for Hurricane Nicole. The rainfall intensity for Hurricane Ian was considered to be a 1 in 500 year event.

The average monthly flows for the Iron Bridge Outfall (D001) were compared to the average monthly flows for the Little Econlockhatchee River as measured downstream by the USGS Gaging Station 02233475 located at the Alafaya Trail bridge. The average monthly flow contributions from Iron Bridge as a percentage of the overall flow of the Little Econlockhatchee River are shown in Table 2-1 and Figure 2-2, and as a percentage of the overall river flow in Figure 2-3. The average monthly effluent flows for Iron Bridge were deducted from the average monthly flows as logged by the USGS Gaging Station to determine the net average monthly river flows.

The average annual flows are shown in Table 2-2, illustrated in Figure 2-4, and shown as a percentage of the overall flow in Figure 2-5.

The Iron Bridge discharge comprised an average of 1.74% of the net flows for the Little Econlockhatchee River in 2022 versus 3.16% in 2021, which experienced lower flow rates that year. Typically, the monthly flows were less than 3.5 MGD with the highest proportions of flow during 2022 occurring in February and May with 4.46% and 4.17%, respectively, due to meager rainfall that created low flows in the river.

The average monthly total nitrogen (TN) concentrations from Iron Bridge Outfall D001 ranged from 1.19 mg/L to 2.55 mg/L and were about 50% higher than those values in the river. The highest values occurred from September thru November due to the hurricane events. The total nitrogen (TN) loadings were from 13.2 lbs/day to 101.55 lbs/day following Hurricane Ian and were lower than those at the river monitoring stations. The monthly average total nitrogen (TN) loadings are shown in Table 2-5 and Table 2-6 in comparison to the values for the river monitoring stations. About 53.6% of the total

nitrogen loadings for 2022 were discharged to the river during the three months following Hurricane Ian.

The average monthly total phosphorus (TP) concentrations from Iron Bridge Outfall D001 ranged from 0.103 mg/L in January to 0.409 mg/L in December. The average monthly total phosphorus loadings were 1.1 lbs/day to 12.39 lbs/day after Hurricane Ian. By comparison, the total phosphorus (TP) loadings for the river were more than 15 times higher at the monitoring stations. The average monthly total phosphorus (TP) loadings are found in Table 2-6 and Table 2-7 in comparison to the values for the river monitoring stations. About 50.8% of the total loadings to the river in 2022 occurred following Hurricane Ian during October thru December.

The percentage of each average monthly nutrient (TN and TP) loading as the proportion of the overall respective annual loading is presented in Figure 2-16. The highest percentage of the nutrient loadings were contributed to the Little Econlockhatchee River following Hurricane Ian. Nutrient levels have generally declined since 2017. Nutrient concentrations were significantly below the permit limits of 3.08 mg/L and 0.94 mg/L, for total nitrogen and total phosphorus, respectively.

2.2 Little Econlockhatchee River Overview

The City of Orlando monitors the Little Econlockhatchee River upstream (Econ Up) and downstream (Econ Down) of the outfall (D001) for the Iron Bridge facility. A far field location (Econ A) was added to the monitoring program and is sampled quarterly. The monitoring locations and Iron Bridge are shown in Figure 2-1.

In 2021, no adequate USGS discharge monitoring sites were available for the Little Econlockhatchee River in proximity to the Econ Up sampling station. The river, however, is monitored downstream of Iron Bridge near Econ A at USGS Station 02233475, which is within Seminole County, Florida on the downstream side of the S.R. 434 Bridge, about 3.5 miles south of Oviedo and 3.8 miles from the confluence of the Little Econlockhatchee River with the Econlockhatchee River.

Discharge and water gage levels are collected daily at USGS Station 02233475 on the Little Econlockhatchee River. Water quality samples are collected monthly by the City of Orlando at Econ Up and Econ Down (refer to Appendix A and Appendix B, respectively) monitoring stations. In 2021, upon the request and approval of FDEP, an additional far field monitoring location (Econ A) was added for the collection of monthly water quality samples.

Econ A is located approximately 120 feet upstream of the respective USGS station. This location was preferred over sampling directly at the USGS station due to the direct adverse impacts of stormwater runoff from the Alafaya Trail bridge and the ease of access to the Little Econlockhatchee River. However, various ditches and stormwater runoff from single family homes, apartments, commercial buildings, and retention ponds, discharge into the Little Econlockhatchee River between the Iron Bridge effluent outfall (D001) and Econ A.

Thus, monitoring station Econ Down continues to be sampled monthly for comparison purposes with results from previous years.

The average monthly flows in 2022 for Econ A ranged from 30.83 MGD to 427.22 MGD and are summarized in Table 2-1 and Appendix A. The flows were elevated in September through November due to two hurricane events. The flows from Iron Bridge Outfall D001 ranged from 1.28 MGD to 4.42 MGD in 2022 and were relatively insignificant in comparison to the overall flows for the Little Econlockhatchee River. This has been the typical situation since 1997 with a couple of exceptions in 2000 and 2006. Most of the flows from Iron Bridge are now routed to the OEW and public access reclaimed water distribution system.

The highest maximum daily flow for Econ A was 3,955.5 MGD and occurred on September 30th during Hurricane Ian. September 2004 had the highest monthly flow of 444.7 MGD. The month with the highest average discharge (178.4 MGD) is September each year. The annual average flows for both the Iron Bridge Outfall (D001) and Little Econlockhatchee River are found in Table 2-2, and illustrated for both monthly and annual average flows in Figure 2-2 through Figure 2-5.

Water quality data at the Econ Up, Econ Down, and Econ A monitoring stations during 2022 is summarized in Table 2-3, and in comparison to the discharge from the Iron Bridge Outfall D001 in Table 2-4. The water quality generally was similar at the three monitoring stations with slightly higher dissolved oxygen (DO) levels at Econ Up. The water quality in 2022 was similar to the results for 2021 despite two major hurricanes.

A bar chart comparison for the water quality parameters is presented in Figure 2-6 for the three monitoring stations for the Little Econlockhatchee River, and with the discharge from the Iron Bridge Outfall D001, in Figure 2-7.

The effluent from the Iron Bridge Outfall (D001) had total nitrogen (TN) and total phosphorus (TP) concentrations that averaged 1.85 mg/L and 0.207 mg/L, respectively, during 2022. The average total nitrogen concentration in 2022 was marginally higher than the average in 2021 (1.58 mg/l). However, the average total phosphorus was lower in 2022 than during 2021 (0.213 mg/l). The DO levels were 50% higher in the Iron Bridge discharge than those levels present in the Little Econlockhatchee River, and had lower ammonia levels as well.

The total nitrogen (TN) loadings were significantly higher at Econ Up and Econ A than the Iron Bridge discharges due to the higher flows for the river. The total nitrogen (TN) concentrations were about 50% lower at Econ Up and Econ A than in the discharge from Iron Bridge. The total nitrogen (TN) loadings for Outfall D001 and monitoring stations for the river are shown in Table 2-5 and Table 2-6. The total nitrogen (TN) loadings for the Iron Bridge discharge were 13.2 lbs/day to 101.55 lbs/day following Hurricane Ian. By comparison, the total nitrogen (TN) loadings for the Little Econlockhatchee River were 174.8 lbs/day at Econ Up to 3,054.1 lbs/day at Econ A after Hurricane Ian. The percentage of the total nitrogen (TN) loadings from Iron Bridge varied from 2.4% to 10.8% at Econ Up with similar results at Econ A. The total nitrogen (TN) results for the Little Econlockhatchee River and Outfall D001 are shown in Figures 2-8 through 2-11.

The total phosphorus (TP) loadings were significantly higher at Econ Up and Econ A than the Iron Bridge discharges due to the much higher flows for the river. The total phosphorus (TP) concentrations were more than 50% to 70% lower at Econ Up and Econ A than in the discharge from Iron Bridge. The biggest difference was observed between Econ Up and the Iron Bridge discharge in November and December 2022.

The total phosphorus (TP) loadings for Outfall D001 and the monitoring stations for the river are shown in Table 2-7 and Table 2-8. The total phosphorus (TP) loadings for the Iron Bridge discharge ranged from 1.1 lbs/day to 12.39 lbs/day following the two hurricane events. By comparison, the total phosphorus (TP) loadings for the Little Econlockhatchee River were 15.39 lbs/day at Econ Up in January to 758.2 lbs/day at Econ A in November. The percentage of the total phosphorus (TP) loadings from Iron Bridge varied from 1.3% to 17.9% at Econ Up. The results were lower at Econ A due to higher loadings with a range of 0.66% to 8.3%. The total phosphorus (TP) results for the Little Econlockhatchee River and Outfall D001 are shown in Figures 2-12 through 2-15.

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Figure 2-1 Locations of Water Quality Monitoring Stations along the Little Econlockhatchee River

Table 2-1 Average Monthly Flows: Little Econlockhatchee River (Econ A) and Iron Bridge Outfall (D001)

Month (2022)	Station Econ A*		Iron Bridge Outfall Flows (MGD)	Percent of Econ A Flows ** (%)
	Gage Height (Feet NAVD 88)	Flow (MGD)		
January	28.05	42.9	1.28	3.08
February	27.45	30.8	1.32	4.46
March	29.27	72.5	1.60	2.25
April	29.71	91.8	1.75	1.94
May	27.68	43.2	1.73	4.17
June	28.81	66.5	1.94	3.00
July	30.42	103.4	1.90	1.88
August	29.90	100.3	2.02	2.05
September	33.34	427.2	3.26	0.77
October	33.38	366.2	4.23	1.17
November	32.61	224.5	4.42	2.01
December	29.60	81.9	2.74	3.46
Average	**30.02**	**137.6**	**2.35**	**2.52**

* Gage height and flows at the Econ A Gaging Station (USGS Station 02233475) are based upon data provided by the United States Geological Survey (USGS).

** Percent of Iron Bridge flows is based upon the net flow at Econ A, that is the flow from the Iron Bridge outfall is deducted from the flow at Econ A.

Table 2-2 Annual Average Flows: Little Econlockhatchee River (Econ A) and Iron Bridge Outfall (D001)

Year	Station Econ A*		Iron Bridge Outfall Flows (MGD)	Percent of Econ A Flows ** (%)
	Gage Height (Feet NAVD 88)	Flow (MGD)		
1997	29.59	97.3	11.13	12.92
1998	29.95	106.4	10.70	11.18
1999	29.71	97.2	8.51	9.59
2000	28.14	37.4	9.11	32.17
2001	29.14	77.4	9.11	13.33
2002	30.18	104.5	9.68	10.20
2003	30.41	112.9	9.09	8.76
2004	30.21	119.0	8.40	7.59
2005	30.50	106.7	7.53	7.60
2006	28.54	44.6	8.05	22.01
2007	28.95	57.2	6.98	13.91
2008	29.81	94.4	7.22	8.29
2009	29.48	85.4	6.38	8.08
2010	29.22	68.4	5.41	8.59
2011	29.17	78.0	3.36	4.50
2012	28.50	56.4	3.46	6.53
2013	28.71	62.2	5.37	9.45
2014	29.63	88.8	6.00	7.25
2015	30.07	111.7	5.91	5.59
2016	29.62	87.9	6.27	7.68
2017	29.23	96.9	3.95	4.68
2018	29.09	74.2	3.32	4.47
2019	29.51	90.9	4.12	4.75
2020	29.46	91.3	3.77	4.31
2021	29.00	76.4	2.34	3.16
2022	30.02	137.6	2.35	2.52
Average	**29.46**	**87.0**	**6.44**	**9.20**

* Gage height and flows at the Econ A Gaging Station (USGS Station 02233475) are based upon data provided by the United States Geological Survey (USGS).

** Percent of Iron Bridge flows is based upon the net flow at Econ A, that is the flow from the Iron Bridge outfall is deducted from the flow at Econ A.

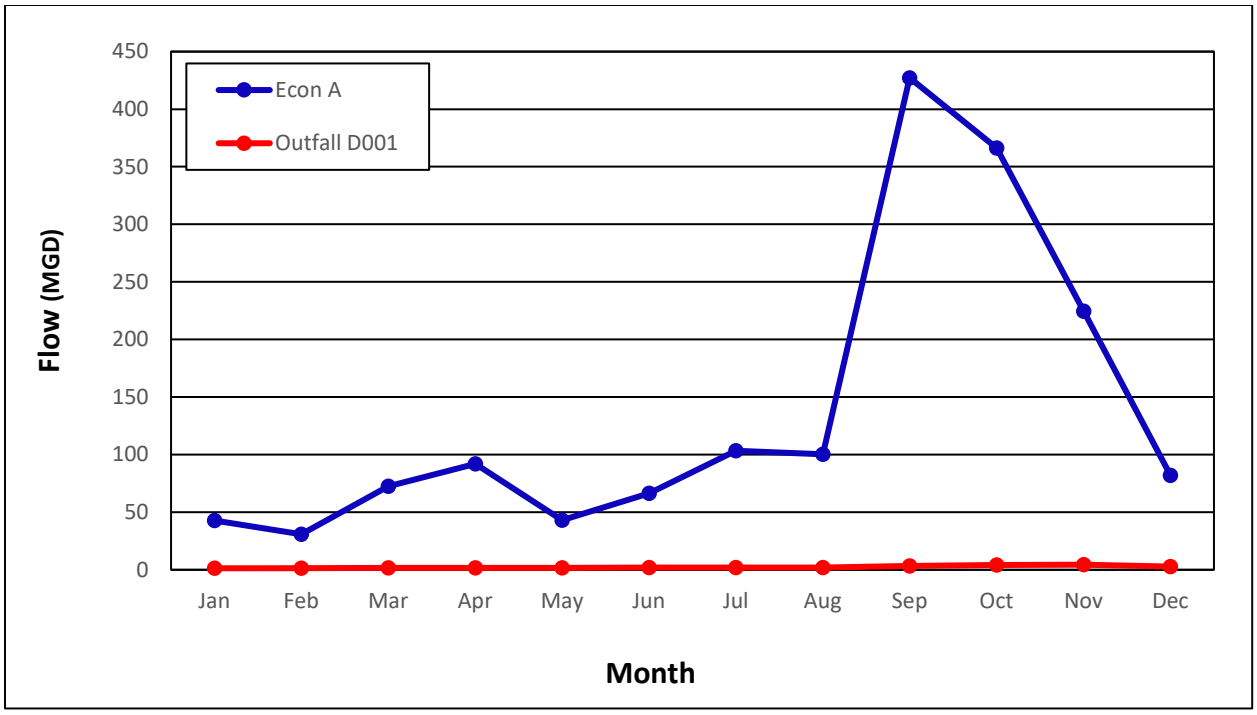

Figure 2-2 Monthly Average Flows: Little Econlockhatchee River (Econ A) and Iron Bridge Outfall (D001) during 2022

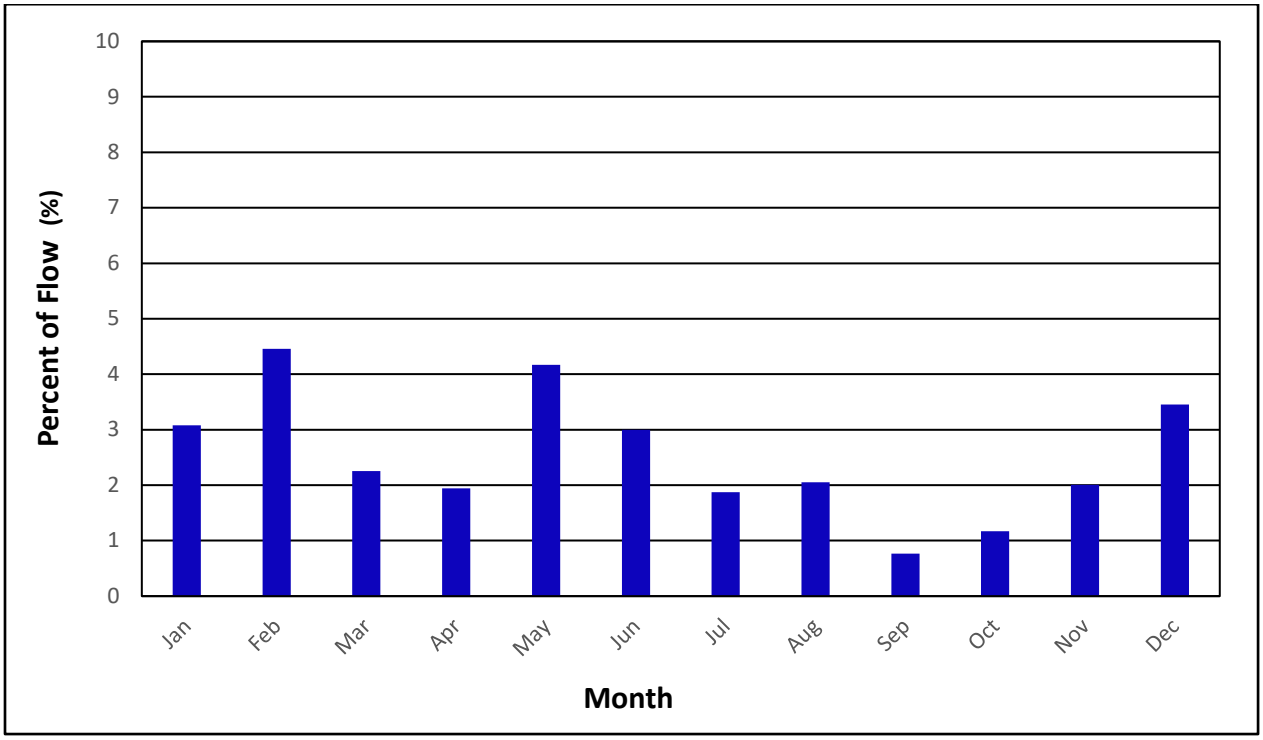

Figure 2-3 Proportion of Monthly Average Flows: Iron Bridge Outfall (D001) Flows in Little Econlockhatchee River Flows (Econ A) during 2022

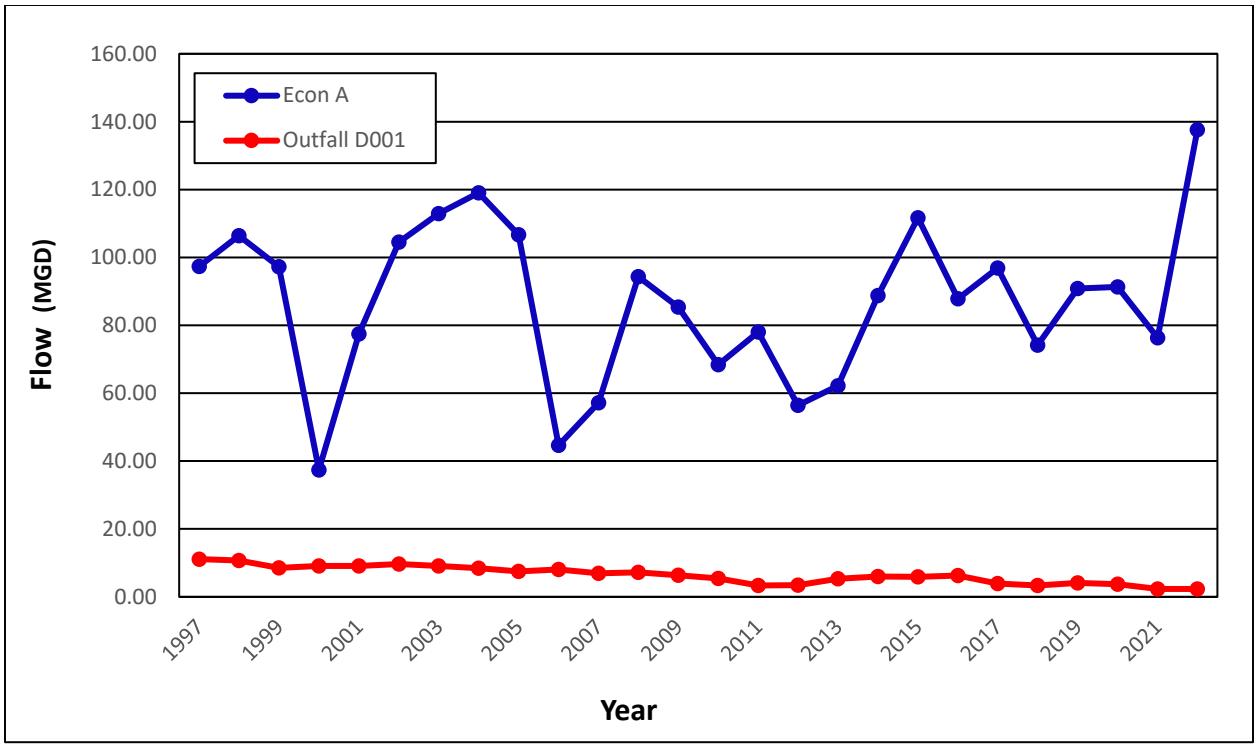

Figure 2-4 Annual Average Flows: Little Econlockhatchee River (Econ A) and Iron Bridge Outfall (D001)

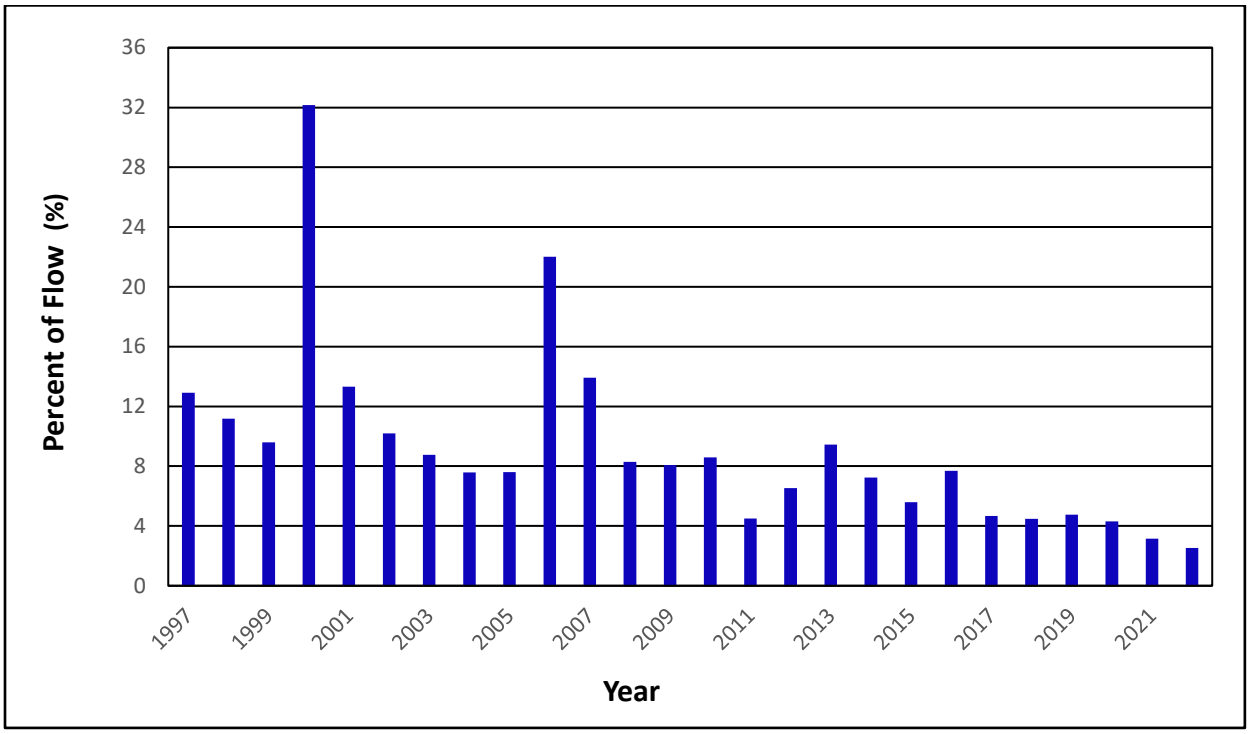

Figure 2-5 Proportion of Annual Average Flows: Iron Bridge Outfall (D001) Flows in Little Econlockhatchee River Flows (Econ A)

Table 2-3 Comparison of Monthly Average Water Quality Parameters: Little Econlockhatchee River Monitoring Stations Upstream and Downstream of the Iron Bridge Outfall (D001) *

Parameter (2022)	Upstream of Iron Bridge Outfall: Econ Up	Downstream of Iron Bridge Outfall: Econ Down	Downstream of Iron Bridge Outfall: Econ A	Iron Bridge Outfall (D001)
Total Ammonia	0.051 mg/L	0.055 mg/L	0.082 mg/L	0.041 mg/L
Total Kjeldahl Nitrogen	0.617 mg/L	0.655 mg/L	0.623 mg/L	0.765 mg/L
Nitrate/Nitrite	0.156 mg/L	0.194 mg/L	0.178 mg/L	1.091 mg/L
Total Nitrogen	0.763 mg/L	0.850 mg/L	0.800 mg/L	1.854 mg/L
Total Phosphorus	0.081 mg/L	0.086 mg/L	0.130 mg/L	0.207 mg/L
Carbonaceous Biochemical Oxygen Demand	< 2.0 mg/L	< 2.0 mg/L	< 2.0 mg/L	< 2.0 mg/L
pH	6.921	6.948	6.954	7.184
Dissolved Oxygen	5.049 mg/L	4.832 mg/L	4.923 mg/L	6.971 mg/L
Chlorophyll-a	0.861 mg/m3	1.074 mg/m3	0.801 mg/m3	N/A

* Average value of 12 monthly samples during 2022. Duplicate sample values were averaged and entered as a single data point for that monthly monitoring event. Average value of 365 dauly samples during 2022 for Outfall D001.

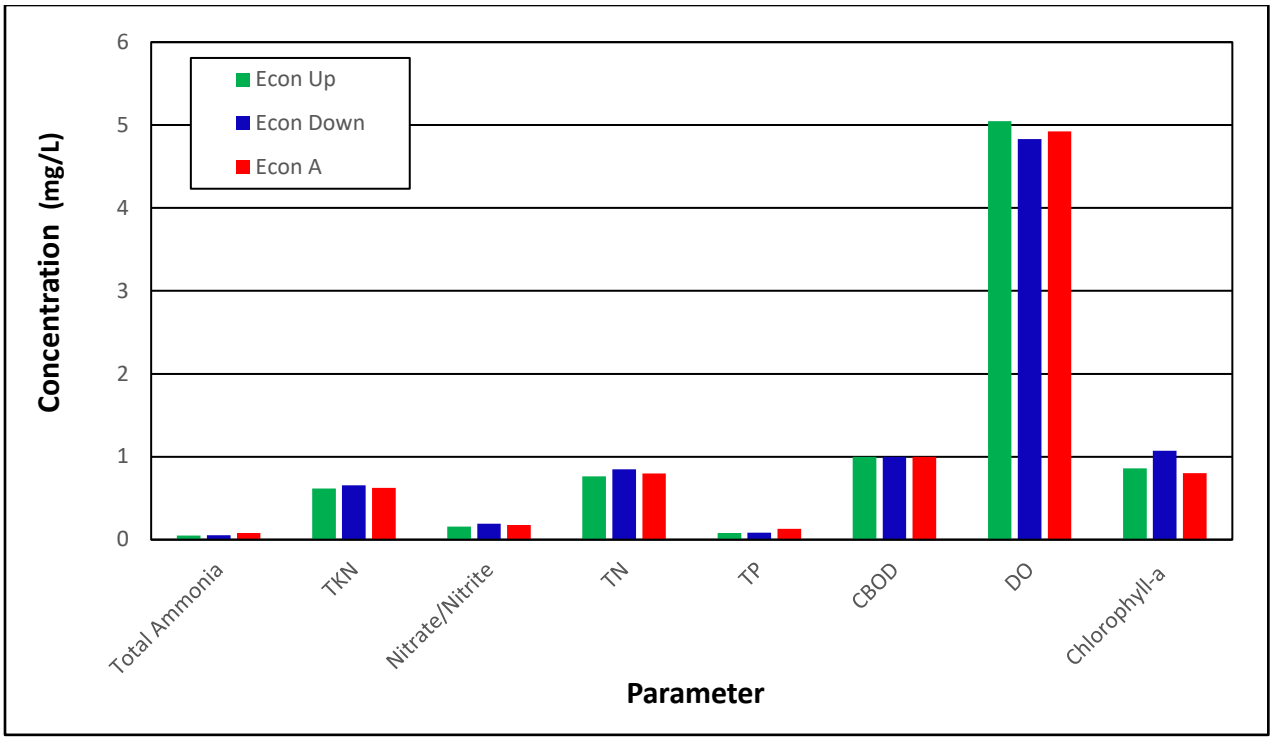

Figure 2-6 Comparison of Monthly Average Water Quality Parameters: Monitoring Stations along the Little Econlockhatchee River for 2022

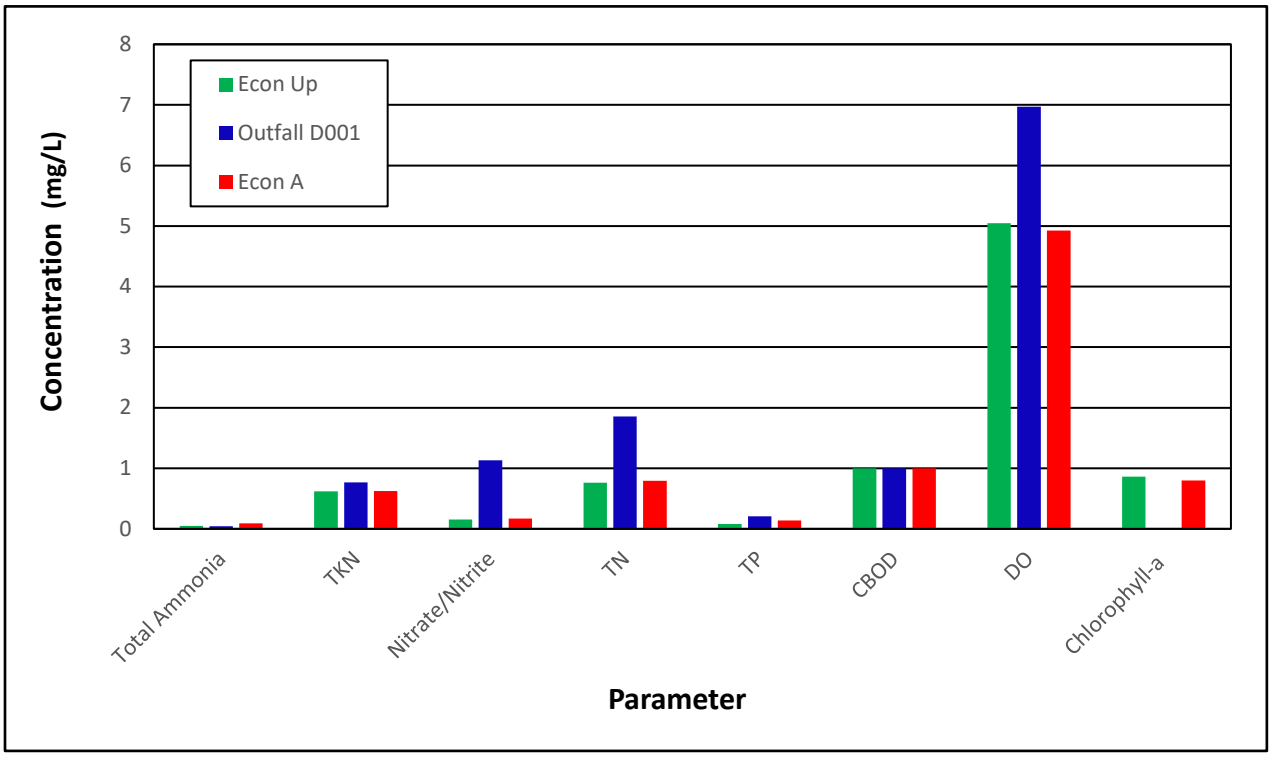

Figure 2-7 Comparison of Monthly Average Water Quality Parameters: Little Econlockhatchee River (Econ Up and Econ A) and Iron Bridge Outfall (D001) Flows for 2022

Table 2-4 Monthly Average Total Nitrogen (TN) Concentrations: Iron Bridge Outfall (D001) and Little Econlockhatchee River (Econ Up and Econ A)

Month (2022)	Outfall (D001)			Econ Up			Econ A		
	TN Conc. (mg/L)	Flow (MGD)	TN Loading (lbs/day)	TN Conc. (mg/L)	Flow (MGD)	TN Loading (lbs/day)	TN Conc. (mg/L)	Flow (MGD)	TN Loading (lbs/day)
January	2.02	1.28	21.3	0.74	42.9	265	0.75	42.9	268
February	1.19	1.32	13.2	0.68	30.8	175	0.70	30.8	180
March	1.60	1.60	21.7	0.73	72.5	442	0.77	72.5	466
April	1.83	1.75	27.0	0.71	91.8	544	0.76	91.8	582
May	1.82	1.73	26.2	0.67	43.2	241	0.71	43.2	256
June	1.57	1.94	25.8	0.66	66.5	366	0.61	66.5	338
July	1.70	1.90	27.2	0.71	103.4	612	0.72	103.4	621
August	1.84	2.02	31.3	0.66	100.3	552	0.68	100.3	569
September	2.44	3.45	75.5	0.88	427.2	3,135	0.83	427.2	2,957
October	2.55	4.23	101.6	0.89	366.2	2,718	1.00	366.2	3,054
November	2.25	4.42	85.6	0.74	224.5	1,385	1.04	224.5	1,947
December	1.45	2.73	33.7	1.21	81.9	826	1.04	81.9	710
Average	**1.86**	**2.36**	**40.8**	**0.77**	**137.6**	**938.4**	**0.80**	**137.6**	**995.7**

Table 2-5 Proportion of Monthly Average Total Nitrogen (TN) Loadings: Iron Bridge Outfall (D001) and Little Econlockhatchee River (Econ Up and Econ A)

Month (2022)	Outfall (D001)		Econ Up		Econ A	
	TN Loading (lbs/day)	Percent of Annual Loading (%)	TN Loading (lbs/day)	Percent of Econ Loading (%)	TN Loading (lbs/day)	Percent of Econ Loading (%)
January	21.3	4.35	265	8.04	268	7.93
February	13.2	2.69	175	7.53	180	7.32
March	21.7	4.42	442	4.90	466	4.65
April	27.0	5.51	544	4.96	582	4.63
May	26.2	5.34	241	10.84	256	10.23
June	25.8	5.26	366	7.03	338	7.61
July	27.2	5.55	612	4.44	621	4.38
August	31.3	6.39	552	5.67	569	5.50
September	75.5	15.41	3,135	2.41	2,957	2.55
October	101.6	20.73	2,718	3.74	3,054	3.33
November	85.6	17.48	1,385	6.18	1,947	4.40
December	33.7	6.88	826	4.07	710	4.74
Average	**40.8**	**8.33**	**938.4**	**5.82**	**995.7**	**5.61**

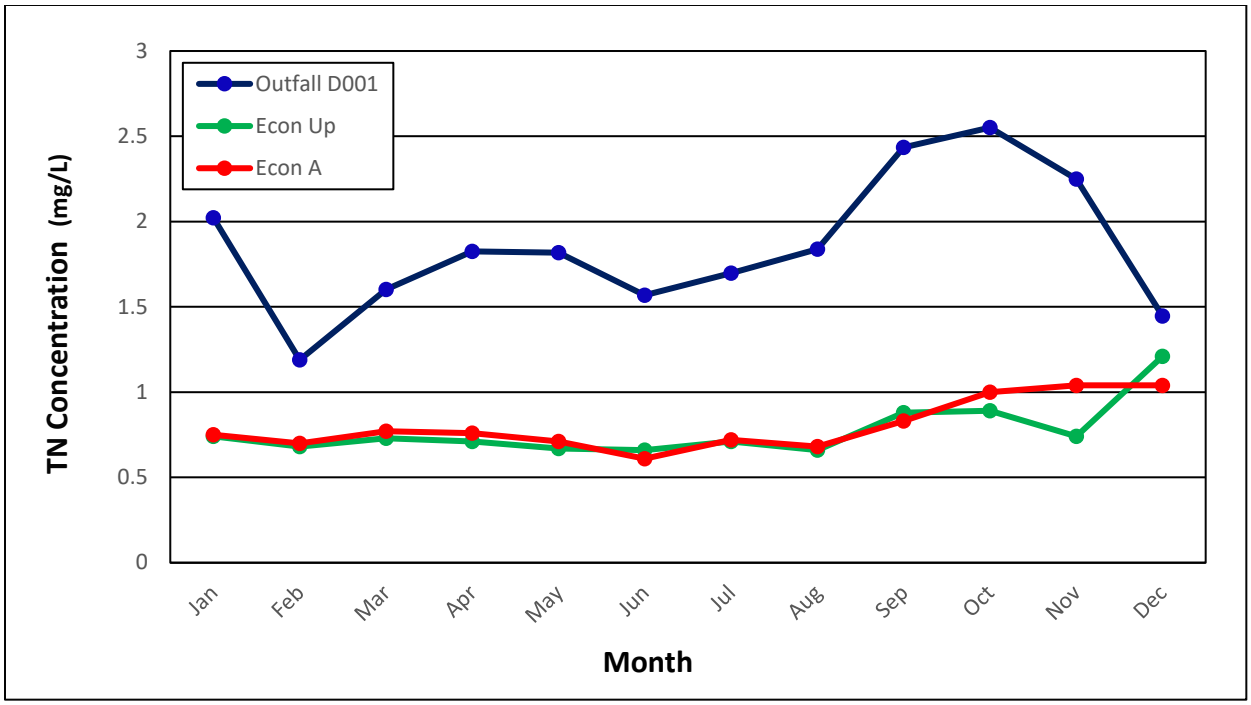

Figure 2-8 Monthly Average Total Nitrogen (TN) Concentrations: Little Econlockhatchee River (Econ Up and Econ A) and Iron Bridge Outfall (D001) Flows during 2022

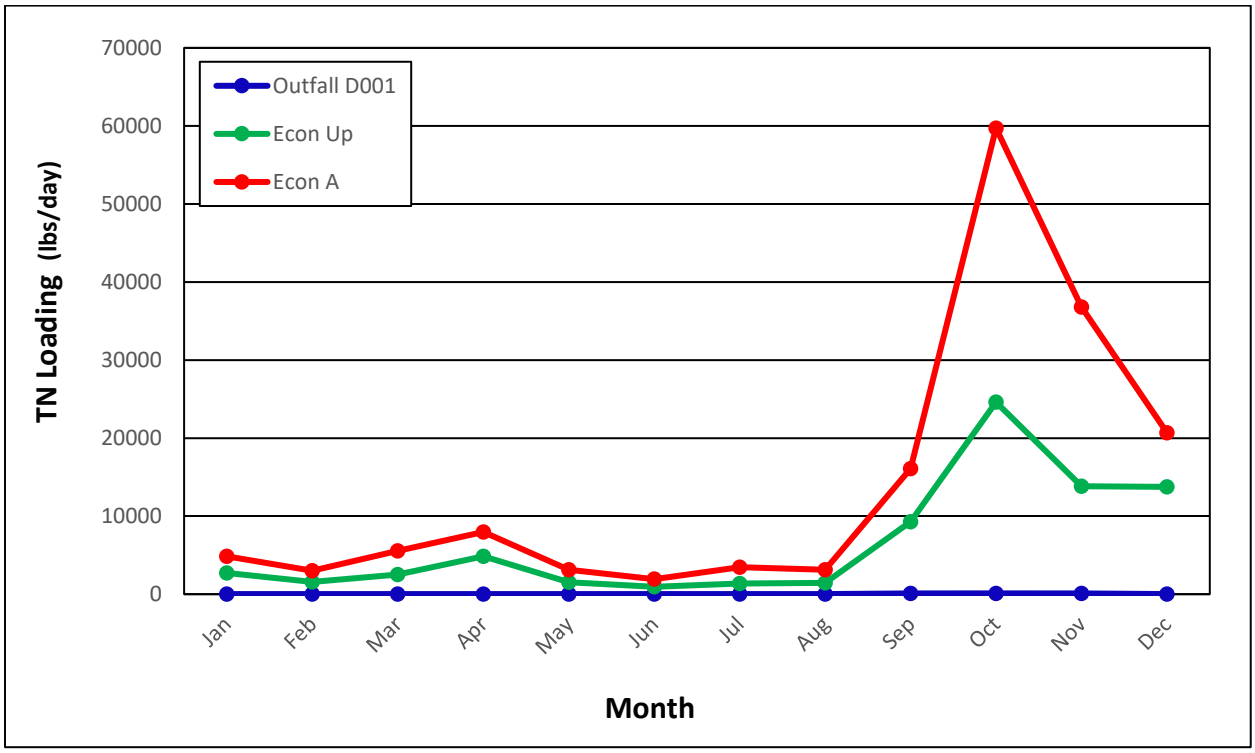

Figure 2-9 Monthly Average Total Nitrogen (TN) Loadings: Little Econlockhatchee River (Econ Up and Econ A) and Iron Bridge Outfall (D001) Flows during 2022

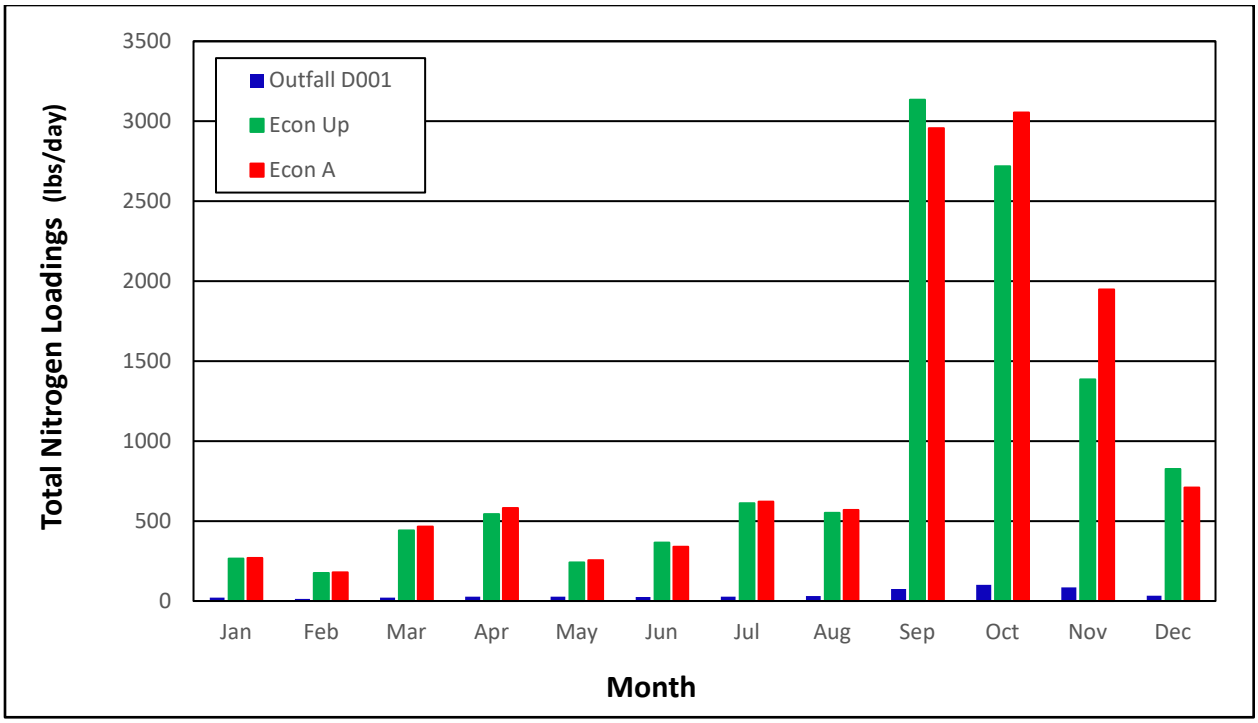

Figure 2-10 Comparison of Monthly Average Total Nitrogen (TN) Loadings: Little Econlockhatchee River (Econ Up and Econ A) and Discharges from Iron Bridge Outfall (D001) during 2022

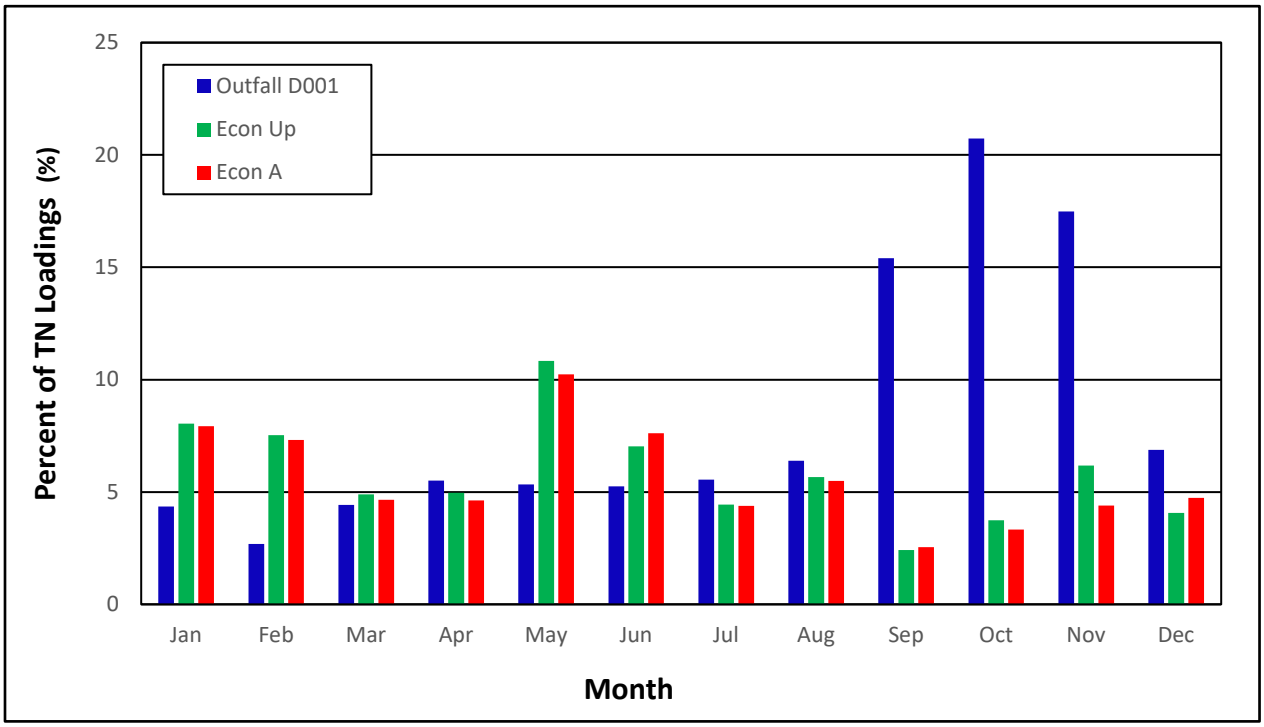

Figure 2-11 Proportion of Monthly Average Total Nitrogen (TN) Loadings: Iron Bridge Outfall (D001) Flows in Little Econlockhatchee River (Econ Up and Econ A) during 2022

Table 2-6 Monthly Average Total Phosphorus (TP) Loadings:
Iron Bridge Outfall (D001) and Little Econlockhatchee River (Econ Up and Econ A)

Month (2022)	Outfall (D001)			Econ Up			Econ A		
	TP (mg/L)	Flow (MGD)	TP Loading (lbs/day)	TP (mg/L)	Flow (MGD)	TP Loading (lbs/day)	TP (mg/L)	Flow (MGD)	TP Loading (lbs/day)
January	0.103	1.28	1.10	0.043	42.9	15.4	0.050	42.9	17.9
February	0.217	1.32	2.38	0.076	30.8	19.5	0.112	30.8	28.8
March	0.208	1.60	2.77	0.091	72.5	55.0	0.112	72.5	67.7
April	0.194	1.75	2.83	0.062	91.8	47.5	0.068	91.8	52.1
May	0.153	1.73	2.21	0.111	43.2	40.0	0.101	43.2	36.4
June	0.207	1.94	3.34	0.084	66.5	46.6	0.115	66.5	63.8
July	0.223	1.90	3.54	0.070	103.4	60.4	0.075	103.4	64.7
August	0.170	2.02	2.86	0.068	100.3	56.9	0.072	100.3	60.2
September	0.140	3.45	4.03	0.078	427.2	277.9	0.080	427.2	285.0
October	0.119	4.23	4.20	0.106	366.2	323.8	0.208	366.2	635.3
November	0.336	4.42	12.39	0.097	224.5	181.6	0.405	224.5	758.3
December	0.409	2.73	9.31	0.076	81.9	51.9	0.167	81.9	114.1
Average	**0.207**	**2.36**	**4.245**	**0.080**	**137.6**	**98.0**	**0.130**	**137.6**	**182.0**

Table 2-7 Comparison of Monthly Average Total Phosphorus (TP) Loadings:
Iron Bridge Outfall (D001) and Little Econlockhatchee River (Econ Up and Econ A)

Month (2022)	Outfall (D001)		Econ Up		Econ A	
	TP Loading (lbs/day)	Percent of Annual Loading (%)	TP Loading (lbs/day)	Percent of Econ Loading (%)	TP Loading (lbs/day)	Percent of Econ Loading (%)
January	1.10	2.16	15.4	7.15	17.9	6.15
February	2.38	4.67	19.5	12.19	28.8	8.27
March	2.77	5.44	55.0	5.03	67.7	4.09
April	2.83	5.55	47.5	5.96	52.1	5.43
May	2.21	4.33	40.0	5.52	36.4	6.07
June	3.34	6.56	46.6	7.17	63.8	5.24
July	3.54	6.95	60.4	5.86	64.7	5.47
August	2.86	5.62	56.9	5.03	60.2	4.75
September	4.03	7.91	277.9	1.45	285.0	1.41
October	4.20	8.24	323.8	1.30	635.3	0.66
November	12.39	24.31	181.6	6.82	758.3	1.63
December	9.31	18.27	51.9	17.94	114.1	8.16
Average	**4.25**	**8.33**	**98.04**	**6.79**	**182.0**	**4.78**

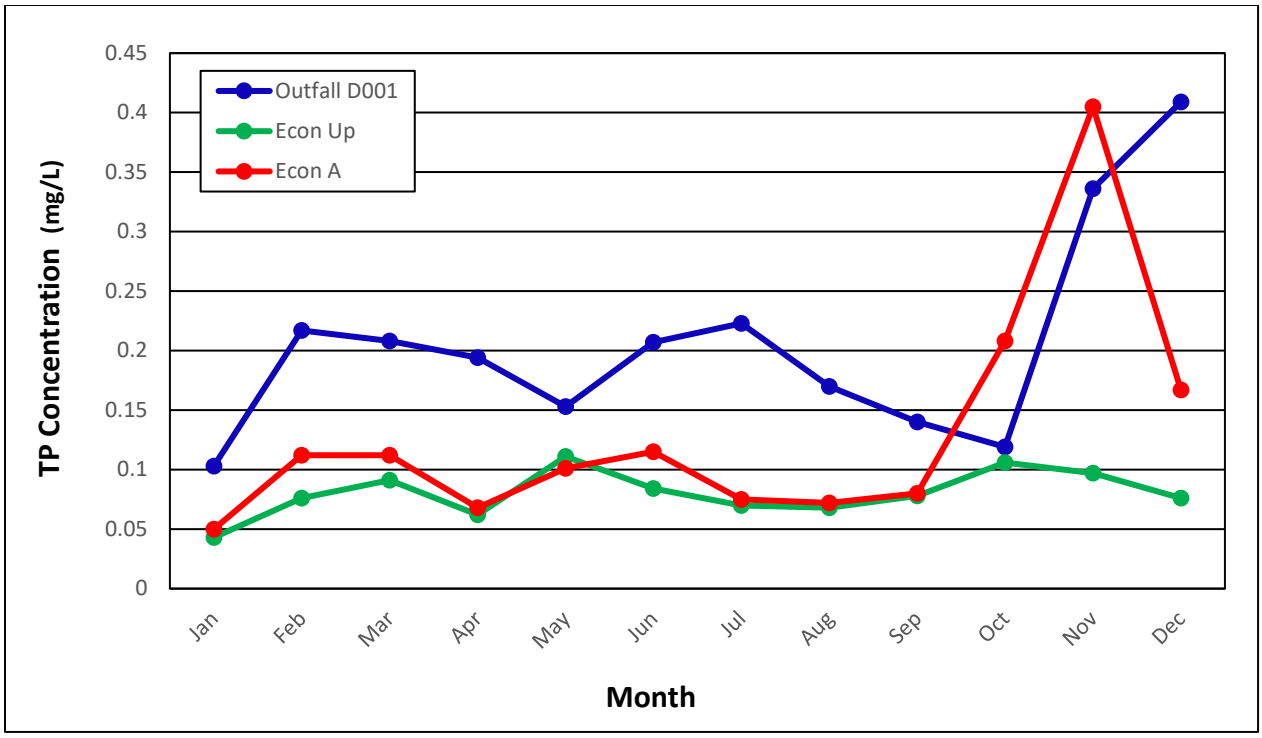

Figure 2-12 Monthly Average Total Phosphorus (TP) Concentrations: Little Econlockhatchee River (Econ Up and Econ A) and Iron Bridge Outfall (D001) Flows during 2022

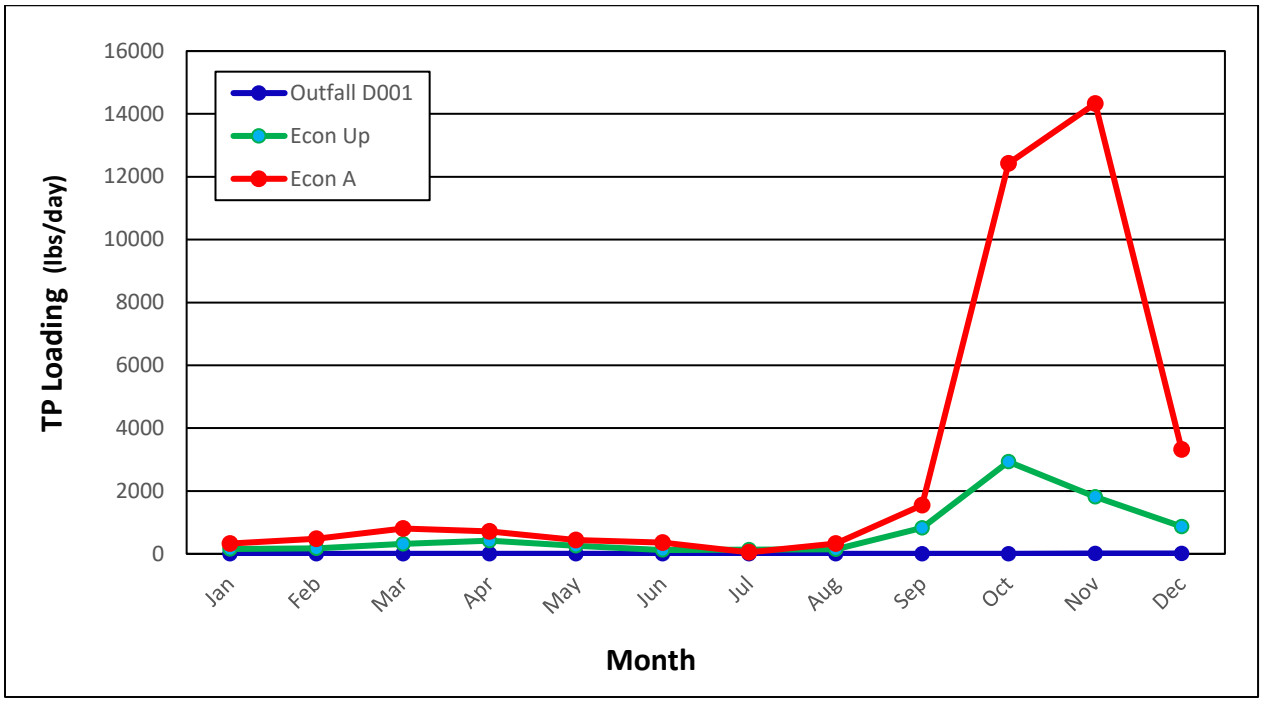

Figure 2-13 Monthly Average Total Phosphate (TP) Loadings: Little Econlockhatchee River (Econ Up and Econ A) and Iron Bridge Outfall (D001) Flows during 2022

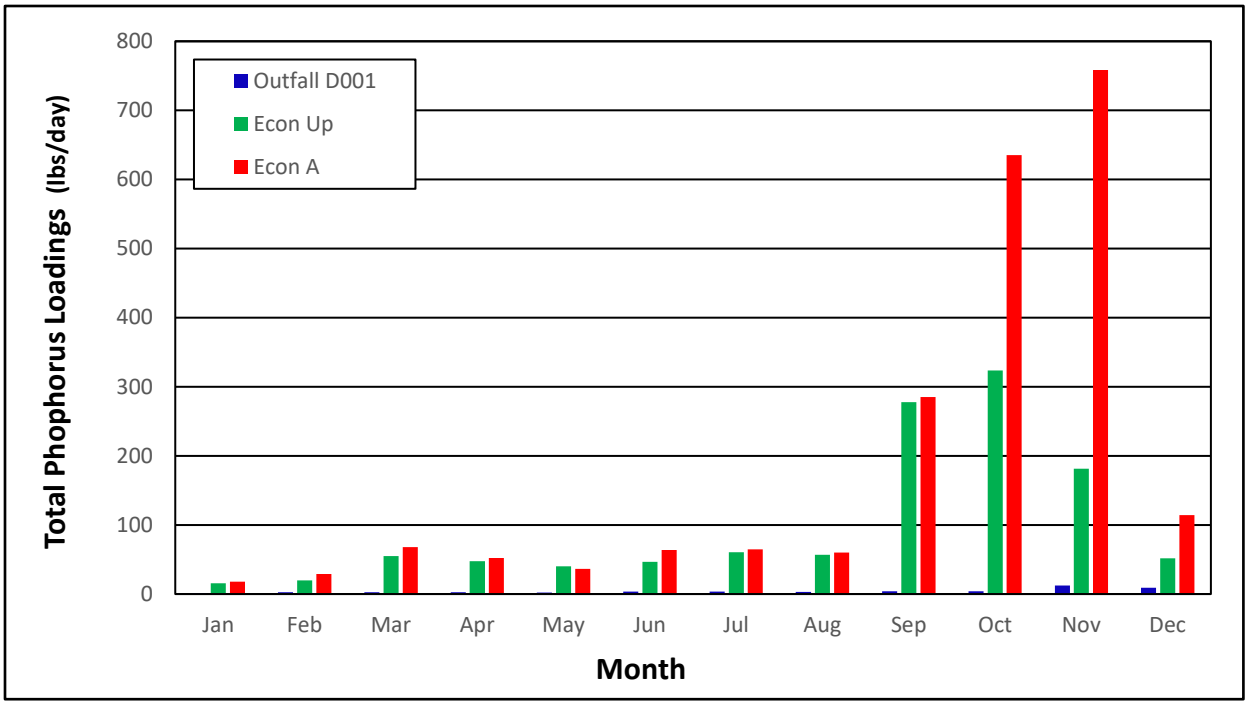

Figure 2-14 Comparison of Monthly Average Total Phosphorus (TP) Loadings: Little Econlockhatchee River (Econ Up and Econ A) and Iron Bridge Outfall (D001) during 2022

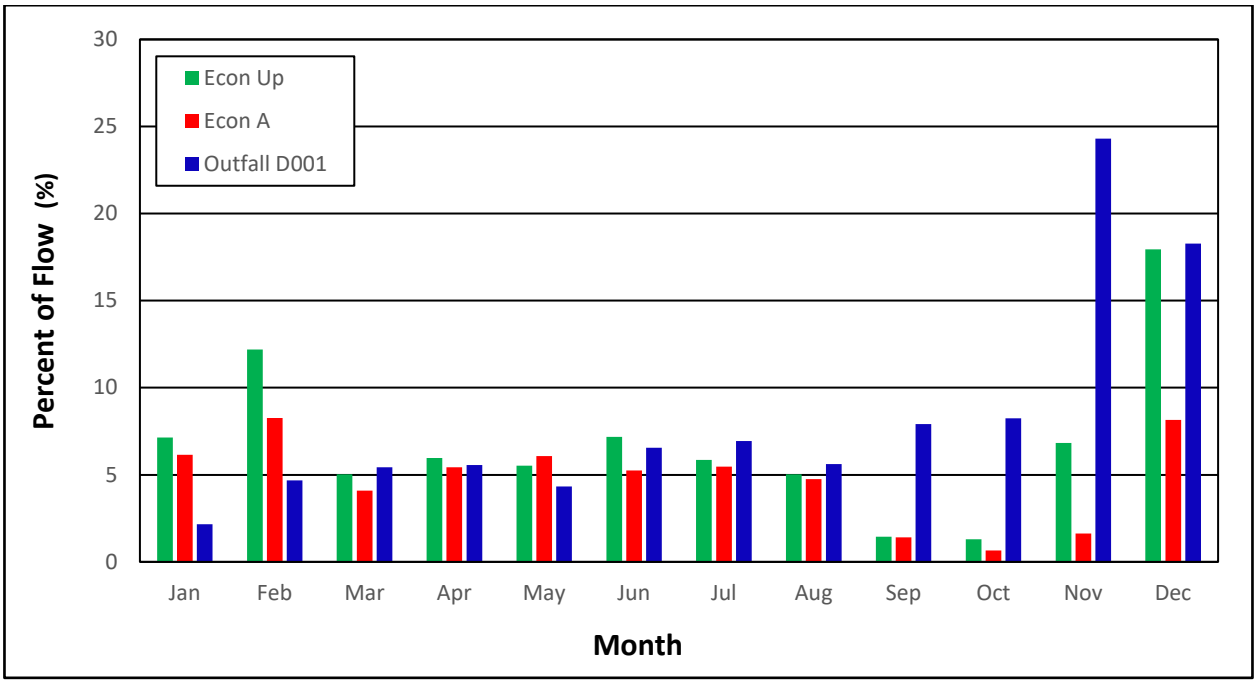

Figure 2-15 Proportion of Monthly Average Total Phosphorus (TP) Loadings: Iron Bridge Outfall (D001) Flows in Little Econlockhatchee River (Econ Up and Econ A) during 2022

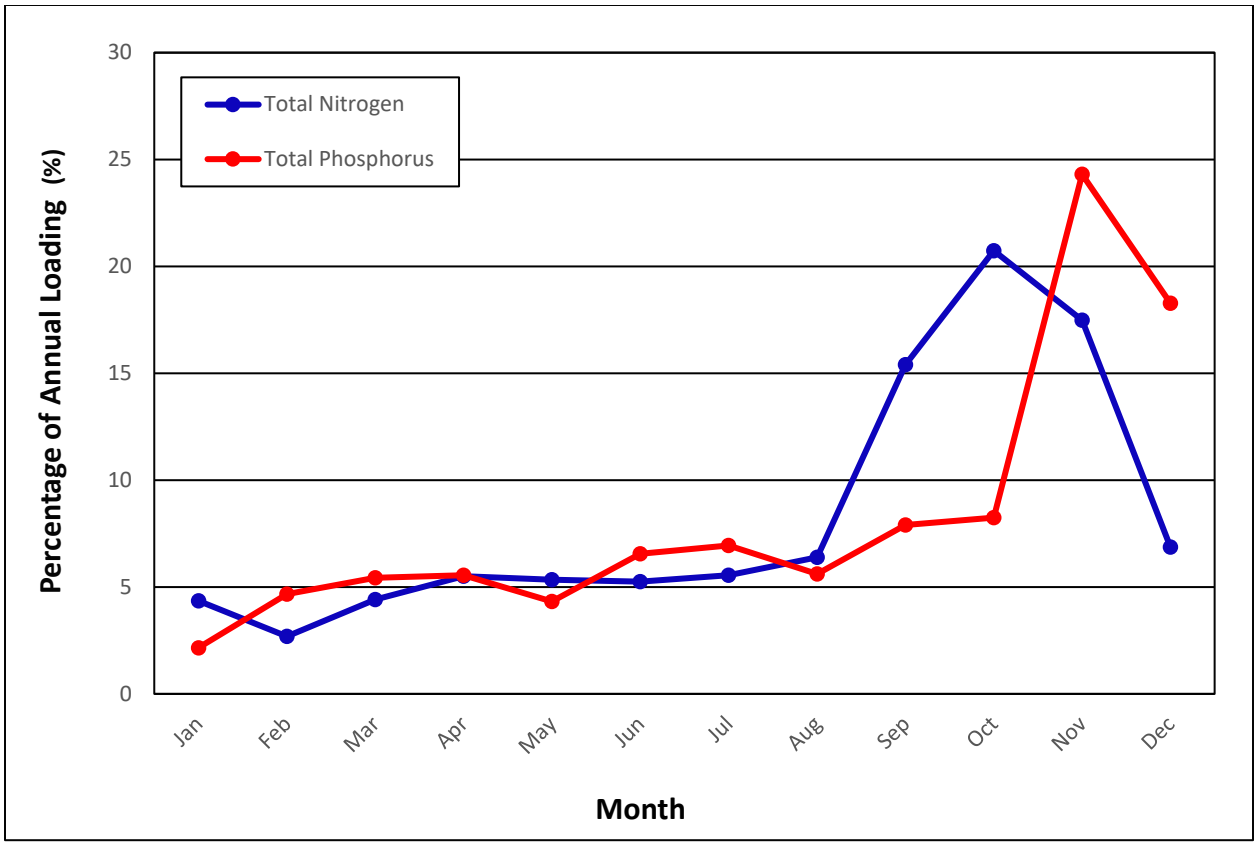

Figure 2-16 Percentage of Monthly Average Total Nitrogen (TN) and Total Phosphate (TP) Loadings as a Proportion of Overall Annual Nutrient Loadings: Iron Bridge Outfall D001 during 2022

Table 2-8 Annual Average Total Nitrogen (TN) Concentrations and Loadings: Iron Bridge Outfall (D001) and Little Econlockhatchee River (Econ Up and Econ A)

Year	Econ Up			Econ Down			Outfall (D001)		
	TN Conc. (mg/L)	Flow (MGD)	TN Loading (lbs/day)	TN Conc. (mg/L)	Flow (MGD)	TN Loading (lbs/day)	TN Conc. (mg/L)	Flow (MGD)	TN Loading (lbsday)
2002	1.04	104.5	903	1.12	104.5	976	1.46	9.68	117.9
2003	0.98	112.9	925	1.10	112.9	1,033	1.25	9.09	94.8
2004	0.92	119.0	915	1.08	119.0	1,076	1.41	8.40	98.8
2005	0.98	106.7	874	1.08	106.7	961	2.00	7.53	125.6
2006	0.74	44.6	277	0.97	44.6	363	1.79	8.05	120.2
2007	0.79	57.2	379	1.05	57.2	502	2.38	6.98	138.6
2008	1.05	94.4	828	1.28	94.4	1,004	2.41	7.22	145.1
2009	0.96	85.4	685	1.13	85.4	803	2.03	6.38	108.0
2010	0.94	68.4	535	1.07	68.4	612	2.06	5.41	93.0
2011	0.99	78.0	646	1.23	78.0	797	2.20	3.36	61.7
2012	0.88	56.4	412	1.07	56.4	503	1.92	3.46	55.4
2013	0.83	62.2	431	1.12	62.2	579	1.83	5.37	82.0
2014	0.85	88.8	628	0.93	88.8	688	1.49	6.00	74.6
2015	0.83	111.7	769	0.97	111.7	905	1.45	5.91	71.5
2016	0.78	87.9	573	0.89	87.9	651	1.74	6.27	91.0
2017	0.91	96.9	737	0.92	96.9	744	2.15	3.95	70.8
2018	0.83	74.2	511	0.99	74.2	611	2.12	3.32	58.7
2019	0.86	90.9	654	0.96	90.9	725	2.00	4.12	68.7
2020	0.72	91.3	550	0.93	91.3	710	2.08	3.77	65.3
2021	0.74	76.4	472	0.82	76.4	522	1.58	2.34	30.8
2022	0.77	137.6	939	0.88	137.6	1,010	1.85	2.36	40.8
Average	**0.88**	**87.9**	**649.7**	**1.03**	**87.9**	**751.2**	**1.87**	**5.67**	**86.4**

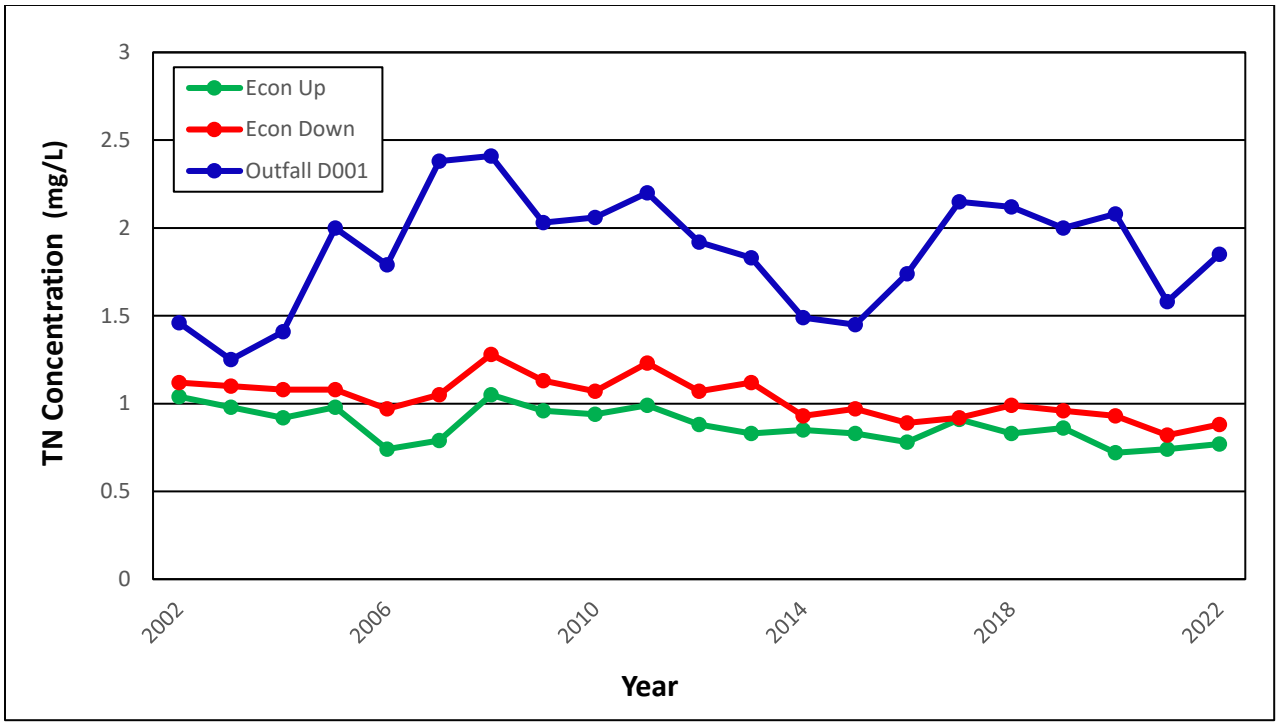

Figure 2-17 Annual Average Total Nitrogen (TN) Concentrations: Little Econlockhatchee River (Econ Up and Econ A) and Iron Bridge Outfall (D001)

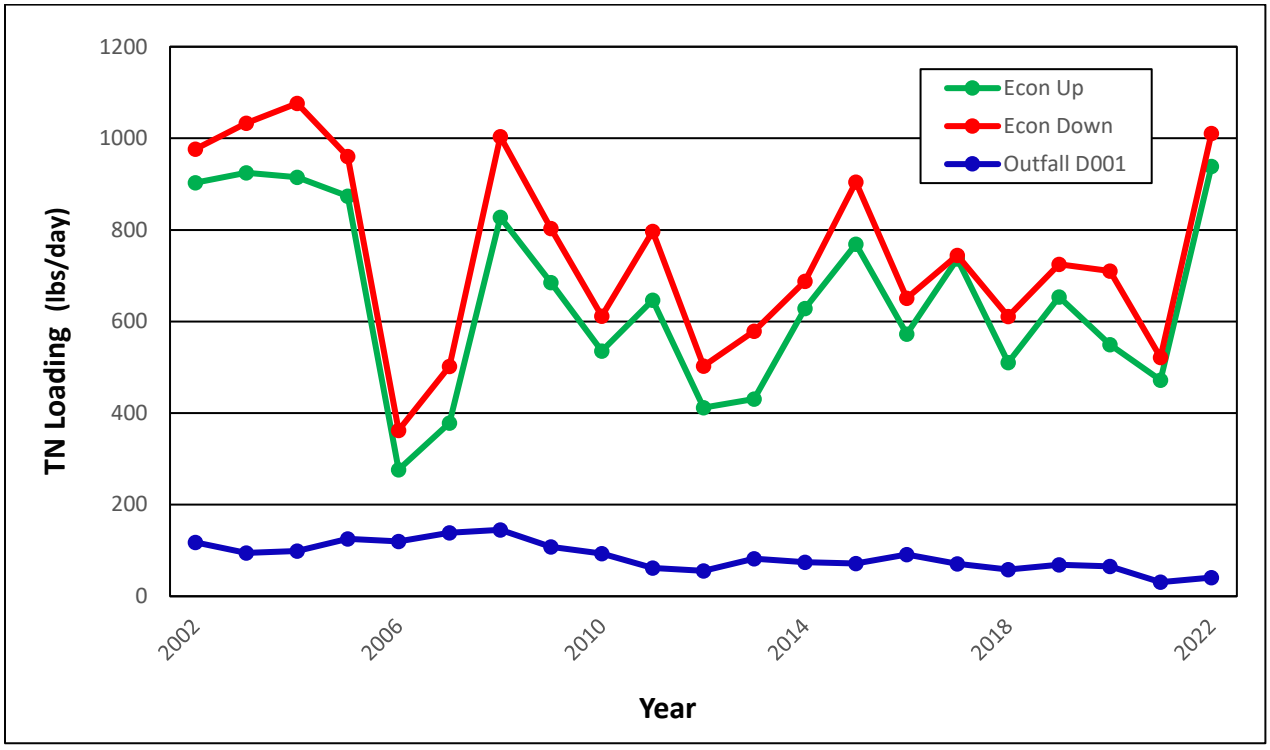

Figure 2-18 Annual Average Total Nitrogen (TN) Loadings: Little Econlockhatchee River (Econ Up and Econ A) and Iron Bridge Outfall (D001)

Table 2-9 Annual Average Total Phosphorus (TP) Concentrations and Loadings: Iron Bridge Outfall (D001) and Little Econlockhatchee River (Econ Up and Econ A)

Year	Econ Up			Econ Down			Outfall (D001)		
	TP Conc. (mg/L)	Flow (MGD)	TP Loading (lbs/day)	TP Conc. (mg/L)	Flow (MGD)	TP Loading (lbs/day)	TP Conc. (mg/L)	Flow (MGD)	TP Loading (lbs/day)
2002	0.09	104.5	82.1	0.11	104.5	95.8	0.236	9.68	19.05
2003	0.09	112.9	80.3	0.10	112.9	94.5	0.203	9.09	15.39
2004	0.10	119.0	94.8	0.15	119.0	151.2	0.247	8.40	17.30
2005	0.11	106.7	100.2	0.14	106.7	128.1	0.409	7.53	25.69
2006	0.08	44.6	29.1	0.13	44.6	49.6	0.337	8.05	22.63
2007	0.08	57.2	39.5	0.14	57.2	65.5	0.276	6.98	16.07
2008	0.08	94.4	62.5	0.11	94.4	83.5	0.215	7.22	12.95
2009	0.07	85.4	51.9	0.09	85.4	66.1	0.155	6.38	8.25
2010	0.07	68.4	38.7	0.09	68.4	51.2	0.143	5.41	6.45
2011	0.07	78.0	46.3	0.09	78.0	55.8	0.160	3.36	4.48
2012	0.08	56.4	35.8	0.09	56.4	40.4	0.192	3.46	5.54
2013	0.08	62.2	41.4	0.10	62.2	52.2	0.289	5.37	12.94
2014	0.08	88.8	55.8	0.12	88.8	86.0	0.466	6.00	23.32
2015	0.06	111.7	60.2	0.09	111.7	82.8	0.240	5.91	11.83
2016	0.07	87.9	49.6	0.10	87.9	71.2	0.285	6.27	14.90
2017	0.10	96.9	77.3	0.08	96.9	67.2	0.145	3.95	4.78
2018	0.09	74.2	53.5	0.08	74.2	48.6	0.147	3.32	4.07
2019	0.08	90.9	60.2	0.09	90.9	65.3	0.299	4.12	10.27
2020	0.07	91.3	51.7	0.08	91.3	62.5	0.201	3.77	6.31
2021	0.07	76.4	45.3	0.08	76.4	52.8	0.213	2.34	4.16
2022	0.08	137.6	98.0	0.09	137.6	103.3	0.207	2.36	4.25
Average	**0.08**	**87.9**	**59.7**	**0.10**	**87.9**	**74.9**	**0.241**	**5.67**	**11.94**

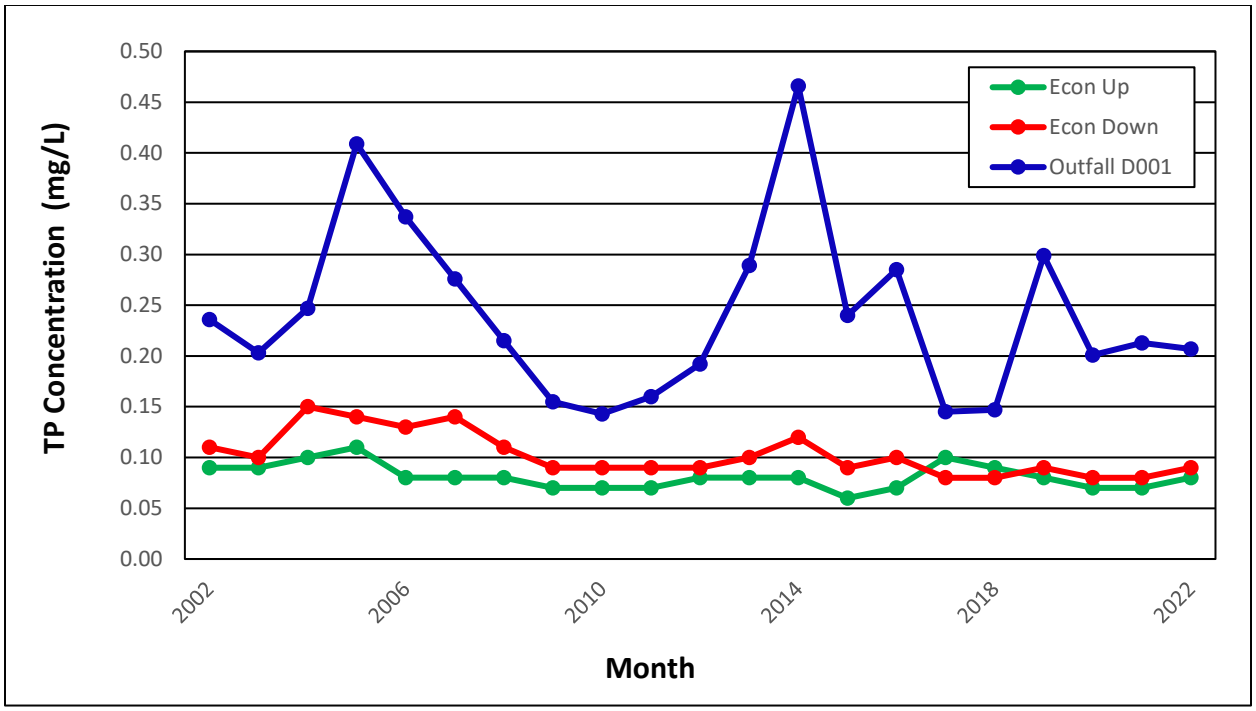

Figure 2-19 Annual Average Total Phosphorus (TP) Concentrations: Little Econlockhatchee River (Econ Up and Econ A) and Iron Bridge Outfall (D001)

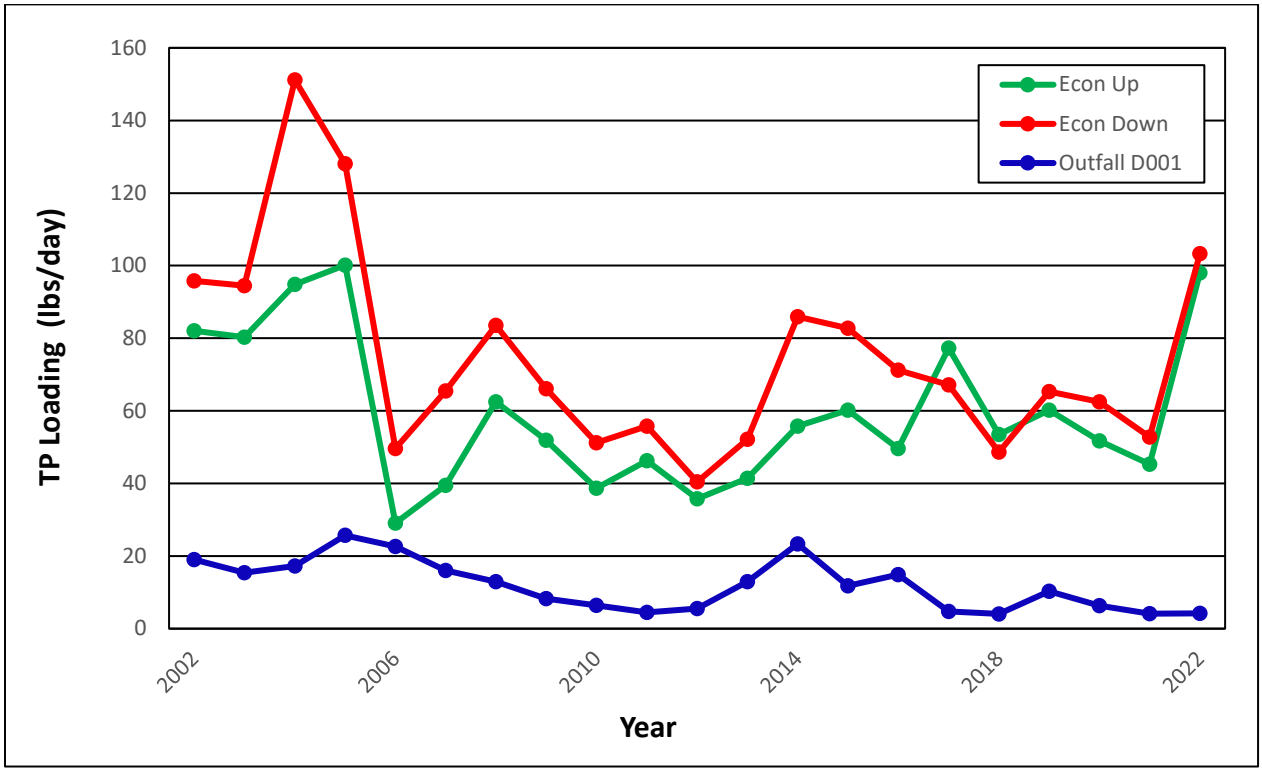

Figure 2-20 Annual Average Total Phosphate (TP) Loadings: Little Econlockhatchee River (Econ Up and Econ A) and Iron Bridge Outfall (D001)

Chapter 3
Orlando Easterly Wetlands and St. Johns River

3.1 Orlando Easterly Wetlands Overview

The wetlands pump station at Iron Bridge provides the influent flows to the OEW, which is designated as R001 in the facility permit (FL 037966). The wetlands pump station conveys the reclaimed water through a 16 mile, 48 inch diameter, concrete transmission pipeline to the OEW. Both the pump station discharges and OEW influent flows are monitored continuously.

During 2022, the average monthly influent flows ranged from 12.3 MGD to 30.39 MGD with an average of 19.69 MGD and a maximum day flow of 40.74 MGD. The average monthly and maximum day influent flows are summarized in Table 3-1 and Figure 3-2.

The annual average influent flows have fluctuated between 12.17 MGD and 19.69 MGD with an average of 14.8 MGD since inception of operations in September 1988. The annual average and maximum day influent flows are found in Table 3-2 and Figure 3-3. The annual average influent flow remains about 47% of permit capacity (35 MGD), except for 2022, which was 20% higher than in 2021. The monthly and annual average percentages are illustrated in Figure 3-4 and Figure 3-5, respectively.

Monitoring locations were defined in the Iron Bridge facility permit to determine the flows and nutrient loadings created by the discharges from Outfall D001 into the Little Econlockhatchee River, and likewise, for the discharges from the OEW through Outfall D002 and Outfall D003 into an un-named ditch flowing into the St. Johns River. Both the effluent flows and specific constituent concentrations are monitored at these discharge points on a monthly basis. Compliance monitoring is conducted in accordance with the requirements set forth in the Iron Bridge facility permit.

The effluent flows are continuously measured at Outfall D002 and Outfall D003, when in operation, with an ultrasonic open channel meter, American Sigma Model 980. The flows are documented with a circular chart recorder, Honeywell Model DR 4300. One of the 4-20 mA outputs can be used to drive other monitoring devices, such as a pH probe or an automatic sampler.

The monitoring stations for these sites consist of two automatic composite samplers, both units are an ISCO Model 3710FR. One sampler collects samples on a flow proportional basis. The other sampler operates on a timed interval in the event that the flow signal is lost and prevents the retrieval of flow proportional aliquots. The flow proportional composite sampler is designated for compliance purposes and the time proportional being reserved as a back-up composite sampler in the event that the primary flow proportional composite sampler should fail.

The average flow for the OEW was 22.38 MGD with a maximum day discharge of 63.38 MGD during Hurricane Ian and an average of 34.13 MGD. Outfall D003 operated periodically during 2022. The average annual discharge for the OEW has been 17.16 MGD since 1988 with an average maximum month of 30.06 MGD. The average monthly and maximum day flows for the OEW are found in Table 3-3 and shown in Figure 3- 6 with the annual average and maximum month flows in Table 3-4 and Figure 3-7.

Historically, the wetland treatment system has minimally impacted the volume of total flows for the St. Johns River since start-up in September 1988. The average annual flows from the wetlands (D002 and D003) have accounted for 2.42% and 1.60% of the total flow for the St. Johns River as measured at the USGS Gauging Station at S.R. 50 (SJR-1) and S.R. 46 (SJR-5), respectively, since operations began in 1988.

During 2022, the average annual discharge was 22.39 MGD for the OEW compared to an average annual flow of 922 MGD for the St. Johns River at Station SJR-1 and 1,797 MGD at Station SJR-5. The proportion of flow from the OEW ranged from 0.90% in October to 10.68% in June with an annual average of 4.82% at Station SJR-1 and from 0.42% in October to 4.87% in June with an annual average of 2.36% at Station SJR-5, which is located downstream of the discharge point into the St. Johns River. The proportion of the flow was 42.1% lower at both USGS Stations in 2022 as compared to 2021 due to the two hurricanes in Fall 2022. The proportion of the OEW average monthly flows for these sites is shown in Figure 3-10 and Figure 3-14. The proportion of the OEW annual average flows is found in Figure 3-11 and Figure 3-15.

3.2 St. Johns River Overview

The City of Orlando (City) samples the St. Johns River monitoring sites upstream and downstream of the OEW monthly. One station located upstream of the OEW is located at State Road 50 near Christmas, Florida, designated as USGS Station 02232500, and identified as SJR-1 for the City monitoring program. The station is approximately 3.9 miles south of the confluence of the OEW discharge canal and St. Johns River. The other station is situated downstream of the OEW at State Road 46 near Geneva, Florida, designated as USGS Station 02234000, and identified as SJR-5 for the City monitoring program. This station is upstream of Lake Harney and is approximately 9.2 miles north of the OEW discharge canal exit into the St. Johns River. A map of these sampling sites and OEW are depicted in Figure 3-1. River discharge and gage heights are collected daily at both USGS stations. Samples are collected monthly by the City to determine water quality data. The results for 2022 are summarized in Appendix A and B, respectively.

The average monthly flows at Station SJR-1 ranged from 172.7 MGD in June to 3,315 MGD in October with an annual average flow of 922 MGD in 2022. The annual average flows varied from 271 MGD in 2000 to 1,483 in 2005 with an average of 823 MGD. The average monthly flows and gage heights for this monitoring station are summarized in Table 3-5 and shown in Figure 3-8. The annual average flows are presented in Table 3-6 and Figure 3-9.

The average monthly flows at Station SJR-5 ranged from 378 MGD in June to 7,161 MGD in October with an annual average flow of 1,797 MGD in 2022. The annual average flows varied from 336 MGD in 2000 to 1,957 in 2005 with an average of 1,230 MGD. The average monthly

flows and gage heights for this monitoring station are summarized in Table 3-7 and shown in Figure 3-12. The annual average flows are presented in Table 3-8 and Figure 3-13.

Higher flows and gage heights were realized during 2022 in the St. Johns River in comparison to 2021 due to the two hurricane events.

Maximum average monthly flows at these two monitoring stations typically occur in October due to hurricane events with existing high water levels. Maximum daily flows for SJR-1 and SJR-5 were 7,497 MGD on October 11-13, 1953, and 9,630 MGD on October 2, 2022, respectively. Maximum monthly flows were 6,547 MGD in October 1953 for SJR-1 and 7,161 MGD in October 2022 for SJR-5. October has the highest monthly and average flows at both monitoring stations. The proportion of the OEW flows at SJR-1 are illustrated in Figure 3-10 and Figure 3-11, and for SJR-5 in Figure 3-14 and Figure 3-15.

By comparison, the 2021 OEW average annual discharge was 19.91 MGD while SJR1 had an annual average flow of 588 MGD and at SJR-5, an annual average of 925 MGD, which was 3.39% and 2.15% of the total river flow, respectively.

3.3 Numeric Nutrient Criteria Standards

In August 2021, upon the request and approval of FDEP, three additional sampling locations were added in the un-named ditch and discharge channel to meet the Numeric Nutrient Criteria (NNC) Standards: NNC Up, NNC Near Field and NNC Far Field (Figure 3-1). NNC Up is approximately 50 ft. upstream of D003. Both NNC Up and NNC Near Field are located on the channelized un-named ditch prior to a final weir control for the discharge channel to the St. Johns River. NNC Far Field is located approximately 70 ft from the exit point of the discharge channel.

The purpose of the quarterly sampling events at these locations was to assist in the NNC Habitat Assessment for early 2022. NNC sampling events at these locations were expected to be conducted quarterly during 2022. A summary of the results is presented in Table 3-21 and Appendix D, and illustrated in Figure 3-39.

The average water quality was similar at the three NNC monitoring stations along the un-named ditch and discharge channel to the St. Johns River. The average total nitrogen (TN) and total phosphorus (TP) decreased downstream, except for total phosphorus at the control weir, which was slightly higher than at the NNC Up monitoring station. Dissolved oxygen (DO) significantly improved as the flow traveled downstream and was highest at the control weir before going into the St. Johns River.

Generally, total nitrogen (TN) and total phosphorus (TP) loadings decreased each quarter from the NNC Up monitoring station near Outfall D003 to NNC Far monitoring station near the control weir. Elevated nutrient loadings were observed in the 3rd and 4th quarters due to the wet season and two hurricane events. The loadings were significantly higher in the 4th quarter due to Hurricanes Ian and Nicole. The nutrient loadings are summarized in Table 3-22 and Table 3-23, and shown in Figure 3-40 through Figure 3-43.

3.4 Nutrient Loadings

During 2022, the Orlando Easterly Wetlands effluent had an annual average concentration of 0.604 mg/L of total nitrogen (TN), and 0.046 mg/L of total phosphorus (TP). The total nitrogen (TN) and total phosphorus (TP) concentrations are summarized for the St. Johns River monitoring stations (SJR-1 and SJR-5) and OEW discharges in Table 3-11 and Table 3-13, and illustrated in Figures 3-17, 3-18, 3-21, and 3-22. The average water quality parameters for upstream and downstream river monitoring stations and discharges from Outfall D002 are found in Table 3-10 and Figure 3-17.

The nutrient loadings for the OEW are compared to the nutrient loadings in the flows at the two St. Johns River monitoring stations (SJR-1 and SJR-5) upstream and downstream of the discharge point in Table 3-11 and Table 3-13, and shown in Figures 3-18 and 3-20. The percentages of nutrient loadings for the OEW discharges are found in the previous tables and presented in Figures 3-19 and 3-20 for total nitrogen (TN), and in Figures 3-23 and 3-24 for total phosphorus (TP).

The annual average nutrient concentrations for the OEW are listed in Table 3-14 and Appendix D, and depicted in Figures 3-25 and 3-26. A comparison with the total nitrogen (TN) levels at the two St. Johns River monitoring stations (SJR-1 and SJR-5) is presented in Table 3-15 and Figure 3-27, and are compared in Figure 3-28. The total phosphorus (TP) annual average loadings are presented in Table 3-16 and Figure 3-29, and are compared in Figure 3-30. As can be seen, the contributions from the wetland treatment system are relatively insignificant in comparison with the loadings typically observed in the daily flows of the St. Johns River.

The proportion of the Wasteload Allocation of the monthly nutrient loadings for the OEW are in Table 3-17 and as an annual average in Table 3-18. These percentages are shown graphically in Figure 3-31 and Figure 3-32. As can be seen, the percentages of the loadings are less than 3%.

3.5 Combined Annual Average Nutrient Loadings

The FDEP facility permit specifies limitations on the discharges to the Little Econlockhatchee River, Orlando Easterly Wetlands, and un-named ditch flowing into the St. Johns River. These limitations and monitoring locations were described in the Introduction and summarized on Page 4. The annual average concentrations of total nitrogen (TN) and phosphorus (TP) shall not exceed 2.31 mg/L and 0.20 mg/L, respectively, regardless of the flows from the OEW to the un-named ditch.

The waste load allocation determined the nutrient contributions (loadings) from all three permitted discharge points (D001, D002, and D003) into the Lake Harney basin within the St. Johns River watershed and quantified the combined annual average nutrient loadings for the Iron Bridge facility. The combined annual average nutrient loadings for total nitrogen (TN) and total phosphorus (TP) cannot exceed 780 lbs/day and 220 lbs/day, respectively, for the Iron Bridge facility. A portion of the overall waste load allocation was designated for the wetland treatment system. Total nitrogen (TN) and total phosphorus (TP) loadings are restricted to 385 lbs/day and 33 lbs/day, respectively, in the discharges from D002 and D003 to the un-named ditch.

During 2022, the discharge for Outfall D001 was 2.35 MGD with annual average TN and TP concentrations of 1.854 mg/L and 0.207 mg/L, respectively. The OEW discharged 22.38 MGD with annual average TN and TP concentrations of 0.604 mg/L and 0.046 mg/L, respectively. The higher annual average flows were the direct result of two hurricanes in Fall 2022. The annual average TN and TP concentrations complied with the limits set forth in the FDEP facility permit for Iron Bridge.

By comparison, in 2021, Iron Bridge discharge (D001) was 2.70 MGD with annual average TN and TP concentrations of 1.58 mg/L and 0.213 mg/L, respectively. The OEW discharged 19.91 MGD with annual average TN and TP concentrations of 0.62 mg/L and 0.037 mg/L, respectively.

The annual average TN and TP concentrations in the OEW discharge (D002 and D003) are presented in Table 3-13, and Figures 3-24, 3-25, and 3-26. The TN and TP concentrations have remained low and relatively consistent since 2009 with a slight dip in TN levels since 2018.

The combined annual average flows in 2022 were 24.74 MGD from Iron Bridge (Outfall D001) and influent flows for the OEW, which was 39.27% of the permitted total discharge capacity of 63 MGD. The combined flow in 2021 was 22.61 MGD, which was 35.9% of the permitted total discharge capacity and 8.61% less than the permitted flows for 2022.

The combined annual average total nitrogen (TN) loadings were 152.03 lbs/day, and 12.22 lbs/day for total phosphorus (TP) loadings, which was 19.49% and 5.55%, respectively, of the allowable permit limits. The combined annual average loadings for 2022 were significantly below the allowable permit limits of 780 lbs/day and 220 lbs/day, respectively.

For the OEW discharges, the annual average total nitrogen (TN) loadings were 111.22 lbs/day, which was 28.89%, and 7.97 lbs/day for total phosphorus (TP) loadings, which was 24.16% and 28.89%, respectively, of the wasteload allocation of 385 lbs/day and 33 lbs/day, respectively, for the wetland treatment system. The results are presented in Table 3-19 and Figure 3-33 for the OEW discharges, and Figure 3-34 for the three discharges (D001, D002, and D003) to the St. Johns River watershed.

By comparison in 2021, the combined annual average loadings for TN and TP were 17.76% and 4.98%, respectively, of the allowable permit limits. For the OEW, the nutrient loadings were 26.74% and 18.60%, respectively, for total nitrogen and phosphorus.

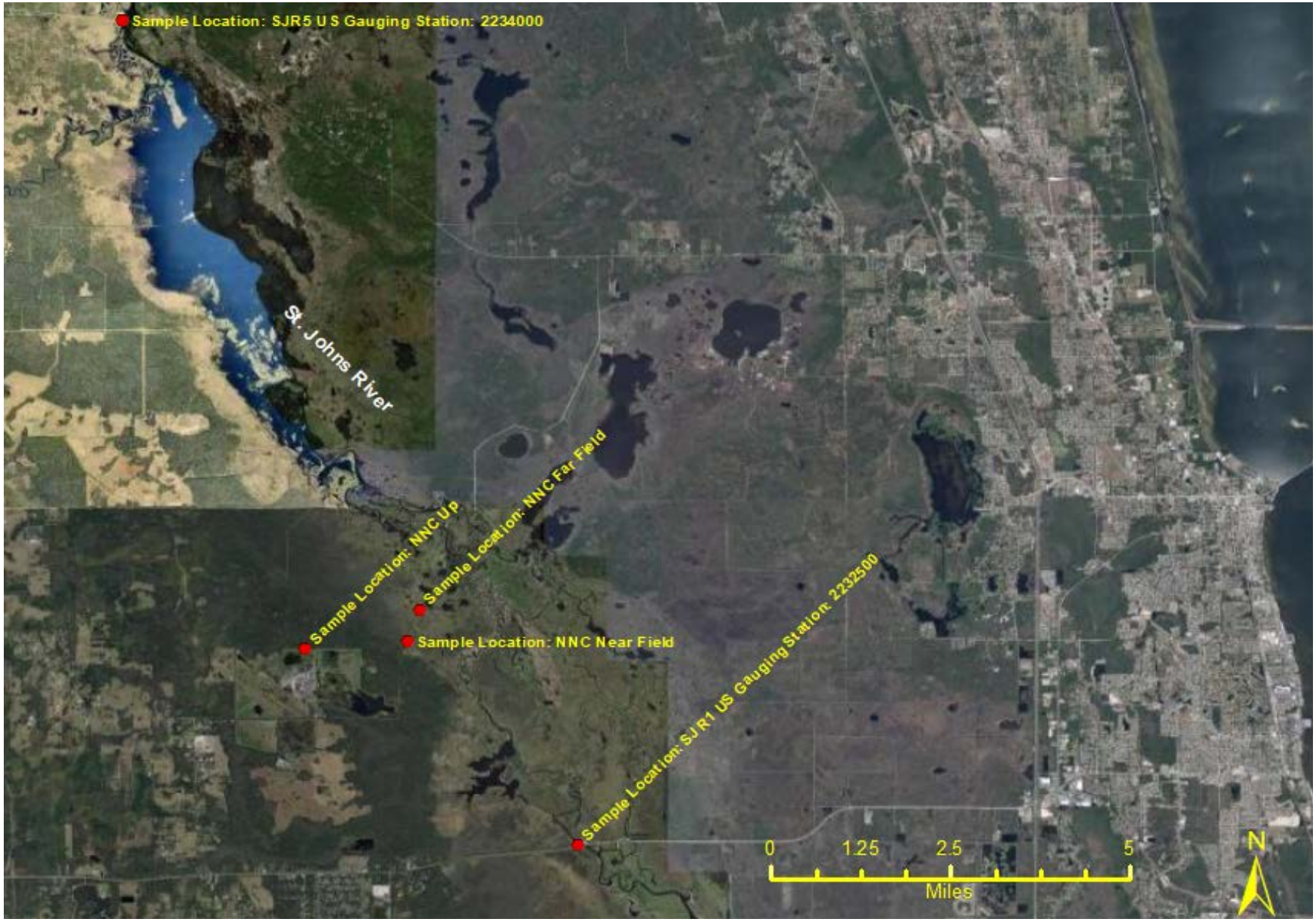

Figure 3-1 Locations of Water Quality Monitoring Stations for Un-Named Ditch and St. Johns River

Table 3-1 Monthly Average Influent Flows (R001) for OEW in 2022

Month (2022)	Influent Flow (MGD)	Maximum Day Flow (MGD)	Percent of Permit Limit (%)
January	16.61	18.19	47.46
February	15.57	17.74	44.49
March	18.47	23.51	52.77
April	20.40	27.26	58.29
May	12.31	19.57	35.17
June	13.39	16.46	38.26
July	16.98	21.54	48.51
August	17.75	25.60	50.71
September	26.15	36.31	74.71
October	30.02	37.60	85.77
November	30.39	40.74	86.83
December	18.26	23.97	52.17
Average	**19.692**	**25.708**	**56.262**

* Flow rates are from Iron Bridge monthly Discharge Monitoring Reports and SCADA database. Hurricane Ian occurred on September 29, 2022 and Hurricane Nicole on November 10, 2022.

Table 3-2 Annual Average Influent Flows (R001) for OEW

Year	Influent Flows (MGD)	Maximum Monthly ADF (MGD)	Percent of Permit Limit (%)
1988	9.98	- - - - -	49.90
1989	13.33	- - - - -	66.65
1990	13.28	- - - - -	66.40
1991	12.90	- - - - -	64.50
1992	12.77	12.98	63.85
1993	12.63	12.99	63.15
1994	12.42	13.02	62.10
1995	15.12	15.94	75.60
1996	15.68	16.43	78.40
1997	15.22	17.99	76.10
1998	14.22	17.46	71.10
1999	17.20	20.29	86.00
2000	17.45	19.77	87.25
2001	17.86	20.22	51.03
2002	16.59	21.37	47.40
2003	17.36	21.75	49.60
2004	17.20	23.54	49.14
2005	18.27	23.02	52.20
2006	12.68	18.08	36.23
2007	12.33	14.90	35.23
2008	12.17	20.32	34.77
2009	14.14	18.21	40.40
2010	15.29	18.91	43.69
2011	15.17	19.39	43.34
2012	14.33	19.00	40.94
2013	14.16	20.32	40.46
2014	14.32	17.87	40.91
2015	11.80	17.86	33.71
2016	12.95	17.41	37.00
2017	15.30	25.30	43.71
2018	15.75	20.87	45.00
2019	16.40	22.46	46.86
2020	15.65	21.74	44.71
2021	16.42	21.47	46.91
2022	19.69	30.39	56.26
Average	**14.80**	**19.40**	**53.44**

* City of Orlando Water Reclamation Division SCADA database and monthly Discharge Monitoring Reports.

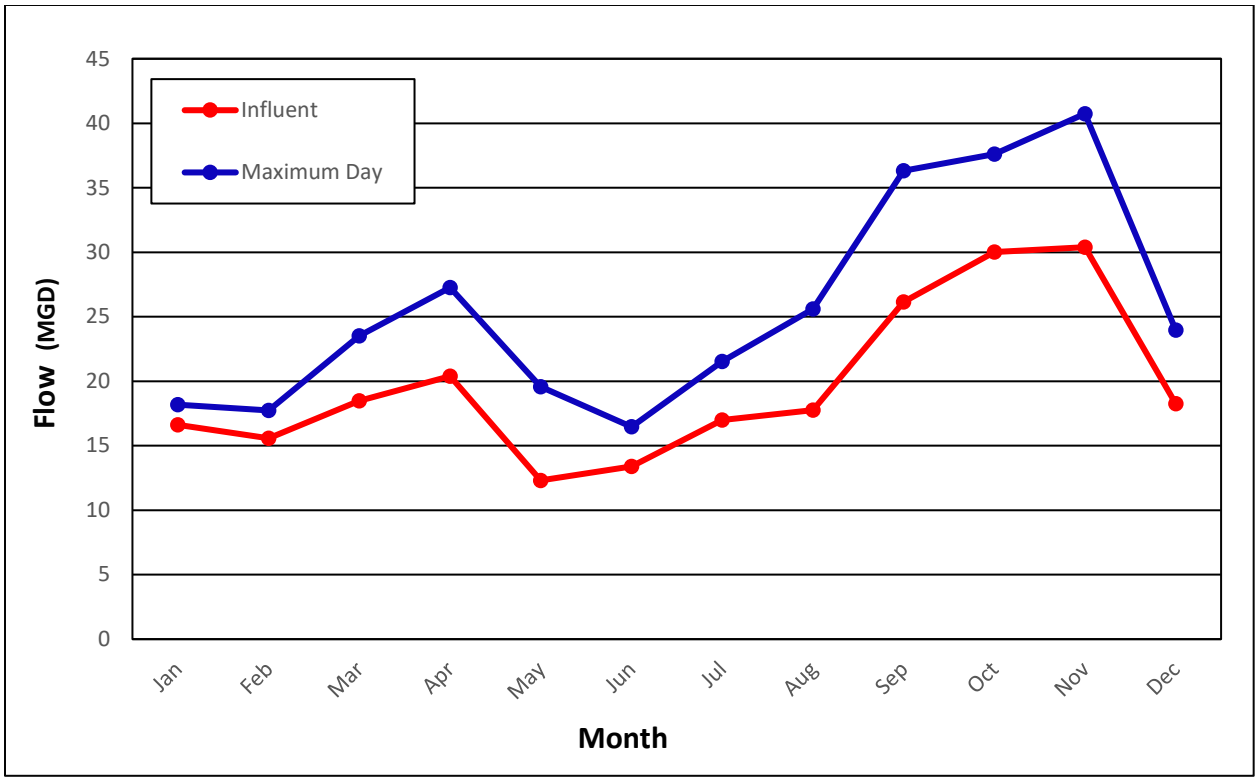

Figure 3-2 Monthly Average and Maximum Day Influent Flows (R001) for OEW during 2022

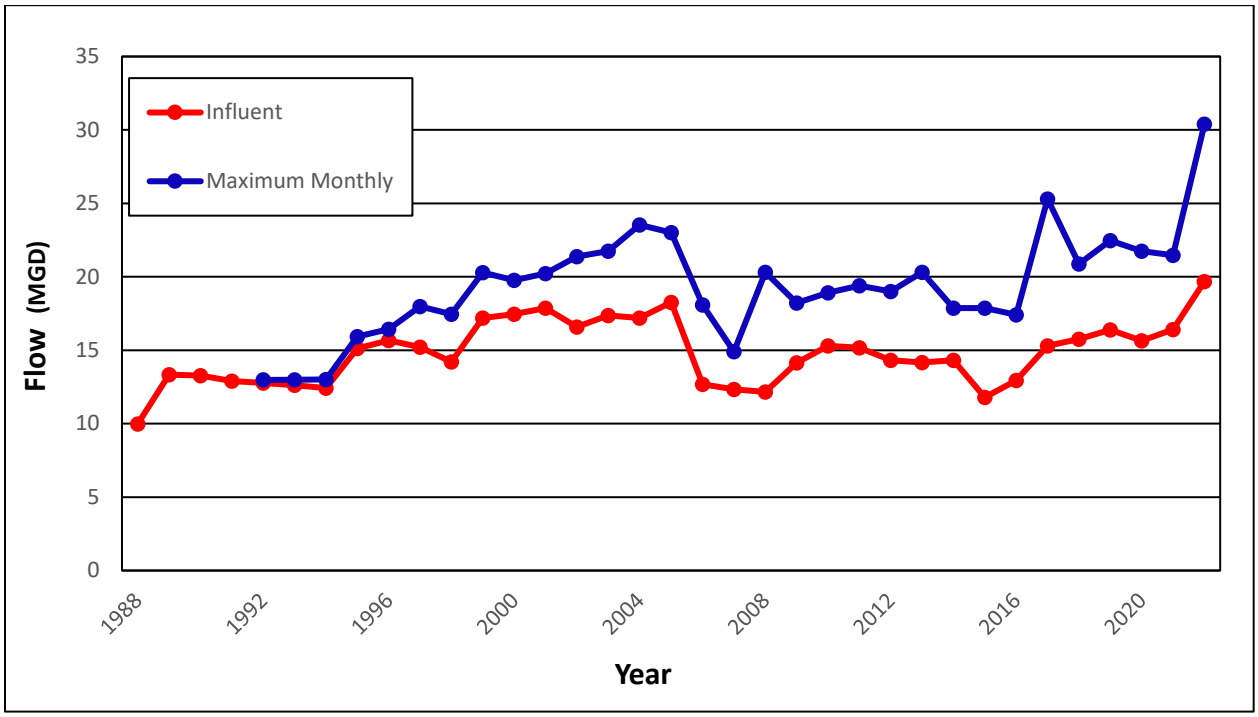

Figure 3-3 Annual Average and Maximum Month Influent Flows (R001) for OEW

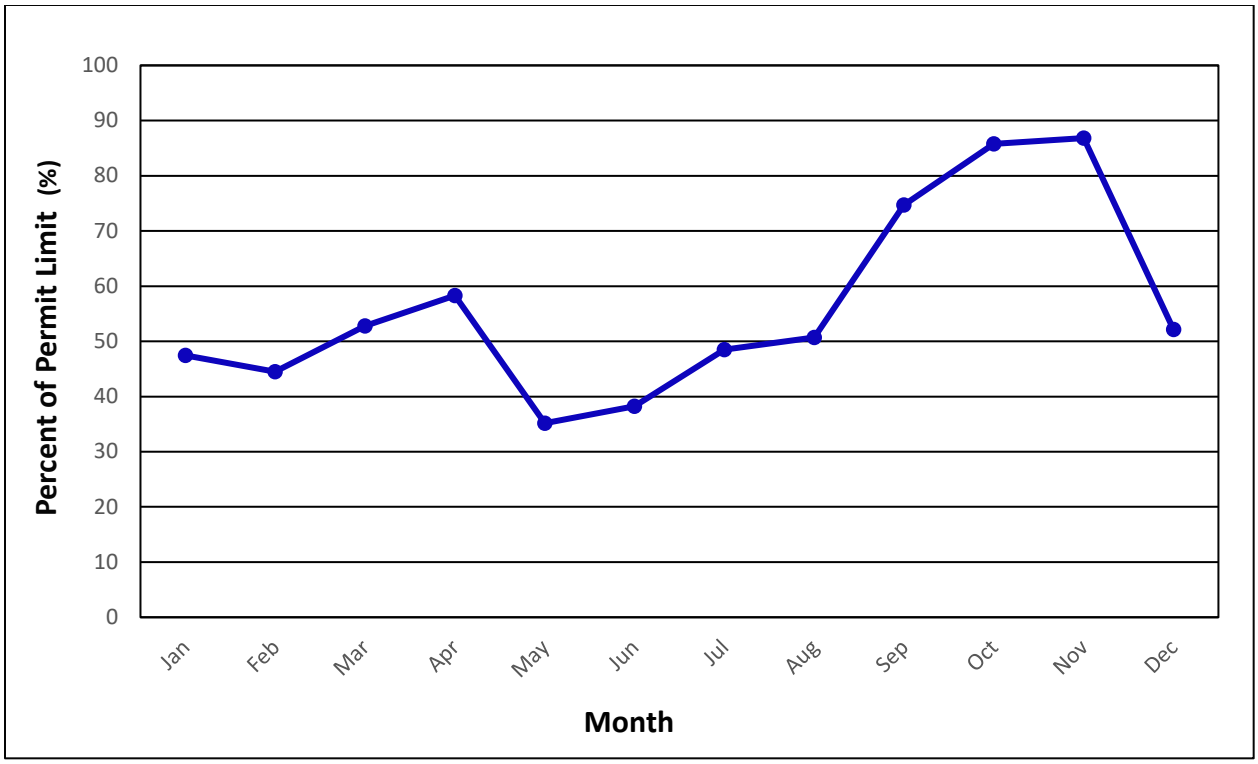

Figure 3-4 Percentage of Permit Limit for Monthly Average Influent Flows (R001) for OEW during 2022

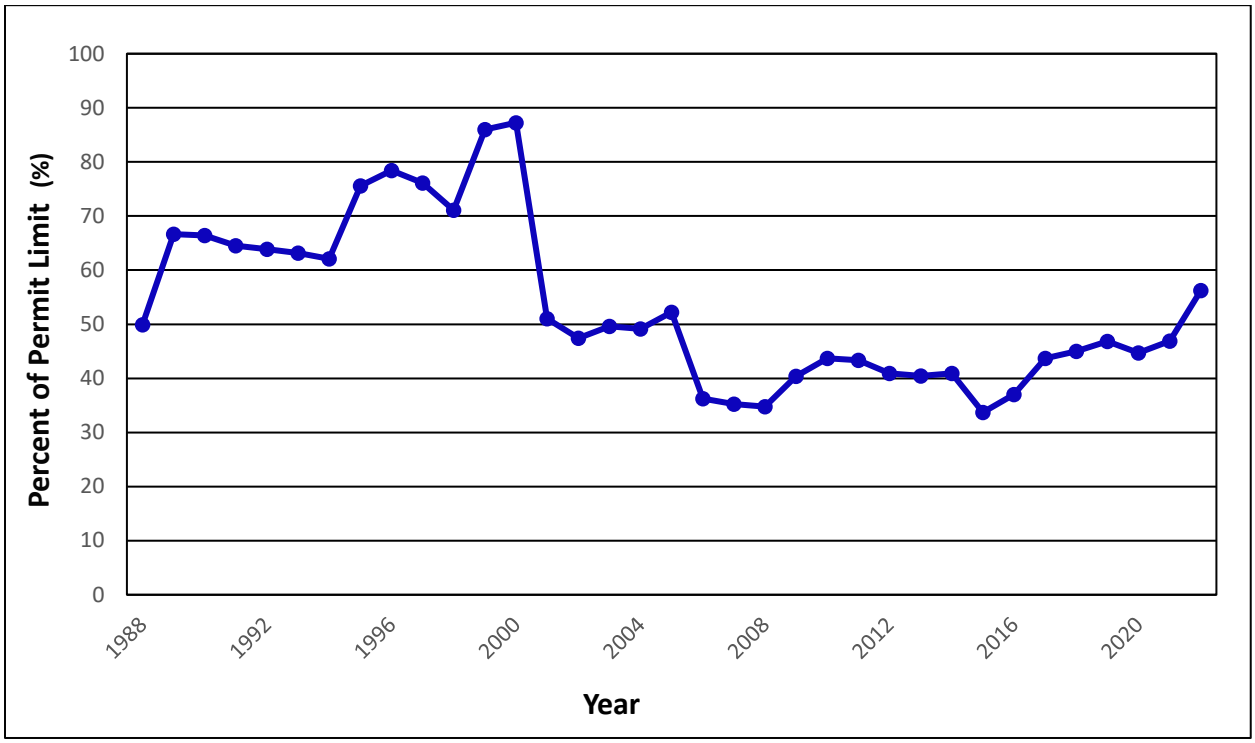

Figure 3-5 Percentage of Permit Limit for Annual Average Influent Flows (R001) for OEW

Table 3-3 Monthly Average Flows: OEW Discharges (D002 and D003) in 2022

Month (2022)	D002 Flow (MGD)	D003 Flow (MGD)	Total Discharge Flow (MGD)	Maximum Day Flow (MGD)
January	16.79	0.42	17.21	23.09
February	14.35	1.83	16.17	19.21
March	19.73	1.64	21.37	30.26
April	22.66	0.00	22.66	33.53
May	13.13	0.00	13.13	16.64
June	18.40	0.00	18.40	29.66
July	22.51	0.00	22.51	31.94
August	22.79	0.00	22.79	39.65
September	34.31	0.27	34.58	63.38
October	29.53	0.37	29.69	54.44
November	30.26	0.00	30.26	42.07
December	19.75	0.00	19.75	25.66
Average	**22.02**	**0.38**	**22.38**	**34.13**

* Flow rates are from Iron Bridge monthly Discharge Monitoring Reports and SCADA database. Hurricane Ian occurred on September 29, 2022 and Hurricane Nicole on November 10, 2022.

Table 3-4 Annual Average Flows: OEW Discharges (D002 and D003)

Year	Total Discharge Flows (MGD)	Maximum Monthly ADF (MGD)
1988	10.63	- - - - -
1989	13.91	- - - - -
1990	10.68	- - - - -
1991	13.40	- - - - -
1992	11.60	- - - - -
1993	10.00	- - - - -
1994	12.52	19.66
1995	8.79	11.53
1996	16.34	21.15
1997	16.66	26.94
1998	13.96	20.96
1999	19.41	30.47
2000	13.69	19.66
2001	16.76	28.20
2002	16.59	31.47
2003	22.51	39.54
2004	24.87	56.81
2005	25.25	33.93
2006	17.59	27.76
2007	14.62	20.63
2008	15.06	57.60
2009	15.39	21.52
2010	18.96	26.48
2011	17.18	29.13
2012	18.11	30.47
2013	19.18	36.13
2014	18.55	40.38
2015	16.57	35.81
2016	16.16	25.75
2017	23.94	41.53
2018	26.02	44.59
2019	21.84	32.12
2020	21.40	27.15
2021	19.91	28.81
2022	22.38	34.13
Average	**17.16**	**30.05**

* City of Orlando Water Reclamation Division SCADA database and monthly Discharge Monitoring Reports.

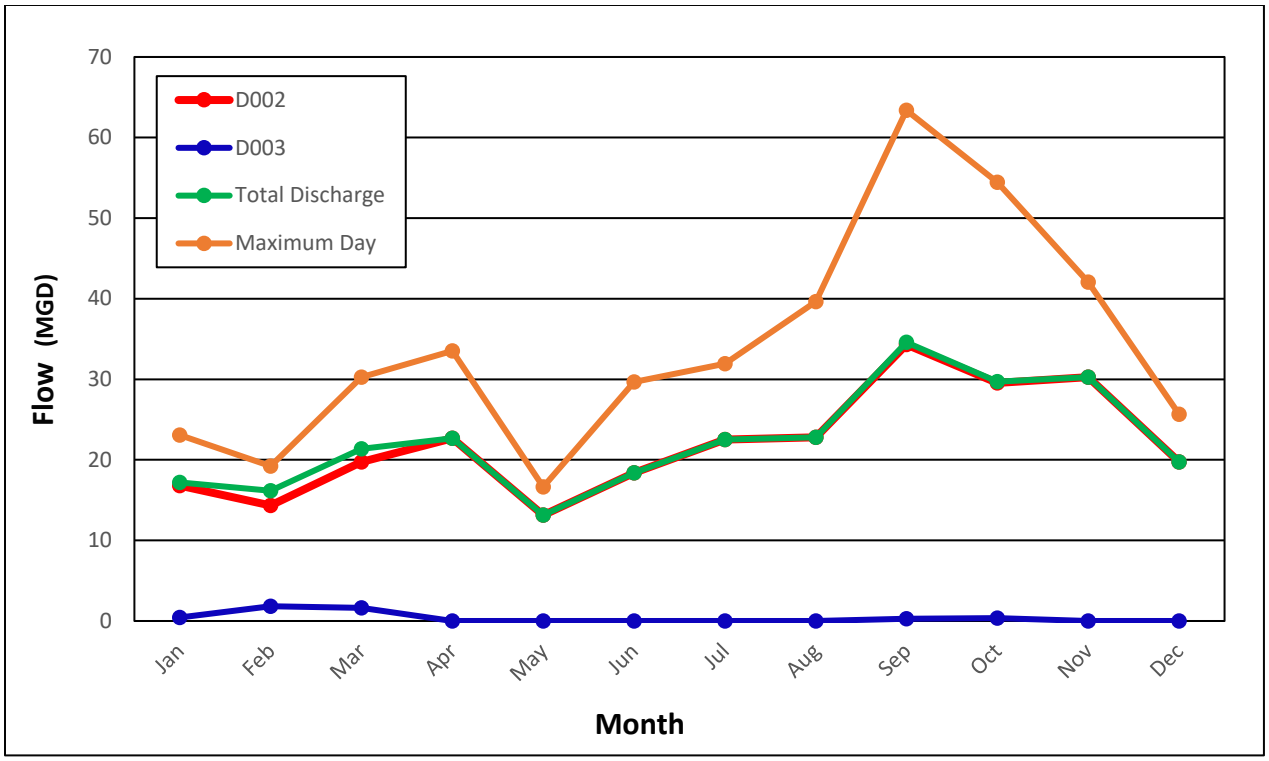

Figure 3-6 Monthly Average and Maximum Day Flows (D002 and D003) for OEW during 2022

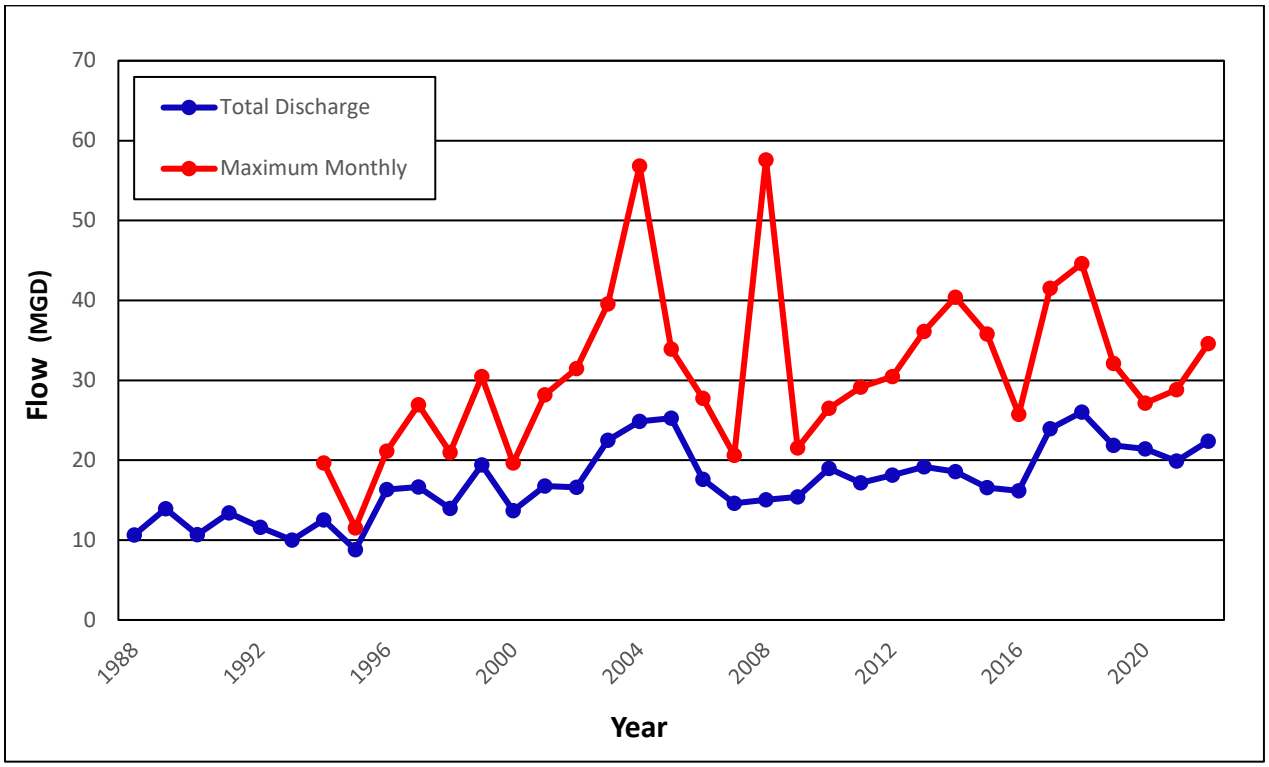

Figure 3-7 Annual Average and Maximum Month Flows (D002 and D003) for OEW

Table 3-5 Monthly Average Flows: St. Johns River (SJR-1) at S.R. 50 and OEW Discharges (D002 and D003) in 2022

Month (2022)	Station SJR-1 *		OEW Flows (MGD)	Percent of SJR Flows (%)
	Gage Height (Feet NAVD 88)	Flows (MGD)		
January	4.32	438.5	16.79	3.83
February	3.29	276.1	14.77	5.35
March	4.23	413.1	21.56	5.22
April	5.63	819.5	24.30	2.97
May	3.27	277.6	13.13	4.73
June	2.47	172.2	18.40	10.68
July	2.90	228.3	22.51	9.86
August	3.04	260.7	22.79	8.74
September	6.22	1,263.6	34.58	2.74
October	10.92	3,314.9	29.70	0.90
November	8.45	2,238.8	30.26	1.35
December	6.90	1,363.5	19.75	1.45
Average	**5.14**	**922.2**	**22.39**	**4.82**

* Gage height and discharge rates at the Econ A sample station (USGS Station 02232500) are based upon data provided by the United States Geological Survey (USGS).

Table 3-6 Annual Average Flows: St. Johns River (SJR-1) at S.R. 50 and OEW Discharges (D002 and D003)

Year	Station SJR-1 *		OEW Flows (MGD)	Percent of SJR Flows (%)
	Gage Height (Feet NAVD 88)	Flows (MGD)		
1988	5.03	559.9	10.63	1.90
1989	4.34	412.1	13.91	3.38
1990	4.77	508.1	10.68	2.10
1991	6.71	1,235.9	13.40	1.08
1992	5.92	1,002.1	11.60	1.16
1993	5.11	586.7	10.00	1.70
1994	5.94	1,164.3	12.52	1.08
1995	6.67	1,474.8	8.79	0.60
1996	5.60	697.3	16.34	2.34
1997	4.98	677.1	16.66	2.46
1998	5.98	1,273.7	13.96	1.10
1999	4.33	830.8	19.41	2.34
2000	2.86	271.1	13.69	5.05
2001	4.06	825.3	16.76	2.03
2002	4.80	1,072.0	16.59	1.55
2003	5.11	953.1	22.51	2.36
2004	4.74	1,095.5	24.87	2.27
2005	6.34	1,482.9	25.25	1.70
2006	3.40	355.8	17.59	4.94
2007	3.37	328.1	14.62	4.46
2008	4.47	1,038.8	15.06	1.45
2009	3.91	617.5	15.39	2.49
2010	3.66	469.3	18.96	4.04
2011	3.80	793.2	17.18	2.17
2012	4.66	693.4	18.11	2.61
2013	4.43	650.2	19.18	2.95
2014	4.96	1,076.7	18.55	1.72
2015	4.55	600.0	16.57	2.76
2016	5.63	1,006.0	16.16	1.61
2017	4.74	1,319.4	23.94	1.81
2018	4.56	908.3	26.02	2.87
2019	3.79	532.5	21.84	4.10
2020	4.84	779.2	21.40	2.75
2021	4.60	587.9	19.91	3.39
2022	5.14	922.2	22.39	2.43
Average	**4.79**	**822.9**	**17.16**	**2.42**

* Gage height and discharge rates at the SJR1 sample station (USGS Station 02232500) are based on data provided by the United States Geological Survey (USGS).

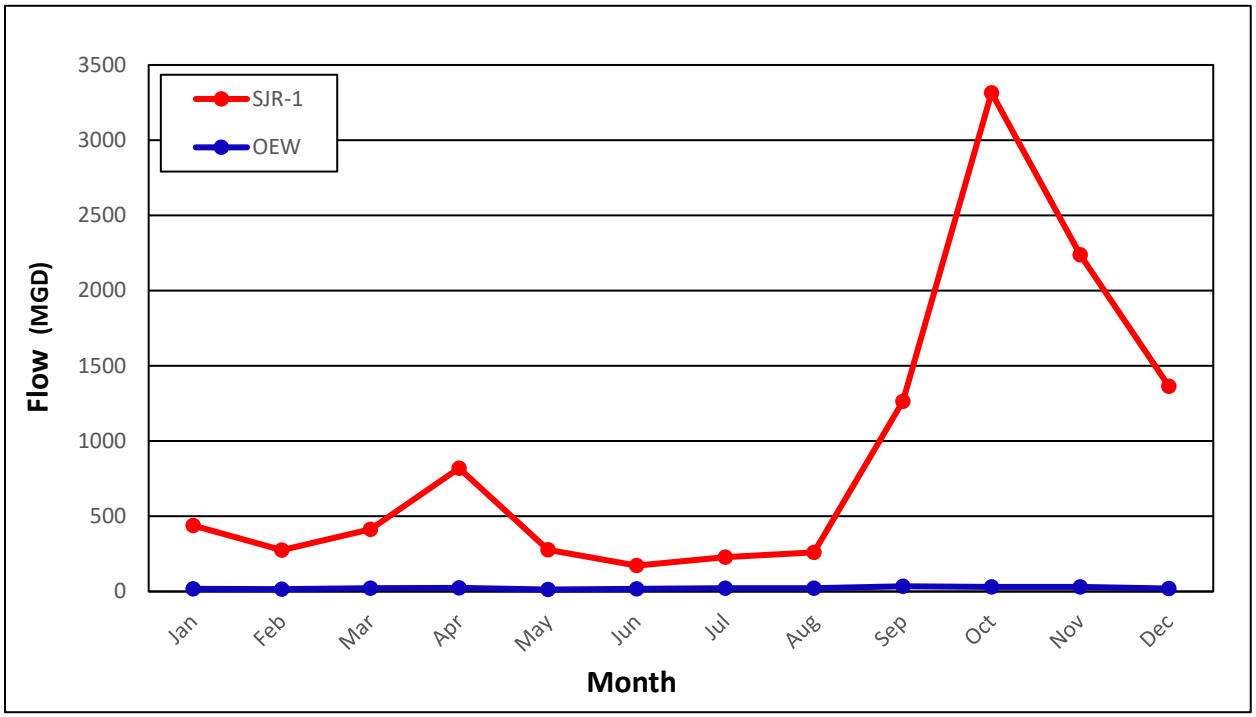

Figure 3-8 Monthly Average Flows: St. Johns River Monitoring Station SJR-1 and OEW Discharges (D002 and D003) during 2022

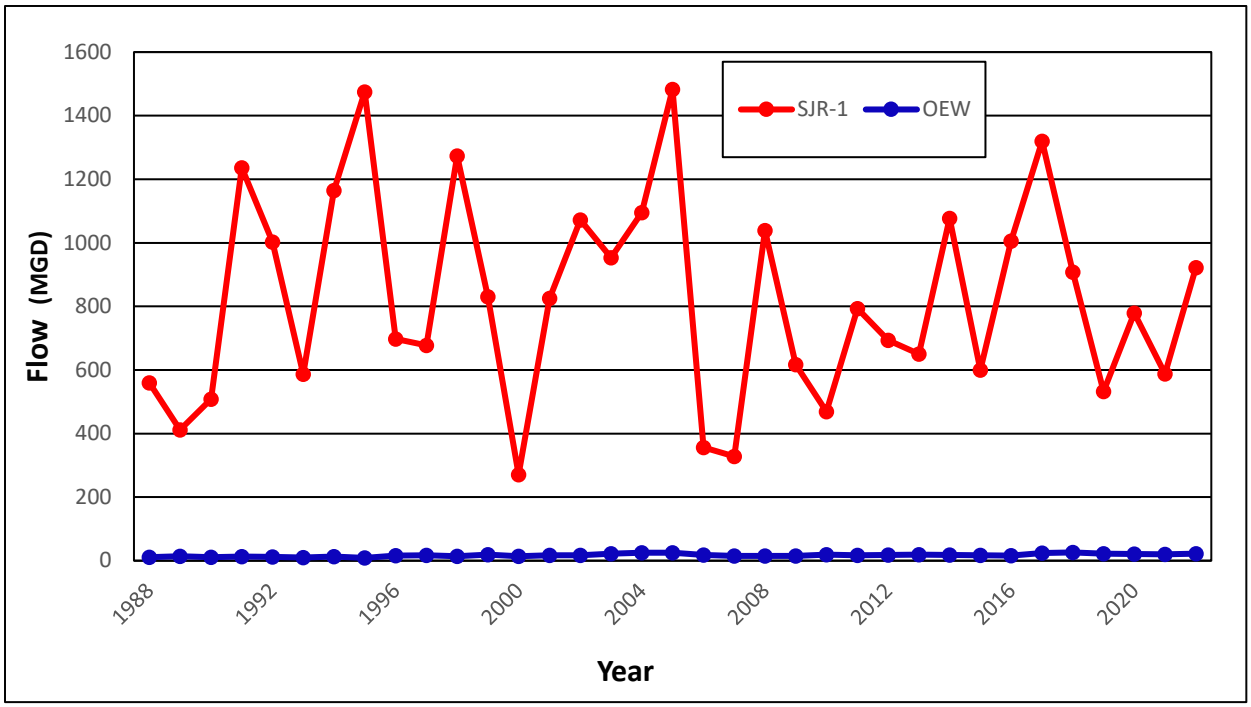

Figure 3-9 Annual Average Flows: St. Johns River Monitoring Station SJR-1 and OEW Discharges (D002 and D003)

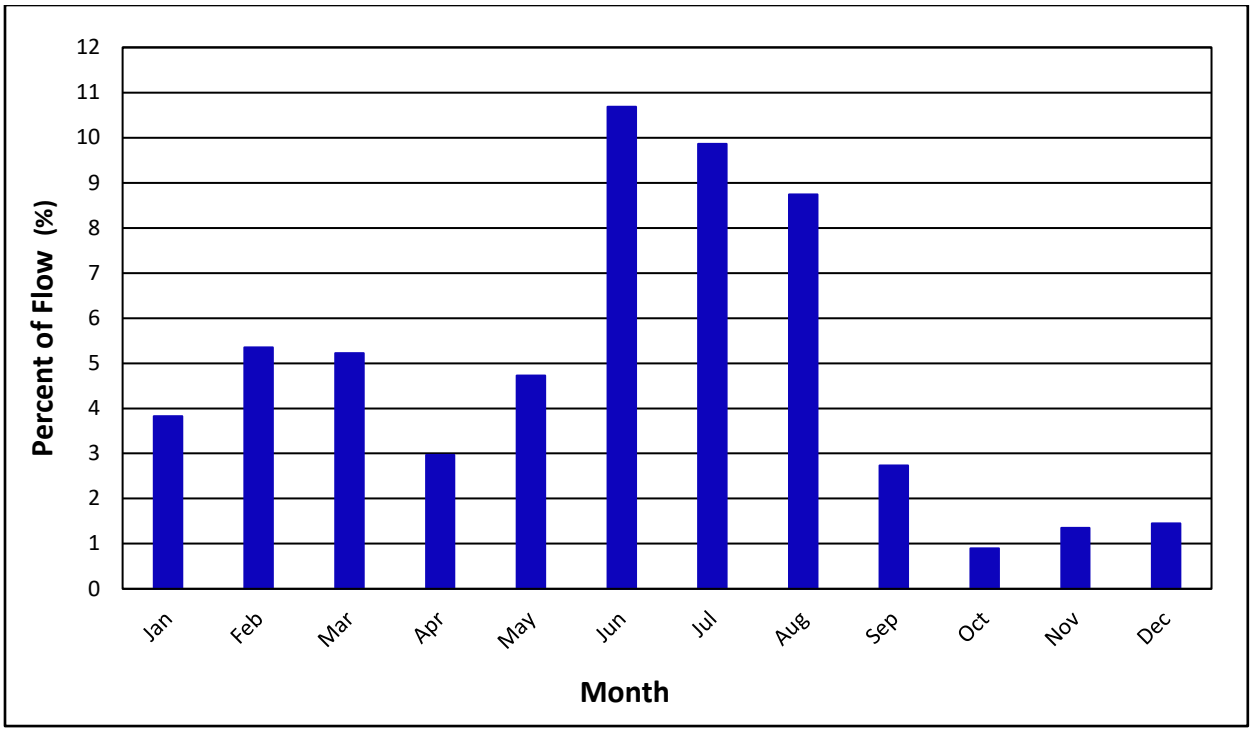

Figure 3-10 Proportion of Monthly Average OEW Discharges (D002 and D003) and St. Johns River Flows at Monitoring Station SJR-1 during 2022

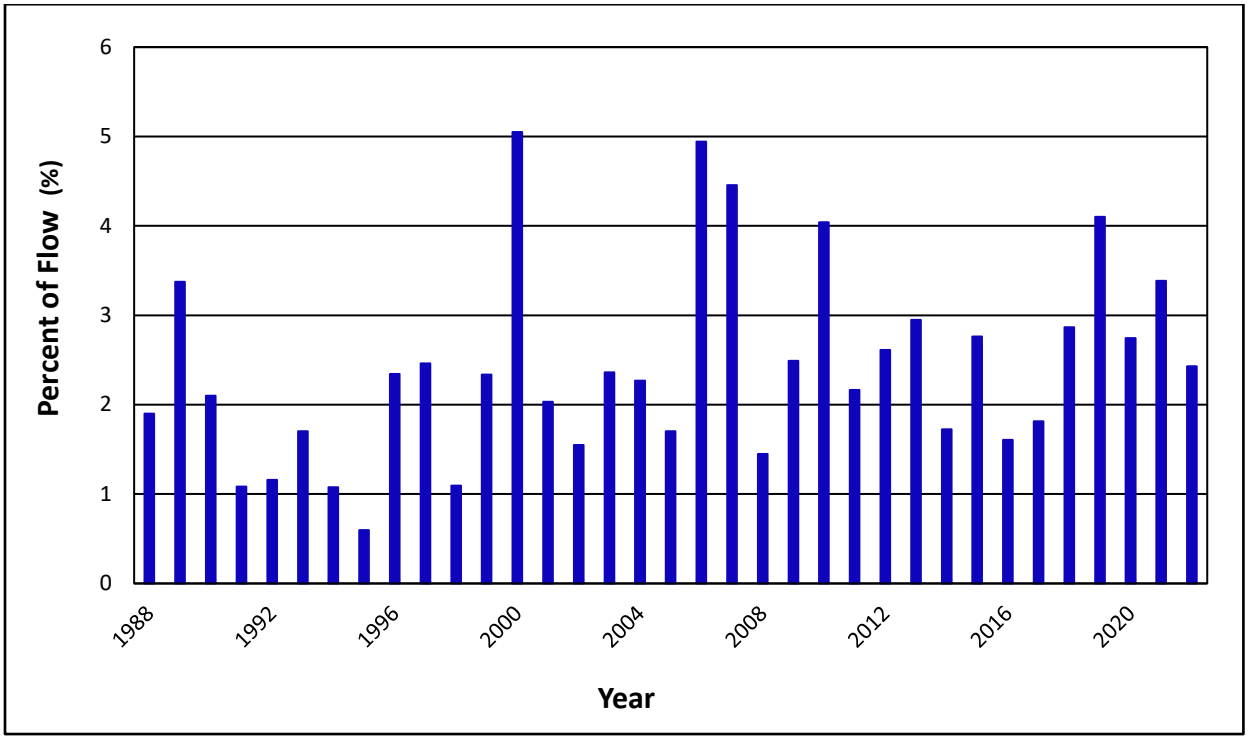

Figure 3-11 Proportion of Annual Average OEW Discharges (D002 and D003) and St. Johns River Flows at Monitoring Station SJR-1

Table 3-7 Monthly Average Flows: St. Johns River (SJR-5) at S.R. 46 and OEW Discharges (D002 and D003)

Month (2022)	Station SJR-5 *		OEW Flows (MGD)	Percent of SJR Flows (%)
	Gage Height (Feet NAVD 88)	Flows (MGD)		
January	2.95	778.2	16.79	2.16
February	1.98	518.2	14.77	2.85
March	2.59	862.2	21.56	2.50
April	3.85	1,258.4	24.30	1.93
May	2.24	525.8	13.13	2.50
June	1.58	377.8	18.40	4.87
July	1.83	576.5	22.51	3.91
August	1.75	550.7	22.79	4.14
September	5.53	2,324.8	34.58	1.49
October	11.70	7,161.2	29.70	0.42
November	8.73	4,242.4	30.26	0.71
December	5.76	2,383.6	19.75	0.83
Average	**4.21**	**1,796.6**	**22.39**	**2.36**

* Gage height and discharge rates at the Econ A sample station (USGS Station 02232500) are based upon data provided by the United States Geological Survey (USGS).

Table 3-8 Annual Average Flows: St. Johns River (SJR-5) at S.R. 46 and OEW Discharges (D002 and D003)

Year	Station SJR-5 *		OEW Flows (MGD)	Percent of SJR Flows (%)
	Gage Height (Feet NAVD 88)	Flows (MGD)		
1988	2.73	1,050.0	10.63	1.01
1989	1.74	647.6	13.91	2.15
1990	1.57	566.5	10.68	1.89
1991	3.91	1,813.6	13.40	0.74
1992	3.13	1,464.4	11.60	0.79
1993	2.33	903.2	10.00	1.11
1994	4.15	2,203.8	12.52	0.57
1995	4.59	1,988.0	8.79	0.44
1996	3.29	1,116.1	16.34	1.46
1997	2.77	1,109.0	16.66	1.50
1998	4.16	1,750.6	13.96	0.80
1999	2.94	1,134.7	19.41	1.71
2000	1.41	335.9	13.69	4.08
2001	2.89	1,227.5	16.76	1.37
2002	3.45	1,389.4	16.59	1.19
2003	3.70	1,430.8	22.51	1.57
2004	3.53	1,812.3	24.87	1.37
2005	4.75	1,956.7	25.25	1.29
2006	1.68	640.7	17.59	2.75
2007	1.80	610.4	14.62	2.40
2008	3.25	1,447.0	15.06	1.04
2009	2.54	927.0	15.39	1.66
2010	2.09	700.2	18.96	2.71
2011	2.46	1,062.1	17.18	1.62
2012	2.54	922.4	18.11	1.96
2013	2.61	973.9	19.18	1.97
2014	3.88	1,538.4	18.55	1..21
2015	3.03	1,088.6	16.57	1.52
2016	3.25	1,240.2	16.16	1.30
2017	3.72	1,745.0	23.94	1.37
2018	3.70	1,469.7	26.02	1.77
2019	2.95	886.8	21.84	2.46
2020	3.51	1,172.9	21.40	1.83
2021	3.02	924.7	19.91	2.15
2022	4.21	1,796.6	22.39	1.25
Average	**3.07**	**1,229.9**	**17.16**	**1.60**

* Gage height and discharge rates at the SJR1 sample station (USGS Station 02232500) are based on data provided by the United States Geological Survey (USGS).

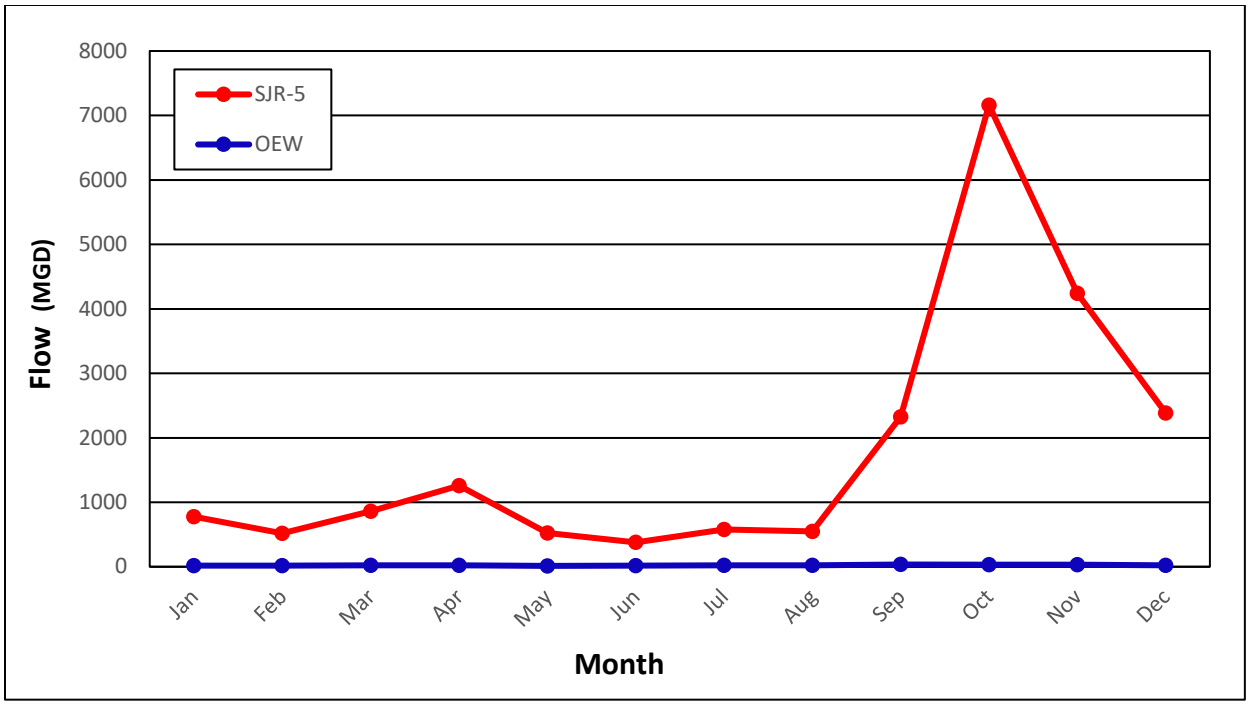

Figure 3-12 Monthly Average Flows at St. Johns River Monitoring Station SJR-5 and OEW Discharges (D002 and D003) during 2022

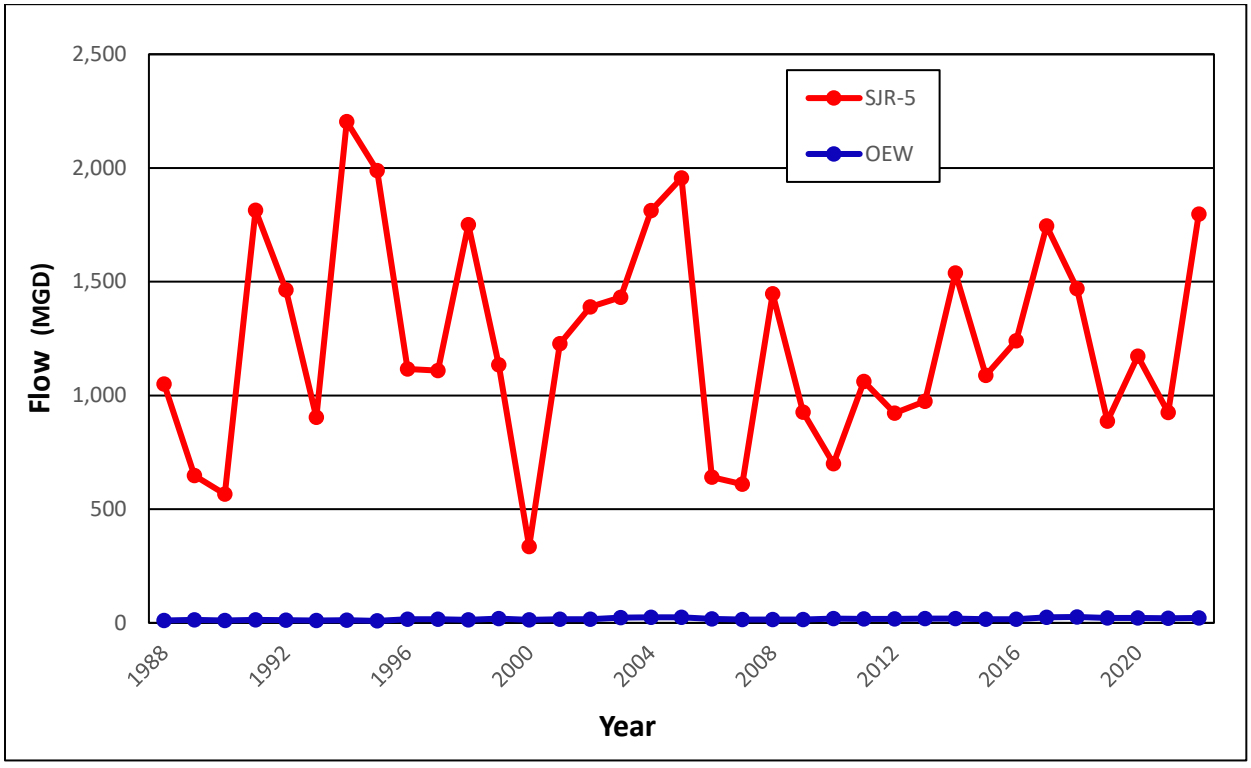

Figure 3-13 Annual Average Flows at St. Johns River Monitoring Station SJR-5 and OEW Discharges (D002 and D003)

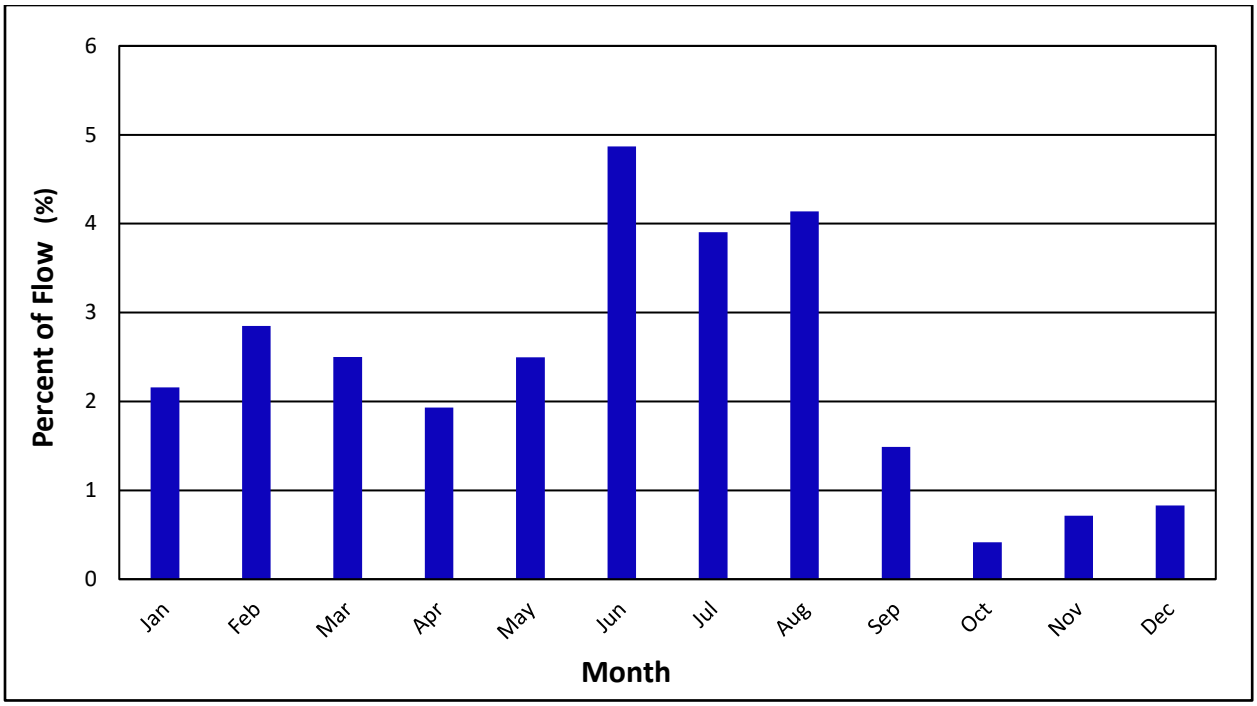

Figure 3-14 Proportion of Monthly Average Flows: OEW Discharges (D002 and D003) at St. Johns River Monitoring Station SJR-5 during 2022

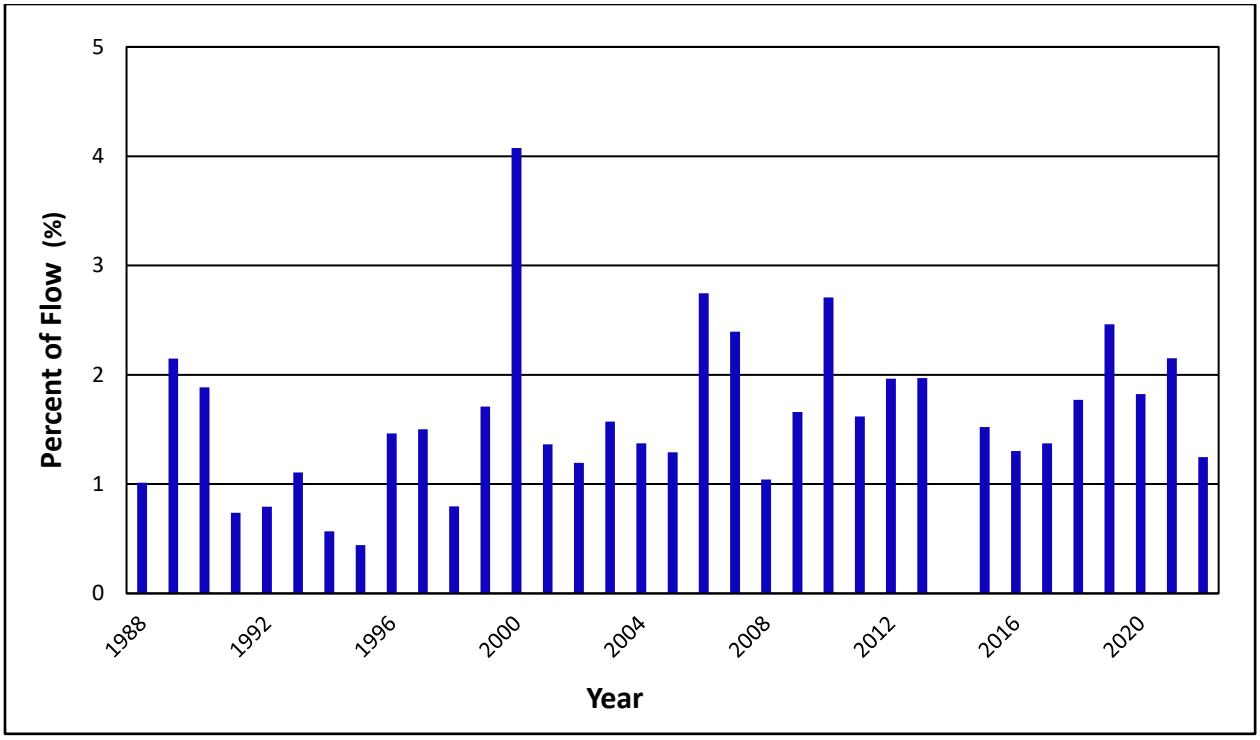

Figure 3-15 Proportion of Annual Average Flows: OEW Discharges (D002 and D003) St. Johns River Monitoring Station SJR-5

Table 3-9 Average Water Quality Parameters: St. Johns River Monitoring Stations (SJR-1 and SJR-5) and Outfall D002 *

Parameter (2022)	Monitoring Locations		
	Upstream of Outfall D002 SJR-1	Downstream of Outfall D002 SJR-5	Outfall D002
Total Kjeldahl Nitrogen	1.098 mg/L	1.024 mg/L	0.629 mg/L
Nitrate/Nitrite	0.021 mg/L	0.070 mg/L	0.027 mg/L
Total Nitrogen	1.115. mg/L	1.096 mg/L	0.653 mg/L
Total Phosphorus	0.081 mg/L	0.105 mg/L	0.059 mg/L
pH	7.153	7.095	6.945
Specific Conductivity	580 umhos	485 umhos	516 umhos
Dissolved Oxygen	0.815 mg/L	3.786 mg/L	1.538 mg/L
Chlorophyll-a	5.48 mg/m3	3.02 mg/m3	2.95 mg/m3
Secchi Disk Depth	9.95 ft	19.0 ft	- - - - -

* Average value of 12 monthly samples during 2022. Duplicate sample values were averaged and entered as a single data point for that monthly monitoring event.

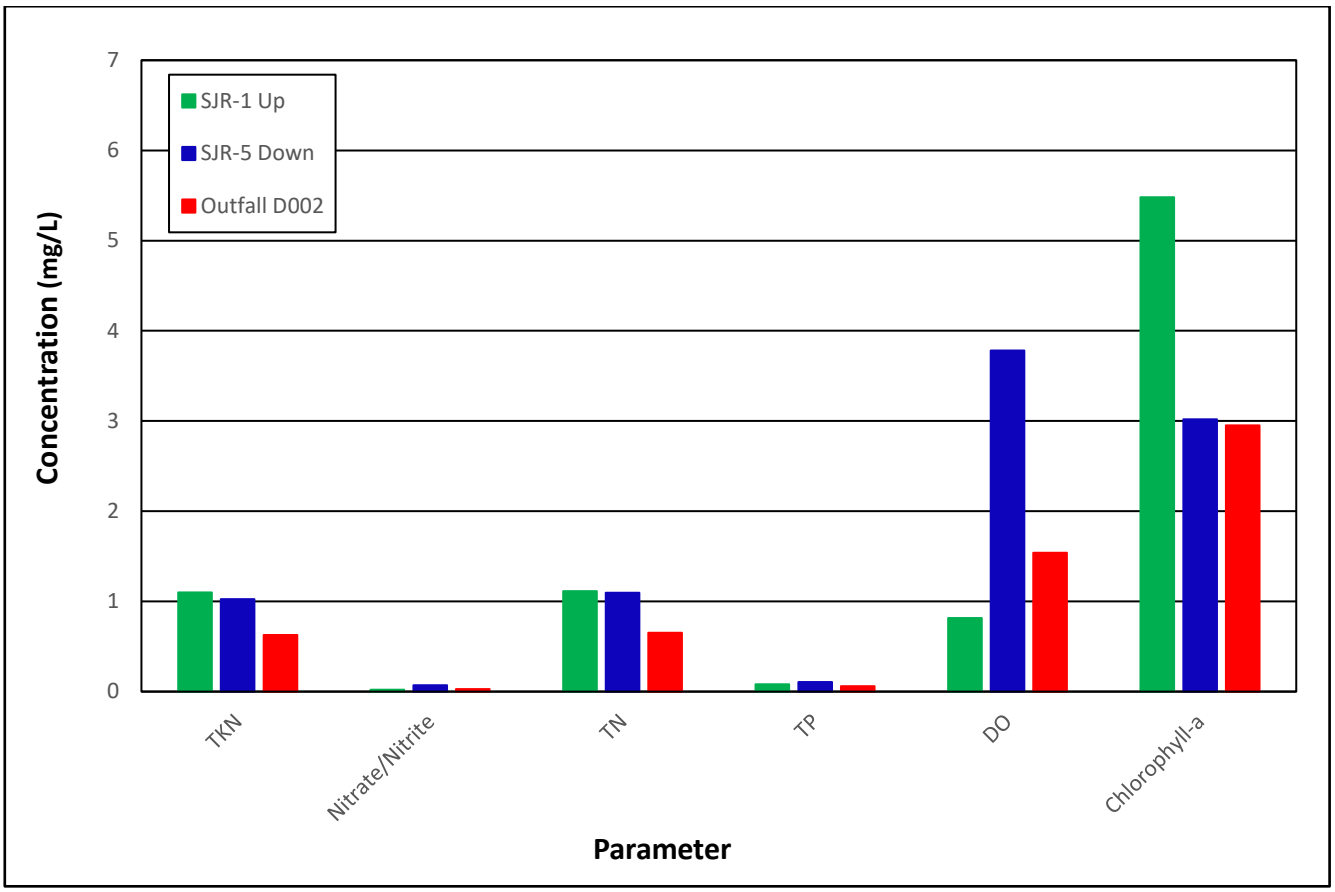

Figure 3-16 Comparison of Average Water Quality Parameters: St. Johns River Monitoring Stations (SJR-1 and SJR-5) and Outfall D002 in 2022

Table 3-10 Monthly Average Total Nitrogen (TN) Loadings: OEW Discharges (D002 and D003) and St. Johns River Monitoring Stations (SJR-1 and SJR-5)

Month (2022)	OEW Discharge			SJR-1			SJR-5		
	TN (mg/L)	Flow (MGD)	TN Loading (lbs/day)	TN (mg/L)	Flow (MGD)	TN Loading (lbs/day)	TN (mg/L)	Flow (MGD)	TN Loading (lbs/day)
January	0.67	17.21	96.6	1.47	439	5,375	1.08	778	7,009
February	0.66	16.18	89.3	1.53	276	3,523	1.18	518	5,099
March	0.65	21.37	115.9	1.23	413	4,237	0.94	862	6,759
April	0.61	22.66	115.5	1.19	820	8,134	0.92	1,258	9,655
May	0.60	13.13	65.2	1.67	278	3,866	1.30	526	5,701
June	0.62	18.40	95.3	1.99	172	2,859	1.27	378	4,002
July	0.62	22.51	116.2	1.29	228	2,456	0.89	577	568
August	0.64	22.79	121.1	1.58	261	3,436	1.13	551	5,190
September	0.60	34.58	172.5	1.71	1,264	18,020	1.17	2,325	22,685
October	0.51	29.70	126.3	1.36	3,315	37,599	1.06	7,161	63,308
November	0.51	30.26	129.7	1.45	2,239	27,074	0.77	4,242	27,244
December	0.55	19.75	91.1	1.78	1,364	20,242	1.42	2,384	28,229
Average	**0.60**	**22.38**	**111.2**	**1.52**	**922.2**	**11,402**	**1.09**	**1,796.7**	**15,454**

Table 3-11 Comparison of Monthly Average Total Nitrogen (TN) Loadings: OEW Discharges (D002 and D003) and St. Johns River Monitoring Stations (SJR-1 and SJR-5)

Month (2022)	OEW Discharge		SJR-1		SJR-5	
	TN Loading (lbs/day)	Percent of Annual Loading (%)	TN Loading (lbs/day)	Percent of SJR Loading (%)	TN Loading (lbs/day)	Percent of SJR Loading (%)
January	96.6	7.24	5,375	1.80	7,009	1.38
February	89.3	6.69	3,523	2.54	5,099	1.75
March	115.9	8.68	4,237	2.73	6,759	1.71
April	115.5	8.65	8,134	1.42	9,655	1.20
May	65.2	4.88	3,866	1.69	5,701	1.14
June	95.3	7.14	2,859	3.33	4,002	2.38
July	116.2	8.71	2,456	4.73	568	20.48
August	121.1	9.07	3,436	3.52	5,190	2.33
September	172.5	12.92	18,020	0.96	22,685	0.76
October	126.3	9.47	37,599	0.34	63,308	0.20
November	129.7	9.72	27,074	0.48	27,244	0.48
December	91.1	6.83	20,242	0.45	28,229	0.32
Average	**111.2**	**8.33**	**11,402**	**2.00**	**15,454**	**2.84**

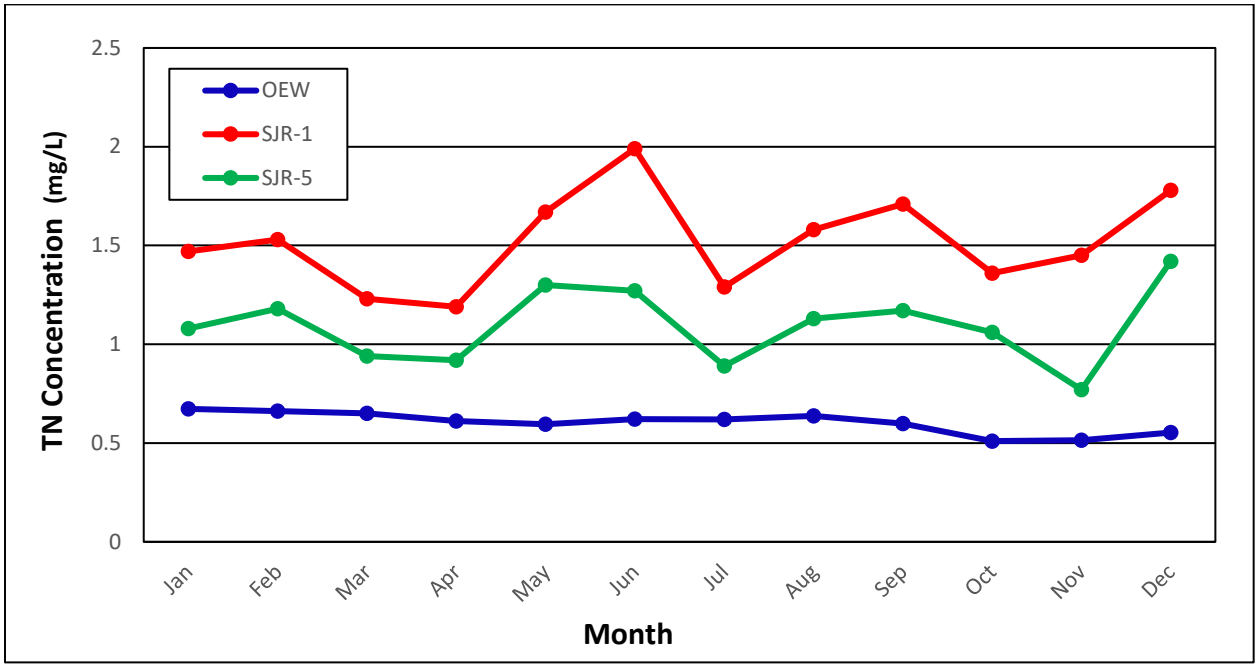

Figure 3-17 Monthly Average Total Nitrogen (TN) Concentrations: St. Johns River Monitoring Stations (SJR-1 and SJR-5) and OEW Discharges (D002 and D003) during 2022

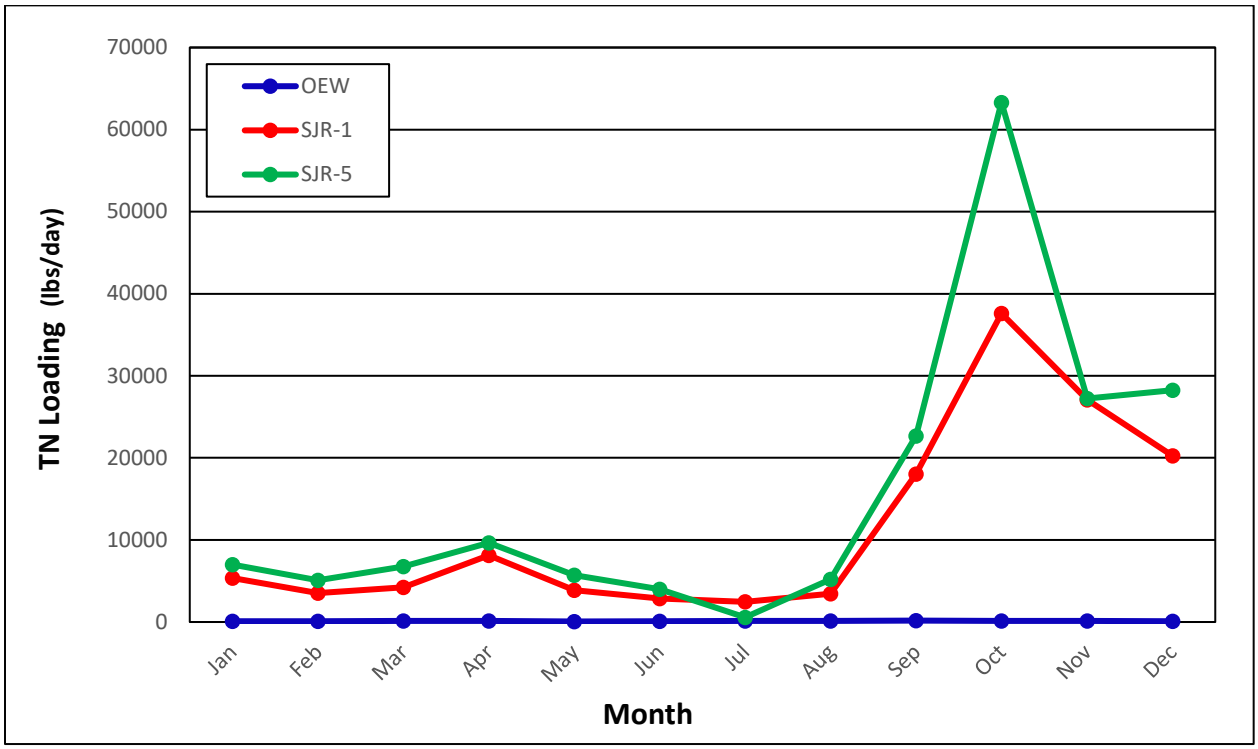

Figure 3-18 Monthly Average Total Nitrogen (TN) Loadings: St. Johns River Monitoring Stations (SJR-1 and SJR-5) and OEW Discharges (D002 and D003) during 2022

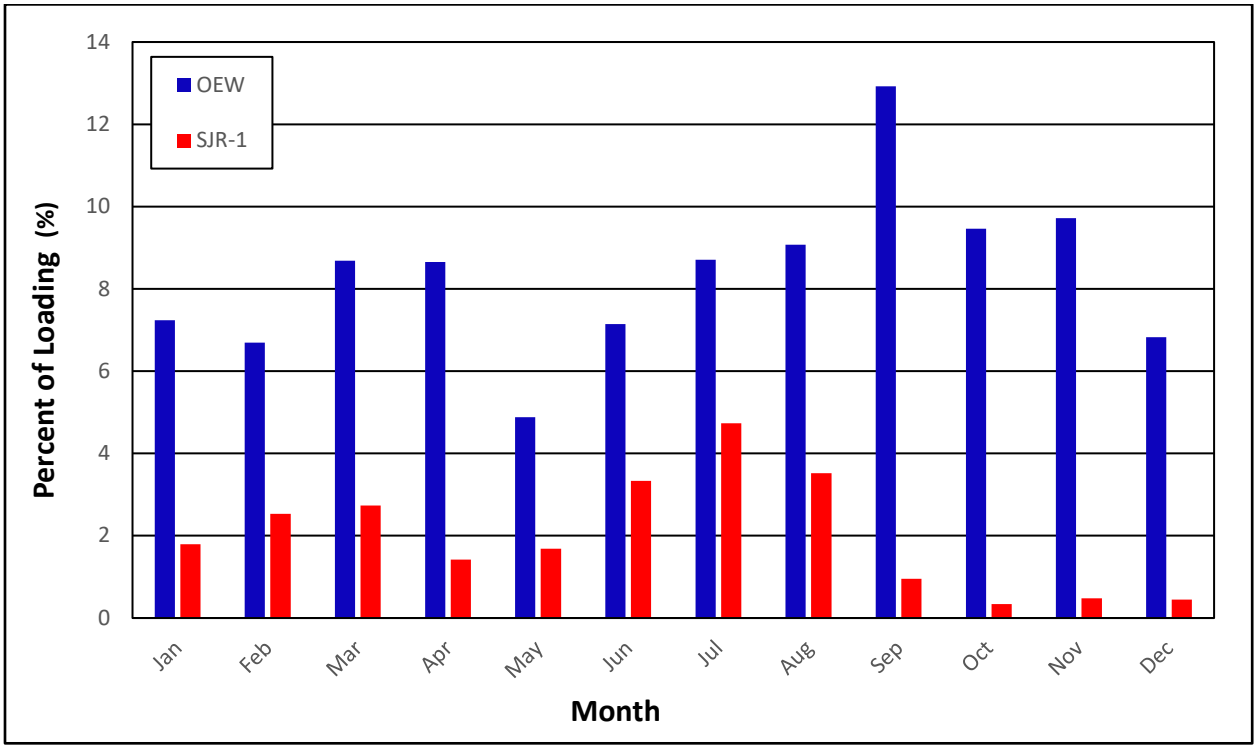

Figure 3-19 Proportion of Monthly Average Total Nitrogen (TN) Loadings: OEW Discharges (D002 and D003) at St. Johns River Monitoring Station SJR-1 during 2022

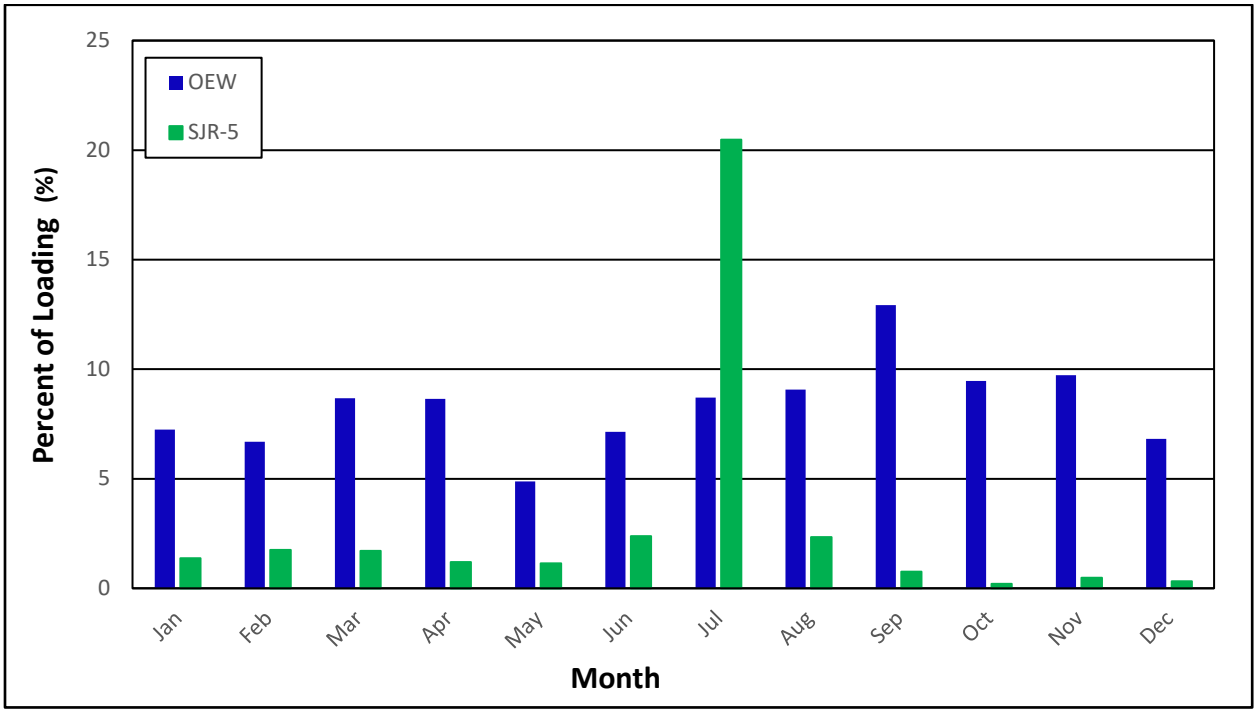

Figure 3-20 Proportion of Monthly Average Total Nitrogen (TN) Loadings: OEW Discharges (D002 and D003) at St. Johns River Monitoring Station SJR-5 during 2022

Table 3-12 Monthly Average Total Phosphorus (TP) Loadings: OEW Discharges (D002 and D003) and St. Johns River Monitoring Stations (SJR-1 and SJR-5)

Month (2022)	OEW Discharge			SJR-1			SJR-5		
	TP (mg/L)	Flow (MGD)	TP Loading (lbs/day)	TP (mg/L)	Flow (MGD)	TP Loading (lbs/day)	TP (mg/L)	Flow (MGD)	TP Loading (lbs/day)
January	0.063	17.21	9.04	0.075	439	274	0.110	778	714
February	0.090	16.18	12.14	0.114	276	263	0.076	518	328
March	0.080	21.37	14.26	0.051	413	176	0.060	862	431
April	0.047	22.66	8.88	0.089	820	608	0.064	1,258	672
May	0.041	13.13	4.49	0.184	278	426	0.127	526	557
June	0.040	18.40	6.14	0.172	172	247	0.171	378	539
July	0.018	22.51	3.38	0.096	228	183	0.079	577	50.4
August	0.022	22.79	4.18	0.140	261	304	0.092	551	423
September	0.031	34.58	8.94	0.109	1,264	1,149	0.094	2,325	1,823
October	0.018	29.70	4.46	0.229	3,315	6,331	0.148	7,161	8,839
November	0.026	30.26	6.56	0.235	2,239	4,388	0.113	4,242	3,998
December	0.080	19.75	13.18	0.178	1,364	2,024	0.131	2,384	2,604
Average	**0.046**	**22.38**	**7.97**	**0.139**	**922**	**1,364**	**0.105**	**1,755**	**1,748**

Table 3-13 Comparison of Monthly Average Total Phosphorus (TP) Loadings: OEW Discharges (D002 and D003) and St. Johns River Monitoring Stations (SJR-1 and SJR-5)

Month (2022)	OEW Discharge		SJR-1		SJR-5	
	TP Loading (lbs/day)	Percent of Annual Loading (%)	TP Loading (lbs/day)	Percent of SJR Loading (%)	TP Loading (lbs/day)	Percent of SJR Loading (%)
January	9.04	9.45	274	3.30	714	1.27
February	12.14	12.69	263	4.63	328	3.70
March	14.26	14.91	176	8.12	431	3.31
April	8.88	9.28	608	1.46	672	1.32
May	4.49	4.69	426	1.05	557	0.81
June	6.14	6.42	247	2.49	539	1.14
July	3.38	3.53	183	1.85	50.4	6.71
August	4.18	4.37	304	1.37	423	0.99
September	8.94	9.35	1,149	0.78	1,823	0.49
October	4.46	4.66	6,331	0.07	8,839	0.05
November	6.56	6.86	4,388	0.15	3,998	0.16
December	13.18	13.78	2,024	0.65	2,604	0.51
Average	**7.97**	**8.33**	**1,364**	**2.16**	**1,748**	**1.70**

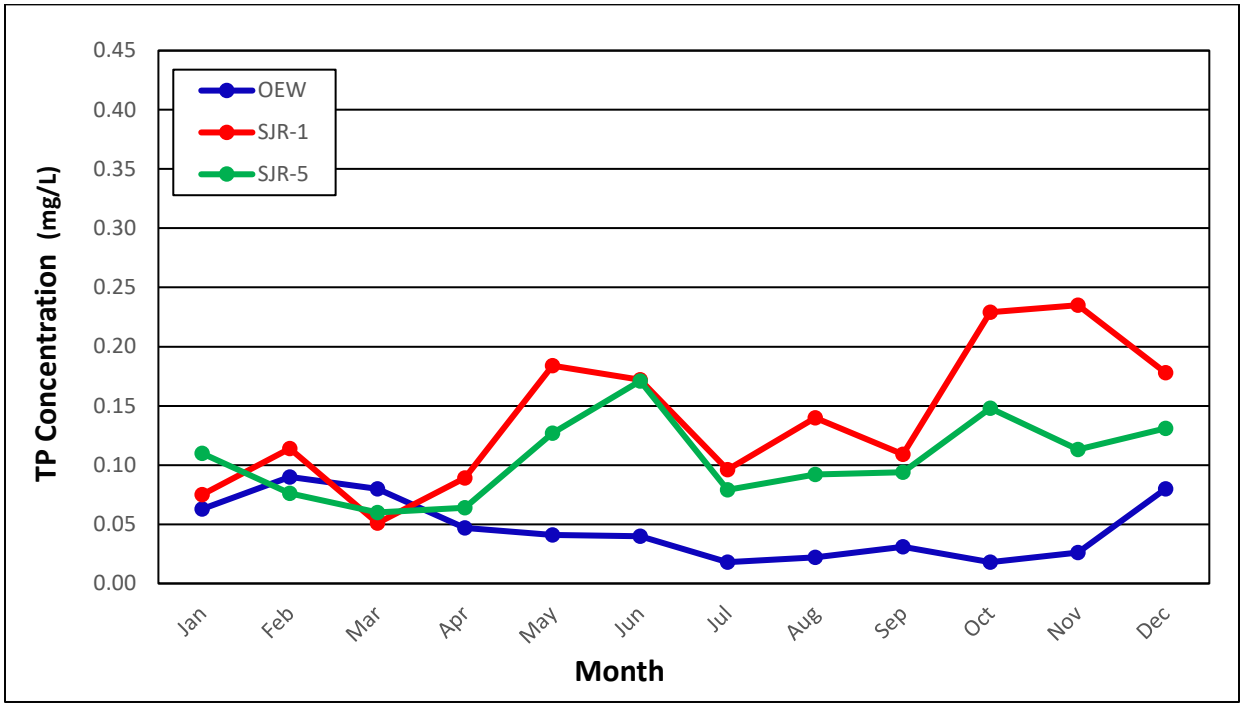

Figure 3-21 Monthly Average Total Phosphorus (TP) Concentrations: St. Johns River Monitoring Stations (SJR-1 and SJR-5) and OEW Discharges during 2022

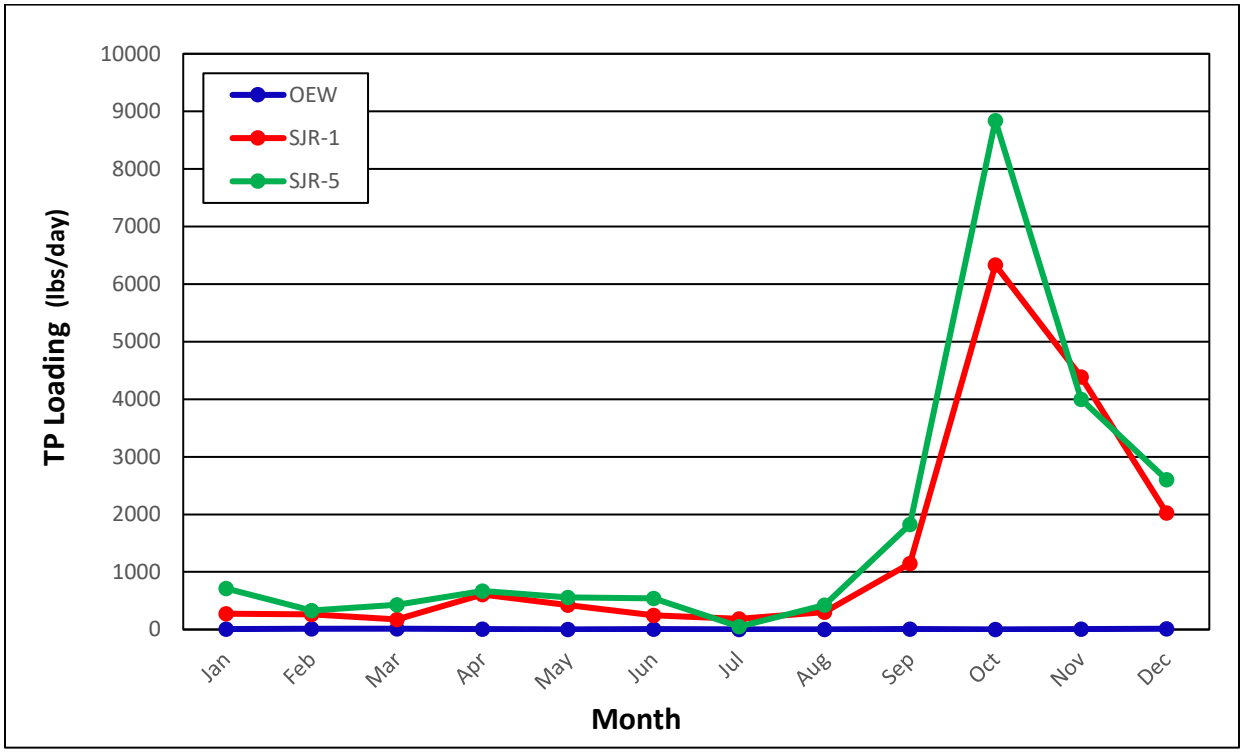

Figure 3-22 Monthly Average Total Phosphorus (TP) Loadings: St. Johns River Monitoring Stations (SJR-1 and SJR-5) and OEW Discharges during 2022

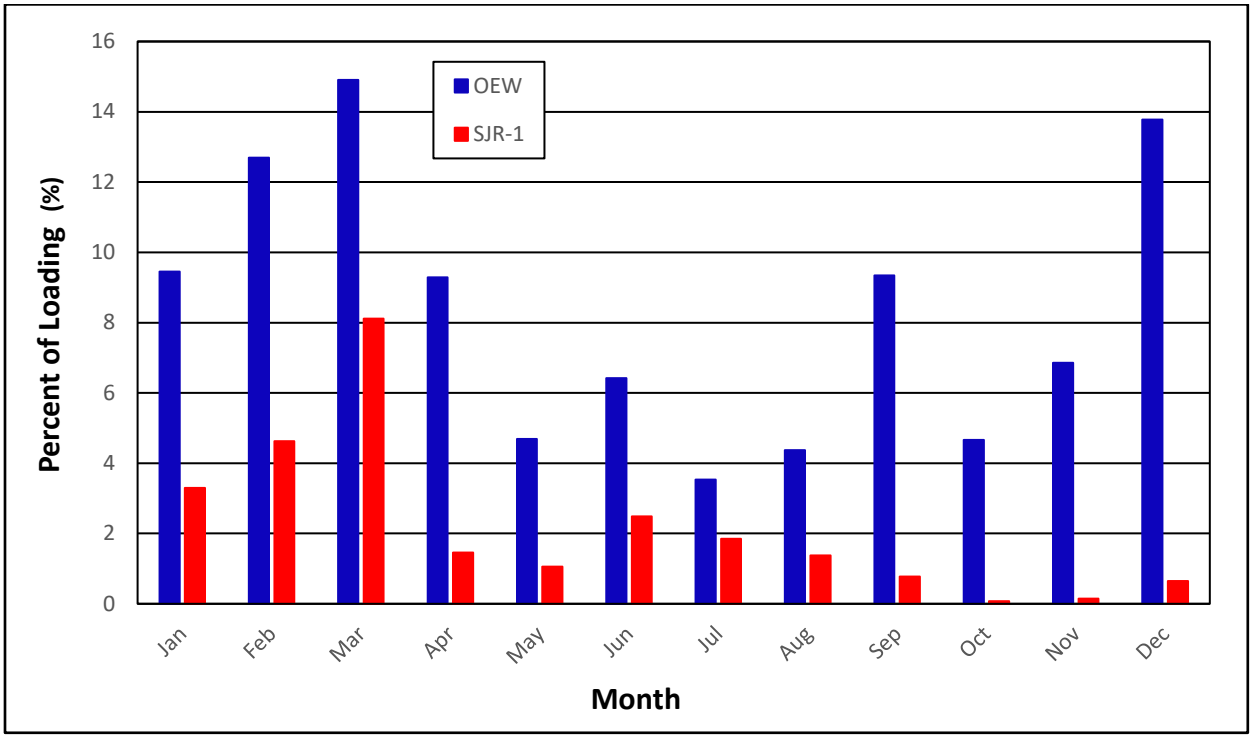

Figure 3-23 Proportion of Monthly Average Total Phosphorus (TP) Loadings: OEW Discharges (D002 and D003) at St. Johns River Monitoring Station SJR-1 during 2022

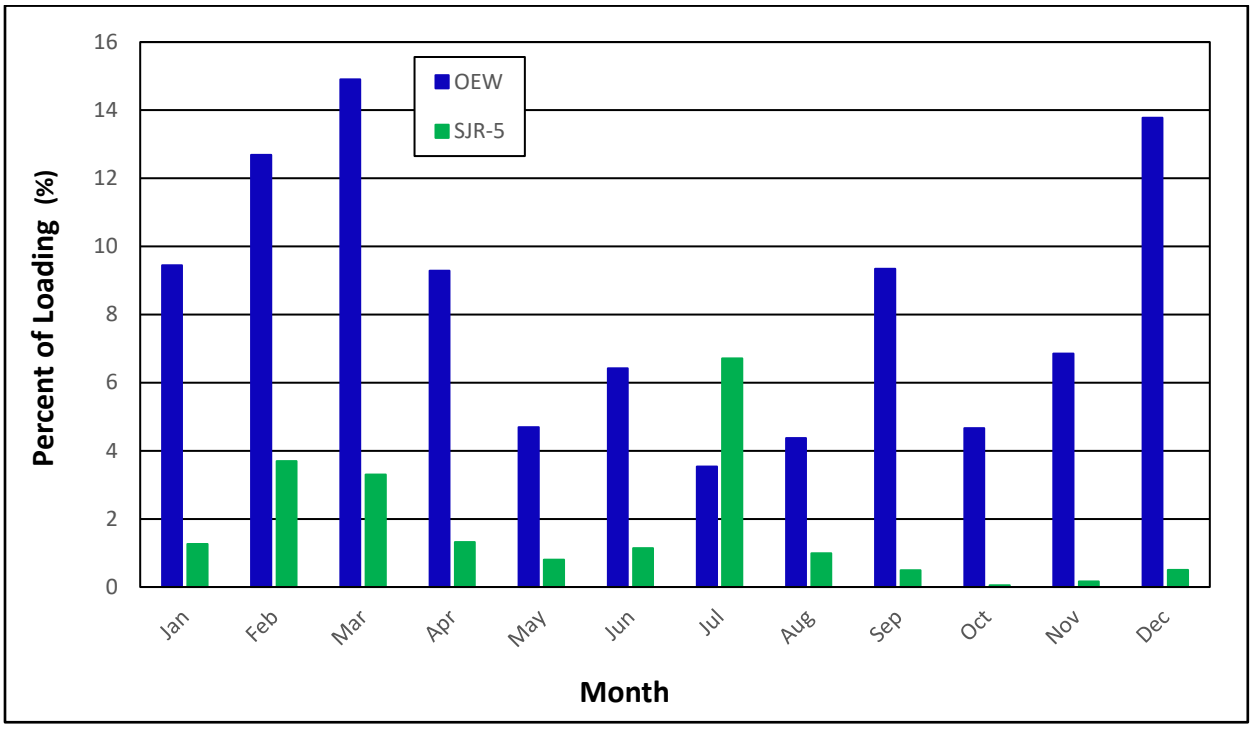

Figure 3-24 Proportion of Monthly Average Total Phosphorus (TP) Loadings: OEW Discharges (D002 and D003) at St. Johns River Monitoring Station SJR-5 during 2022

Table 3-14 Annual Average Total Nitrogen (TN) and Total Phosphorus (TP) Concentrations: OEW Discharges (D002 and D003) and St. Johns River Monitoring Stations (SJR-1 and SJR-5)

Year	Total Nitrogen (mg/L)			Total Phosphorus (mg/L)		
	OEW	SJR-1	SJR-5	OEW	SJR-1	SJR-5
1988 [a]	0.84	0.87	0.87	0.100	0.140	0.150
1989	0.92	0.88	0.89	0.080	0.070	0.070
1990	0.93	1.08	0.89	0.090	0.100	0.080
1991	0.80	1.05	1.09	0.090	0.050	0.120
1992	0.74	1.25	1.05	0.060	0.090	0.110
1993	0.76	1.14	1.00	0.060	0.070	0.090
1994	0.68	1.16	1.06	0.050	0.070	0.080
1995	0.73	1.35	1.23	0.050	0.070	0.080
1996	0.69	1.46	1.30	0.050	0.110	0.090
1997	0.84	1.45	1.28	0.040	0.070	0.070
1998	0.84	1.50	1.39	0.075	0.080	0.090
1999	0.84	1.93	1.44	0.060	0.100	0.110
2000	0.84	2.47	1.93	0.060	0.110	0.090
2001	0.88	2.23	1.91	0.070	0.070	0.110
2002	0.77	2.16	1.77	0.075	0.083	0.116
2003	0.78	1.98	1.51	0.070	0.071	0.078
2004	0.92	1.98	1.49	0.060	0.099	0.092
2005	0.84	1.78	1.37	0.088	0.077	0.080
2006	0.94	2.19	1.76	0.129	0.087	0.104
2007	0.98	2.28	1.73	0.066	0.116	0.100
2008	1.20	2.68	2.35	0.062	0.113	0.106
2009	1.16	2.87	2.14	0.041	0.106	0.093
2010	1.01	2.84	1.92	0.041	0.120	0.088
2011	1.00	2.58	2.10	0.036	0.093	0.088
2012	0.96	2.31	1.99	0.036	0.085	0.084
2013	0.89	2.07	1.86	0.037	0.072	0.073
2014	0.88	1.65	1.42	0.079	0.086	0.088
2015	0.95	1.83	1.19	0.075	0.080	0.046
2016	0.80	1.55	1.28	0.051	0.082	0.075
2017	0.87	1.66	1.42	0.068	0.109	0.106
2018	0.78	1.96	1.29	0.049	0.097	0.059
2019	0.61	1.70	1.28	0.053	0.083	0.061
2020	0.65	1.57	1.18	0.050	0.077	0.068
2021	0.62	1.70	1.27 [b]	0.037	0.086	0.070 [b]
2022	0.60	1.52	1.09	0.046	0.139	0.105
Average	**0.85**	**1.79**	**1.46**	**0.063**	**0.090**	**0.090**

[a] OEW (HS10) – TN and TP concentrations are annual averages based on the monthly Iron Bridge DMRs. Beginning in 2006, TN and TP concentrations were measured as weighted averages for both Outfalls D002 and D003.

[b] Annual average does not include the October 2021 grab sample due to the site closed for construction.

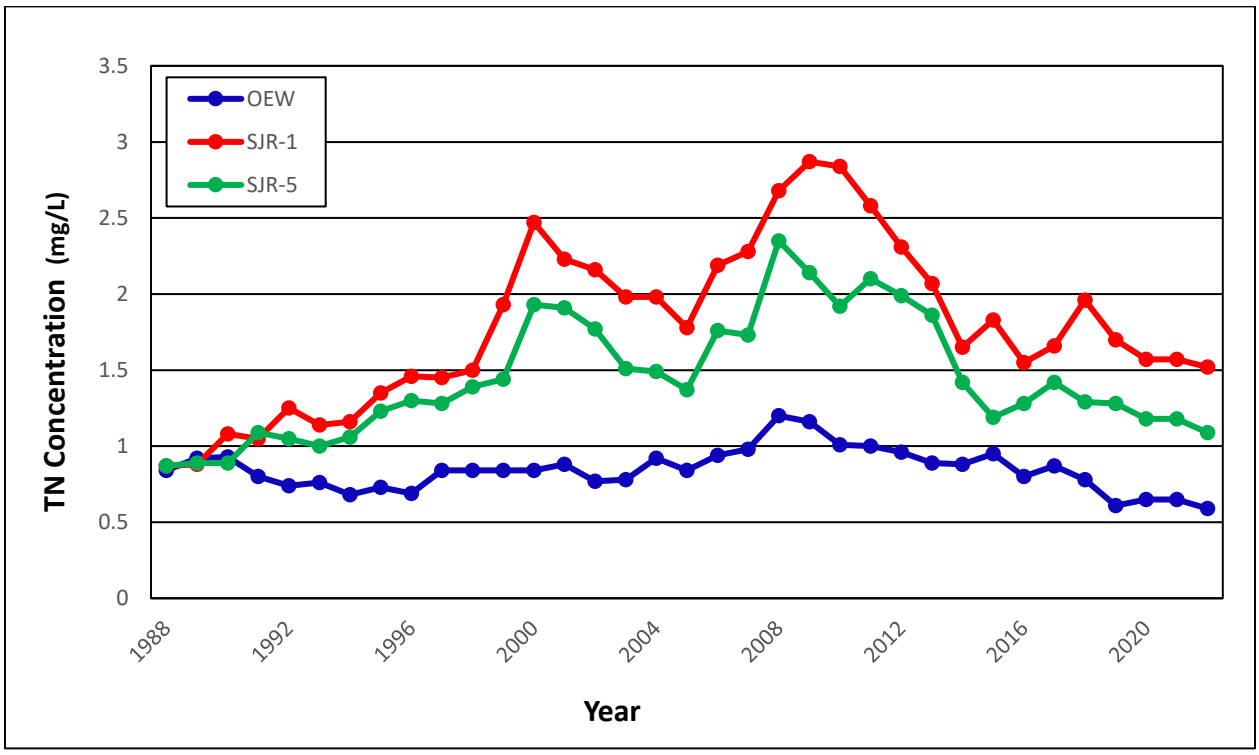

Figure 3-25 Annual Average Total Nitrogen (TN) Concentrations: St. Johns River Monitoring Stations (SJR-1 and SJR-5) and OEW Discharges (D002 and D003)

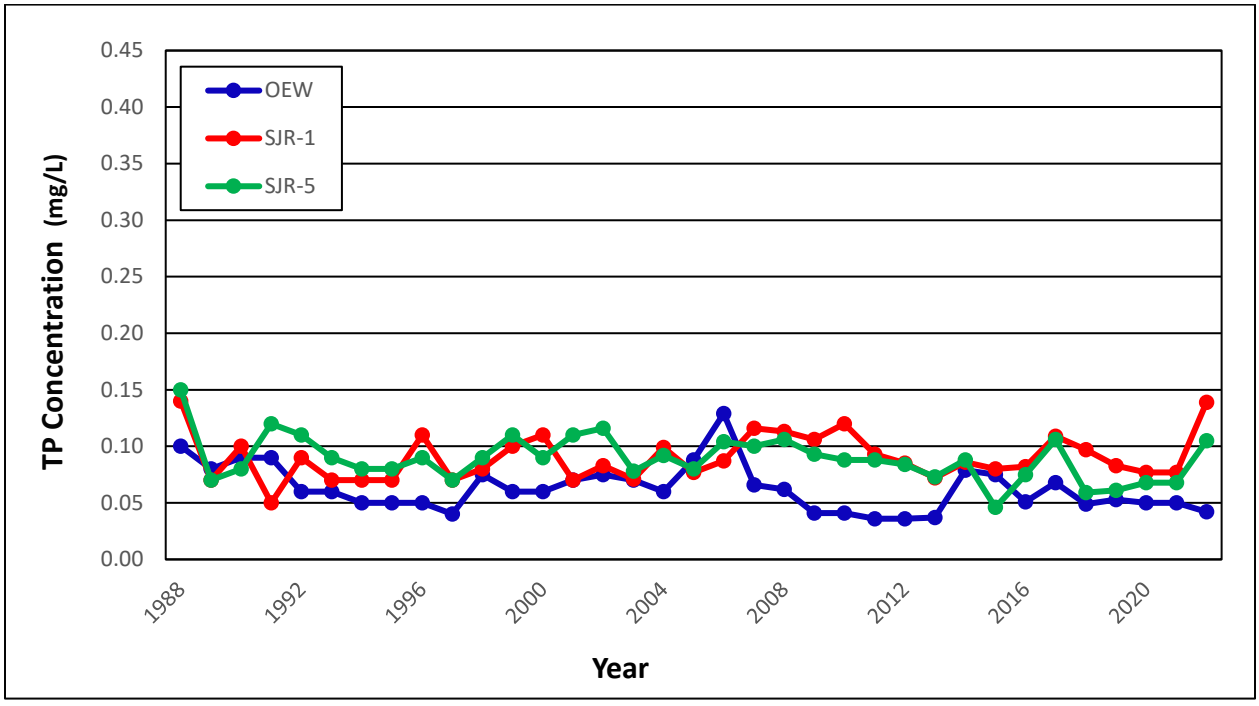

Figure 3-26 Annual Average Total Phosphorus (TP) Concentrations: St. Johns River Monitoring Stations (SJR-1 and SJR-5) and OEW Discharges (D002 and D003)

Table 3-15 Comparison of Annual Average Total Nitrogen (TN) Loadings: OEW Discharges (D002 and D003) and St. Johns River Monitoring Stations (SJR-1 and SJR-5)

Year	OEW	SJR-1		SJR-5	
	Loading (lbs/day)	Loading (lbs/day)	Percent of SJR Loading (%)	Loading (lbs/day)	Percent of SJR Loading (%)
1988 [a]	74.5	4,062	1.83	7,619	0.98
1989	106.7	3,024	3.53	4,808	2.22
1990	82.8	4,576	1.81	4,205	1.97
1991	89.4	10,823	0.83	16,487	0.54
1992	71.6	10,447	0.69	12,824	0.56
1993	63.4	5,578	1.14	7,533	0.84
1994	71.0	11,264	0.63	19,482	0.36
1995	49.1	16,605	0.30	20,393	0.24
1996	99.9	8,490	1.18	12,100	0.83
1997	97.2	8,188	1.19	11,839	0.82
1998	96.8	15,933	0.61	20,294	0.48
1999	133.7	13,373	1.00	13,628	0.98
2000	93.8	5,584	1.68	5,406	1.74
2001	123.0	15,349	0.80	19,553	0.63
2002	106.5	19,311	0.55	20,509	0.52
2003	146.4	15,739	0.93	18,019	0.81
2004	190.8	18,090	1.05	22,521	0.85
2005	176.9	22,014	0.80	22,357	0.79
2006	137.9	6,499	2.12	9,404	1.47
2007	119.5	6,239	1.92	8,807	1.36
2008	150.7	23,218	0.65	28,360	0.53
2009	148.9	14,780	1.01	16,544	0.90
2010	159.7	11,116	1.44	11,212	1.42
2011	143.3	17,067	0.90	18,601	0.77
2012	145.0	13,359	1.09	15,309	0.95
2013	142.4	11,225	1.27	15,107	0.94
2014	136.1	14,816	0.92	18,218	0.75
2015	131.3	9,157	1.43	10,804	1.22
2016	107.8	13,004	0.83	13,240	0.81
2017	173.7	18,267	0.95	20,666	0.84
2018	169.3	14,847	1.14	15,812	1.07
2019	111.1	7,550	1.47	9,467	1.17
2020	116.0	10,203	1.14	11,542	1.01
2021	107.9	7,698	1.40	9,100 [b]	1.19
2022	111.2	11,402	0.98	15,454	0.72
Average	**119.6**	**11,969**	**1.18**	**14,492**	**0.95**

[a] OEW (HS10) – TN and TP loadings are annual averages based on the monthly Iron Bridge DMRs. Beginning in 2006, TN and TP concentrations were measured as weighted averages for both Outfalls D002 and D003.

[b] Annual average does not include the October 2021 grab sample due to site closed for construction.

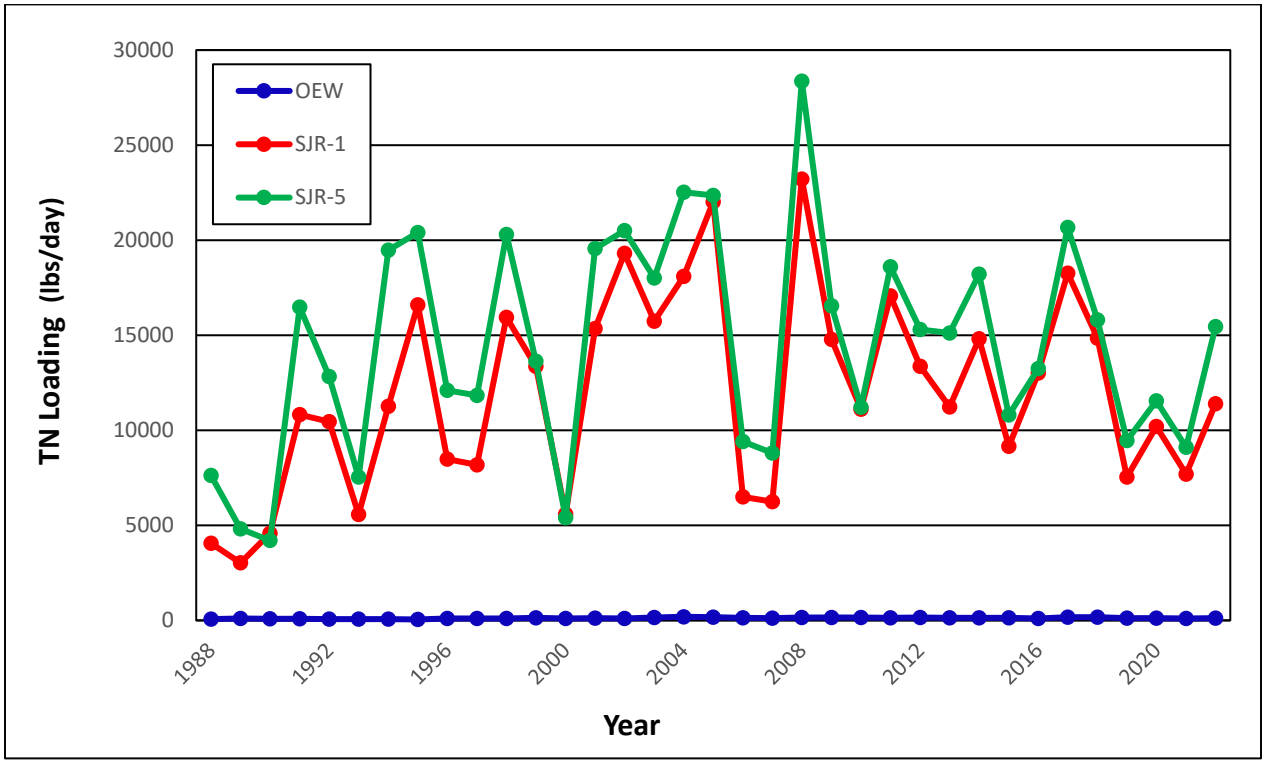

Figure 3-27 Annual Average Total Nitrogen (TN) Loadings: St. Johns River Monitoring Stations (SJR-1 and SJR-5) and OEW Discharges (D002 and D003)

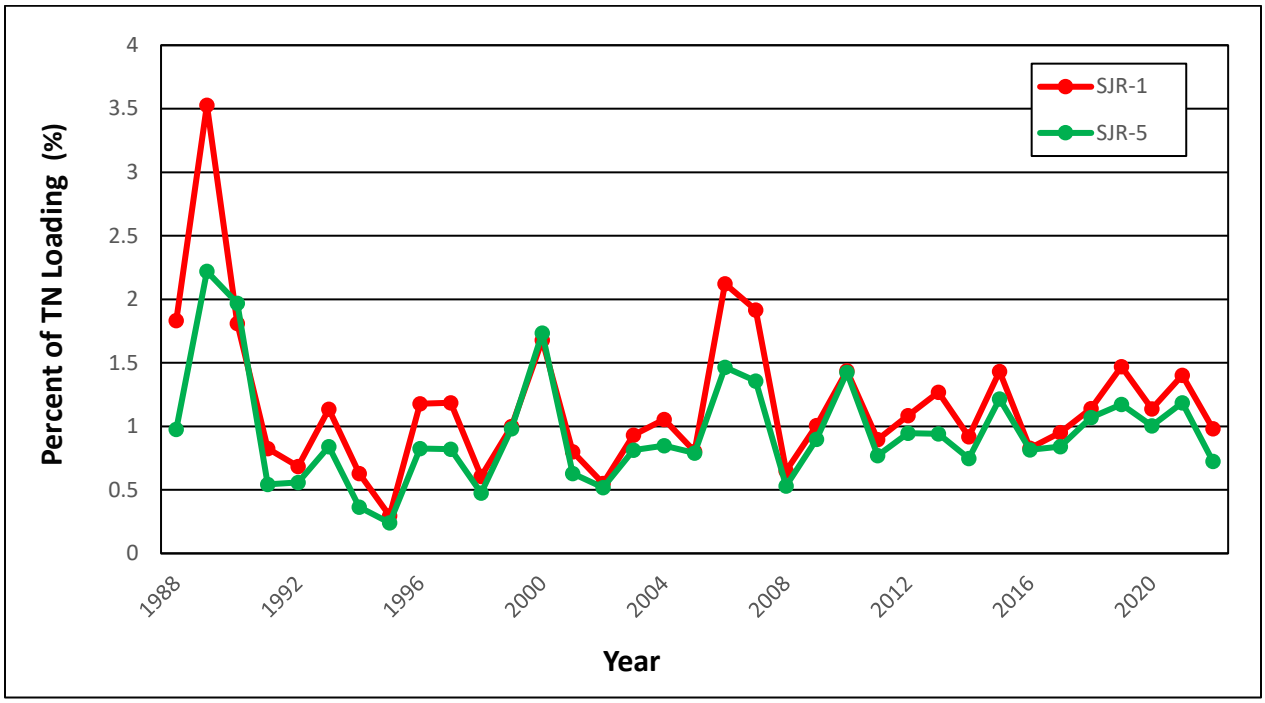

Figure 3-28 Comparison of Annual Average Total Nitrogen (TN) Loadings: St. Johns River Monitoring Stations (SJR-1 and SJR-5) and OEW Discharges (D002 and D003)

Table 3-16 Comparison of Annual Average Total Phosphorus Loadings: OEW Discharges (D002 and D003) and St. Johns River Monitoring Stations (SJR-1 and SJR-5)

Year	OEW	SJR-1		SJR-5	
	Loading (lbs/day)	Loading (lbs/day)	Percent of SJR Loading (%)	Loading (lbs/day)	Percent of SJR Loading (%)
1988 [a]	8.87	654	1.36	1,575	0.56
1989	9.28	241	3.86	378	2.45
1990	8.02	424	1.89	378	2.12
1991	10.06	515	1.95	1,815	0.55
1992	5.81	752	0.77	1,344	0.43
1993	5.00	343	1.46	678	0.74
1994	5.22	680	0.77	1,470	0.36
1995	3.40	861	0.39	1,326	0.26
1996	6.41	640	1.00	838	0.76
1997	6.11	395	1.55	647	0.94
1998	6.17	850	0.73	1,314	0.47
1999	9.66	693	1.39	1,041	0.93
2000	6.97	249	2.80	252	2.77
2001	9.79	482	2.03	1,126	0.87
2002	10.38	742	1.40	1,344	0.77
2003	13.14	564	2.33	931	1.41
2004	12.45	905	1.38	1,391	0.90
2005	18.53	952	1.95	1,306	1.42
2006	18.92	258	7.33	556	3.41
2007	8.05	317	2.54	509	1.58
2008	7.79	979	0.80	1,279	0.61
2009	5.26	546	0.96	719	0.73
2010	6.48	470	1.38	514	1.26
2011	5.16	615	0.84	780	0.66
2012	5.44	492	1.11	646	0.84
2013	5.92	390	1.52	593	1.00
2014	12.22	772	1.58	1,129	1.08
2015	10.37	400	2.59	418	2.48
2016	6.87	688	1.00	776	0.89
2017	13.58	1,200	1.13	1,543	0.88
2018	10.63	735	1.45	723	1.47
2019	9.65	369	2.62	451	2.14
2020	8.92	500	1.78	665	1.34
2021	6.14	378	2.20	524 [b]	1.58
2022	7.97	1,364	0.58	1,748	0.46
Average	**8.70**	**612**	**1.73**	**935**	**1.18**

[a] OEW (HS10) – TN and TP loadings are annual averages are based on the monthly Iron Bridge DMRs. Beginning in 2006, TN and TP concentrations were measured as weighted averages for both Outfalls D002 and D003.

[b] Average does not include October 2021 grab sample, due to site closed for construction.

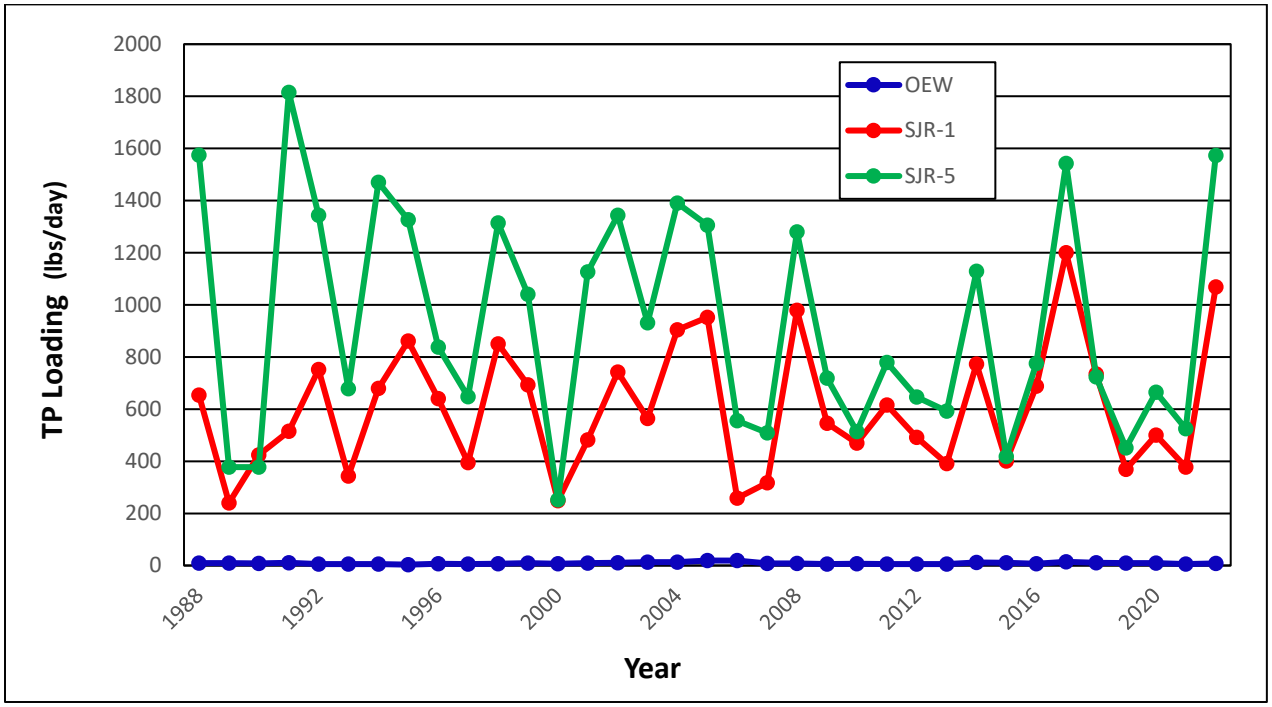

Figure 3-29 Annual Average Total Phosphorus (TP) Loadings: St. Johns River Monitoring Stations (SJR-1 and SJR-5) and OEW Discharges (D002 and D003)

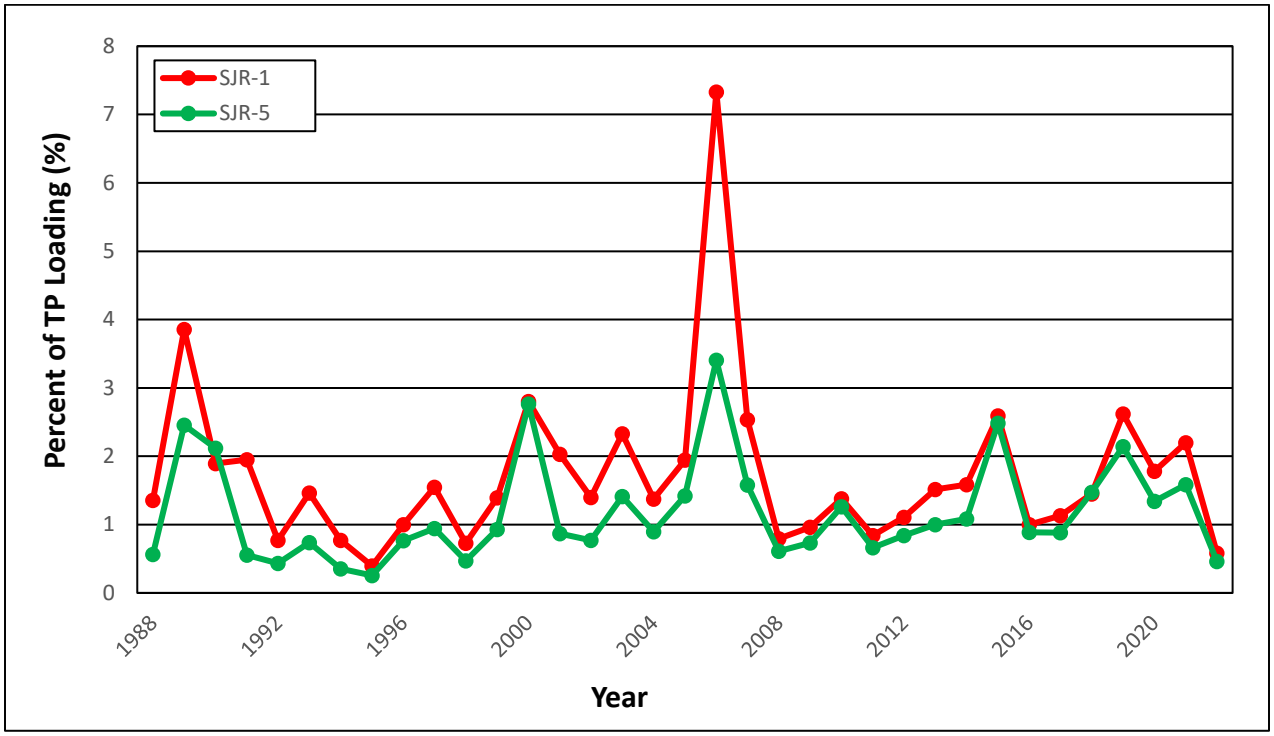

Figure 3-30 Proportion of Total Phosphorus (TP) Loadings: OEW Discharges (D002 and D003) at St. Johns River Monitoring Stations (SJR-1 and SJR-5)

Table 3-17 Proportion of Wasteload Allocation of Monthly Average Nutrient Loadings: OEW Discharges (D002 and D003) [(a)]

Month (2022)	Total Nitrogen Loading (lbs/day)	Percent of Allocation (%)	Total Phosphorus Loading (lbs/day)	Percent of Allocation (%)
January	96.60	25.09	9.04	27.39
February	89.33	23.20	12.14	36.79
March	115.85	30.09	14.26	43.21
April	115.47	29.99	8.88	26.91
May	65.15	16.92	4.49	13.61
June	95.30	24.75	6.14	18.61
July	116.21	30.18	3.38	10.24
August	121.07	31.45	4.18	12.67
September	172.46	44.79	8.94	27.09
October	126.33	32.81	4.46	13.52
November	129.72	33.69	6.56	19.88
December	91.09	23.66	13.18	39.94
Average	**111.22**	**28.89**	**7.97**	**24.15**

[(a)] TN and TP loadings are annual averages. Permit limit for TN loadings is 385 lbs/day, and for TP, 33 lbs/day for the discharges from the OEW.

Table 3-18 Proportion of Wasteload Allocation of Annual Average Nutrient Loadings: OEW Discharges (D002 and D003) [a]

Year	Total Nitrogen Loading (lbs/day)	Percent of Allocation (%)	Total Phosphorus Loading (lbs/day)	Percent of Allocation (%)
1988	74.46	19.34	8.87	26.86
1989	106.73	27.72	9.28	28.12
1990	82.84	21.52	8.02	24.29
1991	89.40	23.22	10.06	30.48
1992	71.59	18.59	5.81	17.59
1993	63.38	16.46	5.00	15.16
1994	71.00	18.44	5.22	15.82
1995	49.13	12.76	3.40	10.29
1996	99.94	25.96	6.41	19.41
1997	97.16	25.24	6.11	18.53
1998	96.75	25.13	6.17	18.70
1999	133.67	34.72	9.66	29.28
2000	93.83	24.37	6.97	21.12
2001	123.00	31.95	9.79	29.65
2002	106.54	27.67	10.38	31.45
2003	146.43	38.03	13.14	39.82
2004	190.82	49.56	12.45	37.71
2005	176.89	45.95	18.53	56.16
2006	137.90	35.82	18.92	57.35
2007	119.49	31.04	8.05	24.38
2008	150.72	39.15	7.79	23.60
2009	148.89	38.67	5.26	15.95
2010	159.71	41.48	6.48	19.65
2011	143.28	37.22	5.16	15.63
2012	145.00	37.66	5.44	16.48
2013	142.37	36.98	5.92	17.94
2014	136.14	35.36	12.22	37.04
2015	131.28	34.10	10.37	31.41
2016	107.82	28.01	6.87	20.83
2017	173.70	45.12	13.58	41.14
2018	169.27	43.97	10.63	32.22
2019	111.11	28.86	9.65	29.25
2020	116.01	30.13	8.92	27.04
2021 [b]	107.93	28.03	6.14	18.61
2022	111.22	28.89	7.97	24.15
Average	**119.58**	**31.06**	**8.70**	**26.37**

[a] TN and TP loadings are annual averages. Permit limit for TN loadings is 385 lbs/day, and for TP, 33 lbs/day for the discharges from the OEW.

[b] Annual average does not include the October 2021 grab sample.

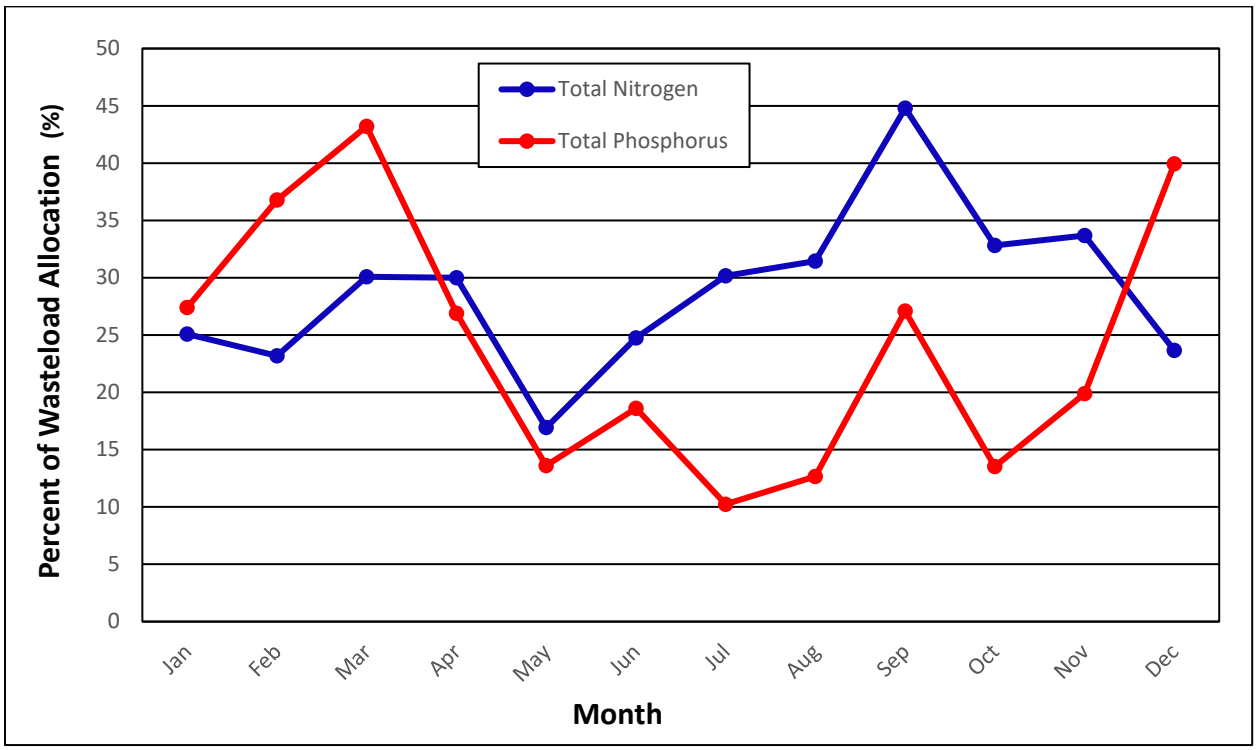

Figure 3-31 Proportion of Wasteload Allocation of Monthly Average Total Nitrogen (TN) and Total Phosphorus (TP) Loadings in OEW Discharges (D002 and D003)

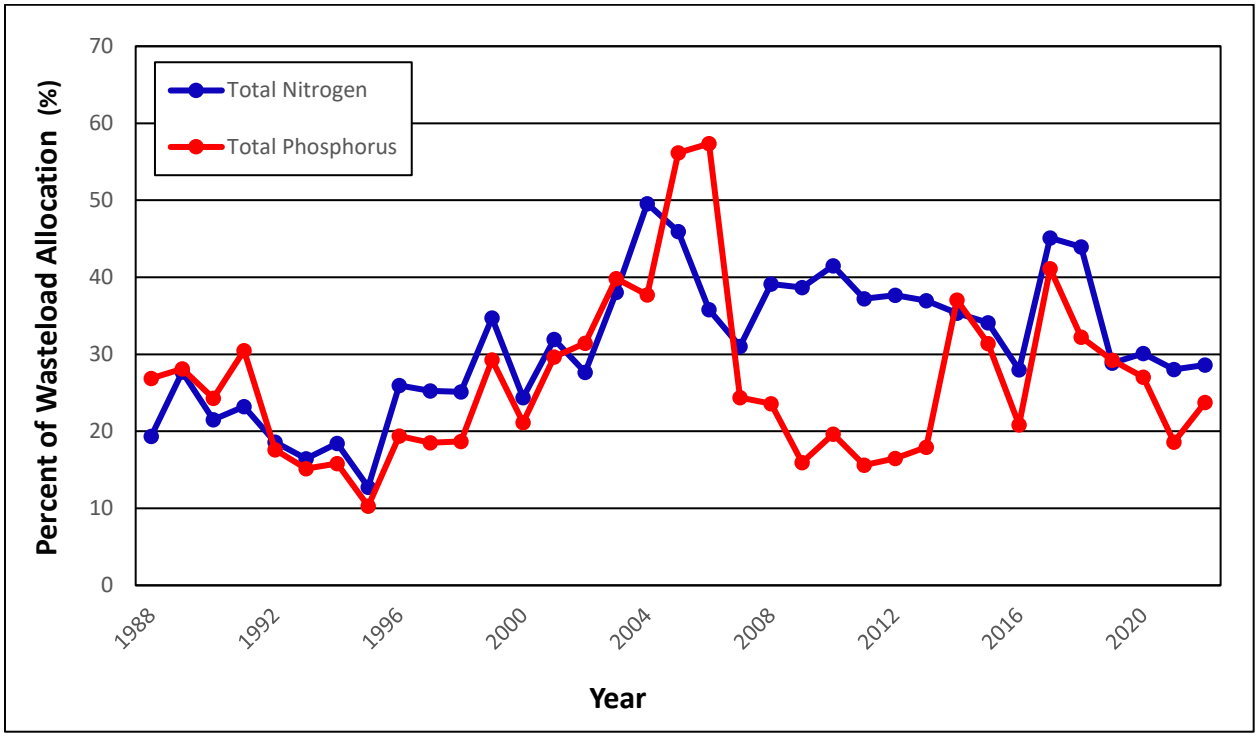

Figure 3-32 Proportion of Wasteload Allocation of Annual Average Total Nitrogen (TN) and Total Phosphorus (TP) Loadings in OEW Discharges (D002 and D003)

Table 3-19 Combined Average Nutrient Loadings: Iron Bridge Outfall (D001) and OEW Discharges (D002 and D003)

Source *	Annual Average Daily Discharge Rate (MGD)	Annual Average Daily Total Nitrogen (2022)		Annual Average Daily Total Phosphorus (2022)	
		Concentration (mg/L)	Loading (lbs/day)	Concentration (mg/L)	Loading (lbs/day)
Little Econ Outfall (D001)	2.35	1.8542	40.82	0.207	4.25
OEW Outfalls (D002 & D003)	22.38	0.6036	111.22	0.0463	7.97
Total	24.74		152.03		12.22
Permit Limit Total	63.0		780		220
Percent of Permit Limit (%)	39.270		19.49		5.55

* Flows are discharged from the Iron Bridge outfall (D001) to the Little Econlockhatchee River (Little Econ). Flows are discharged from the OEW treatment system thru outfalls (D002 and D003) to the un-named ditch, which flows into the St. Johns River. Refer to Page 4 for a complete summary of permit limits.

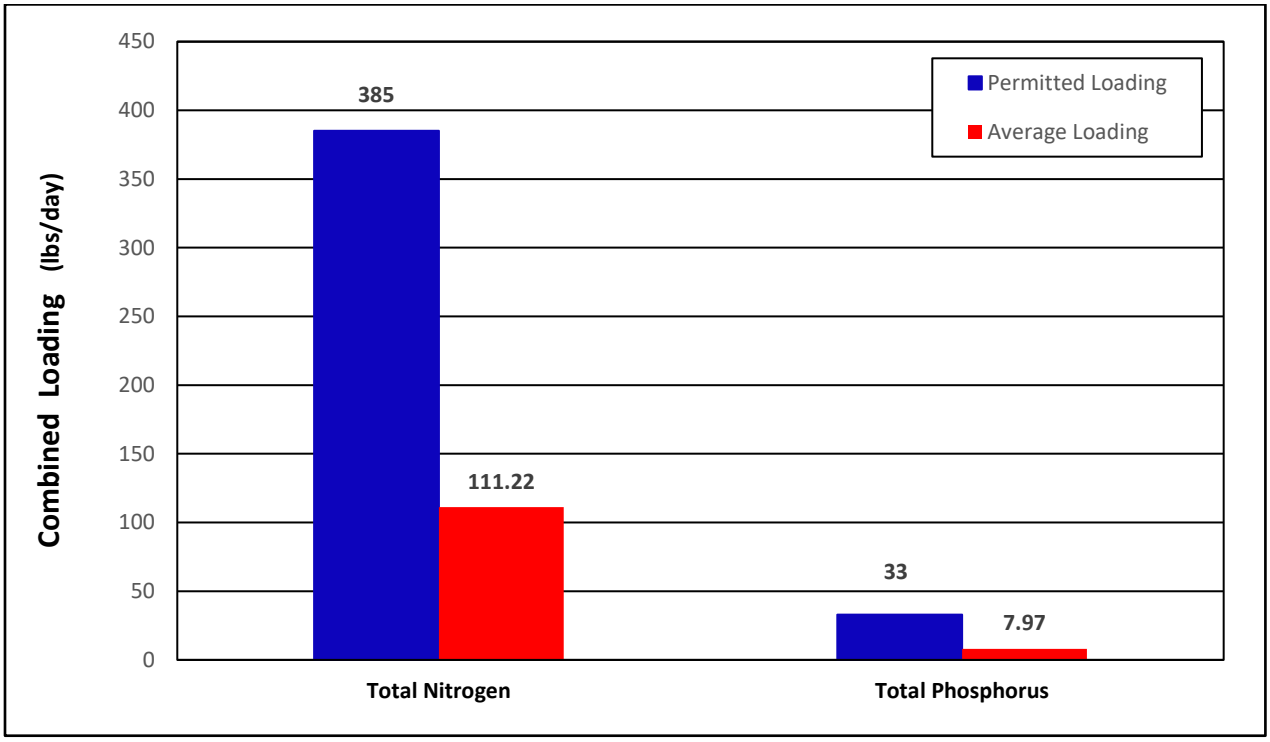

Figure 3-33 Combined Average Nutrient Loadings: OEW Discharges (D002 and D003) for 2022.

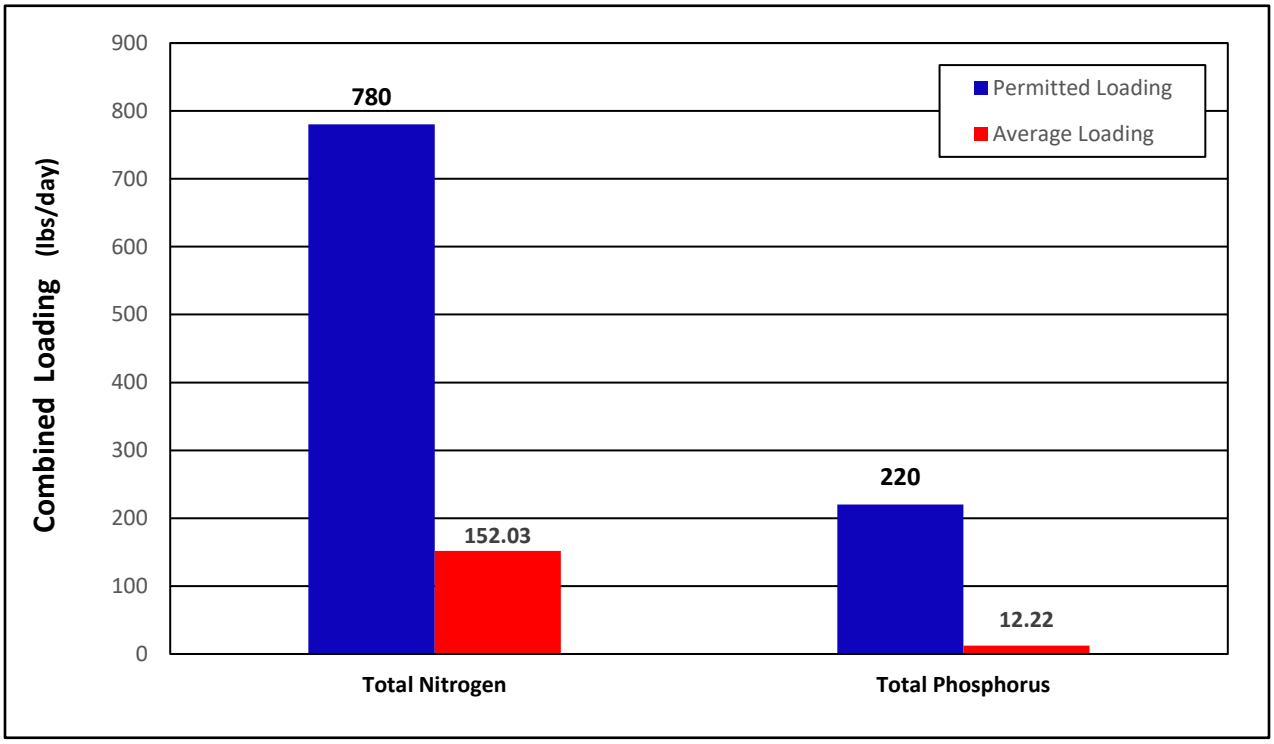

Figure 3-34 Combined Average Nutrient Loadings: Iron Bridge Outfall (D001) Flows and OEW Discharges (D002 and D003) for 2022

Table 3-20 Combined Annual Average Nutrient Loadings: Iron Bridge Outfall (D001) and OEW Discharges (D002 and D003) *

Year	FLOW (MGD)				TOTAL NITROGEN (pounds/day)				TOTAL PHOSPHORUS (pounds/day)			
	D001	OEW	TOTAL	PERCENT OF PERMIT LIMIT	D001	OEW	TOTAL	PERCENT OF PERMIT LIMIT	D001	OEW	TOTAL	PERCENT OF PERMIT LIMIT
1995	10.83	8.79	19.62	31.14	129.83	49.13	178.96	22.94	14.616	3.395	18.011	8.19
1996	10.49	16.34	26.83	42.59	116.67	99.94	216.61	27.77	12.580	6.405	18.985	8.63
1997	11.13	16.66	27.79	44.11	140.34	97.16	237.50	30.45	13.635	6.114	19.749	8.98
1998	10.70	13.96	24.66	39.14	162.73	96.75	259.48	33.27	11.470	6.171	17.641	8.02
1999	8.51	19.41	27.92	44.32	119.46	133.67	253.13	32.45	23.083	9.661	32.744	14.88
2000	9.11	13.69	22.80	36.19	121.84	93.83	215.67	27.65	26.270	6.970	33.240	15.11
2001	9.11	16.76	25.87	41.06	131.55	123.00	254.55	32.63	18.037	9.785	27.822	12.65
2002	9.68	16.59	26.27	41.70	117.20	106.54	223.74	28.68	19.347	10.377	29.724	13.51
2003	9.09	22.51	31.60	50.16	96.93	146.43	243.36	31.20	15.238	13.141	28.379	12.90
2004	8.40	24.87	33.27	52.81	102.95	190.82	293.77	37.66	16.626	12.445	29.071	13.21
2005	7.53	25.25	32.78	52.03	124.61	176.89	301.50	38.65	25.628	18.532	44.160	20.07
2006	8.05	17.59	25.64	40.70	118.75	137.90	256.65	32.90	23.109	18.924	42.033	19.11
2007	6.98	14.62	21.60	34.29	138.73	119.49	258.22	33.11	16.137	8.047	24.184	10.99
2008	7.22	15.06	22.28	35.37	143.83	150.72	294.55	37.76	12.838	7.787	20.625	9.38
2009	6.38	15.39	21.77	34.56	106.43	148.89	255.32	32.73	8.115	5.263	13.378	6.08
2010	5.41	18.96	24.37	38.68	92.38	159.71	252.09	32.32	6.455	6.483	12.938	5.88
2011	3.36	17.18	20.54	32.60	61.47	143.28	204.75	26.25	4.493	5.158	9.651	4.39
2012	3.46	18.11	21.57	34.24	55.26	145.00	200.26	25.67	5.668	5.437	11.105	5.05
2013	5.37	19.18	24.55	38.97	82.74	142.37	225.11	28.86	14.195	5.919	20.114	9.14
2014	6.00	18.55	24.55	38.97	76.01	136.14	212.15	27.20	24.729	12.222	36.951	16.80
2015	5.91	16.57	22.48	35.68	71.54	131.28	202.82	26.00	12.253	10.365	22.618	10.28
2016	6.27	16.16	22.43	35.60	90.68	107.82	198.50	25.45	4.949	6.874	11.823	5.37
2017	3.95	23.94	27.89	44.27	70.17	173.70	243.87	31.27	4.949	13.577	18.526	8.42
2018	3.32	26.02	29.34	46.57	59.26	169.07	228.53	29.30	3.996	10.633	14.629	6.65
2019	4.12	21.84	25.96	41.21	69.86	111.11	180.97	23.20	10.176	9.654	19.830	9.01
2020	3.77	21.40	25.17	39.95	65.24	116.01	181.25	23.24	6.310	8.924	15.234	6.93
2021	2.34	19.91	22.25	35.32	35.61	107.93	143.54	18.40	4.800	6.140	10.940	4.97
2022	2.35	22.39	24.74	39.27	40.82	111.22	152.03	19.49	4.247	7.971	12.218	5.55
Average	**6.74**	**18.49**	**25.23**	**40.05**	**97.96**	**129.49**	**227.46**	**29.16**	**12.998**	**9.013**	**22.012**	**10.01**

* Permit Limits: Total flows of 63 MGD. Combined total nitrogen loading of 780 lbs/day. Combined total phosphorus loading of 220 lbs/day. Refer to Page 4.

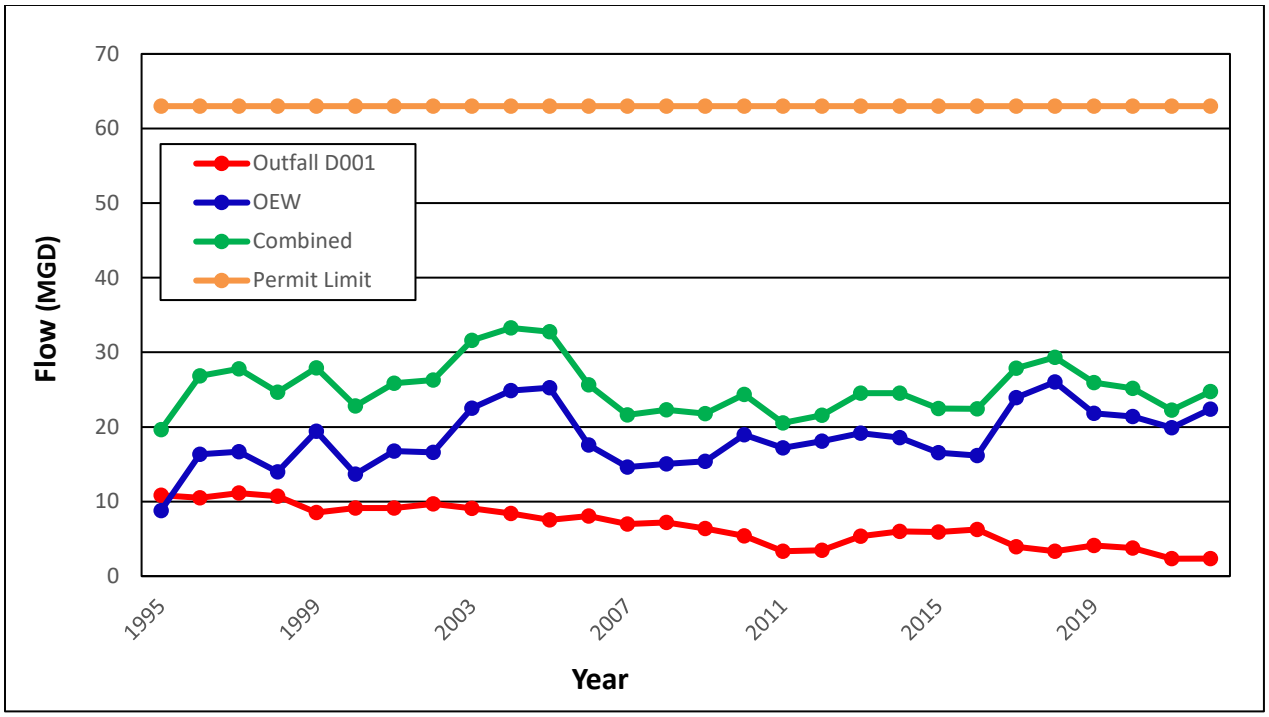

Figure 3-35 Combined Annual Average Flows: Iron Bridge Outfall (D001) and OEW Influent Flows (R001)

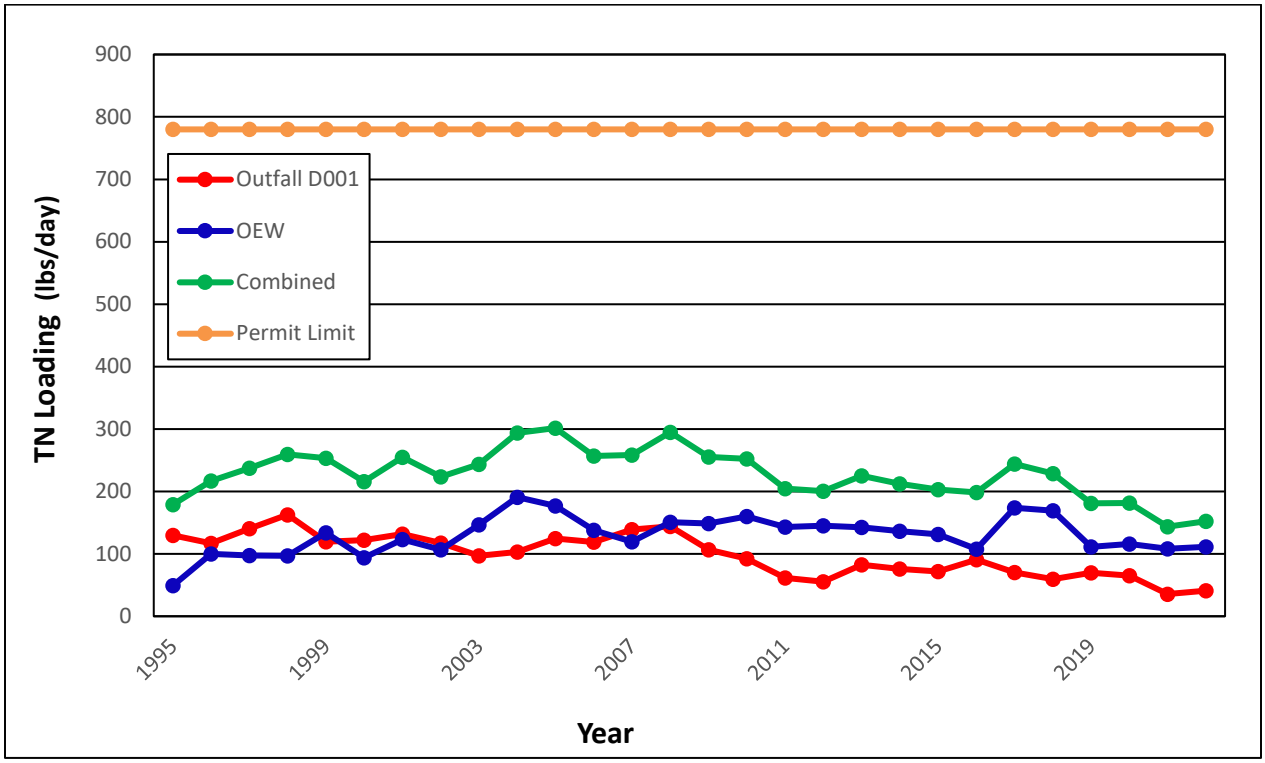

Figure 3-36 Combined Annual Average Total Nitrogen (TN) Loadings: Iron Bridge Outfall (D001) and OEW Discharges (D002 and D003)

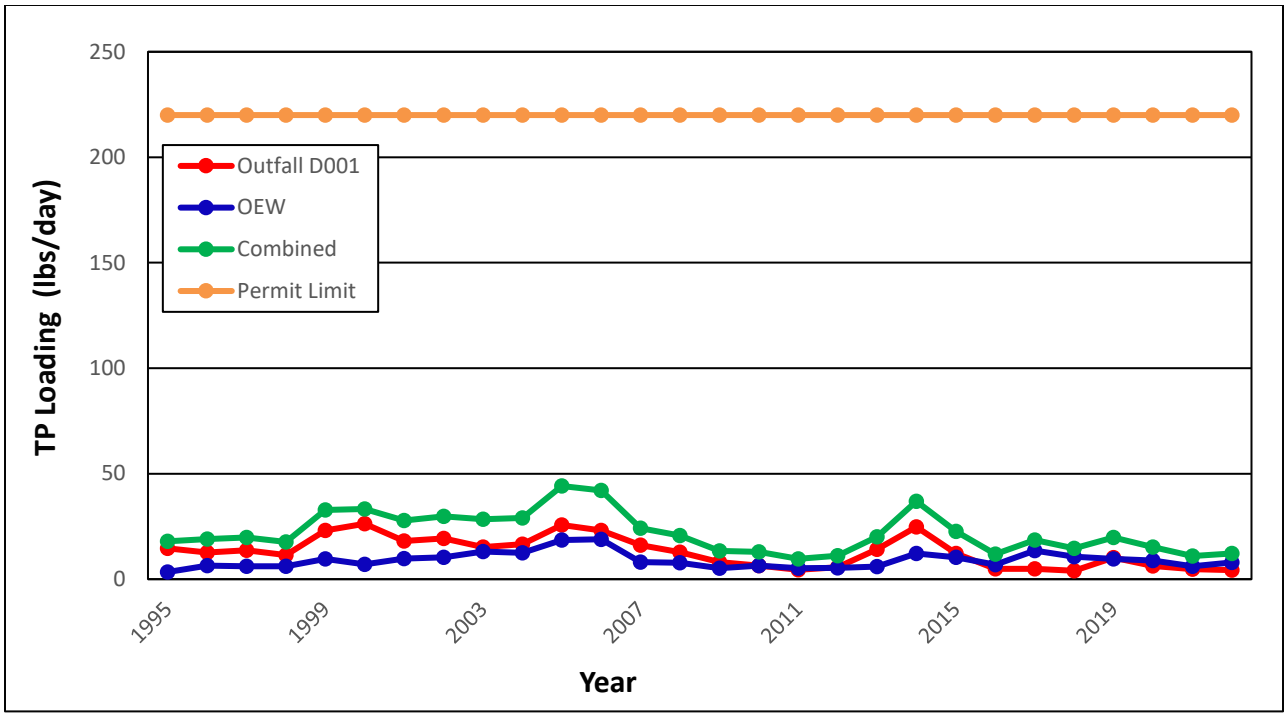

Figure 3-37 Combined Annual Average Total Phosphorus (TP) Loadings: Iron Bridge Outfall (D001) Flows and OEW Discharges (D002 and D003)

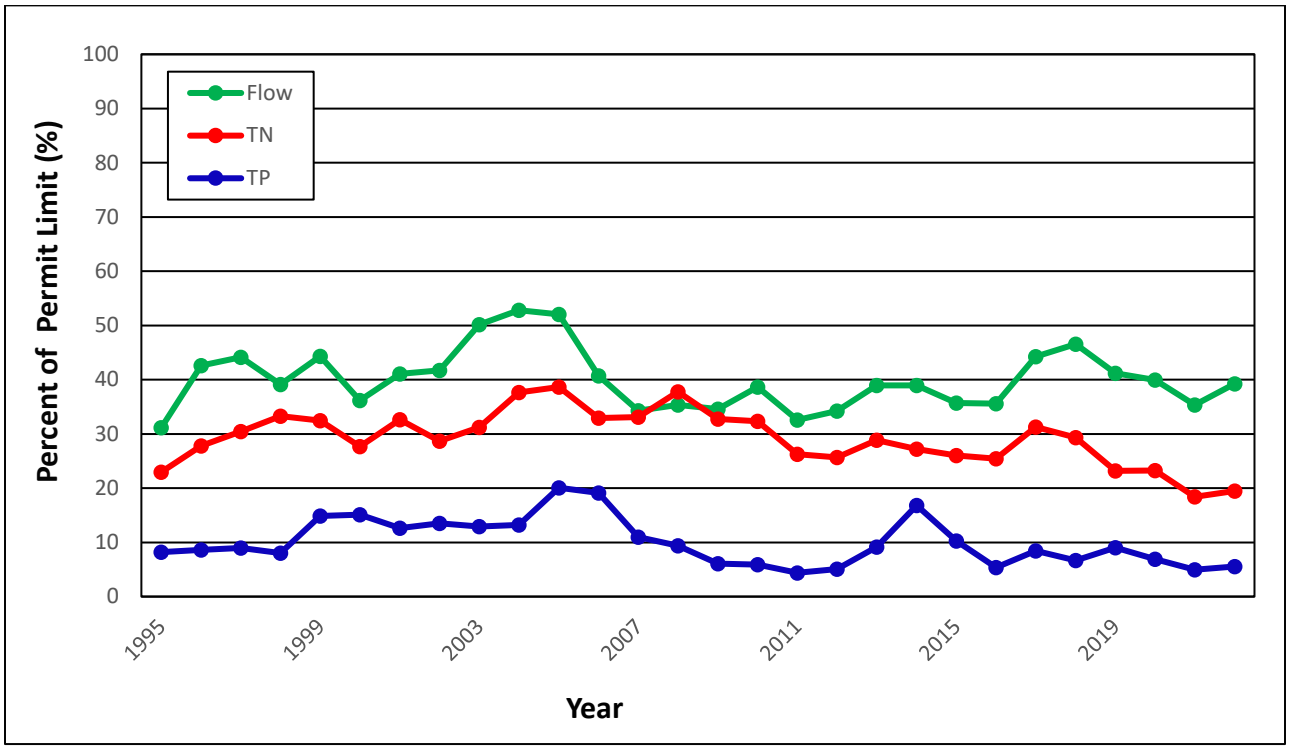

Figure 3-38 Percentage of Permit Limits for Annual Average Flows, Total Nitrogen (TN) Loadings, and Total Phosphorus (TP) Loadings: Iron Bridge Outfall (D001) and OEW Discharges (D002 and D003)

Table 3-21 Average Water Quality Parameters: NNC Monitoring Stations along the Un-Named Ditch *

Parameter (2022)	NNC Up: 50' Upstream of Outfall D003	NNC Near: 50' Upstream of Final Weir Control	NNC Far: 70' Upstream of Confluence
Total Kjeldahl Nitrogen	1.098 mg/L	0.810 mg/L	0.816 mg/L
Nitrate/Nitrite	0.021 mg/L	0.021 mg/L	0.021 mg/L
Total Nitrogen	1.115. mg/L	0.828 mg/L	0.834 mg/L
Total Phosphorus	0.081 mg/L	0.073 mg/L	0.089 mg/L
pH	7.153 s.u.	7.095 s.u.	7.175 s.u.
Specific Conductivity	580 umhos	485 umhos	507 umhos
Dissolved Oxygen	0.815 mg/L	3.786 mg/L	4.013 mg/L
Chlorophyll-a	5.48 mg/m3	3.02 mg/m3	2.59 mg/m3
Secchi Disk Depth	9.95 in	19.0 in	21.3 in

* Average value of 4 quarterly samples during 2022. Duplicate sample values were averaged and entered as a single data point for that quarterly monitoring event.

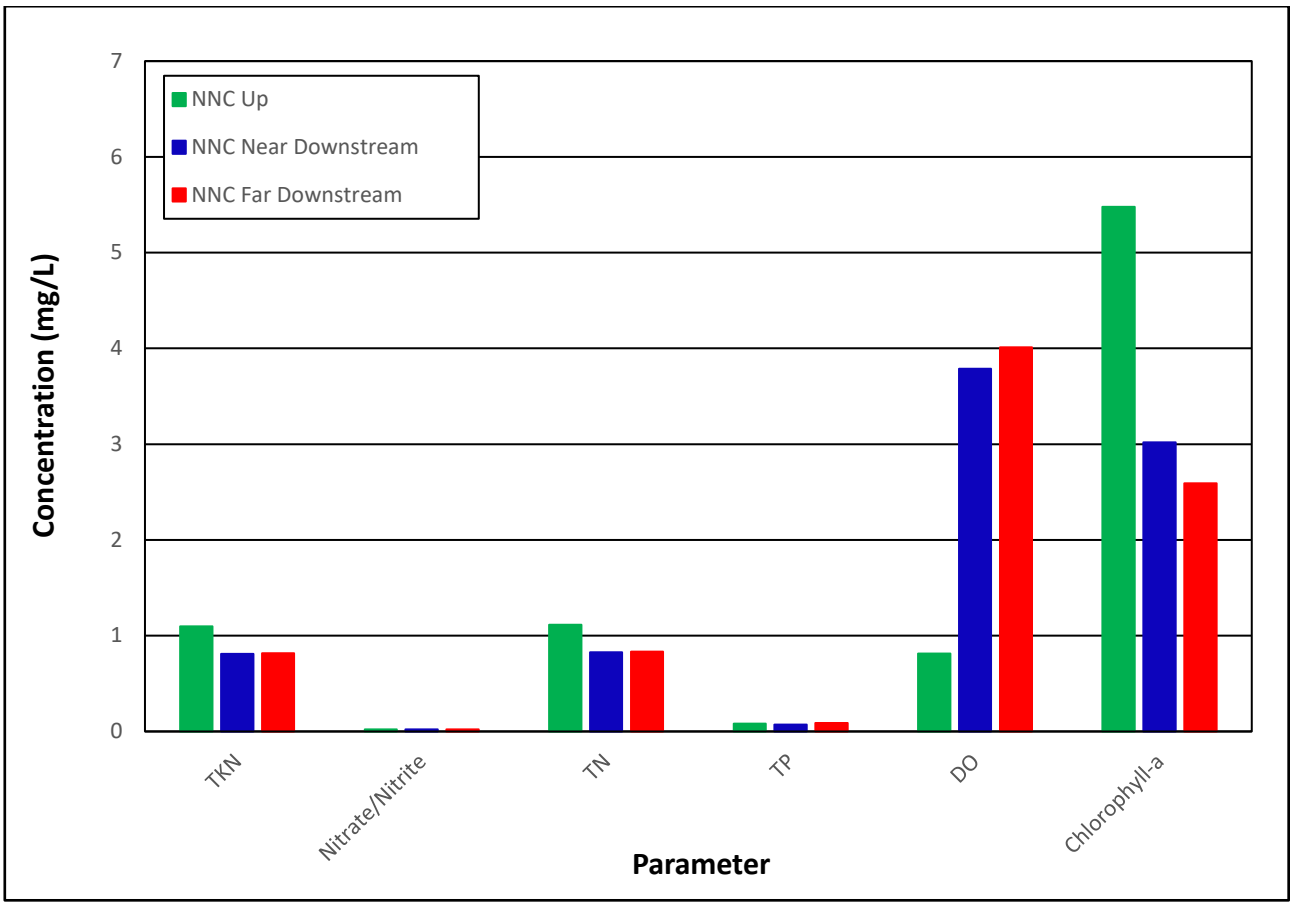

Figure 3-39 Comparison of Average Water Quality Parameters: NNC Monitoring Stations along the Un-Named Ditch for 2022

Table 3-22 Average Quarterly Total Nitrogen (TN) Concentrations and Loadings: NNC Monitoring Stations along the Un-Named Ditch *

Date (2022)	OEW Discharge	NNC Upstream		NNC Near Downstream		NNC Far Downstream	
	Flow (MGD)	TN (mg/L)	TN Loading (lbs/day)	TN (mg/L)	TN Loading (lbs/day)	TN (mg/L)	TN Loading (lbs/day)
1st Quarter February 21	16.18	0.74	99.9	0.580 0.570	78.3 76.9	0.560	75.6
2nd Quarter May 09	13.13	1.01	110.6	0.550	60.2	0.600 0.550	65.7 60.2
3rd Quarter August 15	22.79	0.99	188.2	0.700 0.670	133.1 127.4	0.680	129.3
4th Quarter November 07	30.26	1.71	431.5	1.500	378.6	1.610 1.430	406.3 360.9
Average	**20.59**	**1.12**	**207.5**	**0.762**	**142.4**	**0.905**	**183.0**

* Duplicate samples are collected twice each calendar year at the downstream sites. Hurricane Ian occurred on September 29, 2022 and Hurricane Nicole happened on November 10, 2022.

Table 3-23 Average Quarterly Total Phosphorus (TP) Concentrations and Loadings: NNC Monitoring Stations along the Un-Named Ditch *

Date (2022)	OEW Discharge	NNC Upstream		NNC Near Downstream		NNC Far Downstream	
	Flow (MGD)	TP (mg/L)	TP Loading (lbs/day)	TP (mg/L)	TP Loading (lbs/day)	TP (mg/L)	TP Loading (lbs/day)
1st Quarter February 21	16.18	0.090	12.14	0.042 0.076	5.668 10.256	0.039	5.263
2nd Quarter May 09	13.13	0.065	7.12	0.130	14.236	0.045 0.037	4.928 4.052
3rd Quarter August 15	22.79	0.047	8.93	0.015 0.015	2.851 2.851	0.015	2.851
4th Quarter November 07	30.26	0.120	30.28	0.088	22.208	0.255 0.270	64.354 68.139
Average	**20.59**	**0.081**	**14.62**	**0.061**	**9.678**	**0.110**	**24.931**

* Duplicate samples are collected twice each calendar year at the downstream sites. Hurricane Ian occurred on September 29, 2022 and Hurricane Nicole happened on November 10, 2022.

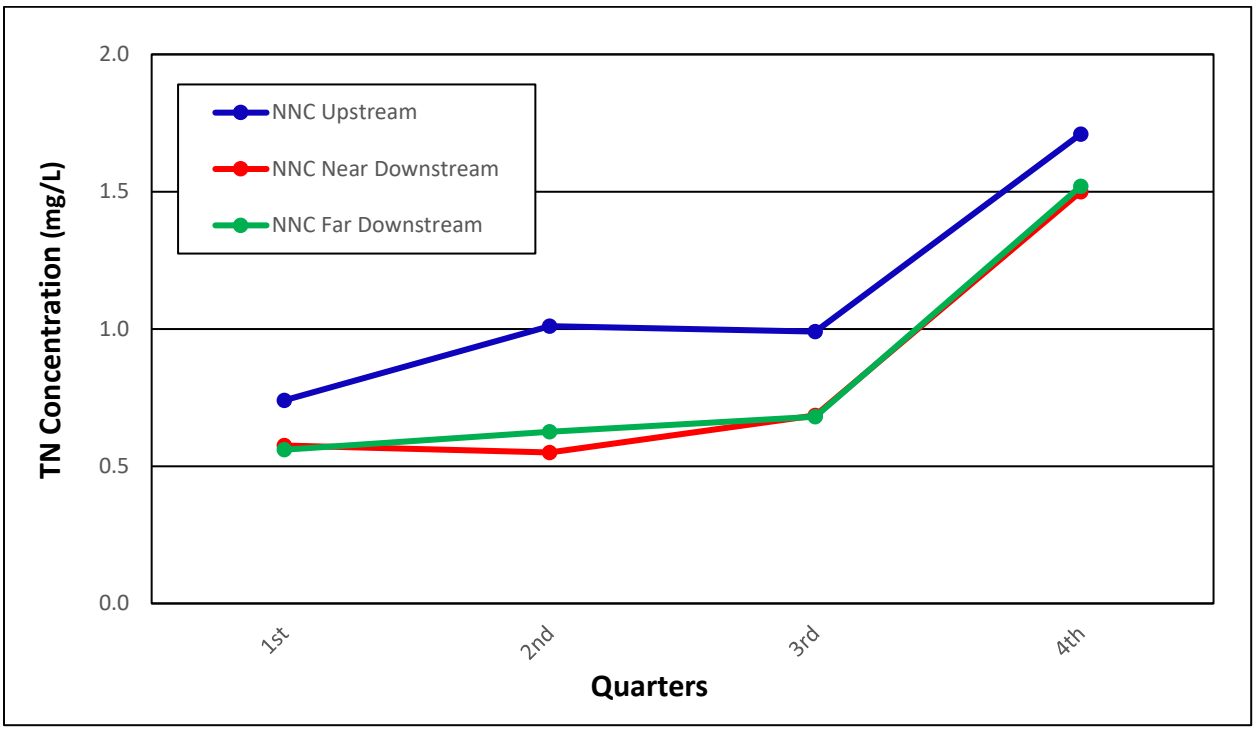

Figure 3-40 Average Quarterly Total Nitrogen (TN) Concentrations: Un-Named Ditch (NNC-Up, NNC-Near, and NNC-Far) for 2022

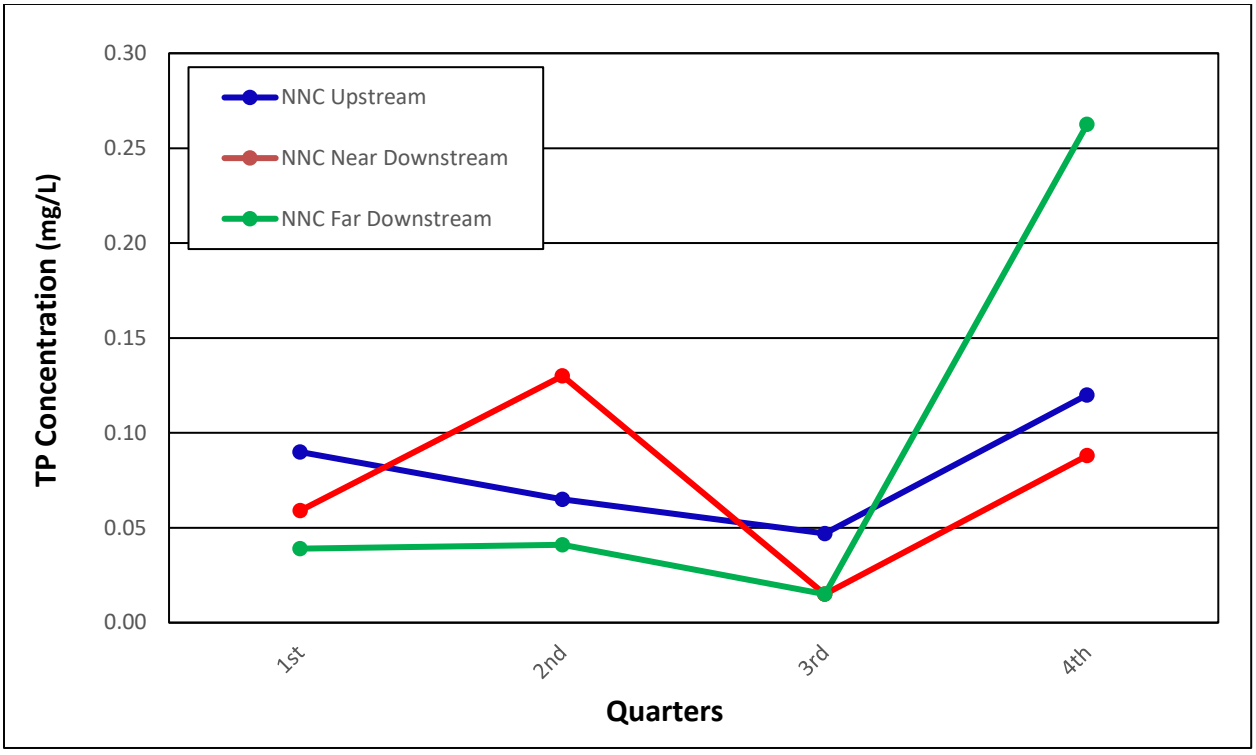

Figure 3-41 Average Quarterly Total Phosphorus (TP) Concentrations: Un-Named Ditch (NNC-Up, NNC-Near, and NNC-Far) for 2022

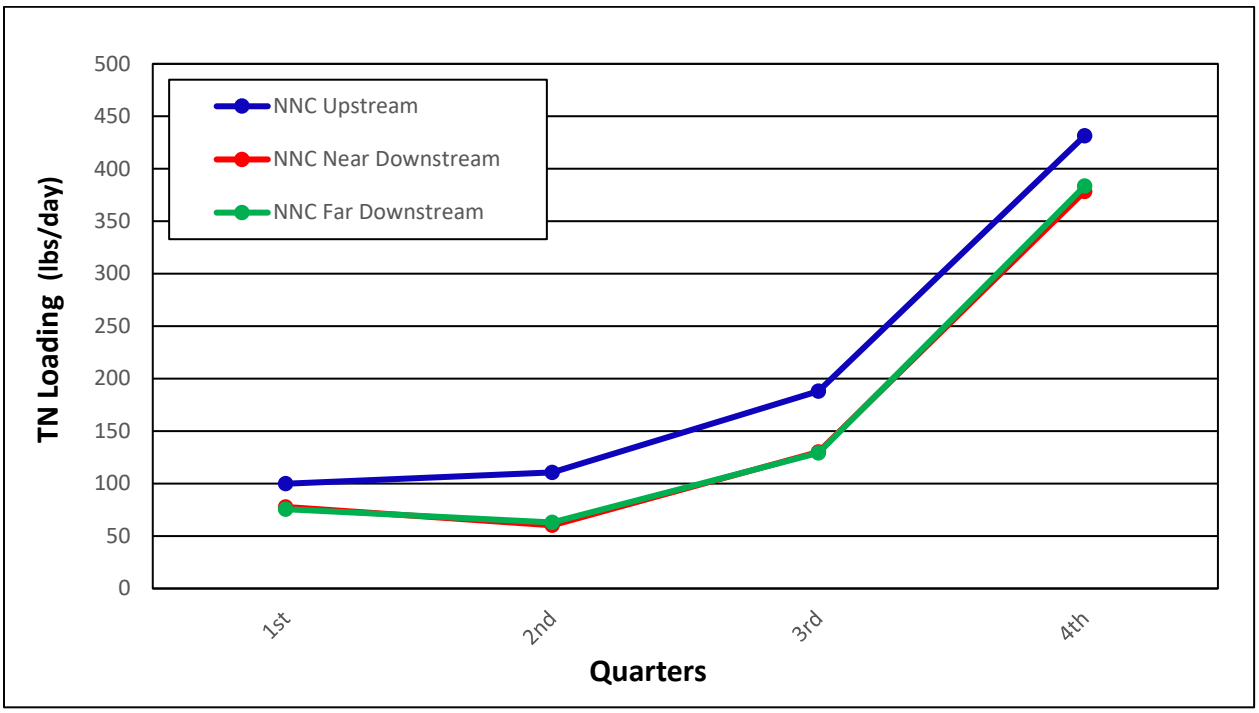

Figure 3-42 Average Total Nitrogen (TN) Loadings: Un-Named Ditch (NNC-Up, NNC-Near, and NNC-Far) and OEW Discharges (D002 and D003) for 2022

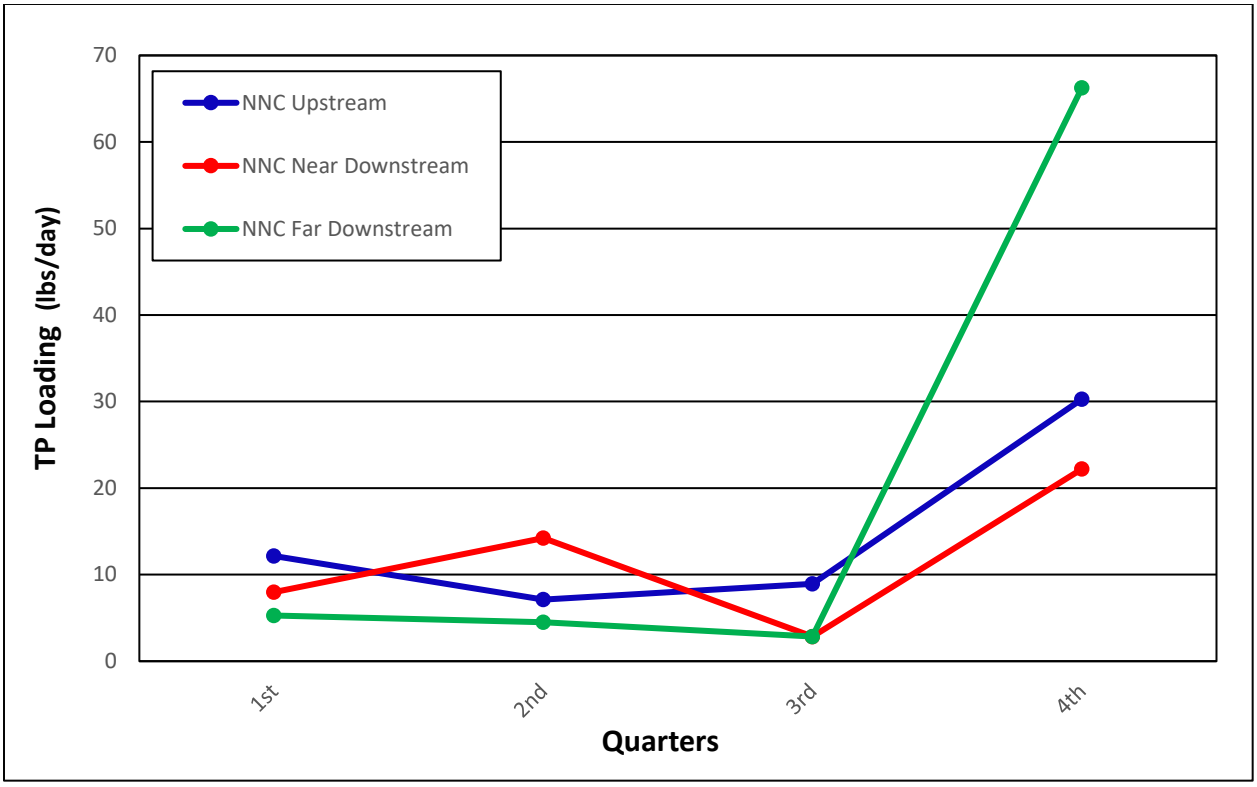

Figure 3-43 Average Total Phosphorus (TP) Loadings: Un-Named Ditch (NNC-Up, NNC-Near, and NNC-Far) for 2022

Chapter 4
Orlando Easterly Wetlands

4.1 Operations and Management

The wetlands treatment system was designed to simulate a natural freshwater marsh and hardwood swamp with a lake. Critical to the successful operation of the system is replication of typical water depths and hydroperiod of Florida natural systems. This section describes the management of the OEW to optimize reliable and consistent nutrient sequestration and removal.

Sixty-seven (67) control structures were installed, including bi-directional flow structures, to allow the flows (water) to be diverted throughout the OEW. The control structures, groundwater monitoring wells, and sampling stations are shown in Figure 4-1. Several of the control structures and groundwater monitoring wells are listed in the FDEP operation permit as compliance sampling locations.

The OEW has five (5) treatment strata that the influent water will flow through the treatment trains or paths. Several sampling locations are designated for each strata in the FDEP facility permit. The five strata and related compliance sampling stations include the following:

- Station WP1 represents the influent flows and referred to as R001 in the FDEP facility permit.

- Stratum 1 includes Cells 1, 2, 11, and 12. In accordance with the FDEP facility permit, Stratum 1 is sampled at WP2 (WL11X) and WP3 (WL1Y).

- Stratum 2 includes Cell 3, 4, 5, and 6. In accordance with the FDEP facility permit, Stratum 2 is sampled at WP4 (WL4X) and WP5 (WL3A).

- Stratum 3 includes Cell 7, 8, 9, 10, and 15. In accordance with the FDEP facility permit is sampled at WP6 (WL8X) and MM7 (WL15X).

- Stratum 4 includes Cell 13, 14, and 18. In accordance with the FDEP facility permit is sampled at MM8 (WL13X).

- Stratum 5 includes Cells 16A, 16B, 17, and Lake Searcy. In accordance with the FDEP facility permit is sampled at WLHS9, which is at Lake Searcy.

- Station WLHS10 represents the outfall for the discharges from the OEW and is referred to as D002 in the FDEP facility permit.

The OEW is divided into three (3) distinct flow paths through the wetland treatment system: northern, central, and southern. The flow paths are illustrated in Figure 4-2. The northern flow path includes Cells Nos. 1, 3, 4, 7, 8, 13, and 17. The central flow path incorporates Cell Nos. 2, 5, 6, 9, 10, 14, 16B, and 17. The southern flow path encompasses 11, 12, 18, 16A, and 17. The flows from the three different treatment paths travel through Cell No. 17 to Outfall D002. The influent flows for the OEW can be routed through any of these three flow paths. Typically, the three flow paths are open and receive about 1/3 of the influent flow entering the OEW.

Periodically, treatment cells are demucked to remove sediments and to restore the nutrient assimilative and sequestration capacity upon re-establishment of the aquatic vegetative communities. During demucking renovations, the treatment cell is drained with the accumulated organic material being removed down to the original soil layer. Upon completion of excavations and grading, the treatment cell is flooded and beneficial aquatic plant communities are reintroduced into the renovated area.

Paul Boudreau, a University of Central Florida graduate under the supervision of Dr. Lisa Chambers, conducted a biogeochemistry study during the winter of 2019 through the spring of 2021, to assess the effects of wetland drawdown on the treatment system and nutrient removal. The study utilized a long dry down period to identify the impacts on accumulated organic matter and how the technique may be used to increase nutrient uptake throughout the wetland treatment system. Effective drawdown events could delay more costly maintenance activities and invasive demucking events.

Cell 11 was designated for the study and was drained, ditched, and pumped dry. Cell 11 received no flow throughout the study. Cell 12 maintained normal flow conditions for comparison. Soil core and water quality samples were collected throughout the study. Water quality parameters included, but were not limited to, nitrate/nitrite, ammonium, and orthophosphate. Results from the study will be reported in a future annual report as a supplement. Monthly and semi-annual water quality sampling was conducted at WL12Y was substituted for WL11X as a replacement.

In 2015, the City of Orlando began a program to rehabilitate control structures and upgrade staff gages from horizontal survey Datum NAD 27 to Datum NAD 83. The upgrade was completed in 2021. The changes in flows and weir board manipulations for water depth were conducted throughout the year. A summary of these activities appears in Table 4-1.

Several times a year, the weir control structures are cleared of vegetation and debris. Certain cells, which have numerous dead trees are often cleared of limbs, branches, and logs to assure proper flow of water through the OEW. A containment boom was installed ahead of Outfall D002 as a floating mat exclusion device. The installation successfully prevented water lettuce (*Pistia stratoides*) from traveling into the St. Johns River and contained other floating debris from entering the un-named ditch.

Herbicide treatment is the primary means of invasive vegetation control that focuses on dominant aquatic species, such as cattails (*Typha* spp.) and water lettuce (*Pistia stratiotes*). Vegetation control promotes a diverse habitat within the OEW and improves the water quality in the treatment cells. More than, 240 hours were spent in aquatic herbicide

application. Although spraying is occasionally used throughout the wetland treatment system, most applications were focused on Cells 13, 14, 16A, 16B, 17, and Lake Searcy.

Another aquatic vegetation control method currently used at the OEW is prescribed burning. A prescribed fire event was conducted in Cells 11 and 12 in February 2022. This fire was incomplete and only affected about 10% of the total area of the cells. A prescribed burn was initiated in March 2022 in Cells 5, 8, 9, 10, and 18. The coverage of these fires was complete, except Cell 18, which was burned only 10% of the area. These cells were selected to reduce the extent of the cat tail mats for improved nutrient removal and operation. Cell 2 was burned in February 2021 for the same purpose. Prescribed burning may be used in the future to supplement or in lieu of herbicide applications. The prescribed burn areas are shown in Figure 4-4.

4.2 Nutrients

The water quality and performance data for January 2022 through December 2022, are presented in Appendix C and Appendix D. Samples were collected at the following locations: WP1, WL11X, WL15X, HS9, and HS10 as designated in the FDEP facility permit. WL11X in Cell 11 was returned to the sampling program for 2022 following completion of the biogeochemistry study. Monitoring at WL12Y was discontinued. Each designated sampling location is further away from the influent point (WP-1).

4.2.1 Nitrogen

The average monthly total nitrogen (TN) influent and effluent concentrations are presented in Table 4-2 and Figure 4-5. The influent and effluent TN concentrations averaged 1.745 mg/L and 0.604 mg/L, respectively, which resulted in a 62.9% reduction in 2022. The TN influent (WP-1) and effluent (HAS-10) concentrations were significantly below the allowable permit concentration limits of 6 mg/L and 2.31 mg/L, respectively.

The average monthly influent and effluent TN loadings for 2022 averaged 303.7 lbs/day and 111.2 lbs/day, respectively, with a 57.1% reduction through the wetland treatment system. These loadings are summarized in Table 4-3 and depicted in Figure 4-6. The highest monthly TN effluent concentrations and loadings were observed in September through November due to the hurricane events and resultant higher discharge flows.

The annual average TN influent and effluent concentrations have averaged 2.06 mg/L and 0.842 mg/L, respectively, since 1988 with a 55.6% reduction as summarized in Table 4-4 and shown in Figure 4-7. The influent TN concentration was 15.9% higher in 2022 than 2021, but had a lower TN effluent concentration with a 25% higher removal rate, which may be due to the higher flow rates and warmer weather.

The annual average TN effluent loadings for the OEW since 1988 are in Table 4-5 and shown pictorially in Figure 4-8. The annual average effluent TN loadings have been less than 116 lbs/day since 2019 with better than 50.2% removal as seen in Figure 4-9. The annual average removal was 61.3% in 2022.

The annual average TN concentration profiles for 1988 through 2022 are summarized in Tables 4-6 and 4-7 and illustrated in Figures 4-10 and 4-11 for the northern and southern flow trains, respectively. The annual average TN concentration profiles for 2002 through 2022 are summarized in Table 4-8 and shown in Figure 4-12 for the central flow train, which were the years that this flow path was monitored.

The effluent TN concentrations were lower at Outfall D002 in 2022 than in 2021 despite higher influent TN loadings to the OEW. The TN concentration declined with distance from the influent feed point.

The annual average TN effluent loading was 112 lbs/day for 2022 and was significantly (70.9%) below the FDEP permit limit of 385 lbs/day for discharge to the St. Johns River, and demonstrated the continued consistent performance for the wetland treatment system.

4.2.2 Phosphorus

The average monthly total nitrogen (TP) influent and effluent concentrations and loadings are presented in Table 4-9 and Figure 4-13. The influent and effluent TP concentrations averaged 0.238 mg/L and 0.048 mg/L, respectively, which resulted in a 75.9% reduction in 2022. The TP influent (WP-1) and effluent (HAS-10) concentrations were significantly below the allowable permit concentration limits of 0.75 mg/L and 0.20 mg/L, respectively.

The average monthly influent and effluent TP loadings for 2022 averaged 39.6 lbs/day and 7.96 lbs/day, respectively, with a 74.4% reduction through the wetland treatment system. These loadings are summarized in Table 4-10 and depicted in Figure 4-14. The highest monthly TP concentrations and loadings were observed in September through November due to the hurricane events and resultant higher discharge flows.

The annual average TP influent and effluent concentrations since 1988 have averaged 0.257 mg/L and 0.062 mg/L, respectively, with a 74% reduction as summarized in Table 4-11 and shown in Figure 4-15.

The annual average TP effluent loadings for the OEW since 1988 are in Table 4-12 and shown pictorially in Figure 4-16. The annual average effluent TP loadings have been less than 10 lbs/day since 2019 with better than 67% removal and are presented in Figure 4-17. The annual average removal rate was 77.4% in 2022.

The annual average TP concentration profiles for 1988 through 2022 are summarized in Table 4-13 and Table 4-14 and illustrated in Figure 4-18 and Figure 4-19 for the northern and southern flow trains, respectively. The annual average TP concentration profiles for 2002 through 2022 are summarized in Table 4-15 and shown in Figure 4-20 for the central flow train, which were the years that this flow path was monitored.

The effluent TP concentrations were lower at Outfall D002 during 2022 than in 2021 despite higher influent TP loadings to the OEW. The TP concentration declined with distance from the influent feed point.

The annual average TP effluent loading was 8.96 lbs/day in 2022 and was significantly (72.8%) below the FDEP permit limit of 33 lbs/day for discharge to the St. Johns River, and demonstrated the continued consistent performance for the wetland treatment system.

4.3 Dissolved Oxygen

Measurements for dissolved oxygen (DO) were collected daily at Outfalls D002 and D003 (when discharging). Daily measurements to calculate the monthly average concentrations were sourced from the Discharge Monitoring Reports (DMRs) for Iron Bridge and City Intranet data base. The annual average DO concentrations in 2022 for the discharges from Outfall D002 was 4.863 mg/L, and for Outfall D003, was 5.791 mg/L. In comparison, the annual average DO concentration was 5.1 mg/L for 2021. The average monthly DO concentrations for the discharges from the OEW are shown in Table 4-16.

The monthly average DO concentrations were significantly lower than the annual average target of 3.8 mg/L set forth in the FDEP facility permit, except for Outfall D003 in early October, which followed Hurricane Ian after being out of service for five months. The monthly average DO concentrations for Outfalls D002 and D003 in comparison to the FDEP target concentration of 3.8 mg/L are depicted in Figure 4-22. The minimum allowable annual average concentration has been 3.8 mg/L for DO since permit issuance in October 2017.

4.4 Priority Pollutant Analytes

Two semi-annual monitoring events were conducted at the several sampling sites from January 2022 through December 2022. The results from these events for metals, volatile organic compounds (VOCs), polychlorinated biphenyls (PCBs), and organochlorine pesticides are summarized in Appendix E. Samples were collected at the following locations: WP-1, WL-11X, WL-15X, HS-9, and HS-10 as designated in the FDEP facility permit. Sample site WL-11X was returned to the monitoring program after completion of the biogeochemistry study in March 2021. Sampling at site WL-12Y was suspended as an alternate location.

Results from the semi-annual metals monitoring events show the presence of barium, boron, calcium, iron, magnesium, manganese, nickel, and zinc for both sampling events and at most of the monitoring locations. Generally, metal concentrations declined from the influent point at WP-1 to HS-9 and Outfall D002. Iron was not present at HS-9 and HS-10 and ranged from 21.1 ug/L to 38.9 ug/L for the other sampling sites. Zinc was present only at WP-1 (32.2 ug/L and 27.8 ug/L) and once at WL-11X (8 ug/L). Beryllium was found once at WL-15X (0.106 ug/L). Copper was extant only at WP-1 (1.42 ug/L). Nickel endured from 3.3 ug/L at HS-9 to 10.6 ug/L at WL-11X. Barium ranged from 8.5 ug/L at HS-9 to 10.1 ug/L at WL-11X. Boron existed from 134 ug/L at HS-9 to 192 ug/L at WP-1. The other metals were below the method detection limits (MDLs).

VOCs were indicated at Site WP-1 for both monitoring events, including chlorodibromomethane (2.3 ug/L to 3.2 ug/L), chloroform (87 ug/L to 120 ug/L), and dichlorobromomethane (21 ug/L to 27 ug/L). These compounds dissipated as the flow traveled through the treatment cells from the influent to the outfalls (D002 and D003). VOCs were below the method detection limits and not found at the other monitoring locations. The VOCs were analyzed using EPA Method 624.1.

The results for both monitoring events indicated no presence of organochlorine pesticides and PCBs at the Orlando Easterly Wetlands, except for endosulfan II during the second monitoring event at a level of 0.0026 ug/L, which was just above the method detection level. These analytes were evaluated using EPA Method 608.3,

4.5 Water Budget

The evapotranspiration/percolation volume is estimated using the following water balance equation:

OEW Discharge = (OEW Influent + Rainfall) – (Evapotranspiration + Percolation)

Monthly rainfall totals for 2022 are presented in Table 4-17. The rainfall gage measurements were collected using the St. Johns River Water Management District's WSR-88 NexRad Radar, 'pixels' identification #114624, #114625, and #114150, for the Orlando Easterly Wetlands perimeter. This method was implemented in 2017.

The total rainfall for 2022 was 59.17 inches, which was 8.17% higher than in 2021 due to the hurricane events. This amount of rainfall equates to an average of approximately 5.24 MGD. During 2022, approximately 31.2% (18.47 inches or 1.64 MGD) of the 2022 annual rainfall occurred during September due to Hurricane Ian. More than two-thirds (39.16 inches or 3.468 MGD) of the annual rainfall happened in four months: March, July, August, and September.

Soils for the wetland treatment system have low permeability with very little of the rainfall percolating into the underlying aquifers. Thus, the primary mechanism for water loss for the OEW includes evaporation and plant transpiration. The total loss was 28.68 inches or 2.54 MGD. Most of the evaporation occurs during the dry season with higher rates of transpiration during May through October.

The annual water budget for the OEW is presented in Table 4-18 and Figure 4-27. Using the water balance equation above, the annual evapotranspiration/percolation flow, or net water gain, for 2022 increased to 2.54 MGD from 1.35 MGD in 2021. The increase was the direct result of higher rainfall from Hurricane Ian. The discharge from the OEW was 13.7% higher in 2022.

Figure 4-1 Locations of Control Structures, Groundwater Monitoring Wells, and Sampling Stations

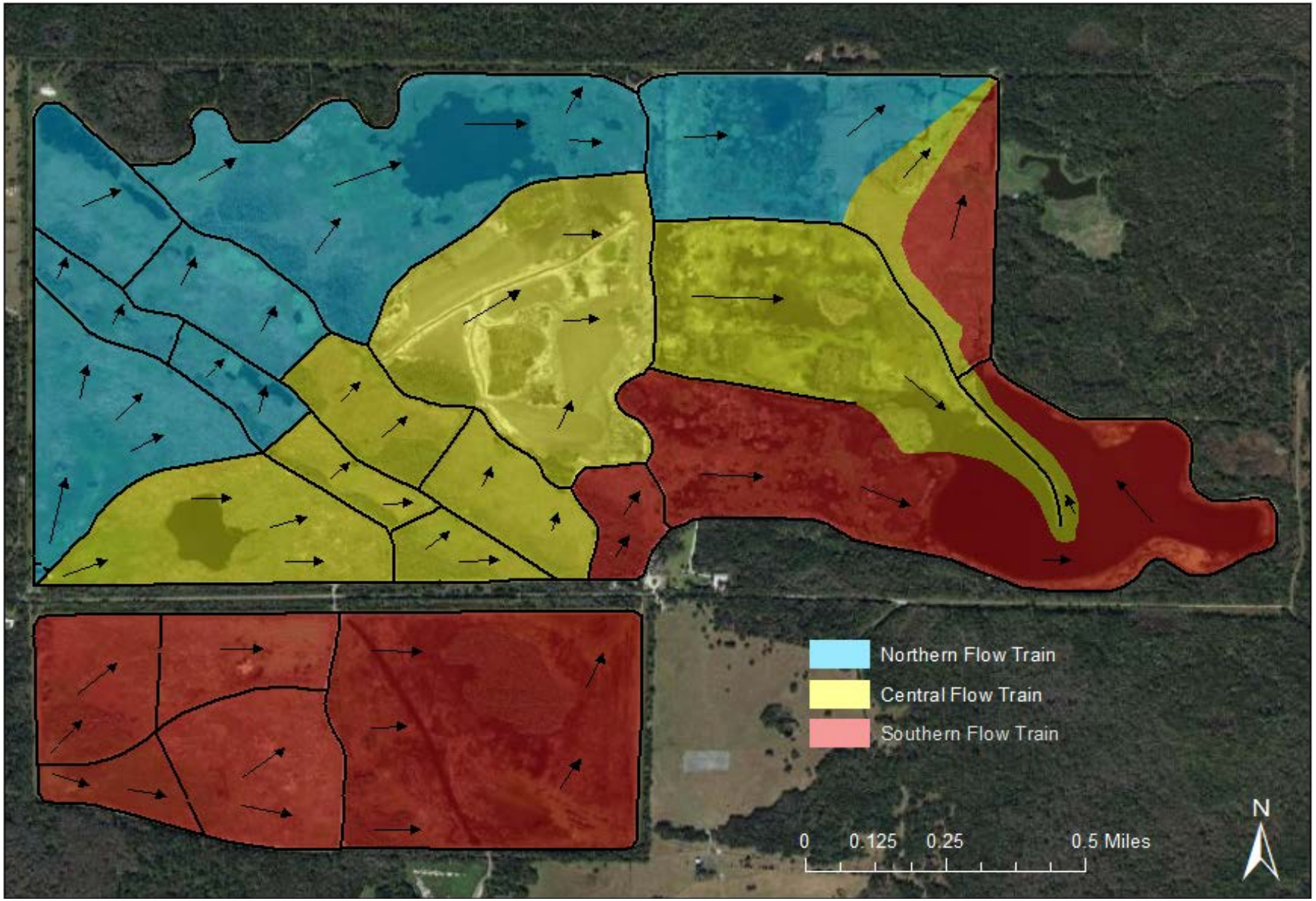

Figure 4-2 Schematic of Flow Train Paths and Treatment Cells

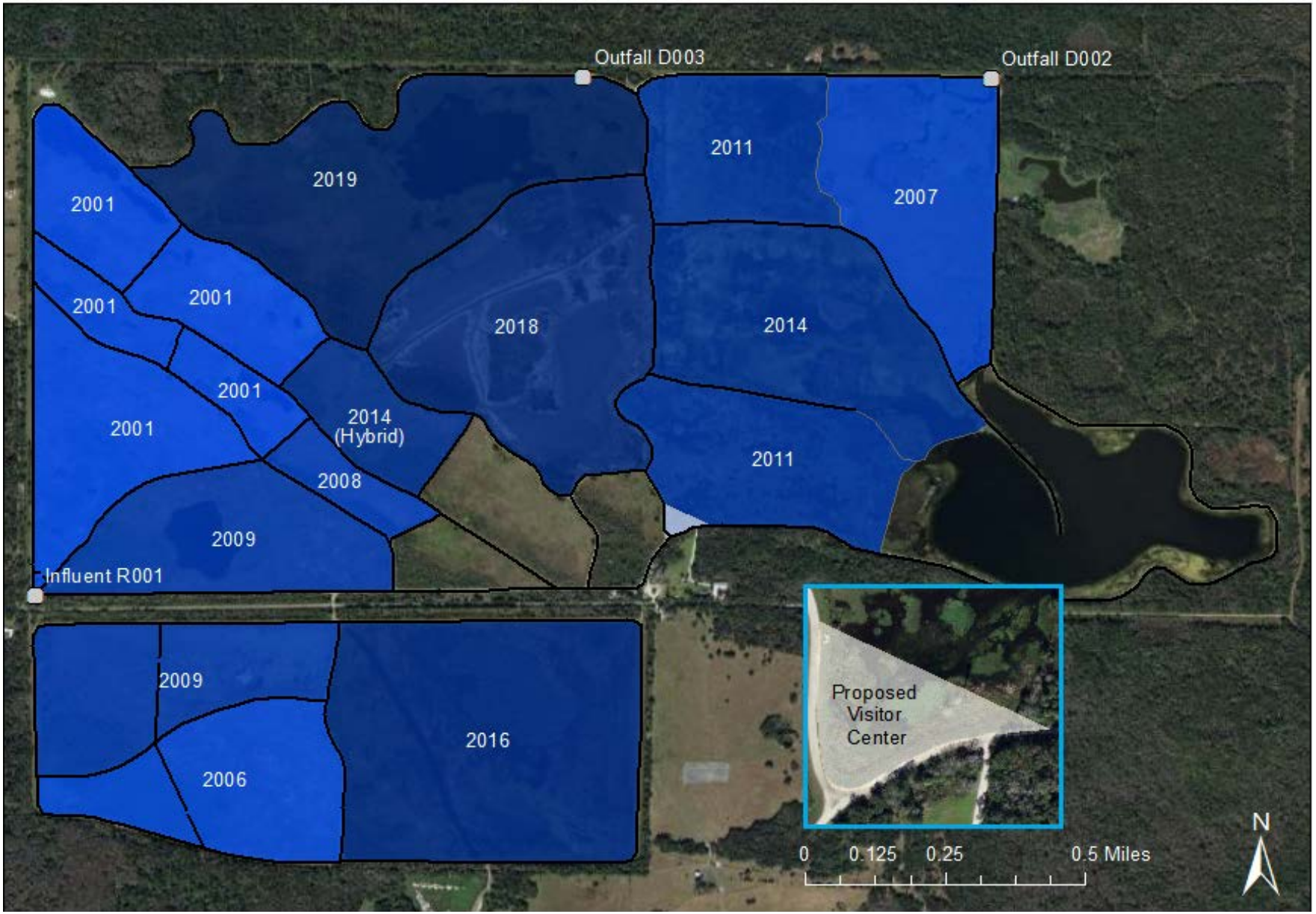

Figure 4-3 Demucked Areas and Proposed Visitor Center Location

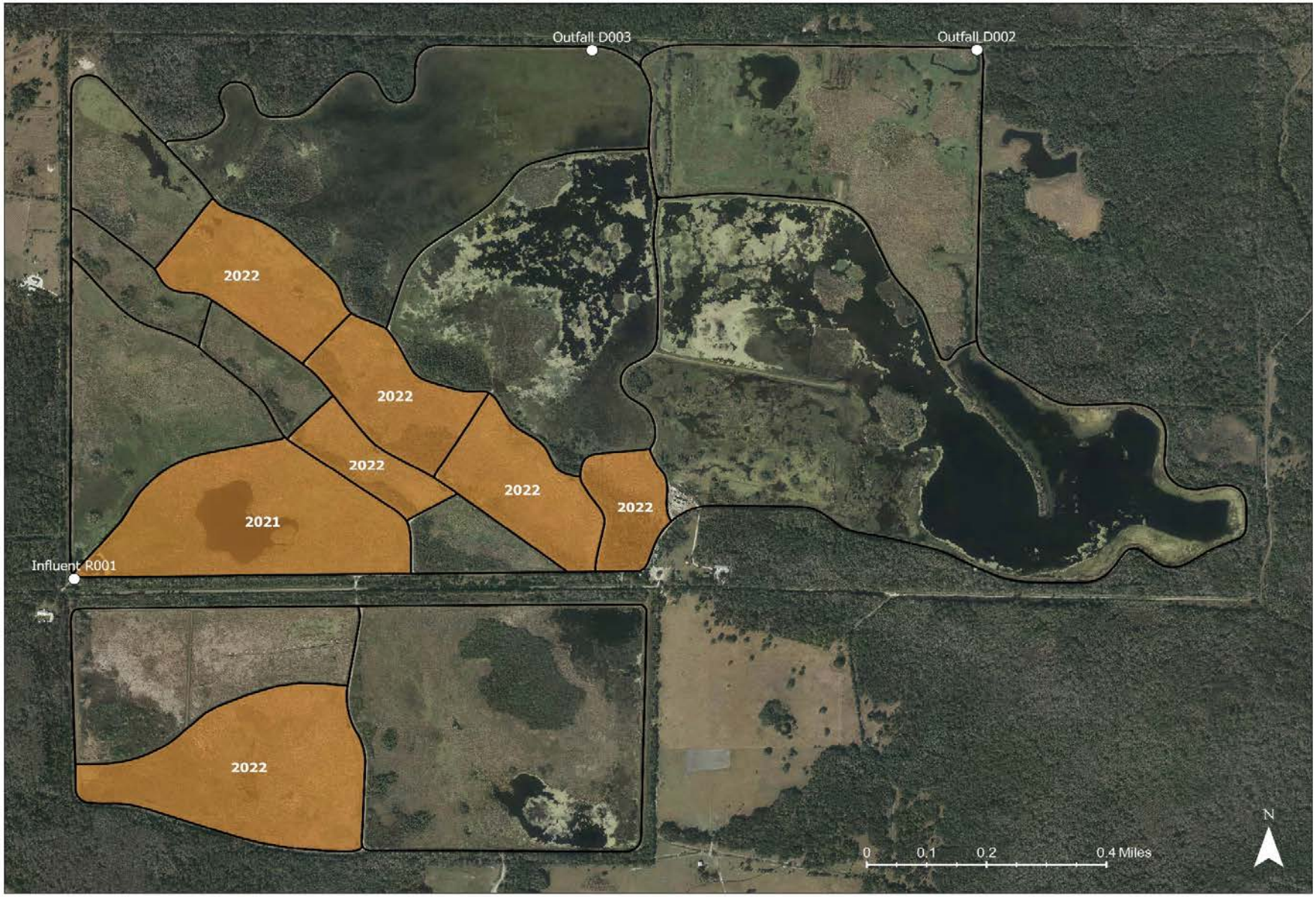

Figure 4-4 Prescribed Burn Areas

Table 4-1 OEW Control Structure Weir Board and Gate Manipulations during 2022

Date	Location	Action	Outcome or Reason
01/03/2022	13X and 13Y	Added 1 board	Raise water level in Cell 13 to start flow at D003
01/05/2022	13X and 13Y	Added 1 board	Raise water level in Cell 13 to start flow at D003
01/19/2022	D003	Lowered gate 4”	Discharge began at D003 at 11:33 am with flow of 2.09 MGD
01/27/2022	13X and 13Y	Added 1 board	Raise water level in Cell13 to divert more flow to D003
03/16/2022	D003	Raised gate 4”	Shut off flows at D003 at 8:10 am
03/21/2022	13X and 13Y	Removed 1 board	Lower flow at D003
03/30/2022	13X and 13Y	Removed 2 boards	Lower water level in Cell 13 for wildlife
04/01/2022	13X	Removed 1 board	Increase shore birds
05/08/2022	D002	Raised gate 3”	Reduce TSS at outfall
06/07/2022	LS2	Installed turbidity curtain	Facilitate construction of boardwalk
06/10/2022	LS1/ HS9	Installed turbidity curtain	Installed for construction of boardwalk
06/15/2022	Cell 16A	Begun installation of pilings	Construction of 2,200 foot boardwalk
09/23/2022	D002	Lowered gate 4”	Reduce water level for Hurricane Ian preparation
09/26/2022	D002	Lowered gate 3”	Reduce water level for Hurricane Ian preparation
09/26/2022	14A	Removed 1 board	Divert flow from Cell 14A away from Cell 16
09/29/2022	D003	Lowered gate 3”	Started discharging. Flow increased to collect accurate composite samples in pipe, which had 18” of head space.
09/30/2022	D003	Lowered gate 2”	Flow was 0.51 MGD. Flow increased to divert flow from Cell 17 and to collect accurate composite samples.
10/03/2022	D003	Lowered gate 3”	Flow was 1 MGD. Diverted flow from Cell 17.
10/03/2022	D003	Lowered gate 1.5”	Maintain flow overnight. Flow was 3.4 MGD. Divert flow from Cell 17.
10/04/2022	D003	Raised gate 9.5”	Stop flow at 10:27 am. Approx. 8.5” head.
10/17/2022	D003	Raised gate 3”	Prevent scouring of Cell 17
11/08/2022	D002	Lowered gate 1”	Reduce water level for Hurricane Nicole preparation

Table 4-2 Monthly Average Total Nitrogen (TN) Influent and Effluent Concentrations during 2022 *

Month (2022)	Influent TN Concentration (mg/L)	Effluent TN Concentration (mg/L)	Percent Reduction (%)
January	1.85	0.673	63.62
February	1.07	0.662	38.19
March	1.46	0.650	55.33
April	1.68	0.611	63.63
May	1.63	0.595	63.59
June	1.37	0.621	54.70
July	1.44	0.619	57.13
August	1.54	0.637	58.52
September	2.29	0.598	73.91
October	2.32	0.510	78.06
November	2.49	0.514	79.35
December	1.80	0.553	69.28
Average	**1.75**	**0.604**	**62.94**

* Hurricane Ian occurred on September 29, 2022 and Hurricane Nicole happened on November 10, 2022.

Table 4-3 Monthly Average Total Nitrogen (TN) Influent and Effluent Loadings during 2022 *

Month (2022)	Influent TN Loading (lbs/day)	Effluent TN Loading (lbs/day)	Percent Reduction (%)
January	256.2	96.6	62.30
February	139.0	89.3	35.75
March	224.1	115.9	48.31
April	285.9	115.5	59.61
May	167.9	65.2	61.19
June	153.1	95.3	37.75
July	204.4	116.2	43.15
August	227.4	121.1	46.76
September	499.8	172.5	65.49
October	581.9	126.3	78.29
November	630.9	129.7	79.44
December	274.1	91.1	66.77
Average	**303.7**	**111.22**	**57.07**

* Hurricane Ian occurred on September 29, 2022 and Hurricane Nicole happened on November 10, 2022.

Table 4-4 Annual Average Total Nitrogen (TN) Influent and Effluent Concentrations

Year	Influent Concentration (mg/L)	Effluent Concentration (mg/L)	Percent Reduction (%)
1988	4.18	0.84	79.9
1989	5.52	0.92	83.3
1990	2.83	0.93	67.1
1991	2.44	0.80	67.2
1992	2.74	0.74	73.0
1993	2.24	0.78	65.2
1994	2.29	0.76	66.8
1995	1.96	0.68	65.3
1996	1.43	0.73	49.0
1997	1.45	0.69	52.4
1998	1.85	0.84	54.6
1999	2.42	0.84	65.3
2000	1.81	0.84	53.6
2001	2.14	0.88	58.9
2002	1.42	0.77	45.8
2003	1.23	0.78	36.6
2004	1.44	0.92	36.1
2005	1.67	0.84	49.7
2006 [a]	1.61	0.94	41.6
2007	2.38	0.98	58.8
2008	2.25	1.20	46.7
2009	1.90	1.16	39.0
2010	1.94	1.01	47.9
2011	2.07	1.00	51.7
2012	1.77	0.96	45.8
2013	1.70	0.89	47.7
2014	1.40	0.88	37.1
2015	1.35	0.95	29.6
2016	1.66	0.80	51.8
2017	2.07	0.87	58.0
2018	2.00	0.78	61.0
2019	1.88	0.61	67.6
2020	1.94	0.65	66.5
2021	1.51	0.62	58.9
2022	1.75	0.60	62.9
Average	**2.06**	**0.84**	**55.5**

[a] Beginning in 2006, effluent flow and nutrient concentrations were measured as the weighted averages for both D002 and D003.

[b] On 3/11/2015, since no sample was collected from the flow for R001, then this flow was not added to the average flow.

Table 4-5 Annual Average Total Nitrogen (TN) Loadings and Overall Reductions

Year	Influent Flow (MGD)	Influent Conc. (mg/L)	Influent Loading (lbs/day)	Effluent Flow (MGD)	Effluent Conc. (mg/L)	Effluent Loadings (lbs/day)	Percent Reduction (%)
1988	9.98	4.18	347.9	10.63	0.84	74.5	78.6
1989	13.33	5.52	613.7	13.91	0.92	106.7	82.6
1990	13.28	2.83	313.4	10.68	0.93	82.8	73.6
1991	12.42	2.44	252.7	13.40	0.80	89.4	64.6
1992	12.77	2.74	291.8	11.60	0.74	71.6	75.5
1993	12.63	2.24	236.0	10.00	0.78	65.1	72.4
1994	12.42	2.29	237.2	12.52	0.76	79.4	66.5
1995	15.12	1.96	247.2	8.83	0.68	50.1	79.7
1996	15.63	1.43	186.4	16.34	0.73	99.5	46.6
1997	15.22	1.45	184.1	16.67	0.69	95.9	47.9
1998	14.22	1.85	215.8	13.93	0.84	97.6	54.8
1999	17.20	2.42	347.1	19.43	0.84	136.1	60.8
2000	17.45	1.81	263.4	13.69	0.84	95.9	63.6
2001	17.86	2.14	318.8	16.76	0.88	123.0	61.4
2002	16.59	1.42	196.5	22.51	0.77	144.6	26.4
2003	17.36	1.23	178.1	24.87	0.78	161.8	9.2
2004	17.20	1.44	206.6	21.48	0.92	164.8	20.2
2005	18.27	1.67	254.5	25.25	0.84	176.9	30.5
2006 [a]	12.68	1.61	170.3	17.63	0.94	138.2	18.8
2007	12.33	2.38	244.7	14.62	0.98	119.5	51.2
2008	12.17	2.25	228.4	15.06	1.20	150.7	34.0
2009	14.14	1.90	224.1	15.39	1.16	148.9	33.6
2010	15.29	1.94	247.4	18.96	1.01	159.7	35.4
2011	15.17	2.07	261.9	17.18	1.00	143.3	45.3
2012	14.33	1.77	211.5	18.11	0.96	145.0	31.4
2013	14.16	1.70	200.8	19.18	0.89	142.4	29.1
2014	14.32	1.40	167.2	18.55	0.88	136.1	18.6
2015	11.80 [b]	1.35	132.9	16.57	0.95	131.3	1.2
2016	12.95	1.66	179.3	16.16	0.80	107.8	39.9
2017	15.30	2.07	264.1	23.94	0.87	173.7	34.2
2018	15.75	2.00	262.7	26.02	0.78	169.3	35.6
2019	16.40	1.88	257.1	21.84	0.61	111.1	56.8
2020	15.65	1.94	253.2	21.40	0.65	116.0	54.2
2021	16.42	1.51	206.8	19.91	0.62	103.0	50.2
2022	19.69	1.75	303.7	22.38	0.60	111.2	57.1
Average	**14.79**	**2.06**	**248.8**	**17.30**	**0.84**	**120.7**	**46.9**

[a] Beginning in 2006, effluent flow and nutrient concentrations were measured as the weighted averages for both D002 and D003.

[b] On 3/11/2015, since no sample was collected from the flow for R001, then this flow was not added to the average flow.

Table 4-6 Total Nitrogen (TN) Concentration Profile: Northern Flow Path

Year	Station [a]					
	Influent WP1 (mg/l)	Stratum 1 WP3 (mg/l)	Stratum 2 WP4/5 [b] (mg/l)	Stratum 3 WP6 (mg/l)	Stratum 4 MM8 (mg/l)	Final Outfall HS10 (mg/l)
1988	4.18	1.53	1.51	1.27	0.96	0.84
1989	5.52	1.92	1.74	1.59	1.22	0.92
1990	2.83	0.98	1.00	1.09	1.19	0.93
1991	2.44	2.20	1.02	1.11	1.25	0.80
1992	2.74	1.01	0.99	0.93	0.88	0.74
1993	2.24	0.71	0.72	0.75	1.07	0.78
1994	2.29	1.07	0.92	0.81	0.95	0.76
1995	1.96	1.14	0.90	0.79	0.77	0.68
1996	1.43	1.09	0.95	0.84	1.10	0.73
1997	1.45	0.87	0.76	0.67	0.96	0.69
1998	1.82	1.01	0.85	0.80	0.86	0.84
1999	2.42	1.32	1.04	0.92	0.97	0.84
2000	1.81	0.80	0.77	0.68	0.80	0.84
2001	2.14	1.15	1.02	1.30	1.04	0.88
2002 [c]	1.42	0.80	0.73	0.80	0.97	0.77
2003	1.23	0.72	0.77	0.95	1.12	0.78
2004	1.44	1.20	1.09	0.92	1.04	0.92
2005	1.67	1.13	1.19	1.17	0.96	0.84
2006 [d]	1.61	1.03	0.95	1.02	1.08	0.94
2007	2.38	0.80	0.86	0.96	0.97	0.98
2008 [e]	2.25	1.03	1.08	1.10	- - - -	1.20
2009 [e] [f]	1.90	1.10	1.07	1.17	- - - -	1.16
2010	1.94	0.95	0.99	1.24	1.68	1.01
2011	2.07	0.92	0.97	1.04	1.19	1.00
2012	1.77	0.87	0.85	0.91	1.26	0.96
2013 [g]	1.70	0.87	0.87	0.91	1.05	0.89
2014 [h]	1.40	0.69	0.70	0.75	0.88	0.88
2015	1.35	0.69	0.76	0.78	1.06	0.95
2016	1.66	0.67	0.69	0.70	0.90	0.80
2017	2.07	0.60	0.63	0.76	0.86	0.87
2018	2.00	0.76	0.72	0.89	0.86	0.78
2019 [i]	1.88	0.65	0.65	- - - -	- - - -	0.61
2020	1.94	0.56	0.55	0.61	0.73	0.65
2021	1.51	0.53	0.53	0.63	0.83	0.62
2022	1.75	0.69	0.55	0.56	0.76	0.60
Average	**2.06**	**0.97**	**0.90**	**0.92**	**1.01**	**0.84**

(a) Averages for Stations WP1 and HS10 are from monthly monitoring events.

(b) WP4/5 represents the average of stations WP4 and WP5, assuming equal flow through each control structure.

(c) The northern flow train was offline during much of 2002.

(d) Beginning in 2006, TN concentrations were measured as the weighted averages for both D002 and D003.

(e) Stratum 4 was offline, D003 was flowing.

(f) TN results do not include data collected for the drawdown experiment.

(g) TN results do not include data collected for the pulsing study from May through December 2013.

(h) Beginning in 2014, TN results were compiled by averaging monthly results from all tested control structures.

(i) Stratums 3 and 4 were offline from April through December 2019 due to Cell 13 renovation project.

Table 4-7 Total Nitrogen (TN) Concentration Profile: Southern Flow Path

Year	Station [a]				
	Influent WP1 (mg/l)	Stratum 1 WP2 (mg/l)	Stratum 3 MM7 (mg/l)	Stratum 5 HS9 (mg/l)	Final Outfall HS10 (mg/l)
1988	4.18	1.47	0.84	0.99	0.84
1989	5.52	1.47	1.03	0.81	0.92
1990	2.83	1.01	0.85	0.85	0.93
1991	2.44	0.94	0.69	0.63	0.80
1992	2.74	1.09	0.69	0.78	0.74
1993	2.24	1.07	0.61	0.89	0.78
1994	2.29	0.90	0.77	0.84	0.76
1995	1.96	0.82	0.65	0.70	0.68
1996	1.43	0.75	0.63	0.85	0.73
1997 [b]	1.45	0.99	0.76	0.89	0.69
1998 [b]	1.82	1.08	0.79	0.78	0.84
1999	2.42	0.76	0.81	0.77	0.84
2000	1.81	0.80	0.66	0.73	0.84
2001	2.14	0.86	0.77	0.92	0.88
2002	1.42	1.01	0.71	0.90	0.77
2003	1.23	1.15	0.79	0.93	0.78
2004	1.44	0.96	0.74	0.84	0.92
2005	1.67	1.09	0.69	0.93	0.84
2006 [c]	1.61	0.88	0.89	1.06	0.94
2007	2.38	0.90	0.78	1.40	0.98
2008	2.25	1.26	1.12	2.83	1.20
2009	1.90	1.17 [d]	1.18	1.18	1.16
2010	1.94	0.89	0.95	1.01	1.01
2011	2.07	1.06	0.99	0.98	1.00
2012	1.77	1.01	1.03	0.80	0.96
2013 [e]	1.70	1.10	0.86	1.12	0.89
2014 [f]	1.40	1.13	1.96	1.30	0.88
2015	1.35	0.94	0.84	1.22	0.95
2016 [g]	1.66	ND	ND	1.05	0.80
2017	2.07	0.67	0.68	0.95	0.87
2018	2.00	0.83	0.79	1.07	0.78
2019	1.88	0.77	0.70	0.81	0.61
2020 [h]	1.94	0.57	1.15	0.71	0.65
2021	1.51	0.66	0.76	0.76	0.62
2022	1.75	0.69	0.64	0.77	0.60
Average	**2.06**	**0.93**	**0.85**	**0.97**	**0.84**

(a) Averages for Stations WP1 and HS10 are from monthly monitoring data.

(b) Southern Flow Train was offline from August 1997 through March 1998 due to capacity study.

(c) Beginning in 2006, TN concentrations were measured as weighted averages for both D002 and D003.

(d) WP2 was offline from January 2009 through June 2009, due to the renovation project.

(e) TN results do not include data collected for the pulsing study from May through December 2013.

(f) Beginning in 2014, TN levels were compiled by averaging monthly results from all tested control structures.

(g) Southern Flow Train was offline from November 2015 through November 2016 due to demucking of Cell 15.

(h) Cell 11 was offline in 2020, due to biogeochemistry study. Mean TN levels were from WL12X and WL12Y.

Table 4-8 Total Nitrogen (TN) Concentration Profile: Central Flow Path

Year	Station [a]						
	Influent WP1 (mg/l)	Stratum 1 WP2 (mg/l)	Stratum 2 WP4/5 [b] (mg/l)	Stratum 3 WP6 (mg/l)	Stratum 4 MM8 (mg/l)	Stratum 5 HS9 (mg/l)	Final Outfall HS10 (mg/l)
2002	1.42	0.80	0.73	0.80	0.97	0.90	0.77
2003	1.23	0.72	0.64	0.67	0.88	0.93	0.78
2004	1.44	0.69	0.64	0.69	1.09	0.84	0.92
2005	1.67	0.76	0.72	0.65	0.93	0.93	0.84
2006 [b]	1.61	0.71	0.68	0.64	0.94	1.06	0.94
2007	2.38	0.83	0.77	0.68	0.94	1.40	0.98
2008	2.25	1.08	1.19	1.06	1.28	2.83	1.20
2009 [c]	1.90	1.11	1.00	0.91	1.08	1.18	1.16
2010	1.94	1.20	1.01	1.01	1.24	1.01	1.01
2011	2.07	1.14	1.07	0.94	1.14	0.98	1.00
2012	1.77	0.99	0.92	0.88	0.88	0.80	0.96
2013 [d]	1.70	0.92	0.92	0.88	1.06	1.12	0.89
2014 [e]	1.40	0.78	0.80	0.80	0.96	1.30	0.88
2015	1.35	0.68	0.70	0.71	0.92	1.22	0.95
2016	1.66	0.76	0.68	0.66	0.81	1.05	0.80
2017	2.07	0.64	0.60	0.60	0.79	0.95	0.87
2018	2.00	0.82	0.81	0.79	ND [f]	1.07	0.78
2019	1.88	0.58	0.61	0.66	0.82	0.81	0.61
2020	1.94	0.54	0.53	0.50	0.84	0.71	0.65
2021	1.51	0.57	0.58	0.59	0.82	0.76	0.62
2022	1.75	0.69	0.55	0.56	0.76	0.77	0.60
Average	**1.76**	**0.81**	**0.77**	**0.75**	**0.96**	**1.08**	**0.87**

(a) Averages for Stations WP1 and HS10 are from data presented in Appendix B. Other stations are from data presented in Appendix A.

(b) Beginning in 2006, TN concentrations were measured at HS10 as the weighted averages between both D002 and D003.

(c) TN results do not include data collected for the drawdown experiment.

(d) TN results do not include data collected for the pulsing study from May through December 2013.

(e) Beginning in 2014, TN results for strata were compiled by averaging monthly concentrations from all tested control structures.

(f) Stratum 4 (Cell 14) was offline from April 2018 through January 2019 due to demucking activities.

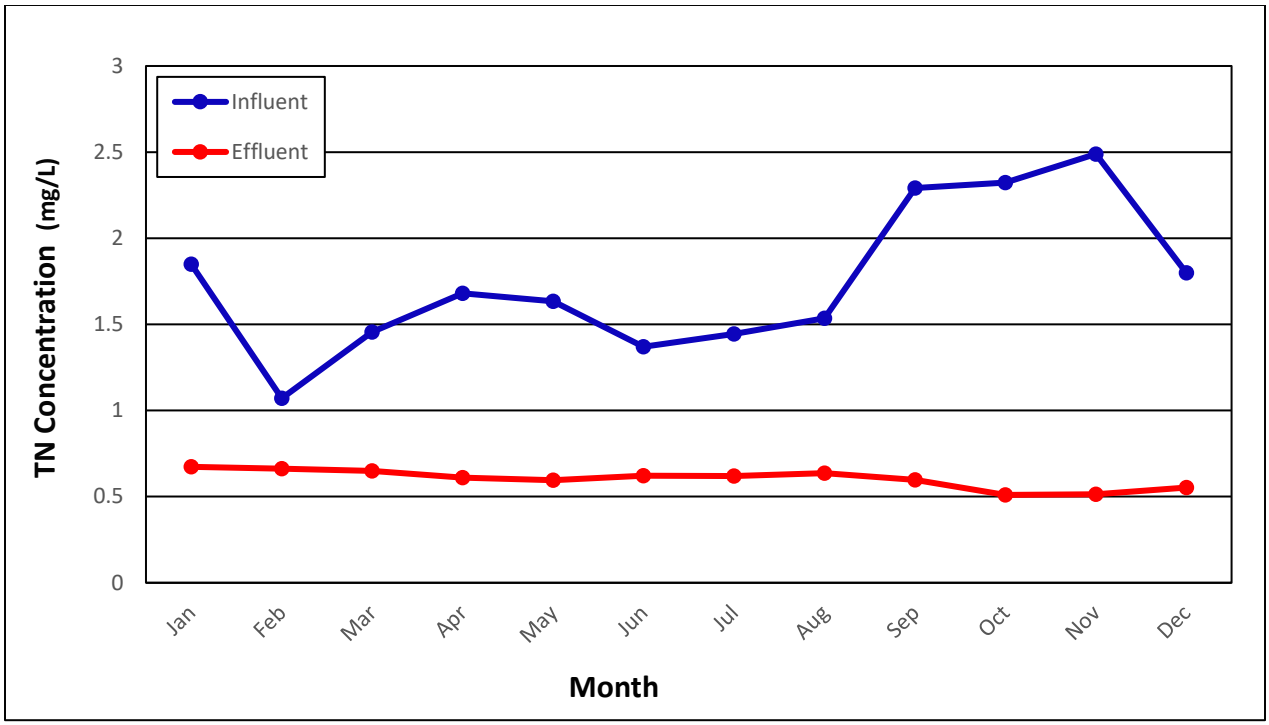

Figure 4-5 Monthly Average Total Nitrogen (TN) Concentrations

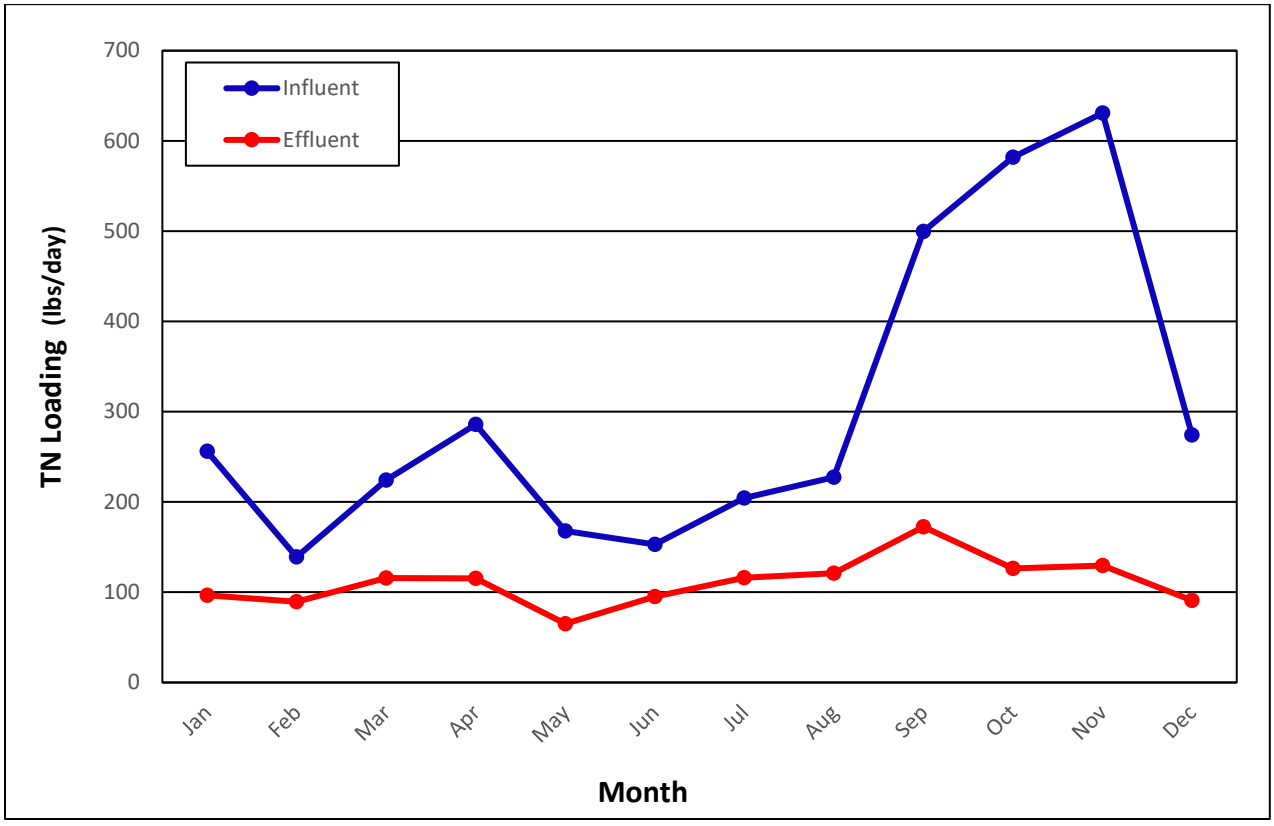

Figure 4-6 Monthly Average Total Nitrogen (TN) Loadings

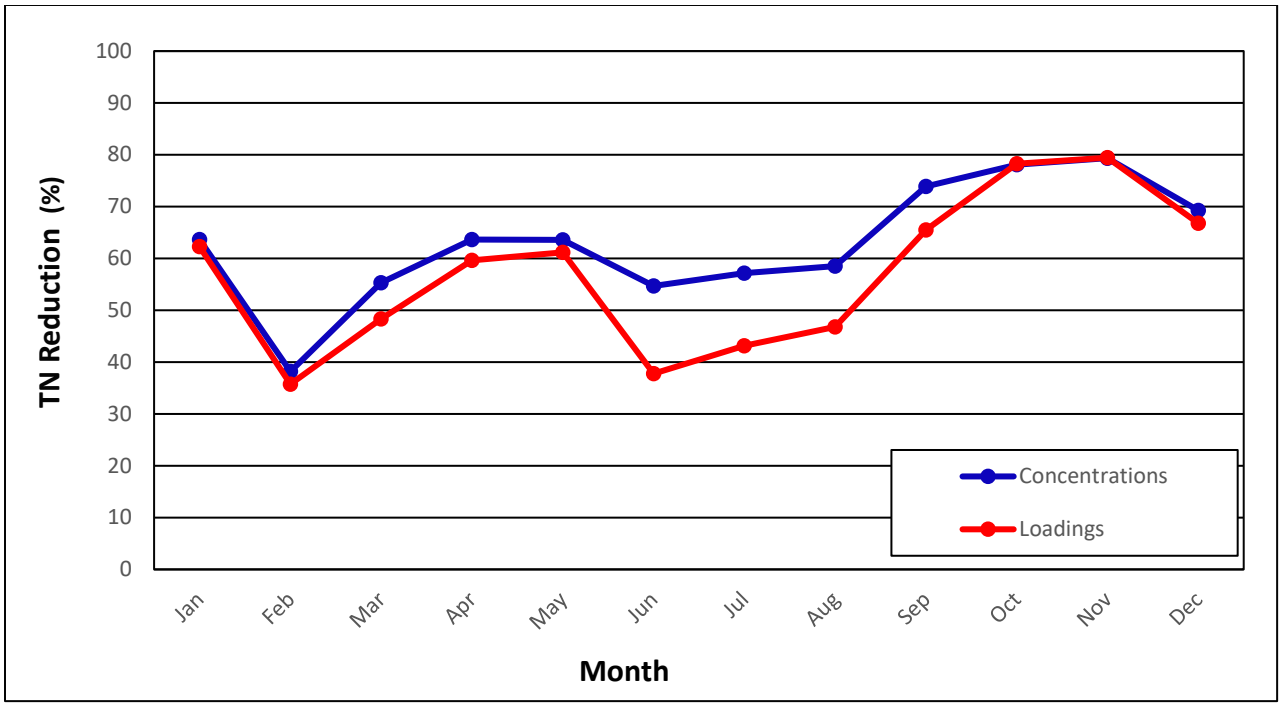

Figure 4-7 Reductions in Monthly Average Total Nitrogen (TN) Concentrations and Loadings through the OEW

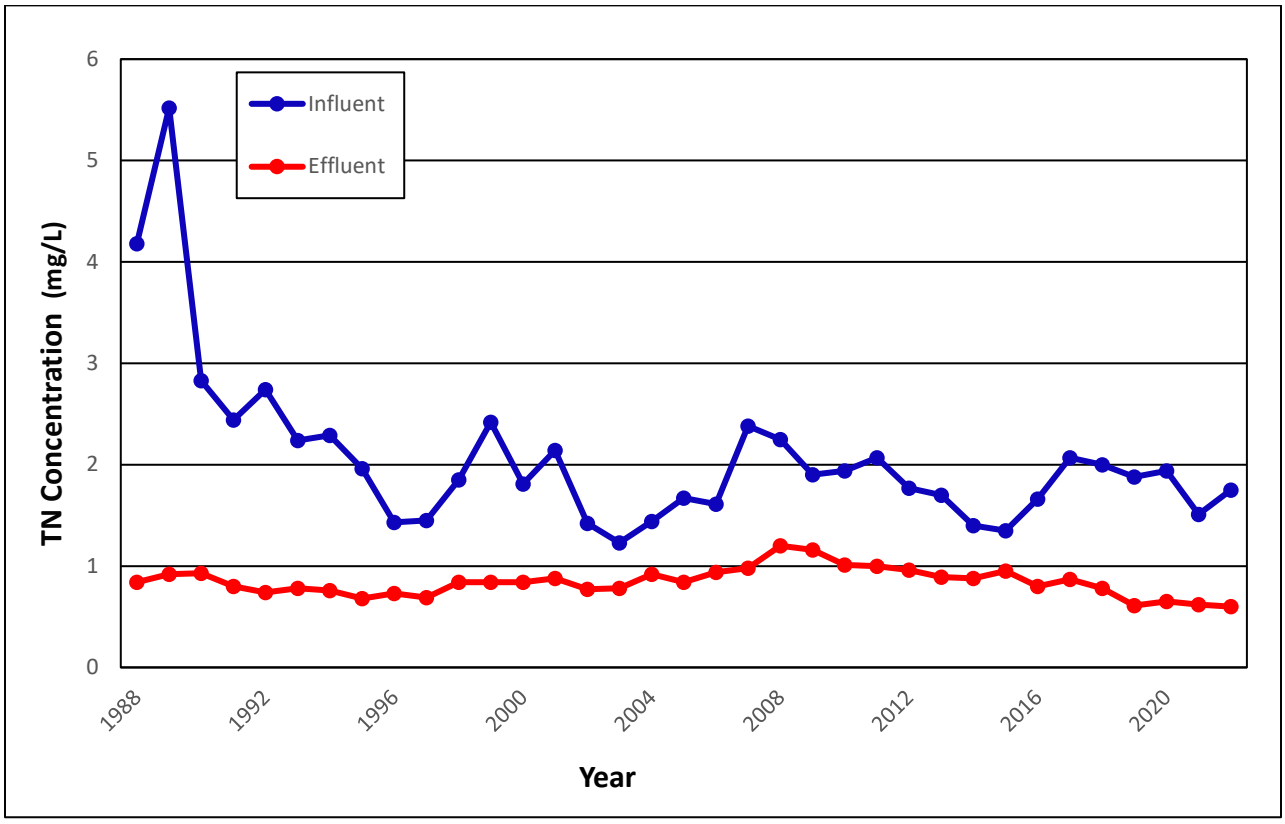

Figure 4-8 Annual Average Total Nitrogen (TN) Concentrations

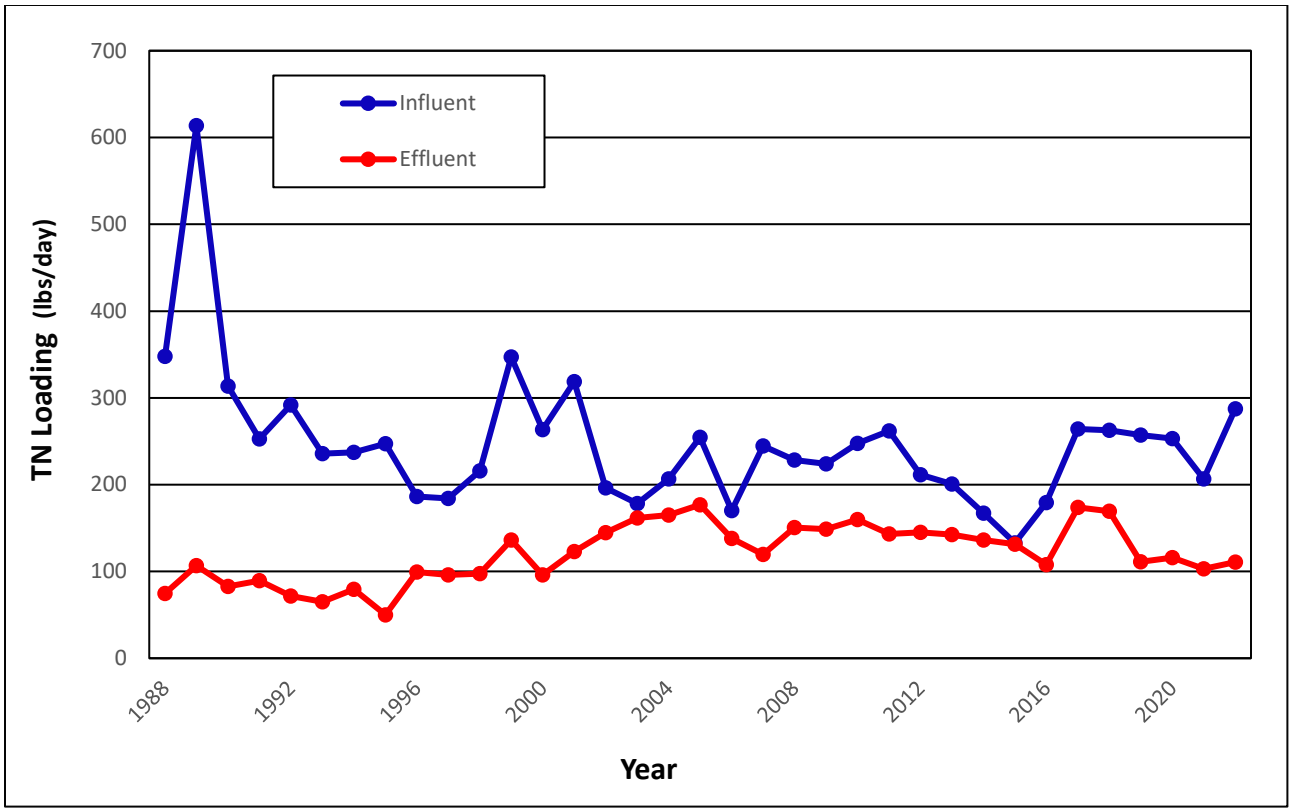

Figure 4-9 Annual Average Total Nitrogen (TN) Loadings

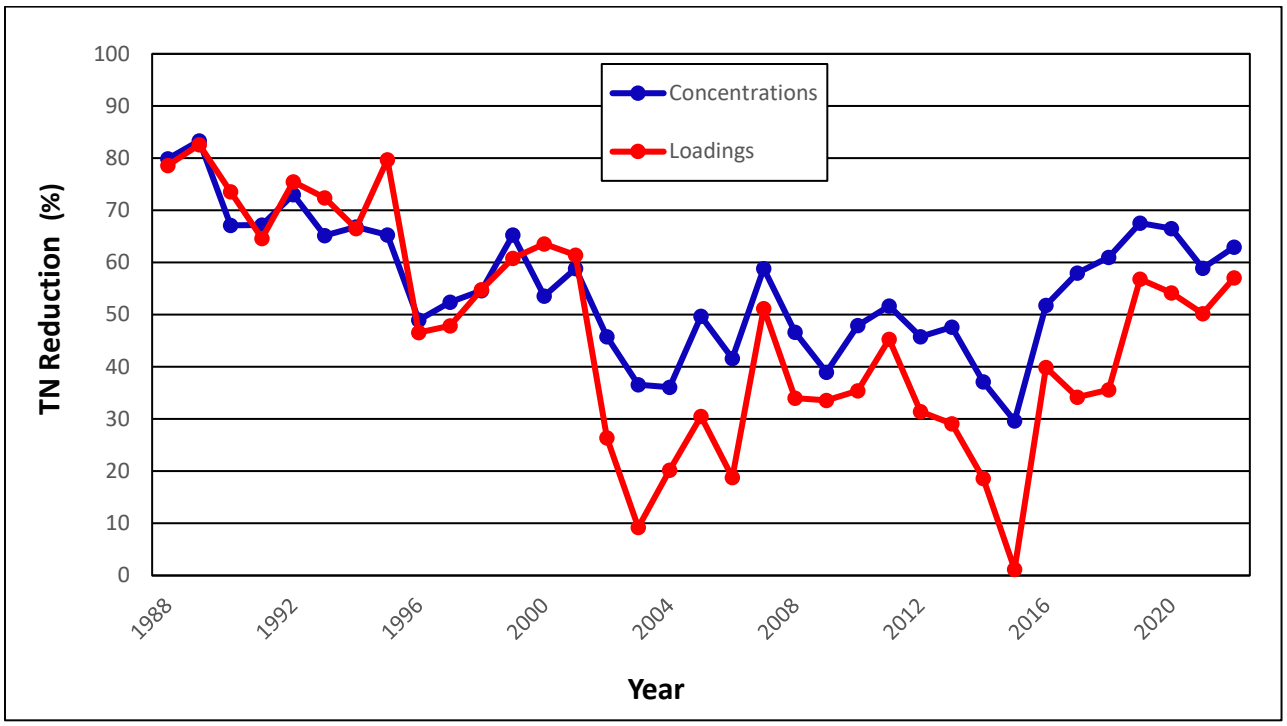

Figure 4-10 Reductions in Annual Average Total Nitrogen (TN) Loadings through the OEW

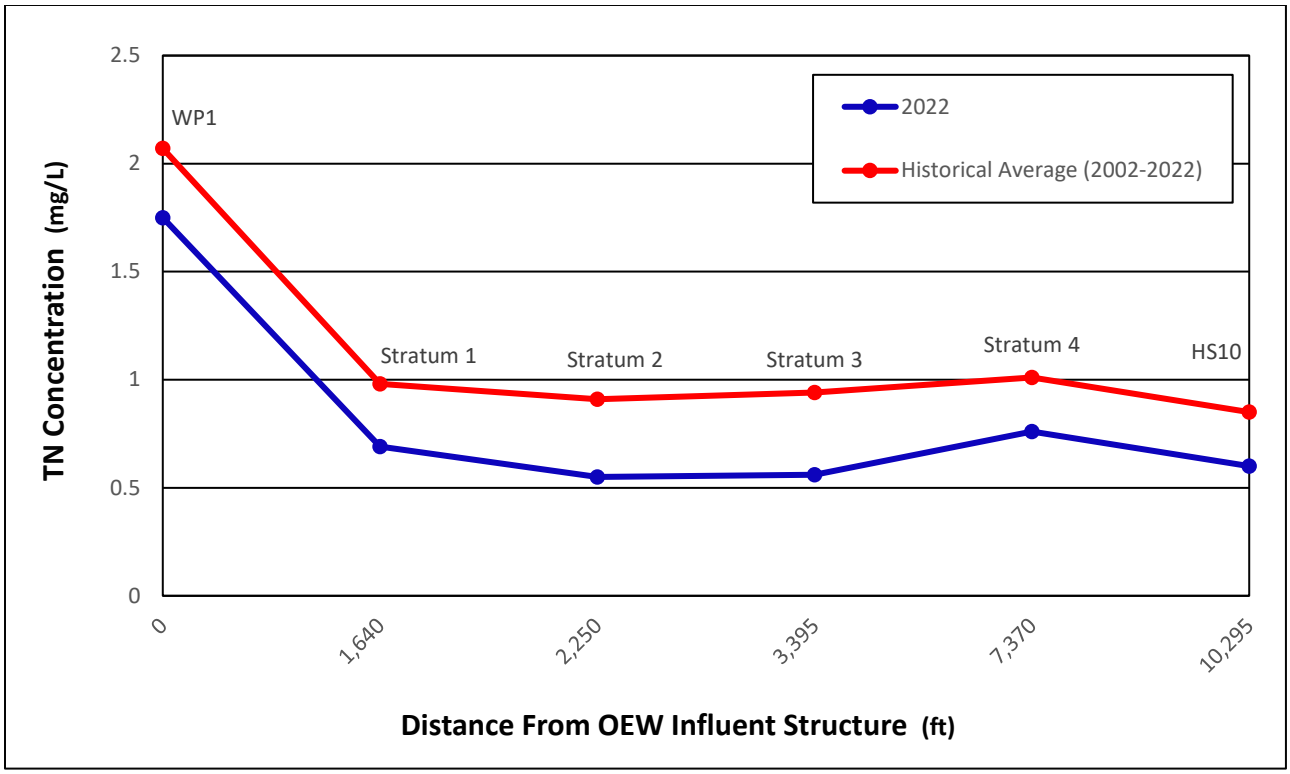

Figure 4-11 Total Nitrogen (TN) Profile through the Northern Flow Train

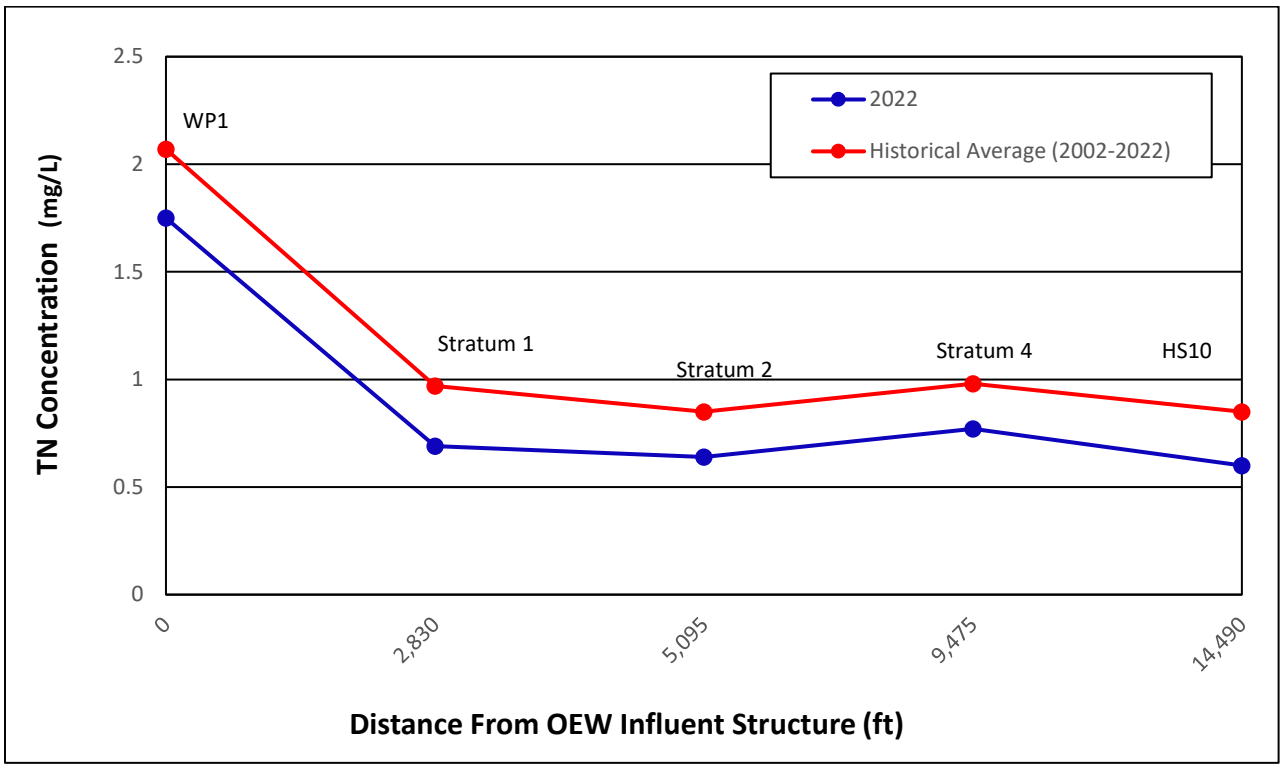

Figure 4-12 Total Nitrogen (TN) Profile through the Southern Flow Train

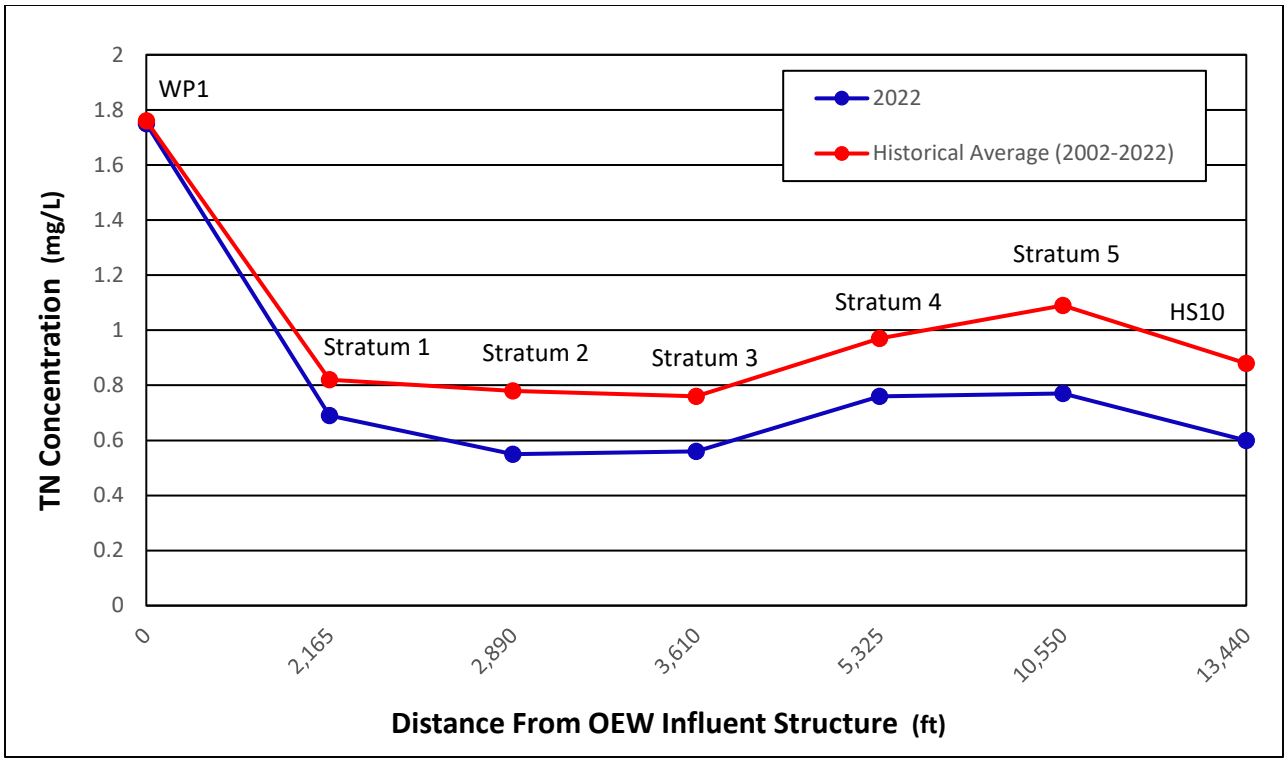

Figure 4-13 Total Nitrogen (TN) Profile through the Central Flow Train

Table 4-9 Monthly Average Total Phosphorus (TP) Influent and Effluent Concentrations during 2022 *

Month (2022)	Influent TP Concentration (mg/L)	Effluent TP Concentration (mg/L)	Percent Reduction (%)
January	0.107	0.064	40.09
February	0.225	0.090	59.90
March	0.223	0.079	64.57
April	0.205	0.047	76.95
May	0.166	0.041	75.66
June	0.221	0.040	81.81
July	0.250	0.018	92.92
August	0.178	0.022	87.38
September	0.151	0.039	74.17
October	0.127	0.017	86.61
November	0.403	0.026	93.57
December	0.605	0.080	86.75
Average	**0.238**	**0.047**	**76.70**

* Hurricane Ian occurred on September 29, 2022 and Hurricane Nicole happened on November 10, 2022.

Table 4-10 Monthly Average Total Phosphorus (TP) Loadings during 2022 *

Month (2022)	Influent TP Loading (lbs/day)	Effluent TP Loading (lbs/day)	Percent Reduction (%)
January	14.76	9.16	37.93
February	29.23	12.19	58.32
March	34.30	16.59	51.64
April	34.85	8.03	76.95
May	17.08	4.16	75.66
June	24.68	4.49	81.81
July	35.39	2.51	92.92
August	26.28	3.32	87.38
September	32.85	11.23	65.80
October	31.72	5.07	84.03
November	102.04	6.57	93.57
December	92.08	12.20	86.75
Average	**39.61**	**7.96**	**74.40**

* Hurricane Ian occurred on September 29, 2022 and Hurricane Nicole happened on November 10, 2022.

Table 4-11 Annual Average Total Phosphorus (TP) Influent and Effluent Concentrations

Year	Influent Concentration (mg/L)	Effluent Concentration (mg/L)	Percent Reduction (%)
1988	0.57	0.10	82.46
1989	0.72	0.08	88.89
1990	0.41	0.09	78.05
1991	0.23	0.09	60.87
1992	0.24	0.06	75.00
1993	0.18	0.06	66.67
1994	0.20	0.05	75.00
1995	0.18	0.05	72.22
1996	0.12	0.05	58.33
1997	0.14	0.04	71.43
1998	0.14	0.05	64.29
1999	0.32	0.06	81.25
2000	0.30	0.06	80.00
2001	0.240	0.070	70.83
2002	0.235	0.075	68.09
2003	0.207	0.070	66.18
2004	0.240	0.060	75.00
2005	0.401	0.088	78.05
2006 [a]	0.333	0.129	61.26
2007	0.276	0.066	76.09
2008	0.210	0.062	70.48
2009	0.015	0.041	- - - - -
2010	0.134	0.041	69.40
2011	0.159	0.036	77.36
2012	0.194	0.036	81.44
2013	0.284	0.037	86.97
2014	0.464	0.079	82.97
2015	0.247	0.075	69.64
2016	0.295	0.051	82.71
2017	0.146	0.068	53.42
2018	0.154	0.049	68.18
2019	0.311	0.053	82.96
2020	0.208	0.050	75.96
2021	0.237	0.037	84.39
2022	0.238	0.047	76.70
Average	**0.257**	**0.062**	**73.90**

[a] Beginning in 2006, effluent flow and nutrient concentrations were measured as the weighted averages for both D002 and D003.

[b] On 3/11/2015, since no sample was collected from the flow for R001, then this flow was not added to the average flow.

Table 4-12 Total Phosphorus (TP) Loadings and Overall Reductions for OEW

Year	Influent Flow (MGD)	Influent Conc. (mg/L)	Influent Loading (lbs/day)	Effluent Flow (MGD)	Effluent Conc. (mg/L)	Effluent Loading (lbs/day)	Loading Reduction (%)
1988	9.98	0.570	47.44	10.63	0.100	8.87	81.3
1989	13.33	0.720	80.04	13.91	0.080	9.28	88.4
1990	13.28	0.410	45.41	10.68	0.090	8.02	82.3
1991	12.42	0.230	23.82	13.40	0.090	10.06	57.8
1992	12.77	0.240	25.56	11.60	0.060	5.80	77.3
1993	12.63	0.180	18.96	10.00	0.060	5.00	73.6
1994	12.42	0.200	20.72	12.52	0.050	5.22	74.8
1995	15.12	0.180	22.70	8.83	0.050	3.68	83.8
1996	15.63	0.120	15.64	16.34	0.050	6.81	56.5
1997	15.22	0.140	17.77	16.67	0.040	5.56	68.7
1998	14.22	0.140	16.13	13.93	0.050	6.27	61.1
1999	17.20	0.320	45.90	19.43	0.060	9.72	78.8
2000	17.45	0.300	43.66	13.69	0.060	6.85	84.3
2001	17.86	0.240	35.75	16.76	0.070	9.78	72.6
2002	16.59	0.235	32.51	22.51	0.075	14.08	56.7
2003	17.36	0.207	29.97	24.87	0.070	14.52	51.6
2004	17.20	0.240	34.48	21.48	0.060	10.75	68.8
2005	18.27	0.401	61.10	25.25	0.088	18.53	69.7
2006 [a]	12.68	0.330	35.22	17.63	0.129	18.97	46.1
2007	12.33	0.276	28.38	14.62	0.066	8.05	71.6
2008	12.17	0.210	21.31	15.06	0.062	7.79	63.4
2009	14.14	0.153	18.04	15.39	0.041	5.26	70.8
2010	15.29	0.134	17.09	18.96	0.041	6.48	62.1
2011	15.17	0.159	20.16	17.18	0.036	5.16	74.4
2012	14.33	0.194	23.19	18.11	0.036	5.44	76.5
2013	14.16	0.285	33.66	19.18	0.037	5.92	82.4
2014	14.32	0.464	55.41	18.55	0.079	12.22	78.0
2015	11.80 [b]	0.247	24.31	16.57	0.075	10.36	57.4
2016	12.95	0.295	31.86	16.16	0.051	6.87	78.4
2017	15.30	0.146	18.63	23.94	0.068	13.58	27.1
2018	15.75	0.154	20.23	26.02	0.049	10.63	47.5
2019	16.40	0.311	42.54	21.84	0.053	9.65	77.3
2020	15.65	0.208	27.15	21.40	0.050	8.92	67.2
2021	16.42	0.237	32.46	19.91	0.037	6.14	81.1
2022	19.69	0.238	39.61	22.38	0.047	7.96	74.4
Average	**14.79**	**0.260**	**31.62**	**17.30**	**0.062**	**8.81**	**69.3**

[a] Beginning in 2006, effluent flow and nutrient concentrations were measured as weighted averages for both D002 and D003.

[b] On 3/11/2015, since no sample was collected from the flow for R001, this flow was not included in the average flow.

Table 4-13 Total Phosphorus (TP) Concentration Profile: Northern Flow Path

Year	Station [a]					
	Influent WP1 (mg/l)	Stratum 1 WP3 [b] (mg/l)	Stratum 2 WP4/5 [c] (mg/l)	Stratum 3 WP6 (mg/l)	Stratum 4 MM8 (mg/l)	Final Outfall HS10 (mg/l)
1988	0.570	0.100	0.100	0.110	0.090	0.100
1989	0.720	0.080	0.070	0.070	0.050	0.080
1990	0.410	0.160	0.140	0.110	0.050	0.090
1991	0.230	0.370	0.120	0.110	0.060	0.090
1992	0.240	0.100	0.080	0.070	0.050	0.060
1993	0.180	0.070	0.070	0.060	0.070	0.060
1994	0.200	0.060	0.060	0.050	0.050	0.050
1995	0.180	0.070	0.060	0.050	0.040	0.050
1996	0.120	0.130	0.070	0.090	0.060	0.050
1997	0.140	0.110	0.070	0.080	0.040	0.040
1998	0.140	0.080	0.060	0.050	0.040	0.050
1999	0.320	0.260	0.210	0.160	0.110	0.060
2000	0.300	0.190	0.210	0.160	0.040	0.060
2001	0.240	0.210	0.190	0.310	0.070	0.070
2002 [d]	0.235	0.200	0.170	0.170	0.130	0.075
2003	0.207	0.030	0.030	0.030	0.055	0.070
2004	0.240	0.165	0.106	0.040	0.050	0.060
2005	0.401	0.275	0.315	0.210	0.100	0.088
2006 [e]	0.333	0.236	0.194	0.133	0.190	0.129
2007	0.276	0.139	0.146	0.089	0.101	0.066
2008 [f]	0.210	0.140	0.123	0.081	- - - -	0.062
2009 [f]	0.153	0.103	0.087	0.080	- - - -	0.041
2010	0.134	0.069	0.049	0.072	0.117	0.041
2011	0.159	0.013	0.062	0.043	0.082	0.036
2012	0.194	0.177	0.128	0.054	0.053	0.036
2013 [g]	0.284	0.338	0.351	0.230	0.042	0.037
2014 [h]	0.464	0.426	0.328	0.280	0.201	0.079
2015	0.247	0.310	0.282	0.229	0.309	0.075
2016	0.295	0.261	0.246	0.182	0.144	0.051
2017	0.146	0.171	0.152	0.142	0.137	0.068
2018	0.154	0.126	0.117	0.104	0.100	0.049
2019 [i]	0.311	0.258	0.228	- - - -	- - - -	0.053
2020	0.208	0.145	0.124	0.140	0.073	0.050
2021	0.237	0.259	0.227	0.208	0.038	0.037
2022	0.238	0.242	0.214	0.184	0.068	0.046
Average	**0.261**	**0.174**	**0.148**	**0.123**	**0.088**	**0.062**

(a) Averages for Stations WP1 and HS10 are from monthly monitoring events. From 1998 through 2002, the TP detection limit was 0.04 mg/L. Values lower than the detection limit were reported as 0.04 mg/L.

(b) WP3 represents the average of stations WL1X and WL1Y assuming equal flow through each control structure.

(b) WP4/5 represents the average of stations WP4 and WP5, assuming equal flow through each control structure.

(c) The northern flow train was offline during most of 2002.

(d) Beginning in 2006, TP concentrations are the weighted averages between both D002 and D003.

(e) TP results do not include data collected for the drawdown experiment. Stratum 4 was offline. D003 was discharging.

(f) TP results do not include data collected for the pulsing study from May through December 2013.

(g) Beginning in 2014, TP results were compiled by averaging monthly concentrations from all tested control structures.

(h) Stratums 3 and 4 were offline due to Cell 13 renovation project from April through December 2019

Table 4-14 Total Phosphorus (TP) Concentration Profile: Southern Flow Path

Year	Station [a]				
	Influent WP1 (mg/l)	Stratum 1 WP2 [b] (mg/l)	Stratum 3 MM7 [c] (mg/l)	Stratum 5 HS9 (mg/l)	Final Outfall HS10 (mg/l)
1988	0.570	0.090	0.050	0.130	0.100
1989	0.720	0.110	0.080	0.050	0.080
1990	0.410	0.160	0.110	0.110	0.090
1991	0.230	0.090	0.070	0.090	0.090
1992	0.240	0.080	0.060	0.060	0.060
1993	0.180	0.060	0.050	0.050	0.060
1994	0.200	0.050	0.040	0.030	0.050
1995	0.180	0.040	0.040	0.050	0.050
1996	0.120	0.110	0.050	0.050	0.050
1997	0.140	0.050	0.060	0.060	0.040
1998	0.140	0.060	0.040	0.050	0.050
1999	0.320	0.080	0.120	0.060	0.060
2000	0.300	0.070	0.090	0.070	0.060
2001	0.240	0.190	0.110	0.100	0.070
2002	0.235	0.134	0.117	0.078	0.075
2003	0.207	0.141	0.103	0.076	0.070
2004	0.240	0.150	0.130	0.040	0.060
2005	0.401	0.350	0.180	0.060	0.088
2006 [c]	0.333	0.335	0.264	0.219	0.129
2007	0.276	0.314	0.124	0.172	0.066
2008	0.210	0.246	0.119	0.275	0.062
2009	0.153	0.045 [d]	0.112	0.056	0.041
2010	0.134	0.032	0.039	0.037	0.041
2011	0.159	0.042	0.037	0.033	0.036
2012	0.194	0.046	0.038	0.035	0.036
2013 [e]	0.284	0.126	0.084	0.056	0.037
2014 [f]	0.464	0.244	0.416	0.104	0.079
2015	0.247	0.263	0.278	0.070	0.075
2016 [g]	0.295	- - - -	- - - -	0.048	0.051
2017	0.146	0.089	0.043	0.065	0.068
2018	0.154	0.083	0.030	0.043	0.049
2019	0.311	0.245	0.058	0.038	0.053
2020	0.208	0.157 [h]	0.144	0.035	0.050
2021	0.237	0.153	0.076	0.050	0.037
2022	0.238	0.237	0.214	0.056	0.068
Average	**0.261**	**0.137**	**0.105**	**0.075**	**0.062**

(a) Averages for Stations WP1 and HS10 are from monthly monitoring events. From 1998 through 2002, the TP detection limit was 0.04 mg/L. Values lower than the detection limit was reported as 0.04 mg/L.

(b) WP2 represents the average of stations WL1X and WL1Y assuming equal flow through each control structure.

(c) Beginning in 2006, TP was measured at HS10 as the weighted averages for both D002 and D003.

(d) WP2 was offline during renovation project from January 2009 through June 2009.

(e) TP results do not include data collected for the pulsing study from May through December 2013.

(f) Beginning in 2014, TP results were compiled by averaging monthly concentrations from all tested control structures.

(g) Southern Flow Train was offline for renovation project from November 2015 through November 2016.

(h) Cell 11 was offline in 2020 due to a biogeochemistry study. Mean TP was from WL12X and WL12Y.

Table 4-15 Total Phosphorus (TP) Concentration Profile: Central Flow Path

Year	Station [a]						
	Influent WP1 (mg/l)	Stratum 1 WP2 [b] (mg/l)	Stratum 2 WP4/5 [c] (mg/l)	Stratum 3 WP6 [d] (mg/l)	Stratum 4 MM8 [e] (mg/l)	Stratum 5 HS9 (mg/l)	Final Outfall HS10 (mg/l)
2002	0.235	0.198	0.172	0.129	0.078	0.078	0.075
2003	0.207	0.150	0.135	0.080	0.076	0.076	0.070
2004	0.240	0.184	0.170	0.130	0.040	0.040	0.060
2005	0.401	0.327	0.295	0.208	0.064	0.064	0.088
2006 [f]	0.333	0.346	0.284	0.226	0.219	0.219	0.129
2007	0.276	0.254	0.215	0.163	0.172	0.172	0.066
2008	0.210	0.045	0.179	0.120	0.275	0.275	0.062
2009 [g]	0.153	0.048	0.043	0.056	0.056	0.056	0.041
2010	0.134	0.073	0.055	0.050	0.037	0.037	0.041
2011	0.159	0.081	0.081	0.058	0.033	0.033	0.036
2012	0.194	0.114	0.097	0.056	0.035	0.035	0.036
2013 [h]	0.284	0.201	0.152	0.167	0.056	0.056	0.037
2014 [i]	0.464	0.395	0.377	0.265	0.102	0.102	0.079
2015	0.247	0.291	0.317	0.230	0.070	0.070	0.075
2016	0.295	0.265	0.267	0.199	0.048	0.048	0.051
2017	0.146	0.155	0.189	0.124	0.065	0.065	0.068
2018 [j]	0.154	0.110	0.098	- - - -	0.043	0.043	0.049
2019	0.311	0.282	0.253	0.076	0.038	0.038	0.053
2020	0.208	0.148	0.132	0.138	0.035	0.035	0.050
2021	0.237	0.246	0.224	0.169	0.050	0.050	0.037
2022	0.238	0.237	0.235	0.193	0.099	0.056	0.046
Average	**0.244**	**0.198**	**0.189**	**0.142**	**0.081**	**0.079**	**0.060**

(a) Averages for Stations WP1 and HS10 are from data presented in Appendix B. Other stations are from the data presented in Appendix A.

(b) WP2 represents the average of stations WL1X and WL1Y assuming equal flow through each control structure.

(c) WP4/5 represents the average of stations WL3A and WL4X assuming equal flow through each control structure.

(d) WP6 represents the average of stations WL9X, WL9Y, WL10X, and WL10Y assuming equal flow through each control structure.

(e) MM8 represents the average of stations WL14X and WL14Y assuming equal flow through each control structure.

(f) Beginning in 2006, total phosphorus concentrations were measured at HS10 as the weighted averages for both D002 and D003.

(g) TP results do not include data collected for the drawdown experiment.

(h) TP results do not include data collected for the pulsing study from May through December 2013.

(i) Beginning in 2014, TP results for strata were compiled by averaging monthly concentrations from all its tested control structures.

(j) Cell 14 was offline for renovation project from April 2018 through January 2019.

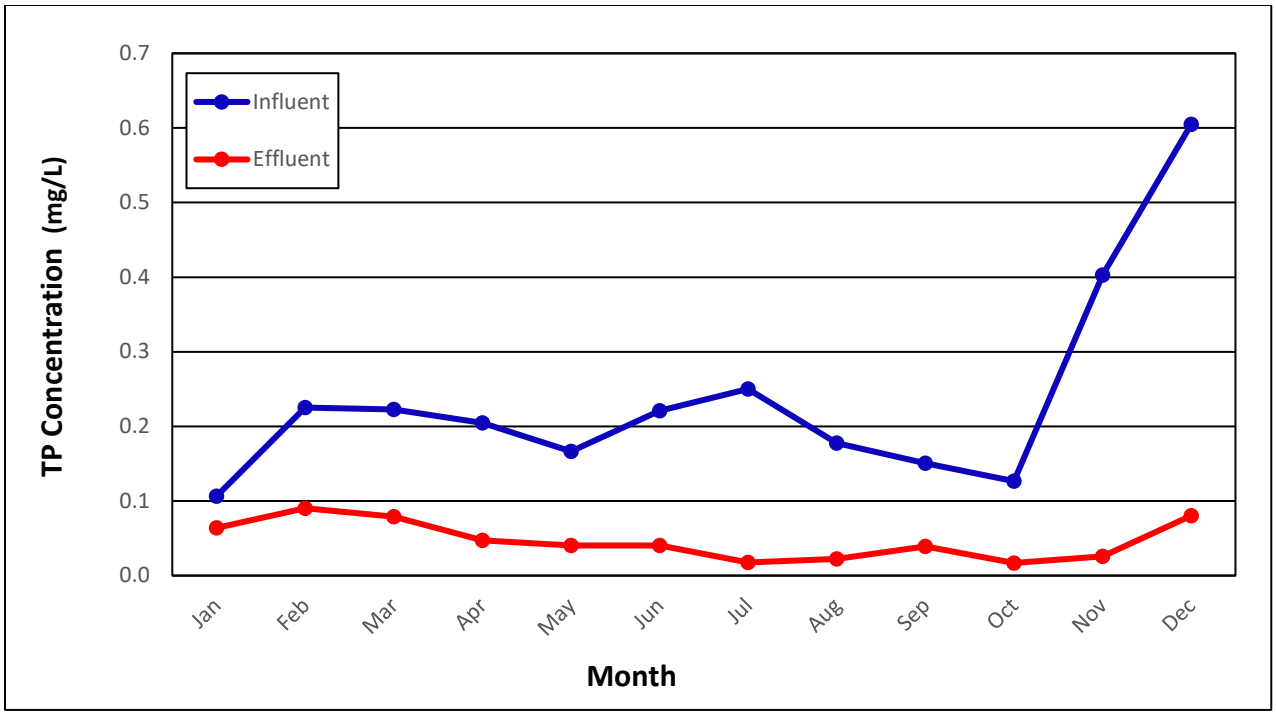

Figure 4-14 Monthly Average Total Phosphorus (TP) Concentrations

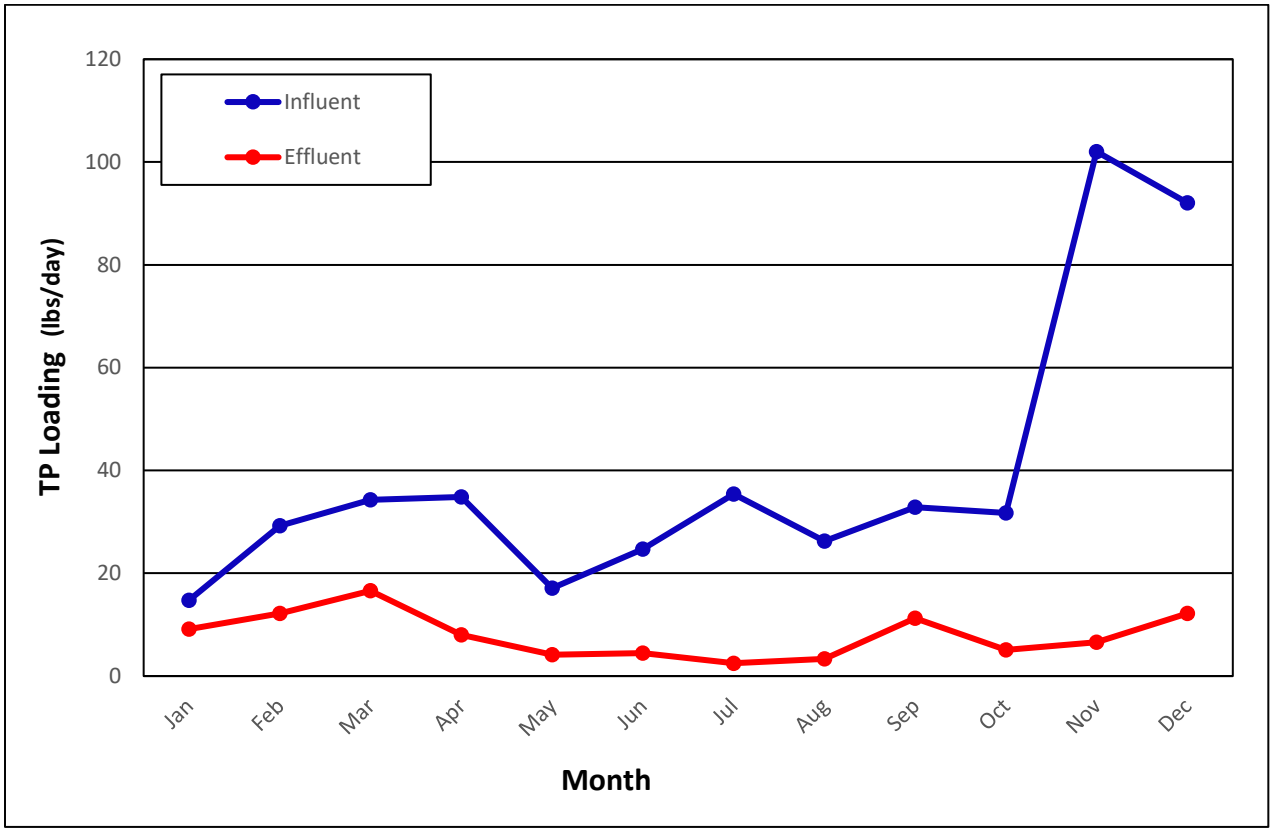

Figure 4-15 Monthly Average Total Phosphorus (TP) Loadings

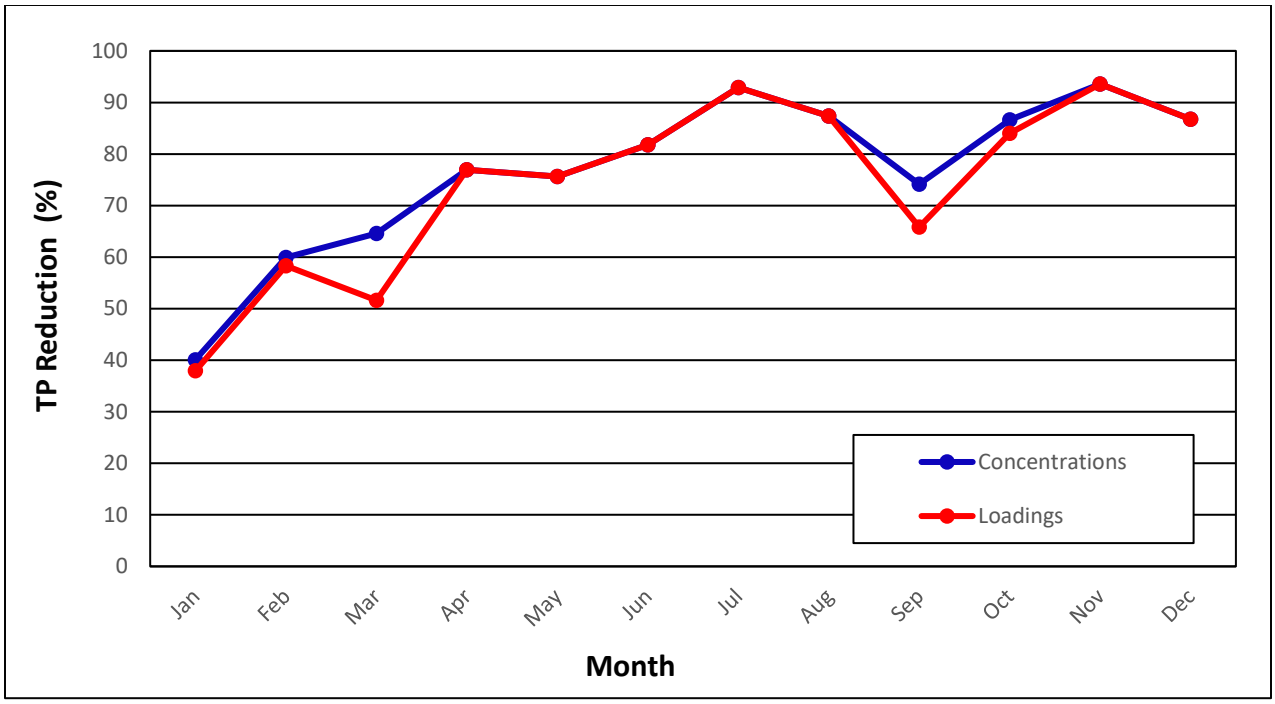

Figure 4-16 Reductions in Monthly Average Total Phosphorus (TP) Concentrations and Loadings through the OEW

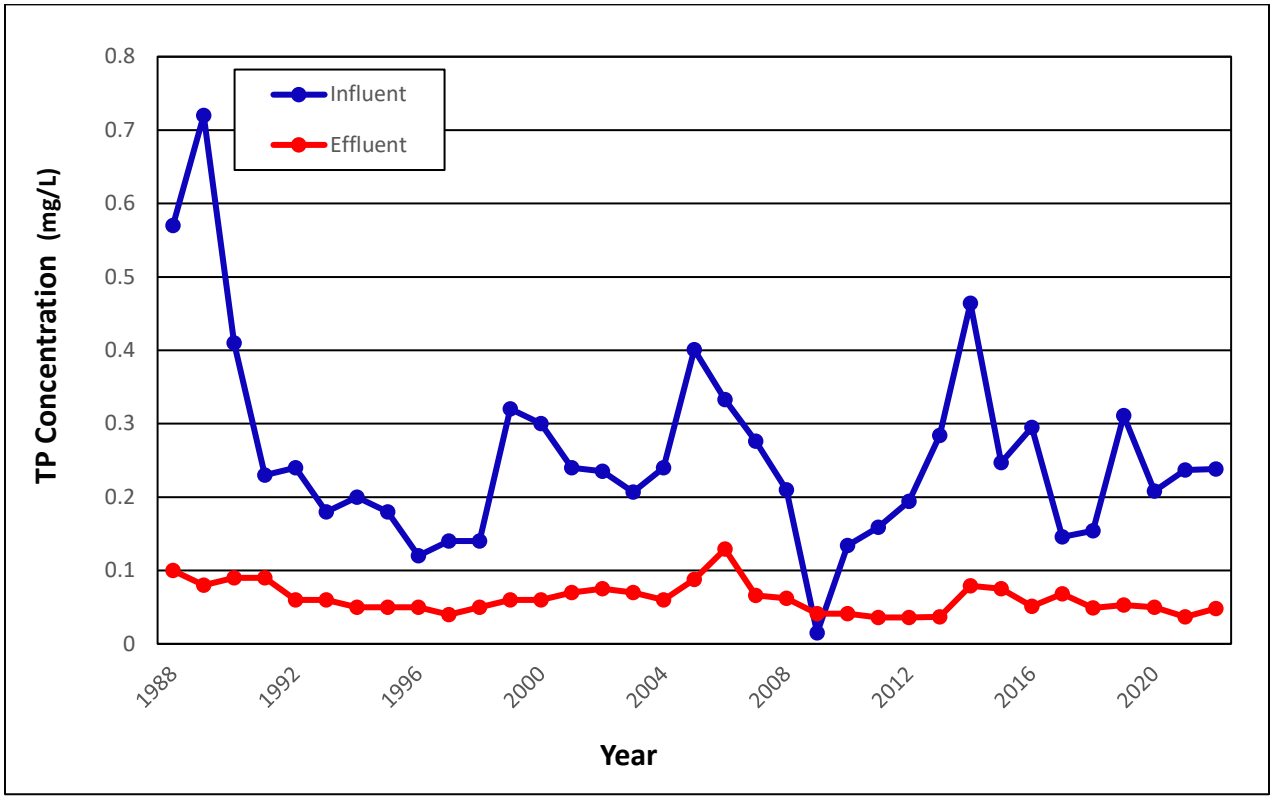

Figure 4-17 Annual Average Total Phosphorus (TP) Concentrations

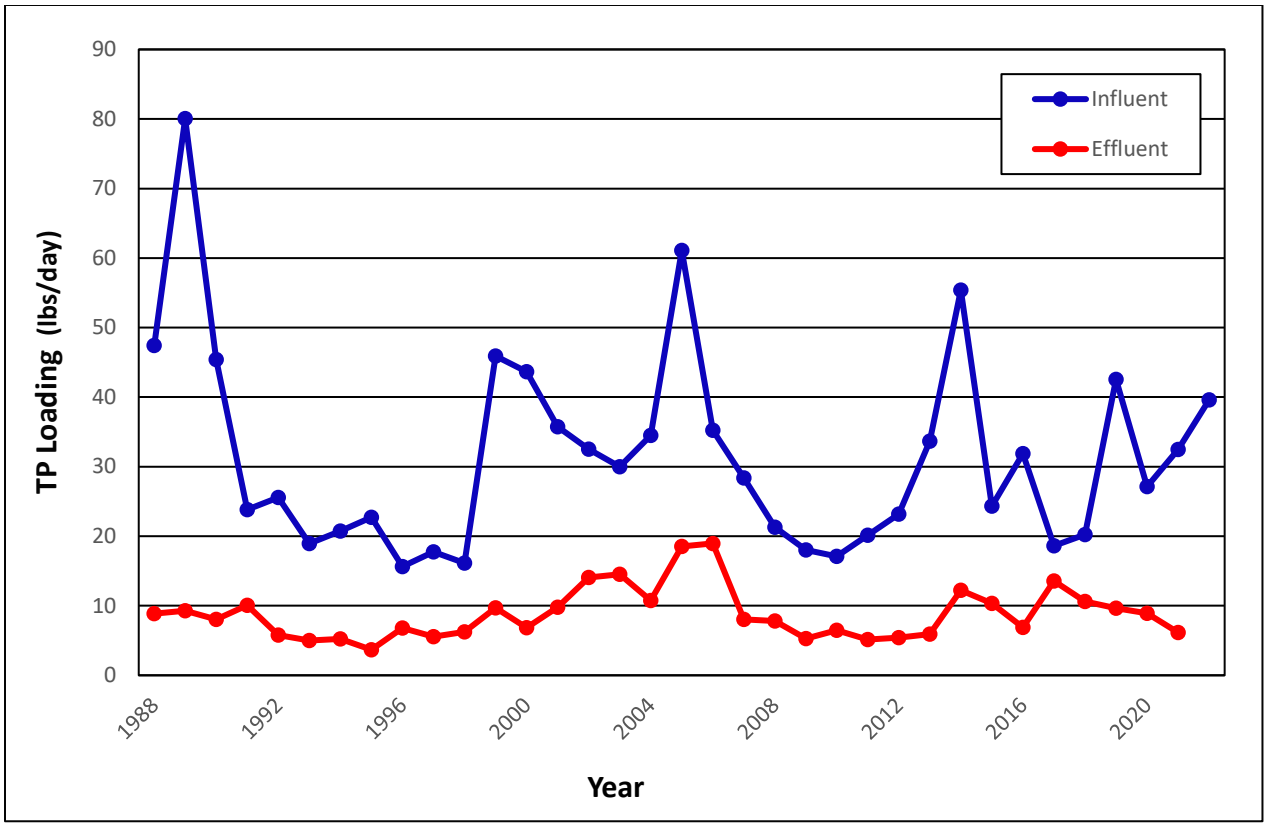

Figure 4-18 Annual Average Total Phosphorus (TP) Loadings

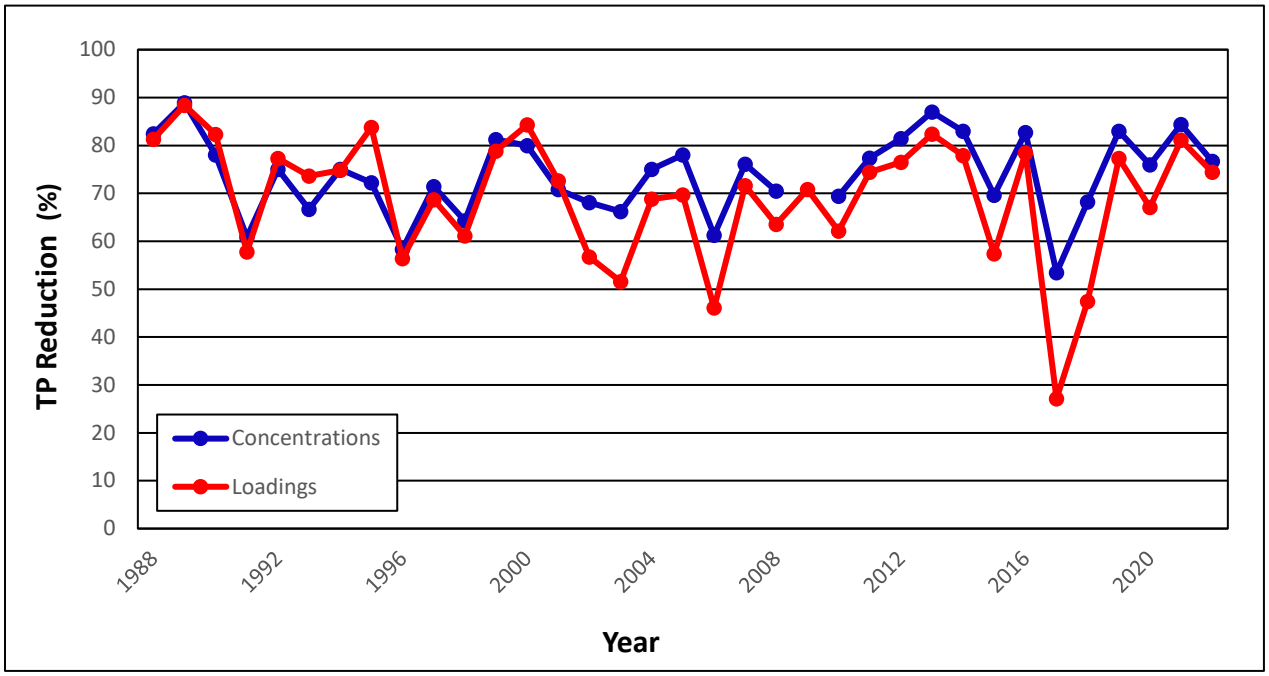

Figure 4-19 Reductions in Annual Average Total Phosphorus (TP) Concentrations and Loadings through the OEW

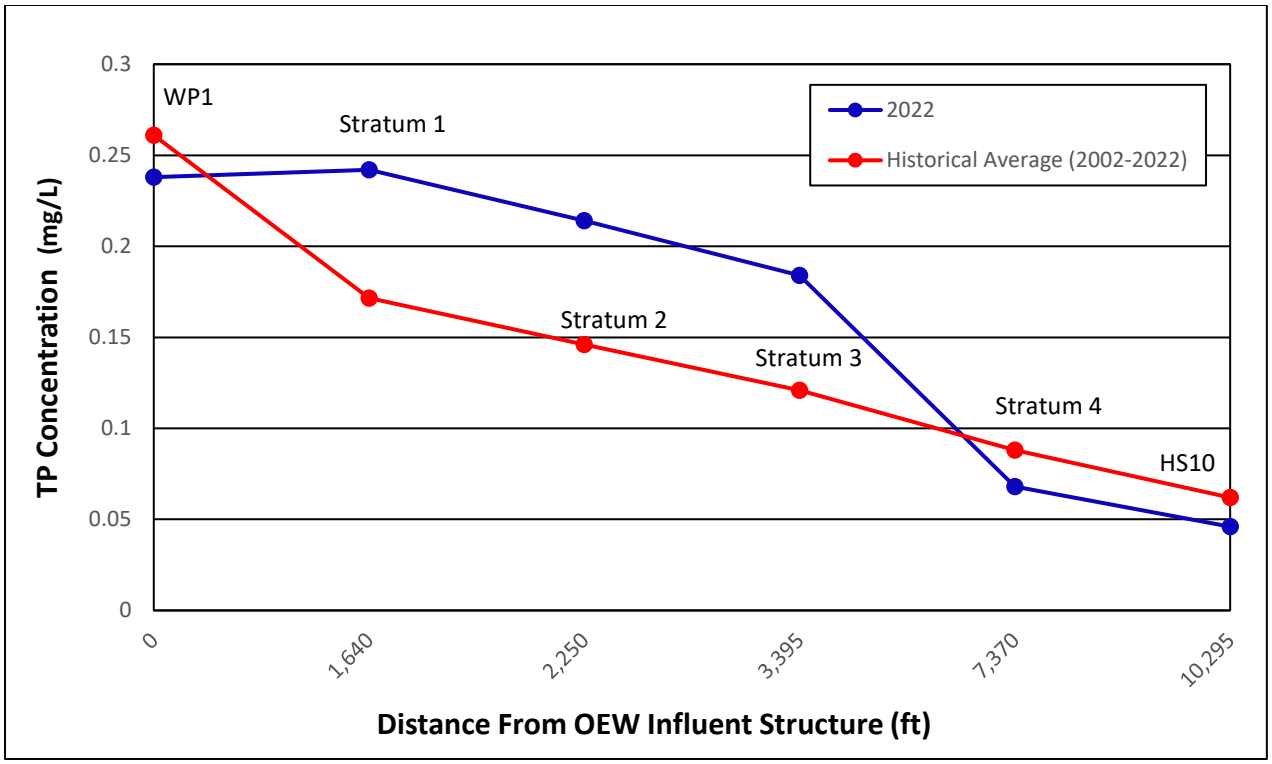

Figure 4-20 Total Phosphorus (TP) Profile through the Northern Flow Train

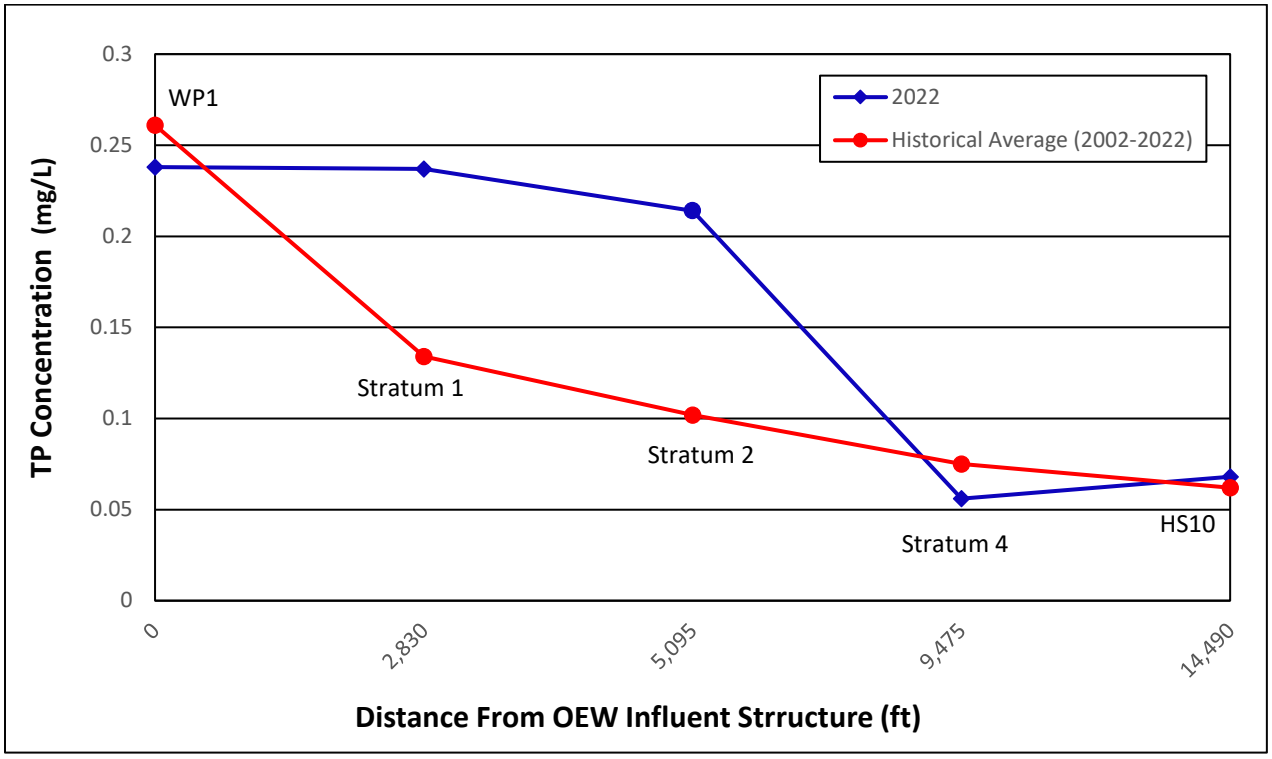

Figure 4-21 Total Phosphorus (TP) Profile through the Southern Flow Train

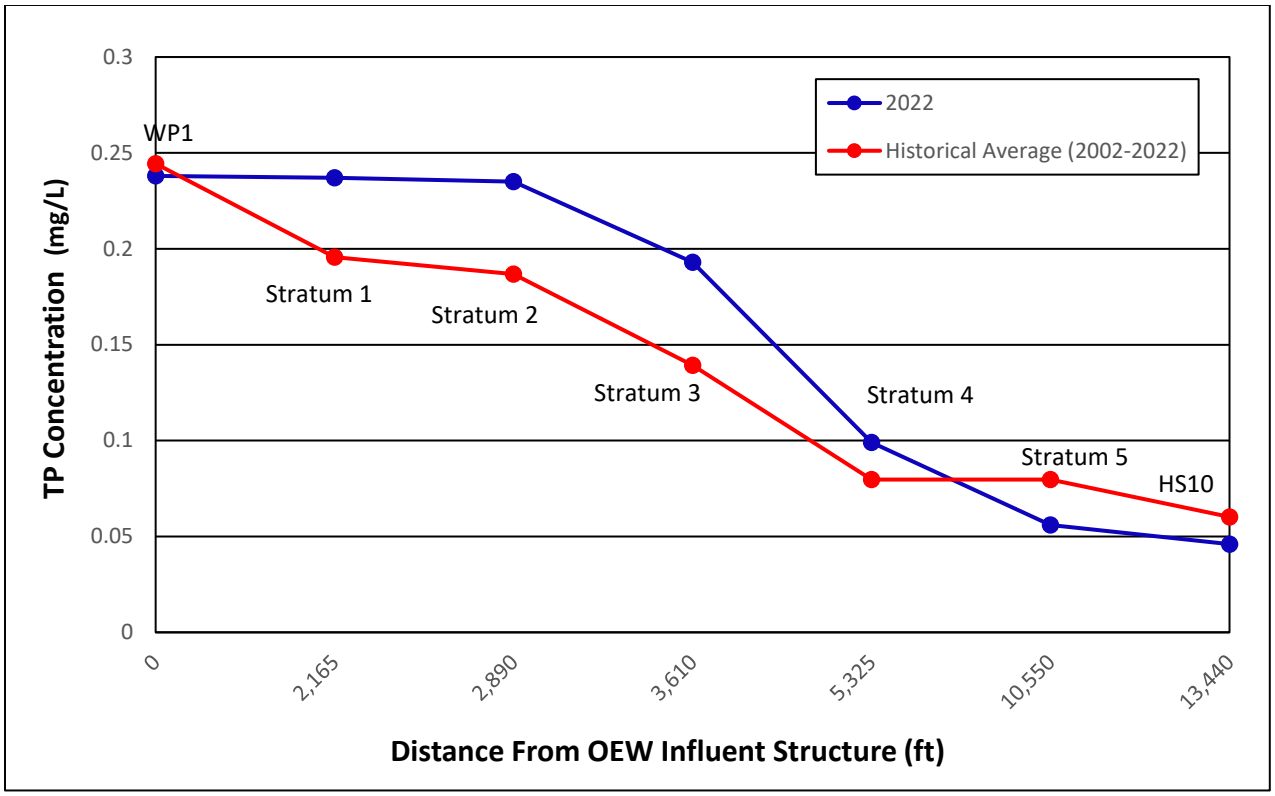

Figure 4-22 Total Phosphorus (TP) Profile through the Central Flow Train

Table 4-16 Comparison of Average Monthly Dissolved Oxygen (DO) Concentrations: OEW Discharges and FDEP Annual Permit Limit

Month (2022)	D002 (mg/l)	D003 [(a)] (mg/l)	FDEP Annual Average Permit Limit (mg/l)
January	5.900	7.050	3.8
February	5.739	7.729	3.8
March	4.816	6.150	3.8
April	4.597	ND	3.8
May	4.410	ND	3.8
June	4.327	ND	3.8
July	4.445	ND	3.8
August	4.384	ND	3.8
September	3.990	4.300	3.8
October	4.681	3.725	3.8
November	5.393	ND	3.8
December	5.671	ND	3.8
Average	**4.863**	**5.791**	**3.8**

(a) DO levels for D003 were determined by averaging the values only for those days with actual discharges.

ND – No Discharge.

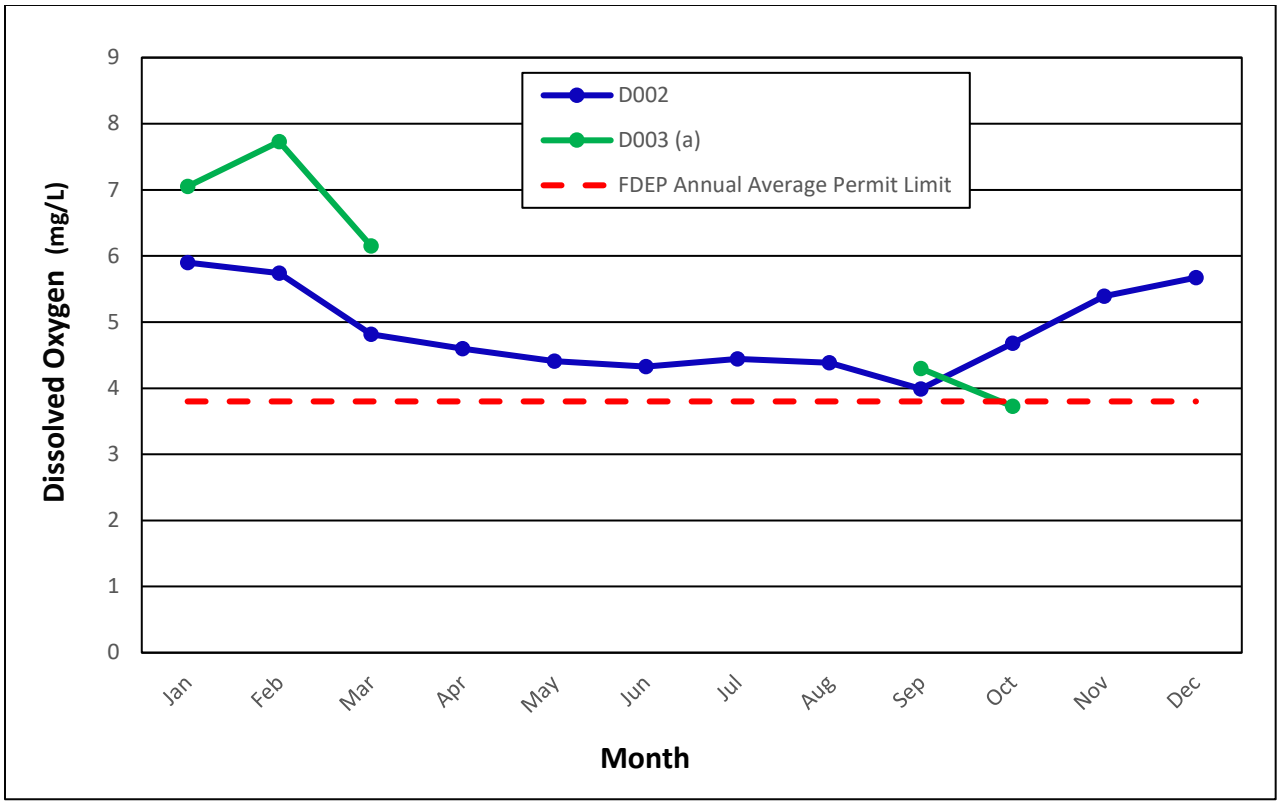

Figure 4-23 Monthly Average Dissolved Oxygen (DO) Concentrations: OEW Discharges (D002 and D003) during 2022

[a] No discharge from D003 from April thru August, November, and December.

Table 4-17 Monthly Rainfall at OEW [(a)]

Month (2022)	Rainfall (inches)	Rainfall (MGD)	Percentage of Annual Rainfall (%)
January	1.535	0.136	2.59
February	0.668	0.059	1.13
March	8.938	0.792	15.11
April	4.615	0.409	7.80
May	1.726	0.153	2.92
June	5.031	0.446	8.50
July	5.241	0.464	8.86
August	6.517	0.577	11.01
September	18.465	1.635	31.20
October	0.165	0.015	0.28
November	4.559	0.404	7.70
December	1.713	0.152	2.90
Total Annual - 2022	**59.174**	**5.240**	**8.33 avg.**

(a) Data compiled by St. Johns River Water Management District's WSR-88D NexRad Radar. Average rainfall was determined by using "pixel ids" 114624, 114625, and 114150.

Table 4-18 Water Budget: OEW Annual Flows and Rainfall Amounts

Year	Influent Flow (MGD)	Discharge Flow (MGD)	Rainfall (inches)	Rainfall [a] (MGD)	Evapotranspiration/ Percolation [b] (MGD)
1988	9.88	10.63	52.50	4.65	3.90
1989	13.33	13.91	45.41	5.27	3.44
1990	13.28	10.68	36.00	3.64	5.79
1991	12.90	13.40	67.00	5.36	5.43
1992	12.77	11.60	59.00	5.30	6.39
1993	12.63	10.00	36.61	3.37	5.87
1994	12.42	12.52	80.62	3.09	7.04
1995	15.12	8.83 [c]	44.52	4.31	10.23
1996	15.68	16.34	64.55	3.62	5.05
1997	15.22	16.67	71.42	3.94	4.87
1998	14.22	13.96	45.21	5.05	4.26
1999	17.20	19.43	36.63	4.30	1.04
2000	14.45	13.69	37.65	3.72	7.09
2001	17.86	16.76	54.75	4.85	5.95
2002	16.59	22.51	59.57	5.27	-0.65
2003	17.36	24.87	41.10	3.64	-3.87
2004	17.20	26.80	60.58	5.36	-4.24
2005	18.27	25.25	59.90	5.30	-1.68
2006	12.68	17.63	38.05	3.37	-1.58
2007	12.33	14.62	34.90	3.09	0.80
2008	12.17	15.06	48.68	4.31	1.42
2009	14.14	15.39	43.49	3.62	2.37
2010 [d]	15.29	18.96	44.49	3.94	0.27
2011	15.17	17.18	57.00	5.05	3.04
2012	14.33	18.11	48.54	4.30	0.52
2013	14.16	19.18	41.99	3.72	-1.30
2014	14.32	18.55	62.97	5.57	1.34
2015	11.80	16.57	49.00	4.34	-0.43
2016	12.95	16.16	52.21	4.62	1.41
2017 [e]	15.30	23.94	51.24	4.54	-4.10
2018	15.75	26.02	63.56	5.63	-4.64
2019	16.40	21.84	60.24	5.33	-0.11
2020	15.65	21.40	55.48	4.91	-0.84
2021	16.42	19.91	54.70	4.84	1.35
2022	19.69	22.39	59.17	5.24	2.54
Average	**14.71**	**17.70**	**51.96**	**4.47**	**1.94**

(a) Rainfall data conversion is based on an even distribution across the 1,190 acres of the OEW.

(b) Evaporation/Percolation estimate is determined by the difference between the discharge flows and influent plus rainfall flows.

(c) Flow meter at D002 was not functional during a portion of the year.

(d) Locations with closer proximity to OEW were used for the average rainfall information.

(e) Rainfall data was compiled by the St. Johns River Water Management District using WSR-88D NexRad Rada

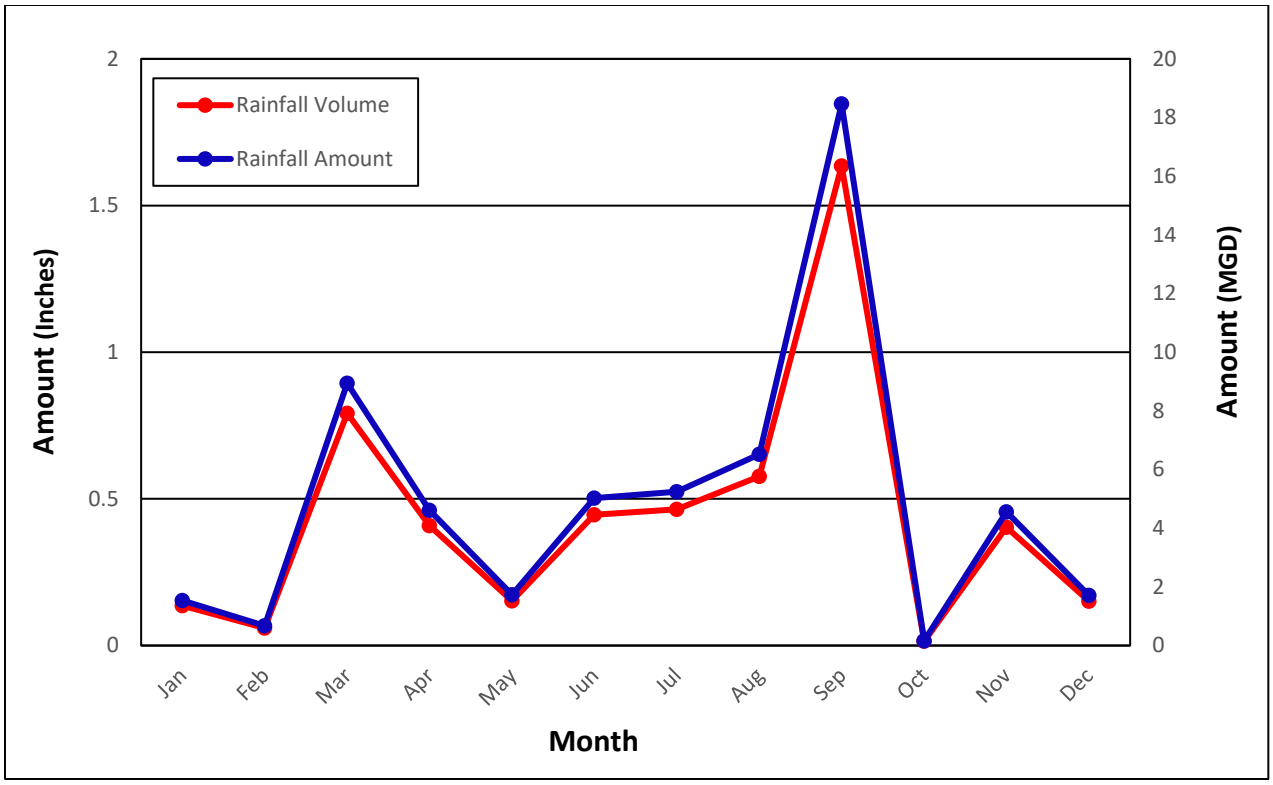

Figure 4-24 Monthly Rainfall Amounts and Volumes (Flows) during 2022

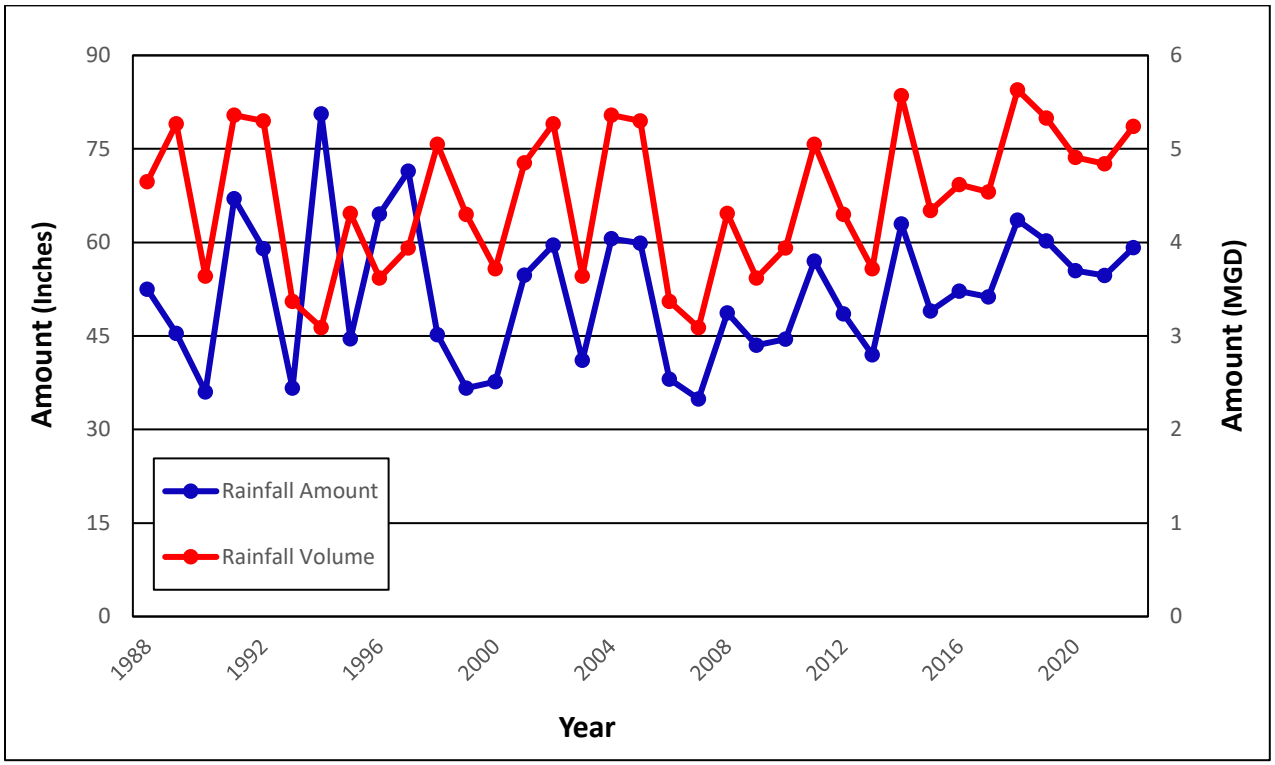

Figure 4-25 Annual Rainfall Amounts and Volumes (Flows)

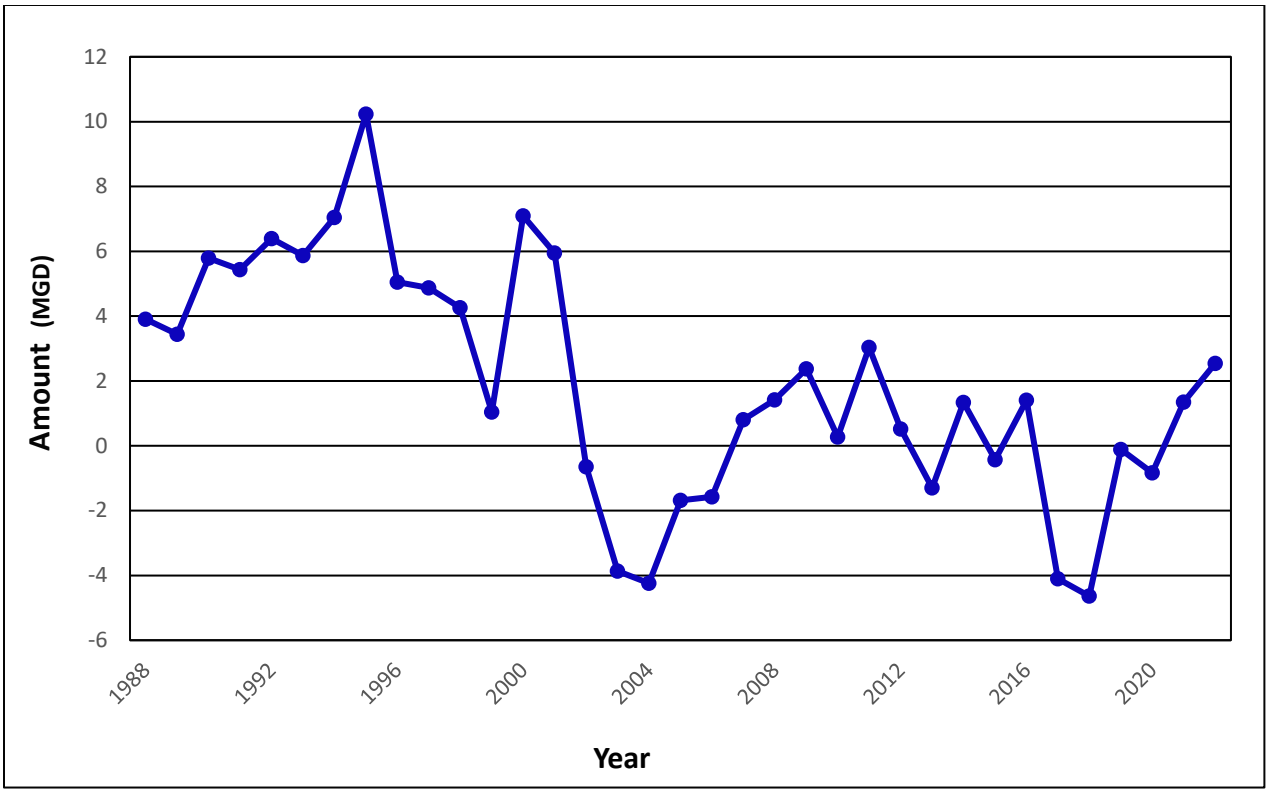

Figure 4-26 Annual Net Water Budget (Evapotranspiration/Percolation Flow)

Conclusions

The discharges from the Orlando Easterly Wetlands (OEW) during calendar year 2022 continued to comply with the requirements and limitations set forth in the FDEP Domestic Wastewater Facility Permit (FL 0037966) for the Iron Bridge Regional WRF (Iron Bridge). Monitoring events were performed regularly to demonstrate compliance with applicable permit conditions. The 2022 Orlando Easterly Wetlands Annual Report presents a summary of the water quality data and monitoring results, including flows, in satisfaction of the reporting requirements for the Iron Bridge Regional WRF and related wetland treatment system (OEW).

The Orlando Easterly Wetlands (OEW) was designed to reduce nutrient loadings from reclaimed water discharged by the Iron Bridge Regional WRF. The wetland treatment system during 2022 continued to demonstrate the ability to perform as designed and removed or sequestered nutrients prior to discharge to the St. Johns River.

Conclusions on the compliance and performance review of the OEW for 2022 include:

- ✓ The two hurricane events did not negatively impact the performance of the wetlands treatment system.
- ✓ Discharges from the Iron Bridge Outfall D001 had minimal impacts on the water quality, flows, and nutrient loadings of the Little Econlockhatchee River.
- ✓ Discharges from Iron Bridge Outfall D001 had significantly higher DO levels than the Little Econlockhatchee River.
- ✓ Discharges for the OEW had minimal impacts on the water quality, flows, and nutrient loadings of the St. Johns River since inception of operations in 1987.
- ✓ The influent and effluent nutrient concentrations for the OEW during 2022 were siginificantly less than the FDEP maximum limits.
- ✓ The OEW had higher annual average nutrient loadings in 2022 due to the hurricane events, which were an even smaller percentage of the total nutrient loadings for the St. Johns River, especially for total phosphorus.
- ✓ The annual average nutrient loadings for the OEW and in combination for Outfall D001 continued to be significantly below the wasteload allocation limits in the facility permit.
- ✓ Annual average nutrient loadings for the OEW and in combination with Outfall D001 were slightly higher in 2022 than 2021 despite the hurricane events.
- ✓ The OEW performed better in 2022 than 2021 with higher percent reduction in nutrient concentrations and loadings.

- ✓ Nutrient concentrations declined as the flow traveled through the flow paths toward the outfalls.

- ✓ Nutrient loadings appeared to decrease along the un-named ditch from the OEW outfalls to the St. Johns River.

- ✓ The average DO concentrations in the discharges from the OEW were significantly higfher than the FDEP annual average target concentration of 3.8 mg/L.

- ✓ The hurricane events increased the net water budget by 88.1% with higher annual rainfall and discharge flows.

The Orlando Easterly Wetlands continued to provide excellent nutrient removal, diverse wildlife habitats and sanctuaries, recreation opportunities, and educational initiatives as a premier multifaceted beneficial reuse project. The City plans to expand these invaluable services while exploring other opportunities for this iconic facility.

Electronic References and Credits

City of Orlando, Environmental Analytical Laboratory, Results of Analysis, Databases, and Reports.

ESRI Digital Globe, GEO Eye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Get Mapping, Aerogrid, IGN. IGP, Swisstopo, and GIS User Community.

St. Johns Water Management District, Radar Rainfall, Retrieved from *https://webapub.sjrwmd.com/agws10/radrain*.

U.S. Geological Survey, USGS Current Water Data for Florida (*https://waterdata.usgs.gov/fl/nwis/rt*), retrieved from *https://waterdata,usgs.gov/fl/nwis/current/?type=flow&group_key=basin_cd.*

Appendices
Calendar Year 2022

A: USGS Gage Heights and Discharge Flows

B: Water Quality Data

C: Water Quality and Performance Data – Orlando Easterly Wetlands

D: Water Quality and Performance Data – Un-Named Ditch

E: Comprehensive Monitoring Data: Semiannual Metals, Organochlorine Pesticides, PCBs, and Volatile Organic Compounds (VOCs)

Appendix A

USGS Gage Heights and Discharge Flows

Little Econlockhatchee River and St. Johns River

Calendar Year 2022

Index:
ND: Not Documented
A:e USGS Approved and Estimated

SJR-5

USGS Gage Height and Discharge Data

USGS 02234000 ST. JOHNS RIVER near S.R. 46, GENEVA, FL

Date	Gage Height (ft)	Stream Flow (cfs)	Discharge (MGD)
1/1/2022	3.76	1,710	2,645.76
1/2/2022	3.71	1,660	2,568.40
1/3/2022	3.64	1,550	2,398.20
1/4/2022	3.56	1,600	2,475.57
1/5/2022	3.50	1,550	2,398.20
1/6/2022	3.43	1,510	2,336.32
1/7/2022	3.36	1,440	2,228.01
1/8/2022	3.28	1,490	2,305.37
1/9/2022	3.22	1,440	2,228.01
1/10/2022	3.17	1,270	1,964.98
1/11/2022	3.12	1,290	1,995.92
1/12/2022	3.05	1,320	2,042.34
1/13/2022	2.99	1,180	1,825.73
1/14/2022	2.96	1,130	1,748.37
1/15/2022	2.90	1,130	1,748.37
1/16/2022	2.86	1,110	1,717.42
1/17/2022	2.88	994	1,537.95
1/18/2022	2.84	1,100	1,701.95
1/19/2022	2.78	1,120	1,732.90
1/20/2022	2.73	1,070	1,655.53
1/21/2022	2.66	1,050	1,624.59
1/22/2022	2.60	1,030	1,593.65
1/23/2022	2.54	1,010	1,562.70
1/24/2022	2.50	984	1,522.47
1/25/2022	2.45	922	1,426.54
1/26/2022	2.44	933	1,443.56
1/27/2022	2.45	971	1,502.36
1/28/2022	2.46	945	1,462.13
1/29/2022	2.51	853	1,319.79
1/30/2022	2.50	996	1,541.04
1/31/2022	2.47	966	1,494.62
2/1/2022	2.44	894	1,383.22
2/2/2022	2.40	945	1,462.13
2/3/2022	2.36	923	1,428.09
2/4/2022	2.32	878	1,358.47
2/5/2022	2.28	870	1,346.09
2/6/2022	2.23	871	1,347.64

SJR-5

USGS Gage Height and Discharge Data

USGS 02234000 ST. JOHNS RIVER near S.R. 46, GENEVA, FL

Date	Gage Height (ft)	Stream Flow (cfs)	Discharge (MGD)
2/7/2022	2.21	859	1,329.07
2/8/2022	2.18	848	1,312.05
2/9/2022	2.21	841	1,301.22
2/10/2022	2.20	856	1,324.43
2/11/2022	2.16	860	1,330.62
2/12/2022	2.13	847	1,310.50
2/13/2022	2.11	819	1,267.18
2/14/2022	2.09	837	1,295.03
2/15/2022	2.05	871	1,347.64
2/16/2022	1.97	877	1,356.92
2/17/2022	1.90	875	1,353.83
2/18/2022	1.87	739	1,143.40
2/19/2022	1.83	786	1,216.12
2/20/2022	1.79	816	1,262.54
2/21/2022	1.75	750	1,160.42
2/22/2022	1.70	728	1,126.38
2/23/2022	1.65	703	1,087.70
2/24/2022	1.60	673	1,041.28
2/25/2022	1.56	664	1,027.36
2/26/2022	1.52	647	1,001.06
2/27/2022	1.46	607	939.17
2/28/2022	1.41	564	872.64
3/1/2022	1.38	566	875.73
3/2/2022	1.41	589	911.32
3/3/2022	1.45	523	809.20
3/4/2022	1.46	498	770.52
3/5/2022	1.43	527	815.39
3/6/2022	1.37	503	778.26
3/7/2022	1.32	473	731.84
3/8/2022	1.47	730	1,129.48
3/9/2022	1.64	1,020	1,578.17
3/10/2022	1.87	1,180	1,825.73
3/11/2022	2.12	1,370	2,119.70
3/12/2022	2.36	1,400	2,166.12
3/13/2022	2.50	1,490	2,305.37
3/14/2022	2.62	1,630	2,521.98
3/15/2022	2.71	1,630	2,521.98

SJR-5

USGS Gage Height and Discharge Data

USGS 02234000 ST. JOHNS RIVER near S.R. 46, GENEVA, FL

Date	Gage Height (ft)	Stream Flow (cfs)	Discharge (MGD)
3/16/2022	2.98	1,890	2,924.26
3/17/2022	3.16	1,950	3,017.10
3/18/2022	3.28	2,090	3,233.71
3/19/2022	3.47	2,130	3,295.60
3/20/2022	3.56	1,970	3,048.04
3/21/2022	3.56	1,930	2,986.15
3/22/2022	3.54	1,880	2,908.79
3/23/2022	3.49	1,730	2,676.71
3/24/2022	3.46	1,580	2,444.62
3/25/2022	3.43	1,520	2,351.79
3/26/2022	3.37	1,470	2,274.43
3/27/2022	3.32	1,450	2,243.48
3/28/2022	3.26	1,430	2,212.54
3/29/2022	3.19	1,420	2,197.06
3/30/2022	3.12	1,480	2,289.90
3/31/2022	3.01	1,300	2,011.40
4/1/2022	3.27	1,260	1,949.51
4/2/2022	3.48	1,410	2,181.59
4/3/2022	3.78	1,660	2,568.40
4/4/2022	3.96	1,930	2,986.15
4/5/2022	4.10	2,160	3,342.01
4/6/2022	4.18	2,260	3,496.74
4/7/2022	4.26	2,320	3,589.57
4/8/2022	4.31	2,240	3,465.79
4/9/2022	4.30	2,250	3,481.26
4/10/2022	4.28	2,290	3,543.15
4/11/2022	4.25	2,280	3,527.68
4/12/2022	4.20	2,260	3,496.74
4/13/2022	4.15	2,230	3,450.32
4/14/2022	4.11	2,180	3,372.96
4/15/2022	4.05	2,150	3,326.54
4/16/2022	4.01	2,130	3,295.60
4/17/2022	3.95	2,100	3,249.18
4/18/2022	3.93	2,070	3,202.76
4/19/2022	3.93	2,060	3,187.29
4/20/2022	3.88	2,100	3,249.18
4/21/2022	3.81	2,000	3,094.46

SJR-5

USGS Gage Height and Discharge Data

USGS 02234000 ST. JOHNS RIVER near S.R. 46, GENEVA, FL

Date	Gage Height (ft)	Stream Flow (cfs)	Discharge (MGD)
4/22/2022	3.76	1,930	2,986.15
4/23/2022	3.69	1,870	2,893.32
4/24/2022	3.60	1,770	2,738.59
4/25/2022	3.54	1,690	2,614.82
4/26/2022	3.47	1,600	2,475.57
4/27/2022	3.39	1,530	2,367.26
4/28/2022	3.39	1,530	2,367.26
4/29/2022	3.31	1,620	2,506.51
4/30/2022	3.24	1,530	2,367.26
5/1/2022	3.17	1,460	2,258.95
5/2/2022	3.10	1,380	2,135.18
5/3/2022	3.01	1,310	2,026.87
5/4/2022	2.93	1,280	1,980.45
5/5/2022	2.83	1,200	1,856.67
5/6/2022	2.73	1,130	1,748.37
5/7/2022	2.68	1,070	1,655.53
5/8/2022	2.56	1,060	1,640.06
5/9/2022	2.46	1,010	1,562.70
5/10/2022	2.32	980	1,516.28
5/11/2022	2.21	918	1,420.36
5/12/2022	2.14	875	1,353.83
5/13/2022	2.11	750	1,160.42
5/14/2022	2.11	679	1,050.57
5/15/2022	2.12	654	1,011.89
5/16/2022	2.14	527	815.39
5/17/2022	2.14	558	863.35
5/18/2022	2.13	571	883.47
5/19/2022	2.11	595	920.60
5/20/2022	2.04	627	970.11
5/21/2022	2.06	597	923.70
5/22/2022	2.12	663	1,025.81
5/23/2022	2.10	685	1,059.85
5/24/2022	2.06	716	1,107.82
5/25/2022	1.99	692	1,070.68
5/26/2022	1.89	663	1,025.81
5/27/2022	1.82	556	860.26
5/28/2022	1.76	591	914.41

SJR-5

USGS Gage Height and Discharge Data

USGS 02234000 ST. JOHNS RIVER near S.R. 46, GENEVA, FL

Date	Gage Height (ft)	Stream Flow (cfs)	Discharge (MGD)
5/29/2022	1.65	527	815.39
5/30/2022	1.57	464	717.91
5/31/2022	1.47	432	668.40
6/1/2022	1.37	437	676.14
6/2/2022	1.30	407	629.72
6/3/2022	1.24	363	561.64
6/4/2022	1.20	306	473.45
6/5/2022	1.21	307	475.00
6/6/2022	1.28	255	394.54
6/7/2022	1.44	270	417.75
6/8/2022	1.55	366	566.29
6/9/2022	1.65	518	801.46
6/10/2022	1.76	670	1,036.64
6/11/2022	1.80	741	1,146.50
6/12/2022	1.81	814	1,259.44
6/13/2022	1.81	792	1,225.41
6/14/2022	1.80	735	1,137.21
6/15/2022	1.75	724	1,120.19
6/16/2022	1.67	664	1,027.36
6/17/2022	1.61	657	1,016.53
6/18/2022	1.57	596	922.15
6/19/2022	1.55	520	804.56
6/20/2022	1.60	723	1,118.65
6/21/2022	1.66	817	1,264.09
6/22/2022	1.72	891	1,378.58
6/23/2022	1.72	796	1,231.59
6/24/2022	1.68	690	1,067.59
6/25/2022	1.64	674	1,042.83
6/26/2022	1.61	592	915.96
6/27/2022	1.61	571	883.47
6/28/2022	1.62	565	874.18
6/29/2022	1.60	511	790.63
6/30/2022	1.59	566	875.73
7/1/2022	1.62	599	926.79
7/2/2022	1.73	632	977.85
7/3/2022	1.81	710	1,098.53
7/4/2022	1.84	778	1,203.74

SJR-5

USGS Gage Height and Discharge Data

USGS 02234000 ST. JOHNS RIVER near S.R. 46, GENEVA, FL

Date	Gage Height (ft)	Stream Flow (cfs)	Discharge (MGD)
7/5/2022	1.84	828	1,281.11
7/6/2022	1.83	789	1,220.76
7/7/2022	1.80	762	1,178.99
7/8/2022	1.74	727	1,124.84
7/9/2022	1.66	654	1,011.89
7/10/2022	1.66	698	1,079.97
7/11/2022	1.65	741	1,146.50
7/12/2022	1.65	818	1,265.63
7/13/2022	1.66	874	1,352.28
7/14/2022	1.69	839	1,298.12
7/15/2022	1.66	836	1,293.48
7/16/2022	1.67	793	1,226.95
7/17/2022	1.73	834	1,290.39
7/18/2022	1.80	845	1,307.41
7/19/2022	1.88	894	1,383.22
7/20/2022	2.02	1,130	1,748.37
7/21/2022	2.10	1,310	2,026.87
7/22/2022	2.13	1,350	2,088.76
7/23/2022	2.14	1,270	1,964.98
7/24/2022	2.14	1,210	1,872.15
7/25/2022	2.10	1,150	1,779.31
7/26/2022	2.03	1,060	1,640.06
7/27/2022	1.98	1,010	1,562.70
7/28/2022	1.95	1,010	1,562.70
7/29/2022	1.88	936	1,448.21
7/30/2022	1.81	830	1,284.20
7/31/2022	1.71	732	1,132.57
8/1/2022	1.59	644	996.42
8/2/2022	1.49	584	903.58
8/3/2022	1.42	571	883.47
8/4/2022	1.31	501	775.16
8/5/2022	1.23	499	772.07
8/6/2022	1.18	449	694.71
8/7/2022	1.12	420	649.84
8/8/2022	1.09	416	643.65
8/9/2022	1.07	420	649.84
8/10/2022	1.06	389	601.87

SJR-5

USGS Gage Height and Discharge Data

USGS 02234000 ST. JOHNS RIVER near S.R. 46, GENEVA, FL

Date	Gage Height (ft)	Stream Flow (cfs)	Discharge (MGD)
8/11/2022	1.05	371	574.02
8/12/2022	1.06	399	617.34
8/13/2022	1.04	365	564.74
8/14/2022	1.03	347	536.89
8/15/2022	1.03	337	521.42
8/16/2022	1.09	363	561.64
8/17/2022	1.21	412	637.46
8/18/2022	1.37	497	768.97
8/19/2022	1.56	669	1,035.10
8/20/2022	1.74	842	1,302.77
8/21/2022	1.85	977	1,511.64
8/22/2022	1.90	1,040	1,609.12
8/23/2022	1.96	1,020	1,578.17
8/24/2022	2.09	1,150	1,779.31
8/25/2022	2.20	1,280	1,980.45
8/26/2022	2.39	1,450	2,243.48
8/27/2022	2.75	1,550	2,398.20
8/28/2022	3.13	1,730	2,676.71
8/29/2022	3.47	2,070	3,202.76
8/30/2022	3.76	2,290	3,543.15
8/31/2022	3.99	2,360	3,651.46
9/1/2022	4.18	2,380	3,682.40
9/2/2022	4.28	2,370	3,666.93
9/3/2022	4.31	2,350	3,635.99
9/4/2022	4.30	2,330	3,605.04
9/5/2022	4.26	2,280	3,527.68
9/6/2022	4.19	2,180	3,372.96
9/7/2022	4.11	2,060	3,187.29
9/8/2022	4.15	2,000	3,094.46
9/9/2022	4.45	2,220	3,434.85
9/10/2022	4.55	2,320	3,589.57
9/11/2022	4.58	2,400	3,713.35
9/12/2022	4.60	2,440	3,775.24
9/13/2022	4.64	2,480	3,837.13
9/14/2022	4.71	2,490	3,852.60
9/15/2022	4.95	2,610	4,038.27
9/16/2022	5.11	2,850	4,409.60

SJR-5

USGS Gage Height and Discharge Data

USGS 02234000 ST. JOHNS RIVER near S.R. 46, GENEVA, FL

Date	Gage Height (ft)	Stream Flow (cfs)	Discharge (MGD)
9/17/2022	5.28	3,160	4,889.24
9/18/2022	5.54	3,650	5,647.38
9/19/2022	5.74	3,890	6,018.72
9/20/2022	5.96	4,100	6,343.64
9/21/2022	6.15	4,230	6,544.78
9/22/2022	6.29	4,390	6,792.33
9/23/2022	6.39	4,520	6,993.47
9/24/2022	6.48	4,720	7,302.92
9/25/2022	6.54	4,700	7,271.97
9/26/2022	6.55	4,620	7,148.20
9/27/2022	6.55	4,480	6,931.58
9/28/2022	6.86	4,320	6,684.03
9/29/2022	9.21	6,880	10,644.93
9/30/2022	11.03	12,500	19,340.36
10/1/2022[E]	ND	14,200	21,970.65
10/2/2022[E]	ND	14,900	23,053.71
10/3/2022[E]	ND	14,200	21,970.65
10/4/2022[E]	12.62	13,300	20,578.14
10/5/2022[E]	12.58	12,800	19,804.53
10/6/2022	12.50	12,400	19,185.64
10/7/2022	12.37	12,000	18,566.74
10/8/2022	12.23	11,800	18,257.30
10/9/2022	12.09	11,500	17,793.13
10/10/2022	11.95	11,500	17,793.13
10/11/2022	11.84	11,400	17,638.41
10/12/2022	11.76	11,500	17,793.13
10/13/2022	11.71	11,400	17,638.41
10/14/2022	11.60	11,400	17,638.41
10/15/2022	11.49	11,600	17,947.85
10/16/2022	11.38	11,600	17,947.85
10/17/2022	11.27	11,400	17,638.41
10/18/2022	11.16	11,000	17,019.52
10/19/2022	10.97	10,300	15,936.45
10/20/2022	10.85	10,800	16,710.07
10/21/2022	10.74	10,300	15,936.45
10/22/2022	10.64	10,200	15,781.73
10/23/2022	10.53	10,200	15,781.73

SJR-5

USGS Gage Height and Discharge Data

USGS 02234000 ST. JOHNS RIVER near S.R. 46, GENEVA, FL

Date	Gage Height (ft)	Stream Flow (cfs)	Discharge (MGD)
10/24/2022	10.43	9,840	15,224.73
10/25/2022	10.31	9,660	14,946.23
10/26/2022	10.19	9,400	14,543.95
10/27/2022	10.08	9,060	14,017.89
10/28/2022	9.97	8,660	13,399.00
10/29/2022	9.86	8,520	13,182.39
10/30/2022	9.77	8,480	13,120.50
10/31/2022	9.68	8,220	12,718.22
11/1/2022	9.57	8,020	12,408.77
11/2/2022	9.46	7,800	12,068.38
11/3/2022	9.33	7,360	11,387.60
11/4/2022	9.20	7,310	11,310.24
11/5/2022	9.09	7,190	11,124.57
11/6/2022	8.99	6,960	10,768.71
11/7/2022	8.87	6,740	10,428.32
11/8/2022	8.76	6,510	10,072.46
11/9/2022	8.71	6,170	9,546.40
11/10/2022	8.99	7,610	11,774.41
11/11/2022	9.08	6,860	10,613.99
11/12/2022	9.13	7,240	11,201.94
11/13/2022	9.16	7,300	11,294.77
11/14/2022	9.15	7,370	11,403.08
11/15/2022	9.11	7,170	11,093.63
11/16/2022	9.04	6,820	10,552.10
11/17/2022	8.92	6,610	10,227.18
11/18/2022	8.81	6,520	10,087.93
11/19/2022	8.72	6,430	9,948.68
11/20/2022	8.61	6,200	9,592.82
11/21/2022	8.53	6,180	9,561.87
11/22/2022	8.45	6,040	9,345.26
11/23/2022	8.36	5,950	9,206.01
11/24/2022	8.27	5,940	9,190.54
11/25/2022	8.18	5,810	8,989.40
11/26/2022	8.08	5,640	8,726.37
11/27/2022	7.98	5,520	8,540.70
11/28/2022	7.87	5,380	8,324.09
11/29/2022	7.76	5,230	8,092.01

SJR-5

USGS Gage Height and Discharge Data

USGS 02234000 ST. JOHNS RIVER near S.R. 46, GENEVA, FL

Date	Gage Height (ft)	Stream Flow (cfs)	Discharge (MGD)
11/30/2022	7.65	5,040	7,798.03
12/1/2022	7.53	4,910	7,596.89
12/2/2022	7.43	4,940	7,643.31
12/3/2022	7.32	4,770	7,380.28
12/4/2022	7.22	4,600	7,117.25
12/5/2022	7.12	4,520	6,993.47
12/6/2022	7.02	4,430	6,854.22
12/7/2022	6.92	4,310	6,668.56
12/8/2022	6.83	4,230	6,544.78
12/9/2022	6.73	4,130	6,390.05
12/10/2022	6.63	4,000	6,188.91
12/11/2022	6.53	3,920	6,065.14
12/12/2022	6.44	3,830	5,925.89
12/13/2022[E]	ND	3,830	5,925.89
12/14/2022[E]	ND	3,770	5,833.05
12/15/2022	6.17	3,680	5,693.80
12/16/2022	6.11	3,520	5,446.24
12/17/2022	6.03	3,580	5,539.08
12/18/2022	5.96	3,440	5,322.47
12/19/2022	5.87	3,430	5,306.99
12/20/2022	5.80	3,360	5,198.69
12/21/2022	5.76	3,260	5,043.97
12/22/2022	5.71	3,290	5,090.38
12/23/2022	5.65	3,140	4,858.30
12/24/2022	5.57	3,120	4,827.35
12/25/2022	5.50	3,070	4,749.99
12/26/2022	5.42	3,020	4,672.63
12/27/2022	5.35	2,950	4,564.32
12/28/2022	5.29	2,910	4,502.44
12/29/2022	5.21	2,850	4,409.60
12/30/2022	5.15	2,800	4,332.24
12/31/2022	5.07	2,730	4,223.93
Average	**4.14**	**2,792.0**	**4,319.82**

Note: Hurricane Ian occurred on September 29, 2022 and Hurricane Nicole happened on November 10, 2022.

[E] Estimated values for stream flow (cfs).

ND No Data.

Appendix B

Water Quality Data

Little Econlockhatchee River and St. Johns River

Calendar Year 2022

Index:
[J] FDEP Analysis Code: J Code

Monthly Water Quality Data

Little Econlockhatchee River - Upstream

January - December 2022

Date	Unionized NH3 (mg/L)	Total Ammonia (mg/L)	TKN (mg/L)	Nitrite/ Nitrate (mg/L)	Total N (mg/L)	Total P (mg/L)	CBOD (mg/L)	Chlorophyll a (mg/m$^{3)}$	pH (s.u.)	DO (mg/L)	Specific Conductivity (umhos)	Temp. (^{o}C)	Water Depth (ft.)	Secchi Disk Depth (ft.)
1/12/2022	< 0.01	0.03	0.51	0.23	0.74	0.043	< 2	< 0.8	7.11	6.20	162	18.2	18.5	18.5
2/9/2022	< 0.01	0.04	0.46	0.22	0.68	0.076	< 2	< 0.8	7.20	7.50	167	16.3	20	20
3/17/2022	< 0.01	0.05	0.61	0.12	0.73	0.091	< 2	1.07	7.08	5.82	154	21.2	43	43
4/6/2022	< 0.01	0.04	0.61	0.1	0.71	0.062	< 2	< 0.8	6.82	ND	151	23.3	49.2	49.2
5/4/2022	< 0.01	0.05	0.57	0.1	0.67	0.1	< 2	2.14	6.93	4.83	162	25.5	19	19
5/4/2022	< 0.01	0.05	0.57	0.1	0.67	0.121	< 2	2.14	6.93	4.83	161	25.5	19	19
6/8/2022	< 0.01	0.07	0.53	0.13	0.66	0.084	< 2	1.07	7.20	4.64	192	27.1	26.5	26.5
7/13/2022	< 0.01	0.07	0.55	0.16	0.71	0.07	< 2	< 0.8	6.92	3.94	173	29.8	23	23
8/10/2022	< 0.01	0.05	0.54	0.14	0.68	0.067	< 2	< 0.8	7.05	4.56	190	28.1	24	24
8/10/2022	< 0.01	0.05	0.5	0.14	0.64	0.068	< 2	< 0.8	7.05	4.4	190	28.1	24	24
9/14/2022	< 0.01	0.03	0.76	0.12	0.88	0.078	< 2	< 0.8	6.82	4.45	156	27.5	18	18
10/12/2022	< 0.01	0.04	0.75	0.16	0.91	0.113	< 2	1.07	6.60	3.25	149	25.3	33	33
10/12/2022	< 0.01	0.04	0.7	0.16	0.86	0.098	< 2	1.6	6.66	3.91	146	25.3	33	33
11/16/2022	< 0.01	0.07	0.6	0.14	0.74	0.097	< 2	2.14	6.60	ND	136	22.8	43.2	30
12/7/2022	< 0.01	0.07	0.96	0.25	1.21	0.076	< 2	< 0.8	6.56	ND	171	21.3	18	18
Average	**< 0.01**	**0.050**	**0.615**	**0.151**	**0.766**	**0.0829**	**< 2**	**1.103**	**6.902**	**4.861**	**164**	**24.35**	**27.43**	**26.55**

Note: Hurricane Ian occurred on September 29, 2022 and Hurricane Nicole happened on November 10, 2022.

ND No Data.

Monthly Water Quality Data

Little Econlockhatchee River - Downstream

January - December 2022

Date	Unionized NH3 (mg/L)	Total Ammonia (mg/L)	TKN (mg/L)	Nitrite/ Nitrate (mg/L)	Total N (mg/L)	Total P (mg/L)	CBOD (mg/L)	Chlorophyll a (mg/m^3)	pH (mg/L)	DO (mg/L)	Specific Conductivity (umhos)	Temp. (^oC)	Water Depth (ft.)	Secchi Disk Depth (ft.)
1/12/2022	< 0.01	0.03	0.55	0.38	0.93	0.054	< 2	< 0.8	7.03	6.57	203	18.6	52.8	52.8
2/9/2022	< 0.01	0.04	0.46	0.28	0.74	0.08	< 2	< 0.8	7.19	6.90	197	16.7	50	50
3/17/2022	< 0.01	0.05	0.63	0.15	0.78	0.09	< 2	< 0.8	7.13	5.76	163	21.3	65.5	52
4/6/2022	< 0.01	0.04	0.64	0.12	0.76	0.085	< 2	1.07	6.81	ND	159	23.4	50	50
5/4/2022	< 0.01	0.06	0.58	0.12	0.7	0.092	< 2	2.14	6.95	4.15	212	25.5	23	23
6/8/2022	< 0.01	0.06	0.64	0.17	0.81	0.078	< 2	1.60	7.17	4.22	215	27.3	43.2	43.2
7/13/2022	< 0.01	0.08	0.57	0.18	0.75	0.075	< 2	1.07	6.98	3.76	190	29.8	25	25
8/10/2022	< 0.01	0.06	0.56	0.16	0.72	0.074	< 2	< 0.8	6.94	4.71	210	28.1	27	27
9/14/2022	< 0.01	0.03	0.72	0.12	0.84	0.082	< 2	< 0.8	6.82	3.43	162	27.5	41.5	35
9/14/2022	< 0.01	0.03	0.80	0.12	0.92	0.085	< 2	< 0.8	6.79	3.45	161	27.5	41.5	35
10/12/2022	< 0.01	0.06	0.77	0.21	0.98	0.103	< 2	1.60	6.8	3.98	164	25.4	63	41
11/16/2022	< 0.01	0.08	0.71	0.18	0.89	0.101	< 2	2.67	6.44	ND	144	22.9	40	29
12/7/2022	< 0.01	0.07	1.02	0.26	1.28	0.116	< 2	1.07	7.14	ND	180	21.4	26	26
12/7/2022	< 0.01	0.07	0.97	0.26	1.23	0.116	2.1	< 0.8	7.13	ND	180	21.4	26	26
Average	**< 0.01**	**0.054**	**0.687**	**0.194**	**0.881**	**0.0879**	**< 2**	**1.001**	**6.9514**	**4.693**	**181.428571**	**24.06**	**41.04**	**36.79**

Note: Hurricane Ian occurred on September 29, 2022 and Hurricane Nicole happened on November 10, 2022.

ND No Data.

Monthly Water Quality Data

Little Econlockhatchee River - Econ A

January - December 2022

Date	Unionized NH3 (mg/L)	Total Ammonia (mg/L)	TKN (mg/L)	Nitrite/ Nitrate (mg/L)	Total N (mg/L)	Total P (mg/L)	CBOD (mg/L)	Chlorophyll a (mg/m^3)	pH (mg/L)	DO (mg/L)	Specific Conductivity (umhos)	Temp. (^oC)	Water Depth (ft.)	Secchi Disk Depth (ft.)
1/12/2022	< 0.01	0.03	0.51	0.24	0.75	0.050	< 2	-0.8	7.11	6.76	176	18.3	18.5	18.5
2/9/2022	< 0.01	0.04	0.45	0.25	0.70	0.112	< 2	-0.8	7.18	7.29	195	16.7	26	26
3/17/2022	< 0.01	0.05	0.62	0.15	0.77	0.112	< 2	-0.8	7.17	6.00	162	21.4	74	52
4/6/2022	< 0.01	0.04	0.63	0.12	0.75	0.068	< 2	-0.8	6.82	N/D	157	23.0	71.8	35.2
4/6/2022	< 0.01	0.04	0.64	0.12	0.76	0.068	< 2	-0.8	6.82	N/D	159	23.0	71.8	35.2
5/4/2022	< 0.01	0.06	0.56	0.15	0.71	0.101	< 2	1.07	7.06	2.26	228	25.2	30	30
6/8/2022	< 0.01	0.06	0.49	0.12	0.61	0.124	< 2	1.60	7.24	4.60	204	27.7	28	28
6/8/2022	< 0.01	0.07	0.5	0.12	0.62	0.105	< 2	1.60	7.23	4.64	204	27.7	28	28
7/13/2022	< 0.01	0.07	0.54	0.18	0.72	0.075	< 2	-0.8	7.04	3.92	188	29.9	44.5	44.5
7/13/2022	< 0.01	0.08	0.54	0.18	0.72	0.075	< 2	-0.8	7.02	3.99	188	29.9	44.5	44.5
8/10/2022	< 0.01	0.05	0.52	0.16	0.68	0.072	< 2	-0.8	7.10	4.81	217	28.3	25	25
9/14/2022	< 0.01	0.03	0.71	0.12	0.83	0.08	< 2	-0.8	6.94	4.21	162	27.6	37	27
10/12/2022	< 0.01	0.1	0.78	0.22	1.00	0.208	< 2	1.07	6.59	4.40	163	25.3	61	33
11/16/2022	< 0.01	0.32	0.83	0.16	0.99	0.406	< 2	2.14	6.62	N/D	144	22.8	28	28
11/16/2022	< 0.01	0.32	0.92	0.16	1.08	0.404	< 2	3.20	6.62	N/D	144	22.8	28	28
12/7/2022	< 0.01	0.12	0.78	0.26	1.04	0.167	< 2	-0.8	6.59	N/D	216	21.1	36	28
Average	**< 0.01**	**0.093**	**0.626**	**0.169**	**0.796**	**0.1392**	**< 2**	**0.918**	**6.9469**	**4.807**	**181.6875**	**24.42**	**40.76**	**31.93**

Note: Hurricane Ian occurred on September 29, 2022 and Hurricane Nicole happened on November 10, 2022.

ND No Data.

Monthly Water Quality Data

St. Johns River - SJR-1 on S.R. 50, Christmas, Florida

January - December 2022

Date	Unionized NH3 (mg/L)	Total Ammonia (mg/L)	TKN (mg/L)	Nitrite/ Nitrate (mg/L)	Total N (mg/L)	Total P (mg/L)	CBOD (mg/L)	Chlorophyll a (mg/m^3)	pH (mg/L)	DO (mg/L)	Specific Conductivity (umhos)	Temp. (^oC)	Water Depth (ft.)	Secchi Disk Depth (ft.)
1/12/2022	< 0.01	0.06	1.28	0.17	1.45	0.058	< 2	1.60	7.56	7.23	807	17.7	20	20
1/12/2022	< 0.01	0.06	1.32	0.17	1.49	0.092	< 2	1.60	7.59	7.14	807	17.7	20	20
2/9/2022	< 0.01	0.09	1.32	0.21	1.53	0.114	< 2	3.74	7.62	7.33	869	14.8	33	23.2
3/17/2022	< 0.01	0.04	1.18	0.02	1.20	0.055	< 2	6.94	7.27	5.65	905	22.4	32.8	23
3/17/2022	< 0.01	0.04	1.23	0.02	1.25	0.047	< 2	6.41	7.27	5.65	905	22.4	32.8	23
4/6/2022	< 0.01	0.05	1.19	< 0.01	1.19	0.089	< 2	< 0.8	6.87	N/D	732	24.8	33.2	21
5/4/2022	< 0.01	0.10	1.60	0.07	1.67	0.184	< 2	3.74	7.16	1.20	419	26.9	24	17
6/7/2022	0.01	0.22	1.81	0.18	1.99	0.172	< 2	8.01	7.71	5.12	1,370	32.1	23.8	23.8
7/13/2022	< 0.01	0.12	1.21	0.08	1.29	0.096	< 2	4.27	7.59	3.86	1,540	30.5	35	20
8/9/2022	< 0.01	0.10	1.51	0.07	1.58	0.140	< 2	21.9	7.43	4.28	2,040	29.8	31.5	30.5
9/14/2022	< 0.01	0.08	1.70	0.01	1.71	0.109	< 2	1.60	6.70	1.75	973	28.5	29.5	18
10/12/2022	< 0.01	0.01	1.36	< 0.01	1.36	0.229	3.1	7.48	6.38	0.13	365	26.0	58	37.5
11/16/2022	< 0.01	0.14	1.45	< 0.01	1.45	0.235	< 2	3.74	6.55	N/D	369	23.5	79	21
12/7/2022	< 0.01	0.06	1.74	0.04	1.78	0.178	< 2	3.20	7.11	N/D	423	21.7	48	26
Average	**< 0.01**	**0.084**	**1.421**	**0.095**	**1.496**	**0.1284**	**< 2**	**5.331**	**7.2007**	**4.485**	**894.571429**	**24.20**	**35.76**	**23.14**

Note: Hurricane Ian occurred on September 29, 2022 and Hurricane Nicole happened on November 10, 2022.

ND No Data.

Monthly Water Quality Data

St. Johns River - SJR-5 on S.R. 46, Geneva, Florida

January - December 2022

Date	Unionized NH3 (mg/L)	Total Ammonia (mg/L)	TKN (mg/L)	Nitrite/ Nitrate (mg/L)	Total N (mg/L)	Total P (mg/L)	CBOD (mg/L)	Chlorophyll a (mg/m^3)	pH (mg/L)	DO (mg/L)	Specific Conductivity (umhos)	Temp. (^oC)	Water Depth (ft.)	Secchi Disk Depth (ft.)
1/12/2022	< 0.01	0.03	0.99	0.09	1.08	0.110	< 2	1.07	7.54	6.73	821	17.3	62	31
2/9/2022	< 0.01	0.06	1.03	0.15	1.18	0.061	< 2	2.14	7.46	7.25	1,070	14.6	48	35.5
2/9/2022	< 0.01	0.05	1.02	0.15	1.17	0.091	< 2	3.20	7.46	7.25	1,070	14.6	N/D	N/D
3/17/2022	< 0.01	0.04	0.90	0.04	0.94	0.060	< 2	3.20	7.00	5.62	877	20.3	57.5	29
4/6/2022	< 0.01	0.03	0.91	0.01	0.92	0.064	< 2	1.07	6.55	N/D	453	23.0	72	28
5/4/2022	< 0.01	0.07	1.22	0.08	1.30	0.127	< 2	2.67	7.14	4.2	344	26.2	59	31
6/7/2022	< 0.01	0.11	1.11	0.16	1.27	0.171	< 2	3.74	7.47	4.17	1,420	27.9	36	36
7/13/2022	< 0.01	0.09	0.80	0.09	0.89	0.079	< 2	2.14	7.29	3.87	714	29.0	38	23.5
8/9/2022	< 0.01	0.08	1.07	0.06	1.13	0.092	< 2	8.54	7.71	4.77	1,620	30.6	27	18.5
9/14/2022	< 0.01	0.05	1.14	0.03	1.17	0.094	< 2	1.07	6.80	2.65	542	27.7	57	17
10/12/2022	< 0.01	0.01	1.06	< 0.01	1.06	0.148	2.8	6.41	6.28	0.08	241	25.8	152	36.5
11/16/2022	< 0.01	0.08	0.72	0.05	0.77	0.113	< 2	2.67	6.25	N/D	154	22.7	138	29
12/7/2022	< 0.01	0.05	1.34	0.08	1.42	0.131	< 2	2.67	6.67	N/D	387	21.6	107	27
Average	**< 0.01**	**0.058**	**1.024**	**0.083**	**1.100**	**0.1032**	**< 2**	**3.122**	**7.0477**	**4.659**	**747.153846**	**23.18**	**71.13**	**28.50**

Note: Hurricane Ian occurred on September 29, 2022 and Hurricane Nicole happened on November 10, 2022.

ND No Data.

Appendix C

Water Quality and Performance Data

Orlando Easterly Wetlands

Calendar Year 2022

Index:
ND: Not Documented
NS: Not Sampled
[J] FDEP Analysis Code: J Code

Monthly Water Quality Data

Sample Location: WLWP1

January - December 2022

Part 1

Date	Unionized Ammonia (mg/L)	Total Ammonia (mg/L)	TKN (mg/L)	Nitrite/ Nitrate (mg/L)	Total N (mg/L)	Ortho P (mg/L)	Total P (mg/L)	CBOD (mg/L)	TOC (mg/L)	TSS (mg/L)
1/10/2022	< 0.01	0.02	1.44	0.72	2.16	0.080	0.123	< 2	7.23	< 1
2/7/2022	< 0.01	0.02	0.46	0.8	1.26	0.116	0.123	< 2	6.91	< 1
3/9/2022	< 0.01	0.01	0.52	0.64	1.16	0.326	0.358	< 2	6.92	< 1
4/4/2022	< 0.01	0.02	0.54	0.79	1.33	0.337	0.351	< 2	7.32	< 1
5/2/2022	< 0.01	0.03	1.64	0.79	2.43	0.095	0.141	< 2	7.04	< 1
6/6/2022	< 0.01	0.04	0.58	0.61	1.19	0.213	0.333	< 2	7.33	< 1
7/11/2022	< 0.01	0.04	0.40	0.67	1.07	0.213	0.232	< 2	6.87	< 1
8/8/2022	< 0.01	0.02	< 0.01	1.18	1.18	0.171	0.181	< 2	6.55	< 1
9/20/2022	< 0.01	0.02	2.91	0.95	3.86	0.076	0.117	< 2	7.65	< 1
10/10/2022	< 0.01	0.77	1.71	1.52	3.23	0.118	0.134	< 2	7.99	< 1
11/14/2022	0.02	3.38	1.75	4.99	6.74	0.48	0.633	< 2	9.68	10.4
12/6/2022	< 0.01	0.08	0.42	5.78	6.2	0.494	2.12	< 2	10.1	51.6
Average	**< 0.01**	**0.371**	**1.031**	**1.620**	**2.651**	**0.2266**	**0.4038**	**< 2**	**7.633**	**5.58**

Note: Hurricane Ian occurred on September 29, 2022 and Hurricane Nicole happened on November 10, 2022.

ND No Data.

Monthly Water Quality Data

Sample Location: WLWP1

January - December 2022

Part 2

Date	TDS (mg/L)	Alkalinity (mg/L)	Chloride (mg/L)	Sulfate (mg/L)	Chlorophyll a ($mg/m^{3)}$	pH (s.u.)	DO (mg/L)	Specific Conductivity (umhos)	Temp. (^{o}C)	Water Level (ft.)
1/10/2022	276	125	79.1	25.6	< 0.8	7.09	7.05	571	25.8	N/D
2/7/2022	326	137	79.6	27.2	< 0.8	7.09	7.69	562	24.1	N/D
3/9/2022	316	125	80.8	29.5	< 0.8	7.08	6.95	589	26.5	N/D
4/4/2022	300	118	70.6	29.2	< 0.8	6.95	7.28	549	26.5	N/D
5/2/2022	306	127	79.7	27.5	< 0.8	7.14	0.04	629	28.0	N/D
6/6/2022	322	129	77.3	31.4	< 0.8	7.28	4.67	654	29.4	N/D
7/11/2022	310	124	78.5	27.7	< 0.8	7.17	4.72	626	30.6	N/D
8/8/2022	324	124	78.1	29.8	< 0.8	7.68	4.66	663	31.0	N/D
9/20/2022	274	96.2	63.1	26.9	< 0.8	6.87	5.46	533	30.1	N/D
10/10/2022	258	101	54.2	27.0	< 0.8	6.94	5.75	486	28.6	N/D
11/14/2022	228	98.2	54.4	21.3	< 0.8	6.93	N/D	468	27.3	N/D
12/6/2022	266	106	69.6	29.0	< 0.8	7.20	N/D	518	26.8	N/D
Average	**292.2**	**117.5**	**72.08**	**27.68**	**< 0.8**	**7.118**	**5.427**	**570.7**	**27.89**	**N/D**

Note: Hurricane Ian occurred on September 29, 2022 and Hurricane Nicole happened on November 10, 2022.

ND No Data.

Monthly Water Quality Data

Sample Location: WL12Y

January - December 2022

Part 1

Date	Unionized Ammonia (mg/L)	Total Ammonia (mg/L)	TKN (mg/L)	Nitrite/ Nitrate (mg/L)	Total N (mg/L)	Ortho P (mg/L)	Total P (mg/L)	CBOD (mg/L)	TOC (mg/L)	TSS (mg/L)
1/10/2022	N/D	0.03	< 0.01	0.58	0.58	0.080	0.084	< 2	N/D	< 1
2/7/2022	N/D	0.02	< 0.01	0.40	0.4	0.327	0.387	< 2	N/D	< 1
3/9/2022	N/D	< 0.01	< 0.01	0.50	0.5	0.409	0.423	< 2	N/D	5.8
4/4/2022	N/D	< 0.01	< 0.01	0.41	0.41	0.08	0.082	< 2	N/D	< 1
5/3/2022	N/D	0.02	< 0.01	0.56	0.56	0.111	0.150	< 2	N/D	< 1
6/6/2022	N/D	N/D	N/D	N/D	N/D	N/D	N/D	< 2	N/D	3.9
7/11/2022	N/D	0.05	< 0.01	0.64	0.64	0.168	0.174	< 2	N/D	1.3
8/8/2022	N/D	0.05	< 0.01	0.72	0.72	0.178	0.194	< 2	N/D	3.2
9/19/2022	N/D	0.05	< 0.01	0.63	0.63	0.111	0.132	< 2	N/D	1.1
10/10/2022	N/D	0.02	< 0.01	0.48	0.48	0.030	0.045	< 2	N/D	< 1
11/14/2022	N/D	0.09	< 0.01	0.62	0.62	0.170	0.141	< 2	N/D	< 1
12/5/2022	N/D	0.05	< 0.01	0.82	0.82	0.655	0.603	< 2	N/D	< 1
Average	**N/D**	**0.035**	**< 0.01**	**0.578**	**0.578**	**0.2108**	**0.2195**	**< 2**	**N/D**	**1.57**

Note: Hurricane Ian occurred on September 29, 2022 and Hurricane Nicole happened on November 10, 2022.

ND No Data.

Monthly Water Quality Data

Sample Location: WL12Y

January - December 2022

Part 2

Date	TDS (mg/L)	Alkalinity (mg/L)	Chloride (mg/L)	Sulfate (mg/L)	Chlorophyll a ($mg/m^{3)}$	pH (s.u.)	DO (mg/L)	Specific Conductivity (umhos)	Temp. (^{o}C)	Water Level (ft.)
1/10/2022	N/D	N/D	N/D	N/D	< 0.8	6.74	0.42	481	18.3	27.5
2/7/2022	N/D	N/D	N/D	N/D	1.60	6.87	0.97	475	16.5	27.4
3/9/2022	N/D	N/D	N/D	N/D	2.67	6.87	0.15	481	23.2	27.6
4/4/2022	N/D	N/D	N/D	N/D	< 0.8	6.81	0.71	501	21.6	27.6
5/3/2022	N/D	N/D	N/D	N/D	2.67	6.83	0.16	577	23.8	27.4
6/6/2022	N/D	N/D	N/D	N/D	< 0.8	6.89	2.49	611	25.8	27.4
7/11/2022	N/D	N/D	N/D	N/D	1.07	6.85	0.1	560	27.2	27.5
8/8/2022	N/D	N/D	N/D	N/D	1.60	6.83	0.27	644	27.1	27.5
9/19/2022	N/D	N/D	N/D	N/D	< 0.8	6.88	0.13	477	26.6	27.8
10/10/2022	N/D	N/D	N/D	N/D	1.07	6.69	0.12	429	24.0	27.8
11/14/2022	N/D	N/D	N/D	N/D	< 0.8	6.71	N/D	408	22.1	27.8
12/5/2022	N/D	N/D	N/D	N/D	< 0.8	6.83	N/D	448	20.5	27.5
Average	**N/D**	**N/D**	**N/D**	**N/D**	**1.090**	**6.817**	**0.552**	**507.7**	**23.06**	**27.57**

Note: Hurricane Ian occurred on September 29, 2022 and Hurricane Nicole happened on November 10, 2022.

ND No Data.

Monthly Water Quality Data

Sample Location: WL13X

January - December 2022

Part 1

Date	Unionized Ammonia (mg/L)	Total Ammonia (mg/L)	TKN (mg/L)	Nitrite/ Nitrate (mg/L)	Total N (mg/L)	Ortho P (mg/L)	Total P (mg/L)	CBOD (mg/L)	TOC (mg/L)	TSS (mg/L)
1/10/2022	< 0.01	0.02	< 0.01	0.77	0.77	0.014	0.045	< 2	9.10	< 1
4/4/2022	< 0.01	0.02	< 0.01	0.54	0.54	0.024	0.093	< 2	7.77	< 1
5/2/2022	< 0.01	0.03	< 0.01	0.78	0.78	0.009	0.073	< 2	9.51	1.1
6/6/2022	< 0.01	0.04	< 0.01	0.78	0.78	0.020	0.055	2.3	11.1	1.9
7/11/2022	< 0.01	0.04	< 0.01	0.83	0.83	0.006	0.043	2.2	8.85	1.3
8/8/2022	< 0.01	0.03	< 0.01	1.00	1.00	0.010	0.051	< 2	10.5	1.1
9/19/2022	< 0.01	< 0.01	< 0.01	0.79	0.79	0.010	0.059	< 2	7.50	1.2
10/10/2022	< 0.01	0.01	< 0.01	0.61	0.61	0.012	0.046	< 2	7.91	< 1
11/14/2022	< 0.01	0.05	< 0.01	0.60	0.60	0.060	0.076	< 2	7.38	< 1
12/5/2022	< 0.01	0.03	< 0.01	0.89	0.89	0.117	0.138	< 2	7.85	< 1
Average	**< 0.01**	**0.028**	**< 0.01**	**0.759**	**0.759**	**0.0282**	**0.0679**	**< 2**	**8.747**	**< 1**

Note: Hurricane Ian occurred on September 29, 2022 and Hurricane Nicole happened on November 10, 2022.

ND No Data.

Monthly Water Quality Data

Sample Location: WL13X

January - December 2022

Part 2

Date	TDS (mg/L)	Alkalinity (mg/L)	Chloride (mg/L)	Sulfate (mg/L)	Chlorophyll a ($mg/m^{3)}$	pH (s.u.)	DO (mg/L)	Specific Conductivity (umhos)	Temp. (^{o}C)	Water Level (ft.)
1/10/2022	N/D	129	77.4	14.8	1.60	6.98	5.63	485	19.2	17.0
4/4/2022	N/D	123	71.7	14.3	3.20	7.18	2.76	519	21.9	17.0
5/2/2022	N/D	136	77.1	15.5	3.74	7.03	0.22	536	23.3	16.5
6/6/2022	N/D	181	87.6	15.4	5.87	7.26	2.34	670	25.5	16.4
7/11/2022	N/D	144	72.7	14.6	5.34	7.11	0.54	611	27.2	16.5
8/8/2022	N/D	160	86.0	12.9	3.74	7.06	0.67	669	27.1	16.3
9/19/2022	N/D	126	65.7	19.2	< 0.8	6.96	0.07	492	25.4	17.1
10/10/2022	N/D	95.0	49.8	14.6	1.07	6.75	0.16	407	22.8	16.9
11/14/2022	N/D	97.4	59.9	14.8	5.34	6.76	N/D	402	21.2	17.0
12/5/2022	N/D	108	62.6	19.7	1.60	6.93	N/D	443	19.8	16.6
Average	**N/D**	**129.9**	**71.05**	**15.58**	**3.190**	**7.002**	**1.549**	**523.4**	**23.34**	**16.73**

Note: Hurricane Ian occurred on September 29, 2022 and Hurricane Nicole happened on November 10, 2022.

ND No Data.

Monthly Water Quality Data

Sample Location: WL13Y

January - December 2022

Part 1

Date	Unionized Ammonia (mg/L)	Total Ammonia (mg/L)	TKN (mg/L)	Nitrite/ Nitrate (mg/L)	Total N (mg/L)	Ortho P (mg/L)	Total P (mg/L)	CBOD (mg/L)	TOC (mg/L)	TSS (mg/L)
1/10/2022	< 0.01	0.05	< 0.01	0.78	0.78	0.019	0.047	< 2	8.94	< 1
2/7/2022	< 0.01	0.03	< 0.01	0.73	0.73	0.012	0.032	< 2	8.07	1.0
3/9/2022	< 0.01	0.01	< 0.01	1.05	1.05	0.003	0.037	2.3	9.04	1.5
4/4/2022	< 0.01	0.03	< 0.01	0.58	0.58	0.014	0.054	< 2	10.4	< 1
5/2/2022	< 0.01	0.04	< 0.01	0.66	0.66	0.014	0.090	< 2	10.6	< 1
6/6/2022	< 0.01	0.06	< 0.01	0.95	0.95	0.026	0.084	2.4	11.5	1.7
7/11/2022	< 0.01	0.08	< 0.01	1.04	1.04	0.014	0.049	2.4	11.6	< 1
8/8/2022	< 0.01	0.03	< 0.01	0.99	0.99	0.010	0.054	< 2	10.7	1.2
9/19/2022	< 0.01	0.01	< 0.01	0.83	0.83	0.007	0.053	< 2	8.33	1.1
10/10/2022	< 0.01	0.01	< 0.01	0.63	0.63	0.011	0.049	< 2	8.47	< 1
11/14/2022	< 0.01	0.09	< 0.01	0.66	0.66	0.011	0.032	< 2	7.89	< 1
12/5/2022	< 0.01	0.04	< 0.01	0.92	0.92	0.100	0.132	< 2	8.19	< 1
Average	**< 0.01**	**0.040**	**< 0.01**	**0.818**	**0.818**	**0.0201**	**0.0594**	**< 2**	**9.478**	**< 1**

Note: Hurricane Ian occurred on September 29, 2022 and Hurricane Nicole happened on November 10, 2022.

ND No Data.

Monthly Water Quality Data

Sample Location: WL13Y

January - December 2022

Part 2

Date	TDS (mg/L)	Alkalinity (mg/L)	Chloride (mg/L)	Sulfate (mg/L)	Chlorophyll a (mg/m$^{3)}$	pH (s.u.)	DO (mg/L)	Specific Conductivity (umhos)	Temp. (^{o}C)	Water Level (ft.)
1/10/2022	N/D	132	78.9	15.3	2.14	7.29	2.49	484	19.2	17.1
2/7/2022	N/D	122	82.4	20.9	2.14	7.51	4.29	467	16.9	17.5
3/9/2022	N/D	117	75.9	12.8	3.74	7.27	1.58	544	23.0	17.8
4/4/2022	N/D	138	74.6	15.0	4.27	7.31	2.42	528	22.0	17.1
5/2/2022	N/D	138	77.8	23.3	3.20	7.33	0.30	542	23.0	16.6
6/6/2022	N/D	178	89.0	17.2	4.27	7.39	1.02	683	25.7	16.4
7/11/2022	N/D	154	75.7	16.0	4.81	7.11	0.04	595	26.9	16.6
8/8/2022	N/D	166	86.5	17.0	3.74	7.14	0.10	704	27.7	16.4
9/19/2022	N/D	136	65.7	20.1	< 0.8	7.00	0.08	512	25.5	17.1
10/10/2022	N/D	104	52.4	15.7	3.20	6.78	2.72	363	22.8	16.9
11/14/2022	N/D	101	59.8	14.8	5.34	6.91	N/D	404	21.0	17.1
12/5/2022	N/D	121	64.0	12.9	4.27	6.95	N/D	449	20.0	16.6
Average	**N/D**	**133.9**	**73.56**	**16.75**	**3.460**	**7.166**	**1.504**	**522.9**	**22.81**	**16.93**

Note: Hurricane Ian occurred on September 29, 2022 and Hurricane Nicole happened on November 10, 2022.

ND No Data.

Monthly Water Quality Data

Sample Location: WL14X

January - December 2022

Part 1

Date	Unionized Ammonia (mg/L)	Total Ammonia (mg/L)	TKN (mg/L)	Nitrite/ Nitrate (mg/L)	Total N (mg/L)	Ortho P (mg/L)	Total P (mg/L)	CBOD (mg/L)	TOC (mg/L)	TSS (mg/L)
1/10/2022	< 0.01	0.01	< 0.01	0.44	0.44	0.086	0.127	< 2	7.33	1.0
2/8/2022	< 0.01	0.03	< 0.01	0.68	0.68	0.070	0.129	< 2	7.12	< 1
3/8/2022	< 0.01	0.02	< 0.01	0.75	0.75	0.082	0.089	< 2	7.16	1.5
4/5/2022	< 0.01	0.02	< 0.01	0.64	0.64	0.020	0.058	< 2	7.63	< 1
5/3/2022	< 0.01	0.05	< 0.01	0.68	0.68	0.056	0.097	< 2	9.21	< 1
6/6/2022	< 0.01	0.24	< 0.01	0.81	0.81	0.075	0.136	2.4	9.52	1.7
7/11/2022	< 0.01	0.19	< 0.01	0.94	0.94	0.046	0.073	2.8	8.53	1.2
8/8/2022	< 0.01	0.24	< 0.01	1.12	1.12	0.051	0.075	4	9.13	1.4
9/20/2022	< 0.01	0.04	< 0.01	0.81	0.81	0.062	0.073	< 2	7.74	1.0
10/10/2022	< 0.01	0.01	< 0.01	0.67	0.67	0.025	0.060	< 2	8.00	1.4
11/14/2022	< 0.01	0.08	< 0.01	0.55	0.55	0.128	0.133	< 2	7.92	< 1
12/5/2022	< 0.01	0.04	< 0.01	0.60	0.60	0.330	0.328	< 2	8.30	1.2
Average	**< 0.01**	**0.081**	**< 0.01**	**0.724**	**0.724**	**0.0859**	**0.1148**	**< 2**	**8.133**	**1.03**

Note: Hurricane Ian occurred on September 29, 2022 and Hurricane Nicole happened on November 10, 2022.

ND No Data.

Monthly Water Quality Data

Sample Location: WL14X

January - December 2022

Part 2

Date	TDS (mg/L)	Alkalinity (mg/L)	Chloride (mg/L)	Sulfate (mg/L)	Chlorophyll a (mg/m$^{3)}$	pH (s.u.)	DO (mg/L)	Specific Conductivity (umhos)	Temp. (^{o}C)	Water Level (ft.)
1/10/2022	N/D	121	79.9	24.2	3.74	7.27	6.82	500	19.7	17.5
2/8/2022	N/D	127	81.9	30.1	2.67	7.35	5.59	471	15.7	17.5
3/8/2022	N/D	126	79.7	23.6	4.27	7.44	4.84	534	21.7	17.8
4/5/2022	N/D	109	69.2	9.6	< 0.8	7.06	N/D	458	21.9	17.8
5/3/2022	N/D	129	65.6	15.7	2.67	6.92	0.24	536	23.0	17.6
6/6/2022	N/D	154	86.7	3.6	< 0.8	7.04	0.14	614	24.4	15.1
7/11/2022	N/D	140	86.3	14.4	10.7	6.94	2.47	603	26.4	17.5
8/8/2022	N/D	150	85.5	18.3	8.01	6.91	0.34	642	26.9	17.4
9/20/2022	N/D	99.2	58.3	22.5	< 0.8	6.85	0.06	453	26.1	17.9
10/10/2022	N/D	94.5	53.4	26.5	11.2	6.81	2.17	417	24.6	17.7
11/14/2022	N/D	98.2	62.3	12.5	1.07	6.90	N/D	422	22.5	17.8
12/5/2022	N/D	107	64.9	20.1	2.14	7.24	N/D	455	21.8	17.5
Average	**N/D**	**121.2**	**72.81**	**18.43**	**3.973**	**7.061**	**2.519**	**508.8**	**22.89**	**17.43**

Note: Hurricane Ian occurred on September 29, 2022 and Hurricane Nicole happened on November 10, 2022.

ND No Data.

Monthly Water Quality Data

Sample Location: WL14Y

January - December 2022

Part 1

Date	Unionized Ammonia (mg/L)	Total Ammonia (mg/L)	TKN (mg/L)	Nitrite/ Nitrate (mg/L)	Total N (mg/L)	Ortho P (mg/L)	Total P (mg/L)	CBOD (mg/L)	TOC (mg/L)	TSS (mg/L)
1/10/2022	< 0.01	0.05	< 0.01	0.48	0.48	0.093	0.120	< 2	7.47	< 1
2/8/2022	< 0.01	0.02	< 0.01	0.68	0.68	0.051	0.147	< 2	7.53	< 1
2/8/2022	< 0.01	0.02	< 0.01	0.75	0.75	0.049	0.146	< 2	7.73	< 1
3/8/2022	< 0.01	0.07	< 0.01	1.01	1.01	0.024	0.095	< 2	8.55	1.0
4/5/2022	< 0.01	0.03	< 0.01	0.69	0.69	0.018	< 0.030	< 2	8.34	< 1
5/3/2022	< 0.01	0.08	< 0.01	0.59	0.59	0.058	0.042	< 2	10.5	1.6
6/6/2022	< 0.01	0.16	< 0.01	1.22	1.22	0.042	0.097	< 2	11.3	1.9
7/11/2022	< 0.01	0.11	< 0.01	0.85	0.85	0.032	0.054	< 2	10.2	1.6
8/8/2022	< 0.01	0.23	< 0.01	1.11	1.11	0.05	0.068	3.3	10.2	1.1
9/20/2022	< 0.01	0.04	< 0.01	0.82	0.82	0.046	0.068	< 2	8.09	< 1
10/10/2022	< 0.01	0.04	< 0.01	0.61	0.61	0.022	0.043	< 2	7.91	< 1
11/14/2022	< 0.01	0.08	< 0.01	0.80	0.80	0.034	0.071	< 2	8.41	2.6
12/5/2022	< 0.01	0.04	< 0.01	0.67	0.67	0.099	0.118	< 2	8.84	1.5
Average	**< 0.01**	**0.075**	**< 0.01**	**0.791**	**0.791**	**0.0475**	**0.0891**	**< 2**	**8.852**	**1.10**

Note: Hurricane Ian occurred on September 29, 2022 and Hurricane Nicole happened on November 10, 2022.

ND No Data.

Monthly Water Quality Data

Sample Location: WL14Y

January - December 2022

Part 2

Date	TDS (mg/L)	Alkalinity (mg/L)	Chloride (mg/L)	Sulfate (mg/L)	Chlorophyll a ($mg/m^{3)}$	pH (s.u.)	DO (mg/L)	Specific Conductivity (umhos)	Temp. (^{o}C)	Water Level (ft.)
1/10/2022	N/D	126	80.9	26.6	1.07	7.02	2.64	484	18.2	17.5
2/8/2022	N/D	131	81.9	27.9	2.67	7.31	5.24	474	15.7	17.5
2/8/2022	N/D	135	82.6	28.2	2.14	7.31	5.13	473	15.7	N/D
3/8/2022	N/D	121	76.7	10.9	2.67	7.17	2.38	507	22.2	17.8
4/5/2022	N/D	110	68.5	19.2	1.60	6.94	N/D	456	22.0	17.7
5/3/2022	N/D	128	81.5	20.8	3.74	6.99	0.25	558	24.4	17.6
6/6/2022	N/D	156	91.0	5.9	21.9	7.16	0.62	665	25.6	17.4
7/11/2022	N/D	145	80.8	3.6	5.87	6.99	1.37	590	26.7	17.5
8/8/2022	N/D	148	88.0	8.3	8.01	6.90	0.56	656	26.8	17.4
9/20/2022	N/D	98.8	59.3	23.9	< 0.8	6.85	0.25	450	26.2	17.9
10/10/2022	N/D	98.1	51.3	15.8	3.74	6.80	1.04	417	24.5	17.7
11/14/2022	N/D	100	63.8	16.3	9.08	6.86	N/D	418	22.0	17.8
12/5/2022	N/D	115	63.3	16.3	2.67	7.32	N/D	452	21.5	17.4
Average	**N/D**	**124.0**	**74.58**	**17.21**	**5.043**	**7.048**	**1.948**	**507.7**	**22.42**	**17.60**

Note: Hurricane Ian occurred on September 29, 2022 and Hurricane Nicole happened on November 10, 2022.

ND No Data.

Monthly Water Quality Data

Sample Location: WL15X

January - December 2022

Part 1

Date	Unionized Ammonia (mg/L)	Total Ammonia (mg/L)	TKN (mg/L)	Nitrite/ Nitrate (mg/L)	Total N (mg/L)	Ortho P (mg/L)	Total P (mg/L)	CBOD (mg/L)	TOC (mg/L)	TSS (mg/L)
1/10/2022	< 0.01	0.04	< 0.01	0.61	0.61	0.023	0.082	< 2	7.73	< 1
2/7/2022	< 0.01	0.03	< 0.01	0.61	0.61	0.059	0.072	< 2	7.08	< 1
3/9/2022	< 0.01	0.01	< 0.01	0.64	0.64	0.032	0.056	< 2	10.5	< 1
4/4/2022	< 0.01	0.06	< 0.01	0.58	0.58	0.019	0.072	< 2	8.85	< 1
5/2/2022	< 0.01	0.09	< 0.01	0.65	0.65	0.018	0.070	< 2	9.70	1.0
6/6/2022	< 0.01	0.09	< 0.01	0.65	0.65	0.033	0.044	< 2	10.5	< 1
7/11/2022	< 0.01	0.08	< 0.01	0.70	0.70	0.020	0.036	< 2	8.77	1.2
8/8/2022	< 0.01	0.05	< 0.01	0.77	0.77	0.014	0.031	< 2	9.25	< 1
9/20/2022	< 0.01	0.03	< 0.01	0.64	0.64	0.028	0.049	< 2	7.16	< 1
10/10/2022	< 0.01	0.02	< 0.01	0.51	0.51	0.013	< 0.030	< 2	7.88	< 1
11/14/2022	< 0.01	0.05	< 0.01	0.55	0.55	0.040	0.043	< 2	8.35	< 1
12/5/2022	< 0.01	0.04	< 0.01	0.81	0.81	0.146	0.122	< 2	7.69	< 1
Average	**< 0.01**	**0.049**	**< 0.01**	**0.643**	**0.643**	**0.0371**	**0.0577**	**< 2**	**8.622**	**< 1**

Note: Hurricane Ian occurred on September 29, 2022 and Hurricane Nicole happened on November 10, 2022.

ND No Data.

Monthly Water Quality Data

Sample Location: WL15X

January - December 2022

Part 2

Date	TDS (mg/L)	Alkalinity (mg/L)	Chloride (mg/L)	Sulfate (mg/L)	Chlorophyll a ($mg/m^{3)}$	pH (s.u.)	DO (mg/L)	Specific Conductivity (umhos)	Temp. (^{o}C)	Water Level (ft.)
1/10/2022	N/D	129	83.0	17.8	1.60	6.99	1.14	485	18.1	24.2
2/7/2022	N/D	132	81.3	26.7	1.60	7.17	2.93	481	16.7	24.2
3/9/2022	N/D	108	67.1	-2.0	2.14	7.26	2.30	472	23.6	24.7
4/4/2022	N/D	110	66.9	11.0	2.67	6.99	N/D	452	21.1	24.5
5/2/2022	N/D	128	81.1	11.7	2.14	7.08	0.92	563	24.3	24.2
6/6/2022	N/D	148	85.8	22.7	4.27	7.03	0.13	638	26.1	24.2
7/11/2022	N/D	132	80.7	18.1	3.74	7.03	0.51	593	28.0	24.4
8/8/2022	N/D	140	84.8	9.2	2.14	7.01	0.21	662	28.1	24.2
9/20/2022	N/D	103	58.4	12.8	< 0.8	6.97	0.64	586	26.8	24.6
10/10/2022	N/D	80.0	48.9	18.8	1.60	6.76	0.64	400	23.6	24.6
11/14/2022	N/D	102	61.6	10.4	< 0.8	6.92	N/D	420	21.7	24.7
12/5/2022	N/D	112	68.0	17.2	< 0.8	7.04	N/D	438	20.2	24.5
Average	**N/D**	**118.7**	**72.30**	**14.53**	**1.925**	**7.021**	**1.047**	**515.8**	**23.19**	**24.42**

Note: Hurricane Ian occurred on September 29, 2022 and Hurricane Nicole happened on November 10, 2022.

ND No Data.

Monthly Water Quality Data

Sample Location: HS9

January - December 2022

Part 1

Date	Unionized Ammonia (mg/L)	Total Ammonia (mg/L)	TKN (mg/L)	Nitrite/ Nitrate (mg/L)	Total N (mg/L)	Ortho P (mg/L)	Total P (mg/L)	CBOD (mg/L)	TOC (mg/L)	TSS (mg/L)
1/10/2022	< 0.01	0.26	0.02	0.80	0.82	0.061	0.099	< 2	7.64	1
2/8/2022	< 0.01	0.27	0.02	1.00	1.02	0.056	0.115	< 2	7.49	1.2
3/9/2022	< 0.01	0.09	0.01	0.93	0.94	0.032	0.065	< 2	7.84	1.6
4/5/2022	< 0.01	0.14	< 0.01	0.83	0.83	0.052	0.112	< 2	8.29	1
5/2/2022	< 0.01	0.06	0.04	0.71	0.75	0.034	0.124	< 2	8.87	2
6/6/2022	< 0.01	0.08	0.04	0.78	0.82	0.022	0.045	< 2	9.56	5.5
7/11/2022	< 0.01	0.06	0.03	0.64	0.67	0.012	< 0.030	2.2	8.59	5.7
8/8/2022	< 0.01	0.03	0.04	0.73	0.77	0.016	0.032	< 2	8.34	< 1
9/20/2022	< 0.01	0.02	0.02	0.68	0.7	0.007	< 0.030	< 2	7.45	1.4
10/10/2022	< 0.01	< 0.01	< 0.01	0.56	0.56	0.003	< 0.030	< 2	6.62	< 1
11/14/2022	< 0.01	0.04	0.09	0.60	0.69	0.005	< 0.030	< 2	7.76	< 1
12/5/2022	< 0.01	0.03	0.03	0.62	0.65	0.005	< 0.030	< 2	8.18	1.9
Average	**< 0.01**	**0.090**	**0.029**	**0.740**	**0.768**	**0.0254**	**0.0556**	**< 2**	**8.053**	**1.90**

Note: Hurricane Ian occurred on September 29, 2022 and Hurricane Nicole happened on November 10, 2022.

ND No Data.

Monthly Water Quality Data

Sample Location: HS9

January - December 2022

Part 2

Date	TDS (mg/L)	Alkalinity (mg/L)	Chloride (mg/L)	Sulfate (mg/L)	Chlorophyll a (mg/m$^{3)}$	pH (s.u.)	DO (mg/L)	Specific Conductivity (umhos)	Temp. (^{o}C)	Water Level (ft.)
1/10/2022	N/D	134	76.1	11.9	2.67	7.44	3.95	499	20.3	16.3
2/8/2022	N/D	134	80.7	24.4	2.67	7.60	5.38	477	16.3	16.3
3/9/2022	N/D	132	82.1	21.7	3.74	7.60	3.54	560	23.7	16.6
4/5/2022	N/D	120	73.3	13.1	3.74	7.50	N/D	509	23.8	16.8
5/2/2022	N/D	120	68.0	14.5	4.81	7.32	0.50	548	25.1	16.4
6/6/2022	N/D	119	82.9	11.8	2.14	7.57	1.75	603	28.8	16.5
7/11/2022	N/D	120	84.4	15.7	3.74	7.73	3.36	602	31.3	16.7
8/8/2022	N/D	131	82.1	21.8	1.07	7.63	2.89	660	31.3	16.4
9/20/2022	N/D	133	65.9	18.6	< 0.8	7.61	3.68	539	28.4	17.4
10/10/2022	N/D	98.4	50.0	17.8	2.14	7.84	6.99	394	26.0	17.3
11/14/2022	N/D	111	60.7	19.1	3.20	7.72	N/D	458	24.0	17.3
12/5/2022	N/D	112	61.0	17.5	5.34	8.17	N/D	448	23.2	16.5
Average	**N/D**	**122.033**	**72.27**	**17.33**	**1.103**	**7.644**	**3.560**	**524.8**	**25.18**	**16.71**

Note: Hurricane Ian occurred on September 29, 2022 and Hurricane Nicole happened on November 10, 2022.

ND No Data.

Monthly Water Quality Data

Sample Location: HS10

January - December 2022

Part 1

Date	Unionized Ammonia (mg/L)	Total Ammonia (mg/L)	TKN (mg/L)	Nitrite/ Nitrate (mg/L)	Total N (mg/L)	Ortho P (mg/L)	Total P (mg/L)	CBOD (mg/L)	TOC (mg/L)	TSS (mg/L)
1/10/2022	< 0.01	0.04	0.10	0.36	0.46	0.054	0.099	< 2	7.23	1.3
2/7/2022	< 0.01	0.02	0.16	0.59	0.75	0.056	0.112	2.1	7.04	< 1
3/9/2022	< 0.01	0.01	< 0.01	0.74	0.74	0.058	0.095	< 2	8.11	1.6
4/4/2022	< 0.01	0.01	< 0.01	0.71	0.71	0.02	0.042	< 2	7.63	1.3
5/2/2022	< 0.01	0.02	< 0.01	0.65	0.65	0.013	0.100	< 2	8.28	< 1
5/2/2022	< 0.01	0.03	< 0.01	0.55	0.55	0.015	0.074	< 2	8.66	< 1
6/6/2022	< 0.01	0.04	< 0.01	0.60	0.60	0.010	0.074	< 2	9.09	1.3
7/12/2022	< 0.01	0.03	< 0.01	0.60	0.60	0.015	< 0.030	< 2	8.45	< 1
8/9/2022	< 0.01	0.02	< 0.01	0.74	0.74	0.025	0.031	< 2	8.61	< 1
9/20/2022	< 0.01	0.01	< 0.01	0.70	0.70	0.016	0.044	< 2	7.78	2.3
10/11/2022	< 0.01	< 0.01	< 0.01	0.53	0.53	0.008	0.031	< 2	7.04	1.6
11/15/2022	< 0.01	0.04	< 0.01	0.54	0.54	0.010	0.030	< 2	7.32	< 1
12/6/2022	< 0.01	0.04	0.02	0.84	0.86	0.029	0.043	< 2	8.93	< 1
Average	**< 0.01**	**0.024**	**0.025**	**0.627**	**0.648**	**0.0253**	**0.0646**	**< 2**	**8.013**	**< 1**

Note: Hurricane Ian occurred on September 29, 2022 and Hurricane Nicole happened on November 10, 2022.

ND No Data.

Monthly Water Quality Data

Sample Location: HS10

January - December 2022

Part 2

Date	TDS (mg/L)	Alkalinity (mg/L)	Chloride (mg/L)	Sulfate (mg/L)	Chlorophyll a (mg/m$^{3)}$	pH (s.u.)	DO (mg/L)	Specific Conductivity (umhos)	Temp. (^{o}C)	Water Level (ft.)
1/10/2022	284	131	77.0	10.6	1.07	7.09	1.27	493	20.0	15.2
2/7/2022	338	136	79.5	22.0	1.07	7.04	1.37	467	16.1	15.2
3/9/2022	288	124	76.1	13.4	1.60	7.04	0.24	510	22.9	15.5
4/4/2022	280	119	71.7	9.9	1.07	6.97	2.52	492	22.8	15.9
5/2/2022	276	122	76.8	10.7	1.07	6.84	0.36	528	24.1	15.1
5/2/2022	304	125	77.3	10.9	< 0.8	6.85	0.37	528	24.1	15.1
6/6/2022	336	140	83.5	20.9	24.0	7.03	1.05	624	28.0	15.1
7/12/2022	318	134	81.4	12.0	< 0.8	7.04	0.35	609	28.9	15.5
8/9/2022	348	152	85.0	18.1	1.60	6.97	0.19	658	28.3	15.2
9/20/2022	288	127	65.0	18.4	< 0.8	7.00	0.18	531	27.2	16.5
10/11/2022	226	99.0	50.6	18.9	2.67	6.68	7.85	403	24.6	15.9
11/15/2022	224	108	62.5	16.0	< 0.8	6.81	N/D	438	22.5	16.3
12/6/2022	256	117	62.7	16.0	< 0.8	6.83	N/D	440	20.4	15.5
Average	**289.7**	**125.7**	**73.01**	**15.22**	**1.103**	**6.938**	**1.432**	**517.0**	**23.84**	**15.54**

Note: Hurricane Ian occurred on September 29, 2022 and Hurricane Nicole happened on November 10, 2022.

ND No Data.

Appendix D

Water Quality and Performance Data

Un-Named Ditch

Calendar Year 2022

Index:
ND: Not Documented
NS: Not Sampled
[J] FDEP Analysis Code: J Code

Quarterly Water Quality Data

Un-Named Ditch - Near Downstream

January - December 2022

Date	TKN (mg/L)	Nitrite/ Nitrate (mg/L)	Total N (mg/L)	Total P (mg/L)	Chlorophyll a (mg/m^3)	pH (s.u.)	DO (mg/L)	Specific Conductivity (umhos)	Temp. (^oC)	Water Depth (ft.)	Secchi Disk Depth (ft.)
2/21/2022	0.51	0.070	0.580	0.042	< 0.80	7.31	5.93	499	17.7	18.5	18.5
2/21/2022	0.50	0.070	0.570	0.076	1.60	7.31	5.88	501	17.7	N/D	N/D
5/9/2022	0.55	< 0.01	0.550	0.130	< 0.80	7.2	4.53	550	24.8	16.5	16.5
8/15/2022	0.70	< 0.01	0.700	< 0.03	1.60	7.25	3.78	644	26.9	23	23
8/15/2022	0.67	< 0.01	0.670	< 0.03	1.60	7.25	3.84	644	26.9	23	23
11/7/2022	1.50	< 0.01	1.500	0.088	9.08	6.62	0.9	245	23.1	56	18
Average	**0.738**	**0.027**	**0.762**	**0.0610**	**2.447**	**7.15667**	**4.143**	**513.8**	**22.85**	**27.40**	**19.80**

Note: Hurricane Ian occurred on September 29, 2022 and Hurricane Nicole happened on November 10, 2022.

ND No Data.

Quarterly Water Quality Data

Un-Named Ditch - Far Downstream

January - December 2022

Date	TKN (mg/L)	Nitrite/ Nitrate (mg/L)	Total N (mg/L)	Total P (mg/L)	Chlorophyll a ($mg/m^{3)}$	pH (s.u.)	DO (mg/L)	Specific Conductivity (umhos)	Temp. (^{o}C)	Water Depth (ft.)	Secchi Disk Depth (ft.)
2/21/2022	0.49	0.070	0.560	0.039	1.07	7.39	6.93	481	17.9	29	29
5/9/2022	0.60	< 0.01	0.600	0.045	< 0.80	7.29	4.33	546	24.8	19	19
5/9/2022	0.55	< 0.01	0.550	0.037	1.07	7.29	4.29	545	24.8	19	19
8/15/2022	0.68	< 0.01	0.680	< 0.03	1.07	7.33	4.61	634	27	20	20
11/7/2022	1.61	< 0.01	1.610	0.255	6.94	6.69	0.2	366	25	91	17
11/7/2022	1.43	< 0.01	1.430	0.270	8.01	6.69	0.2	366	25.1	91	17
Average	**0.893**	**0.016**	**0.905**	**0.1102**	**3.093**	**7.11333**	**3.427**	**489.7**	**24.10**	**44.83**	**20.17**

Note: Hurricane Ian occurred on September 29, 2022 and Hurricane Nicole happened on November 10, 2022.

ND No Data.

Quarterly Water Quality Data

Un-Named Ditch - Upstream

January - December 2022

Date	TKN (mg/L)	Nitrite/ Nitrate (mg/L)	Total N (mg/L)	Total P (mg/L)	Chlorophyll a ($mg/m^{3)}$	pH (s.u.)	DO (mg/L)	Specific Conductivity (umhos)	Temp. (^{o}C)	Water Depth (ft.)	Secchi Disk Depth (ft.)
2/21/2022	0.74	< 0.01	0.740	0.090	7.48	7.22	2.12	561	16.6	12	12
5/9/2022	1.01	< 0.01	1.010	0.065	2.67	7.23	0.45	561	22.7	9	9
8/15/2022	0.99	< 0.01	0.990	0.047	2.67	7.15	0.51	557	25.1	10.3	10.3
11/7/2022	1.65	0.070	1.720	0.120	9.08	7.01	0.18	640	23.8	8.5	8.5
Average	**1.098**	**0.021**	**1.115**	**0.0805**	**5.48**	**7.1525**	**0.815**	**579.8**	**22.05**	**9.95**	**9.95**

Note: Hurricane Ian occurred on September 29, 2022 and Hurricane Nicole happened on November 10, 2022.

ND No Data.

Appendix E

Comprehensive Monitoring Data:

Semiannual Metals,
Organochlorine Pesticides, PCBs, and
Volatile Organic Compounds (VOCs)

Orlando Easterly Wetlands

Calendar Year 2022

Index:
NA: Not Analyzed
[J] FDEP Analysis Code: J Code

ORLANDO EASTERLY WETLANDS

Semi-Annual Metals Analysis

January - December 2022

		Monitoring Location									
ANALYTICAL METHOD	Constituent (ug/L)	WP-1 (Influent)		WL-11X		WL-15X		HS-9		HS-10 (Outfall D002)	
		5/10/2022	11/8/2022	5/10/2022	11/8/2022	5/10/2022	11/8/2022	5/10/2022	11/8/2022	5/10/2022	11/8/2022
ICP	Aluminum (Al)	< 50	< 50	< 50	< 50	< 50	< 50	< 50	< 50	< 50	< 50
	Arsenic (As)	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
	Barium (Ba)	9.8	8.6	10.1	9.6	8.9	10.5	8.5	9.5	9	10
	Boron (B)	192	165	179	146	185	150	168.5	134	174	138
	Calcium (Ca)	40.6	36.7	41.2	40.4	41.2	41.6	34.9	41.7	37.1	42.5
	Chromium (Cr)	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
	Iron (Fe)	38.9	37.8	29	< 15	21.1	< 15	< 15	< 15	< 15	< 15
	Magnesium (Mg)	8.31	6.33	8.39	6.940	8.440	6.84	7.68	6.48	8.01	6.73
	Manganese (Mn)	1.6	1.8	2.8	3.0	< 1.5	4.4	4.9	2.8	2.0	2.6
	Nickel (Ni)	8.8	6.7	10.6	7.0	7.0	7.5	3.3	5.9	5.5	7.3
	Seleniium (Se)	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
	Zinc (Zn)	32.2	27.8	8.0	< 5	< 5	< 5	< 5	< 5	< 5	< 5
	Hardness (mg/L)	136	118	137.00	129.000	138.000	132	119	131	126.00	134.00

Note: ND No Data

< Less than the Method Detection Limit (MDL)

ORLANDO EASTERLY WETLANDS

Semi-Annual Metals Analysis

January - December 2022

		Monitoring Location									
ANALYTICAL METHOD	Constituent (ug/L)	WP-1 (Influent)		WL-11X		WL-15X		HS-9		HS-10 (Outfall D002)	
		5/10/2022	11/8/2022	5/10/2022	11/8/2022	5/10/2022	11/8/2022	5/10/2022	11/8/2022	5/10/2022	11/8/2022
AA Graphite Furnace	Antimony (Sb)	< 2.5	< 2.5	< 2.5	< 2.5	< 2.5	< 2.5	< 2.5	< 2.5	< 2.5	< 2.5
	Beryllium (Be)	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	0.106	< 0.1	< 0.1	< 0.1	< 0.1
	Cadmium (Cd)	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
	Copper (Cu)	1.42	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
	Lead (Pb)	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
	Silver (Ag)	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
	Thallium (Tl)	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Cold Vapor											
	Mercury (Hg)	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2

Note: ND No Data

< Less than the Method Detection Limit (MDL)

ORLANDO EASTERLY WETLANDS

Organochlorine Pesticides and PCBs

January - December 2022

		Monitoring Location									
ANALYTICAL METHOD	Constituent (ug/L)	WP-1 (Influent)		WL-11X		WL-15X		HS-9		HS-10 (Outfall D002)	
		3/14/2022	9/6/2022	3/14/2022	9/6/2022	3/14/2022	9/6/2022	3/14/2022	9/6/2022	3/14/2022	9/6/2022
EPA Method 608.3	Aldrin	<0.024	<0.05	<0.024	<0.05	<0.025	<0.05	<0.024	<0.05	<0.026	<0.05
	alpha-BHC	<0.024	<0.05	<0.024	<0.05	<0.025	<0.05	<0.024	<0.05	<0.026	<0.05
	beta-BHC	<0.024	<0.05	<0.024	<0.05	<0.025	<0.05	<0.024	<0.05	<0.026	<0.05
	Chlordane	<0.24	<0.5	<0.24	<0.5	<0.25	<0.5	<0.24	<0.5	<0.26	<0.5
	4,4'-DDD	<0.024	<0.05	<0.024	<0.05	<0.025	<0.05	<0.024	<0.05	<0.026	<0.05
	4,4'-DDE	<0.024	<0.05	<0.024	<0.05	<0.025	<0.05	<0.024	<0.05	<0.026	<0.05
	4,4'-DDT	<0.024	<0.05	<0.024	<0.05	<0.025	<0.05	<0.024	<0.05	<0.026	<0.05
	DCB Decachlorobiphenyl (%)	18	73	14	75	29	81	22	85	28	88
	delta-BHC	<0.024	<0.05	<0.024	<0.05	<0.025	<0.05	<0.024	<0.05	<0.026	<0.05
	Dieldrin	<0.024	<0.05	<0.024	<0.05	<0.025	<0.05	<0.024	<0.05	<0.026	<0.05
	Endosulfan1	<0.024	<0.05	<0.024	<0.05	<0.025	<0.05	<0.024	<0.05	<0.026	<0.05
	Endosulfan II	<0.024	<0.05	<0.024	<0.05	<0.025	<0.05	<0.024	<0.05	<0.026	<0.05
	Endosulfan sulfate	<0.024	<0.05	<0.024	<0.05	<0.025	<0.05	<0.024	<0.05	<0.026	<0.05
	Endrin	<0.024	<0.05	<0.024	<0.05	<0.025	<0.05	<0.024	<0.05	<0.026	<0.05
	Endrin aldehyde	<0.024	<0.05	<0.024	<0.05	<0.025	<0.05	<0.024	<0.05	<0.026	<0.05
	gamma-BHC (Lindane)	<0.024	<0.05	<0.024	<0.05	<0.025	<0.05	<0.024	<0.05	<0.026	<0.05
	Heptachlor	<0.024	<0.05	<0.024	<0.05	<0.025	<0.05	<0.024	<0.05	<0.026	<0.05
	Heptachlor epoxide	<0.024	<0.05	<0.024	<0.05	<0.025	<0.05	<0.024	<0.05	<0.026	<0.05
	Methoxychlor	<0.024	<0.05	<0.024	<0.05	<0.025	<0.05	<0.024	<0.05	<0.026	<0.05
	Tetrachloro-m-xylene (%)	60	54	53	56	55	54	53	64	58	58
	Toxaphene	<2.4	<5	<2.4	<5	<2.5	<5	<2.4	<5	<2.6	<5

Note: ND No Data

< Less than the Method Detection Limit (MDL)

ORLANDO EASTERLY WETLANDS

Organochlorine Pesticides and PCBs

January - December 2022

		Monitoring Location									
ANALYTICAL METHOD	Constituent (ug/L)	WP-1 (Influent)		WL-11X		WL-15X		HS-9		HS-10 (Outfall D002)	
		3/14/2022	9/6/2022	3/14/2022	9/6/2022	3/14/2022	9/6/2022	3/14/2022	9/6/2022	3/14/2022	9/6/2022
EPA Method 608.3	PCB-1016	<0.48	<1	<0.48	<1	<0.5	<1	<0.48	<1	<0.51	<1
	PCB-1221	<0.48	<1	<0.48	<1	<0.5	<1	<0.48	<1	<0.51	<1
	PCB-1232	<0.48	<1	<0.48	<1	<0.5	<1	<0.48	<1	<0.51	<1
	PCB-1242	<0.48	<1	<0.48	<1	<0.5	<1	<0.48	<1	<0.51	<1
	PCB-1248	<0.48	<1	<0.48	<1	<0.5	<1	<0.48	<1	<0.51	<1
	PCB-1254	<0.48	<1	<0.48	<1	<0.5	<1	<0.48	<1	<0.51	<1
	PCB-1260	<0.48	<1	<0.48	<1	<0.5	<1	<0.48	<1	<0.51	<1
	PCB-1262	<0.48	<1	<0.48	<1	<0.5	<1	<0.48	<1	<0.51	<1
	PCB-1268	<0.48	<1	<0.48	<1	<0.5	<1	<0.48	<1	<0.51	<1

Note: ND No Data

< Less than the Method Detection Limit (MDL)

ORLANDO EASTERLY WETLANDS

Volatile Organic Compounds (VOCs)

January - December 2022

ANALYTICAL METHOD	Constituent (ug/L)	Monitoring Location									
		WP-1 (Influent)		WL-11X		WL-15X		HS-9		HS-10 (Outfall D002)	
		3/14/2022	9/6/2022	3/14/2022	9/6/2022	3/14/2022	9/6/2022	3/14/2022	9/6/2022	3/14/2022	9/6/2022
EPA Method 624.1	1,1,1-Trichloroethane	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
	1,1,2,2 Tetrachloroethane	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
	1,1,2 Trichloroethane	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
	1,1 Dichloroethane	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
	1,1 Dichloroethene	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
	1,2 Dichlorobenzene	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
	1,2 Dichloroethane	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
	1,2 Dichloropropane	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
	1,3 Dichlorobenzene	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
	1,4 Di-chlorobenzene	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
	4 Bromofluorobenzene	101	98	103	99	101	97	99	102	103	101
	Benzene	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
	Bromoform	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
	Carbon Tetrachloride	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
	Chlorobenzene	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
	Chlorodibromomethane	2.4	3	<1	<1	<1	<1	<1	<1	<1	<1
	Chloroethane	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
	Chloroform	87	120	<1	<1	<1	<1	<1	<1	<1	<1
	Chloromethane	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
	cis-1,2 Dichloroethene	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
	cis-1,3 Dichloropropene	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2

Note: ND - No Data

< Less than the Method Detection Limit (MDL)

ORLANDO EASTERLY WETLANDS

Volatile Organic Compounds (VOCs)

January - December 2022

		Monitoring Location									
ANALYTICAL METHOD	Constituent (ug/L)	WP-1 (Influent)		WL-11X		WL-15X		HS-9		HS-10 (Outfall D002)	
		3/14/2022	9/6/2022	3/14/2022	9/6/2022	3/14/2022	9/6/2022	3/14/2022	9/6/2022	3/14/2022	9/6/2022
EPA Method 624.1	Dibromofluoromethane	102	101	104	102	103	101	106	94	105	101
	Dichlorobromomethane	21	26	<1	<1	<1	<1	<1	<1	<1	<1
	Dichlorodifluoromethane	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
	Ethylbenzene	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
	Methyl tert-butyl ether	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
	Methylene Chloride	<8.4	<8.4	<8.4	<8.4	<8.4	<8.4	<8.4	<8.4	<8.4	<8.4
	m-Xylene & p-Xylene	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
	Naphthalene	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
	0-Xylene	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
	Tetrachloroethene	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
	Toluene	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
	Toluene-d8	103	98	103	98	103	99	102	100	102	98
	trans-1,2-Dichloroethene	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
	trans-1,3-Dichloropropene	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
	Trichloroethene	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
	Vinyl Chlorida	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
	Xylenes, Total	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4

Note: ND - No Data

< Less than the Method Detection Limit (MDL)